Study of Flora and Fauna and Conservation Plan for Schedule I & II Species of the Study Area

ToR Letter No. IA-J-11015/34/2018-IA-II(M), dated 10th May 2018

STONE ALONG WITH ASSOCIATED MINOR MINERALS OF KALALI AND KALYANA MINING PROJECT

Khasra No. 223 min, 224 to 228 & 72 ,
Lease Area- 64.40 Hectors
Project Category- A

Production Capacity- 5.8 MTPA
Lease Period- 18 years
Study Period- March – May 2018

Applicant
M/s Ridhi Sidhi –KSM Resources-JV
Khatoni No. 1049, Behind Hotel Mejban,
Loharu Road, Charkhi Dadri, Haryana

Consultant:

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June, 2018

Biodiversity (Flora and Fauna) and Conservation Plan for Schedule I & II Species of the Study Area

(ToR Letter No. IA-J-11015/34/2018-IA-II(M), dated 6th May 2018)

STONE ALONG WITH ASSOCIATED MINOR MINERALS OF KALALI AND KALYANA MINING PROJECT

(Mine Location: Khasra No. 223 min, 224 to 228 & 72 Area-64.40 Hectares,

Near Kalali Village, District- Charkhi-Dadri, Haryana)

Applicant

M/s Ridhi Sidhi –KSM Resources-JV

Khatoni No. 1049, Behind Hotel Mejban,

Loharu Road, Charkhi Dadri, Haryana

Environment Consultant

Voyants Solutions Pvt. Ltd., Gurugram

June, 2018

Site Name:	Stone Along with Associated Minor Minerals of Kalali and Kalyana Mining Project, Charkhi Dadri, Haryana
Report Title:	Study of Flora and Fauna and Conservation Plan for Schedule I & II Species of the Study Area for Stone Along with Associated Minor Minerals of Kalali and Kalyana Mining Project, Charkhi Dadri, Haryana
Project Code:	GUR 17-18 -098 EMS
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1	June 2018	00
2	August 2018	01
3	October 2018	02

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1 INTRODUCTION AND PROJECT BACKGROUND

1.1 GENERAL

Stone along with associated minor minerals of Kalali and Kalyana mining Project of M/s Ridhi Sidhi KSM Resources-JV is situated at Khasra No.- 223 min, 224 to 228 & 72 (Authorised Khasra Map of the Mine lease area is attached as Annexure 2), Village Kalali, Tehsil- Dadri, District: - Charkhi - Dadri, Haryana, over an area of 64.40 hectares. The mining lease was granted to M/s Ridhi Sidhi KSM Resources-JV on 26.03.2018 shall be up to 25.03.2036 as per the LoI (Memo No. DMG/HY/ML/Kalali & Kalyana/2018/1491 Dated Chandigarh, the 26.03.2018, Copy of LoI is enclosed as Annex 3). The anticipated life of mine is 18 years. The total mine lease area is Gram panchayat stony wasteland. There are no litigations/court cases pending against the project as afformed by an affidavit submitted by the project proponent.

1.2 NATURE, SIZE AND LOCATION

Nature

The project is meant for excavating stone and associated minor minerals by fully mechanized opencast method utilizing Heavy Earth Moving Equipment (HEMM) in conjunction with deep hole drilling by crawler mounted DTH drills and blasting. After proper sizing, Stone will be loaded manually into the trucks.

Size

Mining activities will be carried out in 64.40 ha, situated in Khasara no. 223 min, 224 to 228 & 72 in Kalali village, Charkhi-Dadri district. Annual production capacity of is proposed 5.8 MTPA. The project has no other interlinked project.

Figure 1.1: Site Accessibility

Table 1-1: Location Details

Details of area	Location Map Plate No. (1)
District	Charkhi Dadri and State - Haryana
Tehsil	Dadri
Village	Kalali
Khasra details	223 min, 224 to 228 & 72
Area	64.40 hectares
Whether the area is recorded to be in forest	No.
Ownership/occupancy	Gram Panchayat
Existence of public road/railway line	No
Toposheet no.	H43W2

1.3 LEASEHOLD AREA

Details of the land covered in the 'M.L. Area' are as under:-

District : Charkhi-Dadri

State : Haryana

Village	Taluka	Khasra no.	Area in hectares	Ownership
KALALI	Dadri	223 min, 224 to 228 & 72	64.40	Gram panchayat

The following are the GPS locations of the mine lease hold area which have been considered in two blocks:

Lat: 28° 33' 2.999"N & Long: 76° 11'15.646"E

To

Lat: 28° 33' 1.930"N & Long: 76° 11' 15.303"E

Period for which mining lease is granted: The mining lease was granted to M/s Ridhi Sidhi KSM Resources-JV on 26.03.2018 shall be up to 25.03.2036 as per the LoI (Memo No. DMG/HY/ML/Kalali & Kalyana/2018/1491 Dated Chandigarh, the 26.03.2018, Copy of LoI is enclosed as Annex 3).

Table 1-2: Present Land Use pattern

Sr.no	Details	Present land use pattern Area (ha)
1	Quarry Area	17.78
2	Infrastructure	0.50
3	Haulage Road	2.85
4	Agriculture	0.00
5	Plantation	0.80
6	Water Body	0.00
7	Habitation	0.00
8	Undisturbed land	42.97
9	OB Dump	0.00
Total		**64.40**

1.4 INFRASTRUCTURE

The following infrastructure facilities are available in the lease area/ Kalali and Kalyana village

1.4.1 Electric Power

Presently there is no arrangement for supply, at the mine but it is proposed to take an extension of the electricity line from the nearby point which is just 500m from mines site.

1.4.2 Hospital

Primary health centre is available in Kalyana village. The nearest hospital is at Charkhi-Dadri (Shehrawat Hospital) which is 8.6 km from the area.

1.4.3 School/Colleges

The village Kalyana has primary school and the nearest college is Saraswati College of Education, present at 5.1km away in ESE direction

1.4.4 Water

The Daily water demand will be about 50 KLD which will be met from hired tanker supply from nearby village.

1.5 METHODS OF ESTIMATION OF RESERVES

Methods of estimation of reserves of Stone along with Associated Minor Minerals-

- The total mineral resources and reserves have been calculated by cross-sectional area method. In this method the cross-sectional area of section line is multiplied by the influence of the section line to arrive at volume.
- The reserves are calculated on the basis of established width, thickness and strike length/influence of the mineralized formation in the area where good pits are available such area in put under proved category.
- The entire reserves of stone are put under proved category above valley level i.e. up to 250 MRL. Next 30 meters *i.e.,* reserves between 250 MRL and 220 MRL are considered as probable and further 15 meters *i.e.,* up to 205 MRL as possible.
- The bulk density of road metal and masonry stone (quartzite) is considered 2.5 which is further multiplied by volume to arrive at the tonnage

Table 1-3: Details of Stone and associated minor minerals mining

Cross section line	Cross sectional area	Influence length(m)	Bulk Density	Proved Reserves MT	Probable Reserves MT	Possible Reserves MT
A-A'	3870 12900 6450	150	2.5	1451250	4837500	2418750
B-B'	9216 14400 7200	200	2.5	4608000	7200000	3600000
C-C'	19640 14700 7350	200	2.5	9820000	7350000	3675000
D-D'	15420 11340 5670	200	2.5	7710000	5670000	2835000
E-E'	16756 9600 4800	200	2.5	8378000	4800000	2400000
F-F'	24250 9300 4650	200	2.5	12125000	4650000	2325000
G-G'	12336 8760 4380	200	2.5	6168000	4380000	2190000
H-H'	2980 4200 2100	200	2.5	1490000	2100000	1050000
I-I'	2700 3240 1620	200	2.5	1350000	1620000	810000
J-J'	160 2340 1170	200	2.5	80000	1170000	585000
K-K'	0 2080 1200	200	2.5	0	1040000	600000
L-L'	0	140	2.5	0		

Cross section line	Cross sectional area	Influence length(m)	Bulk Density	Proved Reserves MT	Probable Reserves MT	Possible Reserves MT
	2600 1560				910000	546000
Category-wise reserves				53180250	45727500	23034750
Total Geological Reserves				12,19,42,500 MT		
Mineable reserves @89.5%				10,97,09,250 MT		

1.6 MINING OPERATIONS

The mining operations will comprise of following activities for excavation of mineral.

- Drilling of "Down-the-Hole" holes as per specified pattern.
- Blasting of holes -Primary blasting only. No secondary blasting envisaged. Oversized boulders will be broken utilizing rock breakers
- Loading of blasted material by deploying hydraulic excavators
- Transportation of material to Crusher

Thus, these mining operations shall be carried out by fully mechanized opencast method utilizing Heavy Earth Moving Equipment (HEMM) in conjunction with deep hole drilling by crawler mounted DTH drills and blasting. To start with benches shall be kept narrow and then gradually widened. To the extent possible, benches shall be kept along dip and advanced along the strike to give a fairly well blended material in each bench. The direction may be varied in due course based on experience gained, to give wider benches, longer faces and proper alignment along haul roads / ramps.

It is proposed to adopt mechanized opencast mining method for exploitation of the mineral. Drilling and blasting shall be required to dislodge the mineral. The mining method involves breaking the rocks with explosives, loading the material with excavators and haulage with dumpers.

To start with benches shall be kept narrow and then gradually widened. To the extent possible, benches shall be kept along dip and advanced along the strike to give a fairly well blended material in each bench. The direction may be varied in due course based on experience gained, to give wider benches, longer faces and proper alignment along haul roads / ramps.

It is proposed to adopt mechanized opencast mining method for exploitation of the mineral. Drilling and blasting shall be required to dislodge the mineral. The mining method involves breaking the rocks with explosives, loading the material with excavators and haulage with dumpers.

1.6.1 Methodology

The present mining operations are designed to be carried out by open cast mining methods. The entire mining operation proposed is mechanized. Apart from mining, the loading and transportation shall be

done mechanically. It is proposed to load the mineral in the trucks/dumpers directly to the destinations and mineral is not put up in stack yard to avoid the double handling. In the present operation the working bench height shall be 9m with width 15-20 m each bench will advance one by one. While carrying out the mining operations in accordance with the above provision the overall pit slope shall be maintained at 490. The mineral bearing rocks are being hard and compact.

1.6.2 Conceptual mine plan parameter

The detailed mining plan has been prepared with a project life of 18 years. The mining is conceived as one long open mine pit. The opencast mechanized mining method has been considered feasible for exploitation of the deposit.

The aspects of geotechnical behaviour of quarry rocks have also been taken into consideration to ascertain the suitable mine pit slopes. The major rock of the quarry is quartzite with clay intercalations and could be classified in the category of harder rock strata. The conceptualized mine pits are based on appropriate overall slope angle broadly confirming to prevailing norms of mine safety department for harder rock strata. The broad configurations of mine pit slope are shown in the enclosed drawing (Plate2) and the broad details are as follows –

- Overall Slope – 49 degree
- Bench Height – 9 meters
- Bench Width – Operating width 15-20 mtrs which will finally reduce to 6.5 meters with intermediate safety berm of 8 mtrs width.
- Individual Bench Slope – 80 degrees
- Burden of Holes - 4 meters
- Spacing of Holes - 5 meters

1.6.3 Ultimate Size of the pit

The reserves up to 40m below the valley level (212 MRL) are proposed to be worked. The surface level reserves will not be depleted during the next 12 years. The workings will start at 351 MRL and will reach up to 252 MRL (Ground Level) at the end of 5th year as detailed in the year wise plans Plate no.5-9 and Sections plate no.10.

1.6.4 Final Slope angle

The final slope angle will be maintained as 49°.

1.6.5 Ultimate Capacity of dumps

The Stone and other associated minor minerals are very well exposed, except overburden and inter mixed. No overburden dump has been planned outside the lease area. However, within mine a dump of height up to 6m shall be developed in 0.60 ha during the five years to accommodate waste/mineral

rejects. Entire waste/low grade mineral is saleable. Lessee will get permission from The State Government to sale the waste.

1.6.6 Post Mining Reclamation plan including Afforestation:

Plantation at 3mx3m grid will be done. The green belt shall be developed as per approved mine lease plans and as per CPCB/MoEF guidelines. Plantation shall be carried out in side lease area in 7.5m wide safety zone, along roads, on dumps, office premises in about 12.8 ha of which during first five years 3.72 ha shall be taken up for plantation @0.8ha/year by planting 800 trees. Native plants like Neem, Pipal, Khejri, Ber and other local species will be planted. A suitable combination of trees that can grow fast and also have good leaf cover shall be adopted to develop the greenbelt. It is proposed to plant 4000 no's of native species along with some fruit bearing and medicinal trees during the plan period

1.6.7 Extent of Mechanization

Description for the calculation of adequacy and type of machinery and equipment proposed to be used in different mining operations are enumerated below-

Targeted Production = 58, 00,000 MT per Annum

Working days per annum = 300

Production per day = 19333 MT

Drilling

a) Tonnage of mineral excavated per hole = 9m x 4m x 5m x 2.5= 450 T

b) No. of holes required per day= 19333 T/450 T = 43

c) Total meterage of drilling/day= 43 holes x 9m = 387 m

d) Capacity of each drill machine= 10 m per hour or 60 m per shift or 120 m per day

e) Hence no of drill machines= Drilling required per day/capacity of drilling per day = 387/120 = 3.22 say 4 Nos of drill machine

Thus, it is proposed to use drill machines of 100 - 110mm dia. As per the production target of around 19333 MT (7733 m^3per day) it is estimated that about 43 holes of 9 m depth per day (387 m per day) will be required to maintain the proposed production targets. Therefore at least 4 drill machines of higher drilling rate (10 m/hour) with availability of 75% of time as well and 80 % utilization hours will be required.

The details of machinery and performance will be as follows-

Table 1-4: Details of machineries used in mining operations

Sr.no	Details	
1	A machine can drill total of meters in a shift	100-110m
2	Total drill meters required per day	387 m
3	Total no of machines required per day	3.22
4	20% consideration for maintenance and spare capacity	0.64
5	Total no of machines required (4.04 say 4)	4

1.6.8 Loading Equipment, Haulage and Other Mining Machinery

Hydraulic Excavator

The productivity of excavator is decided based on the following consideration i.e. two shifts per day working and 300 days in a year

Table 1-5: Details of hydraulic excavators

	Excavator Category	Capacity
A	Diesel Hydraulic shovel	3.2 m^3
B	Fill Factor	90 %
C	Tonnage Factor	2.50
D	Availability of excavator	80 %
E	Utilization of excavator	80%

For arriving at the rate of production per hour in case of the mine under reference, the following formula is applicable:

Q= C x F x T x BD x BF/Tc

Where, Q= Per hour handling of excavator in T

C= Bucket Capacity in cubic meters = 3.2 cum

F = 0.90

T = Time in seconds = 3600

Bf = Operating efficiency = 0.90

BD = Blasted Mass = 1.4

Tc = Time cycle per pass at 90-degree swing = 45 seconds

Thus Q = 3.2 x 0.9 x 3600 x 1.4 x 0.90/45 = 290 T per Hour

Per Excavator Per Day Output = Hourly capacity of excavator x effective hour per day = 290 x 12 = 3480 T

Therefore, No of Excavators required = Total Handling per day/Handling by excavator per day = 19333 / 3480 = 5.55 say 6 Nos

Hauling Equipment

For calculation of number of dumpers, it is the lead from the mine to the destination which will determine the no of dumpers. Based on calculations, it is established that total 18 Nos of 25 MT capacity dumpers would be sufficient to execute the rated production at an average lead of 1.5 km (one way with average speed of dumper 20 Kmph) However, including the standby equipment; total requirement of dumper works out to be 22 Nos. of 25 MT capacities.

