WILDLIFE CONSERVATION PLAN
OF
Mukundara Hills Tiger Reserve Tiger / Darrah Wildlife Sanctuary

For

Development of 8 lane (Greenfield highway) from Banda Hera village (Ch. 392.800) to Moondiya village (Ch. 452.425) Section of NH-148 N (Total length 59.625 Km), Under BHARATMALA PARIYOJANA Lot-4/Pkg-4 in the state of Rajasthan

SUBMITTED BY
National Highway Authority of India

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1 Brief about the Proposed Project

Government of India has decided to develop ~42,000 km of Economic Corridors, Inter Corridors and Feeder Routes to improve the efficiency of freight movement in India under the Bharatmala Pariyojana. Delhi-Mumbai Greenfield Highway via Vadodara is one of the projects under Bharatmala Pariyojana.

The project being discussed under this report concerns a section of the proposed green-field highway under Bharatmala Pariyojana Lot 4 / Package 4: Rajasthan – Haryana Border to Kota.

The proposed project is 8-lane (Greenfield highway) shall start from Banda Hera village (Ch. Km 392.800) and ends near Moondiya village (Ch. Km 452.425) Section of NH-148 N (Total length 59.425 Km), under Bharatmala Priyojana Lot-4/Pkg-4 in the state of Rajasthan.

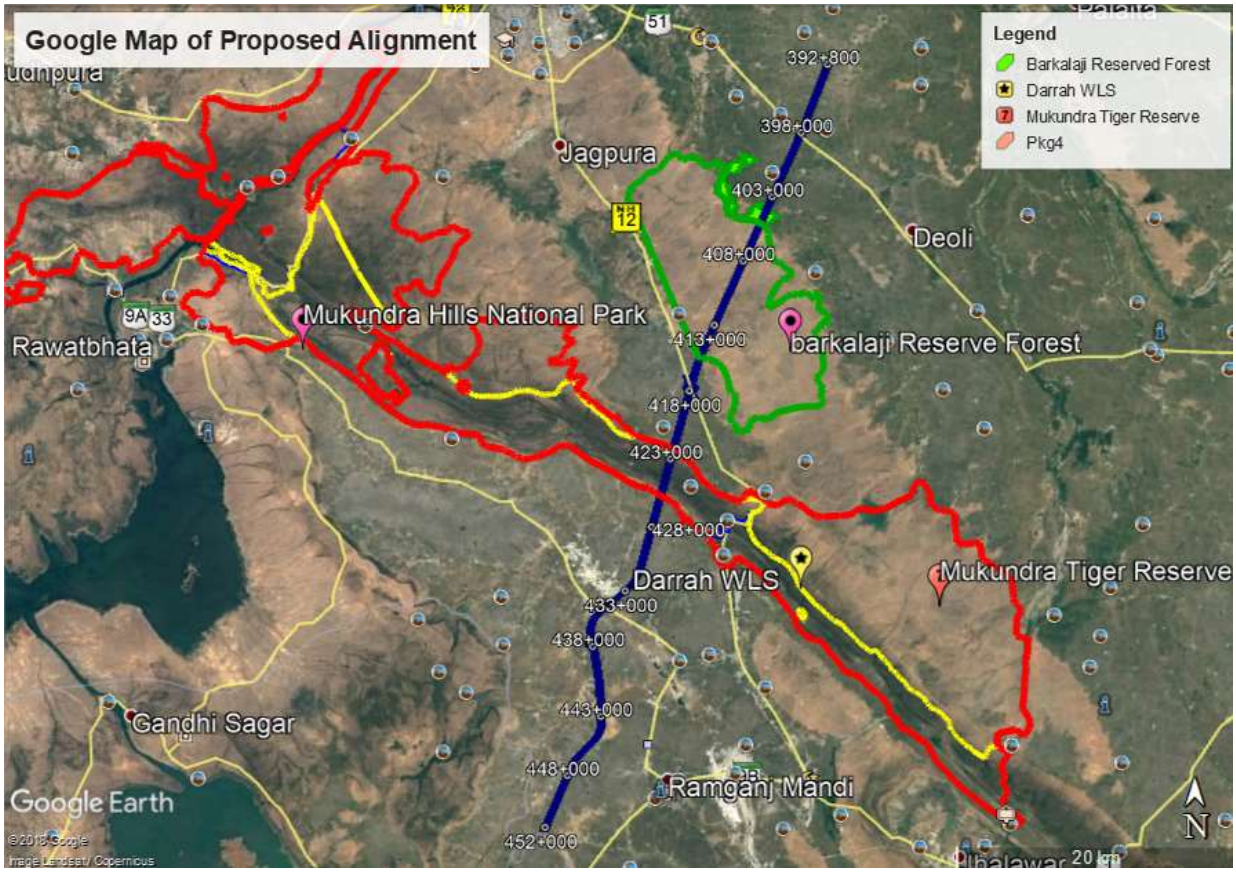

Figure 1-1: Location Map of Proposed Highway ((blue colour marked on (Google Earth)

1.1 Salient Features of the Proposed Project:

S. No.	Particular	Details
1	Project Name	Development of 8 lane (Greenfield highway) from Banda Hera village (Ch. Km 392.800) to Moondiya village (Ch. Km 452.425) Section of NH-148 N (Total length 59.425 Km), Under Bharatmala Priyojana Lot-4/Pkg-4 in the state of Rajasthan
2	Nature of Project	8-lane, Access-controlled Greenfield Highway
3	Location of project stretch	The proposed green field section starts from close vicinity of Banda Hera village (Ch. Km 392.800) and ends near Moondiya village (Ch. Km 452.425) Section of NH-148 N (Total length 59.425 Km) in Kota district of state Rajasthan)
4	Geographical Coordinates	25° 6'29.90"N, 76° 3'28.39"E to 24°36'58.25"N, 75°51'25.65"E
5	Land details	Proposed highway follows plain, rolling and hilly terrain.
6	Nearest railway station	Ravtha Road Railway Station-at a distance of 1.5 km from the proposed road
7	Nearest State highway / National highway	Proposed alignment is crossing SH-9A, SH-51 and NH-12
8	Nearest airport	Kota Airport- Approx. 22.0 km
9	Seismic Zone	Proposed alignment falls under Seismic Zone II, which is considered to be low damage risk zone. According to the rating, Zone II is considered to be most stable zone, whereas Zone - V least stable zone. Proposed alignment is located in High Damage Risk Zone (Vb = 47 m/s) as per Wind and Cyclone Hazard Classification of India.

2 Project Location

The proposed Project alignment start from close vicinity of Banda Hera village (Ch. Km 392.800) (25°06'29.90"N, 76°03'28.39"E) and traverses entirely greenfield through plain, rolling and hilly terrain at places and ends near Moondiya village (Ch. 452.425 Km) (24°36'58.25"N, 75°51'25.65"E) of Kota district in Rajasthan state. This project is an 8-lane highway for a length of 59.425 km. The location of the Project stretch is shown in Figure below.

Location of the Project stretch is shown in below Figure.

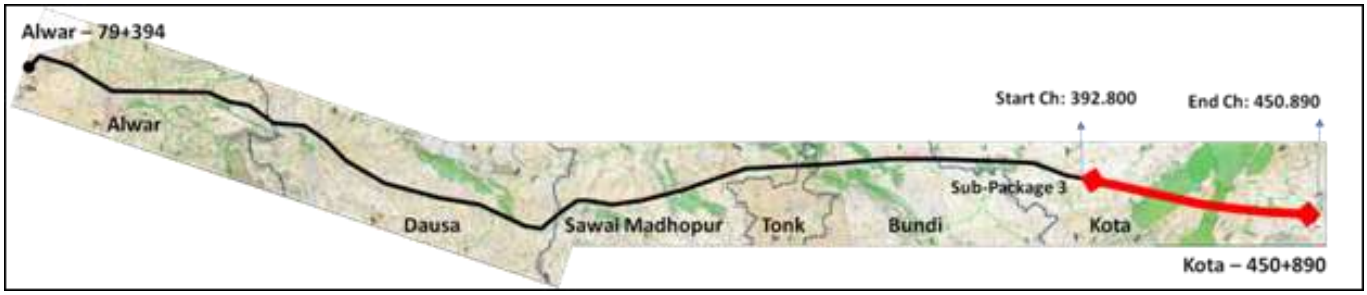

Figure 2-1: Location Map of Proposed Highway

3 Project Profile

The Project entails 8 lane access-controlled green-field highway section of NH-148N. The proposed stretch of the project starts from Ch. km 392.800 near Banda Hera village and ends near Moondiya Village at Ch. km 452.425 in Kota district of Rajasthan state. This section covers 59.425 km length in Kota district of state of Rajasthan. The Geo-graphical Coordinates of start and end points are given in Table below.

Table 3-1: Project Coordinates

Description	Coordinates
Starting point	25°06'29.90"N, 76°03'28.39"E
Terminating point	24°36'58.25"N, 75°51'25.65"E

Total length of the project is about 59.425 km with 100m ROW (Right of Way) has been considered for proposed alignment.

3.1 Project Design Features

The Project highway is 8 lane green-field highway and follows expressway standards as per IRC SP 99-2013. The various aspects of design that have been considered in the development of design for the proposed highway are brought out in this section. It mainly consists of geometrics of expressway, interchange design, junction design, cross sections, drainage design, pavement design, structure design for culverts, bridges, flyover, VUP's, LVUP's, SVUP's, and interchanges.

Design Speed

The project corridor passes through plain and rolling terrain. The adopted design speed is 120kmph throughout the stretch. Design speed for various terrains given below table:

Table 3-2: Design Speed

Nature of Terrain	Cross Slope of Ground	Design Speed (Kmph)
		Ruling
Plain, Rolling & Hilly	Upto 25%	120

Right of Way

The recommended minimum Right of Way is given in below table:

Table 3-3: Recommended Minimum Right of Way

Section	Right of Way (ROW) in m
Rural Section	100
Rural sections passing through semi urban areas	100

At interchanges, toll booth, highway amenities, truck lay byes additional land shall be acquired.

Cost

The total civil cost of the project is about INR 1200.00 Cr.

Tunnel

The Project alignment passing through the Mukundra Hills Tiger Reserve from Chainage km 422+200 to km 425+750 (Length about 3.550 km). The proposed highway alignment is crossing two hillocks and a valley portion in between. In order to obviate the needless bisection of the MHTR, an underground tunnel is suggested by MoEFCC EAC Committee in the above section. Moreover, in order to avoid disturbance in the vicinity of the tiger reserve, both end faces of the tunnel may be

placed about 500m away from the boundary of protected area of Critical Tiger Habitat (Core of Mukundra Hills Tiger Reserve) by implying "Cut & Cover Technique.

