

Full title of the Project : "Permission of NBWL/SBWL River Sand/Bajri Mine M.L. No 547/2012 (Mine Lease Area 4280 Ha.) Tehsil – Marwar Junction, District – Pali (Rajasthan)"

Proposal No. : FP/RJ/MIN/6239/2022

Date of Proposal : 25-02-2022

Mining Lease Area : 4280 ha

"BIO DIVERSITY IMPACT ASSESSMENT REPORT"

I/We **Giriraj Sharma, LOI Holder, M/s Kuber Associates** hereby undertake that required area within sanctuary is More than 50 ha. for "**Permission of NBWL/SBWL River Sand/Bajri Mine M.L. No 547/2012 (Mine Lease Area 4280 Ha.) Tehsil – Marwar Junction, District – Pali (Rajasthan)**" hence Bio Diversity Impact Assessment report is applicable.

Place: Jaipur
Date: 25-02-2022

For M/s Kuber Associates

Giriraj Sharma

Aop Member

Authorized Signatory

Countersigned
Divisional Forest officer
Forest Division _____
Office Seal _____

all the locations within study area. The Leq day time and night time noise levels and Leq day and night time noise levels at each of the sampling location are presented in **Table 3.24**.

Table 3.24 : Noise Levels [dB(A)] in the Study Area

Station Code	Location	Leq Day	Leq Night	Leq Day & Night
N-1	Marwar Junction	64.2	52.4	62.6
N-2	Dhanla Village	57.3	50.6	56.0
N-3	Dhanla River bed	53.7	43.9	52.2
N-4	Awa village	54.0	46.6	52.6
N-5	Siriyari village	57.1	47.8	55.6
N-6	Bhagora village	53.2	42.4	51.6
N-7	Musalia village	54.4	44.3	52.8

3.8.3. Interpretation of Results

The noise monitoring shows the day and night time noise level at mine site (Dhanla) the noise recorded at mine site 53.7 dB (A) Leq during day time and 43.9 dB (A) Leq during night time. The highest level of noise marked at Marwar Junction i.e. 64.2 dB (A) Leq during daytime and 52.4 dB (A) Leq during nighttime, due to vehicle movement at nearest road and exceed the prescribed limit. During daytime, the noise levels marginally exceed the prescribed limit for all other sites. The major source of the noise in the study area is the vehicular movement. The ambient air quality standards in respect of noise are 75, 65, 55 and 50 dB (A) Leq in daytime and 70, 55, 45 and 40 dB (A) Leq during nighttime for industrial, commercial, residential and silence zone respectively. The daytime noise level measured during 6:00 a.m. to 10:00 p.m. and nighttime measured from 10:00 p.m. to 6:00 am.

3.9. Biological Environment

3.9.1. Flora

3.9.1.1 Forest and Forest Types

The extent of natural forests in Rajasthan is not only one of the lowest in the country but also the lowest in terms of productivity of forest. On the contrary the state is endowed with the largest chunk of wasteland which is about 20% of the total wastelands of the country. Total forests area of Rajasthan is 32639 km² forest, which is 9.54 % of the total state's geographical area. Reserve Forests constitute 38.16%, Protected Forests 53.36% and Un-classed Forests 8.48% of the forest area. The present mine lease project Marwar Junction

falls in district Pali, Rajasthan, which accounts for a geographical area of 12,387 km² having 662 km² forest cover which is 5.34% of the district's geographical area. A 268 km² scrub land is also reported from Pali district which supports a variety of flora and fauna together with forest land. According to Champion and Seth (1968), the state has 20 forest types which belong to two forest type groups viz. Tropical Dry Deciduous and Tropical Thorn Forests. Different forest types existing in Pali district are listed in **Table 3.25**.

Table 3.25 : Forest Types in the Pali Forest Division

Group	Sub-type	Dominant Species
1. Tropical Dry Deciduous Forest	a. Anogeissus Pendula Forest (5B/E1)	<i>Anogeissus pendula, Boswellia Serreta, Buteo monosperma, Cassia fistula</i>
	b. Boswellia Forest (5B/E2)	<i>Boswellia Serreta, Anogeissus pendula, Acacia sp., Albezia lebbek</i>
	c. Saline Alkaline Scrub Savana (5B/E8)	<i>Acacia nilotica, Prosopis cineraria, Ziziphus xylopyrus, Prosopis juliflora</i>
	d. Butea Forest (5B/E5)	<i>Butea monosperma, Holoptelea integrifolia, Salvadoria persica</i>
	e. Dry Bamboo Breaks (5B/E9)	<i>Dendrocalamus sp.</i>
Tropical Dry Deciduous Scrub	a. Dry Deciduous Scrub (E1/DS1)	<i>Anogeissus pendula, Adhatoda Vasica, Calotropis gigantean, Datura metel</i>
	b. Dry Savannah Forests (E1/DS2)	<i>Acacia nilotica, Prosopis cineraria, Ziziphus xylopyrus, Calotropis sp.</i>
	c. Euphorbia Scrub (DS3)	<i>Euphorbia sp., Ziziphus sp., Acacia sp.</i>
	d. Dry Grassland Forest (DS4)	<i>Prosopis cineraria, Acacia sp.</i>
2. Tropical Thorn Forest	a. Desert Thorn Forest (6B/C1)	<i>Acacia sp., Acacia nilotica, Prosopis cineraria, Ziziphus sp., Apluda mutica</i>
Tropical Thorn Scrub	a. Zizyphus Scrub (6B/DS1)	<i>Ziziphua sp. Euphorbia hirta</i>
	b. Tropical Euphorbia Scrub (6B/DS2)	<i>Euphorbia neriifolia, Rhus mysurensis</i>
	c. Acacia senegal Forest (6B/E2)	<i>Acacia senegal, Calotropis sp. Datura sp.</i>

3.9.1.2 Floristic Objectives

Objectives of the present baseline floristic study are as follows:

- To inventorize taxonomic diversity of plants in the study area
- To assess the plant community structure in the study area
- To Determine Importance Value Index and Shannon Wiener Diversity Index for tree, shrub and herbs present in the study area.

