

**DETAILS OF UNDERPASSES/OVERPASSES  
PROPOSED FOR THE SAFE PASSAGE OF  
WILD ANIMALS (NH-209 BRT)**

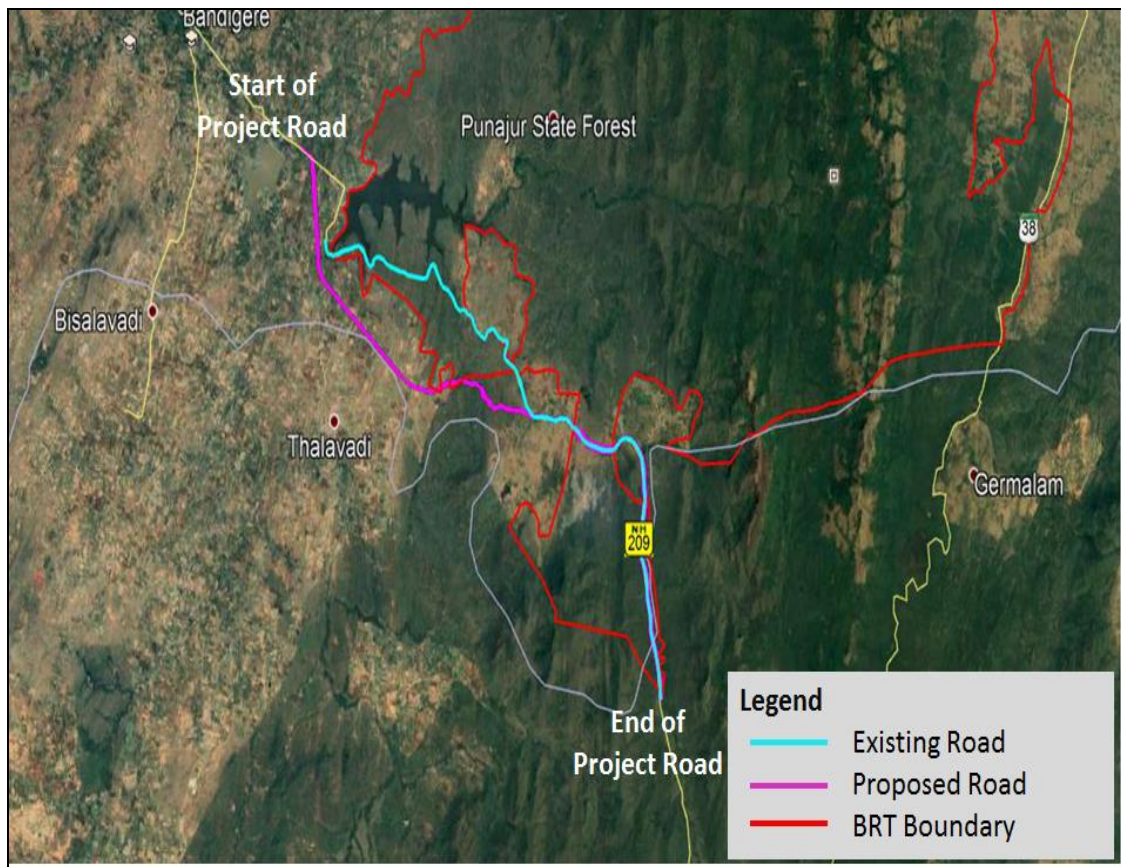
  
Project Director  
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## 1. INTRODUCTION

### 1.1 Project

NH-209 starts in the state of Tamil Nadu near Dindigul and ends at Bangalore in Karnataka. The entire stretch of NH 209 passes through Erode, Coimbatore, Dindigul districts in Tamilnadu, Bangalore Urban, Ramnagara, Mandya and Chamrajanagar districts in Karnataka and passing through important cities/towns like Dindigul, Palani, Coimbatore, Satyamangalam, Chamrajanagar, Kollegal, Malavalli, Kanakapura, Harohalli and ending at Bangalore. The Total length of NH 209 is 493 Kms. of which 269 km is in Tamil Nadu and 224 km is in Karnataka.

Here, the Project Road Starts from TamilNadu/Karnatka Border (Existing km 266.448) to BRT Tiger reserve boundary on NH-209 (Existing km 290.868) and Length of the project stretch is 24.420 km.



**Figure 1-1: Project Road**

National Highways Authority of India (NHAI) has been entrusted to implement the Detailed Project Report for Rehabilitation and Up-gradation of NH Stretches for Tamilnadu / Karnataka border – BRT Tiger Reserve section of NH-209 under NHDP-phase IV B.

### 1.2 Need of the Project

Existing width of Carriageway is 5.5 m and 1.0 m Earthen Shoulder on both sides i.e. 7.5 mtr. As the width of the existing carriageway is only 5.5 mtr is causing hindrances to movement of traffic and safety. As per the current traffic volume, the project road requires to be widened to four lane based on the Ministry vide circular no F.No. RW/NH-33044/37/2015/S&R (R) dated 26.05.2016 for capacity augmentation of the National Highways.

Whereas Considering the ecosensitivity of the project area, proponent recommended to improve the existing road from intermediate/2 lane to two lane with paved shoulder specification i.e., cross sec-

tion of 12 m having 7.0 m main carriageway width and 1 / 1.5 m paved shoulder on both sides and 3 m for other facilities.

The present wildlife mitigation report has been prepared for sustainability of wildlife along the project corridor.

### **1.3 Study Area**

The Project Road Starts from KA/TN border on NH-209 (Des. Ch 266+448) to end of BRT Tiger Reserve (Des. Ch 288+936). Length of the existing project stretch is 22.488 km and mainly passes through Punjur, Hollipalaya, Doddabudenahalli in Karnataka and Thalavadi in Tamil Nadu. It is proposed to follow the existing ROW in the forest/wildlife area. Hence forth 12 m right of way is proposed from Des. Ch 266+448 to Des. Ch 280+200 and 30 m from Des. Ch. 280+200 to 288+936. The project road is traversing through the BRT Tiger Reserve and Buffer Zones of BRT ESZ and Sathyamangalam Tiger Reserve.

The Environment Assessment has been included in project preparation to streamline environmental issues in project design; constructional and operational stages which assess the impact of the project highway as per provisions of the applicable laws and also to identify a package of measures to reduce / eliminate the adverse impacts identified during the assessment. During preliminary study Sanctuary maps were collected from the authority and it has been identified that the entire project Road section is located within BRT Wildlife Sanctuary/Tiger Reserve boundary and within 1 km from Sathyamangalam Tiger Reserve. However, the proposed project road shall not acquire any land or forest produce including water, etc. from the Biligiri Rangaswamy Temple (BRT) Tiger reserve which notified by Government of India. This report provides background information, identifies key wildlife issues and provides recommendations to mitigate impacts due to widening of project road in the protected area to wildlife and wildlife habitat related to a Biligiri Rangaswamy Temple (BRT) Tiger Reserve.

