

## **PROJECT NOTE**

### **1.0 INTRODUCTION**

National Highways Development Project (NHDP) Phase-VI is for development of 1000 km of expressways and includes construction of about 379 km long Vadodara-Mumbai Expressway (VME) including SPUR. Expressway proposed to be implemented under Public Private Partnership mode and to be executed as Design, Build, Finance and Operate (DBFO) contracts.

The proposed project is the development of 8 lane SPUR of Vadodara Mumbai Expressway (VME) Starting from Km 26.582 of VME main alignment and terminating at proposed junction with the Multi-Modal Corridor of MMRDA in the state of Maharashtra. It is a green field alignment and length of the SPUR alignment to be developed in the initial stage is **79.783 km**.

As per the EIA Notification, 2006 and its subsequent amendments, it is a category "A" project. The Terms of Reference (ToR) for undertaking EIA study was issued vide MoEFCC letter no. dated 16<sup>th</sup> March 2020 (MoEFCC File No. 10-29/2019-IA.III). EIA Report has been prepared as per the approved ToR and submitted for Public Hearing on 19<sup>th</sup> January 2021. Public Hearing has been conducted in three districts (Raigad, Thane & Palghar) and Final EIA Report was submitted to the MoEFCC on 15<sup>th</sup> October 2021.

The project was considered by the Expert Appraisal Committee (**EAC**) of the MoEFCC in its 278<sup>th</sup> meeting held on 28.10.2021 and 279<sup>th</sup> meeting held on 15.11.2021 for Environmental Clearance. **The MOEFCC granted Environment Clearance vide letter dated 12<sup>th</sup> April 2022.**

The **Matheran Monitoring Committee recommended the proposal for approval in the 4<sup>th</sup> meeting held on 23.02.2022.** The Office of the District Collector, Raigad vide letter dated 22.03.2022 forwarded the copy of the minutes of the meeting of the Monitoring Committee.

**Wildlife Conservation Plan** prepared for the project **has been approved by the Principle Chief Conservator of Forests and Chief Wildlife Warden, Maharashtra State vide letter dated 01.09.2021.**

### **2.0 PROJECT LOCATION**

The proposed SPUR starts at km 26.582 of main alignment of the Vadodara Mumbai Expressway at Koshimb village of Palghar district at Ch. 0+000 (19°29'19.45"N, 72°52'58.78"E) and terminate at the proposed junction with the Multi-Modal Corridor of Mumbai Metropolitan Region Development Authority (MMRDA) in Morbe village of Raigad district at Ch. 79+783 (19°3'59.65"N, 73°10'49.57"E). **Total length of the SPUR alignment is 79.783 km;** out of which 18.900 km lies in Palghar district, 55.260 km lies in Thane district and remaining 5.623 km lies in Raigad district of Maharashtra. The proposed alignment is passing through 68 villages and 6 Tehsils

(Vasai, Wada, Bhiwandi, Kalyan, Ambarnath and Panvel) in the State of Maharashtra.

### 3.0 ANALYSIS OF ALTERNATIVES

A Comprehensive Transportation Study for the Mumbai Metropolitan Region has been done in 2008-2009 by the MMRDA. This network envisages construction of a link from NH4 to NH8 to freeway standards. The alignment options studied here generally follow the links identified in this study and have been modified to suit site conditions.

**Six alternative alignments** for the SPUR to connect JNPT and Mumbai Pune Expressway were studied. A committee was formed in the year 2010 under the Chairmanship of Divisional Commissioner, Konkan Region for the selection of the greenfield alignment of VME including SPUR. The committee recommended the alignment of the main Vadodara Mumbai Expressway in Maharashtra and the SPUR to JNPT (Node No. 1-2-4-11-12-9-10-14). The Government of Maharashtra accepted the recommendations of the committee and the formal approval of the alignment was communicated by the Government of Maharashtra vide their letter NHP2010/CR81/NH1 dated 03/2/2011 addressed to Chairman NHAI.

Government of Maharashtra approved SPUR alignment starts from the main Vadodara Mumbai Expressway near Koshimb village and ends at km 24.476 of NH-4B near Panvel (length was 94.390 km). In later stage, MMRDA planned to develop a Multi-Modal Corridor (MMC) which connects SPUR alignment at Morbe village. Thereafter, during the meeting between MMRDA & NHAI, it was decided to have a common corridor of MMC & SPUR beyond km 79+783. During the meeting held on 22<sup>nd</sup> March 2019 in the office of Regional Officer (NHAI) Mumbai, it is decided that:

- Start point of SPUR will be at Km 26.582 of main alignment of Vadodara Mumbai Expressway;
- SPUR will be developed up to km 79.783 i.e. the proposed junction with the Multi-Modal Corridor of MMRDA.
- Development of the remaining section (up to JNPT) shall be clubbed with the development of Multi-Modal Corridor and shall be taken up later.

Hence, length of the SPUR alignment to be developed in the initial stage is **79.783 km**. The alignment of SPUR has already been included in the Mumbai Metropolitan Regional Plan 2016-36 of MMRDA.

### 4.0 BENEFITS OF THE PROJECT

During the draft Feasibility Study of the Mumbai – Vadodara Expressway, it was felt that the starting point of proposed Vadodara Mumbai Expressway on NH-8 near Dahisar at Mumbai end would pose a serious problem for safe and quick dispersal of traffic from the Expressway and also would not serve the purpose of connecting to major traffic generators like JNPT Port and to Mumbai-Pune expressway. Currently, the traffic bound for Gujarat and further north from JNPT, NH-4 and Mumbai – Pune Expressway follows

Thane-Ghodbandar Road which is already congested and passes through / close to Sanjay Gandhi National Park. Widening of this stretch as per IRC standard is not feasible. This traffic has to pass through congested road network of Mumbai Metropolis from southward destination and the goods earmarked for export and import also find difficulty in commuting to and from JNPT, Navi Mumbai. Therefore it would be prudent to connect the proposed Vadodara Mumbai Expressway to major traffic generators like JNPT and Mumbai – Pune Expressway.

