भारतीय वन्यजीव संस्थान
Wildlife Institute of India
(An Autonomous Institute under Ministry of Environment, Forest & Climate Change, Govt. of India)
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Azadi Ka Amrit Mahotsav

No. WII/Hastinapur_Road/2021-01/2022-02

Dehradun, the June 22nd 2022

To

The GM(T)/Project Director
National Highways Authority of India
Ministry of Road Transport and Highways
Project Implementation Unit - Meerut
A-1, Vaishno Dham, Near Gayatri Heights, Meerut – 250001
E-mail: meerut@nhai.org

Sub.: Confirmation regarding modified alignment for Meerut-Nazibabad NH-119 – reg.

Ref.: Your Letter No. NHAI/PIU-MRT/66100/2022/D-247719; 22.06.2022

Dear Sir,

The modified alignment shown in red in the attached map (Enclosed) is as per the suggestion of the Wildlife Institute of India according to a detailed report regarding the Mitigation and Conservation Plan for Meerut-Nazibabad NH-119.

Thanking you,

Yours faithfully,

(Dr. Y. V. Jhala)
Dean, FWS

10/10/22
Santosh Kumar Bajpai
Project Director
National Highways Authority of India
PIU - Meerut

Encls: As above

Copy to:

1. Principal Chief Conservator of Forests (Wildlife), Chief Wildlife Warden. Govt. of Uttar Pradesh. 17, Rana Pratap Marg, Lucknow, (U.P.), 226001. E-mail: pccfwl-up@nic.in
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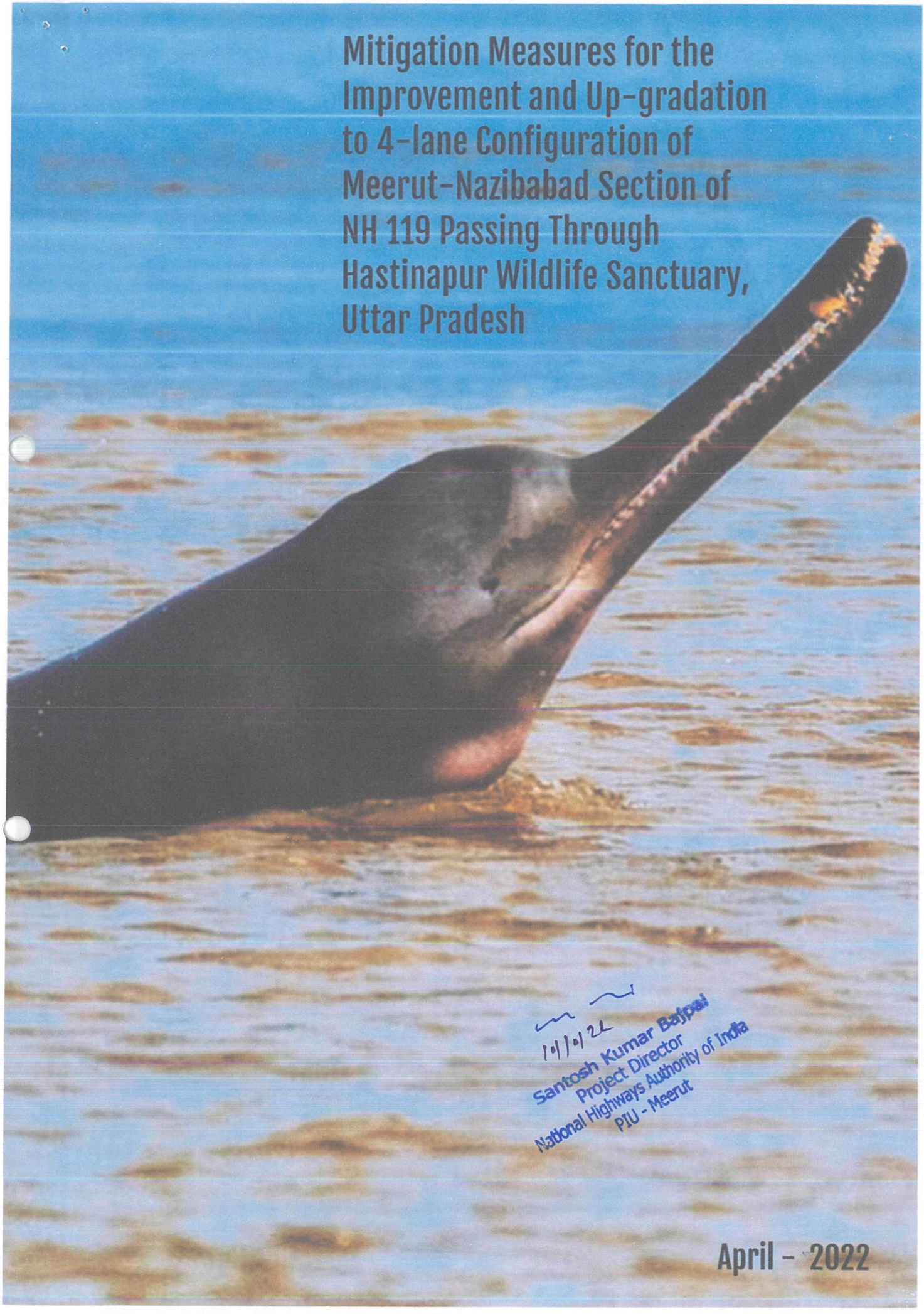
4. Divisional Forest Officer, Muzaffarnagar. E-mail: dfomu-up@nic.in
5. Divisional Forest Officer, Nazibabad. E-mail: dfonzbi-up@nic.in

Mitigation Measures for the Improvement and Up-gradation to 4-lane Configuration of Meerut-Nazibabad Section of NH 119 Passing Through Hastinapur Wildlife Sanctuary, Uttar Pradesh



