Environmental Impact Assessment

January 2017

Georgia: Batumi Bypass Road Project (Part 3)

Prepared by Hagler Bailly, Pakistan for the Ministry of Regional Development and Infrastructure of Georgia, Roads Department and the Asian Development Bank.

Appendix 1: TOR EIA UPDATE BATUMI BYPASS-9 MAY 2016

See following pages.

Terms of Reference for updating of the Batumi Bypass Environmental Impact Assessment Report

1. **Background:** The Government of Georgia (GOG) intends to carry out construction of Batumi Bypass under ADB financing. The section represents a two-lane road with a total length of 12km. The Detail Design for the mentioned road section was prepared in 2011-2012 through the ADB financing. As of today, the preparatory activities for implementation of the project are underway.
2. **Objectives of the assignment** is the update EIA prepared during the Detail Design stage in accordance but not limited to the scope of the services listed below:
3. **Scope of Services**

The broad activities that need to be conducted for the EIA are listed below, and the specific detailed outline of Environmental Assessment report is also presented. The consultant will review, revise and update the existing EIA for the project with the assistance of experts in the area of environmental assessment, noise and vibration modeling, GIS and social impact assessment etc.

- Perform a scoping exercise and gap analysis to see how the present EIA differs from the required EIA format of ADB, according to ADB SPS 2009. The EIA is to follow pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards[1] such as the World Bank Group's Environmental, Health and Safety Guidelines. (WB EHS guidelines);
- Update, revise and supplement the information on the project description as per the detailed design. This should include specific information on the number, location and design of the fly-overs and bridges. This should be supplemented with maps that show the location in relation to the back ground environment of the area, all information should be adequately cross referenced;
- Study the relevant baseline information including: biodiversity, noise, air quality and water quality; conduct baseline surveys for each parameter to establish ambient environmental conditions in the area. Conduct noise, vibration and air dispersion modelling using the traffic projections for the project to establish likely environmental impacts in the area;
- Perform an impacts analysis for the construction and operation stages of the project and propose mitigation measures to minimize and/or remove the impacts;

[1] These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, more whichever is more stringent will be followed. If less stringent levels or measures are appropriate in view of specific project circumstances, a full justification is to be provided.

- Assess environmental impacts of the operation and its ancillary activities also discuss *cumulative environmental impacts*;
- Perform a clear analysis of project alternatives such that the environmentally most feasible option emerges as the selected alignment;
- Develop an environmental sensitivity mapping of the area using the baseline data collected; include data on noise, vibration, social indicators, water and soil;.
- Perform a risk based environmental impact analysis of the likely impacts of the operation based on the findings and results of the noise and air emissions modeling, biodiversity baseline and other sensitive environmental parameters along the alignment;
- Propose state of the art mitigation measures to minimize, mitigate or altogether remove these impacts;
- As part of the EIA prepare an environmental management plan (EMP) including the use of appropriate mitigation technologies, an environmental monitoring plan with monitoring indicators, and institutional arrangements and responsibilities (including cost estimates and training);
- Conduct an institutional environmental capacity review with regards to the EAs implementation capacity with regards to Environmental safeguards. Prepare a capacity development program to deal with each of the identified capacity gaps.
- Conduct meaningful public consultation with communities and relevant stakeholders in the area of influence of the project at least twice during the environmental assessment process, once at the planning stage and once when the detailed design is available for sharing with all stakeholders. Consult all local and national level stakeholders, including Community based organization and national and international NGOs actively working in the area;
- Ensure, and provide evidence that the findings and concerns of the communities have been addressed in the EIA report;
- The EIA report that should include an EMP and environmental monitoring plan as required by ADB's safeguards policy statement 2009;
- Ensure that the EIA contains an environmental management cost, i.e., the cost for implementing the EMP in the field;
- The EIA and its EMP should contain the requirement for the preparation of a site specific EMP by the contractor (using a risk based approach) to ensure that the mitigation measures are customized to the needs of the various aspects of the operation and the alignment;
- The EIA should contain maps and figures to explain the details and all supporting data and studies performed as part of the EIA should be duly annexed;
- Prepare a Grievance Redress Mechanism that is operational for the project, including community representation along the entire alignment of the road.

OUTLINE OF AN ENVIRONMENTAL IMPACT ASSESSMENT REPORT (SPS 2009)

This outline is part of the Safeguard Requirements for Environment. The EIA for each of the power plants must contain the following major elements. The substantive aspects of this outline will guide the preparation of environmental impact assessment reports, although not necessarily in the order shown.

A. Executive Summary

This section describes concisely the critical facts, significant findings, and recommended actions.

B. Policy, Legal, and Administrative Framework

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

C. Description of the Project

This section describes the proposed project; its major components; and its geographic, ecological, social, and temporal context, including any associated facility required by and for the project (for example, access roads, power plants, water supply, quarries and borrow pits, and spoil disposal). It normally includes drawings and maps showing the project's layout and components, the project site, and the project's area of influence.

D. Description of the Environment (Baseline Data)

This section describes relevant physical, biological, and socioeconomic conditions within the study area. It also looks at current and proposed development activities within the project's area of influence, including those not directly connected to the project. It indicates the accuracy, reliability, and sources of the data.

E. Anticipated Environmental Impacts and Mitigation Measures

This section predicts and assesses the project's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic (including occupational health and safety, community health and safety, vulnerable groups and gender issues, and impacts on livelihoods through environmental media), and physical cultural resources in the project's area of influence, in quantitative terms to the extent possible; identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions and specifies topics that do not require further attention; and examines global, transboundary, and cumulative impacts.

F. Analysis of Alternatives

This section examines alternatives to the proposed project site, technology, design, and operation—including the no project alternative—in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. It also states the basis for selecting the particular project design proposed and, justifies recommended emission levels and approaches to pollution prevention and abatement.

G. Information Disclosure, Consultation, and Participation

This section:

(i) describes the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders;

(ii) summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and Indigenous Peoples; and

(iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation.

H. Grievance Redress Mechanism

This section describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.

I. Environmental Management Plan

This section deals with the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts (in that order of priority). It may include multiple management plans and actions. It includes the following key components (with the level of detail commensurate with the project's impacts and risks):

(i) Mitigation:
  (a) identifies and summarizes anticipated significant adverse environmental impacts and risks;
  (b) describes each mitigation measure with technical details, including the type of impact to which it relates and the conditions under which it is required (for instance, continuously or in the event of contingencies), together with designs, equipment descriptions, and operating procedures, as appropriate; and
  (c) provides links to any other mitigation plans (for example, for involuntary resettlement, Indigenous Peoples, or emergency response) required for the project.

(ii) Monitoring:
  (a) describes monitoring measures with technical details, including parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits and definition of thresholds that will signal the need for corrective actions; and

(b) describes monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and document the progress and results of mitigation.

(iii) Implementation arrangements:

(a) specifies the implementation schedule showing phasing and coordination with overall project implementation;

(b) describes institutional or organizational arrangements, namely, who is responsible for carrying out the mitigation and monitoring measures, which may include one or more of the following additional topics to strengthen environmental management capability: technical assistance programs, training programs, procurement of equipment and supplies related to environmental management and monitoring, and organizational changes; and

(c) estimates capital and recurrent costs and describes sources of funds for implementing the environmental management plan.

(iv) Performance indicators: describes the desired outcomes as measurable events to the extent possible, such as performance indicators, targets, or acceptance criteria that can be tracked over defined time periods.

J. Conclusion and Recommendation

This section provides the conclusions drawn from the assessment and provides recommendations.

4. Contract Duration and Reporting Obligation

The Duration of the Contract is 2 months:

Reporting Obligation of the Consultant is as follows:

1. Draft Final Environmental Impact Assessment Report the Report will be submitted at the end of 1 month after commencement of the service and will include EIA report prepared based on the requirements underlined under the Scope of Services of the ToR.
2. Final Environmental Impact Assessment Report will be submitted within 1 week period after obtaining comments from the employer and shall incorporate all revisions deemed necessary arising from comments received from the Road Department following discussions and agreements in the course of evaluating the draft report and will be submitted to the Client for approval and disclosure.
   Note: all reports shall be submitted in English and Georgian Language.

5. Qualification and experience:

The EIA Consultant shall be a qualified Environmental specialist with at least 5 years working experience. The successful candidate should have:

- An advanced degree in Environmental Studies (or relevant) from an accredited educational institution;

- Proven practical experience in Environmental monitoring, reporting and stakeholder consultation (include names and contact information of previous clients).
- Knowledge and practical experience In preparation of EIA reports;
- Familiar with IFI financed projects;
- Good knowledge of written and spoken English language;

Selection criteria:

Selection will be done according to the recruitment of individual consultant selection method provided in Guidelines on The Use of Consultants by Asian Development Bank and Its Borrowers (available at http://www.adb.org/documents/guidelines-use-consultants-asian-development-bank-and-its-borrowers), and the following criteria and weights:

1. 20% General Qualification.
2. 70% Assignment-related Experience.
3. 10% Regional Experience

Appendix 2: AIR QUALITY SAMPLING RESULTS

1. This appendix contains the laboratory analysis reports for the following parameters

2. This appendix contains the laboratory analysis reports for the following parameters:

- NO_X and NO_2 in diffusion tubes
- SO_2 in diffusion tubes
- O_3 in diffusion tubes
- NO_2 in rapid analysis monitors
- SO_2 in rapid analysis monitors

gradko environmental
(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER K06466R

BOOKING REFERENCE No K06466

DESPATCH NOTE No SOR 32394

CUSTOMER Hagler Bailly Pakistan Ltd
39, Street 3, E7
Islamabad 44000
Pakistan

DATE SAMPLES RECEIVED 19/10/2016

			Exposure Data			NO_2	NO_X	NO	NO_2	NO_X	NO	TOTAL	TOTAL
NO_2	Tube Number	NO_x	Date On	Date Off	Time (hr.)	ppb *	ppb *	ppb * +	µg/m³ *	µg/m³ *	µg/m³ *+	µG NO_2	µG NOx
793991	A1 - Oil Terminal	793998	30/09/2016	14/10/2016	336.58	5.48	13.19	7.70	10.51	25.26	14.76	0.26	0.62
793990	A2 - Batumi	793997	30/09/2016	14/10/2016	335.42	21.05	34.32	13.27	40.32	65.76	25.43	0.98	1.60
793989	A3 - Long Bridge	793996	30/09/2016	14/10/2016	333.95	6.71	6.34		12.85	12.15		0.31	0.30
793987	A4 - Reference	793994	30/09/2016	14/10/2016	332.67	6.04	11.12	5.07	11.58	21.30	9.72	0.28	0.52
793988	A5 -Interchange	793995	30/09/2016	14/10/2016	332.18	18.85	30.96	12.11	36.12	59.31	23.20	0.87	1.43

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

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St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

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LABORATORY ANALYSIS REPORT

Lab Blanks	336.58	0.19	0.20	0.00	0.37	0.38	0.01	0.009	0.009

Comment: Results are not blank subtracted

Where nitric oxide (NO) results have not been calculated result for NO_x was lower than result for NO_2

[+]NO results are derived by subtracting NO2 from NOx.

Results have been corrected to a temperature of 293K (20C)

Overall M.O.U. 7.3% +/- **Limit of Detection** 0.071ug NOx, 0.017ug NO2 on tube

Tube Preparation: 20%TEA/Water Analysed on UVS04 Camspec M550

Analyst Name Charlotte Grove

Date of Analysis 20/10/2016 **Date of Report** 26/10/2016

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

REPORT OFFICIALLY CHECKED

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LABORATORY ANALYSIS REPORT

DETERMINATION OF SULPHUR DIOXIDE IN DIFFUSION TUBES BY ION CHROMATOGRAPHY

REPORT NUMBER K06468R
BOOKING IN REFERENCE No K06468
DESPATCH NOTE No 32394

CUSTOMER Hagler Bailly Pakistan Ltd
39, Street 3, E7
Islamabad 44000
Pakistan

DATE SAMPLES RECEIVED 19/10/2016

Location	Sample Number	Date Exposed	Date Finished	Exposure Hours	µg S Total	µg S - Blank	SO_2 µg/m^3*	SO_2 ppb*
A0- TBILSI	794001	30/09/2016	14/10/2016	337.25	<0.03	<0.01	<1.37	<0.51
A1- OIL TERMINAL	794007	30/09/2016	14/10/2016	336.58	<0.03	<0.01	<1.37	<0.52
A2- BATUMI	794006	30/09/2016	14/10/2016	335.42	<0.03	<0.01	<1.38	<0.52
A3- LONG BRIDGE	794004	30/09/2016	14/10/2016	333.95	<0.03	<0.01	<1.39	<0.52
A3A- SHORT BRIDGE	794005	30/09/2016	14/10/2016	333.95	<0.03	<0.01	<1.39	<0.52
A4- REFERENCE	794002	30/09/2016	14/10/2016	332.67	<0.03	<0.01	<1.39	<0.52
A5- INTERCHANGE	794003	30/09/2016	14/10/2016	332.18	<0.03	<0.01	<1.39	<0.52
Laboratory Blank					0.01			

Comment: Results are blank subtracted
Results reported as <0.03µg S are below the reporting limit.

Overall M.U. ±6.0%
Reporting Limit 0.03µg S

Analysed on Dionex ICS3000 ICU5
Analyst Name Katya Paldamova

Date of Analysis 20/10/2016
Date of Report 21/10/2016

Analysis has been carried out in accordance with in-house method GLM1

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LABORATORY ANALYSIS REPORT

DETERMINATION OF OZONE IN DIFFUSION TUBES BY ION CHROMATOGRAPHY

REPORT NUMBER K06475R
BOOKING IN REFERENCE No K06475
DESPATCH NOTE No 32394
CUSTOMER Hagler Bailly Pakistan Ltd

39, Street 3, E7
Islamabad 44000
Pakistan

DATE SAMPLES RECEIVED 19/10/2016

Location	Sample Number	Date Exposed	Date Finished	Exposure Hours	µg on Tube Total	µg - Blank	O_3 µg/m^3*	O_3 ppb*
A1- OIL TERMINAL	794012	30/09/2016	14/10/2016	336.58	0.26	0.25	43.21	21.60
A2- BATUMI	794011	30/09/2016	14/10/2016	335.42	0.24	0.23	40.13	20.07
A3- LONG BRIDGE	794010	30/09/2016	14/10/2016	333.95	0.17	0.16	27.74	13.87
Laboratory Blank					0.01			

Comment: Results are blank subtracted

Overall M.U. ±10.0%
Reporting Limit 0.096µg O_3

Analysed on Dionex ICS3000 ICU5
Analyst Name Katya Paldamova

Date of Analysis 20/10/2016
Date of Report 21/10/2016

Analysis has been carried out in accordance with in-house method GLM 2

REPORT OFFICIALLY CHECKED

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ilac-MRA UKAS TESTING
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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN RAPID ANALYSIS MONITORS BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER K06471R
BOOKING IN REFERENCE No K06471
DESPATCH NOTE No 32394

CUSTOMER Hagler Bailly Pakistan Ltd Attn: Shahid Mehmood
39, Street 3, E7
Islamabad 44000
Pakistan

DATE SAMPLES RECEIVED 19/10/2016

Location	Sample Number	Exposure Data Date On	Date Off	Time (hr.)	Temp. Deg C	µG NO_2 on RAM	µg/m^3 *	ppb *
A1- OIL TERMINAL	794018	14/10/2016	15/10/2016	19.20	20.0	0.49	14.92	7.79
A2- INTERCHANGE	794017	14/10/2016	15/10/2016	17.72	20.0	0.70	23.01	12.01
Laboratory Blank				19.20	20.0	0.01	0.00	0.00

Comment: Results are not blank subtracted
If temperatures are not supplied results are calculated assuming a temperature of 293 K (20°)
Limit of Detection
0.035µgNO_2
Analysed on UVS04
Preparation : 20% TEA / Water Camspec M550

Analyst Name Blazej Fiser

Date of Analysis 25/10/2016 **Date of Report** 25/10/2016

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

REPORT OFFICIALLY CHECKED

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LABORATORY ANALYSIS REPORT

DETERMINATION OF SULPHUR DIOXIDE IN RAPID AIR MONITORS BY ION CHROMATOGRAPHY

REPORT NUMBER K06473R
BOOKING IN REFERENCE No K06473
DESPATCH NOTE No 32394
CUSTOMER Hagler Bailly Pakistan Ltd

39, Street 3, E7
Islamabad 44000
Pakistan

DATE SAMPLES RECEIVED 19/10/2016

Location	Sample Number	Date Exposed	Date Finished	Exposure hours	Temp. ℃	µgSO_2 on RAM	µgSO_2 on RAM-Blank	SO_2 µg/m^3 *	SO_2 ppb *
A1- OIL TERMINAL	794015	14/10/2016	15/10/2016	19.20	20.00	<0.53	<0.13	<4.45	<1.67
A2- INTERCHANGE	794014	14/10/2016	15/10/2016	17.72	20.00	<0.53	<0.13	<4.83	<1.81
Laboratory Blank						0.40			

Comment: Results are blank subtracted
If temperatures are not supplied results are calculated assuming a temperature of 293 K (20°)
Results reported as <0.053µg SO2 on RAM are below the reporting limit.

Overall M.U. ±7.8% at 20µgm^{-3} (1 to 4 week exposure) **Reporting Limit** 0.53µg SO2 on RAM

Analysed on Dionex ICS3000 ICU5 **Analyst Name** Katya Paldamova

Date of Analysis 20/10/2016 **Date of Report** 21/10/2016

Analysis has been carried out in accordance with in-house method GLM1

REPORT OFFICIALLY CHECKED

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Signed.....
L. Gates, Laboratory Manager

Appendix 3: WATER QUALITY SAMPLING RESULTS

1. This appendix contains the following laboratory analysis reports:
   - General water parameters
   - Metals in water

საქართველოს გარემოსა და ბუნებრივი რესურსების დაცვის სამინისტრო
MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES PROTECTION OF GEORGIA

გარემოს ეროვნული სააგენტო
NATIONAL ENVIRONMENTAL AGENCY

№ 12/1-940 21 10 2016

ფიზიკურ პირს

ბ-ნ ჰასან ბუხარს

ბატონო ჰასან,

საქართველოს გარემოსა და ბუნებრივი რესურსების დაცვის სამინისტროს ს.ს.ი.პ „გარემოს ეროვნულ სააგენტო“-სა და თქვენს შორის 2016 წლის 26 სექტემბერს გაფორმებული ფასიანი მომსახურების შესახებ №ფმ-3/847 ხელშეკრულების შესაბამისად, გაწვდით, თქვენს მიერ წარმოდგენილი წყლის (6 (ექვსი) და ნიადაგის (6 (ექვსი) სინჯებში ჩატარებული ქიმიური და ბიოლოგიური ანალიზის შედეგებს.

დანართი: გვ.

