# EXECUTIVE SUMMARY

## For

**Development of 6-Lane Access Controlled Greenfield Highway of Mohali – Sehna from Km Ch. 0+000 to Km Ch. 135+370 (Total length = 135.370 km) in the State of Punjab under Bharatmala Pariyojana Phase II (Lot-9/Package-1)**


**Project Proponent:**

**NATIONAL HIGHWAYS AUTHORITY OF INDIA**
**(Ministry of Road Transport &Highways, Government of India)**

**Environmental Consultant:**

**Centre for Envotech & Management Consultancy Pvt. Ltd., Bhubaneswar**

**Accredited by NABET (Quality Council of India)**

**for EIA studies as 'A' Category Consultant**

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# EXECUTIVE SUMMARY

## E1 INTRODUCTION

The Ministry of Road Transport and Highways (MORTH), Government of India has proposed "Bharatmala Pariyojana" an Umbrella scheme of road development project through National Highways Authority of India (NHAI), National Highway, Industrial Development Corporation Ltd (NHIDCL) and State Public Works Departments (PWD) at an estimated cost of INR 5,35,000 crores. This is the second largest highways construction project in the country after NHDP, where in almost 50,000 km of roads are targeted across the country. This project aims to improve connectivity particularly on economic corridors, border areas and to remote areas with an aim of rapid and safe movement of cargo to boost exports. International trade considered as a key aspect in this scheme have been given special focus.

The draft EIA/EMP report is prepared for Development of 6-Lane Access Controlled Greenfield Highway of Mohali – Sehna from Km Ch. 0+000 to Km Ch. 135+370 (Total length = 135.370 km) in the State of Punjab under Bharatmala Pariyojana Phase II (Lot-9/Package-1). The proposed National Highway will pass through Sahibzada Ajit Singh Nagar, Fatehgarh Sahib, Patiala, Malerkotla, Sangrur and Barnala districts in the state of Punjab.

L N Malviya Infra Projects Pvt. Ltd. (Mohali to Sirhind Stretch) and M/s Egis India Consulting Engineers Pvt. Ltd in joint venture with K & J Projects Pvt. Ltd. (Sirhind to Sehna Stretch) has been appointed as DPR Consultant by NHAI to carry out the Development of 6-Lane Access Controlled Greenfield Highway of Mohali – Sehna from Km Ch. 0+000 to Km Ch. 135+370 (Total length = 135.370 km) in the State of Punjab under Bharatmala Pariyojana Phase II (Lot-9/Package-1). Further, DPR Consultants has assigned Centre for Envotech & Management Consultancy Pvt. Ltd. a NABET accredited consultant to obtain Environmental Clearance from MoEF&CC including preparation of the Environmental Impact Assessment report and Environmental Management Plan for the above referred project.

## E2 BRIEF ABOUT THE PROJECT AND ITS LOCATION

The proposed National Highway is Green field alignment project and proposed for 6 lane carriageway width with paved shoulders. The proposed project starts from near Mohali (St. Ch. 0+000) and terminates near Sehna (End Ch. 135+370) in the state of Punjab having a total length of 135.370 Kms. The proposed National Highway project has been envisaged through an area which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel. The project will act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety and provide better transportation facilities and other facilities such as way side amenities. The salient features of the proposed project are presented in **Table No. E1** below.

