DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED

ENVIRONMENTAL ASSESSMENT (Final)

of

Kaurara – Chamrola section
(Tundla detour of Bhaupur-Khurja section)

September, 2012

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ABBREVIATIONS

AAQ	Ambient Air Quality
ADB	Asian Development Bank
AFs	Affected Families
AIDS	Acquired Immunodeficiency Syndrome
ASI	Archaeological Survey of India
BIS	Bureau of Indian Standard
BOD	Biological Oxygen Demand
cc	Cubic Centimeter
CF	Conservator of Forest
Cl	Chlorine
CO	Carbon Monoxide
CPCB	Central Pollution Control Board
CPRs	Common Property Resources
CS	Construction Supervision
dB	Decibel
DFC	Dedicated Freight Corridor
DFCCIL	Dedicated Freight Corridor Corporation of India Limited
DFO	Divisional Forest Offices
DO	Dissolved Oxygen
DR	Detailed Railway
EA	Environmental Assessment
EAC	Expert Appraisal Committee
EIA	Environment Impact Assessment
EMAP	Environment Management Action Plan
EMP	Environmental Monitoring Plan
EMU	Environment Management Unit
ESIMMS	Environmental and Social Impact Mitigation Measures Study
EWG	Environmental Working Group
Fe	Iron
GoI	Government of India
Hg	Mercury
HIV	Human Immunodeficiency Virus
ICCP	Information and Community Consultation Programme
ICD	Inland Container Depot
IS	Indian Standards
LA_E	Exposure Noise Level
LAeq	Equivalent Noise Level
LPG	Liquefied Petroleum Gas
MLA	Member of Legislative Assembly
MoEF	Ministry of Environment & Forests
MP	Member of Parliament
N	Nitrogen
Na	Sodium
NEP	National Environmental Policy
NGO	Non Government Organization
NO	Nitrogen Oxide
NPRR	National Policy on Resettlement and Rehabilitation

NRCP	National River Conservation Plan
OM	Organic Matter
OP	Operational Policy
PAFs	Project Affected Families
PAPs	Project Affected Person
Pb	Lead
PCCF	Principal Conservator of Forest
PDA	Passenger Diesel A (Plain Route) Train
PUC	Pollution Under Control Certificate
RAP	Resettlement Action Plan
ROB	Railway Over Bridge
ROW	Right of Way
RPM	Respiratory Particulate Matter
RRP	Resettlement and Rehabilitation Plan
RUB	Railway under Bridge
SC	Scheduled Caste
SDOE	State Department of Environment
SEIA	State Environment Impact Assessment
SIA	Social Impact Assessment
SPCB	State Pollution Control Board
SPM	Suspended Particulate Matter
SR	Sensitive Receptors
ST	Scheduled Tribe
TOR	Terms of Reference
VRC	Village Rehabilitation Committee
WB	World Bank
WLS	Wildlife Sanctuaries
Zn	Zinc

EXECUTIVE SUMMARY

1.0 BACKGROUND

Ministry of Railways established a Special Purpose Vehicle for construction, operation and maintenance of the dedicated freight corridors. This SPV "Dedicated Freight Corridor Corporation of India Limited (DFCCIL)", will undertake planning & development, mobilization of financial resources and construction, maintenance and operation of the dedicated freight corridors. DFCCIL was incorporated as a company on 30th October 2006 under the Companies Act 1956. Mumbai-Delhi and Delhi-Howrah routes have capacity utilization of more than 140%. This has led to the saturation of the Railways system in terms of line capacity utilizations on these corridors, which are specifically called the Western and Eastern corridor respectively. Dankuni -Sonnagar-Ludhiana section has been identified Eastern corridor while from JNPT to Dadri via Vadodara – Ahmedabad - Palanpur-Phulera - Rewari is called Western corridor. These corridors encompass a double line electrified traction corridors. Total length of EDFC is 1843 Kms. Present EA study is confined to 72 km, Kaurara to Chamraula. It is part of Bhaupur to Khurja (total 344 km) section of EDFC. The Environmental assessment (EA) of 272 km section of Bhaupur-Khurja was conducted separately.

2.0 OBJECTIVES OF THE ASSIGNMENT

Current regulations of Government of India does not include railway project for seeking Environmental Clearance from the Ministry of Environment and Forests (MoEF). Therefore this project does not require Environmental Impact Assessment (EIA) studies. However, considering the magnitude of activities envisaged as part of EDFC, the DFCCIL decided to conduct an EA and prepare an Environmental Management Plan (EMP) to mitigate potential negative impacts for the project. However, fresh Environmental Management Framework (EMF) is not required, because EMF developed during earlier EA of 272 km Bhaupur-Khurja remains valid for Kaurara-Chamraula section as well.

3.0 SCOPE OF ENVIRONMENTAL ASSESSMENT (EA)

Scope of study for the subject project of Kaurara – Chamraula section (about 72 km) includes environmental assessment, environmental management plan and environmental management frame work(EMF) Since EMF was prepared during EA of Bhaupur-Khurja section (272 km), hence same has not been prepared again.

4.0 DESCRIPTION OF PROJECT

Present project confines to the section between Kaurara & Chamrola which alignment is in place of previous Tundla detour. This alignment traverses through two districts, Ferozabad & Agra, both within Uttar Pradesh. Details are given in the **Table- 1.**

Table -1 Chainage and length of alternative Alignment of TundlaDetour (Kaurara km1200-to Burhan Km 1266)

Stretch	District	Chainage(From)	Chainage To	Total length
Parallel	Ferozabad (Km 1200-Km 1245)	Kaurara Khurd (Km 1200)	Vijaupur NaglaBhavsingh (1224)	23.8

Stretch	District	Chainage(From)	Chainage To	Total length
		Datauji(km1234)	Chullawali (1245)	10.3
	Agra (Km 1254-1266)	Mitavali(1254)	Burhan(1262)	6.9
	Agra	Burhan(Km1264)	Burhan (1266)	1.6
	Total length in parallel			**42.60**
Bypass	Ferozabad	Vijaupur NaglaBhavsingh (Km1224)	Datauji (1234)	11.98
	Ferozabad/Agra	Chullavali (Km1245)	Mitavali (1254)	14.38
	Agra	Burhan (1262)	Burhan(Km1264)	3.20
	Total length in Bypass			**29.56**
	Total length (bypass & parallel)			**72.16 Say 72**

Note: chainage shown here is that of IR, not DFC

5.0 KEY ENVIRONMENTAL LAWS AND REGULATIONS

Following environmental regulations and legislations are relevant to project.

Table 2: Environmental Regulations and Legislations

Sl. No.	Act / Rules	Purpose	Applicability to the project	Authority
1	Environment Protection Act-1986	To protect and improve overall environment	The project activities should maintain emission standards	MoEF. GoI; DoE, State Gov. CPCB; SPCB
2	Environmental Impact Assessment Notification- 14th Sep-2006 and its amendment	To provide environmental clearance to new development activities following environmental impact assessment	Railway project not included in the Notification Hence not applicable in this project	MoEF
3	National Green Tribunal Act, 2010 National Green Tribunal (Prevention and Protection) Rules 2011	Address Grievances regarding cases related to environment protection & compensation against other natural resources	Applicable	MoEF
4	Forests (Conservation) Act. 1980 The Forest (conversion) Rules 1981	To check deforestation by restricting conversion of forested areas into non-forested areas	Applicable.	Forest Department, Govt. UP (for land conversion below 5 hectare & 40 % density).
5	Wild Life Protection Act 1972, amendment	To protect wildlife through certain of National Parks and Sanctuaries	No wild life Sanctuary or National park in the project area Not Applicable	-
6	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution	Applicable Emissions from construction machinery and vehicle should be checked time to time.	UPPCB
7	Water Prevention and Control of Pollution) Act,1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Applicable Various parameters in Effluents from construction sites and workshops are to be kept below the prescribed standards	UPPCB

Sl. No.	Act / Rules	Purpose	Applicability to the project	Authority
8	Noise Pollution (Regulation and Control Act) 2000	The standards for noise for day and night have been promulgated by the MoEF for various land uses.	Applicable DG sets at construction sites and workshops should be provided with acoustics enclosures.	UPPCB
9	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act,2010 National Monuments Authority has been set up under above Act	Conservation of cultural and historical remains found in India	Applicable ASI protected structure “Budhiya ka Tal” near Athamadpur, Agra in close proximity, NOC from NMA required.	NMA, Archaeological Dept GoI, Indian Heritage
10	Public Liability and Insurance Act 1991	Protection form hazardous materials and accidents.	Applicable	UPPCB
11	Explosive Act 1884	Safe transportation, storage and use of explosive material	Applicable Respective Authorization shall be obtained from CCE	Chief Controller of Explosives
12	Minor Mineral and concession Rules	For opening new quarry.	Applicable Quarry Licenses shall be obtained by Contractors.	District Collector
13	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	To check vehicular air and noise pollution.	Applicable All vehicles in Use shall obtain Pollution Control Check certificates	Motor Vehicle Department
14	The Mining Act	The mining act has been notified for safe and sound mining activity.	Applicable Quarry Licenses shall be obtained by Contractors.	Department of mining, GoUP
15	Railway (Amendment) Act, 2008	Land acquisition for special railway project	Applicable	GoI
16	The Petroleum Rules, 2002	Storage of petroleum products for operation of construction machineries	Applicable	Chief Controller of Explosive/ District Magistrate
17	Taj Trapezium Zone (TTZ) Pollution (Prevention and Control) Authority Notification may 13, 1998	For regulation of Growth and control of Pollution in TTZ area and implementation of pollution prevention measures	Applicable for obtaining tree cutting permission in TTZ portion from Green Bench of Honourable Supreme Court	TTZ Pollution (Prevention and Control) Authority

Environmental Impact Assessment (EIA) is required for projects with potential to have significant adverse environmental impacts (Category ‘A’). Category B projects are considered to have some adverse environmental impacts, but of lesser degree or significance than those for category ‘A’ projects. Category ‘B’ projects require Environmental Assessment (EA) to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the EA is regarded as the final environmental assessment report as is the case for this project. The subject DFC section alignment passes through very small patches of degraded forests area. There is no presence of endangered fauna and flora along the project railway line. It may also be mentioned that diversion of only 4.1920 ha forest land is involved. The Government of India issued Environmental Impact Assessment Notification in 1994 and amended this Notification in 2006.These Notifications were issued under Environmental (Protection) Act, 1986. The EIA Notifications have listed various activies under Category ‘A’ and ‘B’ but Railway projects do not fall under any category requiring an environmental clearance from MoEF. Only No Objection Certificate (NOC) is required from SPCB under the Air and Water Acts during construction phase.

Tree cutting permission in portion of EDFC alignment falling in TTZ portion (km 1221 to 1266) to be obtained from the Green Bench of Honourable Supreme Court of India.

It has been established that there is a need for improving the infrastructure capacity of the transport sector to cater the projected demand for freight and goods movement. By building up the rail infrastructure which uses 1/6th the fossil fuel consumption as compared to road, overall improvement in environmental condition is envisaged. Further, in this case it would be electric traction. There is also possibility that the electricity used for DFC may come from nuclear power. Therefore, this project will be an eco-friendly and efficient transport system to meet with the demand of India's growing economy.

Since this is a large scale project and likely to have some reversible impacts on environment during construction phases & some impact, not of much significance, during operation, this project is being considered as **'A' category project** as per the World Bank safeguard policy. This will help not only in tweaking the construction stage to be more eco-compliant but setting systems to have better and more environment friendly construction in forthcoming railway projects. DFCCIL is committed to establish most efficient and eco-friendly system.

6.0 BASE LINE ENVIRONMENT

Data was collected from secondary sources for the macro-environmental settings like climate, physiographic (Geology and slope), biological and socio-economic environment within Project influence area.. First hand information has been collected to record the micro-environmental features within Corridor of Impact. Collection of first hand (Primary) information includes preparation of base maps, extrapolating environmental features on proposed alignment, environmental monitoring covering ambient air, water, soil, noise and vibration, tree enumeration, location and measurement of socio-cultural features in the project alignment. The environmental profile and strip plan have been prepared.

7.0 ENVIRONMENTAL SENSITIVITY OF THE PROJECT & SUMMARY OF THE ENVIRONMENTAL FEATURES ALONG PROPOSED ALIGNMENT

The entire environmental profile covering five km on both side of the proposed alignment has been studied, and strip plans have been prepared to cover the RoW of the proposed alignment in parallel as well as detour sections. Based on this analysis, the following conclusions can be drawn:-

1. No wild life sanctuary or national park exists along the parallel or detour sections of the proposed DFC.
2. There is no wetland along the proposed corridor.
3. Protected forests are located along the proposed alignment from Kaurara to Chamrola. However, these areas are forest land and have scattered plantations of babool. The total forest land requies to be acquired for non-forest use is **4.1920** ha.
4. There are congested sections with residential / commercial structures located along the existing railway alignment.
5. No perennial river / water body crosses the proposed alignment.

6. Number of religious structures, schools, and colleges are located along the proposed alignment.
7. The proposed alignment may result in felling of estimated **4352** trees out of which approx. **800** are within Railway properties. Major species present along the alignment are babool, neem, shisam, papal, mango, bargad, kanji, labhera, ashok, sirsa, guler, jamun, ber, eucalyptus, mahua and bel.
8. One Archaeological monument Budhiya-ki-Tal exists. This is in Tundla detour at crossings of railway line with NH-2.
9. In order to reduce the pollution and to regulate the growth, Minstry of Environment and Forest, Government of India has Notitied Taj Trapazeum Zone(TTZ) around Taj Mahal. The geographical limits of the Taj Trapezium Zone is defined in the shape of a trapezoid between 26^{0} 45'N & 77^{0} 15'E to 27^{0} 45'N & 77^{0} 15'E in the West of the Taj Mahal and in the East of Taj Mahal between 27^{0} 00'N & 78^{0} 30'E to 27^{0} 30'N & 78^{0} 30'E, lying in the Agra Division of Uttar Pradesh and in the Bharatpur Division of the State of Rajasthan. Total area of TTZ is 10400 sq km.
10. The EDFC portion between km 1221 to 1266 is falling in Taj Trapezium Zone formulated through notification of Taj Trapezium Zone Pollution (Prevention and Control) Authority notified on May 13, 1998

8.0 SOCIAL IMPACT

Social impact affects number of PAFs & PAPs are 1745 & 10005 respectively. 97 affected structures falling in two U.P. districts of Ferozabad & Agra have been identified. Details are indicated in the relevant sections of the report. Total **258.87** ha land will be acquired, out of which 224.03 ha is private land, 34.84 ha is Govt. land.

9.0 PUBLIC CONSULTATION AND DISCLOSURE

The Public Consultation meetings for the proposed section have been conducted in five places during March, 2011. For these meetings, environmentally sensitive villages that could potentially be affected by the proposed project were selected. The overall objective of the public consultation was to provide information to the stakeholders and collect feedback from them on related environmental issues.

10.0 ANALYSIS OF ALTERNATIVES

The analysis of alternative has been done for the alignment finalization of Ferozabad, Tundla and Barhan detours. The alignment best suiting environmentally, socially and technically have been selected.

11.0 POTENTIAL IMPACT

Environmental impact assessment was conducted for one season only, because this is a small part of Bhaupur-Khurja for which two seasons EIA was conducted earlier and the EA report thereof has alreasy been shared with the World Bank. EIA involves prediction of potential impacts by the development of the project on the surrounding area. Based on the baseline environmental status described and the proposed project activities, potential impacts have been identified, assessed, predicted and appropriate mitigation measures are suggested to avoid / reduce / compensate for the potential adverse impacts and enhance its positive impacts. The impacts due to the development of the proposed Dedicated Freight Corridor (DFC) have been assessed for three phases, planning phase, construction phase and implementation phase. The project implementation will have impact in TTZ portion due to cutting of Trees. The tree cutting in this portion requires permission from Green Bench of Honourable Supreme Court of India.

12.0 MEASURES FOR THE MITIGATION OF ENVIRONMENTAL IMPACTS

Prevention or avoidance of impact is better than mitigation of impact. Hence approach to avoid and reduce adverse impacts is proposed for adoption during the design stage through continued interaction between the design and environmental teams. This is reflected in the design of the horizontal & vertical alignment, cross sections adopted, construction materials and methods. In-depth site investigations have been carried out so that sensitive environmental resources are effectively avoided, leading to acceptable alignment which has minimum impact on the environment. The appropriate mitigation measures have been suggested during various phases of the project including specific measures for noise and vibration. The tree cutting permission for those trees which are located in TTZ area will be obtained from Green Bench of Honourable Supreme Court of India. In order to comply with the TTZ requirement no Hot Mix plant and crusher will be established in construction camp in TTZ portion of EDFC.

13.0 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan is an implementation plan to mitigate and offset the potential adverse environmental impacts the project might have for enhancing its positive impact. Based on the environmental baseline conditions, planned project activities and impact assessed earlier, this section enumerates the set of measures to be adopted in order to minimize adverse impact during pre-construction, construction & operation phases. Social impact mitigation and land acquisition plan are also included. Social impact mitigation measures are described in details in Ressettlement Action Plan (RAP) document. The process of implementing mitigation and compensatory measures, execution of these measures, agencies responsible for the implementation of these measures and indicative cost has been mentioned. The environmental management plan budget has been formulated and this includes costs for monitoring of tree cutting in TTZ, permission for tree cutting and compensatory plantation monitoring.

CHAPTER 1 : INTRODUCTION

1.1 BACKGROUND

Indian Railway (IR) is one of the largest railway systems in the world. It serves a landmass of over 3.3 million sq.km. and a population of over one billion. The last 50 years have seen a tremendous growth in the Indian transportation sector. In the past few years, the volume of rails freight has increased by over five times and the number of passenger kilometers has increased over seven times. The tonnage handled by Indian ports has increased 16 times while the airfreight has increased 30 times. Railway freight, which was 73 MT in 1950-51, had increased to 474 MT in 2000-01, at an average annual increase of 10.98 percent. However, post 2001, the freight traffic has grown at an annual average of 8.50 percent and about 794 MT of freight was transported in 2008-09. This rapid increase in freight traffic is attributed to India's economic growth, which resulted in traffic congestion on the existing railway track.

1.2 DEDICATED FREIGHT CORRIDOR

To cater to the rapid growth and demand for additional capacity of rail freight transportation, Government of India has initiated development of 'Dedicated Freight Corridors' along eastern and western routes, connecting the metro cities of Delhi with Kolkata and Mumbai. Dedicated Freight Corridor Corporation of India Limited (DFCCIL) was established in 2006 to undertake planning & development, mobilization of financial resources and construction, maintenance and operation of the dedicated freight corridors.

- The western corridor is of 1483 km double line track from Mumbai (JNPT) to Delhi near Dadri and connects the cities of Vadodara, Ahmedabad,Palanpur, Phulera and Rewari.
- The eastern corridor is of 1843 km track from Dankuni, near Kolkota to Ludhiana. This encompasses a double line electrified traction corridor from Sone Nagar to Khurja (820 Km), Khurja to Dadri on NCR double line electrified corridor (46 Km) and single electrified line from Khurja to Ludhiana (412 Km).

The eastern and western corridors are proposed to meet at Dadri, near Delhi.

1.3 CURRENT PROJECT

The current project beween Kaurara and Chamraula having a length of about 72 km is a part of Bhaupur-Khurja section (total 344 km) and has been named as Tundla Detour. The Environmental Assessment of Bhaupur-Khurja section was carried out. However, based on feedback of Public Consultation Meetings (PCM), the alignment of Tundla detour was changed to minimize land acquisition. Since the alignment is changed, a fresh environmental impact assessment based on one season baseline data has been undertaken for this Kaurara-Chamrola section. It may be noted that two seasons EIA was conducted for previous Tundla detour in the same area of Bhaupur-Khurja. The project stretch falls in the portion which is being funded by the World Bank. Therefore, Environmental Assessment has been undertaken as per World Bank Safeguard Policies and requirements.

1.4 OBJECTIVES OF EIA

As per the current regulations of Government of India, railway projects do not require Environmental Impact Assessment (EIA) studies and Environmental Clearance (EC) from the Ministry of Environment and Forests (MoEF). However, considering the magnitude of activities of Eastern Dedicated Freight Corridor (EDFC) of which current project is a part, DFCCIL has engaged Engineering and Technological Services, Delhi an independent Consultant to conduct EA and prepare an Environmental Management Plan (EMP) to mitigate potential negative impacts for the Kaurara- Chamraula section. Environmental Management Framework (EMF) earlier prepared during Bhaupur-Khurja EA remains applicable and no EMF is required to be prepared now.

The objectives of the EA are to:-

- Identify potential environmental impacts to be considered in the design of Kaurara-Chamraula Section of EDFC and recommend specific measures to mitigate the impacts.
- Review the proposed alignment of Kaurara-Chamraula Section and identify possible environmental issues to be addressed during the planning, Design, construction and operation of the project.
- Formulate an implementable Environmental Management Plan (EMP) integrating the measures to avoid the identified impacts and an appropriate monitoring and supervision mechanism to ensure EMP implementation.
- Recommend suitable institutional mechanisms to monitor and supervise effective implementation of Environmental Management Plan (EMP).

1.5 SCOPE OF WORK

The scope of work of Environmental Assessment is as follows:

- Brief Description of the proposed project comprising various proposed activities, their phased implementation and their inter-linkages with regard to environmental impacts.
- Detailed Environmental Profile of the Project Influence Area (within 5 km on either side of the proposed alignment) with details of all the environmental features such as Reserve Forests, Sanctuaries / National Parks, Rivers, Lakes / Ponds, Religious Structures, Archaeological monuments, Natural Habitats, School, Irrigation Canals, Utility Lines, other sensitive receptors, etc. have been covered.
- Detailed Field Reconnaissance of the Proposed Alignment, with strip maps presenting all the environmental features and sensitive receptors (trees and structures in the ROW, Reserve Forests, Sanctuaries / National Parks, Rivers, Lakes / Ponds, Religious Structures, Archaeological monuments, Natural Habitats, Schools, Irrigation Canals, Utility Lines, other sensitive structures) along the project corridor. The environmental features recorded on the strip maps indicating their distance from the centre-line of the proposed alignment.
- Detailed Baseline Environmental Monitoring of various environmental attributes such as Ambient Air Quality, noise level, vibration level, water quality (surface & groundwater), ecological profile, etc.
- Assessment of Environmental Impacts of the project, including analysis of alternatives has been carried out for both 'with the project' and 'without the project' scenarios. In case of detour / by pass locations the alternatives should consider alignment parallel to the existing rail line and the proposed detour / bypass alignment (s).
- Measures for the Mitigation of Environmental Impacts identified. The measures for the mitigation of impacts should consider options such as minor modification in alignment, reduction of RoW and engineering measures such as noise barrier / attenuation measure, RUBs/ ROBs, protection of water bodies, conservation of archaeological / heritage structures, etc. Opportunities for enhancement of environmental resources, cultural properties or common property resources explored and recommendations for appropriate measures for implementation.

- Public Consultation and Disclosure of the project and its impacts as per the WB operational policies.
- Environmental Management and Monitoring Plan, comprising a set of remedial (prevention, mitigation and compensation) measures have been developed by the consultant and ensure that these commensurate with nature, scale and potential of the anticipated environmental impacts with necessary Institutional Mechanism for the implementation and monitoring of EMP.

1.6 METHODOLOGY

In order to assess the environmental impacts due to the proposed project, observations were made through repeated field visits. Relevant secondary data was also collected from various government agencies such as District Collector, Indian Meteorological Department, District Statistical Office, Central Ground Water Board, Survey of India, Geological Survey of India, District Industries Centre, District Forest Office, and Archaeological Survey of India

The **environmental profile** of the project influence area and strip maps are prepared based on the following.

- **Toposheets (scale 1:50000) of Survey of India: -** Toposheets have been collected from Survey of India, Dehradun and proposed alignment has been marked on the topo sheets.
- **Field reconnaissance of the proposed alignment: -** The entire area has been surveyed to gather the information on environmental features.
- **Collecting the data of sensitive receptors during field visit: -** The details on sensitive receptors such as schools, religious structures, hospitals etc. are collected and marked on the strip map.
- **Public consultation at village level:** During public consultation, the information on sensitive receptors are also collected and marked on strip maps.

Based on the data collected, the strip maps and environmental profile was developed to present all the environmental features and sensitive receptors.

Preparation of baseline environmental profile, collection of meteorological data from nearest IMD station (Aligarh and Agra in this current project) and field monitoring of ambient air quality, water quality, noise, vibration, soil quality and ecological components as per relevant IS methods / Central Pollution Control Board Standards.

An **analysis of alternative** alignments was carried out and finalized based on reconnaissance survey of project impact zone, analysis of data and screening to minimize impact on environment covering settlements, sensitive receptors, and ecological components.

Series of **Public consultations** were conducted at five places with assistance / guidance of DFCC project office at Kanpur.

Based on the baseline environmental status and project activities, potential impact has been identified, assessed and predicted and appropriate mitigation measures have been suggested in planning phase, construction phase and post-construction phase.

Environmental management and monitoring plan have been formulated based on the outcome of the environmental impact assessment.

1.7 ORGANIZATION OF THE REPORT

The outputs of the study are presented in ten chapters, as mentioned below.

Chapter 1 provides brief background of the project, scope of the EIA study, methodology and organization of the report.

Chapter 2 describes type of the project, salient features of the project with details on various components of the project.

Chapter 3 describes legal and administrative framework / policy relevant to the present project.

Chapter 4 covers the environmental profile of the study area within 5 km on either side of the proposed alignment and strip maps presenting all the environmental features and sensitive receptors covering trees and structures within RoW.

Chapter 5 assesses the nature, type and dimensions of the study area and describes the relevant physical, biological environmental and social components along the proposed railway corridor. The database on the environmental components relevant to decisions about project location; design and operation have been assembled from various secondary sources and primary monitoring of ambient air quality, noise and vibration levels, water and soil quality, aquatic and terrestrial ecology.

Chapter 6 assesses the various alternatives covering parallel alignment / detours options and details on selection of final alignment to minimize the negative social and environmental impacts.

Chapter 7 covers the prediction of potential environmental impacts by the development of the project on the surrounding area. The impacts due to development of the proposed Dedicated Freight Corridor are assessed for planning phase, construction phase and implementation phase.

Chapter 8 covers the mitigation measures to mitigate the negative impacts due to the development of Kaurara-Chamraula section of EDFC on various components of the environment during life cycle of the project i.e. Pre-Construction, Construction and Operation phases

Chapter 9 covers the details on public consultation meeting, disclosure of the project and its impacts are covered in this chapter.

Chapter 10 covers the environmental management plan for various environmental parameters, implementation details, monitoring plan and environmental budget.

CHAPTER 2 : PROJECT DESCRIPTION

2.1 INTRODUCTION

This chapter presents the details of various project components and their salient features, based on the detailed project report prepared by DFCCIL.

2.2 SIZE & LOCATION OF EASTERN DFC

A major portion of eastern corridor is located on Northern Central Railway and is being designed for a maximum speed of 100 kmph train operation.

The Total length from Kaurara to Chamraula section (the section under the present study), is about 72 km. This section includes Tundla Junction which is an important junction on Delhi - Howrah double line electrified main trunk route of Northern Central Railway connecting the Northern, Central and Eastern regions of the country. The entire stretch of the project is located in the State of Uttar Pradesh and passes through 2 districts namely, Ferozabad, and Agra.

The terrain of the project area is generally flat and no Major River crossing the alignment. The entire length lies in the Indo-Gangetic planes. Following table shows parallel & detour sections of 72 km project:

Table 2-1: Chainage and length of alternative Alignment of Tundla Detour (Kaurara km1200-to Burhan Km 1266)

Stretch	District	Chainage(From)	Chainage To	Total length
Parallel	Ferozabad (Km 1200-Km 1245)	Kaurara Khurd (Km 1200)	Vijaupur NaglaBhavsingh (1224)	23.8
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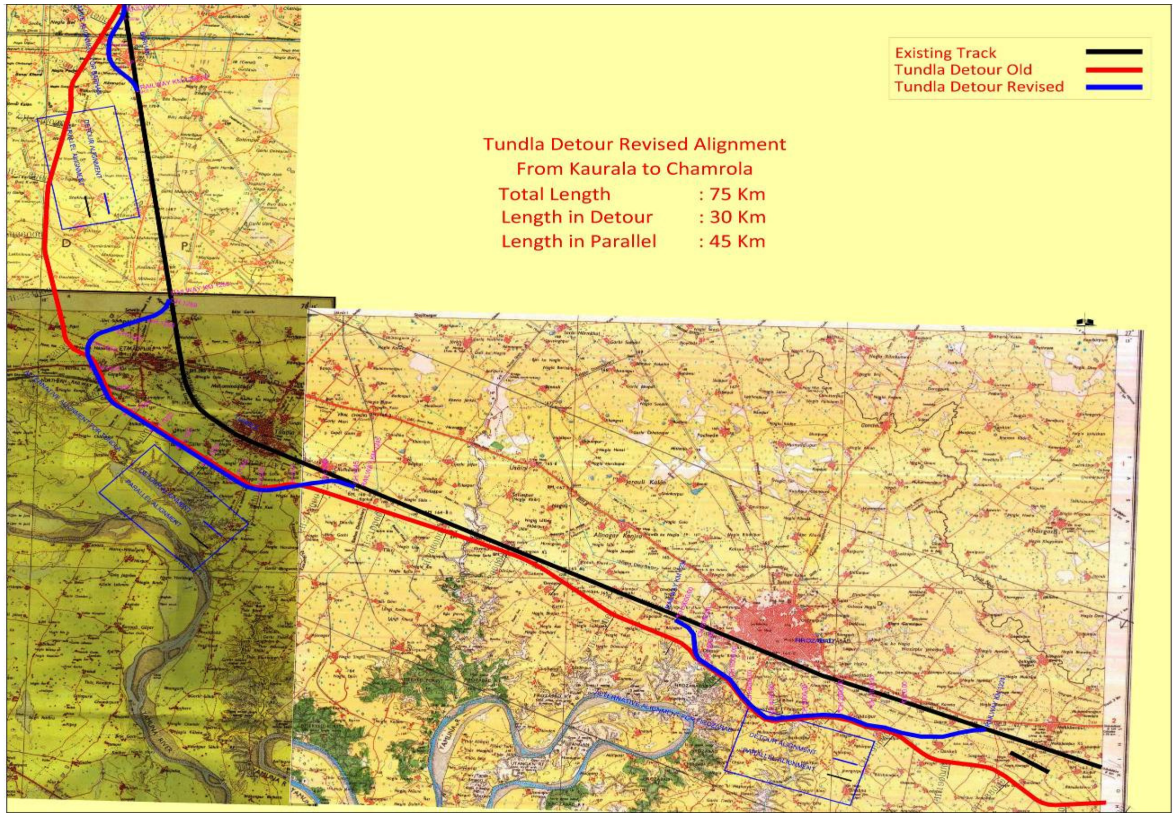
	Agra	Barhan(Km1264)	Barhan (1266)	1.6
	Total length in parallel			**42.6**
Bypass	Ferozabad	Vijaupur NaglaBhavsingh (Km1224)	Datauji Km1234)	11.98
	Ferozabad/Agra	Chullavali (Km1245)	Mitavali (1254)	14.38
	Agra	Barhan (1262)	Barhan(Km1264)	3.2
	Total length in Bypass			**29.56**
	Grand Total length (bypass & parallel)			**72.16 Say, 72 km**

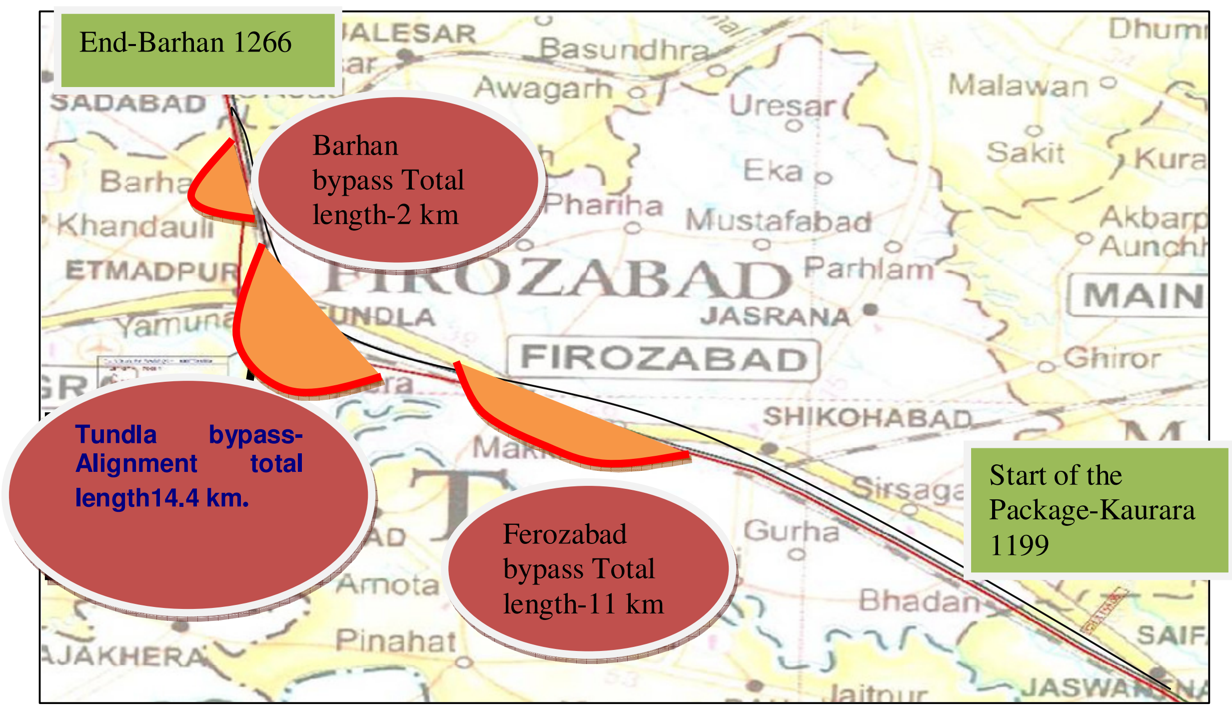
The detours have been proposed based on the following criteria.

1. Busy railway stations, where no space available to pass the DFC track after yard modification
2. Involuntary displacement of large number of people and families, dismantling of large number of structures etc.
3. forest area, so as to avoid/ reduce impact on natural resources

A schematic map of Kaurara – Chamraula section is shown in **Figure.2.1,** while entire eastern corridor is presented in **Figure 2.2**

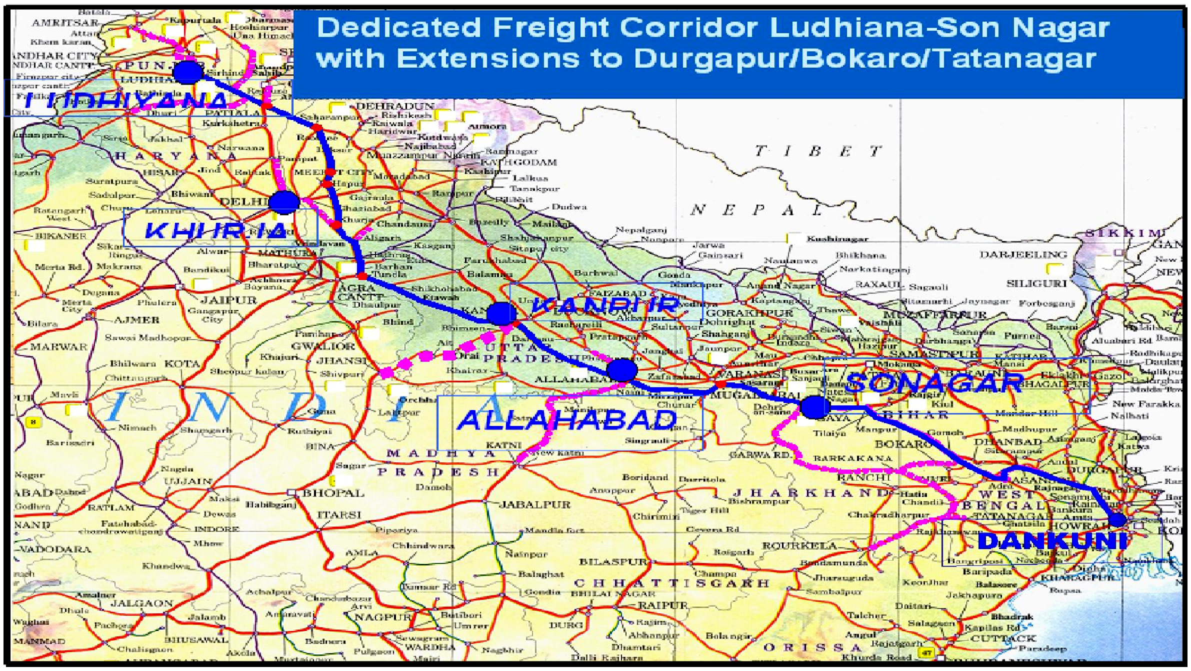
Figure 2-1: Schematic Map Of Kaurara – Chamraula





डेडीकेटेड फ्रेट कोरीडोर

Figure 2-2:Eastern Dedicated Corridor



2.3 SALIENT FEATURES OF THE PROJECT

The salient features of the project are summarized in **Table - 2.2** below.

Table 2-2: Summarized Description of the Project

Sl.No.	Description	Details
1	Route length (km)	72.16 km, say 72km; Out of this 55 km falls within TTZ
2	Parallel:	42.6 km
3	Detour:	29.56 km
4	No. of Detours	3 i.e., Firozabad, Tundla and Barhan
5	**Gradient**	
a.	Ruling Gradient	1 in 200 (Compensated)
b.	Steepest Gradient in yards	1 in 1200, 1 in 400 in exceptional cases
6	**Standard of Construction**	
a.	Gauge	1676mm
b.	Rails	60 Kg 90 UTS rails

Sl.No.	Description	Details
c.	Sleeper	PSC, 1660 Nos./km for main line & 1540 Nos./km for loop line & sidings
d.	Points & Crossings	60 kg rail, 1 in 12 curved switches with CMS crossings on Fan shaped PSC sleepers layouts.
e.	Ballast	300 mm cushion
f.	Design speeds	100 kmph
g.	Design Axle load	Freight Traffic with 32.5 tone axle load
7	**Formation**	
a.	Bank width for Double line	13.5m.
b.	Slope on Embankment	2H:1V
c.	Cutting Width for Double line	19.25 m
d.	Earthwork	C.B.R. > 5
e.	Earthwork for Top 1m.	C.B.R. > 8
f.	Slope of cutting (ordinary Soil)	1 : 1
g.	Blanketing thickness	0.60 m
8	**Curves**	
a.	Maximum degree of curvature	2.5 degree
b.	Grade Compensation on curves	at the rate of 0.04 % per degree of curvature
9	**Track Centers (Minimum)**	
a.	Between two tracks of DFC	6 m
b.	Between Existing track and DFC	13-15m
10	**Bridges**	
a.	Standard of Loading	32.5 tonne axle load, 15 tonne/m trailing load (DFC Loading)
b.	Number of Important Bridges	Nil
c.	Number of major bridges	5
d.	Number of RUBs (Major)	1
e.	Number of RUBs (Minor)	35
f.	Number of Minor Bridges	32
g.	Number of Rail Flyovers	1
h.	Two DFC lines flying over a single existing Railway line	---

Sl.No.	Description	Details
i.	Two DFC lines flying over a Double existing Railway line	--
j.	One DFC line flying over a double existing Rly line.	1
11	**Road Crossings**	
a.	Number of level crossings	19
12	**Stations**	8
a.	Junction Stations	2
b.	Crossing Stations	1
13	**Additional Land Required**	**258.87 hectares**

2.4 DESIGN FEATURES

2.4.1 Gauge

The proposed alignment DFC line almost is parallel to the existing line and the Gauge for the DFC line has necessarily to be Broad Gauge. (BG-1676mm).

2.4.2 Category of Line

The proposed DFC line is having a potential of maximum permissible speed of 100 kmph for goods trains to meet the anticipated traffic requirements. All bridges will be constructed to DFC loading standard with 32.5 t axle load.

2.4.3 Ruling Gradients

The ruling gradient for the proposed line has been kept as 1 in 200(compensated). Grade compensation has been provided at the rate of 0.04% per degree of curvature as per Para 418 of Indian Railway's Permanent Way Manual. The maximum length of loop and tonnage of goods trains catered for in the design are 715m and 3600T respectively.

2.4.4 Curves

For permitting maximum permissible speed of 100 kmph, a radius of 638 m (2.74º) is adequate with Cant as 140 mm and Cant deficiency as 75mm. However, maximum degree of curve is restricted to 2.5 degrees in the proposed corridor.

2.4.5 Section

Vertical curves as specified in para 221 of Engineering Code (Para 419 of Indian Railways Permanent Way Manual) have been provided. As per Engineering Code, vertical curves have been provided only at those locations where the algebraic difference in change of grade is equal to or more than 4mm/m i.e.0.4%. A minimum radius of the vertical curves of 4000m as applicable for 'A' category lines for BG has been adopted.

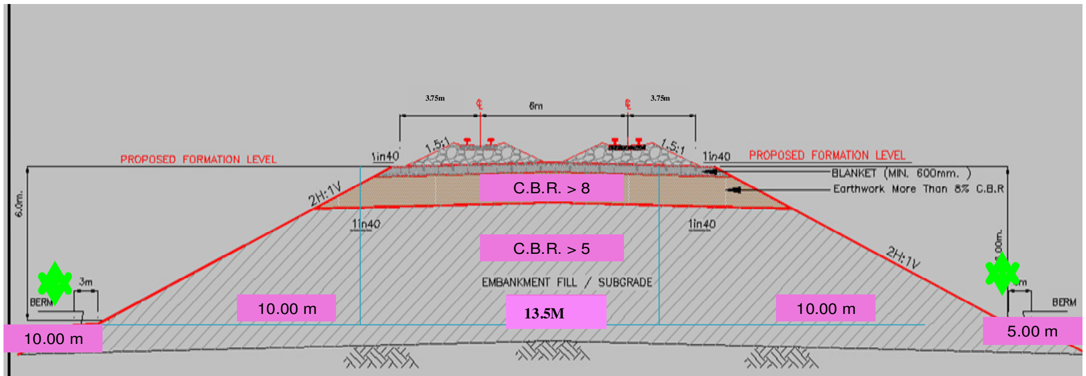
2.4.6 Spacing between Tracks

Spacing between track Centre to centre spacing of DFC tracks has been specified as 6 m and centre to centre spacing of DFC tracks from existing track has been specified as at 13m to 15m to avoid the infringement of existing IR infrastructure. However, spacing of DFC track has been reduced to 7m at thickly populated locations to reduce/avoid the displacement of inhabitants.

2.4.7 Formation

Being a double line construction, a top width of 13.5 m has been considered for embankment with side slopes of 2:1. Formation width in the cutting has been kept as 19.5 m. with side drains. Typical cross section of the proposed freight corridor is presented in **Figure-2.3.**

Figure 2-3: Cross Section of the Proposed Freight Corridor



Cross Section various Embankment Layers

2.4.8 Bank

Formation width of 13.5m.on straight alignment has been considered. The slopes on banks are proposed as 2H: 1V. Where the bank height is more than 6m, a berm of minimum 3m width has been proposed at every 6m height.

2.4.9 Cutting

A bottom width 19.90 m with 1:1 slopes including side drains on both sides have been kept. Where the cutting height is more than 6m, berm of 3m width has been proposed at every 6 m cutting height.

2.4.10 Blanketing

Blanketing layer is provided with 0.6m depth.

2.4.11 Fixed Structure Clearance

Minimum vertical clearance as per SOD for ROB and FOB would be 8.705m to accommodate OHE suitable for the designed speed of 100 kmph.

2.4.12 Permanent Way

The track structure shall consist of 60 kg/m, 90 UTS, FF first class new rails on PSC sleepers having 1660 nos. per km density for main line. First class rails with PSC sleepers having 1540 nos/km density have been adopted for Loop lines and sidings. It is proposed to provide CWR/LWR as per the provision of the P-Way manual.

2.4.13 Points and Crossing

Points and Crossing with 60 kg rail on MBC sleepers with fan shaped Layouts, 1 in 12 on running lines and for non-running lines and sidings with curved switches and CMS crossings have been proposed.

2.4.14 Ballast

The depth of hard stone ballast (65mm size) cushion below MBC sleepers has been kept as 300mm for main lines. Therefore, a quantity of 4.316 cum/m for straight portion is provided. Provision for wastage, curvature and Points & crossing has been considered as per the provision of para 263 of P-Way Manual.

2.4.15 Road Crossings/Level Crossing

Add details of total level crossings along the parallel and detour sections and improvement plan and also mention DFC's policy on LCs.

There are about 19 level crossings on the alignment between Kaurara to Chamraula section. The details of the level crossings are given in the **Annexure 2.1**.

2.4.16 Stations

The Freight Corridor will have two types of stations. Stations required for normal operating requirement are called crossing stations and stations where the loads have to be transferred to/ from existing railway network have been called as Junction Stations. There is one Junction Station at Tundla. Crossing Stations have been proposed in a manner that there is at least one, either crossing station or junction station approximately at 40 km. There is one crossing stations on Kaurara-Khurja Section This station will be at New Tundla. At each station, minimum two numbers of loops, with 750 m CSR have been provided and Sand Dead Hump has been proposed. At station, necessary rooms for S & T have been proposed. Each station will comprise of a small 2-room office with basic amenities for DFC staff.

The details of the existing railway stations and proposed DFC stations are provided in the **Table - 2.3** below.

Table 2-3: Details of the Existing stations and Proposed DFC Stations along Kaurara-Chamraula Section of EDFC

Details of Existing Stations			
S.No.	**Station**	**Changing**	**Remark**
1	Kaurara (KAA)	1201.13	Tundla Detour
2	Shikohabad jn (SKB)	1212.02	
3	Makhanpur (MNR)	1221.77	
4	Firozabad (FZB)	1232.05	
5	Hirangaon (HNG)	1239.75	
6	Tundla jn (TDL)	1248.51	
7	Mitawali (MTI)	1256.12	
8	Barhan jn (BRN)	1263.22	
9	Chamraula (CMR)	1269.95	

2.4.17 Residential Accommodation

Residential accommodation is planned at stations. Standard type II, III & IV quarters have been proposed as per the requirement. At each station average 20 nos. houses (10 Type II, 7 Type III, and 3 Type IV) have been proposed to house the essential staff.

2.5 Land

Proposed DFC track is planned at about 13-15m c/c from existing UP line of Delhi Howrah route of North Central Railway. Formation width of proposed DFC track (double line) has been planned for 13.5m and side slopes of 2:1 in embankment and

1:1 in cutting. In addition to the above, a minimum 10m & 5m extra land from the toe of the bank is planned for the service road and maintenance purposes.

Since the detour is proposed in embankment, the land requirement is higher compared to the parallel section (about 50m to 60m depending up on height of embankment).

A land strip of about 1000 x 60 m of additional land will be acquired for the storage of construction material (dumping station) at about every 40 km. In addition to the above, about 2500m x 100m of land strip will be acquired for crossing / junction stations. Land will also be acquired for electrical installation such as S.P., S.S.P. & T.S.S as per norms of DFC Electrical Department. There is no interference with the military installations and major townships.

Table 2-4: Land Required for Various Purposes
(Area in ha, length in km)

District	Parallel		Bypass	
	length	Area	length	Area
Ferozabad	34.1	95.21	26.36	85.82
Agra	8.5	85.82	3.2	58.02
Total	**42.6**	**115.02**	**29.56**	**143.85**
Grand Total (Ch. 1200 to 1266)				**258.87 ha**

Source: Detailed LAP,CPM Office Kanpur

The proposed project stretch will involve acquisition of about 283 ha of land in which about 88% is under private acquisition. However, the project will require very less about 0.12 ha of built-up area which includes residential, commercial or resi-cum commercial land use. At many built-up locations land width (CoI) has been reduced to as less as 18 m., which resulted in reducing impact on the residential as well as commercial structures

2.5.1 Utilities

The project involves shifting of number of utility services such as electrical lines (HTL/LTL), transformers, tube wells, bore wells, hand pumps etc. A detailed shifting plan for each of the utilities has been prepared in the project and a summary of utilities that need to be shifted is presented in **Table 2.5** and details are presented

Table 2-5: Summary of Utilities

Name of utilities	Approx. No.
440 V electric line	02
11 KV electric line	23
33 KV electric line	18
132 KV electric line	12
220 KV electric line	16
400 KV electric line	14
500 KV DC	1
Bore well, Tube well & Hand pumps	

Source: Consultants Field Survey

In general, a high-tension line runs parallel on south side of the existing alignment. Care has been take to maintain the same pattern in detour sections as well. Therefore, at every detour high tension line is crossing at two locations.

The utilities will be shifted in consultation with the stakeholder agencies including local panchayats and owners of private utilities. Appropriate funds will be allocated in the project for utility shifting.

2.5.2 Turfing

Considering high embankments in detours sections (more than 4 m), turfing has been proposed in detour sections and in major bridge approaches.

2.5.3 Tree Plantation

The project proposes plantation of about 10 trees per km in the stretch on either side of the track.

2.5.4 Side Drains

The proposed alignment runs parallel at 13m-15m distance from the existing alignment. In between two embankments, a gully formation is expected. To avoid water logging in the gully areas, concreted side drains (0.75m width with 1:1 side slope) have been proposed. In detour section, no concrete side drain will be constructed on eitherside.

2.5.5 Retaining Walls

The project proposes retaining walls to manage site-specific issues such as lack of space or impacts on densely populated areas, etc. The location will be identified in consultation with local population considering the engineering requirements.

2.6 STRUCTURE WORK

2.6.1 Major Bridges

The linear waterway for all the major bridges has been proposed on the basis of span on existing railway line. All the major/important bridges are proposed as PSC girder bridges with substructures on pile foundations. All bridges are to be constructed to DFC Loading Standard with a maximum axle load of 32.5 MT, for the Locomotive and a trailing load of 12 t/m. There are 5 major bridges proposed along the alignment having a total 250m linear waterway.

As presented in **Table- 2.6,** the project proposes 5 major bridges at various locations.

Table 2-6: Details of the Major bridges

S. No.	Bridge No.	Proposed Location	Span Arrangement	Name of Location
1	Br No 1	1249/280.00	1x6.1	Tundla Bypass
2	Br No 2	1249/530.470	1x6.1	Tundla Bypass
3	Br. No 3	1249/906.893	1x6.1	Tundla Bypass
4	Br. No.4	1255/652.192	1x6.1	Tundla Bypass
5	Br. No.5	1256/035.670	1x6.1	Tundla Bypass

2.6.2 Minor Bridges

RCC boxes are provided at minor bridge locations. As per Railway Board’s Circular letter no. CBS/DCS dated 6.7.1989; the minimum clear span for new bridges has been kept as 1m for proper inspection and maintenance of bridges. All existing minor bridges with a span of less than 1m have been proposed to be extended up to a minimum span of 1.2m opening for crossing the proposed alignment. There are 32 nos., locations of which have been given in **Annexure-2.2.**

2.6.3 Railway Flyover

Rail Flyovers have been provided wherever the Freight Corridor line is to cross any existing branch or main line. Rail flyovers are proposed with earthen embankment & main structure with composite Girder. There is proposal for one flyover in the current project. The detail of the same is given in **Table-2.7.**

Table 2-7: Details of Railway flyover

S. NO	Section	BRIDGE NO	CHAINAGE	FORMATION LEVEL	SPAN		REMARKS
					NO	W	
1	TUNDLAS BY PASS	RFO No.1	1254/749.694	173.304	3	30.5	Double Line Flyover on Single Tundla Agra Line

2.6.3.1 Flyover for Agra line crossing on Tundla Detour

This flyover is proposed for DFC double line to cross the existing Agra-Tundla line on Tundla Detour. Flyover is proposed with 1 x 35m spanning arrangement with composite girder, RCC abutment & pile foundation.

2.6.4 RUBs (Major)

This type of RUB is such, which crosses National Highway or busy state Highway, where spanning arrangement is proposed with 24.4 m to 30.5 m PSC girders. One RUB is proposed in the in Kaurara- Chamraula section.

2.6.5 RUBs (Minor)

This type of RUB is proposed on detour portion only. As per the DFC policy, surface crossing on detours are to be avoided. So to facilitate the local public RUBs have been proposed on detour alignment. RUBs have been proposed at each road crossing. Effort has been made to minimize the number of RUBs by diverting the existing road to the nearest road crossing where RUB has been proposed. Spanning arrangement has been decided as per the requirements of road traffic. A minimum of 3. X 3 size has been proposed for crossing village roads. The maximum size goes up to 5.5mx3.5m To cross the district roads & state highways 5.5m x 4.5m and 5.5m x 5.5m sizes have been proposed. The details of minor RUBs are given in **Annexure 2-3.**

2.6.6 Sleepers

60 Kg/90UTS rails on PSC sleepers with a density of 1660 sleepers per km with 300

mm ballast cushion have been provided for the main line. In station yards, for the loop lines, 60Kg rails on PSC sleepers with a density of 1540 sleepers/Km with 300 mm ballast cushion has been proposed. The main line is proposed to be provided with LWR / CWR. Loop line is provided with SWR/ LWR. Entire project length is proposed for track circuiting. Glued joints are provided wherever required. 60 Kg points and crossings on PSC fan shaped layouts are proposed.

Flash butt welding is proposed to convert the single rails into LWR/CWR as per plan approved by DFCCIL by contractor's portable road trailer mounted flash butt welding machine.

The required quantity of ballast to the maximum extent (not less than 4.314 cum per meter length) is to be brought by contractor's dumpers on the formation and laid on the proposed alignment by contractor's pavers. Extensive testing on the completed new tracks is proposed to be done using the track recording and oscillate graph cars for assessing track geometry and ride quality. PSC sleepers are transported from the factory by road and stacked near level crossings. Transportation charges for sleepers have been considered for a distance of 300km. Hard Stone ballast of 65 mm size with 300 mm cushion on the main line, turnouts, on loops and sidings is proposed. Nearly 4.3 cum / running meter of ballast is required for the track.

2.6.7 Electric Sub-stations

The electric sub-stations are having the facilities of signals / relay rooms and have a requirement of area around 140 x 85 m. The sub-stations are having booster transformers and return conductors with a maximum voltage capacity of 27.5 KV.

There are total 10 electric sub-stations with signals / relay rooms facilities are proposed, 04 are at junctions stations between chainages at 52.611-54.617(Tundla detour), and 06 are at crossing stations at chainages 1074.820-1076.831, 1113.320-1115.331, 1144.320-1146.332, 1187.820-1189.831, TDL D-16.169-18.175 (crossing Tundla detour) and 1287.820-1289.831.

2.6.7.1 Traction Service Stations (TSS)

The basic consideration in locating the traction substations is to ensure satisfactory voltage condition on the OHE. while the maximum voltage at sub-station should not exceed 27.5 kV, the voltage of the farthest and based on the traction load conditions taking into account the traffic density, the load, the speed of the train and terrain shall not fall below 19 kV. The total five TSS are proposed at chainages 1098.2, 10.11 (Etawah detour), 1213 (Tundla detour), 1267 and 1328.0. The total area requirement for each TSS is 140 x 85 meter and these shall be located along the railway track.

2.6.7.2 Sectioning and Paralleling Post (SP)

The conventional neutral section in the OHE at the sectioning and paralleling post is 41 m long and overlap type. The electric locomotive coasts through this dead section in case it comes to a halt under this portion of OHE, there being no power in the OHE, the electric locomotive becomes immobile. In such a situation it needs to be pushed or pulled by another locomotive to bring it under a live OHE. The site for location of the neutral section, therefore, needs to be selected with case, so that the terrain assists the train in negotiating it. Accordingly the natural section for the sectioning post should be located on a straight track at sufficient distance from a stop signal either behind or ahead of it. In undulating terrain the neutral section should be located in a valley. The SPs are proposed are at Ch. 1183, 1242, in parallel portion.The land area requirement for SPs is 55m x 30m meter.

2.6.7.3 Sub-Sectioning and Paralleling Post (SSP)

Between the feeding post and the sectioning post a number of intermediate sub-sectioning and paralleling posts are inserted in the OHE, to provide remote controlled switches for facilitating isolation of faulty sections of OHE. The area requirement for the SSPs are 55 x 25 meter and these are proposed to be located at chainages 1193, 1203, 1223, detour chainage 10(Ferozabad), 7.0 (Tundla Detour), and 1257 (Parallel section).

2.6.7.4 Tower Wagon Sheds

These are proposed at crossing stations and junction stations and between chainages 16.169 (Tundla detour) and 18.175. Both are on Tundla Detour.

2.6.7.5 Signal and Signal Rooms

Signals are proposed at every 2 km length with a provision of one signal rooms for ten numbers of signals.

2.7 FENCING

RCC Jali fencing shall be provided on all station platforms for about 2 km Length.

2.8 SERVICE ROAD

As per the policy decided by DFC, service road has been proposed adjoining the embankment. Service road has been planned for 5.5 m width with W.B.M surface. Hume Pipe culverts have been proposed along the service road where there is a minor bridge location on proposed alignment. Service road is discontinued at Major bridges, rail flyovers and densely populated area.

2.9 LABOUR FOR CONSTRUCTION

Approx. 60 skilled and 100 unskilled will be employed for a given stretch during the construction phases. Local labour is adequately available and will be utilized during the construction phase.

2.10 WATER REQUIREMENT

The total water requirement during construction period will be about 3600 cubic meter per kilometre spread over the construction period of about 4 years. The daily requirement for per kilometre length during construction period will be about 5000 litre and will be met through local water resources.

2.11 CONSTRUCTION MATERIAL

Construction material will be required in sufficiently large quantities. While sand will be obtained from River Yamuna (within 100 km from the Project alignment), rail, sleepers, cement and steel will be obtained through respective by manufacturers.

