Initial Environmental Examination

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Armenia: Armenia-Georgia Border Regional Road (M6 Vanadzor-Bagratashen) Improvement Project

M6 Road Improvement

Prepared by the Ministry of Territorial Administration and Infrastructure for the Asian Development Bank

CURRENCY EQUIVALENTS

(as of 12 May 2025)

Currency unit	-	Armenian Dram (AMD)
AMD1.00	=	$0.002567
$1.00	=	AMD 389.5

ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	Affected Person
CSC	-	Construction Supervision Consultant
DEO	-	Deputy Environmental Officer (of the contractor)
EARF	-	Environmental Assessment and Review Framework
EIA	-	Environmental Impact Assessment
EO	-	Environmental Officer (of the contractor)
ESR	-	Environmental Scoping Report
EMP	-	Environmental Management Plan
GOST	-	Gosudarstvennyy Standart
GRG	-	Grievance Review Group
GRM	-	Grievance Redress Mechanism
HSO	-	Health and Safety Officer
IA	-	Impact Assessment
IEE	-	Initial Environmental Examination
LARP	-	Land Acquisition and Resettlement Plan
MOE	-	Ministry of Environment
MTAI	-	Ministry of Territorial Administration and Infrastructure
NGO	-	Non-Governmental Organisation
PPE	-	Personal Protective Equipment
RA	-	Republic of Armenia
RDF	-	“Road Department” Fund (the Client)
REA	-	Rapid Environmental Assessment
RSA	-	Road Safety Assessment
SEMP	-	Site-Specific Environmental Management Plan
SNCO	-	State Non-Commercial Organization
SPS	-	Safeguard Policy Statement
SQEP	-	Suitably Qualified and Experienced People
TBD	-	To be determined
TLV	-	Threshold Limit Value (TLV)
TOR	-	Terms of Reference
UN	-	United Nations
UNCEC	-	United Nations Economic Commission for Europe
WBG	-	World Bank Group

WEIGHTS AND MEASURES

dB(A)	-	A-weighted decibel
ha	-	hectare
km	-	kilometer
km^2	-	square kilometer
Leq	-	equivalent continuous noise level
µg	-	microgram
m	-	meter
m^2	-	square meter
PM	-	particulate matter of 2.5 micron or 10 micron size

NOTES

(i) The fiscal year (FY) of the Government of Armenia and its agencies begins on 1 January and ends on 31 December. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2023 begins on 1 January 2023 and ends on 31 December 2023.

(ii) In this report, "$" refers to United States dollars unless otherwise stated.

(iii) Dates are written in the format dd.mm.yyyy

(iv) All measurements are expressed in the International System of Units, unless otherwise stated.

(v) The English language version of this report is considered as the original and prevails over the Armenian language translation.

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EXECUTIVE SUMMARY

1. This an initial environmental examination (IEE) prepared for the rehabilitation of M6 Road between km 31+700 and km 90+191, which forms part of the rehabilitation of the Armenia-Georgia Border Regional Road (M6, Vanadzor-Bagratashen) Improvement Project, for which the Republic of Armenia has received a loan from the Asian Development Bank. A matter of policy of the Bank requires that all projects supported and funded by the ADB must comply with the requirements of the Safeguard Policy Statement (SPS, 2009).

2. The Ministry of Territorial Administration and Infrastructure of Armenia (MTAI) has the overall responsible for implementation of the Project and has delegated implementation functions to the Road Department Fund (RDF). The construction duration is estimated as 30 months. RDF will be responsible for day-to-day management of the Project, including implementation of requisite safeguards measures.

3. This IEE has been prepared by JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH ("BERNARD – ACTES") on behalf of RDF in accordance with ADB's Safeguard Policy Statement 2009 (SPS 2009). The IEE was carried out based on review of the site and site inspections, technical feasibility reports, collection and review of secondary data, field surveys/investigations and consultations, analysis of data, and preparation of reports.

4. **Project Area and Components.** The majority of the road from km 31+700 to km 76+800 and km 82+300 to km 90+191 is in the Lori marz, which is in the north of Armenia bordering Georgia. The provincial capital is Vanadzor, and other towns include Stepanavan, Alaverdi, and Spitak. The section km 76+800 to km 82+300 is in the Tavush marz, which is in the north-east of Armenia and borders Azerbaijan and Georgia. The provincial capital of Tavush is Ijevan, and other towns include Dilijan, Berd, Noyemberyan and Ayrum. The region is prone to earthquakes and landslides.

5. The civil works of the M6 road rehabilitation were completed in spring of 2023, but from 24 to 26 May 2024, an active cyclone from the Mediterranean brought intense rainfall across Armenia and this continuous heavy rainfall caused the Debed and Aghstev rivers to overflow and flood nearby communities, damaging social infrastructure, bridges, and the major highways of the M6 and M4. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km, with the three general sections being: km 31+675 – km 39+350 (around Tumanyan); km 55+950 – km 67+620 (north of Alaverdi towards Akhtala); km 84+570 – km 85+200 (north of Ayrum towards the border with Georgia). Further significant damage was recorded between km 71 and km 72 (Shnogh) as well as at km 76+300 (Shinih).

6. For improvement of the M6 road, a detailed hydrological model study of the Debed River has been conducted and "build back better" options are being considered. An outcome of this study was the determination that the 2024 flood was a 1 in 180-year event. The works to rehabilitate and upgrade the road include (i) protection of the riverbank to secure the road and prevent further erosion; (ii) prevention of flooding of road sections; (iii) repair of bridges, in particular piers which have been subjected to scour; (iv) new construction of the deck of the bridge at km 56+540; (v) clearing and repair of minor culverts and drainage channels; (vi) securing of road sections which are prone to rockfall; (vii) improvement of road safety through the construction of safety barriers, pavement markings, rumble strips and signs.

7. **Categorization and Legal Framework.** The legal framework in Armenia embraces more than 30 laws and more than 100 supportive legal regulations to protect the environment. The national policies and legislative regulatory framework containing regulations to a greater or lesser extent applicable to the road construction sector, as well as their practical implementation, were studied as part of screening. The principle applicable laws and regulations, applicable legal obligations related to environmental and social protection and the Impact Assessment (IA) process as required by Armenia are set out within the IEE under the following areas: ADB Safeguard Policy Statement (2009), RA legislation on Environment, RA legislation on OHS.

8. The assessment and implementation of the Project will be governed by laws, regulations, and standards for environmental assessment and management of Armenia. The environment protection and environmental assessment process in Armenia is governed by the Law on Environmental Impact Assessment and Expertise (new addition dated by 03.05.23 ՀՕ-150-Ն) which requires evaluation of projects on their environmental impacts,).

9. Under ADB's SPS the Project is classified as Category B because the potential adverse environmental impacts are generally site-specific, few if any of them are irreversible, and mitigation measures can be designed readily.

10. **Description of the Environment.** The environmental setting for the Project in terms of the surrounding physical and biological features is described within the IEE including social and economic conditions, livelihoods and quality of life. The project area for the biological environment and landscape resources with a focus on the affected 30 sections was assessed in September 2025. Data was collected at points of interest or sensitive areas.

As a result of the conducted air quality research, exceeding the permissible values of inorganic dust was observed exceeded the permissible limit concentration up to 4.5. At mobile passive sampling observatories, weekly average SO_4 TLV exceedances were observed with a maximum of 2.3 times.

Information on exceedances of permissible values of water quality parameters is provided in the Hydrology section, in particular in "Table 12: Summary of surface water quality monitoring from Hydrometeorology and Monitoring Center".

According to RA Government Resolution N 92-Ն, the soil contamination was recorded by copper and arsenic contamination. However, according to Order N 01-N of the Minister of Health, the maximum permissible concentrations for the following elements were exceeded: S, Cr, Mn, Ni, Cu, Zn, As, and Pb. Further details on soil contamination are presented in the Soils section and in particular in "Table 13: Summary of soil quality survey results".

Short sections of road are affected by rockfall and this is a topic of the detailed design for rehabilitation. There are 29 moderately to severely affected sections; 25 minor sections.

11. "Dsegh" Important Bird Area is located in Lori marz with its boundary on the east side of the M6, but it will not intersect with the planned embankment works. In Lori marz also located one of the candidates to Emerald sites, "Lori lakes" area, about 1596,4 ha. The shortest distance from the site to the start of the M6 highway (the city of Vanadzor) is 23.5 km, and to the start point of work on this highway, it is 30 km. A significant section of the M6 highway runs along the boundary of the potential "Debed Gorge" site. The main ecosystems of this potential site are oak and beech forests and open forests, and the primary focus is the conservation of numerous bird species listed

in Resolution 6 of the Bern Convention[1].

12. **Impacts and Mitigations.** It is expected that the Project will provide overall and long term positive environmental and social impacts, ultimately contributing to improved traffic safety and increased social and economic benefits of the nearby communities.

13. During construction, major anticipated impacts from project activities include (i) increased congestion, economic impacts, and reduced accessibility for businesses and residents of communities in the region due to lane restrictions as part of traffic management schemes; (ii) affect of vibration on nearby buildings; (iii) pollution of water due to construction work and materials used, work in or close to the river, wastewater and accidental spills; (iv) workers' health and safety during construction due to work on a trafficked road and close to or in the river; and (v) disturbance due to noise. Overall, construction-related impacts are localized, short-term, and can be effectively mitigated through the application of good construction and housekeeping practices and implementation of construction phase community and occupational health and safety plans as defined in the EMP.

14. Transport of commercially sourced construction materials will create continuous dust, noise, and traffic safety concerns throughout the construction. Additionally, there will be trucks carrying gravel, cement, diesel, oil, other, and waste supplies, and vehicles transporting personnel. Construction works are accompanied by the risk of improper waste disposal and deposition of hazardous materials / construction wastes. The IEE and Project documentation identifies these risks and issues and proposes mitigations and specific responsibilities on key Project duty holders to address these risks.

15. **Consultation and Information Disclosure.** Stakeholders have been identified and their needs recognized, their area of interest and the appropriate engagement mechanism has been identified. Within the framework of environmental engagement and due diligence, information disclosure and public consultations meetings were held in Alaverdi, Ayrum and Tumanyan communities on 09.12.2025, these convened and managed by RDF and the Consultant, and attended by community leaders, community residents, and the village administration head and his employees. A total of 51 persons participated. Issues were raised the details of which are contained within the IEE and supporting documentation as well as the recorded position and where appropriate go forward actions. The project will establish and maintain a project-specific grievance redress mechanism (GRM) to address public complaints related to project activities during project implementation and operation. Consultation and participation will continue throughout project implementation and any environmental complaints or disputes will be handled in accordance with the GRM.

16. **Environmental Management Plan.** An EMP has been developed for the design and pre-construction, construction, and operation phases of the project. The EMP sets out (i) actions to implement mitigation measures; (ii) entities responsible for the implementation; (iii) a monitoring and reporting program; (iv) institutional/organizational arrangements; and (v) cost estimates.

[1] Currently, the Emerald ecological network effectively does not exist. Firstly, the current law "On Specially Protected Natural Areas" does not include the concept of "ecological network." A new version of the law is currently being considered by the Armenian Parliament, and this concept will be included in it. Secondly, potential Emerald network sites were submitted to the Bern Convention Secretariat as part of the research programs, but they have not yet been approved by the government. The scope and location of the potential sites are currently being reviewed by the Armenian Ministry of Environment.

17. The EMP identifies sensitive receptors and provides necessary measures to reduce impacts during rehabilitation and operation. The final EMP will be included as a separate annex in all bidding documents. The Contractor will be made aware of its obligations to implement the EMP, to budget EMP implementation costs in their bids, and to develop a Site-Specific EMP fully responsive to the project EMP. The SEMP is to include all mitigation measures and monitoring requirements to be carried by the Contractor.

18. The RDF will be responsible for ensuring environmental supervision of the implementation of the EMP. The RDF will be supported by a Construction Supervision Consultant that will directly supervise the implementation of the SEMP by the Contractor. The Contractor will be required to have permanent staff on site with responsibility for environmental management, health and safety, and social safeguards, reporting to the CSC and government counterparts.

19. An environmental monitoring program will be conducted in pre-construction, construction and post-construction phases. Environmental monitoring includes the monitoring of physical and ecological parameters, as well as ensuring the compliance of the Contractor with the SEMP.

20. **Conclusion and Recommendations.** No particular difficulties were encountered by the Consultant in compiling the IEE. The Project construction is restricted to areas along the existing road, specifically towards the river-side for embankment repair and protection works, and the mountain-side for rockfall protection work. The impacts from construction and operation will be manageable and no significant or unmanageable impacts are predicted because all the mitigation measures in the EMP will be included in the contract documents and will be implemented thoroughly. RDF shall ensure that the EMP is included in the contract documents, and the EMP provisions are implemented and monitored to their full extent.

I. INTRODUCTION

A. Project background

21. The Republic of Armenia (RA) has received a EUR 41.39 million, USD 46 million (approx. equivalent) loan from the Asian Development Bank (ADB) to finance rehabilitation of the Armenia-Georgia Border Regional Road (M6, Vanadzor-Bagratashen) improvement project.

Figure 1: Overview map of road network with project area marked (Source: ADB)

22. The Ministry of Territorial Administration and Infrastructure of Armenia (MTAI) has the overall responsibility for implementation of the Project and has delegated implementation functions to the Road Department Fund (RDF).

23. The Road Department Fund ("RDF") has signed Contract No. ADB/M6/CS/QCBS/03 with the JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH ("BERNARD – ACTES") for provision of consultancy services for Armenia-Georgia Border regional Road (M6 Vanadzor – Bagratashen) Improvement Project. This contract was initially for preparation of detailed designs for the rehabilitation of the M6 road, and later an amended to include field assessments and surveys as well as detail design and preparation of bidding documents for the M6 road refurbishment.

24. BERNARD – ACTES has associated with subconsultants Transproject CJSC and MC Mobility Consultants GmbH to carry out the assignment.

25. The civil works to rehabilitate the M6 highway were completed in spring of 2023, but from 24 to 26 May 2024, an active cyclone from the Mediterranean brought intense rainfall across Armenia and this continuous heavy rainfall caused the Debed and Aghstev rivers to overflow and flood nearby communities, damaging social infrastructure, bridges, and the major highways of the M6 and M4. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km.

26. The RA intends to apply the unutilized part of the loan proceeds for preparation of detailed designs for rehabilitation/reconstruction of the M6 road sections already damaged by the flood, as well as for improvement of those prone to possible future flooding.

B. Aim and scope of this report

27. As part of the project screening activities a Rapid Environmental Assessment (REA) Checklist has been prepared. It is included in the IEE as Appendix A. Within the Project Categorization Proposal, the rapid assessment of the Project concluded a category 'B'. The social and ecological condition of the project area proposed works such as rehabilitation activities and indicated possible impacts were considered. Although works sites along the road are generally in low population areas it is expected that the project will have some limited land acquisition and resettlement (LAR) impacts. No physical resettlement is anticipated. Impacts due to the works and can be avoided or at least minimized by defining effective mitigation measures within the EMP.

28. The Project categorization as 'B' results in the requirement of an initial environmental examination (IEE). If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

29. This IEE is part of the process of compliance with the ADB Safeguard Policy Statement (2009). it reviews the existing environmental and engineering documentation prepared to date; reports on visits to the project site to inspect the existing condition and status of the project site; provides a verification that the design complies with international standards and best practice, especially the environmental requirements, and proposes improvement measures where appropriate.

30. An Environmental Management Plan (EMP) has been prepared for the project. The EMPs are included as part of this IEE and include (i) mitigation measures for potential environmental impacts during the design, construction and operation phases of implementation, (ii) an environmental monitoring program, and (iii) identification of the responsible entities for mitigation, monitoring, and

reporting.

31. Mitigation will be assured by a program of environmental monitoring to be conducted during the construction stages. The environmental monitoring program will ensure that all mitigation measures proposed in the EMPs are implemented and will determine whether the environment is protected as intended. Any requirements for remedial action will be reported to the ADB.

32. Project stakeholders were consulted during preparation of the IEE and invited to express any environmental and social concerns they had regarding the project. No significant environmental and social concerns were raised, and all stakeholders consulted strongly support the project and are looking forward to the benefits of the improved road. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and RDF websites in both English and Armenian. The consultation process will be continued during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Background

33. The legal framework in Armenia embraces more than 30 laws and more than 100 supportive legal regulations to protect the environment. The national policies and legislative regulatory framework containing regulations to a greater or lesser extent applicable to the road construction sector, as well as their practical implementation, were studied as part of screening. The principle applicable laws and regulations, applicable legal obligations related to environmental and social protection and the Impact Assessment (IA) process as required by Armenia are set out in subchapters C and D:

B. ADB Safeguard Policy Statement (2009)

34. The present study has been undertaken in accordance with the ADB Safeguard Policy Statement (SPS) (2009). Internationally recognized standards and guidelines have been applied where local standards were not available. This includes World Bank Group (WB) Environmental, Health, and Safety General Guidelines (2007).

35. A matter of policy the Bank requires that all projects supported and to be funded by the ADB must comply with the requirements of the SPS that describes common objectives of ADB's safeguards, lays out policy principles, and outlines the delivery process for ADB's safeguard policy. In particular the Environmental Safeguard Policy Principles are to be applied.[2]

36. The SPS sets the requirements of IAs for all projects supported by the ADB. An Impact Assessment Report is required for all environment category "A" and "B" projects. The level of detail and comprehensiveness of the Impact Assessment Report is directly related with the significance of potential impacts and risks to the environment. One of the main Policy Principles is to use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.

C. RA legislation on Environment

37. Environment: Laws and codes

- The Law on Environmental Impact Assessment and Expertise (new addition dated by 03.05.23 ՀՕ-150-Ն) requires evaluation of projects on their environmental impacts, screening and categorisation according to activity type, expert examination of evaluation reports and issue of expert examination conclusion. This Law serves as a framework for the Ministry of Environment (MOE) to grant approval of various development projects in the country. In accordance with Chapter 3 Article 12, the categories of the economic activities subject of EIA[3] and Expertise for any activity or

[2] ADB SAFEGUARD POLICY STATEMENT (2009) A. Overarching Statement on ADB's Commitment and Policy Principles, page 14, 1. Environmental Safeguards, Policy Principles, page 16.
[3] Armenian legislation doesn't differentiate the terms of impact assessment for the project environmental categories both A and B categories require an EIA, while the ADB SPS (2009) foresees the Environmental Impact Assessment for A category and Initial Environmental Examination (IEE) for B category projects.

project included in the specified lists shall undergo environmental impact assessment on the design stage prior to their implementation, and only after MOE approval is issued project activities may start, and project implemented. Furthermore, the Chapter 4 Procedures and requirements to the Environmental Impact Assessment and Expertise process, as well as Chapter 7 Procedures and requirements to the public notification and meetings, are applicable.

- The Law on Wastes (2004) regulates the collection, transportation, storage, treatment, recycling and disposal of the wastes including construction-related ones.
- The Law on Environmental Oversight (2005) regulates the organization and enforcement of the oversight over the implementation of environmental legislation of the Republic of Armenia.
- The Law on Organization and Implementation of Inspections in Armenia (2014) regulates the procedures on performance of inspections over the economic activities.
- The Law on Atmospheric Air Pollution (1994) regulates the emission permits and provides maximum allowed loads/concentrations for atmospheric air pollution etc.
- The Water Code (2002) provides the legal basis for the protection of the country's water resources, and for the effective management of water resources and safeguarding the protection for future generations. The following regulations and procedures of the Water Code (2002) are relevant: (a) water use permitting procedures, (b) environmental flows, (c) drainage water, (g) reservation of underground water sources, and (i) public awareness and publicity of the documents developed by WRMA and other normative documents which provide guidelines directly linked with water and environmental issues.
- The Law on Flora (1999) and the Law on Fauna (2000) outline the national policies for the conservation, protection, use, regeneration, and management of natural populations of plants and animals, and for regulating the impact of human activities on biodiversity. The laws provide for assessing and monitoring the species, especially rare and endangered species.
- The Law on the Preservation and Use of Historical and Cultural Immovable Monuments and Protection of Historical Areas (11.11.1998).
- The RA Law on Special Protected natural areas (2006), provide the state policy and legal basis of proper development, restoration, protection, reproduction and use of specially protected natural areas of the Republic of Armenia as ecosystems, natural complexes and individual objects of environmental, economic, social, scientific, educational, historical-cultural, aesthetic, health, recreational value.

38. Environment: Other legal acts

- RA Government Decree N 1325-Ն "On the procedures of information disclosure and public consultations" (19.11.2014)
- RA Government Decree N 121-Ն "On the procedures of treatment, utilization, storage,

transportation and disposal of hazardous waste in RA" provides for regulations on handling hazardous waste generated in Armenia including those in urban development sector (2003)

- RA Government Decree N 1404-Ն "On the determination of topsoil stripping norms and on the requirements to the topsoil preservation and utilization and on recognizing the RA Government Decree N 1026-Ն
- Sanitary Norms № 2-III-11.3 "Noise in the workplaces, in residential and public buildings and in residential construction areas" adopted by the order of RA Minister of Health № 138 on 06.03.2002
- GOST 17.2.4.05-83. "Environmental protection. Atmosphere. Gravimetric method for determination of suspended dust particles"
- RA Government Decree № 160- Ն. "Norms of maximum permissible concentrations (MPC) of atmospheric air pollutants in residential areas" (02.02.2006)
- RA Government Decree N438 on the Order on State Registration, Study, Preservation, Repair, Rehabilitation and Use of Historical and Cultural Immovable Monuments (20.04.2002)
- RA Government Decree N 43-Ն on "Reconstruction or expansion or technical or technological renovation or reprofiling/ reinforcement or conservation or relocation or discontinuation or closing or demolition or project change on approval of the procedure for determining the need for environmental impact assessment and expertise.
- Soil quality assessment is carried out in accordance with the Order of the Minister of Health of the Republic of Armenia No. 01-N of January 25, 2010.
- Decree of the Minister of Health "Drinking water: hygienic requirements for water quality in centralized water supply systems: quality control" n 2-iii-a 2-1 On approval of sanitary norms and rules, N 876, December 25, 2002
- RA Government Decree On establishing water quality norms for the statuses of surface water bodies of each water basin management area, depending on the specifics of the location, N 75-N, January 27, 2011
- RA Government Decree On determining the procedure for the management of forestry and implementation of work not related to forest use in state forest land, August 30, 2007 N 1045-N

D. Armenian EIA procedures

39. The environmental impact assessment procedure in Armenia is regulated by the Law on Environmental Impact Assessment and Expertise (03.05.23 ՀՕ-150-Ն). The list of activities and strategic papers subject to an EIA is set out in Article 12 of the Law. According to point 3, subpoint 10) – "construction of motorways and highways with a continuous length of more than 1 km" is subject to an EIA. In addition, Article 4, which defines all definitions used in the law mentions that

planned activities also includes reinforcement.

40. Therefore, it is important to understand that rehabilitation and upgrade of the road is also the subject of EIA.

41. The final decision on the necessity of an EIA and expertise belongs to the Ministry of Environment (Authorized body) and it will be provided on design stage, based on the procedure described in the RA Government Decree N 43-Ն, adopted on 11 January, 2024 according to the Law on Environmental Impact Assessment and Expertise (03.05.23 ՀՕ-150-Ն) article 8, 1st part point 5. According to the procedure provided by RA Government Decree N 43-Ն the application includes:

    i. Name and place of residence of the initiator.

    ii. the name of the type of activity planned and the name of the planned change in accordance with Article 12 of the law.

    iii. the date, month, year and number of the state expertise conclusion (if available).

    iv. description of the area, buildings and structures subject to the planned activity.

    v. description of the intended activity (production capacities, technical and technological solutions).

    vi. comparative analysis of the current state and planned changes.

    vii. the table describing the possible effects of changes on the environment of this Decree,

    viii. the document certifying the payment of the state duty.

42. The chart below shows how the Ministry of Environment (Authorized body) considers an EIA report and provides a final conclusion of an EIA.

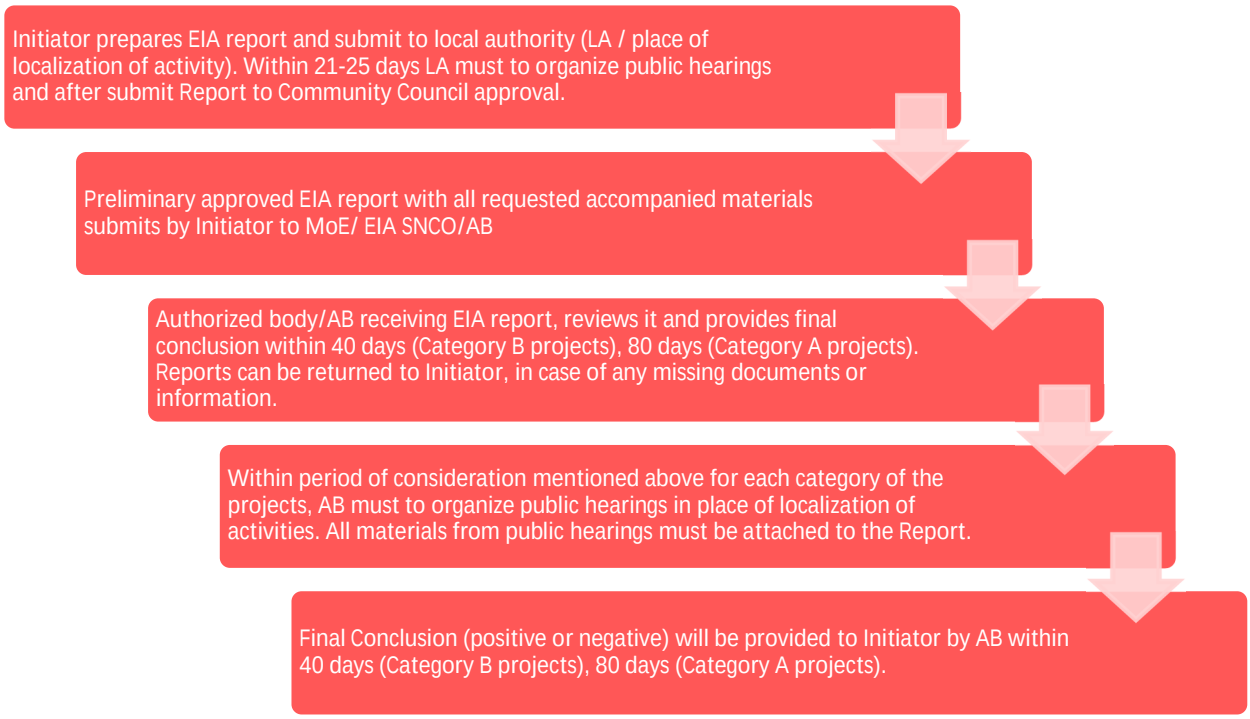


Figure 2: Flowchart of process for submission of EIA and decision-making by the local authority and the authorized body.

E. RA legislation on OHS

43. Occupational safety and health regulations

- **Civil Code of the Republic of Armenia** prescribes among others the main principles of labour relations.
- **The Criminal Code of the Republic of Armenia** provides for adequate penalties for violations of occupational safety and health laws and regulations.
- **Code of the Republic of Armenia on Administrative Offenses** prescribes the main principles of administrative liability, and administrative offenses (misdemeanours) of labour legislation**.**
- The Law of the RA On Organizing and Conducting Inspections in the Republic of Armenia outlines the labour inspectors' functions, rights, and duties.
- **The Law of the RA On State Regulation of Ensuring Technical Safety.** The purpose of this law is to establish the principles of the state strategy in the sphere of technical safety and mechanisms of their realization directed to the prevention of technogenic accidents, elimination of their effects, and decrease in risks of damage caused to society and economy owing to such accidents and also protection of the population and the environment.
- **The Law of the RA On Employment** regulates economic and organizational situations and the legal basis of stimulation of employment of the population in the Republic of

Armenia, establishes the realization of the rights of citizens in the sphere of employment of the population, types of services rendered by the state, types of social assistance in case of unemployment.

44. GOST (Russian: ГОСТ) gosudarstvennyy standard (state standard or governmental standard) refers to a set of international technical standards maintained by the Euro-Asian Council for Standardization, Metrology and Certification (EASC), a regional standards organization operating under the auspices of the Commonwealth of Independent States (CIS).

- GOST 17.2.4.05-83. Environmental protection. Atmosphere. Gravimetric Method for Determination of Suspended Dust Particles.
- GOST 12.0.004-2015 Organization of training on labour protection.
- GOST 12.0.230-2007 General requirements for the organization of labour protection.
- GOST 12.0.002-2014 System of occupational safety standards.

F. National Standards

45. Armenia regulates air, water, noise, and vibration through a mix of laws, government decisions, and sanitary-norm orders. The key standards applicable to this project, covering air quality, water quality, and noise and vibration, are summarised below.

CATEGORY	LEGAL BASIS	KEY STANDARDS / LIMIT VALUES
Air Quality	**Law of the Republic of Armenia on Atmospheric Air Protection** – establishes that Maximum Permissible Concentrations (MPCs) and maximum permissible emissions are set uniformly nationwide, with stricter local limits permissible. **Government Decision No. 160-N (2006)** – approves the concrete ambient air quality standards table (24-hour and maximum daily limits for SO_2, NO_2, CO, dust, O_3, etc.).	**Ambient MPC values (illustrative – verify against latest amendment):** SO_2: 24-h mean ≈ 0.05 mg/m³; max daily ≈ 0.15–0.5 mg/m³ CO: 24-h mean ≈ 3 mg/m³; max daily ≈ 5 mg/m³ Dust (TSP / PM analogue): 24-h mean ≈ 0.15 mg/m³; max daily ≈ 0.5 mg/m³ $PM_{2.5}$ / PM_{10}: Until recently, Armenia did not have formal MPCs for $PM_{2.5}$ and PM_{10}. Projects therefore typically apply WHO Air Quality Guidelines (e.g., $PM_{2.5}$ 25 µg/m³ 24-h; 10 µg/m³ annual) or project-specific limits in the absence of binding national thresholds.
Water Quality	**Water Code of the Republic of Armenia (Law No. HO-373-N)** – assigns the national water body responsibility for approving water-quality standards, maximum allowed concentrations, and wastewater discharge criteria. **MoH Sanitary-Epidemiological Norms** – govern drinking water and surface-water uses across Class I–IV water-use categories (drinking, recreation, industrial,	**Wastewater discharge limits (framework values):** pH: 6.5–8.5 BOD_5: ≤ 30 mg/L Suspended solids: ≤ 35 mg/L Strict limits apply separately for heavy metals and other priority substances under the MoH norms.

CATEGORY	LEGAL BASIS	KEY STANDARDS / LIMIT VALUES
	fish habitat). AST-ISO methods (e.g., AST ISO 5664, ISO 5666) embed the test-method norms.	
Noise and Vibration	**Sanitary Norms "Noise in Workplaces, Residential and Public Buildings and Areas of Residential Development" (Order No. 138)** – sets LAeq limits for residential indoor and workplace environments. **Law on Nature Protection** – covers vibration and other harmful physical influences (noise, vibration, EMF) under its implementing government specifications.	**Noise – residential indoor (LAeq):** Daytime (06:00–22:00): ≤ 40 dB(A) Nighttime (22:00–06:00): ≤ 30 dB(A) **Noise – residential outdoor (LAeq):** Daytime (06:00–22:00): ≤ 55 dB(A) Nighttime (22:00–06:00): ≤ 45 dB(A) **Occupational noise:** ≤ 85 dB(A) LAeq,8h (aligned with Soviet-era norms still in force) **Vibration:** Treated under the same "harmful physical influences" umbrella as noise. Explicit numeric vibration thresholds are less consolidated in current national regulations.

46. These national standards provide the regulatory framework; however, for the purpose of this Project, more stringent international standards may be applied where relevant.

G. International Conventions and Protocols

47. In addition to the above presented list and summaries of laws, numerous strategies, concept frameworks, and national programs related to the nature protection and OHS have been developed as well as a number of international agreements and conventions have been signed and ratified by the Republic of Armenia. The most relevant are listed below.

TITLE, PLACE AND DATE ADOPTED	RATIFIED BY NATIONAL ASSEMBLY	IN FORCE FOR RA
GLOBAL CONVENTIONS		
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971) - aka Ramsar Convention	Acceded as assignee by the request of MFA RA 1993	1993
UN Convention on Biological Diversity (Rio de Janeiro, 1992)	31 Mar 1993	14 May 1993
Cartagena Protocol on Bio-safety (Montreal, 2001)	16 Mar 2004	29 Jul 2004
UN Framework Convention on Climate Change (New York, 1992)	29 Mar 1993	21 Mar 1994
Kyoto Protocol (Kyoto, 1997)	27 Dec 2002	16 Feb 2005
Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)	Acceded as assignee by the request of MFA RA in 1993	1993

TITLE, PLACE AND DATE ADOPTED	RATIFIED BY NATIONAL ASSEMBLY	IN FORCE FOR RA
UN Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989)	26 Mar 1999	01 Oct 1999
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Washington, 1979)	10 Apr 2008	21 Jan 2009
Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979)	27 Oct 2010	01 Mar 2011
C087 - Freedom of Association and Protection of the Right to Organise Convention	02 Jan 2006	1948
C098 - Right to Organise and Collective Bargaining Convention	12 Nov 2003	1949
C100 - Equal Remuneration Convention	29 Jul 1994	1951
C105 - Abolition of Forced Labour Convention	17 Dec 2004	1957
C111 - Discrimination (Employment and Occupation) Convention	29 Jul 1994	1958
C138 - Minimum Age Convention	11 Nov 1996	1973
C182 - Worst Forms of Child Labour Convention	02 Jan 2006	1999
REGIONAL (EUROPEAN) CONVENTIONS		
UNECE Convention on Environmental Impact Assessment in a Trans-boundary Context (Espoo, 1991)	14 May 1996	10 Sep 1997
Protocol on Strategic Environmental Assessment (Kiev, 2003)	25 Oct 2010	24 Apr 2011
UNECE Convention on access to information, public participation in decision making and access to justice in environmental matters (Aarhus, 1998)	14 May 2001	01 Aug 2001
European Landscape Convention (Florence, 2000)	23 Mar 2004	01 Jul 2004
Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property	22 Jun 1993	
Convention Concerning the Protection of World Culture and Natural Heritage	22 Jun 1993	
European cultural convention	22 Jun 1993	
Convention for Protection of Non-material Cultural Heritage	20 Mar 2006	
Bern Convention - Council of Europe Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979)	26 Feb 2008	01 Aug 2008

Table 1: Multilateral international environment agreements signed/or ratified by Armenia

48. **Permitting Requirements:** Environmental permits, agreements, conclusions necessary for accomplishing the works envisaged by rehabilitation of the M6 road, including data on issuing authorities and tentative timing of obtaining the permit are summarized in the table below:

NAME OF PERMIT, AGREEMENT, ETC.	ISSUING AUTHORITY	OBTAINING STAGE	RESPONSIBILITY FOR OBTAINING
Technical Expertise conclusion	Licensed organization	During design stage	Designer
Construction license	Urban Development Committee	After design stage, prior to bidding	Contractor
State Traffic Police Permit Traffic Police of RA	Permit obtained during the design stage. Traffic Management Plan to be approved prior to commencement of civil works in each section during implementation stage.	Prior to construction	Designer / Client Contractor for the Traffic Management Plan
Lease agreement or ownership documents for construction site	Property owner	Before establishment of the construction site	Contractor
Mining license	Ministry of Territorial Administration and Infrastructure	During construction stage, in case of extraction of construction materials	Contractor
Purchase documents for purchased construction materials (such as crushed stone, gravel, cement, sand, etc.)	Authorized seller	During construction stage for purchase of the construction materials	Contractor
Conclusion of Technical Security Expertise	Urban Development, Technical Standards and Fire Safety Inspectorate (UTFSIB)	During construction stage (required for some types of heavy machinery, technological processes that require use of a compressor or compressor stations, fuel storages exceeding certain capacity, etc.)	Contractor
Maximum permissible discharge permit	Ministry of Environment	During construction stage	Contractor
Agreement for disposal of construction waste	Head of the Alaverdi, Tumanyan, Ayrum communities	During construction stage, before disposal of the waste off-site	Designer for identification of area Contractor before disposal of waste
Agreement for disposal of dangerous and hazardous materials and waste	Ministry of Environment	During construction stage, before disposal of the dangerous and hazardous materials and waste off-site	Contractor before disposal of waste

Table 2: Required environmental permits and agreements

49. Though all the permits identified in the table are relevant for the Project implementation, some of them might not be necessary depending on the nature of works and their organization (e.g., contractor is not required to hold a mining license when crushed stone is purchased; however, the company producing the crushed stone should possess a valid mining license).

H. Administrative Framework

50. This section briefly presents the roles of entities that may have involvement in the Project, primarily but not exclusively from an environment perspective.

Ministry of Environment

51. The Ministry of Environment (MoE) is responsible for the protection, sustainable use, and regeneration of natural resources as well as the improvement of the environment in the Republic of Armenia. In those areas, the Ministry of Environment authority includes overseeing national policy development, developing environmental standards and guidelines, and enforcement. The MoE implements those functions through the following structural departments:

- Legal Department.
- Department of International Cooperation.
- Department of Waste and Atmospheric Emissions Management
- Department of Specially Protected Areas of Nature and Biodiversity Policy
- Department of bioresources management,
- Department of water resource management.
- Department of water policy.
- Department of Climate policy.
- Department of Atmospheric policy.
- Department of Forest policy.
- Department Strategic policy.
- Department of Hazardous Substances and Waste policy.
- Department of Land and Underground Resources policy.
- Hydro-meteorological and Monitoring Service SNCO is the structural entities acting within the Ministry of Environment
- "Hayantar" SNCO is structural entities acting within the Ministry of Environment.

52. The key departments within the MoE that have administrative authority over EIA and the project approval process are:

    ix. The «Environmental Impact Expertise Center» (EIEC), the State Non-commercial Organization (SNCO) is responsible for reviewing and issuance of assessment conclusion reports required for implementation of a project and adding conditions when necessary to protect the environment.

    x. The «Environmental Protection and Mining Inspection Body» (EPMIB) is responsible for inspecting projects to ensure compliance with conditions imposed by the EIEC and with the Project EMP.

53. To satisfy relevant regulations and to gain a positive assessment conclusion from the Ministry of Environment, the EIA report should be prepared in accordance with the Law on Environmental Impact Assessment and Expert Examination (July 22, 2014, new addition dated by 03.05.23 ՀՕ-150-Ն) and the legislative provisions relevant to environmental protection should be considered accordingly.

54. The MoE is also the Government authorized body in the area of waste management of the RA. Article 8 of the Law on Waste (24.11.2004) sets authorities of the environmental sector (Ministry of Environment of RA) as the state authorized body mandated with the tasks and responsibilities in the area of waste management.

Ministry of Territorial Administration and Infrastructure

55. The Ministry of Territorial Administration and Infrastructure of the Republic of Armenia is a central body of executive authority that develops and implements the policy of the Government of the Republic of Armenia in the field of territorial administration and infrastructure management.

56. Regional administration bodies are responsible for administration of public roads of local significance falling under the regional jurisdiction. Bodies of local self-government (communities) are responsible for administration of public roads of local significance registered as ownership of communities. The Ministry of Territorial Administration and Emergency Situations also elaborates and implements the policies of the Republic of Armenia Government in the area if civil defence and protection of population in emergency situations. The RDF is the main authority involved in road sector, and mainly in implementation of the investment projects.

Road Department Fund

57. According to the RA Government Decree, in 2021 the "Road Department" state non-commercial organization was reorganized into the "Road Department" Fund. “Road Department” SNCO was considered to be the legal successor of “Transport Projects Implementation Unit” State Institution and “North-South Road Corridor Investment Program Implementation Organization” State Non-Governmental Organization.

58. The main scope and goals of the Fund are to ensure effective implementation of projects in transport sphere of the Republic of Armenia.

59. The RDF environmental specialist is ensuring good environmental and social performance under

the project.

Ministry of Health

60. Within the structure of the Ministry of Health of National Centre of Disease Control is responsible for coordination of all issues related to health (including those on noise and vibration) and for supervision over implementation of sanitary norms, hygienic and anti-epidemiological measures implementation by organizations and citizens.

The Ministry of Education, Science, Culture and Sport

61. The Ministry of Culture is a republican body of executive authority, which elaborates and implements the policies in the culture sector. The purpose of the ministry is to maintain and replenish the cultural heritage, promotion and development of contemporary art. The Ministry also includes two separately structures:

    - Agency of Protection of Cultural Heritage,
    - Historical and Cultural Heritage Protection Agency.

I. Comparison of ADB and national requirements

62. The environmental assessment of the Project will need to satisfy the requirements of both ADB and EA. A harmonised safeguard framework is developed for conducting the study of the Project and is presented below along with a comparison of ADB and RA EIA requirements:

ASPECT	ADB	RA	HARMONISED FRAMEWORK
Environmental and social policy and regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard requirement areas: • Environmental safeguards, • Involuntary resettlement safeguards, and • Indigenous people's safeguards	Environmental Impact Assessment and Expertise (EIAE) in Armenia is regulated by the Law on Environmental Impact Assessment and Expertise. The law defines: (i) the types of activities subject to mandatory EIA (Annex 1 and Annex 2), (ii) the procedures of screening, scoping, expertise, public participation, (iii) requirements for preparing EIA documentation, (iv) decision-making by authorized body (MoE).	The Project shall comply with Lender's and national requirements.

ASPECT	ADB	RA	HARMONISED FRAMEWORK
Screening	Project screening and categorization at the earliest stage of project Rapid Environmental Assessment (REA) Checklist is used for categorisation.	Armenia uses a project classification system defined in Article 12 of the EIA law. Category A – activities requiring mandatory full EIA and state expertise. Category B – activities requiring scoping to determine the need for EIA.	The Project is Categorized as Category B under RA law.
Alternatives	Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts. Consider no project alternative.	Alternative assessments are to be carried out for the project location and design.	Assessment of alternatives will include the location and design, and also no project alternative.
EIA Report	For Category A projects EIA (that includes EMP describing mitigation and monitoring issues) is obligatory. For Category B projects an Initial Environmental Examination (IEE) is required to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Guidelines and the outline of an EIA report are provided in SPS (2009).	Initiator prepares EIA report and submit to local authority (LA / place of localization of activity). Within 21-25 days LA must to organize public hearings and after submit Report to Community Council approval. Preliminary approved EIA report with all requested accompanied materials submits by Initiator to MoE/ EIA SNCO/AB. Authorized body/AB receiving EIA report, reviews it and provides final conclusion within 80 days (Category A projects). Reports can be returned to Initiator, in case of any missing documents or information.	The national EIA will follow the table of contents proposed by ADB SPS (2009). The report for obtaining Environmental Decision from the MoE will consider national regulatory requirements.
Public consultations and public meetings	Carry out meaningful consultation with affected people and facilitate their informed participation. Involving stakeholders, project- affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and taken into account.	Publication of information in national and regional mass-media. Arrange two public meetings – one at the scoping stage. Second within at 40 days of submission of the draft EIA report to MoE. All stakeholders are invited for the meetings.	Consultations will be carried out with the stakeholders, directly and indirectly affected people, NGOs throughout the project cycle and consider their views in project design and safeguard plan. Questions and concerns raised during public consultations held will be considered and addressed in the IEE/EIA.

ASPECT	ADB	RA	HARMONISED FRAMEWORK
Public disclosure	Draft EIA will be published in ADB website for 120 days before. Project approval by the Board.	The scoping document is available for public review for 2 weeks before public consultations.	Draft IEE (English and Armenia) will be disclosed in ADB and RDF websites. The copies of the draft IEE will be provided to the Municipality or Community, where the PC is planned.

Table 3: Comparison of ADB and RA EIA requirements

III. PROJECT DESCRIPTION AND ACTIVITIES

A. Existing situation

63. The M6 road between km 31+700 and km 90+191 forms part of the rehabilitation of the Armenia-Georgia Border Regional Road (M6, Vanadzor-Bagratashen) Improvement Project. The existing road consists of a two-lane asphalt-paved carriageway with hard shoulders. In several sections, the asphalt pavement is narrow, with widths ranging between approximately 5.0 m and 6.0 m, and hard shoulders averaging about 0.5 m.

64. The civil works of the M6 road rehabilitation were completed in spring of 2023, but from 24 to 26 May 2024, an active cyclone from the Mediterranean brought intense rainfall across Armenia and this continuous heavy rainfall caused the Debed and Aghstev rivers to overflow and flood nearby communities, damaging social infrastructure, bridges, and the major highways of the M6 and M4.

65. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km, with the three general sections being: km 31+675 – km 39+350 (around Tumanyan); km 55+950 – km 67+620 (north of Alaverdi towards Akhtala); km 84+570 – km 85+200 (north of Ayrum towards the border with Georgia). Further significant damage was recorded between km 71 and km 72 (Shnogh) as well as at km 76+300 (Artchis).

66. A map showing the main areas of damage is shown below followed by pictures of the damage and a quantified summary of damages in the 30 sections.

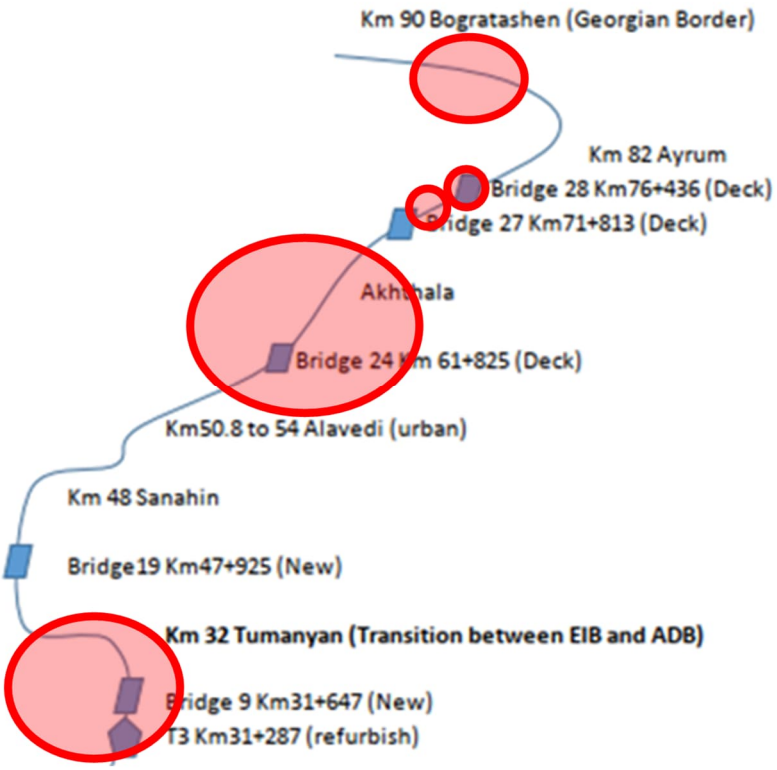


Figure 3: Alignment overview with areas of significant damage marked

NO.	LOCATION, KM POSITION	DAMAGED ROAD ELEMENT	QUANTITY M	PHOTOS BEFORE TEMPORARY REHABILITATION
1	31+675-32+765	R/c culvert d=1m	16.25	  
		Retaining wall	285	
		Embankment	380	
		Shoulder	660	
		Paved shoulder	23	
		Sidewalk	7	
		Pavement	325	
		Concrete parapet	255	
2	33+030	Retaining wall	36	  
		Paved shoulder	18	
		Sidewalk	18	
		Concrete parapet	13	
3	33+165-33+860	Retaining wall	230	
		Embankment	135	
		Pavement	230	
		Shoulder	975	
		Concrete parapet	135	
4	33+920-33+970	Embankment	50	
		Shoulder	50	
		Guardrails	50	
5	35+060-35+160	Embankment	100	
		Shoulder	100	
		Guardrails	60	

6	35+250-35+760	Retaining wall	160	 
		Shoulder	320	
		Embankment	160	
		Gabions	340	
		Pavement	160	
		Concrete parapet	160	
7	37+100-37+150	Embankment	50	 
		Shoulder	50	
		Guardrails	25	
8	37+510 - 37+800	Embankment	40	
		Retaining wall	40	
		Shoulder	500	
		Pavement	60	
		Concrete parapet	110	
9	38+400 - 38+450	Embankment	20	
		Shoulder	20	
		Concrete parapet	10	

10	39+100-39+350	Shoulder	250	
		Concrete parapet	10	
11	55+950-56+270	Shoulder	640	  
		Guardrails	20	
		Flumes	110	
12	56+450-56+540	Retaining wall	90	
		Embankment	80	
		Shoulder	90	
		Concrete parapet	10	
13	56+900-57+050	Embankment	150	
		Gabions	150	
14	57+230-58+340	Retaining wall	560	
		Embankment	420	
		Shoulder	580	
		Pavement	130	
		Concrete parapet	130	
		Guardrails	16	
		Flumes	160	

15	58+990-59+070	Retaining wall	80	
		Embankment	80	
		Shoulder	80	
		Pavement	30	
		Concrete parapet	80	
16	60+560-60+640	Retaining wall	7	
		Embankment	80	
		Shoulder	50	
		Concrete parapet	7	
17		Embankment	30	

	61+050-61+240	Shoulder	145	
18	63+305-63+330	Embankment	25	 
19	63+450-63+610	Retaining wall	100	
		Embankment	160	
		Shoulder	160	
		Pavement	30	
		Concrete parapet	100	
		Guardrails	9	
20	66+650-66+965	Shoulder	315	
21	67+050-67+300	Embankment	250	
		Shoulder	250	
		Pavement	15	
		Guardrails	200	

		Flumes	250	  
22	67+360-67+620	Embankment	50	
		Shoulder	520	
23	71+090	Embankment	30	  
24	71+250-71+400	Embankment	150	
		Shoulder	150	
		Guardrails	66	
		Flumes	100	
25	76+300-76+370	Retaining wall	70	 
		Embankment	70	
		Shoulder	70	
		Pavement	70	
		Concrete parapet	70	

26	84+570-84+640	Concrete parapet	18	  
27	84+880	Retaining wall	4	
		Embankment	25	
		Shoulder	30	
		Concrete parapet	4	
28	85+050	Retaining wall	15	
		Concrete parapet	15	
29	85+540-85+620	Shoulder	80	
30	85+670-86+200	Shoulder	1060	

Table 4: Summary table of damages caused by the 2024 flood and photographic examples

67. Emergency repairs were carried out in the aftermath of the 2024 floods to bring the road back to a serviceable condition.

B. Proposed Project

68. For improvement of the M6 road, a detailed hydrological model study of the Debed River has been conducted and “build back better” options are being considered. An outcome of this study was the determination that the 2024 flood was a 1 in 180-year event. The intent of the project is to protect the road from the effects of a 1 in 200-year event.

69. Due to the damage caused by the flood event, the following problems need to be addressed to improve on the rehabilitation carried out in the immediate aftermath of the flooding and “build back better”:

- Protection of the riverbank to secure the road and prevent further erosion;
- prevention and/or management of road flooding;
- repair of bridges, in particular piers which have been subjected to scour;
- new construction of the deck of the bridge at km 56+540;
- clearing and repair of minor culverts and drainage channels;
- securing of road sections which are prone to rockfall;
- improvement of road safety, predominantly through the construction of safety barriers, pavement markings, rumble strips and signs; and
- reconstruction of pavement in previously repaired sections.

70. In addition to the above and despite the planned works, it is not realistic to prevent the entire road from flooding during a 1 in 200-year event, when (based on the hydrological model) sections of the road would be submerged by up to approx. 2 m. To ensure traffic is protected an early warning and flood forecasting system is recommended as a separate package to the main works. This system should enable closure of the road with traffic lights and barriers during extreme events.

71. It is noted that the project is focused on the protection of the road from flooding damage and as such the design developed does not consider the protection of third-party property or infrastructure as its primary objective; however, the concepts shall not directly worsen the current situation for third parties.

C. Description of key construction activities

72. The locations for the works identified in the chapter above are identified on the General Arrangement Drawings included in the design. In general, the locations for embankment protection and repaving works correspond to those identified in Table 4.

73. Embankment protection: The embankment protection measures selected are as follows:

- Option 1 Stone Rip-Rap walls with a concrete cantilever top section – combination of Options 1a and 3 below

- Option 1a Small road protection cantilever retaining walls[4]

The flood-protection concept utilizes L-shaped pre-cast concrete (PCC) retaining wall elements, each with a height of 1,5 m, a base width of 1,5 m, and a unit length of 3,0 m. These modules are deployed along road sections that are regularly exposed to flooding and are intended to protect the road structure from excessive hydraulic forces. Importantly, the system is not designed to keep the road surface dry; rather, it provides structural protection while allowing controlled inundation.

The L-shaped geometry offers high stability, with mass and leverage that effectively resist sliding and overturning under design-level hydraulic loads. The retaining wall does not interfere with the river's natural flood retention volume: water is able to pass behind the wall through integrated drainage openings (DN 250, spaced at 3.0 m), and additional flow can spill over the wall crest when water levels exceed the element height. This ensures that the retention volume of the river remains intact and that downstream water levels are not artificially increased.

Allowing water to pass behind and over the retaining wall creates a still-water zone on the road, which acts as a secondary retention area while remaining hydraulically connected to the river. This still-water volume significantly reduces shear stress and flow velocity along the road embankment during flood events. By lowering the hydraulic loading on the road structure and associated embankments, the system effectively minimizes erosion risk, scouring, and structural damage.

The modular PCC elements enable rapid installation, reliable manufacturing quality, and straightforward replacement of individual units if required. Overall, the retaining wall system provides a robust, low-maintenance, and hydraulically compatible measure for safeguarding road infrastructure in flood-prone sections.

- Option 2 Riverside cantilever retaining walls

Cast-in-place cantilever retaining walls are applied in sections of the road corridor where geometric restrictions limit other protection options. These in situ poured concrete structures are adapted to the specific local conditions, ensuring that the structural configuration meets both hydraulic and geotechnical requirements.

The cantilever walls are particularly used in narrow areas of the gorge where there is no available space for riprap solutions. Their vertical alignment minimizes the required space taken from the Debed river while still providing a robust barrier capable of withstanding hydraulic forces during flood events. The foundation is constructed beneath the riverbed, offering enhanced stability against scour and dynamic hydraulic pressures. To further safeguard the structure, the foot of the wall is protected with a layer of riprap, reducing local erosion and ensuring long-term performance.

As with the pre-cast concrete retaining walls, the cantilever wall system is not intended to keep the road dry; rather, it provides structural protection while allowing water to inundate the road in a controlled manner. This approach enables the creation of a still-water zone on the road surface, which helps

[4] Source for picture: https://pacificprecastgroup.com/product/retaining-wall/

maintain the river's natural retention capacity while simultaneously reducing shear stress acting on the road embankment during flood events. By lowering flow velocities and shielding the road structure from direct hydraulic attack, the system contributes to the long-term resilience of the M6.

- Option 3 Stone Rip-Rap walls

The Riprap was selected as a nature-based solution for bank protection. The large-stone riprap consists of carefully chosen rocks, typically weighing between 1.000 and 3.000 kg. The stones are placed in such a way that each rock interlocks on all four sides. This interlocking arrangement provides strong resistance to water-induced shear forces as well as impact forces from rocks, trees, and transported sediments. The riprap foundation includes a foot stone weighing between 3.000 and 6.000 kg, which must be set 1.6 m below the riverbed.

This approach represents a flexible protection measure that can accommodate local changes and can show early signs of damage without sudden or complete failure. The riprap walls are planned with slopes ranging from 1:1,2 (vertical : horizontal) to 3:1. Riprap with a 1:1,2 slope will be constructed dry (without concrete filling) for riprap heights below 8,5 m (vertical). The backfilling behind the riprap will be executed using gravel with a grain size of 16/32. For higher riprap structures a C20/25 filling for the lower 3 rock rows and the foot stone is necessary to resist the seismic loads. Steeper slopes, however, concrete filling becomes necessary throughout the whole height of the riprap.

In addition to providing structural stability, the chosen riprap design supports ecological functions within the river system. The voids between the interlocked rocks create microhabitats that can be used by aquatic organisms, while the coarse backfill promotes groundwater exchange and improves bank drainage. Overall, the solution balances engineering requirements with environmental considerations, contributing to a more sustainable and resilient riverbank.

74. The Drawings shall be referred to for the exact locations and design of deployment of solutions. The table below summarises the issues by approximate location and the solutions proposed for embankment rehabilitation and protection works.

KM FROM	KM TO	SECTION LENGTH (M)	ISSUE	PROPOSED SOLUTION(S)
31+675	33+000	325	Significant area of collapsed and damaged riverbank	Multiple retaining solutions and permitting the road to flood
33+000	33+030	30	Damage to bridge abutments • Local damage recorded around km 33+020 to 33+060	Option 3 to repair the riverbank and permitting the road to flood
33+165	33+860	695	Significant area of collapsed and damaged riverbank • The hydrological model indicates that the road will flood in a design event	Multiple retaining solutions (combinations) and permitting the road to flood
33+920	33+970	50	Significant area of collapsed and damaged riverbank	Multiple retaining solutions

KM FROM	KM TO	SECTION LENGTH (M)	ISSUE	PROPOSED SOLUTION(S)
35+060	35+160	100	This section of road has been heavily impacted by the recent flooding and there is significant rock fall risk	Multiple retaining solutions (combinations) and permitting the road to flood
35+250	35+760	510	Significant area of collapsed and damaged riverbank. Specific attention is required around 35+740	This section and the embankment require significant areas of repair and replacement. Multiple retaining solutions (combinations) and permitting the road to flood
37+100	37+150	50	Area of damaged and collapsed retaining wall and existing retaining wall foundation to be secured	Option 3 to repair the riverbank and permitting the road to flood
37+510	37+800	290	Significant area of collapsed and damaged riverbank	Option 3 to repair the riverbank and Option 2 for sections of the retaining wall that have damaged and washed-out foundations
38+400	38+450	50	Road was flooded. Shoulder was damaged.	Multiple retaining solutions (combinations) and permitting the road to flood
39+100	39+350	250	Road was flooded. Shoulder was damaged. No visible damage at visit except at 39+350 (retaining wall damage)	Option 2 and permitting the road to flood
55+950	56+270	320	The water level during the last flooding event was very high Damaged riverbank was noted	Combination of Options 2 and 3 to secure the riverbank and road as well as permitting the road to flood
56+450	56+540	90	Damaged embankment and settlement cracking evident in highway shoulder area	Option 3
56+900	57+050	150	Damaged embankment and highway shoulder area	Multiple retaining solutions (combinations) and permitting the road to flood
57+230	58+340	110	Damage to embankment and foundation of the existing retaining wall appears to be washed out.	Multiple retaining solutions (combinations) and permitting the road to flood
58+990	59+070	80	Damage to embankment foot of existing retaining wall to be secured	Multiple retaining solutions (combinations) and permitting the road to flood
60+560	60+640	80	Damaged area on outer bank river adjacent to the road.- extend retaining wall	Multiple retaining solutions (combinations)
61+050	61+240	190	Damaged area - outer bank eroded	Option 1 and permitting the road to flood

KM FROM	KM TO	SECTION LENGTH (M)	ISSUE	PROPOSED SOLUTION(S)
63+305	63+330	45	Damaged embankment and settlement cracking evident in highway shoulder area	Options 1 or 3
63+450	63+610	160	Damage to embankment and foundation of the existing retaining wall appears to be washed out.	Options 2 or 3 and permitting the road to flood
66+650	66+965	315	Significant damage to embankment and foundation of the existing retaining wall appears to be washed out.	Multiple retaining solutions (combinations) and permitting the road to flood
67+050	67+300	250	Significant damage to embankment and foundation of the existing retaining wall appears to be washed out.	Multiple retaining solutions (combinations) and permitting the road to flood
67+360	67+620	260	Significant damage to embankment	Multiple retaining solutions (combinations) and permitting the road to flood
71+090	71+090	0 (spot)	Local damage to embankment	Option 3
71+250	71+400	150	Significant damage to embankment	Option 3
76+300	76+370	70	Significant damage to embankment	Multiple retaining solutions (combinations) and permitting the road to flood
84+570	84+640	70	Location adjacent to Georgian border. Concrete parapet damage.	Option 1
84+880	84+910	30	Location adjacent to Georgian border. Retaining wall, embankment damage and shoulder damage.	Option 1
85+050	85+065	15	Location adjacent to Georgian border. Retaining wall and concrete parapet damage.	Option 1
85+540	85+620	80	Location adjacent to Georgian border. Shoulder damage – new concrete shoulder proposed.	Option 1
85+670	86+200	530	Location adjacent to Georgian border. Shoulder damage – new concrete shoulder proposed.	Option 1

Table 5: Summary of proposed solutions along the Project road

75. Pavement: New pavement should have the same structure as on undamaged sections of the road. The pavement is therefore be re-laid in sections to the standard and thickness as was carried out for the pre-flood road design, and there are 2 possible cases where new pavement is needed:

i. Areas where the road was repaired after flooding: After the flood the pavement and partially also the subgrade was washed away. In order to operate the road safely these pavement spots were complemented provisionally. To rebuild the road in a proper way now these temporarily measures must be rebuilt as it was before the flood including pavement, subgrade and the design of the road

ii. Areas with new protection measures: In order to build a retaining wall or a riprap, parts of the street have to be demolished, because there is space needed for the excavation pit. This space should be as little as possible to keep most parts of the road. It should also be minimized as possible to have at least one lane available for the ongoing traffic. It is not possible to close the road and also bypasses are not possible because of the narrow valley.

76. To rehabilitate the pavement, excavators, bulldozers, or reclaimers break up the entire asphalt layer. The asphalt must be strictly divided from the other material. The asphalt is then crushed into small pieced and reused as new asphalt mixes at hot-mix plants, cold recycling operations, or base layers for roads.

77. The pavement layers for the existing road, which shall be applied to newly laid pavement are shown in the figure below:

Option 2: Average Quality Subgrade

ՏԱՐԲԵՐԱԿ 2 ($H_{ընդ}$ = 49սմ) / OPTION 2 (H_{tot} = 49cm)

Շերտ Layer	Առաձգականության մոդուլ Ei (Mpa) Elastic Modulus Ei (Mpa)	Հաստություն hi (սմ) Thickness hi (cm)	Նյութեր Materials
Մաշվածքի շերտ Wearing Course	E_1 = 3200 ՄՊա/MPa	4	Մանրահատիկային, խիտ ա/բ, 60/90 (BCH Ստանդարտ 46-83-85), 10°C տակ Fine hot, dense a/c, 60/90 (BCH Standard 46-83-85), under 10°C
Կապակցման շերտ Binder	E_2 = 2000 ՄՊա/MPa	5	Խոշորահատիկավոր ա/բ, 60/90 (BCH Ստանդարտ 46-83-85) Coarse a/c, 60/90 (BCH Standard 46-83-85)
Բիտումային հիմքի շերտ Bituminous Base	E_3 = 700 ՄՊա/MPa	8	Սևխճային ա/բ (BCH Ստանդարտ 46-83-85) Black Crushed Stone a/c (BCH Standard 46-83-85)
Հիմք Base	E_4 = 250 ՄՊա/MPa	12	Չափազատված խճի շերտից ակնացված սեպավորման եղանակով (BCH Ստանդարտ 46-83-85) Fractionated crushed stone layer made by wedging method (BCH Standard 46-83-85)
Ստորհիմնաշերտ Sub-Base	E_5 = 180 ՄՊա/MPa	20	Ավազա-կոպճային խառնուրդներ (N1,2,4 ըստ GOST 25607-83) Sand gravels (N1,2,4 according to GOST 25607-83)
Հողային պաստառ Subgrade	E_{sor} = 50 Mpa/MPa	//////////////	Գոյություն ունեցող հողային պաստառը Existing Subgrade

Figure 4: Pavement layers as per the Lotti Ingegneria's Final Engineering Report

78. Bridges and major culverts: Works required at bridges are categorised as follows:

- Category 1: Renewal of superstructure or of the whole structure necessary

- Category 2: Minor repair work necessary
- Category 3: Extensive repair work necessary but is requires further determination on site because either a specialist inspection vehicle is required to assess parts of the structure, or because insufficient information was available to the designer to prepare a design. Specifically for the following bridges there was insufficient data: 47+940, 61+820, 71+720, 72+910, 76+420. Rehabilitation with scour protection is shown on the drawings, but the design details shall be verified by the Contractor on site.