## Table No E1: Salient features of the project

| | | |
|---|---|---|
| 1. | Project Road | Development of 6-Lane Access Controlled Greenfield Highway of Mohali – Sehna from Km Ch. 0+000 to Km Ch. 135+370 (Total length = 135.370 km) in the State of Punjab under Bharatmala Pariyojana Phase II (Lot-9/Package-1) |
| 2. | Location of the sub project road | The proposed project starts from near Mohali (St. Ch. 0+000) and terminates near Sehna (End Ch. 135+370) in the state of Punjab. |
| 3. | No. of Towns and Villages falling along the project road | Sahibzada Ajit Singh Nagar district : 07 villages<br>Fatehgarh Sahib District: 64 villages<br>Patiala District: 07 villages<br>Malerkotla District: 23 villages<br>Sangrur District: 10 villages<br>Barnala District: 16 villages<br>**Total: 127 villages** |
| 4. | Total design length of the project | 135.370 km |
| 5. | Total Area of Land Acquisition | Total Land Acquisition: **952.6 Ha**.<br>Private Land: 826.4 Ha.<br>Government Land: 119.25 Ha.<br>Forest Land: 7 Ha. |
| 6. | Terrain | Plain/Rolling |
| 7. | Seismic Zone | Zone IV |
| 8. | Geographical Location | Start Location: 30° 40' 2.97" N 76° 40' 25.42" E<br>End Location: 30°24'41.91" N, 75°20'15.65"E |
| 9. | No. of Existing Bridges | Major Bridges – 07 Nos.<br>Minor Bridges – 21 Nos. |
| 10. | Total Culverts | 184 Nos |
| 11. | Right of Way | 60 m |
| 12. | Carriageway | 22 m |
| 13. | Safety Measure | Lighting all along including High Masts at Toll plazas, interchanges, major bridges / ROB's and Amenities and Truck Parking Areas |
| 14. | Total Capital Project Cost / per km (including Civil, LA, R&R, Utility Shifting and Forest, Environment) | Rs 6332.07 Cr / 46.88 Cr (approx.) |
| **Environmental & Social Features** | | |
| 15. | Forest Land Diversion | 7 ha. |
| 16. | Water bodies Impacted | 10 Nos. of Canals, 01 No. of Nallah and 04 Nos. of Nali/Drains |
| 17. | Existing trees within ROW | Approx. 2582 nos. of trees |
| 18. | Compensatory plantation | Approx. 1,99,680 nos. of trees will be planted at |

| | | |
|---|---|---|
| | | Minimum 2 nos. of row, (@10 m distance) of trees on either sides of the proposed highway |
| 19. | Green belt development | As per IRC SP 21:2009 / MoRTH Code / Guidelines |

## E3 DESCRIPTION OF ENVIRONMENT

**Study Area:** The base-line data has been collected for Core Zone [Corridor of Impact (COI)], an area covering 500 m on both sides of the proposed alignment and 10 km buffer zone for prominent environmental attributes like Ambient Air quality, Noise Level, Water quality and Soil profile. Primary and Secondary data has also been collected for other environmental attributes for the preparation of EIA/EMP report. The baseline study for the project was conducted during the months from October 2021 to December 2021 (Winter Season).

**Baseline Study**: The findings of the baseline environmental status on land (topography, geology, soil quality, land use pattern), meteorology (Temperature, Relative Humidity, rainfall, wind speed, wind rose), air (ambient air quality- $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_X$. and CO), water (surface & ground water), noise level, ecological environment (terrestrial and aquatic flora & fauna), socio-economic conditions (demographic profile and households condition) were presented and interpreted with reference to environmental standards.

**Meteorology:** The study area is located in Sahibzada Ajit Singh Nagar, Fatehgarh Sahib, Patiala, Malerkotla, Sangrur and Barnala districts in the state of Punjab. The climate of project districts can be classified as tropical steppe, hot and semi-arid which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrates into the district. There are four seasons in a year. The hot weather season starts from mid-March to last week of the June followed by the south west monsoon which lasts upto September. The transition period from September to November forms the post-monsoon season. The winter season starts late in November and remains up to first week of March. The wind rose diagram has been prepared for the IMD station (Patiala) indicating wind speed and pre dominant wind direction along with Temperature Profile, Humidity, Pressure and the data is used in impact prediction.

