

# Environmental Monitoring Report

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## Mongolia: Western Regional Road Corridor Investment Program - Tranche 2

Prepared by the Project Implementation Unit (Ministry of Roads and Transport Development) for the Government of Mongolia and the Asian Development Bank.

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## Asian Development Bank

# 2017

## SEMIANNUAL ENVIRONMENTAL MONITORING REPORT



Western Regional Road Corridor Investment  
Program

Project Implementation Unit

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## **ABBREVIATIONS**

MRT – Ministry of Road and Transportation

ADB – Asian Development Bank

MET – Ministry of Environment and Tourism

EIA- Environmental Impact Assessment

DEIA- Detailed Environmental Impact Assessment

EMP- Environmental Management Plan

EPP- Environmental Protection Plan

EMR-Environmental Monitoring Report

PIU – Project Implementation Unit

COMO – Community Outreach Monitoring Officers

HSE – Health, safety and environment

## 1. INTRODUCTION

### 1.1 ABOUT THE REPORT

This annual Environmental Monitoring Report summarizes environmental works and activities carried out by the Project Implementation Unit, the Contractors, the Supervising consultant and their environmental staff in 2017. It also provides evaluation on implementation of the Environmental Management Plan for the Western Regional Road Corridor Development Project during the 2017 construction season which lasted between April and October.

This report is prepared by the PIU Environmental Monitoring Consultant E. Hasar with inputs from the Contractors.

The report comprises of following sections:

1. Section 1 provides brief introductions to this EMR report and updates on construction progress.
2. Section 2 describes environmental requirements, EMP objectives, environmental personnel and trainings organized.
3. In Section 3, environmental management actions undertaken during 2017 have been summarized.
4. In section 4, environmental monitoring activities carried out in 2017 and the corresponding results have been analyzed.
5. Section 5 provides summary of community consultation activities took place during the 2017 construction season.
6. Section 6 provides conclusion of environmental works in 2017 and recommendations on further activities.

Figure 1: Project location



## 1.2 CONSTRUCTION PROGRESS UPDATE

The Tranche-2 section, which connects Khovd provincial center to Ulaanbaishint border point, is divided into 4 lots. The contractor for the lots CW1-1, CW1-3 and CW 1-4 is Huashi Enterprises Co., Ltd while the contractor for lot CW1-2 is HKB International LLC. Inter-Continental Technocrats (ICT) LLC has been chosen as the supervising consultant for all four lots of the Tranche-2.

The 2017 construction season for the Tranche-2 section has commenced in May for the CW1-2 lot and in June for the lots CW1-1 and CW1-3. The reason for late commencement of construction for the lots CW1-1 and CW1-3 was that issuance of visa (by the Ministry of Labor and Social Protection) for the construction staff of Huashi Enterprises took longer than expected.

**Contract Package CW1-1:** During the 2017 construction season, the Contractor has mobilized total 252 laborers, of which 124 are Chinese workers and 128 are local workers. A total of 128 equipment were mobilized.

**Contract Package CW1-2:** During the 2017 construction season, the Contractor has mobilized total 242 laborers, of which 217 are Chinese workers and 25 are local workers. A total 118 equipment were mobilized including AC mixing plant, Crushing plant and concrete mixing plant at the project site. The Contractor has three bridge construction teams at the site.

**Contract Package CW1-3:** During the 2017 construction season, the Contractor has mobilized total 229 laborers, of which 129 are Chinese workers and 100 are local workers. A total of 144 equipments are mobilized at the project site.

***Table 1: Construction work progress rate for Tranche-2 section***

Lots	Start and end points	Length, km	Actual work progress rate as of October 30, 2017	Targeted work progress rate up to October 30, 2017
CW1-1	Shurga bridge to Khashaat pass	50 km	55%	66.01%
CW1-2	Khovd provincial center to Shurga bridge	56.6 km	64.27%	91.01%
CW1-3	Khashaat pass to Tolbo lake	60 km	25.16%	43.02%



**Table 2. Linear progress of road works for the lot CW1-1 as of October 30, 2017.**

Sl. No.	Description of Works	Unit	Completed
1	Road length under Package CW1-1	km	50
2	Embankment	km	50
3	Sub-base	km	50
4	1 <sup>st</sup> layer of Base Course	km	28.4
5	2 <sup>nd</sup> layer of Base Course	km	24
6	1 <sup>st</sup> layer of Gravel Shoulder	km	26
7	2 <sup>nd</sup> layer of Gravel Shoulder	km	0
8	Asphalt Concrete Pavement	km	14.7

**Table 3. Linear progress of road works for the lot CW1-2 as of October 30, 2017.**

Sl. No.	Description of Works	Unit	Completed
1	Road Length under Package CW1-2	km	56.6
2	Embankment	km	55.6
3	Sub-base	km	55.6
4	1 <sup>st</sup> layer of Base Course	km	47.4
5	2 <sup>nd</sup> layer of Base Course	km	44.6
6	1 <sup>st</sup> layer of Gravel Shoulder	km	55.6
7	2 <sup>nd</sup> layer of Gravel Shoulder	km	21
8	Asphalt Concrete Pavement	km	44.4

**Table 4. Linear progress of road works for the lot CW1-3 as of October 30, 2017.**

Sl. No.	Description of Works	Unit	Completed
1	Road Length under Contract Package CW1-3	km	60
2	Site Clearance	km	56.2
3	Embankment	km	26.2
4	Sub-base	km	23.5
5	1 <sup>st</sup> layer of Base Course	km	14.5
6	2 <sup>nd</sup> layer of Base Course	km	8.4
8	1 <sup>st</sup> layer of Gravel Shoulder	km	14.5
9	Asphalt Concrete Pavement	km	1



*Figure 2. Construction of asphalt concrete surfacing at the lot CW1-1. September 25, 2017*



## **2. ENVIRONMENTAL PROTECTION AND MANAGEMENT**

### **2.1. ENVIRONMENTAL REQUIREMENTS**

Environmental responsibilities for the Contractors and their construction activities are stated in the Contract signed between the ADB, MRT and the contractors. On one hand, all the construction activities shall meet ADB's rules and standards regarding environmental protection, and on the other hand, it shall obey the environmental laws and regulations of Mongolia.

The Contractors are also responsible for obtaining necessary permission on quarry sites, borrow pits and drilling water wells from the local soum Governments. In addition, funding and expenses related to implementation of the Environmental Management Plan and report preparation are included in their contracts.

DEIA and EMP for the Tranche-2 section is updated and approved by the Ministry of Environment and Tourism in November, 2016. The updated DEIA report has reflected recent updates on the project planning, such as wildlife crossings and site-specific mitigation measures for the

environmentally sensitive areas. Also, it reflected changes in environmental laws and regulations of Mongolia by updating the legislation section.

## **2.2 KEY OBJECTIVES OF THE EMP:**

The updated EMP for the Tranche-2 section defines mitigation and monitoring measures and describes the institutions and mechanisms to monitor and ensure compliance. Such institutions and mechanisms will seek to ensure continuous improvement of environmental protection activities during preconstruction, construction, and operation of the project in order to prevent, reduce, or mitigate adverse impacts. The EMP draws on the domestic EIA and on discussions and agreements made with the relevant government agencies. This environmental management plan (EMP) was prepared in line with ADB's SPS 2009. Specific measures are developed in relation to the design, construction and operation of each project component and the impacts identified in relation to physical, biological, cultural and socio-economic resources.

Key tasks for the contractor during implementation of the Environmental Management Plan are to:

1. Ensure that environmental requirements specified in the contract documents are adequately performed.
2. Carry out construction and supportive activities in compliance with all relevant Government laws, rules and regulations including environmental laws in force.
3. Manage construction works and operations to prevent or at least minimize adverse impacts on the environment.
4. Implement environmental protection and mitigation measures specified in the EMP.
5. Employ necessary personnel, local consultant to carry out environmental protection measures and monitoring activities.
6. Allocate a budget necessary for carrying out environmental monitoring activities.
7. Provide safeguard rules to protect workers from any accident and hazard associated with the construction operations and ensure protection of their health
8. Ensure protection of the health and welfare of road side communities by minimizing nuisance including pollution.

9. Observe the laws and other environmental regulations of the country and liaise with the Engineer and statutory authorities for the smooth and efficient operation to complete the Project.

The contractors have started implementation of the updated EMP for Tranche-2 in 2017. The on-site environmental staffs and key engineers were trained on implementation of the EMP. In order to fulfil their environmental duties, the contractors have hired local professionals and laboratories who carried out field environmental monitoring works.

### **2.3. ENVIRONMENTAL PERSONNELS**

The PIU employs E. Hasar as the environmental monitoring consultant for the project who is responsible for implementing the EMP, training contractors' environmental staffs and handling environmental issues related with the project on daily basis. He started working at the PIU in January, 2014 and on April 01, 2016 his contract was extended through 2018 construction season.

The environmental monitoring consultant has visited the Project area 4 times in 2017, during May 23-28, and July 20-25, August 20-22 and September 23-28. The field trips were aimed to i). carry out to environmental monitoring works ii). visit environmentally sensitive points, construction camps and nearby soum centers to undertake observations, measurements iii) organize interviews and meetings with environmental staff of the contractors and soum administration to find out existing problems. During the field trips, he had carried out following tasks:

1. Organized meetings with environmental officers of Khovd, Buyant, Erdeneburen and Tolbo soums
2. Organized meetings with Khar Lake Khovd River Water Basin Administration.
3. Visited active construction and environmental monitoring spots and environmentally sensitive areas.
4. Organized EMP trainings for contractor's environmental staffs.
5. Checked EMP implementation status and provide feedback.