The project involves about 1,20,000 cubic meter of earthwork in cutting and 21,400,000 cubic meter of earth work in embankment. Borrow earth for these activities will be obtained by the contractor from the borrow areas, as per the guidelines detailed out in the subsequent sections of this EIA report.

It is estimated that about 1,700,000 cubic meter of ballast would required for laying the track. The ballast would be obtained by the contractor from authorized quarries, as approved by the engineer in charge and in compliance to the guidelines detailed out in the subsequent sections of this report.

2.12 CONSTRUCTION PERIOD

The construction period for the completion of the freight corridor will be four years.

Annexure 2-1

Details Of Level Crossing

S. No	Chainage	LC No
1	1266/21-23	L.C.80C
2	1261/23-25	L.C.78C
3	1258/5-7	L.C.77C
4	1255/23-25	L.C.76C
5	1244/9-11	L.C.69C
6	1241/29-31	L.C.68C
7	1240/1-3	L.C.67C
8	1234/27-29	L.C.64C
9	1223/17-19	L.C.58C
10	1222/7-9	L.C.57C
11	1221/11-13	L.C.56C
12	1219/1-3	L.C. 55c
13	1215/19-21	L.C. 54C
14	1214/7-9	L.C. 53C
15	1211/11-13	L.C. 51C
16	1207/9-11	L.C. 50C
17	1205/11-13	L.C. 49C
18	1203/7-9	L.C. 48A
19	1201/15-17	L.C. 47C

Annexure 2-2

Details of the Major and Minor Bridges

DETAILS OF MAJOR RUB				
S. No.	**Section**	**BRIDGE NO.**	**PROPOSED LOCATION**	**Span Arrangement**
1		Major RUB No1	1255/172.960	2X24.4
Total = 1 No				
DETAILS OF MAJOR BRIDGES				
S. No.	**Section**	**BRIDGE NO.**	**PROPOSED LOCATION**	**Span Arrangement**
1	TDL By Pass	Br No. 1	1249/280.00	1X6.1
2		Br No. 2	1249/530.470	1X6.1
3		Br No. 3	1249/906.893	1X6.1
4		Br No. 4	1255/652.192	1X18.3
5		Br No. 5	1256/035.670	1X18.3
Total = 5 Nos				

LIST OF MINOR BRIDGES (TUNDLA SECTION)					
S. No	**Section**	**MINOR BR LIST OF PARALLEL SECTION (1200.00 TO 1224.00)**			
1	Tundla By Pass	Bridge No. 74	1200/3-5	1x1.2x1.2	
2		Bridge No. 75	1201/21-23	1X1.2X2	
3		Bridge No. 76	1204/11-13	1X4X3	
4		Bridge No. 77	1209/1-3	1X4X2	
5		Bridge No. 78	1213/23-25	1X6X3	
6		Bridge No. 79	1215/5-7	1X1.2X2	
7		Bridge No. 80	1222/25-27	1X1.2X2	
		FIROZABAD BY PASS (1224.00- 1234.00)			
8		Br No. 1	3814.02	1x6x3	
9		Br No. 2	6791.02	1x3x2	
10		Br No. 3	8500	1x6x4.0	
11		Br No. 4	8600	1x6x4	
12		Br No. 5	8700	3x6x4.0	
13		Br No. 6	8840	1x6x4.0	
14		Br No. 7	9120	1x6x4.0	
15		Br No. 8	9450	1x6x4.0	

LIST OF MINOR BRIDGES (TUNDLA SECTION)					
S. No	**Section**	**MINOR BR LIST OF PARALLEL SECTION (1200.00 TO 1224.00)**			
16		Br No. 9	9862.74	2x6x4.0	
17		Br No. 10	9970	1x6x4.0	
18		Br No. 11	10150	1x6x4.0	
19		Br No. 12	10330	1x6x4.0	
		MINOR BR LIST OF PARALLEL SECTION (1234.00 TO 1245.00)			
20		Bridge No. 89	1241/01 -03	1x2x2	
21		Bridge No. 87D	1241/07 -09	1x2x2	
22		Bridge No. 87A	1244/13-15	1X2X2	
		TUNDLA BY PASS (1245.00 TO 1254.00)			
23		Br No. 1	1247/050.00	1X2X2	
24		Br No. 2	247/546.810	1x2x3	
25		Br No. 3	1253/620	1X2X2	
26		Br No. 5	1257/640	1X2X2	
		MINOR BR LIST OF PARALLEL SECTION (1254.00 TO 1262.00)			
27		Br No. 90	1255/27-29	1x2.0x2.0	
28		Br No. 91	1256/29-31	1x2.0x1.2	
29		Br No. 93	1260/13-15	1x1.2x2	
30		Br No. 94	1261/19-21	1x1.2x1.2	
		BARAHAN BY PASS (1262.00- 1264.00)			
31		Br No. 1	1360	1X2X2	
32		Br No. 2	2390	1X2X2	
Total Minor BR – 32					

Annexure 2-3

Details of RUB

LIST OF RUB (TUNDLA SECTION)					
S. No.	**Section**	**Br No**	**Chainage**	**Span**	**Remarks**
	Tundla By Pass	**FIROZABAD BY PASS (1224- 1234)**			
1		RUB1	1843.630	1X5.5X3.5	
2		RUB2	2188.970	1X5.5X3.5	
3		RUB3	3191.740	1X5.5X3.5	
4		RUB4	3908.470	1X5.5X3.5	
5		RUB5	4319.000	1X3X3	
6		RUB6	4509.180	1X3x3	
7		RUB7	4630.370	1x3x3	
8		RUB8	5784.470	1x5.5x3.5	
9		RUB9	6891.100	1x5.5x3.5	
10		RUB10	7273.160	1x5.5x3.5	
11		RUB11	7542.470	1x3x3.0	
12		RUB12	7844.630	1x5.5x3.5	
13		RUB13	8061.290	1x3x3.0	
14		RUB14	9851.660	1x5.5x4.5	
15		RUB15	10753.590	1x3x3.0	
		TUNDLA BY PASS (1245- 1254)			
16		RUB1	1245/767.435	1x3x3	
17		RUB2	1245/996.491	1x5.5x3.5	
18		RUB3	1247/288.155	1x5.5x3.5	
19		RUB4	1247/666.93	1x5.5x3.5	
20		RUB5	1248/242.594	1x5.5x3.5	
21		RUB6	1248/765.838	1x5.5x3.5	
22		RUB7	1250/337.093	1x5.5x3.5	
23		RUB8	1250/927.188	1x5.5x3.5	
24		RUB9	1251/772.594	1x5.5x3.5	
25		RUB10	1252/135.036	1x5.5x3.5	
26		RUB11	1253/013.220	1x5.5x3.5	
27		RUB12	1253/800.00	1x5.5x4.5	
28		RUB13	1253/975.521	1x5.5x4.5	
29		RUB14	1255/366.8563	1x7.5x5.5	
30		RUB15	1256/293.970	1X5.5X4.5	
31		RUB16	1257/495.777	1x5.5x3.5	
		BARAHAN BY PASS (1262- 1264)			
32		RUB No. 1	908.621	1X5.5X3.5	
33		RUB No. 2	1440.195	1X5.5X3.5	
34		RUB No. 3	1947.303	1X5.5X3.5	
35		RUB No. 4	2576.454	1X3X3	
Total RUB Tundla By Pass – 35					

CHAPTER 3 : POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter reviews the existing institutional and legislative regulations pertaining to the project both at the National and state levels. The chapter also elaborates various clearances and permissions would be required for the project from statutory authorities / bodies.

3.1 INSTITUTIONAL SETTING

The project has been initiated and is being carried out by the DFCC. The primary responsibility of the project rests with the DFCCIL in providing encumbrance free ROW to the concessionaire who shall implement the project. Main government ministries / departments who are responsible to implement various environmental legislations are as under:

- Ministry of Environment and Forests, Government of India (MoEF), New Delhi formulates and regulates all country level legislations besides giving prior environmental clearances through a committee for category ‘A’ projects, wild life clearances and forest diversion clearances.
- State Level Environmental Impact Assessment Authority (SEIAA), at Lucknow, gives prior environmental clearances to category ‘B’ projects.
- Central Pollution Control Board (CPCB) monitors and implements pollution related legislations & standards.
- State Pollution Control Board monitors and implements pollution related legislations in the state besides giving NOC for establishing and operating plants under Air (Prevention and Control of Pollution) Act. 1981 and Water (Prevention and Control of Pollution) Act, 1974. SPCB also monitors implementation of other environmental laws.
- State Forests Department processes for permission for forest land diversion and felling of trees.
- In the context of the present project there is existence of Taj Trapazeum Zone (TTZ) Pollution (Prevention and Control) Authority. This authority has been constituted to control pollution and to regulate growth through TTZ Notification May 13, 1998.

3.2 THE LEGAL FRAMEWORK

The Governments of India & Uttar Pradesh and the World Bank have formulated host policy guidelines. Acts and regulations aimed at protection and enhancement of environmental resources. The following sections discuss the various legal issues associated with the project.

3.2.1 Country Level Environmental Legislations

Following provides the legislations pertaining to the project that has been framed by the Government of India.

Table 3-1: Country Level Environmental Laws & Regulations

S. No.	Law / Regulation / Guidelines	Relevance	Applicable Yes / No	Reason for application	Implementing / Responsible Agency
1	The Environmental (Protection)	Umbrella Act. Protection and improvement of the environment.	Applicable	Environmental	DFCCIL

S. No.	Law / Regulation / Guidelines	Relevance	Applicable Yes / No	Reason for application	Implementing / Responsible Agency
	Act. 1986, and the Environmental (Protection) Rules, 1987-2002 (various amendments)	Establishes the standards for emission of noise in the atmosphere.		notifications, rules and regulations are issued under the Act	
2	The EIA Notification, 14th September 2006 and amendments till date	Railway projects are exempted from this notification	Not Applicable	Railway project is not included	-
3	The Water (Prevention and Control of Pollution) Act, 1974	Central and State Pollution Control Board to establish/enforce water quality and effluent standards, monitor water quality, and issue licenses for construction/operation of certain facilities.	Applicable	Consent required for not polluting ground & surface water during construction. Contractor need to obtain consent to establish construction camps	Contractor / DFCCIL
4	The Air (Prevention and Control of Pollution) Act. 1981	Empowers SPCB to set and monitor air quality standards	Applicable	Consent required for establishing & operation of Construction camps, concrete batch Mix Plants, Hot Mix plants	Contractor / DFCCIL
5	Noise Pollution (Regulation And Control) Act, 2000	Standards for noise pollution control	Applicable	Machineries and vehicles to conform to the standards during construction & operation.	Contractor / DFCCIL
6	Forest (Conservation) Act, 1980	Conservation and definition of forest areas. Diversion of forest land follows the process as laid by the act	Applicable	Forest land diversion for the project	DFCCIL
7	Wild Life Protection Act,	Protection of wild life in sanctuaries and National	Not Applicable	No wildlife sanctuary /	-

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S. No.	Law / Regulation / Guidelines	Relevance	Applicable Yes / No	Reason for application	Implementing / Responsible Agency
	1972	Park		national park involved	
8	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act,2010 National Monuments Authority has been set up under above Act.	To protect and conserve cultural and historical remains found.	Applicable	DFC alignment is passing through regulated zone, 140 m from boundary of Archaeological structure Budhiya ki Tal	DFCCIL
9	Central Motor Vehicle Act. 1988	Empowers State Transport Authority to enforce standards for vehicular pollution. From August 1997 the "Pollution Under Control Certificate is issued to reduce vehicular emissions.	Applicable	All vehicles used for construction will need to comply with the provisions of this act.	Contractor
10	The Explosives Act (& Rules) 1884 (1983)	Sets out the regulations as to regards the use of explosives and precautionary measures while blasting & quarrying.	Applicable	If contractor decides to store hazardous materials such as HSD and Lubricants at project site.	Contractor / DFCCIL
11	Public Liability And Insurance Act,1991	Protection to the general public from accidents due to hazardous materials	Applicable	Hazardous materials shall be used for road construction	DFCCIL
12	Hazardous Wastes (Management, Handling and Transboundary) Rules, 2008	Protection to the general public against improper handling and disposal of hazardous wastes	Applicable	Hazardous wastes shall be generated due to activities like of maintenance and repair work on vehicles & construction equipment at Construction camps	Contractor / DFCCIL
13	The Batteries	To regulate the disposal and	Applicable	Disposal of	Contractor

S. No.	Law / Regulation / Guidelines	Relevance	Applicable Yes / No	Reason for application	Implementing / Responsible Agency
	(Management and Handling) Rules 2001, amendment 2011	recycling of lead acid batteries		used lead acid batteries if likely to be used in any equipment during construction and operation stage	/ DFCCIL
14	Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996	Protection against chemical accident while handling any hazardous chemicals resulting	Applicable	Handling of hazardous (flammable, toxic and explosive) chemicals during road construction	DFCCIL/ Contractor
15	Railways (Amendment) Act, 2008	Related to compensation to PAFs, PAPs, CPRs etc.	Applicable	Land acquisition is involved	DFCCIL
16	The Petroleum Rules, 2002	Applicable	Contractor may store more than the prescribed quantity at camp site	Chief Controller of Explosive	Contractor/ DFCCIL
17	Taj Trapazeum Zone (TTZ) Pollution (Prevention and Control) Authority Notification, May 13, 1998	• Monitor the scheme for the protection of Taj Mahal and Programs for improvement and Protection of Environment in TTZ • take all necessary steps to ensure compliance of specified emission standards by motor vehicles and ensuring compliance of fuel quality standards • Deal with any environmental issue which may be referred to it by the Central Government or the State Governments of Uttar Pradesh and Rajasthan relating to the Taj Trapezium	Applicable	1-Tree cutting permission in TTZ area (Tree cutting permission in RoW to be obtained from Supreme Court in TTZ portion of Project Length) 2- Prohibition of HMP and Crushers in TTZ area	DFCCIL

S. No.	Law / Regulation / Guidelines	Relevance	Applicable Yes / No	Reason for application	Implementing / Responsible Agency
		Zone.			

3.2.2 State Level Environmental Legislation

The consent under Air and Water Act are under the preview of UP Pollution Control Board. Moreover, clearances for setting up and operation of hot-mix plants, batching plants, etc., during construction under the Air and the Water Acts, establishing new quarries for sand and stone and establishment of new tube-wells / bore-holes are required from SPCB, State Department of Mining and Sate Ground Water Boards / Authorities respectively.

3.2.3 Other Legislations Applicable to Railway Construction Projects

The Concessionaire shall ensure that other legislations like Child Labour (Prohibition and Regulation) Act; 1986, Minimum Wages Act; 1948. The factories Act; 1948, The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 etc. are properly followed.

3.2.4 World Bank Operational Policies

The operational policies of the World Bank, both triggered and non triggered, the details and the applicability to the Project road are provided in the **Table- 3.2**. The World Bank environment assessment (EA) requirements are based on a three-part classification system such as Category A, Category B and Category C as defined by the World Bank OP 4.01. A Project designated as Category A, requires a full environmental assessment (EA) Category B projects require a lesser level of environmental investigation. Category C projects require no environmental analysis beyond that determination.

Table 3-2: World Bank Safeguard Policies

Sl. No.	Safeguard Policy	Subject Category	Triggered	Triggered By	Mitigation Measures	Documentation
1.	OP 4.01	Environment Assessment	Yes	Sensitive areas and impacts on environmental and social components	Mitigation measures incorporated	EIA and EMP prepared
2.	OP 4.04	Natural Habitats	Yes	Reserve forests issues	Incorporated	EIA and EMP
3.	OP 4.11	Physical Cultural Resources	Yes	Risk to cultural properties	Adequate mitigation measures if affected	EMP & RAP prepared
4.	OP 4.36	Forestry	Yes	Diversion of forest land	To be carried out as per Forest (conservation) Act, 1980	Not Applicable

3.2.5 Type of Project

For projects with potential to have significant adverse environmental impacts (Category A) an environmental impact assessment (EIA) is required. Category B projects are judged to have some adverse environmental impacts, but of lesser degree or significance than those for category A projects and require an Environmental Assessment (EA) to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the EA is regarded as the final environmental assessment report as is the case for EDFC. The project railway line passes through very small patches of degraded forests area. No presence of endangered fauna and flora along the project railway line envisaged. It may also be mentioned that there is only marginal acquisition for forest land due to the proposed section and it is at the crossing of alignment with NH-2. The Government of India has issued Environmental Impact Assessment Notification in 1994 as a part of Environmental (Protection) Act, 1986 and amendments in September 2006. Railway projects do not fall under any category requiring an environmental clearance from MoEF. Only No Objection Certificate (NOC) is required from SPCB under the Air and Water Acts for operating various equipment during construction works.

It has been established that there is a need for improving the infrastructure capacity of the transport sector to cater the projected demand for freight and good movement. By building up the rail infrastructure which uses $1/6^{th}$ the fossil fuel consumption as compared to road, overall improvement n environmental condition is envisaged. Over and above since traction in this case would be electricity based, there is a possibility that this electricity can come from the budding nuclear capacity of the nation. Thus there can not be more eco-friendly and efficient transport system to meet with the demand of India's growth economy.

Since this is a large scale project and likely to have some reversible impacts on environment during construction phases & some impact, not of much significance, during operation, this project is being considered as **'A' category project** as per the World Bank safeguard policy. This will help not only in tweaking the construction stage to be more eco-compliant but setting systems to have better and more environment friendly construction in forthcoming railway projects. DFCCIL is committed to establish most efficient and eco-friendly system.

3.2.6 Clearance Requirements for the Project

The summary table showing time requirements for agency responsible for obtaining clearance, and a stage at which clearance will be required is given below:

Table 3-3: Summary of Clearances & NOCs

Sl. No	Type of clearance	Statutory Authority	Applicability	Project stage	Time required	Responsibility
1	Prior Environmental Clearance	SEIAA/ EIAA	Not applicable	Pre - construction	-	-
2	NOC for Construction Activities near-Budhiya ka Tal an ASI protected structure	National Monuments Authority	Applicable	Pre - construction	Applied, follow up maintain-ned with NMA	DFCC

Sl. No	Type of clearance	Statutory Authority	Applicability	Project stage	Time required	Responsibility
3	Clearance for working / diversion of sanctuary land	PCCF & Chief Wild Life Warden	Not applicable	Pre - construction	-	-
4	Forest Clearance	State Forest dept. and MoEF regional office	Diversion of Forest land	Pre - construction	6-8 months	DFCC
5	Tree felling permission in Private Land	Forest department	Felling of trees	Pre - construction	2-3 months	DFCC
6	NOC And Consents Under Air , Water Acts & Noise Pollution Rules	State Pollution Control Board	to establish construction equipment / plants	Construction (Prior to work initiation)	2-3 months	Concessionaire / Contractor
7	NOC And Consents Under Air , Water & Noise Pollution Rules to establish Construction camp	State Pollution Control Board	For operating Hot mix plants, Crushers and batching plants	Construction (Prior to work initiation)	1-2 months	Concessionaire / Contractor
8	Permission to store Hazardous Materials specially fuel oil and Lubricants at Construction camps	State Pollution Control Board and Controller of Explosives	Storage and Transportation of hazardous materials and explosives	Construction (Prior to work initiation)	2-3 months	Concessionaire / Contractor
9	Explosive license	Chief Controller of Explosives	Storage of Explosive materials	Construction (Prior to work initiation)	2-3 months	Concessionaire / Contractor
10	PUC certificate for use of vehicles for construction	Department of Transport	For all construction related commercial vehicles	Construction (Prior to work initiation)	1-2 months	Concessionaire / Contractor
11	Quarry lease deeds and license	Dept. of Geology and Mines, GoUP	Quarrying and borrowing operations	Construction (Prior to work initiation)	2-3 months	Concessionaire / Contractor

Sl. No	Type of clearance	Statutory Authority	Applicability	Project stage	Time required	Responsibility
12	NOC for water extraction for construction and allied works	Ground Water Authority	Ground water extraction	Construction (Prior to work initiation)	2-3 months	Concessio-naire / Contractor
13	Permission for cutting of trees from the RoW for the project portion (km 1221 to 1266) falling in TTZ area	Supreme Court of India and TTZ Authority	Tree cutting	Construction (Prior to work initiation)	3-4 months	DFFCIL

3.3 CONCLUSION

Review of environmental regulations clearly indicates that the subject DFC project does not require any environmental clearance. However, clearance for the diversion of forest land and permission for cutting the trees within the proposed right of way of the alignment will be required from the Forest Department. Clearance is required from ASI structure 'Budhiya – ka- Tal'. In addition to the above, the concessionaire would require the following NOCs & licenses from the authorities during construction:

- NOC And Consents Under Air , Water, EP Acts & Noise rules of SPCB for establishing and operating Construction Camps from UP Pollution Control Board
- PUC certificate for use of vehicles for construction from Department of Transport
- Quarry lease deeds and license and Explosive license from Dept. of Geology and Mines & Chief controller of explosives
- NOC for water extraction for construction and allied works from Ground Water Authority

Apart from the above clearances, the concessionaire also has to comply with the following:

- Clearance of Engineer for location and layout of Worker's Camp, Equipment yard and Storage yard.
- Clearance of Engineer for Traffic Management Plan for each Section of the route after it has been handed over for construction.
- An Emergency Action Plan should be prepared by the contractor and approved by the Engineer for accidents responding to involving fuel & lubricants before the construction starts. Submit a Quarry Management Plan to the Engineer along with the Quarry lease deeds

CHAPTER 4 : ENVIRONMENTAL PROFILE AND STRIP MAPS

4.1 INTRODUCTION

This section presents environmental profile of the project influence area and its salient features. The objective is to ascertain the environmental sensitivity of the project, and identify the likely impact zones of the project.

Considering the nature of the project alignment, an area of about 5 km on either side of the corridor has been considered for studying the profile. The environmental features such as reserved forest, sanctuaries / national parks, rivers, lakes and ponds, religious structures, archaeological monuments, natural habitats, schools, irrigation canals along with other sensitive receptors were mapped in the profile through detailed field inventories and presented on the topo sheets (on a scale of 1:50,000) of Survey of India.

Addition to the above, the detailed walk through surveys were carried out to map specific environmental features within the Right of Way (ROW) of the proposed alignment. These features were presented on strip map/ strip plan. Following sections present details of these surveys.

4.2 METHODOLOGY

The methodology followed in the preparation of the environmental profile of the project influence area and strip maps comprised the following:-

- **Collection of Toposheets (scale 1:50000 & 1:250000 of Survey of India** from Survey of India and demarcation of the proposed alignment on the toposheets.
- **Field reconnaissance of the proposed alignment through detailed walk through surveys**
- Mapping of **sensitive receptors** such as schools, religious structures, hospitals etc.
- Interactions with **local villagers and resource persons to understand the importance of various** sensitive features and other local resources (if any).

The data collected from the above tasks was mapped on the detailed Kilometer wise strip maps and topo sheets on a scale of 1:50,000.

4.3 ENVIRONMENTAL PROFILE OF THE PROJECT INFLUENCE AREA

The environmental profile of the influence area (within 5 km on either side of the proposed alignment) presented in **Annexure-4.1**, indicates that

- the alignment generally runs through plain areas of indo-gangetic plains and is devoid of sensitive environmental features
- at many of the locations, lower *Ganga* canal and its distributaries cross the alignment
- The alignment does not cross any perennial river.

In addition to the above, no sensitive features like wild life sanctuary/ national park, wetland, etc. were observed within the project influence area.

4.4 ENVIRONMENTAL FEATURES WITHIN PROJECT RoW

The environmental features within the right of way (RoW) of the project were recorded through the kilometre wise strip maps, as presented in **Annexure 4.1,** indicate that the proposed alignment,

- does not pass through any wild life sanctuary or sensitive natural resource like National Park
- not affecting wetland
- does not require significant acquisition of reserve / protected forest areas However, as presented in **Table- 4.1**, small portion of forest land in totaling to about 4.1920 Ha. would need to be acquired at location of the proposed alignment crossing NH-2. The plantation along NH-2 has been declared as Protected Forest.

Table 4-1: Total forest land acquisition

Name of District	Name of Tehsils	District wise Acquired Land Ha.)
Ferozabad	Ferozabad	4.1920
Agra	Tundla	nil
Total		**4.1920**

- At change Chainage, approx. 1251 km, along Tundla detour, the project alignment runs close to an archeological monument, ‘Budhiya ki Tal’ . This would require ‘No Objection Certificate’ from Archaeological Survey of India, for which application has already been submitted ASI.
- Considering dense settlements and developments along the existing railway line near the towns of Barhan, Tundla and Ferozabad, the project proposes 2 detours (One for Ferozabad and Tundla and one for Barhan).
- The project alignment runs through one seasonal river and number of small water bodies.
- The alignment also crosses the lower Ganga distributary at 1255 km. The impacts on the canal however are mitigated in the design by providing adequate cross drainage works at al the locations.
- Number of religious structures (2), schools / educational institutions (3), and ASI structure (01) i.e. total 6 SRs are located along the proposed alignment. The details of these structures are presented in **Table 4.2.**
- The proposed is expected to involve the cutting of4352 trees, out of which approx. 800 trees are in Railway properties. . Most of these tree species comprise common species such as neem, papal, mango, eucalyptus, etc., and doesn’t involve cutting of any sensitive / endangered species.

Table 4-2: Details Sensitive Receptors

S.No.	Type of Receptors	Name	Location/ Chainage	Parallel / detour	Distance from the centerline of the DFCC alignment (Meter)	Side (w.r.t Kanpur to Khuja)
1.	Religious	Old Shiva Temple	Bhandari/1205	Parallel	15	L
2	Educational	School at Alampur Jarkhi	Alampur Jarkhi/1236	Parallel	30	R
3	Educational	School	Ulau Kheda /1240	Parallel	2	L

S.No.	Type of Receptors	Name	Location/ Chainage	Parallel / detour	Distance from the centerline of the DFCC alignment (Meter)	Side (w.r.t Kanpur to Khuja)
4	Educational	School	Mittawali /1254	Detour	150	L
5	ASI structure	Budhiya - ki- Tal	NH-2/ 1257	Detour	147	R
6	Religious	Mosque/ Darga	NH-2/ 1251km	Detour	78	R

Relocation of SR in case of school at sr. no. 3 and noise barrier in case of old Shiva temple & school at sr. no. 1 & 2 above are recommended. Mosque/ Darga at sl. No.6 is not ASI structure.

4.5 VIBRATION

Vibration in railways and its impact on the sensitive receptors is an important issue. Since no national standard exists, Japanese standard has been considered for vibration measurement and deciding mitigation measure.

CHAPTER 5 : BASELINE ENVIRONMENTAL PROFILE

5.1 INTRODUCTION

This chapter assesses the nature, type and dimensions of the study area and describes the relevant physical and biological environmental components along the proposed railway line. The data on various environmental components related to the project area have been collected from various secondary sources and primary environmental surveys on ambient air quality, noise and vibration levels, water and soil quality, aquatic and terrestrial ecology. A deailed environmental profile prepared based on the above information is presented in the subsequent sections of this chapter.

5.2 BASELINE ENVIRONMENTAL SURVEY

As presented in **Table-5.1** below, detailed base line environemental surveys were carried out for the key components of environment (ambient air, water quality, soil, noise, vibration, terrestrial and aquatic ecological parameters) during early March 2011. Data on meteorology has been collected from the nearest IMD stations at Aligarh, and Agra. Environmental monitoring was carried out along Kaurara-Chamraula section of EDFC covering detour and parallel sections.

Table 5-1: Details of Baseline Data Collection Schedule

Field	Parameters	No. of Sampling Locations	Sampling Duration	Frequency	Criteria for selection of no. of samples and locations
Ambient Air Quality	SO_2 NOx PM10 PM2.5 CO	5	24 hrs continuous for SO_2, NO_x, SPM, RPM and One Hour for CO	Once a Day in Early March	Covering locations in urban, Rural and truly representative of the area. Locations have been selected at Level Crossing, sensitive receptors such as Schools, Temples, etc. These cover both parallel and detour sections.
Meteorology	Wind Speed Wind Direction Ambient Temperature Rainfall Humidity Atmospheric Pressure	02	December 2008 to February 2009 and March 2009 to May 2009	Long term data at 8:30 and 17:30 IST	Nearest IMD stations viz. Aligarh, and Agra to represent the meteorological condition of the study area
Water Quality (Ground Water Sample)	Physical Parameters pH, Colour and Odour, Temperature, Turbidity, TSS, TDS, Total Hardness,Total Alkalinity, Total Iron, Chlorides, Sulphates, Nitrates as NO3, Nitrite as NO2, Fluorides, Phosphates as PO4, Magnisium as Mg, Heavy Metals (Pb, Zinc, Chromuim, arsenic), Coliform, BOD	04 Ground water Samples (No perennial surface water source in project stretch)	Grab Sample	Early March 2011 , once at each location	As per IS: 10500 Standards covering ground water
Noise	L_{eq}	05	24 hrs continuous	Early March 2011, once at each location	Noise monitoring was carried out covering all types of land uses(Senisitive, Rural , residential and commercial). The monitoring locations have been done in parallel and detour sections.

Field	Parameters	No. of Sampling Locations	Sampling Duration	Frequency	Criteria for selection of no. of samples and locations
Vibration	L_{max}	05	24 hrs continuous / during passing of various trains	Early march 2011	The sensitive and residential locations have been covered in parallel as well as detour locations
Soil	pH, Electrical Conductivity, Texture Class, Sand, Silt and Clay Percentages, Bulk density, water Holding capacity, Nitrogen, phosphorus and potassium Percentages, Organic,matter, Lead as Pb, Arsenic, Iron, Sulphates(Meq/100 gm), Chlorides (MEQ/100 gm)), Calcium (meq/100 gm), Copper (mg/kg), Zinc (mg/kg), Manganese (mg/kg), Moisture (%), Porosity (%), Na2CO3 /Nacl infiltration capacity(inch/hr), Alkalinity (ppm), Acidity (ppm)	04	Grab Sample	Eraly March 2011	As per IS Standards to represent the soil quality in terms of fertility in the study area. Samples drawn from Agriculture fields
Ecology	Aquatic	02	Random	May 2009*	Terrestrial by quadrate and linetransact, aquatic by plankton and phyto and zoo benthos to assess the aquatic and terrestrial ecology, secondary data from Forest Deptt.
	Terrestrial	02	Random	May 2009*	

* Conducted during EA of Bhaupur- Khurja Section

5.3 METEOROLOGY

The project area presents tropical climatic characteristics.There is no significant variation in climatic characteristics.The project stretch from Kaurara to Chamraula passess through two districts of Uttar Pradesh i.e. Agra and Ferozabad.To understand the meterological features of the project area, data has been collected from the two nearest meteorological stations (monitored by Indian Meterological Department), at Aligarh and Agra in 2009 during EA of Bhaupur- Khurja Section. **Table-5.2** sumarizes meteorological characteristics of the project area.

Table 5-2: Meteorological Data During December 2008 to May 2009

Month	Ambient Temperature(^{0}C)		Atmospheric Pressure, hPa		Relative Humidity(%)		Average Wind Speed, km/hr.	Pre-dominant Wind Direction	Rainfall, mm
IMD Station: Aligarh (height above msl : 187 m)									
	Daily Max.	Daily Min.	At 8:30 hrs.	At 17.30 hrs.	At 8:30 hrs.	At 17.30 hrs.			
Dec. 2008	23.0	8.7	997.2	993.7	76	55	4.8	W & NW	5.2
Jan. 2009	20.2	7.1	996.4	993.2	80	55	5.4	W	12.6
Feb. 2009	25.1	9.8	994.6	992.9	72	45	6.5	W	11.2
Mar. 2009	31.4	15.3	992.8	988.7	60	34	7.1	W & NW	7.8
Apr. 2009	38.6	21.5	987.7	983.2	38	25	7.6	W & NW	6.6
May 2009	41.9	26.0	984.1	979.6	40	23	8.2	W & NW	14.8
IMD Station: Agra (height above msl : 169 m)									
Dec. 2008	24.5	8.6	999.8	994.6	72	55	2.1	NW	3.4
Jan. 2009	22.3	7.2	998.5	994.1	75	50	28	NW & W	16.2
Feb. 2009	24.2	10.6	994.3	992.6	65	38	3.7	NW	11.0
Mar. 2009	30.2	16.5	993.8	989.6	55	32	3.9	NW & SW	8.6
Apr. 2009	40.1	23.0	989.9	984.1	39	28	4.1	NW & SW	2.0
May 2009	42.3	27.4	982.6	981.4	38	25	4.8	NW & SW	13.8

Source: IMD, Aligarh, and Agra

5.3.1 Temperature

The meteorological data observed during the winter season shows that daily maximum temperature varies from 20.2 to 25.1 ^{0}C and the temperature characteristics in this season are relatively similar. Both Maximum and minimum Temeratures have been recorded at Aligarh. The daily minimum temperature has been recorded as 7.1 ^{0}C. Lowest daily minimum temparature has been observed in January 2009 in Aligarh. During summer season, average daily maximum temperature is around 42 ^{0}C during May 2009 at all the stations.

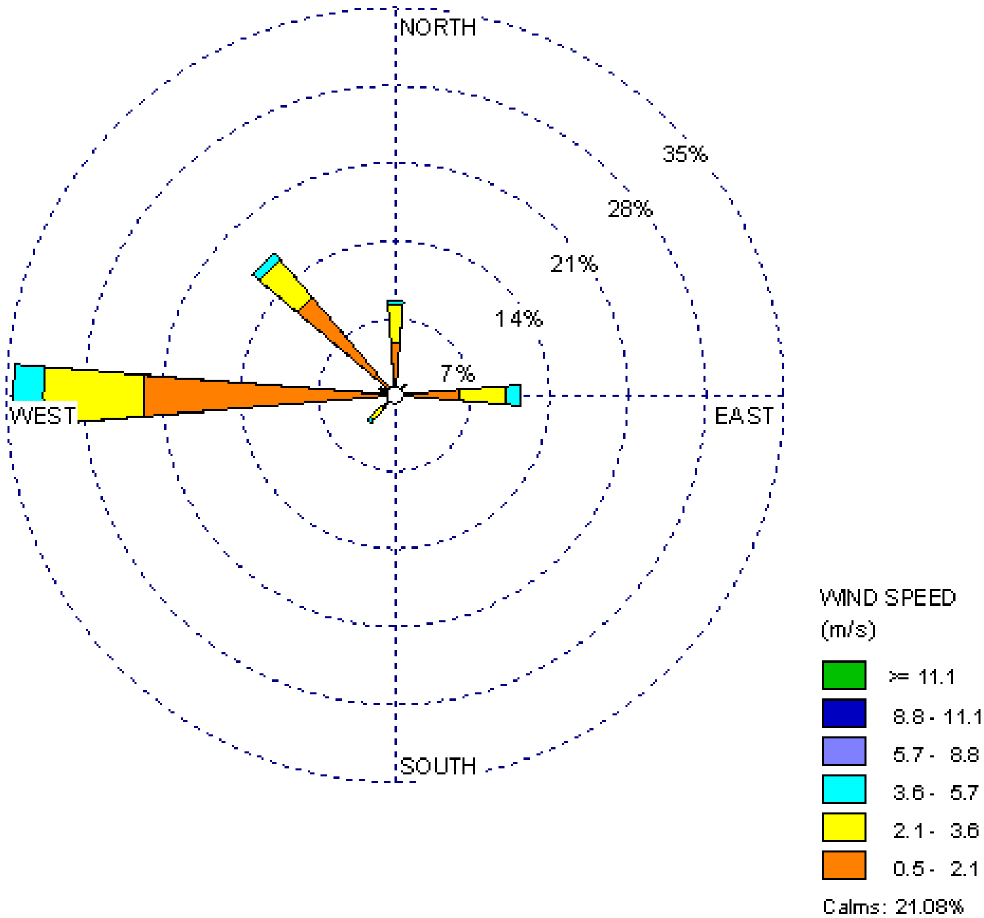
5.3.2 Relative Humidity

The relative humidity of the project area varies from 65% to 80% at 8:30 hrs during winter season and 38% to 55% at 17:30 hrs. The relative humidity decreases during summer and lowest (23%) was recorded at Aligarh in May 2009.

5.3.3 Wind Speed and Direction

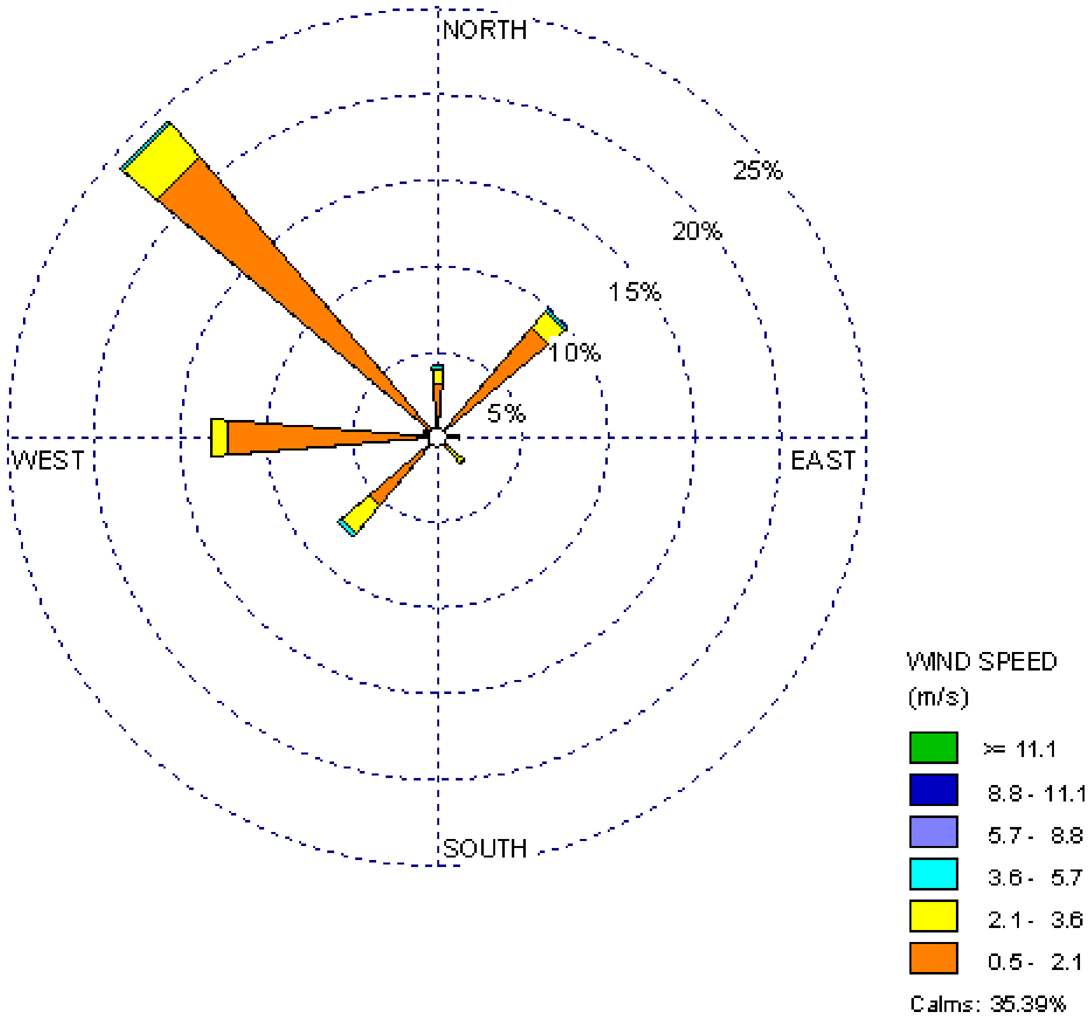
Analysis of wind records shows that the winds are generally light to moderate in this area. The windrose diagrams for the period December 2008 to February 2009 (Winter season) and March 2009 to May 2009 (Pre Mansoon season) at Aligarh, and Agra are presented in **Figures 5.1 to 5.4**. The pre-dominant wind directions are West in Aligarh and North-West in Agra during winter season. During summer season, the pre-dominant directions are West and North-West in Aligarh and North-West and South-West in Agra. Average wind speed increases during summer season as compare to winter. The maximum average wind speed was observed in May 2009 at all the stations, while, December was comparatively calm. The average wind speeds are higher at Aligarh.

Figure 5-1: Aligarh (December 2008 to February 2009)



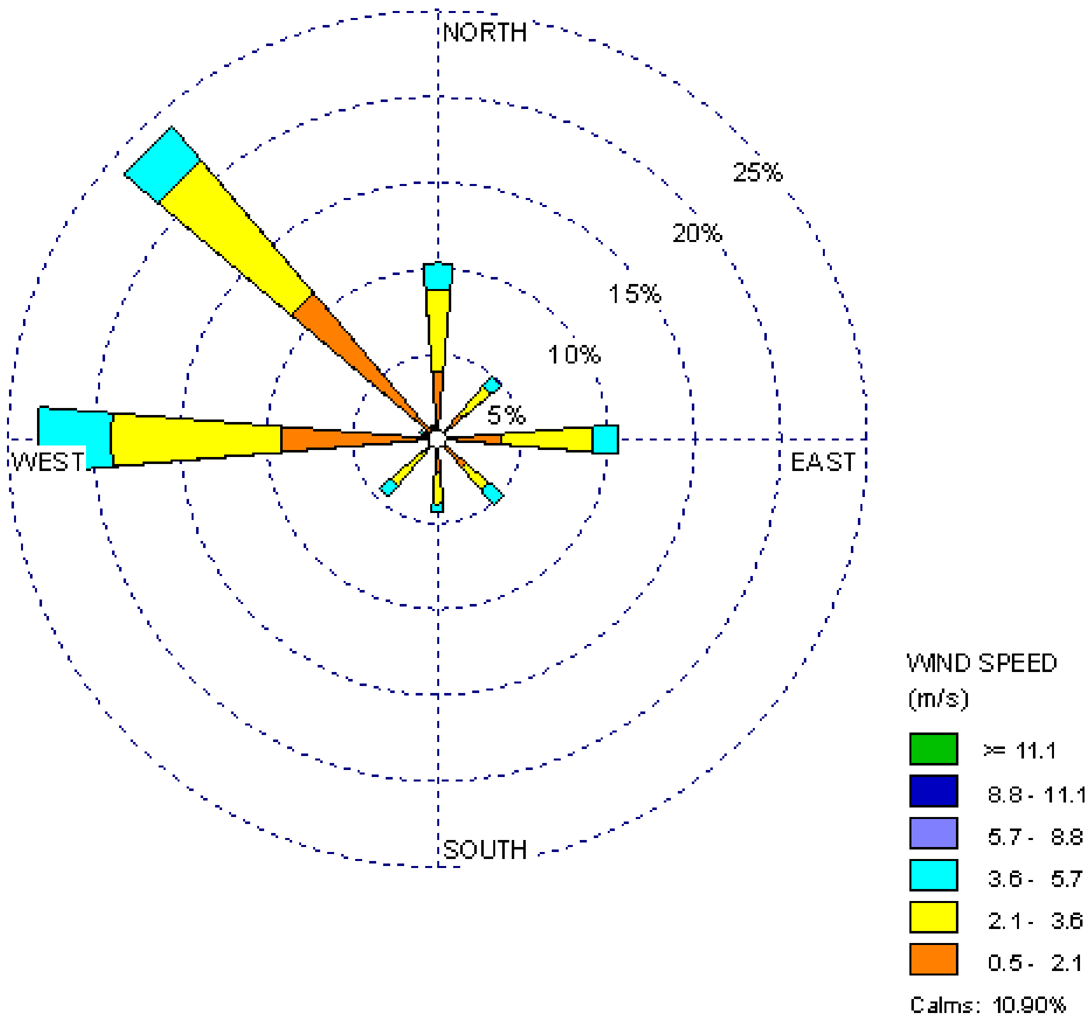
(Note: data collected during Bhaupur-Khurja EA study)

Figure 5-2: Agra (December 2008 to February 2009



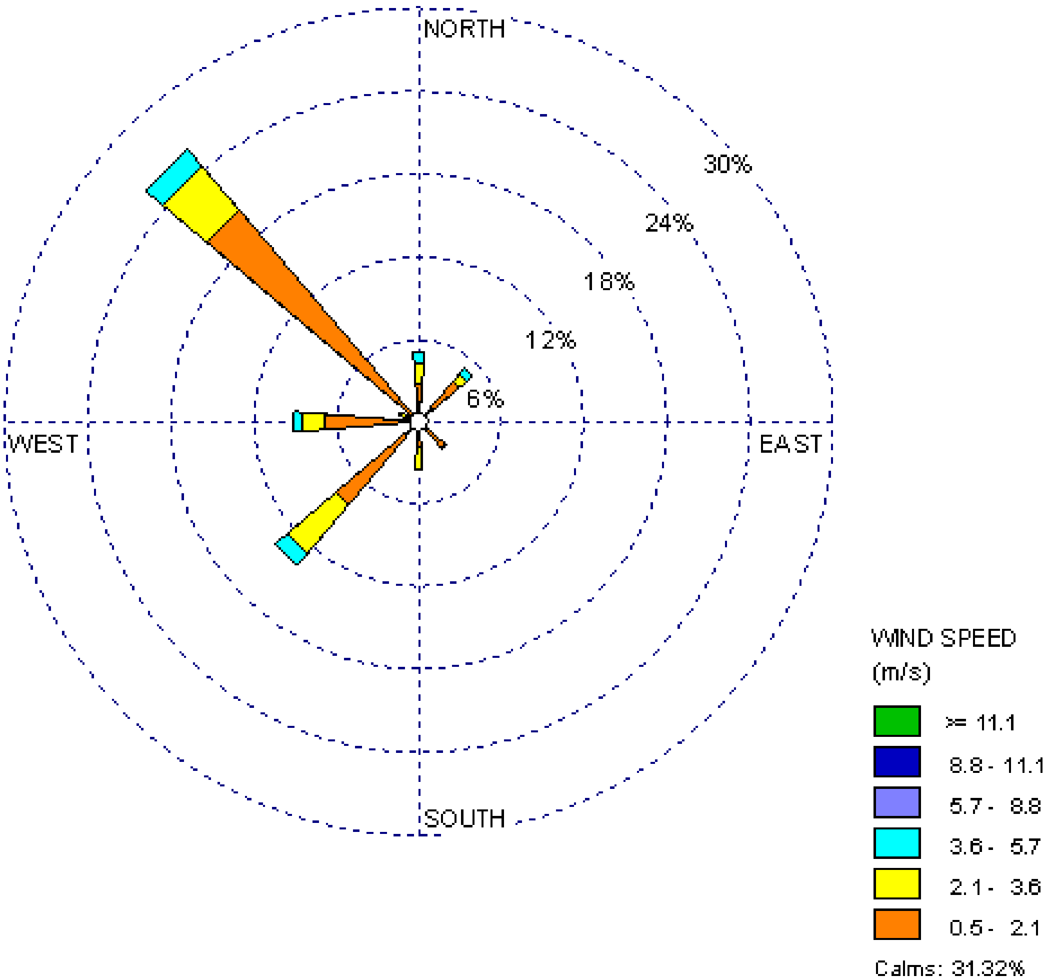
(Note: data collected during Bhaupur-Khurja EA study)

Figure 5-3: Aligarh (March 2009 to May 2009)



(Note: data collected during Bhaupur-Khurja EA study)

Figure 5-4: Agra (March 2009 to May 2009)



(Note: data collected during Bhaupur-Khurja EA study

5.3.4 Atmospheric Pressure

The minimum and maximum monthly atmospheric pressure varies from 982.6 to 999.8 hPA at 08:30hrs and from 979.6 to 994.6 hPA at 17.30hrs.

5.3.5 Rainfall

The rainfall is generally low during the non-monsoon season. The average rainfall recorded is highest (16.2 mm, Agra) in January and lowest in April 2009 (2 mm, Agra). The month-wise total rainfall is shown in **Table -5.1**.

5.4 AMBIENT AIR QUALITY

Sulphur dioxide (SO_2), Oxides of Nitrogen (NO_x), CO, PM_{10} and $PM_{2.5}$ are the five major air pollutants, which cause concern to environment and other living beings. In order to understand the base line trends of these pollutants in the project area, ambient air monitoring was carried out at 24 critical locations

During early March,2011 environmental monitoring at 4 locations in the stretch has been carried out. The locations were selected based on impacted residential area, sensitive receptors both in parallel alignments and detour locations. Monitoring was carried out continuously for 24 hours at each location.

Air Quality monitoring at Uaukhera

5.4.1 Methodology (Air Monitoring)

The air pollution analysis techniques include the

evaluation of the following:

1. Particulate Matter ($PM_{2.5}$ and PM_{10})
2. Sulphur dioxide (SO_2)
3. Nitrogen oxides (NO_x)
4. Carbon Monoxide (CO)

As regard the techniques for collection of sample of particulate matter, the “Respirable Dust Sampler Envirotech Model APM 460 BL” was used for air monitoring.

The dust particulate matter were collected on filter paper (size GF/A 20.3 x 25.4 cm) and dust cup and the gaseous pollutants were collected simultaneously by a known volume of air through a number of bubblers of different flow rate through appropriate solution for absorbing different gases. The gaseous air pollutant samples were collected in glass impinges filled with adsorbing solvents by passing of ambient air and analyzed according to standard method.

Calculation

For particulate matter

PM_{10} ($\mu g/m^3$) = RSPM + (final weight of cyclonic cup – initial weight of cyclonic cup) / volume of air.

$PM_{2.5}$= (Weight of Final Filter Paper-Weight of Initial Filter Paper/Volume of Air

For gaseous pollutants

SO_2 ($\mu g/m^3$) = $(A - A_0) \times 1000 \times B \times D / V$

NO_x ($\mu g/m^3$) = $(A - A_0) \times 1000 \times B \times D / 0.82V$

Where, A = Sample Absorbance,

A_0 = Reagent blank Absorbance, and

B = Calibration factor (µg/absorbance)

D = Volume of absorbance solution in impinger during monitoring / volume of absorbing solution taken for analysis.

V = Volume of Air Sample in liters.

CO was monitored by using sensor based Non Dispersive Infrared equipment which gives direct result.

Table 5-3: Ambient Air Quality of the Study Area (March 2011)

S.No	Location	Date	Category	Parameters					Remarks
				PM2.5 $\mu g/m^3$	PM10 $\mu g/m^3$	SO_2, $\mu g/m^3$	NOx, $\mu g/m^3$	CO, $\mu g/m^3$	
1.	Bhandari (km 1223)	12-03-2011	Residential & Rural area	21	69	16.2	19.3	BDL	Within the limit of NAAQS
2.	Vijaipur Nagla Bhavsingh (km 1223)	11-03-2011	Residential & Semi urban area	18	78	19.2	22.5	BDL	Within the limit of NAAQS
3.	Alampur Jarkhi (km1236)	10-03-2011	Residential & Rural area	19	65	18.1	21.4	BDL	Within the limit of NAAQS
4	Mitawali	09-03-2011	Rural and Residential area	23	72	18.6	21.8	BDL	Within the limits of NAAQS

Source: Field Monitoring

Carbon monoxide has been less than detectible limit at all sites (Less than 1 ppm)

A review of ambient air quality data presented in **Table-5.3** above shows that air quality of the project area is generally good and all parameters of air quality are well within the limits. Overall, the result indicates that PM10 levels vary from 43-70 µg/m^3, whereas $PM_{2.5}$ varies from 19-28 µg/m^3. SO_2, NOx and CO levels are also, well within the NAAQ standards at all the monitoring locations.

5.5 NOISE LEVELS

Noise attributed to a line project depends on factors such as traffic intensity, the type and condition of the traffic. Excessive high noise levels are a concern for sensitive receptors, i.e., hospitals, educational institutions, etc. The baseline information about the existing noise level along the railway track has been collected by monitoring the noise levels. The noise monitoring was carried out in each parallel location and near the receptors in detour location by using IMV JAPAN Models 6226 and 6224 complying with Japanese Standard JIS C1509 which consists of data logger facility.

The Central Pollution Control Board has specified ambient noise levels for different land uses for day and night times. Importance was given to the timing of exposure and areas designated as sensitive. **Table 5.4** presents the noise standards specified by the Central Pollution Control Board.

Table 5-4: National Standards for Ambient Noise

Area Code	Category	Limits in Decibels (dB A)	
		Day Time	Night Time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zones	50	40

Note: (1) Daytime: 6 AM to 10 P.M., Night-time 10 PM to 6 AM;

(2) Silence zone is an area up to 100 m around premises as hospitals, educational institutions and courts.

Locations for noise monitoring along the project route were identified based on the criteria same as those used for air monitoring but the relative importance of each criterion carries a weight age in arriving at the final set of locations. The noise monitoring was carried out at 4 locations covering semi urban , residential and silence zones in May 2009 for continuously 24 hrs covering day and night as per relevant Noise standards of CPCB.

5.5.1 Methodology for Noise Monitoring

The intensity of sound energy in the environment is measured in a logarithmic scale and is expressed in a decibel (dB) scale. Ordinary

Sound level meter measures the sound energy that reaches the microphone by converting it into electrical energy and then measures the magnitude in dB. In a sophisticated type of sound level meter, an additional circuit is provided ,which modifies the received signal in such away that it replicates the sound signal as received by the human ear and the magnitude of sound level in this scale is denoted as dB (A) .The sound levels are expressed in dB (A) scale for the purpose of comparison of noise levels, which is accepted by Central pollution Control Board (CPCB) as per Environment (Protection) Act, 1986 (29 of 1986) read with rule 5 of the Environment (Protection) Rules, 1986, the Central Government.

The general noise monitoring was carried out within 30 m from railway track in each parallel location and near the receptors in detour location. In this mode the noise was recorded continuously for 24 Hrs. Simultaneously categories of all the trains passing through the track were recorded. The Leq during day and night (6 AM to 10 PM reckoned as Day and 10PM to 6 AM as Night) were calculated as per the National Standards for Ambient Noise levels. The measured results of this general monitoring are provided in **Table-5.5 below:**

Table 5-5: Noise Monitoring Results

S. No.	Locations	Category	Parameters				Noise Level at 30 mtr		
			Distance	Leq dB(A) Day	Leq dB(A) Night	dB(A) (Max.)	One train is passing, max value in dB(A)	Two trains are passing, max value in dB(A)	Date of Measurements
1.	Bhandari(km 1205)	Parallel Section - Temple within 20 m	15 mt	68.4	49.6	102.7	90.3	96.8	11-3-2011
2.	Vijaipur Nagala Bhav Singh (km 1223) –	Start of Ferozabad Detour	12.5 mt	62.6	52.4	109.8	86.2	96.2	12-3-2011
3.	Alampur Jarkhi (km 1236)	Residential Area (along existing track) - Parallel Section	36 mt	68.2	49.8	89.2	102.4*	98.2	10-3-2011
4.	Ulau Kheda (km 1240)	Silence Zone (School) – Parallel Section	12.5 mt	68.4	56.1	96.6	92.6	94.0	9-3-2011
5.	Mittawali Railway station (km1254)	End of Tundla Detour- Rural Area	12.5 mt	76.8	56.8	110.2	92.8	96.0	8-3-2011

*During Whistling of Train

5.5.2 Result and Discussions based on general noise monitoring

Review of noise levels presented in table 5.6 indicates that the noise levels exceed permissible standards at all the locations along the existing railway track (where DFC is proposing track parallel to the existing in parallel section). The noise levels go instantly high up to 98.2 dB(A) at 30 mteres when two trains are passing and 110.2 dB(A) at 12.5 meters when single train is passing.

Further to understand the noise attenuation patterns caused by different categories of trains with distances from the track, noise levels were also monitored at 12.5, 25 & 50 Meter from the center of the track at Vijaipur Nagl Bhavsingh and Ulaou Khera Stations. These results are given in **Table-5.6** below:

Table 5-6: Noise levels for different train movements

Category of Trains	Running speed (km/hr)	Railway Noise Level dB (A)					
		Leq			Lmax		
		12.5	25.0	50.0	12.5	25.0	50.0
FE1A Open Wagon	98	99	81.2	76.3	105.9	93.8	86.2
FE2A Closed Wagon	94.1	104.1	90.2	83.2	109.8	95.8	87
PEA (Super Fast)	112	93.4	78.2	70.3	96.6	87.6	79.7
PEA (Express)	104.8	89.1	84.3	70.2	92.7	89.6	78.4

As presented in table 5.6, above, the noise levles between passenger trains and freight trains are significantly different. The range of difference is around 15 dbs at 12.5 mts and reduces to around 12 dB(A) at 25 mtrs.

However, the noise attenuation was found to be ranging from about 10 dB(A) to 15 dB (A) from 12.5 to 25 m and about 10 dB(A) to 12 dB(A) from 25 to 50 m, from the centre of the railway track. Similar to noise levels, the attenuation levels both for passenger and freight trains were noted to be same. This indicates no significant impact on noise levels due to the category of train type.

5.6 VIBRATION

5.6.1 Background Information

Vibration assessments are a key element of the environmental impact assessment process for mass transit projects. Vibration may lead to damage of cultural assets and other establishments near railway tracks and also may have impact on the human health.

Experience has shown that vibration is among the major concerns with regard to the effects of a railway project on the surrounding community.

Vibration is often associated with noise but is a problem in its own right. Notwithstanding health effects to the passengers it impacts the inmates of the buildings close to the track in the form of scare, sleeplessness and postural discomfiture. It also affects the buildings in the form of short and long term impacts.

Vibration can also be affecting the train drivers and operators including drivers of specialist vehicle used during the construction phase. Appropriate mitigation measures will vary but may include design considerations for vehicles and equipment, control of exposure times, proper maintenance, protective clothing and alterations to working practices. A Detailed elaboration has been provided regarding the mitigation measures available.

Measurement

As discussed in the earlier sections, the proposed track runs in two different alignments.

