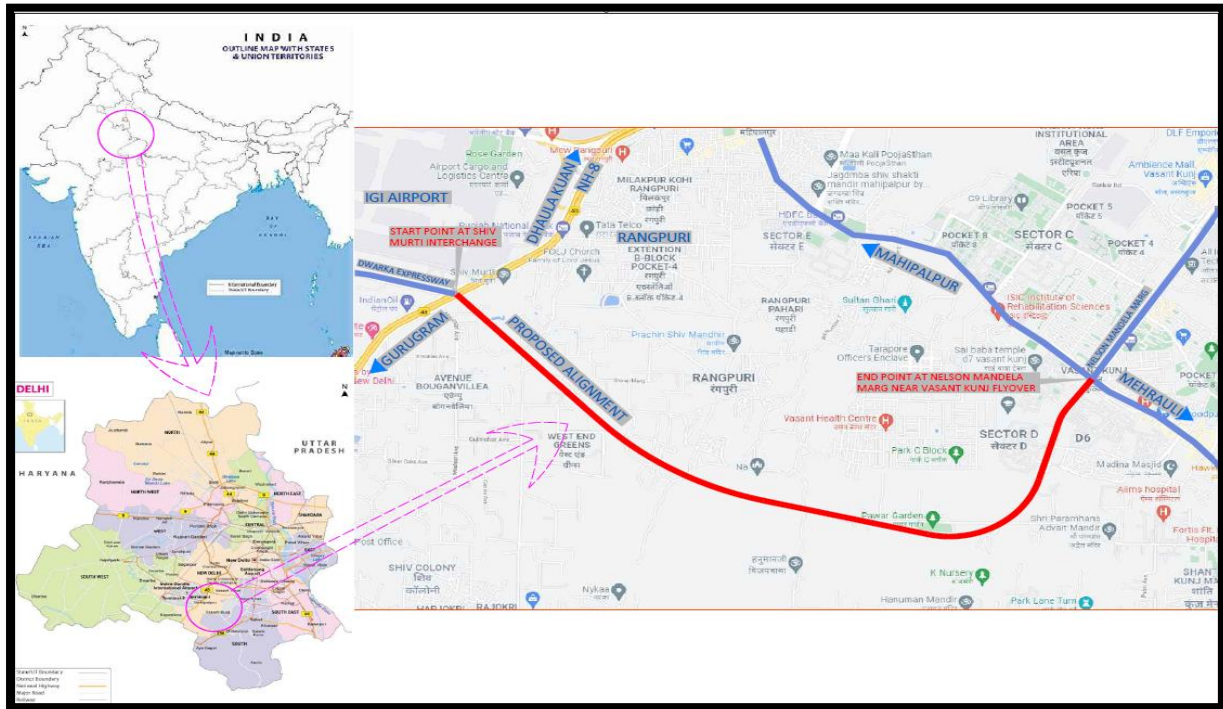


EXECUTIVE SUMMARY

For

“Construction of a Road Tunnel for NH-148E with its approach and connection to NH-248BB in NCT of Delhi”.



Project Proponent:

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



Environmental Consultant:



Ambiental Global Private Limited
(NABET Accredited EIA Consultant Organization)

Plot No.182, Ground Floor, Sector-7, Raj Nagar ,
Ghaziabad(Delhi-NCR)
Uttar Pradesh ,pincode-201002

Certificate No.NABET/EIA/1922/IA0047 Validity- 09/04/2025

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EXECUTIVE SUMMARY

E.1 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). NHAI is engaged in the development of National Highways and as part of this endeavour, the Authority has decided to undertake the Economic Corridors, Inter-Corridors, Feeder Routes primarily to improve freight movement in the Country under Bharatmala Pariyojana Programme. Bharatmala Pariyojana focuses on optimizing efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps through effective interventions like development of Economic Corridors, Inter Corridors and Feeder Routes, National Corridor Efficiency Improvement, Border and International connectivity roads, Coastal and Port connectivity roads and Green-field expressways.

The proposed project is a part of the Bharat Mala Project which has been envisaged as an umbrella program under the Ministry of Road Transport and Highways. The project involves constructions or improvement of national highways/ newly declared National Highways with an aim to improve road connectivity to border areas, backward areas, religious and tourist sites.

Delhi being National Capital generates and attracts huge quantum of traffic not only from within Delhi but also from surrounding region. In order to cater to this regional traffic, Inner and Outer ring roads were planned in 1962, of which only inner ring road could be completed whereas outer ring road is still not a full ring. Additionally, non-Delhi destined traffic i.e. traffic to/from North Indian States (which includes Punjab, Northern Haryana, Jammu & Kashmir) to remaining Indian states (which includes Rajasthan, Southern Haryana, Gujarat, Maharashtra) has to pass through Delhi due to absence of alternate network. This leads to heavy congestion on the existing ring roads.

The National Highways Authority of India has been assigned the work of “Construction of a Road Tunnel for NH-148AE with its approach and connection to NH-248BB and existing Delhi internal roads in the State of Delhi.”