A summary of the work required at bridges and their categorisation is presented in the table below:

~ chainage	~ length	no. of spans	material	condition	defects	Rehabilitation Measures	category
31+620	70,00	3	STC	5-4		- Rehab of Scour Protection - verification measurement (install points, measurement every year)	2
35+080	150,00	25	STC prefabricated and concrete blocks	1		- Clear away the material that has slipped down the slope - Connect concrete blocks together firmly to create a retaining wall effect - Alternatively: secure blocks with steel tension straps or rockfall nets - Backfill with suitable material *Recommendations:* *- Complete reconstruction of the building*	1
35+740	35,00	1	STC prefabricated	3-2	- reinforcement visible/few concrete cover - low bearing depth on abutment - missing scour protection	- Rehab of Scour Protection - Additional Foundation beam necessary to ensure stability of Prefab-Wall-Elements - add beam on top of middle wall to ensure bearing-depth *Recommandations:* *- renewing of waterproof*	2

~ chainage	~ length	no. of spans	material	condition	defects	Rehabilitation Measures	category
35+920	85,00	5	STC	3-2	**- reinforcement visible/few concrete cover** **- damage to the underside of the bridge in the supporting axes** - missing joints –> caused damages on superstructure not visible - do bearings exist?	- Removing of flotsam - Rehab of Scour Protection - verification measurement (install points, measurement every year) not feasable due to lack of data: - rehabilitation of cross beams of the peers - adding of bearings - installing of joints *Recommendations:* *- Special inspection of:* *Reinforcement on the upper side of the supporting structure* *Support areas of the precast beams* *to clarify whether reinforcement measures may be necessary in the support area*	3
47+940	10,00-20,00 (var.)	1	STC - slab-beams Steel composite	5-4	- superstructure was not visible/assessable - riverbed was not visible	*Recommendations:* *- Observe abutments with regard to scouring* *- Inspection of riverbed and superstructure*	2
50+600	56,00	3	STC	5-4	- superstructure not visible from bottom - no joints	- Rehab of Scour Protection - verification measurement (install points, measurement every year) *Recommendations:* *- Checking whether reinforcement of the foundation area is necessary*	2
50+600	56,00	3	STC	4-3		- Removing of flotsam - Rehab of Scour Protection - verification measurement (install points, measurement every year) *Recommendations:* *- Checking whether reinforcement of the foundation area is necessary*	2
56+540	9,00	1	STC - slab-beams (prefabricated)	2	- superstructure not visible from bottom - clear hight sufficient? - condition of girders bad	- Removing of flotsam - Rehab of Scour Protection *Recommendations:* *- renewing of superstructure*	1

~ chainage	~ length	no. of spans	material	condition	defects	Rehabilitation Measures	category
61+820	25,00	1	STC	5-4	**- reinforcement visible/few concrete cover** **- Low bearing depth at the abutments** **- Severe spalling and exposed reinforcement in the bearing area**	*Recommendations:* *- Special inspection of:* *Reinforcement on the upper side of the supporting structure* *Support areas of the longitudinal beams* *to clarify whether reinforcement measures may be necessary in the support area*	3
71+720	20,00	2	STC	3-2	**- reinforcement visible/few concrete cover** **- Low bearing depth at the abutments** **- Severe spalling and exposed reinforcement in the bearing area** - attaching of handrail needs redesign - design of cable-duct necessary	- Removing of flotsam - Rehab of Scour Protection - design of cable-duct necessary - attaching of handrail needs redesign not feasable due to lack of data: - Renewing of edge precast elements may be necessary	3
72+640	20,00	3	STC - slab	3-2	- damage of scour protection - clear hight sufficient? - flotsam - missing handrail - poor concrete quality of bridge deck	- Provide railings as fall protection - Removing of flotsam - Rehab of Scour Protection not feasable due to lack of data: - Widening of abutments - renew precasted beams on one side *Recommendations:* *- Widening of abutments* *- Paving of the riverbed*	3
72+910	9,00	2	STC - slab	3-2	- superstructure not visible form bottom - shear reinforcement visible - sintering on outside girder (lack of waterproof - missing handrail on one side - lack of waterproof --> damaged concrete	- Provide railings as fall protection - Removing of flotsam - Rehab of Scour Protection *Recommendations:* *- Inspection of the underside of the bridge in order to determine further measures.*	3

~ chainage	~ length	no. of spans	material	condition	defects	Rehabilitation Measures	category
76+420	25,00	1	Steel composite	3-2	**- reinforcement visible/few concrete cover** **- Cracks and spalling on the abutments in the bearing area** - lack of waterproof - bad quality of concrete deck	- Provide railings as fall protection *Recommendations:* *- Inspection of the underside of the bridge in order to determine further measures.* *- Special inspection of:* *Reinforcement on the upper side of the supporting structure* *Support areas of the longitudinal beams* *to clarify whether reinforcement measures may be necessary in the support area*	3

79. <u>Buttress structure at km 35:</u> The buttress structure and concrete block wall at km 35 appears to be an important structure for preventing slope mobilisation and debris falling onto the road. Although the vertical elements visually appear to be in good condition blocks in the wall above appear to be loose. The source of rockfall is from the cliffs high above the road and the concrete blocks forming the wall at the top of the structure may prevent rockfall reaching the road. It can be seen that there is growth of trees behind the wall. The roots may be fixing the ground, but may also contribute to loosening of the blocks.

Due to the condition of the wall immediate rehabilitation measures are necessary. All measures are carried out from sectional wall to sectional wall. In the centre of the supporting wall a construction joint of 2 cm is placed.

1. Remove rubble and loose stones behind the wall
2. Excavation and securing the excavation pit
3. Drill and glue fixing brackets into the stones (4 per stone block)
4. Produce floor slabs
5. Concrete walls in sections: Hmax ≤ stone height or ≤ 1.00m
6. Backfill with suitable material
7. Install rockfall protection netting according to the drawings

Figure 5: Drone photo of the river and road section with the buttress wall

80. Minor culverts: Minor culverts were mostly blocked and could not be fully inspected. General recommendations are therefore made concerning the condition and for the rehabilitation of minor culverts:

    - All drainage pipes and culverts should be cleaned and cleared of all debris waste and sedimentation material.
    - Once the pipes and culvers have been cleared to their original formation there should be a further visual inspection of each culvert and where culvers are scoured, damaged, cracked of misaligned then these defects should be recorded and presented on a schedule to the Client. This detailed clearance work is required to facilitate the secondary and detailed inspection.

81. Rockfall: Securing of road sections which are prone to rockfall is carried out using the following methods:

NO.	SOLUTION	REGIME DESCRIPTION	PHOTOGRAPHIC EXAMPLE
1	Low barrier at roadside 1a: Ditch without barrier 1b: Ditch with concrete barrier 1c: Ditch with gabions	The most widely used rockfall protection solution in the design is the installation of low barriers by the roadside, intended to stop falling and rolling rocks released from smaller heights. In localities with higher risk, especially larger expected falling blocks, Options 1b or 1d were specified. These involve placing mechanically linked concrete barriers on the roadside, in the case of 1d with additional protective fencing. These solutions are generally sufficient for protecting the road from even large boulders, as long as the source area isn't high enough to	 [Source: Geobrugg]

NO.	SOLUTION	REGIME DESCRIPTION	PHOTOGRAPHIC EXAMPLE
	1d: Ditch with concrete barrier and fence	pose a risk of the blocks bouncing over the barrier. A ditch for the purposes of drainage and providing an additional barrier to falling rocks is included in all design options.	
2	Conformal netting on rock face	Conformal rock netting involves fastening the woven steel net over the rock face by means of rock bolts, spike plates, and border ropes, such that it follows the contours of the face and holds tightly against it. The purpose of this is to prevent unstable blocks from detaching from the rock face, or if they do detach, hold them firmly against the rock face. This not only prevents falling rocks, but also stabilises the face as a whole, thanks to the dense bolting grid. Installing conformal nets requires specialist workers and equipment to drill the bolt pattern and place the netting. For this reason, the height of netting was limited to 12 m, as this is the height generally reachable by self-loading cranes on commonly used trucks. In cases where cliffs were higher than this, rockfall protection fences or other solutions were used in combination with conformal netting.	 [Source: Geobrugg]
4	Rockfall protection fences	Rockfall protection barriers are a common method of protecting against high-energy rockfall. They are composed of high-strength fencing held up by posts (often hinged at the base), anchored into the slope, and braced with similarly anchored steel cables. Such systems are used globally and offered by a variety of manufacturers. They are generally rated by the maximum kinetic energy they can safely absorb, with ranges from hundreds of kJ to 8000kJ currently on the market. Rockfall protection barriers were used both as standalone protection measures and in concert with conformal netting to provide comprehensive protection at cliffs too tall to be netted fully. For simplicity of design, logistical convenience, and ample safety margin, barriers rated to 2000kJ were specified for all localities in the Project area.	 [Source: Consultant]
6	Hybrid rockfall barrier	Hybrid rockfall barriers, also known as attenuators, are an innovative solution to rockfall protection that can, in appropriate settings, offer energy absorption comparable to many rockfall protection barriers while requiring significantly less maintenance. They are composed of a high-strength steel net suspended on posts (hinged at the base) on the hillward side and allowed to hang freely or rest	

NO.	SOLUTION	REGIME DESCRIPTION	PHOTOGRAPHIC EXAMPLE
		on the slope on the valley side. This allows the net to swing freely under impacts, absorbing significant energy, and funnelling the incoming blocks to a collection area at the foot of the cliff, whence they can be easily removed. The ease of removing fallen blocks, combined with reduced reliance of semi-consumable steel brakes greatly reduces the maintenance effort required for this type of system. It should be noted, however, that it can only be used in locations where sufficient space is available for constructing a safe collection area.	[Source: Geobrugg]
7	Wholesale removal of free-standing, hazardous rocks	In most cases, managing rockfall hazard by simply removing rock outcrops is impractical or outright impossible due to the topography around the outcrops or the scale of the excavation that would be necessary. Despite this, in specific cases, hazards originate from localised, free-standing rocks, whose removal poses a realistic and permanent solution to the rockfall or slope stability issues at the locality. This option is therefore maintained and currently applied at one locality. This is a non-trivial excavation involving potentially unstable rock masses that requires specialist planning the use of appropriate methods, including mechanical breaking or blasting, which should be planned by a specialist site engineer.	 [Source: https://www.shotcreteconcrete.com/]

The table below sets out the locations for rockfall protection along with the solution selected:

KM FROM	KM TO	ROCK TYPE	HAZARD CLASS	SOLUTION
31+845	31+950	Basalt	Severe	2: Conformal netting on rock face & 4: Rockfall protection fences
33+180	33+620	Basalt	Moderate	6: Hybrid rockfall barrier
33+620	33+710	Basalt	Severe	3: Rock bolting
33+740	34+130	Basalt	Severe	6: Hybrid rockfall barrier
34+190	34+700	Fluvial deposit	Minor	1a: Ditch without barrier
34+770	34+880	Basalt	Moderate	6: Hybrid rockfall barrier
35+080	35+210	Basalt	Severe	6: Hybrid rockfall barrier
35+250	35+550	Fluvial deposit	Minor	1b: Ditch with concrete barrier
35+800	35+890	Basalt	Minor	2: Conformal netting on rock face

KM FROM	KM TO	ROCK TYPE	HAZARD CLASS	SOLUTION
37+560	37+620	Altered Basalt	Severe	7: Wholesale removal of free-standing, hazardous rocks
39+650	40+380	Altered Basalt	Minor	1b: Ditch with concrete barrier
40+380	40+550	Altered Basalt	Minor	1d: Ditch with concrete barrier and fence
40+550	41+600	Fluvial deposit	Minor	1b: Ditch with concrete barrier
40+630	41+900	Fluvial deposit	Minor	1a: Ditch without barrier
42+050	42+190	Fluvial deposit	Minor	1a: Ditch without barrier
42+720	43+210	Fluvial deposit	Minor	1b: Ditch with concrete barrier
43+270	43+360	Fluvial deposit	Minor	1b: Ditch with concrete barrier
43+540	43+970	Fluvial deposit	Minor	1b: Ditch with concrete barrier
44+210	44+320	Altered Basalt	Moderate	1b: Ditch with concrete barrier
44+390	44+850	Altered Basalt	Moderate	1b: Ditch with concrete barrier
45+830	46+140	Fluvial deposit	Minor	1b: Ditch with concrete barrier
46+340	46+650	Fluvial deposit	Minor	1b: Ditch with concrete barrier
46+680	46+900	Altered Basalt	Moderate	1b: Ditch with concrete barrier
47+150	47+210	Basalt	Moderate	1b: Ditch with concrete barrier
47+250	47+300	Basalt	Moderate	1a: Ditch without barrier
47+300	47+490	Basalt	Moderate	1b: Ditch with concrete barrier
50+030	50+090	Basalt	Moderate	1a: Ditch without barrier
50+090	50+300	Basalt	Moderate	2: Conformal netting on rock face
52+100	52+220	Basalt	Moderate	2: Conformal netting on rock face
53+660	54+000	Basalt	Severe	4: Rockfall protection fences
58+790	58+920	Basalt	Severe	2: Conformal netting on rock face & 4: Rockfall protection fences *(early works section)*
58+920	59+100	Basalt	Severe	6: Hybrid rockfall barrier *(early works section)*
59+100	59+200	Basalt	Moderate	1b: Ditch with concrete barrier *(early works section)*
60+170	60+550	Fluvial deposit	Minor	1b: Ditch with concrete barrier *(early works section)*
61+230	61+460	Fluvial deposit	Minor	1a: Ditch without barrier

KM FROM	KM TO	ROCK TYPE	HAZARD CLASS	SOLUTION
61+460	61+550	Fluvial deposit	Minor	1c: Ditch with gabions
62+670	63+150	Fluvial deposit	Minor	1b: Ditch with concrete barrier
66+700	66+890	Basalt	Moderate	4: Rockfall protection fences
66+920	67+290	Basalt	Minor	1d: Ditch with concrete barrier and fence
67+370	67+580	Basalt	Moderate	1c: Ditch with gabions
68+560	68+730	Basalt	Moderate	1d: Ditch with concrete barrier and fence
69+640	69+650	Basalt	Moderate	1c: Ditch with gabions
69+740	69+820	Basalt	Moderate	6: Hybrid rockfall barrier
71+300	71+520	Basalt	Severe	1d: Ditch with concrete barrier and fence
71+830	72+380	Basalt	Moderate	1b: Ditch with concrete barrier
76+670	76+870	Basalt	Minor	1b: Ditch with concrete barrier
76+880	76+940	Basalt	Moderate	2: Conformal netting on rock face
77+100	77+180	Fluvial deposit	Minor	1d: Ditch with concrete barrier and fence
77+200	77+280	Fluvial deposit	Minor	1b: Ditch with concrete barrier
78+380	78+510	Basalt	Minor	1d: Ditch with concrete barrier and fence
79+800	80+050	Basalt	Minor	1d: Ditch with concrete barrier and fence
82+160	82+500	Fluvial deposit	Minor	1a: Ditch without barrier
82+900	82+950	Fluvial deposit	Minor	1b: Ditch with concrete barrier
84+780	84+850	Basalt	Moderate	1c: Ditch with gabions

Table 6: Identified rockfall areas and applied solutions

82. Road safety measures will be implemented along the length of the project and are identified on drawings. They include:

- Provision of metal (or concrete) crash barriers to protect vehicles from falling into the river.
- Include energy-absorbing terminal treatments for all new crash barrier installations.
- Ensuring proper connection between metal crash barriers and concrete parapets or

structures.

- Use of rumble strips.
- Widening shoulders to >1 meter on both sides, where feasible, with edge markings and chevron signs at curves to improve curve delineation.
- Improved signage, in particular for crossings.

83. During the Public Consultation meetings in Ayrum, community leaders informed of a specific accident blackspot between km 80+700 and km 81+100 which consists of a series of left/right bends when traveling in a northerly direction. Special measures are implemented in design to alleviate the situation.

84. A key recommendation of the road safety assessment is a reduction of speed limit and enforcement by automatic speed cameras. This is essential for improving road safety but requires RDF‘s commitment and implementation for the road as a whole.

85. Removal and deposit of topsoil:

Topsoil consists of humus (containing organic material) and a boundary layer (soil beneath the humus layer which still contains some organic material). These two layers are to be removed and deposited separately, and their thicknesses are to be documented. Large areas of these layers shall not be removed, rather, small areas are removed as required by progress of further excavating the ground below. Freshly exposed surfaces are to be drained appropriately. For surfaces which are only used temporarily, topsoil layers shall be replaced in their original thicknesses.

Topsoil shall be removed and deposited with an excavator with an attached slope-work bucket. Bulldozers shall not be used for stripping or placing topsoil. Work with topsoil may only be carried out in dry ground and dry weather conditions.

If possible, excavated topsoil material from the site should be immediately used to cover newly completed areas and seeded to limit erosion. Temporary spoil deposits shall have maximum dimensions of 2x base width to 1x the height dimensions. This height to base width ratio must not be exceeded unless specific temporary work calculations have been produced by a competent engineer and are available on site for inspection. The stability of spoil piles will remain the responsibility of the contractor. The contractor must ensure the foundation of the spoil pile/ excavated material is adequate to prevent collapse movement and/ or secondary effects on adjacent structures, systems, and components. Topsoil heaps shall be assessed, designed and maintained by the contractor to assure stability and preclude soil slip or movement. The base to height ratio shall not exceed 2:1 (as noted above).

Figure 6: Excavator with attached slope-work bucket in operation

Figure 7: Example of a topsoil heap

Spoil heaps/ storage areas which will be required for more than 6 weeks shall be prepared with a trough-shaped surface to allow managed drainage, surface run off water will be managed and collected and not allowed to contaminate adjacent facilities such as rivers, water courses or land. Furthermore, the topsoil heaps shall be sowed with seeds and planting typical to the region to prevent erosion. The heaps are to be mown at least twice a year.

Temporary deposits of topsoil or any other ground surfaces with a topsoil layer shall not be compacted unnecessarily. Measures, such as fences, shall be implemented to ensure that these surfaces are not driven over be heavy vehicles.

86. Re-cultivation of sites

To minimise exposed surfaces which are not re-cultivated, topsoil should be placed on compacted terraces or slopes after completion of each compacted layer and before starting the next layer. Boundary layer topsoil and humus are to be placed separately. Re-cultivation is completed with sowing of seed. The seed type and composition should be determined by local specialists and must be shown to be free of invasive plant species.

Layer thicknesses are:

- Boundary layer topsoil 50 cm
- Humus 30 cm

87. Local plant species

The hereafter mentioned plant species, which grow in the region, are adapted to the local conditions and fit well for reforestation and rehabilitation conception. The mentioned species occur frequently in the mapped vegetation and would replace the lost vegetation the best possible way.

It is proposed to restore forest vegetation in disturbed areas, primarily in terms of hornbeam-oak forest. The choice of hornbeam (*Carpinus betulus*) is determined, first of all, by its unpretentiousness and good seed germination, rapid growth and independent reproduction in place (Figure 8). Efforts should also be made to plant oak (*Quercus macranthera*) seedlings (Figure 9, Figure 10) to create a more natural ecosystem, but poor oak seed germination may be a problem. It is, of course, possible to

purchase planting material from nurseries.

Below are the varieties of trees that grow in the Debed gorge.

- *Acer trautvetteri* (Figure 11)
- *Lonicera caucasica* (Figure 12)
- Pyrus caucasica
- Rubus idaeus
- Sambucus ebulus
- *Sorbus aucuparia* (Figure 13)
- Viburnum lantana
- The grass cover must recover naturally.

Figure 8: Forest with Carpinus betulus dominance

Figure 9: Quercus macranthera (a long staying tree)

Figure 10: Oak forest (Quercus macranthera)

Figure 11: Acer trautvetteri

Figure 12: Lonicera caucasica

Figure 13: Sorbus aucuparia

D. Analysis of alternatives

88. There are not any alternatives to the project itself, since road and associated infrastructure, where damaged, requires rehabilitation and/or upgrade. However, a variety of alternatives to carrying out embankment works and rockfall protection were considered as identified in the following paragraphs. In general, the most technically appropriate, constructable and cost-effective solutions were selected for each location.

89. Embankment rehabilitation and protection alternatives selected – see Chapter III.C:

- Option 1 Stone Rip-Rap walls with a concrete cantilever top section
- Option 1a Small road protection cantilever retaining walls
- Option 2 Riverside cantilever retaining walls
- Option 3 Stone Rip-Rap walls

90. Embankment rehabilitation and protection alternatives not selected:

- Option 4 Gabions

OPTION	 [Source: https://www.gabionbarriers.com/construction-materials/index.html]
UTILISATION	Widespread use to secure slopes and provide aesthetically pleasing finishes. Can be used in areas with low energy water flow.

METHOD	Creation of a stable foundation; placement of rocks in steel cages.
PROS	Highly adaptable to topography Uses readily available materials
CONS	We note the stream velocities and impact energies as contained within the hydraulic model. In addition and as part of our optioneering process we have considered the use of gabions and concluded that this design option would only be applied in very limited locations due to durability and hydrostatic loading challenges. Durability at the M6 location – to ensure the cages will not be ripped open by high-energy flow and debris the steel used would need to be a larger diameter than is typically used for gabions. Therefore, the solutions would become very expensive. Does not prevent undermining and long-term washout of the road, since water can flow through gabions. Labour-intensive construction.

- Option 5 Sheet-pile wall

OPTION	 [Source: https://www.sheetpilinguk.com/sheet-pile-river-wall-secures-mirfield-supermarket/]
UTILISATION	This detail is used in river and road construction although it is normally employed where there is a significant business and engineering justification. Homogeneous soft or loose ground conditions (e.g., soft clay or sandy gravel) are required for driving of sheet piles. This system is recommended for walls between 6-8 m if a head restraint is employed.
METHOD	Sheet piling works have significant establishment requirements and generally require a large plant in the form of a piing rig and crane in attendance together with a large 360° excavator as well as a significant laydown area. Clearly the laydown area in the case of the M6 could be position either along the road forward or behind the piling rig or some distance away in a logistic yard. The piling rig would be positioned on the road and the piling head would be over the river edge. Piling rigs of this nature are significant in size and would partially block the M6 road traffic. The piling rig once established would vibrate or hammer the sheet pile to the desired depth. This activity causes significant noise and vibration during the installation. This vibration could cause secondary issues such as social disruption and potential destabilisation of existing structures and may cause rock fall issues.
PROS	The sheet pile once installed is structurally efficient and takes minimal space in the road river environment. The lifespan of sheet piles can in the range of 50 to 100 years bases on local conditions, material quality.

CONS	Significant environmental and social disturbance. Requires homogeneous ground conditions; unlikely to be suitable in the gorge location with bedrock and boulders. Secondary effects due to vibration. Disturbance to riverbank.

- Option 6 Raising of road

  Localised raising of the road through construction of a raised embankment, which prevents localised flooding of the road.

- Option 7 Reinforced earth (geotextiles, geogrids)

  This option was considered but discounted immediately due to the likelihood of failure as well as the difficulty of construction.

- Option 8 Concrete piled wall

OPTION	 [Source: https://ausheet.com.au/services/piling/secant-piling-walls/]
UTILISATION	Can be used in various ground conditions to create a vertical wall, though not directly at the road-river interface. Very high walls are possible.
METHOD	Piling of ground by a specialist contractor to construct a concrete pile wall.
PROS	Robust and durable solution. Possible where very high walls are required.
CONS	Very expensive solution. Requires use of bentonite in unstable ground which risks soil contamination and involves significant logistics and land-take. Requires specialist capabilities. Cannot be used directly at the road-river interface.

- Option 9 River training

  Although river training possibilities were considered such as channelling to divert the river and blocks to disrupt flow or dissipate energy, river training is not recommended as such measures:

  - change the dynamic and flow-regime of the river with the potential for secondary

consequences (environmental and ecological effects, impact on downstream hydropower plants, affects on properties, may cause flooding elsewhere);

- o require ongoing hydrological modelling;
- o in large flood events are unlikely to be effective.

91. Rockfall protection alternatives selected – see Chapter III.C:

- Option 1 Low barriers at roadside
- Option 2 Conformal rock netting
- Option 4 Rockfall protection barriers
- Option 6 Hybrid rockfall barrier
- Option 7 Wholesale removal of free-standing, hazardous rocks

92. Rockfall protection alternatives not selected:

NO.	SOLUTION	REGIME DESCRIPTION	PHOTOGRAPHIC EXAMPLE
4	Rockfall protection fences	High-energy absorption fences applicable for preventing (unavoidable) rockfall on a long section reaching the road. Specialist product, installation difficulty depends on location.	 [Source: Consultant]
5	Concrete gallery over the road	Significant structure requiring specialist design with interaction between the slope and foundations next to the river. Similar to a tunnel but may be open on the downhill side. Implemented when a long-term solution is required for a slope where rockfall cannot be prevented. Most expensive solution; complex construction.	 [Source: Consultant]
8	Geotechnical monitoring	Passive measure for situations which may develop or installed solutions. Requires permanent monitoring and data analysis.	

IV. PROPOSED SCHEDULE FOR IMPLEMENTATION

93. The complete project duration is estimated at 30 months.

94. Works during the winter period (assumed as December to March) may prove more challenging due to snowfall and freezing conditions; however, the water level in the river is generally lower and therefore embankment protection works may be advantageous in this period.

95. Work in the river should be carried out carefully or avoided in high-water seasons, e.g., spring, and shall also be timed to avoid fish spawning and migration seasons, which are:

    i. Brown trout — spawns in October–November;

    ii. Other fish – migrate for spawning in May – July (*Capoeta capoeta* Güldenstädt, 1772 — Caucasian scraper, *Barbus cyri* De Filippi, 1865 — Barbus cyri, and *Luciobarbus mursa* Güldenstädt, 1773 — Mursa)

96. The schedule is based on the following assumptions for key works:

    i. The Contractor deploys 3 general teams and sets of equipment to carry out embankment protection, rockfall protection, culvert and road rehabilitation works in sections. Sections are not worked on concurrently by the same team to minimise traffic disruption, i.e., there are a maximum of 3 traffic management sections at any one time.

    ii. Utility relocations take 2 weeks per section.

    iii. Embankment protection progresses at 8 m per day per equipment set (multiple equipment sets per team envisaged). At sections where other works are required below new rockfall protection, the rockfall protection measures shall be installed first and embankment protection works shall be carried out either side of these sections.

    iv. Rockfall protection is carried out at the following rates: Ditches – 40 m / day; netting 10 m / day.

    v. Road sub-base / base / paving works progresses at 40 m per day.

    vi. Minor culverts are cleaned and minor repairs carried out in 2 days. New culverts are constructed in 20 days. (Work is not on the critical path.)

Pos.	Activity	Approx. Month Start	Approx. Month End	Notes
1	**Contract award**			
1.1	Signing of contract	1	1	
1.2	Ensure all necessary permits are in place	1	2	Requires signing of contract
1.3	Commencement date (42 days after signing)	2	2	Requires signing of contract
2	**Mobilization phase**			
2.1	Mobilization of contractor to site and establish contractor camps	2	3	Immediately after commencement date
3	**Embankment protection sections including rockfall, minor culverts and road furniture works - Team 1**			
3.1	Section km 31+680 - 32+340	3	8	Section length 660 m, very complicated section, 3 excavators assumed
3.2	Section km 32+620 - 34+130	8	18	Section length 1510 m, complicated section, 3 excavators assumed
3.3	Section km 34+190 - 35+980	18	30	Section length 1790 m, complicated section, 3 excavators assumed
4	**Embankment protection sections including rockfall, minor culverts and road furniture works - Team 2**			
4.1	Section km 36+390 - 37+860	3	13	Section length 1470 m, complicated section, 1 excavator assumed (190 m)
4.2	Section km 38+290 - 45+595	13	20	Section length 7305 m, extensive 1b rockfall protection, 2 excavators assumed (190 m)
4.3	Section km 45+830 - 57+730	20	24	Section length 14990 m, long setions of rockfall protection and large gaps, 2 excavators assumed (580 m)
5	**Embankment protection sections including rockfall, minor culverts and road furniture works - Team 3**			
5.1	Section km 60+820 - 67+600	3	22	Section length 6780 m, 2 excavators assumed (740 m)
5.2	Section km 67+600 - 77+200	22	28	Section length 9600 m, complicated section
5.3	Section km 77+200 - 87+700	28	30	Section length 10500 m, long sections of rockfall protection and large gaps, 2 excavators assumed (230 m)
6	**Bridge works**			
6.1	Bridge 31+620	4	7	
6.2	Bridge 35+740	8	10	
6.3	Bridge 35+920	10	12	
6.4	Bridge 47+940	12	14	
6.5	Bridge 50+600	14	16	
6.6	Bridge 56+540	16	18	
6.7	Bridge 61+820	18	20	
6.8	Bridge 71+720	20	22	
6.9	Bridge 72+640	22	24	
6.10	Bridge 72+910	24	26	
6.11	Bridge 76+420	26	28	
6.12	Bridge 72+910	28	30	
7	**Road safety works outside of embankment protection zones**			
8.1	Road furniture, signage and markings in section	25	29	
8	**Completion**			
9.1	Acceptance procedure and taking-over of works	29	30	After completion of testing and provision of documentation by Contractor
9.2	Demobilization of contractor	30	30	
9.3	Completion of project	30	30	

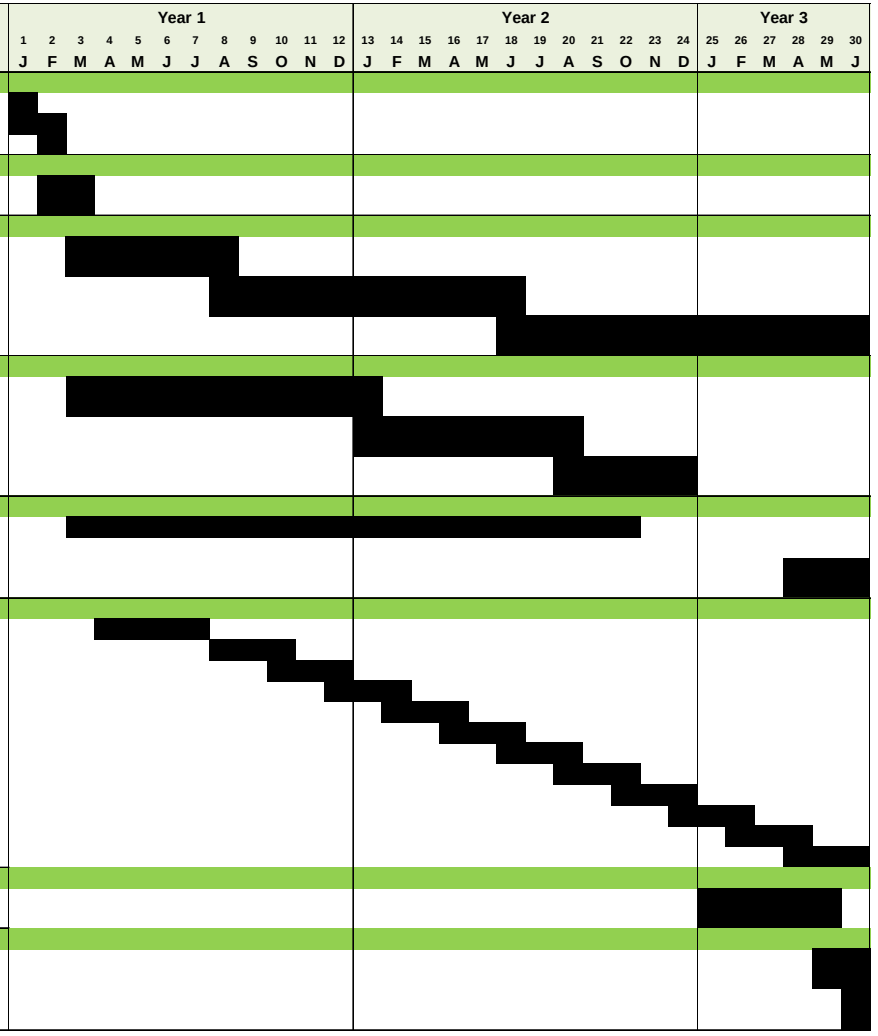


Figure 14: Outline project implementation schedule

V. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

A. Biological Environment

97. The M6 highway passes through the territory of the Lori and Tavush regions or the Lori and Ijevan floristic regions of Armenia. The majority of the road from km 31+700 to km 76+800 and km 82+300 to km 90+191 is in the Lori marz. The short section from km 76+800 to km 82+300 is in the Tavush marz.

98. Lori and Tavush regions are considered among the greenest areas of the republic with large territories covered by forests, about 62 % of total amount of forest in Armenia is located in the northeast part of the republic mostly covered with oak, beech, and hornbeam trees.

99. Lori is a province (marz) of Armenia which located in the north of the country, bordering Georgia. Situated in the north of Armenia, Lori covers an area of 3,789 square kilometres. It is bordered by Tavush Province in the east, Kotayk Province in the southeast, Aragatsotn Province in the southwest and Shirak Province in the west. The provincial capital is Vanadzor, and other towns include Stepanavan, Alaverdi, and Spitak.

100. The Tavush region of the Republic of Armenia is located in the northeastern part of the territory of the Republic of Armenia. It includes the regions of Ijevan, Dilijan, Noyemberyan, Berd and Ayrum. The region borders on the Gegharkunik and Kotayk regions of the Republic of Armenia in the south, on the Lori region of the Republic of Armenia in the west, on Georgia in the north and on Azerbaijan in the east. The regional center is the city of Ijevan. The area of the region is 2704 sq.

Flora and vegetation

101. The project area is in the Lori floristic region (1280 species), which covers the entire Lori plateau, in the east by the foothills of the Lalvar and Lejan mountain ranges it is delimited from the Ijevan floristic region. In the west the border with the Upper Akhuryan floristic region runs along the Javakheti ridge. The northern border coincides with the state border of Armenia with Georgia. In the south the region covers the upper reaches of the Pambak River on the Pambak ridge, and in the southwest it borders the Shirak floristic region.

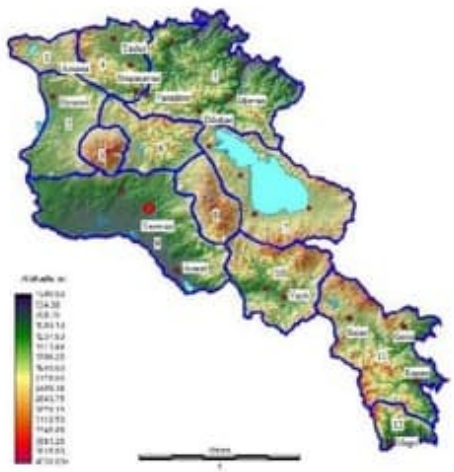


Figure 15: Floristic regions of Armenia (Takhtajan, 1954)

1 – Upper Akhuryan, 2 – Shirak, 3 – Aragats, 4 – Lori, 5 – Ijevan, 6 – Aparan, 7 – Sevan, 8 – Gegham, 9 – Yerevan, 10 – Darelegis, 11 – Zangezur, 12 – Meghri

102. Administratively, the Lori floristic region almost completely coincides with the Lori region of Armenia. The vegetation is represented mainly by meadows and forests (oak and beech), as well as wetland vegetation of the relict lakes of the Lori Plateau. The altitudes of the area are from 1300 to 2550 m above sea level. Endemic species – 6 (Fayvush, 2007). Species included in the Red Book of Plants of Armenia (2010) – 30.

103. Within the Lori and Ijevan floristic regions, in the immediate vicinity of the M-6 highway, oak (*Quercus iberica*) and beech (Fagus orientalis) forests are mainly represented (Figure 16 and Figure 17). In small areas there are natural pine (*Pinus kochiana*) forests (Figure 18).

Figure 16: Oak (Quercus iberica) forest)

Figure 17: Beech (Fagus orientalis) forest

Figure 18: Pine (Pinus kochiana) forest

104. These regions have the variety of ecosystems on the various mountain belts and altitudes, including mountainous plateau, alpine zone, mountain steppe, subalpine meadows, river valleys, etc. Dozens of wild relatives of domesticated plants are native to these regions.

105. The Idjevan floristic region covers the basins of the Aghstev and Debed rivers, as well as the former Shamshadin administrative region north of the Sevan ridge. Flora of Ijevan floristic region consists of 1550 species of vascular plants.

106. During previous survey of vegetation near the M6 highway carried out in 2016, 48 species of vascular plants from 31 genera and 21 families were identified. Two species are to be added, which are included in the Red Data book of plants of Armenia: Jurinea praetermissa (EN) and Adianthum capillus-veneris (VU) (Figure 19 and Figure 20).
Jurinea praetermissa (EN) – The species grows in small populations on cliffs along the road stretching from Vanadzor almost to Ayrum. However, it is found on the cliffs on the opposite side of the road from the river. The majority of planned works is on the river side of the road, with only rockfall protection works (specifically conformal netting and rockbolting) at limited locations on lower reaches of cliffs prone to rockfall. Heavy construction machinery shall be operated with caution to avoid damaging the cliffs on the opposite side of the road.
Adianthum capillus-veneris (VU) – One subpopulation of this species was previously known along the M-6 highway (41°05’N, 44°42’E); however, it was destroyed during the road expansion process in recent years. Another nearby population is located on the cliffs along the road to Haghpat, which is outside the impact zone of the current project.

Figure 19: Jurinea praetermissa

Figure 20: Adianthum capillus-veneris

107. The following ecosystems are common in the immediate vicinity of the M-6 highway.

C2.2 - Permanent non-tidal, fast, turbulent watercourses (Figure 21)

This ecosystem is permanent water course with fast-flowing turbulent water and their associated animal and microscopic algal pelagic and benthic communities. The bed is typically composed of rocks, stones or gravel with only occasional sandy and silty patches.

Figure 21: Permanent non-tidal, fast, turbulent watercourse of Debed river

*C2.3 - Permanent non-tidal, smooth-flowing watercourses (*Figure 22*)*

These are permanent water courses with non-turbulent water and their associated animal and microscopic algal pelagic and benthic communities. The bed is typically composed of sand or mud. Some parts of Debed river are considered as such ecosystems (especially in summer before rainy period).

Figure 22: Permanent non-tidal, smooth-flowing watercourses of Debed river

G1.1143 – Armenian willow galleries (Figure 23)

Habitats are common in Armenia, they are represented near all big rivers (including Debed river) in lower and middle mountain belts. *Salix alba, S. excelsa, S. caprea, S. armeno-rossica, S. triandra, S. pseudomedemii* usually are dominants in these communities.

Figure 23: Armenian willow gallery (Debed river)

*J4.21 – Road-bed (*Figure 24*).*

M6 highway has an asphalt pavement.

Figure 24: Road bed of Highway M6

J4.22 – Roadsides

The width of roadsides depends on the relief – up to 2-2.5 m.

*J4.23 – Mountain roads escarps (*Figure 25*)*

Escarps near mountain roads were built during roads building or enwidening. They can be bare or vegetated. Their height may be up to 15-20 m.

Figure 25: Road's escarp

Survey of the M6 Highway

108. The botanical survey was conducted on September 4-5, 2025. The work was carried out by the route method with visits to all 30 allocated areas where restoration and/or work to prevent further destruction of the roadbed will be carried out. During the survey, attention was primarily paid to the presence/absence of rare species included in the Red Data Book of Plants of Armenia. During the survey, species growing along the side of the road and areas between the road and the Debed River were identified. Particular attention was paid to woody plant species, which significantly reduce soil erosion and roadbed collapse.

109. Almost all areas have sections that are completely devoid of vegetation. In the future, they may begin to be overgrown with mainly annual, weed, invasive plants.

1. Location (km position) - 31+675-32+765 (Figure 26)

The area between the highway and the Debed River is mostly represented by a pile of large stones, without vegetation. There are individual trees (or groups of 3-4 trees) – *Ulmus elliptica, Salix alba, Salix excelsa, Populus nigra.* Shrubs – *Prunus divaricata,* abundantly developed creeping branches of *Rubus caesius.* In addition, there is an abundance of growth of invasive alien species *Ailanthus altissima* here.

Number of trees on the site – 14.

Figure 26: Site 1

2. Location (km position) – 33+030

A short patch where a few specimens of an invasive plant *Ailanthus altissima,* and *Populus nigra* grow. Abundantly grow *Rubus caesius,* liane *Humulus lupulus* (Figure 28) and invasive alien species *Ambrosia artemisiifolia.*

Number of trees on the site – 0.

Figure 27: Humulus lupulus on the Site 2

3. Location (km position) - 33+165-33+860

There is no woody vegetation, a pile of large stones. Of the herbaceous plants, individual specimens of weeds and invasive species are here – *Ambrosia artemisiifolia, Conyza canadensis, Portulaca oleracea, Achillea millefolia.*

Number of trees on the site – 1

4. Location (km position) - 33+920-33+970

The woody plants on the site include invasive species *Ailanthus altissima, Robinia pseudoacacia.* Of the herbaceous plants, individual specimens of weeds and invasive species – *Ambrosia artemisiifolia, Conyza canadensis, Artemisia vulgaris.*

Number of trees on the site – 3

5. Location (km position) – 35+060-35+160

As in section 4, predominantly invasive species are represented: *Ailanthus altissima* and *Robinis pseudoacacia.* There are *Rubus caesius, Humulus lupulus.*

Number of trees on the site – 2

6. Location (km position) - 35+250-35+760

As in sections 4 and 5, predominantly invasive species are represented: *Ailanthus altissima* and *Robinis pseudoacacia.* There are *Rubus caesius, Humulus lupulus.* Of the herbaceous plants *Ambrosia artemisiifolia, Conyza canadensis, Melilotus officinalis, Setaria viridis.*

Number of trees on the site – 3

7. Location (km position) - 37+100-37+150 (Figure 28)

Among the woody plants are represented: *Ulmus elliptica* and *Ulmus suberosa.* The slope is heavily overgrown by *Rubus caesius.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 8.

Figure 28: Site 7

8. Location (km position) - 37+510 - 37+800

Among the woody plants are represented: *Ulmus elliptica, Ulmus suberosa* and *Salix alba.* There are *Rubus caesius* and *Humulus lupulus.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 4.

9. Location (km position) - 38+400 -38+450

Among the woody plants are represented: *Ulmus elliptica* and *Ulmus suberosa.* There are *Rubus caesius* and *Humulus lupulus.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 2

10. Location (km position) - 39+100-39+350

The woody plants are represented by shoots of *Ulmus suberosa, Salix caprea, Robinia pseudoacacia.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 0.

11. Location (km position) - 55+950-56+270

There are dense thickets of *Robinia pseudoacacioa, Ailanthus altissima* and *Ulmus elliptica* on the site*.* Of the herbaceous plants there are dense populations of *Ambrosia artemisiifolia*, and *Conyza canadensis,* as well there are weeds *Amaranthus retroflexus, Datura stramonium.*

Number of trees on the site –28.

12. Location (km position) - 56+450-56+540

Continuation of the previous section with thickets of *Robinia pseudoacacia, Ailanthus altissima* and *Ulmus elliptica.*

Number of trees on the site – 3.

13. Location (km position) - 56+900-57+050

Continuation of the previous section with thickets of *Robinia pseudoacacia, Ailanthus altissima* and *Ulmus elliptica*.

Number of trees on the site – 3.

14. Location (km position) - 57+230-58+340

Individual specimens of woody plants (*Acer campestre* and *Ulmus elliptica*) are presented, as well very dense tickets of invasive *Ambrosia artemisiifolia* (Figure 29)*.*

Number of trees on the site – 10.

Figure 29: Ambrosia artemisiifolia on the Site 14

15. Location (km position) - 58+990-59+070

Continuation of the previous section with the same set of plant species.

Number of trees on the site – 0.

16. Location (km position) - 60+560-60+640

Dense growths of *Robinia pseudoacacia* along the road. The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 2

17. Location (km position) – 61+050-61+240

From woody plants thickets of *Ulmus elliptica, Ulmus suberosa, Populus nigra.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 8.

18. Location (km position) – 63+305-63+330

There is no woody vegetation. The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 0.

19. Location (km position) – 63+450-63+610

There is no woody vegetation. The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 0

20. Location (km position) – 66+650-66+965

The area is within the city of Akhtala. Relatively many *Salix alba*, represented *Populus nigra, Ulmus elliptica, Ulmus suberosa.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 10

21. Location (km position) – 67+050-67+300

The area is within the city of Akhtala. There is no woody vegetation. Dense tickets of *Ambrosia artemisiifolia.*

Number of trees on the site – 0.

22. Location (km position) – 67+360-67+620

The area is within the city of Akhtala. There is no woody vegetation. The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 0

23. Location (km position) – 71+090

Solely samples of *Salix alba* and *Robinia pseudoacacia.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 8.

24. Location (km position) – 71+250-71+400

Solely trees of *Robinia pseudoacacia,* among which there are a small number of *Ficus carica* shrubs*.* The herbaceous plants include weeds that are common in disturbed habitats.

Number of trees on the site – 3.

25. Location (km position) – 76+300-76+370

The site is within the village of Chochkan. There is no woody vegetation. Herbaceous plants include weeds, common in disturbed habitats.

Number of trees on the site – 0

26. Location (km position) – 84+570-84+640

Dense tickets of *Robinia pseudoacacia,* there individual trees of *Salix alba, Populus nigra, Ulmus suberosa, Ulmus elliptica. Ambrosia artemisiifolia* is very abundant.

Number of trees on the site – 6.

27. Location (km position) – 84+880

Continuation of the previous section with the same set of woody plants. Herbaceous plants include weeds, common in disturbed habitats.

Number of trees on the site – 5.

28. Location (km position) – 85+050

Continuation of the previous section with the same set of woody plants. Herbaceous plants include weeds, common in disturbed habitats.

Number of trees on the site – 7.

29. Location (km position) – 85+540-85+620 (Figure 30)

Very dense tickets with *Robinia pseudoacacia, Salix alba, Populus nigra, Ulmus suberosa, Sambucus nigra.* Ailanthus altissima, Prunus spinosa, Corylus avellana, Juglans nigra are represented by individual specimens. Invasive Ambrosia artemisiifolia and Conyza canadensis are abundantly represented.

Number of trees on the site – 10.

Figure 30: Site 29

30. Location (km position) – 85+670-86+200

Continuation of the previous section with the same set of species.

Number of trees on the site – 0.

110. According to the results of the field survey of the areas along the M6 highway subject to

restoration and reconstruction, it was established that there are no rare, endangered species included in the Red Book of Plants of Armenia. Woody vegetation is represented either by plants previously used as roadside forest plantations or by common species that are part of the coastal vegetation. In addition, the overgrown alien invasive species *Ailanthus altissima* and *Robinia pseudoacacia* are abundant. Among the herbaceous plants, only weeds are represented, characteristic of disturbed habitats, and the invasive species *Ambrosia artemisiifolia* and *Conyza canadensis* are abundant.

Protected areas

111. In the south of the Lori marz are the Important Bird Area ”Pambak” and “Dsegh”. Both IBAs are located within the wider project area. The M6 road runs along the Dsegh IBA, which is mainly situated on the slopes and canyons above the Debed River. A small area of overlap (approximately 17 ha) is also present between the Dsegh IBA and Dilijan National Park. The Pambak IBA is located further from the road corridor, with the nearest point approximately 5–10 km from the project sections. The identified IBAs are therefore located at varying distances and elevations relative to the road alignment, with most works planning to take place on the river side of the road. The Dsegh IBA is located higher on the slopes above the road, and no encroachment is expected.

112. Among the potential sites is the "Lori Lakes" site, located in the Lori highland plain (the nearest large settlement is the city of Stepanavan). The site's main ecosystems are mesotrophic relict lakes. The shortest distance from the site to the start of the M6 highway (the city of Vanadzor) is 23.5 km, and to the start point of work on this highway, it is 30 km (Fig. 3). A significant section of the M6 highway runs along the boundary of the potential "Debed Gorge" site. The main ecosystems of this potential site are oak and beech forests and open forests, and the primary focus is the conservation of numerous bird species listed in Resolution 6 of the Bern Convention.[5] There are no other potential sites for the Emerald ecological network near the M6 highway.

[5] Currently, the Emerald ecological network effectively does not exist. Firstly, the current law "On Specially Protected Natural Areas" does not include the concept of "ecological network." A new version of the law is currently being considered by the Armenian Parliament, and this concept will be included in it. Secondly, potential Emerald network sites were submitted to the Bern Convention Secretariat as part of the research programs, but they have not yet been approved by the government. The scope and location of the potential sites are currently being reviewed by the Armenian Ministry of Environment.

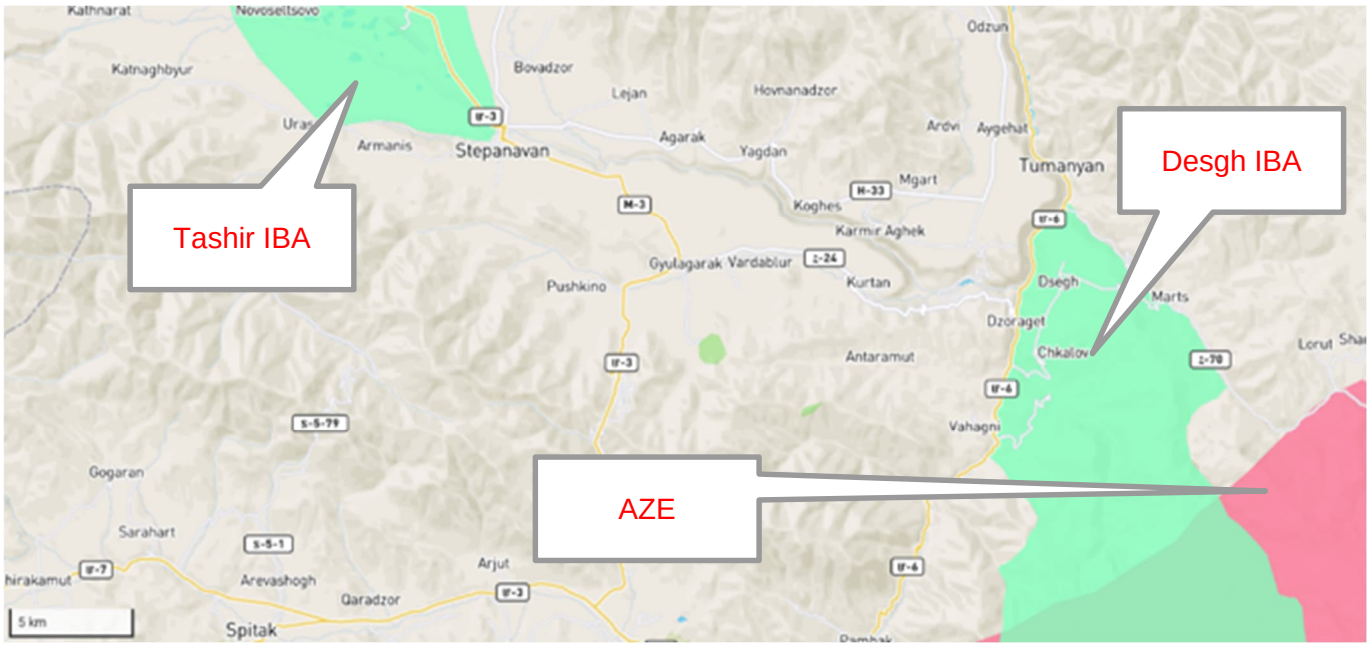


Figure 31: KBAs and IBAs (source: IBAT)

Fauna

113. Zoological surveys along the M6 highway were conducted using the transect (route) method, covering all 30 designated sections where construction and restoration works are planned. The surveys mainly focused on areas extending from the roadbed towards the river.

114. During the assessment, special attention was given to the presence or absence of rare species included in the Red Data Book of Animals of Armenia and IUCN.

115. In addition to data collected during the field assessment (10–11 September 2025) to the study area, this report also includes available information on previous research conducted in these areas, as well as accessible scientific sources relevant to the region (reference sources, various reports, and the scientific collections of the Institute of Zoology). During the data collection process, the following available literature and material were reviewed: Dahl S.K. (1954), Heptner V.G. et al. (1967), Martirosyan B.A., Papanyan S.B. (1983), Bibikov D.I. (1985), Agadzhanyan F.S. (1986, 1993), Ghasabyan M.G. (1986, 2001, 2014), Popov G.Yu. (2003), Avagyan A.V. (2010), Adamian M.S. & Klem D. Jr. (1999, 2000), Red Data Book of Animals of Armenia (1987, 2010), ASPB reports on IBA territories[6], and preliminary data from the “EMERALD” network in the Republic of Armenia (2016, 2019).

General Description of the Study Area

116. Armenia is part of the South Caucasus and one of the most important regions in terms of biodiversity richness. The country’s territory encompasses nearly all of the main ecosystems of the Caucasus. Armenia hosts more than 3,800 species of vascular plants—over half of the entire Caucasus flora—as well as more than 550 species of vertebrate animals (birds, mammals, amphibians, reptiles, and fish). The segments of the M6 highway due for rehabilitation run mainly

[6] http://bird-links.org/important-bird-areas/

through the Lori region and closer to the border with Georgia, the road crosses into the northwestern part of the Tavush region.

Lori region

117. The diverse ecosystems of the Lori region support a wide variety of bird species. In forested areas with well-developed undergrowth, passerines such as redstarts, flycatchers, tits and others predominate. Various pigeons, thrushes and woodpeckers are found both in dense stands of tall forest and in small remnant forest patches within narrow valleys. Woodlands are also abundant in birds of prey - both diurnal and nocturnal. Species such as the Goshawk (*Accipiter gentilis*), Eurasian sparrowhawk (*Accipiter nisus*), European honey buzzard (*Pernis apivorus*), Common buzzard (*Buteo buteo*) and Long-eared owl (*Asio otus*) are common in the forests of Lori. Species typical of mountain-steppe including ground- and shrub-nesting birds, are also abundant. Larks, wheatears, wagtails and various shrikes nest in large numbers in shrubs and on the ground under grassy vegetation. Almost all gallinaceous species occur in the mountains of the region. The Caspian snowcock (*Tetraogallus caspius*) occurs in high-altitude zones, the Caucasian black grouse *(Tetrao mlokosiewiczi)* is found at the upper tree line in the subalpine belt, while grey partridge and quail are numerous in meadows and mountain steppe. Species such as Long-legged Buzzard (*Buteo rufinus*), kestrel, red-listed vultures, Golden eagle (*Aquila chrysaetos*) and Peregrine falcon (*Falco peregrinus*) nest in rocky outcrops and river gorges. Small lakes and wetlands host both resident waterbird species and migratory birds passing through the region, including herons, geese, ducks, and waders. During spring and autumn migration, large birds of prey and two species of red-listed cranes are commonly observed in the region.

118. The mammals inhabiting the Lori region include members of most families found throughout Armenia. Among the large predators, bears occur in the forest belt and in high-altitude areas. Wild boar (*Sus scrofa*) and Roe deer (*Capreolus capreolus*) are also common. Species such as Lynx (*Lynx lynx*), Stone marten (*Martes foina*) and European badger (*Meles meles*) occur both in the forest and mountain-steppe areas. Wolves (*Canis lupus*), Foxes (*Vulpes vulpes*) and hares (*Lepus europaeus*) are found across almost all altitudinal landscape zones, from the highlands to the lower plateaus. Golden Jackal (*Canis aureus*), which has recently become widely common across the country is mainly found along river valleys and wetlands and occasionally frequents into human settlements. Small mammals, including insectivores and rodents, are also common. The Southern White-breasted Hedgehog (*Erinaceus concolor*) and Forest dormouse (*Dryomys nitedula*) occur both in small tree plantations and orchards. The Persian squirrel (*Sciurus anomalus)* is a common denizen of forest in the region. Forest mouse (*Apodemus sp.)*, Major's pine vole (*Microtus majori)* and Common vole (*Microtus arvalis*) are widely spread across much of the habitat landscapes of the region, while Grey dwarf hamster (*Nothocricetulus migratorius*) is regularly seen in human settlements. During twilight and nighttime, some bat species can be spotted chasing nocturnal insects in the region's mid-altitude zones and certain settlements. One of these species, the Brown Long-eared Bat (*Plecotus auritus*), is included in the Red Data Book of Armenia.

119. Amphibians and reptiles are also well represented throughout the region. Green toad (*Bufo viridis)*, Shelkovnikov's tree frog (*Hyla arborea schelkownikowi*), Long-legged wood frog (*Rana macrocnemis*) and Marsh frog (*Pelophylax ridibundus*) are found nearly across all wetlands and water bodies. The slowworm, several species of rock lizards (*Darevskia sp.)* and the Caucasus emerald lizard (*Lacerta strigata*) are also frequently encountered. Among snakes, the most commonly encountered are the Grass Snake (*Natrix natrix*), Dice Snake (*N. tesselata*), Transcaucasian Ratsnake (*Zamenis hohenackeri*) and Smooth Snake (*Coronella austriaca*). The

venomous snakes occurring in the region include the Steppe viper (*Vipera eriwanensis*).

Tavush Region

120. It is the only region in Armenia that borders both Georgia and Azerbaijan. To the west, it is bounded by Lori Region and by Gegharkunik Region to the south.

121. Tavush is the most forested region in Armenia, with more than half of its territory covered by forests. The main forest stands are dominated by hornbeam (*Carpinus*), beech (*Fagus*), and oak (*Quercus*). Mixed forests, incorporating coniferous species, are found on the northern slopes of the Areguni Ridge, whereas maple (*Acer*) and ash (*Fraxinus*) dominate at lower elevations. Central parts of the region are characterized by open juniper (*Juniperus*) woodlands with xerophytic vegetation spanning lower altitudes. Along the border with Azerbaijan, the lowest parts of the region support scattered semi-desert plant communities.

122. Tavush Region features numerous rivers, the largest being the Aghstev, along with its tributaries: Getik, Voskepar, and Sarnajur. Originating in the Miapor Mountains, rivers such as the Akhum, Tavush, and Khndzorut traverse picturesque valleys before joining the Kura River. The region also hosts several small forest lakes, among them are Lake Parz and Lake Gosh, renowned for their remarkable natural beauty. In comparison to Lori Region, Tavush has far fewer wetlands and moist meadows. A large portion of the region is encompassed by Dilijan National Park. The landscape and diversity described above, similar to those in Lori Region, largely determine the composition of the vertebrate fauna in Tavush.

123. The diverse ecosystems of Tavush Region support a wide variety of bird species. In forested areas with a well-developed understory, passerines such as redstarts and tits are predominant. Various pigeons, thrushes, and woodpeckers occur in small residual forest patches along narrow canyons. Forested habitats are also rich in both diurnal and nocturnal birds of prey. Booted Eagle (*Hieraaetus pennatus*), Eurasian Sparrowhawk, European Honey Buzzard, Common Buzzard and Long-eared Owl are also common in Tavush forests. Skylarks, wheatears, wagtails and various shrikes nest in shrubs and on the ground under herbaceous vegetation. Grey Partridge (*Perdix perdix*) and Common Quail (*Coturnix coturnix*) are abundant in meadows and montane steppes. The Caspian Snowcock can occasionally be found at higher elevations, while Caucasian black grouse is still present at the upper tree line in the subalpine zone.

124. Rock outcrops within forested areas and montane steppes provide nesting sites for Long-legged buzzard, kestrel as well as red-listed Egyptian Vulture (*Neophron percnopterus*), Griffon Vulture (*Gyps fulvus*), Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*). During autumn and spring migrations, large-size raptors are frequently observed crossing the skies over the entire region.

125. Mammals inhabiting Tavush Region include many of the families found across Armenia. Among large predators, Brown Bear (*Ursus arctos*) occurs in forested and high-mountain zones. The Eurasian Lynx (*Lynx lynx*), Stone Marten (*Martes foina*) and European Badger (*Meles meles*) are found in both forest and montane-steppe belts. Wild boar (*Sus scrofa*) and Roe deer (*Capreolus capreolus*) are permanent residents of the region's forests. Wolves (*Canis lupus*), foxes (*Vulpes vulpes*) and hares (*Lepus* spp.) are present across almost all altitudinal belts, from highlands down to the lowland plateaus. In river valleys, Golden Jackals (*Canis aureus*), which have recently expanded their range, are frequently observed and occasionally venture into human

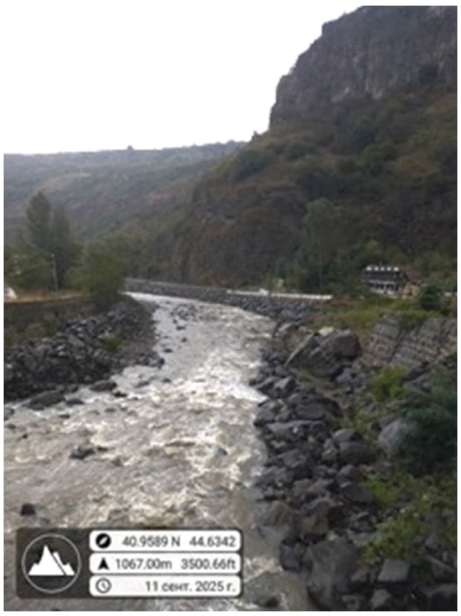
settlements. And of course, small mammals occur widely throughout the region. The Southern White-breasted Hedgehog and Forest Dormouse (*Dryomys nitedula*) occur in both small tree plantations and orchards. The Persian Squirrel (*Sciurus anomalus*) is a common forest dweller in Tavush. Forest mouse (*Apodemus sp.*) and Common Vole are abundant across multiple habitats, while the Grey dwarf hamster is regularly seen in human settlements. During twilight and nighttime, bats can be observed flying along river valleys and within settlements.

126. Reptiles and amphibians are widely represented throughout the region. the Long-legged wood frog and Marsh frog, Green toad and Shelkovnikov's tree frog are found in nearly all wetlands and water bodies. Caspian turtle (*Mauremys caspica*) is found in the lower reaches of the Debet River. European glass lizard (*Pseudopus apodus*), Caucasian agama (*Paralaudakia caucasia*), several species of rock lizards and Medium lizard are regular residents of their typical habitats. The snake fauna is represented by the Blindsnake (*Xerotyphlops vermicularis*), Dice snake and Dahl's whipsnake (*Platyceps najadum*), whereas the Caucasian catsnake (*Telescopus fallax*) occurs less frequently. Among venomous snakes, the Levant or Blunt-nosed viper (*Macrovipera lebetina*) is present.

Results of the survey along Highway M6

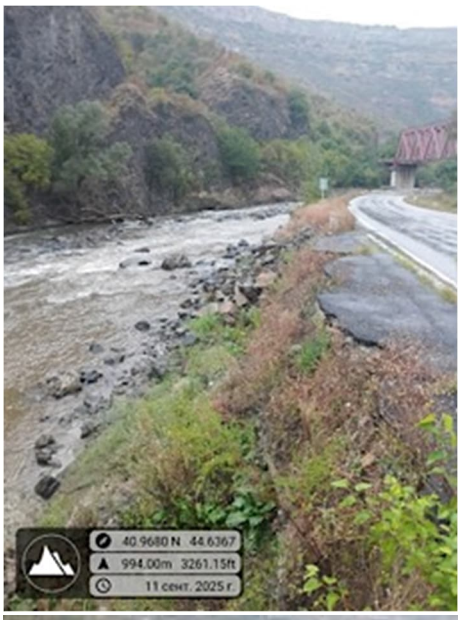
Location 1 (km 31+675 – 32+765)

The stretch between the highway and the Debed River is dominated by large boulders with only scant herbaceous cover in the gaps. A small cluster of trees hosted Black Redstart (*Phoenicurus ochruros*) and Common Blackbird (*Turdus merula*), while migrating leaf warblers (*Phylloscopus* spp.) may occur during passage. The terrain likely supports the forest mouse (*Apodemus spp.*), and the European water vole (*Arvicola amphibius*) may be present in the river. Among predators, only Golden Jackal is expected to descend to the river in search of fish remains, edible scraps carried by the river downstream or small rodents. A rock lizard species was observed on the retaining wall.



Location 2 (km 33+030)

A small site represented with patches of blackberry thickets and vine-like creeping stems, interspersed with low herbaceous vegetation among piled stones along the riverbank. Avifauna observed included White wagtail (*Motacilla alba*), Green sandpiper (*Tringa ochropus*) and White-throated Dipper (*Cinclus cinclus*) perched in a midstream boulder in the river. A rock lizard species was observed on a fragment of asphalt from a collapsed section of the road. Golden Jackal tracks were also documented.



Location 3 (km 33+165 – 33+860)

Throughout the surveyed section, extending from the road to the river, the habitat is largely represented by piles of deposited large stones. Magpie (*Pica pica*) was spotted amidst branches of a single tree growing in the middle of the area. In sparse vegetation, three European goldfinches (*Carduelis carduelis*) feeding on seed of dry stalks and Black redstart were observed. From boulders on the right bank, Little Egret (*Egretta garzetta*) flew off to the left bank. Near small structures, Grey dwarf hamster was recorded, along with tracks of a Red fox. Rock lizards were also noted on the walls of the buildings and along the roadside verge.

Location 4 (km 33+920 – 33+970)

No vertebrate species were recorded in this section.

Location 5 (km 35+060 – 35+160)

Within small thickets of Tree of Heaven (*Ailanthus altissima*) and Locust (*Robinia pseudoacacia*), Common blackbird was observed. Blackberry thickets hosted Red-backed Shrike (*Lanius collurio*), Common Redstart (*Phoenicurus phoenicurus*) and Eurasian Wren (*Troglodytes troglodytes*). Tracks and scat of the Golden Jackal were spotted in the mud near the water. Marsh frog

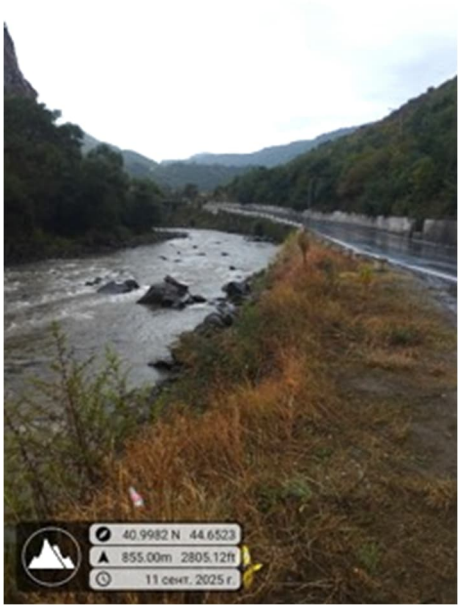
was found hiding under a stone in a small silted section of the river.

Location 6 (km 35+250 – 35+760)

From trees on the opposite slope, a Song Thrush (*Turdus philomelos*) crossed the road and entered thickets of Locust, foraging for insects among the branches. Common Kestrel (*Falco tinnunculus*) took off from the same slope and headed downward along the right bank of the river. Rock Buntings (*Emberiza cia*) were recorded in grassy vegetation. Crag martins (*Ptyonoprogne rupestris*) were seen flying over the river in the lower sections of the surveyed segment. Golden Jackal tracks were spotted along the shores. Several years ago, Eurasian otter (*Lutra lutra*) was captured near this location, although it was never reported from here previously, neither in existing literature sources nor from local residents. Subsequently, no further evidence of the species was found in the Debed river or in the lower reaches of the Martz River. Stagnant sections of the Debed River supported Marsh frog, while lizard species likely belonging to the genus Darevskia (Rock lizards) were recorded in dense stands of grasses along the riverbank.These species are not protected and are classified as Least Concern (LC) on the IUCN Red List.

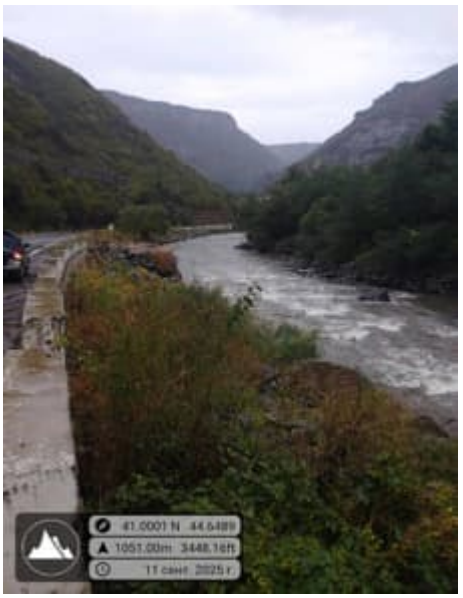
Location 7 (km 37+100 – 37+150)

Among branches of Elm trees, Common Blackbird and Great Tit (*Parus major*) were observed. Common Swifts (*Apus apus*) and House Martins (*Delichon urbicum*) were seen flying over river. Blackberry thickets hosted European Robin (*Erithacus rubecula*) and European Greenfinch (*Chloris chloris*). White Wagtails were seen on broken asphalt. Eurasian Wren and European Goldfinches are also likely to occur in these habitats. As elsewhere along the entire riverbank, tracks of Golden Jackal were recorded. Green Toad and rock lizards were found in shrubs between stones.



