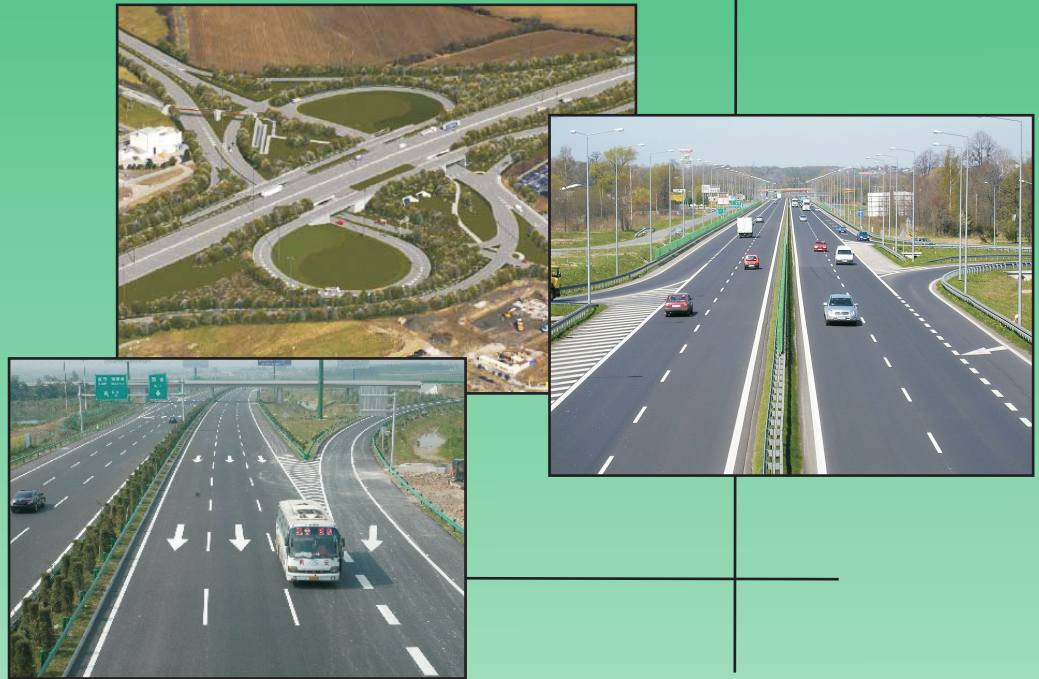




**National Highways Authority of India**  
(Ministry of Road Transport & Highways)  
Government of India

**Development of 6-lane SPUR starting from  
Km 26.320 of Vadodara - Mumbai Expressway and  
terminates at Km 24.416 of NH-4B in the state of  
Maharashtra (94.390 Km) by  
M/s NHA [F.No. 10-4/2013-IA-III]**



**EXECUTIVE SUMMARY**  
(English)

**Project Director**  
National Highways Authority of India,  
Project Implementation Unit – Panvel,  
Survey No. 63, 'D' Point on NH-4B,  
Chinchpada Kalamboli Bypass Road,  
Panvel - 410206



**Intercontinental Consultants and  
Technocrats Pvt. Ltd.**  
A-8, Green Park, New Delhi - 110 016, India

## **EXECUTIVE SUMMARY**

### **0.1 GENERAL**

Transportation network serves as a prop to any nation's economy. Apart from the direct impact of easy accessibility to places and fast movement, roads constructed indirectly helps increase the commercial value of land as well as strengthen livelihood opportunities. However, an expressway, highest in the hierarchy of road gives fast movement for through traffic with restricted access triggering emergence of activities especially in the origin and destination places. Unlike national highways or state highways it instigates more of macro level or regional development and less of micro level economic development.

Thousand kilometers of expressways has been taken to be developed under the National Highways Development Project (NHDP) Phase-VI. It includes the development of 379 km of expressway from Vadodara to Mumbai. The present project of spur alignment shall connect the main expressway near Mumbai to the Mumbai Pune National Highway NH-4B to be implemented under Public Private Partnership mode and to be executed as Design, Build, and Finance and Operate (DBFO) contracts.

### **0.2 PROJECT PROPONENT**

National Highway Authority of India (Ministry of Road Transport and Highways, Govt. of India) is the project proponent. The National Highways Authority of India was constituted by an act of Parliament, the National Highways Authority of India Act 1988, it is responsible for the development maintenance and management of National Highways entrusted to it and for matters connected or incidental thereto. The authority was operationalized on Feb 1995. Primary mandate of NHAI is time and cost bound implementation of National Highways Development Project (NHDP) through host of funding options including funding by external multilateral agencies like World Bank, Asian Development Bank, JBIC etc. The NHAI has established Project Implementation Units (PIU) at various places for the execution/implementation of works. The PIU, Panvel is looking after the implementation of the SPUR alignment.

<i>NHAI, PIU - Panvel Survey No. 63, 'D' Point on NH-4B, Chinchpada Kalamboli Bypass Road, Panvel - 410 206</i>
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### **0.3 CONSULTANT**

Intercontinental Consultants and Technocrats Pvt. Ltd (ICT), India has been appointed as Consultants to provide consultancy services to assist it in all aspects of study in accordance with Terms of Reference (ToR).

M/s ICT Pvt. Ltd is an accredited consultant by Quality Council of India and is at S. No. 81 of the list of provisionally accredited Consultants (Rev. 20, May 05, 2014) and is Eligible for carrying out Environment Impact Assessment Study for Category A Projects in Highways Sector.

### **0.4 CATEGORY OF THE PROJECT**

The project is construction of new expressway for a length of 94.390 km with PROW being 120/60m falling under Category A in terms of EIA Notification 2006 and subsequent amendments, which means project will be appraised by Expert Appraisal Committee of Infrastructure and Miscellaneous, CRZ Project, Ministry of Environment and Forests New Delhi. Accordingly, as per statutory requirement EIA/EMP study has been carried out for the proposed Spur project.

