Initial Environmental Examination (Part 1)

Project Number: 51228-001
June 2018

India: Railways Track Electrification Project
Rohtak-Panipat Railway Track

Prepared by the Central Organization for Railway Electrification for the Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
AEE	–	Assistant Executive Engineer
ASI	–	Archaeological Survey of India
CAP	–	Corrective Action Plan
CPD	–	Chief Project Director
CFE	–	Consent for Establishment
CPD	–	Consent for Operation
CORE	–	Central Organization for Railway Electrification
CPCB	–	Central Pollution Control Board
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
EARF	–	Environmental Assessment and Review Framework
FSI	–	Forest Survey of India
GSI	–	Geological Survey of India
HVPNL	–	Haryana Vidyut Prasaran Nigam Ltd.
IEE	–	Initial Environmental Examination
LHS	–	Left Hand Side
LED	–	Light Emitting Diode
MCC	–	Model Career Center
MOEFCC	–	Ministry of Environment, Forests and Climate Change
MSL	–	Above Mean Sea Level
NOC	–	No Objection Certificate
NDMA	–	National Disaster Management Authority
RHS	–	Right Hand Side
ROW	–	Right of Way
SSE	–	Senior Section Engineer
SDMA	–	State Disaster Management Authority
SDO	–	Sub Divisional Officer
SP	–	Sectioning and Paralleling Post
SSP	–	Sub-Sectioning and Paralleling Posts
TSS	–	Traction Sub Station
SPS	–	Safeguard Policy Statement

CURRENCY EQUIVALENTS

(As of 20 Nov 2017)

Currency unit	–	Indian rupee (□)
Re1.00	=	$0.01560
$1.00	=	□64.1200

WEIGHTS AND MEASURES

µg	–	microgram
dB(A)	–	weighted decibel
km	–	kilometer
km^2	–	square kilometer
m	–	meter
m^2	–	square meter

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EXECUTIVE SUMMARY

INTRODUCTION

At the request of the Government of India and the Ministry of Railways, the Asian Development Bank (ADB) will provide up to $750 million a non-sovereign loan assistance to the Indian Railway Finance Corporation (IRFC), a 100% wholly owned subsidiary of Ministry of Railways for financing of 4,000 route kilometers electrification of existing rail tracks spread all over the country. The project will be executed by CORE through appointment of contractors through national tendering process. Detailed cost estimates and bid document have been prepared by CORE and process of tendering is followed for the identified corridor as per time frame prepared by the CORE for the electrification of each identified rail track.

This Initial Environmental Examination (IEE) has been prepared for the for Rohtak-Panipat rail track section in accordance Asian Development Bank's Safeguard Policy Statement (SPS, 2009).

PROJECT DESCRIPTION

The electrification works of rail tracks will include erection of poles, establishment of Traction sub-station (TSS), Sectioning and Paralleling Post (SP), and Sub- Sectioning and Paralleling Posts (SSP) for regulation of electricity supply and wiring and sagging as part of overhead electrification works along the railway track. As part of electrification, there will be installation of transmission line for the supply of electricity to the track. These transmission lines will connect TSS to the grid.

The rail track from Rohtak to Panipat is of about 71.4 km in length. It starts at Rohtak Junction Railway Station and ends at Panipat Junction Railway station. The stations enroute are Makrauli, Jassia, Rukhi, and Bhainswan. Gohana, Mundlana, Dhurana, Israna, Naultha, and Binjhol. As part of electrification infrastructure, in addition to electrical poles, wiring and sagging, two SPs (at km 0+800and km 69+000 both on LHS), two SSPs (at km 16+400 on LHS and km 30+300 and 58+380 on RHS) and one TSS (at km 42+600) are also part of electrification works planned for Rohtak- Panipat rail track. The TSS, SP and SSPs are planned within the available right of way (RoW) of rail. The subproject also involves construction of Tower Wagon shed at Gohana Railway station which is almost midpoint of Rohtak- Panipat rail corridor.

As part of electrification project one electricity supply transmission line has also been planned from 132 kV substation of Haryana Vidyut Prasaran Nigam Ltd. (HVPNL) at Mundalana village to TSS location at km 42+600. The length of this transmission line is about 8 km. The total cost of the subproject including transmission line is INR 713 million. The project total construction duration is 24 months.

STATUTORY REQUIREMENTS

Under the EIA Notification, 2006 promulgated under Environment (Protection) Act, 1986, the project does not require prior environmental clearance. Tree Cutting permit will be acquired by HVPNL prior to clearing the transmission line alignment. Other applicable regulatory (e.g. Water Act (1974) and Air Act (1981)) requirements will also have to be complied by CORE. There is no requirement for obtaining any clearance for electrification and transmission line works under the Forest (Conservation) Act, 1980 and the Wildlife (Protection) Act, 1972.

ENVIRONMENTAL ASSESSMENT

This initial environment examination (IEE) report provides details on baseline environmental conditions in surroundings of rail line (proposed for electrification) and proposed electric supply transmission line. The potential environmental impact of the civil and electrification works, and ways of mitigating and addressing these are also part of IEE report.[1] The rail track from Rohtak to Panipat and planned transmission line alignment do not pass through any protected areas (national parks, bird sanctuaries, tiger reserves, etc.), reserved or protected forests. There is no crossing of any perennial river or water body by the rail track and transmission line. The subproject sites are on plain land. There are no wetlands; mangroves; or estuaries in or near the rail track of the Rohtak- Panipat route and proposed alignment of transmission line. The site proposed construction for electrification works are in a relatively open area and civil works are of small scale. There is no record of endangered species of flora and fauna along the existing railway track and proposed alignment of transmission line.

The environmental impacts due to electrification of Rohtak- Panipat rail track have been assessed to be localized and limited during construction phase. the construction phase impacts include: (a) short-term deterioration of air quality which may take place due to increase in fugitive dust emission from earthmoving activities, unpaved transport, and emissions from equipment and other mobile sources; (b) surface water contamination due to increased siltation and turbidity; (c) elevated noise levels from civil works and mobile sources; (d) soil and water contamination from inappropriate waste disposal, (e) unsafe working conditions for workers due to inadequate training; and (e) habitat clearing along forested areas. Corresponding mitigating measures are presented in the Environmental Management Plan of this IEE which include the following: proper planning of location and timing of construction activities and regular maintenance of equipment; regular water sprinkling on unpaved surfaces of the construction vicinity, use of tarpaulin covers in storage areas to control dust; storage of solid and liquid wastes in predefined storage areas; limitation of construction activities nearby residential areas during evening and nighttime; use of temporary noise barriers near sensitive locations and forested areas; installation of silt fence to contain erosion; avoidance of locating construction camp near any surface water body and forest area; use of proper protective equipment (e.g. ear plugs, helmet) for workers, provision of adequate signage at construction sites, and provision for safety trainings. Approximately 150 trees will be cleared along the alignment of transmission line from Mundalana substation to TSS the two transmission lines right of way, which need be compensated based on a 1:10 ratio.

The operation phase will have positive impacts such as reduction in air emissions and greenhouse gas emissions from reduced diesel fuel usage of the locomotives. Diesel locomotives can be a considerable source of engine noise, with significant engine exhaust noise emitted at a height of approximately four metres above the rail; shift to electric locomotives generally produce less mechanical noise and require no exhaust. However, increased in train speed due to electrification may contribute to relatively short periods of high noise frequencies, that can trigger annoyance to nearby sensitive receptors. Acoustic barriers by creation of multilayer plantation and speed limitations shall then be implemented along railway track which passes along sensitive receptors. Railway workers are always at risk of accidents due to moving trains and exposure to occupational risks (e.g. elevated noise, electrical hazards) during operations and maintenance. Safety manual will be prepared to identify all project related occupational and community health and safety issues, which will

[1] Local stakeholders were involved in developing the IEE through on-site discussions and public consultation. Their views were incorporated into the IEE and the design of the subproject. The IEE will be made available at public locations in the town such as municipal office building and district administration office. It will be disclosed to a wider audience via the ADB, and CORE websites.

periodically be reviewed and implemented on site. Protective equipment and proper training will be provided to all operations and maintenance crew of the subproject. The operational EMP will be taken up by CORE to ensure mitigation measures implementation.

INSTITUTIONAL ARRANGEMENT

The CORE through CPD office at Ambala will be responsible for overall planning and implementation of the electrification works for this subproject. It will ensure that IEE and EMP prepared for this subproject and Environmental Assessment and Review Framework (EARF), already prepared for Railway Sector Investment Program and adopted for this subproject also, are followed during implementation. The safeguard consultants to be engaged under the proposed TA will assist CPD office in compliance of EMP implementation during the construction phase. The safeguard consultants will also assist CORE in preparing semi-annual safeguards monitoring reports as required by ADB for category 'B' projects during construction and annual reports during operation. Currently, there are no dedicated Environmental and Health and Safety Officers from CPD. Hence, ADB contemplated on providing a Technical Assistance (TA) to Indian Railway which will include support from environmental and health and safety consultants hired through the TA. This TA is assist CORE and CPD offices to comply with the EMP implementation during the construction and operations phases. The safeguards consultants will also assist India Railway in preparing semi-annual safeguards monitoring reports as required by ADB for category 'B' projects during construction and annual monitoring during operations.

CONCLUSION

The subproject has been categorized as category “B” under ADB’s Environmental Assessment Guidelines (2003) after evaluating all key environmental components and it is not expected to lead to loss of medicinal plants, endangered floral species. Under the EIA Notification, 2006 promulgated under Environment (Protection) Act, 1986, the project is categorized as Category “B2” and does not require prior environmental clearance.

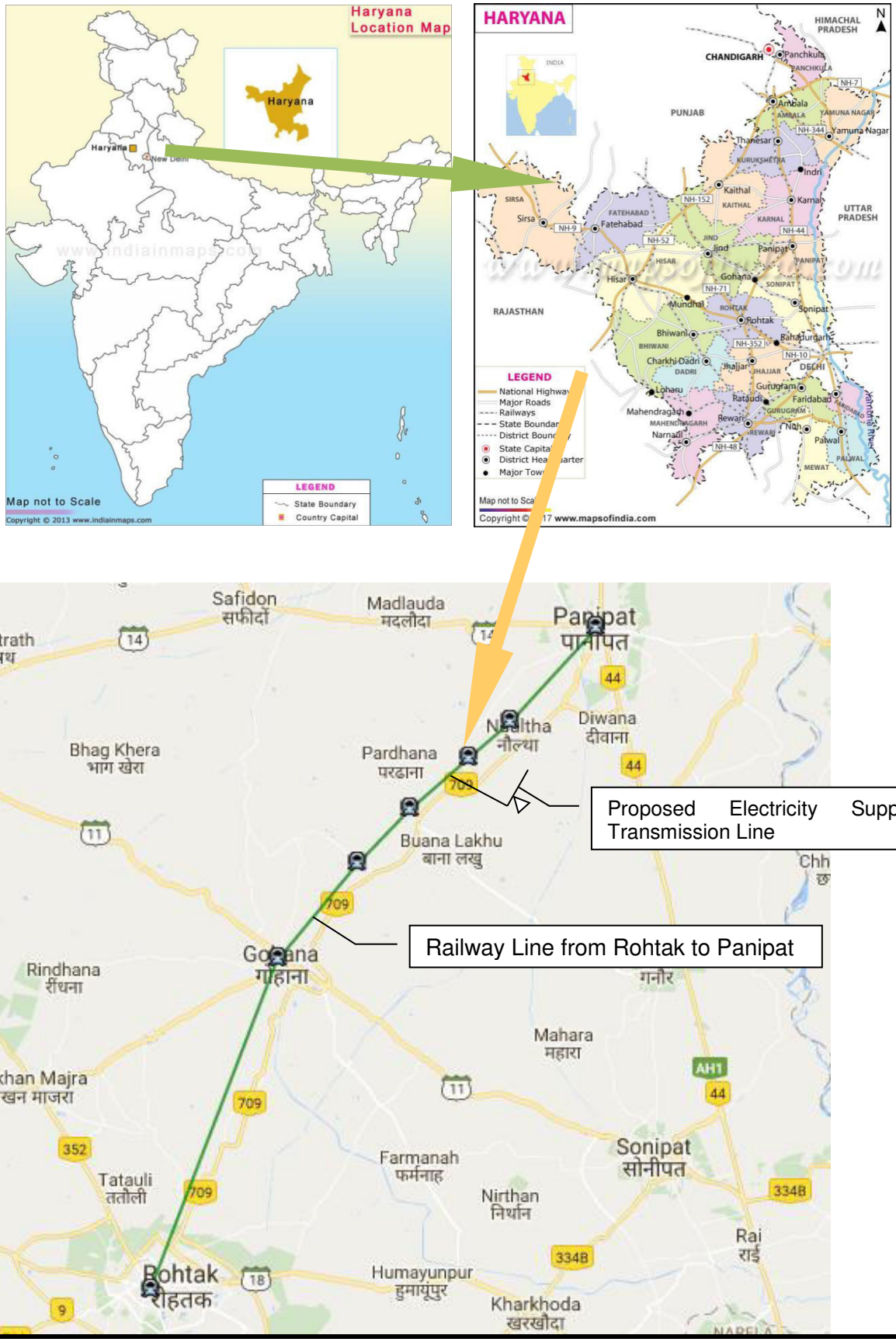
The finding of IEE indicates that the project is unlikely to cause significant adverse environmental impacts. The effective implementation of environmental management plan will facilitate the avoidance and minimization of the environmental impact to acceptable level. All attempts shall be made to minimize cutting of the trees along the transmission line right of way. ADB Technical Assistance will strengthen the institutional capacity of Indian Railway and CORE to implement the safeguards requirements in accordance with ADB SPS.