Location 8 (km 37+510 – 37+800)

In addition to species recorded in the previous section, European Robin and Eurasian Wren were observed in willow trees. Grassy vegetation supported Forest mouse and Medium lizard.



Location 9 (km 38+400 – 38+450)

Green Sandpiper was observed along riverbanks, while European Greenfinch flitted among branches of an Elm tree. On dry stalks of herbaceous plants, European Goldfinches were feeding on seeds. Barn Swallows (*Hirundo rustica*) were flying above the river.

Location 10 (km 39+100 – 39+350) (

White Wagtail, House Sparrow and Common Starling (*Sturnus vulgaris*) were observed on the highway asphalt. A Dice Snake was spotted on a small midstream stone in a calm section of the river, while Marsh Frog was present along riverbanks.

Location 11 (km 55+950 – 56+270)

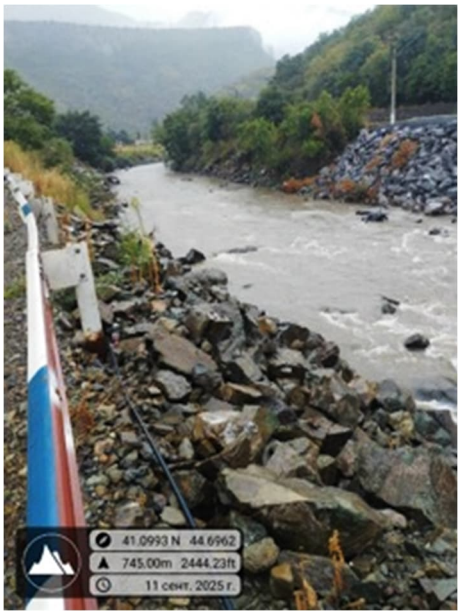
White wagtail, Common Starling and House Sparrow were observed on asphalt and among ruined structures. Common Sandpiper (*Actitis hypoleucos*) and Grey Wagtail (*Motacilla cinerea*) were present on riverbanks, while House Martin and Common Swift were flying above the river.

In spruce (*Picea* sp.) trees near buildings, Great Spotted Woodpecker (*Dendrocopos major*), European Greenfinch, Eurasian Treecreeper (*Certhia familiaris*), European Goldfinch, Common Redstart were observed together with House Sparrow and Eurasian Jay (*Garrulus glandarius*). Great Ttit (*Parus major*) and Eurasian Wren were seen in nearby bushes.

Tracks of Golden Jackal, hedgehog and possibly European Weasel (*Mustela nivalis*) were recorded along the riverbank. Grey dwarf hamster was also noted, while rock lizards were observed among ruined structures and on a retaining wall, and Green Toad was present in grassy vegetation.

Location 12 (km 56+450 – 56+540)

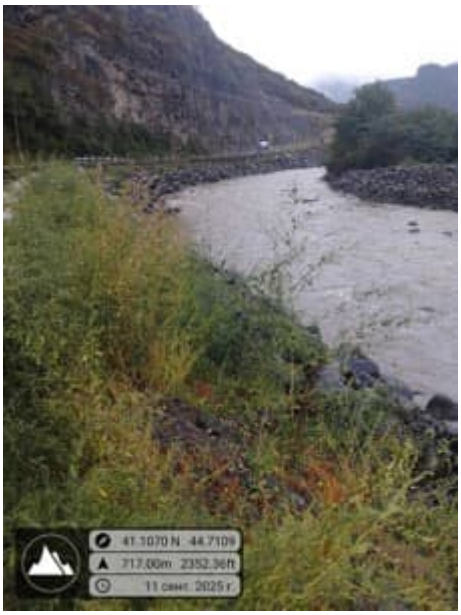
White Wagtail, Eurasian Jay, Common Kestrel, House Sparrow and Blue Tit (*Cyanistes caeruleus*) were recorded. Forest mouse (*Apodemus sp.*) occurs in this area and rock lizards and Green Toad were also observed in this section of the road.



Location 13 (km 56+900 – 57+050)

Common Blackbird, Eurasian Jay, and Great Tit were observed among the dense branches of Elm trees. Along the stones of the riverbank, a White Wagtail was recorded, while in nearby ruins a Magpie, Black Redstart, and House Sparrow were noted. Over the river and adjacent structures, European Bee-eaters (*Merops apiaster*) and House Martins were seen flying. A Grey Dwarf Hamster was observed among the building ruins. Tracks of a Golden Jackal were recorded in the area, and Rock Lizards were also present.

Location 14 (km 57+230 – 58+340)



The area is mostly represented by bare riverbanks with scattered boulders and scree stones as well as retaining walls. In the mid part of this road section, nearly 250 meters in length are buildings surrounded by dense thickets of Elm, Maple and Willow saplings, along with numerous bushes and herbaceous vegetation.

In this section, Magpie, House Sparrow, Eurasian Jay, Hawfinch (*Coccothraustes coccothraustes*), Grey (*Motacilla cinerea*) and White Wagtails (*Motacilla alba*), European Goldfinch, Rock Bunting (*Emberiza cia*), Long-tailed Tit (*Aegithalos caudatus*) and Eurasian Wren were recorded. House Martin and European Bee-eaters (*Merops apiaster*) were flying in the air.

A Forest Mouse was observed in bushy thickets, and a Grey Dwarf Hamster may occur near buildings. Hedgehog tracks were noted in the mud, and tracks of a Golden Jackal were recorded along the entire site. Rock Lizards were encountered along the ruined retaining walls. During autumn and spring migration, various species of migratory leaf warblers may visit this site.

Location 15 (km 58+990 – 59+070)

The site is primarily characterized by a steep riverbank and a retaining wall. At the beginning of the section, a small bushy patch hosted a pair of Red-backed Shrikes. A White Wagtail was observed on the road. Two Common Swifts and a small flock of European Bee-eaters were seen flying above the river. Tracks of a Golden Jackal were found along the remainder of the highway.

Location 16 (km 60+560 – 60+640)

The riverbank contained scattered scree stones of various sizes, a retaining wall, a small tree, and sparse grassy vegetation. Common Blackbird and White Wagtail were recorded, while House Martins were seen flying low over the water. Tracks and droppings of a Golden Jackal were noted, and a Grey Dwarf Hamster was observed. A Green Toad was spotted near the road along the riverbank.

Location 17 (km 61+050 – 61+240)

Along the riverbank, dense thickets of Elm, Poplar, and Willow saplings were present, with minimal grassy vegetation. Common Blackbird, Great Tit, European Goldfinch, and Eurasian Jay were observed in the trees. A Willow Warbler was recorded in the bushes. A Rock Lizard was spotted on the retaining wall.

Location 18 (km 63+305 – 63+330)

Carrion Crow (*Corvus corone*), White Wagtail and European Bee-eater were flying above the area, while tracks of a Golden Jackal were noted on the ground.

Location 19 (km 63+450 – 63+610)

Trees were present at the beginning and end of the road section, while the middle section was represented by a bare riverbank. Common Wood Pigeon (*Columba palumbus*), Eurasian Chaffinch (*Fringilla coelebs*) and Common Redstart were recorded in trees. White Wagtail was observed along the riverbank.

Location 20 (km 66+650 – 66+965)

A wide section of the riverbank was dominated by Willow, Elm, and Poplar along the shore. Common Wood Pigeon, Eurasian Jay, Great Tit, and Common Redstart were observed in the trees. European Goldfinch and Common Chiffchaff (*Phylloscopus collybita*) were seen in small patches of herbaceous vegetation. Grey Wagtail was noted on the rocky riverbank. Tracks of a Golden Jackal were present throughout the site. Beneath a road bank, a Green Toad was observed, and Rock Lizards were recorded on the retaining wall.

Location 21 (km 67+050 – 67+300)

As in the previous section, trees were present along the riverbank, and the vertebrate fauna observed was similar to that recorded at the preceding site.

Location 22 (km 67+360 – 67+620)

A few bushes were present along the riverbank. House Sparrow, Magpie, White Wagtail, and Rock Pigeon (*Columba livia*) were recorded. Tracks of a Golden Jackal and the presence of a Forest Mouse were noted. Rock Lizards and Marsh Frog were also observed.

Location 23 (km 71+090)

On a short section of the riverbank, White Wagtail, Magpie, Carrion Crow, and European Bee-eaters were observed. Tracks of a Golden Jackal and a Red Fox were noted. A Green Toad was also present.

Location 24 (km 71+250 – 71+400)

Along the riverbank, locust trees were present, including *Ficus* (*Ficus* sp.) and other low-growing trees, with various herbaceous vegetation. Carrion Crow, Blackbird, and Common Starling were observed in the trees. European Goldfinch was recorded in the herbaceous vegetation. A Sparrowhawk was seen chasing House Sparrows, while House Martins were flying above the river. Tracks of a

Golden Jackal were found again, and a Forest Dormouse was observed feeding on fruits in a fig tree. A Striped Lizard was also noted.

Location 25 (km 76+300 – 76+370)

The site consisted of a small, steep riverbank with a damaged retaining wall. A White Wagtail was observed on the shore, and House Sparrows were seen in the ground vegetation.

Location 26 (km 84+570 – 84+640)

Dense thickets of Acacia (*Acacia* sp.), along with Elm, Poplar, and Willow, were present. Low undergrowth and dense herbaceous vegetation covered the area. Carrion Crow, Magpie, Common Buzzard, Common Wood Pigeon, Eurasian Treecreeper, Great Tit, and Tree Sparrow (*Passer montanus*) were observed in this short section of the road. Grey Heron (*Ardea cinerea*) was spotted flying off the sandy shore. Southern White-breasted Hedgehog, Forest Dormouse, and Forest Mouse (*Apodemus* sp.) were noted, along with tracks of a Golden Jackal. Medium Lizard, Green Toad, and Long-legged Wood Frog were also present. Dice Snake was observed in the river.

Location 27 (km 84+880)

Rock Dove (*Columba livia*), Common Kestrel, and White Wagtail observed on the asphalt were recorded in this road section. Beneath a steep bank, a Northern Wheatear (*Oenanthe oenanthe*) was observed. Great Cormorants (*Phalacrocorax carbo*) were flying above the river, and tracks of a Golden Jackal were found along the road.

Location 28 (km 85+050)

Common Buzzard, Common Wood Pigeon, Great Spotted Woodpecker, Song Thrush, Common Redstart, Common Chiffchaff, and Eurasian Jay were observed. Grey Heron and Little Egret were seen flying off the riverbank. Tracks of a Golden Jackal and the presence of a

Forest Dormouse were also recorded. A Green Toad was present as well.

Location 29 (km 85+540 – 85+620)

Common Wood Pigeon, Eurasian Jay, Blackbird, European Robin (*Erithacus rubecula*), Common Redstart, and Great Tit were observed in thickets of trees growing beneath the road. Common Sandpiper and Great Cormorant were also recorded along the shores. Tracks of a Golden Jackal were noted. Marsh Frog and Dice Snake were present in the river.

Location 30 (km 85+670 – 86+200)

This is one of the longest and most diverse sections of the survey, both in length and habitat variety. Avifauna observed here included Common Buzzard, Eurasian Sparrowhawk (*Accipiter nisus*), Common Kestrel, Common Quail, Common Wood Pigeon, Rock Dove, Eurasian Skylark (*Alauda arvensis*), House Martin, Barn Swallow (*Hirundo rustica*), White Wagtail, Whinchat (*Saxicola rubetra*), Common Chiffchaff, Blackbird, Eurasian Jay, Magpie, and Carrion Crow, all observed in thickets of trees, bushes, and orchards.

Great Cormorant, Grey Heron, Little Egret, Common Sandpiper, and White Wagtail were recorded along the riverbank. Tracks of a Golden Jackal and a Red Fox were observed throughout the section. Tracks of Southern White-breasted Hedgehog were found among orchard trees. Burrows of Forest Mouse (*Apodemus* sp.) and remains of Forest Mouse were also noted.

Amphibians and reptiles recorded included Marsh Frog, Long-legged Wood Frog, Shelkovnikov's Tree Frog, Dice Snake, and Medium Lizard.

127. Based on the results of field surveys implemented over 2-day period in September 2025 along sections of the M6 Vanadzor–Bagratashen highway subject to restoration and reconstruction, it was established that among the rare and endangered species listed in the Red Book of Armenia, only one species—Great Cormorant (*Phalacrocorax carbo*)—was actually observed. It is listed in the IUCN Red List of Threatened Species (ver. 3.1) as Least Concern. In the Armenian Red Data Book according to IUCN criteria it is categorized as Vulnerable VU B1ab(iii). It should be noted, however, that observations of this species were mainly associated

with the central parts of the Debed River channel (midstream), so construction and restoration activities along the riverbanks are unlikely to have a significant impact on its habitats.

Regarding the Eurasian Otter (*Lutra lutra*), no recent records were noted, and historical presence appears limited. It is listed in the IUCN Red List of Threatened Species (ver. 3.1) as Near Threatened NT under criteria A2c. In the Armenian Red Data Book according to IUCN criteria it is categorized as Endangered EN D.

Overall, it is concluded that the planned works are unlikely to cause significant damage to the zoological components of the natural ecosystems and should not adversely affect populations of rare animal species in Armenia.

Photographs of Observed Species

128. None of the species shown are listed as VU, EN, or CR on the IUCN Red List.

Little Egret

Grey Heron

Long-legged Buzzard

Common Kestrel

Common Wood Pigeon

Laughing Dove

Common Swift

Barn Swallow

Eurasian Skylark

White Wagtail


Red-backed Shrike


White-throated Dipper


Black Redstart


Northern Wheatear


Eurasian Blackbird


Eurasian Chaffinch

Common Chiffchaff

Great Tit

Blue Tit

Long-tailed Tit

Rock Bunting

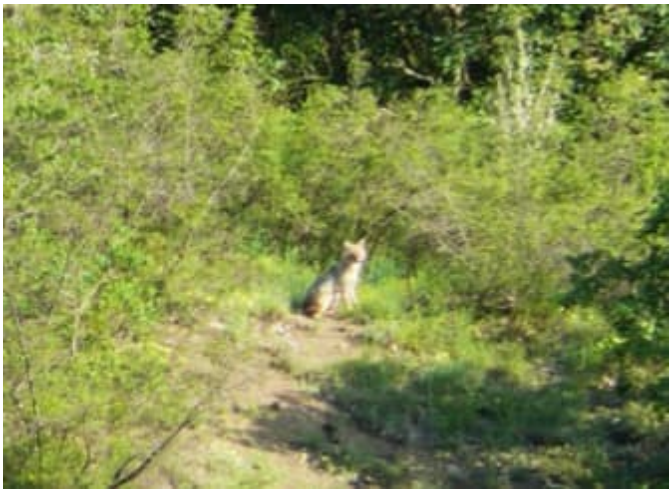
Eurasian Jay

Eurasian Magpie

Hedgehog tracks

Southern White-breasted Hedgehog

Red Fox



Golden Jackal

Least Weasel

Darevskia Saxicola

Marsh Frog

Long-legged wood frog

Dice Snake

Blunt-nosed Viper

Fish species diversity of the Debed River

129. After the Araks River, the Debed River ranks among the first in the Republic of Armenia in terms of its length, water abundance, and the size of its drainage basin. It originates from the Jajur Pass and flows into the Khram tributary of the Kura River (Ktsia-Khrami). The total length of the

Debed River, including its Pambak tributary, is 176 km (154 km within the territory of the Republic of Armenia). The drainage basin area is 4,080 km², of which 3,790 km² are located in Armenia. The river has a mixed feeding regime—comprising meltwater, rainwater, and sources emerging from lava sediment layers—and an irregular flow pattern. The river floods in spring, when the water discharge exceeds that of winter by more than 100 times. Flooding also occurs in autumn, while the relatively low-water period corresponds to the winter months (Mnatsakanyan, 2007; Boynagaryan, 2009).

130. The main right-bank tributaries of the Debed River (starting from the source of the Pambak River) are: Tsaghkarun, Vordnav, Spitak, Lernajur (via the Karachoban tributary), Tandzut (via the Vanadzor tributary), Chanakhchi, Martz, and Shnogh. The left-bank tributaries include Chichkhan, Dzoraget (with its right-bank tributaries Sev and Gargar, and left-bank tributaries Karakala, Tashir, and Meskhanka) (Boynagaryan, 2009).

131. According to literature data, the following fish species have been found in the Debed River:

№	Species (Latin)	Common Name	IUCN	Red Book
1	*Capoeta capoeta* Guldenstadt 1772	Caucasian Scraper	LC	Not Threatened
2	*Barbus cyri* De Filippi, 1865	Barbus cyri	NE	Not listed
3	*Luciobarbus mursa* Güldenstädt, 1773	Mursa	LC	Not Threatened
4	*Gobio sp.*	(an incompletely identified species of the genus gobios)	NE	Not listed
5	*Pseudorasbora parva* Temminck & Schlegel, 1846	Stone moroko	LC	Not Threatened
6	*Alburnus filippii* Kessler, 1877	Kura bleak	LC	Not Threatened
7	*Alburnus hohenackeri* Kessler, 1877	*North Caucasian bleak*	NE	Not listed
8	*Leucaspius delineatus* Heckel, 1843	Belica	LC	Not Threatened
9	*Alburnoides eichwaldii* De Filippi 1863	Kura chub	NE	Not listed
10	*Squalius orientalis* Heckel, 1847	Chub	LC	Not Threatened
11	*Carassius gibelio* Bloch, 1782	Gibel carp	LC	Not Threatened
12	*Cyprinus carpio* Linnaeus, 1758	Common carp	LC	Not Threatened
13	*Oxynoemacheilus brandtii* Kessler, 1877	Kura loach	NE	Not listed
14	*Salmo trutta fario* Linnaeus, 1758	Brown trout	LC	Protected/sensitive; *Often listed as a protected species under salmonid or "native trout" entries*

15	*Oncorhynchus mykiss* Walbaum, 1792	Rainbow trout	LC	Not protected

132. According to expert input and available data, no fish species listed in the Red Book of the Republic of Armenia or classified as Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) on the IUCN Red List are present in the Debed River within the Project area. Studies confirm that species such as ship sturgeon and European eel have not been recorded in the Debed River in Armenia. While these species have been reported in neighbouring regions (e.g. Georgia), there are no confirmed records within the Armenian section of the river.

133. The current analysis of the species composition of the Debed River fish was based on the data from studies conducted by team members at the stations in recent years. To determine the current species composition of fish in the Debed River, five observation sites were selected, covering the upper, middle, and lower sections of the river. This approach is a widely accepted format for conducting ichthyological studies in river systems. In selecting the observation sites, the presence of tributaries flowing into the river was also taken into account, as these can influence changes in fish species composition.

Thus, the observation sites selected for the study are:
№1 Ayrum - 41°11'50"N 44°54'07"E
№2 Shnogh - 41°09'08"N 44°49'55"E
№3 Akhtala - 41°08'53"N 44°46'58"E
№4 Alaverdi - 41°05'45"N 44°40'30"E
№5 After the confluence of the Dzoraget - 40°57'28"N 44°37'58"E

The distribution of fish species by stations was as follows:

Station № 1: Ayrum - 41°11'50"N 44°54'07"E:

This observation point of the river is quite rich in water and maintains similar ecological conditions almost up to the point where the river exits the borders of our Republic. Taking this into account, as well as the accessibility of this section for research purposes, this location was selected as the observation point. The following fish species are found at this site:

1. *Alburnoides eichwaldii De Filippi 1863 - Kura chub*
2. *Barbus cyri De Filippi, 1865 – Kura barbel*
3. *Capoeta capoeta Guldenstadt 1772 - Caucasian Scraper*
4. *Oxynoemacheilus brandtii Kessler, 1877 - Kura loach*
5. *Gobio sp. - (an incompletely identified species of the genus gobios)*
6. *Pseudorasbora parva Temminck & Schlegel, 1846 - Stone moroko*
7. *Carassius gibelio Bloch, 1782 - Gibel carp*
8. *Oncorhynchus mykiss Walbaum, 1792 - Rainbow trout*
9. *Squalius orientalis Heckel, 1847 - Chub*

Station № 2: Shnogh - 41°09'08"N 44°49'55"E:

In this section of the river, the Debed River and the Shnogh tributary merge. At this point, certain ecological conditions begin to change, which is due to the presence of the Shnogh tributary. The following fish species have been captured from this observation point:

1. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
2. *Barbus cyri* De Filippi, 1865 – Kura barbel
3. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
4. *Luciobarbus mursa* Güldenstädt, 1773 - Mursa

Station № 3: Akhtala - 41°08'53"N 44°46'58"E:

At this observation point, the river widens and contains large rocks. The following fish species have been captured from this site

1. *Oncorhynchus mykiss* Walbaum, 1792 - Rainbow trout
2. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
3. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
4. Barbus cyri *De Filippi, 1865* – Kura barbell
5. *Alburnus filippii* Kessler, 1877 - Kura bleak

Station № 4: Alaverdi - 41°05'45"N 44°40'30"E:

At this observation point, the river is quite fast-flowing and has been directly affected by flooding. The following fish species have been captured from this site.

1. *Salmo trutta fario* Linnaeus, 1758 - Brown trout
2. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
3. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
4. *Oxynoemacheilus brandtii* Kessler, 1877 - Kura loach
5. Barbus cyri *De Filippi, 1865* – Kura barbell
6. *Alburnus filippii* Kessler, 1877 - Kura bleak
7. Squalius orientalis Heckel, 1847 - Chub

Station № 5: After the confluence of the Dzoraget - 40°57'28"N 44°37'58"E:

In this section of the river, the Dzoraget River flows into the Debed River, and from this point, the Debed River is formed. The ecological conditions in this area are quite favorable for fish species compared to other observation points located downstream. The following fish species are found here:

1. *Salmo trutta fario* Linnaeus, 1758 - Brown trout
2. *Oncorhynchus mykiss* Walbaum, 1792 - Rainbow trout
3. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
4. *Gobio sp. - (an incompletely identified species of the genus gobios)*
5. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
6. *Oxynoemacheilus brandtii* Kessler, 1877 - Kura loach
7. Barbus cyri *De Filippi, 1865* – Kura barbell
8. *Alburnus filippii* Kessler, 1877 - Kura bleak

12 species of fish were recorded in the studied stations of the Debed and Dzoraget rivers.

1. *Salmo trutta fario Linnaeus, 1758- - Brown trout*
2. *Oncorhynchus mykiss Walbaum, 1792 - Rainbow trout*
3. *Alburnoides eichwaldii De Filippi 1863 - Kura chub*
4. *Gobio sp. - (an incompletely identified species of the genus gobios)*
5. *Capoeta capoeta Guldenstadt 1772 - Caucasian Scraper*
6. *Oxynoemacheilus brandtii Kessler, 1877 - Kura loach*
7. *Barbus cyri De Filippi, 1865– Kura barbel*
8. *Carassius gibelio Bloch, 1782 - Gibel carp*
9. *Pseudorasbora parva Temminck & Schlegel, 1846 - Stone moroko*
10. *Alburnus filippii Kessler, 1877 Kura bleak*
11. *Luciobarbus mursa Güldenstädt, 1773 - Mursa*
12. *Squalius orientalis Heckel, 1847 - Chub*

134. According to studies conducted in recent years for various purposes, the most abundant fish species in the Debed River is Kura chub, comprising 63.12% of the total population. Also common are Caucasian Scraper (10.35%) and Kura barbel (11.71%). All other species with smaller population shares together make up 14.82% of the total. Among the identified species, no fish listed in the Red Book has been found. The valuable fish species found in the river include Brown trout, Scraper, Barbel, and Mursa. These species are migratory and, in addition to their ecological significance, also have economic value and are considered desirable targets for recreational fishing.

Capoeta capoeta Guldenstadt 1772 - Caucasian Scraper

Luciobarbus mursa Güldenstädt, 1773 – Mursa

Alburnoides eichwaldii De Filippi 1863 - Kura chub

Barbus cyri De Filippi, 1865– Kura barbel

Gobio sp.- (an incompletely identified species of the genus gobios)

Carassius gibelio Bloch, 1782 - Gibel carp

Oncorhynchus mykiss Walbaum, 1792 - Rainbow trout

Salmo trutta fario Linnaeus, 1758- Brown trout

Alburn us filippii Kessler, 1877 Kura bleak

Pseudorasbora parva Temminck & Schlegel, 1846 - Stone moroko

Squalius orientalis Heckel, 1847 – Chub

Oxynoemacheilus brandtii Kessler, 1877 - Kura loach

B. Physical Environment

Climate Characteristics

135. Lori has a humid continental, no dry season, warm summer climate. The yearly temperature is 7.32ºC and it is -3.08% lower than Armenia's average. Lori typically receives about 104 millimetres of precipitation and has 177.46 rainy days annually.

136. The valley of Dzoraget occupies the southeastern part of the Lori depression, the region of the lower reaches of Dzoraget with the adjacent plateaus. The climate of this sub-region is quite mild. The annual variation of air temperature is 21°C. Summer is cool with an average of 17°C. Winter is mild: the average temperature is -2 to 3°C (Stepanavan, Gulagarak), the absolute

minimum is -28 to -31°C. The duration of winter is 3-3.5 months. The frost-free period lasts 150-160 days. The annual atmospheric precipitation is quite abundant, about 700 mm. However, the height of the snow cover is insignificant. The average ten-day rainfall in January-February is 9-10 cm.

137. Winters in the Pambak Valley are mild, the average temperature in January is -4 to -5°C, and the minimum is -25 to -30°C. The snow cover is not stable and forms an insignificant layer. The average ten-day height in the Vanadzor region is 4-9 cm, the maximum is 24-38 cm, and in Lermontovo it is 16-19 cm and 74 cm, respectively.

138. Wind directions in the region are defined in the direction of the Pambak, Debed rivers and their tributary valleys. The average annual velocity ranges from 1.4 m/s (Shnogh) to 3.4 m/s (Spitak). The windiest part of the region is the Pushkin Pass, where southern winds prevail in the winter months and northern winds in the summer. The average annual speed here is quite high at 6.3 m/s, reaching 10.3 m/s in January. The maximum speed in the mountain pass is 43 m/s, and the gust is 53 m/s. Storms are often observed here. The number of cloudy days is significant.

Climate Change

139. Armenia's NC4 reports that it experienced an average temperature rise of 1.23°C between 1929–2016. This historical rise in temperatures has resulted in the rapid shrinking of the glaciers in Armenia's mountain regions, with spatial extents retreating at around 8 m per year. Trends suggest climate variability is increasing and in 2018, Yerevan experienced a new record July temperature, reaching 42°C. Armenia's NC4 reported a 10% reduction in average annual precipitation volume was documented over the period 1935–2012. The spatial distribution of precipitation changes is irregular: the northeast and central regions have become more arid. However, precipitation has increased in the southern and northwestern regions and in the western region of the Lake Sevan Basin. Additionally, the number of days with heavy rainfall and hailstorms has increased.[7]

140. As climate change assessment has been prepared for this project as a separate report. In summary, eleven main climate risks were identified and classified into four categories: temperature-related (n = 3), water-related (n = 4), solid mass-related (n = 2), and miscellaneous/compound (n = 2). To assess the risks, the relevant climate impact drivers were evaluated based on their hazard and damage potential, using a five-level classification system for both components (i.e. negligible, low, moderate, high and very high). Finally, the risks were placed within a 5x5 matrix, resulting in four risk levels ranging from low to very high. None of the identified risks were classified as low or very high. Six risks were classified as 'moderate' and five as 'high'. The latter are: W1: fluvial flooding from the Debed River; W2: fluvial flooding from the Debed River tributaries; W3: mudflow events from torrent catchments; M1: risks of injury, fatalities, and community isolation; and M2: compound events.

141. To ensure long-term safety, functionality and resilience, a coordinated set of engineering, operational, environmental and institutional adaptation measures has been developed. For example, temperature- related risks can be mitigated by selecting appropriate materials, adapting construction practices to withstand heat, and implementing wildfire prevention measures. Water-related risks necessitate the application of, for example, a climate change factor during design,

[7] https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15765-WB_Armenia%20Country%20Profile-WEB.pdf

the establishment of an early warning system, enhanced drainage capacity, reinforced embankments and riverbanks, and upstream debris retention structures. Solid mass-related hazards require measures such as slope stabilisation, protective structures and continuous monitoring.

142. Climate change observations and recommendations informing the design and EMP are summarised in the table below:

No.	Main climate risks	Risk classification	Key adaptation solution and recommendations
T2	Heat stress for workers	**MODERATE**	• Schedule work during cooler hours (early morning/evening) • Implement heat-stress management protocols (hydration, shade, rest limits) • Provide heat-adapted PPE • Build on and enforce existing regulations and standards
T3	Wildfire risk during road rehabilitation - construction	**MODERATE**	• Restrict high-risk activities during fire-danger periods • Provide on-site firefighting equipment • Train workers in wildfire prevention and emergency response
T4	Wildfire risk during road operation	**MODERATE**	• Road safety measures for low visibility periods due to smoke • Consider T4 within ITS
W1	Fluvial floods originating from the Debed River affecting the road	**HIGH**	• Apply design flood values for high return periods (i. e. >> 1-in-100 years) • Establish flood forecasting and early-warning systems with traffic control measures • Conduct regular post-flood inspections and maintenance • Apply riverbank protection
W2	Fluvial floods from the tributaries of the Debed River affecting bridges	**HIGH**	• Recalibrate bridge clearances for high return periods so that future climate change is taken into account • Apply climate change flood factor for heavy precipitation and high return periods, respectively • Use flood early-warning systems
W3	Mudflow events from torrent catchments affecting the road and culverts	**HIGH**	• Apply climate change allowance and high return periods (i.e. >> 1-in-100 years) for heavy precipitation in the design process • Implement debris-flow early-warning systems • Design debris-tolerant culverts with maintenance access; culverts should have debris-tolerant geometries and be easily accessible for maintenance. • Proper maintenance and restoration of slope vegetation
W4	Pluvial floods and soil erosion affecting drainage system and culverts	**MODERATE**	• Upgrade drainage capacity (larger culverts) using climate allowance and high return periods (i.e. >> 1-in-100 years) • Apply erosion control (terracing, mulching, geotextiles, culvert screening measures) • Regularly clear and maintain drainage structures through culvert screening measures • Proper maintenance and restoration of slope vegetation
S1	Rockfall affecting the road and structures	**MODERATE**	• Install rockfall barriers, fences and nets • Stabilise slopes and improve rock mass drainage

No.	Main climate risks	Risk classification	Key adaptation solution and recommendations
			• Implement continuous or periodic rockfall monitoring
S2	Landslides affecting the road	**MODERATE**	• Apply geotechnical stabilisation (soil nailing, retaining walls, deep drainage) • Manage surface water to avoid slope saturation • Install landslide monitoring systems in high-risk areas • Proper maintenance and restoration of slope vegetation
M1	Risks of injury, fatalities, and community isolation caused by climate-related hazards	**HIGH**	• Establish multi-hazard early-warning systems (floods, rockfall, debris flows) • Install access-control measures (warning signs, VMS, traffic lights) in hazard-prone areas
M2	Compound event that affects the road	**HIGH**	• Apply Sendai Framework principles (risk understanding and preparedness) • Focus on non-structural measures (awareness, preparedness, adaptive capacity) due to limited feasibility of hard mitigation

Table 7: Summary of climate key adaptation solutions and recommendations

143. Specifically for compound events the climate assessment notes:

i. The overspill discharge from Dzoraget hydroelectric scheme or increased discharges from other hydroelectric plants along the river should be considered and managed via a coordinated control system such that they do not coincide with a significant storm event thus exacerbating the road and community flooding.

ii. It was noted from historic records that during 1679 and 1840 there were significant earthquake events which caused significant landslides that blocked rivers that later broke their banks and released significant hydraulic energy.

Ambient air quality

144. Air quality data was taken from the data published by the Hydrometeorology and Monitoring Center, for 30.06-04.07.2025. July data from 3 stationary active sampling observatories in Alaverdi city and 20 mobile passive sampling observatories in the Alaverdi-Akhtala adjacent areas were used. The sampling locations and obtained data are enclosed with this report in **Appendix E**.

145. The Hydrometeorology and Monitoring Center monitors atmospheric air quality in Lori Marz in the cities of Vanadzor and Alaverdi with stationary active sampling and mobile passive sampling observatories. The assessment of atmospheric air quality is performed in comparison with the limit permissible concentrations of pollutants (MPC) approved by the RA Government's decision N 160-N of February 2, 2006. Observations of dust, sulphur dioxide and nitrogen dioxide are made in the city of Alaverdi. There are 3 fixed observation stations and 20 mobile observation stations in the Alaverdi and Akhtala cities.

146. Ambient air quality monitoring has been completed along the M6, per the table below.

SURVEY DATE	For the 3 active sampling locations, daily air quality data was obtained for the whole of July 2025. For the 20 passive sampling locations, average daily concentrations are available for each week from 30.06.2025 – 04.08.2025.
METHODOLOGY	Performed by the Hydrometeorology and Monitoring Centre of the RA Ministry of Environment in compliance with the permissible concentrations of pollutants limits set by the RA Government's decision N 160-N of February 2, 2006. Inorganic dust (particulate matter – PM), NO_2 and SO_2 were measured at active sampling locations. NO_2 and SO_2 were measured at passive sampling locations.
OUTPUTS	At the active sampling locations: • dust concentration exceeded the Threshold Limit Value (TLV) up to 2 times at station 1, up to 4.5 times at station 2 and up to 1.06 times at station 3 • there were no exceedances of the TLV for NO_2 and SO_2 At passive sampling locations: • no exceedances of the TLV for NO_2 indicators were observed • weekly average SO_2 TLV exceedances were observed a total of 24 times (out of 98 data points, with a maximum value of 2.3 x TLV The sampling locations and obtained data are enclosed with this report in **Appendix E**.

Table 8: Summary of ambient air quality monitoring from Hydrometeorology and Monitoring Center

147. Subsequently, a survey was conducted along the M6 on 03-10.11.2025 using the Passive Sampling method to assess the ambient air condition along the M6. Research work was carried out along the road, starting from the area adjacent to the Debed village to the Bagratashen village border crossing. Passive samplers for nitrogen dioxide and sulphur dioxide were installed at 15 observation points on 03.11.2025. On 10.11.2025, the mentioned passive samplers were collected and analyzed at the Hydrometeorology and Monitoring Center laboratory.

148. Sampling was carried out according to the limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006, Decision N 160-Ա.

SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
Air quality 03.11.2025 10.11.2025	Measurement of ambient air quality (NO_2, SO_2). Consultation with officials from the Hydrometeorology and Monitoring Center in the Ministry of Environment regarding their air quality monitoring	Air quality was conducted along the M6 using the Passive Sampling method. 15 mobile passive sampling observatories along the M6 were used. Sampling was carried out according to the limitations permitted concentrations of	The locations of the monitoring stations are presented in the table M6 Passive Air Sampler Locations. NO_2 and SO_4 indices were measured at mobile passive sampling observatories.	No exceedances of the TLV for NO_2 indicators were observed at mobile passive sampling observatories. At mobile passive sampling observatories, weekly average SO_4 TLV exceedances were observed in 5 sampling sites, with

SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
	data and experiences with respect to the project area.	atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006, Decision N 160-Ն.		a maximum of 1.3 times. Results are reported in the tables below.

Table 9: Summary of ambient air quality monitoring using passive sampling method in November 2025

№	SAMPLING SITE	MUNICIPALITY	M6 ROAD SECTION KM	COORDINATES	
				N	E
1	F1	Village Debed; COAF SMART Center	28.4 (30)	40.92635	44.64082
2	F2	Tumanyan town; Martsigeti river mouth	35.8	40.96053	44.63408
3	F3	Village Dzoraget; Tufenkian Hotel	32 (32.5)	40.98649	44.65269
4	Ex1	Tumanyan city; Near the bridge	38 (38.1)	41.00278	44.6447
5	Ex2	Village Kobayr	38.8-40	41.00607	44.63707
6	Ex3	Alaverdi city, Sanahin station, kindergarten No. 3	46.7 (49.3)	41.07264	44.61842
7	Ex4	Alaverdi city, Baghramyan, school number 10	49.5 (49.8)	41.08628	44.6296
8	Ex7	Village Haghpat	57.5 (61.3)	41.09252	44.70162
9	Ex8	Village Neghots	65.5	41.13992	44.77213
10	Ex10	Village Shnogh	72 (71.9)	41.15034	44.83195
11	Ex11	Village Archis	77.7 (83)	41.18032	44.88727
12	Ex12	Ayrum city	80.5 (80.7)	41.18797	44.89289
13	Ex13	Haghtanak village	83 (83.6)	41.20778	44.90818
14	Ex14	Village Ptghavan	89 (89.5)	41.2271	44.857
15	Ex15	Bagratashen village, border checkpoint	90.1	41.23252	44.83665

Table 10: M6 passive air sampler locations

SAMPLE NAME	AVERAGE DAILY CONCENTRATION, mg/m³	
	SULPHUR DIOXIDE ($TLV_{average\ daily}$ = 0.05 mg/m³)	NITROGEN DIOXIDE ($TLV_{average\ daily}$ = 0.05 mg/m³)
F1	0.0320	0.0028
F2	0.0652	0.0032
F3	0.0274	0.0105
Ex1	0.0363	0.0114
Ex2	0.0299	0.0103
Ex3	0.0277	0.0076
Ex4	0.0124	0.0059
Ex7	0.0159	0.0051
Ex8	0.0054	0.0084
Ex10	0.0038	0.0096
Ex11	0.0569	0.0072
Ex12	0.0625	0.0139
Ex13	0.0383	0.0222
Ex14	0.0588	0.0146
Ex15	0.0571	0.0152

Table 11: Tabulated results of ambient air quality monitoring using passive sampling method in November 2025

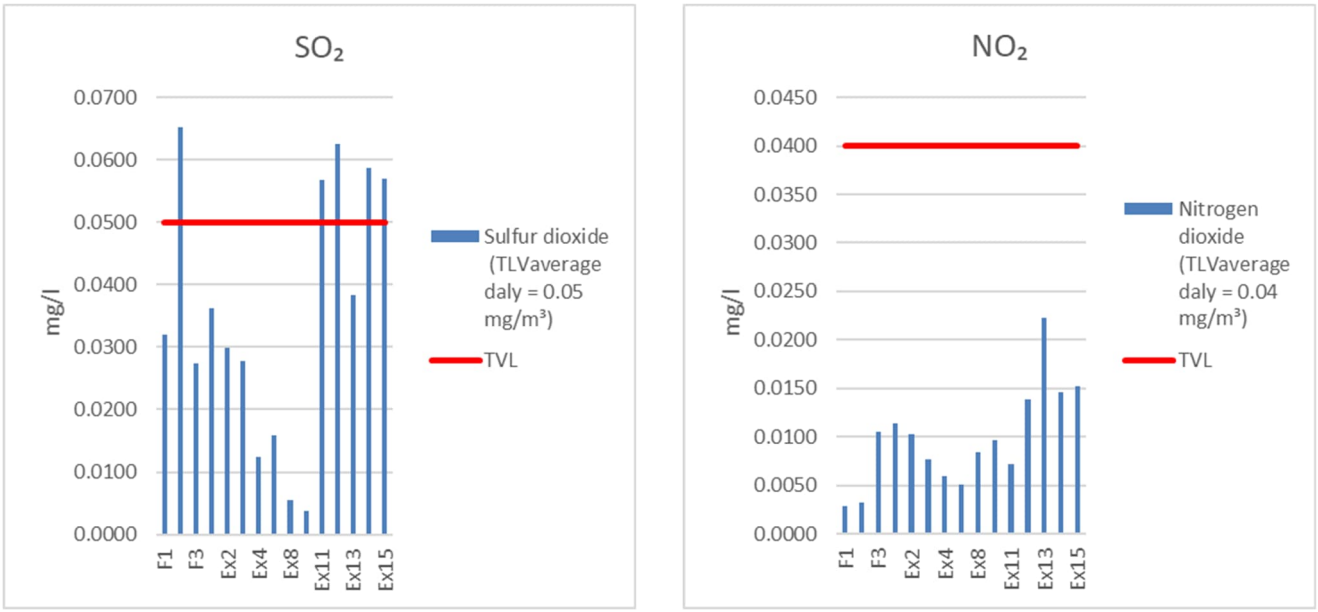


Figure 32: Graphical representation of results of passive air sampling in November 2025

Hydrology

149. Debed River Basin belongs to the Northern Watershed Management Area.

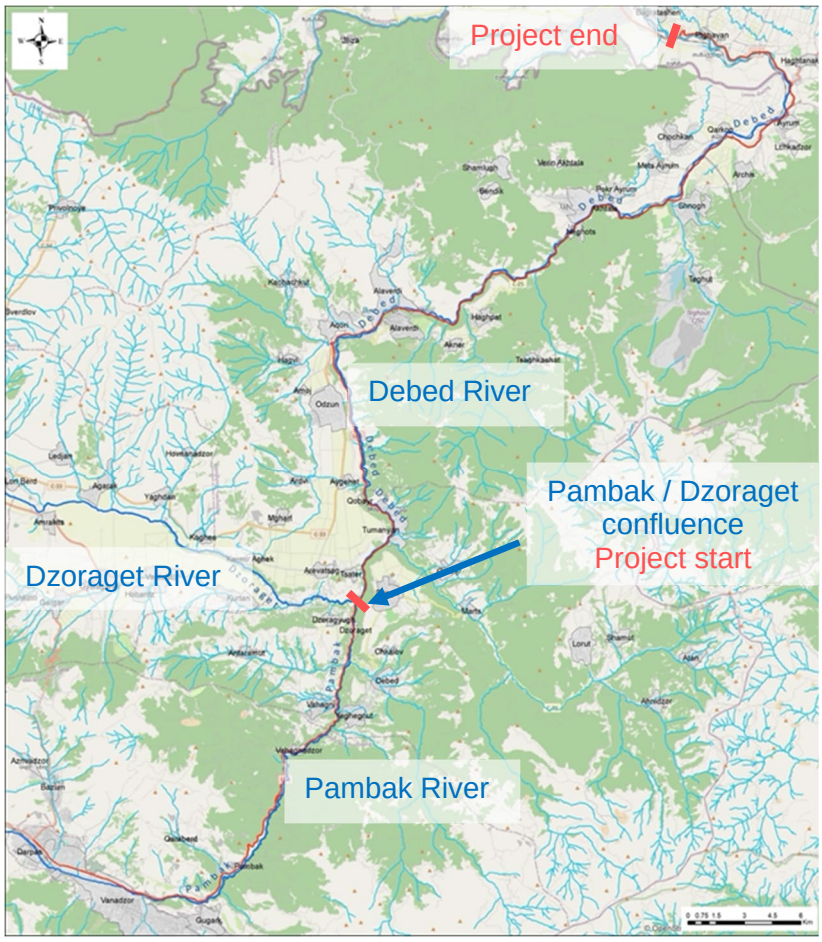


Figure 33: Debed River in the project area

150. The ***Debed River*** Basin belongs to the Northern Watershed Management Area. The river is the main river of Lori region it is one of the largest rivers of the Republic of Armenia. The length of the river together with the Pambak tributary is 154 km, the catchment area is 3790 km². The biggest tributaries are Pambak and Dzoraget.

- ***Pambak River*** is the main tributary of the Debed River. The river originates from the Shirak Mountains at an altitude of 2100 m, it has a length of 84 km, the catchment area is 1370 km².
- ***Dzoraget River*** is the main tributary of the Debed River. The river originates from the Javakhq Mountains at an altitude of 2320 m, it has a length of 67 km, the catchment area is 1460 km²³.
- ***Gargar (or Gergerka) river*** is the right tributary of Dzoraget. It starts from the northeastern slopes of the Bazum mountain range, at an altitude of 2300 m. The length is 28 km, the catchment area is 129 km².

151. The Debed River has mixed feeding. The following stages are typical for the Debed River water regime: spring- high water, summer-autumn low water. On an annual basis over 32% of the flow runs during the flood season (from March to June), 27% rain flow, and 41% groundwater.

152. Spring floods usually begin in mid-March and continue until mid-June and have a well-expressed wave. The average duration is about 90-110 days, depending on the river feeding regime, air temperature, liquid precipitation in snow melting period, water reserve present in snow,

conditions of formation and disappearance of stable snow cover. In the Debed basin, a stable snow cover is formed at the end of the second decade of December, and it disappears at the end of March or early April; the maximum thickness of snow cover is observed in late February or early March. Snow reserves take part in the freshets in the second week of March and in some years, in the third week of March.

153. At the sampling sites, the river water quality was assessed as class 1 or 2 according to the Cu, Zn, and As indicators. According to the Ca indicator, only at the sampling site TPW0: Pambak, above Vanadzor, the water quality was assessed as class 3, while at the remaining sampling sites it was class 1 or 2 according to the Ca indicator.

154. According to the Mineralization and Conductivity indicators, the water quality at all sampling sites of the Pambak River was assessed as Class 3, and the water quality at all sampling sites of the Debed River was assessed as Class 2.

155. According to the Fe indicator, the water quality at all sampling sites was assessed as class 3. Except for TPW12: Debed, Bagratashen sampling site, the water quality was assessed as class 5.

156. According to the Suspended Solids indicator, the water quality at TPW05: Debed, Tumanyan sampling site, was assessed as class 4, and at TPW11: Debed, Ayrum, and TPW12: Debed, Bagratashen sampling sites, the water quality was assessed as class 5. At the other sampling sites, the water quality was assessed as class 2 or 3.

157. The Hydrometeorology and Monitoring Center carries out quantitative and qualitative monitoring of surface waters. The ecological flow in 30 hydrological observation points of the "Hydrometeorology and Monitoring Center" operating and closed in the Northern RBD was calculated according to the 2018 regulation of the Government of the Republic of Armenia. of the requirements of the annex to the decision No. 57-N of January 25. There are no watercourses with calculated ecological flow in the immediate project area.

158. Water quality is characterized by 40-65 physicochemical indicators (main anions and cations, nutrients, heavy metals, primary organic pollutants), with a frequency of 5-12 times per year, in 17 sampling sites. The assessment of water quality is carried out in accordance with the 2011 Government of the Republic of Armenia to the decision N75-N of January 27.

159. The groundwater resources of the Northern BRD are 27.1 m^3/s or 854.7 million m^3, of which the flow of springs is 3.67 m^3/second or 115.8 million m^3, the drainage flow is 14.6 m^3/s or 459.5 million m^3 and the deep flow is 6.3 m^3/s or 198.7 million m^3: The sources and drainage flows of the underground water resources of the Northern BRD take part in the river flow, coming out to the surface. The Debed basin is relatively rich in underground water resources, where the underground water body of Pliocene fissured basalts is widespread.

160. The delineation of groundwater bodies (GWB) was implemented based on the approaches presented in EU WFD CIS Guidance Document N2. In the conditions of cut relief, the main part of groundwater is discharged to the surface of the earth in the form of concentrated (springs) and scattered, linear, drainage flow. For drinking water supply in the Debed river basin, mainly the waters of lacustrine formations formed in volcanic rocks and intermountain depressions are used.

161. Baseline ground water and surface water sampling at locations within the project area have

been completed and processed data is enclosed with this report as **Appendix F**. The following table summarizes the results.

SURVEY DATE	Water quality survey undertaken on 24.08.2025
METHODOLOGY	Sample collection was undertaken at 13 sampling sites along the Pambak and Debed rivers and laboratory analysis of chemical parameters was undertaken. The chemical analysis was undertaken in accordance with industry best practice and the results were assessed against the permissible concentration limits as set out in the RA Government Decision N 75 dated January 27, 2011. Analysis has been conducted for the following parameters: • Mineralization • Suspended solids • pH • Conductivity • Calcium (Ca) • Titanium (Ti) • Iron (Fe) • Copper (Cu) • Zinc (Zn) • Arsenic (As)
OUTPUTS	pH: River water fluctuated between 7.9 and 9, which is in accordance with the standard. Ti: Although titanium is not a standard parameter required by RA Government Decision N 75Ա, this indicator was chosen as a result of the titanium encountered in the soil which is significant. Suspended solids: The water quality at TPW05: Debed, Tumanyan sampling site, was assessed as Class 4. At TPW11: Debed, Ayrum, and TPW12: Debed, Bagratashen sampling sites, the water quality was assessed as Class 5. At the other sampling sites, the water quality was assessed as Class 2 or 3. Fe: The water quality at all sampling sites was assessed as Class 3, except at TPW12: Debed, Bagratashen, where it was assessed as Class 5. Mineralization and conductivity: The water quality at all sampling sites of the Pambak River was assessed as Class 3, and the water quality at all sampling sites of the Debed River was assessed as Class 2. Cu, Zn, As: At the sampling sites the river water quality was assessed as Class 1 or 2 according to the Cu, Zn, and As indicators. Ca: Only at the sampling site TPW0: Pambak, above Vanadzor, the water quality was assessed as Class 3, while at the remaining sampling sites it was Class 1 or 2.

Table 12: Summary of surface water quality monitoring from Hydrometeorology and Monitoring Center

Soils

162. Surveys for soil quality have been carried out in August 2025. Processed data is enclosed with this report in **Appendix G**.

163. 16 surface soil samples were taken along the M6 road, at a distance of 20 to 130 m from the road depending on the characteristics of the area. The following table summarises the survey process and findings.

SURVEY DATE	Soil survey undertaken 24.08.2025
METHODOLOGY	Soil sampling and laboratory analysis have been undertaken using established XRF methods. The permissible limit concentrations of dangerous substances in soil are defined in RA Government Resolution N 92-Ա of January 25, 2005 and the "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ա dated January 25, 2010. The soil samples have been tested for the following parameters Li, Be, B, Na, Mg, Al, P (total), Sulphur (total), Chlorine (total), K, Ca, Ti, V, Cr, Fe, Mn, Ni, Cu, Zn, As, Se, Rb, Sr, Y, Zr, Nb, Mo, Ag, Cd, Sn, Sb, W, Hg, Pb, Bi, Th, Silicon
OUTPUTS	The results of the soil tests have shown: Cu: • Very high levels of contamination were recorded at the TPS7 (Alaverdi, Genocide Monument) and TPS10 (Qarkop, pavilion-chatroom) research platforms • High levels of contamination were found at the TPS9 (Akhtala, entrance) research platform. As: High level of contamination at the TPS10 (Qarkop, pavilion-chatroom) research platform. At other locations intermediate levels of contamination have been detected for Cu, Zn and As. The remaining elements, which are regulated by Government Resolution N 92-Ա, were in permissible or low concentrations. However, according to Order N 01-N of the Minister of Health, the maximum permissible concentrations for the following elements were exceeded: S, Cr, Mn, Ni, Cu, Zn, As, and Pb.

Table 13: Summary of soil quality survey results

Noise

164. Surveys for noise have been carried out in December 2025 at sensitive receptors which were identified by the project team based on the intended work locations. Processed data is enclosed with this report in **Appendix H**.

165. The following table summarises the survey process and findings.

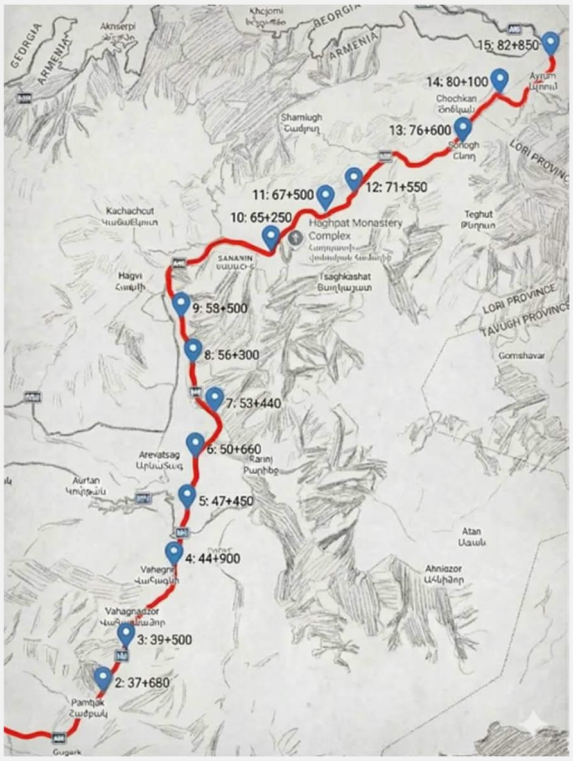
SURVEY DATE	Noise survey undertaken in December 2025	
METHODOLOGY	Daytime and nighttime measurement of noise using calibrated field equipment OKTABA-110A at 14 points along the M6 road in the project area at buildings close to the location of planned works (see map on the right).	

OUTPUTS

The main sources of noise was traffic, both during the day and night.

Daytime values range from 48 – 75 dBA, with the maximum value recorded at km 58+500 and km 71+550.

Nighttime values range from 28 – 55 dBA, with the maximum values again recorded at km 58+500 and km 71+550.



km 58+500 is north of Alaverdi in a narrow section of the Debed Gorge. The measurement point at the building is located slightly above the road.

The measurement point at 71+550 is located next to the road.

Table 14: Summary of noise survey results

Vibration

166. Vibration was reported to be an issue at the locations listed below (source: RDF – AP list of cases from vibration survey dated 16.11.2017). The locations may not be exhaustive with respect to the planned works.

167. The right-hand column cross-references these locations to the works and their potential impact with respect to vibration.

168. It is noted that the locations are almost all in areas not subject to flooding and therefore without works for embankment protection or pavement repair. At many locations rockfall protection work is to be carried out. Conformal netting or construction of rockfall netting may result in vibrations, and where there are sensitive structures alternative solutions could be sought.

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
1	Lori	Alaverdi city	06-002-0006-0048	Residential	Residential construction	0,2021	48+980	Left	1	No work planned
2	Lori	Alaverdi city	06-002-0191-0014	Residential	Residential construction	0,1807	47+680	Left	1	No work planned
3	Lori	Alaverdi city	06-002-0198-0054	Residential	Residential construction	0,1660	47+600	Right	1	Low. Rockfall protection work is rockfall fences which may require some drilling but this is on the other side of the road and stops before this location.
4	Lori	Alaverdi city	06-002-0198-0103	Residential	Residential construction	0,1229	47+140	Right	1	Low. Rockfall protection work is conformal netting which will require drilling but this is on the opposite side of the road.
5	Lori	Alaverdi city	06-002-0198-0104	Residential	Residential construction	0,0707	47+100	Right	1	Low. Rockfall protection work is conformal netting which will require drilling but this is on the opposite side of the road.
6	Lori	Alaverdi city	06-002-0198-0116	Residential	Residential construction	0,0731	47+080	Right	1	Low. Rockfall protection work is conformal netting which will require drilling but this is on

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
										the opposite side of the road.
7	Lori	Alaverdi city	06-002-0198-0120	Residential	Residential construction	0,1106	47+060	Right	1	Low. Rockfall protection work is conformal netting which will require drilling but this is on the opposite side of the road.
8	Lori	Alaverdi city	06-002-0198-0141	Residential	Residential construction	0,1852	46+980	Right	1	Low. Rockfall protection work is conformal netting which will require drilling but this is on the opposite side of the road.
9	Lori	Alaverdi city	06-002-0198-0146	Residential	Residential construction	0,2863	46+880	Right	1	Low. Rockfall protection work is conformal netting which will require drilling but this is on the opposite side of the road.
10	Lori	Alaverdi city	06-002-0393-0014	Residential	Residential construction	0,2693	45+740	Right	1	Low. Rockfall protection work is limited to provision of a roadside barrier on the opposite side of the road.
11	Lori	Aygehat	06-014-0102-0002	Residential	Residential construction	0,02300	39+640	Left	1	Low. Rockfall protection work is

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
										limited to provision of a roadside barrier.
12	Lori	Haghpat	06-060-0210-0002	Agricultural	Arable	0,1089	61+920	Right	1	Low. Work limited to minor bridge refurbishment at 61+820.
13	Lori	Neghoc	06-080-0572-0013				67+160	Left	1	Unclear – no property at this location except on the other side of the river. This will be a location of intensive work with a retaining wall on the river-side and concrete wall with a protection net on the mountain side.
14	Lori	Odzun	06-112-0437-0005	Residential	Other lands	0,1039	46+960	Left	1	Medium. Rockfall protection work is conformal netting which will require drilling on the rock slope close to the property.
15	Lori	Odzun	06-112-0437-0039	Residential	Commercial	0,2210	46+400	Left	1	Low. Rockfall protection work is limited to provision of a concrete wall
16	Lori	Odzun	06-112-0438-0104	Residential	Residential construction	0,0571	44+380	Left	1	Low. Rockfall protection work is

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
										limited to provision of a roadside barrier.
17	Lori	Odzun	06-112-0502-0012	Residential	Residential construction	0,1299	44+200	Left	1	Low. Rockfall protection work is limited to provision of a roadside barrier.
18	Lori	Odzun	06-112-0461-0005	Residential	Commercial	0,1355	44+460	Right	1	Low. Rockfall protection work is limited to provision of a concrete wall on the opposite side of the road.
19	Lori	Alaverdi city	06-002-0033-0034				47+940	Left	2	No work planned
20	Lori	Alaverdi city	06-002-0033-0006				47+980	Left	2	No work planned
21	Lori	Alaverdi city	06-002-0033-0004				48+000	Left	2	No work planned
22	Lori	Alaverdi city	06-002-0198-0050				47+620	Right	2	No work planned
23	Lori	Alaverdi city	06-002-0198-0190				46+220	Right	2	Low. Rockfall protection work is limited to provision of a concrete wall 50 m before property on the opposite side of the road.
24	Lori	Alaverdi city	06-002-0198-0187				46+300	Right	2	Low. Rockfall protection work is

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
										limited to provision of a concrete wall on the opposite side of the road.
25	Lori	Alaverdi city	06-002-0198-0183				46+320	Right	2	Low. Rockfall protection work is limited to provision of a concrete wall on the opposite side of the road.
26	Lori	Alaverdi city	06-002-0198-0176				46+460	Right	2	Low. Rockfall protection work is limited to provision of a concrete wall on the opposite side of the road.
27	Lori	Alaverdi city	06-002-0198-0175				46+480	Right	2	Low. Rockfall protection work is limited to provision of a concrete wall on the opposite side of the road.
28	Lori	Alaverdi city	06-002-0198-0166				46+600	Right	2	Low. Rockfall protection work is limited to provision of a concrete wall on the opposite side of the road.
29	Lori	Alaverdi city	06-002-0198-0163				46+680	Right	2	Low. Rockfall protection work is conformal netting

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
										which will require drilling but this is on the opposite side of the road.
30	Lori	Alaverdi city	06-002-0198-0162				46+700	Right	2	Low. Rockfall protection work is conformal netting which will require drilling but this is on the opposite side of the road.
31	Lori	Alaverdi city	06-002-0198-0065				47+420	Right	2	Low. Rockfall protection work is rockfall fences which may require some drilling but this is on the other side of the road.
32	Lori	Alaverdi city	06-002-0198-0048				47+680	Right	2	No work planned. Rockfall fences extend to 47+600 at most on the opposite side of the road.
33	Lori	Alaverdi city	06-002-0191-0013				47+700	Left	2	No work planned. Rockfall fences extend to 47+600 at most.
34	Lori	Alaverdi city	06-002-0198-0205	Residential	Residential construction	0,0276	47+820	Right	1	No work planned.

N	Marz	Community	Cadastral lot-code of the land plot	Target purpose of the land plot by cadaster	Type of land/actual usage purpose of the land plot by cadaster	Total area of the land plot by cadaster, ha	Location of the property, PK (km)		The land plot is: 1. In LAR boundaries 2. Out of LAR boundaries	Potential impact
35	Lori	Alaverdi city	06-002-0031-0026				48+800	Right	2	No work planned.
36	Lori	Alaverdi city	06-002-0006-0033				49+200	Left	2	No work planned.

Table 15: AP list of cases from vibration survey dated 16.11.2017 [source: RDF]

Natural Hazards

169. Among natural disasters in Debed RBD mudflows, landslides, and dramatic fluctuations of river water level (floods) are common, which often cause a significant damage to economy.

170. Landslides, which are one of the main disasters causing damage to society, have certain distribution in Lori marz. A landslide event is normally the result of the combined influence of several of the above-mentioned factors. The damage caused by landslides impact particularly on rural territories, thus causing damage to housing sector, local and community roads, bridges, and water supply and irrigation systems.

171. There are about 50 more or less active registered landslides in the territory of Lori region. Among the landslides in Debed River Basin the most active ones are distributed in the Martz, Tandzut, Gargar and Akhtala River Basins. About 1900 hectares of land is influenced by landslides in Lori Marz. The reasons for rockfall are as follows:- flowing water, windfall of rocks or overwetting from precipitation and groundwater, as well as earthquake, human economic activity, when the geological conditions of the place were not taken into account, and deforestation. Para. 81 identifies and assesses the locations of rockfall affecting the M6 and describes the solutions to protect the road.

172. Floods can also be induced by sudden outbursts of artificial lakes that accumulate in the Debed Canyon due to landslides blocking the normal waterway of Debed. In Lori marz, mudflows occur in the valleys of the southern and western slopes of the Bazum and Pambak mountain ranges, and the southern and western slopes of the Lalvar and Lejan mountains. In general, maximum costs in the Debed River with catastrophic consequences are repeated once every 8-10 years.

C. Socio-economic environment

Lori marz

Population

173. According to the 2011 official census, Lori has a population of 235,537 (111,675 men and 123,862 women), forming around 7.8% of the entire population of Armenia. The urban population is 137,784 (58.5%) and the rural is 97,753 (41.5%). The province has 8 urban and 105 rural communities. The largest urban community is the provincial centre of Vanadzor, with a population of 86,199. The other urban centres are Alaverdi, Stepanavan, Spitak, Shamlugh, Tashir, Akhtala and Tumanyan. The average population density of the Lori region is approximately 50 people/km^2. 53.8% of the population are women, 46.2% are men. The proportion of children and economically active population is quite large in terms of age group, which is natural.

Ethnic groups and religion

174. The majority of Lori are ethnic Armenians who belong to the Armenian Apostolic Church. However, small communities of ethnic Russian Molokans are mainly found in the villages of Fioletovo and Lermontovo, and in less numbers in the villages of Sverdlov, Mikhayelovka,

Privolnoye, Pushkino, Medovka and the town of Tashir. The total number of Molokans in Lori is 3,882 individuals. There are a few Orthodox Russians and Ukrainians in Vanadzor, Stepanavan and the village of Amrakits.

175. 793 individuals of the Yazidi community are found in the southern villages of the province including Lermontovo and Lernantsk.

176. Lori is also home to a small Greek community of 655 individuals who speak the Pontic dialect. Small Greek communities can also be found in the towns of Alaverdi, Akhtala, Stepanavan and Vanadzor. The majority of the Yaghdan village is Greek.

Influenced communities

177. Alaverdi community of Lori marz, including districts Akner, Sanahin and Madan, as well as Akori, Kachachkut, Haghpat, Tsaghkashat Gilizha, Akhtala, Bendik, Chochkan, Shamlut, Mats Ayrum, Pokr Ayrum, Nekhuts, Shnogh, Teghut, Karkup, Odzun, Amoch, Aygehat, Aravatsag, Ardvi, Tsater, Karmir Agheg, Hagvi, Mghart villages. The center of the community is the city of Alaverdi, located far from Vanadzor (44 km) and from Yerevan (169 km). It borders the Republic of Georgia, about 300 km from the border with the Russian Federation.

178. The main artery of the Republic of Armenia's railway communication, the Tbilisi-Yerevan railway, the main export and import road transport of the Republic, the Tbilisi-Alaverdi-Yerevan highway, as well as the Debed River, the most water-rich transboundary river in Armenia, pass through the community.

179. The area of the Alaverdi community is 295,134 sq.km. Due to the rugged and complex relief, the neighbourhoods and settlements of the community are quite far from each other. The relief is characterized by different levels of elevation (750-1700 m), very large slopes (up to 350).

180. Alaverdi city was established in 1939. In 2022, as a result of the enlargement of communities, clusters of communities were formed in the Republic of Armenia, including the enlarged community of Alaverdi. The populations is 24 935.

181. There are 11 secondary schools, a house of culture, libraries, kindergartens, a stadium, a sports school, a music school, a polyclinic, a hospital, and a communication hub in Alaverdi. The branch of the Yerevan Research Institute of Mining is located here.

182. In Alaverdi, in the 1920s-30s, carbide, copper jasper, and sulfuric acid factories were put into operation. In the 1940s-50s, a copper chemical plant was founded.

Tavush marz

Population

183. Tavush is the second least populated province in Armenia. According to the 2011 official census, Tavush marz has a population of 128,609 (62,083 males and 66,526 females), forming around 4.3% of the entire population of Armenia. The urban population is 54,186 (42.1%) and the rural is 74,423 (57.9%). The province has 5 urban and 61 rural communities. The largest urban

community is the provincial centre of Ijevan, with a population of 21,081. The other urban centres are Dilijan, Berd, Noyemberyan, Ayrum. The average population density of the Lori region is approximately 42.5 people/km². 51.8% of the population are women, 48.2% are men. The proportion of children and economically active population is quite large in terms of age group, which is natural.

Ethnic groups and religion

184. The majority of Tavush are ethnic Armenians who belong to the Armenian Apostolic Church. The town of Berd is home to around 200 Udis who also belong to the Armenian Church. A tiny community of Yazidis is found in Dilijan.

Influenced communities

185. The Noyemberyan community of Tavush marz includes Noyemberyan and Ayrum cities, and Archish, Bagratashen, Baghanis, Lchkadzor, Koghb, Koti, Haghtanak, Voskepar, Ptghavan, Jujevan, Dovegh, Zorakan, Barekamavan, Voskevan, Berdavan, Debedavan, Deghjavan villages. The centre of the community is the city of Noyemberyan, located far from Ijevan 55 km and from Yerevan 195km. It borders the Republic of Georgia and Azerbaijan.

