भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
National Highways Authority of India
(सड़क परिवहन और राजमार्ग मंत्रालय)
(Ministry of Road Transport and Highways)
प.क्रि.इ. – मकान नं. 54–55 (प्रथम तल), अमरलोक कालोनी, हरदा (म.प्र.)–461331
P.I.U. Office – H.No. 54-55 (1st Floor) Amarlok Colony Harda (M.P.)-461331
e-mail : piuharda@nhai.org, nhaiharda@gamil.com

NHAI/PIU/Harda/T-C/P-2/PCCF Bhopal/Forest/2022/1008 Dated: 03.02.2022

To,
The PCCF Wildlife
Bhopal (M.P.)

Sub.: Four Laning of Harda – Betul Raod, Temagaon to Chicholi section of NH-47 from Km. 30+000 to Km. 81+000 (Total Length – 51 Kms.) in the State of Madhya Pradesh **– Submission of Revised Wildlife Mitigation Measures of Temagaon - Chicholi Package-2 – Reg.**

Ref: Letter No- Kramank/va.pra/machi/N.H-47/GEN-288/8084 dated 02/11/2021.

Sir,

With respect to the captioned subject matter, please refer to the PCCF (Wildlife) Bhopal letter dated 02.11.2021 regarding finalization of Wildlife Mitigation Measures after site visit on 12.10.2021

Accordingly, as per the observations received during the Meeting, the proposal is modified by the DPR Consultant M/s. LEA Associates South Asia Pvt. Ltd.

The Wildlife Mitigation Measures is submitted herewith for the further processing of forest diversion proposal.

Thanking you.

Encl.: As above.
① Mitigation 2 copy.
② Highway Drawing 2 copy.

GM (T)/Project Director
NHAI, PIU-Harda (M.P.)

Copy to:
1. The Regional Officer, M.P., Bhopal for kind information please.
2. The Divisional Forest Officer, West (Betul), Hoshangabad and Harda for kind information please.

कार्यालय प्रधान मुख्य वन संरक्षक (वन्यप्राणी), मध्य प्रदेश
प्रगति भवन, भोपाल विकास प्राधिकरण, तृतीय तल, एम.पी.नगर, भोपाल
दूरभाष : 0755-2674318, 2674337, फैक्स : 0755-2766315
E-mail : pccfwlsmpforest.org

क्रमांक / व.प्रा. / मा.चि / एन एच.-47 / GEN.-286 / 8084 भोपाल, दिनांक 2-11-2021

प्रति,

1. प्रधान मुख्य वन संरक्षक (वन्यप्राणी) मध्यप्रदेश, भोपाल
2. श्री एल.कृष्णमूर्ति
   मुख्य वनसंरक्षक एवं क्षेत्र संचालक,
   सतपुड़ा टाईगर रिर्जव होशंगाबाद ।
3. श्री विवेक जैसवाल, जी.एम.(टी) आर.ओ. भोपाल
   क्षेत्रीय अधिकारी, भारतीय राष्ट्रीय राजमार्ग प्राधिकरण,
   ई–2 / 167, अरेरा कालोनी, हबीबगंज स्टेशन के सामने, भोपाल ।
4. श्रीमति एस.एम. प्रीता,
   वनमंडलाधिकारी, पश्चिम बैतूल (सा.) वनमंडल।
5. श्री नरेश दोहरे,
   वनमंडलाधिकारी, हरदा (सा.) वनमंडल।

विषय :– राष्ट्रीय राजमार्ग–47 हरदा से बैतूल सेक्शन से गुजरने वाले भाग में वन्यजीव शमन उपाय **(Wildlife Mitigation Measures)** के संबंध में।

———000———

उपरोक्त विषयांतर्गत राष्ट्रीय राजमार्ग–47 हरदा से बैतूल सेक्शन से गुजरने वाले भाग में वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में दिनांक 12.10.2021 को भारतीय राष्ट्रीय राजमार्ग क्रमांक–47 हरदा से बैतूल मार्ग का वनक्षेत्र / कॉरीडोर क्षेत्र से गुजरने वाले भाग का संबंधित वनाधिकारियों एवं भारतीय राष्ट्रीय राजमार्ग प्राधिकरण के अधिकारियों के साथ सयुक्त मौका / स्थल निरीक्षण किया गया। निरीक्षण उपरांत मार्ग के उक्त भाग में किये जाने वाले वन्यजीव शमन उपायों का विवरण / प्रतिवेदन संलग्न कर आवश्यक कार्यवाही हेतु प्रेषित है।

संलग्न :– उपरोक्तानुसार।

02.11.21

(डॉ. एच.एस. नेगी)
अपर प्रधान मुख्य वनसंरक्षक(वन्यप्राणी)
मध्य प्रदेश भोपाल

राष्ट्रीय राजमार्ग–47 हरदा से बैतूल सेक्शन से गुजरने वाले भाग में वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में दिनांक 12/10/2021 को किये गये संयुक्त स्थल निरीक्षण का प्रतिवेदन ।

दिनांक 12.10.2021 को अधोहस्ताक्षरकर्ता की अध्यक्षता में भारतीय राष्ट्रीय राजमार्ग, भोपाल के क्षेत्रीय अधिकारियों एवं संबंधित वनाधिकारियों के साथ भारतमाला परियोजना के अंतर्गत राष्ट्रीय राजमार्ग क्रमांक–47 हरदा से बैतूल सेक्शन के कॉरीडोर वनक्षेत्र से गुजरने वाले भाग में मार्ग के दो लेन से चार लेन में उन्नयन करने हेतु वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में मौका/स्थल का संयुक्त निरीक्षण किया गया। निरीक्षण के दौरान निम्नलिखित अधिकारीगण उपस्थित रहे :–

1. श्री एल.कृष्णमूर्ति, मुख्य वनसंरक्षक एवं क्षेत्र संचालक, सतपुड़ा टाईगर रिर्जव होशंगाबाद ।
2. श्रीमति एस.एम. प्रीता, वनमंडलाधिकारी, पश्चिम बैतूल (सा.) वनमंडल।
3. श्री नरेश दोहरे वनमंडलाधिकारी, हरदा (सा.) वनमंडल।
4. श्री संजय जैन, उपवनमंडलाधिकारी, उत्तर हरदा उपवनमण्डल।
5. श्री विवेक जैसवाल, जी.एम.(टी) आर.ओ. भोपाल ।
6. श्री प्रशांत पाठक, प्रोजेक्ट डारेक्टर, हरदा म.प्र.।
7. श्री मनीष, प्रोजेक्ट डारेक्टर, छिन्दवाड़ा ।
8. श्री ब्रजेश साहू, प्रबंधक (T)।
9. श्री ए.एस. राजपूत, ज्वाइंट एडवाइजर (वन)।

M/s LASA–(डी.पी.आर.सलाहकार)

10. श्री धरूबा ज्योति घटक, जनरल मैनेजर।
11. श्री एम.राकेश, सहायक मैनेजर।
12. श्री मोईद अहमद, इंजीनियर (पर्यावरण)।

राष्ट्रीय राजमार्ग –47 हरदा से बैतूल के चैनेज कि.मी. 30+000 से 81+000 भारतमाला परियोजना के अंतर्गत सड़क चौड़ीकरण से वन्यप्राणियों के आवागमन/आवास पर पड़ने वाले प्रभाव को कम करने के लिये Wildlife Mitigation संरचनाऐं बनाये जाने हेतु मौका/स्थल निरीक्षण किया गया। प्रस्तावित एवं वर्तमान में मौजूद मार्ग सघन वनक्षेत्र में से होकर गुजरता है। इस कारण वन्यजीव शमन उपाय के औचित्य को ध्यान में रखते हुए निम्नानुसार संरचनाओं के निर्माण पर सहमति व्यक्त की गई :–

S.No	Location	Recommendation
1	Km 31+570	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 100 मीटर स्पान का ओव्हरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
2	Km 32+400	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए 50 मीटर तक की चेनलिंक फेंसिंग के साथ कम से कम 40 मीटर स्पान का ओव्हरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
3	MJB @ Km 34+010	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए 250 मीटर से बढ़ाकर कम से कम 300 मीटर स्पान का अंडरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
4	Km 36+500	हरदा की तरफ 15 मीटर स्पान का अण्डर पास दिया जाना।

S.No	Location	Recommendation
5	Km 36+620 to Km 36+695	बैतूल की तरफ 15 मीटर स्पान के 03 अंडरपास शामिल करते हुए 15 मीटर का पुल इस प्रकार कुल 60 मीटर स्पान का अंडरपास निर्माण कर वन्यजीव शमन किया जाना।
6	Km 41+700	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 100 मीटर स्पान का अंडरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
7	Km 51+800	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 50 मीटर स्पान का ओव्हरपास एवं वन्यजीवों को गिरने से रोकने के लिए उचित फेसिंग कार्य कराया जायेगा।
8	Km 59+350	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 300 मीटर स्पान का अंडरपास दिया जाना ।
9	Km 59+850	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 75 मीटर स्पान का अंडरपास दिया जाना ।
10	Km 60+850	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 75 मीटर स्पान का अंडरपास दिया जाना ।

उपरोक्तानुसार बैठक के दौरान लिये गये निर्णय के परिप्रेक्ष्य में राष्ट्रीय राजमार्ग प्राधिकरण इकाई को उक्त सिफारिशों को वन्यजीव शमन उपायों के रूप में शामिल करते हुए अनुमति हेतु संशोधित प्रस्ताव पुनः प्रस्तुत करने की सलाह दी गई ।

02.11.21

(डॉ. एच.एस. नेगी)
अपर प्रधान मुख्य वनसंरक्षक(वन्यप्राणी)
मध्य प्रदेश भोपाल

NATIONAL HIGHWAY AUTHORITY OF INDIA.

(Ministry of Road Transport and Highways)

(PIU- Harda, NHAI, Madhya Pradesh)

MITIGATION FOR FRAGMENTATION OF WILDLIFE ANIMAL

(SATPURA – MELGHAT TIGER CORRIDOR)
HARDA – BETUL, NH-47 (PACKAGE -2)

LEA Associates South Asia Pvt. Ltd., New Delhi

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1. INTRODUCTION

National Highways Authority of India entrusted to optimise the efficiency of freight and passenger movements by bridging critical infrastructure gaps through development of economic corridor, inter-corridor and feeder route, National Corridor efficiency movements, Border &international connectivity roads, coastal and port connectivity roads and Green –field expressway under Bharatmala Priyojana. The construction of 24800km was being taken up in the phase – 1.

In this connection, the NHAI proposed for 4-laning of NH-47 from Harda to Betul.

The entire project corridor is divided into three packages.

The package -1 starts from Harda and ends at Temagoan.

The package-2 starts Km 30.00 from Temagaon village of Harda town which ends at interchange of Bhopal & Nagpur, Km 81.00at Chicholi very close to Betul traversing through three districts named as Harda, Hoshangabad and Betul of Madhya Pradesh. Package -3 starts from Chicholi which ends at Betul. Package 1& 3 is proposed for 4-laning by expanding the old road from single carriageway to a four – lane configuration.

However, the majority of section of package - 2 is passing through the forested area of Satpura – Melghat corridor; therefore, it has been proposed to build two-lane configurations separate from the current alignment.As road route of package-2 notified under the tiger corridor, therefore detail study for defragmentation of wildlife animal by providing adequate mitigation measures to prevent road kills are conducted.

The entire length of package-2 covers 50.00km. The project road falls under three different forest divisions. The project length from km 30+000 to 43+095 falls under the Harda Forest Division, the project road from Km 34+095 to 41+750 comes under Hoshangabad Forest Division and the last from Km 41+750 to 81+00 lies under West Betul Forest Division. We conducted a site survey of the road with the objective of proposing mitigation measures of wildlife crossing based on *"Eco- friendly measures to mitigate impacts of linear infrastructure on wildlife"*. In detail study techno feasible cost effective & environmentally sound alignments was proposed justifying conservation practice of reserve & protected forest as to minimize forest diversion for non-forest – use and to prevent animal kills by taking due diligence at sensitive locations incorporation natural crossing in design as to provide mitigation along the Satpura – Melghat Corridor for the safe passage of wildlife animal.

In report behavior of wild-life, types of species and mitigation to minimize impacts on animal along the forest in project route are studied in details. In the finding on field study in forest along road route where deterrents or barriers for movement / cross of road due to associated traffic on proposed economic corridor was taken into considerations for defragmentation of wildlife along the project road.

1.1. ECO-SENSITIVE AREA

The present study is related to eco-sensitive area along project road.

Roads and associated traffics act as deterrents or barriers to movement between habitats of many terrestrial wildlife species. When wildlife crosses roads, they are at risk of getting killed by vehicles and these collisions can be a safety issue for people too. Mortality of wildlife due to vehicle collisions can reduce its populations and exacerbate the threat of extinction for rare animal of wildlife. The package - 2 of proposed economic corridor, Harda to Betul traverses through the reserve & protected forest crossing the three different districts of forest divisions in its road route. All those forest divisions connect the Satpura Tiger reserve with the Melghat Tiger reserve which forms the Satpura – Melghat Corridor. The Satpura Tiger reserve is located in Hoshangabad Districts of Madhya Pradesh while the Melghat Tiger Reserve is located in Amravati & Bulghana district of Maharastra. The Satpura – Melghat Tiger Corridor is required protection, restoration and mitigation measures to maintain the connectivity for multiple species of wildlife animal.

The National Tiger Conservation Authority in collaboration with the Wildlife Institute of India has mapped-out 32 major corridors across the country. The Satpura - Melghat tiger corridor is one among them which lies in Gawasen & Sawanligargh village as Least Cost Path from km 59+300 to km 60+850 under forest compartment 369 and 1420 in package -2 of project road, NH-47. The management and mitigation through a Tiger Conservation Plan is mandatory

under section 38.0.1.g of the Wildlife (Protection) Act, 1972. This corridor is mostly through forested landscape of Hoshangabad, Betul and Harda and currently has low intensity agriculture and human density. It would be timely to safeguard this corridor and further development projects within this region should only be permitted with appropriate safeguards so as to maintain the functionality of the habitat as a viable corridor permitting gene flow of wild species between Satpura and Melghat.