The contractors employ on-site environmental staffs at their respective sites who are responsible for implementing the EMP and coordination of environmental monitoring. The CW1-1 construction team has employed Mr. Uyanzorig as a designated environmental personnel starting

from April 2016. The CW1-3 construction team Mr. Jangiirkhan as on-site environmental staff beginning from May 2017. The CW1-2 construction team employs Mrs. Dungaamaa as its environmental staff since September 2015.

**Table 5. On-site environmental staffs**

Construction packages	Name of on-site environmental staff	Phone number	Employed since
CW1-2	Ms. Dungaamaa	99806855	September, 2015
CW1-1	Mr. Uyanzorig	95590306	April, 2016
CW1-3	Mr. Jangiirhan	99413777	May, 2017

## 2.4. ENVIRONMENTAL TRAININGS ORGANIZED

As part of his duties, the PIU environmental monitoring consultant has organized EMP trainings for the contractors and their key staffs. Following table shows EMP trainings conducted during the first half of 2017.

**Table 6. Trainings organized by PIU Environmental monitoring consultant**

Training	Date	Attendants	Key topics presented
Implementation of the updated EMP	2017. May 23-25	Zhang Wang Guo - CW1-2 Team Leader Dungaamaa - Environmental staff of CW1-2 Cai Juhong - CW1-1 Team Leader Uyanzorig - Environmental staff of CW1-1 Jangiirkhan – Environmental staff of CW1-3 Khurts - Translator of CW1-3	Impact mitigation measures proposed in the updated EMP, timing, relevant standards to obey, monitoring spots, law requirements
Environmental Management actions	2017. July.21	Jangiirkhan – Environmental staff of CW1-3 Khurts - Translator of CW1-3 Enkhbold – Supervising engineer at CW1-3	Environmental requirements by the Professional Inspection Agency of Bayan-Ulgii province, correction measures, safety measures
Domestic rehabilitation standards and requirements	2017.09.25	Dungaamaa - Environmental staff of CW1-2 Uyanzorig - Environmental staff of CW1-1 Jangiirkhan – Environmental staff of CW1-3	Rehabilitation requirements and methods, specifications for technical rehabilitation of borrow points

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### 3. MANAGEMENT OF ENVIRONMENTAL IMPACTS

#### 3.1. DUST MANAGEMENT

Following mitigation measures to protect sensitive receptors from air quality issues have been implemented:

- ❖ Asphalt plants and concrete batching plants is located at least 1000 m downwind from the nearest dwellings in order to reduce the impact of fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions.
- ❖ The location of the stockpile is on downwind of sensitive receptors.
- ❖ Dust monitoring is undertaken at the selected monitoring spots on monthly basis to ensure dust level is within the maximum allowed level.

***Figure 3. Dust measurement at active construction sites, July 2017***



- ❖ Earth material transporting vehicles started used blankets to prevent dust spread

*Figure 4. Earth material transporting vehicles use designated blanket to prevent from dust spread, July 2017*



- ❖ Construction site management. Water is sprayed on construction sites and material handling routes where fugitive dust is generated.

The CW1-1 construction team had 7, CW1-2 team had 6 and CW1-3 team had 8 water spray trucks respectively that had been deployed for watering the temporary roads, embankment construction sites, borrow points and quarry sites to reduce dust generation. However, dust generation has not been reduced to an expected level due to dry weather this summer.

*Figure 5. The contractors employed water spray trucks, August 2017*



### 3.2. NOISE PREVENTION

The potential noise impacts are mitigated through following measures:

- ❖ Source control: Maintain all exhaust systems in good working order; undertake regular equipment maintenance;
- ❖ Locate sites for concrete-mixing and similar activities at least 500 m away from sensitive areas;
- ❖ Consider the use of mobile noise barriers if nomadic ger dwellers establish their summer residence near to construction sites;
- ❖ Operate between 8am-6pm only and reach an agreement with nearby residents regarding the timing of heavy machinery work, to avoid any unnecessary disturbances;
- ❖ Provide advance warning to the community on timing of noisy activities.



### 3.3. PROTECTION OF WATER RESOURCES

#### **Lot CW1-1:**

The CW1-1 road crosses Shurga and Hongio rivers and passes adjacent to the river in the Hongio valley. The contractor will construct a new bridge on the Hongio river. Protection of Hongio valley from potential pollution is important.

In order to prevent from oil spills, the contractor has constructed a deviation road embankment with culverts under it at the Shurga river in July.

***Figure 6: Temporary road embankments over Hongio and Shurga rivers, August 2017***



At around STA.20, the space between the Hongio river and the mountain foot is very tiny, thus in order to allow a deviation road, the river bank shall be diverted.

***Figure 7: The point where Hongio river bank will be diverged, July 2017***



The contractor is using Shurga and Hongio river water for both drinking and construction purposes and has obtained a written approval from (Approval on Water Consumption) the Khar Lake and Khovd river basin administration.

**CW1-2:**

The project road crosses 3 streams of the Buyant river in the delta. 2 bridges with length of 150 will be built over the stream No.1 and 2. At the stream No.3, the culverts will be installed under the road embankment.

***Figure 8. Bridge construction over the Buyant river. CW1-2. September, 2017.***



Preventing from pollution of Buyant river water is very important because there are about 1800 families are residing and planting watermelon down the stream of Buyant river, as per Buyant soum governor. In order to prevent oil spill from construction trucks, the contractor has constructed embankments at 3 points where the temporary deviation road crosses the river streams in 2016.

***Figure 9: A deviation road embankment over the Buyant river, July 2017.***



The contractor draws water from Buyant river and water wells for construction purpose and obtained a water use permission from the Khovd soum administration and Khar Lake and Khovd river basin administration bureau on May 16, 2017. To prevent from river pollution, the contractor has created a borehole on the eastern bank of the river from which the trucks draw water to be consumed for construction purposes.

Water quality monitoring is conducted on monthly basis and water samples taken from Buyan river is tested at the laboratory of the Institute of Meteorology of Khovd province.

### **CW1-3:**

The road alignment crosses Buraat and Hongor Ulun rivers and there will be new bridges constructed on both rivers. Protection of the surface water resources from pollution is a critical task for the contractor. In order to prevent from oil spill, CW1-3 team has constructed river crossing embankments for deviation roads at 3 points for Buraat and Hongor Ulun rivers, at STA.72+500, STA.75+800 and STA.100+700 respectively. Culverts are installed under the deviation which allows water flow.



*Figure 10. Deviation road embankment over the Hongor Ulun river. STA.100+700, September 26, 2017.*



The contractor uses surface water from Buraat, Hongor Ulun, Hongio and Hatuu rivers for construction purposes and has obtained written approval from the Tolbo soum administration, and Khar Lake and Khovd river basin administration office on annual basis. The Khar Lake and Khovd River Basin Administration concludes in the water use approval that there is no serious impact caused by drawing water from the existing rivers for construction purposes.

The contractor has obtained permission from the Tolbo soum administration on drilling of water wells at 1 spot: nearby the workers camp site (STA.65). The approval was given to well drilling at 3 spots, However only one water well has been created because water table at the other 2 spots were too deep. Drinking water for the main camp site is supplied from a well where the water table is about 60m.

***Figure 11: Water supply well at the main camp site, lot CW1-3, July 2017.***



According to the road design, 100 meters long section of the Buraat river was diverted at STA.74+500 to enable construction of the embankment.

***Figure 12. The point where the Buraat river has been diverted. STA.74+500, August 2017.***



### 3.4. LANDSCAPE AND SOIL RESOURCES

Operation of a paved road will improve the environment as it provides an alternative to currently driving through multiple unimproved earth tracks, which has contributed to land degradation.

#### CW1-1:

The CW1-1 construction team has obtained permission on 14 borrow pits and exploited 13 pits in 2017. The contractor has executed technical rehabilitation at 4 borrow pits which meets the requirements of the Mongolian standard on technical rehabilitation at damaged land sites: MNS 5917-2008.

***Figure 13. Rehabilitation of borrow pit at STA.32, September 25, 2017.***



The quarry site for the CW1-1 section is located nearby the main camp where the contractor produces aggregates for cement and asphalt concrete, graded crushed stone base course material located. All the necessary permissions and approvals were obtained for the quarry site. There is no herder households residing in 5 km radius of the quarry site, thus any noise and vibration impacts were minimal.



***Figure 14. Quarry site for the CW1-1 lot. September 24, 2017.***



**CW1-3:**

The construction team has obtained permission to use 22 borrow pits from the Tolbo soum government.

***Figure 15. Borrow point at STA.96, CW1-3, July 2017.***



The main quarry site locates nearby the main workers' camp at STA.65. Another quarry site



planned for the CW1-3 section locates at STA.93.

#### **CW1-2:**

The contractor has obtained the permission from the local government for 20 borrow sites in 2017. Additionally, the contractors have used 2 old borrow pits along the 2.7km road to Modon Ovoo that were previously used by local road repair teams.

***Figure 16. Rehabilitation of borrow pit along the 2.7km road to Modon Ovoo, September 24, 2017.***



The quarry site is located in 4 km distance from the main camp at STA.81+300.

**Crusher at the quarry site:** In order to increase gravel material production, the contractor hired 2 new crushers. Relevant permits were obtained from the local government and environmental monitoring activities cover the crusher sites.

*Figure 17. Crusher at the quarry site, August, 2017.*



The contractors' construction team has obtained permission on workers' camp sites from the Khovd soum administration. Besides the main camp, which locates at STA.77, there are 2 sub-camps for bridge construction and 2 more sub-camps for embankment construction.

