



**Office of the Principal Chief Conservator of Forests
(Head of Forests Force), Maharashtra State**

Addl. Principal Chief Conservator of Forests & Nodal Officer,
1st Floor, B Wing, Van Bhavan, Ramgiri Road, Civil Lines, Nagpur- 440 001
Tel.No.: 0712- 2556916 , E-mail: apccfnodal@mahaforest.gov.in

Email

No.:- Desk-17/FCA-S1/PID-145510/YT/2025-26/1460
Nagpur- 440 001, Dated 25/09/2025

To,

**The Assistant Inspector General of Forest
Ministry of Environment, Forest & Climate Change
(Forest Conservation Division), New Delhi.**

Sub: Submission of Final Wildlife Conservation and Mitigation Plan for diversion of 146.996 ha forest land under section 2 (1) (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 for Integrated Coal mining including post mine reclamation in Marki Mangli II Coal Block in Yavatmal District, Maharashtra State in Favour of M/s Yazdani International Pvt. Ltd. (FP/MH/MIN/145510/2021)- Regarding

Ref: 1. Government of India, Ministry of Environment, Forests and Climate Change, New Delhi letter dated-25.02.2025
2. Principle Chief Conservator of Forests (Wildlife), Maharashtra State, Nagpur vide letter No. Desk 23 (2)/WL/Survey/C.No149/766, dated 30.05.2025

Sir,

The Government of India, vide letter under reference no. 1, has informed that the competent authority of the Ministry desires to obtain comments regarding the Wildlife Conservation Plan submitted by the State Government.

Accordingly, the Principal Chief Conservator of Forests (Wildlife), Maharashtra State, Nagpur has already submitted a copy of the mitigation plan. A copy of the same is enclosed for further necessary action.

(Naresh Zurmure)

Addl. Principal Chief conservator of Forest &
Nodal Officer

Copy to:

Principal Chief Conservator of Forests (Wildlife), Maharashtra State, Nagpur
Chief Conservator of Forests (T), Yavatmal



Forest Department

Principal Chief Conservator of Forest (Head of Forest Force)
Maharashtra State



Phone No.- 0712-2560953 Principal Chief Conservator of Forest (Wildlife) Maharashtra State.

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Website – www.mahaforest.gov.in “Van Bhavan”, 3rd Floor, Ramgiri Road, Civil Lines, Nagpur – 440 001.

Email No :- Desk-23(2)/WL/Survey/C.No.149/766 /2025-26 Date 30/05/2025

To,

The Assistant Inspector General of Forests,
Ministry of Environment Forest & Climate Change
(Forest Conservation Division), New Delhi.

Sub :- Submission of Final Wildlife Conservation and Mitigation Plan for diversion of 146.996 ha forest land under section 2(1) (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 for Integrated Coal Mining including post mine reclamation in Marki Mangli II coal Block in Yavatmal District, Maharashtra State in favour of M/s Yazdani International Pvt. Ltd. (Online number FP/MH/MIN/145510/2021)- Regarding.

Ref :- 1. Wildlife Institute of India, Dehradun Letter dated 09/02/2025 received through MoEF&CC (FCA Division) dated 25/2/2025.
2. This office letter no. Desk-23(2)/WL/Survey/C.No.149/5673, dated 11/03/2025.
3. Wildlife Institute of India, Dehradun letter no. WII/AE&CB/BH/Dongargaon-Limestone/ 281/2024-01, dated 25/03/2025.
4. Additional Principal Chief Conservator of Forests & Nodal Officer, Nagpur letter no. Desk-17/FCA-S1/PID-145510/Yavatmal/362, dated 20/05/2025.

As per reference letter no.(2) dated 11/03/2025 the revised Wildlife Mitigation Plan for Marki Mangli-II coal block was sent to Wildlife Institute of India, Dehradun.

As per reference letter no.(3) dated 25/03/2025 Wildlife Institute of India, Dehradun has given remarks to revise the mitigation plan. The user agency has submitted revised mitigation plan to office of Additional Principal Chief Conservator of Forests & Nodal Officer, Nagpur vide letter dated 08/05/2025. Additional Principal Chief Conservator of Forests & Nodal Officer, Nagpur has requested vide reference letter no.(4) dated 20/05/2025 for appropriate action.

As project agency has submitted compliance to queries raised by Wildlife Institute of India, Dehradun, the wildlife conservation and mitigation plan is forwarded for further necessary action.

Encl : As above.



(M. Srinivasa Rao)
Principal Chief Conservator of Forests
(Wildlife), Maharashtra State

- Copy to :-
1. Director, Wildlife Institute of India, Dehradun for kind information.
 2. Additional Principal Chief Conservator of Forests & Nodal Office, M.S. for information and necessary further action.
 3. Additional Principal Chief Conservator of Forests (Wildlife) East, Nagpur for information.
 4. Conservator of Forests (T), Yavatmal for information and necessary action.
 5. M/s Yazdani International Private ltd. Bhuvneshwar for information.
Email ID- ashok@yazdaniinternational.com

**Office of the Principal Chief Conservator of Forests (Head of Forests Force),
Maharashtra State, Nagpur**

Additional Principal Chief Conservator of Forests & Nodal Officer, M.S.Nagpur
1st Floor, B Wing, Van Bhavan, Ramgiri Road, Civil Lines, Nagpur- 440 001
Tel.No.: 0712- 2556916 , E-mail: apccfnodal@mahaforest.gov.in

No. : Desk-17/FCA-S1/PID-145510/Yavatmal/362
Nagpur – 440 001, Dated 20/05/2025

To:
Principal Chief Conservator of Forests (Wildlife),
M.S.Nagpur

Sub :- Submission of Final Wildlife Conservation and Mitigation Plan for
Diversion of 146.996 ha. forest land under section 2(1)(ii) of the Van
(Sanrakshan Evam Samvardhan) Adhiniyam, 1980 for Integrated Coal
Mining and Post-Mining Reclamation in Marki Mangli II Coal Block,
Yavatmal District, Maharashtra in favour of M/s Yazdani
International Private Limited (Online No. FP/MH/MIN/145510/2021) –

Ref :- Letter from Vice President, Yazdani International Private Limited,
Bhubaneswar dated 8/5/2025

The request letter dated 8/5/2025 from the User Agency has been received in this office. A
copy of the same is enclosed herewith for necessary action.

You are therefore requested to take appropriate action in the matter and inform this office
accordingly.

Encl :- As above

(Handwritten signature and date 20/5/25)

(Naresh Zurmure)
Additional Principal Chief Conservator of Forests
& Nodal Officer, Nagpur

Copy to the M/s Yazdani International Private Limited, 7th Floor, C-Wing, Fortune Towers,
Chandrasekharpur, Bhubaneswar -- 751023 (Odisha) for information.

23(2)

(Handwritten initials and date 21/5)

(Handwritten signature and date 22/5)

(Handwritten signature and date 22/5)



Yazdani
International (P) Ltd.
Steering success, anchoring credibility

Date: 08.05.2025

To
Additional Principal Chief Conservator of Forests (Nodal)
Government of Maharashtra,
Van Bhavan, Civil Lines
Nagpur 440001

Subject: Submission of Final Wildlife Conservation and Mitigation Plan for Diversion of 146.996 ha of Forest Land under Section 2(1)(ii) of the Forest (Conservation) Act, 1980 for Integrated Coal Mining and Post-Mining Reclamation in Marki Mangli II Coal Block, Yavatmal District, Maharashtra in favour of Yazdani International Pvt. Ltd. (Online Proposal No. FP/MH/MIN/145510/2021)

Reference:

1. Letter from AIG of Forests, MoEF&CC dated 25/02/2025
2. Letter from Wildlife Institute of India (WII), Dehradun dated 25/03/2025
3. Letter from the User Agency dated 02/04/2025

Respected Sir/Madam,

With reference to the above, the Assistant Inspector General of Forests, MoEF&CC, vide their letter dated 25/02/2025 (Ref. 1), has requested the submission of a Wildlife Conservation Plan, duly revised as per the suggestions of the Wildlife Institute of India (WII), Dehradun.

Subsequently, WII, vide letter dated 25/03/2025 (Ref. 2), provided their comments on the draft plan. The User Agency, vide letter dated 02/04/2025 (Ref. 3), submitted the revised Wildlife Management Plan (WMP), incorporating inputs from Dr. Habib Bilal, Scientist at WII.

The final Wildlife Conservation and Mitigation Plan has been updated to align with the requirements and suggested framework, including financial provisions. The plan includes mitigation measures at both project and forest division levels and outlines cost allocations to be deposited under CAMPA. Additionally, it incorporates contributions to the Wildlife Conservation Trust as per the directives of the Government of Maharashtra.

The final Wildlife Conservation and Mitigation Plan is now submitted along with an executive summary and the cost estimates of the Wildlife Conservation and Mitigation Plan. The same is enclosed for your ready reference and consideration for approval.

You may kindly note that the issuance of Stage-I Forest Clearance is pending for the endorsement of WII, as per the directive in Ref. 1 though it has been discussed and recommended in FAC held in August 2024 This in turn is holding up further statutory clearances including Environmental Clearance, Wildlife Clearance, and Lease Execution.

In the latest review meeting convened by the Ministry of Coal on 02/05/2025, representatives of MoEF&CC and the APCCF (Nodal) assured that the remaining formalities would be completed shortly.

It is reiterated that all further processing of EC, Lease execution and CTO etc. are on hold for want of stage I approval and impacting performance parameters issued by Ministry of Coal.

We, therefore, request you to kindly review the enclosed final Wildlife Conservation and Mitigation Plan, including its financial components, and forward it with your recommendation for endorsement by the Wildlife Institute of India as per the directives of the AIG, Forest.

Thanking you.



Yours sincerely,
Ashok Kumar Pani
Authorized Signatory
Yazdani International Pvt. Ltd.

Copy to:

1. Assistant Inspector General of Forests (MoEF&CC) – for information with a request to kindly issue stage I letter as per the provision mentioned above.
2. PCCF (WL) and CWL along with two sets of Wildlife Mitigation Plan for further action at your end
3. Director, Wildlife Institute of India, Dehradun with one hard copy for review and endorsement

COMPLIANCES OF OBSERVATION/ COMMENTS OF WII DATED 25/3/2025

S. No.	Remarks on revised WMP (February 2025) by WII	Remarks on revised WMP (25 March 2025) by WII	Reply/ Compliances submitted by YIPL on remarks of WII raised on 25.03.25
1.	<p>The list of faunal species is not comprehensive, includes only large common mammals/birds/herpetofauna, and omits smaller mammals. Further the schedules under which these species are placed are not updated based on the revised WPA, 1972.</p>	<p>The schedules are still not as per the 2022 amendment of the WPA, 1972. Further, several faunal species found in the region such as common palm civet, small Indian civet, rusty spotted cat have not been mentioned. Further, several errors have been made in the list of species. Common names and vernacular names have been interchanged for many species. The common name of <i>Hyaena hyaena</i> has been given as wild dog.</p>	<p>Schedules presented here are as per the 2022 Amendment of WPA, 1972 Act. Those faunas, which are found/available in the study area are only mentioned in the Schedule furnished in the Chapter No. 3 in the Table 3.4 on page no. 38- 58 of the Wildlife Conservation/ Mitigation Plan Report updated as per the comments received from WII as per the letter dated 25.03.2025. However, the updated list has been presented as.....</p> <ul style="list-style-type: none"> • List of mammals is given in table 3.4.1 on page no. 38 to 41 • List Aves is given in table 3.4.2 on Page no. 41 to 50 • List HERPATOFAUNA is given in table 3.4.3 on Page no. 50 to 52 • List Amphibian is given in table 3.4.4 on Page no. 52 to 53 • List Pisces is given in table 3.4.5 on Page no. 53 to 55 • List Butterflies is given in table 3.4.6 on Page no. 55 to 57

			<ul style="list-style-type: none"> • List Insects is given in table 3.4.7 on Page no. 57 to 58 • A summary of Faunal species is given in the table on page no. 59 • Out of 279 faunal Species 152 faunal species are found in core zone area. <p>Thus, the Tables has been updated comprising faunal species such as Common Palm Civet on sr. no. 28, and small Indian civet on sr. no. 42 of the Table 3.4.1 (Mammals). Rusty spotted cat species is not available in our study area. The list of flora and fauna available in the study area authenticated by DFO, Pandharkawda is already been furnished in the WMP report as Annexure 5 on page no. 168 to 185. The common name of <i>Hyaena hyaena</i> has been corrected to Stripped Hyeana on sr. no. 16 of Table 3.4.1 (Mammals).</p> <p>Similarly, List of Schedule-1 Species as per the 2022 Amendment of WPA, 1972 Act is presented in the same chapter in Table 3.5 on page no. 60 to 62</p>
2.	In addition to being covered under the	The revision mentioned has not been	Yes , it is true that total of 146.996 ha of

	<p>Approved Tiger Conservation Plan of Tadoba Andhari Tiger Reserve, the corridor falls within the modelled tiger corridor as per the publication "Telemetry based tiger corridors of Vidarbha Landscape,</p>	<p>made, and cannot be found on the said page (27, under section 3.1. Tiger Corridor of India).</p>	<p>forest land out of 339.467 ha of the proposed coal block for mining covered under the forest compartments passes through the compartments of forest land which are covered under approved Tiger Conservation Plan (TCP) of Tadoba Andhari Tiger Reserve (TATR) within the modelled tiger corridor as per the publication "Telemetry based tiger corridors of Vidarbha Landscape.</p> <p>Details have been elaborated in Chapter 4 (Page no. 63 to 66) and also under the Para 4.2 on page no. 64 to 66 incorporated in the updated WMP Report</p> <p><i>Similarly, The Location of proposed mine along the identified Tiger Corridor under the 'Telemetry based tiger corridors of Vidarbha Landscape, Maharashtra, India' is shown in yellow color in Figure 4.1 presented on page no. 66</i></p>
3.	<p>A chapter on impacts of the mine on biodiversity (chapter 5) and one on mitigation measures for wildlife and</p>	<p>Adequate measures for noise and light pollution, forest fire prevention and spread of invasive species have not been</p>	<p>Adequate measures for control of Noise, Light, Forest fire and spread of invasive species along with other</p>

	<p>biodiversity have been added (Chapter 9). However, these chapters lack detailed measures and plans.</p> <p>Further, considering that the mine falls within the corridor area, a management plan specifically focused on maintaining the corridor function of the area i.e., maintaining animal movement, is noticeably missing</p>	<p>mentioned. Specific measures and their timelines to mitigate these impacts need to be part of the WMP</p>	<p>environmental parameters affecting wildlife movement due to the said mining projects are given in Chapter 10 title Mitigative measures of the WMP report spread over page no. 131 to 157</p> <p><u>A) Control of Noise pollution</u></p> <ul style="list-style-type: none"> ➤ Adequate measures for control of Noise pollution to minimize the adverse impacts on wildlife movement are given under para 10.3 on page 132 to 134. ➤ Similarly, Zone-wise analysis of noise generation and mitigation to control is given in table 10.1 on page no. 134 of WMP report. <p><u>B) Control of Light pollution & Forest fire Prevention</u></p> <ul style="list-style-type: none"> ➤ Para 9.1.3 in chapter 9 on page no. 128 & 129 elaborates the impacts of lighting effects due to vehicular movements within mine and on approach road resulting in the disturbances of wildlife movement near mine as well as approach ➤ Para 10.4 on page no. 135 gives the mitigative measures for light pollution vis' a vis' para 10.5 on page no. 135, forest fire prevention
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			<p>elaborates on the mitigation for forest fire prevention.</p> <p><u>C) Spread of Invasive Species</u></p> <p>➤ Paragraph 10.6 on page no. 136 provides details about the mitigation given to control spread of invasive species.</p>
4.	<p>In addition to measures to control siltation (Page 36 of report), measures to check heavy metal contamination in the wastewater from mining activities should be explicitly provided.</p>	<p>Regular testing has been mentioned as a measure to control heavy metal and other types of water pollution. The schedule of testing and the parameters to be tested need to be added here.</p>	<p>The details of the suggested Environment Monitoring Program for monitoring of ground as well as surface water quality and the schedule of testing and the parameters to be tested needed for Marki Mangli II Coal Mining Project are provided in Table given in chapter 5, under caption 5.1.4.2 Water environment on page no. 74 & 75</p> <p>Similarly Physical and chemical parameters, Health related parameters and Trace metals ascertained to test the water quality (Surface as well as ground water) to ensure that no adverse impacts on human vis' a vis' wildlife health shall happen are given on page no. 76 to 80</p> <p>Zone-wise magnitude of impacts on water bodies due to the mining project are given in table 10.5 on page no. 145.</p>

			This describes the zone-wise water pollution vs. wildlife risk levels. Similarly, table 10.6.1 & 10.6.2 on page no. 146, gives the strategy for treatment of water before leaching into the streams/surface water to reduce the adverse impact on the health of wildlife.
5.	In addition to educating workers about wildlife in the area, awareness about legal and illegal activities as per the Wildlife (Protection) Act, 1972 should be created periodically. Further, the report should explicitly state that "Project proponent will make sure that no labour camps are located in the mine area, as well as forest areas surrounding the mine".	In addition to educating workers about wildlife in the area, awareness about legal and illegal activities as per the Wildlife (Protection) Act, 1972 should be created periodically. Further, the report should explicitly state that "Project proponent will make sure that no labour camps are located in the mine area, as well as forest areas surrounding the mine".	No further modifications are required as the revisions are adequate.
6.	In addition to checking siltation, the water from sedimentation tank should be tested for heavy metals and sulphides, as the proponents plan to use the water for green belt development. If unchecked, the heavy metals and other pollutants may leach into the groundwater.	The schedule of testing and the parameters to be tested need to be added.	The answer to this query is same as the answers given for questions in serial no. 4 above. <u>Control of Siltation</u> Construction of Toe drains are proposed along with Gabion wall to control siltation. A series of open drains and sedimentation tanks will be provided on dump body to arrest surface run-off and

prevent siltation. In addition to checking siltation, **the water from sedimentation tank would be tested for heavy metals and sulphides**, along with other chemical parameters to assess the water quality and potability. **Parameters need to be tested** for water quality and potability are

PH, Ambient temperature, turbidity, **Chemical Parameters** like- Dissolved Oxygen, Dissolved Solids, Suspended Solids, Chlorides, Sulphates, and Total Hardness, **Health parameters** like fluorides, nitrates, Trace metals viz. Arsenic, Cadmium, Chromium, Mercury, Selenium, lead similarly copper iron manganese and zinc etc. shall be tested periodically to ensure a safe water for consumption of human and wildlife.

The schedule of testing of these parameters are as per the Table under

			<p>para 5.1.4.2 Water environment on page no. 74 & 75 of the WMP report.</p> <p>Similarly, Soil Moisture conservation to <i>retain water holding and reduce siltation is given under para 10.9 in table 10.2 on page no. 139 along with a monetary budget in table 10.3 on page 139 for implementation of soil moisture conservation (SMC) to reduce the siltation.</i></p>
7.	Measures for maintaining the corridor for movement/dispersal of wildlife is missing from the revised report	Measures for maintaining the corridor for movement/dispersal of wildlife is missing from the revised report	No further modifications are required as the revisions are adequate.
Comments on Additional Observations by WI			
8.	Under heading "Waste Management" on Page 34 (Chapter on Mitigation Measures for Environmental Impact), the various types of wastes anticipated to be generated have been listed. However, an explicit plan to manage this waste is missing	An explicit plan to manage different kinds of solid waste is still missing. Instead of "proper handling and management is suggested to avoid such contamination/pollution", a specific plan to handle different kinds of solid waste should be detailed.	<p><u>Solid Waste management:</u> -</p> <p>The significant solid waste in mine is overburden and is fully utilized in Backfilling and Dumps. Detail Management of the OB and associated pollution is given under (Para 10.7.1 on Page 136 to 137)</p> <p>Mitigation measures for soil and moisture Conservation during</p>

			excavation is given under Para 10.8 on page no. 138
9.	In Annexure 6 (Financial Provision for Mitigation of Impact on Wildlife due to Mining Activity), adequate budgetary provisions for repair and maintenance of the chain-link fence (SN 1) and cattle trenches (SN 2) should be made for subsequent years as well (e.g., on 3 rd and 5 th year) to ensure the effectiveness of the measures.	User Agency have included installation and maintenance costs of chain-link fence and cattle trenches in year 1. Annual maintenance costs and details for the next 5 years should be certified by the local DFO.	Budget has been updated indicating Annual Maintenance Cost for next 5 years incorporating the provision for annual maintenance of fencing and cattle trenches etc. and a copy of budget duly approved by DFO is enclosed as Annexure 10 on page no.193 with the compliance report.
10.	Plantation of edible/fruited trees for herbivores should not be done too close to the mining area (Section "Plantation in Buffer Zone" Page 37).	Plantation of edible/fruited trees for herbivores should not be done too close to the mining area (Section "Plantation in Buffer Zone" Page 37).	No further modifications are required as the User Agency have proposed plantation activity in collaboration with Forest Department in the revision.
11.	There is no mine closure plan, and details of previous mines (closed or functional in the area, if any)	The mine closure plan needs to be certified by the local DFO.	The mine plan and mine closure plan has been approved by Ministry of Coal. A copy is annexed as Annexure 8 on page no. 189 to 191 . Further, copy of the approved mine closure plan endorsed by D.F.O is enclosed Annexure 9 on page no. 192 of Wildlife Mitigation plan Report.
12.		Additionally, as per the Wildlife Management Plan submitted for review in December 2024, "Incidentally mine area is well connected to pucca road and	Mine area is well connected to pucca road and hence no new road is required to be constructed for transportation of ore. It is proposed to

		<p>hence no new road is required to be constructed for transportation of ore". However, the re-revised WMP mentions that there is a need for an alternate road for transportation. This requires clarification and further approval since construction of multiple roads would add to the impacts on biodiversity in the area, which is part of a wildlife corridor</p>	<p>strengthen the existing road only by User Agency/Allottee for ore transportation.</p> <p>No new road will be constructed for transportation and has been mentioned in sr.no. 12 of Table-1 of WMP on page number 4</p>
13.		<p>Since the area falls under designated wildlife corridor, a comprehensive and detailed wildlife mitigation plan with timelines and specific measures is desired, which is currently lacking in the management plan.</p>	<p>A detailed and comprehensive wildlife mitigation plan has been prepared and updated in line with the comments and observations of WII time to time.</p> <p>Chapter 7 of the report highlight on the Wild Life Conservation Plan for Schedule-1 species found in the study area. Page no. 90-114</p> <p>Chapter 8 details about an Action plan for conservation/Mitigation of wildlife in the area. Page no. 115-126</p> <p>Chapter 9 predicts the impacts of proposed activity on wildlife; However, Chapter 10 gives detailed Mitigation for overcome/ minimizing the negative impacts on wildlife due to proposed mine. Page no. 131-156</p>

			The WMP comprises Timeline in Chapter 11 on page no.161 in Table 11.3," Timeline for implementation of Wildlife Mitigation plan" and a budget on page no. 159-160 duly certified by DFO on page no. 193
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Copy to:

1. The Director, Wildlife Institute of India, Post Box No.18, Chandrabani,Dehradun-248001,Uttarakhand.
2. Additional Principal Chief Conservator of Forests & Nodal Office, M.S

Wildlife Conservation & Mitigation Plan for Marki Mangli-II Coal mine,

(Updated after incorporating the suggestions by WII dated 25/3/2025)



MINING WITH CARE: A MODEL FOR ECOLOGICAL CO-EXISTENCE

Project Agency: - Yazdani International Private Limited, Bhubaneshwar

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

A) INDEX

Sr. No.	Chapter/Paragraph	Particulars/Contents	Page No.
1.		Executive Summary	A-B
2.		prologue	i-vii
3.	Chapter - 1	Introduction	1-8
	1.1	About the Industry	1-2
	1.3	Salient Features of the project	2-4
	1.4	Climate of the Project Area	4-6
	1.5	Socio Economic Status	6-8
4.	Chapter 2	Need of Wildlife Conservation & Mitigation Plan	9-10
3.	Chapter - 3	Biological study	11-62
	3.1	Objective of biological study	11
	3.2	Type of Forests	11-13
	3.3	Terrestrial Flora and Fauna	13
	3.4	Methodology	13
	3.4.1	Sampling Design and Enumeration of Floristic Data and Vegetation Analysis	13-16
	3.4.2	Flora Biodiversity	16-18
	3.4.2.1	Methodology for Terrestrial Flora	17-18
	3.4.2.2	Selection of Monitoring Location	18-19
	3.4.2.3	Observations and Results	23
	3.4.2.3	Fauna Biodiversity	36
	3.4.2.3.1	Methodology for Assessment of Faunal Diversity	36-59
	3.4.2.3.2	Sources of Secondary Information	59
	3.4.2.3.3	Endangered Flora	60
	3.4.2.3.4	Endangered Fauna	60
4.	Chapter - 4	Tiger Corridor and its Importance	63-68
	4.1	Tiger Corridor of India	63
	4.2	Corridor identified in Telemetry Study by WII	64-66

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

5	Chapter - 5	Description of Environment	69-85
	5.1.1	Baseline	69-71
	5.1.2	Present Environmental Scenario	71
	5.1.3	Environmental impact Assessment Study	72
	5.1.4	Existing/ Present Environmental Scenario Prior To Commissioning Of The Project.	72
	5.14.1	Ambient Air Quality	73
	5.1.4.1.1	Results and Discussion	73-74
	5.1.4.2	Water Environment	74
	5.1.4.2.1	Physical Parameters	76
	5.1.4.2.2	Chemical Parameters	76
	5.1.4.2.3	Health Related Parameters	77
	5.1.4.2.4	Trace Metals	77-78
	5.1.4.2.5	Surface water quality	78-79
	5.1.4.2.6	Ground water quality	80
	5.1.4.3	Details Of Wet Lands / Major Water Bodies	80
	5.1.4.4	Noise Environment	80
	5.1.4.4.1	Noise & Vibration Management	81
	5.1.4.5	Solid Waste Handling – Soil & Overburden	82
	5.1.4.5.1	Soil Environment	83
	5.1.4.5.2	Impact on Soil	84-85
6	Chapter - 6	Mine Closure Plan with Habitat Restoration	86-89
	6.1	Introduction	86
	6.2	Wildlife-Focused Closure Activities	86-87
	6.3	Cost Estimate – Per Hectare of Restored Mined Area	87
	6.4	Post-Mining Tiger Habitat Restoration Plan: Best Practices & Activities	87
	6.4.1	Ecological Restoration of Mined-Out Land	87
	6.4.2	Prey Base Recovery	87
	6.4.3	Corridor and Landscape Connectivity Enhancement	88
	6.4.4	Monitoring and Adaptive Management	88

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

	6.4.5	Community Integration and Human-Wildlife Conflict Reduction	88
7	Chapter - 7	Wildlife Conservation plan for Schedule-1 Species	90-114
	7.1	Introduction	90
	7.2	Need for the conservation plan	90-92
	7.3	Endangered Flora	92
	7.4	Endangered Fauna	92
	7.5	Status Of Wildlife Belonging to Schedule-I	95
	7.5.1	TIGER (PANTHERA TIGRIS)	95-99
	7.5.2	LEOPARD (PANTHERA PARDUS)	99-101
	7.5.3	INDIAN PEAFOWL (PAVO CRISTATUS)	101-102
	7.5.4	BLACKBUCK (ANTILOPE CERVICAPRA)	103-104
	7.5.5	INDIAN WOLF (CANIS LUPUS PALLIPES)	104-106
	7.5.6	CHINKARA (GAZELLA BENNETTII)	106-108
	7.5.7	SLOTH BEAR (MELURSUS URSINUS)	109-112
	7.5.8	FOUR-HORNED ANTELOPE (TETRACERUS QUADRICORNIS)	112-113
	7.5.9	ROCK PYTHON (PYTHON MOLURSUS)	113-114
8	Chapter - 8	ACTION PLAN AND FINANCIAL PROJECTION FOR CONSERVATION PLAN	115-126
	8.1	Introduction	115-
	8.2	Action Plan	115-
	8.2.1	Non-formal Education	115-116
	8.2.2	Institutional Infrastructure	116
	8.2.3	Indian Tradition of Conservation	116
	8.2.4	Role of the Individual	116-117
	8.2.5	Improvement of Water availability	117
	8.2.6	Eco-Development Works	117
	8.2.7	Horticultural Nursery	117-118
	8.2.8	Controlled grazing	118
	8.2.9	Protection against fire	118
	8.2.10	Protection against hunting	118