## 0.5 PROJECT LOCATION

The entire alignment of the spur is a greenfield project. The project road starts at km 26+320 of the main Vadodara Mumbai expressway near Vasai and ends at km 24.476 of NH-4B near Panvel. The total length of the spur is 94.390 km out of which 18.9 km (km 0.000 to km 18.900) lies in Palghar district, 55.3 km (km 18.900 to km 74.200) lies in Thane district and 20.190 km (km 74.200 to km 94.390) lies in Raigad district of Maharashtra. The alignment passes mostly through plain and rolling terrain except in Matheran where the terrain is hilly. On its way, the alignment passes the residential clusters and towns of Virar, Shirsad, Bhinar, Ganeshpuri, Akloli, Vajreswari, Zidke, Awala, Mahapoli, Angaon, Taloli (NH 3 Crossing), Savad (Pise), Ambivli, Bapsai (NH222 Crossing), Vasat (Jambhul), Badlapur, Juweli, Tamsai, Koproli, Vichumbe before ending at Panvel. After Juweli, the alignment enters steep hills in Matheran eco-sensitive zone through a proposed tunnel between km 71+675 and 76+121. Near Vichumbe, the alignment approaches Panvel and ends on JNPT Road near Nandgaon (Panvel). Including other small tributaries, the alignment crosses major rivers viz; Tansa and Ulhas. The project location is shown in **Fig Es 1**.

The Project has been divided into three phases for implementation as given below. The present study report is for SPUR.

### Phase I

From km 104+700 to km 378+722 (274.022 km). in the state of Gujarat (260.40km), Union Territory of Dadra & Nagar Haveli (5.5kms) and district of Thane in the state of Maharashtra (8.1kms).

### Phase II

From km 26+320 to km 104+700 (78.38 km) in District Thane of Maharashtra and SPUR (Km 0+00 to Km 94+390) - Total length is 94.390 km. The Spur alignment passes through the districts of Thane and Raigad in the state of Maharashtra but recently district Palghar has been carved out of district Thane, hence, now the Spur alignment passes through three districts viz; Palghar (comprising of talukas Vasai and Wada), Thane (comprising of talukas Bhivandi, Kalyan and Ambarnath) and Raigad (comprising of taluka Panvel). The district-wise chainage details are given in **Table Es 1**.

**Table Es 1: District-wise stretches of Spur**

Sl. No.	State	District	From (Km.)	To (Km.)	Length (in Km.)
1	Maharashtra	Palghar	0+000	18+900	18.900
2	Maharashtra	Thane	18+900	74+200	55.300
3	Maharashtra	Raigad	74+200	94+390	20.190
<b>Sub-Total</b>					<b>94.390</b>

### Phase III

From km 0.00 to km 26+320 (26.320 km) in District Thane of Maharashtra

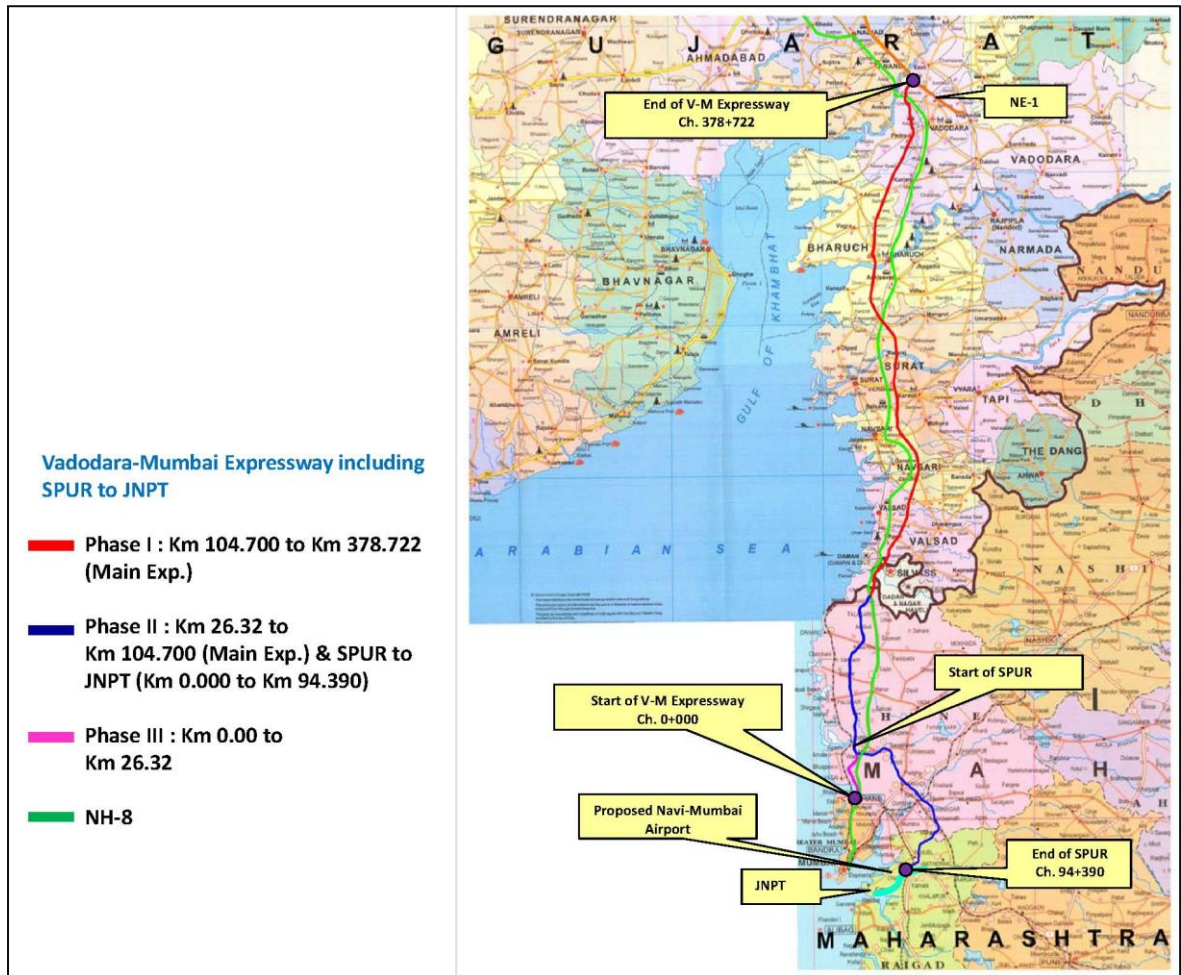


Fig Es 1: Index Map

## 0.6 NEED OF SPUR

The Mumbai Ahmedabad Corridor in the western part of the country is one of the important transport corridors in the country. Mumbai, the financial capital of India is on one side and on the other are Ahmedabad and Vadodara, the major industrial business cities. There are many industrial hubs and major ports along this corridor. The corridor lies within the proposed Delhi-Mumbai Industrial Corridor which is being planned as hub of industries and urban activities.