186. The Yerevan–Tbilisi railway, Yerevan–Alaverdi–Tbilisi and Yerevan–Ijevan–Tbilisi highways are passing through the community. The area of the Noyemberyan community is 33,886.8km². The community is located at the elevation of 700-900 meters. The relief is complex, slopes are steep the central part is flat.

187. There are 22 secondary schools, a house of culture, libraries, kindergartens, a stadium, a sports school, a music school, a polyclinic, a hospital, a communication hub in Noyemberyan.

Cultural heritage survey

188. A cultural heritage survey has been carried out with the purpose of identifying potential impacts of the proposed project on physical cultural resources (PCR) - movable or immovable objects, sites, structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or cultural significance. A report has been prepared which identifies all known historical and cultural units of the project area (Appendix I).

189. Historical and cultural heritage features are present within the broader Project area along the Debed River corridor, reflecting long-term settlement patterns associated with riverine terraces. These include monuments and sites located at varying distances from the existing M6 road, with some situated in closer proximity to the alignment and others more dispersed across the valley landscape.

190. A cultural heritage survey of the four damaged sections of the M6 was carried out on 12, 15 and 22 November 2025 by Hayk Haydosyan and Boris Gasparyan of the Institute of Archaeology and Ethnography of the National Academy of Sciences of the Republic of Armenia. The survey combined walkover of each damaged section with a desk review of the State Lists of Immovable Monuments for Lori Province (RA Government Decision No. 385-N, 15 March 2007)

and Tavush Province (RA Government Decision No. 1929-N, 30 December 2004), the *Corpus of Armenian Epigraphy* and the published Palaeolithic record for the Debed Valley. The full survey report, photographs, stratigraphic context and references are provided at **Appendix I**.

191. Sixteen heritage assets were identified within or adjacent to the damaged road sections. Three of these sit physically on or against the works footprint:

192. **Sanahin bridge (1195 AD), Alaverdi (~km 57).** A vaulted stone bridge over the Debed River, included on the State List of Lori Province (code 5.2.23) and part of the UNESCO World Heritage inscription *Monasteries of Haghpat and Sanahin* (C 777). The bridge is the most sensitive cultural-heritage asset on the corridor.

193. **"Igahat" medieval village and 13th–14th century wine production complex, 1.6 km NW of Kober railway station (~km 37).** Rescue-excavated in 2018 during the earlier Vanadzor–Alaverdi highway works; the wine press lies immediately adjacent to the right-hand side of the current M6 carriageway. Part of the wider Tumanyan–Alaverdi High Medieval viticultural landscape.

194. **Bagratashen-1 Middle Palaeolithic open-air site (~95,000–100,000 years BP), Bagratashen village (~km 85).** One of the most important Middle Palaeolithic sources in the region, documented by the joint Armenian–American expedition of the Institute of Archaeology and Ethnography (NAS RA) and the University of North Carolina Greensboro, with excavations in 2010–2011. Formal designation on the State List is in progress; the site is protected under RA law as a "newly discovered" monument pending designation. Excavation trenches are recorded immediately adjacent to the existing carriageway.

195. The remaining thirteen assets lie in the vicinity of the works rather than within the footprint. They are listed in the table below, organised by damaged road section. Two of them (the "Avanakar" fortress settlement and the 10th–12th c. cemetery near Kober) are located on right-bank Debed River terraces close to the alignment; the rest are within adjacent settlements (Tumanyan, Neghots, Bagratashen).

Chainage	Heritage asset	Period	Location relative to road
km 31+675 – 39+350	Cemetery with khachkars (Lori 5.4.1)	9th–15th c.	Western edge of Tumanyan
km 31+675 – 39+350	Khachkar with 1247 inscription (Lori 5.4.2)	13th c.	Southern end of Tumanyan
km 31+675 – 39+350	Khachkar near cave entrance (Lori 5.4.3)	12th–13th c.	Garment Factory area, Tumanyan
km 31+675 – 39+350	Khachkar (Lori 5.4.4)	13th c.	~50 m NW of Garment Factory
km 31+675 – 39+350	Khachkar near railway bridge (Lori 5.4.6)	13th–14th c.	Adjacent to railway bridge, Tumanyan
km 31+675 – 39+350	Khachkar (Lori 5.4.8)	14th–15th c.	South-west edge of Tumanyan
km 31+675 – 39+350	Settlement at foot of "Avanakar" fortress (Lori 5.4.1.1)	14th–15th c.	Right-bank terrace of Debed, near Kober station
km 31+675 – 39+350	Cemetery, divided by earlier highway works (Lori 5.4.1.3)	10th–12th c.	1.8 km east of Kober, near tunnel

Chainage	Heritage asset	Period	Location relative to road
km 31+675 – 39+350	"Igahat" medieval village with 13th–14th c. wine production complex (rescue-excavated 2018)	Medieval	Immediately adjacent to right side of current M6 carriageway, 1.6 km NW of Kober
km 55+950 – 67+620	Sanahin bridge over the Debed (Lori 5.2.23) — part of UNESCO serial property	1195 AD	Inside Alaverdi city; crosses the Debed
km 55+950 – 67+620	"Terunakan" khachkar, erected by Bishop Sargis of Haghbat (Lori 5.80.4)	1086 AD	1 km west of Neghots village, near Debed riverbank
km 84+570 – 85+200	Two khachkars, Bagratashen (Tavush 10.16)	Not specified	Bagratashen village administrative area
km 84+570 – 85+200	Bagratashen-1 Middle Palaeolithic open-air site (excavated 2010–2011; designation in progress)	~95–100 ka BP	Excavation trenches recorded immediately adjacent to existing carriageway, Bagratashen
km 84+570 – 85+200	Bagratashen-3 Middle Palaeolithic open-air site	Middle Palaeolithic	Bagratashen; palaeosol find layer exposed in section
km 84+570 – 85+200	High Medieval Bagratashen village remains	High Medieval	Adjacent to Bagratashen-1 site
km 71+000 – 72+000 and km 76+300 (Shnogh)	No designated or documented heritage assets identified.	—	—

196. Two UNESCO World Heritage properties are located on the upper terraces of the Debed gorge above the M6 corridor: the Monasteries of *Haghpat* and *Sanahin* (inscribed 1996, extended 2000). Only the Sanahin old bridge, as described above, lies within the Project corridor itself; the monasteries themselves are well above the road on the valley sides and are not within the zone of direct physical influence of the works.

197. More broadly, the Tumanyan–Alaverdi reach of the M6 (approximately km 31+700 to km 55+000) traverses a High Medieval viticultural and horticultural landscape documented through terraced plantings, earthenware storage vessels (karas) and the rescue-excavated wine complex at Igahat. This landscape context is material to the interpretation of the individual sites in Section 1 but does not itself constitute a designated monument. It is recorded here, and in more detail in Appendix I, for completeness.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Due Diligence Review of Potential Environmental Impacts

198. At the commencement of the environmental study a due diligence review was undertaken on all project components and a Rapid Environmental Appraisals (REA) prepared (Appendix A).

199. The due diligence entailed:

i. Site visits on the proposed project area
ii. Review of project information provided by RDF
iii. Preparation of REA
iv. Professional opinion and experience of Environment Specialist
v. Preparation of an IEE and EMP
vi. Preparation and conducting for Public Consultations

200. The expected overall positive environmental and social impacts from the proposed project will be long term and cumulative in nature, ultimately contributing to the increased social and economic benefits of the nearby communities.

201. The Project construction is restricted to areas along the existing road, specifically towards the river-side for embankment repair and protection works, and the mountain-side for rockfall protection work.

B. Methodology

202. The methodology used for assessing the environmental impacts from the proposed Project involves the following steps:

i. identifying the environmental components that will be impacted;
ii. identifying the type of impacts;
iii. identifying the assessment area where the impacts will be felt;
iv. defining the criteria for assessing the significance of each type of impact;
v. screening of project impacts during (pre-)construction (C), and operation (O) stages of the project; and
vi. identifying the significance of impacts (minor, moderate and major) to guide development of mitigation measures and ensure that there are no or minimal residual impacts.

203. The potential adverse impacts are screened to identify their relative significance, reflecting the requirements set out in ADB's SPS (2009). Impacts during (pre-) construction and operation phases are considered separately. Impacts are considered in terms of the receptor, sensitivity of the receptor and magnitude of impacts:

i. "**Receptor**" (asset): The resource (human / natural environment / economic / social) which is potentially affected by an impact.
ii. **"Sensitivity"**: The ability to cope with specific impact and/or its importance to Armenia. It is generally accepted that human health is always a high sensitivity receptor. However,

in terms of physical / natural resources, ecology, landscape and livelihood the sensitivity varies according to the receptor, e.g., scrubland with no significant biodiversity is considered less sensitive than a mature forest which supports ecosystems and livelihoods.

iii. **"Magnitude"**: The size of the potential impact. Impacts may be short-term and considered low magnitude (e.g., noise or temporary reduction of income during a short construction project) or long-term and high magnitude (e.g., permanent loss of income). The same impact factor can cause a different magnitude. e.g., the land take of 100 m² does not endanger the livelihood of a farmer, but could cause the loss of income for illegal shop holders.

204. The overall significance of each impact was classified as major, moderate or minor as demonstrated in Table 16. The overall impact significance is assessed qualitatively in Table 17 and Table 18. The residual impact significance is the significance of the impact remaining after mitigation has taken place. Mitigation measures cannot always eliminate all impacts and this is reflected in the screening. However, residual impact significance more accurately describes the impacts of the project as it is anticipated that the requirements of the EMP will be followed and impacts satisfactorily mitigated.

		MAGNITUDE OF IMPACT		
		LOW	MEDIUM	HIGH
RECEPTOR SENSITIVITY & IMPORTANCE	LOW	Low	Low	Medium
	MEDIUM	Low	Medium	High
	HIGH	Medium	High	High

Table 16: Potential impact significance classification

Table 17: Environmental impact significance – (pre-)construction phase

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
Land consumption – *clearing of land for access roads and construction sites; use of land for temporary construction sites*	Vegetation	Yes	Medium Some tree cutting / vegetation clearance maybe required where embankment protection solutions are required. The biodiversity survey identified the numbers of trees at intended work locations, though not all of these will require felling.	Medium, ST	Medium	Low	By compensation of trees at 1:10 ratio the residual impact is low
	Wildlife	Yes	Low Based on the survey it is concluded that the planned works are unlikely to cause significant damage to the zoological components of the natural ecosystems and should not adversely affect populations of rare animal species in Armenia.	Medium, ST	Low	Low	
Noise – *from construction activities since traffic along the road already exists*	Public health and safety	Yes	Medium There are communities scattered across the project area; however, they are generally not located in areas susceptible to flooding where works will be carried out.	Medium, ST Construction activities will unavoidably create noise.	Medium	Low	
	Wildlife	Yes	Low	Low, ST	Low	Low	-

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
			The sensitivity of wildlife to noise is low (no permanent relevant noise level)				
Air quality	Public health and safety	Yes	Low There are communities scattered across the project area; however, they are generally not located in areas susceptible to flooding where works will be carried out. Road already exists.	Medium, ST Works and truck movements will cause air pollution	Low	Low	Some effective measures can be taken to reduce propagation of dust and particular matter (e.g., watering of transport routes, tyre washing, covering of trucks with tarpaulins)
	Climate	Yes	Medium Pre-load of dust and SO_2 exceeding permissible concentrations	Medium, ST Activities will generate further dust	Medium	Medium	
Water quality – *pollution from construction work and materials used, camps, accidental spills*	Vegetation	Yes	Medium Potential for effect of polluted water from many sources	Medium, ST Potential for impact on riverside vegetation	Medium	Low	Remaining impacts are low due to water treatment measures, spillage prevention and restriction of site to already used land.
	Wildlife	Yes	High Wildlife sensitive to polluted water	Medium, ST Effect of spillages and hazardous materials on water sources	High	Low	
	Public health and safety	Yes	High Potential for contamination of water sources	High, LT Significant impact if drinking water sources contaminated	High	Low	
	Surface water	Yes	High	High, LT	High	Medium	

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
			Potential contamination of water courses, in particular due to work in the river	Significant impact if surface water contaminated			
	Groundwater	Yes	Medium Potential contamination of groundwater due to chemicals used	Medium, ST	Medium	Low	
	Soil	Yes	Low Land already utilised and soil already contaminated	Medium, ST	Low	Low	
Vibration – *from vehicle movements and works (e.g., compaction, drilling)*	Structures	Yes	Medium Affects on structures close to the works	Medium, ST	Medium	Low	Condition surveys and monitoring of buildings. Compared to existing list of vibration issues, embankment protection works are not being done at these locations.
	Public health and safety	No	-	-	-	-	Road already exists
Visual impact	Landscape	Yes	Low Road already exists, and works are constrained to existing used areas	Low, LT	Low	Low	Minimal impact compared to existing situation
Traffic and transportation – *increased congestion, disruption due to roadworks,*	Public – social aspects	Yes	Medium Vehicles will need to queue at locations with temporary traffic restrictions	Medium, ST	Medium	Medium	Temporary traffic restrictions to a single-lane are unavoidable. They should be used only at work

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
economic impact, reduced accessibility for businesses							locations, mobile and flexible to enable quick changes in location, and kept short and with traffic lights which change regularly to keep traffic flowing. The Contractor shall develop its Traffic Management Plan and coordinate construction activities with the Road police. Flagpersons shall be present on narrowed road sections.
Occupational health and safety – *due to the works*	Worker health and safety	Yes	High Worker safety due to work close to water, next to live traffic, at height for rockfall protection, and around slopes prone to rockfall.	High, ST	High	Medium	Implementation of strict health and safety controls by the Contractor, training in project-specific risks and procedures, appropriate PPE, supervision.
Collisions and accidents	Public health and safety	Yes	High Worker and community safety issues due to work being executed next to live traffic	High, ST	High	Medium	A correctly implemented, high-quality traffic management plan with lane closures, barriers, netting,

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
							and sufficient distance between traffic and work areas can be taken to reduce accident rates
Cultural heritage – *damage due to works*	Religious monuments and buildings	Yes	Low	Medium, ST Potential of damage due to construction activities or disturbance by workers	Low	Low	Fence off monuments, buildings, cemeteries etc. if close to the works. Educate workers.
	Other monuments	Yes	Low	Medium, ST Potential of damage due to construction activities or disturbance by workers	Low	Low	Fence off monuments if close to the works. Educate workers.

Table 18: Environmental impact significance – operation phase

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
Noise – *from traffic*	Public health and safety	Yes	Low Road passes through various communities already.	Low, LT Road already exists; traffic can be expected to increase over time	Low	Low	No significant change from pre-existing condition
	Wildlife	Yes	Low	Low, LT Road already exists; traffic can be	Low	Low	No significant change from pre-existing condition

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
			The sensitivity of wildlife to noise is low	expected to increase over time			
Air quality – *from traffic*	Public health and safety	Yes	Low Road passes through various communities already.	Low, LT Road already exists; traffic can be expected to increase over time although vehicle emissions reduce over time	Low	Low	No significant change from pre-existing condition
	Climate	Yes	Medium Pre-load of dust and SO_2 exceeding permissible concentrations	Low, LT Traffic can be expected to increase over time although vehicle emissions reduce over time	Low	Low	No significant change from pre-existing condition
Water quality	Vegetation	No	-	-	-	-	No change from pre-existing condition
	Wildlife	No	-	-	-	-	
	Public health and safety	No	-	-	-	-	
	Surface water	No	-	-	-	-	
	Groundwater	No	-	-	-	-	
	Soil	No	-	-	-	-	
Vibration	Structures	No	-	-	-	-	No significant change from existing condition
	Public health and safety	No	-	-	-	-	
Visual impact	Landscape	No	-	-	-	-	Minimal impact compared to existing situation

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
Traffic and transportation	Public – social aspects	No	-	-	-	-	Benefit to local economy due to the improved resilience of the road
Collisions and accidents	Public health and safety	No	-	-	-	-	Road safety improved compared to existing situation
Cultural heritage	Religious monuments and buildings	No	-	-	-	-	No impacts beyond construction
	Other monuments	No	-	-	-	-	No impacts beyond construction

C. Positive environmental and social impacts

205. Road rehabilitation, while challenging during the process, can have several positive impacts once completed. These benefits can be seen in terms of safety, economic growth, environmental sustainability, and overall infrastructure resilience. Here are the key positive impacts of road rehabilitation specific to the M6:

IMPACT	DESCRIPTION
Improvements to the road's resilience and safety	✓ **Improved resilience:** The road will be repaired and protected so that it does not fail in flood conditions. ✓ **Modern safety features:** The road safety will be improved through measures such as provision of crash barriers and traffic calming measures. ✓ **Reduced accident rates:** By improving road safety, the rehabilitation reduces the likelihood of accidents.
Improvements to traffic safety.	✓ **Upgrading road infrastructure: C**learer signage, improved lighting, pedestrian crossings, and traffic-calming measures in high-risk areas. ✓ **Strengthening traffic management and enforcement:** Better road markings, speed control, and the use of intelligent transport systems to reduce accidents. ✓ **Enhancing public awareness and driver education:** Safe driving behavior, pedestrian safety, and compliance with traffic regulations.
Economic benefits	✓ **Job creation:** The rehabilitation process creates jobs for construction workers, engineers, and other professionals, providing a temporary economic boost to the local economy. ✓ **Increased reliability:** Once rehabilitated, the road can handle traffic more reliably, reducing closures and improving the flow of goods and services, which supports local and regional economies. ✓ **Attracting investment:** Improved infrastructure can attract businesses and investors to the area, particularly as the M6 road is a critical transportation corridor.
Community and social benefits	✓ **Improved accessibility:** Enhanced road infrastructure can improve access for emergency services, enabling quicker response times in case of emergencies. ✓ **Increased property values:** Properties and businesses in the vicinity of a upgraded road often see an increase in value due to improved accessibility and infrastructure reliability. ✓ **Public confidence:** Successfully completed rehabilitation projects can boost public confidence in local government and infrastructure management, leading to greater public support for future projects.

Table 19: Positive impacts of the Project

D. Negative environmental and social impacts

206. In general, the potential adverse environmental impacts associated with the works to carried out on project area are expected to be small, short-term and localized.

207. The majority of the potential adverse impacts will be applicable during the construction period and will occur in areas which have incurred damage and require repair. With references to the Project activities identified in Section III of this report, the likely adverse environmental and occupational health and safety impacts during the construction phase will include, but not be limited to the following:

- degradation of soil, landscape and soil erosion due to the works as well as improper disposal of excavated materials and construction waste;
- clearing land for construction sites can lead to the loss of trees and vegetation, reducing biodiversity and contributing to soil erosion;
- spillage of fuel (hydrocarbons) and chemicals associated with construction during the construction period, in particular in the river;
- pollution of water resources from construction work, camps, and accidental spills;
- use of temporary construction sites (camps, machinery sites, storage facilities, etc.);
- temporary air pollution related to increased truck traffic during the construction;
- noise and vibration disturbances from vehicle movements and operation of construction plant, in particular for buildings and residents close to the works;
- construction activities generate dust and particulate matter, contributing to air pollution;
- increased traffic congestion due to temporary lane closures and traffic light regimes around the works, which consequently increases travel times;
- increased traffic and accident risk for residents;
- restricted access to homes and businesses;
- pedestrian risks near work zones.

208. **Degradation of landscapes and soil erosion.** Some tree cutting / vegetation clearance maybe required where embankment protection solutions are required. The biodiversity survey identified the numbers of trees at intended work locations, though not all of these will require felling.

209. **Generation of excavated materials and construction wastes.** Some demolition debris will be generated during the rehabilitation works of due to removal of embankment material. These effects will be localized, and must be minimised by means of appropriate removal and disposal procedures. Since material will be required for backfill of retaining walls, non-contaminated, appropriately graded excavated material can be recycled directly on site.

210. **Impacts from temporary work sites.** Localised environmental impacts at specific work locations can enhance soil erosion and degrade the landscape. Temporary traffic management schemes associated with the work sites can cause congestion. There is also increased health and safety risks to workers and the community due to works on a trafficked road.

211. **Pollution by construction run-offs.** Construction activities may result in pollution of soil, groundwater, and surface water due to contaminated run-off. As a result of oil leakage from machinery and stockpiled construction materials and asphalt, oil products and chemicals can penetrate to the soil and/or ground water or run off to water recipients, in particular the Debed River. In addition, excavation works and construction activities carried out close to or within the river channel may mobilise fine sediments. During rainfall events, these sediments can be washed into the river, increasing turbidity and suspended solids concentrations, which may temporarily affect water quality and aquatic habitats downstream. Works in the river shall be protected by small cofferdams, which also minimise run-off.

212. **Impacts on biodiversity.** No major impacts on flora or habitat are expected due to rehabilitation of road within the corridor, since the road was built and intensively operated for years, and rehabilitation was carried out recently; therefore throughout this period ecosystems were significantly transformed and already carry significant anthropogenic footprint. There may be a requirement for removal of some trees on the riverbank to enable protection works. The biodiversity survey identified the numbers of trees at intended work locations, though not all of these will require felling.

213. Works within and near the river will be scheduled outside sensitive periods for fish (spawning and migration seasons) and birds (breeding and nesting seasons). Fish spawning seasons are:

i. Brown trout — spawns in October–November;

ii. Other fish – migrate for spawning in May – July (Caucasian scraper, Barbus cyri, and Mursa)

In-stream activities will be minimized and controlled to avoid increased turbidity, sedimentation, and disturbance. During any work carried out in the river, regardless of the spawning period, it is necessary to maintain sections of the riverbed (fish passages) that allow fish to move freely upstream and downstream. Riparian vegetation and riverbank habitats will be identified beforehand and protected through clearly marked no-go buffer zones prohibiting any construction, vegetation removal, or machinery access. Ecological supervision will be present during in-stream works, riverbank stabilization, and vegetation clearance to ensure that fish habitats, bird nests, and riparian fauna are not harmed. Immediate guidance will be implemented if active nests, spawning areas, or wildlife are detected.

214. **Impacts on Species of Conservation Concern**

215. Appendix C (Biodiversity Report — Fauna) and the IUCN Red List check reported in Appendix C1 identified five species of conservation concern on the regional list for the M6 corridor: two globally threatened (Egyptian Vulture, Armenian Steppe Viper), two Near Threatened (Eurasian Otter, Caucasian Grouse), and the rock-lizard complex (Darevskia sp.) which could potentially include the Endangered Darevskia rostombekowi pending species-level identification. One RA-Red-Book species (Great Cormorant) was directly observed on the September 2025 survey at the northern end of the corridor, consistent with the Appendix C conclusion. This section addresses each species of concern in turn.

216. Egyptian Vulture (Neophron percnopterus) — IUCN Endangered; RA Red Book listed

- The Egyptian Vulture was not observed on the September 2025 survey but is present in the wider Lori and Tavush region, nesting on rocky outcrops and in river gorges. The M6 alignment passes through suitable cliff habitat in places but no active nests are recorded within the 7 km of works. The works are restoration of embankments, retaining walls and riverbank protection on an existing carriageway and do not involve new quarrying, blasting of rock faces or alteration of cliff habitat. Significant impact on Egyptian Vulture is considered unlikely. The following precautionary measures apply:

- Contractor induction shall cover identification of Egyptian Vulture and the RA-Red-Book-listed raptor species (Golden Eagle, Peregrine Falcon, Griffon Vulture), with a find-and-report procedure for any sightings during construction.
- No rodenticides shall be used on site, to avoid secondary poisoning of scavenging raptors.
- If an active nest is reported within 500 m of an active works location during the breeding season (March to August inclusive), works in the vicinity shall pause and the Contractor shall notify the Engineer. The CSC will decide on any further action.

217. Armenian Steppe Viper (Vipera eriwanensis) — IUCN Vulnerable; RA Red Book listed The Armenian Steppe Viper is endemic to the Armenian Plateau and was not observed on the September 2025 survey. The species typically occupies mountain-steppe habitat above the tree line; the M6 corridor along the Debed gorge is predominantly riparian and marginal habitat. Significant impact is not anticipated. The precautionary measures below are consistent with worker occupational health and safety (the existing EMP "Protection from poisonous reptiles" row covers the worker-safety side; this is the biodiversity counterpart):

- Contractor induction shall cover identification of *V. eriwanensis* and the other venomous snake species likely to occur in the area (*Macrovipera lebetina*, IUCN LC), with a "no deliberate killing" rule — snakes found in active work areas shall be relocated outside the works footprint using the snake-handling equipment maintained on site under the existing EMP poisonous-reptile row.
- Any confirmed *V. eriwanensis* sighting shall be logged by the Contractor's Environment Officer and reported to the Engineer in the monthly E&S report.

218. Eurasian Otter (Lutra lutra) — IUCN Near Threatened; RA Red Book listed. A single historical capture is recorded near Location 6 (~km 35+250 – km 35+760) with no subsequent confirmed records; Dr T. Vardanyan (SCZHI) confirmed during preparation of Appendix C that there are no recent otter records in the Debed within the project corridor. The probability of otter presence in the works zone of influence is therefore low. The following measures apply:

- The Contractor's Environment Officer shall include an otter check (visual inspection for spraints, footprints or holts on accessible riverbanks) in the routine daily site inspection for any reach where in-river or riverbank works are active.
- If otter signs are recorded, the Environment Officer shall notify the Engineer, and works in the affected 200 m of riverbank shall pause pending CSC direction.
- In-river works shall be undertaken in daylight hours only.

- Construction run-off and dewatering discharges to the Debed and Aghstev rivers shall meet the IFC EHS Guidelines Table 1.3.1 limits (TSS ≤ 50 mg/L; oil and grease ≤ 10 mg/L) as specified in the Project Standards note. This is a general Project commitment and covers the otter protection pathway without additional species-specific provision.

219. Rock lizards (Darevskia spp.) — potentially including D. rostombekowi (IUCN Endangered)

220. Rock lizards were observed at thirteen of the thirty survey locations, identified only to genus. Several Darevskia species occur in the Lori and Tavush marzes at altitudes consistent with the records, most of which are IUCN Least Concern. One species in the complex, Darevskia rostombekowi, is IUCN Endangered and endemic to Armenia and adjacent Azerbaijan; its presence in the corridor cannot be excluded without species-level identification. The appropriate response is precautionary observation during construction, on the same mechanism as the cultural-heritage chance-find procedure:

- Contractor induction shall cover recognition of rock lizards as a species of conservation concern and the requirement to report sightings.

- The Contractor's Environment Officer shall log any rock-lizard sightings at each active work site, with photographs where possible, in the monthly E&S report. Where a sighting could plausibly be *D. rostombekowi* (based on reference photographs provided in induction), the Engineer shall be notified and the CSC will handle escalation — including, if warranted, engagement of a herpetologist to confirm the species.

- If *D. rostombekowi* is confirmed at any location, the impact assessment for that location shall be reviewed by the CSC and any site-specific mitigation agreed before affected works continue. No demolition of retaining walls, ruined structures or rock piles that host rock lizards shall take place within 50 m of a confirmed *D. rostombekowi* record until that review is complete.

221. Caucasian Grouse (Lyrurus mlokosiewiczi) — IUCN Near Threatened; RA Red Book listed

The Caucasian Grouse occupies subalpine habitat above the tree line, typically above 1,800 m. The M6 works sections lie between approximately 500 m and 1,100 m elevation, well below the species' range. The species is not expected to occur in the zone of influence of the works and no species-specific mitigation is proposed. The species is retained on the watchlist for completeness of the conservation-concern record only.

222. General biodiversity measures

- In addition to the species-specific measures above, the following general measures apply throughout the construction phase:

- No hunting, trapping or collection of wildlife by any person on the Project site. Buying wildlife from local people is also prohibited. Violation is grounds for dismissal. (This reinforces the existing EMP "Mobilisation of workforce" row on wildlife impacts.)

- Contractor induction includes a general module on local wildlife value, the species of conservation concern identified in Appendix C1, and the find-and-report procedure for any

encountered species on that list.

- The Contractor's Environment Officer maintains a biodiversity observation log as part of the routine site record, consolidated into the monthly E&S report to the RDF.

223. With the measures above applied, residual impacts on biodiversity are considered not significant. The five species of conservation concern are either absent from the works footprint (Caucasian Grouse), present regionally but unlikely in the zone of influence (Egyptian Vulture, Armenian Steppe Viper), historically recorded once but not recently confirmed (Eurasian Otter), or present at genus level only with species-level identification handled through a precautionary chance-encounter mechanism (rock lizards).

224. **Noise, vibration, and emissions.** Noise, vibration, and emissions will be generated due to the works, as well as during the transportation of construction materials and truck traffic. Emission of inorganic dust from digging-loading works, emission of harmful substances and dust from combustion of diesel used by transportation means and machinery, as well as bitumen smoke arising from road construction work occur during the construction works. Welding works cause welding aerosol and manganese monoxide emissions. Concrete mixers work result in concrete dust emissions. If mobile asphalt plants are used they could cause negative impact on water, ground water and air if not properly managed. This type of asphalt plant should be avoided. All asphalt plants should be certified and inspected according to Armenian norms before they are allowed to be used for the rehabilitation.

	TIME (HOURS)	MAXIMUM PERMISSIBLE NOISE LEVELS		REPUBLIC OF ARMENIA / WORLD BANK STANDARDS
		L_{Aeq} 15 min [dB]	L_{Amax}15 min [dB]	
Near residential dwellings and institutional buildings	06.00 ~ 22.00	55	70	RA and WB
	22.00 ~ 06.00	45	60	
Industrial and commercial	06.00 ~ 22.00 & 22.00 ~06.00	70	70	WB

Table 20: Permissible noise levels

225. Construction-phase noise may affect nearby sensitive receptors—such as residents, public facilities, workers, and wildlife—by causing disturbance, reduced comfort, and potential health or behavioural impacts. In assessing construction phases impacts the report focuses on four areas of potential impact:

- Noise from excavation of stones / embankment at the river
- Noise from milling
- Noise from vibrating rollers / compactors

- Noise from drilling for rock bolts in rock faces

  Noise generating Powered Mechanical Equipment (PME) has been identified for each activity. Sound Power Levels (SPL) have been assigned based on Appendix A of the Australian Standard AS 2436—2010 Guide to noise and vibration control construction, demolition and maintenance sites[8] which lists typical noise levels generated by construction plant.

226. **Dust** arising from construction works and movements of excavated material will have negative impact on the ambient air quality, and it is necessary to take effective protective measures to minimize the negative impact, especially in settlements and protected areas.

227. **Disposal of excavated materials and construction wastes.** Excavated materials will be generated during the riverbank protection works. These effects will be localized and will be minimized by means of appropriate removal and disposal procedures, which may include but not be limited to careful selection of waste temporary accumulation sites. Material shall be recycled wherever possible and asphalt pavement must be recycled. In particular, since material will be required for backfill of retaining walls, non-contaminated, appropriately graded excavated material can be recycled directly on site.

The Alaverdi Community has offered an area for disposal of non-recyclable construction waste located in the northwest part of Koshaberd Street in Alaverdi city, approx. 4.5 km from nearest turnoff of the M6 at km 52+900. The route is identified in Figure 34 below. The area is approx. 12,000 m² and is accessible by existing, paved roads. It is used as the community disposal area. The official letter concerning this area from the Alaverdi Community is enclosed with this report in **Appendix M**.

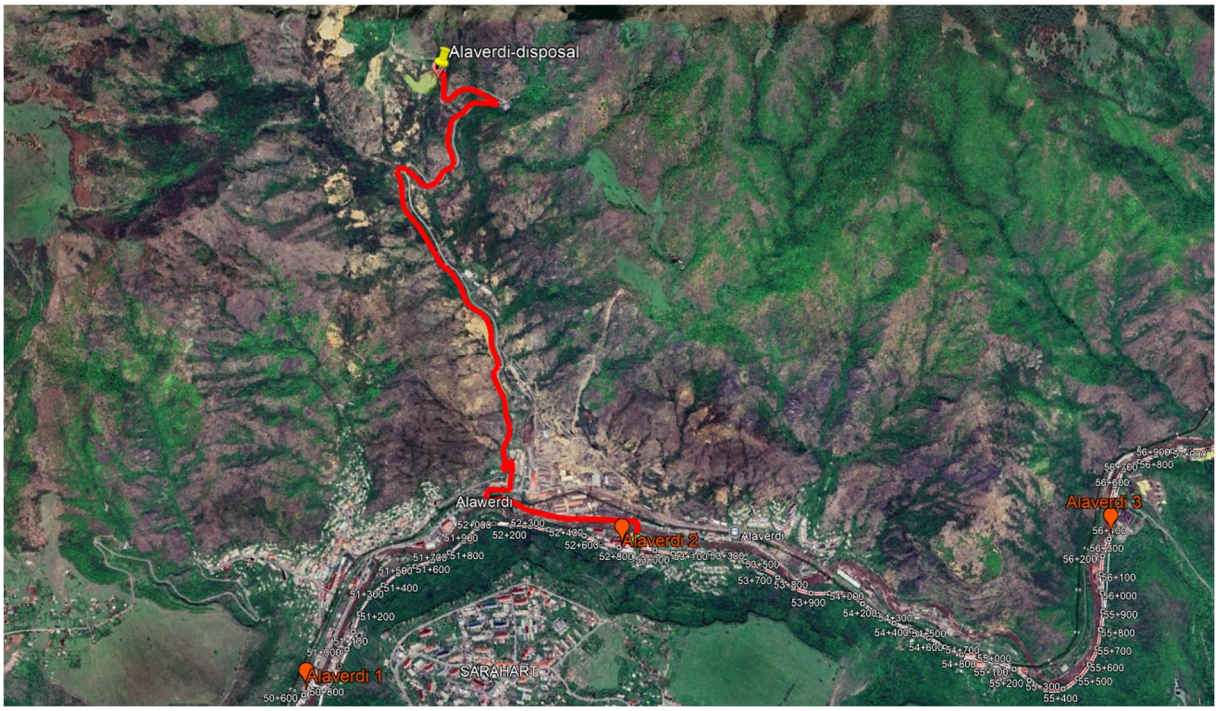


Figure 34: Location of area and transport route for waste disposal in Alaverdi area

[8] The table is derived from information in AS 2436—1981 Guide to noise control on construction, maintenance and demolition sites and British Standard BS 5228-1, Code of practice for noise and vibration control on construction and open sites. Noise

The Noyemberyan Community has also offered an area for disposal of non-recyclable construction waste within the administrative territory of Haghtanak Village, in the area known as “Khechi Dzor”, approx. 500 m from nearest turnoff of the M6 at km 81+500. The route is identified in Figure 34 below. The area is approx. 12,000 m² and is accessible by an existing, unpaved road. It is used as the community disposal area. The letter concerning this area from the Noyemberyan Community is enclosed with this report in **Appendix M**.

Figure 35: Location of area and transport route for waste disposal in Noyemberyan area

The Tumanyan Community could not provide a suitable area. Their official letter is also enclosed with this report in **Appendix M**.

228. **Safety hazards from construction activities.** Safety hazards can occur due to violation of proper health and safety practices and may lead to injuries and accidents. Work close to a river and next to a trafficked road involves significant risks which need to be carefully managed through the application of proper construction practices and safety procedures are applied. Work at height during slope protection activities, such as installation of conformal netting, or around slopes prone to rockfall, represents a major health and safety risk and requires strict safety controls, appropriate PPE, and trained personnel to prevent falls and related injuries.

229. **Community health and safety.** The project can change the community’s exposure to risks and impacts arising from accidents and structural failures. Impacts on the health and safety of the community may also arise during rehabilitation works as a result of accidents and collisions, as well as noise, dust and other emissions from earthmoving, paving works, and operation of equipment and vehicles. The negative social impacts of the project arising during construction however can be mitigated through correct organization of the construction process and

implementing suitable mitigation measures.

230. **Cultural Heritage.** A chance find procedure shall be implemented during construction in accordance with national legislation. If any cultural heritage is found, works will stop in that area and the relevant authorities will be notified. Works shall only resume following clearance and approval.

E. Operation phase impacts

231. **Improved road safety**. Quality of the road provided improves due to upgrade of the road and associated furniture, signage and equipment.

232. **Impact on provision of transportation services.** Rehabilitation of the road will improve the resilience of the road, and therefore the reliability for the provision of transportation services and will allow to ensure reliable, safe and speedy transportation of passengers and goods.

233. **Traffic noise and air quality impact.** Rehabilitation of the road will not significantly change traffic movement.

234. **Impacts on population.** The project will create temporary and some permanent job opportunities for the local population (both men and women), as they could be employed during rehabilitation and maintenance. Local businesses may also be affected, including potential conflicts with workers and traffic delays, but in general they are also likely to benefit during the construction phase as demand for goods and services from workers will in increase.

235. Based on initial observations, all of the mentioned potential adverse environmental and social impacts revealed during scoping process can be prevented and/or minimized as a result of proper and timely implementation of mitigation measures as well as best management practices (identified in the EMP) for the project and to be implemented during construction works and further operation of the rehabilitated road.

236. At this stage of analysis, it should be noted that the positive social and economic impacts of the rehabilitation of will outweigh potential environmental and social risks.

F. Design and pre-construction phase mitigation

237. In the design phase it is important for the RDF to ensure that the mitigation measures identified in this IEE are incorporated into bidding and contract documentation. The EMP tables clearly identify items that will need to be included. This allows the Contractor to clearly understand the environmental requirements of the project, in particular their monitoring and reporting responsibilities. Following award of the Contract the Contractor shall prepare a SiteSpecific Environmental Management Plan (SEMP) 28 days prior to works commencement date, that takes the proposals in the IEE and develops them with the Contractor's working methods and construction programme. The Contractor shall gain approval of the SEMP from the Construction Supervision Consultant (CSC) and prepare checklists for regular onsite audit of environmental performance (including compliance) by linking the checklists back to the SEMP. In addition, the Contractor shall provide environmental information on environmental performance in the monthly and quarterly project reports. An outline of Contractor's SEMP presented in the Appendix L.

238. The Contractor will be responsible for ensuring that all subcontractors abide by the conditions of the SEMP.

239. The Contractor should ensure the engagement of a full-time National Environmental Specialist and a part-time Cultural Heritage Expert throughout project implementation..

240. To ensure that there are adequate and suitably qualified health and safety staff engaged on the project, RDF shall include requirements for a national Occupational Health and Safety (OHS) specialist to be employed permanently during the construction period. The role of the OHS specialist will be to ensure that all activities are conducted in a safe and healthy environment, minimizing risks to workers and the community, specifically for works around the river and close to the road, as well as for safe traffic management.

241. In addition, a national Environmental Specialist, national Social Specialist, national Health and Safety Specialist and part-time cultural heritage specialist, with strong backgrounds of environment, social issues, health and safety, and cultural heritage management should be employed within the CSC team and deployed for the full duration of the works.

242. The CSC should ensure the engagement of a part-time International Environmental Specialist (IES) throughout project implementation. The role of the IES will be to coordinate and strengthen the safeguards activities of the CSC and the Contractor to ensure that design construction and operation will proceed following the requirements of the EMP. Both on-the-job training and in-house workshops on specific environmental management issues relating to ADB safeguard policy and the requirements of this IEE and its implementation will be provided to the Contractor and CSC team through this support.

G. Construction phase mitigation measures

243. Mitigation measures that could be used where appropriate are separately defined for the design, construction and operation phases and included in the EMP.

244. The construction phase is the period when most disturbances to the environment will occur. This will include clearing of vegetation, open excavations, establishment of camps for the storage of fuel, oil, bitumen, chemicals, and the emission of dust and noise during working hours at work sites. To minimize potential degradation of landscapes and soil erosion and pollution from disposal of excavated materials and construction wastes, existing quarries for materials will be used. This is particularly important for the sourcing of riprap. Work areas shall be clearly delineated, separated from traffic, and closely monitored, so that they do not expand during construction. Workers should be assigned appropriate safety equipment for their personnel security. Dust, noise and vibration from the construction site should be minimized where activities are close to residential areas and sensitive uses. Non-recyclable construction concrete waste, debris and spoils shall be transported and disposed in compliance with legislation at locations provided by the heads of Alaverdi, and Noyemberyan communities, only at officially designated and approved disposal sites, in accordance with national regulations. The legal status, ownership, and suitability of these sites shall be confirmed prior to use. After completion of construction and rehabilitation works landscape shall be restored to quasi-original conditions. Details of proposed mitigation measures are presented below.

245. **Preserving landscapes and minimizing soil erosion.** To minimize degradation of

landscapes and soil erosion the Contractor(s) shall use existing quarries for required additional materials. The permits from the Ministry of Territorial Administration and Infrastructure, as needed, from the local regional authorities will be obtained if the opening and/or use of quarries are required. In the unlikely case any access roads are required, they will be carefully chosen and delineated to minimize impacts on landscape and soil erosion, and will be closely monitored to eliminate their unduly expansion during construction works. After completion of construction and rehabilitation works and after use of quarries, landscape shall be restored to quasi-original conditions, and plant species specific for the project area shall be preferably used. No quarries, borrow pits, or access roads to these sites will be permitted within protected areas, nationally or internationally designated sites. Further, no borrow pit or quarry shall be used that is within 500 m of residential properties.

246. **Managing construction run-off.** The top surface of any access roads and work areas will be compacted to facilitate water runoff and avoid flooding the area. This may require digging drainage ditches and connecting them to natural drainage rainwater discharge system. These works will be confined to the existing right of way.

247. **Work sites, machinery maintenance areas and construction camps.** Although work sites for this project will unavoidably be located close to the Debed River, machinery maintenance areas and construction camps shall be located away from rivers to prevent adverse impact on water quality. Noise activities in the manufacturing area – rock and gravel processing, crushing, concrete batching and asphalt plant, will be located at least 500 m from sensitive receivers such as residential areas and shall only operate during the daytime. None of these sites shall be permitted within protected areas, nationally or internationally designated sites.

248. **Prevention of spillages.** To reduce the likelihood of oil spillage from construction equipment, well maintained machinery and equipment shall be used to reduce likelihood of oil drips, excessive exhaust gas emissions and noise. In addition, sand or fine gravel should be spread on the ground in the locations designated for parking, and servicing construction machinery. In case of spillage the contaminated layer should be removed to a designated waste disposal site and the affected area replaced with clean sand or fine gravel. If no sewerage system connection is available, the contractor shall ensure no faecal contamination from construction camp waste, e.g., septic tank system regularly emptied by a licensed organization. All drivers and equipment operators shall be provided by spill kits.

249. **Water treatment.** No water used during construction shall be allowed to run-off into surface waters. Any wastewater shall be captured and transported by a special truck to a centralized wastewater collector, based on agreement obtained from the local authorities during the design phase.

250. **Preserving biodiversity.** Although most works will take place within the existing RoW, construction activities (movement of machinery, retaining works, river works) can affect nearby habitats if not well controlled. The impact on biodiversity will be minimal, as the works will be carried out within the footprint of the existing area. Use of land outside the right-of-way (RoW) is not allowed unless formally approved. All temporary facilities like camps, storage areas, waste areas, access tracks must be located within the RoW or in pre-approved designated areas only, based on Contractor method statements and layout plans. The Contractor shall prepare method statements for high-risk activities, clearly showing working limits, no-go areas, and protection measures (marking site boundaries and supervising works to avoid encroachment). Materials shall

be sourced from licensed existing quarries only; new borrow areas are not allowed without separate approval. Compliance shall be strictly monitored, and any unauthorised land use or damage to vegetation will require corrective action.

251. There may still be requirements for some tree cutting and vegetation removal, in particular between the road and river at locations of riverbank protection work. In this instance any trees cut from this area will be replaced on a 1:10 basis at a location determined by the local communities. Tree replanting and maintenance shall be completed by the Contractor during the course of the construction phase. A tree planting management plan will form part of the Contractors SEMP and will describe the native species to be replanted, locations and the tree maintenance activities. Should any tree die during the first two years from planting, the Contractor will be obliged to replant on a 1:2 basis. Given the above, tree planting should commence at the alternative location as soon as detailed designs have been prepared, the exact areas calculated for clearance and the tree planting plan approved by Hayantar SNCO under the Ministry of Environment.

252. In addition, works near the river shall be carried out in accordance with the EMP, which includes measures to protect aquatic habitats. These include limiting in-river works to defined areas, installing sediment control measures (e.g. silt fences or barriers), preventing discharge of untreated wastewater or construction runoff, proper storage and handling of fuels and chemicals, and immediate response to any spills. Low, temporary cofferdams shall be implemented to secure any works in the river and prevent water flow into or through the sites. These measures are intended to minimise sedimentation, pollution, and disturbance to aquatic habitats.

253. **Managing noise, vibration, and emissions.** Dust-suppression measures aimed at prevention of air pollution will include watering of construction sites and any access roads; however, polluted sites shall not be watered, and water shall not runoff into the Debed River or its tributaries. During construction, air pollution in the form of dust from earthworks and vehicle emissions will increase. Regular water sprinkling and enforcement of low-speed limits (suggested, 20 km/h or lower) during construction will alleviate dust impacts. Dust at construction sites and on transport routes will be minimized by using closed/covered trucks for transportation of construction materials (especially loose construction materials such as gravel, sand, soil, etc.) and debris. Loose construction materials shall be properly stored. To minimize impacts on nearby residents all vehicles will be equipped with exhaust mufflers and regularly inspected to ensure they are operating efficiently. In addition, sites will only operate during daytime hours (9:00-18:00). Other measures planned to maintain good air quality include locating asphalt plants and concrete mixing sites and stockpiles in isolated areas, as well as confining working vehicles to designated routes away from sensitive receptors. Noise and vibration impact can adversely impact on sensitive receivers close to the works. At all times the Contractor shall minimize noise impact by use of natural topographic barriers or by placing physical barriers between noise generating activities and sensitive uses and only work during daytime hours. The Contractor shall inform residents about the start of work.

254. Specifically to avoid and minimise vibration impacts the Contractor will take the following measures which will be monitored by the CSC:

1. Identify exactly the buildings which may be affected by the works.

2. Carry out an initial condition survey of the building / structure. Create a protocol including photo documentation. Agree and sign-off with the owner.

3. Re-check the status of the building / structure just before construction starts in the area. Create a protocol which either confirms the original assessment or documents any changes. Agree and sign-off with the owner.

4. Work only during permitted hours.

5. Minimise vibrations during work / select equipment and methods which will not cause excessive vibration.

6. Monitor any critical buildings / structure.

7. Carry out a post-construction check of buildings / structures. Create a protocol which either confirms the original assessment or documents any changes. Agree and sign-off with the owner.

255. **Topsoil management.** If a vegetated area is used for establishment of a construction site, the topsoil will be carefully removed and stored in piles as described in para. 83 and will be used on completion of works for site restoration.

256. **Waste management.** Construction concrete rubble, debris and spoil will be transported and disposed in approved disposal sites. Permits from the local regional authorities or contracts with specialized entities will be signed to carry out transportation and disposal of excavated materials and construction waste. Restoration to quasi-original conditions will be carried out after completion of renovation works and after use of quarries. Hazardous waste (waste oils, fuels, contaminated materials) will be managed separately in accordance with national regulations and the requirements of the EMP, including proper storage, handling, and disposal through licensed contractors.

257. **Managing safety hazards.** The work involves significant risks which need to be carefully managed through the application of proper construction practices and safety procedures, following the Work Bank Group's (IFC) Environmental, Health and Safety General Guidelines[9] and ADB's OHS Guidebook[10].

The Contractor will be required to ensure that all works are planned and coordinated. In planning the works the contractor must undertake task planning and ensure that the planned work is supported by a risk assessment. In addition, the Contractor must ensure that his workforce is trained and competent to undertake the planned tasks. Both the risk assessment and work planning (in the form a construction phase plan and task method statements, both written documents) will be briefed to the workforce prior to undertaking work. Daily briefings must be undertaken by the work supervisor to ensure that the workforce understand the work, the coordination requirements, and any residual risks. The Contractor shall ensure that people are provided with training, supervision, personal protective equipment and suitable welfare facilities including rest.

The work involves significant risks, and the Contractor shall remain responsible for planning the safe execution of all work. In addition, he will remain responsible for all supporting systems and temporary works. The following high-risk activities will receive additional planning and

[9] https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-en.pdf
[10] https://www.adb.org/sites/default/files/project-documents/46282/46282-001-tacr-en_0.pdf

detailed risk assessment.

- Demolition works
- Working near rivers or open water
- Work at height
- Work in pits
- Work on slopes
- Work at the base of slopes prone to rockfall
- Work close to a trafficked road
- Welding and cutting works.

258. The work sites and camps shall be clearly delineated by barriers and fence. Access to construction sites and camps shall be strictly controlled and limited to authorised personnel. Personal protective equipment must be available and be used during implementation of works. If works require drilling, the works will be implemented only by specially trained personal using specialized personal protective equipment. In addition, all workers shall receive appropriate orientation and instruction (including first aid training) prior to commencing their involvement in construction works.

During previous rehabilitation works for the road, contractors have situated their camps at the locations shown below, and utilised existing buildings at the locations. The previous camps are all close to the M6 at km 39+500, km 56+550, and km 81+500, and are well-situated for the works to be carried out. It is the Contractor's responsibility to make appropriate arrangements for its camps.

Figure 36: Previous contractor camp located at a former brick factory (access from M6 km 35+900 as marked in red)

Figure 37: Previous contractor camp located at a former brick factory (access from M6 km 56+550)

Figure 38: Previous contractor camp located on the opposite site to the road to the Noyemberyan community disposal area (access from M6 km 81+500)

259. Managing the construction camp.

The Contractor shall comply with the joint publication by the international Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) on Workers' Accommodation: Processes and Standards[11].

To ensure the well-being of workers, minimize environmental impact, and maintain good relations with nearby communities, the Contractor will ensure the site has all necessary infrastructure within his construction camp, such as water supply and sanitation, waste management systems,

[11] Available at https://www.ifc.org/en/insights-reports/2000/publications-gpn-workersaccommodation

electricity, and access roads, parking, storage, and security. The Contractor will provide safe, comfortable, well-ventilated/heated accommodation for workers, with drinking water and sanitary-hygienic facilities such as showers, toilets, and laundry areas. In addition, these facilities must be kept clean and free from defects. The Contractor will manage his workforce and ensure that the needs and sensitivities of the local community is acknowledged and respected. The Contractor will liaise with local authorities/ police and ensure good relations with local communities. The Contractor must undertake induction training with each member of the workforce (including day visitors) part of this induction must establish standards and expectations and address social issues such as drugs and alcohol standards on site.

During previous rehabilitation works for the road, contractors have situated their camps at the locations shown below, and utilised existing buildings at the locations. It is the Contractor's responsibility to make appropriate arrangements for its camps.

260. **Managing waste in camps.** Waste containers will be placed near the construction camp and sites to collect the household waste generated during the works. Agreements / contracts will be signed with the appropriate authority / entity to ensure timely transportation and disposal of waste.

261. **Preserving historic and/or cultural monuments.** The baseline survey (Appendix I) identified sixteen heritage assets within or adjacent to the four damaged road sections. Three sit on or against the works footprint and are the focus of impact management:

- Sanahin bridge (1195 AD), Alaverdi (~km 57) — part of the UNESCO World Heritage inscription *Monasteries of Haghpat and Sanahin* (State List Lori 5.2.23). The bridge itself is not subject to rehabilitation; nearby riverbank and retaining-wall works are.

- "Igahat" medieval village and 13th–14th century wine press (~km 37) — rescue-excavated in 2018; immediately adjacent to the right-hand side of the M6 carriageway.

- Bagratashen-1 and -3 Middle Palaeolithic and High Medieval sites (~km 85) — excavation trenches immediately adjacent to the carriageway; protected under RA law as "newly discovered" monuments pending State List designation.

262. The remaining thirteen assets (khachkars, cemeteries and settlement remains listed in the baseline section) lie in the vicinity of the works rather than within the footprint. For these the pathways of concern are indirect — dust, vibration, vehicle movements, and construction-plant encroachment beyond the demarcated working area. Given the continuous record of human occupation of the Debed gorge, unrecorded archaeological material may also be encountered during earthworks in any of the four sections, including the Shnogh sections where no assets were identified in the pre-construction survey.

263. The following measures apply corridor-wide:

- The Contractor shall prepare a Cultural Heritage Management Plan (CHMP) as a sub-plan of the CEMP, covering the identified assets within 100 m of the works, the protective measures below, site-specific measures for Sanahin, Igahat and Bagratashen, and the chance-find procedure. The CHMP shall be reviewed and approved by the CSC before any works begin within 100 m of an asset.

- All construction staff shall receive cultural-heritage awareness training as part of their site induction, covering the identified assets, recognition of archaeological material (pottery, lithics, worked stone, burials, unusual stratigraphy), the chance-find procedure, and the prohibition on unauthorised collection or movement of material under RA law.

- Where works come within 50 m of a known heritage asset, the Contractor shall erect temporary protective fencing (minimum 1.8 m high, bilingual "Protected Cultural Heritage — No Access" signage) before any machinery enters the area. Machinery, plant, stockpiles, access roads and welfare facilities shall be kept outside the fence line.

- A pre-construction photographic record shall be taken of every asset within 100 m of the works by the Contractor's Environment Officer — dated photographs from fixed viewpoints with a scale bar, and a brief written note on visible condition. The record shall be submitted to the Engineer before mobilisation and shall serve as the baseline for condition checks.

- Condition of each asset shall be checked every three months during construction by the Environment Officer (tightened from the generic six-monthly interval to reflect the density of assets along the corridor). The check shall repeat the baseline photographs and complete a one-page condition checklist. Any observed deterioration shall be reported to the Engineer within five working days, and works in the vicinity shall be reviewed for dust-control and machinery-movement compliance.

- Vibration at the façade of any masonry heritage asset shall not exceed the DIN 4150-3 Line 3 (sensitive structures) limits specified in the Project Standards note.

- Dust-suppression measures shall be enhanced within 100 m of any heritage asset; stockpiling of granular materials within 50 m is prohibited.

264. **Site-specific measures — Sanahin bridge**. Because the bridge is a component of a UNESCO-inscribed property, additional measures apply:

- No works shall be carried out on the bridge structure itself. Works in its vicinity (riverbank protection, retaining walls, adjacent pavement works) shall be kept to the minimum necessary, with the working-corridor limits set out in the CHMP.

- The RDF, through the Ministry of Foreign Affairs as State Party to the World Heritage Convention, shall notify the UNESCO World Heritage Centre of the scope and programme of works in the vicinity of the bridge prior to mobilisation (ADB SPS 2009 PCR; IFC PS 8; Operational Guidelines para 172).

- Vibration at the bridge shall be monitored during any works within 100 m, with an action level at 80% of the DIN 4150-3 Line 3 limit and a stop-work trigger at the limit.

265. **Site-specific measures — Igahat (~km 37)**. The CHMP shall set out a no-excavation buffer (default 20 m) around the exposed wine-press features, within which no machine excavation is permitted. Any necessary ground disturbance within the buffer shall be by hand. Compliance with the buffer shall be recorded daily by the Environment Officer. If additional features are exposed, the chance-find procedure below applies.

266. **Site-specific measures — Bagratashen (~km 85).** The Palaeolithic sites and the adjacent

Medieval village remains are treated as designated monuments. Before mobilisation in this reach, the RDF shall notify the Institute of Archaeology and Ethnography (NAS RA) — the body that carried out the 2010–2011 excavations and the 2025 pre-construction survey. The CHMP shall set out no-excavation buffers around the recorded trenches and the Medieval pottery layer, within which the same hand-excavation rule as at Igahat applies. Any material recovered shall be handled under arrangements agreed with the Institute; no material shall be retained by the Contractor.

267. **Chance-find procedure (all four damaged road sections).** If during construction any material or feature of possible archaeological, historical, palaeontological or cultural significance is observed — including pottery sherds, lithic artefacts, worked or dressed stone, masonry or foundations, skeletal remains, burial features, metalwork, coins or unusual stratigraphic horizons — the Contractor shall:

- **Stop work** within a 25 m radius and secure the area against further disturbance or unauthorised access
- **Notify the Engineer the same working day.** The Engineer will initiate any specialist attendance required.
- **Not resume** works within the 25 m radius until cleared in writing by the CSC.
- **Record** the find and its handling in the next monthly E&S monitoring report to the RDF

268. Unauthorised collection, retention, sale or export of archaeological material by any person on the Project site is prohibited and shall be grounds for immediate dismissal.

269. **Public awareness.** To mitigate the disturbance to the population, appropriate information on the project (including duration of construction works) shall be regularly provided to affected communities. The local population should be appropriately informed about the commencement of construction works / phases of construction (information on proposed construction activities should be available on the website of the Ministry of Territorial Administration and Infrastructure, RDF, local authorities, and also through community newsletters, local TVs and from community leaders). Notification on commencement of construction works, limitations of vehicle movement, alternative access and detour arrangements shall be provided to affected communities in advance of commencement of construction works.

270. The project shall have an established **grievance redress mechanism** that will allow affected parties to raise their concerns and obtain feedback. Information on steps of grievance review and redress procedure as well as parties involved in grievance resolution shall be made publicly available and disclosed in affected communities.

271. When an incident is identified the observer assigns it as an Observation, Opportunity for Improvement or a non-conformity. Only a non-conformity requires the issue of a Corrective / Preventative Action Request generated by the CSC. Incidents / accidents shall be recorded using the forms provided in Appendix L. Observations and Opportunities for improvement are relayed verbally to the supervisor at site, recorded on the site audit sheet and summarised in monthly reporting.

H. Operation phase mitigation measures

272. During the operation phase emphasis should be on better vehicle maintenance and emission checks to minimize negative environmental impact from traffic.

273. **Asset management.** Regular inspections of all assets along the road and implementation of timely maintenance. Clearing of any debris on the road, including rockfall, and clear-out of any rockfall behind barriers, walls or fences.

274. **Waste management.** Waste containers will be placed along the road, in particular at stopping points and lay-bys. As a part of an operation and maintenance programme, agreement should be reached with appropriate authorities / entities to ensure timely regular cleaning of the road and collection, transportation, and disposal of waste to an approved disposal site.

275. **Maintenance of drainage system.** Proper maintenance of culverts and drainage systems to ensure they do not become blocked, including regular inspections and repairs as needed.

276. **Managing safety hazards.** Proper operation and maintenance of the road will ensure risk is minimized. Roads signs, marking and safety elements (including guardrails, speed bumps, etc.) shall be regularly inspected and kept in appropriate working condition. A speed control system must be installed.

277. **Regular structural inspections.** As recommended in the design, at least once yearly inspections of structures (in particular the underside of superstructure) with qualified personnel and appropriate vehicles / equipment. Maintenance and repair if necessary, or more intensive monitoring.

I. Environmental reporting requirements

278. The Contractor will prepare a SEMP (outline attached in the Appendix L) that will take on board the environmental concerns identified in this IEE and detailed in the EMP. The SEMP is the Contractor's opportunity to address the environmental concerns identified in the IEE and their own experience and site practices to state clearly how environmental issues will be addressed. From the SEMP a series of checklists will be derived by the Contractor with CSC input for use in auditing the Contractor Environmental performance and offering early identification of any deteriorating environmental standards.

279. The Contractor will produce monthly engineering reports and these must include information on environmental performance. Reporting will include but not be limited to:

- Status of the SEMP;
- status of any other contractor prepared environmental documents;
- status of environmental permits (e.g. asphalt plant, borrow areas if appropriate);
- recording any physical environmental monitoring results (e.g. air, noise, water quality, vibration);
- results of Contractor and joint Contractor / CSC site audits;

- grievance redress mechanism;
- interaction with the public – public consultations and complaints;
- training of site staff in environmental matters.

280. RDF with CSC support will prepare a semi-annual Environmental Monitoring Report drawing on the Contractor's monthly environmental monitoring information and reporting the environmental performance of the project after loan effectiveness and until project completion report is issued. This document will be disclosed on the ADB project website in English and RDF webpage in Armenian.

VII. PUBLIC CONSULTATION, INFORMATION DISCLOSURE, PUBLIC COMMUNICATION, CONSULTATION AND PARTICIPATION

A. Stakeholder Categories and Groups

281. The Project stakeholders have been grouped into the following two major categories:

- Internal stakeholders representing the organizations that undertake the Project and those who work within them such as management, staff, owners, shareholders, as well as contractors and subcontractors involved in the Project implementation and benefiting from it (investors and shareholders); and
- External stakeholders representing the groups or individuals that are not part of the organizations implementing the Project but are affected in some way by the decisions and actions of such organizations.

INTERNAL STAKEHOLDER	ROLE
Road Department Fund	Executing agency with overall responsibility for the project and communications with other stakeholders
Ministry of Territorial Administration and Infrastructure	Ministry with overall responsibility for implementation of the Project and has delegated implementation functions to the Road Department Fund
Asian Development Bank	Donor
M6 Road Operator	Day-to-day operation and maintenance of the road
Design consultant (JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH)	Responsible for development of ESR and IEE, as well as support of RDF in stakeholder consultations
Contractors and their subcontractors	Responsible for construction of the project and compliance with all legal, environmental, social and health and safety requirements
Other consultants (e.g. supervisors)	Responsibilities as defined in their contracts

Table 21: Identification of internal stakeholders

282. **External stakeholders:** In order to ensure effective and meaningful engagement, the Project's external stakeholders have been clustered into the following groups:

- Potentially affected parties/facilities (if any);
- Potentially vulnerable groups (if any);
- Non-commercial organizations (Non-Governmental Organizations (NGOs), mass media, academia etc.);
- State authorities;

- Local government authorities;
- Infrastructure management authorities

EXTERNAL STAKEHOLDERS	INTEREST / ROLE	ENGAGEMENT TOOL
Potentially affected parties/facilities		
Residents of nearby communities (e.g., Alaverdi, Tumanyan, Sanahin)	May be potentially affected by: • construction traffic May be interested in: • employment opportunities during the construction works	Community meetings Focus groups Individual consultation meetings
Non-commercial organizations		
Nationally relevant NGOs	May be interested in: • monitoring the project progress and tracking how their views / suggestions regarding the project implementation have been taken into account; • positive E&S changes associated with the implementation of the Project.	Meetings
Scientific, research and educational organizations	May be interested in: • information about the Project, its progress and its E&S impacts; • participating in the project consultations	Study tours for students
State authorities		
Ministry of Environment (MoE)	Responsible for the sustainable management, preservation, protection, of the subsoil, lands, water resources, atmosphere, flora and fauna, as well as protected areas, forests, and for proper use and reproduction of natural resources (except for mineral resources). Within the structure of the MoE, the Environmental Impact Expertise Center SNCO conducts environmental expert examinations of designs for reconstruction, rehabilitation and maintenance activates according to the requirements of the Armenian legislation.	Meetings and consultation
Hayantar SNCO	Conservation, protection, reproduction and effective use of the state forest fund of the Republic of Armenia	Meetings and consultation
Ministry of Internal Affairs	The Ministry of Internal Affairs elaborates and implements the policies of the Republic of Armenia Government in the area if civil defence and protection of population in emergency situations.	Meetings and consultation

EXTERNAL STAKEHOLDERS	INTEREST / ROLE	ENGAGEMENT TOOL
Ministry of Health	Within the structure of the Ministry of Health the National Center for Disease Control and Prevention (NCDC), among other functions is responsible for coordination of issues related to health (including those on noise and vibration) and for supervision over implementation of sanitary norms, hygienic and anti-epidemiological measures implementation by organizations and citizens.	Consultation Official announcements of NCDC
Ministry of Labor and Social Affairs	To assure stable workplaces	Reports
Health and labour inspection body of the Republic of Armenia	To ensure safe workplaces for employees and visitors	Inspections Consultations
Environmental Protection and Mining Inspection Body of the Republic of Armenia	Reasonable use and reproduction of subsoil and mineral resources.	Inspections Consultations
Road police	Responsible for traffic safety and road diversions.	Inspections Consultations
Regional / community authorities		
Regional Lori Province, Tumanyan and Alaverdi and Tavush province Sanahin communities	May be interested in: • stable workplace to hire from local community. • communication with the communities.	Community meetings Consultations
Infrastructure management authorities		
Veolia Jur CJSC	Responsible as the Unified Operator for managing water and wastewater systems in Armenia.	Consultations
CJSC Electric Network of Armenia (ENA)	Responsible for the regulated distribution and sale of electrical energy in Armenia, including in the project area.	Consultations
Gazprom Armenia LLC	Responsible as the Unified Operator for natural gas supply systems in Armenia.	Consultations
Telecommunications utility companies	Optic fiber networks providers	Consultations

Table 22: Identification of external stakeholders

B. Information disclosure requirements

283. The main methods for stakeholder engagement and information disclosure include meetings with identified stakeholders, consultations, disclosure on project internet websites (i.e., RDF's website), through local government authorities, social networks, notice boards in communities, distribution of leaflets, and announcements in the local media.

284. Public consultation/stakeholder meetings organized in project area (e.g. regional centres)

in publicly accessible places and open for attendance by all stakeholders. The information about upcoming events should be disseminated at least 7 working days before the event date.

285. Documents concerning the project should be published on the Client's website as well as on the Armenian e-procurement platform.

286. The IEE will be disclosed on the RDF and ADB websites.

C. Public Consultations

287. Public consultations were held in the Alaverdi, Ayrum and Tumanyan Communities on 09.12.2025. They were held by RDF and the Consultant, and attended by community leaders, community residents, and the village administration head and employees. In Alaverdi 19 persons participated; and in Tumanyan 18 persons and in Ayrum 14 persons participated. The minutes of the consultations are enclosed in this report as Appendix J.

288. A summary of the key issues raised in Alaverdi is as follows:

- There are certain places along the M6 road, which are far from the river and probably will not be damaged, for instance near Baghramyan, but the road is constantly settling. The Consultant has observed the whole section from km 31 to 91. The study is focused on places which are already damaged because of flooding as well as based on the results of digital modeling.

- Whether the design include also rock falling protection measures? Nine different regimes for management of rock fall areas were considered. Have been chosen 3 most commonly applied solutions: low barrier at roadside, conformal netting on rock face and rock bolting.