Hydraulic Rock Breaker

To minimize the secondary blasting and to contain the accidents due to fly rocks, it is proposed to deploy Hydraulic rock breakers for breaking of big boulders generated consequently upon primary blasting, at working face site.

Thus, the total population of the equipment and other ancillaries as per above assumptions and calculations, are summarized in below table:

Table 1-6: Details of all equipment needed for mining

S.No.	Equipment	Size	Nos
1	Hydraulic Excavator for Loading of mineral	3.2cu.m	6
2	Rock breaker (Hydraulic Excavator) as substitute to secondary blasting	1.6 cum	2
3	Rear dumpers for transportation of mineral from mine to destination	25T	22
4	Drill Machine with compressor of 365 cfm capacity.	100-110mm	5
5	Track chain Dozer	350 HP	1
6	Pay loader (General Purpose, loading etc.)	145 HP	1
7	Crane	40T	1
8	Tyre handler	-	1
9	Water sprinkler	10 KL	2
10	Mobile Maintenance van		1
11	Tractor	50hp	1
12	Tractor mounted compressor		1

1.6.9 Requirement of Diesel for Operations of Heavy Earth Moving Machines and Ancillary Equipment

Table 1-7: Quantity of Diesel / Energy fuel Consumption per day

S. No.	Machine	Details of Diesel requirements	Consumption of Diesel (in ltr.)
1.	Dumper	(Considering diesel consumption by the dumper is 3 km / ltr.) Total Diesel consumption / 22 Dumper = 32 x 22 = 704 ltr.	704 ltr
2.	Excavator	Hourly Consumption = 15ltr / Shovel/ excavator 10-hour diesel consumption = 15x 11x 8= 1320 ltr.	1320 ltr.
3.	Dozer & Payloader	Diesel consumption 12ltr / hr 10 hrs diesel consumption = 12 x10 = 120ltr x2= 240	240 ltr
4.	Wagon Drill / Air Compressor	No. of Compressor- 5 compressors Diesel consumption by 5 compressors in 10-hour working = 5 x15 x 10 = 750 ltr.	750 ltr.
6.	Explosive Van		40ltr
7.	Maintenance Van		60ltr
8.	Water Tanker		30ltr
9.	Light Vehicles		30ltr
Total Diesel requirements			**3174 ltr / day**

1.6.10 Blasting Parameters

For mining of Stone and associated minor minerals, drilling and blasting is required. The job of drilling and blasting is of continues nature. Considering the time frame of mining and total requirement of material, the daily mineral production comes out to 18333 MT (7051 m3) the above target will be utilized to frame the pattern and size of blast. The blasting parameters are described in **Table 2.10.**

Table 1-8: Blasting Parameters

Item	Values
Bench height (m)	09
Hole depth (m) (including sub-grade drilling)	10
Burden (m)	4.0

Item	Values
Spacing (m)	5.0
Volume (m^3)	4x5x9=
Tonnage yield (t)	180x2.5=450 T
Powder Factor (assumed)	6 T/kg of explosive
Charge per hole (kg)	450 T/6 = 75 Kg
Total quantity of rock to be Broken per day (ton)	58,00,000 t/ 300 days = 19,334 TPD
Explosive required for blasting per day	19,334/6 =3,223 kg
Blasting Frequency (Every day)	1
Explosive required per blast per day	3223 kg
No. of holes per day	19,334t (Production/day)/450t (Tonnage per hole) =42.96 say 43 Holes
No of holes per blast	43

No. of holes per round = 43

Total Explosive to be fired per round = 3223 kg

It is expected that 5.8 MTPA ROM will need blasting per year. Assuming powder factor of 6 MT/kg. The total requirement of year will be 9,66,666Kg

Expected consumption of Explosive per month= 96690 Kg.

Av. Daily consumption will be about 3055 Kg

1.6.10.1 Type of Explosives

Emulsion Primer charge

Slurry Explosive column charge

ANFO can also be used as column charge.

Initiation System and minimum charge per delay

- Delay ---------- milliseconds delay detonators (17,25 & 43)
- Drilling pattern ------- staggered
- Firing pattern------- V pattern

1.6.10.2 Storage of explosive

Keeping in view the consumption of explosive, one permanent magazine for storage of explosives (10 T capacities) and storage of initiation system will be arranged. All statutory provisions as under the Explosive Act -1888 and modifications thereof are proposed to be followed.

Or Alternatively

Tie up with explosive supplier maintaining an explosive magazine with License to Purchase, Sell and Use. This agency can bring explosives (sell) as per requirement and use in the project premises. This system will avoid construction of explosive magazine in mine premises.

1.6.10.3 Blasting Operation Near Habitation

Blasting shall be carried out as per DGMS norms/ lows/ rules after taking permission from DGMS. Blasting activities will be carried out 300m away from the habitation as per prescribed standards of DGMS. As per present DGMS norms 300m distance is required to carry out blasting activity. For real assessment of impact of blasting, vibration studies shall be taken up through reputed institutes.

1.7 GENERAL FEATURES

1.7.1 Surface Drainage Pattern

Open cast mining projects requires effective arrangements for drainage and provision of adequate dewatering capacity in the pits under mining. In the area under mining water can reach the workings from surface drainage, rainwater and due to seepage through joints and fissures. Therefore, the problem can be solved by preventing drainage water from entering the pits on one hand and pumping out the percolated and direct rain water from the pits on the other hand. The general water table around the lease area is at 48 meters below ground.

1.7.2 Drainage Around and Within Mine:

The hill is mainly sloping both east and west direction. Initial mining will be mainly above the general ground level with only one side of the pit having slope along hill and other side will remain open. Such situation does not warrant any water accumulation as natural drainage will be available from the other open side of the pit.

However, as the mine progresses and mining continue below the general ground level as envisaged during later part of lease period, the mining area will become a depression, which may warrant accumulation of water during rainy season. A scheme is proposed to prevent the accumulation of such water-

- Garland drainage will be made all round the pit to prevent the entry of surface/ rain water inside the pits.

- All the benches will be provided with mild inward slope to keep the benches in drained condition. Provision of sumps is provided. The lowest bench will be slightly sloped towards the sump so that the entire drain water goes to the sump.
- The working faces will be advanced with a mild upward gradient to facilitate the drainage. The water will be gradually drained from the upper most bench to the lowest bench and then ultimately to the sump.
- Similarly, in the ultimate pit position, large sump will be provided at the pit bottom to accumulate drained water as well as direct rain water.

1.7.3 Dewatering

Since the depth of mining proposed is well above the water table, there will be no chance of encountering the ground water table during the mining operations. Hence normal-pumping operations will be required during the monsoon season only. The water accumulates within the pits will be due to direct rainfall over the pit and seepage from adjoining areas, if any. Further the rain water accumulated in the pit if any will percolate down in to the porous excavated bed rock/aquifer.

The average rainfall of the last 10 years is 500mm only.

An examination of the above reveals that the rainy season extends from June to September. Although in the above period under consideration there has been rainfall in other months also, but it can be considered as stray occurrence and will not after all proposed pumping plan.

The water to be pumped out from the open pits will be contributed both by direct precipitation over the open pits and seepage. The water due to direct precipitation will depend upon the rainfall and the area of the pit.

Based on the rainfall records, the sumps of the sizes as shown plate's No. 5-9 shall be provided at the bottom most bench. During the monsoon period a continuous process of dewatering the sumps shall be there to facilitate the mining at the lower benches.

Based on the Rainfall data it is proposed to have a diesel engine operated water pump of 7.5HP which may dewater 20m^3/hour from the pit. The water will be sent to the drain of 0.5mtr depth. This water will finally go into the natural nallah.

1.7.4 Transportation

The transportation of stone and mineral from pit head to the consumer pulveriser's crushers / traders will be carried out by the trucks of the applicant of generally 25 MT Capacity. There is all weather metal led roads and then a kutcha road right up to mines to dispatch the material from mines to the market/crushers. It will be purchased by the parties at mine site and transported by them through their own arrangement of trucks. The practice is quite sound in the area and ensure continuous lifting of the material. Customers come with transport arrangement of their own.

To accommodate and to ensure smooth production of mineral the following points shall be considered:

- Existing Kachcha road which joins mine to metalled road shall be widened, strengthened and shall be maintained regularly so that dumpers of 25 T capacity can ply on it smoothly.
- Proper traffic control shall be done at road crossings.

- Road crossings shall be wide enough to ensure that dumpers plying on the roads are safe to cross/overtake, where ever necessary.
- Along the both side of kachcha road, plantation shall be done as it will arrest the dust and will act as sound barrier to larger extent.
- Regular/Daily, water spraying shall be done on main haulage road in South and North Block through water tankers fitted with sprinklers.

It is proposed to load in the trucks/dumpers directly to the destinations and mineral is not usually put up in this stack yard to avoid the double handling. However, in the event of less demand or any other reasons it is proposed to stack the mineral in the dump yard. The height of the dump yard may attain a maximum of 8 m; with moderate slope of 39 degrees.

1.7.5 Beneficiation / Processing

In view of the availability of direct market for building stone R.O.M., there is no proposal of beneficiation. Mineral will be sold to various crushers located in the area. Part of the building stone product will be sold in the form of lumps to the crusher owners.

1.8 SITE SERVICES

1.8.1 Manager's Office

As detailed in the preceding chapter, the mine is designed to produce some 5.8 MTPA of Stone and Associated Minor Minerals. The activities shall be supervised by one competent person i.e. Mines Manager, one Mining Mate cum blaster to supervise the drilling and blasting operation. Since this is very small mines. The office of Manager 5 x 3 metres, shall also provide accommodation for supervisory staff as well.

1.8.2 Canteen -cum-rest shelter

In order to provide the rest shelter for the personnel working in the mine and also to provide tea/refreshment etc.as per the Mines act, 1952. The arrangement shall be made to install a rest shelter-cum-canteen as shown in plate no.4 and shall be utilized by the workers. The rest shelter will be for having rest during the lunch hours by the operators/ labour. The size of rest shelter shall be about 5 x 3 meter to accommodate the working labours.

1.8.3 Store

Since the mining operation will involve heavy earth moving machinery a small storeroom will be provided for day to day operations. No provisions for a separate workshop is being made as the heavy repairs will be carried out elsewhere.

1.8.4 First Aid Room

To provide the first aid for any sort of injuries encountered during the mining operation, one small first aid room shall be provided. First aid kit and sufficient stock of material / medicines needed for first aid shall be provided as per requirement. As the mining engineer / Manager and mining mates are qualified first aiders they can provide first aid to the injured on the spot. More ever the Govt. Hospitals is there at Nangal Chaudhary and Narnaul, which are just 6km and 25km respectively from the mine and necessary medical aid can be provided from there.

1.8.5 Creche

At present provision of crèche is not provided, however in future if women workers are employed, arrangement for a small crèche shall be made as per the requirement.

1.8.6 V.T. Centre

Necessary arrangement will be made for conducting refresher course as laid down in Mines vocational training rules.

1.8.7 Magazine

A magazine of the required size will be provided to fulfill the requirement of blasting of mineral as well as inter burden as detailed in the chapter of Blasting. The Magazine shall be erected as shown in the enclosed plate no 5-9. The design of the magazine shall be as per approval of the chief controller of Explosives, Govt. Of India. The magazine shall be properly fenced and provided with as security guard round the clock.

1.8.8 Electricity Supply

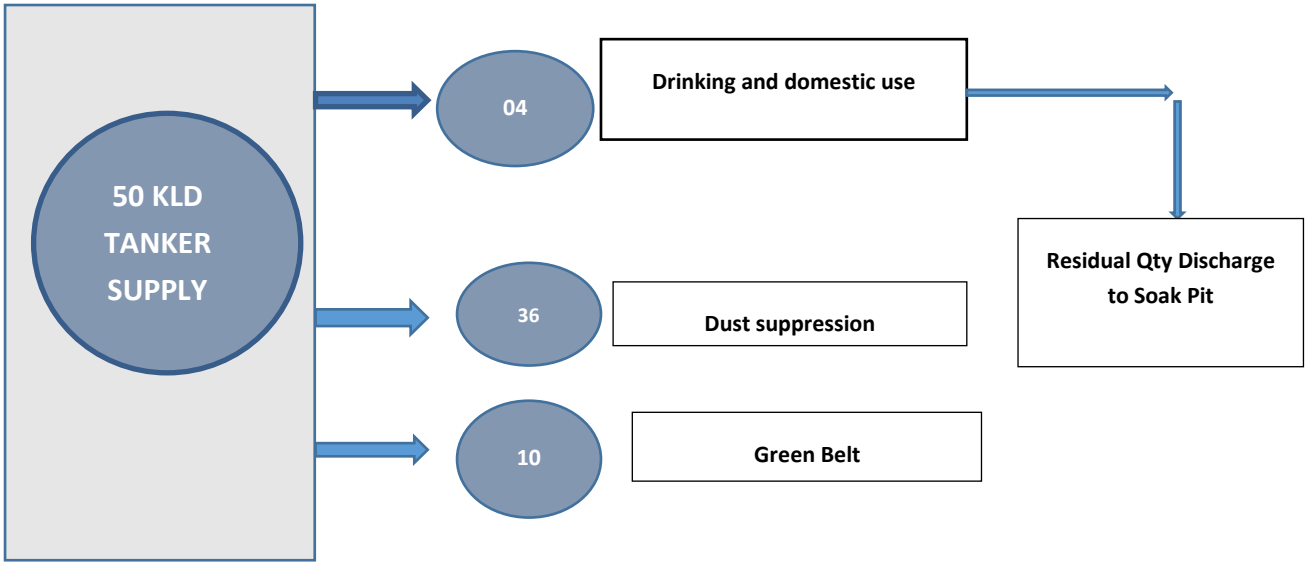
Presently there is no arrangement for supply, at the mine but it is proposed to take an extension of the electricity line from the nearby point which is just 500m from mines site.

1.8.9 Water Supply

The water supply for drinking purpose proposed as well as for dust suppression is proposed to be done through tanker supply from nearby village. The requirement of water for various activities is detailed here below.

Table 1-9: Water Requirement

S. No	Particular	Proposed KLD
1	Dust suppression	36
2	Drinking and domestic	4
3	Green Belt/ Plantation	10
Total Water Requirement		**50**



1.9 MANPOWER REQUIREMENTS

In this project the mechanized mining is proposed for production of stone and associated minor minerals. The proposed organizational structure for the project is worked out in view of the type of mining system adopted and the need of effective Environment Management Plan. The requirement of various technical and non-technical personnel is determined while adopting the following norms

- The mine will be worked in two shifts in day.
- In estimating the requirement of magazine attendants, and provision of competent person, mates, blaster etc. due consideration has been given to the statutory provisions.

The manpower requirement has been assessed in view of the provisions of Mines Act, 1952 and MMR-1961 and elucidated in **Table 1.10** and **1.11**.

Table 1-10: List of manpower for managerial and operative staff

S. No.	Designation	Category	Nos
1	Project Manager / Mines Manager	Highly skilled	1
2	Assistant Managers (Shift Manager)	Highly skilled	2
3	Mining Mate cum Blaster	Highly skilled	2
4	Mechanical Engineer	Highly Skilled	1
5	Mechanical Foreman	Highly skilled	1
6	Mining Foreman	Highly Skilled	2
7	Diesel hydraulic shovel operator	Highly skilled	7

8	Front End Loader Operator	Highly skilled	1
9	Rear dumpers operators	Highly skilled	18
10	Drill operators	Highly skilled	4
11	Track chain Dozer operators	Highly skilled	1
Total			**40**

Thus, total strength of managerial and operative staff shall be 40.

In addition, following manpower shall be arranged through suitable mode for related mining works, operations of ancillary equipment, handling of explosives and management of environment cell.

