

EXECUTIVE SUMMARY

0.1 INTRODUCTION

National Highway Authority of India (NHAI) has been entrusted to implement an ambitious plan on development of various national highway corridors for augmenting their capacity adequately for safe and speedy movement of traffic taking into account the traffic growth in such corridor in future decades. Such network of good national highways is projected to be the minimum basic requirement of providing a level playing field for the producers and manufacturers in different regions of the country. The project of 2 lane with paved shoulder of Jowai town to Assam/Meghalaya section (km 69.2 to km173.200) of NH-44 in the state of Meghalaya is part of National Highways Development Phase III Programme. NH-44, which takes off from NH-40 at Shillong passing through Jowai and Silchar, enters Tripura and goes up to Agartala. This National Highway is thus a lifeline for Tripura State and touches international border.

0.2 DESCRIPTION OF THE PROJECT

The project road takes-off after Jowai town, at a Chainage km 69.200, and ends, at km 173.200 near Assam/Meghalaya border (Total Length is 104 km). The project road traverses through the settlements, of Khlerihat, Ludrambai, Wapung and Mynkere, Sonapur falling in the district Jaintia Hill of Meghalaya State, the stretch of the project road passes through hilly terrain having a general height of 100 m to 1600 m above MSL through the district of Jaintia Hills, which is a part of eastern side of Meghalaya. Quite a few settlements are thickly populated and there is no land available for widening.

The proposed improvement will aim at improving riding quality, and journey speed and reducing traffic congestion on the highway. The options of concentric widening and left or right side widening have been considered for the improvement project so as to utilize the existing right-of-way (ROW) as far as possible and minimize acquisition of additional land. However, land acquisition will be required through entire stretch.

Table Es 1: project Interventions

Sl.no	Features	Existing	Proposed
1	Right of way	10 to 12m in hilly terrain; 15 to 17m in rolling	20m
2	Carriageway	2- lane carriageway with width of 6.45 to 8.3m.	2- lane carriageway of 7m with 1m paved shoulder on hill side and 1.5m paved plus 0.5m granular shoulder on valley side.
	Junctions	Minor-29	Up-gradation
3	Bridges: Major	4	1 reconstruction; 3 repaired
	Minor	35	1 reconstruction 34 to be repaired
4	Culverts : Pipe	50	10 to be reconstructed 40 to be repaired
5	Slab/ RCC slab	391	85 to be reconstructed 306 to be repaired
6	Drainage	Masonry drain – 68.716 km	Unlined drain -74.8 km Stone masonry drain -3.36km
7	Slope	Masonry retaining	• Retaining walls and breast walls-

	protection	wall- 11.59km, Breast wall- 501m Gabion wall - 57.5m length	20.49 km (2 to 7m ht.) <ul style="list-style-type: none"> • Extension of 5m wall- 4.63 km • Gabion wall of 2m ht- 2.98 km • Gabion wall at slope protection work- 385m • 3.06 km by installing synthetic erosion control mat etc. and rock bolts. (Slope protection measures will be taken as per IRC:56-1974)
8	Bus stop	Nil	17 at 10 location
9	Toll plaza	Nil	2
10	Truck parking	Nil	1
11	Way side Amenities	Nil	2

0.3 METHODOLOGY ADOPTED FOR EIA

Environmental Impact Assessment (EIA) is the processes in which environmental factors are integrated in to the project planning and decision making so as to achieve ecologically sustainable development. Best practice EIA is to identify environmental risks, lessens conflict by community participation and minimizes the adverse environmental effects. This has to consider all environmental parameters that are likely to be impacted by a project. Such parameter may be physical, biological, Socio-economic and cultural.

The process had involved Screening ; Scoping (Finalization of Terms of Reference at this stage by Expert Appraisal Committee, MoEF); Preparation of Draft EIA report along with Impact analysis, mitigation measures, Environment monitoring and management plan; Public Consultation (present stage); preparation of final EIA report; Appraisal by the EAC and then approval to the project if found environmentally sound.

The Environmental Management and monitoring plan is developed along with cost provision, on the basis of potential impact analysis and possible mitigation measures, to monitor implementation of mitigation measures on ground and provides detailed time schedule and duration of monitoring measures. In developing the EIA/ EMP report, the EIA Guidance Manual – Highway by MoEF has been duly followed.