პატივისცემით,

სააგენტოს უფროსი **თამარ ბაგრატია**

დ. აღმაშენებლის გამზ. 150, 0112, თბილისი, საქართველო
150 D. AGMASHENEBELI AVE, 0112, TBILISI, GEROGIA

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E-mail: info@meteo.gov.ge Web: www. meteo.gov.ge

THE NATIONAL ENVIRONMENTAL AGENCY
THE DEPARTMENT OF ENVIRONMENTAL POLLUTION MONITORING

ATMOSPHERIC AIR, WATER and SOIL ANALYSIS LABORATORY

8th Floor – David Agmashenebeli ave. 150, Tbilisi, Georgia O112

- Test report –
#122-2016

Registered sample number: #1230-#1235 (Surface water); #1236-#1241 (Soil)

Number of Parties to the Protocol: 11

Name of customer: Private person – Hasan Buhar; Private #423015-607857-1

Address of customer: Pakistan, Islamabad, ave. #21 F8/2

Tel.: (+99532) 599 18-17-53

Identification of samples by the applicant: #W01-#W06 (Surface water**);** #S01-#S06 (Soil)

Description and identification of the sample (matrix): Surface water and soil

Identification of the used method: Ion-Chromatography, spectrophotometer, titrimetric, ICP-OES, Microwave Extraction Systems-MILESTONE and BERGOF, Weight method, mobile apparatus

The date of receipt of the sample: 05.10.2016

The date of examination: 05.10.2016 – 21.10.2016

Date of issue: 24.10.2016

#1230 (2)

Adjara Region

Surface water - W02 BPG

#	Measured Parameters	Unit	Results	MPC	Methods
1	Turbulence	NTU	0.14		Photometric
2	Total suspended solid	mg/l	4.4		ISO 11923:2007
3	Hardness	mgeqv./l	0.72		ISO 6059-84
4	BOD_5	mg/l	0.64	6.0	ISO 5815-1:2010
5	COD	mg/l	1.96	30.0	ISO 6060:2010
6	Sulphate	mg/l	2.098	500	ISO 10304-1:2007
7	Chloride	mg/l	1.983	350	ISO 10304-1:2007
8	Alkalinity	mg/l	48.0		Titrimetric
9	Sodium	mg/l	2.5	200	ISO 9964-3:2010
10	Calcium	mg/l	9.83	180	ISO 6058:2008
11	Potassium	mg/l	0.5470		ISO 11885:2007
12	TDS	mg/l	31.0	1000	Weight
13	Total coliforms	in 1 dm^3	10 000		membrane filtration method
14	E-coli	in 1 dm^3	8 000	5000	membrane filtration method
15	Fecal streptococci	in 1 dm^3	N/D		membrane filtration method

#1231 (3)

Adjara Region

Surface water - W03 BPG

#	Measured Parameters	Unit	Results	MPC	Methods
1	Turbulence	NTU	0.14		Photometric
2	Total suspended solid	mg/l	3.8		ISO 11923:2007
3	Hardness	mgeqv./l	0.64		ISO 6059-84
4	BOD_5	mg/l	0.93	6.0	ISO 5815-1:2010
5	COD	mg/l	1.76	30.0	ISO 6060:2010
6	Sulphate	mg/l	1.521	500	ISO 10304-1:2007
7	Chloride	mg/l	1.514	350	ISO 10304-1:2007
8	Alkalinity	mg/l	46.0		Titrimetric
9	Sodium	mg/l	2.0	200	ISO 9964-3:2010
10	Calcium	mg/l	8.49	180	ISO 6058:2008
11	Potassium	mg/l	0.5034		ISO 11885:2007
12	TDS	mg/l	31.0	1000	Weight
13	Total coliforms	in 1 dm^3	12 000		membrane filtration method
14	E-coli	in 1 dm^3	8 000	5000	membrane filtration method
15	Fecal streptococci	in 1 dm^3	N/D		membrane filtration method

#1232 (4)

Adjara Region

Surface water - W04 BPG

#	Measured Parameters	Unit	Results	MPC	Methods
1	Turbulence	NTU	0.59		Photometric
2	Total suspended solid	mg/l	3.0		ISO 11923:2007
3	Hardness	mgeqv./l	1.48		ISO 6059-84
4	BOD_5	mg/l	1.23	6.0	ISO 5815-1:2010
5	COD	mg/l	2.35	30.0	ISO 6060:2010
6	Sulphate	mg/l	3.750	500	ISO 10304-1:2007
7	Chloride	mg/l	3.420	350	ISO 10304-1:2007
8	Alkalinity	mg/l	104.0		Titrimetric
9	Sodium	mg/l	7.5	200	ISO 9964-3:2010
10	Calcium	mg/l	15.93	180	ISO 6058:2008
11	Potassium	mg/l	0.8808		ISO 11885:2007
12	TDS	mg/l	96.0	1000	Weight
13	Total coliforms	in 1 dm^3	9 000		membrane filtration method
14	E-coli	in 1 dm^3	7 000	5000	membrane filtration method
15	Fecal streptococci	in 1 dm^3	N/D		membrane filtration method

#1233 (5)

Adjara Region

Surface water - W05 BPG

#	Measured Parameters	Unit	Results	MPC	Methods
1	Turbulence	NTU	0.09		Photometric
2	Total suspended solid	mg/l	6.2		ISO 11923:2007
3	Hardness	mgeqv./l	2.2		ISO 6059-84
4	BOD_5	mg/l	0.79	6.0	ISO 5815-1:2010
5	COD	mg/l	3.92	30.0	ISO 6060:2010
6	Sulphate	mg/l	7.081	500	ISO 10304-1:2007
7	Chloride	mg/l	5.428	350	ISO 10304-1:2007
8	Alkalinity	mg/l	132.0		Titrimetric
9	Sodium	mg/l	9.5	200	ISO 9964-3:2010
10	Calcium	mg/l	26.08	180	ISO 6058:2008
11	Potassium	mg/l	0.8646		ISO 11885:2007
12	TDS	mg/l	199.0	1000	Weight
13	Total coliforms	in 1 dm^3	N/D		membrane filtration method
14	E-coli	in 1 dm^3	N/D	5000	membrane filtration method
15	Fecal streptococci	in 1 dm^3	N/D		membrane filtration method

#1234 (6)

Adjara Region

Surface water - W06 BPG

#	Measured Parameters	Unit	Results	MPC	Methods
1	Turbulence	NTU	0.68		Photometric
2	Total suspended solid	mg/l	5.4		ISO 11923:2007
3	Hardness	mgeqv./l	1.30		ISO 6059-84
4	BOD_5	mg/l	0.68	6.0	ISO 5815-1:2010
5	COD	mg/l	2.94	30.0	ISO 6060:2010
6	Sulphate	mg/l	4.125	500	ISO 10304-1:2007
7	Chloride	mg/l	3.286	350	ISO 10304-1:2007
8	Alkalinity	mg/l	88.0		Titrimetric
9	Sodium	mg/l	7.0	200	ISO 9964-3:2010
10	Calcium	mg/l	16.31	180	ISO 6058:2008
11	Potassium	mg/l	0.8598		ISO 11885:2007
12	TDS	mg/l	143.0	1000	Weight
13	Total coliforms	in 1 dm^3	13 000		membrane filtration method
14	E-coli	in 1 dm^3	10 000	5000	membrane filtration method
15	Fecal streptococci	in 1 dm^3	N/D		membrane filtration method

#1235 (1)

Adjara Region

Surface water - W01 BPG

#	Measured Parameters	Unit	Results	MPC	Methods
1	Turbulence	NTU	0.31		Photometric
2	Total suspended solid	mg/l	4.8		ISO 11923:2007
3	Hardness	mgeqv./l	0.74		ISO 6059-84
4	BOD_5	mg/l	0.79	6.0	ISO 5815-1:2010
5	COD	mg/l	2.74	30.0	ISO 6060:2010
6	Sulphate	mg/l	1.496	500	ISO 10304-1:2007
7	Chloride	mg/l	4.449	350	ISO 10304-1:2007
8	Alkalinity	mg/l	42.0		Titrimetric
9	Sodium	mg/l	8.0	200	ISO 9964-3:2010
10	Calcium	mg/l	8.73	180	ISO 6058:2008
11	Potassium	mg/l	1.4990		ISO 11885:2007
12	TDS	mg/l	50.0	1000	Weight
13	Total coliforms	in 1 dm^3	N/D		membrane filtration method
14	E-coli	in 1 dm^3	N/D	5000	membrane filtration method
15	Fecal streptococci	in 1 dm^3	N/D		membrane filtration method

The National Environmental Agency
The Department of the Environmental Pollution Monitoring

The Atmospheric air, water
and soil Analyses laboratory
www.nea.gov.ge

Note: Test results may be disputed within 14 days from the date of receipt of the Protocol.

Executors:

G.Kuchava

M.Chigitashvili

M.Khvedeliani

M.Mikava

N.Korchilava

N.Vasadze

Head of laboratory: **Elina Bakradze**

THE NATIONAL ENVIRONMENTAL AGENCY
THE DEPARTMENT OF ENVIRONMENTAL POLLUTION MONITORING

ATMOSPHERIC AIR, WATER and SOIL ANALYSIS LABORATORY

8th Floor – David Agmashenebeli ave. 150, Tbilisi, Georgia O112

Accreditation Certificate

GAC -TL - 0094

Registration date 23 December, 2014

Valid until 23 December, 2018

- Test report –
#122a-2016

Registered sample number: #1230-#1235

Number of Parties to the Protocol: 9

Name of customer: Private person – Hasan Buhar; Private #423015-607857-1

Address of customer: Pakistan, Islamabad, ave. #21 F8/2

Tel.: (+99532) 599 18-17-53

Identification of samples by the applicant: #W01 - # W06

Description and identification of the sample (matrix): Surface water

Identification of the used method: ICP-OES

The date of receipt of the sample: 05.10.2016

The date of examination: 05.10.2016 – 21.10.2016
Date of issue: 24.10.2016

#1230 (2)

Adjara Region

Surface water - W02 BPG

#	Measured Parameters	Unit	Results	MPS	Methods
1	pH		7.52	6.5-8.5	ISO 10523:2010
2	Iron - Fe	mg/l	0.0269	0.3	ISO 11885:2007
3	Zinc - Zn		0.0066	1.0	
4	Cadmium - Cd		0.0002	0.001	
5	Cupper - Cu		0.0011	1.0	
6	Nickel-Ni		0.0016	0.1	
7	Arsenic - As		0.0033	0.05	
8	Lead - Pb		0.0024	0.03	
9	Chrome - Cr		0.0041	0.5	
10	Manganese-Mn		0.0068	0.1	
11	Mercury		<0.0002	0.0005	
12	Aluminum - Al		0.0189	0.5	
13	Antimony - Sb		0.0130	0.05	
14	Barium - Ba		0.0058	0.1	
15	Boron - B		0.0483	0.5	
16	Selenium - Se		<0.00006	0.01	

#1231 (3)

Adjara Region

Surface water - W03 BPG

#	Measured Parameters	Unit	Results	MPS	Methods
1	pH		7.69	6.5-8.5	ISO 10523:2010
2	Iron - Fe	mg/l	0.0323	0.3	ISO 11885:2007
3	Zinc - Zn		0.0115	1.0	
4	Cadmium - Cd		0.0003	0.001	
5	Cupper - Cu		0.0011	1.0	
6	Nickel-Ni		0.0014	0.1	
7	Arsenic - As		0.0008	0.05	
8	Lead - Pb		0.0030	0.03	
9	Chrome - Cr		0.0044	0.5	
10	Manganese-Mn		0.0024	0.1	
11	Mercury		<0.0002	0.0005	
12	Aluminum - Al		0.0226	0.5	
13	Antimony - Sb		0.0075	0.05	
14	Barium - Ba		0.0055	0.1	
15	Boron - B		0.0109	0.5	
16	Selenium - Se		<0.0006	0.01	

#1232 (4)

Adjara Region

Surface water - W04 BPG

#	Measured Parameters	Unit	Results	MPS	Methods
1	pH		7.61	6.5-8.5	ISO 10523:2010
2	Iron - Fe	mg/l	0.0974	0.3	ISO 11885:2007
3	Zinc - Zn		0.0062	1.0	
4	Cadmium - Cd		0.0001	0.001	
5	Cupper - Cu		0.0024	1.0	
6	Nickel-Ni		0.0001	0.1	
7	Arsenic - As		0.0037	0.05	
8	Lead - Pb		0.0016	0.03	
9	Chrome - Cr		0.0031	0.5	
10	Manganese-Mn		0.0026	0.1	
11	Mercury		<0.0001	0.0005	
12	Aluminum - Al		0.0694	0.5	
13	Antimony - Sb		0.0005	0.05	
14	Barium - Ba		0.0041	0.1	
15	Boron - B		0.0028	0.5	
16	Selenium - Se		0.0009	0.01	

#1233 (5)

Adjara Region

Surface water - W05 BPG

#	Measured Parameters	Unit	Results	MPS	Methods
1	pH		7.41	6.5-8.5	ISO 10523:2010
2	Iron - Fe	mg/l	0.0137	0.3	ISO 11885:2007
3	Zinc - Zn		0.0100	1.0	
4	Cadmium - Cd		0.0003	0.001	
5	Cupper - Cu		0.0017	1.0	
6	Nickel-Ni		0.0015	0.1	
7	Arsenic - As		0.0023	0.05	
8	Lead - Pb		0.0046	0.03	
9	Chrome - Cr		0.0095	0.5	
10	Manganese-Mn		0.0016	0.1	
11	Mercury		<0.0003	0.0005	
12	Aluminum - Al		0.0057	0.5	
13	Antimony - Sb		0.0041	0.05	
14	Barium - Ba		0.0009	0.1	
15	Boron - B		0.0004	0.5	
16	Selenium - Se		<0.0003	0.01	

#1234 (6)

Adjara Region

Surface water - W06 BPG

#	Measured Parameters	Unit	Results	MPS	Methods
1	pH		7.64	6.5-8.5	ISO 10523:2010
2	Iron - Fe	mg/l	0.1054	0.3	ISO 11885:2007
3	Zinc - Zn		0.0090	1.0	
4	Cadmium - Cd		0.0002	0.001	
5	Cupper - Cu		0.0025	1.0	
6	Nickel-Ni		0.0005	0.1	
7	Arsenic - As		0.0039	0.05	
8	Lead - Pb		0.0032	0.03	
9	Chrome - Cr		0.0047	0.5	
10	Manganese-Mn		0.0031	0.1	
11	Mercury		<0.0002	0.0005	
12	Aluminum - Al		0.0758	0.5	
13	Antimony - Sb		0.0073	0.05	
14	Barium - Ba		0.0044	0.1	
15	Boron - B		0.0035	0.5	
16	Selenium - Se		0.0069	0.01	

#1235 (1)

Adjara Region

Surface water - W01 BPG

#	Measured Parameters	Unit	Results	MPS	Methods
1	pH		7.68	6.5-8.5	ISO 10523:2010
2	Iron - Fe	mg/l	0.0881	0.3	ISO 11885:2007
3	Zinc - Zn		0.0082	1.0	
4	Cadmium - Cd		0.0002	0.001	
5	Cupper - Cu		0.0006	1.0	
6	Nickel-Ni		0.0002	0.1	
7	Arsenic - As		0.0018	0.05	
8	Lead - Pb		0.0050	0.03	
9	Chrome - Cr		0.0055	0.5	
10	Manganese-Mn		0.0047	0.1	
11	Mercury		<0.0003	0.0005	
12	Aluminum - Al		0.0477	0.5	
13	Antimony - Sb		0.0004	0.05	
14	Barium - Ba		0.0201	0.1	
15	Boron - B		0.0064	0.5	
16	Selenium - Se		<0.0006	0.01	

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www.nea.gov.ge

Note: Test results may be disputed within 14 days from the date of receipt of the Protocol.

Executors:

G.Kuchava

S.Khmiadashvili

M.Chigitashvili

Head of laboratory: **Elina Bakradze**

Appendix 4: CONSULTATION ATTENDANCE LIST

See following pages.

Public Consultation Attendance Sheet

საჯარო განხილვის დამსწრეთა სია

Date: 22 - 10 - 2016 Time: 11 - 30 am Venue: Makhinjauri

თარიღი დრო მისამართი

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
1.	[illegible]	[illegible]	593 54 07 62		
2.	[illegible]	[illegible]	558-99-47-49		
3.	[illegible]	[illegible]	557-91-75-99		
4.	[illegible]	[illegible]	593261303		
5.	[illegible]	[illegible]	41 577222270		
6.	[illegible]	[illegible]	595809988		
7.	[illegible]	[illegible]	593247002		
8.	[illegible]	[illegible]	577 47 57 74		

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
9.	[illegible]	[illegible]	W10 558727775	[illegible]	[illegible]
10.	[illegible]	[illegible]	558669018	kamil.[illegible]	[illegible]
11.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.	032-593-14-22-73	[illegible]	[illegible]	[illegible]	[illegible]
13.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

X

Public Consultation Attendance Sheet

საჯარო განხილვის დამსწრეთა სია

Date: 22 - 10 - 2016 თარიღი

Time: 11 02 - 30 pm დრო

Venue: Kapreshumi მისამართი

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
1.	[illegible]	[illegible]	579-13-4295		[illegible]
2.	[illegible]	[illegible]	555 18-06-65		[illegible]
3.	[illegible]	[illegible]	555-97 00 43		[illegible]
4.	[illegible]	[illegible]	595 90 31 89		[illegible]
5.	[illegible]	[illegible]	57109.03.44		[illegible]
6.	[illegible]	[illegible]	593276725		[illegible]
7.	[illegible]	[illegible]	591055322		[illegible]
8.	[illegible]	[illegible]	591055320		[illegible]

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
9.	ჯემალ გოგიტიძე	ხელვაჩაური, ს. განთალი	558 52 12 37		ჯ. გოგი[signature]
10.	ზაქრო გოგიტიძე	ხელვაჩაური, ს. განთალი	555 956705		ზ. [signature]
11.	ლევანიძე ჯუმა	ხელვაჩაური, ს. განთალი	555 426305		ჯ. ლევ[signature]
12.	ლევანიძე ომარი	ხელვაჩაური, ს. განთალი	593 450958		ო. ლევ[signature]
13.	მახარაძე იამზე	ხელვაჩაური, სამება [illegible]	557 702737		ი. მახარაძე
14.	ქარცივაძე ფრიდონი	ხელვაჩაური, ს. განთალი	558 192110		ფ. [signature]
15.	ჯურაბ მნელიძე	ხელვაჩაური, ს. განთალი	593 124622		ჯ. მნ[signature]
16.	რამაზ ქარცივაძე	ხელვაჩაური, ს. განთალი	577 175790		[signature]
17.	სოლომონ ქარცივაძე	ხელვაჩაური, ს. განთალი	595 917576		ს. [signature]
18.	ლაშა ქარცივაძე	ხელვაჩაური, ს. განთალი	591 978721		[signature]
19.	~~[illegible]~~ თენგიზ ლეჟავა	ხელვაჩაური, ს. განთალი	558 176235		მ. [signature]
20.	ნათელა ვარაძე	ხელვაჩაური, ს. განთალი	558 343232		ვ. [signature]

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
	X				
13.					
14.	[illegible]	[illegible]	599 13 89 23		
15.	[illegible]	[illegible]	593-68-88-80		
16.	[illegible]	[illegible]	593-30-85-44.		
17.	[illegible]	[illegible]	593-26-13-03		
18.	[illegible]	[illegible]	568-75-49-74		
19.	[illegible]		593 22 16 55		
20.	[illegible]	[illegible]	598 25 40 85		

Public Consultation Attendance Sheet

საჯარო განხილვის დამსწრეთა სია

Date: 23 - 10 - 2016 Time: 11 : 30 am Venue: Makhlivauri

თარიღი დრო მისამართი

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
1.	[illegible]	[illegible]	557-[illegible]25-87-50		
2.	[illegible]	[illegible]	595073323		
3.	[illegible]	[illegible]	555599199		
4.	[illegible]	[illegible]	577765953		
5.	[illegible]	[illegible]	574460002		
6.	[illegible]	[illegible]	599968702		
7.	[illegible]	[illegible]	568400376		
8.	[illegible]	[illegible]	595096311		

No	Name სახელი	Address მისამართი	Mobile ტელეფონი	Email	Signature ხელმოწერა
9.	ბელთან ქობულ	ბახვი	579.07.07.55		
10.	ზურაბ ჩხეიძე	ბახვი	577000903		
11.	ლევანი დოლიძე	ბახვი	558244472		
12.	დავით ბერიძე	ბახვი	557494768		
13.	ნოდარ ანთაძე	ბახვი	593309415		
14.	ნუგზარ დოლაძე	ბახვი	593 499-356		
15.	ქიაბა ფუტკარაძე	ბახვი	555 128708		
16.	დოლიძე ძე თენგიზ	ბახვი	558-44-85-50		
17.	ნოდარ ლეშკაძე	ბახვი	558-640-881		
18.	ჩუკუნ ლეშკაძე	ბახვი	555 58 69 38		
19.	ამირან დეკანოზ.	ბახვი	557 97 20 20		
20.	ზია თუთაბერიძე	ბახვი	557 77 4600		

Public Consultation Attendance Sheet

საჯარო განხილვის დამსწრეთა სია

Date: ____________________ Time: ____________________ Venue: ______________________________

თარიღი დრო მისამართი

No	Name *სახელი*	Address *მისამართი*	Mobile *ტელეფონი*	Email	Signature *ხელმოწერა*
1.	[illegible]	ხელვაჩაური, ს. [illegible]	555 917761		[illegible]
2.	[illegible]	[illegible]	555 129994		[illegible]
3.	[illegible]	ხელვაჩაური, ს. [illegible]	557 226664		[illegible]
4.					
5.					
6.					
7.					
8.					