Following are the mitigatory/conservation activities have been proposed to reduce impact on Wildlife:

- Provision of Elephant and Animal Underpass
- Enhancements of cross drainage structures along the project road.
- Speed Control and other restrictions

**Biligiri Rangaswamy Temple (BRT) Tiger Reserve** is a mountainous biodiversity rich forest landscape located towards east from the Western Ghats (11°43'-12°09'N and E 77°01'-77°15'). Further to the south, BRT Tiger Reserve is linked with Sathyamangalam Tiger Reserve (STR) and Nilgiri Biosphere Reserve (11°36'-12°00'N and 76°00'-77°15'E). On the East and North-Eastern side, through Edeyarahalli Reserve Forest, BRT is linked with Malai Madheswara Wildlife Sanctuary (MM Hills), Cauvery Wildlife Sanctuary (CWS) and further to Bannerghatta National Park (BNP). The Tiger Reserve is approximately 50 km long north-south and 25 km wide east-west and is spread over an area of 540 km<sup>2</sup>. Historically 322.4 square kilometres of the wildlife sanctuary was created around the temple on 27 June 1974 and extended to 539.52 square kilometres on 14 January 1987. In December 2010 it was declared as a Tiger Reserve, which is the second Tiger Reserve in Chamarajanagar District and fifth in the Karnataka state.

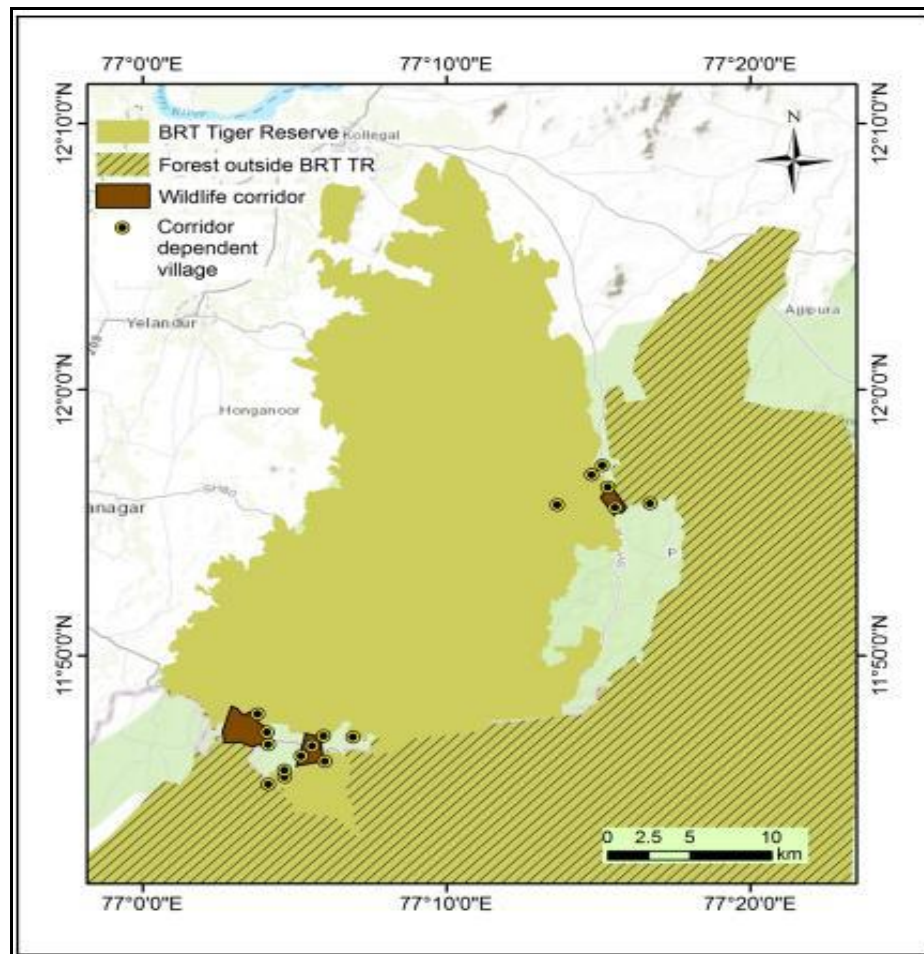


Figure 1-2: Wildlife Corridors<sup>1</sup> in BRT Tiger Reserve.

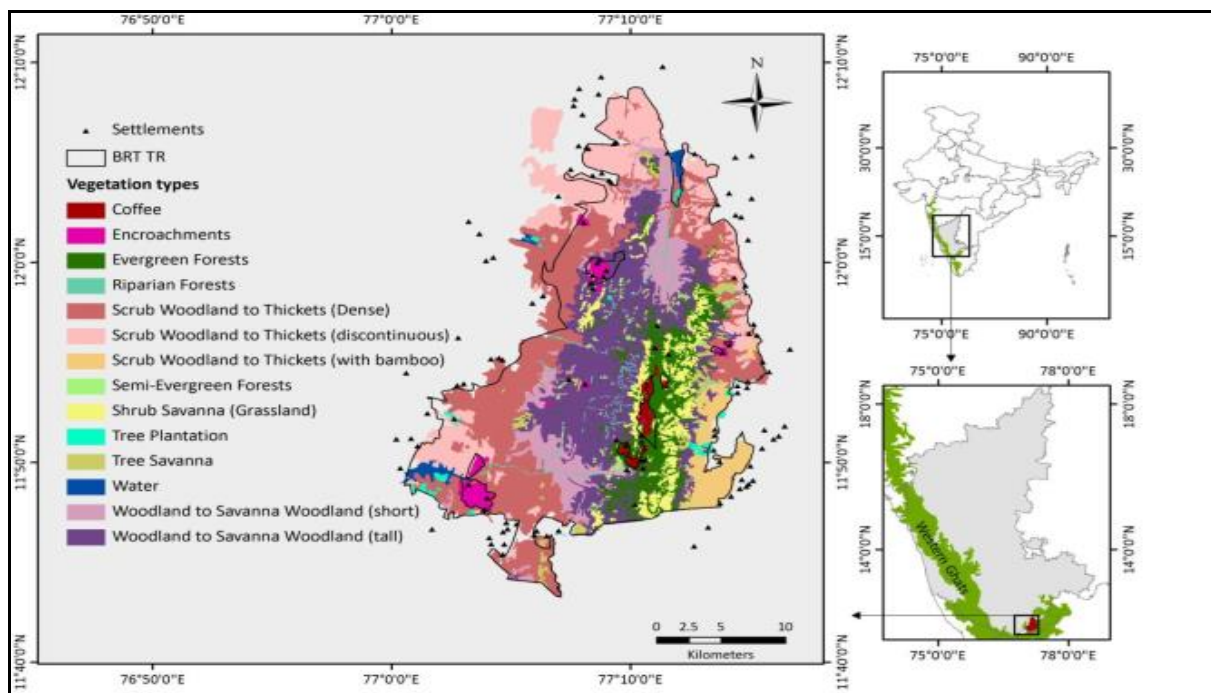


Figure 1-3: LandUse/Landcover in BRT Tiger Reserve, Western Ghats.

<sup>1</sup> Paramesha Mallegowda , Ganesan Rengaiyan , Jayalakshmi Krishnan and Madhura Niphadkar Assessing Habitat Quality of Forest-Corridors through NDVI Analysis in Dry Tropical Forests of South India: Implications for Conservation

In Biligiri Rangaswamy Temple Tiger Reserve (BRT hereafter), a dry tropical forest of southern India, BRT have the corridors which are critically important for wildlife conservation given their vital role in ecological processes but subjected to various kinds of threats. The importance of corridors is to preserve ecological and evolutionary processes, as well as enhance connectivity between important conservation sites by effectively increasing the amount of habitat with biodiversity value near them (CEPF 2007). (Kamal S. Bawa *et al*, 2007)

**a) Chamarajanagar – Talamalai corridor at Punajanur**

Chamarajanagar-Talamalai corridor at Punajanur (termed as Punjur-Kolipalya corridor in KETF report 2012, hereafter Punajanur corridor) is an important elephant corridor in BRT (KETF 2012), identified and documented during the early 1980s (Sukumar 1985). This corridor (measures about 1.5 km in length and 1.5 km in width, located between 11°46'04" to 11°47'00"N and 77°05'50" to 77°06'03"E) provides an important passage for elephants as well as other large mammals in a north-south direction between two tiger reserves, BRT tiger reserve of Karnataka state and Sathyamangalam tiger reserve of Tamil Nadu state.