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

	8.2.11	Checks and control on the Movement of Vehicle	119
	8.2.12	Pressure horn	119
	8.2.13	Vehicles head lights	120
	8.2.14	People Participation	120
	8.2.15	Encourage local villagers to grow trees on their on their field bounds/court yards	120
	8.2.16	Reducing Environmental Pollution	120
	8.2.17	Provide employment to the villagers	120
	8.3	PLANTATION IN THE BUFFER ZONE	121
	8.4	SUPPORTING ACTIVITIES REQUIRED FROM STATE GOVERNMENT	122
	8.6	ACTION PLAN & FINANCIAL PROJECTION	122-126
9	Chapter - 9	Prediction of Impacts of Opencast Mining on Wildlife	127-130
	9.1	IMPACTS OF PROPOSED MINING ON FLORA, FAUNA AND ECOSYSTEM	127
	9.1.1	Direct loss in the form of Removal of Trees	127-128
	9.1.2	Interference of noise generated due to construction and transport to the wildlife.	128
	9.1.3	Lighting effect from the vehicles	128-129
	9.1.4	Fragmentation to the forest and other important habitat areas	129
	9.1.5	Decline in wildlife population, their flow and movement	130
	9.1.6	Reduced access to summer and winter ranges of ungulates, breeding sites and nesting habitats of birds	130
10	Chapter - 10	Mitigation for wildlife conservation (WMP)	131-156
	10.1	Flora and fauna Conservation and Mitigation Measures	131
	10.2	Management of Activities	131-132
	10.3	Control of Noise Pollution	132

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

10.4	Control of Light pollution	132-135
10.5	Forest Fire prevention	135
10.6	Invasive Species Management	136
10.7	Solid waste Management	136-
10.7.1	Overburden dumps management	136
10.8	Strategies/Mitigative measures delineated to minimize the impacts on wildlife within the project area	138
10.8	Soil and moisture conservation	138
10.9	Zone wise Soil Moisture Conservation Plan	139
10.10	Preventive steps for the animals not to fall in the Mine Pits	140
10.10.1	Restoration of soil dump	140
10.10.2	Control of siltation	140
10.10.2.1	Physical Parameters	141
10.10.2.2.	Chemical Parameters	141
10.10.2.2.1	Health Related Parameters	141
10.10.2.3	Wildlife encounter in the project area	141
10.10.3	Strategies/Mitigative measures delineated to minimize the impacts on wildlife outside the project area	141
10.10.31	Plantation in Buffer Zone	141
10.10.3.2	Creation of water holes and water sheds at appropriate places	142
10.10.4	Establishment of Joint Forest Management and Biodiversity Committees	142
10.11	Nursery development	142
10.12	Surface Water Pollution Control Measures	142
10.13	Ground Water Pollution Control Measures:	145
10.14	Water Security Plan	147
10.15	Dust Generation and Wildlife Impact from Mining – Zone-wise Assessment	148

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

	10.15.1	Sources of Dust in Mining and Related Activities	148
	10.15.2	Zone wise dust load and impacts on wildlife and mitigations	148
	10.16	Non-formal Education	149
	10.17	Institutional Infrastructure	149
	10.18	Indian Tradition of Conservation	149
	10.19	Role of the Individual	150
	10.20	Improvement of Water availability	150
	10.21	Eco-Development Works	150
	10.22	Horticultural Nursery	151
	10.26	Controlled grazing	151
	10.24	Protection against fire	151
	10.25	Protection against hunting	151
	10.26	Checks and control on the Movement of Vehicle	
	10.27	Pressure horn	
	10.28	Vehicles head lights	
	10.29	People participation	152
	10.30	Encourage local villagers to grow trees on their on their field bounds/court yards	153
	10.31	Reducing Environmental Pollution	153
	10.32	Provide employment to the villagers	153
	10.33	Integrating Biodiversity Enhancement with Mining Activity	153
	10.33.1	During Project Development	153
	10.33.2	During Mining Operation	154
	10.33.3	During Closure	155
	10.33.4	Habitat Management for Wildlife	155
11	Chapter 11	Cost estimate for the implementation of measures of mitigation of impacts of mining on Environment, Ecology and Habitat	157-161

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

	11.1	Introduction	157
	11.2	Timeline for implementation of wildlife mitigation plan	161

B) LIST OF TABLES

Sr. No.	Table no.	Content	Page No.
1.	1.1	Salient features of the project	3-4
2.	1.2	Monthly Mean Rainfall at Yavatmal	5
3.	3.1	Methodology of Data Collection & Paramaters Considered during the survey	17-18
4.	3.2	List of Biological Environment Survey Monitoring Stations	18-19
5.	3.3	List of existing floristic composition within core and Buffer zone	23-36
6.	3.3.1	TREES	23-28
7.	3.3.2	shrubs	29-31
8.	3.3.3	herbs	31-32
9.	3.3.4	climbers	33-34
10.	3.3.5	Grasses & Bambu	34-36
11.	3.4	Faunal Diversity from study area (Core zone & Buffer Zone) updated as per the 22 nd amendment of WPA 1972	38-58
12.	3.4.1	Mammals	38-41
13.	3.4.2	Aves	41-50
14.	3.4.3	Herpetofauna	50-52
15.	3.4.4.	Amphibians	52-53
16.	3.4.5	Pisces	53-55
17.	3.4.6	Butterfly	55-57
18.	3.4.7	insects	57-58
19.	3.5	List of Schedule –I species as per 22 nd amendment of WPA, 1972	60-62
20.	7.4	List of Scheduled I Species as per 22 nd Amendment pf WPA1972	93-94
21.	8.1	Site Specific Integrated Wildlife Conservation Plan	123-125
22.	8.2	Comprehensive conservation plan budget	126
23.	10.1	Zone wise Analysis of Noise Generation	134
24.	10.2	Zone wise Soil & Moisture Conservation Measures	139
25.	10.3	Proposed Measures, Techniques & unit cost for implementation of Soil & Moisture Conservation	139
26.	10.4	Likely Toxic & Heavy Metals leached from Coal block with Special reference to Environment/Health risk	143
27.	10.5	Zonewise Magnitude of Impacts on Water Bodies	145
28.	10.6	Methods & treatment before leaching into streams	146

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

29.	10.6.1	Physico Chemical Methods	146
30.	10.6.2	Passive Green Methods	146
31.	10.15.2	Zone wise dust loads and impacts on Wildlife	148
32.	11.1	Zone wise Impacts and Mitigation Measures & Cost Estimates	158
33.	11.2	Summary of Cost implementation of Wildlife Mitigation plan	159-160
34.	11.3	Timeline for Implementation of Wildlife Mitigation Plan.	161

C) LIST OF ANNEXURES

Sr. no.	Annexure No.	Contents	Page No.
1.	1	Vesting Order	162-164
2.	2	Location of MM II Project on the Forest map	165
3.	3	Cadastral Map	166
4.	4	Distance from Tipeshwar Tiger Reserve buffer zone	167
5.	5	Authenticated List of flora and fauna found in RF around the proposed mining project as endorsed by Dy. Conservator of forests, Pandharkawda.	168-185
6.	6	Mine Closure Plan	186-187
7.	7	Undertaking not to establish labour camps in forest area	188
8.	8	Approval of mining Plan from competent Authority	189-191
9.	9	Certified Copy of Approved Mine Closure Plan from DFO	192
10.	10	Certified Budget from DFO	193

D) LIST OF FIGURES

Sr No.	Figure No	Particulars	Page No.
1.	1.1	Location of proposed Marki Mangli-II Coal Block	2
2.	1.2	Gender ratio in the project area	6
3.	3.1	Location of Sample Plots for Flora Study	20
4.	3.2	Location of Forest Patches around Mining Lease	21
5.	3.3	Google Map showing forest area in core zone	22
6.	4.1	Location of proposed mine along the identified Tiger Corridor under the 'Telemetry based tiger corridors of Vidarbha Landscape, Maharashtra, India'	66

EXECUTIVE SUMMARY

The proposed coal mining project of Marki Mangli II comprises 146.996 Ha from Ruikot, Sawali, Pardi villages of Zari Jamni Tahsil of Yavatmal District of Maharashtra. Proposed coal block is 28 km away from Tipeswar WLS and falls within a critical ecological landscape as it forms part of approved Tiger Conservation Plan of Tadoba Andhari Tiger Reserve and forms connecting link as per Telemetry based Tiger Corridors of Vidarbha Landscape by WII. The project necessitates an Integrated Wildlife Conservation and Mitigation Plan to ensure ecological sustainability alongside resource extraction through opencast mining under the provision of section 38-1(O)(g) of WPA 1972.

Baseline surveys identify the forest as Southern Tropical Dry Deciduous, hosting species like Tiger, Leopard, Sloth Bear, Chital, Critical wildlife movement corridors and seasonal water sources have been mapped within the project influence zone (1 km, 5 km, 10 km).

Impact assessment highlights potential threats such as habitat loss, disturbance from mining operations, and disruption of wildlife corridors. Special attention is given to address the impacts on Schedule I species and water-dependent biodiversity.

The Mitigation Strategy emphasizes:

- Ensuring safety of wildlife from entering into the mining pits using eco-friendly barriers like chain link fencing, trench around mine lease area and creating green belt of native species in safety zone and 100 meters beyond lease boundary in forest area.
- Minimization of dust, noise, and barrier effects through engineering and operational controls.
- Restoration of habitats through native species plantation and scientific reclamation of OB dumps and backfilled area with bio-remedial interventions
- Strengthening of wildlife corridors to maintain landscape connectivity.
- Prey base enhancement for carnivore conservation and habitat improvement in buffer area through multiple interventions like promoting natural regeneration, gap filling, removal invasive species, soil and moisture conservations, water holes creation, solar pumps on water resources etc.

A Monitoring and Adaptive Management Framework is proposed, including wildlife population tracking, habitat quality assessments, and environmental parameter monitoring, with adaptive management loops to refine conservation actions.

Local community participation is integral, promoting eco-development, alternative livelihoods, and participatory conservation initiatives.

The plan is structured for phased implementation with defined timelines, responsibilities, and budget allocations, ensuring a science-driven, inclusive, and resilient approach to conservation during mining operations.

**SUMMARY OF BUDGETARY PROVISIONS FOR THE IMPLEMENTATION OF WILDLIFE
CONSERVATION/MITIGATION PLAN**

Sr. No	Activity Head	Responsibility	Amount in Crores
1	Mitigation Measures to be implemented within leasehold area of project	Project Proponent	7.92
2	Mitigation Measures to be implemented by FD in 500-meter buffer zone	Forest Department Pandharkawda	4.48
3	Wildlife Conservation Measures in influence zone of 5 km from lease boundary as approved by PCCF (WL)	CAMPA	1.775
4	4% of project cost in wildlife area to be deposited with Wildlife Conservation Trust as per advice of PCCF (WL) GOM	WL Conservation Trust of WLS as per advice of CWL GOM	3.289
		TOTAL	17.47

Prologue

The Marki Mangli II Coal Mine (ML area 339.467 Ha: Forest 146.996 ha & 192.471 ha Non-Forest Land as per block summary provided by Ministry of Coal) at village Ruikot, Savli, Mukutban and Pardi of Tahsil Jhari-jamni, Dist Yavatmal, Maharashtra has been vested in favor of Yazdani International Private Limited, Bhubaneswar, Odisha being the successful bidder Vide order NA-104/3/2020-NA date March 03, 2021.

The National Tiger Conservation Authority in collaboration with the Wildlife Institute of India has published a document titled "Connecting Tiger Populations for Long-term Conservation", which has mapped out 32 major corridors across the country, management interventions for which are operationalized through a Tiger Conservation Plan, mandated under section 38V of the Wildlife (Protection) Act, 1972. **Proposed project location is not part of major 32 notified Tiger Corridor.**

Wildlife Institute of India has published a report titled "Telemetry based Tiger Corridors of Vidarbha Landscape, Maharashtra, India" (WII Report). This report is about the delineation/identification of critical tiger corridors in Vidarbha Landscape of Maharashtra. The report is based on monitoring of tiger movement over a long period of time, from 2015 to 2020. which has identified 37,067 square kilometres of tiger movement corridors within the 97,321 square kilometre landscape, revealing the importance of agricultural lands and human-dominated areas for tiger movement. Forest land of 146.996 ha involved in this project is covered under approved Tiger Conservation Plan and hence attracts section 38-(O) -(g) of Wildlife Protection Act 1972.

This area with significant Landscape acts as a crucial link between central and southern Indian tiger populations, facilitating gene flow and population viability.

Present Wildlife Conservation Plan comprising wildlife mitigation plan (WMP) has been modified after incorporating extensive details of floral and faunal biodiversity study as suggested by WII in core and buffer zone and all the observations and

suggestions of WII communicated vide letter 11/03/2025 and 25/3/2025. (**Appendix 1**)

Reports elaborate the strategies proposed for reducing the impacts of mining on wildlife through mitigation measures at project site zone (Lease area including safety zone of 750 meter along lease boundary), buffer area up to 100 meter after lease boundary and strengthening support of eco-zone up to 5 km with adequate budgetary support.

❖ ***Strategies/Mitigative measures delineated to minimize the impacts on wildlife within the project area including safety zone of 7.5 meter in forest as well as non forest area along lease boundary.***

1. Soil and moisture conservation:

Mining activity in the proposed area will involve clearing of vegetation. Mining activity will also involve removal of top soil. Due to removal of vegetation cover and top soil, moisture in the soil tends to reduce. The following strategies will be useful in mitigating and to conserve the essential moisture.

- Garland drains will be constructed around the mine to arrest any soil from the mine area being carried away by the rain water.
- Toe drains with suitable baffles will be provided all along the toe of the soil dumps to arrest any soil from the dump slopes being carried away by the rain water.
- Plantation of Agave including seeding of grass seeds along contour trenches on slopes of OB dump to minimize erosion to reduce OB dump erosion and plantation of readily developed trees with proper bio cultures and nutrients
- Gully formations, if any, on sides of the benches will be provided with check dams of local stone or sand filled bags. The inactive slopes will be planted with bushes, grass, shrubs and trees after applying top soil to prevent soil erosion.

- Retaining walls (concrete or local stone)/ gabion structures will be constructed, around the stockpile or wherever required, to support the benches or any loose material as well as to arrest sliding of loose debris.
- Regular addition of manure and vegetative mulches in soil.

2. Preventive steps for the animals not to fall in the Mine Pits

Company shall strictly observe the mitigation to protect wildlife in the area by fixing a Chain link fencing around the mine of height 2.5 to 3 meter to prevent wild life from falling into the mine pit. Additional fencing at inner side of the 7.5m green belt is also proposed to develop green belt to reduce dusts from mining activities. Cattle trench around the mine outside the leasehold boundary would help in this direction besides chain link fencing.

3. Restoration of Overburden dump

In line with the provision of regulation 106(2) of CMR and the circular issued by DGMS, Gol company have carried out a slope stability study by Visveswaraya National Institute of Technology (VNIT), Nagpur for planning, designing and safety of the overburden dumps created during mining operations and also to ensure Slope stability to reduce soil erosion through bio-engineering , terracing with grassing of slopes besides plantation of native species having deep root systems and besides use of Geo-synthetic fabrics for slope stabilization. This will control the landslides from the dumps so that no human or wildlife in the vicinity of OB dump shall get injured.

4. Control of siltation

Construction of Toe drains are proposed along with Gabion wall to control siltation. A series of open drains and sedimentation tanks will be provided on dump body to arrest surface run-off and prevent siltation. In addition to checking siltation, the water from sedimentation tank would be tested for heavy metals and sulphides, along with other chemical parameters to assess the water quality and potability.

Parameters need to be tested for water quality and potability are given below and shall include....

4.1 Physical Parameters

Like PH values of all ground water and surface water to ensure the values are within the acceptable pH range of 6.5 to 8.5 as per IS 10500:2012 standards for drinking water. Ambient temperature and turbidity shall also test to make the water drinkable and to use for plantations after processing if the values are not within the permissible limits.

4.2 Chemical Parameters

Like Dissolved Oxygen, Dissolved Solids, Suspended Solids, Chlorides, Sulphates, and Total Hardness shall also be test periodically to ensure a safe water for consumption.

4.3 Health Related Parameters

Like fluorides, nitrates, Trace metals viz. Arsenic, Cadmium, Chromium, Mercury, Selenium, Lead similarly copper iron manganese and zink shall also be tested periodically to ascertain the results within standards.

5. Wildlife encounter in the project area

Small animals like squirrel, mongoose, and snakes may enter in to the area. The user agency will educate the labours and staff to protect these animals and not to harm them. Contact details of snake rescuers in the area will be available with the security room. In case on snake encounter the staff will be trained to report the sighting to the security room for safe rescue.

❖ Strategies/Mitigative measures delineated to minimize the impacts on wildlife outside the project area (Buffer up to 100 meter)

6. Plantation in Buffer Zone

Natives Trees will be planted in the buffer zone forest under assistated regeneration floral development and gap filling .. Some of the tree species includes **Saja** (*Terminalia tomentosa*), **Baheda** (*Terminalia bellerica*), **Bija** (*Pterocarpus masupium*), **Bargad** (*Ficus benghalensis*), **Peepal** (*Ficus religiosa*), **Mahua** (*Madhuca latifolia*), **Sal** (*Shorea robusta*), etc. Care will be taken to include some fruit bearing trees like **Gular** (*Ficus glomerata*), **Aonla** (*Emblica officinalis*), **Aam** (*Mangifera indica*) and

such trees to provide food to the herbivores which in turn will be the food source for the carnivores to maintain the biodiversity of the area.

7. Forest Fire prevention

Fire hazard needs to be prevented for survival of Forest as well as Wildlife. Steps shall be taken for prevention of forest fire. The user agency must create awareness among the truck drivers and their labours not to through cigarette of bidi butts in the forest area. Similarly, company shall avoid labour camps in the forest area to avoid forest fire due to lighting of challah. Special training of JFM committee and Biodiversity committee for fire monitoring and prevention. Required assistance will be provided by the company as and when required.

Strategies/Mitigative measures delineated to minimize the impacts on wildlife outside buffer area up-to 5 kilometer influence zone.

1. Habitat development through promoting natural regeneration and gap plantation, weeds removal to accommodate fruit trees including development of forage to promote prey base for the carnivores
2. Fire protection
3. Creation of waterholes and create source of perennial water sources by providing solar pumps in existing deep wells and ponds around.
4. Establishment of Joint Forest Management, Biodiversity Committees and produced company and their training for management of forest resources alternate livelihood, control grazing, as fire protection squad. These committees would be provided financial support under CSR of the company.
5. **Captive Nursery development with focus of propagation of saplings of native species and species which are vulnerable in this area like Bija (Pterocarpus Marsupium)**

It is proposed to enhance the forest area around the mine by carrying out plantation of native trees and shrubs for plantation in safety zone and buffer area This activity must be done simultaneously with the mining in consultation and guidance of forest department at project cost so that by the end of mining operation good forest cover is developed adjacent to the mine. Thus, user agency

is committed for planning and implementation of the mitigation measures suggested by WII and incorporated in this report.

CONCLUSION:

The proposed open-cast mining project in Ruikot- Mukutban Forest Block in Wani Tauka of Yavatmal District with Latitude 19° 49' 02" N to 19° 50' 31" N and Longitude 78° 48' 56" E to 78° 50' 30" E covered under Toposheet No. 56 1/13 entails impacts in approximately 340 hectares, including 146.996 hectares of classified forest located within a sensitive wildlife corridor landscape as per Telemetry Study undertaken by WII and covered forest compartments in Approved Tiger Corridor.

The area supports Schedule-I fauna such as *Panthera tigris* (Tiger), *Panthera pardus* (leopard), *Melursus ursinus* (sloth bear), *Canis lepus pallipes* (Indian wolf). There are no reported endangered and threatened species of flora. However, *Pterocarpus marsupium* Roxb (Bija) is vulnerable and special efforts will have to be made in plantation program.

Key ecological risks identified includes habitat fragmentation, loss of biodiversity, disturbance to wildlife corridors.

To mitigate these impacts, a comprehensive species- and habitat-specific conservation plan has been formulated with the following major interventions:

- Habitat Protection and Restoration through aided natural generation, gap filling fire protection, soil and moisture conservation in buffer zone upto 5-kilometer influence zone from lease area
- Compensatory afforestation over 155 ha using native species with more focus of vulnerable species
- **Eco-restoration of mined-out areas (backfilling, topsoil management, bio-remediation using bio-culture developed by NEERI for plantation on mined out areas and indigenous planting)**
- Soil stabilization (Technical Reclamation) and grassland creation on overburden dumps

- Schedule-I Fauna Species Specific Conservation:
- Creation of inviolate refuge patches for tiger conservation.
- Conflict mitigation measures for leopard and sloth bear.
- Protection and monitoring of Indian wolf habitats.
- Installation of camera traps, establishment of wildlife corridors, and formation of rapid response teams.
- Endangered, nearly threatened and vulnerable Flora Conservation under plantation programs and reclamation programs
 - Establishment of community medicinal plant zones.
 - Corridor and Connectivity Strengthening:
 - Establishing Wildlife –Community Conflict Resolution and immediate response Committee within company.
 - Formation of Eco-Development Committees (EDCs) for conservation-linked income generation including skill training under CSR initiative of the company
 - Training of local “Wildlife Guardians” for monitoring and conflict resolution through reputed NGO
 - Promotion of eco-tourism initiatives through reputed NGO/ Agency
 - Research, Monitoring, and Adaptive Management:

The total estimated investment for implementing the full conservation and mitigation plan is approximately ₹ 17.47 crore over 5 years, structured into phased actions to align with mining operations and progressive rehabilitation efforts under three heads viz.

1. Project Authority Rs. 7.92 Crore for site specific mitigation measures
2. Forest Division Pandharkawada 1.775 Crore for wildlife conservation to be deposited in CAMPA) and
3. Wildlife Welfare Trust Funds to be deposited with TipheshwarWLS division or TATR as per advice of PCCF (WL) Government of Maharashtra (3.289 Crore)

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

This integrated plan ensures that mining operations are conducted with minimal ecological disruption, enhances conservation of endangered species, restores forest ecosystems disturbed due to mining as per Mine Closure Plan, and strengthens community stewardship of natural resources.

Chapter 1

Project Overview

1.1 About the Industry

Coal is one of the major mineral deposits occurring in the Indian sub-continent. It has played a great role in industrial development. There is a significant demand- supply gap in coal which is a key raw material for production of power. It is therefore necessary to increase the production of coal for power generation to make the country self-sufficient in power sector to maintain pace of sustainable industrial development. The government is also providing various subsidies to industrial sector to help Indian industry to grow.

Coal mining in forest areas, especially those falling within wildlife corridors, presents Significant environmental challenges. The process involves the removal of vast amounts of earth, leading to habitat destruction, fragmentation, and pollution of air, water, and soil. This is particularly concerning when the forest area lies within or near protected wildlife corridors that serve as critical habitats for migratory and endangered species. Such disturbances not only threaten biodiversity but also disrupt ecosystems that are crucial for maintaining wildlife populations and forest health.

1.2 Marki Mangli II Coal Block Salient Features

The Marki Mangli II Coal Mine (ML area 339.467 Ha: Forest 146.996 ha & 192.471 ha Non- Forest Land as per block summary provided by Ministry of Coal) at village Ruikot, Savli, Tahsil Jhari-jamni, Dist Yavatmal, Maharashtra has been vested in favor of Yazdani International Private Limited, Bhubaneswar, Odisha being the successful bidder Vide order NA-104/3/2020-NA date March 03, 2021.

The mining lease area of 340.00 Ha falls in four revenue villages viz., Pardi, Savli, Ruikot and Mukutaban in Yavatmal District of Maharashtra state. The net geological reserves of coal are estimated to be 11.54 million tonnes. It is proposed to produce 0.30 million tonnes / annum of coal from this mine. The

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

life of mine is proposed to be 34 years including construction period. The nearest Tiger Reserve from the proposed mine is around 28 km. The mining operations will be carried out by conventional benching method of opencast with shovel-dumper combination.

Figure 1.1 gives the location of proposed coal deposit. The area of 340 Ha has been earmarked on the Survey of India toposheet No. 56 I/13 on a scale of 1:50,000 and is bounded by the Latitude 19°49'2"N to 19°50'31"N and Longitude 78°48'56"E to 78°50'32"E.

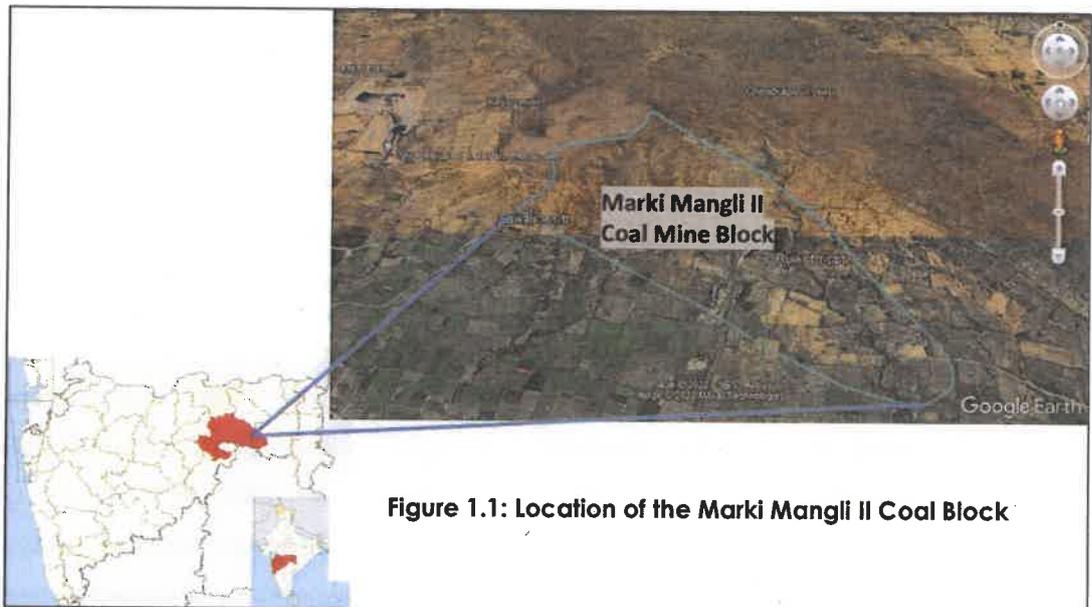


Figure 1.1: Location of the Marki Mangli II Coal Block

The coal block is located around 35 km from Wani. The area can be approached either by Wani-Kayar-Patan road. Kayar and Ganeshpur are located at a distance of 12 km and 5 km respectively from Marki Mangli - II coal block.

Table 1.1: Salient features of the project

SN	Particulars	Details
1.	Applied Mining Leas Area	339.467 Ha
2.	Location	Latitude: 19°49'2"N to 19°50'31"N Longitude: 78°48'56"E to 78°50'32"E

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

		<p>Village: Pardi, Savli, Ruikot, Mukutaban</p> <p>District: Yavatmal</p> <p>State: Maharashtra (Annexure 2)</p> <p>Location of MM II Project on the Forest map</p>
3.	Land ownership	<p>Private Agriculture Land: 181.066 ha</p> <p>Government non forest land: 11.405 ha</p> <p>Grazing land: 7.875 ha</p> <p>Water body: 3.530 ha</p> <p>Forest land: 146.996 ha</p> <p>Reserve forest: 119.078 ha</p> <p>Govt. land: 27.918 ha</p> <p>Cadastral Map Shown as (Annexure 3)</p>
4.	Toposheet No.	56 I/13
5.	Proposed production capacity	0.3 million tonnes/annum
6.	Geological reserve	11.34 million tonnes
7.	Minable reserve	11.34 million tonnes

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

8.	Life of mine	37 years
9.	Project capital cost	189.89 cr.
10.	Protected area around proposed project	Tipeshwar Tiger Reserve
11.	Distance from Tipeshwar Tiger Reserve buffer zone	28 km (Annexure 4)
12.	Transportation of coal	Mine area is well connected to pucca road and hence no new road is required to be constructed for transportation of ore. It is proposed to strengthen the existing road only by User Agency/Allottee for ore transportation.