Table 1-11: List of manpower for additional work

S. No.	Designation	Category	Nos
1	Crane	Highly skilled	1
2	Heavy duty tow truck	Highly skilled	1
3	Tire handler	Highly skilled	1
4	Water sprinkler	Skilled	2
5	Maintenance van driver	Skilled	2
6	Tractor operator/driver	Skilled	2
7	Tractor compressor operator	Skilled	2
8	Mechanic/Helpers/labour	Semi-skilled	25
9	Crusher Engineer	Highly Skilled	3
10	Crusher Foreman	Skilled	2
11	Crusher Operation & Maintenance Staff	Skilled & Semi Skilled	20
Total			**61**

In addition to the above-mentioned staff rest of the function i.e. supply of explosives, preparation and amendment of plans etc. shall proposed to be performed from the professional on contract basis.

1.10 PROJECT IMPLEMENTATION SCHEDULE

Pre- production development work is required to start the mining from top downwards therefore, to align the mine road and to reach the mine for mining. The reserves up to 40m below the valley level (212 MRL) are proposed to be worked. The surface level reserves will not be depleted during the next 12

years. The workings will start at 351 MRL and will reach up to 252 MRL (Ground Level) at the end of 5th year. The total length of the road will be 1500 meters with 10m width. The gradient of the road is proposed 1:16. The construction of garland parapet, wire fencing etc., shall be provided year wise and will be shifted along with the development of pit. Provision of stack yard for mineral is not proposed as the same is loaded and transported directly to the consumers. Year wise Production & Development for the first Five years.

The elevation of the hill top is 361 MRL, the ground level is 252 MRL and working is proposed 40 mts below ground level i.e. up to 212 MRL.

There is a thin soil/alluvium cover about 0.5-1m in the area which needs to dredged and placed at the location earmarked for stacking the soil.

2 OBJECTIVE AND METHODOLOGY

2.1 INTRODUCTION

The ecology is the scientific analysis and study of interactions among organisms and their environment. It is an interdisciplinary field that includes biology and Earth science. The biodiversity and conservation discipline explore natural landscapes, species and ecosystems and acquires theories and practical methods in preserving environments and organisms. Biodiversity refers not only to endangered species but also to every organism, including microbes and fungi. Biodiversity and conservation program increase awareness and understanding of how human life depends on preserving animal species and natural ecosystems. Biodiversity and conservation is connected to similar disciplines like environmental science, natural resources management and animal sciences.

The district is inhabited by various groups of mammals. Primates are represented by Rhesus Macaque and the Langur. The carnivorous animals found in the district are the jungle cat, the small Indian civet, jackal and the Indian fox. Pigeons and doves are common in the cultivated fields, besides, the colorful birds like parakeets, black partridges, quails, bulbuls and kingfishers. The common poisonous snakes found in the district include: Krait, Russel's and Viper. The non-poisonous snakes are blind snake, Indian python, John's sand boa, wolf snake and rat snake. All the lizards found in the district are non-poisonous. The common lizard can be seen in the houses. Kirla or girgit is found in the lawns and hedges, besides a few other types of lizards are found in bushes and areas of thick vegetation.

2.2 METHODOLOGY

- In order to study the wild mammals, avifauna, here to fauna and insects of the project area 2-5 km transect trails were carried out in the different locations. The study area was divided into different strata based on vegetation and topography. Sampling for habitat and animals was done in different strata. As the normal systematic transects for mammals and birds were not possible in this study area due to difficult terrain, therefore mostly trails were used for faunal sampling. In addition to the field sampling secondary data and information was also collected as follows:
- Direct sighting and indirect evidences such as calls, signs and trophies of mammals were recorded along the survey routes taking aid from Prater (1980).
- Interviews of local villagers for the presence and relative abundance of various animal species within each locality.
- Authorized list of fauna collected by dept. of wildlife, Charkhi-Dadri

2.3 STUDY APPROACH

Since the buffer zone of the proposed mining site reported with Schedule I and II species, a systematic study was conducted to assess their status inter movements and habitat use of these species. List of

Schedule I & II species of fauna received from forest department is enclosed as **Annexure3.** At first, a detailed biological survey of the core zone and buffer zone (10km radius from periphery of the mine lease area was carried out to understand the status distribution of the species in the study area. Further, survey was carried out to understand the recent status of these species sighting sand their movements. Local inhabitants of Kalyana (nearest village), Kalali, Jhojhu Kalan, Mahra, and Mandoli villages were interviewed to understand the possible habitat, food and feeding habitat of these species in the study area. The conclusion of the survey issued the potential sightings & habitat use, and movement and food habits of peacock in the study area.

2.4 DATA COLLECTION

The data collection is done in pre-designed format especially for this specific purpose. In data collection the support and help of local forest officials are taken. Local senior citizens were employed for this specific project to help in identification of fauna and flora by direct and indirect method both.

Data collection on vegetation was done through laying of square quadrats. 10 percent area of the core zone is taken as sample. Information on animals is collected through interviews from the villagers of the core and buffer zones.

2.5 LAYING OF SAMPLE PLOTS:

Sample plots are laid in core as well as in the buffer area adjoining to the boundary representing up to 10 km. Selection of center of the plot of I ha. i.e. the point of inter-section of two diagonals i.e. NE to SW and NW to SE of the plot is done. The length of each diagonal measures 141.42 m. After reaching the plot center stout peg, fixed firmly on the ground in the center.

Dimensions of the plot i.e. all sides measure 100 meters horizontal distance.

2.6 SAMPLING FOR TREE LAYER

Saplings and trees with a girth of 20cm or more were taken as trees. The core zone was divided on the map in to 1000 x 1000m squares. At the intersection of the lines one ha (100 x 100m sq) plots were taken. In total 37, such I ha sampling plots were marked. The marked sampling plots were reached with the help of GPS. Circumference of all the trees at the breast height is recorded species wise.

2.7 COLLECTION OF SECONDARY DATA

Secondary data is collected i.e., Compartment History prepared by the Forest Department, Working Plan of the Area other relevant records such as plantation journals and records of wild life / forest offence cases.

2.8 REVIEW / REFFERENCE OF RELEVANT LITERATURE/BOOKS

To complete this study the information from published books, materials and scientific literature is relied

upon.

2.9 SAMPLING FOR SHRUB LAYER

Seedlings and saplings of trees and other woody shrubs were included in this category. Shrub layer was sampled with the help of 5 x 5m square quadrats, one within each 1 ha sampling plot. Only the number of shrubs, species wise, were recorded.

2.10 SAMPLING FOR HERB LAYER

Small, non-woody plants were included in this category. The herb layer was sampled with the help of I x 1m quadrants. Like the shrub layer only the number of herbaceous plants, species wise, were counted.

2.11 DATA ANALYSIS

Frequency and density of all the species, in all the categories viz: tree, shrub and herb layer were calculated while for the tree layer density, frequency and basal area were calculated. From these values relative frequency, relative density and relative basal area and then

Importance Value Index (IVI) was calculated for trees using following formulae: (a) Frequency: Frequency was calculated as:

$$\text{Frequency: } \frac{\text{No. of segments in which species is present}}{\text{Total no. of segments studied}}$$

(b) Relative Frequency: Relative frequency was calculated with the help of the following formula

$$\text{R.F\%} = \frac{\text{No. of species}}{\text{Total no. of species}} \times 100$$

(c) Dominance: Dominance was calculated as:

Dominance: $C = E\,(ni/N)^2$

Where: ni= number of individual species.

N= total number of species.

(d) Frequency: Frequency was calculated as:

(e)Relative Dominance: Relative dominance was calculated by using the formula as given below:

$$\text{Relative Dominance} = \frac{\text{Cover of one species}}{\text{Cover of all species}} \times 100$$

(f) Importance Value Index (IVI) : As per Curtis (1959).

IVI = Relative Frequency + Relative Density + Relative Dominance

2.12 DATA SYNTHESIS AND RESULTS

The primary data collected from the field are subjected to standard statistical tests and species are identified with reference to published books and materials. The study revealed following status of the species i.e. flora and fauna in the given area.

3 STATUS OF FLORA AND FAUNA IN THE STUDY AREA

3.1 INTRODUCTION

The ecology is the scientific analysis and study of interactions among organisms and their environment. It is an interdisciplinary field that includes biology and Earth science. The biodiversity and conservation discipline explore natural landscapes, species and ecosystems and acquires theories and practical methods in preserving environments and organisms. Biodiversity refers not only to endangered species but also to every organism, including microbes and fungi. Biodiversity and conservation program increase awareness.

3.2 FLORA

3.1.1 Flora of the Core Zone

The core zone of the study area constitutes Aravalli Hills mainly rocky area, mostly having steep slope.

During survey herbs and shrubs observed in and around the lease area are *Calotropis procera, Tridax procumbens, Argemone mexicana, Laptodenia, Tephrosea, zyziphus, Tribulus terrestris, Parthenium hysterophorus, Sida acuta, Cassia tora, Datura stramonium* etc.

3.1.2 Flora of the Buffer zone (10 km Study area)

The major land use of the study area is Built up land in association with water, vegetation and vacant lands, Land with or without scrub, Fallow land, Dense Evergreen vegetation and Water bodies. The vegetation of the buffer zone of the study area can be classified into fairly dense vegetation at some patches dominated by tree species like *Azadirachta indica*, *Dalbergia sissoo, Mangifera indica, Bombax Ceiba, Albezia lebbek, Acacia albida, Propsopis cineraria, Holoptalia integrifolia, Acacia tonalis, Acacia nilotica, Pongamia pinnata, Prosopis juliflora, Syzygium cumini, Ziziphus mauritiana, Zizyphus xylopyra* etc.

Dominant tree species observed in the study area are Kikar or Babul (*Acacia nilotica*), *Acacia tonalis*, *Holoptalia integrifolia*, Neem (*Azadirachta indica*), Shisham (*Dalbergia sissoo*), Pipal (*Ficus religiosa*), Aam (*Mangifera indica*), Jamun (*Syzygium cumini*), Imli (*Tamarindus indica*), Banyan (*Ficus indicus*), Ber (*Zizyphus mauritiana*), Khara Jal (*Salvador persica*), Semul, Khejri (*Prosopis cineraria*), Lasura (*Cordia dichotoma*), Amla, Dhak (*Butea frondosa*), Shahtoot (*Morus alba*), eucalyptus, Amrood (*Psidium guajava*), and Papri (*Holoptalia*).

Some small tree species observed in the study area are *Careya arboreal, Holarrhena antidysenterica,*

Zizyphus mauritiana etc.

Species of Shrubs species observed in the study area are *Adhatoda sp., Callicarpa macrophylla, Carissa opaca, Clerodendron viscosum, Euphorbia royleana, Ixora sp., Murraya sp., Zizyphus sr. etc.* Species of

Grasses observed in the study area are *Chrysopogon sp., Cymbopogon martini, Heteropogon contortus, Saccharum spontaneum, Vetiveria zizanioides* etc.

Table 3-1: List of plant species recorded in the study area

Sr. No.	Botanical Name	Common Name	Family
Trees			
1.	*Acacia leucophloea*	Harmo	Fabaceae
2.	*Acacia nilotica*	Desibaval	Fabaceae
3.	*Acacia senegal*	Khairi	Fabaceae
4.	*Acacia albida*	Ronjh	Fabaceae
5.	*Acacia tortalis*	Israeli Kikar	Fabaceae
6.	*Aegle marmelos*	Bel	Rutaceae
7.	*Albizia lebbeck*	Siras	Fabaceae
8.	*Alianthus excelsa*	Ullu Neem	
9.	*Albizia procera*	Kala Siras	Fabaceae
10.	*Anogeissus latifolia*	Dhawan	
11.	*Anogeissus Pendula*	Dhauk	
12.	*Azadirachta indica*	Limdo	Meliaceae
13.	*Bauhinia variegata*	Kachnar	Fabaceae
14.	*Belanite aegyptica*	Hingot	Zygophyuaceae
15.	*Bombax ceiba*	Simlo	Bombacaceae
16.	*Boswallia serrata*	Salai Guggal	Bursaraceae
17.	*Cassia fistula*	Garmalo	Caesalpiniaceae
18.	*Cassia siamea*	Kesia	Fabaceae
19.	*Capparis decidua*	Karir	Capparaceae
20.	*Crateava religiosa*	Barna	Capparidaceae
21.	*Cordia dichotoma*	Gundo	Boraginaceae
22.	*Cordia mixa*	Lasura	Boraginaceae
23.	*Commifora mukul*	Guggal	B ursaraceae
24.	*Dalbergia sissoo*	Shisham	Fabaceae
25.	*Emblica officinalis*	Amla	Euphorbiaceae

Sr. No.	Botanical Name	Common Name	Family
26.	*Erythrina indica*	Coral Tree	Fabaceae
27.	*Ficus benghalensis*	Vad	Moraceae
28.	*Ficus racemosa*	Umro	Moraceae
29.	*Ficus religiosa*	Piplo	Moraceae
30.	*Ficus glomerta*	Gular	Moraceae
31.	*Ficus infectoria*	Pilkhan	Moraceae
32.	*Holorrina anticlysentrica*	Indra jo	Apocynaceae
33.	*Holoptalia intregrifolia*	Pahari papari	Ulmaceae
34.	*Jacaranda mimosifolia*	Jacaranda	Bignoniaceae
35.	*Kigelia pinnata*	Kigelia	Bignoniaceae
36.	*Mangifera indica*	Aam	Anacardiaceae
37.	*Melia azedarach*	B akayan	Meliaceae
38.	*Moringa oleifera*	Mithosaragavo	Moringaceae
39.	*Mimosops hyzandra*	Khirni	Sapotaceae
40.	*Phoenix sylvestris*	Khajur	Arecaceae
41.	*Pithecellobium dulce*	Jungle jalebi	Fabaceae
42.	*Polyalthia longifolia*	Ashoka	Annonaceae
43.	*Pongamia pinnata*	Karanj, Kanji	Fabaceae
44.	*Prosopis cineraria*	Khijdo	Fabaceae
45.	*Prosopis juliflora*	Gando baval	Fabaceae
46.	*Syz,ygium cumini*	Jambu	Myrtaceae
47.	*Tamarindus indica*	Khati Amli	Fabaceae
48.	*Tectona grandis*	Sag	Verbenaceae
49.	*Tecomela undulata*	Rohira	Bignoniaceae
50.	*Terminalia arjuna*	Arjunsad	Combretaceae
51.	*Ziziphus mauritiana*	Bor	Rhamnaceae
52.	*Eugenia jambolana*	Jamoa	Myrtaceae

Sr. No.	Botanical Name	Common Name	Family
53.	*Zizyphus xylopyra*	Ghatbor	Rhamnaceae
54.	*Salvadora persica*	Jhal	Salvadoraceae
55.	*Wrightia tinctoria*	Kherni	
Shrubs			
56.	*Adhatoda vasica*	Adulsa	Acanthaceae
57.	*Annona squamosa*	Sitafal	Annonaceae
58.	*Argemone mexicana*	Pila Dhatura	Papaveraceae
59.	*Calotropis gigantea*	Shivark, Akdo	Apocynaceae
60.	*Calotropis procera*	Mudar	Asclepiadaceae
61.	*Crotalaria juncea*	Indian Hemp	Fabaceae
62.	*Euphorbia neriifolia*	Thor	Euphorbiaceae
63.	*Ipomoea fistulosa*	Beshram	Convolvulaceae
64.	*Lantana camara*	Lantana	Verbenaceae
65.	*Nyctanthes arbor-tristis*	Tamat, Harsingar	Oleaceae
66.	*Opuntia dillenii*	Opuntia	Cactaceae
67.	*Sida acuta*	Chikan	Malvaceae
Herbs			
68.	*Achyranthes aspera*	Unga, Keora	Amaranthaceae
69.	*Agave americana*	Ram Baas	Agavaceae
70.	*Aloe vera*	Gwarpatha	Liliaceae
71.	*Amaranthus spinosus*	Jungli Cholai	
72.	*Cannabis sativa*	Bhang	Cannabaceae
73.	*Cassia tora*	Puwad, Panwar	Fabaceae
74.	*Cassia glauca*	Bathu	Fabaceae
75.	*Chenopodium album*	Goosfoot	Amaranthaceae
76.	*Datura stramonium*	Dhatura	Solanaceae
77.	*Parthenium hysterophorus*	Gajar Ghaas	Asteraceae
78.	*Tephrosia purpurea*	Sarpankha	Fabaceae