Present study areas comprises of mine lease area along the rivers in Tehsil and area within 10 km radius of mining zones as per the ToR. Five sampling locations; two in mining areas (core zone) and three in outer area within the 10 km of core zone (Buffer zone) were selected for carrying out phyto-sociological surveys of the vegetation and in addition an inventory of various floristic elements was also prepared by walking different transects around these sampling sites. In order to understand the composition of the vegetation, most of the plant species were identified in the field itself whereas the species that could not be identified a herbarium specimen was collected along with their photographs for identification later with the help of available published literature and floras of the region.

Methodology

To understand the community composition of vegetation of the study area, a stratified random sampling method was used to obtain baseline data. The size and number of quadrats needed were determined using the species-area curve method (**Mishra, 1968**). The sampling consisted with randomly placed quadrats of 10 x 10 m² for trees, 5 x 5 m² for shrubs and 1 x 1 m² for herbs. Quadrats were spatially distributed so as to minimize the autocorrelation among the vegetation and trap maximum composition. The data on vegetation were quantitatively analyzed for density, frequency and abundance as per **Curtis & McIntosh (1950)**. The Importance Value Index (IVI) for trees was determined as the sum of relative density, relative frequency and relative dominance (**Curtis, 1959**). Tree individuals with > 31.5 cm CBH (circumference at breast height i.e., 1.37 m from the ground) were individually measured for CBH. Data was collected during winter season (**January 2014**).

The index of diversity was computed by using Shannon Wiener Diversity Index (Shannon Wiener, 1963) as: $H = - \sum (ni/n) \times \ln (ni/n)$ Where, ni is individual density of a species and n is total density of all the species.

The Evenness Index (E) was calculated by using Shannon's Evenness formula (Magurran, 2004). **Evenness Index (E) = H / ln (S)** Where, H is Shannon Wiener Diversity index; S is number of species.

Species richness (SR) was calculated by using Margalef index. **Margalef Species Richness (SR) = S-1/ln(N)** Where, S is total number of species and N is total number of individuals.

Sampling Location

The vegetation sampling was carried out at five different sampling sites the locations which area are given in **Table 3.26**.

Table 3.26 : Sampling Location of Floristic Survey

Site	Sampling Location	Zone
S-1	Bandi River course near Bhagora	Mining area (core zone)
S-2	Sukari River near Phulod	Mining area (core zone)
S-3	Near Seeryari Dam	Surrounding area (buffer zone)
S-4	Near Phulod Dam RF	Surrounding area (buffer zone)
S-5	Mandawa-pipli RF	Surrounding area (buffer zone)

3.9.1.3 Taxonomic Diversity

Although the Working Plan , 2012-13 to 2021-22, Pali Forest Division reported 104 trees, 74 shrubs/herbs, 28 climbers and 40 grasses species under its territorial jurisdiction (http://rajforest.nic.in/writereaddata/Pali_final.pdf), but during this primary study, a total of 18 trees, 19 shrubs and 20 herbs species were found in the study area zone. All the above plant species belong to 14 families each of tree and shrub and 10 families of herb. Fabaceae, Apocynaceae and Poaceae were the dominated families in tree, shrub and herb flora respectively. **(Figure 3.15)**