1.3 Climate of the Project Area

The area has a hot and dry climate. During summer season temperature rises to a maximum of 48°C and humidity falls to a minimum of 10%. Monsoon season starts from mid-June and lasts till mid-September. Winter is experienced between mild-November to January & temperature generally does not fall below 10°C.

Rainfall: The average rainfall during 10 year period was 1,036 mm for Yavatmal District. The maximum rainfall was 1,379.8 mm in 1995 while minimum was 716.4 mm in 2004. Records of rainfall in the district are available for 11 stations for 10 to 49 years. The normal annual rainfall in the district is 1012.1 mm. The rainfall generally increases from the northwest towards the southeast. Ner, near the northwestern border of the district receives 870.3 mm annual rainfall while Pandharkawda near the southeast border receives 1145.7 mm. The rainfall during southwest monsoon accounts for about 87% of the total annual rainfall, July being the most wet month.

Table 1.2 : Monthly Mean Rainfall at Yavatmal

Month		Rainfall, mm
Jan	:	10.7
Feb	:	6.4
Mar	:	17.1
Apr	:	12.9
May	:	20.6
Jun	:	191.1
Jul	:	291.0
Aug	:	283.2
Sep	:	177.3
Oct	:	54.0
Nov	:	15.4
Dec	:	12.4
TOTAL	:	1092.1 mm

Note: Heaviest rainfall recorded in 24 hrs. –256.6 mm on 12.06.1970

Source: IMD Observatory, Yavatmal

Temperature: There are two meteorological observatories in the district, one each at Yavatmal and Pusad. The temperature rises rapidly after the month of February till May which is the hottest month of the year. In May, the mean daily maximum and minimum temperatures recorded are 42.1°C and 27.7°C respectively. On some days in May and June, the maximum temperature rises

up to 47°C. Thundershowers sometimes provide relief from intense heat. With the arrival of the southwest monsoon by middle of June, there is an appreciable drop in day temperatures and the weather becomes pleasant. After the end of September, when the southwest monsoon withdraws, the day temperature increases slightly, but the night temperatures decrease progressively. After October both day and night temperatures decrease rapidly. December is usually the coldest month with the mean daily maximum and minimum temperature at 29°C and 13°C respectively.

Humidity: Except during the monsoon season when the humidity is high (70-80%), the air is generally dry. The summer months are the driest, with the relative humidity in the afternoons being about 20%.

Wind speed and Wind Direction: Winds are generally light to moderate with some increase in speed during May to August. In the post-monsoon and cold seasons, the winds generally blow from east or northeast.

1.4 Socio Economic Status

As per the 2011 Census data the project area comprises of 64 inhabited villages. The village size as estimated from the number of inhabitants as per the census indicated that 28 villages fall within 1- 500 population range, while 16 village are in the population range of 501-1000, 19 villages fall in 1001-5000 population range and only 1 village has population more than 5000. A village Mehandi with population of 59 is the least populated village whereas Mukutban with population of 6785 is the most populated one.

The study area has 64 inhabited villages with a total population of 56,458 comprising of 28,823 male and 27,635 female. The population is distributed among 13,716 households. The male-female Sex ratio of the society with respect to proportion of males and female is shown in the **figure 1.2**.

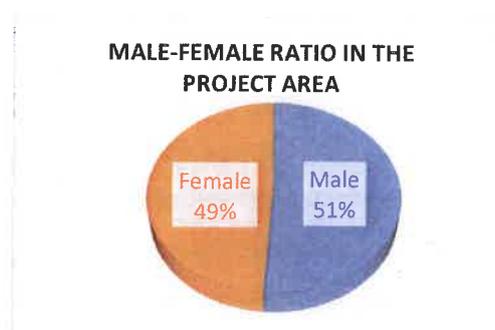


Figure 1.2: Gender ratio in the project area

As per the 2011 census the scheduled caste population of the study area is 7.51% of the total population and scheduled tribe population is 23.78%.

The people are engaged in agriculture, animal husbandry, weaving and craft-related occupations. Some of them sell vegetables and work as labours.

The overall literacy in the 64 villages of the study area is 77.94%. The male literacy in the study area was 87.18% as compared with State figure 88.38%; the female literacy was 68.01% as compared to 75.87% for the State. It may be noted that percentage of literacy of study area was less than State as a whole in both male and female.

The occupational structure is indicative of overall economy of the project area. In the context of development, structural changes always take place and shift of resources always occurs away from the primary sectors (Agriculture, forestry, fishery, dairy, poultry, mining etc.) to the manufacturing sector or the secondary sector. Most of the commodities are provided by these two sectors while tertiary sector provides services. The structural transformation sets the economic development process in motion. Occupational structure of the workforce is indicative of the economic activity in the project area. Any changes in the occupational structure are indicative of economic changes. The occupational structure has been worked out for different categories of occupations in the project area which include cultivators, agricultural laborers, household industry workers etc. The families directly engaged in agriculture i.e. cultivators and agriculture labors combined in study area villages were 60.3 per cent, having agriculture as their main source of income, followed by 23.5 per cent who worked as laborers, 1.5 per cent in the services sector, 10.3 per cent were engaged in business, 2.9 per cent were having other occupation and 1.5 per cent were having HH occupation Data is representative of inclusion of respondents from all occupations and economic activities. In the study area, agriculture is the main source of income for the people. The details indicate that:

- Agriculture is purely dependent upon rainfall which is scanty in study area.

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

- The main crop grown in kharif is Cotton, Soyabean, Tur and other Small Millets and Gram and Wheat in Rabi season.
- Per acre production is less and there is scope for improvement.
- Besides agriculture people are engaged in small and petty business
- There are no cottage industries around and hence there is ample scope for its development. Project proponent is expected to promote cottage industries with special investment under corporate social responsibility.
- The status of marginalized workforce is indicative of high potential for socio-economic development if industrial growth takes place in this area along with natural resources especially agriculture and allied sectors.
- As regards to rearing of domestic animals it was observed that bovine animal (Cow, buffalo and bull) was 57.55 per cent, followed by goat/sheep 19.42 per cent and 23.02 per cent poultry.

Drinking Water Sources: Information on source of drinking water indicated that 78 per cent respondents had community source of water while 22 % have private source for drinking water.

Occupational Pattern: Seasonal diseases are indicative of the fact that precautionary measures are needed in study area villages. Villagers, being in close proximity of Wani have always preferred the services of Private Doctors for disease cure. Health facilities are the one of the most essential parts of livelihood that is needed in this area. They include hospitals, clinics, outpatient care centers, and specialized care centers, such as birthing centers and psychiatric care centers. Good medical facilities are provided by Government of Maharashtra such as Sub-Health center, health center, Anganwadi etc. People are also benefited by various Government health schemes such as Development of Women and Children in Rural areas, Self Help Group, National Rural Health Mission etc. The findings from this survey in the 10 km radius area, indicate that medical facilities are needed to be improved by the Government Health Sub-Centre's is available only in some villages i.e. Parsevni, Sali, Nayakund, Amdi villages. Primary Health Centre is also available in some villages only. In the case of serious condition patients are moved to the nearest villages where hospitals are available. Tuberculosis, Asthma and Cancer diseases are reported in some villages. The degree of the facility is important, so the area requires better health services.

Chapter 2

Need Of Wildlife Conservation and Mitigation Plan

As per the standard ToR condition "A detailed study of flora and fauna in the study area (core zone and buffer zone, 10 km radius of the periphery of the mine lease) shall be carried out. The list of flora & fauna duly authenticated separately for the core and study area and a statement clearly specifying whether the study area forms a part of migratory corridor of any endangered fauna should be given. If the study area has endangered flora and fauna, or if the area is occasionally visited or used as a habitat by Schedule-I fauna, or if the project falls within 15 Km. of ecologically sensitive area, or used as a migratory corridor then a comprehensive Conservation Plan should be prepared and comments of CWLW of the State Govt. should be obtained.

Statutory Requirement Under Section 38-1(O)(G) Of Wildlife Protection Act:

As per updated guidelines issued by MoEFCC (WFC Division) dated 8/7/2024 proposal located in Tiger Corridor linking one wildlife sanctuary with other wildlife sanctuary will require prior recommendations of Standing Committee of National Board of Wildlife.

Wildlife Institute of India has published a report titled "**Telemetry based Tiger Corridors of Vidarbha Landscape, Maharashtra, India**" (WII Report). This report is about the delineation/identification of critical tiger corridors in Vidarbha Landscape of Maharashtra. The report is based on monitoring of tiger movement over a long period of time, from 2015 to 2020. which has identified 37,067 square kilometers of tiger movement corridors within the 97,321 square kilometer landscape, revealing the importance of agricultural lands and human-dominated areas for tiger movement. This area with significant Landscape acts as a crucial link between central and southern Indian tiger populations, facilitating gene flow and population viability.

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

In our case, a total of 146.996 ha of forest land out of 339.467 ha of the proposed coal block mining covered under the forest compartments passes through compartments of forest land which are covered under approved Tiger Conservation Plan (TCP) of Tadoba Andhari Tiger Reserve (TATR) within the modelled tiger corridor as per the publication "Telemetry based tiger corridors of Vidarbha Landscape. Hence, a **comprehensive Conservation Plan comprising wildlife mitigation plan** needs to be prepared and comments of CWLW of the State Govt. should be obtained and processed for obtaining recommendations of SC NBWL, GOI.

Requirment MoEF & CC To Incorporate Wildlife Mitigation/ Management Plan:

As per the directives of MoEF CC (Forest Conservation Division) dated 25/2/2025 given to State Government of Maharashtra for submission of WMP duly endorsed by WII Dehradun.

Chapter 3

Biological Study

3.1 Objective of biological study

A natural ecosystem is a structural and functional unit of nature. It has components, which exists in harmony and survives by interdependence. Study of "Biological Environment" is one of the important aspects in view of the need for conservation of Environmental quality. The study was done to:

- Assess the distribution of floral diversity and faunal life spectra around the project area.
- Record the crop pattern in the study area.
- Record the fauna in the core zone and buffer zone and identification of Schedule-I animal.
- Identification of the impacts of the project on flora and fauna.
- To suggest suitable mitigation measures to eradicate or minimize the adverse impacts, if any.

3.2 Type of Forests

The study area is located in Yavatmal district of Maharashtra state. is a state in the western peninsular region of India occupying a substantial portion of the Deccan Plateau. Maharashtra is the second-most populous state in India and the second-most populous country subdivision globally. Maharashtra is the third largest state of the country with an area of 3,07,713 km². The State lies between 15°35' N to 22°02' N latitude and 72°36' E to 80°54' E longitude. Study area is dominated by the terrestrial vegetation survey, which includes sparse deciduous forests, and degraded forest.

The Yavatmal district of Central Vidarbha Zone of Maharashtra State is located between 20.39925" of North Latitude while 78.11792" of Eastern Longitude. The major area of the district is located in the Southern Plateau of Berar. It is

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

surrounded by Amravati districts in the North, Akola and Parbhani districts in the West, Nanded and Adilabad districts in the South and Chandrapur and Wardha districts in the East. The district comes under assured rainfall area of VIIIth Agroclimatic Zone with average annual rainfall of 1050 mm mostly received during June to September months from the north-eastern monsoon rains. Average annual temperature is 26.8°C. The State is drained by a number of rivers, which include Wardha, Penganga, Narmada, Tapti, Wainganga, Godawari. The State has 36 districts, of which 13 are tribal districts. The state of Maharashtra is home to rich biodiversity and unique biological diversity. It is significantly rich in endemism with respect to many plants having medicinal properties.

As per the Working Plan of Pandharkawada for the period 2012-13 to 2021-22 the forest in the area falls under following categories of Champion and Seth's Classification:

Group 5- Tropical Dry Deciduous Forest,

Sub Group 5A - Southern Tropical Dry Deciduous Forests,

Climax Type – (1) 5A/Cia - Dry Teak Bearing Forests, Local Sub type Teak Forest and (2) 5A/Cib - Dry Teak Forest,

Local Sub type - Degraded Scrub Forest

These forest falls under the Pandharkawada Forest Division and Adilabad Forest Division. The Forest in this division is categorized as Tropical Dry Deciduous Forest as per the Champion and Seth's Classification. The buffer zone having various patches of discrete forest land bears is mostly covered with teak forests, the principal specie is teak (*Tectona grandis*). The other associate tree species are Ain (*Terminalia tomentosa*), Dhawada (*Anogeissus latifolia*), Tiwas (*Ougenia oojeinesis*), Lendia (*Lagerstroemia parviflora*), Tendu (*Diospyros melanoxylon*), Bhirra (*Chloroxylon swietenia*), Beheda (*Terminalia bellirica*), Bija (*Pterocarpus marsupium*), Bel (*Aegle marmelos*), Amaltas (*Cassia fistula*), Awala (*Emblica officinalis*), Char (*Buchanania lanzan*), Dudhi (*Wrightia tinctoria*), Ghoti (*Zizyphus xylocarpa*), Palas (*Butea monosperma*), Dhaman (*Grewia filiaefolia*), Moyen (*Lannea grandis*), Bartondi (*Morinda tinctoria*), Lokhandi (*Ixora parviflora*), Kalam (*Mitragyna parviflora*), Rohan (*Soymida*

febrifuga), Salai (*Boswellia serrata*), Semal (*Bombax ceiba*), Sisham (*Dalbergia latifolia*), Neem (*Azadiracta indica*), Bhokar (*Caridia Macleadii*).

3.3 Terrestrial Flora and Fauna:

Biological communities are the indicator environmental condition and resource of its distribution and survival. Biotic component comprises of both plants (Flora) and animal (Fauna) communities, which interact not only within and between them but also with the Abiotic components, viz. physical and chemical components of the environment. The changes in biotic community are studied in the pattern of distribution, abundance and diversity.

1.4 Methodology

3.4.1 Sampling Design and Enumeration of Floristic Data and Vegetation Analysis

Quadrat Method

The study was aimed at enumeration of the available plant resources and obtaining a broad representation of the existing floristic variations in the mine lease area and surrounding mine lease areas. Enumeration of the plant wealth was done by surveying the area through walking followed by collection and identification of plant specimens. Phyto-sociological aspects of the study were carried out by perambulating and sampling through quadrates method. Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different parts of the areas within the mine lease area as well as the surrounding mine lease area.

Selection of sites for vegetation data was done by random sampling procedure. Accordingly, equal number of quadrates of 10 m x 10 m for the study of tree layer in the mine lease area and surrounding mine lease area were laid. Within these sample plots, 5 sub-plots of 2 m x 2 m were laid out randomly for studying the shrub layer and regeneration of tree species. For information on ground layer including herbaceous species, 5 quadrates of 1 m x 1 m size were laid out within the tree quadrat.

All species encountered during the transect walk were recorded and their herbarium specimens prepared for identification and future use. The girth at

breast height (gbh) of all individuals in each quadrat was measured for all species of trees and woody climbers. All individuals with gbh > 10 cm were considered and recorded as trees (Parthasarathy and Karthikeyan, 1997). Individuals below 10 cm gbh were considered as saplings and shrubs. This concept was tested further during the fieldwork. Basal area of plants was measured following Philips (1959). The plants were identified using floras by Haines (1921-25), Saxena and Brahmam (1994-96).

The primary data recorded on number of individuals in a species and girths were utilized to derive secondary attributes like density and frequency following standard phyto-sociological methods of Misra (1968). Relative values were calculated following Philips (1959). Important Value Index (IVI) was calculated by adding up relative frequency, relative density and relative dominance (Curtis, 1959). In the case of shrubs, herbs and saplings; IVI was calculated based only on relative values, i.e., relative frequency and relative density. Formulae used for various calculations are:

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

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

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

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

$$\text{Mean basal area} = \frac{\text{-----} (C = \text{Mean of the circumference})}{4\pi}$$

$$\text{Total basal area} = \text{Mean basal area} \times \text{Density}$$

$$\text{Mean of the circumference (C)} = \frac{\text{Sum of all cbh of a species}}{\text{Total number of individuals of a species}}$$

$$\text{Relative Density} = \frac{\text{Density of a the species}}{\text{Total density of all species}} \times 100$$

$$\text{Relative Frequency} = \frac{\text{The frequency of a species}}{\text{Total frequency of all species}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{Total basal cover of a species}}{\text{Total basal cover of all species}} \times 100$$

$$\text{Importance Value Index (IVI)} = \text{Relative Density} + \text{Relative Frequency} + \text{Relative Dominance}$$

The Shannon–Wiener Index or species diversity (Whitt, when properly manipulated, always results in a diversity value (H') ranging between 0, indicating a low community complexity and 4 and above indicating high

community complexity. Species diversity (H') was computed following the Shannon and Weiner (1963) information index as follows:

$$H = \sum \frac{n_i}{N} \log_n \frac{n_i}{N}$$

The Stratified Random Sampling Method was followed to select the sample plots for detailed study. Initially, the forest area was divided between moderately dense and degraded forests based on the satellite maps of the study area. These plots were laid in the topographical map of the study area having 1km x 1km grids / quadrants marked. From these quadrants suitable numbers of sample plots were selected both in the Core and Buffer Zones. Taking Latitude and Longitude of the centre of each quadrant as the centre of plot, it was located on the ground with the help of GPS.

3.4.2 Flora Biodiversity

The Vegetation and plant species composition observed and documented during field visit in and around the proposed location of the project. Besides primary surveys in the project sites, published literature and various floras were consulted to prepare an inventory of plant species growing at project sites. The vegetation of the study area is highly degraded and some areas consisting water bodies. The plant diversity is classified into various plant groups such as tree, shrubs, herbs, climbers, sedges and grasses. The plant diversity survey in the project area was undertaken during the summer season with the objectives of preparing a checklist of flora in the study area which is divided into two parts i.e. Core Zone & Buffer Zone.

3.4.2.1 Methodology for Terrestrial Flora

Table 3.1: Methodology of data collection and parameters considered during the Survey

Sr. No.	Aspect	Mode of Data collection	Parameters monitored	Remarks
1.	Terrestrial Biodiversity	By field survey	Floral and Faunal diversity	<p>For Floral Diversity: Random survey, sapling survey/forest inventory, walking transects, collection and identification with the help of relevant literature.</p> <p>For Faunal Diversity: direct and indirect sampling, walking transects, point sampling and nest sampling etc.</p>
2.		From authentic sources like Forests department of Maharashtra and available published literatures from ZSI, BSI etc.	Floral and Faunal diversity and study of vegetation, forest type, importance etc.	Data collected from the working plan of the region, forest types from the authentic literature of Champion & Seth.
3.	Aquatic Biodiversity	By field survey	Floral and Faunal diversity	<p>For Plankton Study- Lackey's drops method and light microscope</p> <p>For other aquatic- Random survey, opportunistic observations</p>
4.		From authentic sources like	Floral and Faunal	Desktop literature review to identify the representative

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

		Forests department of Maharashtra.	diversity and study of vegetation, forest type, importance etc.	spectrum of threatened species, population and ecological communities.
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3.4.2.2 Selection of Monitoring Location

The selection of terrestrial and aquatic ecological sampling location was based on land use pattern, topography and habitat patterns of the study area. Ecological survey was carried out in forest and non-forest areas (agricultural fields, roadsides, urban & semi-urban wastelands, etc.) and the aquatic ecological survey was carried out in rivers & ponds/lakes (within the study area). The study area outside the ML area was divided into three buffer zones stretching for 10 Km radially from the core.

Table 3.2: List of Biological Environment Survey Monitoring Stations

Code	Latitude	Longitude	Near Village	Distance (KM)	Direction	Type of Forest
BS-01	19°49'45.25"N	78°49'37.59"E	Ruikot	-	-	Reserved Forest Area
BS-02	19°50'26.82"N	78°49'29.66"E	Ruikot	-	-	Reserved Forest Area
BS -03	19°49'26.85"N	78°51'17.69"E	Mukutban	1.50	EES	Forest Area
BS -04	19°49'35.91"N	78°54'9.48"E	Chilai	6.90	E	Chilai RF
BS -05	19°49'51.34"N	78°55'25.78"E	Chilai	7.1	E	Chilai RF
BS -06	19°46'28.85"N	78°49'34.63"E	Bailampur	4.91	SSW	Reserved Forest Area
BS-07	19°46'32.73"N	78°49'52.63"E	Bailampur	4.80	SSW	Reserved Forest Area
BS -08	19°49'37.46"N	78°45'42.71"E	Khapri	4.50	W	Sekapur Forest
BS-09	19°50'27.43"N	78°44'38.87"E	Khapri	5.23	NW	Paunar Forest

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

BS -10	19°50'14.10"N	78°43'53.31"E	Khapri	7.9	Nw	Forest Area
BS-11	19°50'43.16"N	78°49'8.87"E	Adakoli	7.4	NNW	Paunar Forest
BS-12	19°53'16.57"N	78°46'25.87"E	Adakoli	7.6	NNW	Paunar Forest
BS-13	19°43'57.27"N	78°50'20.81"E	Chinchgha †	9.8	N	Forest Area
BS-14	19°49'50.65"N	78°55'53.98"E	Chilai	8.9	N	Chilai RF
BS-15	19°51'56.21"N	78°54'5.27"E	Nerad	9.2	SE	Scrub Land

BS=Base Station

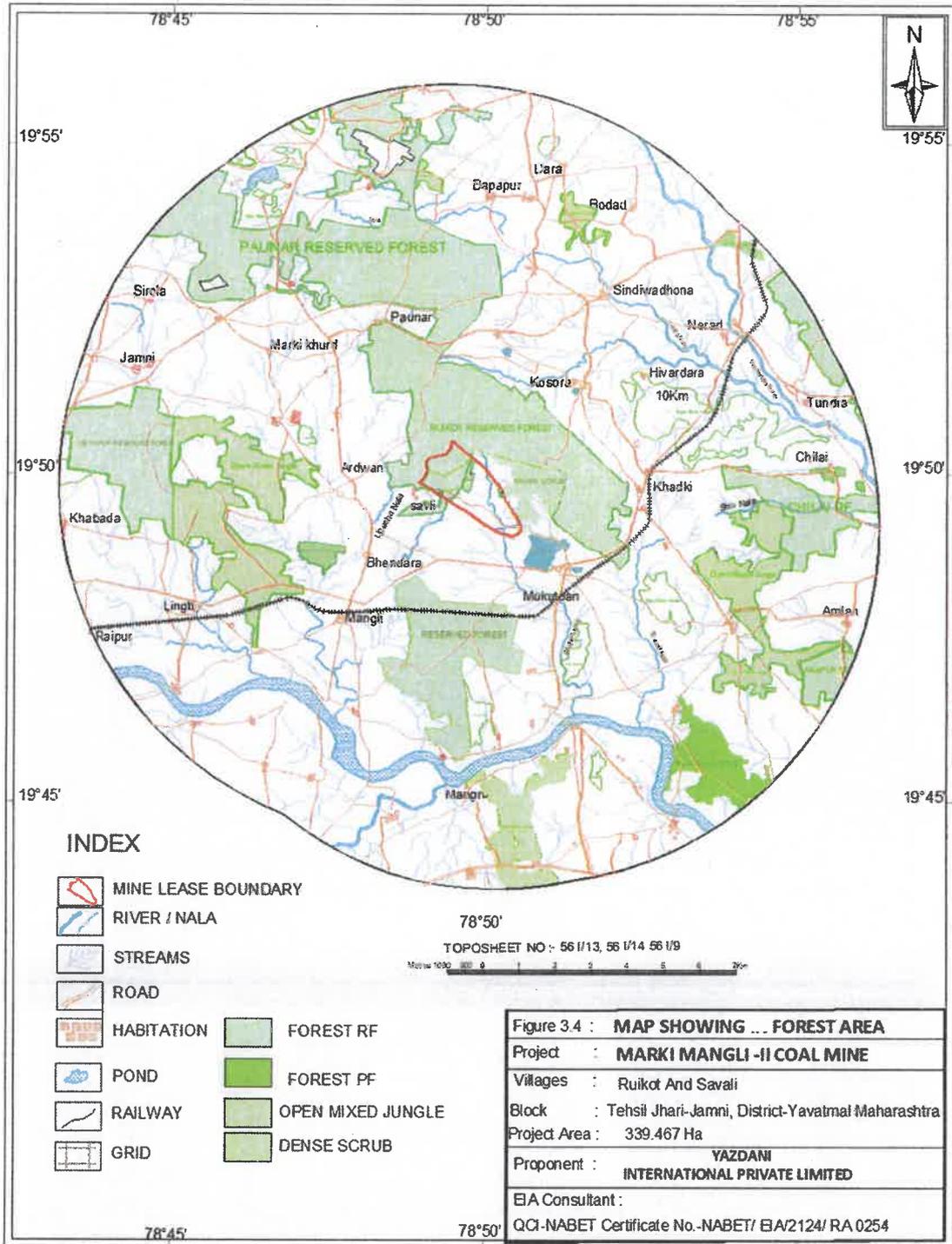


Figure 3.2: Location of Forest Patches around Mining Lease



Fig. 3.3 Google Map showing forest area in core zone

3.4.2.3 Observations and Results

A total of 198 floral species have been recorded during survey in the Buffer zone of the study area having green cover, out of which 85 are trees, 29 are herbs, 37 are shrubs, 24 are climbers, 23 species of Grasses & bamboos have been recorded from Buffer zone. In the Core zone total 171 floral species recorded out of which Tree (65), Shrub (37), Herb (23), climber (23) and Grasses and Bamboos (23).

The dominant and co-dominant species of each site were identified on the basis of relative basal cover. The species having highest relative basal cover was defined as dominant and that having the second highest relative basal cover was defined as co-dominant species. The species richness (number of species per unit area), evenness (distribution of abundances among the species) and unified indices (exponential Shannon– Wiener index and Simpson's diversity) as measures of a-diversity, were calculated for each site.

Authenticated List of flora and fauna found in RF around the proposed mining project as endorsed by Dy. Conservator of forests, Pandharkawda has been provided in this plan as Annexure 5

Given below is the list of flora fauna based on the data collected from field, primary vis' a vis' secondary, and the presence of flora and fauna in the core as well as buffer zone.