### **Blasting works in July:**

The contractor has hired Davkhar Tesrelt LLC to conduct blasting works at the quarry site (STA.81+300) on 3 July 2017. The blasting team consists of 4 professionals has conducted blasting works under supervision by ICT Sain LLC engineers, Khovd province police department, Professional Inspection Agency and Environmental Department. Environmental and safety staffs of the contractor met with the local administration and herds people to inform the upcoming blasting works 3 days prior to the blasting action. There are no any herder household is residing in the vicinity of the blasting site (in 10km radius).

*Figure 18. Blasting at the quarry site. CW1-2, July, 2017.*



### 3.5. WASTE MANAGEMENT

#### **Solid waste management:**

- ❖ Domestic and waste construction materials are disposed to a designated waste collection points at each camp site.
- ❖ Garbage boxes are placed at each office and dormitory rooms and the construction staff are not allowed to throw any waste at or nearby the construction areas
- ❖ The contractors have signed "Agreement on waste handling" with the Tolbo, Jargalant and Erdeneburen soum administrations.
- ❖ Construction waste is delivered to the central dumpsite of the soum center. In accordance with the "Agreement on waste handling", the contractor pays a waste disposal fee of 400,000 MNT per month to the soum administration for using the local dumpsite.



***Figure 19. Waste collection point at the main camp site, CW1-1, May 2017.***



**Wastewater management:**

Sewage generated by camp sites are collected in septic tank or designated pits. Kitchen and toilets at the workers camp sites are connected to the steel septic tanks with underneath pipelines. Once the septic tank get full, the wastewater is disposed to the Khovd city Waste Water Treatment Plant.

***Figure 20: Designated wastewater collection facility, May, 2017.***



### 3.6. CAMP SITE MANAGEMENT

The main camp of the lot CW1-1 which covers 2.8 hectares of area is located on the right side of the road alignment at STA.31+400 while the sub camp which covers 0.3 hectares of area is located on the left side of the road alignment at STA.9+100.

The main camp of the lot CW1-2 is located on the right side of the road alignment at STA.76+740 while 3 sub camps are located at STA.57+240, STA.68+980 and STA.96+500 respectively.

The CW1-3 construction team has constructed 3 camps. The main camp is located on the right side of the road alignment at STA.66+300 while the sub camps are located at STA.81+500 and STA.114+163 respectively.

Waste collection points, sanitation system, rest rooms, canteen, ventilator, dorms and office rooms are available at all camp sites. The camp site is protected by surrounding drainage and fences. Necessary permits were obtained from local government for all the camp sites. In order to establish comfort for workers, the camp sites are provided with concrete basketball field and convenient dormitory rooms for staffs. As shown in the Appendix A, the camp site meets all the basic requirements.

***Figure 21. The main camp for the lot CW1-1, July 2017.***



*Figure 22. Main campsite environment, CW1-3, May 2017.*

### 3.7. WILDLIFE PROTECTION

As proposed by the Wildlife movement survey, there will be 4 wildlife crossings along the Tranche-2 road, 3 crossings in the Hongio river valley and 1 crossing at the Buraat pass.

*Table 7. The proposed wildlife crossing points for Tranche-2 road*

No.	Wildlife species	Longitude*	Latitude*	Elevation, m
<b>Lot CW1-1</b>				
Crossing 1	Argali sheep, ibex, snow leopard	48.41935	90.93569	1867
Crossing 2	Argali sheep, ibex, snow leopard	48.40641	90.87063	1952
Crossing 3	Argali sheep, ibex, snow leopard	48.40230	90.85270	1977
<b>Lot CW1-3</b>				
Crossing 4	Argali sheep, ibex, snow leopard	48.46631	90.46074	2625

The PIU environmental monitoring specialist and ICT supervising engineer had a joint visit at the proposed wildlife crossing points to determine implementation possibility. Depending on the height of the road embankment and landscape condition for wildlife movement, they agreed on wildlife crossing locations at STA.6+520, STA.7+956 and STA.13+425.

**Figure 23. Wildlife crossing at 6+520**



**Wildlife crossing at STA.13+425, July, 2017.**



**Figure 24. Wildlife crossing at STA.7+956**

**July 2017.**



**Wildlife crossing at Buraat pass, STA.85+040,**



These wildlife crossing will be constructed in 2018 once the pavement works are completed. In accordance with domestic standard, there will be slopes with angles less than 30 degrees on both sides of road embankment, warning signs for drivers on both side of the road and 3 speed bumps at each crossing point.

### **3.8. HEALTH AND SAFETY**

Each construction team employs a permanent safety staff at their camp.



**Table 8. On-site safety staffs**

Name of safety staff	Construction package	Contact phone
Mr. Bayasgalanbat	CW 1-1	95590306
Mr. Tumenbayar	CW 1-2	99964855
Mr. Jangiirkhan	CW 1-3	99413777

**Health and safety staffs carry our following works on daily basis:**

- ❖ Checking up workplace arrangements and identify risks
- ❖ Checking up the Health and safety principles, determine actions to be taken to improve the work place safety
- ❖ Dress inspection before the construction workers go out to workplace
- ❖ Checking the abnormal status and risk factors for the heavy machineries and equipment and determine preventive measures
- ❖ Clear signs placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials and excavation and raising awareness on safety issues.
- ❖ If any risks are found, inform it to field supervisors and recommend appropriate mitigation measures

**Figure 25. All construction workers are provided with PPE, June, 2017.**



*Warning signages were place at deviation roads and active construction sites*



*Warning signages were placed at the jungles and nearby borrow pits*



### 3.9. PROTECTION OF CULTURAL HERITAGES

There were 23 ancient tombs existed within 20m distance of the road alignment in the Hongio river valley. Of which, 13 tombs were located under or very close to the road alignment, thus removed by professional organization in October 2016. The remaining 10 tombs that locate in 50-100m distance from the road alignment have been protected with visibility fencing.

*Figure 26. An ancient tomb protected in Hongio river valley, July, 2017.*



#### CW1-3:

There are 4 ancient tombs and 1 ancient sculpture have been discovered along the CW1-3 road alignment. An ancient tomb is located at STA.86+400, was removed by Archeological Institute of Mongolia in October 2016 and the remaining tombs have been protected with visibility fencing.

**CW1-2:**

There is an ancient rock painting at STA.68+060 which has dimensions of 2 meter high and 5 meter long. The Historical Heritage Institute of Khovd province sent a professional team of 14 archeologists who conducted rescue excavation successfully and brought the painted rocks to their museum.

*Figure 27. Painted rocks were removed to safe place, August 2017.*



## 4.ENVIRONMENTAL MONITORING

### 4.1.ENVIRONMENTAL MONITORING SPOTS

Environmental monitoring spots were selected based on impact degree, potential impact receptors and vulnerability. Below tables show the selected monitoring spots for each lot:

*Table 9: Environmental monitoring spots for CW1-1 section.*

Location of the monitoring spots	Road mark	Potential receptors
<b>Lot CW1-1</b>		
Nearby Shurga river bridge	STA.49	Shurga river
Nearby construction camp	STA.26	Hongio canyon, camp workers, nearby tombs
Quarry site	STA.25	Hongio river, nearby residents and tombs
Hongio bridge	STA.15	Hongio river, nearby residents and tombs
Hongio valley	STA.11	Hongio river, nearby residents and tombs
<b>Lot CW1-2</b>		
Nearby wastewater treatment plant	STA.93	60 farmer households, Wastewater Plant and its treated water removal area
Nearby bridge on Buyant river	STA.86	30-40 herder household, ancient tomb, 3 streams of Buyant river

Nearby quarry site		Physical pollution on surrounding environment
Nearby main camp		Physical pollution on surrounding environment
Nearby a herder's cattle yard	STA.69	A herder family right along the road alignment
<b>Lot CW1-3</b>		
Hongor Ulun river	STA.101	Upstream of Hongor Ulun river, migratory birds
Shar bulag	STA.98	Physical pollution on surrounding environment
Buraat pass	STA.84	Physical pollution on surrounding environment
Buraat valley	STA.75	Buraat river and surrounding environment
Nearby main camp and quarry site	STA.65	Physical pollution on surrounding environment

#### 4.2.MONITORING PARAMETERS:

In accordance with the project EMP requirements, ADB standards and Mongolian regulations on environmental protection, the Contractor has chosen following parameters for environmental monitoring measurements:

- ❖ Dust concentration level (m<sup>3</sup>/mg)
- ❖ Noise emission level (decibel)
- ❖ Water chemical contents: turbidity, mineralization, hardness and contents of other chemicals
- ❖ Water contamination: contents of Pb, Zn, Cd, Cr and Ni.
- ❖ Soil contamination: contents of Pb, Zn, Cd, Cr and Ni.
- ❖ Hygiene inspection: inspection on waste and sewage removal, physical condition of camp sites, hygiene condition of kitchen and canteen, drinking water standards.

#### 4.3.MONITORING ACTIVITIES

The contracted local laboratories sent a team of experts to carry out field monitoring works every month. The environmental monitoring team has conducted dust and noise level measurements using devices Dust Trak and Volt Craft, taken soil and water samples at the selected monitoring spots. Test analysis for soil and water samples were conducted at the Laboratory of National Geographic Academy in Ulaanbaatar and at the Laboratory of Khovd province Institute of Meteorology.

*Figure 28: Noise and dust measurement devices used for monitoring*

#### 4.4.MONITORING FREQUENCY AND SCHEDULE

Considering the relatively short construction season in Mongolia due to climate condition, the Contractors have carried out the environmental monitoring activities on monthly basis between May and September in 2017.