Keeping view of the above, provision of SPUR to VME was explored. The spur will not only connect to these major traffic generators but will also result in better dispersal of traffic in the Mumbai Metropolitan Region.

The project highway will provide smooth, safe and uninterrupted traffic movement between Vadodara to Mumbai in respect to the alternative road NH 48. The NH 48 (Old NH8) is currently carrying more than 100,000 PCUs with much substandard geometry and is heavily congested. It will reduce the travel time about 3 to 4 hours between Vadodara to Mumbai. The proposed expressway falls in the Delhi-Mumbai Industrial Corridor. It will connect to the largest container port, JNPT near Mumbai with northern part and Dahej port, other ports in Gujarat. Surat is at the heart of the world's diamond-polishing industry contributing billions of dollars to the Indian GDP. Vapi, Daman and Silvassa are the major industrial hub will be connected. Development of this section will reduce the existing distance between Vadodara-Mumbai by about 22 km and ultimately there will be reduction in distance between Delhi-Mumbai.

The SPUR will connect the main expressway to JNPT, Maharashtra Samrudhi Marg (Mumbai-Nagpur Expressway) and Mumbai Pune Expressway. Therefore the traffic bound for JNPT, Nagpur and Pune will ply on SPUR and will not enter the Mumbai city. This will reduce both traffic congestion and pollution in the city. The proposed SPUR of VME will be linking Vadodara – Mumbai Expressway, Ahmedabad- Vadodara Expressway, Mumbai –Nagpur Expressway and Mumbai - Pune Expressway and thus will provide expressway connectivity from Delhi – Ahmedabad – Mumbai – Nagpur - Pune.

## 5.0 PROPOSED DEVELOPMENT

Total length	79.783 km
Proposed Right of Way	100 m in general / 70 m in forest area
Carriageway and Shoulder	<u>Carriage way</u> : Dual carriageway 2 x 4 (8 lane), 3.75 m width <u>Shoulder</u> : Paved Shoulder: 3.0 m, Earthen shoulder: 2.0 m
Interchanges	7
Fly-over	3
Rail over bridge (RoB)	1
RoB cum Viaduct	1
Major bridges	7
Major bridges cum viaduct	6

Minor bridges	23
<b>Land Bridge / Animal Overpass</b>	<b>2</b>
<b>Dedicated Animal Crossing</b>	<b>53</b>
Small Vehicular / <b>Animal Underpasses</b>	<b>33</b>
Vehicular Underpass	5
Vehicular Overpass	8
Light Vehicular Underpasses	29
Culverts	185
Way side Amenities	1 at Km 50+800
Smaller Parking Places with Toilet Facilities	2 at Km 11+000 and Km 16+000
Toll Plaza	7 at Km 1+860, Km 20+136, Km 39+748, Km 43+000, Km 52+810, Km 69+000 and Km 78+750
Truck Parking	At 2 locations
Tunnel	To preserve ecology of the Matheran, <b>4.160 km long tunnel</b> (from Km 71.520 to Km 75.680) is proposed which will go under the Matheran Eco-Sensitive Zone.
Safety Measures	<ul style="list-style-type: none"> <li>Thrie beam metal crash barriers</li> <li>Advanced Traffic Management System (ATMS)</li> </ul>
Cost of Civil Construction	Rs, 5,672.99 Cr.

## 6.0 TRAFFIC DATA

The traffic estimates on Vadodara – Mumbai Expressway (SPUR) connecting JNPT have been obtained by assignment of horizon year transport demand on the horizon year networks. The traffic on SPUR will mostly comprise of diverted traffic from the competing road network. The traffic of SPUR has been obtained at sectional levels where a section represents the length of the expressway between any two adjacent interchanges proposed on this facility. A total of 7 interchanges on the SPUR have been planned to facilitate the accessibility of various localities, cities and industrial hubs with the expressway. The sectional volume on the SPUR is expected to be in the range of 18,000 to 44,000 PCUs/day in the opening year.

## 7.0 LAND ACQUISITION

The proposed land acquisition for SPUR is tentatively **1019.5375 ha** out of which **111.7321 ha is forest land** and 907.8054 ha is non-forest land. Forest Division wise summary of forest & non-forest land is presented in **Table-1** and district wise summary of forest & non-forest land is presented in **Table-2**.

**Table-1 Forest Division wise Summary of Forest & Non-forest Land**

Forest Division	Forest Land (ha)	Non-forest Land (ha)	Total Land (ha)
Dahanu	19.4521	174.3596	193.8117

Forest Division	Forest Land (ha)	Non-forest Land (ha)	Total Land (ha)
Jawhar	15.7617	35.7643	51.526
Thane	62.2824	650.4895	712.7719
Alibag	14.2359	47.192	61.4279
<b>Total (ha)</b>	<b>111.7321</b>	<b>907.8054</b>	<b>1019.5375</b>

**Table-2 District wise Summary of Forest & Non-forest Land**

District	Forest Land (Ha)	Non-forest Land (Ha)	Total Land (Ha)
Palghar	35.2138	210.1239	245.3377
Thane	62.2824	650.4895	712.7719
Raigad	14.2359	47.192	61.4279
<b>Total (ha)</b>	<b>111.7321</b>	<b>907.8054</b>	<b>1019.5375</b>

## 8.0 BASELINE ENVIRONMENT

### 8.1 Seismicity

The project area is situated in the **Zone III** (having moderate seismic intensity) of the Seismic Map of India (as per IS: 1893, Part I, 2002) and therefore has a moderate risk of potential damage due to earthquake.