0.4 REGULATORY FRAMEWORK

Review of the existing legislation, institutions and policies relevant to the Environmental Impact Assessment at the National and State levels has been done and clearance requirements for the project at various stages of the project have been identified.

The proposed rehabilitation and upgradation of NH 44 is between km 69.200 to km 173.20 for a length of 104 km. In terms of the provision of Ministry of Environment and Forests 2006 notification and subsequent amendments, this project is classified as a category ‘ A’ project” and requires Environmental clearance for execution since the project requires an additional right of way greater than 20m and length is more than 30 m. It falls within 10 km of Interstate boundary (Assam / Meghalaya) and hence ‘General Condition’ applies. However, environmental clearance for the project stretch from Jowai km 69.200 to Sonapur (km139.050) is already obtained (File No: 5-15/2008-1A-III dated 10th December 2008) for four lanning with 4 bypasses.

Other requirement of obtaining the clearances from authorities at the state level for the project is indicated in **Table Es 2**.

Table Es 2: Clearance requirement for the present project

Sl. No.	Activity	Statutory Authority	Relevant Statute
1	Setting of hot mix plants, crushers and batching plants	Meghalaya State Pollution Control Board	Air (Prevention and Control of Pollution) Act, 1981 and the Noise Pollution (Regulation and Control) Rules, 2000
3	Establishment of workers camp, equipment and storage yards	Meghalaya State Pollution Control Board	Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989
4	Storage, handling and transport of hazardous materials	Meghalaya State Pollution Control Board	Hazardous Waste (Management and handling) Rules, 1989 and Manufacturing, storage and Import of Hazardous chemical Rules, 1989
5	Waste water discharge from labour camps	Meghalaya State Pollution Control Board	Water (Prevention and Control of Pollution) Act, 1974
6	Opening up new quarries	Department of Mining, Govt. of Meghalaya	Environment (Protection) Act, 1986
7	Tree cutting permission	Forest division, Jowai	Tree preservation Act , 1976
8	Diversion of forest land	Forest division, Jowai	Assam forest regulation Act 1891. The Meghalaya Forest Regulation (Application and Amendment) Act 1973

0.5 ENVIRONMENTAL SETTING

Physical Features

Climate

The project corridor lies in subtropical zone. It is per-humid (as per C. W. Thornthwaite's climatic classification) with small seasonal water deficiency. The humidity of the study area is moderate to high that varies between 30% to 80 % during the months of October and August respectively. The average rainfall ranges between 2,000 and 4,000 mm. The mean summer temperature rises as high as 26°C and mean winter temperature falls down to 9°C. At times it drops below freezing point. The mean annual soil temperature at higher elevations is less than 22°C but it is higher than 15°C; at lower elevations, it exceeds 22°C.

Topography

The state represents ancient plateau of Precambrian Indian peninsular shield. The altitude varies between 100 to 3000 m above MSL. For initial 35 kms it has gentle slope ranging from 16° to 15° and rest of the stretch varies from 20° to 45°.

Geology

The rock types exposed along NH-44 between Jowai (km 63) to Assam Border (km 173.00) belongs from Archeans to Tertiary group of rocks. The lithological distribution along the road section is submitted in **Table Es.3**.

Table Es. 3: Table Showing Lithological Distribution of Rock Units

Section	Chainage (km)		Total (km)	Rock Types	% wise Distribution
	From	To			
I	64	73	9.0	Gneissic Rock with Schist	8.4
II	73	88	15	Sand Stone with quartzite and shale (without coal seam)	14
III	88	123	35	Sand Stone and Shale (with coal seam)	32.7
IV	123	139	16	Lime stone with shale	15
V	139	171	32	Thinly bedded shale with sand stone and clay stone	30

The major structural features seen in the area are Dauki fault (km 140) and Boraghat faults (km 131). Dauki fault separates sand stone and clay stone of Brail group with rocks of Jaintia group near Sonapur. The Boraghat fault separates the rocks of Brail formation with sand stone of Sylhat formation. The structural features used for hazard zonation mapping includes, beddings, joints and foliation.

Land slide hazard zone mapping

Mapping has been done based on Landslide Hazard Evaluation Factor (LHEF) Rating Scheme to assess the risk of landslide. It is based on major inherent causative factors of slope instability, lithology, structure, slope morphometry, relative relief, land with soil cover and ground water conditions. 28 such locations have been identified along the project road.