The total length of the project is 4.983 Km with a PRow of 45m. The main objective of the proposed project is decongestion of traffic. The proposed tunnel is completely Greenfield / underground and hence will have negligible impact on environment.

E 2. BRIEF ABOUT THE PROJECT AND ITS LOCATION

The project starts from Near Shivmurti Interchange NH-8 proposed Ch. 0+000 and ends at Nelson Mandela Marg at Vasant Kunj with Chattarpur-Mahipalpur Road proposed Ch. 4+983.

The proposed underground Tunnel is passing through New Delhi & South Delhi district in the NCT of Delhi. The main objective of the project is that NH-48 carries very heavy traffic to Chattarpur/ Vasant

Kunj from Gurugram creates a heavy congestion at Mahipalpur due to very narrow city road, traffic to and from Delhi airport and Mahipalpur/ Rangpuri market.

The salient features of the proposed project are presented in **Table No. E-1** below.

Table No E-1: Salient features of the project

1.	Project Name	Construction of a road tunnel for NH-148E with its approach and connection to NH-248BB in NCT of Delhi.												
2.	Location of the sub project road	The project NH-148AE starts from Shiv murti Interchange Ch. 0.000 Km (Dwarka Expressway Package-1/UERIINH248BB) at NH-48 and ends at Nelson Mandela Marg Ch. 4.983 Km in Vasant Kunj in New Delhi.												
3.	Total design length of the project	4.983 Km												
	3.1 Tunnel Length	4.306 Km												
	3.2 Approach Ramp	0.594 Km												
	3.3 At Grade	0.074 Km												
	3.4 New Proposed Flyover	0.668 Km												
4.	Geographical Location	Start 28°31'55.31"N, 77°06'27.34"E End 28°31'44.78"N, 77°8'53.25"E												
5.	Start Point	NH-8 Near Shivmurti Interchange												
6.	End Point	Nelson Mandela Marg Vasant Kunj												
7.	Project Category (as under EIA Notification, 2006)	Category-A												
8.	Total Civil cost	3426.38 Cr												
9.	Total Capital Project Cost (including Civil, Utility Shifting and Forest, Environment)	4089.09 Cr												
10.	Resource Requirement													
	i. Reinforcement	17,213.42 Tons												
	ii. Concrete	<table><tr><th>Item</th><th>Estimated Qty (m3)</th></tr><tr><td>Dry lean Cement Concrete (DLCC)</td><td>14866.05</td></tr><tr><td>Plain Cement Concrete (PCC)</td><td>33360</td></tr><tr><td>M30</td><td>48459</td></tr><tr><td>M25</td><td>7714</td></tr></table>	Item	Estimated Qty (m3)	Dry lean Cement Concrete (DLCC)	14866.05	Plain Cement Concrete (PCC)	33360	M30	48459	M25	7714		
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Dry lean Cement Concrete (DLCC)	14866.05													
Plain Cement Concrete (PCC)	33360													
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M25	7714													
	iii. Water	<table><tr><th>Thematic area</th><th>Quantity (m3/day)</th></tr><tr><td>Road construction (tunnel)</td><td>300 KLD</td></tr></table>	Thematic area	Quantity (m3/day)	Road construction (tunnel)	300 KLD								
Thematic area	Quantity (m3/day)													
Road construction (tunnel)	300 KLD													

		Road making Local surface/ground water	20 KLD		
		Dust suppression	50 KLD		
		Others (including drinking and domestic purposes)	50 KLD		
		Total	420 KLD		
		15% Contingency	63 KLD		
		Total	483 KLD		
	iv. Estimated Manpower requirement (Skilled and unskilled)	400 – 450 per day			
11.	Transportation				
	i. Muck Disposal	122 trip per day			
	ii. Concrete	88025 m³			
	iii. Segments (To be estimate TBM contractor)	10563 Nos			
12.	Power of Consumption				
	i. DG Set during construction phase	3 Nos x 750 KVA			
	ii. TBM Capacity	7371758 KWH			
13.	Terrain	Plain & rolling			
14.	Existing right of way (ERoW)	0-45 m.			
15.	Proposed Right of Way	30-45 m			
16.	Carriageway	10.5 m (3.5m + 3.5m + 3.5m)			
17.	Design Speed	80 Km/hr			
18.	Safety Measure	New Jersey Crash Barriers			
19.	Flyover	1 Nos			
20.	Proposed Toll Plaza	1 Nos (Ch 4+900)			
Feature of EIA Importance					
21.	Type of Mode	EPC			
22.	Location of Proposed Project Name	Construction of a road tunnel for NH-148E with its approach and connection to NH-248BB in NCT of Delhi.			
23.	Jurisdiction	SI No.	State	District	Village
		1	NCT of Delhi	New Delhi	Samalka
		2		New Delhi	Rajokari
		3		New Delhi	Rangpuri
		4		New Delhi	Masoodpur
		5		South Delhi	Mehrauli