I. One parallel to the existing track, which could involve,

- Higher amplitude vibrations impacting the buildings now coming closer to railway vibrations (within critical distance) on the side of new track
- Higher amplitude vibrations impacting all close buildings and human inmates due to instances of multiple trains running at same instance of time
- Higher frequency of such multiple train running instances resulting to higher time of exposure
- Increased impact due to increased speeds of Freight Trains.
- Increased impact due to higher No of freight trains running closer

II. Detours from the existing track passing through areas of different land use:

On detours there are no existing tracks at the moment. This will necessitate *abinitio* laying of the track which will involve movement of heavy and fast moving freight trains for transportation of material and goods. In addition there will be impact due to construction activity itself.

Finally there will be impacts due to DFC operations which will be in the form of

- Creation of a new Vibration environment along the detour effecting the building and inmates present within the critical distance of impact of vibrations
- Impacts due to trains running, at higher speeds / axle loads.

As part of the base line analysis of vibration levels, data was collected through measurement of vibration levels at several locations along parallel tracks as well as detour locations, covering all the possible scenarios mentioned above.

The data collected along with the patterns of Vibration propagation with distance, speed, axle load for single, dual and multiple train operations have been estimated. The same data has been used to predict impacts on sensitive locations along the entire corridor. The highest vibration values based on the 100km/hr speed of freight trains (containers or tankers) have been used for the prediction of impacts.

5.6.2 Standards on Vibration Measurements for Railway Projects

There are no specific standards for vibaration levels in India. However there are number of international standards (as indicated below) for evaluating the potential impacgts for building damage and also the human response.

ISO Standards on vibration (ISO 2631/2- 1989, ISO 8041-1990, and ISO 4866-1990)

JIS Z-8735 (Method of measurement for vibration levels) and JIS C-1510 (Standard for Vibration level meter).

BS 6472

DIN 4150

While each of the above standards have specific approach to the measurement and assessment of vibration impacts, considering the fact that the feasibility study for the project was carried out based on Japanese standards (JIS 8735 and JIS 1510) and DFC is also implementing same standards in the western corrirodor, the same standards have also been in the current study. The important features of GIS 8735 are:-

- depend on one single parameter ie Lpeak as against multiple parameters such as (VDV and PPV)
- does not require further calculations after the collection of data,
- the standards suggesets single parameter to assess the vibration impacts on buildings and the residents with one common parameter.

Considering the above, the above JIS Z 8735 have been following for measuring and prediction of vibration impacts of the project .

5.6.3 Methodology

The ambient vibration levels and railway vibration levels were measured as part of the base line surveys.

While railway vibrations were measured for various train types and speeds at varying distances, the ambient vibrations were measured on Sensitive Receptors

5.6.4 Measurement Instrument

As according to JIS C 1510, vibration meter 1220E manufactured by IMV Japan, was chosen for measuring vibration.The instrument provides vibration measurements in all the three axes and also measures velocity or acceleration parameters. The instrument, also captures and stores values at predefined intervals and calculates maximum and minimum or percentile values.

Specifications of the selected instrument are below:

Features

- Conforms to JIS C1510-1995.
- Measures vibration pollution from factory, construction site and traffic
- Calculates Vibration level Lv, Vibration acceleration level Lva, Max. value Lmax, Min value Lmin, Time rate vibration level (Lx : 5-value), Power averaged level (Leq) in 3-direction and displays with selection

Model	VM-1220E
Frequency Range	1 - 80 Hz
Measuring Range	30 - 120 dB
Level Range	20 dB step, 2-range 30 -90dB, 50 -110dB
Linearity	75dB
Measured Item	Vibration level Lv, Vibration acceleration level Lva, Max. value Lmax, Min value Lmin, Time rate vibration level (Lx: 5 value), Power averaged level (Leq)

Measuring Time	1s,3s,5s,10s,1min,5min,10min,15min,30min,1h,8h,24h Manual (Max 199h59min59s)
Ambient Condition	Temperature Range: 10 -50^{0}C Humidity: 30 - 90% (not dew condensation)

5.6.5 Vibration Levels

Based on the approach formulated above, the vibration levels were measures at the following locations presented in Tables 5.8 to 5.15 along the project corridor.

Table 5-7: Ambient Railway Vibration Along Kaurara- Chamraula Section

S. No.	Location
1.	Bhandari (km 1205)
2.	Vijaipur Nagla Bhav Singh (km 1223)
3.	Alampur Jarkhi (km 1236)
4.	Ulau Kheda (km 1240)
5.	Mittawali Station (km 1254)

Table 5-8: Vibrations Measured at Bhandari as per Japanese Standards

S.No.	Name of Location	Distance	LMAX
1	Bhandari (Near Shiv Mandir)	15 mt	72.9

Table 5-9: Vibrations Measured at Vijaipur Nagla Bhav Singh (17.5m., 30.0m. & 55m.) as per Japanese Standards

Speed Km/Hr	Vibration in dB at 17.5m.	Vibration in dB at 30m.	Vibration in dB at 55m.
Passenger Down Trains			
99.3	64.3	57.2	49.9
102	62.8	55.3	47.6
96.6	68.1	58.3	50.1
87.6	65.7	57.9	46.3
104.5	69.9	58.8	50.6

Source: Consultants' Field Monitoring

Speed Km/Hr	Vibration in dB at 17.5m.	Vibration in dB at 30m.	Vibration in dB at 55m.
Passenger Up Trains			
74.5	62.4	54.3	43.6
72.8	61.5	52.6	45.8
56.7	59.2	50.2	41.6
69	60.3	49.6	41.2
69	60.1	49.5	40.6
93.8	68.5	57.9	47.8
70.9	61.8	51.6	40.9
76.1	64.5	53.6	45
110	69.7	59.1	51.8
87.2	66.1	55.5	48.4
94.6	67.5	58.1	50.7
110.3	70.1	61.3	52.4

Table 5-10: Wagon and Other Down Trains

Category of Train	Speed Km/Hr	Vibration in dB at 17.5m.	Vibration in dB at 30m.	Vibration in dB at 55m.
Closed Wagon	94.1	72.6	63.9	55.6
Closed Wagon	88.8	71.9	62.5	54.9
Open Wagon	79.05	70.6	61.6	53.2
Open Wagon	77.26	70.4	60.9	51.8
Open Wagon	98	73.4	64.9	56.7

Table 5-11: Vibrations Measured at Alampur Jarakhi at km 1236 as per Japanese Standards

S.No.	Name of Location	Distance	LMAX
1	Alampur (Near School)	36 mt	59.3

Table 5-12: Vibrations Measured at Ulau Kheda at km 1240.0 (17.5m., 30.0m. & 55m.) as per Japanese Standards

Speed Km/Hr	Vibration in dB at 17.5m.	Vibration in dB at 30m.	Vibration in dB at 55m.
Ulau Kheda DRP of Passenger Down Trains			
23.9	63.2	54.6	42.1
98.3	58.4	50.9	40.2
103.5	67.9	58.9	46.2
103.5	65.5	56.2	45.2
82.8	64.8	55.3	44.6
103.5	61.3	51.4	41.7
82.8	60.9	50.9	40.8
72.8	60.6	50.3	39.9
Open Wagon Freight Down Trains			
52.7	65.7	55.8	46.9
55.5	61.2	52.2	42.9
84.9	68.9	57.7	44.7
53.5	65.8	56.0	43.9

Table 5-13: Vibrations Measured at Ulau Kheda for Freight Down Trains (Others)

Category of Train	Speed Km/Hr	Vibration in dB at 17.5m.	Vibration in dB at 30m.	Vibration in dB at 55m.
Tanker	81	63.9	52.4	46.2
Cargo	46.4	64.6	53.8	45.1

Table 5-14: Vibrations Measured at Ulau Kheda (12.5m., 25.0m. & 50m.) as per Japanese Standards

Speed Km/Hr	Vibration in dB at 12.5m.	Vibration in dB at 25m.	Vibration in dB at 50m.
Passenger Up Trains			
27.2	54.6	46.2	39.2
91	76.5	68.1	56.8
104.8	66.8	58.4	49.5

Speed Km/Hr	Vibration in dB at 12.5m.	Vibration in dB at 25m.	Vibration in dB at 50m.
66.2	63	53.8	41.6
112	68.3	60.3	51.2
103.5	75.1	67.9	54.8
69	65.1	57.4	43.6
51.7	62.8	52.1	42.2
62.1	69.5	59.4	47.2
38.6	55.4	46.5	38.5
Open Wagon Freight Up Trains			
111	75.3	66.8	58.4
84.2	62.3	55.3	47.8

Table 5-15: Vibration Measured at Mittawali Station at km 1254

S.No.	Name of Location	Distance	LMAX
1	Mittawali (Near Crossing)	12.5 mt	72.3

5.6.6 Measured Vibrations Levels on Sensitive Receptors

Measurements in residential, sensitive receptors located closest to the track / proposed track were collected. This data, collected during Railway Vibrations, on plain routes was used for calculation / extrapolation of vibration levels on SRs that were not physically covered during vibration measurement process. While doing so, it was presumed that buildings which were in the line of alignment will be removed and will not to be included in prediction. The land between the proposed track and selected receptors was identical to similar situations elsewhere. The measurements on similar locations were therefore directly transposable to similar uncovered locations in order to assess the impact on such locations.

Values of maximum vibrations recorded on those receptor / important locations which can help in prediction of vibrations on all SRs are presented in **Table 5.16**.

Table 5-16: Vibration Levels on Sensitive Receptors with Train Passing

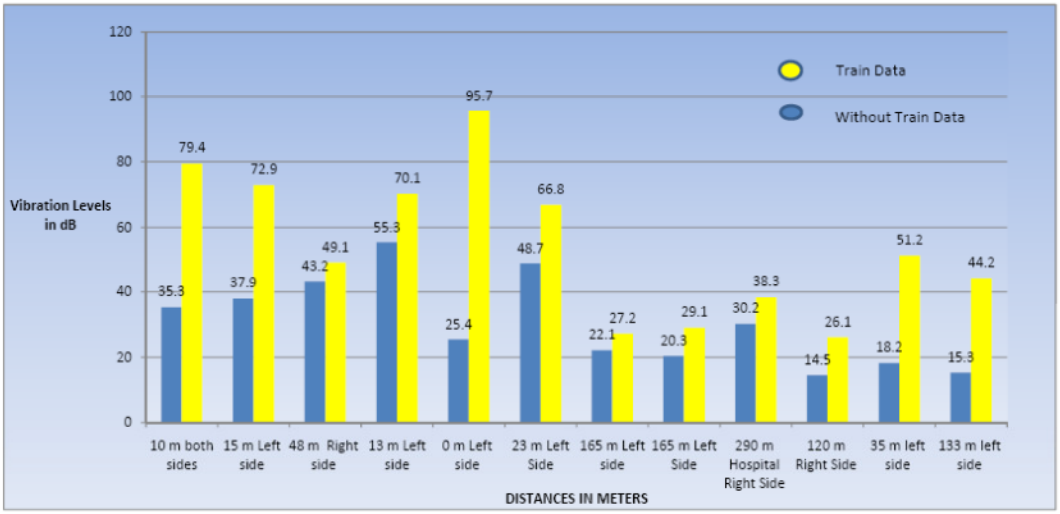
Name of Location	Distance (m) and Side Left/Right	LMAX, dB
Houses at Bhandari km 1205 parallel section	10 m both sides	79.4
Temple at Bhandari km 1205	15 m Left side	72.9
School at Alampur Jarkhi km 1236	48 m Right side	49.1
Houses at Alampur Jarkhi km 1236	13 m Left side	70.1
School at Ulau Kheda km 1240	2 m Left side	95.7
Houses at Ulau Kheda km 1240	23 m Left Side	66.8
Hiran Gaon School km 1239	165 m Left side	27.2
Hiran Gaon Houses	165 m Left Side	29.1
Vijaipur Nagla Bhav Singh Houses km 1223	290 m Hospital Right Side	38.3
DETOUR LOCATIONS		

Name of Location	Distance (m) and Side Left/Right	LMAX, dB
Budhia ka Tal	147 m Right Side	26.1
Mittawali Village School km 1254	35 m left side	51.2
Mittawali Village km 1254	133 m left side	44.2

Vibrations due to the rail traffic at sensitive locations such as residential areas, religious places, educational institutons, etc., located close to the track / proposed track were also measured. The measurements were carried out both with and without train crrosing the measurement location. As presented in the **Table 5.17 and Figure 5.5** below, the vibration levels wary from 95.7 dB highest level during train movement and 14.5 dB lowest during other periods of the day. These max and min levels are however irrelevant as the levels are to be seen in relation to location of measurement ie close to existing track / detour location as well as in relation to distance of measurement point from source of vibration. Seen in this perspective data indicates high vibration levels close to the track / source of vibrationvand gradual decrease as the receptor distance increases. This data and analysis formed the basis for calculation / extrapolation of vibration levels on similar SRs that could not be measured during the field measurements.

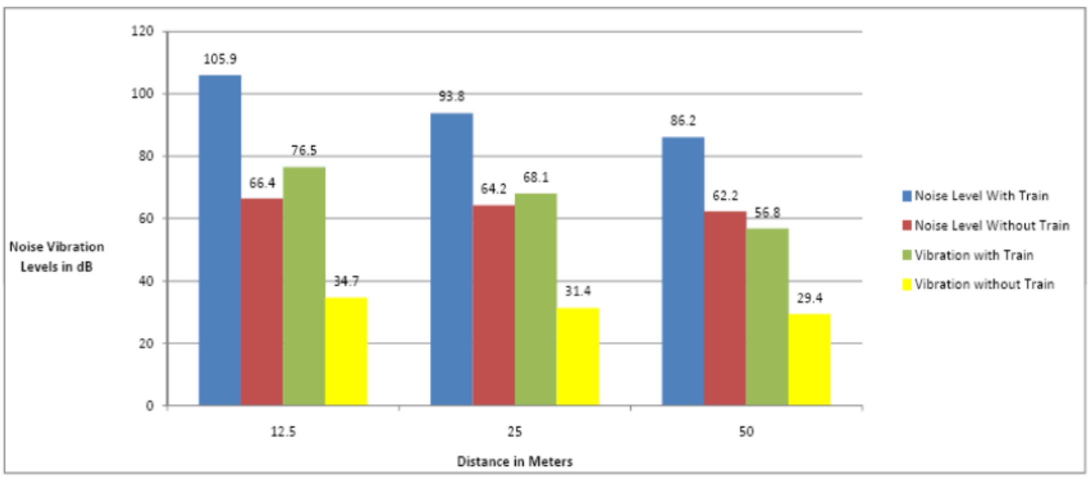
Table 5-17: Vibration Levels on Sensitive Receptors Without Train Passing

Name of Location	Distance (m) and Side Left/Right	LMAX, dB
Houses at Bhandari km 1205 parallel section	10 m both sides	35.3
Temple at Bhandari km 1205	15 m Left side	37.9
School at Alampur Jarkhi km 1236	48 m Right side	43.2
Houses at Alampur Jarkhi km 1236	13 m Left side	55.3
School at Ulau Kheda km 1240	2 m Left side	25.4
Houses at Ulau Kheda km 1240	23 m Left Side	48.7
Hiran Gaon School km 1239	165 m Left side	22.1
Hiran Gaon Houses	165 m Left Side	20.3
Vijaipur Nagla Bhav Singh Houses km 1223	290 m Hospital Right Side	30.2
DETOUR LOCATIONS		
Budhia ka Tal	147 m Right Side	14.5
Mittawali Village School km 1254	35 m left side	18.2
Mittawali Village km 1254	133 m left side	15.3



The pictorial representation of the changes in Vibration Levels due to movement of train(s) is provided below in **Figure-5.5.**

Figure 5-5: Variation of Noise Vibration Levels with and Without Train Movement



5.7 WATER: HYDROLOGY AND DRAINAGE

5.7.1 Surface water & Drainage

The project area from Kaurara to Chamraula is a part of the Ganges basin, which contains the largest river system on the subcontinent comprising the Rivers of Ganga, Yamuna and number of other rivers. The flow in the basin is largely contributed by the southwesterly monsoon winds from July to October, as well as on the flow from melting Himalayan snows in the hot season from April to June. Tropical cyclones originating between June and October in Bay of Bengal also contribute to water flows in the basin. The average annual rainfall varies from 760 mm at the western end of the basin to more than 2,290 mm at the eastern end of this river basin.

The alignment of DFCC from Kaurara-Chamraula does not cross any of the perennial rivers of Ganga Basin or any other river systems. The general slope of the area was noted to be from North West to South East with elevation ranging from 124 MSL at Kanpur to 126 MSL Mitawali. Passing through the districts of Agra and Ferozabad these areas are located in the central plains and South Western Semi Arid agro-climatic zones of Uttar Pradesh.

There is no river in the project area crossing the drain.

5.7.2 Ground Water

The project area is underlain by thick pile of quaternary sediments which comprises sands of various grades, clays and *kankar*. The quaternary sediments overlain the pre-existing Vindhyan Basement with the thickness varies from 286 to 380 meters. The Vindhyan basin tends to grow deeper from west to east.

Ground Water Monitoring at Vijaypur

The Central Ground Water Board, Aligarh demarcates the project area in to a three tier aquifer system occurring down to bed rock, as indicated below.

I Aquifer Group	00.00-130.00 mbgl	–	Quality fresh
II Aquifer Group	100.00 – 150.00 mbgl	–	Quality Brackish to saline
III Aquifer Group	130.00 – 300.00 mbgl	–	Quality brackish to saline

The ground water is encountered in the first aquifer group, while deeper aquifers are under semi-confined to confined conditions. Overall, the depth of ground water in the project area generally varies from 5 to 50 m below ground level, during pre-monsoon period and ranges between 3 m and 20 m below ground level during post-monsoon period. The ground water levels are observed to be rainging between 0.30 and 8.24 m , with an overall fluctuations of about 2 meters.

With good to moderate water yield capacities, the first aquifer group is fit for domestic and industrial consumption. The yield is expected to be around 2000-3000 lpm through tube wells and 1000-2000 lpm through shallow tube wells.

5.8 WATER QUALITY

As presented in **Section 5.7** above, there are no major or perennial water bodies in the project area. While there is no major irrigation or drinking water uses, few domestic uses such as animal bathing, washing, etc. were observed.

Table 5-18: Water Quality Criteria and Standards for Freshwater Classification (CPCB, 1979)

Parameters	BOD mg/l	pH	D.O. in mg/l	Oil & Grease mg/l
CPCB standard Class A (drinking water without conventional treatment but after disinfections)	≤ 2.0	6.5 – 8.5	≥ 6.0	---
CPCB standard Class B (for outdoor	≤ 3.0	6.5 –	5.0	--

Parameters	BOD mg/l	pH	D.O. in mg/l	Oil & Grease mg/l
bathing)		8.5		
CPCB standard Class C (drinking water after conventional treatment and disinfections)	≤ 2.0	6 – 9	≥ 4.0	--
CPCB standard Class D (for propagation of wild life, fisheries)	--	6.5 – 8.5	≥ 4.0	≤ 0.1
CPCB standard Class E (for irrigation)	--	6.0-8.5	--	--

' --' Indicates not applicable/relevant

In order to assess the base line water quality of these water bodies, samples were collected from 4 hand pumps / tube wells, and one village Pond. The village pond is located near Mitawali station at km 1254.0. The water quality results are presented in **Tables-5.19 & 5.20**.These results show high hardness and chlorides contents. The pond water is not fit for drinking and shows a higher BOD.

Table 5-19: Water Quality Results for Surface Water

Parameters/ units	Test Method	Location Mitwali (km 1245)
Colour(hazen)	IS:3025-Pt:4	Light Green
Odour	IS:3025-Pt:5	Pungent Smell
Temperature(^{o} C)	IS:3025-Pt:9	28
Turbidity	IS:3025-Pt:10	81
pH value	IS:3025-Pt:11	8.26
Total hardness as $CaCO_3$	IS:3025-Pt:21	260
Iron (mg/l)	A.A.S	3.2
Chlorides (mg/l)	IS:3025-Pt:32	160.30
Fluoride (mg/l)	IS:3025	<0.2
Total Dissolved solids (mg/l)	IS:3025-Pt:16	16.30
Magnesium as Mg	IS:3025	1.0
Sulphates (mg/l)	IS:3025-Pt:24	670.32
Nitrates (mg/l)	IS:3025-Pt:34	<1.0
Coliform (MPN/100ml)	IS:1662	10.0
BOD (mg/l)	IS:3025-Pt:44	
Phosphate(mg/l)	APHA	<0.2
Nitrites (mg/l)	IS:3025	<1.0

Parameters/ units	Test Method	Location Mitwali (km 1245)
Arsenic As	A.A.S	<0.01
Lead (mg/l)	A.A.S	<0.05
Zinc (mg/l)	A.A.S	<1.0
Chromium (mg/l)	A.A.S	<0.05
Alkalinity (mg/l)	IS:3025-Pt:23	727.20
Total Suspended Solids (mg/l)	IS:3025-Pt:17	110

Table 5-20: Water Quality Results for Ground Water

Parameters/ units	Test Method	Locations				
		Mitawali (km 1245)	Ulaukhera(km1240)	Alampu Jarkhi (km 1236/12)	Bhandari(km1205)	Vijaypur (km 1223)
Colour(hazen)	IS:3025-Pt:4	Colourless	Colourless	Colourless	Colourless	Colourless
Odour	IS:3025-Pt:5	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Temperature(^{o} C)	IS:3025-Pt:9	26	25	24	25	27
Turbidity	IS:3025-Pt:10	<1.0	<1.0	<1.0	<1.0	<1.0
pH value	IS:3025-Pt:11	8.16	8.12	8.02	7,92	7.62
Total hardness as $CaCO_3$	IS:3025-Pt:21	220	100	316	356	328
Iron (mg/l)	A.A.S	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorides (mg/l)	IS:3025-Pt:32	56.57	39.60	22.63	37.71	39.60
Fluoride (mg/l)	IS:3025	<0.2	<0.2	<0.2	<0.2	<0.2
Total Dissolved solids (mg/l)	IS:3025-Pt:16	1364	786	468	498	452
Magnesium as Mg	IS:3025	18	16	16	19	18
Sulphates (mg/l)	IS:3025-Pt:24	533.12	97.11	19.36	25.95	22.66
Nitrates (mg/l)	IS:3025-Pt:34	<1.0	<1.0	<1.0	<1.0	<1.0
Coliform (MPN/100ml)	IS:1662	Absent	Absent	Absent	Absent	Absent
BOD (mg/l)	IS:3025-Pt:44					
Phosphate(mg/l)	APHA	<0.2	<0.2	<0.2	<0.2	<0.2
Nitrites (mg/l)	IS:3025	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic As	A.A.S	<0.01	<0.01	<0.01	<0.01	<0.01
Lead (mg/l)	A.A.S	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc (mg/l)	A.A.S	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium (mg/l)	A.A.S	<0.05	<0.05	<0.05	<0.05	<0.05
Alkalinity (mg/l)	IS:3025-Pt:23	665.38	523.0	381.78	367.23	305.0
Total Suspended	IS:3025-Pt:17	16.0	6.0	<5.0	<5.0	<5.0

Parameters/ units	Test Method	Locations				
		Mitawali (km 1245)	Ulaukhera(km1240)	Alampu Jarkhi (km 1236/12)	Bhandari(km1205)	Vijaypur (km 1223)
Solids (mg/l)						

Source: Consultants' Field Monitoring

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5.9 GEOLOGY

As discussed earle, the proposed alignment of the project is a part Ganga plain lying between the rocky Himalayan belt in the north and the southern hilly tract comprising Pre-Cambrian rocks. Flexing of the Indian lithosphere in response to the compressive forces due to collision, and thrust fold loading produced the Ganga Plain foreland basin. The basin is filled with recent alluival sediments which are at places more than 1,000 m, thick and an amalagam of sand, silt, clay in varying proportions. As presented in **Figure-5.6**, the project alignment from Kaurara- Chamraula is located in the younger alluvium of Ganga Basin and generally there is no significant variation in geology.

Figure 5-6: Geological Map of Uttar Pradesh

Source:- Directorate of Geology and Mining, U. P.

5.10 GEOGRAPHY AND SOIL QUALITY

Since the project is situated in the younger alluvium of Ganga Basin, the soil is prone to erosion. The entire alluvial plain along the alignment can be divided into three sub-regions These include, the eastern tract know as scarcity areas wth highest population density and lower per capita land, the central tract and western tract comprising well developed irrigation system.

Soil Monitoring at Alampur

However, being alluvial the land is very fertile and cultivation of rice, wheat, millets, gram, barley and sugar cane, etc are the main crops of the region. The project area is famous for Potato crop..

In order to establish the base line soil samples were collected from four locations, spread across the project area. As presented in **Table 5.21** below, the soil in the project area is good for agricultural and plantation purposes and NPK ratio is favourable. The soil in the study area is fertile in nature.

Table 5-21: Soil Analysis Report

S. No.	Test Parameter/ units	Locations				
		Mitawali (km 1245)	Ulaukhera (km1240)	Alampu Jarkhi (km 1236/12)	Bhandari (km1205)	Vijaypur (km 1223)
1	Soil Texture					
a)	Sand Size Fraction (%)	40	25	32	15	30
b)	Silt Size Fraction (%)	38	43	55	59	52
c)	Clay Size Fraction (%)	18	20	13	26	16
d)	Gravel Size Fraction (%)	4	12	Nil	Nil	2.0
2	pHValue	7.44	7.46	7.80	7.62	7.50
3	Bulk Density (gm/cm3)	1.740	1.750	1.681	1.696	1.764
4	Water Holding Capacity (%)	27.16	26.92	28.52	27.90	30.12
5	Nitrogen (as N)(kg/ha)	0.02	0.06	0.04	0.03	0.04
6	Phosphorous (%)	13.6	12.8	16.8	15.6	14.0
7	Potassium(meq/100g)	0.64	0.511	0.762	0.662	0.792
8	Organic Matter (%)	0.72	0.68	0.70	0.50	0.56
9	Lead (as pb)(ppm)	ND	ND	ND	ND	ND
10	Arsenic(ppm)	ND	ND	ND	ND	ND
11	Iron (%)	3.18	3.42	3.16	3.60	3.56.
12	Sulphate(meq/100g)	0.225	0.198	0.210	0.246	0.261
13	Chloride(meq/100g)	0.165	0.180	0.149	0.156	0.172
14	Calcium(meq/100g)	12.80	12.76	13.12	14.68	13.92
15	Copper (mg/kg.)	5.28	4.96	4.68	4.85	4.90
16	Zinc (mg/kg.)	34.12	32.54	33.62	35.19	31.98
17	Manganese (mg/kg.)	2.98	3.08	3.19	3.10	3.41
18	Moisture (%)	10.2	11.5	10.4	.12.6	14.2
19	Porosity (%)	46.48	51.69	54.41	52.34	50.77

S. No.	Test Parameter/ units	Locations				
		Mitawali (km 1245)	Ulaukhera (km1240)	Alampu Jarkhi (km 1236/12)	Bhandari (km1205)	Vijaypur (km 1223)
20	Electrical Conductivity (mhos/cms)	210	200	205	208	206

Source: Consultants' Field Monitoring

5.11 LAND USE

General Land Use Pattern of the area along the proposed DFC corridor is predominantly under agriculture use. The alignment passes through 73 villages in the districts of Agra and Ferozabad in Uttar Pradesh.

The land use of the area comprises of agriculture and cropping (69.3 percent), non-agricultural use (10%), forest (7.2%) and current fallow (2.3%) and the remaining land under residential and other uses. The average size of the land holding in the project area ranges between 0.70 to 1.19 hectares and the economy of the project areas is dependent on subsistence agriculture with wheat, maize and Potato cultivation.

As presented in **Table 5.22**, the project involves acquisition of about 395 ha of land (about 88% is private land), about 0.11 ha built-up area under residential, commercial or resi-cum commercial land use.

Table 5-22: Land Use of Affected Area

District	No. of Villages	Land(area in ha)
Firozabad	41	181.04
Agra	13	77.83
Total	**54**	**258.87**

Source: Primary Cesus survey by Social Assessment Study

To minimize the impacts on the PAPs, a separate social assessment studies have been commissioned by DFCCIL and a project specific Rehabilitation Action Plan has been prepared for the project.

5.12 ECOLOGY

Any project has some impact on the flora and fauna in the project area. Plant and animal communities are indicators of the environment. They respond not only to one environmental factor, but also to an interacting group of factors. These communities influence and react sensitively to change in the balance of environmental stresses.
Therefore, a detailed knowledge of the diversity of the area definitely helps in managing the area properly following suitable practices. The study was conducted in the project area to assess all possible consequences on the biological environment.
Floral and faunal surveys conducted for assessing the biological diversity and its status over a period of time that forms an integral part of Impact Assessment Techniques. The present study is highlighting the various issues pertaining to floristic diversity and the faunal wealth including Ethno-botany and silvicultural issues in the submergence area and also the area beyond the limit of the submergence. Accordingly, for the Environmental Impact Assessment (EIA) studies, the total area has been sub-divided into the following areas;

- Dedicated Freight Corridor Chainage
- About 1km surrounding area of DFC
- Natural vegetation in the study area.
- Forest area (Protected/Reserved)
- Rivers and Ponds in vicinity

Site Selection Criteria:

Three sampling locations were selected to study the terrestrial eco-system, with due consideration to the following points.

a) Major affected area
b) Natural vegetation in the study area.
c) National Park, Wildlife Sanctuary, Wetland in the study area.
d) Natural Water Body in the study area

Terrestrial Study was conducted at two locations across the Chainage. The biological study of terrestrial flora, fauna and aquatic biota has been done for different transects. However, the surveys have also been created for the entire area in the vicinity of proposed DFCC alignment.

5.12.1 OBJECTIVES

The biological study of the area has been conducted in order to understand the ecological status of the existing flora and fauna to generate baseline information and evaluate the probable impacts on the biological environment.

Terrestrial Ecology

The study was undertaken with a view:

- To assess nature and distribution of the vegetation in the area.
- To assess the frequency, frequency class, relative frequency, abundance, density, diversity index.
- To evaluate the dominant species of plant and animal.
- To list the endangered species (both flora and fauna).
- To mark the wetlands and other ecologically sensitive areas such as national parks/ sanctuaries
- To asses the effect of construction and operation of the project on existing ecology
- To recognize the diversity indices of the terrestrial and aquatic communities.
- To Asses the spawning and feeding habitats of aquatic species with respect to time and location.

Aquatic Ecology

The study was carried out in the project site aiming at:

- Inventory of different aquatic species (plankton (phyto & zoo), benthos, fishes).
- Population density of the macro invertebrates and fishes in the river.
- To identify the feeding and breeding grounds of economically important fishes.
- To assess the existing status of endangered species.

5.12.2 METHODOLOGY

Floral Study

The vegetation sampling was carried out by using the least count quadrate method and line transacts cutting method across different habitats. The line transact method was useful to describe general vegetation pattern over large area and the quadrants are useful for quantification of density and abundance of the vegetation in the study area. The size and number of quadrates needed were determined using the species area curve (Mishra, 1968) and the running mean method (Kershaw, 1973). Summarization of previously used methods and recommendations led to the use of more than often (10x10m) quadrates laid out for sampling the tree stratum and 1x1m quadrates for herbs, grasses and seedlings of tree species. However, for examining the shrub species 3x3m sample plots were laid out. The enumeration of the vegetation was done by measuring both individually in case of woody vegetation, and collar diameter in case of herbs and grasses using the tree caliper and electronic digital caliper. In case of grasses and sedges, each erect shoot is considered by a plant tiller, and the enumeration was done by laying 1m x 1m quadrates at random, further subdivided into 10 x 10 cm segments. Four such segments selected at random were analyzed from each quadrate by counting the tillers individually as per the method used was that of Singh and Yadava (1974).

The vegetation data collected for phytosociological information were quantitatively analyzed for density, frequency, abundance and specific diversity index according to Curtis and McIntosh (1950). The relative values of frequency, density and dominance of all the species were summed up to represent Importance Value Index (IVI). The followings are the formulae to derive frequency, density, dominance, IVI etc.

$$\text{Frequency} = \frac{\text{Total number of quadrats in which species occurred}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance} = \frac{\text{Total number of individuals of species in all quadrats}}{\text{Total number of quadrats in which species occurred}}$$

$$\text{Density} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrats studied}}$$

IVI = Relative frequency + Relative dominance (basal area) + Relative density

$$\text{Relative Frequency} = \frac{\text{Frequency of the species}}{\text{Total frequency of all species}} \times 100$$

$$\text{Relative Density} = \frac{\text{Density of the species}}{\text{Total density of all species}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{Dominance of the species}}{\text{Total dominance of all species}} \times 100$$

$$\text{Relative Abundance} = \frac{\text{Abundance of the species}}{\text{Total abundance of all species}} \times 100$$

Diversity of the Forest Vegetation

The tree species diversity for each stand in different forest types was determined using Shannon Wiener information function (Shannon and Wiener, 1963), which is:

$$\bar{H} = \sum_{i=1}^{S} \left(\frac{Ni}{N}\right) \log_{10} \left(\frac{Ni}{N}\right)$$

Where, Ni is the total number of individuals of species i and N is the total number of all species in a stand.

Concentration of dominance

Concentration of dominance (Cd) was measured by Simpson Index (Simpson, 1949):

$$CD = \sum_{i=1}^{S} \left(\frac{Ni}{N}\right)^2$$

Where, Ni and N were the same as for Shannon Wiener information function. This index ranges from one, if all the individuals belong to one species, to (1/s) if they are equally divided among species (S).

Faunal Study

Terrestrial Fauna

A ground survey was carried out in the impact zone of the proposed project section. Important animal groups: butterflies (insects), birds and mammals inhabiting the area were surveyed.

For sampling butterflies, the standard '*Pollard Walk method'*; for birds '*point sampling*' along the fixed transect (foot trails) and for sampling mammals, '*direct count on open width (20m) transect'*, were used on fixed transects. Sampling was carried for 3 ha in each of the tree transects at every site.

Seasonal variation in species diversity of different groups of animals (butterflies and birds) were evaluated using Shannon-diversity Index (***H'***) to know the season of peak diversity in the area amongst the post monsoon seasons studied.

$$H' = -\Sigma^{N}_{1} \text{Pi In Pi}$$

(From species 1 to n; n= total number of species)

Where, **Pi** is the proportion of the individual species in the total population.

Aquatic Fauna

Zooplankton

For zooplankton analysis, 20L of subsurface water was strained through 53µ Nytex plankton net and the concentrate was transferred to labelled plankton bottle after rinsing the net with distilled water. The planktons were immediately preserved in 4% neutral formaldehyde solution for subsequent examination and quantification.

Zooplankton samples were observed in a sedimentation chamber under an inverted plankton microscope. Planktons were identified with the help of standard keys and references. For quantification, an aliquot of the concentrate was suitably diluted. After thorough mixing, one ml of the sample was transferred to a clean Sedgwick-Rafter cell and examined under the inverted microscope. Planktons were counted under the various genera identified. Three replicates were taken and averaged. The number of organisms per litre under each genus was calculated by the following formula:

No. of organisms L^{-1} = Vol. of conc. (ml) X No. of organism / Vol. of conc. Examined (ml) X Vol. of water filtered (L)

Phytoplankton

Similarly, for phytoplankton analysis, water sample were taken directly from the sites in 100 ml sampling bottles and preserved with Lugol's solution immediately. Then the samples were centrifuged in the laboratory followed by removal of desired amount of supernatant from the centrifuge tube to make the required concentration. Phytoplanktons were then analysed using a compound microscope and haemocytometer in the concentrates. The number of organisms per litre was calculated as follows:

No. of organisms L^{-1} = No. of organism X 10^{7} / Concentration factor X No. of slides examined

Benthos

For the benthic organism study, sediment samples were taken from the bottom of pond at Mitawali manually and brought to laboratory for analysis. The samples were washed through sieves to harvest the organisms and then preserved in sampling vials using formal dehyde as preservative. Benthic organisms were enumerated using a simple microscope/ hand lens.

Fishes

Fisheries data has been collected through consultation with local fishermen and throwing nets.

Macrophytes

Macrophytes were studied visually in the field. Photographs were taken for identification assistance. The diversity was noted in visual method (1-5 grade point scale).

Phytoplankton Productivity

Phytoplankton productivity was measured using Light and Dark bottle method of

Gaarder and Grann. The dissolve oxygen measurement for this purpose was done by Winkler's Iodometric method.

5.12.3 Flora of the project Area

General survey of flora has been carried out district in both the districts. On the basis of Survey and secondary data collected from forest office a large variety of Trees, herbs and shrubs found suited to climatic condition. The structure and type of vegetation depends on climatic conditions and physiographic conditions, as well as requirements of the local inhabitants of the area. The vegetation in the study area is deciduous in nature. Mainly three type of forests were found in the study area.

i. Tropical Moist Deciduous Forests:

These forests are found in the moist region of Terai. They grow in regions that record 100 to 150 cm. of rainfall annually, have an average temperature between 26˚-27˚ C. and have considerable degree of humidity.

A special feature of the forests is that deciduous trees of uneven size grow in higher altitude regions. Lower regions have several species interspersed with Bamboo, Climbers, Cand and ever green shrubs. Main trees are Sal, Ber, Gular, Jhingal, Palas, Mahua Semal, Dhak, Amla, Jamun, etc.

ii. Tropical Dry Deciduous Forests:

These forests are found in all parts of the plains, and usually in central eastern and western regions. The trees are mostly deciduous. Since sunlight reaches the ground in abundance, shrubs and grasses also grow here. Large tracts of these forests have been cleared for cultivation. Important trees are Sal, Palas, Amaltas, Bel, Anjeer etc. Neem, Peepal, Sheesham, Mango, Jamun, Babool, and Imli (Tamarind) etc. grow along riverbanks and in other moist regions.

iii. Tropical Thorny Forests:

These are mostly found in south-western parts of the State. Such forests are confined to the areas with low annual rainfall (50-70 cms), mean annual temperature between 25˚C to 27˚C and low humidity (less than 47%). Widely scattered thorny trees, such as Babool, Thorny, Legumes and Euphorbias, are found here. During rains, short grasses are also found here. The trees are generally small, forming open dry forests. Important trees of these regions are Phulai, Khair, Kokke, Dhaman, Danjha, Neem, etc. Various types of resin and gum are also obtained from these trees.

The study area enjoys sub-tropical climatic conditions with four seasons, pre monsoon (March to June), monsoon (July to September), post monsoon season (October and November) and winter season (December to February). List of plant species and its ecological importance based on secondary data is listed below.

Table 5-23: List of Plant Species based on Secondary data in the Study Area

Plant Species	Vernacular Name	Enthanobotanical Values
Azadirachta indica	Neem	Medical, Timber, Fuel
Acacia nilotica	Kikar	Timber, Fuel
Acacia leucophloea	Babul	Timber, Fuel
Albizzia lebbek	Siras	Timber, Fuel

Plant Species	Vernacular Name	Enthanobotanical Values
Acacia catechu	Khair	Medical, Timber, Kattha
Aegle marmelos	Bel	Food, Timber, Mythological
Bauhinia variegate	Kachnar	Ornamental
Cassia fistula	Amaltas	Aesthetic, Fuel
Dalbergia sissoo	Shisham	Timber, Fuel
Delonix regia	Gulmohar	Aesthetic, Recreational
Eucalyptus hybrid	Safeda	Timber, Fuel
Emblica officinalis	Amla	Mythological, Fuel Timber,
Polyalthia longifolia	Ashok	Aesthetic, Recreational
Prosopis julifera	Kabuli kikar	Timber, Fuel
Phoenix dactylifers	Khajur	Food, MFP (Fan)
Populus sp.	Poplar	Timber
Pongamia glabra	Karanj	Medicinal
Ficus religiosa	Papal	Mythological, Timber
Ficus benghalensis	Bargad	Timber, Fuel
Holoptelea intgrifolia	Papri	Timber, Medicinal
Morus alba	Shahtoot	Food, Timber
Morus raphii	Philkhan	Timber, Fuel
Mangifera indica	Aam	Mythological, Timber, Fuel
Syzygium cumini	Jamun	Food, Timber
Tarminalia arjuna	Arjuna	Aesthetic, Recreational
Teminalia belerica	Baheda	Medicinal, Timber
Anisomeles ovata	Jangali Tulsi	Medicinal
Achyranthes aspera	Apmarg	Drugs, Medicinal
Calotropis procera	Aak	Medicinal
Mimosa pudica	Chiumui	Aesthetic
Nerium indica	Kaner	Aesthetic, Recreational
Opuntia dillenii	Nagphani	Medicinal
Sathura matel	Datura	Poison, Medicinal
Tribulus terrestris	Gokharu	Medicinal
Zizyphus numularia	Jahrberi	Food, Fodder
Cynodon dactylon	Dub	Fodder
Desmostachya bipinnata	Dab	Huts
Erianthus munja	Munj	Huts
Saccharum spontaneum	Kans	Huts
Cuscuta reflexa	Amarbel	Medicinal
Butea monosperma	Palash	Aesthetic
Tectona grandis	Teak	Timber
Ocimum gratissimum	Ram Tulsi	Medicinal
Delonix regia	Gulmohar	Ornamental
Calotropis procera	Akman	

Source: Data collected from Forest Deptts

iv. Tree Cutting

The proposed alignment may cause cutting of approximately 4352 trees including approximately 800 within Railway Properties. The detailed list of trees has been given in **Annexure-5.1.** The major species present along the alignment are babool, neem, shisam, papal, mango, bargad, kanji, labhera, ashok, sirsa, guler, jamun, ber, eucalyptus, mahua and bel. As these trees are located all along the proposed alignment of 72 km, it is assumed that cutting of these trees will not have significant ecological impacts. It may be mentioned that major part of project DFC corridor falls in Taj Trapezium Zone area. The numbers of trees falling in TTZ are 3932.

Table 5-24 Girthwise List of Trees to be cut

A. Parallel Section

			Girth Size (m)					
S.No.	**Chainage (km)**	**Name of Trees**	**0 To 0.3 m**	**0.3 To 0.6 m**	**0.6 To 0.9 m**	**0.9 To 1.2 m**	**Above 1.2 m**	**Total**
District Firozabad, Tehsil Shikohabad								
1	1200-1200/1	Sisham		2				2
2		Neem		2	2			4
3		Babool			4			4
		Sub-Total						**10**
1	1200/9-11	Shisham		2				2
2		Babool		8	8		2	18
		Sub-Total						**20**
1	1200/11-13	Khajoor					8	8
		Sub-Total						**8**
1	1200/13-15	Shisham					2	2
2		Khajoor				4	2	6
		Sub-Total						**8**
1	1200/17-19	Neem					2	2
		Sub-Total						**2**
1	1201/1-3	Babool		2	2			4
		Sub-Total						**2**
1	1202/21-23	Mango					66	66
2		Jamun				2		2
3		Shisham		2	14		2	18
4		Neem		20	6	16	30	72
5		Sirsa			2			2
6		Jungli Babool		10	10		2	22
7		Labhera					10	10
		Sub-Total						**194**
1	1205/11-13	Pakar					4	4
2		Lakar					4	4
3		Pipal					2	2
4		Neem				2	2	4
		Sub-Total						**14**
1	1205/21-23	Neem					2	2
		Sub-Total						**2**
1	1206/1-3	Jungli Babool			14			14
		Sub-Total						**14**

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
1	1206/3-5	Shisham					4	4
		Sub-Total						**4**
1	1206/5-7	Shisham			2			2
		Sub-Total						**2**
1	1206/15-1206/17	Pakar					2	2
2		Kanji					2	2
		Sub-Total						**4**
1	1206/17-19	Sisham					2	2
		Sub-Total						**2**
1	1207/7-9	Neem					12	12
		Sub-Total						**12**
1	1207/9-11	Neem		6	4	4	12	26
2		Pipal					4	4
3		Babool		2				2
4		Mango		2			6	8
5		Shisham			2	2	2	6
		Sub-Total						**46**
1	1208/3-5	Neem			4			4
2		Sisham		2				2
		Sub-Total						**6**
1	1208/7-9	Khajoor		2		2		4
2		Neem		6	10	4		20
3		Shisham		2		4		6
4		Mango					4	4
5		Kanji				2		2
		Sub-Total						**36**
1	1208/17-19	Neem			10			10
		Sub-Total						**10**
1	1208/19-21	Neem			16			16
		Sub-Total						**16**
1	1208/21-23	Neem			6			6
		Sub-Total						**6**
1	1208/23-25	Neem		26		2		28
2		Shisham			6			6
		Sub-Total						**34**
1	1208/25-27	Neem			6		2	8
		Sub-Total						**8**
1	1208/27-1209	Sisham			6			6
2		Neem			2	2	2	6

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
3		Kanji			2			2
		Sub-Total						**14**
1	1209/1-3	Mango					6	6
2		Neem			2			2
3		Sisham		4				4
		Total						**12**
1	1209/3-5	Neem		2		20	6	28
2		Sisham			4			4
3		Mango					2	2
		Sub-Total						**34**
1	1209/5-7	Neem			4		8	12
2		Sisham			4	2		6
		Sub-Total						**18**
1	1209/7-1209/9	Kanji			2			2
2		Neem			2			2
		Sub-Total						**4**
1	1209/9-11	Neem		2	26	2		30
2		Sisham			6			6
3		Babool					2	2
		Sub-Total						**38**
1	1209/17-/19	Neem			4			4
		Sub-Total						**4**
1	1209/21-23	Sisham			6			6
		Sub-Total						**6**
1	1209/23-25	Neem			2			2
		Total						2
1	1209/25-27	Neem		2				2
		Sub-Total						**2**
1	1209/25-27	Neem			6	4	2	12
		Sub-Total						**12**
1	1210/5-17	Arua				2		2
		Sub-Total						**2**
2	1210/7-9	Kanji					2	2
		Sub-Total						**2**
3	1210/11-13	Neem				2	2	4
		Sub-Total						**4**
1	1210/13-15	Sisham			2			2
2		Neem		2	2			6
3		Babool			2			2
		Sub-Total						**10**

			Girth Size (m)					
S.No.	**Chainage (km)**	**Name of Trees**	**0 To 0.3 m**	**0.3 To 0.6 m**	**0.6 To 0.9 m**	**0.9 To 1.2 m**	**Above 1.2 m**	**Total**
1	1210/17-19	Neem					2	2
		Sub-Total					**2**	**2**
1	1210/17-19		NIL					
2		Neem					2	2
		Sub-Total						**2**
1	1210/23-25	Sisham			2			2
		Total						**2**
1	1211/11-13	Kanji					4	4
2		Mango					8	8
3		Shisham				2	2	6
4		Neem				2		2
		Sub-Total						**18**
1	1214/7-9	Babool			2			2
2		Sisham		6	2			8
3		Kanji			2			2
		Sub-Total						**12**
1	1215/5-7	Shisham		2	4			6
		Sub-Total						**6**
1	1215/7-9	Shisham		14				14
2		Babool			2	2	2	6
3		Neem			4	2		6
4		Labhera		6			2	8
5		Pipal					2	2
		Sub-Total						**36**
1	1215/21-23	Neem				12		12
		Sub-Total						**12**
1	1215/23-25	Neem		2	2			4
2		Shisham				2		2
		Sub-Total						**6**
1	1216/3-5	Babool					4	4
		Sub-Total						**4**
1	1216/11-13	Neem		2	4			6
		Sub-Total						**6**
1	1216/13-15	Labhera					2	2
2		Neem		2		2	6	10
3		Babool		2		2		4
4		Shisham			8			8
5		Mango			2			2
		Sub-Total						**26**
1	1216/19-21	Neem		2	2	6		10

S.No.	Chainage (km)	Name of Trees	Girth Size (m) 0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
2		Mango			2			2
		Sub-Total						**12**
1	1216/21-23	Beri			2			2
2		Labhera			2			2
3		Neem				2		2
		Sub-Total						**6**
1	1216/23-25	Neem			2	2	2	6
2		Labhera				2		2
		Sub-Total						**8**
1	1216/25-/27	Neem				2	2	4
		Sub-Total						**4**
1	1217-1217/1	Neem				4		4
2		Papri				2		2
		Sub-Total						**6**
1	1217/7-9	Neem					2	2
		Sub-Total						**2**
2	1217/9-11	Neem				4	2	6
		Sub-Total						**6**
1	1218/1-3	Sisham			2		2	4
2		Neem		2	12			14
		Sub-Total						**18**
1	1218/7-9	Neem					2	2
2		Pipal					2	2
		Total						4
1	1218/23-25	Babool			2			2
2		Mango				2		2
		Sub-Total						**4**
1	1218/25-27	Neem		4	2			6
2		Sisham			2			2
3		Labhera				2		2
4		Gular				2		2
		Sub-Total						**12**
1	1219/1-3	Neem			2			2
		Sub-Total						**2**
1	1219/3-5	Neem		2	10	6	8	26
2		Beri				2		2
3		Pakar				2		2
4		Labhera					2	2
5		Babool		14	**2**	**2**		**18**
		Sub-Total						**50**

			Girth Size (m)					
S.No.	**Chainage (km)**	**Name of Trees**	**0 To 0.3 m**	**0.3 To 0.6 m**	**0.6 To 0.9 m**	**0.9 To 1.2 m**	**Above 1.2 m**	**Total**
1	1220/21-23	Shisham					2	2
		Sub-Total						**2**
1	1220/23-25	Babool				2		2
		Bakain		2				2
		Sub-Total						**4**
1	1220/27-1221	Babool					2	2
		Sub-Total						**2**
1	1221/7-9	Eucalyptus					8	8
2		Neem			8	2	10	20
3		Mango			2		2	**4**
		Sub-Total						**32**
1	1221/13-15	Dry Pipal				2		2
2		Sisham			2			2
3		Neem				2		2
4		Eucalyptus					20	20
5		Kanji				2		2
		Sub-Total						**28**
1	1221/15-17	Neem				2		2
2		Babool				2		2
3		Sisham		4	2			6
		Sub-Total						**10**
1	1221/17-19	Neem		2	30	2		34
2		Babool			2	4		6
3		Sisham					2	2
4		Kanji			4			4
		Sub-Total						**46**
1	1221/19-21	Neem			2			2
2		Sisham		2				2
3		Dry Sisham					2	2
		Sub-Total						**6**
1	1221/21-23	Sisham					4	4
2		Dry Sisham					2	2
3		Eucalyptus					2	2
4		Babool				**2**		2
		Sub-Total						**10**
1	1221/23-25	Sisham					6	6
2		Eucalyptus					2	2
3		Kanji			**4**			4
4		Labhera			2			**2**
		Sub-Total						**14**

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
1	1221/25-27	Sisham					2	2
2		Dry tree					2	2
		Sub-Total						**4**
1	1221/27-29	Sisham					6	6
2		Kanji					2	2
		Sub-Total						**8**
1	1221/29-31	Sisham					6	6
2		Kanji					2	2
3		Babool					2	2
4		Eucalyptus					6	6
		Sub-Total						**16**
1	1221/31-1222	Eucalyptus					12	12
2		Neem					**2**	2
3		Pipal				2	4	6
		Sub-Total						**20**
1	1222/7-9	Sisham			4			4
		Sub-Total						**4**
1	1222/13-15	Eucalyptus					2	2
2		Sisham					4	4
		Sub-Total						**6**
1	1222/17-19	Neem			2		2	4
		Sub-Total						**4**
1	1222/19-21	Babool		2		2	2	6
2		Neem			26	2		28
		Sub-Total						**34**
1	1222/21-23	Neem			2			2
		Sub-Total						**2**
1	1222/31-33	Sisham			2		4	6
2		Babool			4	6		10
3		Neem		2	4	4	4	16
4		Bel					2	2
		Sub-Total						**34**
1	1223/13-15	Eucalyptus					4	4
2		Neem				2	14	16
		Sub-Total						**20**
1	1223/15-17	Sisham					2	2
2		Neem					2	2
3		Kanji					2	2
		Sub-Total						**6**
1	1223/17-19	Neem				4	4	8

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
2		Sisham					2	2
3		Kanji					2	2
		Sub-Total						**12**
1	1223/19-21	Neem				16		16
		Sub-Total						**16**
1	1223/21-23	Neem		2	4	10	10	26
2		Kanji					2	2
		Sub-Total						**28**
1	1223/23-25	Neem				2	4	6
		Sub-Total						**6**
1	1234/7-9	Chilbil					2	2
2		Neem					2	2
		Sub-Total						**4**
1	1234/11-13	Babool		2	2			4
2		Beri		1				2
		Sub-Total						**6**
1	1234/23-25	Khajoor				2		2
		Sub-Total						**2**
1	1234/27-1235	Neem					2	2
2		Sisham		2	2			4
		Sub-Total						**6**
1	1235/9-11	Babool		12	8			20
		Sub-Total						**20**
1	1235/19-21	Neem		2				2
2		Papri		2				2
		Sub-Total						**4**
1	1235/21-23	Neem			2	2	2	6
2		Babool			2			2
		Total						**8**
1	1235/23-27	Babool		8	12			10
2		Neem		6	6	8	4	24
3		Papri		2			2	4
4		Jamun		2				2
5		Sahtoot					2	2
6		Pakar					2	2
		Sub-Total						**44**
1	1235/27-1236	Chilbil				2		2
		Sub-Total						**2**
1	1236/1-/3	Babool			2			2

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
2		Neem			2	2	6	10
		Sub-Total						**12**
1	1236/5-7	Neem		8	2	4		16
2		Chilbil			2	4		6
		Sub-Total						**22**
1	1236/7-9	Neem		4			2	6
2		Babool		1				2
		Sub-Total						**8**
1	1236/11-13	Neem		2	2			4
		Sub-Total						**4**
1	1236/17-19	Lasohar			2		2	4
2		Neem		6	6	6		18
3		Babool		4				4
		Sub-Total						**26**
1	1237/5-7	Neem		4	6			10
2		Babool		2				2
3		Sisham			2			2
		Sub-Total						**14**
1	1237/7-9	Neem		2	6			8
2		Papri		4				4
3		Imli			2			2
		Sub-Total						**14**
1	1237/11-13	Neem		2	4	6		10
2		Babool		2				2
		Sub-Total						**12**
1	1237/13-15	Neem			2			2
2		Babool		2				2
		Sub-Total						**4**
1	1237/17-19	Neem		2	4	2		8
2		Papri		2				2
3		Imli		2				2
		Sub-Total						**12**
1	1237/21-23	Babool		4				4
		Sub-Total						**4**
1	1237/25-27	Neem		2				2
		Sub-Total						**2**
1	1238-1238/1	Neem		2		2		4
2		Babool		2		2		4
3		Mango				2	2	4
		Sub-Total						**12**

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
1	1238/5-7	Khajoor					2	2
		Sub-Total						**2**
1	1238/9-11	Urua				**2**		2
2		Neem			2			2
		Sub-Total						**4**
1	1238/17-19	Babool		2				2
		Sub-Total						**2**
1	1238/21-/23	Eucalyptus					4	4
		Sub-Total						**4**
1	1238/23-25	Eucalyptus				2		2
		Sub-Total						**2**
1	1238/25-27	Eucalyptus					2	2
2		Babool		4				4
3		Neem		4				4
		Sub-Total						**10**
1	1239/5-7	Sisham			2			2
		Sub-Total						**2**
1	1239/15-17	Babool		2				2
2		Chilbil	4	4	2	4		14
3		Neem	2			2		4
		Sub-Total						**14**
District Firozabad, Tehsil Tundla								
1	1239/17-19	Babool		12	12	4		28
2		Neem		16	6	2	10	34
3		Imli				2		2
4		Pipal					2	2
5		Shisham					2	2
		Sub-Total						**36**
1	1242/1-/3	Babool		2				2
2		Pipal				4	2	6
		Sub-Total						**8**
1	1242/11-13	Papri		2		2		4
2		Babool				2	2	4
		Sub-Total						**8**
1	1243/3-5	Sisham		4				4
		Sub-Total						**4**
1	1243/9-11	Chilbil					2	2
		Sub-Total						**2**
1	1243/11-13	Neem				4	2	6
2		Pipal					2	2

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
		Sub-Total						**8**
1	1243/23-25	Sisham				2		2
2		Babool			2			2
3		Neem			2	2		4
		Sub-Total						**8**
1	1244/3-5	Lasohar				2		2
2		Babool		2				2
3		Neem			2	2		4
		Sub-Total						**8**
1	1244/5-7	Chilbil		2				2
2		Sisham				2		2
3		Neem			4			4
4		Babool		2		2	2	6
		Sub-Total						**14**
1	1254/25-27	Neem			6	2	4	12
2		Shisham				10	2	12
3		Babool				2	2	4
4		Kanji				4	2	6
5		Mol Shri				2		2
		Sub-Total						**36**
1	1254/33	Mol Shri			2	14	4	22
2		Chandi			2	4	2	8
3		Neem			26	36	22	84
4		Desi Babool		2	4	6	2	14
5		Vilayati Babool			4	4	4	12
6		Babool					2	2
7		Shisham		4	12	2	4	12
8		Bunch of Bamboo					2	2
9		Kanji		2	2			4
10		Pipal					2	2
11		Papri			4	2		6
12		Shahtut				2		2
13		Ashok		4				4
		Sub-Total						**184**
1	1256/23-25	Babool				2	2	4
2		ber				2		2
3		desi babool		10	16	18	10	52

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
4		Labhera				2		2
5		Mlo shri					2	2
6		neem			12	6	10	28
7		papri			6	2	2	10
8		shisham		8	2	2		12
9		Siras				2		2
10		Vilayti Babool				2		2
		Sub-Total						**118**
District Agra, Tehsil Etamdpur								
1	1259/23-25	Babool		2		6	4	12
		Sub-Total						**12**
1	1260/27-29	Neem		2	2	6		10
2		Sisham				2		2
3		Babool				4	2	6
4		Papri			4	2		6
		Sub-Total						**24**
1	1261/3-5	Mango			8	2		10
2		Sisham		2				2
3		Papri			2	10	4	16
4		Pipal			2			2
5		Neem		2		2		4
		Sub-Total						**34**
1	1261/9-11	Babool		2	4	12		18
2		Neem			2	4		6
		Sub-Total						**24**
1	1261/13-15	Babool		6	6	8	2	20
2		Neem		4	20	2		24
3		Pipal		2			2	4
4		Papri		2	4	2	4	12
5		Gular					2	2
6		Beri		2				2
		Sub-Total						**64**
1	1261/23-25	Neem				2		2
2		Chilbil			2	4		6
3		Chul		2				2
4		Babool			2			2
5		Pipal			2	2		4
		Sub-Total						**16**
1	1265/11-13	Neem		4		16		20
2		Mango		4	4	2		10