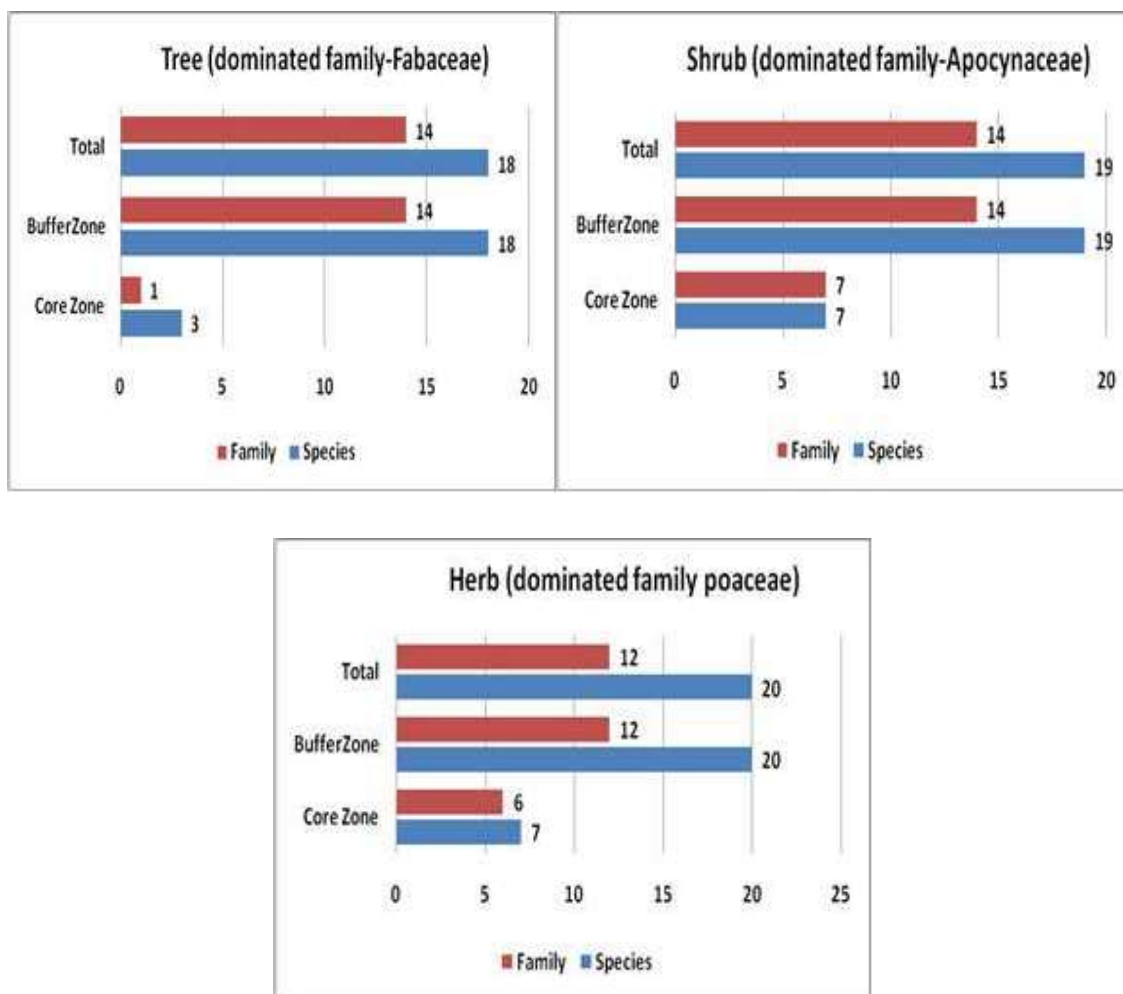


Figure 3.18 : Number of families and species in different life forms in the study area

3.9.1.4 Community Structure

The forests of the study area represent scattered patches of vegetation which comprise of very low density of vegetation. In mining zones, few individuals of trees (*Acacia nilotica*, *Acacia leucophloea*, and *Acacia Senegal*) were recorded. *Opuntia dilenii* and *Lantana camera* in the shrub flora were found distributed in the mining areas whereas *Saccharum munja*, *Argemone mexicana* and *Cannabis sativa* were the dominant herbs species recorded in the mining area.

3.9.1.5 Phyto-sociological Characters of Plant Species

Mining areas (Core zone)

Tree density was recorded as 13.33 trees ha⁻¹ in sampling location I and 20.00 trees ha⁻¹ in sampling location-II. *Acacia nilotica* was found in both the sampling locations in core

zone with highest IVI values (147.22 and 202.89). Shrub density was recorded as 380 shrubs ha⁻¹ at Site-I and 260 shrubs ha⁻¹ at Site-II while Herb's density was recorded as 4400 and 5200 herbs ha⁻¹ at Site-I and Site-II respectively (**Table 3.27**).

Table 3.27 : Phyto-sociological Characters of Different species recorded in proposed mining area

S. N.	Species	Site-I				Site-II			
		Den (per ha)	F (%)	Ab	IVI	Den (per ha)	F (%)	Ab	IVI
	Tree								
1	<i>Acacia nilotica</i>	6.67	6.67	1.00	147.22	13.33	13.33	1.00	202.89
2	<i>Acacia leucophloea</i>	6.67	6.67	1.00	152.78				
3	<i>Acacia senegal</i>					6.67	6.67	1.00	97.11
	Total	13.33			300.00	20.00			300.00
	Shrub								
1	<i>Acacia jacquemontii</i>	60.00	10.00	1.50	40.48				
2	<i>Calotropis gigantea</i>	100.00	20.00	1.25	86.14				
3	<i>Cassia tora</i>	80.00	15.00	1.33	51.54	80.00	10.00	2.00	81.93
4	<i>Ipomoea sp</i>	100.00	15.00	1.67	58.15				
5	<i>Jatropha curcas</i>	40.00	10.00	1.00	63.69	60.00	10.00	1.50	63.56
6	<i>Lantana camara</i>					40.00	10.00	1.00	80.01
7	<i>Opuntia dilenii</i>					80.00	10.00	2.00	74.50
	Total	380.00			300.00	260.00			300.00
	Herb								
1	<i>Cannabis sativa</i>	1600.00	12.00	1.33	123.67				
2	<i>Argemone mexicana</i>	1200.00	8.00	1.50	75.60	1600.00	8.00	2.00	105.55
3	<i>Euphorbia hirta</i>	800.00	4.00	2.00	37.41	800.00	4.00	2.00	34.18
4	<i>Saccharum munja</i>	800.00	4.00	2.00	63.33				
5	<i>Cannabis sativa</i>					1200.00	4.00	3.00	67.87
6	<i>Dodonaea viscosa</i>					1200.00	8.00	1.50	69.70
7	<i>Vernonia cinerea</i>					400.00	4.00	1.00	22.70

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		4400.00			300.00	5200.00			300.00
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Surrounding areas (Buffer zone)

In the indirect influence area of project, tree density ranged from 87 to 107 trees ha⁻¹, shrub species density was recorded between 380 to 500 shrubs ha⁻¹ whereas the herb density values were found between 6000 to 13200 herbs ha⁻¹. *Acacia leucophloea* was the only tree species recorded in all the sampling sites. *Acacia jacquemontii* and *Calotropis procera* were distributed in two sampling sites among shrub flora while *Argemone maxicana* was found highly distributed among herb flora respectively. (Table 3.28)