It is important as tiger and other species of wild life animals are more likely to use the entire corridor and not just the Least Cost Path travel. In ground reality, individual tiger will almost never end –up using the exact path of the Least Cost Path, rather, they will end-up using the multiple alternative connectivity or combination of the multiple connectivity as predicted by the resistance based circuits-cape models. A wildlife mapping of the corridor are out-lined after the field study of animal sign survey conducted by the Wildlife Conservation Trust in association with LEA Associated Private Limited to which are compared with All India Estimation Exercise of wildlife survey report as shown in Fig –1-1, 1-2, 1-3, 1-4, 1-5 and 1-6 below indicates that almost entire area of the Satpura – Melghat Corridor have high potential for tiger movements. This is applying for other co-predator and small mammal. The another issues on the Least Cost Path as defined by Qureshi et al, 2015 is that the LCP is passing through West Betul is the fringe of forest and mostly through agriculture & revenue land. Therefore, the LCP passing through the Gawasen Range of West Betul is end of forested area from where habitations are started. The mitigation measures only in that compartment of 369 & 1420 based on LCP will be ineffective & detrimental to wild life animal.

Therefore, a detail study has been conducted taking entire section of forested area under the package -2 of the project road from Temagoan to Chicholi to verify the eco-sensitive sites related to tiger movements, other wildlife animal and reserve & protected forest for development of mitigation to minimize impacts of flora & fauna and to propose adequacy of wildlife crossing to prevent fragmentation of wildlife and animal kills by road traffics. The study area has been undertaken therefore limited to 1.0 km either side of reserve forest as wildlife protection measures and provisions of underpass as a natural cave for crossing of animal and avoid reaching directly on road and particularly at the Satpura - Melghat tiger corridor as to mitigate the road barrier for protection of animal life & environment.

Project Director
NHAI, PIU-Harda (M.P.)

LEA ASSOCIATES SOUTH ASIA PVT. LTD. NEW DELHI

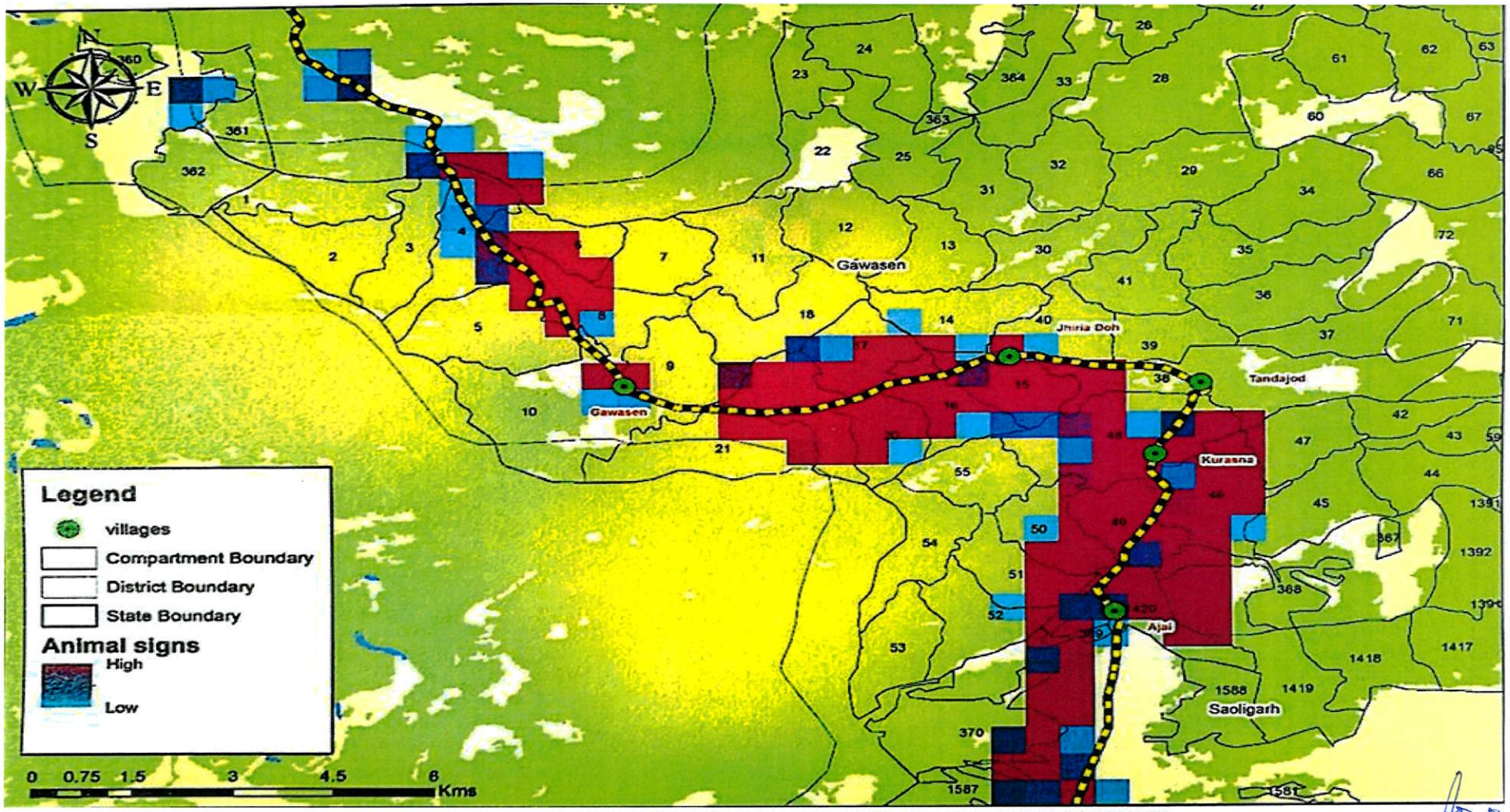

Figure 1-1: INTENSITY OF WILD ANIMAL ALONG THE PROJECT CORRIDOR AS PER ANIMAL SIGN SURVEY

Source: Field Study, the W.C.T & LEA Associates from: 05thDec, 2019 to 50th Dec, 2019.

Project Director
NHAI, PIU-Harda (M.P.)

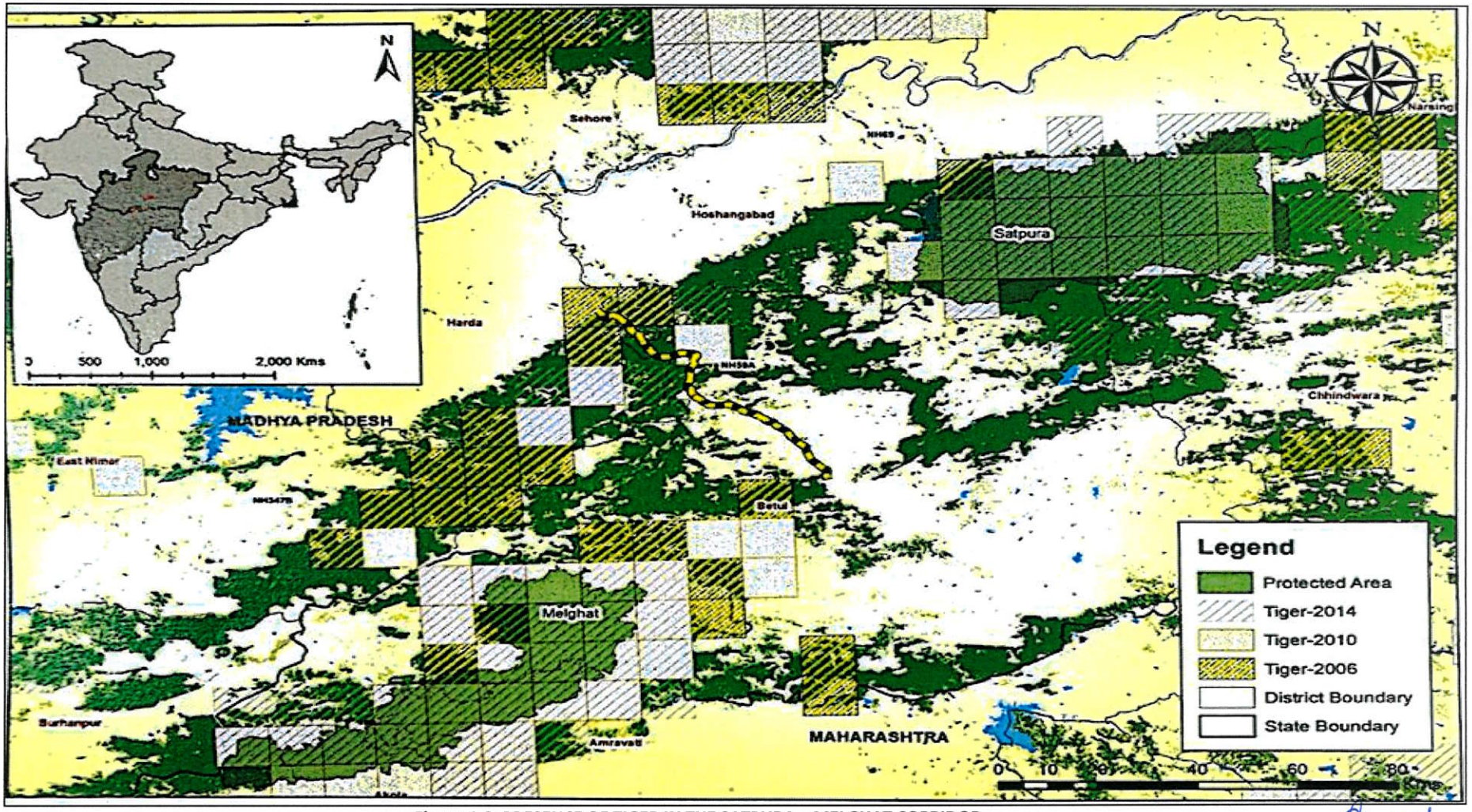

Figure 1-2: PRESENCE OF TIGER IN THE SATPURA – MELGHAT CORRIDOR

Source: NTCA's All India Estimation Exercise(2006,2010,2014)

Project Director
NHAI, PIU-Harda (M.P.)

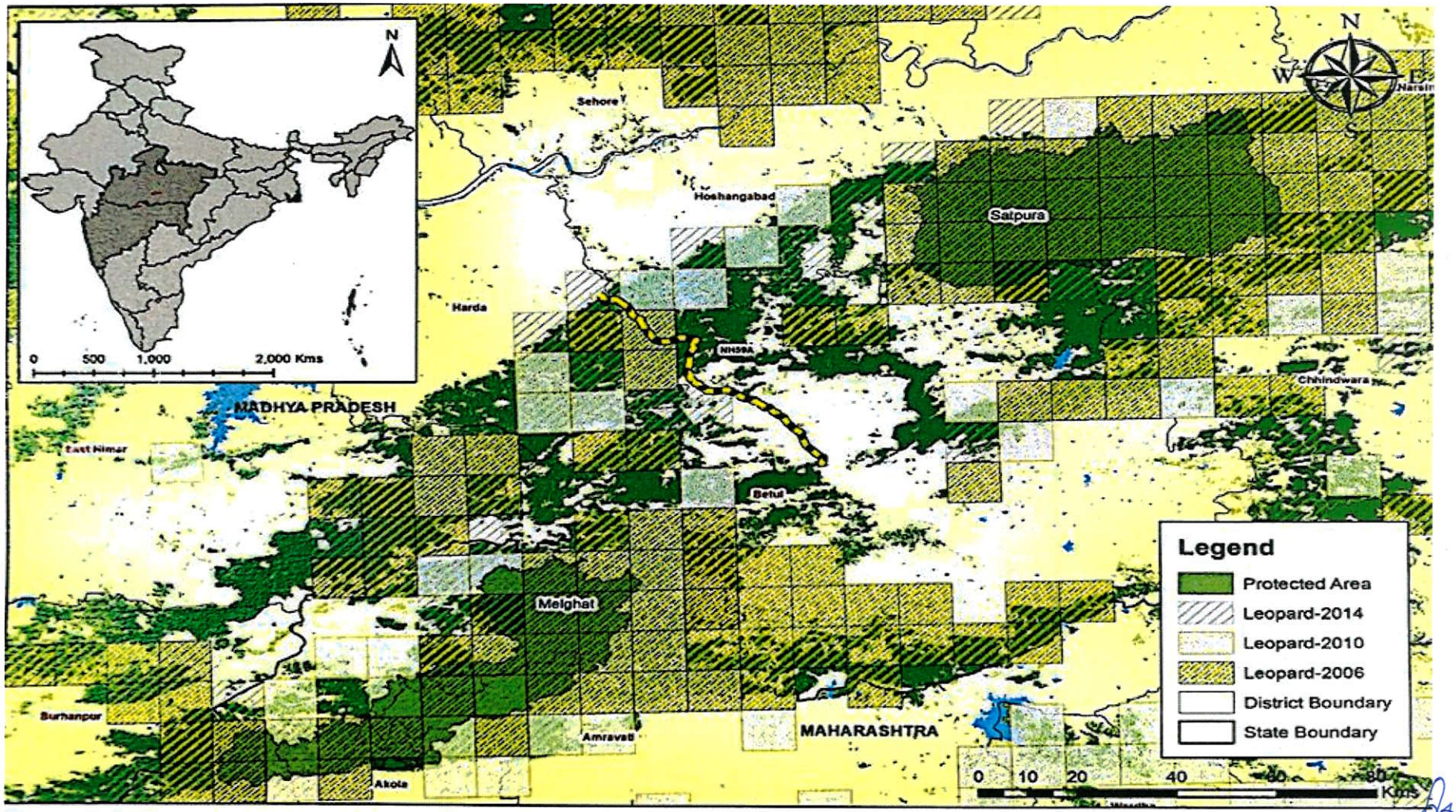

Figure 1-3: PRESENCE OF LEOPARD IN THE SATPURA – MELGHAT CORRIDOR

Source: NTCA's All India Estimation Exercise (2006, 2010, 2014)

Project Director
NHAI, PIU-Harda (M.P.)