### 8.3 Hydrology

- The proposed SPUR alignment runs along River Tansa mainly over its right bank between chainage 0+000 to 18+800. The alignment crosses Tansa river twice at Ch. 3+400 and again at Ch. 18+850. No major tributary of Tansa crosses the proposed alignment within this stretch of about 18.8 km.
- Between chainage 19+000 to 45+000 the proposed alignment crosses only one major river namely Kamvadi River at Ch. 33+334.
- Between Ch. 45+000 to 67+400 the proposed alignment crosses major rivers namely River Bhatsa (Ch. 45+400), River Kalu (Km 47+300), River Barvi (Km 57+619) and River Ulhas (Km 67+470).
- From Km 70+000 onwards, the proposed alignment runs through Matheran hills upto Km 76+200. Rolling / Plain terrains are visible where the alignment approaches Panvel
- Rocks are visible in the beds and banks of almost all the rivers crossing the proposed alignment.
- Major Rivers of the study area are Tansa, Bhatsa, Kalu, Kamvadi, Barvi and Ulhas River.
- The Study area comes under Sub zone 5(a) for West Coast Region (Konkan Coasts) as per classification of The Central Water Commission.

### 8.3 Land Use

- Land Use within PROW: Agricultural and allied uses occupied largest part amounting 63.93% of the total area, followed by barren / waste land (16.06%), forest (11.91%), industrial area (4.31%), built-up area (2.46%) and water bodies (1.33%).

- Land Use within Study Area: Total study area is 301296.21 ha. Agriculture land occupied major part (36.53%) of the total area, followed by forest (31.06%), barren/ waste land (15.25%), built-up area (9.6%), water bodies (5.37%) and industrial area (2.19%)

#### 8.4 Climate

Past climatic data show that May is the hottest month with the mean daily maximum temperature around 34.4°C and January is recorded to be the coldest month with the mean daily minimum temperature of 17.3°C. The normal annual rainfall in the study area ranges from 1900 mm to 2600 mm and mean annual rainfall during the year 1981 to 2010 is 1874.6 mm.

A maximum temperature of 36.2°C and minimum temperature of 19°C was observed during the monitoring period (October to December 2020). Maximum Relative humidity is found to be 93.5% while minimum relative humidity was about 16.6%. Total rainfall during this period was 155.3 mm.

#### 8.5 Ambient Air Quality

**Six sampling stations** were set up for monitoring ambient air quality within the study area. The ambient air quality at the monitored locations does not exceed National Standards and well within the limits. No industrial sources of air emission are observed along the proposed alignment of the SPUR. Air quality data of the study area generated through manual monitoring network has been utilized to calculate the monitoring date wise AQI of the study area and it can be concluded that **68.5% time** of the monitoring period air quality of the area was **satisfactory** while **29% time** of the monitoring period air quality of the area was **good** and **2.5% time** of the monitoring period air quality of the area was **moderately polluted**.

#### 8.6 Ambient Noise Level

To assess the background noise levels in the study area ambient noise monitoring was conducted at **six locations**. The daytime and night time equivalent noise levels show that the ambient noise levels are within the stipulated noise standards of residential and silence area. Maximum equivalent noise level during day time [54.3 dB(A)] is observed and during night time [43.9 dB(A)] is observed at at Kuske Village (NQ3). The measured and calculated values of the study area indicate that ambient noise levels **not exceeding the threshold limits**

#### 8.7 Surface Water

Surface water samples (grab samples) were collected once in the month of November 2020 from **6 locations** covering river and pond and analyzed for physical, chemical and bacteriological parameters as per established standard methods and procedures. pH values of the surface water are varies between 7.1-7.9 which is within the tolerance limit of 8.5. The slight alkalinity of the water may be associated with alkaline soil of the region. Dissolved Oxygen (DO) levels are found to be in the range of 5.9-6.8 mg/l. BOD ranges from 2.1-2.9 mg/l while COD ranges are found to be 8.1-18.2 mg/l. The values of BOD

indicate that greater amount of oxidizable organic material in the water resulting increase of oxygen demand and thereby, lowering of dissolved oxygen levels. The BOD level in river water can be attributed to use of fertilizers in the agricultural fields of river catchment as well as industrial activities in the surrounding area. Chloride and sulphate contents were 19-880 mg/l and 21-440 mg/l respectively. Calcium content varied between 16-150 mg/l, magnesium ranged between 5-87 mg/l. Level of iron in all samples were less than 0.06 mg/l while arsenic, chromium, cadmium, copper, manganese, zinc and mercury are found to be below detectable limit. Fecal coliforms are also present in all the samples

## 8.8 Ground Water

- **Depth of Ground Water:** In the study area, pre monsoon depth to water level (May-2012) ranging between 2 to 5 mbgl and 5 to 10 mbgl while post-monsoon depth to water level (Nov- 2012) ranging between 2 to 5 mbgl in major part of the study area..
- **Ground Water Category:** As per the CGWA classification, all the Talukas, through which the proposed SPUR is passing, fall under safe category.
- **Ground Water Quality:** Ground water samples were collected once in the month of November 2020 from 6 locations comprising hand operated tube wells (hand-pumps) and analyzed for physical, chemical and bacteriological parameters as per established standard methods and procedures. The physico-chemical qualities of the ground water satisfy the acceptable limit as stipulated in Drinking Water Standards of India (IS 10500 : 2012) and suitable for human consumption.

## 8.9 Ecology and Biodiversity

**Quadrat Study of Flora:** Entire stretch of the proposed alignment comprises various land uses; Forest, forest land, human settlement, agricultural land etc. The survey was carried out between 19.12.2020 to 23.12.2020. For vegetation sampling quadrat method was used. For trees 10x 10m, for shrub 3x 3m while for herbs and grasses 1x 1m size of quadrat was used. A total 25 quadrats were laid out and calculated species' frequency, density abundance, diversity indices etc. Analysis of trees data shows that among six sites *Acacia auriculiformis* was the most frequent species followed by *Tectona grandis*. Density of *Tectona grandis* was also recorded highest among the tree species followed by *Acacia auriculiformis*.

Analyzing the shrub layer data it was found that the most frequent and dominant shrub species were *Calotropis procera*, and *Cassia siamea* among the six sampling sites. Data of herbaceous layer showed that in all the six sites most frequent and dominant herb species were *Cynodon dactylon*, and *Dactyloctenium aegyptium*, in all the six sampling sites, these species were also observed to be the densest species among the six forest sites.

**Mangrove:** Proposed project does not involve diversion of mangrove forest. Hence, there will be **no impact on mangrove**.