Sr. No.	Botanical Name	Common Name	Family
79.	*Tribulus terrestris*	Gokha ru	Zygophyllaceae
80.	*Tridax procumbens*	Kumru	Asteraceae
81.	*Caparis decidua*	Kair	
82.	*Ocimum canum*	Jungli Tulsi	
83.	*Aerva pseudotomentosa*	Bui	
84.	*Withania somnifera*	Ashwagandha	
85.	*Leptoden ia pyrotechnica*	Kheep	
Climbers			
86.	*Asparagus racemosus*	Shatavari	Asparagaceae
87.	*Abrus precarious*	Rati	
88.	*Cuscuta reflexa*	Amarbel	Convolvulaceae
89.	*Cucumis callosus*	Kachri	
90.	*Convolvulus arvensis*	Shankh Pushpi	
91.	*Momordica charantia*	Jungli Kerala	Cucurbitaceae
92.	*Tinospora cordifolia*	Neem Giloy	Menispermaceae
Grass			
93.	*Cenchrus ciliaris*	Dhaman	
94.	*Cenchrus biflorus*	Bhurat	
95.	*Cenchrus setigerus*	Anjan	
96.	*Cynodon dactylon*	Dub	Poaceae
97.	*Desmodium bipinnata*	grass	
98.	*Dichanthium annulatum*	Karad	Poaceae
99.	*Heteropogon contortus*	Sukhala	Poaceae
100.	*Digitaria sp.*	Crabgrass	Poaceae
101.	*Lasirus cindicus*	Seven	
102.	*Cenchrus pennisetiformis*	Dhamnio	
103.	*Saccharum spontaneum*	Munja	

Source: Survey team in consultation with concern state forest officials and local people

3.3 FAUNAL INVESTIGATION

3.3.1 Mammals

Faunal assessment provides a basis for determining relative abundance and rarity of each species which is important for assessing the diversity of fauna of a particular area. Since animals are capable of movements from one place to another, this makes their study entirely different. Different animals prefer different types of habitat for food and shelter.

During the mammalian survey, the species observed in the study area are Indian Hare (*Lepus nigricollis*), Indian gray mongoose (*Herpestes edwardsi*) and Five striped Palm Squirrel (*Funambulus palmarum*), Jackal, Chinkara, Monkey, Jungle cat. During public consultation and discussion with forest and wildlife department it was documented that species like Common House Rat (*Rattus rattus*), Nilgai *(Boselaphus tragocamelus*), Jackal (*Canis aureus*), Indian Hare (*Lepus nigricollis*), India Fox, Hyena, Chinkara, Indian fox, Monkeys are observed in the study area.

During the faunal investigation some of Schedule-I species & two Schedule-II also observed in the study area.

3.3.2 Reptiles and Amphibians

During survey, the reptilian species observed in the study area are Monitor Lizard, Cobra, Sand Boa, Rat Snake. As per discussion with local people it was noted that Rat snakes (*Ptyas mucosa*) is generally observed in and around the human habitation.

Amphibians are commonly found at the places along the margin of aquatic and terrestrial ecosystems. Due to presence of water bodies like river, nalas, etc the study area is providing shelter to many amphibian species. Some of the commonly reported species are *Bufo melanostictus* (common Indian toad), *Euphlyctis cyanophlyctis* (Indian skipper frog), *Hoplobatrachus tigerinus* (Indian bull frog) etc.

The list of fauna/ reptiles/Amphibians found in the study area is given in Table.

Table 3-2: List of Fauna / Reptiles and Amphibians recorded in Study Area

S. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
Mammals					
1.	Boselaphus tragocamelus	Nilgai	Bovidae	Schedule II	Least Concern

S. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
2.	Canis aureus	Jackal	Canidae	Schedule II	Least Concern
3.	Funambulus pennanti	Five Striped Palm Squirrel	Sciuridae	Schedule IV	Least Concern
4.	Herpestes edwardsi	Mangoose	Herpestidae	Schedule II	Least Concern
5.	Lepus nigricollis	Indian Hare	Leporidae	Schedule IV	Least Concern
6.	Chinkara			Schedule I	
7.	Indian Fox			Schedule II	
8.	Jungal cat			Schedule II	
9.	Mus musculus	Gharelu Musa	Muridae	Schedule V	Least Concern
10.	Rattus rattus	Black Rat	Muridae	Schedule V	Least Concern
1 1.	Rousettus leschenaulti	Chamgadar	Pteropodidae	Schedule V	Least Concern
12.	Monkey				
Reptiles and Amphibians					
13.	Duttaphrynus melanostictus	Common Indian toad	Bufonidae	Not Enlisted	Least Concern
14.	Calotes versicolor	Garden lizard	Agamidae	Schedule IV	Not Evaluated
15.	Hemidactylus sp	House lizard	Gekkonidae	Schedule IV	Not Evaluated
16.	Hoplobatrachus tigerinus	Indian bull frog	Dicroglossidae	Schedule IV	Not Evaluated
17.	Euphlyctis cyanophlyctis	Indian	Dicroglossida	Schedule IV	**Not Evaluated**

S. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
		skipper frog	e		
18.	Ptyas mucosa	Rat snakes	Colubridae	Schedule IV	**Not Evaluated**
19.	Monitor Lizard				
20.	Cobra				
21.	Sand Boa				
22.	Bufo stomaticus	Skipping frog	Bufonidae	Schedule IV	Not Evaluated

Source: Survey team in consultation with concern state forest officials and local people

3.3.3 Avifauna

Diversity of avifauna is one of the most important ecological indicators to evaluate the quality of habitats. Now-a-days, avifaunal diversity has been decreasing due to the destruction of natural habitats and human disturbances. Both plant and bird diversity have an important role in maintaining the ecological balance and these are the indicator of health of the ecosystem. Bird diversity has a direct relationship with plant diversity. Plant diversity provides a space to birds for nesting, feeding and breeding.

Different land use in the study area was identified to get maximum bird diversity. In the study area, a good number of birds are totally dependent on plants for food and shelter. The bushy vegetation around the lease area provides good shelter for bird species.

The species observed in the study area are Rose Ringed Parakeet (*Psittacula krameri*), Small Blue Kingfisher (*Alcedo atthis*), Cattle Egret (*Bubulcus ibis*), Little Egret (*Egretta garzetta*), Common Myna (*Acridotheres tristis*), Indian Roller (*Coracias benghalensis*), Blue Rock Pigeon (*Columba livia*), Magpie Robin (Copsychus saularis), Koel (Eudynamys scolopaceus), Common Babbler (Turdoides caudate), Jungle Babbler (*Turdoides striata*), Small Green Bee Eater (*Merops orientalis*), House Crow (*Corvus splendens*), Purple Sunbird (*Cinnyris asiaticus*), Red Vented Bulbul (*Pycnonotus cafer*), Indian Robin (*Saxicoloides fulicatus*), House Sparrow (*Passer domesticus*), White Wagtail (*Motacilla alba*), Golden Oriole (*Oriolus oriolus*). List of birds observed in the study area are presented in below-

Table 3-3: List of Avifauna recorded in the Study Area

Sr. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
1.	*Accipiter badius*	Shikara	Accipitridae	Schedule IV	Least Concern
2.	*Acridotheres tristis*	Common Myna	Sturnidae	Schedule IV	Least Concern
3.	*Alcedo atthis*	Small Blue Kingfisher	Alcedinidae	Schedule IV	Least Concern
4.	*Anlaurornis phoenicurus*	White Breasted Waterhen	Rallidae	Schedule IV	Least Concern
5.	*Anas poecilorhyncha*	Spot-billed Duck	Anatidae	Schedule IV	Least Concern
6.	*Ardeola grayii*	Indian Pond Heron	Ardeidae	Schedule IV	Least Concern
7.	*Bubulcus ibis*	Cattle Egret	Ardeidae	Schedule IV	Least Concern
8.	*Butastur teesa*	White eyed buzzard	Accipitridae	Schedule IV	Least Concern
9.	*Cinnyris asiaticus*	Purple Sunbird	Nectariniidae	Schedule IV	Least Concern
10.	*Columba livia*	Blue Rock Pigeon	Columbidae	Not Enlisted	Least Concern
11.	*Copsychus saularis*	Magpie Robin	Muscicapidae	Schedule IV	Least Concern
12.	*Coracias benghalensis*	Indian Roller	Coraciidae	Schedule IV	Least Concern
13.	*Corvus macrorhynchos*	Jungle Crow	Corvidae	Not Enlisted	Least Concern

Sr. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
14.	*Corvus splendens*	House Crow	Corvidae	Schedule V	Least Concern
15.	*Dendrocitta vagabunda*	Rufous Treepie	Corvidae	Schedule IV	Least Concern
16.	*Dicrurus adsimilis*	Fork-tailed Drongo	Dicruridae	Schedule IV	Least Concern
17.	*Egretta garzetta*	Little Egret	Ardeidae	Schedule IV	Least Concern
18.	*Eudynamys scolopaceus*	Koel	Cuculidae	Schedule IV	Least Concern
19.	*Francolinus pondicerianus*	Grey Partridge	Phasianidae	Schedule IV	Least Concern
20.	*Halcyon smyrnensis*	White Breasted Kingfisher	Halcyonidae	Schedule IV	Least Concern
21.	*Lanius excubitor*	Grey Shrike	Laniidae	Not Enlisted	Least Concern
22.	*Lonchura malabarica*	White Throated Munia	Estrildidae	Schedule IV	Least Concern
23.	*Merops orientalis*	Small Green Bee Eater	Meropidae	Not Enlisted	Least Concern
24.	*Motacilla alba*	White Wagtail	Motacillidae	Schedule IV	Least Concern
25.	*Motacilla capsica*	Grey Wagtail	Motacillidae	Schedule IV	Least Concern
26.	*Motacilla flava*	Yellow Wagtail	Motacillidae	Schedule IV	Least Concern
27.	*Oriolus oriolus*	Golden Oriole	Oriolidae	Schedule IV	Least Concern

Sr. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
28.	*Passer domesticus*	House Sparrow	Passeridae	Not Enlisted	Least Concern
29.	*Pavo cristatus*	Common Peafowl	Phasianidae	Schedule I	Least Concern
30.	*Phalacrocorax niger*	Little Cormorant	Phalacrocoracidae	Schedule IV	Least Concern
31.	*Ploceus philippinus*	Baya Weaver	Ploceidae	Schedule IV	Least Concern
32.	*Psittacula krameri*	Rose Ringed Parakeet	Psittaculidae	Schedule IV	Least Concern
33.	*Pycnonotus cafer*	Red Vented Bulbul	Pycnonotidae	Schedule IV	Least Concern
34.	*Saxicoloidesfulicatus*	Indian Robin	Muscicapidae	Schedule IV	Least Concern
35.	*Streptopelia chinensis*	Spotted Dove	Columbidae	Schedule IV	Least Concern
36.	*Sturnus pagodarum*	Brahminy myna	Sturnidae	Schedule IV	Least Concern
37.	*Turdoides caudate*	Common Babbler	Timaliidae	Schedule IV	Least Concern
38.	*Turdoides striata*	Jungle Babbler	Timaliidae	Schedule IV	Least Concern
39.	*Upupa epops*	Hoopoe	Upupidae	Not Enlisted	Least Concern

Source: Survey team in consultation with concern state forest officials and local people

4 CONSERVATION PLAN FOR FAUNA

4.1 BACKGROUND

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. IUCN, (2008) has evaluated 1976 animal species from India, among them 313 have been recognized as threatened species. Among them one species is considered as extinct, while 44 species are in critically endangered (CR) category, 88 is in endangered category (EN), while 181 is considered as vulnerable (VU). Wild Life (Protection) Act, 1972, amended on 17thJanuary 2003, is an Act to provide for the protection of wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country. Some of the sighted fauna was given protection by the Indian Wild Life (Protection) Act, 1972 by including them in different schedules. Among the birds in the study area, Pea fowl (Pavocristatus) is included in schedule I of Wild life protection Act (1972), while many other birds are included in schedule IV. Among the reptiles, Indian Cobra (Najanaja) were provided protection as per Schedule-II of Wild Life Protection Act, (1972). Among mammals; there is no any species found under schedule-I while Common Mongoose (Herpestesed wardsi), Jackal (Canisaureus (Linnaeus) are a schedule –II animals. Nilgai (*Bos elaphustragocamelus*) is protected as Schedule-III animal and hares and five stripped squirrels are included in schedule IV of Wild Life Protection act 1972.

4.2 DECLINE OF WILDLIFE

Biological evolution on earth is associated with extinction of older species and descent of new species but the disappearance of species from the surface of the earth has speeded up 1000 to 10,000 times as compared to the natural disappearance, due to destructive activities of man. Important reasons for decline of wildlife are:

- Fragmentation, degradation and loss of habitat
- Hunting and poaching
- Man-animal conflict
- Pollution

4.3 OBJECTIVES OF CONSERVATION PLAN

- To prepare the list of flora and fauna of core and buffer zone falling within ten kilometre radius area from the project site and classification as per schedules of Wildlife Protection Act, 1972.
- To evaluate the ecological sensitivity of the area.
- To explore whether the area forms a corridor for any scheduled wildlife.

- To locate the Sanctuary, National Park, Bio-sphere reserve, Tiger/ Elephant reserve or notified Eco-sensitive zones falling in 10-kilometer radius area from the proposed site.
- To evaluate the possible threat of wildlife in the area and possible impact of mining on flora and fauna.
- To prepare a comprehensive Conservation Plan for the schedule I & II animal.

4.4 ANIMALS AND BIRDS OF THE CORE & BUFFER ZONE (Belonging to schedule I and II of Wildlife (Protection) Act, 1972.)

Table 4-1: List of Schedule I and II species

S. No.	Common Name	Scientific name	Wildlife Schedule
Mammals:			
1.	Chinkara	*Gazella gazella*	I
2.	Jackal	*Canis aureus L.*	II
3.	Jungle Cat	*Felis chaus*	II
4.	Indian Fox	*Vulpes bengalensis*	II
5.	Mongoose	*Herpestes edwardsii*	II
Avian flora (Birds):			
6.	Peacock	*Pavo cristatus*	I
Reptiles & Amphibians			
7.	Rat snakes	*Ptyas mucosa L.*	II
8.	Monitor Lizard	*Varanus bengalensis Daudin*	I
9.	Indian Cobra	*Naja naja*	

4.5 CONSERVATION PLAN FOR AVIAN FAUNA

4.5.1 Pea Fowl (Pavo cristatus)

4.5.1.1 *Introduction*

Zoological name– ***Pavo cristatus***

The **peafowl** include three species of birds in the genera *Pavo* and *Afropavo* of the Phasianidae family, the pheasants and their allies. There are two Asiatic species (the blue or Indian peafowl originally of

India and Sri Lanka and the green peafowl of Myanmar, Indochina, and Java) and one African species (the Congo peafowl native only to the Congo Basin). Male peafowl are known for their piercing call and their extravagant plumage. The latter is especially prominent in the Asiatic species, who have an eye-spotted "tail" or "train" of covert feathers which they display as part of a courtship ritual. The term **peacock** is properly reserved for the male; the female is known as a **peahen**, and the immature offspring are sometimes called **peachicks.**

An Indian peafowl or Peacock or Mor (*Pav ocristatus*) is a large pheasant justifiably declared as the National Bird of India in 1963 due to its flag ship value founded on its glorious position in mythology and its widespread distribution and grandeur. In India, it is given the utmost protection by inclusion in Schedule I of Indian Wildlife (Protection) Act, 1972. Being a wide spread species, apart from the various urban habitats, it is also found in agriculture fields, along streams with vegetation and close to human habitations in a semi-feral condition (Johnsgard1986). The species (*Pavo cristatus*) was observed in buffer zone of the mine lease area during the site visit and the potential habitat of the species was also recorded.