Appendix 5: BACKGROUND INFORMATION DOCUMENT (ENGLISH-GEORGIAN)

See following pages.

Background Information Document on the Environmental Impact Assessment of Batumi Bypass Construction Project

The 121-kilometer (km) Senaki-Poti-Sarpi Road (S-2) along the Western coast of Georgia is a key highway and international transit route in Georgia. It is connected to the major Black Sea ports of Georgia and a number of holiday resorts.

The road runs through heavily built up tourist and residential areas including the coastal town of Batumi. To ease the pressure on the roads within the town, the Government of Georgia intends to construct a bypass to Batumi on S-2 (the "Project"). The Project will be financed by the Asian Development Bank (ADB) and the Asian Infrastructure Investment Bank (AIIB).

The Roads Department, Ministry of Regional Development and Infrastructure of Georgia (RD) is executing the Project. The RD has hired the services of the Hagler Bailly Pakistan(Private) Limited to update the environmental impact assessment (EIA) of the proposed Project prepared earlier.

As part of the EIA process, consultations are undertaken with the stakeholders of the Project to seek input on the planned project activities to increase positive project outcomes and avoid or effectively mitigate negative Project impacts. This document has been prepared for informed consultations with the stakeholders.

The consultations are an on-going activity and will continue throughout the life of the Project. The information provided in this document is subject to changes as further information on some aspects of the Project becomes available or the Project is modified as a result of the EIA process.

The total length of the proposed road is about 13 km. Key features of the Bypass include construction of 5 tunnels, 15 bridges and 4 interchange. The alignment of the road is shown in the attached map.

The EIA will cover all aspects of the potential impacts of the Project including, but not limited to, noise, vibration, air quality, water quality, ecology, and socioeconomic impacts during construction and operation of the Project

ბათუმის შემოვლითი გზის პროექტის გარემოზე ზემოქმედების შეფასების ანგარიშის მოკლე მიმოხილვა

121 კილომეტრიანი არსებული სენაკი-ფოთი-სარფი (ს-2) საავტომობილო გზა წარმოადგენს ძირითად ავტომაგისტრალს და საერთაშორისო სატრანზიტო დერეფანს საქართველოში. ავტომაგისტრალი აკავშირებს საქართველოს ძირითად საზღვაო პორტებსა და საკურორტო ზონებს და გადის მჭიდროდ დასახლებულ პუნქტებში, მათ შორის ქ. ბათუმში. ქალაქში საცობების განსატვირთად საქართველოს მთავრობას დაგეგმილი აქვს ააშენოს ბათუმის შემოვლითი გზა. პროექტი დაფინანსდება აზიის განვითარების ბანკის (აგბ) და აზიის ინფრასტრუქტურის საინვესტიციო ბანკის (აის) მიერ. პროექტი განახორციელდება საქართველოს რეგიონალური განვითარების და ინფრასტრუქტურის სამინისტროს საგზაო დეპარტამენტის მიერ. საგზაო დეპარტამენტმა გარემოზე ზემოქმედების შეფასების ანგარიშის განსაახლებლად დაიქირავა საერთაშორისო კომპანია "HaglerBailly Pakistan".

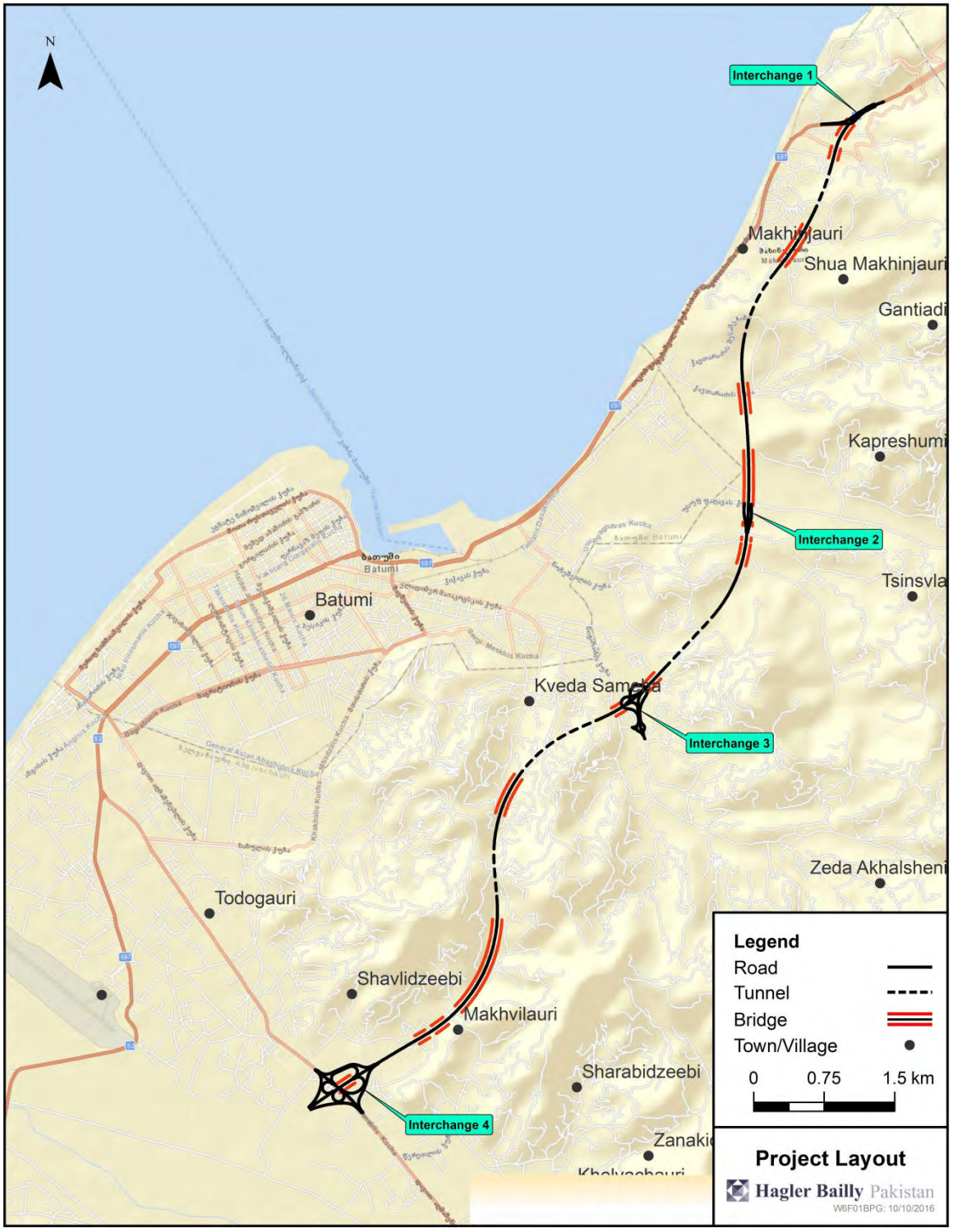
გარემოზე ზემოქმედების შეფასების ანგარიში ითვალისწინებს დაინტერესებულ მხარეებთან შეხვედარას, პროექტის აღწერას, დაგეგმილი ღონისძიებების მიმოხილვას პროექტის დადებითი ზემოქმედების გასაზრდელად და უარყოფითი მხარეების ასაცილებლად ან შესარბილებლად. პროექტის მიმოხილვა მომზადებულია დაინტერესებულ მხარეებთან კონსულტაციების გასამრთად. კონსულტაციები წარმოადგენს გრძელვადიან პროცესს და გაიმართება პერიოდულად, პროექტის განხორციელებისას. მიმოხილვაში წარმოდგენილი პროექტის დეტალები შესაძლებელია შეიცვალოს გარემოზე ზემოქმედების შეფასების ანგარიშის მოთხოვნების შესაბამისად.

	საპროექტო მონაკვეთის სიგრძეა 13 კმ. და მოიცავს 5 გვირაბს, 15 ხიდს და 4 გზაგამტარს. შემოვლითი გზის განლაგება ნაჩვენებია თანდართულ რუკაზე. გზშ-ს ანგარიში მოიცავს ყველა პოტენციურ ზემოქმედებას, გამოწვეულს პროექტის განხორციელებისას, მათ შორის: ხმაური, ვიბრაცია, ატმოსფერული ჰაერის და წყლის რესურსების დაბინძურება, ეკოლოგია და სოციო-ეკონომიკური ზემოქმედება.

For more information on the EIA contact

For Project Proponents: *Gia Sophadze* *Head of Environmental Division of Environmental and Resettlement Department, Road Department, Ministry of Regional Development and Infrastructure, Georgia* *Tel. (995)599939209* *Email: sopgia@hotmail.com*	***For EIA Consultants:*** *Hidayat Hasan,* *Hagler Bailly Pakistan* *Block 1, Commercial Area, Street 21* *F8/2 Islamabad* *Tel: +995 599 00 16 76, +92 51 285 7200-07* *Fax: +92 51 285 7208-09* *Email: hhasan@haglerbailly.com.pk*

Exhibit 1: Layout of the Project



Appendix 6: PUBLIC CONSULTATION LOG

See following pages.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Directorate of Environmental Resources**	
Consultation:	Scoping Consultation	
Date:	Oct 11, 2016	
Time:	11:00	
Meeting Venue:	Directorate Environmental Resources, Batumi	
Attended by and contact details:	**Name**	**Contact Number**
	Jamal Nakashitza (JN), Deputy Director, Directorate Environmental Resources	N/A
Conducted by:	Hidayat Hasan (HH)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian, English	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, PT briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities, and shared the project location map and information on the development. At the end of the information session, PT invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	During and post construction activities he has no responsibility to monitor construction activities.	JN	
2	Monitoring is responsibility of monitoring unit which is under the central Ministry of Environment.	JN	
3	Their responsibility includes, among others, approval of documents submitted by companies as per legislative requirements.	JN	
4	Presented a book on Adjara climate change strategy to assist with the EIA preparation.	JN	

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Batumi Shota Rustaveli University, Biodiversity Department**	
Consultation:	Scoping Consultation	
Date:	Oct 11, 2016	
Time:	13:00	
Meeting Venue:	Directorate Environmental Resources, Batumi	
Attended by and contact details:	**Name**	**Contact Number**
	David (DA), Head of Biodiversity Department	N/A
Conducted by:	Paata Tchankotadze (PT)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian, English	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, PT briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities, and shared the project location map and information on the development. At the end of the information session, PT invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	During the 1990s a study had been conducted along the right of way and no naturally occurring highly protected species were found. Some were found but they have been planted by land owners.	DA	
2	The individual who was involved in this study was called to double check the above information.	DA	
3	Also confirmed that there were no critical habitats for birds or animals in the Study Area.	DA	

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Batumi Botanical Garden**	
Consultation:	Scoping Consultation	
Date:	Oct 10, 2016	
Time:	11:00	
Meeting Venue:	Batumi Botanical Garden	
Attended by and contact details:	**Name**	**Contact Number**
	Tamaz Darchidze (TD), Director, Batumi Botanical Garden	N/A
Conducted by:	Paata Tchankotadze (PT)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian, English	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, PT briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities. At the end of the information session, PT invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	He was not aware of any studies that have been conducted along the RoW to be able to advise on the possible impacts of the Project.	TD	

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Institutional Consultation Workshop**	
Consultation:	Scoping Consultation	
Date:	Oct 13, 2016	
Time:	14:00	
Meeting Venue:	Era Palace, Batumi	
Attended by and contact details:	**Name**	**Contact Number**
	Merab Kidzinidze (MK), Head of Mayor Administration, Batumi City Hall	N/A
	Paata Dumbadze (PT), Director of Batumi public transport	N/A
	Nugzar Papunidze (NP), Batumi MoE representative	N/A
	Gia Sophadze (GS), RD environmentalist	N/A
	Zviad Khalvashi (ZK), Khelvachauri Municipality	N/A
Conducted by:	Hidayat Hasan (HH), Paata Tchankotadze (PT)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian, English	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, HH briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities with the aid of a PowerPoint presentation. At the end of the information session, HH invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action. The Background Information Document was also distributed to all participants.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	Is the design of the bypass already approved and is it final version?	MK	We have final draft version of design, but it could be changed according EIA`s requirements Gonio and Kviarti the final segment is not confirmed
2	How will construction of bypass reduce traffic in Batumi?	PD	This survey are included in EIA with perspective of 20 years

No.	Issues, Concerns and Suggestions	By	Response Provided
3	There are a lot of unknown underground oil pipelines in Ajara. During implementation of construction activities pipelines could be damaged and oil will pollute soil and water?	NP	Before commencement of any excavation activities the Contractor will conduct survey of construction corridor using metal detector
4	How useful will be modeling of noise and vibration in case of conflict between PIU and owners of houses, damaged during construction of bypass? What will show noise modeling	GS	Vibration modeling cannot show exactly, which houses will be affected during construction and exploitation phases of the Project. Modeling of vibration will indicate houses, which definitely will be affected and gray zone – houses, which are located in potentially risk area. Before commencement of construction activities, preconstruction survey of all houses, located in the risk zone should be conducted. Noise modeling will show, at which houses, located near RoW, noise level during construction and exploitation of bypass exceeds permissible level. Based on modeling results such houses will be included in RAP, or noise protective walls will be installed between the RoW and houses
5	What is the width of construction corridor and will it be same on all sections of the bypass?	ZK	In general width of the Row is 50m, but based on the results of modeling it could be increased in some sections
6	what is the deadline for the Project	PD	Approximately 3 -4 years after commencement.
7	Do you have baseline information regarding air, soil and water quality in the RoW and in Batumi?	NP	We have measured air quality (CO, NOx, SO2 and PM) along the RoW and at the existing Batumi bypass, also 6 samples of water and 6 of soil have been collected and passed to the environmental agency for complex testing. Testing results will be included in EIA report.
8	weather stations in Batumi, will share link for data	MK	Thanked him for this
9	compare current quality of air in Batumi will what is project to be after	NP	Yes the EIA will contain this information.

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**World Wildlife Fund**	
Consultation:	Scoping Consultation	
Date:	Nov 23-25, 2016	
Meeting Venue:	Email Correspondence	
Attended by and contact details:	**Name**	**Contact Number**
	Nugzar Zazanashvili (NZ), Conservation Director, WWF-Caucasus Ana Tsintsadze, Regional Partnership and Communications Manager WWF-Caucasus	nzazanashvili@wwfcaucasus.org atsintsadze@wwfcaucasus.org
Conducted by:	Hassan Bukhari (HB)	
Reviewed by:	Hidayat Hasan	
Language:	English	
Preamble:	WWF was emailed the background information document and the ecological baseline and was briefed the objective of the stakeholder consultation. WWF was invited to share their views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	At this stage it is quite difficult to assess the document (or its part) from our side according to attached information.	NZ	This is a scoping consultation. WWF will be provided with the complete document at the time of the public disclosure and comments.
2	It would be good if document includes rough estimates of wood volume (or number of woody plants) of Georgian Red List species that will be cut.	NZ	
3	Most of the threats are listed. From our viewpoint, this sub-chapter needs some more elaboration to underline better (more sharply) the impacts (or no impacts) that could bring this particular infrastructural project	NZ	This is the baseline chapter, the impact assessment chapter has further information on these impacts.
4	Planned road is located too close to the vulnerable Kobuleti wetlands' PAs: in this context, will be good to have some more information about possible impact (or no impact) at the ecosystem level.	NZ	The Kobuleti Bypass is beyond the scope of this assessment.

No.	Issues, Concerns and Suggestions	By	Response Provided
5	The baseline says that The Study Area does not contain areas of globally significant concentrations or numbers of individuals of congregatory species. Sites important for congregatory species are located outside the Study Area." We think this is not correct or fully correct - here is located quite well-known IBA that is well known exactly because of "concentrations or numbers of individuals	NZ	Noted and corrected.
6	It seems, figure/map for protected areas is outdated: Machakhela National Park is indicated as planned one, but it was established in 2012 on the Georgian side; on the Turkish side there is Jamili Biosphere Reserve that should be either indicated or removed from the map. It seems also that shapes of some mapped protected areas are not exact, particularly - for again Machakhela and Kintrishi PAs; we suggest to check this with Agency of Protected Areas.	NZ	Noted and corrected.

Additional Comments:
No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Batumi Raptor Count (BRC) and SABUKO**	
Consultation:	Scoping Consultation	
Date:	Oct 21 - Nov 10, 2016	
Meeting Venue:	Email Correspondence	
Attended by and contact details:	**Name**	**Contact Number**
	Folkert de boer (FB), Chairman of the Board, BRC	folkert.deboer@batumiraptorcount.org
	Alexander Rukhaia (AR), Director of SABUKO	alexander.rukhaia@sabuko.org
Conducted by:	Hassan Bukhari	
Reviewed by:	Hidayat Hasan	
Language:	English	
Preamble:	The stakeholders were emailed the background information document and was briefed the objective of the stakeholder consultation. They were invited to share their views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	The attached information is too insufficient to make any judgement on this for the moment	FB	This is a scoping consultation. They will be provided with the complete document at the time of the public disclosure and comments.
2	For migrants the impact is not very obvious and road construction is usually not impacting at all if not roosting habitats are destroyed. And there are no roosting habitats for raptors nor passerines along this part of the road to our knowledge.	FB	Noted.
3	The largest impact by the construction is the habitat loss for breeding birds. There could be a potential future impact if the road is finally constructed on sites that come further south. Not sure whether the potential impact on the delta increases by growing infrastructure such as this road construction. This would turn more into political outlooks.	FB	Noted. The impact of the southern portion will be assessed in a second assessment.
4	Is there any additional infrastructure to be built alongside the road such as power lines for example? Good insulation to avoid electrocution would be advisable.	FB	Noted. No other infrastructural developments are part of this Project

No.	Issues, Concerns and Suggestions	By	Response Provided
5	It would also be good to contact Alexander Abuladze and Tbilisi University, as they did a lot of research in Batumi.	FB	Noted.