The existing NH-8 is the only road connecting along the busiest corridor carrying highest range of traffic which is about 100000 PCUs. It was observed that a heavy volume of freight traffic moving along NH-8, leaves the highway at Dahisar, destined to Navi Mumbai, Pune and JNPT using NH-4B and SH-42. Hence disposal of the traffic in Mumbai would pose a serious problem and may lead to increased congestion. To ensure safe dispersal of traffic a proposal for 6—lane Spur alignment connecting to Mumbai Pune expressway and JNPT port was mooted by Ministry of Road Transport & Highways (MoRTH).

The SPUR alignment is in conformity with the outer alignment recommended in the comprehensive Transport Study conducted by MMRDA. The Spur connects the main expressway to JNPT and Mumbai Pune Expressway. Therefore, the traffic bound for JNPT and Pune will ply on SPUR resulting in reduction of traffic entering Mumbai which will further lead to decrease in congestion and pollution in the city.



## 0.7 ENVIRONMENT IMPACT ASSESSMENT

Environment Impact Assessment is a formal process for identifying the likely effects of projects on the components of Valued Eco System and acts as a planning tool that is now generally accepted as an integral component of sound decision-making. The objective of EIA is to foresee and address potential environmental problems/concerns at an early stage of project planning and design. EIA/EMP should assist planners and government authorities in the decision making process by identifying the key impacts / issues and formulating mitigation measures.

### **Methodology Adopted & Scope of EIA Study**

The process of obtaining Environment Clearance and conducting EIA / EMP study is as per EIA Notification, 2006 and subsequent amendments. The EIA Guidance Manual – Highway by MoEF had been duly followed while conducting the study and preparing the Draft EIA / EMP report. The Environmental Management and monitoring plan is developed along with cost provision, on the basis of potential impact analysis and possible mitigation measures, to monitor implementation of mitigation measures on ground and provides detailed time schedule and duration of monitoring measures.

The application for Environment Clearance along with the proposed Terms of Reference was submitted to MoEF and appraised by the Expert Appraisal Committee (EAC) for ToR approval. MoEF has approved and finalized the Terms of Reference (ToR) in the 120<sup>th</sup> EAC meeting held on 28<sup>th</sup> -29<sup>th</sup> January, 2013 vide letter dated 21<sup>st</sup> February, 2013. Thereafter the draft EIA study has been prepared in compliance to the approved TOR. At this stage the draft EIA report is being forwarded to the State Pollution Control Board for conducting Public Hearing in the districts of Palghar, Thane and Raigad.

## 0.8 PROPOSED RIGHT OF WAY (PROW)

The Proposed Right of way (PROW) varies from 60m to 120m, 60m being at the elevated section.

## 0.9 TRAFFIC ESTIMATE

The projected traffic in the proposed SPUR alignment is given below:

Section No.	Chainage from/to	Estimated AADT (in PCU)		Expressway Lane Requirements	
		2017	2035	2017-2035	2035-2045
<b>SPUR to JNPT</b>					
Section 1	Km 0+000 - Km 1+860	25880	47260	6-lanes	6-lanes
Section 2	Km 1+860 - Km 39+748	44144	80661		
Section 3	Km 39+748 - Km 52+810	42454	76139		
Section 4	Km 52+810 - Km 90+610	40716	73016		
Section 5	Km 90+610 - Km 94+390	17395	31084		

## 0.10 LANE CONFIGURATION: 6 LANE

The traffic estimates for the Spur indicate that it is appropriate to provide 6 lane facility for the entire length. However all structures will be eight lane from the opening year except the elevated corridor of 3.4 km between Mumbai Pune

expressway and NH 4B which will be built as 6-lane structure. The proposed lane configuration for SPUR is as below:

Sl. No.	Element	Section Description
1.	Carriage way	Dual carriageway 2 x 3 x 3.75 (6 lane)
2.	Paved shoulder	3m on outer edge of each carriageway
3.	Earthen shoulder	3m on outer edge of each carriageway
4.	Depressed Median	19.5m (considering future inside widening)

#### 0.11 LAND ACQUISITION

The proposed land acquisition for SPUR is 1241.551 Ha. The District wise proposed land acquisition details are as below

Sl. No	Taluka	Land (in Ha.)		Total Land (in Ha.)
		Private	Government	
<b>District Palghar</b>				
1.	Vasai	176.4817	20.8935	197.3752
2.	Wada	43.9470	13.9715	57.9185
<b>Sub-Total (A)</b>				<b>255.294</b>
<b>District Thane</b>				
1.	Bhivandi	317.4899	29.5757	347.0656
2.	Kalyan	171.6071	21.4723	193.0794
3.	Ambarnath	132.9263	47.1308	180.0571
<b>Sub-Total (B)</b>				<b>720.202</b>
<b>District Raigad</b>				
1.	Panvel	176.4388	89.6160	266.0548
<b>Sub-Total (C)</b>				<b>266.055</b>
<b>Total (A+B+C)</b>				<b>1241.551</b>

#### 0.12 PROJECT INTERVENTIONS

Sl. No.	Features	Specific intervention	Sl. No.	Features	Specific intervention
1	Length	94.390km	12	Minor Bridges (Utility)	6 (2+4)
2	PROW	100/120/60m	13	ROBs	6 (4+2)
3	Interchanges	6	14	Culverts	150 (127+23)
4	Pavement type	Rigid Pavement	15	Wayside amenities (A)	2

Sl. No.	Features	Specific intervention	Sl. No.	Features	Specific intervention
5	Flyovers	6	16	Wayside amenities (B)	4
6	Vehicular underpass	14 (13+1)	17	Truck parking	2
7	Vehicular overpass	10	18	Service roads	10.925 km (on both sides)
8	Pedestrian underpass	29 (27+2)	19	Tunnel	4.400 km
9	Cattle underpass	33	20	Elevated structure	3.400 km
10	Major Bridges	10	21	Toll Plaza	7 (on Interchange)+ 1 (on main Spur)
11	Minor Bridges	20 (19+1)	22	Tolling System	Closed type

### 0.13 MATERIAL REQUIREMENT

The quantity of the construction material to be utilized in the proposed development of Spur has been estimated and given in below

