

GOVERNMENT OF MIZORAM

PUBLIC WORKS DEPARTMENT

**WIDENING TO 2-LANE, RE-ALIGNMENT
AND GEOMETRIC IMPROVEMENT OF
TLABUNG - KAWRPUICHHUAH ROAD
(75.380 KM to 87.351 KM) WITHIN
MIZORAM STATE ROADS II PROJECT**

ENVIRONMENTAL MANAGEMENT PLAN

September 2015

Submitted by



STUP Consultants Pvt. Ltd

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Section 1 - INTRODUCTION

1.1 Environmental Management Plan for Tlabung-Kawrpuchuah Road Upgrading

Based on the findings of the EIA, the Environmental Management Plan (EMP) consists of the set of mitigation, monitoring and institutional measures to be taken during the design, construction and operation stages of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The plan also includes the actions needed for the implementation of these measures. The main objective of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced.

The objectives of the EMP at various stages of the project planning and implementation are as follows:

Design stage

- To have minimum impact on road side trees, forestation and ground cover
- To keep land acquisition and building demolition at a minimum
- To provide maximum safety to the highway users and road side communities as well as segregation of local and slow moving traffic in the congested areas
- To develop a design that incorporates environmental safeguards and
- To provide mitigation measures to all expected environmental degradation

Construction stage

- To prevent and reduce the negative environmental impacts of the project by implementing mitigation measures, to be carried out by the Contractor.
- To ensure that the provisions of the EMP are strictly followed and implemented by strengthening implementation arrangements.

Operation stage

- To prevent deterioration of environment components of air, water, soil, noise etc.
- To improve the safety of the highway users and road side communities

1.2 Component and structure of EMP

The EMP consist of the following components: monitoring during project implementation and operation, institutional capacity building and training, mitigation

of potentially adverse impact, environmental cost estimates, and integration of EMP with project planning, design, construction and operation

Commitment

The following commitments are important to effectively implement the EMP and have been adopted to address the various objectives of the EMP.

Commitment to address environmental health, safety and social impacts

To improve the environmental conditions, including areas such as environmental health, safety and social impacts, measures have been suggested and included as part of the EMP. Such measures will be continuously developed as an interactive process.

Commitment for constant dialogue with the public and interested stakeholders

The community consultation process was carried out right from the inception stage of the project. Continuous dialogue with local inhabitants and stakeholders including public agencies has been established on various environmental issues to obtain their feedback. Consultation would continue throughout the implementation Stage of the project.

Commitment related to training

For the effective implementation of the EMP measures proposed, sustainable institutional arrangements have been proposed. To educate and train the PIU, the personnel of the Construction Supervision Consultants and the Contractors, an extensive training schedule has been worked out as part of the EMP. The training program will be implemented as per the schedule proposed.

Commitment to meet legal requirements

The legal requirements, procedures, etc., that are necessary or mandatory for the commencement of the project have been met. The conditions stipulated by the various Statutory Authorities as the State Pollution Control Boards, Forest Departments etc. will be complied with.

Structure of EMP report

The EMP report is meant to be read in conjunction with the full EIA report, which provides background on the project, detailed project description, assessment of

impacts and explanation of management measures, and useful / relevant maps and other figures.

The EMP is hence organized in the following chapters -

Section 1: Introduction

Section 2 Environment Management Plan

Section-3 Reporting System

Section 4 – Institutional arrangement

Section 5 Training

Section 6 Environmental Monitoring Plan

Section 7 Environmental budget and

1.3 Proponent and EIA Consultant

Public Works Department (PWD) of the Government of Mizoram is the proponent of the L-T-K Road. The Project Implementation Unit (PIU) within the PWD will be the implementing agency for the MRSP II including L-T-K Road. The PIU is located in the capital of Mizoram State, Aizawl. The detailed address of the proponent is given below.

Project Director, Project Implementation Unit, Chief
Engineer Road's Office, Tuikhuah Tlang
Mizoram:Aizawl Tel: 0389 -2324001;Fax: 0389-
2321524
e- mail: piupwd@gmail.com, piupwd@yahoo.com

EIA Consultant

STUP Consultants Pvt. Ltd is assigned as a consultant by PWD to carry out the EIA study as per the requirements of the World Bank Policies and Government of India requirements. The address of the consulting firm is:

STUP Consultants Pvt. Ltd
P-11, Darga road, Park Circus, Kolkotta700017
Tel.- 033 – 40109797, 2280 7430, 22807431
E-mail: kolkata@stupmail.com

Section 2 : ENVIRONMENTAL MANAGEMENT PLAN

2.1 Major findings of the Environmental Assessment

The major findings of the EIA are presented in the following sections:

Stability of Slopes

Widening of up-gradation corridor is being carried out by cutting the hillside for a major length of the project route. Stability of the cut slopes is an issue of concern given the immature geology of the project area. 40 vulnerable locations with respect to landslides and potential for severe erosion are identified where adequate protection measures are worked out.

Disposal of construction debris

The cutting activities shall generate an earthwork of 8.47 million cu.m. The disposal of which is an issue of concern. Earth generated from cutting will be utilized as construction fill material and also for building road sub grade. Remaining debris needs to be disposed at dumping locations.

Impact on forests and bio-diversity:

The roadside slope all along the up-gradation route supports a variety of flora species including ferns, orchids, bryophytes etc. Nearby streams and rivers also contain a high degree of biodiversity. The proposed road upgrading may affect such areas due to construction activities if adequate precautionary measures are not taken up. Movement of machinery can also destroy the rare and endangered plant species at the very edge of the road on the valley side and medicinal plants near the road corridor. Some direct loss of trees and forest resources will also result from the project, as well as loss of topsoil from hill cutting and earth works. During construction, the poaching by laborers can pose a significant threat to the faunal community.

In addition, during operations phase there may be cumulative and induced impacts to biodiversity and forests resulting from the increased market access to the region, influx of people, changes to agricultural practices and land uses, etc. which may result, especially when the network of planned trade corridors (of which the proposed road is a part) is completed.

Impact on sensitive surface Water sources

The corridor passes close to couple of marshy lands that would be impacted due to the proposed widening activities during construction and operation stages. Disposal of debris during construction stage and contamination by road run-off during operation stage onto these sensitive water resources are significant negative impacts that need to be addressed.

In addition, several streams from the hillside, form beautiful waterfalls along the corridor. Cutting of the hill face at these waterfalls will disturb the drainage of these streams and also destroy their visual appeal and deny access to the local people who tap these streams at present.

Resettlement and loss of livelihood

Affected families are being displaced due to the proposed works. Though the magnitude of resettlement is not very high in terms of the families to be displaced, the project needs to address the R&R and loss of livelihood issues, as the entire affected population is tribal.

Health and safety risks

Project construction will pose traffic safety risks to road users and local communities, which need to be proactively managed. Worker safety is also an important concern throughout construction stage. In addition, poor environmental management of worker camps and their effluents can pose health risks to workers and communities. During the operations phase, the increased speed of traffic may pose safety risks to pedestrians and community members in areas where homes and other properties are close to the road. The cumulative increased traffic on the road, particularly of trucks and other through-traffic (once the full trade corridor is developed connecting onwards to Lunglei, and into Bangladesh), has the potential to also pose health risks to local communities such as increased HIV/AIDS.

2.2 Environmental Management Measures proposed

A description of the various management measures during the various stages of the project is provided in the following sections.

Pre-construction Stage

During the pre-construction stage, the management measures required will include the clearance of the ROW, plantation of trees, the measures for protecting/replacing community resources such as hand pumps and other utilities likely to be impacted. Their enhancement shall also be completed before construction actually starts so that the community can start using these while the construction activity begins

During the pre-construction stage, management measures required will be implementation by PWD of R&IPDP which includes acquisition and relocation of structures, utility relocation, relocation of cultural properties, removal and replacement of common property resources as washing platforms, relocation of water harvesting structures and pig sty. Identification of trees likely to be cut with joint verification of MPWD and Forest Department shall be taken up.

Contractor Mobilisation and Site Clearance

Activities during this stage involves: clearance of vegetation; setting up of construction camps with all environmental safeguards including sanitary provisions; setting up of hotmix plants; identification of dumping sites as per guidelines provided for the same; provision of alternate routes for the villages whose existing access routes will be disturbed in the construction stage. Construction of water harvesting structures as an alternate source of water for construction shall also be completed in this stage.

Construction Stage

This will be the most crucial and active stage for the Environmental Management Plan. This stage would involve handling huge quantities of earthwork from the proposed cutting on the hillside for the accommodation of the proposed cross-section. Construction activities shall be effectively monitored to ensure that the environment is not impacted beyond permissible limits. Enhancement of waterfall locations, mitigation measures suggested for conservation of critical biodiversity locations and for sensitive water resources will go on simultaneously as the construction progresses.

To facilitate implementation of the enhancement and mitigation measures suggested, working drawings and specifications of the same (as appropriate) have been provided in the Appendices.

In addition, the need for the balanced evaluation and planning for risks associated with construction activities related to roads such as accidental spillage and consequent damage to the surrounding environment in terms of loss of flora and fauna, agricultural crop or fertile land, continues to grow importance. Other possible locations of concerns include the locations of hot-mix plants (spillage of fuel, bitumen etc.) and labour-camp sites.

Operation Stage

Operation stage will essentially entail monitoring activity along the corridor, for various indicators to evaluate the performance of mitigation measures suggested in the project. Monitoring of the indicators specified in the monitoring plan will serve the two purposes.

To check the efficacy of the protection/mitigation/enhancement measures implemented, and to help verify or refute the predictions made as a part of the impact assessment.

The operation stage will essentially entail monitoring activity along the corridor. The monitoring for pollutants specified in the monitoring plan will serve the two purposes. In addition to checking the efficacy of the protection/ mitigation/ enhancement measures implemented, this will help verify or refuse the predictions made as a part of the impact assessment. Thus, it will complete a very important feedback loop for the PWD.

Measures adopted and/or to be adopted during the different stages of the project have been detailed in Table-2.1.

The responsibility for implementation and supervision of EMP is vested with three entities, namely Contractors, PWD-PIU (who may in turn assign some tasks to NGOs), and Supervision consultants. The Contractors herein mean the entities hired for execution of the construction works for the respective contract packages. PWD PIU would be implementation agency.

Table-2.1: Environmental Management Plan

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
P-1 : Pre-construction Stage						
P.1.1 Implementation of R&IPDP	All requirements of the R&IPDP shall be complete before start of construction stage. The activities broadly include acquisition of structures, cultural properties relocation of utilities, common property resources and relocation of domestic water drums and pig sty and hand pumps		Refer Annexure -3 of this report	Before construction starts	NGOs, Collaborating Agencies, SLAO, MPWD, Grievance Redressal Cells (GRC), Village Level Committee (DLC) District Revenue authorities	MPWD
P.1.2	The construction-stage grievance redressal mechanism shall be established and clearly communicated to all local communities, road users and other potentially affected stakeholders.		Refer to annexure 14 of this report.	Before construction starts	MPWD	MPWD
M-1 : Contractor Mobilization & Site Clearance						
M.1.1 Removal of Vegetation	Vegetation will be removed from the Corridor of Impact, and disposed in an appropriate manner as approved by the Engineer, before the commencement of Construction.		Corridor of Impact.	Before Construction starts.	Contractor	Engineer ⁵ , MPWD

¹ Some of the mitigation measures are preventive in nature while some others include additional measures in terms of environmental conservation and involve physical and construction work.

² The contract requirements refer to the following:

Ministry of Surface Transport, Roads Wing (MoST), Government of India. Specifications for Road and Bridge Works (Third Revision, 1995. Reprinted, 1998). Specific and general conditions of the contract.

³ Unless otherwise stated, the Project Site covers area beyond the Corridor of Impact and/or the RoW, such as borrow areas, access roads, service roads and equipment storage sites (MoST: 306.3).

⁴ Time frame refers to the duration or instant of time when the mitigation measures will be taken.

* Refer EIA Report of the project for required details on the various mitigation/management measures proposed.

⁵ Engineer means – Construction supervision consultant (CSC)

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
M.1.2 Setting up of construction camps	<p>Construction labourers' camps shall be located at least 500m away from the nearest habitation and 200m away from plantations as given in Annexure -I. No construction camp will be located within 500m on either side of the realignment.</p> <p>The Contractor during the progress of work will provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labour to standards and scales approved by the resident Engineer.</p> <p>There shall be provided within the precincts of every workplace, latrines and urinals in an accessible place, and the accommodation, separately for men and women, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996.</p> <p>Sewage system (including septic tones & soak-pits) for a construction labourer's camp shall be designed, built and operated so that no pollution to ground or adjacent water bodies/ watercourses takes place. Compliance with the relevant legislation shall be strictly adhered to. Garbage bins shall be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner, to the satisfaction of the relevant norms and the Engineer.</p> <p>In connection with underground water resources, including percolating water, the contractor shall take all necessary precaution to prevent interference with such water resources.</p> <p>All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 shall be adhered to.</p>	<p>MoST: 111.14</p> <p>MoST: 111.1</p>	<p>All areas in immediate vicinity of construction campsite chosen by the contractor and approved by the engineer.</p> <p>For suggested location refer table 2.1 of chapter 2 of this report</p>	<p>During Establishment, Operation and Dismantling of Such Camps.</p>	<p>Contractor.</p>	<p>Engineer, MPWD.</p>
M.1.3. Setting up	Hot mix plants and batching plants shall be located	MoST: 111.5	All Hot-mix and	During Erection,	Contractor.	Engineer,

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
of Hot mix plants	sufficiently away from habitation, agricultural operations or industrial establishments. Where possible such plants will be located at least 1000m away from the nearest habitation. Avoid those areas which have habitation within in 1000m of the dominant downwind direction.		Batching Plants.	Testing, Operation and Dismantling of Such Plants.		MPWD
M.1.4 identification of dumping sites	Location of dumping sites shall be finalized based on the guidelines given in Annexure – 3 and 4 of EMF and Annexure 4 of this report and the Engineer shall certify that these are not located within designated forest areas. (b) The dumping does not impact natural drainage courses (c) No endangered/rare flora is impacted by such dumping. (d) Settlements are located at least 0.8km away from the site. (e) identified Locations given in Annexure – 5.		Throughout the corridor	During mobilization	Contractor	Engineer, MPWD
M.1.5 Identification of landslide locations	The contractor shall identify locations sensitive to landslides in addition to those provided in Annexure – 2.1 of this report and shall duly report these to the Supervision Consultant (SC) and to MPWD.	MoST: 306.3	Throughout the corridor	During mobilization	Contractor	Engineer, MPWD
C-1: Construction Stage						
C.1.1 Land Slides	Slope of the hill side cut shall as per guideline in those suggested in Annexure – 2.1 All areas of cutting shall be covered with vegetation Bioengineering techniques as appropriate shall be undertaken at all vulnerable locations.(refer annexure-13) A combination of bio-engineering techniques and hard engineering solutions shall be as toe walls, breast walls, rock bolting, and provision of band drains, gabion at locations vulnerable to landslides shall be provided, based on the suitability at site, as decided by the geotechnical expert of the engineer.	MoST: 306.3	High hill cutting locations	During cutting, blasting pre-splitting operations	Contractor	Engineer
C.1.2 Generation	Debris generated due to the dismantling of the existing	MoST:112.6	Throughout Project	During	Contractor	Engineer,