			Girth Size (m)					
S.No.	**Chainage (km)**	**Name of Trees**	**0 To 0.3 m**	**0.3 To 0.6 m**	**0.6 To 0.9 m**	**0.9 To 1.2 m**	**Above 1.2 m**	**Total**
3		Chilbil				2	2	4
4		Lasohar					2	2
5		Sirsa				2		2
		Sub-Total						**38**
1	1265/13-15	Neem				4		4
		Sub-Total						**4**
1	1266/11-13	Neem			2			2
2		Babool			2			2
		Sub-Total						**4**
1	1266/19-21	Babool		2	2			4
2		Neem		2		2	6	10
3		Gular			2	2		4
		Sub-Total						**18**
1	1266/23-25	Babool		2				2
		Sub-Total						**2**
1	1266/25-27	Babool				2		2
		Sub-Total						**2**
1	1266/27-29	Neem		2				2
2		Babool			2			2
		Sub-Total						**4**
1	1266/29-31	Babool			2			2
		Sub-Total						**2**
1	1266/31-1267	Labhera			2			2
		Sub-Total						**2**
1	1267/3-5	Neem		2	4			6
		Total						**6**
1	1267/5-7	Babool		16	4			20
2		Sisham			4			4
3		Mango			4	4		8
4		Neem			4	2	2	8
		Sub-Total						**40**
1	1267/7-9	Babool		8				8
2		Neem		2				2
		Sub-Total						**10**
1	1267/7-9	Babool			6			6
		Sub-Total						**6**
1	1267/15-17	Babool			2			2
		Sub-Total						**2**
1	1267/25-27	Mango					8	8
2		Shisham			2			2

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
		Sub-Total						**10**
1	1267/27-29	Mango					12	12
		Sub-Total						**12**
1	1267/29-31	Mango					8	8
		Sub-Total						**8**
1	1267/31-/1	Neem						2
		Sisham						2
		Sub-Total						**4**
1	1268/7-9	Babool		2				2
2		Kanji			2			2
		Sub-Total						**4**
1	1268/9-11	Neem			2			2
2		Kanji				2		2
		Sub-Total						**4**
1	1268/11-13	Kanji			2			2
2		Neem			6	2		8
3		Sisham			2			2
		Sub-Total						**12**
1	1268/13-/15	Neem	2					2
2		Sagon					2	2
3		Gular				2		2
		Sub-Total						**6**
1	1268/15-17	Ashok			2			2
2		Mango	2					2
3		Labhera	2					2
4		Babool	2					2
		Sub-Total						**8**
1	1269/17-21	Neem			6	2		8
		Total						**8**
1	1269/19-21	Neem				2		2
		Sub-Total						**2**
1	1269/21-23	Babool		4				4
2		Babool			20			20
		Sub-Total						**24**
1	1270/3-5	Babool			34	8		42
2		Neem				2		2
		Sub-Total						**44**
1	1270/7-9	Babool		2	2			4
		Sub-Total						**4**
1	1270/9-11	Babool	2	2				4

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
2		Neem	2	2	2		2	8
		Sub-Total						**12**
1	127-/15-1270/17	Neem-		8			2	10
		Sub-Total						**10**
1	1270/21-23	Neem		2			8	**10**
		Bakyan		2	2			**4**
		Sub-Total						**14**
1	1270/23-25	Neem			8			8
		Kanji		**2**				**2**
		Sub-Total						**10**
1	1270/25-27	Neem			8	2		10
		Sub-Total						**10**
1	1270/27-29	Neem			6			6
		Sub-Total						**6**
1	1270/29-31	Neem		14	**2**			16
		Sub-Total						**16**
1	1270/31-33	Neem		8	10			18
		Sub-Total						**18**
1	1270/33-1271/1	Neem		10	2	4		16
		Sub-Total						**16**
1	1271/1-3	Sahtoot		2				2
2		Neem		2	12			14
		Sub-Total						**16**
		Total	**10**	**414**	**886**	**608**	**714**	**2746**

B. Firozabad Detour

			Girth Size (m)					
S.No.	Chainage (km)	Name of Trees	0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
1	1224/1-3	Shisham			4	2		6
2		Neem		10	6	11	11	38
3		Bel			8	6		14
4		Gular					2	2
5		Bunch of Bamboo	50 nos.				2	2
6		Mango					2	2
7		30 Guava		2				2
8		Labhera					2	2
9		Babool					2	2

S.No.	Chainage (km)	Name of Trees	Girth Size (m) 0 To 0.3 m	0.3 To 0.6 m	0.6 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
10		**Sub-Total**						**70**
11	2/250	21 Sagon				4		4
12		Beri		2				2
13		Babool					2	2
14		Neem		1				2
15		**Sub-Total**						**10**
16	3/200	Mango			2	2	14	18
17		Babol		2	4		6	12
18		Jamun				2	2	4
19		Neem		36	40	22	14	112
20		Labhera		4				4
21		Chilla		2	2	2		6
22		Gold Mohar					2	2
23		Beri		20	8		2	30
24		shisham		8				8
25		papri		2	2		2	2
26		**Sub-Total**						**202**
27	5/300	Neem	2	8	28	34	34	106
28		Babool		4	18	10	4	36
29		Shisham				4	4	8
30		Beri	4	16	42	10	2	74
31		labhera		4				4
32		3 forest Babool			2			2
33		pipal			4		2	6
34		Hikota					2	2
35		20 babool		2				2
36		3 babool			2			2
		10 Babool			2			2
37		**Sub-Total**						**244**
38	1234/11-13	Deshi Babool		2				2
39		Babool		4				4
40		Beri			2			2
41		**Sub-Total**						**8**
42	1234/7-9	Neem		10	26	18	2	56
43		Babool		12	12	6		34

			Girth Size (m)					
S.No.	**Chainage (km)**	**Name of Trees**	**0 To 0.3 m**	**0.3 To 0.6 m**	**0.6 To 0.9 m**	**0.9 To 1.2 m**	**Above 1.2 m**	**Total**
44		Bakayan		6	2	2		10
45		Beri		2				2
46		Kanji		2				2
47		Chameli		2				2
48		Pipal				2		2
49		Ber		2			2	4
50		**Sub-Total**						**112**
		Total	**12**	**340**	**216**	**138**	**114**	**644**

c. Tundla Detour

			Girth Size (m)					
S.No.	**Chainage (km)**	**Name of Trees**	**0 To 0.3 m**	**0.3 To 0.6 m**	**.60 To 0.9 m**	**0.9 To 1.2 m**	**Above 1.2 m**	**Total**
1	1244/23-25	Shisham				10		10
2		Dry Shisham			2			2
3		Neem			2			2
4		Gular					2	2
5		**Sub-Total**						**16**
6	1245	Neem			4			4
7		Babool			2			2
8		Shisham				2		2
9		Papri			2			2
10		**Sub-Total**						**10**
11	1246	Neem			2		4	6
12		Papri				2		2
13		Babool			2			2
14		Shisham					2	2
15		**Sub-Total**						**12**
16	1245/4	Babool			2	2	2	6
17		Shisham			2	2	2	6
18		Neem				4		4
19		**Sub-Total**						**16**
20	1245/5	Shisham		30	32	18	20	100
21		Neem		32	52	100	60	244
22		Babool	2	80	150	90	28	350
23		Gular				`	6	6
24		Beri		8	8	4	2	24
25		Kanji		14	20	8	6	48
26		Shahtut		2		2		4

S.No.	Chainage (km)	Name of Trees	Girth Size (m) 0 To 0.3 m	0.3 To 0.6 m	.60 To 0.9 m	0.9 To 1.2 m	Above 1.2 m	Total
27		Labhera			4	2		6
28		Bel		2			6	8
29		Gul Mohar			2			2
30		Papri		8		2	4	14
31		Jamun					4	4
32		Mango					8	8
33		Guawa			24			24
34		Neembu			2	2		4
35		Sirsa		2			2	4
36		Pipal					26	26
37		Bargad					2	2
38		Ukeliptus				4	4	8
39		Lemon		4			4	8
40		Bamboo					2	2
41		Wakayan		18	2			20
42		**Sub-Total**						**908**
		Total	**2**	**198**	**316**	**252**	**190**	**962**
Grand Total			**A+B+C**					**4352**

5.12.4 Biodiversity Profile

District-wise secondry data collected from Forest Department on tree, shrubs and other species are presented below in **Tables 5.25 & 5.26:**

Table 5-25: Bio-Diversity Profile of Ferozabad Region

S. No.	Botanical Name	Common Name
1.	*Butea frondosa*	Dhak
2.	*Butea monosperma*	Palas
3.	*Vetiveria zinzanoides*	Ganra
4.	*Saccharum munja*	Munj
5.	*Eulaliopsis binta*	Baib
6.	*Desmostachya bipinnata*	Dab
7.	*Saccharum spontaneum*	Kans
8.	*Cynodon dactylon*	Doob

Source: Forest Department

Table 5-26 :Bio-Diversity Profile of Agra Region

Sl. No.	Botanical Name	Common Name
1.	*Syzygium cumini*	Jamun
2.	*Shorea Robusta*	Sal, Shakhu
3.	*Anogeissus latifolia*	Bakli, Dhaura
4.	*Aegle mormelos*	Bel

5.	*Holdina cordifolia*	Haldu
6.	*Mitragyna parvifolia*	Kaim or Tekui
7.	*Mallotus philippensis*	Rohini
8.	*Modhuca longifolia var. latifolia*	Mahua
9.	*Dalbergia sissoo*	Sheesham
10.	*Ficus religiosa*	Peepal
11.	*F. auriculata*	Timla
12.	*F. semicordata*	Khainu
13.	*F. virens*	Pakad
14.	*F. benghalensis*	Bargad
15.	*Acacia catechu*	Khair
16.	*Albizia lebbeck*	Siris
17.	*Terminalla alata*	Asna, Asain
18.	*T. bellirica*	Bahera
19.	*Holoptelea integrifolia*	Dhamina
20.	*Streblus asper*	Sehore
21.	*Butea monosperma*	Dhak, Palas
22.	*Buchanania lanzon*	Chirongi
23.	*Cassia fistula*	Amaltas
24.	*Lannea coromandelica*	Jigma, Jhingan
25.	*Pongamia pinnata*	Karanj

Source: Forest Department

5.12.5 QUANTITATIVE ANALYSIS OF TREE, SHRUB AND HERB BY QUADRATE METHOD

Location No.1: Tundla (Start of Detour)

Acasia nilotica was found to be the most dominant species, followed by *Prosopis juliflora, Butea monosperma and Melia azedarach*. *Parthenium hysterophorous* was very common in the study area. It may be observed that *Acacia nilotica* is the most abundant specie. The overall species diversity index for study area was computed as 0.575.

Location No.2: Parallel Section Ahead of Mittawali Station

During the study 24 species were observed. *Acasia nilotica* was found to be the most dominant species, followed by *Prosopis juliflora and Butea monosperma*. Density and diversity index of different species observed during the studies was 0.735. It may be observed that *Prosopis juliflora* is the most abundant species followed by *Dalbergia sisoo, Delonix regia*.

The diversity, abundance and species diversity index of both locations are given in **Annexure No. 5.2.**

5.12.6 QUANTITATIVE ANALYSIS OF TREE, SHRUB AND HERB BY LINE TRANSACT METHOD

Location No.1: FEROZABAD Reserved Forest (R. F.)

Tree species recorded in the area included *Tactona grandis, Cedrus deodara, Pistacia integerina* and *Quercus ilex. The density of Tactona grandis (116 trees/ha) was found highest followed by Cedrus Deodara (42 trees/ ha) and Pinus Wallichiana (19 trees/ha). The IVI of Olea cuspidate(41.83) was found maximum.*

Table 5-27: Phytosociological analysis of the tree species

S. No.	Name of the Species	Density/ha	Abundance	Frequency (%)	Importance Value Index
1.	*Tactona grandis*	116	1.4	70	115

S. No.	Name of the Species	Density/ha	Abundance	Frequency (%)	Importance Value Index
2.	*Alnus nitida*	8	1.0	9	11.85
3.	*Cedrus deodara*	42	1.7	28	38.50
4.	*Pistacia integerina*	26	1.0	26	24.70
5.	*Punica granatum*	18	1.0	18	19.79
6.	*Olea cuspidata*	17	1.0	24	41.83
7.	*Pinus wallichiana*	19	1.3	28	29.89
	Total	246			281.56

Source: Consultant Survey

The common understorey species in the area include *Plectranthus rugosus, Rubus lasiocarpus, Urtica dioica, Daphne oleoides* and *Debreagasia hypoleuca.* Amongst these *Plectranthus rugosus* showed high dominance with density 2863 plants/ha and IVI of 83.7 followed by *Myrsine Africana* (2380 plants/ha; IVI: 66.85). Species diversity index ' was 1.70 .

Table 5-28: Phytosociological analysis of the under storey species

S. No.	Name of the Species	Density/ha	Abundance	Frequency (%)	Importance Value Index
1.	*Debraegesia hypoleuca*	917	1	82.5	36.02
2.	*Prinsepia utilis*	1000	2.25	40	24.77
3.	*Plectranthus rugosus*	2863	3.28	80	81.7
4.	*Urtica dioica*	556	1.05	47.5	21.62
5.	*Rubus ellipticus*	361	1.3	25	10.02
6.	*Myrsine africana*	2360	2.9	77.5	63.85
7.	*Daphne oleoides*	1667	2.22	67.5	51.01
	Total	9917			280.99

Source: Consultant Survey

The common herbs found in the area included *Solanum nigrum, Oxalis corniculata, Viola serpens, Achyranthes bidentata, Trifolium repens, Malva* sp, *Chenopodium album, Plantago* sp, *Dicliptera roxburghiana, Euphorbia* spp and *Fragaria vesca. The species Thymus linearis (0.43 plants/m^2), Origanum vulgare (0.43 plants/m^2) and Euphorbia sp. (0.43 plants/m^2) have the maximum density followed by Rumex hastatus (0.38 plants/m^2). Plantago lanceolata showed an IVI of 48.97 considerably more than Euphorbia sp (30.71) and Origanum vulgare (20.91).* Species diversity H' was observed to be 2.85**.**

Table 5-29: Phytosociological analysis of the herbacious species

S. No.	Name of the Species	Density/ m^2	Abundance	Frequency (%)	Importance Value Index
1.	*Ajuga bracteosa*	0.23	1.56	15	9.56
2.	*Euphorbia sp*	0.43	1.3	33.33	30.71
3.	*Artemisia gmelli*	0.23	1.4	16.67	11.41
4.	*Chenopodium album*	0.13	1.6	8.33	6.7
5.	*Cynodon dactylon*	0.4	2	20	15.7
6.	*Origanum vulgare*	0.43	1.44	30	20.91

7.	*Mentha longifolia*	0.12	1.4	8.33	8.88
8.	*Micromeria biflora*	0.3	1.8	16.67	13.25
9.	*Nasturtium officinale*	0.08	1.67	5	4.12
10.	*Plantago lanceolata*	0.2	1.71	11.67	48.97
11.	*Plantago major*	0.07	2	3.33	3.78
12.	*Poa sp*	0.37	1.69	21.67	15.39
13.	*Polygonum capitatum*	0.2	1.5	13.33	10.3
14.	*Rumex hastatus*	0.38	1.64	23.33	19.07
15.	*Rumex nepalensis*	0.22	1.86	11.67	11.35
16.	*Solanum nigrum*	0.18	1.57	11.67	7.14
17.	*Tagetes minuta*	0.35	1.62	21.67	17.52
18.	*Thymus linearis*	0.43	1.86	23.33	15.62
19.	*Trifolium pratense*	0.32	1.9	16.67	14.97
20.	*Trifolium repens*	0.2	1.33	15	9.34
21.	*Viola canescens*	0.12	1.4	8.33	5.33
	Total	5.39			300.02

Source: Consultant Survey

5.12.7 FAUNA

The domestic animals observed in the study area are mainly mammals and avis as listed in the **Table 5.30**. In absence of natural forest (National parks and Sanctuary), there is a dearth of wild animals in the study area. Peacocks can be easily seen in the study area, even in villages. Infact, peacocks are treated as pet birds in this area. A list of birds, reptiles, amphibians and rodents based on information gathered from local enquiries and Forest department is presented in **Table 5.31.**

Table 5-30: List o Domestic Fauna Observed in the Study Area

S. No.	Zoological Name	Common Name	Schedule
1.	*Bos indicus*	Cow	
2.	*Bubalus indicus*	Buffalo	
3.	*Boselaphus tragocamelus*	Nilgai	III
4.	*Cains familieris*	Dog	
5.	*Capra hircus*	Goat	
6.	*Equus cabilus*	Horse	
7.	*Equus hermionus*	Ass	
8.	*Felis domesticus*	Cat	
9.	*Ovius polic*	Sheep	
10.	*Sus cristatus*	Pig	
11.	*Suborder ruminantia*	Camel	
12.	*Nigicollis*	Monkey	
13.	*Lepus ruficandatus*	Hares	
14.	*Vulpes bengalensis*	Indian fox	

Source: Consultant Survey & Data from Forest Department

Table 5-31: List of Birds, Reptiles, Amphibians and Rodents observed in the Study Area

S. No	Scientific Name	Common Name	Schedule
Birds			
1.	*Alcedo atthis*	Common Kingfisher	IV
2.	*Cucculus micropterus*	Indian Cuckoo	IV
3.	*Columba livia*	Rock Pigeon	IV
4.	*Corvus splendens*	House Crow	V
5.	*Eudynomys scolopacea*	Asian Koel	

S. No	Scientific Name	Common Name	Schedule
6.	*Prinia hodgsonii*	Grey-breasted Prinia	
7.	*Pycnotus jacosus*	Red-whiskered Bulbul	IV
8.	*Ploceus philippinus*	Baya Weaver	
9.	*Pavo cristatus*	Peafowl	I
10.	*Polyplectron bicalearaturn*	Peacock pheasants	I
11.	*Streptopelia chinensis*	Spotted Dove	IV
12.	*Grus nigricollis*	Crane	I
Reptiles			
1.	*Calotes versicolor*	Garden lizard	
2.	*Varanus monitor*	Monitor lizards	
3.	*Bangarus caearulus*	Karait	
Amphibian			
1	*Bufo malanostidus*	Toad	
2	*Rana cynophlyctis*	Frog	
3	*Rana tigrina*	Frog	
Rodent			
1	*Bandicota indica*	Bandicoot rat	V
2	*Mus muscatus*	Mouse	V
3	*Ratus ratus*	House rat	V
4	*Ratufa indica*	Squirrel	

Source: Consultant Survey & Data from Forest Department

Endangered / Sensitive Species of Fauna:

As per list of **The Indian Wildlife (Protection) Act, 1972,** Fauna coming under the **schedule - I** is treated as endangered species. The **schedule - I** fauna as per reconnaissance survey are *Pavo cristatus, Polyplectron bicalearaturn, Grus nigricollis.* Although these are very common species and found in every locality, even in villages, certain steps should be taken to conserve the wild life and provisions of the Act to be followed:

1. Programs for the conservation of wildlife will be formulated and implemented outside the protected areas by educating the local communities with help of local public agencies, and other stakeholders including the environment division officers of our company, in order to reduce the scope of man-animal conflict.
2. It will be ensured that human activities on the fringe of the protected areas do not degrade the habitat.

Over all, the status of wildlife in a region is an accurate index of the state of ecological resources, and thus, of natural resources base of human well-being. This indicates the interterdependent nature of ecological entities (the web of life0, in which wild life is a vital link and a base of eco-tourism. Thus, the importance of conserving and protecting wildlife will be spread among the local people.

5.12.8 AQUATIC ECOLOGY

There are no aquatic resources of significance in the study area. The common fishes pond in the village ponds and low lying areas are summarized below:

List of Fishes in the Study Area

Fish species reported in the area are listed in **Table 5.32**. Main fishes are *Notopterus notopterus, Catla catla, Labeo calbasu, Labeo rohita, Labeo bat, Mystus vittatus, Rita rita, Barbus spp*. and *Cirrinus raba*.

Table 5-32: List of Fishes Reported in the Study Area

S. No.	Fish Species
1	*Notopterus notopterus*

S. No.	Fish Species
2	*Catla catla*
3	*Labeo calbasu*
4	*Labeo rohito*
5	*Labeo bata*
6	*Cirrihinus mrigala*
7	*Cirrihinus raba*
8	*Clarius batrachus*
9	*Wallago attu*
10	*Heteropneustres fossiliis*
11	*Mystus vittatus*
12	*Mystus aor*
13	*Hilra ilisha*
14	*Barbus spp.*
15	*Rita rita*

Source: Consultant Survey

Rare and Endangered Species

In reference to Red Data Book of Botanical Survey of India and Wildlife (Protection) Act 1972, no endangered species of flora and fauna have been found during the study period.

Ecologically Sensitive Areas

There are no ecologically sensitive locations within the study area. The project road portion from km 1221 to 1266 is located in TTZ area.

5.13 SOCIO-ECONOMIC CHARACTERISTICS OF THE STUDY AREA

5.13.1 Socio -Economic Characteristics of the Project Area

Most of the people in the project districts are dependent on the agricultural activities. The **Table-5.37** below indicates that the project area has poor performance on important development indices such as work participation rate. The socio-cultural indicators point to low development indices. Total literacy is 79%. Socio-economic position of both Ferozabad & Agra districts is given in **table 5.33**.

Table 5-33: Social and Economic Indicators of the Project Districts

Project District	Economic		Social& Demographic			
	Work Participation Rate (%)	% Non-Workers	Literacy			Decadal Growth Rate
			Total	Male	Female	
Firozabad	27.22	72.77	64.48	75.89	50.95	33.44
Agra	27.18	72.81	62.60	74.60	48.35	31.27

Source: Census of India, 2001

5.13.2 Social Stratification Profile of the Project

Most important religious group in the project area is Hindu. Other important religious communities are Muslim, Jain and Sikh. There is a presence of several important scheduled castes of the state constituting about 20% of the total population of both the districts. Three Schedule Tribe families are present in project influenced area. Some of the important scheduled castes of the area are Chamars, Kori, Khatiks and Balmiki. Some of the important scheduled tribes of the area are Bhotia, Juansari and other generic tribes. However, none belong to ‘indigeneous category’ as per the WB safeguard policy.

Table 5-34: Social Stratification in the Project Districts

Project District	Scheduled Castes					Scheduled Tribes				
	Chamar	Dhanuk	Khatik	Balmiki	Kori	Bhotia	Juansari	Tharu	Raji	Generic Tribes
Firozabad	☑		☑		☑	☑	☑			☑
Agra	☑			☑	☑	☑	☑			☑

Source: Census of India, 2001

5.13.3 Social Profile of the PAPs

(i) Age-Sex Composition: Among families that will loose agricultural land due to the project, there are 5337 males (55.84%) and 4220 females (44.16%). It is examined from **Table 5.35** that the sex ratio is 790 for the project stretch.

Table 5-35: PAPs Age-Sex Composition

Type of Impact	0-6		6-15		15-18		18-45		45-59		59-Above		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Agricultural Land	436	415	1003	755	473	348	2495	1855	531	520	399	327	**5337**	**4220**
Structure	15	17	51	34	26	16	123	85	20	18	24	19	**259**	**189**
Total	451	432	1054	789	499	364	2618	1940	551	538	423	346	**5596**	**4409**

(ii) Social Composition: In the families losing agricultural land in the project, the dominant religious group is Hindu constituting 97.6 % of the total population. The other religious group present is Muslim, constituting about 2.4% percent of the population.

Table 5-36: Social Composition of PAFs

Section	Hindu	Muslims	Total
Kaurara-Chamraula Section	1703	42	1745

(iii) Social Stratification: Specific impacts on three ST families, consultation strategies and detailed mitigation measures will be dealt in SMF.

(iv) Education Status: Amongst the PAPs, there is a high degree of illiteracy (19.72%) in the project area.. About 29 % of the PAPs are basic literate. About 17% PAPs have studied up to the 8th standard school level as given in **Table 5.37**. There are only 10% graduates in the area. Less number of professionally educated PAPs points to the lower level of opportunities in the project area. Since illiteracy level is high, awareness about social issues resettlement and rehabilitation options, compensation and project related decisions would require special attention to discuss and communicate it to the PAPs.

Table 5-37: Education Status of PAPs

Package	Education level						Total
	Un Educated	Educated	8th	10th	Interme-diate	Graduate	
Kaurara-Chamrola	1973(19.72%)	2932(29.31 %)	1677 (16.76 %)	1534(15.33 %)	932(9.31 %)	957(9.57 %)	10005

(iv) Vulnerability Status: Table 5.38 presents number of PAPs under vulnerable categories as per NRRP 2007. Out of these, 71.71% are old people above the age of 50 years. Other significant categories are widows (2.10%) and unmarried girls above the age of 18 years (11.47%). This would become significant while planning for the women's income generation and restoration strategies. These vulnerable categories of PAPs will be supported by the project but within the purview of NRRP 2007.

Table 5-38: PAPs Vulnerability Status

Package	Project Affected Persons					Total
	Disabled / Orphan	Widow	Un Married Girls above 18 years	Abandoned Women	Person above 50 years	
Kaurara - Chamrola	102	210	213	0	1331	1856

5.14 ECONOMIC PROFILE

(i) Occupational Background: In the families loosing agricultural land, about 26.2% PAPs are housewives, a certain percent of whom are engaged in economic activities on mostly an informal basis, within and outside the household. Another, 15% are students, 9.5% PAPs are labourers in the agricultural sector or otherwise. About 29.34% of the PAPs are engaged in business activities (trade and petty business). Many of these businesses people are associated with the small economic activities such as Tiffin centers, tea centers, general stores, etc. The details are presented in **Table 5.39.**

Table 5-39: Occupation Profile of PAPs

Type of Impact	Service		Business		cultivator		Students		House Wife	Labor		Un-Employed		Workers		Others		Total	
	M	F	M	F	M	F	M	F	F	M	F	M	F	M	F	M	F	M	F
Agricultural Land	275	26	95	6	1658	69	1687	1194	2507	1097	26	149	28	14	52	362	312	**5337**	**4220**
Structure	14	0	4	0	52	3	76	40	117	72	3	21	2	5	7	15	17	**259**	**189**
Total	716	1257	1434	1498	1006	671	1072	462	2624	711	246	657	275	711	246	711	246	**5596**	**4409**

(ii) Income Level: Amongst the total number of 1745 families losing agricultural land, 47.33% families earn less than Rs 50,000 and 52,67% families earn more than Rs 50,000. The details are presented in **Table 5.40.**

Table 5-40: PAFs Losing Agricultural Land: Income Level

Package	Income Group (Rs.)				Total
	0 - 25000	25000 - 50000	50000 - 1 Lakh	above 1 Lakh	
Kaurara - Chamrola	249	577	585	334	1745

Out of the total 97 families losing structures in the project area, 79 families belong to residential category in both title holders and non title holders category. **(Table -5.41).** Ten families have commercial structures and balance 8 have kiosks.

Table 5-41: PAFs Losing Structures

Package Wise	Titleholders		Non-Titleholders (Squatters, Tenant & Kiosks)				Total
	Resi	Comm	Resi	Comm	Tenants	Kiosks	
Kaurara - Chamrola	64	10	15	0	0	8	**97**

The details of temperatory and permanent structures and common property resources being impacted are given below. It is clear from this table that 17 wells, 8 tube wells, 40 hand pumps, 43 religious structures and 97 total structures (temporary and permanent) are falling in the RoW these are given in Table-5-42.

Table 5-42: List of Common Property Resources and Structures

A.Parallel section

S. No.	Chainage	Well	Tube well	Hand pump	Religious	Temporary /Permanent Structures	Others
1	1200/13-1200/15			2 Nalkoop			
2	1201/1-1201/3			1 Kachha Bore			
3	1201/15-1201/17					1House	
4	1201/29-1201/31			1 Kachha Bore			
5	1202/3-1202/5	2 well		5 Katcha Bore+3 Pucca Bore			1 Pucca Shop
6	1205/5-1205/7			1 Handpump		6 House	
7	1205/7-1205/9	3 well		1 Handpump+3 Kachha Bore+2 Pucca Bore	4 Samadhi+3 Temple +1 Pucca Shivling	33 House+4Boundary wall Cemented+1 Naad+1 Pucca Chabutara +1 Dharamsala+3Pucca Abonded+1pucca pilinth	
8	1240/3-5				1 Temple		
9	1240/7-9			2 Handpump	2 Temple+5 Dev Sthan+1 Samadhi	3 House+1 Hospital+1 PanchayatGhar+1Dharamsala+2Chabutara+3 Boundary wall+1School+1 hut	2 Shop+1Rasta
10	1258/19						1 Mitawali Sewa Kendra Filling Station Petrol Pump
11	1259/15-17	1 well				1Old Building	
12	1270/11-15			1 HandPump		2House	

S. No.	Chainage	Well	Tube well	Hand pump	Religious	Temporary /Permanent Structures	Others
18	1270/15-17			6 HandPump		4 House+Boundry+1Baramada+2 plot+1 tin shed	
19	1270/21-23			6 HandPump		1Boundry+2 Double Storey House+7 houses	
	Total	**6**	**-**	**33**	**17**	**86**	**5**
	Grand Total	**147**					

B. Firozabad Detour

S. No.	Chainage	Well	Tube well	Hand pump	Religious	Temporary/permanent Structures	Others
1	3/200	3 Well	1 Tube Well	5 Boaring+1 Hand pump+1 Samar civil	3 Dev Sthan	11 Houses+1 Shop+4Chappar+2 Kothari+2 Baramada	1 Bhata
	Total	**3**	**1**	**7**	**3**	**20**	**1**
	Grand Total	**35**					

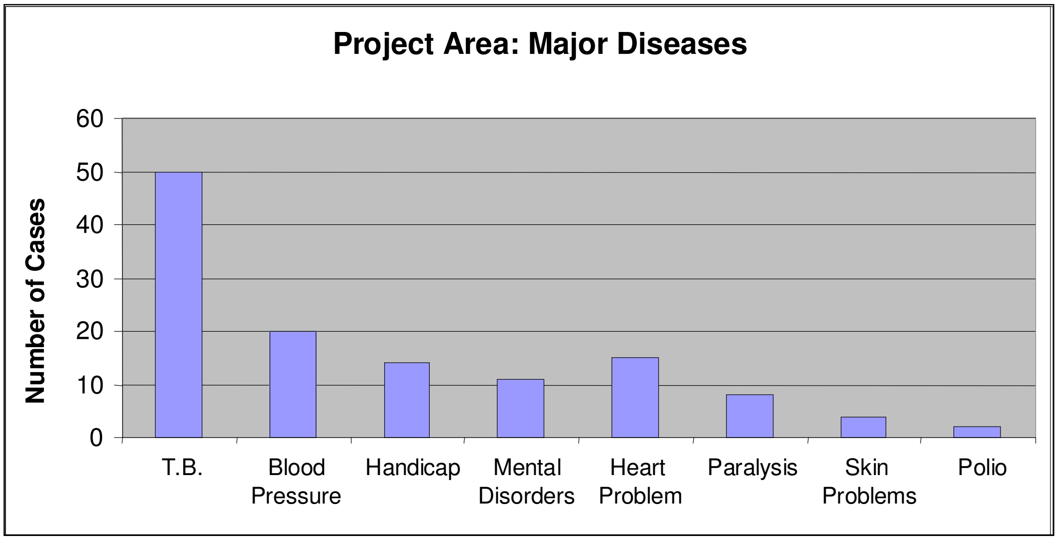
C. Tundla Detour

S. No.	Chainage	Well	Tube well	Hand pump	Religious	Temporary/permanent Structures	Others
1		4 wells	3 boaring+ 2 tube well+ 2 nal koops		19 samadhis+ 3 dev sathan+1 temple	5 houses+6 rooms+1 chabutra+1 boundary wall	5 water tanks+1 naad +1 shamshan+1 murgi tin shed farm
	Total	**4**	**7**		**23**	**13**	**8**
	Grand Total	**55**					

5.15 OTHER SOCIAL STATUS

(i) Illness: The people of the project area are suffering from different diseases. Most common diseases cited are: Tuberculosis, blood pressure, heart problems, paralysis, and skin diseases. Special care has to be taken while implementing the health care system of resettlement and rehabilitation. Most of the diseases cited are illnesses requiring long-term medications like T.B, blood pressure etc., thus incurring costs for the families and increasing the vulnerability of the population.

Figure 5-7: Illness and Diseases reported by PAPs



(ii) Migration: Information social team suggests that about 41% of the people have migrated at some point in time. About 69% of the migrants have migrated within the district. About 17% have migrated outside the district but within the same state. About 43% of the total migrants migrate in the summer season. Another 42% migrate during summer, winter and rainy seasons.

5.16.1 Sensitive stretches

The sensitive social cultural receptors viz., temples, mosque, school and hospitals and one archaeological site etc. along the existing RoW of existing railway line and proposed track are surveyed and details are present in environmental profile and strip plan. The summarized table of impacted receptors and sensitive locations are presented in**Table4.2.**

Annexure 5-1

Villagewise Detail of Trees to be cut

A. Parallel Section

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1	1200-1200/1	Firozabad	Sikohabad	**Kaurara Khurd**	595	Sisham	0.30		✓	
2						Neem	0.80		✓	
3						Neem	0.30		✓	
4						Babool	0.70		✓	
5						Babool	0.75		✓	
6	1200/9-1200/11				403	Sisham	1.40			✓
7						Babool	1.20			✓
8						Babool	0.60			✓
9						Babool	1.50			✓
10						Babool	0.70			✓
11						Babool	0.40			✓
12						Babool	0.50			✓
13						Babool	0.60			✓
14						Babool	0.50			✓
15						Babool	0.40			✓
16	1200/11-1200/13					Khajoor	1.50	✓		
17						Khajoor	1.80	✓		
18						Khajoor	1.40	✓		
19						Khajoor	1.50	✓		
20	1200/13-1200/15					Sisham	1.20	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
21						Khajoor	1.20	✔		
22						Khajoor	1.30	✔		
23		Firozabad	Sikohabad	**Kaurara Khurd**		Khajoor	1.20	✔		
24	1200/17-1200/19					Neem	1.20	✔		
25	1201/1-1201/3			**Tilyani**	312	Babool	0.40		✔	
26						Babool	0.60		✔	
27	1202/21-1202/23			**Mahadpur**	77	Mango	1.50			✔
28						Mango	1.60			✔
29						Mango	1.80			✔
30						Mango	1.80			✔
31						Mango	1.80			✔
32						Mango	1.80			✔
33						Mango	1.80			✔
34						Mango	1.90			✔
35						Mango	1.90			✔
36						Mango	1.90			✔
37						Mango	1.90			✔
38						Mango	2.00			✔
39						Mango	2.10			✔
40						Mango	2.10			✔
41						Mango	2.20			✔
42						Mango	2.20			✔
43						Mango	2.20			✔

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
44						Mango	2.20			✓
45						Mango	2.40			✓
46						Mango	2.40			✓
47						Mango	2.70			✓
48		Firozabad	Sikohabad			Mango	2.60			✓
49						Mango	2.50			✓
50						Mango	2.80			✓
51						Mango	2.80			✓
52						Mango	2.70			✓
53						Mango	2.50			✓
54						Mango	2.70			✓
55						Mango	2.30			✓
56						Mango	2.30			✓
57						Mango	1.90			✓
58						Mango	2.00			✓
59						Mango	2.40			✓
60						Jamun	1.00			✓
61				**Dargahpur Angadpur**	63	Sisham	0.80		✓	
62						Sisham	0.80		✓	
63						Sisham	0.80		✓	
64						Sisham	1.20		✓	
65						Neem	0.90		✓	
66				**Patsui Naglamir**	696	Neem	1.50		✓	
67					692	Jungli Babool	1.40		✓	
68					686	Jungli Babool	0.70		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
69						Jungli Babool	0.70		✔	
70						Jungli Babool	0.70		✔	
71		Firozabad	Sikohabad			Jungli Babool	0.70		✔	
72						Neem	0.70		✔	
73						Neem	0.70		✔	
74					684	Neem	1.00		✔	
75						Sisham	0.60		✔	
76				**Bhandari**	551	Sirsa	0.90		✔	
77						Neem	0.40		✔	
78					541	Sisham	0.60		✔	
79						Sisham	0.60		✔	
80						Sisham	0.60		✔	
81					540	Neem	1.20		✔	
82						Neem	1.20		✔	
83						Neem	0.50		✔	
84						Neem	0.50		✔	
85						Neem	0.50		✔	
86						Neem	0.50		✔	
87						Neem	1.10		✔	
88						Neem	1.10		✔	
89						Neem	0.40		✔	
90						Neem	0.40		✔	
91						Neem	0.40		✔	
92						Neem	0.40		✔	
93						Neem	0.40		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
94						Neem	0.90		✓	
95						Neem	1.50		✓	
96						Neem	1.50		✓	
97		Firozabad	Sikohabad			Neem	1.50		✓	
98						Neem	1.50		✓	
99						Neem	1.50		✓	
100						Neem	1.50		✓	
101						Sisham	0.40		✓	
102						Neem	1.70		✓	
103						Neem	1.70		✓	
104						Neem	0.60		✓	
105						Neem	1.00		✓	
106						Neem	1.00		✓	
107						Neem	1.50		✓	
108						Jungli Babool	0.60		✓	
109						Labhera	1.60		✓	
110						Labhera	1.60		✓	
111						Labhera	1.60		✓	
112						Labhera	1.60		✓	
113						Labhera	1.60		✓	
114						Neem	2.00		✓	
115						Neem	1.20		✓	
116						Neem	1.20		✓	
117						Jungli Babool	0.50	✓		
118						Jungli Babool	0.50	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
119						Jungli Babool	0.50	✔		
120						Firozabad	Sikohabad	✔		
121		Firozabad	Sikohabad			Jungli Babool	0.50	✔		
122						Neem	0.90	✔		
123	1205/11-1205/13				335	Pakar	2.50		✔	
124						Lakar	2.00		✔	
125						Lakar	2.00		✔	
126						Pipal	2.00		✔	
127						Neem	1.70		✔	
128						Pakar	1.50		✔	
129						Neem	0.90		✔	
130	1205/21-1205/23					Neem	1.20	✔		
131	1206/1-1206/3					Jungli Babool	0.80	✔		
132						Jungli Babool	0.80	✔		
133						Jungli Babool	0.80	✔		
134						Jungli Babool	0.80	✔		
135						Jungli Babool	0.80	✔		
136						Jungli Babool	0.80	✔		
137						Jungli Babool	0.80	✔		
138	1206/3-1206/5					Sisham	1.20	✔		
139						Sisham	1.20	✔		
140	1206/5-1206/7					Sisham	0.60	✔		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
141	1206/15-1206/17			**Aurangabad**		Pakar	5.50	✓		
142						Kanji	1.50	✓		
143	1206/17-1206/19					Sisham	1.60	✓		
144	1207/7-1207/9					Neem	1.20	✓		
145						Neem	1.20	✓		
146						Neem	1.20	✓		
147	1207/9-1207/11					Neem	1.60	✓		
148				**Katora Bujurg**	58	Neem	1.60		✓	
149					59	Pipal	8.00		✓	
150					60	Neem	1.00		✓	
151						Pipal	8.00		✓	
152						Babool	0.70		✓	
153					62	Neem	0.60		✓	
154						Neem	0.50		✓	
155					11	Neem	1.00		✓	
156						Neem	0.90		✓	
157						Neem	1.20		✓	
158						Mango	1.60		✓	
159						Mango	1.60		✓	
160						Mango	1.60		✓	
161						Mango	0.70		✓	
162						Neem	0.80		✓	
163						Neem	0.80		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
164		Firozabad	Sikohabad			Neem	1.20		✔	
165						Sisham	1.20		✔	
166						Neem	0.60		✔	
167						Sisham	0.70		✔	
168						Sisham	0.90		✔	
169						Neem	2.00		✔	
170	1208/3-1208/5					Neem	0.70	✔		
171						Sisham	0.50	✔		
172				**Ashua**	774	Neem	0.60		✔	
173	1208/7-1208/9					Khajoor	1.00	✔		
174					772	Sisham	0.60		✔	
175						Neem	0.90		✔	
176					771	Neem	0.60		✔	
177						Neem	0.60		✔	
178						Sisham	0.90		✔	
179						Sisham	0.90		✔	
180						Neem	0.80		✔	
181						Neem	0.80		✔	
182						Neem	0.80		✔	
183						Neem	0.80		✔	
184						Neem	0.80		✔	
185						Mango	1.40		✔	
186					769	Khajoor	0.50		✔	
187						Neem	0.90		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
188					768	Mango	1.40		✔	
189		Firozabad	Sikohabad			Kanji	1.00		✔	
190						Neem	0.60		✔	
191	1208/17-1208/19					Neem	0.70	✔		
192						Neem	0.70	✔		
193						Neem	0.70	✔		
194						Neem	0.70	✔		
195						Neem	0.70	✔		
196	1208/19-1208/21					Neem	0.80	✔		
197						Neem	0.80	✔		
198						Neem	0.80	✔		
199						Neem	0.80	✔		
200						Neem	0.80	✔		
201						Neem	0.60	✔		
202						Neem	0.60	✔		
203						Neem	0.60	✔		
204	1208/21-1208/23					Neem	0.60	✔		
205						Neem	0.60	✔		
206						Neem	0.80	✔		
207	1208/23-1208/25					Neem	0.50	✔		
208						Neem	0.50	✔		
209						Sisham	0.90	✔		
210						Sisham	0.90	✔		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
211						Sisham	0.90	✓		
212						Neem	0.50	✓		
213		Firozabad	Sikohabad			Neem	0.50	✓		
214						Neem	0.50	✓		
215						Neem	0.50	✓		
216						Neem	0.50	✓		
217						Neem	0.50	✓		
218						Neem	0.50	✓		
219						Neem	0.50	✓		
220						Neem	0.50	✓		
221						Neem	0.50	✓		
222						Neem	0.50	✓		
223						Neem	1.00	✓		
224	1208/25-1208/27					Neem	0.60	✓		
225						Neem	0.60	✓		
226						Neem	0.60	✓		
227						Neem	1.50	✓		
228	1208/27-1209					Sisham	0.60	✓		
229						Sisham	0.70	✓		
230						Neem	0.70	✓		
231					761	Neem	1.50		✓	
232						Neem	1.00		✓	
233						Kanji	0.90		✓	
234					695	Sisham	0.70		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
235	1209/1-1209/3					Mango	1.40	✓		
236						Mango	1.40	✓		
237						Mango	1.40	✓		
238		Firozabad	Sikohabad			Neem	0.70	✓		
239						Sisham	0.50	✓		
240						Sisham	0.50	✓		
241	1209/3-1209/5					Neem	0.90	✓		
242						Neem	0.50	✓		
243						Neem	1.60	✓		
244						Neem	1.00	✓		
245						Neem	1.00	✓		
246						Neem	1.00	✓		
247						Neem	1.00	✓		
248						Neem	1.00	✓		
249						Neem	1.00	✓		
250						Neem	1.00	✓		
251						Neem	1.00	✓		
252						Sisham	0.80	✓		
253					694	Mango	2.00		✓	
254						Neem	1.60		✓	
255						Neem	1.60		✓	
256						Sisham	0.70		✓	
257						Neem	0.90		✓	
258	1209/5-					Neem	0.90	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
	1209/7									
259						Sisham	0.60	✓		
260						Sisham	0.60	✓		
261					693	Neem	0.90		✓	
262						Neem	1.20		✓	
263		Firozabad	Sikohabad			Neem	1.20		✓	
264						Neem	1.20		✓	
265						Sisham	0.90		✓	
266					692	Neem	1.20		✓	
267	1209/7-1209/9					Kanji	0.60	✓		
268						Neem	0.60	✓		
269	1209/9-1209/11					Neem	0.90	✓		
270						Sisham	0.70	✓		
271						Sisham	0.70	✓		
272						Babool	1.20	✓		
273						Neem	0.50	✓		
274						Sisham	0.80	✓		
275						Neem	0.80	✓		
276						Neem	0.80	✓		
277						Neem	0.80	✓		
278						Neem	0.80	✓		
279						Neem	0.80	✓		
280						Neem	0.80	✓		
281						Neem	0.80	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
282						Neem	0.80	✓		
283						Neem	0.80	✓		
284						Neem	0.80	✓		
285						Neem	0.80	✓		
286						Neem	0.80	✓		
287						Neem	0.80	✓		
288	1209/17-1209/19	Firozabad	Sikohabad			Neem	0.80	✓		
289						Neem	0.60	✓		
290	1209/21-1209/23					Sisham	0.70	✓		
291						Sisham	0.70	✓		
292						Sisham	0.70	✓		
293	1209/23-1209/25					Neem	0.60	✓		
294	1209/25-1209/27					Neem	0.50	✓		
295	1209/25-1209/27					Neem	1.00	✓		
296						Neem	1.50	✓		
297					667	Neem	0.90		✓	
298					666	Neem	0.60		✓	
299						Neem	0.60		✓	
300						Neem	0.60		✓	
301	1210/5-1210/7					Arua	0.90	✓		
302	1210/7-1210/9					Kanji	1.80	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
303	1210/11-1210/13					Neem	1.00	✔		
304					663	Neem	1.60		✔	
305	1210/13-1210/15					Sisham	0.60	✔		
306						Neem	0.80	✔		
307						Neem	0.80	✔		
308						Neem	0.40			
309		Firozabad	Sikohabad			Babool	0.70	✔		
310	1210/17-1210/19					Neem	1.20	✔		
311	1210/17-1210/19			**Kishunpur Mohammdabad**		NIL				
312				**Nijampur Gadhuma**	106	Neem	1.40		✔	
313	1210/23-1210/25					Sisham	0.60	✔		
314	1211/11-1211/13					Kanji	1.20	✔		
315						Kanji	1.20	✔		
316					65					
317										
318				**Neeb kheriya**	217	Mango	2.20		✔	
319					216	Mango	2.80		✔	
320				**Chichamai**	299	Mango	2.20		✔	
321						Mango	2.20		✔	
322						Sisham	1.40		✔	
323						Sisham	0.90		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
324					298	Neem	0.90		✓	
325	1214/7-1214/9					Babool	0.60	✓		
326						Sisham	0.50	✓		
327						Sisham	0.50	✓		
328						Sisham	0.60	✓		
329						Sisham	0.40	✓		
330						Kanji	0.80	✓		
331	1215/5-1215/7	Firozabad	Sikohabad			Sisham	0.80	✓		
332						Sisham	0.80	✓		
333						Sisham	0.50	✓		
334	1215/7-1215/9					Sisham	0.50	✓		
335						Sisham	0.50	✓		
336						Sisham	0.50	✓		
337						Sisham	0.50	✓		
338						Sisham	0.50	✓		
339						Sisham	0.50	✓		
340						Sisham	0.50	✓		
341				**Aaronj**	619	Babool	0.60		✓	
342						Babool	1.40		✓	
343						Neem	0.60		✓	
344					620	Neem	0.80		✓	
345						Pipal	6.00		✓	
346						Babool	0.90		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
347						Neem	1.10		✓	
348						Labhera	1.40		✓	
349						Labhera	0.40		✓	
350						Labhera	0.40		✓	
351						Labhera	0.40		✓	
352	1215/21-1215/23					Neem	0.90	✓		
353						Neem	0.90	✓		
354						Neem	0.90	✓		
355						Neem	0.90	✓		
356		Firozabad	Sikohabad			Neem	0.90	✓		
357						Neem	0.90	✓		
358	1215/23-1215/25					Neem	0.60	✓		
359						Neem	0.50	✓		
360						Sisham	0.90	✓		
361	1216/3-1216/5					Babool	1.40	✓		
362				**Galamai**	108	Babool	1.20		✓	
363	1216/11-1216/13					Neem	0.70	✓		
364						Neem	0.70	✓		
365						Neem	0.40	✓		
366	1216/13-1216/15					Labhera	1.40	✓		
367						Neem	1.20	✓		
368						Babool	0.40	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
369						Neem	1.40	✓		
370						Neem	1.40	✓		
371					99	Sisham	0.70		✓	
372						Sisham	0.70		✓	
373						Sisham	0.70		✓	
374						Sisham	0.70		✓	
375					98	Babool	0.60		✓	
376						Neem	0.90		✓	
377					97	Neem	0.50		✓	
378						Mango	0.80		✓	
379	1216/19-1216/21	Firozabad	Sikohabad	**Galamai**		Neem	0.40	✓		
380						Mango	0.70	✓		
381						Neem	1.00	✓		
382						Neem	0.70	✓		
383						Neem	1.10	✓		
384						Neem	1.10	✓		
385	1216/21-1216/23					Beri	0.60	✓		
386						Labhera	0.70	✓		
387						Neem	1.10	✓		
388	1216/23-1216/25					Neem	0.90	✓		
389						Labhera	0.90	✓		
390						Neem	0.70	✓		
391						Neem	1.50	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
392	1216/25-1216/27					Neem	1.00	✓		
393						Neem	1.80	✓		
394	1217-1217/1					Neem	1.10	✓		
395						Papri	1.10	✓		
396						Neem	1.10	✓		
397	1217/7-1217/9					Neem	1.20	✓		
398	1217/9-1217/11					Neem	1.00	✓		
399						Neem	1.00	✓		
400				**Govindpur**	105	Neem	1.70		✓	
401	1218/1-1218/3	Firozabad	Sikohabad	**Ramnagar Rajpur Balai**		Sisham	0.80	✓		
402					38	Neem	0.50		✓	
403						Neem	0.60		✓	
404						Neem	0.80		✓	
405						Neem	0.80		✓	
406						Sisham	1.40		✓	
407						Neem	0.60		✓	
408						Neem	0.60		✓	
409						Neem	0.60		✓	
410	1218/7-1218/9					Neem	1.10	✓		
411						Pipal	4.00	✓		
412	1218/23-1218/25					Babool	0.80	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
413					24	Mango	1.10		✓	
414	1218/25-1218/27			**Khirthara Mohammadpur**		Neem	0.50	✓		
415						Sisham	0.70	✓		
416						Labhera	1.00	✓		
417					156	Neem	0.60		✓	
418						Neem	0.50		✓	
419						Gular	1.00		✓	
420	1219/1-1219/3					Neem	0.60	✓		
421	1219/3-1219/5					Neem	0.50	✓		
422						Neem	1.00	✓		
423					137	Neem	2.00		✓	
424		Firozabad	Sikohabad	**Khirthara Mohammadpur**		Neem	2.50		✓	
425						Neem	1.80		✓	
426						Beri	1.00		✓	
427						Babool	0.50		✓	
428						Babool	0.50		✓	
429						Neem	0.90		✓	
430						Neem	0.80		✓	
431						Neem	0.80		✓	
432						Neem	0.80		✓	
433						Neem	0.80		✓	
434						Neem	0.80		✓	
435						Babool	0.50		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
436						Babool	0.50		✔	
437						Babool	0.50		✔	
438						Babool	0.50		✔	
439						Babool	0.50		✔	
440						Babool	0.70		✔	
441				**Kishunpur Amrajat**	80	Labhera	1.40		✔	
442						Pakar	3.50		✔	
443						Neem	1.20		✔	
444						Neem	1.10		✔	
445				**Rajpur Balai**	69	Babool	1.10		✔	
446	1220/21-1220/23					Sisham	2.50	✔		
447	1220/23-1220/25					Babool	0.90	✔		
448		Firozabad	Sikohabad	**Rajpur Balai**		Bakain	0.50	✔		
449	1220/27-1221					Babool	1.40	✔		
450	1221/7-1221/9					Eucalyptus	1.70	✔		
451						Eucalyptus	2.50	✔		
452						Eucalyptus	2.50	✔		
453						Eucalyptus	2.50	✔		
454					38	Neem	2.20		✔	
455						Neem	3.00		✔	
456						Mango	0.60		✔	
457						Neem	7.00		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
458						Mango	1.80		✓	
459						Neem	1.80		✓	
460						Neem	0.90		✓	
461						Neem	0.80		✓	
462						Neem	1.70		✓	
463						Neem	0.80		✓	
464						Neem	0.80		✓	
465						Neem	0.70		✓	
466	1221/13-1221/15				37	Dry Pipal	10.00	✓		
467						Sisham	0.70	✓		
468						Neem	0.90	✓		
469						Eucalyptus	1.70	✓		
470						Eucalyptus	1.70	✓		
471						Eucalyptus	1.70	✓		
472						Eucalyptus	1.70	✓		
473		Firozabad	Sikohabad	**Rajpur Balai**		Eucalyptus	1.70	✓		
474						Eucalyptus	1.70	✓		
475						Eucalyptus	1.70	✓		
476						Eucalyptus	1.60	✓		
477						Eucalyptus	1.60	✓		
478						Eucalyptus	1.60	✓		
479					40	Kanji	0.90			✓
480	1221/15-1221/17					Neem	0.90	✓		
481						Babool	0.90	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
482						Sisham	0.50	✔		
483						Sisham	0.80	✔		
484						Sisham	0.50	✔		
485	1221/17-1221/19					Neem	0.80	✔		
486						Babool	0.60	✔		
487						Babool	0.90	✔		
488						Neem	0.40	✔		
489						Neem	1.00	✔		
490						Sisham	1.50	✔		
491						Neem	0.80	✔		
492						Neem	0.80	✔		
493						Neem	0.80	✔		
494						Neem	0.80	✔		
495						Neem	0.80	✔		
496						Neem	0.80	✔		
497						Neem	0.80	✔		
498		Firozabad	Sikohabad			Neem	0.80	✔		
499					41	Kanji	0.80		✔	
500						Kanji	0.80		✔	
501						Babool	0.90		✔	
502						Neem	0.70		✔	
503						Neem	0.70		✔	
504						Neem	0.70		✔	
505						Neem	0.70		✔	
506						Neem	0.70		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
507						Neem	0.70		✓	
508	1221/19-1221/21			**Jijoli**		Neem	0.80	✓		
509						Sisham	0.40	✓		
510						Dry Sisham	1.60	✓		
511	1221/21-1221/23					Sisham	1.10	✓		
512						Dry Sisham	1.10	✓		
513						Sisham	1.70	✓		
514						Eucalyptus	1.20	✓		
515					159	Babool	0.90		✓	
516	1221/23-1221/25					Sisham	1.70	✓		
517						Eucalyptus	1.70	✓		
518						Sisham	2.10	✓		
519						Sisham	2.10	✓		
520						Kanji	0.80	✓		
521						Kanji	0.80	✓		
522						Labhera	0.80	✓		
523	1221/25-1221/27	Firozabad	Sikohabad			Sisham	1.00	✓		
524						Dry tree	1.50	✓		
525	1221/27-1221/29					Sisham	1.30	✓		
526						Sisham	2.50	✓		
527						Kanji	1.80	✓		
528						Sisham	1.10	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
529	1221/29-1221/31					Sisham	1.20	✓		
530						Sisham	1.20	✓		
531						Sisham	1.20	✓		
532						Kanji	1.50	✓		
533						Babool	1.80	✓		
534						Eucalyptus	1.50	✓		
535						Eucalyptus	1.50	✓		
536						Eucalyptus	2.00	✓		
537	1221/31-1222					Eucalyptus	1.60	✓		
538						Eucalyptus	1.60	✓		
539						Eucalyptus	1.60	✓		
540						Eucalyptus	1.60	✓		
541						Eucalyptus	1.60	✓		
542						Eucalyptus	2.50	✓		
543						Neem	1.10	✓		
544						Pipal	3.50	✓		
545					134	Pipal	2.50		✓	
546						Pipal	1.00		✓	
547	1222/7-1222/9	Firozabad	Sikohabad			Sisham	0.80	✓		
548						Sisham	0.80	✓		
549	1222/13-1222/15					Eucalyptus	1.20	✓		
550						Sisham	1.40	✓		
551						Sisham	1.30	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
552	1222/17-1222/19					Neem	1.30	✓		
553						Neem	0.70	✓		
554	1222/19-1222/21					Babool	0.50	✓		
555					129	Neem	0.90		✓	
556						Babool	0.90		✓	
557						Babool	1.40		✓	
558						Neem	0.60		✓	
559						Neem	0.60		✓	
560						Neem	0.60		✓	
561						Neem	0.60		✓	
562						Neem	0.60		✓	
563						Neem	0.60		✓	
564						Neem	0.60		✓	
565						Neem	0.60		✓	
566						Neem	0.60		✓	
567						Neem	0.60		✓	
568						Neem	0.60		✓	
569						Neem	0.60		✓	
570						Neem	0.60		✓	
571	1222/21-1222/23	Firozabad	Sikohabad			Neem	0.60	✓		
572	1222/31-1222/33					Sisham	2.50	✓		
573						Sisham	1.40	✓		
574				**Vijaypur Nagla**	296	Babool	0.90		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
				Bhav Singh						
575						Babool	0.60		✓	
576						Babool	0.60		✓	
577						Neem	0.70		✓	
578						Neem	0.50		✓	
579						Sisham	0.60		✓	
580					288	Babool	1.10		✓	
581					287	Neem	1.10		✓	
582					282	Neem	0.90		✓	
583					280	Babool	1.00		✓	
584						Neem	0.80		✓	
585						Neem	0.80		✓	
586						Neem	1.50		✓	
587						Neem	1.50		✓	
588						Bel	1.80		✓	
589	1223/13-1223/15					Eucalyptus	1.50	✓		
590						Eucalyptus	1.50	✓		
591					279	Neem	1.50		✓	
592						Neem	1.50		✓	
593						Neem	1.50		✓	
594						Neem	1.50		✓	
595		Firozabad	Sikohabad			Neem	1.50		✓	
596					278	Neem	1.50		✓	
597						Neem	1.50		✓	
598						Neem	0.90		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
599	1223/15-1223/17					Sisham	2.00	✓		
600					255	Neem	3.30		✓	
601						Kanji	2.50		✓	
602	1223/17-1223/19					Neem	2.20	✓		
603						Sisham	1.60	✓		
604						Neem	1.40	✓		
605						Kanji	1.70	✓		
606						Neem	1.00	✓		
607						Neem	0.90	✓		
608	1223/19-1223/21					Neem	1.10	✓		
609						Neem	1.10	✓		
610						Neem	1.10	✓		
611						Neem	1.10	✓		
612						Neem	1.10	✓		
613						Neem	1.10	✓		
614						Neem	1.10	✓		
615						Neem	1.10	✓		
616	1223/21-1223/23					Neem	1.50	✓		
617						Neem	1.50	✓		
618						Kanji	1.40	✓		
619		Firozabad	Sikohabad			Neem	1.50	✓		
620						Neem	0.50	✓		
621						Neem	0.90	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
622						Neem	0.90	✓		
623						Neem	1.10	✓		
624						Neem	0.60	✓		
625						Neem	0.60	✓		
626						Neem	1.30	✓		
627						Neem	0.90	✓		
628						Neem	1.10	✓		
629						Neem	1.50	✓		
630	1223/23-1223/25					Neem	1.80	✓		
631					246	Neem	0.90		✓	
632						Neem	1.60		✓	
633	1234/7-1234/9			**Vajidpur Kutubpur**		Chilbil	1.30	✓		
634						Neem	1.10	✓		
635	1234/11-1234/13					Babool	0.45	✓		
636						Babool	0.60	✓		
637					15	Beri	0.40		✓	
638	1234/23-1234/25			**Rupashpur**		Khajoor	1.00	✓		
639	1234/27-1235					Neem	2.00	✓		
640						Sisham	0.40	✓		
641					28	Sisham	0.70			✓
642	1235/9-1235/11			**Aalampur Jarkhi**	227	Babool	0.70		✓	
643						Babool	0.80		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
644						Babool	0.80		✓	
645						Babool	0.60			
646					220	Babool	0.40		✓	
647						Babool	0.35		✓	
648						Babool	0.40		✓	
649						Babool	0.40		✓	
650						Babool	0.40		✓	
651						Babool	0.35		✓	
652	1235/19-1235/21					Neem	0.50	✓		
653						Papri	0.54	✓		
654	1235/21-1235/23					Neem	1.00	✓		
655						Neem	0.80	✓		
656						Neem	1.80	✓		
657					219	Babool	0.60		✓	
658	1235/23-1235/27					Babool	0.40	✓		
659						Babool	0.40	✓		
660						Babool	0.40	✓		
661						Babool	0.80	✓		
662						Neem	0.44	✓		
663						Neem	0.60	✓		
664						Neem	0.65	✓		
665						Neem	0.40	✓		
666						Neem	0.52	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
667						Neem	1.00	✓		
668						Neem	1.00	✓		
669						Neem	0.90	✓		
670						Neem	0.85	✓		
671						Neem	1.65	✓		
672						Neem	0.90	✓		
673						Papri	1.10	✓		
674						Papri	0.40	✓		
675						Jamun	0.40	✓		
676						Sahtoot	1.00	✓		
677						Pakar	1.60	✓		
678					200	Neem	1.45		✓	
679						Babool	0.40		✓	
680	1235/27-1236					Chilbil	0.90	✓		
681	1236/1-1236/3					Babool	0.80	✓		
682						Neem	0.60	✓		
683						Neem	1.00	✓		
684						Neem	1.50	✓		
685						Neem	1.70	✓		
686						Neem	1.40	✓		
687	1236/5-1236/7					Neem	0.90	✓		
688						Neem	0.50	✓		
689						Neem	1.10	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
690						Neem	0.40	✓		
691						Neem	0.60	✓		
692						Neem	0.90	✓		
693						Neem	0.50	✓		
694						Neem	0.55	✓		
695						Chilbil	0.80	✓		
696						Chilbil	1.05	✓		
697						Chilbil	0.95	✓		
698	1236/7-1236/9					Neem	0.40	✓		
699						Neem	0.55	✓		
700						Neem	1.70	✓		
701						Babool	0.50	✓		
702	1236/11-1236/13					Neem	0.45	✓		
703						Neem	0.60	✓		
704						Neem	0.55	✓		
705	1236/17-1236/19					Lasohar	0.65	✓		
706						Lasohar	1.20	✓		
707						Neem	0.40	✓		
708						Neem	0.35	✓		
709						Neem	1.10	✓		
710						Neem	0.90	✓		
711						Neem	0.55	✓		
712						Neem	0.62	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
713						Neem	0.35	✓		
714						Neem	0.90	✓		
715						Neem	0.80	✓		
716				**Jalopura**						
717				**Daragpur**	25	Babool	0.45			✓
718						Babool	0.30			✓
719	1237/5-1237/7					Neem	0.50	✓		
720						Neem	0.55	✓		
721						Neem	0.60	✓		
722						Neem	0.40	✓		
723						Neem	0.40	✓		
724						Babool	0.30	✓		
725						Sisham	0.60	✓		
726	1237/7-1237/9					Neem	0.70	✓		
727						Neem	0.80	✓		
728						Neem	0.85	✓		
729						Neem	0.40	✓		
730						Papri	0.45	✓		
731						Papri	0.40	✓		
732						Imli	0.80	✓		
733	1237/11-1237/13					Neem	1.00	✓		
734						Neem	0.90	✓		
735						Neem	0.85	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
736						Neem	0.70	✓		
737						Neem	0.30	✓		
738						Babool	0.40	✓		
739	1237/13-1237/15					Neem	0.60	✓		
740					49	Babool	0.50			
741	1237/17-1237/19					Neem	0.60	✓		
742						Neem	0.65	✓		
743						Neem	0.90	✓		
744						Neem	0.45	✓		
745						Papri	0.40	✓		
746						Imli	0.45	✓		
747	1237/21-1237/23			**Jarauli Khurd**		Babool	0.35	✓		
748						Babool	0.45	✓		
749	1237/25-1237/27					Neem	0.55	✓		
750	1238-1238/1					Neem	1.00	✓		
751					31	Neem	0.40		✓	
752						Babool	0.45		✓	
753						Babool	1.00		✓	
754					140	Mango	1.00		✓	
755						Mango	1.10		✓	
756	1238/5-1238/7					Khajoor	1.10	✓		
757	1238/9-					Urua	2.00	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
	1238/11									
758						Neem	0.60	✓		
759	1238/17-1238/19					Babool	0.35	✓		
760	1238/21-1238/23					Eucalyptus	1.90	✓		
761						Eucalyptus	1.40	✓		
762	1238/23-1238/25					Eucalyptus	2.00	✓		
763	1238/25-1238/27			**Hirango**		Eucalyptus	1.80	✓		
764					39	Babool	0.45		✓	
765						Babool	0.42		✓	
766						Neem	0.55		✓	
767						Neem	0.45		✓	
768	1239/5-1239/7					Sisham	0.60	✓		
769	1239/15-1239/17					Babool	0.30	✓		
770						Chilbil	1.10	✓		
771						Chilbil	0.90	✓		
772						Chilbil	0.85	✓		
773						Chilbil	0.45	✓		
774						Chilbil	1.00	✓		
775						Chilbil	1.00	✓		
776						Chilbil	0.40	✓		
777						Neem	0.90	✓		
778						Neem	1.00	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
779	1239/17-1239/19			**Khemkaranpur**		Babool	0.30	✓		
780			**Tundla**	**Latifpur**	202	Neem	0.30		✓	
781						Neem	0.35		✓	
782						Neem	0.60		✓	
783					117	Babool	0.90		✓	
784						Babool	0.90		✓	
785						Babool	0.30		✓	
786						Babool	0.60		✓	
787						Babool	0.60		✓	
788						Babool	0.60		✓	
789						Babool	0.60		✓	
790						Babool	0.60		✓	
791						Neem	0.80		✓	
792						Neem	0.50		✓	
793						Neem	0.50		✓	
794						Imli	1.00		✓	
795						Neem	0.50		✓	
796						Pipal	2.60		✓	
797						Babool	0.50		✓	
798						Babool	0.70		✓	
799						Babool	0.40		✓	
800						Babool	0.30		✓	
801						Neem	0.30		✓	
802						Neem	0.50		✓	
803						Babool	0.50		✓	