*Table 10: Environmental monitoring schedule*

Monitoring parameters	2017		2018
	Frequency	Months of monitoring	
1. Dust and noise monitoring	Every month in the 1st half of the year, once a quarter in the 2d half of the year	May, June, July and October	Once a year if necessary
2. Water quality monitoring			
Chemical and heavy metals analysis			
3. Workplace condition, safety & hygiene			
4. Soil quality monitoring	Once a year	June	
Contamination analysis			
5. Wildlife monitoring			



## 4.5. MONITORING RESULTS

### 4.5.1. Soil quality monitoring

*Table 11: Heavy metals analysis for soil samples, May and June, 2017*

Spot No.	Name of the monitoring spot	Depth sm	Content of heavy metals (mg/kg)				
			Ni	Cd	Pb	Zn	Cr
May 2017							
1	Nearby bridge No.1 at Buyant river	0-30	26.5	9.9	0.073	16.4	25.4
2	Nearby quarry site CW1-2	0-30	32.6	8.2	0.051	24.3	20.9
3	Nearby main camp CW1-2	0-30	39.4	9.7	0.078	29.6	24.5
June 2017							
1	Nearby main camp CW1-1	0-30	20.2	0	3.2	36.9	3.84
2	Hongio valley	0-30	6.65	0	19.5	5.44	0
3	Nearby the quarry site CW1-3	0-30	23.1	0	10.4	55.2	7.05
4	Nearby Hongor Ulun river	0-30	6.91	0	27.3	2.09	0
5	Nearby bridge No.1 at Buyant river	0-30	14.6	0	23.7	21.9	0
6	Nearby quarry site CW1-2	0-30	20.5	0	4.3	7.96	8.71
Mongolian Standard (MNS 5850 : 2008)			150	3	100	300	150

*Table 12: Heavy metals analysis for soil samples, July, 2017*

Spot No.	Name of the monitoring spot	Depth sm	Content of heavy metals (mg/kg)				
			Ni	Cd	Pb	Zn	Cr
1	Nearby main camp CW1-1	0-30	24.7	0	4.1	30.5	1.92
2	Hongio valley	0-30	9.96	0.1	13.0	5.83	0.8
3	Olon nuuruud valley	0-30	39.3	0.2	20.7	24.5	8.63
4	Nearby quarry CW1-3	0-30	1.84	0.1	27.1	2.81	0.91
5	Nearby bridge No.1 at Buyant river	0-30	24.9	9.6	0.069	15.0	29.7
6	Nearby quarry site CW1-2	0-30	37.1	8.5	0.048	21.8	19.3
<b>Mongolian Standard (MNS 5850 : 2008)</b>			<b>150</b>	<b>3</b>	<b>100</b>	<b>300</b>	<b>150</b>

*Table 13: Heavy metals analysis for soil samples, August 2017*

Monitoring Spot No.	Name of the monitoring spot	Depth sm	Content of heavy metals (mg/kg)				
			Cr	Pb	Cd	Ni	Zn
1	Nearby main camp CW1-1	0-30	1.90	3.7	0.1	25.0	27.43
2	Hongio valley 1	0-30	0.74	11.2	0.2	9.86	9.21
3	Nearby bridge No.1 at Buyant river	0-30	21.6	9.0	0.062	15.9	30.1
4	Nearby quarry site CW1-2	0-30	33.8	7.5	0.045	21.0	17.8
5	Olon nuuruud valley	0-30	8.63	18.0	0.1	21.4	17.7
6	Nearby quarry CW1-3	0-30	2.15	16.5	0.2	19.5	9.8
Mongolian Standard (MNS 5850 : 2008)			150	100	3	150	300

*Table 14: Heavy metals analysis for soil samples, September 2017*

Monitoring Spot No.	Name of the monitoring spot	Depth sm	Content of heavy metals (mg/kg)				
			Cr	Pb	Cd	Ni	Zn
1	Nearby main camp CW1-1	0-30	2.00	8.0	0.2	24.9	15.83
2	Hongio valley 1	0-30	1.05	9.1	0.3	11.6	9.32
3	Nearby bridge No.1 at Buyant river	0-30	20.3	8.2	0.054	16.3	30.7
4	Nearby quarry site CW1-2	0-30	29.6	7.1	0.039	17.5	17.3
5	Olon nuuruud valley	0-30	5.68	15.8	0.2	22.7	14.2
6	Nearby quarry CW1-3	0-30	4.13	17.6	0.1	20.6	13.1
Mongolian Standard (MNS 5850 : 2008)			150	100	3	150	300

The monitoring team has chosen soil monitoring spots at the environmentally sensitive points and active construction sites such as quarries, borrow pits and workers camps. In the each month of soil contamination monitoring, heavy metals contents in the soil samples were within the standard levels. Based on the laboratory test analysis, it can be concluded that there is no soil contamination.



## 4.5.2. Results of water quality monitoring carried out by the contractors on monthly basis

**Table 15: Water Chemical analysis, May 2017. CW1-2**

Parameters	Buyant river, stream No.1	Buyant river, stream No.2	Buyant river, stream No.10	Kitchen of the main camp	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	0	0	0	0	mg/l	1.5
Mineralization	160.8	169.8	156	162.4	mg/l	1000
Reaction	7.53	7.41	7.13	7.34	pH	6.5-8.5
EC:	207	219	179	209	dS/m	
Hardness:	2.08	2.16	1.92	2	mg/l	7
HCO <sub>3</sub>	85.4	90.9	89.1	90.9	mg/l	
Cl	8.2	8.5	7.8	9.9	mg/l	350
SO <sub>4</sub>	25.9	27.4	17.3	19.7	mg/l	500
Ca	35.3	33.7	30.7	33.1	mg/l	100
Mg	3.9	5.8	4.8	4.3	mg/l	30
Na+K	2.2	3.5	3	4.5	mg/l	200
NH <sub>4</sub>	0.36	0.28	0.66	0.52	mg/l	1.5
No <sub>2</sub>	0.003	0.004	0.009	0.007	mg/l	1
NO <sub>3</sub>	0.25	0.28	0.27	0.24	mg/l	50
F	0.22	0.18	0.36	0.31	mg/l	0.7-1.5

**Table 16: Water Chemical analysis, June, 2017. CW1-1 and CW1-3.**

Parameters	Hongio river	CW1-1 main camp, kitchen	Buraat river	Hongor Ulun river	Kitchen of main camp	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	0	0	0	0	0	mg/l	1.5
Reaction	7.11	7.21	7.37	7.59	7.65	pH	6.5-8.5
EC:	104	181	301	230	197	dS/m	
Hardness:	1.72	1.61	1.96	1.8	1.92	mg/l	7
HCO <sub>3</sub>	80.5	78.1	86.8	86	80.6	mg/l	

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Cl <sup>-</sup>	9.2	8.5	9.9	10.6	12.1	mg/l	350
SO <sub>4</sub>	10.6	12.5	16.8	119.1	83.1	mg/l	500
Ca	29.9	27.4	36.9	31.4	33.9	mg/l	100
Mg	2.8	3.9	1.4	2.8	2.8	mg/l	30
NH <sub>4</sub>	0.12	0.16	0.24	0.22	0.18	mg/l	1.5
NO <sub>2</sub>	0.005	0.004	0.002	0.003	0.008	mg/l	1
NO <sub>3</sub>	0.29	0.27	0.18	0.24	0.22	mg/l	50
F	0.15	0.16	0.07	0.57	0.53	mg/l	0.7-1.5
Fe	0.13	0.07	0.04	0.12	0.17	mg/l	0.3
PO <sub>4</sub>	0.028	0.012	0.008	0.2	0.017	mg/l	0.1

**Table 17: Water Chemical analysis, June 2017. CW1-2.**

Parameters	Buyant river, stream No.1	Buyant river, stream No.2	Buyant river, stream No.10	Kitchen of the main camp	Ulaan Bogoch spring	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	1.5	1.5	1.5	0	0	mg/l	1.5
Reaction	7.32	7.56	7.71	7.44	7.27	pH	6.5-8.5
EC:	224.0	195.8	292	203	229.0	dS/m	
Hardness:	1.96	1.80	1.76	1.64	1.76	mg/l	7
HCO <sub>3</sub>	91.5	94.6	86.6	81.7	79.9	mg/l	
Cl	12.0	10.6	10.6	9.2	11.3	mg/l	350
SO <sub>4</sub>	17.3	19.7	20.7	11.0	102.8	mg/l	500
Ca	33.7	33.1	29.9	26.6	26.6	mg/l	100
Mg	3.4	1.8	3.3	3.8	5.2	mg/l	30
NH <sub>4</sub>	0.18	0.21	0.13	0.10	0.45	mg/l	1.5
NO <sub>2</sub>	0.003	0.002	0.009	0.001	0.006	mg/l	1
NO <sub>3</sub>	0.23	0.28	0.23	0.19	0.15	mg/l	50
F	0.16	0.24	0.21	0.27	0.19	mg/l	0.7-1.5
Fe	0.04	0.07	0.08	0.12	0.04	mg/l	0.30
PO <sub>4</sub>	0.015	0.01	0.016	0.01	0.011	mg/l	0.1