Table 3.3: List of existing floristic composition within core and Buffer zone

3.3.1 TREES:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Acacia catechu</i> (L.f.) Willd.	Khair	Fabaceae	*	*
2	<i>Acacia concinna</i> (Willd.) DC.	Sikakai	Fabaceae	*	*
3	<i>Acacia leucophloea</i> (Roxb.) Willd.	Hiwar/Reunjha	Fabaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
4	<i>Aegle marmelos</i> (L.) Corrêa	Bel	Rutaceae	-	*
5	<i>Ailanthus excelsa</i> Roxb.	Maharukh/ Mahaneem	Simarubiaceae	*	*
6	<i>Albizia lebbbeck</i> (L.) Benth.	Kala siris	Fabaceae	*	*
7	<i>Albizia odoratissima</i> (L.f.) Benth.	Chichwa	Fabaceae	*	*
8	<i>Albizia procera</i> (Roxb.) Benth.	Safed Siris/ Karahi	Fabaceae	*	*
9	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr.	Dhaora/Dhawda	Combretaceae	*	*
10	<i>Azadiracta indica</i> A.Juss.	Neem	Meliaceae	*	*
11	<i>Balanites aegyptiaca</i> (L.) Del.	Hingot	Balanitaceae	*	*
12	<i>Bauhinia malabarica</i> Roxb.	Amfi	Fabaceae		*
13	<i>Bauhinia purpurea</i> L.	Keolar	Fabaceae	*	*
14	<i>Bauhinia racemosa</i> Lam.	Asta/Aapta	Fabaceae	*	*
15	<i>Bauhinia variegata</i> L.	Kachnar	Fabaceae	*	*
16	<i>Bombax ceiba</i> L.	Semal	Malvaceae	*	*
17	<i>Boswellia serrata</i> Roxb. ex Colebr.	Salai/ Saliha	Burseracea	*	*
18	<i>Bridelia retusa</i> (L.) A.Juss.	Kasai/Kasahi	Euphorbiacea	*	*
19	<i>Buchanania lanzan</i> (Lour.) M.R.Almeida	Achar/ Char Chiraonji	Anacardiaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
20	<i>Butea monosperma</i> (Lam.) Taub. (<i>Butea Manosperma</i> Kuntze)	Palash/ Parsa/Padas	Fabaceae	*	*
21	<i>Careya arborea</i> Roxb.	Kumbhi/ Bhui	Mayrtaceae	-	*
22	<i>Caryota urens</i> L.	Fish tail palm	Arecaceae	-	*
23	<i>Casearia graveolens</i> Dalzell	Gilchi	Samydaceae	*	*
24	<i>Casearia tomentosa</i> Roxb.	Tondri	Samydaceae	*	*
25	<i>Cassia fistula</i> L.	Amaltas/Bahawa	Fabaceae	*	*
26	<i>Cassine glauca</i> (Rottb.) Kuntze	Jamrasi	Celastraceae	*	*
27	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mainphal	Rubiaceae	*	*
28	<i>Chloroxylon swietenia</i> DC.	Bhirra	Meliaceae	*	*
29	<i>Cochlospermum religiosum</i> (L.) Alston	Galgala	Bixaceae	*	*
30	<i>Cocos nucifera</i> L.	Nariyal	Arecaceae		*
31	<i>Cordia macleodii</i>	Bhokar	Boraginaceae	*	*
32	<i>Dalbergia latifolia</i> Roxb.	Shisham	Fabaceae	-	*
33	<i>Dalbergia paniculata</i> (Roxb.) Thoth.	Dhobin	Fabaceae	*	*
34	<i>Dalbergia sissoo</i> DC.	Sissoo/Sisham	Fabaceae	-	*
35	<i>Diospyros melanoxylon</i> Roxb.	Tendu	Ebenaceae	*	*
36	<i>Diospyros montana</i> Roxb.	Bistendu	Ebenaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
37	<i>Dolichandrone falcata</i>	Medsing	Bignoniaceae	*	*
38	<i>Ehretia laevis</i> Roxb.	Datranga	Boraginaceae	*	*
39	<i>Emblica officinalis</i>	Amla	Phyllanthaceae	*	*
40	<i>Erythrina indica</i> Lam.	Pangra	Fabaceae	*	*
41	<i>Eucalyptus</i> sp.	Nilgiri	myrtaceae	-	*
42	<i>Ficus benghalensis</i> L.	Bad	Moraceae	*	*
43	<i>Ficus mollis</i> Vahl	Gular	Moraceae	-	*
44	<i>Ficus racemosa</i> L.	Gular	Moraceae	-	*
45	<i>Ficus religiosa</i> L.	Pipal	Moraceae	*	*
46	<i>Gardenia latifolia</i> Aiton	Papra	Rubiaceae	-	*
47	<i>Garuga pinnata</i> Roxb.	Kekad	Burseracea	-	*
48	<i>Gmelina arborea</i> Roxb.	Khamhar	Verbenaceae	-	*
49	<i>Grewia tiliifolia</i> Vahl	Dhaman	Tilliaceae	*	*
50	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Haldu/Kalmi	Rubiaceae	-	*
51	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Bhanwarmal	Rubiaceae	*	*
52	<i>Kydia calycina</i> Roxb.	Baranga	Malvaceae	*	*
53	<i>Lagerstroemia parviflora</i> Roxb.	Lendia	Lythraceae	*	*
54	<i>Lannea coromandelica</i>	Jhingan/Movei	Anacardiaceae	*	*
55	<i>Limonia acidissima</i>	Kawat	Rutaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
56	<i>Madhuca longifolia</i>	Mahua	Sapotaceae	*	*
57	<i>Mallotus philippensis</i> (Lam.) Müll. Arg.	Sinduri/ Rori	Euphorbiaceae	-	*
58	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Kalam/Kadamb	Rubiaceae	*	*
59	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Kadamb	Combretaceae	-	*
60	<i>Ougenia oojeinesis</i>	Tiwas	Fabaceae	*	*
61	<i>Peltophorum ferrugineum</i> (Decne.) Benth.	Peltaphorum	Fabaceae	*	*
62	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajur	Palmae	*	*
63	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	China ashok	Annonaceae		*
64	<i>Pongamia pinnata</i> (L.) Pierre	Karanj	Fabaceae	*	*
65	<i>Prosopis juliflora</i> (Sw.) DC.	Khejdi	Fabaceae	*	*
66	<i>Psidium guajava</i> L.	Jam	myrtaceae	-	*
67	<i>Pterocarpus marsupium</i> Roxb.	Bija	Fabaceae	*	*
68	<i>Saccopetalum tomentosum</i> Hook.f. & Thomson	Kari	Annonaceae	*	*
69	<i>Schleichera oleosa</i> (Lour.) Merr.	Kusum	Sapindaceae	*	*
70	<i>Schrebera swietenoides</i> Roxb.	Mokha	Oleaceae	*	*
71	<i>Semecarpus anacardium</i> L.f.	Bibba	Anacardiaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
72	<i>Senna occidentalis</i> (L.) Link	Kasondi	Fabaceae	*	*
73	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Acacia	Fabaceae	*	*
74	<i>Soymida febrifuga</i> (Roxb.) A. Juss.	Rohan	Meliaceae	*	*
75	<i>Sterculia urens</i> Roxb.	Kulu	Sterculiaceae	-	*
76	<i>Stereospermum suaveolens</i> (Roxb.) DC.	Badapadar	Bignoniaceae	*	*
77	<i>Syzygium cumini</i> (L.) Skeels	Jamun	Myrtaceae	*	*
78	<i>Tamarindus indica</i> L.	Imli	Fabaceae	*	*
79	<i>Tamilnadia uliginosa</i> (Retz.) Tirveng. & Sastre	Kala Phetra	Rubiaceae	*	*
80	<i>Tectona grandis</i> L.f.	Sagaun	Verbenaceae	*	*
81	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjun	Combretaceae	*	*
82	<i>Terminalia tomentosa</i>	Ain/Saja	Combretaceae	*	*
83	<i>Trema orientalis</i> (L.) Blume	Jivan	Urticaeaceae	-	*
84	<i>Vitex negundo</i> L.	Morphal	Verbenaceae	-	*
85	<i>Ziziphus jujuba</i> Mill.	Ber	Rhamnaceae	*	85
Total				65	85

Note: (*) indicates presence of species & (-) indicates absence

3.3.2 SHRUBS:

S.No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Achyranthes aspera</i> L.	Chirchira	Amaranthaceae	*	*
2	<i>Balanites aegyptiaca</i> (L.) Del.	Hingot	Balanitaceae	*	*
3	<i>Calotropis gigantea</i> (L.) Dryand.	Aak	Asclepiadaceae	*	*
4	<i>Colebrookea oppositifolia</i> Sm.	Kalabans	Labiatae	*	*
5	<i>Dodonaea viscosa</i> subsp. <i>Aungustifolia</i> (L.f.) J.G. WEST	sadabahar	Apocynaceae	*	*
6	<i>Eranthemum pulchellum</i> Andrews	Bantulsi	Acanthceae	*	*
7	<i>Flacourtia indica</i> (Burm.f.) Merr.	Kakai	Bixaceae	*	*
8	<i>Gardenia gummifera</i> L.f.	Dikamali	Rubiaceae	*	*
9	<i>Grewia hirsuta</i> Vahl	Gutdukri	Tiliaceae	*	*
10	<i>Grewia rothii</i> DC.	Bansuli	Tiliaceae	*	*
11	<i>Gymnosporia spinosa</i> (Blanco) Merr. & Rolfe	Baikal	Celastraceae	*	*
12	<i>Helicteres isora</i> L.	Marophali	Sterculiaceae	*	*
13	<i>Hibiscus rosa-sinensis</i> L.	Gudhal	Malvaceae	*	*
14	<i>Holarrhena antidysenterica</i> (Roth) Wall. ex A.DC.	Dhudh	Apocynanceae	*	*
15	<i>Hyptis suaveolens</i> (L.) Poit.	Van Tulsi	Meliaceae	*	*
16	<i>Indigofera cassioides</i> DC.	Girol	Fabaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S.No	Botanical Name	Local Name	Family	Core	Buffer
17	<i>Ixora parviflora</i>	Lokhandi	Rubiaceae	*	*
18	<i>Jasminum sambac</i> (L.) Aiton	Bela	Oleaceae	*	*
19	<i>Justicia adhatoda</i> L.	Adusa	acanthaceae	*	*
20	<i>Martynia annua</i> L.	Baghanakha	Martiniaceae	*	*
21	<i>Mimosa pudica</i> L.	Chhuimui	Fabaceae	*	*
22	<i>Morinda tinctoria</i>	Bartondi/Aali	Rubiaceae	*	*
23	<i>Mucuna pruriens</i> (L.) DC.	Beeja	Fabaceae	*	*
24	<i>Nerium oleander</i> L.	Lal Kaner	Apocynaceae	*	*
25	<i>Phoenix acaulis</i> Roxb.	Chhind	Palmae	*	*
26	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Bilayati Imli	Fabaceae	*	*
27	<i>Prosopis cineraria</i> (L.) Druce	Sami/Gugurali	Fabaceae	*	*
28	<i>Ricinus communis</i> L.	Arand	Euphorbiaceae	*	*
29	<i>Senna auriculata</i> (L.) Roxb.	Takhad	Fabaceae	*	*
30	<i>Solanum virginianum</i> L.	Bhatkataiya	Solanaceae	*	*
31	<i>Tephrosia purpurea</i> L.	Sarphonka	Fabaceae	*	*
32	<i>Triumfetta rhomboidea</i> Jacq.	Chipti	Malvaceae	*	*
33	<i>Urena lobata</i> L.	Chikti	Malvaceae	*	*
34	<i>Wrightia tinctoria</i>	Dudhi	Apocynaceae	*	*
35	<i>Xanthium strumarium</i> L.	Okharu	Asteraceae	*	*
36	<i>Ziziphus mauritiana</i>	Ber	Rhamnaceae	*	*

S.No	Botanical Name	Local Name	Family	Core	Buffer
37	<i>Zizyphus xylopyrus</i>	Ghoti	Rhamnaceae	*	*
Total				37	37

Note: (*) indicates presence of species & (-) indicates absence

2.3.3 HERBS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Phool ghans	Amaranthaceae	*	*
2	<i>Alysicarpus vaginalis</i> (L.) DC.	Chipti	Fabaceae	*	*
3	<i>Antidesma acidum</i> Retz.	Khatua	Euphorbiaceae	*	*
4	<i>Azanza lampas</i> (Cav.) Alef.	Bankapas	Malvaceae		*
5	<i>Boerhavia diffusa</i> L.	Punarnava	Nictaginaceae	*	*
6	<i>Senna tora</i> (L.) Roxb.	Panwar	Fabaceae	*	*
7	<i>Andrographis paniculata</i> (Burm.f.) Wall. Ex Nees	Kalmegh	Acanthaceae	*	*
8	<i>Curculigo orchioides</i> Gaertn.	Kali mushli	Hypoxidaceae		*
9	<i>Cyperus scariosus</i> R.Br.	Motha	Cyperaceae	*	*
10	<i>Cyperus dubius</i> Rottb.	Motha	Cyperaceae	*	*
11	<i>Desmodium gangeticum</i> (L.) DC.	Chapti	Fabaceae	*	*
12	<i>Desmodium laxiflorum</i> DC.	Latkani	Fabaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
13	<i>Desmodium triflorum</i> (L.) DC.	Tinpatiya	Fabaceae	*	*
14	<i>Enicostemma littorale</i> Blume.	Naibuti	Gentianaceae	*	*
15	<i>Euphorbia hirta</i> L.	Dudhi	Euphorbiaceae	*	*
16	<i>Euphorbia thymifolia</i> L.	Choti dudhi	Euphorbiaceae	*	*
17	<i>Jatropha gossypifolia</i> L.	Jamal ghoti	Euphorbiaceae		*
18	<i>Merremia emarginata</i> (Burm. f.) Hallier f.	Muskani	Fabaceae		*
19	<i>Ocimum basilicum</i> L.	Barbari tulsi	Meliaceae	*	*
20	<i>Ocimum sanctum</i> L.	RamaTulsi	Meliaceae		*
21	<i>Petalidium angustitubum</i> P.G. Mey.	Indrajata	Acanthaceae		*
22	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Bhui Aonla	Phyllanthaceae	*	*
23	<i>Sida acuta</i> Burm.f.	Khakhara	Malvaceae	*	*
24	<i>Sida cordifolia</i> L.	Bariyari	Malvaceae	*	*
25	<i>Sida rhombifolia</i> L.	Vishkhopadi	Malvaceae	*	*
26	<i>Tagetes erecta</i> L.	Genda	Asteraceae	*	*
27	<i>Tephrosia purpurea</i> (L.) Pers.	Sarphonka	Fabaceae	*	*
28	<i>Tridax procumbens</i> (L.) L.	Ghamara	Asteraceae	*	*
29	<i>Trigonella</i> sp.	Ban methi	Fabaceae	*	*
Total				23	29

Note: (*) indicates presence of species & (-) indicates absence

3.3.4 CLIMBERS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Ampelocissus latifolia</i> (Roxb.) Planch.	Jangli angur	Vitaceae	*	*
2	<i>Antigonon leptopus</i> Hook. & Arn.		Polygonaceae	*	*
3	<i>Asparagus racemosus</i> Willd.	Stawar	Liliaceae		*
4	<i>Spatholobus parviflorus</i> (DC.) Kuntze	Nasbel	Fabaceae	*	*
5	<i>Butea superba</i> Roxb.	Palas bel	Fabaceae	*	*
6	<i>Capparis zeylanica</i>	Waghati	Capparidaceae	*	*
7	<i>Celastrus paniculatus</i> Willd.	Mal Kangni	Celastraceae	*	*
8	<i>Cocculus hirsutus</i> (L.) W.Theob.	Jaljamni	Menispermaceae	*	*
9	<i>Cryptolepis dubia</i> (Burm.f.) M.R.Almeida	Karanta	Asclepiadaceae	*	*
10	<i>Dioscorea bulbifera</i> L.		Dioscoreaceae	*	*
11	<i>Dioscorea hispida</i> Dennst.	Baichandi	Dioscoreaceae	*	*
12	<i>Dioscorea pentaphylla</i> L.	Musalkand	Dioscoreaceae	*	*
13	<i>Diplocyclos palmatus</i> (L.) C. Jeffrey		Cucurbitaceae	*	*
14	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.		Apocynaceae	*	*
15	<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	Dhimar Bel	Apocynaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
16	<i>Ipomoea pes-tigridis</i> L.		convolvulaceae	*	*
17	<i>Pergularia daemia</i> (Forssk.) Chiov.	Kadukand	Apocynaceae	*	*
18	<i>Rhynchosia minima</i> (L.) DC.	Ban sem	Fabaceae	*	*
19	<i>Tinospora cordifolia</i> (Willd.) Miers	Giloy	Menispermaceae	*	*
20	<i>Tylophora indica</i> (Burm. f.) Merr.	Dambela	Apocynaceae	*	*
21	<i>Vallis solanacea</i> (Roth) Kuntze	Dudhbela	Apocynaceae	*	*
22	<i>Ventilago denticulata</i> Willd.	Keoti	Rhamnaceae	*	*
23	<i>Ampelocissus indica</i> (L.) Planch.	Jangli angur	vitaceae	*	*
24	<i>Ziziphus oenopolia</i> (L.) Mill.	Makor	Rhamnaceae	*	*
Total				23	24

Note: (*) indicates presence of species & (-) indicates absence

3.3.5 GRASSES & BAMBOOS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Aristida setacea</i> Retz.	Bargi Ronda	Poaceae	*	*
2	<i>Arundinella setosa</i> Trin.	Sidi	Poaceae	*	*
3	<i>Bothriochloa pertusa</i> (L.) A.Camus	Bhond grass	Poaceae	*	*
4	<i>Cenchrus purpureus</i> (Schumach.) Morrone		Poaceae	*	*
5	<i>Cynodon dactylon</i> L.	Doob	Poaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
6	<i>Dichanthium annulatum</i> (Forssk.) Stapf	Chhoti Marbel	Poaceae	*	*
7	<i>Eragrostis amabilis</i> (L.) Wight & Arn.	Bhurbhusi	Poaceae	*	*
8	<i>Eulaliopsis binata</i> (Retz.) C.E.Hubb.	Bagai	Poaceae	*	*
9	<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	Kushal, lampa	Poaceae	*	*
10	<i>Imperata cylindrica</i> (L.) Raeusch.	Chhir	Poaceae	*	*
11	<i>Eulaliopsis binata</i> (Retz.) C.E.Hubb.	Sabai	Poaceae	*	*
12	<i>Iseilema laxum</i> Hack.	Mushan	Poaceae	*	*
13	<i>Sehima nervosum</i> (Rottler) Stapf	Munsel	Poaceae	*	*
14	<i>Panicum antidotale</i> Retz.	Kosra	Poaceae	*	*
15	<i>Panicum sumatrense</i> Roth	Chire Kufik	Poaceae	*	*
16	<i>Panicum repens</i> L.		Poaceae	*	*
17	<i>Saccharum spontaneum</i> L.	Kans	Poaceae	*	*
18	<i>Sehima nervosum</i> (Rottler) Stapf	Sheda	Poaceae	*	*
19	<i>Setaria verticillata</i> (L.) P.Beauv.	Latkani	Poaceae	*	*
20	<i>Sorghum halepense</i> (L.) Pers.	Baru	Poaceae	*	*
21	<i>Themeda quadrivalvis</i> (L.) Kuntze	Gunher	Poaceae	*	*
22	<i>Bambusa bambos</i> (L.) Voss	Kanta bans	Graminaeae	*	*

S. No	Botanical Name	Local Name	Family	Core	Buffer
23	<i>Dendrocalamus strictus</i> (Roxb.) Nees	Bans	Graminaeae	*	*
Total				23	23

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey Data)

3.4.2.3 Fauna Biodiversity

The study of fauna takes substantial amount of time to understand the specific faunal characteristic of area. The assessments of fauna were done by extensive field survey of the area. During survey, the presence of wildlife has been confirmed by direct field survey and by the oral information by local inhabitants and data procured from the concerned forest department has been made and given in below.

3.4.2.3.1 Methodology for Assessment of Faunal Diversity

For mammals and reptiles, intensive survey was conducted by using transect method in all major habitats and recorded the species through direct and indirect evidences.

For amphibians, survey was conducted both in aquatic and terrestrial areas during day and night by searching under the logs and stones, digging through litter and soil, searching below the ground vegetation, tree hollows and under fallen barks.

For sampling butterflies, line transect of variable length was used. Generally, 500- 1000 m transect were laid in all habitats.

Butterflies seen within 5m on either side of this transect were recorded. Birds were sampled in two ways - line transects and point counts.

Line transects: In this method, a straight line of 1km or less (if the habitat is small) was laid. In this line, all birds seen or heard within 25 m on either side of transect were recorded.

Point counts: In this method, at one-point birds seen or heard within 50 m radius for 5 minutes were recorded. After a gap of 10 minutes, it was repeated and the observations made were recorded. In the same manner, repeated the observation in another point and recorded different species of birds. Photographs were also taken for evidences, wherever possible.

The study of fauna takes substantial amount of time to understand the specific faunal characteristic of area. The assessments of fauna were done by extensive field survey of the area. During survey, the presence of wildlife has been confirmed by direct field survey and by the oral information by local inhabitants and data procured from the concerned forest department has been made and given in below. **Schedules presented here are as per the 22nd Amendment of WPA, 1972 Act. Those faunas, which are found/available in the study area are only mentioned here.** Similarly, a list of fauna authenticated by DFO, Pandharkawda has been given in **Annexure-5**

Total 279 faunal species have been recorded from field survey and from secondary information documented in forest working plan of Pandharkawada forest division of Yavatmal district where Aves (132), Mammals (43), Herpatofauna (20), Butterflies (36), Amphibian (8), species of Pisces 22 and 18 insects were recorded.

In the core zone of the study area, the faunal presence has been separately analyzed where total 152 faunal species diversity have been recorded. Class wise faunal presence like Aves (80), Mammals (27), Herpatofauna (10), Butterflies (18) and only two species of Pisces were recorded.

Table 3.4: Faunal Diversity from study area (Core zone & Buffer Zone) updated as per the 22nd amendment of WPA 1972

3.4.1 MAMMALS:

Sr. No.	Scientific name	Vernacular Name	Common name	Schedules as per 2022 Ammendment of Wildlife Protection Act 1972/ IUCN Status	Occurance	
					Core Zone	Buffer Zone
1.	<i>Anathana ellioti</i>	Shrew	Indian/ Madras Tree Shrew	LC /II	*	*
2.	<i>Antilope cervicapra</i>	Kala Hiran	Blackbuck	VU / I	*	*
3.	<i>Axis axis</i>	Chital	Spotted Deer	LC / II		*
4.	<i>Bos gaurus</i>	Gava	Indian Gaur / Bison	VU / I		*
5.	<i>Boselaphus tragocamelus</i>	Nilgai	Blue Bull	LC / II		*
6.	<i>Canis aureus</i>	Kolha	Golden Jackal	LC / I	*	*
7.	<i>Canis lupus pallipes</i>	Landga	Indian Wolf	VU / I	*	*
8.	<i>Cuon alpinus</i>	Dhol	Wild Dog	EN/I		*
9.	<i>Rusa unicolor</i>	Sambar	Sambar	LC / I		*
10.	<i>Felis chaus</i>	Ranmanjar	India Jungle Cat	NT / I	*	*
11.	<i>Funambulus pennanti</i>	Khar	Five striped Squirrel	LC /NL	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

12.	<i>Gazella bennettii</i>	Chinkara	Chinkara	LC / I		*
13.	<i>Herpestes auropunctatus</i>	Mongoose	Small Indian mongoose	LC / I	*	*
14.	<i>Herpestes edwardsi</i>	Mongoose	Common mongoose	LC / I	*	*
15.	<i>Hipposideros ater</i>	Vatvaghul	Dusky Leaf-nosed bat	LC /NL	*	*
16.	<i>Hyaena hyaena</i>	Lakadbagga	Striped Hyaena	DD / I	*	*
17.	<i>Hystrix indica</i>	Mulhapandi	Indian crested porcupine	LC / I	*	*
18.	<i>Lepus nigricollis</i>	Sasa	Indian Hare	LC / II		*
19.	<i>Megaderma lyra</i>	Vatvaghul	Indian false vampire bat	LC /NL	*	*
20.	<i>Melursus ursinus</i>	Aswal/Bhalu	Sloth Bear	VU /I	*	*
21.	<i>Miniopterus schreibersi</i>	Vatvaghul	Schreiber's Long-fingered bat	LC /NL	*	*
22.	<i>Moschiola meminna</i>	Hiran	Mouse Deer	VU / I		*
23.	<i>Muntiacus muntjak</i>	Hiran	Barking Deer	LC / I		*
24.	<i>Mus phillipsi</i>	Undir	Wroughton's small spiny Mouse	LC / NL	*	*
25.	<i>Mus platythrix</i>	Undir	Indian Brown spiny mouse	LC / NL		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

26.	<i>Panthera pardus</i>	Tendua	Leopard	VU / I		*
27.	<i>Panthera tigris</i>	Wagh/Bagh	Tiger	EN / I		*
28.	<i>Paradoxurus hermaphroditus</i>	Kasturi Jowadi manjur	Common Palm civet	LC / I	*	*
29.	<i>Presbytis pileatus</i>	Langur	Common langur	LC / II	*	*
30.	<i>Pipistrellus dormeri</i>	Vatvaghul	Dormer's bat	LC / NL	*	*
31.	<i>Pipistrellus coromandra</i>	Undir	Coromandel Pipistrelle	LC / NL		*
32.	<i>Prionailurus bengalensis</i>	Manjar	Leopard Cat	NT / I		*
33.	<i>Pteropus giganteus</i>	Vatvaghul	Indian flying fox	LC / II	*	*
34.	<i>Rhesus macaque</i>	Bandar	Monkey	LC / II	*	*
35.	<i>Rhinolophus lucius</i>	Vatvaghul	Great Eastern Horseshoe bat	NT / NL	*	*
36.	<i>Rhinopoma hardwickei</i>	Vatvaghul	Mouse-tailed bat	LC / NL		*
37.	<i>Semnopithecus entellus</i>	Langur	Hanuman Langur	LC / II	*	*
38.	<i>Sus scrofa cristatus</i>	Randukkar	Wild boar	II/LC	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

39.	<i>Tatera indica</i>	Undir	Indian Antelope Rat	LC / NL	*	*
40.	<i>Tetracerus quadricornis</i>	Chaushinga	Four Horned Antelope	VU / I	*	*
41.	<i>Vandeleuria oleracea</i>	Undir	Indian Long-tailed Tree Mouse	LC / NL	*	*
42.	<i>Viverricula indica</i>	Kasturi Jowadi manjur	Small Indian civet	NT / I	*	*
43.	<i>Vulpes bengalensis</i>	Kholha	Bengal Fox	LC / I		*
Total					27	43

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note:- NA= Not yet assessed, LC=Least Concern, VU= Vulnerable., EN=Endangered, NT=Not Threatened, DD=Data Deficient, NL=Not Listed, Roman I & II indicates Schedule- I & Schedule-II Species.