S. No.	Item	Unit	Quantity
1	Cement	MT	1,230,000.00
2	Aggregate	MT	4,960,000.00
3	Sand	MT	2,940,000.00
4	Water	KL	5,640,000.00
5	Bitumen	MT	1,500.00
6	Diesel	KL	30,000.00
7	Earthwork in cut	Cum	7,580,000.00
8	Earthwork in fill	Cum	26,800,000.00
9	Tunnel excavates (50% rock & 50 % earth)	Cum	13,67,190.00
(i)	Rock	Cum	6,83,595.00
(ii)	Earth	Cum	6,83,595.00

**0.14 DESCRIPTION OF ENVIRONMENT**

<b>i) PHYSIO-BIOLOGICAL ENVIRONMENT</b>			
Location of the Project	<ul style="list-style-type: none"> <li>• <b>Geographic location-</b> Latitude 19°29'08"N to 18°58'10.63"N and between 72°52'58.28"E to 73°06'44.47"E Longitude.</li> <li>• <b>Mean sea level</b> varies between 5 feet to 2050 feet.</li> <li>• <b>Length of the proposed expressway-</b> 94.390km for the spur alignment.</li> <li>• <b>Passing through</b> the districts of Palghar, Thane and Raigad in the State of Maharashtra.</li> <li>• The project road starts at km 26+320 of the main Vadodara Mumbai expressway near Vasai and ends at km 24.476 of NH-4B near Panvel. On its way, the alignment passes the residential clusters and towns of Virar, Shirsad, Bhinar, Ganeshpuri, Akloli, Vajreswari, Zidke, Awala, Mahapoli, Angaon, Taloli (NH 3 Crossing), Savad (Pise), Ambivli, Bapsai (NH222 Crossing), Vasat (Jambhul), Badlapur, Juweli, Tamsai, Koproli, Vichumbe before ending at Panvel. After Juweli, the alignment enters steep hills in Matheran eco-sensitive zone through a proposed tunnel between km 71+675 and 76+121. Near Vichumbe, the alignment approaches Panvel and ends on JNPT Road near Nandgaon (Panvel). The Spur alignment superimposed on Survey of India (SOI) Toposheet is shown in <b>Annexure Es 1</b>.</li> </ul>		
Physiography and Terrain	<p>The alignment crosses through plain / rolling terrain except from km 71.640 to Km 75.524 where it passes through hilly terrain where a tunnel is proposed.</p> <ul style="list-style-type: none"> <li>• Coastal Plain (cross slopes less than 10 percent);</li> <li>• Rolling Terrain (cross slopes 10-25 percent); and</li> <li>• Mountains (cross slopes 25-60 percent)</li> </ul>		
Geology, Soil & Seismology	<ul style="list-style-type: none"> <li>• Basalt flows, popularly known as Deccan traps of Cretaceous-Eocene Age, forms the predominant formation.</li> <li>• Soil type: deep black soil, coastal alluvial, medium black soil and brownish-black soil</li> <li>• The project area falls in Zone –III i.e. moderate damage risk zone (MSK VII)</li> </ul>		
Landuse	<b>Land use Type</b>	<b>Area (ha)</b>	<b>Area %</b>
	Agriculture & Related	6580.286	69.21
	Forest	1524.15	16.03
	Settlement	125.2726	1.32
	Industrial	46.58313	0.49
	Water Bodies	231	2.43
	Barren Land (Non-cultivable)	1000	10.52
	<b>Total</b>	<b>9507.29</b>	<b>100.00</b>



Climate	<ul style="list-style-type: none"> <li>• The climate of the area is tropical wet and dry.</li> <li>• Three main seasons viz. summer, monsoon and winter.</li> <li>• Summer begins in early March and last till June; The maximum temperature has reached approximately 40°C in the years of 2007, 2011 and 2013.</li> <li>• Monsoon begins in late June and lasts until end of September. During monsoon project area receives rainfall 2697mm – 3087 mm. July receives the maximum amount of rainfall.</li> <li>• Winter starts in December and lasts until late February and minimum temperature of 12°C was recorded in the year 2012..</li> </ul>
Wind	<ul style="list-style-type: none"> <li>• Annual mean wind speed 12.33 km/h</li> <li>• High wind is observed during May to August, while lowest during November.</li> <li>• Winds during May and the monsoon months are mainly from directions between southwest and west.</li> </ul>
Relative Humidity	<ul style="list-style-type: none"> <li>• Relative humidity ranges from 43% to 88%.</li> <li>• The air is very humid during rainy seasons as in this season relative humidity reaches up to 85%.</li> <li>• Minimum humidity in March i.e. 43 %.</li> </ul>
Water Resources	<p><b>Surface Water</b></p>
	<p>Rivers</p> <ul style="list-style-type: none"> <li>• Tansa (a tributary of Vaitarna River)</li> <li>• Ulhas River <ul style="list-style-type: none"> <li>- Bharvi</li> <li>- Bhatsa</li> </ul> </li> <li>• Kalu (a tributary of Bhatsa River)</li> </ul> <p>Stagnant water bodies</p> <p>95 numbers of identified water logged areas within the PROW and 5 numbers of marshy lands which are majorly serving as farm ponds and ground water recharge points.</p>
	<p><b>Ground Water</b></p> <ul style="list-style-type: none"> <li>• The ground water table in the whole project area ranges from 0.50 to 7 mbgl (Pre-monsoon) &amp; 0.3 to 4.32 mbgl (Post-monsoon) in Thane to 0.55 to 8.6 mbgl (Pre-monsoon) &amp; 0.3 to 3.28 mbgl (Post-monsoon) in Raigad.</li> </ul>
Drainage	<ul style="list-style-type: none"> <li>• Tansa Basin</li> <li>• Kalu-Ulhas Basin</li> <li>• Gadhi Basin</li> </ul>
Water Quality	<ul style="list-style-type: none"> <li>• 3 Surface water quality-monitoring stations.</li> <li>• 2 Ground water quality-monitoring stations</li> <li>• All the parameters are within permissible limits except odour and iron content in GW-2</li> <li>• According to CPCB's water quality criteria surface water resource comes under Category E. In case of total coliform SW-01, SW03 falls in Category A and SW-03 falls in category B.</li> </ul>