**b) Chamarajanagar – Talamalai corridor at Mudalli**

To the west of the Punajanur corridor, another narrow corridor termed as Chamarajanagar Talamalai corridor at Mudalli (hereafter Mudalli corridor) was identified, which measures about 1.5 km in length and 1.5 km in width and located between 11°46'20" to 11°47'47"N and 77°02'10" to 77°04'40"E. As the movement of large mammals especially elephants are constrained by the steep terrain to the eastern part of Punajanur corridor. Therefore, Mudalli corridor is very close to the periphery of the elephant range and serves as an alternative migratory route for elephants as well as other large mammals (Menon *et al*. 2005).

The project NH-209 passes through both of these corridors. A 24 hour vehicular traffic survey revealed that an average of two vehicles per minute passed through the southern corridors that connect BRT and Sathymangalam tiger reserves. In a period of four decades, Punajanur and Mudalli corridors were completely lost due to various anthropogenic pressures like establishment of settlements, agricultural expansion and the National Highway network. Near Punajanur corridor approximately 400 hectares of forest was cleared for settlers from Tamil Nadu. (<http://www.centraltibetanreliefcommittee.org>)

Therefore, wildlife sensitive road planning and operation is one critical component of conservation of rare and endangered species in the fast developing and thus rapidly changing landscape. The impacts of road development are available in public domain. Detailed information in this regard has been submitted to the government as guidelines by the National Board for Wildlife (NBWL) and subsequent amendments. These points have also been raised during number of project appraisals. Various central government acts such as the Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980 and Environment (Protection) Act, 1996 clearly place restrictions on development of roads through Protected Areas (PA) and other forest areas. Any road development activity that may have negative impacts on wildlife and its habitats need clearance from the NBWL if within 1 km of Protected Area, National Tiger Conservation Authority (NTCA) for Tiger Reserves, or Forest Advisory Committee (FAC) for other forest areas.



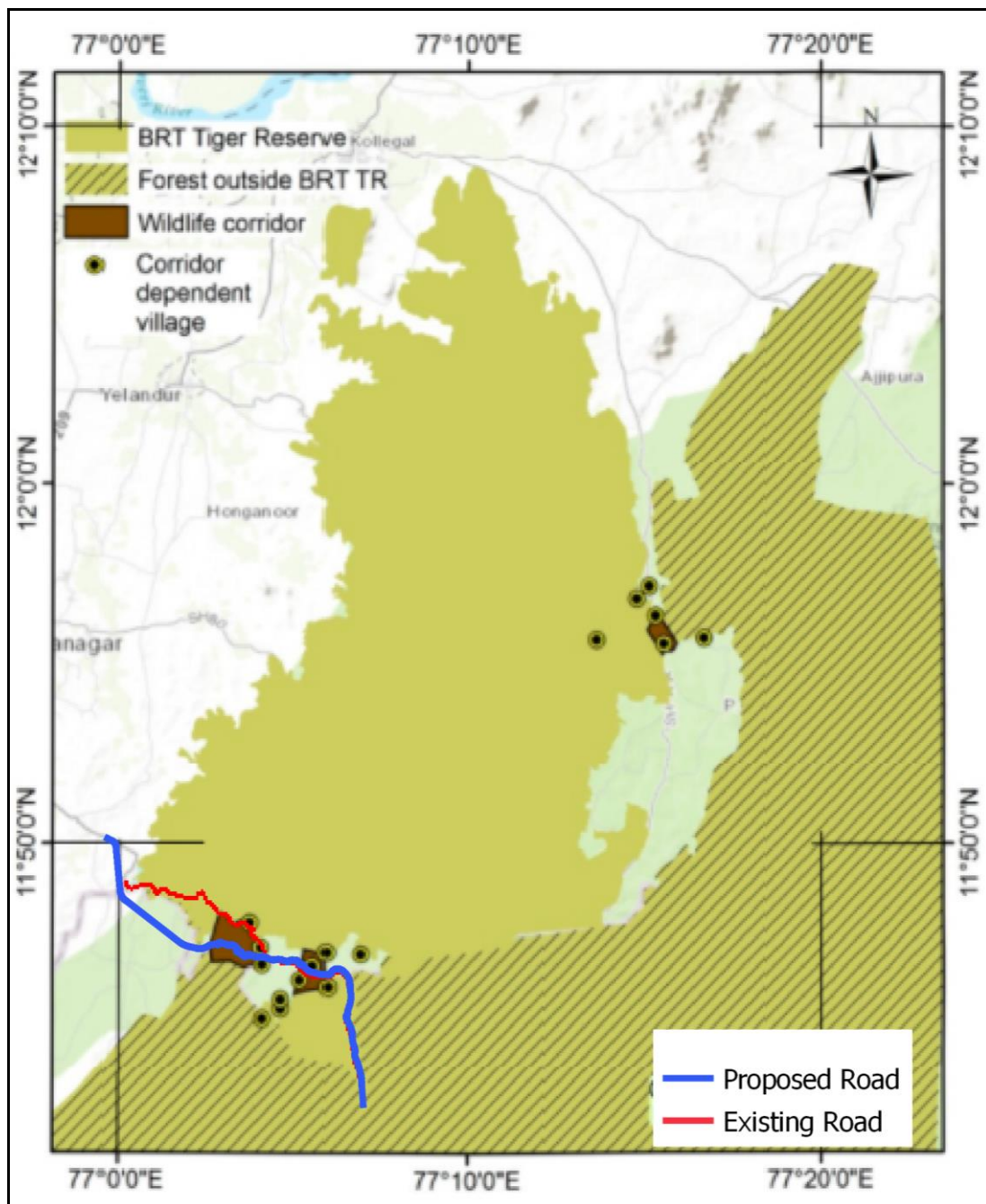


Figure 1-4: Wildlife corridors<sup>2</sup> along the Project road

<sup>2</sup> Paramesha Mallegowda , Ganesan Rengaiyan , Jayalakshmi Krishnan and Madhura Niphadkar, Assessing Habitat Quality of Forest-Corridors through NDVI Analysis in Dry Tropical Forests of South India: Implications for Conservation

## 2. RECOMMENDATIONS FOR CONSERVATION AND MANAGEMENT

### 2.1 Background

The EIA notification and its subsequent amendments states that project road, classified as national highway, does not require environmental clearances as the individual length is less than 100 km and required additional ROW is less than 40 m on existing alignment and less than 60m on by-passes. However, Wildlife Clearance and Forest Clearance is required from Govt. of India for the sections passing through the BRT Tiger Reserve.

### 2.2 Approach & Methodology

This chapter aims to suggest the conservation and management actions to be taken by the project authority with other concerned state government department mainly the State Forest Department, Karnataka to minimize the impacts on forest and wildlife and to provide value addition to the project with regard to wildlife conservation. The actions are based on the following:

- Reconnaissance Survey
- Consultations with Forest and Wildlife Authorities
- Consultations with Project Authorities



Figure 2-1: Wildlife crossing board along the project road



Figure 2-2: Joint Site inspection with Forest Department

### 2.3 Mitigation Measures

Mitigation measures adopted target Significant Impacts such as

- Focus on the most extinction – prone taxa (eg. Tiger, Elephant) and habitats in the landscape under consideration.