24.	Seismic Zone	Zone IV
25.	Forest Land Diversion	Forest land involving 5.8257 ha falling under Southern Ridge Reserved Forest and 1.6888 ha falling under Deemed Forest will be diverted. The Project involves 417 trees cutting at the exit point and U-turn Modification. Permission for the same has been granted by Hon'ble Supreme Court via diary no.(s) 34870/2023 in W.P. (Civil) no. 4677/1985 listed date on 18.10.2023 (Copy Attached as Annexure II).
26.	Water bodies Impacted	None
27.	Existing trees within ROW	417 at the exit point near Nelson Mandela Marg and modification of U-turn are given in Annexure III .
28.	Compensatory Plantation	Approx. 4170 (ten times of total trees to be felled) shall be planted as compensatory plantation.
29.	Wildlife Sanctuaries	NIL
30.	Nos of Structure Affected	NIL
31.	Total Area of Land Acquisition	Land Acquisition would not be required due to the project is an underground Tunnel

E.3 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 March 2022 to May 2022 (Summer 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- PM₁₀, PM_{2.5}, SO₂, 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 New Delhi and South Delhi. The climate of district is mainly influenced by its inland position and prevalence of air of the continental type during major part of the year. Extreme

dryness with intensely hot summer and cold winter are characteristics of the climate. The cold season starts towards the latter half of November when both day and night temperatures drop rapidly with the advance of the season. January is the coldest month with the mean daily maximum temperature at 21.3°C and the mean daily minimum temperature at 7.3°C. May and June are the hottest months. In May and June, maximum temperature may sometimes reach 46 or 47°C.

Air Environment:

Ambient air quality monitoring has been done at 8 locations. Specific station-wise Ambient Air Quality (AAQ) data for PM 2.5, PM 10, SO₂, NO₂ and CO as recorded during the months from March 2022 to May 2022. The minimum and maximum values of, PM_{2.5}, PM₁₀, SO₂, NO₂ and CO analyzed along the proposed project tunnel are 62.4(µg/m³) to 125.6(µg/m³), 111.5(µg/m³) to 216.5(µg/m³), 10(µg/m³) to 19.5(µg/m³), 17.8 (µg/m³) to 34.6 (µg/m³) and 0.69 (mg/m³) to 1.92 (mg/m³) 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 have been taken along the proposed project highway/tunnel. The pH varies from 7.3 to 7.4, Total dissolved solids vary from 325.6– 344.0 mg/l, and Total Hardness as CaCO₃ varies from 116.5 – 161.0 mg/l. whereas no surface water body is presented near the alignment. 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 8 locations along the proposed Expressway. 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 vary from 52.4 to 59.7 dB (A) during daytime and whereas during night time the noise level varies from 43.7 dB to 51.0 dB (A), which are within the prescribed norms as defined in Noise standards, 200.

Soil Environment:

Soil sampling has been done at 8 locations near to the proposed highway. The pH of the soil samples ranged from 7.19 to 7.30 during the study period, indicating that soils are slightly neutral to slightly alkaline in nature. The soil Electrical Conductivity (EC) also varies from 19.6 µs/cm to 24 µs/cm. These parameters indicate that soils are neutral in reaction and having average EC. The Nitrogen content ranges from 2.88 kg/ha to 5.81 kg/ha, Bulk density ranges from 2.88 kg/ha to 5.81 kg/ha and Zinc content ranged from 1.66 mg/kg to 2.02 mg/kg during the study period. Based on soil analysis

data it is concluded that soil is rich in nutrient. The availability of Nutrients for the plant growth in the study area is good.

Ecological Environment:

The forest crop is dominant plants present in the study area were *Acacia nilotica*, *A. leucophloea*, *A. catechu* and *A. modesta*, *Capparis sepiaria*, *C. decidua*, *Tribulus terrestris*, *Zizyphusaenoplia*, *Croton sparaijlorus*, *Tephrocia purpurea*, *Prosopis juliflora* etc. The major fauna species present in the study area are includes Nilgai, Jungle Cat, Small Indian Civet, Ruddy Mongoose and Small Indian Mongoose, Rufous Tailed hare, Por lizard 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 project alignment passes through New Delhi and South Delhi district in the state of Delhi.

District New Delhi

New Delhi with a density of 4,057 persons per km². According to the provisional results of the 2011 national census, New Delhi has a population of 1,42,004, making it one of most populated UT. The district occupies the eighth place in terms of area as it shares 2.4 per cent of the total area of the State. The district is fully urban. In terms of Population, it occupies the fourth position and shares 0.8 percent population of the State. It has no villages. No uninhabited villages of the State fall in this district. It's two tehsils are totally urban. In terms of density, it occupies the eighth position in the State. The Sex Ratio of the district is only 822 and it occupies 9th place amongst all the nine districts.

District South Delhi

South Delhi with a density of 11,060 persons per km². According to the provisional results of the 2011 national census, New Delhi has a population of 27,31,929, making it one of most populated UT. The district occupies the third place in terms of area as it shares 16.7 per cent of the total area of the State. In terms of Population, it occupies the fourth position and shares 16.3 percent population of the State. No uninhabited villages of the State fall in this district. It has only 3 villages and its two tehsil are totally urban. In terms of density, it occupies the sixth place in the State. The Sex Ratio of the district is only 862 and it occupies 7th place amongst all the nine districts.