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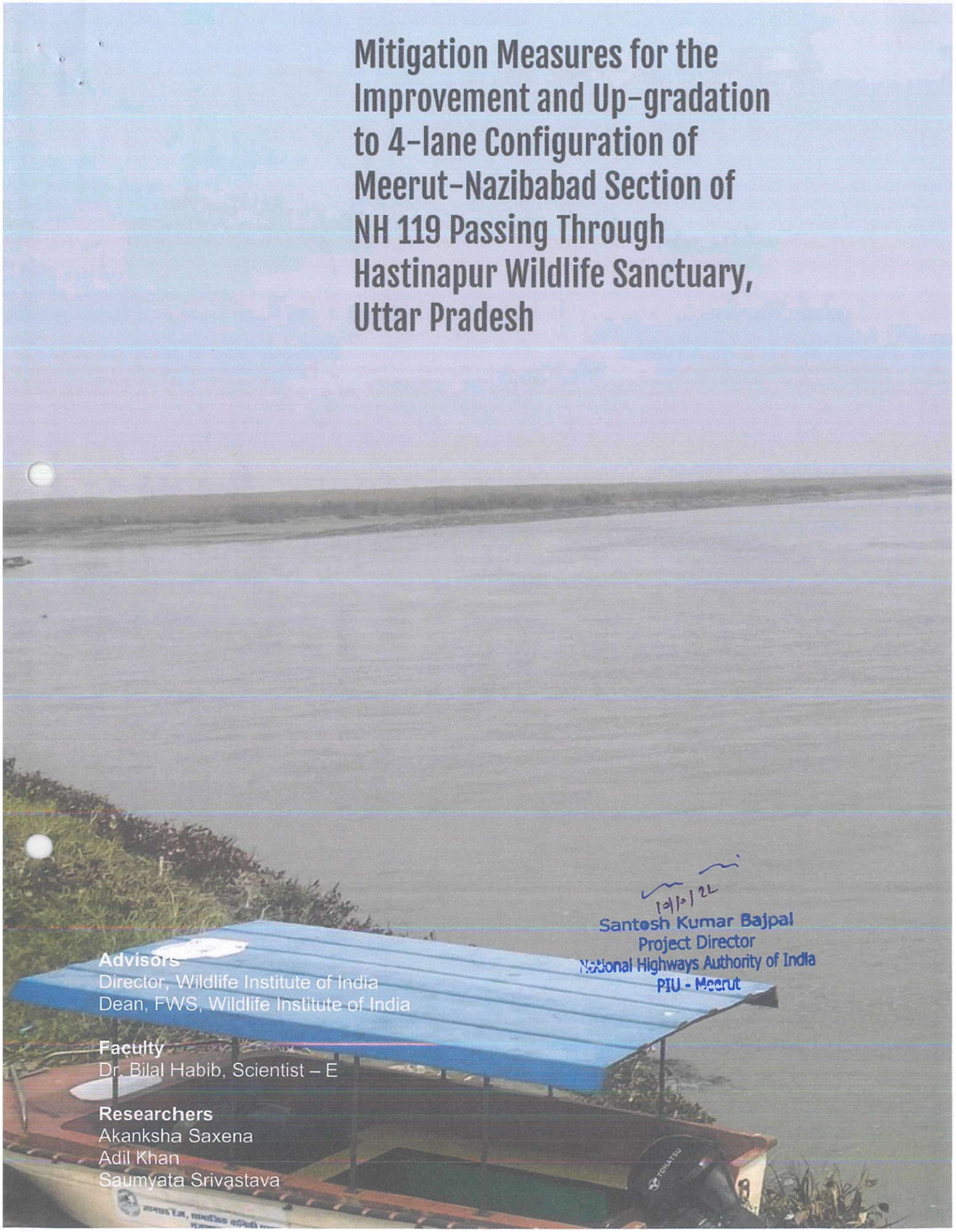
April - 2022

Mitigation Measures for the Improvement and Up-gradation to 4-lane Configuration of Meerut-Nazibabad Section of NH 119 Passing Through Hastinapur Wildlife Sanctuary, Uttar Pradesh



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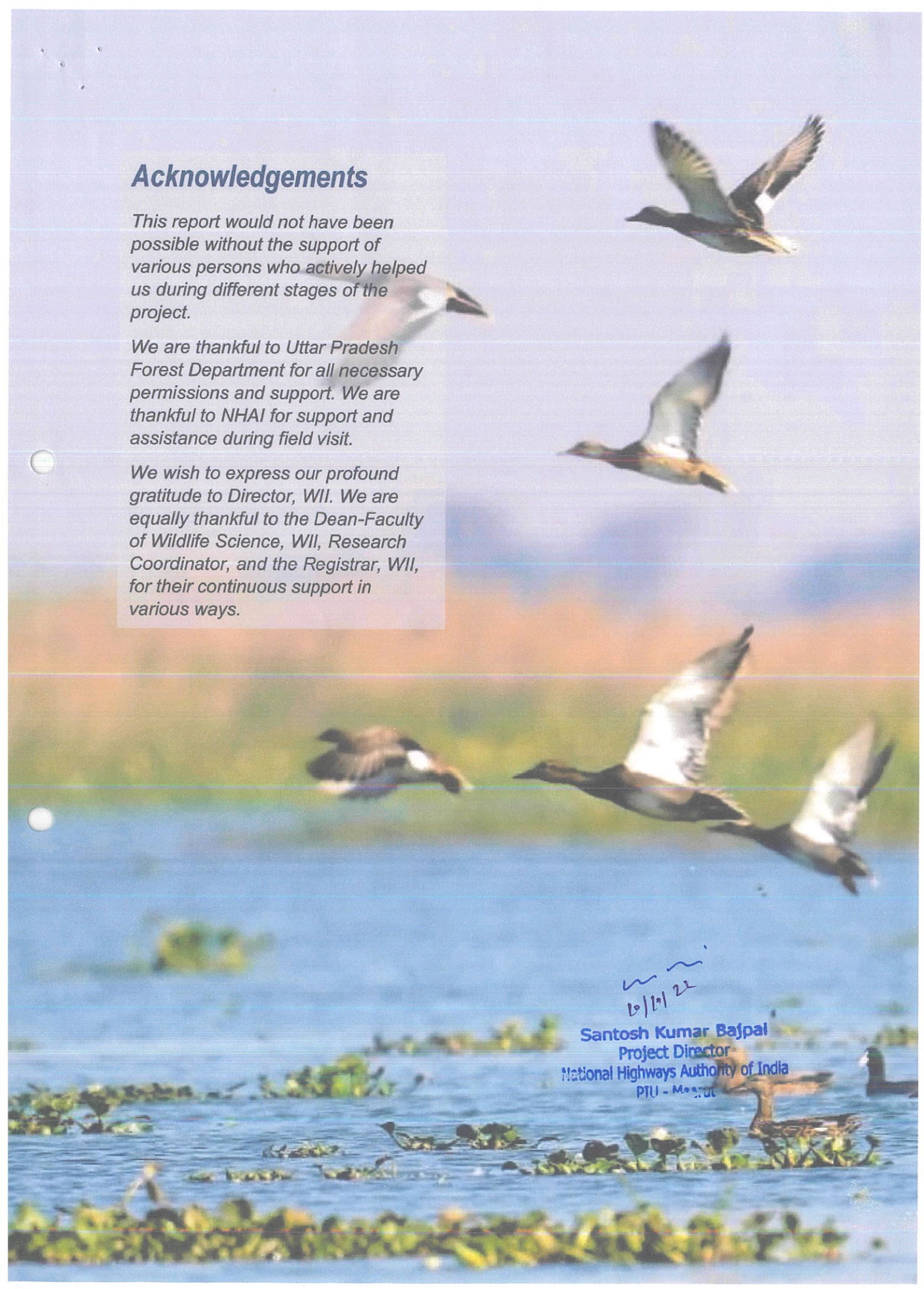

Acknowledgements

This report would not have been possible without the support of various persons who actively helped us during different stages of the project.

We are thankful to Uttar Pradesh Forest Department for all necessary permissions and support. We are thankful to NHAI for support and assistance during field visit.

We wish to express our profound gratitude to Director, WII. We are equally thankful to the Dean-Faculty of Wildlife Science, WII, Research Coordinator, and the Registrar, WII, for their continuous support in various ways.

19/12/22

Santosh Kumar Bajpai
Project Director
National Highways Authority of India
PIU - Meerut

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Introduction

India has the second-largest road network in the world, spanning over 5.8 million km (IBEF 2021) and costing more than INR 6.26 lakh crore. More than 64.5% of all goods in the country are transported through roads, while about 90% of the total passenger traffic uses this road network to commute (Ministry of Road Transport & Highways 2020). The Indian Government launched the Bharatmala Pariyojana, which aims to build 66,100 km of economic corridors, border and coastal roads, and expressways to boost the highway network[1]. It is envisaged that the programme will provide 4-lane connectivity to 550 districts, increase the vehicular speed by 20-25% and reduce the supply chain costs by 5-6%.