- Mitigation plan shall consider avoidance of development in source areas of threatened taxa. If avoidance is not possible, stringent measures shall be stipulated in areas representing specialized habitats, the habitat ranges of protected species, migratory routes and bottlenecks in ecological corridors that are crucial to effective conservation in the long term.
- The mitigation plan shall include clear institutional responsibilities for implementation of measures and the cost estimates for mitigation action. (Eco-friendly measures to mitigate impacts of linear infrastructure on wildlife)

Mitigation measures have been proposed along the project road in consultation with wildlife authorities, Conservator of Forests, Assistant Conservator of Forests, Billigiri Rangaswamy Temple Tiger Reserve Division, Chamarajnagara, locals etc. with the aim of reducing the effects due to proposed widening of the project road for the natural movement of wildlife. Further, wildlife mitigation report shall be updated with the mitigation measures as directed by the Forest department of Karnataka & Tamil Nadu.

## **2.4 Construction of Elephant Underpasses and Overpasses**

Wildlife movement corridors, also called dispersal corridors or landscape linkages as opposed to linear habitats, are linear features whose primary wildlife function is to connect at least two significant habitat areas (Beier and Loe 1992). These corridors may help to reduce or moderate some of the adverse effects of habitat fragmentation by facilitating dispersal of individuals between substantive patches of remaining habitat, allowing for both long-term genetic interchange and individuals to recolonize habitat patches from which populations have been locally extirpated. Many natural areas are critical core habitat and are therefore inappropriate for any human development; thus, the preservation of corridors will not mitigate against additional loss of core habitat (Beier 1993, Rosenberg 1997). In cases where some development may be acceptable, maintenance of corridors can be incorporated into the design of a development project by conserving an existing landscape linkage or restoring habitat to function as a connection between larger protected areas.

The level of connectivity needed to maintain a population of a particular species will vary with the demography of the population, including population size, survival and birth. Linear habitats (such as fencerows in an agricultural landscape or streamside buffers) are valued primarily as habitat (Beier and Loe 1992) rates, and genetic factors such as the level of inbreeding and genetic variance (Rosenberg *et al.* 1997). These demographic parameters are important baseline data to determine the efficacy of a corridor. In addition, there are a number of general principles for designing and monitoring the effectiveness of wildlife corridors.

Linear development such as roads and railway lines do cut across these corridors and restrict the natural movement of animals. As discussed in earlier chapters, the Western Ghats region has many important elephant corridors. One such corridor passes through the BRT Tiger Reserve which is being depleted due to anthropogenic forces. The project road NH-209 passes through this corridor diagonally as have been shown in Figure 1-4. Elephant crosses the road at three locations in BRT Tiger Reserve section of NH-209.

Other animals such as Hyena, Jackal, Wild boar and other smaller animals also cross the road at these locations. As per the information available elephants and other animals face difficulty to cross the road due to the speeding traffic all the time. It is expected that after widening and development of NH-209, the vehicular may increase many folds. The picture which emerge from the analysis suggest that that the due to anthropogenic pressure the landscape is only partially supporting a well-defined corridor or movement path for existing population of elephant which are being frequently used by elephants throughout the year. Nevertheless, there were at least three locations on the NH-209, through which long term elephant movement can be ensured and thus connecting them with the larger landscape.



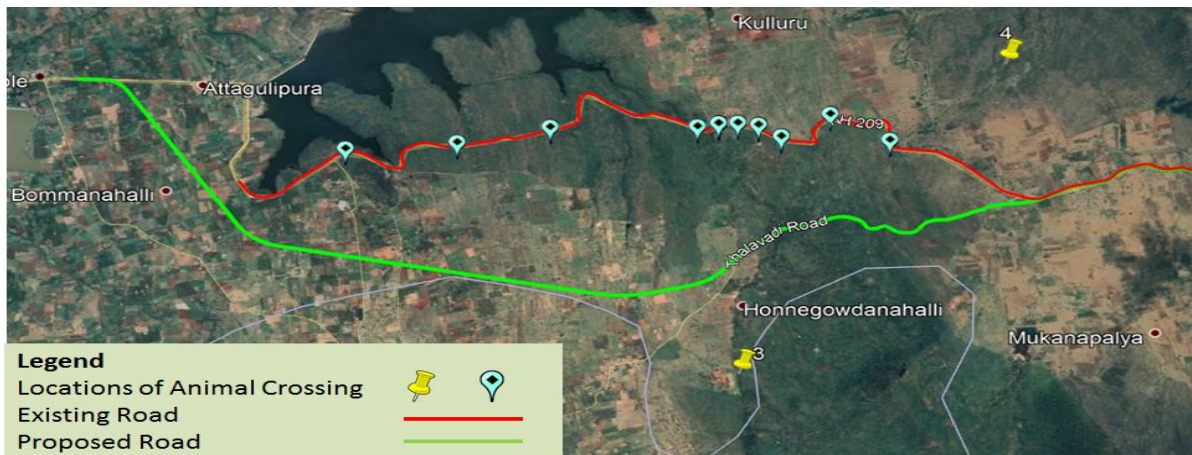


Figure 2-3: Locations of Animal crossings along the existing road



Figure 2-4: Locations of Animal crossings along the existing road (contd)

To facilitate the unrestricted movement of elephants in this corridor, civil interventions along with biological ones are required. Accordingly, five Elephant underpasses are proposed to be constructed. Each Elephant underpass will be 30m wide with two spans of 15m width each and height of 6m to as suitable for the site conditions. Guide rails/EPT will be installed along both sides of the underpass to direct the elephant and other wildlife movement to the underpass. Camouflaging plantations will be made along the rails to minimize disturbance to elephants. Topsoil of the diverted area inside protected area will be preserved and used for reforestation activates as these are very rich in nutrients. The detailed drawings of animal crossing locations are shown in **Figure 2-3 & Figure 2-4**. The designs and location of underpasses will be finalized in concurrence with the forest and wildlife department.

With reference to the literature, at the country level, except a few culverts and underpasses, there were no other type of structures (like elevated highway or overpass) constructed for the elephant crossing. There is a debate on wildlife underpass versus overpass over cost. However, based on the costs and background work undertaken for designing it, the underpass is being considered as best option.

**Proposed mitigation measures:** In addition to elephant underpasses, following measures could be undertaken in view of projected increase in traffic load which could facilitates the elephant and other wildlife to cross the road:

- Creation of barrier/funnel effect by erecting poles as fences (**Figure 2-6**) or creating pucca elephant proof trench (3m x 2m x 1.5m by KETF Report, 2012) as shown below, or sharp edged stone pitched embankment to force the elephants to use the bridges and underpass

## Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)