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
of Debris	pavement structure and the cutting of the hillside for the widening shall be suitably reused in the proposed construction, such as: As fill materials, for embankments For construction of retaining walls, For filling pedestrian foot-path in settlement area, creating parking spaces, etc. The sub grade of the existing pavement shall be used as embankment fill material.	MoST: 112.2	Corridor.	Construction		MPWD.
C.1.3 Disposal of Debris	The disposal of debris shall be carried out only at sites identified for the purpose. The contractor shall carry out the disposal as described in Annexure – 4 and 5 of this report. All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the Engineer.		Sites identified by the contractor and approved by the engineer. Refer annexure 4 and 5	During Construction	Contractor, Engineer	Engineer, MPWD
C.1.4 Compaction of Soil	Construction vehicle, machinery and equipment shall move or be stationed in the RoW. While operating on temporarily acquired agricultural land for any construction activities, top soil will be preserved in stockpiles.	MoST: 112.6	Throughout Project Corridor and all areas temporarily acquired.	During Construction.	Contractor.	Engineer, MPWD.
C.1.5 Soil Erosion	On road embankment slopes, slopes of all cut, fill etc., shrubs and grass will be planted. On sections with high filling and deep cutting the side slopes will be graded and covered with bushes and grass, etc., adopting suitable bioengineering techniques. The suitability to be decided by the Engineer at site. Along sections abutting water bodies stone pitching needs to be carried out for slopes between 1 vertical: 4 horizontal to 1 vertical to 2 horizontal. At the outfall of each culvert, erosion prevention measure, such as the following, will be undertaken, as provided in the	MoST: 305.2.2.2 MoST: 306.2	Throughout Project Corridor, Service roads and equipment storage sites, etc. List of cross drains is provided as Annexure 2.2 and 2.3	During Construction.	Contractor.	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>design:</p> <ol style="list-style-type: none"> 1. Grass scales 2. Rock riprap 3. Rock mattresses 4. Cut off wall 5. Downstream silt screens/walls <p>The work shall consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution, through use of berms, dikes, sediment basins, fiber mats, mulches, grasses, slope drains and other devices. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work.</p>					
C.1.6 Contamination of Soil and water bodies by Fuel and Lubricants	<p>Vehicle/machinery and equipment operation, maintenance and refueling shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. An “oil interceptor” will be provided for wash down and refueling areas. (Refer Annexure –7)</p> <p>Fuel storage shall be in proper bunded areas. All spills and collected petroleum products shall be disposed off in accordance with MoEF and MPCB guidelines at designated locations.</p> <p>Fuel storage and refilling areas shall be located at least 300m from all cross drainage structures and important water bodies or as directed by the Engineer.</p>		At fuel storage areas – usually at construction camps, temporarily acquired site.	During Construction.	Contractor.	Engineer, MPWD.
C.1.7 Quarry Operations	The Contractor shall obtain materials from quarries only after consent of the DoE or other concerned authorities and only after development of a comprehensive quarry ⁷ redevelopment plan. Alternatively the Contractor shall	MoST: 111.3	List of quarries along the project corridors is given in Annexure 8	During licensing and during operation of the quarries for the	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>acquire the required material from quarries licensed by the SPCB and having NoC from mining and geology department of Mizoram or licensed as per the gazette notification, 2000 and regulations of the concerned State Government Departments. New quarry, if needed during construction, can only be opened with prior approval of quarry management plan by the Engineer and MPWD as well as by State Pollution control Board.</p> <p>For existing quarries, an environmental due diligence report must be submitted for the prior approval of the PWD and engineer before materials sourcing begins, and shall ensure quarries and transportation of materials are in compliance with environmental requirements from relevant ministries. This due diligence report shall include verifying the existence of environmental management plans, proper permitting and compliance with all applicable environmental, health and safety requirements of relevant ministries. Beds or banks of rivers/rivulets will not be used for quarrying.</p> <p>Redevelopment plans for quarry areas from which material is extracted and have exhausted in the construction period, shall be developed by the contractor in coordination with PWD, and implemented in co-ordination with the Mining & Geology Department, Mizoram and the Forest Department, Mizoram.</p>			project		
C.1.8 Use of Crusher Dust	Crusher dust shall be used in the project instead of sand wherever possible. The contractor shall obtain requisite permission from the Engineer, if crusher dust is not adequate and sand is to be hauled for construction, indicating the source.		Throughout the project corridor	During construction	Contractor	Engineer, MPWD
C.1.9 Loss of Water Bodies	Construction of a series of pipe culverts shall be undertaken to enable unhindered cross-flow and maintain the level of water in the swampy area. Construction at the ponds shall be carried out during non-monsoon months only. Construction work shall be restricted to 3m – 4m width from the existing			During construction	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	formation near ponds/swamps. The workers shall be instructed not to venture into or poach for wildlife within the swamp. The volume of water storage lost shall be compensated for by excavation of an equal volume of similar depth at closest possible location in the direction of flow and shall be done with the approval of the engineer.	MoST: 305.4.1	All ponds along the corridor	Whenever encountered during construction		
C.1.10 Loss of other Water Sources	Any source of water (potable or otherwise) for the community such as water tanks along the water streams for community uses etc., incidentally lost shall be replaced immediately. The location and siting of the replaced source of water shall be in consultation with the local user population. Generally, the source of water supply will be moved away from the road and within the settlement area. The replacement shall be ready prior to demolition/dismantling of the existing source. This sub-clause covers the identified sources of water in the pre-construction stage.	MoST: 110.3 MoST 301.5	Throughout Project Corridor,	Whenever encountered during construction	Contractor	Engineer, MPWD.
C.1.11 Flooding	In addition to the design requirements for control of flooding, the contractor shall take all desired measures as directed by the Engineer such measures to prevent temporary or permanent flooding of the site or any adjacent area. The scope for prevention of flooding includes prevention of loss of use, loss of access of any land or property thereon resulting from flowing or stagnant water as direct/ indirect impact of construction.	MoST: 305.3.2	List of water body / streams / waterfall locations given in Annexure -9 Throughout project corridor, all access roads, temporarily acquired sites.	During Construction and the Defects Liability Period.	Contractor.	Engineer, MPWD.
C.1.12 Siltation into Water Bodies	Silt fencing will be provided at the base of the embankment for the perimeter of water bodies abutting the road. Silt fencing shall be as per the technical specifications given in Section 1.12. Siltation of soil into the water bodies will be prevented as	MoST: 306	Throughout Project Corridor, all access roads, temporarily acquired sites.	During Construction.	Contractor.	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	far as possible. Construction materials containing fine particles shall be stored in an enclosure such that sediment-laden water does not drain into nearby watercourses. All discharge standards promulgated under Environmental Protection Act, 1986, shall be adhered to. All waste generated from the site shall be disposed off as acceptable to the Engineer and MPWD.	MoST: 306				
C.1.13 Alteration of Drainage	In sections along water courses, and close to cross-drainage channels, earth, stone or any other construction materials or appendage shall be disposed off so as not to block the flow of water. All necessary measures shall be taken to prevent earthwork, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at rivers, streams, water canals and existing irrigation and drainage systems.	MoST: 305.3.7 MoST: 306	Throughout Project Corridor, all access roads, temporarily acquired sites.	During Construction.	Contractor.	Engineer, MPWD.
C.1.14 Sanitation and waste disposal and restriction of odour from construction camps	Unless otherwise arranged by the local sanitation authority, arrangements for proper disposal of excreta by Composting at the workplace suitably approved by the local medical health or municipal authorities or as per directed by Engineer, shall be made.	MoST: 111.14 MoST: 111.1	All areas in immediate vicinity of construction campsite chosen by the contractor.	During Establishment, Operation and Dismantling of Such Camps.	Contractor.	Engineer, MPWD.
C.1.15 Use of Water by contractor	The Contractor shall arrange for supply and storage of water and no such supply and storage will be provided by the MPWD. The Contractor shall not open a new bore well or extract groundwater without permission from the Ground Water Board. The contractor will minimize wastage of water in the construction process/operations. The contractor will arrange for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected wherever		Throughout Project Corridor	During Construction.	Contractor.	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	possible.					
C.1.16 Harvesting of Water for Construction	Water harvesting structures will be constructed as per the typical designs. Drawing provided in the EMP. Selection of the typology applicable will be decided by the Engineer with inputs from the MPWD. Additional guidance on water harvesting structures is outlined in Annexure 10. Such storage of water will be deemed incidental to the work. The contractor will be responsible for the maintenance of water quality in such storage.	As per Annexure - 10	Throughout Project Corridor	Before start of construction and before monsoon	Contractor	Engineer, MPWD
C.1.17 Disruption to other Users of Water	While working across or close to rivers or streams, the Contractor shall not prevent the flow of water. If for any cross-drainage work, closure of flow is required, the Contractor shall seek approval of the Engineer. The Engineer will have the right to ask the Contractor to serve notice on the downstream users of water sufficiently in advance. Construction over and close to the non-perennial streams shall be undertaken in the dry session. Construction work expected to disrupt users and impacting community water bodies will be taken up only after serving notice on the local community. Where required, contractor will obtain permission of the Department of Irrigation prior to initiating works that may disrupt or affect streams or other waterways used for irrigation. The Contractor may use the natural sources of water subject to the provision that any claim arising out of conflicts with other users of the said natural source shall be dealt with		Throughout Project Corridor, all access roads, sites temporarily acquired and as well as the immediate surroundings of these areas.	During Construction	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	entirely by the contractor.					
C.1.18 Generation of Dust	<p>All vehicles delivering materials to the site shall be covered to avoid spillage of materials.</p> <p>The Contractor shall take every precaution to reduce the level of dust emission from the hot mix plants and the batching plants up to the satisfaction of the Engineer.</p> <p>All existing highways and roads used by vehicles of the contractor, or any of his sub-contractor or suppliers of materials or plant and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. Clearance shall be affected immediately by manual sweeping and removal of debris, or, if so directed by the Engineer, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed completely. Additionally, if so directed by the Engineer, the road surfaces shall be hosed or watered using necessary equipment.</p> <p>Plants, machinery and equipment shall be so handled (including dismantling) as to minimise generation of dust.</p>	<p>MoST: 111.9</p> <p>MoST: 111.5</p> <p>MoST: 111.9</p> <p>MoST: 111.10</p> <p>MoST: 118.1</p>	Throughout Project Corridor, all access roads, temporarily acquired sites.	During Construction	Contractor	Engineer, MPWD.
C.1.19 Emission from Hot-Mix Plants and Batching Plants	<p>Hot mix plants and batching plants shall be located sufficiently away from habitation, agricultural operations or industrial establishments. Where possible such plants will be located at least 1000m away from the nearest habitation.</p> <p>The exhaust gases shall comply with the requirements of the relevant current emission control legislation. All operations at plants shall be undertaken in accordance with all current rules and regulations protecting the environment.</p>	<p>MoST: 111.5</p> <p>MoST: 111.5</p>	All Hot-mix and Batching Plants.	During Erection, Testing, Operation and Dismantling of Such Plants.	Contractor.	Engineer, MPWD.
C.1.20 Emission from Construction Vehicles,	The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall conform to the relevant Bureau of Indian		Throughout Project Corridor, all access roads, sites temporarily acquired	During Construction.	Contractor.	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
Equipment and Machinery	Standard (BIS) norms. All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of MPCB and the Engineer.		and all borrow areas.			
C.1.21 Pollution from Crusher	All crushers used in construction shall conform to relevant dust emission control legislations. Clearance for siting shall be obtained from the MPCB. Alternatively, only crushers already licensed by the MPCB shall be used. Water will be sprayed during the non-monsoon months, regularly to minimize dust, in the whole crusher plant area. The particulate matter contribution value at a distance of 40m from a controlled isolated as well as from a unit located in a cluster should be less than NAAQS 2009. The monitoring is to be conducted as envisaged in the monitoring plan.	MoST: 111.1 NAAQS ,2009 (Refer chapter 5 of EMP)	All Aggregate Crushing Plants.	During Erection, Testing, Operation and Dismantling of Such plants.	Contractor.	Engineer, MPWD.
C.1.22 Noise from Vehicles, Plants and Equipment.	The plants and equipment used in construction (including the aggregate crushing plant) shall strictly conform to the GoI noise standards. All vehicles and equipment used in construction shall be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site. Noise limits for construction equipment used in this project (measured at one metre from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB(A), as specified in the Environment (Protection) Rules, 1986 and Noise rule 2010	MoST: 111.13 MoST: 111.13 MoST: 111.1 MoST: 111.13	Throughout Project Corridor, all access roads, sites temporarily acquired and all borrow areas.	During Construction.	Contractor.	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum.</p> <p>Workers in vicinity of loud noise, and workers working with or in crushing, compaction, concrete mixing operations shall wear earplugs.</p>	MoST: 111.6				
C.1.23 Noise from Blasting or Pre-splitting Operations	<p>Blasting shall be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.</p> <p>Blasting shall be carried out during fixed hours (preferably during mid-day), as permitted by the Engineer. The timing should be made known to all people within 500m (200m for pre-splitting) from the blasting site in all directions. People, except those who actually light the fuse shall be excluded from the area of 200m (50m for pre-splitting) from the blasting site in all directions at least 10 minutes before the blasting.</p>	<p>MoST: 302.1</p> <p>MoST: 302.4</p>	All Blasting and Pre-splitting Sites. Refer Annexure - 11	During Preparation, Operation and Closure of Such Sites.	Contractor.	Engineer, MPWD.
C.1.24 Loss or Damage of Vegetation	<p>All works shall be carried out in such a fashion that the damage or disruption to the flora is minimum. Trees or shrubs will only be felled or removed that impinge directly on the permanent works or necessary temporary works with prior approval from the Engineer.</p> <p>The Engineer shall approve such felling on the advice of the MPWD and only when the MPWD receives a “clearance” for such felling from the DoF, as applicable.</p> <p>Trees felled shall be replaced as per the compensatory afforestation criteria of 10 trees for each tree felled.</p>		Entire Project Site. As encountered During Construction	<p>During Construction</p> <p>During Construction</p> <p>As per Department of Forest Existing Programs.</p>	<p>Contractor</p> <p>Engineer, MPWD</p> <p>Department of Forest</p>	<p>Engineer, MPWD.</p> <p>MPWD.</p> <p>MPWD.</p>
C.1.25 Roadside Tree Plantation	In addition to the compensatory afforestation being carried out by the State Forest Department, tree plantation along the valley side slopes shall be carried out all along the corridor.		All along the corridor except at locations having dense	During construction	NGOs, VCs	Engineer, MPWD, State

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>A minimum of 5,000 saplings shall be planted. Species selection and other specifications for plantation are provided in Annexure 6, and in the EIA.</p> <p>The plantation along the corridor shall be carried out by an NGO designated by the MPWD. Bamboo tree guards shall be provided for the trees planted up to 500 m on either side of the villages along the corridor. (Refer specification Annexure – 6)</p>		vegetation.			Forest Department
C.1.26 Conservation of Biodiversity at specific locations	<p>Bamboo fencing shall be erected to delineate the area rich in biodiversity as identified from field visits. Drains will be provided in the area to prevent exposure to contaminated run-off during the construction phase. Drawing: (in Annexure –12) are attached at the end of the EMP for protection works. The protection works shall follow these Drawings.</p> <p>Introduction of exotic species will be prevented in the roadside plantation for such stretches.</p>		No bio-diversity rich spot identified need to be implemented if found during construction	<p>During Construction</p> <p>But protection works to be completed before earthworks start in stretch extending 500 m on either side of chainages specified.</p>	Contractor	Engineer, MPWD.
C. 1. 27 Protection of Biodiversity-rich area and forest resources	<p>No bio-diversity rich area has been identified within the core impact zone. If such areas are identified, access to the road shall be restricted using barbed wire fencing.</p> <p>Workers shall be prohibited from extracting timber or other forest products. Contractors shall provide suitable non-timber fuel sources for cooking at construction camps.</p>		<p>Any bio-diversity rich spot identified during construction</p> <p>Construction workers' camps; all throughout project area</p>	<p>During construction period</p> <p>During construction period</p>	<p>Contractor</p> <p>Contractor</p>	<p>Engineer, MPWD</p> <p>Engineer, MPWD</p>
C.1.28 Conservation of Ecological rich area	No designated Ecological Identity Area is located in the core impact zone. If such area is identified during construction, blasting will be prohibited in the stretch extending 200m on either side of such area, these will be assessed and site specific mitigations designed. Water spraying shall be carried out every day during the duration		No bio-diversity rich spot identified need to be implemented if found during construction		Contractor	Engineer, MPWD

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	of earthwork in such areas.					
C.1.29 Damage or Loss of Chance-found Important Flora	During construction, at any point of time, if a rare/threatened/endangered flora species is found, it shall be conserved in a suitable manner. The Engineer, on specific advice from the MPWD shall approve detailed conservation processes, plans and designs as well as associated modification in the project design. Drawing in Annexure 12 shall be adopted at appropriate locations.		Throughout Project Area.	During Construction	Contractor, Engineer.	MPWD.
C.1.30 Loss, Damage or Disruption to Fauna.	There is no known wildlife habitat or movement route in the LTK Road influence area. As a pre-cautionary measure, all works are to be carried out in such a fashion that the damage and disruption to fauna is minimum. Construction workers shall be instructed to protect natural resources and fauna, including wild animals and aquatic life. (if found) hunting and unauthorized fishing are prohibited.		All along the Project corridor, all access roads, sites temporarily acquired.	During Construction.	Contractor.	Engineer, MPWD. Engineer, Forests Department, MPWD
C.1.31 Damage or Loss of Chance-found Important Fauna.	During construction, at any point of time, if a rare/endangered / threatened fauna species is spotted, the contractor shall make all arrangements to intimate the Forests (wildlife) authorities and measures will be taken for its conservation during the operation period also.		Entire Project Site.	During Construction.	Contractor, Engineer	MPWD.
C.1.32 Loss of Access	The Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses connecting the project road. Work that affects the use of side roads and existing accesses shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer. The works shall not interfere with or cause inconvenience to public or restrict the access to use and occupation of public or private roads, and any other access footpaths to or of	MoST: 112.7	All along the Project corridor	During Construction	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>properties whether public or private. Access across the work-zone will be provided for two slots every day during construction (2 hours in the morning and 2 hours in the afternoon). Specific schedules shall be consulted and agreed with local communities and Village Councils, and shall be posted visibly at the sites and communicated clearly to local communities. For this purpose the contractor shall maintain a strip of pavement across the work zone of such quality that light motor vehicles (LMV) can pass without difficulty or danger of breaking down.</p> <p>Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversion shall be maintained in a satisfactory condition till such time they are required as directed by the PWD/ Engineer-in-Charge of works. Temporary roads shall be kept free of dust by frequent applications of water, if necessary.</p>					
C.1.33 Traffic Delays and Congestion	<p>Detailed Traffic Control Plans shall be prepared and submitted to the Engineer for approval, 5 days prior to commencement of works on any section of road. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.</p> <p>The Contractor shall ensure that the running surface is always maintained in running condition, particularly during the monsoon so that no disruption to the traffic flow occurs.</p>	<p>MoST: 112.1</p> <p>MoST: 112.2</p>	All along the Project Corridor.	During Construction	Contractor	Engineer, MPWD.
C.1.34 Traffic Control and Safety	The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement.	<p>MoST: 112.4</p> <p>MoST: 112.1</p>	Entire Project site	During Construction	Contractor	Engineer, MPWD

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>All signs, barricades, pavement markings shall be as per the MoST specification. Before taking up construction on any section of the highway, a traffic control plan shall be devised to the satisfaction of the Engineer. The contractor shall consult the proposed traffic control plan with local communities and Village Councils prior to presenting it to the Engineer.</p> <p>At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the carriageway) the lane width path for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the PWD Engineer-in-Charge of works. At night, the passage shall be delineated with lanterns or other suitable light source.</p> <p>One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns / lights.</p> <p>On both sides, suitable regulatory / warnings signs showing timings when road will be open for traffic as approved by the PWD Engineer-in-Charge of works, shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of design as specified by the Engineer.</p>					
C.1.35 Risk from Operations	The Contractor is required to comply with all the precautions as required for the safety of the workmen as per the International Labour Organisation (ILO) Convention No. 62 as far as those are applicable to this contract. The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff. The contractor has to comply with all regulation regarding safe scaffolding, ladders, working platforms,		Entire Project site.	During Construction	Contractor	Engineer, MPWD

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	gangway, stairwells, excavations, trenches and safe means of entry and egress. No child labour shall be utilized in the project					
C.1.36 Risk from Electrical Equipment	Adequate precautions will be taken to prevent danger from electrical equipment. No material or any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provisions and to the satisfaction of the Engineer.	MoST: 106	Entire Project site.	During Construction	Contractor	Engineer, MPWD
C.1.37 Risk at Hazardous Activity	All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stonebreakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any herbicide or other toxic chemical shall be strictly in accordance with the manufacturer's instructions. The Engineer shall be given at least 6 working days notice of the proposed use of any herbicide or toxic chemical. A register of all herbicides and other toxic chemicals delivered to the site shall be kept and maintained up to date by the Contractor. The register shall include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	MoST: 111.1 MoST: 111.6	Entire Project site.	During Construction	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
C.1.38 Risk of Lead Pollution	No man below the age of 18 years and no woman shall be employed on the work of painting with products containing lead in any form. No paint containing lead or lead products will be used except in the form of paste or readymade paint. Face masks will be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.	MoST: 111.1	Entire Project site	During Construction	Contractor	Engineer, MPWD.
C.1.39 Risk caused by Force' Majure	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.		Entire Project site	During Construction	Contractor	Engineer, MPWD.
C.1.40 Risk from Explosives	Except as may be provided in the contract or ordered or authorised by the Engineer, the Contractor shall not use explosives. Where the use of explosives is so provided or ordered or authorised, the Contractor shall comply with the requirements of the following Sub-Clauses of this Clause besides the law of the land as applicable: The Contractor shall at all times take every possible precaution and shall comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and shall, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. Explosives will be used in accordance with the recommendations of the Indian Standard Code of practice and will be stored under proper security at a safe distance from the road and at least 300 m from any inhabited premises. The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies	MoST: 302.4 Explosives Act, 1884 and the Explosives Rules 1983	All blasting and Pre-splitting Sites.	During Construction	Contractor	Engineer

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations.					
C.1.41 Malarial risk	The Contractor shall, at his own expense, conform to all anti-malarial instructions given to him by the Engineer.		Entire Project site.	During Construction	Contractor.	Engineer, MPWD.
C.1.42 First Aid	At every workplace, a readily available first aid unit including an adequate supply of sterilised dressing material and appliances will be provided as per the Factory Rules of Mizoram. Workplaces, remote and far away from regular hospitals will have indoor health units with one bed for every 250 workers. Suitable transport will be provided to facilitate take injured or ill person(s) to the nearest applicable hospital. At every workplace and construction camp, equipment and nursing staff shall be provided.	MoST: 1207.6	Entire Project site.	During Construction	Contractor	Engineer, MPWD.
C.1.43 Potable Water	In every workplace at suitable and easily accessible places a sufficient supply of cold potable water (as per IS) will be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.	BIS 10500	Entire Project site.	During Construction	Contractor	Engineer, MPWD.
C.1.44 Hygiene	All sanitary facilities shall be cleaned four times daily and at least twice during working hours. Receptacles shall be tarred inside and outside at least once a year. All temporary accommodation must be maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be regularly emptied and the garbage disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta shall be made by putting a layer of night soils at the bottom of a permanent tank prepared for the purpose and covering it with 15 cm		All Construction Labourers' Camps	During Construction	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	<p>layer of waste or refuse and then covering it with a layer of earth for a fortnight (by then it will turn into manure).</p> <p>On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.</p>					
C.1.45 Protection/Mitigation of Religious Structures and Shrines	<p>All necessary and adequate care shall be taken to minimize impact on cultural properties. Temporary barricades during construction and permanent protection / barricade shall be provided to ensure identified religious or cultural sites are protected during construction and use of the road.</p> <p>All conservation and protection measures will be taken up as per design.</p>	MoST: 301.5	Church in Tlabung and Budhist temple in Kwrpuichhuah village	During Construction	Contractor	Engineer, MPWD.
C.1.46 Chance found Archaeological property	<p>All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government, and shall be dealt with as per provisions of the relevant legislation.</p> <p>The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped 100m all directions from the site of discovery.</p> <p>The Engineer shall seek direction from the Archaeological Society of India (ASI) before instructing the Contractor to recommence work on the site.</p>		Entire Project site.	During Construction	Contractor	Engineer, MPWD.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
C.1.47 Roadside Amenities	Provision, of bus stands, complete with seating arrangement, infrastructure, etc., if any, as per designs shall be taken up. The design layout drawings and specifications of the various roadside amenities shall be as per the engineering design.		At locations indicated in the DPR	During Construction	Contractor	Engineer, MPWD.
C.1.48 Road Furniture	Road furniture including footpaths, railings, storm water drains, crash barrier, traffic signs, speed zone signs, pavement markers and any other such items will be provided as per design given in the Bid Documents. Intersections, rotaries, traffic islands, roadside protection and other structures or furniture shall be constructed, complete with the landscape elements as per landscape strategy.		At locations as per the detailed design.	During Construction	Contractor	Engineer, MPWD.
C.1.49 Decommissioning and restoration of construction areas	Prior to completion of construction, the contractor shall fully decommission and restore all areas used during construction including stockpile areas, machine and equipment yards, workers camps, borrow and waste disposal areas, temporary access roads, quarries, etc.		Throughout project area.	During construction.	Contractor	Engineer, MPWD
O-1.: Operation Stage						
O.1.1 Water quality degradation due to road run-off	Silt fencing, Oil & Grease traps, etc. shall be provided at sensitive water bodies to ensure that the water quality is not impaired due to contaminants from road run-off. Monitoring shall be carried out as specified in the Monitoring plan Culverts and drains shall be regularly maintained and cleared of garbage, which should be deposited in approved locations away from water bodies.		As specified in the monitoring plan	As per Monitoring plan	MPWD and/or MPCB	MPWD
O.1.2 Contamination of Soil and Water	Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals. Spill of oil, fuel and automobile servicing units without		Entire Project corridor.	Framework at State and Sector Level is expected	Flying Squad of the Motor Vehicles Department.	Motor Vehicles Inspector.

