



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

**Development of Vadodara Mumbai Expressway
(Phase-I) from Km 104+700 (Km 390+864 of NH-8) to
Km 378+722 (Km 80 of NE-1) in the State of
Gujarat, Maharashtra and
Union Territory of Dadra & Nagar Haveli**



**EXECUTIVE SUMMARY IN ENGLISH
(DRAFT EIA REPORT)**

Project Director

National Highways Authority of India,
Project Implementation Unit – Surat (Expressway),
Shri Laxmi Bunglow no.3&4,
Behind Big Bazar, Near S D Jain School,
Vesu Piplod Road, Surat-395007
Ph.: 0261 2254167, 2254571



**Intercontinental Consultants and
Technocrats Pvt. Ltd.**

A-8, Green Park, New Delhi - 110 016, India

EXECUTIVE SUMMARY

0.1 INTRODUCTION

Change is the inevitable process of nature and when one advances on the path of development it stimulates changes in environment and the life of the community. The development of roads and highways also bring changes affecting eco-systems, productivity of land, settlements, and demographic pattern and may accelerate urbanization in the areas through which it traverses. Improved and efficient road facilities help in the development of the hinterland. It is also a fact that a well-developed and properly maintained road reduces the overall accident rate, air pollution, noise pollution, travel time, fuel consumption and at the same time provides a quick and safe access to the market.

The NH network contributes to about 2% of the country's road network but carries about 40% of total traffic. Road transport in India is the dominant mode of transport accounting for 65% of freight movement and 85% of passenger traffic. The production of all categories of vehicles has grown at the rate of 16% during the years between 2001-2002 and 2005-2006. Automotive industry because of its deep forward and backward linkages is a key sector of the Indian economy and is likely to act as one of the drivers of economic growth. Such spectral growth will be possible because of the strength of a huge domestic market, rapidly growing purchasing power, market-linked exchange rate and well-established market and corporate governance laws. In this context, the development of road sector has to be accelerated to match the pace of development of passenger and goods traffic.

Most of our National Highways are severely congested. Internationally a goods vehicle travels an average of 600-800 km a day until recently the average distance covered was only 250-300 km a day. Good physical connectivity is essential for sustaining the economic growth of the country. Major improvements are required in this sector to ensure level playing field for the producers and manufacturers located in different parts of the country.

Non-urban Roads in the country are classified into six categories:

1. Expressways
2. National Highways
3. State Highways
4. Major District Roads
5. Other District Roads
6. Village Roads

“The Function of expressway is to cater for movement of heavy volumes of motor traffic at high speeds. They connect major points of traffic generation and are intended to serve trips of medium and long length between large residential areas, industrial or commercial concentrations, and the central business district. They are divided highways with high standards of geometrics and full or partial control of access and provided generally with grade separation at intersections. Parking, loading and unloading of goods and passengers and pedestrian traffic are not permitted on these highways.”

0.2 PROJECT LOCATION

The proposed Vadodara - Mumbai expressway starts (km 0.0) at Km 499 of Ahmedabad - Mumbai National Highway (NH 8) and ends at km 378.722 (at Km 80 of Ahmedabad - Vadodara Expressway (NE 1)). The length falling within

Maharashtra, Dadra & Nagar Haveli and Gujarat are 112.851 km, 5.423 km and 260.407 km respectively. The location of the project is shown in **Fig Es 1**. The Project has been divided into three phases for implementation as given below.

Phase I

The project includes construction of new 6/8 lane expressway from km 104+700 (km 390+864 of NH-8) to km 378+722 (Km 80 of NE-1). The total length of Phase-I of the project road is 274.022kms and proposed Right of Way is 100/120 m. The Phase I of VME is passing through Vadodara (54.4km), Bharuch (62.5 km), Surat (57.3km), Navsari (37.6km) and Valsad (48.6km) in the state of Gujarat (260.40km), Union Territory of Dadra & Nagar Haveli (5.5kms) and district of Palgarh in the state of Maharashtra (8.1kms).