**Table 18: Water Chemical analysis, July, 2017.**

Parameters	Hongio river	Hongor Ulun river	Buraat river	Hongor Ulun river	Kitchen of main camp CW1-1	Buyant river	Kitchen of the main camp CW1-2	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	0	0	0	0	0	0	0	mg/l	1.5
Reaction	7.23	7.41	7.49	7.41	7.47	7.68	7.23	pH	6.5-8.5
EC:	201	210	278	210	173	217	217	dS/m	
Hardness:	1.89	1.79	2.04	1.79	1.76	2.23	2.17	mg/l	7
HCO <sub>3</sub>	90.9	90.1	89.2	90.1	86.3	96.2	87.1	mg/l	
Cl <sup>-</sup>	9.1	11.6	10.6	11.6	14.3	9.2	10.6	mg/l	350
SO <sub>4</sub>	14.2	108.9	19.3	108.9	71.4	28.9	17.3	mg/l	500
Ca	31.2	30.6	34.5	30.6	32.8	38.1	30.4	mg/l	100
Mg	2.7	2.4	3.2	2.4	3.6	2.4	3.8	mg/l	30
NH <sub>4</sub>	0.28	0.36	0.32	0.36	0.26	0.39	0.48	mg/l	1.5
NO <sub>2</sub>	0.002	0.014	0.008	0.014	0.011	0.005	0.011	mg/l	1
NO <sub>3</sub>	0.22	0.41	0.28	0.41	0.2	0.29	0.36	mg/l	50
F	0.41	0.54	0.15	0.54	0.42	0.31	0.34	mg/l	0.7-1.5
Fe	0.09	0.16	0.07	0.16	0.14	0.03	0.07	mg/l	0.3
PO <sub>4</sub>	0.034	0.028	0.032	0.028	0.028	0.023	0.018	mg/l	0.1

**Table 19: Water Chemical analysis, August, 2017. Lots CW1-1 and CW1-2**

Parameters	Main Camp kitchen CW1-1	Hongio river	Buyant river	Kitchen of the main camp CW1-2	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	0.00	0.00			mg/l	1.5
Reaction	7.14	7.22			pH	6.5-8.5
EC:	203.0	184.0	201	281	dS/m	
Hardness:	1.66	1.62	1.45	1.82	mg/l	7.0
HCO <sub>3</sub>	89.1	86.0	84.2	86.0	mg/l	

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Cl <sup>-</sup>	8.2	7.1	5.0	6.4	mg/l	350
SO <sub>4</sub>	18.7	20.6	20.6	16.3	mg/l	500
Ca	26.6	27.4	22.6	29.0	mg/l	100
Mg	4.0	3.0	3.9	4.5	mg/l	30
TSS	7.0	12.6	2.8	8.6		
NH <sub>4</sub>	0.26	0.28	0.16	0.19	mg/l	1.5
NO <sub>2</sub>	0.005	0.004	0.008	0.005	mg/l	1
NO <sub>3</sub>	0.20	0.15	0.33	0.22	mg/l	50
F	0.42	0.34	0.26	0.28	mg/l	0.7-1.5
Fe	0.10	0.05	0.03	0.07	mg/l	0.3
PO <sub>4</sub>	0.023	0.016	0.009	0.026	mg/l	0.1

**Table 20: Water Chemical analysis, August 2017. Lot CW1-3.**

Parameters	<i>Hongio river</i>	<i>Hongor Ulun river</i>	<i>Buraat river</i>	<i>Kitchen of main camp CW1-3</i>	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	0	0	0	0	mg/l	1.5
Reaction	7.22	7.4	7.39	7.61	pH	6.5-8.5
EC:	184.0	220	192	179.0	dS/m	
Hardness:	1.62	1.74	1.82	1.78	mg/l	7
HCO <sub>3</sub>	86.0	93.9	92.1	88.4	mg/l	
Cl <sup>-</sup>	7.1	5.7	5.0	7.8	mg/l	350
SO <sub>4</sub>	20.6	42.3	17.8	19.2	mg/l	500
Ca	27.4	29.8	31.9	29.0	mg/l	100
Mg	3.0	3.0	2.9	4.0	mg/l	30
TSS	12.6	11.2	17.2	15.2		
NH <sub>4</sub>	0.28	0.19	0.22	0.24	mg/l	1.5
NO <sub>2</sub>	0.004	0.005	0.004	0.004	mg/l	1
NO <sub>3</sub>	0.15	0.18	0.16	0.25	mg/l	50

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F	0.34	0.36	0.29	0.46	mg/l	0.7-1.5
Fe	0.05	0.00	0.02	0.05	mg/l	0.3
PO4	0.016	0.018	0.025	0.013	mg/l	0.1

**Table 21: Water Chemical analysis, September, 2017. Lots CW1-1 and CW1-2**

Parameters	Main Camp kitchen	Hongio river	Buyant river	Kitchen of the main camp	Measuring unit	Drinking Water Standard (MNS 9000:2005)
Turbidity	0.00	0.00	0	0	mg/l	1.5
Reaction	7.41	7.22	7.13	7.38	pH	6.5-8.5
EC:	201.0	181.0	207	194	dS/m	
Hardness:	1.66	1.62	1.78	1.82	mg/l	7.0
HCO <sub>3</sub>	78.1	75.6	86.2	86.0	mg/l	
Cl <sup>-</sup>	4.6	3.9	7.1	6.4	mg/l	350
SO <sub>4</sub>	19.2	16.8	21.6	18.7	mg/l	500
Ca	26.6	27.4	26.6	29.8	mg/l	100
Mg	4.0	3.0	5.5	4.0	mg/l	30
TSS	5.6	10.4	12.6	14.0		
NH <sub>4</sub>	0.18	0.14	0.24	0.21	mg/l	1.5
NO <sub>2</sub>	0.003	0.003	0.004	0.004	mg/l	1
NO <sub>3</sub>	0.14	0.18	0.24	0.22	mg/l	50
F	0.37	0.41	0.30	0.34	mg/l	0.7-1.5
Fe	0.14	0.16	0.10	0.12	mg/l	0.3
PO <sub>4</sub>	0.022	0.016	0.030	0.019	mg/l	0.1



**Table 22: Water Chemical analysis, September 2017. Lot CW1-3.**

<b>Parameters</b>	<b><i>Hongor Ulun river</i></b>	<b><i>Buraat river</i></b>	<b><i>Kitchen of main camp</i></b>	<b>Measuring unit</b>	<b>Drinking Water Standard (MNS 9000:2005)</b>
Turbidity	0	0	0	mg/l	1.5
Reaction	7.63	7.54	7.47	pH	6.5-8.5
EC:	204	220	169.0	dS/m	
Hardness:	1.74	1.82	1.78	mg/l	7
HCO <sub>3</sub>	78.1	84.2	83.6	mg/l	
Cl <sup>-</sup>	5.0	5.7	6.4	mg/l	350
SO <sub>4</sub>	14.4	16.3	20.6	mg/l	500
Ca	29.8	31.7	29.1	mg/l	100
Mg	3.1	2.9	4.0	mg/l	30
TSS	10.6	9.6	15.4		
NH <sub>4</sub>	0.25	0.18	0.27	mg/l	1.5
NO <sub>2</sub>	0.004	0.004	0.005	mg/l	1
NO <sub>3</sub>	0.26	0.20	0.19	mg/l	50
F	0.19	0.27	0.23	mg/l	0.7-1.5
Fe	0.11	0.03	0.07	mg/l	0.3
PO <sub>4</sub>	0.010	0.027	0.021	mg/l	0.1

Water quality monitoring was aimed i).ensuring the surface water resources in the vicinity of the construction area is not affected and ii).well water at the construction camps is well suited for human drinking.

Looking at the lab test results, level of turbidity, hardness and contents of other chemicals in water samples taken from the nearby surface water resources were all within the standard level.

Laboratory test results for the water samples taken from the kitchens of the construction camps show that all of the indicators are within the allowed level of Drinking Water Standard of Mongolia, thus well water could be used for human drinking.

### Results of water quality monitoring carried out by the PIU independent consultant Mr. Tserendorj

The PIU has hired Mr. Tserendorj as an independent water quality monitoring consultant since October 2014. He carries out water quality monitoring once a year to ensure the water resources are not affected by the project construction activities. Also, the water quality monitoring carried out by him provides the PIU with an independent source of monitoring data which can be compared to water quality monitoring data from the contractors.

Mr. Tserendorj has chosen 8 water quality monitoring spots along the Tranche-2 road corridor and has taken water samples at the monitoring spots in August 2017.