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
Resources from Spills Accidents	adequate disposal systems in place to be discouraged.			to be developed.		
O1.3 Traffic and Accident Safety	Depending on the level of congestion and traffic hazards, traffic management plans will be prepared. Traffic control measures including speed limits to be enforced strictly. Road control width to be enforced. Local government bodies and development authorities will be encouraged to control building development along the highway.		All along the Project corridor and surrounding areas.	Through Operation Stage.	MPWD, Local Government Bodies, Development Authorities.	MPWD
O1.4 Accidents involving Hazardous Materials	Compliance with the Hazardous Wastes (Management and Handling) Rules, 1989 including: For delivery of hazardous substances, permit license, driving license and guidance license will be required. Public security, transportation and fire fighting departments will designate a special route for vehicles delivering hazardous material. These vehicles will only be harboured at designated parking lots. In case of spill of hazardous materials, the relevant departments will be intimated at once to deal with it with the spill contingency plan.	Hazardous wastes (Management and Handling) Rules, 1989.	All along the Project corridor and surrounding areas	Framework Expected to be During Early Operation Stage.	MPWD, Motor Vehicles Department.	MPWD, Motor Vehicles Department.
O.1.5 Biodiversity	Conservation measures in the biodiversity rich areas include the contributed restriction of access to these. Monitoring during construction by way of transects at locations identified will provide important feedback for this and other such projects. No development shall be allowed along the bio-diversity rich or ecological identity area, if found subsequently. MPWD to complete Strategic Forest and Biodiversity Assessment and implement recommendations to offset		Throughout project corridor	As per the monitoring plan During the lifetime of the project During lifetime of	Institution/NGO selected by MPWD Village Councils MPWD	MPWD MPWD MPWD

Environmental Impact/Issue	Mitigation Measures ¹	Cross reference ²	Location ³	Time Frame ⁴	Responsibility	
					Implementation	Supervision
	cumulative impacts of trade corridor development on forests and biodiversity.			the project		
O.1.6 Road side tree plantation	Trees planted along the corridor shall be maintained for a period of three years. Maintenance works include, watering of the saplings, replacement of the bamboo fence every year for 3 years and all necessary measures for survival of the sapling.	ToR for Tree plantation	All along the corridor	Immediately from the planting of sapling	NGO / CBO	MPWD

Section - 3 REPORTING SYSTEM

3.1 Reporting system

Reporting system provides the necessary feedback for project management to ensure quality of the works and that the program is on schedule. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the Environmental Management Plan get implemented in the project.

The reporting system will operate linearly with the contractor reporting to the Supervision Consultant, who in turn shall report to the MPWD. All reporting by the contractor and Supervision Consultant shall be on a quarterly basis. The MPWD shall be responsible for preparing targets for each of the identified EMP activities. All subsequent reporting by the contractor shall be monitored as per these targets set by the MPWD before the contractors move on to the site. The reporting by the Contractor will be a monthly report like report of progress on construction and will form the basis for monitoring by the MPWD, either by its own Environmental Engineer/s or the Environmental Specialist hired by the Supervision Consultant. The monitoring and the subsequent reporting would include:

- Monitoring of facilities at construction camps
- Monitoring of air, noise, soil and water parameters including silt load
- Monitoring of survival rate of trees planted on valley slopes
- Monitoring of cleaning of drains and water bodies
- Monitoring for biodiversity – protection measures during construction phase
- Monitoring of bio-engineering measures suggested

Table 3.1: Desired Monitoring and Reporting Process and Responsibilities

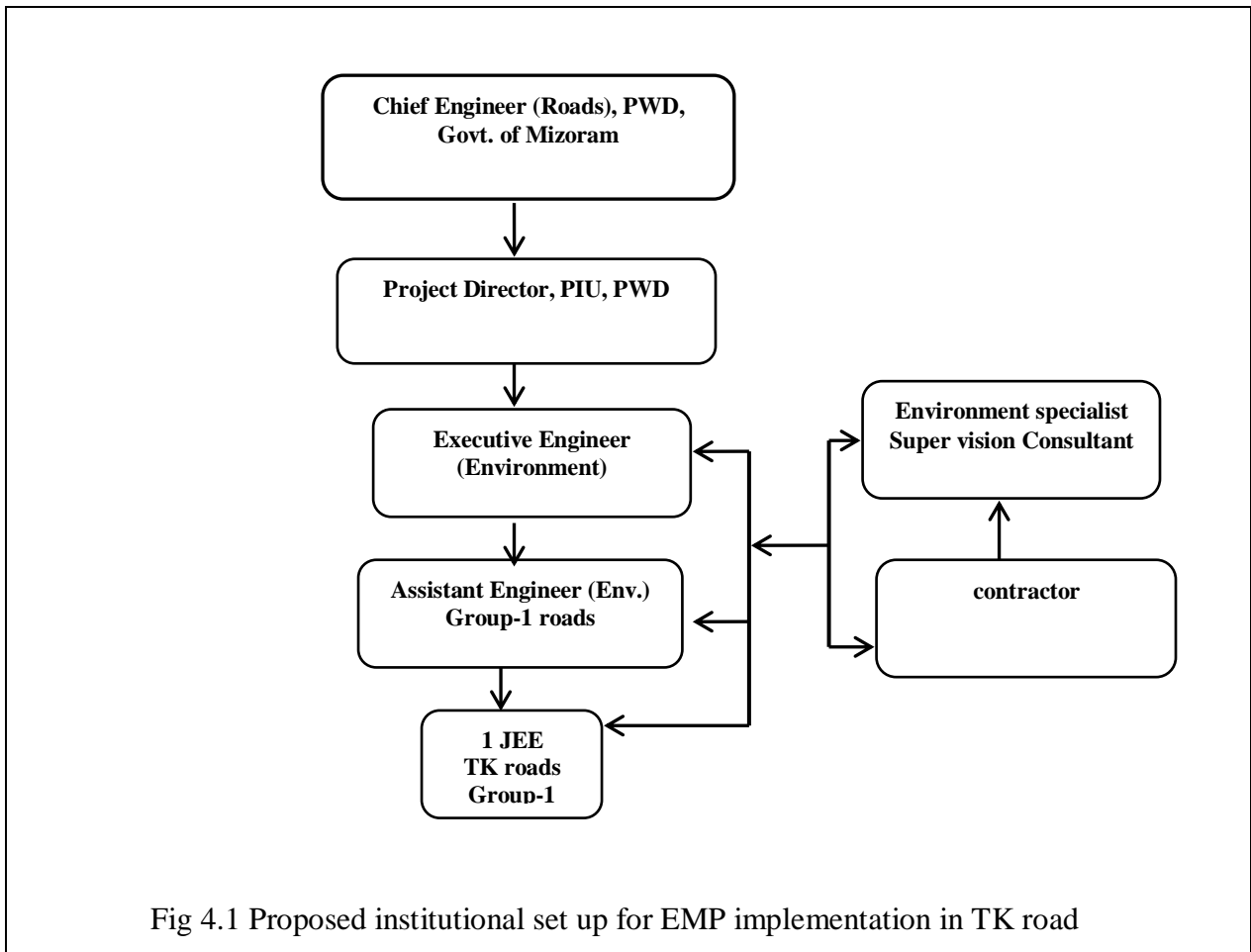
Format No.	Item	Timing	Supervision Consultant (SC)		MPWD		World Bank (WB)
			Supervision	Reporting to MPWD	Oversee/ Field Compliance Monitoring	Report to WB	Desired Supervision
CONTRACTOR MOBILISATION AND SITE CLEARANCE							
M1	Reporting by contractor to SC for dumping locations	Before start of construction	As required	As required		Quarterly	Half yearly
CONSTRUCTION PHASE							
C1	Monitoring of construction site and construction camp	Before start of work		Quarterly		Quarterly	Half yearly
C2	Target sheet for Pollution Monitoring		As required	After Monitoring		After Monitoring	Half yearly
C3	Target sheet for Tree cutting		Monthly	Quarterly	Quarterly	Half yearly	Yearly
C4	Target sheet for monitoring of cleaning Culverts		Monthly	Monthly	Quarterly	Half yearly	Yearly
C5	Target sheet for protection measures at specific locations where endangered flora is found	Before start of work at the location	Quarterly	Quarterly	As required	Half yearly	Yearly
C6	Monitoring sheet for specific endangered flora locations to be protected	Before start of work	Quarterly	Quarterly	As required	Half yearly	Yearly

Format No.	Item	Timing	Supervision Consultant (SC)		MPWD		World Bank (WB)
			Supervision	Reporting to MPWD	Oversee/ Field Compliance Monitoring	Report to WB	Desired Supervision
OPERATION PHASE							
O1	Target sheet for Pollution Monitoring		As per Monitoring Plan	After Monitoring		After Monitoring	Half yearly
O2	Target sheet for roadside plantation				Quarterly	After monitoring	Once after completing plantation
O3	Target sheet for monitoring of cleaning culverts				Quarterly	After monitoring	Twice during operation phase
O4	Monitoring of Landslide clearance	As required			As required	After Monitoring	Twice during operation phase

Section – 4 INSTITUTIONAL ARRANGEMENTS

4.1 Proposed institutional set up for EMP implementation in TK road

In line with the EMF for implementation of EMP for this road it has been proposed that Executive engineer (Environment) will be in charge for the implementation of EIA and EMP for this road. He will be assisted by Assistant Engineer (Environment), who will be assisted by a Junior Engineer, and an Environment Specialist of Supervision consultant and contractor (Refer Figure 4.1).



Supervision Consultant

The construction supervision consultant are expected to have in-house capacity to advise on and supervise the implementation of the EMP including suggesting enhancement design options and nay modifications, if needed. For this purpose, the supervision consultant will employ a full-time environmental specialist.

Non-Governmental Organizations

The TK Road requires undertaking plantation and maintenance and protection of vegetation in addition to compensatory plantation as part of environmental mitigation and enhancement works. Similarly, spoils will be used, where possible, to create community assets on demand/request of the community. In these types of works, TK Road project may engage NGO or CBO.

4.2 Institutional arrangement for monitoring of EMP implementation

In order to ensure that the proposed mitigation measures have the intended results and comply with GoI and World Bank requirements, an environmental performance monitoring arrangement for Monitoring of Environmental Issues has been proposed as described in table 4.1. Details of the monitoring and reporting requirements have been discussed in EMP in detail.

Table 4.1 Institutional arrangement for Monitoring of Environmental Issues

SN	Issue	Procedure	Timing	Responsibility
A. Pre-Construction				
1	Incorporation of mitigation measures and environmental guidelines	Review detail design/drawings of the project	During project approval	PIU, PWD
2.	Location of camp sites and location of plants	Review of camp location Approval of layout of camp and plants	Prior to Contractor mobilization	PIU, PWD,
3.	Statutory clearances from different agencies like- Pollution control board, mining department, Revenue department etc.	Review of documents and clearance certificates.	Prior to Contractor mobilization	PIU, PWD
B. During Construction				
4	Construction and location of drainage facilities.	Site inspections at places where such drains are required.	During active construction	PIU, Contractor, Local NGOs.
5.	Proper use of explosives for blasting.	Site observation and discussion with local people and workers	Whenever blasting takes place.	PIU, Contractor,

6	Care and safe storage of top soil for later use.	Inspection of site clearance practices, top soil storage sites	Monthly during construction.	PIU, Contractor,
7.	Care for vegetation in the RoW and immediate vicinity	Inspection of site clearance Activities.	Bi-Weekly during construction.	PIU, Local NGOs, Contractor
8.	Safeguarding of drinking water sources.	Site observation	During and immediately after construction in the water source vicinity.	PIU, Local NGOs, Contractor
9.	Disposal of spoil materials and other construction wastes	Disposal site observation and disposal practice	Weekly.	PIU, Local NGOs, Contractor
10.	Impacts on agricultural land due to spoil disposal/soil erosion/water-logging due to construction	Site observation and discussion with local people	Weekly	PIU, Local NGOs, Contractor
11.	Reclamation of disposal sites	Observation of reclaimed disposal sites	Periodically	PIU, Local NGOs, Contractor
12	Plantation of vegetation in the cut slope	Observation of sites	Periodically	PIU, Local NGOs, Contractor
13	Timely construction of other slope protection measures, such as, retaining walls.	Observation of sites	Immediately after	PIU, Local NGOs, Contractor
14	Quality of surface water.	Water testing	Construction site near a water body	PIU, Local NGOs, Contractor
15	Operation and closure of quarries and borrow pits confirmed to the requirements related to location, vegetation protection, soil conservation, erosion control, siltation and stability concerns.	Site inspection, discussion with workers and local people.	During quarry operation or bi-weekly	PIU, Local NGOs, Contractor
16	Air pollution near settlements	Observation of construction practices and consultation with local residents and workers	Periodically	PIU, Local NGOs, Contractor
17	Public complain on environmental problems	Grievance Redress Mechanism (GRM) by GRM cell and consultation with public (refer annexure- 14)	During construction and in defect liability period	PIU, PWD

Section 5 - TRAINING

5.1 Need for Training

Staff of MPWD entrusted for MSRP II – RCTP is already in place and are overseeing the project preparation activities. However, there is lack of environmental and social expertise. This deficiency should be mitigated as soon as possible to enable the MPWD in integrating the social and environmental issues in its day-to-day operation and in internalising the environmental and social issues in the future road development projects. To achieve this goal, staff of MPWD, need to be trained on road development and environment management and the effective implementation of the environmental issues.

5.2 Target of proposed training

The training programme should equip the members of the Environmental cell to implement and supervise the EMP and expose senior members of the MPWD to environmental and social issues associated with the highway projects. Such a group of senior staff can then be given the responsibility of active dissemination of the culture of environmental/social consciousness and ethics within the rest of the organisation.

Once the staff of the MPWD have received training and have gained experience through the implementation of the EMP, they should be ready to resume leadership role within the MPWD in providing training and in implementing future projects. In order to disseminate environmental experience gained by the MPWD, each staff would be required to maintain good records and prepare dissemination notes on specific issues and problems encountered and resolved, and how the experience gained could be integrated in future road projects. Competent members of the MPWD should be offered additional environmental training and should be encouraged to train other staff.

5.3 Training for Capacity enhancement

To enable the PWD in integrating the social and environmental issues in its day-to-day operation and in internalizing the environmental and social issues in the existing and future road development projects training is conceived. To achieve this goal, the MPWD, needs training on road development and environment management and the effective implementation of the environmental issues.

Training proposed for capacity development in EMF document of MSRP-II RTCP (Refer EMF) will also be applicable for this project because this project is a component of MSRP

II-RTCP. The training to be undertaken need to be of relevance to the specific context of the roads in Mizoram, focusing on the following issues:

Conservation of biodiversity

Slope stability and vulnerability to landslides

Siting criteria for identification of dumping sites

Harnessing water resources, including rain water harvesting

Concepts of bio-engineering and application of bio-engineering techniques for slope protection

Types of training envisaged are summarized in the table below.

Table 5.1: Training for Implementation of Environmental Management Framework

S. No.	Training Recipients	Content of the module
Module – I	Environmental staff of “Environmental and Social Management Cell”. Associated NGOs in implementation and staff associated with construction supervision	Environmental overview:Key issues, Methodology, Public Consultation, Value Addition
Module – II	Members of PWD staff involved in supervising up-gradation corridor, NGO representatives;	Mizoram State Road Project: Environmental Impact Assessment Social Impact Assessment, Environmental Management Plan, Slope protection
Module - III	Contractors’ representatives; NGO representatives; Supervision Consultants’ representatives; Members of PWD staff involved in supervising up-gradation corridor,	Institutional Framework for Implementation of MSRP: The role of the PWD, The responsibilities of the Supervision Consultant and the NGO Reporting requirements, Contractual Obligations and Environmental Protection.
Module – IV	Members of PWD staff involved in supervising Major Maintenance, Upgradation; NGO staff implementing the R&IPDP; District Officials & Members of special committees – MVAC and GRC	Special Issues in MSRP-2: Bio-Diversity Assessment and Conservation, Geo-morphological Assessment and Slope Protection Consultation and Counselling, Income generation and Economic Rehabilitation Preparation of Micro-plans
Module – V	Members of the PWD; Selected Officers of the line Departments such as Forests, Officials of the Pollution Control Board, Mining and Geology department	Improved Co-ordination with other departments: Overview of the MSRP Environmental & Social Impacts of the proposed improvements Statutory permissions – procedural requirements, Co-operation with the Forests Department, Co-operation with the Revenue Department

S. No.	Training Recipients	Content of the module
Module – VI	Members of PWD involved in MSRP	Long-term issues in Planning Roads development in Mizoram Environmental & Social Assessment Methodology, Preparation of EMP & RAP, Stability of Hill Roads and mitigation measures, Conserving bio-diversity along roadside, Highway related diseases and AIDS Consultation tools and techniques.