3.4.2 AVES:

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
1	<i>Accipiter badius</i>	Shikra	LC / I		*
2	<i>Actitis hypoleucos</i>	Common Sandpiper	LC / II	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
3	<i>Alauda gulgula</i>	Small Skylark	LC / II	*	*
4	<i>Alcedo atthis</i>	Small Blue Kingfisher	LC / II	*	*
5	<i>Amandava amandava</i>	Red Munia	LC / II	*	*
6	<i>Amandava formosa</i>	Green Munia	LC / I		*
7	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	LC / II	*	*
8	<i>Anas crecca</i>	Common Teal	LC / II		*
9	<i>Anas poecilorhyncha</i>	Spot-billed Duck	LC / II	*	*
10	<i>Anaslomus oscitans</i>	Asian Open Bill Stork	LC / II		*
11	<i>Anhinga melanogaster</i>	Darter/Snake Bird	LC / II		*
12	<i>Anthus rufulus</i>	Paddy-field Pipit	LC / II	*	*
13	<i>Apus affinis</i>	Indian House Swift	LC / II	*	*
14	<i>Ardea cinerea</i>	Grey Heron	LC / II		*
15	<i>Ardea purpurea</i>	Purple Heron	LC / II		*
16	<i>Ardeola grayii</i>	Indian Pond Heron	LC / II	*	*
17	<i>Aythya fuligula</i>	Tufted Pochard	LC / II		*
18	<i>Aythya nyroca</i>	Ferruginous Pochard	LC / II		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
19	<i>Bubulcus ibis</i>	Cattle Egret	LC / II	*	*
20	<i>Burhinus oedicephalus</i>	Stone-Curlew	LC / II		*
21	<i>Cacomantis passerinus</i>	Plaintive Cuckoo	LC / II		*
22	<i>Casmerodius albus</i>	Eastern Large Egret	LC / II	*	*
23	<i>Celeus brachyurus</i>	Rufous Woodpecker	LC / II		*
24	<i>Ceryle rudis</i>	Lesser Pied Kingfisher	LC / II	*	*
25	<i>Charadrius dubius</i>	Little -Ringed Plover	LC / II		*
26	<i>Chrysomma sinense</i>	Yellow-eyed Babbler	LC / II		*
27	<i>Ciconia episcopus</i>	White-necked Stork	LC / II	*	*
28	<i>Cisticola juncidis</i>	Streaked Fantail Warbler	LC / II		*
29	<i>Clamator jacobinus</i>	Pied-Crested Cuckoo	LC / II	*	*
30	<i>Columba livia</i>	Blue Rock Pigeon	LC / II	*	*
31	<i>Copsychus saularis</i>	Oriental Magpie-Robin	LC / II	*	*
32	<i>Coracias benghalensis</i>	Indian Roller	LC / II	*	*
33	<i>Coracina macei</i>	Large Cuckoo Shrike	LC / II		*
34	<i>Corvus macrorhynchos</i>	Indian Jungle Crow	LC / II	*	*
35	<i>Corvus splendens</i>	Indian House Crow	LC / II	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
36	<i>Coturnix coromandelica</i>	Rain Quail	LC / II		*
37	<i>Coturnix coturnix</i>	Common Quail	LC / II	*	*
38	<i>Cuculus canorus</i>	Common Cuckoo	LC / II	*	*
39	<i>Cuculus micropterus</i>	Indian Cuckoo	LC / II	*	*
40	<i>Cypsiurus batasiensis</i>	Palm Swift	LC / II	*	*
41	<i>Dendrocopos mahrattensis</i>	Yellow fronted Pied Woodpecker	LC / II		*
42	<i>Dendrocopos nanus</i>	Brown-capped Pygmy Woodpecker	LC / II		*
43	<i>Dendrocygna javanica</i>	Lesser Whistling Duck	LC / II		*
44	<i>Dicrurus macrocercus</i>	Black Drongo	LC / II	*	*
45	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker	LC / II		*
46	<i>Dumetia hyperythra</i>	Rufous bellied Babbler	LC / II		*
47	<i>Egretta garzetta</i>	Little Egret	LC / II	*	*
48	<i>Eremopterix grisea</i>	Ashy-crowned Sparrow Lark	LC / II		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
49	<i>Eudynamys scolopacea</i>	Asian Koel	LC / II	*	*
50	<i>Falco tinnunculus</i>	Common Kestrel	LC / II		*
51	<i>Francolinus pictus</i>	Painted Francolin	LC / II	*	*
52	<i>Francolinus pondicerianus</i>	Grey Francolin	LC / II		*
53	<i>Fulica atra</i>	Common Coot	LC / II		*
54	<i>Galerida cristata</i>	Crested Lark	LC / II	*	*
55	<i>Galerida deva</i>	Sykes's Crested Lark	LC / II	*	*
56	<i>Gallicrex cinerea</i>	Water Cock	LC / II	*	*
57	<i>Gallinago gallinago</i>	Common Snipe	LC / II	*	*
58	<i>Gallinula chloropus</i>	Common Moorhen	LC / II	*	*
59	<i>Galloperdix spadicea</i>	Red Spur-Fowl	LC / II		*
60	<i>Gallus sonneratii</i>	Grey Jungle Fowl	LC / I	*	*
61	<i>Halcyon capensis</i>	Stork-billed Kingfisher	LC / II		*
62	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	LC / II	*	*
63	<i>Hemiprocne coronata</i>	Crested Tree Swift	LC / I		*
64	<i>Hierococcyx varius</i>	Common hawk-cuckoo	LC / II	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
65	<i>Himantopus himantopus</i>	Black-winged Stilt	LC / II	*	*
66	<i>Hirundo concolor</i>	Dusky Crag Martin	LC / II		*
67	<i>Hirundo daurica</i>	Red rumped Swallow	LC / II	*	*
68	<i>Hirundo fluvicola</i>	Streak -throated Swallow	LC / II	*	*
69	<i>Hirundo rusttea</i>	Common Swallow	LC / II	*	*
70	<i>Hirundo smithii</i>	Wire-tailed Swallow	LC / II	*	*
71	<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana	LC / II	*	*
72	<i>Ammomanes phoenicurus</i>	Rufous-tailed Finch-Lark	LC / II	*	*
73	<i>Lonchura punctulata</i>	Spotted Munia	LC / II	*	*
74	<i>Megalaima haemacephala</i>	Coppersmith Barbet	LC / II	*	*
75	<i>Megalaima zeylanica</i>	Brown-headed Barbet	LC / II		*
76	<i>Merops orientalis</i>	Small Bee- eater	LC / II	*	*
77	<i>Merops philippinus</i>	Blue-Tailed bee-eater	LC / II	*	*
78	<i>Mesophoyx internledia</i>	Median Egret	LC / II		*
79	<i>Metopidius indicus</i>	Bronze-winged Jacana	LC / II	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
80	<i>Milvus migrans</i>	Black kite	LC / II	*	*
81	<i>Motacilla alba</i>	White Wagtail	LC / II		*
82	<i>Motacilla cinerea</i>	Grey Wagtail	LC / II	*	*
83	<i>Motacilla maderaspatensis</i>	Large Pied Wagtail	LC / II		*
84	<i>Muscicapa daurica</i>	Asian Brown Flycatcher	LC / II		*
85	<i>Nectarinia asiatica</i>	Indian Purple Sunbird	LC / II	*	*
86	<i>Nettapus coromandelianus</i>	Cotton Teal	LC / II		*
87	<i>Numenius arquata</i>	Curlew	LC / II		*
88	<i>Ocyrceros birostris</i>	Indian Grey Hornbill	LC / II	*	*
89	<i>Orthotomus sutorius</i>	Indian Tailor Bird	LC / II	*	*
90	<i>Passer domesticus</i>	Indian House Sparrow	LC / II	*	*
91	<i>Pavo cristatus</i>	Peacock	LC / I	*	*
92	<i>Perdicula asiatica</i>	Jungle Bush Quail	LC / II	*	*
93	<i>Pericrocotus cinnaimomeus</i>	Small Minivet	LC / I	*	*
94	<i>Pericrocotus lammeus</i>	Scarlet Minivet	LC / II	*	*
95	<i>Phalacrocorax niger</i>	Little Cormorant	LC / II	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
96	<i>Phylloscopus collybita</i>	Common Chiff Chaff	LC / II		*
97	<i>Pitta brachyura</i>	Indian Pitta	LC / II		*
98	<i>Ploceus philippinus</i>	Baya Weaver	LC / II	*	*
99	<i>Porphyrio porphyrio</i>	Purple Moorhen	LC / II	*	*
100	<i>Prinia socialis</i>	Ashy Prinia	LC / II	*	*
101	<i>Psittacula krameri</i>	Rose-Ringed Parakeet	LC / II	*	*
102	<i>Pterocles indicus</i>	Painted Sandgrouse	LC / II		*
103	<i>Pycnonotus cafer</i>	Red-vented Bulbul	LC / II	*	*
104	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	LC / II	*	*
105	<i>Rhipidura albicollis</i>	White-throated Fantail Flycatcher	LC / II	*	*
106	<i>Netta rufina</i>	Red-crested Pochard	LC / II		*
107	<i>Rostrata benghalensis</i>	Greater Painted Snipe	LC / II		*
108	<i>Sarkidiornis melanotus</i>	Comb Duck	LC / II		*
109	<i>Saxicola caprata</i>	Pied Bushchat	LC / II	*	*
110	<i>Saxicoloides julicata</i>	Indian Robin	LC / II	*	*
111	<i>Sireptopelia decaocto</i>	Eurasian Collared Dove	LC / II	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
112	<i>Sterna aurantia</i>	River Tern	LC / I		*
113	<i>Streptopelia chinensis</i>	Spotted dove	LC / II	*	*
114	<i>Streptopelia senegalensis</i>	Little brown Dove	LC / II	*	*
115	<i>Sturnus pagodarum</i>	Brahminy Starling	LC / II	*	*
116	<i>Tactybaptus ruficollis</i>	Little Grebe	LC / II		*
117	<i>Tadorna ferruginea</i>	Brahminy Shelduck	LC / II		*
118	<i>Tephrodornis pondicerianus</i>	Common Wood shrike	LC / II		*
119	<i>Terpsiphone paradisi</i>	Asian Paradise-Flycatcher	LC / II	*	*
120	<i>Tringa glareola</i>	Wood Sandpiper	LC / II		*
121	<i>Tringa nebularia</i>	Common Green Shank	LC / II		*
122	<i>Tringa ochropus</i>	Green Sandpiper	LC / II		*
123	<i>Tringa totanus</i>	Common Red Shank	LC / II		*
124	<i>Turdoides caudatus</i>	Common Babbler	LC / II	*	*
125	<i>Turdoides malcolmi</i>	Large Grey Babbler	LC / II	*	*
126	<i>Turdoides striatus</i>	Peninsular Jungle Babbler	LC / II	*	*

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core Zone	Buffer Zone
127	<i>Turnix suscitator</i>	Common Buttonquail	LC / II		*
128	<i>Upupa epops</i>	Common Hoopoe	LC / II	*	*
129	<i>Vanellus indicus</i>	Red -wattled Lapwing	LC / II	*	*
130	<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing	LC / II		*
131	<i>Zoothera citrina</i>	Orange-headed Thrush	LC / II	*	*
132	<i>Zosterops palpebrosa</i>	Oriental White Eye	LC / II	*	*
Total				80	132

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note:- LC=Least Concern, Roman I & II indicates Schedule I & Schedule II Species.

3.4.3 HERPATOFAUNA:

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
					Core Zone	Buffer zone
1.	<i>Argyrogena fasciolatus</i>		Banded racer	NT /NL		*
2.	<i>Boiga Irigonala</i>		Cat snake	NT /NL	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

3.	<i>Bungarus caeruleus</i>		Common Indian Krait	LC / NL		*
4.	<i>Calotes versicolor</i>	Sarda	Indian garden lizard	LC / NL	*	*
5.	<i>Cyrtodactylus collegalensis</i>	Lizard	South Indian Rock Gecko	NT / NL		*
6.	<i>Elaphe helena</i>		Trinket Snake	NT / NL		*
7.	<i>Hemidactylus frenatus</i>	Lizard	Tickticky House Gecko	LC / NL	*	*
8.	<i>Lycodon aulicus</i>		Common wolf snake	LC / IV		*
9.	<i>Mabuya beddomii</i>	Sapsoli	Common skink	LC / NL	*	*
10.	<i>Mabuya carinata</i>	Sapsoli	Common Indian skink	LC / NL	*	*
11.	<i>Mabuya innotata</i>	Sapsoli	Bronzy-olive skink	LC / NL		*
12.	<i>Mabuya macularia</i>	Sapsoli	Little skink	DD/ NL	*	*
13.	<i>Naja naja</i>	Nag	Spectacled Cobra	LC / I	*	*
14.	<i>Psammophilus blanfordanus</i>		Common Indian rock lizard	LC / NL	*	*

15.	<i>Ptyas mucosus</i>	Dhaman	Rat Snake	LC / I	*	*
16.	<i>Python molurus</i>	Ajgar	Rock Python	NT / I		*
17.	<i>Ramphotyphlops braminus</i>		Common Blind snake	VU / II	*	*
18.	<i>Varanus bengalensis</i>	Ghorpad	Bengal Monitor Lizard	LC / I		*
19.	<i>Vipera russelli</i>		Russel's Viper	VU / I		*
20.	<i>Fowlea piscator</i>		Checkedd keelback snake	NT / I		*
Total					10	20

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note:- NA= Not yet assessed, LC=Least Concern, VU= Vulnerable., EN=Endangered, NT=Not Threatened, DD=Data Deficient, NL=Not Listed. Roman I & II indicates Schedule I & Schedule II Species.

3.4.4 Amphibians:

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status	Occurance	
				Core	Buffer
1.	<i>Bufo melanostictus</i>	Common Indian Toad	NE / NL	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

2.	<i>Bufo stonlaticus</i>	Marbled toad	NE / NL		*
3.	<i>Euphlyctis cyanophlyctis</i>	Skipper Frog	NE / NL		*
4.	<i>Hoplobatrachus crassus</i>	Jerdon's Bull Frog	NE / NL	*	*
5.	<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	NE / II	*	*
6.	<i>Limnonectes limnocharis</i>	Indian Cricket Frog	NE / NL	*	*
7.	<i>Microhyla ornata</i>	Ornate Microhylid	NE / NL		*
8.	<i>Polypedates maculatus</i>	Common Tree Frog	NE / NL	*	*
Total				5	8

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note:- NE=Not Endangered, NL=Not Listed. Roman I & II indicates Schedule I & Schedule II Species.

4.4.5 PISCES:

Sr. No.	Scientific name	Vernacular name	Common name	IUCN STATUS	Occurance	
					Core	Buffer
1	<i>Ambasis ranga</i>	Zanjad	Indian glassy fish	NA		*
2	<i>Barilius barna</i>	Batri	River carp baril	LC		*
3	<i>Catla catla</i>	Katla	Major Carp	LC		*
4	<i>Channa striatus</i>	Dhadak	Banded snake head	LC		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular name	Common name	IUCN STATUS	Occurance	
					Core	Buffer
5	<i>Cirrhinus mrigala</i>	Naren	Major Carp	LC	*	*
6	<i>Clarius batracus</i>	Mangur	Magur	NA		*
7	<i>Cyprinus carpio</i>	Cipla	Cipla	VU		*
8	<i>Gambusia affinis</i>	Machar Machli	Mosquito fish	LC		*
9	<i>Glossigobius girus</i>	Kaddu	Tank gobi	NA		*
10	<i>Heteropneustes fossilis</i>	Ingur	Stinging cat fish	LC		*
11	<i>Labeo rohita</i>	Rohu	Common carp	LC	*	*
12	<i>Labeo calbasu</i>	Black rohu	Calbasu	LC		*
13	<i>Mastacembelus armatus</i>	Bamb	Spiny eel	LC		*
14	<i>Mystus cavasius</i>	Singara	Cat fish	LC		*
15	<i>Mystus seenghala</i>	Katwa	Gangatic mystus	LC		*
16	<i>Nandus nandus</i>	Dukkar	Leaf fish	LC		*
17	<i>Osteobrama cotio</i>	Bhondu	Cotio	LC		*
18	<i>Punctius amphibious</i>	Ghuruti	Scarlet Banded barb	NA		*
19	<i>Rita rita</i>	Bhokhi	Rita	LC		*
20	<i>Salmostoma bacaila</i>	Chal	Silver fish	LC		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular name	Common name	IUCN STATUS	Occurance		
					Core	Buffer	
21	<i>Tor khudree</i>	Mahseer	Deccan Mahaseer	LC		*	
22	<i>Xenentodon cancilla</i>	Chocha	Needle fish	LC		*	
Total						2	22

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note: NA= Not yet assessed, LC=Least Concern, VU=Vulnerable.

3.4.6 BUTTERFLIES:

Sr. No.	Scientific name	Common Name	Family	IUCN STATUS	Occurance	
					Core	Buffer
1.	<i>Ariadne merione</i>	Common caster	Nymphalidae	NA	*	*
2.	<i>Catopsillia iranthe</i>	Mottled emigrant	Pieridae	NA	*	*
3.	<i>Catopsillia omona</i>	Common emigrant	Pieridae	NA	*	*
4.	<i>Cepora nerissa</i>	Common gul	Pieridae	NA		*
5.	<i>Chilades pandav</i>	Plain cupid	Hesperiidae	NA	*	*
6.	<i>Danaus chrysippus</i>	Plain tiger	Nymphalidae	LC	*	*
7.	<i>Euploea core</i>	common indian crow	Nymphalidae	LC		*
8.	<i>Eurema hecabe</i>	Common grass Yellow	Pieridae	NA	*	*
9.	<i>Hypolimnas misippus</i>	Dannaid Egg Fly	Nymphalidae	NA		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

10.	<i>Junoniya arithya</i>	Blue pansy	Nymphalidae	NA		*
11.	<i>Junoniya iphita</i>	Chocolate pansy	Nymphalidae	NA	*	*
12.	<i>Junoniya lemonias</i>	Lemon pansy	Nymphalidae	NA		*
13.	<i>Leptotes plinius</i>	Zebra blue	Lycaenidae	NA		*
14.	<i>Melanitis leda</i>	Common evening brown	Nymphalidae	LC	*	*
15.	<i>Pachliopta aristolochiae</i>	Common rose	Papilionidae	LC		*
16.	<i>Papilio demoleus</i>	Lime	Papilionidae	NA	*	*
17.	<i>Papilio polytes</i>	Common mormon	Papilionidae	NA	*	*
18.	<i>Prosotas nora</i>	common line blue	Hesperiidae	NA		*
19.	<i>Tirumala limniace</i>	Blue tiger	Nymphalidae	NA		*
20.	<i>Pachliopta hector</i>	Crimson Rose	Papilionidae	LC		*
21.	<i>Virachola Isocrates</i>	Guava Blue	Lycaenidae	II		*
22.	<i>Castalius rosimon</i>	Common pierrot	Lycaenidae	NA	*	*
23.	<i>Rapala manea</i>	Slate Flash	Lycaenidae	LC	*	*
24.	<i>Synthia cardui</i>	Painted Lady	Nymphalidae	NA		*
25.	<i>Ypthima asterope</i>	Common Three Ring	Nymphalidae	NA		*
26.	<i>Catopsilia pomona</i>	Common emigrant	Pieridae	NA		*
27.	<i>Cepora nerissa</i>	Common Gull	Pieridae	NA		*
28.	<i>Eurema hecabe</i>	Common Grass yellow	Pieridae	NA	*	*
29.	<i>Danaus chrysippus</i>	Plain Tiger	Nymphalidae	NA	*	*

30.	Danaus genutia	Striped Tiger	Nymphalidae	NA		*
31.	Euploea core	Common crow	Nymphalidae	NA	*	*
32.	Junonia lemonias	Lemon Pansy	Nymphalidae	NA	*	*
33.	Junonia orithya	Blue Pansy	Nymphalidae	NA		*
34.	Melanitis leda	Common evening brown	Nymphalidae	NA	*	*
35.	Hypolimnas bolina	Great eggfly	Nymphalidae	NA		*
36.	Tirumala septentrionis	Dark Blue Tiger	Nymphalidae	NA		*
Total					18	36

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note: - NA= Not yet assessed, LC=Least Concern, VU= Vulnerable.

3.4.7 INSECTS

Sr. No.	Scientific name	Common name	IUCN Status	Occurance	
				Core	Buffer
1	<i>Poduridae</i>	Podura	LC		*
2	<i>Blatta orientalis</i>	Cockroach	LC	*	*
3	<i>Mantodea</i>	Mantis	LC	*	*
4	<i>Chinavia hilaris</i>	Green Stink Bugs	LC		*
5	<i>Pyrrhocoridae</i>	Red Bugs	LC		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

6	<i>Formucidae</i>	Ant	LC	*	*
7	<i>Solenopsis spp.</i>	Red Ant (Fire Ant)	LC	*	*
8	<i>Paraponera clavata</i>	Bullet Ant	LC		*
9	<i>Apis dorsata</i>	Giant Honey Bee	LC	*	*
10	<i>Apis dorsata</i>	Rock Bee	LC		*
11	<i>Apis spp.</i>	Honey Bee	LC	*	*
12	<i>Andrenidae</i>	Bee	LC	*	*
13	<i>Bombus spp.</i>	Black Bee	LC	*	*
14	<i>Vespidae</i>	Yellow Wasps	LC	*	*
15	<i>Ichneumonidae</i>	Wasps	LC		*
16	<i>Chilomeness. maculate</i>	Ladybird	LC		*
17	<i>Meloidae</i>	Blister Beetle	LC		*
18	<i>Honotricha serrate</i>	Grubs	LC		*
	Total			10	18

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey & Secondary Data)

Note: - NA= Not yet assessed, LC=Least Concern, VU= Vulnerable

Summary of Faunal Species

Class	Core Zone	Buffer Zone	TOTAL
Mammals	27	43	43
Aves	80	132	132
Herpatofauna	10	20	20
Amphibians	5	8	8
Pisces	2	22	22
Butterfly	18	36	36
Insects	10	18	18
TOTAL	152	279	279

3.4.2.3.2 Sources of Secondary Information

Secondary information on flora, fauna and their distribution was collected from Forest Department (Working Plan / Management Plan of Pandharkawda Division, period 2012-13 to 2021-22 Yavatmal District). Faunal availability was also verified from the local people and staff working in the Forest Department.

Flora and fauna information were also verified with standard publications of Botanical survey of India, Zoological Survey of India and National and International published literature. Conservation status of the flora and fauna were cross-checked under IUCN Red list through published literature and online as well as Indian Wildlife Protection Act (IWPA), 1972 and further Amendments.

3.4.2.3.3 Endangered Flora

No endangered or endemic flora was recorded from core and buffer zone of the project area. However, *Pterocarpus marsupium* Roxb known as Beeja falls in vulnerable category due to biotic pressure for their timber and medicinal value and need to be looked into for including in plantation programme.

3.4.2.3.4 Endangered Fauna

A total of 279 faunal species documented through primary and secondary data which could be seen in the vicinity of the project site as well as 10 km area radius following **schedule -I species as per the 22nd amendment of WPA 1972** has been listed within the study area (**Table 2.4**).

Table 3.5: List of Schedule –I species as per 22nd amendment of WPA, 1972

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status
1	<i>Antilope cervicapra</i>	Blackbuck	VU / I
2	<i>Bos gaurus</i>	Indian Gaur / Bison	VU / I
3	<i>Canis aureus</i>	Golden Jackal	LC / I
4	<i>Canis lupus pallipes</i>	Indian Wolf	VU / I
5	<i>Rusa unicolor</i>	Sambar	LC / I
6	<i>Felis chaus</i>	India Jungle Cat	NT / I
7	<i>Herpestes auropunctatus</i>	Small Indian mongoose	LC / I
8	<i>Herpestes edwardsi</i>	Common mongoose	LC / I

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

9	<i>Hyaena hyaena</i>	Striped Hyaena	DD / I
10	<i>Hystrix indica</i>	Indian crested porcupine	LC / I
11	<i>Melursus ursinus</i>	Sloth Bear	VU / I
12	<i>Moschiola meminna</i>	Mouse Deer	VU / I
13	<i>Muntiacus muntjak</i>	Barking Deer	LC / I
14	<i>Panthera pardus</i>	Leopard	VU / I
15	<i>Panthera tigris</i>	Tiger	EN / I
16	<i>Paradoxurus hermaphrodites</i>	Common Palm civet	LC / I
17	<i>Prionailurus bengalensis</i>	Leopard Cat	NT / I
18	<i>Tetracerus quadricornis</i>	Four Horned Antelope	VU / I
19	<i>Viverricula indica</i>	Small Indian civet	NT / I
20	<i>Vulpes bengalensis</i>	Bengal Fox	LC / I
21	<i>Accipiter badius</i>	Shikra	LC / I
22	<i>Amandava formosa</i>	Green Munia	LC / I
23	<i>Gallus sonneratii</i>	Grey Jungle Fowl	LC / I
24	<i>Hemiprocne coronata</i>	Crested Tree Swift	LC / I
25	<i>Pavo cristatus</i>	Peacock	LC / I
26	<i>Pericrocotus cinnamomeus</i>	Small Minivet	LC / I

27	<i>Sterna aurantia</i>	River Tern	LC / I
28	<i>Naja naja</i>	Spectacled Cobra	LC / I
29	<i>Ptyas mucosus</i>	Rat Snake	LC / I
30	<i>Python molurus</i>	Rock Python	NT / I
31	<i>Varanus bengalensis</i>	Bengal Monitor Lizard	LC / I
32	<i>Vipera russelli</i>	Russel's Viper	VU / I
33	<i>Fowleā piscator</i>	Checked keelback snake	NT / I

As per survey we have not seen any direct evidences about presence of these scheduled animal within the study area because more than 3 mining projects are already operational within study area and major land use of area is agriculture. Very small patches between human habitation and agricultural land indicate that this area is quite disturbed area for such wildlife. The area supports Schedule-I fauna such as *Panthera tigris* (Tiger), *Panthera pardus* (leopard), *Melursus ursinus* (sloth bear), *Canis lepus pallipes* (Indian wolf). There are no reported endangered and threatened species of flora. However, *Pterocarpus marsupium* Roxb (Bija) is vulnerable and special efforts will have to be made in plantation program.

Chapter 4

Tiger Corridor and its importance

Wildlife Corridors/ tiger corridor can be defined as a linear habitat, embedded in a dissimilar matrix, that connects two or more large blocks of habitat and that is proposed for conservation on the premise that it will enhance or maintain the viability of specific wildlife populations in the habitat blocks

These wildlife corridors serve as 'links to allow the wildlife populations to migrate to the 'sources', where the population can survive and breed. Together, they provide the habitats upon which the conservation of much of the flora and fauna in developed landscapes ultimately depends. Although corridors may have intrinsic habitat value, their salient wildlife value is that they connect more substantive patches of habitat. The dispersal of populations over distant habitats enhances the chances of survival of species due to a reduction in competition for food and space. If species are not restricted to smaller areas, then the localized extinction of a population will not occur due to an outbreak of epidemics as well as natural calamities such as floods or forest fires. In the long run, the chances of extinction of populations due to excessive inbreeding are also reduced. The loss of wildlife corridors also results in a steep escalation in human-wildlife conflict. Some wildlife corridors are of immense importance as they are crucial for the long-term survival of wildlife, including threatened species such as the Indian tiger (*Panthera tigris*). Areas linking one tiger reserve or protected area with another tiger reserve or protected area are not diverted for ecologically unsustainable uses, except in public interest and with approval of the National Board for Wildlife and on advice of the National Tiger Conservation Authority as per Section 38 O (1) (g) of the Wildlife (Protection) Act, 1972.

4.1 Tiger Corridor of India

India is committed to secure the livelihoods of its citizens while simultaneously minimizing its impact on its wildlife conservation goals. The National Tiger Conservation Authority in collaboration with the Wildlife Institute of India has published a document titled "Connecting Tiger Populations for Long-term Conservation", which has mapped out 32 major corridors across the country, management interventions for which are operationalized through a Tiger Conservation Plan, mandated under section 38V of the Wildlife (Protection) Act, 1972. Proposed project area does not fall in well-established 32 corridors of country nor it is a part of WII and NTCA's publication "Atlas of Tiger Corridor of Eastern Vidarbha Land scape".

4.2 Corridor identified in Telemetry Study by WII

Wildlife Institute of India has published a report titled "Telemetry based Tiger Corridors of Vidarbha Landscape, Maharashtra, India" (WII Report). This report is about the delineation/identification of critical tiger corridors in Vidarbha Landscape of Maharashtra. The report is based on monitoring of tiger movement over a long period of time, from 2015 to 2020. which has identified 37,067 square kilometres of tiger movement corridors within the 97,321 square kilometre landscape, revealing the importance of agricultural lands and human-dominated areas for tiger movement. This area with significant Landscape acts as a crucial link between central and southern Indian tiger populations, facilitating gene flow and population viability.

Out of total of 146.996 ha of forest land out of 339.467 ha of the proposed coal block mining covered under the forest compartments passes through compartments of forest land which are covered under approved Tiger Conservation Plan (TCP) of Tadoba Andhari Tiger Reserve (TATR) within the modelled tiger corridor as per the publication "Telemetry based tiger corridors of Vidarbha Landscape.

User Agency has complied with all directives issued by the State Government and MoEFCC in a timely and diligent manner. The Wildlife Conservation Plan along with

wildlife mitigation plan, with a budgetary provision of ₹177.5 lakhs, was submitted to the Divisional Forest Officer, Pandharkawda, on 28.02.2023 and duly recommended by APCCF (East, Nagpur) to PCCF (WL) on 24.08.2023. The WCP/WMP was subsequently approved by the competent State Authority and communicated to User Agency by PCCF (WL) and Chief Wildlife Warden.

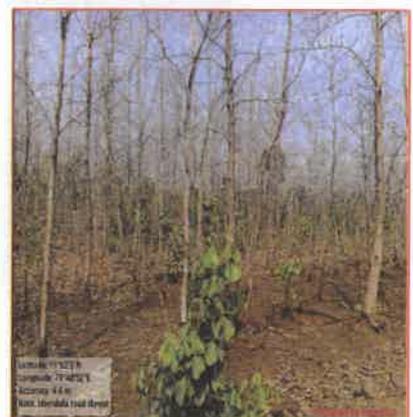
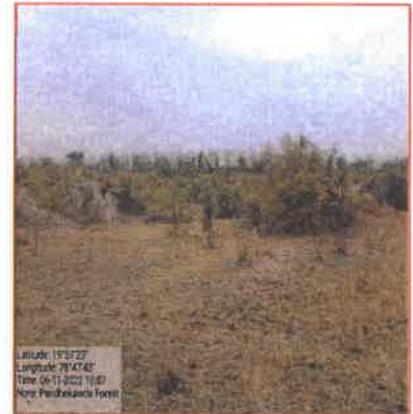
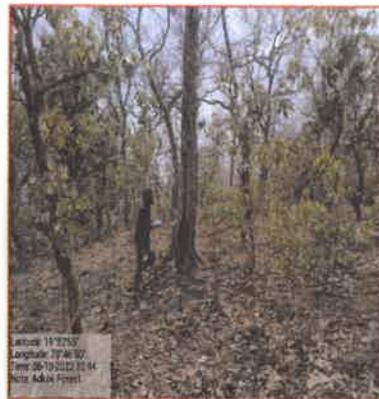
The project area falls within the Approved Tiger Conservation Plan of Tadoba-Andhari Tiger Reserve and is part of a modeled tiger corridor, as per the "Telemetry-Based Tiger Corridor of Vidarbha Landscapes" study. The User Agency has proactively submitted a site-specific Wildlife Mitigation Plan and Wildlife Clearance Proposal to the PCCF (WL) through APCCF (WL) East, which was forwarded to WII for vetting by PCCF (WL), GOM

PCCF (WL) sought an undertaking from the User Agency regarding implementation of all mitigation measures suggested in the WMP and any additional recommendations made by WII, including bearing WII's vetting charges. This was duly complied by the User Agency.