I. INTRODUCTION

A. Background

1. **Location:** The subproject covered under this IEE pertains to electrification of existing railway track between Rohtak Junction to Panipat Junction (about 71 Km in length) under Northern Railways of Indian Railways and associated (proposed) electric supply transmission line from 132 kV substation at Mundalana village to TSS location at km 42+600 (LHS) on Railway line. The railway line component (Rohtak-Gohana-Panipat) is traversing through Panipat, Sonepat and Rohtak districts in the state of Haryana. The electric transmission line is of about 8 km in length and traverses Gohana Tehsil of Sonepat district of Haryana state. The geographical area of the railway line alignment lies between the Latitude 28°89'07" N to 29°23'20" N and longitude 76°58'01" E to 76°57'50"E. The geographical spread of transmission line is between the Latitude 29°11'32" N to 29°12'56" N and longitude 76°45'31" E to 76°45'35"E. The project location, alignment and components are shown **Figure 1** for Rail track and **Transmission** line. The elevation of rail track at Rohtak Junction Station is about 220m above mean sea level and at Panipat Junction station, the elevation is 235 m.

Figure 1: Location of Subproject Site



2. **Present status of Rail Track and Transmission Line Alignment:** The rail track from Rohtak to Panipat is on plain land. The right of way (RoW) of this corridor is marked with boundary pillars on either side of rail corridor. There are ten numbers of small railway stations that fall in the existing rail track from Rohtak Junction to Panipat Junction. These stations are Makrauli, Jasia, Rukhi, Bhainswan, Gohana, Mundlana, Dhurana, Israna, Naultha, and Binjhol. Some photos of existing rail line corridor are shown in **Figure 2**. As part of electrification works, in addition to electric poles, two sectioning and paralleling posts (SPs) and three sub sectioning and posts (SSPs), one traction substation (TSS) and tower wagon shed are planned. The detailed description of these components has been covered in the subsequent sections.

3. The electric supply transmission line is planned from existing 132 kV substation of HVPNL at Mundalana village. The alignment of this transmission line also passes through plain land. The photographs of proposed alignment of transmission line are given in **Figure 3**.

Figure 2: Photographs of Project Site

SP Location at Rohtak at km 0+800 (LHS)

View of Rail Corridor at km 16+400

View of SSP at Jassia at km 16+400

View of SSP Location at Gohana at km 30+300

View of TSS location at km 42+600 (LHS)

Another View of TSS Location at km 42+600 LHS

View of TSS Location at km 42+600

View of SSP Location at Naultha at km 58+380 (RHS)

Location of SP on LHS at Panipat 69+000

Figure 3: Photographs of Electric Supply Transmission Line

Start point of Electricity Transmission line for TSS atHVPNL Substation

Transmission line Crossing Point at Panipat Rohtak NH

Agricutute Fields on Transmission line route

View of Agricuture Field on Transmission line route

B. Compliance with India's Environmental Regulatory Framework

4. India's environmental rules and regulations, as relevant for this proposed subproject, are shown in **Table 1**. The Environmental Impact Assessment (EIA) notification, 2006 by the Ministry of Environment, Forests and Climate Change (MOEFCC), Government of India specifies the requirements for mandatory environmental clearances. All projects and activities are broadly categorized into two categories—category A and category B, based on the spatial extent of potential impacts on the environment, human health, and natural and human-made resources. However, all railway projects have been exempted from the ambit of EIA Notification 2006; accordingly, subproject will not require any prior environmental clearance according to the environmental rules and regulations of India. The electric supply transmission lines have also not been listed in the schedule of activities / Industries requiring prior environmental in the EIA Notification 2006, so no prior environmental clearance is needed for the transmission line also. Further, as shown in **Table 1**, most other rules pertaining to India's Ancient Monuments and Archaeological Sites and Remains Act, 1958; the Wildlife (Conservation) Act, 1972, amended in 2003 and 2006; and the Forest (Conservation) Act, 1980, will not apply to this subproject.

Table 1: Environmental Regulatory Compliance

Subproject	Applicability of Acts and Guidelines	Compliance Criteria
Electrification of Rohtak-Panipat rail Track and Electric Supply Transmission line from Mundalana to TSS near Mundalana station	The EIA notification, 2006 (and its subsequent amendments till date) provides for categorization of projects into category A and B, based on extent of impacts.	The subproject components (electrification and transmission line) are not covered in the ambit of the EIA notification (amended till date), either as a category A or Category B project. As a result, the categorization, and the subsequent environmental assessment and clearance requirements, either from the state or the Government of India, are not triggered. – **Not Applicable**
	The Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules, 1959 provide guidance for carrying out activities including conservation, construction and reuse in and around the protected monuments.	The Rail Track from Rohtak to Panipat and proposed alignment of Transmission line are not close to any monument which is protected by the ASI. Hence, no clearance is needed from ASI. – **Not Applicable**
	Water (Prevention and control of pollution) Act, 1974 and Air (prevention and control of pollution) Act, 1981	CFE and CFO from the State Pollution Control Board will be required during construction for installation of diesel generator set (>15 kW), hot mix plant, and concrete batching plant, if required for the project. For the operation phase, no CFO or CFE will be required. – **Applicable for construction phase**
	The Wildlife Conservation Act, 1972, amended in 2003 and 2006, provides for protection and management of Protected Areas.	No wildlife protected areas nearby (within aerial distance of 10 km). – **Not Applicable**
	Forest (Conservation) Act, 1980	This act provides guidelines for conservation of forests and diversion of forest land for non-forest use. It describes the penalties for contravention of the provisions of the Act. If forest land has to be acquired for the project, clearance is required from the Forest Department. No forest land diversion is required for this subproject. Hence, this is not applicable. – **Not Applicable**
	Noise Pollution (Regulation and Control) Rules, 2000 (Amended 2002)	These Rules will be applicable during the construction phase of project. **Applicable for construction phase**
	Hazardous Waste Management, Handling and Transboundary Movement Rules 2008 (Amended 2009)	The subproject activities in construction and operation phases are not likely to generate any hazardous waste, so these Rules will not be applicable **Not Applicable**
	Batteries Management and Handling Rules 2001.	These Rules will be applicable during construction and operation phases of the subproject for disposal of discarded batteries **Applicable**

ASI = Archaeological Survey of India, CFE = consent for establishment, CFO = consent for operation, EIA = environmental impact assessment.
Source: Asian Development Bank.

C. Asian Development Bank's Environmental Safeguard Policy Principles

5. Since the proposed Rail Track Electrification project is being funded by the ADB, it has

to comply with its Safeguard Policy Statement (SPS) 2009, in addition to India's own environmental laws and regulations. The environmental safeguard policy principles embodied in the SPS aim to avoid adverse impacts on the environment and on affected people and/or communities; minimize, mitigate and/or compensate for adverse project impacts, if unavoidable; help borrowers to strengthen their safeguard systems, and to develop their capacity in managing the environmental and social risks. The SPS categorizes all projects into three environmental categories (A, B or C) based on their potential impacts. [2] The categorization form has been completed to confirm category of subproject (**Appendix 1**). Similarly, ADB's Rapid Environmental Assessment checklist method was followed to assess the potential impact of the proposed subproject (**Appendix 2**). As will be explained above, the subproject has been categorized as 'B' category project. Accordingly, this IEE has been prepared to address the potential impacts in line with the requirements for category B projects. The IEE was based mainly on baseline data generation on environmental parameters and secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE. An environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the subproject is included in the IEE. The climate risk screening has also been carried out and it has been found that climate related risk is 'low' for the subproject (**Appendix 3**). It may be mentioned that the current Rail Track Electrification Project follows the Environmental Assessment and Review Framework (EARF) prepared for Rail Sector Investment Program in India, under ADB's sovereign assistance. This EARF has been accepted by the Ministry of Rail, Government of India. The current project is also being implemented by the Ministry of Rail through Central Organization for Rail Electrification (CORE) so the same EARF has been adopted. This EARF has been given in **Appendix 4**.

D. Review and Approval Procedure

6. For category B projects, the draft environmental status report is reviewed by the relevant ADB departments and the borrowing agency. Additional comments are incorporated into the final documents as relevant. These are reviewed by the borrowing agency and ADB safeguards team. The borrowing agency then officially submits the IEE report to ADB for consideration by the Board of Directors. The final report is made available worldwide by ADB, via the depository library system and the ADB website.

E. Report Structure

7. This report contains eight sections: (i) introduction; (ii) description of project components; (iii) description of the existing environment around the subproject; (iv) environmental impact and mitigation measures; (v) EMP; (vi) processes for public consultation and information disclosure; (vii) findings and recommendations; and (viii) conclusions.

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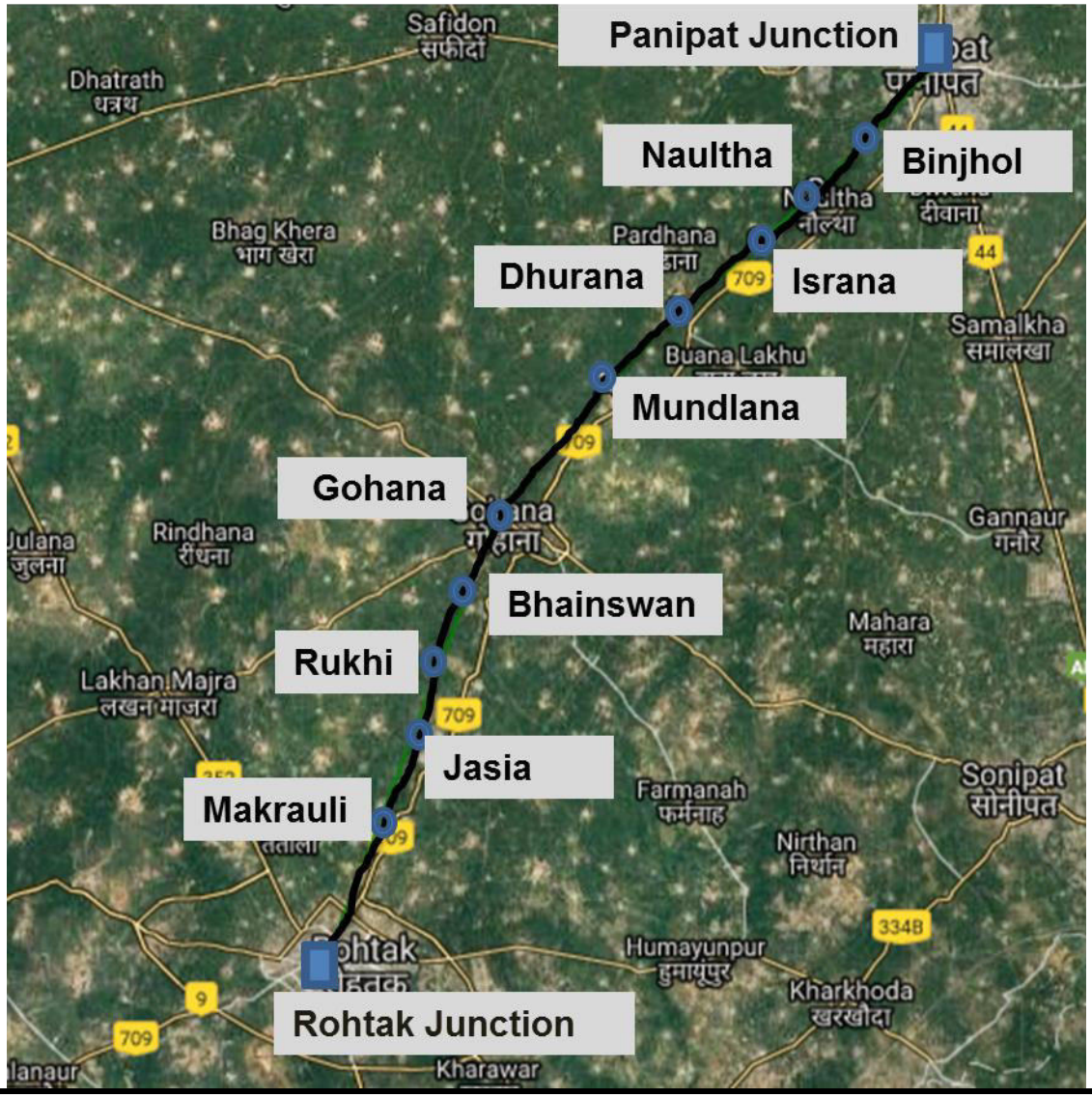
[2] As per the SPS, projects are assigned to one of the following four categories: (i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required. (ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required. (iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed (iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial institution.