5.4 Logistical Support Required

Besides the trainings, there are various logistic supports including various items that need to be procured for the effective and efficient functioning of Environmental Cell> thes, include but not limited to, the following: equipments for monitoring noise levels, digital Camera and adequate computing facilities to allow the documentation unit to be self-sufficient etc. The cell should have access to one licensed copy of the latest version of the software useful for environmental wing. These could include CALINE-4 (for air pollution modeling from traffic emissions), SOUND 32 (for traffic noise) and a fugacity-based model (for predicting the behaviour of volatile/hazardous material that might spill on the road. A well-stocked library with books and manuals related to environmental impacts of infrastructure in general and roads in particular, would be an advantage, etc.

Section 6 : ENVIRONMENTAL MONITORING PLAN

6.1 Environmental monitoring

The monitoring program is devised to ensure that the envisaged purposes of the project are achieved and result in desired benefits to the target population. To ensure effective implementation of the EMP, it is essential that an effective monitoring program be designed and carried out. The environmental monitoring program provides such information on which management decision may be taken during construction and operational phases. It provides basis for evaluating the efficiency of mitigation and enhancement measures and suggest further actions that need to be taken to achieve the desired effect.

The monitoring includes:

Visual observations;

Selection of environmental parameters at specific locations;

Sampling and regular testing of these parameters.

6.2 Objectives of Environmental monitoring program

The objectives of environmental monitoring program are:

Evaluation of the efficiency of mitigation and enhancement measures;

Updating of the actions and impacts of baseline data;

Adoption of additional mitigation measures if the present measures are insufficient;

Generating the data, which may be incorporated in environmental management plan in future projects.

6.3 Monitoring methodology

Monitoring methodology covers the following key aspects: Components to be monitored; parameters for monitoring of the above components; monitoring frequency; monitoring standards; responsibilities for monitoring; direct responsibility, overall responsibility; and monitoring costs. Environmental monitoring of the parameters involved and the threshold limits specified are discussed below.

Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters recommended for monitoring road transportation developments are PM₁₀, PM_{2.5}, Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Sulphur Dioxide (SO₂) and Lead (Pb). These will be monitored at designated locations starting from the commencement of construction activity. Data should be generated at all identified locations in accordance to the National Ambient Air Quality Standards, 2009 (Table 6.1). The location, duration and the pollution parameters will be monitored and the responsible institutional arrangements are detailed out in the Monitoring Plan (Table 6.4)

Table 6.1 : National Ambient Air Quality Standards (2009)

[अध्याय III—खण्ड 4]					
भारत का राजपत्र : असाधारण					
3					
NATIONAL AMBIENT AIR QUALITY STANDARDS					
CENTRAL POLLUTION CONTROL BOARD					
NOTIFICATION					
New Delhi, the 18th November, 2009					
No. B-29016/20/90/PCI-L—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11 th April, 1994 and S.O. 935(E), dated 14 th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-					
NATIONAL AMBIENT AIR QUALITY STANDARDS					
S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM ₁₀ µg/m ³	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM _{2.5} µg/m ³	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O ₃) µg/m ³	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m ³	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m ³	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH ₃) µg/m ³	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method



(1)	(2)	(3)	(4)	(5)	(6)
9	Benzene (C ₆ H ₆) µg/m ³	Annual*	05	05	• Gas chromatography based continuous analyzer • Adsorption and Desorption followed by GC analysis
10	Benzo[<i>a</i>]Pyrene (BaP) - particulate phase only, ng/m ³	Annual*	01	01	• Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m ³	Annual*	06	06	• AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m ³	Annual*	20	20	• AAS /ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman
[ADVT-III/4/184/09/Extr.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, Extraordinary vide notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998.

Source: Central Pollution Control Board, Delhi.

*Average Arithmetic mean of minimum 104 measurements in a year taken for a week 24 hourly at uniform interval.

**24 hourly/8 hourly values should meet 98 percent of the time in a year

Water quality monitoring

The physical and chemical parameters recommended for analysis of water quality relevant to road development projects are pH, total solids, total dissolved solids, total suspended solids, oil and grease, COD, chloride, lead, zinc and cadmium. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at all identified locations in accordance to the Indian Standard Drinking Water Specification – IS 10500: 1991 (stated in Table-6.2)

Table-6.2 : Indian Standard Drinking Water Specification-IS 10500:1991

Sl. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
Essential Characteristics						
1	Colour, Hazen units, Max.	5	Above 5, consumer acceptance decreases	25	3025 (Part 4) 1983	Extended to 25 only if toxic substances are not suspected, in absence of alternate sources
2	Odour	Unobjectionable	-	-	3025 (Parts 5):1984	a) Test cold and when heated b) Test at several dilutions
3	Taste	Agreeable	-	-	3025 (Part 7 and 8) 1984	Test to be conducted only after safety has been established
4	Turbidity NTU, Max.	5	Above 5, consumer acceptance decreases	10	3025 (Part 10) 1984	-
5	Ph Value	6.5 to 8.5	Beyond this range, the water will affect the mucous membrane and/or water supply system	No relaxation	3025 (Part 11) 1984	-
6	Total hardness (as CaCO ₃) MG/1, Max	300	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21) 1983	-
7	Iron (as Fe) mg/1, Max	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	1	32 of 3025 : 1964	-
8	Chlorides (as Cl) mg/1, Max	250	Beyond this limit, taste, corrosion and palatability are affected	1000	3025 (Part 32) 1988	-
9	Residual, free chlorine, mg/1, Min	0.2	-	-	3025 (Part 26) 1986	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required,

Sl. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
						it should be <i>Min</i> 0.5 mg/l

Desirable Characteristics

1	Dissolved solids mg/1, <i>Max</i>	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	3025 (Part 16) 1984	-
2	Calcium (as Ca) mg/1, <i>Max</i>	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40) 1991	-
3	Magnesium (as Mg), mg/1, <i>Max</i>	30	Encrustation to water supply structure and adverse effects on domestic use	100	16, 33, 34 of IS 3025: 1964	-
4	Copper (as Cu) mg/1, <i>Max</i>	0.05	Astringent taste, discoloration and corrosion of pipes, fitting and utensils will be caused beyond this	1.5	36 of 3025: 1964	-
5	Manganese (as Mn) mg/1, <i>Max</i>	0.1	Beyond this limit taste/appearance are affected, has adverse effects on domestic uses and water supply structures	0.3	35 of 3025: 1964	-
6	Sulphate (as 200 SO ₄) mg/1, <i>Max</i>	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	3025 (Part 24) 1986	May be extended up to 400 provided (as Mg) does not exceed 30
7	Nitrate (as NO ₂) mg/1, <i>Max</i>	45	Beyond this, may cause methaemoglobinemia	100	3025 (Part 34) 1988	-
8	Fluoride (as F) mg/1, <i>Max</i>	1	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	23 of 3025: 1964	-
9	Phenolic compounds (As C ₆ H ₅ OH) mg/1, <i>Max</i>	0.001	Beyond this, it may cause objectionable taste and odour	0.002	54 of 3025: 1964	-
10	Mercury (as Hg) mg/1, <i>Max</i>	0.001	Beyond this, the water becomes toxic	No relaxation	(see Note) Mercury ion analyser	To be tested when pollution is suspected
11	Cadmium (as Cd), mg/1, <i>Max</i>	0.01	Beyond this, the water becomes toxic	No relaxation	(See note)	To be tested when pollution is suspected
12	Selenium (as Se), mg/1, <i>Max</i>	0.01	Beyond this, the water becomes toxic	No relaxation	28 of 3025: 1964	To be tested when pollution is suspected
13	Arsenic (As As) mg/1, <i>max</i>	0.05	Beyond this, the water becomes toxic	No relaxation	3025 (Part 37) 1988	To be tested when pollution is suspected
14	Cyanide (As CN), mg/1, <i>Max</i>	0.05	Beyond this limit, the water becomes toxic	No relaxation	3025 (Part 27) 1986	To be tested when pollution is

Sl. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
						suspected
15	Lead (as Pb), mg/1, <i>Max</i>	0.05	Beyond this limit, the water becomes toxic	No relaxation	(see note)	To be tested when pollution is suspected
16	Zinc (As Zn). Mg/1, <i>Max</i>	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	39 of 3025: 1964)	To be tested when pollution is suspected
17	Anionic detergents (As MBAS) mg/1, <i>Max</i>	0.2	Beyond this limit it can cause a light froth in water	1	Methylene-blue extraction method	To be tested when pollution is suspected
18	Chromium (As Cr ⁶⁺) mg/1, <i>Max</i>	0.05	May be carcinogenic above this limit	No relaxation	38 of 3025: 1964	To be tested when pollution is suspected
19	Poly nuclear aromatic hydrocarbons (as PAH) g/1, <i>Max</i>	-	May be carcinogenic above this limit	-	-	-
20	Mineral oil mg/1, <i>Max</i>	0.01	Beyond this limit undesirable taste and odour after chlorination take place	0.03	Gas Chromatographic method	-
21	Pesticides mg/1, <i>Max</i>	Absent	Toxic	0.001	-	-
22	Radioactive materials:				58 of 3025:01964	-
23	a) Alpha emitters Bq/1, <i>Max</i>	-	-	0.1	-	-
24	Beta emitters pci/1, <i>Max</i>	-	-	1	-	-
25	Aluminium (as Al), mg/1, <i>Max</i>	200	Beyond this limit taste becomes unpleasant	600	13 of 3025:1964	-
26	Aluminium (as Al), mg/1, <i>Max</i>	0.03	Cumulative effect is reported to cause dementia	0.2	31 of 3025: 1964	-
27	Boron, mg/1, <i>Max</i>	1	-	5	29 of 3025: 1964	-

Source: Indian Standard Drinking Water Specification-IS10500:1991

Noise levels Monitoring

The measurements for monitoring noise levels would be carried out at all designated locations in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) in 1989 (refer Table 6.3) Sound pressure levels would be monitored on twenty-four hour basis. Noise should be recorded at an “A” weighted frequency using a “slow time response mode” of the measuring instrument. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan (Table-6.4).

Table 6.3: National Noise Level Standards (CPCB)

Km.	Noise level for Day	Noise level for
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40

Day time - 6.00 am - 9.00 pm (15 hours)

Night time - 9.00 pm - 6.00 am (9 hours)

The monitoring plan along with the environmental parameters and the time frame is presented, environmental monitoring plan.

6.4 Monitoring Plan

The monitoring plan for the various performance indicators of the project in the construction and operation stages is summarised in the Table 6.4

Table 6.4 : Environmental Monitoring Plan

Env. component	Project Stage	MONITORING						Institutional responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Duration	Implementation	Supervision
Air	Construction stage	SPM, RSPM, SO ₂ , NO _x , CO, HC	Dust sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	Hot mix plant/Batching plant	Quarterly for three years	Continuous 24 hours/ or for 1 full working day	Contractor through approved monitoring agency	Engineer, MPWD
	Construction stage	SPM, RSPM	Dust Sampler to be located 40 m from the earthworks site downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	Stretch of the road where construction is in progress site	Quarterly for three years	Continuous 24 hours/ or for 1 full working day	Contractor through approved monitoring agency	Engineer, MPWD
Water Quality	Construction stage	pH, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	As directed by the Engineer (At maximum 5 locations)	End of summer before the onset of monsoon every year for 3 years	-	Contractor through approved monitoring agency	Engineer, MPWD
	Operation stage	pH, BOD, COD, TDS, TSS, DO, Pb, Oil and Grease.	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	As directed by the Engineer (At maximum 5 locations)	End of summer before the onset of monsoon	-	MPWD	MPWD

Env. component	Project Stage	MONITORING						Institutional responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Duration	Implementation	Supervision
		Flooding and Cleaning of drains/water bodies	Flooding locations to be identified and choked drains, water bodies under going siltation and subject to debris disposal should monitored under cleaning operations	Water quality standards of CPCB and cleaning shall be to the satisfaction of the engineer (MPWD)	All along the corridor + land slide location	Thrice in monsoon and post-monsoon seasons.	-	MPWD	MPWD
Noise levels	Construction stage	Noise levels on dB (A) scale	Free field at 1 m from the equipment whose noise levels are being determined.	Noise standards by CPCB	At equipment yards	Once every month (max) for three years, as required by the engineer	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.	Contractor through approved monitoring agency	Engineer, MPWD
		Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement	Noise standards by CPCB	As directed by the Engineer (At maximum 5 locations)	Thrice a year for three years during the construction period.	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.	Contractor through approved monitoring agency	Engineer, MPWD
Soil Erosion	Construction stage	Turbidity in Storm water Silt load in ponds, water courses	-	As specified by the engineer MPWD / Water quality standards	As directed by the Engineer (At maximum 5 locations)	Pre-monsoon and post-monsoon seasons for three years		Supervision Consultant	MPWD

Env. component	Project Stage	MONITORING						Institutional responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Duration	Implementation	Supervision
Construction Sites and Construction Camps	Construction Stage	Monitoring of: 1. Storage Area 2. Drainage Arrangements 3. Sanitation in Construction Camps	The parameters mentioned are further elaborated in the reporting format C1. These are to be checked for adequacy.	To the satisfaction of the MPWD and the standards given in the reporting form.	At Storage area and construction camps	Quarterly in the construction stage.		Engineer	MPWD
Bio-diversity	Construction stage	Species diversity	Quadrat method	Comparison with pre-project situation	At locations selected by engineer	Quarterly	1 time evaluation at each site	Engineer	MPWD
Bioengineering measures	Operation Stage	Vegetation cover (sq.m)			Selection of locations as advised by Geotechnical personnel of Engineer	Quarterly	1 time evaluation at each site	Engineer	MPWD
Landslides	Construction	Monitoring of soil movement using pegs/bolts on cut slopes	The study location to be identified in consultation with Geotechnical Expert of Engineer		At vulnerable land slide location	Fortnight	1 time measurement	GSI	Geo Engineer
	Operation	Monitoring of soil movement using pegs/bolts on cut slopes	The study location to be identified in consultation with Geotechnical Expert of Engineer		At vulnerable land slide location	Fortnight	1 time measurement	GSI	MPWD

Section 7: ENVIRONMENTAL BUDGET

Budget for implementation of EMP of 12 km length Tlabung – Kawrpuichhuah Road (T-K Road) has been estimated as Rs 3, 610, 000.00. Detail of the budget has been given in table 7. 1.

Table 7.1: Environmental Budget for TK up gradation corridor

COMPONENT	STAGE	ITEM	Unit	Unit Cost (INR)	QUANTITY	Total Cost (INR)
Mitigation / Enhancement						
Vegetated bamboo crib wall	Construction	Construction of vegetated bamboo crib wall width 1.2m & height 1.5m including providing and suppling bamboo, binding wire cutting, plantation of vegetation/grass, making benching and backfilling	Rm	660	1200	7,92,000
Turfing with sods	Construction	Furnishing and laying of the live sods of perennial turf forming grass on embankment slope, verges or other location shown on the drawing or as directed by the engineer including preparation of ground, fetching of rods and watering complete as per MoRT &H specification 307	Sq.m	50	4500	2,25,000
AIR	Construction	Sprinkling of water in the settlement and working area as per instruction of CSC	Month	30,000	18	540,000
WATER	Pre-construction	Hand pump	No.	60,000	3	180,000

COMPONENT	STAGE	ITEM	Unit	Unit Cost (INR)	QUANTITY	Total Cost (INR)
FLORA	Construction	Compensatory afforestation, in accordance with Forest Conservation Act (1980)	No	-	-	To be decided by Forest department and fund will be transferred to Forest department by PIU,PWD
		Additional tree plantation along valley slopes as per guideline provided in Annexure-5	No	30	5000	150,000
		Maintenance Grant to local NGOs for ensuring survival as per guideline provided in Annexure-6	No	50	5000	250,000
		Provision of bamboo tree guards for the trees 500m on either side of villages as per guideline provided in Annexure-6& annexure-XII	m	-	-	-
CONSERVATION OF BIODIVERSITY	Construction	Provision of barbed wire fencing along realignment guideline provided in Annexure-6 & annexure-XII	m	150	-	-
		Mitigation designs for plant species as per guideline provided in Annexure-6 & annexure-XII	m	200	-	-
STABILITY OF SLOPES		Bioengineering measures for protection of slopes As per guideline provided in EMP &	sq. m.	60	5000	300,000

COMPONENT	STAGE	ITEM	Unit	Unit Cost (INR)	QUANTITY	Total Cost (INR)
		annexure-XII and annexure-XIII				
ENVIRONMENTAL ENHANCEMENTS	Construction	Enhancement of water harvesting points	No.	20,000	4	80,000
PROTECTION OF RELIGIOUS STRUCTURES	Construction	Fencing of, boundary wall of church at Tlabung	m	100	1000	100,000
(A) Mitigation / Enhancement Costs						
Monitoring						
AIR	Construction	Monitoring near all hot mix plant locations approved by the Engineer as per NAAQS ,2009 CPCB	No. of Samples	10000 for 3-sample set	6	60,000
	operation	Monitoring at construction sites in tandem with construction Engineer as per NAAQS ,2009 CPCB	No. of Samples	10000 for 3-sample set	-	-
WATER QUALITY	Construction	At locations specified in the monitoring plan as per IS 10,500 & IS 2296	No. of Samples	10,000	6	60,000

COMPONENT	STAGE	ITEM	Unit	Unit Cost (INR)	QUANTITY	Total Cost (INR)
	Operation	At four locations specified in the Monitoring Plan as per IS 10,500 & IS 2296	No. of Samples	10,000	6	60,000
NOISE	Construction	At equipment yards as directed by the Engineer as per CPCB guideline 1989	No. of Samples	500	25	12,500
	Operation	At locations of compensatory plantation, All along the corridor as per CPCB guideline 1989	No. of Years	30,000	-	-
Bio Engineering Measures	Construction	Monitoring survival	No. of Visits of Monitoring team	50,000	5	250,000
	Operation	Monitoring effectiveness	No. of Visits of Monitoring team	50,000	2	100,000
Bio Diversity study	Construction & operation	Monitoring of impact on biodiversity	Half yearly	50,000	5	250,000
(B) MONITORING COSTS						
Protection of disposal sites						

COMPONENT	STAGE	ITEM	Unit	Unit Cost (INR)	QUANTITY	Total Cost (INR)
Retaining wall 3m height	Construction		m	Will be covered in engineering cost		Will be covered in engineering cost
Gabion wall 3m height	Construction		m	Will be covered in engineering cost		Will be covered in engineering cost
Side drain	Construction		m	Will be covered in engineering cost		Will be covered in engineering cost
(C) Protection of disposal sites						
Training & Mobilisation						
Training	Construction and Operation	As per modules 1 to 5 developed for MSRP	No. of modules 5	@ 50,000 per training	250,000	
Advocacy and policy making	Operation	Erection of hoardings indicating the biological diversity, and scenic views along the project route	No.	4,000	5	40,000

COMPONENT	STAGE	ITEM	Unit	Unit Cost (INR)	QUANTITY	Total Cost (INR)
		Holding meetings for policy planning and subsequent review meetings with the Revenue Department, local representatives, town-planning authorities, NGOs, etc. regarding development controls especially w.r.t biodiversity preservation and land use development studies	Year	50,000	2	100,000
Miscellaneous items		Digital Camera for the Environmental Cell	No	20,000	1	20,000
		Portable sound level meter	No	25,000	1	25,000
(E) Training & Mobilization Costs						
TOTAL BUDGETED COSTS						38,44,500

Guideline for construction camp

GUIDELINES FOR SANITATION AND HOUSE KEEPING AT THE LABOUR /CONSTRUCTION CAMPS

SITE SELECTION

- The construction camps will be located at least 200 - 500 m away from habitations at identified sites. The living accommodation and ancillary facilities for labour shall be erected and maintained to standards and scales approved by the resident engineer.
- All sites used for camps must be adequately drained. They must not be subject to periodic flooding, nor located within 200 feet of swamps, pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures.
- The camps must be located such that the drainage from and through the camps will not endanger any domestic or public water supply.
- All sites must be graded, ditched and rendered free from depressions such that water may get stagnant and become a nuisance.