4.5.1.2 Classification

Kingdom: Animalia

Phylum: Chordata

Class: Aves

Order: Galliformes

Family: Phasianidae

Genus: *Pavo*

Species: *cristatus*

Vernacularname: MororPeacock

4.5.1.3 Conservation Status

IUCN: Others (LC)ver.3.1

IWPA: Schedule I.

CITES: Not listed.

Geographical Distribution: India, Pakistan and Sri Lanka. Many feral populations exist throughout the world.

4.5.1.4 Appearance

The Indian peacock has iridescent blue and green plumage. The peacock "tail", known as a "train", consists not of tail quill feathers, but highly elongated upper tail coverts. These feathers are marked with eyespots, best seen when a peacock fans his tail. Both sexes of all species have a crest atop the head. The Indian peahen has a mixture of dull grey, brown, and green in her plumage. The female also displays her plumage to ward off female competition or signal danger to her young.

Male peacock has a spectacular glossy green long tail feathers that may be more than 60 percent of the bird's total body length. These feathers have blue, golden green and copper colored ocelli (eyes). The long tail feathers are used for making rituals like court ship displays. The feathers are arched in to a magnificent fan shaped for macros the back of the bird and almost touching the found on both sides. Females do not have these graceful tail feathers. They have the fan like crest with whitish face and throat, chest nut brown crown and hind neck, metallic green upper breast and mantle, white belly and brown back rump and tail. Their primaries are dark brown.

4.5.1.5 Geographical Distribution

The Indian sub-continent is the natural habitat of the Indian Peafowl. It is found in good numbers in Indian Territory ranging from Outer Himalayas through vast stretch of the country including the Peninsula. It is also found in Pakistan, Nepal and Sri Lanka. The arid deserts of Rajasthan, the riverbanks of Gujarat and Madhya Pradesh, the foothills of the Himalayas in Uttar Pradesh and the forests of Haryana – these are considered to be the major and commonly-known habitats of peacocks in India.

4.5.1.6 Habitat and Behavior

The scrub jungles and forest edges are the natural habitat of this bird; has affinity towards moist & dry deciduous and semiarid biomes. It is also found along streams with good vegetation and in agricultural fields and in close proximity with the human settlements. Habitat mosaic of scrub and open areas with ample sites for "dust bathing" and "lekking". Dust bathing is critical as this bird has to condition its feathers and remove feather-degrading bacteria and other external parasites. The peafowl are forest birds that nest on the ground. The peafowl are terrestrial feeders but roost in trees. It has got a loud scream that can scary many enemies. The life expectancy is about 10-15 years.

4.5.1.7 Food and Feeding Habits

Peafowls are omnivores, eating plant parts, flower petals, seed heads, insects and other arthropods, reptiles and amphibians. In the study area at some places, dense tree canopy cover supports good insect diversity which is very common food for peafowls.

4.5.1.8 Threats in the Study Area

No perceptible threats were identified in the villages surveyed. Village residents are against hunting or poaching of the peafowl, due to culture and mythology reasons. Adult peafowl can usually escape ground predators by flying into trees.

a) For aging in groups provides some safety as there are more eyes to look out for predators.

b) Habitat loss, specially the shortage of tall trees in and around the villages for roosting and for providing shade during hot summer months.

c) Shortage of drinking water for the birds during the hot summer days.

d) Casualties caused by eating chemically treated agricultural crop seeds.

e) Illegal hunting by some communities.

4.6 CONSERVATION PLAN FOR MAMMALS

4.5.2 CHINKARA (*Gazella gazella*)

4.5.2.1 Introduction

The mountain gazelle (*Gazell agazella)* is a species of gazelle widey but unevenly distributed in Israel, Lebanon, the Golan Heights, Iran and Turkey. It inhabits mountains, foothills and coastal plains. Its range coincides closely with that of the acacia trees that grow in these areas. It is mainly a grazing species, though this varies with food availability. It is less well adapted to hot, dry conditions than the Dorcas late Holocene in a period of climatic warming.

4.5.2.2 Classification

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Cetardiodactyla	Bovidae

IUCN: (Vulnerable)ver.3.1

IWPA: Schedule I.

Geographical Distribution:

Native: Israel; Oman; Saudi Arabia; United Arab Emirates; Yemen

Possibly extinct: Jordan

Regionally extinct: Egypt; Syrian Arab Republic

4.5.2.3 Appearance

Male mountain gazelles weigh between 17 and 29.5 kg, whereas the smaller females weigh 16-25 kg. They are sexually dimorphic with the males being larger and having larger horns. Tooth rows of mountain gazelles are nearly straight.

Gazelles have a slender build with proportionally long necks and legs. The hind legs of mountain gazelles are particularly long.

Mountain gazelles are a dark brown with white underparts, flanks, and light brown limbs. The face is marked with an off-white stripe with black lower margins. There is also a narrow, dark flank-band that separates the dark dorsal tones from the white underparts. The base of the hairs from the underside are buff colored. The black tail is short and bushy. The ears are also relatively short. The white line down the thigh stops at the hock. Pelage is short and sleek, and reflects the sun's radiation in the summer months, and is much longer, thicker and rainproof during the winter to protect the animal from the heavy winter rains.

Both sexes have horns. The relatively short horns of the males (220-294 mm) vary greatly depending on habitat. Female mountain gazelles have horns that are less than 70% the length of males' horns in the same population (84-153 mm). Males' horns are thick and have prominent rings whereas the females' horns are un-ringed. The horns are elliptical in a cross-section and the gap at the base is about 25 mm.

Male horns bow out from the base with the tips almost always pointing in. The females' horns are curved slightly forward. Horn shape may vary greatly within populations, but in most cases the horns resemble an S-shape. Horns also have broad grooves that run up the anterior part of the core, a groove along the posterior boarder, and a less prominent groove that runs medial to the aspect of the core (Groves and Lay, 1985; Mendelsohn et al., 1995).

4.5.2.4 Geographical Distribution

Gazella gazella, or mountain gazelle, is one of several closely related species found in the Middle East. Its distribution includes the Arabian Peninsula, Egypt, Iran, Israel, Jordan, Lebanon, Oman, Saudi Arabia, Syrian Arab Republic, Yemen, and the United Arab Emirates (Mendelsohn et al., 1995; IUCN Species Survival Commission, 2000).

4.5.2.5 Habitat & Behavior

Mountain gazelles live in mountainous and hilly habitats consisting of light forests, fields, or desert plateaus. They usually spend the days in the hills bedded down and descend at night or in the early morning to forage.

Mountain gazelles live in areas with an average annual temperature of 21-23 degrees Celsius and an average winter temperature of about 14 degrees Celsius. The areas occupied by G. gazella are dry, usually with an annual precipitation of 300-400 mm (Mendelsohn et al., 1995; Massicot, 2001).

4.5.2.6 Food & Feeding Habits

This diurnal species is highly territorial. The social organization of the G. gazella consists of maternity herds, bachelor male herds, and territorial solitary males. Incidents of fighting escalate as the males mature, however, fights between territorial males are ritualized and less violent than those between adult bachelor males. The immature bachelor males have more frequent horn contact during fights than do adult or territorial males. Males maintain a territory of about 0.6 km year round, while non-territorial males have a home range of about 6.7 km . Female groups have overlapping ranges of about 1 km and neighboring groups avoid overlap.

Mountain gazelles are excellent runners for several hundred meters, and can reach speeds of 80 kilometers per hour. This species has excellent vision as well as good smell and hearing. Vision is the sense mainly used for predator detection, whereas smell is used to find food (Grau and Walther, 1976; Mendelsohn et al., 1995; Duhnam, 1998; Geffen et al., 1999).

4.5.2.7 Threats in the Study Area

The major threats are illegal hunting for meat and live capture for pets and private collections. Habitat loss through agricultural development, fencing pasture for cattle, construction of roads and settlement is also a major threat.

Hunting (killed for meat) and live trapping for sale as pets.

4.5.3 JACKAL (*Canis aures*)

4.5.3.1 Introduction

Jackals are medium-sized omnivorous mammals of the genus Canis, which also includes wolves and the domestic dog. While the word "jackal" has historically been used for many small canids, in modern use it most commonly refers to three species: the closely related black-backed jackal and side-striped jackal of sub-Saharan Africa, and the golden jackal of south-central Eurasia, which is more closely related to other members of the genus Canis.

Jackals and coyotes (sometimes called the "American Jackal") are opportunistic omnivores, predators of small- to medium sized animals and proficient scavengers. Their long legs and curved canine teeth are adapted for hunting small mammals, birds, reptiles and their large feet and fused leg bones give them a physique well-suited for long distance running, capable of maintaining speeds of 16 km/h (9.9 mph) for extended periods of time. Jackals are crepuscular, most active at dawn and dusk.

Their most common social unit is a monogamous pair, which defends its territory from other pairs by vigorously chasing intruding rivals and marking landmarks around the territory with their parents until they establish their own territories. Jackals may occasionally assemble in small packs, for example, to scavenge a carcass, but they normally hunt either alone or in pairs.

4.5.3.2 Classification

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Canidae

IUCN: (Least Concern)ver.3.1

IWPA: Schedule II.

4.5.3.3 Geographical Distribution:

Native:

Afghanistan; Albania; Algeria; Bahrain; Bhutan; Bosnia and Herzegovina; Bulgaria; Central African Republic; Croatia; Djibouti; Egypt; Eritrea; Ethiopia; Greece; India; Iran, Islamic Republic of; Iraq; Israel; Jordan; Kenya; Kuwait; Lebanon; Libya; Mali; Mauritania; Morocco; Myanmar; Nepal; Niger; Nigeria; Oman; Pakistan; Qatar; Saudi Arabia; Senegal; Somalia; South Sudan; Sri Lanka; Sudan; Syrian Arab Republic; Tanzania, United Republic of; Thailand; Tunisia; Turkey; Turkmenistan; United Arab Emirates; Viet Nam; Western Sahara; Yemen

Vagrant: Austria; Italy; Slovakia; Slovenia

4.5.3.4 Appearance

The body length of the golden jackal is 70 to 85 cm, with a tail length of about 25 cm. Its standing height is approximately 40 cm. The fur is generally coarse and not very long. Its coat is usually yellow to pale gold and brown-tipped, but the color can vary with season and region. On the Serengeti Plain in Northern Tanzania, golden jackals are brown-tipped yellow in the rainy season (December-January), changing to pale gold in the dry season (September-October).

4.5.3.5 Geographical Distribution

The golden jackal occurs in North and East Africa, Southeastern Europe and South Asia to Burma.

4.5.3.6 Habitat & Behavior

The golden jackal is the most northerly of jackal species, and also the most widely distributed. It overlaps biotopes only with the black-backed jackal in East African savannas. Golden jackals prefer dry open country, arid short grasslands and steppe landscapes.

The basic social unit of the golden jackal is a mated pair or a mated pair and its young. Golden jackal pairs forage and rest together. All of their behavior is highly synchronized. Cooperative hunting is important to the jackals. Pairs are three times more likely to be successful than individuals in hunting. Members of the same family also cooperate in sharing larger food items and transport food in their stomachs for later regurgitation to pups or to a lactating mother. Hunting families hold territories of two to three square kilometers throughout the year, portions of which are marked with urine, either by the male or the female jackal, to ward off intruders.

Though the golden jackal is a capable hunter, it normally does not attack larger animals. When the gazelles in the Serengeti give birth, every day several newborns are grabbed by the jackals and are taken to the dens to be eaten. Jackals also take part in the kills of larger animals, such as those of the lion. They howl when a lion makes a kill, which usually lures other jackals to the scene. If a sated lion leaves an unfinished carcass, the jackals rush in to devour the remains. Should other animals arrive at the scene, the jackals bury their pieces of meat. Using their forepaws, they dig a trench, lay the bits of quarry into it, and then close the trench using the ridge of the nose.

Both male and female members of a golden jackal pair have important roles in maintaining their territory and in raising the young. When one parent dies, it is unlikely that the rest of the family will survive. However, most jackal families have helpers. These helper associations are probably responsible for reports of large packs hunting together. Within the family, helpers are subordinate to parents.

Helpers strengthen the family in several ways. The presence of a single adult at the den provides considerable protection: adults both "rumble growl" and "predators bark" to warn the pups to take refuge, and a single adult can successfully drive off large predators. Helpers also bring food to a lactating mother and improve the provisioning of the pups indirectly by allowing the parents to spend more time foraging alone or hunting as a pair. Families with helpers may be able to defend and exploit a carcass more successfully than an individual would be able to. Pup survival improves in the presence of helpers, though not as markedly in golden jackals as in other jackal species.

The female golden jackal initiates all den changes. Though the males are predominantly monogamous, females reserve their aggression for female intruders, preventing the sharing of the male and his paternal investment.

Golden jackals are strictly nocturnal in areas inhabited by humans but may be partly diurnal elsewhere. They dig caverns for shelter, or use crevices in rocks, or caverns that were dug by other animals. Golden jackals live in pairs and are friendly to one another, scratching their partners all over their bodies. However, if strange jackals meet each other, most of the behavior expresses subordination, superiority, or eagerness to attack.

They behave in a manner similar to domesticated dogs and wolves. Males raise a hind leg when spraying their urine, and female squat at the site they wish to spray. Males and females alike mark their territory by spraying, primarily during the mating season.

Each jackal species communicates through its own repertoire of calls. Golden jackals use a wide inventory of howls to locate one another. By howling together, a pair shows that there is a bond between them, and thus the choral howling can be considered a kind of betrothal.

4.5.3.7 Food & Feeding Habits

Golden jackals consume 54% animal food and 46% plant food. They are opportunistic foragers with a very varied diet, which consists of young gazelles, rodents, (especially during winter), hares, ground birds and their eggs, reptiles, frogs, fish, insects and fruit. They take carrion on occasion.

4.5.3.8 Threats in the Study Area

Over its entire range, except in protected areas like National Parks and Sanctuaries, the jackal population is steadily declining. Traditional land use practices, like livestock rearing and dry farming that were conducive to the survival of jackals and other wildlife, are being steadily replaced by industrialization and intensive agriculture; wilderness areas and rural landscapes are being rapidly urbanized. Jackal populations adapt to some extent to this change and may persist for a while, but eventually disappear from such areas like other wildlife.

There is no significant trade in jackal products, although skins and tails are occasionally sold.

4.5.4 INDIAN FOX (*Vulpes bengalenesis*)

4.5.4.1 Introduction

The Bengal Fox *(Vulpes bengalensis),* also known as the Indian fox, is a fox endemic to the Indian subcontinent and is found from the Himalayan foothills and Terai of Nepal through southern India and from southern and eastern Pakistan to eastern India and southeastern Bangladesh.

4.5.4.2 Classification

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Canidae

IUCN: (Least Concern) ver.3.1

IWPA: Schedule II.