Table 3.28 : Phyto-sociological Characters of Different species recorded around mining areas

S. N.	Species	Site-I				Site-II				Site-III			
		Den (per ha)	F (%)	Ab	IVI	Den (per ha)	F (%)	Ab	IVI	Den (per ha)	F (%)	Ab	IVI
1	<i>Acacia leucophloea</i>	20	27	1	94	40	27	2	127	13	7	2	36
2	<i>Acacia nilotica</i>	27	7	4	88					20	13	2	79
3	<i>Azadirachta indica</i>	7	7	1	22								
4	<i>Bahunia variagata</i>	7	7	1	19								
5	<i>Bombex Ceiba</i>	7	7	1	20								
6	<i>Erythrina ilndica</i>					13	13	1	35	7	7	1	18
7	<i>Ficus bengalensis</i>					7	7	1	16	7	7	1	22
8	<i>Moringa oleifera</i>	7	7	1	20	13	13	1	38	7	7	1	17
9	<i>Phoenix sylvestris</i>	7	7	1	18	7	7	1	18	13	7	2	23
10	<i>Prosopis cineraria</i>					7	7	1	18				
11	<i>Prosopis juliflora</i>					7	7	1	17				
12	<i>Sapindus mukorossi</i>					7	7	1	15				
13	<i>Syzygium cumini</i>	7	7	1	18								
14	<i>Ziziphus xylopyrus</i>					7	7	1	15				
15	<i>Acacia senegal</i>									13	7	2	33
16	<i>Butea monosperma</i>									13	13	1	39
17	<i>Emblica officinais</i>									7	7	1	18
18	<i>Ricinus communis</i>									7	7	1	16
		87			300	107			300	107			300
	Shrub												
1	<i>Acacia jacquemontii</i>	80	5	4	43	80	15	1	63	40	10	1	32

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2	<i>Adhatoda Vasica</i>					60	10	2	40				
3	<i>Caesalpinia bonduc</i>	60	5	3	29								
4	<i>Calotropis gigantea</i>	80	15	1	60								
5	<i>Calotropis procera</i>	60	10	2	42	40	10	1	41	40	10	1	29
6	<i>Capparis decidua</i>					40	5	2	26				
7	<i>Cassia auriculata</i>	60	10	2	51								
8	<i>Cassia tora</i>					40	5	2	32				
9	<i>Datura stramonium</i>					40	5	2	32				
10	<i>Euphorbia nivulia</i>	60	10	2	37								
11	<i>Ipomoea sp</i>					40	10	1	33				
12	<i>Martynia annua</i>					40	10	1	33				
13	<i>Xanthium strumarium</i>	40	5	2	38					60	10	2	36
14	<i>Carissa carandas</i>									60	10	2	34
15	<i>Crotalaria burhia</i>									60	5	3	25
16	<i>Jatropha curcas</i>									60	10	2	32
17	<i>Lantana camara</i>									60	10	2	38
18	<i>Nyctanthes arbor-tristis</i>									80	10	2	48
19	<i>Opuntia dilenii</i>									40	5	2	26
	Total	440			300	380			300	500			300
	Herbs												
1	<i>Abrus precatorius</i>	2000	8	3	52	1200	8	2	54				
2	<i>Achyranthes aspera</i>					800	8	1	53				
3	<i>Aerva javanica</i>					400	4	1	17				
4	<i>Apluda mutica</i>					1600	8	2	91				
5	<i>Argemone mexicana</i>	1600	4	4	27	800	4	2	37	1200	8	2	28
6	<i>Barleria cristata</i>	2000	8	3	57								
7	<i>Cannabis sativa</i>	2800	8	4	63								
8	<i>Cenchrus ciliaris</i>	800	8	1	22								
9	<i>Cynodon dactylon</i>	1200	8	2	26								
10	<i>Dodonaea viscosa</i>					1200	8	2	49				
11	<i>Echinops echinatus</i>	1200	4	3	24								
12	<i>Euphorbia granulata</i>	800	4	2	14								
13	<i>Saccharum munja</i>	800	4	2	14								
14	<i>Acacia pennata</i>									1600	8	2	40
15	<i>Euphorbia hirta</i>									2000	8	3	46
16	<i>Heteropogon contortus</i>									1200	8	2	28
17	<i>Parthenium hysterophorus</i>									2800	12	2	75
18	<i>Solanum xanthocarpum</i>									400	4	1	14