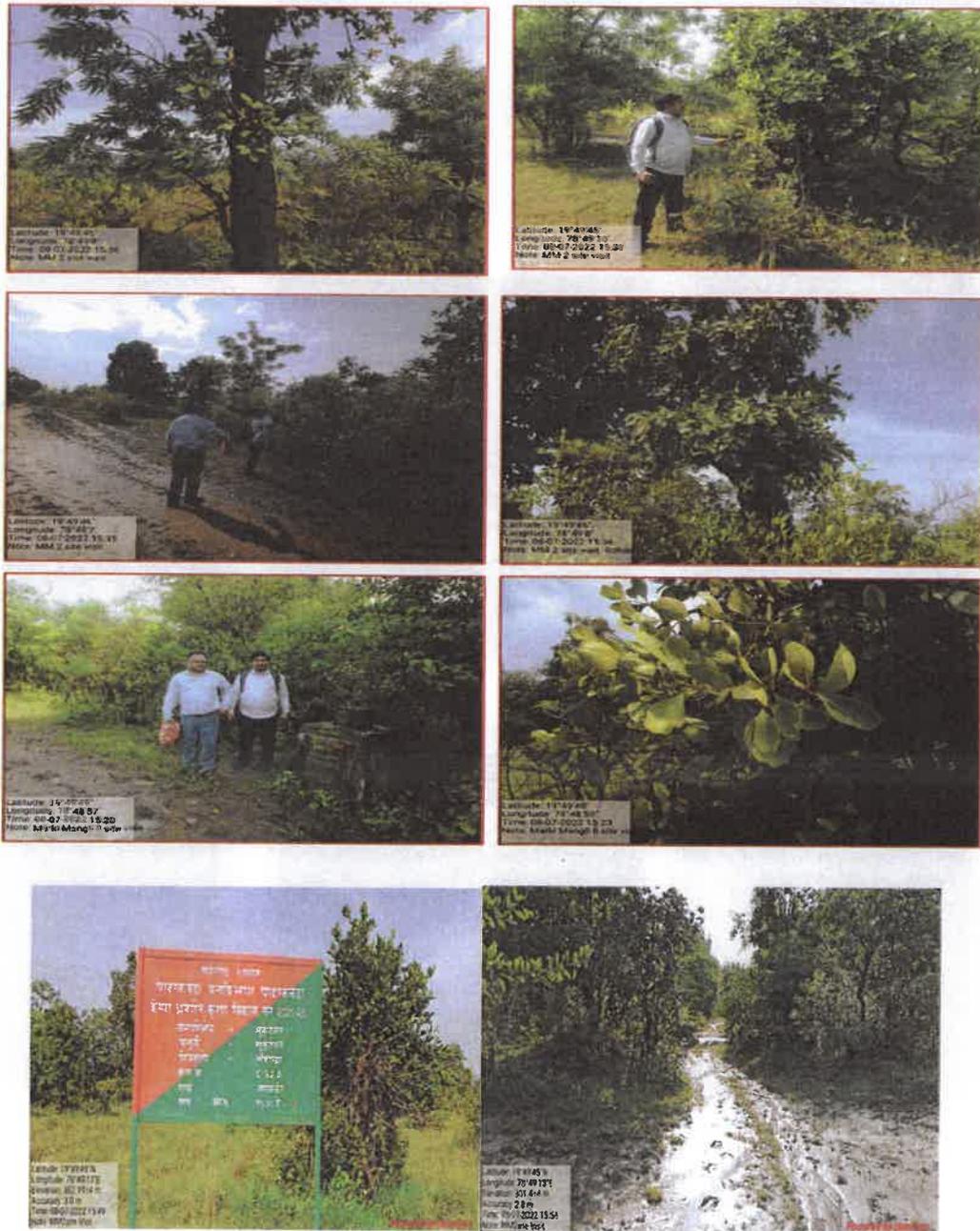
Figure- 4.1 Boundary shown in yellow is the Location of proposed mine along the identified Tiger Corridor under the 'Telemetry based tiger corridors of Vidarbha Landscape, Maharashtra, India'

Photographs of Biodiversity Studies



It is evident from the photographs above that vegetation in the forest area appears to be sparse and the density of forest is very low. This implies that possibility of wildlife habitats in the core zone is negligible.

Photographs of Flora in core zone



Chapter 5

Description of Environment & Impacts

5.1.1 Mineral development has a close interface with the issues of environment, development, welfare of local (indigenous) communities and poverty alleviation and its sustainability is crucial for the promotion of inclusive growth. Emerging Issues in India's Mineral Sector' has identified the following elements for Sustainable Mining:

- **Scientific Mining**

- Mine planning
- Methods of mining
- Level of mechanization
- Technology upgradation
- Availability, depletion and conservation of mineral resources.
- Mine closure planning and target-setting
- Progressive implementation of mine closure plan and commitment to rehabilitation

- **Environmental protection and mitigation**

- Land use
- Water use and efficiency
- Energy use and efficiency
- Waste minimization
- Tailings management
- Air pollution, liquid effluents and solid wastes

- Dust management
- Noise and vibration control
- Biodiversity loss and mitigation
- Environmental compliance and voluntary activities
- Conformity to environmental management standards (eg. ISO-14001)
- **Community stakeholder engagement**
 - Policy on and extent of stakeholder involvement in mining operations
 - Mechanisms of stakeholder participation/consultations in decision-making
 - Procedures for attending to stakeholder grievances and concerns
 - Engagement procedures and principles in respect of indigenous people (adivasis)
 - Policy on business ethics
 - Approach to bribery and competition
 - Resettlement of communities affected by mining project
- **Local socio-economic development in mining project areas**
 - Policy on and procedure for assessing socio-economic impact of mining operations in a project area
 - Mechanisms and procedures for preparing and implementing area development plans and projects
 - Plans for generating local community income
 - Investments in community and mineral wealth distribution
 - Contribution to local employment
 - Level of commitment to education, training and skill development
 - Contribution to the development of physical infrastructure in mining area
- **Transparency and Accountability**
 - Policy on and approach to public disclosure of key elements of enterprise performance
 - Nature and effectiveness of the reporting system

5.1.2 PRESENT ENVIRONMENTAL SCENARIO:

The mine lease area of mine comprises of forest land. Various features of the existing environment are described below:

- a) **Population** – The study area is pre-dominantly forest and non-forest land. There is no habitation or public transport road in the mining lease area. The population density and traffic movement in the buffer zone of the mine is low.
- b) **Industrial activities** - The area is under-developed, though a few numbers of industries are present in the study area.
- c) **Topography and Drainage** – The topography of the area is flat to slightly undulating. The drainage of the area is controlled by natural/seasonal gullies and streams which ultimately flow in to the nallah within lease area.

5.1.3 Environmental impact Assessment Study

Environmental Impact Assessment (EIA) is crucial for wildlife conservation by evaluating the potential effects of projects on the environment and wildlife habitats. The EIA process helps identify, predict, and mitigate potential negative impacts, ensuring projects don't harm wildlife or ecosystems. By incorporating EIA, decision-makers can make informed choices that prioritize both development and environmental protection.

An EIA study to evaluate the impacts on environment and ecology of the study area before commencement of the mining activities was conducted in the study area to establish a baseline environmental status and to identify the impacts due to mining activities on environmental parameters and to suggest a proper implementable mitigative measures to minimize the impacts. The parameters evaluated during the study and their results based on the basis of laboratory analysis of the samples collected are presented here. Similarly, environmental parameters which may affect the quality of life of animals present in the study area are only incorporated here.

5.1.4 EXISTING/ PRESENT ENVIRONMENTAL SCENARIO PRIOR TO COMMISSIONING OF THE PROJECT.

As a statutory requirement for obtaining environmental clearance an environmental study prior to commencement of the mining was conducted covering all the parameters envisaged by CPCB.

The frequency of parameters to be assessed and nature of parameters assessed is given under the chapter impacts of the project.

5.1.4.1 AMBIENT AIR QUALITY:

Air quality plays an important role in the quality of life of human vis' a vis' animals present in the study area. To assess the baseline ambient air quality, 9 air quality monitoring locations were selected on the basis of topography and meteorological parameters in core and buffer zone. One station was located in core zone and 8 in the buffer zone. The study area represents totally rural environment.

As per the prescribed TOR, **parameters checked for air pollutants** viz. PM₁₀, PM_{2.5}, Sulphur dioxide (SO₂), Oxides of Nitrogen (NOX), Ozone (O₃), Carbon Monoxide (CO) & Heavy Metals were monitored as representative parameters of ambient air quality in the study area.

The sample collection, its preservation, transportation from site to laboratory was carried out by Sr. Chemist, of M/s. Nilawar Laboratories, Nagpur. Sample preservation and analysis was made as per the approved standard operating procedures. M/s. Nilawar Laboratories is NABL accredited laboratory. The samples were analyzed by gravimetric, colorimetric and atomic absorption spectrophotometric (AAS) methods as per standard methods specified by Central Pollution Control Board (CPCB 2011).

5.1.4.1.1 Results and Discussion:

The results of air quality monitoring carried out during March to May 2022 are discussed below and compared with **National Ambient Air Quality Standards (as per GR: GSR 826(E) dated 16th Nov. 2009)**.

Particulate Matter (PM₁₀): The maximum PM₁₀ concentration covering all the air quality monitoring stations were observed in the range of 44.8 to 60.64 µg/m³. All the stations have PM₁₀ concentrations within permissible limit i.e. 100 µg/m³ as prescribed by MoEF&CC for industrial, residential, rural and other area.

Particulate Matter (PM_{2.5}): The maximum PM_{2.5} concentration covering all the air quality monitoring stations were observed in the range of 19.1 to 34.4 µg/m³ as against the NAAQ Standards of MoEF & CC prescribed limit of 60 µg/m³ for industrial, residential, rural and other areas.

Sulphur Dioxide (SO₂): The maximum SO₂ concentrations covering all sampling were in the range of 13.1 to 21.0 µg/m³. All monitored stations have SO₂ concentrations well within the stipulated limit of 80 µg/m³ as prescribed for industrial, residential, rural and other areas under revised NAAQ Standards of MoEF & CC .

Oxides of Nitrogen (NO_x): The maximum NO_x concentrations covering all sampling stations were observed in the range of 18.7 to 31.2 µg/m³. All monitored stations have NO_x concentrations well within the stipulated limit of 80 µg/m³ as prescribed for industrial, residential, rural and other areas under NAAQ Standards of MoEF&CC .

Heavy Metals: Representative samples from all sampling stations were collected and analyzed for heavy metals i.e. Lead, Arsenic & Nickel. The concentrations of heavy metals were observed **below detectable limit** at all the stations.

Free Silica: A few samples of PM₁₀ were analyzed for free silica which was found to be below detection limit. In summary, the ambient air quality of Marki Mangli-II Coal Mine area and its buffer zone showed that the concentrations of all monitored parameters were within the stipulated standards of MoEF&CC.

5.1.4.2 Water Environment:

Environment Monitoring Program for Key Parameters (Water)

The details of the suggested Environment Monitoring Program for monitoring of **ground as well as surface water quality and the schedule of testing and the parameters to be tested needed for Marki Mangli II Coal Mining Project** are provided in Table below:

S.No.	Particular	Monitoring Frequency	Sampling Duration	Monitoring Parameters
1.	Surface Water : 1) Dadhani Nala (D/S)	Once in 3 month	Grab	As per the parameters

2.	2) Dadhani Nala(U/S)	Once in 3 month	Grab	specified under IS: 2296 (Class-C) As per the parameters specified under IS: 10500 – 2012.
3.	3) Penganga River	One/ month	One time	
4.	Ground water : 5 Stations in Adjoining Villages	Once in 3 month	One time	Ground water quality parameters
5.	Well or Bore Wells or piezometers in Mine Lease (2 locations) and surrounding areas (5 locations).	Once in a season	One time	Static water level, pumped water level, seasonal fluctuation and other relevant parameters
6.	Mine Effluents	Once in a month	24 hour composite	As per EPA guidelines, 1986

The characteristics of ground and surface water samples are checked prior to mining respectively along with desirable as well as permissible limits for each parameter prescribed by the Indian Standard: BIS **10500:2012** and amendments thereof and the results of analysis are discussed below.

5.1.4.2.1 Physical Parameters:

- **pH Value:** The pH values of all ground water samples ranged between 7.18 to 7.50 pH, whereas those of surface water samples varied between 7.77 to 8.47. These values are within the acceptable pH range of 6.5 to 8.5 as per IS 10500:2012 standards for drinking water.
- **Ambient Temperature:** The ambient temperature encompassing all ground water samples varied from 26.7 to 27.2°C while that of surface water samples varied from 27.4 to 27.9°C.
- **Turbidity:** Turbidity of all ground was observed in the range of 2.2 to 3.5 NTU was lower than the permissible limit (5 NTU) as prescribed in IS : 10500 – 2012 and in surface water samples in the range of 6 to 9.

5.1.4.2.2 Chemical Parameters

- **DISSOLVED Oxygen:** All surface water samples showed dissolved oxygen levels ranging from 5.6 to 6.0 mg/l which is good as expected.
- **DISSOLVED Solids:** All ground water samples showed dissolved solids concentration from 380 to 668 mg/l, which are below permissible limit of 2000 mg/l as per IS 10500:2012. Whereas all surface water samples showed dissolved solids ranging from 248 to 298 mg/l which are below permissible limit of 1500 mg/l as Per IS 2296 (Class C) for surface water quality standards.
- **SUSPENDED Solids:** All ground water samples showed suspended solids concentration from 7.9 to 23.7 mg/l whereas all surface water samples showed suspended solids concentration ranging from 18.8 to 65.5 mg/l.
- **CHLORIDES:** The chloride concentrations in all ground water samples were 39.2 to 185.8 mg/l, the values are below acceptable limit of 250 mg/l as prescribed in IS 10500:2012. Chloride concentrations were 40.1 to 60.8 mg/l

in surface water which are below permissible limit of 600 mg/l as Per IS 2296 (Class C) for surface water quality standards.

- **SULPHATES:** The sulphate concentrations in all ground water samples were 26.8 to 104.2 mg/l, these values are below acceptable limit of 200 mg/l as prescribed in IS 10500:2012. In surface water samples sulphate concentrations were 14.4 to 44.5 mg/l which are below permissible limit of 400 mg/l as Per IS 2296 (Class C) for surface water quality standards.
- **Total Hardness:** All ground water samples showed hardness values ranging from 237 to 418, which are within the permissible limit of 600 mg/l as permissible in IS 10500:2012 and in surface water samples total hardness showed values from 164 to 172 mg/l.

5.1.4.2.3 Health Related Parameters

- **FLUORIDE:** All ground water samples showed fluoride values ranging from 0.14 to 0.42 mg/l which are below the acceptable limit of 1 mg/l as prescribed in IS 10500:2012. **whereas** all surface water samples showed fluoride values from 0.08 to 0.18 mg/l, which are below permissible limit of 1.5 mg/l as Per IS 2296 (Class C) for surface water quality standards.
- **NITRATE:** All ground water samples showed nitrate values ranging from 19.1 to 25.6 mg/l which are below the acceptable limit of 45 mg/l as prescribed in IS 10500:2012. Whereas all surface water samples showed nitrate values as 0.032 to 0.048 mg/l.

5.1.4.2.4 Trace Metals

- **ARSENIC, Cadmium, Chromium, Mercury, Selenium, Lead:** All ground water and surface water samples showed the concentration of above trace metals as BDL and Nil.

- **COPPER:** All ground water samples showed concentration of copper as 0.126 to 0.232 mg/l which are above acceptable limit but below the permissible limit 1.5 mg/l as per IS 10500:2012. Whereas all surface water samples showed concentration of copper as 0.138 to 0.152 mg/l, which are below permissible limit of 1.5 mg/l as Per IS 2296 (Class C) for surface water quality standards.
- **IRON:** All ground water samples showed concentration of iron as 0.023 to 0.063 mg/l which is well within the acceptable limit of 0.3 mg/l. The corresponding concentration in surface water samples was observed 0.236 to 0.342 mg/l which are below the acceptable limits.
- **MANGANESE:** All ground water samples showed concentration of Manganese as 0.032 to 0.053 mg/l. All the ground water samples have Mn values below acceptable limit 0.1 mg/l of IS 10500:2012. The corresponding concentration in surface water samples was observed as 18.1 to 29.2 mg/l.
- **ZINC:** All ground water samples showed concentration of zinc as 0.136 to 0.235 mg/l which were well below the acceptable limit (5mg/l) of IS 10500:2012. Whereas the zinc concentration in surface water ranged from 0.0 to 0.009 mg/l which are well below permissible limit.

In summary, overall quality of water samples indicated that the water quality of all the sources is satisfactory of the area are not polluted. **Due to non contamination and potability consumption of this water will not affect adversely on the wildlife in the study area**

5.1.4.2.5 Surface water quality

The study of CGWB also collaborate that the quality of ground water in the district is generally suitable for both drinking and irrigation is within permissible limit as per Indian Standards for water use. The mining will be above water table and there will not be

any adverse impact of quality of ground water. It is expected that suspended particle in surface water during rainy season may increase. The suspended solids generated during the mining operations pose major problem for contamination of surface water. These are mainly from following sources.

- Discharge of mine run-off during rains to the surface water channels;
- Wash off from waste dumps and mineral stock piles during rainy season;
- Oil spillage from maintenance workshops;
- Wastewater discharge from office building etc.

The location of the waste dumping area shall be properly planned, shaped, capped and graded, so as to prevent soil erosion along with the run-off by providing garland drains around external dump and early start of backfilling thus minimizing external dumping, the possibility of surface water contamination due to wash off water from dumps may not be anticipated.

The colour of water due to intermixing of overburden may mislead as contamination of in water. It is proposed to install a sedimentation pond on the lowest discharge point to arrest suspended particle as mitigation measure. The filter media will absorb all suspended particles and release clear potable water into system for use.

Sanitary wastewater generated from offices at mine site is proposed to be treated in Portable Sewage Treatment Plant (STP). For treating the domestic effluent, M/s YIPL has proposed installation of Sewage Treatment Plant (STP) of adequate capacity.

Workshop effluent will be treated in Effluent Treatment Plant (ETP) which will be designed for adequate capacity having O & G trap. . The oil, grease & sludge collected from the ETP will be recycled through authorized CPCB vendors and the treated water from ETP will be reused in workshop.

Regular monitoring of mine water quality will be carried out to prevent and control the contamination/pollution of the nearby surface water sources.

5.1.4.2.6. Ground Water Quality:

Ground water pollution can take place only if the mining rejects contain chemical substances. The chemicals get leached by the precipitating water and percolate to the ground water table thus polluting it. Any nearby wells or other sources of water can be rendered unfit for use as source of drinking water and even for industrial use.

Wastewater generated from the workshop and the offices, if discharged without proper treatment, will have adverse impact on the ground water quality and could lead to water borne diseases, etc. However, the likelihood of the ground water getting contaminated is very rare as there will be no release of harmful chemical substances from the mining operations.

Regular monitoring of ground water quality will be carried out to ensure effectiveness of pollution control measures.

5.1.4.3. DETAILS OF WET LANDS / MAJOR WATER BODIES:

It is recorded that core and buffer zone of mine is not a part of any designated wet land or major water bodies. It is further stated that there is no wet land within 500 m from this project. **Hence possibility of wildlife habitat forming specially in the marshy places is negligible.**

5.1.4.4. NOISE ENVIRONMENT:

The basic sources of noise during mine operation are blasting, heavy machinery operation, diesel generators, vehicular movements and sounding horn. During the mine operation phase with increasing distance from the source, the noise level decreases due to wave divergence. Additional decrease also occurs due to atmospheric effects and interaction with objects in the transmission paths.

Machinery / equipment proposed to be deployed in mining complex are used as input as noise generating sources. The noise level will remain well within the prescribed CPCB standards and thus the impact of the project operation on the ambient noise level wrt flora and fauna will be insignificant.

Once the mine becomes operational, there will be various sources of noise in the area as listed below:

- Drilling & Blasting
- Vehicular movement
- Mining machinery like excavators, drills, dump trucks, dozers, rock breakers, compressors, wheel loaders, etc.
- Mineral transportation vehicles

5.1.4.5. Noise & Vibration Management:

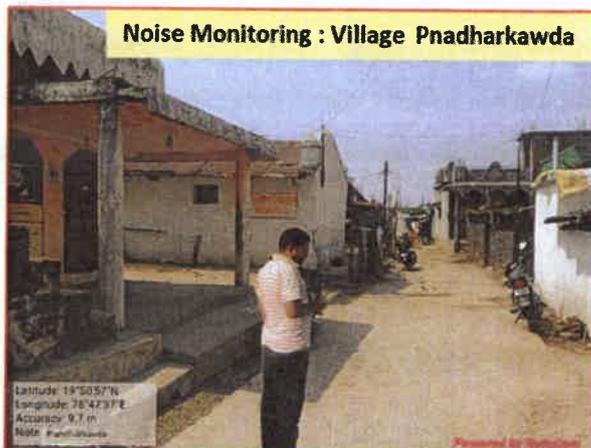
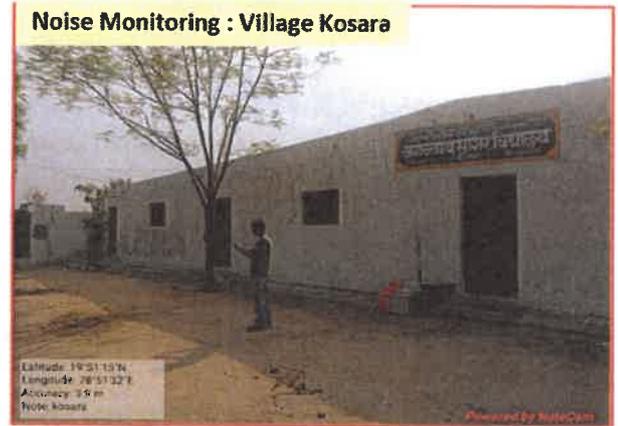
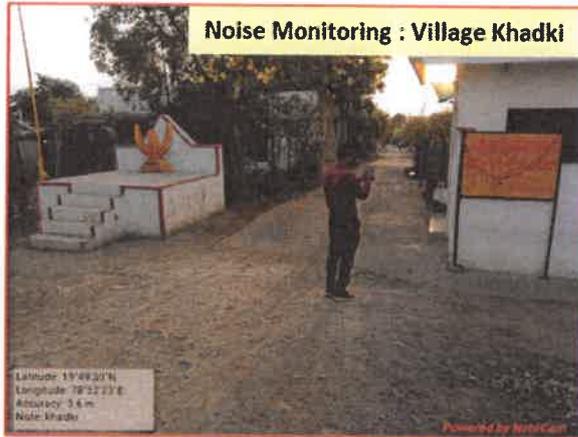
Noise is best abated at source by choosing machinery and equipment suitably, by proper mounting of equipment & ventilation systems and by providing noise insulating enclosures or padding where practicable. Proper maintenance of vehicles shall be done which keeps the noise level within limits.

At the boundary of mining lease, Green Belt of local trees shall be planted which acts as acoustic barriers. Planting of bushy trees of rich canopy in and around the mine area to intercept noise transmission shall be done. A Green Belt of trees of different heights shall be useful to act as noise attenuator in the mining areas.

Mechanical ripping shall be used, where possible, to avoid or minimize the use of explosives. Use of specific blasting plans, correct charging procedures and blasting ratios, delayed / micro delayed or electronic detonators, and specific in-situ blasting tests (the use of down the hole initiation with short-delay detonators improves fragmentation and reduces ground vibrations) shall be done. Implementation of ground vibration and overpressure control with appropriate drilling grids shall be practised. Ground vibrations caused by blasting shall be monitored in order to know their degree and to build safe guards.

Noise monitoring was done prior to the commencement of project in the study area. The noise level observed were within the prescribed standards by CPCB. The

photographs of noise monitoring are given below.



5.1.4.6. SOLID WASTE HANDLING – SOIL & OVERBURDEN

Mining process involves movement of large number of work force and vehicles within the mining area, a large quantity of waste and garbage is generated in the mining

area resulting from mining operations. The garbage includes solid waste such as overburden, mine waste, sub-grade ore, some amount of bio degradable waste and hazardous waste such as used oil, used batteries, oily sludge, filter materials containing oil are likely to be generated within the project area. These materials will create pollution leading to various health problems for wild animals. So, proper handling & management is suggested to avoid such contamination/pollution.

Similarly, during the construction phase, solid waste will be generated in the form of excavated soil, construction residues, etc. These will be generated in small quantities and will be utilized in the site levelling and road construction activities. There will not be any dumping required for the solid waste generated during construction phase. Waste oils and lubricants from the machines and equipment's used during construction phase will be collected separately in leakage proof bins and will be disposed to authorized recycling vendors. Burning of any combustible waste will be strictly prohibited.

5.1.4.7. Soil Environment

Soil is vital for wildlife habitat formation as it provides the foundation for plant growth, which in turn supports a vast array of animal life. Soil's structure, composition, and nutrient content directly influence plant communities, ultimately shaping the availability and diversity of food and shelter for wildlife. Additionally, soil supports a diverse community of microorganisms, invertebrates, and animals that are essential for ecosystem processes like nutrient cycling and decomposition, which are crucial for a healthy and functioning habitat.

The physico-chemical characteristics of soil in the study area are summarized as below:

- (a) **Texture** of soil in waste land is sandy to silty clay, agriculture land silty clay loam and in forest lands it is silty clay.

- (b) **Colour** of soil in waste land is light grey, while it is grey to dark grey in agriculture and forest land.

Other characteristics of soil of waste, agriculture, and forest lands are as follow:

- (c) **pH value** varies from waste land is 7.5 to 7.9, in agriculture land and Forest land is 6.9 indicating neutral nature of soil.
- (d) **Electrical conductivity** varies from in waste land is 0.426 to 0.526 $\mu\text{S}/\text{cm}$, Agriculture 0.214 to 0.236 $\mu\text{S}/\text{cm}$, Forest land 0.277 to 0.299 $\mu\text{S}/\text{cm}$.
- (e) **Organic matter** content ranges from waste land 0.26 to 0.48 %, Agriculture land 0.59 to 0.67%, Forest Land 0.71 to 0.76%.
- (f) **Total nitrogen** varies from waste land 99.75 to 186.2 kg/ha, Agriculture land 226.1 to 259.35 kg/ha, Forest Land 272.6 to 292.6 kg/ha.
- (g) **Total phosphorous** content varies from waste land 18.2 to 38.2 kg/ha, Agriculture land 52.3 to 55.4 kg/ha, Forest Land 52.6 to 55.3 kg/ha.
- (h) **Total potassium** content is of the order of waste land 168.5 to 255.2 kg/ha, Agriculture land 240.3 to 245.2 kg/ha, Forest Land 286.2 to 288.3 kg/ha respectively.

5.1.4.8. IMPACT ON SOIL:

The environmental impacts of the mining activities on topsoil depends on the nature of activities, extent of area covered and associated aspects of environmental concern. As per the approved mining plan, there is a very small quantum of top soil cover on the area which will be excavated during the mining plan period. However, the balance area may have thin top soil cover in some pockets. It is proposed to systematically utilize, even though meagre generated soil, for plantation on backfilled areas and also on external dump areas.

The dust generated during blasting operations, loading and unloading operations and vehicular movements normally form heavier particles that would readily settle on very small areas within the mining area itself. This will have no adverse impact on the surrounding areas.