**Faunal Composition:** The fauna of project area is based on direct sighting during field survey, stakeholder consultation, review of Forest working plans of Dahanu Division, Thane

Division and Alibag Division, Wildlife Management plan of Tungeshwar Wildlife Sanctuary and published literature. During filed visit no direct sighting of wildlife was occurred, except some birds. Hence local people and concerned forest departments were approached and information on wild life was gathered. It was noted that in areas which come within buffer zone, some Schedule-I species were reported. It was noted that total 24 Schedule-I species are noted in the buffer zone of the proposed alignment.

### 8.10 Protected Areas

- The proposed SPUR does **not pass through** any protected areas.
- The **Conservator of Forests, Sanjay Gandhi National Park, Bborivali vide letter dated 08.10.2021 certified** that the proposed SPUR alignment is located at a distance of **0.619 km** from the boundary of the **Tungareshwar Wildlife Sanctuary** and outside it's ESZ. The alignment of proposed expressway is located at a distance of 0.275 km from the notified ESZ boundary i.e. outside the ESZ. It may be mentioned that the same has been vetted by the forest officials who were present during site visit of EAC sub-committee on 14.11.2019.
- **Tansa Wildlife Sanctuary** is located at a distance of approx. **13.6 km** from the proposed alignment of SPUR.
- The proposed alignment passes through **Matheran ESA** from km 71+532 to 75+426 (both buffer and eco-sensitive zone) and from km 77+115 to km 77+691 (only buffer zone). To preserve ecology of the Matheran, **4.160 km long tunnel** is proposed in this section which will go under the Matheran Eco-Sensitive Zone. The start point of the tunnel is at km 71.520 (before buffer zone) and end point of the tunnel is at km 75.680 (after buffer zone).

## 9.0 COASTAL REGULATION ZONE (CRZ)

The proposed VME-SPUR crosses Tansa River, Bhatsa River and Kalu River, which are regulated under CRZ Notification. CRZ map and report has been prepared by the National Centre for Earth Science Studies (NCESS), Thiruvananthapuram, a MoEFCC approved agency. Village wise length of VME – SPUR alignment in CRZ crossing area and category wise breakup of CRZ area are given in **Table-3** and **Table-4**.

**Table-3 Village wise length of VME-SPUR Alignment in CRZ Crossing Areas**

Proposed Chainage		Length (km)	Village	River
From	To			
45+256	45+535	0.278	Sange – Konderi	Bhatsa River
47+124	47+455	0.331	Sangode - Balyani	Kalu River
		<b>0.609</b>		

Source: CRZ Map & Report prepared by NCESS, July 2021



**Table-4 Village wise Break-up CRZ Categories in VME SPUR Crossing Points** (area in Sq. m.)

Location	CRZ IA		CRZ IB	CRZ II	CRZ III	CRZ IVA	CRZ IVB
	Mangrove	Mangrove Buffer					
Kashid Kopar	-	-	141.19	-	1533.8	-	280.47
Sange	-	-	2161.09	-	9093.73	-	4810.18
Konderi	-	-	938.22	-	9355.1	-	1488.8
Sangode	-	-	3889.35	-	16573.49	-	10472.23
Balyani	-	-	0	8978.1	0	-	0
<b>Total (in sq. m.)</b>			<b>7129.85</b>	<b>8978.1</b>	<b>36556.12</b>		<b>17051.68</b>
<b>Total (in ha)</b>			<b>0.713</b>	<b>0.898</b>	<b>3.656</b>		<b>1.705</b>
<b>Grand Total = 69715.75 Sq. m / 6.972 ha</b>							

Source: CRZ Map & Report prepared by NCESS, July 2021

The proposal for CRZ Clearance was uploaded through online portal of MCZMA on 13<sup>th</sup> July 2021. The proposal was considered by the Environment and Climate Change Department, Government of Maharashtra on 21.09.2021 and recommended the proposal for grant of CRZ clearance vide letter dated **29.09.2021**

## 10.0 ARCHAEOLOGICAL SITES

There are no archaeological sites within 300 m on either side of the proposed expressway.

## 11.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A summary of the anticipated environmental impacts during construction and operation phase along with recommended mitigation measures is summarized in **Table-5**.

**Table-5 Summary of Anticipated Impacts and Recommended Mitigation Measures**

Area	Impacts	Mitigation Measures
<b>Construction Phase:</b>		
Topography and geology	<ul style="list-style-type: none"> <li>Disfiguration &amp; change in existing profile of the land due to borrow pits &amp; construction of realignments.</li> <li>Disturbance on geological setting due to quarrying.</li> <li>Uncontrolled digging of borrow pits resulting in water accumulation &amp; breeding of vector disease.</li> <li>Establishment of construction camp</li> </ul>	<ul style="list-style-type: none"> <li>Borrow pits shall be allowed at only pre-identified locations with prior permission from competent authority</li> <li>Borrow pits shall be restricted to 1 m depth followed by resurfacing of pits.</li> <li>Road building materials shall be procured from approved and licensed quarries.</li> <li>Suitable seismic design of the structures shall be adopted to mitigate the earthquake impacts.</li> </ul>
Soil	<ul style="list-style-type: none"> <li>Disruption &amp; loss of productive top soil from agricultural fields</li> <li>Soil erosion and contamination</li> </ul>	<ul style="list-style-type: none"> <li>Adequate measures like drainage, embankment consolidation &amp; slope stabilization shall be taken to avoid soil erosion.</li> <li>Top soils (15 cm) of borrow pit sites shall be conserved and restored after excavation is over.</li> <li>Accidental spills of lubricants/oil and molten</li> </ul>