E.4 IMPACTS AND MITIGATION MEASURES

The potential impact and their mitigation measures during of the Pre-Construction, Construction & Operation Phase have been presented in **Table No. 10.2**.



Table No.E.2 :- Potential impact and their mitigation measures suggested for the proposed project

Pre-Construction					
Sr. No.	Activities	Potential impacts	Significance (Criteria for determining significant impact (e.g., any impacts trigger law of land, impact irreversible, the likelihood of causing accident and disaster or donor requirement or international commitment)	Mitigation Measures	Responsibility
1.	Land acquisition	• Loss of land, structure, standing crops, tress, and other assets • Removal and relocation of utilities and common • Property Resources (CPR's) etc. • Removal and relocation of Cultural and Religious Properties	Insignificant	There is no land acquisition is required for tunnel projects it is underground. Also no structure of any type is going to impact due to construction of underground tunnel.	NHAI & Contractor
2.	Site preparation	• Conversion of existing land into construction site as per design,	Significant	• As far as possible maximum efforts shall be made to minimize the number of trees proposed to be felled	NHAI &



		removal of standing crop, felling of tress and removal of top soils Air, noise & water pollution		by adopting of engineering designs. - Trees shall be removed from the Corridor of Impact (Col) and construction sites before the commencement of construction. Prior Permission shall be obtained from the concerned authority for the trees felling. - There is no crop which are going to affect due to construction of underground tunnel. - Construction of tunnel is underground will not affect top soil except at entry & exit point. - Ambient Air Quality monitoring will be performed by the contractor as per the Environmental Monitoring Program and in accordance with the general and specific condition as stipulated in Environment clearance letter, CTE and CTO.	Contractor
3.	Procurement of machinery (Construction Vehicles, equipment and machinery for casting plant, Hot- mix Plants & Batching Plants)	- Disruption to traffic flow and disturbance to sensitive receptors and nearby community including road accident. - Air, noise & water pollution	Significant	- Crushers, hot mix plants, and casting and batching plants shall comply with the requirements and specifications of the current emission control legislation and specifications. Consent / NOC for all such plants shall be submitted. - Casting plant, batching plant, crushers, hot-mix plants shall be located at least 1000m (1km) away from residential/ settlements, forests, wetland, and commercial establishments, preferably in the downwind direction. - The Contractor shall submit a detailed layout plan for all such sites and seek prior approval of Engineer-In-charge of Supervision Consultant before entering into a formal agreement with a landowner for setting-up such sites. Actions by Supervision Consultant and NHAI against any non-compliance shall be borne by the Contractor at his own cost. - Arrangements to minimize dust pollution through the provision of windscreens, water spray, mist spray units, and dust encapsulation shall be provided at all	Contractor



				such sites. - No such installation by the Contractor shall be allowed till all the required legal clearances are obtained from the competent authority and the same is submitted to the NHAI and the Supervision Consultant. - Noise limits for construction plant and equipment that are to be procured such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators etc. shall not exceed 75 dB (A), when measured at one-meter distance from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. - The Contractor shall maintain a record of Pollution under Control (PUC) certificate for all vehicles and machinery used during the contract period, which shall be produced to the NHAI and the Supervision Consultant for verification whenever required.	
4.	Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	Significant	- Obtain all necessary consents (including CTE for casting plant, batching plant/hot mix plant from DPCC), permits, clearance, NOCs, etc. prior to start of civil works. - Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction - Acknowledge in writing to NHAI and provide report on compliance obtained under different statutes. - Also cost/fee of the necessary permissions/clearances/permits shall bear by contractor.	Contractor
5.	Raw material sourcing	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage	Significant	Arrangement for locating the source of supply of material for the Tunnel construction as well as compliance with environmental requirements, as applicable, shall be the sole responsibility of the	Contractor



		patterns, ponding and water logging, and water pollution • Increase in traffic load on existing infrastructure and increase road accident.		Contractor. • Fly ash utilization: To the extent possible the Contractor shall explore the possibilities of utilising the Fly ash for the construction purposes as specified in the Notification 2021 on use of fly ash. • To prevent dusting at temporary stockpiles, water shall be sprayed and covered with tarpaulins. • Contactor shall prepare traffic management and get it approved by NHAI and local authority.	
6.	Development of Construction stockyard and construction activities	Improper storage/ non availability of storage space leads to soil erosion, air and water pollution.	Significant and reversible	• Dust suppression measures with spraying of water should be taken for all roads used for transport. • The location for stockyard for construction materials shall be identified at least 500 m from watercourses or water body.	Contractor
7.	Construction of labour camp	Risk of social conflict	Significant	• Construction camps shall not be proposed within 500m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. • Contractor as per prevalent rules shall carry out negotiations with the landowners (private) for obtaining their consent for temporary use of labour camp. Contractor shall submit labour camp.	Contractor
8.	Accessibility/approach road	Traffic problems and conflict near project locations and haul road.	Significant	• The construction on tunnel is underground will not affect any existing road and path. However, in case if any road blockage, it is ensured and provide safe and convenient passage for vehicles, pedestrians, etc by providing temporary connecting road.	Contractor