Earlier, when environmental protection was poorly regulated, protected areas (PAs) were managed as natural 'islands' that remained largely untouched by human influence (WII 2016). Today, it is understood and recognized that these 'islands' can no longer exist as individual identities and that they are part of larger, global matrix that need to interact for their survival – and the survival of biodiversity. Their survival is dependent on a wide variety of human and natural factors – some of which are disruption of contiguity as a result of construction and up-gradation of linear infrastructure. In India, forests cover a total of 21.34% of the country's land surface, out of which only 4.89% come under protection (WII 2016). Within many of these protected areas, roads, railway lines and transmission lines cut across the landscape, fragmenting (Taylor & Goldingay 2010) them and opening them to further exploitation and death. Wide-ranging species require contiguity of their habitat across landscapes. With the increase in extent of linear development in most landscapes, outside protected areas present a major challenge for wildlife management and conservation. The impact of roads and railway lines are similar, as they convert a strip of land into an area of fast-paced vehicles that can collide and maim/ kill both human and animal (Rendall et al. 2021). They also emit loud noises and lights that act as a deterrent and thus create a sense of physical barrier to the movement of animals (Rico et al. 2007; van der Ree et al. 2011; Shilling et al. 2020).

The need to harmonise linear development and biodiversity conservation is essential to both economic and ecological security. Wildlife crossing structures and mitigation strategies like underpasses (e.g., amphibian tunnel, badger pipe, ledges in culvert), overpasses (e.g., land bridge, rope bridge, glider pole), early – warning systems (Santos et al. 2017; Ford et al. 2017) etc. can help regulate and ensure safe movement of wildlife across roads and highways (WII 2016; Development Bank 2019; United States Department of Agriculture 2021).

Project Background

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The National Highways Authority of India (NHAI) has proposed up-gradation and improvement of a 40 km section of the National Highway 119 between Meerut and

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[1] Soni, Prerna. "Highway to growth". *Invest India: National Investment Promotion & Facilitation Agency*.

Nazibabad in Uttar Pradesh. The total length of the road is 40.165 km, out of which 8.085 km of road traverses the Eco-Sensitive Zone (ESZ) of the Hastinapur Wildlife Sanctuary (HWLS), 1.830 km is outside HWLS, and remaining 30.250 km passes through HWLS. NH-119 is to be developed as 4 lane road to provide alternative connectivity to Haridwar to relieve pressure on Delhi – Haridwar National Highway (NH 58) during the annual pilgrimage of Shiva devotees during the '*Shravan*' months i.e. monsoon. Hundreds of thousands of devotees from surrounding states of Delhi, Uttar Pradesh, Haryana, Rajasthan, Punjab, Bihar, Jharkhand, Chhattisgarh and Madhya Pradesh reach these places to participate in Kanwar Mela. Heavy security measures are undertaken by the government and the traffic on the Delhi – Haridwar National Highway (NH 58) and is diverted to NH 119 (presently 2 lane) for the period. The project road provides connectivity from take-off point at NH-58 to NH-119 (near Meerut) and at terminal point on Nazibabad on NH-74 to ensure seamless movement of traffic on NH-58, NH-74 & NH-119.

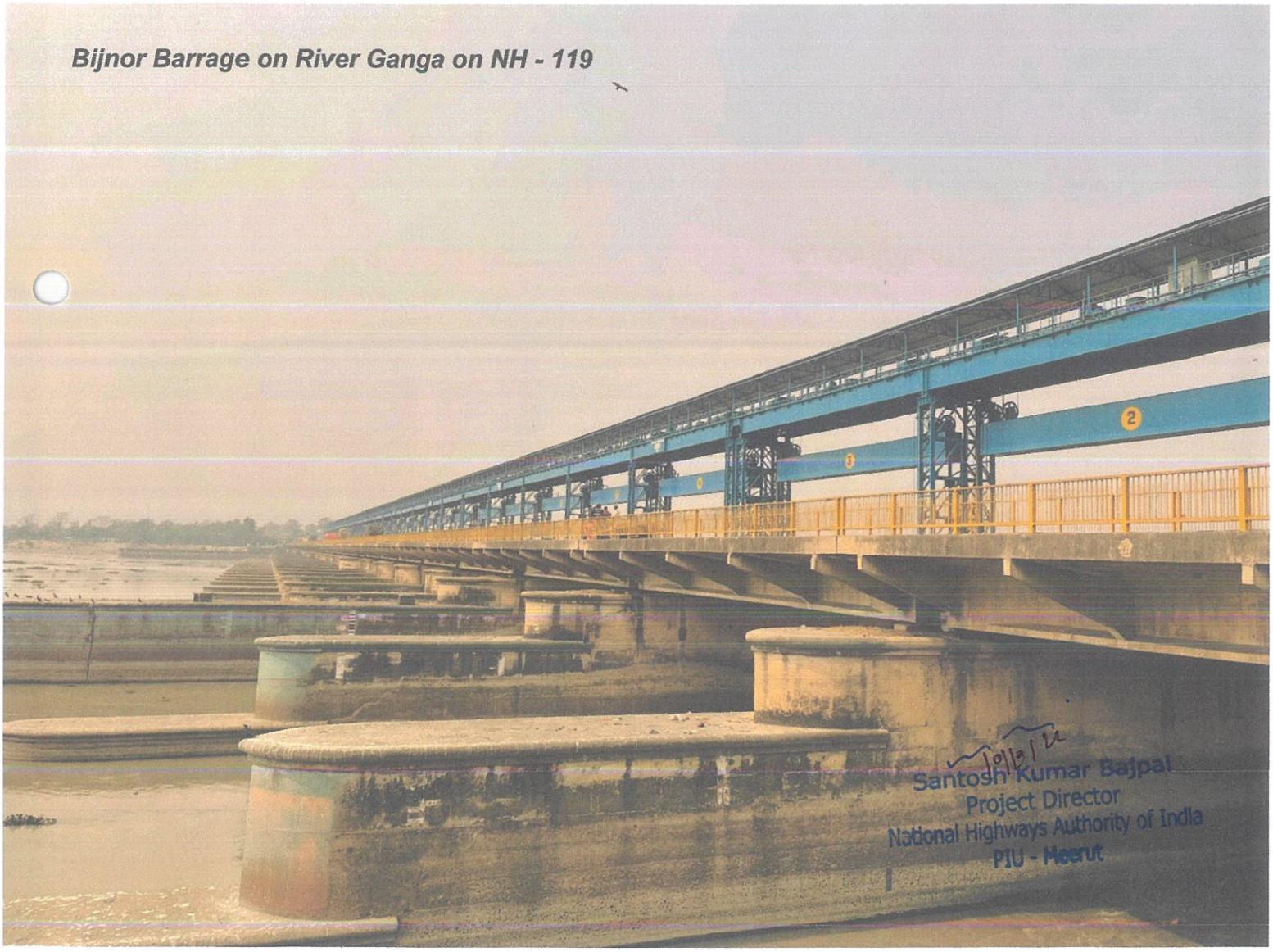
Project Site

The proposed up-gradation of NH-119 traverses the Hastinapur Wildlife Sanctuary (HWLS) for a total length of 40.165 km, of which 8.085 km of road traverses the Eco-Sensitive Zone (ESZ) of the HWLS, 1.830 km is outside HWLS, and remaining 30.250 km passes through HWLS. The sanctuary covers an area of 2037 sq. km. of which 239.41 sq. km. comprises of the ESZ.

HWLS is situated between 29.5799° and 28.7538° latitude, and 77.9009° and 78.1372° longitude in the state of Uttar Pradesh. It is spread across 5 districts in the state of Uttar Pradesh, namely – Meerut, Bijnor, Muzaffarnagar, Hapur and Amroha. The altitude of the area ranges between 130 and 150 m above mean sea level (Khanal et al. 2013). This sanctuary was notified to specifically provide protection to a niche specific mega-herbivore, the swamp deer (*Rucervus duvaucelii duvaucelii*) (Kumar et al. 2021). It is also home to other mammals like leopard (*Panthera pardus*), striped hyena (*Hyaena hyaena*), nilgai (*Boselaphus tragocamelus*), and spotted deer (*Axis axis*) among other animals (Ramsar 2021).