Air quality	<ul style="list-style-type: none"> <li>• 5 monitoring stations.</li> <li>• Readings were recorded for 24 hours at each location. The monitoring was done in the winter months between Dec 2012 – Feb 2013</li> <li>• Air quality parameters at all monitoring locations are within the permissible limits.</li> </ul>
Noise quality	Noise monitoring was done at 5 locations and found to be within permissible limit in all locations except for village Karanjade where the day time noise level exceeds by 2 dB(A) and night time by 1dB(A)
Ecological Resources	<p><b>Forest</b></p> <ul style="list-style-type: none"> <li>• Tropical Semi-Evergreen</li> <li>• Tropical Moist Deciduous</li> <li>• Tropical Dry Deciduous</li> <li>• Littoral and Swamp</li> </ul> <p>Total forest area to be diverted is 99.713 ha. Out of which 19.501 ha is in Palghar, 46.794 ha in Thane and 33.419 ha is in Raigad district.</p>
	<p><b>Eco- Sensitive Zone</b></p> <p>Matheran Eco- Sensitive Zone.</p>
	<p><b>Protected Area within 10 km radius</b></p> <p>Karnala Bird Sanctuary Tungareshwar Wildlife Sanctuary</p>
	<p><b>Flora</b></p> <p>13,534 trees are present in the corridor. The pre-dominant species are kair, shesham, sagwan, chandan and mahua.</p>
	<p><b>Fauna</b></p> <p>Common Species are <i>Mantiacus muntjak</i> (Barking deer), <i>Presbytis entellus</i> (Common langur), <i>Hyaena</i> (Hyaena), <i>Canis aureus</i> (Jackal), <i>Cervus unicalor</i> (Sabar) black bucks, nilgai, chitals, wild boar, four horned antelope, rusty spotted cats, neelgai, monkeys (Lungur), Neelgai etc.</p>
<b>ii) SOCIO- ECONOMICENVIRONMENT</b>	
Districts within the project area	<ul style="list-style-type: none"> <li>• Palghar</li> <li>• Thane</li> <li>• Raigarh</li> </ul>
Total Population	The majority of the total population of project impacted districts falls in the district of Palghar and Thane i.e. 11,060,148 (81%) followed by Raigarh i.e. 2,634,300 (19%) as per Census of India 2011.
Sex ratio	Sex ratio of Thane district (885 females per 1000 males) is lower than that of Maharashtra State (946 per 1000 males). Raigarh's sex ration is more than the state average i.e. 959.
Tribal and SC Population	Percentage of SC and tribal population in Thane is 6.6 and 13.9% and Raigarh is 5% and 11 % respectively.

Literacy Rate	Literacy rate in Thane and Raigarh is 74.4%.
Workers/Non-workers	Non –workers are more than workers showing large dependency ratio. Largest share of the workers are engaged in agriculture.
Villages Affected	About 81 revenue villages and towns are likely to be affected in Spur.
Population in Project Districts`	The total population of project districts is 1,36,94,448 in which a majority of population falls in the district of Thane followed by Raigarh district.

### 0.15 ANALYSIS OF ALTERNATIVE ALIGNMENTS

Six alternative alignments have been studied (**Table Es 2**) out of which Alternative –6 has been finalized that majorly follows the outer alignment envisaged in Mumbai Metropolitan Region by the Government of Maharashtra. Though the inner alignments i.e. alternative 1 to 4 have shorter length, lesser cost and are expected to attract more traffic due to proximity to the city of Mumbai. However, these alignments are likely to have severe environmental (5 to 6 km of marshy land with mangroves and dense reserve forest) and social impact (semi urban region with greater number of affected structures and high land cost due to proximity to suburb of Mumbai).

The outer alternative alignments i.e. alternative 5 and 6 are longer and shall attract relatively less traffic but these are passing through mostly rural area with lesser impact on structures. They are passing through fringes of reserve forest with open vegetation. Alternative- 5 is passing through Mumbai Industrial Development Corporation (MIDC) between nodes 11 to 8 having high cost of land. Alternative 6 passes through Matheran Eco Sensitive Zone for a length of 4.4 km. Provision of tunnel has been made to avoid disturbance to the ecological parameters.

**Table Es 2: Comparison of alternative alignments**

Alt. No.	Alignment Name ( No.)	Alignment Length	Length in forest area (km)	Length in Marshy land (km)	Approx. Civil Cost (crores)	Nature of Land to be acquired	Opening year Assigned Traffic (average)
1	1-2-3-6-8-9-10	72.00	4.60	6	2252	Urban/ Semi Urban/ Rural	52096
2	1-2-3-6-7-13-10	58.00+ 5km of NH4	4.60	6	2173	Urban/ Semi urban/ Rural	61948
3	5-3-6-7-13-10	46.00+ 5km of NH4	5.80	6	1987	Urban/ Semi Urban	61933
4	5-3-6-8-9-10	60.00	5.45	6	2017	Urban/ Semi Urban	49546

Alt. No.	Alignment Name ( No.)	Alignment Length	Length in forest area (km)	Length in Marshy land (km)	Approx. Civil Cost (crores)	Nature of Land to be acquired	Opening year Assigned Traffic (average)
5	1-2-4-11-8-9-10	88.40	0.5	0	2461	Mostly Rural	37000
6	1-2-4-11-12-9-10-14	94.39	4.5	0	2946	Mostly Rural	37000

### 0.16 IMPACTS AND MITIGATION MEASURES

The impacts due to the development of Spur expressway can be long Term or short term, reversible or irreversible. The potential impacts and mitigation measures associated with the project are given in **Table Es 3**.

**Table Es 3: The Potential Impacts and Mitigation Measures**

S. No	Parameter	Potential Impact	Mitigation Measures
<b>1. Physical Environment</b>			
(i)	Topography	<ul style="list-style-type: none"> <li>Minor Change in Topography due to increase in height of Embankment.</li> <li>Minor impact in topography from km 71+675 to km 76+121 where tunneling is proposed. Approximately 12 lac cum of material will be cut.</li> </ul>	<ul style="list-style-type: none"> <li>The height of embankment will be kept in accordance with the IRC guidelines.</li> <li>The cut material shall be used in construction of embankment.</li> </ul>
(ii)	Geology	<ul style="list-style-type: none"> <li>Low level of impacts through removal of stones aggregate and sand from identified quarries which are in operation.</li> <li>49.6 lakh MT of Aggregates and 29.4 lakh MT of sand will be required for construction of Spur Expressway.</li> </ul>	<ul style="list-style-type: none"> <li>The stones will be obtained from existing quarries which have all valid permits applicable under law.</li> <li>New Quarry will be opened up only after taking all approvals.</li> <li>Sand shall be extracted from approved Quarries.</li> </ul>



