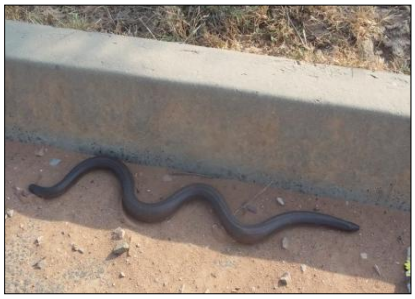
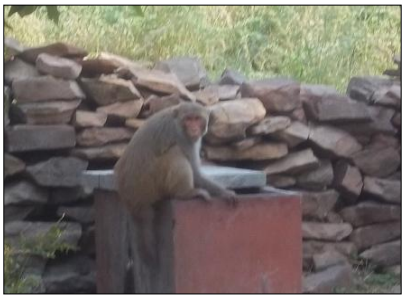
DCM SHRIRAM

M/S DCM SHRIRAM LTD.

Biodiversity Impact Assessment for Proposed Expansion of DCM Shriram Ltd. at Khasra No. 13 to 18 of village Umedganj, Khasra No. 324, 322 of village Rajpura, Khasra No. 207, 210, 242, 245, 246, 247, 248, 249 of village Kansua & Khasra No. 319 of village Raipura, Shriram Nagar Industrial Area of Tehsil Ladpura, District Kota in Rajasthan.

AUGUST 2017



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Biodiversity Impact Assessment for Proposed Expansion of DCM Shriram Ltd. at Khasra No. 13 to 18 of village Umedganj, Khasra No. 324, 322 of village Rajpura, Khasra No. 207, 210, 242, 245, 246, 247, 248, 249 of village Kansua & Khasra No. 319 of village Raipura, Shriram Nagar Industrial Area of Tehsil Ladpura, District Kota in Rajasthan.

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Name of Publication	Biodiversity Impact Assessment for Proposed Expansion of DCM Shriram Ltd. at Khasra No. 13 to 18 of village Umedganj, Khasra No. 324, 322 of village Rajpura, Khasra No. 207, 210, 242, 245, 246, 247, 248, 249 of village Kansua & Khasra No. 319 of village Raipura, Shriram Nagar Industrial Area of Tehsil Ladpura, District Kota in Rajasthan..						
Project Number		**Report No.**	1	**Version**	1	**Released**	August, 2017

DECLARATION			
"We, hereby, certify that we were a part of the EB team in the following capacity that developed this Report"			
Activity	**Name**	**Role**	**Signature**
Prepared By	Bhavin Jambucha	Team Member	
Reviewed By	Dr. K.K. Gangwar	Functional Area Expert	
Accepted By	Sangram Kadam	Director	

DISCLAIMER

Kadam has taken all reasonable precautions in the preparation of this report as per its auditable quality plan. Kadam also believes that the facts presented in the report are accurate as on the date it was written. However, it is impossible to dismiss absolutely, the possibility of errors or omissions. Kadam therefore specifically disclaims any *liability* resulting from the use or application of the information contained in this report. The information is not intended to serve as legal advice related to the individual situation.

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ABBREVIATIONS

EB	:	Ecology and Biodiversity
FAE	:	Functional Area Expert
TFLO	:	Terrestrial Flora
TFAU	:	Terrestrial Fauna
AFLO	:	Aquatic Flora
AFAU	:	Aquatic Fauna
MFLO	:	Marine Flora
IUCN	:	International Union for Conservation of Nature
IWPA 1972	:	Indian Wild Life Protection Act, 1972

EXECUTIVE SUMMARY

DCM Shriram Limited is proposing for expansion of their existing units namely Chlor-Alkali, Stable Bleaching Power and modernization/upgradation/shutting of existing old power plants giving marginal additional capacity of about 15 MW. It is situated in Notified Industrial Area of Kota. Total plot area of DCM Shriram, Kota Complex is 320.1 Ha, out of which expansion for Chlor-Alkali will be done on ~8.0 Ha and Power plant will be done on ~2.0 Ha.

The proposed expansion units require Environmental Clearance from State and Central Authorities.

Also, it is noted that National Wildlife Sanctuary namely National Ghariyal Sanctuary is situated at ~5.6 Km from the project site, considering buffer of 1.0 Km from river bank. For the same, NBWL clearance is also required.

Ecological understanding of the surrounding environ of the proposed project activity is important to minimize its impact. Hence, Biodiversity Impact Assessment was conducted during October, 2014 and further reassessment was carried out in July-August, 2017. The study included inventorization of floral and faunal components of the project area. Survey was conducted in the project site (core zone) and buffer zone (10 km from existing project boundary).

Project site is occupied with the existing green belt species and undergrowth of grasses herbs and shrubs species. All together, 5.0 Lacs trees of 38 species have been planted and developed. Also one species of reptile i.e. Garden Lizard and 14 avifaunal species reported from the site were Koel, Purple Sunbird, Common Myna, Small Green Bee-Eater, Spotted dove, White Wagtail, Rose ringed Parakeet, Indian Peacock, Magpie Robin, House Crow, Indian Robin, Common Myna, Red-vented Bulbul and House sparrow. One species of mammal i.e. *Funambulus pennanti* (Indian Five-Striped Squirrel) was reported from site.

From buffer zone, overall 64 tree species (33 families), Shrubs and herbs of 63 species (22 families), 17 Grass (1 family) and 8 species of climbers (8 families) were reported. Totally, 73 species of birds, 21 species of herpetofauna and 13 species of mammals have been enlisted based on direct and indirect evidences. Similarly, in aquatic biodiversity, 70 species of phyto planktons (algae), 21 species of zooplanktons, 23 species of benthos and 24 species of fishes have been incorporated from secondary literature.

Study area (buffer zone) encompasses ecologically sensitive areas like National Chambal River Sanctuary, Ummed Ganj Conservation Reserve, Ladpura Reserve Forest, Sakatpur Reserve Forest, Alnia Dam Important Bird Area (IBA).

Various habitats of study area also supports important species like, *Tecomella undulata* (Rohida) is enlisted in threatened plant list by Rajasthan Biodiversity Board. While among fauna, two species of birds i.e. *Pavo crestatus* (Peacock) is Schedule-I species and *Grus antigone* (Sarus Crane), a bird species characteristic of wetlands, is categorized as Vulnerable on the IUCN Red list 2007 in India and it occur mostly outside protected areas. Ummedganj, a "Conservation Reserve". Similarly, among herpetofauna, *Lissemys punctata* (Indian Flap shell Turtle), *Varanus bengalensis* (Common Indian monitor), *Crocodilus palustris* (Marsh crocodile) and *Gravialis gangeticus* (Gharial) falls in the Schedule –I category of Wild life Protection Act, (1972). Conservation plan suggesting plantation in the Ladpura forest areas has been incorporated to improve habitat status of the forest area.

Proposed expansion (capacity expansion) will take place within existing boundary. No extensive clearing of floral components will be required therefore no significant or permanent impact on the habitat structure of associated faunal diversity is expected.

Treated water is being discharged in Kansuva Nalla, which meets Chandraloi River ultimately meeting Chambal River (~ 27 Km) after meeting RPCB discharge norms. Thus, due to existing operations and proposed expansion, there may not have any impact on protected area (National Ghariyal Sanctuary).

Factory premises posses already developed greenbelt which provides habitat for many species of animals and plants. Further existing greenbelt will be maintained within project site. Moreover, plantation in Ladpura RF is suggested to improve habitat status of this area. Altogether, proposed expansion activity may not have influence on the biological components keeping in the view of regular maintenance of existing greenbelt and implementation of suggestions in this report. Implementation of necessary EMP / mitigation measures will be done to ensure that the biodiversity of the study area should not impacted.

1 SCOPE, AIM & OBJECTIVE OF STUDY

Scope, aim and objective of the Biodiversity Impact Assessment Study is:

- To inventories floral and faunal components of project area (project site or core zone and 10 km. radius / buffer zone).
- To locate / demarcate and understand ecological setting of the project area in terms of national parks / wildlife sanctuary / reserve forests / tiger reserve / Eco-sensitive Areas / wetlands etc. within 10 km. radius from project site (if any).
- To identify Schedule-I, rare, endemic and endangered species within the project study area and prepare conservation plan for same.
- To identify impact zone and evaluate the likely impact of the proposed project on floral and faunal components of the project study area.
- To suggest / prepare action plan to mitigate likely impacts on the biodiversity of the project area through plantation around project area to reduce / mitigate likely impacts.

2 DESCRIPTION OF THE ENVIRONMENT

2.1 Biological Environment

Biological impact assessment is an integral and important component of environmental impact assessment study. A description of the flora and fauna in the vicinity of the site, their habitats and their description is necessary to help identify potential impacts of the proposed project on various ecological components.

2.2 Study Period

A field study for biodiversity inventory was carried out on October, 2014 and further reassessment was carried out in July-August, 2017.