Haiderpur Wetland, a Ramsar site (Ramsar 2021) is located in Muzaffarnagar and Bijnor Districts of Uttar Pradesh in the northern part of India, has an area of 60.98 sq. km. Towards the east of the wetland is River Ganga, to the west is Nizampur and Haiderpur Reserve Forest and Bijnor Barrage on the south of the wetland. Haiderpur Wetland came into existence in 1984 after the construction of Madhya Ganga Barrage on River Ganga, about 10 km west of Bijnor city and is located within the boundaries of Hastinapur Wildlife Sanctuary. The entire wetland is thus protected under India's Wildlife (Protection) Act, 1972. This freshwater human-made wetland receives backwater flow from River Ganga during monsoons and retains water till the end of February. It comprises varied deep upstream reservoir, shallow flooded land and stretches of river (Ganga and Solani). In addition to the perennially inundated patches, the wetland boundary also takes into account the seasonal patches and ecologically sensitive areas between these patches. This mosaic is the key to the rich biodiversity

associated with the wetland and hence has been included in the wetland boundary. Haiderpur Wetland at least 32 species of plants, over 300 species of birds of which 102 species are water birds, more than 40 species of fishes and at least 10 species of mammals including Ganges River Dolphin (*Platanista gangetica*). The site also serves as a breeding ground for the near-threatened Indian Grassbird (*Graminicola bengalensis*) and nesting site for gharials (*Gavialis gangeticus*) ("Haiderpur Wetland" 2021).



Bijnor Barrage on River Ganga on NH - 119

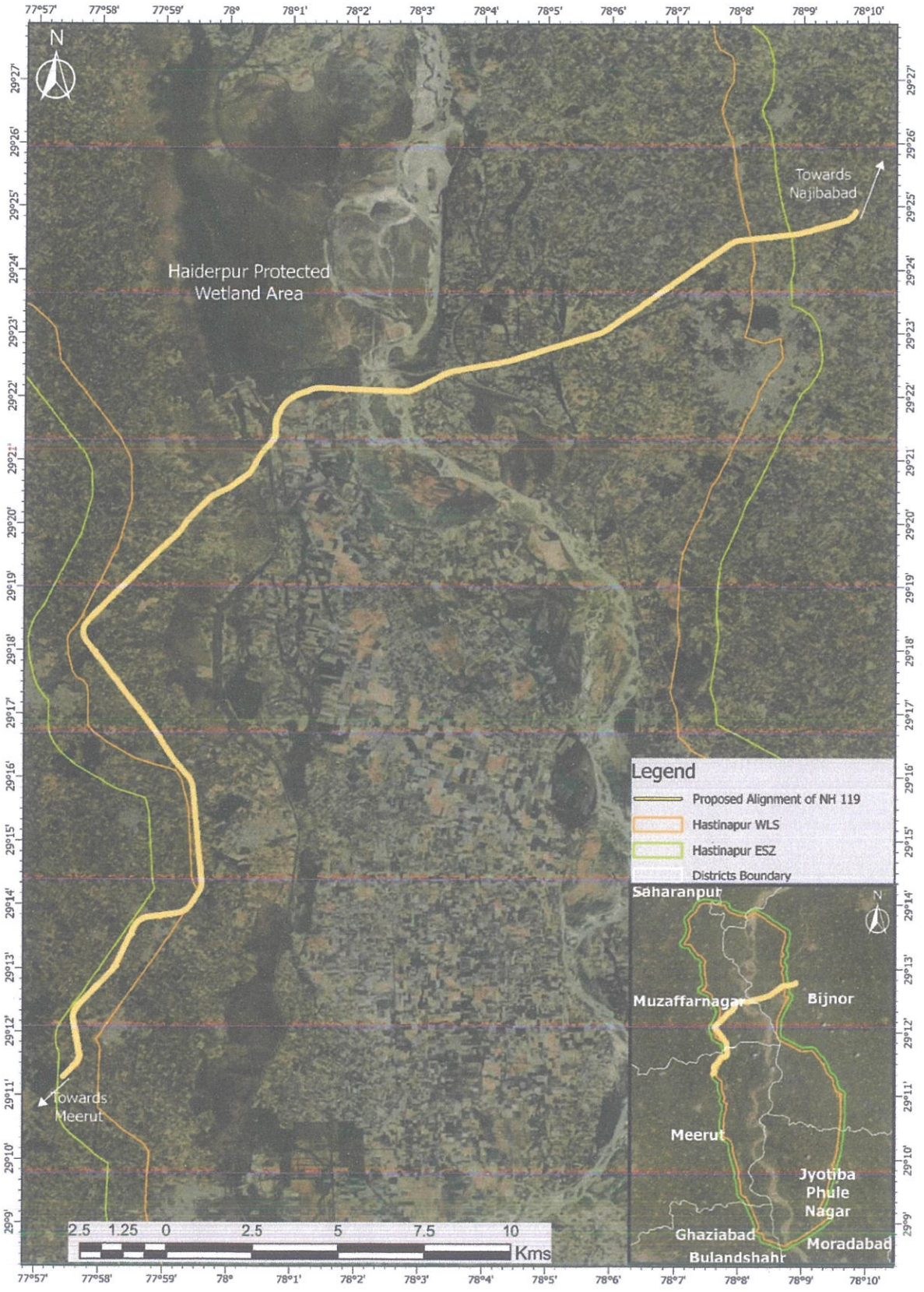


Figure 1: Proposed alignment of the National Highway 119 passing through Hastinapur Wildlife Sanctuary and ESZ.

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Projected impacts of the highway up-gradation

The proposed up-gradation of NH-119 passes through the Hastinapur Wildlife Sanctuary covering a total length of the road is 40.165 km, out of which 8.085 km of road traverses the Eco-Sensitive Zone (ESZ) of the Hastinapur Wildlife Sanctuary (HWLS), 1.830 km is outside HWLS, and remaining 30.250 km passes through HWLS.

The impact of roads and railway lines are similar, as they convert a strip of land into an area of fast-paced vehicles that can collide and maim/ kill both human and animal (Rendall et al. 2021). Widening of the roads for up-gradation will amplify their negative impacts on wildlife. Not only will the animal be present on the road for a longer duration while crossing (Rendall et al. 2021) especially for larger slow moving species (Saxena et al. 2020), they will also be more prone to getting hit by vehicle due to higher speed limits on vehicles (Jackson 2000; Dennehy et al. 2021). They also emit loud noises and lights that act as a deterrent and are also known to influence bird nesting (Rao & Koli 2017) and alter small mammal populations (Roedenbeck et al. 2007). Increased traffic intensity, fast-paced traffic along with higher probability of wildlife-vehicle collisions therefore creates a sense of physical barrier to the movement of animals (Rico et al. 2007; van der Ree et al. 2011; Shilling et al. 2020) as well as poses a threat to human life (Taylor & Goldingay 2010; Diaz-Varela et al. 2011; Kučas & Balčiauskas 2021).

WII's involvement

The National Highways authority of India (NHAI) has proposed up-gradation and improvement of a 40 km section of the National Highway 119 between Meerut and Nazibabad in Uttar Pradesh. The NHAI has requested WII to conduct a biodiversity impact assessment, wildlife study, and to prepare a mitigation and conservation plan for the project vide letter NHAI/PIU-MrT/66011/2021/D-22365 dated 30th July, 2021. Directives to conduct the study were also issued by the Principal Chief Conservator of Forests (HoFF), Lucknow, vide letter Desk-2870/26-11 NH-119 (43253/2019) dated 8th September 2021. A study plan was subsequently submitted by WII, and field work and desk studies were subsequently conducted.