II. DESCRIPTION OF THE PROJECT COMPONENTS

A. Components of the Subproject

8. The location of subproject sites and surroundings are shown in **Figures 1 to 3.** The location of Rail track on Google map is shown in **Figure 4.** Some subproject site photographs have been shown in Figure 1 and 2 in previous section**.** The subproject comprises of two parts namely (a) electrification works along the existing rail track from Rohtak Junction railway station to Panipat Junction railway station and (b) electric supply transmission line for feeding electric supply to the electrification line from 132 kV substation at Mundalana to TSS location near Mundalana station**.** The chainages of various stations from Rohtak to Panipat are given below in **Table 2**. It is clear that subproject route length is about 71.40 km.

Figure 4: Location of Existing Rohtak Panipat Rail line Site on Google Map



Source: Google map

Table 2: Distance Of Stations From Rohtak Junction To Panipat Junction

Sl. No.	Stations	Chainage
1	Rohtak Junction (Start Station)	0
2	Makrauli	10
3	Jasia	18
4	Rukhi	22
5	Bhainswan	27
6	Gohana	32
7	Mundlana	42
8	Dhurana	48
9	Israna	53
10	Naultha	59
11	Binjhol	66
12	Panipat Junction (End station)	71

Source: Google map

B. Need for the Subproject

9. The Rohtak- Panipat rail section is an important rail link connecting three districts of Haryana namely Panipat, Sonepat and Rohtak. This rail line provides link to two important trunk routes of Indian Railway namely (a) Delhi- Amritsar- Pathankot - Jammu and (b) Delhi-Bhatinda. The rail track electrification will result in reduced travel time on account of higher speed of electric locomotives. The other reasons necessitating electrification of this section are as follows:

- Reduction in greenhouse gas emissions and reduced air from reduce diesel usage;
- Potential for introduction of additional train services on route. This will result in better access to health and educational facilities for the local public; and
- Improved passenger safety.

C. Detailed Description of Project Components

10. The subproject involves electrification of 71.40km length of the railway track between Rohtak and Panipat. The subproject components include (i) erection of poles along the railway track to support overhead line suspended from poles; (ii) erection of overhead lines; (iii) erection of 2 numbers of Sectioning and Paralleling Post (SP); (iv) erection of 3 numbers of Sub Sectioning and Paralleling Post (SSP); (v) erection of one Traction Substation (TSS); (vi) erection of 2 bays at Mundalana substation exclusively for this subproject; and (vii) erection of 132kV transmission line from Mundalana substation to Traction substation at Mundalana Railway Station. The summary of subproject components is given in **Table 3**.

Table 3: Summary Of Proposed Subproject Components

Sl. No.	Subproject Components	Location	Component Description
1	Erection of poles	All along the 71.4km track and adjacent to the track at a distance of 2.9m from the centre of the track	About 1586 poles will be erected.
2	Erection of overhead lines	All along the 71.4km track	Overhead lines will be erected suspended from poles erected along the entire length.

Sl. No.	Subproject Components	Location	Component Description
3	Erection of Sectioning and Paralleling (SP) Post	Two numbers, one at km 0/800 near Rohtak Junction and anther at km 69/000 near Panipat Junction	The SP will be erected in an area of 5.67m x 20.8m (perpendicular x parallel) and is erected at about 3.5-4.5m away from the edge of the track
4	Erection of Sub Sectioning and Paralleling (SSP) Post	Three numbers, one at km 16/400 near Jasia Station, second at km 30/300 near Gohana Junction and third at km 58/380 near Naulatha Station.	The SSPs will be erected in an area of 5.62m x 17.8m (perpendicular x parallel) and is erected at about 3.5-4.5m away from the edge of the track.
5	Erection of Traction Substation (TSS)	One TSS at km 42/600 near Mundalana Station	The TSS will be erected in an area of 45m x 85m (perpendicular x parallel) and is erected at about 3.5m to 4.5m away from the track.
6	Erection of Bays	Two bays in 132kV Mundalana Substation	Two additional bays will be erected.
7	Transmission line	132kV transmission line from Mundalana substation to Mundalana TSS	132kV transmission line will be erected for a length of 8km

11. Except the 132kV transmission line which will pass through private land requiring the erection of electricity towers (pylon) in private land, all other subproject components are sited on government land free from encumbrance and does not involve any private land acquisition.

12. The description of each of the subproject components long with the details of their location is discussed in the following paragraphs.

13**.** **Erection of poles.** Poles would be erected all along the 71.4 km length of the railway track on one side of the track with each pole erected at an interval of 49.5m and sometimes in the range of 27to 49.5m depending on the need for additional poles at curves and level crossings. The poles will be erected at a distance of about 2.9 m from the centre of the track and within the existing right-of-way, which ranges between 6 to12m. Hence, all poles would be erected within the railway right-of-way that is free from any encumbrance. In all about 1586 poles is expected to be erected to support overhead line suspended from poles. Transect walks was undertaken along the route accompanied by Assistant Executive Engineer (AEE), Railway Electrification of Rohtak Division and Senior Section Engineers (SSE) of Ambala Division to confirm that the right-of-way is free from encumbrance for erecting the poles. The poles would be transported through flat wagons along the track.

14. **Erection of Overhead Lines.** Once the erection of poles is completed, the overhead lines will be erected suspended from poles by using wagons, designed for this purpose that will move on the track transporting the poles and cables. At stations, where there are multiple tracks, the overhead lines are erected across the portal which is about minimum 3.3m wide. The overhead lines are erected within the track and do not involve any impact to private assets.

15. **Erection of Sectioning and Paralleling Post.** Two Sectioning and Paralleling (SP) Post is proposed in this subproject, one near Rohtak Junction at km 0/800 and another near Panipat Junction at km 69/000. The SP requires an area of 5.67m x 20.8m and is erected at about 3.5-4.5m away from the edge of the track. The siting will be about 3.5-4.5m away from the edge of the track and the post area required is 5.67m perpendicular to the track and 20.8m

parallel to the track. The location of SP is identified by the SSEs through a walkthrough survey in the particular location after ascertaining the availability of adequate right-of-way, suitability of land with no water logging and accessible from a nearby approach road. Both the SPs are proposed on railway right of way and are free from encumbrance.

16. The SP posts are situated approximately midway between feeding posts marking the demarcating point of two zones fed from different phases from adjacent sub-stations. At these posts, a neutral section is provided to make it impossible for the pantograph of an electric locomotive or EMU train to bridge the different phases of 25 kV supplies, while passing from the zone fed from one sub-station to the next one. Since the neutral section remains 'dead', warning boards are provided in advance to warn and remind the Driver of an approaching electric locomotive/EMU to open locomotive circuit breaker (DJ) before approaching the 'neutral section', to coast through it and then switch 'on' on the other side. Special care is taken in fixing the location of neutral sections, on level tangent tracks far away from signals, level crossing gates etc. to ensure that the train coasts through the neutral section at a sufficiently high speed, to obviate the possibility of its stopping and getting stuck within the neutral section[3].

17. **Erection of Sub Sectioning and Paralleling Post.**Three Sub Sectioning and Paralleling Post (SSP) is proposed in this subproject, one near Jasia Station at km 16/400, second one near Gohana Junction at km 30/300 and the third near Naulatha Station at km 58/380. The SSPs requires land measuring 5.62m x 17.8m and is sited at about 3.5-4.5m away from the edge of the track. The siting will be about 3.5-4.5m away from the edge of the track and the post area required is 5.67m perpendicular to the track and 17.8m parallel to the track. Similar to SSPs, the location of SP is identified by the SSEs through a walkthrough survey in the particular location after ascertaining the availability of adequate right-of-way, suitability of land with no water logging and accessible from a nearby approach road. All the three SPs are proposed on railway right of way and are free from encumbrance.

18. One or more SSPs are provided between each FP and adjacent SP depending upon the distance between them. In a double track section, normally three interrupters are provided at each SSP i.e. two connecting the adjacent sub-sectors of up and down tracks and one for paralleling the up and down tracks[4].

19. **Erection of Sub Sectioning and Paralleling Post.**Three Sub Sectioning and Paralleling Post (SSP) is proposed in this subproject, one near Jasia Station at km 16/400, second one near Gohana Junction at km 30/300 and the third near Naulatha Station at km 58/380. The SSPs requires land measuring 5.62m x 17.8m and is sited at about 3.5-4.5m away from the edge of the track. The siting will be about 3.5-4.5m away from the edge of the track and the post area required is 5.67m perpendicular to the track and 17.8m parallel to the track. Similar to SSPs, the location of SP is identified by the SSEs through a walkthrough survey in the particular location after ascertaining the availability of adequate right-of-way, suitability of land with no water logging and accessible from a nearby approach road. All the three SPs are proposed on railway right of way and are free from encumbrance.

20. One or more SSPs are provided between each FP and adjacent SP depending upon the distance between them. In a double track section, normally three interrupters are provided at each SSP i.e. two connecting the adjacent sub-sectors of up and down tracks and one for paralleling the up and down tracks[5].

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[3] Source: Indian Railways Manual of AC Traction Maintenance and Operation (Vol - I).
[4] Source: Indian Railways Manual of AC Traction Maintenance and Operation (Vol - I).
[5] Source: Indian Railways Manual of AC Traction Maintenance and Operation (Vol - I).

21. **Bay at Mundalana Substation.**The Mundalana 132kV substation has 8 existing bays and it has been proposed to augment its capacity with 2 additional bays to feed the Mundalana TSS as part of the electrification of Rohtak to Panipat subproject. This component is being executed by Haryana Vidyut Prasaran Nigam Limited (HVPNL) and the cost will be borne by CORE.

22. A bay of a substation is a part of a substation containing extra-high (or high) voltage switching devices and connections of a power line, a power transformer, etc., to the substation busbar system(s) as well as protection, control, and measurement devices for the power line, the power transformer, etc.

23. The substation belonging to HVPNL has adequate land within the campus of the substation to house the 2-additional bays proposed for this subproject

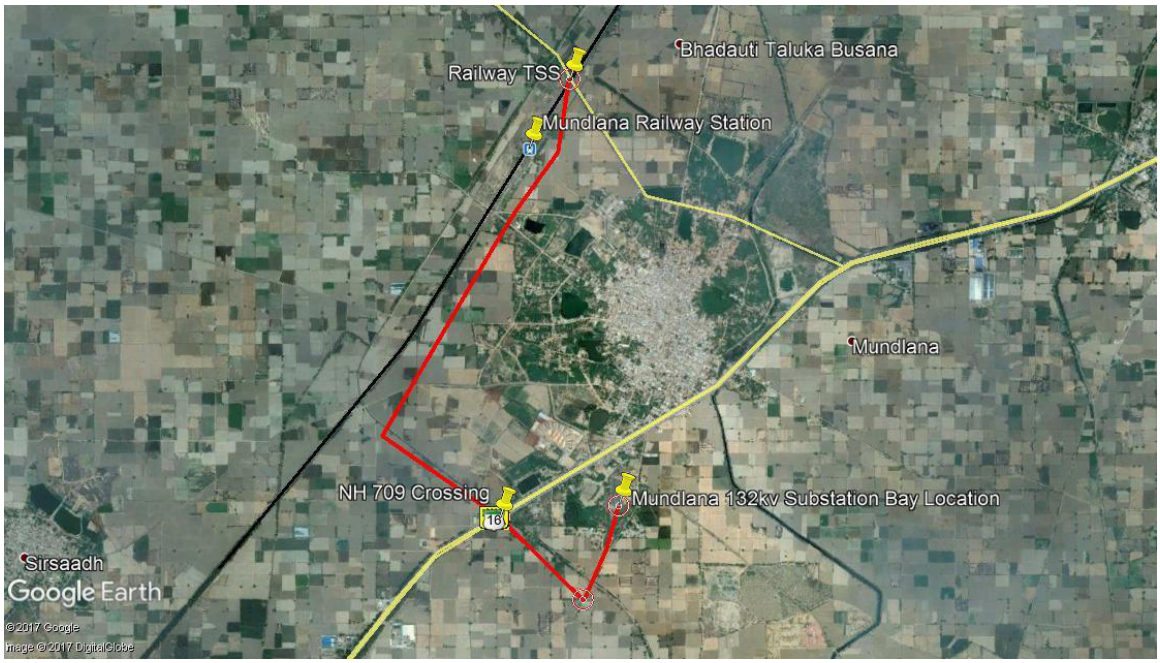
24. **132kV transmission line.**The subproject will involve erection of 132kV transmission line from Mundalana substation to Traction substation at Mundalana Railway Station for a length of about 8km. While the actual distance between the Substation and the TSS is about 5km, the length of the proposed transmission line is longer as it takes a circuitous route to avoid habitations.