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Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
804						Neem	1.00		✓	
805						Neem	1.50		✓	
806						Neem	0.50		✓	
807						Neem	0.60		✓	
808					116	Neem	1.30		✓	
809						Neem	1.30		✓	
810						Neem	1.40		✓	
811					114	Neem	1.40		✓	
812					112	Sisham	1.30		✓	
813	1242/1-1242/3					Babool	0.50	✓		
814					74	Pipal	3.00			✓
815						Pipal	2.00			✓
816						Pipal	1.80			✓
817	1242/11-1242/13					Papri	0.90	✓		
818						Papri	0.35	✓		
819					38	Babool	1.00		✓	
820				**Bankat**	287	Babool	1.50		✓	
821	1243/3-1243/5					Sisham	0.35	✓		
822						Sisham	0.30	✓		
823	1243/9-1243/11					Chilbil	1.50	✓		
824	1243/11-1243/13					Neem	1.00	✓		
825					291	Neem	2.00		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
826						Pipal	1.85		✓	
827					181	Neem	1.60		✓	
828	1243/23-1243/25					Sisham	1.00	✓		
829					185	Babool	0.60		✓	
830						Neem	0.70		✓	
831						Neem	1.00		✓	
832	1244/3-1244/5					Lasohar	1.00	✓		
833					186	Babool	0.40		✓	
834						Neem	1.00		✓	
835						Neem	0.85		✓	
836	1244/5-1244/7					Chilbil	0.50	✓		
837					188	Sisham	1.00		✓	
838					28	Neem	0.70		✓	
839						Neem	0.85		✓	
840				**Rampur**	1	Babool	0.50		✓	
841				**Hemrajpur**	150	Babool	1.30		✓	
842					89	Babool	1.00		✓	
843	1254/25-27	Firozabad	Tundla	**Nagla Punu**	34	Neem	0.85	✓		
844						Neem	0.90	✓		
845						Neem	0.80	✓		
846						Neem	1.85	✓		
847						Neem	1.80	✓		
848						Neem	0.80	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
849						Shisham	1.10	✓		
850						Shisham	1.00	✓		
851						Shisham	1.70	✓		
852						Shisham	0.90	✓		
853						Shisham	1.00	✓		
854						Shisham	0.90	✓		
855						Babool	1.30	✓		
856						Mol Shri	0.90	✓		
857						Babool	1.05	✓		
858						Kanji	0.85	✓		
859						Kanji	0.90	✓		
860						Kanji	0.80	✓		
861										
862	1254/33	Agra	Etmadpur	**Rasulpur**	111	Mol Shri	1.00	✓		
863						Mol Shri	1.00	✓		
864						Mol Shri	1.05	✓		
865						Mol Shri	1.15	✓		
866						Mol Shri	1.20	✓		
867						Mol Shri	1.50	✓		
868						Mol Shri	1.05	✓	✓	
869					53	Neem	1.10		✓	
870						Chandi	1.20		✓	
871						Neem	1.30		✓	
872						Neem	1.10		✓	
873					113	Neem	0.80	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
874						Vilayati Babol	0.85	✓		
875						Vilayati Babol	1.30	✓		
876						Vilayati Babol	0.90	✓		
877						Desi Babol	0.80	✓		
878						Vilayati Babol	1.30	✓		
879						Vilayati Babol	0.85	✓		
880						Vilayati Babol	1.10	✓		
881						Desi Babol	1.10	✓		
882						Neem	0.80	✓		
883						Neem	1.45	✓		
884						Neem	0.80	✓		
885						Chandi	0.60	✓		
886						Neem	1.00	✓		
887						Neem	0.80	✓		
888						Neem	0.60	✓		
889						Neem	0.95	✓		
890						Neem	1.00	✓		
891						Neem	0.90	✓		
892						Neem	1.30	✓		
893						Shisham	0.90	✓		
894						Babool	1.20	✓		
895						Desi Babol	1.55	✓		
896						Papri	1.10	✓		
897						Neem	1.00	✓		
898						Neem	0.90	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
899						Neem	0.95	✔		
900						Neem	1.00	✔		
901						Desi Babol	0.95	✔		
902						Neem	0.60	✔		
903						Papri	0.80	✔		
904						Papri	0.80	✔		
905						Neem	1.10	✔		
906						Neem	1.00	✔		
907						Neem	1.00	✔		
908						Neem	1.80	✔		
909						Desi Babol	0.70	✔		
910						Kanji	0.50	✔		
911						Neem	1.20	✔		
912						Kanji	0.60	✔		
913						Ashok	0.50	✔		
914						Ashok	0.40	✔		
915						Neem	1.20	✔		
916						Mol Shri	1.00	✔		
917						Neem	1.20	✔		
918						Neem	1.20	✔		
919						Neem	0.90	✔		
920						Mol Shri	0.90	✔		
921						Mol Shri	0.70	✔		
922						Neem	1.00	✔		
923						Neem	1.00	✔		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
924						Neem	1.40	✓		
925						Mol Shri	0.90	✓		
926						Desi Babol	1.00	✓		
927					36	Chandi	1.00			✓
928						Chandi	0.90			✓
929						Neem	1.00	✓		
930						Neem	1.10	✓		
931						Neem	0.80	✓		
932						Desi Babol	0.40	✓		
933						Shisham	0.70	✓		
934						Shisham	0.70	✓		
935						Shisham	0.60	✓		
936						Shisham	0.40	✓		
937						Shisham	0.40	✓		
938						Shisham	0.75	✓		
939						Neem	1.20	✓		
940						Shisham	0.70	✓		
941						Neem	0.60	✓		
942						Neem	0.80	✓		
943						Shisham	1.20	✓		
944						Neem	0.80	✓		
945						Shahtut	0.90	✓		
946						Neem	0.70	✓		
947						Neem	1.40	✓		
948						Neem	0.75	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
949						Pipal	3.20	✓		
950						Bunch of Babboo		✓		
951						Neem	0.80	✓		
952						Shisham	2.20	✓		
953						Shisham	0.60	✓		
954					58	Mango	0.90		✓	
955						Mango	0.70		✓	
956						Mango	0.65		✓	
957						Mango	0.75		✓	
958						Neem	1.00		✓	
959					59	Papri	0.85		✓	
960						Papri	0.90		✓	
961						Papri	1.00		✓	
962						Pipal	0.60		✓	
963						Neem	0.40		✓	
964						Papri	1.20		✓	
965						Papri	1.00	✓	✓	
966	1256/23-25			**Mitawali**	595	Desi Babol	1.10	✓		
967						Desi Babol	1.00	✓		
968						Desi Babol	1.00	✓		
969						Desi Babol	1.20	✓		
970						Shisham	0.50	✓		
971						Papri	0.50	✓		
972						Desi Babol	0.45	✓		
973						Neem	0.60	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
974						Neem	0.80	✓		
975						Neem	0.70	✓		
976						Ber	1.00	✓		
977						Neem	0.90	✓		
978						Siras	0.80	✓		
979						Neem	0.70	✓		
980						Neem	0.90	✓		
981						Papri	0.40	✓		
982						Desi Babol	0.70	✓		
983						Shisham	0.30	✓		
984						Desi Babol	0.70	✓		
985						Papri	0.90	✓		
986						Papri	1.20	✓		
987						Shisham	0.40	✓		
988						Papri	0.40	✓		
989						Neem	1.10	✓		
990						Desi Babol	0.90	✓		
991						Desi Babol	0.80	✓		
992						Labhera	1.00	✓		
993						Neem	1.20	✓		
994						Shisham	0.40	✓		
995						Shisham	0.80	✓		
996						Shisham	0.90	✓		
997						Mol Shri	1.20	✓		
998						Neem	0.75	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
999						Neem	0.80	✓		
1000						Desi Babol	1.10	✓		
1001						Desi Babol	1.20	✓		
1002						Desi Babol	0.90	✓		
1003						Babool	1.30	✓		
1004						Babool	1.10	✓		
1005						Vilayati Babol	0.80	✓		
1006						Desi Babol	0.80	✓		
1007						Desi Babol	1.30	✓		
1008						Desi Babol	1.20	✓		
1009						Desi Babol	0.90	✓		
1010						Desi Babol	0.80	✓		
1011						Desi Babol	0.80	✓		
1012					587	Desi Babol	0.50		✓	
1013						Desi Babol	0.90		✓	
1014						Desi Babol	0.70		✓	
1015					594	Neem	1.20		✓	
1016						Neem	1.50		✓	
1017						Neem	1.30		✓	
1018					533	Desi Babol	0.90		✓	
1019					532	Desi Babol	0.55		✓	
1020						Desi Babol	0.60		✓	
1021						Desi Babol	0.55		✓	
1022						Desi Babol	0.40		✓	
1023					162	Neem	1.30		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1024	1259/23-1259/25	Agra	Etmadpur	**Nagla Gole**		Babool	1.00	✓		
1025					167	Babool	0.90		✓	
1026						Babool	1.50		✓	
1027						Babool	0.50		✓	
1028						Babool	1.50		✓	
1029						Babool	1.00		✓	
1030	1260/27-1260/29					Neem	0.80	✓		
1031					155	Neem	1.00		✓	
1032						Neem	1.00		✓	
1033						Neem	1.00		✓	
1034					133	Sisham	1.00		✓	
1035						Babool	0.90		✓	
1036						Papri	0.60		✓	
1037					55	Papri	0.90		✓	
1038						Papri	0.80		✓	
1039						Babool	1.50		✓	
1040						Babool	1.00		✓	
1041					56	Neem	0.50		✓	
1042	1261/3-1261/5					Mango	0.80	✓		
1043						Sisham	0.50	✓		
1044					57	Papri	2.00		✓	
1045						Papri	1.50		✓	
1046						Papri	1.00		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1047					58	Mango	0.90		✓	
1048						Mango	0.70		✓	
1049						Mango	0.65		✓	
1050						Mango	0.75		✓	
1051						Neem	1.00		✓	
1052					59	Papri	0.85		✓	
1053						Papri	0.90		✓	
1054						Papri	1.00		✓	
1055						Pipal	0.60		✓	
1056						Neem	0.40		✓	
1057						Papri	1.20		✓	
1058						Papri	1.00	✓	✓	
1059	1261/9-1261/11					Babool	1.00	✓		
1060						Babool	1.00	✓		
1061						Babool	0.80	✓		
1062						Babool	0.80	✓		
1063						Babool	2.00	✓		
1064						Neem	0.60	✓		
1065						Neem	1.00	✓		
1066						Neem	0.90	✓		
1067						Babool	0.30	✓		
1068						Babool	1.00	✓		
1069						Babool	1.00	✓		
1070						Babool	1.00	✓		
1071	1261/13-					Babool	0.60	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
	1261/15									
1072						Babool	0.70	✓		
1073						Neem	0.60	✓		
1074						Neem	0.65	✓		
1075					63	Neem	1.00		✓	
1076						Neem	0.70		✓	
1077						Neem	0.80		✓	
1078						Neem	0.60		✓	
1079						Neem	0.65		✓	
1080						Neem	0.50		✓	
1081						Babool	1.00		✓	
1082					64	Babool	0.40		✓	
1083						Babool	0.30		✓	
1084						Babool	0.30		✓	
1085						Pipal	0.70		✓	
1086					66	Neem	0.70		✓	
1087						Neem	0.60		✓	
1088						Neem	0.50		✓	
1089						Beri	0.60		✓	
1090						Babool	1.00		✓	
1091						Babool	1.00		✓	
1092						Babool	1.20		✓	
1093						Babool	0.90		✓	
1094						Papri	1.00		✓	
1095						Papri	1.00		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1096						Papri	0.90		✔	
1097						Papri	0.80		✔	
1098						Papri	0.70		✔	
1099						Papri	0.40		✔	
1100						Gular	1.30		✔	
1101						Pipal	1.30		✔	
1102	1261/23-1261/25					Neem	1.00	✔		
1103						Chilbil	1.00	✔		
1104						Chul	0.40	✔		
1105						Chilbil	0.60	✔		
1106						Pipal	0.85	✔		
1107						Chilbil	1.00	✔		
1108						Babool	0.60	✔		
1109					12	Pipal	3.00		✔	
1110	1265/11-1265/13			**Barhan**	1187	Neem	2.00		✔	
1111						Neem	1.00		✔	
1112						Neem	0.45		✔	
1113						Neem	0.60		✔	
1114						Neem	0.60		✔	
1115						Mango	0.80		✔	
1116						Mango	0.95		✔	
1117						Mango	0.50		✔	
1118						Mango	0.75		✔	
1119						Chilbil	1.50	✔		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1120						Lasohar	1.20	✓		
1121						Sirsa	0.90	✓		
1122						Chilbil	1.00	✓		
1123					1174	Neem	0.70		✓	
1124						Neem	0.70		✓	
1125						Neem	1.00		✓	
1126						Neem	0.40		✓	
1127						Neem	0.80		✓	
1128						Mango	0.40		✓	
1129	1265/13-1265/15					Neem	0.90	✓		
1130						Neem	1.00	✓		
1131	1266/11-1266/13			**Biruni**		Neem	0.80	✓		
1132					306	Babool	0.60		✓	
1133	1266/19-1266/21					Babool	0.85	✓		
1134						Babool	0.40	✓		
1135						Neem	0.40	✓		
1136						Neem	1.20	✓		
1137						Neem	1.00	✓		
1138						Neem	1.50	✓		
1139						Neem	1.50	✓		
1140						Gular	1.00	✓		
1141						Gular	0.60	✓		
1142	1266/23-1266/25					Babool	0.40	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1143	1266/25-1266/27					Babool	0.90	✓		
1144	1266/27-1266/29					Neem	0.50	✓		
1145						Babool	0.80	✓		
1146	1266/29-1266/31					Babool	0.80	✓		
1147	1266/31-1267					Labhera	0.70	✓		
1148	1267/3-1267/5					Neem	0.40	✓		
1149						Neem	0.60	✓		
1150						Neem	0.70	✓		
1151	1267/5-1267/7					Babool	0.35	✓		
1152						Babool	0.50	✓		
1153						Babool	0.50	✓		
1154						Babool	0.50	✓		
1155					290	Neem	1.00		✓	
1156						Babool	0.70		✓	
1157						Babool	0.70		✓	
1158						Neem	0.70		✓	
1159						Neem	0.70		✓	
1160					73	Babool	0.50		✓	
1161						Babool	0.50		✓	
1162						Babool	0.50		✓	
1163						Babool	0.50		✓	
1164						Sisham	0.60		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1165						Neem	1.20			✓
1166					72	Mango	0.80			✓
1167						Mango	1.00			✓
1168						Mango	0.80			✓
1169						Mango	1.00			✓
1170	1267/7-1267/9					Babool	0.50	✓		
1171						Babool	0.50	✓		
1172						Babool	0.50	✓		
1173						Neem	0.50	✓		
1174					71	Babool	0.40		✓	
1175	1267/7-1267/9					Babool	0.60	✓		
1176					66	Babool	0.70		✓	
1177						Babool	0.70		✓	
1178	1267/15-1267/17					Babool	0.80	✓		
1179	1267/25-1267/27			**Jamalnagar Bhais**		Mango	1.20	✓		
1180						Mango	1.20	✓		
1181						Mango	1.20	✓		
1182						Mango	1.20	✓		
1183						Sisham	0.60	✓		
1184	1267/27-1267/29					Mango	1.20	✓		
1185						Mango	1.20	✓		
1186						Mango	1.20	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1187						Mango	1.20	✓		
1188						Mango	1.20	✓		
1189						Mango	1.20	✓		
1190	1267/29-1267/31					Mango	1.20	✓		
1191						Mango	1.20	✓		
1192						Mango	1.20	✓		
1193						Mango	1.20	✓		
1194	1267/31-1268/1					Neem	0.60	✓		
1195						Sisham	0.60	✓		
1196	1268/7-1268/9					Babool	0.60	✓		
1197						Kanji	0.70	✓		
1198	1268/9-1268/11					Neem	0.70	✓		
1199						Kanji	0.90	✓		
1200	1268/11-1268/13					Kanji	0.70	✓		
1201						Neem	0.60	✓		
1202						Neem	0.90	✓		
1203						Neem	0.70	✓		
1204						Neem	0.70	✓		
1205						Sisham	0.70	✓		
1206	1268/13-1268/15					Neem	1.00	✓		
1207						Sagon	1.20	✓		
1208						Gular	0.90	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1209	1268/15-1268/17					Ashok	0.80	✓		
1210						Mango	3.00	✓		
1211						Labhera	1.00	✓		
1212					238	Babool	1.00		✓	
1213	1269/17-1269/21					Neem	0.90	✓		
1214						Neem	0.80	✓		
1215						Neem	0.80	✓		
1216					312	Neem	0.70		✓	
1217	1269/19-1269/21					Neem	0.90	✓		
1218	1269/21-1269/23					Babool	0.40	✓		
1219						Babool	0.40	✓		
1220						Neem	0.80	✓		
1221					308	Neem	0.60		✓	
1222						Neem	0.60		✓	
1223						Neem	0.60		✓	
1224						Neem	0.60		✓	
1225						Neem	0.60		✓	
1226						Neem	0.60		✓	
1227						Neem	0.60		✓	
1228						Neem	0.60		✓	
1229						Neem	0.60		✓	
1230	1270/3-1270/5					Babool	0.60	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1231						Babool	0.90	✓		
1232						Babool	0.90	✓		
1233						Babool	0.90	✓		
1234						Babool	0.60	✓		
1235						Babool	0.60	✓		
1236						Babool	0.60	✓		
1237						Babool	0.60	✓		
1238						Babool	0.60	✓		
1239						Babool	0.60	✓		
1240						Babool	0.70	✓		
1241						Babool	0.70	✓		
1242						Babool	0.70	✓		
1243						Babool	0.70	✓		
1244						Babool	0.70	✓		
1245						Babool	0.70	✓		
1246						Babool	0.70	✓		
1247						Babool	0.70	✓		
1248						Babool	0.70	✓		
1249						Babool	0.70	✓		
1250						Babool	0.90	✓		
1251						Neem	0.90	✓		
1252	1270/7-1270/9			**Jampur**		Babool	0.70	✓		
1253						Babool	0.40	✓		
1254	1270/9-1270/11					Babool	0.50	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1255						Babool	1.00	✔		
1256						Neem	0.50	✔		
1257						Neem	0.70	✔		
1258						Neem	1.00	✔		
1259						Neem	1.50	✔		
1260	1270/11-1270/13				95					
1261	1270/23-1270/25					Neem	0.80	✔		
1262						Neem	0.70	✔		
1263						Neem	0.50	✔		
1264						Neem	0.60	✔		
1265	1270/25-1270/27					Neem	0.50	✔		
1266						Neem	0.80	✔		
1267						Neem	0.70	✔		
1268						Neem	0.50	✔		
1269						Neem	0.60	✔		
1270	1270/27-1270/29					Neem	0.60	✔		
1271						Neem	0.60	✔		
1272						Neem	0.60	✔		
1273	1270/29-1270/31					Neem	0.50	✔		
1274						Neem	0.50	✔		
1275						Neem	0.50	✔		
1276						Neem	0.50	✔		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1277						Neem	0.50	✓		
1278						Neem	0.50	✓		
1279						Neem	0.50	✓		
1280						Neem	0.50	✓		
1281	1270/31-1270/33					Neem	0.60	✓		
1282						Neem	0.50	✓		
1283						Neem	0.50	✓		
1284						Neem	0.50	✓		
1285						Neem	0.50	✓		
1286						Neem	0.50	✓		
1287						Neem	0.50	✓		
1288						Neem	0.50	✓		
1289						Neem	0.50	✓		
1290	1270/33-1271/1					Neem	0.40	✓		
1291						Neem	0.40	✓		
1292						Neem	0.40	✓		
1293						Neem	0.40	✓		
1294						Neem	0.40	✓		
1295						Neem	0.60	✓		
1296						Neem	0.90	✓		
1297						Neem	0.90	✓		
1298	1271/1-1271/3					Sahtoot	0.40	✓		
1299						Neem	0.50	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1300						Neem	0.50	✓		
1301						Neem	0.70	✓		
1302					23	Neem	0.60		✓	
1303						Neem	0.60		✓	
1304						Neem	0.60		✓	
1305						Neem	0.60		✓	

B. Firozabad Detour

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1	1224/1-3	Firozabad	Firozabad	**Dokeli**	114	Shisham	0.90		✓	
2						Neem	1.10		✓	
3						Neem	1.10		✓	
4						Neem	1.20		✓	
5					101	Neem	1.20		✓	
6						Neem	0.90		✓	
7						Neem	0.90		✓	
8						Bel	1.10		✓	
9						Bel	1.10		✓	
10						Bel	1.10		✓	
11					100	Neem	1.20		✓	
12						Neem	1.20		✓	
13						Neem	0.80		✓	
14						Neem	1.10		✓	
15						Bel	0.80		✓	
16						Bel	0.80		✓	
17						Bel	0.70		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
18					99	Bel	0.70		✔	
19						Neem	0.40		✔	
20						Neem	0.70		✔	
21					98	Neem	1.30		✔	
22					172	Gular	2.40		✔	
23						Shisham	0.60		✔	
24						Shisham	0.60		✔	
25						Bunch of Bamboo	50 Nos		✔	
26						Babool	1.20		✔	
27						Neem	0.50		✔	
28						Neem	0.40		✔	
29						Neem	0.40		✔	
30						Neem	0.40		✔	
31					94	Mango	2.50		✔	
32					136	30 Guava	0.30		✔	
33					379	Neem	1.00		✔	
34						Neem	0.75		✔	
35					382	Labhera	1.50		✔	
36	2/250			**Rashidpur Kaneta**	604	21 Sagon	0.20		✔	
37					592	11 Sagon	0.20		✔	
38					516	Beri	0.30		✔	
39					658	Babool	1.50		✔	
40						Neem	0.40		✔	
41	3/200			**Jamalpur**	16	Mango	2.60		✔	
42						Mango	2.30		✔	
43						Mango	2.80		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
44						Mango	1.50		✔	
45						Mango	1.80		✔	
46					15	Babool	1.00		✔	
47					14	Jamun	1.10		✔	
48					10	Neem	1.00		✔	
49					7	Neem	1.40		✔	
50					25	Neem	0.40		✔	
51						Babool	1.00		✔	
52						Neem	0.40		✔	
53						Labhera	0.50		✔	
54						Neem	0.90		✔	
55					35	Neem	1.00		✔	
56						Neem	0.70		✔	
57						Shisham	0.40		✔	
58						Chilla	0.80		✔	
59						Mango	0.70		✔	
60						Neem	0.60		✔	
61						Neem	0.90		✔	
62					76	Gold Mohar	1.30		✔	
63						Neem	0.90		✔	
64						Neem	1.20		✔	
65						Neem	0.40		✔	
66						Neem	0.40		✔	
67						Neem	0.60		✔	
68						Labhera	0.40		✔	
69						Beri	0.30		✔	
70				**Gazipur**	165	Beri	0.45		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
71						Shisham	0.40		✓	
72						Neem	0.35		✓	
73						Chilla	0.60		✓	
74					164	Chilla	0.40		✓	
75						Neem	0.80		✓	
76						Beri	1.00		✓	
77						Neem	0.80		✓	
78					88	Neem	0.60		✓	
79						Neem	1.20		✓	
80						Neem	0.70		✓	
81						Neem	1.00		✓	
82						Neem	1.00		✓	
83						Papri	0.60		✓	
84						Neem	1.20		✓	
85						Mango	2.10		✓	
86						Neem	0.50		✓	
87						Neem	0.80		✓	
88						Neem	1.00		✓	
89						Papri	0.50		✓	
90						Neem	0.60		✓	
91						Neem	0.30		✓	
92						Neem	0.40		✓	
93						Neem	0.40		✓	
94						Neem	0.70		✓	
95						Neem	0.30		✓	
96						Neem	0.30		✓	
97						Neem	0.80		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
98						Neem	1.50		✔	
99						Neem	1.00		✔	
100						Jamun	2.20		✔	
101						Neem	1.50		✔	
102					86	Neem	1.00		✔	
103						Neem	0.80		✔	
104						Neem	0.60		✔	
105						Neem	0.80		✔	
106						Neem	1.20		✔	
107						Neem	0.40		✔	
108						Mango	0.80		✔	
109						Babool	1.00		✔	
110						Beri	0.80		✔	
111						Neem	0.60		✔	
112						Papri	1.20		✔	
113						Mango	1.50		✔	
114						Neem	0.35		✔	
115						Neem	0.60		✔	
116					31	Babool	0.80		✔	
117					35	Neem	0.40		✔	
118						Babool	0.80		✔	
119						Beri	0.30		✔	
120						Beri	0.30		✔	
121						Neem	1.00		✔	
122						Babool	0.35		✔	
123						Neem	0.35		✔	
124						Neem	0.35		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
125						Neem	0.40		✓	
126						Neem	0.60		✓	
127						Beri	0.80		✓	
128						Beri	0.35		✓	
129						Beri	0.40		✓	
130						Beri	0.40		✓	
131						Neem	0.80		✓	
132						Neem	0.80		✓	
133						Neem	0.40		✓	
134						Beri	0.80		✓	
135						Neem	0.80		✓	
136						Beri	0.80		✓	
137					40	Shisham	0.30		✓	
138						Shisham	0.30		✓	
139					44	Beri	0.40		✓	
140						Beri	0.40		✓	
141						Beri	0.30		✓	
142	5/300			**Barkatpur**		Neem	1.20	✓		
143						Neem	1.50	✓		
144					201	Pipal	2.40		✓	
145						Beri	1.50		✓	
146					192	37 Beri	0.80		✓	
147						Neem	0.60		✓	
148						Beri	0.40		✓	
149						Beri	0.70		✓	
150						Beri	0.90		✓	
151						Beri	0.90		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
152						Babool	2.00		✔	
153						Babool	1.50		✔	
154						Beri	0.80		✔	
155						Shisham	2.00		✔	
156						Shisham	1.00		✔	
157						Neem	2.10		✔	
158						Beri	0.40		✔	
159					229	55 Neem	0.80		✔	
160						3 Forest Babool	0.75	✔		
161					159	Neem	1.40		✔	
162						Neem	1.10		✔	
163						Beri	0.50		✔	
164						Labhera	0.30		✔	
165						Labhera	0.35		✔	
166						Beri	1.00		✔	
167						Beri	0.25		✔	
168						Beri	0.25		✔	
169						Beri	0.60		✔	
170						Beri	0.60		✔	
171						Beri	0.80		✔	
172						Beri	0.90		✔	
173						Beri	0.80		✔	
174						Beri	0.90		✔	
175						Beri	0.60		✔	
176						Beri	0.35		✔	
177						Beri	0.60		✔	
178						Beri	0.50		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
179						Beri	0.60		✔	
180						Beri	0.70		✔	
181						Beri	0.80		✔	
182						Beri	0.60		✔	
183						Beri	0.60		✔	
184						Beri	0.60		✔	
185						Beri	0.70		✔	
186						Beri	0.60		✔	
187						Beri	0.50		✔	
188						Beri	0.80		✔	
189					229	25 Neem	0.55		✔	
190				**Prempur Repura**	370	Beri	0.80		✔	
191					972	Babool	0.80		✔	
192						Neem	1.80		✔	
193						Neem	1.50		✔	
194						Babool	0.90		✔	
195						Neem	0.50		✔	
196						Neem	1.20		✔	
197						Neem	1.00		✔	
198						Babool	0.30		✔	
199						Neem	1.00		✔	
200						Neem	0.20		✔	
201						Neem	0.80		✔	
202						Neem	1.00		✔	
203					973	Neem	1.00		✔	
204						Neem	1.00		✔	
205						Neem	1.00		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
206					1008	Babool	0.60		✔	
207						Babool	0.60		✔	
208						Neem	1.00		✔	
209						Neem	0.60		✔	
210						Neem	0.60		✔	
211					1014	Neem	1.00		✔	
212						Babool	0.80		✔	
213						Neem	1.50		✔	
214					1003	Neem	1.50		✔	
215					1002	Neem	1.20		✔	
216						Neem	1.00		✔	
217						Neem	0.90		✔	
218						Neem	0.90		✔	
219						Neem	1.20		✔	
220						Neem	1.50		✔	
221					969	Neem	1.50		✔	
222						Neem	1.20		✔	
223						Hikota	1.00		✔	
224						Babool	0.50		✔	
225					964	Neem	0.70		✔	
226						Neem	0.80		✔	
227						Neem	0.70		✔	
228						Neem	0.80		✔	
229						Neem	1.00		✔	
230					959	Neem	1.00		✔	
231						Neem	0.80		✔	
232						Neem	1.50		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
233						Beri	0.60		✔	
234						Pipal	0.70		✔	
235						Pipal	0.80		✔	
236					965	Neem	0.80		✔	
237						Neem	0.60		✔	
238						Neem	0.70		✔	
239						Babool	0.60		✔	
240				**Sofipur**	400	Babool	1.00		✔	
241						Neem	1.50		✔	
242					369	Shisham	1.50		✔	
243					282	Neem	2.00		✔	
244						Neem	1.00		✔	
245						Neem	1.00		✔	
246						Babool	0.60		✔	
247						Beri	0.40		✔	
248						Beri	0.35		✔	
249					247	Babool	0.70		✔	
250						Babool	0.80		✔	
251						Babool	0.70		✔	
252					246	Babool	1.00		✔	
253						Babool	1.00		✔	
254						Babool	1.00		✔	
255					436	20 Babool	0.35		✔	
256					285	Shisham	1.00		✔	
257					282	Neem	2.00		✔	
258						Neem	0.50		✔	
259						10 Babool	0.60		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
260						Neem	0.70		✓	
261						Beri	0.60		✓	
262						Neem	1.00		✓	
263					247	3 Babool	0.65		✓	
264	1234/11-13			**Dataunji**		Deshi Babool	0.40	✓		
265						Babool	0.50	✓		
266						Babool	0.50	✓		
267						Beri	0.60	✓		
268	1234/7-9					Neem	0.80	✓		
269					40	Neem	0.70		✓	
270						Neem	0.90		✓	
271						Babool	1.00		✓	
272					43	Bakayan	0.50		✓	
273						Bakayan	1.00		✓	
274					44	Bakayan	0.40		✓	
275						Bakayan	0.40		✓	
276						Bakayan	0.70		✓	
277						Babool	0.50		✓	
278					67	Beri	0.50		✓	
279					165	Babool	0.70			✓
280					165	Babool	0.30			✓
281						Babool	0.70			✓
282					199	Neem	0.70		✓	
283						Babool	0.80		✓	
284						Babool	0.80		✓	
285					200	Babool	0.40		✓	
286					244	Neem	0.90		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
287						Neem	0.90		✓	
288						Neem	0.90		✓	
289						Kanji	0.50		✓	
290					243	Neem	0.90		✓	
291						Neem	0.90		✓	
292						Neem	1.00		✓	
293						Chameli	0.50		✓	
294					245	Pipal	0.90		✓	
295						Neem	0.70		✓	
296						Neem	0.40		✓	
297					323	Babool	0.80		✓	
298						Babool	1.10		✓	
299						Neem	0.60		✓	
300						Neem	0.60		✓	
301						Neem	0.60		✓	
302						Neem	0.60		✓	
303						Neem	0.70		✓	
304						Neem	0.70		✓	
305						Babool	0.50		✓	
306						Babool	0.50		✓	
307					248	Babool	0.30		✓	
308					249	Neem	0.30		✓	
309						Neem	0.40		✓	
310						Neem	1.30		✓	
311						Neem	0.60		✓	
312						Babool	0.50		✓	
313						Babool	0.30		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
314					250	Neem	1.10		✓	
315					320	Babool	0.90		✓	
316						Babool	0.60		✓	
317						Neem	0.60		✓	
318					843	Neem	0.80		✓	
319						Neem	0.80		✓	
320					1388	Ber	0.40		✓	
321						Neem	0.50		✓	
322						Neem	0.50		✓	

C. Tundla Detour

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
1	1244/23-25	Firozabad	Tundla	**Chulhawali**	Rly	Shisham	0.90	✓		
2						Shisham	1.10	✓		
3						Dry Shisham	0.80	✓		
4					339	Shisham	0.90		✓	
5						Shisham	0.90		✓	
6						Shisham	0.90		✓	
7						Neem	0.80		✓	
8					340	Gular	3.00		✓	
9	1245				Rly	Neem	0.80	✓		
10						Babool	0.80	✓		
11						Shisham	1.10	✓		
12						Papri	0.80	✓		
13						Neem	0.80	✓		
14	1246					Neem	0.70	✓		
15						Papri	1.10	✓		
16						Babool	0.80	✓		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
17						Neem	1.50	✓		
18						Neem	1.25	✓		
19						Shisham	1.50	✓		
20	1245/4					Babool	0.80	✓		
21						Babool	1.25	✓		
22						Shisham	1.50	✓		
23						Shisham	0.80	✓		
24						Shisham	1.15	✓		
25						Babool	0.90	✓		
26						Neem	0.85	✓		
27						Neem	0.80	✓		
28	1245/5					Shisham	0.60	✓		
29						Shisham	0.90	✓		
30						Neem	0.90	✓		
31						Neem	1.00	✓		
32					362	Babool	0.80			✓
33					340	Neem	1.50		✓	
34						Neem	1.00		✓	
35						Babool	0.80		✓	
36					365	Neem	0.60		✓	
37					367	Neem	1.80			✓
38					374	Babool	0.90		✓	
39					739	Babool	0.90			✓
40						Babool	0.80			✓
41				**Nagla Valiya**	24	Shisham	1.00		✓	
42					16	Shisham	1.20			✓
43					39	Gular	0.90			✓
44					42	Neem	0.35		✓	
45						Neem	0.50		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
46						Neem	0.90		✓	
47						Neem	0.90		✓	
48						Neem	0.50		✓	
49					40	Neem	1.00		✓	
50						Neem	0.70		✓	
51					42	Neem	1.25		✓	
52					44	Neem	1.25		✓	
53					16	Neem	1.10		✓	
54						Neem	1.20		✓	
55						Neem	1.00		✓	
56						Neem	1.10		✓	
57						Shisham	0.60		✓	
58						Shisham	0.70		✓	
59						Shisham	0.50		✓	
60						Shisham	0.50		✓	
61						Shisham	0.40		✓	
62						Babool	0.60		✓	
63						Neem	0.50		✓	
64						Neem	0.40		✓	
65						Papri	1.20		✓	
66				**Anwara**	283	Pipal	2.00		✓	
67					285	Pipal	2.00		✓	
68						Neem	1.00		✓	
69						Neem	1.50		✓	
70						Neem	1.50		✓	
71						Neem	0.90		✓	
72						Beri	0.50		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
73					292	Babool	0.85		✔	
74					322	Babool	1.00		✔	
75						Babool	2.00		✔	
76						Babool	0.70		✔	
77						Shahtut	0.50		✔	
78					153	Shisham	0.40		✔	
79						Shisham	0.50		✔	
80						Shisham	0.70		✔	
81						Shisham	0.90		✔	
82						Shisham	0.80		✔	
83						Shisham	0.60		✔	
84						Shisham	1.00		✔	
85						Shisham	0.35		✔	
86						Shisham	1.00		✔	
87					173	Neem	1.40		✔	
88						Babool	1.50		✔	
89						Babool	0.60		✔	
90					183	Neem	0.90		✔	
91						Neem	0.80		✔	
92					181	Babool	1.30		✔	
93				**Rudhau Mushtkil**	573	Neem	0.60		✔	
94						Neem	0.60		✔	
95						Neem	0.60		✔	
96						Neem	0.60		✔	
97						Neem	0.60		✔	
98						Neem	1.50		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
99						Neem	1.00		✔	
100						Neem	0.70		✔	
101						Babool	0.60		✔	
102						Babool	0.60		✔	
103						Babool	0.60		✔	
104						Babool	0.60		✔	
105						Babool	0.60		✔	
106						Babool	0.60		✔	
107						Babool	0.60		✔	
108						Babool	0.60		✔	
109						Shisham	0.60		✔	
110						Shisham	0.60		✔	
111					570	Neem	1.20		✔	
112						Shisham	0.40		✔	
113						Shisham	0.50		✔	
114						Shisham	0.40		✔	
115						Neem	0.50		✔	
116					571	Neem	1.00		✔	
117						Babool	0.30		✔	
118					570	Neem	0.60		✔	
119						Neem	0.60		✔	
120						Neem	0.50		✔	
121						Neem	0.70		✔	
122						Neem	0.60		✔	
123						Shisham	0.70		✔	
124						Shisham	0.40		✔	
125						Shisham	0.70		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
126						Shisham	0.70		✓	
127						Shisham	0.40		✓	
128						Shisham	0.40		✓	
129						Neem	0.50		✓	
130					560	Babool	0.80		✓	
131					502	Neem	0.60		✓	
132					499	Neem	0.60		✓	
133					497	Babool	1.20		✓	
134						Babool	0.70		✓	
135						Babool	0.80		✓	
136						Babool	0.90		✓	
137						Babool	0.35		✓	
138						Babool	0.40		✓	
139					686	Neem	1.30		✓	
140						Bel	1.50		✓	
141						Babool	0.80		✓	
142						Neem	0.50		✓	
143						Neem	0.50		✓	
144						Babool	0.90		✓	
145					459	Babool	1.00		✓	
146						Babool	0.40		✓	
147						Babool	0.90		✓	
148						Babool	0.70		✓	
149					452	Beri	0.80		✓	
150					Road	Babool	0.50			✓
151					751	Babool	0.60			✓
152						Babool	0.90			✓
153						Babool	0.80			✓

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
154						Babool	0.50			✔
155						Babool	0.90			✔
156						Babool	0.80			✔
157						Babool	0.40			✔
158						Babool	0.80			✔
159					784	Neem	1.50			✔
160					762	Pipal	1.50		✔	
161						Babool	0.90		✔	
162					760	Jamun	2.40		✔	
163				**Bhikanpur Vakalpur**	223	Babool	0.80		✔	
164					147	Neem	1.50		✔	
165						Neem	2.00		✔	
166						Neem	2.00		✔	
167					144	Babool	0.60		✔	
168						Babool	0.65		✔	
169						Babool	0.70		✔	
170				**Surhara**	560	Babool	0.50		✔	
171						Babool	0.40		✔	
172					546	Babool	0.40		✔	
173					523	Shisham	1.00		✔	
174						Babool	0.50		✔	
175					517	Papri	0.90		✔	
176					519	Babool	0.90		✔	
177					508	Babool	0.50	□	✔	
178						Babool	0.90		✔	
179						Babool	0.40		✔	
180						Babool	0.50		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
181						Babool	0.40		✓	
182						Babool	0.40		✓	
183						Beri	0.40		✓	
184					497	Babool	0.90		✓	
185					494	Babool	1.00		✓	
186						Babool	0.90		✓	
187					415	Babool	0.40		✓	
188						Babool	0.60		✓	
189						Babool	0.60		✓	
190						Babool	0.60		✓	
191					416	Babool	0.90		✓	
192						Babool	0.90		✓	
193						Babool	0.60		✓	
194						Babool	0.60		✓	
195						Neem	1.00		✓	
196					418	Neem	1.00			✓
197						Neem	0.80			✓
198						Babool	0.80			✓
199						Babool	0.65			✓
200						Neem	1.00			✓
201						Beri	0.65			✓
202					429	Neem	1.00		✓	
203						Neem	0.95		✓	
204						Neem	1.05		✓	
205						Neem	0.75		✓	
206					419	Neem	0.90		✓	
207						Neem	1.10		✓	
208						Babool	0.90		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
209					432	Babool	0.45			✔
210					435	Babool	0.90		✔	
211					434	Babool	0.90		✔	
212						Babool	1.50		✔	
213					11	Babool	1.10		✔	
214						Sirsa	1.50		✔	
215						Neem	0.80		✔	
216						Shisham	0.90		✔	
217					13	Pipal	1.50		✔	
218						Neem	1.50		✔	
219						Neem	1.50		✔	
220						Neem	1.00		✔	
221						Neem	0.90		✔	
222						Neem	1.00		✔	
223						Neem	1.00		✔	
224						Neem	0.90		✔	
225						Neem	0.80		✔	
226						Neem	1.00		✔	
227						Neem	0.90		✔	
228					28	Pipal	1.50		□	✔
229				**Dharera**	660	Neem	1.50		✔	
230						Pipal	1.00		✔	
231						Gular	1.00		✔	
232						Labhera	1.10		✔	
233						Labhera	0.70		✔	
234						Shahtut	1.00		✔	
235					Road	Shisham	1.50			✔
236						Neem	0.90			✔

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
237						Kanji	0.90			✔
238						Kanji	0.60			✔
239						Kanji	0.60			✔
240						Kanji	0.80			✔
241						Kanji	0.80			✔
242						Kanji	0.50			✔
243						Kanji	0.60			✔
244						Shisham	1.10			✔
245						Shisham	1.40			✔
246						Shisham	1.40			✔
247						Shisham	2.00			✔
248						Shisham	0.50			✔
249						Shisham	0.50			✔
250						Kanji	0.70			✔
251						Kanji	0.80			✔
252						Kanji	0.50			✔
253						Kanji	0.40			✔
254						Kanji	0.70			✔
255						Kanji	0.70			✔
256						Kanji	0.60			✔
257						Kanji	0.50			✔
258						Neem	1.10			✔
259					136	Shisham	0.60		✔	
260					134	Babool	0.60		✔	
261					127	Babool	0.80		✔	
262						Beri	0.60		✔	
263					Nala	Shisham	0.60		✔	
264					123	Babool	0.80		✔	
265						Babool	0.30		✔	
266						Neem	0.80		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
267						Neem	1.00		✔	
268						Neem	0.90		✔	
269						Neem	0.70		✔	
270						Neem	1.00		✔	
271						Babool	0.60		✔	
272						Babool	1.00		✔	
273						Babool	0.80		✔	
274						Babool	0.80		✔	
275				**Kherani**	158	Babool	0.30		✔	
276						Babool	0.30		✔	
277						Babool	0.90		✔	
278					156	Babool	0.30		✔	
279					160	Babool	1.10		✔	
280						Babool	0.90		✔	
281						Babool	0.90		✔	
282						Babool	0.90		✔	
283						Babool	0.80		✔	
284						Babool	0.80		✔	
285						Babool	1.10		✔	
286						Babool	0.90		✔	
287						Babool	0.90		✔	
288						Babool	0.90		✔	
289						Babool	0.70		✔	
290						Babool	1.30		✔	
291						Babool	1.30		✔	
292						Babool	0.80		✔	
293						Babool	0.80		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
294					142	Babool	0.50		✔	
295				**Sawai**	404	Pipal	3.50		✔	
296						Neem	1.00		✔	
297						Neem	0.90		✔	
298						Neem	2.00		✔	
299						Neem	1.10		✔	
300						Neem	0.90		✔	
301						Ukeliptus	1.50		✔	
302						Ukeliptus	0.90		✔	
303						Papri	1.50		✔	
304					408	Neem	0.50		✔	
305						Neem	0.60		✔	
306						Babool	0.65		✔	
307						Babool	1.00		✔	
308						Babool	1.00		✔	
309						Babool	1.50		✔	
310						Babool	1.00		✔	
311						Babool	0.70		✔	
312						Babool	0.50		✔	
313						Neem	1.65		✔	
314					426	Babool	1.30		✔	
315						Babool	0.70		✔	
316					493 (Road)	Neem	0.80			✔
317						Shisham	1.30			✔
318						Neem	0.90			✔
319						Neem	1.30			✔
320						Neem	1.20			✔
321						Neem	1.50			✔

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
322						Labhera	1.10			✔
323						Wakayan	0.80			✔
324						Kanji	1.00			✔
325						Pipal	1.50			✔
326						Gular	3.00			✔
327					522	Shisham	0.80		✔	
328					520	Kanji	1.00		✔	
329						Beri	0.70		✔	
330					519	Babool	0.90		✔	
331						Shisham	0.90		✔	
332						Babool	0.90		✔	
333						Babool	0.20		✔	
334					545	Pipal	4.80		✔	
335						Gold Mohar	-		✔	
336					546 (Chakroad)	Gold Mohar	-			✔
337					548 (Chakmarg)	Neem	0.80			✔
338						Neem	0.90			✔
339						Neem	1.00			✔
340						Neem	1.00			✔
341					551	Neem	0.45		✔	
342						Shisham	0.60		✔	
343						Babool	0.40		✔	
344						Babool	0.30		✔	
345						Sehtut	1.15		✔	
346						Kanji	0.35		✔	
347					553	Neem	0.90		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
348						Neem	1.10		✓	
349						Neem	0.80		✓	
350						Neem	1.10		✓	
351						Neem	1.20		✓	
352						Babool	0.60		✓	
353						Babool	0.30		✓	
354						Kanji	1.20		✓	
355						Kanji	1.00		✓	
356						Kanji	0.50		✓	
357						Sirsa	0.30		✓	
358					554	Beri	0.90		✓	
359						Beri	0.60		✓	
360					548	Pipal	3.70		✓	
361					555	Lemon	0.50		✓	
362					566	Babool	1.00		✓	
363					632	Babool	0.80		✓	
364						Babool	0.30		✓	
365						Babool	1.00		✓	
366						Babool	0.70		✓	
367						Babool	0.60		✓	
368					620	Neem	1.70		✓	
369						Neem	1.50		✓	
370						Babool	0.30		✓	
371						Babool	0.70		✓	
372						Babool	0.70		✓	
373						Babool	0.90		✓	
374						Babool	0.60		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
375						Babool	0.70		✓	
376						Babool	0.65		✓	
377						Babool	0.30		✓	
378						Babool	0.35		✓	
379					686	Kanji	1.20		✓	
380						Shisham	0.80		✓	
381						Shisham	0.70		✓	
382						Shisham	1.00		✓	
383					683	Shisham	1.70		✓	
384						Shisham	0.35		✓	
385				**Barhan**	Pacca Road	Papri	0.35	✓		
386						Papri	0.35	✓		
387						Babool	0.50	✓		
388						Papri	0.40	✓		
389						Babool	1.80	✓		
390						Babool	1.80	✓		
391						Babool	1.80	✓		
392						Babool	1.50	✓		
393						Neem	0.40	✓		
394						Babool	1.30	✓		
395						Babool	1.00	✓		
396					1770	Guawa	0.65		✓	
397						Guawa	0.65		✓	
398						Guawa	0.65		✓	
399						Guawa	0.65		✓	
400						Guawa	0.65		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
401						Babool	0.70		✔	
402					1772	Neem	1.15		✔	
403					1774	Neem	0.50		✔	
404						Neem	0.50		✔	
405						Babool	0.50		✔	
406						Neem	0.40		✔	
407						Babool	0.50		✔	
408						Babool	0.50		✔	
409					1773	Neem	1.60		✔	
410						Neem	0.90		✔	
411					1720	Babool	0.90		✔	
412						Babool	0.80		✔	
413						Neem	1.00		✔	
414						Wakayan	0.50		✔	
415						Wakayan	0.50		✔	
416						Wakayan	0.50		✔	
417						Wakayan	0.50		✔	
418					1718	Babool	0.50		✔	
419						Babool	0.50		✔	
420						Babool	0.60		✔	
421						Babool	0.60		✔	
422						Babool	0.60		✔	
423						Babool	0.60		✔	
424						Babool	0.60		✔	
425						Babool	0.60		✔	
426						Babool	0.60		✔	
427						Babool	0.60		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
428						Babool	0.60		✔	
429						Babool	0.60		✔	
430						Wakayan	0.40		✔	
431						Wakayan	0.35		✔	
432						Wakayan	0.40		✔	
433						Wakayan	0.35		✔	
434						Wakayan	0.35		✔	
435						Kanji	0.50		✔	
436						Beri	0.35		✔	
437						Neem	0.60		✔	
438					1560	Bel	0.40		✔	
439					1559	Pipal	4.60		✔	
440					1625	Babool	0.50		✔	
441						Babool	1.00		✔	
442						Babool	0.60		✔	
443						Babool	0.90		✔	
444						Babool	0.60		✔	
445						Babool	0.45		✔	
446						Babool	1.00		✔	
447						Beri	0.40		✔	
448					1573	Neem	1.60		✔	
449					1527	Mango	1.70		✔	
450						Pipal	5.00		✔	
451						Jamun	2.15		✔	
452						Mango	2.50		✔	
453					1528	Guawa	0.80		✔	
454						Guawa	0.80		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Girth(m)	Railway	Pvt.	Gov
455						Guawa	0.80		✔	
456						Guawa	0.80		✔	
457						Guawa	0.80		✔	
458						Guawa	0.80		✔	
459						Guawa	0.80		✔	
460						Beri	1.50		✔	
461						Bel	1.00		✔	
462						Beri	0.90		✔	
463						Nembu	0.90		✔	
464						Bel	1.00		✔	
465						Neem	1.00		✔	
466						Neem	1.20		✔	
467						Neem	1.20		✔	
468						Neem	0.90		✔	
469						Mango	1.00		✔	
470						20 Bamboo			✔	
471						Mango	1.00		✔	
472						Nembu	0.80		✔	
473					1520	Shisham	1.20			
474						Babool	1.00			
475						Babool	0.50			
476						Babool	0.85			
477						Babool	0.70			
478					1247	Papri	0.55			
479					1234	Bargad	8.00			
480					1233	Kanji	2.00			
481					1217	Pipal	6.00			

Annexure 5-2

Quantitative Analysis of Tree, Shrub and Herb By Quadrate Method

5.24.2 Location No.1: Tundla (Start of Detour)

A. Diversity, Abundance and Species Diversity Index

S. No.	Name of Species	No. of Quadrate Studies										Total No. of Species (n)	Total No. of Quadrate	Density	Pi = n/N	log Pi	Pi x log Pi	Total No. of Quadrate Occurred	Abundance
		1	2	3	4	5	6	7	8	9	10								
1	*Cassia fistula*	-	-	-	-	7	2	-	-	-	-	9	10	0.9	0.024	-1.623	-0.039	2.000	0.45
2	*Acacia nilotica*	7	8	4	9	6	4	17	-	-	-	55	10	5.5	0.146	-0.837	-0.122	7.000	0.79
3	*Dalbergia sissoo*	2	4	-	-	-	-	-	-	-	-	6	10	0.6	0.016	-1.799	-0.029	2.000	0.30
4	*Delonix regia*	-	-	4	-	-	-	-	-	-	-	4	10	0.4	0.011	-1.975	-0.021	1.000	0.40
5	*Butea monosperma*	-	-	1	-	-	-	-	-	-	-	1	10	0.1	0.003	-2.577	-0.007	1.000	0.10
6	*Bougainvillea glabra*	-	4	-	-	-	-	-	-	-	-	4	10	0.4	0.011	-1.975	-0.021	1.000	0.40
7	*Parthenium hysterophorus*	14	21	24	28	17	15	23	24	41	38	245	10	24.5	0.648	-0.188	-0.122	10.000	2.45
8	*Prosopis juliflora*	4	8	-	5	4	-	7	-	-	-	28	10	2.8	0.074	-1.130	-0.084	5.000	0.56
9	*Zizyphus mauritiana*	1	-	4	2	2	-	-	-	-	-	9	10	0.9	0.024	-1.623	-0.039	4.000	0.23
10	*Alianthus exceles*	-	-	-	1	-	-	-	-	-	-	1	10	0.1	0.003	-2.577	-0.007	1.000	0.10
11	*Madhuca indica*	-	1	-	-	-	-	-	-	-	-	1	10	0.1	0.003	-2.577	-0.007	1.000	0.10
12	*Azardirachta indica*	1	-	-	-	-	-	-	-	-	-	1	10	0.1	0.003	-2.577	-0.007	1.000	0.10
13	*Capacious Cactus*	-	-	3	-	-	-	-	-	-	-	3	10	0.3	0.008	-2.100	-0.017	1.000	0.30
14	*Acacia catechu*	-	-	2	-	-	-	-	-	-	-	2	10	0.2	0.005	-2.276	-0.012	1.000	0.20
15	*Bambusa vulgaris*	-	7	-	-	-	-	-	-	-	-	7	10	0.7	0.019	-1.732	-0.032	1.000	0.70
16	*Melia azedarach*	-	-	2	-	-	-	-	-	-	-	2	10	0.2	0.005	-2.276	-0.012	1.000	0.20
18	*Brassica oleracea*	-	-	-	-	-	-	-	42	-	-	42	10	4.2	0.111	-0.954	-0.106	1.000	4.20
19	*Daucus carota*	-	-	-	-	-	-	-	17	11	-	28	10	2.8	0.074	-1.130	-0.084	2.000	1.40
20	*Cicer arietinum*	-	-	-	-	-	-	-	-	19	-	19	10	1.9	0.050	-1.299	-0.065	1.000	1.90
21	*Orijza Sativa*	-	-	-	-	-	-	-	-	-	65	65	10	6.5	0.172	-0.765	-0.131	2.000	3.25
												378					**-0.575**		

Species Diversity Index = 0.575

B. Frequency and Frequency%

S. No.	Name of Species	No. of Quadrate Sampled										Total No. of Quadrate Occurred	Total No. of Quadrate Sampled	% Frequency	Frequency Class
		1	2	3	4	5	6	7	8	9	10				
1	*Cassia fistula*	-	-	-	-	+	+	-	-	-	-	2	10	20	B
2	*Acacia nilotica*	+	+	+	+	+	+	+	-	-	-	7	10	70	D
3	*Dalbergia sissoo*	+	+	-	-	-	-	-	-	-	-	2	10	20	B
4	*Delonix regia*	-	-	+	-	-	-	-	-	-	-	1	10	10	A
5	*Butea monosperma*	-	-	+	-	-	-	-	-	-	-	1	10	10	A
6	*Bougainvillea glabra*	-	+	-	-	-	-	-	-	-	-	1	10	10	A
7	*Parthenium hysterophorus*	+	+	+	+	+	+	+	+	+	+	10	10	100	E
8	*Prosopis juliflora*	+	+	-	+	+	-	+	-	-	-	5	10	50	C
9	*Zizyphus mauritiana*	+	-	+	+	+	-	-	-	-	-	4	10	40	C
10	*Alianthus excels*	-	-	-	+	-	-	-	-	-	-	1	10	10	A
11	*Madhuca indica*	-	+	-	-	-	-	-	-	-	-	1	10	10	A
12	*Azardirachta indica*	+	-	-	-	-	-	-	-	-	-	1	10	10	A
13	*Capacious Cactus*	-	-	+	-	-	-	-	-	-	-	1	10	10	A
14	*Acacia catechu*	-	-	+	-	-	-	-	-	-	-	1	10	10	A
15	*Bambusa vulgaris*	-	+	-	-	-	-	-	-	-	-	1	10	10	A
16	*Melia azedarach*	-	-	+	-	-	-	-	-	-	-	1	10	10	A
17	*Pithecellobium dulce*	-	-	-	-	-	-	+	-	-	-	1	10	10	A
18	*Brassica oleracea*	-	-	-	-	-	-	-	+	-	-	1	10	10	A
19	*Daucus carota*	-	-	-	-	-	-	-	+	+	-	2	10	20	B
20	*Cicer arietinum*	-	-	-	-	-	-	-	-	+	-	1	10	10	A
21	*Orijza Sativa*	-	-	-	-	-	-	-	-	-	+	1	10	10	A

Acasia nilotica was found to be the most dominant species, followed by *Prosopis juliflora, Butea monosperma and Melia azedarach*. *Parthenium hysterophorous* was found very common in the study area. It may be observed that *Acacia nilotica* is the most abundant and frequent. The overall species diversity index for study area was computed as 0.575.