Objectives of the study

To avoid, minimize and remedy the adverse impacts of the proposed up-gradation to 4-lane configuration of Meerut-Nazibabad section of NH-119, Uttar Pradesh on biodiversity values of the protected area, reserve forests and maintain connectivity in the larger landscape through appropriate planning and mitigation measures. The objectives of the assessments are as follows:

1. To identify critical wildlife areas across the stretch of highway segment to be upgraded.

2. To suggest mitigation measures considering animal movement and presence locations in the study area.

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1. Identification of critical wildlife areas across the stretch of highway segment to be upgraded

Methods

A team of WII biologists accompanied by local forest department personnel surveyed the entire stretch of the highway (38.335 km) to assess potentially important wildlife areas and crossing points based on animal signs, direct sightings (presence) and landscape features. During two intensive surveys, we considered direct sightings of animals, presence of carcasses, and other signs such as pug/ hoof marks and scat/ pellet/ dung as evidence of animal presence.

Locations of regular animal crossing locations as well as important bird sites (including Haiderpur Wetland) were also recorded based on information from beat guards. All the spatial information was recorded, including GPS locations of the signs, sightings and crossing locations.

We also conducted spatial characterization of area around proposed alignment to be upgraded to identify land-use land-cover types that are important in the context of wildlife and bird presence/movement.

We used high resolution optical satellite data i.e. Sentinel-2 imagery. Sentinel-2 Level-2 data with band composition of red (R), green (G), blue (B), near-infrared (NIR) and short-wave infrared (SWIR) for the year 2021. The data after monsoon season was stacked together to include the pixel value of the region for each season and then it was reduced to calculate mean for further processing. Only RGB, NIR and SWIR was used from the sentinel data as they have same spatial resolution i.e. 10 meters, and because normalized difference vegetation index (NDVI) and normalized difference water index (NDWI), can be computed using red and NIR band, and NIR and SWIR respectively. The analysis work has been done in Google Earth Engine (GEE).

An effective classification system and an adequate number of training samples are the basic requirements for a good classification. The land cover was divided into 5 major classes – Water Bodies, Forest, Built-up, Grassland and Agricultural land. Grassland and forest land have been classified using NDVI index, while water class is demarcated using NDWI index, and normalized difference built-up index (NDBI) helps in identification of built-up area. The classification method used for this is random forest classifier. Random forest, like its name implies, consists of a large number of individual decision trees that operate as an ensemble. Each individual tree in the random forest spits out a class prediction and the class with the most votes becomes our model's prediction. These large number of relatively uncorrelated models (also represented as trees in the classifier) operating as a group will outdo any of the individual constituent models.

Data received from the Forest Department and the information collected during the field surveys were collated for the presence of animals and/or movement near the

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existing and proposed highway to identify important animal corridors and crossing points intersected by the highway.

Finally, all animal presence locations, records of endangered and rare birds and nesting sites were collated and overlaid with the spatial characterization layer in the GIS domain to identify critical areas for mitigation in the area.

Results

We found that most of the new and existing alignment of the highway passes through agricultural land (Fig. 2). The forests lie near the Haiderpur Wetland, and some riverine grasslands near the barrage.

We found 2 potential areas of importance from the wildlife perspective (Fig. 2 (a) and (b)):

a) The grassland patch near the barrage which is part of the Haiderpur Wetland has been reported to be the breeding site of vulnerable bristled Grassbird (*Schoenicola striatus*) and near-threatened Indian Grassbird (*Graminicola bengalensis*). The area is also known to host the critically endangered yellow-breasted bunting (*Emberiza aureola*) whose population has been rapidly declining (IANS 2021).

b) An 800 m stretch of the road having forest cover on both the side. This stretch is being used by animals like spotted deer and nilgai (Meerut Bureau 2019) to cross. The segment lies between chainages 60/250 – 61/050.

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Gharial with hatchlings

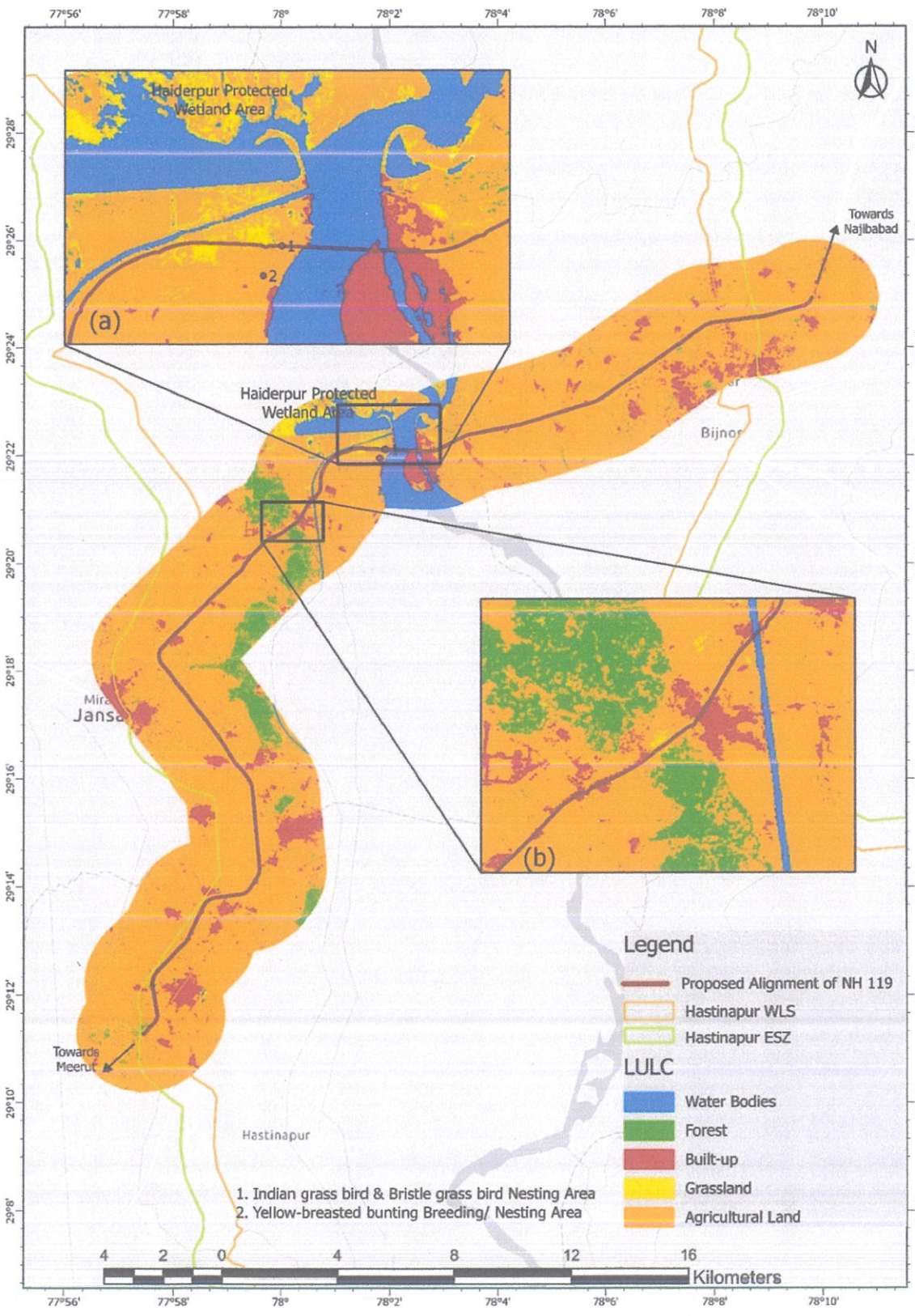

Figure 2: Consolidated map of LULC classes on 2 km buffer on either side of the proposed alignment of National Highway 119, and ((a) and (b)) important sites identified for wildlife and birds).