Geographical Distribution:

Native: Bangladesh; India; Nepal; Pakistan

4.5.4.3 Appearance

Bengal foxes are medium sized foxes. They have elongated muzzles and small patches of black hair on the upper portion of the muzzle. The most prominent feature of Bengal foxes is a large bushy tail accounting for up to 60% of their body length and possessing a distinct black tip. During normal movement, the tail is left trailing. When running the tail is carried horizontally. It is held vertical when these foxes make sudden turns. Dorsal pelage varies seasonally and within populations but is generally hoary gray on the dorsum and paler ventrally. Pelage on the ears is dark brown with a black margin. Their ears are large for their size and are possible an adaptation to thermoregulation in their hot, arid habitats.

4.5.4.4 Geographical Distribution

Vulpes bengalensis is native to the Indian subcontinent, including India, Nepal and Pakistan and is widespread throughout its range. These foxes are found in the Himalayan foothills to the tip of the Indian peninsula. (Johnsingh and Jhala, 2004)

4.5.4.5 Habitat & Behavior

Bengal foxes generally prefer foothills and non-forested regions such as open grassland, thorny scrub, semi-desert and arid environments. They can also be found in agricultural fields, as they are not generally fearful of humans. Bengal foxes inhabit burrows built approximately two to three feet below ground surface. These burrows have several openings converging towards the center burrow area. Many of these openings are blind while others lead towards a large, central breeding space. (Johnsingh, 1978).

Bengal foxes are tame and generally not fearful of humans, making them vulnerable to hunting. In response to human presence, Bengal fox populations alter their active periods from daytime to crepuscular and nocturnal habits. In mild temperatures and cloudy weather, daytime hunting also occurs. Hunting is a solitary behavior in these foxes. The basic social unit is one breeding pair but larger aggregations may occur when grown pups remain in their natal area. Female Bengal foxes have been witnessed sharing dens during

lactation and four adult foxes have been seen emerging from the same den. (Johnsingh, 1978; Manakadan and Rahmani, 2000)

4.5.4.6 Food & Feeding Habits

Vulpes bengalensis is an omnivorous, opportunistic species that feeds mainly on insects, birds and their eggs, small rodents, reptiles, and fruits. While the primary diet of adults is insects, the fecal matter of pupsis is composed primarily of rodent hair. Common prey includes orthopterans, termites, ants, beetle grubs, spiders, soft-furred rats (*Millar diameltada*), little Indian field mice (*Musbooduga*), Indian gerbils (*Tatera indica*), Indian mynahs (*Acridotheres tristis*), Grey Partridge (*Francolinu sponticerianus*), and ashy-crowned finch larks (*Eremopterix griseus*). Less common prey items include ground lizards, rat snakes (Ptyas mucuosus), hedgehogs (*Parantechinus nudiventris*), and Indian hares (*Lepus nigricollis*). They feed on fruits of ber (*Ziziphus*), neem (*Azadirachta indica*), mango (*Mangifera indica*), jambu (*Syizigium cumini*), and banyan (*Ficus bengalensis*). (Johnsingh, 1978; Manakadan and Rahmani, 2000).

4.5.4.7 Threats in the Study Area

Although the Indian Fox is widespread, it occurs generally at low densities throughout its range, and populations can undergo major fluctuations due to prey availability and disease (rabies and canine distemper virus have been recorded to cause local population declines in western India). They can tolerate some human disturbance, although with expanding human populations and continued development of grasslands for agricultural and industrial uses, the habitat of the Indian Fox is continuously being depleted. The combination of above factors along with disease and/or natural mortality could potentially cause localized extirpations. In certain states like Gujarat, Maharashtra, and Rajasthan, Indian Fox habitat is widespread with minimal threats, while in other states like Karnataka and Tamil Nadu the habitats of the Indian Fox are under threat (Johnsingh and Jhala 2004).

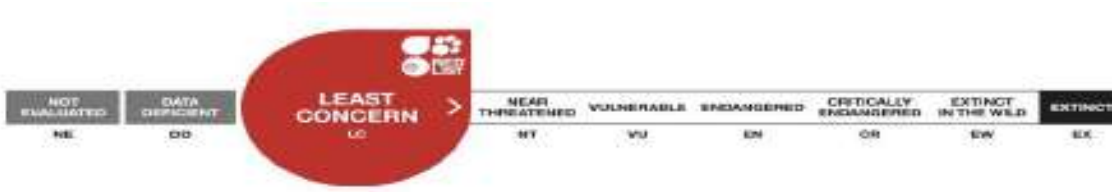
4.5.5 JUNGLE CAT (*Felis chaus*)

4.5.5.1 Introduction

The jungle cat (*Felis Chaus),* also called the reed cat or swamp cat, is a medium-sized cat native to the Middle East, South and Southeast Asia and southern China. It is a member of the genus *Felis.* Ten sub-species are recognized at present.

The jungle cat is a habitat generalist; it inhabits places with adequate water and dense vegetation, such as swamps, wetlands and riparian areas. Despite its name, the jungle cat shuns rain forests and woodlands.

4.5.5.2 Classification



Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Felidae

IUCN: (Least Concern) ver.3.1

IWPA: Schedule II.

Geographical Distribution:

Native:

Afghanistan; Armenia (Armenia); Azerbaijan; Bangladesh; Bhutan; Cambodia; China; Egypt; Georgia; India; Iran, Islamic Republic of; Iraq; Israel; Jordan; Kazakhstan; Lao People's Democratic Republic; Lebanon; Myanmar; Nepal; Pakistan; Russian Federation; Sri Lanka; Syrian Arab Republic; Tajikistan; Thailand; Turkey; Turkmenistan; Uzbekistan; Vietnam

4.5.5.3 Appearance

Jungle cats range in size from 70 to 120 cm long and 35 to 38 cm tall. They weigh from 4 to 16 kg. Adult males are larger and heavier than adult females. Throughout their range, significant variation in mass occurs. For example, in west Israel, they weigh 43% more than those in east India. This is likely due to increased competition between different cat species in the east. Jungle cats have long, slim faces with white lines above and below their bright yellow eyes with a dark spot just below each eye near the nose. They have long rounded ears, with a distinctive tuft of hair at the tips. Jungle cats have relatively short tails, about 1/3 of their total body length, which have several dark rings along its length and a black tip. Their coat color varies from a reddish or sandy brown to tawny grey. Black jungle cats are regularly seen in southeastern Pakistan and India. Kittens may be striped and spotted; however, these markings typically fade with age and are only retained on the fore and hind limbs. The muzzle, throat, and belly of the jungle cat are a pale cream color, and their winter coat is darker and denser than their summer coat. ("International Society for Endangered Cats", 2001; Mukherjee and Groves, 2007; Nowell and Jackson, 1996; Sunquist and Sunquist, 2002)

4.5.5.4 Geographical Distribution

Jungle cats have a wide-ranging distribution that extends from Egypt, Israel, Jordan, northern Saudi Arabia, Syria, Iraq, Iran, to the shores of the Caspian Sea and the Volga River delta, east through Turkmenistan, Uzbekistan, Tadzhikistan, Kazakhstan and to western Xingjian, Afghanistan, Pakistan, Nepal, India, Sri Lanka, Myanmar, Laos, Thailand, Cambodia, Vietnam, and southwestern China. (Sunquist and Sunquist, 2002).

4.5.5.5 Habitat & Behavior

Jungle cats prefer habitats near water with dense vegetative cover but can be found in a variety of habitats including deserts (where they are found near oases or along riverbeds), grasslands, shrubby woodlands and dry deciduous forests, as well as cleared areas in moist forests. They are commonly found in tall grass, thick brush, riverside swamps, and reed beds. They also adapt well to cultivated land and can be found in many different types of agriculture and forest plantations. Jungle cats are known to occur at elevations of up to 2500 m but are more common in lowlands. ("International Society for Endangered Cats", 2001; Nowell and Jackson, 1996; Ogurlu, et al., 2010; Sunquist and Sunquist, 2002)

Except for breeding season, jungle cats live solitary lives. They are most active at night, but are not strictly nocturnal. They are more often seen at dusk and travel approximately 5 to 6 km per night. They typically rest in dense cover during the day but often sunbathe on cold winter days. Unlike most cat species, jungle cats have an affinity for water and are proficient swimmers that will dive into water to catch fish with their mouths. (Mukherjee, 2008; Sunquist and Sunquist, 2002; Taber, et al., 1967)

4.5.5.6 Food & Feeding Habits

Jungle cats primarily prey on animals that weigh less than 1 kg and commonly consume rodents, lizards, snakes, frogs, birds, hare, fish, insects, livestock, and even fruit during the winter. Rodents are its primary prey item, however, which provides up to 70% of its daily energy intake. Although they specialize on small prey, jungle cats have been known to kill wild pigs (Susscrofa) and chital fawns (Axis axis). (Baker, et al., 2003; Duckworth, et al., 2008; Mukherjee, et al., 2004; Mukherjee, 2008)

4.5.5.7 Threats in the Study Area

The biggest threat to Jungle Cat is habitat loss particularly industrialization and urbanization of low intensity agricultural areas and scrubland in the Indian subcontinent.

Habitat destruction for agricultural purposes and infrastructure development (Ogurlu *et al.* 2010, Sanei *et al.* 2016).

Additionally, environmental pollution and illegal hunting are threatening the Jungle Cat

Illegal killing of Jungle Cats by shooting or trapping is a threat (Sanei *et al.* 2016).

Jungle cats can do well in cultivated landscapes (especially those that lead to increased numbers of rodents).

Unselective trapping, snaring and poisoning around agricultural and settled areas have caused population declines in many areas throughout its range (Abu-Baker *et al.* 2003, Duckworth *et al.* 2005).

India formerly exported large numbers of Jungle Cat skins before the species came under legal protection (over 300,000 were declared as being held by traders there when export was banned in 1979), and some illegal trade (and killing) continues there (Sunquist and Sunquist 2002, Choudhury 2010.

4.5.6 COMMON MONGOOSE (*Herpestes edwardsi*)

4.5.6.1 Introduction

Zoological name- *Herpestes edwardsi*

The Indian grey mongoose or common grey mongoose (*Herpestes edwardsi*) is a mongoose species mainly found in West Asia and on the Indian subcontinent. The grey mongoose is commonly found in open forests, scrublands and cultivated fields, often close to human habitation. It lives in burrows, hedgerows and thickets, among groves of trees, and takes shelter under rocks or bushes and even in drains. It is very bold and inquisitive but wary, seldom venturing far from cover. It climbs very well. Usually found singly or in pairs. It preys on rodents, snakes, birds' eggs and hatchlings, lizards and variety of invertebrates. It breeds throughout the year.

4.5.6.2 Classification

IUCN: (Least Concern) ver 3.1

IWPA: Schedule-II

4.5.6.3 Geographical Distribution

Afghanistan; Bahrain; Bangladesh; Bhutan; India; Iran, Islamic Republic of; Kuwait; Nepal; Pakistan; Saudi Arabia; Sri Lanka; Turkey (Turkey-in-Asia); United Arab Emirates.

4.5.6.4 Appearance

Herpestides have long bodies, short legs and highly developed and scent glands. Their coats are thick and coarse in texture. Herpestes edwardsi is identified by its silver- grey, salt and pepper speckled fur and white tipped tail. (Santiapillai, et al., 2000). They have five toes on fore and hind feet. The hind foot is naked to the heel, but the forefoot has hair to its sharp, curved claws. (Ewer, 1973; Walker. 1975). The Indian grey mongoose has tawny grey or iron grey fur, which is more grizzled and stiffer and coarser than that of other mongooses. The ruddiness of the coat varies in different subspecies, but it is described as appearing more grey than other mongooses. The grizzled appearance comes from the individual hairs being ringed by creamy-white and black. The legs are brown and darker than the body. The hair around the muzzle and eyes is also brown but with a stronger rusty red colouring. The tail is bushy, whilst the tip of the tail, if coloured, is pale yellow or white. Males are significantly larger than the females.

4.5.6.5 Geographical Distribution

Indian Grey Mongoose occurs from Turkey and the Arabian Peninsula east to India, Bhutan and Bangladesh (Veron *et al*. 2006, Tempa *et al*. 2013).

4.5.6.6 Habitat & Behavior

Indian mongoose has been observed in areas of thickets, in cultivated fields, bushy vegetation. (Bridges, 1948). They also occupied open areas, grasslands and scrub. Habitat regions are temperate, tropical, and terrestrial. They are terrestrial solitary hunters. This species is known for its behavior in combating snakes.

4.5.6.7 Food & Feeding Habits

Mongooses are omnivores, which means they eat both meat and vegetation. They prefer to eat small animals such as birds, reptiles, fish, snakes, crabs, rodents, frogs, insects and worms. They will also supplement their diet with eggs, nuts, fruits, roots, berries and seeds. They have been known to prey in grasslands in search of snakes and small mammals. ("Rajaji National Park", 2000; Postanowicz, 2002; Santiapilai, et al., 2000; Whitefield, 1978).

4.5.6.8 Threats in the Study Area

Indian Grey Mongoose has no range-wide threats sufficient to drive significant population declines. It is likely that in some areas the levels of harvest are sufficient to reduce local densities. Over recent centuries the species has probably benefited from conversion of closed evergreen forest (at most only rarely occupied) to open habitats.

4.5.7 COMMON MONKEY (*Macca mulatta*)

4.5.7.1 Introduction

Zoological Name - *Macca mulatta*

The rhesus macaque (*Macaca mulatta*), is one of the best-known species of Old World monkeys. Divided according to country of origin, rhesus macaques are referred to as Chinese-and Indian- derived. Chinese-derived rhesus macaques include subspecies *M. m. vestita*, *M. m. lasiota*, *M. m. sanctijohannis*, and *M. m. brevicauda*.

4.5.7.2 Classification

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Primates

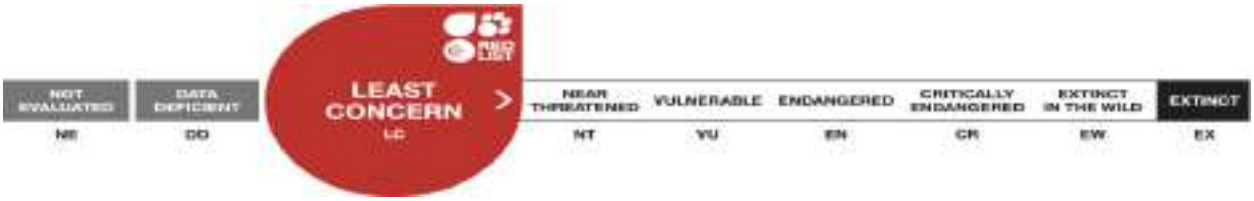
Family: Cercopithecidae

Genus: *Macaca*

Species: *M. mulatta*

Vernacular name: Bandar, Monkey

4.5.7.3 Conservation Status



IUCN: Least Concern ver 3.1

IWPA: Schedule II.

CITES: Not listed.

Geographical Distribution: From Afghanistan to India and Thailand to southern China

Native:

Afghanistan; Bangladesh; Bhutan; China; India; Lao People's Democratic Republic; Myanmar; Nepal; Pakistan; Thailand; Vietnam

Introduced:

Hong Kong; United States (Florida)

4.5.7.4 Appearance

Rhesus macaques, both Chinese- and Indian-derived, range in color from dusty brown to auburn with little to no fur found on their reddish-pink faces. Its tail is of medium length and averages between 20.7 and 22.9 cm (8.1 and 9.0 in). Adult males measure approximately 53 cm (21 in) on average and weigh about 7.7 kg (17 lb). Females are smaller, averaging 47 cm (19 in) in length and 5.3 kg (12 lb) in weight. Males and females are sexually dimorphic. The rhesus macaque has 32 teeth with a dental formula of 2.1.2.3/2.1.2.3 and bilophodont molars. The upper molars have four cusps: paracone, metacone, protocone and hypocone. The lower molars also have four cusps: metaconid, protoconid, hypoconid and entoconid.