WATER SUPPLY

- An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing and laundry purposes.
- Potable water supply systems for labour camps occupants shall be as per the design approved by the Local Public Health Engineering Department and meet the water quality standards as prescribed by the State Pollution Control Board. In addition, the design of water system facilities shall be based on the suppliers Engineer's estimates of water demands.
- The drinking water system must be monitored in accordance with the water quality parameters as prescribed by the State Pollution Control Board. The water supply system used for cooking purposes that is drained seasonally must be cleaned, flushed, and disinfected prior to use. Furthermore, a water sample of satisfactory bacteriologic quality, i.e. a sample showing not more than one coliform bacteria per 100 ml sample must be obtained before being placed into service.
- At all construction camps and other workplace, good and sufficient water supply shall be maintained to eliminate chances of waterborne/water -related/water -based diseases to ensure the health and hygiene of the workers.

TOILET FACILITIES AND HYGIENE

- There shall be adequate supply of water, close to latrines and urinals.
- Within the precincts of every workplace, latrines and urinals shall be provided in an accessible place, and the accommodation, separately for each of these, as per standards set by

the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. Except in workplaces provided with water - flushed latrines connected with a water borne sewage system, all latrines shall be provided with dry - earth system (receptacles) which shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year.

- Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located so as to be accessible, without any individual passing through any sleeping room.
- A toilet room must be located within 200 feet of the door of each sleeping room. No toilet may be closer than 100 feet to any sleeping room, lunch area or kitchen.
- Where the toilet rooms are shared, such as in multifamily shelters and in barracks type facilities, separated toilet rooms must be provided for each sex. These rooms must be distinctly marked “for men” and “for women” by signs printed in English and in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols. If the facilities for each sex are in the same building, they must be separated by solid walls or partitions extending from the floor to the roof or ceiling.
- Urinals must be provided on the basis of one unit or 2 linear feet of urinal trough for each 25 men. The floor from the wall and for a distance not less than 15 inches measured from the outward edge of the urinals must be constructed of materials impervious to moisture. Where water under pressure is available, urinals must be provided with an adequate water flush. Urinals troughs in privies must drain freely into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit.

WASTE DISPOSAL

- The sewage system for the camp must be designed, built and operated to the satisfaction of the concerned local State Govt. Department so that no health hazard occurs and no pollution to the air, ground or adjacent watercourse takes place. Compliance with the relevant legislation must be strictly adhered to.
- Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner to the satisfaction of relevant norms.
- Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta by incineration at the workplace shall be made by means of a suitable incinerator approved by the local medical health or municipal authorities. Alternatively, excreta may be disposed off by putting a layer of night soils at the bottom of permanent tank prepared for the

purpose and covering it with 15 cm layer of waste or refuse and then covering it with a layer of earth for a fortnight (by then it will turn into manure).

- On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer

FIRST AID

- Injuries might occur during the construction period. It is therefore pertinent to provide first aid facilities for all the construction workers. At construction camps and at all workplaces first aid equipment and nursing staff must be provided. Since many of the workplaces may be far away from regular hospitals, an indoor health unit having one bed facility every 250 workers needs to be provided.
- Adequate transport facilities for moving the injured persons to the nearest hospital must also be provided in ready to move condition.
- The first aid units should apart from an adequate supply of sterilized dressing material should contain other necessary appliances as per the factory rules

MAINTENANCE

- All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition and be protected from rubbish accumulation.
- All necessary means shall be employed to eliminate and control any infestations of insects and rodents within all parts of any labor camp. This shall include approved screening or other control of outside openings in structures intended for occupancy or food service facilities.
- Each structure made available for occupancy shall be of sound construction, shall assure adequate protection against weather, and shall include essential facilities to permit maintenance in a clean and operable condition. Comfort and safety of occupants shall be provided for by adequate heating, lighting, ventilation or insulation when necessary to reduce excessive heat.
- Each structure made available for occupancy shall comply with the requirements of the Uniform Building Code. This shall not apply to tent camps.

Annexure 2.1

**DETAILED PROJECT REPORT FOR MIZORAM STATE ROADS PROJECT-II
GROUP :1 (TLABUNG-KAWRPUICHHUAH ROAD)**

Name of Road : Tlabung-Kawrpuichhuah Road within Mizoram (75.380 -87.351Km)

Length of road : 11.682 Km

LOCATION OF RETAINING WALL

Culvert Sl. No of LTK road.	CHAINAGE		LENGTH in m	HEIGHT in m	REMARKS
	FROM	TO			
594	75575	75585	10	4.0	RHS
595	75595	75605	10	3.0	RHS
596	75675	75685	10	4.0	RHS
597	75685	75695	10	6.0	RHS
598	75695	75705	10	5.0	RHS
599	75775	75785	10	5.0	RHS
600	75785	75795	10	3.0	LHS
601	75795	75805	10	4.0	RHS
602	77135	77145	10	4.0	RHS
603	77145	77155	10	5.0	RHS
604	77275	77285	10	4.0	RHS
605	77745	77755	10	3.0	RHS
606	78075	78085	10	4.0	RHS
607	78155	78165	10	5.0	RHS
608	78175	78185	10	4.0	RHS
609	78245	78255	10	5.0	RHS
610	78265	78275	10	3.0	RHS
611	78535	78545	10	3.0	RHS
612	78615	78625	10	5.0	RHS
613	78715	78725	10	6.0	RHS
614	79075	79085	10	4.0	RHS
615	79175	79185	10	5.0	RHS
616	79185	79195	10	6.0	RHS
617	79255	79265	10	6.0	RHS
618	79325	79335	10	3.0	LHS
619	79325	79335	10	5.0	RHS
620	79335	79345	10	6.0	LHS
621	79355	79365	10	6.0	LHS
622	79365	79375	10	4.0	LHS
623	79365	79375	10	4.0	RHS
624	79375	79385	10	4.0	RHS
625	79505	79515	10	5.0	RHS
626	79975	79985	10	4.0	RHS

**DETAILED PROJECT REPORT FOR MIZORAM STATE ROADS PROJECT-II
GROUP :1 (LUNGLEI-TLABUNG-KAWRPUICHHUAH ROAD)**

Name of Road : Tlabung-Kawrpuchhuah Road within Mizoram(75.380 -87.351Km)

Length of road : 11.682 Km

LOCATION OF BREAST WALL

SR.NO.	CHAINAGE		LENGTH in m	HEIGHT in m	SIDE	REMARKS
	FROM	TO				
1.	73395.0	73410.0	15.00	2.00	RHS	LINK ROAD
2.	73495.0	73510.0	15.00	2.00	LHS	LINK ROAD
3.	73660.0	73675.0	15.00	3.00	LHS	LINK ROAD BARAPANIS URY
4.	73885.0	73900.0	15.00	2.00	RHS	LINK ROAD
5.	74170.0	74185.0	15.00	2.00	LHS	LINK ROAD
6.	74645.0	74660.0	15.00	2.00	LHS	LINK ROAD
7.	75345.0	75360.0	15.00	2.00	RHS	TLABUNG
8.	79735.0	79750.0	15.00	2.00	RHS	TLABUNG
9.	82475.0	82490.0	15.00	2.00	LHS	LINK ROAD
10.	85155.0	85170.0	15.00	2.00	LHS	LINK ROAD
11.	86955.0	86970.0	15.00	2.00	RHS	LINK ROAD
12.						

SUMMARY

**DETAILED PROJECT REPORT FOR MIZORAM STATE ROADS PROJECT-II
GROUP :1 (TLABUNG-KAWRPUICHHUAH ROAD)**

Name of Road : Tlabung-Kawrpuchhuah Road within Mizoram(75.380 Km -87.351Km)

Length of road : 11.682 Km

LOCATION OF GABION WALL

SR.NO.	CHAINAGE		LENGTH in m	HEIGHT in m	REMARKS
	FROM	TO			
13.	76085	76095	10	3.000	RHS
14.	77925	77935	10	3.000	RHS
15.	78525	78535	10	3.000	RHS
16.	78545	78555	10	3.000	RHS

17.	79685	79695	10	3.000	RHS
18.	79985	79995	10	2.000	RHS
19.	80045	80055	10	2.000	RHS
20.	80055	80065	10	2.000	RHS
21.	80075	80085	10	2.000	LHS
22.	80075	80085	10	2.000	RHS
23.	80085	80095	10	2.000	LHS
24.	80085	80095	10	2.000	RHS
25.	80095	80105	10	2.000	LHS
26.	80095	80105	10	2.000	RHS
27.	80105	80115	10	2.000	LHS
28.	80105	80115	10	2.000	RHS
29.	80115	80125	10	2.000	RHS
30.	80115	80125	10	2.000	LHS
31.	80125	80135	10	2.000	RHS
32.	80125	80135	10	2.000	LHS
33.	80135	80145	10	2.000	RHS
34.	80135	80145	10	2.000	LHS
35.	80145	80155	10	2.000	LHS
36.	80155	80165	10	2.000	LHS
37.	80165	80175	10	2.000	LHS
38.	80525	80535	10	2.000	LHS
39.	80765	80775	10	2.000	RHS
40.	80895	80905	10	2.000	RHS
41.	80905	80915	10	2.000	LHS
42.	80915	80925	10	2.000	RHS
43.	81045	81055	10	2.000	RHS
44.	81445	81455	10	2.000	LHS
45.	81455	81465	10	2.000	RHS
46.	81455	81465	10	2.000	LHS
47.	81465	81475	10	3.000	LHS
48.	81465	81475	10	3.000	RHS
49.	81475	81485	10	3.000	LHS

50.	81485	81495	10	3.000	LHS
51.	81485	81495	10	3.000	RHS
52.	81495	81505	10	3.000	LHS
53.	81495	81505	10	3.000	RHS
54.	81505	81515	10	3.000	LHS
55.	81505	81515	10	3.000	RHS
56.	81515	81525	10	3.000	LHS
57.	81515	81525	10	3.000	RHS
58.	81525	81535	10	3.000	LHS
59.	81525	81535	10	3.000	RHS
60.	81535	81545	10	3.000	LHS
61.	81535	81545	10	3.000	RHS
62.	81545	81555	10	3.000	LHS
63.	81545	81555	10	3.000	RHS
64.	81555	81565	10	3.000	LHS
65.	81555	81565	10	3.000	RHS
66.	81565	81575	10	3.000	LHS
67.	81565	81575	10	3.000	RHS
68.	81575	81585	10	3.000	LHS
69.	81575	81585	10	3.000	RHS
70.	81585	81595	10	3.000	LHS
71.	81585	81595	10	3.000	RHS
72.	81595	81605	10	3.000	LHS
73.	81595	81605	10	3.000	RHS
74.	81605	81615	10	3.000	LHS
75.	81615	81625	10	3.000	LHS
76.	81615	81625	10	3.000	RHS
77.	81625	81635	10	3.000	LHS
78.	81625	81635	10	3.000	RHS
79.	81635	81645	10	3.000	LHS
80.	81635	81645	10	3.000	RHS
81.	81645	81655	10	3.000	LHS
82.	81645	81655	10	3.000	RHS

83.	81655	81665	10	3.000	LHS
84.	81695	81705	10	3.000	RHS
85.	81695	81705	10	3.000	LHS
86.	81705	81715	10	3.000	RHS
87.	81705	81715	10	3.000	LHS
88.	81715	81725	10	3.000	RHS
89.	81715	81725	10	3.000	LHS
90.	81725	81735	10	3.000	RHS
91.	81725	81735	10	3.000	LHS
92.	81735	81745	10	3.000	RHS
93.	81735	81745	10	3.000	LHS
94.	81745	81755	10	3.000	RHS
95.	81745	81755	10	3.000	LHS
96.	81755	81765	10	3.000	RHS
97.	81755	81765	10	3.000	LHS
98.	81765	81775	10	3.000	RHS
99.	81765	81775	10	3.000	LHS
100.	81775	81785	10	3.000	RHS
101.	81775	81785	10	3.000	LHS
102.	81785	81795	10	3.000	RHS
103.	81785	81795	10	3.000	LHS
104.	81795	81805	10	3.000	RHS
105.	81795	81805	10	3.000	LHS
106.	81805	81815	10	3.000	RHS
107.	81805	81815	10	3.000	LHS
108.	81815	81825	10	3.000	RHS
109.	81815	81825	10	3.000	LHS
110.	81825	81835	10	3.000	RHS
111.	81825	81835	10	3.000	LHS
112.	81835	81845	10	3.000	RHS
113.	81835	81845	10	3.000	LHS
114.	81845	81855	10	3.000	RHS
115.	81845	81855	10	3.000	LHS

116.	81855	81865	10	3.000	RHS
117.	81855	81865	10	3.000	LHS
118.	81865	81875	10	3.000	RHS
119.	81865	81875	10	3.000	LHS
120.	81875	81885	10	3.000	RHS
121.	81875	81885	10	3.000	LHS
122.	81885	81895	10	3.000	RHS
123.	81885	81895	10	3.000	LHS
124.	81895	81905	10	3.000	RHS
125.	81895	81905	10	3.000	LHS
126.	81905	81915	10	3.000	RHS
127.	81905	81915	10	3.000	LHS
128.	81915	81925	10	3.000	RHS
129.	81915	81925	10	3.000	LHS
130.	81925	81935	10	3.000	RHS
131.	81925	81935	10	3.000	LHS
132.	81935	81945	10	3.000	RHS
133.	81935	81945	10	3.000	LHS
134.	81945	81955	10	3.000	RHS
135.	81945	81955	10	3.000	LHS
136.	81955	81965	10	3.000	RHS
137.	81955	81965	10	3.000	LHS
138.	81965	81975	10	3.000	RHS
139.	81965	81975	10	3.000	LHS
140.	81975	81985	10	3.000	RHS
141.	81975	81985	10	3.000	LHS
142.	81985	81995	10	3.000	LHS
143.	81995	82005	10	3.000	LHS
144.	82005	82015	10	3.000	RHS
145.	82005	82015	10	3.000	LHS
146.	82015	82025	10	3.000	RHS
147.	82015	82025	10	3.000	LHS
148.	82025	82035	10	3.000	RHS

149.	82025	82035	10	3.000	LHS
150.	82035	82045	10	3.000	RHS
151.	82045	82055	10	3.000	RHS
152.	82045	82055	10	3.000	LHS
153.	82055	82065	10	3.000	RHS
154.	82055	82065	10	3.000	LHS
155.	82065	82075	10	3.000	RHS
156.	82065	82075	10	3.000	LHS
157.	82075	82085	10	3.000	RHS
158.	82075	82085	10	3.000	LHS
159.	82085	82095	10	3.000	RHS
160.	82085	82095	10	3.000	LHS
161.	82095	82105	10	3.000	RHS
162.	82095	82105	10	3.000	LHS
163.	82105	82115	10	3.000	LHS
164.	82105	82115	10	3.000	RHS
165.	82115	82125	10	3.000	RHS
166.	82125	82135	10	3.000	RHS
167.	82135	82145	10	3.000	RHS
168.	82145	82155	10	3.000	RHS
169.	82235	82245	10	3.000	RHS
170.	82335	82345	10	3.000	LHS
171.	82345	82355	10	3.000	LHS
172.	82355	82365	10	3.000	LHS
173.	82365	82375	10	3.000	LHS
174.	82375	82385	10	3.000	LHS
175.	82725	82735	10	3.000	RHS
176.	82875	82885	10	3.000	RHS
177.	82885	82895	10	3.000	RHS
178.	82995	83005	10	3.000	RHS
179.	83015	83025	10	3.000	RHS
180.	83265	83275	10	3.000	LHS
181.	83405	83415	10	3.000	RHS

182.	83625	83635	10	3.000	LHS
183.	83635	83645	10	3.000	RHS
184.	83635	83645	10	3.000	LHS
185.	83645	83655	10	3.000	LHS
186.	83655	83665	10	3.000	LHS
187.	83665	83675	10	3.000	LHS
188.	83675	83685	10	3.000	LHS
189.	83685	83695	10	3.000	LHS
190.	83695	83705	10	3.000	LHS
191.	83705	83715	10	3.000	LHS
192.	83715	83725	10	3.000	RHS
193.	83715	83725	10	3.000	LHS
194.	83725	83735	10	3.000	LHS
195.	83725	83735	10	3.000	RHS
196.	83735	83745	10	3.000	RHS
197.	83745	83755	10	3.000	RHS
198.	83755	83765	10	3.000	RHS
199.	83815	83825	10	3.000	RHS
200.	83825	83835	10	3.000	RHS
201.	83835	83845	10	3.000	RHS
202.	84485	84495	10	3.000	LHS
203.	84765	84775	10	3.000	LHS
204.	84985	84995	10	3.000	LHS
205.	84995	85005	10	3.000	LHS
206.	84995	85005	10	3.000	RHS
207.	85005	85015	10	3.000	RHS
208.	85015	85025	10	3.000	RHS
209.	85015	85025	10	3.000	LHS
210.	85025	85035	10	3.000	RHS
211.	85025	85035	10	3.000	LHS
212.	85035	85045	10	3.000	LHS
213.	85045	85055	10	3.000	LHS
214.	85105	85115	10	3.000	LHS

215.	85445	85455	10	3.000	LHS
216.	85645	85655	10	3.000	LHS
217.	86115	86125	10	3.000	LHS
218.	86125	86135	10	3.000	RHS
219.	86135	86145	10	3.000	LHS
220.	86675	86685	10	3.000	RHS
221.	86675	86685	10	3.000	LHS
222.	86685	86695	10	3.000	RHS
223.	86685	86695	10	3.000	LHS
224.	86695	86705	10	3.000	LHS
225.	86695	86705	10	3.000	RHS
226.	86705	86715	10	3.000	LHS
227.	86705	86715	10	3.000	RHS
228.	86715	86725	10	3.000	RHS
229.	86965	86975	10	3.000	LHS
230.	86975	86985	10	3.000	LHS
231.	87115	87125	10	3.000	LHS
232.	87135	87145	10	3.000	LHS
233.	87145	87155	10	3.000	LHS
234.					