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Makhinjauri and surrounding communities**	
Consultation:	Feedback Consultation	
Date:	Oct 22, 2016	
Time:	11:00	
Meeting Venue:	Makhinjauri, Khelvachauri District	
Attended by and contact details:	**Name**	**Contact Number**
	Attendance list attached at the end of the appendix	
Conducted by:	Hidayat Hasan (HH), Paata Tchankotadze (PT)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, HH briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities. At the end of the information session, HH invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action. The Background Information Document was also distributed to all participants.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	M. Gurgenidze thinks, that noise level and air emissions will disturb her in exploitation phase of the Project	Medea Gurgenidze	Modeling of air emissions and noise level is part of EIA. Relevant mitigation measures will be considered in EIA; people, who's houses are located in red (most affected) zone will be resettled if mitigation measures will not reduce negative impacts
2	M. Gurgenidze wanted to sell 400 m^2 land plot, located in close proximity to the bypass. After construction of the road price of the land will be reduced. Who will compensate losses	Medea Gurgenidze	This issue should be discussed with resettlement team
3	What will be noise and vibration levels in the houses; what is the depth of piles	Tamar Nakashidze	EIA report will be submitted to MoE and published on 30 of November. All necessary data will be provided in the report

No.	Issues, Concerns and Suggestions	By	Response Provided
4	Part of the land plot is located in the RoW. Will the RD buy the remaining part of the land plot	Amiran Gogiberidze	This issue should be discussed with resettlement team
5	Distance between house and the portal of the tunnel is 9 m. Mr. Chijavadze thinks, that his house will be damaged in result of increased vibration	Haidar Chijavadze	RD/the Contractor will conduct preconstruction survey of all houses, located in risk zone; in case of increasing of cracks in the walls, houses will be repaired/purchased by the RD
6	Family cemetery is located directly in the RoW. Mr. Chijavadze wants to replace cemetery to the empty land plot, located near his house	Merab Chijavadze	This issue should be discussed with resettlement team; the Consultant will recommend RD to comply with the request of Mr. Chijavadze
7	The house is located in 10 meters from the RoW. Is it possible to live in the immediate vicinity from the road	Khatuna Khibaia	Director of Batumi RD promised to purchase the house

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Kapreshumi and surrounding communities**	
Consultation:	Feedback Consultation	
Date:	Oct 22, 2016	
Time:	14:30	
Meeting Venue:	Kapreshumi, Khelvachauri District	
Attended by and contact details:	**Name**	**Contact Number**
	Attendance list attached at the end of the appendix	
Conducted by:	Hidayat Hasan (HH), Paata Tchankotadze (PT)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, HH briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities. At the end of the information session, HH invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action. The Background Information Document was also distributed to all participants.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	His house is located in 32 meters from RoW. Air emission and noise will be increased after construction of bypass	Emer Dolidze	Modeling of noise and air emissions will show affected areas. Relevant mitigation measures will be implemented
2	Bypass cut access road. After construction of bypass Mr. Dolidze will not have access to the house	Emer Dolidze	RD will provide access to all land plots or purchase them
3	Was modeling of noise and vibration included in EIA for Kobuleti bypass?	Nodar Lortkipanidze	Our company is responsible for Batumi bypass EIA and did not work for Kobuleti project
4	Who will be responsible for assessment of condition of houses, located near RoW?	Hasan Gogoberidze	RD/the Contractor will conduct preconstruction survey of all houses, located in risk zone; in case of increasing of cracks in the walls, houses will be repaired/purchased by the RD

No.	Issues, Concerns and Suggestions	By	Response Provided
5	What will be noise level in the houses after construction of bypass?	Khava Tebidze	Modeling of air emissions and noise level is part of EIA. Relevant mitigation measures will be considered in EIA; people, who's houses are located in red (most affected) zone will be resettled if mitigation measures will not reduce negative impacts
6	House is located in 50 m from bypass. Can vibration damage his house?	Jemal Vanadze	Modeling of vibration level is part of EIA. Relevant mitigation measures will be considered in EIA; people, who's houses are located in red (most affected) zone will be resettled if mitigation measures will not reduce negative impacts

Additional Comments:

No additional comments.

Consultation Log for Batumi Bypass Project

Record of the Consultation Meeting

Stakeholder/s:	**Makhlivauri and surrounding communities**	
Consultation:	Feedback Consultation	
Date:	Oct 23, 2016	
Time:	11:30	
Meeting Venue:	Makhlivauri, Khelvachauri District	
Attended by and contact details:	**Name**	**Contact Number**
	Attendance list attached at the end of the appendix	
Conducted by:	Hidayat Hasan (HH), Paata Tchankotadze (PT)	
Recorded by:	Paata Tchankotadze (PT)	
Reviewed by:	Hassan Bukhari	
Language:	Georgian	
Preamble:	The meeting started with the introduction of the participants and the HBP representative. After the introduction, HH briefed the objective of the stakeholder consultation and gave a description of the EIA study and related activities. At the end of the information session, HH invited the participant to share his views, concerns, and suggestions related to the development activities, which have been documented below. The participants were assured that their concerns would be communicated to the Project proponent for their consideration and action. The Background Information Document was also distributed to all participants.	

No.	Issues, Concerns and Suggestions	By	Response Provided
1	Roads between villages will be cut by bypass. Will RD provide alternative access	Ioseb Tsulukidze	RD will provide alternative access to all villages and houses
2	What kind of measures will be implemented for houses, affected by vibration?	Ioseb Tsulukidze	Modeling of vibration level is part of EIA. Relevant mitigation measures will be considered in EIA; people, who's houses are located in red (most affected) zone will be resettled if mitigation measures will not reduce negative impacts
3	How RD assess prices of trees?	Ioseb Tsulukidze	Medgar Tchelidze: resettlement team use data of Statistic Department

No.	Issues, Concerns and Suggestions	By	Response Provided
4	Old houses, located near RoW could be damaged during construction and operation phases of the project. How RD will compensate looses?	Murman Avjishvili	RD/the Contractor will conduct preconstruction survey of all houses, located in risk zone; in case of increasing of cracks in the walls, houses will be repaired/purchased by the RD
5	Will existing Makhvilauri internal road be blocked?	Roman Varshanidze	No

Additional Comments:

The consultation team was thanked for providing the community with useful information.

Appendix 7: ASSESSMENT OF BLASTING INDUCED VIBRATION

See following pages.

Table of Content

Tables

Figures

Acronyms

ADB	Asian Development Bank
BS	British Standard
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
LARP	Land Acquisition and Resettlement Plan
PPV	Peak Particle Velocity
RD	Roads Department
RQD	Rock quality designation
SC	Supervision Consultant
UCS	Uniaxial compressive strength

Units

Hz	Hertz
ips	inch per second
kg	Kilogram
km	kilometer
kN/m^3	kilo Newton per cubic meter
m	Meter
m/s^2	Meter per second square
m^2	Square meter
m^3	Cubic meter
mm/s	millimeters per second
MPa	Mega Pascal

1. Introduction

1. The energy released from explosives is used to break rock for the construction of the tunnels. Blasting results in release of energy in four forms: a) ground vibration; b) airborne shockwaves; c) flying debris and rocks; and d) sound waves. All forms have potential to affect humans and structures. The subject of this paper is the assessment of potential damage to structures from ground vibration caused by blasting. It does not cover other potential impacts associated with vibration.

2. Ground vibrations travel away from a blast site as waves. As they travel through the ground, a disturbance is created in the ground material, as well as the structures on the ground, and the particles are displaced from their normal position. Normally, the displacement is small and oscillatory, i.e., to and fro about the mean position and as the vibration energy dies out the particles return to their normal position. However, if the magnitude of vibration is high or the displacement is rapid, the particle arrangement may be permanently changed. If that happens on a surface structure, it is classified as a damage.

3. The common unit of measuring ground vibrations is peak particle velocity (PPV)—how fast the particles move from the mean position. It is reported in millimeters per second (mm/s) in the metric system and inches per second (ips) in the imperial system of measurement.

2. Evaluation Criteria

4. This section surveys the various standards and guidelines for evaluating ground vibration induced damage to structures.

2.1 British Standard BS 7385-2:1993

5. The BS 7385-2:1993 (Evaluation and measurement for vibration in buildings—Part 2: Guide to damage levels from ground borne vibration)[1] gives guidance on the levels of vibration above which building structures could be damaged. The guideline values are shown in **Table 1**.

Table 1: BS 7385-2:1993 Guideline Values for Evaluating Damage to Buildings

Type of Building	Peak Component particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 HZ and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light Framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz Increasing to 50 mm/s at 40 Hz and above

[1] British Standard BS 7385-2:1993, *Evaluation and measurement for vibration in buildings—Part 2: Guide to damage levels from ground borne vibration*. http://www.persona.uk.com/ashton/Core_docs/New/D40.pdf

2.2 German Standard DIN 4150-3:1999

6. The German Standard DIN 4150-3:1999 (Structural vibration Part 3: Effects of vibration on structures)[2] provides guideline vibration levels which, "when complied with, will not result in damage that will have an adverse effect on the structure's serviceability." For residential buildings, the standard considers serviceability to have been reduced if cracks form in plastered surfaces of walls; existing cracks in the building become enlarged; and partitions become detached from load bearing walls or floors. These effects are deemed 'minor damage' in DIN 4150-3.The guideline values are shown in **Table 2**.

Table 2: DIN 4150-3:1999 Guideline Values for Evaluating Damage to Buildings

Type of Structures	Vibration Thresholds for Structural Damage, PPV (mm/s)				
	Short-Term				Long-Term
	At Foundation			Uppermost Floor	Uppermost Floor
	0 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All Frequencies	All Frequencies
Commercial /industrial	20	20 to 40	40 to 50	40	10
Residential	5	5 to 15	15 to 20	15	5
Sensitive/Historic	3	3 to 8	8 to 10	8	2.5

2.3 US Federal Transit Administration

7. The United States Federal Transit Administration manual *Transit Noise and Vibration Impact Assessment*[3] adopts the criteria shown in **Table 3**.

Table 3: FTA Construction Vibration Damage Criteria

Building Category	PPV (mm/s)
I. Reinforced-concrete, steel or timber (no plaster)	12.7
II. Engineered concrete and masonry (no plaster)	7.6
III. Non-engineered timber and masonry buildings	5.1
IV. Buildings extremely susceptible to vibration damage	3.0

2.4 Criteria Used for this Project

8. The buildings that are likely to be affected by this Project predominantly fall in the residential category. Further these buildings are generally old, often in poor condition, and structurally not very sound. Therefore the evaluation criteria considered for this analysis is as shown in **Table 4**. These are primarily based on BS 7385-2:1993 and DIN 4150-3.

Table 4: Criteria for Evaluation of Damage due to Blasting Induced Vibration

No Damage Likely	PPV < 5 mm/s
Cosmetic damage risk	PPV 5 to 15 mm/s
Structural damage risk	PPV > 15 mm/s

[2] Reported in *Newmarket Viaduct Designation: Vibration & Excavation Assessment*, 2014. http://www.aucklandcity.govt.nz/council/documents/district/updates/t377/pm377app6vibrationexcavationassess.pdf

[3] Office of Planning and Environment, Federal Transit Administration. *Transit Noise and Vibration Impact Assessment*. 2006

3. The Proposed Tunnels

9. The Project road, bypassing the city of Batumi from East, is entirely located in Khelvachauri District (see **Figure 1** for the alignment and location of tunnels and bridges). The design alignment goes through the villages of Makhinjauri, Gantiadi, Kapreshumi, Salibauri, Peria, and Makhvilauri. Passing through the above villages, the design alignment crosses complex landscape of multiple ravines, streams, rivers, hills and hillsides. The Project road alignment starts north of Makhinjauri. It swings of to the left from the existing highway by means of an interchange at the end of the newly constructed Chakvi Tunnel. This point is taken as 0 kilometer (km) of the chainage[4]. The total length of the Project road is approximately 13.2 km.

10. Five tunnels are planned along the Project alignment as listed in **Table 5**. The total length of tunnels along the alignment is 3,808 m. Emergency shafts will be installed in Tunnels 2, 3 and 4. Due to short lengths, no shaft will be required in the Tunnels 1 and 5. Tunnel design is based on the principles of New Austrian Tunneling Method. Tunnels are to be excavated through very weak weathered soil layer which consists of lean, brown-reddish clay, crushed stone and eluvial tuff-breccia. Typical dimension of the tunnels is shown in **Table 6**; typical cross-section is shown in in **Figure 2**; whereas **Figure 3** shows an image of an already constructed nearby tunnel of similar design.

Table 5: List of Tunnels

Tunnel	Length	Chainage	
		Start	End
Tunnel 1	542 m	938 m	1,480 m
Tunnel 2	807 m	2,215 m	3,022 m
Tunnel 3	805 m	5,994 m	6,799 m
Tunnel 4	1,067 m	7,663 m	8,730 m
Tunnel 5	587 m	9,520 m	10,107 m

Table 6: Typical Tunnel Dimensions

Parameters	Value
Width of traffic lanes (2 lanes)	3.75 m each
Width of sidewalk (2 sidewalks)	0.75 m each
Total width of tunnel	10.76 m
Height clearance of tunnel	5.0 m
Pavement type	Cement concrete

[4] For linear infrastructure such as a road, chainage refers to linear measured from one end of the road along the center line of the road. It is a useful way to indicate the location of features on and in the vicinity of the road.

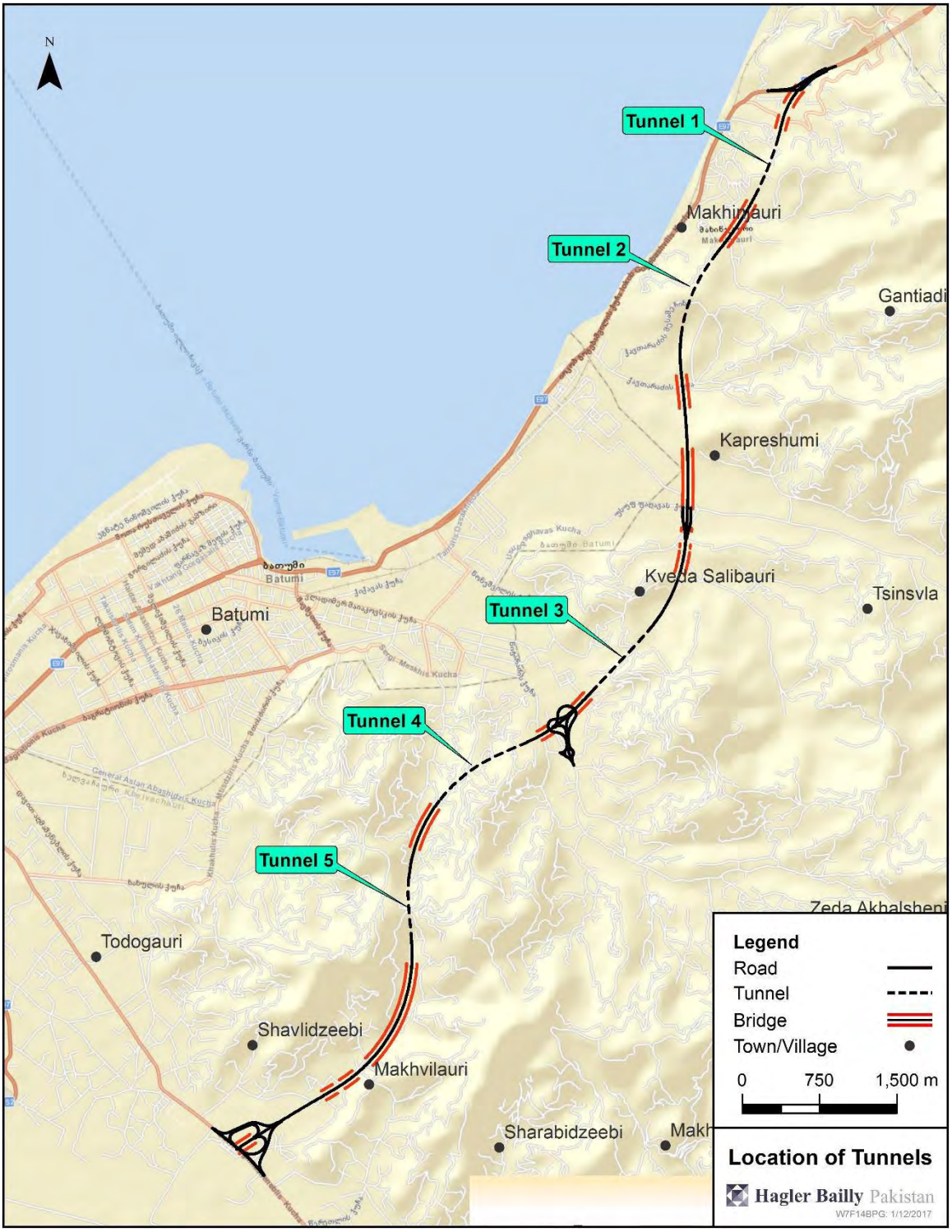


Figure 1: Location of Tunnels

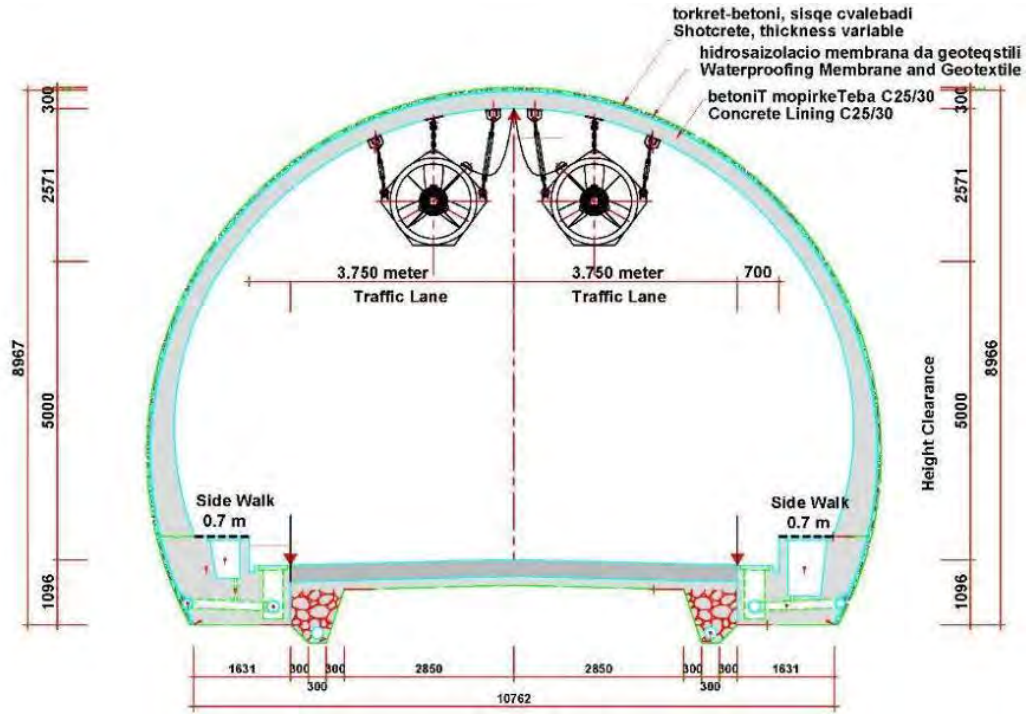


Figure 2: Typical Tunnel Cross Section

Figure 3: A Tunnel with Similar Design

11. Based on the geological assessment, five types of rock/soil are anticipated in the tunnels (**Table 7**). The anticipated subsurface conditions and the strength of soil layers create varying conditions that shall be taken into consideration for the design and construction of tunnels.