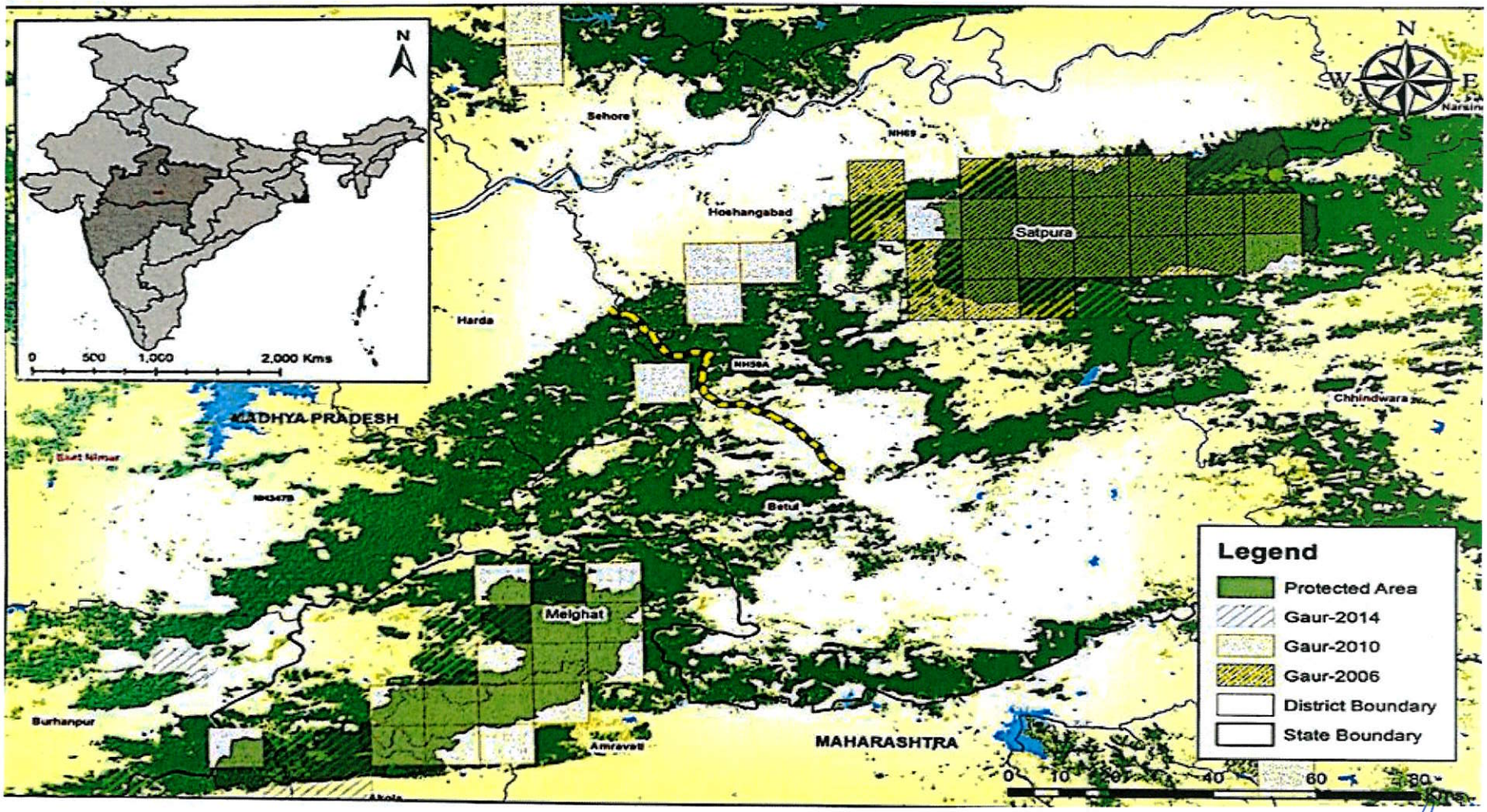

Figure 1-4: PRESENCE OF GAUR IN THE SATPURA – MELGHAT CORRIDOR

Source: NTCA's All India Estimation Exercise (2006, 2010, 2014)

Project Director
NHAI, PIU-Harda (M.P.)

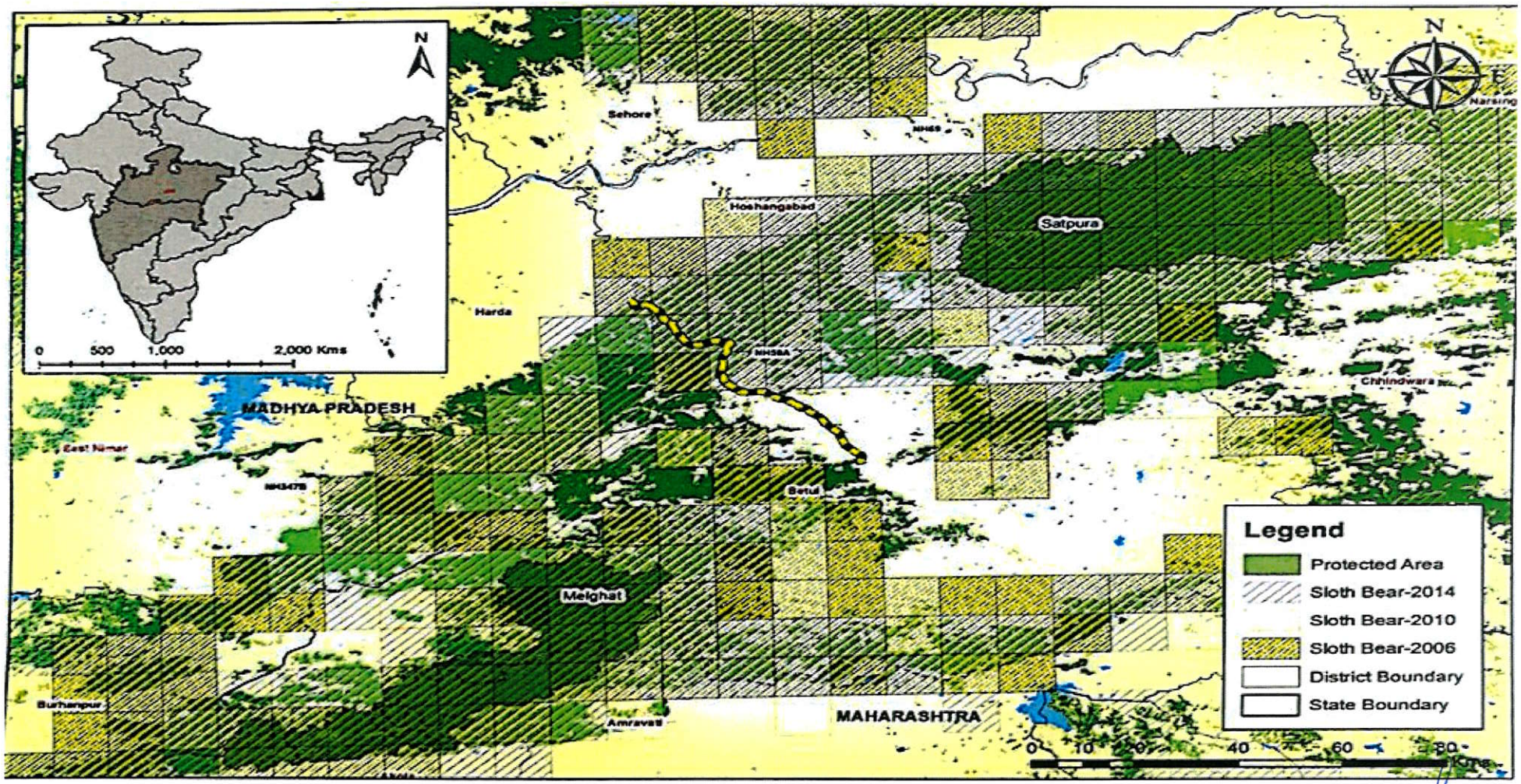

Figure 1-5: PRESENCE OF SLOTH BEAR IN THE SATPURA – MELGHAT CORRIDOR

Source: NTCA's All India Estimation Exercise(2006,2010,2014)

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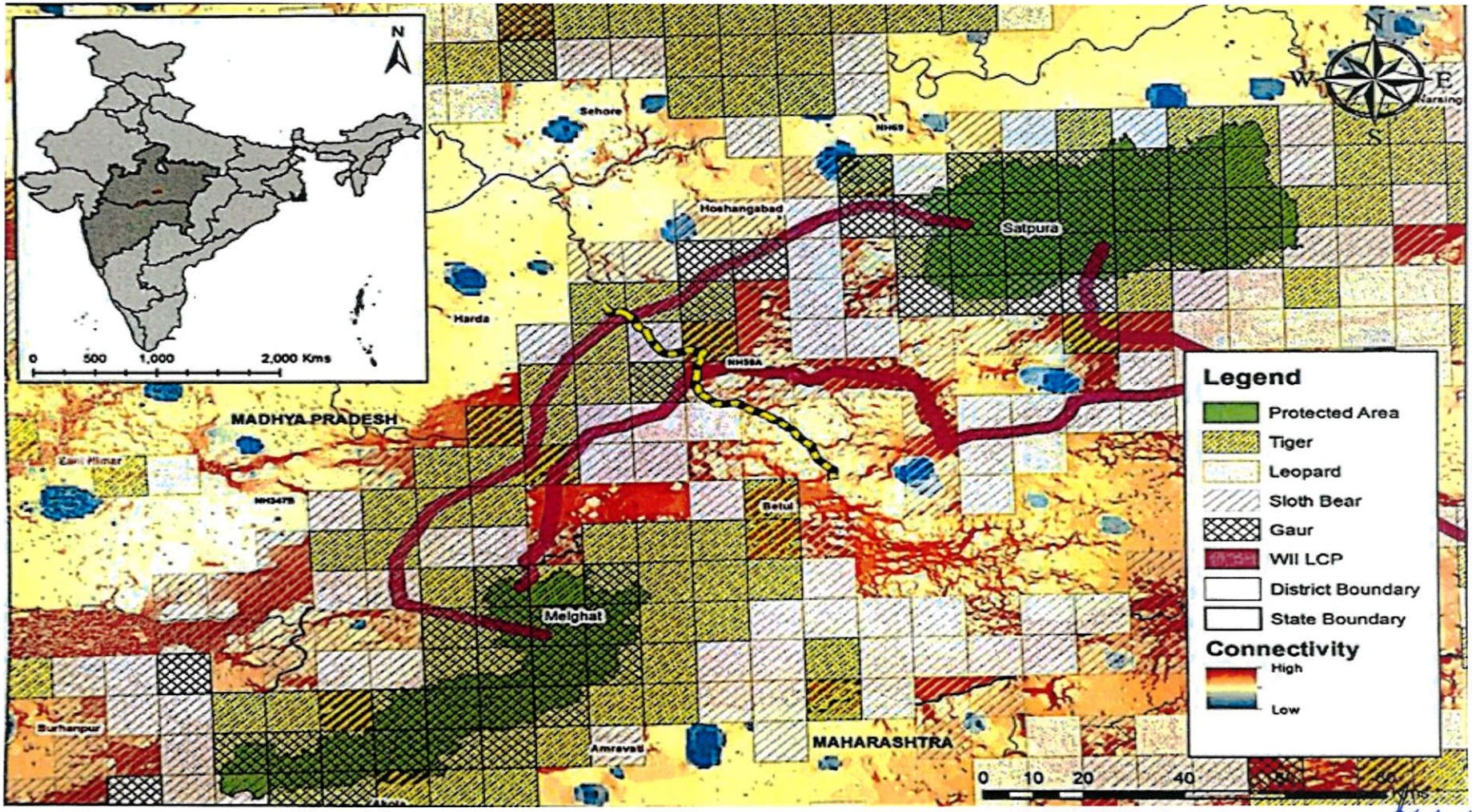

Figure 1-6: PRESENCE OF TIGER, LEOPARD, SLOTH BEAR AND GAUR IN THE SATPURA – MELGHAT CORRIDOR

Source: NTCA's All India Estimation Exercise (2006, 2010, 2014)

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Forest along the project road is given in table below:

Table 1-1: Forest Location Along Project Road

HARDA TO BETUL, NH47							
Sl. No	Chainage		Total Length			Nature of Land	Forest Division
	From	To	RF	PF	Private Land		
1.	30+000	34+095	4.095			RF	Harda
2.	34+095	41+750	7.655			RF	Hoshangabad
3.	41+750	45+000	3.250			Khokrakheda RF	West Betul
4.	45+000	50+000	5.000			Saoligarh RF	
5.	50+000	55+000	5.000			Saoligarh RF	
6.	55+000	60+850	5.850			Gawasen RF	
7.	60+850	65+700			4.850	Private Land	
8.	65+700	65+800	0.100			RF	
9.	65+800	70+000			4.200	Private Land	
10.	70+000	75+000			5.000	Private Land	
11.	75+000	77+100			2.100	Private Land	
12.	77+100	77+450		0.350		PF	
13.	77+450	79+000			1.550	Private Land	
14.	79+000	79+750	0.750			PF	
15.	79+750	80+000			0.250	Private Land	
16.	80+000	81.000			1.000	Private Land	
						Source: Field Study & Forest Department	

Forest patch along the project road shown in Topo Map 1:50000 scale in Figure 1-7