289. A summary of the key issues raised in Tumanyan is as follows:

- Is it possible to build retaining walls to avoid flooding in future? Modeling done by Geonifo provides information how is the height of road changing in comparison to the river, sometimes its higher and sometimes lower. The problem is when the river rises and the road is lower the river will flood the road and our aim is to make sure that the water will not stay in the road and will come back to the river when the river goes back.

- Also the issue of the rehabilitation of the railway, damaged by flood has been raised by the community, though is not relevant to the project.

290. A summary of the key issues raised in Ayrum is as follows:

- Road safety in the two curves was highlighted by the Ayrum community leaders and stakeholders. The issue was that vehicles approaching these bends often drive too quickly and misjudge the bend, sometimes crossing the middle of the road and then causing head on crashes. The crash frequence and severity at this location was very high and the consequences are significant. The Consultant advised that road safety improvements will be considered at these locations and they have subsequently been incorporated in design. Measures at this location include crash barriers, shoulder rumble strips, central hatching, signage to improve curve delineation, and solar-powered electric speed detector signs.

VIII. GRIEVANCE REDRESS MECHANISM

291. In order to receive and facilitate the resolution of potential APs concerns, complaints, and grievances with regard to Project implementation, a Grievance Redress Mechanism (GRM) was established. The proposed GRM does not impede access to the Armenia's judicial or administrative remedies. The Contractor will appropriately inform the affected people about the GRM before commencement of civil works.

292. Complaints and grievances received prior to construction and during construction will be addressed through the following steps and actions (Figure 35).

293. The procedural steps of the GRM for the Project are provided below. Note that the processing times refer to the maximum time allowed at each stage. If an issue is not resolved within the processing time it automatically passes to the next stage.

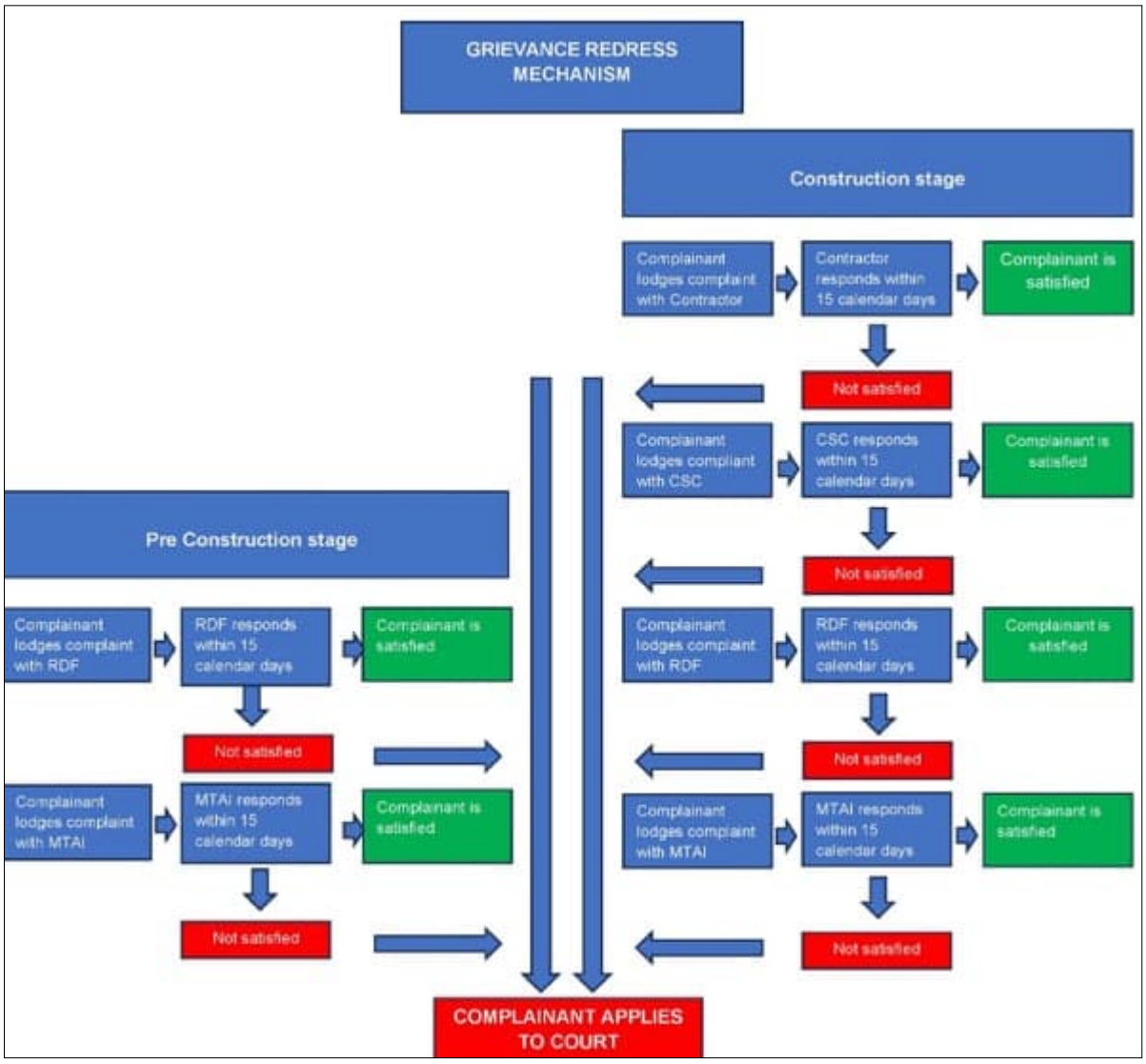


Figure 39: Outline of GRM

A. Pre-construction stage:

294. **Step 1.** The person affected by the Project could raise their suggestions/concerns/complaints first of all to RDF, which receives and resolves/replies to the AP's grievances.

295. If a complainant is not satisfied with the response or RDF responsible staff needs additional capacity to response the complainant's grievance, the Grievance Review Committee (GRC) can be formulated to ensure comprehensive, equitable and transparent discussion of the case. To establish legitimacy of the GRC to review and judge on the substantive merit of the complaint, the composition of the GRC should be balanced and include an independent observer to ensure the impartiality and transparency of the complaint review process. The following composition of the GRC is proposed:

Representative of RDF	Chairperson
Representative Safeguard Team of RDF	Member
Representative of Local Government	Member
Representative of Engineer/Contractor	Member
Representative of AP	Member
Independent party / NGO	Member
Certified Technical Expert	Member

296. To ensure effective complaint processing, the role and responsibilities of each GRG member should be carefully described and explained to them.

297. **Step 2.** If complainant is not satisfied with RDF's decision even after the GRC's review of the grievance, then the complainant can lodge the grievance to the RA MTAI. MTAI follows Public Administration RA law[12] for registration, revision and resolving the case. The MTAI responds to the complaint within 15 calendar days.

B. Construction Stage:

298. **Step 1.** The person affected by the Project could raise their suggestions/complaints firstly through the Project's initiative. In order to maintain transparency and accountability to affected communities and to make information, assistance and grievance resolution services accessible to the APs, RDF will establish the GRM Committee.

i. An AP's application to the Contractor's representative (engineer, social or environmental specialist) on-site and/or register their suggestion /complain into the grievance register book kept by Contractor at the field office established in the construction camp located nearby. The template for recording grievance, content and format of the application shall

[12] https://www.arlis.am/hy/acts/194274/latest

be in accordance with the Employer's EMP.

ii. The Contractor ensures the provision of contact information (field office location, operating hours, names of responsible contact persons, phone numbers, regular mail and email addresses, etc.) via posters and Project information boards.

299. The Contractor should immediately inform the Construction Supervision Consultant (CSC) and RDF if a complainant raises a grievance and should send the copy of written complaint to them. Verbal complaints should be recorded by the Contractor's representative, and the relevant information must be immediately shared with the CSC. The Contractor should implement appropriate mitigation measures to resolve the issue and send the written response/reply to the complainant within 15 calendar days with copies to the CSC and RDF.

300. **Step 2.** Should the complainant not be satisfied with the Contractor's solution to its complaint, further opportunities are available. The complainant may apply to the CSC by raising the complaint within one month after receiving/not receiving a response from the Contractor. The CSC shall respond to complaints within 15 calendar days.

301. **Step 3.** Should the CSC fail to resolve the complaint, the Complainant can apply to RDF, MTAI and ADB ARRM. The complaint in the construction stage at the RDF level will be handled following the same scheme as in the pre-construction stage. All the contact information shall be provided by the Contractor on posters and on the Project information boards. The Contractor shall serve as an entry point during this stage and provide the necessary explanations and assistance in application to the mentioned entities, if needed through the personal contact with the complainant.

302. If not possible, attempts will be made to resolve the issues at the MTAI level to avoid/minimize litigation as much as possible. All complaints regardless of the outcome and solutions will be properly documented and made available for review, monitoring and evaluation purposes. Finally, the AP can always seek attention and interference of the court.

C. ADB's Accountability Mechanism

303. ADB's website[13] presents the Accountability Mechanism (AM) as a forum where people adversely affected by ADB-assisted projects can voice and seek solutions to their problems and report alleged noncompliance of ADB's operational policies and procedures.

304. ADB remains firmly committed to the principle of being accountable for complying with its operational policies and procedures and solving problems of project-affected people and ensures high standards of accountability, transparency, openness, and public participation. The AM policy of 2012 which, as presented on ADB's website (http://www.adb.org/documents/accountability-mechanism-policy-2012), is designed to:

i. enhance ADB's development effectiveness and project quality;
ii. be responsive to the concerns of project-affected people and fair to all stakeholders;
iii. reflect the highest professional and technical standards in its staffing and operations;
iv. be as independent and transparent as possible; and

[13] https://www.adb.org/who-we-are/accountability-mechanism

v. be cost-effective, efficient, and complementary to the other supervision, audit, quality control, and evaluation systems at ADB.

305. The ADB AM executes the tasks via the problem-solving function which assists people who are directly, materially, and adversely affected by ADB-assisted projects to find solutions to their problems. Contractor shall inform the APs on the ADB AM as an alternative opportunity for solving of problems.

EMP Implementation Responsibilities

The EMP specifies the roles and responsibilities of key project stakeholders in overall environmental management:

- Executing Agency: The -Ministry of Territorial Administration and Infrastructure of the RA------ will be the executing agency (EA) for the project and will oversee overall project implementation and management activities to ensure smooth and timely implementation and completion of subproject activities. The EA has overall responsibility for the project and therefore is ultimately responsible for ensuring the implementation of the mitigation in the EMP and for ensuring compliance with loan covenants. The EA will guide and coordinate closely with other government agencies and the ADB for timely resolution of any issues.

  Project Implementing Unit: On behalf of the EA, the RDF will assume day-to-day management of the project and will be responsible for coordinating and implementing project activities, including procurement, recruitment, disbursement, contract administration, monitoring and reporting. The RDF will be headed by Project Manager and will comprise full-time core staff, including full time and qualified national Environmental Safeguards Specialist. The ES will be mobilized throughout the project implementation period and report to Project Manager who bears the responsibility on environmental safeguards.
- The following provides a term of reference for the Environment specialist
  (i) Scope of Services:
  - Ensure inclusion of Environmental Management Plan (EMP) in bid and contract documents;
  - Review and clear contractor's Site-Specific EMPs (SEMPs);
  - Ensure that the SEMPs contain health and safety management plan following international good practice and relevant national/local requirements;
  - Carry out public consultation during project implementation;
  - Supervise contractors and construction supervision consultant in implementation of the EMP, for overall compliance with ADB Safeguard Policy Statement (2009) requirements and project environment-related legal covenants.
  - Conduct environmental monitoring, routine site visits and ensure that the day-to-day construction activities are carried out following the EMP and SEMPs and in an environmentally sound and sustainable manner;
  - Ensure corrective actions are implemented when necessary;
  - Prepare environmental monitoring reports (EMRs) (semi-annual during construction and annual during operation) and submit to ADB for disclosure,
  - Disclose relevant information from environmental safeguards documents (including EMRs) to affected persons in the local language;
  - Report in a timely manner to ADB of any non-compliance or breach of ADB safeguard requirements.
  - Update the project's Initial Environmental Examination (IEE) in case of unanticipated impacts.
  - Make sure that the grievance redress mechanism (GRM) is operational to effectively handle environmental and social concerns of project affected persons.

Qualification: The environmental specialist should have at least a bachelor's degree in environmental sciences or equivalent, with at least 5 years' working experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures during implementation of projects including foreign aided road project.

- Design Institute: A design institute will be hired to prepare detail design of the subproject, incorporating IEE / EMP and acquiring State Expertise clearance for design documentation package.

- Construction Supervision Consultants (CSC): Supervision Consultants will be mobilized and located at project sites, and thus, will have immediate and direct supervision over daily EMP /SEMPs implementation, monitoring and reporting through the Contractors SEMP and related aspects of the project. The CSC will also be responsible for reviewing and approving the monthly reports prepared by the Contractor, to ensure that it contains all of the required reporting elements, such as instrumental monitoring results. CSC will prepare regular monthly and semi-annual Environmental Monitoring Reports.
  CSC will also be responsible for regular review and attendance of the Contractor's environmental, health and safety training. The CSC should retain the use of Environmental Specialist, both national (NES) and international (IES), to ensure that the Contractor is compliant with his environmental obligations. Terms of reference for both specialists is provided below.

- CSC International Environmental Specialist: Scope of services include:
  - Assist RDF in managing and implementing the project and ensuring compliance with the project implementation plan, the loan agreement, and the project agreement(s), particularly with ADB SPS (2009) requirements, and the IEE, the EMP of the project.
  - Review the IEE including the EMP to understand the project's environmental safeguards requirement, and assist RDF in updating the IEE in case of unanticipated impacts;
  - Conduct trainings, workshops, and other knowledge sharing sessions on lessons and good practices on safeguards, health and safety, etc. to RDF staff (including the environmental specialist) and contractor's staff (especially the contractor's environmental officer, the contractor's health and safety officer), and build capacity of relevant staff to undertake their tasks in EMP implementation and monitoring. One of the trainings should be conducted prior to the start of construction to develop the knowledge and understanding of the environmental, health and safety aspects of the project;
  - Assist RDF in reviewing the SEMPs prepared by contractor(s) and provide clearance;
  - Ensure that the contractors (and its subcontractors, if any) comply with the relevant measures and requirements set forth in the IEE, the EMP, and any corrective or preventative actions set out in periodic EMRs;
  - Assist RDF in supervising and monitoring the EMP /SEMPs implementation and in preparation of periodic EMRs for further submission to ADB;
  - Support RDF in resolving project-related complaints/grievances;
  - Assist RDF in organizing and conducting consultations and awareness-raising activities;
  - Contribute inputs to the Engineer's monthly compliance reports, highlighting potential and actual issues and/or problems related to the EMP/SEMPs and recommending corrective measures for RDF's actions;
  - Upon completion of the civil works, prepare a report on the project's environmental compliance performance; including lessons learned that may help RDF in their environmental monitoring of future projects. This report will be part of the input to the overall Project Completion Report.

IES Qualification:

- Master's degrees in environmental science or equivalent.
- Preferably fifteen years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental

mitigation measures and health and safety plans during implementation of projects including road projects funded by developing partners, including twelve years' international experience.
- Working knowledge of Armenia is preferred.

Time Period: The IES shall be engaged on a part-time basis for a period of 2.5 months spread over the duration of the construction period (one month per year). The specific on-site inputs will be determined by the CSC and the RDF.

The CSC shall also retain a national environmental specialist and health and safety specialist for the duration of the Contract. The specialist will be responsible for the day-to-day monitoring of health and safety aspects of the Contractors works as well as keeping a log of safety statistics.

- CSC National Environmental Specialist (NES): Scope of services include:
  - (i) review all documents and reports regarding the integration of environmental including contractor's environmental action plan,
  - (ii) supervise the contractors' compliance to EMP,
  - (iii) prepare monthly compliance reports,
  - (iv) supporting of BAP and BMMP implementation.

NES Qualification:

- Degree in environmental sciences or equivalent.
- Preferably five years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures during implementation of projects including highway projects funded by developing partners.

Time Period – The NES shall be employed permanently over the duration of the construction period and part -time during DLP.

Contractor:

306. **Contractor Environmental, Cultural heritage and Health and Safety Staff.** The Contractor shall appoint a dedicated full time Health and Safety Officer (HSO), Environmental Officer (EO) and Deputy Environmental Officer (DEO) responsible for undertaking health, safety and environmental management tasks as set out in the Contract and lead the monitoring team, as well as part time cultural heritage expert. The Environmental team will report directly to the Project Manager.

During construction the Contractor must retain the expertise of an Environmental Officer (EO) to implement and continually update the SEMP and to oversee and report on the operation throughout the contract period. The EO should be full-time member of staff on the Contractors roster and should be on site at least five days per week.

The required qualifications of the EO are as follows:

- Degree in environmental sciences and related expertise.
- Fluent in Armenian.
- Experience of at least one construction project of a similar size and scale.

307. The responsibilities of the EO will include:

- Ensuring the contractor implements the environmental protection and management specifications set out in the Contract, EMP and the SEMP;
- undertaking day-to-day environmental management tasks as required for the Project and weekly environmental audits;
- maintaining a daily Site Diary recording all relevant matters concerning environmental management on the Site including protections and controls, audits, inspections, and related incidents. Making the Site Diary available for inspection by the Engineer upon request;
- participating in joint inspections to be undertaken by RDF, ADB and other environmental missions;
- preparing and submitting the reports as required by the Contract, EMP and the SEMP;
- preparing of weekly environmental checklists and an environmental section of the Contractor's monthly progress reports that shall be submitted to the CSC for review.
- conducting EHS orientation/specialized trainings/instructions for the Contractor's and sub-contractor's staff on the topics detailed in Training Programme (Plan);
- implementing the environmental mitigation measures and their related monitoring activities on a daily basis;
- monitoring baseline data surveys as required in the Technical Specifications and the EMP;
- ensuring condition surveys of existing buildings close to the works are prepared and signed-off;
- carries on site visits and inspections on a weekly basis, and documents monitoring activities and results in a weekly environmental report;
- in case of inadequate monitoring results, identifying the necessary corrective actions through a Corrective Action Plan as soon as possible;
- preparing monthly environmental report as part of Contractor's monthly progress report;
- carrying out regular visits (at least 2 visits) during the defects liability period and providing a site status report.

308. The DEO will support the EO in his daily duties and assume the EO responsibilities when the EO is not on site or otherwise engaged.

309. The responsibilities of the Cultural Heritage Expert will include:

- Review and support preparation of the Cultural Heritage Management Plan (CHMP), including site-specific protection measures, no-excavation buffer zones, vibration and

dust control requirements, and the chance-find procedure in compliance with national legislation and international good practice.

- Conduct regular site inspections and monitor construction activities near cultural heritage assets to ensure compliance with the CHMP, protection fencing requirements, buffer zones, and restrictions on machinery movement and excavation activities.
- Deliver cultural heritage awareness and chance-find training to construction personnel, including identification of archaeological materials, reporting obligations, and procedures for protecting newly discovered heritage resources.
- Coordinate with relevant national authorities and institutions, including the Ministry of Education, Science, Culture and Sport, the Institute of Archaeology and Ethnography (NAS RA), and UNESCO-related focal points, as required for works near protected or newly discovered heritage assets.
- Supervise and document chance-find incidents, provide technical guidance on required protection measures, and ensure that works are suspended and resumed only in accordance with the approved clearance procedures and CSC instructions.

310. The Contractor shall also hire qualified Health and Safety Specialists for the Project duration. The H&S specialists shall have at least five years on-site experience of similar sized infrastructure Projects.

311. The responsibilities of the HSO will include:

- Ensuring the contractor implements the health and safety objectives and legal requirements to provide a safe construction environment and assure a safe place of work;
- ensuring the Contractor complies with its Health and Safety Plan, as well as applicable guidelines (as identified in para. 257);
- undertaking day-to-day health and safety management tasks as required for the Project and weekly/ regular safety audits;
- undertake workforce and stakeholder engagement meetings and incident investigations where required;
- contributing to the daily Site Diary recording all relevant matters concerning health and safety management on the site including protection and controls, audits, inspections, and related incidents;
- participating in joint inspections to be undertaken by RDF, ADB and other EHS missions;
- conducting HS orientation/specialized trainings/instructions for the Contractor’s and sub-contractor's staff;
- ensuring the traffic management plan is implemented safely, both for workers and the

community;

- carries on site's visits and inspections on a weekly basis, and documents monitoring activities and results in a weekly safety report.
- in case of inadequate performance, identifying the necessary corrective actions through a Corrective Action Plan as soon as possible;
- halt work immediately in the event of inadequate performance and significant risk to personnel life and wellbeing, ensuring that work resumes only once the situation is corrected and safety is fully ensured;
- in cases of accidents/incidents notifying the CSC immediately: The initial notification might be verbal, but must be followed by a written report within 24 hours after the incident or accident occurred using the Incident Notification Form in accordance with the template provided in **Appendix K**;
- in cases of accidents/incidents, subsequent comprehensive reporting outlining the root cause analysis and future preventive measures must be submitted within 21 working days using the Incident Root Cause Investigation and Corrective Action Form in accordance with the templates provided in Appendix K;
- coordinating and reporting to the CSC, including a report on all accidents/ incidents and the near misses immediately according to the format attached in Appendix K;
- contribution monthly health and safety report as part of Contractor's monthly progress report;
- carrying out regular visits (at least 2 visits) during the defects liability period and providing a site status report.

312. In order to introduce reasoned analysis of incidents identified on-site it is proposed that their levels of incident reporting are available:

- Observation: No discernible environmental impact on the site.
- Opportunity for Improvement: Minor impact that is reversible with minor intervention.
- Non-conformity: Major incident requiring significant resources to rectify.

313. In carrying out site inspections the EO and HSO will record any environmental and health and safety incidents, under three levels of severity:

Non-Compliance		What it means on site	Reported by?	On-site reporting as:
Level I	A non-compliance situation not consistent with the requirements of the EMP, but not believed to represent an immediate or severe social or environmental	An unplanned and undesirable event is observed where there was no damage to the environment but there could have been. Health and safety non-conformity	Everyone on site. HSO for health and safety issues Responsibility of the	"**Observation**"

	risk. Health and safety risks to personnel health and wellbeing. Repeated Level I concerns may become Level II concerns if left unattended.	or non-compliance.	Environmental Officer to educate the workforce	
Level II	A non-compliance situation that has not yet resulted in clearly defined damage or irreversible impact, but which potential significance requires expeditious corrective action and site specific attention to prevent severe effects. Health and safety risks to personnel health and wellbeing. Repeated Level II concerns may become Level III concerns if left unattended.	An unplanned and undesirable event is observed where there was no damage to the environment but there could have been. Health and safety near miss.	The teams responsible for carrying out the regular site audits. HSO for health and safety issues Includes CSC's environmental officer, Contractor's Environmental Officer, etc.	"**Opportunity for Improvement**"
Level III	A critical non-compliance situation, typically including observed significant social or environmental damage or a reasonable expectation of very severe impending damage. Health and safety risks to personnel health and wellbeing. Intentional disregard of specific prohibitions is also classed as a Level III concern.	Where a situation exists, or with potential to create a situation, where there is damage to the environment. Health and safety near incident.	The teams responsible for carrying out the regular site audits. Includes CSC's environmental officer and HSO, Contractor's Environmental Officer and HSO, etc.	"**Non-conformity**"

Table 23: Reporting environmental and health and safety incidents on site – three levels of incident

IX. ENVIRONMENTAL MANAGEMENT PLAN

314. The EMP should be implemented in three stages: (i) before construction, (ii) during construction, and (iii) during operation and maintenance. The EMP is a dynamic document and will be updated and adjusted in line with ongoing data collection, contractors' performance and monitoring results. The Implementing Agency will be responsible for introducing modifications to the EMP and include them in the report which will be submitted to ADB twice a year.

315. The tables at the end of this section present an Environmental Management Plan (EMP) that identifies feasible and cost-effective measures to be taken to reduce potentially significant adverse impacts to acceptable levels. The tables reflect the various stages of the project cycle: pre-design, design, rehabilitation, operations, and maintenance. The last set of tables describe environmental monitoring activities at the pre-design, construction, and operations stages.

316. This EMP is site-specific and is focused on the rehabilitation and upgrading of the Project area. The Contractor will be responsible for preparing more comprehensive EMPs based on this EMP to match the Contractor's working methods. These documents will be called Site Specific Environmental Management Plans (SEMP).

317. 28 days before construction activities commence, the Contractor will prepare and submit proposals and method statements consistent with the EMP to the CSC who will in turn submit to RDF (as the Implementing Agency) for review and approval.

318. The indicative costs associated with the EMP are summarised as follows:

Description	**Unit**	**Quantity**	**Unit Rate (AMD)**	**Amount (AMD)**
Tree planting	Nos.	3500	20,000	70,000,000
Contractor's EO	Months	30	4,000,000	120,000,000
Contractor's DEO	Months	30	3,500,000	105,000,000
Contractor's HSO	Months	30	4,000,000	120,000,000
PPE (new items plus repair / replacement)	No. sets	30	230,000	6,900,000
Dust control	Months			Included in Contractor's costs
Acoustic screening	Nos.			
Condition surveys for buildings / structures	Nos.			
Protection of water sources against pollution around construction sites	Months			
Worker healthcare and welfare facilities on-site as part of the OHS Plan	Months			
Periodic safety training for workforce	Months			
Temporary traffic management	Months			
Implementation of waste separation and recycling on site	Months			
Reinstatement and landscaping of sites	Lump sum			
Total				**AMD 421,900,000**

Table 24: Summary of indicative cost estimates for environmental mitigation measures

Contractor			
	Quantity	**Unit Rate (AMD)**	**Amount (AMD)**
Pre-Construction			
Ambient air quality monitoring (locations as baseline survey, once)	15	30,000	450,000
Surface water quality monitoring (locations as baseline survey, once)	13	150,000	1,950,000
Soil quality monitoring (locations as baseline survey, once)	16	22,000	352,000
Noise monitoring (locations as baseline survey, once)	15	13,000	195,000
Construction			
Ambient air quality monitoring (every 2 weeks for active construction sites, assume, 3 active sites at once = 3 x 2 x 30)	180	30,000	5,400,000
Surface water quality monitoring	180	150,000	27,000,000
Soil quality monitoring (every 2 months)	45	22,000	990,000
Noise monitoring (irregular for sensitive receptors)	50	13,000	650,000
Vibration monitoring (irregular for specific buildings)	50	55,000	2,750,000
Post-Construction			
Ambient air quality monitoring (locations as baseline survey, twice)	30	30,000	900,000
Surface water quality monitoring (locations as baseline survey, twice)	26	150,000	3,900,000
Soil quality monitoring (locations as baseline survey, twice)	32	22,000	704,000
Noise monitoring (locations as baseline survey, twice)	30	13,000	390,000
Total			**AMD 45,631,000**
Construction Supervision Consultants (CSC)			
	Months	**Unit Rate (AMD)**	**Amount (AMD)**
National Environmental Specialist (NES)	30	3,000,000	90,000,000
International EHS Specialist (IES)	2.5	5,500,000	13,750,000
National Social Specialist	30	3,000,000	90,000,000
National Health and Safety Specialist	30	3,000,000	90,000,000
Herpetologist (provisional)	3 (call offs)	700,000	2,100,000
Total			**AMD 285,850,000**
RDF			
	Months	**Unit Rate (AMD)**	**Amount (AMD)**
Safeguards Specialist	30	2,000,000	60,000,000
Health and Safety Specialist	30	2,000,000	60,000,000
Monitoring the success of re-vegetation and tree health	2 (visits)	900,000	1,800,000
Total			**AMD 121,800,000**

Table 25: Summary of indicative cost estimates for environmental monitoring

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
DESIGN PHASE				
Identification of cultural heritage issues	Negative impact on special protected historical/ cultural areas and monuments	The designer will identify potential historical / cultural sites that could be affected by onsite or offsite construction activity. The Contractor will locate optional construction sites/activities away from them. Ensure construction personnel are aware of locations of historical / cultural areas and avoid them. If the proposed construction passes close to historical / cultural areas, the contractor will employ temporary fences to restrict machines and activities from encroaching in the area. Photographic records of the condition of the item/ area will be taken before the start of construction and the historical / cultural areas and artifacts will be inspected every 6 months and a short condition assessment reported to the client.	Designer will identify areas to be protected. Contractor will ensure that on site mitigation measures are employed.	None
Incorporation of environmental issues in design	Design does not adequately address environmental issues	Ensure that all designers and contractors are fully aware of the environmental need and requirements through good, clear structured communication and project documentation. Design provides proper well engineered solutions for environmental protection. Specific to this project this includes: - Appropriate drainage solutions - Rehabilitation of drainage structures - Utilise existing infrastructure to the greatest extent possible - Minimise surface impacts - Constrain development to areas already impacted	Designer	None
Design of drainage solutions	Erosion of earthworks, watercourses and slopes	Site drainage structures are designed avoid a cascade effect and to ensure that runoff is conveyed into natural drainage lines with controlled velocities. - The receiving areas are designed and lined with stones or concrete to protect soils at outflow areas. - Incorporate sufficient number of drainage outlets so that flow from any individual outlet is not excessive	Designer to design and Contractor to implement	None
Identification of cultural heritage assets	Direct or indirect impact on designated or documented heritage assets within or adjacent to the works footprint, including a UNESCO-inscribed property.	The Designer shall finalise the inventory of heritage assets within 100 m of the works footprint based on Appendix I. Sixteen assets are identified; three are on or against the works footprint: • Sanahin bridge (~km 57) — State List Lori 5.2.23; part of UNESCO World Heritage serial property C 777. • Igahat medieval village and 13th–14th c. wine press (~km 37). • Bagratashen-1 / -3 Middle Palaeolithic and Medieval village sites (~km 85). The fixed existing alignment shall be retained. No works shall be designed within the recorded footprint of any heritage asset. Bid documents shall incorporate the inventory and the requirement for a Cultural Heritage Management Plan (CHMP) as a sub-plan of the CEMP.	Designer Client (RDF) to include in bid documents	None
PRE-CONSTRUCTION PHASE (Mobilisation stage)				
Procurement	Environmental requirements are not communicated or fully addressed in bid documents or construction documents	EMP to be included as an integral part of the bid documents. The bidding documents shall have an Environment Protection section and include this EMP so that the bidder is aware of the environmental requirements for the Project. The bidding documents will also include the baseline survey data and a requirement to measure and report ongoing results against the baseline data/ data locations during the work and identify threshold values. SEMP will be prepared by Contractor 28 days before construction activities with the content identified in Appendix L of this IEE. This will be reviewed by the Client and/or CSC (depending on timing of engagement).	Client will manage the bidding process and documentation	None
Procurement	Contractor not capable of managing environmental issues.	Qualification criteria require bidders to demonstrate competence in managing environmental issues. Bidders (and subsequently the Contractor) required to included dedicated staff and resources for managing environmental issues. Bidders required to outline their approach to managing environmental issues in their proposals.	Client will manage the bidding process and documentation	None

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Obtaining permits	Permits not in place or fully discharged	Ensure that all permits are identified, and the Client and Contractor shall obtain permits for which they are respectively responsible.	Client Contractor	None
Contractor's methodologies for safe and environmentally friendly working methods	Contractor's methodologies are unsafe, inappropriate for the nature of the works, do not consider known environmental issues, or create new environmental problems	Client to set out its requirements for the Contractor's methodologies in bidding documents. Client and/or CSC (depending on timing of engagement) to thoroughly review methodologies and require Contractor to make improvements where necessary. CSC to ensure that Contractor is implementing its approved methodologies during construction.	Contractor to prepare its methodologies Client and/or CSC to review	None
Establishing environmental baseline	Baseline (pre-construction) environmental conditions are not captured	Contractor to carry out pre-construction environmental monitoring in compliance with the Environmental Monitoring Plan. Client and/or CSC (depending on timing of engagement) to review intended locations for monitoring, the Contractor's methods and equipment, and the results.	Contractor Client and/or CSC to review	See EMoP
Biodiversity induction and pre-works surveys	Workers unaware of species of conservation concern; breeding raptors, otter or rock lizards disturbed by works starting without prior check.	Worker induction (every worker, before site access): • Identification of the five species of conservation concern (Egyptian Vulture, Armenian Steppe Viper, Eurasian Otter, rock lizards / Darevskia spp., Caucasian Grouse) with reference photographs. • Find-and-report procedure: record, photograph, notify the EO within the working day. • No hunting, trapping or collection of wildlife; no buying of wildlife from local people. Violation is grounds for dismissal. • No deliberate killing of snakes. Snakes in active work areas relocated using the snake-handling equipment kept on site (cross-reference to existing EMP "Protection from poisonous reptiles" row). • Training register maintained on site; audited monthly by the CSC. Pre-works raptor nest check (each reach, before works start): • Carried out by the EO within the month before works start in that reach, and no later than 1 March if works begin during the March–August breeding season. • Binocular observation of cliffs, outcrops and buildings within 500 m of the work location, from the road or other safe vantage. Repeated on three separate days. • Looks for: occupied nests, adult raptors carrying food, whitewash (droppings) on cliff faces. • Recorded on a one-page form with photographs, countersigned by CSC before works start. Pre-works otter riverbank walkover (each reach with in-river or riverbank works, within 14 days before works start): • EO walks both banks for the full length of the affected reach plus 200 m upstream and downstream, looking for spraints, tracks, feeding remains, and holts. • Recorded on a one-page form with photographs and coordinates of any signs, countersigned by CSC before in-river works start.	Contractor (EO to deliver induction and carry out pre-works surveys) CSC to audit induction register monthly; countersign pre-works survey forms	Included in Contractor's preliminaries (pre-works surveys are a routine walkover, no specialist engagement required)
Siting of Contractor's site installations	Inappropriate location of contractor' camp and other site installations	Contractor shall position all its intended installations within the project area to the greatest possible extent on surfaces already impacted. Contractor shall demarcate the limits of its site installation area and install fencing. Client and/or CSC (depending on timing of engagement) to review site installation planning and ensure that the Contractor complies with its approved plans. Site installations directly at the river shall be avoided.	Contractor Client and/or CSC to review	None
Siting of construction waste and muck disposal areas	Improper disposal of contaminated materials and other waste	In advance of construction the locations for disposal of construction waste and muck (i.e., uncontaminated soil and rock excavated from the road) shall be agreed upon with the local authorities. The areas shall be sited away from surface water bodies (at least 50 m). The areas shall be demarcated / fenced by the Contractor, access established and signs posted to secure the areas for use.	Client Contractor	None (included in the Contractor's construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	generated by the Project			
Sources of construction materials	Procurement of materials from illegal sources	Contractor to prepare and implement a resource management plan which identifies the sources of all materials for the Project and quantities from each source. Client and/or CSC (depending on timing of engagement) to review Contractor's submission. Maximise reuse of materials to minimise use of new resources. Ensure that construction materials will only be obtained from sources that have the required government environmental approvals. Secure and submit to the Client and CSC proof that quarries and other facilities such as batching plants possess all necessary environmental permits.	Contractor Client and/or CSC to review	None
Tree retention	Trees unnecessarily cut down by Contractor	No trees shall be cut unnecessarily Identify and label all trees on the project site to be removed and obtain necessary permission for their removal. Every tree removed shall be replanted with a compensation factor of at least 1:10 Tree planting shall only be carried out in collaboration with the Hayantar SNCO	Contractor	AMD 20,000 per tree including planting 350 trees estimated, therefore 3500 to be planted giving a total cost of AMD 70,000,000
Public consultation and engagement	Lack of information and understanding by stakeholders and affected parties about the Project may lead to frustration and complaints, which in turn could result in delays for the Project.	1. Organize the discussion meetings with key stakeholders and the public consultation/ hearing events on the Project 2. Present the GRM which shall be established for the Project in accordance with the mechanism described in the Section I. GRM. 3. Place the information on the project and the final IEE/EMP at the RDF and ADB websites	Client	None
Preparation of Cultural Heritage Management Plan (CHMP)	CHMP not prepared or approved; protective measures not in place before works start.	The Contractor shall prepare a CHMP as a sub-plan of the CEMP not less than 28 days before mobilisation. The CHMP shall set out: • Inventory of heritage assets within 100 m of each works section. • Protective fencing and buffer measures at each asset. • Site-specific measures for Sanahin, Igahat and Bagratashen, including working-corridor limits and no-excavation buffers. • Chance-find procedure. • Cultural-heritage awareness content for the worker induction. The CHMP shall be reviewed and approved by the CSC before any works begin within 100 m of an asset.	Contractor to prepare CSC to approve	Included in Contractor's preliminaries
Pre-construction photographic baseline	No comparator for later condition checks; deterioration during construction cannot be attributed or detected.	Before mobilisation, the Contractor's Environment Officer (EO) shall take a photographic record of every heritage asset within 100 m of the works, using dated photographs from fixed viewpoints with a scale bar, together with a one-page written note on visible condition (cracks, surface, immediate setting). The record shall be submitted to the Engineer and shall serve as the baseline for quarterly condition checks during construction.	Contractor (EO) CSC to accept	Included in Contractor's costs
CONSTRUCTION PHASE				

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
1. Environmental and Health & Safety Orientation Plan				
Mobilisation and induction of workforce	Workers not able to understand environmental and health and safety risks arising from the works.	Workers shall be provided with appropriate equipment to protect the environment and assure their own health and safety, such as spill kits and personal protective equipment (PPE) such as safety shoes, hard hats, safety glasses, ear plugs, gloves, etc. The contractor shall provide a full induction to workers on camp rules, environmental and health and safety issues related to their activities as well as on the proper use of PPE and equipment. Training shall also be provided on biodiversity aspects and cultural heritage. The Contractor will establish a rolling programme of health and safety briefings and behavioural safety workshops.	Contractor	PPE cost – see heading 2. Occupational Health, and Safety Plan
Mobilisation of workforce	Negative impact on the health and social wellbeing of local population due to the introduction of workforce from other places.	Conduct special briefing or on-site training on environmental, and health requirements of the project workers. Strictly supervise workers not to interfere with local affairs or quarrel with local people. Code of conduct to be prepared by contractor and disseminated to workers, In case of complaints from local people on the issues caused by workers, complaints will be solved as soon as possible with collaboration of the CSC's social specialist, per the project GRM.	Contractor	None (included in the Contractor's construction costs)
Site establishment	Public health and safety risks	Due to the location of the site on a trafficked road the Contractor shall prepare a Traffic Management Plan including schemes for lane closure and managing the passing of traffic is required. This shall ensure safety for the public, in particular for road users especially vulnerable road users such as pedestrians and cyclists.. Enforced speed restrictions and traffic light use and deployment of flagpersons shall be considered.	Contractor	None (included in the Contractor's construction costs)
Demolition works	Demolition works hold significant health and safety risks which must be planned managed and mitigated.	The Contractor must undertake necessary additional structural assessments and plan the temporary works and demolition works in writing prior to briefing the workforce of the plan and residual risks. The plan shall include construction sequences and monitoring systems. The contractor must remain vigilant throughout the works for latent defects and hazards that may be encountered during the demolition. The CSC shall be responsible for reviewing the Contractor's plan, monitoring the Contractor's compliance with its plan and stopping any unsafe work.	Contractor CSC for review and monitoring	None (included in the Contractor's construction costs)
Maintenance, and refuelling of vehicles Storage of materials hazardous to health	Risks to the environment resulting from the use of site plant and machinery and the need to store diesel on site.	The Contractor will ensure that its Health and Safety Management Plan includes details of the vehicle maintenance and procedures, which comply with the following requirements: ✓ Carry out maintenance and refuelling only in designated, bunded and impermeable areas. ✓ Use drip trays and absorbents during all maintenance works. ✓ Inspect equipment and vehicles regularly for leaks, worn parts, and defects. ✓ Immediately repair any oil or hydraulic leaks. ✓ Store used oil, filters, and spare parts in sealed, labelled containers. ✓ Dispose of maintenance waste through licensed contractors. ✓ Keep spill kits available and train staff in their use. Chemicals that are hazardous to health will be stored in a dedicated and protected store which reflects the manufactures safe storage requirements and appropriate firefighting, and emergency arrangements will be developed. Staff must ensure that chemicals and chemical products are not disposed of in a way that could adversely affect the environment. The CSC shall be responsible for reviewing the Contractor's plan, monitoring the Contractor's compliance with its plan	Contractor CSC for review and monitoring	None (included in the Contractor's construction costs)
2. Occupational Health, and Safety Plan				
Health and safety planning / responsibilities	Contractor needs to take responsibility for occupational health and safety	The Contractor shall nominate an Environment Officer (EO), Deputy Environment Officer (DEO) and a Health and Safety Officer (HSO) who shall develop, implement and supervise a Health and Safety Management Plan (HSMP), as well as ensure that the requirements of the EMP are implemented.	Contractor	Assuming a 30-month deployment of an EO, DEO and HSO, at a tentative rate of AMD 4,000,000 / AMD 3,500,000

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
				(DEO) per month, the total cost would be AMD 345 million.
Health and safety planning / responsibilities	Lack of information on applicable health and safety regulations for the Project may lead to sickness, injury or death or workers, as well as Project affected persons, and other people near the site caused by exposure to substances, slips, trips, falls and falling objects.	The Contractor shall prepare its Health and Safety Management Plan with the following minimum content: a) HEALTH & SAFETY ORIENTATION PROGRAM 1. Ensure all the staff is undergone Occupational Health & Safety orientation trainings on the OHS-related topics, particularly for demolition and underground works. 2. Responsible officers for Health & Safety are appointed for every working section their contacts are placed in visible places. 3. Regular job-specific instructions on safe working of the whole staff as per Armenian legislation, ITA and WBG guidelines and prior starting the new work, as well as newly hired workers prior starting the job are implemented. The register is maintained and is available for inspection. b) PERSONAL PROTECTIVE EQUIPMENT 1. Provide the staff and ensure everybody on-site is wearing the uniform and PPE appropriate for the type of work being undertaken. 2. Health and safety accidents/ incidents to be recorded and reported to the CSC, PIU and the relevant authorities when needed. 3. Toolbox talks to be provided to reinforce the importance of use. 4. The Contractor must ensure that people are visible to moving vehicles and appropriate PPE must be provided. c) TOOLS & AUXILIARY FACILITIES 1. Provide safety tools and establish intrinsically safe auxiliary facilities (e.g. ventilation, electrical supplies etc). 2. Exclude unsafe working practices and unsafe tools at the construction site. Work and working practices are to be assessed at each workface. 3. All the excavated tranches, pits, manholes, all dangerous and risky areas, etc., are fenced-off, covered and protected during and by the end of the working day. Any underground excavations are never left unsecured and unsupported. 4. Exclude unsafe working practices and unsafe tools from the construction-site. 5. Fire-fighting system (including appropriate types of fire-extinguishers) is established and available, and easily accessible in all operating machinery, field camps and in all sections of the construction site. d) WORKPLACE HEALTH CARE 1. Regular medical check-ups of worker’s and other personnel’s health by the medical professional and records available on-site for inspection (if permitted in compliance with data protection laws). 2. First aid kits are available and easily accessible in all operating machinery and in all sections of the construction site. 3. Provide the Contractor’s Personnel, with sufficient health education materials, condoms, regular STI/HIV testing, and for necessary cases, STI treatments and AIDS treatments, all free of charge. 4. Develop an Infectious Diseases (such as Covid-19) Health & Safety Plan. Ensure availability of Infectious Diseases (such as Covid-19) control means, tools and facilities at all the working areas. e) PUBLIC SAFETY MEASURES 1. Take all reasonable precautions (protective, signal and temporary fencing, guard points, prohibiting posters, etc.) to isolate the working area and prevent unauthorized entry to the construction site. 2. Visibly install the signs/ posters informing on the ongoing works and warning of the dangers. 3. Provide a bypass route for the local residents and other people to ensure they don’t enter the working area. Install the signs indicating the bypass route where needed. 4. Register any local persons who unavoidably must access the site to reach their land, and provide them with access passes and health and safety orientation.	Contractor for preparation and implementation CSC for review and monitoring	Preparation of Plan included in the Contractor’s costs. Cost of 30 sets of PPE estimated at AMD 230,000 per set = AMD 6.9 million total

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		6. Keep the pathways used by people/visitors clean and exclude the surface became sloppy from muck from construction sites. f) PROTECTION FROM POISONOUS REPTILES 1. Correct use of PPE: work with high boots and protective gloves. 2. As much as possible keep safe distance from any kind of snakes and other reptiles. 3. Hold toolbox talks and awareness training including first aid protocols will be communicated to the workforce. 3. Involve a reptile specialist (herpetologist) at the beginning of the works, who will train the staff how to recognize them and will capture the individuals of the reptiles found in the working area and release them in a safe place favourable for inhabiting of those animals. 4. Consider travel times and liaise with local hospitals on their capability. Arrange with the hospitals to have anti-snake serum or other medicines ready for used in case of poisonous snake bites. 5. Have designated vehicle available on site to enable a victim to be taken to the nearest capable hospital as soon as possible.		
Construction works and traffic management	Health and safety risks arising from construction works together with traffic on and off site. This is of particular importance close to a trafficked road and river.	The Contractor will install traffic management systems (e.g., traffic lights, cones, barriers, netting, lane closure etc) to delineate the work zone, regulate traffic close to sites. Workers shall be provided with appropriate personal protective equipment (PPE) such as safety shoes, hard hats, safety glasses, ear plugs, gloves, etc. The Contractor shall use the appropriate trainings, inductions and instructions to ensure workers are aware of health and safety issues related to their activities as well as on the proper use of PPE. Workers shall be provided with potable water supply and sunscreen. Workers will be supplied with reflective clothing or reflective devices as part of PPE to ensure they are visible to moving vehicles. Vehicles will have reversing cameras and a banksman will be in attendance with each machine.	Contractor	None (included in the Contractor's construction costs)
Construction works and traffic management	Transportation and control of dust, there is a risk that in the summer and dryer months that air born dust can become a significant issue	Existing tracks/roads are to be used for hauling of materials. Dust suppression by water tankers with sprinkling systems are to be deployed along the haul routes. The vehicles deployed for material transportation will be spill proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any. Precaution will be taken to avoid inconvenience to the local community due to movement of materials. Dry materials stored on site and dry materials being transported shall be covered by tarpaulins to prevent dust blow. Drivers to be educated on using appropriate speed limits when transporting material.	Contractor	None (included in the Contractor's construction costs)
3. Public Consultation and Communications Plan				
Public consultation and engagement	Social or community concerns are not captured or fully understood / addressed.	The Contractor will develop a stakeholder and community engagement plan and undertake regular public consultations in accordance with its plan. The Contractor will advise the local community of project plans in advance of construction and capture their issue and concerns and where possible mitigate these issues as necessary.	Contractor	None (included in the Contractor's construction costs)
Mobilisation of workforce	Impacts on local wildlife by workforce	Carry out training and awareness training campaigns on wildlife value, for workers. Any worker found hunting, or buying wildlife from local people, will be dismissed from the job. Supply workers with sufficient food.	Contractor	None (included in the Contractor's construction costs)
Damage to third party property	Ensure that damage to personal community property is minimised and adequately addressed in terms of	Ensure works are restricted to the site, and to the right-of way of the existing road for off-site activities. Ensure projected impacts and proposed measures have been discussed in advance with the affected community. Contactor to work with local government officers and non-governmental organizations. In particular for work close to buildings which may be susceptible to vibration impacts, the Contractor shall implement the following procedure: 1. Identify exactly the buildings which may be affected by the works.	Contractor	None (included in the Contractor's construction costs) Costs for monitoring of water quality covered in the

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	rectification or compensation	2. Carry out an initial condition survey of the building / structure. Create a protocol including photo documentation. Agree and sign-off with the owner. 3. Re-check the status of the building / structure just before construction starts in the area. Create a protocol which either confirms the original assessment or documents any changes. Agree and sign-off with the owner. 4. Work only during permitted hours. 5. Minimise vibrations during work / select equipment and methods which will not cause excessive vibration. 6. Monitor any critical buildings / structure. 7. Carry out a post-construction check of buildings / structures. Create a protocol which either confirms the original assessment or documents any changes. Agree and sign-off with the owner.		Environmental Monitoring Plan
4. Cultural Heritage Management Plan				
General protection of heritage assets (all four damaged road sections)	Damage, disturbance or accelerated deterioration of heritage assets through dust, vibration, plant encroachment or accidental impact.	At every heritage asset within 50 m of the works: • Temporary protective fencing (minimum 1.8 m, bilingual "Protected Cultural Heritage — No Access" signage) erected before machinery enters the work area. Plant, stockpiles, access roads and welfare facilities kept outside the fence line. • No stockpiling of granular materials within 50 m of any heritage asset. Corridor-wide: • Vibration at the façade of any masonry heritage asset shall not exceed DIN 4150-3 Line 3 (sensitive structures) limits, as specified in the Project Standards note. • Dust-suppression measures enhanced within 100 m of any heritage asset. • Cultural-heritage awareness training forms part of every worker's site induction, covering identified assets, recognition of archaeological material, the chance-find procedure, and the prohibition on unauthorised collection under RA law. • The EO carries out a quarterly photographic condition check of every asset within 100 m of the works, repeating the baseline photographs and completing a one-page checklist. Any observed deterioration reported to the Engineer within 5 working days.	Contractor (EO) CSC to audit monthly	Included in Contractor's costs
Site-specific: Sanahin bridge (~km 57, UNESCO property)	Damage, structural deterioration or degradation of the Outstanding Universal Value of a UNESCO-inscribed property.	• No works on the bridge structure itself. Works in the vicinity (riverbank protection, retaining walls, adjacent pavement works) kept to the minimum necessary; working-corridor limits set out in the CHMP. • The RDF, through the Ministry of Foreign Affairs as State Party to the World Heritage Convention, shall notify the UNESCO World Heritage Centre of the scope and programme of works in the vicinity of the bridge prior to mobilisation (ADB SPS 2009 PCR; IFC PS 8; Operational Guidelines para 172). • Vibration at the bridge shall be monitored during any works within 100 m. Action level: 80% of DIN 4150-3 Line 3 limit. Stop-work trigger: at the limit.	RDF for State Party notification Contractor for monitoring and compliance CSC to oversee	State Party notification within RDF's costs Vibration monitoring included in Contractor's costs
Site-specific: Igahat wine complex (~km 37) and Bagratashen sites (~km 85)	Damage to exposed archaeological features or stratified deposits during earthworks adjacent to the carriageway.	**Igahat (~km 37):** • CHMP sets out a no-excavation buffer (default 20 m) around the exposed wine-press features. No machine excavation within the buffer; any necessary ground disturbance by hand. • EO records compliance with the buffer daily in the site record. **Bagratashen (~km 85):** • The Palaeolithic sites and Medieval village remains are treated as designated monuments. Before mobilisation, the RDF shall notify the Institute of Archaeology and Ethnography (NAS RA). • CHMP sets out no-excavation buffers around the recorded trenches and the Medieval pottery layer. Same hand-excavation rule as at Igahat. • Any recovered material handled under arrangements agreed with the Institute; no material retained by the Contractor.	RDF for Institute notification Contractor (EO) for buffer compliance CSC to audit	Included in Contractor's costs
Chance-find procedure (all four damaged road sections)	Loss or damage of previously unrecorded archaeological material exposed during earthworks.	If any material or feature of possible archaeological, historical, palaeontological or cultural significance is observed during construction — including pottery sherds, lithic artefacts, worked or dressed stone, masonry or foundations, skeletal remains, burial features, metalwork, coins or unusual stratigraphic horizons — the Contractor shall: • Stop work within a 25 m radius and secure the area against further disturbance or unauthorised access. • Notify the Engineer the same working day. The Engineer will initiate any specialist attendance required. • Not resume works within the 25 m radius until cleared in writing by the CSC.	Contractor to stop, secure, notify and record CSC to clear resumption	Included in Contractor's costs Contingent provisional sum for rescue

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		• Record the find and its handling in the next monthly E&S monitoring report to the RDF. Unauthorised collection, retention, sale or export of archaeological material by any person on the Project site is prohibited and shall be grounds for immediate dismissal.		excavation if triggered
5. Surface and Underground Water Protection plan				
Execution of construction	There is a risk that surface water is contaminated through construction activities.	If appropriate, the Contractor shall implement a system which channels and diverts all water run-off during construction to a temporary water treatment facility. Only water which has been treated may be released into watercourses. Water purity shall be ensured through monthly testing in compliance with the Environmental Monitoring Plan. Construction water run-off must be collected and not permitted to migrate over natural surfaces or enter the underground or surface water systems.	Contractor	None (included in the Contractor's construction costs) Costs for monitoring of water quality covered in the Environmental Monitoring Plan
Construction camp operations	There is a risk that surface water is polluted through operation of the construction camp.	If appropriate, the Contractor shall implement a system which channels and diverts all water from surface construction areas during construction to a temporary water treatment facility. Only water which has been treated may be released into watercourses. Water purity shall be ensured through monthly testing in compliance with the Environmental Monitoring Plan. Similarly, wastewater from the construction camp shall also be treated before release into watercourses. Tyres of vehicles shall be washed to prevent spread of dirt. Install water collection basins and sediment traps in all areas where construction equipment is washed. Divert contaminated water to treatment facilities.	Contractor	None (included in the Contractor's construction costs) Costs for monitoring of water quality covered in the Environmental Monitoring Plan
6. Biodiversity Management Plan				
Site clearance and establishment of contractor's welfare	Removal of vegetation and land clearing activities, Contractor's camp, muck disposal area and construction waste area	The area requiring clearing will be clearly demarcated on ground as per alignment plan. During land clearing operations, topsoil will be collected, preserved, and reused as a base for turfing of embankment slopes or development of barren areas along roadside. Tree felling (if any) within the area will be agreed with the landowner and Client prior to being cut. The hunting and capture of wild animals is prohibited.	Contractor	None (included in the Contractor's construction costs)
Risks and mitigation measures for fauna, e.g. to birds and aquatic fauna	To avoid disturbance to sensitive fauna, including fish and birds, through seasonal restrictions, controlled lighting, habitat protection, and implementation of appropriate ecological mitigation measures.	Works within and near the river shall be scheduled outside sensitive periods for fish (spawning and migration seasons) and birds (breeding and nesting seasons) to the greatest extent possible. In-stream activities will be minimized and controlled to avoid increased turbidity, sedimentation, and disturbance. During any work carried out in the river, regardless of the spawning period, it is necessary to maintain sections of the riverbed (fish passages) that allow fish to move freely upstream and downstream. Riparian vegetation and riverbank habitats will be identified beforehand and protected through clearly marked no-go buffer zones prohibiting any construction, vegetation removal, or machinery access. Ecological supervision will be present during in-stream works, riverbank stabilization, and vegetation clearance to ensure that fish habitats, bird nests, and riparian fauna are not harmed. Immediate guidance will be implemented if active nests, spawning areas, or wildlife are detected.	Contractor CSC for monitoring	None (included in the Contractor's construction costs)
Routine biodiversity compliance (all four damaged road sections)	Disturbance, killing or displacement of	• No rodenticides shall be used anywhere on the Project site for the full duration of the Contract (to avoid secondary poisoning of scavenging raptors including Egyptian Vulture). Rodent control by traps only.	Contractor (EO)	Included in Contractor's costs

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	wildlife during construction; secondary poisoning of raptors; pollution of watercourses affecting aquatic wildlife.	• In-river works shall be undertaken in daylight hours only (07:00–19:00 summer; 08:00–17:00 winter). • Construction run-off and dewatering discharges to the Debed and Aghstev rivers shall meet IFC EHS Table 1.3.1 limits (TSS ≤ 50 mg/L; oil and grease ≤ 10 mg/L) as specified in the Project Standards note. • Works restricted to the existing road right-of-way and the demarcated working corridor. No disturbance of vegetation or habitat outside the working corridor. • EO maintains a biodiversity observation log as part of the routine daily site record, capturing sightings of species of concern and any other notable wildlife. Log consolidated into the monthly E&S report to the RDF. • Monthly biodiversity compliance audit by CSC using a standard checklist (induction register complete; no rodenticides on site; daylight-only rule observed; effluent monitoring showing compliance with IFC Table 1.3.1; observation log complete and up to date; any encounter events from Row 3 closed out within required timeframes). Non-conformances closed within 14 working days.	CSC to audit monthly against defined checklist	
Egyptian Vulture nest protection (if found on pre-works check or during works)	Disturbance, nest abandonment or loss of chicks at an occupied Egyptian Vulture nest within the zone of influence of the works.	• If the pre-works raptor check (Row 1) or any sighting during works identifies an occupied Egyptian Vulture nest within 500 m of an active or planned work location: • Noisy works within the 500 m buffer (compaction, breaking, drilling, blasting, rock bolting, piling) are prohibited from 1 March to 31 August (breeding season) inclusive. Quiet manual works (paving finishing, minor hand-tool works, surveying) may continue. • The EO notifies the Engineer within the working day of identification. The CSC confirms the buffer on the ground within 5 working days. • Outside the 1 March – 31 August window, works proceed without restriction. • EO inspects the nest fortnightly during the breeding season from 500 m by binocular (no closer approach) and records occupancy and any disturbance indicators in the monthly E&S report. If the nest fails or is abandoned for reasons clearly unrelated to the works (confirmed by CSC), the restriction may be lifted.	Contractor (EO for nest checks and buffer compliance) CSC to confirm buffer; to approve lifting of restriction if nest fails	Included in Contractor's costs Programme float to absorb the March–August restriction to be built into the Contractor's works programme for any reach with a confirmed nest
Eurasian Otter protection (if signs found on pre-works walkover)	Disturbance of Eurasian Otter during breeding and rearing; displacement from a stretch of river habitat during sensitive period.	• If the pre-works riverbank walkover (Row 1) or any observation during works identifies otter spraints, tracks, feeding remains or a holt in the reach of active in-river or riverbank works: • In-river works in the affected reach (the length where signs were found, plus 200 m upstream and 200 m downstream) are restricted to the period 1 July to 30 September inclusive. Outside this window, only works that do not enter the wetted channel (i.e. works on the riverbank behind a sheet-pile or cofferdam) may proceed. • If a holt is identified, a 200 m buffer (100 m upstream, 100 m downstream) applies to all works (in-river and riverbank) for as long as the holt remains occupied. EO confirms occupancy monthly by inspection for fresh signs from 20 m distance (no closer approach). • Daylight-only in-river works rule (Row 2) applies throughout. • EO notifies the Engineer within the working day of identifying signs; CSC confirms the buffer on the ground within 5 working days.	Contractor (EO for walkover and monthly holt checks; buffer compliance) CSC to confirm buffer	Included in Contractor's costs Programme float to absorb the 1 July – 30 September window to be built into the Contractor's works programme for any reach with confirmed otter signs
Rock lizard protection before demolition of wall or rock-pile habitat	Loss of rock-lizard habitat; mortality of individuals; potential loss of RA-Red-Book-listed or IUCN-	• Before demolition of any retaining wall, ruined structure, rock pile or stone embankment within the works footprint, the EO carries out a lizard check: 15 minutes of observation in warm sunny conditions (ambient temperature > 18 °C, not in rain), recording and photographing any lizards seen. Recorded on a one-page form. • If no rock lizards are observed, works proceed.	Contractor (EO for lizard check and assisting translocation)	Lizard check: included in Contractor's costs

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	Endangered Darevskia rostombekowi if present.	• If rock lizards are observed, the EO notifies the Engineer within the working day and demolition at that structure does not proceed. The CSC commissions a herpetologist (from the Appendix C fauna team or equivalent) to identify the species, aiming for attendance within 14 calendar days. • If the herpetologist confirms only IUCN Least Concern Darevskia species, demolition proceeds. • If the herpetologist confirms Darevskia rostombekowi or any RA-Red-Book-listed rock-lizard species, habitat translocation is required before demolition: hand-capture of individuals in warm daytime conditions by the herpetologist with the EO assisting, and release to an equivalent rock or wall habitat outside the works footprint and within 200 m of the capture point, agreed with the herpetologist. Captures recorded with date, individual count, species, and release location.	CSC to commission herpetologist within 14 calendar days of trigger	Herpetologist call-out and translocation (contingent): provisional sum held within CSC budget, triggered only on EO's positive finding. Indicative allowance to be included for 2–3 call-outs across the Contract. Two days for inspections by a specialist One day for reporting AMD 200,000 per day for an expert AMD 100,000 per trip for expenses Total per call-out AMD 700,000 Total for three call-outs AMD 2,100,000
7. Utilities Protection and Relocation Plan				
Utility removal and relocation	There is a risk that utilities may be damaged during the works which could affect people living in the local area or the environment more generally	All public utilities like power transmission cables, telephone cables, water/sewerage lines, drains, tube wells etc. falling within road land width will be recorded and arranged for relocation /shifting to adjacent areas in consultation with the respective utility providers and authorities. Prior to starting any construction works the Contractor must undertake a utility desktop survey from historic records and all known services must be marked on the ground / surface where they are believed to exist and wherever possible these must be isolated and proved dead. Where there are mechanical services these must be depressurised and drained prior to removal. Care must be taken to ensure that any oils or hydraulic fluids are collected and not permitted to escape into the environment. These fluids must be sent for specialist disposal and processing to a licenced site. Prior to undertaking any excavation or invasive work including demolition the area must be scanned with a cable avoidance tool (CAT). The Contractor must ensure that temporary services designed to run on a low voltage system designed for construction site use is deployed and commissioned within the project area prior to removing and decommissioning the existing system.	Contractor	Included in the Contractor’s construction costs
8. Environmental Protection Plan				
Execution of works	There is a risk that the environment could be contaminated or damaged during the works and as such an environmental	To manage environmental risks and issues an environmental protection plan will be required. The Contractor will compile this plan and identify the risks and mitigations in the form a risk assessment and mitigation plan and ensure that the hazard and probability are scored such that risks can be prioritised and managed accordingly. The Environmental Protection Plan shall identify limit values for the concentration of pollutants in air, water and soil, and maximum noise emissions. It shall further identify measures to be implemented should maximum values be exceeded. The Contractor shall implement its SEMP and the CSC shall monitor implementation. The Contractor shall restrict its activities to site.	Contractor CSC for monitoring	None (included in the Contractor’s construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	protection plan will be required			
9. Construction Work Camps Plan				
Establishment of construction camp sites (offices, workshops, temporary installations and residential accommodation)	Social, health and environmental risks associated with construction site accommodation and large populations of people.	As identified the Contractor's office and accommodation camp locations must be agreed with the Client. The construction camps will be located away from any local human settlement areas and preferably located on land areas, which are disused or waste lands. They shall not be located close to the Debed River or other watercourses. Workers' accommodation shall comply with the IFC and EBRD guidance note [14] on this subject. The Contractor shall develop a Camp Management Plan to be reviewed by the CSC. The Contractor's office and accommodation camps will be supplied with adequate water supply, sanitation, and all requisite infrastructure facilities. Washing facilities or showers shall be provided at the workers' camps. Toilets/sanitation facilities with proper flushing provisions in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. This will minimize dependence on outside resources, presently being used by local population and minimize social community friction. The Contractor's office and accommodation camps will have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. The Contractor's office and accommodation camps will be provided with a secure energy source, e.g., electrical power, to remove the practice of using firewood for cooking. Accommodation for taking meals and for shelters during interruption of work due to adverse weather conditions. Fire-extinguishing equipment should be provided at construction camps, asphalt plants, storage areas for combustible materials and other areas where fire hazards are found. After completion of the construction works, the contractor's office and accommodation establishment will be restored to its previous state by undertaking clean-up operations. During the operation of the Contractor's office and accommodation establishment all litter and waste must be collected and disposed of. No site, litter or waste is permitted to escape into the natural environment. Special attention must be paid to plastic waste. The Contractor must employ a programme of weekly litter picks and ensure that the environment is kept clean and clear of waste material.	Contractor	None (included in the Contractor's construction costs)
Establishment of construction camp sites (offices and residential accommodation)	Occupational health and safety hazards at work and camp sites	The Contractor shall comply with National Labor Law. Children and pregnant women will not be allowed to work under any circumstances. Moreover, no personnel will be allowed to work at site for more than 10 hours per day (8-hour makes one work shift). In addition, each worker must be given at least two days per week rest and provided with a minimum of 20 days per year holiday. All personnel at work sites will be provided with protective gears like helmets, boots, etc. so that injuries to personnel are avoided or minimized. Workforce, likely to be exposed to noise levels beyond regulatory stipulated limits, will be provided with protective gears like ear plugs etc and regularly rotated.[15] The Contractor must undertake a hand arm vibration assessment and ensure people are protected from harmful effects.[16] Dust suppression measures such as spraying, or the use of water sprinklers will be used at all operations areas. The construction camps will have health care facilities for all workers and provide occupational screening advice and emergency medical care. All construction personnel will be subjected to routine vaccinations and other preventive/healthcare. The work and campsites will have suitable facilities for handling any emergency like fire, explosion, etc. All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations. All required permits for storage of inflammable/hazardous materials are to be obtained. The personnel in charge of such areas will be properly trained, licensed and with sufficient experience. The operational areas will be access controlled and entry will be allowed only under authorization.	Contractor	None (included in the Contractor's construction costs)

[14] Available at: https://www.ifc.org/en/insights-reports/2000/publications-gpn-workersaccommodation
[15] Guidance available at: https://www.hse.gov.uk/pubns/indg362.htm
[16] Guidance available at: www.hse.gov.uk/vibration/hav/index.htm