25. Based on the request of CORE, HVPNL had carried out a walkover survey or transact walk to identify the alignment that does not involve any habitation or forest area and have prepared the tentative alignment which passes across open land and the alignment would be further adjusted during execution. The cost estimate for erection of 8km transmission line would be prepared by HVPNL and submitted to CORE and upon receipt of payment; tender process for the execution of the work will be initiated by HVPNL.

26. The 8km transmission line will traverse through private agricultural fields and cross highway and 132kV towers will be erected in private land.

27. **Figure 5** depicts the proposed transmission line alignment from the Mundalana substation to the Mundalana TSS.

Figure 5: Proposed Electric Supply Transmission Route Alignment



Source: Google map

D. Subproject Implementation

28. The subproject is one of the corridors being considered by ADB for funding. The cost of subproject is about INR 713 million. The subproject on ground will be implemented by CORE through the contractors. The ADB will transfer credit to IFRC, a 100% wholly owned subsidiary of Ministry of Railways. There is currently no dedicated Environmental and Health and Safety Officers from CORE or India Railway. Hence, ADB contemplated on providing a Technical Assistance to India Railway which will include support from environmental safeguard consultants to assist CORE and CPD offices comply with the subproject EMP implementation during the construction and operations phases. The safeguard consultants will also assist India Railway in preparing semi-annual safeguards monitoring reports as required by ADB for category 'B' projects during construction and annual monitoring reports during operations. These safeguard consultants will also CORE in supervision of construction works for IEE and EMP implementation in the entire duration of construction phase.

E. Manpower

29. There will be employment of around 250 persons (skilled and unskilled combined) during construction phase of electrification and 100 permanent employment in post construction phase.

F. Implementation Schedule and Sources of Construction Materials

30. The implementation period for the proposed subproject is 24 months. The design for the construction works is under progress by the design team of CORE. The bidding process for the subproject is expected to start in January 2018and will be awarded for construction by April 2018. The contractor is expected to be mobilized by May 2018. The construction work is expected to be completed by May 2020

31. The transmission line will be implemented by HPVNL which is currently in the process of finalization of transmission line alignment and preparation of cost estimates. Once estimates are approved, CORE will provide funds to HPVNL will award work to the selected contractor. The selected contractor will implement the work on turnkey basis. The construction materials are planned to be sourced locally from market due to civil works for SSP, SP and TSS being small in nature.

G. Disposal and /or Utilization of Existing Diesel Locomotive and Source of New Locomotives

32. The existing diesel locomotives being used on Rohtak- Gohana- Panipat Rail Line section will be shifted to other rail lines not electrified in Northern Railways. The new electric locomotives will be sourced from the Indian Railways electric locomotives manufacturing factory at Chiranjan in West Bengal. This factory is known as ' Chitranjan Locomotive Works'.

III. DESCRIPTION OF THE EXISTING SUBPROJECT ENVIRONMENT

33. This section presents a brief description of the existing environment around the subproject site, including its physical resources, ecological resources, socioeconomic development and social and cultural resources. Broad aspects of various environmental parameters such as geography, climate and meteorology, physiographic, geology, seismology, ecology, socio-cultural and economic development parameters that are likely to be affected by the proposed subproject have also been discussed. For completing the baseline description, secondary information was collected from relevant government agencies like the Forest Department, Central Pollution Control Board, Haryana State Pollution Control Board, India Meteorological Department, Central Ground Water Board and Census of India 2011.

A. Environmental Profile

1. Ambient Air and Noise Quality

34. Baseline ambient air quality along the Rohtak- Panipat rail corridor data were taken from secondary sources; for Panipat and Gohana cities data available in IEE report of Panipat Water Supply project has been given in **Table 4**. The SO2 values range from 6.1 to 15.7 ug/m3, NOx values range from 8.0 to 33.2 ug/m3 and PM 10 value ranges from 119.9 to 362 ug/m3. For Rohtak city data Published by Haryana State Pollution Control Board **(Appendix 5)** has been used as baseline information for the city. The SO2 values range from 2.06 to 14.56 ug/m3, NOx values range from 11.6 to 24.43 ug/m3 and PM 2.5 value ranges from 67.76 to 178.19 ug/m3. The So2 and NOx values are well within the specified limits of NAAQS while particulate matter has been noted to exceed the standard for both cities. The particulate matter concentrations are high because of local dust due to various construction activities, vehicular pollution and industrial emissions in the area.

Table 4: Ambient Air Quality In Panipat

Location	Land Use	Monitoring Date	Monitored Values (ug/m3)		
			SOx	NOx	SPM (PM_{10})
National Ambient Air Quality Standards			80	80	100
ESI Hospital	Mixed / Residential	18-Mar-2009	15.7	14.6	195.8
HUDA Sector 17	Residential	10-Apr-2009	8.0	33.0	139.8
HUDA Sector 13	Residential	10-Apr-2009	14.0	27.0	362.0
STP, Jatal Road	Residential/Rural	21-Mar-2009	13.0	8.0	119.9

Near Gohana Railway station	Mixed/Residential	10-Mar-2009	6.1	33.2	335.2
HP Petrol Pump, Jatal Road	Mixed/Residential	21-May-2009	6.1	23.3	325.6

Source: IEE report for Panipat Water Supply Project under the Capacity Development of the National Capital Region Planning Board, New Delhi

35. It was observed that ambient noise level in the surroundings of subproject rail track is quite low in open areas, but noise levels at major urban junctions (Rohtak and Panipat) is higher due to commercial activities. There are no industrial establishments along the rail track corridor as well as along the alignment of transmission line. In the surroundings of rail line, traffic density is very low. The noise measurements were undertaken at habitations along the rail line. The measured noise levels are given below in **Table 5.**

Table 5: Ambient Noise Levels Along Railway Line

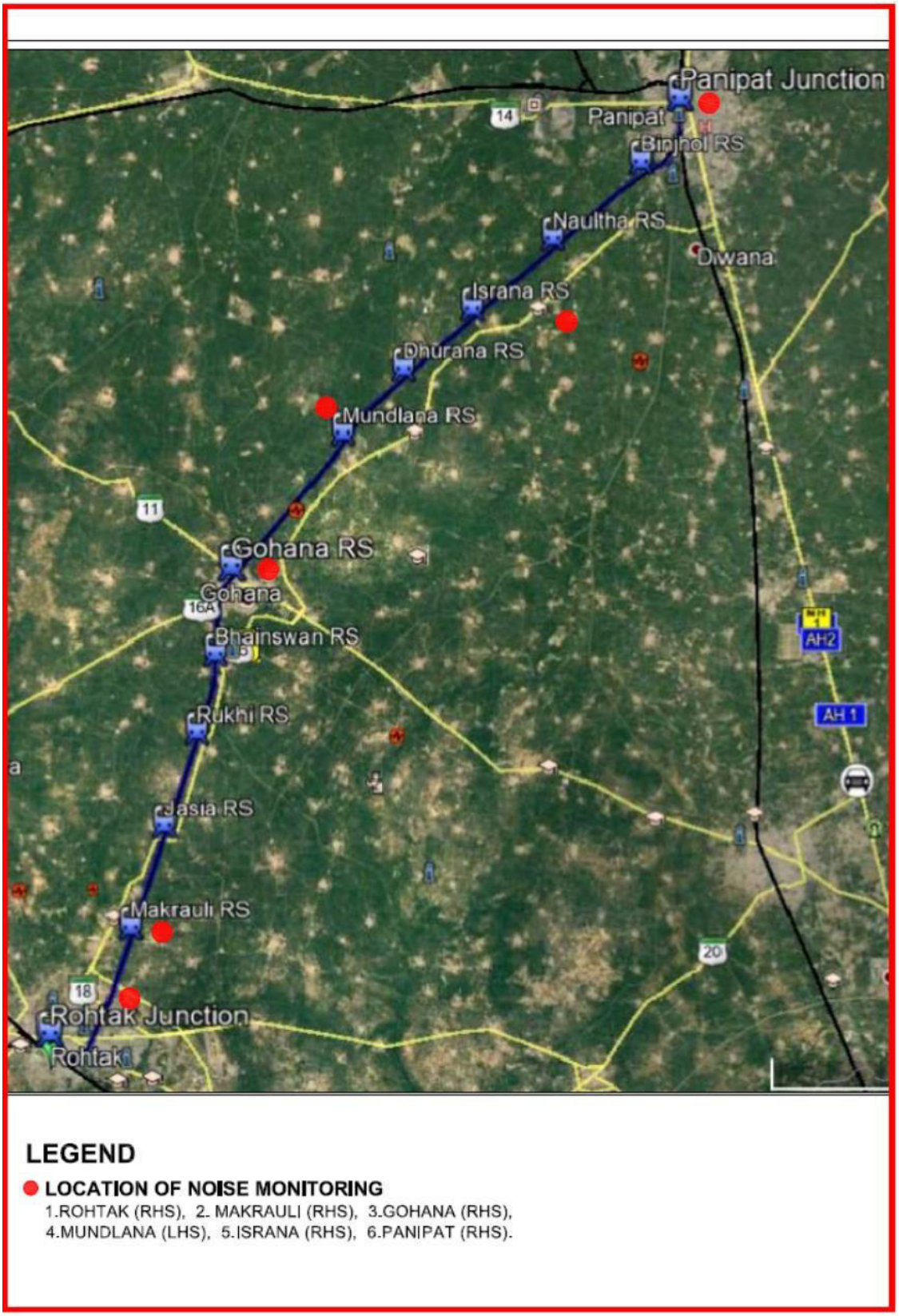
Sl. No.	Location Name	Land Use	Measured Noise Levels dB(A)			Distance from Rail Line (m)	Applicable Standards (dB(A))	
			Leq (Day)	Leq (Night)	Lmax**		Leq (Day)	Leq (Night)
1	Rohtak City at location CH 0+800 (near SP site) on RHS	Commercial and Residential	60.2	52.3	89.9	22	65	55
2	Residential Houses near Makrauli Station (CH10+000) on RHS	Rural and Residential	40.50	33.50	87.5	30	55	45
3	Gohana City (CH30+500) on RHS	Urban and Commercial	55.30	46.60	91.2	32	65	55
4	TSS Location Near Mundalana (CH42+600) on LHS	Open and Rural	39.80	33.60	87.0	30	55	45
5	Residential area near Israna railway Station at CH 53+500 on LHS	Semi Urban and Residential	45.0	37.70	86.3	50	55	45
6	Panipat City (CH 69+000) on RHS	Urban and Residential	54.50	45.90	91.0	20	55	45

** Lmax measured during passage of train run by diesel locomotive
Source: Consultant's Field Monitoring

36. It is clear from the results that values are well within the stipulated limits at all locations along the corridor. The noise levels at TSS location have been recorded extremely low because this site is in an open area with no residential or vehicular noise. In Gohana noise levels are little higher because of commercial activities. There are no industrial establishments along the rail track corridor as well as along the alignment of transmission line. In the surroundings of rail line, traffic density is very low, the noise either from point or nonpoint sources have not been observed in the subproject area. Moreover, there will be not much rise in the noise due to the proposed electrification of the Rohtak-Panipat Railway line. The construction activity noise will have incremental noise consequence at SSP locations at CH 16 + 400 and as CH 58 + 380 as these are located in open area with no habitations within 2 km The SPP locations at CH 0+800 (in Rohtak town) and CH 69+000 (in Panipat city) and SP

location at CH 30+300 (in Gohana town) are in built up areas. These locations of SSP and SSP are in close vicinity of urban built up, and commercial areas, therefore, noise levels have been measured at these both locations. The noise monitoring locations have been shown below in **Figure 6.**

Figure 6: Locations of Noise Level Measurements near Rail Line



2. Climate

37. The climate in the project districts can be classified as subtropical monsoon, mild and dry winter, hot summer and sub-humid which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrates into the project region. The hot weather season starts from mid-March to last week of the June followed by the south west monsoon which lasts up to September. The transition period from September to November forms the post monsoon season. The winter season starts late in November and remains up to first week of March.