**DETAILED PROJECT REPORT FOR MIZORAM STATE ROADS PROJECT-II
GROUP :1 (LUNGLEI-TLABUNG-KAWRPUICHHUAH ROAD)**

Name of Road :Tlabung-Kawrpuchhuah Road within Mizoram (75.380 -87.351 Km)

Length of road : 11.682 Km

LOCATION OF TOE WALL

SR.NO.	CHAINAGE		LENGTH in m	HEIGHT in m	REMARKS
	FROM	TO			
1	74385	74395	10	3.000	RHS
2	78165	78175	10	2.000	RHS
3	79335	79345	10	3.000	RHS
4	79345	79355	10	3.000	LHS
5	79355	79365	10	3.000	RHS

**DETAILED PROJECT REPORT FOR MIZORAM STATE ROADS PROJECT-II
GROUP :1 (LUNGLEI-TLABUNG-KAWRPUICHHUAH ROAD)**

Name of Road :Tlabung-Kawrpuchhuah Road within Mizoram(75.380 -87.351Km)

Length of road 11.682 Km

LIST OF PROPOSED CULVERTS

Sr. No.	Chainage (m)	Curve /Straight	Radius	Type	Span X Depth	Remarks
	75357	C	45.0	BOX-TYPE-1	1.5 X 1.5	RECONSTRUCTION
	75523	S		BOX-TYPE-1	1.5 X 1.5	RECONSTRUCTION
	75586	C	47.3	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	75616	C	52.9	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	75738	C	-55.0	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	75785	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	75863	C	145.6	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	75912	C	60.0	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	76098	C	62.2	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	76252	C	30.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	76339	C	-48.5	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	76557	S		HPC-TYPE-1	1.2 X D NP4	RECONSTRUCTION
	76670	C	187.0	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	76834	C	36.6	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	77024	C	96.6	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	77132	C	-30.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	77294	C	30.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	77345	C	156.5	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	77540	C	45.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	77743	C	63.1	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	77847	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	77938	C	114.1	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	78073	C	45.9	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	78259	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	78335	C	62.3	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	78435	C	242.6	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	78553	C	-108.8	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	78620	C	30.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	78715	C	-65.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	79000	C	50.4	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	79040	C	30.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION

	79195	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	79254	C	144.2	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	79346	C	45.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	79504	C	30.6	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	79696	C	51.9	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	79749	C	30.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	80066	S		HPC-TYPE-1	1.2 X D NP4	PROPOSED
	80536	C	-66.9	HPC-TYPE-3	1.2 X D NP4	PROPOSED
	80777	C	30.3	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	80911	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	81043	C	31.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	81169	C	46.6	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	81481	C	37.2	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	81607	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	82036	S		HPC-TYPE-3	1.2 X D NP4	PROPOSED
	82254	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	82724	C	36.2	HPC-TYPE-3	1.2 X D NP4	PROPOSED
	83012	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	83271	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	83326	C	65.0	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	83415	S		HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	83859	C	36.1	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	84316	C	31.4	HPC-TYPE-2	1.2 X D NP4	PROPOSED
	84778	C	-38.3	HPC-TYPE-3	1.2 X D NP4	PROPOSED
	85011	C	-79.4	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	85303	C	-102.6	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	85657	C	-87.3	HPC-TYPE-3	1.2 X D NP4	RECONSTRUCTION
	85850	C	-30.0	HPC-TYPE-3	1.2 X D NP4	PROPOSED
	86133	C	-30.0	HPC-TYPE-3	1.2 X D NP4	PROPOSED
	86626	C	-95.5	HPC-TYPE-2	1.2 X D NP4	RECONSTRUCTION
	87126	C	30.0	HPC-TYPE-3	1.2 X D NP4	PROPOSED

DETAILED PROJECT REPORT FOR MIZORAM STATE ROADS PROJECT-**II****GROUP :1 (LUNGLEI-TLABUNG-KAWRPUICHHUAH ROAD)**

Name of Road :Tlabung-Kawrpuchhuah Road within Mizoram(75.380 - 87.351Km)

Length of road : 11.682 Km

Location of culvert outlet required outlet drain to connect with natural nallah

Sr.No.	Chainage	Clear Width of Chute	Length of Chute	Remarks
	74111	1.85	20	Type-1
	74380	2.70	20	Type-2
	74772	2.70	20	Type-2
	75586	2.70	20	Type-2
	75616	2.70	20	Type-2
	75785	1.85	20	Type-1
	76252	2.70	20	Type-2
	76834	3.20	20	Type-3
	77132	2.70	20	Type-2
	77294	2.70	20	Type-2
	77540	2.70	20	Type-2
	77743	2.70	20	Type-2
	77847	1.85	20	Type-1
	77938	2.70	20	Type-2
	78073	2.70	20	Type-2
	78259	1.85	20	Type-1
	78620	2.70	20	Type-2
	78715	2.70	20	Type-2
	79040	2.70	20	Type-2
	79195	1.85	20	Type-1
	79254	2.70	20	Type-2
	79346	2.70	20	Type-2
	79504	2.70	20	Type-2

	79696	3.20	20	Type-3
	79749	2.70	20	Type-2
	80536	2.70	20	Type-2
	80777	2.70	20	Type-2
	80911	1.85	20	Type-1
	81043	2.70	20	Type-2
	81169	2.70	20	Type-2
	81481	2.70	20	Type-2
	81607	1.85	20	Type-1
	82036	1.85	20	Type-1
	82254	1.85	20	Type-1
	82724	2.70	20	Type-2
	83012	1.85	20	Type-1
	83271	1.85	20	Type-1
	83326	2.70	20	Type-2
	83415	1.85	20	Type-1
	83859	2.70	20	Type-2
	84778	2.70	20	Type-2
	85011	3.20	20	Type-3
	85657	2.70	20	Type-2
	85850	2.70	20	Type-2
	86133	2.70	20	Type-2
	87126	2.70	20	Type-2

Annexure -3 Common Property in CIZ in Tlabung – Kawrpuichhuah

<u>Common Property in CIZ in Tlabung – Kawrpuichhuah</u>					
Sl. No	Structure	Area of Affected Land /Structure (Sq. M)	Common Property	Government Property	Name of Village
1.	Land	1307.72	VC		Tlabung
2.	Land	1156.8		Horticulture Dept.	Tlabung
3.	Land	3939.15		Agriculture Dept.	Tlabung
4.	Land	187.00		PWD, Tlabung Division	Tlabung
5.	Land	4636.8	YMA, Zodin Branch		Tlabung
6.	Land	8159.4	Mizoram Baptist Church		Tlabung
7.	Building	675.08		PWD, Tlabung Division	Tlabung
8.	Land	112.00	YMA, Zodin Branch		Tlabung
9.	Land			Supply Dept.	Tlabung
10.					
11.	RCC Building	4.00		SDO, Civil	Tlabung
12.	Land	15290.00		DSP	Tlabung
13.	Land	2987.70		EFCI, Electricity, Lunglei (Land use)	Tlabung
14.	Land		VC, Zodin		Tlabung
15.	Building	72.88	VC, Zodin		Tlabung
16.	Step	4.00		PHED	Tlabung
17.	Building	4.00	TKP BCM Tlabung Bial		Tlabung
18.	R/Wall	52.00	VC Zodin		Tlabung
19.	Pavement	238.00	VC Zodin		Tlabung
20.	RCC Building	4.00	BCM, Tlabung bial		Tlabung
21.	RCC Building	4.00	VC Zodin		Tlabung
22.	RCC Urinal	4.00	4.00 m ²		Tlabung
23.	Memorial Stone	2.4	YMA, Zodin Branch		Tlabung

24.	RCC Building	29.64	VC Zodin		Tlabung
25.	RCC Building	4.00	VC Zodin		Tlabung
26.	Semi Permananent Building	18.36		Trade & Commerce Dept.	Tlabung
27.	RCC under construction	195.84		Supply Dept.	Tlabung
28.	Land	210.00		SDO, Civil	Tlabung
29.	Land	-		Supply Godown	Tlabung
30.	RCC Building	131.04		Health Dept.	Tlabung
31.	Memorial Stone, Land	2574.00	YMA, Tlabung Branch		Tlabung
32.	Land	6270.43	Presbyterian Church, Tlabung vengchhak.		Tlabung
33.	Land	946.80	EFCI Tlabung		Tlabung
34.	RCC Building	117.81	Leprosy Hospital		Tlabung
35.	Assam Type Building	138.40	UPC Church		Tlabung
36.	Land	37206.66	Leprosy Hospital		Tlabung
37.	RCC Building	29.89	YMA Chawnpui		Tlabung
38.	Assam Type Building	63.24		Vety Department	Tlabung
39.	Assam Type Building	61.20		Prison Department	Tlabung
40.	Assam Type Building	37.1		Prison Department	Tlabung
41.	Assam Type Building	121.18		Treasury Office	Tlabung
42.	Assam Type Building	63.92		SDO, Civil	Tlabung
43.	Assam Type Building	59.84		SDO, Civil	Tlabung
44.	Full Pavement	19.08		SDO, Civil, Tlabung	Tlabung
45.	Assam Type Building	19.08		SDO, Civil, Chawnpui	Tlabung
46.	Land	3568.00		Forest Department	Tlabung
47.	Land	2736.00		Vety Department	Tlabung
48.	Land	7824.00		Prison (Jail) Department	Tlabung
49.	Land	3024.00		Treasury Department	Tlabung
50.	Land	1530.00		SDO (Civil)	Tlabung

Annexure - 4 Guidelines for identification of debris disposal sites

Guidelines for identification of debris disposal sites

The locations of dumping sites have to be selected such that -

- No residential areas are not located downwind side of these locations,
- Dumping sites are located at least 100m away from locations given in Annexure - V, biodiversity assessment of the location is to be carried out for identified locations. Biodiversity expert hired for the purpose by the contractor will conduct the assessment.
- Dumping sites do not contaminate any water sources, rivers etc, and
- Dumping sites have adequate capacity equal to the amount of debris generated.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the Village Council President is to be obtained for the dumping site selected

Guidelines for disposal of debris

The cutting activities shall generate an earthwork of 0.1 million cu.m./km i.e in MSRP-2 amount of excavated earth will be about 46.6 million cu.m . The disposal of which is an issue of concern. Earth generated from cutting will be utilised as construction fill material and also for building road subgrade. Remaining needs to be disposed at dumping locations. This remaining earth shall be disposed off in an environmentally suitable manner. Certain guidelines for debris disposal are given below.

- The debris generated shall be disposed of within designated areas only.
- The filled up area shall be used for designated purposes such as:

a) Playing fields

- These will be created by leveling of the filled up area and compacting the fill with several passes of a roller.
- This compacted area will be covered with topsoil from excavation for a depth of 15-30 m.
- The soil will be watered and grassed to develop a green cover over an area of the playing field.

b) Short realignments

- The short realignments provide ideal disposal sites for substantial quantities of debris of cutting.
- The valley between the sharp curve shall be filled to the level of the sub-grade.
- A retaining wall of dimensions as per engineering design shall be constructed and the road section shall be constructed on the filled area.

Debris will be continued to fill till the level of the top of the pavement is reached between the new and old roads.

Annexure 5 -Identified dumping sites in LT-K road

Identified dumping sites in LT-K road: are -

- Tlabung playground, located at 800m NW from 0.000Km
- 1.8000 - 1.950 Km
- 2.900 - 3.000 Km
- 4.000 - 4.100 Km
- 5.300 - 5.450Km
- 7.00 - 7.500Km
- 9.100 - 9.250Km
- 10.150 - 10.250 Km

Any new dumping site proposed during construction will be screened and reviewed by Environmental Specialist, of the Engineer , based on the review approved dumping site will be approved by the PIU PWD in consultation and with proper agreement with the land owner .

Annexure – 6 Specifications

SPECIFICATIONS FOR ENVIRONMENTAL ENHANCEMENT WORKS

Jungle Clearance

Jungle clearance shall comprise uprooting of rank vegetation, grass, brushwood, shrubs, stumps, trees and saplings of girth upto 30 cm. Measured at a height of one meter above the ground level. Where only clearance of grass is involved it shall be measured and paid for separately.

Uprooting of Vegetation

The roots of trees and saplings shall be removed to a depth of 60 cm. Below ground level or 30 cm. Below formation level or 15 cm below sub grade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and leveled. Trees, shrubs, poles, fences, signs, monuments, pipe lines, cables etc. within or adjacent to the area which are not required to be disturbed during jungle clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable.

Staking and Disposal

All useful materials obtained from clearing and grubbing operation shall be staked in the manner as directed by the Engineer. Trunks and branches of trees shall be cleared of limbs and tops and stacked neatly at places indicated by the Engineer- in – charge. The materials shall be the property of the Government. All unserviceable materials, which in the option of the Engineer cannot be used or auctioned, shall be removed up to a distance of 50 m. outside the periphery of the area under clearance. It shall be ensured by the contractor that unserviceable materials are disposed off in such a manner that there is no likelihood of getting mixed up with the materials meant for construction.

Felling Trees

Felling: While clearing jungle, growth trees, above 30 cm. Girth (measured at a height of one meter above ground level) to be cut, shall be approved by the Engineer-in-charge and then marked at the site. Felling trees shall include taking out roots up to 60 cm. below ground level or 30 cm. below formation level or 15 cm. below sub-grade level, whichever is lower. All excavations below general ground level arising out of removal of trees, stumps etc. shall be filled with suitable material in 20 cm. layers and compacted thoroughly so that the surface at these points conform to the surrounding area. The trunks and branches of trees shall be cleared of limbs and tops and cut into suitable pieces as directed by the Engineer-in-charge.

Staking of disposal:

Wood branches, twigs of trees and other useful material shall be the property of the Government. The serviceable materials shall be staked in the manner as directed by the Engineer-in-charge cannot be used or auctioned shall be removed from the area and disposed off as per the directions of the Engineer-in-charge. Care shall be taken to see that unsuitable waste materials are disposed off in such a manner that there is no likelihood of these getting mixed with the materials meant for construction.

Earthwork

Excavation in all kinds of soil

All Excavation operation shall include excavation and getting out the materials. In case of excavation trenches 'getting out' shall include throwing the excavated materials at a distance of at least one meter or half the depth of excavation, whichever is clearer off the edge of excavation.

During the excavation the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Under mining or under cutting not be done.

The excavation shall be done true to levels, slope shape & pattern indicated by the engineer in charge.

Filling

Lumps and clogs exceeding 8 cm. in any direction shall be broken. Each layer shall be watered and consolidated with steel rammer or ½ tone roller. Where specified every third & top most layer shall also be consolidated with power roller of minimum 8 tones. The Top & sides of the filling shall be neatly raised. The contractor shall make good of substance & shrinkage in each filling embankments traverse etc. during execution and fill the completion of works.

Fencing

Chain Link Fencing

Materials

The chain link mesh shall be of 1.5 standard and of an approved brand. The angle sizes shall be as per drawings. The iron angles have to be free from rust, cracks and blowholes.

Spacing of Posts and Struts

The spacing of post shall be as per drawings or as directed by the supervision engineer. Fixing of posts and struts will be as shown in the drawings. The angle iron must be split at the bottom for fixing in the concrete base.

Fixing of the Fencing

The chain link mesh shall be fixed with angle posts by means of 8mm diameter bolts. The holes for the bolts shall be made 300mm centre to centre on the iron sections. The bottom of the fencing must be at a height of 14cm from the ground level. The fencing top shall be horizontal to the ground.

Silt Fencing

Materials

The wire mesh and geotextile miraf shall be of approved standard and brand. The iron sections to be used as struts shall be of IS standard and free from rust, cracks etc.

Assemble

The angles are to be assembled as per drawing and directions of supervision engineer. The mesh has to be fixed with the frame after the geotextile miraf is fixed with the mesh.

Fixing

The fencing shall be fixed at site in such a manner that the geotextile miraf is placed next to the silt.

Horticultural and Landscaping Works

General

Scope

Contractor to furnish all materials, labour and related items necessary to complete the work indicated on drawing and specified herein.

Materials

Plant Materials

Plant Materials shall be well formed and shaped true to type, and free from disease, insects and defects such as knots, sun-scaled, windburn, injuries, abrasion or disfigurement.

All plant materials shall be healthy, sound, vigorous, free from plant diseases, insect's pests, of their eggs, and shall have healthy, well-developed root systems. All plants shall be hardy under climatic conditions similar to those in the locality of the project. Plants supplied shall conform to the names listed on both the plan and the plant list. No plant material will be accepted if branches are damaged or broken. All material must be protected from the sun and weather until planted.

Any nursery stock shall have been inspected and approved by the Environmental Specialist of the Engineer. All plants shall conform to these requirements specified in the plant list. Except that plants larger than specified may be used if approved, but use of such plants shall not increase the contract price. If the use of the larger plant is approved, the spread of roots or ball of earth shall be increased in proportion to the size of plant.

Deliver plants with legible identification labels.

Top Soil (Good Earth)

Top soil or good earth shall be a friable loam, typical of cultivated top soils of the locality containing at least 2% of decayed organic matter (humus). It shall be taken from a well-drained arable site. It shall be free of subsoil, stones, earth skins, sticks, roots or any other objectionable extraneous matter or debris. It shall contain no toxic material. No topsoil shall be delivered in a muddy condition. It shall have pH value ranging between 6 to 8.5.

Fertilizer

Dry okhla sludge can be used. Measurement of sludge shall be in stacks, with 8% reduction for payment. It shall be free from extraneous matter, harmful bacteria insects or chemicals. (Subjected to safety norms).

Root System

The root system shall be conducive to successful transplantation. While necessary, the root-ball shall be preserved by support with Hessaian or other suitable material. On soils where retention of a good ball is not possible, the roots should be suitably protected in some other way, which should cause any damage to roots.

Condition

Trees and shrubs shall be substantially free from pests and diseases, and shall and shall be materially undamaged. Torn or lacerated roots shall be pruned before dispatch. No roots shall be subjected to adverse conditions such as prolonged exposure to drying winds or subjection to water lodging, between lifting and delivery.

Supply and Substitution

Upon submission of evidence that certain materials including plant materials are not available at time of contract, the contractor shall be permitted to substitute other and plants, with an equitable adjustment of price. All substitutions shall be of the nearest equivalent species and variety to the original specified and shall be subjected to the approval of the Landscape Architect.

Packaging

Packaging shall be adequate for the protection of the plants and such as to avoid heating or drying out.

Marking

Each specimen of tree and shrub, or each bundle, shall be legibly labeled with the following particulars:
Its name.

The name of the supplier, unless otherwise agreed.

The date of dispatch from the nursery.

Tree Planting**Plants and Shrubs**

Trees should be supplied with adequate protection as approved. After delivery, if planting is not to be carried out immediately, balled plants should be placed check to check and the ball covered with sand to prevent drying out. Bare rooted plants can be heeled in by placing the roots in prepared trench and covering them with earth which should be watered into avoid air pockets round the roots. Trees and shrubs shall be planted as shown in architectural drawings and with approval of site supervision.

Digging of Pits

Tree pits shall be dug a minimum of three weeks prior to backfilling. The pits shall be 120cms in diameter and 120cms deep. While digging the pits, the topsoil upto a depth of 30cms may be kept aside, if found good (depending upon site conditions), and mixed with the rest of the soil.

If the side of the below, it shall be replaced with the soil mixture as specified further herein. If the soil is normal it shall be mixed with manure; river sand shall be added to the soil if it is heavy.

The bottom of the pit shall be forked to break up the subsoil.

Back Filling

The soil back filled watered through end gently pressed down, a day previous to planting, to make sure that it may not further settle down after planting. The soil shall be pressed down firmly by treading it down, leaving a shallow depression all round for watering.

Planting

No tree pits shall be dug until final tree position has been pegged out for approval.

Care shall be taken that the plant sapling when planted is not be buried deeper than in the nursery, or in the pot.

Planting should not be carried out in waterlogged soil.

Plant trees at the original soil depth; soil marks on the stem is an indication of this and should be maintained on the finished level, allowing for setting of the soil after planting. All plastic and other imperishable containers should be removed before planting. Any broken or damage roots should be cut back to sound growth.