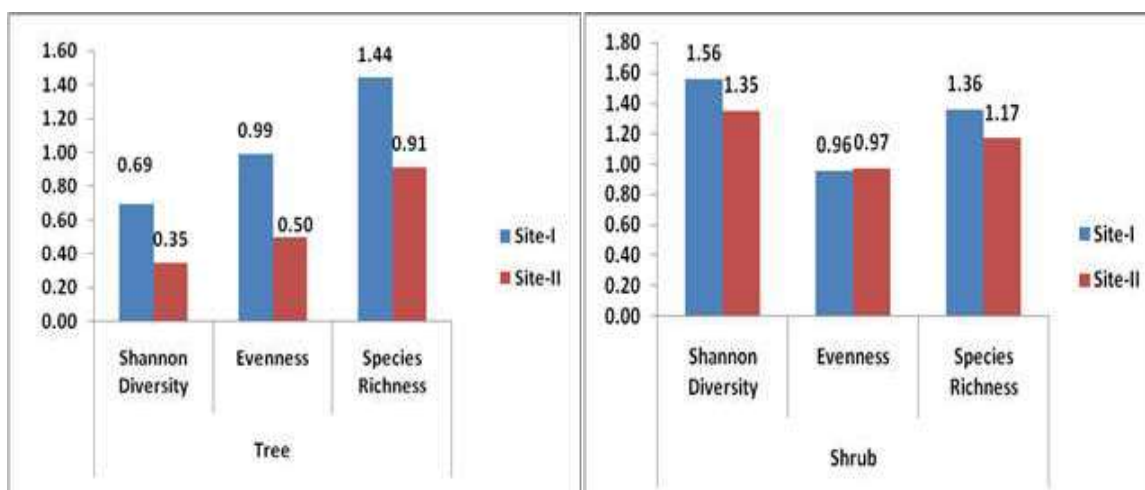
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19	<i>Tephrosia purpurea</i>								1200	8	2	36
20	<i>Vernonia cinerea</i>								1200	8	2	32
	Total	13200			300	6000			300	11600		300

3.9.1.6 Species Diversity, Evenness and Richness

Mining Areas (Core Zone)

Diversity for tree species was recorded between 0.35 to 0.69, shrub species diversity was between 1.35 to 1.56 and herb diversity was found between 1.34 to 1.52. Tree species richness was higher in Site-I (1.44), shrub species richness was recorded highest at Site-I (1.36) whereas species richness for herb species recorded highest (1.56) was recorded at Site-II showed in **Figure 3.19**.



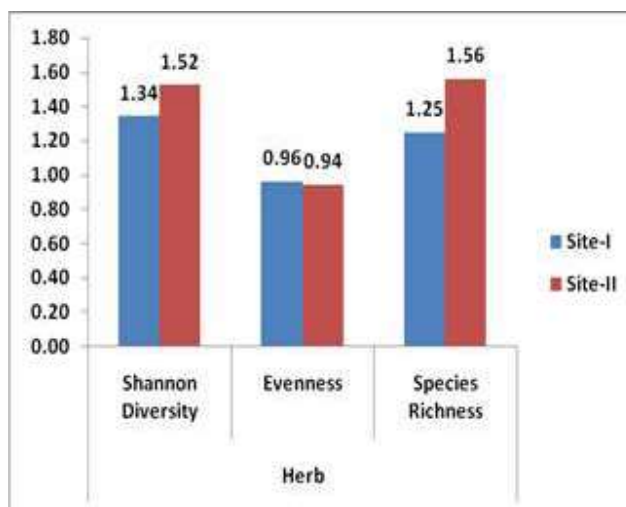
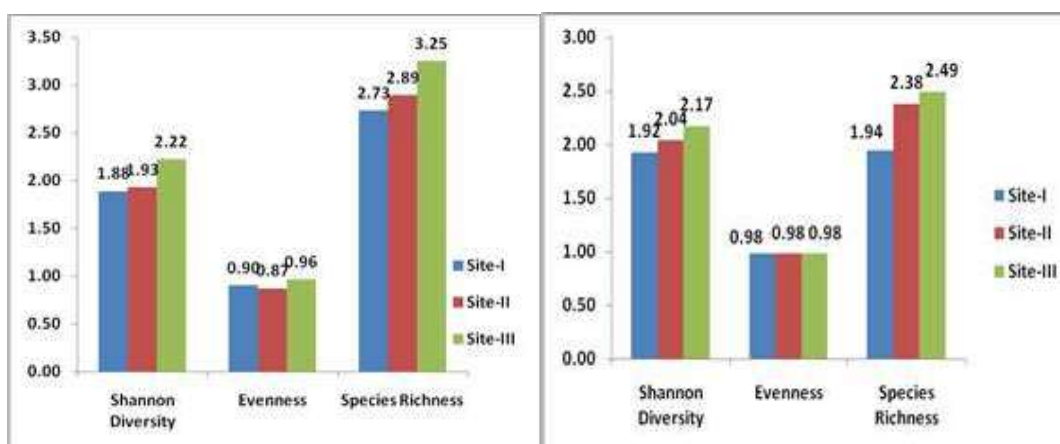


Figure 3.19 : Shannon diversity, species Richness and Evenness index in proposed mining area

Surrounding areas (Buffer zone)

In the buffer zone of study area, Shannon diversity index values for tree species ranged from 1.88 to 2.22. Shrub diversity was found highest (2.17) at Site-III whereas highest herb diversity (2.10) was recorded at sampling Site I. Tree species richness was ranged between 2.73 to 3.25, shrub species richness was found between 1.94 to 2.49 whereas herb species richness was recorded between 1.85 to 2.29. (Figure 3.20)



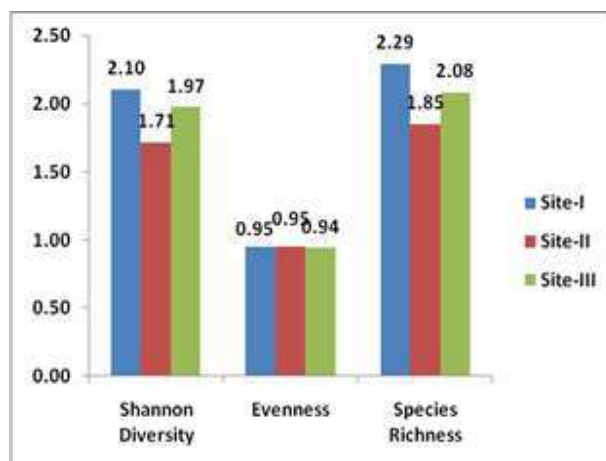


Figure 3.20 : Shannon diversity, species Richness and Evenness index in surrounding area

3.9.1.7 Micro Flora

Beside higher plants, the study area also inventorised for micro floral species. Although these plants area under-utilized but ecologically equal important. During present primary study no micro floral species has been recorded in the main rivers as there was no flowing discharge in them. But some Blue-green algae were sighted floating on stagnant water in mining and influenced area, mainly on d/s of anicuts/reservoir.