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Establishment of construction camp sites (offices and residential accommodation)	Cleaning work sites and waste disposal	All operational areas (office/storage area, work force camps, and borrow pit areas) will be cleaned up and restored to its original state (or better) as soon as possible after operations have completed. All construction waste will be disposed of in approved disposal sites and in no case will it be permitted for waste to escape into the natural environment. Local district authorities will be consulted to determine disposal sites and implement any conditions imposed within specific permits.	Contractor	See 14 [Site Reinstatement, Landscaping, and Revegetation Plan]
10. Site Management Plan (quarry and borrow pit, dumping sites, concrete batching, and asphalt plants)				
Operation of quarries and borrow pits	Environmental and health and safety risks arising from earthworks and operating of quarries and borrow pits. Erosion and instability of cut faces and borrow pits. (Noted that borrow pits are unlikely to be required; materials for concrete brought to site rather than opening a project-specific quarry.)	Minimize major earthworks during the rainy and high-water periods, to the extent feasible. Collect and store topsoil from borrow pits carefully to one side, where it can be later used for reinstatement. During construction, employ erosion prevention measures such as the use of hay bales. At the end of the construction phase, re-contour/ reprofile borrow pit walls, replace topsoil, and re-vegetate. Provide vegetative cover on erosion-prone areas. Install intercepting ditches at the top and at the bottom of slopes. Use gutters and spillways to control the flow of the water down slopes. Provide retaining structures such as gabions, riprap, or rock material embedded in a slope face, in combination with vegetation measures, as appropriate. Reinforce earth embankment walls as the earth fill is placed, with anchors compacted into the fill material. For re-vegetation purposes, use native varieties according to the soil type, climate, and ease of maintenance. Saplings shall be planted to coincide with appropriate season to ensure early establishment.	Contractor	None (included in the Contractor's construction costs)
Temporary material storage and processing areas	Environmental and health and safety risks arising from the establishment of temporary material storage and processing areas (crushing, concrete batching, asphalt plant)	The Contractor's temporary storage and processing areas for construction works will be located away from human residential areas (minimum 500 m) and the Debed River or other watercourses. The office and storage areas will preferably be located on barren/waste lands and conversion of agricultural/cultivable lands for office and storage areas will not be allowed. All fuel oil/lubricants loading, unloading and storage areas will be paved (impermeable), and have separate storm water collection system with facility for separation of oil/lubricants prior to discharge. Storage areas shall be bunded at 110% capacity to contain rupture of largest tank. The temporary office and storage area will be provided with adequate water supply, sanitation, septic tank/soak pit of adequate capacity so that it functions properly for the entire duration of its use. All storage areas will be securely fenced, clearly demarcated, and equipped with appropriate safety signage. Stored materials, including hazardous substances, will be properly labelled to indicate contents, risks, and handling requirements, ensuring that only authorized personnel have access.	Contractor	Contractors' costs will be included within preliminaries and are expected to be minimal
Storage of materials hazardous to health	Pollution due to use and storage of hazardous substance	Hydrocarbon, toxic material and will be stored in adequately protected sites to prevent soil and water contamination. Storage areas shall be bunded at 110% capacity to contain rupture of largest tank. While vehicle maintenance and refuelling will be confined to a local designated area, used oil and other toxic and hazardous materials shall be disposed of in an authorized facility off-site. The personnel in-charge of these sites will be properly trained. Spill kits are available and staff will be trained in their use. All storage areas will be securely fenced, clearly demarcated, and equipped with appropriate safety signage. Stored materials, including hazardous substances, will be properly labelled to indicate contents, risks, and handling requirements, ensuring that only authorized personnel have access.	Contractor	None (included in the Contractor's construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Storage of materials hazardous to health	Improper disposal of solid waste	Segregation of waste shall be observed. Organic (biodegradable) shall be collected and disposed of onsite by composting (no burning on site). Recyclables shall be recovered and sold to recyclers. Residual and hazardous waste shall be disposed of in disposal sites approved by local authorities. The Contractor shall comply with applicable national regulations.	Contractor	None (included in the Contractor's construction costs)
11. Traffic and Access Management Plan				
Construction works and traffic management	Health and safety risks arising from construction traffic during the construction works	The Contractor will install traffic management systems (e.g., traffic lights, cones, barriers, multiple warning signs which consider night-time visibility) to delineate the work zone in compliance with its approved Traffic Management Plan. Workers will be supplied with reflective clothing or reflective devices or otherwise conspicuously visible material for workers to moving vehicles. Existing tracks/roads are to be used for hauling of materials. Dust suppression by water tankers with sprinkling systems are to be deployed along haul routes. The vehicles deployed for material transportation will be spill proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any. Precaution will be taken to avoid inconvenience to the local community due to movement of materials. Dry and loose materials in trucks to be covered with tarpaulins to avoid dust blow. Drivers to be educated on using appropriate speed limits when transporting material.	Contractor	None (included in the Contractor's construction costs)
12. Emergency Response Plan				
Emergency responses for construction works	Emergency plans are required to support construction	Emergency plans to be developed for all construction activities, in particular for works close to or in the river. Construction work plan shall include provisions for emergency air, service supply and rescue. These emergency plans must assess potential emergency situations and natural and manmade hazards and devise plans and emergency arrangements to rescue and recover people. The Contractor must ensure the people on site are trained to enact these recovery plans and they have the tools, equipment, and resources necessary. The Contractor must ensure that there is pre-planning and coordination with the local emergency services, including an established direct line of contact with the nearest hospital.	Contractor	None (included in the Contractor's construction costs)
13. Waste and Material Management Plan				
Execution of demolition and construction works	Waste arising from the construction work can accumulate quickly and overwhelm the disposal routes or site.	The Contractor will be required to develop a waste and material management plan which will identify the type and volume (over time) of material and list a disposal route for each waste stream. These waste streams will include but are not limited to: - Office and welfare waste - Waste arising from the accommodation camps. - Waste arising from the removal of rubble during riverbank works. - Construction, hazardous and liquid waste. The overview list above provides an example of the types of waste that will be expected. All waste arisings must have a waste disposal stream and the work areas and natural environment must be kept clean and clear of all waste.	Contractor	None (included in the Contractor's construction costs)
14. Site Reinstatement, Landscaping, and Revegetation Plan				
Reinstatement, landscaping following the road rehabilitation works	Following the road rehabilitation the project close out is not afforded the time and resources	The site close out including the reinstatement and landscaping is vital to ensure that surface water run-off is managed and that any remaining or waste material is removed from site. The Contractor must ensure that the reinstatement plan is submitted to the Client early and that this plan demonstrates that the site will be returned to the minimum original condition while incorporating and accommodating the new works.	Contractor	None (included in the Contractor's construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	needed and site reinstatement is not completed satisfactorily.			
POST-CONSTRUCTION PHASE				
Defect liability period Operation and maintenance period	These is a risk that construction defects and unresolved issues present environmental issues	The works contract shall include a defects liability period and retention clause to ensure that there are sufficient mechanisms in place to manage and rectify any close-out issues and defects such that the environment can be protected	Contractor during DLP CSC for monitoring during DLP Client during O&M	-
Defect liability period Operation and maintenance period	Functionality of the water treatment plant	Regular inspection and maintenance (as defined by the Contractor) to ensure the continued functionality of the constructed drainage system which drain water from the roadway before release into watercourses	Contractor during DLP CSC for monitoring during DLP Client during O&M	Carried out by road operator on site, so no extra cost
Defect liability period Operation and maintenance period	Functionality and effectiveness of road safety installations	Regular inspection and maintenance (as defined by the Contractor) of road safety installations. Collection and review of accident data to assess effectiveness of implemented measures and determine any blackspots. External road safety audit if considered necessary.	Contractor during DLP CSC for monitoring during DLP Client during O&M	Inspections carried out by road operator on site, so no extra cost Accident data collected by Road Police Maintenance costs depend on repairs necessary (if any)
Operation and maintenance period	Unsuccessful re-vegetation of areas used during construction and trees planted	Monitor the success of re-vegetation and tree health 2 and 5 years after planting	Client	Two days for inspections by a specialist Two days for reporting AMD 200,000 per day for an expert AMD 100,000 per trip for expenses Total AMD 1,800,000

Table 26: Environmental management plan

X. ENVIRONMENTAL MONITORING PLAN

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
PRE- CONSTRUCTION PHASE (Mobilization stage)							
Air quality	Dust, nitrogen dioxide, sulphur dioxide	At sensitive receptors close to planned work sites. At areas to be used by the contractor, i.e., site installation areas, labour camps.	Sampling according to limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006	Variance from parameter values measured in this report. Record current preload of air quality (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 15 locations AMD 30,000 per location Total AMD 450,000
Water quality	pH, conductivity, mineralization, toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt), petroleum, suspended matter	In Debed River, streams and gullies close to planned work sites.	Sampling to assess permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. Sampling to assess the permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002.	Variance from parameter values measured in this report. Record current preload of water quality (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 13 locations AMD 150,000 per location Total AMD 1,950,000
Soil quality	Toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt)	At planned work sites. At areas to be used by the contractor, i.e., site installation areas, labour camps.	Sampling to test permissible limit concentrations of dangerous substances in soil are defined in accordance with "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ա dated January 25, 2010.	Variance from parameter values measured in this report. Record current preload of air quality (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 16 locations AMD 22,000 per location Total AMD 352,000
Ambient noise	Noise measurement of ambient noise level daytime	At sensitive receptors close to planned work sites. At areas to be used by the contractor, i.e., site installation areas, labour camps.	Measuring of dB(A) at receptors outside and inside (if any). Maximum permissible noise levels according to World Bank standards for industrial and commercial premises L_{Aeq} 15 min and L_{Amax}15 min = 70 dB.	Variance from parameter values measured in this report. Record current preload of ambient noise (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 15 locations AMD 13,000 per location Total AMD 195,000
Baseline photographic record of heritage assets	Dated photographs of each asset from fixed viewpoints with scale bar; one-page written note on visible condition (cracks, surface, immediate setting).	All 16 heritage assets within 100 m of works (Appendix I).	Contractor's EO takes the photographs and completes the condition note. Record held on Project file as comparator for later inspections.	Baseline record complete and accepted by CSC before works start within 100 m of any asset.	Contractor (EO); CSC (accept).	Once, before mobilisation.	Included in Contractor's costs
Pre-works raptor nest check	Occupied Egyptian Vulture nests (and other RA-Red-Book raptor nests) within 500 m of each work location.	All cliff, outcrop and building features within 500 m of each planned work location, for each of the four damaged road sections.	EO conducts binocular observation from the road or other safe vantage on three separate days in the month before works start in each reach (or no later than 1 March if works begin during the breeding season). Recorded on one-page form with photographs.	Form complete for each reach, countersigned by CSC before works start in that reach.	Contractor (EO); CSC countersigns.	Once per reach, before works start in that reach.	Included in Contractor's costs
Pre-works	Otter spraints, tracks,	Both banks of the Debed	EO walkover within 14 days before works start in each	Form complete for each	Contractor	Once per reach, within 14	Included in Contractor's

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
otter riverbank walkover	feeding remains, holts.	and Aghstev in each reach with in-river or riverbank works, plus 200 m upstream and 200 m downstream.	reach. Signs photographed and coordinates recorded on one-page form.	reach, countersigned by CSC before in-river works start.	(EO); CSC countersigns.	days before in-river works start.	costs
CONSTRUCTION PHASE							
Air quality	Dust, nitrogen dioxide, sulphur dioxide Visual observation for dust around the site, on transport routes and at disposal areas	At the locations where pre-construction phase surveys were undertaken. At active construction sites.	Sampling according to limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	At least every two weeks during the construction phase for active construction sites Assumed that there are 3 active sites at once.	AMD 30,000 per location per survey Total AMD 5,400,000 for construction phase
Ambient noise	Noise measurement of ambient noise level daytime	At the locations where pre-construction phase surveys were undertaken. At active construction sites.	Measuring of dB(A) at receptors outside and inside (if any). Maximum permissible noise levels according to World Bank standards for industrial and commercial premises L_{Aeq} 15 min and L_{Amax}15 min = 70 dB.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Irregular monitoring for sensitive receptors close to construction sites	Estimated 25 locations twice AMD 13,000 per location Total AMD 650,000 for construction phase
Water quality	pH, conductivity, mineralization, toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt), petroleum, suspended matter Visual observation for water clarity	At the locations where pre-construction phase surveys were undertaken. In streams or gullies close to work sites and in Debed River just downstream of sites. At active construction sites.	Sampling to assess permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. Sampling to assess the permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	At least every two weeks during the construction phase for active construction sites Assumed that there are 3 active sites at once.	AMD 150,000 per location Total AMD 27,000,000 for construction phase
Soil quality	Toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt)	At the locations where pre-construction phase surveys were undertaken. At active construction sites.	Sampling to test permissible limit concentrations of dangerous substances in soil are defined in accordance with "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ъ dated January 25, 2010.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	At least every two months during the construction phase for active construction sites Assumed that there are 3 active sites at once.	AMD 22,000 per location Total AMD 990,000 for construction phase
Vibration monitoring	Vibration levels	At sensitive receptors close to planned work sites.	Measuring of ground accelerations at the construction site and any sensitive receptors. Maximum permissible vibration levels will be assessed and set by the Contractor based on his activities and set to assure that the and sensitive structural elements and receptors are not adversely affected by construction activities.	Variance from parameter values established by the Contractor prior to the commencement of work	Contractor with checking by CSC	Irregular monitoring for specific buildings close to construction sites	Estimated 25 locations twice AMD 55,000 per location Total AMD 2,750,000 for construction phase
Condition and dust check at heritage assets	Photographic comparison against baseline; visible dust on monument surfaces; any visible damage.	All 16 assets (photographic check); within 100 m of works (dust).	EO repeats baseline photos and completes a one-page condition checklist; daily visual for dust.	No visible deterioration vs baseline. Any visible deterioration reported to the Engineer within 5 working days.	Contractor (EO); CSC (audit).	Quarterly (photographic / checklist). Daily visual during works within 100 m.	Included in Contractor's costs

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
Vibration at Sanahin bridge	Peak Particle Velocity (PPV, mm/s).	Sanahin bridge (~km 57), during any works within 100 m.	Vibration monitor deployed by Contractor. Action level at 80% of DIN 4150-3 Line 3 limit; stop-work at the limit.	DIN 4150-3 Line 3 limit not exceeded.	Contractor (EO); CSC (audit).	During works within 100 m of the bridge.	Included in Contractor's costs
Works near Sanahin, Igahat and Bagratashen	Compliance with working-corridor limits and no-excavation buffers set out in the CHMP; any visible damage.	Sanahin bridge (~km 57); Igahat (~km 37); Bagratashen (~km 85).	EO keeps a daily site record of compliance with the CHMP working limits.	No works on the Sanahin bridge structure. No machine excavation within the buffers. No visible damage.	Contractor (EO); CSC (audit).	Daily during works in these reaches; weekly summary in E&S report.	Included in Contractor's costs
Chance-find register	Number of chance finds; time to stop-work; disposition of each find.	All four damaged road sections.	Contractor-maintained register; monthly summary in the Contractor's E&S report.	On every occurrence: stop work within 25 m, secure area, notify Engineer, no resumption until cleared by CSC.	Contractor (EO, register); CSC (clearance).	On occurrence; monthly summary report.	Included in Contractor's costs (contingent provisional sum for rescue excavation if triggered)
Routine biodiversity compliance (corridor-wide)	No rodenticides on site; daylight-only in-river works; works kept within demarcated corridor; effluent to IFC Table 1.3.1; biodiversity observation log maintained; induction register up to date.	All four damaged road sections; all Contractor sites and compounds.	EO monitors daily as part of routine site inspection. CSC monthly audit against standard biodiversity compliance checklist.	Zero rodenticides found on site; zero in-river works outside daylight hours; zero instances of work outside the demarcated corridor; effluent within IFC Table 1.3.1; log and register complete. Non-conformances closed within 14 working days.	Contractor (EO); CSC (monthly audit).	Daily (EO); monthly (CSC audit).	Included in Contractor's costs
Egyptian Vulture nest monitoring (only where nest confirmed)	Nest occupancy; adult activity; chick presence; any disturbance indicators.	Any confirmed Egyptian Vulture nest within 500 m of a work location.	EO fortnightly binocular inspection from 500 m (no closer approach). Recorded with photographs in monthly E&S report.	Noisy works within 500 m buffer kept to zero between 1 March and 31 August while nest is occupied; quiet works only. Nest occupancy status reported monthly.	Contractor (EO); CSC approves any lifting of restriction if nest fails.	Fortnightly during breeding season (1 March – 31 August).	Included in Contractor's costs
Eurasian Otter buffer compliance (only where signs confirmed)	In-river works timing (must fall within 1 July – 30 September); holt occupancy if holt confirmed; buffer compliance.	Any reach where pre-works walkover or subsequent observation recorded otter signs, plus 200 m upstream and 200 m downstream.	EO daily site record for in-river works timing and buffer compliance. If a holt is present, EO monthly check for fresh signs from 20 m distance.	Zero in-river works in affected reach outside 1 July – 30 September window. Zero works within 200 m of an occupied holt. Daylight-only rule observed at all times.	Contractor (EO); CSC (audit).	Daily (works timing, buffer); monthly (holt occupancy).	Included in Contractor's costs
Pre-demolition rock-lizard check	Rock-lizard presence; species identification if present.	Every retaining wall, ruined structure, rock pile or stone embankment planned for demolition within the works footprint.	EO 15-minute observation in warm sunny conditions (> 18 °C, not in rain). If lizards present, CSC commissions herpetologist (target attendance within 14 calendar days) to identify species and, if RA-Red-Book or D. rostombekowi confirmed, to supervise translocation.	Check form complete for every demolition event before works proceed. If lizards present and RA-Red-Book species confirmed: translocation completed, individuals released within 200 m of capture, record submitted before demolition.	Contractor (EO for check and translocation assistance); CSC (commission herpetologist when triggered).	Once before every demolition event (on occurrence).	Lizard check: included in Contractor's costs. Herpetologist + translocation (contingent): provisional sum in CSC budget, triggered only on positive finding.
POST-CONSTRUCTION PHASE (Defect Notification Period)							
Monitoring of replaced trees and re-	Monitor the success of re-vegetation and tree health	At locations where re-vegetation and tree planting were carried out	Inspection and reporting	Healthy vegetation and trees as assessed by subject specialists	Client	2 and 5 years after planting	Two days for inspections and travel by a specialist Two days for reporting

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
vegetated areas							AMD 200,000 per day for an expert AMD 100,000 per trip for expenses and accommodation Total AMD 1,800,000
Air quality	Dust, nitrogen dioxide, sulphur dioxide,	At the locations where pre-construction phase surveys were undertaken	Sampling according to limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction 1 year after completion of construction works	Estimated 15 locations AMD 30,000 per location Total in phase AMD 900,000
Ambient noise	Noise measurement of ambient noise level daytime	At the locations where pre-construction phase surveys were undertaken	Measuring of dB(A) at receptors outside and inside (if any). Maximum permissible noise levels according to World Bank standards for industrial and commercial premises L_{Aeq} 15 min and L_{Amax}15 min = 70 dB.	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction 1 year after completion of construction works	Estimated 15 locations AMD 13,000 per location Total in phase AMD 390,000
Water quality	pH, conductivity, mineralization, toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt), petroleum, suspended matter	At the locations where pre-construction phase surveys were undertaken	Sampling to assess permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. Sampling to assess the permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002.	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline. Determine the effectiveness of the treatment of the polluted water. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction 1 year after completion of construction works	Estimated 13 locations AMD 150,000 per location Total in phase AMD 3,900,000
Soil quality	Toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt)	At the locations where pre-construction phase surveys were undertaken	Sampling to test permissible limit concentrations of dangerous substances in soil are defined in accordance with "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ն dated January 25, 2010.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction 1 year after completion of construction works.	Estimated 16 locations AMD 22,000 per location Total in phase AMD 704,000

Table 27: Environmental monitoring plan for measurement of environmental parameters

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
PRE-CONSTRUCTION PHASE (Mobilization stage)						
Permits obtained	Permits required for the Project's implementation obtained	n/a	Project permit register	All necessary permits obtained	Contractor: Obtain permits for which it is responsible. CSC: Maintain permit register RDF: Ensures RDF has obtained all permits under its responsibility.	Continuously until all permits are obtained.
Work opportunities for local workers, unskilled workers and women	Hiring policy of Contractor Numbers of local workers, unskilled workers and women hired	All construction sites / Contractor's camps	One-time audit of the Contractor's documents which shall include employment records and details of job postings.	Number of local workers, unskilled workers and proportion of genders hired for the Project. There must be gender pay and condition equality. The employment and project culture shall respect all people equally.	Contractor: Develops the hiring programme for local and unskilled workers and for gender equality. He will ensure that information is available in a clear and unambiguous document. Supporting information will be made available on request. CSC: Social specialist will review the Contractor's hiring programme and information via audit and provide feedback. RDF: Supervises the CSC.	Once during mobilisation when the Contractor is planning its recruitment.
Suitably Qualified and Experienced People	General: Employees must be qualified in their area of work (e.g. machine driver etc.) as well as having general site awareness activities and process/ procedures (including but not limited to safety requirements, emergency arrangements). Persons responsible for Safeguards: Persons responsible for management, environmental and health and safety safeguards will be fully trained and experienced. All staff are to be appropriately trained and qualified.	All construction sites / Contractor's camps	Review of CVs of Key Personnel; ensure consistency with personnel nominated by Contractor in its bid.	Compliance with Work's Requirements for Key Personnel as set out in the bidding documents. All persons must be trained and suitably qualified for their intended positions. CVs of employees will be provided together with a staff/ sub-contractor summary table showing clear information such as name position, responsibilities training completed and qualifications together with details of training gaps and planned completion dates.	Contractor: Provides CVs, overview table, and deployment plan. Maintains training matrix and underpinning training record with copy of certificates. CSC: Reviews all documents provided by the Contractor and approves Key Personnel including for Safeguards. RDF: Supervises the CSC.	Once during mobilisation when the Contractor is planning its recruitment. Review of CV(s) prior to mobilization of the person(s).
Pre-construction meetings about the planned works	Pre-construction public meetings will be undertaken GRM presented	In communities along the road.	Information disclosed to the public by posters, invitations, presentations, hand-outs and	Written evidence record file of undertaken pre-construction meetings.	Contractor: Prepares, organises and carries out meetings. Prepares	Once during mobilization period in each community.

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
	Information available on RDF and ADB websites		information boards. Meeting records, attendance sheets and photographs.		written record. CSC: Reviews Contractor activities and approves information to be disclosed. Informs RDF of activities. Attends meetings. RDF: Monitors activities and participates in meetings. Ensures information and IEE is placed in RDF and ADB websites.	
Orientation, awareness raising and training on environmental, health and safety, and social safeguards	Training session is organized and implemented	All construction sites / Contractor's camps	Review of Contractor's training program including the training material Attendance of the training course organized by the Contractor Meeting records and attendance sheets will be retained as part of the site record. These will be made available for the Clients or his nominated representatives' inspection. The absence of an authenticated record will be deemed as a non-compliance Photographic documentation of training sessions.	All site personnel have attended the training course. Written evidence record file of complete, regular and comprehensive engagement for orientation awareness training.	Contractor: Implements orientation awareness training and keeps record file. Invites CSC to attend. Training to be undertaken for each person attending site. CSC: Reviews Contractor's training program. Attends training. Reviews Contractor's records. RDF: Supervises the process.	Once during mobilisation for each person deployed to site.
On-site mobilization activities	Information boards installed Camp areas established Traffic management and signage prepared Construction waste disposal areas fenced Trees to be removed identified and labelled	Construction waste disposal area Construction sites Contractor's camp	Review of Contractor's mobilization plan Site visits to monitor activities	Compliance with the Contractor's mobilisation plan and SEMP	Contractor: Prepares and submits mobilization plan and SEMP. Organizes Road Police review and approval of installed signs. CSC: Reviews and approves Contractor's plans. RDF: Supervises the process.	Once during mobilisation
Occupational health and safety	Appropriate work clothing and full PPE issued to Contractor's personnel as required by their activities Safety equipment installed and tests at construction sites	All construction sites / Contractor's camps	Review of Contractor's Health and Safety Management Plan (HSMP) Site visits to monitor activities	HSMP approved and included in SEMP. Work clothing and PPE issued Safety equipment installed All accidents / incidents / near misses recorded and treated in compliance with the plan	Contractor: Prepares and implements HSMP. CSC: Reviews and approves Contractor's plans.	Once during mobilisation

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					RDF: Supervises the process.	
CONSTRUCTION PHASE						
Environmental and safety orientation	Appropriate work clothing and full PPE issued to Contractor's personnel as required by their activities Safety equipment installed and tests at construction sites	All construction sites / Contractor's camps	Review of Contractor's Occupational Health and Safety activities and documentation (compiled in accordance with its HSMP) Inspections and documentation of health and safety on site Inspection of Contractor's accident register	HSMP available Safety posters and instructions available on site Regular training given to workers and documented, along with list of attendees PPE utilised correctly Reports, registers and documents available for review	Contractor: Implements HSMP. Acts to resolve non-compliances with corrective actions. CSC: Reviews and monitors Contractor's plans; carries out inspections. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Plan developed and approved prior to construction Inspections according to monitoring schedule Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Public consultation and communications	Stakeholder and community engagement plan implemented through regular public consultations Worker and community grievance registers	All construction sites / Contractor's camps	Public consultations Review of grievance registers	Consultations held in accordance with plan GRM implemented	Contractor: Implements Public Consultation and Communications Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans; attends public consultations. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process and attends consultations as appropriate.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Cultural heritage management	Implementation of mitigation measures set out in the Cultural Heritage Management Plan	All construction sites	Site inspections	Contractor has developed Cultural Heritage Management Plan Chance finds procedure established and implemented	Contractor: Implements Cultural Heritage Management Plan. Acts to resolve non-compliances with corrective actions. CSC:	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	
Surface and underground water protection	Implementation of mitigation measures set out in the Surface Water Protection Plan, in particular the treatment of water run-off from the road, surface and wastewater from the camp.	All construction sites Contractor's camps Tyre washing locations Water treatment facilities	Site inspections Water quality monitoring data	Refer to Environmental Monitoring Plan for water quality	Contractor: Implements Surface Water Protection Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Refer to Environmental Monitoring Plan for water quality Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Flora & fauna protection and vegetation clearing	Vegetation clearing and tree felling minimised Topsoil collected, preserved and re-used	All construction sites / Contractor's camps	Review of register for tree felling Site inspections	Contractor has developed Flora & Fauna Protection and Vegetation Clearing Plan Register for tree felling is available Mitigation measures implemented for protecting flora and fauna	Contractor: Implements Flora & Fauna Protection and Vegetation Clearing Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Utilities protection and relocation	All utilities identified and marked on site Cases of disruption of services impacting the end users	All construction sites / Contractor's camps	Review of Utilities Protection and Relocation Plan Site inspections	Contractor has developed Utilities Protection and Relocation Plan Cases of disruption of services impacting the end users recorded and investigated	Contractor: Implements Utilities Protection and Relocation Plan. CSC: Reviews and supervises Contractor's plans.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					RDF: Supervises the process.	
Environmental protection	Parameters identified in the Environmental Monitoring Plan (air quality, noise, water quality, soil quality, vibration etc.) Soil erosion Use of topsoil stockpiles	Locations for measurement as identified in the Environmental Monitoring Plan	Review of Environmental Protection Plan Review of complaints logged in grievance registers Review of data for measured parameters Site inspections	Contractor has developed Environmental Protection Plan Number and severity of complaints logged in grievance registers Cases of soil erosion Compliance with topsoil stockpile requirements Measured parameters	Contractor: Implements Environmental Protection Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Refer to Environmental Monitoring Plan Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Construction work camps	Location, layout, available facilities and management arrangements of work camps Compliance with National Labor Law for employment of workers, working hours, and paid leave	Contractor's camps	Review of the Contractor's Work Camps Plan and management arrangements to ensure that working practices and management arrangements are suitable Double check of availability of landowner's permissions Camp inspections	Contractor has developed Work Camps Plan Processes and procedures are sufficient for the number of people and activities undertaken whilst maintaining health and safety of persons working and visiting the site and the environment is protected from hazards. Employment and payment records Number and severity of complaints logged in grievance registers Training records with attendance lists on camp rules and cultural awareness.	Contractor: Implements Work Camps Plan. Keeps up-to-date employment and payment records on site which are available to the CSC for review. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Site management plan (quarry and borrow pits, dumping sites, concrete batching, and asphalt plants)	Location, layout and management of quarry and borrow pits, dumping sites, concrete batching, and asphalt plants Special attention to be applied to the control of substances hazardous to health and the	Locations of these sites	Review of the Contractor's Site Management Plan Particular review of Contractor's plan and risk assessment for handling explosives Site inspections	Contractor has developed Site Management Plan Location and layout comply with the plan Number and severity of complaints logged in grievance registers	Contractor: Implements Site Management Plan. Maintains material inventories. Acts to resolve non-compliances with corrective actions. CSC:	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
	storage and use of explosives in compliance with national regulations			Inventory record of hazardous materials and report any missing / unaccounted materials	Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	
Traffic and access management	Public roads and access locations Material and waste transportation itineraries. Nuisances to locals and public safety issues. Damages to roads and drainage lines Signs for alternative routes	Construction sites on M6 road Roads used for transportation of equipment, materials, and waste Locations with signs for alternative routes and diversions	Review of the Contractor's Traffic and Access Management Plan Site inspections	Approval of the Contractor's Traffic and Access Management Plan by the Road Police of Armenia Contractor's compliance with the plan Number and severity of complaints logged in grievance registers	Contractor: Develops Traffic and Access Management Plan and obtains approval by the Road Police. Installs signs for alternative routes / road diversions. Implements plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Emergency response	Dealing with emergency situations specific to the Project, in particular for works close to or in the Debed River Handling of hazardous substances	All construction sites / Contractor's camps	Review of the Contractor's Emergency Response Plan Site inspections Review of accident reports	Approval of the Contractor's Emergency Response Plan Training records with attendance lists on emergency responses All accidents / incidents / near misses requiring or potentially requiring an emergency response recorded and treated in compliance with the plan	Contractor: Develops and implements Emergency Response Plan. Holds training for employees. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF:	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports Accident reports whenever accidents / incidents / near misses occur

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					Supervises the process.	
Waste and material management	Management of waste and construction material during construction	All construction sites / Contractor's camps Waste disposal locations	Review of the Contractor's Waste and Material Management Plan Site inspections Inspection of waste records	Approval of the Contractor's Waste and Material Management Plan Legal grounds for waste categorization and disposal are obtained and are available. All types of wastes and material are managed in compliance with the Plan. A waste register is maintained.	Contractor: Develops and implements Waste and Material Management Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports (which includes the waste register) as well as CSC's Monthly Reports.
Site reinstatement, landscaping and revegetation	Construction site is cleaned from all the material, equipment and waste All the temporary used surfaces (including quarries and borrow pits) are restored and revegetated)	All construction sites / Contractor's camps Waste disposal locations	Site inspections	Approval of the Contractor's Site Reinstatement, Landscaping and Revegetation Plan All the used surfaces are restored to their original state Tree planting shall only be carried out in collaboration with the Hayantar SNCO at a ratio of 1:10	Contractor: Develops and implements Site Reinstatement, Landscaping and Revegetation Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. RDF: Supervises the process.	Plan developed and approved prior to construction Reporting on site reinstatement, landscaping and revegetation as part of taking-over process
Records and reporting	Site inspection checklists, Minutes of meetings, log-books for stakeholder engagement records, training records, Accident/ incident reports, Corrective Action Reports	Reports submitted by the Contractor to the CSC Registers and log-books available at site	Review or records and reports	Records are complete and up-to-date	Contractor: Maintains up-to-date records and reports CSC: Reviews Contractor's records and reports. Prepares its own reports. RDF: Reviews CSC's reports and	Contractor's Progress Reports and weekly Corrective Action Plan CSC Monthly Reports and weekly monitoring report RDF submits semi-annual reports to ADB

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					prepares semi-annual reports for ADB.	
POST-CONSTRUCTION PHASE						
Elimination of defects	Impact on the environment due to the fact that the EMP is not followed and is neglected	All former construction sites / Contractor's camps	Site inspections	Compliance with the SEMP	Contractor: Implements SSEMP and resolves any remaining issues CSC: Identifies remaining issues and supervises Contractor activities to resolve them RDF: Implements audit site visit Supervises the process	As required based on the defects identified
Traffic movements	Parameters identified in the Environmental Monitoring Plan (air quality, noise, water quality, soil quality, vibration etc.)	Locations for measurement as identified in the Environmental Monitoring Plan	Review of complaints Review of data for measured parameters Site inspections	Number and severity of complaints Measured parameters	Contractor during the DLP CSC to supervise	Refer to Environmental Monitoring Plan
Surface water protection	Water quality	Locations for measurement as identified in the Environmental Monitoring Plan	Review of sensor data Site inspections	Measured parameters	Contractor during the DLP CSC to supervise Road operator for operation and maintenance	As required by Environmental Monitoring Plan Regular monitoring of sensor data
Site reinstatement, landscaping and revegetation	Normal growth of planted trees and shrubs	Locations where planting has been carried out	Site inspections	Health of trees and shrubs	Carried out by the road operator	At 2 and 5 years after planting

Table 28: Environmental monitoring plan assessing implementation of environmental management plan activities

XI. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

319. Based on the indication of the Rapid Environmental Assessment attached in Appendix A and the findings of the IEE, the classification of the subproject as Category “B” is confirmed, and no detailed EIA will be needed to comply with the ADB environmental policies.

320. The project will have positive impacts, including improvements to the road‘s resilience and safety, improvements to traffic safety, economic , and community and social benefits.

321. All negative impacts are from dust, noise and on flora and fauna. Assuming that the mitigation measures and monitoring requirements in the Environmental Management Plan are effectively implemented, the project is not expected to have a significant adverse environmental impact. It is important that environmental supervision and monitoring is conducted as described and all actions are documented properly.

322. Public consultations were held in the Alaverdi, Tumanyan and Ayrum communities by RDF and the Consultant on 09.12.2025. They were attended by community leaders, community residents, and the village administration head and employees.

A Grievance Redress Mechanism tailored to the project has been developed to receive and facilitate the resolution of affected persons’ concerns, complaints and grievances.

B. Recommendations

323. RDF shall ensure that the EMP is included in the contract documents, and the EMP provisions are implemented and monitored to their full extent.

324. Based on the EMP, the Contractor will prepare and submit for the CSC’s approval, the Site-Specific EMP, with detailed operating environmental management and monitoring measures during the pre-construction, construction and post-construction phases.

325. The compliance of construction activities to the ADB safeguards and to Armenian legislation shall be checked through regular monitoring carried out by the Contractor (self-monitoring), CSC and RDF.

326. The Contractor shall perform baseline data measurements for air quality, water quality, noise and vibration in the pre-construction phase, and shall implement regular measurements of the same parameters and at least the same locations during the construction phase and the defects liability period.

327. The CSC shall maintain a non-compliance register and issue non-compliance notices if SSEMP mitigation measures are not properly implemented in a timely manner. The Contractor shall implement corrective actions to resolve non-compliances before deadlines set by the CSC.

328. The Contractor and CSC shall report on implementation of the SEMP and safeguard activities in compliance with the requirements of their contracts.

Appendix A: Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Armenia: Rehabilitation of the M6 Road

Conducted by Alisa Savadyan

SCREENING QUESTIONS	YES	NO	REMARKS
A. PROJECT SITING Is the Project area ...			
• densely populated?		X	The road predominantly passes through non-populated areas although there are some properties along the road. The centre of the only significant town, Alaverdi (km 52), is bypassed. Works are generally constrained to low population areas.
• heavy with development activities?		X	There are developments in the area, particularly around Alaverdi and there are existing hydroelectric schemes. It is unlikely that any further major projects / activities are going to be implemented simultaneously in the project area of influence.
• adjacent to or within any of the following environmentally sensitive areas?			
o Cultural heritage site		X	The29 January 2004 N 49-Ն Government Decree defines the list of cultural heritage of the Lori region.[17] There are many historical sites, such as old churches, old castle fences, and cross stones. Several old graveyards exist alongside of the road on the right side of Debed river (e.g., at the start of the Project at km 31+650, north of Alaverdi), but are mostly away from the road. None of these will be disturbed by the planned works. Nevertheless all cultural heritage sites will be identified as "valued sensitive receptor" and will be protected by the special measures in the EMP. Access by construction traffic shall be monitored. An archaeological survey will be carried out in October 2025.
o Legally protected area (core zone or buffer		X	No

[17] http://lori.mtad.am/u_files/file/lori/husharzan2.pdf

SCREENING QUESTIONS	YES	NO	REMARKS
zone)			
o Wetland		X	No
o Mangrove		X	N/A for Armenia
o Estuarine		X	No
o Buffer zone of protected area		X	No
o Special area for protecting biodiversity		X	No
o Bay		X	N/A for the project
B. POTENTIAL ENVIRONMENTAL IMPACTS Will the Project cause…			
• impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		X	No impacts are expected. The area is pre-loaded due to the already existing road.
• disturbance to precious ecology (e.g. sensitive or protected areas)?		X	No
• alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?	X		Work at the river-road interface may cause soil erosion; however, in the Project end-stage, the target is to stabilise the river bank and prevent further erosion. The solutions implemented (rip-rap bank protection, retaining walls etc.) may alter the hydrology of the Debed River and therefore the Consultant has recommended re-running of the hydrological model developed for the Project with the inclusion of the designed solutions.
• deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	X		Potential impact is manageable. Worker camps (if any) shall not be close to the river and it is anticipated that the contractor will rent local accommodation which is connected to sanitary utilities. Temporary impacts including some increased risk of silt runoff and sedimentation, and storage and use of chemicals shall be managed by the special mitigation measures planned in the EMP. A Waste and Material Management Plan will be developed, including sanitary and chemical wastes.
• increased air pollution due to project construction and operation?	X		Since the road exists, the additional impact during construction will be minor. There will be no additional impact during operation. Routine temporary impact typical for asphalt pavement, and chemicals from asphalt processing. Regular mitigation measures (including to prevent propagation of dust) envisaged in the EMP will manage the impact.
• noise and vibration due to project construction or operation?	X		Yes, construction will cause noise and is likely to cause vibration; however, solutions will be selected which minimise these impacts. It is not expected that heavy plant will be installed on site for construction. Special mitigation measures shall be designed to manage the impact and shall be included in the EMP.

SCREENING QUESTIONS	YES	NO	REMARKS
			There will be no additional impact during operation.
• involuntary resettlement of people? (physical displacement and/or economic displacement)	X		It is assumed that some land acquisition will be required, but due to the solutions under consideration and their locations, there will be no involuntary resettlement. A Land Acquisition and Resettlement Plan will be prepared for economic displacement.
• disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	N/A for the project area
• poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STIs and HIV/AIDS) from workers to local populations?	X		Worker camps (if any) shall not be close to the river and it is anticipated that the contractor will rent local accommodation which is connected to sanitary utilities. Work sites are relatively small-scale. Regular mitigation measures in the EMP will manage the impact.
• creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?		X	No impacts are expected.
• social conflicts if workers from other regions or countries are hired?		X	The probability that the risk will materialize is negligible. The works contractor will be encouraged (via the tender documents) to give preference to the local work force, as well as to hire a social specialist to manage conflicts (if any).
• large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	No impacts are expected.
• risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		The main risks are work close to the river and at a trafficked main road. In addition, the river and other watercourses are polluted by effluent discharge. A Traffic Management Plan will be developed to enhance safety around worksites. The contractor will be required to develop a Health and Safety Plan as part of its Site-Specific Environmental Management Plan (SSEMP) to manage Project and site-specific risks.
• risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and	X		During construction there will be transport of equipment, materials, and waste to-and-from work sites. There will be no additional impact during operation.

SCREENING QUESTIONS	YES	NO	REMARKS
other chemicals during construction and operation?			
• community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	Work sites will be next to the existing trafficked road; therefore a Traffic Management Plan will be developed to enhance safety at these areas. Access to sites by pedestrian and vehicles will be restricted where possible, and warning signs provided. The safety of the road will be significantly enhanced for operation due to the incorporation of road safety measures in the design.
• generation of solid waste and/or hazardous waste?	X		Excavation of soil/earth. Removal of damaged reinforced concrete elements, walls, and asphalt, which needs to be disposed in compliance with national regulations.
• use of chemicals?	X		Chemicals typically used for civil works, e.g., additives for concrete, epoxy paint, diesel, thermoplastic paints for road markings.
• generation of wastewater during construction or operation?		X	None expected. Concrete mixers shall not be washed-out on site.

Checklist for Preliminary Climate Risk Screening

Country/Project Title: Armenia: Rehabilitation of the M6 Road

Sector : Urban Development

Division/Department: Environment and Safeguards Division (RSES)

SCREENING QUESTIONS		SCORE	REMARKS[18]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	2	The rehabilitation of the M6 road is a reaction to the flooding and resultant damage in 2024, which was recognised as an extreme climate event.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	2	The project design considers a 200-year flood recurrence period, since the 2024 flood is estimated as a 180-year event. As these estimates are associated with considerable uncertainty, which will increase in the face of climate change, we recommend a wider water management approach (i.e. proper disaster risk reduction, including flood forecasting), next to structural measures..
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	All construction material will be required in accordance with the standards that integrate the weather-related parameters.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	1	Maintenance of e.g. culverts, channels, torrent barrier, and implementing of a flood forecasting / warning system (including measuring devises) is essential.
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No, since the solutions themselves are developed to handle current and future climate conditions.

[18] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

RESPONSE	SCORE
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): **High**

Other Comments: **None**

Prepared by: **Alisa Savadyan, Klaus Schneeberger**

Appendix B: Biodiversity Report (Flora)

REPORT ON THE BOTANICAL SURVEY OF 30 SECTIONS OF THE M6 HIGHWAY (VANADZOR-BAGRATASHEN) SUBJECT TO RESTORATION AND IMPROVEMENT DUE TO DESTRUCTION AS A RESULT OF FLOODING

Flora of Armenia

Armenia is part of the Caucasus (a hot spot of Earth's biodiversity) and is one of the most important territories in terms of the richness of plant diversity.

Currently, the algoflora of Armenia contains 497 species of land and water algae, which are included in 131 genera. Summarizing the literary sources available to us and the research data of recent years, it was found that diatom (Bacillariophyta) algae prevail in different ecosystems of the territory of Armenia. In the second place are blue-green (Cyanophyta) algae or cyanobacteria, green (Chlorophyta) and yellow-green (Xantophyta) algae are present in significant numbers. Euglenophyta, Dinophyta and Chrysophyta are found in a small number of species.

According to the latest lichenological studies, 619 lichenized fungi taxa have been reported from the Republic of Armenia so far.

Over the years, studies of the bryoflora of Armenia documented 433 species of mosses belonging to 168 genera and 65 families. Of these, 50 species (28 genera, 20 families) are from Liverworts and 383 species (140 genera, 45 families) from Mosses.

Armenia has over 3,800 species of vascular plants, which makes up more than half of the flora of the entire Caucasus. A characteristic feature of the flora is the absolute predominance of both the number of species and genera of angiosperms - about 97%. Club mosses, horsetails and ferns are represented by 39 species, and gymnosperms - only nine species. Among angiosperms, dicots completely predominate - about 80% species.

Moreover, all the main ecosystems of the Caucasus are represented here (except for the ecosystems of humid subtropics).

Area of M6 Highway

The M6 highway passes through the territory of the Lori and Tavush regions or the Lori and Ijevan floristic regions of Armenia.

Lori and Tavush regions are considered among the greenest areas of the republic with large territories covered by forests, about 62% of total amount of forest in Armenia is located in the northeast part of the republic mostly covered with oak, beech, and hornbeam trees.

The forest plant diversity of Armenia is evident from the many species of trees (125 species), shrubs (111), small shrubs (30), semi-shrubs (48) and woody lianas (9). Forest vegetation in the republic occurs mainly at altitudes of 500–2000 m a.s.l., while in some areas forests grow up to 2400 m a.s.l., forming so-called park forests. The main forest areas of the republic are confined to the northern (62%) and southern (36%) regions, the central part of Armenia being much less afforested (2%). The main forest-forming species in Armenia are *Fagus orientalis, Quercus iberica* and *Q. macranthera,* and partly *Carpinus betulus* and *Carpinus orientalis*. In general, forest communities in Armenia occur in the foothills and the lower and middle mountain belts at slopes with inclinations of 20–25°. The timberline reaches up to 2300–2400 m a.s.l., though individual trees occur above the upper timberline till altitudes of 2700–2800 m a.s.l. Oak and beech forests are most dominant, and are located at altitudes of 1300–2000 m a.s.l. The stands dominated by *Pinus kochiana, Taxus baccata, Corylus colurna* and other rare tree species decreased

considerably in this area in historic time (Main populastions of these species occur in Lori and Idjevan floristic regions). At present they occur in patches or as sporadic trees. Moreover, *Taxus baccata* and *Corylus colurna* which occur in small populations, are remarkable relict elements. The forest ecosystems are very diverse but occupy only about 10% of the territory of Armenia. We can distinguish riparian and gallery woodland dominated by *Populus* spp. and *Salix* spp., Irano-Anatolian mixed riverine forests (dominated by *Platanus orientalis* and *Populus euphratica*), *Fagus orientalis* forests, non-riverine woodland with *Betula, Sorbus, Quercus iberica, Q. macranthera, Carpinus betulus, Fraxinus oxycarpa, Acer* spp., *Tilia cordata, T. caucasica, Ulmus* spp., *Pinus kochiana*, and *Taxus baccata*. About 20 locally endemic species are growing in the forests of Armenia, e.g. *Colchicum goharae, Merendera mirzoevae, Psephellus debedicus, Psephellus zangezuri* and *Pyrus elata*. The open oak forests are important ecosystems in Armenia. *Quercus araxina* occurs only in the South Zangezur and Megri floristic regions in the lower montane belt, up to 1100 m a.s.l.

Within the Lori and Ijevan floristic regions, in the immediate vicinity of the M-6 highway, oak (*Quercus iberica*) and beech (Fagus orientalis) forests are mainly represented (Fig. 1 and 2). In small areas there are natural pine (*Pinus kochiana*) forests (Fig. 3).

Fig. 1. Oak (*Quercus iberica*) forest

Fig. 2. Beech (*Fagus orientalis*) forest

Fig. 3. Pine (*Pinus kochiana*) forest

These regions have the variety of ecosystems on the various mountain belts and altitudes, including mountainous plateau, alpine zone, mountain steppe, subalpine meadows, river valleys, etc. Dozens of wild relatives of domesticated plants are native to these regions.

Lori floristic region covers the entire Lori plateau, the southern border runs along the watershed of the Bazum ridge, the eastern border - along the watershed of the Lalvar and Lejan mountains, in the west along the Javakh ridge there is a border with the Upper Akhuryan floristic region, the northern border coincides with the state border of Armenia with Georgia. The flora of Lori floristic regions consists of 1280 species of vascular plants.

Idjevan floristic region covers the basins of the Aghstev and Debed rivers, as well as the former Shamshadin administrative region north of the Sevan ridge. Flora of Ijevan floristic region consists of 1550 species of vascular plants.

During previous survey of vegetation near the M6 highway carried out in 2016, 48 species of vascular plants from 31 genera and 21 families were identified. We have to add to these figures more two species, which are included in the Red Data book of plants of Armenia: *Jurinea praetermissa* (EN) and *Adianthum capillus-veneris* (VU) (Fig. 4 and 5).

Fig. 4. *Jurinea praetermissa*

Fig. 5. *Adianthum capillus-veneris*

The following ecosystems are common in the immediate vicinity of the M-6 highway.

C2.2 - Permanent non-tidal, fast, turbulent watercourses (Fig. 6)

This ecosystem is permanent water course with fast-flowing turbulent water and their associated animal and microscopic algal pelagic and benthic communities. The bed is typically composed of rocks, stones or gravel with only occasional sandy and silty patches.

Fig. 6. Permanent non-tidal, fast, turbulent watercourse of Debed river

C2.3 - Permanent non-tidal, smooth-flowing watercourses (Fig. 7 and 8)

These are permanent water courses with non-turbulent water and their associated animal and microscopic algal pelagic and benthic communities. The bed is typically composed of sand or mud. Some parts of Debed river are considered as such ecosystems (especially in summer before rainy period).

Fig. 7 and 8. Permanent non-tidal, smooth-flowing watercourses of Debed river

G1.1143 – Armenian willow galleries (Fig. 9)

Habitats are common in Armenia; they are represented near all big rivers (including Debed river) in lower and middle mountain belts. *Salix alba, S. excelsa, S. caprea, S. armeno-rossica, S. triandra, S. pseudomedemii* usually are dominants in these communities.

Fig. 9. Armenian willow gallerie (Debed river)

J4.21 – Road-bed (Fig. 10).
M6 Highway has asphalt covering.

Fig. 10. Road bed of Highway M6

J4.22 – Roadsides
The wide of roadsides depends on the relief – up to 2-2,5 m.

J4.23 – Mountain roads escarps (Fig. 11)
Escarps near mountain roads were built during roads building or enwidening. They can be bare or vegetated. Their height may be up to 15-20 m]

Fig. 11. Road's escarp

Survey of the M6 Highway

The botanical survey was conducted on September 4-5, 2025. The work was carried out by the route method with visits to all 30 allocated areas where restoration and/or work to prevent further destruction of the roadbed will be carried out. During the survey, attention was primarily paid to the presence/absence of rare species included in the Red Data Book of Plants of Armenia. During the survey, species growing along the side of the road and areas between the road and the Debed River were identified. Particular attention was paid to woody plant species, which significantly reduce soil erosion and roadbed collapse.

Almost all areas have sections that are completely devoid of vegetation. In the future, they may begin to be overgrown with mainly annual, weed, invasive plants.

31. Location (km position) - 31+675-32+765 (Fig. 12)

The area between the highway and the Debed River is mostly represented by a pile of large stones, without vegetation. There are individual trees (or groups of 3-4 trees) – *Ulmus elliptica, Salix alba, Salix excelsa, Populus nigra.* Shrubs – *Prunus divaricata,* abundantly developed creeping branches of *Rubus caesius.* In addition, there is an abundance of growth of invasive alien species *Ailanthus altissima* here. Number of trees on the site – 14.

Fig. 12. Site 1.

32. Location (km position) – 33+030

A short patch where a few specimens of an invasive plant *Ailanthus altissima,* and *Populus nigra* grow. Abundantly grow *Rubus caesius,* liane *Humulus lupulus* (Fig. 13) and invasive alien species *Ambrosia artemisiifolia.* Number of trees on the site – 0.

Fig. 13. *Humulus lupulus* on the Site 2.

33. Location (km position) - 33+165-33+860

There is no woody vegetation, a pile of large stones. Of the herbaceous plants, individual specimens of weeds and invasive species are here – *Ambrosia artemisiifolia, Conyza canadensis, Portulaca oleracea, Achillea millefolia.* Number of trees on the site – 1

34. Location (km position) - 33+920-33+970

The woody plants on the site include invasive species *Ailanthus altissima, Robinia pseudoacacia.* Of the herbaceous plants, individual specimens of weeds and invasive species – *Ambrosia artemisiifolia, Conyza canadensis, Artemisia vulgaris.* Number of trees on the site – 3

35. Location (km position) – 35+060-35+160

As in section 4, predominantly invasive species are represented: *Ailanthus altissima* and *Robinis pseudoacacia.* There are *Rubus caesius, Humulus lupulus.* Number of trees on the site – 2

36. Location (km position) - 35+250-35+760

As in sections 4 and 5, predominantly invasive species are represented: *Ailanthus altissima* and *Robinis pseudoacacia.* There are *Rubus caesius, Humulus lupulus.* Of the herbaceous plants *Ambrosia artemisiifolia, Conyza canadensis, Melilotus officinalis, Setaria viridis.* Number of trees on the site – 3

37. Location (km position) - 37+100-37+150 (Fig. 14)

Among the woody plants are represented: *Ulmus elliptica* and *Ulmus suberosa.* The slope is heavily overgrown by *Rubus caesius.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 8.

Fig. 14. Site 7.

38. Location (km position) - 37+510 - 37+800

Among the woody plants are represented: *Ulmus elliptica, Ulmus suberosa* and *Salix alba.* There are *Rubus caesius* and *Humulus lupulus.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 4.

39. Location (km position) - 38+400 -38+450

Among the woody plants are represented: *Ulmus elliptica* and *Ulmus suberosa.* There are *Rubus caesius* and *Humulus lupulus.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 2

40. Location (km position) - 39+100-39+350

The woody plants are represented by shoots of *Ulmus suberosa, Salix caprea, Robinia pseudoacacia.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 0.

41. Location (km position) - 55+950-56+270

There are dense thickets of *Robinia pseudoacacioa, Ailanthus altissima* and *Ulmus elliptica* on the site. Of the herbaceous plants there are dense populations of *Ambrosia artemisiifolia,* and *Conyza canadensis,* as well there are weeds *Amaranthus retroflexus, Datura stramonium.* Number of trees on the site –28.

42. Location (km position) - 56+450-56+540

Continuation of the previous section with thickets of *Robinia pseudoacacia, Ailanthus altissima* and *Ulmus elliptica.* Number of trees on the site – 3.

43. Location (km position) - 56+900-57+050

Continuation of the previous section with thickets of *Robinia pseudoacacia, Ailanthus altissima* and *Ulmus elliptica*. Number of trees on the site – 3.

44. Location (km position) - 57+230-58+340

Individual specimens of woody plants (*Acer campestre* and *Ulmus elliptica*) are presented, as well very dense tickets of invasive *Ambrosia artemisiifolia* (Fig. 15). Number of trees on the site – 10.

Fig. 15. *Ambrosia artemisiifolia* on the Site 14.

45. Location (km position) - 58+990-59+070

Continuation of the previous section with the same set of plant species. Number of trees on the site – 0.

46. Location (km position) - 60+560-60+640

Dense growths of *Robinia pseudoacacia* along the road. The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 2

47. Location (km position) – 61+050-61+240

From woody plants thickets of *Ulmus elliptica, Ulmus suberosa, Populus nigra.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 8.

48. Location (km position) – 63+305-63+330

There is no woody vegetation. The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 0.

49. Location (km position) – 63+450-63+610

There is no woody vegetation. The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 0

50. Location (km position) – 66+650-66+965

The area is within the city of Akhtala. Relatively many *Salix alba*, represented *Populus nigra, Ulmus elliptica, Ulmus suberosa.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 10

51. Location (km position) – 67+050-67+300

The area is within the city of Akhtala. There is no woody vegetation. Dense tickets of *Ambrosia artemisiifolia.* Number of trees on the site – 0.

52. Location (km position) – 67+360-67+620

The area is within the city of Akhtala. There is no woody vegetation. The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 0

53. Location (km position) – 71+090

Solely samples of *Salix alba* and *Robinia pseudoacacia.* The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 8.

54. Location (km position) – 71+250-71+400

Solely trees of *Robinia pseudoacacia,* among which there are a small number of *Ficus carica* shrubs. The herbaceous plants include weeds that are common in disturbed habitats. Number of trees on the site – 3.

55. Location (km position) – 76+300-76+370

The site is within the village of Chochkan. There is no woody vegetation. Herbaceous plants include weeds, common in disturbed habitats. Number of trees on the site – 0

56. Location (km position) – 84+570-84+640

Dense tickets of *Robinia pseudoacacia,* there individual trees of *Salix alba, Populus nigra, Ulmus suberosa, Ulmus elliptica. Ambrosia artemisiifolia* is very abundant. Number of trees on the site – 6.

57. Location (km position) – 84+880

Continuation of the previous section with the same set of woody plants. Herbaceous plants include weeds, common in disturbed habitats. Number of trees on the site – 5.

58. Location (km position) – 85+050

Continuation of the previous section with the same set of woody plants. Herbaceous plants include weeds, common in disturbed habitats. Number of trees on the site – 7.

59. Location (km position) – 85+540-85+620 (Fig. 16)

Very dense tickets with *Robinia pseudoacacia, Salix alba, Populus nigra, Ulmus suberosa, Sambucus nigra.* Ailanthus altissima, Prunus spinosa, Corylus avellana, Juglans nigra are represented by individual specimens. Invasive Ambrosia artemisiifolia and Conyza canadensis are abundantly represented. Number of trees on the site – 10.

Fig. 16. Site 29.

60. Location (km position) – 85+670-86+200

Continuation of the previous section with the same set of species. Number of trees on the site – 0.

Conclusion

According to the results of the field survey of the areas along the M6 Vanadzor-Bagratashen highway subject to restoration and reconstruction, it was established that there are no rare, endangered species included in the Red Book of Plants of Armenia. Woody vegetation is represented either by plants previously used as roadside forest plantations or by common species that are part of the coastal vegetation. In addition, the overgrown alien invasive species *Ailanthus altissima* and *Robinia pseudoacacia* are abundant. Among the herbaceous plants, only weeds are represented, characteristic of disturbed habitats, and the invasive species *Ambrosia artemisiifolia* and *Conyza canadensis* are abundant.

I consider that the planned work will not cause damage to the plant component of natural ecosystems and will not affect the populations of rare species of vascular plants of the Armenian flora.

Head of Department of Geo-botany and Ecological physiology
of the Institute of Botany after the name of A. Takhtajyan NAS RA,
Doctor of Biology, Professor
G. Fayvush

08.09.2025

Appendix C: Biodiversity Report (Fauna)

REPORT

On the zoological study of 30 sections of the M6 highway from the city of Vanadzor to the village of Bagratashen, located on the border with Georgia. The study mainly covered all sections of the road subject to restoration and improvement following the damage caused by the spring flood.

Material and Methods

Zoological surveys along the M6 highway were conducted using the transect (route) method, covering all 30 designated sections where construction and restoration works are planned. The surveys mainly focused on areas extending from the roadbed towards the river.
During the assessment, special attention was given to the presence or absence of rare species included in the Red Data Book of Animals of Armenia.
In addition to data collected during the short-term field assessment trip (10–11 September 2025) to the study area, this report also includes available information on previous research conducted in these areas, as well as accessible scientific sources relevant to the region (reference sources, various reports, and the scientific collections of the Institute of Zoology). During the data collection process, the following available literature and material were reviewed: Dahl S.K. (1954), Heptner V.G. *et al*. (1967), Martirosyan B.A., Papanyan S.B. (1983), Bibikov D.I. (1985), Agadzhanyan F.S. (1986, 1993), Ghasabyan M.G. (1986, 2001, 2014), Popov G.Yu. (2003), Avagyan A.V. (2010), Adamian M.S. & Klem D. Jr. (1999, 2000), *Red Data Book of Animals of Armenia* (1987, 2010), ASPB reports on IBA territories (http://bird-links.org/important-bird-areas/), and preliminary data from the "EMERALD" network in the Republic of Armenia (2016, 2019).

General Description of the Study Area

Armenia is part of the South Caucasus and one of the most important regions in terms of biodiversity richness. The country's territory encompasses nearly all of the main ecosystems of the Caucasus. Armenia hosts more than 3,800 species of vascular plants—over half of the entire Caucasus flora—as well as more than 550 species of vertebrate animals (birds, mammals, amphibians, reptiles, and fish). The segments of the M6 highway due for restoration run mainly through the Lori region and closer to the border with Georgia, cross into the northwestern part of the Tavush region.

The Lori and Tavush regions are considered among the most wooded areas of the republic, with extensive forest cover. About 60% of Armenia's total forest resources are concentrated in the northeastern part of the country, consisting primarily of oak, beech, and hornbeam forests. In addition to forests, these regions are notable for the diversity of their ecosystems across different mountain belts and altitudes, including river gorges, mountain steppe, highland plateaus, subalpine and alpine meadows, and more.

Lori Region

The Lori region fully encompasses the basin of the Debed River. It is characterized by extensive mountain ranges, terraced slopes, and deep canyons. The Pambak Basin and the Lori Plateau stand out, separated from one another by the Bazum mountain range. The Lori Plateau is represented by open meadow-steppe landscapes with scattered forest plantations and sparse shrub vegetation. The plateau is also abundant with wet meadows and bogs, as well as a few small relict lakes. Throughout much of the plateau, there are cultivated lands such as orchards and crop fields. The main watercourse of the region is the Debed River with its principal tributaries—the Dzoraget, Pambak, and Marts. The area is also rich in mineral springs. Originating at the junction of the Pambak and Dzoraget rivers, the Debed River flows rapidly through a deep gorge for many kilometers and only near the Georgian border does it transition into a slow-flowing lowland river. This combination of landscapes and vegetation largely determines the composition of vertebrate species inhabiting the Lori region.

The diverse ecosystems of the region support a wide variety of bird species. In forested areas with well-developed undergrowth, passerines such as redstarts, flycatchers, tits and others predominate. Various pigeons, thrushes and woodpeckers are found both in dense stands of tall forest and in small remnant forest patches within narrow valleys.

Woodlands are also abundant in birds of prey - both diurnal and nocturnal. Species such as the Goshawk (*Accipiter gentilis*), Eurasian sparrowhawk (*Accipiter nisus*), European honey buzzard (*Pernis apivorus*), Common buzzard (*Buteo buteo*) and Long-eared owl (*Asio otus*) are common in the forests of Lori. Species typical of mountain-steppe including ground- and shrub-nesting birds, are also abundant. Larks, wheatears, wagtails and various shrikes nest in large numbers in shrubs and on the ground under grassy vegetation. Almost all gallinaceous species occur in the mountains of the region. The Caspian snowcock (*Tetraogallus caspius*) occurs in high-altitude zones, the Caucasian black grouse *(Tetrao mlokosiewiczi)* is found at the upper tree line in the subalpine belt, while grey partridge and quail are numerous in meadows and mountain steppe. Species such as Long-legged Buzzard (*Buteo rufinus*), kestrel, red-listed vultures, Golden eagle (*Aquila chrysaetos*) and Peregrine falcon (*Falco peregrinus*) nest in rocky outcrops and river gorges. Small lakes and wetlands host both resident waterbird species and migratory birds passing through the region, including herons, geese, ducks, and waders. During spring and autumn migration, large birds of prey and two species of red-listed cranes are commonly observed in the region.

The mammals inhabiting the Lori region include members of most families found throughout Armenia. Among the large predators, bears occur in the forest belt and in high-altitude areas. Wild boar (*Sus scrofa*) and Roe deer (*Capreolus capreolus*) are also common. Species such as Lynx (*Lynx lynx*), Stone marten (*Martes foina*) and European badger (*Meles meles*) occur both in the forest and mountain-steppe areas. Wolves (*Canis lupus*), Foxes (*Vulpes vulpes*) and hares (*Lepus europaeus*) are found across almost all altitudinal landscape zones, from the highlands to the lower plateaus. Golden Jackal (*Canis aureus*), which has recently become widely common across the country is mainly found along river valleys and wetlands and occasionally frequents into human settlements. Small mammals, including insectivores and rodents, are also common. The Southern White-breasted Hedgehog (*Erinaceus concolor*) and Forest dormouse (*Dryomys nitedula*) occur both in small tree plantations and orchards. The Persian squirrel (*Sciurus anomalus)* is a common denizen of forest in the region. Forest mouse (*Apodemus sp.)*, Major's pine vole (*Microtus majori)* and Common vole (*Microtus arvalis*) are widely spread across much of the habitat landscapes of the region, while Grey dwarf hamster (*Nothocricetulus migratorius*) is regularly seen in human settlements. During twilight and nighttime, some bat species can be spotted chasing nocturnal insects in the region's mid-altitude zones and certain settlements. One of these species, the Brown Long-eared Bat (*Plecotus auritus*), is included in the Red Data Book of Armenia.

Amphibians and reptiles are also well represented throughout the region. Green toad (*Bufo viridis)*, Shelkovnikov's tree frog (*Hyla arborea schelkownikowi*), Long-legged wood frog (*Rana macrocnemis*) and Marsh frog (*Pelophylax ridibundus*) are found nearly across all wetlands and water bodies. The slowworm, several species of rock lizards (*Darevskia* sp.) and the Caucasus emerald lizard (*Lacerta strigata*) are also frequently encountered. Among snakes, the most commonly encountered are the Grass Snake (*Natrix natrix*), Dice Snake (*N. tesselata*), Transcaucasian Ratsnake (*Zamenis hohenackeri*) and Smooth Snake (*Coronella austriaca*). The venomous snakes occurring in the region include the Steppe viper (*Vipera eriwanensis*).

Tavush Region is the only region in Armenia that borders both Georgia and Azerbaijan. To the west, it is bounded by Lori Region and by Gegharkunik Region to the north.

Tavush is the most forested region in Armenia, with more than half of its territory covered by forests. The main forest stands are dominated by hornbeam (*Carpinus*), beech (*Fagus*), and oak (*Quercus*). Mixed forests, incorporating coniferous species, are found on the northern slopes of the Areguni Ridge, whereas maple (*Acer*) and ash (*Fraxinus*) dominate at lower elevations. Central parts of the region are characterized by open juniper (*Juniperus*) woodlands with xerophytic vegetation spanning lower altitudes. Along the border with Azerbaijan, the lowest parts of the region support scattered semi-desert plant communities.

Tavush Region features numerous rivers, the largest being the Aghstev, along with its tributaries: Getik, Voskepar, and Sarnajur. Originating in the Miapor Mountains, rivers such as the Akhum, Tavush, and Khndzorut traverse picturesque valleys before joining the Kura River. The region also hosts several small forest lakes, among them are Lake Parz and Lake Gosh, renowned for their remarkable natural beauty. In comparison to Lori Region, Tavush has far fewer wetlands and moist meadows. A large portion of the region is encompassed by Dilijan National Park. The landscape and diversity described above, similar to those in Lori Region, largely determine the composition of the vertebrate fauna in Tavush.

The diverse ecosystems of Tavush Region support a wide variety of bird species. In forested areas with a well-developed understory, passerines such as redstarts and tits are predominant. Various pigeons, thrushes, and woodpeckers occur in small residual forest patches along narrow canyons. Forested habitats are also rich in both diurnal and nocturnal birds of prey. Booted Eagle (*Hieraaetus pennatus*), Eurasian Sparrowhawk, European Honey Buzzard, Common Buzzard and Long-eared Owl are also common in Tavush forests. Skylarks, wheatears, wagtails and various shrikes nest in shrubs and on the ground under herbaceous vegetation. Grey Partridge (*Perdix perdix*) and Common Quail (*Coturnix coturnix*) are abundant in meadows and montane steppes. The Caspian Snowcock can occasionally be found at higher elevations, while Caucasian black grouse is still present at the upper tree line in the subalpine zone.