Table 23. Location of water quality monitoring spots by Mr. Tserendorj

Water Points			Coordinates						Road package
Name	Type	Number							
Buraat River	River Water	1	49	25	6.66	90	22	26.48	CW1-3
Olon Nuuruud lake	Lake Water	2	48	29	40.8	90	37	29.1	CW1-3
Khongio River-1	River Water	3	48	24	26	90	52	19.6	CW1-1
Khongio River-2	River Water	4	48	25	2.6	90	58	41.6	CW1-1
Khongio River-3	River Water	5	48	23	44.9	91	2	27.4	CW1-1
Aravt spring	Spring	6	48	6	31.8	91	40	59.8	CW1-2
Buyant River-1	River Water	7	48	6	38.1	91	41	9.8	CW1-2
Buyant River-2	River Water	8	48	6	3.7	91	41	56.7	CW1-2

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**Table 24. Results of lab test analysis for the water samples taken at the 8 monitoring spots in August, 2017**

Water Quality Parameters	Number of Monitoring Points									Drinking Water Standard, MNS:900: 2005	Examine the standard		Comparison	
	1	2	3	4	5	6	7	8	9		MNS	WB	MNS	WB
PH	8.08	8.46	8.26	8.31	8.4	8.26	8.27	7.66	8.15	6.5-8.5	6.5-8.5	6.9	+	-
		8.26			7.92			7.56	7.83				+	-
		8.32	8.03	8.06	8.24	8.01		7.98	8.03				+	-
Calcium (Ca <sup>2+</sup> )	0.94	1.08	1.78	0.84	1.24	1.08	0.96	0.97	1.44	200 mg/dm <sup>3</sup>				
		1.22			0.98			1.26	1.26					
		1.52	0.97	1.07	1.34	0.87		1.38	1.47					
Sodium (Na <sup>+</sup> )	0.96	1.42	18.76	6.82	7.65	7.66	7.25	3.99	8.09					
		3.6			9.42			7.34	7.43					
		4.14	15.31	5.12	6.56	3.46		5.22	6.83					
Calcium (Ca <sup>2+</sup> )	8.7	45.4	51.34	17	20.4	18.3	24.5	18.02	26.8	100 mg/dm <sup>3</sup>				
		35.01			19.17			25.75	25.98					
		33.19	17.03	13.17	14.72	9.50		20.46	22.84					
Magnesium (Mg <sup>2+</sup> )	2.35	9.86	11.99	2.84	4.68	3.11	5.16	3.86	5.91	30 mg/dm <sup>3</sup>				
		12.35			3.02			5.3	5.39					
		13.20	9.80	2.23	2.83	2.04		4.74	5.11					
Ammonium (NH <sub>4</sub> <sup>+</sup> )	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.5 mg/dm <sup>3</sup>				
		<0.20			<0.20			<0.20	<0.20					
		<0.20	<0.20	<0.20	<0.20	<0.20		<0.20	<0.20					
Chloride (Cl <sup>-</sup> )	8.51	8.51	34.02	27.2	20.42	27.2	10.21	13.61	13.61	350 mg/dm <sup>3</sup>				
		8.51			23.82			6.81	6.81					
		3.40	<3.0	<3.0	6.81	<3.0		<3.0	3.40					
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	<5.0	7.4	31.27	<5.0	<5.0	<5.0	5.76	<5.0	9.88	500 mg/dm <sup>3</sup>				
		9.05			12.6			26.3	24.9					
		6.59	10.70	6.57	9.88	7.41		3.29	23.05					
Nitrite (NO <sub>2</sub> )	0.07	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	1.0 mg/dm <sup>3</sup>				
		<0.05			<0.05			<0.05	<0.05					
		<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05					
Nitrate (NO <sub>3</sub> )	0.14	0.12	0.17	0.09	0.04	0.03	0.09	0.02	0.03	50 mg/dm <sup>3</sup>				
		0.25			0.19			0.19	0.19					
		<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01					
Carbonate, (CO <sub>3</sub> <sup>2-</sup> )	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5					
		<1.5			<1.5			<1.5	<1.5					
		4.59	3.06	3.83	<1.5	4.59		4.59	3.06					
Hydrocarbonate, (HCO <sub>3</sub> <sup>2-</sup> )	30.5	161.7	152.5	42.7	79.3	48.8	103.7	67.1	97.6					
		164.7			48.81			82.4	91.5					

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		152.6	122.0	54.90	54.9	32.54		90.72	82.40					
General Hardness	0.63	3.08	3.55	1.08	1.4	1.17	1.65	1.22	1.82					
		2.76			1.21			1.72	1.74					
		2.74	1.66	0.84	0.97	0.64		1.41	1.56					
Dry Residue	100.7	168	246	92	110	96	124	88	132	1000 mg/dm <sup>3</sup>				
		166			106			126	130					
		162.0	136.0	78.00	84.0	60.00		102.0	124.0					
Hemorrhoids H <sub>2</sub> SiO <sub>3</sub>	5.1	8	12.11	11.12	8.84	12.04	10.44	8.91	9.67					
		6.48			9.22			7.77	7.69					
		8.27	12.80	13.83	10.40	12.38		12.53	9.71					
Enhancement /KMnO <sub>4</sub> /	10.4	4.48	3.84	1.92	4.8	5.6	4.8	11.36	1.92					
		2.24			1.92			1.76	2.56					
		2.40	7.84	7.84	4.16	10.88		4.80	0.80					
Arsenic (As)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.04	0.01 mg/dm <sup>3</sup>	0.05mg /l	0.1mg /l	+	+
		<0.01			<0.01			<0.01	<0.01				+	+
		<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01				+	+
Cadmium (Cd)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.003 mg/dm <sup>3</sup>	0.03mg /l	0.1mg /l	+	+
		<0.005			<0.005			<0.005	<0.005				+	+
		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				+	+
Chrome (Cr)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.05 mg/dm <sup>3</sup>	0.05mg /l	0.1mg /l	+	+
		<0.005			<0.005			<0.005	<0.005				+	+
		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				+	+
Copper (Cu <sup>2+</sup> )	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1.0 mg/dm <sup>3</sup>	0.3mg/ ěl	0.5mg /l	+	+
		<0.02			<0.02			<0.02	<0.02				+	+
		<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02				+	+
Iron (Fe <sup>2+</sup> , Fe <sup>3+</sup> )	0.08	<0.03	0.1	0.1	<0.03	<0.03	<0.03	0.14	0.11	0.3 mg/dm <sup>3</sup>	1mg/l	3.5mg /l	+	+
		<0.03			<0.03			<0.03	<0.03				+	+
		<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03				+	+
Lead (Pb)	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01 mg/dm <sup>3</sup>	0.1mg/l	0.1mg /l	+	+
		<0.01			<0.01			0.01	<0.01				+	+
		<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01				+	+
Cianide (CN)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.01 mg/dm <sup>3</sup>	0.05mg /l	0.2mg /l	+	+
		<0.002			<0.002			<0.002	<0.002				+	+
		<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	<0.002				+	+
Öiñ	0	0	0	0	0	0	0	0	0	0.05	5mg/l	10mg/ l	+	+

Based on the detailed lab test analysis, it can be concluded that there is no any signs of pollution of surface water resources along the Tranche-2 road corridor These rivers and spring water can be

used as drinking water for local people and livestock since their quality parameters met drinking water standard of Mongolia.

#### 4.5.3. Dust measurement

Dust measurements were made nearby construction camps, borrow pits, active construction sites and deviation roads (access dirt roads) where there are relatively high traffic. The monitoring team specialists have measured dust concentration levels with average value of one hour duration. Average dust concentration level per hour is shown in the below table. The maximum allowed level of dust concentration is 0.1 mg/m<sup>3</sup> according Mongolian Standard on Ambient Air Quality.

**Table 25: Measured dust concentration levels, May and June, 2017.**

Monitoring Spot No.	Name of the monitoring spot	Average dust concentration level /per hour/, mg/m3	Standard level mg/m3
May 2017			0.1
1	Nearby wastewater treatment plant CW1-2	1.312	
2	Nearby bridge No.2 at Buyant river	0.614	
3	Nearby quarry site CW1-2	3.116	
June 2017			
1	Hongio valley 1	0.479	
2	Nearby the quarry site CW1-1	0.122	
3	Olon nuur valley	0.236	
4	Buraat valley	0.083	
5	Nearby quarry site CW1-3	0.126	
6	Nearby bridge No.1 at Buyant river	0.23	
7	Nearby quarry site CW1-2	3.412	
8	Nearby main camp CW1-2	0.176	



**Table 26: Measured dust concentration levels, July 2017.**

Monitoring Spot No.	Name of the monitoring spot	Average dust concentration level /per hour/, mg/m3	Standard level mg/m3
1	Hongio valley	0.937	0.1
2	Nearby the quarry site CW1-1	1.235	
3	Olon nuur valley	0.802	
4	Buraat valley	0.095	
5	Nearby quarry site CW1-3	0.078	
6	Nearby waste water treatment plant of Khovd city	0.263	
7	Nearby bridge No.2 at Buyant river	0.087	
8	Nearby quarry site CW1-2	2.75	

**Table 27: Measured dust concentration levels, August, 2017.**

Monitoring Spot No.	Name of the monitoring spot	Average dust concentration level /per hour/, mg/m3	Standard level mg/m3
1	Hongio valley	0.618	0.1
2	Nearby the quarry site CW1-1	3.023	
3	Nearby bridge No.2 at Buyant river	0.436	
4	Nearby quarry site CW1-2	4.137	
5	Main camp CW1-2	0.932	
6	Borrow pit at Olon nuur valley	0.647	
7	Buraat valley 1	0.095	
8	Nearby quarry site CW1-3	0.715	

*Table 28: Measured dust concentration levels, September, 2017.*

Monitoring Spot No.	Name of the monitoring spot	Average dust concentration level /per hour/, mg/m3	Standard level mg/m3
1	Hongio valley	4.732	0.1
2	Nearby the quarry site CW1-1	2.306	
3	Nearby asphalt mixing plant at the main camp CW1-2	3.902	
4	Nearby quarry site CW1-2	5.589	
5	Borrow pit at Olon nuur valley	0.02	
6	Buraat valley 1	0.01	
7	Nearby quarry site CW1-3	2.016	

Measured dust concentration level was higher than the standard level at many monitoring sites between May and September. The contractors were instructed to intensify watering along the deviation road and the borrow points and it helped to reduce dust level, but not to the expected level. Due to an extended drought and an unusually dry weather this year, the dry soil absorbs sprayed water in just a few minutes and dries up again quickly.

Since measured dust levels exceeded the maximum allowed level at the active construction sites, following additional measures were undertaken by the contractors:

- ❖ All trucks transporting earth materials shall be covered with tarpauling
- ❖ Fine particle stockpiles nearby the crusher need to be covered with tarpaulin.
- ❖ Provide construction workers with protection masks and goggles.