Another important aspect is soil erosion from slopes, if not managed properly. Soil erosion may also get accelerated on areas where the overburden will be dumped. As there is neither a toxic effluent nor solid waste from the mines, quality of soil is not expected to be adversely affected. Impact on soil will be localized i.e. around the mine site. Likelihood of any adverse impact from soil erosion and disturbance in quality is remote. However, the impacts that will occur are reversible as the impacts will be felt in the initial stages of mine operation i.e. till the vegetative cover is re-developed

Chapter 6

Mine Closure Plan with Habitat restoration

Mine Closure Plan with Wildlife Habitat Restoration – Marki Mangli II Coal Block

As per the mine and progressive mine closure plan approved by ministry of coal GOI Final post mining Land Use is as under (Ref. **Annexure 6**)

Sr. No.	Post Closer Land use	Area in Ha
1.	Bio reclaimed and afforested mined out Land	37.06
2.	Backfilled area bio reclaimed for agriculture use	126.37
3.	Bio-reclaimed Overburden Dumps afforested:	52.00
4.	Water Body on excavated land:	51.78
5.	Settling pond	2.00
6.	Garland drains and nalha	3.68
7.	Road and infrastructure land afforested:	12.20
8.	Rationalisation area converted into agriculture	3.12
9.	Rationalization area afforested:	39.68
10.	Embakment public utility	5.52
11.	Safety Zone afforested with green belt	6.06
	Total	339.47

6.1. Introduction

This Mine Closure Plan outlines key activities and associated costs for restoring wildlife habitats in mined-out areas of the Mukutban coal belt. The plan is aligned with MoEFCC mine closure guidelines (2023) and NTCA recommendations for ecological restoration in tiger habitats.

6.2. Wildlife-Focused Closure Activities

- Habitat Reshaping: Terracing, slope stabilization, and contour leveling
- Topsoil Management: Redistribution of preserved topsoil with organic enrichment

- Native Plantation: Mixed forest trees, grasses, and shrubs for prey and pollinator attraction
- Water Resource Creation: Construction of ponds and ephemeral wetlands for fauna
- Wildlife Shelter Structures: Rock piles, wooden brush shelters, and deadwood placement
- Corridor Linkage: Establishing natural buffers and linkages to existing forests
- Monitoring & Patrolling: Use of camera traps, patrolling teams, and wildlife studies
- Community Involvement: Employing local communities for eco-restoration and protection

6.3 Post-Mining Tiger Habitat Restoration Plan: Best Practices & Activities

This document outlines the recommended activities for restoring tiger habitats post-mining, with the objective of bringing back displaced wildlife in areas such as Mukutban in Yavatmal district. These recommendations are based on national guidelines and successful practices from other mining-affected landscapes in India.

6.3.1 Ecological Restoration of Mined-Out Land

- Land contouring, backfilling of pits, and stabilization of overburden dumps.
- Soil conditioning with compost and topsoil application.
- Plantation of native species (e.g., Terminalia, Butea, Bamboo) instead of monocultures.
- Creation of microhabitats like grassy patches, thickets, and water mounds.

- Reference: CMPDI Biodiversity Restoration Manual, WCL Saoner Restoration Park

6.3.2 Prey Base Recovery

- Construction of waterholes (solar or gravity-fed) for perennial availability.
- Installation of salt licks and mineral blocks to aid herbivore health.
- Maintenance of forest openings for chital, sambar, and nilgai.

- Reference: WII Guidelines for Tiger Habitat Management

6.3.3 Corridor and Landscape Connectivity Enhancement

- Restoration of wildlife corridors with strategic afforestation.
- Installation of underpasses or overpasses across roads and tracks.
- Removal of invasive species like Lantana and Parthenium.

- Reference: NTCA Corridor Management Guidelines (2012), MoEFCC Infrastructure Guidelines (2019)

6.3.4 Monitoring and Adaptive Management

- Deployment of camera traps and bioacoustics devices for tiger movement.
- Use of radio collars and telemetry for tracking reoccupation.
- Community involvement in monitoring and ecological feedback.

- Reference: NTCA M-STRIPES Framework

6.3.5. Community Integration and Human-Wildlife Conflict Reduction

- Alternative livelihood options (eco-tourism, forest patrolling, nursery work).
- Fast and transparent compensation for wildlife-related damages.
- Education and awareness programs for local communities.

- Reference: Satpura Foundation Programs, Pench-Melghat Corridor

Key Good Practice References

- **CMPDI & MoEFCC: Best Practices in Reclamation of Mined-Out Areas (www.cmpdi.co.in)**
- **WII: Ecological Restoration of Tiger Habitats and Corridors (<https://wii.gov.in>)**
- **NTCA (2012): Guidelines for Tiger Habitat and Corridor Conservation**
- **FAO (2020): Forest Landscape Restoration in Mining-Affected Areas**
- **ICFRE: Manual on Forest Restoration Post-Mining in Central India**

6.4. Cost Estimate – Per Hectare of Restored Mined Area

Sr. no.	Activity	Unit Cost (INR/HA)
1.	Earth reshaping and slope stabilization	40,000
2.	Topsoil application & amendment	30,000
3.	Plantation (native trees, grasses, shrubs)	35,000
4.	Water body creation (pond/check dam)	60,000
5.	Wildlife shelter (wood/rock piles)	10,000
6.	Plantation (native trees, grasses, shrubs)	35,000
7.	Water body creation (pond/check dam)	60,000
8.	Wildlife shelter (wood/rock piles)	10,000
9.	Fencing (if required)	20,000
10.	Wildlife monitoring (camera traps, patrol)	15,000
11.	Community employment/training	10,000
	Total	1,90,000

Total area to be restored as forest 340 ha. Total estimated budget is: 6.46 CR

References and Best Practices

1. MoEFCC Guidelines for Mine Closure (2023)
2. NTCA Eco-restoration Framework (for tiger habitats)
3. CAMPA Funding Norms for Degraded Forest Restoration
4. International Council on Mining and Metals (ICMM) – Mine Closure Toolbox
5. Wildlife Institute of India (WII) – Habitat Restoration Protocols

Chapter 7

Wildlife Conservation Plan for schedule-1 species

7.1 INTRODUCTION-

Wildlife management is an attempt to balance the needs of wildlife with the needs of people using the best available science. It consists of promoting welfare factors, arresting or reducing the impacts of decimating factors and neutralizing harmful effects of limiting factors by effectively planning of mitigation measures that helps in maintaining balance in the ecosystem and create sustainable developments. Before planning of appropriate mitigation measure assessments of habitat quality, extent and analysis of usage and problems are essential prerequisite.

The formulation of a Conservation Plan is one of the steps towards the environment conservation. Since the scheduled animals have a special status in the Wildlife (Protection) Act, 1972, they are required to be conserved by improving the landscape for their protection and conservation.

7.2 Need for the conservation plan

This Conservation Plan is formulated to:

- ❖ Identify and describe the important natural features and resources in the study area.
- ❖ Promote conservation of these natural features and resources.
- ❖ Provide species specific conservation strategy.
- ❖ Guide and suggest the protection measure to project proponent for implementation and monitoring the same.

The standard stipulation under TOR for issue of Environment Clearance requires a mitigation/ conservation plan for wildlife. This plan will be additional to the Management Plan being implemented by the Forest Department on long term basis. And by this user agency would assist the State Forest Department to strengthen the activities which will directly help in ameliorating the landscape and conservation of habitat adjoining to the mine areas. On getting the Environment Clearance for the project, the amount approved by the Forest Department for such works will be deposited with the Forest Department for implementation.

Similarly, Wildlife Institute of India has published a report titled "**Telemetry based Tiger Corridors of Vidarbha Landscape, Maharashtra, India**" (WII Report). This report is about the delineation/identification of critical tiger corridors in Vidarbha Landscape of Maharashtra. The report is based on monitoring of tiger movement over a long period of time, from 2015 to 2020. which has identified 37,067 square kilometers of tiger movement corridors within the 97,321 square kilometer landscape, revealing the importance of agricultural lands and human-dominated areas for tiger movement. This area with significant Landscape acts as a crucial link between central and southern Indian tiger populations, facilitating gene flow and population viability.

In our case, a total of 146.996 ha of forest land out of 339.467 ha of the proposed coal block mining covered under the forest compartments passes through compartments of forest land which are covered under approved Tiger Conservation Plan (TCP) of Tadoba Andhari Tiger Reserve (TATR) within the modelled tiger corridor as per the publication "Telemetry based tiger corridors of Vidarbha Landscape. Hence, a **comprehensive Conservation Plan comprising wildlife mitigation plan** should be prepared and comments of CWLW of the State Govt. should be obtained.

The implementation of the wildlife conservation strategy is a challenging task with the forest fringe communities, who consider themselves as an integral part of the forest ecosystem and try to maximize its utilization. Though no reported direct impact of the coal mining activities on wildlife is recorded, yet at times, wild animals come to

agricultural crops for grazing/ browsing and thus in conflict with human interest and earns a nuisance or pest value.

It is important to create activities in these areas (10 Km from core zone boundary), which will help in mitigating human-animal conflict and help in conserving the wildlife in general and wildlife landscape in particular. Survey/ census are mostly concerned with collecting data on presence or absence of wild animals from different localities for documenting diversity of larger wild animals present in the area. Usually, these animals are reported from good forest patches as well as from hillocks situated inside and outside forest areas.

Locally, no clear data about estimates of these animals are available. The recorded population trend is not found. There is urgent need to take up such estimation studies for planning and taking suitable action for future conservation.

This Conservation/mitigation Plan has been prepared interlinking all the abiotic and biotic components in the system. Knowledge on territory, home range, density, habit, habitat, behaviour, food habits and threat etc. of individual species as well as knowledge on carrying capacity of the area are required. Therefore, in the area under present consideration, accordingly interventions have been proposed.

7.3 ENDANGERED FLORA:

No endangered or endemic flora was recorded from core and buffer zone of the project area.

7.4 ENDANGERED FAUNA:

A total of 279 faunal species documented through primary and secondary data which could be seen in the vicinity of the project site as well as 10 km area radius following **schedule -I species as per the 22nd amendment of WPA 1972** has been listed within the study area (**Table 2.4**).

7.4 List of Schedule –I species as per 22nd amendment of WPA, 1972

Sr. No.	Scientific name	Common name	Schedules of Wildlife Act/ IUCN Status
1	<i>Antelope cervicapra</i>	Blackbuck	VU / I
2	<i>Bos gaurus</i>	Indian Gaur / Bison	VU / I
3	<i>Canis aureus</i>	Golden Jackal	LC / I
4	<i>Canis lupus pallipes</i>	Indian Wolf	VU / I
5	<i>Rusa unicolor</i>	Sambar	LC / I
6	<i>Felis chaus</i>	India Jungle Cat	NT / I
7	<i>Herpestes auropunctatus</i>	Small Indian mongoose	LC / I
8	<i>Herpestes edwardsi</i>	Common mongoose	LC / I
9	<i>Hyaena hyaena</i>	Striped Hyaena	DD / I
10	<i>Hystrix indica</i>	Indian crested porcupine	LC / I
11	<i>Melursus ursinus</i>	Sloth Bear	VU / I
12	<i>Moschiola meminna</i>	Mouse Deer	VU / I
13	<i>Muntiacus muntjak</i>	Barking Deer	LC / I
14	<i>Panthera pardus</i>	Leopard	VU / I
15	<i>Panthera tigris</i>	Tiger	EN / I
16	<i>Paradoxurus hermaphroditus</i>	Common Palm civet	LC / I
17	<i>Prionailurus bengalensis</i>	Leopard Cat	NT / I
18	<i>Tetracerus quadricornis</i>	Four Horned Antelope	VU / I
19	<i>Viverricula indica</i>	Small Indian civet	NT / I

20	<i>Vulpes bengalensis</i>	Bengal Fox	LC / I
21	<i>Accipiter badius</i>	Shikra	LC / I
22	<i>Amandava formosa</i>	Green Munia	LC / I
23	<i>Gallus sonneratii</i>	Grey Jungle Fowl	LC / I
24	<i>Hemiprocne coronata</i>	Crested Tree Swift	LC / I
25	<i>Pavo cristatus</i>	Peacock	LC / I
26	<i>Pericrocotus cinnamomeus</i>	Small Minivet	LC / I
27	<i>Sterna aurantia</i>	River Tern	LC / I
28	<i>Naja naja</i>	Spectacled Cobra	LC / I
29	<i>Ptyas mucosus</i>	Rat Snake	LC / I
30	<i>Python molurus</i>	Rock Python	NT / I
31	<i>Varanus bengalensis</i>	Bengal Monitor Lizard	LC / I
32	<i>Vipera russelli</i>	Russel's Viper	VU / I
33	<i>Fowlea piscator</i>	Checked keelback snake	NT / I

As per survey we have not seen any direct evidences about presence of these scheduled animal within the study area because more than 3 mining projects are already operational within study area and major land use of area is agriculture. Very small patches between human habitation and agricultural land indicate that this area is quite disturbed area for such wildlife.

Baseline surveys identify the forest as Southern Tropical Dry Deciduous, hosting species like Tiger, Leopard, Sloth Bear, Chital, Critical wildlife movement corridors and seasonal water sources have been mapped within the project influence zone (1 km, 5 km, 10 km).

7.5 STATUS OF WILDLIFE BELONGING TO SCHEDULE-I

7.5.1. TIGER (PANTHERA TIGRIS):

Distribution& Habitat:

The tiger is essentially associated with forest habitats. Tiger populations thrive where populations of wild cervids, bovids and suids are stable. Records in Central Asia indicate that it occurred foremost in Tugay riverine forests along the Atrek, Amu Darya, Syr Darya, Hari, Chu and Ili Rivers and their tributaries. In the Caucasus, it inhabited hilly and lowland forests. Historical records in Iran are known only from the southern coast of the Caspian Sea and adjacent Alborz Mountains. In the Amur-Ussuri region, it inhabits Korean pine and temperate broadleaf and mixed forests, where riparian forests provide food and water, and serve as dispersal corridors for both tiger and ungulates. On the Indian subcontinent, it inhabits mainly tropical and subtropical moist broadleaf forests, moist evergreen forests, tropical dry forests and the swamp forests of the Sundarbans. In the Eastern Himalayas, tigers were documented in temperate forest up to an elevation of 4,200 m (13,800 ft) in Bhutan and of 3,630 m (11,910 ft) in the Mishmi Hills. In Thailand, it lives in deciduous and evergreen forests. In Laos, 14 tigers were documented in semi-evergreen and evergreen forest interspersed with grassland in Nam Et-Phou Louey National Protected Area during surveys from 2013 to 2017. In Sumatra, tiger populations range from lowland peat swamp forests to rugged montane forests.

Physical Description

Tigers have reddish-orange coats with prominent black stripes, white bellies and white spots on their ears. Like a human fingerprint, no two tigers have the exact same markings. Because of this, researchers can use stripe patterns to identify different individuals when studying tigers in the wild. Tigers are powerful hunters with sharp teeth, strong jaws and agile bodies. They are the largest terrestrial mammal whose diet consists entirely of meat. The tiger's closest

relative is the lion. In fact, without fur, it is difficult to distinguish a tiger from a lion.

Food/Eating Habits

Tigers are solitary ambush predators that rely on stealth and strength to take down prey. These apex predators primarily hunt large ungulates, such as wild boar and deer, but are also known to consume monkeys, buffalo, sloth bears, leopards and even crocodiles. When tigers are found in close proximity to humans, they may also feed on domestic animals, such as cattle or goats. Tigers are adept swimmers and have even been recorded hunting in the wild.

These powerful cats hunt primarily at night, using sight and sound to identify prey. Their striped coats help them blend into their surroundings, where they lie in wait for prey to pass by. At the opportune moment, tigers pounce on their prey, take it to the ground and finish the kill by breaking or biting the neck. Tigers hunt about once a week and consume as much as 75 pounds (34 kilograms) of food in one night.

Threats

The most immediate threat to wild tigers is poaching. Their body parts are in relentless demand for traditional medicine and are status symbols within some Asian cultures. Resources for guarding protected areas where tigers live are usually limited.

People and tigers increasingly compete for space. Tigers have lost 93 per cent of their historical range due to human activity and development.

As forests shrink and prey becomes scarce, tigers are forced to hunt domestic livestock, which many local communities depend on for their livelihoods. In retaliation, tigers are killed or captured. These "conflict tigers" are commonly sold on the black market.

Conflict with humans

Tiger attacks on humans

- Most attacks are defensive to protect cubs or self, particularly when wounded (Goodrich 2010)
- Man-eating tigers unusual - typically incapacitated by disease/wounds/infection/age, or are transients living in marginal areas (Sunquist and Sunquist 2002)
- Loss of human life greatest in South Asia and Sumatra (Goodrich 2010)
- Dozens of people killed each year by tigers in the Sundarbans (extensive mangrove forest region of Bangladesh and India)
- 1-5 per year killed in Sumatra

Tiger attacks on domestic animals

- Typically attack domestic animals as prey, most often where wild prey have been depleted (Goodrich 2010)

Tigers that approach human-dominated areas

- Local people often request intervention from government authorities (Goodrich 2010)

Conservation actions

Priority actions (Global Tiger Initiative 2009)

- Improve wildlife crime control

- Strengthen wildlife legislation
- Build capacity to detect trafficking
- Mitigate human-wildlife conflicts
- Connect discontinuous patches of forest habitat
- Develop framework for monitoring tiger populations
- Improve Protected Area management, infrastructure, equipment
- Translocate tigers
- Combat threats from development infrastructure
- Increase public awareness of ban on tiger trade

Maintain prey abundance and protected zones

- Tiger populations able to recover from significant decline if abundant prey available (Sunquist et al. 1999)
- Isolated reserves not sufficient, due to poaching and tigers' needs for large territories and large prey populations - need core zones connected by wildlife corridors (Sanderson et al. 2006)
- Survival of the species will require core zones of at least 3,000 sq km² (1,158 mi²) where tigers and their prey are not hunted (Karanth and Nichols 2002; Johnson 2006)
- About 4,000 km² (1,550 mi²) of Amur tiger range in Sikhote-Alin Mountains, Russia, was designated a [World Heritage Site](#) in 2001
- Better legal protection for prey species and enforcement are essential (Kawanishi et al. 2013)

Importance of the Indian subcontinent

- Highly critical region to preserve genetic integrity of the species

- Wild tigers in that region have much higher genetic variation than elsewhere, and it contains the maximum diversity of tiger habitats (Mondol et al. 2009; Ryder 2009)

7.5.2 LEOPARD (PANTHERA PARDUS):

Habitat: Indian leopard has high capability to adopt any type of habitat where it can get sufficient food and covers. Leopards avoid overlapping their territory or the home range with the tigers. Therefore, they try to occupy the fringe areas of the forests, as well as dare more to enter the human inhabited areas.

Behavior: Leopards are highly territorial. Leopards are not only the widest ranging of all Big Cats but are actually one of the most adaptable and are found in a variety of different habitats. The Leopard can be found inhabiting numerous different areas providing that there is a good source of cover and an ample supply of food including tropical rainforests, tree-lined savannah, barren deserts and mountain highlands. One of the reasons why they are thought to be still surviving successfully throughout much of their natural range is that Leopards have adapted to the growing presence of people and are known to both live and hunt in areas close to urban activity. However, in some parts of their natural range populations are threatened by loss of their natural habitats to both deforestation and growing settlements.

Food Habits: The diet of these big cats is surprisingly varied which includes: wildebeest, impalas, reed-bucks, Thomson's gazelles, jackals, monkeys, fish and storks. However, at times they seem to show a preference for canines, even attempting to snatch dogs right from the feet of their masters. They can also eat fish and domestic stock such as goats and cows. They will even eat carrion.

Threats: The Indian leopard (*Panthera pardus fusca*) is facing the crisis of adaptation. The species could soon qualify for Vulnerable under criterion A4 (30% decline over a period of 30 years = three generations, including both past and future). Despite being the most widespread cat, the Indian leopard faces

several types of threat. The animal shares its habitat with other animals, which include tigers, bears, wolves, Asian elephants, hyenas, and wild dogs. These animals may kill leopard cubs if given a chance. Apart from its natural enemies, the leopard's main threat is people. For years, it has been threatened, due to loss of habitat and poaching. A rapidly increasing threat to Leopards is the poisoning of carcasses targeting carnivores as a form of retaliation as well as a means of predator control. An estimated 50% of the population lives outside Protected Areas and so it is vulnerable to habitat destruction. Conflicts: Major conflicts arise when leopards start preying on livestock. These conflicts have increased in recent years due to population growth among humans. The conflict becomes more severe when some leopards become man-eaters. They can prey on children and even enter homes at night to attack humans.

Conservation Status: CITES APPENDIX: I; Indian wildlife (Protection) Act (1972) (As amended up to 2002); Sheduled-1; Part-1; Indian Red Data Book (IUCN, 1994); Vulnerable; (IUCN 1998) (Proposed); Vulnerable (National) and Data Deficient (Global).

Status: The species has been assigned almost all the categories of IUCN Red List Categories including: Near threatened, Threatened, Endangered, Critically endangered to Vulnerable, by different workers and agencies. However, these categories have been assigned mostly on regional basis. On global basis the species has been assigned Lower Risk Status. The species has been included in Shedule I in The Wildlife (Protection) Act, 1972 of our country.

Perceived Threats: Leopards face multiple threats across their range including habitat loss and fragmentation (Nowell & Jackson, 1996), conflict with livestock or game keepers (Ogada et al., 2003; Kissui, 2008; Swanepoel et al., 2015), loss of prey (Datta, Anand & Naniwadekar, 2008; Qi et al., 2015), killing for the illegal trade in skins and parts (Oswell, 2010; Raza et al., 2012), and in some areas, unsustainable legal trophy hunting (Packer et al., 2010). Hunting of Indian leopards for the illegal wildlife trade is the biggest threat to their survival. They are also threatened by loss of habitat. A significant immediate threat to wild

leopard populations is the illegal trade in poached skins and body parts. Habitat loss and fragmentation is a primary driver of biodiversity loss (Fahrig, 2003) and contributor to leopard decline (Nowell & Jackson, 1996).

Man-leopard Conflicts: Major conflicts arise when leopards start preying on livestock. These conflicts have increased in recent years due to population growth among humans. The conflict becomes more severe when some leopards become man-eaters. They can prey on children and even enter homes at night to attack humans.

7.5.3 INDIAN PEAFOWL (PAVO CRISTATUS):

The Indian Peafowl (*Pavo cristatus*), is also known as the Common Peafowl or the Blue Peafowl. The peacock is the **National Bird of India**.

Habitat: It is found in forests, but can live also in cultivated regions and around human habitations and is usually found where water is available.

Food: It is an omnivorous bird. Its diet consists of small mammals like: mice, reptiles like lizards and snakes, amphibians, arthropods like: insects, ticks, termites, ants, locusts and scorpions, seeds, fruit, vegetables, flowers, leaves, and minnows in shallow streams and so on. With its strong bill it is able to kill a snake, even a cobra. Around cultivated areas, peafowl feed on a wide range of crops such as groundnut, tomato, paddy, chilly, and even bananas. Around human habitations, they feed on a variety of food scraps and even human excreta.

Threat: Poaching of peacocks for their meat, feathers and accidental poisoning by feeding on pesticide treated seeds are known threats to wild birds. Methods to identify if feathers have been plucked or have been shed naturally have been developed as Indian law allows the collection of feathers that have been shed. However, presently, there is no severe threat to this species, primarily for its status as a national bird and secondarily due to religious belief this species is protected. But its train feathers are in great demand for commercial purposes and are the main threat to its survival. Their loud calls

make them easy to detect, and in forest areas, often indicate the presence of a predator such as a tiger.

Conservation: They are generally protected by religious sentiment and will forage around villages for scraps. The people living in the surrounding area should be rewarded for timely information about disturbing and/or poaching of the bird. The bird has a wide range of food items, hence, improvement of and protection of the bird in the buffer zone will provide sufficient food to the animal.

Conservation Status: IUCN Red List, Least Concern species. Schedule-I species under Indian Wildlife (Conservation) Act, 1972.

Status: The Indian Peafowl is listed as Least Concern species in the Red List of International Union for Conservation of Nature (Bird Life International 2008), probably owing to its widespread distribution, occurrence of locally abundant semi-feral populations, and protection from people on religious grounds. In India, it is given the utmost protection by inclusion in the Schedule I of Indian Wildlife Act, 1972. Although the train feathers of the Indian Peafowl are traded for various reasons, it is not included on any Appendix of the Convention on International Trade of Endangered Species perhaps on the claim that these feathers are naturally fallen ones during annual molt of the species, and also that the scale of trade across international border is still to be understood.

Threats: The Indian Peafowl is under threat from various quarters that include the demand for feathers and wild meat, conflict with farmers during cropping season, increased use of chemical fertilizers and pesticides, and habitat degradation. Other threats include habitat degradation and loss - more significantly from conversion of their habitat to agriculture, habitation and Industrial growth, poisoning to counter crop damage, consumption of eggs and fat extracts for alleged medicinal values, and killing for wild meat (del Hoyo et. al., 1994; Chakkaravarthy 2002). Although these threats are believed to be causing an alarming decline in populations, the magnitude and pattern of the effects in different parts of the country are yet to be quantified.

7.5.4 BLACKBUCK (ANTILOPE CERVICAPRA):

Habitat : The blackbuck inhabits grassy plains and thinly forested areas where perennial water sources are available for its daily need to drink. Blackbuck lives in open woodlands and semi- desert areas, but also enjoys areas with thorn or dry deciduous forest. They like to stay near areas where grassland is available. On hot days blackbucks rest in the shade.

General Description: Adult bucks stand approximately 73.7 - 83.8cm at the shoulder and on average have a head and body length of 120cm. The blackbuck is one of the few antelope whose colour differs between sexes. The males are rich dark brown above, on the sides, and on the outside of the legs. Females tend to be yellowish in the same areas. Both sexes exhibit white under parts and insides of the legs, and a prominent white circular patch around the eye. Also, males gradually become darker with age. Black- bucks have a graceful and slender built. The horns are borne only by males and range from 50 - 61 cm; they are ringed at the base and twist spirally up to approximately 4 turns. The narrow muzzle is sheep like, the tail is short, and the hooves are delicate and sharply pointed.

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

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

Threats to Blackbuck: For the most part, threats to Blackbuck are anthropogenic in nature. Hunting for subsistence and trade by humans outside and in protected areas has threatened the species (Schaller 1967; Macdonald 1984; Sheikh and Molur 2004). Earlier, 4 million blackbucks were present in India and were hunted by Maharajas using tamed Cheetah (*Acinonyx jubatus venaticus*). The decision of the government in 1996 to allow shooting of Nilgai as crop pest has led to increase in illegal hunting of Blackbuck in areas where both species have common habitat (Mallon and Kingswood 2001). This threat is also indicated by the IUCN (2017).

Conservation: The blackbuck was once the most abundant hoofed mammal in India and Pakistan, but their populations have been greatly reduced through excessive hunting and loss of habitat due to agricultural development.

7.5.5 INDIAN WOLF (CANIS LUPUS PALLIPES):

Description: The Indian wolf is similar in structure to the Eurasian wolf, but is smaller, more slightly built, and has shorter fur with little to no underfur. It is typically around 57–72 cm (22–28 in) at shoulder height, with males ranging from 19 to 25 kg (42–55 lb) and females 17–22 kg (37–49 lb) in weight. Its length ranges from 103 to 145 cm (41–57 in) from nose to tail. Like the Arabian wolf, it has short, thin fur in summer, though the hair on the back remains long even in summer, an adaptation thought to be against solar radiation. The fur is generally greyish-red to reddish-white with grey tones. The hairs are grizzled with black, particularly on the back, which sports a dark V-shaped patch

around the shoulders. The limbs are paler than the body, and the underparts are

almost completely white. Pups are born sooty-brown, with a milk-white patch on the chest that fades with age. Its habits are similar to those of other grey wolf subspecies, though the Indian wolf generally lives in smaller packs rarely exceeding 6-8 individuals, and are relatively less vocal, having rarely been known to howl.