**Air Environment:** Ambient air quality monitoring has been done at 11 locations. Specific station-wise Ambient Air Quality (AAQ) data for $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_2$ and CO as recorded during the months from October 2021 to December 2021**.** The minimum and maximum values of $PM_{10}$, $PM_{2.5}$, $So_2$, $NO_2$ and CO analyzed along the proposed project highway are 72.3 ($\mu g/m^3$) to 99.6 ($\mu g/m^3$), 36.2 ($\mu g/m^3$) to 59.4 ($\mu g/m^3$), 5.0 ($\mu g/m^3$) to 32.4 ($\mu g/m^3$), 11.3 ($\mu g/m^3$) to 42.7 ($\mu g/m^3$) and 0.29 ($mg/m^3$) to 1.57 ($mg/m^3$) respectively. All the parameters have been analyzed and show that all the parameters are well below the National Ambient Air quality standards, 2009.

**Water Environment:** The development of any region is based on the availability of sufficient water resources, as developmental activities require water for irrigation, domestic and other

purposes. 08 Ground water samples and 06 surface water samples of canals have been taken along the proposed project highway. The pH in Ground water varies from 7.11 to 8.31, TDS varies from 221– 338 mg/l, EC at 25$^{o}$C varies from 368.33 - 573.54 us/cm and Total Hardness as $CaCO_3$ varies from 112 – 174 mg/l whereas in Surface water samples pH varies from 7.18 to 8.32, TDS varies from 94– 192.4 mg/l, Faecal Coliform varies from 112 - 121 MPN / 100 ML and Total Coliform varies from 318 – 345 MPN / 100 ML. All physical and general parameters were compared with the desirable and permissible limits as per IS10500:2012 for ground water and it is interpreted that all results are within Permissible limits and water can be used for drinking purpose.

**Noise Environment:** Ambient noise level monitoring has been done at 11 locations along the proposed project highway. The hourly recorded noise level at various locations in the study area shows fluctuations because of change in traffic movement, construction activities and other man-made sources. The noise levels varies from 49.4 to 64.6 dB (A) during daytime and whereas during night time the noise level varies from 36.6 dB to 53.9 dB (A), which are within the prescribed norms as defined in Noise standards, 2000.

**Soil Environment:** Soil sampling has been done at 10 locations near to the proposed highway. The pH of the soil samples ranged from 6.98 to 7.96 during the study period, indicating that soils are slightly neutral to alkaline in nature. The soil Electrical Conductivity (EC) also varies from 156 umho/cmto 266 umho/cm. These parameters indicate that soils are neutral in reaction and having average EC. The moisture content in the soil samples ranged from 1.68 w/w to 8.6 w/w, Nitrogen content ranges from 345.2 kg/ha to 578.4 kg/ha, Bulk density ranges from 1.29 to 1.48 gm/cm$^3$ and Zinc content ranged from 34.1 mg/kg to 45.6 mg/kg during the study period. Based on soil analysis data it is concluded that soils are rich in nutrient. The availability of Nutrients for the plant growth in the study area is good**.**

**Ecological Environment:** The forest crop is dominated by the species Popular, Eucalyptus, Shisham (*Dalbergia sissoo*), Kikar (*Acacia nilotica*), Mulberry (*Morus alba*) etc. The forest in Ludhiana conforms to the category of 5B/C2 Northern Dry Mixed Deciduous forests as per classification of Champion and Seth. The major fauna species present in the study area are Snakes, Jackal, Indian fox, Small Indian Mongoose, Wolf, Jungle cat etc. The detail list of flora and fauna in the project area has been provided in EIA/MP report.
The proposed alignment does not pass through any Wildlife Sanctuary/National Park and its eco sensitive zone.

**Socio Economic Environment:** The primary purpose of socio-economic analysis is to provide an overview of the State's, socio-economic status and the relative status of the Project Influence Area (PIA) within the State.

The proposed project passes through Sahibzada Ajit Singh Nagar, Fatehgarh Sahib, Patiala, Malerkotla, Sangrur and Barnala districts in the state of Punjab. Punjab is home to 2.30% of India's population; with a density of 551 persons per km$^2$. According to the provisional results of the 2011 national census, Punjab has a population of 27,743,338, making it the 16$^{th}$ most populated state in India out of which male and female are 14,639,465 and 13,103,873 respectively. 32% of Punjab's population consists of Dalits.