4.5.7.5 Geographical Distribution

The species as a whole is found throughout most of southern Asia, in eastern Afghanistan, Bangladesh, Bhutan, central and southern China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Shaanxi, Sichuan, Tibet, and Yunnan, as well as the island of Hainan), northern and central India (in the states of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattisgarh, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkand, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tripura, Uttaranchal, Uttar Pradesh and West Bengal), Lao PDR, Myanmar, Nepal, northern Pakistan, northern Thailand, and Viet Nam.

In India, *Rhesus macaques* are found in flat, cultivated areas, where agricultural fields dominate the landscape and, in the plains, foothills and mountainous regions where habitat includes cultivated fields, tropical forests and dry, deciduous forests. Average annual rainfall ranges between 420 and 2150 mm (1.38 and 7.05 ft), depending on elevation, and annual range in temperature is between -4° C (25° F) and 48° C (118° F) (Seth & Seth 1986). During the hottest parts of the year, groups in the Himalayan region of India migrate to higher elevations where cooler temperatures persist throughout the summer months (Seth et al. 2001). In urban areas of India, they are found on roadsides, canal banks, in railway stations, villages, towns, and temples (Richard et al. 1989). It is estimated that 48.5% of rhesus macaques in northern India live in villages, towns, cities, temples and railway stations where they are in close and frequent contact with people at all times. About 37.1% of the population lives with some human contact on roadsides and canal banks and only 14.4% of the rhesus macaques in the northern part of the country live in isolation from humans and do not rely on them at all for food (Southwick & Siddiqi 1994). It occurs to the north of the Krishna River in central and eastern India and to the north of the lower Tapti River in western India.

4.5.7.6 Habitat and Behavior

It resides in a range of habitats, including temperate coniferous, moist and dry deciduous, bamboo, and mixed forests, mangroves, scrub, rainforest, and around human habitations and developments, including cultivated areas, temples, and roadsides (Choudhury 2001; Srivastava and Mohnot 2001). In Pakistan this monkey remains in mountainous regions with forest cover; it is typically associated with Himalayan moist temperate forest (Roberts 1997). It is found at elevations up to 4,000m (Molur *et al*. 2003). Due to hunting in Lao PDR and Viet Nam the species does not occur in commensal situations there, and is restricted to forest areas where it is generally associated with riverine environments over a range of altitudes (Timmins pers. comm.). In western and northern parts of its range it seems to occur in a wider array of environments. It is highly adaptable to man-made habitat. Its generation time is 12 years (Molur *et al.* 2003).

4.5.7.7 Food and Feeding Habits

This species is diurnal and omnivorous but they are mostly herbivorous, feeding mainly on fruit, but also eating seeds, roots, buds, bark, and cereals. They are estimated to consume around 99 different plant species in 46 families. During the monsoon season, they get much of their water from ripe and succulent fruit. Macaques living far from water sources lick dewdrops from leaves and drink rainwater accumulated in tree hollows. They have also been observed eating termites, grasshoppers, ants, and beetles.

4.5.7.8 Threats in the Study Area

This species is generally unthreatened, though its original habitat is increasingly being lost to development. While M. mulatta exists easily around humans, the increasing level of cohabitation has been associated with waning levels of human tolerance for the animals (Molur et al. 2003).
Confiscation for laboratory testing is a mostly localized threat, but it is considerable in certain areas (A. Kumar pers. comm.).
Capture and release of laboratory and “problem monkeys” from rural and urban areas into natural forests is a major threat to wild macaques.

4.7 CONSERVATION PLAN FOR REPTILES

4.7.1 INDIAN COBRA (*Najanaja*)

4.7.1.1 Introduction

Zoological name– *Naja naja*

The Indian cobra is a poisonous snake occupying large areas of the Middle East, from India through China and Indonesia. Indian natives call it nag, naga, pambo, gokhura and nagarahavu. The Indian cobra normally grows to a length of around one meter. It lives anywhere it can find suitable shelter,

even in are as occupied by humans. Cobras do not normally attack humans when not threatened, except during mating season. When meeting a cobra, the best strategy is to remain calm, since cobras react aggressively to rapid movements. The cobra's poison, similarly to that of other rat snakes (genus *Elaphe*) has primarily neurotoxic effects.

4.7.1.2 Classification

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia

Order: Squamata

Suborder: Serpentes

Family: Elapidae

Genus: *Naja*

Species: *N.naja*

Local Names: In most parts of India derivatives of the Sanskrit Nag; Bengali Nagagokurra (binocellate form), Keauthia (monocellate form); Pushtu Chajitiwalla; Tamil Nallapambu, Nagapambu; Kannada Nagarahavu; Malayalam Moorkan, Surpam; SinghaleseNaya.

4.7.1.3 Conservation Status

i) **IUCN category-**LeastConcernver3.1

ii) **CITES Listing-**Appendix III**.**

iii) **AsperWPA,1972-**Schedule–II.

Size: Longest measured 2250mm. usually from 1371 to 1625mm.

4.7.1.4 Identification:

The cobra can be immediately distinguished from other land' snakes by the presence of as mall cunete scale between the 4thand 5th in Fra labials. Rarely two may be present and very rarely the cuneate may be absent. Another distinguishing characteristics the preocular touching the intranasal, a character seen in too their

species of Indian snakes also but the cobra can be separated from these in having the 3rd supraliminal in contact with the eye. The hood is formed by the elongated ribs of the 3rd and the following 27 vertebrae, the 9th on the left and 10th on the right are the longest, the preceding and succeeding ribs short unprogressively giving an oval out line to the expand edhood. At rest their belie along the length of the body, the overlying skins but loosely attached. When erect the dorsal skinis stretched making the hood markings conspicuous and the head bent strongly at the atlas (1stvertebra) is carried at right angle stothe hood. The hood when dilated is diagnostic, more so when the markings are visible. The markings may be absent and in death the hood may not be demonstrable. The King Cobra has a well-developed hood and many other snakes have the ability to flatten the neck are at more limited degree. Head depressed with short, rounded snout. The nostrils are large and pupils round. Obvious welling at the temporal region over the under lying poison glands. Head shields glossy, body with a more or less distinct groove down the spine.

4.7.1.5 Coloration

Extremely variable in coloration and markings. Three races are recognized on the basis of the hood pattern: The spectacled or binocellate Cobra of peninsular India (*Naja naja naja*) yellowish, brownish or black above with or without a black and white mark on hood, a black and white spot on the inside of the hood with one or two black cross bars below hood. Sri Lankan and south Indian cobras are usually of shades of brown with well – defined hood marks. Cobras from the north are more often black and the hood pattern may not be well defined or may be absent. Monocellate Cobra (*Naja naja kaouthia*) differs in having only a single yellow or orange O-shaped mark on the hood. General colour olive, brown or black. This is the common Cobra of eastern India and east wards of India. The Black Cobra (*Naja naja oxiana*) occurs in the extreme North West. Light grey or brown above when young with dark cross bars. Adult brown or black uniform.

4.7.1.6 Habitat, Distribution and Status

Absent in arid desert sand in the hills above 1800m. Occurs from Trans caspiain the north, through Indian subcontinent to southern China in the east and to the Philippines in the south. Andamans and Sri Lanka. Found almost anywhere, in heavy jungle, open cultivated land, in populated areas where old masonry constructions form ideal refuge. White ant nests, holes in the ground or the tangle of roots at the base of a tree are particularly favoured frequently found near or in water and is a strong swimmer. Usually not aggressive and often exceedingly timid but occasionally fierce and aggressive when disturbed. Young are much more dangerous than adults being more easily excited and ready to strike repeatedly and with determination. When alarmed it adopts the well-known pose with erect fore body and spread hood. The height to which the fore body is raise dis-approximately one-third the total length of the snake and forms the effective striking range. Whilst thus poised the snakes ways backward sand forward shissing in an explosive manner brief and high pitched during in halation and longer, louder, lower pitched and intermittently explosive during exhalation. The throat is pouched; more so, during exhalation and the whole body is inflated. The tongue flickers in and out during inhalation and exhalation. The bite is often ameresnap but sometimes bites and hangs on and the jaws have to be forced open. Occasionally when the snake misses, the

poison is ejected as pray by the forceful thrust of the lunging snake. Usually more active and alert at night though hunts for food during the late afternoon and early evening.

4.7.1.7 Food

Feeds principally on rats, frogs and toads. Also takes birds, lizards, other snakes including other cobras and is an invert is rate egg stealer. Eggs are swallowed whole and digested in about 48 hours.

4.7.1.8 Breeding

Mating has been seen in January and the majority of eggs are laid in April/May but clutches have been obtained up to August. The period of gestation is about sixty-two-day set may extend considerably. Eggs hatch in 48 to 69days. Twelve to twenty-two, in one instance 45 (36 fertile) eggs are deposited data time. The eggs are soft-shelled elongate oval measuring 49x28mm. The parents cohabit before pairing and the eggs are guarded by one or both. Both parents known to incubate. Hatchlings measure 250-280mm at birth. The poison in glands are active from birth.

4.7.1.9 Poison Apparatus and Poison

Usually two fully operative canaliculated fangs on each side. These are shed singly at intervals. Fangs about 7mm in length are small compared to viper in fangs but are more solid. The bore of the fang opens widely at the base and by a small aperture at the tip. The poison in glands are analogous to the parotid salivary glands in mammals and have the shape and size of an almond kernel. The venom is a clear, viscid fluid resembling olive oil in appearance and consistency which solidifies into an amorphous mass. The amount secreted varies with age, vitality and temper of the animal and the average discharge at a bite is about 211mgm in dry weight. Comparative data on the basis of experiments on other animals gives the lethal dose form as 15 to 17. 5mgm for a weight of 60Kg person. However, the poison can be swallowed without ill effects provided there are no internal ulcers. The poison acts mainly as a neurotoxin and blood and cell destroyer. The neurotoxin paralyses the respiratory Centre and is the chief cause of death. Other effects are loss of clotting power of the blood and destruction of red blood cells. The symptoms produced in man; start with a stinging or burning pain accompanied by swelling and oozing of blood-stained serum. The constitutional effects are a gradual but rapidly advancing paralysis commencing with the legs, the neck droops, the muscles of the tongue, lips, and throat, are affected and speech becomes difficult. The lower lip falls and allows saliva to dribble, swallowing becomes difficult or impossible. Breathing becomes difficult, laborious and stops. Other symptoms are vomiting and hemorrhaged from the various orifices of the body. It does not necessarily mean at the bite of a cobra is fatal at all times, depending as it does on the quantity of venom injected, the natural resistance of the victim, the condition of the snake and various other factors. Records indicate that case of recovery from a bite is equal to if not more than cases of death and there is always hope however serious the symptoms. The Haffkine Institute's polyvalent serum is fully effective even when symptoms are far advanced.

4.7.1.10 Facts about Cobra

a) The Indian cobra is one of the most dangerous snakes in India, killing around 10,000 people each year.

b) The Indian cobra is attracted to places like rice paddies, where many cases of biting occur.

c) The poison of the Indian cobra is used in research, and for manufacturing analgesics and anti-cancer medications.

d) Cobras are deaf, and their 'dance' is action to the movements of a fakir's flute, rather than the music.

e) Indian cobras kept in captivity may live up to 30 years.

f) Indian cobras are considered holy animals and certain days of the year are dedicated to their worship.

g) The Indonesian subspecies of the Indian cobra can spray its venom to a distance of several meters.

4.7.1.11 Threats

Direct threats include killing due to its venom potency, fear due to its aggressive behavior known to lay man encountered with it and road kills. This snake is exploited extensively by all Indian snake charmers and comes in skin trade too. Many communities consume this species for edible use. Its venom is used in production of Anti-Venom Serum and various research use so venom harvesting is done illegally in some parts of India and many other countries of its range. This is one among many venomous snake which are in high demand for Chinese medicines and snake vine.

4.7.2 RUSSELL 'VIPER (*Daboia Russlii*)

4.7.2.1 Introduction

Zoological name - *Daboia russelii*

Russell's viper (*Daboia russelii*) is a species of venomous snake in the family Viperidae. Daboia is a monotypic genus of venomous Old World vipers. The genus Daboia is represented by a single species, Daboia russelii. Apart from being a member of the big four snakes in India, Daboia is also one of the genera responsible for causing the most snakebite incidents and deaths among all venomous snakes on account of many factors, such as their wide distribution, generally aggressive demeanor, and frequent occurrence in highly populated areas.

4.7.2.2 Classification

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia

Order: Squamata

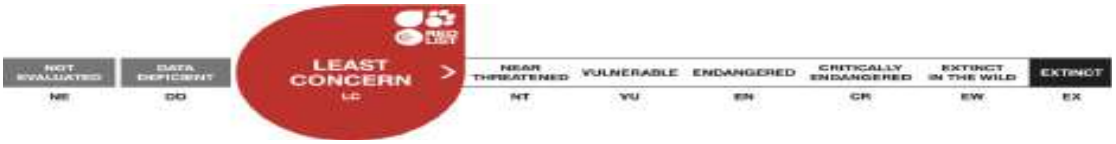
Suborder: Serpentes

Family: Viperidae

Genus: *Daboia*

Species: *D. russelii*

4.7.2.3 Conservation Status



IUCN: Least Concern ver 3.1

CITES: Not listed.

Geographical Distribution: India, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka.

4.7.2.4 Appearance

This species can be identified easily by robust and stout body covered with keeled scales. In three rows eye or almond like spots found in whole dorsal body. This character helps people to differentiate between Russell's viper and non-venomous Indian Rock Python which is found in the same range. It can be easily identified by checking oval shaped hollow or solid spots in three rows in dorsal body and highly keeled non-shiny scales.

4.7.2.5 Description:

New born-24cm.
Average length-100cm(3.3ft).
Maximum length- 180cm (6ft).

Dorsal

Body stout, robust and covered with highly keeled pointed and dry looking scales. Dorsal light or dark grayish-brown, reddish, orange or entirely gray occasionally. Color and patterns become faint in adults or sometimes adults fund to be completely pattern less. Continuous or discontinuous eye or almond like hollow or solid spots of dark brown or blackish color present in three longitudinal rows along the body; starts from head and generally become faint or absent on tail side. Side spots smaller and more rounded than spots present on the top and generally discontinuous.

Ventral

Belly white or light yellow with deep dark brown or blackish semi lunar spots on the edge of most of ventral scales. Underside of tail usually darker (brown or deep yellow) than ventral scales with paired sub-caudals.

Head

Head triangular, pointed with small keeled scales; clearly broader than neck. Two triangular shaped spots of rounded edge present on the top. Upper lip pinkish white mostly. Supra nasal crescentic with large nostril. Moderate eyes have vertically elliptical pupil. Two very long fangs present in front side of mouth from birth.

Tail

Rather small tail with pointed tip and covered with typical keeled scales; usually without patterns.

4.7.2.6 Geographical Distribution

Distributed throughout the country up to Assam. Not found in Indian islands, Himalayan hills and most of the North-states. Recorded from following states: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Daman & Diu, Delhi, Goa, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Puducherry, Punjab, Tamil Nadu, Telangana, Uttar Pradesh, Uttrakhand, West Bengal. Also found in Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka.