5.24.3 Location No.2: Parallel Section Ahead of Mitawali Station

A. Diversity, Abundance and Species Diversity Index

S. No.	Name of Species	No. of Quadrate Studies										Total No.of Species (n)	Total No. of Quadrate	Density	Pi = n/N	log Pi	Pi x log Pi	Total No. of Quadrate Occurred	Abundance
		1	2	3	4	5	6	7	8	9	10								
1	*Cassia fistula*	-	-	-	4	6	-	-	-	-	-	10	10	1	0.026	-1.587	-0.041	2.000	0.50
2	*Acacia nilotica*	-	2	5	-	-	-	2	-	-	-	9	10	0.9	0.023	-1.632	-0.038	3.000	0.30
3	*Dalbergia sissoo*	-	4	-	-	-	4	-	-	-	-	8	10	0.8	0.021	-1.683	-0.035	2.000	0.40
4	*Delonix regia*	-	2	-	8	-	-	-	-	-	-	10	10	1	0.026	-1.587	-0.041	2.000	0.50
5	*Butea monosperma*	2	-	4	6	-	-	-	-	-	-	12	10	1.2	0.031	-1.507	-0.047	3.000	0.40
6	*Thevetia peruviana*	-	-	4	-	-	3	-	-	-	-	7	10	0.7	0.018	-1.741	-0.032	2.000	0.35
7	*Pongamia pinnata*	-	2	-	-	-	-	-	-	-	-	2	10	0.2	0.005	-2.286	-0.012	2.000	0.10
8	*Parthenium hysterophorus*	11	25	21	27	45	29	17	17	14	34	240	10	24	0.622	-0.206	-0.128	10.000	2.40
9	*Prosopis juliflora*	-	4	4	-	5	-	2	-	-	-	15	10	1.5	0.039	-1.410	-0.055	4.000	0.38
10	*Zizyphus mauritiana*	-	-	-	-	2	-	-	-	-	-	2	10	0.2	0.005	-2.286	-0.012	1.000	0.20
11	*Ficus religiosa*	1	-	4	2	-	-	-	-	-	-	7	10	0.7	0.018	-1.741	-0.032	3.000	0.23
12	*Tamrindus indica*	-	-	-	-	4	2	-	-	-	-	6	10	0.6	0.016	-1.808	-0.028	2.000	0.30
13	*Alianthus exceles*	2	-	6	-	-	5	-	-	-	-	13	10	1.3	0.034	-1.473	-0.050	3.000	0.43
14	*Azardirachta indica*	-	5	-	3	-	7	-	-	-	-	15	10	1.5	0.039	-1.410	-0.055	3.000	0.50
15	*Mangifera indica*	-	4	-	3	-	2	-	-	-	-	9	10	0.9	0.023	-1.632	-0.038	3.000	0.30
16	*Capacious Cactus*	-	-	-	4	-	3	-	-	-	-	7	10	0.7	0.018	-1.741	-0.032	2.000	0.35
17	*Acacia catechu*	-	-	2	-	-	-	1	-	-	-	3	10	0.3	0.008	-2.109	-0.016	2.000	0.15
18	*Bambusa vulgaris*	-	6	-	5	-	-	-	-	-	-	11	10	1.1	0.028	-1.545	-0.044	2.000	0.55
19	*Melia azedarach*	-	2	4	-	-	-	-	-	-	-	6	10	0.6	0.016	-1.808	-0.028	2.000	0.30
20	*Solanum melongeana*	-	-	-	-	-	-	-	14	-	-	14	10	1.4	0.036	-1.440	-0.052	1.000	1.40
21	*Brassica oleracea*	-	-	-	-	-	-	-	-	27	-	27	10	2.7	0.070	-1.155	-0.081	1.000	2.70
22	*Oryza sativa*	-	-	-	-	-	-	-	-	-	45	45	10	4.5	0.117	-0.933	-0.109	1.000	4.50
23	*Daucus carota*	-	-	-	-	-	-	-	21	-	-	21	10	2.1	0.054	-1.264	-0.069	1.000	2.10
												386					**-0.735**		

Species Diversity Index = 0.735

B. Frequency and Frequency%

Sl. No.	Name of Species	No. of Quadrate Sampled										Total No. of Quadrate Occurred	Total No. of Quadrate Sampled	% Frequency	Frequency Class
		1	2	3	4	5	6	7	8	9	10				
1	*Cassia fistula*	-	-	-	+	+	-	-	-	-	-	2	10	20	B
2	*Acacia nilotica*	-	+	+	-	-	-	+	-	-	-	3	10	30	B
3	*Dalbergia sissoo*	-	+	-	-	-	+	-	-	-	-	2	10	20	B
4	*Delonix regia*	-	+	-	+	-	-	-	-	-	-	2	10	20	B
5	*Butea monosperma*	+	-	+	+	-	-	-	-	-	-	3	10	30	B
6	*Thevetia peruviana*	-	-	+	-	-	+	-	-	-	-	2	10	20	B
7	*Pongamia pinnata*	-	+	-	-	-	-	-	-	-	-	1	10	10	A
8	*Parthenium hysterophorus*	+	+	+	+	+	+	+	+	+	+	10	10	100	E
9	*Prosopis juliflora*	-	+	+	-	+	-	+	-	-	-	4	10	40	C
10	*Zizyphus mauritiana*	-	-	-	-	+	-	-	-	-	-	1	10	10	A
11	*Ficus religiosa*	+	-	+	+	-	-	-	-	-	-	3	10	30	B
12	*Tamrindus indica*	-	-	-	-	+	+	-	-	-	-	2	10	20	B
13	*Alianthus excels*	+	-	+	-	-	+	-	-	-	-	3	10	30	B
14	*Azardirachta indica*	-	+	-	+	-	+	-	-	-	-	3	10	30	B
15	*Mangifera indica*	-	+	-	+	-	+	-	-	-	-	3	10	30	B
16	*Capacious Cactus*	-	-	-	+	-	+	-	-	-	-	2	10	20	B
17	*Acacia catechu*	-	-	+	-	-	-	+	-	-	-	2	10	20	B
18	*Bambusa vulgaris*	-	+	-	+	-	-	-	-	-	-	2	10	20	B
19	*Melia azedarach*	-	+	+	-	-	-	-	-	-	-	2	10	20	B
20	*Solanum melongeana*	-	-	-	-	-	-	-	+	-	-	1	10	10	A
21	*Brassica oleracea*	-	-	-	-	-	-	-	-	+	-	1	10	10	A
22	*Oryza sativa*	-	-	-	-	-	-	-	-	-	+	1	10	10	A
23	*Daucus carota*	-	-	-	-	-	-	-	+	-	-	1	10	10	A

During the study 23 species were observed. *Acasia nilotica* was found to be the most dominant species, followed by *Prosopis juliflora and Butea monosperma*. Density and diversity index of different species observed during the studies was 0.735. It may be observed that *Prosopis juliflora* is themost abundant speciesfollowedby*Dalbergiasisoo,Delonixregia*.bnm bnm bnm bnm bnm bnm bnm bnm bnm bnm bnm bnm bnm

Annexure 5-3

Villagewise Structures and Common Property Resourses in the RoW

A. Parallel Section

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
1	1200/13-1200/15	Firozabad	Sikohabad	**Kaurara Khurd**	404	Pucca Nalkoop		✔	
2					405	Pucca Nalkoop		✔	
3	1201/1-1201/3			**Tilyani**	314	Kachha Bore		✔	
4	1201/15-1201/17				190	Pucca House	Ashok kumar s/o Ulfati Singh	✔	
5	1201/29-1201/31				212	Kachha Bore		✔	
6	1202/3-1202/5				214	Pucca Bore		✔	□
7				**Mahadpur**	76	Well & Borewell		✔	□
8				**Dargahpur Angadpur**	63	Pucca Shop		✔	□
9						Kachha Bore		✔	□
10				**Patsui Nagla Mir**	692	Pucca Bore		✔	□
11					684	Kachha Bore		✔	□
12					641	Kachha Bore		✔	□
13				**Bhandari**	541	Kachha Bore		✔	□
14					540	Pucca well & Pucca bore		✔	□
15						2- Kachha bore		✔	□
16	1205/5-1205/7				327	Pucca House	Pancham Singh s/o Bhunni Singh	✔	
17						Pucca House	Ram prakash s/o Phoolan	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
							Singh		
18						pucca house & Hand pump	Devi ram s/o Keshav singh	✔	
19					328	Pucca House	Ramesh chandra s/o Ram bharose Lal	✔	
20						Pucca House	Rakesh s/o Ram bharose Lal	✔	
21						Pucca House	Ram Naresh s/o Keshav Singh	✔	
22	1205/7-1205/9				335	Pucca House	Ram ratan s/o Bhunni lal	✔	
23						Pucca House	Mohan lal s/o Bhunni lal	✔	
24						Pucca House	Santosh, Brijesh, Kamlesh s/o Mahadev	✔	
25						Pucca House	Udayveer Singh s/o Phoolan Singh	✔	
26						Pucca House	Ram prakash s/o Phoolan Singh	✔	
27						Pucca House	Pancham Singh s/o Bhunni Singh	✔	
28						Pucca House	Dalveer Singh	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
29						Pucca House	Virendra singh s/o Anwar Singh	✔	
30						Pucca House-2 N0s.	Kaptan singh s/o Hisab singh	✔	
31						Pucca House	Saitan Singh s/o Hisab Singh	✔	
32						Pucca House	Satya dev singh s/o Hisab singh	✔	
33						Pucca House-3 Nos.	Punjabi lal s/o Bhule singh	✔	
34						Kachha House	Punjabi lal s/o Bhule singh	✔	
35						Pucca House	Sukhlal s/o Bhule singh	✔	
36						Pucca House	Chote lal s/o Gandarbh singh	✔	
37						Pucca House	Ramveer singh, Shyam veer singh, Ajay veer singh s/o Babu ram	✔	
38						Temple	Ramveer singh, Shyam veer singh, Ajay veer singh s/o Babu ram	✔	
39						Pucca house	Sarman Singh s/o Amir Singh	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
40						Pucca house	Sunil kumar s/o Narendra singh	✔	
41					369	Kachha Bore		✔	
42					376	Kachha Bore		✔	
43				**Katora Bujurg**	58	Pucca Bore		✔	
44					59	Kachha Bore		✔	
45				**Nijampur Gadhuma**	Railway Boundary	2- Samadhi		□	
46					154	Samadhi		✔	
47					177	Boundary wall	Ram ratan	✔	
48					65	Hind Lamp Factory Boundary wall	Approx. 300 mtr. Length	✔	
49				**Neeb kheriya**	237	Semi pucca house	Tejpal Singh s/o Narpat Singh	✔	
50					237	Pucca house & Hand pump	Joti ram s/o Ram lal	✔	
51					234	Pucca house	Sundar singh s/o Laturi	✔	
52				**Ramnagar Rajpur Balai**	38	Electric Nalkoop & Pucca well, Chabutara(Pucca)		✔	
53				**Khirthara Mohammadpur**	137	2- Cemented Naad		✔	
54				**Kishunpur Amrajat**	80	Abonded Pucca Structure		□	✔

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
55				**Rajpur Balai**	68	Double storey tube well with electric connection		✔	
56					38	Temple, Pucca dharamsala, Pucca house, Pucca Shivling, Pucca Chabutra, Abonded pucca structure, Pucca Samadhi		✔	
57					41	Pucca Pilinth		✔	
58				**Jijoli**	Railway Boundary	Pucca Abonded structure			
59					134	Double storeyPucca house		✔	
60					Railway Boundary	Pucca Samadhi			
61			Firozabad	Aalampur Jarkhi	219	Pucca Bore, Well, Pucca room, Temple	Prem Pal Singh s/o Layak Singh	✔	
62					191	pucca house	Roshan lal s/o Ram singh	✔	
63						Pucca house	Kuwar pal s/o Kaptan Singh	✔	
64					187	pucca house & Hand pump	Narvish singh, Sujan Singh s/o Maharaj Singh	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
65						Pucca house	Saurav s/o Sishpal Singh	✔	
66						Pucca house, Pucca Boring	Kanchan Singh s/o Jahar Singh	✔	
67						Pucca house	Sundar singh s/o Jahar Singh	✔	
68					183	Pucca house	Rajveer Singh s/o Phoran Singh	✔	
69						Pucca house	Arjun Singh s/o Megh Singh	✔	
70				Jarauli Khurd	31	Dev Sthan		✔	
71				Khemkaranpur	72	Pucca shop	Gadhve s/o Shyam lal	✔	
72					72	Pucca house	Rameshwar s/o Surjan Singh	✔	
73					68	Pucca house	Noor Mohammad s/o Jumaan Khan	✔	
74					68	Boundary wall	Kanth Sri w/o Premchand	✔	
75					68	Boundary wall	Ratan lal s/o Sri Pal	✔	
76	1240/3-5	Firozabad	Tundla	Ulau Khera		Temple		□	
77	1240/7-9				341	Cabin		□	
78					352	Hand Pump	Nirottam Singh s/o Puttilal	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
79					352	Boundry Wall	Chotelal, Ram Dulare s/o Lalaram	✔	
80					352	Boundry Wall	Baijnath Singh, Pramod Kumar s/o Kaptan Singh	✔	
81					352	Pucca House	Sumit, Yogendra Singh s/o Ramesh Chandra	✔	
82					352	School	Shri Balwant Singh	✔	
83					352	Pucca House	Udayram s/o Chironji Lal	✔	
84					352	Boundry Wall	Virendra Singh s/o Fateh Singh	✔	
85					352	Rasta		□	
86			Tundla	Latifpur	114	Hut		✔	
87					112	Kachha Chabutra & Handp Pump(govt.)	Pope Singh s/o Charan Singh	✔	
88					112	Boundary wall	Ram Prakash, Ramroop s/o Munni lal	✔	
89					112	Chabutra Dev Sthan		✔	
90					76	Pucca house	Shyam Singh	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
91				Bankat	291	Temple, Chabutara		✔	
92					181	Pucca well		✔	
93					185	Dev Sthan		✔	
94					186	Dev Sthan		✔	
95					188	Shop, Hand pump	Shyamveer s/o Dauji Ram	✔	
96					202	Hospital, Panchayat ghar, Samadhi			✔
97					29	Dev Sthan		✔	
98				Nagla Gole	67	Chabutra Dev Sthan			✔
99					12	Shop, Temple, Dharamsala		✔	
100				Biruni	293	Kachha Bore		✔	
101	1258/19	Agra	Etmadpur	**Mitawali**		Mitawali Sewa Kendra Filling Station Petrol Pump		□	
102	1259/15-17					Old Building		□	
103	1270/11-15			Jamnagar	95	House	Mukesh, Avdesh, Subhash Chandra s/o Ajab Singh	✔	
104						Pucca House, Handpump	Hardevi w/o Khushal Singh	✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
105	1270/15-17					Pucca House	Sudhir Kumar, Rakesh Kumar, Santosh Kumar s/o Ram Khilari		
106						Boundry	Primary School		
107						Pucca House (13 x 5)	Bhuri Singh s/o Prabhu Dayal		
108						Pucca House (8 x 20), Hand Pump	Suresh Chandra s/o Surya Pal		
109						Plot (16 x 4), Hand Pump	Shiv Kumar, Jitendra Kumar, Shailendra Kumar s/o Bharat Singh		
110						House (10 x 5), House (10 x8) Hand Pump Govt.	Manoj Kumar s/o Niranjan Singh, Vinod Kumar, Virendra Singh, Avdhesh s/o Rajaram		
111						Plot, Hand Pump	Jaypal Singh, Mahipal Singh, Jay Dayal Singh, Satish Chandra s/o Durveen Singh		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
112						Pucca House - 3	Ashok Kumar s/o Tej Singh		
113						Neem	1.2		
114						Pucca Room, Baramda, Hand Pump	Basdev s/o Shokiram		
115						Room	Jwahar Singh s/o Ram Swarup		
116						Room-4, Hand Pump	Shyam Sundar s/o Hari Singh		
117						Room, Samar, Tin Shed	Ram Shankar s/o Edal Singh		
118	1270/21-23					Double Story House	Vijay Pal Singh s/o Ram Shankar		
119						Room	Arvind Kumar s/o Ram Shankar		
120						House, Hand Pump	Pushpendra, Manvendra, Raghvedra s/o Bhikam Singh		
121						Hand Pump	Sudhir, Dinesh, Rinku s/o Bacchu Singh		
122						House	Hari Shankar s/o Om prakash		
123						Double Story House	Ved Praksh s/o Hari Shankar		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Gov
124						House, Samar	Omkar s/o Hari Shankar		
125						Katcha House	Salikram s/o Genda lal		
126						Katcha House	Munnalal s/o Gandrabh Singh		
127						Katcha House, Hand Pump	Shrikant s/o Munna Lal		
128						Katcha House, Hand Pump	Vinod Kumar s/o Munna Lal		
129						Katcha House	Ausan Singh, Radhe Shyam, Hari Charan s/o Janki Prasad		
130						Katcha House, Hand Pump	Nepal Singh s/o Mishri Lal		
131						Boundry, Hand Pump	Hari Charan s/o Janki Prasad		

B. Firozabad Detour

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
1	3/200	Firozabad	Firozabad	**Jamalpur**	5	House & Boaring			
2				**Gazipur**	147	Boaring			
3					88	Boaring & Pucca Kothari			
4					86	Boaring			
5					35	Samar Sarvil			
6				**Barkatpur**	201	Dev Sthan			
7					199	Pucca Boaring			

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
						Room			
8						Pucca Tubewell			
9					157	Pucca House	Vidya ram s/o Gopali, Munnalal s/o Babulal, Shyam Singh s/o Mul Chandra, Jay Chand s/o Gulab Singh, Beri Singh s/o Rameshwar, Kalraj s/o Jasram, Dorilal s/o Johari Lal		
10				**Prempur Repura**	974 1007	3 Pucca House			
11					1064	2 House	Rakesh Kumar s/o Shadilal, Shadilal s/o Tej Singh		
12					374	Bhatta			
13				**Sofipur**	400	House, Shop	Badshah s/o Kishun Lal		
14					367	House	Ram Charan s/o Hajarilal		
15						Well, Kothari			
16						Dev Sthan			
17				Dataunji	195	Well, Pucca House	Shankar Lal s/o Gopilal		
18						Pucca House	Om Prakash		

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
19					1388	Dev Sthan, Well			
20					--	Katcha Chappar	Heeralal s/o Suran Singh		
21					--	Pucca Chappar	Durga Singh s/o Badan Singh		
22					--	Katcha Chappar	Munnalal s/o Megh Singh		
23					--	Pucca House			
24					--	Katcha Chappar, Pucca House, Baramda, Hand Pump India marka	Rewati Singh s/o Megh Singh		
25					--	Pucca House, Baramda	Jay Narayan s/o Megh Singh		

C. Tundla Detour

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
1		Firozabad	Tundla	**Nagla Valiya**	38	Samadhi		✔	
2						Samadhi		✔	
3						Samadhi		✔	
4						Samadhi		✔	
5						Samadhi		✔	
6						Samadhi		✔	
7						Samadhi		✔	
8						Samadhi		✔	
9						Samadhi		✔	
10						Samadhi		✔	
11						Samadhi		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
12					16	Samar Sebul Boaring		✓	
13						Water Tank		✓	
14				**Anwara**	285	Dev Sthan		✓	
15					153	Samadhi		✓	
16						Samadhi		✓	
17						Samadhi		✓	
18						Samadhi		✓	
19						Samadhi		✓	
20				**Rudhau Mushtkil**	498	Old Well		✓	
21					762	Pucca Dev Sthan		✓	
22					760	Nal Koop		✓	
23						Room (10 x 10)		✓	
24				**Bhikanpur Vakalpur**	147	Boaring		✓	
25						Naad		✓	
26					146	Shamshan		✓	
27					142	Pucca Well		✓	
28				**Surhara**	21	Temple (10x6)		✓	
29				**Dharera**	660	Room		✓	
30				**Sawai**	553	Samadhi		✓	
31						Semi Pacca Room		✓	
32					632	Room (Double Floor) 3.80x6.30		✓	
33						Semi Pacca Boaring		✓	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
34						Water Tank 3x2.50		✔	
35					620	Pacca Nalkup		✔	
36						Pacca Room 3.20x2.90		✔	
37				**Barhan**	1881	Chabutara 8x6		✔	
38					1774	Tubewell		✔	
39						Pacca Room 3x4		✔	
40						Water Tank 1x2		✔	
41						Dev Sthan 1x1		✔	
42						Pacca Well		✔	
43					1718	Pacca Samadhi 3.40x1.70		✔	
44					1558	Murgi Farm Teen Shed (5.80 x 12.50)		✔	
45					1559	Pucci Nali Water Tank		✔	
46					1527	Samadhi Shed (2 x 2)		✔	
47					1528	Pucca Well		✔	
48					1513	2 Than (0.50 x 0.50)		✔	
49					1247	Tube Well Room (3 x 5)		✔	
50						Water Tank (1.50 x 1.50)		✔	

Sl. No.	Chainage	District	Tehsil	Village Name	Survey No.	Variety	Owner Name	Pvt.	Govt
51					1233	3 House	Charan singh s/o Shankar Lal, Mahaveer Singh s/o Mewaram, Premwati w/o Babulal,		
52						Boundry Wall	Saroj w/o Ashok		
53					1221	Pucca House	Bhup Singh s/o Kishanlal, Girraj Singh s/o Rambabu Lal, Shankarlal s/o Antram, Rameshpal Singh s/o Komal Singh, Mitan Singh s/o Ramratan		

Annexure 5-4

Monitoring Photographs

Air Sampling Photographs

Air Sampling at Alampur

Air Sampling at Bhandari

Air Sampling at Mitwali

Air Sampling at Vijaywarwa

Soil Sampling Photographs

Soil Sampling at Bhandari

Soil Sampling at Mitwali


Soil Sampling at Ulaukhera


Soil Sampling at Vijaypur

Water Sampling Photographs


Water Sampling at Alampur


Water Sampling at Bhandari


Water Sampling at Mitwali


Water Sampling at Ulaukhera

Water Sampling at Ulaukhera

Noise Sampling Photographs

Noise Sampling at Alampur

Noise Sampling at Bhandari

Noise Sampling at Vijaypur

5.25 Environmental Issues due to Part Length of Kaurara-Chamraula Section in Taj Trapezium Zone (TTZ)

In order to reduce the pollution and to regulate the growth, Minstry of Environment and Forest (MoEF), Government of India has Notified Taj Trapazeum Zone(TTZ) around Taj Mahal. The authority to regulate growth and Pollution in TTZ hs been named as Taj Trapezium Pollution (Prevention and Control) Authority. The geographical limits of the Taj Trapezium Zone is defined in the shape of a trapezoid between 26^0 45'N & 77^0 15'E to 27^0 45'N & 77^0 15'E in the West of the Taj Mahal and in the East of Taj Mahal between 27^0 00'N & 78^0 30'E to 27^0 30'N & 78^0 30'E, lying in the Agra Division of Uttar Pradesh and in the Bharatpur Division of the State of Rajasthan.

The Taj Trapezium Zone (TTZ) has been notified to control industrial and other development activities so as to keep air pollution minimum. The total area of TTZ is 10400 sq km. It is spread in Agra, Mathura, Hatharas, Firozabad and Etah districts of Uttar Pradesh, Dholpur and Bharatpur district of Rajasthan.

The length of Kaurara-Chamraula section falling in TTZ is about 49 km (km 1221 to 1266) out of total length of 72 km. The number of trees falling in TTZ area is 3932. The permission to cut these trees will be obtained from TTZ Authority and Honorable Supreme Court of India. Further, establishment of crushers and Hot Mix Plant (HMP) is not allowed in the TTZ. Hence during the construction phase, if any of the construction camp is planned in TTZ then crushers and HMP should not be established.

CHAPTER 6 : ANALYSIS OF ALTERNATIVES

6.1 BACKGROUND

The present project consists of laying out the double line broad gauge railway line of 72km length for freight trains associated facilities such as bridges (5 major bridges, 1 major RUB, 32 minor bridges and 35 minor RUBs), electrical facilities including signal, electric sub-stations and junctions & crossing stations etc. The detailed descriptions of the facilities are presented in **Chapter-2.**

6.2 ALIGNMENT

The Kaurara-Chamraula section of EDFC is a part of section starting at the Delhi end and ending at Bhaupur station (km 1040.00). During earlier Bhau-Khurja alignment a lengthy detour of Tundla was planned. This detour was 70.74 km long (1200.00 km to 1266.00km). This detour bypassed the cities of Shikohabad, Ferozabad, Tundla, Makhanpur, and Barhan. Being a long detour there was huge requirement of agriculture land. Public resentments during the stakeholder consultations for re-consideration of the alignment. The Tundla detour has been revised, alignment has been made parallel to the existing IR tracks and three smaller length detours (Ferozabad, Tundla, and Barhan) have been planned. However, various alternatives considered in finalizing the alignments in parallel and detour section have been analyzed keeping in view environmental, social and technical requirements. The details of the parallel and detour locations are given below in the **Tables -6.1.** All the detours are on the left side (w.r.t. existing railway alignment from Kaurara to Chamraula) i.e., south side of the railway track. All the parallel alignments are on the left hand side of the existing railway track

Table 6-1: Locations of the Parallel Alignment

S. No.	From	To	P/D	Start	End	Length (km)
1	Kaurara	Ferozabad Detour Start	parallel	1200.00	1224.00	23.80
2	Ferozabad Detour Start	Ferozabad Detour End	Detour	1224.00	1234.00	14.38
3	Ferozabad Detour End	Tundla Detour Start	parallel	1234.00	1245.00	10.3
4	Tundla Detour Start	Tundla Detour End	Detour	1245.00	1254.00	11.98
5	Tundla Detour End	Barhan detour Start	parallel	1254.00	1262.00	6.9
6	Barhan Detour start	Barhan Detour End	Detour	1262.00	1264.00	3.2
7	Barhan Detour End	Chamraula	parallel	1264.00	1266.00	1.6
Total				72.16km, say 72 km		

The objective of examining various alternatives was to screen the manifest features of the environment and to assess which of the alternative alignments are likely to have the most significant environmental impacts. Three alternatives i.e. parallel alignment, right side alignment and left side alignment have been considered along the critical area, where environmental and social impacts are significant.

6.3 ANALYSIS OF ALTERNATIVES

The various alternatives for each detour are discussed below:-

6.3.1 FEROZABAD DETOUR

This detour is 14.38 kms long and envisages areas of mass settlement of Firozabad which are very close to Railway boundary. This will help to avoid mass displacement at Dabrai village at kms1224/27, Rashidpur Kanneta at km 1226/7, Mora Gaon at 1227/9 and on Firozabad yard and its approaches On this detour, alignment has been kept superimposed with earlier alignment wherever possible to avoid further resentment from locals. Various options explored have been given in **Figure-6.1**

Figure 6-1: Ferozabad Detour

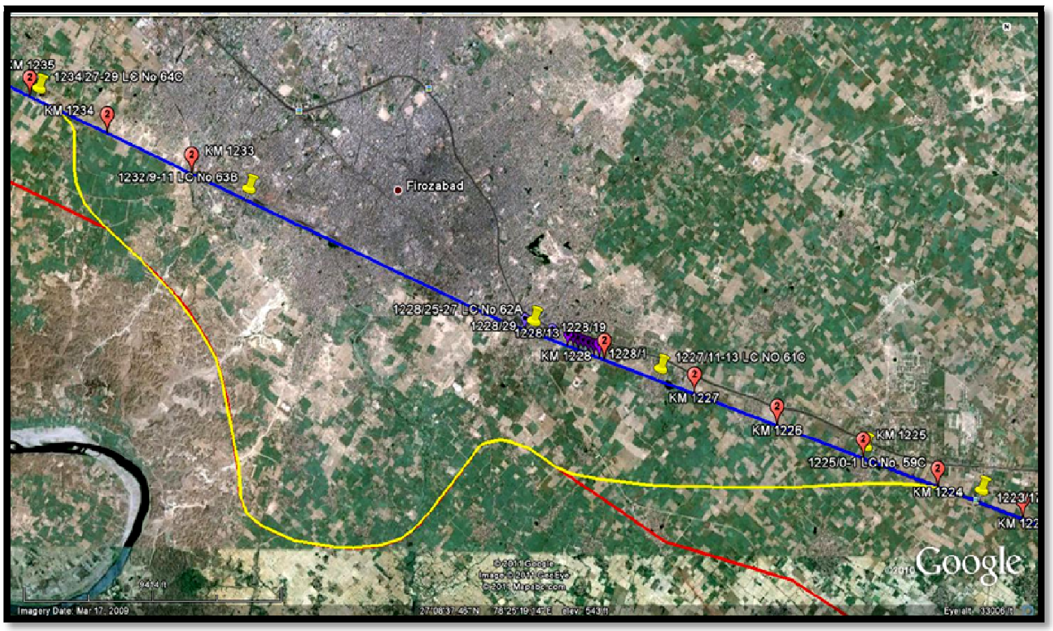


Table 6-2: Issues related to Ferozabad Detour

S. No.	Issues	Parallel along existing IR track	On north side of existing IR track	On south side of existing IR track	Recommendation
1.	Land width	10-12 meter additional width is required	Proposed width is 60 meter	Proposed width is 60 meter	The detour is recommended on south side of the existing track.
2.	Acquisition of structures	About 32 structures and 54 families will be displaced	Passes through agriculture land and crosses lower Ganga canal, HT line	Passes through agricultural and barren land	
3.	Issues of ROB	Construction of ROB at LC gate will displace about 100 houses	None	None	
4.	Technical constrains	Need modification of yard	Need additional bridges along the water bodies. HT lines shall have to be shifted four times adding to the cost	Need underpasses at crossing locations	Appropriate measures to mitigate noise and vibration such as appropriate reduction of RoW and construction of noise barriers shall be taken near sensitive receptors Special attention shall be given on farmers who will lose fertile agriculture land for income restoration
5.	Public Opinion	Not favourable	Not favourable Dabrai Village, district head quarters of Ferozabad have direct impact	Loss of land and livelihood, need good communication strategies and consultation	
6.	Environmental issues covering noise, vibration and impact on sensitive receptors	Noise and vibration impact on residential and sensitive receptors	Impact on the surrounding villages due to construction of new track	Impact are less as alignment is avoiding through villages	
7.	Site suitability for various facilities such as freight stations, electric substation etc.	Not suitable due to congestion along the track	Suitable as sufficient land is available along the track	Suitable as sufficient land is available along the track	
8.	Ecological impact such as tree cutting	Not significant	Not significant	Not significant	
9.	Other impacts	Remaining houses will have impacts of vibration and noise pollution	Increased noise and associated impact on villages	Less impacts as entire habitation have been avoided	

6.3.2 Tundla Detour

Length of this detour is 11.98 km. This detour has been planned to avoid mass settlements (24 structures) at 1246/3 at Chudawali village. Also grade separation was necessary to crossing of Agra-Tundla line at Two locations at 1249/11 and at 1251/13. This detour also helps us avoid crossing with ROB at 1252/9 at which adequate clearances were not available. On this detour, wherever possible alignment has been kept superimposed with earlier alignment to avoid further resentment from locals. The alignment of Tundla detour has been shown in Figure-6.2. The detour also shows various options explored**.**

Figure 6-2: Tundla Detour

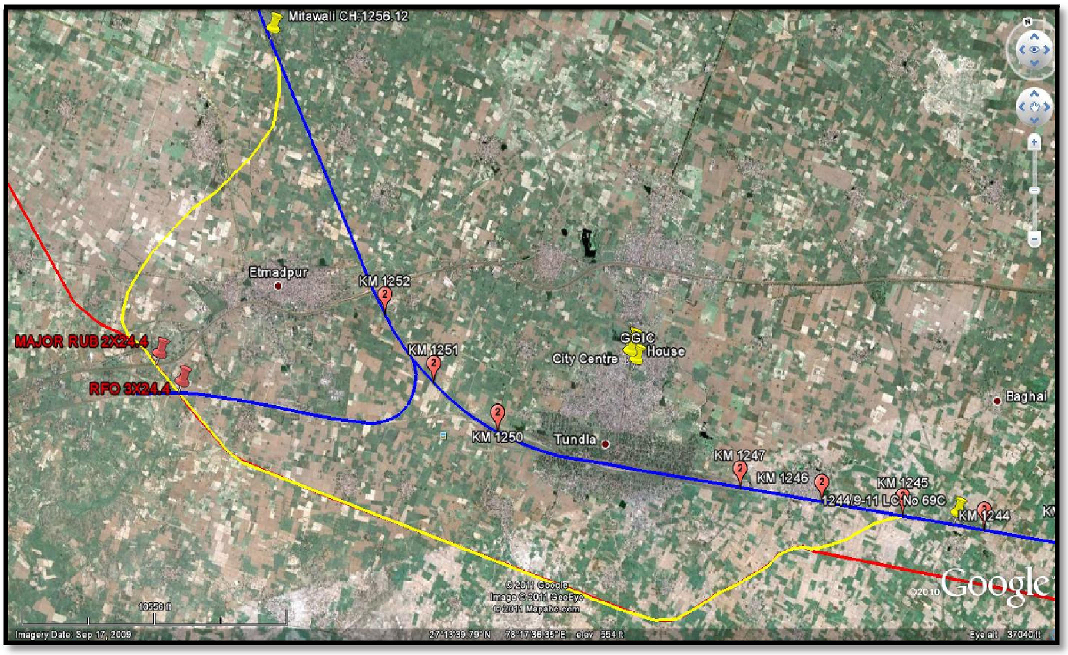


Table 6-3: Issues related to Tundla Detour

S. No.	Issues	Parallel along existing IR track	On north side of existing IR track	On South side of existing IR track	Recommendation
1.	Land width	8-12 meter additional width is required	Proposed width is 60 meter	Proposed width is 60 meter	The detour is recommended on south side of the existing track, considering lower impact as compared to parallel or the right side alignment , in which case project impact on environmentally & socially sensitive issues.
2.	Acquisition of structures	About 49 structures and 58 families will be displaced	The Tundla town will be affected	Passes through low grade agricultural and barren land	
3.	Issues of ROB/RUB	There will be req	One RUB for NH-2 Crossings		
4.	Technical constrains	At this location alignment has been planned with cut and cover option largely parallel to existing yard. With ROW of 22 m dismantling of 4 pvt and 11 Rly structures which include lobby also will be involved. This will also involve dismantling of existing loco line. This will also involve taking over of two loops of existing dispatch yard and taking over of Agra Mitawali line by DFCC. This will envisage box pushing at existing ROB of NH. This will also involve crossing existing Agra Tundla both	Need additional bridges along the water bodies and changing the alignment from left to right causes technical complications, HT lines shall have to be shifted four times adding to the cost	Need underpasses at crossing locations	

S. No.	Issues	Parallel along existing IR track	On north side of existing IR track	On South side of existing IR track	Recommendation
		South and North line at a level difference and laying track at underground with cut and cover option. In alternate plan we can envisage small detour at Tundla yard.			
5.	Public Opinion	Not favourable	Not favourable as Tundla Town will directly be impacted	Loss of land and livelihood, Land losers are apprehensive and ask for specific R & R packages	
6.	Environmental issues covering noise, vibration and impact on sensitive receptors	Noise and vibration impact on residential and sensitive receptors	Impact on the surrounding villages due to construction of new track	Impact are less as less structures are impacted	
7.	Site suitability for various facilities such as freight stations, electric substation etc.	Not suitable due to congestion along the track specially at Tundla Yard	Suitable as sufficient land is available along the track, however, Budhia Ka Tal Monument is within 147 m	Suitable as sufficient land is available along the track	
8.	Ecological impact such as tree cutting	Not significant	Not significant	Not significant	
9.	Other impacts	Remaining houses will have impacts of vibration and noise pollution	Increase noise and associated impacts on villages	Less impacts, but houses are closed to the proposed line may have some vibration and noise	

S. No.	Issues	Parallel along existing IR track	On north side of existing IR track	On South side of existing IR track	Recommendation
				impacts	

6.3.3 Barhan Detour

At Barhan yard existing Railway boundary is 5 meter from Up line and that on Dn side is 5 meter from Barhan - Etawah line. Total length of this detour is 3.2 km. On the up side, after 5 meter we have a road and on a ROW of 22 meter 32 double storied dwelling units which are in good condition are getting affected. In addition to this one overhead tank @ 15m and one masdid at 10 m were also coming in ROW so small detour has been planned at barhan yard**.**

Figure 6-3: Barhan Detour

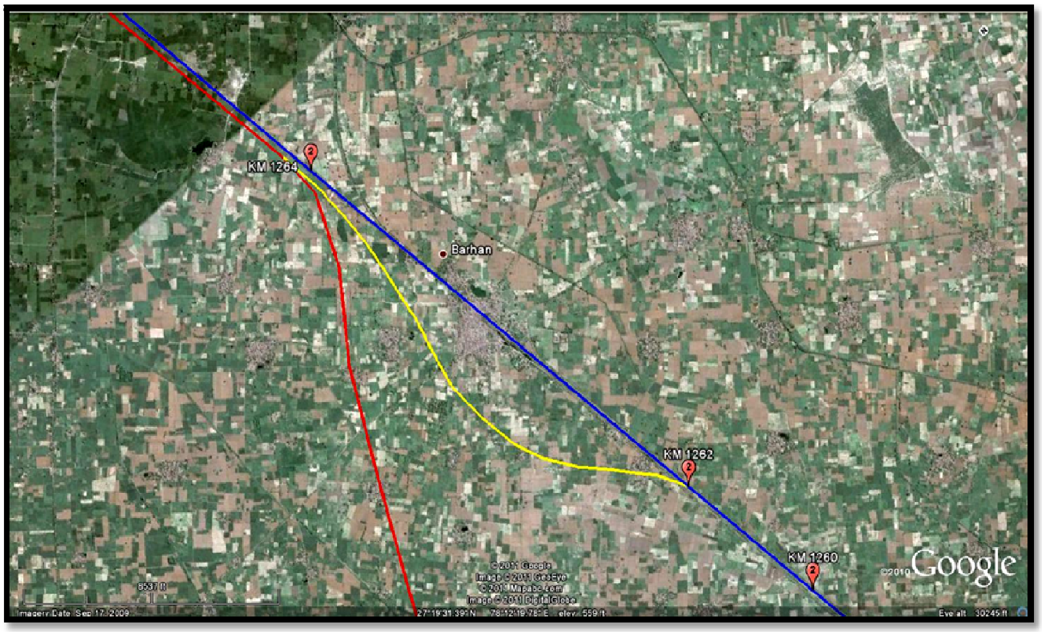


Table 6-4: Issues related to Barhan Detour

S. No.	Issues	Parallel along existing IR track	On north side of existing IR track	On south side of existing IR track	Recommendation
1.	Land width	6-7 meter additional width is required	Proposed width is 60 meter	Proposed width is 60 meter	The detour is recommended on south side of the existing track
2.	Acquisition of structures	About 32double storeyed buildings on left side, one overhead tank , one masjid on leftside of IR track and Barhan Yard boundary on Right side.	Passes through agriculture land and crosses	Passes through reserve agricultural and broken land	
3.	Issues of ROB	No issue of RoB	One rail flyover needed for Barhan Etah line	No issue of RoB	
4.	Technical constrains	Need modification of yard establishment at station building, dense habitation	Need to consider Barhan etah	Need underpasses at crossing locations and high cost due to major bridge construction over river Yamuna, constrain due to ravine terrain and geography location also causes problems	
5.	Public Opinion	Not favourable	Apprehensions of villages on agriculture land, however, good compensation package, livelihood restoration address the concern of the PAPs	Not favourable	
6.	Environmental issues covering noise, vibration and impact on sensitive receptors	Noise and vibration impact on residential and sensitive receptors	Impact on the surrounding villages due to construction of new track	Major environmental issues on the location of reserve forest, high concentration of trees, proximity with Chambal and Yamuna river	

S. No.	Issues	Parallel along existing IR track	On north side of existing IR track	On south side of existing IR track	Recommendation
7.	Site suitability for various facilities such as freight stations, electric substation etc.	Not suitable due to congestion along the track	Suitable as sufficient land is available along the track	Not suitable as reserve forest land is required for additional facilities	
8.	Ecological impact such as tree cutting	Not significant	Less significant as compare to left side alignment	Significant impact due to cutting of trees	
9.	Other impacts	Remaining houses will have impacts of vibration and noise pollution	Increased noise level and associated impacts on village	Less impacts, but houses are close to the proposed alignment may have vibration and noise impacts	

CHAPTER 7 : ENVIRONMENT IMPACT ASSESSMENT

7.1 INTRODUCTION

Environmental impact assessment involves prediction of potential impacts by the development of the project on the surrounding area. Based on the baseline environmental status described in earlier section and the proposed project activities, potential impacts have been assessed and predicted, and appropriate mitigation measures are suggested to avoid / reduce / compensate for the potential adverse impacts of the project and enhance its positive impact. The impact due to development of the proposed Dedicated Freight Corridor has been assessed for the planning phase, construction phase and implementation phase.

7.2 IMPACT ASSESSMENT METHODOLOGY

To assess the impact of the project, a simple qualitative method that determines potential existence of impact has been employed. Thereby, the judgments related to the magnitude and importance of the impacts caused by the project is presented. This involves development of Matrix summarizes environmental impact of the DFC project. The following parameters and scale is adopted for developing matrix. Parameters and scale of impact matrix is presented in **Table 7.1.**

Table 7-1: Parameter and Scale of Impact Matrix

Significance	Scale	Remarks	
No impact	E	Positive	Negative
Negligible impact	D	Positive	Negative
Insignificant impact	C	Positive	Negative
Relatively significant impact	B	Positive	Negative
Significant impact	A	Positive	Negative

For the assessment of impacts, the following criteria is adopted

Scale A: If National Parks, Wildlife Sanctuaries, wetland, ecosensitive zone or any designated natural reserve, protected species of any kind are directly affected.

Scale B: If large areas of forest, grassland, cultivable land or any natural environment for tourism are indirectly affected.

Scale C: If impacts is temporary and reversible

Scale D: If impact is hardly measurable

Scale E: No impacts or not applicable to assessment.

Sections below assess the impacts following the above method.

7.3 DESCRIPTION OF EXPECTED IMPACT

The description of impact on natural resources is as follows:-

7.3.1 Impact on Topography and Geology

1) Planning Phase

The project has been planned to minimize the impact on topography by avoiding sensitive topographic features such as tunnels, rivers/hills etc. However, impacts due to high embankment are expected.

2) Construction Phase

- Change in topography is envisaged due to the clearing of land, felling of trees, cutting and filling & due to the construction of structures.
- Construction of railway embankment is not likely to cause aesthetic change in the landscape. However, suitable landscaping and plantation activities, slope protection activities are envisaged to minimize the aesthetic impacts.
- Filling and excavation of earth will be required in the detour stretches, where the track traverses through undulating topography. However, changes will be limited within RoW of the track, hence overall impact will be localized.
- No impact is envisaged on geology due to the project.

3) Operation Phase

- Since the alignment runs on high embankment, issues of access of local communities and storm water drainage are anticipated during the operation phase of the project. These impacts are minimized by providing adequate ROBs, RUBs, and CD Works, etc.

7.3.2 Impact on Soil

1) Planning Phase

- The high embankment in water bodies is avoided during the planning stage to minimize the soil erosion.

2) Construction Phase

- Clearing of land, cutting of trees, excavation of borrow areas are likely to trigger soil erosion. Movement of vehicle / machinery / equipments and working force is also likely to cause soil erosion.
- The detour section is likely to traverse through agricultural and forested areas which will require clearing of the land.
- Soil in the agricultural regions is fertile and consists of alluvial deposits. Thus, loss of fertile soil is likely to occur.
- Borrow areas will be required for the project. Most portion of the DFC is embankment. The borrow areas are likely to cause soil erosion and affect agricultural areas. Appropriate measures for borrow area management are suggested in the chapter.
- Pits can be formed due borrowing, which may cause harm to local residents in the vicinity.
- Debris generated due to dismantling of structures
- Oil spills from the operation of the diesel generator/ pump and diesel storage, during transportation and transfer, parking places and diesel generator sets.
- Operation of the emulsion sprayer and laying of hot mix in service road
- Operation of the residential facilities for the labour and officers
- Storage and stock yards of bitumen and emulsion

3) Operation Phase

- Due to change in land use, impact is envisaged on soil during operation phase. However, the impacts are within the RoW.

7.3.3 Impact on Air Quality

1) Planning Phase

- Currently the cargo is transported by railway and road. It is estimated one litre of fuel can move 24 ton-km of freight by road, 85 ton-km by rail. Once the DFC is operational, consumption of fuel is likely to decrease which may subsequently reduce air pollution in the area. Moreover, proposed movement of freight trains would be by electricity, therefore, emissions are negligible. By planning the freight corridor, the overall ambient air quality of the area will improve.

2) Construction Phase

- During the construction phase, the air quality is likely to be affected due to generation of dust from construction activities and gaseous emissions from construction vehicles/ DG set. However, the impact will remain localized, short-termed and reversible.

3) Operation Phase

It is basically an eco-friendly project. DFC will help to reduce dependency on road transportation of goods, thus reducing cause for Green House effect or GHG emission.

- The movement of trucks during loading / unloading may have some impact near freight stations, however, these impacts are localized and concentrated in a specified area only.
- Plantation along the DFC is likely to improve the ambient air quality of the area.

7.3.4 Impact on Ground Water

1) Planning Phase

- No impact is envisaged on ground water in planning phase as water requirement is very nominal.

2) Construction Phase

- During construction phase pollution of groundwater is likely to occur due to seepage and runoff from construction site. However, the impact will be negligible. The total water requirement during construction period will be 3600 cubic meter per kilometre spread over the construction period of about 3 years. The daily requirement per kilometre length during the construction period will be 5000 litre and will be met through the local water supply. There will be no appreciable impact on ground water. The labour camp, which may be established during construction period, should have proper sanitation facilities and discharge of wastewater through soak pit. Hence, no impact is predicted on ground water quality.
- The impact on water resources due to the proposed project is tabulated in **Table 7.2**.

Table 7-2: Impact on Water Resources due to the Proposed Project

Impacts due to construction	Indicators	Remarks
Loss of water body	Water body affected	No impact in parallel section. In detour section no water pond is being impacted. Pond near Mitawali railway Station is out of Right of Way.
Loss of other water sources	Number of well affected	Some tube-well and hand pumps may be shifted / compensated
Alteration of drainage, run-off, flooding	No. of cross drainage channels	May have impact on detour section, sufficient cross drainage structures are

Impacts due to construction	Indicators	Remarks
		proposed
Depletion of ground water recharge	Decrease in water table depth	Not appreciable impact as water requirement is not significant
Use of water supply for construction	Quantum of water used	Not significant
Contamination from fuel and lubricants	Nature and quantum of contaminations	Not significant
Contamination from improper sanitation and waste disposal in construction camp	Area of camp/disposal site and proximity to water bodies/channels	Proper sanitation facilities at construction camp will minimize it

3) Operation Phase

- No impact is envisaged on water quality during the post construction phase as no wastewater will be generated during operation. However, the facilities near the stations may release sewage water which shall be disposed in a properly designed treatment facilities.

7.3.5 Hydrological Condition (Rivers / Canal and Lakes)

1) Planning Phase

- No impact is envisaged on hydrological cycle during planning phase.
- There is no perennial river crossing the present alignment. The village ponds have been avoided while planning the alignment of detour sections
- The alignment does not cross any significant water course / channel.

2) Construction Phase

- Drainage and flooding problem during construction due to stockpiling of materials, debris and construction of temporary approach road and yards would have impact of temporary nature.
- Local drainage may be affected during construction phase due to formation of embankments. The slope of project alignment is towards east. During the construction phase the embankment should be designed in such a way that the natural drainage pattern is not disturbed in order to avoid any water logging in the low lying area.
- Drainage pattern of the area may be studied in detail and suitable management plan may be prepared in the detailed design stage.

3) Operation Phase

- Local drainage is likely to be affected due to the formation of Railway Embankment as embankment will be an impediment for free flow of storm water. However, sufficient number of cross drainage structure will minimize the impact.

7.3.6 Flora

1) Planning Phase

- Tree plantation of local species is proposed during planning stage at appropriate places along the alignment.

2) Construction Phase

- The construction activity involving clearing of site, felling of trees, settlement of construction camps and office is likely to affect the flora of the area.
- The proposed alignment may cause cutting of approx.4352 trees. The major species present along the alignment are babool, neem, shisam, papal, mango,

bargad, kanji, labhera, ashok, sirsa, guler, jamun, ber, eucalyptus, mahua and bel.

- Acquisition of the forest land and construction activity likely to disturb the habitat. However, the forest land having mainly babool plantation, there will be no specific impact in terms of habitat loss etc.
- The species likely to be affected do not fall under the rare, threatened and/or endangered category, and are common in distribution.

3) Operation Phase

- No impact envisaged on flora during post construction phase. However, development of the green belt is suggested near stations and maintenance of plantation may be undertaken by Railway Dept. Plantation carried out along the alignment and as compensatory aforestation is likely to enhance the ecological condition of the area.

7.3.7 Fauna

1) Planning Phase

- No impact on fauna in planning phase as there is no wildlife sanctuary / national park is falling in the proposed alignment. The area has only domesticated fauna.

2) Construction Phase

- **Nilgai-Boselaphus tragocamelus** is the most common wildlife found in the study area. Construction activity is likely to affect the movement of the animal. However, to compensate, sufficient number of underpasses are provided at the detour section.
- Felling of trees is likely to affect the avifauna. However, the impact is not significant.
- Any construction near water bodies may impact the aquatic life. However no major water bodies are significantly affected due to this project.
- The impact on habitat is likely to be permanent, as the DFC will fragment the area which will restrict the movement of animals on either side.

3) Post Construction Phase

- The movement of freight train is likely to restrict the movement of animal on either side of the track, specifically in the detour section.
- Possibilities of collision of domestic animals with freight train.
- Disturbance of domestic animals due to the noise produced during the passage of trains.

7.3.8 ASI Protected Monuments

The ASI protected monument, Budhiya ka Tal exists within 140 m from the DFC alignment. This monument is protected under ASI Act, 2010. Discussion held during field survey with Superintending Archaeologist (SA), Agra as proposed Tundla detour alignment is within regulated zone (140 m from the boundary) of this monument. As per the ASI Act, 2010, the area upto 100 m from the boundary of the monument is considered as prohibited zone and further upto 200 m from the prohibited zone, the area is called regulatory zone. Permission is required from National Monuments Authority for undertaking construction with regulated zone of the ASI monument. The application is under consideration at NMA HQ Delhi.

Figure-7.1 : ASI Protected Monument-Budhiya ka Tal

7.3.9 Other Sensitive Structures

A number of sensitive structures likely to have impact as described in Table 4.2. Sensitive receptors include school, hospitals, religious structures and one ASI structure. Some will have impact due to noise and vibration at the time of railway operation. Appropriate mitigation measures shall be undertaken as suggested in Chapter-8.

7.3.10 Impact due to Construction of Freight Station, Electric-sub Stations, various Signaling Facilities etc.

No major impact is expected because these facilities are planned on barren / agriculture land along the alignment and limited land is required for their construction. However, safety features shall be provided along these structures as per the railway manual and safety norms.

7.4 ENVIRONMENTAL MATRIX

Based of the potential impacts on natural resources in planning construction and operation phase an impact matrix has been created. The scale of impact is discussed above under individual parameter with mitigation measures. The Environmental Impact Matrix for pre-construction and construction stages are provided in **Table 7.3 and 7.4** respectively.

Most of the impacts are localized, insignificant and temporary in nature, except those related to noise and vibration during the operation phase.