Table 7: Soil Types in the Study Area

Category	Description
4	Lean Clay, brownish-reddish, firm, with crushed stone inclusions
13	Lean clay, brownish-reddish, with inclusions, eluvial tuffbreccia
14	Highly weathered tuffbreccia
15	Tuffbreccia of medium weathered and fractured andesite-basalt content
16	Tuffbreccia of slightly weathered andesite-basalt content

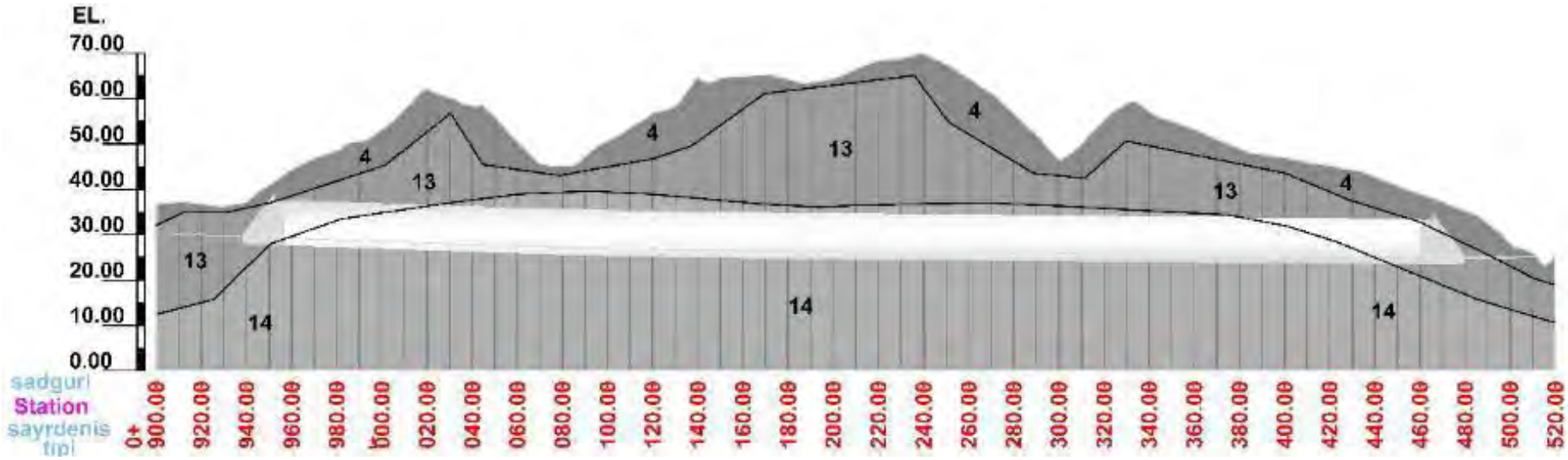
12. Tunnels will be excavated using two methods: a) excavators of 0.5 cubic meter (m^3) capacity, excavators and jackhammers and b) drilling and blasting. The first method will be used for Category II-III[5] soils and for Category V soils near the tunnel mouth. The second method will be used for Category V rock away from the tunnel mouth. With reference to Soils Types (**Table 7**), Soil Type 4, 13 and 14 fall in Categories II and III whereas Soil Type 15 and 16 fall in Category V. A breakdown of estimated excavation volume by tunnel and method is provided in **Table 8.** These are estimated volumes based on available information. The actual volume is likely to differ from these estimated. In addition to the main tunnel, about 118 m^3 of soil and rock will be removed near mouth of the tunnel.

Table 8: Estimated Excavation Quantities for Tunnels (100 m^3)

	Tunnel					Total Excavation by method
	1	2	3	4	5	
Excavation of soil layer of category II-III by 0.5 m^3 capacity, excavators and jackhammers	632	226	568	365	363	2,154
Excavation of soil layer of Category V by drilling and blasting		555	301	543	176	1,574
Total excavation of main tunnel	**632**	**781**	**869**	**908**	**539**	**3,728**

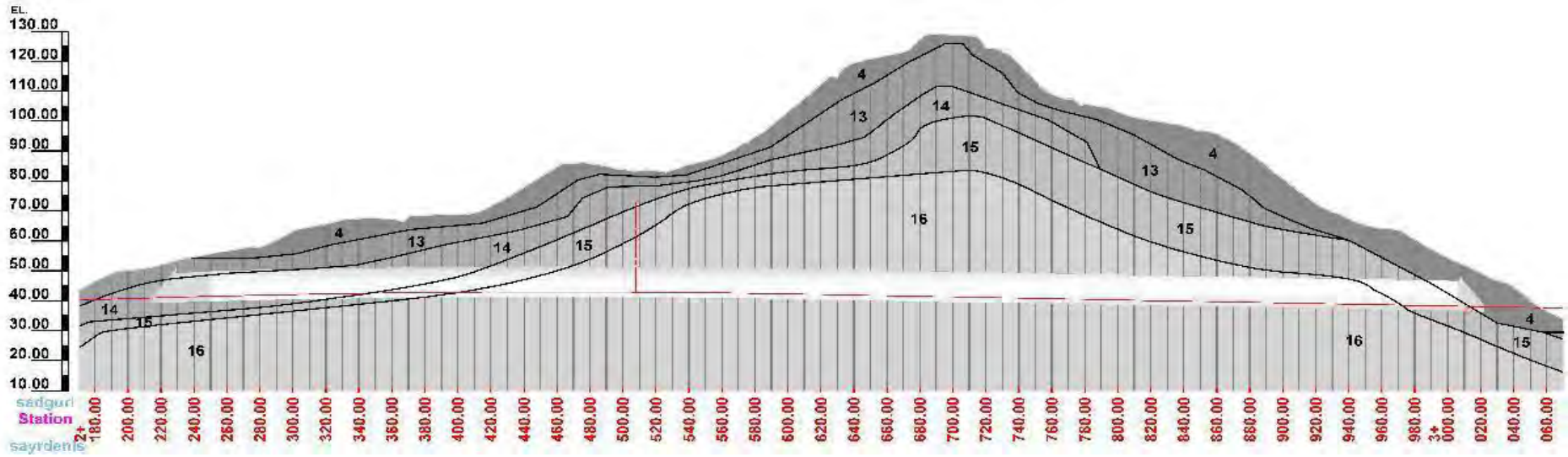
13. The linear cross-sections of the tunnels and the type of soils is shown in **Figure 4** to **Figure 8**.

[5] Here rock categories are defined with respect to the volume that they will take after removal. Category II is defined as *fragmented rock but the muck pile is "frozen"*; Category III as *fragmented rock pile with mucking difficulties*; Category V is Fragmented rock. https://books.google.com.pk/books?id=8NHKBQAAQBAJ&pg=PA13&lpg=PA13&dq=Blasting+Category+V+Rocks&source=bl&ots=_APKZS89cx&sig=DkeqfS2s5OHHnrSaMy6WcoQutHU&hl=en&sa=X&ved=0ahUKEwiE9uOTqfDQAhXJPBoKHTuuDlUQ6AEIHTAB#v=onepage&q=Blasting%20Category%20V%20Rocks&f=false



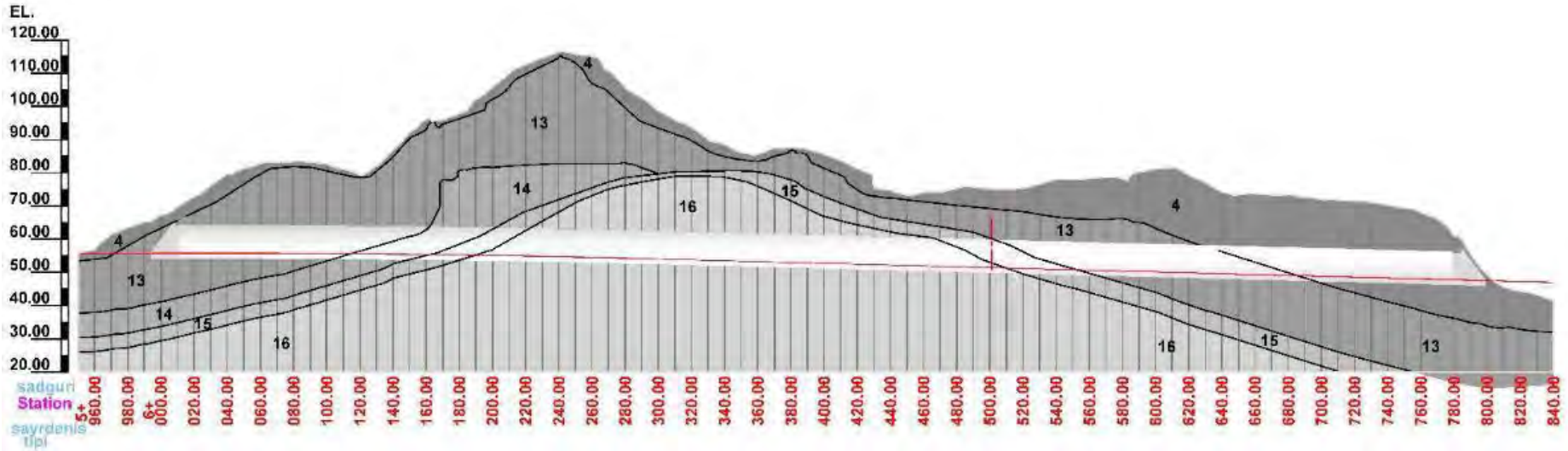
For soil categorization see **Table 7**

Figure 4: Depth of Tunnel 1



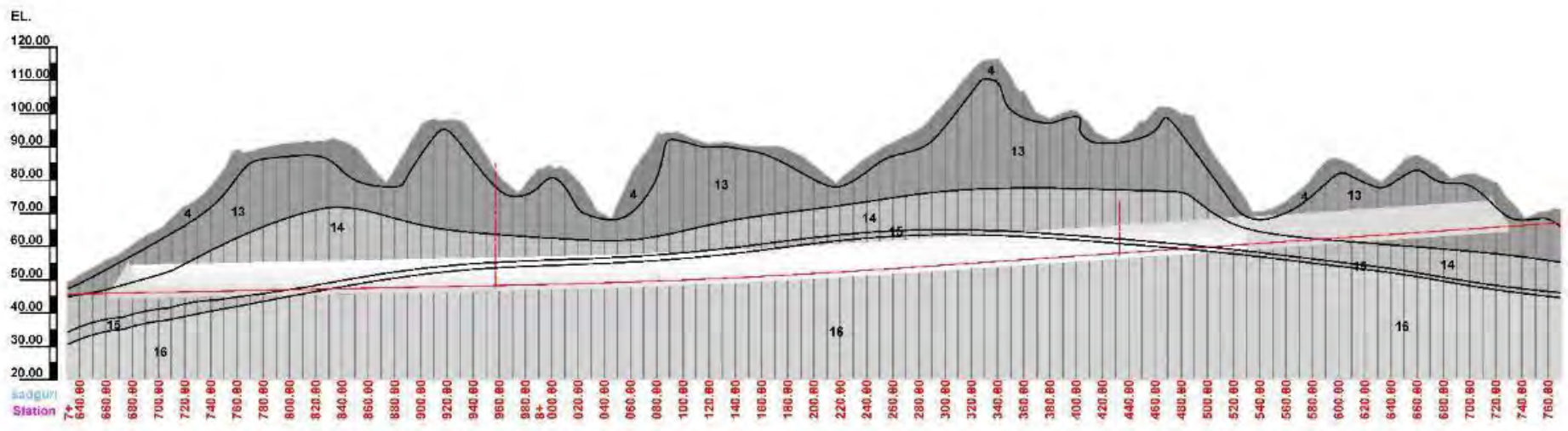
For soil categorization see **Table 7**

Figure 5: Depth of Tunnel 2



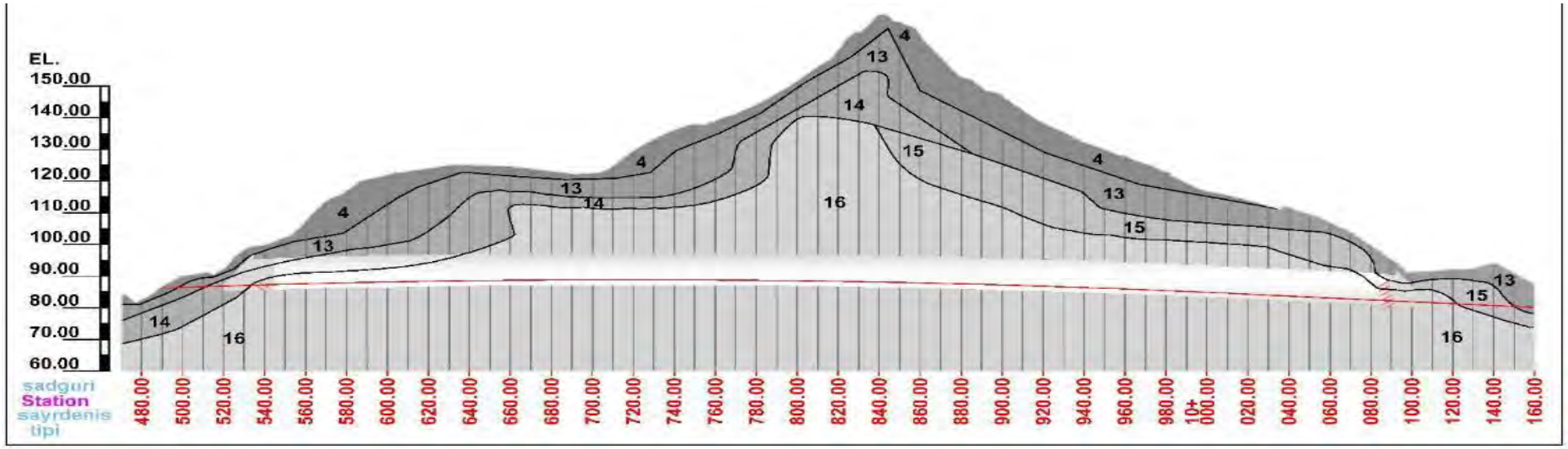
For soil categorization see **Table 7**

Figure 6: Depth of Tunnel 3



For soil categorization see **Table 7**

Figure 7: Depth of Tunnel 4



For soil categorization see **Table 7**

Figure 8: Depth of Tunnel 5

4. Predicting the Vibration Levels

4.1 Prediction Model

14. Prediction of vibration levels at a location away from the blasting site is a complex function of blasting parameters and rocks through which the waves propagate. A number of site specific experimental formulae have been developed to predict and control blasting effects. All of these formulae have the same form:

$$PPV = k \left(\frac{R}{Q^n}\right)^{-b} \qquad \text{Equation 1}$$

where:

PPV = peak particle velocity (mm/s);

k = site constant

R = distance to the point of concern (m);

Q = maximum instantaneous charge weight;

b = rock properties constant; and

n = constant that depends on the geometry of the explosive.

15. Zhou et al (2000) have identified 8 different formulae from various studies. Similarly, Kumar et al (2016) have listed 23 different formulae.

16. The constant n is generally taken as ½ in most of the studies. The predicted value of PPV critically depends on the empirical constants, k and b. These are considered site specific and are normally determined by blast experiments. In the absence of experimental data, as is the case with this Project, empirical models can be used to evaluate these constants. Because of wide variation in site condition—charge per delay, vibration frequency, rock characteristics (type, unit weight, layering, slope of layers), blast hole conditions, presence of water, propagation of surface and body waves in the ground, and method of initiation—the site-specific empirical equations, if used at other sites are likely to have large errors.

17. Kumar et al (2016), have studied the effects of important engineering properties of rock and have developed an empirical model that relates the unit weight, uniaxial compressive strength (UCS) and rock quality designation (RQD) with the PPV. The present study uses the Kumar model for predicting the vibration levels.

18. According to Kumar's model,

$$PPV = \frac{f_c^{0.642}}{\gamma} \left(\frac{R}{Q^{1/2}}\right)^{-1.463} \qquad \text{Equation 2}$$

where:

PPV = peak particle velocity (mm/s);

f_c = UCS of rock

R = distance to the point of concern (m);

Q = maximum instantaneous charge weight (kg);

γ = unit weight (kN/m^3).

The value of f_c is proposed as follows:

For RQD less than or equal to 75 $f_c = 0.59476\ RQD + 0.00893\ RQD^2$

For RQD Greater than 75 $f_c = -7.91562\ RQD + 0.12152\ RQD^2$

4.2 Composite Rock Property

19. The vibration from blasting will propagate through the rocks in the surrounding hills. Geological information on the rocks is not available. However, given that the rocks in the five tunnels are of similar nature, it is reasonable to assume that similar rocks will be present in the surrounding areas also. For the purpose of calculating the PPV of the vibration, a composite rock property has been the developed. Five different types of rocks have been identified in the Project Area as shown in **Figures 4** to **8**. Using the cross-sectional area of the rocks in these figures, the proportion of each type of rock has been calculated. All properties are then calculated by taking weighted average of the individual rock type. The result is shown in **Table 9**.

Table 9: Composite Rock Property Calculation

	Rock Category 4, 3, and 14	Rock Category 15	Rock Category 16	Composite
Volume fraction (%)	67	9	24	100
RQD (%)	10	68	91	34.7
f_c (MPa)	6.84	81.74	286.0	31.3
γ (kN/m^3)	26	27	27	26.3

20. RQD has been obtained from the geotechnical engineering report[6] whereas for γ the density of predominant rocks, andesite and basalt has been used. Both have a density of about 2.7 g/cm^3. To obtain, unit weight it has been multiplied by the value of g, the acceleration due to gravity (9.81 m/s^2).

4.3 Maximum Instantaneous Charge Weight

21. The mass of explosives required to break a unit volume of rocks, called the powder factor, depends on the strength of rocks and the type of explosives. The recommended typical powder factor for different types of rocks are given in **Table 10**.[7]

Table 10: Powder Factor for Different Hardness of Rocks

Rock Type	Powder Factor (kg/m^3)
Hard	0.7 – 0.8
Medium	0.4 – 0.5
Soft	0.25 – 0.35
Very Soft	0.15 – 0.25

[6] Ministry of Regional Development and Infrastructure of Georgia, Road Department. *Bidding Documents for Construction of Batumi Bypass Road Section Km. -1 +000~km. 13+325. Volume 3.2 Supplementary Information Geotechnical Engineering Report, Material Sources*. October 2016.

[7] Dyno Nobel. *Blasting and Explosives Quick Reference Guide*. 2010.

22. As basalt and andesite are both categorized as hard rocks,[8] for this analysis the mean value for hard rock as shown in **Table 10** is taken.

23. In the standard drilling and blasting tunneling method, the sequence of activities in one cycle is shown in **Figure 9**.[9] After one cycle, a slice of the rock is removed. The thickness of the slice depends on the depth of borehole. The total volume of rock removed in one cycle is equal to the cross-sectional area of the tunnel multiplied by the depth of the borehole. Once the volume is known the total quantity charge to be used in one cycle can be calculated by using the powder factor.