38. All three districts through which the subproject rail track passes have a sub-tropical continental monsoon climate where we find seasonal rhythm, hot summer, cool winter, unreliable rainfall and great variation in temperature. Air is generally dry during greater part of the year. Dust storms mostly occur during April to June period. Sometimes dense fog occurs in winter season.

39. The area receives normal annual rainfall to the extent of 680 mm which is spread over July to September period. About 77% of rainfall occurs during south-west monsoon.

3. Temperature

40. The temperature, in the subproject region, exhibits seasonal variation, lowest during the winter, and higher during the summer. April, May, June, and July are the hottest months while January, February, and December are the cold months. The maximum temperature rises to about 47°C and the minimum temperature falls to about –1.9°C. January is the coldest month with mean daily maximum temperature 21.3°C and means daily minimum temp 7.3°C. May is the hottest month with mean daily maximum temp 26.6°C. In May and June, the maximum temperature sometimes reaches about 47°C.

4. Rainfall

41. The subproject region experiences maximum rainfall during monsoon season from June to September while as least rainfall is received in November, December and January.

42. The recent data of rainfall for Rohtak, Sonepat and Panipat indicates an annual rainfall of 284.10, 307.80 and 321.60 mm respectively. This shows below normal rainfall in the year 2016 in the project region. The rainfall data for past 5 years for the subproject districts is given in **Appendix 5.**

5. Humidity

43. As per long term meteorological data analyzed by the Central Ground Board in their publication titled as 'Ground Water Year Book of Haryana State (2015-2016)' the mean relative humidity in the subproject region on an average varies from 30% in April to 90% in August, the annual average being 60%. Relative humidity is generally high in the mornings during monsoon season and from December to February. During summer season relative humidity is as low as 28 percent in the afternoons. The deficiency of moisture is felt over the greater part of the year

44. Wind speed and direction: Winds are generally light in the subproject region with some strengthening in force during late summer and monsoon seasons. Cloudiness is moderate to heavy during monsoon season, rest of the year skies are generally clear or lightly clouded. Easterly or south easterly winds blow during monsoon season but for the rest of year winds

are westerly or north-westerly. Air is dry for most part of the year. Dust storms and high velocity winds are quite common during summer.

45. The average wind speed during winter and post monsoon month is around 2.6 m/s Dominant wind direction during winter is west and during post monsoon North-West.

6. Topography, Floods and Soils

46. The subproject region in Rohtak district is occupied by Indo-Gangetic alluvium. There are no surface features worth to mention. Physiographically the area is flat terrain. The area slopes towards northeast to southwest with an average gradient of 0.19 m/km. The general elevation in the district varies between 215 m to 222m above MSL.

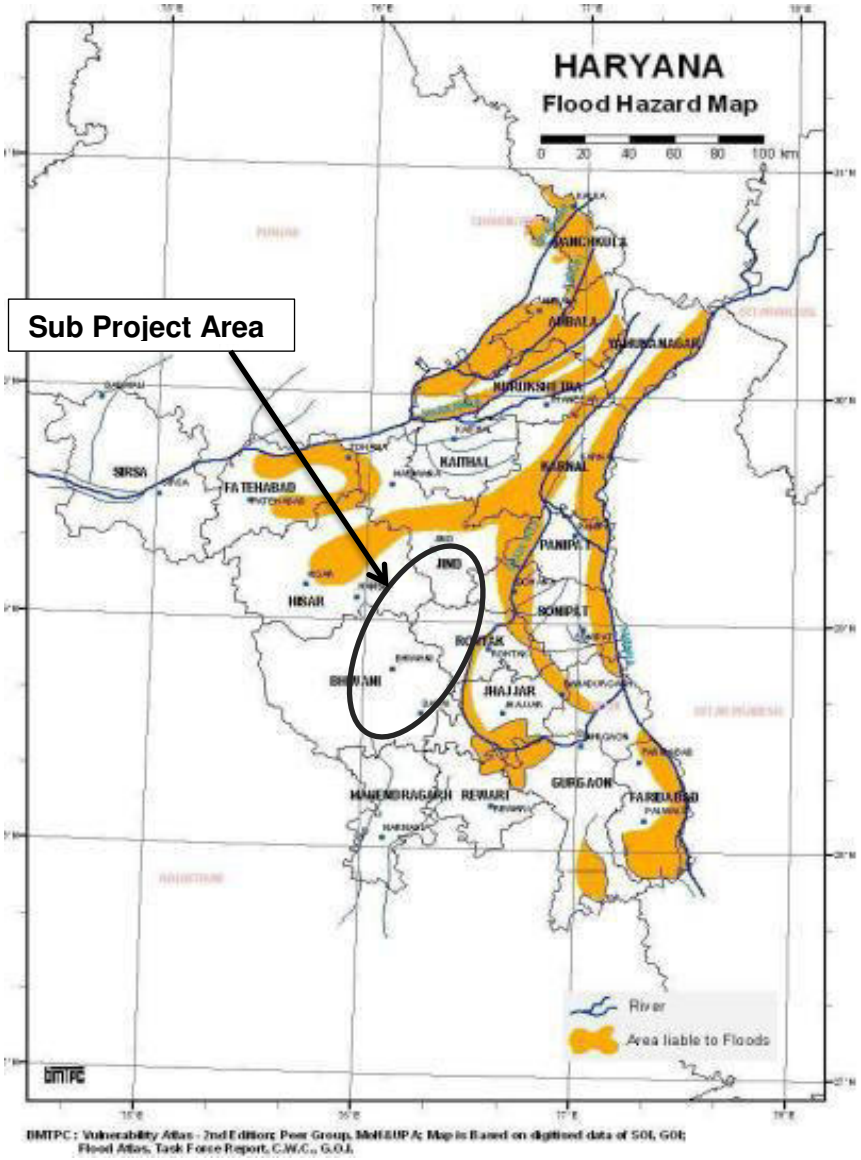
47. The subproject region in Sonepat district also forms a part of the Indo-Gangetic plains and exhibits flat terrain with general slope from North to South. The area is devoid of any prominent topographic features. However, a natural depression exists in North & Northwest of Gohana (29° 08'22"N & 76° 42'55"E). The maximum elevation of the plain is 230m above msl. Topographically the Sonepat district can be divided into the following units.

- Active flood plains along the present day course of the river Yamuna in eastern part of the district
- Abandoned flood plains of recent past. These are generally bordering the active flood plains and are wider, low lying flat tracts.
- Upland plains representing the relatively older river deposits. The western Yamuna canal has been roughly aligned along the ridge formed by upland plains

48. The Panipat district forms a part of Indo gangetic plain and lies in Yamuna Sub basin of main Ganga basin. Physiographically, the district is characterized by two distinct features i.e. vast upland plain and Yamuna flood plain. The width of the flood plain varies according to the amount of shift experienced by the river. It is narrow in the Northern part and widens downstream. The district is mainly drained by the river Yamuna and its tributaries. The river Yamuna is major Perennial River which flows all along the eastern margin of the district from northern to southern direction. The district is also drained by the artificial drain named as 'Naurah Drain' which originate in southern eastern part of Madlauda block and flows through south western part of Panipat and all along eastern boundary of Israna block in southerly direction.

49. **Floods**: Many parts of the state of Haryana are prone to flooding. The devastating floods hit Haryana many times. In 1977, 1978, 1980, 1983, 1988, 1993 and 1995, 1996 floods occurred in Haryana. Floods have caused extensive damage not only to standing crops but also loss of lives and cattle. The floods in Haryana can occur because of some natural reasons such as its physiographic situation which makes a depressional saucer shape zone around the Delhi-Rohtak-Hisar-Sirsa axis and it has a poor natural drainage system and sometimes the heavy precipitation becomes a major contributing factor in causing flood as such in case of Rohtak flood, 1995. The state receives an average rainfall of about 650 mm. In flood manual of Haryana, there are 102 vulnerable points in Haryana which need special attention during monsoon. The flood hazard map of Haryana has been given in **Figure 7**; subproject area is noted to be outside the flood areas. The Rohtak -Panipat rail line is existing since 1960 and formation width of this line is above HFL.

Figure 7: Flood Hazard Map of Haryana



BMTPC : Vulnerability Atlas - 2nd Edition; Peer Group, MoH&UPA; Map is Based on digitised data of SOI, GOI; Flood Atlas, Task Force Report, C.W.C., G.O.I.

50. **Soils**: The soils of the subproject region in Rohtak district are fine to medium textured. It comprises of sandy loam in Rohtak. High potassium, medium phosphorus and low nitrogen occur in the soils. The soils of the subproject region are classified as arid brown (Solemnized) and sierozem. Soils as classified by National Bureau of Soil survey and Land use Planning (ICAR), Nagpur, the Rohtak district has mainly Orthids-Fluvents types of soils. The district contains loamy (Bhangar and Nardak) soils. Sizeable chunk of the tract is characterized by the presence of saline and alkaline soils. The vegetation growing over such areas mostly comprises of bushes.

51. The Panipat district has two types of soils viz-tropical arid brown and arid brown soils (solemnized). The arid brown soils are found in major parts of the district whereas tropical arid brown soils are found in north eastern part of the district especially in parts of Bapoli and Panipat blocks.

52. The Sonepat district is located on the western side of the Yamuna River and the whole area forms part of Indo-Gangetic Alluvial Plain. The soil of the district varies from sandy to

clayey loam; almost 67 per cent is Sandy. In the recent alluvial plain or Khadar, the soils are silty loam with slight mixture of sand or the stiff clay. The low-lying area of undulating land is affected by the problem of salinity and alkalinity. Old alluvial plain, Sonepat Upland Plain or Bhangar area is well drained and level plain. Soils of this area are loamy and have good water holding capacity. Loam (Bhangar and nardak) and silty loam (Khadar) soils are found in the district. The district has mainly Aquents-Fluvents, aquepts-Orchrepts and Orchrepts types of soils as classified by National Bureau of Soil survey and Land Use Planning (ICAR) Nagpur.

7. Surface Water and Groundwater

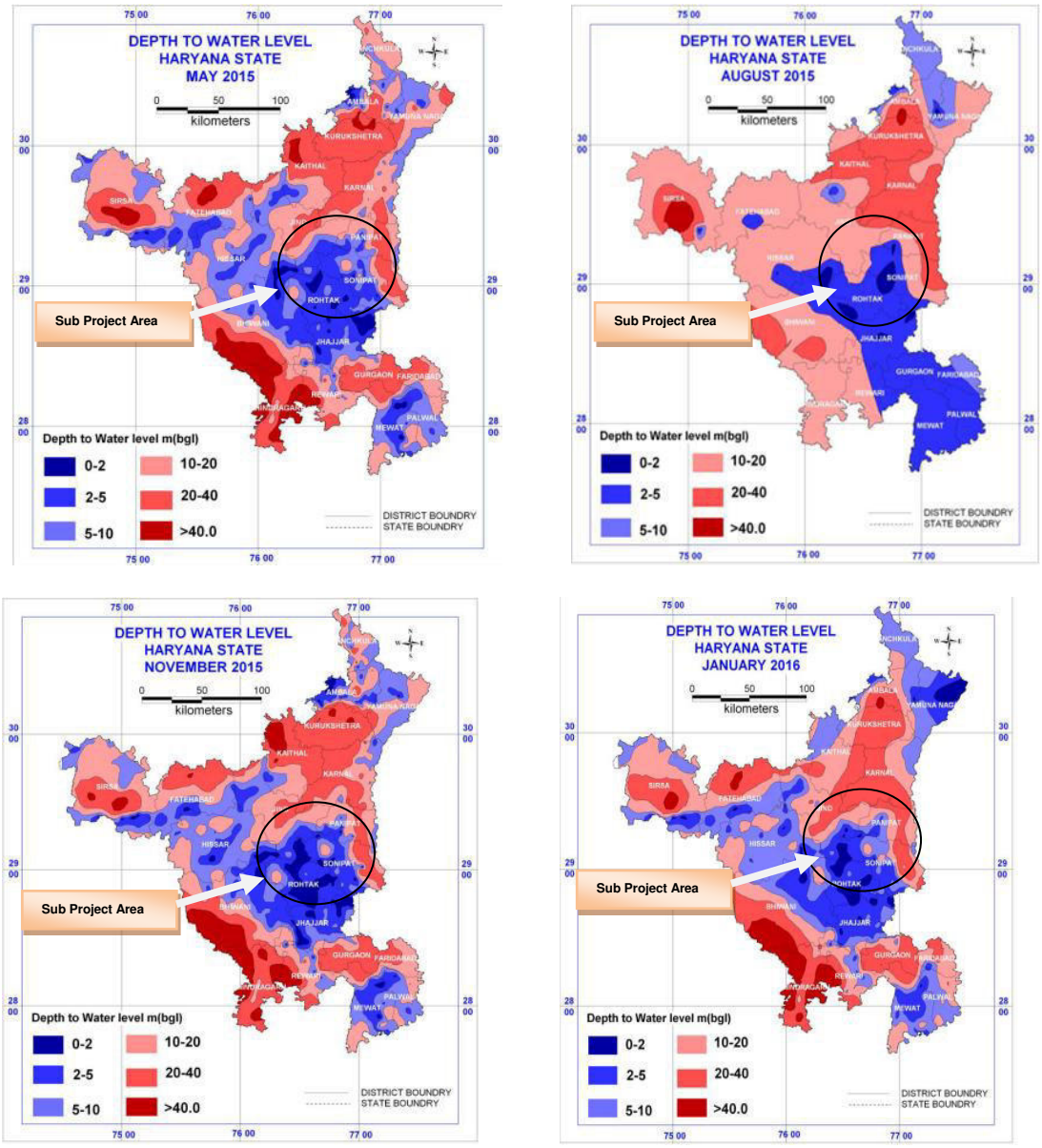
53. The drinking water supply is mainly canal water based in the Rohtak district. The short fall in water supply to the towns, cities and villages is met with the installation of hand pumps by the public individually as spot and convenient source of water. There are 16995 minor irrigation units with the depth ranging from 15 to 20m. Most of these shallow tube wells are cavity type and either run by diesel engines or electric motors. The blockwise ground water resource potential in the district has been assessed by the Central Ground Water Board. The stage of ground water development ranges between 39% (block Sampla) to 111% (block-LakhanMajra). The total replenishes able ground water resource in the Rohtak district is 450.17 mcm, while the existing ground water draft is 307.43 mcm. Ground water availability for future irrigation development is 139.09 mcm. The stage of ground water development in the district is 68%.