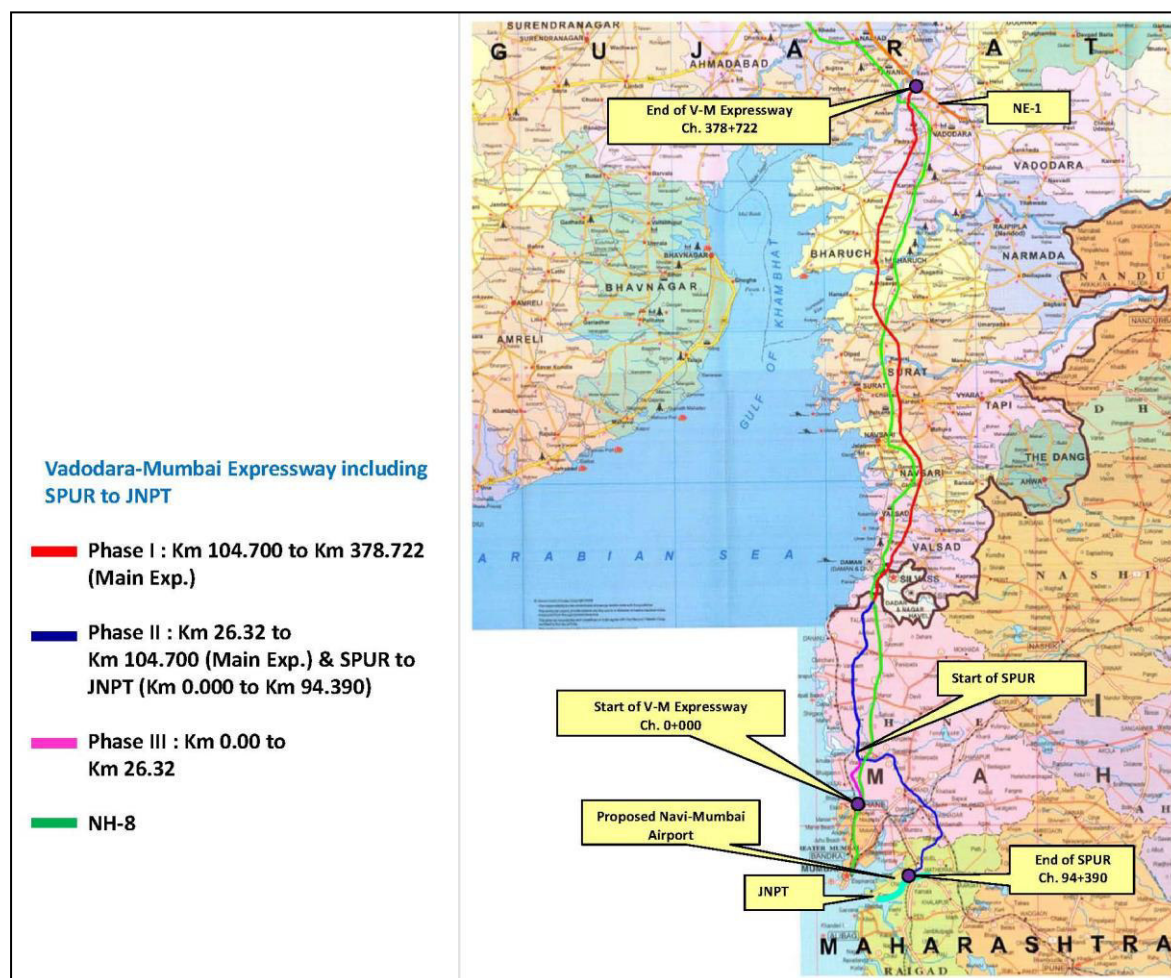
Phase II

From km 26+320 to km 104+700 (78.38 km) in District Thane of Maharashtra

Phase III

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

Fig. Es 1: Index Map



The present EIA study is for Phase-I of Mumbai Vadodara Expressway. The length of expressway in different district is as follows:-

Chainage (Km)			District/UT/State
Start	End	Length	
Phase I : Km 104.700 to Km 378.722 (274.022 km - Main Expressway)			
104.700	112.851	8.151	Palgarh / Maharashtra
112.851	115.300	2.449	Valsad / Gujarat
115.300	119.900	4.6	Dadra & Nagar Haveli
119.900	123.256	3.356	Valsad / Gujarat
123.256	124.115	0.859	Dadra & Nagar Haveli
124.115	166.935	42.82	Valsad / Gujarat
166.935	204.487	37.552	Navsari / Gujarat
204.487	261.774	57.287	Surat / Gujarat
261.774	324.274	62.5	Bharuch / Gujarat
324.274	378.722	54.448	Vadodara / Gujarat

0.3 IMPLEMENTING AGENCY

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 in February, 1995. The Project at field is being managed by Project Implementation Unit viz

Project Director, National Highways Authority of India, PIU – Surat (Expressway), Shri Laxmi Bunglow no.3&4, Behind Big Bazar, Near S D Jain School, Vesu Piplod Road, Surat-395007, Ph.: 0261 2254167, 2254571

0.4 CONSULTANT

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

M/s ICT Pvt. Ltd is accredited with Quality Council of India at S. No. 81 of the list of provisionally accredited Consultants (as on Rev. 21 A/ August 19, 2014) and is eligible for carrying out Environment Impact Assessment Study for Category A Project in Highways Sector.

0.5 NEED OF PROJECT

The Mumbai–Ahmedabad Corridor in the western part of the country is one of the important transport corridors of the country. On one side of this corridor is Mumbai which is the financial capital of the country and on the other side is Vadodara, an important commercial and business city. There are many industrial centres on this route. Industries like, textile industry, gems and jewelleryes, petrochemical & fertilizer and other industrial complexes have been established along this corridor. This corridor also serves SEZ areas and ports. Development works of these corridors like improvement of National Highways, construction of expressways, construction of dedicated railway freight corridors, modernization of

airports located along this corridor have been taken up. The project road lies within the proposed Delhi Mumbai Industrial corridor which is being planned as hub of industrial and urban activity.

NH-8 is of great significance for transportation in this corridor starting from the country's administrative capital of Delhi to financial capital of Mumbai. Present condition and steps taken to develop it speed and safety are as follows:

- The Vehicle Damage Factor (VDF) as assessed on NH8 section for 2 axle vehicles varies from 2.04 to 5.86 whereas VDF for 6 axle vehicles were in the range of 19.48 to 25.69.
- The average journey speed on Mumbai-Vadodara section of NH 8 was found to be in the range of 50-60 km/hr(major part of the section) to 80-90 km/hr. whereas a National Highway is designed for the speed of 100km/hr.
- NH8 is carrying traffic in the range of 50,000 to 80,000 PCU per day. It has been developed as 6- lane recently but many of the sections are reaching nearly the capacity volume (LOS E) of 6 lane NH (120,000 PCU) in the year 2015 itself

Even with six laning or further widening, segregation of long distance and local and / or slow traffic is hard to achieve. Further since it's a National Highway (not access controlled) and passes through many settlements land availability and displacement of people would be a major concern.

0.6 BENEFITS OF THE PROJECT

The project will have multiple benefits. Some of the benefits are given below:

- Fast and safe connectivity resulting in savings in fuel, travel time and total transportation cost to society
- Employment opportunity to people
- Development of local industry, agriculture and handicrafts
- Development of tourism and pilgrimage
- Quick Transportation of processing and marketing of perishable agricultural produce
- Increased Road Safety
- Reduction in pollution due to less emission as there will be free flow of traffic.
- Better approach to Medical & Educational services and quick transportation of perishable goods like fruits, vegetables and dairy products
- Improved quality of life of the area etc.

0.7 CATEGORY OF PROJECT

The Proposed Project is a green field expressway and falls in Column no 3 of S. No 7 (f) of the schedule to the EIA Notification 2006 and subsequent amendments thereof, hence categorized as category A and requires Prior Environment Clearance from Ministry of Environment and Forests, GOI.

0.8 ENVIRONMENTAL 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. The objective of EIA Study can best be described in **Table Es 1**.

Table Es 1: Objectives of the EIA Study

1	Identify	:	Sources of Pollution and Resource Utilization during Construction and Operation phases of the project
2	Asses	:	Extent of Environment Gradation and Resource Utilization
3	Devise	:	Cost Effective, Environment Friendly, Technically Feasible mitigation measure to offset or mitigate the adverse impact on Valued Eco System Components
4	Develop	:	Environment Management and Monitoring Plan to ensure effective implementation of mitigative measures and to check whether predicted impacts are within predictable limits.