Given there were no any receptors nearby the construction sites besides the construction workers, they need to wear facial masks to protect themselves from the dust.

At the quarry site of the CW1-2 lot, fine dust particles emerged from constant movement of heavy duty trucks and the crushers lay on the ground around the site which increases the dust level when it's windy. The contractor cleaned the site by collecting the fine dust particles and landfilling.

## 4.5.4. Noise monitoring

**Table 29: Measured noise levels, CW1-1**

Monitoring Spot No.	Name of the monitoring spot	Measured noise level /dB/				Standard level dB (at construction site)
		June 2017	July 2017	August 2017	September 2017	
1	Nearby Shurga river bridge	18.2	26.7	18.9	12.5	90
2	Ontsiin Khutul	17.8	11.2	9.5	12.7	
3	Shar nuur	21	14.5	13.0	12.0	
4	Nearby construction camp	42.6	29.8	27.0	23.5	
5	Hongio bridge	33.1	68.6	56.3	72.8	
6	Hongio valley 1	72.5	76.1	75.2	71.7	
7	Hongio valley 2	71.7	78	80.1	31.8	
8	Hongio valley 3	46.4	74.9	79.0	24.9	
9	Bayan Enger	49.8	38	52.1	38.3	
10	Khashaat pass	29.6	63.5	64.8	15.6	

**Table 30: Measured noise levels, CW1-2**

Monitoring Spot No.	Name of the monitoring spot	Measured noise level /dB/					Standard level dB (at construction site)
		May	June	July	August	September	
1	Nearby waste water treatment plant	58.9	63.4	79.5	77.3	39.8	90
2	Nearby bridge No.1 at Buyant river	80.1	79.8	78.2	72.6	66.3	
3	Nearby bridge No.2 at Buyant river	90.0	85.6	67	75.9	62.9	
4	River crossing point at stream No.10	63.2	57.2	45.6	37.2	48.7	
5	Ulaan Bogoch spring	84.3	80.9	61.3	58.7	30.0	
6	Nearby quarry site	88.7	89.7	90	83.2	89.2	
7	Nearby main camp	22.6	34.5	29.9	31.9	84.5	
8	Nearby a herder's cattle yard	27.2	26.3	27	21.6	12.5	
9	Nearby a herder's spring shelter	49.1	36.9	33.2	30.7	13.2	
10	Nearby Shurga river bridge	18.0	22.3	13.8	48.5	10.8	

**Table 31: Measured noise levels, CW1-3**

Monitoring Spot No.	Name of the monitoring spot	Measured noise level /dB/				Standard level dB (at construction site)
		June	July	August	September	
1	Khashaat pass	52.1	48.3	69.1	16.0	90
2	Hongor Ulun river	77.3	55	28.7	11.5	
3	Holboo lake	41	12.5	21.6	8.3	
4	Nearby sub-camp	50.7	21.7	19.0	37.2	
5	Shar bulag	79.4	82.5	57.1	19.1	
6	Planned quarry site STA.96	71.3	78.1	30.0	17.2	
7	Buraat pass	39.6	26.2	22.3	20.0	
8	Buraat valley 1	33.5	69.9	54.2	31.5	
9	Buraat valley 2	33.3	67.5	59.6	28.1	
10	Nearby main camp and quarry site	84.5	88.2	80.9	62.8	

The monitoring spots chosen for noise measurement considering construction activities and sensitive receptors and the points where construction staff are working such as camp sites and quarry sites. Maximum allowed level of noise during day time is 90 decibels according to both ADB EIA for Tranche-2 and the Mongolian Standard on Noise. At all monitoring spots, the noise levels were within the allowed level.

## 5.GRIEVANCE REDRESS MECHANISM

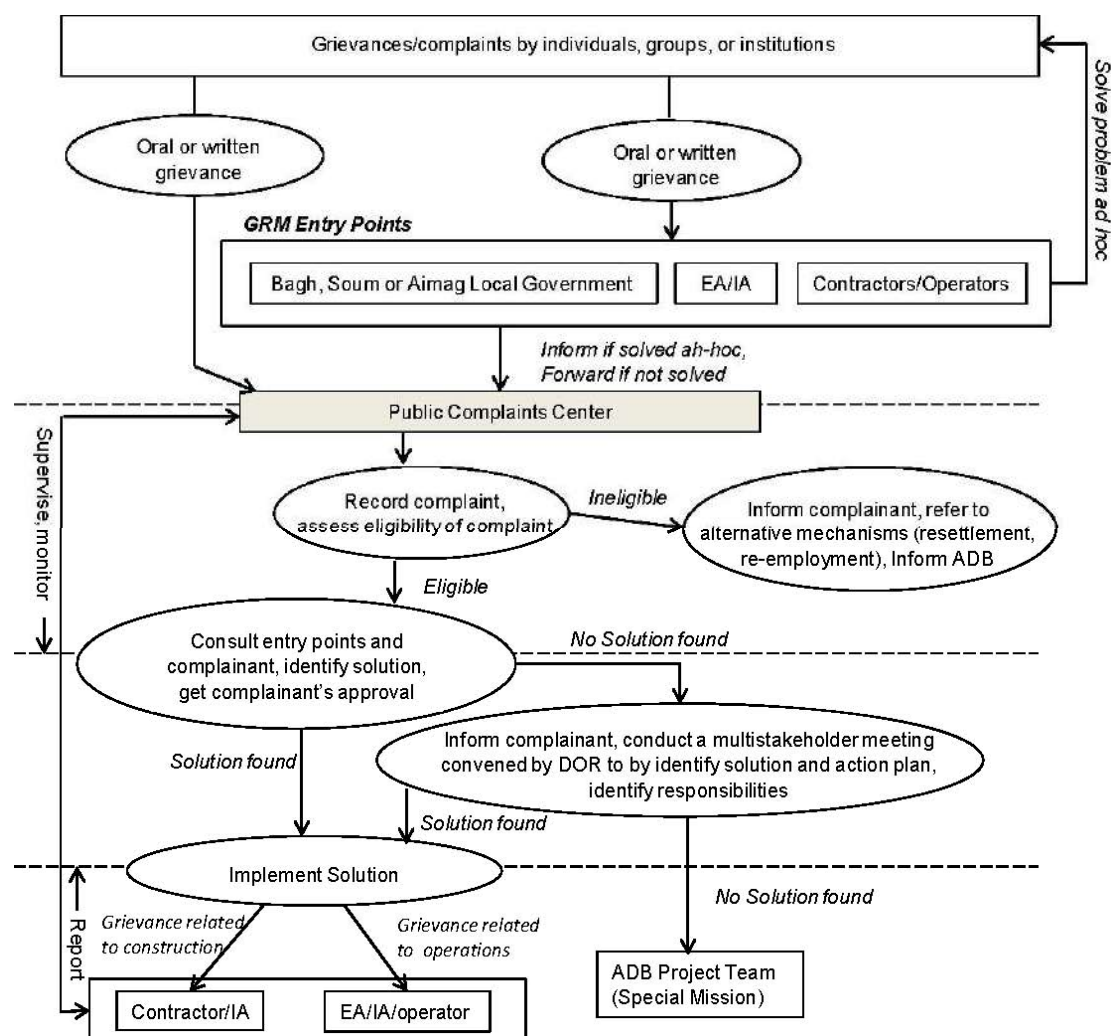
### 5.1. GRM STRUCTURE

There are 3 main GRM entry points: local administration, EA and the contractors. The contractors' environmental staffs and Chinese-Mongolian translators are designated to take responsibility to receive and record complaints from local residents and pass it to managers and EA. The PIU environmental monitoring consultant has developed a good relationship with each soum and bag governors and organize monthly meetings with them to discuss complaints raised by local residents.

Aslo, the PIU hired community outreach monitoring officers (COMO) at each lot to implement GRM measures: Ulzii Orshikh at CW1-1, Kharul Majat at CW1-3 and Khishigtogtoh at CW1-2.

**Table 32. Community Outreach Monitoring Officers**

Name of COMO officer	Construction package	Contact phone
Ms. Hishigtogtoh	CW 1-2	88750511
Mr. Ulzii-Orshih	CW 1-1	95502499
Mr. Khairolmajat	CW 1-3	99165438

**Figure 29. GRM scheme for the Project.**



## 5.2. COMMUNITY CONSULTATION ACTIVITIES IN 2017

### Lot CW1-2:

PIU Community outreach monitoring officer Ms. Khishigtogtokh starts her work from May, 2017. She organizes monthly meetings with local soum administration and local residents and visit herder households for interview about the project and collect their opinion on the construction works.

COMO Ms. Khishigtogtokh visited 180 households of Buyant and Khovd soums during 2017. During the meetings with local households, she provided information on road construction progress, contractors and their staffs, number of equipment mobilized and environmental management actions.

*Figure 30. COMO Khishigtogtokh visits a herder household in Buyant soum. July, 2017.*



Ms. Khishigtogtokh organized a group discussion with local residents in Buyant soum twice in 2017. On June 06, 2017, 35 local residents attended a meeting which provided presentations on prevention measures from infectious diseases. September group discussion was focused on introducing prevention measures for drug use and 22 people attended. Also, in both meetings, the participants were provided with information on road construction progress, contractors and their

staffs, number of equipment mobilized and environmental management actions. There were no any negative opinions and complaints.

***Figure 31. Group discussion meeting at Buyant soum June 2017.***



**Lot CW1-1:**

PIU Community outreach monitoring officer Mr. Ulzii-Orshikh starts his work from May 2017. He organizes monthly meetings with local soum administration and local residents and visit herder households for interview about the project and collect their opinion on the construction works.