S. No	Parameter	Potential Impact	Mitigation Measures
(iii)	Soils	<ul style="list-style-type: none"> <li>• Physical &amp; chemical contamination of soil.</li> <li>• Compaction and structural damage.</li> <li>• Soil erosion.</li> <li>• Loss of Productive Soil</li> <li>• 26.8 million cum of earth shall be required for construction of SPUR Expressway.</li> </ul>	<ul style="list-style-type: none"> <li>• Construction waste will be reused in the construction to the extent possible.</li> <li>• Construction waste will be dumped if required, the dumping site will be protected by a layer of clay</li> <li>• Storage of construction material in accordance with the IRC norms.</li> <li>• Avoiding work during periods of heavy rainfall.</li> <li>• Borrow Areas shall be opened up, operated and rehabilitated as per IRC guidelines.</li> <li>• Top soil to a depth of 150 mm shall be stripped , stored as per IRC guidelines and reused in filling up medians for plantation, slopes of embankment for sodding /grass turving , rehabilitation of borrow areas. and implementation of soil erosion control plan.</li> <li>• The construction vehicles and machineries shall move on designated routes only.</li> <li>• All works shall be carried out as per clause no 306 Soil Erosion and Sedimentation Control of SPECIFICATIONS FOR ROAD AND BRIDGE WORKS of Ministry of Road Transport and Highways.</li> </ul>
<b>2. Climate</b>			
(i)	<ul style="list-style-type: none"> <li>• Temperature, Rainfall, Humidity</li> </ul>	<ul style="list-style-type: none"> <li>• Low spatially restricted short-term impact because of cutting of 13534 nos. of trees excluding plants throughout the stretch of Project road and because of construction activities.</li> </ul>	<ul style="list-style-type: none"> <li>• saplings will be planted on both sides of road as per IRC:SP:21-2009</li> <li>• Compensatory afforestation shall be carried out in accordance with Forest Conservation Act, 1980.</li> </ul>

<b>S. No</b>	<b>Parameter</b>	<b>Potential Impact</b>	<b>Mitigation Measures</b>
<b>3. Land</b>			
(i)	Loss of Productivity	<ul style="list-style-type: none"> <li>• The loss of productive land coming under the Right of way.</li> <li>• 1241.551 Ha. of land is proposed to be acquired for development of SPUR to JNPT which includes 255.294 Ha in district Palghar, 720.202 Ha. in district Thane, and 266.055 Ha. in district Raigad. Out of which 859.277 Ha. is agriculture.</li> </ul>	<ul style="list-style-type: none"> <li>• The land owners shall be suitably compensated</li> </ul>
(ii)	Loss of Land / Properties	<ul style="list-style-type: none"> <li>• 1241.551 Ha. of land is proposed to be acquired for development of SPUR to JNPT which includes 255.294 Ha in district Palghar, 720.202 Ha. in district Thane, and 266.055 Ha. in district Raigad in Maharashtra.</li> <li>• 237 structures which includes 197 private properties, 25 Government properties, 13 community properties and 2 religious properties</li> <li>• 197 project affected households (PAHs) are likely to be affected by the proposed Spur alignment</li> </ul>	<ul style="list-style-type: none"> <li>• Six alternative alignments have been studied out of which Alternative –6 has been finalized that majorly follows the outer alignment envisaged in Mumbai Metropolitan Region by the Government of Maharashtra.</li> <li>• The compensation to the land / property owner shall be paid in accordance with the NH Act.</li> </ul>
(ii)	Induced Development	<ul style="list-style-type: none"> <li>• The probability of induced development is very less as proposed SPUR is fully access controlled expressway.</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of NH Act</li> </ul>

S. No	Parameter	Potential Impact	Mitigation Measures
<b>4. Water Environment</b>			
(i)	Surface water	<ul style="list-style-type: none"> <li>• 37 ponds are fully impacted due to proposed development. Out of 37.66 ha of total stagnant water bodies, 17 ha is anticipated to get impacted.</li> <li>• Obstruction to the Flow of Water in streams being crossed by proposed alignment of Spur</li> <li>• Degradation of water quality due to construction activities.</li> <li>• Water Stress on the existing users.</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity of Ponds shall be maintained either by increasing the depth / area of ponds. If required additional ponds shall be developed to mitigate the adverse impact.</li> <li>• Required Cross Drainage Structures has been proposed on Rivers, Streams, Nallah's which are being crossed by the proposed road. .</li> <li>• Piers shall be so spaced that minimum disturbance is caused to free flow of water.</li> <li>• Use of sediment traps, silt fencing, sodding / grass turfing etc. for minimization of soil movement;</li> <li>• Use of cofferdams for construction of abutments and bridge pier. Cofferdams to be made of such material that cannot be brought into suspension by flowing water</li> <li>• Stream flow only to be disturbed for construction of abutments and piers</li> <li>• Tarpaulins or other catchment devices will be slung under the bridge to prevent debris, wastes and toxic compounds from entering the stream</li> <li>• Avoidance of lead-based paints in painting components of bridges</li> <li>• Implementation of a protocol for storage of topsoil, construction waste away from water course. etc.</li> <li>• Location of onsite refueling stations away from water resource.</li> <li>• Use of oil/water separators to extract floating oil.</li> <li>• Water Quality will be monitored during construction and operation.</li> </ul>

<b>S. No</b>	<b>Parameter</b>	<b>Potential Impact</b>	<b>Mitigation Measures</b>
	Drainage	<ul style="list-style-type: none"> <li>• Drainage of the area may be impacted due to construction of embankment of road.</li> </ul>	10 Major and 20 Minor bridges, 37 canal bridges and 150 nos. box culverts are proposed for maintaining natural drainage of area.
(ii)	Ground water	<ul style="list-style-type: none"> <li>• The Ground Water Hydrology may be impacted.</li> <li>• 9 wells and 8 hand pumps and 2 bore wells shall be impacted.</li> <li>• Deterioration in Ground Water Quality during construction activities and Operation phase.</li> <li>• Ground Water shall be abstracted when inevitable after taking permission from Central Ground Water Board.</li> </ul>	<ul style="list-style-type: none"> <li>• Relocation / Compensation of ground water facility in consultation with communities. Relocation shall be done prior to start of construction of expressway.</li> <li>• Ground water shall be abstracted only when inevitable after taking permission from Central Ground Water Board.</li> <li>• Water for construction shall be obtained preferably from Maharashtra Infrastructure Board.</li> <li>• Fuelling, change of Oil and Grease shall be carried out at designated locations which will have impervious floor and shall be fitted with Oil and Grease separators.</li> <li>• During operation phase all the vehicles carrying Hazardous material shall adhere all the provisions of MVA (1998) and other environment and safety laws.</li> <li>• Emergency Action Plan shall be prepared before the start of operation of expressway for Road Safety and Transportation of Hazardous Material.</li> <li>• Ground water Quality shall be monitored during construction and operation of the project.</li> <li>• Ground Water shall be extracted only after taking permission from Central Ground Water Board.</li> </ul>