Key objectives of EIA implementation and follow up are to:

- confirm that the conditions of project approval are implemented satisfactorily;
- verify that impacts are within predicted or permitted limits;
- take action to manage unanticipated impacts or other unforeseen changes;
- ensure that environmental benefits are maximized through good practice; and
- Learn from experience in order to improve EIA process and practice.

The proposed Project is a Greenfield expressway being developed by National Highway Authority of India, Govt. of India , hence falls in item no 7(f) of the Schedule to the EIA Notification 2006 and subsequent amendments thereof, Hence requires Prior Environment Clearance from Ministry of Environment and Forests , GOI. In order to obtain prior environment clearance Environment Impact Assessment Study is required to be carried out based on approved Terms of Reference by Ministry of Environment and Forest, GOI.

0.9 SCOPE OF EIA STUDY

The application for Approval of Terms of Reference for EIA study was submitted to Director IA.III Ministry of Environment and Forests, New Delhi by Chief General Manager, National Highway Authority of India, Govt. of India undertaking vide letter no. 1013/1/2K/GM (ENV)/373 dated 13.09.2013, subsequently the project was appraised by Expert Appraisal Committee, Infrastructure and Miscellaneous Projects and CRZ, Ministry of Environment and Forests, New Delhi. The Ministry of Environment and Forests approved the Terms of Reference and issued additional Terms of Reference for carrying out Environment Impact Assessment Study vide MoEF letter dated 14th November, 2013 (**Annexure 1.1**). Compliance to additional ToR is annexed as **Annexure 1.2**.

0.10 PROJECT DESCRIPTIONS

0.10.1 Right of Way

The proposed right of way is 100/120 m in general and 90 m in village Tigra of the Union Territory of Dadra Nagar Haveli except at interchanges area.

0.10.2 Traffic Estimate

The projected traffic in the proposed expressway and lane configuration are given below:

Section No.	Chainage from/to	Estimated AADT (in PCU)		Expressway Lane Requirements	
		2017	2035	2017-2035	2035-2045
Main Expressway					
Section 1	Km 0+000 - Km 24+380	40981	84720	6-lanes	6-lanes
Section 2	Km 24+380 - Km 26+320	46280	97204		
Section 2-1	Km 26+320 - Km 78+650	72165	144465	8-lanes	8-lanes
Section 3	Km 78+650 - Km 104+700	68653	137255		
Section 4	Km 104+700 - Km 129+110	66878	133357		
Section 5	Km 129+110 - Km 155+595	75087	151315		
Section 5-1	Km 155+595 - Km 190+535	82941	167145		
Section 6-1	Km 190+535 - Km 218+100	81163	163476		
Section 7	Km 218+100 - Km 254+430	80159	162819		
Section 8	Km 254+430 - Km 287+365	88305	176696		
Section 9	Km 287+365 - Km 353+670	67611	136425	6-lanes	
Section 10	Km 353+670 - Km 374+335	63723	128495		
Section 11	Km 374+335 - Km 378+722	25096	55921		

0.10.3 Lane Configuration: 6/8 Lane

Based on the above traffic projection the proposed lane configurations in the opening year are as follows:

Sl. No	Chainage (km)		6/8 lane
	From	To	
1.	0.000	26.320	6 lane
2.	26.320	287.365	8 lane
3.	287.365	378.722	6 lane

The proposed lane configuration for Phase I are as below:

Sl. No	Chainage Km		Length	6/8 Lane
	From	To		
1.	104.700	287.365	182.665	8 lane
2.	287.365	378.722	91.357	6 lane

0.10.4 Configuration:

The Proposed cross section details for 6/8 lanes are as follows:

Sl. No	Element	Section Description
1.	Carriage way	Dual carriageway 2 x 4 x 3.75 (8 lane) 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	12 m for 8 lane & 19.5m for 6 lane (considering future inside widening)

The configuration is also shown in **Fig Es 2** and typical cross section with / without service road is placed at the end of chapter.

0.10.5 Land Acquisition

The proposed land acquisition for the Phase I of the project is 3427.563Ha. The state / District wise proposed LA details are as below:

Sl. No	District	Land in (Ha.)
Maharashtra		
1.	Thane & Palgarh	136.988
Dadra and Nagar Haveli		
1.	Dadra and Nagar Haveli	77.991
Gujarat		3229.8739
1.	Navsari	454.775
2.	Valsad	588.491
3.	Surat	684.003
4.	Bharuch	781.215
5.	Vadodara	721.3599
	Total	3444.8529

0.10.6 Salient Features of the Project

Type of Features	Main Expressway	Phase I
Length (in Km)	378.722	274.022
Interchanges	14	11
Fly-Over	24	18
Vehicular Underpasses	76	53
Vehicular Overpass	13	10
Pedestrian Underpasses	129	102
Cattle Underpasses	232	184
Major Bridges	29	20
Minor Bridges	88	64
Major Bridges (Canal)	9	7
Minor Bridges (Canal)	36	30
Minor Bridges (Utility)	22	21
ROBs	8	7
Culverts (Cross Drainage)	447	343
Culverts (Irrigation /Utility)	391	280
Way Side Amenities (A)	8	6
Way Side Amenities (B)	18	14
Truck Parking	8	6
Service Roads (km)	48.167	30.605
Tunnel	--	--
Elevated Structure	--	--
Toll Plaza	32 (on loop/ramp) + 2 (on main)	24 (on loop/ramp) + 1 (on main)
Tolling System	Closed Type	Closed Type
Emergency Cross overs	Every 5 km	Every 5 km

Locations and details of Interchanges, Flyover, Vehicular Underpasses, Pedestrian Underpasses, Cattle underpasses, Major Bridge, Minor Bridge, Major Bridges (canal), Minor Bridges (utility), ROB's, Culverts (cross drainage), Culverts (Irrigation/Utilities), Way side Amenities (A), Way site Amenities (B), Truck parking, are placed in Chapter-2 of this report.

0.10.7 Material Requirement

The raw material requirements for the development of the expressway are as follows:

Construction Material	For total length of Phase-I	For length in Palgarh District
Aggregate	12357566.72 Cum	356906 MT
Sand	4740423.74 Cum	139788 MT
Cement	3789072.73 Ton	110046 MT
Bitumen	2126.624 Ton	63 MT
Soil	30 million cum	892264 cum
Fly ash	2 million cum	59484 cum

Total water requirement for 36 months of construction period for VME Phase-I is estimated to be 7000 KLD.