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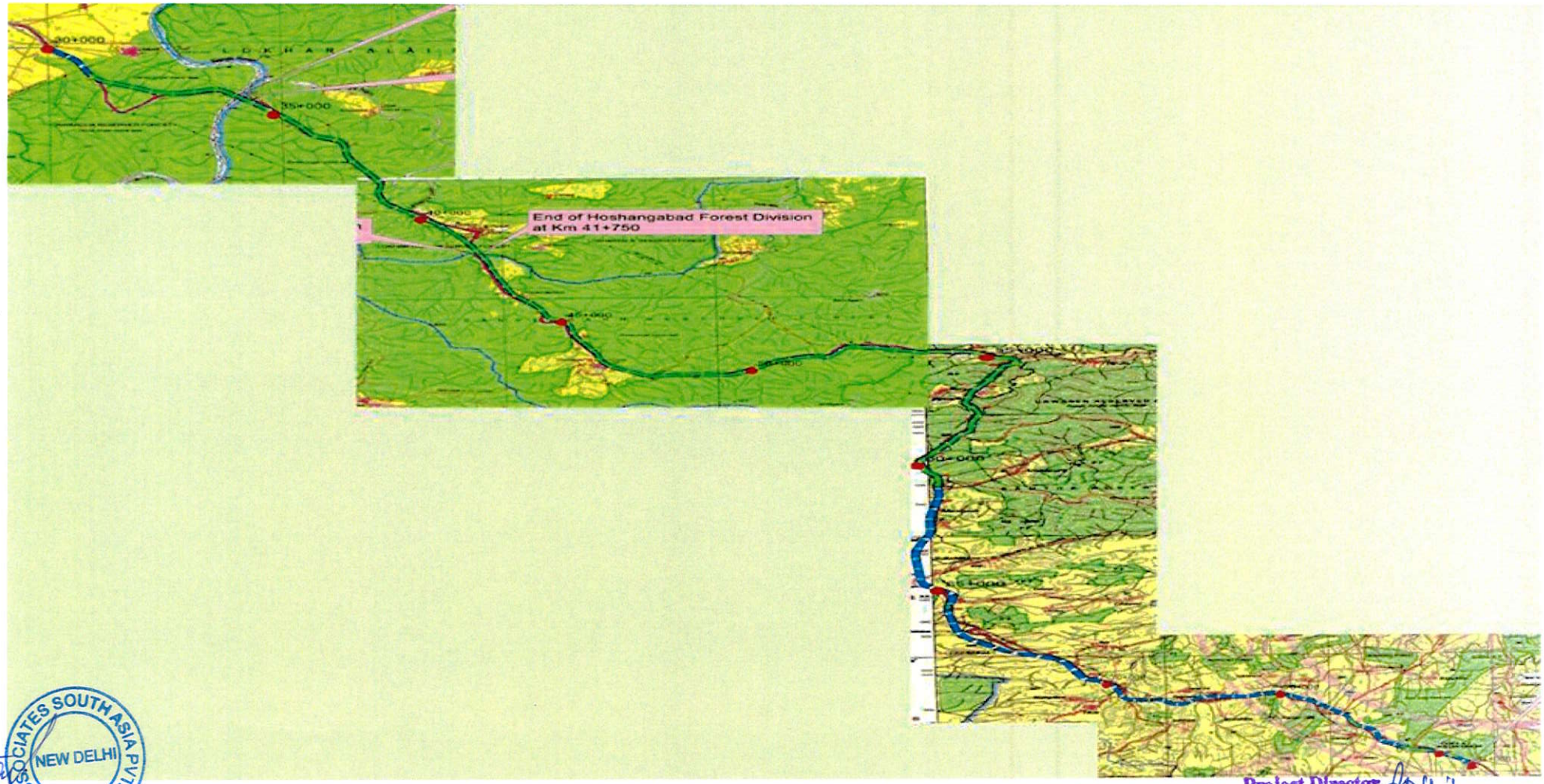

Figure 1-7: RF & PF (FOREST PATCH) ALONG THE PROJECT ROAD IN TOPO MAP 1:50000 SCALE

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Animal crossing on road through Satpura-Melghat corridor is given in Table 1-2

Table 1-2 : Satpura-Melghat Corridor

HARDA TO BETUL, NH47				
Chainage		Nature of Forest	Village	Forest Division
From	To			
59+300	60+850	Gawasen RF	Amapura	West Betul
				Source : West Betul Forest Division

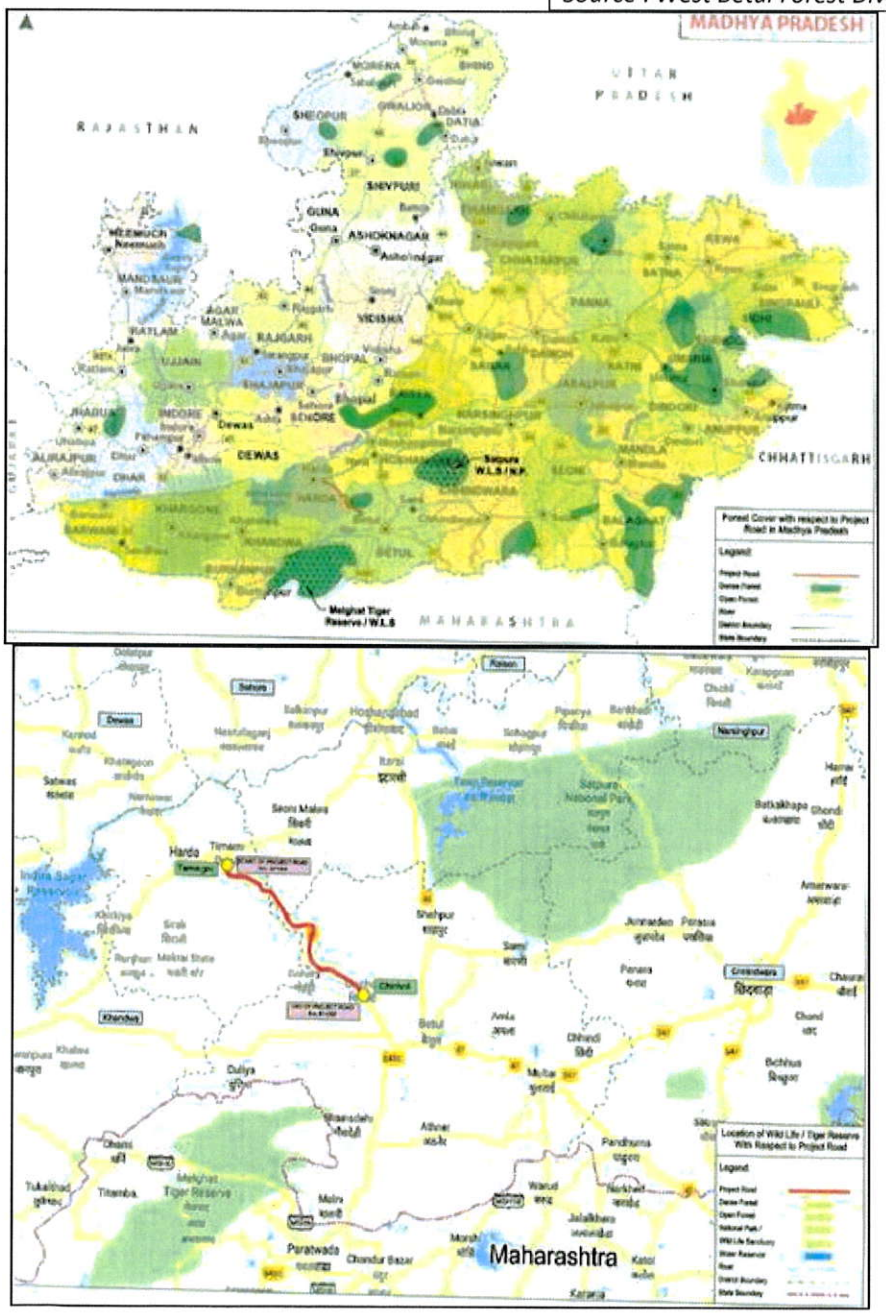

Figure 1-8: Map Showing Proposed Satpura-Melghat Corridor On Project Road Harda – Betul, Nh-47

For the study of eco-sensitive sitesfollowing acts are considered:

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I. **Wild Life Protection Act, 1972** – relates to protection of wild life in sanctuaries and National Park. This act is not applicable it is not passing through any wildlife sanctuary/National park but as notified by the West Betul forest division that the our road is passing through **Satpura - Melghat tiger** corridor has a future plan which lies in road route under the forest compartment **369 and 1420**.

II. **Forest (Conservation) Act, 1980** – relates to diversion of forestland for non-forest use. The act is applicable as lowest minimum of 56.515 Ha land are proposed for diversion of land for non – forest use.

Therefore, forthe study of cumulative impacts on wildlife in RF & PF along project road is essentially required to formulate adequate mitigation plan for terrestrial animal crossing and finding suitable points on road in the forest compartment at Satpura-Melghat tiger corridor in order to provide animal underpass as natural cave in design to prevent directly reaching the animal on road and occurrence of road kills as to protect wildlife and fragmentation of species.

1.2. TRAFFIC CONDITION OF THE STUDY AREA

The important factor of project is construction of economic corridor to optimise the efficiency of freight and passenger movements by bridging critical infrastructure gaps. The widening of existing road shall have high vehicular movements due to improved facilities for commercial as well as public transport. Therefore, widening of road and increase of traffics are the two factors which will create direct impact on local flora and fauna. In the process of widening of project in the forest area will create temporary impacts on wildlife during the pre-construction & construction activities. To assess the potential impact on the wildlife and its movement, existing and projected traffic pattern is very important.

To understand traffic pattern, the baseline & projected traffic volume count in forest location passing along the project from Km 30.00 to Km81.00 has been taken into account.

The traffic survey was carried –out in the year of 2017. The figures for traffic data have been projected by considering Traffic Growth Rates which has been arrived using standard procedure and other relevant factors to get the best projected value for the assessment of mitigation measures from road kills and fragmentation of species.

The traffic projection for the 3 scenarios is presented in Table 1-3

Table 1-3 : Projected Traffic in Wildlife Area of Project Road

Year	Most Likely Scenario Km 211.900 PCUs	Optimistic Scenario Km 211.900 PCUs	Pessimistic Scenario Km 211.900 PCUs
2017	2678	2678	2678
2018	2844	2867	2811
2019	3021	3071	2952
2020	3209	3290	3100
2021	3393	3506	3255
2022	3589	3736	3417
2023	3796	3982	3588
2024	4016	4245	3768
2025	4248	4525	3956
2026	4464	4785	4154
2027	4690	5060	4361
2028	4929	5352	4579
2029	5180	5660	4808
2030	5444	5986	5049
2031	5708	6313	5301
2032	5985	6657	5566
2033	6276	7021	5845
2034	6581	7405	6137

Year	Most Likely Scenario Km 211.900 PCUs	Optimistic Scenario Km 211.900 PCUs	Pessimistic Scenario Km 211.900 PCUs
2035	6901	7810	6444
2036	7237	8238	6766
2037	7590	8690	7104
2038	7960	9166	7459
2039	8348	9670	7832
2040	8756	10201	8224
2041	9184	10762	8635
2042	9633	11354	9067
2043	10105	11979	9520
2044	10600	12639	9996
2045	11120	13335	10496
2046	11666	14071	11021
2047	12239	14848	11572
2048	12841	15668	12151
2049	13472	16534	12758

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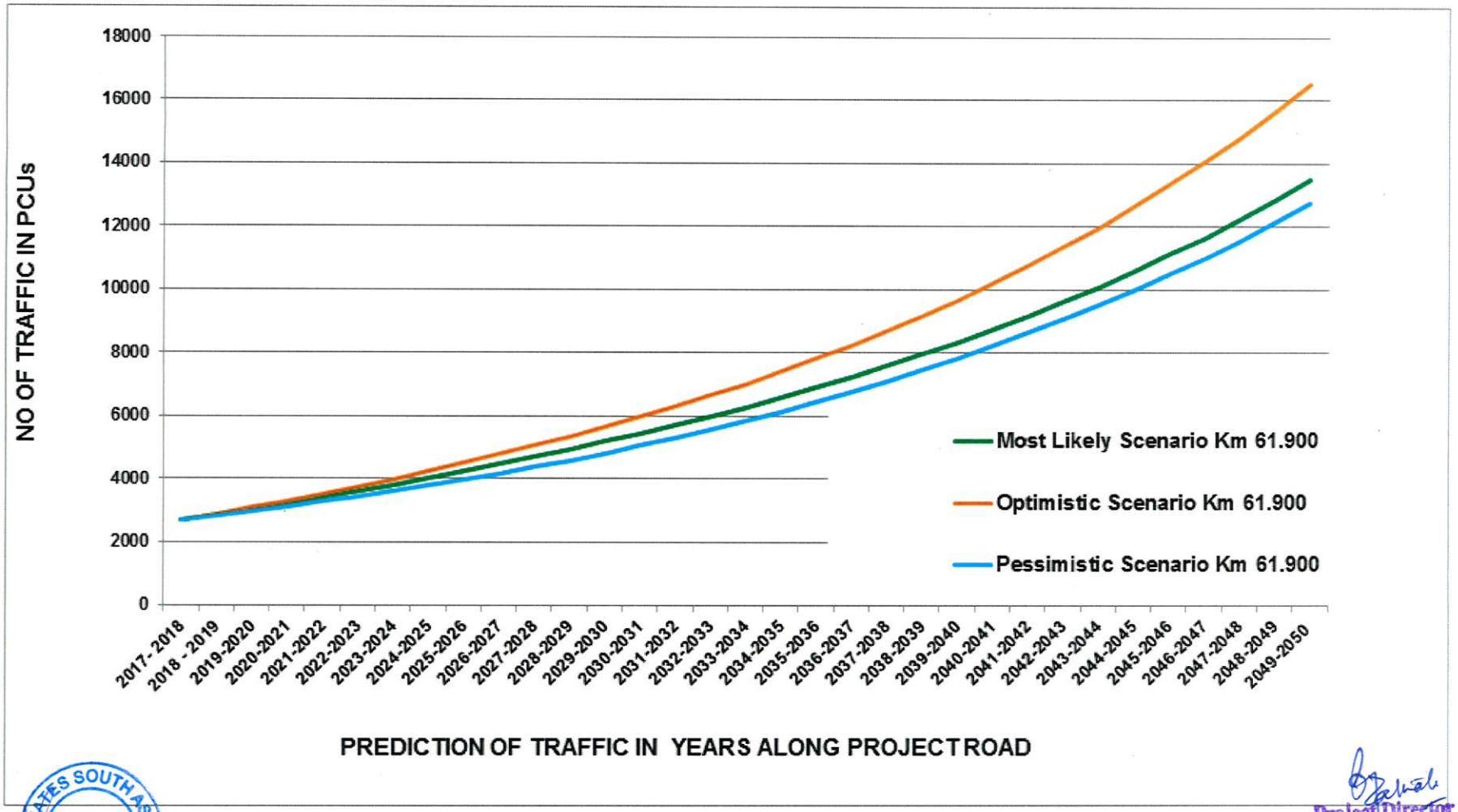

Figure 1-9: Traffics In Various Possible Prediction Along the Wildlife Corridor

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1.3. PREDICTION OF IMPACTS

Keeping in view the above prediction of road traffics scenarios in30 years durations the projected traffic volume shall be one & half time in year 2027 two & half time in year 2037 and almost increase by four times in year 2019 as compare to the current traffic volume. The speed of traffics shall also be increased due to improve in riding quality after road construction. It is quite evident that the increased of traffics numbers and the speed of traffics shall create more impacts on wildlife animal and its natural movements along forest reach than the present time.