Surface water resources and quality

Two major rivers viz. Lubhaa River, Baleshwar river and seasonal streams viz. Muksa, Motaiya, Narpur, Tamung, Umjrun, Tongsheng, Umprushung, Apha are crossed by the project road. Monitoring has been done at four locations viz. Muksa in Ladrymbai, stream in Mumdihatti, Lubha river and Baleshawar river. Biochemical oxygen demand for all samples are >3mg/l (Water quality Criteria Below C as per CPCB standards). In terms of total coliform its less than 500 and falls in Water quality criteria B. E-coli is absent in all samples. The water quality is fair in all the locations and mainly because they are flowing water bodies.

Ground water resources and quality

Depth to ground water table is 2.49 to 3.99 mbgl in pre- monsoon and 1.5 to 1.7 m bgl in post monsoon. Stage of ground water development is only 0.16% which leaves a greater scope for ground water development and hence no requirement of provisions for ground water recharge. There are 8 hand pumps, 16 water taps and 1 tank in the project corridor within 5 to 9 m of center line. The water samples are deficient in iron (<0.3 mg/l desirable limit), fluoride (<1 mg/l desirable limit), chloride ranging from 13 to 22 mg/l (< 250 mg/l desirable limit). Water quality in all the location is fair with dissolved oxygen around 6.8 mg/l.

Air Quality

Air quality was monitored at six locations in the project corridor. The monitoring station comprises rural, urban and suburban areas. At all these location all the parameters were within permissible limits. 90 percent of time PM 10 is < 75.44 µg/m³ and PM 2.5 is < 39 µg/m³ and are on the higher side due to the presence of coal depots along the road.

Noise Quality

Noise level was monitored at six locations truly representative of the site. At two locations monitoring has been done on both side of road simultaneously. The noise levels near

Ratacherra primary school (sensitive location) is higher by 2 dB(A). Near church in Thangskai village its more by 2.9 dB (A) than Day time permissible limit and within limit at night time. In Sonapur and Umkiang it exceeds by approximately 5 dB(A) in the day time.

Ecological Resources

Protected site / Notified forest / wildlife area

The project road passes through Narpuh Reserve forest from Lubha Bridge at km141.500 to km 145.00 (Block -I) and km 160.00 to km 167.100 (Block -II). Forest land proposed to be diverted is 2.805 ha. The project road does not pass through any wild life sanctuary. Also no site or monument notified by Archeological survey of India does exist within 10 kms of the project road.

Flora

Roadside vegetation all along the stretch varying id densities and composition represents the major ecological component of the project corridor. The girth size class distribution also indicates that there is a considerable difference in distribution of age classes. The most common species is pine and others include Kseh, Ngan, Lakhar, Salynda, Sochram, Diengkseh, Kwai, Talong, Jympa, Kathol, Cham etc. The vegetation not only provides fruits, flowers, fuelwood and small timber for the roadside communities. This is also the habitat of common birds of the region. No endangered floral species does exist within the project corridor. A total of 3450 trees have been identified as likely to be cut including both in forest and non- forest areas.

Fauna

The species found here are - Hoolock - the only tailless ape in India, Golden Cat, Leopard Cat, Jungle Cat, Large Indian Civet, Binturong or Bear Cat, Himalayan Black Bear, Barking Deer, Pangolin.

0.6 PUBLIC CONSULTATION

The consultation process established for the project has employed a range of formal and informal consultative tools including in depth interviews with likely key informants, focus groups discussions (FDGs), onsite consultation and meetings. The enactment of the participation and consultations with the stakeholders was done at various levels throughout the project preparation stage. District level consultation shall be carried out involving NHAI, PWD and the concerned state organizations such as the State Forest Department, State Pollution Control Board, Department of Fisheries etc. Village level consultations were held in rural, suburban and urban areas along the corridor of impact of the project road to inform people about the purpose and preliminary design of the project. Such consultations provided means to get the opinion of the people and their issues of concern. Village/local level consultations were held at selected locations. The consultation session are proposed to be continued during the implementation and monitoring stages of the project.

Public consultation revealed that roadside communities use the road extensively for their requirement. So local people in the immediate neighborhood have an interest in widening of the road but they had some reservation in case this results in excessive dislocation of people and properties. Issues like compensation, drainage problem, safety, impact on roadside vegetation, compensatory plantation and water bodies etc raised by a people during consultations have been taken into consideration while devising mitigation measures.