0.11 DESCRIPTION OF ENVIRONMENT

Environmental description of the project area is summarized below:

PHYSICAL ENVIRONMENT	
Location of the Project	• Geographic location- Latitude 19⁰.16'55.50"N to 22⁰27'59.38"N and between 72⁰53'10.56"E to 73⁰06'52.65"E Longitude. • Mean sea level varies between 19 feet to 318 feet. • Length of the proposed expressway-378.722 km for the main alignment and 94.290km for the spur alignment. • Passing through the states of Gujarat, Maharashtra and union territory of Dadra & Nagar Haveli. • Expressway starts from Ghorbandar near Creek Bridge (km 0.00) in the Thane district and traverses through the districts Palgarh, Silvasa, Valsad, Navsari, Surat, Bharuch, Vadodara (km 378.722) and 238 large, medium and small settlements.
Physiography and Terrain	Three easily distinguishable landscape regions along which the proposed alignment runs are • Coastal Plain (cross slopes less than 10 percent); • Rolling Terrain (cross slopes 10-25 percent); and
Geology, Soil & Seismology	• Part of Gondwanaland. • Rock formation-Metamorphosed Quartzite, Slates and Lime stones. • Soil type: deep black soil, coastal alluvial, medium black soil and grey brown soil • Soil characteristics: moderately well drained to poorly drain, acidic to slightly alkaline and medium to high textured

Land use	Land Use Type	Area (ha)	Area (%)
	Agriculture & related	3124.3249	90.69
	Barren Land (non-cultivable)	197.269	5.75
	Built-up	39.500	1.15
	Vegetation	32.009	0.93
	Water bodies (ponds & river/ streams)	51.750	1.509
	Total	3444.8529	100.00
Climate	The climate of the area is tropical wet and dry with three main seasons viz. summer, monsoon and winter.		
Rainfall	Annual 5 –year average rainfall received by the project area is 1488 mm. Annual average rainfall received in Palgarh is 2125mm, Valsad is 763 mm, Surat is 1324 mm, DNH 1945 mm, Bharuch is 517 mm, Navsari is 1728 mm and Valsad is 2015 mm.		
Temperature	Annual 5- year average maximum and minimum temperature of Vadodara is 35⁰C to 12⁰C, Surat is 36⁰C to 25⁰C, and Palgarh is 33⁰C to 20⁰C.		
Wind	- Annual mean wind speed 12.33 km/h - High wind is observed during May to August, while lowest during November. - Wind direction in the project area is South-West and West.		
Relative Humidity	- Relative humidity of 62.6%. - The maximum relative humidity- August i.e. 89 %, which together with high temperature makes the weather sultry. - Minimum humidity in February i.e. 53 %.		
Water Resources	<i>Surface Water</i> - The proposed alignment crosses the Daman Ganga River, Ambika River, Purna River, Narmada River, Tapi River, Par River, Kolak River, Bhukhi River, Mindhola River, Dhadhar River, Kim River, Auranga River. - There are 12 major wet ponds that are being crossed by the alignment.		
	<i>Ground Water</i> The ground water table in the whole project area ranges from around 18 mbgl in Palgarh to 121 mbgl in Vadodara.		

Drainage	Major river Basins • Narmada Basin • Tapi Basin • Daman Ganga
Water Quality	• 4 Surface water quality-monitoring stations. • 5 Ground water quality-monitoring stations • Total Dissolved Solids and Sulphates are a little higher than the permissible limits in GW1 sample from Ghodadra Village, at Bharuch district of Gujarat. Groundwater sample in GW2 sample at Limodra Village, Surat found to be highly alkaline compared to other samples. Nitrates and Fluoride levels in all the samples are found to be within desirable limits. • Iron and Zinc are well within the permissible limits. • Total coliforms in all the ground water samples are in small concentrations • According to CPCB's water quality criteria surface water resource comes under Category D & E.
Air quality	• 9 monitoring stations. • Readings were recorded for 24 hours at each location. The monitoring was done in the summer month of April. • Air quality parameters at all monitoring locations are within the permissible limits except for particulate matter.
Noise quality	Noise monitoring was done at 9 locations. The noise level exceeds at few locations due to industrial and commercial activities.
Ecological Resources	<i>Forest</i> • Tropical Moist Deciduous • Tropical Dry Deciduous • Tropical Thorn • Littoral and Swamp
	<i>Eco- Sensitive Zone</i> Dahanu Eco- Sensitive Zone.
	<i>Critically Polluted Areas</i> Vapi & Ankleshwar
	<i>Flora</i> Orchids of Mango, Amla and Cashew Nut. 30,786 trees are present in the corridor. Pre-dominant species are Khair, Shesham, Sagwan, Chandan and Mahua.
	<i>Fauna</i> Common species- Mantiacus muntjak (Barking deer), Presbytis entellus (Common langur), Hyaena (Hyaena),

	Canis aureus (Jackal), Cervus unicolor (Sabar) black bucks, nilgai, chitals, wild boar, four horned antelope, rusty spotted cats, Monkeys (Lungur) and like Bateya like bird i.e. Rain quail (Chinna Bateya). One wildlife sanctuary is coming within 10km of proposed project area viz. Wildlife Sanctuary in Dadra and Nagar Haveli.
CRZ Area	The proposed alignment of Vadodara- Mumbai, expressway is passing for a length 2.175 km through CRZ- I(b), CRZ- III and CRZ- IV across river Narmada.
SOCIO- ECONOMIC ENVIRONMENT	
Districts within the project area	• Palgarh • Valsad • Navsari • Surat • Bharuch • Vadodara • Dadra and Nagar Haveli
Total Population	The total population of project impacted districts is more than 28 million in which a majority of population falls in the district of Thane & Palgarh (38.31%) followed by Surat (21.06%), Vadodara (14.43%), Valsad (5.91%), Bharuch (5.37%), Navsari (4.60%) and DNH (1.19%).
Sex ratio	Sex ratio of Thane & Palgarh district (885 females per 1000 males) is lower than that of Maharashtra State.. In Dadra and Nagar Haveli sex ratio (774 females per 1000 males) is lowest in comparison to other concerned districts.
Tribal and SC Population	The census data, 2011 reveals that the percentage of SC population ranges from 6.6% to 1.8% in all the affected districts. Tribal population is highly varying with Valsad having higher population of STs (52.92%).
Literacy Rate	Out of the eight impacted districts, Navsari has the highest literacy rate of 75.4%. The literacy rate of other districts is also higher than the national literacy rate of 74.04%, except Valsad, Vadodara and Dadra & Nagar Haveli.
Occupational structure	Percentage of people engaged in agriculture is around 17 % in Thane & Palgarh, 12% in DNH and an average of 44% in Gujarat. This shows the dependency of people in economic activities other than Agriculture.
Villages Affected	About 162 villages are likely to be affected in VME. Out of which 8 villages fall in the Talasari Taluka of Palgarh district.