3.9.1.8 Economically Important Flora

The dependency level of the nearby habitation on forest was found very low but for some species like, *Prosopis cineraria*, *Azadirachta indica*, *Dalbergia sissoo* *Embllica officinais*, *Moringa oleifera*, *Sapindus mukorossi*, *Adhatoda Vasica*, *Cassia tora* etc. These plants are utilized in day to day life of local inhabitants. During the study knowledgeable and elderly persons of study area villages were interviewed and information on plants parts (seed, bark, leaf & root) used and indigenous knowledge was gathered. Secondary information was also consulted to know the ethno-botanical importance of the region. People of the study area are using these plant species for timber, fuel, fodder, food, and making agricultural implements.

3.9.1.9 Rare and Endangered Flora

Harsh climatic conditions and low rainfall have led to decline of many valuable plant species and degradation of their habitats in the study area. 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 RET category.

3.9.2. Faunal Diversity

To study the wild mammals, avifauna, herpetofauna 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.

The Forest Working Plan of the Forest Division falling in the project area was referred to for secondary informations on the wildlife of the area.

3.9.2.1 Mammals

Around 2-5 km long transects and trails of different habitation were walked to study the wild mammalian fauna of the study area. Direct sighting of animals as well as indirect signs like scat, pellets, pugmarks, scraps, vocalizations, horns etc. were also recorded during the survey walk. Secondary data as well as information elicited from the locals were also noted for the presence or absence of the wild animals in the area. Forest Working Plan of Pali Forest Division has reported 30 species of mammals in the total forest area under its jurisdiction and out of these 9 species were directly and indirectly sighted during this survey of the area. **(Table 3.29)**

Table 3.29 : Mammalian Fauna Sighted during the primary survey

SN	Name	Scientific Name	Order	Family	CS	Schedule
1	Rhesus Monkey	<i>Macaca mulatta</i>	Primates	Cercopithecidae	LC	II
2	Blue Bull	<i>Boselaphus tragocamelus</i>	Artiodactyla	Bovidae	LC	III
3	Common House Rat	<i>Rattus rattus</i>	Rodentia	Muridae	LC	V

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4	Indian Fox	<i>Vulpes bengalensis</i>	Carnivora	Canidae	LC	II
5	Indian Hare	<i>Lepus nigricollis</i>	Lagomorpha	Leporidae	LC	IV
6	Indian Palm Squirrel	<i>Funambulus palmarum</i>	Rodentia	Sciuridae	LC	IV
7	Jungle Cat	<i>Felis chaus</i>	Carnivora	Felidae	LC	II
8	Wild Boar	<i>Sus scrofa</i>	Artiodactyla	Suidae	LC	III
9	Indian Grey Mongoose	<i>Herpestes edwardsii</i>	Carnivora	Herpestidae	LC	II

CS- Conservation Status (IUCN), LC-Least Concern, Schedule (As per WPA, 1972)

Threatened and Endangered Mammals

The animals such as Common langur, Rhesus macaque, Jungle cat, Jackal, Indian fox, Wild boar, all rats and shrews are reported as least concern category of IUCN Red Data Book (ver. 3.1). The Indian Wildlife Protection Act (1972) has also scheduled the animals in various categories for given them varying degree of protection. Among these mammals, three species reported as Schedule II, two as Schedule III, two as Schedule IV and one as Schedule V category.

3.9.2.2 Avifauna

As During any primary study, time constraint and accessibility factors play an important role. Under present survey, birds were also sampled on the same transect and trails marked for mammals. Sampling was carried out on fixed width trails of 2 km to 3 km wherever the terrain permitted. A prismatic field binocular (10x50) was used for the bird watching during transect walk as well as during the morning and evening hours nearby the habitation of study area. Birds were identified with the help of field guide, ***Birds of Indian Subcontinent*** by **Grimmett, Inskipp and Inskipp**.

By considering the migration large number of birds should have been present in the area but due to limited surface water sources chances of sighting became rare. As per the Forest Working Plan, 160 bird species have been reported in the territorial jurisdiction of the forest division, of which Peafowl is the only Schedule –I Bird species while the rest belong to Schedule-IV. The avifauna of study area is comprised of Bulbuls, Pigeon and Doves, Robin and Flycatchers, Drongos, etc., and a large portion of avifaunal species is comprised of resident birds in the project study area which belong to Schedule-IV of WPA, 1972. Some of them are local residents, while some exhibit widespread migration pattern. Many bird species of these classes perform altitudinal and local migrations. During the study, 26 bird species has been recorded. Order Passeriformes and Charadriiformes were the largest

groups of the birds (Figure 3.21). The birds recorded from the study area are given in **Table 3.30**.