54. The block wise ground water resource potential in the Panipat district has also been assessed by the Central Ground Water Board. The ground water development in all the blocks has exceeded the available recharge and thus all the blocks have been categorized as over exploited. The stage of ground water development ranges between 137% (block-Panipat) to 186% (block-Bapoli). The net ground water resource in the district is 720.81 mcm, of which the net utilizable ground water resources availability is 554.86 mcm. The net ground water draft is 1350.53 mcm thus having an overdraft of 701.80 mcm, which shows 152% as stage of ground water development. The exclusive ground water development data for Sonepat district is not available, but trend as explained for Panipat is expected.

55. The ground water quality of the Sonepat and Rohtak Districts is alkaline in nature and varies from fresh to saline. EC ranges from 640 to 9037 Micromhos /cm at 25 0C. The water quality of Panipat is better in terms of hardness and electrical conductivity.

56. Based on 2011 data, the depth to water level in subproject region ranges from less than 1.72 m below ground level (bgl) to 10.75 mbgl during pre-monsoon period, and1.46 to 9.07 m during post monsoon period. The water level trend during pre-monsoon period indicates average fall of 0.06m/year and rise at places ranging from 0.02m to 1.74m during the same period. The long-term water level trend is show small decline. The variation of ground water table depth has been shown in **Figure 8** below:

Figure 8: Variation of Groundwater Table in Sub project Area



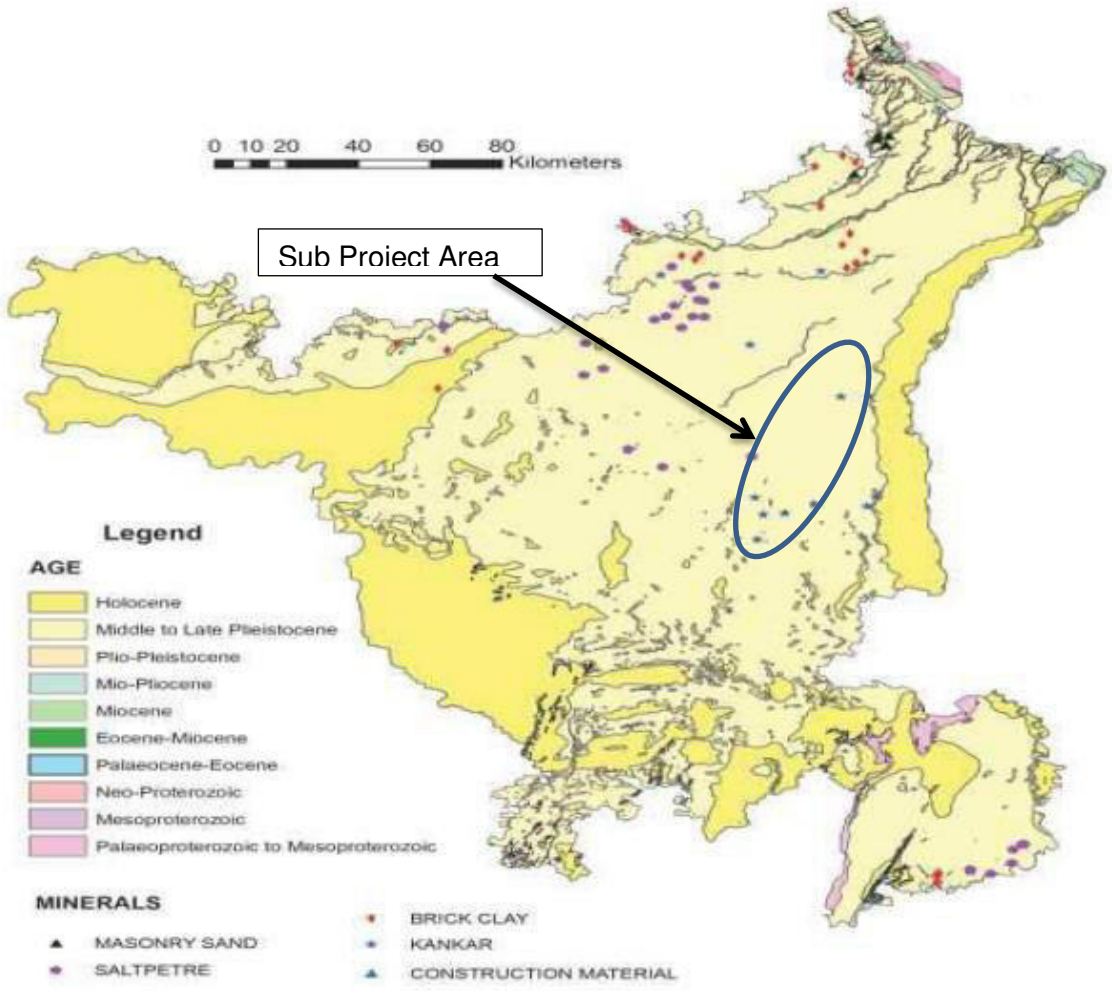
Source: Ground Water year book Haryana State 2015-16, Central Ground Water Board, Ministry of Water Resources, Government of India New Delhi.

8. Geology and Seismology

57. The geology of Haryana is predominated by the Quaternary alluvium and Aeolian sediments covering nearly 95% of area. The rest of the area comprises Proterozoic and Tertiary rocks exposed in the southern and northeastern extremities of the state.

58. The area of the subproject is occupied by geological formations of Quaternary Age comprising of recent alluvial deposits belonging to the vast Gangetic alluvial plains. The geological map of Haryana state showing subproject region is given below in **Figure 9**.

Figure 9: Geological Map of Haryana



Source: Geological Survey of India

59. India's seismic code divides the country into five seismic zones (I to V). The subproject stretch comes under seismic zone IV as defined by Urban Earthquake Vulnerability Project and the Atlas prepared by the Building Materials Promotion and Technology Council Government of India and UNDP (IS 1893 [Part I: 2002]). The earthquake hazard map prepared for Haryana is given in **Figure 10**. It may be mentioned that intensity of earthquake increases from Zone I to V. According to IS: 1893-1984, areas falling in Zone IV will experience major earthquake shock. Hence subproject region will experience major shocks in the event of earthquakes occurrence with magnitude of 5 and above.

Figure 10: Earth Quake Hazard Map of Haryana

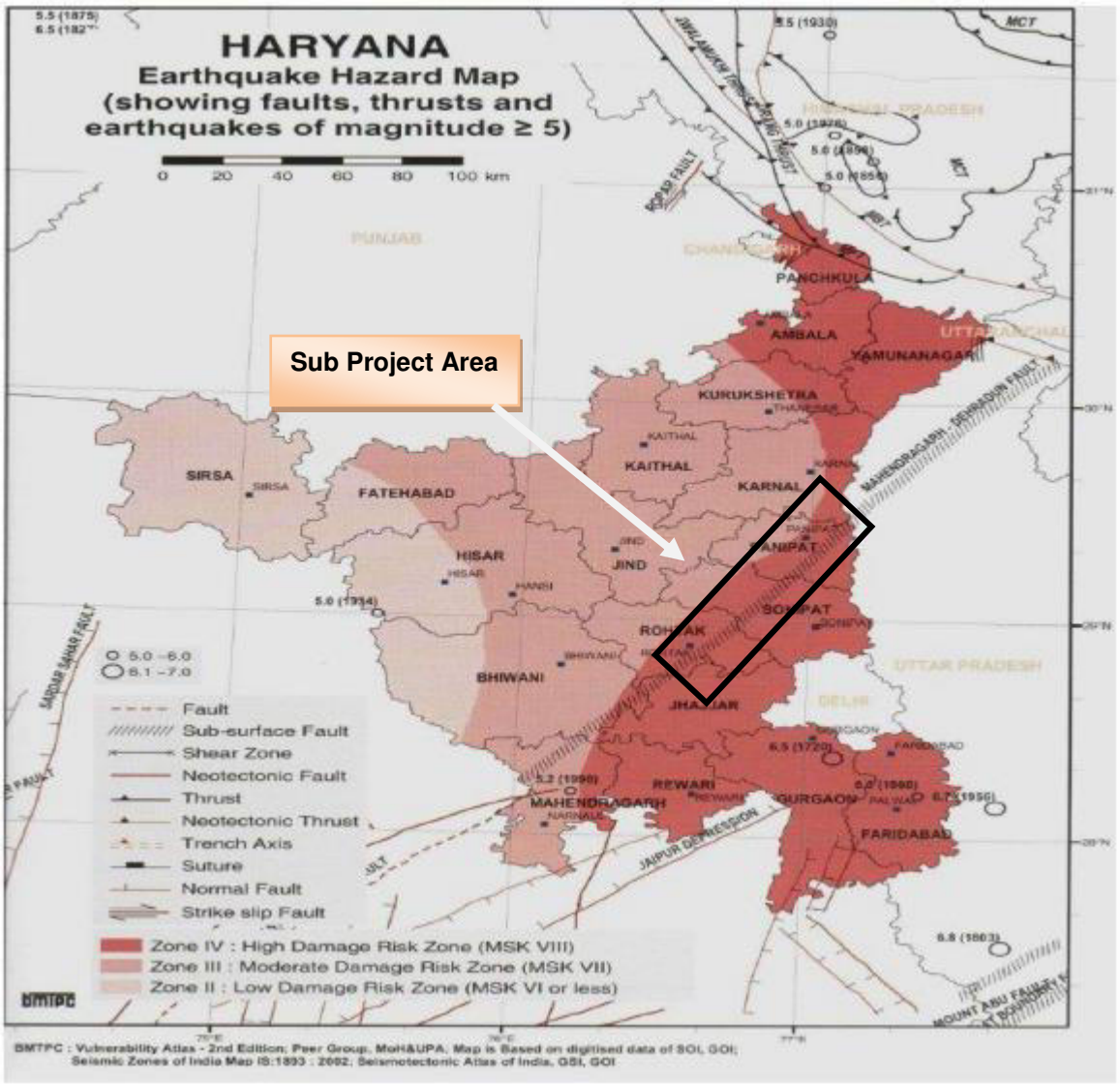


Figure: Earthquake Hazard Map of Haryana

9. Drainage

60. There is no perennial river in the subproject area. General slope of the area is from north to south. Canals, sub branches, distributaries emanating from Delhi Branch of the Western Yamuna Canal irrigate the majority of the subproject area. Up to the year 1878 obstructions caused by Old Rohtak Canal in the natural drainage of the subproject area produced water logging. The re-alignment of the canal greatly improved the natural drainage. The subproject region is drained by the tributaries of Yamuna River through local natural drains and streams.