4 Protected Areas along the Project:

Rajasthan is noted for its National Park, Wildlife Sanctuary and Tiger Reserves. There are 5 National Park and 26 Sanctuaries in the state. The Darrah wildlife Sanctuary came into existence in 1955 the area has recently been declared as Mukundra National Park in 2013 and is further upgraded as the Third Tiger Reserve, Mukundra Hills Tiger Reserve of Rajasthan (MHRT). Darrah is the part of this National Park and Tiger Reserve.
MHTR was notified as a tiger reserve in the year 2013, which encompasses the areas of Mukandra National Park & Dara Sanctuary, Jawahar Sagar Sanctuary and part of Chambal Sanctuary. It became the third tiger reserve of the state of Rajasthan.

Earlier, Mukundra National Park was also known as Darrah wildlife Sanctuary. Darrah was declared a (Protected area) wildlife sanctuary in 1955. The total area of the sanctuary is about 250 km2. The Darrah wildlife sanctuary was declared as a National park (Mukundra Hills (Darrah) National Park) in 2004. The entire stretch of MHTR has a very good quality of vegetation of Anogeissus pendula (Kala Dhok), Khair (Acacia catechu), Ber (Zizyphus mauratiana), Palas Butea monosperma, Gurjan Lannea coramendlica and Kadaya Sterculia urens. The wild animals found in this tiger reserve are Panthers, Sloth bears, Wolfs, Chinkaras, Spotted deers, Wild boars, Sambars, Blue Bulls (Nilgai), Jackals, Hyenas, Jungle cat & Foxes etc. Many species of birds and reptiles are also found. This part of the National Chambal Sanctuary has a large population of Otters, Gharials and Crocodiles and various types of fishes.

4.1 Darrah Wildlife Sanctuary:

Darrah wildlife sanctuary located about 56 kilometres away from the city of Kota and situated at the edge of Malva plateau at 23^{o} 45' to 25^{o} 53' N latitudes and 75^{o} 9' to 77^{o} 26' E longitude of in Rajasthan state. This region is quite unique not only because of its historical, cultural and geographical heritage but also to its perennial and seasonal rivers and water reservoirs. As well as the thick and dense forest that supports the growth and development of different species of various plant groups. The climate of this area is dry or semi humid.

Recently, three tigers had been relocated from RTR and released in the areas of Mukandra National Park & Dara Sanctuary. One free ranging male tiger from the source population in RTR has used the linking corridors between RTR and MHTR and has reached on 9th February 2019 in Mashalpura area of Darrah range and is presently located there.

This sanctuary is quite rich when it comes to the fauna species. The place is a safe habitat for various mysterious animals like wild boars, Nilgai, sloth bears, deer, and cheetah. The sanctuary takes pride in having a high number of wolves and antelopes in the region. Other animal inhabitants of the sanctuary are chinkaras and leopards. A good number of reptiles and birds are also present in the sanctuary.

Apart from a good number of animal species, the Darrah Wildlife Sanctuary also houses many unique flora species like trees, flowers, medicinal herbs, etc.

Proposed alignment passing through Darrah Wildlife sanctuary Chainage km 422+200 to km 425+750 (Length about 3.550 km).

5 BIO-DIVERSITY STUDY

5.1 Objectives

In order to understand the composition of the vegetation, most of the plant species were identified in the field itself whereas the species that could not be identified a herbarium specimen were collected along with their photographs for identification later with the help of respective forest department and available published literature and floras of the region.

5.2 Methodology

Community analysis was carried out during post monsoon season. In every study sites, 10 quadrates of 10m X 10m (100 sq.m.) size were randomly laid to study tree species. The circumference of all the adult individuals [(≥30 cm circumference at breast height (CBH)] was measured with Freeman's tape. All individuals were enumerated and measured by species for each 10 m x 10 m quadrates, the number of species and density were recorded.

The study of communities was carried out by using qualitative characteristics and quantitative characteristics. Qualitative characteristic mainly involved presence/absence of the species, genera and family. This showed the community structures, composition and other characteristic can be readily described by visual observation without actual measurements. The quantitative analysis involved the structure and composition of vegetation across vegetation types and compared in terms of frequency, density, abundance and basal area of tree species.

The density, frequency abundance and basal area of tree species, were determined as per Curtis and McIntosh (1950).

(a) Density

Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrates is divided by the total number of quadrates studied. Density is calculated by the equation:

$$\textbf{Density} = \frac{\text{Total number of individuals of a species in all quadrates}}{\text{Total number of quadrates studied}}$$

(b) Frequency (%)

This term refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage occurrence. It was studied by sampling the study area at several places at random and recorded the name of the species that occurred in each sampling units. It is calculated by the equation:

$$\textbf{Frequency (\%)} = \frac{\text{Number of quadrates in which the species occurred}}{\text{Total number of quadrates studied}} \times 100$$

(c) Abundance

It is the study of the number of individuals of different species in the community per unit area. By quadrates method, samplings are made at random at several places and the number of individuals of each species was summed up for all the quadrates divided by the total number of quadrates in which the species occurred. It is represented by the equation:

$$\textbf{Abundance} = \frac{\text{Total number of individuals of a species in all quadrates}}{\text{Total number of quadrates in which the species occurred}}$$

(d) Importance Value Index

This index is used to determine the overall importance of each species in the community structure. In calculating this index, the percentage values of the relative frequency, relative density and relative dominance are summed up together and this value is designated as the Importance Value Index or IVI of the species (Curtis, 1959).

(e) Relative density

Relative density is the study of numerical strength of a species in relation to the total number of individuals of all the species and can be calculated as:

Relative density = Number of individual of the species X 100 / Number of individual of all the species

(f) Relative frequency

The degree of dispersion of individual species in an area in relation to the number of all the species occurred.

Relative frequency = Number of occurrence of the species X 100 / Number of occurrence of all the species

(g) Relative dominance.

Dominance of a species is determined by the value of the basal cover. Relative dominance is the coverage value of a species with respect to the sum of coverage of the rest of the species in the area.

(h) Relative dominance = Total basal area of the species X 100 / Total basal area of all the species

The total basal area was calculated from the sum of the total diameter of immerging stems. In trees, poles and saplings, the basal area was measured at breast height (1.5m) and by using the formula $\pi r2$.

The forest communities were identified on the basis of IVI values of trees. The single tree species representing >50% of the total IVI was designated as a single species dominated community, whereas two or more species contributing 50 or >50% of the total IVI were named as a mixed community.

(i) Species diversity and species Evenness index

Species diversity and species evenness index is calculated by using the Shannon-Wiener Diversity Index formula and Evenness Index formula, respectively.

Shannon-Wiener Diversity Index (H) = $- \Sigma$ pi ln (pi)

Where, pi is the proportion of total number of species made up of the species.

Evenness index (E): H/ ln S

Where, H is Shannon-Wiener Diversity Index of general diversity and S is number of species.

5.3 Survey Sites

To know the status of plant diversity of the study area, qualitative and quantitative assessment has been carried out at 5 different locations all along the proposed alignment.

During the survey 72 plant species from 37 families were recorded in which Mimodaceae, Moraceae and Rubiaceae are dominant families followed by Boraginaceae, Caesalpiniaceae and Combretaceae all along the study area.

The sampling locations showing on Google map in Figure below.

Figure 5-1: Vegetation sampling locations

5.4 Species Diversity Index (H') & Evenness Index (E)

To understand species variation in community, diversity and evenness Index was calculated. Biodiversity assessment results showing that maximum diversity recorded at sampling site 2 followed by sampling site 3 and 1. Evenness index for trees were recorded maximum sampling site 4 and 5 respectively.

Table 5-1: Density, Frequency and Species Diversity Index (H') & Evenness Index (E)

Sampling site	Frequency	Density	Shannon-Wiener Diversity Index	Evenness
Sampling site 1	160	220	1.71	0.95
Sampling site 2	110	110	1.85	0.95
Sampling site 3	120	140	1.81	0.93
Sampling site 4	70	90	1.37	0.99
Sampling site 5	100	120	1.59	0.99

6 Flora and Fauna in the Study Area

6.1 Floral Diversity Assessment

The floral prosperity of Rajasthan state is affluent and diverse. Most of the forests in the state are in the hilly regions i.e. in Rajsamand, Udaipur, Baran, Kota, Chittorgarh, Sirohi, Sawai Madhopur, Alwar, Bundi, Banswara and Jhalawar districts.

The recorded forest area of the state is 32,737 m2, which is 9.57% of its geographical area. The Reserved, Protected and Unclassified forests are 38.11%, 55.64% and 6.25% respectively. Project area falls entirely under Kota district of Rajasthan which comprise of Thick natural forests seen in sheltered patches, typically restricted to different wild-life sanctuaries and national parks.

Table 6-1: The Reserved, Protected and Unclassified forests in project influence districts

S.no.	Name of District	Total forest cover	Reserved forests	Protected forests	Unclassified forests
1	Kota	1,310.04	874.83	412.58	22.63

The forests of Kota division can be classified into 2 extensive forest categories according to Champion and Seth forest classification 1968.

- **Tropical Thorn Forests**

The major species of this type of forests are *Acacia leucophloea*, *Prosopis cineraria*, *Capparis aphylla*, *Zizyphus* spp., *Flacourtia* spp. and *Acacia nilotica*, etc.

- **Tropical Dry Deciduous Forests**

The chief species of this type are *Anogeissus latifolia*, *Anogeissus pendula*, *Terminalia tomentosa*, *Acacia catechu*, *Terminalia arjuna*, *Terminalia balerica*, *Dendrocalamus strictus*, *Boswellia serrata* and *Lanea grandis*.