Table 3.30 : Avifauna Sighted during the primary survey

S. No.	Name	Scientific Name	Order	Habit
1	House Sparrow	<i>Passer domesticus</i>	Passeriformes	R
2	Bank Myna	<i>Acridotheres ginginianus</i>	Passeriformes	R
3	Black Drongo	<i>Dicrurus macrocercus</i>	Passeriformes	R
4	Black-winged Stilt	<i>Himantopus himantopus</i>	Charadriiformes	WV
5	Common Myna	<i>Acridotheres tristis</i>	Passeriformes	R
6	Common Peafowl	<i>Pavo cristatus</i>	Galliformes	R
7	Common Pigeon	<i>Columba livia</i>	Columbiformes	R
8	Eurasian Curlew	<i>Numenius arquata</i>	Charadriiformes	WV
9	Goose Greylag	<i>Anser anser</i>	Anseriformes	WV
10	Grey Heron	<i>Ardea cinerea</i>	Pelecaniformes	R
11	House Crow	<i>Corvus splendens</i>	Passeriformes	R
12	Indian Courser	<i>Cursorius coromandelicus</i>	Charadriiformes	R
13	Indian Pond Heron	<i>Ardeola grayii</i>	Pelecaniformes	R
14	Indian Robin	<i>Saxicoloides fulicatus</i>	Passeriformes	R
15	Indian Roller	<i>Coracias benghalensis</i>	Coraciiformes	R
16	Indian Silverbill	<i>Euodice malabarica</i>	Passeriformes	R
17	Little Egretta	<i>Egretta garzetta</i>	Ciconiiformes	R
18	Little Green Bee-eater	<i>Merops orientalis</i>	Coraciiformes	R
19	Little Ringed Plover	<i>Charadrius dubius</i>	Charadriiformes	R
20	Pintail Duck	<i>Anas acuta</i>	Anseriformes	WV
21	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Passeriformes	R
22	River Tern	<i>Sterna arantia</i>	Charadriiformes	R
23	Spotted Dove	<i>Stigmatopelia chinensis</i>	Columbiformes	R
24	Cuckoo	<i>Eudynamys scolopaceus</i>	Cuculiformes	R
25	Indian Tree pie	<i>Dendrocitta vagabunda</i>	Passeriformes	R
26	Weaver Bird	<i>Ploceus philippinus</i>	Passeriformes	R

R-Resident, WV-Winter Visitor

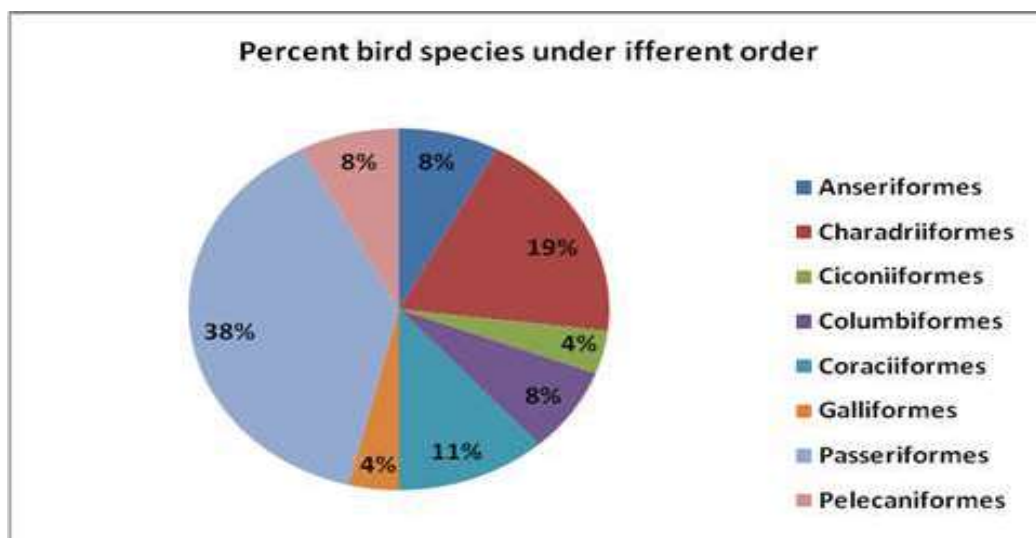


Figure 3.21 : Percent bird species belonging to different orders

Migratory Pattern

Migration is the best studied of animal behaviors, yet few empirical studies have tested hypotheses explaining the ultimate causes of these cyclical annual movements. Fretwell's (1980) hypothesis predicts that if nest predation explains why many tropical birds migrate uphill to breed, then predation risk must be negatively associated with elevation. The proportion of nests depredated by different types of predators differed among elevations. In present study, 22 bird species were local resident species while other 4 were recorded as winter visitors.

3.9.2.3 Herpetofauna

The herpetofauna were also sampled on the same transect marked for mammals. The sampling was also carried along river banks and the sampling was repeated during night following the time constraint Visual Encounter Rates (VES) method was adopted. Four species of lizard i.e. Common House Gecko (*Hemidactylus brookii*), Leopard gecko (*Eublepharis macularius*), and Common garden lizard (*Calotes versicolor*) Indian chameleon (*Chamaeleo zeylanicus*) were sighted from the study area during the survey. However rat snake was reported by the villagers during consultation. As per Forest Working Plan of Pali forest division 8 species of reptiles and 4 species of amphibian have been reported. However during study period the following species of Herpetofauna were noticed. (Table 3.31)