1.4. PROJECT FEATURES – EXISTING & PROPOSED

- The project road starts from Km 30.000 and traversing through villages Ajai, Alamgarh, Chirapatla, Bela, Tadhar, Pathakheda, Godhna, Uskali, and Alampuretc and terminate at Chicholi village at km 81.000. The proposed alignment is designated as economic corridor, with total design length of 51.000 km.
- The existing carriageway width is 7.50 m throughout the corridor with the flexible pavements. The proposed right of way (ROW) was kept 18.00m length in forest area from km 30+600 to 81+000. The ROW is 30.00 m was proposed In non- forest from km 30.00 to 30+600 only. The proposed road is a new alignment passing through the reserve & protected forest existing along the road.
- The project road section is 2-lane without paved shoulders while 2-lane with paved shoulder proposed.
- The 7- Typical cross section is proposed for the entire road. In this section 3 cross sections are proposed for the 4-lanes which are planned in non- forest area. In the section of reserve forest only two lanes with 1.5m paved and 2.00m earthen shoulders are proposed with 4- typical cross – sections.
- In improvements proposal flexible pavements are proposed along the entire section of road.
- The proposed project will involve construction of 1.0 major bridge, 13 – minor bridge and 58 culverts. Further, proposed road has 31 nos bus - shelters along the project highways with the one toll plaza. As the project road is passing through the Satpura – Melghat tiger corridor, therefore, the animal underpass at 6-specific points are proposed with wild- life fencing to funnel the animal crossing to the passage structure.
- The proposed road is improvements of alignments for safety of road-users and provision of various facilities to prevent fragmentation of wildlife and road kills by proposing animal underpass, wildlife signboards, trench along the project road for mitigation of impacts of wildlife.
- There are no major junctions along the road rout; but there are number of side roads along the project road leading to village, agriculture land, school.
- The design speed of project road is proposed minimum 80 km and maximum 100 km in plain and rolling terrain. And minimum 40 km and maximum 60 km per hour is proposed in wildlife and hilly & steep slope.

1.5. CLIMATOLOGICAL TREND IN PROJECT DISTRICTS

The entire project length is lies in three districts. In Harda district project start from km 30.00 and end at km 35.00 covering total 5km in length. After that the project road enters into the Hoshangabad district which ends km 41+750covering 6.750 km length. Third & last section is 39.250 km length ends at Chainage km 81.00 in Betul district.

All three districts are touches with inter-district boundary of each consecutive district in rout of road where reserve forest laid either side of road. Therefore, total 30.00 Km out of 51 km of project road comes under direct coverage of Reserve& Protected forest comprising under the district Harda, Hoshangabad and part of West Betul forest division.

All three districts lies in the southern region of Madhya Pradesh, therefore climatic-conditions of this region shall directly influence the flora & fauna consequently create impacts on wildlife movements, fragmentation of terrestrial animal and road kills due to road traffics when animal became more active during on-set of monsoon. All three district experiences sub-tropical climate with dry summer from April –June followed by monsoon from July – September and cool & relatively dry winter. Entire section of project road falls in Satpura ranges which in plain to hilly range from Harda to Betul. Average rain fall along project road is lies between 180mm to 270 mm from June to

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September. Only the year 2019, unexpected rainfall is appeared which gone up-to 800mm in July. The dust storms and heat waves common along the project road are passing through the districts from April and May. The temperature begins to rise towards the end of March till the end of May, which is hottest month of the year. The temperature range along the project road varies in district between 17^{0}C and 41^{0}C from January to June. The hottest month is June. And the December is the coldest month with mean daily maximum and minimum temperatures being 4.0^{0}Cto 1.5^{0}Crespectively. In the month of June the temperature goes up-to 41^{0}C. Relative humidity varies from 82% in summer to lowest 14% in month of March whereas 36% in winter throughout project passing along the districts. Based on the IMD Rainfall data (2015-2018) it observed that all three districts receive maximum downpour between July-August.

Therefore, wildlife along the forest are more vulnerable during this period where appropriate measures are required to prevent the animal directly reaching on road by providing appropriate crossing in road design by provision of amphibian / reptile tunnel in forest area and the wildlife crossing as a mitigation of fragmentation of wildlife terrestrial animal as like dear, wild boar, hyena etc. Furthermore the project route is identified the tiger movements which is linked the Satpura to Melghat tiger corridor in route. Therefore, animal underpass has been proposed at specific locations with the fencing along the ROW to fennel the wildlife to the passage structure as to prevent them from the road kills.

Rainfall distribution of the project districts is depicted in Figure 1-10

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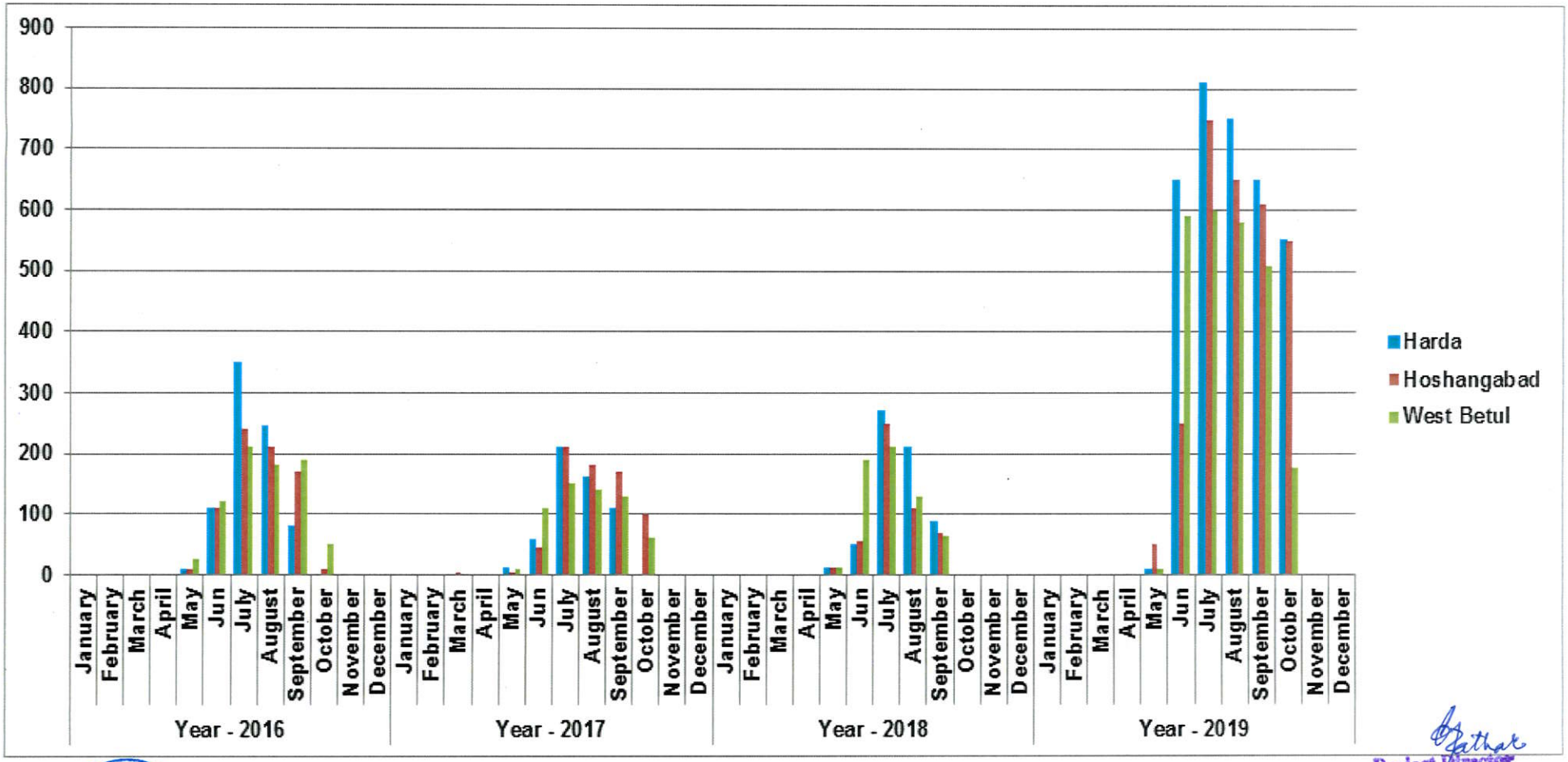

Figure 1-10: Graphical Representation Of Rainfall All Districts Along Project Road

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2. SITE STUDY FOR WILDLIFE MITIGATION

As per the study of rainfall in project area it shows that during the monsoon in June receives less rainfall comparatively in July. The monsoon starts picking up after middle of July. This draws attention of animal as like deer, antelopes & wild boar which in turn draws the predators also.

The project area falling in reserve forest is nesting & breeding period for various ground dwelling birds, terrestrial animal, amphibian & reptiles and other forest dwellers during the period from June-August. As per secondary information, the large terrestrial mammal inside the forest sub-division Harda, Hoshangabad and west Betul are became more active and remain in courtship period in this time as like Jackal wild dog and hyena. The lesser cats are also supposed to breed during this period. In the event of rains various amphibians & reptiles come-out on open land due to submergence of its burrow by rain water. It is also best time to track butterflies and dragonflies which proves health of biodiversity in area.

The project road is within the reserve forest in Harda, Hoshangabad and part of west Betul forest division; therefore ground dwelling species shall have more chance to get affected on road kills, fragmentation and biodiversity due to widening of road. In this case the mitigation plan for wildlife crossing is essential to protect animals from road kills by providing suitable passes& crossing of road to maintain species biodiversity of the RF & PF along either side of project road. Furthermore, along the project road a tiger corridor is also planned to connect Melghat to Satpura wildlife sanctuaries in order to maintain biodiversity by facilitate free movements of wildlife in forest region.

2.1. STUDY AREA

The project road is broadly divided into three forest divisions.

The study area is the section of reserve forest & protected forest of project road. Therefore, wildlife movements are studied within the section only.

First part is under the RF of Harda Forest Division from km 30+0000 to km 43+095 in.

The Second Part RF is under Hoshangabad FD from 34+095 to 41+750. And the last third one from Km 41+750 to 60+850 in West Betul forest division.

Project road from Km 60+850 to 80+000 is not the part study for mitigation of wildlife movements as private land are falling either side of project road or protected forest are distinct away the proposed widening of project road. In this section, therefore, wherever the patch of RF & PF is closely associated with project road generic consideration for mitigation for wildlife crossing are considered by construction of additional structure of culvert guiding with trench for the amphibian & reptiles followed by adequate cleaning in the monsoon.

2.2. METHODOLOGY

The widening of project road is linear development. Therefore, it bisects the forest region in to two sections. For the study of wildlife movements rapid field study has been conducted for assessment of probable movements of wildlife animals.

In this procedure, each 5.00 km interval is randomly selected at sixlocations in 30 km forested area for onsite field study where standard line transects method was adopted. In this method transect line were drawn perpendicular with road axis. The length & location of transect line depend on habitat &terrain extending maximum 1.00km either side of the road.

We laid five lines parallel to road at 0-10 m, 250 m, 500 m 750 m and 1000mat both sides of road. A team of wildlife expert from M/S WCT and team of M/S Lea associated who expertise to classify animal signs assisted by conservation trained sniffer dogs of Belgium Malionois and Weimaraner breeds who able to detect animal signs by scent was deployed to walk each line from 05th Dec, 2019 to 25th Dec, 2019. The wildlife team coversabout 50-100 meter wide area along the line. Any water bodies, stream and animal traces perpendicular to the line were noted & evaluated. The finding of animal signs and direct sightings of wildlife animal identified by its calls was recorded. As the project road is forested area of Satpura & Melghat wildlife sanctuary& tiger reserve which is associated with notified area of tiger corridor. As the animal crossing is also determined by the adjoining terrain, therefore, finding

of tiger movements besides the notified area of tiger corridor, which is hilly was also studied for the finding of animal sign-survey, hoof marks etc. as to determine animal underpass at suitable locations besides the critical area of the tiger corridor. In this case, we also compare the data from the NTCA up-to last three years *'All India Estimation Exercise'* from 2006, 2010 & 2014.

Furthermore, the small species as like ground dwelling birds, amphibian & reptiles and other forest dwellers as like rabbit etc. are more vulnerable. In this view, the existing culverts are also examined to understand the probable movements of wild fauna and their path for foraging. In field studies of regular 15 days stays various marks of wildlife existence are observes due to presence of foot/pug/hoof/ take-off skin of snake etc.. In the rapid study, movements of wildlife crossing through culverts and other cross structure etc. as like reptiles & rabbit etc. are not come to the notice due to dry land in month of Dec,2019 and siltation in culvert. Therefore, besides the field study consultation with stakeholders was also conducted, as secondary information to understand possible movements of wildlife fauna. In this process consultation with local public, experts from forest& wildlife was made for information of wildlife animal in project road. The Forest - ranger& Field officers were also consulted. For which following documents were taken from the forest departments.