0.7 ANALYSIS OF ALTERNATIVES

There has been a conscious decision to stick to the existing alignment while undertaking the proposed rehabilitation and upgradation work. To reduce damages to roadside vegetation and to keep down the level of dislocation of people and properties the option of semi-concentric and eccentric widening was exercised all along the alignment. Analysis of alternatives has been carried out for scenarios "with or without the project" on the existing alignment. The "With project scenario" has been further analyzed through

ranking and matrix method in two parts viz. without mitigation measures and with mitigation measures. Total scores achieved were -1820 and +1685 respectively.

0.8 ASSESSMENT OF ENVIRONMENTAL IMPACTS

Table Es. 4 Potential Impacts and Mitigation Measures

Environment al Concerns		Mitigation Measures	Locations
Surface water channels and ground water aquifers	<ul style="list-style-type: none"> • Rivers and streams may get affected due to siltation, oil spills during construction. • Road runoff with grease/ oil, hydrocarbons and metallic ions may into the water channels during operation • In both cases it may also contaminate ground water 	<ul style="list-style-type: none"> • Construction work and location of plant and machinery near water bodies will be avoided. • Construction of Oil and grease interceptors refueling platforms • An enhancement plan to be prepared for the protection of springs and water fall • All waste arising due to project activities will be disposed of in designated areas identified by the supervision consultant during implementation, as per State Pollution Control Board norms • Packaged sewage treatment system shall be used in the labour camps • Silt Fencing & sediment traps. • Water quality monitoring plan • Construction of bridges in lean season • Cofferdams for deep foundations • Appropriate drainage design • Natural drainage shall be maintained • 74.8 km of unlined drain and 3.36km of stone masonry drain has been proposed that will take care of the runoff; recharge pits shall be provided wherever feasible and let the water pass through oil/ grease interceptor. 	At all water bodies near the work front.
Air pollution	<ul style="list-style-type: none"> • Fugitive and gaseous emission may increase during construction and will be temporary • Emission from plying vehicles during operation 	<ul style="list-style-type: none"> • Construction camps shall be at 1000m down wind direction from the settlements • Construction machinery will be fitted with dust extraction units. • All vehicles delivering materials to the site will be covered to avoid spillage of materials. • All vehicles, equipment and machinery used for construction 	Throughout the Project Corridor at places where construction machinery will be sited

Environment al Concerns		Mitigation Measures	Locations
		<p>will be regularly maintained to ensure that the pollution emission levels conform to the SPCB norms.</p> <ul style="list-style-type: none"> During operation by improving intersections; by removing traffic bottlenecks; by maintaining a steady stream flow of traffic 	
Noise Pollution	<ul style="list-style-type: none"> Increase in noise due to construction activity but would be for short term During operation period due to increase in traffic 	<ul style="list-style-type: none"> The plants and equipment used in construction will strictly conform to the GoI noise standards. All vehicles and equipment used in construction will be fitted with exhaust silencers. The noise from the equipment must comply with the relevant legislation for levels of sound emission. Workers in vicinity of loud noise, and workers working with or in crushing, compaction, concrete mixing operation will wear earplugs. All activities pertaining to procurement, storage, transport and handling of explosives and subsequent blasting will be carried out as per the statutory Indian Explosives Act 1984. Cutting will be restricted only to daytime hours. Prior information of blasting operational times (if any) shall be given to people living near such blasting sites. Construction activity shall not be carried out at night Camps shall be 1000m away from settlement Signage, speed barriers to be provided at sensitive areas like schools, hospitals. Slope correction and improved geometry will help in reduction of noise. 	<ul style="list-style-type: none"> Construction sites and camps; site where cutting would be carried out Sensitive land uses like schools and hospitals will feel the exposure more
Landslide	1.8 lakh m ³ of hard and soft rock cutting is involved for 150 to 200mm lateral depth on the hill	<ul style="list-style-type: none"> Retaining wall of 20.49 km has been proposed along with extension of 5m height wall for 4.63 km. Gabion wall of 2 m height for 2.98 km and that at slope protection work for 385m 	Landslide prone zones as