Rock outcrops within forested areas and montane steppes provide nesting sites for Long-legged buzzard, kestrel as well as red-listed Egyptian Vulture (*Neophron percnopterus*), Griffon Vulture (*Gyps fulvus*), Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*). During autumn and spring migrations, large-size raptors are frequently observed crossing the skies over the entire region.
Mammals inhabiting Tavush Region include many of the families found across Armenia. Among large predators, Brown Bear (*Ursus arctos*) occurs in forested and high-mountain zones. The Eurasian Lynx (*Lynx lynx*), Stone Marten (*Martes foina*) and European Badger (*Meles meles*) are found in both forest and montane-steppe belts. Wild boar (*Sus scrofa*) and Roe deer (*Capreolus capreolus*) are permanent residents of the region's forests. Wolves (*Canis lupus*), foxes (*Vulpes vulpes*) and hares (*Lepus* spp.) are present across almost all altitudinal belts, from highlands down to the lowland plateaus. In river valleys, Golden Golden Jackals (*Canis aureus*), which have recently expanded their range, are frequently observed and occasionally venture into human settlements. And of course, small mammals occur widely throughout the region. The Southern White-breasted Hedgehog and Forest Dormouse (*Dryomys nitedula*) occur in both small tree plantations and orchards. The Persian Squirrel (*Sciurus anomalus*) is a common forest dweller in Tavush. Forest mouse (*Apodemus sp.*) and Common Vole are abundant across multiple habitats, while the Grey dwarf hamster is regularly seen in human settlements. During twilight and nighttime, bats can be observed flying along river valleys and within settlements.

Reptiles and amphibians are widely represented throughout the region. the Long-legged wood frog and Marsh frog, Green toad and Shelkovnikov's tree frog are found in nearly all wetlands and water bodies. Caspian turtle (*Mauremys caspica*) is found in the lower reaches of the Debet River. European glass lizard (*Pseudopus apodus*), Caucasian agama (*Paralaudakia caucasia*), several species of rock lizards and Medium lizard are regular residents of their typical habitats. The snake fauna is represented by the Blindsnake (*Xerotyphlops vermicularis*), Dice snake and Dahl's whipsnake (*Platyceps najadum*), whereas the Caucasian catsnake (*Telescopus fallax*) occurs less frequently. Among venomous snakes, the Levant or Blunt-nosed viper (*Macrovipera lebetina*) is present.

Results of the survey along Highway M6
Location 1
(km 31+675 – 32+765) (Fig. 1)

The stretch between the highway and the Debed River is dominated by large boulders with only scant herbaceous cover in the gaps. A small cluster of trees hosted Black Redstart (*Phoenicurus ochruros*) and Common Blackbird (*Turdus merula*), while migrating leaf warblers (*Phylloscopus* spp.) may occur during passage. The terrain likely supports the forest mouse (*Apodemus spp.*), and the European water vole (*Arvicola amphibius*) may be present in the river. Among predators, only Golden Golden Jackal is expected to descend to the river in search of fish remains, edible scraps carried by the river downstream or small rodents. A rock lizard species was observed on the retaining wall.

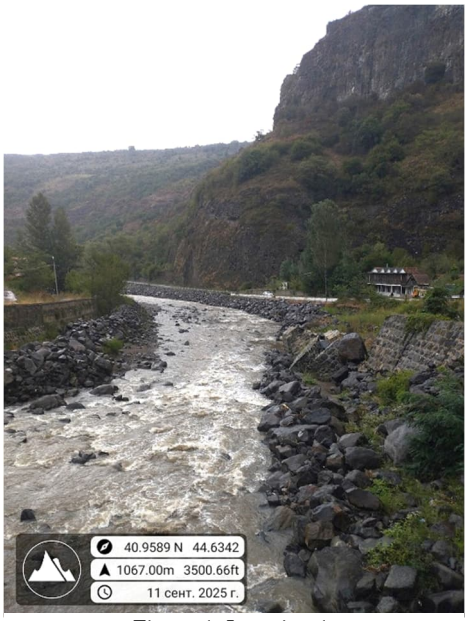


Figure 1. Location 1.

Location 2
(km 33+030) (Fig.2)
A small site represented with patches of blackberry thickets and vine-like creeping stems, interspersed with low herbaceous vegetation among piled stones along the riverbank. Avifauna observed included White wagtail (*Motacilla alba*), Green sandpiper (*Tringa ochropus*) and White-throated Dipper (*Cinclus cinclus*) perched in a midstream boulder in the river. A rock lizard species was observed on a fragment of asphalt from a collapsed section of the road. Golden Golden Jackal tracks were also documented.

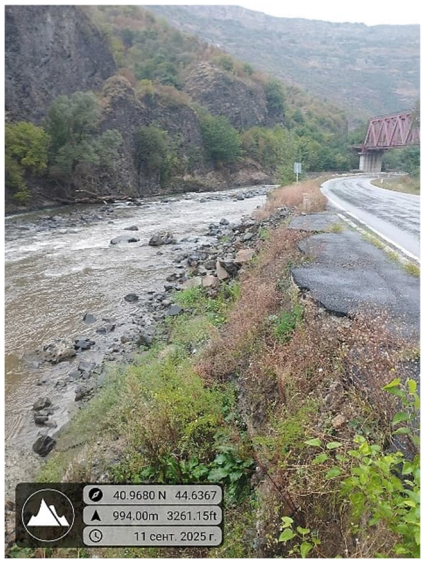


Figure 2. Location 2.

Location 3
(km 33+165 – 33+860) (Fig. 3)
Throughout the surveyed section, extending from the road to the river, the habitat is largely represented by piles of deposited large stones. Magpie (*Pica pica*) was spotted amidst branches of a single tree growing in the middle of the area. In sparse vegetation, three European goldfinches (*Carduelis carduelis*) feeding on seed of dry stalks and Black redstart were observed. From boulders on the right bank, Little Egret (*Egretta garzetta*) flew off to the left bank. Near small structures, Grey dwarf hamster was recorded, along with tracks of a Red fox. Rock lizards were also noted on the walls of the buildings and along the roadside verge.

Figure 3. Location 3.

Location 4
(km 33+920 – 33+970)
No vertebrate species were recorded in this section.

Location 5
(km 35+060 – 35+160)
Within small thickets of Tree of Heaven (*Ailanthus altissima*) and Locust (*Robinia pseudoacacia*), Common blackbird was observed. Blackberry thickets hosted Red-backed Shrike (*Lanius collurio*), Common Redstart (*Phoenicurus phoenicurus*) and Eurasian Wren (*Troglodytes troglodytes*). Tracks and scat of the Golden Jackal were spotted in the mud near the water. Marsh frog was found hiding under a stone in a small silted section of the river.

Location 6
(km 35+250 – 35+760)
From trees on the opposite slope, a **S**ong Thrush (*Turdus philomelos*) crossed the road and entered thickets of Locust, foraging for insects among the branches. **C**ommon Kestrel (*Falco tinnunculus*) took off from the same slope and headed downward along the right bank of the river. Rock Buntings (*Emberiza cia*) were recorded in grassy vegetation. **C**rag martins (*Ptyonoprogne rupestris*) were seen flying over the river in the lower sections of the surveyed segment. Golden Jackal tracks were spotted along the shores. Several years ago, Eurasian otter (*Lutra lutra*) was captured near this location, although it was never reported from here previously, neither in existing literature sources nor from local residents. Subsequently, no further evidence of the species was found in the Debed river or in the lower reaches of

the Martz River. Stagnant sections of the Debed River supported Marsh frog, while Medium lizard and Rock lizards were recorded in dense stands of grasses along the riverbank.

Location 7
(km 37+100 – 37+150) (Fig. 4)
Among branches of Elm trees, Common Blackbird and Great Tit (*Parus major*) were observed. Common Swifts (*Apus apus*) and House Martins (*Delichon urbicum*) were seen flying over river. Blackberry thickets hosted European Robin (*Erithacus rubecula*) and European Greenfinch (*Chloris chloris*). White Wagtails were seen on broken asphalt. Eurasian Wren and European Goldfinches are also likely to occur in these habitats. As elsewhere along the entire riverbank, tracks of Golden Jackal were recorded. Green Toad and rock lizards were found in shrubs between stones.

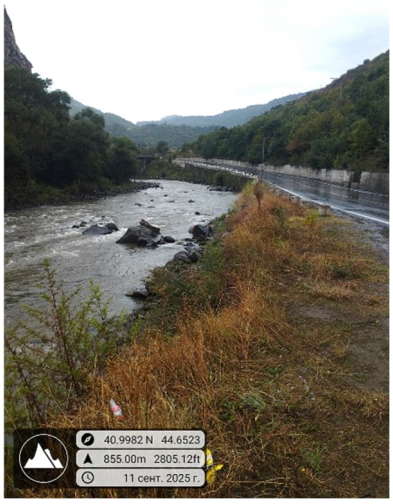


Figure 4. Location 7

Location 8
(km 37+510 – 37+800) (Fig. 5)
In addition to species recorded in the previous section, European Robin and Eurasian Wren were observed in willow trees. Grassy vegetation supported Forest mouse and Medium lizard.

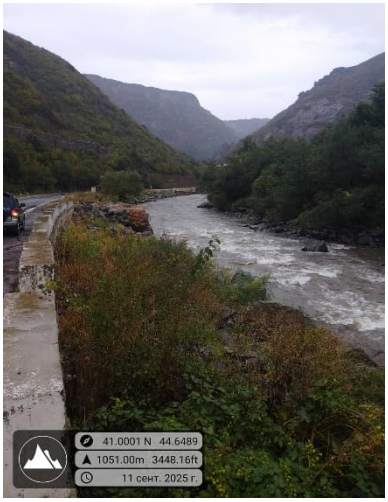


Figure 5. Location 8

Location 9
(km 38+400 – 38+450)
Green Sandpiper was observed along riverbanks, while European Greenfinch flitted among branches of an Elm tree. On dry stalks of herbaceous plants, European Goldfinches were feeding on seeds. Barn Swallows (*Hirundo rustica*) were flying above the river.

Location 10
(km 39+100 – 39+350) (Fig. 6)
White Wagtail, House Sparrow and Common Starling (*Sturnus vulgaris*) were observed on the highway asphalt. A Dice Snake was spotted on a small midstream stone in a calm section of the river, while Marsh Frog was present along riverbanks.

Location 11
(km 55+950 – 56+270)
White wagtail, Common Starling and House Sparrow were observed on asphalt and among ruined structures. Common Sandpiper (*Actitis hypoleucos*) and Grey Wagtail (*Motacilla cinerea*) were present on riverbanks, while House Martin and Common Swift were flying above the river.
In spruce (*Picea* sp.) trees near buildings, Great Spotted Woodpecker (*Dendrocopos major*), European Greenfinch, Eurasian Treecreeper (Certhia familiaris), European Goldfinch, Common Redstart were observed together with

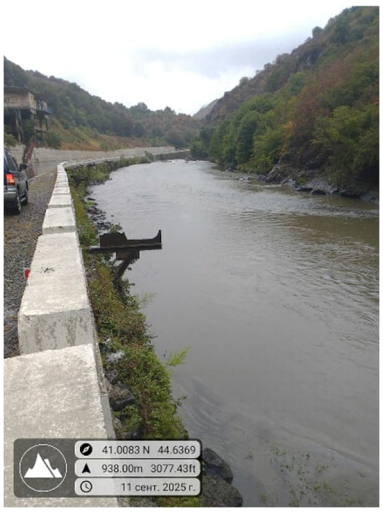


Figure 6. Location 10.

House Sparrow and Eurasian Jay (*Garrulus glandarius*). Great Ttit (*Parus major*) and Eurasian Wren were seen in nearby bushes.
Tracks of Golden Jackal, hedgehog and possibly European Weasel (*Mustela nivalis*) were recorded along the riverbank. Grey dwarf hamster was also noted, while rock lizards were observed among ruined structures and on a retaining wall, and Green Toad was present in grassy vegetation.

Location 12
(km 56+450 – 56+540) (Fig. 7)
White Wagtail, Eurasian Jay, Common Kestrel, House Sparrow and Blue Tit (*Cyanistes caeruleus*) were recorded. Forest mouse (*Apodemus sp.*) occurs in this area and rock lizards and Green Toad were also observed in this section of the road.

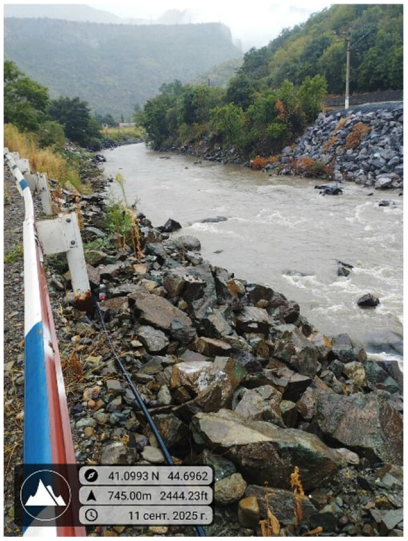


Figure 7. Location 12.

Location 13
(km 56+900 – 57+050)
Common Blackbird, Eurasian Jay, and Great Tit were observed among the dense branches of Elm trees. Along the stones of the riverbank, a White Wagtail was recorded, while in nearby ruins a Magpie, Black Redstart, and House Sparrow were noted. Over the river and adjacent structures, European Bee-eaters (*Merops apiaster*) and House Martins were seen flying. A Grey Dwarf Hamster was observed among the building ruins. Tracks of a Golden Jackal were recorded in the area, and Rock Lizards were also present.

Location 14
(km 57+230 – 58+340) (Fig. 8)
The area is mostly represented by bare riverbanks with scattered boulders and scree stones as well as retaining walls. In the mid part of this road section, nearly 250 meters in length are buildings surrounded by dense thickets of Elm**,** Maple and Willow saplings, along with numerous bushes and herbaceous vegetation.
In this section, Magpie, House Sparrow, Eurasian Jay, Hawfinch (*Coccothraustes coccothraustes*), Grey (*Motacilla cinerea*) and White Wagtails (*Motacilla alba*), European Goldfinch, Rock Bunting (*Emberiza cia*), Long-tailed Tit (*Aegithalos caudatus*) and Eurasian Wren were recorded. House Martin and European Bee-eaters (*Merops apiaster*) were flying in the air.

A Forest Mouse was observed in bushy thickets, and a Grey Dwarf Hamster may occur near buildings. Hedgehog tracks were noted in the mud, and tracks of a Golden Jackal were recorded along the entire site. Rock Lizards were encountered along the ruined retaining walls. During autumn and spring migration, various species of migratory leaf warblers may visit this site.

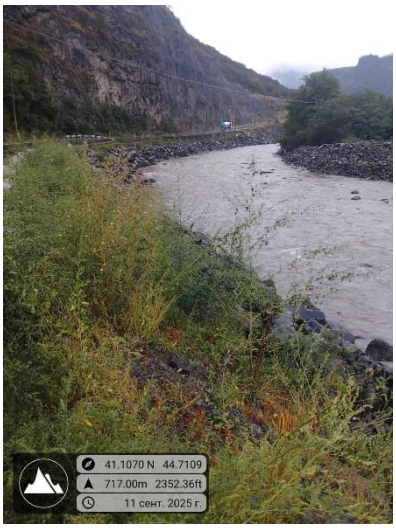


Figure 8. Location 14.

Location 15
(km 58+990 – 59+070)
The site is primarily characterized by a steep riverbank and a retaining wall. At the beginning of the section, a small bushy patch hosted a pair of Red-backed Shrikes. A White Wagtail was observed on the road. Two Common Swifts and a small flock of European Bee-eaters were seen flying above the river. Tracks of a Golden Jackal were found along the remainder of the highway.

Location 16
(km 60+560 – 60+640) (Fig. 9).

The riverbank contained scattered scree stones of various sizes, a retaining wall, a small tree, and sparse grassy vegetation. Common Blackbird and White Wagtail were recorded, while House Martins were seen flying low over the water. Tracks and droppings of a Golden Jackal were noted, and a Grey Dwarf Hamster was observed. A Green Toad was spotted near the road along the riverbank.

Figure 9. Location 16.

Location 17
(km 61+050 – 61+240)
Along the riverbank, dense thickets of Elm, Poplar, and Willow saplings were present, with minimal grassy vegetation. Common Blackbird, Great Tit, European Goldfinch, and Eurasian Jay were observed in the trees. A Willow Warbler was recorded in the bushes. A Rock Lizard was spotted on the retaining wall.

Location 18
(km 63+305 – 63+330)
Carrion Crow (*Corvus corone*), White Wagtail and European Bee-eater were flying above the area, while tracks of a Golden Jackal were noted on the ground.

Location 19
(km 63+450 – 63+610)
Trees were present at the beginning and end of the road section, while the middle section was represented by a bare riverbank. Common Wood Pigeon (*Columba palumbus*), Eurasian Chaffinch (*Fringilla coelebs*) and Common Redstart were recorded in trees. White Wagtail was observed along the riverbank.

Location 20
(km 66+650 – 66+965) (Fig. 10)
A wide section of the riverbank was dominated by Willow, Elm, and Poplar along the shore. Common Wood Pigeon, Eurasian Jay, Great Tit, and Common Redstart were observed in the trees. European Goldfinch and Common Chiffchaff (*Phylloscopus collybita*) were seen in small patches of herbaceous vegetation. Grey Wagtail was noted on the rocky riverbank. Tracks of a Golden Jackal were present throughout the site. Beneath a road bank, a Green Toad was observed, and Rock Lizards were recorded on the retaining wall.

Figure 10. Location 20.

Location 21
(km 67+050 – 67+300)
As in the previous section, trees were present along the riverbank, and the vertebrate fauna observed was similar to that recorded at the preceding site.

Location 22
(km 67+360 – 67+620) (Fig. 11)
A few bushes were present along the riverbank. House Sparrow, Magpie, White Wagtail, and Rock Pigeon (*Columba livia*) were recorded. Tracks of a Golden Jackal and the presence of a Forest Mouse were noted. Rock Lizards and Marsh Frog were also observed.

Figure 11. Location 22

Location 23
(km 71+090)
On a short section of the riverbank, White Wagtail, Magpie, Carrion Crow, and European Bee-eaters were observed. Tracks of a Golden Jackal and a Red Fox were noted. A Green Toad was also present.

Location 24
(km 71+250 – 71+400)
Along the riverbank, locust trees were present, including *Ficus* (*Ficus* sp.) and other low-growing trees, with various herbaceous vegetation. Carrion Crow, Blackbird, and Common Starling were observed in the trees. European Goldfinch was recorded in the herbaceous vegetation. A Sparrowhawk was seen chasing House Sparrows, while House Martins were flying above the river. Tracks of a Golden Jackal were found again, and a Forest Dormouse was observed feeding on fruits in a fig tree. A Striped Lizard was also noted.

Location 25
(km 76+300 – 76+370)
The site consisted of a small, steep riverbank with a damaged retaining wall. A White Wagtail was observed on the shore, and House Sparrows were seen in the ground vegetation.

Location 26
(km 84+570 – 84+640)
Dense thickets of Acacia (*Acacia* sp.), along with Elm, Poplar, and Willow, were present. Low undergrowth and dense herbaceous vegetation covered the area. Carrion Crow, Magpie, Common Buzzard, Common Wood Pigeon, Eurasian Treecreeper, Great Tit, and Tree Sparrow (*Passer montanus*) were observed in this short section of the road. Grey Heron (*Ardea cinerea*) was spotted flying off the sandy shore. Southern White-breasted Hedgehog, Forest Dormouse, and Forest Mouse (*Apodemus* sp.) were noted, along with tracks of a Golden Jackal. Medium Lizard, Green Toad, and Long-legged Wood Frog were also present. Dice Snake was observed in the river.

Location 27
(km 84+880) (Fig. 12)
Rock Dove (*Columba livia*), Common Kestrel, and White Wagtail observed on the asphalt were recorded in this road section. Beneath a steep bank, a Northern Wheatear (*Oenanthe oenanthe*) was observed. Great Cormorants (*Phalacrocorax carbo*) were flying

Figure 12. Location 27.

above the river, and tracks of a Golden Jackal were found along the road.

Location 28
(km 85+050)
Common Buzzard, Common Wood Pigeon, Great Spotted Woodpecker, Song Thrush, Common Redstart, Common Chiffchaff, and Eurasian Jay were observed. Grey Heron and Little Egret were seen flying off the riverbank. Tracks of a Golden Jackal and the presence of a Forest Dormouse were also recorded. A Green Toad was present as well.

Location 29
(km 85+540 – 85+620)
Common Wood Pigeon, Eurasian Jay, Blackbird, European Robin (*Erithacus rubecula*), Common Redstart, and Great Tit were observed in thickets of trees growing beneath the road. Common Sandpiper and Great Cormorant were also recorded along the shores. Tracks of a Golden Jackal were noted. Marsh Frog and Dice Snake were present in the river.

Location 30
(km 85+670 – 86+200)
This is one of the longest and most diverse sections of the survey, both in length and habitat variety. Avifauna observed here included Common Buzzard, Eurasian Sparrowhawk (*Accipiter nisus*), Common Kestrel, Common Quail, Common Wood Pigeon, Rock Dove, Eurasian Skylark (*Alauda arvensis*), House Martin, Barn Swallow (*Hirundo rustica*), White Wagtail, Whinchat (*Saxicola rubetra*), Common Chiffchaff, Blackbird, Eurasian Jay, Magpie, and Carrion Crow, all observed in thickets of trees, bushes, and orchards.
Great Cormorant, Grey Heron, Little Egret, Common Sandpiper, and White Wagtail were recorded along the riverbank. Tracks of a Golden Jackal and a Red Fox were observed throughout the section. Tracks of Southern White-breasted Hedgehog were found among orchard trees. Burrows of Forest Mouse (*Apodemus* sp.) and remains of Forest Mouse were also noted.

Amphibians and reptiles recorded included Marsh Frog, Long-legged Wood Frog, Shelkovnikov's Tree Frog, Dice Snake, and Medium Lizard.

Conclusion

Based on the results of field surveys along sections of the M6 Vanadzor–Bagratashen highway subject to restoration and reconstruction, it was established that among the rare and endangered species listed in the Red Book of Armenia, only one species—Great Cormorant (*Phalacrocorax carbo*)—was actually observed. It should be noted, however, that observations of this species were mainly associated with the central parts of the Debed River channel (midstream), so construction and restoration activities along the riverbanks are unlikely to have a significant impact on its habitats.
Regarding the Eurasian Otter (*Lutra lutra*), no recent records were noted, and historical presence appears limited.

Overall, it is concluded that the planned works are unlikely to cause significant damage to the zoological components of the natural ecosystems and should not adversely affect populations of rare animal species in Armenia.

Head of the Laboratory of Vertebrate Zoology,
Scientific Center for Zoology and Hydroecology, NAS RA
M. G. Ghasabyan, PhD

ANNEX 1. Photographs of Observed Species

Little Egret

Grey Heron

Long-legged Buzzard

Common Kestrel

Common Wood Pigeon

Laughing Dove

Common Swift

Barn Swallow

Eurasian Skylark

White Wagtail

Red-backed Shrike

White-throated Dipper

Black Redstart

Northern Wheatear

Eurasian Blackbird

Eurasian Chaffinch

Common Chiffchaff

Great Tit

Blue Tit

Long-tailed Tit

Rock Bunting

Eurasian Jay

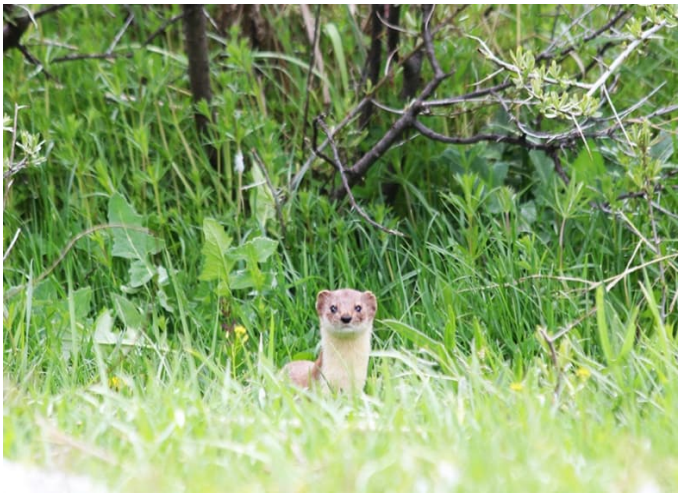
Eurasian Magpie

Hedgehog tracks

Southern White-breasted Hedgehog

Red Fox

Golden Jackal



Least Weasel

Darevskia saxicola

Marsh Frog

Long-legged wood frog

Dice Snake

Blunt-nosed Viper

Appendix D: Biodiversity Report (Fish)

FISH SPECIES DIVERSITY OF THE DEBED RIVER

Introduction

THE DEBED RIVER AND ITS BASIN TRIBUTARIES

After the Araks River, the Debed River ranks among the first in the Republic in terms of its length, water abundance, and the size of its drainage basin. It originates from the Jajur Pass and flows into the Khram tributary of the Kura River (Ktsia-Khrami). The total length of the Debed River, including its Pambak tributary, is 176 km (154 km within the territory of the Republic of Armenia). The drainage basin area is 4,080 km², of which 3,790 km² are located in Armenia. The river has a mixed feeding regime—comprising meltwater, rainwater, and sources emerging from lava sediment layers—and an irregular flow pattern. The river floods in spring, when the water discharge exceeds that of winter by more than 100 times. Flooding also occurs in autumn, while the relatively low-water period corresponds to the winter months (Mnatsakanyan, 2007; Boynagaryan, 2009).

The main right-bank tributaries of the Debed River (starting from the source of the Pambak River) are: Tsaghkarun, Vordnav, Spitak, Lernajur (via the Karachoban tributary), Tandzut (via the Vanadzor tributary), Chanakhchi, Martz, and Shnogh. The left-bank tributaries include Chichkhan, Dzoraget (with its right-bank tributaries Sev and Gargar, and left-bank tributaries Karakala, Tashir, and Meskhanka) (Boynagaryan, 2009).
According to literature data, the following fish species have been found in the Debed River:

1. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
2. *Barbus cyri* De Filippi, 1865 - Barbus cyri
3. *Luciobarbus mursa* Güldenstädt, 1773 - Mursa
4. *Gobio sp.* - (an incompletely identified species of the genus gobios)
5. *Pseudorasbora parva* Temminck & Schlegel, 1846 - Stone moroko
6. *Alburnus filippii* Kessler, 1877 - Kura bleak
7. *Alburnus hohenackeri* Kessler, 1877 - *North Caucasian bleak*
8. *Leucaspius delineatus* Heckel, 1843 - Belica
9. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
10. *Squalius orientalis* Heckel, 1847 - Chub
11. *Carassius gibelio* Bloch, 1782 - Gibel carp
12. *Cyprinus carpio* Linnaeus, 1758 - Common carp
13. *Oxynoemacheilus brandtii* Kessler, 1877 - Kura loach
14. *Salmo trutta fario* Linnaeus, 1758 - Brown trout
15. *Oncorhynchus mykiss* Walbaum, 1792 - Rainbow trout

Pipoyan S. Arakelyan A., «The Ichthyofauna of Aghstev and Debed River Basins (North Armenia) and the Impact of Separate Factors on its Transformation», *International Journal of Oceanography & Aquaculture*, 2018.
Arakelyan A. S., «Spawning features of Kura chub *Alburnoides eichwaldii* (…) in the basin of Debed and Aghstev rivers», *Biological Journal of Armenia*, 2019.

The current analysis of the species composition of the Debed River fish was based on the data from our studies conducted at the stations in recent years.
To determine the current species composition of fish in the Debed River, five observation sites were selected, covering the upper, middle, and lower sections of the river. This approach is a widely accepted format for conducting ichthyological studies in river systems. In selecting the observation sites, the presence of tributaries flowing into the river was also taken into account, as these can influence changes in fish species composition.
Thus, the observation sites selected for the study are:
№1 Ayrum - 41°11'50"N 44°54'07"E
№2 Shnogh - 41°09'08"N 44°49'55"E
№3 Akhtala - 41°08'53"N 44°46'58"E
№4 Alaverdy - 41°05'45"N 44°40'30"E
№5 After the confluence of the Dzoraget - 40°57'28"N 44°37'58"E

The distribution of fish species by stations was as follows:

Station № 1: Ayrum - 41°11'50"N 44°54'07"E:

This observation point of the river is quite rich in water and maintains similar ecological conditions almost up to the point where the river exits the borders of our Republic. Taking this into account, as well as the accessibility of this section for research purposes, this location was selected as the observation point. The following fish species are found at this site:

1. *Alburnoides eichwaldii De Filippi 1863 - Kura chub*
2. *Barbus cyri De Filippi, 1865 – Kura barbel*
3. *Capoeta capoeta Guldenstadt 1772 - Caucasian Scraper*
4. *Oxynoemacheilus brandtii Kessler, 1877 - Kura loach*
5. *Gobio sp. - (an incompletely identified species of the genus gobios)*
6. *Pseudorasbora parva Temminck & Schlegel, 1846 - Stone moroko*
7. *Carassius gibelio Bloch, 1782 - Gibel carp*
8. *Oncorhynchus mykiss Walbaum, 1792 - Rainbow trout*
9. *Squalius orientalis Heckel, 1847 - Chub*

Station № 2: Shnogh - 41°09'08"N 44°49'55"E:

In this section of the river, the Debed River and the Shnogh tributary merge. At this point, certain ecological conditions begin to change, which is due to the presence of the Shnogh tributary. The following fish species have been captured from this observation point:

1. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
2. *Barbus cyri* De Filippi, 1865 – Kura barbel
3. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
4. *Luciobarbus mursa* Güldenstädt, 1773 - Mursa

Station № 3: Akhtala - 41°08'53"N 44°46'58"E:

At this observation point, the river widens and contains large rocks. The following fish species have been captured from this site

1. *Oncorhynchus mykiss* Walbaum, 1792 - Rainbow trout
2. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
3. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
4. Barbus cyri *De Filippi, 1865* – Kura barbell
5. *Alburnus filippii* Kessler, 1877 - Kura bleak

Station № 4: Alaverdy - 41°05'45"N 44°40'30"E:

At this observation point, the river is quite fast-flowing and has been directly affected by flooding. The following fish species have been captured from this site.

1. *Salmo trutta fario* Linnaeus, 1758 - Brown trout
2. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
3. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
4. *Oxynoemacheilus brandtii* Kessler, 1877 - Kura loach
5. Barbus cyri *De Filippi, 1865* – Kura barbell
6. *Alburnus filippii* Kessler, 1877 - Kura bleak
7. Squalius orientalis Heckel, 1847 - Chub

Station № 5: After the confluence of the Dzoraget - 40°57'28"N 44°37'58"E:

In this section of the river, the Dzoraget River flows into the Debed River, and from this point, the Debed River is formed. The ecological conditions in this area are quite favorable for fish species compared to other observation points located downstream. The following fish species are found here:

1. *Salmo trutta fario* Linnaeus, 1758 - Brown trout
2. *Oncorhynchus mykiss* Walbaum, 1792 - Rainbow trout
3. *Alburnoides eichwaldii* De Filippi 1863 - Kura chub
4. *Gobio sp. - (an incompletely identified species of the genus gobios)*
5. *Capoeta capoeta* Guldenstadt 1772 - Caucasian Scraper
6. *Oxynoemacheilus brandtii* Kessler, 1877 - Kura loach
7. Barbus cyri *De Filippi, 1865* – Kura barbell
8. *Alburnus filippii* Kessler, 1877 - Kura bleak

Conclusion

12 species of fish were recorded in the studied stations of the Debed and Dzoraget rivers.

1. *Salmo trutta fario Linnaeus, 1758- - Brown trout*
2. *Oncorhynchus mykiss Walbaum, 1792 - Rainbow trout*
3. *Alburnoides eichwaldii De Filippi 1863 - Kura chub*
4. *Gobio sp. - (an incompletely identified species of the genus gobios)*
5. *Capoeta capoeta Guldenstadt 1772 - Caucasian Scraper*
6. *Oxynoemacheilus brandtii Kessler, 1877 - Kura loach*
7. *Barbus cyri De Filippi, 1865– Kura barbel*
8. *Carassius gibelio Bloch, 1782 - Gibel carp*
9. *Pseudorasbora parva Temminck & Schlegel, 1846 - Stone moroko*
10. *Alburnus filippii Kessler, 1877 Kura bleak*
11. *Luciobarbus mursa Güldenstädt, 1773 - Mursa*
12. *Squalius orientalis Heckel, 1847 - Chub*

According to studies conducted in recent years for various purposes, the most abundant fish species in the Debed River is Kura chub, comprising 63.12% of the total population. Also common are Caucasian Scraper (10.35%) and Kura barbel (11.71%). All other species with smaller population shares together make up 14.82% of the total. Among the identified species, no fish listed in the Red Book has been found. The valuable fish species found in the river include Brown trout, Scraper, Barbel, and Mursa. These species are migratory and, in addition to their ecological significance, also have economic value and are considered desirable targets for recreational fishing

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Capoeta capoeta Guldenstadt 1772 - Caucasian Scraper

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Oncorhynchus mykiss Walbaum, 1792 - Rainbow trout

Salmo trutta fario Linnaeus, 1758- Brown trout

Alburn us filippii Kessler, 1877 Kura bleak

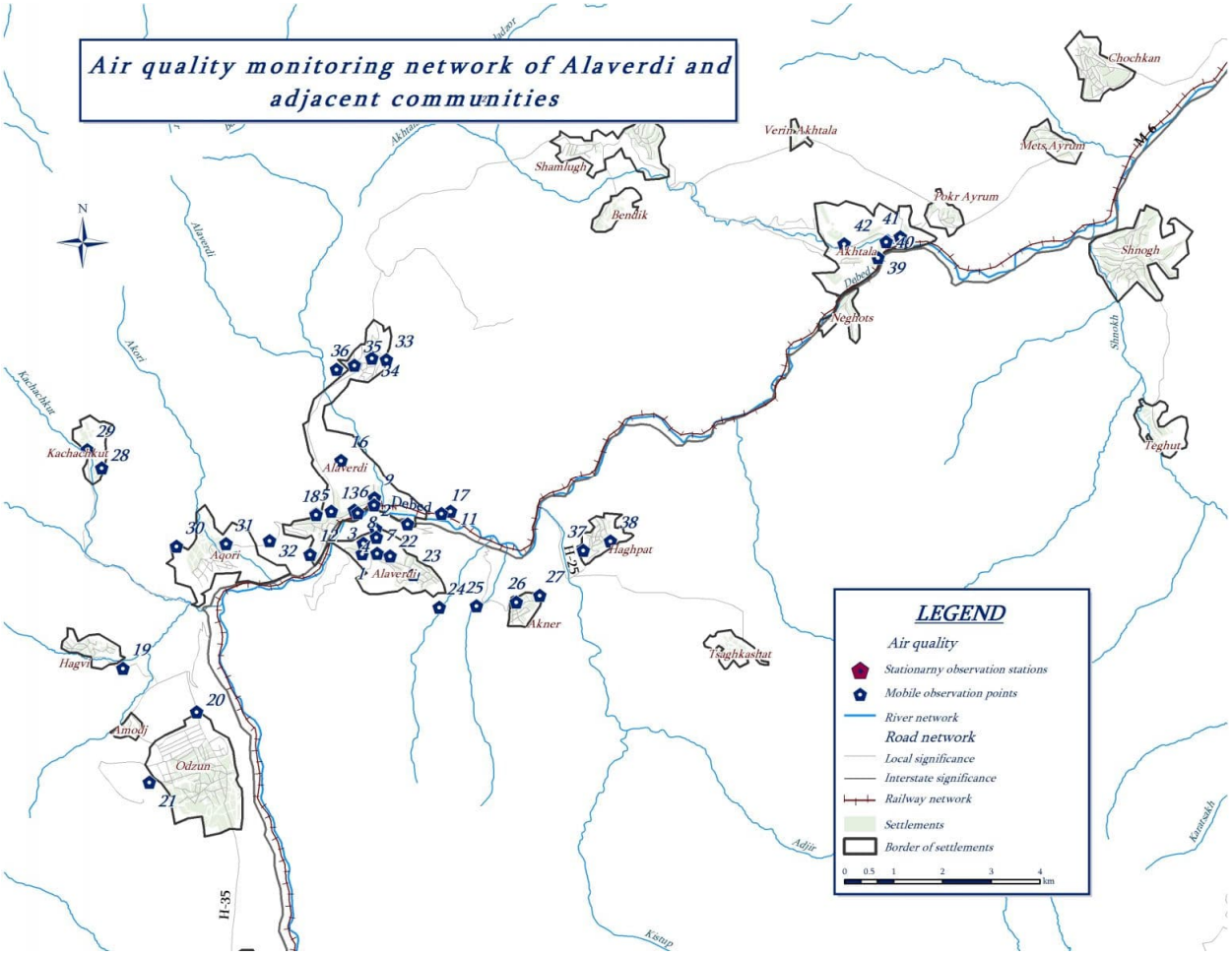
Pseudorasbora parva Temminck & Schlegel, 1846 - Stone moroko

Squalius orientalis Heckel, 1847 – Chub

Oxynoemacheilus brandtii Kessler, 1877 - Kura loach

Appendix E: Baseline survey – ambient air quality

Ambient Air Quality data



Coordinates of active monitoring stations:

Community	Station ID	Location	X_Longitude	Y_Latitude
Alaverdi	1	Sayat-Nova	44,646692	41,096871
	2	Sanahin Sarahart	44,653780	41,091450
	3	Debed district 10	44,675380	41,099440

Active monitoring station data:

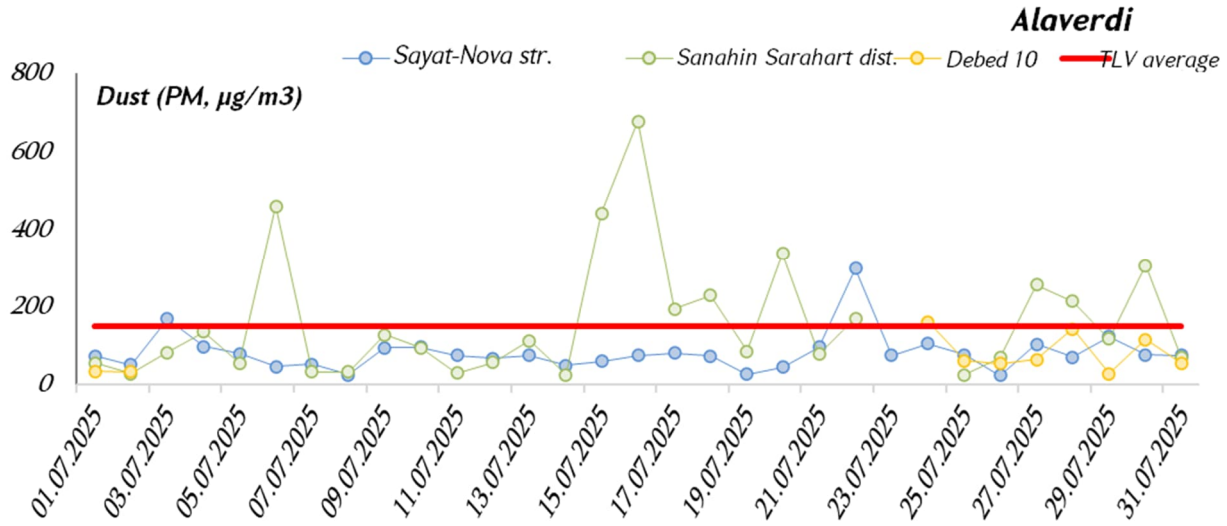
City: Alaverdi

Sampling method: active sampling

Pollutant: dust (PM, μg/m^3) TLV average daily = 150 μg/m^3

Date (sampling start/end)		Station 1, PM (μg/m^3)	Station 2, PM (μg/m^3)	Station 3, PM (μg/m^3)	Average (μg/m^3)
7/1/2025	7/2/2025	72.71	53.73	32.65	53.03
7/2/2025	7/3/2025	50.29	27.02	32.15	36.49
7/3/2025	7/4/2025	167.28	81.39		124.33
7/4/2025	7/5/2025	97.13	133.62		115.38
7/5/2025	7/6/2025	77.76	53.98		65.87
7/6/2025	7/7/2025	44.53	460.22		252.38
7/7/2025	7/8/2025	50.88	31.51		41.19
7/8/2025	7/9/2025	24.17	31.30		27.74
7/9/2025	7/10/2025	94.18	126.86		110.52
7/10/2025	7/11/2025	94.43	92.99		93.71
7/11/2025	7/12/2025	74.02	28.16		51.09
7/12/2025	7/13/2025	65.75	56.05		60.90
7/13/2025	7/14/2025	73.10	112.33		92.71
7/14/2025	7/15/2025	47.48	23.92		35.70
7/15/2025	7/16/2025	58.41	442.33		250.37
7/16/2025	7/17/2025	73.44	677.20		375.32
7/17/2025	7/18/2025	80.52	193.05		136.78
7/18/2025	7/19/2025	71.68	228.77		150.23
7/19/2025	7/20/2025	26.11	83.99		55.05
7/20/2025	7/21/2025	43.19	336.98		190.09
7/21/2025	7/22/2025	95.26	76.89		86.08
7/22/2025	7/23/2025	298.06	168.96		233.51
7/23/2025	7/24/2025	73.66			73.66
7/24/2025	7/25/2025	104.71	46.78	159.74	103.75
7/25/2025	7/26/2025	75.64	24.11	60.59	53.45
7/26/2025	7/27/2025	22.12	68.14	53.38	47.88
7/27/2025	7/28/2025	102.80	255.81	63.76	140.79
7/28/2025	7/29/2025	69.33	212.77	141.36	141.15
7/29/2025	7/30/2025	122.67	116.41	27.59	88.89
7/30/2025	7/31/2025	74.70	305.74	114.55	165.00
7/31/2025	8/1/2025	73.82	69.85	53.48	65.71
Median		***73.66***	***88.49***	***57.03***	***73.66***
Average		***80.64***	***154.03***	***73.92***	***102.86***

Count	***31***	***30***	***10***	***71***
Count> TLV	***2***	***10***	***1***	***13***
Count>5 TLV	***0***	***0***	***0***	***0***
CountDays>TLV	***2***	***10***	***1***	***12***
Min	***22.12***	***23.92***	***27.59***	***22.12***
Max	***298.06***	***677.20***	***159.74***	***677.20***



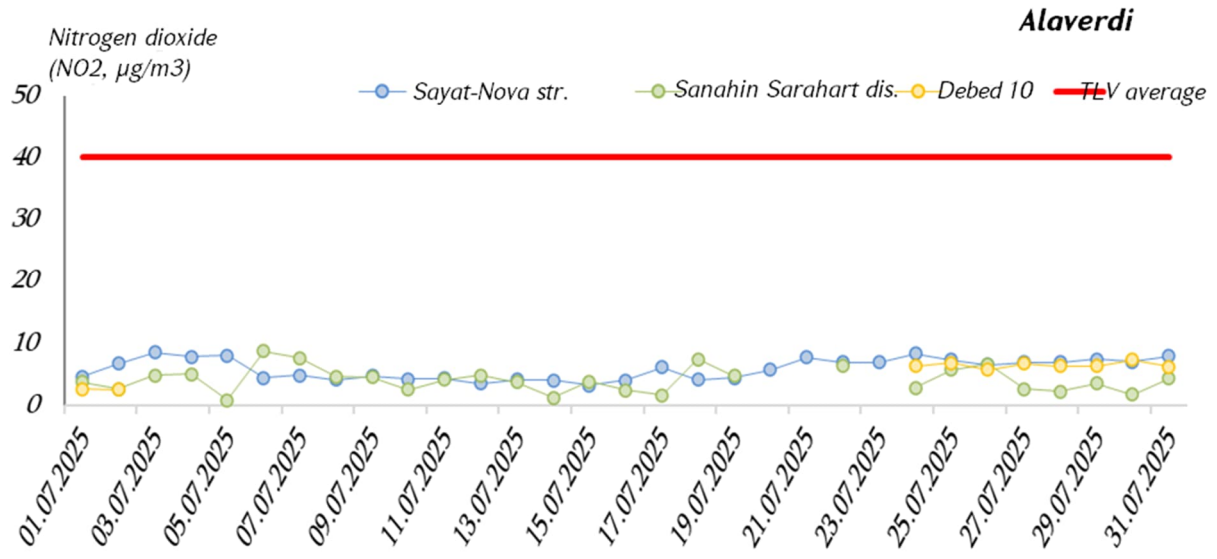
City: Alaverdi

Sampling method: active sampling

Pollutant: nitrogen dioxide (NO_2, µg/m^3) TLV average daily = 40 µg/m^3

Date Start-end		Station 1, NO_2 (µg/m^3)	Station 2, NO_2 (µg/m^3)	Station 3, NO_2 (µg/m^3)	Average (µg/m^3)
7/1/2025	7/2/2025	4.62	3.71	2.60	3.65
7/2/2025	7/3/2025	6.69	2.56	2.51	3.92
7/3/2025	7/4/2025	8.50	4.78		6.64
7/4/2025	7/5/2025	7.77	4.97		6.37
7/5/2025	7/6/2025	7.98	0.77		4.37
7/6/2025	7/7/2025	4.34	8.63		6.49
7/7/2025	7/8/2025	4.73	7.54		6.14
7/8/2025	7/9/2025	4.07	4.62		4.34
7/9/2025	7/10/2025	4.66	4.52		4.59
7/10/2025	7/11/2025	4.14	2.47		3.30
7/11/2025	7/12/2025	4.24	4.10		4.17
7/12/2025	7/13/2025	3.51	4.74		4.13

7/13/2025	7/14/2025	4.04	3.73		3.89
7/14/2025	7/15/2025	3.96	1.21		2.59
7/15/2025	7/16/2025	3.17	3.82		3.49
7/16/2025	7/17/2025	3.96	2.40		3.18
7/17/2025	7/18/2025	6.10	1.62		3.86
7/18/2025	7/19/2025	4.11	7.37		5.74
7/19/2025	7/20/2025	4.42	4.70		4.56
7/20/2025	7/21/2025	5.71	4.99		5.35
7/21/2025	7/22/2025	7.65	9.83		8.74
7/22/2025	7/23/2025	6.87	6.30		6.59
7/23/2025	7/24/2025	6.83			6.83
7/24/2025	7/25/2025	8.25	2.81	6.30	5.78
7/25/2025	7/26/2025	7.29	5.67	6.72	6.56
7/26/2025	7/27/2025	6.46	6.61	5.63	6.23
7/27/2025	7/28/2025	6.89	2.64	6.69	5.40
7/28/2025	7/29/2025	6.89	2.19	6.28	5.12
7/29/2025	7/30/2025	7.35	3.48	6.28	5.70
7/30/2025	7/31/2025	6.98	1.67	7.31	5.32
7/31/2025	8/1/2025	7.89	4.27	6.21	6.12
Median		***6.10***	***4.19***	***6.28***	***6.10***
Average		***5.81***	***4.29***	***5.65***	***5.25***
Counta		***31***	***30***	***10***	***71***
Count>TLV		***0***	***0***	***0***	***0***
Count>5 TLV		***0***	***0***	***0***	***0***
CountDays> TLV		***0***	***0***	***0***	***0***
Min		***3.17***	***0.77***	***2.51***	***0.77***
Max		***8.50***	***9.83***	***7.31***	***9.83***



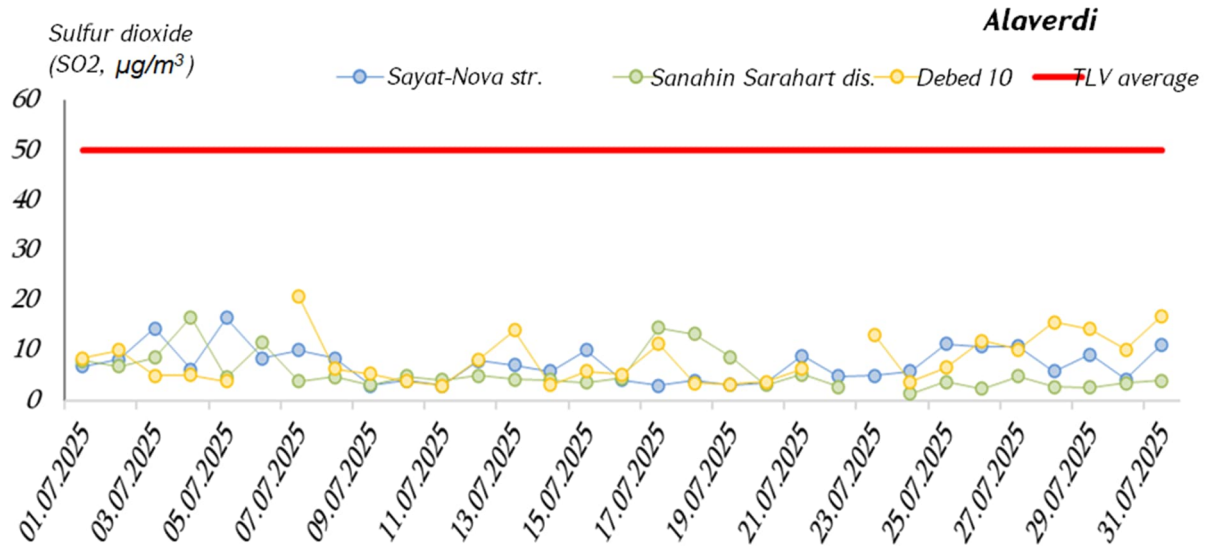
City: Alaverdi

Sampling method: active sampling

Pollutant: sulfur dioxide (SO_2, $\mu g/m^3$) TLV average daily = 50 $\mu g/m^3$

Date Start-end		Station 1, SO_2 ($\mu g/m^3$)	Station 2, SO_2 ($\mu g/m^3$)	Station 3, SO_2 ($\mu g/m^3$)	Average ($\mu g/m^3$)
7/1/2025	7/2/2025	6.74	7.94	8.34	7.67
7/2/2025	7/3/2025	8.16	6.73	9.97	8.29
7/3/2025	7/4/2025	14.34	8.49	4.92	9.25
7/4/2025	7/5/2025	6.19	16.57	5.10	9.29
7/5/2025	7/6/2025	16.44	4.53	3.82	8.26
7/6/2025	7/7/2025	8.38	11.43		9.91
7/7/2025	7/8/2025	10.02	3.83	20.58	11.48
7/8/2025	7/9/2025	8.40	4.71	6.34	6.49
7/9/2025	7/10/2025	3.00	3.12	5.28	3.80
7/10/2025	7/11/2025	3.97	4.85	3.85	4.22
7/11/2025	7/12/2025	3.00	4.08	2.89	3.32
7/12/2025	7/13/2025	7.87	4.87	8.10	6.95
7/13/2025	7/14/2025	7.06	4.23	13.97	8.42
7/14/2025	7/15/2025	5.78	4.02	3.12	4.31
7/15/2025	7/16/2025	9.98	3.55	5.82	6.45
7/16/2025	7/17/2025	4.11	4.41	5.22	4.58
7/17/2025	7/18/2025	2.95	14.38	11.25	9.53
7/18/2025	7/19/2025	3.88	13.25	3.48	6.87
7/19/2025	7/20/2025	3.03	8.60	3.25	4.96
7/20/2025	7/21/2025	3.50	3.09	3.63	3.41
7/21/2025	7/22/2025	8.83	5.12	6.25	6.74
7/22/2025	7/23/2025	4.75	2.66		3.70
7/23/2025	7/24/2025	4.98		13.06	9.02
7/24/2025	7/25/2025	5.76	1.36	3.67	3.59
7/25/2025	7/26/2025	11.25	3.63	6.50	7.13
7/26/2025	7/27/2025	10.76	2.37	11.80	8.31
7/27/2025	7/28/2025	10.72	4.85	10.14	8.57
7/28/2025	7/29/2025	5.76	2.74	15.52	8.01
7/29/2025	7/30/2025	9.10	2.56	14.25	8.64
7/30/2025	7/31/2025	4.18	3.41	10.13	5.91
7/31/2025	8/1/2025	11.12	3.91	16.75	10.59
Median		***6.74***	***4.32***	***6.34***	***7.04***

Average	***7.23***	***5.64***	***8.17***	***7.01***
Counta	***31***	***30***	***29***	***90***
Count>TLV	***0***	***0***	***0***	***0***
Count>5 TLV	***0***	***0***	***0***	***0***
CountDays> TLV	***0***	***0***	***0***	***0***
Min	***2.95***	***1.36***	***2.89***	***1.36***
Max	***16.44***	***16.57***	***20.58***	***20.58***



Coordinates of passive monitoring stations:

Sampler ID	Location	Community	X_Longitude	Y_Latitude	Altitude
1	Observation post 2/Sarahart district/	Alaverdi	44,65380556	41,09144444	1021
2	Sarahart ropeway	Alaverdi	44,657	41,09602778	957
4	Television company, building 2/26	Alaverdi	44,65725	41,09447222	985
5	Observation station 1/Sayat-Nova str./	Alaverdi	44,64247222	41,09886111	728
6	Zoravar Andranik St., Music School	Alaverdi	44,65186111	41,0995	752
7	2/29, Sarahart Street, laboratory building	Alaverdi	44,65738889	41,09152778	999
8	6 Tumanyan, Armeconombank	Alaverdi	44,65269444	41,099	721
9	Spansdaryan11	Alaverdi	44,65677778	41,10177778	745
10	Marx Street, newspaper stand	Alaverdi	44,65663889	41,10044444	719
11	Observation post 3 /Debed district/	Alaverdi	44,67538889	41,09936111	723
13	Khudyakov St., School of Fine Arts	Alaverdi	44,64622222	41,09925	775
14	Engels district, school No. 1	Alaverdi	44,65663889	41,10047222	704
16	Jravazan 3A, /kindergarten No. 2/	Alaverdi	44,6485	41,10883333	748
17	Debed district, school number 9	Alaverdi	44,67316667	41,09888889	698
18	Zoravar Andranik 8/1	Alaverdi	44,64255556	41,09861111	754
21	Odzun village, Hushardan district	Odzun	44,60219444	41,04916667	1179
39	Akhtala, Near the bridge	Akhtala	44,77947222	41,14655556	
40	Akhtala, 130 m above the train Train Bar gate	Akhtala	44,78141667	41,14952778	
41	Akhtala, Crossroad Akhtala - Mets Ayrum	Akhtala	44,78488889	41,15038889	
42	Akhtala, Near the Akhtala school	Akhtala	44,77116667	41,14905556	

City: Alaverdi

Sampling method: passive sampling

Pollutant: nitrogen dioxide (NO_2, $\mu g/m^3$) TLV average daily = 40 $\mu g/m^3$

№	Average daily concentration of NO_2, $\mu g/m^3$					Average monthly concentration in $\mu g/m^3$
	30.06.2025	07.07.2025	14.07.2025	21.07.2025	28.07.2025	
	07.07.2025	14.07.2025	21.07.2025	28.07.2025	04.08.2025	
PS1	4.69	1.07	4.82	2.56	5.55	3.53
PS2	6.53	3.97	22.62	6.4	10.07	10.01
PS4	2.86	17.5	4.74	2.82	6.57	7.06
PS5	25.61	6.19	8.41	15.36	12.29	13.31
PS6	7.85	1.32	3.84	28.6	18.65	11.55
PS7	8.58	1.2	2.73	3.24	6.79	4.16
PS8	5.51	2.48	3.59	18.05	16.99	8.71
PS9	3.63	2.65	3.76	22.92	7.51	8.29
PS10	5.21	3.8	5.25	8.57	6.1	5.77
PS11	3.59	7.98	0.76	9.05	8.07	5.75
PS13	3.71	2.13	5.12	15.88	11.57	7.43
PS14	3.88	2.01	2.9	4.65	8.79	4.04
PS16	5.25	1.71	3.76	3.16	8.24	4.03
PS17	2.56	8.11	6.44	7.73	7.9	6.55
PS18	4.05	4.61	5.08	7.43	8.66	5.77
PS21	5.21	2.94	2.73	24.5	9.09	8.99
PS39	4.23	6.79	3.33	7.47	14.68	6.68
PS40	4.14	3.67	7.9	3.12	6.53	4.96
PS41	5.15	2.35	3.33	3.76	7.3	4.07
PS42	7.84	2.09	3.05	7.73	10.16	5.73

Median	***4.92***	***2.80***	***3.80***	***7.60***	***8.45***	***6.16***
Average	***6.00***	***4.23***	***5.21***	***10.15***	***9.58***	***6.82***
Counta	***20***	***20***	***20***	***20***	***20***	***80***
Count>TLV	***0***	***0***	***0***	***0***	***0***	***0***
Count>5TLV	***0***	***0***	***0***	***0***	***0***	***0***
Min	***2.56***	***1.07***	***0.76***	***2.56***	***5.55***	***0.76***
Max	***25.61***	***17.50***	***22.62***	***28.60***	***18.65***	***28.60***

City: Alaverdi

Sampling method: passive sampling

Pollutant: sulfur dioxide (SO_2, mg/m^3) TLV average daily = 50 mg/m^3

№	Average daily concentration of SO_2, $\mu g/m^3$					Average monthly concentration in $\mu g/m^3$
	30.06.2025	07.07.2025	14.07.2025	21.07.2025	28.07.2025	
	07.07.2025	14.07.2025	21.07.2025	28.07.2025	04.08.2025	
PS1	34.06	12.55	60.95	59.16	33.34	40.85
PS2		51.99	75.29	17.93	57.37	44.50
PS4	53.78	1.79		71.71	1.79	30.16
PS5	39.44	26.89	64.54	32.27	71.71	44.82
PS6	73.5	39.44	59.16	48.4	7.17	48.34
PS7	77.09	28.68	3.59	82.46	8.96	41.98
PS8	1.79	26.89	8.96	75.29	7.17	26.37
PS9	14.34	78.88	3.59	17.93	10.76	26.83
PS10	16.13	82.46	5.2	12.55	34.06	30.14
PS11	23.3	21.51	26.89	14.34	114.73	33.48
PS13	16.13	32.27	23.3	3.59	48.4	22.73
PS14	30.48	14.34	7.17	34.06	3.59	18.91
PS16	19.72	8.96	8.96	17.93	16.13	13.99
PS17	3.59	7.17	23.3	60.95	30.48	25.27
PS18	46.61	16.13	7.17	48.4	96.8	37.70
PS21	51.99	35.85	60.95	34.06	50.19	46.09
PS39	41.23	3.59	30.48	44.82	14.34	27.64
PS40	1.79	21.51	60.95	5.38	16.13	22.26
PS41	46.33	25.1	31.37	30.48	5.38	29.30
PS42	48.26	37.65	27.79	34.06	59.16	39.44

Median	***34.06***	***26.00***	***26.89***	***34.06***	***23.31***	***30.15***
Average	***33.66***	***28.68***	***31.03***	***37.29***	***34.38***	***32.54***
Counta	***19***	***20***	***19***	***20***	***20***	***20***
Count>TLV	***4***	***3***	***6***	***5***	***6***	***0***
Count>5TLV	***0***	***0***	***0***	***0***	***0***	***0***
Min	***1.79***	***1.79***	***3.59***	***3.59***	***1.79***	***13.99***
Max	***77.09***	***82.46***	***75.29***	***82.46***	***114.73***	***48.34***

Appendix F: Baseline survey – surface water quality

Surface Water Quality data

Sampling locations

№	Site / sample name	River	Location	Latitude	Longitude
1	TPW0	Pambak	1 կմ above Vanadzor	40,84672	44,407386
2	TPW1	Pambak	0.5 km below Vanadzor	40,813911	44,507558
3	TPW2	Pambak	Below Vaghanadzor, under the small bridge	40,88725	44,59976
4	TPW3	Pambak	Dzoraget, under the old bridge	40,95747	44,63234
5	TPW4	Debed	Dzoraget, Below the Dzoraget HPP	40,97155	44,6366
6	TPW5	Debed	Tumanyan, 0.5 km below the Martsiget discharge point	41,002796	44,645243
7	TPW6	Debed	Alaverdi, Sanahin Station	41,08023	44,61802
8	TPW7	Debed	Alaverdi, above the Sanahin (Stone) bridge	41,09916	44,65702
9	TPW8	Debed	Haghpat (train station), near the bridge leading to the cemetery	41,11319	44,71371
10	TPW9	Debed	Akhtala, near the new bridge	41,14615	44,77934
11	TPW10	Debed	Karkop, near the new bridge	41,18037	44,86242
12	TPW11	Debed	0.5 կմ above Ayrum	41,187716	44,892104
13	TPW12	Debed	Ptghavan, Near the Georgian border	41,221308	44,882645

Analysis results

№	Site / sample name	Mineralization mg/l	Suspended solids mg/l	pH	Conductivity µSm/cm	Ca mg/l	Ti mg/l	Fe mg/l	Cu mg/l	Zn mg/l	As mg/l
1	TPW0	385	13.8	8.4	592	86.37	0.006	0.493	0.0018	0.0054	0.00081
2	TPW1	401	29.2	8.3	617	67.69	0.0048	0.351	0.0032	0.0125	0.00145
3	TPW2	331	40	7.9	509	51.02	0.005	0.386	0.0033	0.0067	0.00175
4	TPW3	315	53.3	7.9	484	48.36	0.0051	0.347	0.0033	0.0057	0.00162
5	TPW4	212	33	8.1	326	41.72	0.005	0.274	0.0023	0.0181	0.00166
6	TPW5	199	77.5	9.0	306	38.21	0.0085	0.417	0.0034	0.0182	0.00184
7	TPW6	221	41.8	8.2	340	39.45	0.0055	0.298	0.0026	0.0127	0.00161
8	TPW7	229	36.8	8.0	352	41.59	0.005	0.289	0.0031	0.0147	0.00165
9	TPW8	223	44.3	8.1	343	40.71	0.0055	0.285	0.0035	0.0119	0.00177
10	TPW9	226	32.3	8.3	347	41.53	0.0049	0.284	0.0039	0.0126	0.00177
11	TPW10	258	38.9	8.5	397	43.57	0.0053	0.295	0.0077	0.0137	0.00185
12	TPW11	280	410.1	8.7	431	42.93	0.0227	0.757	0.0113	0.014	0.0036
13	TPW12	257	1370.1	8.9	395	43.16	0.0435	2.485	0.0151	0.0232	0.00757

Class 1	142	2.84	7	218	40		0.09	0.003	0.043	0.0042
Class 2	284	30		436	75		0.2	0.023	0.1	0.01
Class 3	1000	60		1500	150		1	0.05	0.2	0.05
Class 4	1500	120		2300	300		2	0.1	0.5	0.1
Class 5	>1500	>120		>2300	>300		>2.0	>0.1	>0.5	>0.1

Appendix G: Baseline survey – soil quality

Soil Quality data

Sampling locations

N	Site / sample name	Community	Address / location	Distance from the road (m)	Latitude	Longitude
1	TPS0	Vanadzor	Entrance to Vanadzor from Spitak	25	40,84792	44,41814
2	TPS1	Vanadzor	Entrance to Vanadzor from Alaverdi	30	40,81609	44,52303
3	TPS2	Vahagnadzor	Entrance to Vahagnadzor from Alaverdi	28	40,88715	44,59987
4	TPS3	Dzoraget	At the entrance to the cemetery	20	40,95725	44,63241
5	TPS4	Tumanyan	Near the statue of H. Tumanyan, under the mulberry tree	52	41,00304	44,64567
6	TPS5	Qobayr	Entrance to Qobayr from Alaverdi	26	41,05957	44,62458
7	TPS6	Alaverdi	Sanahin train station, near the river	130	41,08033	44,61772
8	TPS7	Alaverdi	Near the Genocide Monument	22	41,09975	44,65456
9	TPS8	Haghpat	Near the Debed-Haghpat Cemetery	75	41,11336	44,71380
10	TPS9	Akhtala	Entrance to Akhtala from Ayrum	100	41,14604	44,79409
11	TPS10	Qarkop	Near the pavilion-chatroom, in front of the bridge	120	41,18081	44,86183
12	TPS11	Ajrum	Entrance to Ayrum from the Georgian border	100	41,19723	44,90813
13	TPS12	Ptghavan	In front of the "Yerak" hotel	30	41,22002	44,87555

Analysis results

Site	Location	Units	Al	Si	P	S	Cl	K	Ca	Ti	V	Cr	Mn
TPS0	Entrance to Vanadzor from Spitak	PPM	51811	169148	2032	2328	1064	12904	32011	2707	<25	38	906
TPS1	Entrance to Vanadzor from Alaverdi	PPM	67058	143836	<50	1703	822	7280	50261	3704	26	<10	955
TPS2	Entrance to Vahagnadzor from Alaverdi	PPM	63323	185566	<50	1259	1055	22136	10253	2570	<25	43	778
TPS3	At the entrance to the cemetery	PPM	57127	191170	2559	2251	589	12880	26572	2953	<25	32	831
TPS4	Near the statue of H. Tumanyan, under the mulberry tree	PPM	49209	109068	2150	3181	2758	12535	31245	2734	<25	<10	992
TPS5	Entrance to Qobayr from Alaverdi	PPM	60813	145456	<50	1654	506	13131	79439	3542	<25	88	937
TPS6	Sanahin train station, near the river	PPM	56972	178321	<50	1902	650	14757	62605	5079	28	74	1208
TPS7	Near the Genocide Monument	PPM	33154	66656	3302	5413	1746	7303	33747	969	<25	<10	712
TPS8	Near the Debed-Haghpat Cemetery	PPM	59100	157258	<50	4155	1318	11542	35604	3629	<25	96	976
TPS9	Entrance to Akhtala from Ayrum	PPM	79751	195057	2778	2986	638	16149	35306	3789	<25	98	1098
TPS10	Near the pavilion-chatroom, in front of the bridge	PPM	45913	108046	2271	2636	1584	10277	50830	3137	<25	28	867
TPS11	Entrance to Ayrum from the Georgian border	PPM	75981	178120	1098	1878	475	11303	41010	3483	<25	57	844
TPS12	In front of the "Yerak" hotel	PPM	77841	190268	<50	2368	<50	12667	25335	4002	<25	78	1006

Content (concentration) corresponding to the level of contamination (mg/kg)

RA Government Resolution No. 92-N of January 25, 2005 on approving the procedure for assessing the impact of economic activity on land resources.