B. Ecological Resources

1. Forests and Protected Areas

61. The Rohtak- Panipat rail track and proposed alignment of Transmission line do not pass through any reserved, protected, or revenue forest. This has been confirmed through

Survey of India Topo sheet map. This map showing rail track have been given in **Figure 11.** The forest cover in the subproject area is not significant because this area is agriculture rich area. The district wise forest cover in Rohtak, Panipat and Sonepat district is given in **Table 6.** The subproject infrastructure components (SSPs, SPs, Transmission line alignment, tower wagon shed and poles erection along transmission line) locations are not within any forest land. The description of forest areas in general in the subproject districts has been provided in the following paragraph.

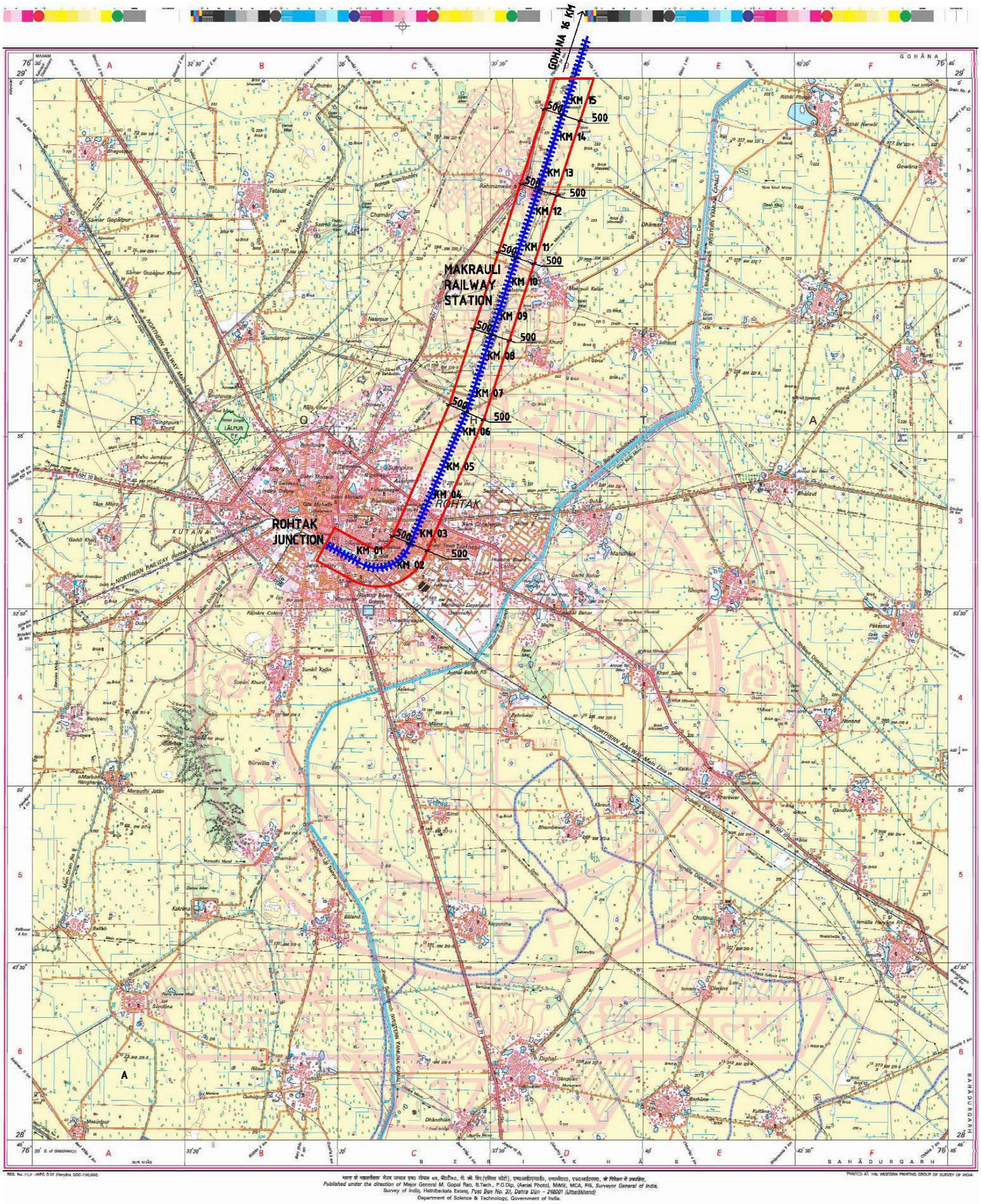
62. The area under regular forests in the district is very small. Only poor uncultivable area is left for Forest Department for developing forests. The areas unfit for agricultural purposes are managed by Forest Department for afforestation. The forest divisions of Rohtak, Panipat and Sonepat actively engaged in intensive implementation of farm forestry, afforestation and regeneration programs. Plants like shisham, neem, siris, jamun, kikar, drek and ornamental plants like amaltas and goldmohar are raised in a number of forest nurseries for plantation in different forest areas. Minor forest produce consists of grasses like kana, mallah (palla) and gum etc. Shisham (Dalbergia sissoo) provides the best timber for furniture. Kikar (Acacia nilotica), Israili kikar (Acacia tortilis), neem, siris and jand provide firewood and timber. Sarkanda grass is used for thatching.

Table 6: Area Under Forest Cover In Subproject Districts

Sl. No.	Type of Forest	Rohtak (Area in Sq kms)	Sonepat (Area in Sq kms)	Panipat (Area in Sq kms)
1	Reserved Forests	Nil	Nil	Nil
2	Protected Forest	40.0	74	41
3	Unclassed Forest	3.8	Nil	Nil
4	Forest under section 38 of IFA,1927	Nil	Nil	Nil
5	Forest under section 4 and 5 of LPA,1900	2.2	Nil	Nil
	Total Forest Area	**46.0**	**74**	**41**

Source: HFD overview Haryana Panchkula 2010-11

Figure 11: Sub project Alignment on Survey of India Topo Sheets



NOTES:

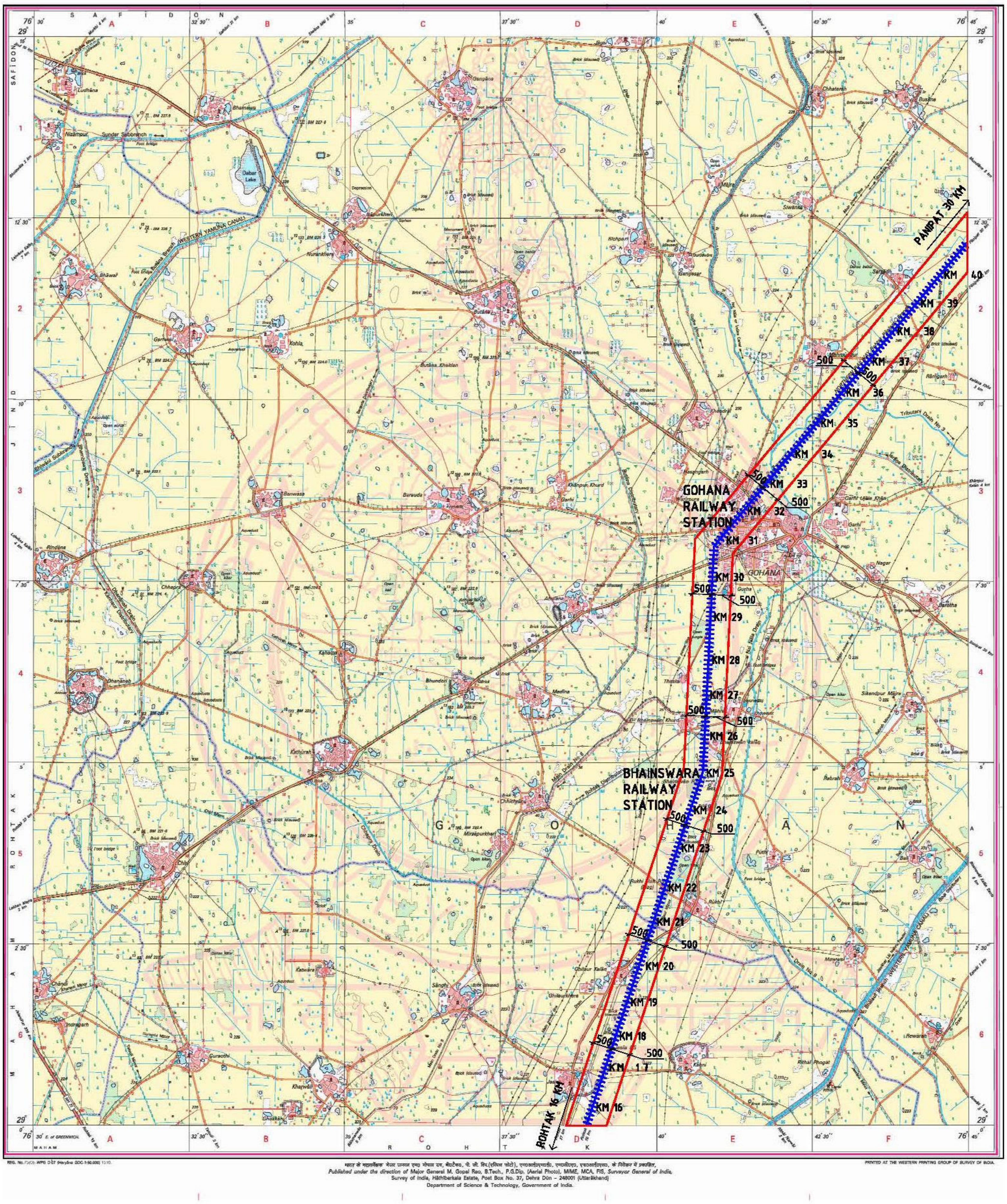
- DIMENSIONS ARE IN METER UNLESS SPECIFIED.

NORTHERN RAILWAY

RAILWAY LINE ROHTAK JUNCTION-PANIPAT JUNCTION
(KM 0+000 TO 15+500)

SOI SHEET NO: 53D/9

Figure 11: Sub project Alignment on Survey of India Topo Sheets (Contd.)



NOTES:

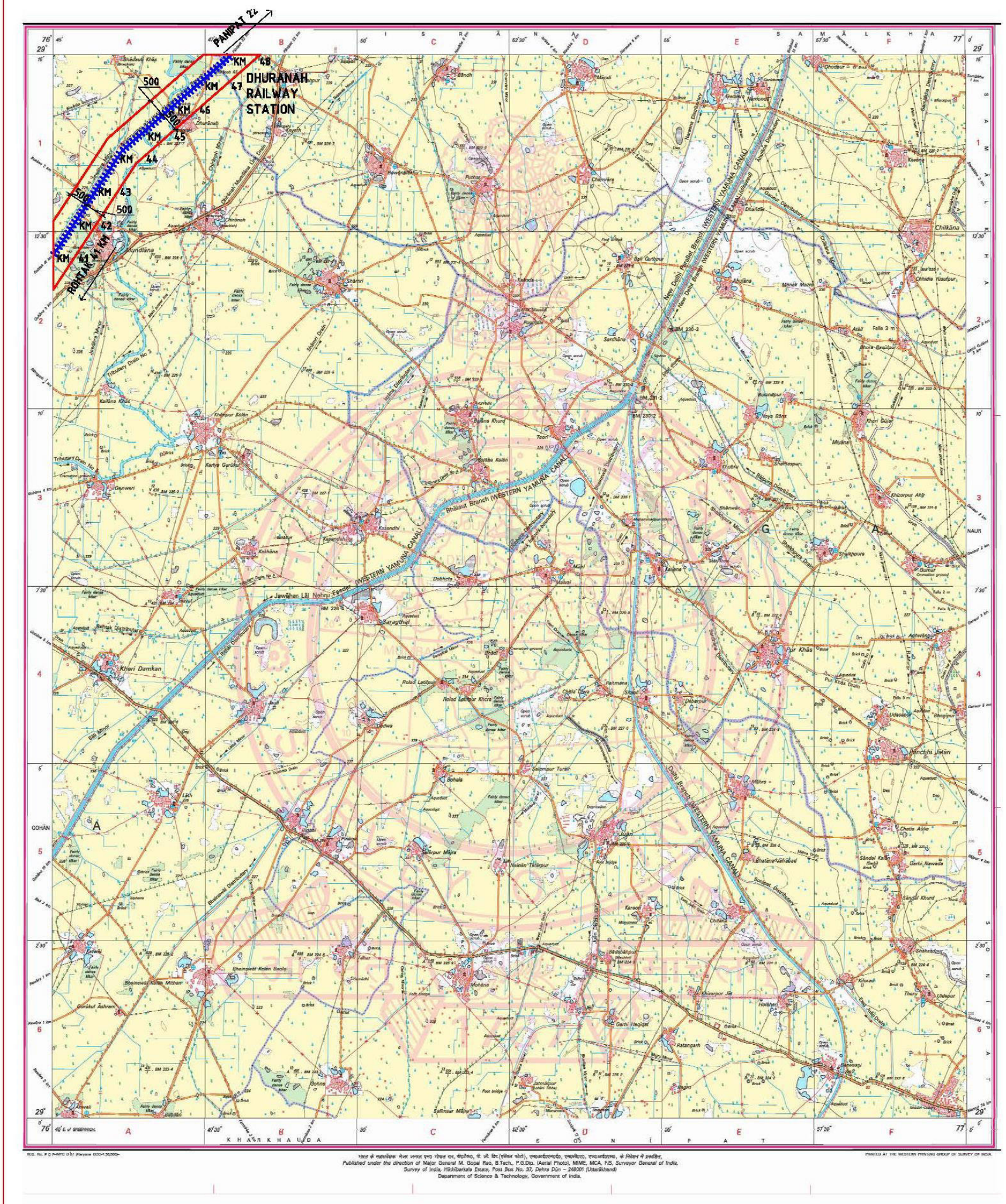
- DIMENSIONS ARE IN METER UNLESS SPECIFIED.