2.3 Study Area

2.3.1 Project Site / Core Zone and Buffer Zone

Project site as a core zone and surrounding 15 km radius considered as a buffer zone for ecological sensitive area study.

2.3.2 Sensitivity / Habitats of the Study Area

Project study area encompasses following sensitive ecological attributes in the project study area.

Rivers

Table 2-1: Details of River in the Buffer Zone

Name of River	Distance from Project Site	Direction (towards)
Chambal River	Approx. 6.6 km	NW
Alnia River	Approx. 3.6 km	NE

Forests Areas

Table 2-2: Details of Forest Areas in the Buffer Zone

Type of Forest	Distance from Project Site	Direction (towards)
Ladpura Reserve Forest	Approx. 0.1 Km	S
Sakatpur Reserve Forest	Approx. 7.5 km	NW

Water bodies / Important Bird Area

Table 2-3: Details of Water Bodies in Buffer Zone

Name	Distance from Project Site	Direction (towards)
Sur Sagar	Approx. 0.6 km	NW

Name	Distance from Project Site	Direction (towards)
Kishor Talav	Approx. 5.5 km	NW
Alnia Dam Important Bird Area –IBA[1]. IBA Criteria: A1 (Threatened Species), A4iii (≥20,000 waterbirds)	Approx. 12.2 km	S

Wildlife Sanctuary

Table 2-4: Details of Wildlife Sanctuary in the Buffer Zone

Name	Distance from Project Site	Direction (towards)
National Chambal River Sanctuary (or National Ghariyal Sanctuary[2]) also Important Bird Area-IBA[3]. IBA Criteria: A1 (Threatened Species)	Approx. 5.6 km (Considering buffer of 1 km from river bank – as per notification)	NW

Conservation Reserve

Table 2-5: Details of Conservation Reserve in the Buffer Zone

Name	Distance from Project Site	Direction (towards)
Ummed Ganj Conservation Reserve (declared by Rajasthan State Biodiversity Board[4])	Approx. 2.5 km.	SE

2.4 Methodology

2.4.1 Desktop Literature Review

Secondary information have been used from research papers, sanctuary notification, forest working plan and IBA website (Important Bird Areas in India – Rajasthan) to make report more informational.

2.4.2 Field Data Collection / Inventory

Existing floral and faunal species at project site were enlisted / inventoried. Buffer zone was roamed covering various habitats to inventorize floral and faunal components.

2.4.3 Threat Assessment Criteria

Indian Wild Life Protection Act, 1972, ENVIS Database, IUCN Database, Red Data Book etc. were referred.

1

1 http://ibcn.in/wp-content/uploads/2011/12/37-847_897-Rajasthan.pdf (Indian Bird Conservation Network).

2 Revenue (Group-VIII) Department, Notification, Jaipur, July – 20, 1983).

3 http://ibcn.in/wp-content/uploads/2011/12/37-847_897-Rajasthan.pdf (Indian Bird Conservation Network).

4 www.rsbb.rajasthan.gov.in accessed on 15th December 2014 at 2:22 pm.

2.5 Terrestrial Biodiversity Status

2.5.1 Flora

Core Zone / Project site

Proposed development is for capacity expansion which will take place within existing premises of the existing project site. Existing project site encompasses well developed greenbelt having about 5.0 Lacs trees of 38 species and understory vegetation (grasses, herbs and shrubs) and landscaping. Site does not have natural dense vegetation which will be not cleared during any stage of project activity. So, it does not require quantification from ecological point of view. However, details of all floral species are given in "Existing Greenbelt" section of this report, ***Chapter 4, Section 4.1, Pg. 30***.

Buffer Zone

Overall 64 tree species (33 families), Shrubs and herbs of 63 species (22 families), 17 Grass (1 family) and 8 species of climbers (8 families). Details taxonomic account for all life forms is tabulated in following ***Table 2-6***.

Table 2-6: Tree Species Reported from Buffer Zone of the Study Area

S. No.	Scientific Name	Hindi Name	S. No.	Scientific Name	Hindi Name
1.	*Emblica officinalis*	Aaola	2.	*Bauhinia variegata*	Kachnar
3.	*Alangium salvifolium*	Akol	4.	*Feronia limonia*	kaith
5.	*Morinda tinctoria*	Aaal	6.	*Mitragyna parvifolia*	Kalam
7.	*Mangifera indica*	Aam	8.	*Anogeissus pendula*	Dhonk
9.	*Cassia fistula*	Amaltash	10.	*Bridelia retusa*	Kalzadiya
11.	*Hardwickia binata*	Anjan	12.	*Pongamia pinnata*	Karanj
13.	*Buchanania lanzan*	Chirongi	14.	*Ficus hispida*	Katumbar
15.	*Acacia leucophloea*	Ronz	16.	*Acacia catechu*	Khair
17.	*Sapindus emarginatus*	Aritha	18.	*Phoenix sylvestris*	Khajur
19.	*Ailanthus excelsa*	Ardu	20.	*Terminalia arjuna*	Kohda
21.	*Polyalthia longifolia*	Ashoka	22.	*Acacia senegal*	Kumtha
23.	*Acacia nilotica*	Babool	24.	*Cassia siamea*	Kasod
25.	*Terminalia ballerica*	baheda	26.	*Cappris decidua*	kair
27.	*Melia azedarach*	Bakain	28.	*Madhuca indica*	Mahua
29.	*Ficus bengalensis*	Bargad	30.	*Opuntia dillenii*	Nagni Thor
31.	*Aegle marmelos*	Bel	32.	*Azadirachta indica*	Neem
33.	*Zizyphus mauritiona*	Ber	34.	*Thespesia populnea*	Paras Pipal
35.	*Pterocarpus marsupium*	Bija	36.	*Ficus religiosa*	Pipal
37.	*Diospyros montana*	Vishtendu	38.	*Mimusops hexandra*	Ren
39.	*Parkinsonia aculeata*	Bukan	40.	*Tecomella undulate*	Rohida
41.	*Butea monosperma*	Chola	42.	*Tectona grandis*	Sagwan
43.	*Holoptelea integrifolia*	Churail	44.	*Moringa oleifera*	Sehjan
45.	*Wrightia tinctoria*	Dhudhi	46.	*Morus alba*	Sahtoot

S. No.	Scientific Name	Hindi Name	S. No.	Scientific Name	Hindi Name
47.	*Dalbergia paniculata*	Dhoban	48.	*Anona squamosa*	Sitaphal
49.	*Tamarire articulate*	Farash	50.	*Eucalyptus globulus*	Safeda
51.	*Zizyphus xylopyra*	Ghatber	52.	*Tamarindus indica*	Imali
53.	*Cochlospermum gossypium*	Girnar	54.	*Diospyros melanoxylon*	Tendu
55.	*Ficus glomerata*	Gular	56.	*Pithecolobium dulce*	Junjal jalebi
57.	*Delonix regia (BOJ)*	Gulmohar	58.	*Salvadora persica*	Jal
59.	*Cordia dichotoma*	Gunda, Lasoda	60.	*Syzygium cumini*	Jamun
61.	*Albizzia lebbeck*	Kali Siras	62.	*Salvidora oleoides*	Jal Pilu
63.	*Balanites aegyptica*	Hingot	64.	*Manilkara hexandra*	Chokoo