Impacts and Mitigation Measures

The impacts due to the development of Vadodara Mumbai 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 below.

S. No	Parameter	Potential Impact	Mitigation Measures
1. Physical Environment			
(i)	Topography	- Minor Change in Topography due to increase in height of Embankment. - Minor impact in topography from km 106.700 to 106.890 where hill cutting is proposed. Approximately 51,000 cum of material will be cut.	- The height of embankment will be kept in accordance with the IRC guidelines. - The cut material shall be used in construction of embankment.
(ii)	Geology	- Low level of impacts through removal of stones aggregate and sand from identified quarries which are in operation. 123 lakh cum of Aggregates and 47 lakh cum of sand will be required for construction of Vadodara Mumbai Expressway.	- The stones will be obtained from existing quarries which have all valid permits applicable under law. - New Quarry will be opened up only after taking all approvals. - Sand shall be extracted from approved Quarries.
(iii)	Soils	- Physical & chemical contamination of soil. - Compaction and structural damage. - Soil erosion. - Loss of Productive Soil 30 million cum of earth shall be required for construction of Vadodara Mumbai Expressway.	- Construction waste will be reused in the construction to the extent possible. - Construction waste will be dumped if required, the dumping site will be protected by a layer of clay - Storage of construction material in accordance with the IRC norms. - Avoiding work during periods of heavy rainfall.

S. No	Parameter	Potential Impact	Mitigation Measures
			- Borrow Areas shall be opened up, operated and rehabilitated as per IRC guidelines. - 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. - The construction vehicles and machineries shall move on designated routes only. - 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.
2. Climate			
(i)	Temperature, Rainfall, Humidity	Low spatially restricted short-term impact because of cutting of 30786 nos. of trees excluding plants throughout the stretch of Project road and due to construction activities.	- saplings will be planted on both sides of road as per IRC:SP:21-2009 - Compensatory afforestation shall be carried out in accordance with Forest Conservation Act, 1980.
3. Land			
(i)	Loss of Productivity	The loss of productive land coming under the Right of way.	The land owners shall be suitably compensated

S. No	Parameter	Potential Impact	Mitigation Measures
		3444.8529 Ha. of land is proposed to be acquired for development of Mumbai – Vadodara Expressway which includes 3229.8739 Ha in Gujarat, 77.991 Ha. in Union Territory of Dadra Nagar and Haveli, 136.988 Ha. in the State of Maharashtra. Out of which 3124.32Ha.is agriculture.	
(ii)	Loss of Land / Properties	3444.8529 Ha. of land is proposed to be acquired for development of Mumbai – Vadodara Expressway which includes 3229.8739 Ha in Gujarat, 77.991 Ha. in Union Territory of Dadra Nagar and Haveli, 136.988 Ha. in the State of Maharashtra. 1197 structures in Gujarat which includes 960 private properties, 39 religious properties, 91 Government properties, 107 community properties. 40 private properties in Dadra Nagar Haveli and 109 private properties in Maharashtra	- In 1992 Govt. of Gujarat has frozen the corridor of 600m width for development of Vadodara Mumbai Expressway. - The compensation to the land / property owner shall be paid in accordance with the NH Act.
(ii)	Induced Development	The probability of induced development is very less as proposed Mumbai Vadodara Expressway is fully access controlled expressway.	Provision of NH Act

S. No	Parameter	Potential Impact	Mitigation Measures
4. Water Environment			
(i)	Surface water	12 Ponds shall be impacted due to proposed development. 5.804 Ha of area shall be impacted. - Obstruction to the Flow of Water in streams being crossed by proposed alignment of VME - Degradation of water quality due to construction activities. - Water Stress on the existing users.	- 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. - Required Cross Drainage Structures has been proposed on Rivers, Streams, Nallah's which are being crossed by the proposed road. . - Piers shall be located keeping adequate clear waterway as per design. - Use of sediment traps, silt fencing, sodding / grass turfing etc. for minimization of soil movement; - 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 - Tarpaulins or other catchment devices will be slung under the bridge to prevent debris, wastes and toxic compounds from entering the stream - Avoidance of lead-based paints in painting components of bridges - Implementation of a protocol for storage of topsoil, construction waste away from water course. etc.

S. No	Parameter	Potential Impact	Mitigation Measures
			- Location of onsite refueling stations away from water resource. - Use of oil/water separators to extract floating oil. - Water Quality will be monitored during construction and operation.
	Drainage	Drainage of the area may be impacted due to construction of embankment of road.	20 Major and 64 Minor bridges, 37 canal bridges, 343 nos. box culverts, 280 of hume pipe culverts and longitudinal drain on both side of the road are proposed for maintaining natural drainage of area.
(ii)	Ground water	- The Ground Water Hydrology may be impacted. 27 wells and 59 bore wells shall be impacted. - Stress on Existing Communities due to use of water for Construction / labor camps as area falls under blocks notified by Central Ground Water Board. - Deterioration in Ground Water Quality during construction activities and Operation phase. - Ground Water shall be abstracted when inevitable after taking permission from Central Ground Water Board.:	- Relocation / Compensation of ground water facility in consultation with communities. Relocation shall be done prior to start of construction of expressway. - Ground water shall be abstracted only when inevitable after taking permission from Central Ground Water Board. - Water for construction shall be obtained preferably from Gujarat Infrastructure Board. - 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. - During operation phase all the vehicles carrying