Table 6-2: List of Flora reported in the study area

S. No.	Family Name	Scientific Name	S. No.	Family Name	Scientific Name
1	Anacardiceae	*Magnifera indica*	37	Mimosaceae	*Acacia senegal*
2	Anonaceae	*Plyalthia longifolia*	38	Mimosaceae	*Acacia leucophloea*
3	Anonaceae	*Anona squamosa*	39	Mimosaceae	*Leucoena leucocephala*
4	Apocynaceae	*Wrightia tinctoria*	40	Mimosaceae	*Albizzia procera*
5	Apocynaceae	*Halarrhena antidysenterica*	41	Mimosaceae	*Albizzia lebek*
6	Apocynaceae	*Wrightia tomentosa*	42	Mimosaceae	*Prosopis juliflora*
7	Apocynaceae	*Manikara hexandra*	43	Moraceae	*Ficus bengalensis*
8	Bignoniaceae	*Stereaspermum suavealens*	44	Moraceae	*Ficus glomerata*
9	Bignoniaceae	*Tercomelia undulata*	45	Moraceae	*Ficus tomentosa*
10	Biscaceae	*Flacourtia indica*	46	Moraceae	*Ficus rumphii*
11	Boraginaceae	*Cordia dichotoma*	47	Moraceae	*Morus alba*
12	Borginaceae	*Ehretia laevis*	48	Moraceae	*Morus indica*
13	Borginaceae	*Cordia gharaf*	49	Moringaceae	*Moringa concanensis*
14	Bruseraceae	*Commiphora wrightii*	50	Myrtaceae	*Syzygium cumini*
15	Burseraceae	*Boswella serrata*	51	Myrtaceae	*Eucalyptus globulus*
16	Caesalpiniaceae	*Cassia fistula*	52	Palmae	*Pheonix sylvestris*
17	Caesalpiniaceae	*Tamarindus indica*	53	Palmae	*Pheonix acaulis*
18	Caesalpiniaceae	*Bauhinia racemosa*	54	Papilionaceae	*Dalbergia lanceclaria*
19	Caesalpiniaceae	*Bauhinia variegota*	55	Papilionaceae	*Pongamia pinnata*
20	Capparidaceae	*Crataeva raligicea*	56	Papilionaceae	*Dalbergia sissoo*
21	Celastraceae	*Maytenus amarginata*	57	papilonaceae	*Butea monosperma*
22	Combretaceae	*Anogeissus latifolia*	58	Rhamnaceae	*Zizyphus mauritiana*
23	Combretaceae	*Anogeissus pendula*	59	Rhamnaceae	*Zizyphus glabarrima*
24	Combretaceae	*Anogeissus sericea*	60	Rubiaceae	*Mitrogyna parvifolia*

S. No.	Family Name	Scientific Name	S. No.	Family Name	Scientific Name
25	Combretaceae	*Terminalia arjuna*	61	Rubiaceae	*Gardenia turgida*
26	Ebenaceae	*Diospyros cordifolia*	62	Rubiaceae	*Hesperethusa crenulata*
27	Euphorbiaceae	*Emblica afficinalis*	63	Rubiceae	*Morinda tinctoria*
28	Euphorbiaceae	*Bridelia squamosa*	64	Rutaceae	*Aegle marmelos*
29	Gimarubaceae	*Ailanthus excelsa*	65	Rutaceae	*Feronia limonia*
30	Malvaceae	*Bombex ceiba*	66	Salvadoraceae	*Salvadra aleoides*
31	Meliaceae	*Melia azadiracht*	67	Sapindaceae	*Schleichera aleasa*
32	Meliaceae	*Azadrachea indica*	68	Simarubacea e	*Balanites aegyptica*
33	Mimodaceae	*Acacia nilotica*	69	Sterculiaceae	*Sterculia urens*
34	Mimosaceae	*Dichrostrachys cinerea*	70	Tamaricaceae	*Tamarix aphylla*
35	Mimosaceae	*Acacia catechu*	71	Tamaricaceae	*Tamarix dioca*
36	Mimosaceae	*Prosopis cineraria*	72	Urticaceae	*Haloptelea integrifolia*

Source: *Forest working plan Kota and primary site survey*

6.2 Faunal Diversity Assessment

Finding the presence of mammals, Reptiles and Birds by using conventional methods like transect walk or plot search during the day. Mostly trails were used to survey the wild animals in the study area. The survey of wild animals conducted by using 10x50 prismatic field binocular and hand held GPS 72 in different habitat. The presence of wildlife was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the catchment and study area. In addition to these, secondary sources mainly literature was also referred for preparing checklists and other analysis in the study of animals in the region.

The methodology followed for the current survey is as follows:

i. Direct sighting and indirect evidences such as calls, signs and trophies of mammals were recorded along the survey routes taking aid from Prater (1980).
ii. Interviews of local villagers for the presence and relative abundance of various animal species within each locality.
iii. Data collection on habitat condition, animal presence by direct sighting and indirect evidences.
iv. Checklist of birds was prepared based upon Ali & Ripley (1983) and Flaming et al. (1984) were used as field guides for the birds. In the survey stretches also recorded other animal evidences and general composition of the habitats.

a. Mammals:

Domesticated animals mainly constitute the faunal population within the project area. The forest department have reported the presence of some wild & endangered animals in the nearby forest areas; however, no endangered species were recorded during the site reconnaissance and survey. Proposed alignment is passing through Mukundra Hills National Park / Mukundra Tiger Reserve / Darrah Wildlife Sanctuary.

A list of wild mammals has been prepared by the help of secondary literature and consultation with villagers provided below.

Table 6-3: List of Mammals reported in the study area

S. No.	Family	Common Name	Scientific Name	IUCN 3.1	WL Schedule 1972
1	Cercopithecidae	Rhesus macaque	*Macaca mulatta*	LC	II
2	Cercopithecidae	Common Langur	*Pressbytis entellus*	LC	II
3	Felidae	Leopard	*Panthera pardus*	VU	I
4	Felidae	Jungle Cat	*Felis chaus*	LC	II
5	Herpestidae	Common Mongoose	*Herpestes edwardsii*	LC	II
6	Canidae	Jackal	*Canis aureus*	LC	II
7	Canidae	Indian Fox	*Vulpes bengalensis*	LC	II
8	Hyaenidae	Striped Hyaena	*Hyaena hyaena*	NT	III
9	Viverridae	Common Palm Civet	*Paradoxurus hermaphrodites*	LC	III
10	Mustelidae	Smooth Indian Otter	*Lutra persicillata*	VU	II
11	Bovidae	Blue Bull	*Boselaphus tragocamelus*	LC	III
12	Cervidae	Chital	*Axis axis*	LC	III
13	Cervidae	Sambhar	*Cervus unicolor*	vu	III
14	Suidae	Indian Wild Boar	*Sus scrofa*	LC	III
15	Sciuridae	Five Striped palm Squirrel	*Funambulus pennati*	NA	IV
16	Muridae	Common House Rat	*Mus booduga*	LC	V
17	Hystricidae	Indian Porcupine	*Hystrix indica*	LC	II
18	Leporidae	Indian Hare	*Lepus nigricollis*	LC	IV
19	Soricidae	Grey Musk Shrew	*Suncus murinus*	LC	NA
20	Pteropodidae	Fruits Bat	*Ptetopus giganteus*	LC	V
21	Bovidae	Black Buck	*Antilope Cervicapra*	LC	I
22	Bovidae	Indian Gazelle	*Gazella Benneti*	LC	I
23	Felidae	Tiger	*Panthera Tigris*	EN	I
24	Canidae	Wild Dog	*Cuon alpines*	NA	II
25	Canidae	Indian Wolf	*Canis lupus pallipes*	LC	I
26	Ursidae	Sloth Bear	*Melursus ursinus*	VU	I

Source: *Forest working Plan Kota division and primary site survey*

b. Avifauna

During the survey, avifaunal species were directly sighted in their natural habitat composed by small bushy vegetation, bare stone grounds and forest area near Mukundra Hills National Park / Mukundra Tiger Reserve / Darrah Wildlife Sanctuary and close to human habitation. The study of avifaunal survey has revealed that large portion of bird species are comprised of resident birds in the project study area. House sparrow, Grey wagtail, Red vented, bulbul, House crow, Common myna, Black Drongo, House swift, Spotted dove, Common Peafowl and Cattle egret are commonly seen in the study area. On the basis of primary survey and secondary data an inventory of avifauna has been prepare and listed below.

Table 6-4: List of Avifauna reported in the study area

S. No.	Family	Common Name	Scientific Name	IUCN 3.1	WL Schedule 1972
1	Ardeidae	Grey Heron	*Ardea cinerea*	LC	NA
2	Ardeidae	Pond Heron	*Ardea intermedia*	LC	NA
3	Ardeidae	Cattle Egret	*Bubulcus ibis*	LC	IV
4	Ardeidae	Large Egret	*Ardea alba*	LC	IV
5	Ardeidae	Smaller Egret	*Ardea intermedia*	LC	IV
6	Ardeidae	Little Egret	*Egretta garzetta*	LC	IV
7	Ardeidae	Night Heron	*Nycticorax nycticorax*	LC	NA
8	Ardeidae	Purple Heron	*Ardea purpurea*	LC	NA
9	Ardeidae	Little Bittern	*Ixobrychus minutes*	LC	IV
10	Accipitridae	Black winged Kite	*Elanus caeruleus*	LC	NA
11	Accipitridae	Pariah Kite	*Milvus migrans*	LC	NA
12	Accipitridae	Brahmini Kite	*Haliastur Indus*	LC	NA
13	Accipitridae	Shikra	*Accipiter badius*	LC	NA
14	Accipitridae	Tawny Eagle	*Aquila rapax*	VU	NA
15	Accipitridae	King Vulture	*Sarcogyps calvus*	CE	III
16	Accipitridae	Indian long billed Vulture	*Gyps fulvus*	LC	III
17	Accipitridae	Scavenger Vulture	*Neophron percnopterus*	EN	III
18	Falconidae	Kestrel	*Falco tinnunculus*	LC	NA
19	Pandionidae	Osprey	*Pandion haliaetus*	LC	III
20	Phasianidae	Grey Quail	*Coturnix coturnix*	LC	IV
21	Phasianidae	Common Peafowl	*Pavo cristatus*	LC	III
22	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	LC	NA
23	Charadriidae	Spur winged Plover	*Vanellus spinosus*	LC	IV
24	Charadriidae	Yellow wattled Lapwing	*Vanellus malabaricus*	LC	NA
25	Charadriidae	Little ringed Plover	*Charadrius dubis*	NA	IV
26	Charadriidae	Kentish Plover	*Charadrius alexandrinus*	LC	IV
27	Scolopacidae	Common Redshank	*Tringa tetanus*	LC	NA
28	Scolopacidae	Green Shank	*Tringa nebutaria*	LC	NA
29	Scolopacidae	Common Sandpiper	*Tringa hypoleucos*	LC	IV
30	Scolopacidae	Black tailed Godwit	*Limosa limosa*	NT	NA
31	Scolopacidae	Spooted Redshank	*Tringa erythropus*	LC	NA
32	Scolopacidae	Fantail Snipe	*Gallinago gallinago*	LC	IV
33	Scolopacidae	Little Stint	*Calidris minuta*	LC	NA
34	Recurvirostridae	Black winged Stint	*Himantopus himantopus*	LC	NA