Table 7-3: Impact Matrix (Pre-Construction & Construction Stage)

S.No.	Items	Overall Evaluation on the Project	Pre-construction Stage			Construction Stage											
										Construction Works for railway line and related structures							
			Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Extraction of Building Materials (stones, aggregates, sand, soil, etc.) at Quarries and Borrow Areas	Earth Moving: Cutting and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines and Vehicles for Construction Works	(A) Construction Works for Railway Lines and Installation of Related Facilities (signals, rails, etc.)	(B) Construction Works for ICDs and Freight Logistic Parks	(C) Construction Works for Stations (Terminal, Junction and Crossing)	(D) Construction Works for ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works
1	Topography and Geology	C	D	D	D	C	C	C	C	C	C	D	D	C	E	E	C
2	Soil	B	D	D	E	B	B	C	C	C	C	B	D	D	E	E	E
3	Groundwater	C	D	D	C	D	D	D	D	D	D	D	D	D	E	E	E
4	Hydrological Condition	D	E	E	E	D	E	D	D	D	D	D	D	C	E	C	C
5	Fauna, Flora and Biodiversity	D	D	C	C	C	C	D	C	C	D	D	D	D	E	D	D
6	Protected Areas / Sanctuaries	E	D	D	D	D	D	D	D	D	D	D	D	D	E	D	D

7	Landscape	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
8	Local Meteorological Conditions	E	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
9	Global Warming	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Table 7-4 :Environmental Impact Matrix (Post Construction Phase)

S.No.	Project Activities / Items of the Environment Subject to Positive / Negative Changes	Traffic conditions of passenger trains	Logistic conditions of goods, raw materials, agro & industrial products	Traffic condition of roads	Operation & maintenance of railway lines & related structures	Employment opportunities (whole country / local level)	Freight oriented business opportunities	Passenger oriented business opportunities	Promoting development of surrounding areas	Increase in settlers & vision to the project area
1	Topography and Geology	C	D	D	D	D	C	C	C	C
2	Soil	E	D	D	E	D	E	C	C	C
3	Groundwater	E	D	D	C	D	D	D	D	D
4	Hydrological Condition	E	C	C	C	D	C	D	D	C
5	Coastal and Marine Environment	Not Applicable								
6	Fauna, Flora and Biodiversity	D	D	C	C	C	C	D	C	C
7	Protected Areas / sanctuaries	E	D	D	D	E	D	D	D	D
8	Landscape	E	D	D	D	D	D	D	D	D
9	Local Meteorological Conditions	E	D	D	D	D	D	D	D	D
10	Global Warming	E	D	D	D	D	D	D	D	D

डेडीकेटेड फ्रेट कोरीडोर

Table 7-5: Scaling of Impacts on Natural environment due to DFC Section From Kaurara-Chamraula

S.No.	Natural Environment Contents	Scaling	Reasons (during construction phase)	Reasons (after-construction phase)
1	Topography and Geology	C/ D	C-During construction marginal changes in Topography are likely to take place because of excavation, construction of bridges, embankment etc. 2) No significant change in Geology is anticipated as requirement of construction material is not significant.	D: Negligible impact, no change is expected.
2	Soil Erosion	C/D	C-During construction marginal effect on soil because of erosion is likely to take place due to the loss of upper crust of soil in the local area. The impact will be marginal only since the project is linear in nature.	D: Negligible impact
3	Ground water	D	D: Negligible impact is likely to occur There will be requirement of about 2000 litres/day for every 15 km length	D: Only marginal impact is supposed to be felt. As there will be requirement of water for operation of stations.
4	Hydrological Condition	D	D: negligible, no river involved	D: no significant impact.
5	Costal and Marine Environment	E	E: No impact	E: No impact
6	Fauna, Flora and bio diversity	D	Loss of marginal herbal cover. This will be due to cutting of trees and removal of vegetation from RoW	D: Only marginal impact is supposed to be felt.
7	Protected areas, Natural/ecological reserves and sanctuaries	E	E: Negligible impact, no such area is getting directly affected. It is not within 10 km radius	D: Negligible Impact
8	Landscape	D	D: Negligible impact	D: Negligible impact.
9	Local meteorological condition	E	E: No impact	D: Negligible impact
10.	Global Warming	E	E: No impact	Positive impact as shifting of freight transportation from road to rail will decrease the emission of greenhouse gaseous
11.	Air Pollution	D	D : Negligible impact	Positive impact due to shifting of freight transport from road to rail as rail transport

				requires six times less fuel as compared to road

7.5 IDENTIFICATION, PREDICTION & EVALUATION OF IMPACTS DUE TO VIBRATIONS

Vibration is a complex phenomenon. Railway vibrations are generated by motion of heavy loads on tracks. Vibrations become more complex as speeds of motion change. Further complications are introduced by complex scenarios of multiple trains running in the same or opposite directions to each other. Vibrations require a medium for their transmission. Any variation in the medium present between the track and point of impact plays a significant role and complicates the assessment further.

Most studies in developed countries have ignored the variation due to multiple factors. Type of trains, speed have always been considered by them. However impact of variation in medium (ground) between the track and point of impact has mostly not been included in these studies. It did not bring inaccuracy in their estimations and prediction since a wide strip on both sides of the track was of only one kind / medium. They did not have the variety of the magnitudes we see in India. The advantage of this simplicity was easy to use of formulae and correlation in those studies.

We have included factor of variation in this medium in our studies and therefore been able to follow an assessment of impact that is more close to the ground scenario along the corridor.

In our study we have depended heavily on live data from real vibrations caused by the trains. From this data, we have picked up the highest vibration generating trains / speed / load / ground and situations. These are all live values and are not estimation. Having picked up these values, graphical extrapolation is used to estimate the vibration levels for train speed of 100 kmph. Thereafter, standard mathematical calculations have been applied to estimate the vibration levels due to multiple trains running together.

In chapter 4.5 we had provided a detailed justification for using Japanese As standards JIS Z8735 and JIS 1510. We have further explored the Laws relating to factory act, labor laws and laws for occupational health for co-relating norms. We have however not found any standards or limits relating to building vibrations or human annoyance due to vibrations. Most these laws cover are the whole body or hand arm vibrations caused by tools and equipment used by the workers. So we have remained aligned to Japanese standards quoted above and have used Db as units of measurements. This unit also helps in calculating combined effect of two adjacent vibration levels by way of simple formula. The formula used is

$$\mathbf{Lmax_{eq} = Lmax_{track\ 1} - Lmax_{track2} + Lmax_{track\ 3}}$$

As No of variables existing in this study are over a dozen we have not used co-relational equations to estimate as we expected it to introduce mathematical errors in the calculations. Instead we depended on Real time values and graphical assessment and extrapolation.

Methodology We have therefore channeled our study in following steps

1 Identification of Impacts of Freight trains. having different kinds of wagons.

2 Identification of category of train (wagons) causing highest vibrations.

3.Identification of impact of train speeds on vibrations

4.Identification of impact of train axel loads on vibrations

5 Identifying Highest vibration level from above data
6. Extrapolating this highest level of vibration for train speed of 100 Km / Hr
7. Calculation of change in this value of vibration of single train due to presence of multiple trains running together
8. Purifying this highest value for any effects of medium variation between the track and measurement point
9. Predicting the Maximum vibrations for plain route and for populated areas
10. Transposing vibration levels so estimated on to Sensitive Receptors identified and predicting the impact..

Identification of Impacts:

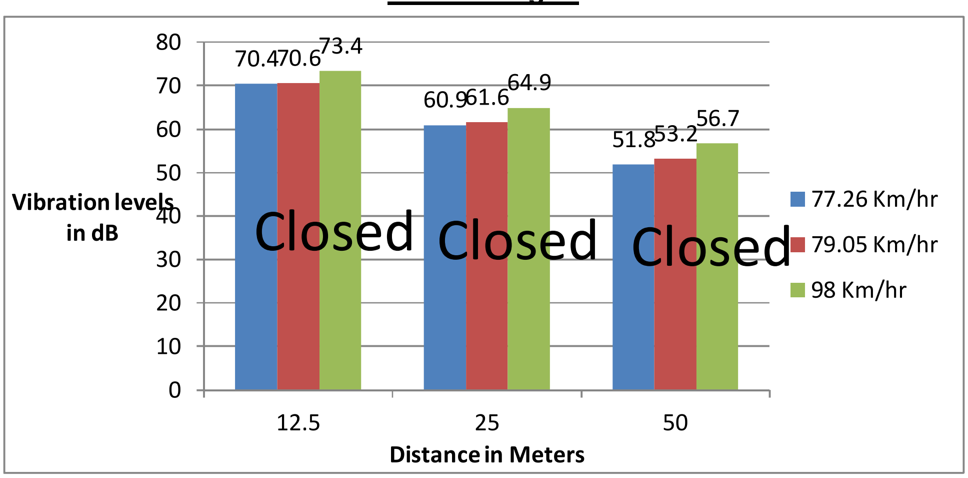
We have identified several kind of impacts from the data collated in previous chapters Typical these impacts could be of following types

1) **Impacts in Plane areas ie** travel of Vibration; reverberations at 90 degree to the track will affect all the buildings, archeological Monuments, inmates of the building. These variations in vibrations could be due to following factors;
   - Distances from the track
   - Speed and
   - Axel loads
   - Train Crossings
2) **Impacts due to train crossings ie** trains while crossing each other or while running parallel to each other in 2 or more numbers cause overall vibrations to increase or reduce. This aspect is to be taken into consideration for estimating maximum impacts in each of the above two situations
3) **Impacts in Populated Areas ie** travel of Vibrations, reverberations through the variety of ground conditions existing between the track and point of measurement / impact assessment. Varieties existing included mix of plain, embankment, hard standing platform of building floors, and roads. .

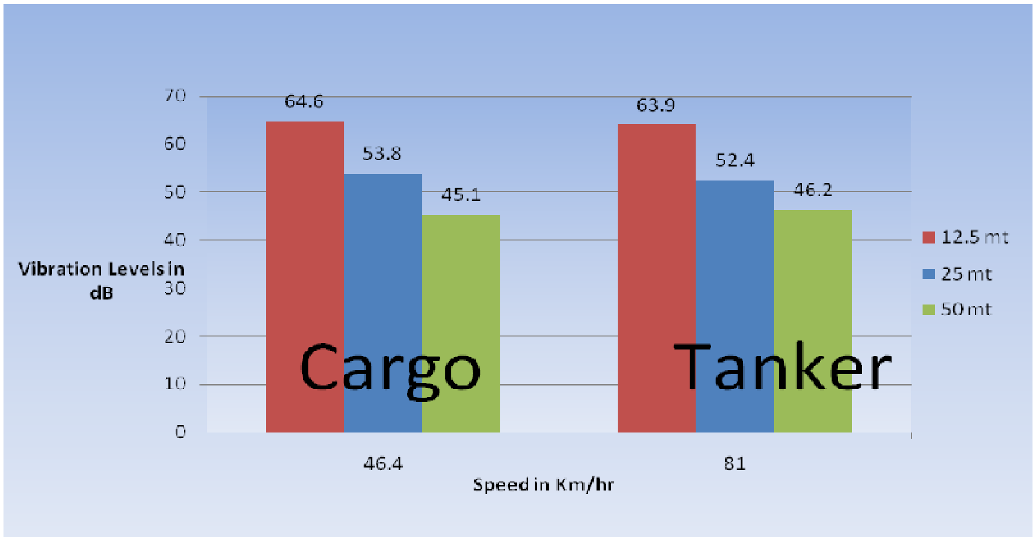
Impacts in Plain areas vis a vis distances from the track

We have compared the existing distance based vibration levels being generated by the trains running on the existing tracks. For the four categories of freight trains considered by us, the levels of vibrations generated in plane areas are provided in the figures below.

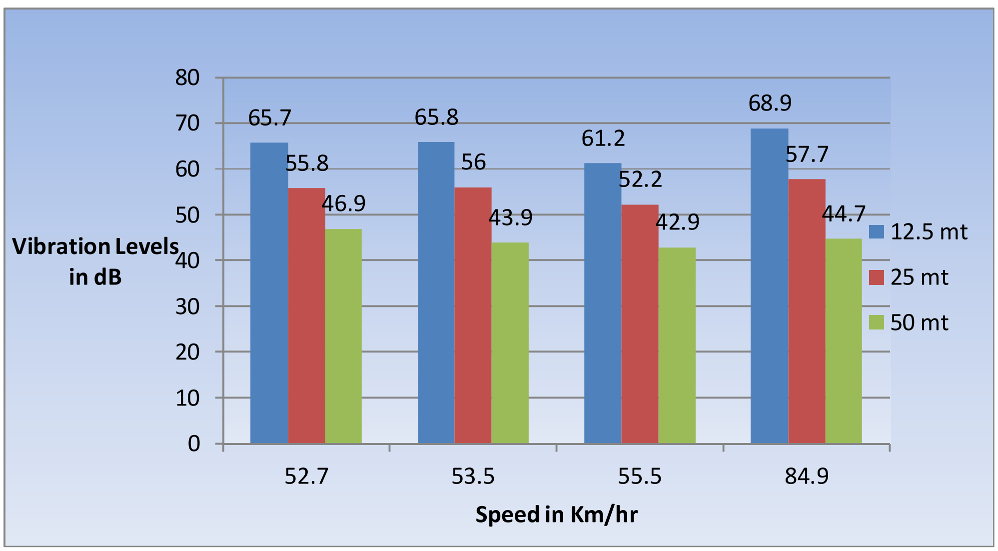
Closed Wagon



Tanker and Cargo



Open Wagon



From the graphs above, we can select the highest vibration levels of all the categories of train for one distance (say 12.5 or 25 or 50 meters) as the upper limit for that distance, for estimating the impact at 90 degree to the track. This is tabulated below.

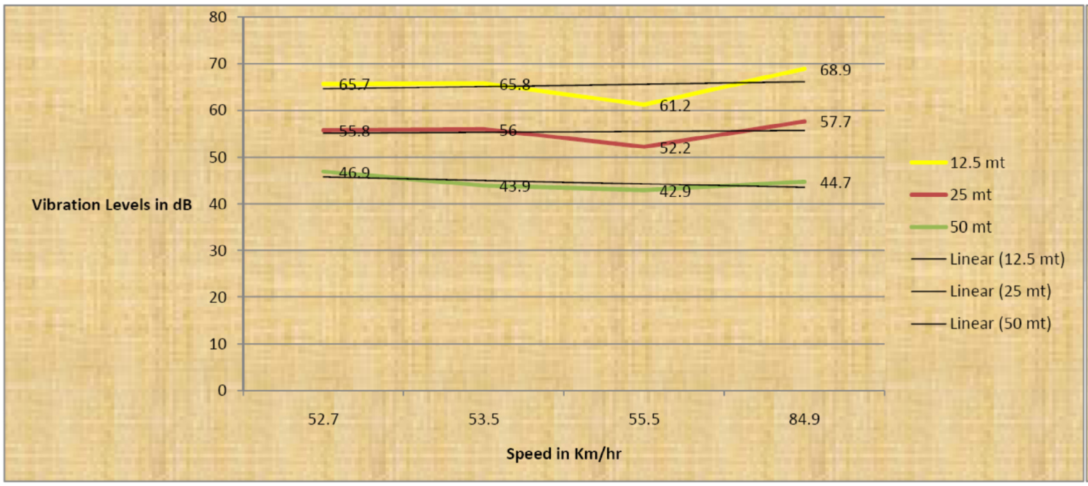
Table 7-6: Highest Vibration Levels for All Category of Trains

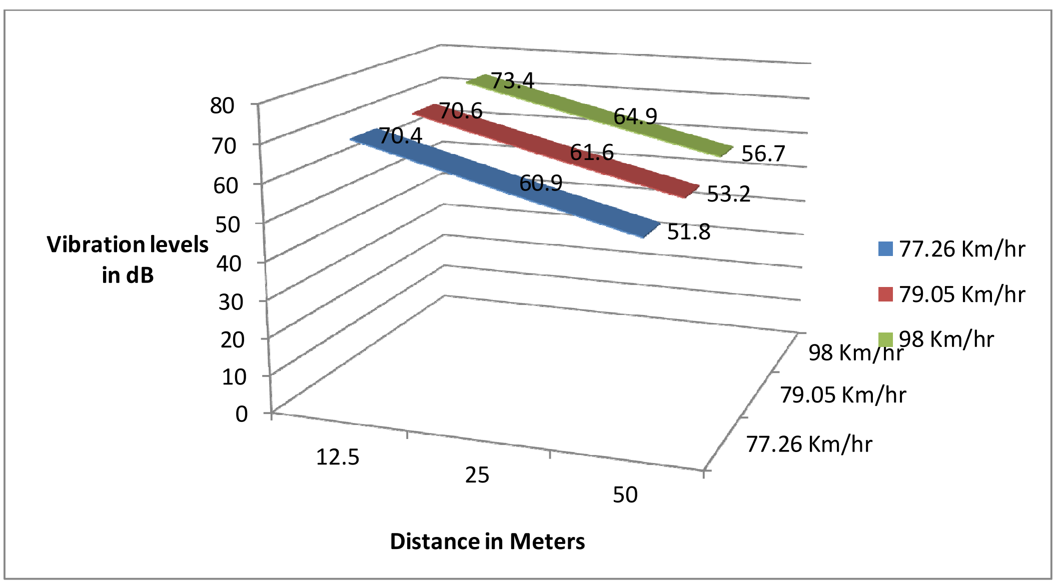
Distance	Maximum dB
12.5	73.4
25	70.6
50	70.4

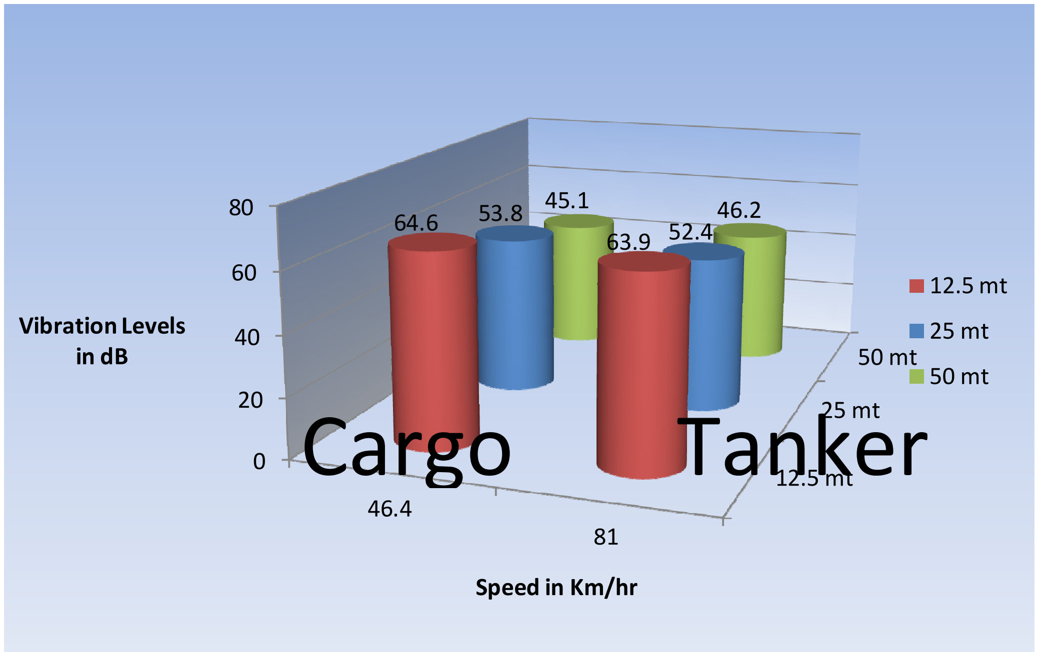
These values for all the three distances coincidentally correspond to only one categories of freight train that is **Closed Wagon**; Graph for this is produced below:

Impacts with speed and axel load were also similarly evaluated. These were identified for

- maximum speeds of trains in each category as well as for
- maximum vibration in these categories and are as placed below:

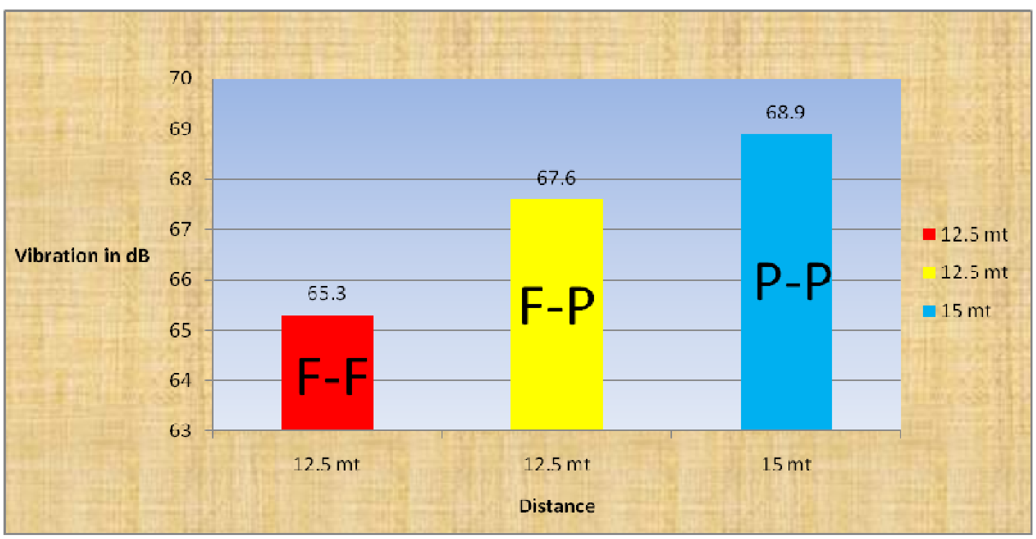






Impacts of Two Train Crossings

The data available includes several occasions of crossings of trains. These are in the form of Passenger – Passenger crossing (P-P), Passenger – Freight crossing (P-F), Freight – Passenger Crossing (F-P) and Freight – Freight crossing (F-F). These crossings are representation of similar crossing likely to take place on DFC on parallel tracks. F-F crossing is representation of similar crossing on detours.



From graphs above it is inferred that in parralel section maximum vibrations occur when two Passenger trains cross each other. The expected level is 68.9 dB at 15 Meters. For detour section this will be a crossing between 2 freight trains. Using the graph for vibration amplitude versus distance from the track, its value can be extrapolated.

Impacts in populated areas on residential / commercial / Industry/ Social structure. It is quite possible to generate similar charts for residential/ industrial / commercial complexes including sensitive receptors. However it will not be completely appropriate to use these graphs for assessing impacts on other buildings etc along the track. The variation will be due to dis-similarities of the grounds between the railway track and point of measurement for different structures considered for estimation of impacts. Additionally impact of vibration caused by road traffic and other movements in corresponding locations may further complicate the estimation. Therefore the data collected for such location has also been assigned as reference vibration levels for typical structures interfacing the track and the measurement point, The reference data is appended below in **Tabe-7.7**:

Table 7-7: Suggested Vibrations Interfacing Structures for Sensitive Receptors

S. No	Name of Location	Distance(m)	Lmax	Interfacing Structure
1	Temple at Bhandari (km 1205)	15	72.9	Wall in between Track and Boundary of Temple
2	School at Bhandari	85	40.2	Variety of Interfaces
3	Hospital at Vijaipur Nagla Bhav Singh	290	38.3	Too Far away
4	School at Alampur Jarkhi (km 1236)	48	49.1	Variety of Interfaces
5	School at Ulau Kheda (km 1240)	2	95.7	Too close
6	School at Mittawali (km 1254)	35	51.2	Some interfaces
7	Budhia Ka Tal	147	26.1	Agricultural land and boundary

These reference vibration levels for different interfacing ground studies can be transposed to impacted structures under assessment at any location with similar interfacing structure.

Prediction of Impacts

The Vibration measurements carried out fall into two groups broadly: For the portion of corridor that will run parallel to the existing track and portion of the corridor that will go through the detours. Parallel track, running of the trains will engage maximum of four parallel tracks. Of these two would be occupied by the freight trains and two by Passenger trains. The corridor will be completely together and will be parallel to the existing track. Average distance between the centre of passenger and freight trains is expected to be 23 meters

The levels of vibration on 2 tracks have been examined in previous section. Since the 3rd track scenario was not available for actual evaluation in locations where trains were running at reasonable speeds, we have mathematically calculated the same. Vibrations on parallel tracks for trains running together on these tracks have also been evaluated below.

Of all possibilities, maximum vibrations will be generated by the various combinations of trains running on 3 closest tracks as these trains have maximum influence of individual vibrations on each other. From the graphs of two trains crossing each other as placed in previous section, we notice the highest Vibration Level for two train crossed is 68.9 dB for Passenger – Passenger combination. This is however very much below the levels caused by single freight train running on the nearer track. The reason for this phenomenon to occur is the fact that both the trains are running opposite to each other and are therefore canceling effect of vibration waves generated by them individually.

Calculations

Check for vibrations for 100 Km/Hr train speed:

By examining the trend of change in Vibration Levels with the increase in speed in the graphs in previous sections we notice that in most cases the vibration levels increase with increase in speed. We have extrapolated this trend of vibration of freight container & estimated the **vibration level at 100 km/hr to be 71.4 dB**. This however is lower than the maximum vibration level for single freight train being considered by us and therefore not relevant

Check for multiple train running:

From the measurements and graphs as discussed earlier the maximum level of Vibrations occurring for any Freight container Train on any track and at 12.5 mts from the center of the concerned track (Container) = 75.3 **dB**

The Mathematically Attenuated value calculated for vibration at 35 meters in reference to the train running on the 3rd track = **72.8 dB** (Refer variation of vibrations with distance for containers)

Combined effect of these two Vibration Levels at the same measurement location that is 12.5 meters from the nearer track can be calculated as follows.

$$Lmax_{eq} = Lmax_{track\ 1} - Lmax_{track2} + Lmax_{track\ 3}$$

In the light of this discussion for predictions, 75.3 **dB** as highest vibrations for freight trains have been used in our calculations below.

Predicted Vibration Levels for multiple trains running together– These estimations workout as below.

On DFC side of parallel Track

1. On the freight corridor side, two freight trains running in opposite directions with a gap of 5 meters from each other.
   - Highest value of Vibration level by one freight train = 75.3**dB**
   - This level attenuated to 17.5 mts for second freight train = **71.5 dB**.

For these trains running in opposite directions, resultant level is difference of the 2 vibration levels.

$$Lp_{F-F} = 10*LOG\ (10^{\wedge}(75.3/10)-10^{\wedge}(71.5/10)) = 72.9\ dB.$$

2. One freight train running closer to the 12.5 mts measurement point in the same direction from a passenger train 10 mts away
   - Highest value of Vibration level by one freight train = **75.3**
   - Highest value of Vibration level of passenger train attenuated to 35mtrs = **72.9**

   Since both the trains are running in same direction the relevant level will be addition of the two levels

$$Lp_F + Lp_{Psngr} = 10*LOG\ (10^{\wedge}\ (75.3/10) +10^{\wedge}\ (72.9/10)) = 77.2$$

3. A Freight train running on the 2nd track farther from the 12.5 meter measurement point and a passenger train running opposite to its direction in the third track.

   - Highest value of Vibration Level of Passenger train attenuated to 35 meters = **72.9**

   - Highest Value of Vibration level by one Freight train attenuated to 20 meters = **71.5**

   Since the trains are running in opposite directions. Therefore, resultant value is difference of the 2 vibration levels.

   $$Lp_{F-P} = 10*LOG(10^{(72.9/10)} - 10^{(71.5/10)}) = 67.3 \text{ dB}$$

4. The next scenario is for vibrations on parallel tracks for three trains running together on the first three Tracks.

   - Highest Value for the Vibration Level by Freight – Passenger in First and Third Track running in same direction: **77.2**

   - Highest Value of Vibration level by one Freight train running in 2nd track attenuated to 20 meters = **71.5**

Since this is a scenario of parallel running of the trains in composite manner

$$Lp_{F-F-P} = 10*LOG(10^{(71.5/10)} + 10^{(77.2/10)}) = 78.2 \text{ dB}$$

<u>On Passenger Track Side</u>

5. On the other side of all four tracks the situation will be driven by passenger train in similar four possibilities. The evaluated highest Lmax for these four possibilities are:

   i. 2 Passenger trains running on track 4 and 3 opposite to each other= 68.9 **dB**

   ii. 1 Passenger in track 4 and one freight on track 2 both in same direction=**65.1 dB**

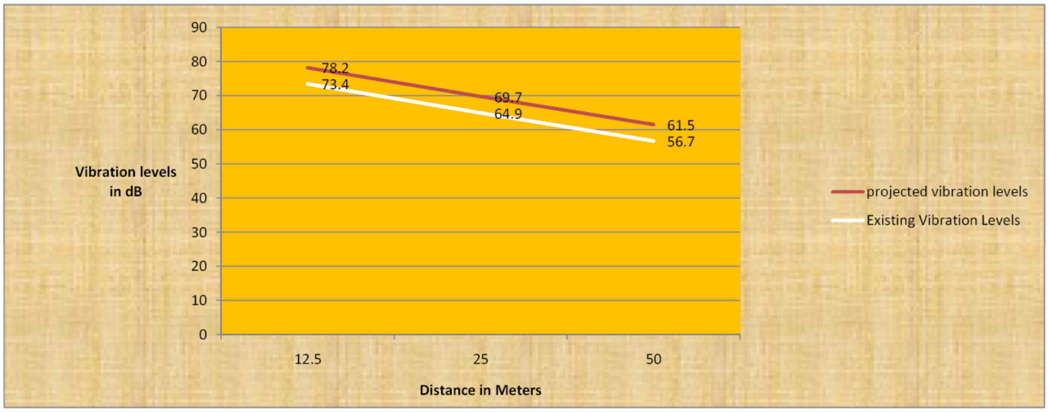
   iii. 1 Passenger on track 3 and one freight on track 2 both in opposite direction- **66.5 dB**

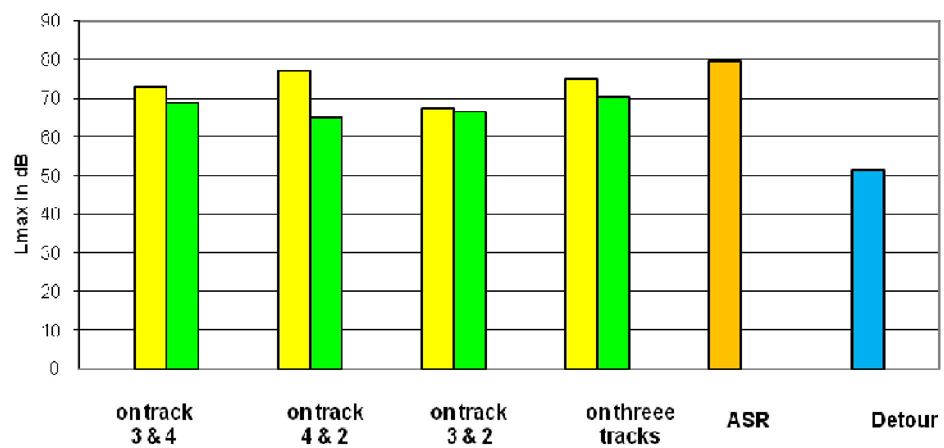
   iv. 2 Passengers on track 4 and 3 and one freight on track 2 = **70.4 dB**

6. The other less effective combinations would be different mixes of trains running on, third and fourth tracks.

From all the above calculations we consider the worst case scenario for plain routes and select the maximum vibration levels as upper limit expected to be encountered , The maximum possible vibrations as calculated above = **78.2 dB. I**t occurs when 2 freight and one passenger trains run together on first 3 track of DFC track side.

We display below graphically the predicted values for various distances from the track alongwith the graph for freight train vibrations for the similar distances.





Predicted highest Vibration Levels for the Detour track – These estimations workout as below

For the detour locations the scenario will always be two Freight trains crossing each other in opposite directions for which we have calculated highest Vibration level as **71.5 dB** at 12.5 meters measurement point, when the interfacing ground is plain ground.

However this value is lower than the highest Vibration Levels generated by running of Single Freight train.

Therefore predicted highest vibration levels for the detour portions = **75.3dB** at 12.5 meters from nearer track for freight containers.

Evaluation of Impact

Based on the predicted values, evaluation of the impacts has been carried out in following steps:

1. We have examined the Japanese standards for Permissible Vibration values in Habituated and Plane areas. The pictorial information in this regard which also includes the level of complaints received by procure department of railway vibration in 2006 is displayed below;

Standard of Vibration Intensity (decibel)

90	Violent shaking of house and falling of unstable things
80	Shaking of house and rattling of doors and paper doors
70	Perceived by many people and slight movement of doors and paper doors
60	Perceived only by people at rest
50	Rarely perceived by human beings

Vibration level

The vibration level is determined by the amplitude and speed of vibration. Human beings perceive vibration in a complex manner.Therefore, vibration is corrected so that it can be measured on the same basis even if human perception of the vibration is different. The vibration level is also expressed by the unit of "decibel."

From the extract above it is apparent that standards 70 dB vibration level defines the acceptability criteria in general, however in densely habituated areas the lower level will have to be allowed based on these criteria the permissible limits for vibrations are provided below.

As worked out in the prediction process above, various highest vibration levels likely to occur in different portions of the DFC are as below:

Plain route: 78.2 as against permissible levels of 70dB

Populated areas 78.2 as against permissible levels of 65dB

Therefore vibration levels have to reduced by

8.2 dBs - for Plain areas

13.2 dBs - Populated areas

8.2 to 13.2 dBs - plain / SR area

Prediction of Impacts on Sensitive Receptors

Prediction of Impacts on Sensitive Receptors based on the methodology described above has been carried out. The SRs have been identified during survey of the track alignment. From these listed receptors, those falling within the track alignment have been eliminated as they would require removal replacement or shifting. The balance receptors have been listed and predicted levels have been estimated. These details are given in **Table 7.8**.

Table 7-8:List of sensitive Receptors and Predicted Vibration Levels on them

S.N.	Type of Receptors	Name	Location/ Chainage	Parallel / detour	Distance from the centerline of the DFCC alignment (Meter)	Side (w.r.t Kanpur to Khuja)	Predicted max Vibration before mitigation
1.	Religious	Temple	Bhandari/1205	Parallel	15	L	76.2
2	Educational	School	Bhandari	Parallel	85	R	55.0
3	Health	Hospital	Vijaipur Nagla Bhav Singh	Start of Feroza bad Detour	290	R	Too far for prediction
4	Educational	School at Alampur	Alampur Jarkhi/1236	Parallel	48	R	62.5

S.N.	Type of Receptors	Name	Location/ Chainage	Parallel / detour	Distance from the centerline of the DFCC alignment (Meter)	Side (w.r.t Kanpur to Khuja)	Predicted max Vibration before mitigation
		Jarkhi					
5	Educational	School	Ulau Kheda /1240	Parallel	2	L	98.3
6	Educational	School	Mittawali /1254	Detour	35	L	65.0
7	Archaeological Site	Budhia Ka Tal	NH/1257	Detour	147	R	54.0

7.6 PREDICTION AND EVALUATION OF IMPACTS ON NOISE ALONGSIDE RAILWAY LINES

The detailed railway noise survey was conducted at 05 in the entire stretch. The result shows that during train operation along the railway track the noise level always exceeds the statutory limit; however, at detour locations the noise levels are less and within the statutory limits. For the prediction purposes, the highest noise level i.e. 104.1dB(A) recorded at 12.5m from the centre of the existing track used as a reference for maximum noise level prediction. The Leq noise level recorded at 12.5 m is around 99 dB(A) from the centre of the track is taken as reference for Leq noise level prediction.

Examination of Prediction Method

1) Railway Noise

Regarding railway noise generated by conventional trains (local trains, express trains and limited express trains), main causes include (1) traction movements, (2) structures and (3) machines equipped to the train. Among them, the traction movement contributes to the generation of noise greatly.

Several types of prediction equations were proposed for various types of railway track structures, such as the elevation, embankment and cutting.

Therefore, prediction was carried out applying the actual data of railway noise level, running speed (V) of trains, and the distance from center of the nearest railway track (D).

Based on the obtained the data of railway noise, the empirical equation was extracted by using a simple regression and correlation analysis. The following equation is used for noise prediction.

Assuming V is constant, D is only one variable, and the empirical equation is shown below. A predicted railway noise level is shown in the below table.

$$L_2 = L_1 - 20 \text{ Log } D_2/D_1 \qquad \text{-------------} \ (1\text{-}1)$$

$$L_{Aeq} = 10 \text{ Log } (10^{N1/10} + 10^{N2/10} + 10^{N3/10} + \ldots\ldots)/T$$

Where,

L_1 and L_2 are the noise levels at D_1 and D_2 distance.

N_1, N_2, N_3 are the noise pressure levels at a different time interval. T is the number of reading.

Reference: JICA Study on DFCC Corridor

1) Condition of Prediction

Following conditions are assumed:

- Type of traction: electrified traction (electric locomotive)
- Running operation: 150 trains/direction/day with the same time interval (approximately one train for every five minutes)
- Maximum running velocity: 100 km/h
- Majority of the existing railway line structures is the embankment structures with approximately 2 to 5 m high from the ground level at the site.
- Railway noise and vibration generation level due to planned dedicated freight train; remains the same as the existing freight train,
- DFCC plan would have various factors contributing to reduction in railway noise.

2) Prediction and Evaluation Points

a) Sites along the existing railway lines within the parallel sections of the DFCC Project.

1. Sites along the planned detour routes where no railway noise was observed as a reference point of the background level monitoring.

Prediction and Evaluation Results

1) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq}) were evaluated by using comparative and trends from (i) the ambient noise standard in India, (ii) existing ambient noise levels at SR and (iii) existing railway noise at SR.

The noises level predicted are presented in **Table 7.9**.

Table 7-9: Prediction of Noise Level on Sensitive Receptors

S.N.	Type of Receptors	Name	Location/ Chainage	Parallel / detour	Distance from the centerline of the DFCC alignment (Meter)	Side (w.r.t Kaurara to Chamraula)	Predicted max noise, dB(A)	Predicted Leq Noise Level, dB(A)	Remai
1.	Religious	Shiva Temple	Bhandari/1205	Parallel	15	L	102.7	68.4	
2	Educational	School	Bhandari Km 1205	Parallel	85	R	74.2	69.5	
3	Health	Hospital	Vijaipur Nagla Bhav Singh	Start of Ferozabad Detour	290	R	62.8	57.3	Noise mitigatio not conside due to Distanc
4	Educational	School at Alampur Jarkhi	Alampur Jarkhi/1236	Parallel	48	R	72.8	68.2	
5	Educational	School at Ulau Kheda	Ulau Kheda /1240	Parallel	2	L	96.6	68.4	Reloca Recom ded
6	Educational	School at Mittawali village	Mittawali /1254	Detour	35	L	82.1	76.8	
7	Archaeological Site	Budhia Ka Tal	Etmadpur	Tundla detour	147	R	77.4	72.5	

Analysis of Evaluated Results

The noise levels have been predicted at all the sensitive receptors located up to 150 m from the centre of the proposed track. The predicted noise level shows that noise level is considerably high at all the locations up to 100 m from the centre of the track. However, no barrier has been considered during the prediction, therefore, the actual noise level may be less due to attenuation of noise. The noise levels were also monitored at five sensitive receptors and combined impact due to the proposed DFCC project is given in **Table 7.10.**

Table 7-10: List of Sensitive Receptors where noise level was measured

S. No.	Sensitive Receptors	Monitored Noise Level		Resultant Noise Level,		CPCB Standards ,		Remarks	Distance (m) from Track
		Day	Night	Day	Night	Day	Night		
1.	Budhiya Ka Taal, Tundla Detour	72.5	74.7	72.5	74.7	55	45	Background noise level is high due to proximity with NH and too far	147
2.	Temple at Bhandari	68.4	49.6	97.2	88.5	50	40	Exceeds the CPCB noise standards	15
3	School at Bhandari	69.5	54.5	70.2	55.1	50	40	Exceeds the CPCB noise standards	85
4	Hospital at Vijaipur Nagla Bhav Singh	57.3	49.7	57.3	49.7	55	45	Too far away	290
5	School at Alampur Jarkhi	68.2	49.8	81.0	50.1	50	40	Exceeds the CPCB noise standards	48
6	School at Ulau Kheda	68.4	56.1	104	86.2	50	40	Exceeds the CPCB noise standards	2
7	School at Mittawali village	76.8	56.8	96.4	85.3	50	40	Exceeds the CPCB noise standards	35

Unit- Leq,dB(A)

Note: Since receptor at Sl. No 1& 4 are beyond 100 m therefore standards of Sensitive Zone will not be applicable. For other receptors standards of sensitive zone will be applicable. The school at Ulaukheda has been recommended for relocation.

As predicted in the table, the noise levels are going to exceed considerably near the proposed track at detour section. The noise levels at all the locations are exceeding the specified limits of CPCB. At Bhudia ka Tal the noise levels are also due to

Railway lines bring located in the urban area and close to exiting NH. These being higher, it is recommended that DFCC alignment should avoid the urban and city areas not to increase the noise levels.

Although in the detour routes the impacts to residents would be small, the railway noise would be newly added to the residents' life, and the appropriate mitigation measures should be prepared for residences along the railway line.

Suggested mitigation measures such as green belt and soundproof concrete barrier wall along the railway track may be considered during design stage.

CHAPTER 8 : MEASURES FOR THE MITIGATION OF ENVIRONMENTAL IMPACTS

8.1 DESCRIPTION OF MITIGATION MEASURES

The mitigation measures to mitigate the negative impacts due to the development of proposed EDFC on various elements of the environment during various phases of the project are described hereunder.

8.1.1 Mitigation Measures of Land Environment

Land acquisition, soil erosion and contamination of soil have emerged as major impact on land, especially in rural areas. Proposed DFC will result in economic growth in the region over time.

Table 8-1: Mitigation Measures for Land Environment

S. No.	Item	Impact	Impact (Reason)	Mitigation / Enhancement
1.	Change in topography	Negligible impact	Due to embankment raising	Turfing will be provided on the slopes
2.	Change in geology	Direct, long term, marginal impact	Extraction of materials (borrow earth, coarse & fine aggregates)	No blasting is envisaged All quarries outside study area and only licensed quarries having redevelopment plan will be used.
3.	Change in seismology	No impact	Since marginal impact geology have been identified therefore no impact on seismology	All project related structures will be complied with earthquake safety factor
4.	**Change in Land Environment**			
a.	Loss of land	Direct, long term negative impact for acquired land	Land acquisition change in land use pattern	Land requirement been minimized to 246 ha only by proposing three detours instead of single detour earlier.
b.	Generation of debris	Negative impact	May contaminate air, water and land, if not disposed properly	Debris may be generated during construction. Its disposal dumping sites will be identified during implementation.
c.	Soil erosion	Low , direct, long term negative impact	Slopes and spoils near the bridges Construction of new bridges and culverts quarry and borrow areas	Embankment protection For Emb, ht.>3 m stone pitching, Emb ht. < 3m. turfing Residual spoil need to be disposed properly silt fencing will be provided near water coarses specially at locations of distributories.,
5.	Contamination of soil	Direct, long term negative impact	Discarded bituminous waste during service road construction. Oil & diesel spills	Measures to prevent soil pollution will be in place. Hazardous Waste (Management and Handling Rules, 1989) to

S. No.	Item	Impact	Impact (Reason)	Mitigation / Enhancement
			Emulsion sprayer and wastage material from hot mix plant Residential facilities for the labor and officers Routine and periodical maintenance	be enforced. Oil interceptor will be provided for accidental spill of oil and diesel Rejected material will be layed in village roads or as directed by engineer Septic tank will be constructed for waste disposal
6.	Soil quality	Limited impact restricted to area where DFC alignment proposed	To see the Effectiveness of planned mitigation measures Any unforeseen impact due to accidental spillages	Measures will be revised & improved to mitigate / enhance environment due to any unforeseen impacts Spilled material will be recovered and contaminated soil will be disposed off as per provisions Hazardous Waste (Management and Handling Rules) 2000

Plantation programme will be carried out to improve the aesthetic look of the construction area. The plantation all along the proposed DFC will be carried out to improve aesthetic look along the existing as well as detour locations. It is proposed to plant ten trees per km on either side of the alignment.

8.1.2 Mitigation Measure for Borrow Area Management

Borrow areas will be finalized either form the list of locations recommended by DPR consultants or new areas identified by contractor. The finalization of locations identified by DPR consultant or identified by contractor depends upon the formal agreement between landowners and contractor and its suitability from civil engineering angle as well as environmental considerations. Meeting the guidelines/notifications as stipulated from time to time by the Ministry of Environment and Forests, Government of India, and local authorities, as applicable shall be the sole responsibility of the contractor.

Besides this certain precaution have to be taken to restrict unauthorized borrowing by the contractor. No borrow area shall be opened without permission of the Engineer/EO. The Engineer in addition to the established practices, rules and regulation will also consider following criteria before approving the Borrow area.

i. avoid any embankment slippage, the borrow areas will not be dug continuously, and the size and shape of borrow pit will be decided by the Engineer. Redevelopment of the borrow areas to mitigate the impacts will be the responsibility of the contractor. The contractor shall evolve site-specific redevelopment plan for each borrow area location, which shall be implemented after the approval of the Enginner-in-Charge.

ii. ensure that the spills, which might result from the transport of borrow and quarry materials do not impact the settlements. It will be ensured that the excavation and carrying of earth will be done during day-time only. Unpaved surfaces used for the haulage of borrow materials will be maintained properly. Borrowing of earth shall be carried out at locations recommended as follows:

Non-Cultivable Lands: Borrowing of earth will be carried out upto a depth of 2 m from the existing ground level.

Borrowing of earth shall not be done continuously. Ridge of not less than 8m width shall be left at intervals not exceeding 300 m. Small drain shall be cut through the ridge, if necessary, to facilitate drainage. Borrow pit shall have slope not steeper than 1 vertical in 4 horizontal.

- **Productive Land**: Borrowing of earth shall be avoided on productive/ cultivable lands. However, in the event of borrowing from productive land, under the circumstance as described above, topsoil shall be preserved in stockpiles. The conservation of topsoil shall be carried out as described in this chapter. At such locations, the depth of borrow pits shall not exceed 45 cm and it may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil aside.
- **Elevated Land**: At locations where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 2 m or up to the level of surrounding field.
- **Borrow pit along Roadside**: Borrow pits shall be located 5m away from the toe of the embankment. Depth of the pit should be such that the bottom of the pit shall not fall within an imaginary line of slope 1 vertical to 4 horizontal projected from the edge of the final section of the bank. Borrow pits shall not be dug continuously. Ridge of not less than 8 m width should be left at intervals not exceeding 300 m. Small drain should be cut through the ridge to facilitate drainage.
- **Borrow pit on the River side**: The borrow pit shall be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood. Flood zone of the river should be considered.
- **Community / Private Ponds**: Borrowing can be carried out at locations, where the private owners (or in some cases, the community) desire to develop lands (mostly low-lying area) for pisciculture purpose and for use as fishponds.
- **Borrow Area near Settlements**: Borrow pit location shall be located at least 1 km from villages and settlements. If unavoidable, they shall not be dug for more than 30 cm and shall be provided with drainage.

After identification of borrow area based on guidelines, contractor will fill reporting format as under and submit the same for approval to the “Engineer” Once approved the contractor will adhere to the recommendation for borrow area to the satisfaction of Engineer.

(1) In no case the depth of borrow area should exceed 2m from the existing ground level.
(2) Borrow pits slope should be maintained, no steeper than 1 Vertical: 2 Horizontal.
(3) Water pooling to be avoided/managed so that no disease spread or mosquito breeding due to water stagnation.
(4) Precautionary measures as the covering of vehicles will be taken to avoid spillage during transportation of borrow material.
(5) The unpaved surfaces used for the haulage of borrow materials shall be maintained properly for dust suppression.
(6) Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction facility is operating at the place of deposition, to minimize dust pollution.
(7) During rains appropriate measures shall be taken to minimize soil erosion, silt fencing shall be provided as directed by Engineer/EO.

The Contractor will keep photographic records of various stages i.e., before using materials from the location (pre-project), for the period of borrowing activities construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

8.1.3 Mitigation Measures to Minimize Soil Erosion

1) Construction Phase

- Suitable protection measures consisting of bio-engineering techniques such as plantation of grass and shrubs, may be provided to control erosion. The measures shall be applied along the slopes at high embankment where bridges will be constructed.
- Borrow area may be finalized considering ecological sensitivity of the area. Agriculture land shall be avoided for the borrow area as far as possible. Priority may be given to degraded area for excavation of borrow material. Rehabilitation of borrow area may be undertaken under the project.
- Construction work may be avoided during rainy season to evade erosion and spreading of loose material.
- Top soil removed from agricultural land may be stored separately in bund area and utilized during plantation or refilling of excavated area.
- Selection of borrow areas may be done considering the waste land available nearby in the district.
- A separate borrow area management plan may be made providing location, ownership details, timing of borrowing and rehabilitation measures.

2) Post-Construction Phase

- No impact is envisaged on soil during post implementation phase. Any damage or breach in embankment shall be repaired immediately.

8.1.4 Mitigation Measures to Improve the Ambient Air Quality

1) Pre Construction Phase

The dust generation due to pre-construction activities will be temporary in nature and localized. This will be effectively countered by sprinkling of water.

2) Construction Phase

In this stage, there are two major activities, **first** one is construction activities at working zone, which cause primarily dust emission and **second** are from operation of the construction plant, equipment and machinery, which cause production of gaseous pollutants. The specific mitigation measures include:

- Lose earth will be stored under cover or water will be sprinkled time to time.
- Hot Mix Plant and Crushers will be located atleast 1 km from habitations and in down wind direction. These will be installed outside Taj Trapazeum Zone (TTZ) as these are not permitted in TTZ.
- Vehicles delivering fine materials like loose soil and fine aggregates shall be covered to reduce spill on road.
- Water will be sprayed on earthworks, temporary haulage and diversion on a regular basis.
- Batch type hot mix plant fitted with the bag filter / cyclone and scrubber will be installed for the reduction of the air pollution.
- Pollution control system like water sprinkling & dust extractor and cover on the conveyor will be installed for the crushers.

- All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the emission level conform to the UPPCB/CPCB norms.
- Air pollution monitoring plan has been delineated for construction phase separately for checking the effectiveness of the mitigation measures adopted during the construction phase of the Contract. The monitoring will be taken up as per this plan.
- Air quality monitoring shall be conducted during construction period as per CPCB norms. The location and frequency of air monitoring are covered in Chapter-9.
- Impact on air quality is likely to be temporary and reversible.

3) Operation Phase

- Air quality of the area is likely to be improved as reduction in emissions due to shifting of freight from road transportation to railway transportation.
- Plantation along the DFC is likely to improve the air quality of the area.

8.1.5 Mitigation Measures for Water Quality

Due to the proposed project there will be some direct and indirect long term impacts on the water resources. Table below presents the major adverse impacts on the water resources and the mitigation measures proposed.

Table 8-2: Mitigation Measures for Water Quality

S. No.	Item	Impact	Impact (Reason)	Mitigation/Enhancement
1.	Loss of water bodies	Negligible as no major water bodies is being impacted.	• Part or acquisition of source of water	• Land acquisition to be minimized with provision of retaining walls • Relocation of ground / surface water sources
2.	Alternation of cross drainage	Negligible impact	• There is proposal for one major bridge on parallel section and 4 major bridges on Tundla Bypass • Widening of minor bridges and culverts	• Construction of new bridges and widening of existing bridges and culverts there will be an improvement in the drainage characteristics of the project area • Adequate cross drainage structures have been planned on Tundla, Ferozabad and Barhan detours
3.	Runoff and drainage	Direct impact	• Siltation of water bodies • Reduction in ground recharge due to incrased paved surface • Increased drainage discharge	• Silt fencing to be provided • Recharge well to be provided to compensate the loss of precious surface water resources • Continuous drain is provided, unlined in rural area and lined in built up areas.
4.	Water requirement for project	Direct impact	• Water requirement for construction activity. • Water requirement of labour • Water requirement during operations	• Contractor will obtain approvals for taking adequate quantities of water from surface and ground water sources from the relevant authorities and follow statutory guideidelines. This is required

S. No.	Item	Impact	Impact (Reason)	Mitigation/Enhancement
			at yards and stations	to avoid depletion of water resources.
5.	Water Quality			
a.	Increased sedimentation	Direct impact	• Increased sediment laden run-off alter the nature & capacity of the watercourse	• Guidelines for sediment control will be enforced
b.	Contamination of water	Direct adverse impact	• Bitumen wastes • Oil & diesel spills • Emulsion sprayer and laying of hot mix • Production of hot mix and rejected materials • Residential facilities for the lbor and officers • Routine and periodical maintenance	• Prevention will be taken to prevent pollution going into water body and ground water. • Hazardous Wastes (Management & Handling) Rules, 2000 to be enforced • Oil interceptor will be provided for accidental spill of oil and diesel • Rejected material will be layed in village roads or as directed by engineer • Septic tank will be constructed for waste disposal
6.	Water quality monitoring	Periodical checkup of surface and ground water quality	• To check the efficacy of mitigation measures • Any unforeseen impact due to accidental spillages	• Measures will be received & improved to mitigate / enhance environment due to any unforeseen impact

Contamination of water

- Oil interceptor will be provided at Construction camp sites and at Parking areas at Stations and other facilities.
- Construction work close to the stream or water body will be avoided during monsoon.
- The effluent standard notified under the Environmental Protection Act, 1986 will be strictly adhered. All wastes arising from the project will be disposed off in a manner that is acceptable to the Uttar Pradesh Pollution Control Board (SPCB).
- Relevant provisions of the Factories Act, 1948, the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 will be adhered.
- Construction labourers' camps will be located at least 1000m away from the nearest habitation.
- Unless authorised by the local sanitary authority, arrangements for proper disposal of excreta at the workplace with a suitable method approved by the local medical health or municipal authorities will be provided.
- Approach roads to river and other surface water bodies need to be closed permanently to avoid vehicle washing and to avoid major pollution sources. This applicable to all areas including the secondary construction sites.
- Water quality shall be monitored regularly near the construction site.

8.1.6 Noise Environment – Mitigation Measures

Environmental noise particularly railway noise, is a complex phenomenon because its intensity and characteristics vary with time depending upon the frequency and speed of the trains. The noise has been identified a major impact in the project.

Table 8-3: Mitigation Measures for Noise Environment

S.No.	Item	Impact	Impact (Reason)	Mitigation / Enhancement
1	Sensitive receptors	Direct impact	• Increase in noise pollution	• Noise barrier will be considered
2	Noise pollution (pre-construction)	Direct impact, short duration	• Man, material and machinery movements • Establishment of labor camps onsite offices, stock yards and construction plants	• Area specific and for short duration • Machinery to be checked & complied with noise pollution regulations. • Camps to be setup away from the settlements. • No construction activity during night time at habitations in the parallel sections
3	Noise Pollution (Construction Stage)	Temporary impact	• stone crushing, asphalt production plant and batching plants, diesel generators etc • Community residing near to the work zones	• Camps to be setup away from the settlements, in the down wind direction. • Noise pollution regulation to be monitored and enforced. • Temporary as the work zones will be changing with completion of construction
4	Noise Pollution (Operation Stage)	Insignificant impact	• due to increase in traffic (due to improved facility)	• this will be mitigated through automatic signaling and installation of noise barriers at habitations
	Noise Pollution Monitoring	Periodical noise will be monitored	• To check the efficacy of mitigation measures	• Measures will be revised & improved to mitigate/ enhance environment due to any unforeseen impact.

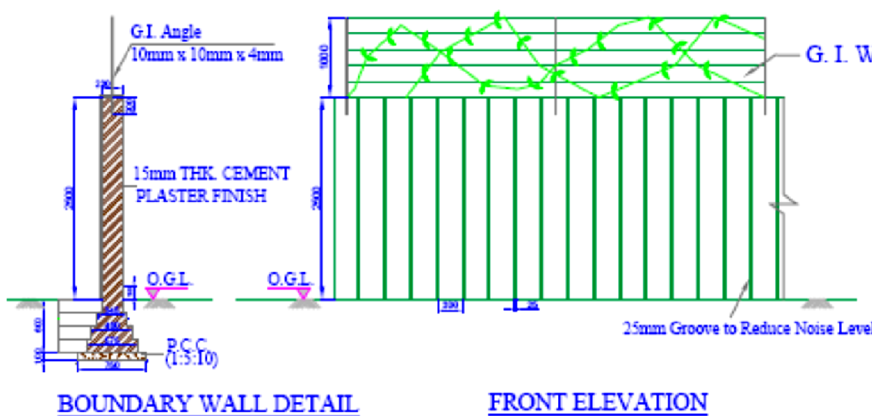
8.1.7 Sensitive Receptors – Mitigation Measures

School, hospital and cultural properties etc. have been identified particularly those close to DFC alignment and likely to have impact due to the project. As evident from predicted noise level that value is exceeding the specified limit at places. In order to bring the noise level within the limit, noise barrier may be considered at the identified sensitive locations. Thus noise level may be reduced by 10 to 15 dB (A) .

This barrier will accommodate the long term impact of the DFC traffic movement . List of sensitive receptors along the project corridor is presented in table below.