Area	Impacts	Mitigation Measures
		<p>asphalt shall be avoided by adherence to good practices.</p> <ul style="list-style-type: none"> <li>Oil Interceptor shall be provided for wash down, refueling areas</li> <li>Vehicle parking area of the construction camp will be made impervious using 75 mm thick P.C.C. bed over 150 mm thick rammed brick bats.</li> </ul>
Land use	<ul style="list-style-type: none"> <li>Changes in existing land use pattern of the PROW for construction of the expressway</li> <li>Loss of agricultural land, forest land etc. due to land acquisition</li> </ul>	<ul style="list-style-type: none"> <li>Earth material generated from excavation shall be reused for embankment construction and site development.</li> <li>Construction debris will be disposed of in suitable pre-identified dumping areas.</li> <li>Dumping areas will be biologically reclaimed.</li> <li>Construction camp will be provided to avoid indiscriminate settlement of construction workers.</li> <li>Construction activities shall be kept confined to PROW only</li> </ul>
Drainage & Hydrology	<ul style="list-style-type: none"> <li>The drainage network along the expressway is subject to impacts due to construction of embankment</li> </ul>	<ul style="list-style-type: none"> <li>A pond is located at chainage 37+420. Major bridges has been proposed at this location. Hence, there will be no impact on pond.</li> <li>To minimize the impact drainage &amp; hydrological flow, 13 major bridges, 23 minor bridges, 238 culverts are proposed to be constructed along the expressway</li> <li>It has been ensured that all the 1<sup>st</sup> and 2<sup>nd</sup> order streams crossing the proposed expressway alignment provided with necessary culverts, mirror bridges and major bridges with capacity of 20% excess discharge</li> <li>All bridges have been designed for a return period of 100 years and culverts have been designed for a return period of 50 years</li> <li>Silt fencing shall be provided between expressway and water bodies to avoid any siltation due to runoff from construction area</li> <li>Shoulder and toe drains has been proposed along the expressway on both side</li> </ul>
Water use	<ul style="list-style-type: none"> <li>Impact on the local water sources due to use of construction water.</li> </ul>	<ul style="list-style-type: none"> <li>Minimum use of water from existing sources for construction purpose</li> <li>The contractor shall arrange water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.</li> <li>If new tube-wells are to be bored, due to the non-availability of water required for construction, prior sanctions and approvals by the Ground Water Department has to be obtained by the Contractor</li> <li>Wastage of water during the construction should be minimized</li> </ul>
Water quality	<ul style="list-style-type: none"> <li>Increase of sediment load in the run off from construction sites and increase in turbidity in receiving water bodies.</li> </ul>	<ul style="list-style-type: none"> <li>Silt fencing will be provided to reduce sediment load</li> <li>Oil interceptor to stop and separate the floating oils</li> </ul>

Area	Impacts	Mitigation Measures
	<ul style="list-style-type: none"> <li>Water pollution due to generation of wastewater from construction camps</li> <li>Water pollution due to use of fly ash in the embankment</li> </ul>	<ul style="list-style-type: none"> <li>Packaged Wastewater Treatment Plant has been recommended for the construction camp</li> <li>All the construction activities will be carried out during dry seasons only.</li> <li>In line with specifications of IRC:SP:58, method of construction of Fly Ash embankments is proposed by alternate layers of fly ash and soil i.e. Sandwich Type Construction</li> <li>Rainwater Harvesting Structures has been proposed at toll plaza, way side amenities and along the expressway with oil &amp; grease removal provisions. Total number of Rainwater Harvesting structures proposed is <b>75</b> and cost of the same has been included in the EMP budget</li> <li>The fuel storage and vehicle cleaning area shall be stationed at least 500m away from the nearest water body</li> <li>Apart from provision of the mitigation measures, water quality shall be monitored during construction and operation phases as per environmental monitoring program to understand the effectiveness of mitigation measures suggested</li> </ul>
Air quality	<ul style="list-style-type: none"> <li>Deterioration of air quality due to fugitive dusts emission from construction activities and vehicular movement along unpaved roads.</li> <li>Deterioration of air quality due to gaseous emissions from construction equipment &amp; vehicular traffic.</li> <li>Deterioration of air quality due to emission from hot mix plants and stone crusher.</li> </ul>	<ul style="list-style-type: none"> <li>Construction materials will be stored in enclosed spaces to prevent fugitive emissions.</li> <li>Truck carrying soil, sand and stone will be duly covered to avoid spilling.</li> <li>Dust suppression measures such as regular water sprinkling on haul &amp; unpaved roads particularly near habitation</li> <li>Hot Mix Plant with Pollution Control Measures having Fabric Filter with multiple wet scrubber shall be installed and elevators at loading section shall be fully covered</li> <li>A combination of dry and wet type control system is suggested for stone crusher to minimize the impact on air quality</li> <li>Hot mix plants &amp; stone crusher shall be located at least 500 m away from inhabited areas &amp; sensitive receptors</li> <li>Air quality shall be monitored during construction and operation phases as per environmental monitoring program to understand the effectiveness of mitigation measures suggested</li> </ul>
Noise level	<ul style="list-style-type: none"> <li>Increase in noise level due to construction activities like operation of construction equipment &amp; vehicular traffic.</li> </ul>	<ul style="list-style-type: none"> <li>Construction camp and temporary labour sheds will be located away from the immediate vicinity of the construction sites and major road traffic.</li> <li>PPEs will be provided to construction personnel exposed to high noise levels as preventive measure.</li> <li>Low noise construction equipment will be used.</li> <li>Stationary construction equipment will be placed 113 m away from inhabited areas.</li> <li>Stationary construction equipment will be placed 200 m away from the silence zones</li> </ul>