The bottom of the planting pit should be covered with 50mm to 75mm of soil. Bare roots should be spread evenly in the planting pit; and small mound in the center of the pits on which the roots are placed will aid on even spread. Soil should be placed around the roots, gently shaking the tree to allow the soil particles to shift into the root system to ensure close contact with all roots and prevent air pockets. Back fill soil should be firmed as filling proceeds, layer by layer, care being taken to avoid damaging the roots, as follows: 200gms of 13% Lindane dust (Lindane dust is not allowed to be used, chlorocyriphos dust) shall be sprinkled on walls of pit, and initially pit shall be filled to 200 depth with earth mixed with 50gms of Lindane dust or chlorocyriphos dust. The balance earth shall be filled in a mixture of 1:3 (1 part sludge to 3 part earth by volume) and 50gms potash, (Mop) 50gms of Super Phosphate and 1Kg. Neem oil cake. Aldrin or equivalent shall be applied every 15 days in a mixture of 5ml in 5 litres of water.

Staking

Newly planted trees must be held firmly although not rigidly by staking to prevent a pocket forming around the stem and newly formed fibrous roots being broken by mechanical pulling as the tree rocks.

Methods:

The main methods of staking shall be:

- (A) A single vertical stake, 900mm longer than the clear stem of the tree, driven 600mm to 900mm into the soil.
- (B) Two stakes as above driven firmly on either side of the tree with a cross bar to which the stem is attached. Suitable for bare- rooted or Ball material.
- (C) A single stake driven in at an angle at 45 degrees and leaning towards the prevailing wind, the stem just below the lowest branch being attached to the stake. Suitable for small bare- rooted or Ball material
- (D) For plant material 3m to 4.5m high with a single stem a three- wire adjustable guy system may be used in exposed situations.
The end of stake should be pointed and the lower 1m to 1.2m should be coated with a non-injurious wood preservative allowing at least 150mm above ground level.

Tying

Each tree should be firmly secured to the stake so as to prevent excessive movement. Abrasion must be avoided by using a buffer, rubber or Hessian, between the tree and stake. The tree should be secured at a point just below its lowest branch, and also just above ground level; normally two ties should be used for tree. These should be adjusted or replaced to allow for growth.

Watering

The Landscape Contractor should allow for the adequate watering in of all newly planted trees and shrubs immediately after planting and he shall during the following growing season, keep the plant material well watered.

Fertilising

Fertilising shall be carried out by application in rotation of the following fertilisers, every 15 days from the beginning of the monsoon till the end of winter:

- Sludge or organic well-rotted dry farm yard manure: 0.05 cum or tussle.
- Urea 25gm.
- Ammonium sulphate 25gm.
- Potassium sulphate 25gm.

All shrubs, which are supplied pot grown, shall be well soaked prior to planting.

Watering in and subsequent frequent watering of summer planted container- grown plants is essential.

Shrub Planting In Planter Beds

All areas to be planted with shrubs shall be excavated, trenched to a depth of 750mm, refilling the excavated earth after breaking clods and mixing with sludge in ratio 8:1 (8 parts of stacked volume of earth after reduction by 20%: 1 part of stacked volume of sludge after reduction by 8%.)

Tall shrubs may need staking, which shall be provided if approved by the Contracting Officer, depending upon the conditions of individual plant specimen.

For planting shrubs and ground cover shrubs in planters, good earth shall be mixed with sludge in the proportion as above and filled in planters.

Positions of planters shall be marked out in accordance with the architectural Drg. When shrubs are set out, precautions should be taken to prevent roots drying. Planting holes 40cmdia. And 40cm deep should be excavated for longer shrubs. Polythene and other non-perishable containers should be removed and any badly damaged roots carefully pruned. The shrubs should then be set in holes so that the soil level, after settlement, will be original soil mark on the stem of the shrub. The hole should be back filled to half of its depth and firmed by treading. The remainder of the soil can then be returned and again firmed by treading.

Grassing

The specifications for grassing/turfing are to be referred from 'specifications for Roads and Bridge works' by MOST, Section 300, Clauses 307.1, 307.2 307.3.

Preparation

During period prior to planting, the ground shall be maintained free from weeds. Grading and preparation of the area shall be completed at least three weeks prior to the actual sowing. Regular watering shall be continued until sowing by dividing the area into portions of approximately 5 m squares by constructing small bunds to retain water. These 'bund's shall be levelled just prior to sowing of grass plants; it shall be ensured that the soil has completely settled.

Soil

The soil itself shall be ensured to the satisfaction of Landscape Architect to be a good-Fibrous loam, rich in humus.

Sowing the grass roots

Grass roots (cynodon dactylon or a local genus approved by the Landscape Architect) shall be obtained from a grass patch, seen and approved before hand.

The grass roots stock received at site may be stored shall be manually cleared of all weeds and water sprayed over areas is scheduled for a later date fresh stock of grass roots shall be ordered and obtained.

Execution

Small roots shall be dibbled about 5 cm apart into the prepared grounds. Grass will only be accepted as reaching practical completion when germination has proved satisfactory and all weeds have been removed.

Maintenance

As soon as the grass is approximately a 3 cm high it shall be rolled with a light wooden roller – in fine, dry weather – and when it has grown to 5 to 8 cms, above to the ground weeds must be removed and regular cutting with the scythe and rolling must be begun. A top-dressing of an ounce of guano to the square yard or well decomposed well broken sludge manure shall be applied when the grass is sufficiently secure in the ground to bear the mowing machine, the blades must be raised an inch above the normal level for the first two or three cuttings. That is to say, the grass should be cut so that it is from 4 to 5 cms in length, instead of the 3 cm necessary for mature grass.

In the absence of the rain, in the monsoon, the lawn shall be watered every ten adys heavily, soaking the soil through to a depth of at least 20 cms.

Damage failure or dying back of grass due to back neglect of watering especially for seeding out normal season shall be the responsibility of the contractor. Any shrinkage below the specified levels during the contract or defect liability period shall be rectified at the contractor's expense. The contractor is to exercise care in the use of rotary cultivator and mowing machines to reduce to a minimum the hazards of flying stones and brickbats. All rotary mowing machines are to be fitted with safety guards.

Rolling

A light roller shall be used periodically, taking care that the area is not too wet and sodden.

Edging

These shall be kept neat and must be cut regularly with the edging shears.

Fertilising

The area shall be fed once in a month with liquid manure prepared by dissolving 45 grms of ammonium sulphate in 5 litres of water.

Watering

Water shall be applied at least once in three days during dry weather. Watering whenever done should be thorough and should wet the soil at least up to a depth of 20 cms.

Weeding

Prior to regular mowing the contractor shall carefully remove rank and unsightly weeds.

Maintenance

Cultivating

The Landscape Contractor shall maintain all planted areas within Landscape contract boundaries for one year until the area is handed over in whole are in phases. Maintenance shall include replacement of dead plants, watering, weeding, cultivating, control of insects, fungus and other diseases by means of spraying with an approved insecticide or fungicide, pruning, and other horticulture operations necessary for proper growth of the plants and for keeping the landscape sub-contract area neat in appearance.

Pruning and Repairs

Upon completion of planting work of the landscape sub-contract all trees should be pruned and all injuries repaired where necessary. The amount of pruning shall be limited to the necessary to remove dead or injured twigs and branches and to compensate for the loss of roots and the result of the transplanting operations. Pruning shall be done in such a manner as not to change the natural habit or special shape of trees.

Tree Guards

Where the tree guards are necessary, care should be taken to ensure that they do not impede natural movement or restrict growth. Two types of tree guards are proposed on the Grand Trunk circular iron tree guards and barbed wire fencing, the specifications for which one given below:

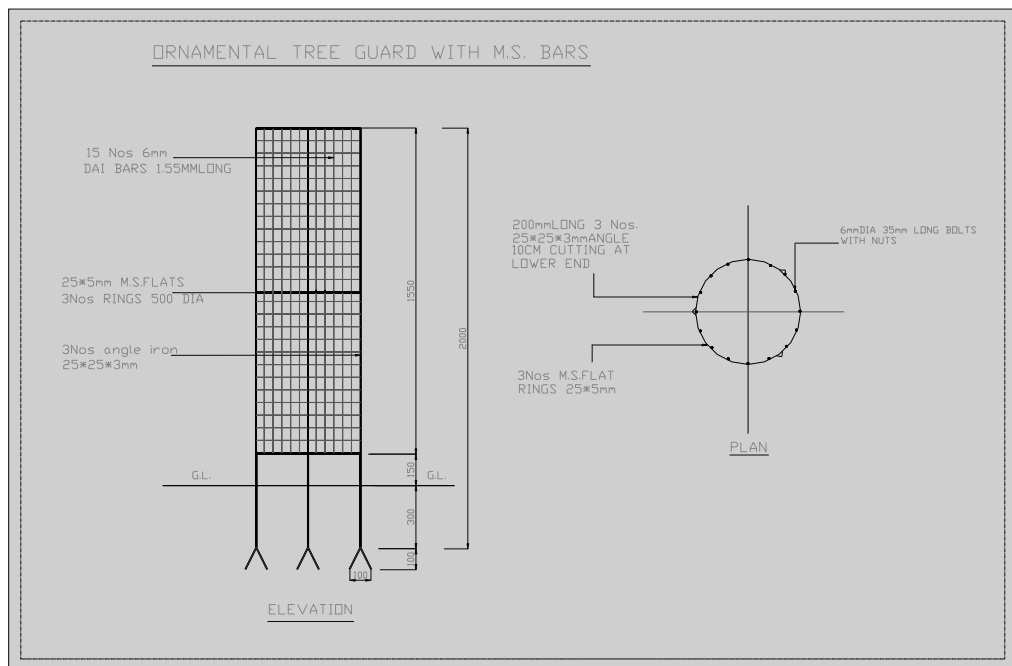
Circular Iron Tree Guard with Bars (Refer Figure 1)

The tree guard shall be 50 cm. in diameter.

The tree guards shall be formed of (i) 3 Nos. 25x25x3mm angle iron verticals 2.00m long excluding splayed outward at lower end upto an extent of 10 cms. (ii) 3 Nos. 25x25mm MS flat rings fixed as per design (iii) 15 Nos. 1.55 metres long 6mm dia bars. Each ring shall be in two parts in the ratio of 1:2 and their ends shall be turned in radially for a length of 4 cm at which they are bolted together with 8mm dia and 30mm long MS bolts and nuts.

The vertical angle irons shall be welded to rings along the circumference with electric plant 15 Nos. bars shall be welded to rings at equal spacing along the circumference of ring. The lower end of the angle iron verticals shall be splayed outwards upto an extent of 10cm. The lower end of the flat of lower ring shall be at a height of 45cm. and upper end of the flat of top ring shall be at the height of 2.00 metres. The middle ring shall be in the center of top and lower ring. The bars shall be welded to rings as shown in the drawing. The entire tree guard shall be given two coats of paint of approved brand and of required shade over a priming coat of ready mixed primer of approved brand. The design of the tree guard shall be as shown in the drawing.

Figure-1, Circular Tree Guard



Barbed Wire Fencing with Angle Iron Posts

Materials: Barbed wire shall be as per IS-278. The angle shall be 40x40x6, free from rest, cracks and blowholes.

Spacing of Post & Streets: The spacing of post shall be 3.00m centre to centre, unless otherwise specified or as directed by engineers to dimensions, which shall be nearest to the 3m. Last but one end post's and corner post shall be strutted on both side and end post on one side only. Fixing of post & struts shall be as shown in drawing the angle iron must be split at bottom end.

Fixing Barbed Wire: The barbed wire shall be stretched and fixed in specified number of rows and two diagonals. The bottom row should be 14 cm above ground level and rest @ 12.5 cm centre to centre. The diagonal weir shall be stretched between adjacent posts from the top wire of one post to the bottom weir of 2nd post. The barbed wire shall be held by tearing the holes of 10mm dia in the post and tied with GI wire turn buckles and straining bolts shall be used at the end post.

Nursery Stack

Planting should be carried out as soon as possible after reaching the site, Where planting must be necessity he delayed, care should be taken to project the plants form pilfering or damage from people animals. Plants with bare-roots should be heeled- in as soon as received or otherwise protected from drying out, and others set closely together and protected from the wind. If planting is to be delayed for more than a week, packaged plants should be unpacked, the bundles opened up and each group of plants heeled in separately and clearly labeled. If for any reason the surface of the roots becomes dry the roots should be thoroughly soaked before planting.

Completion

On completion, the ground shall be formed over and left tidy.

SPECIAL CONDITIONS AND PARTICULAR SPECIFICATONS.

1. Landscape Architect mentioned herein shall mean _____, _____ and/or any person nominated by him.
2. Wherever applicable, work shall be done according to C.P.W.D. specifications, in vogue, at the time of invitation of tender.
3. Water shall be made available, near the tube well at one point. Contractors shall make their own arrangement for drawing water from there. Water charges at _____ of value of work done shall be deducted from the contractors Bills.
4. If electricity is required for the works, the same shall be made available at one point within the site of works, for which recovery @ Rs. _____ per Kwh. shall be made from the contractors' bill.
5. The work included in the schedule of Quantities include grassing as well as planting of trees and shrubs. 'Contractors' quoted rates shall include execution of these works at different levels and nothing extra shall be paid for any item, for working at these levels.
6. The Contractor (s) shall wt be entitled to any compensation for any loses suffered by him and/or revision in the rates originally quoted by him.
 - a. On account unforeseen delay in commencing the work, whatever the cause of such delays be.
 - b. On account of reduction in the scope of work.
 - c. On account of suspension of work, or abandon after award of work.
7. The Contractor shall provide all facilities to Landscape Architect / Project Engineer and / or his authorized representa5ves to make frequent inspection of their Nursery and ascertain the process / quality of various categories of trees/plants etc., grown by them.
8. Contractors' quote rate shall include the cost of transportation of tools and plants to and from the site, sales tax, excise duty, octroi, etc. It shall be clearly understood that no claim for any extra payment on account of sales tax, excised duty, octroi etc., shall be entertained alter the opening of the tender.
9. The safe custody and up-keep of various categories of plants brought to site is the sole responsibility of the contractor and he shall employ sufficient supervisory personnel to ensure the safety of these items.
10. The site of work may be handed over to the contractors for shall of work in phases, as soon as the same are available and the contractor in turn hall work in these areas forthwith. Nothing extra shall be payable for such phased execution of work.
11. While excavating / executing the work the contractors shall ensure that e existing cables / pipe lines / structures / fittings are not damaged and if due to his negligence, these are damaged, the same shall be s right with no extra cost to the clients.
12. The Contractor shall co-ordinate his work with other agencies employed by the Clients and ensure that the work of other agencies are not hampered in any way during the duration of contract.

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13. The Contractor shall keep the site of works neat and clean during the execution of the work. Any debris found at or near the site of work shall be rescued immediately as and when so required by the landscape Architect / Project Engineer.
 14. On completion of the work, the site of work shall be thoroughly cleaned and all debris removed before the work is handed over satisfactorily.
 15. The Contractors shall, without any additional charge to the clients, renew or replace any dead or defective plants/grass and shall fully maintain the whole landscape for a period of 12 months after the certified date of completion.
 16. "General condition of contract and standard contract Forms of shall also form part of the contract.
 17. Trees shall be of minimum length as specified in the schedule of quantities and shall be straight and symmetrical with a crown and having a persistent main stem. The size of crown shall be in good over all proportion to the height of the tree.
 18. Small trees and shrubs shall be well formed with e crown typical of the species or variety.
 19. GENERAL REQUIREMENTS OF PLANTS:
 - Plants shall be typical of their species and variety, well developed branches, and well foliated with fibrous root system. Plants shall be free from defects and injuries. Plants shall not be pruned before planting.
 -
 - Plants shall be free from defects and injuries.
 - Plants shall not be pruned before planting.
 - Plants shall not be freshly dug and nursery grown.
 - Nursery grown plants shall have been at least once transplanted.
 - Bark shall be free from abrasion.
 -
 - All trees, soon after planting, shall be properly supported with bamboo stocks to ensure their safety against winds or any other factor, which may affect it adversely.
 -
 - 20. PROTECTION OF "TREE TO BE PRESERVED"
 - The contractor shall be responsible for the protection of tops, trunks and roots of existing trees on site. Existing trees subject to the construction damage shall be boxed, fenced or otherwise protected before any work is started.
 - 21. GENERAL REQUIREMENTS OF EARTH MANURE AND FERTILISERS
 - EARTH: Good earth shall be agricultural soil of loamy texture, free from kankar, morrum, shingles, rocks, stones, building rubbish and any other foreign matter. The earth shall be free from clods or lumps of sizes bigger than 50mm in any direction. It shall have pH ranging between 6.5 to 7.5

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- - MANURE: Manure shall be of well decayed organic matter obtained in dry state from the Municipal dump or other similar source approved by the Project Engineer. The manure shall be free from earth, stone or other extraneous matter. Manure shall be supplied, at site well screened.
 -
 - FERTILIZERS: If the soil tests indicate pH value not as per the above specification namely between 6.5 to 7.5, following measures need to be taken.
 - If pH exceeds 7.5, aluminium sulphate or equivalent fertilizer should be added at the rate of 1 kg per cubic metre to lower the pH by one full point.
 - If pH is below 6.5, add ground limestone or equivalent fertilizer at the rate of 1 kg per cubic metre to raise pH by one full point.

Oil Interceptor

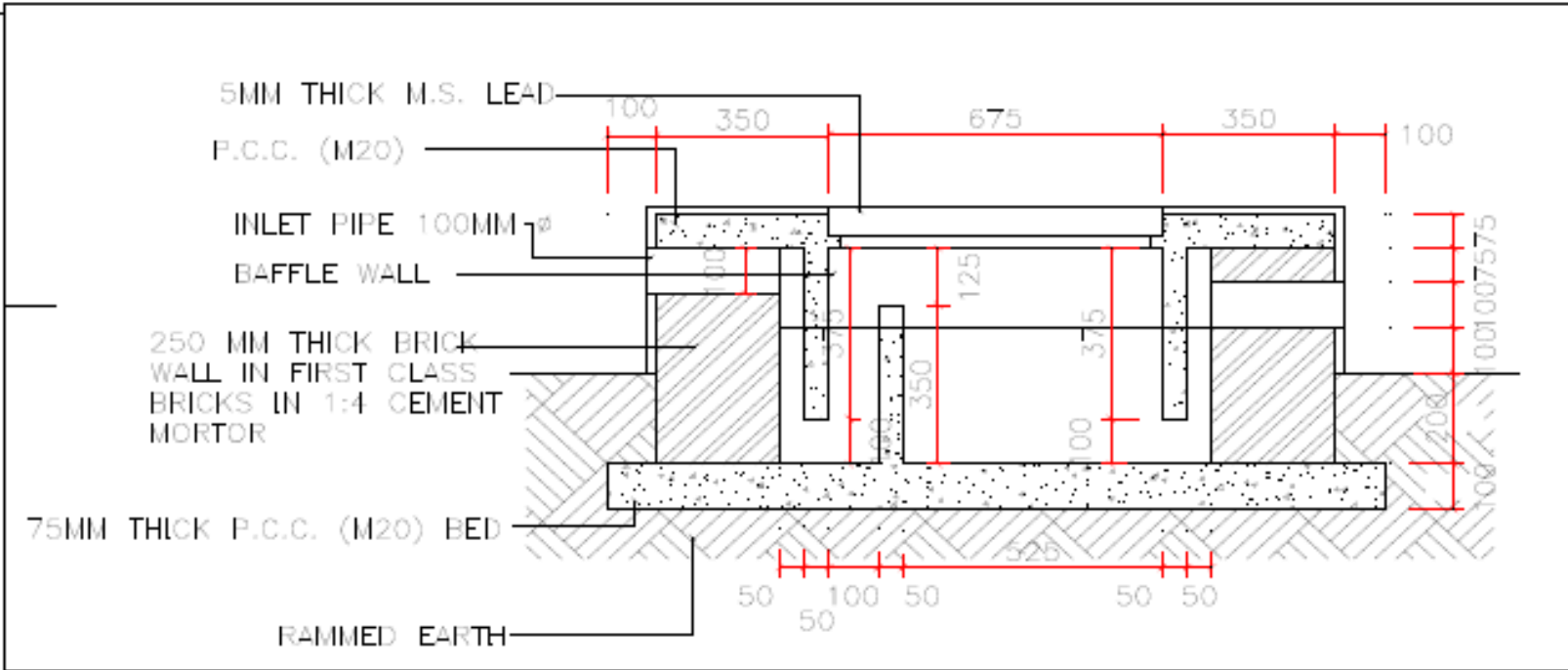


Figure : Oil and Grease Interceptor

Annexure 8 – Quarry Location

Quarry Location

Construction materials for GSB, Cross drainage & Masonry R/Wall etc. works, will be available at local quarry & Maudarh quarry at 374.00 Kmp of NH 54 and WBM, DBM & BC material from Chawilung (Khojoisuri) which is about 48.00 Km from Chhumkhum and sand from Tuichawng River & Darzokai which is about 51.0 Km from takeoff point on Lunglei Tlabung - Kawrpuchhuah road .Water Absorption and AIV of these quarries are within the limit of the Ministry's Specifications. Bitumen will have to be taken from Guwahati, steel and cement from Aizawl.