## E4 IMPACTS AND MITIGATION MEASURES

The potential impact and their mitigation measures have been presented in **Table No. E2** below.

**Table No. E2 :- Potential impact and their mitigation measures suggested for the proposed project**

| S. No. | Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|---|
| 1. | Topography and Soil | • Cut and fill operations during road construction | • The alignment passes through plain/rolling terrain and no substantial cut and fill operations are planned. |
| | | • Borrow earth | • Borrow soil will be procure from approved quarry.<br>• IRC guidelines will be followed during excavation |
| | | • Quarries | • Operational and government licensed quarry have been identified, which will be used to procure the material |
| 2. | Air environment | • Generation of Dust | • Sprinkling of water at:<br>• Earth handling site<br>• Borrow area<br>• Road construction site<br>• Air pollution control at stone crusher<br>• Provision of PPE for workers<br>• Stone crushing units environment compliance<br>• Regulation of construction timings near sensitive receptors and settlements |

| S. No. | Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|---|
| | | • Gaseous Pollution | • Vehicles and machineries will be regularly maintained to conform to the emission standards.<br>• Asphalt mixing sites should be 1 km away from residential area.<br>• Asphalt plant will be equipped with pollution control equipment.<br>• Use of PPE by workers engaged in construction and application of asphalt mix on road surface.<br>• Responsibility of contractors and supervising officers to ensure that the workers use the PPE. |
| 3. | Noise environment | • Increase in Noise level during construction phase | • Properly maintained equipment's to be used<br>• Noise levels of machineries used shall conform to relevant standard prescribed in Environment (Protection) Rules, 1986.<br>• Ear plugs and muffs will be used by workers as per requirement during construction activities.<br>• Regulation of timing of construction work generating noise pollution near the residential areas. |
| 4. | Water environment | • Drainage pattern<br><br>10 Nos. of Canals, 01 No. of Nallah and 04 Nos. of Nali/Drains will be impacted due to the proposed National Highway. | • Provision of proper drainage through culverts along the proposed National Highway.<br>• All the water bodies should be provided with bridges and structures without affecting their original course and flow<br>• Stabilization and turfing of slopes along the water bodies.<br>• At 06 Canals, 10 Drains, 01 Stream, and 15 Distributaries are going to be affected. Protection with boulder pitching has been proposed to minimize the impact. |

| S. No. | Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|---|
| | | • Siltation of water bodies | • Silt fencing around water bodies during construction to avoid silt laden runoff entering water body<br>• Turfing or pitching of embankments of water bodies affected will be done where possible to prevent erosion that causes siltation.<br>• No solid waste will be dumped in or near the water bodies or rivers. |
| | | • Flooding due to siltation of drainages channel | • Excavated earth and other construction materials should be stored away from water bodies |
| | | • Water for construction | • Water source would be selected so that local availability is not affected |
| | | • Rainwater harvesting | • Rainwater harvesting drains will be provided along the road side |
| | | • Contamination from wastes | • Provision of septic tanks to prevent any untreated sewage discharge from construction workers camps<br>• Oil interceptors at construction machine maintenance yards |
| | | • Contamination from fuel and wastes | • Vehicle maintenance will be carried out in a confined area, away from water sources, and it will be ensured that used oil or lubricants are not disposed to water courses |
| | | • Sanitation and water use in construction camps | • Construction camp will be organized in a planned manner.<br>• Proper sanitation facilities will be provided including toilets.<br>• Camps will have separate water supply facilities so that local water sources are not affected<br>• Adequate water should be provided to the camps for drinking and domestic use |
| 5. | Land environment | • Loss of topsoil | Topsoil on stripping shall be removed and stockpiled on sides to be used on the side slopes, for top cover of borrow areas and for plantation in pits |