Area	Impacts	Mitigation Measures
		<ul style="list-style-type: none"> <li>Construction activities carried out near residential area will be scheduled to the daytime only so that minimum disturbances are caused to people.</li> <li>Noise barrier will be constructed in silence zone, interchanges (300m on each side on outer edge), fly-overs (200m on each side on outer edge), truck parking (500m on one side on outer edge), way side amenity - type A (500m on one side on outer edge) and way side amenity - type B (150m on one side on outer edge)</li> <li>Noise level shall be monitored during construction and operation phases as per environmental monitoring program to understand the effectiveness of mitigation measures suggested</li> </ul>
Floral and Forest	<ul style="list-style-type: none"> <li>Diversion of forest land</li> <li>There area 55,355 trees within the proposed RoW; out of which 13,839 trees in forest land and 41,516 trees in non-forest land</li> <li>Loss of habitat of fauna due to felling of trees and diversion of forest land</li> </ul>	<ul style="list-style-type: none"> <li>Forest clearance for diversion of forest land</li> <li>As suggested by the MoEFCC, RoW has been reduced from 100 m to 70 m in the forest area. In 8.756 km stretch, RoW has been reduced and 24.276 ha forest land has been saved</li> <li>Average width of construction zone in the non-forest area is 70 m out of 100 m RoW (Right of Way). Tree counting has been conducted in 100 m area and there are 41,516 trees in non-forest land. Approx. 30% i.e. 12,454 <b>trees</b> standing outside the construction zone on edge of the RoW may be saved in the non-forest area</li> <li>69,680 no. of trees and 40,098 no. of hedges proposed to be planted under greenbelt development plan</li> <li>As per <b>Compensatory afforestation</b> notification 8<sup>th</sup> November, 2017, the requirement is 1,000 plants per ha of Forestland diverted. However, this shall be finalized by the Forest Department</li> <li>Cooking fuel (LPG) shall be provided to construction workers to avoid cutting / felling of trees for fuel wood.</li> <li>Soil erosion shall be checked by adopting bio-engineering measures</li> </ul>
Fauna & Wildlife	<ul style="list-style-type: none"> <li>Diversion of forest land shall directly cause loss of habitat for wildlife. The wildlife dwelling in the forest will be forced to move to other locations and compete for space and food.</li> <li>Proposed expressway may cause obstruction in movement of wildlife</li> <li>Movement of animals between Tungreshwar to Tansa Wildlife Sanctuary is reported near Mandvi village between chainage 2+000 to 2+500 and near village Kelthan and Akloli</li> </ul>	<ul style="list-style-type: none"> <li>364 structures (which include <b>2 animal overpass, 53 numbers of dedicated animal crossings and 33 numbers of small vehicular / animal underpasses</b>) have been proposed along the entire stretch of the VME-SPUR and total length of the structures is 13.447 km. It can be concluded that in every km stretches of the VME-SPUR; around 5 structures have been proposed</li> <li>Circular issued by the Principle Chief Conservator of Forest, Maharashtra State vide letter no. Desk-17/17-4/CR-118/20-21/541 dated 24 September 2020 has been complied. All underpass and animal crossing having a minimum size of width 4.00 m and height 3.00 m has been proposed and</li> </ul>

Area	Impacts	Mitigation Measures
	<p>i.e. chainage between 18+000 to 19+000 near the crossing of Vaitarna River</p> <ul style="list-style-type: none"> <li>▪ Movement of animal between Tungreshwar and Tansa forest areas observed and reported between the areas from design chainage 2+000 to 19+000. Between chainage 0+000 to 2+000 and beyond chainage 19+000 to end point, no such incident neither observed nor reported</li> </ul>	<p>distance between such structures is less than 1 km</p> <ul style="list-style-type: none"> <li>▪ The wildlife kills reported by Tungreshwar Wildlife Sanctuary (TWLS) shows that all the incidence of road kill occurred towards south side and approx. 2.0 km away from the proposed start point of expressway</li> <li>▪ NH-48 (old NH-8) is acting as a barrier for the movement of wild animals from eastern side of the proposed expressway</li> <li>▪ Cost of construction of the animal overpass, dedicated animal crossing &amp; animal underpass is <b>Rs. 173.39 Crore</b> which is part of mitigation cost.</li> <li>▪ Total financial outlay for implementation of wildlife conservation plan and mitigation measures, <b>Rs. 3.57 Crore</b></li> <li>▪ <b>Wildlife Conservation Plan prepared for the project has been approved by the Principle Chief Conservator of Forests and Chief Wildlife Warden, Maharashtra State vide letter dated 01.09.2021</b></li> <li>▪ The Contractor shall ensure that no open fire is done in construction camp as it may lead to fire to surrounding forest causing injury to wildlife</li> <li>▪ Noise will be kept under control by regular maintenance of equipment and vehicles.</li> <li>▪ Noisy activity shall be prohibited during night time</li> </ul>
Protected Area	<ul style="list-style-type: none"> <li>▪ The proposed expressway does not pass through any National Park, Wildlife Sanctuary, Conservation Reserve and Community Reserve; hence <b>no direct impact is envisaged</b></li> <li>▪ The proposed SPUR alignment is intervening Matheran Eco Sensitive Zone at two locations between Km 71.532 to 75.426 and km 77.115 to km 77.691</li> </ul>	<ul style="list-style-type: none"> <li>▪ To preserve ecology of the Matheran, 4.160 km long tunnel is proposed in this section which will go under the Matheran Eco-Sensitive Zone. Start and end point of the tunnel is outside the buffer zone of Matheran ESZ.</li> <li>▪ The Member Secretary, Matheran Eco-Sensitive Zone Committee and District Collector, Raigad vide letter dated 24.03.2021 communicated that the approval given by the Matheran Monitoring Committee for VME-SPUR project vide letter dated 16.04.2013 is still valid.</li> <li>▪ Wildlife awareness &amp; environmental protection training shall be provided to the work force by the Contractor and a budget of Rs. 32 lakh has been proposed for training in the EMP Budget</li> <li>▪ Monitoring of wild animals should be done during construction phase and any incidence of sighting should be immediately reported to Forest Department.</li> <li>▪ Monitoring of Wildlife movement and identify accident prone areas or hot spots for wildlife kill. Fencing has been proposed along the ROW boundary of the entire expressway.</li> <li>▪ Boards depicting wildlife awareness instructions and cautions should be placed near forest areas and at start and end point of the expressway.</li> <li>▪ Animal feeding along the expressway will not be</li> </ul>