S. No	Parameter	Potential Impact	Mitigation Measures
			Hazardous material shall adhere all the provisions of MVA (1998) and other environment and safety laws. - Emergency Action Plan shall be prepared before the start of operation of expressway for Road Safety and Transportation of Hazardous Material. - Ground water Quality shall be monitored during construction and operation of the project. - Ground Water shall be extracted only after taking permission from Central Ground Water Board.
5.	Air	- Increased gaseous pollution along with fugitive dust emissions during construction of Expressway. - Emission from plying vehicles during operation phase. - Estimated emission of CO as modeled is predicted to be within permissible limit.	- Asphalt plant, Crusher, Batching Plant, will be sited 1000 m in down wind direction from nearest settlements. - Vehicles and construction equipment to be maintained properly. - Construction materials & waste will be properly covered during transportation to avoid spillage & dispersion. - Sprinkling of Water Shall be carried out regularly at site - Haulage Road shall be maintained and regular sprinkling of water shall be carried out for suppression of dust. - Construction Material where ever feasible

S. No	Parameter	Potential Impact	Mitigation Measures
			shall be kept moist to avoid air borne particles.
6	Noise	- Construction phase impact low to moderate, spatially restricted and reversible. - During operation phase noise levels will increase due to increased traffic but impact has been minimized as alignment stays clear of settlements. The sensitive area of DNH WLS that is a hilly area receives 4 dB(A) noise more than permissible limit.	- Construction plant & machinery to be located 1 km away from settlements. - Construction vehicles and equipment fixed or mobile to be equipped and maintained with effective muffler system. - Proper traffic management near sensitive receptors. - Putting up “no horn” signage near sensitive receptors. - Provision of earplugs to workers. - Noisy construction to be restricted during the hours by 10 pm- 6 AM. - Provision of sound screens in the shape of road side plantation along both sides of road. - Since the DNH WLS starting point receiving 4 dB(A) more noise is a hilly area it is assessed that the vegetated road facing slope shall absorb the noise.
7. Ecology			

S. No	Parameter	Potential Impact	Mitigation Measures
(i)	Flora	30786 nos of trees present in the Right of Way of expressway are likely to be felled.	- Only those trees which will be directly impinging on work will be felled. 253300 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. - Median Plantation shall be carried out in accordance with IRC Guidelines
(ii)	Forest	- Total forest area to be diverted is 96.403 ha. Out of which 43.38 ha is in Gujarat, 0.543 ha is in DNH and 52.48 ha is in Talasari Taluka of Palgarh district. - The alignment has been so fixed that requirement of forest land is minimum.	- Compensatory afforestation on double the degraded forest land shall be carried out at NHAI's cost. - Net Present Value of the diverted forest land shall be paid by NHAI.
(ii)	Fauna	- No significant impact is anticipated on fauna as Vadodara Mumbai Expressway is not passing through Wild Life Sanctuary. However Wild life sanctuary is 260m (approx) away from the alignment near Dadra Nagar Haveli. - Minor impact may also take place on fauna present in open fields.	- Construction workers will be made aware about the provision of the Wild life (Protection) Act 1972. - Construction Workers will be oriented not to involve in poaching of animals. - Alignment of Vadodara Mumbai Expressway is on the boundary of settlement and shall act as barrier for animals entering into Settlement.
8. Socio Environment			
(i)	Socio Environment	- Displacement of people. - About, 3444.8529 Ha,	Compensation for loss of land, Structures private, community and public.

S. No	Parameter	Potential Impact	Mitigation Measures
		of land is proposed to be diverted which includes 3229.8739 Ha. in Gujarat, 77.991 Ha in Dadra Nagar Haveli and 136.988 Ha in Maharashtra . Influx of construction workers.	- Employment of local labour in unskilled and semi-skilled sector during construction. - Setting up migrant workers camp at least 1 km away from settlements and providing basic facilities like potable water , ration shops etc.
(ii)	Archeological / Historical Monuments	No impact is envisaged as no protected monuments are falling in the Proposed Right of Way.	Alignment has been finalized in such a way that none of the Archaeologically Protected Structure is falling in the Right of Way of project road.
(iii)	Religious Structures, cultural property	39 nos of religious structures are falling in the alignment - Obstruction to places of religious importance and Cremation ground.	Affected structures will be relocated with due consultation with local communities.
(iv)	Quality of Life	Positive Impact due to availability of jobs	Quality of life will be improved due to overall economic development of project implementation.
9. Public Health and Road Safety			
(i)	Public health and road safety	- Psychological impacts of project affected people. - Migration of worker may lead to sanitation problem creating congenial condition for disease vectors. - Discomfort arising of air, noise pollution. - Hazards of accident.	- Continued consultation with PAPs and the competent authority for speedier settlements of compensation package. - Ensure sanitary measures at construction camp to prevent water borne disease and vector borne disease. - Provide appropriate personal protective equipments like earplugs, gloves, gumboot, and mask to the work force.

S. No	Parameter	Potential Impact	Mitigation Measures
			• Safe traffic management at construction area.

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.

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. 4030000.00 (Rupees Forty lac thirty Thousand only)** has been allocated for construction (3 years) as well as operation (2 years) phase and included under Environment Management budget.

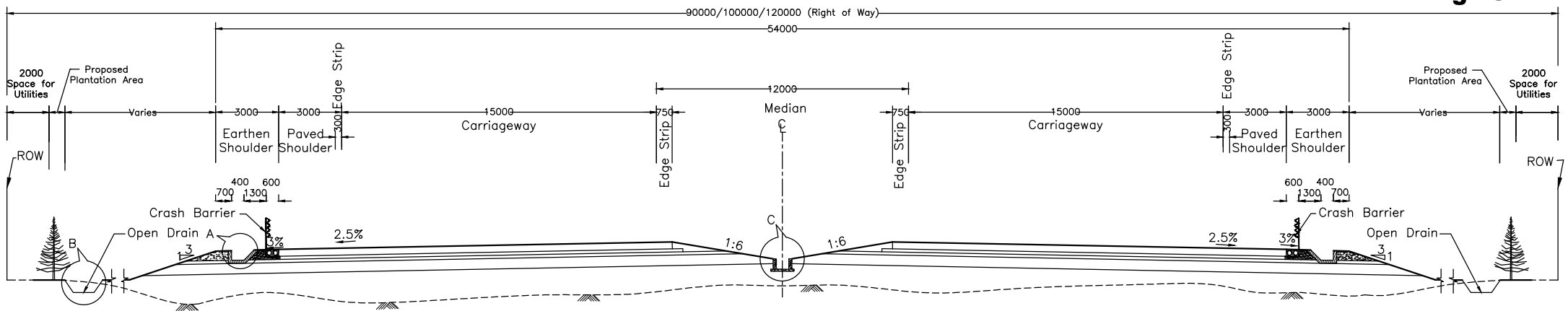
Environment Budget

Rs 15,89,49,000/- (Rupees Fifteen Crores Eighty Nine Lacs and Forty Nine thousand) has been worked out for implementation of Environment Management Plan including Environment Monitoring Programme.