S. No.	Family	Common Name	Scientific Name	IUCN 3.1	WL Schedule 1972
35	Burhinidae	Stone Curlew	*Burhinus oedicnemus*	LC	IV
36	Burhinidae	Great stone Plover	*Esacus racurvirostria*	NT	IV
37	Glareolidae	Small Indian Pratincole	*Glareola lacteal*	LC	NA
38	Laridae	Indian river Tern	*Sterna aurantia*	NT	NA
39	Laridae	Black bellied Tern	*Sterna acuticauda*	EN	NA
40	Laridae	Little Tern	*Sternula albifrons*	LC	NA
41	Columbidae	Blue rock Pigeon	*Columba livia*	LC	IV
42	Columbidae	Indian ring Dove	*Streptopelia decaocto*	LC	IV
43	Columbidae	Red turtle Dove	*Streptopelia tranquebarica*	LC	IV
44	Columbidae	Spotted Dove	*Spilopelia chinensis*	LC	IV
45	Columbidae	Little brown Dove	*Streptopelia senegalensis*	LC	IV
46	Psittacidae	Rose ringed Parakeet	*Psittacula krameri*	LC	IV
47	Psittacidae	Blossom headed Parakeet	*Psittacula cyanocephala*	LC	IV
48	Cuculidae	Palintive Cuckoo	*Cacomantis merulinus*	LC	IV
49	Cuculidae	Pied crested Cuckoo	*Clamator jacobinus*	LC	IV
50	Cuculidae	Koel	*Eudynamys scolopacea*	LC	NA
51	Cuculidae	Crow Pheasant	*Centropus sinensis*	LC	IV
52	Strigidae	Brown Fish Owl	*Bubo zeylonensis*	NA	IV
53	Strigidae	Spotted owlet	*Athene brama*	LC	IV
54	Caprimulgidae	Common Indian Nightjar	*Caprimulgus asiaticus*	LC	NA
55	Apodidae	House Swift	*Apus affinis*	LC	III
56	Alcedinidae	Pied Kingfisher	*Ceryle rudis*	LC	IV
57	Alcedinidae	Small blue Kingfisher	*Alcedo atthis*	LC	IV
58	Alcedinidae	White breasted King fisher	*Halcyon smyrnensis*	LC	IV
59	Meropidae	Green bee Eater	*Merops orientalis*	LC	NA
60	Meropidae	Blue tailed bee Eater	*Merops phililinus*	LC	NA
61	Coraciidae	Indian Roller	*Coracias benghalensis*	LC	IV
62	Upupidae	Hoopoe	*Upupa epops*	LC	NA
63	Bucerotidae	Common grey Hornbill	*Ocyceros birostris*	LC	III
64	Megalaimidae	Coppersmith	*Megalaima haemacephala*	LC	NA
65	Megalaimidae	Large green Barbet	*Megalaima zeylanica*	NA	IV
66	Picidae	Golden Backed Woodpecker	*Dinopium benghalensis*	LC	IV

S. No.	Family	Common Name	Scientific Name	IUCN 3.1	WL Schedule 1972
67	Picidae	Yellow-crowned Woodpecker	*Leiopicus mahrattensis*	LC	IV
68	Pittidae	Indian Pitta	*Pitta brachyuran*	LC	IV
69	Alaudidae	Red winged bush Lark	*Mirafra erythroptera*	LC	IV
70	Alaudidae	Ashy crowned finch Lark	*Eremopterix grisea*	LC	IV
71	Alaudidae	Rufous tailed finch Lark	*Ammomanes phoenicura*	LC	IV
72	Alaudidae	Crested Lark	*Galerida cristata*	LC	IV
73	Hirundinidae	Common Swallow	*Hirundo rustica*	LC	IV
74	Hirundinidae	Wire tailed Swallow	*Hirundo smithii*	LC	IV
75	Laniidae	Grey Shrike	*Lanius excubitor*	LC	NA
76	Laniidae	Bay backed Shrike	*Lanius vittalus*	LC	NA
77	Laniidae	Rufous backed Shrike	*Lanius schach*	LC	NA
78	Laniidae	Brown Shrike	*Lanius cristatus*	LC	NA
79	Monarchidae	Paradise Flycatcher	*Terpsiphone paradise*	LC	IV
80	Dicruridae	Black Drongo	*Dicrurus adsimilis*	LC	IV
81	Dicruridae	White bellied Drongo	*Dicrurus caerulescens*	LC	IV
82	Sturnidae	Brahminy Myna	*Sturnus pagodarum*	LC	IV
83	Sturnidae	Pied Myna	*Gracupica contra*	LC	IV
84	Sturnidae	Common Myna	*Acridotheres tristis*	LC	IV
85	Sturnidae	Bank Myna	*Acridotheres ginginianus*	LC	IV
86	Corvidae	Indian Tree Pie	*Dendrocitta vagabunda*	LC	IV
87	Corvidae	House Crow	*Corvus splendens*	LC	V
88	Corvidae	Jungle Crow	*Corvus macrorhynchos*	LC	V
89	Vangidae	Common wood Shrike	*Tephrodornis pondicerianus*	LC	NA
90	Vangidae	Large cuckoo Shrike	*Coracina macei*	LC	NA
91	Aegithinidae	Common Iora	*Aegithina tiphia*	LC	IV
92	Pycnonotidae	Red vented Bulbul	*Pyncnonotus cafer*	LC	IV
93	Pycnonotidae	White cheeked Bulbul	*Pycnonotus leucogenys*	LC	IV
94	Leiothrichidae	Common Babbler	*Turdoides caudate*	LC	IV
95	Leiothrichidae	Large grey Babbler	*Turdoides malcolmi*	LC	IV
96	Cisticolidae	Tailor Bird	*Orthotomus sutorius*	LC	NA
97	Muscicapidae	Magpie Robbin	*Copsychus saularis*	LC	NA
98	Muscicapidae	Black Redstart	*Phoenicurus ochruros*	LC	NA
99	Muscicapidae	Indian Robin	*Saxicoloides fulicata*	LC	NA

S. No.	Family	Common Name	Scientific Name	IUCN 3.1	WL Schedule 1972
100	Motacillidae	Yellow Wagtail	*Motacilla flava*	LC	NA
101	Motacillidae	Grey Wagtail	*Motacilla cinerea*	LC	NA
102	Motacillidae	Large pied Wagtail	*Motacilla maderaspatensis*	LC	NA
103	Deceidae	Thick billed Flower pecker	*Dicaeum agile*	LC	IV
104	Deceidae	Tickell's Flower pecker	*Dicaeum erythrorhynchos*	LC	IV
105	Nectariniidae	Purple Sunbird	*Nectarinia asiatica*	LC	IV
106	Passeridae	House Sparrow	*Passer domesticus*	LC	NA
107	Ploceidae	Baya	*Ploceus philippinus*	LC	IV
108	Emberizidae	Crested Bunting	*Melophus lathami*	LC	IV

Source: *Forest working plan SWM, Bundi & Kota and primary site survey*

c. Herpeto-fauna

Herpeto-fauna were sampled on the same transect marked for mammals and Birds. The sampling was carried in the study area by constrained Visual Encounter Rates (VES) method. A list of herpeto fauna reported in study area is prepared on the basis of primary survey and secondary data collected and listed below.

Table 6-5: List of Herpeto-fauna reported in the study area

S. No	Family	Common Name	Scientific Name	IUCN 3..1	WL Schedule 1992
1	Elapidae	Banded Krait	*Bungarus fasciatus*	LC	IV
2	Elapidae	Cobra	*Naja naja*	LC	II
3	Elapidae	Common Krait	*Bungarus caeruleus*	NA	IV
4	Pythonidae	Burmese Python	*Python bivittatus*	VU	II
5	Colubridae	Rat Snake	*Ptyas mucosus*	NA	II
6	Viperidae	Russell's Viper	*Piper russelli*	LC	II
7	Chamaeleonidae	The Indian Chameleon	*Chamaeleo zeylanicus*	LC	II
8	Geoemydidae	Indian Sawbaok	*Pangshura tecta*	LC	NA
9	Gekkonidae	Northern house Gecko	*Hemidactylus flaviviridis*	NA	NA
10	Eublepharidae	Far tailed gecko	*Eublepharis macularivl*	LC	NA
11	Agamidae	Common garden lizard	*Calotes versicolor*	NA	NA
12	Scincidae	Common Skink	*Mabuya carinata*	LC	NA
13	Boidae	Johr's earth Boa	*Eryz johnii*	LC	NA
14	Pythonidae	Indian Python	*Python molurus*	VU	II
15	Colubridae	green Keelback	*Macropisthodon plumbicolor*	NA	NA

S. No	Family	Common Name	Scientific Name	IUCN 3..1	WL Schedule 1992
16	Elapidae	Common Indian Krait	*Bungarus caeruleus*	NA	IV
17	Agamidae	Spiny tailed Lizard	*Uromastyx hardwickii*	NA	NA

Source: *Forest working Plan Kota division and primary site survey*

6.3 Mammals Recorded in the Study:

Domesticated animals mainly constitute the faunal population within the project area. The forest and wildlife department (Kota) have reported the presence of some wild & endangered animals in Darrah wildlife sanctuary and its nearby forest areas, however no such species were recorded during the site reconnaissance and survey.

7 Threats to Biodiversity & Wildlife due to Construction of proposed Highway project

Linear infrastructure is important for society because it provides connectivity for people. However, linear infrastructure also exerts significant negative effects on adjacent habitats, wildlife populations, communities and ecosystems. Transportation infrastructure also undermines ecological processes through the fragmentation of wildlife populations, restriction of wildlife movements, and the disruption of gene flow and Meta population dynamics. But in Darrah Wildlife sanctuary area underground tunnel of 3.5 km proposed which will reduce the impact on wildlife.

8 Wildlife Conservation Plan

Biodiversity is part of our daily lives and livelihood, and constitutes resources upon which families, communities, nations and future generations depend. The fragmentation, degradation, and loss of habitats pose serious threat to biological diversity. These losses are irreversible and pose a threat to our own well-being, considering our dependence on food crop and medicines and other biological resources.

The main objective of Conservation Management plan is sustainable use of natural resources which involves scientific management of natural wealth vis- à-vis developmental activities is likely to affect these resources. Therefore, Conservation Management plan has been formulated for the conservation and management of wildlife.

The recommendations are designed to promote long term stand level maintenance and recruitment of important structural attributes such as: wildlife, diversity of species, special or unique habitats for floral and faunal wealth, riparian areas and wetlands, coarse woody debris, horizontal and vertical structural diversity, Biodiversity management is considered as a difficult task as it refers to diversity at all levels like genetic, species and community.

The formulation of conservation plan for a developmental Project is one of the steps towards the environment conservation. Human activities like agricultural expansion, **road construction,** urbanization, and developmental activities are supposed to be major threats to biodiversity and wildlife, therefore, the most effective and efficient mechanisms for conserving biodiversity is to prevent further destruction of degradation of habitats.

Wildlife conservation plans has been prepared with help of consultation with forest & wildlife officials, primary and secondary data collected during the survey activities.

9 Status of Biodiversity in the proposed Project study area

The terrestrial flora of the study area i.e. buffer zone (10 km radial distance) from the project site can be categorized as agriculture vegetation, social forestry plantation, Agro-forestry plantation, natural/forest vegetation and waterbodies. Detail of Schedule- I species reported in the study area given below.