Construction Phase					
Sr. No.	Activities	Potential impacts	Significance	Mitigation Measures	Responsibility
1.	Tunnel Construction	- Use of toxic slurry and other chemicals. - Drainage inside tunnel	Significance	- Use non-toxic slurry and additives and minimize impact of these materials to reduce risk of impact on ground water quality. - Ensure that pressure applied to tunneling and ground treatment is controlled to prevent excessive pressure that will drive the slurry out of the desired range increasing the risk of water pollution. - The Contractor will pass all drainage water from the tunnel through a settlement tank. - If the drainage water meets drinking water standards it can be considered for re-use in any potentially depleted wells during the construction phase.	Contractor
2.	Stripping, stacking and preservation of topsoil & Muck Disposal	- Land use Change and loss of productive top soil. - Trigger erosion earthwork and cut and fill stockpiles etc.	Significant	- Construction of tunnel is underground so removal of top soil is not required. However top soil may affect at entry and exit point of tunnel, so the top soil from construction sites shall be stripped to a specified depth of 150 mm and stored in stockpiles for reuse. - Stockpile shall be arranged such that the slope does not exceed 1:2 (vertical to horizontal), and height is restricted to 2m. If soil is stored for long time, provide silt arrestor to prevent erosion. - The muck generated due to excavation of tunnel will be disposed off at well designated site at Delhi-Meerut Expressway.	Contractor
3.	Auxiliary activities, construction machinery and sourcing of resources	Depletion of resources, soil and ground water contamination, siltation and contamination of surface water, nuisance to public, deterioration of local ambient air and noise quality	Significant	- Requisite permissions shall be obtained for abstraction of groundwater if required. - Contractor must use STP water from near STP. - There is no river to nearby project area. So, no	Contractor



				effect on surface water is anticipated. • Diesel Generator set shall be placed on a cement concrete platform with oil and grease trap to control the oil ingress into soil/water bodies. • All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. • Hazardous waste such as waste/used oil/oil filter/ oil soaked cotton from DG set and vehicles shall be disposed of through authorized recycler. Prior authorization from SPCB should be obtained for the storage and disposal. • Water quality to be monitored periodically as per the monitoring plan (once in six month). • Ensure storm water drain all around periphery of casting and batching plant including regular cleaning and maintenance. • Contractor shall prepare traffic management and dust suppression plan duly approved by NHA/IE. • Ensure that Batching and asphalt mixing plants and crushers shall be located at downwind direction (1 km) from nearest settlement. • Submit PUC certificates for all vehicles/ equipment/ machinery that are being used for the project • Ensure regular water sprinkling and encapsulation of dust source by erection of screen/barriers. Also water shall also be sprayed on haul road and where is required. • Vehicle delivering material shall be covered. End boards in loaders shall be provided to prevent spillage. • Monitor ambient air quality and comply with the	
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				standards. - Noise Limits for construction equipment used in the projects such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (measured at one-meter distance from the edge of equipment in the free field), as specified in the Environment (Protection) Rules, 1986. - At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching shall be stopped during the night time between 9.00 pm to 6.00am.	
4.	Environment Health and Safety	- Failure in safety measure leads to accidents - Occupational hazards - Stoppage of site work and risk of litigation	Significant	- Contractor shall appoint a qualified EHS personnel in the start of the project to conduct training, audit, EMP implementation, monitoring, and EHS compliance - EHS officer shall prepare an annual training calendar targeting workers, supervisors, middle and senior management. - Project manager and workers shall be imparted regular training on EMP implementation including spoils management, general site safety, Standard operating procedures for accident prevention, emergency preparedness plan, first aid training, use of personal protective equipment's, for construction works; - Site shall initiate a work permit system for working at heights, working in confined spaces, and hot jobs. - Signage board shall be used to create EHS awareness - Provide extinguishers at electrical installation, DG Set etc. along with Sand Buckets - Proper ventilation plan shall be prepared for smooth flow of traffic.	Contractor



				• Site shall prepare accident prevention plan • Prepare Standard Operating Procedures for the management of C&D waste and municipal waste • Prepare Standard Operating Procedures for heat stroke, grievance redressed, gender quality and sexual harassment • Protective goggles and clothing to workers engaged in stone breaking activities and workers shall be seated at sufficiently safe intervals • Earplugs to workers exposed to loud noise (above 75 dB (A)) and workers working in crushing compaction or concrete mixing operation. • Develop Standard Operating Procedures for monitoring, reporting and capacity building • The Contractor shall not employ any person below the age of 18 years for any work.	
5.	Labour/ employee welfare	• Gender-based violence • Gender equality and ensure rights of workers not compromised • Social security, health, hygiene	Significant	• Apply and obtain labour license under contract and migrant labour act. • Maintain Wage Register • Maintain a register of advance and overtime at the site. • Site ensure that workers' working hours should not exceed more than nine hours a day or forty-eight hours a week. • Provide a day of rest every week • Proportional engagement of women to total human resource engagement; • Engage women labour from different caste/class; provide equal remuneration; provide separate toilet facilities for women workers • Contractor shall ensure that all workers engaged in	Contractor