24. The total quantity of charge is different from that of the maximum instantaneous charge. One blast cycle may include a number of boreholes. A typical pattern is shown in **Figure 10**.[10] The detonation of the explosive starts from the center and after brief delays, lasting not more a fraction of a second, progresses outward in concentric circle. The quantity of charge in each delay is the instantaneous charge. The number of boreholes blasted, and hence quantity of instantaneous charge, increases as the blast progresses radially. It may be noted that the charge in the perimeter holes is typically less than those in the holes in the center to prevent damage to the walls. Thus the maximum instantaneous charge is not when the outer most ring of boreholes is detonated.[11]

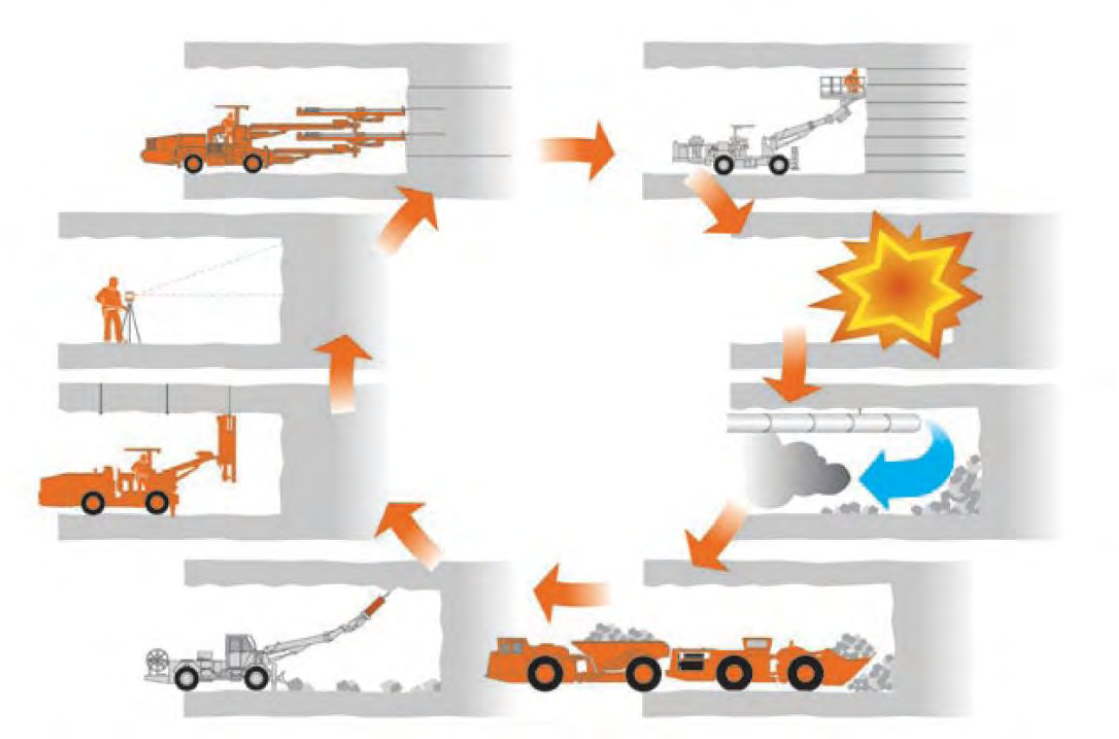


Figure 9: Drilling and Blasting Method

[8] *Hard Rock Miner's Handbook Edition 5*. Jack de la Verne, Stantec Consulting, 2014.

[9] *Rock Excavation Handbook*. Sandvik Tamrock Corp. 1999

[10] Dyno Nobel. Blasting and Explosives Quick Reference Guide. 2010.

[11] Personal communication with road construction engineer

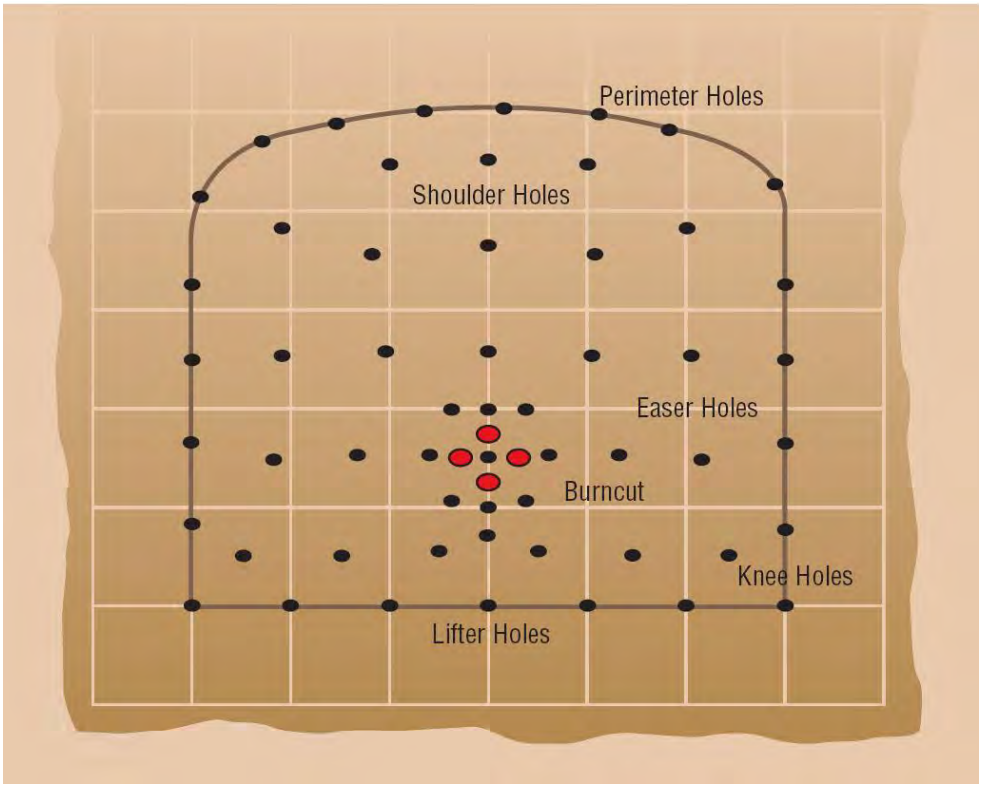


Figure 10: Typical Borehole Pattern

25. Based on the above considerations, the maximum instantaneous charge weight is calculated as shown in **Table 11**.

Table 11: Instantaneous Charge Weight Calculation

Parameter	Value	Explanation
Tunnel cross-section (m^2)	92	Calculated from drawings
Borehole depth (m)	5	Assumed, based on personal communication with road construction engineer
Rock removed in one blast cycle (m^3)	460	
Rock type	Hard	
Powder factor (kg/m^3)	0.75	See **Table 10**.
Total charge weight (kg)	345	
Maximum instantaneous charge weight (kg)	50	Estimated from typical borehole pattern and personal communication with road construction engineer

4.4 Results of Modeling

26. Using the rock parameters and instantaneous charge weight calculated above, the PPV at intervals of 10 m from the blasting site is calculated. The results are shown in **Table 12**.

Table 12: Calculated PPV as Function of Distance from Blast Site

Distance from Blast Site (m)	PPV (mm/s)
10	208.9
20	75.8
30	41.9
40	27.5
50	19.8
60	15.2
70	12.1
80	10.0
90	8.4
100	7.2
110	6.3
120	5.5
130	4.9
140	4.4
150	4.0
160	3.6
170	3.3
180	3.0
190	2.8
200	2.6

27. The results indicate that for the given configuration, the applicable criteria of no damage (5 m/s) will be met at a distance of 130 from the blasting site. Further the PPV will exceed the threshold for structural damage at a distance of 60 m from the blasting site.

28. The above results are based on certain key assumptions and understanding. These are:

- The accuracy and representativeness of information in the Feasibility Study. This includes the rock type, rock type distribution, and RQD;
- The tunnel composition of rock type is representative of the entire area to allow developing property of composite rock;
- The assumptions about borehole depth (5 m), total rock blasted in one cycle (460 m^3), powder factor (0.75) and maximum instantaneous charge (50 kg) are reasonable.

29. It is emphasized that these are assumptions and shall not be considered as binding. They are based on available information and have been selected as indicative of typical conditions that are likely to be encountered in the actual tunneling. In selection of

the numbers, a reasonable level of conservative approach has been taken. Therefore, chances are that the actual level of PPV will be less than the level shown in **Table 12**.

30. It is, therefore, believed that during the blasting for tunnels it shall be possible to meet the evaluation criteria (**Section 2.4**) which shall be considered binding on Construction Contractor.

4.5 Sensitivity Analysis

31. A sensitivity analysis was undertaken to ascertain the variation in distance at which the threshold values are exceeded. For this, the calculations were repeated for possible extremes values of the rock and blasting parameters, and the resulting change in the distance to threshold values was calculated. The results are shown are **Table 13**. This indicates that if Q is increased to 70 kg, the structural damage risk will increase to 72 m. Similarly, if RQD is increased to 55% or the unit weight is decreased to 24, the structural damage risk will increase to 80 and 64 m, respectively.

32. To investigate the impact of simultaneous variation in the three parameters, random variation about the mean values of the three parameters (±40% in Q, ±50% in RQD, ±10% in γ) was generated. The calculated distance to structural damage risk was calculated to be 59 ± 13 m, and to the cosmetic damage risk was calculated to be 126 ± 28 m.

Table 13: Sensitivity Analysis

Condition			Distance to Threshold (m)	
Q (kg)	RQD (%)	γ (kN/m^3)	PPV > 15 m/s	PPV < 5 m/s
50	35	26	60	130
30	35	26	47	101
70	35	26	72	154
50	15	26	38	82
50	55	26	80	172
50	35	24	64	137
50	35	28	58	123

5. Impacts on Houses

33. **Figure 12** through **Figure 16** show the tunnels and the risk zones around the tunnels. It may be noted that:

- The boundaries of risk zones are drawn without taking into consideration the variation in elevation of the terrain. The actual boundaries are likely to be closer to the tunnels.
- Based on the current information, no blasting is anticipated for Tunnel 1. However, recognizing that the actual distribution of rocks may differ from that shown in **Figures 4** to **8**, it is possible that some hard rock may be encountered during drilling and necessity of blasting may arise. Therefore, Tunnel 1 is also include in the Risk Area maps.

- To prevent damage from fly rocks and air blast, restriction is imposed on blasting in the first 50 m from the tunnel portal.
- Emergency tunnels and shafts will be constructed in Tunnels 2, 3, and 4 (2 tunnels). The risk zones boundaries also take into considerations, the location of the surface opening of the emergency tunnels and shafts.

34. Based on this analysis, the number of houses that are at risk in each of the five tunnels are shown in **Table 14**.

Table 14: Houses in Risk Zones

Tunnel	Structural Damage Risk Zone	Cosmetic Damage Risk Zone
1	11	15
2	20	17
3	3	9
4	25	30
5	5	9
Total	**64**	**80**