Environment al Concerns		Mitigation Measures	Locations
	side of road	<p>length have been proposed. Slope protection work has been proposed for a length of 3.06 km</p> <ul style="list-style-type: none"> Cut material shall be used in filling on road side or in rehabilitation of borrow areas 	<p>identified</p> <p>Areas involving hill side cutting</p>
Soil	<ul style="list-style-type: none"> Contamination of Soil and ground water from fuel and lubricants Compaction of Soil (Moderate to light compaction may lead to reduced water loss and help in plant growth. Heavy compaction that may happen due to stationed and moving machineries may impede root growth and intake of water and nutrient) Soil Erosion 	<ul style="list-style-type: none"> Vehicle/ machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Soak pits along with oil and grease traps will be provided around fuel storage areas. In all fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after cessation of such storage and refueling activities. Haulage route creation shall be kept to minimum Turfing on embankments and slopes for 52.59 Ha Slope protection measures will be taken as per IRC:56-1974 	<ul style="list-style-type: none"> At identified locations near construction site Haulage route locations
Vegetation/ flora	<ul style="list-style-type: none"> Micro climatic changes i.e. Increase in temperature Slope instability conversion into paved surface No endangered species 	<ul style="list-style-type: none"> Through proper re-alignment to minimize cutting of trees. Compensatory afforestation @1:2 in terms of land in the forest area and 1:1 in non- forest area. Turfing of slope for 52.59 Ha 	Comparatively more in the reserve forest and hilly stretch
Wild life/ Fauna	<ul style="list-style-type: none"> No wildlife corridor identified No Scheduled species 	<ul style="list-style-type: none"> Loss or injury to wild animals by speeding traffic is therefore a remote possibility. 	
Cultural/comm	<ul style="list-style-type: none"> 318 structures may get 	<ul style="list-style-type: none"> Compensation and assistance as per NHAI Act 1956 	Along built up

Environment al Concerns		Mitigation Measures	Locations
unity structures	<p>affected (299 private)</p> <ul style="list-style-type: none"> Out of 318 , 205 are wooden structure, 50 are semi pucca, 5 pucca, 12 thatched and 1 kutcha structure Affect livelihood of people Loss of residence Impact on water extracting structures (hand pump/ tap) 	<p>(Resettlement Action Plan has been drawn in line with relevant policies and view of affected people) or as decided by the competent authority.</p> <ul style="list-style-type: none"> No structure getting affected shall go un noticed form getting compensation By realignment to avoid impact on the shrines and religious structures. Plans will be proposed for enhancement of temples and other religious structures. Water extracting structures like hand pump and taps shall be relocated in consultation with local people 	areas
Road Safety	May lead to accidents during construction and operation	<ul style="list-style-type: none"> Design improvement at curves Segregation of slow traffic in congested areas by providing service roads Provision of proper signage proper lighting arrangement to avoid accidents. Traffic management plans will be prepared for congested place. IRC:SP:55-2001 shall be followed for Safety in construction zone IRC:67-2010 for road signs and other relevant IRC guidelines shall be followed 	At all construction fronts, congested locations and at curves/hairpin bends

0.9 ENVIRONMENTAL MONITORING PLAN

Environmental Monitoring Plan ensures that the environmental mitigation measures and enhancement programme are properly implemented and the responsibility for implementation is clearly demarcated. Monitoring of environmental quality during construction and during operation reflects the success of implementation of the mitigation measures. Monitoring will be conducted by the project authority with the help of an independent monitoring organization. Monitoring parameters, locations and frequency for air, water, noise quality have been suggested. Monitoring of survival rates of plantations also has been suggested. Cost estimated for Monitoring is **Rs.1125000**.

0.10 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) is the means to ensure that the environmental quality of the zone does not get adversely impacted beyond acceptable level due to the construction and operation of the project. The plan lays down measures for three distinct phases - (a) design phase (b) construction phase and (c) the operational phase. This plan suggests mitigation measures against all identified impacts. Environmental management matrix provides detailed management measures for specified anticipated impacts and defines responsibilities of each participating organization. Mitigation and management measures have been detailed out for impacts on water bodies, roadside vegetation, slope, water /air/ noise quality, road safety, drainage as well as sanitation of labour camps.

A budgetary estimate of **Rs.228 lakhs** for environmental Monitoring and Management activities has been provided. This includes cost of mitigation measures, monitoring and training. Mitigation measures, which are part of engineering activities such as, slope stabilization, sediment /silt control, provision of cross-drainage etc. have not been included in this estimate.

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