S. No	Parameter	Potential Impact	Mitigation Measures
5.	Air	<ul style="list-style-type: none"> <li>• Increased gaseous pollution along with fugitive dust emissions during construction of Expressway.</li> <li>• Emission from plying vehicles during operation phase.</li> <li>• Estimated emission of CO as modeled is predicted to be within permissible limit.</li> </ul>	<ul style="list-style-type: none"> <li>• Asphalt plant, Crusher, Batching Plant, will be sited 1000 m in down wind direction from nearest settlements.</li> <li>• Vehicles and construction equipment to be maintained properly.</li> <li>• Construction materials &amp; waste will be properly covered during transportation to avoid spillage &amp; dispersion.</li> <li>• Sprinkling of Water Shall be carried out regularly at site</li> <li>• Haulage Road shall be maintained and regular sprinkling of water shall be carried out for suppression of dust.</li> <li>• Construction Material where ever feasible shall be kept moist to avoid air borne particles.</li> </ul>
6	Noise	<ul style="list-style-type: none"> <li>• Construction phase impact low to moderate, spatially restricted and reversible.</li> <li>• During operation phase noise levels will increase due to increased traffic but impact has been minimized as alignment stays clear of settlements.</li> </ul>	<ul style="list-style-type: none"> <li>• Construction plant &amp; machinery to be located 1 km away from settlements.</li> <li>• Construction vehicles and equipment fixed or mobile to be equipped and maintained with effective muffler system.</li> <li>• Proper traffic management near sensitive receptors.</li> <li>• Putting up “no horn” signage near sensitive receptors.</li> <li>• Provision of earplugs to workers.</li> <li>• Noisy construction to be restricted during the hours by 10 pm- 6 AM.</li> <li>• Provision of sound screens in the shape of road side plantation along both sides of road.</li> </ul>

S. No	Parameter	Potential Impact	Mitigation Measures
<b>7. Ecology</b>			
(i)	Flora	<ul style="list-style-type: none"> <li>• 13534 nos of trees present in the Right of Way of expressway are likely to be felled.</li> </ul>	<ul style="list-style-type: none"> <li>• Only those trees which will be directly impinging on work will be felled.</li> <li>• 58750 nos of trees shall be planted in 2-3 rows on both side of the road and plants in the median. This will help in increasing vegetation cover.</li> <li>• Median Plantation shall be carried out in accordance with IRC Guidelines</li> </ul>
(ii)	Forest	<ul style="list-style-type: none"> <li>• 99.713 Ha of Forest land shall be diverted which includes 19.501 Ha. in Palghar, 46.794 Ha in Thane and 33.419 Ha. in Raigad districts of Maharashtra.</li> <li>• The alignment has been so fixed that requirement of forest land is minimum.</li> </ul>	<ul style="list-style-type: none"> <li>• Compensatory afforestation on double the degraded forest land shall be carried out at NHAI's cost.</li> <li>• Net Present Value of the diverted forest land shall be paid by NHAI.</li> </ul>
(ii)	Fauna	<ul style="list-style-type: none"> <li>• No significant impact is anticipated on fauna as SPUR Expressway is not passing through Wild Life Sanctuary. However, Tungareshwar Wild life sanctuary is 611m (approx) away from the alignment and Karnala Fort Bird Sanctuary is 7.11 km away from the alignment</li> <li>• Minor impact may also take place on fauna present in open fields.</li> </ul>	<ul style="list-style-type: none"> <li>• Construction workers will be made aware about the provision of the Wild life (Protection) Act 1972.</li> <li>• Construction Workers will be oriented not to involve in poaching of animals.</li> <li>• Number of urban settlements located between the boundaries of the protected areas (PAs) and Spur alignment resulting in insignificant impact on these PAs</li> </ul>
<b>8. Socio Environment</b>			
(i)	Socio Environment	<ul style="list-style-type: none"> <li>• Displacement of people.</li> <li>• 1241.551 Ha. of land is proposed to be acquired for development of SPUR which includes 255.294 Ha in district Palghar, 720.202 Ha. in district Thane, and 266.055 Ha. in district Raigad.</li> <li>• Influx of construction workers.</li> </ul>	<ul style="list-style-type: none"> <li>• Compensation for loss of land, Structures private, community and public.</li> <li>• Employment of local labour in unskilled and semi-skilled sector during construction.</li> <li>• Setting up migrant workers camp at least 1 km away from settlements and providing basic facilities like potable water , ration shops etc.</li> </ul>

S. No	Parameter	Potential Impact	Mitigation Measures
(ii)	Archeological / Historical Monuments	<ul style="list-style-type: none"> <li>No impact is envisaged as no protected monuments are falling in the Proposed Right of Way.</li> </ul>	<ul style="list-style-type: none"> <li>Alignment has been so finalized that none of the Archaeologically Protected Structure is falling in the Right of Way of project road.</li> </ul>
(iii)	Religious Structures, cultural property	<ul style="list-style-type: none"> <li>2 nos of religious structures are falling in the alignment</li> <li>Obstruction to places of religious importance and Cremation ground.</li> </ul>	<ul style="list-style-type: none"> <li>Affected structures will be relocated with due consultation with local communities.</li> <li>No cremation ground/graveyard is falling in alignment of expressway.</li> </ul>
(iv)	Quality of Life	<ul style="list-style-type: none"> <li>Positive Impact due to availability of jobs</li> </ul>	<ul style="list-style-type: none"> <li>Quality of life will be improved due to overall economic development of project implementation.</li> </ul>
<b>9. Public Health and Road Safety</b>			
(i)	Public health and road safety	<ul style="list-style-type: none"> <li>Psychological impacts of project affected people.</li> <li>Migration of worker may lead to sanitation problem creating congenial condition for disease vectors.</li> <li>Discomfort arising of air, noise pollution.</li> <li>Hazards of accident.</li> </ul>	<ul style="list-style-type: none"> <li>Continued consultation with PAPs and the competent authority for speedier settlements of compensation package.</li> <li>Ensure sanitary measures at construction camp to prevent water borne disease and vector borne disease.</li> <li>Provide appropriate personal protective equipments like earplugs, gloves, gumboot, and mask to the work force.</li> <li>Safe traffic management at construction area.</li> </ul>

### 0.17 ENVIRONMENT MANAGEMENT PLAN

Environment Management Plan has been developed outlining measures for implementation of mitigation measures to offset or mitigate them to acceptable levels. The Environment Management Plan has also outlined the responsibility of implementing and supervising the implementation of measures.