				site construction must have insurance, same is applicable to sub- contractors. - In every establishment where 50 or more women or ordinarily employed as contract labour there shall be provided two rooms of reasonable dimensions for the use of their children under the age of 6 years. One of such rooms would be used as a play room for the children and the other as bedroom for the children. For this purpose, the contractor shall supply adequate number of toys and games in the play room including bed in the sleeping room. The standard of construction and maintenance of the crèches as per the condition specified in the BOWC Act. - Every migrant workman shall be registered and entitled for allowance, benefits, etc., as prescribed in the Act. - No female migrant workmen shall be employed by any contractor before 6 a.m. or after 7 p.m. - Provide canteen facility for the use of workers in case the numbers workers are more than 250 (BOCW Rule). - Contractor shall provide accommodation, adequate sanitation and water supply.	
6.	Labour Management	Camp	Location of Construction labour camps	- Camps must be located at least 500m away from settlement areas. - The location, layout and basic facility provision of each labour camp shall be submitted and approved by NHAI/ IE before their construction.	
			Accommodation	- The Contractor shall provide, erect and maintain necessary (temporary) standard living accommodation and ancillary facilities during the progress of work. - Contractor shall provide electricity, water supply and	



				ensure sanitation in the camp.	
		Potable Water Sanitation and Sewage System		- Contractor shall ensure sanitization in labour camp once a week and ensure safety precautions are followed. - Ensure sufficient water availability for drinking, cooking, and washing. - Supply of sufficient quantity of potable water (as per IS) in every workplace/labour campsite at suitable and easily accessible places and regular maintenance of such facilities. - Regular Testing of water shall be done as per the parameters prescribed in IS10500:1991. - Compliance with EMP shall be reported & shall be inspected the labour camp periodically to ensure compliance of the EMP. - The Contractor shall ensure that- - The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occur and no pollution to the air, groundwater or adjacent watercourses take place - Separate and sufficient number of toilets /bathrooms for men (marked in vernacular) and women are to be provided - Adequate water supply is to be provided in all toilets and urinals - STP of suitable capacity shall be installed to manage sewage generation and to maintain sanitation condition at camp site	
		Waste Disposal		The contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed of.	



7.	Community Relations	Community Grievance Process	Significant	- Contractor shall establish a community grievance redressed system to address the public complains and inconvenience. To make it effective, contractor shall also establish an information dissemination mechanism to inform different stakeholders - Spot follow up of complaints recorded in complaints register to assess whether the complaints has been closed or not. - Public meetings to assess whether appropriate information is being provided to communities and whether sufficient information collected from communities	
8.	Archaeological artefacts	Chance finds or discovery of any archaeological artefacts, treasure etc. during excavation	Insignificant	There are no Archaeological structures present near project area.	Project Proponent & Site in- charge
9.	Traffic management	Traffic safety and flow management	Significant	The Traffic Control Plans shall contain details of temporary diversions, traffic safety arrangements, night safety measures, speed limit, signage, barriers, and flag man for traffic control etc.	Contractor
10.	Ecology and biodiversity (flora & Fauna) Aquatic Ecology	Tree cutting	Significant	Compensatory afforestation/plantation. Proper care of Saplings must be taken, so the saplings don't die off or are eaten by cattle.	Contractor under supervision of forest department
		Impact the habitant and wildlife.	Significant	- The construction of tunnel is below the ground level will not affect any habitation and wildlife. - However the Noise and vibration due to construction equipments and TBM may cause problem. So Improved and well-maintained equipment and barges should be used to minimize the noise and vibration during construction.	Contractor/ P



				There is no evidence of any surface water observed nearby project area. So no effect on aquatic life.	
11	Labour/Employee Welfare & Safety	Risk of social conflicts due to religious, cultural or ethnic differences or Gender-based violence.	Significant	- Contractor should ensure that workers' working hours should not exceed more than nine hours a day or forty-eight hours a week and wage register must be maintained. - Provide a day of rest every week. - No female workmen shall be employed by any contractor before 6 a.m. or after 7 p.m. Also have provision under employment contract to reflect POSH rules 2013. - The standard of construction and maintenance of the crèches may be such as may be specified BOWC Act. - To ensure safety, health and hygiene of workers, the contractor shall develop and implement site specific Health and safety plan and prepare a detail Standard operating procedures (SOPs) for each activities, which has potential to trigger injury and accident.	