R&R Budget

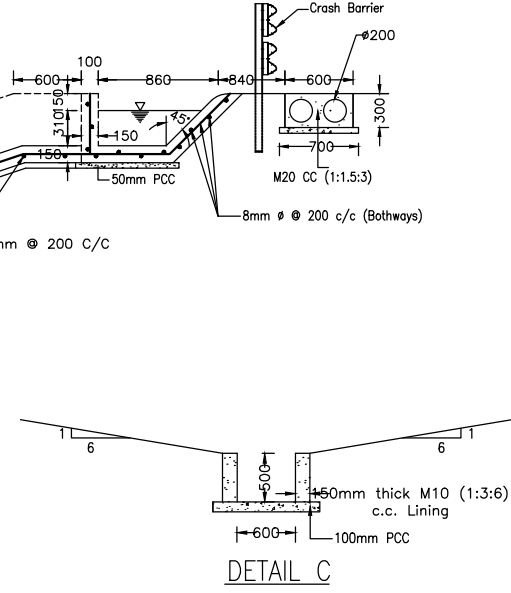
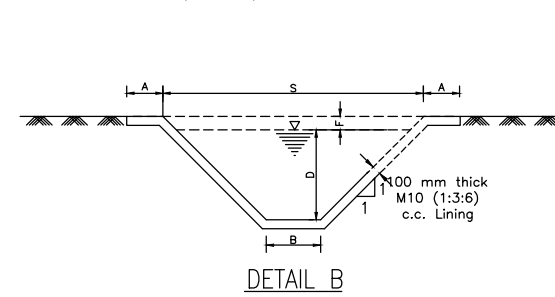
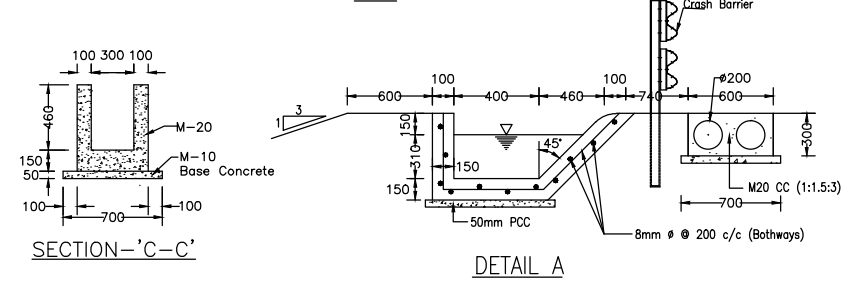
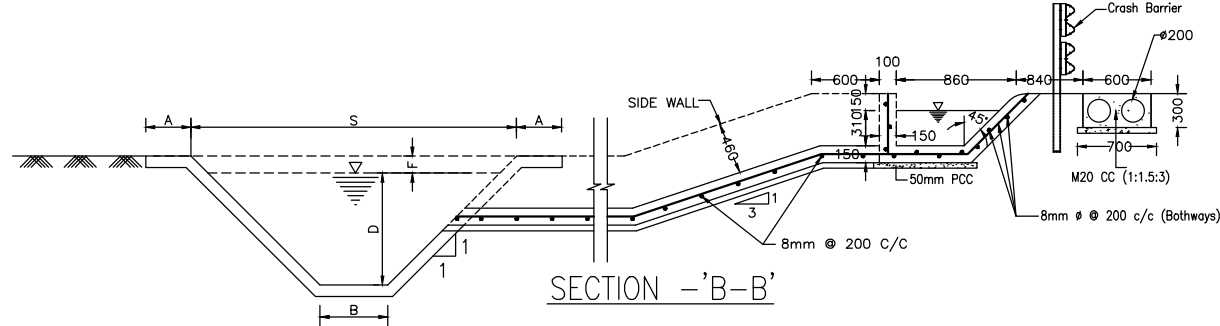
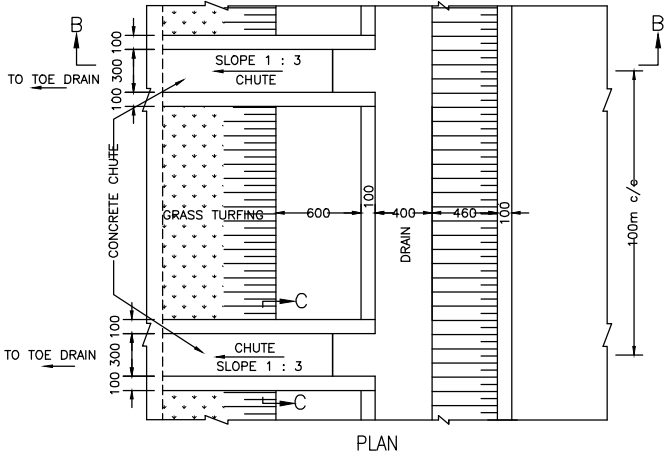
The R&R budget worked out for the proposed VME-Phase-I corridor is **Rs. 3305.3664** Crores which includes cost of land, replacement cost of religious and community structures and R&R assistance to the affected people.