| S. No. | Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|---|
| | | • Loss of topsoil from borrowing | Arable lands will be avoided for earth borrowing. If needed, topsoil will be separated and refilled after excavation |
| | | • Borrowing of fill materials | Excavation from pre-selected locations. After excavation, the borrow pits will be dressed to match with the surrounding. |
| | | **Loss of Land**<br>• As per available data, it is observed that total land acquisition is 952.6 ha. | The compensation to project affected persons will be paid as per the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, National Highways Act (NH Act), 1956 and relevant Acts and guidelines of Government of India and rules of concerned state government. |
| | | **Loss of structures**<br>So far as the type of dwelling structures are concerned approx. 200 nos. (Mainly pump houses) are coming under within alignment. | |
| | | **Loss of Common Property Resources (CPRs)**<br>Few CPRs structures (Temples/Gurudwara and boundary wall of the Gurudwara) fall within proposed alignment. | Relocation of CPRs will be done in consultation with the locals and relocation will be completed first before dismantling the existing structures of CPRs. |
| 6. | Ecological resources | • Loss of approx. 2582 nos. of trees | Minimum 2 nos. of row, (@10 m distance) of trees on either sides of the proposed highway.<br>Green belt development along proposed National Highway. Plantation of about 1,99,680 trees (three row plantations on either sides of the proposed National Highway) proposed. Shrub plantation and grass carpeting in |

| S. No. | Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|---|
| | | | median is also proposed. |
| 7. | Impacts on wildlife | • Avoidance of Road by Animals<br>• To avoid Injury and Mortality of animals | • Different type of underpasses/culverts is proposed to be constructed for animals to cross the National Highway.<br>• Different types of underpasses like Box culverts, pipe culverts, and culverts with furniture will be constructed for passage of herpetofauna, amphibians etc. |
| 8. | Public health and occupational safety | • Safety to public | Signs will be posted on highway before construction areas informing public about the work and safety provisions. |
| | | • Restriction to Access | Safe and convenient passage for vehicles and pedestrians will be arranged during construction work |
| | | • Occupational safety for workers | Contractor will arrange all safety measures for workers as per factories act. |
| | | • Occupational safety for asphalt plant workers | All worker employed on mixing asphaltic material, cement, lime mortars, concrete etc. will be provided with protective footwear and protective goggles |

## E5 ANALYSIS OF ALTERNATIVES

Three alternative alignments have been considered:

**i)** **Option 1:** This part of highway starts from Mohali of Sahibzada Ajit Singh Nagar district to Sehna in Barnala district in the state of Punjab. The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone. The no. of trees, affected structures and area under water bodies is less as compared with other 2 options.

**ii)** **Option 2:** This part of the highway runs on the left side of option -1. The no. of trees, affected structures and area under water bodies is more with Option -1 and it also passes through major habitations. The acquisition of the forest land in this option is also more as compared with the selected option.

**iii)** **Option 3:** This part of the highway runs on the right side of the selected alignment. The no. of trees, affected structures and area under water bodies is more with the other 2 options and the length of the project road is also more as compared with the other 2 options.

Keeping in view of having less/minor effect on environmental and social components, alignment **Option 1** has been fixed and it seems more feasible as compared to the other option. It also provides better alternative to the major districts in the state of Punjab. It will lead to less impact on Environment & Social components than other two options.

## E6 ENVIRONMENTAL MONITORING PROGRAMME

The Environmental Monitoring Programs are also suggested to provide information on which management decisions may be taken during construction and operational phase. The objective of this program is to evaluate the efficiency of mitigation and enhancement measures, updating the actions & impacts of baseline data and adaptation of additional mitigation measures. Total cost for environment monitoring plan is **Rs. 2,66,22,000**.

## E7 ADDITIONAL STUDIES

### E7.1 Public Consultation & Public Hearing

The public consultations were carried out in nearby villages of the project corridors. These consultations were taken up by environmental and social experts. The details are incorporated in draft EIA/EMP report.

As per the EIA notification dated 14th September 2006, vide section 7(f) related to public hearing, the draft EIA/EMP report shall be submitted to the Punjab Pollution Control Board (PPCB) for conducting public hearings in Sahibzada Ajit Singh (SAS) Nagar, Fatehgarh Sahib, Patiala, Malerkotla, Sangrur and Barnala districts in the state of Punjab.