- To provide RCC Box culverts/Animal Underpass at various strategic point, so that along with water various wildlife can also pass through the culvert to reach the other side of the road
- Some existing pipe culverts may also be upgraded to box culverts cum animal underpass between the chainage km 266+448 to km 276+600 passing near the Tiger Reserve area.
- The culvert floor must be naturalized so that small vegetation can grow and give the underneath area a natural passage look.
- Noise barriers shall be installed near the underpasses for effective use of underpasses
- The culvert height shall accommodate animals like Hyena, Jackal, Wild boar etc.
- The hydrological importance shall also be kept in mind while deciding on the relocation / modification of the culverts.
- During Construction period no construction work shall be allowed after night fall.
- Special care should be taken to ensure that the animal movement is not restricted due to the construction work
- Workers & local populace should be made aware through awareness workshops about the importance of wildlife and biodiversity and special attention paid that no poaching and hunting takes place
- Creation of rumble strip on stretches which are passing through longer forest patches.
- Pipe culverts shall be avoided and be replaced with box culverts if located in places having good forest patches on both side with larger and continuous patch size to save the smaller wild animals from road accidents. Culvert floor shall be planted with indigenous plant and grass species.
- No labour camps should be allowed at the construction sites. Arrangements should be made to bring in the labour during the working hours and drop them after that. No fire or cooking should be allowed at the construction site.
- No stocking and dumping of construction material other than the designated sites duly agreed by the Forest Department.
- Construction workers and local communities should be sensitized about importance of wildlife conservation and do's and don'ts through awareness workshops/meeting with full involvement of local Forest personnel. Workers should be made aware of provision of legal penalties to stop poaching and wood cutting.
- Vehicle speed limit should not be more than 30-40 km/hr. in the stretch 266+448 to 276+600 km. warning signage shall be installed at every 500 m in entire project road. Night traffic should be controlled through barriers at appropriate locations to be decided by the project authorities and local forest department. Random checking by the Flying Squad of Transport Authority.

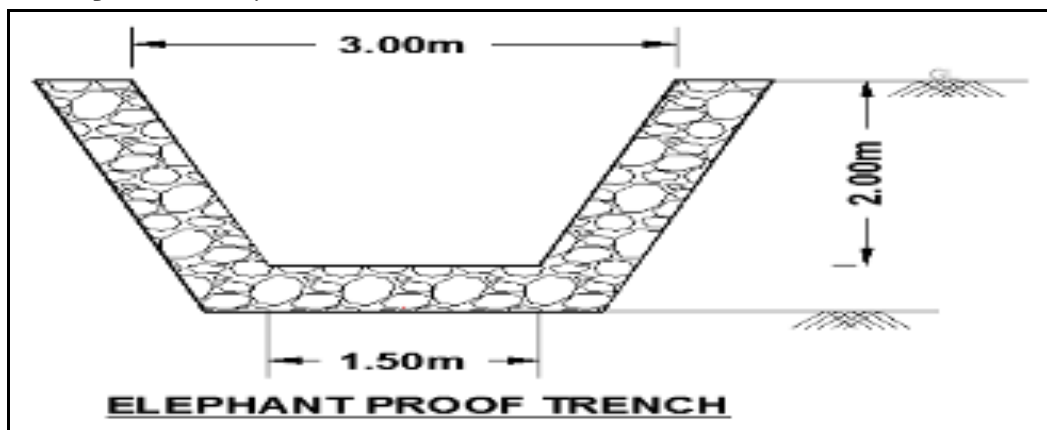


Figure 2-5: Elephant Proof Trench

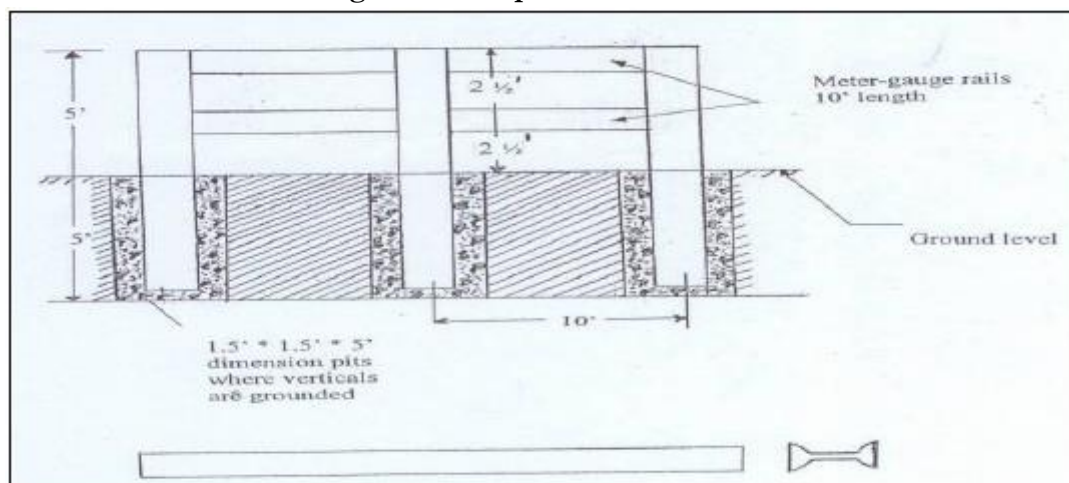


Figure 2-6: Guard Rails

## 2.5 Elephant underpasses/overpasses

Underpasses/overpasses were proposed for safe movement of elephants along the proposed project road and details are given in Table 2-1.

Table 2-1: Details of Proposed Elephant Underpass/Overpass

S.No	Design Chainage	Underpass/Overpass
1	269+100	Elephant Underpass
2	274+600	Elephant Underpass
3	274+950	Elephant Underpass
4	277+280	Elephant Underpass
5	278+800	Elephant Overpass
6	280+500	Elephant Underpass

The Structure details of EOP/EUP is as follows and crossection are given in figure below.