Table 8-4: Mitigation Measures for Noise Sensitive Receptors

S. No.	Chainage	Name of Receptor	Distance from the proposed track (m.)	Impact	Mitigation / Enhancement
1.	Religious	Old Shiva Temple	Bhandari/1205	Direct impact, high noise level	Noise barrier shall be created as per the conceptual drawing shown below
2	Educational	School at Alampur Jarkhi	Alampur Jarkhi/1236	Direct impact, high noise level	Noise barrier shall be created of 200 m length as per the conceptual drawing shown below
3	Educational	School	Ulau Kheda /1240	Direct impact, high noise level	Noise barrier may not solve problem because school is too close to proposed DFC track. Re-location of the school will be better solution.
4	Educational	School	Mittawali /1254	Direct impact, high noise level	Noise barrier will be created of 300 m length as per the conceptual drawing shown below
6.	Tundla Detour	Budhiya Ka Tal, ASI Protected monument, majar and mosque	147	Direct impact, high noise level	Noise barrier will be created as per the conceptual drawing shown below.
7	Tundla Detour	Mosque/ Darga	78	Direct impact, high noise level	Noise barrier It is not ASI structure



8.1.8 Mitigation Measures for Noise during Construction Phases

- Noise standards will be strictly enforced for all vehicles, plants, equipment, and construction machinery. All construction equipment used for an 8-hour shift will conform to a standard of less than 90dB (A). If required, high noise producing generators such as concrete mixers, generators, graders, etc. must be provided with acoustic enclosure.
- Machinery and vehicles will be maintained regularly, with particular attention to silencer and muffler, to keep construction noise level to minimum.
- Workers in the vicinity of high noise level will be provided earplug/ ear muff and engaged in diversified activities to prevent prolonged exposure to noise level of more than 90dB(A) per 8 hour shift.
- During construction vibratory compactors will be used sparingly within the urban areas. In case of complaints from roadside residents, the Engineer will ask the site engineer to take suitable step of restrict the working hours even further or use an alternative roller.
- Proposed tree and shrub plantations planned for avenue plantation especially close to settlement, may form an effective sound buffer during the operation stage.
- People will be convinced / educated to prevent sensitive land uses from developing up adjacent to the project corridor.

8.1.9 Mitigation Measures for Hydrological Impact

1) Construction Phase

- Provision of temporary drainage arrangement due to construction activities shall be made by contractor and suitable and strict clause shall be incorporated in genera or special conditions of the contract document for effective implementation.
- Silt fencing may be provided near water bodies.
- Proper drainage may be planned in the area to avoid water logging.

2) Implementation Phase

- Local drainage is likely to be affected due to formation of Railway Embankment.
- Cross drainage structures shall be provided at appropriate location

8.1.10 Mitigation Measures for Flora

1) Construction Phase

- Felling of trees shall be undertaken only after obtaining clearance from the Forest Dept.-forest areas, Railway Dept and local bodies outside forest area.
- Trees falling outside the RoW shall not be felled.
- Compensation for trees felled must be provided before initiating construction activity.
- Fruit bearing trees shall be compensated including 5 years fruit yield.
- Labour camps and office site shall be located outside and away from the forest area.

2) Post Construction Phase

- No impact envisaged on flora during post construction phase however, development of green belt is suggested near stations and maintenance of plantation may be undertaken by Railway Dept. The plantation carried along alignment and as compensatory afforestation is likely to enhance the ecological condition of the area. There is proposal to plant 10 trees per km on either side of rail track.

8.1.11 Mitigation Measures for Fauna

1) Construction Phase

- Crossing passages must be made for animal movement by provision of under pass followed with some plantation so that it resembles with the habitat.
- Borrow areas can be also developed as pond with grass and shrub planted around it.
- Silt fencing may be used near water body to avoid top soil runoff into the water bodies.
- Construction activity may be avoided during night hours in the forest area.
- Poaching must be strictly banned in the forest area. It may be ensured by the contractor that no hunting or fishing is practiced at the site by any of the worker and that all site personnel are aware of the location, value and sensitivity of the wildlife resources.
- Awareness programme on Environment and Wildlife Conservation may be provided to the work force. Forest Act and Wildlife Act may be strictly adhered.

2) **Post Construction Phase**.

- Fencing may be provided along DFC in areas to avoid collision, wherever feasible.

8.1.12 Landscape

1) Construction Phase

Landscaping Plan may be formulated for restoration, leveling and landscaping of the area once construction activities are over. This may involve the following:-

- The stockpiles may be designed such that the slope does not exceed 1:2 (vertical to horizontal) and the height of the pile restricted to 2 m.
- Stockpiled topsoil may be used to cover the disturbed areas and cut slopes. The top soil shall be utilized for redevelopment of borrow area, landscaping along slope, incidental space etc.
- Incorporation of suitable and effective contractual clause for rehabilitation and restoration of borrow area and other temporary work and landscaping it with surrounding area immediately after its use.
- Landscaping of surrounding area with plantation, ornamental plants may be planted near stations.

2) Post Construction Phase

No impact envisaged on landscape in operation phase; however the green belt development is suggested.

8.1.13 Mitigation Measures for Vibration

In order to mitigate the negative impact due to noise and vibration the impact area are divided in three broad categories;

- Areas identified in Reconnaissance Survey as sensitive residential, commercial industrial or social site.
- Area identified as reference location for carrying out measurements of vibration along EDFC
- Area having building and structure within existing or proposed railway land.
- Building and structure of importance for ASI or other similar historical importance.

For all these target location following scheme shall be applied:

i. Targets falling within the ROW - Pick out and exclude all such target locations from consideration of mitigation measures. These buildings and structures may be relocated.

ii. Targets located at distance falling in no impact zone are also be removed from the list of location requiring mitigation measures. For this trend line of attenuation of vibrations with distance for each type of location has been established. Using this trend distance for permissible vibration level has been identified. All locations farther to this distance have been isolated from assessment of mitigation measures.

iii. Targets that have special character due to historical or archeological or religious importance have to be considered in special manner irrespective of level of impact assessed in their case.

Based on the above, the identified target location have reduced from >10 to 6 as listed in the table. These 6 locations will need mitigation measures to reduce the impact on them. The distribution of these location is in plain areas but on parallel track, inhabited area and detour locations. Due to these distinctions, the level to which vibration impact to be mitigated is also different.

The following mitigation measures are recommended.

It has been found that the vibration level originate at the interaction of rail and wheel

because of various factors which include the following

- The construction of Wagon
- Condition of Wagon , rail and wheel
- Design , engineering , superiority in terms of track support system, soil condition and embankment height

Efficient Track and wheel maintenance: Effective maintenance of track and wheel can reduce upto 10 dB(A) noise and vibration levels. The Condition of the rails and wheels, if not maintained in good condition, will add to vibration level. Some maintenance procedures that are particularly effective at avoiding increases in ground-borne vibration are:

- Rail grinding on a regular basis. Rail grinding is particularly important for rail that develops rail irregularities which in their turn cause impact and low frequency excitation.
- Wheel truing to re-contour the wheel, provides a smooth running surface, and removes wheel flats. The most dramatic vibration reduction results from removing wheel flats and out of roundness.
- Implement vehicle reconditioning programs, particularly when components such as suspension system, brakes, wheels, and slip-slide detectors are involved.
- Install wheel-flat detector system to identify vehicle which are most in need of wheel truing. These systems are becoming more common on railroad and intercity passenger system, but are relatively rare on transit system.
- Install wheel geometry measurement device (e.g. laser based system installed at entrance of depot) with possibility of detecting out of roundness, difference of wheel diameter of wheels on the same axle, wheel wear. (**Vibration is reduced more than 10 dB)**

Therefore we estimate that a reduction of vibration up to **7.5dB** could be achieved as compared to highest Vibration level measured on existing tracks. In such case, predicted vibration level will come down by around 7.5 dB through maintenance efficiency and planning alone.

The DFCC has already designed to operate on elevated embankment of 2m of more. This means that at least 1 m additional height all along the corridor due to embankment. Researches and studies have shown the height of embankment increases the attenuation rate by **1- 2 dB** per meter height of embankment. Therefore at least **1- 2 dB** (for one meter additional height of embankment) will be reduced for entire corridor. In portion of track where no embankment exists currently, this reduction will be possible where it is 2 meter high and reduction will be around 2-3 dB. Therefore, taking a conservative estimate, this inbuilt measure will provide reduction of Vibration levels by **2dB**.

Considering the above, we conclude that the overall vibration will be reduced by a total of 10 dB.

As discussed earlier in the evaluation process maximum vibrations permissible on any site is

Plain route or detour upto: 70dB

Receptors: upto 65 dB

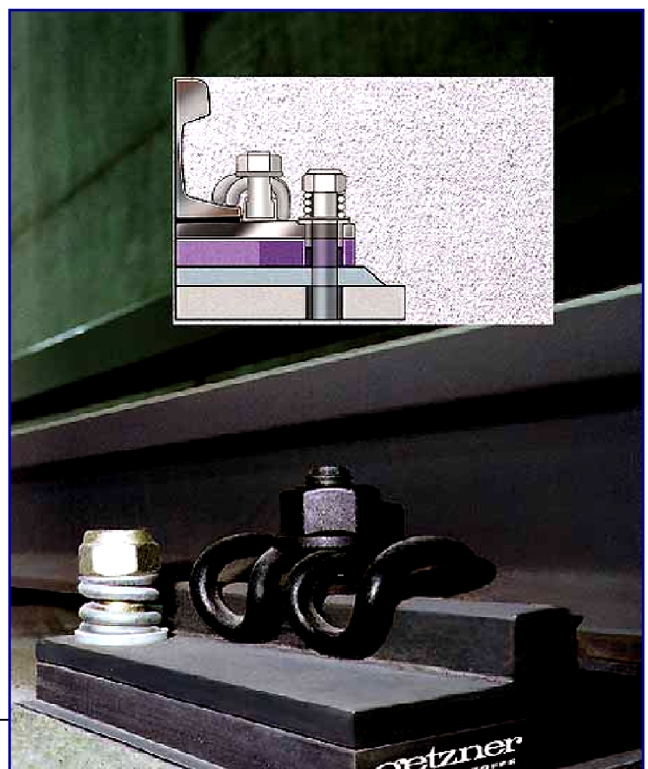
There are 5 locations on the parallel / detour tracks, permissible limit for vibration is 70 dB and maximum vibration level after above mentioned mitigation measures will be reduced to 68 dB.

Similarly there are 1 Receptor, where permissible limit for vibration is 65 dB and

maximum vibration level after above mentioned mitigation measure will be reduced to 68 dB.

Therefore, additional mitigation measure is required to take care of balance impact of 0.2 dBs on Parallel / detour tracks and 5.2 dB at receptor locations.

Resilient Fasteners: Resilient fasteners are very common fastening equipment used in modern track constructions. We feel these must also be included in design of track installation by DFCC. If so, these become another existing resource that will help mitigation of the impact of vibration. These fasteners are used to fasten the rail to concrete track slabs. Standard resilient fasteners are rather stiff in the vertical direction, usually in the range of 40 kN/mm (dynamic stiffness), although they do provide vibration reduction compared to classical rigid fastening system. Special fasteners with vertical dynamic stiffness in the range of 8 kN/mm will reduce vibration by as much as 15 dB at frequencies above 30 Hz. (Conservatively these could **reduce vibrations by 5 to 10 dB)**



Rail and base plate pads for rail resilient rail fasteners are used on trams, subways, light rail and main line train.

Therefore, this resource alone will be able to provide balance mitigation of track vibration.

Therefore it is felt that no additional mitigation measure is required to be considered.

8.2 MITIGATION MEASURES FOR DISPLACED CPRS.

Mitigation measure and compensation for displaced Common Property Resources (CPRs) has been given in below:

Table 8-5: Mitigation Measures for Common Property Resources

S.No	Common Property Resource	Mitigation Measures
1.	6 wells and 33 Handpumps in Parallel section being impacted.	The CPRs falling in Govt.. Land will be relocated for those on private land necessary compensation will be paid.
2.	7 Wells,7 Handpumps and 8 Tube wells are being impacted on Private land.	Necessary Compensation will be paid to the private land owners as per compensation framework.
3.	17 Religious structures (Devsthan, Samadhi and Temples) in Parallel section and 27 Religious structures in detour sections are being impacted.	The religious structures will be relocated in consultations with locals and with proper rituals. Necessary provisions budget have been made for the relocation

8.3 MITIGATION MEASURES FOR ASI PROTECTED STRUCTURES AND CHANCE FINDS

There is only one ASI Protected Monument **'Budhia Ka Tal'** at a distance of about 147 m from the alignment. The precaution measures such as construction activities involving vibrations will be carried out in staggered manner. If need arises temporary vibration dampening devices will be installed. The contractor will ensure that all conditions of NOC issued by ASI are adhered to.

During operation phase green belt will be developed and necessary protection wall at the periphery of RoW will be erected.

The Uttar Pradesh being rich in archeological sites specially Agra District. There may be chance find in the form of coin or relics and some under ground structure. In case of identification of any of the chance finds mentioned above during excavation, the contractor will stop the work and will report to DFCC. The DFCC inturn will inform Department of ASI. Pending decision from ASI work will remain suspended.

CHAPTER 9 : PUBLIC CONSULTATION & DISCLOSURE

9.1 INTRODUCTION

The Public Consultation meetings for the Kaurara-Chamraula Section of Eastern Dedicated Freight Corridor were conducted in the affected villages March 2011. The villages were selected keeping in view of environmental sensitivity and likely to be affected due to the project. The overall objective of public consultation was to provide information to the stakeholders and collect feedback on environmental issues from them at village level.

9.2 OBJECTIVES OF PUBLIC CONSULTATIONS

Public consultations intend to obtain people's participation in the project. It is an ongoing process which can improve communication, interaction and joint decision making between different stakeholders. Through public participation, all parties are well informed about the project, likely impact on environment & society as well range of views on issues and mitigation proposals. Most importantly, a good public participation process will result in better decision making process which is sensitive and responsive to public concerns and values.

It is widely acknowledged that public participation process should vary according to the size, complexity and level of interest in any one issue, policy or plan.

The broad objectives of Public Consultation Meetings (PCMs) were as follows:

- To understand the view of the people affected and Public living in surroundings of alignment
- To identify all major environmental characteristics of the villages to enable planning and implementation.
- To resolve the issue related to environment i.e. air, water, soil, noise pollution and vibration
- Disseminate information to the lowest possible hierarchy in the social system

9.3 METHODOLOGY OF ORGANIZING MEETINGS

These meetings were organized at village level through DFCC project office at Kanpur. In some of the meetings Chief Project Manager was present. Project officers of DFCC have been working in the project area since long and have fairly a good idea of the issues involved at village level. Moreover, the technical drawings, maps and other papers of the alignment were readily available with them and were used while disseminating information and responding to the queries of the stakeholders/ participants. They have developed a network of field functionaries and these field functionaries have established good rapport with the villagers and stakeholders.

The details of the identification of villages, participants, methodology for conducting the meetings and issues emerged during the meetings are briefly described below:

Table 9-1 Schedule and Dates of Consultations

A. Selection of villages

S.No.	Name of Village and Date of Consultation	Environmental Issues Emerged During PCM
1	Bhandari Village (km 1205) in parallel section	Noise pollution Safety of children Habitation on either side of track getting fragmented

S.No.	Name of Village and Date of Consultation	Environmental Issues Emerged During PCM
2	Vijaipur Nagla Bhavsingh (km 1223) Start of Ferozabad Detour	Noise Pollution from railway Track, and NH-2
3	Alampur Jarkhi (km 1236)	Noise Impact on Village, School on Right Hand side at about 30 m
4	Daragpur (km 1240) in parallel section	Acquisition of Agriculture land ,safety issue, and drainage problem

B. Participants

In the selected villages, the information was disseminated through the contact person of the project office of DFCC office in advance and the village head / influential persons was requested one day in advance to arrange the meeting by informing others in his village and nearby villages at a pre-determined place, date & time.

C. Methodology of conducting the meeting

At the outset, the consultant team and project manager of DFCC introduced themselves and welcomed all the stake-holders/ participants.

Project manager with the help of the technical designs of the proposed project introduced the project and its relationship with the concerned village/villages. The Environmental Engineer introduced the subject of Environment like air, water, noise, vegetation plantation, trees, birds, animals etc and possible or likely impact of the new track on environment. The participants expressed their views/ opinions openly w.r.t. the project & their villages.

The stakeholders turn by turn expressed their views and opinions and sometimes raised issues. Their misconceptions about the project were clarified by the Consultants & DFCCIL officials. The deliberations during PCMs were recorded in proforma sheet.

During the deliberations some participants were agitated and wanted that project should not pass through their villages. The project team members provided & explained all information and requested them for suggestions for making the project environment friendly. The record of the participants covers gender, profession etc.. It requires special mention here that few participants were apprehensive to reveal their identity. Photo documentation of the meetings is enclosed as **Annexure – 9. 1**

D. Issues and concerns emerged from the consultation

The issues and concerns shared and mitigation suggested in a tabulated form are given below in **Table -9.2**:

Table 9-2: Issues raised during Consultations and incorporation in Project design

S. No.	Date	Venue	Issues Shared	Mitigation Measures	Remarks
1	13-03-2011	Near Rail Crossing at Bhandari Village	1. Additional Noise on Temple and village on either side due to additional DFCC track 2. Safety of children would	• Wall for the safety and noise for locals • Underpass not possible due to Engineering reasons	DFC Track on left side will be just adjacent to Temple

S. No.	Date	Venue	Issues Shared	Mitigation Measures	Remarks
			be affected as DFC track will extend in habitation of village on left side 3. Locals demanded underpass for animal crossing		
2	13-03 -2011	Vijaipur Nagla Bhav Singh	1. Village is start of Ferozabad detour 2. Increased noise levels as it is between NH-2 and Kanpur- Delhi rail line 3. Tree cutting in Agriculture Fields	1. Noise barrier wall on rightside 2 Tree cutting will be limited within RoW	➢ Villagers raised concerned for the safety ➢ They suggested land acquisition and structure demolition should be minimised. ➢ Project affected people should be given employment
3	12-03-2011	Alampur Jarkhi (km 1236)	1. School on Right side at about 30 m 2. Alampur Jarkhi Village on Rightside adjacent to rail track 3. Increased noise and safety issues	☛ Noise barrier on right side to protect school from noise. ☛ Villagers concerned for safety of children	
4	12-03-2011	Daragpur (km 1240)	1- Agriculture land acquisition 2- Safety Issue for animal Crossing 3- Drainage Issue	1- Land acquisition marginal as DFC track planned parallel to existing on left side 2- Adequate cross drainage	

S. No.	Date	Venue	Issues Shared	Mitigation Measures	Remarks
				structures planned 3- Cross drainage structures will act as underpass during monsoon	

SUMMARY AND MAJOR FINDINGS

1. At most places stakeholders raised the concerns about noise level and suggested to construct boundary wall as noise barrier near the rail track, schools and habitation.
2. Villagers at Daragpur raised the concern for crossing the rail line. They have to cross railway line to go to field on other side. According to them, GRP personnel harass them & prevent cross. They demanded an underpass.
3. In some cases issue of children's safety was raised. They apprehended that accident will increase due to the project and birds, animals & humans would be affected. They drew attention to especially Peacock and Neelgaai. They also asked for mitigation measure against noise.
4. Villagers suggested for sufficient underpasses to cross the track so that accident involving animals/birds are avoided/reduced (Village Daragpur, District Ferozabad).
5. Local residents demanded that those would be rendered landless, should be provided employment by the DFCC in addition to compensation.
6. Many participants suggested for wall near the DFC track to protect animals, human lives and reduction of noise level. Boundary wall was a major suggestion.

8 Majority of the queries were related to land compensation. The villagers demanded that compensation should be paid as per market rate.

9 Participants demanded clarification on Ministry of Railways Job announcement.

Annexure 9-1

Photographs of Public Consultations

Consultations at Alampur 11-03-2011

Consultations at Bhandari on 12-03-2011

Consultations at Mitawali on 10-03-11

Consultations at Daragpur on 12-03-11

CHAPTER 10 : ENVIRONMENT MANAGEMENT PLAN

10.1 INTRODUCTION

Environmental Management Plan is an implementation strategy to mitigate and offset the potential adverse environmental impacts of the project and enhance its positive impacts. Based on the environmental baseline conditions, planned project activities and impacts assessed earlier, this section enumerates the set of measures to be adopted in order to minimize adverse impacts. The process of implementing mitigation and compensatory measures, execution of these measures, agencies responsible for the implementation of these measures and indicative costs are discussed in this chapter.

The project has overall positive impacts by providing a competitive, cost effective, congestion free reliable mode of dedicated freight service. It will certainly reduce the load on the roads and facilitate fast transfer of goods. Railway being an eco-friendly mode will also enhance or at least will not degrade the environmental quality. Since part of alignment (km 1221 to 1266) falls in TTZ area. The necessary mitigation measures to comply with TTZ Notification requirements have also been built to the EMP.

The development of DFC entails civil work, including excavation, filling, construction of RUB/ROB, bridge and cross drainage structures, and utility shifting etc., which are likely to cause adverse impacts on natural and social environment. When the impacts can not be fully avoided, appropriate mitigation measures are suggested to minimize and compensate the potential adverse impacts and enhance positive impacts. Most of the impacts are temporary in nature and are limited to the construction phase. These impacts can potentially be minimized and managed by proper planning and execution. The environmental management plans includes activities for pre-construction, construction and operation phases.

10.2 ENVIRONMENTAL MANAGEMENT PROCESS

Environmental management is based on the potential impacts assessed for the project. Assessment of potential impacts is based on the review of secondary data substantiated by site visits i.e. environmental monitoring, public consultation, household survey and discussion with concerned Govt. Dept. The implementation of Environmental Management Plan (EMP) requires the following:-

- An organizational structure
- Assign responsibilities
- Define timings of implementation
- Define monitoring responsibilities

10.3 EMP DURING CONSTRUCTION & OPERATION

The project activities will be executed in a phased manner, pre-construction phase, construction phase and operation phase. The major activities to be undertaken are described below.

10.3.1 Construction Phase

The environmental issues during construction stage generally involve environment, safety and public health issue. The contractor is required to comply with the laws with respect to environment protection, pollution prevention, forest conservation, resettlement and safety and any other applicable law. Environmental pollution during the construction phase will be less but control of pollution during this phase is of considerable importance. The EMP is an executable part of project, and the activities are to be guided, controlled, monitored and managed as per the provision provided. Following activities require attention during construction phase.

1. Land Acquisition / Diversion Plan

Acquisition of land is indispensable for construction of DFC. The proposed alignment traverses through Protected forest, settlement and agricultural areas. Approximately 4.1920 of forest land and extensive agricultural land are likely to be acquired for the project.

- At the outset as a part of the Land Acquisition Plan, the Right of Way (RoW) along the entire DFC alignment has to be established and confirmed from the State Forest, Agriculture and Land Revenue Departments.
- Diversion of forest land will be carried in compliance to Forest Conservation Act, 1980.
- The acquisition of land and private property shall be carried out in accordance to the Resettlement Action Plan (RAP).

It has to be ensured that all R & R activities including the payment of the compensation may be reasonably completed before construction activities start, on any section of the DFC. No construction work will start before total compensation has been paid to the PAPs.

2. Utility Shifting Plan

There are some utility services along the proposed DFC alignment such as electric lines, telephone lines, cable line, pipe lines etc which may be shifted on consultation with the concerned department before commencement of construction activity. There are road crossing with the DFC. Construction of bridges will be required to maintain their utility. These structures will be shifted in consultation with the concerned departments.

3. Construction / Labour Camp Management

- During the construction phase, the construction / labor camp will be located along the project area. Large numbers of labour are likely to move into the project area. A proper Construction Camp Development Plan has will be formulated to control degradation of the surrounding landscape due to the location of the proposed construction camp. The contractor must provide, construct and maintain necessary living condition and ancillary facilities. These must be included in contract documents provided to the contractor.
- Sufficient supply of potable water shall be provided at camps and working sites. If the drinking water is obtained from the intermittent public water supply, then storage tanks must be provided. All water supply storage may be at least 15 m away from the toilets or drains.
- Adequate and clean washing and bathing facilities must be provided that also have sufficient drainage.
- Adequate sanitary facilities shall be provided within every camp. The place must be cleaned daily and maintain strict sanitary conditions. Separate latrine shall be provided for women. Adequate supply of water must also be provided.
- The contactor must ensure that there is proper drainage system to avoid creation of stagnant water bodies.
- Periodic health check up may be conducted. These activities may be provided by the construction contractor in consultation with State Public Health Department.
- At every camp, first aid facilities with suitable transport shall be provided to take injured or ill person to the nearest hospital.

- Adequate supply of fuel in the form of kerosene or LPG may be provided to construction labourers, to avoid felling of trees for cooking and other household activities. No open fires may be allowed in camps.
- The sites shall be secured by fencing and proper lighting.
- The construction contractor may ensure that all construction equipment, Vehicle, and machineries may be stored at a separate place / yard. Fuel storage and refilling areas may be located 500 m away from the water bodies and from other cross drainage structures.
- All the construction workers shall be provided with proper training to handle potential occupation hazards and on safety and health which include the following:-
  - Environmental awareness programme
  - Medical and first aid
  - Engineering controls, work practices and use of various personal protective equipment
  - Handling of raw and processed material
  - Emergency response
- Construction / labour camps may be located away from forest areas, settlements, cultural heritage and historical sites and water bodies and dry river beds.
- It shall be ensured by the construction contractor that the camp area is cleared of the debris and other wastes after the completion of construction. On completion of construction, the land and surrounding area shall be restored back to its original/organised form.

4. Borrow Area Management Plan

An appropriate Borrow Area Management Plan will be formulated to control the degradation of the surrounding landscape due to the excavation work. The national standard which applies to the manual borrowing of earth is the IRC-10:1961.

- Borrowing of earth shall not be done continuously. Slopes of edges shall be maintained not steeper than 1:4.
- Top soil (15 cm) from all areas may be preserved in stockpiles and utilized for redevelopment of borrow/quarry areas.
- Borrow pit shall be developed as far as possible from the river side, where the inner edge of any borrow pit should be not less than 15 m away from the toe bank. As per as the borrow pits on the rear on landside are considered, it is to be avoided. Where it is unavoidable a berm, at least 25 m wide shall be left between borrow pits and toe bank. The toe of the bank on the rear side shall have a cover of 0.75 m to 1.25 m over the saturation line drawn at a slope of 1:6 from the high flood level on the river side.
- Borrowing of earth shall not be carried out on productive/ cultivable land. In the event that such an occasion arises, the contractor has to obtain permission from the supervising engineer.
- Sources of borrow areas will be identified by the construction contractors in consultation with Engineer..
- No borrow area will be opened without the prior permission from the local administrative bodies like Village Panchayats, State Department of Irrigation, Agriculture and State Pollution Control Board as the case may be..

- Reclamation of borrow area shall be mandatory and must be included in the agreement made with the construction contractor.
- Borrow pits may be located at least 1 km away from the villages and settlements.
- All borrow pits may be reclaimed: -
    - The quarry and borrow area shall be reclaimed back. The pits formed shall be backfilled by construction waste and site shall be stabilized.
    - Spoils may be dumped with an overlay of stocked piled top soil with respect to MoEF/SPCB guidelines.
    - Borrow and quarry pits can be also be developed as ponds and be used for aquaculture as per local requirement. These can also serve as park or picnic/recreation spots.
    - Landscaping of borrow and quarry area may be done, and the grasses, shrubs and tree species may be planted around the reclaimed area. Ornamental plants can also be planted on the access route.
    - Reclamation of borrow area may included in the agreement of the construction contractor.

5. Public Health and Safety

The contractor is required to comply with all the precautions required for the safety of the workmen. The contractor must comply with all regulation regarding scaffolding, ladders, working platform, excavation, etc.

- The contractor must supply safety goggles, helmets, earplugs and masks etc. to the workers and staff.
- Adequate precaution must be taken to prevent dander from electrical equipments. Necessary light and fencing must be provided to protect the public.
- All machines and equipment used for construction purposes must conform to relevant Indian Standards (IS) codes. This equipment must be free from patent defects, in good working condition, regularly inspected, and properly maintained as per IS provisions.
- All labourers working on mixing of asphaltic material, cement, lime mortars, concrete etc should be provided with protective footwear and protective goggles. Workers involved in welding work shall be provided with welder's protective eye shields.

  No men below the age of 18 years or women of any age will be employed to work with paint products containing lead in any form. Face masks must be supplied to workers when they use any form of spray paint or work with surfaces that have been dry rubbed and scrapped with lead paint.
- All reasonable measures must be taken to prevent any damage to the public from fire, floods, etc.
- All necessary steps shallt be taken to prompt first aid treatment for injuries that may be sustained during the course of work.
- The contractor shall conform to all anti malarial instructions, including filling up of borrow pits.
- Work that affects the use of side roads and existing accesses must not be taken without providing adequate provision.
- On completion of the works, all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the entire site left clean and tidy.

- Silica exposure reduction strategy is to be followed asn detailed under 'Measures for Mitigation of Environmental Impacts' in Bid document.

6. Green Belt

The green belt has been recommended as one of the major components of the EMP which will further enhance the environmental quality through:

1. Mitigation of air pollution problems
2. Attenuation of noise level
3. Maintain the Green area and improve aesthetics.

It is most important to chalk out a long-term approach to keep the air in the area clean. One such measure is using the plants for absorbing and trapping the air pollutants. The hypothesis that trees are important particulate sinks is supported by evidence obtained from studies dealing with diverse particulate matter including pollen, salt, precipitation, dust and other unspecified particles. As far as gaseous pollutants are concerned, substantial evidence is available to support the fact that plants in general, and trees in particular, function as sinks for gaseous pollutants. This is achieved through various physiological processes occurring within the plant system.

The gaseous pollutants are transferred from the atmosphere to vegetation by the combined forces of diffusion and flowing air movement. Once the gaseous pollutants come in contact with the plants, they may be bound or dissolved on exterior surface or taken up by the plants via stomata. If the surface of the plant is wet and if the gas is water soluble, the former process can be very important. As a matter of fact, plants act as bio filters for the air pollutants and play a major role in safeguarding the environment and controlling the increasing level of air and noise pollution.

A. Preparation of the Plantation Area

A green belt will be proposed along the alignment. Plantation site should be cleared from all wild vegetation. Suitable soil and water conservation measures will be adopted, if required. Since planting area is large, it shall be divided into blocks inter-linked by paths laid out in such a way that every tree is accessible for all post plantation care. The planting arrangement and size shall be based on the optimum use of the available land and quantum of irrigation water.

A tree requires sufficient space below and above the ground to spread its roots and branches. However, spacing varies with the type of trees, soil fertility, available moisture and purpose of plantation.

B. Preparation of Pits and Sapling Transplantation

The location of each pit shall be marked according to the design and distance of the plantation. The size of the pits may vary with the type of trees. While digging the pit, care shall be taken to place the topsoil on one side and bottom soil on the other side. Dug-out soil and pit should be exposed to weather for two to three months. After exposing to the weather, the pit should be filled two-third to three-fourth height with a mixture of topsoil and decayed farmyard manure.

Planting of the tree shall be done with a suitable between each. While planting the trees, care shall be taken that the installation structure shall be difficult to see through the foliage when seen from a point outside the green envelop. For preventing the horizontal dispersion of the pollutants, the trees shall be planted in alternate rows in a straight line. Tree trunks are free from foliage up to a height of 2 – 3 meters, it is advisable to grow shrubs in front of tree so as to provide coverage to the open portion.

C. Time of Plantation

Plantation shall be done two weeks after the rain starts, as the trees benefit from the seasonal rains. It is advisable to avoid planting during the dry season, as this will require watering. It is advantageous to plant trees on cloudy days.

D. Protection of Greenbelt

- No pruning or lopping of branches shall be done within the greenbelt for at least 10 – 15 years
- Gap filling in the greenbelt should be done in the same season to avoid future gaps.
- Protection of young plants from the ravages of cattle, sheep and goat and other animals.
- Timely replacements of damaged plant and thereafter care is important.

E. Selection of Tree Species

Plants possess a large surface area and their leaves exhibit an efficient pollutant trapping mechanism. It is recommended to select local species for better survival rate. The effectiveness of plants to control pollution depends upon the physiological, morphological traits such as leaf epidermis, size, leaf orientation, internal enzyme system, etc. Systematic screening of plants for their ability to tolerate pollutant need be undertaken. For pollution abatement purposes tree species should be fast growing, wind firm, unpalatable to animals, hardy and pollutants tolerant/resistant. List of some plant species for greenbelt plantation purpose is given in Table below:-

Table 10-1: Suggested List of Tree Species for Green Belt Plantation

Sl. No.	Botanical Name	Common Name
1	*Alstonia scholaris*	Chitvan
2	*Mimusops elengi*	Bakul
3	*Cassia fistula*	Amaltas
4	*Bauhinia purpurea*	Khairwal
5	*Zizyphus mauaritiana*	Ber
6	*Cassia siamea*	Senna
7	*Ficus religiosa*	Peepal
8	*Albizia lebbeck*	Siris
9	*Pongamia pinnata*	Karanj
10	*Polyalthia longifolia*	Ashok
11	*Diospyros melanoxylon*	Tendu
12	*Ailanthus excelsa*	Mar Maharakha
13	*Melia azedarach*	Bakain
14	*Tamarindus indica*	Imli
15	*Terminalia arjuna*	Arjuna
16	*Azadirachta Indica*	Neem
17	*Grevillea robusta*	Savukkamaram
	Shrubs & Grasses	
1	*Calotropis gigantea*	Akand
2	*Nyctanthus arboriristis*	Harsighar
3	*Nerium indicum*	Kaner

F. Plantation for Noise Pollution Control

Trees having thick and fleshy leaves with petioles flexible and capacity to withstand vibration are suitable. Heavier branches and trunks of the trees also deflect or refract the sound waves. The density, height and width are critical factors in designing adequate noise screen with vegetation.

Combination of trees and shrubs together appears to be the best system for combating pollution. The following species are suggested for noise pollution:

- *Alstonia scholaris(Chitvan)*
- *Azadirachta indica(Neem)*
- *Melia azedarach(Bakain)*
- *Grevillea robusta(Savukkamram)*
- *Tamrindus indica(Imli)*
- *Terminalia arjuna(Arjuna)*

Varied plantation techniques and types will reduce noise unequally. In addition to this, it is also relies on categories of plant to block noise. Some type of trees with varying heights block noise better than trees forming a straight line, which can reduce noise up to 3.48%. The formation of plant of different heights planted such that they stand highest to lowest in straight line will have best noise blocking. Port line can reduce noise up to 4.39%. The formation of plant from the highest to lowest in alternate formation will have the best noise reduction in the fifth line which is 7.63% (Chakee, 1989).

10.3.2 Operation Phase

During operation phase, the noise and vibration control along the sensitive and residential area is most important. Regular monitoring will be done for these parameters, and appropriate measures as suggested in the report shall be implemented.

10.4 ENVIRONMENTAL MANAGEMENT PLAN & RESPONSIBILITIES

Table 10.1 presents summary of Environmental Management Plan (EMP) with the objective to minimize adverse environmental impacts as discussed. The table covers all possible environmental issues involved in the project and the necessary mitigation measures. Taking appropriate mitigation measures for the construction phase is the responsibility of the construction contractor, and of the construction projects' Environmental Engineer who will supervise the implementation of the EMP.

The mitigation measures during the operation phase will be implemented by Environmental Management Unit (EMU) of Railway Dept / DFCCIL, which includes an Environmental In-Charge who will supervise the implementation of EMP. Thus, the overall responsibility of the implementation of mitigation measures will be with the Construction Contractor during the construction phase and with the Railway Dept during operation phase. The details of Environmental Management Programme and Environmental Management Unit (EMU) are discussed in the subsequent paragraphs.

Table 10-2: Environmental Management Plan

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
Pre-construction phase				
1.	Removal of Trees	Approximately 4352 number of Trees are likely to be felled in the existing and acquired area for the proposed corridor, DFCC to obtain NOC, arrange cutting of trees to clear sites & sale of wood. In case of TTZ, permission	Forest Dept. / EMU/DFCCIL	EMU

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		of Hon'ble S.C. Green Bench is necessary. There is requirement of 3932 number of trees cutting in TTZ area. The condition laid down in TTZ tree cutting permission may be followed and compliance report has to be prepared. The forest land along the railway line is likely to be acquired for the project will be compensated by providing value of land as per Net Present Value (NPV) Double area of land may be provided for Forest Dept for carrying Compensatory afforestation. Compensation may be provide for plantation of trees		
2.	Land Acquisition /Division	Ownership of land within the ROW and at Junction station shall be confirmed Number of Project Affected Persons (PAPs) to be identified Resettlement Action Plan to be prepared for the PAPS and provide compensation in compliance with National Resettlement and Rehabilitation (R&R) policy Information dissemination and community consultation	EMU/NGOs as collaborati-ng agency	Revenue Dept / DFCCIL
3.	Relocation of Cultural and Religious Properties	Religious structures will be shifted only after public consensus. Relocation shall be completed before construction work is taken up.	Constructi-on Contractor	DFCCIL
Construction Phase				
1.	Soil	Suitable protection measures consisting of bio-engineering techniques such as plantation of grasses and shrubs & check dams, may be provided to control erosion. Borrow areas may be finalized in concern with ecological sensitivity of the area. Agriculture land may be used as as far as possible.	Constructi-on Contractor /EMU	EMU/CS

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		Priority may be given to degraded area for excavation of borrow material. Rehabilitation of borrow area may be taken under the project. Construction work may be avoided during rainy season to evade erosion and spreading of loose material. Top soil removed from agricultural land may be stored separately in bunded areas and utilized during plantation or refilling of excavated area.		
2.	Water Bodies	Provision of temporary drainage arrangement due to construction activities shall be made by Contractor and suitable and strict clause shall be incorporated in General Conditions of Contract document for its effective implementation. Silt fencing shall be provided near water bodies Proper cross drainage structure may be planned at the crossing of the canal in consultation with Irrigation Department Proper drainage may be planned in the area to avoid water logging	Constructi-on Contractor /EMU	EMU/CS
3.	Flora	Felling of trees must be undertaken only after obtaining clearance from the Forest Dept. forest areas, Railway Dept and local bodies outside forest areas Trees falling outside the ROW shall not be felled. Compensation shall be provided before initiating construction activity. Fruit bearing trees may be compensated including 5 years fruit yield. Labour Camps and office site may be located outside & away from Forest area Green belt development may be undertaken in the wasteland near railway line to enhance esthetic and ecological value. Social forestry may be practiced for	Forest Dept./ Constructi-on Contractor /EMU	EMU/CS

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		success of the plantation. Local people can be involved in plantation and maintenance of plantation as part of the project in consultation with Forest Department.		
4.	Fauna	Crossing passages shall be made for wildlife near forest areas such as under pass followed with some plantation so that it resembles with the habitat of wildlife and facilitate crossing of wildlife in forest area. Borrow areas can be also developed as ponds with grasses and shrubs planted around it. Silt fencing shall be used near water bodies to avoid runoff into the water bodies. Construction activity may be avoided during night hours in forest area. Poaching must be strictly banned in the Forest area. It may be ensured by the Contractor that no hunting or fishing is practiced at the site by any of the worker and that all site personnel are aware of the location, value and sensitivity of the wildlife resources. Awareness program on Environment and Wildlife Conservation may be provided to the work force. Force Act and Wildlife Act may be strictly adhered to.	Forest Dept./ Constructi-on Contractor /EMU	EMU/CS
5.	Air Quality in TTZ	Certain restrictions as per TTZ notification and stipulation by Hon'ble S.C. during tree cutting permission order are to be adhered.	Constructi-on Contractor	EMU DFCCIL
Chance Find				
1	Chance Find	If contractor notices coin, artifact, relics or structure during construction, then he will inform DFCC through PMC/Enginner. The DFCC will in turn will inform ASI. Pending the decision work will remain suspended. The	Contractor	EMU/CS

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		coil/artifact/relics will be preserved safely and will be handed over to ASI.		
Pollution Monitoring				
1.	Air	Adequate dust suppression measures such as regular water sprinkling on construction sites, haul & unpaved roads particularly near habitation shall be undertaken to control fugitive dust. Plantation activity will be undertaken at the construction sites Workers may be provided with mask to prevent dust related problems Trucks carrying soil, sand and stone may be duly covered to avoid spilling. Low emission construction equipment, vehicles and generator sets may be used Plants, machinery and equipment shall be handled so as tom minimize generation of dust. All crusher used in construction should confirm to relative dust emission devises Air quality monitoring may be conducted at construction sites.	Constructi-on Contractor /EMU	SPCB / SDOE/ EMU /CS
2.	Water	Silt fencing may be provided near water bodies to avoid spillage of construction material. Discharge of waste from construction / labour camp into water bodies may be strictly prohibited. Construction methodologies with minimum or no impact on water quality may be adopted, disposal of construction wastes at designated sites and adequate drainage system may be provided. Project design may take care of irrigational canal and proper culverts may be proved so that irrigation setup is not disturbed Construction activity may be	Constructi-on Contractor /EMU	SPCB / SDOE/ EMU

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		prohibited during		
3.	Soil	Asphalt emulsifier must be handled with caution and any leakage detected must be immediately rectified. Construction work shall not be done during rainy season to avoid erosion and spreading of loose material Top soil removed during excavation work should be utilized stored separately in bunded area and should be utilized during plantation or refilling of excavated area.	Constructi-on Contractor /EMU	EMU/CS
4.	Solid Waste	Construction work shall be carried in such a way that minimum or no solid waste is generated at construction site. Extra earth material produced may be utilized for refilling of borrow areas. Rainy season may be avoided to minimize spreading of loose materials. Solid waste management may be framed for camp areas. Dustbins may be provided in the Camps. Proper sanitation facilities must be provided in Camp by the Contractor.	Constructi-on Contractor /EMU	SPCB / SDOE/ EMU /CS
5.	Noise & Vibration	Modern technologies producing low noise may be used during construction. Construction equipment's and vehicles must be in good working condition, properly lubricated and maintained to keep noise within permissible limits. Temporary noise barriers installed at settlements and forest area, if required Noise barrier shall be provided at the location specified in Chapter-7. Plantation may be carried at the work site. Head phones, ear plugs to be provided to the workers at construction site.	Constructi-on Contractor /EMU	SPCB / SDOE/ EMU /CS

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		Noise level monitoring must conducted during construction phase. All vehicles, equipment and machinery used in construction should be fitted by exhaust silencers. Equipments shall be maintained regularly and soundproof gadgets shall be used. Portable sound barriers shall be installed near sensitive locations near settlements and Forest area, of required Provision of ear-plugs to heavy machinery operators Plantation along the DFC should be maintained.		
6.	Land Subsidence	Plantation must be carried to control erosion	Constructi-on Contractor	EMU/ CS
7.	Bottom Sediment	Silt fencing may be provided to avoid runoff into the river. Construction activity shall be taken in dry season to avoid spreading of construction material and minimize impact on water quality	Constructi-on Contractor	EMU/ CS
Operation Phase				
1.	Maintenance Plantation	Provision for maintenance of plantation shall be made for at least three years. Plantation may be taken to replace dead sapling. Survey of survival of plants may be taken annually. Lopping of branches may be undertaken to remove obstruction, if any	EMU	DFCCIL
2.	Air Quality	Plantation shall be conduct and maintained along DFC. Green belt development with proper specifies shall be undertaken on priority basis. AAQ monitoring at all Junction station sites and along DFC under the guidance of SPCB	EMU	SPCB / SDOE (State Department of Environmen t)
3.	Water Quality	Waste Collection facility shall be provide at all Junction station Proper drainage system shall be provided at all Junction station	EMU	SPCB / SDOE (State Department

S. No.	Environmental Issue	Action to be Taken	Implement-ation By	Supervisi-on By
		Water quality monitoring at the Junction station stations under the directives of SPCB		of Environment)
4.	Noise & Vibration	Noise and Vibration monitoring may be conducted in operation phase at Sensitive Receptors (SRs) mentioned in Chapter-7.	EMU	SPCB / SDOE (State Department of Environment)

10.5 ENVIRONMENTAL MONITORING

The environmental monitoring shall be undertaken during construction and operation phases as per the following details:

Table 10-3: Proposed Monitoring Programme

Construction Phase

S. No.	Environmental Component	Parameter	Standards	Location	Frequency	Implementation	Supervis
1	Air Quality	PM2.5, PM10, CO, NOx, SO2	CPCB standards	• Bhandari (km 1205) • Vijaypur Nagla Bhav Singh (km 1223) • Alampur Jarkhi (km 1236) • Ulau Kheda (km 1240) • Mittawali Station (km 1254)	3 times in a year (once in every season except monsoon) during construction period	DFCCIL through contractors	CS/EM
2	Water Quality	As per IS:10500 standards	CPCB standards	• Bhandari (km 1205) • Vijaypur Nagla Bhav Singh (km 1223) • Alampur Jarkhi (km 1236) • Ulau Kheda (km 1240) • Mittawali Station (km 1254)	Once in a season During construction period (Excluding Monsoon Season)	DFCCIL through contractors	CS/EM
3	Noise	Noise level on dB (A) scale	CPCB standards	• Bhandari (km 1205)	3 times in a year (once in every non	DFCCIL through contractors	CS/EM

S. No.	Environmental Component	Parameter	Standards	Location	Frequency	Implementation	Supervis
				• Vijaypur Nagla Bhav Singh (km 1223) • Alampur Jarkhi (km 1236) • Ulau Kheda (km 1240) • Mittawali Station (km 1254) • Budhia Ka Tal	monsoon season during construction period)		
4	Soil Quality	Parameters are NPK, Sodium Absorption Ratio, Oil & Grease	CPCB Standards	Locations where baseline monitoring done i.e. Mittawali (km 1254), Alampur Jarkhi (km 1236), Ulau Kheda (km 1240), Bhandari (km 1205)	Once in a year during construction period	DFCCIL through contractors	CS/EM
5	Tree cutting in portion of DFC alignment falling in TTZ	Trees to be cut	Not Applicable	In TTZ portion care has to be taken that only marked trees are cut and all conditions of tree cutting permissions are complied with.	During pre construction phase	DFCCIL through State Forest Department	CS/EM

Operation Phase

S. No.	Environmental Component	Parameter	Standards	Location	Frequency	Implementation	Supervis
1	Noise	Noise level on dB(A) scale	CPCB standards	• Bhandari (km 1205) • Vijaypur Nagla Bhav Singh (km 1223) • Alampur Jarkhi (km 1236) • Ulau Kheda (km 1240) • Mittawali Station (km 1254) • Budhia Ka Tal	3 times in a year (once in every non monsoon season)	DFCCIL through contractors	CS/EM
2	Vibration level	Vibration on dB scale respectively	-	• Bhandari (km 1205) • Vijaypur Nagla Bhav Singh (km 1223) • Alampur Jarkhi (km 1236) • Ulau Kheda (km 1240) • Mittawali Station (km 1254) • Budhia Ka Tal	3 times in a year (once in every non monsoon season)	DFCCIL through contractors	CS/EM
3	Plantation	Survival rate	Survival rate may be calculated annually. Minimum 75%	At compensatory afforestation site and along Kaura – Chamraula Section of EDFC	Annually for 3 years	DFCCIL through contractors	CS/EM

S. No.	Environmental Component	Parameter	Standards	Location	Frequency	Implementation	Supervis
			survival should be maintained. Any loss should be made up during monsoon				

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10.6 ORGANIZATIONAL FRAMEWORK

The proposed project will be implemented by DFCC through its Environmental Management Unit (EMU). The EMU will be coordinating with the field level implementing agencies such as the Independent Engineer, Contractor and field level DFCC officials. Role and responsibilities of important officials is mentioned below.

Table 10-4: Roles and Responsibilities of Officers

Officer	Responsibility
General Manager (SEMU)	• Overview of the project implementation • Ensure timely budget for the EMP. • Coordination with different state level committee, to obtain regulatory clearances. • Participate in state level meetings • Monthly review of the progress. • Reporting to various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation
Chief Project Manager (DFCC)	• Overall responsible for EMP implementation • Coordination with PIU Staff (EMU & DFCC). • Responsible for obtaining regulatory Clearances • Review of the progress made by contractors • Ensure that BOQ items mentioned in EMP are executed as per Contract provisions.
Deputy Chief Project Manager	• Conducting need-based site inspection and preparing compliance reports and forwarding the same to the Environmental Management Unit (EMU) • Programming necessary training program on environmental issues.
Engineer (Supervision Consultant)	• Act as an “Engineer” for supervising EMP implementation • Responsible for maintaining quality of EMP envisioned in detail Project Report • Maintaining progress reports on EMP implementation • Periodic reporting to PIU-DFCC about the status of EMP implementation • Work in close coordination with Asst. Project Manager (package unit) and contractor.
Asst. Project Manager(Environment)	• Working as site-representative of Chief Project Manager • Conducting regular site inspection to all onsite and offsite works • Maintaining records of all necessary statutory compliance, to be obtained from contractor. • Maintaining records of EMP implementation including photographic records • Attending environmental and social training programs • Preparing periodic reports on EMP implementation and forwarding to EE

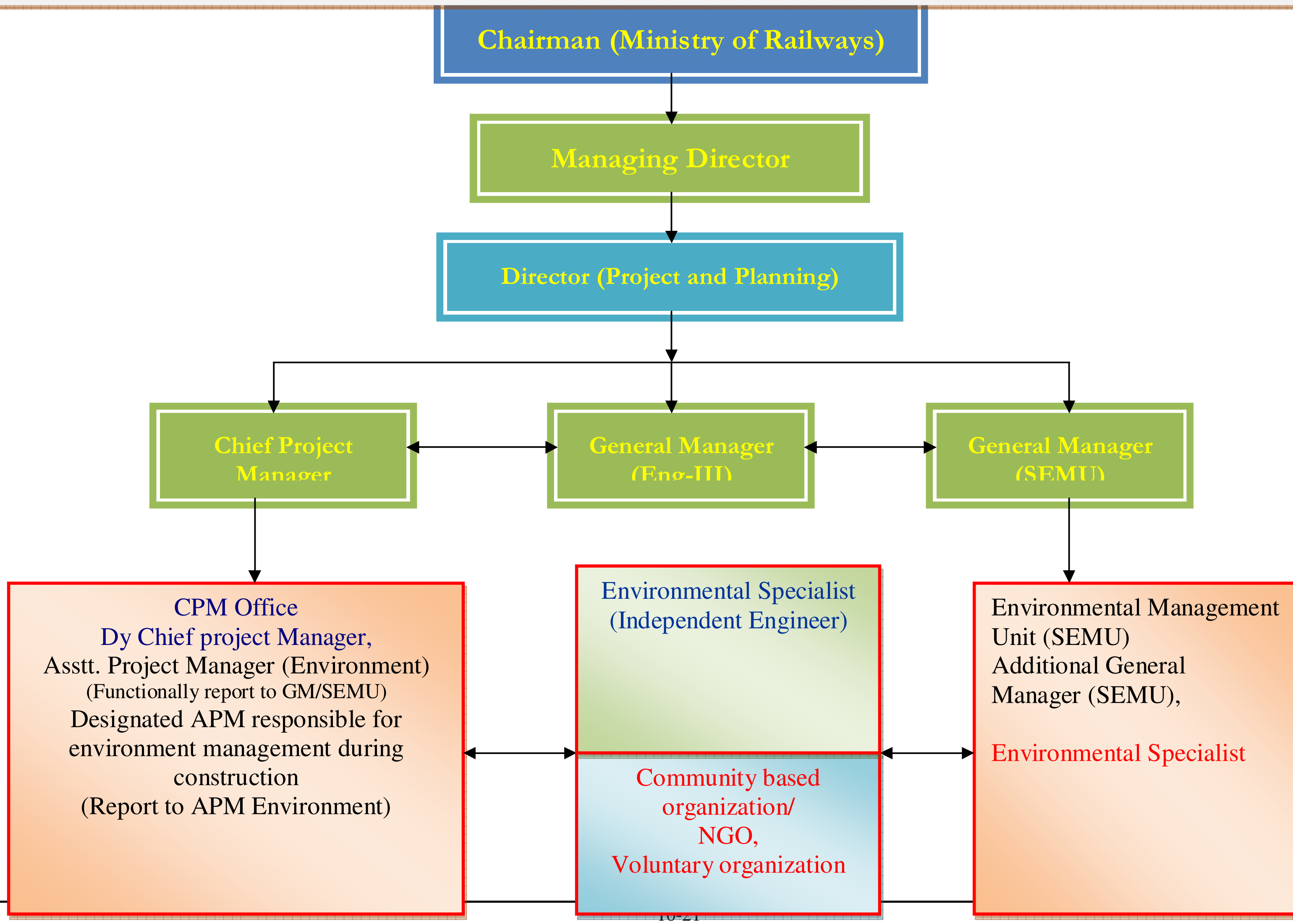
Officer	Responsibility
	• APM (Env) will technically report to GM/SEMU at DFCC HQ
Designated APM (Env)	• He will be responsible for implementation and monitoring of EMP, safeguard policies of WB and report to APM (Env).
Environment & Safety Manger of Contractor	• As detailed below

For ensuring that EMP is implemented as per provision in the document, Contractor shall nominate a qualified and experienced Manager from the commencement to completion of the project.

The responsibilities of Environment & Safety Manager of Contractor will include the following:

- Directly reporting to the Project Manager of the Contractor;
- Discussing various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly;
- Prepare Contractor's Checklist, traffic management plan and safety plan as part of their Work Program;
- Ensure Contractor's compliance with the ESMF stipulations and conditions of statutory bodies;
- Assist the project manager to ensure social and environmentally sound and safe construction practices;
- Conducting periodic environmental and safety training for contractor's engineers, supervisors and workers along with sensitization on social issues that may be arising during the construction stage of the project;
- Preparing a registers for material sources, labour, pollution monitoring results, public complaint/grievance redress, and as directed by the Engineer;
- Assisting the DFCC on various environmental monitoring and control activities including pollution monitoring;
- Preparing and submitting monthly/bio-monthly reports to DFCC on status of implementation safeguard measures ; and
- Will be responsible for getting and maintaining the approvals or clearance for various departments and Environmental office.

ORGANIZATION FRAMEWORK PIU-DFCC



10.7 ENVIRONMENTAL BUDGET

The cost of compliance of environmental issues must be included in the Bill of Quantity for the implementation of EMP, although most of the aspects will be covered under the head engineer such as: -

- Embankment
- Sign boards along construction sites
- Noise barrier
- Underpass for animals
- Culverts for irrigation canals

However, there are issues that are independently covered under the Environmental Budget such as plantation along DFC, monitoring, enhancement measures, noise barrier, sanitation facility at labour camp, and solid waste disposal at site. The shifting and enhancement cost of sensitive receptors such as temple, majar, school, hospital etc shall be covered in R & R under community development. Mitigation measures proposed in the EMP will be implemented by the contractor. The works to be undertaken by the contractor have been quantified and the quantities included in the respective BOQ items such as earth works, slope protection, noise barriers, road safety features and shrub plantation.

Provisional quantities have also been included for additional measures that may be identified during construction and for site fencing, which will depend on the contractors work methods and site locations. Items and quantities have also been included for enhancement measures.

More general environmental management measures to be followed by the contractor have been included in the specifications and in this EMP. These cannot be quantified and are to be included in the contract rates.

The budgetary provisions for the implementation of the environmental management plan of the project are presented in **Table 10.5**

Table 10-5: Cost Estimates for Environmental Management

Sl. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)	Remarks
A. PRE-CONSTRUCTION PHASE						
1.	Tree Felling Permission	Number	-	4352	-	Covered under regulatory clearances
2.	Forest Clearance and land diversion cost	ha	-	4.1920	-	Covered under forest clearances
3.	Forest land Diversion Cost					
4.	Acquisition of land required for acquisition	Ha	-	246	-	Covered under project cost
5.	Utility Shifting	-	-	-	-	Covered under regulatory clearances, engineering cost
B. CONSTRUCTION PHASE						
1.	**Mitigation Measures other than Good Engineering practices**					
1.1	Oil interceptors at camps	Number	6,000	4	240,000	Will be provided near storage, vehicle repair section in construction camp
1.2	Soak pits for construction camp	Number	20,000	2	40,000	
2.	**Tree Plantation and Protection**					
2.1	**Avenue plantation including compensatory plantation**					
2.1.1	Plantation and maintenance of saplings for 3 years(ten Trees per km on eitherside)	Number	1,000	6,516	6,516,000	
2.1.2	Half brick circular tree guard	Number	500	6,516	3,258,000	
3.	**Monitoring of Environmental Attributes during Construction Phase**					
3.1	Monitoring of Air Quality	Per sample	10,000	45	450,000	
3.2	Monitoring of Water Quality	Per sample	6,000	45	270,000	

3.3	Monitoring of Noise Level	Per sample	3,000	45	135,000	
3.4	Monitoring of Soil Quality	Per sample	6,000	36	216,000	
4	**Monitoring of Trees Cutting in Project Length Falling in TTZ Portion**					
	Monitoring for Tree cutting in TTZ Portion (km 1221 to 1266), compliance with tree cutting permission and expenses towards obtaining permission from Green Bench of Honourable Supreme Court, and submission of compliance report to TTZ Authority	Lump sum	-	-	500,000	
C. ITEMS COVERED UNDER THE RAP BUDGET						
1.	Relocation of private properties					Covered under RAP Budget
2.	Relocation of private water points (wells, tanks, water taps and hand pumps)					
3.	Relocation of graveyards, statues, motor sheds					
4.	Relocation of other community assets including temples, majar, mosque, school etc.					
D. OPERATION PHASE						
1.	Monitoring of Noise Level	Per sample	5,000	45	225,000	Initial Three years Monitoring
2.	Monitoring of vibration Level	Per sample	30,000	45	13,50,000	Initial 3 years Monitoring
3.	Noise mitigation measures in form of noise barrier at sensitive receptors	m	6,500	2,000	9,750,000	Initial 3 Years Monitoring
E. GOOD ENGINEERING PRACTICES						
1.	Dust suppression					Covered under contractors

2.	Erosion control measures (Turfing / Pitching / Seeding & Mulching)					quoted rate under construction cost
3.	Provision of cross drainage & side drainage structures					
4.	General borrow area management and maintenance of haul road related to borrow areas					
5.	Air / noise pollution control measures in construction equipments					
6.	Management and disposal of scarified waste bituminous material					
7.	Provision of informatory signs					
8.	Cattle crossings					
9.	Management of quarries					
10.	Redevelopment of borrow area					
11.	Construction camp management cost					
12.	Safety measures for workers					
F. TRAINING & MANPOWER						
1.	Training	Number	100,000	4	400,000	Twice in a year during construction period
2.	Provision of environmental expert	Number	100,000	24	2,400,000	
G.Common Property Resources						
1.	Relocation/ Compensation for CPRS 17 Wells,40 Handpumps,8Tube wells, 43 Religious Structures				6,200,000	CPR relocation budget included in RAP Report.