- Checklists of Flora & Fauna in the project area
- Man Animal Conflict & Road kill records.
- Information on Wild life movement.
- Cropping pattern.

Wildlife Team (M/S Wct) Exercise Animal Sign Survey By Sniffer Dog Forest Range – Harda – Betul, Nh - 47

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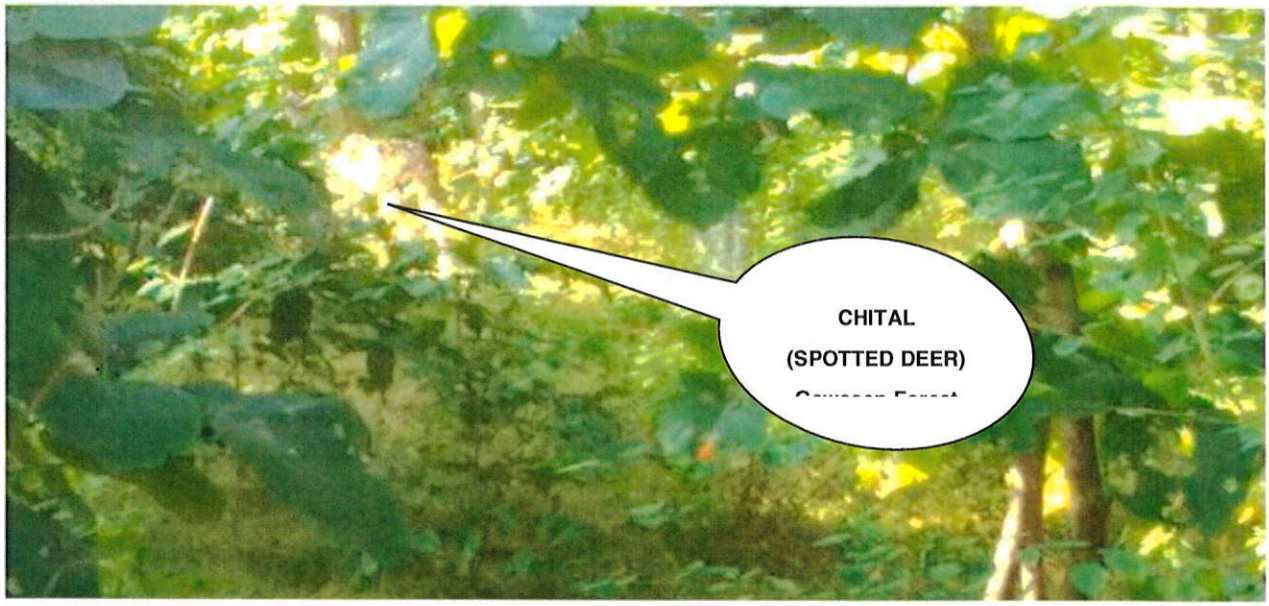

Rhesus Macaque(Macaca Mulatta)& Common Langur(Simnopithecus Entellus) Crossing the Road Throughout Forested Area Harda – Betul, Nh47

2.3. FINDINGS OF STUDIES

The entire section of project road falls in Satpura ranges which in plain to hilly terrain from Harda to Betul. All three district experiences sub-tropical climate with dry summer from April –June followed by monsoon from July – September and cool & relatively dry winter.

The study area received low rain fall and the rock face is highly exposed. The study area has flowing land-use sections, the first one is forest and rest part is hill section towards West Betul partly intercepted with water bodies/river.

The Major habitat along the project area is as follows:

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1. Forest Land: The forest along the project road is Jawardha RF, Khokrakheda RF, Sanvligarh RF and Gawasen RF. The vegetation type of reserve forest is partly moist deciduous and partly dry deciduous. The unique ecological phenomenon of the reserve forest is the occurrence of Sal with predominant teak bearing area.
2. Arable land
3. Seasonal Stream/ River/ Ponds

2.3.1. Flora

The reserve forest and protected forest are lies along either side of the project road. Further the almost full alignment of project road under the package -2 of Harda – Betul, NH-47 is framed a new alignment by the diversion of forest through 56.515 ha land and acquisition of 65.47 ha from the private land. Hence, the project section is a part of Satpura Tiger reserve which has reach in flora comprising majority of teak, Saal, tendu, mahua (Indian butter-tree), bel (stone-apple), bamboos, grasses etc. The project road has more than 62 trees species, 30 small tree species, 58 shrubs species,32 climber species and almost 64 grass species with important medicinal plants and endemic rare herbs.

The Tectona, Shorea robusta,mahogany is most prominent flora along project road. The other plant species under shrubs/herbsare noted as Melastoma Malabthricum, Murraya paniculata, Holmskioldia senguines, Blumea Lanceolaria, Sophora interrupta. As the study of the project road is widely taken on mitigation of wildlife movements and defragmentation animal in road construction, therefore, finding of wildlife animal along the study area are focused in great extent for development of mitigation plan to prevent animal from traffics kills.

2.3.2. Fauna

Thefield study of animal sign survey, secondary informationof field data for last twenty years and public consultation with local people and the forest officers, it has been found- out that the project road, NH-47 from Harda to Betul is rich in biodiversity.The key species of fine scale distribution in the area are carnivore guild consisting of the tiger(Panthera tigris), sloth bear (Melursus ursinus), dhole (Cuon alpinus), striped hyena (Hyaena hyaena), Jackal (Canis aureus), Wolf (Canis lupus), Jungle cat (Felis chaus), Wild cat *(Felis silvestris*), Indian grey mongoose *(Herpestes edwardsii*), Common PalmCivet *(Paradoxurus hermaphrodites).* While the ungulate guild iscomprised of Gaur (Bos gaurus), Nilgai (Boselaphus tragocamelus*)*, Sambar *(Rusa unicolor)*, Chital *(Axisaxis*), Barking deer *(Muntiacus muntjak)*, Blackbuck *(Antilope cervicapra)*, Four Horned Antelope*(Tetracerus quadricornis)*, Chinkara *(Gazella bennettii)*, and hardground Barasingha *(Rucervus duvaucelii branderi*). Furthermore, the Satpura tiger reserve exist in one side and the melghat tiger reserve in another side along the project road. The secondary information on availability of tiger along the project roadare marked for which details studies was carried -out for possible tiger crossing along the project road. Those routes for movements of tiger which linked the Melghat with the Satpura tiger reserve was pointed out to propose animal underpass by proving the fencing along road to funnel wildlife to the passage structure.

Furthermore, in field study numbers of avian faunal are reported. They are mostly ground dwelling and nesting on ground. Key species of dominance are given in table

In accordance to the Wildlife (Protection) Act, 1972, the wild animals are kept in different schedule keeping in view the degree of protection as like schedule I, II, III and IV. Accordingly to this category the species which are critically endangered are kept under the **Schedule I & II** which requires more attention and more conservation practices for their existence. The species which endangered are kept under the **Schedule III & IV**which requires lower degree of protection. The wild life animal which believes to be harmful to crops, farm animals which carry disease treated as vermin kept in the **Schedule: V**are rodents and might be hunted. And the last is **Schedule VI** which has floral species is prohibited from planting & cultivation. It is to be pointed –out that only few mammalian species were sighted on project site in the transect studies. The most common mammalian and other species located during the diurnal survey are listed in Table 2-1

Table 2-1: Schedule-I : Wildlife In Project Area

Sl. No.	Scientific Name	Common Name	Class	Source	Status & Sightings
1.	Black Buck	*Antelope cervicapra*	Mammal	Primary	Uncommon
2.	Sloth bear	Melursus ursinus	Mammal	Secondary	-
3.	Tiger	Panthera tigris	Mammal	Secondary	-

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Sl. No.	Scientific Name	Common Name	Class	Source	Status & Sightings
4.	Leopard	Neofelis nebulosa	Mammal	Secondary	-
5.	Eurasian Spoonbill	*Platalea leucorodia*	Aves	Primary	Uncommon
6.	Indian Peafowl	*Pavo cristatus*	Aves	Primary	Uncommon
7.	Great Indian Hornbill	*Buceros bicornis*	Aves	Primary	Uncommon
8.	Bengal Monitor Lizard	*Varanus Benghalensis*	Reptilia	Primary	Common
9.	Crimson Rose Butterfly	*Pachliopta hector*	Insecta	Primary	Common

Source: Field Study

Table 2-2: Schedule II & III Wildlife in Project Area

Sl. No	Common Name	Scientific Name	Schedule	Class	Source	Status & Sightings
1.	Common Langur	Semnopithecus entellus	II	Mammal	Primary	Common
2.	Hyena	*Hyaena hyaena*	III	Mammal	Animal Sign	Uncommon
3.	Wild Dog/ Dhole	*Cuon alpines*	II	Mammal	Animal Sign	Uncommon
4.	Jungle Cat	*Felis chaus*	II	Mammal	Primary	Common
5.	CommonPalm Civet	*Viverricula indica*	II	Mammal	Secondary	Uncommon
6.	Chameleon	*Chamaeleo zeylanicus*	II	Reptiles	Primary	Common
7.	Russell's Viper	*Vipera ruselli*	II	Reptiles	Primary	Uncommon
8.	Indian Cobra	Ophiophagus hannah	II	Reptiles	Primary	Common
9.	Mongoose	*Herpestes edwarsii*	II	Mammal	Primary	Common
10.	Barking deer	*Muntiacus muntjak*	III	Mammal	Primary	Uncommon
11.	Chital	*Axis axis*	III	Mammal	Primary	Common
12.	Nilgai	*Boselaphus tragocamelus*	III	Mammal	Secondary	Uncommon
13.	Sambar	*Rusa unicolor*	III	Mammal	Animal Sign	Uncommon
14.	Four horned antelope	*Tetracerus quadricornis*	III	Mammal	Secondary	Uncommon
15.	Chinkara	*Gazella bennettii*	III	Mammal	Primary	Uncommon
16.	Hard ground barasingha	*Rucervus duvaucelii branderi*	III	Mammal	Secondary	Uncommon
17.	Wild Pig	*Sus scrofa*	III	Mammal	Secondary	Uncommon

Source: Field Study

Table 2-3 : Ground Dwelling and Ground Nesting Birds in Project Area

Sl. No	Common Name	Scientific Name	Schedule	Class	Source	Status & Sightings
1.	Five-striped plam squirrel	*Funambulus pennanti*	IV	Mammal	Primary	Common
2.	White-browed Bulbul	*Pycnonotus luteolus*	IV	Aves	Primary	Common
3.	White necked stork	*Ciconia episcopus*	IV	Aves	Secondary	Uncommon
4.	Kingfisher	*Alcedo bengalensis*	IV	Aves	Primary	Uncommon
5.	Grey Francolin	*Francolinnus pondicerianus*	IV	Aves	Primary	Common
6.	Red Wattled Lapwing	*Vanellus indicus*	IV	Aves	Primary	Common
7.	River Lapwing	*Vanellus duvaucelii*	IV	Aves	Secondary	Uncommon
8.	River Tern	*Sterna aurantia*	IV	Aves	Secondary	Uncommon

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Sl. No	Common Name	Scientific Name	Schedule	Class	Source	Status & Sightings
9.	Orange Headed Ground Thrush	*Zoothera citrina*	IV	Aves	Primary	Uncommon
10.	Little Ring Plover	*Charadrius dubius*	IV	Aves	Secondary	Common
11.	Ashy Crowned Sparrow Lark	*Eremopterix griseus*		Aves	Primary	Common
12.	Indian Bush Lark	*Mirafra erythroptera*	IV	Aves	Primary	Common
13.	Woolly-necked Stork	Ciconia episcopus	IV	Aves	Secondary	Uncommon
14.	Pied Kingfisher	*Alcedo rudis*	IV	Aves	Primary	Uncommon
15.	Ringed Plover	*Charadrius hiaticula*	IV	Aves	Primary	Uncommon
16.	White-browed Bulbul				Primary	Common
17.	Black-crested Bulbul	*Pycnonotus melanicterus*	IV	Aves	Primary	Common
18.	Malabar Pied Hornbill		IV	Aves	Primary	Uncommon
19.	Indian Pitta	*Pitta brachyura*	IV	Aves	Secondary	Uncommon
20.	Indian Courser	*Cursorius coromandelius*	IV	Aves	Primary	Uncommon
21.	Malabar Whistling Thrush	*Myophonus horsfieldii*	IV	Aves	Primary	Uncommon

Source: Field Study

There are many more fauna species of wildlife observed during transact walk in project area. Among all the faunal species coming under the schedule1, II, III and IV of Wildlife Protection Act, 1972 are listed in the above table.

1.1.1 ROAD CROSSINGS

There are various faunal species spotted crossing the road during field study. In spite of this forest division and the consultation with local people was made for gathering information of animal crossing along project road. The probable lists of wildlife along project road are given in table below. However, it does not limit the wildlife animal along the road.