Total 26 mammal species have been reported from project area, in which 6 species comes under schedule-I under wildlife protection act 1972. Some general behavior and biology of encountered schedule-I species are discussed below which help in making the conservation and management plan successfully. List of schedule-I mammals species reported are given below.

Table 9-7: List of schedule -I mammal's species

S. No.	Family	Common Name	Scientific Name	IUCN 3.1	WL Schedule 1972
1	Felidae	Leopard	*Panthera pardus*	VU	I
2	Bovidae	Black Buck	*Antilope Cervicapra*	LC	I
3	Bovidae	Indian Gazelle	*Gazella Benneti*	LC	I
4	Felidae	Tiger	*Panthera Tigris*	EN	I
5	Canidae	Indian Wolf	*Canis lupus pallipes*	LC	I
6	Ursidae	Sloth Bear	*Melursus ursinus*	VU	I

10 INDIAN LEOPARD (Panthera pardus)

Habitat:
Leopards inhabit a variety of terrain. They are most populous in mesic woodlands, grassland savannas, and forests. They also occupy mountainous, scrub, and desert habitats. They favor trees throughout their entire geographic distribution, and have been recorded at 5638 meters.

Behavior:
Leopards are solitary, nocturnal carnivores. Although they sometimes hunt during overcast days, they are less diurnal in areas close to humans in comparison to uninhabited areas. They mark their territory with urine, feces, and claw marks and communicate with conspecifics by growling, roaring, and spitting when aggravated and purring when content. They also make a rasping cough to advertise their presence to conspecifics. Leopards are most comfortable in the lower forest canopy, where they often feed, and descend from the canopy head-first. They are comfortable in water and are adequate swimmers. When hunting, leopards move with a slow, crouching walk. They can run at bursts of up to 60 km/hour, jump more than 6 m horizontally and 3 m vertically. Leopards are facultative drinkers and obtain much of their water requirements from ingested prey. Leopards have advanced vision and hearing, which makes them especially adept at hunting in dense forests.

Food Habits:
Leopards are ambush predators, pouncing on their prey before it chance to react. They approach potential prey by crouching low to the ground, getting as close as 3 to 10 m to prey before pouncing. Leopards are not likely to chase prey after the first pounce. Once a prey item is captured, they immediately break the prey's neck, causing paralysis. After breaking the prey's neck, leopards asphyxiate them and carry the carcass to a secluded feeding location, typically in a nearby tree. They may also cover prey carcasses in leaves and soil. Their tremendous strength allows them to tackle

prey up to 10 times their own weight.

Leopards generally prey upon mid-sized ungulates, which includes small antelopes, gazelles, deer, pigs, primates and domestic livestock. They are opportunistic carnivores and eat birds, reptiles, rodents, arthropods and carrion when available. Leopards prefer prey that weigh between 10 and 40 kg. They are also known to scavenge from cheetahs (*Acinonyx jubatus*), solitary hyenas, and smaller carnivores as well. They are known to cache food and may continue hunting despite having multiple carcasses already cached.

Predation:

Humans are the primary predator of leopards. Leopards are hunted as trophy animals for their fur, and retaliatory killings by farmers protecting their livestock are not uncommon. Lions (Panthera leo), tigers (Panthera tigris), spotted hyenas (Crocuta crocuta), and African wild dogs (Lycaon pictus) prey upon leopard cubs and are capable of killing adult leopards. Typically, when an adult is killed it is due to a territorial confrontation. Many of the characteristics that make leopards great predators also serve as excellent predator defense mechanisms.

Conservation Status:

Leopards are declining in parts of their geographic range due to habitat loss and fragmentation, and hunting for trade and pest control. As a result, leopards are listed as "**Vulnerable**" on the IUCN Red List of Threatened Species and schedule-I under Wildlife Protection Act 1972. Leopards appear to show some resistance to minor habitat disturbances and are relatively tolerant of humans.

Man-leopard Conflicts:

Expansion of agriculturally used land, encroachment of humans and their livestock into protected areas are main factors contributing to habitat loss and decrease of wild prey. As a result, leopards' approach human settlements, where they are tempted to prey on dogs, pigs and goat's domestic livestock, which constitutes an important part of their diet, if they live on the periphery of human habitations. Human–leopard conflict situations ensue, and have increased in recent years. In retaliation for attacks on livestock, leopards are shot, poisoned and trapped in snares. The leopards are considered to be unwanted trespassers by villagers.

Threats:

Hunting of Indian leopards for the illegal wildlife trade is the biggest threat to their survival. They are also threatened by loss of habitat and fragmentation of formerly connected populations, and various levels of human–leopard conflict in human–dominated landscapes. A significant immediate threat to wild leopard populations is the illegal trade in poached skins and body parts between India. There are well-organized gangs of professional poachers, who move from place to place and set up camp in vulnerable areas. Skins are rough-cured in the field and handed over to dealers, who send them for further treatment to Indian tanning centers. Buyers choose the skins from dealers or tanneries and smuggle them through a complex interlinking network to markets outside India.

Conservation Measures:

Capture and translocation to protected areas has been practiced more as a means of conservation. However, investigations have shown that the animal is highly territorial. Shifting causes inter and intra specific fighting to establish a territory in the translocated area. They are so much particular about their territory that they may make all the efforts to reach back to their original territory. However, Leopard are somewhat tolerant of habitat conversion, and may persist close to large human populations provided they have suitable cover and prey. The MoEF&CC has issued guidelines:

The guidelines suggest a three pronged strategy to deal with man-leopard conflict as a means to their conservation:

- Awareness generation among local communities, media and officials of various departments.
- Establish trained teams at two levels; the primary response team and the emergency response team, and
- Use of latest technology and scientific know-how to improve efficacy of capture, handling, care and translocation of the animal.
- All the Construction work should be avoided in the night and control the noise and vibration during the construction of Tunnel works

11 TIGER (Panthera Tigris)

Habitat:

Tigers live in a wide variety of habitats, suggested by their distribution across a wide range of ecological conditions. They are known to occur in tropical lowland evergreen forest, monsoonal forest, dry thorn forest, scrub oak and birch woodlands, tall grass jungles, and mangrove swamps. Tigers are able to cope with a broad range of climatic variation, from warm moist areas, to areas of extreme snowfall where temperatures may be as low as –40 degrees Celsius. Tigers have been found at elevations of 3,960 meters. In general, tigers require only some vegetative cover, a source of water, and sufficient prey.

Behavior:

Tigers are solitary, the only long-term relationship is between a mother and her offspring. Tigers are most active at night, when their wild ungulate prey are most active, although they can be active at any time of the day. Tigers prefer to hunt in dense vegetation and along routes where they can move quietly. In snow, tigers select routes on frozen river beds, in paths made by ungulates, or anywhere else that has a reduced snow depth. Tigers have tremendous leaping ability, being able to leap from 8 to 10 meters. Leaps of half that distance are more typical. Tigers are excellent swimmers and water doesn't usually act as a barrier to their movement. Tigers can easily cross rivers as wide as 6-8 km and have been known to cross a width of 29 km in the water. Tigers are also excellent climbers, using their retractable claws and powerful legs.

Food Habits:

Tigers prefer to hunt at night, when their ungulate prey are most active. Tigers are thought to locate their prey using hearing and sight more than olfaction. They use a stealthy approach, taking advantage of every rock, tree and bush as cover and rarely chase prey far. Tigers are silent, taking cautious steps and keeping low to the ground so they are not sighted or heard by the prey. They typically kill by ambushing prey, throwing the prey off balance with their mass as they leap onto it. Tigers are successful predators but only 1 out of 10 to 20 attacks result in a successful hunt.

The majority of the tiger diet consists of various large ungulate species, including sambar (Rusa unicolor), chital (Axis axis), hog deer (Axis porcinus), barasingha (Rucervus duvaucelii), barking deer (Muntiacus muntjak), elk (Cervus elaphus), sika deer (Cervus nippon), Eurasian elk (Alces alces), roe deer (Capreolus capreolus), muskdeer (Moschus moschiferus), nilgai (Boselaphus tragocamelus), black buck (Antilope cervicapra), gaur (Bos frontalis), banteng (Bos javanicus), water buffalo (Bubalus bubalis), and wild pigs (Sus scrofa). Domestic ungulates are also taken, including cattle (Bos taurus), water buffalo (Bubalus bubalis), horses (Equus caballus), and goats (Capra hircus). In rare cases tigers attack Malayan tapirs (Tapirus indicus), Indian elephants (Elephas maximus), and young Indian rhinoceroses (Rhinoceros unicornis). Tigers regularly attack and eat brown bears (Ursus arctos), Asiatic

black bears (Ursus thibetanus), and sloth bears (Melursus ursinus). Smaller animals are sometimes taken when larger prey is unavailable, this includes large birds such as pheasants (Pavo cristatus), leopards (Panthera pardus), fish, crocodiles, turtles, porcupines (Hystrix indica), rats, and frogs.

Predation

Tigers have no natural predators, except for humans. Adult tigers are potential predators of younger cubs.

Conservation Status:

Tigers are declining in parts of their geographic range due to habitat loss and fragmentation, and hunting for trade and pest control. As a result, Tigers are listed as "Endangered" on the IUCN Red List of Threatened Species and schedule-I under Wildlife Protection Act 1972. The specific threats to tigers vary regionally, but human persecution, hunting, and human-induced habitat destruction are universal factors in threatening tiger populations.

Threats and Conservation actions:

Large-scale habitat destruction and decimation of prey populations are the major long-term threats to the existence of the dwindling tiger population in the country. Although extensive habitat is available in some landscapes, agriculture, clearing of forests for development – especially road networks, Industrialization and hydel projects are forcing tigers into small and scattered islands of remaining habitat. Tigers need large territories and along with habitat, tigers have also suffered a severe loss of natural prey populations – in particular ungulates such as deer and antelopes.

As tigers continue to lose their habitat and prey species, they are increasingly coming into conflict with humans as they attack domestic animals – and sometimes people. In retaliation, tigers are often killed by angry villagers. Continuous monitoring of dispersed tigers is recommended as they move longer distances in fragmented areas.

Here from Ranthambore to Darraha wildlife complete RTR corridor and tiger habitat has been protected with the help of underground Box culvert and animal underpasses and tunnels and promoted to create more space for dispersing individuals. We also recommend long-term and continuous monitoring of this isolated small tiger population, from which dispersing tigers may move long distances in search of territories, vulnerable to mortalities due to conflicts with humans or poaching

There is limited habitat outside RTR, thus management efforts within RTR should maintain the population and outside on off-reserve lands, efforts should concentrate on enhancing degraded habitats, improving prey populations and water availability, and restoring corridors, so tigers can move when necessary.