• • •



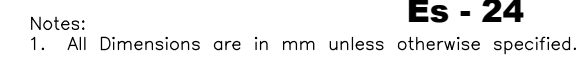
TCS-1

TYPICAL CROSS SECTION OF EXPRESSWAY
8-LANE DIVIDED C/W WITH DEPRESSED MEDIAN & WITHOUT SERVICE ROAD

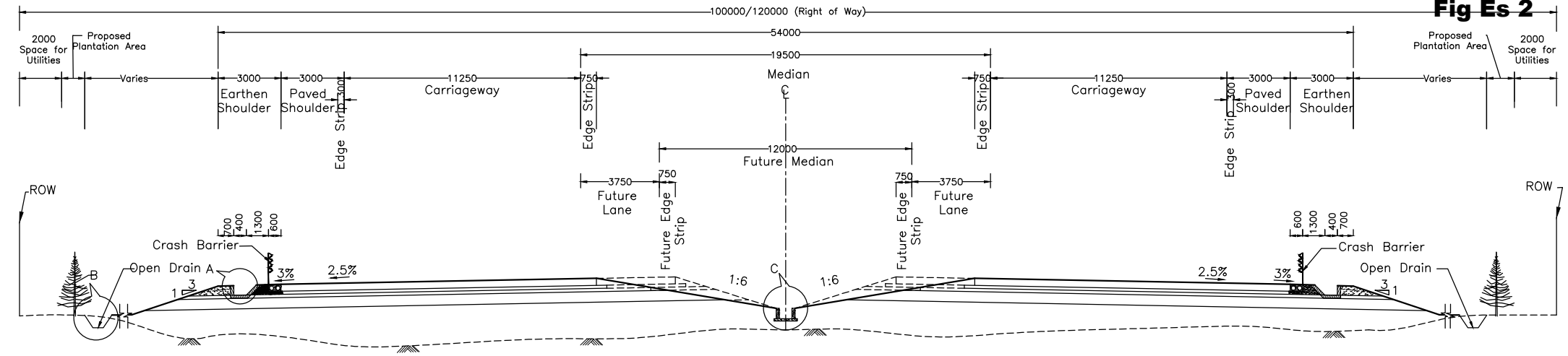


MAIN EXPRESSWAY Detail of Drain - "B" (Toe Drain)

S. No.	Chainages(km)		Dimensions(in mm)				
	From	To	A	B	D	F	S
1	104.700	130.000	400	600	990	150	2880
2	130.000	205.000	400	600	920	150	2740
3	205.000	287.365	400	600	790	150	2480

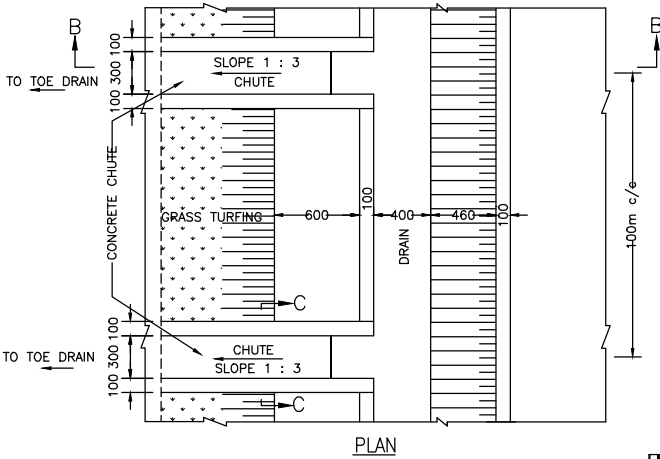


MAIN EXPRESSWAY Detail of Drain – "B" (Toe Drain)							
S. No.	Chainages(km)		Dimensions(in mm)				
	From	To	A	B	D	F	S
1	104.700	130.000	400	600	900	150	2880
2	130.000	205.000	400	600	920	150	2740
3	205.000	287.365	400	600	790	150	2480

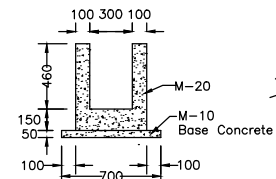


TCS-6

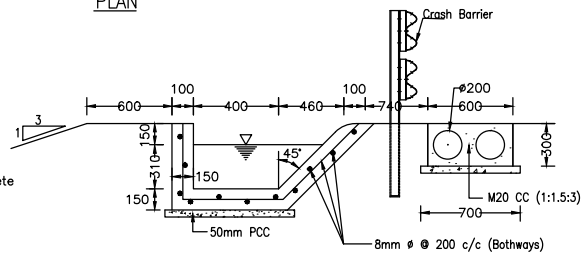
TYPICAL CROSS SECTION OF EXPRESSWAY
6-LANE DIVIDED C/W WITH DEPRESSED MEDIAN & WITHOUT SERVICE ROAD



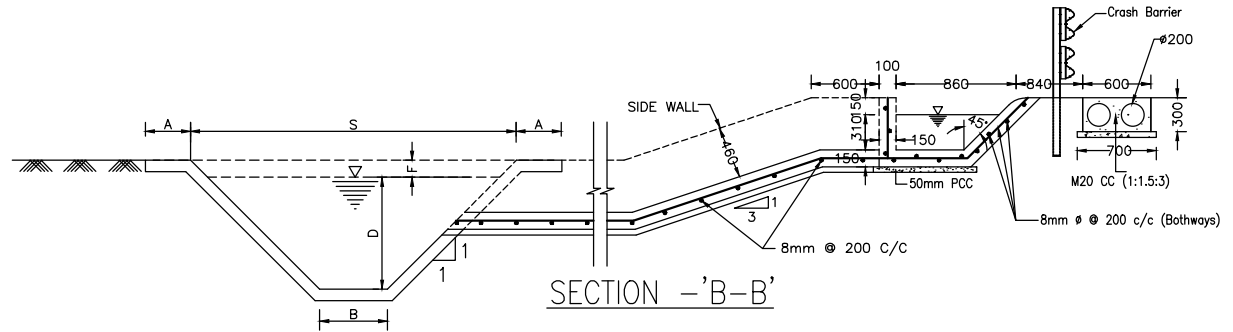
PLAN



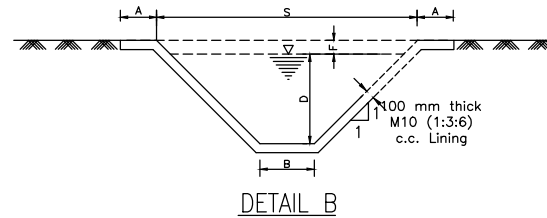
SECTION - 'C-C'



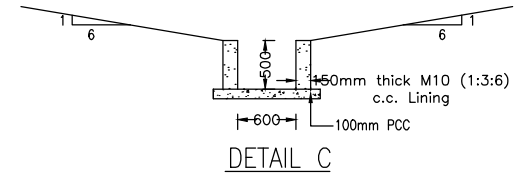
DETAIL A



SECTION - 'B-B'



DETAIL B



DETAIL C

MAIN EXPRESSWAY Detail of Drain - "B" (Toe Drain)

S. No.	Chainages(km)		Dimensions(in mm)				
	From	To	A	B	D	F	S
1	287.365	378.722	400	600	790	150	2480

Notes:

1. All Dimensions are in mm unless otherwise specified.