### **EOP (Elephant Overpass)** Box type structure

Span = 12 m

Height = 5.5m

Width = 30.0 m

### **EUP (Elephant Underpass)** PSC I girder type structure

Span= 30.0 m

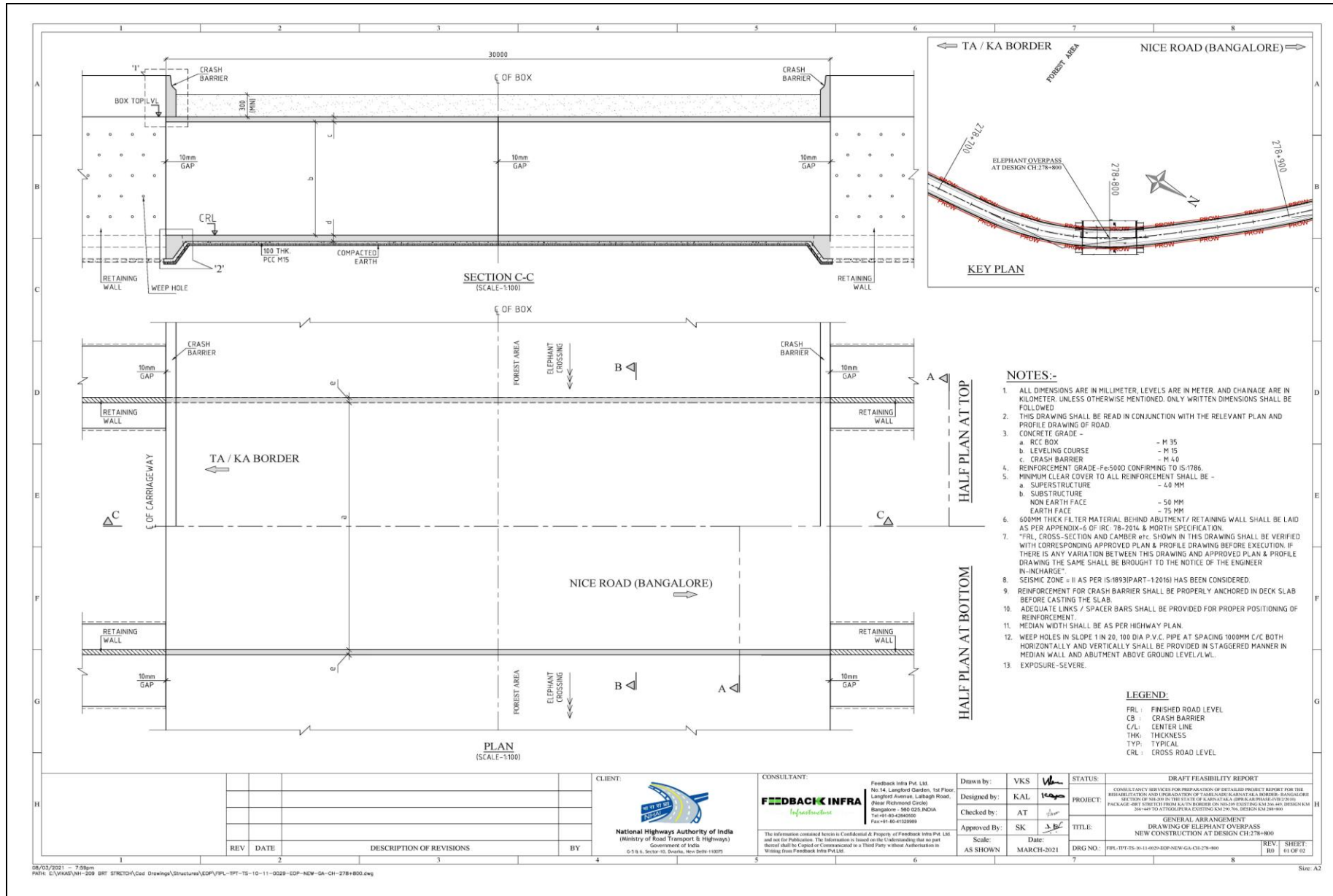
Clear height = 6.0 m

Deck width = 11.6 m+ median + 11.6 m

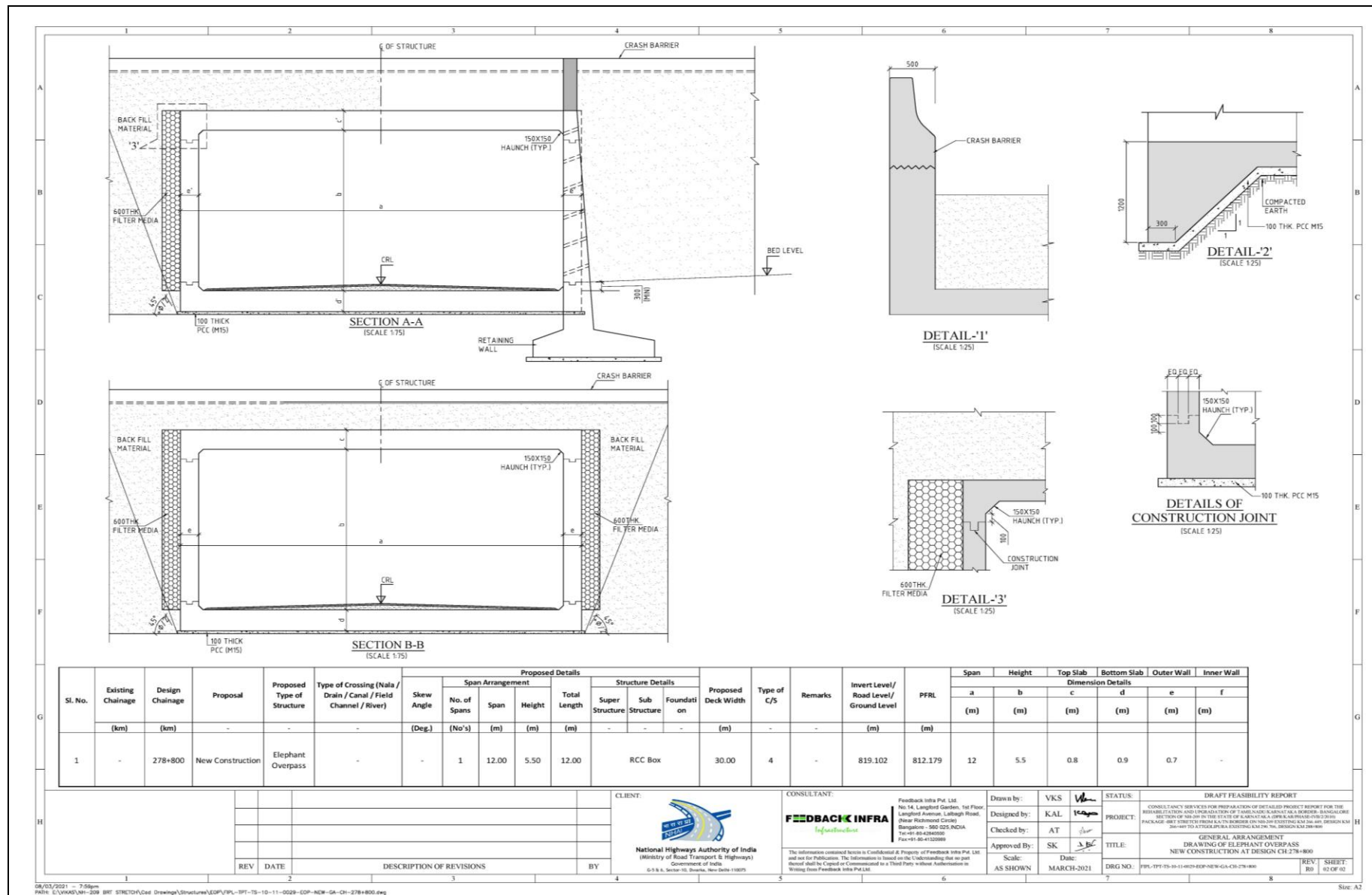
## ELEPHANT OVERPASS



# Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)