Table 3.31 : Herpetofauna recorded from the project area

S. No.	Name	Scientific Name	Order	Family
Reptiles				
1	Common House Gecko	<i>Hemidactylus frenatus</i>	Squamata	Gekkonidae
2	Leopard gecko	<i>Eublepharis macularius</i>	Squamata	Gekkonidae
3	Common garden lizard	<i>Calotes versicolor</i>	Squamata	Agamidae
4	Indian chameleon	<i>Chamaeleo zeylanicus</i>	Squamata	Chamaeleonidae
5	Oriental rat snake	<i>Ptyas mucosus</i>	Squamata	Colubridae
Amphibians				
1.	Comman Indian Toad	<i>Bufo melanostictus</i>	Anura	Bufoidea
2.	Marbled Toad	<i>Bufo stomaticus</i>	Anura	Bufoidea
3.	Indian Bull Frog	<i>Rana tigerina</i>	Anura	Dicrdglossidae

3.9.2.4 Fish and Fisheries

Fishes are the integral component of stream and rivers which are not only the best sources of food and animal protein for the human population but provides a source of income for the local inhabitants. The people use captured fishes for their consumption and in some cases to sell in local markets as an alternative means for procurement of foods and other requirement of daily needs. . Although primary fisheries survey was not conducted as the study was conducted in post monsoon when the river run dry as there was no discharge in the river(s) which only flow during monsoon. Some secondary informations has been gathered about fisheries are available in the existing ponds / reservoirs. Forest Working Plan reported six species listed below. (Table 3.32).

Table 3.32 : Fish species reported from the project area

S. No.	Name	Scientific Name	Order	Family	CS
1	Catla	<i>Catla catla</i>	Cypriniformes	Cyprinidae	LC
2	Rohu	<i>Labeo rohita</i>	Cypriniformes	Cyprinidae	LC
3	Bata	<i>L. Bata</i>	Cypriniformes	Cyprinidae	NE
4	Lanchi	<i>Wallago attu</i>	Siluriformes	Siluridae	NT
5	Singhi	<i>Heteropneustes fossilis</i>	Siluriformes	Heteropneustidae	LC
6	Singhara	<i>M. Seenghala</i>	Siluriformes	Bagridae	NE

3.9.3. Protected Areas

The lease area is a linear area along different ephemeral river(s) like Bandi and its tributaries like Lilki, Mithri, Kantaliyi, Khardi, Sukri upper, Khari and Siriyari Nala which cover a longitudinal profile of 62 km, 36 km, 12 km, 22.5 km, 23 km, 33 km, 13.5 km and 30 km respectively in the Tehsil.

Bandi river and its tributaries originate from the Aravali ranges and flow from East to West in Tehsil Marwar. The upper most extremity of the lease area along these rivers begins after these have debouched from the Aravali range to the plain land of the Tehsil and is close to the Todgarh Raoli Wildlife Sanctuary, located in the Aravali range constituting the eastern boundaries of tehsil Raipur, Sojat, Kharchi (Marwar Jn.) and Desuri and shares boundary with district Ajmer, Rajsamand (Erstwhile Udaipur). The nearest revenue village Dhal, Siriyari and Halawat which lie in the lease area along Sukri river, Siriyari Nala and Bandi river are respectively 1 km, 2 km and 0.8 km away from the western boundary of Todgarh Raowli Wildlife Sanctuary. It is thus evident that some stretches of the mine lease area along the rivers fall within 10 km from the periphery of the western boundary of Todgarh Raoli Wildlife Sanctuary.

Todgarh Raoli WLS has been established vide Rajasthan Government Gazette Notification No. 11/56/Raj/Group-8/82 dated 28-9-1983. The sanctuary has a total aerial extent of 495.27 ha and spatially covers the reserve forest of Aravali range stretch sharing boundary with district Ajmer, Pali and Rajsamand (Erstwhile Udaipur). The district – wise apportionment of the area under WLS is given in **Table 3.33**:

Table 3.33 : District – wise apportionment of the area under WLS

S. No.	District	Tehsil	Area (sq.km.)	Sol Toposheet No.
1	Ajmer	Beawar	91.52	45K/1, 45G/13 and 45 G/14
2	Pali	Raipur	230.25	45G/13, 45G/14, 45G/15 and 45K/1
		Sojat		
		Kharchi (Marwar Jn.)		
3	Rajsamand	Devgarh	173.50	45G/13, 45G/14 and 45G/15
		Bhim		
Total			495.27	

The Southern boundary of the Todgarh Raoli Wildlife Sanctuary is contiguous with the Northern boundary of Kumbhalgarh Wildlife Sanctuary which was established vide Rajasthan Government Gazette Notification No. F/C(2)/Raj/F/7 dated 13-7-1971. The

sanctuary has a total aerial extent of 610.53 ha and spatially covers the reserve forest of Aravali range stretch sharing boundary with district Pali (341.74 sq.km), Rajsamand (141.72 sq.km) and Udaipur (127.07 sq.km). The nearest mine lease location with respect to Kumbhalgarh WLS in Tehsil Marwar Jn. is Halawat which is about 7.5 km away from the northern boundary of the sanctuary.

As of now no ESZ has been notified in respect of these sanctuaries. Besides Todgarh Raoli and Kumbhalgarh WL Sanctuary there are no Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/(existing as well as proposed), within 10 km of the mine lease. Location of the two sanctuaries vis-à-vis the revenue villages covered within 10 km distance from the boundary of WLSs is marked in the Mosaic Map covering Sol Toposheet No. 45G/9, 45 G/10, 45 G/11, 45 G/13, 45 G/14 and 45 G/15. (**Figure 3.22**). As per the approved mining plan for sand bajri mining no mining activity is envisaged either within both sanctuaries or in Forest land.