Many more wildlife exist either side of the reserve forest are given in Table 2-4

Table 2-4: Wildlife Animal Road Crossing

Sl. No.	Common Name	Scientific Name	Class	Schedule	Severity / Remarks
1.	Black Buck	*Antelope cervicapra*	Mammalia	I	Gawasen F
2.	Russell's Viper	*Vipera russeii*	Reptilia	II	Gawasen F
3.	Tiger	*Panthera tigris*	Mammalia	I	Gawasen F
4.	Grey Mongoose	*Vipera russeii*	Mammalia	II	Gawasen F
5.	King cobra	*Ophiophagus hannah*	Reptilia	II	Gawasen F
6.	Common Vine Snake	*Ahaetulla nasuta*	Reptilia	IV	Gawasen F
7.	Garden Lizards	*Calotes versicolor*	Reptilia	IV	Korkrakheda
8.	Indian Peafowl	*Pavo cristatus*	Aves	IV	Sanvligarh F
9.	Wild Boar	*Sus scrofa*	Mammalia	IV	Sanvligarh F
10.	Five-striped Palm Squirrel	*Paradoxurus hemaphroditus*	Mammalia	IV	Sanvligarh F
11.	Common Langur	*Semnopithecus entellus*	Mammalia	II	Entire Project Corridor
12.	Rhesus macaque	(Macaca mulatta)	Mammalia	II	Entire Project

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Sl. No.	Common Name	Scientific Name	Class	Schedule	Severity / Remarks
					Corridor
13.	Hyena	Hyena hyena	Mammalia	III	Gawasen F
14.	Wild Dog or Dhole	Cuon alpinus	Mammalia	II	Gawasen F

2.3.3. Road Kills

In the field study few faunal species are recorded in road kills. Furthermore, the faunal species recorded in road kills by the forest division are also taken to which are given in

Table 2-5

Table 2-5 : Wildlife Animal in Road Kills

Sl. No.	Common Name	Scientific Name	Schedule	Date & Time	Location
In Direct Sighting during Survey					
1.	Common Langur	*Semnopithecus entellus*	II	28.12.2019	Sanvligarh
2.	Rhesus macaque	*Macaca mulatta*	II	26.12.2019	Sanvligarh
Road Kills on Stakeholders' Consultations i.e Forest Division & Local people					
3.	Wild Boar	*Sus scrofa*	IV	04.09.2019	Sanvligarh
4.	Hyena	Hyena hyena	III	01.01.2013	Sanvligarh
5.	Sambar deer	Rusa unicolor		27.01.2013	Sanvligarh
6.	Spectacled Cobra	Ophiophagus hannah		In monsoon	Gawasen
7.	Frog		-	In Monsoon	Gawasen

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3. IMPACT ASSESSMENT & MITIGATION PROPOSED

3.1. FOREST AREAS

The widening of proposed road from Harda-Betul sections shall have an impact on forest areas as diversions of forest land are required for the road construction. However, it is proposed to minimize diversion of land for road – use. The total area for diversion of forest land is estimated to be 56.515 Ha. In Harda district 5.336 ha, Hoshangabad has 13.78 ha and the West Betul district is estimated to be 37.399 ha.

3.1.1. Flora

In the construction of road removal of green-cover from forest is required for road works. Therefore, minimum loss & damage is to be carried out to avoid overcutting of trees.

In diversion of forest land felling of trees should be minimized.

The predominant most common trees species along the project road elther slde of the forest are Sal, teak, mahogany, bamboo. The best effort shall be given to reduce the number of felling to the maximum extent possible. The cutting is limited width along the project road therefore impacts on endangered of endemic species are not envisaged

3.1.2. Fauna

Proposed road lies inside the reserve forest; therefore, consistent damage of biodiversity shall occur due to proposed alignment of project road. Further, it shall create considerable damage to wildlife.

In road crossing wild animal shall also be effected due to fragmentation of species. In study of wildlife, it come to notice that various wildlife animal residing in forest with presence of schedule animal as per the Wild Life Protection Act where few of them are found dead on road kills. Presently, there are low traffics densities but as per site study and local people consultation the road kills rate increases with increase in traffics during the monsoon. In spite of this the project road is considered improvements of alignment which is partly exist a new section and partly on existing road throughout the length which proposed to be constructed by diversion of forest land. Therefore, to minimize the biodiversity loss adequate mitigation to be developed for defragmentation and prevent road kills.

3.2. PROPOSED MITIGATION

As per site study and keeping in view the section of road partially on existing and the new which proposed to be developed on the diversion of lands following mitigation being proposed.

- Provide trench on both the side of 1.4 m width at Top, 0.6 m width at bottom with a depth of 0.8 m all along 26 Km of project road section (Km 31+400 to Km 57+400) to create a barrier as well as to channelize wild life animal movement towards nearest Cross Drainage structure.
- The RCC Box culverts (2.00 to 6.00m wide and 2.0~6.0m height) at specific locations so that wildlife of forest may freely move to other side of the road as well work as drainage of surface run-off during the monsoon.
- In the entire section, there shall not be any pipe culverts.
- In the project route a notified area of tiger corridor existed from km 59+370 to 60+ 870 which connects Satpura tiger reserve to Melghat wildlife sanctuaries. In field study of tiger movements **other specific locations** are also identified after the animal sign –survey besides the notified area of tiger – corridor in Gawasen RF where need to construct the animal underpass. The detail location of animal underpass is given in Table – 11.
- Provide the sign-boards notifying the wild life along project for the safety of animal in forest moving freely along either side of the project road. Also require sign-boards of forest divisions along with the mobile number of the concern forest officers in cases of emergency. The type of signage is attached as Annexure.

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- Total 30 km out of 51 Km of project length is falling under the reserve & protected forest in three different forest divisions namely as Harda, Hoshangabad and Betul Forest Division. This section the traffic speed should be regulated a limit up-to maximum 45 km/hr. Therefore, traffic speed along the project road from km 30.00 to 60.000 need to be controlled with putting-up movable barriers and speed limit boards at interval of specific distance in day & night hrs for the safety of wildlife. Furthermore, this section is a green-belts and the wildlife will became active at night, therefore these section should be declared as silence zone in this consequences no traffics horn should be allowed at night hrs. The speed limit boards and horns prohibited sign boards should also be installed at regular interval for the awareness of road-users. The drawing of signboards are attached as annexures
- In the construction period no work to be allowed at night from 18.00 hrs in summer and 17.30 hr in winter particularly in the road section from km 30.00 to 60.00.
- Road construction work to be carried out5.00 km maximumin length at a time. No new section to be opened unless and until the top layer of road works is completed. The construction site should be adequately barricaded with rigid barriers to minimize animal human conflicts and its free movements during the construction. Further, no borrows shall be opened inside the forest area.
- The workers & local populace to be made aware throughworkshops about the Satpura – Melghat tiger corridor passing along the project corridor andto take precautionary measures for safeguarding the predominant wildlife species in the forest area during the construction period.

3.2.1. Box – Culvert:

Along the project road, there are deficient of appropriate requirements of cross drainage structure. Therefore, details studies have been carried- out for identifying the correct location to facilitate crossing of wildlife as like amphibians & reptiles and small mammal like rabbit etc. to prevent the road kills. There are total 68 box – culverts are proposed for surface run –off . Keeping in view the animal signs and requirements of road crossing the height and width of culvert are modified for clear movements during road crossing. The list of locations identified for crossing of wildlife through box –culverts are given below in Table 3-1

Table 3-1 : New Culvert along the Project Road

S.No	Center Chainage (Km.)	Structure Classification	Highway Cross Section	Span	Clear Span	Clear Height
1	30+840	Box Culvert	2-Lane	1X2X2	2	2
2	34+660	Box Culvert	2-Lane	1X2X2	2	2
3	35+520	Box Culvert	2-Lane	1X2X2	2	2
4	37+000	Box Culvert	2-Lane	1X2X2	2	2
5	37+395	Box Culvert	2-Lane	1X2X2	2	2
6	37+671	Box Culvert	2-Lane	1X2X2	2	2
7	38+640	Box Culvert	2-Lane	1X2X2	2	2
8	39+058	Box Culvert	2-Lane	1X2X2	2	2
9	43+165	Box Culvert	2-Lane	1X2X2	2	2
10	43+230	Box Culvert	2-Lane	1X2X2	2	2
11	43+621	Box Culvert	2-Lane	1X5X2	5	2
12	46+050	Box Culvert	2-Lane	1X2X2	2	2

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S.No	Center Chainage (Km.)	Structure Classification	Highway Cross Section	Span	Clear Span	Clear Height
13	46+561	Box Culvert	4-Lane	1X2X2	2	2
14	47+600	Box Culvert	2-Lane	1X2X2	2	2
15	47+870	Box Culvert	2-Lane	1X2X2	2	2
16	49+050	Box Culvert	2-Lane	1X2X2	2	2
17	51+620	Box Culvert	4-Lane	1X5X2	5	2
18	52+640	Box Culvert	4-Lane	1X5X2	5	2
19	53+120	Box Culvert	2-Lane	1X2X2	2	2
20	53+290	Box Culvert	2-Lane	1X2X2	2	2
21	53+890	Box Culvert	2-Lane	1X2X2	2	2
22	54+420	Box Culvert	2-Lane	1X2X2	2	2
23	54+270	Box Culvert	2-Lane	1X2X2	2	2
24	54+630	Box Culvert	2-Lane	1X4X2	4	2
25	54+920	Box Culvert	2-Lane	1X2X2	2	2
26	54+970	Box Culvert	2-Lane	1X2X2	2	2
27	55+060	Box Culvert	2-Lane	1X2X2	2	2
28	55+114	Box Culvert	2-Lane	1X2X2	2	2
29	56+190	Box Culvert	2-Lane	1X2X2	2	2
30	56+850	Box Culvert	2-Lane	1X2X2	2	2
31	57+857	Box Culvert	2-Lane	1X2X2	2	2
32	57+951	Box Culvert	2-Lane	1X2X2	2	2
33	58+250	Box Culvert	2-Lane	1X2X2	2	2
34	58+380	Box Culvert	2-Lane	1X2X2	2	2
35	58+900	Box Culvert	2-Lane	1X2X2	2	2
36	61+100	Box Culvert	2-Lane	1X5X2	5	2
37	61+520	Box Culvert	2-Lane	1X2X2	2	2
38	62+120	Box Culvert	2-Lane	1X2X2	2	2
39	62+307	Box Culvert	2-Lane	1X5X2	5	2
40	62+500	Box Culvert	2-Lane	1X2X2	2	2
41	62+965	Box Culvert	2-Lane	1X5X2	5	2

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S.No	Center Chainage (Km.)	Structure Classification	Highway Cross Section	Span	Clear Span	Clear Height
42	63+247	Box Culvert	2-Lane	1X2X2	2	2
43	63+700	Box Culvert	2-Lane	1X2X2	2	2
44	64+923	Box Culvert	2-Lane	1X2X2	2	2
45	65+575	Box Culvert	2-Lane	1X2X2	2	2
46	65+950	Box Culvert	2-Lane	1X5X2	5	2
47	66+334	Box Culvert	4-Lane	1X2X2	2	2
48	66+780	Box Culvert	4-Lane	1X2X2	2	2
49	67+335	Box Culvert	4-Lane	1X2X2	2	2
50	67+698	Box Culvert	4-Lane	1X2X2	2	2
51	69+120	Box Culvert	2-Lane	1X2X2	2	2
52	69+500	Box Culvert	2-Lane	1X2X2	2	2
53	69+544	Box Culvert	2-Lane	1X2X2	2	2
54	69+770	Box Culvert	2-Lane	1X2X2	2	2
55	70+425	Box Culvert	2-Lane	1X5X2	5	2
56	70+560	Box Culvert	2-Lane	1X5X2	5	2
57	71+020	Box Culvert	2-Lane	1X5X2	5	2
58	71+906	Box Culvert	2-Lane	1X2X2	2	2
59	73+580	Box Culvert	4-Lane	1X2X2	2	2
60	74+230	Box Culvert	4-Lane	1X2X2	2	2
61	74+400	Box Culvert	2-Lane	1X2X2	2	2
62	74+660	Box Culvert	4-Lane	1X2X2.5	2	2.5
63	75+115	Box Culvert	2-Lane	1X4X2	4	2
64	75+665	Box Culvert	2-Lane	1X2X2.5	2	2.5
65	75+807	Box Culvert	2-Lane	1X2X2	2	2
66	77+190	Box Culvert	2-Lane	1X2X2	2	2
67	77+540	Box Culvert	2-Lane	1X2X2	2	2
68	78+235	Box Culvert	2-Lane	1X2X2	2	2

3.2.2. Minor Bridge:

Minor bridges are provided where there is water way across the project road. Keeping in view the animal sign survey the height & width of minor bridge are modified as mitigation for the wildlife crossing to reach other side of road and to prevent animal fragmentation. There are total of 22 Minor bridge is planned. For the mitigation of

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wildlife animal, proposed height & width of minor bridge as wildlife animal freely cross the road are given below in Table 3-2

Table 3-2: Minor Bridge - Harda – Betul

S.No	Center Chainage. (Km.)	Structure Classification	Highway Cross Section	Proposed Span Arrangement	Total Span Length
1	32+166	MNBR	2-Lane	1 x 6 m	6
2	39+715	MNBR	2-Lane	2 X 25 m	50
3	40 +430	MNBR	4-Lane	1 X 6 m	6
4	44+650	MNBR	2-Lane	1 X 15 m	15
5	45+070	MNBR	2-Lane	1X6m	6
6	45+630	MNBR	2-Lane	1X15m	15
7	46+500	MNBR	4-Lane	1X6m	6
8	48+103	MNBR	2-Lane	1X6m	6
9	48+530	MNBR	2-Lane	1X6m	6
10	50+210	MNBR	2-Lane	1X6m	6
11	55+660	MNBR	2-Lane	2X25m	50
12	56+150	MNBR	2-Lane	2X25m	50
13	57+650	MNBR	2-Lane	1X15m	15
14	57+110	MNBR	2-Lane	1X6m	6
15	58+110	MNBR	2-Lane	1X6m	6
16	58+475	MNBR	2-Lane	2x25m	50
17	63+940	MNBR	2-Lane	1X15m	15
18	64+570	MNBR	2-Lane	1X15m	15
19	66+815	MNBR	4-Lane	1X15m	15
20	72+860	MNBR	4-Lane	1X20m	20
21	76+490	MNBR	2-Lane	1X20m	20
22	77+716	MNBR	2-Lane	1X15m	15

3.2.3. Animal Underpass and Overpass:

In the project tiger corridor existed which linked the Satpura tiger reserve to Melghat wildlife sanctuaries. A site visit with the PCCF Wildlife, and Field Director Satpura Tiger Reserve and other Forest Staff has been conducted on 12/10/2021. A total of 10 points has been selected for providing animal underpass and overpass. The animal underpass and overpass and one major bridge are proposed at 10-specific locations with wild- life fencing to funnel the animal crossing to the passage structure covering all the points as suggested in MOM(attached as annexure).