12 SLOTH BEAR: (Melursus ursinus)

Habitat:
Sloth bears live mainly in tropical areas. They can be found in forested areas and grasslands. They are more frequently found at lower elevations and seem to prefer drier forests and areas with rocky outcrops.

Behavior:
Sloth bears are mainly nocturnal. Their sense of smell is well developed but their sight and hearing are poor. These bears are generally not aggressive, but their poor eyesight and hearing allows humans to draw near, and when feeling threatened these bears will defend themselves. Surprisingly, these bears are described as shy. For example, they live in the tropics but have long, dark, shaggy coats suggesting they are susceptible to cold stress. They are excellent climbers, but do not climb trees to escape danger. During the day they sleep in caves, especially caves by river banks. Not much is known about their social systems but evidence suggests they are solitary except for mothers with cubs. They do not hibernate, but do have a period of inactivity during the rainy season.

Food:
Sloth bears are omnivorous, although their diet typically includes a large proportion of insect foods. Their diet includes leaves, honey, flowers, and fruits. During the months of March through June, fruits are more common and on occasion may make up 50% of these bears' diet. They prefer termite or bee nests and will do everything to get at them. While raiding termite nests these bears insert their long snouts into the nest, rip open the nest with their long claws, blow away the earth and dust, and then feast on their prize by vacuuming the termites into their mouths. This sucking action is also accompanied with a series of puffing and belching which can be heard up to 185 m away. The ability to voluntarily open and close the nostrils prevents the inhalation of dust during this process. Termites are a very secure food source, as they are present all year round. When nearby populated areas sloth bears feed on cultivated crops like sugar cane and maize.

Predation
These bears only risk predation from large predators such as tigers and leopards. Female sloth bears with cubs will occasionally vary from their nocturnal tendencies to avoid these nocturnal predators.

Conservation Status:
As is the case for many species, the destruction of sloth bears' habitats is a major cause for their rapidly declining numbers. Reasons for the destruction include agricultural and developmental plans. An indirect threat to this species is the destruction of termite mounds for fine soil for tennis courts. Termites are a main source of food for these bears. These bears have also been hunted because of their reputation for aggression and crop destruction.

They are protected under Schedule I of the Indian Wildlife Protection Act which prohibits hunting but allows bears to be killed in self-defense or, in special circumstances, where damage has been caused. Listed in **Appendix I** of CITES. The population appears to be falling and sloth bears are described as **"Vulnerable"** in the IUCN Red List and Under **Schedule –I** of Wildlife Protection Act 1972.

Threats:

Habitat loss and poaching are the major threats to the common sloth bear. Historically bears have been poached to be used as captive dancing bears but this is declining and in 2012 it was announced that all Kalandar tribesmen had ceased the practice of keeping dancing bears. Poaching still occurs to obtain bear parts for use in medicine and bears are also hunted and killed due to their reputation for aggression towards humans and for crop destruction.

Loss of forested areas outside parks and reserves poses a major threat to sloth bears because it causes population fragmentation, thereby leaving small, nonviable populations within the parks. A high degree of dispersion among protected areas with sloth bears is evident Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products (cutting timber, lopping branches, collecting fruits and honey), establishment of monoculture plantations (e.g., tea, rubber, teak, eucalyptus), expansion of agricultural areas, and settlement of refugees, diminishes natural food supplies for sloth bears and may result in reduced reproduction. Poor food supplies also may increase the likelihood of sloth bears seeking human-related foods, like sugarcane and peanuts, outside the forest.

13 Black Buck (Antilope cervicapra)

Habitat

Blackbuck live on open woodlands and semi-desert areas, but also enjoy areas with thorn or dry deciduous forest. They like to stay near areas where grassland is available. On hot days blackbucks rest in the shade.

Behavior:

Blackbucks are gregarious and social animals with herds generally ranging from 5 to 50 animals. The herds are harems, with a single adult male and a number of adult females and their young. They tend to be diurnal during the cool season. In the hot season, they are active in the very early morning and late afternoon, resting in the shade at other times. Because of past persecutions, blackbuck are very shy and wary. Their sense of smell and hearing are not highly developed so they rely on eyesight in detecting danger. When in danger, a single animal bounds in the air and is soon followed by the rest of the herd. These animals have great speed and endurance; when in danger they can maintain a gallop with a speed of 40mi/hr. for approximately 15 miles. They are usually silent, but sometimes females give a hissing noise that warns the herd of danger.

Food Habit:

Blackbuck are grazers, they feed on short grass and various cultivated cereals. Concerning their drinking habits, T.J. Roberts writes, “It has been reliably established that they do not drink water even when it is available. It may be, that they can recirculate the nitrogen in their bodies rather than having to excrete it in their urine."

Threats:

Blackbuck numbers declined sharply due to excessive hunting, deforestation and habitat degradation. Some blackbucks are killed illegally especially where the species is sympatric with Nilgai.

Conservation Status:

The blackbuck was once the most abundant hoofed mammal in India, but their populations have been greatly reduced through excessive hunting and loss of habitat due to agricultural development. Black buck protected under Schedule-I of the Indian Wildlife Protection Act which prohibits hunting but allows to be killed in self-defense or, in special circumstances, where damage

has been caused. The population appears to be falling and are described as **"Least Category"** in the IUCN Red List and under **Schedule-I** of Wildlife protection Act 1972.

14 Indian gazelles (Gazella bennettii) Chinkara

Habitat

Indian gazelles (Chinkara)can thrive in a variety of habitats. They have been observed in dry deciduous forests, open woodlands, and dry areas such as sand dunes, semi-arid deserts, and arid valleys that have an annual rainfall of 150 to 750 mm. Indian gazelles are facultative drinkers and can withstand relatively long intervals between visits to water points by conserving metabolic water and taking advantage of water found in vegetation.

Behavior

Indian gazelles are swift and agile. They are generally frightened by humans and recede into the mountains or desert to maintain a distance from agriculture and other human activities. Indian gazelles inhabit broken country and rocky mountain settings in Pakistan, seemingly to avoid motorized vehicles. When alarmed, Indian gazelles stamp their forefoot on the ground and emit a sneeze-like hiss through the nose, hence the local name Chinkara. Indian gazelles have nocturnal feeding habits and are most active just prior to sunset and throughout the night. They can withstand long periods without water due to physiological processes, conserving metabolic water.

Indian gazelles are generally observed alone or in groups of 3 that include a mother and her offspring. Large herds of 8 to 10 individuals are occasionally observed. Larger groups are more commonly observed during the breeding seasons.

Food Habits

Indian gazelles are better adapted to browsing than grazing, but they can consume legumes and grasses in large quantities. Their diet typically consists of grasses, various leaves, crops and fruits such as pumpkins and melons. A majority of their metabolic water intake comes from the vegetation they consume. The bushes and trees that make up their diet are found in mountain ranges and deciduous forests, while grasses and other herbaceous plants are found in valleys and agricultural fields. In the arid Thar Desert, Indian gazelles mainly consume four species of herbs.

Predation

The primary predators of Indian gazelles are golden jackals (*Canis aureus*), Bengal tigers (*Panthera tigris*), Indian wolves (*Canis lupus*), Indian leopards (*Panthera pardus*), Asiatic cheetahs (*Acinonyx jubatus*), crested hawk-eagles (*Nisaetus cirrhatus*), village or feral dogs (*Canis lupus*) and, most importantly, humans. Hunting and illegal poaching have greatly reduced population sizes of this species. Indian gazelles use their speed and stamina to evade predators and use their horns for defense.

Conservation Status

Gazella bennettii is considered a species of "**Least Concern"**in the IUCN Red List and Under **Schedule –I** of Wildlife Protection Act 1972. Indian gazelles were considered threatened in the 1950's due to habitat loss and anthropogenic activities such as hunting and poaching. Agricultural practices along with the general increase in human population has led to extirpation in certain areas. In 1994 the species was considered vulnerable, and in 1996 *Gazella bennettii* was considered a species of lower risk. The species has since recovered and is now considered a species of least concern by the IUCN.

Gazella bennettii was considered a Schedule-Ispecies under the Wildlife (Protection) Act of India in 1972. Indian law fully protects Indian gazelles, reserving 80% of India as protected land, there are over 25 protected areas within Rajasthan. However, the highest densities of Indian gazelles are found outside of these protected areas and parks, mainly within the Vishnoi communities. The national parks of Bandhavgarh and Ranthambore are protected. Populations of Indian gazelles have rebounded, mainly due to conservation efforts.

15 Gray wolves (Canis lupus)

Habitat

Gray wolves are one of the most wide-ranging land animals. They occupy a wide variety of habitats, from arctic tundra to forest, prairie, and arid landscapes.

Behavior

Gray wolves are highly social, pack-living animals. Each pack comprises two to thirty-six individuals, depending upon habitat and abundance of prey. Most packs are made up of 5 to 9 individuals. Packs are typically composed of an alpha pair and their offspring, including young of previous years. Unrelated immigrants may also become members of packs.

There is a strong dominance hierarchy within each pack. The pack leader, usually the alpha male, is dominant over all other individuals. The next dominant individual is the alpha female, who is subordinate only to the alpha male. In the event that the alpha male becomes injured or is otherwise unable to maintain his dominance, the beta male will take his place in the hierarchy. Alpha males typically leave the pack if this occurs, but this is not always the case. Rank within the pack hierarchy determines which animals mate and which eat first. Rank is demonstrated by postural cues and facial expressions, such as crouching, chin touching, and rolling over to show the stomach. Each year, gray wolf packs have a stationary and nomadic phase. Stationary phases occur during the spring and summer, while pups are being reared. Nomadic phases occur during the fall and winter. Wolf movements are usually at night and cover long distances. Daily distance traveled can be up to 200 km, the usual pace is 8 km/hr. Wolves can run at speeds up to 55 to 70 km/hr.

Food Habits

Gray wolves are carnivores. They hunt prey on their own, in packs, steal the prey of other predators, or scavenge carrion. Prey is located by chance or scent. Animals included in the diet of gray wolves varies geographically and depends on prey availability. Wolves primarily hunt in packs for large prey such as moose, elk, bison, musk oxen, and reindeer. Once these large ungulates are taken down, the wolves attack their rump, flank, and shoulder areas. Wolves control prey populations by hunting the weak, old, and immature. A wolf can consume up to 9 kg of meat at one meal. Wolves usually utilize the entire carcass, including some hair and bones. Smaller prey such as beavers, rabbits, and other small mammals are usually hunted by lone wolves, and they are a substantial part of their diet. Wolves may also eat livestock and garbage when it is available.

Predation

Few animals prey on gray wolves. Wolves and coyotes are highly territorial animals so wolves from other packs and coyotes will attack wolves that are alone or young. They will kill pups if they find them.