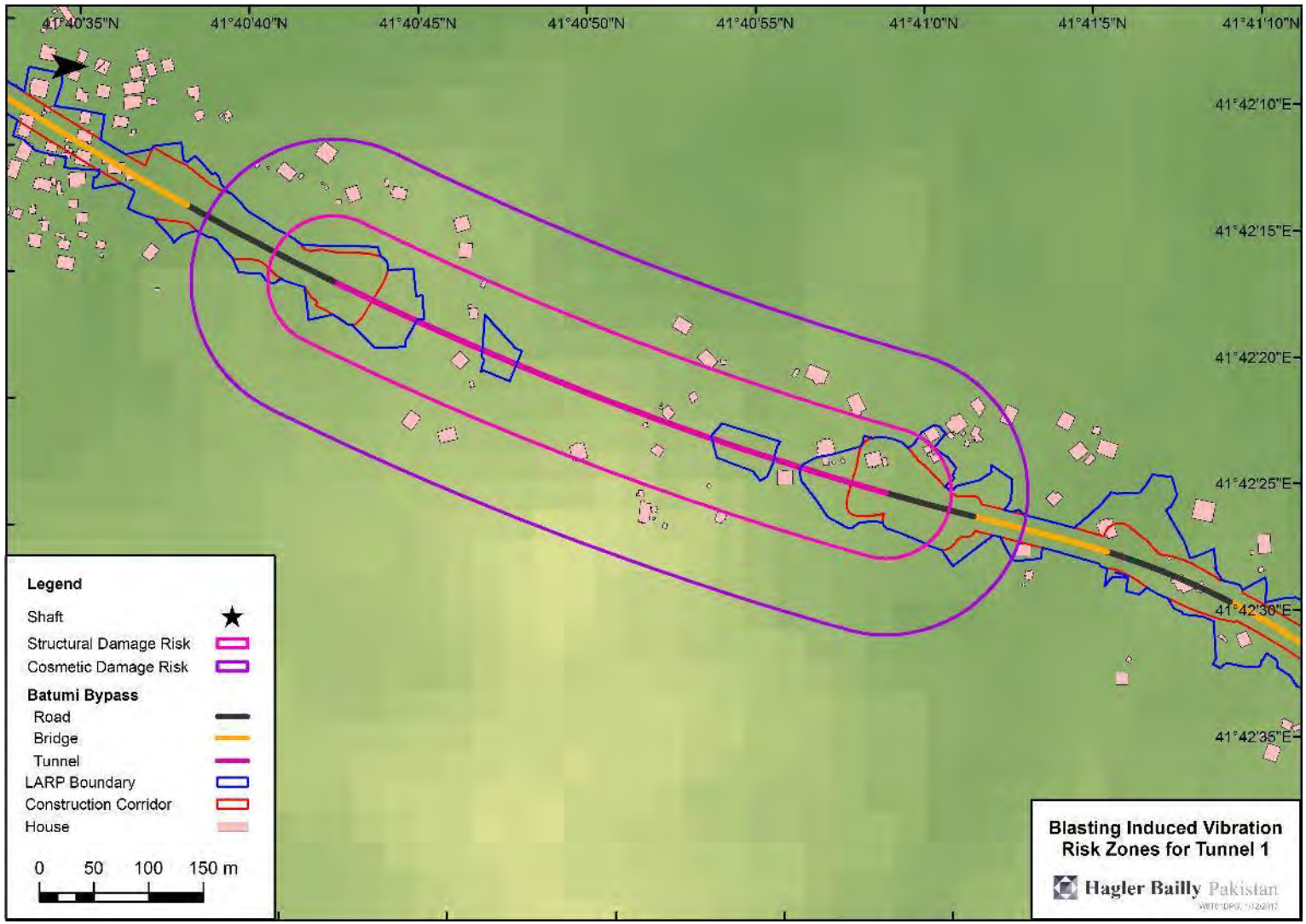


Figure 11: Blasting Induced Vibration Risk Zones for Tunnel 1

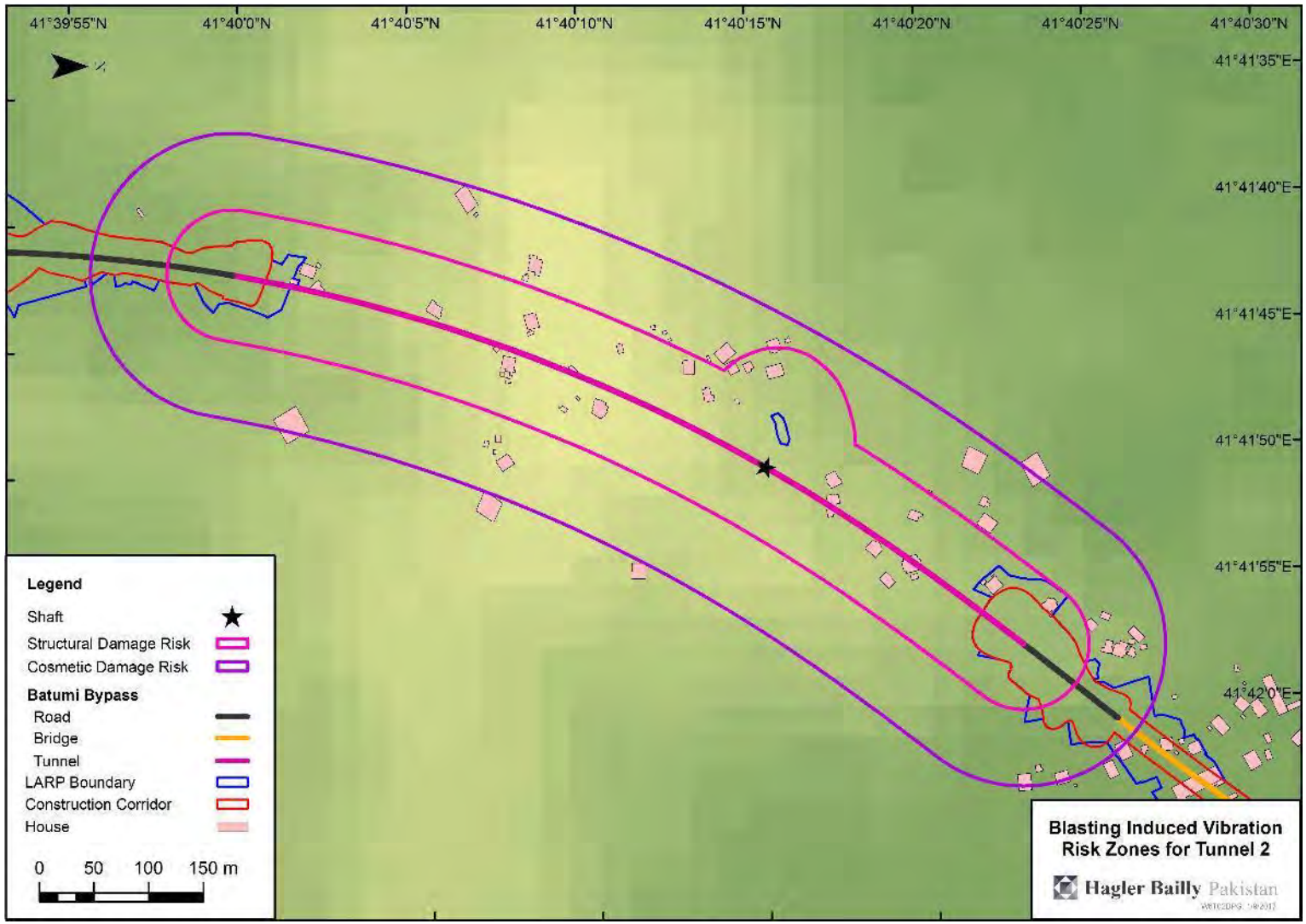


Figure 12: Blasting Induced Vibration Risk Zones for Tunnel 2

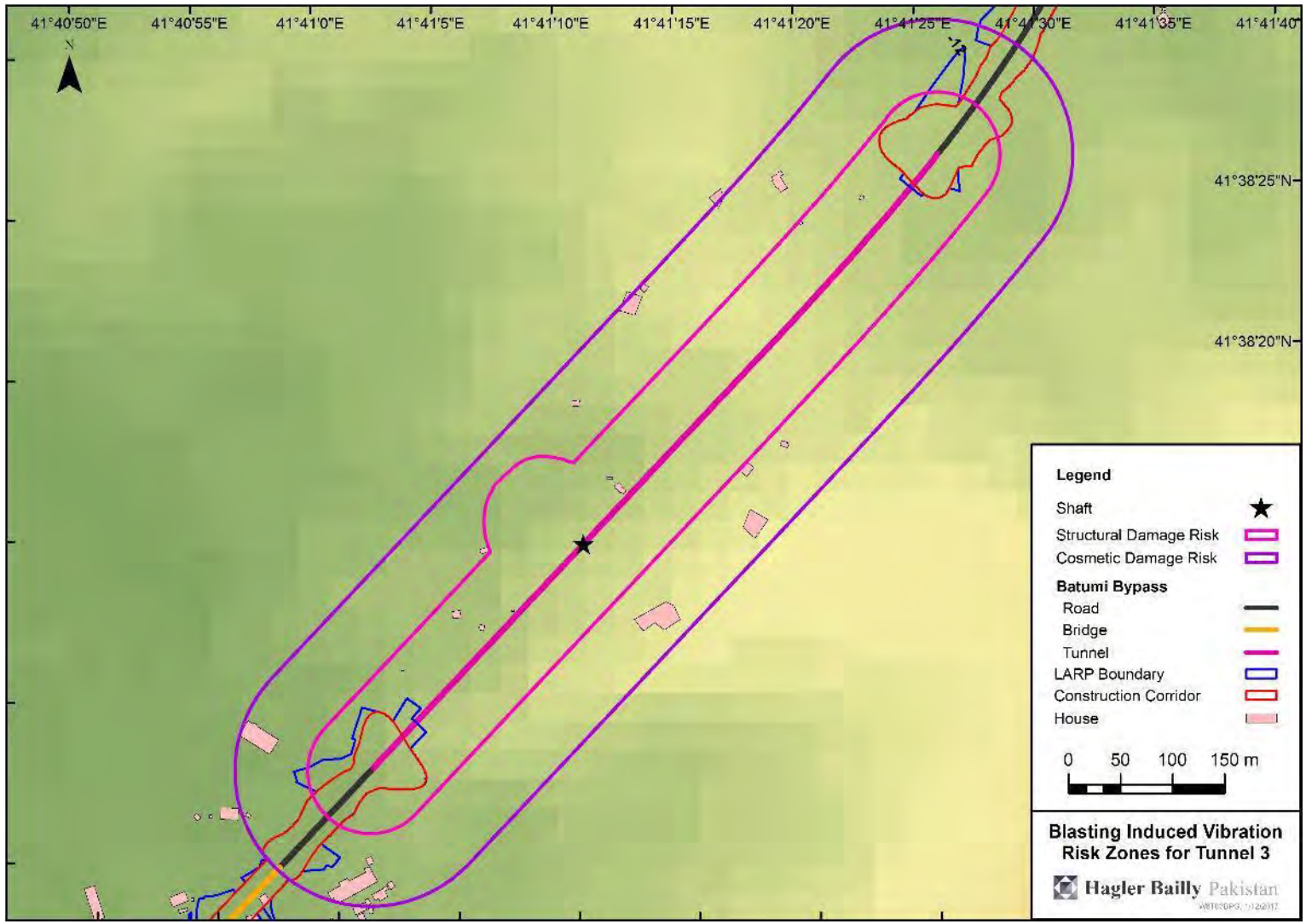


Figure 13: Blasting Induced Vibration Risk Zones for Tunnel 3

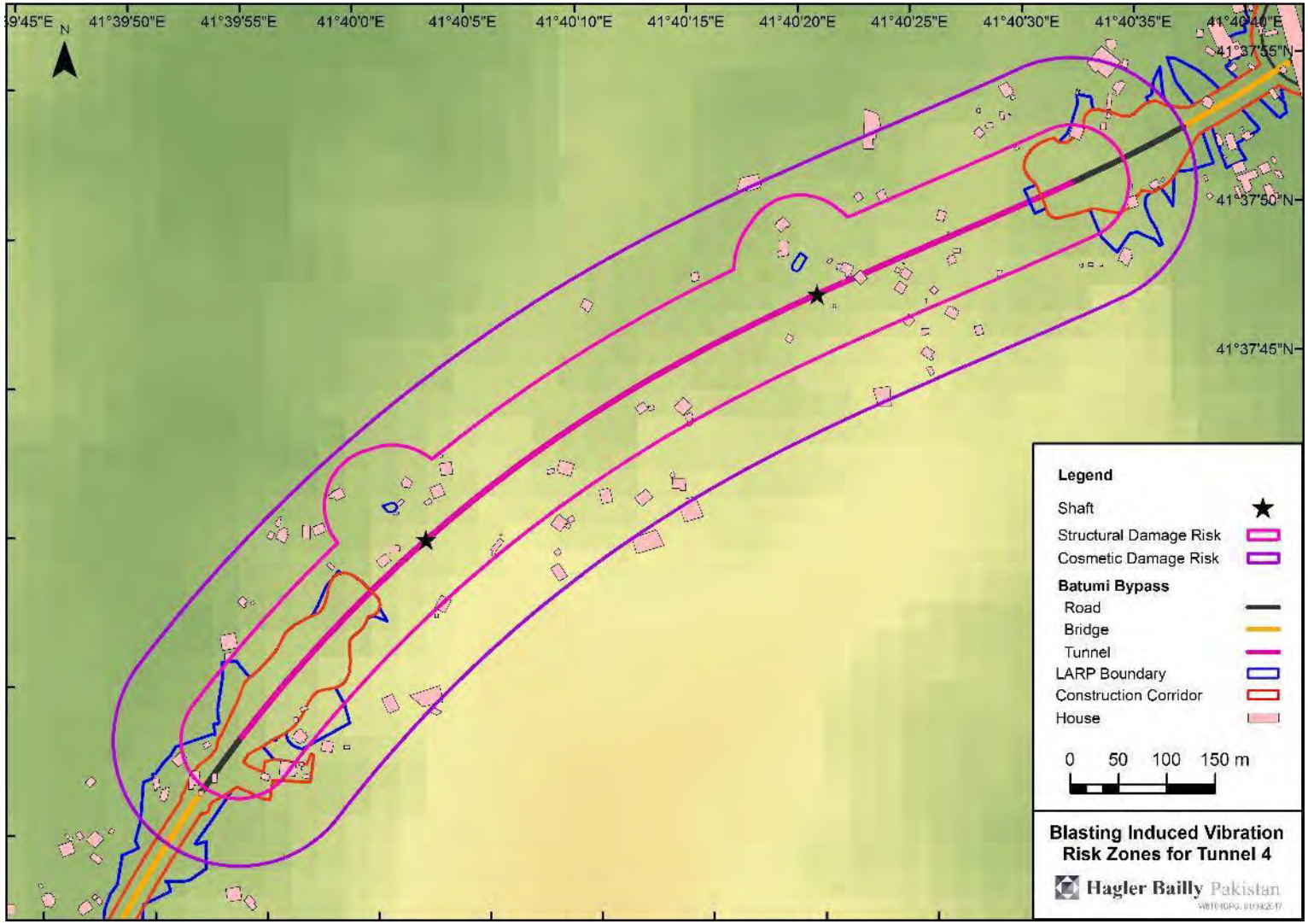


Figure 14: Blasting Induced Vibration Risk Zones for Tunnel 4

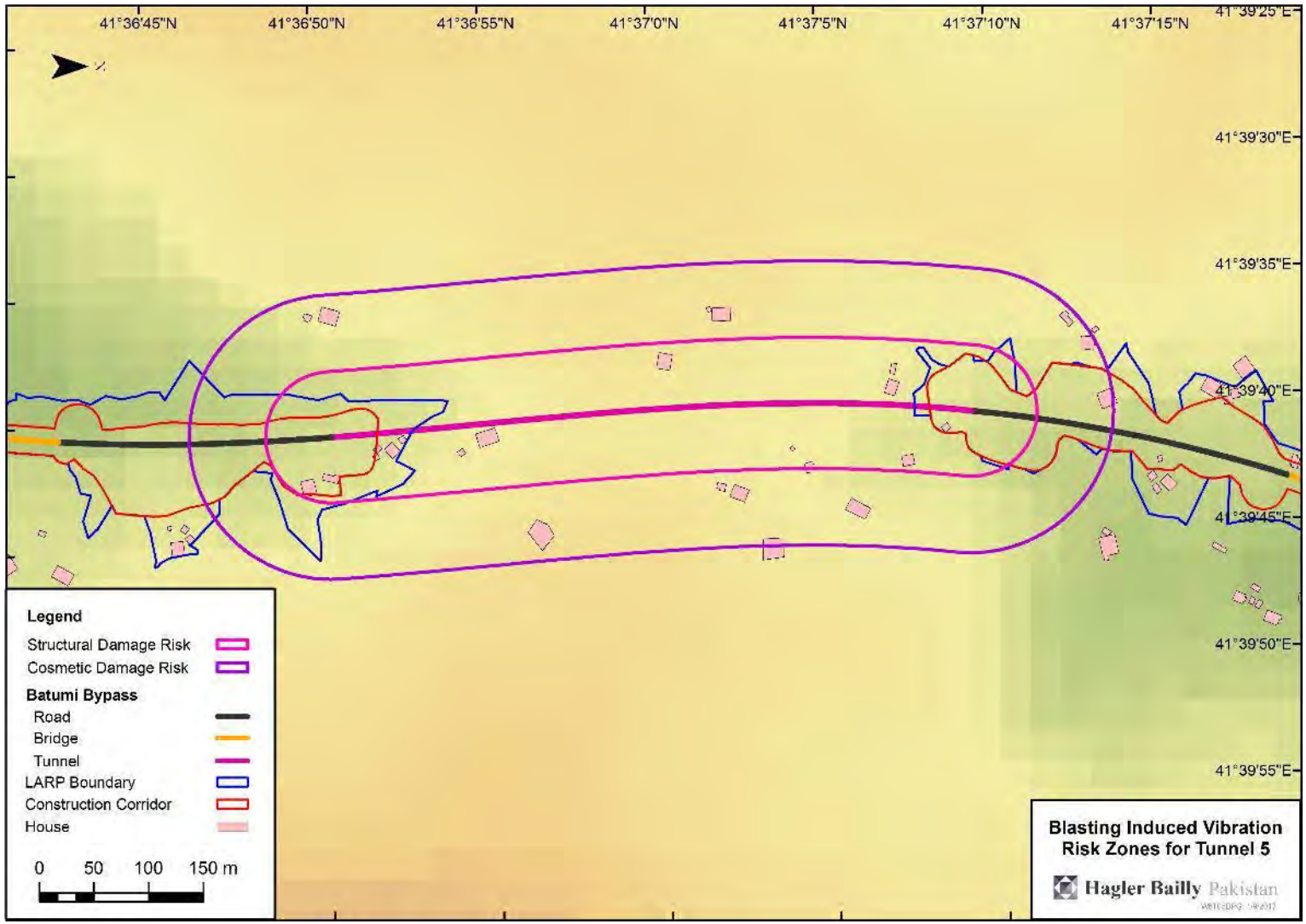


Figure 15: Blasting Induced Vibration Risk Zones for Tunnel 5

6. Mitigation and Monitoring Plan

6.1 Overall Approach

35. The PPV is predicted using a semi-empirical model which is the best alternate in the absence of measured field data. Although, there is reasonable confidence in the predicted value, but the norm is to measure field data to assess vibration levels. It is therefore proposed that the tunneling shall start from a tunnel with sparse population in the surrounding (for example, Tunnel 3). In the initial stages, the blasting induced vibration shall be measured as a function of maximum instantaneous charge and distance from the blasting site. This data shall be then used to refine the damage risk zones on the basis of the adopted criteria.

36. Early during the construction phase, the construction contractor shall develop a detailed tunnel blasting plan as part of the overall construction schedule. The plan shall specify, to a reasonable level of accuracy, the schedule for boring of each tunnel.

37. Using, the refined damage risk map and the tunnel boring schedule, the Supervision Consultant in consultation with the Roads Department and the Construction Contractor, shall identify the houses that will be affected and the impact duration and schedule.

38. For the houses that will fall in the Structural Damage Risk Zone, a temporary relocation plan will be developed. An amendment to the Land Acquisition and Resettlement Plan (LARP) will be commissioned for this purpose. Before start of blasting, all residents of houses in the Structural Damage Risk Zone will be relocated as per the LARP.

39. A survey will be undertaken in both zones, to determine the pre-blasting conditions of the buildings. The survey will be commissioned by the Supervision Consultant and will identify and record any existing damage to the structures. The survey will cover the following aspects:

a. Overall condition of the structures, both exterior and interior.
b. Documentation of defects observed in the structure using digital imagery along with notes, measurements and sketches.
c. Documentation of pre-existing cracks using digital imagery along with notes, measurements and sketches.

40. The survey will be accompanied with consultations with the affected household to explain the extent and reason for the survey, and the process for reporting any grievances regarding vibration impacts. The households should be provided with materials that summarize the grievance redress process.

41. Following completion of the blasting, the survey will be repeated in the Structural Damage Risk Zone to determine the condition of the buildings and verify that they are safe for re-occupation. If the buildings are safe, the residents will be allowed to return to their houses following any necessary damage repairs. If the buildings are damaged beyond repair, compensation will be paid to the owners as per the LARP.

42. If there are any claims or reports of damage in the Cosmetic Damage Risk Zone, the affected house will be surveyed against the pre-Project survey and repairs will be undertaken as appropriate.

6.2 Mitigation Plan

43. Following are key mitigation measures for the management of blasting:

- No blasting will be carried out within 100 m of the portal of the tunnel.
- Blasting will be scheduled during the day only.
- Local communities will be informed of blasting timetable in advance and will be provided adequate notice of when blasts are required outside of the planned schedule.
- A Blasting Management Plan will be developed by the Construction Contractor. The Plan will be reviewed and approved by the Supervision Contractor before the initiation of the blasting work.
- Throughout the blasting activity, vibration sensors will be installed at strategic location to monitor the impact of blasting and to ensure that the vibration levels are within the adopted criteria. The monitoring plan will be part of the Blasting Management Plan.

44. Unlike other construction activities, it is recognized that the impact of blasting on the community can be significant or can be perceived as significant by the community. It is therefore vital that regular and meaningful contact with the community shall be maintained and their grievance shall be attended to in a timely manner. In this regard:

- A meaningful community engagement plan will be developed. The plan will cover identify the affected community; the key contact persons; frequency of engagement; the information to be shared; the responsibilities to manage the plan; and the notice period to be giving to the community for various blasting related generating activities.
- The Grievance Redress Mechanism will be used to record, investigate, and respond to any complaints. Investigation of the complaints will be undertaken by the Supervision Consultant.

6.3 Vibration Monitoring

45. Vibration Monitoring Plan will include monitoring of vibration levels and frequency around the blasting sites. The objectives of the monitoring will be to:

- Ensure that vibration levels in the communities are within the adopted criteria levels;
- Maintain record of vibration to settle any potential conflicts; and
- Monitor changes in the vibration levels due to possible changes in the rock formation and take appropriate corrective actions.

46. Vibration data will be documented, reviewed, and preserved. It will be regularly shared with the RD, ADB, ministry of Environment and the community as part of the monthly progress report.

7. Conclusions

47. The most recent and refined model for predicting the blasting induced vibration has been used in this assessment. The model takes into account the properties of rocks

found in the project area. Nevertheless, it is recognized that the model is semi-empirical and has limitation. An appropriate management approach and mitigation plan is therefore proposed for managing the potential adverse impacts of blasting on the communities and structures.

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Appendix 8: INDEX OF STRUCTURES WITHIN BLASTING INDUCED VIBRATION RISK ZONES

1. Structures that lie within blasting induced vibration risk zone are listed in this Appendix. See **Section 8.7** of the main report for details.

Table 8-1: Tunnel 1

No	Structural Damage Risk	
	X	Y
1	725249.2	4618054
2	725276.3	4618017
3	725311.9	4617958
4	725252.9	4617828
5	725251.7	4617900
6	725217.4	4617910
7	725202.7	4617933
8	725168.5	4617946
9	725209.9	4618082
10	725169.3	4617719
11	725126.3	4617732

No	Cosmetic Damage Risk	
	X	Y
12	725219.6	4618222
13	725236.8	4618190
14	725227.4	4618174
15	725211.6	4618193
16	725308.3	4617889
17	725137.3	4617923
18	725182.3	4618046
19	725237.8	4617708
20	725068.6	4617725
21	725044.4	4617721
22	725016.2	4617664
23	725016.9	4617622
24	724982.6	4617595
25	724996.4	4617561
26	725224.1	4617675

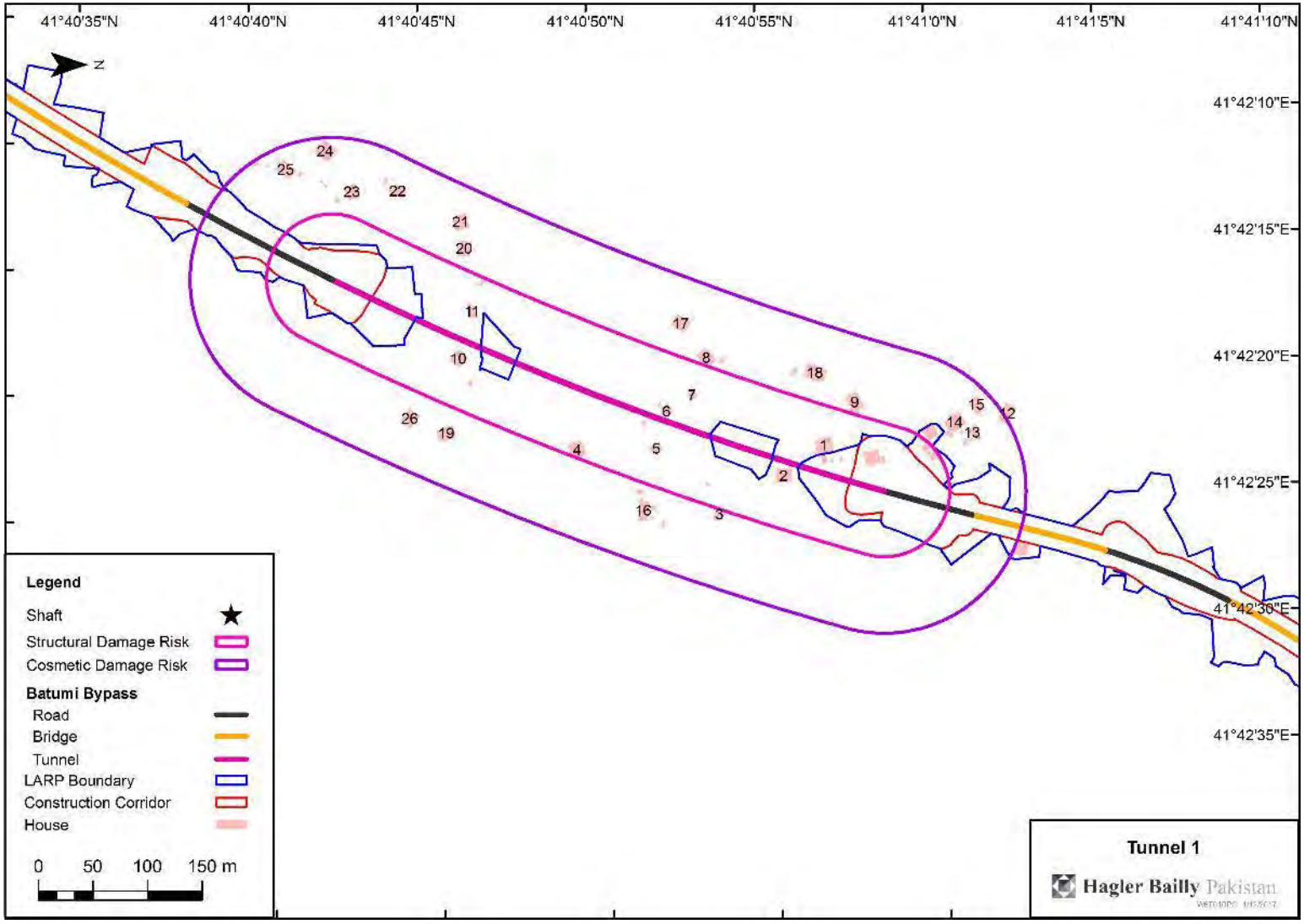

Figure 8-1: Tunnel 1

Table 8-2: Tunnel 2

No	Structural Damage Risk	
	X	Y
27	724442.3	4616518
28	724402.8	4616538
29	724482.6	4616601
30	724444.7	4616682
31	724445.1	4616722
32	724470.3	4616700
33	724444.5	4616737
34	724448.4	4616761
35	724426.9	4616758
36	724547.8	4616814
37	724566.1	4616814
38	724577.4	4616813
39	724610.4	4616852
40	724639.6	4616864
41	724624.6	4616886
42	724580.1	4616889
43	724680.3	4617050
44	724356.4	4616334
45	724372.9	4616343
46	724392.1	4616450

No	Cosmetic Damage Risk	
	X	Y
47	724820	4617024
48	724821.5	4616991
49	724532	4616514
50	724351.2	4616542
51	724431.9	4616715
52	724587.2	4616955
53	724567.6	4616952
54	724700.7	4617066
55	724702.8	4617077
56	724705.4	4617087
57	724689.1	4617092
58	724631	4616637
59	724572.2	4616500
60	724538.2	4616999
61	724529.9	4616943
62	724497.6	4616319
63	724291.1	4616479