Table 3-3: New Animal Underpasses and Overpass on the Tiger Corridor

S.No	Center Chainage. (Km.)	Structure Classification	Highway Cross Section	Proposed Span Arrangement	Minimum Vertical Clerance (in m)	Total Span Length
1	31+510	Animal Overpass	2-Lane	1 X 18.5	5.5	100
2	32+420	Animal Overpass	2-Lane	1 X 18.5	5.5	40
3	34+010	Major Bridge	2- Lane	6 x 50	5.5	300
4	36+ 500	Animal Underpass	2-Lane	1 X 15	5.0	15
5	36+650	Animal Underpass	2-Lane	2 X 30	5.0	60
6	41+ 700	Animal Underpass	4-Lane	4 X 25	5.0	100

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6. CONCLUSION:

The project road from Harda to Betul from km 30.00 to 81.00 is a new alignment which is passing through the reserve & protected forest and part of private land. The major section is passing through forest which existed in route of Melghat – Satpura tiger corridor. Hence, the project area is reach in biodiversity with numerous flora and wildlife animal. Furthermore, after improvements of road number of traffics hall increase many folds which affect free movements of wildlife animal resulting increase in fatality or road kills due to traffic collisions.

Therefore, wildlife mitigation measures are essentially required to prevent road kills and fragmentation of wildlife animal living inside the forest to minimize habitat loss. If adequate mitigations measures will be taken following provision of trenches, animal underpass, regulation of traffic by various regulatory & informatory signboards in wildlife area and noise barriers etc. as proposed in wildlife mitigation strategy then the impacts on wildlife animal shall be minimized and there should not be any difficulties to the wild life after road construction.

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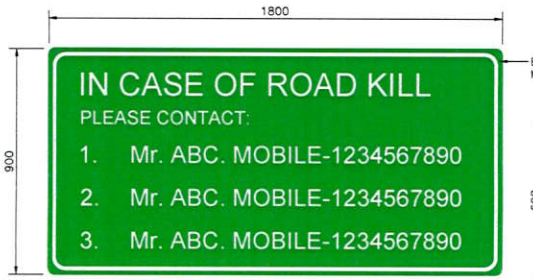
ANNEXURES



PLACE IDENTIFICATION SIGN

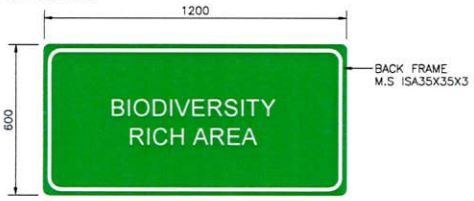
01

PLACE IDENTIFICATION SIGN

02

PLACE IDENTIFICATION SIGN

03



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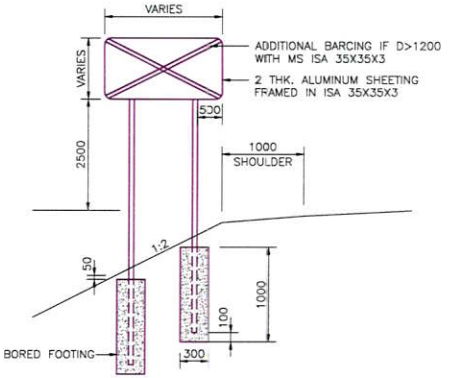
04



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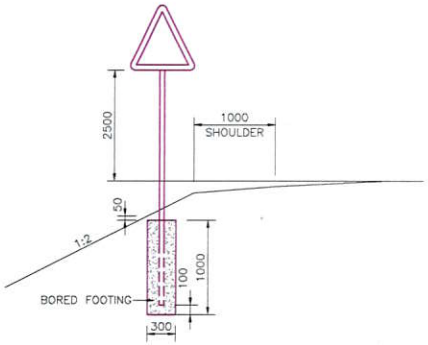

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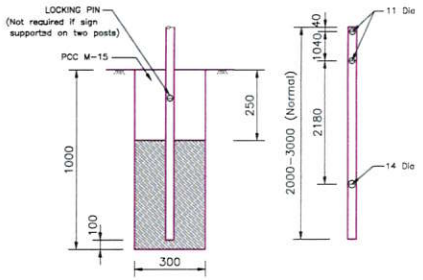

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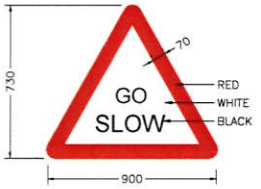

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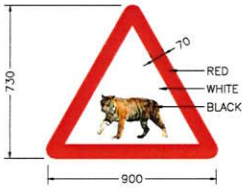

WILD ANIMAL

MAXIMUM SPEED LIMIT

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NHAI, PIU-Harda (M.P.)

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MKD	DATE	DESCRIPTION	BY
		REVISION	

DESIGN CONSULTANT:
LEA ASSOCIATES SOUTH ASIA PVT. LTD.,
B-1, E-27, IInd FLOOR, MOHAN COOPERATIVE INDUSTRIAL ESTATE, MATHURA ROAD,
NEW DELHI-110044
INDIA

SCALE: NOT TO SCALE

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA
(Ministry of Road Transport & Highways)
Government of India

DRAWING TITLE: TYPICAL DETAIL OF ROAD SIGNS
(Sheet 4 of 5)

PROJECT: "PREPARATION OF DETAILED PROJECT REPORT REPORT FOR DEVELOPMENT OF ECONOMIC CORRIDORS, INTER-CORRIDORS, FEEDER ROUTES AND COASTAL ROAD PRIMARILY TO IMPROVE THE FREIGHT MOVEMENT IN THE COUNTRY (LOT-I/MADHYA PRADESH/PACKAGE-I).

DRG. NO: 73579\LASA\HIGHWAYS\DPR\MISC\RS-01
REV: 0

DATE: February 2020 | DRAWN: Praveen

DESIGNED	CHECKED	APPROVED
Abdul Riaz	Sujoy Sinha	J.K.Das

SHEET SIZE A2

कार्यालय प्रधान मुख्य वन संरक्षक (वन्यप्राणी), मध्य प्रदेश

प्रगति भवन, भोपाल विकास प्राधिकरण, तृतीय तल, एम.पी.नगर, भोपाल

दूरभाष : 0755–2674318, 2674337, फैक्स : 0755–2766315

E-mail : pccfwildlifemp@rediffmail.com

क्रमांक / व.प्रा. / मा.चि / एन.एच.–47 / GEN.-286 / 8084 भोपाल, दिनांक 2-11-2021

प्रति,

1. प्रधान मुख्य वन संरक्षक (वन्यप्राणी) मध्यप्रदेश, भोपाल
2. श्री एल.कृष्णमूर्ति
   मुख्य वनसंरक्षक एवं क्षेत्र संचालक,
   सतपुड़ा टाईगर रिर्जव होशंगाबाद ।
3. श्री विवेक जैसवाल, जी.एम.(टी) आर.ओ. भोपाल
   क्षेत्रीय अधिकारी, भारतीय राष्ट्रीय राजमार्ग प्राधिकरण,
   ई–2 / 167, अरेरा कालोनी, हबीबगंज स्टेशन के सामने, भोपाल ।
4. श्रीमति एस.एम. प्रीता,
   वनमंडलाधिकारी, पश्चिम बैतूल (सा.) वनमंडल।
5. श्री नरेश दोहरे,
   वनमंडलाधिकारी, हरदा (सा.) वनमंडल।

विषय :– **राष्ट्रीय राजमार्ग–47 हरदा से बैतूल सेक्शन से गुजरने वाले भाग में वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में।**

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उपरोक्त विषयांतर्गत राष्ट्रीय राजमार्ग–47 हरदा से बैतूल सेक्शन से गुजरने वाले भाग में वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में दिनांक 12.10.2021 को भारतीय राष्ट्रीय राजमार्ग क्रमांक–47 हरदा से बैतूल मार्ग का वनक्षेत्र / कॉरीडोर क्षेत्र से गुजरने वाले भाग का संबंधित वनाधिकारियों एवं भारतीय राष्ट्रीय राजमार्ग प्राधिकरण के अधिकारियों के साथ संयुक्त मौका / स्थल निरीक्षण किया गया। निरीक्षण उपरांत मार्ग के उक्त भाग में किये जाने वाले वन्यजीव शमन उपायों का विवरण / प्रतिवेदन संलग्न कर आवश्यक कार्यवाही हेतु प्रेषित है।

संलग्न :– उपरोक्तानुसार।

02.11.21

(डॉ. एच.एस. नेगी)
अपर प्रधान मुख्य वनसंरक्षक(वन्यप्राणी)
मध्य प्रदेश भोपाल

राष्ट्रीय राजमार्ग–47 हरदा से बैतूल सेक्शन से गुजरने वाले भाग में वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में दिनांक 12/10/2021 को किये गये संयुक्त स्थल निरीक्षण का प्रतिवेदन ।

दिनांक 12.10.2021 को अधोहस्ताक्षरकर्ता की अध्यक्षता में भारतीय राष्ट्रीय राजमार्ग, भोपाल के क्षेत्रीय अधिकारियों एवं संबंधित वनाधिकारियों के साथ भारतमाला परियोजना के अंतर्गत राष्ट्रीय राजमार्ग क्रमांक–47 हरदा से बैतूल सेक्शन के कॉरीडोर वनक्षेत्र से गुजरने वाले भाग में मार्ग के दो लेन से चार लेन में उन्नयन करने हेतु वन्यजीव शमन उपाय (Wildlife Mitigation Measures) के संबंध में मौका/स्थल का संयुक्त निरीक्षण किया गया। निरीक्षण के दौरान निम्नलिखित अधिकारीगण उपस्थित रहे :–

1. श्री एल.कृष्णमूर्ति, मुख्य वनसंरक्षक एवं क्षेत्र संचालक, सतपुड़ा टाईगर रिर्जव होशंगाबाद ।
2. श्रीमति एस.एम. प्रीता, वनमंडलाधिकारी, पश्चिम बैतूल (सा.) वनमंडल।
3. श्री नरेश दोहरे वनमंडलाधिकारी, हरदा (सा.) वनमंडल।
4. श्री संजय जैन, उपवनमंडलाधिकारी, उत्तर हरदा उपवनमण्डल।
5. श्री विवेक जैसवाल, जी.एम.(टी) आर.ओ. भोपाल ।
6. श्री प्रशांत पाठक, प्रोजेक्ट डारेक्टर, हरदा म.प्र.।
7. श्री मनीष, प्रोजेक्ट डारेक्टर, छिन्दवाड़ा ।
8. श्री ब्रजेश साहू, प्रबंधक (T)।
9. श्री ए.एस. राजपूत, ज्वाइंट एडवाइजर (वन)।

M/s LASA–(डी.पी.आर.सलाहकार)

10. श्री धरूबा ज्योति घटक, जनरल मैनेजर।
11. श्री एम.राकेश, सहायक मैनेजर।
12. श्री मोईद अहमद, इंजीनियर (पर्यावरण)।

राष्ट्रीय राजमार्ग –47 हरदा से बैतूल के चैनेज कि.मी. 30+000 से 81+000 भारतमाला परियोजना के अंतर्गत सड़क चौड़ीकरण से वन्यप्राणियों के आवागमन/आवास पर पड़ने वाले प्रभाव को कम करने के लिये Wildlife Mitigation संरचनाऐं बनाये जाने हेतु मौका/स्थल निरीक्षण किया गया। प्रस्तावित एवं वर्तमान में मौजूद मार्ग सघन वनक्षेत्र में से होकर गुजरता है। इस कारण वन्यजीव शमन उपाय के औचित्य को ध्यान में रखते हुए निम्नानुसार संरचनाओं के निर्माण पर सहमति व्यक्त की गई :–

S.No	Location	Recommendation
1	Km 31+570	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 100 मीटर स्पान का ओव्हरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
2	Km 32+400	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए 50 मीटर तक की चेनलिंक फेंसिंग के साथ कम से कम 40 मीटर स्पान का ओव्हरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
3	MJB @ Km 34+010	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए 250 मीटर से बढ़ाकर कम से कम 300 मीटर स्पान का अंडरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
4	Km 36+500	हरदा की तरफ 15 मीटर स्पान का अण्डर पास दिया जाना।

S.No	Location	Recommendation
5	Km 36+620 to Km 36+695	बैतूल की तरफ 15 मीटर स्पान के 03 अंडरपास शामिल करते हुए 15 मीटर का पुल इस प्रकार कुल 60 मीटर स्पान का अंडरपास निर्माण कर वन्यजीव शमन किया जाना।
6	Km 41+700	जमीन की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 100 मीटर स्पान का अंडरपास निर्माण कर वन्यजीव शमन उपाय किया जाना।
7	Km 51+800	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 50 मीटर स्पान का ओव्हरपास एवं वन्यजीवों को गिरने से रोकने के लिए उचित फेसिंग कार्य कराया जायेगा।
8	Km 59+350	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 300 मीटर स्पान का अंडरपास दिया जाना ।
9	Km 59+850	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 75 मीटर स्पान का अंडरपास दिया जाना ।
10	Km 60+850	भूमि की स्थल आकृति एवं पूर्व से निर्मित दो लेन मार्ग को ध्यान में रखते हुए कम से कम 75 मीटर स्पान का अंडरपास दिया जाना ।

उपरोक्तानुसार बैठक के दौरान लिये गये निर्णय के परिप्रेक्ष्य में राष्ट्रीय राजमार्ग प्राधिकरण इकाई को उक्त सिफारिशों को वन्यजीव शमन उपायों के रूप में शामिल करते हुए अनुमति हेतु संशोधित प्रस्ताव पुनः प्रस्तुत करने की सलाह दी गई ।

02.11.21

(डॉ. एच.एस. नेगी)
अपर प्रधान मुख्य वनसंरक्षक(वन्यप्राणी)
मध्य प्रदेश भोपाल