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2. Mitigation measures considering animal movement and presence in the study area

We evaluated existing structures on the highway and assessed the scope of additional measures on identifying priority animal crossings on the basis of these presence points, and assessed possible mitigation measures for the up-gradation of the highway.

Results

With respect to the two priority sites, the following specific measures are recommended. These recommendations have also been summarized in Table 1.

a. For the identified important bird breeding sites, which is also in close proximity to the Haiderpur Wetland, the alignment of the highway should be aligned along the forest edge in a way so as to avoid the grassland habitat lying to the south of the wetland and breeding sites. The bridge on the new alignment should start elevating at chainage 63/250 and the pillars are to be built on the edge of the forest patch with light and sound barriers. The alignment would then join the proposed alignment at chainage 65/250 (Fig. 3). Given the reported presence of Gangetic dolphin and gharial in the area, measures to reduce disturbance to aquatic fauna should be implemented at all stages of the construction of the highway. The height of the proposed bridge should be 9-11 m to reduce the impact on aquatic life. Disturbance to the river bank should be minimised as much as possible. Water and sand from the river should not be used for construction purposes.

b. For the 800 m segment of the highway passing through forested area (chainage 60/250 – 61/050), two 50 m underpasses of 5 m height are recommended (Fig. 4).

Table 1: Summary of mitigation measures recommended on NH 119 proposed for up-gradation passing through the Hastinapur Wildlife Sanctuary and ESZ.

Segment	Mitigation measures recommended	Chainage
(a) Highway alignment south of the Haiderpur Wetland.	Elevated structure to be provided in the forest patch with minor – realignment along the edge of the forest patch.	63/250 – 65/250
(b) 800 m segment passing through forested patch	Two animal underpasses measuring 50 m each	60/350 – 60/400 and 60/750 – 60/800
	Fencing	60/250 – 61/050

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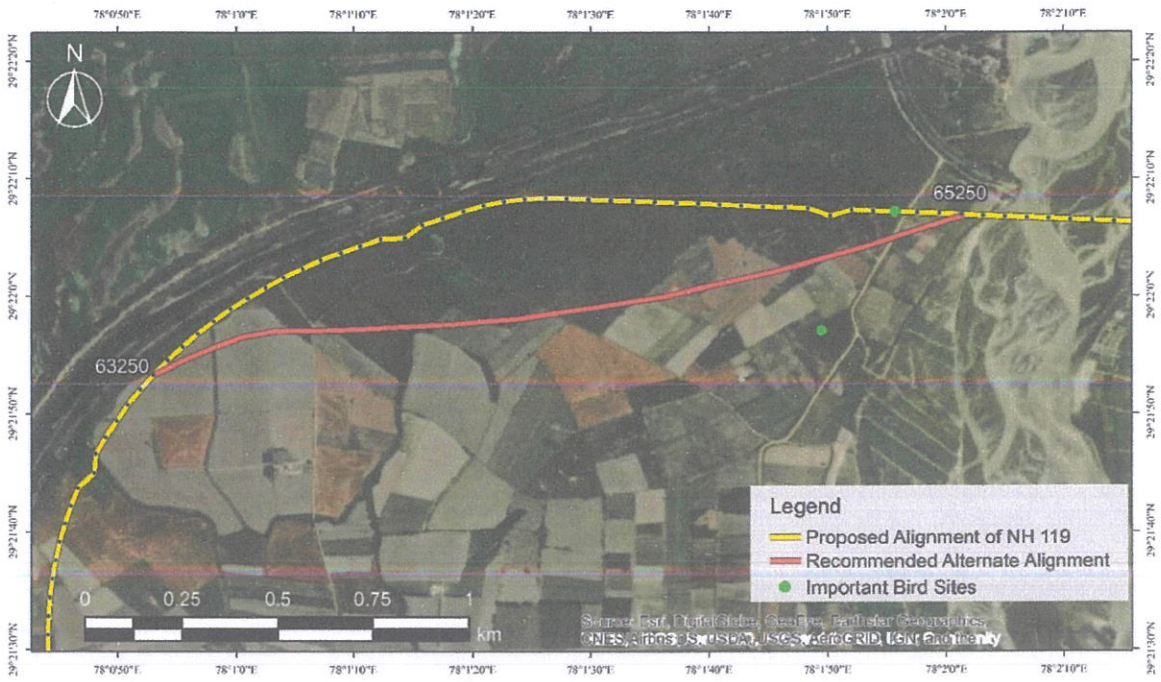

Figure 3: Proposed alignment of NH 119 (red line) around important bird breeding sites on the grasslands south of the Haiderpur Wetland, between chainage 63/250 and 65/250 (Red – line does not represent exact alignment – only for representation to show alignment along the forest edge).

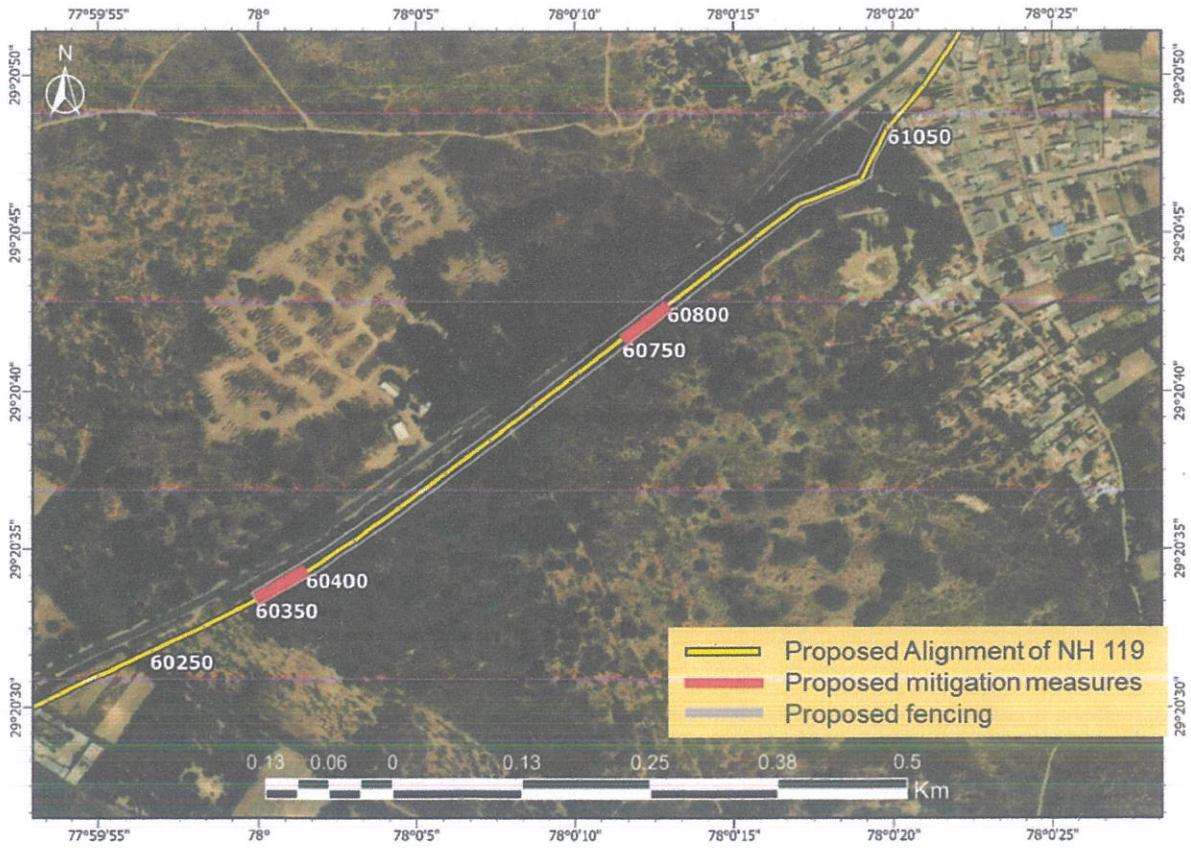

Figure 4: Proposed mitigation measures on NH 119 between chainage 60/250 and 61/050. Red lines indicate locations of two proposed 50 m wildlife underpasses, grey line indicates stretch of the highway to be fenced.