Table 2-7: Shrubs and Herbs Reported from Buffer Zone of the Study Area

S. No.	Scientific Name	Hindi Name	S. No.	Scientific Name	Hindi Name
1.	*Xanthium strumarium*	Aadha Shishi	2.	*Holarrhena anti dysenterica*	Dudhi Kadvala
3.	*Calotropis procera*	Aak	4.	*Euphorbia hirta*	Makod
5.	*Calotropis gigantea*	Aankda	6.	*Zizyphus oenoplia*	edksg
7.	*Achyranthes aspera*	Andi Jhada	8.	*Solanum nigrum*	Makoy
9.	*Cassia auriculata*	Aaval	10.	*Lawsonia inermis*	Menhndi
11.	*Adhatoda vasica*	Adusa	12.	*Indigofera tinctoria*	Neel
13.	*Capparis decidua*	Karil	14.	*Vitex negundo*	Negadh
15.	*Carissa spinarum*	Karonda	16.	*Cassia tora*	Pawariya
17.	*Leptadenia pyrotechnica*	Khimpra	18.	*Barleria prionitis*	Pili Kanteli
19.	*Tribulus terrestris*	Gokhru	20.	*Abutilon ramosum*	Pithariya
21.	*Grewia hirsuta*	Gud Shariya	22.	*Acacia jacquementii*	Boli
23.	*Grewia tenax*	Ganger	24.	*Indigofera cordifolia*	Bekar
25.	*Mollugo cerviana*	Chiron Ka Dhaniya	26.	*Indigofera linifolia*	Bekri
27.	*Alhagi camelorum*	Javasa	28.	*Aereva pseudotomentosa*	Bui
29.	*Tamarix dioica*	Jhavu	30.	*Argemone maxicana*	Sahyanashi
31.	*Zizyphus nummularia*	Jhadi Kher	32.	*Nyctanthes arbortristis*	Safed Syali
33.	*Indigofera oblongifolia*	Jhil	34.	*Lepidagathis trinervis*	Unt Kateli
35.	*Ocimum sanctum*	Tulsi	36.	*Ageratum conyzoides*	Uvati
37.	*Fagonia cretica*	Damasa	38.	*Datura metel*	Dhatura
39.	*Acalypha indica*	Kuppi	40.	*Amaranthus viridis*	jungali chaulayi
41.	*Ammannia baccifera*	Agni Buti	42.	*Commelina benghalensis*	Kana, Kankawa
43.	*Corchorus aestuans*	Conch	44.	*Corchorus aestuans*	Chonch
45.	*Croton bonplandianum*	Kala Bhangra	46.	*Dicoma tomentosa*	--
47.	*Ipomoea aquatica*	Nali, Kalmi Sag	48.	*Laggera alata*	Lumra
49.	*Peristrophe bicalyculata*	Atrilal, Kakajangha	50.	*Parthenium hysterophorus*	Gajar Ghas
51.	*Tridax procumbens*	Khal-muriya	52.	*Phyllanthus fraternus*	bhuinanvalah
53.	*Xanthium strumarium*	chota gokhuru	54.	*Hyptis susveolens*	Vilaiti Tulsi

S. No.	Scientific Name	Hindi Name	S. No.	Scientific Name	Hindi Name
55.	*Leonotis nepetifolia*	Bara guma, Lal guma	56.	*Cyperus iria*	--
57.	*Phragmites karka*	Narkul	58.	*Dichrostachys cinerea*	Kunali
59.	*Prosopis juliflora*	Junglee kikar	60.	*Sesbania sesban*	Jayanti
61.	*Abutilon indicum*	Kanghi	62.	*Adhatoda zeylanica*	Arusa, Vasala
63.	*Lantana camara*	Raimuniya			

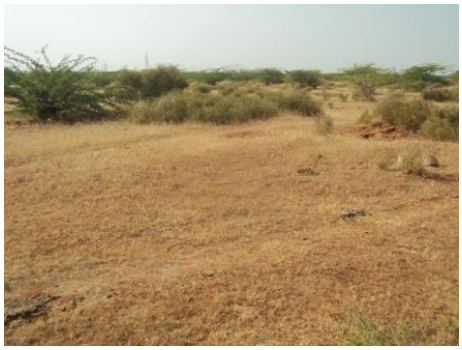
Table 2-8: Grasses & Climbers Reported from Buffer Zone of the Study Area

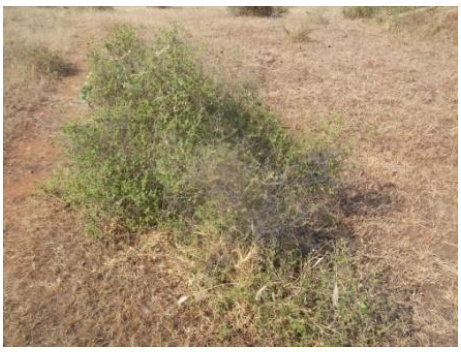
S. No.	Scientific Name	Hindi Name	S. No.	Scientific Name	Hindi Name
Grasses					
1.	*Ceanchrus cilliaris*	Anjan	2.	*Cenchrus barbatus*	Bharut
3.	*Dichanthium annulatum*	Kurad	4.	*Heteropogon contortus*	Sukhala
5.	*Saccharum spontaneum*	Kas	6.	*Echinochloea colonum*	Sivan
7.	*Panicum antidotale*	Gramna	8.	*Cymbopogon martinii*	Raosa
9.	*Cynodon dactylon*	Dub	10.	*Aristida depressa*	Lapla
11.	*Saccharum munja*	Munj	12.	*Dendrocalamus strictus*	Bans
13.	*Apluda mutica*	Polardi	14.	*Bambusa arundinacea*	Bans
15.	*Digitaria pennata*	---	16.	*Dinebra retroflexa*	---
17.	*Eragrostis tenella*	Bharbhusi			
Climbers					
1.	*Mucuna prurita*	Kevach	2.	*Celastrus paniculata*	Malkangani
3.	*Cayratia carnosa*	Katumba	4.	*Asparagus racemosus*	Nahar Kanta
5.	*Oxalis corniculata*	Tripatti	6.	*Tinospora cordifolia*	Nim Giloy
7.	*Cuscuta refliexa*	Amarbel	8.	*Abrus precatorious*	Itti Chirmu

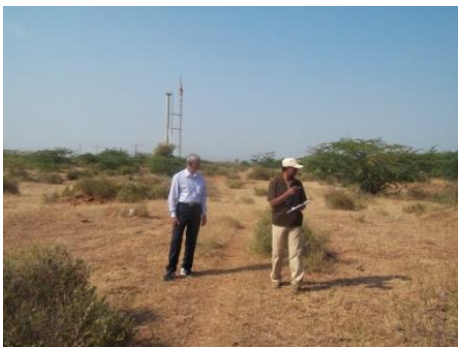
Status of Ladpura Reserve Forest:

Reserved forests are mainly dominated with thorny vegetation like *Zizyphus nummularia, Capparis deciduas, Prosopis juliflora.* A snake, Red Sand Boa and pallets of Nilgai were reported from forest patch on Khera Jagpura village road.

Figure 2-1: Photographs of Ladpura Reserve Forest







2.5.2 Fauna

Herpetofauna

Core Zone / Project Site

One species of *Calotes versicolor* (Indian Garden Lizard) was reported from the site.

Buffer Zone

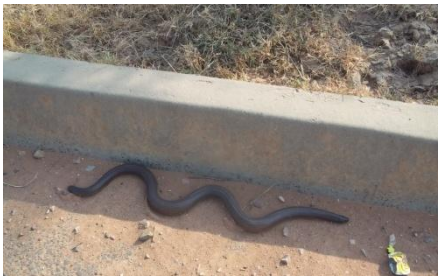
Overall 21 species were documented based on direct and indirect evidences. Details are given in ***Table 2-9***.

Table 2-9: Herpetofauna Reported from Buffer Zone

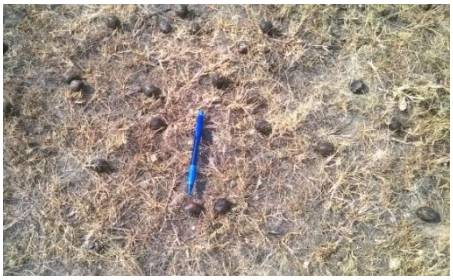
S. No.	Group / Scientific Name	Common English Name	IUCN & IWPA (1972)
TESTUDINE			
1	*Lissemys punctata*#	Indian Flap Shell Turtle	LR-lc, Schedule-I
FROGS/TOADS			
2	*Duttaphrynus melanostictus*	Common Indian Toad	LC, Schedule-IV
3	*Euphlyctis cyanophlyctis*	Skittering Frog	LC, Schedule-IV
LIZARDS			
4	*Varanus bengalensis*#	Common Indian Monitor	LC, Schedule-I
5	*Crocodilus palustris*#	Marsh crocodiles	Schedule-I
6	*Gravialis gangeticus*#	Gharial	Schedule-I
7	*Chamaeleon calcaratus*#	Indian chameleon	Schedule-II
8	*Uromastix hardwickii*#	Spiny Tailed Lizard	Schedule-II
9	*Hemidactylus brookii*	Spotted Indian House Gecko	LR-lc, Schedule-IV
10	*Hemidactylus flaviviridis*	Yellow Bellied House Gecko	Schedule-IV
11	*Calotes versicolor*	Indian Garden Lizard	Schedule-IV
12	*Sitana ponticeriana*	Fan-Throated Lizard	LC, Schedule-IV
13	*Mabuya carinata*#	Common Keeled Grass Skink	LR-lc, Schedule-II
SNAKES			
14	*Ptyas mucosa*#	Indian Rat Snake	Schedule-II
15	*Xenochrophis piscator**	Checkered Keelback Water Snake	Schedule-II
16	*Naja naja*#	Indian Cobra	Schedule-II

S. No.	Group / Scientific Name	Common English Name	IUCN & IWPA (1972)
17	*Bungarus caeruleus*[#]	Common Indian Krait	Schedule-IV
18	*Macropisthodon plumbicolor*[#]	Green kedback	Schedule-II
19	*Vipera russelli*[#]	Russell's viper	Schedule-II
20	*Echis carinata*[#]	Saw scaled viper	Schedule-IV
21	*Eryz johnii*[#]	Red Sand Boa / Johr's earth boa	Schedule-IV
** = secondary evidences, [#] = Rajasthan State Forest Department Working Plan*			

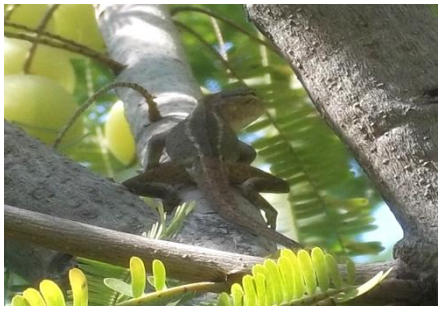
Figure 2-2: Photograph of Various Evidences Reported from Buffer Zone



Eryz johnii or Red Sand Boa



Pallets of Nilgai

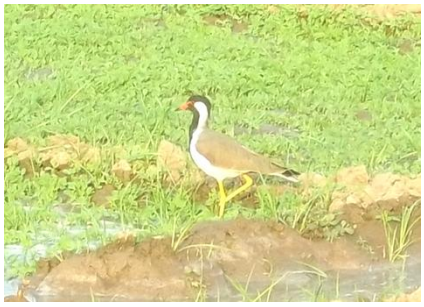


Indian Garden Lizard

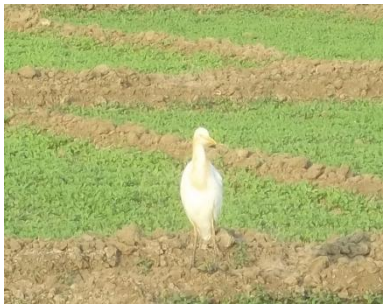
Rhesus Macaque

Indina Hare Pellets

Five striped Palm Squirrel



Red-wattled Lapwing



Cattle Egret

Avifauna

Core Zone

Common 14 avifaunal species reported from the site were Koel, Purple Sunbird, Common Myna, Small Green Bee-Eater, Spotted dove, White Wagtail, Rose ringed Parakeet, Indian Peacock, Magpie Robin, House Crow, Indian Robin, Common Myna, Red-vented Bulbul and House sparrow.

Buffer Zone

Overall 73 species of birds were reported from the buffer zone of the study area. Aquatic species were more dominant than terrestrial. All recorded species area enlisted in the following ***Table 2-10***.

Table 2-10: Birds Reported from Buffer Zone[5]

S. No.	Common Name	Scientific Name	S. No.	Common Name	Scientific Name
1.	Little Grebe	*Podiceps ruficoallis*	2.	Indian night jar	*Caprimulgus asiaticus*
3.	Little cormorant	*Phalacrocorax niger*	4.	House swift	*Apus affinis*
5.	Indian darter	*Anhinga rufa*	6.	Pied kingfisher	*Ceryle rudis*
7.	Grey heron	*Ardea cinerea*	8.	Common kingfisher	*Alcedo atthis*
9.	Indian Pond heron	*Ardeola grayii*	10.	White breasted king fisher	*Helcyon smyrnesis*
11.	Cattle egret	*Bubulcus ibis*	12.	Common Green beeeater	*Merop orientalis*
13.	Litle Egret	*Egretta garzetta*	14.	Indian roller, Blue jay	*Coracias benghalensis*
15.	White ibis	*Threskiornis melanocephala*	16.	Hoopoe	*Upapa epops*
17.	Spoonbill	*Platalea Ieucorodia*	18.	Indian bush lark	*Mirafra erythroptera*
19.	Lesser whistling Teal	*Dendrocygna javanica*	20.	Small minivet	*Pericrocotus cinnamomeus*

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5 Rajasthan State Forest Department Working Plan 2012-13 to 2021-22

S. No.	Common Name	Scientific Name	S. No.	Common Name	Scientific Name
21.	Pintail	*Anas acuta*	22.	White chicked bulbul	*Pycnonotus leucotis*
23.	Spotbill	*A. Poecilorhyncha*	24.	Common babbler	*Turdoiaes caudates*
25.	Cotton Teal	*A. Crecca*	26.	Large grey babbler	*Turdoiaes malcolmi*
27.	Nukta (comb duck)	*Sarkidiornis melanotos*	28.	Crested Honey Buzzard	*Elanus caeryleus*
29.	Oriental magapie robin	*Copsychus saularis*	30.	Creasted lark	*Galerida cridtata*
31.	Shikara	*Accipiter badius*	32.	Wiretailed swallow	*Hirundo smithii*
33.	White eyed Buzzard	*Butastur teesa*	34.	Black Dronge	*Dicrurus macrocercus*
35.	Tawny Eagle	*Aquila repax*	36.	Rosy starling	*Stumus roseus*
37.	Egyptian vulture	*Neophron perenopterus*	38.	Bank myna	*Acridothees ginginianus*
39.	Kestrel	*Falco tinnunculus*	40.	Indian tree pie	*Dendrocitta vagabunda*
41.	Black partridge	*Francolinus francolinus*	42.	House crow	*Corvus splendens*
43.	Grey partridge	*F. pondicerianus*	44.	Partridge	*Perdix hodgsoniae*
45.	India peafowl	*Pavo cristatus*	46.	Indian Robin	*Saxicoloides fulicata*
47.	Sarus crane	*Grus antigone*	48.	White Wagtail	*Motacilla allba*
49.	Moorhen	*Gallinula chloropus*	50.	Purple sunbird	*Nectarinia asiatica*
51.	Common Coot	*Fulica atra*	52.	House Sparrow	*Passer domesticus*
53.	Red wattled lapwing	*Venellus indicus*	54.	Crested Bunting	*Melophus lathami*
55.	Yellow wattled lapwing	*Venellus malabaricus*	56.	Common sand piper	*Tringa hypoleucos*
57.	Red Shank	*Tringa tetanus*	58.	Common Coot	*Fulica atra*
59.	Common sand piper	*Tringa hypoleucus*	60.	Koel	*Eudynamys scolopacea*
61.	Little stint	*Calidris minuta*	62.	Coucal, crowpheasant	*Centropus sinensis*
63.	Black winged stilt	*Himantopus himantopus*	64.	Common tern	*Sterma hirundo*
65.	Eurasian curlew stone	*Numenius arquata*	66.	Large Indian parakeet	*Psittacula eupatoria*
67.	Indian courser	*Cursorius coromandelicus*	68.	Roseringed parakeet	*Psittacula krameri*
69.	River tern	*Sterna aurintia*	70.	Laughing dove	*Streptopelia senegalensis*
71.	Chest nut billied sand grouse	*Terocles exustus*	72.	Blue Rock pigeon	*Columba livia*
73.	Red collared dove	*Streptopelia tranquebarica*			

Mammals

Core Zone

One species of mammal i.e. *Funambulus pennanti* (Indian Five-Striped Squrriel) was reported from site.

Buffer Zone

Totally 13 species have been reported from direct and indirect evidences. All species are enlisted in the ***Table 2-11***.

Table 2-11: Mammals Reported from the Buffer Zone

S. No	Family, Scientific Name	Common Names	IUCN & IWPA 1972 Status
1.	*Rattus rattus*	Common House Rat	--
2.	*Mus booduga*	Indian Field mouse	Lc, Schedule-IV
3.	*Hystrix indica**	Poucupine	Lc, Schedule-IV
4.	*Macaca mulatta*	Rhesus macaque	Lc, Schedule-II
5.	*Semnopithecus entellus**	Common or Hanuman Langur	Lc, Schedule-II
6.	*Sus scrofa**	Wild Pig	Lc, Schedule-III
7.	*Canis aureus**	Jackal	Lc, Schedule-II
8.	*Herpestes edwardsii**	Common or Grey Mongoose	Lc, Schedule-II
9.	*Lepus nigricollis**	Indian Hare	Lc, Schedule-IV
10.	*Hystrix indica**	Indian Porcupine	Lc, Schedule-IV
11.	*Funambulus pennantii*	Five striped Palm Squirrel	Lc, Schedule-IV
12.	*Tatera indica*	Indian Gerbill	Lc, Schedule-V
13.	*Boselaphus tragocamelus**	Nilgai	Lc, Schedule-III
**Secondary sources and Rajasthan State Forest Department Working Plan*			

2.5.3 Status of Threatened and Endemic Biodiversity

From buffer zone, among flora one species i.e. *Tecomella undulata* (Rohida) is enlisted in threatened plant list by Rajasthan Biodiversity Board. While among fauna, two species of birds i.e. *Pavo crestatus* (Peacock) is Schedule-I species ***Figure 1-2*** *(a)* and *Grus antigone* (Sarus Crane), a bird species characteristic of wetlands, is categorized as Vulnerable on the IUCN Red list 2007 in India and it occur mostly outside protected areas. Ummedganj, a "Conservation Reserve" (located within 10 km.) is one of the key breeding sites of the Sarus Crane in Kota district and has Important Bird Area (IBA) Values ***Figure 1-2*** *(b)*. It is a wetland ecosystem only place in India where the tallest flying bird-Sarus Crane, can be seen breeding twice in a year close to the city. (Kaur, 2009)[6]. All other birds belongs to Schedule IV category. Similarly, among herpetofauna, *Lissemys punctata* (Indian Flap shell Turtle), *Varanus bengalensis* (Common Indian monitor), *Crocodilus palustris* (Marsh crocodile) and *Gravialis*

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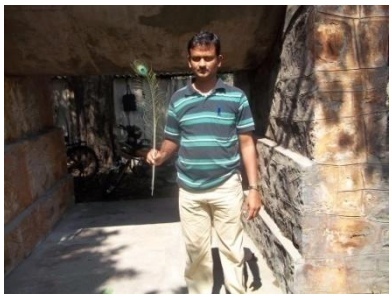
6 Kaur, J. (2009). Proposal for Setting up the Ummedganj Pakshi Vihar Conservation Reserve in Kota, Rajasthan. Detailed project report submitted to the Pakshi Vihar Committee Kota.

gangeticus (Gharial) falls in the Schedule –I category of Wild life Protection Act, (1972). Among recorded faunal species, none of the species can be designated as an endemic[7].

Figure 2-3: Photograph of Schedule-I species Peacock and Ummedganj "Conservation Reserve"



(a) Quill of Schedule-I species, *Pavo crestatus* (Peacock)

(b) Ummedganj "Conservation Reserve" a habitat of Sarus Crane breeding

2.5.4 Major Agriculture Crops

Crops: Soyabeen, Paddy, Mustard, Wheat, Bajra, Maize and Gram.

Fruit Trees: Guava, Mango, Orange, Lime and Aola.

Crop Vegetables: Tomato, Brinjal, Gobhi, Potato, Cucurbit and Bhindi.

Medicinal Aromatic Crops: Ashwagandha, Rose.

2.5.5 Medicinal Plants

Following medicinal plants are being used by various communities in Kota district[8].

Table 2-12: Plants of Etnomedicinal Use (Medicinal Value) in Kota District

S. No.	Disease	Plants used
1	Leprosy	*Calotropis procera, Cassia tora, Cassia fistula, Clitoria ternatea, Acacia nilotica, Argemone mexicana, Tricosanthes dioica*
2	Diarrhea	*Cyperus rotundus, Dalbergia sisso, Ficus benghalensis, Dichrostachys cinerea, Cynadon dactylon, Zizyphus mauritiana, Solanum nigrum*
3	Dysentery	*Parthenium hysterophorus, Euphorbia hirta, Jatropa gossypifolia, Ocimum basilicum, Ficus benghalensis, Cynadon dactylon, Portulaca oleracea*
4	Epilepsy	*Evolvulus alsinoides, Cyperus rotundus, Martynia annua, Cynadon dactylon, Polygala erioptera*
5	Malaria	*Gomphrena celosioides, Xanthium strumarium, Sida rhombifolia, Argemone Mexicana*

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7 Venkataraman, K., Chattopadhyay, A. and Subramanian, K.A. (Editors). 2013. Endemic Animals of India (Vertebrates): 1–235+26 Plates. (Published by the Director, Zoological Survey of India, Kolkata)

8 L. K. Dadhich, Nivedita Sharma, Indu Dadhich (2010). Medicinal Plants In An Urban Environment: Study Of Some Important Medicinal Plants In Urban Area Of Kota, Rajasthan. International Research Journal 10 (1): 85-86.

S. No.	Disease	Plants used
6	Jaundice	*Evolvulus alsinoides, Trichosanthes dioica, Azadirachta indica, Boerhaavia diffusa, Polygonum glabrum*
7	Skin disease	*Cassia tora, Cassia fistula, Ipomoea nil, Cyperus rotundus, Jatropa gossypifolia, Butea monosperma, Azadirachta indica, Argemone Mexicana, Solanum nigrum*
8	Cancer	*Ageratum conyzoides, Rhynchosia minima, Asparagus racemosus, Cynadon dactylon, Hyptis suaveolens*
9	Heart disease	*Capparis decidua, Sida rhombifolia Solanum nigrum Solanum xanthocarpum*
10	Asthma	*Tribulus terrestris, Centella asiatica, Solanum xanthocarpum, Boerhaavia diffusa, Sida ovata, Tephrosia purpurea, Acalypha indica, Capparis decidua*
11	Wound healer	*Blumea lacera, Echinops echinatus, Cyperus rotundus, Tinospora cordifolia, Sesamum indicum, Mitragyna parvifolia*
12	Cold and cough	*Eclipta alba, Echinops echinatus, Capparis decidua, Euphorbia tirucalli, Ricinus communis, Acalypha indica, Alysicarpus vaginalis, Clitoria ternatea, Tephrosia purpurea, Ocimum basilicum, Hyptis suaveolens, Zizyphus mauritiana, Mitragyna parvifolia, Tribulus terrestris*

2.6 Aquatic Biodiversity Status

2.6.1 Phytoplankton

From secondary literature[9] it is well evident that Chambal river is recorded with 70 species of algae belonging to four Classes with 15 genera i.e. Anacystis, Ankistrodesnus, Closterium, Cyclotella, Euglena, Gomphonema, Melosira, Navicula, Nitzschia, Oscillatoria, Phacus, Phormidium, Scenedesmus, Stigeoclonium and Synedra.

2.6.2 Zooplankton

As per Secondary information[10], 21 species from five groups have been reported which includes species, *Arcella sp., Difflugia sp., Phacus sp., Actinophrys sp., Daphnia sp., Ceriodaphnia sp., Diaphanosoma sp., Alona sp., Brachionus sp., Keratella sp., Filina sp., Monostyla sp., Asplanca sp., Mytilina sp., Lecane sp., Cyprio sp., Centrocypris sp., Rhinodiaptomus sp., Cyclops sp., Mesocyclops sp. and Heliodiaptomus sp.*

2.6.3 Benthos

Benthos are are also well studied for Chambal river and shows diversity of seven groups and 23 species[11] i.e. *Chaetogaster sp., Tubifex sp., Nais sp., Limnodrilus sp., Pentaneura sp., Simulium sp., Tabanus sp., Antocha sp., Hirudinaria sp., Ephemerella sp., Centroptilum sp., Heptagenia sp., Cinygmula sp., Leptophlebia sp., Unio sp., Pila sp., Lymnaea sp., Planorbis sp., Vivipara sp., Limax sp., Parathelpusa sp., Psephenus sp. and Ectopria sp.*

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9 Meera Bhatnagar and Nilima Bhardwaj (2013). Biodiversity of Algal Flora in River Chambal at Kota, Rajasthan.. Nature Environment and Pollution Technology 12(3): 547-549.

10, 11 K.S. Gaur, V. Sharma, M.S. Sharma*, R. Modi, B.K. Verma. (2014). Water Quality Assessment in Relation to Trophic Status of the Rana Pratap Sagar Dam and the Chambal River (Rajasthan) India. World Journal of Environmental Biosciences, 3(1):19-33.

2.6.4 Fishes / Crabs / Shrimps

Catla catla (Catla), Cirrhinus mrigala (Narains), Labeo rohita (Rohu), L. calbasu (Kalaunt), L. fimbriatus (Mammola), Garra gotyla gotyla (Pather chat), L. bata (Bata), L. boggat (Raiya), L. gonius (Sarsi), Puntius sarana (Puthi), P. chugma (Puthi), P. sophore (Puthi), Rasbora daniconius (Zebra), P.ticto (Puthi), Osteobrama cotia (Gurda), Botia lohaachata (Bamna), Glossogobuis giuris (Goby), Trichogaster fasciatus (Khaarda), ambassis nama (Sia), Xenentodon cancilla (Suya), Rhinomugil corsula (Gorrah), Mastacembalus armatus (Bam), Lepidocephalichthys guntea (Balu), Esomus danricus (Chilwa).

3 ANTICIPATED BIODIVERSITY IMPACTS AND MITIGATION MEASURES

3.1 Biodiversity Impact Assessment Methodology

Impacts on ecological components were identified by following various steps which are explained in detail in following sections.

3.1.1 Determination of Activities Likely Impacting Ecological Components

Broader level determination of ecological components like Terrestrial Flora (TFL), Terrestrial Fauna (TFA) etc. has been performed on the basis of activities and associated activities involved at the different phases of project.

3.1.2 Scoring the Impact Consequence

The consequences on various ecological components have been ranked into 5 levels ranging from insignificant to extensive consequence and are given in ***Table 3-1.*** This table covers Flora, fauna and habitat / ecosystem level impacts.

Table 3-1: Impact Scoring System – Consequence Assessment

S. No.	Ecological Components Likely Impacted	Impact and Score				
		Insignificant Consequence (+/-) 1 point	**Minor Consequence (+/-) 2 points**	**Moderate Consequence (+/-) 3 points**	**Major Consequence (+/-) 4 points**	**Severe Consequence (+/-) 5 points**
1	Flora / Fauna Habitat / Ecosystem	• Site specific loss (removal) of common floral species (but not any tree or trees). • Vegetation composition does not form a habitat character for any species of conservation significance. • No short term or long term impacts are likely to adversely affect the surrounding habitat / ecosystem. • Site specific disturbance to common / generalist faunal species (e.g. movement pattern, displacement etc.). • No negative impacts on surrounding ecosystem functioning or habitat ecology.	• Site specific loss (removal) of some saplings of trees. • Minor temporary impacts on ecosystem functioning or habitat ecology of common / generalist species. • Minor short term / long term impacts on surrounding / immediate / adjacent habitats and are resilient to changes in habitat structure or condition. • Impact on surrounding agro-ecosystem / agriculture when environmental data / parameters are within permissible limits.	• Site specific loss (removal) of some common well grown tree / trees species. • Site specific loss of nesting / breeding habitat of common / generalist species of flora-fauna but will not result in permanent loss of habitat. • Short term or long term impacts are likely to adversely affect the surrounding habitat character/ habitat ecology/ functioning of ecosystem. • Impact on surrounding agro-ecosystem / agriculture when physical parameters with marginal increase but can be mitigated.	• Site specific impact on threatened species but impacted species is widely distributed outside the project site. Short term impacts may lead to loss of abundance or extent, but unlikely to cause local population extinction. • Site specific habitat loss of fauna listed in IUCN, WCMC, Birdlife International, or any other international literature - secondary information. • Impacts on habitats / ecosystems of international importance.	• Impact on threatened species listed in as a endemic / Schedule-I as per IWPA 1972, BSI, Red Data Book, ZSI, BSI or literature published by any State Govt. Institute, University and Collage etc. • Loss of habitat of above said flora-fauna. • Impact on genetic diversity Impact on NP /PF /WLS /ESZ /IBA / tiger reserve / elephant corridor / corridor. • Impact on ecosystem like river, forest, wetland (e.g. RAMSAR site etc.) etc.

3.1.3 Quantifying the Probability of Occurrence of the Impact

After identifying the consequence severity, the probability of occurrence also needs to be estimated to arrive at a complete picture of environmental impact. ***Table 3-2*** provides probability / likelihood ratings on a scale of 1 to 5. These ratings are used for estimating the likelihood of each occurrence.

Table 3-2: Probability of Impact Occurrence

Probability	Chance of Occurrence	Scoring
Definite / Every day	> 90 % chance of occurrence	5
Probable	60 – 90 % chance of occurrence	4
Possible	30 – 60 % chance of occurrence	3
Improbable	20-30 % chance of occurrence	2
Indefinite / Rare	< 10 % chance of occurrence	1

3.1.4 Quantifying Ecological Impact

The level of environmental impact risk is calculated by multiplying the consequence score and the probability of occurrence together. Thus,

Significance of Impact = Consequence Score × Probability of Occurrence

The final score is in relative point score, rather than actual impact. The impact estimation is carried out assuming an implementation of sound management programmes to maintain healthy ecological conditions. ***Table 2-3*** assigns significance criteria, based on the scale of 1-25, used for prioritizing mitigation measures for reducing the environmental impact and thereafter, formulating and implementing Environmental Management Plans (EMPs).

To do this, environmental impact risk levels are first scored and identified as mentioned earlier and then evaluated on the evaluation scale that follows in ***Table 3-3.***

Table 3-3: Ecological Impact Significance Criteria

Probability	Severity				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Extensive (5)
Indefinite / Rare (1)	1	2	3	4	5
Improbable (2)	2	4	6	8	10
Possible (3)	3	6	9	12	15
Probable (4)	4	8	12	16	20
Definite / Every day (5)	5	10	15	20	25

3.1.5 Categorization of Ecological Risk

Ecological severities are clubbed in to five levels from Minor / Negligible to Extremely Severe (***Table 3-4***). Extreme risk activities are unacceptable in current form and need to be stopped or should be modify such that they are brought to the lower level of ecological risk. Similarly, high and moderate risk activities, although acceptable, require being evaluated and mitigated in that manner those consequences / probabilities are lowered, with more focus on high risk activities vis-à-vis moderate risk activities. Less severe activities do not require any mitigation measures unless escalation of risk is possible while minor / negligible do not require any particular mitigation measures.

Table 3-4: Ecological Risk Categorization

Score	Type of Risk	Action Required
21-25	Extremely Severe	Activity should not proceed in current form
13-20	Highly Severe	Activity should be modified to include remedial planning and actions and be subject to detailed ecological assessment
7-12	Moderate Severe	Activity can operate subject to management and / or modification
4-6	Less Severe	No immediate action required unless escalation of risk is possible. However surveillance is required.
1-3	Negligible	No immediate action required. However surveillance is required.

3.2 Likely Impacts on Flora-Fauna

3.2.1 Identification of Impact Zone

Green Belt design and development has been attributed a great importance and became an essential element of planning policy.

Treated water is being discharged in Kansuva Nalla, which meets Chandraloi River ultimately meeting Chambal River (~ 27 Km) after meeting RPCB discharge norms. Thus, due to existing operations and proposed expansion, there may not have any impact on protected area (National Ghariyal Sanctuary).

Due to the proposed expansion activities, various air pollutants like PM, SO_2, NO_x, HCl, Cl_2 etc. may be deposited within 1 km from the project boundary in worst case scenario, thus impact zone is considered as 1 km from project site. Present mode of treated waste water disposal is in natural drain, Kansuva Nalla. Impact zone includes urban habitats of adjacent Kansua and Prem Nagar area, Canal and Small part of Ladpura Reserve Forest.

3.2.2 Determination of Ecological Components Likely Impacted

Following components are determined which may face likely impacts in different phases due to various project activities. Details are tabulated in the ***Table 3-5***.

Table 3-5: Determination of Impacting Ecological Components

S. No.	Activity	Aspect	Ecological Components					
			TFL	TFA	AFL	AFA	MFL	MFN
1. Pre construction Phase								
1.1	Site Preparation Phase	Removal of herbs, and grasses	√	√	--	--	--	--
1.3	Movement of machinery, workers / labors etc.	Generation of noise	--	√	--	--	--	--
2. Construction Phase / Plant erection								
2.1	Fabrication work, RCC civil foundations and erection activities, transport machinery,	Generation of noise	--	√	--	--	--	--

S. No.	Activity	Aspect	Ecological Components					
			TFL	TFA	AFL	AFA	MFL	MFN
	workers/ labors for mechanical / engineering / technical work etc.							
3. Operational Phase								
3.1	Release of gaseous emission (from stacks)	Release of NO_x (nitrogen oxides)	√	√	--	--	--	--
		Particulate Matter (Fly ash)	√	√	√	√	--	--
		Release of SO_2	√	√	--	--	--	--
3.2	Release of gaseous emission (from process vent)	HCl	√	√				
		Cl_2	√	√				
3.3	Coal handling	Generation of Coal dust during transportation, storage and crushing.	√	√	--	--	--	--
3.4	Storm water drainage	Release of Contaminated storm water	√	√	√	√	--	--

3.2.3 Likely Impacts on Ecological Components

As discussed earlier, environmental aspects and impacts have been identified based on an assessment of environmental aspects associated with the project. Potential impacts on Ecology and Biodiversity are given in ***Table 3-6***.

Table 3-6: Aspect – Impact Identification

S. No.	Project Activities / Aspects	Likely Impacts on Ecology and Biodiversity (EB)
1. Pre-construction Phase		
1.1	Removal of site vegetation: uprooting of common herbs, shrubs and grasses	*Impact-1: Site specific loss of common floral diversity.* *Impact-2: Site specific loss of associated faunal diversity.* *Impact-3: Site specific loss of habitat / habitat diversity.*
1.2	Movement of machinery, workers / labors etc.: Generation of noise	*Impact-4. Site specific disturbance to normal faunal movements at the site.*
2. Construction Phase / Plant erection		
2.1	Fabrication work, RCC civil foundations and erection activities, transport machinery, workers/ labors for mechanical / engineering / technical work etc.	*Impact-5. Site specific disturbance to normal faunal movements at the site due to generation of noise.*
3. Operational Phase		
3.1	Release of gaseous emission like NO_x, PM (fly ash) and SO_2 from flue gas stacks.	*Impact-6. Impact on surrounding agriculture crops, water bodies, urban habitats, urban ecology and Ladpura RF.*
3.2	Release of gaseous emission like HCl & Cl_2 from process vents.	*Impact-7. Impact on surrounding agriculture crops, water bodies, urban habitats, urban ecology and Ladpura RF.*

S. No.	Project Activities / Aspects	Likely Impacts on Ecology and Biodiversity (EB)
3.3	Generation of Coal dust during transportation, storage and crushing.	*Impact-8. Impact on surrounding flora (reduction in photosynthesis) due to deposition of coal dust on leaves.*
3.4	Release of contaminated storm water in case of any emergency.	*Impact-9. Contamination of surrounding water bodies and aquatic biodiversity.*

3.2.4 Quantification of Impacts

Impacts on the flora, fauna and habitats have assessed in the following table on the basis of multiplication of consequence and probability scorings. Final scores are obtained for impacting activities and they are tabulated bellow in ***Table 2-7***.

Table 3-7: Impact Scoring

Code	Impact Consequence - Probability Description / Justification	Impact Scoring			Remarks
		Consequence, C	Probability, P	Final Score C x P	
1. Pre-Construction Phase					
1.1	**Impact-1:** During expansion, common floral (not trees) species will be cleared, which will not result in loss of flora in true sense.	1	5	5	Less Severe
1.2	**Impact-2:** All species reported from site were generalist which uses many varieties of habitats present in the core zone. So there is no threat of this impact.	1	5	5	Less Severe
1.3	**Impact-3:** Expansion does not require additional land, which form a specific habitat character for any species of conservation significance.	1	5	5	Less Severe
1.4	**Impact-4:** Faunal species present from site are generalist and well adapted to the routine urban activities, so this impact will be site specific.	1	5	5	Less Severe
2. Construction Phase / Plant erection					
1.5	**Impact-5:** Faunal species present from site are generalist and well adapted to the routine urban activities, so this impact will be site specific.	1	5	5	Less Severe
3. Operational Phase					
3.1	**Impact-6:** Emission levels of NOx, PM (fly ash) and SO_2 will be bellow permissible levels. However, considering result of the cumulative impact, this impact is rated as a moderated severe.	2	5	10	Moderate Severe (assuming cumulative impact)

Code	Impact Consequence - Probability Description / Justification	Impact Scoring			Remarks
		Consequence, C	Probability, P	Final Score C x P	
3.2	**Impact-7:** Emission levels of HCl, Cl_2 will be within permissible levels.	2	5	10	Moderate Severe
3.2	**Impact-8:** All trucks will be covered during transportation and storage. Crushing will be in closed system.	1	1	1	Negligible
3.3	**Impact-9:** First rain water will be collected and treated in ETP.	1	1	1	Negligible

3.3 Mitigation Measures

Looking towards the likely impacts following mitigation measures will be implemented (***Table 3-8***). Details regarding plantation scheme and plant species have been described in the EMP section.

Table 3-8: Likely Impacts and Mitigation Measures

Code	Likely Impacts	Mitigation Measures
1. Pre Preparation Phase		
1.1	*Impact-1*	No immediate action required. Since it is expansion type of project, no extensive vegetation will be required. Greenbelt is already developed within and also in out of the project boundary, which will improve floral and faunal diversity of the project area.
1.2	*Impact-2*	
1.3	*Impact-3*	
1.4	*Impact-4*	No immediate action required because all species reported from project site are common and well adapted to the routine urban activities.
2. Construction Phase / Plant erection		
1.5	*Impact-5*	No immediate action required because all species reported from project site are common and well adapted to the routine urban activities.
3. Operational Phase		
3.1	*Impact-6*	ESP will be provided for controlling Fly Ash from Power Plant chimneys. Limestone will be dosed with fuel to reduce SO_2 emissions. Highly efficient caustic and water scrubbers will be provided to reduce HCl & Cl_2 emissions from process stacks. Greenbelt is already developed in factory premises and nearest residential area. Surrounding agriculture area of impact zone already encompasses good tree cover. However, native species will be planted in in Ladpura RF to mitigate likely emissions and to improve habitat status and population enhancement of biodiversity. Details of further plantation development are given in Conservation Plan section.
3.2	*Impact-7*	
3.3	*Impact-8*	All material in trucks will be covered with water proof tarpaulin. Also, all storage and crushing facility, if any will be closed type. So, no dust will allowed passing outside. All these impacts will be site specific.
3.4	*Impact-9*	First rain water will be collected and treated in ETP.

4 ENVIRONMENTAL MANAGEMENT PLAN

4.1 Green Belt

The trees have substantial inter-specific as well as intra-specific variation in air pollution tolerance (Garsad and Rutter 1982[12] and Scholz, 1981[13]). Therefore, plant species act as bio-monitoring agent to monitor the air environment as well as to keep and maintain the project environ healthy. The two areas of air pollution by gases and by dust need to be attended to, using plants and such treatments have numerous benefits, especially social and ecological (Chapherkar 1994).

4.1.1 Greenbelt in Factory Premises

Entire Factory premise (DCM Complex) encompasses 261.8 Acres (106 Ha) greenbelt area, which is above 33% of total area of Kota Complex, in peripheral boundary, road side and around building premises plantation.

Approximately 5.0 Lacs trees of 38 species have been planted and developed ***Photographs 4-1***. Layout showing greenbelt is given in ***Figure 4-1***. Taxonomic information is given in ***Table 4-1***.

Photographs 4-1: Photographs of Existing Greenbelt and Landscaping

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12 Garsad, S.G. and Rutter, A. J. 1982. Relative performance of Conifer population in various tests for sensitivity to S and the implications for selecting trees for planting in polluted areas. New Phytol. 93:349-367.

13Scholz, F. 1981. Considerations about of air pollution resistance in polluted stands and consequences for correlated trails. Arch Och. Srod. 2:91-100.

Existing Greenbelt

Table 4-1: Details of Species in Existing Greenbelt Plantation in and around the Project Site

S. No.	Scientific Name of the Plant	Common Name of the Plant
1	*Azadirachta indica*	Neem
2	*Mimusops elengi*	Maulsari
3	*Cassia fistula*	Amaltas
4	*Phanera variegata*	Kachnar
5	*Mangifera indica*	Mango
6	*Ficus religiosa*	Pipple
7	*Dalbergia sissoo*	Seesam
8	*Ficus benghalensis*	Bargad
9	*Citrus sp.*	Lemon
10	*Psidium guajava*	Guava
11	*Eucalyptus globulus*	Eucaliptis
12	*Syzygium cumini*	Jamun
13	*Morus alba*	Melberry
14	*Delonix regia*	Gulmohar
15	*Saraca asoca*	Ashoka
16	*Hyophorbe lagenicaulis*	Bottel palm
17	*Livistona chinensis*	China palm
18	*Nerium oleander*	Narium
19	*Phyllanthus emblica*	Aonla
20	*Ficus racemosa*	Gullar
21	*Santalum album*	Adak chandan
22	*Populus alba*	Poppler
23	*Tectona Grandis*	Teak
24	*Moringa oleifera*	Senjana
25	*Grevillea robusta*	Silver oak
26	*Madhuca longifolia*	Mahua
27	*Ficus elastica*	Rubber plant

S. No.	Scientific Name of the Plant	Common Name of the Plant
28	*Acacia karoo*	Kikar
29	*Albizia lebbeck*	Siris
30	*Cordia dichotoma*	Lasoda
31	*Tamarindus Indica*	Imali
32	*Bombax ceiba*	Seemal
33	*Butea monosperma*	Palas
34	*Murraya koenigii*	Meetha neem
35	*Piper auritum*	Beer
36	*Senegalia catechu*	Kher
37	*Terminalia arjuna*	Arjun
38	*Vachellia nilotica*	Babool

Figure 4-1: Site Layout Plan showing Greenbelt Area

4.2 Maintenance of Existing Greenbelt

Based on the survival rate, it is proposed to plant about 2,000 trees per year in DCM Shriram Kota Complex every year for next five years.

Green belt of native species of appropriate width (50 to 100 m) and consisting of minimum 3 tiers around plant boundary with tree density of 2,000 to 2,500 trees per ha with a good survival rate of around 80% will be maintained within 33% of the total project area within DCM Shriram Kota Complex.

Further plantation with suitable species will be suggested in surrounding habitats / areas falling in identified impact zone. Details of plantation have been given in Conservation Plan section.

5 CONSERVATION PLAN FOR SCHEDULE-I AND THREATENED SPECIES

Buffer zone is reported with many Schedule-I (IWPA, 1972) fauna species i.e. *Pavo crestatus* (Peacock) and two species of herpetofauna i.e. *Lissemys punctata* (Indian Flap shell Turtle) and *Varanus bengalensis* (Common Indian monitor), *Crocodilus palustris* (Marsh crocodile) and *Gravialis gangeticus* (Gharial). Also, Ummed Gunj Conservation Reserve / habitat is well known for breeding place of Vulnerable (IUCN) *Grus Antigone* (Sarus Crane). Moreover, one plant i.e. *Tecomella undulata* (Rohida) reported from buffer zone is enlisted in threatened plant list by Rajasthan Biodiversity Board.

Looking towards distribution of above species, only "Peacock" is closely associated with the human associated habitats (Generalist), also this species has been reported from the impact zone area so it needs conservation attention while other faunal species are restricted to the particular habitats (Specialist) which are out of Impact zone. Conservation plan includes habitat improvement through plantation and monitoring of above species in impact zone area (1 km) in consultation of "State forest department" to improve its population status in the study area.

Sightings and Habitat Use

Presence of peacock was reported from the village habitations and agriculture areas. It is clear that this species is mainly associated with the human allied areas.

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, dense tree canopy cover supports good insect diversity which is very common food for peafowls.

Threats in the Study Area

In the study area, no threat has been observed for peacock or its habitats. However, habitat improvement programme is recommended for improvement of population status of this national bird "Peacock".

Inference - Buffer Zone as a Peacock Habitat

Present survey of the peafowl in the buffer zone of the project site shows that, peafowl is well adapted to the existing rural setting of the study area. However, the following points can give an insight on the overall status of peafowl in the study area and thereby plan for better management strategies related to proposed project activities.

- Local residents of the study area were well aware of the movement pattern of peafowl in their surrounding habitats.
- Peafowl uses agriculture and various rural habitats as a feeding ground during day time while during night time they take shelter on the trees as well as on the roof of the houses. It clearly indicates peafowl normally uses ecosystems or habitats adjacent to village.

From the above said facts, it can be inferred that, some villages area of the buffer zone provide roosting and feeding ground for the peafowl. Therefore, it has been visualized that, the proposed project will not have any significant impact on peacock in terms of their normal movements and other activities. However, habitat improvement programme will be undertaken in consultation of forest department in Ladpura RF area falling in impact zone.

Plantation in Nearest Forest Area for Habitat Improvement

The existing unit already has well developed Greenbelt by using many native species. Apart from the same, tree plantation will be done at small portion of Ladpura RF and sanctuary area for habitat improvement and mitigation of various impacts with suitable plant species[14] suggested in ***Table 5-1***.

Selection of Plant Species

Facts considered during selection of plant species for greenbelt development are:

- Type of pollutant (mainly air) likely to disperse from project.
- Agro-climatic zone and sub-zone of the project area (Central Plateau and Hills).
- Adaptability of plant species to the local environment.
- Biological–filter Efficiency: Absorption of gases, Dust capturing and Noise control.
- Plantation of Threatened plant species (conservation and population improvement).

Table 5-1: Suggested Plant species for Plantation in Ladpura Reserve Forest / Sanctuary Area

S. No.	Species Name / Hindi Name	No of Saplings	Ecological Characters[15,16,17]
1	*Dalbergia sissoo* (Sisam)	350	Drought resistant tree, Dust and gas pollution controller,
2	*Azadiracta indiaca* (Neem)	350	Drought resistant tree, Noise, gas and dust pollution controller
3	*Butea monosperma* (Palas)	500	Drought resistant tree, Noise, gas and dust pollution controller
4	*Cordia dichotoma* (Lasoda)	350	Drought resistant tree
5	*Diospyrous melanoxylon* (Tendu)	300	Drought resistant tree, Noise and gas pollution controller
6	*Ficus bengalensis (*Bad)	300	Drought resistant tree, Noise, dust
7	*Ficus religiosa* (Pipal)	300	Drought resistant tree, Noise, age and dust gas pollution controller, Sensitive to SO_2 (indicator)
8	*Prosopis cineraria* (Khejri)	500	State tree and drought resistant tree
9	*Terminalia arjuna* (Arjun)	350	Drought resistant tree, Noise, gas and dust

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14CPCB 2000. Guidelines for developing green belts, Programme Objective Series PROBES/75/1999-2000nCentral Pollution Control Board, New Delhi, pp. 195.

15 Phytoremediation of particulate matter from ambient environment through dust capturing plant species. 2007. Central Pollution Control Board, Ministry of Environment & Forests, Govt. of India in Delhi.

16 Greenbelts for Pollution Control: Concepts, Design, Applications. 2000. Abbasi, S.A. and F.I. Khan. Discovery Publishing House, New Delhi.

17 EIA Guidelines for Mining Minerals, MoEF. (IL&FS)

S. No.	Species Name / Hindi Name	No of Saplings	Ecological Characters[15,16,17]
			gas pollution controller
10	*Tecomella undulata* (Rohida)	500	Threatened Tree[18], State flower tree and drought resistant tree
11	*Anogeissus latifolia* (Dhok)	500	Drought resistant tree
12	*Syzygium cumini* (Jamun)	350	Drought resistant tree, Sensitive to SO_2 (indicator)
13	*Tamarindus indica* (Emali)	350	Drought resistant tree, Noise and dust gas pollution controller
	Total saplings	**5,000**	

Budget Allocation for Habitat Improvement Programme

Total forest area falling in the impact zone is 1,23,800 m^2, considering 25 m^2 area per tree (full grown tree), 4,952 (round off 5,000) saplings will be required. Detailed budget break-up up to five years is given in ***Table 5-2***.

Table 5-2: Budget for Habitat Improvement Programme

Work or Activity	1st year	2nd year	3rd year	4th year	5th year
Plantation in impact zone area of Ladpura RF and Sanctuary Area (Approx. Cost @ Rs. 100 per sapling & Rs 100 labor cost per sapling)					
Saplings Required	1,000	1,000	1,000	1,000	1,000
Sapling Cost	10,000	10,000	10,000	10,000	10,000
Labor Cost	10,000	10,000	10,000	10,000	10,000
Total Cost	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**
Total Budget : 1,00,000/- (One Lakhs Rupees)[19]					

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18 Rajasthan Biodiversity Board (http://www.rsbb.rajasthan.gov.in/readwritedata/pdfs/R-E-&T-Plants.pdf)

19 All other costs like labor, soil filling dressing, irrigation etc. costs will be burned by client / proponent up to five years.

6 ENVIRONMENTAL MONITORING PLAN

6.1 Biodiversity / Ecological Monitoring

Since the identified impact zone is reported with some schedule species, population of these species will be monitored. Every year, status survey of these species (with consultation of local forest department) will be conducted and report will be submitted to the local forest department. This report will be the base for forest department to strengthen additional conservation activities of Schedule species.

Budgetary environment monitoring plan for ecology and biodiversity is given in ***Table 6-1***.

Table 6-1: Budgetary Environment Monitoring Plan for Ecology and Biodiversity

Project Activity	Operation Controls / Mitigation Measures	Implementation and Management									Remark
		Data Analysis	Measurement Methodology	Frequency	Location	Reporting Schedule / Responsibility	Emergency Procedure	Budget for Mitigation Measure - (in Lacs)	Approximate Recurring Cost – (in Lacs)	Procurement Schedule	
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*
Operation of New Power Plant, Caustic Chlorine plant & SBP Plant and operation of other utilities like heat exchangers, compressors, pumps, blowers	Green belt will be maintained in the total plot area of DCM Shriram unit.	Tree plantation Counts	Manual	During start of construction phase	Within plant premises and around Likely Impact Zone	HR Manager	Minimum of 33% Green belt shall be maintained.	5	1	During Construction & Operation phase	***Capital cost***: Cost for 2000 saplings/year in and around project site for next five years. ***Recurring Cost***: Maintenance of Greenbelt & greenbelt around Ladpura RF.
Capital Cost (in Lacs)								**5**		**During Commissioning phase.**	
Recurring Cost (in Lacs)								**1**		**During Operation phase.**	
Total Cost for EMP (in Lacs)								**6**		**--**	

6.2 Environmental Monitoring and Management Cost

Expenditure to be incurred by DCM Shriram on ecology and biodiversity and its management shall include capital cost of ~ INR 5.0 Lacs and ~ INR 1.0 Lac recurring cost (annually) as tabulated in ***Table 6-2***.

Table 6-2: Environmental Monitoring and Management Cost

S No.	Head	Approximate Capital cost (INR in Lacs)	Approximate Recurring cost per Annum (INR in Lacs)	Basis for Cost Estimates
1	Ecology and Biodiversity	5.0	1.0	***Capital cost***: Cost for saplings in and around project site.
				Recurring cost: Maintenance of green belt.
Total Amount in Lacs		**5.0**	**1.0**	

Kadam

Environmental Consultants

www.kadamenviro.com

Environment for Development

CONTACT DETAILS

Vadodara (Head Office)

871/B/3, GIDC Makarpura, Vadodara, India – 390 010.

E: kadamenviro@kadamenviro.com; T:+91-265-3001000; F: +91-265-3001069

Gurgaon Office

Spaze IT Park ,Unit No.1124

11th floor .Tower B-3 Sector-49, Near Omaxe City Centre Mall, Sohna Road,

Gurgaon,122002(Haryana)

E: delhi@kadamenviro.com;T: +91 124 4242 431;M: +91 880 0688 825; F: +91 124 4242 433