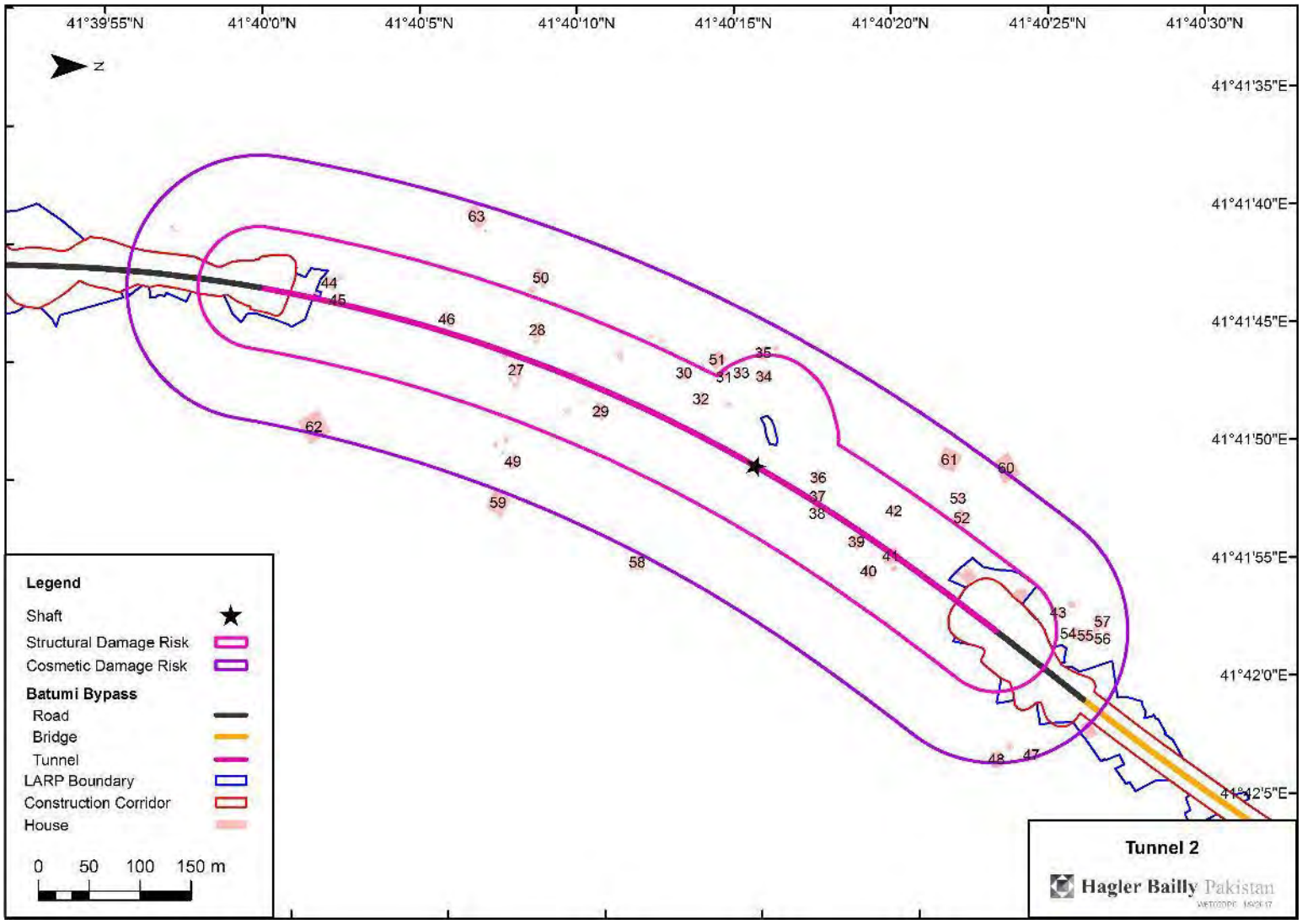

Figure 8-2: Tunnel 2

Table 8-3: Tunnel 3

No	Structural Damage Risk	
	X	Y
64	723888.7	4613069
65	723610.5	4612929
66	723767.7	4613050

No	Cosmetic Damage Risk	
	X	Y
67	723921.4	4613342
68	723511	4612668
69	723537.6	4612660
70	723517.7	4612646
71	723424.8	4612807
72	723805.2	4612926
73	723896.7	4613016
74	723777.9	4613227
75	723861.1	4613329

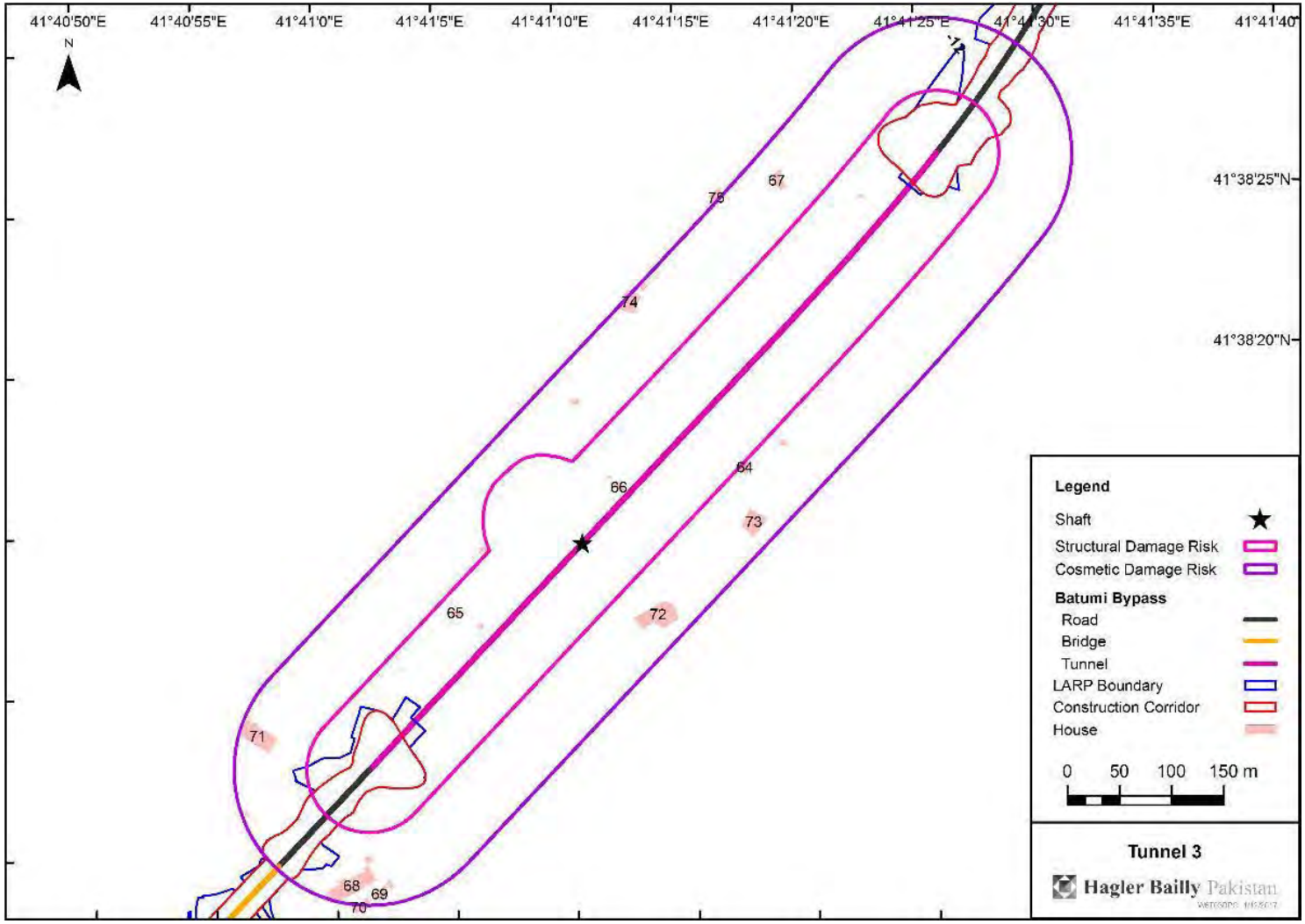

Figure 8-3: Tunnel 3

Table 8-4: Tunnel 4

No	Structural Damage Risk	
	X	Y
76	722923.6	4612222
77	722736.6	4612162
78	722692	4612099
79	722683.7	4612133
80	722689.1	4612147
81	722725.7	4612208
82	722664.8	4612228
83	722641.8	4612144
84	722626.5	4612153
85	722562.2	4612174
86	722568.3	4612080
87	722458.3	4612010
88	722464.5	4611997
89	722415.4	4612008
90	722336.5	4611946
91	722213	4611945
92	722203.8	4611922
93	722172	4611931
94	722100.3	4611919
95	722148.3	4611850
96	722159.4	4611863
97	722209.5	4611805
98	722265.3	4611865
99	722025.7	4611627
100	722560.9	4612198

No	Cosmetic Damage Risk	
	X	Y
101	722916.6	4612165
102	722899.7	4612326
103	722909.5	4612340
104	722896.3	4612364
105	722765.2	4612294
106	722796.4	4612312
107	722640	4612227
108	722470.7	4612144
109	722358.6	4612115
110	722378.4	4611917
111	722081.2	4611883
112	722068.3	4611880
113	722330.1	4611889
114	721987.7	4611766
115	722002.2	4611808
116	722089.8	4611658
117	722044.6	4611871
118	722155.5	4611702
119	722764	4612090
120	722709.9	4612069
121	722416.7	4611918
122	722448.9	4611934
123	722328.5	4611859
124	722736.8	4612107
125	722194.9	4611709
126	722421.4	4611870
127	722466.6	4611903
128	722665.6	4612021
129	722527.2	4612241
130	722652.6	4612298

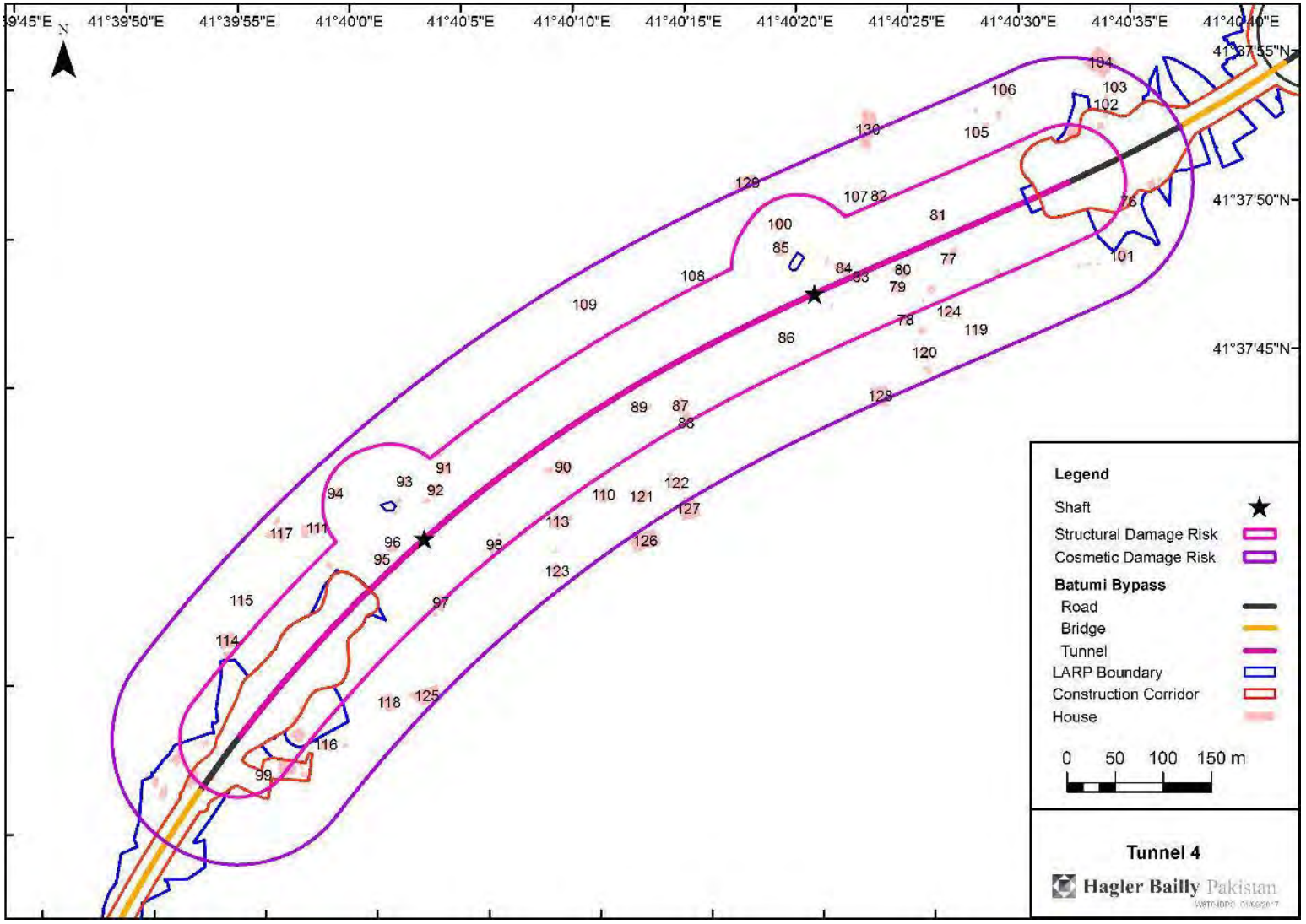

Figure 8-4: Tunnel 4

Table 8-5: Tunnel 5

No	Structural Damage Risk	
	X	Y
131	721662	4610644
132	721731.7	4610482
133	721685.6	4610852
134	721752.2	4610867
135	721758.2	4610776

No	Cosmetic Damage Risk	
	X	Y
136	721628.4	4610342
137	721618.8	4610696
138	721644.8	4611031
139	721622.4	4611012
140	721776.6	4610696
141	721782.6	4610713
142	721796.7	4610821
143	721819.8	4610531
144	721833	4610743

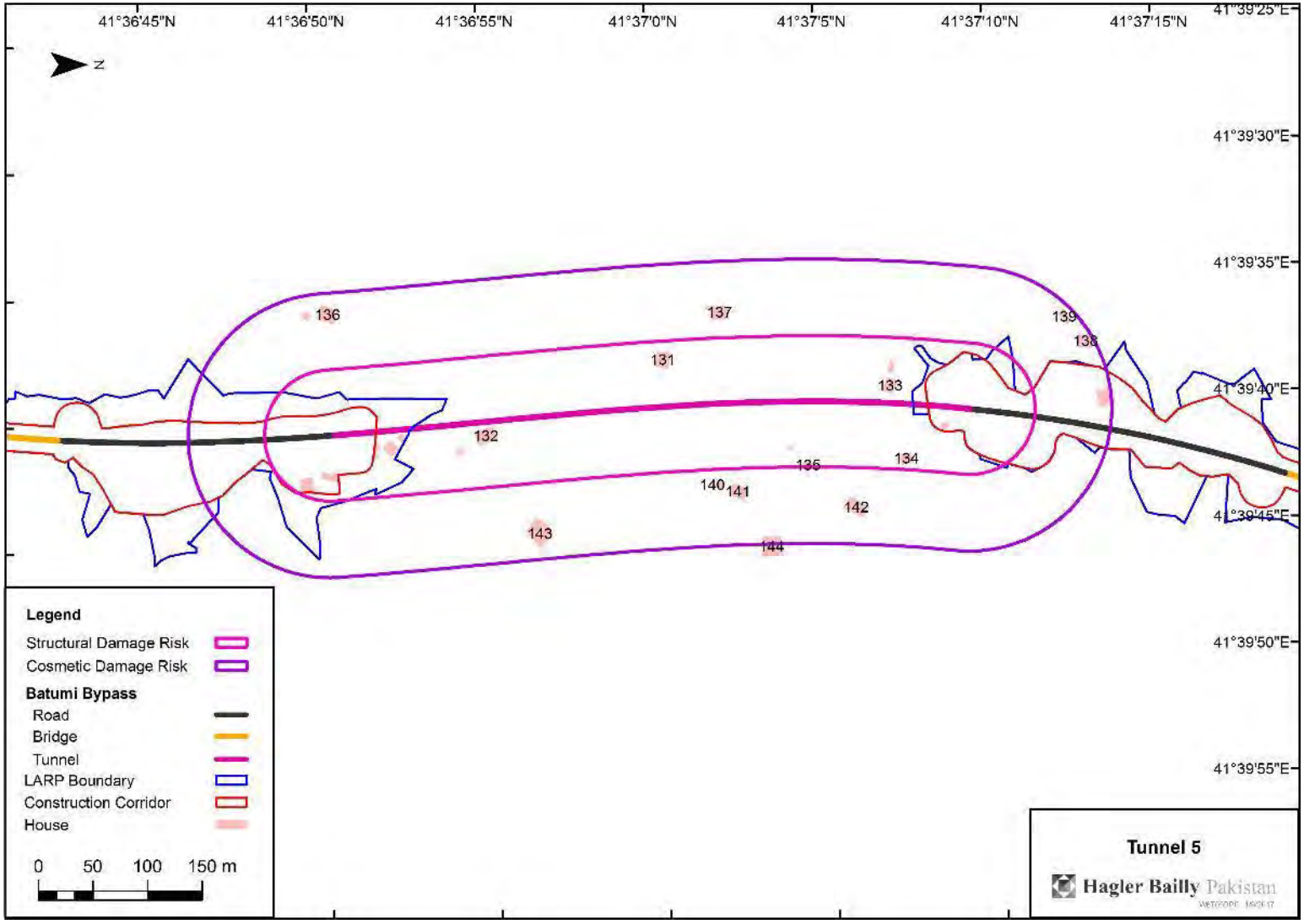

Figure 8-5: Tunnel 5

Appendix 9: ANNEXURES TO GRIEVANCE REDRESS MECHANISM

Form for the Grievance (for APs)

Name, Last name	
Contact Information Please indicate the preferable means of communication (Mail, Telephone, E-mail)	Mail: Please indicate the postal address: _____ _____ Telephone: _____ E-mail:_____
The language desirable for the communication	Georgian English Russian
Describe the grievance/claim:	What is the complaint about? What is the claim? When it happened, what is the problem result?

Date of Negotiation:	Resolution of Negotiation:
In your opinion how this claim should be resolved?	

Signature: _____

Date: _____

Annex 2: Form for the Protocol 1 – Action Plan

We, the claimant ---------- and the (name of entity) ---------- IA for the project ---------- financed by ADB, agree hereby on following actions aimed on mitigation of imacts claimed in a grievance submitted to IA on (date).

#	Agreed Actions	Responsible entity	Agreed Date	Status of implementation (fully/partially/no)
1				
2				
3				
4				
5				
6				
7				

Claimant: Name, passport #, contact details

Date: _____

Signature: _____

IA/PIU: Name, Official address, name of representative signing Action Plan

Date: _____

Signature: _____

Form for the Protocol 2 – Grievance Closure Act

We, the claimant ---------- and the (name of entity) ---------- IA for the project ---------- financed by ADB, agree hereby that all actions specified in the Action Plan have been implemented to the satisfaction of all parties and the claimant has no more claims or grievances in relation with the IA.

The claim is closed.

Claimant: Name, passport #, contact details

Date: _____

Signature: _____

IA: Name, Official address, name of representative signing Action Plan

Date: _____

Signature: _____