Area	Impacts	Mitigation Measures
		<p>permitted and clearly conveyed through sign boards.</p> <ul style="list-style-type: none"> <li>Measures recommended during Environment &amp; CRZ Clearance, Forest Clearance and from the Chief Wildlife Warden, Govt. of Maharashtra shall be complied; progress report of implementation of EMP and recommendations by various authorities shall be submitted as per the schedule</li> </ul>
Tunneling	<ul style="list-style-type: none"> <li>Disturbance on geological setting due to tunneling.</li> <li>Run off from unprotected tunnel faces can result in excessive soil erosion.</li> <li>Muck generated from tunnel construction</li> <li>Change in underground drainage system due to tunnel.</li> <li>Draining of excess water from excavated tunnel.</li> <li>Increase in noise &amp; vibration level due to construction activities like tunneling</li> <li>Trees in tunnel locations saved, thus preserving the ecology of the area</li> </ul>	<ul style="list-style-type: none"> <li>The detailed analysis of Geophysical study shows that there is no water body encountered along the SPUR alignment and the rock is hard and compact which will not affect on the alignment and it is safe for tunneling.</li> <li>The structural geology study shows that the area is good for tunneling.</li> <li>The lineament study and Aquifer mapping shows that the area is safe for tunneling and will not affect any ground water body present in the area.</li> <li>Stabilization measures for tunnel and slope shall be as per final recommendation of Geotechnical Investigation report.</li> <li>Careful planning, timing of cut and fill operations and re-vegetation shall be done to minimize soil erosion.</li> <li>Muck generated from tunnel construction shall be reused in filling operations, embankment construction and other construction activities.</li> <li>Continuous pumping of excess water into the storm water drains, which finally meet the natural water source.</li> <li>Pits, tunnels and headings shall always be kept ventilated to maintain an atmosphere fit for respiration and free from oxygen deficiency, potentially explosive or noxious gases and dust, whether present naturally or otherwise. Ventilation shall also be used to maintain a safe working temperature</li> <li>Tunnel ventilation system shall include the Axial and Jet Fans, Motorized Fire Dampers, Sound Attenuation, Ductwork and Support Steelwork, Inside Tunnel and External Environmental Sensors and Monitoring Equipment</li> <li>It is to be ensured that the ventilation system and its associated equipment meet the requirements of IRC:SP-91-2019, BD78/99, PIARC and NFPA</li> <li>Blasting operations shall be carried out only under the direction of an experienced operator. The Concessionaire shall appoint one competent person to be responsible for the security of explosives</li> <li>The tunnel environment shall be monitored by CO sensors, Visibility (haze) sensors, Velometers, NO sensors and NO2 sensors (Provision for future use)</li> </ul>

Area	Impacts	Mitigation Measures
		<ul style="list-style-type: none"> <li>Noise &amp; vibration monitoring as per Environmental Monitoring Program</li> </ul>
Solid Waste	<ul style="list-style-type: none"> <li>Waste generated during construction may impact soil, agriculture and water quality</li> <li>Waste generated from workers' camps may impact surface and ground water quality and agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Approx. 300 kg/day domestic waste will be generated by the construction workers in all the packages, out of which biodegradable waste is estimated to be 120 kg/day and remaining 180 kg/day is non-biodegradable waste. There will be "Refuse Containers" at site for the management of domestic waste generated by the construction labourers and these containers shall be emptied at least once daily and will be disposed of as per Solid Waste Management Rules, 2016 in consultation with the local authority.</li> </ul>
Construction camp	<ul style="list-style-type: none"> <li>Influx of construction work-force &amp; suppliers who are likely to construct temporary tents in the vicinity.</li> <li>Likely sanitation &amp; health hazards &amp; other impacts on the surrounding environment due to inflow of construction labourers.</li> </ul>	<ul style="list-style-type: none"> <li>Temporary construction camps with adequate potable water supply, primary health facilities and fuel for cooking shall be provided</li> <li>Packaged Wastewater Treatment Plant has been recommended for the construction camp</li> <li>It will be ensured that the construction workers are provided fuel for cooking to avoid cutting of trees from the adjoining areas.</li> <li>Contractor to provide a full-fledged dispensary. The number of beds shall be as per the requirement of the labour license</li> </ul>
Occupational health & safety	<ul style="list-style-type: none"> <li>Health &amp; safety related problems to construction workers due to inadequate health &amp; safety measures.</li> </ul>	<ul style="list-style-type: none"> <li>Adequate safety measures complying to the occupational safety manuals will be adopted to prevent accidents / hazards to the construction workers</li> <li>Contractor shall conduct monthly health check-ups of all his laborers in his camps through registered medical practitioner</li> <li>Contractor to conduct workshop on HIV / AIDS for all his laborers at all his camps at least once in a quarter</li> </ul>
Road safety	<ul style="list-style-type: none"> <li>Increase on incidence of road accidents due to disruptions caused in existing traffic movements.</li> </ul>	<ul style="list-style-type: none"> <li>The proposed project is a greenfield alignment and there is no normal operating traffic as in the case of existing highways. Therefore, there is no specific standard requirement for traffic management plan during construction phase. It is normally the construction vehicles, which will be plying on temporary roads for the construction works. Wherever the proposed expressway is crossing any existing road, during construction phase, the Contractor shall provide and maintain a passage for traffic either along a part of the proposed RoW or along a temporary diversion constructed close to the crossing. The Contractor shall take prior approval of the Authority / Independent Engineer (AE / IE) regarding traffic arrangements during construction.</li> <li>Reduction of speed through construction zones.</li> </ul>
<b>Operation Phase</b>		
Land use and	<ul style="list-style-type: none"> <li>Change of land use by squatter/</li> </ul>	<ul style="list-style-type: none"> <li>Boundary wall has been proposed along the ROW</li> </ul>