NORTHERN RAILWAY

RAILWAY LINE ROHTAK JUNCTION-PANIPAT JUNCTION
(KM 15+500 TO 41+000)

SOI SHEET NO: 53C/12

Figure 11: Sub project Alignment on Survey of India Topo Sheets (Contd.)



NOTES:

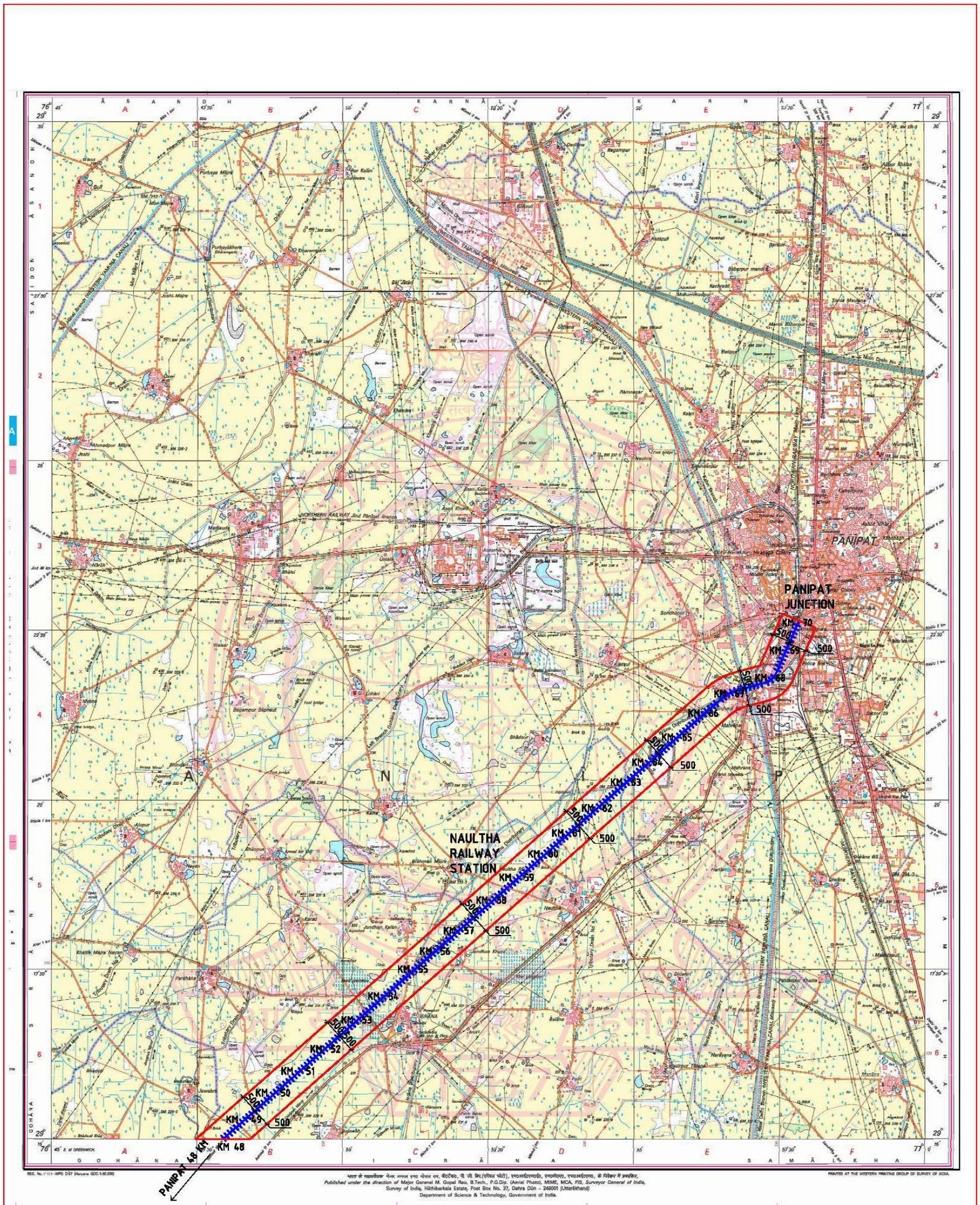
- DIMENSIONS ARE IN METER UNLESS SPECIFIED.

NORTHERN RAILWAY

RAILWAY LINE ROHTAK JUNCTION-PANIPAT JUNCTION
(KM 41+000 TO 48+000)

SOI SHEET NO: 53C/16

Figure 11: Sub project Alignment on Survey of India Topo Sheets (Contd.)



Source: Survey of India, Government of India

63. There are no protected areas such as National Park, Wild Life Sanctuary, Bird Sanctuary or Tiger reserve within an aerial distance of 10 km from the Rohtak- Panipat rail track as well from the proposed alignment of Electric Supply Transmission line. There is no notified wetland also within the aerial distance of 10 km from the rail track and transmission line alignment.

2. Flora and Fauna around sub project area (Around Alignments of Rail Line and Transmission Line)

64. There is nothing particular about the flora of the subproject region. Various kinds of trees and shrubs grow in different localities. On account of pressure of population and extensive cultivation in the subproject region, very little has been left of the natural vegetation and trees. Wherever present, these are of the open evergreen scrub or thorn type consisting mostly of the following trees and scrubs:

65. Some of the characteristic plants of the sandy tracts and dune hillocks are Dholphulio, Jawasa, Rattanjot, Meini, Farid-buti, Khip, Harmal, Malha/Jhad/Beri etc. Many of them are used medicinally. Most characteristic tree of the drier parts of the Rohtak district is Farash but rail line section from Rohtak to Panipat is away from dune hillocks and drier part of this district. In the surroundings of rail line and transmission line alignment Shisham, which is well known for its timber, is grown near villages in open and vacant area. The other trees noticed were Kikar, Reru, Siris, Neem, Dhak, Amaltas, Lasura, Sahtoot, Jumela etc. These trees were seen grown along roadsides and canal banks. Other trees occasionally met with are Kachnar, Barna, Sohanjna, Kaim, Symbal, Lahura, etc. Chhittar Thohar or Nagphani the common prickly cactus may be seen in wastelands and along hedges.

66. Among the fruit trees Aam and Jamun are the most important. In villages and around the village ponds, people have planted trees like Banyan or Bar, Peepal, Neem and Kaindu to provide shade for the cattle. In dry areas, people plant such trees near villages on religious ground. Besides shade, these trees provide food for cattle in the shape of fodder during emergencies and fruits to the birds. The aquatic flora of the district includes such flowering plants as Singhara, Chhota kamal, etc. Most of the herbs and shrubs of the district possess medicinal properties.

67. The common climbers seen subproject region is Coccinea cordifolia (Kutra, Kundru) Maerua arenaris, Pergularia daemia (aaksan), Rynchosia minima and others. During the rainy season, a number of herbs appear on the ground giving it a green appearance. Among these herbs may be recognized species of Hulhul, Kankawwa or Kana, Khurand, Kag-roti, Tandla, Kulfa, Pawad, Santhi, Bhankdi, Kasni, Basuti, etc. In wastelands Bangra, Bichu, Kutra, Bhurat is commonly seen. Other plants growing in waste land are Akk, Kala Bhangra, Satyanasi or kandiari, Rissa or Katola, etc.

68. Biggest and most conspicuous of the grasses is Munj or Sarkara. A Dub is a very good fodder. Other grasses commonly seen in the district are Khaskhas, Makhra or Madana etc. Bansa and Sambhalu are used as roofing material for mud houses. The pictorial view of vegetation around the rail track has been given in **Figure 12**. None of the trees, shrubs, climbers or grasses in the alignment of transmission line and around rail track are endangered or critically endangered. It may be mentioned that there is no requirement of tree cutting along the rail line for construction of SP, SSP, poles erection and TSS construction. There is need to cut around 150 trees in the alignment of transmission line from Mundalana substation to TSS.

69. Rapid increase in human population and extension of cultivation fields has led to disappearance of wild animals to a large extent. Now only a few neelgai (blue bull), antelopes and wild hares are found in the subproject area. Neelgai and antelopes browse the young

shoots and retard the growth of plants. Wild cat, fox, jackal, wolf, hyena and wild pig are very rare. Monkeys are found in the district that ravage sugarcane crop whenever they get chance. The people are unwilling to kill them on religious grounds. Various types of ducks and geese seen near water bodies such as ponds in the subproject region are Brahminy duck, common teal, pintail, gadwall, widgeon, shoveller pochard, mallard, grey-leg geese, bar-headed and large white-fronted geese, snipes cranes etc. Partridges, green pigeons, blue rock pigeons, pea fowl, common sand grouse and other birds such as sparrow, crow, kite, vulture, parrot, baya and dove are found in the subproject area. Scorpions are not very common but snakes are. Poisonous varieties of snakes such as Cobra and Karait are found. In addition to the above, there is domesticated fauna in the subproject region, which includes buffalo, cow, goats, camels, horses, bulls, etc. The IUCN status of faunal species of subproject region is presented below in **Table 7**.

Table 7: Faunal Species In Subproject Region And IUCN Status

Scientific Name	English Name	WLPA 1972: Schedule	IUCN Threat Category
(a) Mammals			
Lepus nigricollis	Hare	Schedule IV	Least Concern
Canis aureuss	Jackal	Schedule II	Least Concern
Funambulus palmarum	Indian Panai Maram Squirrel	Not listed	Least Concern
Rattus norvegicus	Field mouse	Schedule V	Least Concern
Macaca radiata	Bonnet Monkey	Schedule II	Least Concern
Mus musculus	Common (House) mouse	Schedule V	Least Concern
Hystrix indica	Indian porcupine	Schedule IV	Least Concern
Herpestes edwardsii	Common Mongoose	Schedule IV	Least Concern
Boselaphus tragocamelus	Blue Bull	Schedule III	Least Concern
A*ntilo*pe cervicapra	Antelope	Schedule-I	Least Concern
Felis silvestris	Wild Cat	Schedule -I	Least Concern
Lycodon capucinus	Wolf	Schedule - IV	Least Concern
Sus Scrofa	Wild Pig	Schedule III	Least Concern
(b) Reptiles			
Plyas mucosus	Rat snake	Schedule II	Not known No conservation issue CITES Appendix II
Nerodia piscator	Fresh water snake	Schedule IV	Least Concern
Naja	Cobra	Schedule II	No special status CITES Appendix II
Bungaras bungaroides	Krait	Schedule IV	Least Concern
Calotes versicolor	Garden lizard	Common, widespread	No known threat issue
(c) Birds			
Eudynamys scolopaceus	Asian koel	Not listed	Common & widespread; no conservation issue
Corvus splendens	House crow	Schedule V	Least Concern

Scientific Name	English Name	WLPA 1972: Schedule	IUCN Threat Category
Acridotheres tristis	Common myna	Schedule IV	Least Concern
Columba livia	Rock pigeon	Schedule IV	Least Concern
Tylo alba	Barn owl	Schedule IV	Least Concern
Bubulcus ibis	Cattle egret	Schedule IV	Least Concern
Milvus migrans	Pariah kite	Not listed	Least Concern
Coracias benghalensis	Indian roller	Schedule IV	Least Concern
Centropus sinensis	Crow pheasant	Schedule IV	Least Concern
Passer domesticus	House sparrow	Not listed	Least Concern
A*nas* platyrhynchos	Mallard	Schedule IV	Least Concern
Anser	Gey Leg Geese	Not Listed	Not Known
Anser Indicus	Bar-headed fronted geese	Not Listed	Not known
Anas crecca	Common Teal	Schedule IV	Least Concern
Grus antigone (Sarus)	*Saurus Crane*	Schedule -IV	Vulnerable

Source: Haryana State Forest Department, Local Office Sonepat

Figure 12: Photographs showing Flora in Subproject Region