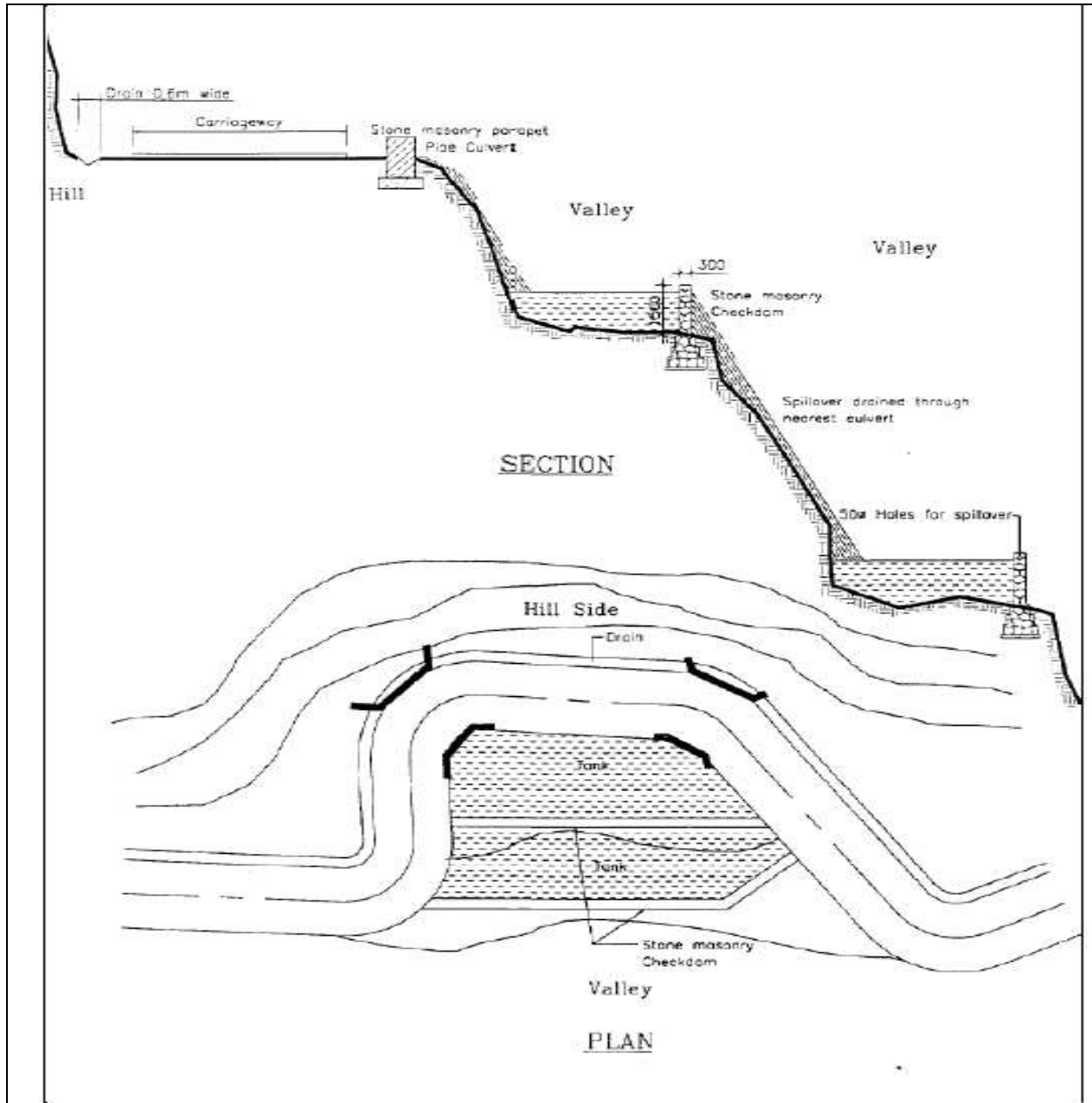
Annexure -9 List of Rivers/Nullahs on the project road

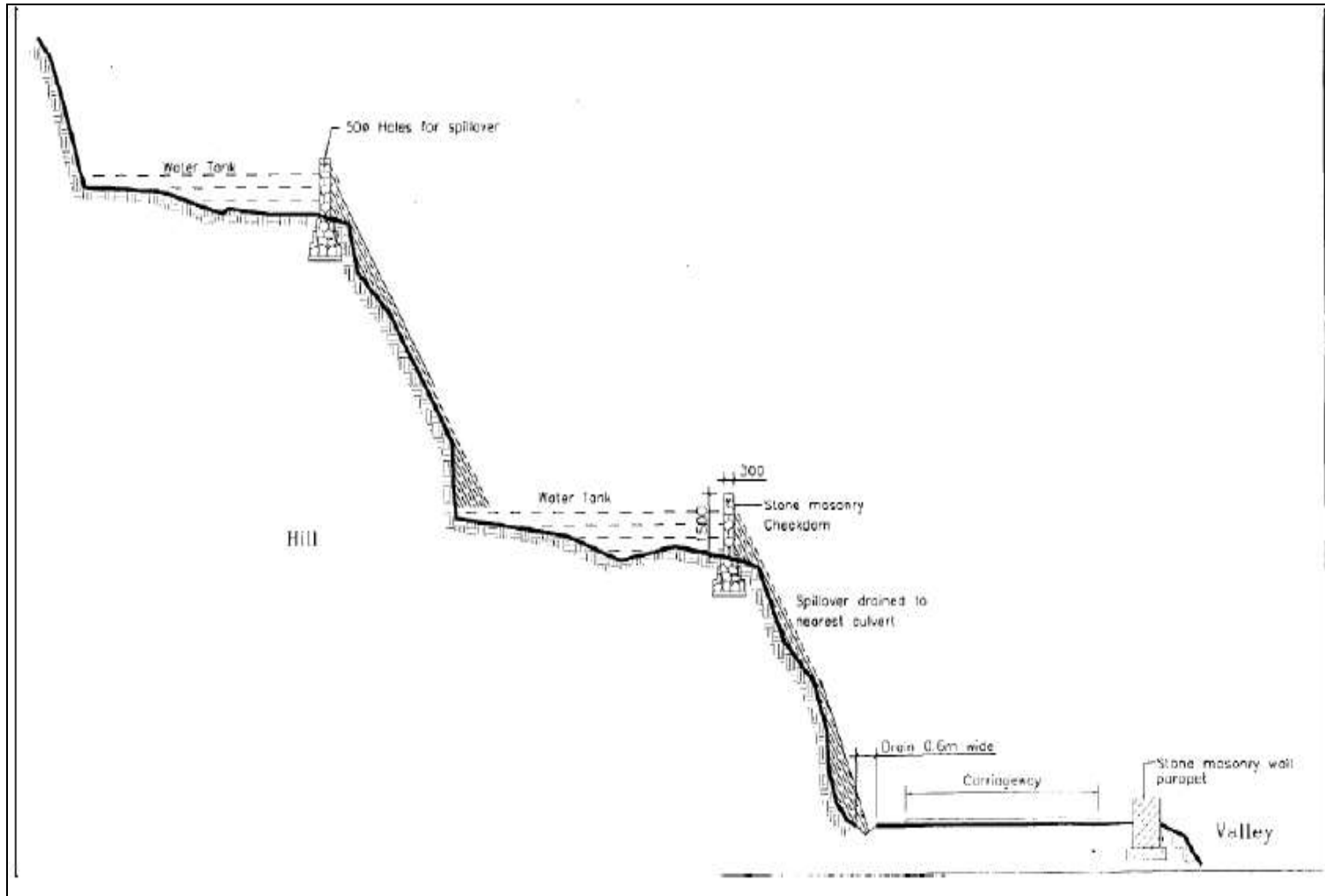
List of Rivers/Nullahs on the project road

Location in Km (Existin LTK chainage) road	Name of River
77+750	Rulpui lui
81+670	Moriskata Lui
87.351	Karnaphuli nallah

Annexure -10 – WATER HARVESTING STRUCTURES

Valley side





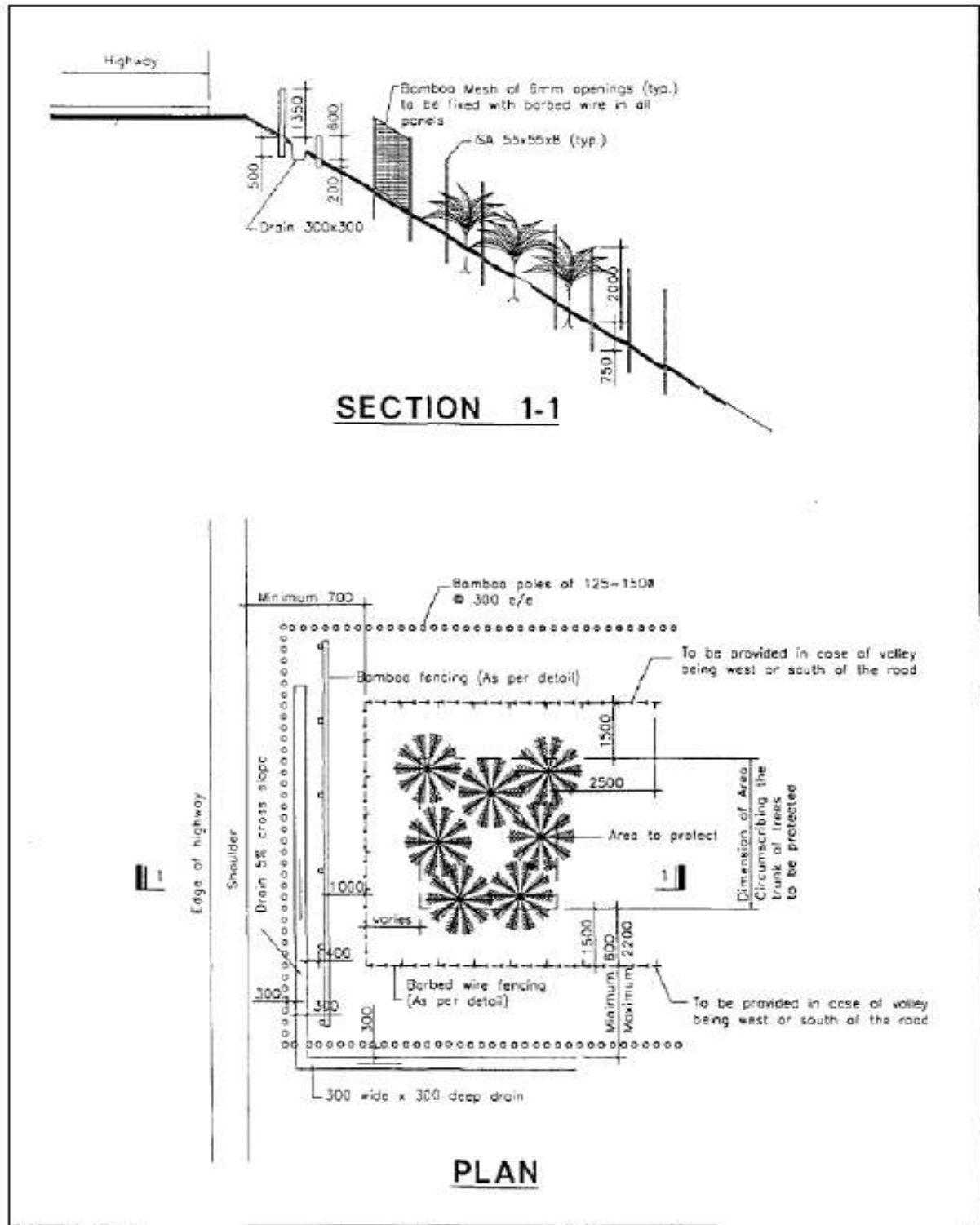
Water harvesting structures hill side

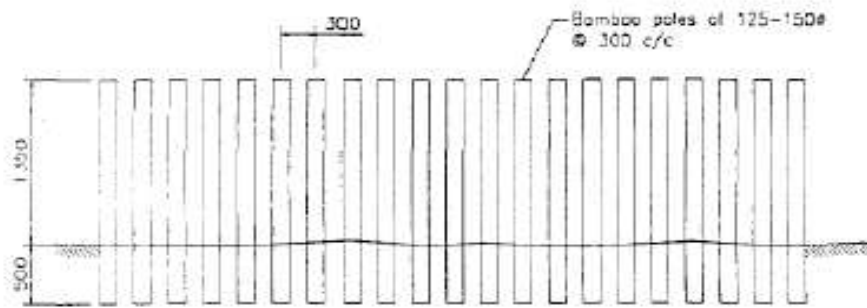
Annexure -11 – Blasting Locations

Tlabung village: 74.600-75.100 (Existing chainage LTK road)

Blasting is needed in those locations for widening and other construction works.

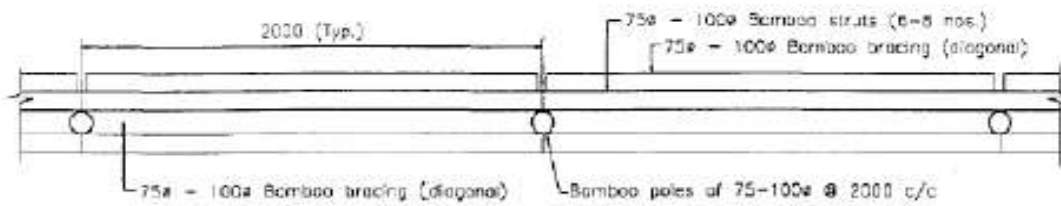
Annexure -12 TREE PROTECTING STRUCTURES AND BARRIERS



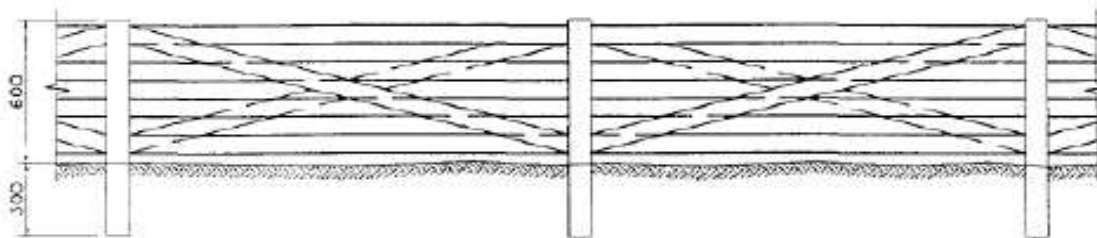


ELEVATION

(Outer Most Row)

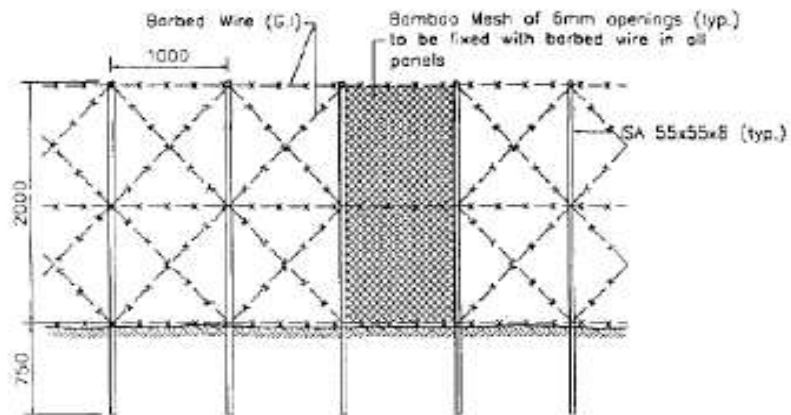


PLAN



ELEVATION

(Intermediate Row)



ELEVATION

(Inner Most Row)

Annexure -13: Bioengineering



ENVIRONMENTAL GRIEVANCE REDRESSAL MECHANISM

GRIEVANCE REDRESSAL

The main objective is to provide a step-by-step process of registering and addressing the environmental grievances. It is expected that this mechanism will ensure redress to the aggrieved party. The local people will have access to the committee, which will function throughout the project period and in defect liability period. The procedure for Grievance Redressal is outlined in Figure 14.1.

RESPONSE TIME

The environmental Grievance Redressal Cell (GRC) will hear grievances once in 15 days. Since the entire resettlement process has to be completed before the road construction is disturbed by public or it reaches to pollution control board, the GRC may meet more than once in every 15 days depending upon the number of such cases. The GRC will inform the concerned affected person / group of their decision within 15 days of the hearing of grievance.

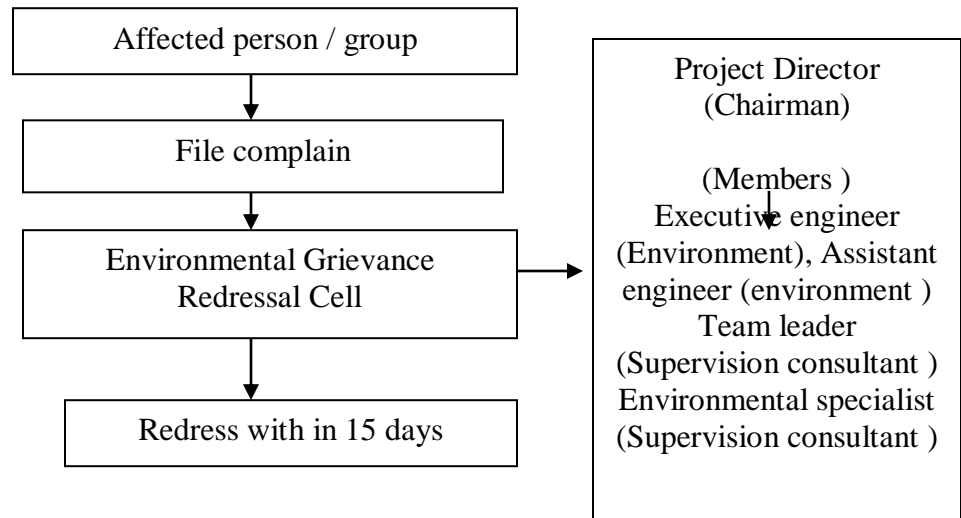


Fig 14.1 ENVIRONMENTAL GRIEVANCE REDRESSAL PROCEDURE