Operation phase					
Sr. No.	Activities	Potential impacts	Significance	Mitigation Measures	Responsibility
1.	Energy conservation measures	Loss of natural resources	Significant	- Use energy efficient electrical equipment - Full horizontal cut off glass lens luminaires are installed at 0o uplift. These luminaires, in addition to reducing sky glow, help to minimize visual intrusion within open landscape. - Where possible use lower lamp heights. - To prevent future pollution issues prohibit the use of sodium light bulbs is prohibited and use LED lights	NHAI & Contractor



				with a “neutral” color temperature of 4000K.	
2	Emergency Response	Accidents in tunnel	Significant	• Emergency Response system shall be provided inside the tunnel for accidents. • Phone booth at regular interval shall be provided. • Tunnel escape route shall be provided in case of emergency. • Phone booth for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible. • Install warning signs.	NHAI & Contractor
3.	Traffic Management	Traffic congestionand Traffic safety	Significant	• Maintenance of all informatory boards, and signage to keep road user aware for direction and other instructions. • Regular maintenance and cleaning of assets such as signboards, bus stops, drains, etc. shall be undertaken. • Spill prevention and control and emergency responsive system • Tow-way facility for the breakdown vehicles if possible	NHAI / Site in-charge

E.5 ANALYSIS OF ALTERNATIVES

Three alternative alignments have been considered:

OPTION 1.

The alignment starts from the proposed Shiv Murti Interchange end point via a tunnel which traverses for a length of 2 Km through southern ridge. The tunnel exits 700m before the end point of Nelson Mandela Marg and then a 594 m ramp and 74 m at grade surface road merges with the Nelson Mandela Marg end point. Salient Features of the Alignment are as follows:

- Total Length- 4983 m
- Tunnel Length-4306 m
- Approach Ramp to Tunnel End Portal- 594 m
- At Grade Surface Road- 74 m

Pros and Cons of option 1 are as follows:

Pros	Cons
• No Impact on Rangpuri Farm House and Ridge Forest Area • No land acquisition is proposed • Least Impact on Existing Utilities • No traffic hassles during construction period	• Long Tunnel Length will lead to increase in cost

OPTION -2

The alignment starts at the same point as discussed in earlier options after Shivmurti interchange with a tunnel which traverses beneath the Rangpuri Farm House Area and Rangpuri forest. The tunnel ends at Nelson Mandela Marg on the existing road and the approach ramps from tunnel will meet the existing road at a gradient of 3.3% before the Vasant Kunj Flyover Red light. This option does not involve any land acquisition but the construction on existing Nelson Mandela Marg which is coming on the end approaches of tunnel will lead to shifting of utilities, traffic hassles during construction as the Nelson Mandela Marg serves as the only connecting road to 4 nos. of DDA housing societies (Ganga, Yamuna, Narmada and Saraswati).

Salient Features of the Alignment are as follows:

- Total Length- 4769 m
- Tunnel Length- 4100 m
- Approach Ramp to Tunnel End Portal- 600 m

- At Grade Surface Road- 69 m

Pros and Cons of Option-2 are as follows:

Pros	Cons
• No Impact on Rangpuri Farm House and Ridge Forest Area • No Land Acquisition	• Long Tunnel Length will lead to increase in cost • Utility Shifting- A number of utilities i.e., IGL gas pipelines, HT Line, Water and Sewer Network are present at the existing Nelson Mandela Road which needs to be shifted. • Traffic Hassles during Construction as the Nelson Mandela Marg serves as the only connecting road to 4 nos of DDA housing societies.

OPTION-3

The proposed alignment is similar to that proposed in Option-3, only the tunnel exits after the Rangpuri Ridge Forest Area reducing the tunnel length to 2800 m and then a 600 m approach ramp and 702 m at grade surface road merges with the Nelson Mandela Marg end point.

In addition to this newly proposed alignment, modifications in existing Nelson Mandela Junction are required to make the junction signal free and smooth flow of traffic. This will include blocking of right movement at the junction and providing a guided U Turn at the existing traffic light near Spinal Injury hospital towards Mahipalpur end. Apart from this, an additional flyover parallel to existing flyover at Nelson Mandela Junction would also be required. Strengthening and upgrading of Nelson Mandela Marg from the dead end till Junction has also been proposed in order to make it similar to the newly proposed green field alignment. For the local societies, the two service lanes have been proposed which will be cater both ways traffic. No direct flow of traffic on the main 6 lanes carriageway is recommended.

Salient Features of the Alignment are as follows:

- Total Length- 4102 m
- Tunnel Length- 2800 m
- Approach Ramp to Tunnel End Portal- 600 m
- At Grade Surface Road- 702 m
- Up-gradation of Nelson Mandela Marg with 2 lanes service roads on both sides for local societies.
- New flyover parallel to existing flyover at Nelson Mandela Junction – 400m length

- Two lanes Guided U turn at traffic lights towards Mahipalpur near Spinal Injury Hospital
- Restricting right turn at Nelson Mandela Junction.

Pros and Cons of Option-3 are as follows:

Pros	Cons
• No Impact on Rangpuri Farm House and Ridge Forest Area • Least Tunnel Length will lead to decrease in project cost • Least Impact on Existing Utilities • No traffic hassles • Smooth traffic flow in and around Nelson Mandela Junction	• Least Land Acquisition- 7.812 Ha considering (1302 m length and 60m width of ROW) • Land Acquisition at one Farm House near the end point

OPTION-3.1 EXTENSION

The proposed alignment is similar to that proposed in Option-3.1 extension, in which the tunnel exits after the Rangpuri Ridge Forest Area reducing the tunnel length to 2800 m and then a 600 m approach ramp is provided. After exiting the tunnel, a 1700m long viaduct is provided which passes on the Nelson Mandela Marg and crosses from above the Vasant Kunj Flyover. The flyover ends before the U turn on the Vasant Kunj Mall Road.