### 0.18 ENVIRONMENT MONITORING PROGRAMME

Environment Monitoring Programme has been developed to check the adequacy of implantation of Environment Management Plan. The performance indicators have been identified which includes Ambient Air Quality, Noise Levels, Water Quality, Soil Quality, Survival rate of plantations, Borrow area rehabilitation. Monitoring parameters, frequency and methodology has been outlined in Environment Monitoring Programme. A separate budgetary provision has been made for implementation of Environmental Monitoring Plan. A budget for **Rs. 20,97,000/- (Rupees Twenty Lacs Ninety Seven Thousand only)** has been

allocated for construction (4 years) as well as operation (2 years) phase and included under Environment Management budget.

**0.19 ENVIRONMENT BUDGET**

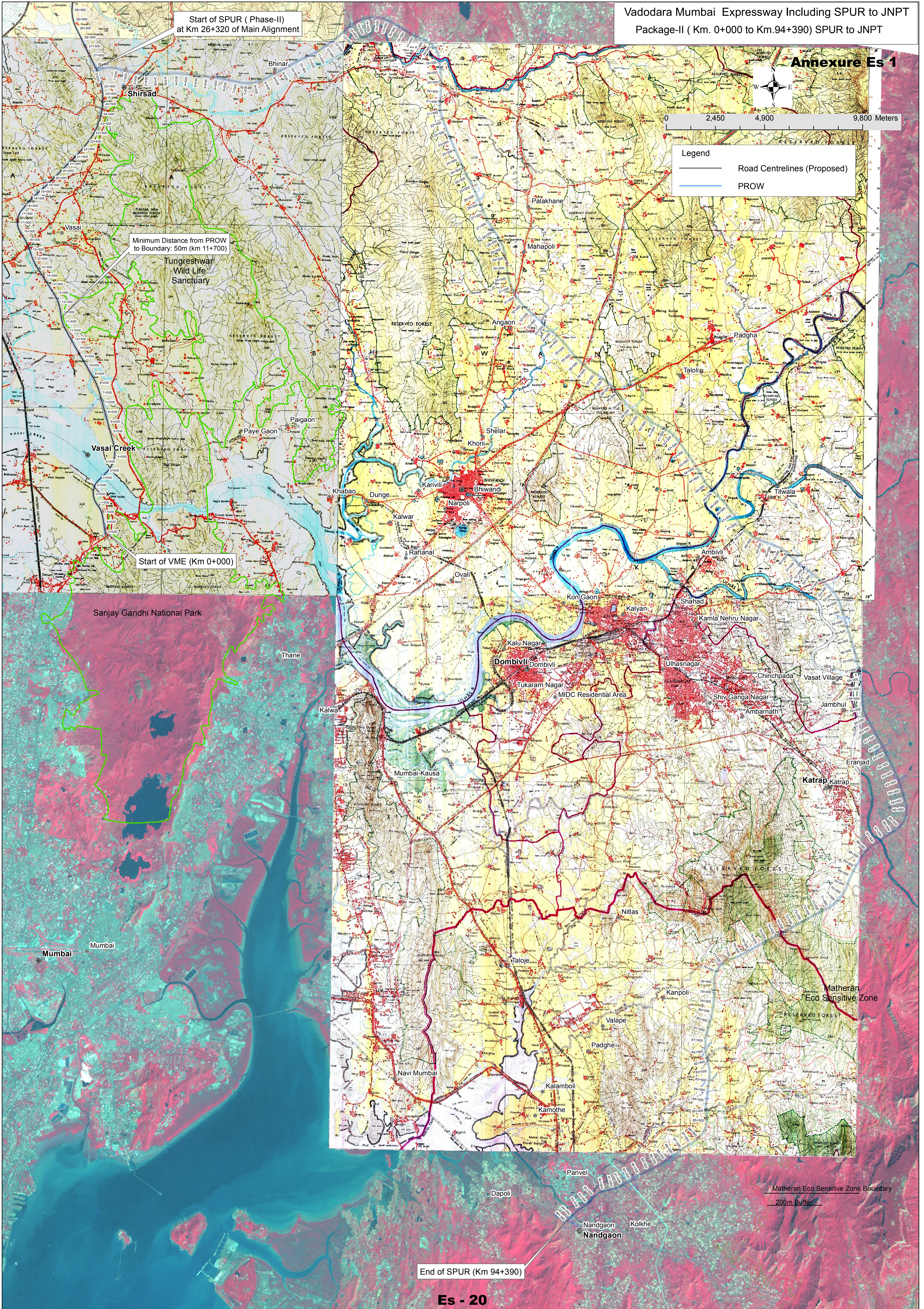
**Rs 21,48,04,338/- (Rupees Twenty One Crores Forty Eight Lacs Four Thousand Three Hundred and Thirty Eight only)** has been worked out for implementation of Environment Management Plan including Environment Monitoring Programme.

**0.20 TOTAL PROJECT COST**

The Total project cost of Spur alignment is **Rs. 6678.32 Crores** which includes R&R budget of **Rs. 1453.64 Crores** as cost of land, replacement cost of religious and community structures and R&R assistance to the affected people.

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Start of SPUR ( Phase-II)  
at Km 26+320 of Main Alignment

Minimum Distance from PROW  
to Boundary: 50m (km 11+700)

Start of VME (Km 0+000)

Sanjay Gandhi National Park

Matheran Eco Sensitive Zone Boundary  
200m Buffer

End of SPUR (Km 94+390)