Level 1: Permissible (<TLV)	<150	<90	<1500
Level 2: Low	150_225	90_150	1500_2000
Level 3: Intermediate	225_300	150_250	2000_3000
Level 4: High	300_450	250_350	3000_4000
Level 5: extremely high	>450	>350	>4000

Site	Location	Units	Fe	Ni	Cu	Zn	As	Se	Rb	Sr	Y	Zr	Nb	Mo
TPS0	Entrance to Vanadzor from Spitak	PPM	31735	37	51	117	13	<5	51	235	22	128	8	<5
TPS1	Entrance to Vanadzor from Alaverdi	PPM	51051	18	85	87	10	<5	18	225	15	64	<5	<5
TPS2	Entrance to Vahagnadzor from Alaverdi	PPM	26542	10	25	74	19	<5	110	109	53	293	10	<5
TPS3	At the entrance to the cemetery	PPM	32625	31	66	143	16	<5	50	223	27	184	9	<5
TPS4	Near the statue of H. Tumanyan, under the mulberry tree	PPM	37205	23	194	204	24	<5	51	174	20	94	9	12
TPS5	Entrance to Qobayr from Alaverdi	PPM	41036	62	127	116	26	<5	61	364	30	184	10	<5
TPS6	Sanahin train station, near the river	PPM	49979	33	93	173	21	<5	53	319	26	181	9	5
TPS7	Near the Genocide Monument	PPM	18475	12	1267	488	25	<5	15	192	25	54	24	45
TPS8	Near the Debed-Haghpat Cemetery	PPM	44790	36	45	102	10	<5	31	95	36	103	<5	<5
TPS9	Entrance to Akhtala from Ayrum	PPM	50054	68	368	459	26	<5	46	216	26	116	10	6
TPS10	Near the pavilion-chatroom, in front of the bridge	PPM	40561	33	563	268	35	<5	38	302	27	126	15	17
TPS11	Entrance to Ayrum from the Georgian border	PPM	43150	45	87	96	13	<5	41	187	24	132	5	<5
TPS12	In front of the "Yerak" hotel	PPM	44544	58	151	152	26	<5	72	198	29	149	13	6

Content (concentration) corresponding to the level of contamination (mg/kg)

RA Government Resolution No. 92-N of January 25, 2005 on approving the procedure for assessing the impact of economic activity on land resources.

Level 1: Permissible (<TLV)	<80	<132	<220	<10	<132
Level 2: Low	80_160	132_200	220_450	10_20	132_200
Level 3: Intermediate	160_240	200_300	450_900	20_30	200_300
Level 4: High	240_500	300_500	900_1800	30_50	300_500
Level 5: extremely high	>500	>500	>1800	>50	>500

Site	Location	Units	Ag	Cd	Sn	Sb	W	Hg	Pb	Bi	Th	U	LE
TPS0	Entrance to Vanadzor from Spitak	PPM	<5	<5	<5	<5	<5	<5	25	<5	12	<5	706702
TPS1	Entrance to Vanadzor from Alaverdi	PPM	<5	<5	<5	<5	<5	<5	9	<5	<5	<5	686685
TPS2	Entrance to Vahagnadzor from Alaverdi	PPM	<5	<5	<5	<5	<5	<5	21	<5	<5	<5	701738
TPS3	At the entrance to the cemetery	PPM	<5	<5	<5	<5	12	<5	41	<5	8	<5	685348
TPS4	Near the statue of H. Tumanyan, under the mulberry tree	PPM	<5	<5	<5	<5	<5	<5	41	<5	20	<5	758415
TPS5	Entrance to Qobayr from Alaverdi	PPM	10	<5	<5	<5	10	<5	31	<5	6	<5	665838
TPS6	Sanahin train station, near the river	PPM	<5	<5	<5	<5	<5	<5	33	<5	9	<5	642378
TPS7	Near the Genocide Monument	PPM	<5	<5	<5	<5	<5	<5	66	<5	71	16	832562
TPS8	Near the Debed-Haghpat Cemetery	PPM	<5	<5	<5	<5	<5	<5	10	<5	<5	<5	695112
TPS9	Entrance to Akhtala from Ayrum	PPM	<5	<5	<5	<5	<5	<5	29	<5	12	<5	628779
TPS10	Near the pavilion-chatroom, in front of the bridge	PPM	<5	<5	<5	<5	<5	<5	53	<5	27	6	742270
TPS11	Entrance to Ayrum from the Georgian border	PPM	<5	<5	<5	<5	<5	<5	14	6	<5	<5	658629
TPS12	In front of the "Yerak" hotel	PPM	<5	<5	<5	<5	<5	<5	59	<5	8	<5	658469

Content (concentration) corresponding to the level of contamination (mg/kg)

RA Government Resolution No. 92-N of January 25, 2005 on approving the procedure for assessing the impact of economic activity on land resources.

Level 1: Permissible (<TLV)	<2	<4.5	<2.1	<65
Level 2: Low	2_3	4.5_9	2.1_3	65_130
Level 3: Intermediate	3_5	9_18	3_5	130_250
Level 4: High	5_10	18_25	5_10	250_600
Level 5: extremely high	>10	>25	>10	>600

Appendix H: Baseline survey – noise

1. **Plan of the area (premises, workplace, etc.) with indication of the noise source: M6 road KM 37+860 – KM 82+900**

Position, name, surname and signature of the person(s) performing the measurements: Head of the Engineering-Technical Department:

A. Khachmanyan

The protocol is made in 2 copies.

Name of the organization performing the research:

"TRANSPROJECT CJSC"

Protocol № 2 of Noise Measurement

Date: February 21, 2026

- **Name of the applicant organization:** "Transproject" CJSC
- **Place of measurement:** M6 road from KM 37+860 – KM 82+900
  (organization, address, workshop, site, group room, classroom, etc.)
- **Representative of the organization present at the measurement:** "Transproject" CJSC project coordinator K. Mnatsakanyan
  (position, name, surname, signature)
- **Technical means of measurement:** OKTAVA-110A
  (name, type, brand)
- **Information about state calibration:** Certificate N 085378 as of 16.12.2025, valid until 16.12.2026.
  (certificate N, date of issue, validity period)
- **Legal basis for performing the measurement:** Order of the Minister of Health of the Republic of Armenia dated March 6, 2002 "Noise in workplaces, residential and public buildings and residential development areas" N2-III-11.3 SN
  NTP, San. R. and N. etc.
- **Main sources of noise:** Transport

M6 Results of Noise Measurement

Location / ID	Measurement Details	Time	Noise Nature	Equivalent Sound Level dBA	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
2	Suggested Point: 37+680, Closest Works: 37+860 (Dist: 180m)	Daytime	Constant / Construction + Traffic	50	48	53	55	53	51	48	43	38	28
2	Suggested Point: 37+680, Closest Works: 37+860 (Dist: 180m)	Nighttime	Intermittent / Traffic only	30	40	42	40	35	30	28	25	20	10
3	Suggested Point: 39+500, Closest Works: 39+640 (Dist: 140m)	Daytime	Constant / Construction + Traffic	52	50	55	57	55	53	50	45	40	30
3	Suggested Point: 39+500, Closest Works: 39+640 (Dist: 140m)	Nighttime	Intermittent / Traffic only	32	42	44	42	37	32	30	27	22	12
4	Suggested Point: 44+900, Closest Works: 44+950 (Dist: 50m)	Daytime	Constant / Construction + Traffic	61	59	64	66	64	62	59	54	49	39
4	Suggested Point: 44+900, Closest Works: 44+950 (Dist: 50m)	Nighttime	Intermittent / Traffic only	41	51	53	51	46	41	39	36	31	21
5	Suggested Point: 47+450, Closest Works: 47+600 (Dist: 150m)	Daytime	Constant / Construction + Traffic	51	49	54	56	54	52	49	44	39	29
5	Suggested Point: 47+450, Closest Works: 47+600 (Dist: 150m)	Nighttime	Intermittent / Traffic only	31	41	43	41	36	31	29	26	21	11
6	Suggested Point: 50+660, Closest Works: 50+690 (Dist: 30m)	Daytime	Constant / Construction + Traffic	65	63	68	70	68	66	63	58	53	43
6	Suggested Point: 50+660, Closest Works: 50+690 (Dist: 30m)	Nighttime	Intermittent / Traffic only	45	55	57	55	50	45	43	40	35	25
7	Suggested Point: 53+440, Closest Works: 53+670 (Dist: 230m)	Daytime	Constant / Construction + Traffic	48	46	51	53	51	49	46	41	36	26
7	Suggested Point: 53+440, Closest Works: 53+670 (Dist: 230m)	Nighttime	Intermittent / Traffic only	28	38	40	38	33	28	26	23	18	8
8	Suggested Point: 56+300, Closest Works: 56+440 (Dist: 140m)	Daytime	Constant / Construction + Traffic	52	50	55	57	55	53	50	45	40	30
8	Suggested Point: 56+300, Closest Works: 56+440 (Dist: 140m)	Nighttime	Intermittent / Traffic only	32	42	44	42	37	32	30	27	22	12
9	Suggested Point: 58+500, Closest Works: 58+500 (Dist: 0m)	Daytime	Constant / Construction + Traffic	75	73	78	80	78	76	73	68	63	53
9	Suggested Point: 58+500, Closest Works: 58+500 (Dist: 0m)	Nighttime	Intermittent / Traffic only	55	65	67	65	60	55	53	50	45	35
10	Suggested Point: 65+250, Closest Works: 65+230 (Dist: 20m)	Daytime	Constant / Construction + Traffic	69	67	72	74	72	70	67	62	57	47
10	Suggested Point: 65+250, Closest Works: 65+230 (Dist: 20m)	Nighttime	Intermittent / Traffic only	49	59	61	59	54	49	47	44	39	29
11	Suggested Point: 67+500, Closest Works: 67+580 (Dist: 80m)	Daytime	Constant / Construction + Traffic	57	55	60	62	60	58	55	50	45	35
11	Suggested Point: 67+500, Closest Works: 67+580 (Dist: 80m)	Nighttime	Intermittent / Traffic only	37	47	49	47	42	37	35	32	27	17

M6 Results of Noise Measurement

Location / ID	Measurement Details	Time	Noise Nature	Equivalent Sound Level dBA	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
11	Suggested Point: 71+550, Closest Works: 71+550 (Dist: 0m)	Daytime	Constant / Construction + Traffic	75	73	78	80	78	76	73	68	63	53
11	Suggested Point: 71+550, Closest Works: 71+550 (Dist: 0m)	Nighttime	Intermittent / Traffic only	55	65	67	65	60	55	53	50	45	35
13	Suggested Point: 76+600, Closest Works: 76+670 (Dist: 70m)	Daytime	Constant / Construction + Traffic	58	56	61	63	61	59	56	51	46	36
13	Suggested Point: 76+600, Closest Works: 76+670 (Dist: 70m)	Nighttime	Intermittent / Traffic only	38	48	50	48	43	38	36	33	28	18
14	Suggested Point: 80+100, Closest Works: 80+050 (Dist: 50m)	Daytime	Constant / Construction + Traffic	61	59	64	66	64	62	59	54	49	39
14	Suggested Point: 80+100, Closest Works: 80+050 (Dist: 50m)	Nighttime	Intermittent / Traffic only	41	51	53	51	46	41	39	36	31	21
15	Suggested Point: 82+850, Closest Works: 82+900 (Dist: 50m)	Daytime	Constant / Construction + Traffic	61	59	64	66	64	62	59	54	49	39
15	Suggested Point: 82+850, Closest Works: 82+900 (Dist: 50m)	Nighttime	Intermittent / Traffic only	41	51	53	51	46	41	39	36	31	21

Appendix I: Cultural heritage survey report

Assessment-Conclusion on the possible negative impact on the archaeological and historical-cultural sites during the implementation of the "M6 Road Improvement" Project

Armenia is a country with a rich cultural heritage whose roots rise through the depth of the centuries. About 33 000 historical and cultural monuments are found in 4500 complexes with a total territory of 20 000 hectares. The protected monuments in the Republic are defined as local or Republican. Especially important and significant are monuments of historical, architectural, scientific, artistic and cultural value, of which there are 80 complexes (with about 400 architectural monuments). In the past, these were included in the USSR's list of cultural and historical significance of all-Union value. The UNESCO World Heritage List, which since 1963 has identified more than 630 historical monuments and natural areas all over the world, includes several sites on the territory of Armenia: Haghpat and Sanahin Monastic Complexes and old bridge, and the historical centers of Ejmiatsin, Zvartnots and Geghardavank. Other Armenian sites have been proposed for the UNESCO List: the Noravank Monastic Complex, the Persian Blue Mosque and the historical capital of Armenia, Dvin. Therefore, the assessment and management of the cultural heritage within the frame of construction projects is a priority and it is considered prudent to include the services of an archaeologist. The objective of the archaeological expertise is to:

1. to identify potential impacts of the proposed project on physical cultural resources (PCR) - movable or immovable objects, sites, structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or cultural significance;

2. to provide archaeological input to an environmental impact assessment (EIA) report including an environmental management and monitoring plan (EMP), both of which will be prepared by an EIA Consultant on behalf of the executing agency (EA), both will be prepared with the help of the Consultant of the project which is "JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH" company, supported by the Transproject CSJC.

3. to undertake desk and field studies of the archaeological sites of the Project area, identify the known and newly discovered sites, develop recommendations on mitigation measures and provide archaeological input to the Project EIA report and EMP. In this report, the sites will likely be divided into those two groups; i.e., sites with direct impact from construction activities and sites that are

unlikely to be affected. Recommendations will be provided to address the impact of the projects for all affected sites.

The works to rehabilitate the M6 highway were completed in the spring of 2023. However, from 24 to 26 May 2024, an active cyclone from the Mediterranean brought intense rainfall across Armenia and this continuous heavy rainfall caused the Debed and Aghstev rivers to overflow and flood nearby communities, damaging social infrastructure, bridges, and the major highways of the M6 and M4. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km.

Damage to the road during the 2024 flood occurred in three general sections as identified on the scheme below (Scheme 1): km 31+675 – km 39+350 (around Tumanyan); km 55+950 – km 67+620 (north of Alaverdi towards Akhtala); km 84+570 – km 85+200 (north of Ayrum towards the border with Georgia). Further significant damage was recorded between km 71 and km 72 (Shnogh) as well as at km 76+300 (Shnogh).

For improvement of the M6 road, a detailed hydrological model study of the Debed River has been conducted and “build back better” options are being considered. In addition to extensive surveys, a range of options have been studied to rehabilitate and upgrade the road. The works include:

- Protection of the riverbank to secure the road and prevent further erosion;
- Prevention of flooding of road sections;
- Repair of bridges, in particular pier which have been subjected to scour;
- New construction of the deck of the bridge at km 56+540;
- Clearing and repair of minor culverts and drainage channels;
- Securing of road sections which are prone to rockfall;
- Improvement of road safety through the construction of safety barriers, pavement markings, rumble strips and signs;
- Utility relocation to enable the above works.

The construction duration and cost are being determined as part of ongoing detailed design. Bank protection work can only be carried out in periods low flow in the river.

The area under study is practically the Debed River Gorge. The Debed River originates in Armenia, formed by the confluence of the Dzoraget and Pambak rivers near km 31+700 of the M6 road. It then flows northward parallel to the M6 road, which, in Armenia, ends at km 90+191, at the border bridge of Bagratashen. From a geological and geomorphological point of view, the studied area is an

erosional valley formed by the cutting of Quaternary (Lower Pleistocene) basaltic lava flows, on whose terraces are deposited sediments of alluvial-deluvial origin. Lacustrine sediments are visible in some places between these flows, and at the base, clays, silts, and gravel formations of late Pliocene age are exposed (**Images 1-4**). The surface of the river terraces are covered by Middle and Upper Pleistocene palesols, which are interspersed with sediments of eolian origin. The upper part of the stratum, in turn, is represented by Holocene age black soils (**Images 5-6**). The stages of the human occupation of the Debed River Gorge are associated with the formation of these strata.

Since the project implementation area passes through the administrative territories of the Lori Province of the Republic of Armenia, and then the Tavush Province of the Republic of Armenia, we used the following documents to identify and localize historical and cultural units within the area of influence of the latter – the State List of the Immovable Monuments of History and Culture of the Republic of Armenia, Lori Province (Appendix of the RA Government's decision on 15th of March of 2007, №385-N) as well as the State List of the Immovable Monuments of History and Culture of the Republic of Armenia, Tavush Province (Appendix of the RA Government's decision on 30th of December of 2004 №1929-N). In parallel, on November 12, 15, and then 22, a field-archaeological survey was conducted along the M6 highway to identify units of historical and cultural value that are at risk of potential direct impact as a result of highway improvement works.

According to the results of the study, the following monuments or groups of monuments may be at risk of direct impact as a result of the implementation of the "M6 Road Improvement" project:

1. km 31+675 – km 39+350 (around Tumanyan) may be at potential risk of impact a significant part of the units registered under code 5.4. in the State list of monuments of the Lori Province of the Republic of Armenia, located within the administrative boundaries of Tumanyan. Those are: the 9th-15th century cemetery with its khachkars on the western edge of the city (code: 5.4.1.), the khachkar with the inscription of 1247 on the southern ending of the city (code: 5.4.2.), the 12th-13th century khachkar near the entrance to the cave not far from the Garment Factory (code: 5.4.3.), the 13th century khachkar 50 m northwest of the same factory (code: 5.4.4.), the 13th-14th century khachkar near the railway bridge (code: 5.4.6.), as well as the 14th-15th century khachkar (code: 5.4.8.), located on the southwestern ending of the city (**Images 7-8**). A possible impact may also be felt by some site located in the neighboring, within the administrative boundaries of the Kober

railway station, registered in the State list of monuments of the Lori Province of the Republic of Armenia under the code 5.4.1.1., located at the foot of the "Avanakar" fortress on one of the right-bank terraces of the Debed River (**Images 9-10**), as well as the 10th-12th century cemetery registered under the code 5.4.1.3., which is located 1.8 km east of the village, near the tunnel and was divided into two parts during the construction of the highway. Here, the list of potentially affected monuments can also include the 10th-16th century khachkar (code: 5.4.1.5.), in addition, so-called Igahat Medieval village remains (located 1.6 km northwest of the Kober railway station), the eastern part of which was affected as early as 2018 during the reconstruction of the M6 highway. Here, in the area immediately adjacent to the right side of the highway, rescue excavations documented a wine production complex or wine press dating back to the 13th-14th centuries (**Images 11-14**). In general, the presence of such structures on the Tumanyan-Alaverdi section of the M6 highway is associated with the extensive viticulture and horticulture zone that developed here and existed in the High Middle Ages, which brought great income to the local population (**Images 15-18**).

2. During the study conducted by us in the next section from km 55+950 to km 67+620 (north of Alaverdi to Akhtala), only two units as subject to potential impact were identified: the famous Sanahin bridge built in 1195 (registered under code: 5.2.23.), located within the administrative boundaries of the city of Alaverdi (**Images 19-20**), and the "Terunakan" khachkar erected in 1086 by the bishop of the Haghbat monastery, Sargis, located 1 km west of the village of Neghots, in the location named "Tashtadzor" (near the Debed River bank), (registered under code: 5.80.4.), (**Images 21-22**).

3. In the section from km 84+570 to km 85+200 (north of Ayrum to the Georgian border), the Paleolithic open-air sites and the medieval village remains located within the administrative boundaries of the village of Bagratashen may be at risk of impact. These units have not yet been included in the State List of Monuments of the Tavush Region (only 2 units, which are khachkars, are registered under the 10.16. code in the State List of Monuments of Tavush Region within the administrative boundaries of the village of Bagratashen), but the process of granting the latter status of a monument is in progress. They were discovered in 2009, during a joint Armenian-American expedition (Institute of Archaeology and Ethnography of the RA National Academy of Sciences – University of North Carolina, Greensboro) in the Debed Gorge, and in 2010-2011, the same expedition

carried out excavations at the Bagratashen-1 open-air site and the Medieval village site (**Images 23-26**). Thanks to them, one of the most important Middle Paleolithic archaeological sources in the region, dated to 95-100 thousand years BP, was documented at the Bagratashen-1.

As for the section from km 71 to 72 (Shnogh), as well as km 76+300 (Shnogh), no units at risk of impact have been documented here.

Summarizing the information presented, we can conclude that the "M6 Road Improvement" project has certain risks in terms of possible negative impact on historical and cultural units. These are the units listed above, the real impact on which can be assessed only with the availability of the final project. In general, the number of affected monument units is insignificant compared to the number of historical and cultural units spread along the Debed River, since the settlement and exploitation of the area is associated with riverine terraces. As the hypsometric study of the archaeological and sites of the Debed Gorge conducted over the years shows, the population that formed the earliest and ancient societies that operated here preferred to live in the landscape features relatively high above the river. This circumstance can be explained by the periodic flooding of the areas near the river, the same factor that affected the M6 highway. And finally, in any case, it would be correct to maintain the "chance find" procedure during the implementation of the project.

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15.12.2025

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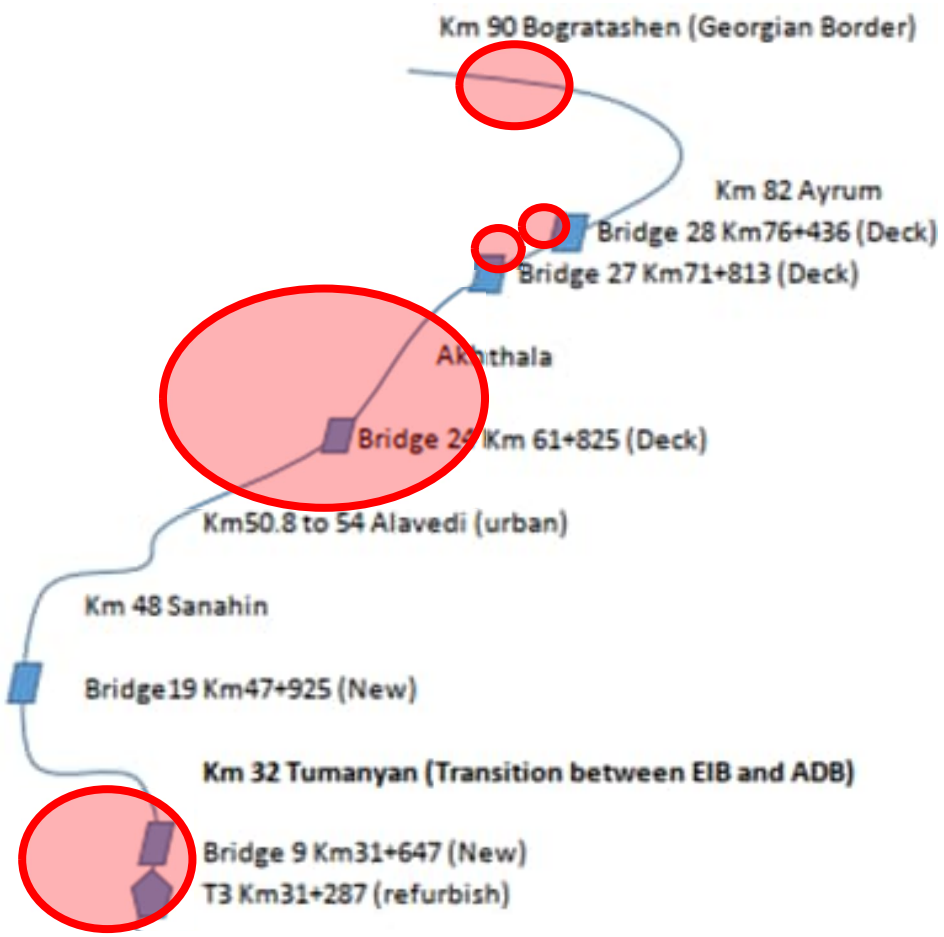
Schemes and Images

Scheme 1



Road alignment overview with areas of significant damage marked

Image 1. The overview of the Debed River Canyon in its middle stream, near the village of Odzun (aerial image)

Image 2. The stratigraphic distribution of Lower Pleistocene basaltic lava flows shaping the Debed River Canyon

Image 3. Lacustral deposits lying between two basaltic flows in the Debed River Canyon

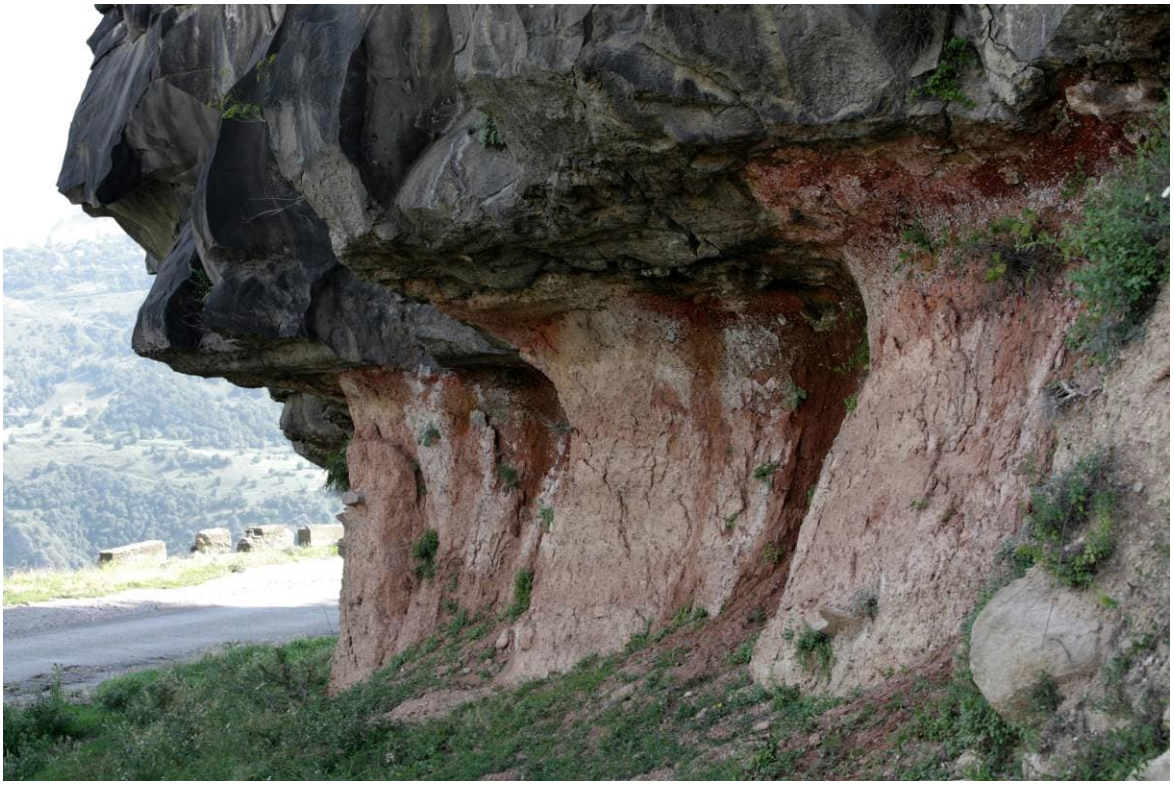


Image 4. Upper Pliocene deposits uderlying the Lower Pleistocene basaltic flow in the Debed River Canyon

Image 5. Section of Middle-Upper Pleistocene palesol and eolian sediments in the Debed River Canyon

Image 6. Upper Pleistocene eolian sediments covered by black soil formations of Holocene in the Debed River Canyon

Image 7. Tumanyan. Kchachkar (1247) at the southern suburbs of the city

Image 8. Tumanyan. 13th-14th centuries khachkar near the railroad bridge

Image 9. The village of Kober Railroad Station. Main view of the 14th-15th centuries "Avanakar" fortress

Image 10. The village of Kober Railroad Station. Settlement spread at the foothills of the 14th-15th centuries "Avanakar" fortress, which is located on one of the right side terraces of the Debed River (Aerial image)

Image 11. The village of Kober Railroad Station. 13th-14th centuries wine production complex uncovered at the eastern ending of the "Igahat" village remains during 2018 safeguard excavations (Aerial image)

Image 12. The village of Kober Railroad Station. 13th-14th centuries wine production complex uncovered at the eastern ending of the "Igahat" village remains during 2018 safeguard excavations (Aerial image)

Image 13. The village of Kober Railroad Station. Nowadays state of the wine production complex uncovered at the eastern ending of the "Igahat" village remains during 2018 safeguard excavations (Aerial image)

Image 14. The village of Kober Railroad Station. Nowadays state of the wine production complex uncovered at the eastern ending of the "Igahat" village remains during 2018 safeguard excavations (Aerial image)

Image 15. Horticultural-gardening landscape spread north from the "Igahat" village remains along the Debed River Canyon
(Satellite image)

Image 16. The overview of the "Igahat" village remains, where the remnants of the foreign gardens can be seen
(Aerial image)

Image 17. Horticultural-gardening landscape spread north from the "Igahat" village remains along the Debed River Canyon in the vicinity of the villages of Odzun and Akori

Image 18. Remnants of the earthenware pot or vine karas open during the construction of the Vanadzor-Alaverdi highway, at the eastern ending of the above mentioned horticultural-gardening landscape

Image 19. The city of Alaverdi. 1195 Sanahin bridge built across the Debed River

Image 20. The city of Alaverdi. 1195 Sanahin bridge built across the Debed River

Image 21. The village of Neghots. Khachkar, erected by the bishop Sargis of the Haghbat Monastery in 1086 at the place named “Tashtadzor”

Image 22. The village of Neghots. A detail of another khachkar, in the neighborhood of the khachkar erected by the bishop Sargis of the Haghbat Monastery in 1086 at the place named “Tashtadzor”

Image 23. The village of Bagratashen. The section of Bagratashen-3 Middle Paleolithic open-air site where the palesol find layer is visible

Image 24. The village of Bagratashen. Trenches, uncovered by the 2011 excavations of the Bagratashen-1 Middle Paleolithic open-air site

Image 25. The village of Bagratashen. Archaeological layer, uncovered during the 2011 excavations of the Bagratashen-1 Middle Paleolithic open-air site where the distribution of the stone artifacts is visible

Image 26. The village of Bagratashen. Layer containing High Medieval pottery recorded at the neighborhood of the Bagratashen-1 Middle Paleolithic open-air site Բագրատաշեն-1 which, most probably, is the remnant of the Medieval Bagratashen village

Appendix J: Minutes of Public Consultations

ARMENIA-GEORGIA BORDER REGIONAL ROAD (M6 VANADZOR- BAGRATASHEN) IMPROVEMENT PROJECT

MINUTES OF PUBLIC CONSULTATIONS

ALAVERDI COMMUNITY, DECEMBER 9, 2025

On December 9, 2025, at 11:00, public consultation was organized in Alaverdi community, Lori region of the Republic of Armenia, within the scope of the Armenia-Georgia Border Regional Road (M6 Vanadzor-Bagratashen) Improvement Project.
The consultations were attended by employees and residents of Alaverdi community, as well as local SME representatives. The total number of participants were 19, the list of participants is attached.
The Road Department Fund was represented by:

- Aram Vardanyan - M6 Project Manager
- Inessa Zargaryan - Environmental Specialist
- Diana Khachatryan- Land acquisition/Social Specialist
- Arman Qocharyan - Engineer

The companies "BERNARD Gruppe" and "Transproject" which are implementing the design works were represented:

- Cristopher Cooper - Bernard Gruppe Internation Projects Leader
- Sirak Gyulbudaghyan - Resettlement Consultant, Transproject
- Tigran Begunyan - Legal Consultant, Transproject
- Syuzan Gardyan - Interpreter

The Deputy Head of Alaverdi community Harutyun Dzavaryan, welcomed the participants and briefly introduced the purpose of the consultations.
T. Begunyan presented the team, the purpose of the meeting, handed over the floor to Christopher Cooper, who provides details of the project and status of implementation.
Christopher Cooper, with the help of an interpreter, presented the details of project implementation. He mentioned that due to flooding from 24 to 26 May 2024, social infrastructure, bridges, and the major highways of the M6 and M4 were damaged. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km. Christopher Cooper mentioned that the scope of the works included the survey of flooding damaged areas and designing of protective measures to prevent damage from future flooding.
The Bernard Group team has conducted surveys from M6 km 30 up to M6 km 91 Georgia border. The scope of works also includes rockfall protection and road safety as well. Christopher Cooper noted that Geoinfo LLC based in Yerevan has conducting digital hydrological modeling of Debed River for 50, 100 and 200 years and design was developed, based on solutions and results of the digital modelling.
Christopher Cooper mentioned that the project team has commenced works in March 2025 and is going to finalize the design by the end of December 2025. Several visits have been conducted with involvement of various specialists.

Environmental and social aspects have been covered by the team of Consultant during the question and answers.

QUESTIONS AND ANSWERS.

Employee of Alaverdi Community.

Question: Am I right, that in your speech you mentioned that the design will be completed by the end of 2025, please confirm.

Answer: Yes, I hope that we will provide the final design by the end of December 2025, though some elements of design may be completed Q1 2026.

Deputy head of Alaverdi Communty

Question: There are certain places along the M6 road, which are far from the river and probably will not be damaged, for instance near Baghramyan, but the road is constantly settling. Please answer if you have considered those sections in your design.

Answer: I don't know which section you exactly mention, but we have observed the whole section from km 31 to 91. Our study is focused on places which are already damaged because of flooding as well as based on the results of digital modeling.

Resident of Alaverdi Community

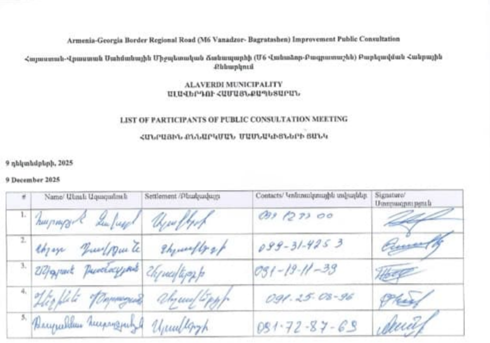
Question: Does your design include also rock falling protection measures?

Answer: Yes, nine different regimes for management of rock fall areas were considered. Of these, we have chosen 3 most commonly applied solutions: low barrier at roadside, conformal netting on rock face and rock bolting.

Question: Do you consider widening of the road?

Answer: Currently, we are studying the compliance of road with the European standards, but I don't think there will be major changes.

List of participants



Armenia-Georgia Border Regional Road (M6 Vanadzor- Bagratashen) Improvement Public Consultation

Հայաստան-Վրաստան Սահմանային Միջպետական Ճանապարհի (Մ6 Վանաձոր-Բագրատաշեն) Բարելավման Հանրային Քննարկում

ALAVERDI MUNICIPALITY

ԱԼԱՎԵՐԴԻ ՀԱՄԱՅՆՔԱՊԵՏԱՐԱՆ

LIST OF PARTICIPANTS OF PUBLIC CONSULTATION MEETING

ՀԱՆՐԱՅԻՆ ՔՆՆԱՐԿՄԱՆ ՄԱՍՆԱԿԻՑՆԵՐԻ ՑԱՆԿ

9 դեկտեմբերի, 2025

9 December 2025

#	Name/ Անուն Ազգանուն	Settlement /Բնակավայր	Contacts/ Կոնտակտային տվյալներ	Signature/ Ստորագրություն
1.	[illegible]	[illegible]	091 12 73 00	
2.	[illegible]	[illegible]	099-31-425 3	
3.	[illegible]	[illegible]	091-19-11-39	
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13.	[illegible]	[illegible]	033350534	
14.	C. Cooper	Innsbruck Austria	0043 670 650 1887	
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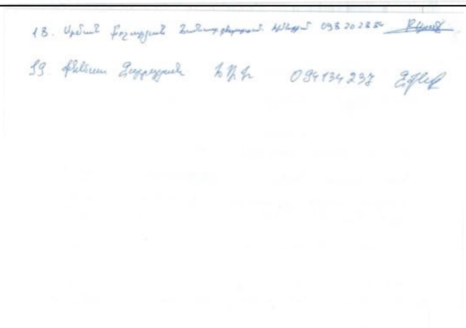


18. [illegible] 098 20 28 84

19. [illegible] 094134237

Photos

ARMENIA-GEORGIA BORDER REGIONAL ROAD (M6 VANADZOR- BAGRATASHEN) IMPROVEMENT PROJECT

MINUTES OF PUBLIC CONSULTATIONS

Tumanyan Community, December 9, 2025

On December 9, 2025, at 14:00, public consultation was organized in Tumanyan community, Lori region of the Republic of Armenia, within the scope of the Armenia-Georgia Border Regional Road (M6 Vanadzor-Bagratashen) Improvement Project.

The consultations were attended by employees of Tumanyan and residents of the community and neighbouring selements: Dsegh. Dzoraget, Chkalov. The total number of participants was 18, the list of participants is attached.

The Road Department Fund was represented by:

- Aram Vardanyan - M6 Project Manager
- Inessa Zargaryan - Environmental Specialist
- Diana Khachatryan- Land acquisition/Social Specialist
- Arman Qocharyan - Engineer

The companies "BERNARD Gruppe" and "Transproject" which are implementing the design works were represented:

- Cristopher Cooper - Bernard Gruppe Internation Projects Leader
- Sirak Gyulbudaghyan - Resettlement Consultant, Transproject
- Tigran Begunyan - Legal Consultant, Transproject
- Syuzan Gardyan - Interpreter

The Head of Alaverdi community Mr Suren Tumanyan, opened the meeting and briefly introduced the purpose of the consultations.

The Deputy Head of Alaverdi community Harutyun Dzavaryan, welcomed the participants and briefly introduced the purpose of the consultations.

T. Begunyan presented the team, the purpose of the meeting, handed over the floor to Christopher Cooper, who provides details of the project and status of implementation.

Christopher Cooper, with the help of an interpreter, presented the details of project implementation. He mentioned that due to flooding from 24 to 26 May 2024, social infrastructure, bridges, and the major highways of the M6 and M4 were damaged. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km. Christopher Cooper mentioned that the scope of the works included the survey of flooding damaged areas and designing of protective measures to prevent damage from future flooding.

The Bernard Group team has conducted surveys from M6 km 30 up to M6 km 91 Georgia border. The scope of works also includes rockfall protection and road safety as well. Christopher Cooper noted that Geoinfo LLC based in Yerevan has conducting digital hydrological modeling of Debed River for 50, 100 and 200 years and design was developed, based on solutions and results of the digital modelling.
Christopher Cooper mentioned that the project team has commenced works in March 2025 and is going to finalize the design by the end of December 2025. Several visits have been conducted with involvement of different narrow specialists.
Environmental and social aspects have been covered by the team of Consultant during the question and answers.

QUESTIONS AND ANSWERS

Head of community.

Question: There is a bridge across Debet River at the entrance to our community. Have you explored the bridge? Apparently it is damaged because of flooding.

Answer: We have done some observations but unfortunately only bridges across M6 are within our scope. The bridge you mentions comes from M6 towards the community and is out of our scope. Yes we have noticed that the bridge is damaged. The project itself is rather big from km 31 to km 92.

Participant.

Question: Is it possible to build retaining walls to avoid flooding in future.

Answer1: Modeling done by Geonifo provides information how is the height of road changing in comparison to the river, sometimes its higher and sometimes lower. The problem is when the river rises and the road is lower the river will flood the road and our aim is to make sure that the water will not stay in the road and will come back to the river when the river goes back.

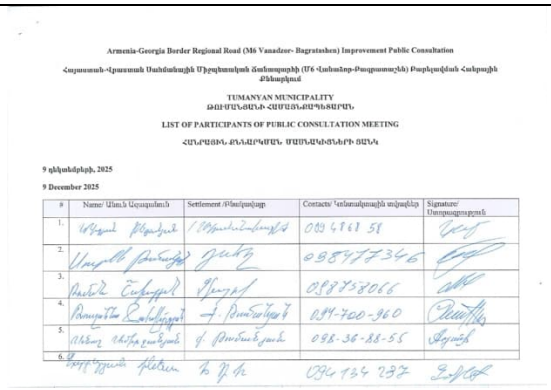
Answer2: Flooding will happen in any case, but the aim is that the water will not stay in the road and damage the road but will come back to the river. Sure we will have retaining walls and also we will have also rip-rap walls and also combination of both.

Head of community.

Question: Railway is also being rehabilitated from the flood damages. Are those works done in cooperation with Road Department.

Answer: No

List of participants



Armenia-Georgia Border Regional Road (M6 Vanadzor- Bagratashen) Improvement Public Consultation

Հայաստան-Վրաստան Սահմանային Միջպետական Ճանապարհի (Մ6 Վանաձոր-Բագրատաշեն) Բարեկարման Հանրային Քննարկում

TUMANYAN MUNICIPALITY
ԹՈՒՄԱՆՅԱՆԻ ՀԱՄԱՅՆՔԱՊԵՏԱՐԱՆ

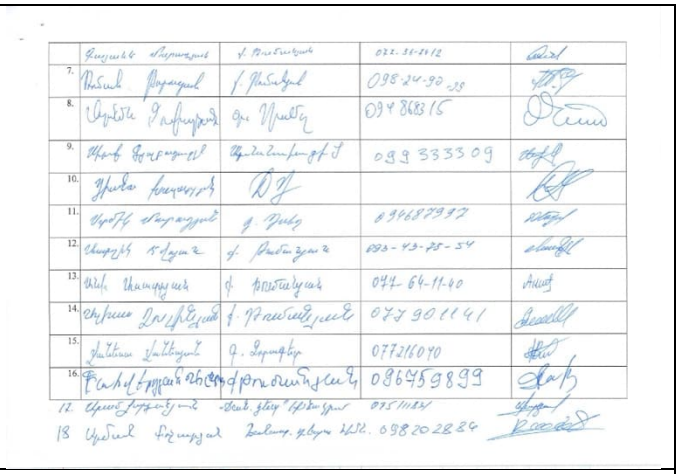
LIST OF PARTICIPANTS OF PUBLIC CONSULTATION MEETING

ՀԱՆՐԱՅԻՆ ՔՆՆԱՐԿՄԱՆ ՄԱՍՆԱԿՑՈՒԹՅԱՆ ՑԱՆԿ

9 դեկտեմբերի, 2025

9 December 2025

#	Name/ Անուն Ազգանուն	Settlement /Բնակավայր	Contacts/ Կոնտակտային տվյալներ	Signature/ Ստորագրություն
1.			094 4761 58	
2.			098477346	
3.			098738066	
4.			094-700-960	
5.			098-36-88-55	
6.			094 124 237	



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7.			098-24-90-28	
8.			094 868315	
9.			099 333309	
10.				
11.			096879997	
12.			093-43-75-54	
13.			077-64-11-40	
14.			077 901141	
15.			077216070	
16.			08645 9899	
17.			091111831	
18			098202884	

Photos

ARMENIA-GEORGIA BORDER REGIONAL ROAD (M6 VANADZOR- BAGRATASHEN)
IMPROVEMENT PROJECT
MINUTES OF PUBLIC CONSULTATIONS

Ayrum Town, December 9, 2025

On December 9, 2025, at 16:00, public consultation was organized in Ayrum town of Noyemberyan community, Tavush region of the Republic of Armenia, within the scope of the Armenia-Georgia Border Regional Road (M6 Vanadzor- Bagratashen) Improvement Project.

The consultations were attended by employees of Ayrum municipality, residents of Ayrum town and Ptghavan settlement. The total number of participants was 14, the list of participants is attached.

The Road Department Fund was represented by:

- Aram Vardanyan - M6 Project Manager
- Inessa Zargaryan - Environmental Specialist
- Diana Khachatryan- Land acquisition/Social Specialist
- Arman Qocharyan - Engineer

The companies "BERNARD Gruppe" and "Transproject" which are implementing the design works were represented:

- Cristopher Cooper - Bernard Gruppe Internation Projects Leader
- Sirak Gyulbudaghyan - Resettlement Consultant, Transproject
- Tigran Begunyan - Legal Consultant, Transproject
- Syuzan Gardyan - Interpreter

The Head of Alaverdi community Mr Suren Tumanyan, opened the meeting and briefly introduced the purpose of the consultations.

T. Begunyan presented the team, the purpose of the meeting, handed over the floor to Christopher Cooper, who provides details of the project and status of implementation.

Christopher Cooper, with the help of an interpreter, presented the details of project implementation. He mentioned that due to flooding from 24 to 26 May 2024, social infrastructure, bridges, and the major highways of the M6 and M4 were damaged. In particular, the newly rehabilitated M6 road was seriously damaged in 30 sections with a total length of about 7 km. Christopher Cooper mentioned that the scope of the works included the survey of flooding damaged areas and designing of protective measures to prevent damage from future flooding.

The Bernard Group team has conducted surveys from M6 km 30 up to M6 km 91 Georgia border. The scope of works also includes rockfall protection and road safety as well. Christopher Cooper noted that Geoinfo LLC based in Yerevan has conducting digital hydrological modeling of Debed River for 50, 100 and 200 years and design was developed, based on solutions and results of the digital modelling.

Christopher Cooper mentioned that the project team has commenced works in March 2025 and is going to finalize the design by the end of December 2025. Several visits have been conducted with involvement of different narrow specialists.

Environmental and social aspects have been covered by the team of Consultant during the question and answers.

QUESTIONS AND ANSWERS

Ayrum mayor.

Question: We have areas where the water comes from the mountains and in winter its always ice and very dangerous for big trucks. What solution do you have for this cases? We have several accidents due to this. On top of this the road in this section is too sharp bended.

Answer: In such cases we aim to prevent the water staying in the road and damaging the road. So when the river goes back the water will go back to the river and will not damage the road. We will consider some solutions in the design, maybe speed limitation will work.

Ptghavan administrative head.

Question: Is it possible to change the riverbed?

Answer: No. If you change the dynamics of the river you solve one local issue but create problem somewhere else. Why do you want to change the riverbed?

Question: The riverbed has changed due to flooding and now if new flooding occurs, the water canal, which serves several settlements, will be damaged. We just want to remove the river back to its original riverbed.

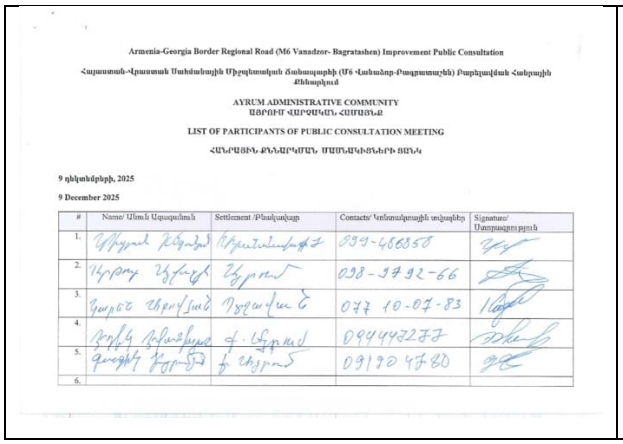
Answer: Please share with me the screenshot of the said area and I will study the situation and maybe include some recommendation into the design.

Garegin Hakobyan. Resident of Ayrum.

Question: In your speech you mentioned that retaining walls and other structures will be designed to prevent the road from flooding and also rock falling. What if the retaining wall will be on privately owned land or there will be business which will be closed.

Answer: In such cases when private properties are affected or businesses are interrupted, the project will provide mitigation measures, including also monetary compensations. At this stage we don't have the entire picture what kind of impact the design will have. When the final design will be ready we will conduct another public consultation and all the people whose properties or businesses are affected will be invited to participate in the consultation.

List of participants



Armenia-Georgia Border Regional Road (M6 Vanadzor- Bagratashen) Improvement Public Consultation

Հայաստան-Վրաստան Սահմանային Միջպետական Ճանապարհի (Մ6 Վանաձոր-Բագրատաշեն) Բարելավման Հանրային Քննարկում

AYRUM ADMINISTRATIVE COMMUNITY
ԱՅՐՈՒՄ ՎԱՐՉԱԿԱՆ ՀԱՄԱՅՆՔ

LIST OF PARTICIPANTS OF PUBLIC CONSULTATION MEETING
ՀԱՆՐԱՅԻՆ ՔՆՆԱՐԿՄԱՆ ՄԱՍՆԱԿԻՑՆԵՐԻ ՑԱՆԿ

9 դեկտեմբերի, 2025

9 December 2025

#	Name/ Անուն Ազգանուն	Settlement /Բնակավայր	Contacts/ Կոնտակտային տվյալներ	Signature/ Ստորագրություն
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2.	[illegible]	[illegible]	098-99 92-66	
3.	[illegible]	[illegible]	077 10-07-83	
4.	[illegible]	[illegible]	094443277	
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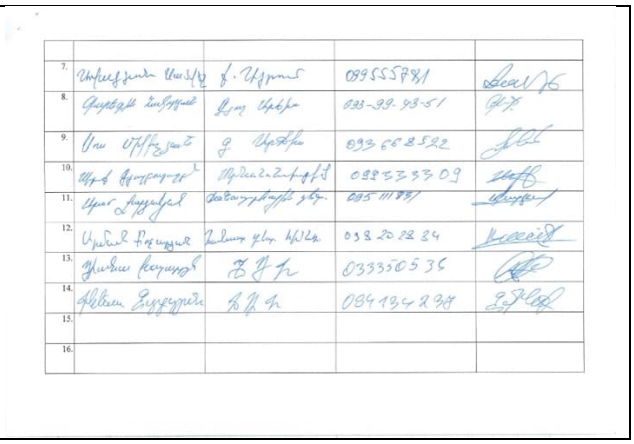
6.				



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12.	[illegible]	[illegible]	093 20 22 24	
13.	[illegible]	[illegible]	033350536	
14.	[illegible]	[illegible]	094 134 238	
15.				
16.				

Photos

Appendix K: Incident / Accident Forms

INCIDENT NOTIFICATION FORM

Project:		**Incident Date:**	
Location:		**Incident Time:**	
Equipment Involved:		**Operation in Progress:**	

Weather: ☐ Clear ☐ Dark ☐ Rain ☐ Snow ☐ High Winds ☐ Other (describe):
Visibility: ☐ Artificial Light ☐ Dark ☐ Dawn ☐ Daylight ☐ Dusk

Reporting Level of Incident:

☐ Fatality ☐ Lost Time ☐ Restricted Work ☐ Medical Aid ☐ First Aid	☐ Near Miss ☐ Equipment Damage ☐ Property Damage ☐ Fire/Explosion	☐ Business Interruption ☐ Security/Trespass/Theft ☐ Mobile Equipment ☐ Vehicle ☐ Spill/Release	☐ Government Reportable ☐ Non-reportable ☐ Contravention ☐ Public Complaint

Contractor Incident: ☐ Yes ☐ No **Contractor name:**

Report Prepared by: Signature: Date:	**Supervisor's Name:** Tel. No. Date:

AFFECTED PERSONS (Worker Positions)

DESCRIPTION OF INCIDENT (Describe what, when, why, who and how. Use separate pages if required. Attach photos if applicable.)

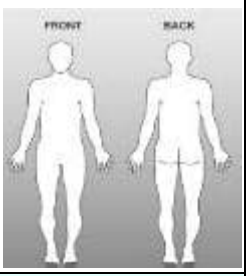
(i) WITNESSES- Provide separate witness reports

(ii) Name	**(iii)**	**(iv) Contact Information**
(v)	**(vi)**	**(vii)**
(viii)	**(ix)**	**(x)**

(xi) NOTIFICATIONS

What internal notifications have been made?	What external notifications have been made?

INJURY INFORMATION (if applicable)

Position:	Current condition:
Was injured person(s) taken to hospital? Yes ☐ No ☐ *(If yes, provide name and location of the hospital)*	
Indicate the area of injury, if applicable, on the diagram to the right, and describe the injury in the space below:	

VEHICLE INFORMATION (if applicable)	
Driver's Name:	Driver's License No.:
Year, Make & Model:	Driver's Phone Number:
License Plate or Serial Number:	Insurer and Policy No.:
Was seat belt done up? ☐ Yes ☐ No	Was a cell phone being used? ☐ Yes ☐ No
Were police notified? Yes ☐ No ☐	Name of police officer:
Road conditions: ☐ Dry ☐ Gravel ☐ Wet ☐ Icy	Other Info/Attachments:

Spill/Release Information (if applicable)		
Product:	**Volume:**	**Quantity Recovered:**

Initial Causal Analysis of Incident:
Direct Cause: (what / how)
Root Cause: (why)
Corrective Actions to Prevent Recurrence:

Note: Refer to the "Root Cause Investigation & Corrective Action Form" for further detail.

INCIDENT ROOT CAUSE INVESTIGATION AND CORRECTIVE ACTION FORM

Project:		**Incident Date:**	
Location:		**Incident Time:**	
Incident Title:			

Has the Incident Notification Form been completed? ☐ Yes ☐ No
If not, complete the incident notification form before completing this form.

☐ Fatality ☐ Lost Time ☐ Restricted Work ☐ Medical Aid ☐ First Aid	☐ Near Miss ☐ Equipment Damage ☐ Property Damage ☐ Fire/Explosion	☐ Business Interruption ☐ Security/Trespass/Theft ☐ Mobile Equipment ☐ Vehicle ☐ Spill/Release	☐ Government Reportable ☐ Non-reportable ☐ Contravention ☐ Public Complaint

Report Prepared by: Signature: Date:	**Supervisor's Name:** Signature: Date:

This form is used to help analyze incident **root causes** and **contributing factors**. Incidents rarely arise due to one single cause, and there are often multiple contributing factors that are involved in an incident.
A **cause** is a condition that produces an effect. If a cause is eliminated, the effect is eliminated.
A **contributing factor** is a condition that influences the effect but does not cause the effect. If the contributing factor is eliminated, the effect is not necessarily eliminated but may be influenced in other ways, such as being less severe, less likely, proceeding more slowly, or other similar effects.

DESCRIPTION OF INCIDENT (Use separate pages if required. Attach photos if applicable.)

Root Cause and Contributing Factor Analysis (add more pages if necessary for any section)

LEADING EVENTS ANALYSIS (Describe the events leading up to the incident that were different to a normal sequence of events for this activity. Consider whether changes from normal sequences of events were causes or contributing factors to the incident.) (Refer to Chapter 6 of the ADB OCHS Guide for detail)

Were the proper safe work practices and procedures being used by the workers in the events leading up to the incident? If not, why not?

Were relevant legislation and standards being followed by the workers in the events leading up to the incident? If not, why not?

Were there any mechanical failures or defects that led to the incident? If yes, describe below:
Were the proper safety devices in place and being used? Were workers using proper personal protective equipment (PPE)? If not, why not?
Did the actions or lack of actions of anyone at the worksite contribute to the incident? If yes, describe below:
Were there any unusual conditions that contributed to the incident, such as (but not limited to) weather, other activities in the area, or anything else that was not typical for the task?
Did the workers present at the incident respond in a safe and appropriate way? Describe below:

Were the workers adequately trained to respond to the incident? If not, what training would have helped to lead to a better outcome?

Are there adequate procedures in place to respond to similar incidents? If not, what procedures need to be developed?

Check any causes and contributing factors from the following list. If necessary, add additional causes and contributing factors.

☐ Operating equipment without training	☐ Inadequate site security
☐ Operating equipment without proper care	☐ Inadequate worker protection from toxic substances
☐ Operating equipment without safety devices in place or with inoperable safety devices	☐ Inadequate PPE
	☐ Improper use of PPE
☐ Inadequate warning to workers of a safety issue	☐ Inadequate lighting
☐ Inadequate barriers or barricades	☐ Inadequate ventilation
☐ Using defective tools or equipment	☐ Inadequate supervision
☐ Proper equipment unavailable	☐ Inadequate training
☐ Improper loading	☐ Fatigue
☐ Poor housekeeping practices	☐ Worker(s) under the influence of substances such as alcohol c medications
☐ Repetitive action injury	☐
☐ Poor maintenance of tools/equipment	☐
☐ Hazardous conditions (gas, dust, fumes)	☐

List the contributing factors and their involvement as a cause of the incident.

Contributing Factors	Involvement

Describe the root cause (s) below:

Corrective Action Analysis

List the corrective actions already taken or planned to prevent a similar incident from occurring. Indicate whether the corrective action is already complete and who is responsible for implementing it.

Corrective Action	Person Responsible	Status?

Summarize any further information learned from this root cause and contributing factor analysis, including any information that needs to be shared with the workers or worksite management.

Appendix L: Outline for Contractor's Site-Specific Environmental Management Plan

A. Introduction: description of what the present SSEMP is developed for, geographic location, PKs; attach map
B. Purpose of the SSEMP;
C. Responsible entities and persons
D. Legislative framework
E. Permissions and approvals
F. Site description:
   I. the present situation, availability of wild nature, topsoil, contaminated soil, dumped waste, trees and shrubs, dust, noise, availability of water bodies, other factors that may impact construction; attach pics
   II. presence of infrastructure: access roads, field roads, pipes, electricity, irrigation, drainage, etc;
   III. presence of sensitive receptors: residential houses, offices, businesses, etc. attach pics;
G. Site operation:
   I. list the works to be implemented here;
   II. Machinery
   III. Staff employed on-site;
H. Impacts and risk Assessment

Complete the Table:

N	Construction Activity	Hazards to consider	Likelihood (1 to 5)	Consequence (1 to 5)	Risk Score	Environmental Mitigation Measures

I. Environmental Management Plans:
   I. Mitigation
      1. Environmental and Safety Orientation Plan
      2. Occupational Health, and Safety Plan
      3. Public Consultation and Communications Plan
      4. Cultural Heritage Management Plan
      5. Surface and Underground Water Protection plan
      6. Flora & Fauna Protection and Vegetation Clearing Plan including the Tree Management Plan
      7. Utilities Protection and Relocation Plan
      8. Environmental Protection Plan
      9. Construction Work Camps Plan (describe the camps, attach the SMP for camp)
      10. Site Management Plan (Quarry and borrow pit, dumping sites, concrete batching and asphalt plants)
      11. Traffic and Access Management Plan
      12. Emergency Response Plan

13. Waste and Material Management Plan (Describe the types and the sources of material: existing or opened, attach permissions types and quantities of waste to be generated in this section, describe the handling of asphalt waste, describe the dump sites existing or newly opened, attach permissions;);
14. Site Reinstatement, Landscaping, and Revegetation Plan : describe how the site will look like upon the closure.

II. Monitoring:

III. Environmental parameters: water quality, air pollution, noise& vibration, describe the measurement points and attach the map;

IV. Regular monitoring of site according to EMP

J. Reporting.

Appendix M: Letters from communities on disposal areas for construction waste

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅՈՒՆ
ԼՈՌՈՒ ՄԱՐԶ
ԱԼԱՎԵՐԴՈՒ ՀԱՄԱՅՆՔԱՊԵՏԱՐԱՆ

Հայաստանի Հանրապետության Լոռու մարզի Ալավերդի համայնք
ՀՀ Լոռու մարզ, ք.Ալավերդի, Զ.Անդրանիկի 8/1, Հեռ. (0253) 2-41-00, էլ. փոստ՝ alaverdimunicipality@gmail.com

N 16
07 հունվար 2026 թ.

ՏԵՂԵԿԱՆՔ

Տրվում է «ՏՐԱՆՍՆԱԽԱԳԻԾ» ՍՊ ընկերությանը, ի դեմս տնօրեն Է. Մարտիրոսյանի, այն մասին, որ Հայաստանի Հանրապետությունը Վրաստանի հետ կապող Վանաձոր-Ալավերդի-Վրաստանի միջպետական ճանապարհի վնասված հատվածների ուսումնասիրման, նախագծման, Դեբետ գետի վարարումից պաշտպանող կոնստրուկցիաների կառուցման և հիմնանորոգման աշխատանքների իրականացման ընթացքում շինարարական աղբի տեղափոխման տարածքը Ալավերդի քաղաքի Կոշաբերդ փողոցի հյուսիս-արևմտյան մասում գտնվող արտադրական թափոնների աղբավայրն է:

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ Դ. ՂՈՒՄԱՇՅԱՆ

REPUBLIC OF ARMENIA
LORI MARZ
ALAVERDI MUNICIPALITY

Armenia, 1702, Lori Marz, Alaverdi, Zoravar Andraniki St., 8/1 Building ., Tel. (0253) 2-41-0, E-mail: alaverdimunicipality@gmail.com

No. 16
January 7, 2026

REFERENCE

Issued to "TRANSPROJECT" LLC, represented by Director E. Martirosyan, stating that during the study, design, construction of structures protecting from the Debet River flooding, and major repairs of damaged sections of the interstate road connecting the Republic of Armenia with Georgia (Vanadzor-Alaverdi-Georgia), the area for transporting construction waste is the production waste landfill located in the northwest part of Koshaberd Street in Alaverdi city.

Head of Community D. GHUMASHYAN

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ՏԱՎՈՒՇԻ ՄԱՐԶԻ ՆՈՅԵՄԲԵՐՅԱՆԻ ՀԱՄԱՅՆՔԱՊԵՏԱՐԱՆԻ ԱՇԽԱՏԱԿԱԶՄԻ ՔԱՐՏՈՒՂԱՐ

Հայաստանի Հանրապետության Տավուշի մարզի Նոյեմբերյան համայնք
ՀՀ, Տավուշի մարզ, ք. Նոյեմբերյան, Երևանյան 4, Հեռ. /0266/22703, /0266/22393, noyemberyan.tavush@mta.gov.am

N Ե-01/46
12 հունվար 2026թ.

ՏՐԱՆՍՆԱԽԱԳԻԾ ՓԲԸ
ՏՆՕՐԵՆ ՄԱՐՏԻՐՈՍՅԱՆ ԷԴՈՒԱՐԴԻՆ

Հարգելի Է. Մարտիրոսյան՝

Ի պատասխան Ձեր գրության Ձեզ ենք ուղարկում Վանաձոր-Ալավերդի-Վրաստան միջպետական ճանապարհի վնասված հատվածների հիմնանորոգման աշխատանքների ժամանակ առաջացած շինարարական աբի տեղափոխման համար հատկացված վայրի մասին տեղեկանքը:

ԱՇԽԱՏԱԿԱԶՄԻ ՔԱՐՏՈՒՂԱՐ ԱՐՄԻՆԵ ԱՄԻՐԱՂՅԱՆ

Կատ. Գլխավոր մասնագետ՝ Ն. Դանիելյան
+37477864111

CHIEF OF STAFF'S SECRETARY OF THE NOYEMBERYAN MUNICIPALITY, TAVUSH REGION OF THE REPUBLIC OF ARMENIA

Republic of Armenia, Tavush marz, Noyemberyan municipality,

RA Tavush marz, Noyemberyan city, St. Erevanyan 4. Tel./0266/22703, /0266/22393,
noyemberyan.tavush@mta.gov.am

N Ъ -01/46
12 january 2026.

To: Martirosyan Eduard director irector of
«Transproject» CJSC

Dear Mr. Martirosyan,

In response to your letter, we hereby submit the certificate regarding the site allocated for the transportation and disposal of construction waste generated during the major rehabilitation works of the damaged sections of the Vanadzor–Alaverdi–Georgia interstate road.

Chief of Staff's Secretary **Armine Amirayan**

Acting Chief Specialist N. Danielyan
+37477864111

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅՈՒՆ
ՏԱՎՈՒՇԻ ՄԱՐԶ ՆՈՅԵՄԲԵՐՅԱՆԻ ՀԱՄԱՅՆՔԱՊԵՏԱՐԱՆ

Հայաստանի Հանրապետության Տավուշի մարզի Նոյեմբերյան համայնք
ՀՀ, Տավուշի մարզ, ք. Նոյեմբերյան, Երևանյան 4, Հեռ. /0266/22703,
/0266/22393, noyemberyan.tavush@mta.gov.am

N 90
12 հունվար 2026 թ.

Տ Ե Ղ Ե Կ Ա Ն Ք

Տրվում է այն մասին, որ Վանաձոր-Ալավերդի-Վրաստան միջպետական ճանապարհի՝ Դեբեդ գետի վարարումից վնասված հատվածներում կոնստրուկցիաների կառուցման և հիմնանորգման աշխատանքների ժամանակ առաջացած շինարարական աղբի համար հատկացվում է Այրում քաղաքին պատկանող աղբավայրը, որը գտնվում է Հաղթանակ գյուղի վարչական տարածքում՝ Խեչի ձոր կոչվող հանդամասում:

ԱՅՐՈՒՄ ՔԱՂԱՔԻ ՎԱՐՉԱԿԱՆ ՂԵԿԱՎԱՐ Ա. ԱՅՎԱԶՅԱՆ

NOYEMBERYAN MUNICIPALITY ADMINISTRATION
TAVUSH MARZ
REPUBLIC OF ARMENIA

Republic of Armenia, Noyemberyan Municipality Administration
Tavush marz
RA. Noyemberyan city, Yerevanyan St. 4
Tel. 0266/22703, 0266/22393
e-mail: noyemberyan.tavush@mta.gov.am

Ref. No. 90
12 January 2026

NOTICE

This is to certify that, for the disposal of construction waste generated during the construction of structures and major rehabilitation works in the sections of the Vanadzor–Alaverdi–Georgia interstate road damaged as a result of the Debed River flooding, the landfill owned by the City of Ayrum is allocated, which is located within the administrative territory of Haghtanak Village, in the area known as "Khechi Dzor.

Head of the Municipality Administration. **A. Avagyan**

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԼՈՌՈՒ
ՄԱՐԶԻ ԹՈՒՄԱՆՅԱՆ ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ

Հայաստանի Հանրապետության Լոռու մարզի Թումանյան համայնք
ՀՀ Լոռու մարզ , ք. Թումանյան, Կենտրոնական փ., շ.1, Հեռ.
(+374)98 04-80-46, tumanyancity.am@gmail.com

N 247
02 մարտ 2026թ.

<<ՏՐԱՆՍՆԱԽԱԳԻԾ>> ՓԲԸ
ՏՆՕՐԵՆ
ԷԴՈՒԱՐԴ ՄԱՐՏԻՐՈՍՅԱՆԻՆ

Հարգելի՛ պարոն Մարտիրոսյան.

Ի պատասխան Ձեր 28.12.2025թ. թիվ Ե-ՏՆ-79/24 գրության.

Թումանյան համայնքի վարչական տարածքի սահմաններում ճանապարհի հիմնանորոգման ընթացքում առաջացած շինարարական աղբի տեղափոխման համար համապատասխան տարածք չկա:

Հարգանքով՝

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ ՍՈՒՐԵՆ ԹՈՒՄԱՆՅԱՆ

HEAD OF TUMANYAN MUNICIPALITY
LORI MARZ
REPUBLIC OF ARMENIA

Republic of Armenia, 1712, Lori Marz, Tumanyan Municipality
Lori Marz, Tumanyan Kentronakan St., 1 Building
Tel. (+374) 98 04-80-46
e-mail: tumanyancity.am@gmail.com

N. 247
02 March 2026

Dear mr. Martirosyan

In response to your letter No. E-TN-79-24 dated 28.12.2025,

There is no designated area within the administrative boundaries of the Tumanyan community for the disposal of construction waste generated during the road rehabilitation works. .

Respectfully

Head of the Community. **Suren Tumanyan**