Salient Features of the Alignment are as follows:

- Total Length- 6111 m
- Tunnel Length- 2800 m
- Approach Ramp to Tunnel End Portal- 600 m
- Viaduct Length- 1700 m
- Approach Ramp to Viaduct- 700m
- At Grade Surface Road- 311 m

Pros and Cons of Option-3.1 Ext are as follows: Pros

Pros	Cons
• No Impact on Rangpuri Farm House and Ridge Forest Area • Traffic coming out from tunnel towards Nelson Mandela will be through movement via the elevated viaduct	• Additional viaduct will lead to more capital cost • Land Acquisition- 7.812 Ha considering (1302 m length and 60m width of ROW) • Land Acquisition at one Farm House near the

	end point Shifting of HT Line (3 Nos. of HT)
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E.6 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. 1,33,06,000**

E.7 ADDITIONAL STUDIES

E.7.1 Public Consultation & Public Hearing

As per the EIA notification dated 14th September 2006, vide section 7(f) related to public hearing, the draft EIA/EMP report is being submitted to the Delhi Pollution Control Committee (DPCC) for conducting public hearings in South Delhi district in the state of Delhi

E.7.2 Social Impact Assessment

The proposed project is underground tunnel does not going to affect any structure. The Tunnel passes through the Ridge Forest area, there is no private land involve in the project. Hence No Social Impact Assessment is required. There is no land acquisition required for the project

E.7.3 Road Safety Features

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

All the urban locations as well grade separated structure locations will be provided lighting arrangements.

In addition to avoid the accidents inside and outside the tunnel & for the smooth and safe flow of traffic it is required to provide the various safety features for the tunnel. In accordance to IRC: SP: 91, the tunnel is classified as long tunnel and therefore require ventilation system and associated MEP systems along with other facilities suitable to all possible tunnel operations modes.

The following section establishes design criteria of mechanical & electrical systems for Tunnel.

- Ventilation System
- Emergency Power supply System

- Fire Fighting system
- Lighting System
- Traffic Management and Controls Systems (TMCS) etc
- Noise & Vibration

The Detailed study is given in Chapter-7 of EIA report.

E.8 PROJECT BENEFITS

As NH-48 carries very heavy traffic to Chattarpur/Vasant Kunj from Gurugram creates a heavy congestion at Mahipalpur due to very narrow city road, traffic to and from Delhi airport and Mahipalpur/Rangpuri market. Since, the road bears heavy traffic and have very heavy settlement enroute, heavy congestion along this route occurs during the peak hours of the day. Widening along this route is almost difficult due to heavy settlement, and therefore, it was proposed to connect NH-248BB with NH-148AE at Nelson Mandela Marg to avoid this congestion. The proposed alignment is a green field alignment and enroute posh area of Westend Green and across the Rangpuri Ridge.

The advantages of this project are as follows:

- Easy flow of traffic from Dwarka Expressway to Nelson Mandela Marg which remain heavily congested areas in Mahipalpur and Rangpuri. No major congestions on NH-48 in peak hours.
- Availability of 6 lane road at Nelson Mandela Marg meets the design configuration of tunnel that has also been proposed a 6-lane tunnel. Traffic flow would be easy without any major hassles.
- No land is being acquired for the construction of underground tunnel. However, Forest land of approx. 7.5145 ha of land will be diverted around the Southern ridge and deemed forest area. Permission for which has already been applied through FCA proposal no. **FP/DL/OTHERS/458849/2024 dated 22.01.2024.**
- It will create a short distance route that will take less travel time, and hence, resolve traffic congestions problem at the aforesaid places. In addition, it will improve local ambient air quality and reduction in carbon footprints during entire life cycle of the project.
- The project also does not trigger displacement, no structure are going to impact due to construction of underground tunnel; however, some public utility will be impacted at the Nelson Mandela area which is the exit point of the proposed Tunnel.
- And being a Greenfield project, it will envisage very less impact upon the environment.

E.9 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. 77.53 Cr.**

E.10 FINDINGS & CONCLUSION

The Draft EIA report for this proposed project 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 Health & Safety, Proper Ventilation System, Mechanical & Electrical arrangement and emergency response system etc. have been proposed to mitigate the impact during construction and operation.
4. No monuments protected by the Archaeological Survey of India (ASI) are located within the ROW of proposed project
5. The most important factors, which need continuous attention and assessment during the construction phase, are the ambient air quality, health & safety, muck disposal and the noise & vibration level. A proper mitigation plan is prepared and will be implemented during the construction phase to maintain the Air & Noise Environment. Muck will be disposed at identified site and Health & safety plan is prepared.
6. Approximately 417 numbers of trees are recorded in corridor of impact to mitigate the impact the impact.
7. There are no structures recorded within the corridor of impact of proposed tunnel. However, the proposed project will definitely have some positive impact on the socio-economic environment of the people of surrounding area experiencing development in the area in specific and state and nation as a whole.