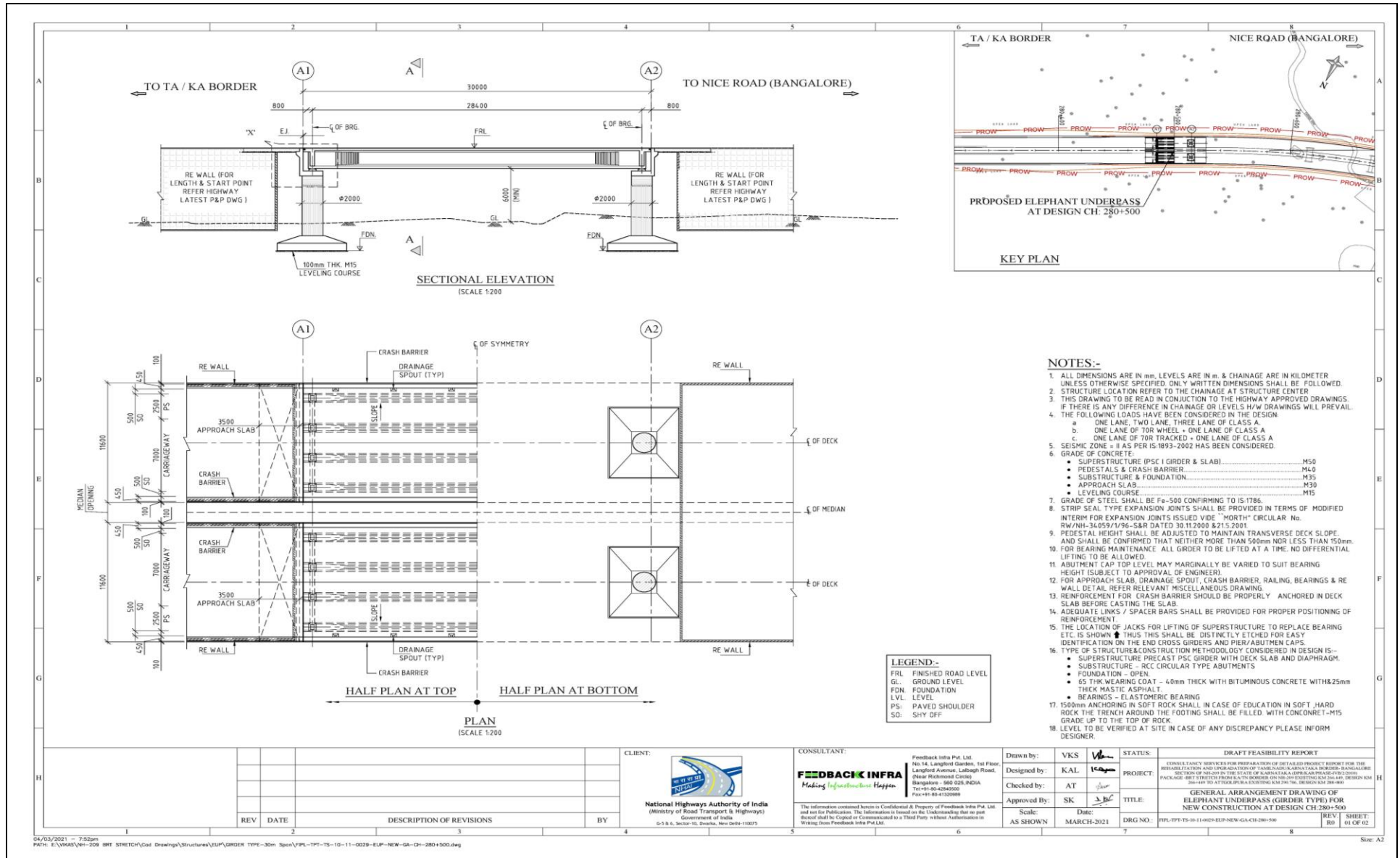


### Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)



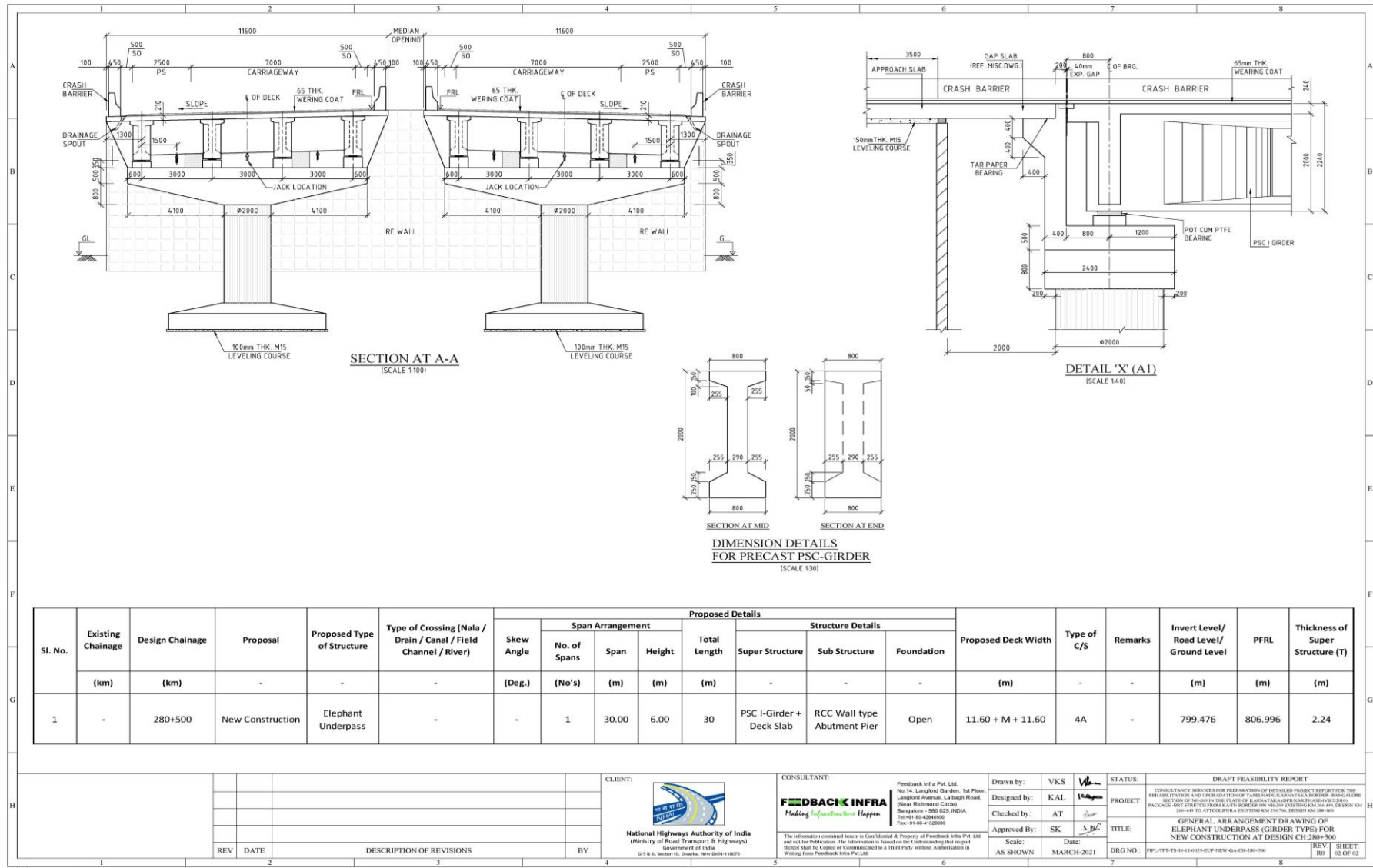
## ELEPHANT UNDERPASS

# Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)