He visited 100 local households of Shurga and Hongio bags of Erdeneburen soum in 2017 to present information on road construction progress, contractors and their staffs, number of equipment mobilized and environmental management actions. Also, he visited local festival in Erdeneburen soum on June 04, 2017 to make presentation on construction progress and environmental protection activities of the project towards local people.

During the meetings, local residents expressed their pleasure toward the road development project and think the sealed road will help to enhance their livelihood.

There were one complaint recorded during the reporting period in Erdeneburen soum. Some local people were concerned about rehabilitation works. The contractor staffs provided construction progress information to them and rehabilitation of the borrow pits already started.

***Figure 32. COMO Ulzii-Orshikh visits a local herder household for interview, August 2017.***



### **CW1-3:**

PIU Community outreach monitoring officers at CW1-3 Mr. Khairolmajat started his work from May, 2017. They organize monthly meetings with local soum administration and local residents and visit herder households for interview about the project and collect their opinion on the construction works.

He visited 230 local households of Tolbo soum during 2017 and met with local soum and bag governors to collect their opinion and present information on road construction progress,

contractors and their staffs, number of equipment mobilized and environmental management actions.

***Figure 33. COMO Khairolmajat visits a local herder household for interview, September, 2017.***



Local kazakh people of Tolbo soum are supportive of the road development project. They think the local economy, business and trade turnover will boost thanks to the sealed road. There were no complaints recorded during the reporting period.

## **6.CONCLUSION**

### **6.1. SUMMARY OF ENVIRONMENTAL WORKS**

The contractors started implementation of the updated EMP requirements from May when the construction activities started. On-site environmental staffs and construction engineers were trained on the EMP implementation. Each construction package employed on-site environmental and safety staffs and hire local professionals laboratories to carry out field monitoring activities (sampling, measurements and lab test).



The construction works were commenced in May for the lot CW1-2 and in June for the lots CW1-1 and CW1-3. In general, the environmental protection measures specified in the EMP were implemented properly, except for the need of improvement at workers' camps. Most of the environmental management activities yielded good results. The key environmental issue during the 2017 construction season was that dust level has not been reduced to the standard level, despite efforts by the contractors and an enormous amount of water sprayed along the deviation roads and construction sites.

Overall, the Project has demonstrated a satisfactory level of environmental due diligence in 2017.

### **6.2. IMPORTANT POINTS FOR THE NEXT CONSTRUCTION SEASON:**

#### **Environmental monitoring budget**

In accordance with the Environmental Management Plan updated and approved by the Ministry of Environment and Tourism in November, 2016, the total environmental monitoring budget for the lots CW1-1, CW1-2 and CW1-3 is 158 million MNT for the whole duration of the construction works between 2016-2018, which equals to 79,000 USD with November 2016 exchange rate and 64,500 USD with the current exchange rate. The contractors have been fulfilling their environmental responsibilities by carrying out monthly environmental monitoring in accordance with the updated EMP.

However, the environmental monitoring budget specified on their civil works contract is only 4500 USD for CW1-1 and CW1-3 respectively and 12,000 USD for CW1-2 that are not sufficient enough to cover the environmental monitoring works for the whole duration of the construction works between 2016-2018.

Thus, ADB and PIU needs to discuss this issue and provide solution.

#### **Lot CW1-1:**

1. Execute technical rehabilitation works at the borrow pits where the exploitation works are over. Strictly comply to Mongolian National Standard on rehabilitation and ensure the slope degrees are less than 30 at the rehabilitated borrow pits.
2. Create livestock crossings at 15 points that are recommended by Erdeneburen soum governor.



3. Create wildlife crossings at STA.6+508, STA.7+956 and STA.13+496 in accordance with the Mongolian standard MNS6515: 2015.

**Lot CW1-2:**

1. Create livestock crossings at the locations proposed by Buyant and Khovd soum administrations.
2. Execute technical rehabilitation works at the borrow pits where the exploitation works are over. Strictly comply to Mongolian National Standard on rehabilitation and ensure the slope degrees are less than 30 at the rehabilitated borrow pits.
3. Pay special attention to reducing dust emission at the quarry site by conducting site cleaning, landfilling.

**Lot CW1-3:**

- ❖ Identify location of livestock crossings through consultation with Tolbo soum administration.
- ❖ The contractor will continue its monthly monitoring activities to ensure the impacts are within control.
- ❖ Create wildlife crossing at STA.85+040 in accordance with the Mongolian standard MNS6515:2015.

## APPENDIX A.

**Table 33: Compliance Checklist for Environmental Protection Measures**

No	Place	Concern issue	Recommended measures	Implementation status
1	Road Construction site	Use of Safety tools (goggles, gloves, dress, helmet, shoes, etc. by the Construction workers/ engineers.	Availability of safety tools at the camp and at the construction site.	Implemented
		Temporary Sign and Signals for construction works	Important signals like Line marker post, STA. post, Aerial markers, Intermediate aerial markers, Warning signs and Identification signs etc. should be made available along the road.	Implemented
2.	Construction camp	Water supply	<ul style="list-style-type: none"> <li>• Arrangement for elevated service reservoir / tank.</li> <li>• Availability of taps in bathroom, toilet, kitchen and dining space</li> <li>• Ensure drinking water quality through tests as per Mongolian standards</li> </ul>	Implemented
		Sanitation	<ul style="list-style-type: none"> <li>• Provision of water closet and flushing system in toilet and bathroom</li> <li>• Effluent transportation arrangement into septic tank for treatment and disposal through soak pits.</li> </ul>	Implemented Implemented
		Kitchen and dining environment.	Provision of adequate ventilation, fixing of hand basins and cleanliness	Implemented

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		Drainage at the camp	Provision of storm water drainage to nearby drain/stream outside the camp area.	Implemented
			Avoid stagnation of water inside the camp.	Implemented
		Solid waste	Placement of waste collection bins (one for two rooms), and Immediate modernization of waste disposal dig with cover and proper handling at the camp.	Implemented
		First aid facilities,	Physician available at camp site	Implemented
		Workshop	<ul style="list-style-type: none"> <li>Structure modification with raised impervious platform and shed/roof.</li> <li>Collection of drips on tray and storing in drum for re-use or safe disposal</li> <li>Soaking arrangement with dry sands in case of accidental spillage and disposal in deep pit away from water body</li> </ul>	Implemented.  N/a  N/a
		Stock pile	Maintenance of stockpile height at a maximum of 4 meter	Implemented
3.	Quarry/Borrow pits.	<ul style="list-style-type: none"> <li>Material collection</li> <li>Compliance with Environmental Law, 2012.</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of a plan for required and available quantity supported by survey data and profiling of the river at the material collection point</li> <li>Collect permission from local authority.</li> </ul>	Implemented          Implemented
4.	Unplanned Hill cutting,	Unplanned hill cutting and disposal of spoil earth and debris materials will lead to erosion of the hill and will deposit the	<ul style="list-style-type: none"> <li>Maintain necessary slope to the hill cutting area and staged disposal of spoil earth from hill cutting with adequate</li> <li>compaction and erosion protection measures to prevent all kinds of soil movement on the constructed road,</li> </ul>	Implemented

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No	Place	Concern issue	Recommended measures	Implementation status
		eroded soil on the road site.	valleys, agricultural lands, and river/stream courses.	
5.	Crusher Plant at site.	Dust pollution at the site resulting different diseases of the residence of the camp	<ul style="list-style-type: none"> <li>Regular spray water at the dust area and the entire internal road, inside the camps.</li> <li>Arrangement for water sprinkler throughout the crushing time, wearing of masks, goggles, etc., and regular health checking of the crusher equipment operators/workers at the site.</li> </ul>	<p>Implemented</p> <p>Implemented</p>
6.	Camp, Offices	Firefighting equipment should be placed at the camp and office	Immediate placement of firefighting equipment so that it can visible and in case of any emergency, it can be utilized.	Implemented
7.	Transport and equipment movement at the camp.	Excessive dust polluting surrounding environment of the camp and sound pollution due to transport movement in the camp.	Equipment meeting environmental standard in respect of sound should be used in the camp and construction area.	Implemented
8.	Tree plantation at the road, camp and at the offices.	For the better environment it is required to plant tree along the roadside, camp, offices etc.	Tree plantation along the road, at the camp and at the offices should be implemented immediately	N/a
9.	Storage and use of chemicals, fuel and lubricant at the camp and at the offices.	Soil pollution for spilled out from the vehicles, bituminous drum etc. at the camp and at the offices.	Strict chemical and solid waste handling and storage practices should be followed.	Implemented
10.	Construction workers related Impact at the camp and at the construction sites.	<ul style="list-style-type: none"> <li>Unhygienic and littered environment around the camp,</li> <li>Exposure to hazards, transmission of diseases among workers, water-sites.</li> </ul>	The local workers should be oriented to hygienic disposal of solid waste, hazardous materials, and proper handling methods. And also should be provided regular health inspections and vaccination among the workers.	Implemented

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No	Place	Concern issue	Recommended measures	Implementation status
		borne diseases to workers.		
11.	Traffic Signal	Without traffic signal accident may be happened	Signal Man should be provided at the construction site.	Implemented
12.	Accommodation in the camp	According to size of the room accommodation of the workers should be provided.	Accommodation of the workers should have enough space and should be cleaned everyday.	Implemented
13.	Environmental officer	In absence of environmental officer contractors activities will may not going on as environment friendly.	Immediate placement of environmental officer.	Implemented