4.7.2.7 Habitat and Behaviour

Found both in plains and moderate elevation up to approximately 4800ft; more common in plains. Distributed in variety of forests including rainforest, mixed, dry, moist deciduous forest, scrub lands, grassland, wetland etc but does tend to avoid dense forests. Habitat includes dry open lands, agricultural fields, open country, scrubs having low bushes, rocky terrain having mounds & vegetation etc. Hides in mounds, holes, piles, caves, cracks, dense leaf litters, dense vegetation etc. Humid environments, such as marshes, swamps, and rain forests, are avoided. D. russelii is terrestrial and active primarily as a nocturnal forager. However, during cool weather, it alters its behavior and becomes more active during the day.

4.7.2.8 Food and Feeding Habits

Feeds chiefly on rodents and small mammals; also feeds on birds, lizards, frogs. Juveniles are crepuscular, feeding on lizards and foraging actively.

4.7.2.9 Threats in the Study Area

Road kill mortality, killing due to its venom potency and aggression on encounter with humans on field are two most commonly known threats. Illegal venom trade for various use including medical and research use is regularly noticed in parts of its range. In many parts of country, it is exploited for skin and edible use.

4.7.3 VERANUS SPS. INDIAN MONITOR LIZARD (*Veranus bengaleneses*)

4.7.3.1 Introduction

Zoological name- *Veranus bengaleneses*

Common Indian monitor is a monitor lizard found widely distributed over the Indian Subcontinent, as well as parts of Southeast Asia and West Asia. This large lizard is mainly terrestrial, and its length can range from about 61 to 175 cm from the tip of the snout to the end of the tail.

4.7.3.2 Classification

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia

Order: Squamata

Family: Varanidae

Genus: *Varanus*

Species: *V. bengalensis*

Vernacular name: Ghorpad

4.7.3.3 Appearance

The common Indian Monitor is a medium-sized, dark brown monitor. It measures from 72 to 75 cm. in the head and body length. The young possess pale ring-spots and blackish cross-bars. The blackish cross-bars sometimes also persist in the adult.

Characteristically, the scales on the crown are larger than those on the neck region and those of the anterior part are rounded and keeled posteriorly. The snout is convex terminally. The nostrils are oblique slits lying midway between the eye and the end of the muzzle. The teeth are acute, long, sharp and re-curved. The tongue is very long, forked and pro-triable. Head and body length.

4.7.3.4 Geographical Distribution

The Common Indian Monitor occurs throughout the Indian subcontinent. It is also found in river valleys in eastern Iran, Afghanistan, Nepal, Sri Lanka, Bangladesh and Burma.

4.7.3.5 Habitat and Behaviour

The monitor is mostly diurnal. It is found in variable habitats, such as, forest, desert, river bank, by the side of nullah, marshy land, tidal creek and the sea coast. It occupies burrows, dense clump of vegetation, hollows of trees, cracks and crevices. This monitor is graceful in its movement and is a good climber and swimmer. It is a formidable reptile, bites hard, lashing with the tail and scratching vigorously with its powerful claws, when approached or caught in the wild condition. Its main food items are small terrestrial vertebrates, preferring ground birds and their eggs; also takes arthropods and fishes. It breeds from July to September. The eggs, 19 to 30 in a clutch, are deposited in holes and are covered with leaves, rubbish and sand.

4.7.3.6 Food and Feeding Habits

Their normal prey consists of beetles, grubs, orthopterans, scorpions, snails, ants and other invertebrates. Vertebrate prey is comparatively rare, and includes frogs, fish, lizards, snakes and rodents. Bengal monitors are also scavengers. They sometimes feed on dead animals.

4.7.3.7 Threats in the Study Area

The population of the Common Indian Monitor lizard has alarmingly dwindled throughout the country, due to excessive exploitation of the adults for their commercially valuable skins.

4.7.4 COMMON RAT SNAKE (*Ptyas mucosus*)

4.7.4.1 Introduction

Zoological name- *Ptyas mucosus*

Rat Snake is a commonly seen snake which is famous for its fast crawling speed and much larger size than most of the widely distributed species found in India. *Ptyas mucosus* belongs to the genus Ptyas of the family Colubridae and is the largest family of snakes which constitutes about two-third of all known living snake species. The genus Ptyas is represented by two species *Ptyas Mucosus* and *Ptyas korros.*

4.7.4.2 Classification

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia

Order: Squamata

Family: Colubridae

Genus: *Ptyas*

Species: *P. mucosa*

Vernacular name: Dhaman

4.7.4.3 Appearance

Very long body with dark color patterns on the whole dorsal surface are its general identification features. Apart from these it can be identifies precisely by checking posterior body reticulated with black color net like markings. Traditionally people differentiate between Cobra and Rat Snake by accepting Rat Snake to be a snake having head broader than neck or neck thinner than mid body.

4.7.4.4 Description:

New born- 32-47cm.
Average length- 210cm (7ft).
Maximum length- 350cm (11ft & 6inch)

Dorsal

Body slender with smooth and keeled scales (majority of scales smooth). Keeled scales present on 4-8 topmost rows mostly on the posterior body. Regular black, yellow and white band like markings present on the whole body according to the color of the dorsal. These black colored patterns become net-Like on tail side and more prominent than rest of dorsal. Dorsal color varies from jet black (Central India and parts of North-East), greenish black, range of brown, yellow etc. Sometimes black colored specimens lack any patterns.

Ventral

Belly color also depends on color of dorsal; from pale yellow or white mixed with green, brown, gray, yellow etc. sometimes dark color patches exist on the whole belly. Subcaudal scales paired in zig-zag manner.

Head

Head pointed, not depressed with shiny smooth scales, clearly broader than the neck. Blackish color border present on upper lip and underside scales. Large eyes have rounded pupil. Tongue color purplish-black with darker color on the front side.

Tail

Long and slender tail typically like other arboreal snakes with a pointed tip. Blackish reticulations present on the whole posterior body.

4.7.4.5 Geographical Distribution

All over the India including North-east and Andaman also found in Islands ,Afghanistan, Bangladesh, Burma (Myanmar), Cambodia, China (Zhejiang, Hubei, Jiangxi, Fujian, Guangdong, Hainan, Guangxi, Yunnan, Tibet, (Hong Kong), India, Sri Lanka, Indonesia (Sumatra, Java, Bali), Iran, Laos, West Malaysia, Nepal, Myanmar, Pakistan (Sindh area), Taiwan, Thailand, Turkmenistan, Vietnam.

4.7.4.6 Habitat and Behaviour

Remain hidden in dark and silent places like rat holes, termite mounds, wood caves, under rocks or any narrow and dark place. Distributed in variety of forests including rainforest, scrub lands, semi-desert, dry, moist and mixed deciduous forests, grasslands, mangroves, wetlands etc. Lives in almost all kinds of habitat due to its tendency to survive in tough conditions; this includes urban areas, dense & open forest, hills & plains, agricultural lands etc. Prefers wet surroundings during summer (shows semi aquatic behavior few times), while dry during monsoon.

4.7.4.7 Food and Feeding Habits

Feeds on a variety of prey mostly on rodents and toads; also feeds upon birds, small mammals, other snakes, all kind of lizards, eggs etc.

4.7.4.8 Threats in the Study Area

Threats includes killing due to misidentification with venomous species like King Cobra, other Cobra species. This is one the most intentionally threatened snake in its range due to its prone activity in and around humans and large size. In many parts of its range it is exploited for skin and edible use. Snake charmers use this species in snake charming because of its large size and harmless to display nature.

5 ACTION PLAN AND FINANCIAL PROJECTION

5.1 INTRODUCTION

Each organism on this earth has a unique place in food chain that helps contribute to the ecosystem in its own special way. After independence India saw exponential growth as a result more and more forest land has been destroyed for development activities. Hence natural habitats of animals and plants are being destroyed which result many of the animals and birds are getting endangered. To protect these birds and animals many initiatives like Project tiger, Project elephant, Crocodile Conservation Project etc. have been taken up. along with these conservation projects of the wild animals, few schemes that are worked upon to protect the biodiversity and minimize the mortality of critically endangered and threatened animals has also initiated. Instead of numerous initiatives in India, the wildlife is facing many problems in terms of survival by way of habitat loss, human invasion of inviolate spaces and developmental related activities obstructing the natural corridors of migrating animals. Hence it is necessary to conserve the forest and its wildlife for maintaining ecological balance. Wildlife conservation is the attempt to protect endangered animal and plant species, along with their natural habitat. The main objective is to make sure that their habitats will be preserved so that the future generations of both wildlife and human can enjoy it. To conserve wildlife awareness must be created among the people about its importance and involvement of local people is must in the wildlife protection.

Following action plan and financial projection has been proposed for implementation of the conservation plan in the project area.

5.2 ACTION PLAN

5.1.1 Special Staff for the Protection and Anti-poaching

Special Staffs will be deployed by the forest department for patrolling and protection of the fauna and flora under their jurisdiction because the regular staff deployed for this purpose, due to their busy schedule, is unable to perform their work properly. Each of the special staff will be equipped with dress, raincoat, gumboots, sticks and wireless set for communication. Financial burden for the same has been included in financial project on of this report.

5.1.2 Reducing man wildlife conflicts

Unauthorized entry into forest for illegal grazing, cutting or poaching are the major causes for Man-Wildlife conflicts. These practices will be reduced as much as possible.

5.1.3 Protection and development of habitat

Activities which may damage the habitat will be kept on watch.

5.1.4 Creating Small Water Hole/Khelis

Water holes will be constructed at the area where "Peacocks" generally (nearby habitat) found. Location of waterholes will be suggested by the local forest department in consultation with the Gram Panchayat (Sarpanch).

5.1.5 Conservation of "Lekking Sites" and Dust Bathing Sites

Habitat mosaic of scrub and open areas with ample sites for "dust bathing" and "lekking". Dust bathing is critical as this bird has to condition its feathers and remove feather-degrading bacteria and other external parasites.

Dust bathing sites will be conserved by planting bushes and shrubs around it.

5.1.6 Creation of drinking water facility

Water is the most important factors to all birds and animals. During drier season water availability in forest is limited, hence to provide water safely places suitable for mini watersheds will be identified in the core as well as in the buffer zone to store rainwater, so that water available throughout the year.

5.1.7 Conserving and restoring of forest area water bodies

Promote traditional techniques and practices for conserving ponds and other sources of water in the forest area.

5.1.8 Provision for environmental restoration

Ensure provision for environmental restoration during commissioning and after decommissioning of project.

5.1.9 Habitat Improvement Action Plan

Habitat improvement programme in the different villages will be under taken in the buffer zone area for shelter of the wild animals. This will be achieved by plantation of local varieties of the tree species near villages in buffer area. Plantation will also be carried in some forest patches identified by local forest department.

Habitat improvement programme will include plantation of various plant species like, *Azadirachta indica* (Neem), *Cordia Dichtoma* (Lasura), *Ficus religiosa* (Peepal), *Prosopis cineraria* (Jandi), *Syzygium cumini (*Jamun), *Zizyphus mauritiana* (Beri) and other species reported from the study are should be taken in to priority. In order to improve vegetation cover, it is suggested to carry out extensive afforestation program different phases. These species will help to provide habitat for faunal species, and also increase the species diversity and maintain the naturalness of the surrounding area.

5.1.10 Seed distribution among the villagers

During this habitat improvement programme the seeds of *Moringa oleifera* (Sehjan) will be distributed in the various villages of the study area. Compost packets will be also provided at the intervals of every six months by the proponent (in consultation of forest department).

5.1.11 Training and Awareness Programme

This is the most important aspect of wildlife conservation. People will be educated regarding the importance of wildlife conservation through mass publicity by installing sign boards, conducting audio visual classes and distributing literature in respective villages in the buffer zone. Experts in the field of wildlife conservation will also be invited to deliver talks through slides.

Signboards: Sign-board strobe displayed are

Wildlife has right to move through roads
Reptiles crossing; drive slow
Plant tree saplings with your name
Fire destroys both the plants and animals
Capturing/ hunting wild animals is punishable offence
Don’t throw burning objects
Wildlife is our precious heritage
Inform forest officer if wildlife is in distress

5.3 BUDGETARY FOR CONSERVATION PLAN

The proponent as proposed a sum of Rs. 140.00 Lakh for the wildlife conservation plan under the following heads in consultation of local forest department. **Table 5.1 & 5.2** gives the details of budget.

Table 5-1: Budgetary allocation for conservation plan (for schedule I & II Species)

Sl. No.	Component/ Intervention	Provision in Lakhs (INR)
1	Planting of Tree groves in buffer zone and surrounding villages	10
2	Promotion of Agro Forest in the villages by planting fruit trees	10
3	Plantation of shelterbelt along the road and canal side in surrounding villages and maintenance	10
4	Construction of Khels/ water holes (small water points) in the surrounding villages and regular filling of water	10
5.	Soil and Moisture Conservation works	25
6.	Strengthening of Villa e Level Institutions	10
7.	Fencing of Mining area	15
8	Post mining rehabilitation works	10
5	Awareness generation of labour and local people, distribution of posters, Pamphlets	15
6	Plantation of herbs/ shrubs / bushes along/ on sand dunes and mining prohibited area for roosting	15
7	Development of Pastures in the surrounding villages	5
8.	Purchase of Animal ambulance	10
9.	Study on impact of Mining on Wildlife	5
Total		**140.00**

Table 5-2: Year wise fund to be submitted by the user agency to Divisional Wild Life Officer, Gurugram

Year	1	2	3	4	5	6	7	8	9	10	11
Provision in Lakhs	20.0	15.0	15.0	10.0	10.0	10.0	5.0	5.0	5.0	5.0	5.0
Year	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Total**			
Provision in Lacs	5.0	5.0	5.0	5.0	5.0	5.0	5.0	140.00			

6 CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

Spatial extent and distribution of vegetation types can be linked to the human induced changes in biodiversity characterization. The baseline study of biodiversity was conducted during March to May 2018, for evaluation of the flora and fauna of the study area in Charkhi-Dadri district in Haryana.

Commercial and developmental activities like construction of roads, expansion of agriculture land and harsh climatic conditions for plant life have led to decline of many valuable plant species and degradation of their habitats. Recorded floral species from the present study area was assessed for their conservation status by cross-checking with Red Data book of Indian plants (by Nayar and Sastry, 1987-90) and none of the plant taxa found under Rare, Endangered and Threatened category.

The district is inhabited by various groups of mammals. Primates are represented by Rhesus Macaque and the Langur. The carnivorous animals found in the district are the jungle cat, the small Indian civet, jackal and the Indian fox. Pigeons are common in the cultivated fields, besides, the colourful birds like parakeets, black partridges, quails, bulbuls and kingfishers. The common poisonous snakes found in the district include: Krait, Cobra, Russel's and Viper. The non-poisonous snakes are blind snake, Indian python, John's sand boa, wolf snake and rat snake. All the lizards found in the district are non-poisonous. The common lizard can be seen in the houses. Kirla or girgit is found in the lawns and hedges, besides a few other types of lizards are found in bushes and areas of thick vegetation.
For the conservation of wild life in the district budget of an amount INR 140 Lakh. has been allotted to fulfill the planned activities.

6.2 FURTHER SUGGESTIONS/RECOMMENDATIONS

- Stopping the increased vehicle pollution, wildlife road fatalities and damage to precious habitat by peoples to start movement towards these areas.
- To carry annual census research projects to ecology and habitat use by peacock.
- By making provision of veterinary care and cages for injured or sick deformed birds.
- The prolific use of insecticides / pesticides should be checked as these harmful chemicals are detrimental and instrumental for killing of insects / butterflies which are natural prey for the birds.
- Declare the animal as economically valuable
- Enact stricter laws to control the capture or exploitation of females of any endangered species and enforce them.
- Indigenous knowledge of endangered animals should be enlisted in all tribal areas.
- Captive breeding should be introduced on a commercial scale and value-added products extracted with people's participation. Profits should be equally shared. This may also discourage the illegal trade.

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