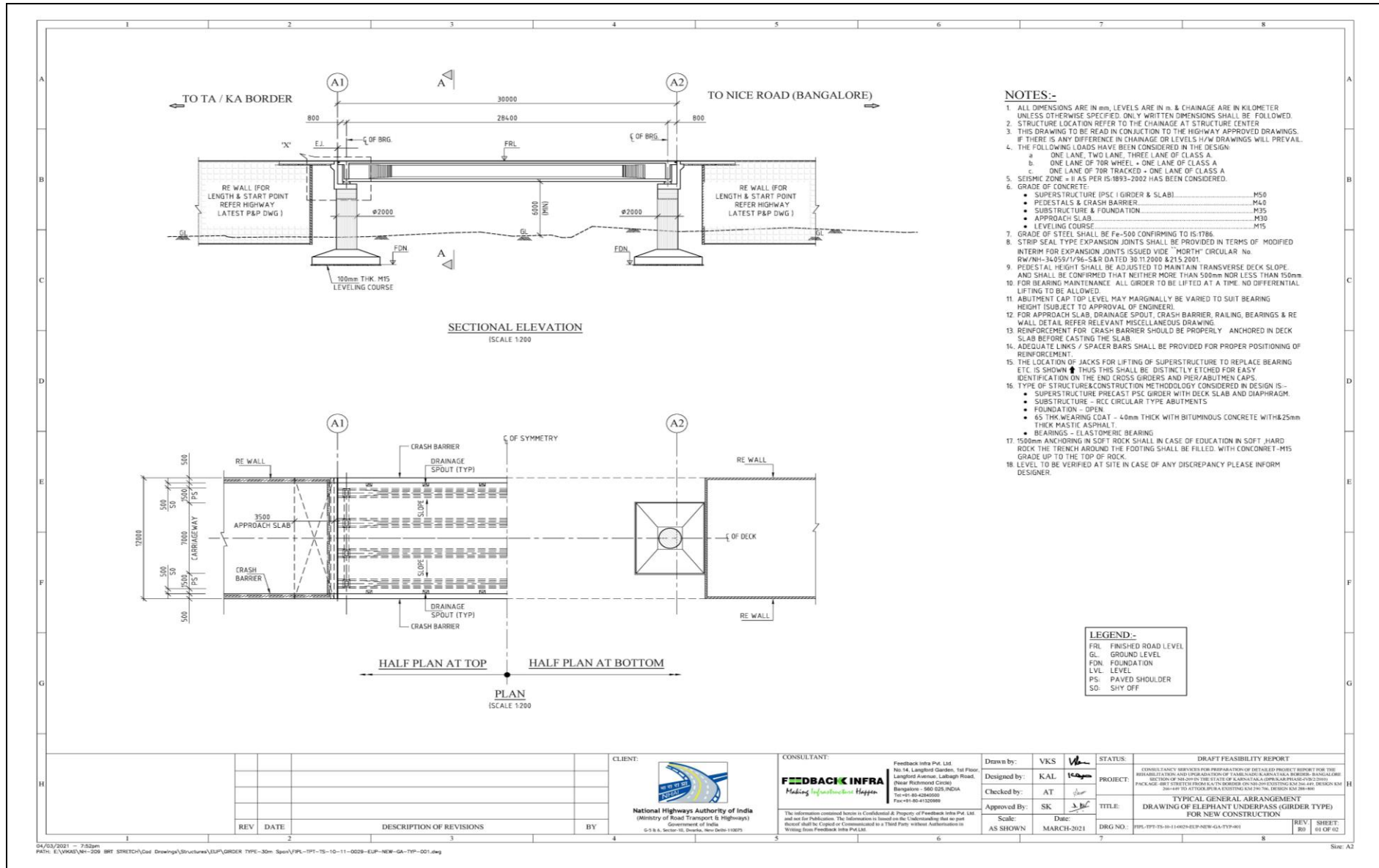
## Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)



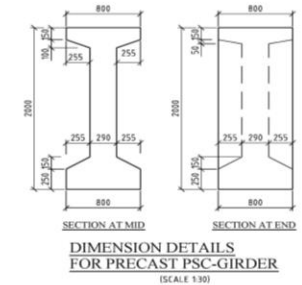
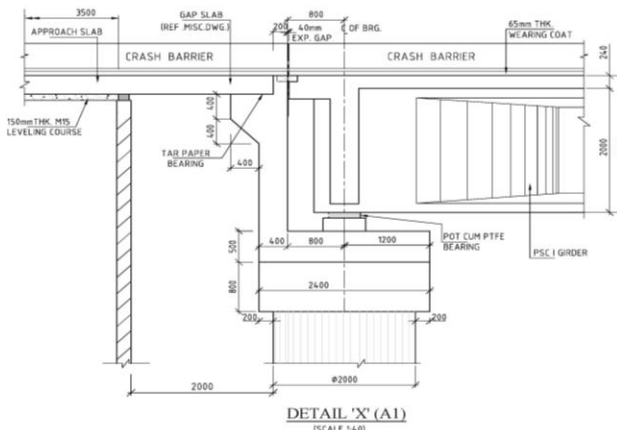
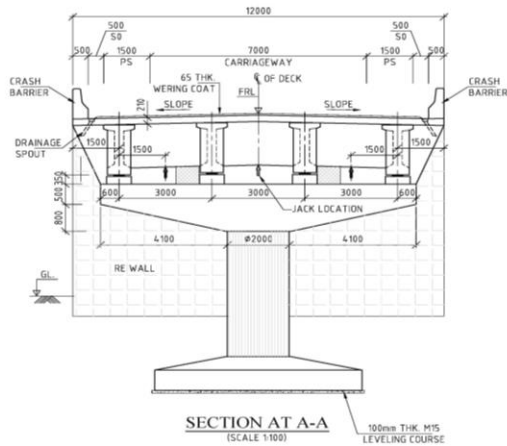
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# Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)



### Details of Underpasses/Overpasses Proposed for the Safe Passage of Wild Animals (NH-209 BRT)



Sl. No.	Existing Chainage	Design Chainage	Proposal	Proposed Type of Structure	Type of Crossing (Nala / Drain / Canal / Field Channel / River)	Proposed Details								Proposed Deck Width	Type of C/S	Remarks	Invert Level/ Road Level/ Ground Level	PFRL	Thickness of Super Structure (m)
						Skew Angle	Span Arrangement			Total Length	Structure Details								
							No. of Spans	Span	Height		Super Structure	Sub Structure	Foundation						
	(km)	(km)	-	-	-	(Deg.)	(No's)	(m)	(m)	(m)	-	-	-	(m)	-	-	(m)	(m)	(m)
1	-	269+100	New Construction	Elephant Underpass	-	-	1	30.00	6.00	30	PSC I-Girder + Deck Slab	RCC Wall type Abutment Pier	Open	12.00	4	-	859.058	866.756	2.24
2	-	274+600	New Construction	Elephant Underpass	-	-	1	30.00	6.00	30	PSC I-Girder + Deck Slab	RCC Wall type Abutment Pier	Open	12.00	4	-	808.622	816.752	2.24
3	-	274+950	New Construction	Elephant Underpass	-	-	1	30.00	6.00	30	PSC I-Girder + Deck Slab	RCC Wall type Abutment Pier	Open	12.00	4	-	802.218	809.631	2.24
4	-	277+280	New Construction	Elephant Underpass	-	-	1	30.00	6.00	30	PSC I-Girder + Deck Slab	RCC Wall type Abutment Pier	Open	12.00	4	-	785.997	793.128	2.24

				CLIENT:	 <b>National Highways Authority of India</b> Ministry of Road Transport & Highways Government of India G-56, Sector 16, Dwarka, New Delhi (110075)		CONSULTANT:		Feedback Infra Pvt. Ltd. 100, 1st, Langford Gardens, 1st Floor Langford Avenue, Langford Road, (Near Richmond Circus) Bangalore - 560 025, INDIA Tel: +91-80-42640600 Fax: +91-80-43230888		Drawn by: VKS  Designed by: K.A.L.  Checked by: A.T. Approved by: SK.  Scale: AS SHOWN Date: MARCH-2021	STATUS:  PROJECT:  TITLE:  DRG NO. 	DRAFT FEASIBILITY REPORT FOR THE CONSULTANCY SERVICES FOR PREPARATION OF DETAILED PROJECT REPORT FOR THE IMPROVED 7 LANE, 40' WIDE, 10' HIGH OVERPASS OF NATIONAL HIGHWAY-48, BANGALORE SECTION OF NH-48 IN THE STATE OF KARNATAKA, INDIA (KARNATAKA-02/2021) PROJECT NO. 100-407-2021-001 (G-56) IN THE DISTRICT OF SOUTH BANGALORE 200-407-2021-001 (KARNATAKA-02/2021) IN THE DISTRICT OF SOUTH BANGALORE	TYPICAL GENERAL ARRANGEMENT FOR NEW CONSTRUCTION	REV:  SHEET: 																																																																																				
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