Area	Impacts	Mitigation Measures
Encroachment	encroachment within ROW and induced development outside the ROW.	boundary of the entire expressway <ul style="list-style-type: none"> <li>Planning agencies and Collector / Revenue Officer will be made involved for controlled development and prohibiting squatter/ encroachment within ROW.</li> </ul>
Drainage	<ul style="list-style-type: none"> <li>Filthy environment due to improper maintenance of drainage.</li> </ul>	<ul style="list-style-type: none"> <li>Shoulder drain &amp; toe drain of sufficient capacity has been provided on both sides of the expressway to accommodate increased run-off. The out fall for these drains will be the nearby culverts / bridges or natural drainage channel. Silt fencing will be provided to sediment entering into the water courses.</li> </ul>
Water quality	<ul style="list-style-type: none"> <li>Chances of contamination of water bodies from road surface run off containing oil spills due to traffic movement &amp; accidents.</li> </ul>	<ul style="list-style-type: none"> <li>Adequate drains have been proposed to accommodate increased run-off. The out fall for these drains will be the nearby culverts / bridges or natural drainage channel.</li> <li>Silt fencing will be provided to sediment entering into the water courses.</li> <li>Monitoring of water quality at specified locations will be conducted at fixed interval</li> </ul>
Air quality	<ul style="list-style-type: none"> <li>Air pollution due to vehicular emission from road traffic.</li> </ul>	<ul style="list-style-type: none"> <li>Results of air quality modeling indicate that due to higher carriageway width, air turbulence and high design speed, emissions from traffic are low at receptor locations. With the introduction of BS-VI compliant fuels and vehicles, the vehicular emission is expected to further reduce and may offset the increased pollutant concentration due to increased traffic volume. Hence, the pollutant concentration is not expected to increase beyond stipulated limits in operation phase of the expressway.</li> <li>Plantation along the expressway will act as sink of air pollutants</li> <li>Monitoring of air quality at specified locations will be conducted at fixed interval</li> </ul>
Noise level	<ul style="list-style-type: none"> <li>Noise pollution due to traffic noise.</li> </ul>	<ul style="list-style-type: none"> <li>Plantation along the expressway will act as a natural noise barrier.</li> <li>Monitoring of noise level at specified representative locations will be conducted at fixed interval.</li> <li>Maintenance of noise barrier</li> </ul>
Flora & fauna	<ul style="list-style-type: none"> <li>Illegal felling of trees along the expressway</li> <li>Effect on aquatic fauna in case of accidental spill of oil, fuel &amp; toxic chemicals into water bodies</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring of avenue plantation along the expressway to be done. Dead sapling shall be replaced and survival rate of 90% shall be maintained. Saplings shall be provided with tree guards to protect from cattle grazing.</li> <li>Regular watering of plants to be done in dry season through drip irrigation system.</li> <li>Regular maintenance of the cattle underpass and culverts, which will act as animal crossing.</li> </ul>



## 12.0 ENVIRONMENTAL MANAGEMENT PLAN

EMP has been prepared addressing the following issues:

- Stage wise (design & pre-construction stage, construction stage & operation stage) environmental management measures;
- Environmental monitoring program during construction and operation phase including performance indicator, monitoring schedule (parameters, locations, frequency of monitoring & institutional responsibility) and reporting system;
- Green belt development plan
- Institutional & implementation arrangement and capacity building
- Various guidelines such as Top Soil Conservation and Reuse, Siting and Layout of Construction Camp, Slope Stabilization, Management of Borrow and Quarry Area, Sediment Control, Comprehensive Waste Management Plan, Traffic Management Plan, Worker's Safety during Construction, Storage, Handling, Use and Emergency Response for Hazardous Substances etc.
- Environmental budget

### Environmental Budget:

**EMP Budget:** A capital cost provision of about **Rs. 56.98 Crore** has been kept towards implementation of environmental management plan.

**Table-6 Summary of Environmental Budget**

Component	Description	To be implemented by	Amount in Rs.
A	Greenbelt Development	Contractor	14,46,18,000
B	Cutting of Trees including trunks, branches & removal		3,20,88,630
C	Mitigation / Enhancement		5,41,85,000
D	Environmental Monitoring		96,19,500
E	Training, Capacity building & Mobilization		32,00,000
F	<b>Subtotal (A+B+C+D+E)</b>		24,37,11,130
G	Contingency @3%		73,11,334
H	<b>Total (F + G)</b>		<b>25,10,22,464</b>
I	Cost of CA & NPV for forest diversion	NHAI	<b>31,87,94,580</b>
<b>Grand Total (H + I)</b>			<b>56,98,17,044</b>
<b>Say</b>			<b>Rs. 56.98 Cr.</b>

### **Budget for Implementation of Wildlife Conservation Plan:**

- Cost of construction of the animal overpass, dedicated animal crossing & animal underpass is Rs. 173.39 Crore which is part of mitigation cost
- Total financial outlay for implementation of wildlife conservation plan and mitigation measures, Rs. 3.57 Crore has been proposed.

- The total financial allocation proposed for implementation of the Wildlife Conservation Plan including its implementation responsibility, **as approved** by the **Principle Chief Conservator of Forests and Chief Wildlife Warden, Maharashtra State is Rs. 177.18 Cr.**

**Table-7 Summary of Financial Allocation for Wildlife Conservation Measures**

Description	Amount (in Cr.)	Implementation Responsibility
Civil Cost for construction of Animal Overpass, Dedicated Animal Crossing and Animal Underpass	173.39	Shall be implemented by the NHAI through Contractor
Cost of conservation / mitigation suggested by the Forest Department	3.79	Shall be implemented by the Forest Department. NHAI will transfer the fund to the Forest Department
<b>Total Financial Allocation</b>	<b>177.18</b>	

### 13.0 CONCLUSIONS

The proposed Greenfield expressway (VME-SPUR) will have impacts on the environment during construction and operation phase. Based on the EIA study, it can be concluded that adverse environmental impacts can be mitigated to an acceptable level by implementation of the mitigation measures as stated in the EIA Report. The mitigation measures suggested and the Environment Management Plan (EMP) prepared for this project seems sound enough to mitigate the present as well future consequences if any during implementation and operation phase.

The proposed VME-SPUR will reduce the traffic load on NH-48 (Old NH-8), NH-3 & NH-222; which will mitigate the safety issues, reduce pollution load in the surrounding area, increase employment opportunity and improve economic development of the region. Further, the expressway will be linking Vadodara – Mumbai Expressway, Ahmedabad-Vadodara Expressway, Mumbai – Nagpur Expressway and Mumbai - Pune Expressway and thus will provide expressway connectivity from Delhi – Ahmedabad – Mumbai – Nagpur - Pune.