Conservation Status

Wolves play an important role in the ecosystem by controlling natural prey populations and removing weak individuals. As settlement increased, the belief that livestock was endangered by wolf populations also increased. As such, the frequency of hunting the gray wolf exploded. The populations were nearly eradicated. Successful recovery plans have been developed throughout the country. These plans evaluate the populations to determine distribution, abundance, and status. The main cause of population declines has been habitat destruction and persecution by humans. Gray Wolf is considered a species of "**Least Concern**" in the IUCN Red List and Under **Schedule –I** of Wildlife Protection Act 1972.

16 Conservation Strategies in context to Delhi-Vadodara Highway Project

Biodiversity conservation plan is developed with the aim to reduce adverse impact on the natural habitat of various Flora and Fauna. Due to the development of Delhi-Vadodara expressway the threats to natural terrestrial and aquatic ecosystems arises and necessary mitigation measures adopted in the project corridor to minimise the loss of natural habitat.

For the finalization of alignment, Rajasthan Wildlife department, Govt. of Rajasthan, form a committee for development of Delhi-Vadodara Expressway passing through the Ranthambore Tiger Reserve, National Chambal Sanctuary and via Mukundra Hills Tiger Reserve and National Park. This committee visited the project area in its entire stretch, where it passed though the Protected Areas falling in parts of Ranthambore Tiger Reserve (RTR), NCS and Mukundara Hills Tiger Reserve (MHTR), on 27th April 2019.

Following Conservation strategy have been recommended by the Forest Committee during the finalization of Alignment in Mukundara hills tiger reserve/ Darrah wildlife sanctuary.

16.1 Project Specific mitigation measures:

Following mitigation measures have been proposed.

Mukundra Hills Tiger Reserve at Ch. 422+200 Km and 425+750 Km at coordinate 24°51'42"N, 75°56'55"E

The Project alignment passing through the Mukundra Hills Tiger Reserve is from **Chainage km 422+200 to km 425+750 (Length about 3.550 km).** The proposed highway alignment is crossing two hillocks and a valley portion in between. In order to obviate the needless bisection of the MHTR, an underground tunnel is suggested in the above section. Moreover, in order to avoid disturbance in the vicinity of the tiger reserve, both end faces of the tunnel may be placed about 500m away from the boundary of protected area of Critical Tiger Habitat (Core of Mukundara Hills Tiger Reserve) by implying "Cut & Cover Technique. The length of the tunnel, the slope of the highway in this stretch and its depth will dependent on the technical feasibility study of the valley area.

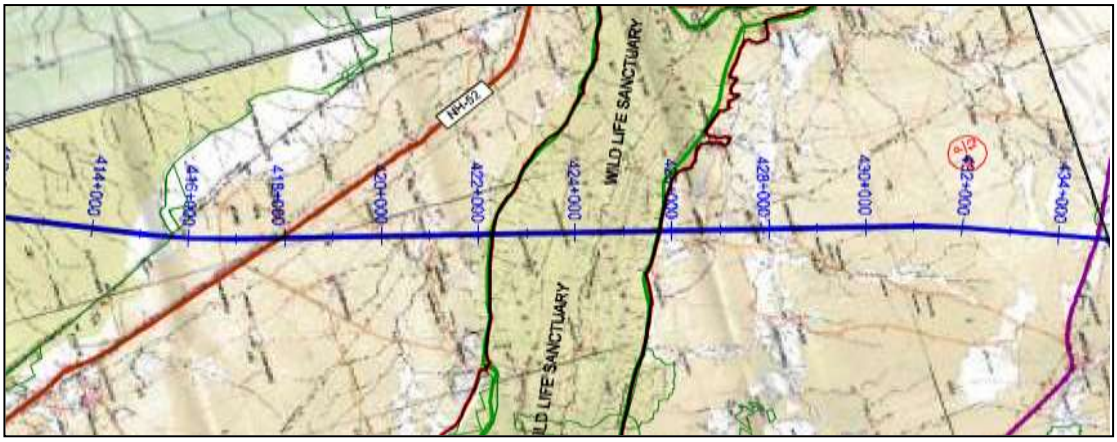

Figure 16-1:Proposed underground Alignment at MHTR/Darrah wildlife sanctuary

The proposed highway alignment is crossing two hillocks and a valley portion in between. In order to obviate the needless bisection of the MHTR, an underground tunnel is suggested in the above section. Moreover, in order to avoid disturbance in the vicinity of the tiger reserve, both end faces of the tunnel may be placed about 500m away from the boundary of protected area of Critical Tiger Habitat (Core of Mukundra Hills Tiger Reserve) by implying "Cut & Cover Technique.

Provision of dual four lane (2x4) tunnel shall be provided as per IRC SP: 99 is proposed at location where alignment is passing through Darrah wildlife sanctuary to avoid the fragmentation of wildlife habitat The twin tunnel comprises of 3 lane tunnel of 11.25m wide carriageway with paved shoulder of 3m along with one side escape footway and walkway width of 750mm above utility duct on another side, refer Expressway Manual IRC: SP: 99 for TCS. Below mentioned table gives brief details of location and proposed span of tunnel.

Table 116-1: Location and proposed length of tunnel

Sl. No.	Chainage (Km)	Length (Km)	Seismic zone
1	Ch. 422+200 Km to 426+750 Km at coordinate 24°51'42"N, 75°56'55"E	3.55	Zone-II

The schematic diagram given below describes typical cross section of the tunnel.

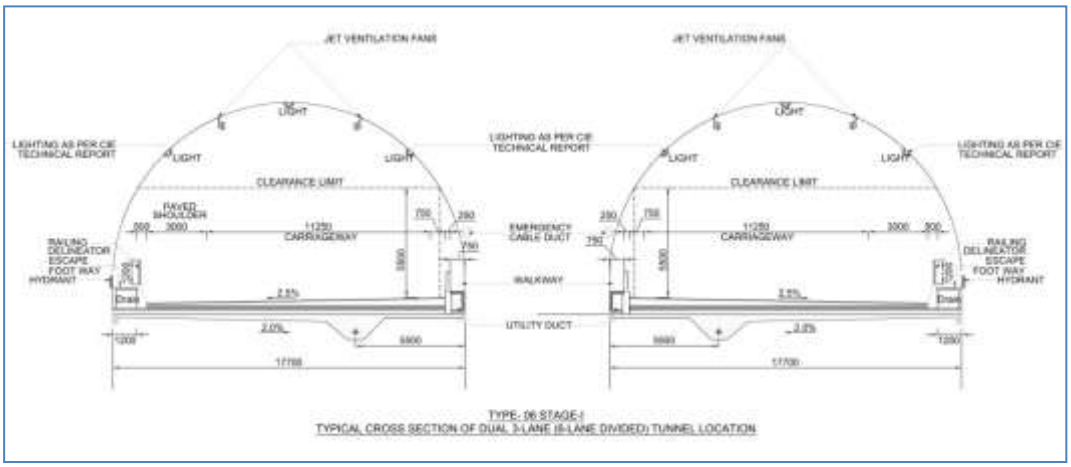

Figure 16-2: Proposed Cross Section of underground Tunnel at MHTR/Darrah wildlife sanctuary

The forest / wildlife committee suggested following mitigation plan after visiting the project site.

1) Project alignment passing through the Mukundra Hills Tiger Reserve is from Chainage km 422+200 to km 425+750 (length about 3.550 km). The proposed highway alignment is crossing two hillocks and a valley portion in between. In order to obviate the needless bisection of the MHTR, an underground tunnel will be constructed in the above section.
2) In order to avoid disturbance in the vicinity of the tiger reserve, both end faces of the tunnel may be placed about 500m away from the boundary of protected area of Critical Tiger Habitat (Core of Mukundra Hills Tiger Reserve) by implying "Cut & Cover Technique. The length of the tunnel, the slope of the highway in this stretch and its depth will dependent on the technical feasibility study of the valley area.
3) Construction activity in the protected area will be done during day time period only.
4) All pre-cast structures are to cast and constructed outside the Protected Areas of the Tiger Reserves.
5) Raw material and Construction waste will not be stored in forest areas.
6) Ground / surface water will not be drawn from protected areas
7) Blasting activity will not be allowed inside the protected area.
8) Mitigation measures will be taken as per approved site specific Wildlife Management plan.
9) During construction all construction zones have to be cordoned off to prevent ingress of stray animals.

16.2 Additional Mitigation Measures:

- The construction shall be done in a manner (quick, with minimum disturbance) and with adequate design and technology to minimize the long-term impacts. Prefabricated and special methods to reduce the time taken in the erection/construction of the intrusions shall be adopted.

- Work during the nights totally be avoided as the movement of many species, especially large mammals and carnivores, is greater during the nights.

- The camping of people/workers must also be avoided. No domestic animals to be allowed. Waste must be carried away from site and not dumped on site. Fuelwood collection and use from the site should not be permitted.

- In case of road vehicles, speed reduction is a key measure that will definitely reduce the number of accidents and these are being implemented in several cases. This needs to be accompanied by measures to prevent unauthorized stopping within Protected Areas.

- **Natural crossings:** wherever possible natural crossings existing across linear intrusions should be retained or encouraged. For instance, overlapping tree canopy in closed canopy evergreen forests is an essential attribute that is a low-cost, efficient and durable solution for the movement of arboreal species. One can also encourage ground, shrubby, or tree

growth at periodic, designated points (say, every 100 – 200 m) along linear intrusions to provide for habitat cover and facilitate animal crossing

Underpasses: well-designed culverts, pipes, and other structures can function as underpasses below roads and bridges, for a wide-range of terrestrial and aquatic species, especially reptiles, frogs and other small animals. It is important to also have underpasses below penstocks in wildlife areas.

Management Measure:

- Along roads through Protected Areas and critical habitat do not promote public transport, and work to reduce influx of private vehicles, including tourist vehicles.
- Management strategies to detect and prevent encroachments or construction of new structures and homesteads along linear intrusions need to be adopted.
- Minimize width of vegetation clearings along roads. Explore options to restore connectivity by natural vegetation.
- Speed restrictions, no honking zone and other guidelines that spell out rules and avoidance of disturbance to wildlife and habitats along roads in natural areas must be prominently conveyed through well-designed signboards at entry and exit points and all other relevant locations.
- Efforts would be made to cover the lights suitably with paint so that strong beam of head light is not formed and light falls in front of the vehicle only. **Anti-glare barriers** necessary mitigation measures to reduce the vibration effect especially in protected and Forest area shall be provided as per CSIR-CRRI recommendations.
- Noise generated by pressure horn disturbs the wild life and forces them to leave the place. No pressure horn would be allowed during the crossing of MHTR protected area. All the drivers would be advised with the help of cautionary sign boards “No horn zone” Silence zone” etc. to make minimum use of horn while crossing the forest/Wildlife area in MHTR/Darrah wildlife sanctuary.
- The provision of fastening chambers also installed inside the tunnel under the protected area so that impact of vibration can be reduced.