### E7.2 Social Impact Assessment

The proposed National Highway will pass through Sahibzada Ajit Singh Nagar, Fatehgarh Sahib, Patiala, Malerkotla, Sangrur and Barnala districts in the state of Punjab. There are approx. 200 structures recorded within the corridor of impact the proposed National Highway. However, the proposed project will definitely have some positive impact on the socio-economic environment of the people of surrounding villages experiencing development in the area in specific and state and nation as a whole. The demographic profile and socio-economic status of the people in the project affected district are presented in EIA/EMP report.

### E7.3 Road Safety Features

The proposed project is entirely green field National Highway. The proposed project would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety and provide better transportation facilities and other facilities such as way side amenities.

Indian Road Congress (IRC) codes are being followed in proposing and designing road safety features. Pavement markings are being done for traffic lane line, edge lines and hatching. The marking is carried out with hot applied thermoplastics materials. The pavement markings are being reinforced with raised RR pavement markers and are provided for median and shoulder edge longitudinal lines and hatch markings. Highway lightings including high masts are being provided at intersections in order to improve the night time visibility.

## E8 PROJECT BENEFITS

The proposed NH will provide better, fast, safe and smooth connectivity for the commuters of Punjab state and especially in Sahibzada Ajit Singh Nagar, Fatehgarh Sahib, Patiala, Malerkotla, Sangrur and Barnala regions. Smooth and fast-moving traffic will cause only lower emissions thereby reducing pollution levels. Accident rates are also expected to come down substantially. Development of the proposed project road will improve the local agriculture and enable farmers to realize better value for their products as well as attract more investment to that region, thus boost economy of the area, state and nation as a whole. The vehicle operating and maintenance cost is expected to go down substantially. The proposed road alignment will also include general amenities like bus bays, truck lay bays, rest areas, service road at built-up locations, pedestrian and cattle underpasses, landscaping and tree plantation, traffic aid post, emergency telecom system, emergency medical aid post, street light at built ups etc. and thus overall facilities to the road users shall improve. People will have increased access to better social and health infrastructure and other services located outside the project area. This will in turn lead to overall improvement of the quality of life of the people residing in the project zone in terms of their economic, social and health status. Growth of local tourism and resultant boost to local economy is also expected due to proposed project.

## E9 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The Environmental Management Plan is prepared for avoidance, mitigation and management of the negative impacts of the project. It also covers remedial measures require to be taken EMP includes the list of all the project related activities, their impacts at different stages of project during construction phase and operational phase on environment and remedial measures to be undertaken to mitigate these impacts.

Total cost for environment management plan (including environmental monitoring plan) for the project is **Rs. 49.85 Crores.**

## E10 FINDINGS & CONCLUSSION

The Rapid EIA report for this proposed National Highway has been prepared after thorough interaction with the engineering section of the DPR consultant and contractor so that the negative impacts on the environment and human population could be avoided as far as possible. Some of the important findings of the study are as follows: -

1. There will be insignificant loss of bio-diversity as no rare plant or animal species are going to be affected by the present project.
2. The proposed alignment is not passing through any Sanctuary or National Park.
3. Precautionary measures such as underpass, pipe culverts and chain link fences etc. have been suggested to mitigate the likely impacts if any, on the wild life present in study area
4. No monuments protected by the Archaeological Survey of India (ASI) are located within the ROW of proposed National Highway.
5. The most important factors, which need continuous attention and assessment during the construction phase, are the ambient air quality, the water quality and the noise level. The ambient air quality of the study area is good. A noise level in the area is also below the limit.
6. Approximately 2582 numbers of trees are recorded in corridor of impact of the proposed National Highway. However, avenue plantation and compensatory afforestation will enhance the environmental condition of the area.
7. There are approx. 200 structures recorded within the corridor of impact the proposed National Highway. However, the proposed project will definitely have some positive impact on the socio-economic environment of the people of surrounding villages experiencing development in the area in specific and state and nation as a whole