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Photograph showing grassland patch – the alignment should be at the edge of the patch, not through the middle of this patch.

Indian Grassbird reported from the grassland patch near the barrage.

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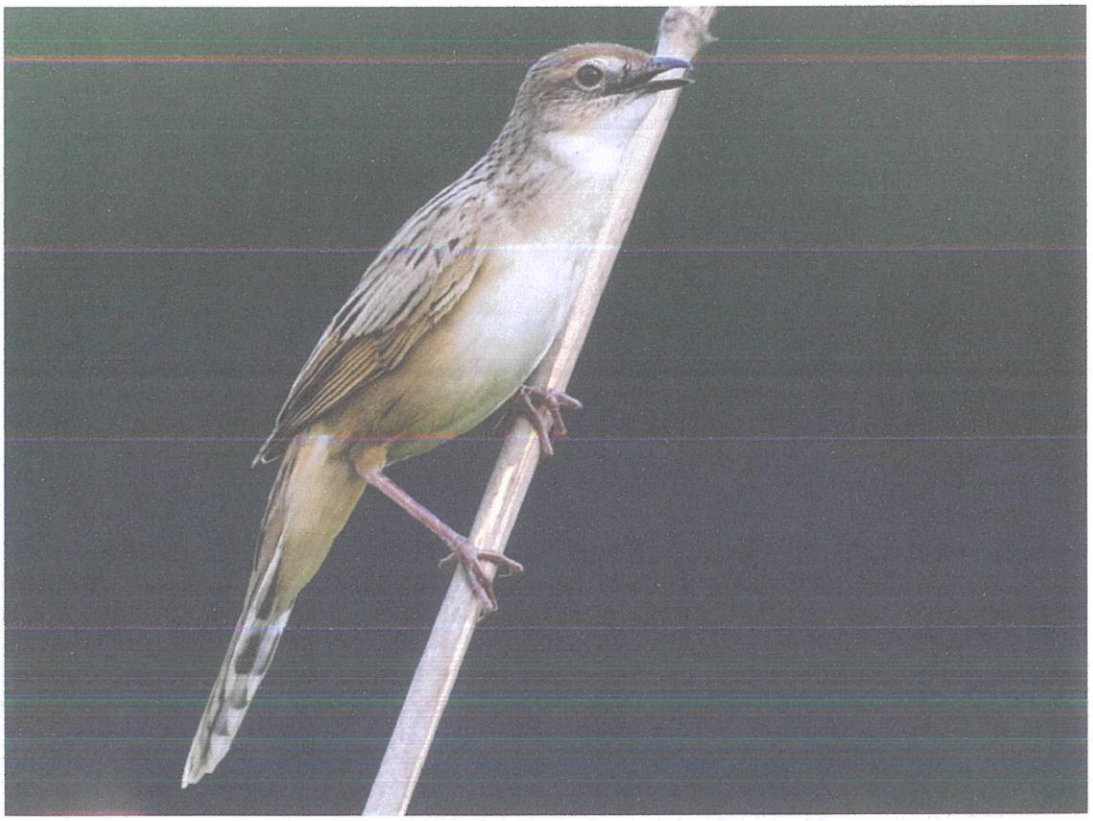
Yellow-breasted bunting reported from the grassland patch near the barrage.



Bristled Grassbird reported from the grassland patch near the barrage.

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General Recommendations

1. Construction near the barrage and important bird sites shall be avoided during winters i.e., time of visit of migratory birds to the wetland and barrage.

2. The height of all bridges, box culverts and other drainage structures (including those in agricultural areas) should not be less than 3 m. The minimum width of all box culverts should not be less than 5 m. The minimum height should not be achieved by ground excavation but by elevating the road.

3. Divisions between the crossing structures should be of pillar type, instead of wall-type (Fig. 5).

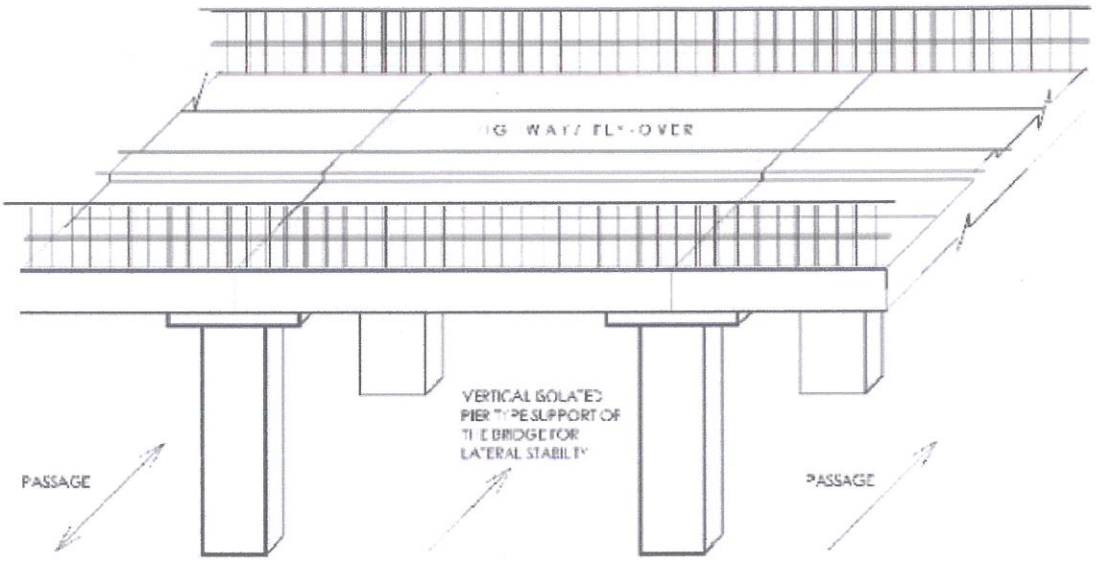

Figure 5: Pillar-type division of bridge

4. The underpasses must be kept free of all human-related activities and disturbances including foot-trails and roads, as these have a negative influence on the use of crossing structures by wildlife. The existing road under the proposed crossing structures between chainages 60/350 and 61/050 should be removed post-construction of the crossing structures. Only the access road from the north side of the highway towards the timber depot near the highway should be used.