Additional Measures:

Non-Formal Education

Conservation education and awareness would be imparted both at the formal and non-formal levels. At the formal level, it would be given at school, colleges and university levels. Formal education, in spite of all the curriculum development and introduction of the study of ecology, wildlife and conservation at the school and college levels, however, largely remains text book and examination oriented. Because of the situation, non-formal education becomes all the more necessary for creating the right kind of awareness and attitude among people at all levels- children, teenagers, adults, family groups, teachers, administrators, politicians and policymakers. To achieve this some local tours of school and college students would be arranged to nearby National Parks.

Institutional Infrastructure

The prime requisite for building up an understanding and awareness about wildlife and conservation is to develop an appreciation, respect and love for nature. Most people lack the curiosity to know even the names of animals and plants they come across in their day-to-day life. Development of an inquisitive mind, a keen sense of observation and curiosity about the fauna and flora are, therefore, very important. Concern for conservation can only emanate from a love for

nature and awareness about the interdependence of all species of animals and plants, including the man. To arouse curiosity about the wildlife in the young mind some quiz and essay. Competitions would be arranged in the schools and colleges of the buffer zone and some nearby areas.

Indian Tradition of Conservation

The theme of conservation, wildlife and reverence for life is reflected in some of the exquisite images in Indian art paintings, sculpture, architecture and decorative art. The most wide-ranging wild life imagery is found in Indian miniature paintings. Early literatures like the Panchatantra and Hitopadesha contain animal fables that have been used to preach both wisdom and morals. The long-term tradition and abiding faith in conservation of nature is vividly seen in recent times also like the Chipko and Appiko movements. These conservation themes would be popularized through pamphlets and posters.

Role of the Individual

Each individual should develop a personal ethic towards nature and wildlife which could pave the way for commitment and conviction not to destroy wildlife particularly that of not considering hunting as a sport, nor to use products made out of skins or other parts of endangered animals. Unless these products are boycotted by their users, the clandestine killing and poaching of wildlife at the hands of unscrupulous people would continue. Everyone can play important role in spreading the message of conservation among their friends, family and community at the large.

Eco-Development Works

People in and around the forest area generally are hostile against the forest department and its staff, because they are prevented from taking out timber and other forest products illegally. Such antagonistic behavior arises mainly because little effort is made to meet their genuine demands either from outside the forest area or from the forest area but in a sustainable manner. Regular interaction with them with agreement for sustainable utilization of forest resources combined with some incentives can completely change their indifferent or even un-concerned attitude to conservative attitude.

People Participation

With the help of the local people and employees of the Company, watch would be kept on the wild life as well as illegal tree felling. A Forest and a police department would be informed if such incident occurs, to take legal action against the offenders. For this they would be trained for motivation.

Encourage local villagers to grow trees on their on their field bounds/court yards

In consultation with the Forest Department, the provision of tree plantation which are having importance for wood, small timber and fuel wood to distribute to the villagers. Bamboo would be another important species with a lot of environmental and economic value. This no doubt would help reduce dependence of people on RF forest; as a result the ecological condition of the area would improve so the wild life would be attracted to this area.

Provide employment to the villagers

On the basis of their suitability, jobs in project road would be provided to the nearby villagers. As a result, their economic condition would improve. This would keep them busy so that they would not be tempted/compelled to cause destruction to forest which would help improve the status of wild life in the zone of influence of industry.

Green Belt Development

A green belt has been developed along the boundary of the proposed highway. The area for green belt plantation consists of undisturbed soil; hence plantation can be made in along the proposed corridor. Green belt is erected not from biodiversity or conservation point of view, but is basically

developed as a screen to check the spread of air and noise pollution.

Following precaution is being taken:

- Seedlings of only local species, suitable for green belt plantation are being considered.
- All the representative plant species of the region are found to grow in and around the study site.
- Care is being provided against grazing and browsing.
- Timely watering during the initial stages of survival and provisions for the allocation of funds are being made as well.
- During the Operation of highway, flora are being regenerated in different stages and the area having matured afforestation are being properly fenced so as to avoid cutting, browsing and hacking of branches and pruning of trees
- Awareness is being created among villagers residing on the periphery of the project road regarding the use of plantations.
- Plantation of indigenous species, fodder and fruit bearing tree species which can also act as habitats for wild life are being carried out.
- Plantation of fruits bearing trees is attracting wildlife population.
- For increasing wildlife population, turfing on the ground on both sides of nallas by grasses are providing a suitable habitat which is most sought food for most of the wildlife.

Important Places – Habitat and Corridors

- Organize an inception workshop with the involvement of GOs and NGOs to agree on tasks and methodology.
- Carry out research and assessment throughout the project ecoregion along with Forest officials.
- Develop or elaborate land and resource use/ landscape plans for key and potential areas of wildlife distribution, considering community conserved areas (CCA), and ensure adoption by relevant governmental organizations.
- Conduct capacity building activities for local stakeholders (including border villages).
- Develop and implement school training programs.
- Conduct social studies and identify economic opportunities for MHRT eco-tourism.
- Disseminate lessons learned in demo projects throughout the ecoregion.

Human Dimension and Socio-Economic Circumstances

- Identify local communities and their natural clusters and groupings in and around wildlife habitats.
- Conduct participatory social–economic surveys and elaborate social-economic development programme for the communities in full collaboration with them.
- Implement the programme in partnership with the communities, governments, NGOs, donors and other stakeholders.
- Establish communication with communities in and around wildlife habitats.
- Hold participatory workshops with community elders (female and male) in the selected community clusters to identify the traditional knowledge and customary institutions of resource management.

- Restore traditional knowledge and document it where appropriate and the customary institutions of resource management.
- Support the local communities involved to formalize and register their restored customary institutions.
- Strengthen their capacities to effectively interact with, and receive support from, outside institutions (political, technical and financial).
- Elaborate and implement partnership with community's sustainable livelihood programme for each community.
- Identify partners within mass media, NGOs, scientific institutions, universities and other groups of civil society.

Table 16-2: Mitigation measures and guidelines

Sl. No.	Mitigation measure/Item	Details as per Guidelines
1	Animal underpass (Ch 8, page 76)	If width of corridor is 3 km or more, 300 m underpass of size (span length -30 to 100 m, height - 5 m and width - 6 to 8 m) are suggested at everykm of the road.
2	Pipe culvert (Hume Pipe), (Ch 6, Page 63 & Ch-8 page 76)	For maintaining connectivity for larger mammalian species, for amphibians or reptiles, pipe culverts (dia - 1.2 to 1.5 m) single/multiple should be constructed in every 100 m stretch of road.
3	Steel wire fencing (Ch 9, Page 94)	As per mitigation measures fences should be at least 80 cm high above ground and 20 cm below ground for reptiles and amphibians, Fencing should ideally be located between two underpasses so as to guide animals to safe passage ways.
4	Steel road side railing	Railing on both sides of the road with 1m height to prevent animal crossing the road.
5	Culvert (Box Type), (Ch 6, Page 62)	Square/Rectangular box type culvert of size 3.0 m X 3.0 m
6	Noise/light mitigation through plantation of hedges/trees, Ch-11, pp113, 117	Natural soil berms, CC panels, Stones in zig-zag, (3-5m) hedging/tree plantations (around 60m width required) for 5-10 dB reduction.
7	Steel canopy bridge, Ch-6, p61	This is a rope, or wooden ladder or walkway suspended either from vertical poles or trees. It should be taut and wide enough for animals to walk on. Size - 10.5m ht x 9m width.
8	Signage's, Ch-10, p100	Reflective/non-reflective as per need, for speed regulation, caution, animal crossings, bird flight area and various information/directional signboards.
9	Tree bridges/canopy	Tree plantations on both sides and median of the road would deter birds to come to the road and would naturally fly from tree top on both sides.

17 Financial Projection for Conservation Plan

Financial Projection

The 5% of project cost shall be deposited to the Rajasthan Wildlife Department towards conservation & preservation of wildlife and reduction of defragmentation of its habitats. An effective conservation plan

Will help in proper management of habitat of such ecologically and nationally significant species. The year wise budgetary allocation in addition to the above-mentioned fund is listed in table below.

Table 17-1: Additional Budget for Wildlife Conservation and Management

Sl. No.	Activities	Budget (in Crore) INR
1.	Landscaping at Interchange and all other locations of the proposed project, camouflaging at entry & exit of the tunnel	4.00
2.	Grassland improvement and tree plantations in and around the MHTR /Darrah wildlife sanctuary area	0.05
3.	Monitoring, maintenance and gap filling	0.25
4.	Eradication of invasive alien species, such as, Prosopis juliflora, etc.	0.10
5.	Development of water holes and Soil & Water conservation measures	0.25
6.	Promotion for Planting of flowering, shade, medicinal, ornamental & fruit bearing trees in suitable area	0.40
7.	Compensation for promotion of traditional agriculture, controlled grazing of livestock and anti-poaching activities	0.50
8.	Reward for conservation efforts to the NGOs and Organic farming to the local villagers	0.05
9.	Development of small water ponds during the pinch period surrounding buffer area and regular supply of water during the pinch period. (100 Ponds in and around the RTR Corridor)	1.00
10.	Awareness programme and capacity building activities	0.10

Table 17-2: Five year Budget for Conservation and Management (in Rupees)

S. No.	Activities	Year 1	Year 2	Year 3	Year 4	Year 5
1.	Landscaping at Interchange and all other locations of the proposed project, camouflaging at entry & exit of the tunnel	0.80	0.80	0.80	0.80	0.80
2.	Grassland improvement and tree plantations in and around the MHTR /Darrah wildlife sanctuary area	0.01	0.01	0.01	0.01	0.01
3.	Monitoring, maintenance and gap filling	0.05	0.05	0.05	0.05	0.05

4.	Eradication of invasive alien species, such as, Prosopis juliflora, etc.	0.02	0.02	0.02	0.02	0.02
5.	Development of water holes and Soil & Water conservation measures	0.05	0.05	0.05	0.05	0.05
6.	Promotion for Planting of flowering, shade, medicinal, ornamental & fruit bearing trees in suitable area	0.08	0.08	0.08	0.08	0.08
7.	Compensation for promotion of traditional agriculture, controlled grazing of livestock and anti-poaching activities	0.1	0.1	0.1	0.1	0.1
8.	Reward for conservation efforts to the NGOs and Organic farming to the local villagers	0.01	0.01	0.01	0.01	0.01
9.	Development of small water ponds during the pinch period surrounding buffer area and regular supply of water during the pinch period. (100 Ponds in and around the RTR Corridor)	0.2	0.2	0.2	0.2	0.2
10.	Awareness programme and capacity building activities	0.02	0.02	0.02	0.02	0.02

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Alignment on Topo sheet: