यूरेनियम कॉरपोरेशन ऑफ इंडिया लि0
(भारत सरकार का संस्थान)

URANIUM CORPORATION OF INDIA LTD.
(A Govt. of India Enterprises)

An ISO 9001 : 2008, ISO 14001 : 2004, IS 18001 : 2007 Company
CIN : U12000 JH 1967 GOI 000806

No. UCIL/ENV/NWP/MoEF/06/2018 13.03.2018

To
The Director (I.A. - Division)
Ministry of Environment, Forest and Climate Change,
Government of India,
3rd Floor, Vayu Vihar, Indira Paryavaran Bhavan,
Jorbagh Road, Aliganj
New Delhi – 110 003

Subject: Environmental Clearance of Proposed Expansion of Narwapahar Uranium Mine of Uranium Corporation of India Limited in East Singhbhum District, Jharkhand.

Ref: 1. Proposal No. IA/JH/MIN/52343/2013
2. Your letter no J-11015/530/2008-IA.II (M) dated 15.05.2017
3. Your Additional Details Sought (ADS) dated 08.08.2017
4. UCIL letter no. UCIL/ENV/NWP/MoEF/03/2017 dated 13.02.2018

Dear Sir,

With the above mentioned subject and additional details sought (ADS) on 08.08.2017, please find our point wise reply:

Sl. No.	(ADS)	Status
1.	*Conservation plan authenticated by Chief Wildlife Warden of Govt of Jharkhand in respect of schedule-I species*	Wildlife Management & Conservation Plan prepared by M/s MECON has been submitted to PCCF, Chief Wildlife Warden & DFO vide our letter dated 30.11.2017. The report is enclosed **(Encl 1).**
2.	*Copy of Authenticated list of flora and fauna along with map*	Authenticated list of flora and fauna along with map is enclosed **(Encl 2).**
3.	*Copy of CGWA clearance for intersection of Ground water table*	CGWA Clearance has been obtained vide letter dated 21.10.2017 **(Encl 3).**

In view of the above, it is requested to issue the formal letter of environmental clearance at the earliest.

Thanking you,

Yours faithfully,
For URANIUM CORPORATION OF INDIA LIMITED

(R. K. Mishra)
Chief Superintendent (Env. Engg.)

Encl: As above

तुरामडीह माइन्स, सिंहभूम (पूर्व), झारखण्ड – 832107 **TURAMDIH MINES**, P.O.-Sundarnagar, Dist-E.Singhbhum, Jharkhand-832107

Phone : 0657-2318001, 2318002, 2318003, 2318004, 2318005, 2318006, 2318007, Fax : 0657-2318008, 2318009, 2318010
Regd. Office : P.O.-Jaduguda Mines, Singhbhum (East), Jharkhand-832 102
E-mail : uranium@ucil.gov.in, Website : www.ucil.gov.in

यूरेनियम कॉरपोरेशन ऑफ इंडिया लि0
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No. UCIL/ENV/ML/Forest/11/2017 30.11.2017

To
PCCF & Chief Wildlife Warden
Govt. of Jharkahnd,
P.O. Doranda, Van Bhawan
Ranchi- 834002

01/12/17

Sub: Site Specific Wildlife Management & Conservation Plan for Narwapahar Mines - authentication regarding

Dear Sir,

This has reference to MoEFCC letter No.J-11015/530/2008-IA.II (M) dated 15.05.2017(Encl.-1). UCIL has applied for environmental clearance (EC) of Narwapahar mine expansion. The proposal has been recommended by Expert Appraisal Committee for EC in the meeting held during 20-21 March, 2017. The committee has observed that there is presence of Schedule-I species in buffer zone of mining lease area. In view of above the committee has sought for following details:

1. Conservation Plan authenticated by Chief Wildlife Warden of the Government of Jharkhand in respect of schedule-1 species
2. Copy of Authenticated list of Flora and Fauna along with map.

Please find enclosed herewith the Site Specific Wildlife Management & Conservation Plan for Narwapahar Mines area prepared by M/s. Mecon Ltd. Ranchi.

The list of flora and fauna found in the study area and the toposheet showing mining lease and study area has been submitted to DFO, Jamshedpur vide our letter No.UCIL/ENV/NWP/Forest/02/2017 dated 06.06.2017 (Enc.2).

It is requested to authenticate the conservation plan.

Thanking you.

Yours faithfully,

For URANIUM CORPORATION OF INDIA LIMITED

(R. K. Mishra)
Chief Superintendent (Env. Engg.)

Copy to:
Divisional Forest Officer, Jamshedpur: Report attached

तुरामडीह माइन्स, सिंहभूम (पूर्व), झारखण्ड – 832107 **TURAMDIH MINES,** P.O.-Sundarnagar, Dist-E.Singhbhum, Jharkhand-832107
Phone : 0657-2318001, 2318002, 2318003, 2318004, 2318005, 2318006, 2318007, Fax : 0657-2318008, 2318009, 2318010
Regd. Office : P.O.-Jaduguda Mines, Singhbhum (East), Jharkhand-832 102
E-mail : uranium@ucil.gov.in, Website : www.ucil.gov.in

कार्यालयः वन प्रमण्डल पदाधिकारी, जमशेदपुर वन प्रमण्डल, जमशेदपुर।
(सी० एच० एरिया रोड नं० 1, जमशेदपुर–831001)
दूरभाष संख्या– 0657–2231017, फैक्स–0657–2231017, ई–मेल– dfojamshedpur@jharkhandmail.gov.in

जहाँ है हरियाली
वहाँ है खुशहाली

पत्रांक:790 /जमशेदपुर दिनांक: 07/03/2018

सेवा में,

श्री आर० के० मिश्रा,
मुख्य अधीक्षक (पर्यावरण अभियंत्रिकी)
यू०सी०आई०एल०,
जादूगोड़ा माईन्स,
जिला – पूर्वी सिंहभूम।

विषय :– सर्वश्री यू०सी०आई०एल० के नरवा पहाड़ माईन्स के 10 कि० मी० परिधि में फ्लोरा–फौना (Flora-fauna) सत्यापन के संबंध में।

महाशय,

उपर्युक्त विषयक सूचित करना है कि आपके द्वारा समर्पित मैप एवं फ्लोरा–फौना (Flora-fauna) सूची का वन क्षेत्र पदाधिकारी, राखामाईन्स के स्थलीय जाँच के आलोक में सत्यापित कर भेजी जा रही है।

विदित हो कि भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय के पत्रांक 7–2/00 (पी०ई०) दिनांक 28.09.2000 के द्वारा सम्पूर्ण सिंहभूम क्षेत्र को सिंहभूम गज आरक्ष्य घोषित किया गया है।

विश्वासभाजन

6/3/18
वन प्रमंडल पदाधिकारी
जमशेदपुर वन प्रमंडल
जमशेदपुर

अनुलग्नक – यथोक्त।

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in Which Listed
Birds			
1	Pariah Kite	*Milvus migrans*	-
2	Common Crow	*Corvus splendens*	V
3	Jungle Crow	*C. marorhynchos*	IV
4	House Sparrow	*Passer domesticus*	-
5	Wagtail	*Motacilla spp.*	
6	Rose Ringed Parakeet	*Psittacula krameri*	IV
7	Common Mynah	*Acridotheres tristis*	IV
8	Pied Mynah	*Sturnus contra*	IV
9	Cattle Egret	*Bubulcus ibis*	IV
10	Pond Heron	*Ardeola grayii*	IV
11	Little Egret	*Egretta garzetta*	IV
12	Small Green Bee-eater	*Merops orientalis*	-
13	Drongo	*Dicrurus adsimilis*	IV
14	Crow Pheasant	*Centropus sinensis*	IV
15	Doves	*Streptopelia spp.*	IV
16	Indian Roller	*Coracias benghalensis*	IV
17	White Breasted Kingfisher	*Halcyon smyrnensis*	IV
18	Red Vent Bulbul	*Pycnonotus cafer*	IV
19	Koel	*Eudynamis scolopacea*	IV
20	Hoopoe	*Upupa epops*	IV
21	Tailor Bird	*Orthotomus sutorius*	IV
22	Magpie Robin	*Copsychus saularis*	IV
23	Swallows	*Hirundo spp.*	IV
24	Purple Sunbird	*Nectarinia asiatica*	IV
25	Tree Pie	*Dendrocitta vagabunda*	IV
26	Shrikes	*Lanius spp*	IV
27	Partridge	*Francolinus spp.*	IV
28	Black Winged Kite	*Elanus caeruleus*	IV
29	Small Indian Cormorant	*Phalacrocorax niger*	IV

List of Plants Found in the Buffer Zone

Sl.No.	Local Name	Hindi Name	Scientific Name
1.	Ashing	Dhaman	Grewia tiliaefolia
2.	Ain	Porho	*Ficus cumia*
3.	Ambo	Amra	*Spondias spp.*
4.	Asendo	Kumbhi	*Careya arborea*
5.	Atkir	Ramdatwan	*Smilex macrophylle*
6.	Bai	Barh	*Ficus bengalensis*
7.	Bandu	Maula	*Butea parviflore*
8.	Baric	Kusum	*Schleichera trijuga*
9.	Barchon	Sabai	*Eulaliopsis binata*
10.	Baurakunda	Bhurkund	*Hymenodictyon excelsum*
11.	Bitagoinr	Pula	*Kydia calycina*
12.	Burja	Kachnar	*Bauhinia spp.*
13.	Burui	Dekamali	*Gardenia gummifera*
14.	Buru-mat	Bans	*Dendrocalamus strictus*
15.	Buru-salai	Salai	*Boswellia serrata*

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES RANGE

Sl. No.	Local Name	Hindi Name	Scientific Name
45.	Saiya	Chorant	*Heteropogon controtus*
46.	Seprum	Harshringar	*Nyctanthes arbotristis*
47.	Sarjom	Sal	*Shorea robusta*
48.	Sengel-sali	Bherul	*Chrooxylon swietenia*
49.	Saiya	Chorant	*Heteropogon controtus*
50.	Seprum	Harshringar	*Nyctanthes arbotristis*
51.	Sarjom	Sal	*Shorea robusta*
52.	Sekri	Sidha	*Lagerstroemia parviflora*
53.	Sengel-sali	Bherul	*Chrooxylon swietenia*
54.	Soso	Bhelwa	*Semecarpus anacardium*
55.	Tati	Apluda	*Apluda varia*
56.	Tila	Tilo	*Wendlandia exserta*
57.	Toraj	Belongan	*Cordia macleodii*
58.	Uli	Aam	*Mangifera indica*
59.	Ulu	Galphuli	*Flemingia chapper*
60.	-	Ban Tulsi	*Ocimum americanum*
61.	-	Madar	*Calotropis spp.*
62.	-	Peepal	*Ficus religiosa*
63.	-	Rend	*Ricinus communis*
64.	-	Shialkanta	*Argemone mexicana*
65.	-	Bharenda	*Jatropha spp.*
66	-	Behya	*Ipomea carnea*
67	-	Putus	*Lantana camara*
68	-	-	*Tridax procumbens*

List of Terrestrial Animals found in the Core Zone

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in Which Listed
Mammals			
1.	Common Mongoose	*Herpestres edwardsii*	IV
2.	Jackal	*Canis aureus*	II
3.	Indian Fox	*Vulpes bengalensis*	II
4.	Common house rat	*Rattus rattus*	V
5.	Indian hare	*Lepus nigricollis*	IV
6.	Indian Porcupine	*Hystrix indica*	IV
7.	Indian Field Mouse	*Mus booduga*	V
8.	Squirrel	*Funambulus pennanti*	IV
9.	Sloth bear	*Melursus ursinus*	I
10.	Barking deer	—	I
Reptiles			
1.	Russel's Viper	*Vipera russelii*	II
2.	Cobra	*Naja naja*	II
3	Yellow Rat Snake	*Ptyas mucosus*	II
4	Common Skink	*Mabuya carinata*	
5	Garden Lizard	*Calotes versicolor*	
6	Indian Python	*Python morulus*	I

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES RANGE

List of Flora and Fauna found in study area of 10 km radius (Narawapahar Mine Expansion Project of UCIL)

List of Plants found in the Core Zone:

Sl. No.	Local Name	Hindi Name	Scientific Name
1.	Ain	Porho	*Ficus cumia*
2.	Ambo	Amra	*Spondias spp.*
3.	Atkir	Ramdatwan	*Smilax macrophylla*
4.	Bai	Barh	*Ficus bengalensis*
5.	Bandu	Maula	*Butea parviflora*
6.	Baric	Kusum	*Schleichera trijuga*
7.	Burja	Kachnar	*Bauhinia spp.*
8.	Buru-mat	Bans	*Dendrocalamus strictus*
9.	Buru-salai	Salai	*Boswellia serrata*
10.	Chiru	Chero-ghas	*Imperata arundinacea*
11.	Dau	Barhar	*Artocarpus lakoocha*
12.	Edel	Semal	*Bombax malabaricum*
13.	Gara-hatna	Arjun	*Terminalia arjuna*
14.	Gara jono	Phul-jharu	*Thysanolaena agrostis*
15.	Hatana	Asan	*Terminalia tomentosa*
16.	Hupu	Galgal	*Chochlospermum gossypium*
17.	Hutar	Jirhul	*Indigofera pulchella*
18.	Huhri	Sinwar	*Vitex negundo*
19.	Icha	Dhoi	*Woodfordia fruticosa*
20.	Jojo	Imli	*Tamarindus indica*
21.	Jomlar	Mahulan	*Bauhinia vahlii*
22.	Koka	Kajhi	*Bridelia retusa*
23.	Kanthal	Kanthal	*Artocarpus heterophylla*
24.	Kaman	Karaunda	*Carissa spinarum*
25.	Kokar	Karkata	*Zizyphus xylopyra*
26.	Kend	Tendu	*Diospyros melanoxylon*
27.	Kita	Khajur	*Phoenix acaulis*
28.	Koroj	Karanj	*Pongamia glabra*
29.	Kuda	Jamun	*Syzygium cumini*
30.	Kaur	Kurchi	*Holarrhena antidyssentrica*
31.	Lowa	Gular	*Ficus glomerata*
32.	Bel	Bel	*Aegele marmelos*
33.	Lupung	Baheda	*Terminalia belerica*
34.	Mudupum	Mahua	*Madhuca indica*
35.	Ber	Ber	*Zizyphus spp.*
36.	Meral	Amla	*Embelica officinalis*
37.	Mur	Palas	*Butea spp.*
38.	Neem	Neem	*Azadirachta indica*
39.	Pandrai	Siris	*Albizzia lebbeck*
40.	Pandrai	Safed-siris	*A. procera*
41.	Palandu	Madhulat	*Combretum decandrum*
42.	Pota	Mainphal	*Randia dumetorum*
43.	Ritha	Ritha	*Sapindus mukorossi*
44.	Rola	Harra	*Terminalia chebula*

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES RANGE

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in which listed
Reptiles			
1.	Monitor Lizard	*Varanus spp.*	I
2.	Russel's Viper	*Vipera russelii*	II
3.	Cobra	*Naja naja*	II
4.	Yellow Rat Snake	*Ptyas mucosus*	II
5.	Indian Python	*Python morulus*	I
6.	Common Skink	*Mabuya carinata*	
7.	Garden Lizard	*Calotes versicolor*	
Birds			
1	Pariah Kite	*Milvus migrans*	-
2	Common Crow	*Corvus splendens*	V
3	Jungle Crow	*C. marorhynchos*	IV
4	House Sparrow	*Passer domesticus*	-
5	Wagtail	*Motacilla spp.*	
6	Rose Ringed Parakeet	*Psittacula krameri*	IV
7	Common Mynah	*Acridotheres tristis*	IV
8	Pied Mynah	*Sturnus contra*	IV
9	Cattle Egret	*Bubulcus ibis*	IV
10	Pond Heron	*Ardeola grayii*	IV
11	Little Egret	*Egretta garzetta*	IV
12	Small Green Bee-eater	*Merops orientalis*	-
13	Drongo	*Dicrurus adsimilis*	IV
14	Crow Pheasant	*Centropus sinensis*	IV
15	Doves	*Streptopelia spp.*	IV
16	Indian Roller	*Coracias benghalensis*	IV
17	White Breasted Kingfisher	*Halcyon smyrnensis*	IV
18	Little Grebe	*Podiceps ruficollis*	IV
19	Red Vent Bulbul	*Pycnonotus cafer*	IV
20	Koel	*Eudynamis scolopacea*	IV
21	Hoopoe	*Upupa epops*	IV
22	Tailor Bird	*Orthotomus sutorius*	IV
23	Magpie Robin	*Copsychus saularis*	IV
24	Swallows	*Hirundo spp.*	IV
25	Purple Sunbird	*Nectarinia asiatica*	IV
26	Tree Pie	*Dendrocitta vagabunda*	IV
27	Shrikes	*Lanius spp*	IV
28	Partridge	*Francolinus spp.*	IV
29	Black Winged Kite	*Elanus caeruleus*	IV
30	Small Indian Cormorant	*Phalacrocorax niger*	IV

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

(R.K. Mishra)
Chief Gupdt (Em Engg)

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES KANG

Sl.No.	Local Name	Hindi Name	Scientific Name
66.	Pasu	Karla	*Cleisanthus collinus*
67.	Palandu	Madhulat	*Combretum decandrum*
68.	Pota	Mainphal	*Randia dumetorum*
69.	Potaporia	Murarphal	*Helicteres isora*
70.	Paripan	Detranga	*Ehretia laevis*
71.	Ritha	Ritha	*Sapindus mukorossi*
72.	Rola	Harra	*Terminalia chebula*
73.	Ruta	Panjan	*Dalbergia paniculata*
74.	Saiya	Chorant	*Heteropogon contortus*
75.	Saprum	Harshringar	*Nyctanthes arbortristis*
76.	Sarjom	Sal	*Shorea robusta*
77.	Sekri	Sidha	*Lagerstroemia parviflora*
78.	Sengel-sali	Bherul	*Chloroxylon swietenia*
79.		Charaigun	*Vitex peduncularis*
80.	Soso	Bhelwa	*Semecarpus anacardium*
81.	Tati	Apluda	*Apluda varia*
82.	Tele	Keonjhi	*Sterculia urens*
83.	Tila	Tilo	*Wendlandia exserta*
84.	Tarob	Pirar	*Buchanania latifolia*
85.	Toraj	Belongan	*Cordia macleodii*
86.	Uli	Aam	*Mangifera indica*
87.	Ulu	Galphuli	*Flemingia chappar*
88.		Ban Tulsi	*Ocimum americanum*
89.		Madar	*Calotropis spp.*
90.		Peepal	*Ficus religiosa*
91	-	Rend	*Ricinus communis*
92	-	Shialkanta	*Argemone mexicana*
93	-	Bharenda	*Jatropha spp.*
94	-	Behya	*Ipomea carnea*
95	-	Putus	*Lantana camara*
96	-	-	*Tridax procumbens*

List of Terrestrial Animals found in the Buffer Zone

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in which listed
Mammals			
1.	Common Mongoose	*Herpestres edwardsii*	IV
2.	Jackal	*Canis aureus*	II, V
3.	Indian Fox	*Vulpes bengalensis*	II
4.	Common house rat	*Rattus rattus*	V
5	Jungle Cat	*Felis chaus*	II
6	Wild Boar	*Sus scrofa*	III
7	Indian hare	*Lepus nigricollis*	IV
8	Indian Porcupine	*Hystrix indica*	IV
9	Indian Field Mouse	*Mus booduga*	V
10	Common Langur	*Presbytis entellus*	II
11	Squirrel	*Funambulus pennanti*	IV
12	Sloth Bear	*Melursus ursinus*	I
13	Elephant	*Elephas maximus indicus*	I
14	Barking Deer	*Muntiacus*	I

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
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RAKHA MINES JHARKHAND

Sl.No.	Local Name	Hindi Name	Scientific Name
16.	Chiru	Chero-ghas	*Imperata arundinecea*
17.	Dau	Barhar	*Artocarpus lakoocha*
18.	Edel	Semal	*Bombax malabaricum*
19.	Gara-hatna	Arjun	*Terminalia arjuna*
20.	Gara-hesel	Phansi	*Anogeissus latifolia*
21.	Gara jono	Phul-jharu	*Thysanolaena agrostis*
22.	Gara tiril	Makar kendu	*Diospyros embryopteris*
23.	Hemsabita	-	*Mitragyna parviflora*
24.	Hatana	Asan	*Terminalia tomentosa*
25.	Hari	Amaltas	*Cassia fistula*
26.	Hehel	Gaj	*Milletia auriculata*
27.	Hid	Piasal	*Pterocarpus marsupium*
28.	Hupu	Galgal	*Chochlospermum gossypium*
29.	Husi	Panrar	*Stereospermum suaveolens*
30.	Hutar	Jirhul	*Indigofera pulchella*
31.	Hutid	-	*Strobilanthes auriculatus*
32.	Huhri	Sinwar	*Vitex negundo*
33.	Icha	Dhoi	*Woodfordia fruticosa*
34.	Jojo	Imli	*Tamarindus indica*
35.	Jomlar	Mahulan	*Bauhinia vahlii*
36.	Koka	Kajhi	*Bridelia retusa*
37.	Kanthal	Kanthal	*Artocarpus heterophylla*
38.	Kaman	Karaunda	*Carissa spinarum*
39.	Kokar	Karkata	*Zizyphus xylopyra*
40.	Kasmar	Gamhar	*Gmelina arborea*
41.	Katangai	Toon	*Cedrela toona*
42.	Kend	Tendu	*Diospyros melanoxylon*
43.	Kiri	Sisoo	*Dalbergia sisoo*
44.	Kita	Khajur	*Phoenix acaulis*
45.	Koroj	Karanj	*Pongamia glabra*
46.	Kuda	Jamun	*Syzygium cumini*
47.	Kunba	Karam	*Adina cordifolia*
48.	Kula-marsal	Bhant	*Clerodendron infortunatum*
49.	Kundri – jamun	Arar	*Acacia pennata*
50.	Kaur	Kurchi	*Holarrhena antidyssentrica*
51.	Kunnmung	Chattim	*Alstonia scholaris*
52.	Kuti	Putri	*Croton oblongifolius*
53.	Lowa	Gular	*Ficus glomerata*
54.	Bel	Bel	*Aegele marmelos*
55.	Lupung	Bahera	*Terminalia belerica*
56.	Mudupum	Mahua	*Madhuca indica*
57.	Ber	Ber	*Zizyphus spp.*
58.	Matasura	Ampti	*Antidesma diandrum*
59.	Meral	Amla	*Embelica officinalis*
60.	Mur	Palas	*Butea spp.*
61.	Neem	Neem	*Azadirachta indica*
62.	Doka	Genjam	*Lannea grandis*
63.	Pandrai	Siris	*Albizzia lebbeck*
64.	Pandrai	Safed-siris	*A. procera*
65.	Papra	Papra	*Gardenia latifolia*

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFIC
RAKHA MINES KANC

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in Which Listed
Birds			
1	Pariah Kite	*Milvus migrans*	-
2	Common Crow	*Corvus splendens*	V
3	Jungle Crow	*C. marorhynchos*	IV
4	House Sparrow	*Passer domesticus*	-
5	Wagtail	*Motacilla spp.*	
6	Rose Ringed Parakeet	*Psittacula krameri*	IV
7	Common Mynah	*Acridotheres tristis*	IV
8	Pied Mynah	*Sturnus contra*	IV
9	Cattle Egret	*Bubulcus ibis*	IV
10	Pond Heron	*Ardeola grayii*	IV
11	Little Egret	*Egretta garzetta*	IV
12	Small Green Bee-eater	*Merops orientalis*	-
13	Drongo	*Dicrurus adsimilis*	IV
14	Crow Pheasant	*Centropus sinensis*	IV
15	Doves	*Streptopelia spp.*	IV
16	Indian Roller	*Coracias benghalensis*	IV
17	White Breasted Kingfisher	*Halcyon smymensis*	IV
18	Red Vent Bulbul	*Pycnonotus cafer*	IV
19	Koel	*Eudynamis scolopacea*	IV
20	Hoopoe	*Upupa epops*	IV
21	Tailor Bird	*Orthotomus sutorius*	IV
22	Magpie Robin	*Copsychus saularis*	IV
23	Swallows	*Hirundo spp.*	IV
24	Purple Sunbird	*Nectarinia asiatica*	IV
25	Tree Pie	*Dendrocitta vagabunda*	IV
26	Shrikes	*Lanius spp*	IV
27	Partridge	*Francolinus spp.*	IV
28	Black Winged Kite	*Elanus caeruleus*	IV
29	Small Indian Cormorant	*Phalacrocorax niger*	IV

List of Plants Found in the Buffer Zone

Sl.No.	Local Name	Hindi Name	Scientific Name
1.	Ashing	Dhaman	Grewia tiliaefolia
2.	Ain	Porho	*Ficus cumia*
3.	Ambo	Amra	*Spondias spp.*
4.	Asendo	Kumbhi	*Careya arborea*
5.	Atkir	Ramdatwan	*Smilax macrophylla*
6.	Bai	Barh	*Ficus bengalensis*
7.	Bandu	Maula	*Bufea parviflora*
8.	Baric	Kusum	*Schleichera trijuga*
9.	Barchon	Sabai	*Eulaliopsis binata*
10.	Baurakunda	Bhurkund	*Hymenodictyon excelsum*
11.	Bilagoinr	Pula	*Kydia calycina*
12.	Burja	Kachnar	*Bauhinia spp.*
13.	Burui	Dekamali	*Gardenia gummifera*
14.	Buru-mat	Bans	*Dendrocalamus strictus*
15.	Buru-salai	Salai	*Boswellia serrata*

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
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Sl. No.	Local Name	Hindi Name	Scientific Name
45.	Saiya	Chorant	*Heteropogon controtus*
46.	Saprum	Harshringar	*Nyctanthes arbotristis*
47.	Sarjom	Sal	*Shorea robusta*
48.	Sengel-sali	Bherul	*Chrooxylon swietenia*
49.	Saiya	Chorant	*Heteropogon controtus*
50.	Saprum	Harshringar	*Nyctanthes arbotristis*
51.	Sarjom	Sal	*Shorea robusta*
52.	Sekri	Sidha	*Lagerstroemia parviflora*
53.	Sengel-sali	Bherul	*Chrooxylon swietenia*
54.	Soso	Bhelwa	*Semecarpus anacardium*
55.	Tati	Apluda	*Apluda varia*
56.	Tila	Tilo	*Wendlandia exeserta*
57.	Toraj	Belongan	*Cordia macleodii*
58.	Uli	Aam	*Mangifera indica*
59.	Ulu	Galphuli	*Flemingia chappar*
60.	-	Ban Tulsi	*Ocimum americanum*
61.	-	Madar	*Calotropis spp.*
62.	-	Peepal	*Ficus religiosa*
63.	-	Rend	*Ricinus communis*
64.	-	Shialkanta	*Argemone mexicana*
65.	-	Bharenda	*Jatropha spp.*
66	-	Behya	*Ipomea carnea*
67	-	Putus	*Lantana camara*
68	-	-	*Tridax procumbens*

List of Terrestrial Animals found in the Core Zone

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in Which Listed
Mammals			
1.	Common Mongoose	*Herpestres edwardsii*	IV
2.	Jackal	*Canis aureus*	II
3.	Indian Fox	*Vulpes bengalensis*	II
4.	Common house rat	*Rattus rattus*	V
5.	Indian hare	*Lepus nigricollis*	IV
6.	Indian Porcupine	*Hystrix indica*	IV
7.	Indian Field Mouse	*Mus booduga*	V
8.	Squirrel	*Funambulus pennanti*	IV
9.	Sloth bear	Melursus ursinus	I
10.	Barking deer	-	I
Reptiles			
1.	Russel's Viper	*Vipera russelii*	II
2.	Cobra	*Naja naja*	II
3	Yellow Rat Snake	*Ptyas mucosus*	II
4	Common Skink	*Mabuya carinata*	
5	Garden Lizard	*Calotes versicolor*	
6	Indian Python	*Python morulus*	I

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Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFIC
RAKHA MINES RANG

List of Flora and Fauna found in study area of 10 km radius (Narawapahar Mine Expansion Project of UCIL)

List of Plants found in the Core Zone:

Sl. No.	Local Name	Hindi Name	Scientific Name
1.	Ain	Porho	*Ficus curnia*
2.	Ambo	Amra	*Spondias spp.*
3.	Atkir	Ramdatwan	*Smilax macrophylla*
4.	Bai	Barh	*Ficus bengalensis*
5.	Bandu	Maula	*Butea parviflora*
6.	Baric	Kusum	*Schleichera trijuga*
7.	Burja	Kachnar	*Bauhinia spp.*
8.	Buru-mat	Bans	*Dendrocalamus strictus*
9.	Buru-salai	Salai	*Boswellia serrata*
10.	Chiru	Chero-ghas	*Imperata arundinacea*
11.	Dau	Barhar	*Artocarpus lakoocha*
12.	Edel	Semal	*Bombax malabaricum*
13.	Gara-hatna	Arjun	*Terminalia arjuna*
14.	Gara jono	Phul-jharu	*Thysanolaena agrostis*
15.	Hatana	Asan	*Terminalia tomentosa*
16.	Hupu	Galgal	*Chochlospermum gossypium*
17.	Hutar	Jirhul	*Indigofera pulchella*
18.	Huhri	Sinwar	*Vitex negundo*
19.	Icha	Dhoi	*Woodfordia fruticosa*
20.	Jojo	Imli	*Tamarindus indica*
21.	Jomlar	Mahulan	*Bauhinia vahlii*
22.	Koka	Kajhi	*Bridelia retusa*
23.	Kanthal	Kanthal	*Artocarpus heterophylla*
24.	Kaman	Karaunda	*Carissa spinarum*
25.	Kokar	Karkata	*Zizyphus xylopyra*
26.	Kend	Tendu	*Diospyros melanoxylon*
27.	Kita	Khajur	*Phoenix acaulis*
28.	Koroj	Karanj	*Pongamia glabra*
29.	Kuda	Jamun	*Syzygium cumini*
30.	Kaur	Kurchi	*Holarrhena antidyssentrica*
31.	Lowa	Gular	*Ficus glomerata*
32.	Bel	Bel	*Aegele marmelos*
33.	Lupung	Baheda	*Terminalia belerica*
34.	Mudupum	Mahua	*Madhuca indica*
35.	Ber	Ber	*Zizyphus spp.*
36.	Meral	Amla	*Embelica officinalis*
37.	Mur	Palas	*Butea spp.*
38.	Neem	Neem	*Azadirachta indica*
39.	Pandrai	Siris	*Albizzia lebbeck*
40.	Pandrai	Safed-siris	*A. procera*
41.	Palandu	Madhuiat	*Combretum decandrum*
42.	Pota	Mainphal	*Randia dumetorum*
43.	Ritha	Ritha	*Sapindus mukorossi*
44.	Rola	Harra	*Terminalia chebula*

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES RANGE

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in which listed
Reptiles			
1.	Monitor Lizard	*Varanus spp.*	I
2.	Russel's Viper	*Vipera russelli*	II
3.	Cobra	*Naja naja*	II
4.	Yellow Rat Snake	*Ptyas mucosus*	II
5.	Indian Python	*Python reticulus*	I
6.	Common Skink	*Mabuya carinata*	
7.	Garden Lizard	*Calotes versicolor*	
Birds			
1	Pariah Kite	*Milvus migrans*	-
2	Common Crow	*Corvus splendens*	V
3	Jungle Crow	*C. marorhynchos*	IV
4	House Sparrow	*Passer domesticus*	-
5	Wagtail	*Motacilla spp.*	
6	Rose Ringed Parakeet	*Psittacula krameri*	IV
7	Common Mynah	*Acridotheres tristis*	IV
8	Pied Mynah	*Sturnus contra*	IV
9	Cattle Egret	*Bubulcus ibis*	IV
10	Pond Heron	*Ardeola grayii*	IV
11	Little Egret	*Egretta garzetta*	IV
12	Small Green Bee-eater	*Merops orientalis*	-
13	Drongo	*Dicrurus adsimilis*	IV
14	Crow Pheasant	*Centropus sinensis*	IV
15	Doves	*Streptopelia spp.*	IV
16	Indian Roller	*Coracias benghalensis*	IV
17	White Breasted Kingfisher	*Halcyon smyrnensis*	IV
18	Little Grebe	*Podiceps ruficollis*	IV
19	Red Vent Bulbul	*Pycnonotus cafer*	IV
20	Koel	*Eudynamis scolopacea*	IV
21	Hoopoe	*Upupa epops*	IV
22	Tailor Bird	*Orthotomus sutorius*	IV
23	Magpie Robin	*Copsychus saularis*	IV
24	Swallows	*Hirundo spp.*	IV
25	Purple Sunbird	*Nectarinia asiatica*	IV
26	Tree Pie	*Dendrocitta vagabunda*	IV
27	Shrikes	*Lanius spp*	IV
28	Partridge	*Francolinus spp.*	IV
29	Black Winged Kite	*Elanus caeruleus*	IV
30	Small Indian Cormorant	*Phalacrocorax niger*	IV

Divisional Forest Officer
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(R.K. Mishra)
Chief Supdt. (Env. Engg.)
URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES RANGE

Sl.No.	Local Name	Hindi Name	Scientific Name
66.	Pasu	Karla	*Cleissanthus collinus*
67.	Palandu	Madhulat	*Combretum decandrum*
68.	Pota	Mainphal	*Randia dumetorum*
69.	Potaporla	Murarphal	*Helicteres isora*
70.	Paripan	Detranga	*Ehretia laevis*
71.	Ritha	Ritha	*Sapindus mukorossi*
72.	Rola	Harra	*Terminalia chebula*
73.	Ruta	Panjan	*Dugenia dalbergioides*
74.	Saiya	Chorant	*Heteropogon controtus*
75.	Saprum	Harshringar	*Nyctanthes arbotristis*
76.	Sarjom	Sal	*Shorea robusta*
77.	Sekri	Sidha	*Lagerstroemia parviflora*
78.	Sengel-sali	Bherul	*Chloroxylon swietenia*
79.		Charaiguri	*Vitex peduncularis*
80.	Soso	Bhelwa	*Semecarpus anacardium*
81.	Tati	Apluda	*Apluda varia*
82.	Tele	Keonjhi	*Sterculia urens*
83.	Tila	Tilo	*Wendlandia exserta*
84.	Tarob	Pirar	*Buchanania latifolia*
85.	Toraj	Belongan	*Cordia macleodii*
86.	Uli	Aam	*Mangifera indica*
87.	Ulu	Galphuli	*Flemingia chappar*
88.		Ban Tulsi	*Ocimum americanum*
89.		Madar	*Calotropis spp.*
90.		Peepal	*Ficus religiosa*
91	-	Rend	*Ricinus communis*
92	-	Shialkanta	*Argemone mexicana*
93	-	Bharenda	*Jatropha spp.*
94	-	Behya	*Ipomea carnea*
95	-	Putus	*Lantana camara*
96	-	-	*Tridax procumbens*

List of Terrestrial Animals found in the Buffer Zone

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in which listed
Mammals			
1.	Common Mongoose	*Herpestres edwardsii*	IV
2.	Jackal	*Canis aureus*	II, V
3.	Indian Fox	*Vulpes bengalensis*	II
4.	Common house rat	*Rattus rattus*	V
5	Jungle Cat	*Folis chaus*	II
6	Wild Boar	*Sus scrofa*	III
7	Indian hare	*Lepus nigricollis*	IV
8	Indian Porcupine	*Hystrix indica*	IV
9	Indian Field Mouse	*Mus booduga*	V
10	Common Langur	*Presbytis entellus*	II
11	Squirrel	*Funambulus pennanti*	IV
12	Sloth Bear	*Melursus ursinus*	I
13	Elephant	*Elephas maximus indicus*	I
14	Barking Deer	*Muntiacus*	I

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E). JHARKHAND

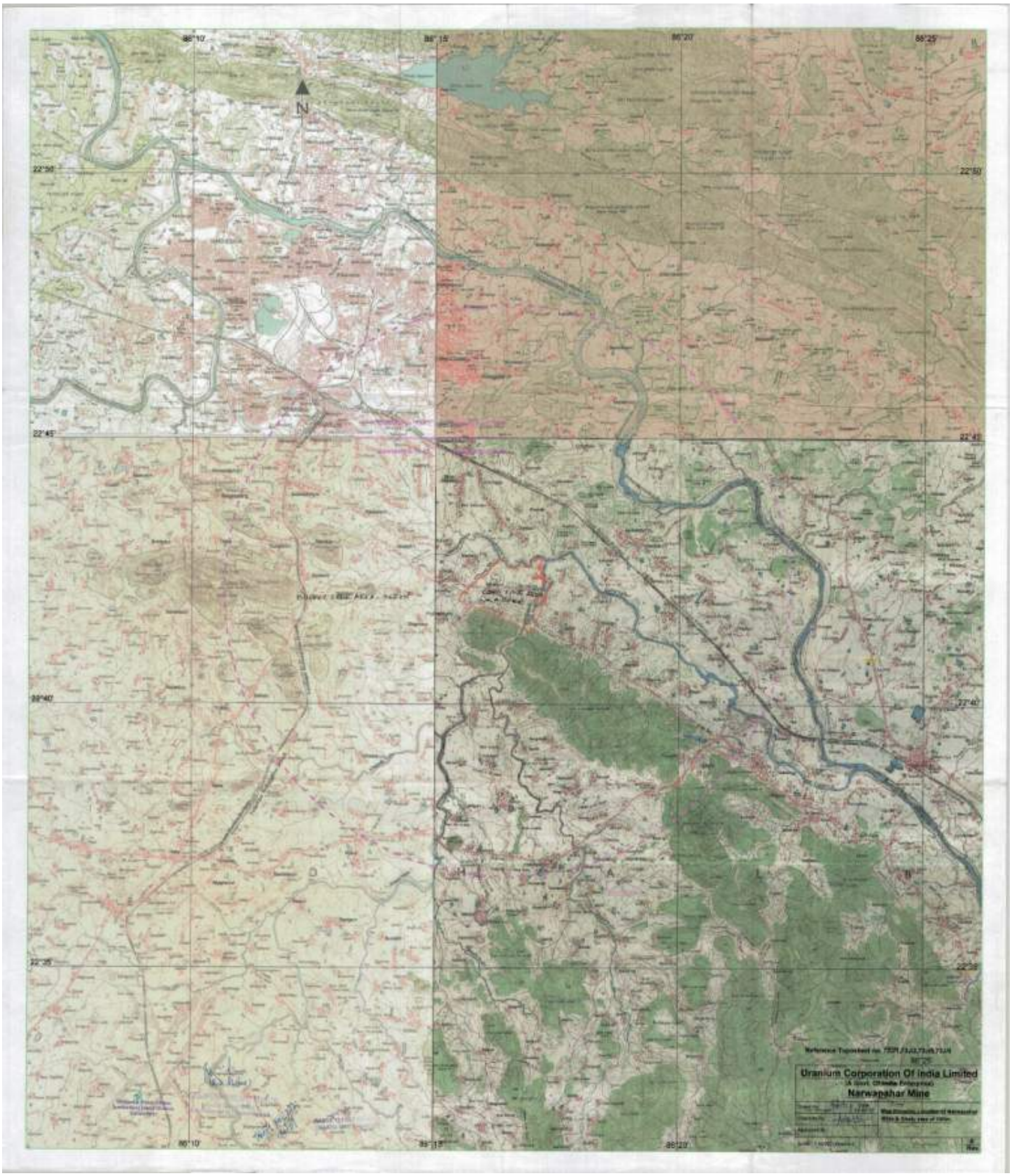
RANGE FOREST OFFICER
RAKHA MINES RANGE

Sl.No.	Local Name	Hindi Name	Scientific Name
16.	Chiru	Chero-ghas	*Imperata arundinacea*
17.	Dau	Barhar	*Artocarpus lakoocha*
18.	Edel	Semal	*Bombax malabaricum*
19.	Gara-hatna	Arjun	*Terminalia arjuna*
20.	Gara-hesel	Phansi	*Anogeissus latifolia*
21.	Gara jono	Phul-jharu	*Thysanolaena agrostis*
22.	Gara tiril	Makar kendu	*Diospyros embryopteris*
23.	Hemsabita	-	*Mitragyna parviflora*
24.	Hatana	Asan	*Terminalia tomentosa*
25.	Hari	Amaltas	*Cassia fistula*
26.	Hehel	Gaj	*Milletia auriculata*
27.	Hid	Piasal	*Pterocarpus marsupium*
28.	Hupu	Galgal	*Chochlospermum gossypium*
29.	Husi	Panrar	*Stereospermum suaveolens*
30.	Hutar	Jirhul	*Indigofera pulcheila*
31.	Hutid	-	*Strobilanthes auriculatus*
32.	Huhri	Sinwar	*Vitex negundo*
33.	Icha	Dhoi	*Woodfordia fruticosa*
34.	Jojo	Imli	*Tamarindus indica*
35.	Jomlar	Mahulan	*Bauhinia vahlii*
36.	Koka	Kajhi	*Bridelia retusa*
37.	Kanthal	Kanthal	*Artocarpus heterophylla*
38.	Kaman	Karaunda	*Carissa spinarum*
39.	Kokar	Karkata	*Zizyphus xylopyra*
40.	Kasmar	Gamhar	*Gmelina arborea*
41.	Katangai	Toon	*Cedrela toona*
42.	Kend	Tendu	*Diospyros melanoxylon*
43.	Kiri	Sisoo	*Dalbergia sisoo*
44.	Kita	Khajur	*Phoenix acaulis*
45.	Koroj	Karanj	*Pongamia glabra*
46.	Kuda	Jamun	*Syzygium cumini*
47.	Kunba	Karam	*Adina cordifolia*
48.	Kula-marsal	Bhant	*Clerodendron infortunatum*
49.	Kundri – jamun	Arar	*Acacia pennata*
50.	Kaur	Kurchi	*Holarrhena antidyssentrica*
51.	Kunnmung	Chattim	*Alstonia scholaris*
52.	Kuti	Putri	*Croton oblongifolius*
53.	Lowa	Gular	*Ficus glomerata*
54.	Bel	Bel	*Aegele marmelos*
55.	Lupung	Bahera	*Terminalia belerica*
56.	Mudupum	Mahua	*Madhuca indica*
57.	Ber	Ber	*Zizyphus spp.*
58.	Matasura	Ampti	*Antidesma diandrum*
59.	Meral	Amla	*Embelica officinalis*
60.	Mur	Palas	*Butea spp.*
61.	Neem	Neem	*Azadirachta indica*
62.	Doka	Genjam	*Lannea grandis*
63.	Pandrai	Siris	*Albizzia lebbeck*
64.	Pandrai	Safed-siris	*A. procera*
65.	Papra	Papra	*Gardenia latifolia*

Divisional Forest Officer
Jamshedpur Forest Division
Jamshedpur

URANIUM CORPORATION OF INDIA LTD.
NARWAPAHAR MINES
SINGHBHUM (E), JHARKHAND

RANGE FOREST OFFICER
RAKHA MINES RANGE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Uranium Corporation Of India Limited
Narwapahar Mine

MEMBER SECRETARY

केन्द्रीय भूमि जल प्राधिकरण
जल संसाधन, नदी विकास एवं
गंगा संरक्षण मंत्रालय
भारत सरकार

Central Ground Water Authority
Ministry of Water Resources
River Development & Ganga Rejuvenation
Government of India

File No: - 21-4/215/JH/MIN/2017 - 2070

NOC No: - CGWA/NOC/MIN/ORIG/2017/2892

Date:- 21 DEC 2017

To

M/s Uranium Corporation of India Limited
Narwapahar Mines, Block Potka,
District East Singhbum, Jharkhand – 832111

Sub:- NOC for ground water withdrawal to M/s Uranium Corporation of India Limited in respect of their existing Strategic Mineral Ores Mines project located at Narwapahar Mines, Village Hartopa, Block Potka, District East Singhbum, Jharkhand – reg.

Refer to your application on the above cited subject. Based on recommendations of Regional Director, Central Ground Water Board, Mid Eastern Region, Patna vide their recommendations dated 01/09/2017 and further deliberations on the subject, the NOC of Central Ground Water Authority is hereby accorded to M/s Uranium Corporation of India Limited in respect of their existing Strategic Mineral Ores Mines project located at Narwapahar Mines, Village Hartopa, Block Potka, District East Singhbum, Jharkhand. The NOC is, however subject to the following conditions:-

1. The firm may abstract 115 cu.m/day (not exceeding 41,975 cu.m/year) of ground water and 1,700 cu.m/day (not exceeding 5, 10,000 cu.m/year) through dewatering the mine seepage on account of mining intersecting the water table. The total withdrawal should not exceed 1,815 cu.m/day (not exceeding 5, 51,975 cu.m/year). No additional dewatering and no additional ground water abstraction structures to be constructed for this purpose without prior approval of the CGWA. The dewatered quantum of groundwater is to be put to gainful use as proposed. Any unexpected variation in inflow of ground water into mine pit should be reported to the concerned Regional Director CGWB.
2. The well as well as dewatering structure shall be fitted with water meter by the firm at its own cost and monitoring of ground water abstraction shall be under taken accordingly on regular basis, at least once in a month.
3. M/s Uranium Corporation Of India Limited, in consultation with the Regional Director, Central Ground Water Board, Mid Eastern Region, Patna may implement ground water recharge measures to the tune of 4,572 cu.m/year as proposed for augmenting the ground water resources of the area within six months from the date of issue of this letter. Firm shall also undertake periodic maintenance of recharge structures at its own cost.
4. The photographs of the recharge structures after completion of the same are to be furnished immediately to the Regional Director, Central Ground Water Board, Mid Eastern Region, Patna for verification and under intimation to this office.

5. The firm at its own cost shall install two (2) piezometers fitted with digital water level recorder having telemetry systems at suitable locations.
6. The firm must monitor the ambient ground water levels for both core and buffer zone by establishing key wells on monthly basis. The ground water quality shall be monitored twice in a year during pre- monsoon and post- monsoon periods.
7. The ground water monitoring data in respect of S. No. 2, 5 & 6 shall be submitted to Central Ground Water Board, Mid Eastern Region, Patna on regular basis at least once in a year.
8. The firm shall ensure proper recycling and reuse of waste water after adequate treatment.
9. Action taken report in respect of S. No. 1 to 8 shall be submitted to CGWA within one year period.
10. The permission is liable to be cancelled in case of non-compliance of any of the conditions as mentioned in S. No. 1 to 9.
11. This NOC is subject to prevailing Central/State Government rules/laws or Court orders related to construction of tubewell/ ground water withdrawal/ construction of recharge or conservation structures/ discharge of effluents or any such matter as applicable.
12. This NOC does not absolve the applicant / proponent of his obligation / requirement to obtain other statutory and administrative clearances from other statutory and administrative authorities.
13. The firm shall report self compliance online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.
14. The NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and be taking decisions independently of the NOC.
15. This NOC is valid from 08/12/2017 till 07/12/2019.

Member Secretary

Copy to:

1. The Member Secretary, Jharkhand State Pollution Control Board, T.A. Division Building (Ground Floor) HEC Campus, Dhurwa, Ranchi-834004, Jharkhand with **a request to ensure that the conditions mentioned in the NOC are complied by the firm in consultation with District Magistrate, District East Singhbum, Jharkhand**
2. The District Magistrate, District East Singhbum, Jharkhand for necessary action.
3. The Regional Director, Central Ground Water Board, Mid Eastern Region, Patna. This has reference to your recommendation dated 01/09/2017.
4. TS to the Chairman, Central Ground Water Authority, Shram Shakti Bhawan, Rafi Marg, New Delhi.
5. Guard File 2017-18.

Member Secretary

NARWAPAHAR MINES

District-East Singhbhum, Jharkhand

SITE SPECIFIC

WILDLIFE MANAGEMENT AND CONSERVATION PLAN

Project Proponent

Uranium Corporation of India Ltd.
(A Government of India Enterprise)
An ISO 9001:2008, ISO 14001:2004
& IS 18001:2007 Company
P.O.- Jaduguda Mines, Dist.- East Singhbhum,
JHARKHAND – 832102

Environmental Consultant

MECON LIMITED
(A Govt. of India Enterprise)
Vivekananda Path
PO. Doranda
Dist – Ranchi,
Jharkhand – 834002
CERTIFICATE NO: NABET/EIA/1619/RA 0068

NARWAPAHAR MINES

District-East Singhbhum, Jharkhand

SITE SPECIFIC

WILDLIFE MANAGEMENT AND CONSERVATION PLAN

No. MEC / 11 / S2 / Q7F9 / FR / 2445 / R-0 **November, 2017**

Project Proponent

Uranium Corporation of India Ltd.
(A Government of India Enterprise)
An ISO 9001:2008, ISO 14001:2004
& IS 18001:2007 Company
P.O.- Jaduguda Mines, Dist.- East Singhbhum,
JHARKHAND – 832102

Environmental Consultant
MECON LIMITED
(A Govt. of India Enterprise)
Vivekananda Path
PO. Doranda
Dist – Ranchi,
Jharkhand – 834002
CERTIFICATE NO: NABET/EIA/1619/RA 0068

CONTENTS

1.0 INTRODUCTION

1.1 GENERAL

Uranium Corporation of India Limited (UCIL), a public sector undertaking under Department of Atomic Energy, Government of India, is the sole producer of uranium ore in the country. At present UCIL operates seven mines (Jaduguda, Bhatin, Narwapahar, Bagjata, Turamdih, and Mohuldih & Banduhurang) in the Singhbhum Thrust Belt in Jharkhand and at Tummalapalle in Y.S.R. District of Andhra Pradesh. It operates ore processing plants at Jaduguda and Turamdih in Jharkhand and at Tummalapalle in Andhra Pradesh. Ore from Jaduguda, Bhatin, Bagjata and Narwapahar Mines is processed at Jaduguda while Turamdih Plant processes ore from Turamdih, Mohuldih & Banduhurang Mines. Ore from Tummalapalle Mine is processed at the ore processing plant located within the mine lease.

UCIL has undertaken a programme to increase its production capacity of the existing mines, including Narwapahar, and by setting new facilities.

Narwapahar Mine Lease is spread over 456.62 ha of which 199.57 ha is under village Hartopa, 196.54 ha is under village Murgaghutu, 34.05 ha is under village Rajdohaand26.46 ha is under village Patharchakri. The leasehold area consists of forest land (25.56 ha), non-forest government land (128.21 ha) and private land (302.85 ha). The mine is an underground mine and is operating since April, 1995. It is envisaged to increase in uranium ore production from existing level of 0.30 Mt/yr to 0.45 Mt/yr without leasing or acquiring any additional land.

The uranium ore mined at Narwapahar is trucked to UCIL's Ore processing plant at Jaduguda which is located at an aerial distance of about 9 km towards the south-east. The uranium present in the ore is extracted as Uranium Peroxide by a complex hydro-metallurgical process. The Uranium Peroxide is dispatched to Nuclear Fuel Complex, Hyderabad for further processing. The coarse tailing generated during the beneficiation process is used in underground mines for stowing. The fine tailings are dumped in engineered tailings ponds located nearby.

UCIL commissioned M/s MECON Limited, a Govt. of India Enterprise under the Ministry of Steel, for carrying out environmental baseline data generation and preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) report for the proposed increase in production from Narwapahar Uranium Mine.

1.2 NEED OF THE PROJECT

India has embarked on an ambitious programme to increase electricity generation from nuclear reactors as one of the strategies towards reduction on its dependency on fossil fuels as a source of energy. Additional quantity of Uranium is required for enhancing nuclear power generation capacity from the present capacity of 4560 MWe to 20,000 MWe by the year 2020 by the end of XI Plan period. It is necessary to continue to extract ore from the existing Jaduguda Mine and Jaduguda Ore Processing Plant to ensure the continued supply of nuclear fuel from indigenous sources.

1.3 THE PRESENT STUDY

The Expert Appraisal Committee (EAC) of Ministry of Environment, Forests & Climate Change, Govt. of India (MoEFCC) has recommended that the proposed expansion project be granted Environment Clearance vide the "Summary Records of the Sixteenth meeting of the Reconstituted Expert Appraisal Committee for Environmental Appraisal of Mining Projects (Non-Coal) of the Ministry of Environment, Forest and Climate Change was held during March 20-21, 2017" "*Subject to submission of Conservation Plan to Chief Wildlife Warden of the State in respect of authenticated list of flora-fauna and schedule-1 species along with map and submission of clearance from CGWA for intersection of Groundwater table*".

UCIL commissioned MECON Limited, a Public Sector Undertaking under the Ministry of Steel, Govt. of India to prepare the Site Specific Wildlife Management and Conservation Plan" in respect of Narwapahar Mine.

The present report includes a study on occurrence of endangered fauna in the study area (comprising of 10 km zone around the mine lease from the lease periphery) and measures for conservation and management of wildlife.

The report covers:

- A brief description of the tract dealt with, covering the mine's location, local geology, climate, soil characteristics, description of the types of forest occurring in the area, flora and fauna found in the area, demography, agricultural situation and other industries located in the area.
- A description of the mine, the mining process to be followed and resource requirements for the mine.

- A study on the habitat utilization by Schedule – I animals in the area.
- A brief description of the threats to wildlife in the region.
- Wildlife Management Plan.
- A broad estimate of the cost of wildlife management

1.4 ACKNOWLEDGEMENT

MECON Limited wishes to place on record its deep appreciation for the trust reposed in MECON by UCIL and for the active interest and help extended by concerned UCIL officials. Cooperation extended to MECON by the officials of State Forest department is also acknowledged.

2.0 TRACT DEALT WITH

2.1 MINE LOCATION

Narwapahar uranium deposit is located in Dhalbhum subdivision of East Singhbhum district in Jharkhand State. The mine lease lies at an aerial distance of about 9.50 km south-east of Tatanagar railway station on Howrah-Mumbai line. The deposit is covered under Survey of India toposheet no. F45I6 (old toposheet no. 73 J/6) bounded between latitudes 22°41'46"N to 22°42'45"N and longitudes 86°15'52"E to 86°17'23"E. The location of Narwapahar mine is shown in **Fig. 2.1.**

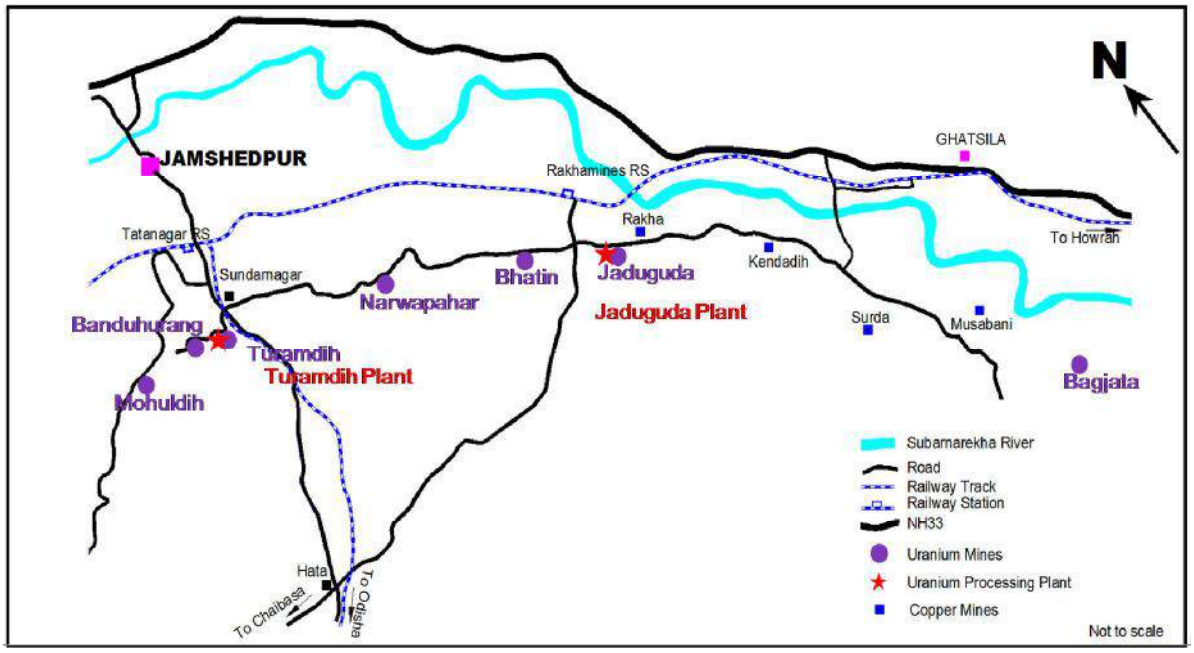

Figure 2.1: Location and Accessibility Map of Narwapahar Uranium Mine

The Lease hold can be approached from the city of Jamshedpur (Tatanagar) by the Tatanagar – Mosabani Road. National Highway NH-33 runs from northwest to southeast at an aerial distance of ~10.4 km from the mine. South Eastern Railway's main Howrah – Nagpur broad gauge line passes through the region. The nearest railway station is Asanboni (~4.3 km east), but the nearest approachable railway station is Tatanagar Junction. The road distance from Tatanagar station to Jaduguda is about 14 km.

The Google Erath Image of Narwapahar area is shown in **Fig. 2.2.**

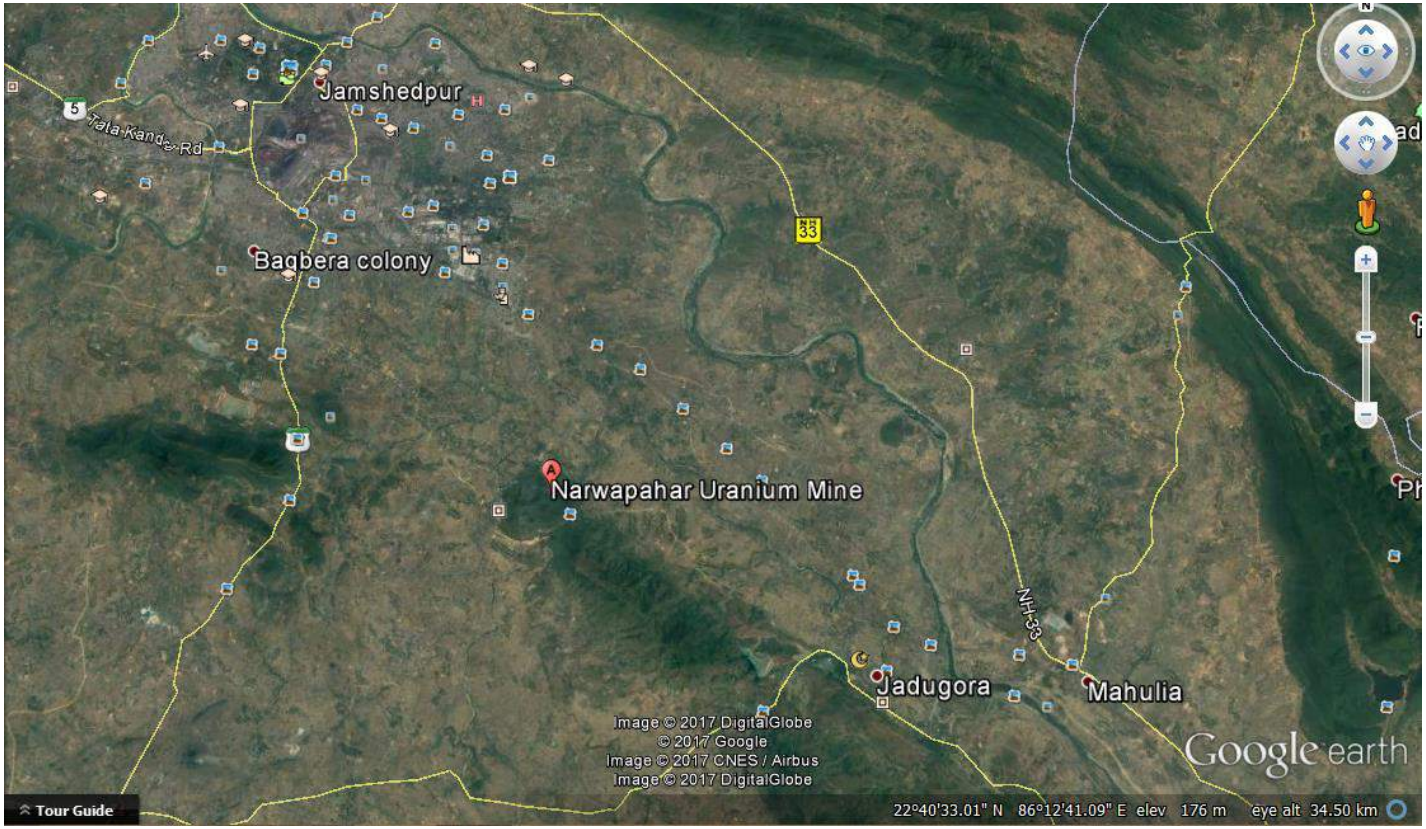

Fig. 2.2: Google Earth Image of Narwapahar Area

There is no national park, biosphere reserve, sanctuary, habitat for migratory birds, archeological site, defense installation and airports within the study area. The area is located in Seismic Zone II and is not landslide prone.

2.2 PHYSIOGRAPHY AND DRAINAGE

The area under study is situated in Singhbhum shear zone, which is characterized by gentle to moderately steep or steep slopes.

The leasehold area is situated at the bottom of series of hills on southern side. Ground level within leasehold area slopes from southern side towards northern periphery of the lease area. Most of the lease area lies at altitude between 120 m AMSL and 150 m AMSL. On the southern side of the lease area there is a steep hill (Narwapahar) rising to 327 m AMSL. The leasehold area is surrounded by three water channels from three sides. The area is bounded by Gara Nala passes through lease area on the eastern side, Laubhanga Nala along northern side, a small Harkarjuriya nala on the western side and hill & villages on the southern side.

Most of the study area is plain or gently undulating with scattered hillocks. In the south eastern part of the study area there is a steep escarpment, Ranga pahar, which rises to 560 m AMSL. This escarpment originates from the southern part of the lease area and runs in the NW ï SE axis. This escarpment is covered with Sal forests. The west central part of the study area is marked with three numbers of prominent ridges with E-W to NW-SE trend at Talsa Pahar, Nandup and Banduhurang. The highest level of the ridge has been recorded at 350 m AMSL with steep slopes along northern and southern flanks.

The elevations of the area vary from 120 m to 150 m above mean sea level. The land area is mainly covered by thick soil cover and the rocks are mica schist.

The area is bounded by hill on the southern side, Gara River passes through lease area on the eastern side, Laubhanga Nala along northern side and a small Harkarjuriya nallah on the western side. The perennial Gara nala flows through the lease, close to its eastern boundary, whereas the Harkarjuriya nala flows along the leaseôs western boundary. Both these streams flow towards the north-east. The Harkarjuriya nala, which dries up during summer, drains into the perennial Laubhanga Nala which flows towards the east to join the Gara Nala. After meeting the Laubhanga Nala, the Gara Nala joins the Subarnarekha River about 5 km east-south-east of the lease area.

The study area is drained by the Subarnarekha River, which is a major perennial river draining major part of Jharkhand and small portions of southern West Bengal and northern Odisha before flowing into the Bay of Bengal. Major part of the area has dendritic drainage pattern comprising of a network of small seasonal and perennial

streams which drain into the Subranarekha River. The general groundwater tables of the lease hold area on the basis of bore hole data has been estimated at 114 mRL (6 ï 8 m bgl).

The area does not fall in seismically active or land slide prone zone. There is no national park, biosphere reserve and sanctuary, habitat for migratory birds, archeological site, defense installation or airports within 10 km of the periphery of core / buffer zone. Dalma wildlife Sanctuary is located at a distance of more than 20 km on northwest side. The area forms the part of Singhbhum Elephant Reserve, however, no elephant has been reported in the study area of mine lease.

2.3 CLIMATE

The study area lies in tropical region where climate is characterised by very hot summers and cool winters.

The nearest observatory of India Meteorological Department (IMD) is at Kadma Colony in Jamshedpur, about 15 km away.

Summer is typically from mid March to mid June when temperature ranges from a maximum of 40.1°C during day time to a minimum of 18.6°C at night. Winter is from December to February when the maximum temperature during day goes up to 29.4°C and minimum temperature at night becomes 11.6°C. The average annual rainfall is 1321 mm. The South-west monsoon lasts from mid June to mid September and the area gets more than 80% of the annual rainfall during this period.

2.4 GEOLOGY

2.4.1 Regional Geology

In South-east Singhbhum, the Iron ore series of rocks consisting of sand ï stone conglomerates, limestones, shales, phyllites, mica ï schist, banded- hematite-quartzites, lavas and agglomerates, have been folded and over thrust. Localisation of economic minerals of copper and Uranium are found along this overthrust and shear zone known as the Singhbhum Shear zone, also known as the Singhbhum thrust belt, or the Singhbhum Copper belts. The thrust belt proper starts from Duarpuram ($22^{o}46'$N; $85^{o}34'$ E) NE of Chakradharpur, and continues through Kharswan, Sini, Turamdih, Narwapahar, Bhatin, Jaduguda, Rakha Mines, Roam, Siddheswar, Kendadih, Surda, Mosabani and Badia. Further south, it dies out on the surface near Singhpura. This zone of shearing along which copper, Uranium and apatite are found, is like an arc indisposition and is about 100 miles long. The various localities in this belt are easily accessible, as the railway line from Kolkata to Mumbai connects most of these places.

The rock types exposed in this region are said to belong to the Iron Ore Series and consist of the following stages and rock types, in order of their relative ages

- Dalma lavas phyllites and agglomerates.
- Dhanjori stage, consisting of conglomerates and quartzites.
- Iron ore stage, consisting of banded-hematite-quartzites, phyllites with tuffs, lavas, limestones, conglomerates and quartzites.
- Chaibasa stage consisting of sandstone- conglomerates, limestones, shales, phyllites and mica ï schists.

The several stages mentioned are not very sharply defined and grade into the one above or below.

The rocks of the iron ore series have been strongly folded and highly metamorphosed. Every grade of metamorphism is represented by the rocks of this area. The Principal tectonic movements were from north to south and the beds were folded into well-defined anticlines and synclines. There are also isoclinal folds, within broader folds, with over-folding towards the south. South of the main fold, tectonic movements were less intense and the changes in the rock types were not so pronounced as to the north of it. The constant tectonic movement towards the south, culminated in a major zone of overthrust. The rocks to the north of this thrust were completely metamorphosed and thrust bodily against the less metamorphosed rocks to the south of the zone. The zone of overthrusting was completely sheared. This is the zone of sheared rocks along which copper and uranium mineralisations have taken place and is referred to as the Singhbhum thrust Belt or Singhbhum copper belt.

2.4.2 Local Geology

The mineralisations thrust zone in Narwapahar is believed to be between Chaibasa stage of rocks (Mica schist and phyllites) and phyllites of Iron Ore stage. There is very little lithological difference between the rocks of the two stages in this area. This lithological similarity of the rocks makes their division into the different stages difficult. Along with mineralisations the rocks have been chloritised and biotitised and this zone of biotitised and chloritised rocks in Narwapahar is very wide. This indicated that the zone of shearing is comparatively wider in Narwapahar than further east along the shear zone.

The rock types in Narwapahar are essentially chlorite and Biotite Schists but in most places chlorite predominates. There is sericite, apatite and magnetite in addition to uranite and pitchblende in the mineralized zone. The foliation strike of the rocks is generally NW-SE with the following dip to the N.E. The Narwapahar hill proper is made of Dhanjori quartzite and zone of thrusting is along the northern foot hill represented by chlorite and Biotite Schists.

The main regional structural feature is the major over-fold, the axial plane of which is parallel to the foliation strike of the rocks. The axial plane shears along which the mineralisation has taken place are also parallel to the foliation strike of the rocks. Apart from this there are certain cross ï folds, whose axial planes are almost at right angles to the regional strike of the rocks. These superposed folds or cross-folds are probably subsequent to the mineralisations. A few transverse and strike faults have also been met with in the area.

2.4.3 Nature of Mineralisation

Mineralisations in the thrust belt have been broadly, in two phases. An earlier phase, a right temperature oxide phase, consists of apatite, magnetite, illmenite and uranite. The later phase, a lower-temperature sulphide- phase, consists of sulphide minerals proper. Uranium in the form of uranite and pitchblende is associated with the higher temperature oxide ï phase. The mineralizing fluids have been localized by the axial-plane shears and thickened up by the crossfolds and confined to the zone of shearing. Usually along the thrust belt uranite showings are to the hang-wall side of the copper showing.

2.5 LAND USE PATTERN

The land use in the lease area is given in **Table 2.2**.

Table 2.2: Landuse Pattern of Lease area

Land Use	Pre-Mining (ha)	Existing (ha)
Agricultural Land	278.77 (61.05%)	154.47 (33.83%)
Forest Land*	25.56 (5.60%)	25.56 (5.60%)
Roads	5.76 (1.26%)	5.76 (1.26%)
Water Bodies	22.90 (5.02%)	22.90 (5.02%)
Barren land	99.54 (21.80%)	61.25 (13.41%)
Waste Dumps	-	2.14 (0.47%)
Plantations	-	80.0 (17.52%)
Settlements	24.09 (5.27%)	59.55 (13.04%)
Vacant areas within acquired land	-	37.36 (8.18%)
Mining infrastructure	-	7.63 (1.67%)
Total	456.62 (100%)	456.62 (100%)
		** Diverted but not used.*

Under the expansion programme, no change in land use within the lease area is envisaged.

Existing land use in the study area has been studied through satellite image processing (RESOURCESAT LISS III) with satellite data of 23.5 m resolution. Existing land use in the study area is shown in **Table 2.3**.

Table 2.3: Approximate land use in Study Area

Land use category	Area (ha)	Percentage
1. Built up area		
• Rural	500.563	1.36
• Urban	2997.66	8.16
2. Agricultural land		
• Crop land	9688.993	26.39
• Plantations	101.509	0.27
• Fallow Land	8778.694	23.91
3. Forest land		
• Dense forest	1200.696	3.27
• Open forest	3503.858	9.54
• Scrub forest	8591.824	23.40
4. Waste land		
• Barren Land / Stony wastes	340.437	0.93
• Dry river beds	260.794	0.71
5. Surface water bodies		
• Rivers	724.017	1.97
• Tanks	31.201	0.08

The table shows that agricultural land is the predominant land use covering 50.57 % of the study area. Forests cover 36.21 % of the study area, settlements cover 9.52% of the study area, waste lands cover 1.64 % of the study area and surface water bodies cover 2.05 % of the study area. The land use pattern of the study area is illustrated in **Fig. 2.3.**

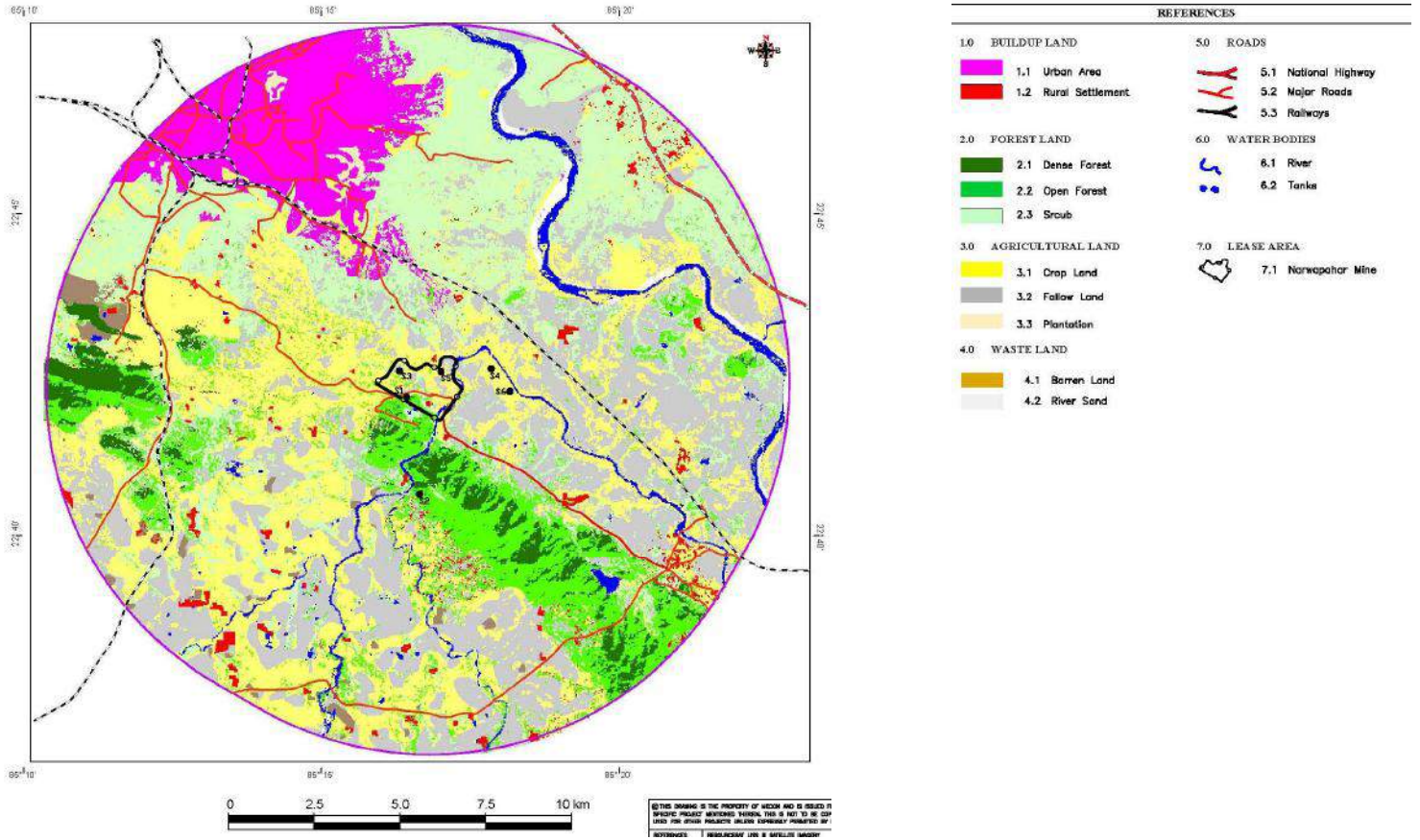

Figure 2.3: Land Cover Pattern Within 10km Radius of Lease Boundary

2.6 SOIL TYPES

The soil of the project area is ñRed Loamy Soilò {Ref. District Planning Map, Purbi Singhbhum prepared by National Atlas and Thematic Mapping Organisation (NATMO)}. About 3 km SW and 4.5 km NE of Jaduguda area, the soils are ñRed Sandyò About 10 km SW of Jaduguda, the soils are ñRed and Yellow Soilò

2.7 DESCRIPTION OF THE FOREST

The study area lies in the Eastern Highlands sub-zone of the Eastern Plateau and Hills agro-climatic zone. Most of the area is rural and is covered with forests, villages and a few uranium-ore and copper-ore mines.

2.7.1 Survey Methodology

A preliminary survey of the study area has been performed to get a general picture of the landscapes in vegetation. Traverses have been taken within different zone of the study area to note major vegetation patterns and plant communities including their growth form and dominant species. Square shaped quadrats of 0.1 ha size were selected based on the representation of plant species and number in it. Faunal survey was based on the data of forest department. Publications referred for completing this study were of Jharkhand State Forest Department, A Revised Survey of the Forest Types of India; by H. G. Champion & S. K. Seth, The Book of Indian Birds; by Salim Ali and The Book on Indian Animals; by S. H. Prater, etc.

2.7.2 Flora and Fauna Distribution

The study area comprises agricultural, waste land, industrial and residential areas. There is a large area for agricultural land across the study site. Rice is the main staple food of the district. Vegetables are also cultivated in some parts of the area. Paddy, fruits and vegetables, cattle rearing, poultry etc. are the natural way of living.

Topography of the area

Terrain of the study area is marked with hillocks of <600 m high, valleys and plains, complemented with characteristic forest type. The southeastern, southern and western portion of the study area contains hillocks supporting forest of different stages. Eastern, northern, north-west and some portion of western side of the study area is devoid of natural forest and predominantly occupied with fallow land, open scrub and rural settlements. The undulating topography and presence of impervious hard rock, controls the soil depth and soil moisture profile of the study area which has obvious variations from place to place, hence the forest type.

The buffer zone consists of agricultural land, barren / fallow land, stony waste land, plantations (primarily of Eucalyptus and Australian Acacia), rural and urban settlements, forest land, small ponds / ditches and a large perennial river (Subarnarekha).

Because of lack of irrigation facilities, most of the agricultural land remains fallow during December to June. Agricultural land adjacent to streams is used during non-monsoon

periods also. Rice is the major crop. Vegetables and pulses are cultivated during non-monsoon periods.

Core Zone Flora

The Mine Lease area comprises of settlements (Narwapahar Colony, Hartopa, Murgaghutu, Rajdoha & Patharchakri villages), Forests, agricultural lands and fallow lands. The forests are located on the hills. The forests are classified as ñNorthern Tropical Dry Deciduous Forestò The list of plants found in the Core Zone is given in **Table 2.4**.

Table 2.4: List of Flora in Core zone area

Sl. No.	Local Name	Hindi Name	Scientific Name
1.	Ain	Porho	*Ficus cumia*
2.	Ambo	Amra	*Spondias spp.*
3.	Atkir	Ramdatwan	*Smilax macrophylla*
4.	Bai	Barh	*Ficus bengalensis*
5.	Bandu	Maula	*Butea parviflora*
6.	Baric	Kusum	*Schleichera trijuga*
7.	Burja	Kachnar	*Bauhinia spp.*
8.	Buru-mat	Bans	*Dendrocalamus strictus*
9.	Buru-salai	Salai	*Boswellia serrata*
10.	Chiru	Chero-ghas	*Imperata arundinacea*
11.	Dau	Barhar	*Artocarpus lakoocha*
12.	Edel	Semal	*Bombax malabaricum*
13.	Gara-hatna	Arjun	*Terminalia arjuna*
14.	Gara jono	Phul-jharu	*Thysanolaena agrostis*
15.	Hatana	Asan	*Terminalia tomentosa*
16.	Hupu	Galgal	*Chochlospermum gossypium*
17.	Hutar	Jirhul	*Indigofera pulchella*
18.	Huhri	Sinwar	*Vitex negundo*
19.	Icha	Dhoi	*Woodfordia fruticosa*
20.	Jojo	Imli	*Tamarindus indica*
21.	Jomlar	Mahulan	*Bauhinia vahlii*
22.	Koka	Kajhi	*Bridelia retusa*
23.	Kanthal	Kanthal	*Artocarpus heterophylla*
24.	Kaman	Karaunda	*Carissa spinarum*
25.	Kokar	Karkata	*Zizyphus xylopyra*
26.	Kend	Tendu	*Diospyros melanoxylon*
27.	Kita	Khajur	*Phoenix acaulis*
28.	Koroj	Karanj	*Pongamia glabra*
29.	Kuda	Jamun	*Syzygium cumini*
30.	Kaur	Kurchi	*Holarrhena antidyssentrica*
31.	Lowa	Gular	*Ficus glomerata*
32.	Bel	Bel	*Aegele marmelos*
33.	Lupung	Baheda	*Terminalia belerica*
34.	Mudupum	Mahua	*Madhuca indica*
35.	Ber	Ber	*Zizyphus spp.*
36.	Meral	Amla	*Embelica officinalis*
37.	Mur	Palas	*Butea spp.*
38.	Neem	Neem	*Azadirachta indica*
39.	Pandrai	Siris	*Albizzia lebbeck*

Sl. No.	Local Name	Hindi Name	Scientific Name
40.	Pandrai	Safed-siris	*A. procera*
41.	Palandu	Madhulat	*Combretum decandrum*
42.	Pota	Mainphal	*Randia dumetorum*
43.	Ritha	Ritha	*Sapindus mukorossi*
44.	Rola	Harra	*Terminalia chebula*
45.	Saiya	Chorant	*Heteropogon controtus*
46.	Saprum	Harshringar	*Nyctanthes arbotristis*
47.	Sarjom	Sal	*Shorea robusta*
48.	Sengel-sali	Bherul	*Chrooxylon swietenia*
49.	Saiya	Chorant	*Heteropogon controtus*
50.	Saprum	Harshringar	*Nyctanthes arbotristis*
51.	Sarjom	Sal	*Shorea robusta*
52.	Sekri	Sidha	*Lagerstroemia parviflora*
53.	Sengel-sali	Bherul	*Chrooxylon swietenia*
54.	Soso	Bhelwa	*Semecarpus anacardium*
55.	Tati	Apluda	*Apluda varia*
56.	Tila	Tilo	*Wendlandia exeserta*
57.	Toraj	Belongan	*Cordia macleodii*
58.	Uli	Aam	*Mangifera indica*
59.	Ulu	Galphuli	*Flemingia chappar*
60.	-	Ban Tulsi	*Ocimum americanum*
61.	-	Madar	*Calotropis spp.*
62.	-	Peepal	*Ficus religiosa*
63.	-	Rend	*Ricinus communis*
64.	-	Shialkanta	*Argemone mexicana*
65.	-	Bharenda	*Jatropha spp.*
66	-	Behya	*Ipomea carnea*
67	-	Putus	*Lantana camara*
68	-	-	*Tridax procumbens*

The core zone includes 25.56 ha of forest land. This area is located on a hill on the southern side of the lease area. The forest land has been preserved. The vegetation in this area consists mostly of bushes with patches of trees up to 6 m tall (refer following photograph). *Shorea robusta* is the dominant tree species. Other trees growing on the hill include *Terminalia tomentosa, Diospyros melanoxylon, Schleichera trijuga, Aegle marmelos, Terminalia belirica, Embelica officinalis* etc.

Photo 2.a: Unused Forest in Core Zone

In the barren areas in the core zone the vegetation consists of grasses, and common shrubs including *Lantana camara, Argemone mexicana* and *Jatorpha* with widely scattered *Butea* (Palash) and *Zizyphus* (Ber) trees. *Ipomea carnea* is growing in low lying areas near the courses of the streams flowing through the lease area.

In the settlements the vegetation consists of Mango, Neem, Jackfruit, Peepal and Banyan trees. *Argemone mexicana, Ricinus communis* and *Jatorpha* are seen growing on rubbish heaps.

Buffer Zone Flora

The plants found in the study area are given in **Table 2.5.**

Table 2.5: List of Plants Found in the Buffer Zone of the Study Area

Sl.No.	Local Name	Hindi Name	Scientific Name
1.	Ashing	Dhaman	*Grewia tiliaefolia*
2.	Ain	Porho	*Ficus cumia*
3.	Ambo	Amra	*Spondias spp.*
4.	Asendo	Kumbhi	*Careya arborea*
5.	Atkir	Ramdatwan	*Smilax macrophylla*
6.	Bai	Barh	*Ficus bengalensis*
7.	Bandu	Maula	*Butea parviflora*
8.	Baric	Kusum	*Schleichera trijuga*
9.	Barchon	Sabai	*Eulaliopsis binata*
10.	Baurakunda	Bhurkund	*Hymenodictyon excelsum*
11.	Bitagoinr	Pula	*Kydia calycina*
12.	Burja	Kachnar	*Bauhinia spp.*
13.	Burui	Dekamali	*Gardenia gummifera*
14.	Buru-mat	Bans	*Dendrocalamus strictus*
15.	Buru-salai	Salai	*Boswellia serrata*
16.	Chiru	Chero-ghas	*Imperata arundinacea*
17.	Dau	Barhar	*Artocarpus lakoocha*
18.	Edel	Semal	*Bombax malabaricum*
19.	Gara-hatna	Arjun	*Terminalia arjuna*

Sl.No.	Local Name	Hindi Name	Scientific Name
20.	Gara-hesel	Phansi	*Anogeissus latifolia*
21.	Gara jono	Phul-jharu	*Thysanolaena agrostis*
22.	Gara tiril	Makar kendu	*Diospyros embryopteris*
23.	Hemsabita	-	*Mitragyna parviflora*
24.	Hatana	Asan	*Terminalia tomentosa*
25.	Hari	Amaltas	*Cassia fistula*
26.	Hehel	Gaj	*Milletia auriculata*
27.	Hid	Piasal	*Pterocarpus marsupium*
28.	Hupu	Galgal	*Chochlospermum gossypium*
29.	Husi	Panrar	*Stereospermum suaveolens*
30.	Hutar	Jirhul	*Indigofera pulchella*
31.	Hutid	-	*Strobilanthes auriculatus*
32.	Huhri	Sinwar	*Vitex negundo*
33.	Icha	Dhoi	*Woodfordia fruticosa*
34.	Jojo	Imli	*Tamarindus indica*
35.	Jomlar	Mahulan	*Bauhinia vahlii*
36.	Koka	Kajhi	*Bridelia retusa*
37.	Kanthal	Kanthal	*Artocarpus heterophylla*
38.	Kaman	Karaunda	*Carissa spinarum*
39.	Kokar	Karkata	*Zizyphus xylopyra*
40.	Kasmar	Gamhar	*Gmelina arborea*
41.	Katangai	Toon	*Cedrela toona*
42.	Kend	Tendu	*Diospyros melanoxylon*
43.	Kiri	Sisoo	*Dalbergia sisoo*
44.	Kita	Khajur	*Phoenix acaulis*
45.	Koroj	Karanj	*Pongamia glabra*
46.	Kuda	Jamun	*Syzygium cumini*
47.	Kunba	Karam	*Adina cordifolia*
48.	Kula-marsal	Bhant	*Clerodendron infortunatum*
49.	Kundri ï jamun	Arar	*Acacia pennata*
50.	Kaur	Kurchi	*Holarrhena antidyssentrica*
51.	Kunnmung	Chattim	*Alstonia scholaris*
52.	Kuti	Putri	*Croton oblongifolius*
53.	Lowa	Gular	*Ficus glomerata*
54.	Bel	Bel	*Aegele marmelos*
55.	Lupung	Bahera	*Terminalia belerica*
56.	Mudupum	Mahua	*Madhuca indica*
57.	Ber	Ber	*Zizyphus spp.*
58.	Matasura	Ampti	*Antidesma diandrum*
59.	Meral	Amla	*Embelica officinalis*
60.	Mur	Palas	*Butea spp.*
61.	Neem	Neem	*Azadirachta indica*
62.	Doka	Genjam	*Lannea grandis*
63.	Pandrai	Siris	*Albizzia lebbeck*
64.	Pandrai	Safed-siris	*A. procera*
65.	Papra	Papra	*Gardenia latifolia*
66.	Pasu	Karla	*Cleissanthus collinus*
67.	Palandu	Madhulat	*Combretum decandrum*
68.	Pota	Mainphal	*Randia dumetorum*
69.	Potaporla	Murarphal	*Helicteres isora*
70.	Paripan	Detranga	*Ehretia laevis*

Sl.No.	Local Name	Hindi Name	Scientific Name
71.	Ritha	Ritha	*Sapindus mukorossi*
72.	Rola	Harra	*Terminalia chebula*
73.	Ruta	Panjan	*Ougenia dalbergioides*
74.	Saiya	Chorant	*Heteropogon controtus*
75.	Saprum	Harshringar	*Nyctanthes arbotristis*
76.	Sarjom	Sal	*Shorea robusta*
77.	Sekri	Sidha	*Lagerstroemia parviflora*
78.	Sengel-Sali	Bherul	*Chloroxylon swietenia*
79.		Charaiguri	*Vitex peduncularis*
80.	Soso	Bhelwa	*Semecarpus anacardium*
81.	Tati	Apluda	*Apluda varia*
82.	Tele	Keonjhi	*Sterculia urens*
83.	Tila	Tilo	*Wendlandia exeserta*
84.	Tarob	Pirar	*Buchanania latifolia*
85.	Toraj	Belongan	*Cordia macleodii*
86.	Uli	Aam	*Mangifera indica*
87.	Ulu	Galphuli	*Flemingia chappar*
88.		Ban Tulsi	*Ocimum americanum*
89.		Madar	*Calotropis spp.*
90.		Peepal	*Ficus religiosa*
91	-	Rend	*Ricinus communis*
92	-	Shialkanta	*Argemone mexicana*
93	-	Bharenda	*Jatropha spp.*
94	-	Behya	*Ipomea carnea*
95	-	Putus	*Lantana camara*
96	-	-	*Tridax procumbens*

Characteristic forest type of the area, distributed along the topography are mainly Tropical Moist Deciduous Forest and Tropical Dry Deciduous Forest. Forest type with their sub group in the study area were characterized as follows:

Type/No.	Forest Type
	GROUP 3 ï TROPICAL MOIST DECIDUOUS FOREST
	Subgroup 3C ï North Indian moist deciduous forests
3C/C2e (iii)	Moist peninsular valley sal
3C/C3 a	Moist mixed deciduous forests (without sal)
3/EI	*Terminalia tomentosa* forest
	GROUP 5 ï TROPICAL DRY DECIDUOUS FORESTS
	Subgroup 5B ï Northern tropical dry deciduous forest
5B/CIc	Dry peninsular sal forest
5B/C2	Northern mixed deciduous forest
5 /E5	*Butea* forest

Distribution of forest is fragmented and restricted to the patches in the plains and on the hills. Within the forest boundaries there are large patches of open scrub with rural settlements. At several places this forest boundary is fragmented due to roads.

The valley bottom and lower hilly slopes contains relatively deep soil due to washout from slopy crystalline rocks. These areas are characterized with the presence of moist peninsular valley sal forest and moderate shrub growth. Top canopy in these areas were dominated by *Shorea robusta* in association with *Terminalia tomentosa*, *Adina cordifolia, Pterocarpus marsupium, Madhuca indica* etc.. Main associates in the Second story tree are *Syzygium cuminii* and Ficus spp.

On the hilly tract in the area, with varying moisture retention capacities forest type changes into moist mixed deciduous forest and in the top canopy predominance of sal is replaced by *Salamalia malabarica* and *Adina cordifolia* in association with *Bridelia retusa, Dillenia pentagyna* etc. Second story trees were represented by *Kydia calicina, Mallotus philippensis* and *Polyalthia ceracoides*. Bamboo community is represented by *Dendrocalamus strictus* in patches in these areas.

In the areas with heavy and wet soil along the valleys or along the water sides of Subarnarekha River with clayey alluvial patches traces of *Terminalia tomentosa* forest were found. Top canopy of these forests were dominated by *Terminalia tomentosa* in association with *T. bellirica*, *Salamalia malabarica* etc. *T. arjuna* is found on the water sides only. *Shorea robusta* is also present in rare frequency. *Mallotus philippensis* is the main associate of second story tree.

On some hilly slopes in the area where shallow soil is resting on hard impervious rock the characteristic forest type is changes into Northern tropical dry deciduous forest. *Shorea robusta* is the dominant tree of top canopy with fair regeneration. Associated trees of the same category and second story are *Anogeissus latifolia, Boswellia serrata, Buchanania lanzan, Cochlospermum religiosum* and *Gardenia gummifera*. Occasionally *Madhuca indica* and *Embelica officinalis* were also found associated. *Woodfordia fruticosa* is the most frequent shrub in this forest type along with *Phoenix acaulis*.

The escarpment extending towards the south-east from the southern part of the lease area is covered with forests. These forests are classified as Northern Tropical Moist Deciduous Forests. These forests are composed mostly of *Shorea robusta* (Sal), *Butea spp*. (Palas), *Albizzia procera* (Safed Siris), *Diospyros melanoxylon* (Tendu), *Terminalia tomentosa* (Asan), *Terminalia chebula* (Harra), *Buchanania latifolia* (Piar), *Pongamia glabra* (Karanj), *Terminalia belirica* (Baheda) etc. *Butea spp*. (Palas) and *Madhuca indica* (Mahua) are fairly common at the foothills. The diversity is low due to predominance of Sal. In the forests, ~1.5 km SE of the core zone, the trees on the hills do not exceed 6m in height and the undergrowth is thick. The trees at the foot hills are much taller. In the dense forests, ~8 km SE of the core zone, the tree density is much higher but the trees are hardly 6 m tall.

Photo 2.b: Vegetation on Escarpment in Buffer Zone ~ 1.5 km East of Mine Lease

Photo 2.c: Dense Sal Forest ~ 8 km South-East of Narwapahar Mine Lease

The plain areas consist of patches of agricultural land, barren land and rural settlements (refer following photograph). As can be seen from the photograph, the vegetation consists of isolated / small patches of Sal, Mahua, Asan, Mango, Mahua, Palash, Neem, Baheda, Date Palm, Ber trees and common shrubs.

Photo 2.d: Typical View of Plain Areas in Buffer Zone

In some areas in the study area, especially on the plains and lower hill slopes, the forests have been degraded due to anthropogenic activities. The vegetation of these degraded forests comprises of dense thickets of shrubs and widely scattered trees.

The plain areas comprise of patches of agricultural land, barren land and rural settlements (refer following photograph). As can be seen from the photograph, the vegetation consists of isolated / small patches of Sal, Mahua, Asan, Mango, Mahua, Palash, Neem, Baheda, Date Palm, Ber trees and common shrubs. There are also plantations of Eucalyptus and Australian Acacia.

There are several water filled road side ditches, village ponds, seasonal and perennial streams and large perennial river, the Subarnarekha, in the Buffer Zone. The vegetation of the road side ditches in the buffer zone is no different from what has been described for similar water bodies in the core zone. The village ponds have also more or less similar vegetation; in addition many ponds have infestations of water hyacinth. Water hyacinth is also seen on the banks of the Subarnarekha.

No endangered species of plant is found in the study area.

Wild life in the area

The mine lease does not support any population of large wild animals. However the forested hill, plantations and agricultural lands support a several species of common reptiles, birds and small mammals. The animals found in the core zone are listed the **Table 2.6**.

Table 2.6: List of Terrestrial Animals found in the Core Zone

Sl. No.	Common Name	Scientific Name	Schedule of Wild Life Protection Act in Which Listed
		Mammals	
1.	Common Mongoose	*Herpestres edwardsii*	IV
2.	Jackal	*Canis aureus*	II
3.	Indian Fox	*Vulpes bengalensis*	II
4.	Common house rat	*Rattus rattus*	V
5.	Indian hare	*Lepus nigricollis*	IV
6.	Indian Porcupine	*Hystrix indica*	IV
7.	Indian Field Mouse	*Mus booduga*	V
8.	Squirrel	*Funambulus pennanti*	IV
		Reptiles	
1.	Russelôs Viper	*Vipera russelii*	II
2.	Cobra	*Naja naja*	II
3	Yellow Rat Snake	*Ptyas mucosus*	II
4	Common Skink	*Mabuya carinata*	
5	Garden Lizard	*Calotes versicolor*	
		Birds	
1	Pariah Kite	*Milvus migrans*	-
2	Common Crow	*Corvus splendens*	V
3	Jungle Crow	*C. marorhynchos*	IV
4	House Sparrow	*Passer domesticus*	-
5	Wagtail	*Motacilla spp.*	
6	Rose Ringed Parakeet	*Psittacula krameri*	IV
7	Common Mynah	*Acridotheres tristis*	IV
8	Pied Mynah	*Sturnus contra*	IV
9	Cattle Egret	*Bubulcus ibis*	IV
10	Pond Heron	*Ardeola grayii*	IV
11	Little Egret	*Egretta garzetta*	IV
12	Small Green Bee-eater	*Merops orientalis*	-
13	Drongo	*Dicrurus adsimilis*	IV
14	Crow Pheasant	*Centropus sinensis*	IV
15	Doves	*Streptopelia spp.*	IV
16	Indian Roller	*Coracias benghalensis*	IV
17	White Breasted Kingfisher	*Halcyon smyrnensis*	IV
18	Red Vent Bulbul	*Pycnonotus cafer*	IV
19	Koel	*Eudynamis scolopacea*	IV
20	Hoopoe	*Upupa epops*	IV
21	Tailor Bird	*Orthotomus sutorius*	IV
22	Magpie Robin	*Copsychus saularis*	IV
23	Swallows	*Hirundo spp.*	IV
24	Purple Sunbird	*Nectarinia asiatica*	IV
25	Tree Pie	*Dendrocitta vagabunda*	IV
26	Shrikes	*Lanius spp*	IV
27	Partridge	*Francolinus spp.*	IV
28	Black Winged Kite	*Elanus caeruleus*	IV
29	Small Indian Cormorant	*Phalacrocorax niger*	IV

Table 2.7: List of Fauna in Buffer Zone Area

Sl. No.	Scientific Name	Local Name	English Name	Schedule of Wildlife Protection Act
MAMMALS				
1.	*Macaca mulatta*	Bandar	Rhesus macaque	II (17-A)
2.	*Presbybtis entellus*	Hanuman	Hanuman Langur	II (4-A)
3.	*Hystrix indica*	Sahi	Porcupine	IV (4-E)
4.	*Suncus murinus*	Chuchundar	Grey Musk Shrew	-
5.	*Felis chaus*	Jangli Billi	Common Jungle Cat	II (2-C)
6.	*Herpestes edwardsii*	Newla	Common Mongoose	IV(6-A)
7.	*Lepus nigricollis*	Khargosh	Indian Hare	IV (4)
8.	*Canis aureus*	Gidar, Siyar	Jackal	II (2-B)
9.	*Vulpes bengalensis*	Lomri	Indian fox	II (1-B)
10.	*Funambulus pennanti*	Gilhari	Five Stripped Squirrel	IV (3-A)
11.	*Rattus rattus*	Chuha, Mus	Rat	V
12.	*Mus booduga*	Chuha, Mus	Indian Field Mouse	V
13.	*Sus scrofa*	Jungli Suar	Wild Pig	III (19)
14.	*Muntiacus muntjak*	Kakar	Barking Deer	III (2)
15.	*Melursus ursinus*	Bhalu	Sloth Bear	I (31-C)
16.	*Elephas maximus*	Haathi	Indian Elephant #	I (12-B)
# Occassional Strays only				
BIRDS				
1.	*Bubulcus ibis*	Gai Bagla	Cattle egret	IV (22)
2.	*Ardeola grayii*		Pond Heron	IV (22)
3.	*Egretta garzetta*	Bagla	Little Egret	IV (22)
4.	*Phalacrocorax niger*	Pankouwa	Small Indian Cormorant	IV (18)
5.	*Milvus migrans*	Chil	Pariah kite	-
6.	*Francolinus pondicerianus*	Safed Titar	Grey partridge	IV (53)
7.	*Coturnix coturnix*	Bater	Common or grey quail	IV (53)
8.	*Francolinus pictus*	Kala Titar	Painted Partridge	IV (53)
9.	*Gallus gallus*	Jangli murgi	Red jungle fowl	IV (53)
10.	*Anastomus oscitans*	Gungla	Open-billed stork	IV (66)
11.	*Treron phoenicoptera*	Common green pigeon	Harial	IV (54)
12.	*Columba livia*	Kabutar	Blue rock pigeon	IV
13.	*Psittacula eupatria*	Ram-tota	Large Indian Parakeet	IV (50)
14.	*Psittacula krameri*	Tota	Rose ringed parakeet	IV (50)
15.	*Cuculus varius*	Papiha	Brain fever bird	IV (17)
16.	*Eudynamys scolopcea*	Koel	Koel	IV (17)
17.	*Clamator jacobinus*	Papiha chatak	Pied crested Cuckoo	IV (17)
18.	*Athene brama*	Ulloo	Spotted Owlet	IV (48)
19.	*Alcedo atthis*	Chotta Kilkila	Common kingfisher	IV (37)
20.	*Halcyon smyrnensis*		White breasted kingfisher	IV (37)
21.	*Coracias benghalensis*	Nilkanth	Indian roller	IV (59)
22.	*Dinopium bengalense*	Kathforwa	Golden backed woodpecker	IV (79)
23.	*Picoides mahrattensis*	Kathforwa	Yellow fronted pied woodpecker	IV (79)
24.	*Pitta brachyura*	Navrang	Indian Pitta	IV (55-A)
25.	*Dicrurus adsimilis*	Bhujang	King crow; Black Drongo	IV (20)
26.	*Dicrurus caerulescens*	Pahari Bhujang	White bellied drongo	IV (20)
27.	*Dicrurus paradiseus*	Bhimraj	Greater Racket tailed	IV (20)

Sl. No.	Scientific Name	Local Name	English Name	Schedule of Wildlife Protection Act
			drongo	
28.	*Acridotheres tristis*	Maina	Common Maynah	IV (45)
29.	*Sturnus contra*		Pied Maynah	IV (45)
30.	*Corvus macrorhynchos*	Junglee Kouwa	Jungle Crow	IV (35)
31.	*Corvus splendens*	Kouwa	Common Crow	V
32.	*Pericrocotus cinnamomeus*		Small minivet	IV (43)
33.	*Pericrocotus flammeus*	Chasm	Scarlet minivet	IV (43)
34.	*Dendrocitta vagabunda*		Indian Tree Pie	IV (35)
35.	*Pycnonotus jocosus*	Pahari Bulbul	Red whisked Bulbul	IV(8)
36.	*Pycnonotus cafer*	Bulbuli	Red Vent Bulbul	(IV (8)
37.	*Pomatorhinus horsfieldii*	Sat Bahan	Slaty headed Scimitar bulbul	IV (3)
38.	*Turdoides striatus*	Sat Bhai	Jungle babbler	IV (3)
39.	*Alcippe poioicephala*	Sat Bhai	Quaker Babbler	IV (3)
40.	*Muscicapa tickelliae*	Shama	Tickell's blue flycatcher	IV (28)
41.	*Centropus sinensis*		Crow Pheasant	IV (17)
42.	*Passer domesticus*	Gouriya	House Sparrow	IV (77)
43.	*Merops orientalis*		Small Green Bee-eater	-
44.	*Orthotomus sutorius*	Tuntuni	Tailor Bird	IV (77)
45.	*Copsychus saularis*	Doyel	Magpie Robin	IV (28)
46.	*Upupa epops*		Hoopoe	-
47.	*Nectarinia asiatica*		Purple Sunbird	IV (68)
48.	*Streptopelia chinensis*		Spotted Dove	IV (54)
49.	*Streptopelia decaocto*		Indian Ring Dove	IV (54)
50.	*Streptopelia tranquebarica*		Red Turtle Dove	IV (54)
51.	*Oriolus xanthornus*		Black headed oriole	IV (47)
52.	*Phoenicurus amaurornis*		White breasted water hen	IV (14)
53.	*Podiceps ruficollis*		Little Grebe	IV (31)
REPTILES				
1.	*Bungarus caeruleus*	Karait saap	Common Krait	IV (12-vi)
2.	*Ptyas mucosas*	Dhaman	Yellow rat snake	II (9)
3.	*Ramphotyphlops braminus*	Telia saap	Common Blind Snake	IV (12-ix)
4.	*Naja naja*	Nag saap	Indian Cobra	II (11)
5.	*Calotes versicolur*	Girgit	Common Garden Lizard	-
6.	*Python morulus*	Ajgar	Python	I (Part-II 14-A)
7.	*Eutropis macularia*		Bronze Grass Skink	-
8.	*Vipera (= Daboia) russelii*	Chandra boda	Russel's Viper	II (14)
9.	*Varanus bengalensis*	Goh	Bengal monitor Lizard	I (Part-II 10)

2.8 DEMOGRAPHIC FEATURES

The demographic features of the study area (as per 2011 Census) are given in **Table 2.8.** The population within 10 km radius area was about 1.11 lakh. The sex ratio was 969.6 females per 1000 males. Tribals constitute 44.3% of the population. It can be noted that about 77% of the main workers are employed in other industries i.e. most likely mines and plants of UCIL, Hindustan Copper Ltd. and in Jamshedpur

Table 2.8: Demographic Features of the Study Area

Sl No	Item	Study area (nos.)	Share in total population (%)
1.0	Population		
1.1	Total	111337	
1.2	Male	56527	50.77
1.3	Female	54810	49.23
2.0	Households	22817	
3.1	SC	5150	4.63
3.2	ST	49352	44.33
4.0	Literates	68564	61.58
5.0	Working population	40670	36.53
	Cultivators	3596	3.23
	Agricultural labourers	1499	1.35
	HH industry	339	0.30
	Others	18222	16.37
5.1	Main workers	23656	21.25
5.2	Marginal workers	17014	15.28
Source: Census 2011, Government of India			

The villages in the study area are listed in **Table 2.9.**

Table 2.9: List of Villages within study area

Hartopa	Chirudih	Pichhli	Dhatkidih
Murgaghutu	Nandup	Chandpur	Birgram
Pathar Chakri	Matku	Somadih	Bhelaidi
Hitku	Baredih	Bara Bhumri	Ghatiduba
Kadma	Nutandih	Chhota Banduya	Digarsai
Chatro	Dholadi	Matkamdi	Kudapal
Rajdoha	Bhuridih Alias Nishchintpur	Roldi	Sindurgauri
Damudih	Gobindpur	Mahuldiha	Madnabera
Domjuri	Bara Gobindpur	Baraghutusigra	Maliyanta
Khursi	Bara Banki	Poradiha	Hirachuni
Kashidi	Kero	Sohada	Salbani
Bagmara	Jhariya	Balijuri	Dhaniya
Bayangbil	Ranikudar	Rohinibera	Keshi Kudar
Dhanbani	Lowadih	Bhatin	Khakripara
Khukhradih	Chemaijuri	Jadugora	Jamshedpur Rly Colony Ward 196
Rugridih	Dhirol	Tilaitanr	Jamshedpur Rly Colony Ward 197
Garadih	Dabanki	Durku	Jamshedpur Rly Colony Ward 198
Bongadungri	Kamalpur	Kuldiha	Jamshedpur Rly Colony Ward 199
Turamdih	Barasigdi	Bandhdih	Jamshedpur Rly Colony Ward 200
Kudada	Khariyasai	Kala Pathar	Jamshedpur Rly Colony Ward 201
Lailam	Kendmuri	Gopalpur	Jamshedpur Rly Colony Ward 202
Talsa	Indasai	Asanbani	Jamshedpur Rly Colony Ward 203
Bhutka	Hesalbil	Tilamura	Jamshedpur Rly Colony Ward 204

(List of above villages is based on information given in the survey of India toposheet no 73 J/6, Edition: 1978).

2.9 OTHER INDUSTRIES

The other major industries located within the study area are listed in **Table 2.10**.

Table 2.10 : Industries and Mines around Narwapahar Mine

Name	Aerial Distance (km) & Direction
Industries	
Lafarge Cement Plant	6.0 km N
Tata Motors	7.5 km NNW
Jamshedpur Railway Workshops	9.3 km NW
Mines (Leases)	
Bhatin Uranium Mine of UCIL	5.5 km SE
Jaduguda Uranium Complex of UCIL	8.0 km SE
Banduhurang Mine of UCIL	9.0 km W
Turamdih Uranim Complex of UCIL	7.5 km W

3.0 PROJECT PROFILE

3.1 LEASEHOLD AREA

Narwapahar leasehold area of UCIL measures 456.62 ha of which 199.57 ha is under village Hartopa, 196.54 ha is under village Murgaghutu, 34.05 ha is under village Rajdohaand26.46 ha is under village Patharchakri. The leasehold area consists of forest land (25.56 ha), non-forest government land (128.21 ha) and private land (302.85 ha).

The rated capacity of the underground mine is 300,000 tonnes per year (t/yr). It is proposed to increase the production to 4,50,000 t/yr without any leasing or acquisition of additional land or change in mining method.

3.2 MINING

3.2.1 Method of Work

At Narwapahar latest technology of trackless mining system has been adopted. ROM is hauled up to finger raise at each level of central ore pass system by trackless method and subsequently after underground crushing it is hoisted to surface by skip hoisting system through vertical shaft. Horizontal Cut and Fill (HCF) method of underground mining is practiced for winning uranium ore. HCF is a method to excavate one slice of ore and filling back the same by waste rock, mill tailings etc. thus creating the platform for men and machinery to work on and to excavate the next slice. The slices are taken from lower level to the upper level leaving requisite sill pillar to for the upper level. At present, the mine working is 3 shifts for 300 days a year. Since 2008, the entire quantity of waste rock generated during mining is used for filling in underground voids in the mine itself.

Existing status of mine working

At Narwapahar mine, production of uranium ore commenced in 1995 ï 96. The year-wise productions of ore from Narwapahar Mine have not been furnished in this report as the same is classified as ñRestricted Informationò as per Section 3 of the Atomic Energy Act, 1962.

Narwapahar mine is a highly mechanized underground mine with entry through a 7° decline and a vertical shaft. Old inclines serve as second outlets. As mentioned above latest technology of trackless mining system is being practiced in this mine with decline and vertical shaft as mine entry and ramps for access in stopes.

Mining of ore is done by cut and fill method of underground mining technology. Stowing is practiced to fill the voids created by excavation. ROM is hauled up to central ore-pass system by trackless method using ST/MT (LHD/LPDT) combination and subsequently by skip hoisting system through shaft. The ore is transported by dumpers to Jaduguda Ore Processing Plant. The entire quantity of waste rock is used for backfilling of voids in underground workings. Prior to 2008, a small portion (~5%) of

the waste rock was brought to surface and dumped externally in a designated area within the area acquired for the project. Mine discharge water is collected at 140 ML and pumped to the surface. Pumps with total capacity of 900 m^3/hr (120 m^3/hr - 3 nos. and 90 m^3/hr- 6 nos.) have already been installed in the existing mine. These are adequate to take care of the higher seepage of rain water in the expanded mine.

The various underground equipment used in the mine are Drill Jumbos, LPDTs, LHDs, service Transport Vehicles like Supply Truck, Service Truck, Passenger Carrier, Road Grader, Scissor Lift and Explosive Van. Other underground auxiliary equipments are pumps, auxiliary fans, jack hammer drill machine, diamond drill machine etc. The various surface equipments are winders, main mechanical ventilation fans, compressors, dozer, pay-loader, various transport vehicles, workshop equipment, D.G. set for emergency power etc.

Proposed mine working

The present method of work, Horizontal Cut and Fill (HCF) method of underground mining, will be continued in the expanded mine also. Narwapahar mine has been developed up to the 7^{th}level. In the expansion phase, the mine will be developed below 7^{th}level to achieve 0.45 Mt/yr ore production. Four deeper levels below 7^{th} level (i.e. from 8^{th}, 9^{th}, $10^{th}$and 11^{th} level) will be developed to add new stopes. The decline will also be extended below the 7^{th} level and the waste muck produced from the decline face can be easily used in the filling the voids created in the 7^{th} level. At present mine workings have reached 275 m below ground level i.e. about 151 m below mean sea level. The mine will be deepened to 450 m below ground level, i.e. about 326 m below mean sea level.

The broad parameters of proposed expansion are:

- Cross section of drive, drift and cross cuts will be 4.5 m X 3.0 m.
- During jumbo drilling, depth of hole will be 3.2 m to get a pull of 3.0 m.
- Back support by rock-bolting at 1.5 m x 1.5 m grid pattern. However, this pattern varies with experience.

Rock bolt system is being practiced to support the rock wherever necessary. The spacing of the rock bolts are determined on case to case basis based on the experience acquired on the rock strength during the operation of the mine.

Mode of Entry

Decline of size 5 m X 3 m size at 7^0 inclination from surface for flexible movement of all trackless diesel equipment is in use. At present, the decline has been excavated up to 275 ML (bgl) i.e. 7^{th} level and it is proposed to extend the decline up to the 11^{th} level i.e. up to 450 ML (bgl).

Vertical shaft of 5m finished diameter up to a depth of 355.3 m from surface is in use. The vertical shaft is concrete lined for its entire depth and connected to underground

levels at 100 ML, 140 ML, 185 ML, 230 ML, 275 ML, 295 ML (crushing chamber) and 315 ML (loading point). The shaft houses the cage, the skip, and counter weights. The cage can carry load of approximately 4.40 t. The skip has a capacity of 5 t. The mine section is shown **Fig. 3.1.**

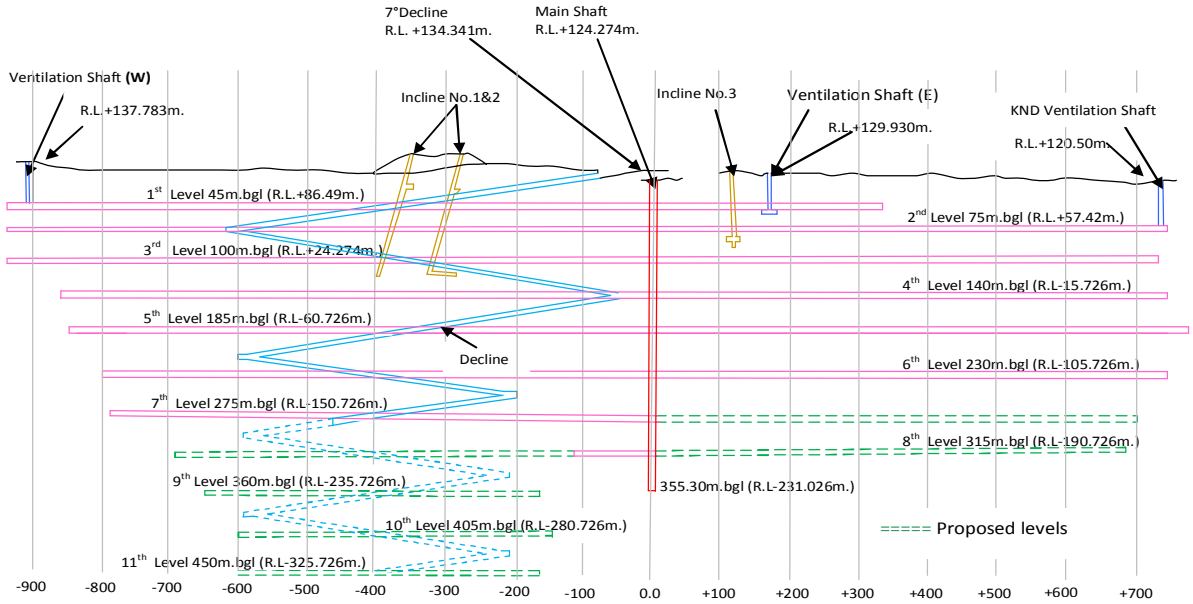

Fig. 3.1: Vertical section through the shaft

System of winding

At present, ore is dumped at main ore pass grizzle at different levels. The ore from proposed deeper levels (i.e. below 7thlevel) will be transported through the decline and will be dumped in the ore pass at 6th level. The ore from the main ore pass is fed into the underground jaw crusher and the crushed material is hoisted by skip to surface and discharged to the ore bin by a covered conveyor. The crushed ore is then trucked to Jaduguda Ore Processing Plant. Capacity of crusher is 80 t/hr of ï 200 mm size. Crusher feed size is 600 mm x 900 mm. Skip is having 5 t capacity and can make average 20 trips/hour. So the present hoisting system can handle 1500 t ore by operating 15 hours/day.

Method and sequence of stoping

The development and stoping commences by cyclic slicing and filling. This progresses from the lower level to the upper level. The sequence of operation followed at Narwapahar for the horizontal cut and fill method are as follows:

- First, stope extremities are defined and the exact ore geometry is established before regular slices can be taken.
- The ore drive, approximately 4.5 m X 3.0 m is developed along the footwall contact from one end of the proposed stope block to other end along the strike. Often each

stope is a distinct ore lens and the above development of ore drive establishes the length and behavior of the ore body at the level. Ore drives are developed in similar manner at the upper and the lower levels.

- The ore drives as developed above are widened to expose the hangwall subject to a maximum width of 10m. Above this width regular 5 m X 5 m pillars are left in the dip direction systematically. This establishes the exact width of the ore body in the proposed stope block.
- The drift along the strike and in footwall rock approximately 20 m to 40 m away from footwall contact of the ore body is developed. This follows the development of the ore drive maintaining a lag of about 50 m. This is done to provide permanent access to the level and serves as the hauling roadway as the ore drives get filled on commencement of stoping operations. Developing the drifts with a lag of 50 m from the ore drive allow the drift to be excavated in a more geometrically regular fashion as the trend of the ore body have already been established.
- At both extremities of the proposed stoping block, raises are put up to connect the lower level to the upper level.
- A ramp is developed in ore/footwall rock to provide access for the trackless equipments like Jumbos & LHDs to the stope. Ramp is developed either from upper level to lower level or from lower level to upper level or a combination of the two.
- The back of the ore drive is stripped up to a height of 5 m to provide access to Physics and Geology personnel to establish the vertical geometry of the ore body. This helps in planning the distances at which footwall drift needs to be developed.

Mine Ventilation

The mine is ventilated by three axial flow main fans (100 m^3/sec capacity) installed at the mouth of east ventilation shaft, west ventilation shaft & KND shaft respectively. The fans jointly take out air from underground. The raises, drives and old workings form the return air path for ventilating circuit.

Fresh air from surface enters the mine, under influence of negative pressure created by the main fans, through the main vertical shaft, decline and incline no. 3. Intake air is distributed to each level through these inclines, decline and shaft as per requirement. Each working stopes have separate intake and return paths. Intake air will enter the working through the access X-cut/ramps and ventilate the face and the exhaust air will pass the stope raise located at the stope boundary. The stope raises are connected to the main fans by a system of end raises and ventilation drives. Since fresh air is taken to the level first, the mineworkers work in fresh air.

The blind headings are ventilated by auxiliary fans whenever necessary. Air from auxiliary fans is taken to the working face by means of ventilation duct. Ducts of different sizes are used depending upon the requirement. In general 700 mm diameter semi-rigid/ flexible ducts are used for coursing the air up to face. Ventilation doors, stopping and regulators are also used in underground for proper coursing the ventilating air. The total

designed capacity of three main is 300 m^3/sec. The present quantity requirement is about 225 m^3/sec. Hence existing fans are sufficient to cater the ventilation requirement of the mine.

Drilling and Blasting

Narwapahar is a mechanized hard rock mine, where excavation of rock is done by breaking it by conventional drilling and blasting method. There are two types of blasting practiced viz. Inverted ôVö pattern for slice blasting at stopes and Burn cut pattern for development headings.

In case of inverted V patterns, on an average 150-160 kg of explosive is consumed for breaking a rock mass of (2.8 m x 8.4 m x 3.2 m) and the average powder factor achieved is estimated as 0.53 kg/t. However, in case of burn cut, the achieved powder factor is around 1.02 kg/t.

Mine Machinery

The existing fleet of major mining and auxiliary equipment and their future fleet are as follows:

Table 3.1: List of Machinery Deployed at Narwapahar Mine

Machine	Existing	Additional Requirement
Scoop Tram (ST)	7	-
Mine Truck (MT) 426)	3	-
Mt 431 B	2	-
Load Haul Dump (LHD)	3	-
Low Profile Dump Truck (LPDT)s/ MT2000	3	-
JUMBO	7	-
Service Equipments	10	-
Rock Breaker	1	2

A list of the other miscellaneous equipments is given below:

Table 3.2: List of Auxiliary Equipment

Type	Nos.
Bull Dozer	1
Pay loader	1
Explosive van	1
Lube truck	1
Scissor lift	4
Supply truck	1
Passenger carrier	3

Type	Nos.
Weigh Bridge	1
Arch Room	1
Ambulance van	1
Jeep	3
Car	1

Waste Management

At present the entire quantity of waste rock generated during mine operations is used for backfilling of voids in underground workings. In expansion, about 2.70 Mt of waste rock will be generated till end of mine life. The generated waste will be utilized for back filling during the mining operations. Till 2008, about 5% of the waste rock was brought to the surface and dumped externally over an area of 2.14 ha in the north eastern part of the lease area. The height of dump is about 5 m with single lift and contains 0.42 Mt of waste. However with cessation of external dumping this dump has been stabilized and is being biologically reclaimed.

3.3 MINERAL PROCESSING

The ore from Narwapahar Mine is trucked to UCIL's Jaduguda Uranium Ore Processing Plant for processing.

UCIL's Jaduguda plant was the first uranium ore-processing system in the country. Its present ore processing capacity is 2500 tonnes per day (i.e. 825000 t/yr).

The methodology adopted in the ore processing plant is a Hydrometallurgical one using crushing and wet grinding, thickening and de-watering, sulphuric acid leaching, clarification, ion-exchange and elution of adsorbed uranium with acidic brine, iron and product precipitation (Uranium Peroxide), filtration and spray drying of the Uranium Peroxide slurry and packing and storage of the finished product.

Tailings generated during ore processing are contained in engineered tailings ponds located nearby. Jaduguda Ore Processing Plant has three numbers of tailings ponds, Tailings Pond No. 1, Tailings Pond No. 2 and Tailings Pond No. 3, of which only Tailings Pond No. 3 is in active use as the two other have filled up to their design capacities.

First phase of rehabilitation of tailings pond no. 2 has been completed by putting a compacted clay layer of at least 300 mm tailings.

Tailings Pond No. 3 has two embankments namely a dam and a dyke. These earthen embankments are raised periodically for safe containment of waste solids. The pond has decantation wells, outfall duct, 900 mm diameter hume pipe across the dam body, spillways & effluent channel for the withdrawal and transfer of clear effluent to Effluent Treatment Plant. Three numbers of 200m (8" N) MSRL pipeline carrying the neutralized

slime slurry runs along the periphery of the tailings pond with intermediate discharge nozzles. These pipes are laid on concrete base and properly clamped for stability.

The neutralized slime slurry (pH > 9.5, 10% – 15 % solid w/w) from Tailings Treatment Plant is discharged into the tailings pond for safe containment. The discharge point of the pipeline is shifted periodically to follow a ring discharge system along the periphery of full pond area. The solid form the slurry settles in the pond area and liquor travels towards decantation well / spillway. The overflow point of decantation wells and spill way is gradually elevated by putting wooden sleepers and concrete sleepers respectively. The heights of the sleepers are always kept at least 150mm above the slurry level in the pond area. This helps in complete settling of solids in the pond and withdrawal of clear effluent. This also helps in keeping the surface of the solid in wet condition which ultimately helps in keeping the activity low and also reduces dust generation.

The shifting of tailings discharge is regulated in such a way as to attain a uniform sloping towards decantation wells / spill way and also to maintain a cover of water in maximum portion of tailings surface.

Raising the height of the dam / dyke is also carried out in a planned way so that always a free board space of at least 2 m is available for the safety of the dam / dyke.

The Uranium Peroxide is packed in special containers and dispatched to Nuclear Fuel Complex, Hyderabad by trucks.

3.4 AUXILLIARY SERVICES

Power Requirement

The estimated peak power requirement for Narwapahar mine is 3.75 MVA . The power is drawn from the Jharkhand State Electricity Board (JSEB) grid through 33 KV line. Two nos. 1000 KVA DG sets (1 working, 1 stand by) have been installed to meet the emergency power requirement. No additional power will be required for the expanded mine.

Water Supply

The water will be required for industrial and drinking purpose (at mines and colony). Peak water requirement will be 3175 m^3/d. This comprises of 1860 m^3/d of water for industrial use, 115 m^3/d of potable water for drinking purpose at mine site and 1200 m^3/d of potable water for the township, Activity wise peak water demand of the mine is given in **Table 3.3**.

Source of Water

Industrial water demand will be met by utilizing treated mine discharge water. Drinking water required at the mine site and at township is supplied from Jaduguda water treatment plant through pipelines. A provision of bore wells has been kept for emergency

drinking water supply at mine site. Necessary permission for water drawl is available with UCIL (Copy of agreement between Water Resources Department, Jharkhand and UCIL for water drawl is enclosed as Annexure 2.1). The underground mine working had already intersected ground water table. The necessary permission for working below ground water and pumping of ground water is being applied to Central Ground Water Authority (CGWA).

Table 3.3: Water demand and sources

Purpose	Avg. Demand	Peak demand	Source
Drinking and pit head bath	115	115	Treated water from Jaduguda water treatment plant
Drilling & spraying	100	100	Mine discharge water
Stowing	1200	1200	Mine discharge water
Dust suppression	200	300	Mine discharge water
Equipment washing	110	110	Mine discharge water
Green belt	100	150	Recycled water from treated STP effluent & industrial operations
Township (including school, hospital, MTC, Market, Bank)	1200	1200	Treated water from Jaduguda water treatment plant
Total	**3025**	**3175**	

Note *Figures are in m^3/d*

1. For fire service 500 m^3 is stored for use

Site Services

The mines have maintenance workshop, central store, fuel station, weigh bridge, telecommunication facilities, offices, pit head bath, locker, canteen, rest shelters (both at the surface and underground) etc. Vocational training centre, township. An ISO: 14001:2004 certified housing colony of 35.49 ha exist partially within the lease and partially outside lease towards SW boundary of lease. This township has 990 dwelling units. Expansion of the township is not envisaged.

A centralized workshop and vehicle maintenance garage has been constructed at the mine. In addition separate facilities have been constructed for rock drill repair, black-smithy, carpentry, pump repair and hydraulics repair in the existing building / structures of the mining complex.

The explosive magazine of the mine is situated in the south-east corner of the lease. The capacity of the magazine is 1.5 t of explosives and 5000 nos. of detonators. The security of the magazine is ensured by fencing in addition to duty outpost of CISF personnel. Telephone, walkie-talkie, emergency siren, spot lights, search lights, etc. have also been provided to the on duty security guard. Lightening arrestors have been provided as per specifications. The walls, doors, windows, ventilators as well as panels have been constructed as per Indian Explosives Act 1884 & Explosive Rules 1983.

HSD required for the mine is stored in 2 nos. tanks each of 20 m^3 capacity. The tanks are replenished from IOCL's depot at Jamshedpur.

3.5 MANPOWER

The mine employs 1041 persons consisting of 44 executives, 41 supervisors and 956 workers. The present manpower is sufficient to enhance ore production.

4.0 HABITAT UTILISATION PATTERN

4.1 INTRODUCTION

Uranium Corporation of India Limited (UCIL) has undertaken to increase the production of Uranium Ore from its Narwapahar Mine, without leasing or acquiring any additional land. The Mine along with necessary infrastructure are located in East Singhbhum District of Jharkhand. Narwapahar mining lease is spread over 456.62 ha. UCIL has submitted an application to Ministry of Environment, Forests and Climate Change, Govt. of India (MoEFCC) for grant of prior Environmental Clearance for increasing the production from the mine without increase in lease area. The Expert Appraisal Committee (EAC) of Ministry of Environment, Forests & Climate Change, Govt. of India (MoEFCC) has recommended that the proposed project be granted Environment Clearance vide the "Summary Records of the Sixteenth meeting of the Reconstituted Expert Appraisal Committee for Environmental Appraisal of Mining Projects (Non-Coal) of the Ministry of Environment, Forest and Climate Change was held during March 20-21, 2017" "Subject to submission of Conservation Plan to Chief Wildlife Warden of the State in respect of authenticated list of flora-fauna and schedule-1 species along with map and submission of clearance from CGWA for intersection of Groundwater table".

Site inspection had been conducted by Divisional Forest Officer, Jamshedpur on 06.05.2015. As per the site inspection report, DFO has noted the presence of wild animals like Elephant, Sloth Bear, Barking Deer, Wild-pig, Jackal, Jungle Fowl, Langur etc in the forest area. It is also referred in the report that the whole East Singhbhum area comes under Singhbhum Elephant Reserve.

In view of the above, a Site Specific Wildlife Conservation Plan for wild animals found within 10 km radius of Narwapahar Mine complex has to be prepared and submitted to the concerned authorities. UCIL commissioned MECON Limited, a Public Sector Undertaking under the Ministry of Steel, Govt. of India to prepare the same.

4.2 METHOD

The Mine Lease area falls under the jurisdictions of Rakha Range of Dhalbhumgarh Forest Division.

4.2.1 Identification of Endangered fauna present in the study area

List of fauna found in the in the Forest Division (Dhalbhumgarh Division) was obtained from the Working Plan of the Division. Discussions were held local villagers to identify the fauna found in the study area. The same was augmented by actual observation (in case of avifauna only).

4.2.2 Identification of Habitat of the Selected Animal Species

MECON's experts made extensive visits to the study area for identification of different habitats in the study area which are utilized by the selected animal species for different activities in different seasons and identify whether there are any migratory pattern (temporary or permanent) / seasonal movement of endangered fauna present in the study area.

4.2.3 Study of Habitat Characteristics

Physical characteristics of the habitat with respect to terrain features, water sources and availability and vegetation cover were studied from Survey of India topo sheets and analysis of satellite imageries. Biotic pressures on the habitats such as occurrence of forest fires, tree felling lopping, grazing etc. were studied by physically visiting the sites. Land use pattern within the study area and in areas adjacent to study area were studied from satellite imageries so as to assess the continuity of similar habitats in adjoining areas and to assess whether the habitat in the study area is fragmented or contiguous in the region.

4.2.4 Human Wild Animal Conflict

Villagers were quizzed to obtain information on occurrence of human – animal conflict , regarding type of incidents, locations, time, frequency and extent of damage.

4.2.5 Preparation of Wildlife Conservation Plan

The wildlife conservation plan as regards fauna, has been prepared on the basis of discussions between MECON's personnel and officials of Rakha Forest Range and on the basis works being carried out by the West Bengal Directorate of Forests in Coochbihar and Jalpaiguri Forest Divisions in and around Jaldapara and Gorumara Wildlife Sanctuaries respectively (MECON had evaluated projects under National Afforestation Programme implemented through Forest Development Agencies in these Divisions during 2006).

4.3 LITERATURE REVIEW

The latest Working Plan of Dhalbhum Forest Division was studied for obtaining the list of Flora and Fauna found in the Forest Division, the migration routes of elephants in the area and the preferred food of elephants in the region.

The publication, "The Book of Indian Animals" by S.H. Prater pub. Bombay Natural History Society (1971) was referred to for habits of the Schedule I fauna present in the study area.

The information collected by MECON from documents available with West Bengal Directorate of Forests during preparation of the reports "Evaluation of Forest Development Agency Projects in Coochbihar Forest Division, West Bengal" and "Evaluation of Forest Development Agency Projects in Jalpaiguri Forest Division, West Bengal" have been referred to for preparation of the Wildlife Management and Conservation Plan.

The book, "Right of Passage: Elephant Corridors of India". Eds. Vivek Menon, S.K. Tiwari, P.S. Easa & R. Sukumar. Pub. Wildlife Trust of India, was referred to for finding out whether any elephant corridor is present in study area.

The report "Comprehensive Wildlife Management Plan for Entire Keonjhar and Bonai Forest Divisions, Orissa" prepared by Shri Arun Kr. Mishra, OFS and submitted by Shri Vikram Singh, IFS and Shri A.O.F. Bakhla, IFS has been referred to for preparation of the Wildlife Management and Conservation Plan.

4.4 RESULTS and DISCUSSIONS

4.4.1 Schedule I Animals present in the Study Area

From the information available with the Forest Department it was concluded that the Schedule I animals found in the study area are Sloth Bear (*Melursus ursinus*), Indian Elephant (*Elephas maximus*), Bengal Monitor Lizard (*Varanus bengalensis*) and Indian Python (*Python morulus*). However Elephants and Sloth Bear have not been observed in the mine lease area.

Sloth Bears

Sloth-bears are mainly nocturnal. They usually stay in the dense forests, sleeping in natural caves and hollows during day time but emerge at night to feed. During foraging they may emerge from forests but stay away from settlements. They are omnivorous, eating insects and fruits. Sloth bears are expert hunters of termites, which they locate by smell. On arriving at an ant-hill, they scrape at the structure with their claws till they reach the large combs at the bottom of the galleries, and will disperse the dirt with violent puffs. The ants are then noisily sucked up through the muzzle. They rarely prey on other mammals but may eat carrion. Sloth bears supplement their diet with fruit and plant matter: in March and April, they will eat the fallen flowers and fruits of mahua trees and are partial to mangoes, kend, jamun and jack-fruit. In winter they eat fallen *ber*. Sloth bears are extremely fond of honey, eating the bees as well as the combs. Sloth bears may also raid fields of sugar-cane and maize.

Indian Elephant

Elephants prefer a dense forest which provides them with fodder and shade. They avoid steep hill slopes. During day time they prefer to rest in dense thickets or bathe in rivers / tanks. They usually feed at night and may raid crops. They feed on:

- Fruits: Mango, Kend, Jackfruit, Banyan, Figs, Mahua, Borassus Palm
- Leaves: Peepal, Banyan, Figs, Bamboo, Sal, Gamhar
- Bark: Peepal, Banyan, Figs
- Grasses

They rarely enter human settlements. The aroma of ripening paddy and freshly harvested paddy attracts elephants towards villages. Elephants also have taste for country liquor (Palm Toddy, *Mahua* & *Haadiya*) and may enter villages to drink country liquor prepared by villagers.

There are two Elephant Corridors in the area (Ref. The book, "Right of Passage: Elephant Corridors of India".):

1. Dalapani – Kankrajhor Elephant Corridor (~19 km East-North-East of Narwapahar).
2. Dumriya – Nayagram Elephant Corridor (>35 km South-East)

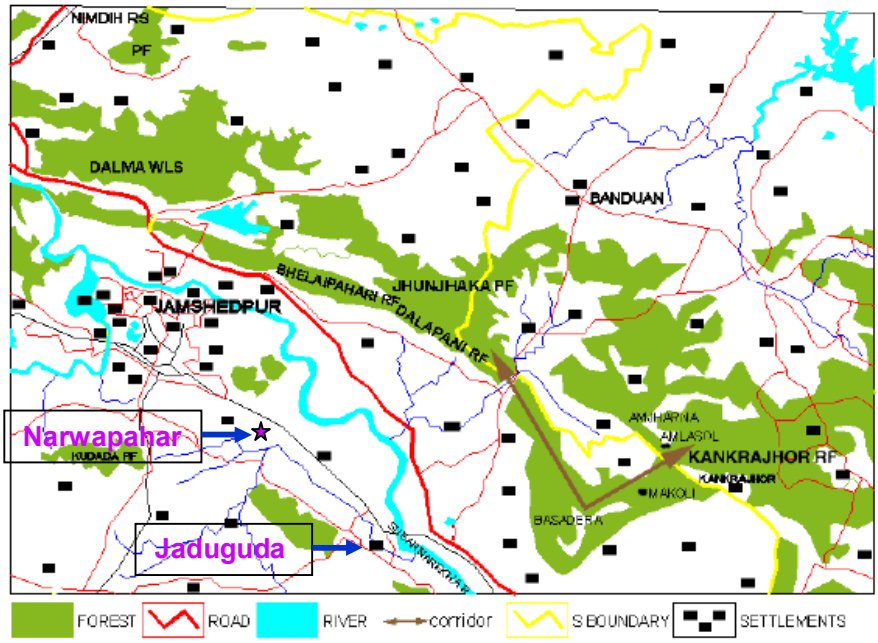

Fig. 4.1: Dalapani – Kankrajhor Elephant Corridor

The Dalapani Elephant Corridor is used frequently by herds of elephants of up to 40 animals and single bulls to travel regularly between Dalma Wildlife Sanctuary and

Midnapur District of West Bengal. This elephant corridor is separated from Narwapahar by the Galudih Barrage on the Subarnarekha, the Howrah – Jamshedpur broad gauge main line of South-Eastern Railway and NH-33. There have been no instances of elephants crossing the railway line (which is a very busy one) or swimming across the Galudih Barrage, but some have strayed close to NH-33.

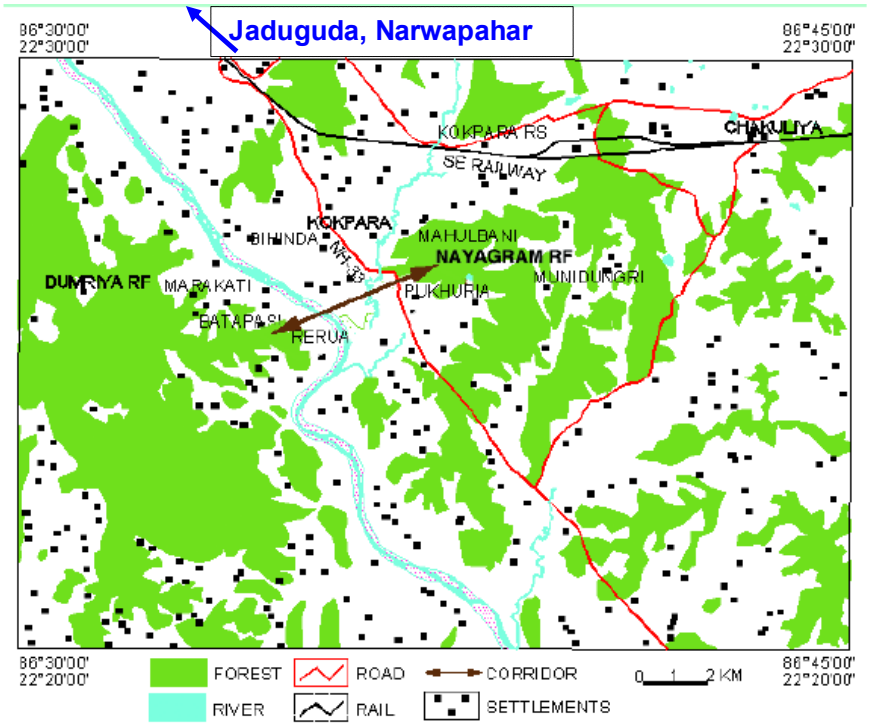

Fig. 4.2: Dumriya – Nayagram Elephant Corridor

The Dumriya – Nayagram Corridor (also called Mosabani – Chakuliya Corridor) links Dumriya Reserve Forest Nayagram Reserve Forest (R.F.). There are no major man-made obstacles between Dumriya R.F. and Narwapahar, except Jaduguda and Mosabani towns, which elephants can easily bypass. This corridor is used during October to January by small herds of 5 - 9 elephants. Some of the elephants in Dumariya R.F. come within 20 – 25 km of Narwapahar Mine (i.e. 10 – 15 km of Jaduguda) through forests and rural areas.

Bengal Monitor Lizard

Bengal monitors are usually solitary and usually found on the ground, although the young are often seen on trees. Bengal monitors shelter in burrows they dig or crevices in rocks and buildings. They may also make use of abandoned termite mounds. Bengal

monitors, like other varanids, show true sleep at night and are diurnal, becoming active around 6 AM and bask in the morning sun. During winter, in the colder parts of their distribution range, they may take shelter and go through a period of reduced metabolic activity. They are not territorial, and may change their range seasonally in response to food availability. They are usually shy and avoid humans. They have keen eyesight and can detect human movement nearly 250 m away. When caught, a few individuals may bite, but rarely do so. Predators of adults include pythons, mammalian predators and birds. A number of ectoparasites and endoparasites are recorded.

Females may be able to retain sperm, and females held in confinement have been able to lay fertile eggs. The main breeding season is June to September. Males, however, begin to show combat behaviour in April. Females dig a nest hole in level ground or a vertical bank and lay the eggs inside, filling it up and using their snouts to compact the soil. The females often dig false nests nearby and shovel soil around the area. They sometimes make use of a termite mound to nest. A single clutch of about 20 eggs are laid. The eggs hatch in 168 to nearly as long as 254 days. About 40 to 80% of the eggs may hatch.

They are capable of rapid movement on the ground. Small individuals may climb trees to escape, but larger ones prefer to escape on the ground. They can climb well. On the ground, they sometimes stand on the hind legs to get a better view or when males fight other males. They can also swim well and can stay submerged for at least 17 minutes.

Bengal Monitor tend to active whole day with different activities including feeding. Large adults may ascend vertical tree trunks, where they sometimes stalk and capture roosting bats. Their normal prey consists of beetles, grubs, orthopterans, scorpions, snails, ants and other invertebrates. In certain areas of West Bengal they have been seen feeding on the invasive exotic snail – African Giant Snail (*Achatina fulica*). Vertebrate prey is comparatively rare, and includes frogs, fish, lizards, snakes and rodents. Bengal monitors are also scavengers. They sometimes feed on dead animals. In areas where livestock are common, they often visit dung, where they forage for beetles and other insects.

Indian Python

The Indian Python is normally a jungle dweller occurring in dense as well as in open forests with rocky out-crops. In absence of forests can also be found in the vicinity of rivers and large ponds / lakes / wetlands.

A lethargic and slow moving snake, it exhibits little timidity, if any, rarely rousing itself seriously to escape even when attacked. They are good climbers and often hide among

branches of trees. They are also good swimmers and can stay submerged for several minutes.

They feed on a wide variety of mammals, birds and reptiles indiscriminately but seem to prefer mammals. Stomach contents have included, frogs, toads, monitor lizards, wild ducks, peafowl, poultry, rats & mice, hare, porcupine, langur, macaques, jackals, mouse deer, chital, hog deer, barking deer, cinkara, sambhar fawns, goats and even leopards. Small prey are digested in about a week, while it may take about 3 weeks to fully digest a goat. Pythons can be diurnal and / or nocturnal. They are ambush hunters waiting patiently for prey to come within striking distance. They can hunt in total darkness using the heat sensing pits near their nostrils to accurately gauge the position of warm blooded prey. They hibernate during winters in cold climate in tree holes, caves, burrows of other animals, under rocks or grass heaps.

Mating occurs during the cold season and 8 – 100 eggs are laid 3 to 4 months later during March – May. The female broods the eggs by coiling round them. The brooding female's temperature is higher than normal and she keeps it constant by shivering when the air temperature makes it necessary. The eggs hatch about 58 days after laying and the mother takes no further interest in the hatchlings.

4.4.2 Summary of Discussions

Villagers

Elephants are rarely seen in the area and that too more than far from Narwapahar mine site on the other side of Subarnarekha River. They sometimes raid crops, especially ripening paddy. They may even damage some houses.

Sloth bears are rarely seen because they are active mostly at night. They are found in the forested hills and usually keep away from villages except during late summer, when they come close to villages to feed on fallen mahua flowers and fruits. They sometimes climb trees to feed on fruits and bee-hives.

Pythons are occasionally seen in the forests basking on rocks or barren ground. They do not attack humans if not disturbed.

Monitor lizards are common in the area and may even enter settlements. They are usually timid but some large ones emit a loud hiss and open their mouths widely if somebody approaches too close. They occasionally raid poultries.

Mine Personnel:

Elephants have never been seen near UCIL's installations in the area. Activities of bears have been reported from the forested hills at a distance from the mines on the fringes of

the study area. They avoid human beings. Monitor lizards are common in the area and may even enter settlements. Most of them are timid and run away fast if shouted or shown sticks. A few larger specimens may exhibit some defiance by hissing loudly or opening their mouths widely but soon move away.

4.5 CONCLUSIONS

- Elephants are seen only occasionally in the area and that too on the other side of Subarnarekha River. These elephants probably are from Dalma wildlife Sanctuary.
- Sloth bears are found in the forested hills on the fringes of the 10 km radius study area. They are nocturnal and usually stay away from human settlements except when they come to feed on mahua flowers and fruits on outskirts of forest fringe villages.
- Pythons are occasionally seen in the forests. They do not attack humans.
- Monitor lizards are common and may enter settlements.
- Monitor lizards are usually timid but a few larger ones may put up a show of threat.
- Monitor lizards may raid poultries.

5.0 THREATS TO WILDLIFE

The study area is located in one of India's strategically important mining regions, with its deposits of Uranium and Copper besides other rare metals including gold. The area is also close to the city of Jamshedpur which is one of India's major industrial cities with its integrated steel plant (Tata Steel – India's first integrated steel plant), automobile manufacturing plant (Tata Motors), cement plant (Lafarge Cement) and numerous other manufacturing units. A copper smelter cum refinery is located about 30 km away at Moubhandar. Before the development of the industries, the area was probably contiguous with the Saranda Forest region of adjoining Odisha and West Bengal States. Saranda Forest is one of the largest tracts of Sal forest in the world.

With the development of the mining industry in the region, the wildlife is facing several threats which are described as follows:

5.1 DEGRADATION OF HABITAT

The biggest threat faced by wildlife in the region is habitat degradation. This includes loss of forest cover & habitat fragmentation, disturbance due to noise, introduction of exotic species, pollution of water sources etc.

5.1.1 Loss of Forest Cover and Habitat Fragmentation

Loss of forest cover is perhaps the biggest threat to wildlife. Due to extensive urbanisation, large tracts of forests have been cut down and degraded. Dense sal forests, characteristic of the region, have given way to open forests, scrub forests and even down & outright waste land in many places. A consequence of loss of forest cover is increased crop raiding by wild animals as wild animals are driven to enter agricultural fields for food.

The entire area was a continuous spread of forests where animals could move freely. Due to development industries, mines and consequent development of infrastructure and urbanization, the continuous tract of forest has been broken up into patches. Some of the individual patches are too small to support any individual large animal, let alone a small viable group. Also the numerous roads carrying heavy traffic load, which criss-cross the area, hamper the free movement of animals looking for additional foraging / hunting territory and / or mates.

Invariably animals emerge from forests and may come into contact with human beings who may be harmful to either human beings or animals or both.

Habitat fragmentation prevents free movement of animals and populations of animals are isolated. The small areas limit the growth of the population. Also isolation invariably leads to inbreeding which is harmful in the long run.

5.1.2 Introduction of Exotic and Invasive Species

In many of the area, exotic species (notably *Acacia auriculiformes, Eucalyptus spp,*) have been planted. These exotic species are unpalatable to most wild-life.

Exotic weeds such as *Parthenium, Eupatorium odoratum* and *Lantana camara* have developed in many places and these have had adverse effects on the local ecology.

Photo 5.a: Australian Acacia Plantation in Study Area

5.1.3 Disturbances due to Noise

Mining and allied activities have led to increase in noise levels due to:

- Operation of mining and mineral processing machinery
- Movement of trucks and trains
- Urbanisation

The noise thus generated has scared away most fauna in and around the mine leases. Movement of large number of trucks carrying minerals and other items required to support the mining operations through forest areas are also likely to have scared away many animals.

Urbanisation resulting from mining activities has also increased noise levels which may have sacred away animals from vicinity of settlements.

5.1.4 Pollution of Water Sources

Surface run-offs from the mines, discharges from human settlements may have affected the quality of the water flowing in the streams in the valleys. Also the solids get deposited in the streams in the valleys affecting the flow regime of the rivers and streams.

5.2 FOREST FIRE

Most of the trees in the area are deciduous in nature and shed their leaves in early summer. There is accumulation of leaf litter and dry vegetation during the hot summer months. This dry vegetation often catches fire during peak summer due to natural reasons or man made sources (e.g. casual discarding of lighted bidis, throwing away of mashaals and spread of fires lighted to facilitate collection of non-timber forest produce like mahua fruits, tendu leaves & fruits, sal leaves & seeds etc.). The resulting fires kills herbs, shrubs and even small trees, damages larger trees, destroys seeds, kills small ground dwelling animals and destroys their nests, eggs and nestlings. The burnt swathes of forest provide little or no grazing for larger herbivores. Fresh plant growth is also slowed down due to destruction of seeds and shallow root – stock and tubers. Devoid of vegetation cover and moisture loss due to heat from the fires, the soil becomes susceptible to erosion. The loss of top soil further adversely affects the regeneration of vegetation.

Photo 5.b: Forest Fire

5.3 SOIL and MOISTURE LOSS

- Loss of soil moisture hampers plant growth and this in turn affects availability of food and cover for wildlife.
- Insufficient moisture kills plants with shallow root systems and the dry vegetation is a fire hazard.
- Insufficient moisture makes the soil loose and it is susceptible to erosion. Loss of top soil in turn hampers plant growth.
- The study area is hilly. Soil eroded from the hill slopes is washed into streams and rivers in the valleys and this affects the water quality and flow regime of the rivers and streams. Accumulation of muck in the stream beds reduces water availability especially during summer seasons when wild animals require more water for drinking and bathing.

5.4 POACHING

With increase in human population, instances of poaching tend to increase. Tribals killing occasional wild pigs, deer or rabbit for their sustenance may not have much effect on the wildlife population but if the hunting becomes regular, the population is bound to

be affected. In case of larger animals such as elephants, whose birth rate is low, killing even one individual may affect the population. A small population of any species in an isolated pocket is not viable in the long run.

5.5 GRAZING AND NTFP COLLECTION

Forest fringe dwellers meet most of their requirements of fuel wood from forests besides other forest products. Since stall feeding of cattle is rarely practiced in the locality, cattle grazing in forest areas is common.

With increase in human population demand for fuel wood and non-timber forest produce (NTFP) has increased. Increased collection of fuel wood and NTFP leads to forest degradation. Also there are increased chances of conflict between wild animals and people entering forests.

Domestic cattle grazing in the forest may be preyed upon by wild carnivores. Also there is risk of communicable diseases prevalent in domestic animals may be passed on to wild animals with disastrous consequences.

5.6 SHIFTING CULTIVATION

Shifting cultivation leads to deforestation, soil erosion and soil moisture loss (i.e. habitat degradation). The effects of habitat degradation have been described above.

6.0 WILDLIFE CONSERVATION AND MANAGEMENT PLAN FOR THE MINE

The mine lease is located in an area, which is known for its deposits of copper and uranium ore. Consequently several mines and mineral processing industries are operating in the area.

The plan aims at minimizing all the potential threats to wildlife both within the mine, on the immediate neighbouring hill slopes and rest of the buffer zone despite the mining operation to be taken up and all other ancillary activities.

Although no major incidents of human-animal conflict, except occasional incidents of snake bites, have occurred in the study area so far it may occur any time. The primary cause of human animal conflict is loss of animalsôhabitat.

6.1 STRATEGY

Although no deforestation will take place due to continuation of mining activities proposed under the scheme, allied activities are likely to disturb animalsô habitat. Therefore the Wildlife Management Plan for the continued operation of Jaduguda Uranium complex will involve:

- Development of alternate habitats and improvement of existing habitats
- Creation of physical barriers between areas of human activities and animal habitats
- Minimisation of Disturbances

Encouraging social forestry and setting up of anti-depredation squads will help wildlife management.

6.1.1 Development of Alternate Habitats & Improvement of Existing Habitats

This is a long term measure aimed at inducing animals away from human habitations associated with the mine. The success is not guaranteed but this measure offers the best conservation option. This measure involves creation of alternate sources of fodder and water slightly away from the existing & proposed areas of human activity associated with the mine.

From literature, it has been noted that elephants feed on a wide variety of vegetation and fruits.

Sloth bears are omnivorous. They prefer to eat a wide variety of fruits, tubers, other vegetation, honey and insects. They rarely hunt other mammals.

Monitor lizards feed on snails, fish frogs, small reptiles, birds and mammals. Pythons prey on mammals, birds, reptiles, amphibians etc. ; the size of prey taken depends on the size of the snake. Larger snakes prefer larger prey. Some of the pythonsôusual prey, small deer are not found in the study area but others are.

It is necessary to provide suitable habitat with shelter, food & water for all animals. The reptiles, birds feed and small herbivorous animals found in the area on insects, grasses & leaves and fruits (kend, mangoes, jackfruit, jamun, ber, Mahua, Neem, Sal etc.). Therefore if plantations of these species were created close to the animalsôhabitat but away from the mine and its townships, the animals can be induced to keep away from areas of human activities. There are tracts of scrub forest & open forest in the buffer zone some distance away from villages. These will be developed to provide alternate wild life habitats. The trees proposed for planting are:

- Mahua / Mahul – *Madhuca indica*
- Jackfruit – *Artocarpus heterophyllus*
- Mango – *Mangifera indica*
- Banyan – *Ficus bengalensis*
- Peepal – *Ficus religiosa*
- Fig – *Ficus racemosa*
- Baheda – *Terminalia bellirica*
- Neem – *Azadirachta indica*
- Sal – *Shorea robusta*
- Semal – *Bombax ceiba*
- Jamun – *Syzygium cuminii*
- Aonla – *Embelica officinalis*
- Ber – *Zizyphus spp.*
- Kend ï *Diospyros melanoxylon*

The above trees yield edible leaves and / or fruits, preferred by wildlife. They also produce flowers which attract insects (including honey-bees) and birds.

It should be noted that mixed plantations of the above trees should be created. Also grasses like *Anthistiria gigantean, Axonopus compressus, Ischaemum aristatum, Panicum flavescens, Rottboelia exaltata, Saccharum spp., Sataria palmifolia, Digitaria spp., Setaria glauca* etc. may be planted to provide grazing to herbivores.

Such improved forest patches will be kept as far as possible from roads. Traffic on nearby roads will be regulated especially during dusk to down. Soil and moisture conservation works will be carried out in these areas to sustain the vegetation.

Under the present proposal, alternate habitat development / habitat improvement will be carried out over a total area of 30 ha comprising of:

- 15 ha of degraded Forest Land will be afforested by planting trees @ 1000 trees per ha.
- Another 15 ha of open forest will be improved upon by planting trees @ 100 trees per ha.

Most animals require water bodies to drink and bathe. Ponds have to be dug in selected areas away from human activities to provide water to meet wild animalsôrequirements. For this purpose it is proposed to dig one no. small game tank in the core zone and three nos. small game tanks (water holes for wildlife), each approximately 25 m long, 6 m wide and 1.5 m deep.

Many birds nest in holes in trees. It has been noted that lack of suitable nesting holes has affected the population of these birds. To partly remedy this, a number of wooden nesting boxes will be strung up on selected tall trees in the mine lease as well as in forest areas outside the mine lease.

All water bodies (natural as well as man-made) within 5 km radius area of the mine lease area will be identified. Wherever possible, the ponds and natural streams will be desilted during summer to provide additional water for wild animals and livestock. These works will be taken up in consultation with the State Forest Department as well as local village panchayats.

6.1.2 Creation of Physical Barriers

Physical barriers have been built to keep wild animals out of areas of human activities. These include walls, fences and trenches.

In case of Narwapahar Mine, a fence of concrete panels encircles the entire mine, which prevents wild-animals from nearby forests from entering the mine area.

Photo 6.a: Fence of Concrete Panels Around Narwapahar Mine

6.1.3 Minimisation of Disturbances

There are several mines in the study area. Mining and allied activities go on round the clock. In order to minimize disturbances to animals, the following measures will be undertaken:

Protection of forest patches

Part of the lease area is forest land which has been preserved in accordance with the advice of Bihar State Pollution Control Board (issued prior to formation of Jharkhand State). The list of animals found within the Core Zone (mine lease) and the Buffer Zone have been given in Chapter 2. It is necessary that the unutilised forest patches within the mine lease be fully protected and / or improved by revegetation with indigenous and locally occurring species that can provide food, cover and shelter to wild animals so that they are attracted to recolonise the area after the mine is closed and abandoned.

The following measures will be undertaken to preserve green cover as much as possible:

- Tree felling will be done only when absolutely essential
- Improvement of open forest patches within lease area which are not likely be utilised within the plan period will be carried out by planting local species in consultation with State Forest Deptt.

Noise reduction

Movement of trucks on roads passing through dense forests where wild animals are known to reside, creates disturbance. Traffic will be regulated on roads passing through forests, especially at night.

In underground mines, ventilation fans are a major source of noise and vibrations at the surface. To reduce noise and vibration generation from the fans, the following measures will be undertaken:

1. Proper balancing of the fans will be carried out.
2. The fans will be thoroughly lubricated.
3. If possible enclosures constructed of sound absorbing material will be built around the fans.

Illumination

Care will be taken to see that the lights are shaded and not focused towards the forest patches where the wildlife may find cover. All head lights of mining vehicles will be shaded and dipper will be used.

6.2 MITIGATION MEASURES

At Narwapahar Mine all mining activities take place underground. The infrastructure necessary for operating the underground mine at the enhanced capacity is already in place. There is no proposal to divert any additional land especially forest land in the immediate future. Hence the wild animals can find shelter if they are made conducive to their stay with proper food, water cover and safety from fire and poaching. Hence the following steps are recommended for providing the same.

6.2.1 Plantation

Mixed plantations of indigenous species, preferably with edible fruits, flower, leaves etc. will be grown over 30 ha of forest blanks in the vicinity of Narwapahar.

Plantation of hardy indigenous species, most preferably those found in the neighbouring hill slopes can be planted up in 0.5 m^3 pits, filled with borrowed valley soil and organic manure. Application of *Rhizobium* or *Azotobacto*r shall also be carried out for establishment of seedlings. Only 2 ï year old healthy saplings should be planted immediately after the onset of monsoon at a spacing of 2.5m x 2.5m. Bio-pesticides like neem oil-cake etc. should be applied, as the area is white ant prone. For all plants grown on sloping ground, half moon trenches may be provided. Planting can also be taken up on 0.5m width x 0.5m deep x 5.0 m long staggered trenches dug up along the

contours at 5m intervals. This will help soil and moisture conservation and make water available to the plants. Clod mulching can be done immediately after the rains to prevent evaporation losses due to capillary action. The species recommended are:

Madhuca indica (Mahua / Mahula)	*Shorea robusta* (Sal)
Embelica officinalis (Amla)	*Artocarpus heterophyllus* (Kathal)
Bombax ceiba (Semal)	*Schleichera oleosa* (Kusum)
Azadirachta indica (Neem)	*Terminalia bellirica* (Baheda)
Ficus bengalensis (Bargad / Banyan)	*Terminalia chebula* (Harra)
Ficus religiosa (Peepal)	*Ficus racemosa* (Dumur)
Pongamia pinnata (Karanj)	*Mangifera indica* (Aam / Mango)
Gmelina arborea (Gamhar)	*Diospyros melanoxylon* (Kend / Tendu)
Zizyphus spp. (Ber)	*Albizzia lebbeck* (Siris)
Syzygium cuminii (Jamun)	*Bauhinia spp.* (Kachnar)

Seeds of edible grasses such as *Anthistiria gigantean, Axonopus compressus, Ischaemum aristatum, Panicum flavescens, Rottboelia exaltata, Saccharum spp., Sataria palmifolia, Digitaria spp.,* or berries may be planted for improving fodder availability. Causalities should be replaced in 1st, 2nd and 3rd year with well grown seedlings in later part of July in 1st year and later June succeeding years. The plantation should be provided active maintenance and protection for 5 years at the end of which the plantations will become self sustaining.

For re-afforrestation of the degraded forest areas, both ñArtificial Regenerationò and ñAided Natural Regenerationò models will be followed. ñArtificial Regenerationò shall involve actual planting of selected species of plants (grasses, shrubs, trees) by way of seeds, seedlings, saplings, cuttings etc. sourced from elsewhere. ñAided Natural Regenerationò shall involve giving protection and applying water, fertilizers and good quality soil to areas around existing native vegetation to enable the natural vegetation to restore itself. This model is especially applicable in case of trees which are very difficult to propagate artificially e.g. Sal (*Shorea robusta*).

The Forest Department Nursery at Rakha Range Office, located close to Jaduguda Mine raises seedlings of the following indigenous species of trees amongst others:

- Neem (*Azadirachta indica*)
- Gamhar (*Gmelina arborea*)
- Karanj (*Pongamia glabra*)
- Chakunda (*Cassia siamea*)
- Neem (*Azadirachta indica*)
- Siris (*Albizzia lebbeck*)
- Semal (*Bombax ceiba*)
- Baheda (*Terminalia bellirica*)
- Arjun (*Terminalia arjuna*)
- Harra (*Terminalia chebula*)
- Amla (*Embelica officinalis*)
- Kadam (*Acanthocepahlus cadamba*)
- Jackfruit (*Artocarpus heterophyllus*)
- Jamun (*Syzigium cuminii*)
- Mango (*Mangifera indica*)
- Sal (*Shorea robusta*)
- Bakain (*Melia azadirachta)*

Another Forest Department Nursery at Kandra (located about 30 km away) also raises seedlings of Mahua (*Madhuca indica*) and Tamarind (*Tamarindus indica*) amongst others. These two nurseries will be the main source of saplings for afforestation works and plantations.

It was also observed that large numbers of seedlings of Banyan (*Ficus bengalensis*) and Peepal (*Ficus religiosa*) are growing on old buildings in the mine area, mine township and elsewhere. These seedlings will be collected and transplanted directly in the field.

In areas earmarked for plantation, after implementation of soil & moisture conservation works and removal of weeds, if the top soil is found to be thin, top soil brought in from elsewhere will be spread. Contour bunds will be constructed down the slope using boulders / stones and gravel excavated from seasonal drainage channels. Water will be sprinkled on the top soil and grasses will be planted on the same to stabilize it.

Pits will be excavated along contours at 2 ï 3 m intervals. The pits will be 0.5 m x 0.5 m area and 0.6 ï 0.75 m deep. They will be filled with a mixture of good quality soil and organic manure (cow dung, agricultural waste, kitchen waste). Saplings of selected tree species will be planted just after the commencement of the monsoons to ensure

maximum survival. The species selected for plantation must be locally growing varieties with fast growth rate and ability to flourish even in poor quality soils.

Post Plantation Care

Immediately after planting the seedlings, watering will be done. Further watering will depend on the rainfall. In the dry seasons watering will be regularly done especially during March to June. Watering of one year old saplings will be more frequent (at least thrice a week). Manuring will be done using organic manure (animal dung, agricultural waste, compost, kitchen waste, etc.). Younger saplings will be surrounded with tree guards. Mulching and weed removal will be carried out on a regular basis. During March, dry vegetation shall be removed from the plantation areas as these can catch fire and lead to death of planted saplings. Diseased and dead plants will be uprooted and destroyed and replaced by fresh saplings. Growth / health and survival rate of saplings will be regularly monitored and remedial actions will be undertaken as required.

6.2.2 Fire protection

Fire is very common in tropical areas and destroys regeneration, grasses, kills small ground dwelling animals, birds, their nests and eggs and nestlings. For this purpose 10 m wide fire lines will be cleared along extraction paths, natural features, forest boundaries etc. before onset of fire season, both in the core zone as well as in the buffer zone. UCIL will engage fire watchers for 4 months (March ï June) every year to watch out for forest fires in and around Narwapahar Lease. Labourers will be engaged every year for cleaning the fire-lines and watching for fires. When any fire is reported, UCILôs resources will be deployed in controlling the fire in association with the Forest Department.

6.2.3 Dust suppression

In order to reduce dust, the roads and extraction paths have been planned to minimize their length. They are sprinkled with water at regular intervals on non-rainy days. In all UCILôs underground mines, water is sprinkled on the freshly blasted ore. The ore is partially crushed inside the mine, raised to the surface and transported by covered conveyors (in case of Jaduguda Mine) or covered trucks (in case of Bagjata, Bhatin and Narwapahar Mines) to the Ore Processing plant.

Photo 6.b: Transportation of Ore from Narwapahar Mine by Covered Truck

The road from Narwapahar Mine to Jaduguda is a public road. Nevertheless the road is maintained by UCIL, which contributes to reduction in generation of fugitive dust, noise and vehicular emissions.

At present the entire quantity of waste rock being generated at Narwapahar Mine is used for stowing under-ground voids. However earlier, the waste rock generated during the initial development of the mine had been dumped on the surface within the mine lease. Also part (~5%) of the waste rock generated during operation of the mine was raised to the surface and dumped in the external waste rock dump. Once external dumping ceased, UCIL has biologically reclaimed this dump, thereby removing a potential source of fugitive dust.

Photo 6.c: Biologically Reclaimed External Waste Rock Dump of Narwapahar Mine

6.2.4 Preventing entry and fall of animals

As some of the mining shafts / adits are more than 200 m deep, any fall by straying animals or humans will be fatal. To prevent this, during mine closure, all entries to the mines will be concreted in accordance with Directorate Generals of Mines Safety (DGMS), Atomic Minerals Directorate for Exploration and Research (AMD) and Atomic Energy Regulatory Board (AERB) regulations.

6.2.5 Garbage Disposal

There is likelihood of accumulation of both bio-degradable and non-degradable solid wastes, as a large work force and others like drivers, helpers, mechanics etc. work / work in the mine area, which is partly located in and around Forests areas. This garbage will be removed from the lease area, segregated and degraded through vermiculture or incineration. Principle of `reduce, reuse and recycleôwill be adopted. The work force will be sensitized not to leave any garbage within the lease hold area. This will sensitize them to avoid bringing polythene, plastics, tetrapaks etc. into the mine lease and even if they bring such material never leave them within the mine lease or its surroundings.

Narwapahar Mine Township has a regular garbage collection programme. A concrete platform has been built where bio-degradable and non-bio-degradable materials are segregated. The bio-degradable waste is composted. The non-bio-degradable materials are packed in bags and dumped in an exhausted stope in the mine.

Care is also taken to see that leaking oil & lubricants or discarded stuff is not drained in the mine area and contaminate the soil. Leaking / waste oil, lubricants and packaging material should be properly collected and disposed off. Working procedures have been suitably modified and enforced to ensure that oil is not spilled on to soil during repair & maintenance of machinery and vehicles. In case oil is spilled on soil, the oil contaminated soil is dug out and disposed off properly outside forest areas and away from natural streams.

6.2.6 Soil and moisture conservation measures

Soil erosion due to unchecked runoff during heavy rains will not only deplete soil on the hill slopes and affect rivers and agricultural land in the valleys below but will lead to moisture loss due to lack of soil cover. Therefore they should be checked. Hence, all gullies should be check dammed with rubble, soil and vegetative barriers. This will also provide drinking water for smaller wild animals like squirrels, foxes, jackals, hares, snakes, lizards, ground birds (lapwings, partridges, quails, jungle-fowl) etc. Staggered

contour trenches of 0.5 wide x 0.5 deep x 5.0 m long at suitable intervals depending on the slope with vegetation on slopes shall also be quite useful.

6.2.7 Solar Lighting in Villages

Solar street lights will be provided in forest fringe villages, where regular electric supply is not available, to discourage wild animals from straying into settlements. In villages with power supply, regular street lights may be provided.

6.2.8 Weed eradication

Most degraded areas / forest blanks have been invaded by weeds such as *Parthemium*, *Eupatorium, Lantana, Achyranthes* spp., *Cassia tora*. These weeds will be uprooted manually before they flower and will be dried and burnt or buried in pits. This exercise will be carried out every year and weed spread shall come down once the canopy is closed.

6.2.9 Anti-Depredation Squads

Labourers will be employed from amongst local villagers to chase away wild animals from agricultural fields when the crops are ripening.

6.2.10 Awareness programme

The success of the exercise towards protection of wild-life is dependent on active participation of local people in the programme.

To this end UCIL, will enlist the help of the State Forest Department and WWF towards enlightening the people towards the need for wild-life protection and measures required for the same. UCIL shall provide necessary support to the State Forest Department and WWF for organizing periodical wild-life awareness programmes for different groups of people, namely school children, mine workers and local villagers.

6.3 PLAN PERIOD

This plan is prepared for 10 years and may undergo revision after completion to that period, based on experience gathered during the plan period and changes that would have taken place, change of thrust, if required and prevailing labor and other rates.

6.4 MONITORING COMMITTEE

A monitoring committee may be set up with Conservator of Forests, Chaibasa as the Chairperson with the DFO, Dhalbhum as convenor. The committee may have

representatives of the UCIL, Hindustan Copper Ltd. (who operate other mines in the area), local BDOs, Range Officers. Any other person can be co-opted if his / her presence is likely to help the monitoring process at the discretion of the Chairperson. The committee may sit as often as needed, but not less than twice every year. This can guide the implementation of different activities and make course correction if required.

6.5 FUNDING

The break-up of the costs is given in Chapter 7.

Rs. Twenty-eights lakhs has been earmarked for various activities. Part of this, especially for activities in the surrounding areas shall be placed with the Forest Department. This entire amount is earmarked for activities only in Narwapahar Mine Lease i.e. the Core Zone.

The Buffer Zone of Narwapahar Mine shares a lot of commonality with the Buffer Zone of Jaduguda – Bhatin Mine, especially the areas, where Schedule I fauna are present. Therefore the activities in the Buffer Zone will be common for both sets of mines. Therefore the expenditure for activities in Buffer Zone areas will be common and will be spent under the Head of Jaduguda – Bhatin Complex. An amount of Rs. One-Crore, Fifty-five Lakhs and sixty thousand only has been earmarked towards wildlife conservation and management measures in the Buffer Zone.

While implementing this plan in letter and spirit, it should be borne in mind not to infringe upon the provisions of Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 and rules made there under. The stipulations of MOEF, State Pollution Control Board, Forest & Environment Department, Jharkhand and Executive Institutions of other statutory authorities like Chief Wildlife Warden, Jharkhand are not violated.

7.0 COST ESTIMATES

The cost of the proposed wildlife management plan has been estimated for a period of 10 years. At the end of the 10 year plan period, the plan will be updated and a fresh estimate will be made. Prices prevailing in 2015 – 16 and labour charge of Rs. 300/- per man-day have been considered while estimating the costs. The cost estimates are as follows:

A. Activities within Core Zone

Sl. No.	Head	Basis for Estimation	Amount (in Lakh Rs.)	Remarks
1	Plantation in forest blanks and maintenance of plantations	2 ha @ Rs.1,50,000 / ha	3.0	To be executed by UCIL under guidance of Forest Department.
2	Soil & moisture conservation works in mine lease	Rs. 1,00,000/- per year for 10 years	10.0	To be executed by UCIL under guidance of Forest Department.
3	Fire Protection			
	Construction of fire watchtowers	2 nos. @ Rs.2,50,000	5.0	To be executed by UCIL under guidance of Forest Department.
	Fire-line clearance	3 km @ Rs.20,000 / km every year for 10 years	6.0	
4	Watering points / bird baths for residual wildlife & their maintenance	Rs. 1,00,000 capital cost and 10% annual maintenance cost	2.0	To be executed by UCIL under guidance of Forest Department.
5	Construction of Small Game-tank	1 nos. @ Rs.2,00,000/-	2.0	To be executed by UCIL under guidance of Forest Department.
		Total	**28.0**	

A. Activities in Buffer Zone

Sl. No.	Head	Basis for Estimation	Amount (in Lakh Rs.)	Remarks
1	Improvement / Restoration of Wildlife habitats			
	Afforestation of degraded forest lands including soil & moisture conservation works	35 ha @ Rs.1,50,000 / ha	52.50	To be carried out in Forest Land by Forest Department.
	Nesting boxes for birds	1000 nos. @ Rs.100 .	1.00	To be set up by Forest Department.
	Construction of Large Game-tanks	1 nos. @ Rs.7,50,000/-	7.50	To be built in Forest Land by Forest Department far from human habitation
	Construction of Small Game-tanks	4 nos. @ Rs.2,00,000/-	8.00	
3	Eradication of invasive weeds	4 nos. labourers for 2 months/yr. for 10 years @ Rs. 300 per man day	6.0	
4	Fire Protection			
	Construction of fire watchtowers	2 nos. @ Rs.2,50,000	5.0	
	Fire-line clearance	5 km @ Rs.20,000 / km per year for 10 years	10.0	
	Fire watchers	6 labourers for 90 days per year for 10 years @ Rs. 300 per man day	16.2	
5	Anti-depredation squads	4 labourers for 120 days per year for 10 years @ Rs. 300 per man day	14.4	
6	Installation of solar lighting systems in forest fringe villages		5.0	To be executed by UCIL under their CSR activities
7	Wildlife Monitoring	2.0 lakhs per year for 10 years	20.0	

Sl. No.	Head	Basis for Estimation	Amount (in Lakh Rs.)	Remarks
8	Awareness programmes, Wildlife Week celebration etc.	@ Rs. 1,00,000 / yr.	10.0	Will be jointly organized by the Forest Department and UCIL
		Total	**155.6**	

NB: All measures for tailings dump reclamation , dust suppression, garbage bins, soil erosion control etc. as per the reclamation plan to be prepared in terms of the approved Mining Plan & Progressive Mine Closure Plan and other relevant guidelines. This component is to be dealt separately as per the above guidelines. Hence no financial forecast on this account is indicated in the conservation plan.

 # The Buffer Zone of Narwapahar Mine shares a lot of commonality with the Buffer Zone of Jaduguda – Bhatin Mine, especially the areas, where Schedule I fauna are present. Therefore the activities in the Buffer Zone will be common for both sets of mines. Therefore the expenditure for activities in Buffer Zone areas will be common and will be spent under the Head of Jaduguda – Bhatin Complex.

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