5. Noise and sound barriers (2 m high) should be installed along the entire stretch of the highway passing through sensitive areas, which would also act as fencing to prevent animals from entering the road corridor. The top ends of the barrier should be turning outwards or be slightly tilted/angled outwards (Fig. 6), to reduce inward propagation of noise (and subsequently within the crossing structure via the gap in the median). Additionally a fibre glass covering should

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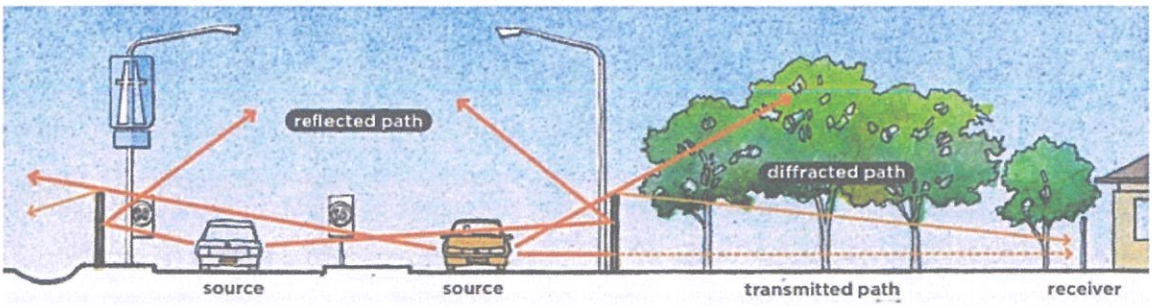
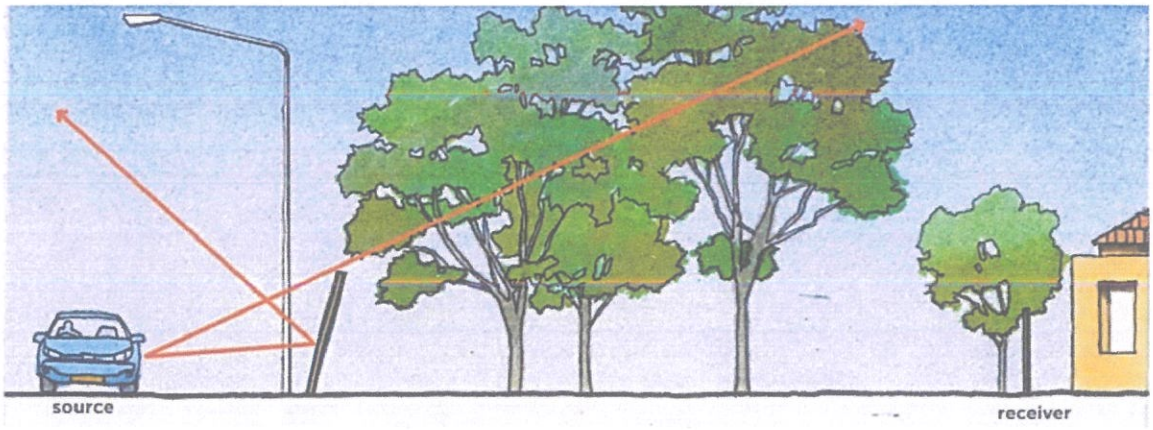
be installed on top of the median opening to reduce ingress of noise into the crossing structures.



Reflective paths can add to noise and need to be considered.



Tilted noise barriers can direct noise away from the receiver.

Figure 6: Barriers for attenuating noise along the highway showing reflected noise (top); tilted noise barriers for minimising reflected noise (bottom).

(Source: Noise wall design guideline, Centre for Urban Design, NSW Government).

6. Cattle guards (2 m wide) must be installed at both ends of all structures to stop wild and domestic animals from getting trapped within the fences/barriers (Fig. 7).

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Figure 7: Cattle guards/grids to be installed at both ends of the crossing structure on NH 119 at Chainage 60/350 and 61/050.
Source: (Clevenger & Huijser 2011)

7. Disturbance during construction in the sensitive areas is to be kept minimum by the following mechanisms:
   - Use of pre-fabricated materials for construction
   - Use of water from sources other than the river
   - Disposal of construction-related debris away from the sensitive sites
   - Prohibition on camping of construction personnel near these sites

8. Post-construction rehabilitation of uprooted grassland and riverine vegetation is to be done using native flora in collaboration with forest department. No avenue plantation or planting of fruit-bearing trees should be done along the sensitive stretches of the highway.

9. Site-specific measures to avoid water pollution and siltation are to be employed including use of oil interceptors.

10. Warning and information boards for awareness should be erected along the highway regarding the ecological importance of the area.

11. Both sensitive stretches should be declared no honking and no stopping/parking zones.

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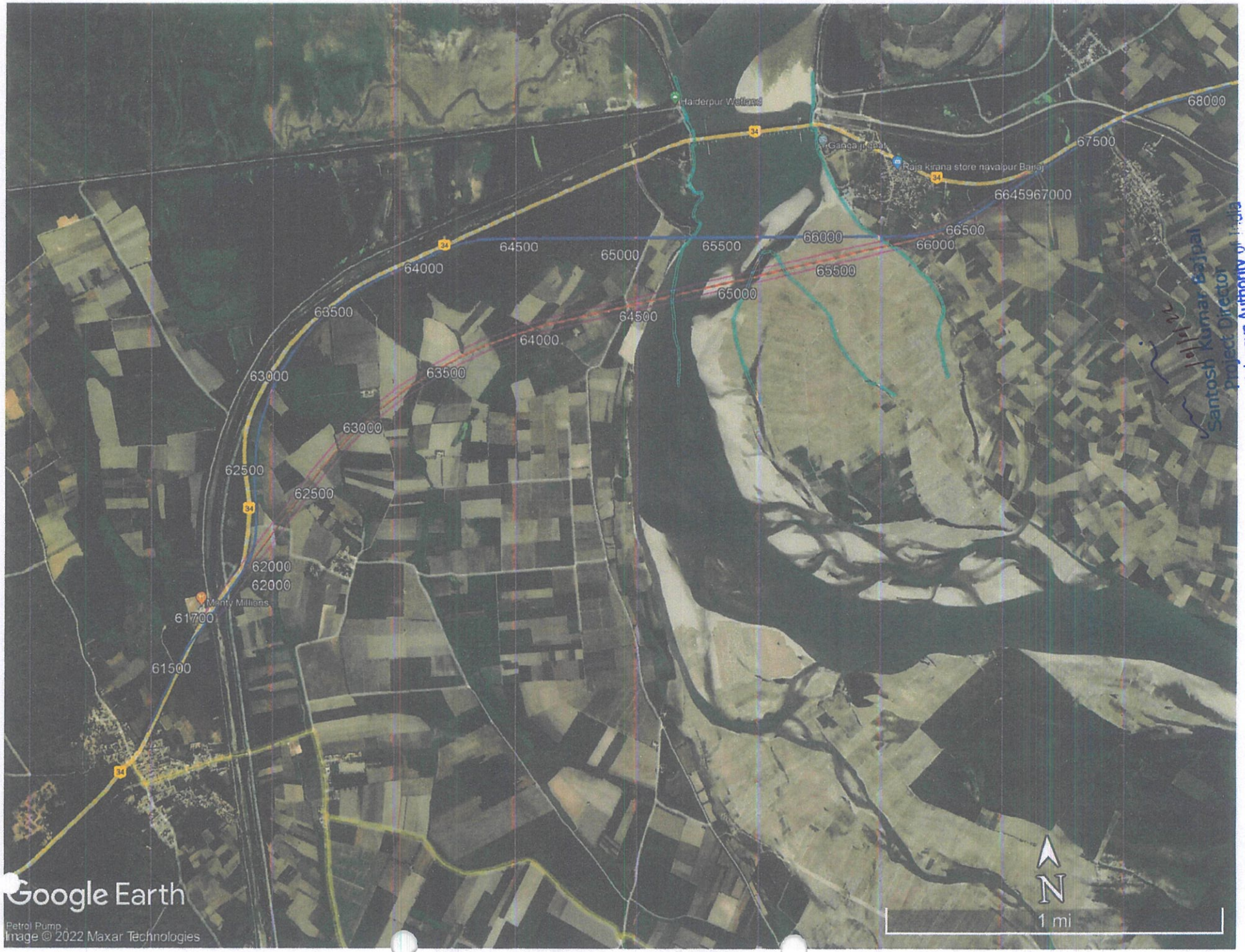

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