Distribution and Habitat: The northern regions of Afghanistan and Pakistan are important strongholds for the wolf. It has been estimated that there are about 300 wolves in approximately 60,000 km² (23,000 sq mi) of Jammu and Kashmir in northern India, and 50 more in Himachal Pradesh. During British rule in India, wolves were not considered game species, and were killed primarily in response to them attacking game herds, livestock, and people. In 1876, in the North- West Provinces and Bihar State, 2,825 wolves were killed in response to 721 fatal attacks on humans. Two years later, 2,600 wolves were killed in response to attacks leaving 624 humans dead. By the 1920s, wolf extermination remained a priority in the NWP and Awadh. Overall, over 100,000 wolves were killed for bounties in British India between 1871 and 1916. In modern India, the Indian wolf is distributed across the states of Gujarat, Rajasthan, Haryana, Uttar Pradesh, Madhya Pradesh, , it is estimated that there are around 2000–3000 Indian wolves in the country. They are mainly found outside of protected reserves and feed mainly on domestic animals, such as goats or sheep. However, in areas where natural prey is still abundant, for example in Velavadar National Park or Panna Tiger Reserve, natural prey species are still preferred. Although protected since 1972, Indian wolves are classed as Endangered, with many populations lingering in low numbers or living in areas increasingly used by humans. Although present in Bhutan, there is no information on the wolves occurring there.

Threats to Wolves in India: Apart from the well-known causes such as of habitat loss; shrinkage and fragmentation of habitat the attitude of people who

consider them as their enemies since they are known to attack sheep, goats, calves of cattle, Chicken etc during night time. Indian wolf (*Canis lupus pallipes*) continues to face threats to their long-term survival in their natural habitats across their distribution range in India and is accordingly listed in Schedule I of the Wildlife (Protection) Act of India 1972. The factors responsible for their decline remains operational and the populations across their range are showing declining trend. Further recent genomics studies have clearly demonstrated them to be genetically distinct from other populations of the sub- species. Maintenance of demographically stable and genetically viable ex-situ populations is thus crucial for ensuring the continued survival of the species.

7.5.6 CHINKARA (*GAZELLA BENNETTII*):

Chinkara are horned ruminants inhabiting arid and semi-arid grasslands. They are selective feeders utilizing a variety of plant matter and are both grazers and browsers. They live in small groups and are an important prey species in their habitat for small and medium carnivores. Poaching and loss of grassland habitats are major threats faced by the species.

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

Physical appearance: Indian gazelles are characterized by a sandy, yellowish and red colored fur with a pale white ventral region. Facial markings are well developed: they have a dark brown or black forehead and a light face with dark stripes and a noticeable nose spot. Fur color varies seasonally. In the winter, Indian gazelles are a dark grayish sandy color, and there is a distinct brown band edging the white ventral area of the torso. In the summer, the fur is a darker brown. Indian gazelles have straight horns with prominent rings and

tips that are slightly out-turned. Horns are found on both males and females, although they are relatively shorter in females. Sub- adult males are hard to distinguish from females because of their intermediate horn length. Horns can reach lengths of 250 to 350 mm in adult males. Female horns are usually half the length of and thinner in width than male horns and have less prominent rings. Average male horn length of the subspecies *Gazella bennetti fuscifrons* and *G. b. shakari* is 256.6 mm. Females of these subspecies have an average horn length of 184.7 mm. Indian gazelles reach 0.9 to 1.2 m in length and 0.6 to 0.8 m in height. Fully grown Indian gazelles weigh 20 to 25 kg. Females tend to weigh less than males and can be as much as 10 cm shorter in height. The braincase is reasonably short and flat, with a long slender premaxilla that has a slight curve. The skull has large auditory bullae and teeth. The toothrows are bowed outward and incurved anteriorly. (Groves, 1993; Jerdon, 1874).

Behaviour: Indian gazelles are swift and agile. They are generally frightened by humans and recede into the mountains or desert to maintain a distance from agriculture and other human activities. Indian gazelles inhabit broken country and rocky mountain settings in Pakistan,

seemingly to avoid motorized vehicles. When alarmed, Indian gazelles stamp their forefoot on the ground and emit a sneeze-like hiss through the nose, hence the local name Chinkara (the sneezer). Indian gazelles have nocturnal feeding habits and are most active just prior to sunset and throughout the night. They can withstand long periods without water due to physiological processes, conserving metabolic water. Indian gazelles are generally observed alone or in groups of 3 that include a mother and her offspring. Large herds of 8 to 10 individuals are occasionally observed. Larger groups are more commonly observed during the breeding seasons. The largest herd recorded was composed of 25 individuals in July 1987 and was observed feeding on millet in a crop field during a drought when the monsoon season did not occur. (Arshad and Hussain Gill, 2010; Bobra, et al., 1992; Dookia, et al., 2009; Dookia, 2009; Jakher, et al., 2002; Rahmani, 1990)

Food habits: Indian gazelles are better adapted to browsing than grazing, but they can consume legumes and grasses in large quantities. Their diet typically consists of grasses, various leaves, crops and fruits such as pumpkins and melons. A majority of their metabolic water intake comes from the vegetation they consume. The brush and trees that make up their diet are found in mountain ranges and deciduous forests, while grasses and other herbaceous plants are found in valleys and agricultural fields. In the arid Thar Desert, Indian gazelles mainly consume four species of herbs: *Crotalaria burhia* (42% of diet), *Ziziphus nummularia* (15%), *Maytenus emerginata* (11%), and *Prosopis cineraria* (9%). (Arshad and Hussain Gill, 2010)

Economic Importance for Humans: Positive: Indian gazelles are considered sacred by the Vishnoi community of Rajasthan, which may contribute to larger populations in this area. Indian gazelles are also hunted for their skin, meat, and occasionally for horns, which serve as trophies.

Conservation status: *Gazella bennettii* is considered a species of least concern by the International Union for Conservation of Nature (IUCN). Indian gazelles were considered threatened in the 1950's due to habitat loss and anthropogenic activities such as hunting and poaching. Agricultural practices along with the general increase in human population has led to extirpation in certain areas. In 1994 the species was considered vulnerable, and in 1996 *Gazella bennettii* was considered a species of lower risk. The species has since recovered and is now considered a species of least concern by the IUCN. *Gazella bennettii* was considered a Schedule I species under the Wildlife (Protection) Act of India in 1972.

Extensive research on Indian gazelles has been conducted by the Ecology and Rural Development Society. This society observes and monitors identified clusters of gazelles, studies population dynamics, creates networks of volunteers for anti-poaching activities, and hosts local level awareness workshops. (Dookia, *et al.*, 2009; Mallon, 2008; Rahmani, 1990; Sahajpal, *et al.*, 2009; Saxena *et al.*, 2008)

7.5.7 SLOTH BEAR (MELURSUS URSINUS):

The allotted coal block area has degraded forest, protected forest as well as cultivated area. Bear is a nocturnal animal. Generally, it remains within the forest area, but occasionally, it intrudes within the village area. This is mainly due to the Mahua flower, because Mahua trees are most common around the village areas. Therefore, approach of the bear near to the village area is more during the months of Mahua flowering: the Months of March and April. Approach of the animal near the village areas in other months is extremely rare. Their density is also very low. A good study on bear has been made in the central India by Bargali et al., 2004.

Habitat: Sloth bears, in the area, occupy a wide range of habitats including forests, scrublands, and grasslands where boulders and scattered shrubs and trees provide shelter. The most common shelter is a den, a cavern like structure generally in rocks. The size of the home range of an individual sloth bear will vary with the concentration of high energy food sources. Thus, the more concentrated the food sources, the smaller the range necessary to maintain an animal. The sloth bear is more inclined to attack man unprovoked than almost any other animal. Sloth bears avoid areas where human disturbance is high, however, the bear raid peanut, maize, and fruit crops. Sloth bears like to escape from the heat of the day and forage for food at night. They will start to become active as the sun starts to set. This is also the time when many insects such as termites are more active. They are generally nocturnal, occasionally approaching near to the village area even during the day time. Locally they prefer isolated shelters below rocks and caverns to spend their day time hours. Occasionally, near to the village area, after consuming large amount of mahua (*Madhuca latifolia*) flower they remain sleeping below the tree late after sun rise.

Food: Sloth bears subsist primarily on termites, ants, and fruits. This is the only species of bear adapted specifically for myrmecophagy (ant and termite-

eating). The ratio of insects to fruits in the diet varies seasonally and geographically. Most bears are opportunistic omnivores. As such, their activities are governed by the availability of food items and dietary components within their habitat. When trees are in fruit, usually during the monsoon season, sloth bears dine on mango, fig, ebony, and other fruits, and also on some flowers. However, ground dwelling ants and termites, dug out of their cement-hard nest mounds, are a year-round staple. They have special liking for the honey for which the animal can climb trees and knock down honeycombs, later collecting the sweet bounty on the forest floor. Beetles, grubs, ants, and other insects round out their diet. During food shortages, sloth bears will eat carrion. In March and April, they will eat the fallen petals of mowha trees and are partial to mangoes, sugar cane, and the pods of the Amaltas and the fruit of the jacktree. Sloth bears are extremely fond of honey. Sloth bears will also climb and shake fruit trees to obtain food. They will also eat leafy plants, sugar-rich fruits, nuts, root, tubers, berries, vegetables, honey, eggs and small vertebrates like rodents.

Many of the non-timber forest produce, forming the food of the bear are collected like flowers and fruits of mahuwa (*Madhuca indica*) and fruits of Bel (*Aegle marmelos*), Char (*Buchanania lanzan*), Jamun (*Syzygium cumini*), and Tendu (*Diospyros melanoxylon*). Such collection may limit their availability for bears. *Ficus* spp. are not used by local people, so are readily available to the bears. Thus, *Ficus* spp. play important roles by providing supply of food for most of the part of the year. This is particularly important during summer when there are no crops in fields to raid and fewer fruiting species, and bears find it difficult to dig for termite and ants.

Threats: Major threats to this species are habitat loss, poaching and conflict killings. Habitat loss is mainly due to overharvest of forest products, monoculture plantations (e.g., teak, eucalyptus), expansion of agricultural areas, human settlements, and roads. Poaching is mainly for the commercial trade in bear parts. Encounters resulting in conflicts between people and sloth bears occur

mainly where the habitat has become severely degraded but still being used by both. The only natural threats to sloth bears are Tigers (*Panthera tigris*) and possibly Leopards (*Panthera pardus*). Dhole packs may also attack sloth bears. Asian elephants are reported not to tolerate sloth bears in their vicinity. The reason for this is unknown. Bear parts are valuable commodities in the trade for Asian medicines. Incentives for killing bears are therefore high. Although, bear is protected to varying degrees by national laws, however, they can be killed to protect life or property.

Conflicts: The sloth bear is more inclined to attack man unprovoked than almost any other animal. Major man-bear conflicts result during the mahua flowering season. Persons going early to collect the flower encounter the animal, frequently, sometimes the bear remain sleeping below the tree

after consuming large amount of mahua flower and is one of the major causes of man-bear conflicts. Persons going to the forest for the collection of wood or other forest produce encounter the bear, inadvertently resulting in conflicts.

Conservation Status: Sloth bears are completely protected under Schedule I of the Indian Wildlife Protection Act of 1972 (as amended in 1986). They cannot be hunted, but can be killed in self defense or in special circumstances where they have caused damage. All trade and export is illegal. Sloth bears are listed under Appendix I of CITES.

Population Threats: Sloth bear populations in India appear to be significantly threatened by poaching. Gall bladders and other parts from poached bears are typically exported to Singapore, Bangkok, Hong Kong, or other intermediary ports, and eventually to Japan, South Korea, or Taiwan. Respondents to our survey indicated that poaching was unimportant. However, based on records obtained by TRAFFIC (Japan), parts from an estimated 700–1,500 bears per year were shipped from India to Japan during the late 1970s through the 1980s (Servheen 1990), and the Wildlife Protection

Society of India (New Delhi in litt. 1996) found that poaching and trade in sloth bear parts is still "fairly common in the hills of the northern States of Uttar Pradesh, Himachal Pradesh and West Bengal, and the central State of Madhya Pradesh (Including Chhattisgarh)".

Habitat Threats: Loss of forested areas outside parks and reserves poses a major threat to sloth bears because it causes population fragmentation, thereby leaving small, nonviable populations within the parks. Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products (cutting timber, lopping branches, collecting fruits and honey), establishment of monoculture plantations (e.g., Tea, Rubber, Teak, Eucalyptus), expansion of agricultural areas, Mining/Industrial activities, and settlement of refugees, diminishes natural food supplies for sloth bears and may result in reduced reproduction. Poor food supplies also may increase the likelihood of sloth bears seeking human-related foods, like sugarcane and peanuts, outside the forest, where they become more vulnerable to being killed as a nuisance.

Human-bear interactions: Sloth bears are known for their aggressiveness, both towards humans and towards other large mammals. They seem to avoid human contact, when possible, but may encounter humans when they are enticed into croplands or when people enter the forest. Sloth bears seem to have a low tolerance toward people when they inadvertently meet.

7.5.8 FOUR-HORNED ANTELOPE (TETRACERUS QUADRICORNIS):

Habitat: Four Horned Antelope prefers living in terrestrial, dry deciduous forests, wooded areas rich in vegetation near streams or rivers. Four-horned antelopes are found primarily in wooded areas in India. The species is still widely distributed throughout its range. *T. quadricornis* uses the hilly country and tall grassy areas for shelter. It prefers open forests and is rarely seen, dashing into thick cover at the first sign of danger.

Physical Description: *T. quadricornis* weighs between 15 and 25 kg. The body length is 80-110 cm, with a shoulder height of 55-65 cm, and a tail length of 10-15 cm. The hair is short, course, and thin, with sexually dimorphic brownish colour above and lighter on sides. The insides of the legs are white along with the middle of the belly, Males are dull-red brown above, with white below, and have a dark stripe that runs down the front of each leg. Older males are yellowish. Females typically are a brownish-bay color. The horns, only on males, are smooth, short, and conical. The posterior set range from 80 to 100 mm in length. The front two are typically 25-38 mm long, and sometimes only a raised black area of skin is present. The muzzle and outer surface of the ears are blackish brown. The small hooves are split and rounded in the front. Four horned Antelopes are unique, being the only bovids with four horns (Nowak, 1999; Walker, 1995; Macdonald, 1984).

Behavior: *T. quadricornis* is not gregarious, and rarely are more than two individuals found together. These animals are sedentary and inhabit the same region throughout their lives. It is not known whether or not territories are formed or defended. In the rut, males have been found to be extremely aggressive to other males. They can be easily tamed when young, but have been found to be extremely delicate in captivity. Population densities are thought to be less than 0.5 animals per square kilometre.

Food Habits: *T. quadricornis* is primarily a grazer. The primary foods of these antelope are grasses, shoots, and fruit. They are rarely found far from water.

Conservation status: *T. quadricornis* is currently listed by the IUCN as vulnerable. The habitat of this species is being fragmented by human activities.

7.5.9 ROCK PYTHON (PYTHON MOLURUS):

Habitat: It is a non-poisonous, lethargic and slow-moving snake, exhibiting little if any timidity and rarely rousing itself seriously to escape, even when attacked. Diurnal and/or nocturnal habit depends upon the degree of disturbance from

man in their environment. The snake hibernates in cold season, in any convenient retreat. There are very few records of attack on human beings are also there in the area.

Food: Feeds on mammals, birds and reptiles, but prefers mammals. Stomach content has shown frogs, toads, monitor lizard, wild duck, peafowl, poultry, rat, hare, porcupine, langur, jackal, mousedeer, and hogdeer, chital, sambar fawn, barking deer, chinkara and leopard. Thus, it has a very wide range of food items.

Threats: It is killed for flesh and skin. However, in the presently applied lease area it is not eaten. Killing for skin is also not reported in the area. However, it is killed only because it is a snake.

Conservation: The snake, although occurs in the area but is rare. Reports of its conflicts with human being are extremely rare. Public awareness is the most important method for its conservation.

Conservation Status: This species is classified as Lower Risk/Near Threatened (LR/NT) on the IUCN Red List of Threatened Species (v2.3, 1994). This means that it has been evaluated, but does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. However, it is considered Near Threatened (NT), meaning that it does not qualify for Conservation Dependent, but is close to qualifying for Vulnerable. Year assessed: 1996.

CHAPTER -8

ACTION PLAN AND FINANCIAL PROJECTION FOR CONSERVATION PLAN

8.1 INTRODUCTION:

Habitat is natural home for wildlife confined in forest areas. Habitat or natural home is territory in which wild animal can walk without fear, enjoy independent breeding activities with availability of food/fodder and water even in Pinch Period and also take rest without disturbance. In the degraded forest, planting in open patches have to be taken to develop the forest areas. Anicuts will be constructed for water availability in forest areas under the guidance of Forest department. To overcome soil erosion, check dams and Guli plugging have to be constructed in the buffer area. It is observed that Village Forest Protection Committees are playing a good role in protection of flora and fauna. It communicates with the local people to protect wild animals because wild animals are our friends and good wealth. Wild animals provide us a healthy environment. VFPMC's supports local people in uplifting their economy, health and livelihood. These committees watch the forest day and night and protect against fire and hunting of wild animals in the area.

8.2 ACTION PLAN:

8.2.1 Non-formal Education:

Conservation education and awareness will be imparted both at the formal and non-formal levels. At the formal level, it will be given at school, colleges and university levels. Formal education, in spite of all the curriculum development and introduction of the study of ecology, wildlife and conservation at the school and college levels, however, largely remains text book and examination oriented. Because of the situation, non-formal

education becomes all the more necessary for creating the right kind of awareness and attitude among people at all levels- children, teenagers, adults, family groups, teachers, administrators, politicians and policymakers. To achieve this some local tours of school and college students will be arranged to nearby National Parks.

8.2.2 Institutional Infrastructure:

The prime requisite for building up an understanding and awareness about wildlife and conservation is to develop an appreciation, respect and love for nature. Most people lack the curiosity to know even the names of animals and plants they come across in their day-to-day life. Development of an inquisitive mind, a keen sense of observation and curiosity about the fauna and flora are, therefore, very important. Concern for conservation can only emanate from a love for nature and awareness about the interdependence of all species of animals and plants, including the man. To arouse curiosity about the wildlife in the young mind some quiz and essay competitions will be arranged in the schools and colleges of the buffer zone and some nearby areas.

8.2.3 Indian Tradition of Conservation:

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

8.2.4 Role of the Individual:

Each individual should develop a personal ethic towards nature and wildlife which could pave the way for commitment and conviction not to destroy wildlife particularly that of not considering hunting as a sport, nor to use

products made out of skins or other parts of endangered animals. Unless these products are boycotted by their users, the clandestine killing and poaching of wildlife at the hands of unscrupulous people will continue. Everyone can play important role in spreading the message of conservation among their friends, family and community at the large.

8.2.5 Improvement of Water availability:

"Water" is the daily requirement of all wild animals. The scarcity of water leads to the migration of wild animals from forest area towards population and thus increasing dangers to their life by way of man animal conflict and attracts poaching also. This includes Repair of existing Anicuts, Talai and water pond will be provided every year before rainy season in consultation with forest department. Development of small mud ponds and ensuring the availability of water in pond and tankis (Drinking Water body for Cattle) should be ensured during the pinch period.

8.2.6 Eco-Development Works:

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

8.2.7 Horticultural Nursery:

There will be demand for seedling for horticultural species in and around Wani/Mukutban. Nurseries can be raised by villagers for selling the same to

different farmers and also to the people in the nearby townships. For this purpose, skill of grafting and budding can also be developed. Ornamental tree species can also be grown for beautification.

8.2.8 Controlled grazing:

Over grazing affects the habitat of wild animals, hence controlled grazing is must to conserve and preserve the habitats of the wild animals. For this, villagers will be made educated regarding the negative impacts of over grazing under the guidance of Forest department.

8.2.9 Protection against fire:

Generally, fire occurs in summer season. The local people use to take smoking bidi and cigarettes into the forest & throw them there which cause fire. The dry grass catches the fire and in no time, fire spreads in the area. However, fire accidents in forest is severe, it destroys the forest as well as the habitat of wild animals. Fire kills the innocent wild animals and their cubs and chinks specially in nesting and breeding season.

Salt is a very important requirement of most wildlife, which they often meet from natural salt licks available in different forests. A survey of the area revealed that such salt licks are badly needed in the area. Hence, artificial Salt licks must be provided at suitable locations, preferably near water holes, where proper watch & ward is possible. Otherwise these spots shall be misused for poaching animals.

8.2.10 Protection against hunting:

Hunting of the wild animals is prohibited in forest and also outside the forest. The local people hunt this wild animal which is a punishable offence. Hunting must not be allowed in the study area. Awareness Camps will be arranged under the guidance of Forest department for labors working in the industry regarding offences against wild animals such as trapping, driving, snaring,

capturing, killing, poisoning. They will be made aware that taking any part of the body of wild animals is restricted and is a nonbailable offense. Offended person could be punished with an imprisonment of 7 years. One cause of depletion of wildlife status is due to poaching by local people. Hence, it is necessary both to improve enforcement and create awareness among the people for eliminating poaching and consequently improve the status of wild animals. For this the protection has to be strengthened at project cost. Towards this end the project proponents may need to send their staff to be properly trained by the forest department and also help local forest protection committee youths'. Necessary equipment like a walkie talkie or mobile handsets would also need to be provided to mine security-men to report to the forest department of any poachers or unsocial looking elements in the jungle or its surroundings. The Project staff should also help the Forest staff to prevent poaching and illicit felling whenever needed.

8.2.11 Checks and control on the Movement of Vehicle:

Due to movement of vehicles injury to animals and reptiles may take place. For this reason, speed limit of vehicles will be fixed and operators will be educated and advised regularly to drive vehicle safely and slowly. All operators will also be advised to stop the vehicle on seeing such reptiles or animals and let it go away before moving the vehicle further.

8.2.12 Pressure horn:

Noise generated by pressure horn disturbs the wildlife and forces them to leave the place. No pressure horn will be fixed on vehicle plying in the area. All the drivers will be advised to make minimum use of horn while working hours.

8.2.13 Vehicles head lights:

Efforts will be made to cover the lights suitably with paint so that strong beam of head light is not formed and light falls in front of the vehicle only.

8.2.14 People Participation:

With the help of the local people and employees of the Company watch will be kept on the wild life as well as illegal tree felling. Forest and police department will be informed if such incident occurs, to take legal action against the offenders. For this they will be trained for motivation. Organizing awareness activities for the wildlife and nature during Wildlife Week (1st Oct to 7th Oct.), on 21 st March (The World Forestry day) and on 5th June (The Environment day) every year, Activities may include painting, photography competition, Essay Writing, Slogan writing, trees and bird's identification etc. □ During the Camps, Publication of Brochure/ Pamphlets regarding Nature and wild life Protection shall be distribution and guidance for protection of Wildlife and environment shall be provided. □ Display of slogans and signage in the entire core zone and 10- km radius shall be provided and displayed especially along road side regarding Wildlife and Nature.

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

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

8.2.16 Reducing Environmental Pollution:

To keep the environment free from smoke, cooking gas cylinders will be provided to all the project workers particularly. To control pollution from project measure outlined in EMP will be followed.

8.2.17 Provide employment to the villagers:

On the basis of their suitability, jobs in project will be provided to the nearby

villagers. As a result, their economic condition will improve. This will keep them busy also, so they will not be tempted/compelled to cause destruction to forest which will help improve the status of wildlife.

8.3 PLANTATION IN THE BUFFER ZONE:

Trees will be planted in the buffer zone also. This plantation will be done at selected places only and only local species will be used in the plantation. Some of the tree species included will be Saja (*Terminalia tomentosa*), Baheda (*Terminalia bellerica*), Bija (*Pterocarpus masupium*), Bargad (*Ficus benghalensis*), Peepal (*Ficus religiosa*), Mahua (*Madhuca latifolia*), Sal (*Shorea robusta*), etc. Care will be taken to include some fruit bearing trees like Gular (*Ficus glomerata*), Aonla (*Emblica officinalis*), Aam (*Mangifera indica*) and such trees to provide food to the herbivores which in turn will be the food source of the carnivores. Water, particularly during drier seasons, becomes the most important factor to all types of wild animals including the mammals, birds and reptiles. If water is available safely, then all other factors become secondary for the presence and survival of the wild life in any forested area. Places suitable for mini watersheds will be identified in the core as well as in the buffer zone to store rainwater. Further, to make water available at all the times, throughout the year, some of these water holes will be recharged through artificial means. Proper slope will be given to approach these water sources so that the wild animals will be able to drink water without any difficulty. Proper cover through vegetation or any other type of even artificial cover will be developed near to these water sources so that the prey species will be able to hide themselves from the predators, at the time of approaching the water sources. To attract the birds, plants yielding food to the birds will be planted on priority basis. If water and food are available

to the birds without any anthropogenic disturbances the area can become an ideal place for bird watching.

8.4 SUPPORTING ACTIVITIES REQUIRED FROM STATE GOVERNMENT.

Conservation activities suggested by State Forest department will be implemented. Conservation activities suggested by State Forest department will be implemented by Project authority.

Review and Monitoring of Wildlife Conservation Plan: The conservation plan proposed for the Schedule- I fauna in buffer area of plant site should be monitored continuously to assess any short comings and to remediate further and implement the plan to achieve the goal for conservation and improvement of the wildlife population and its habitat. The team will review the progress and evaluate the works and submit reports periodically in ten years. The report should also suggest remedial measures for effective conservation and management of the threatened and Schedule- I faunal species.

Field Monitoring It will be difficult to assess the results and success of this proposed conservation plan unless the status of threatened and Schedule- I fauna, associated wild animals and its habitat are monitored on regular basis. The team will review the progress and evaluate the works and submit reports periodically.

8.5 SUCCESS INDICATORS

Following factors will be undertaken as measurable indicators of success of the plan:

- I. Increase in vegetation density and ground cover in buffer area.
- II. Increase in population and abundance of rare, threatened and Schedule-I faunal species as mentioned in the plan.
- III. Increase in population and abundance of biodiversity and other wildlife in the area.
- IV. Overall health of the habitat and ecosystem in buffer areas

8.6 ACTION PLAN & FINANCIAL PROJECTION:

Action Plan: The proposed site-specific action plan is tabulated below:

8.1 SITE-SPECIFIC INTEGRATED WILDLIFE CONSERVATION PLAN

Sr. No	Plan	Action	Role		Location	Age-ncy	Fun-ding	Timeline	
			PP	FD				ST	LT
1.	Habitat Conservation and Management	Conservation and Protection of Scrubland, patches of grassland and the wildlife habitats	X	√	RFs	FD	PP	X	√
		Protection and enhancement of reserved forests	X	√	RFs	FD	PP	X	√
2	Habitat Improvement & Manipulation	Water supply, Saltlicks, Fruits. Fodder development	√	√	RFs & CA	FD &PP	PP	√	√
		Development of grassland and scrubland and control of invasiveweeds	√	√	RFs & CA	FD &PP	PP	√	√
3	Protection of home range and movement corridor	Protection and management of the home range inthe RFs and movement corridor.	X	√	RFs	FD	NA	√	√

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

4	Reduction of mortality due to Traffic	Vehicular traffic and speed should be minimised to check the chance of accidents along the highways passing through this area by providing Barriers & speed breakers at regular intervals.	√	√	Traffic	FD & PP	NA	√	√
5	Research and Monitoring	Regular Monitoring of Wildlife population to understand their population dynamics.	√	√	RFs	FD & WII	PP	√	√
		Research should include resource inventory, habitat carrying capacity	√	√	RFs	FD & WII	PP	√	√
6	Public awareness and involvement	Organization of Nature & Wildlife Education Program and Wildlife tours	√	√	Public institutions	PP, FD & Media	PP	√	√

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

		Creation of public awareness through public and social media;NGOs; Eco-clubs;Nature lovers	√	√	Public institutions	PP, FD & Media	PP	√	√
		Fixing of signboards with wild animal Paintings along the highways where wildlife cross	X	√	Wildlife road crossing areas	FD	PP	√	√
7	Enhancing cooperation	Interdepartmental cooperation, public private partnership, NGOs, Institutionsand local communityrelationship	√	√	X	FD	PP	√	√
8	PollutionContr ol	Control of air (dust), water andnoise pollution due to mining	√	X	Mine lease area & Crusher	PP	PP	√	√

Note : ST=Short Term, LT= Long Term, PP=Project Proponent, FD=Forest Department, RF=Reserve Forest

Financial Projection: The proposed fund allocation/budget for implementation of this Wildlife Conservation plan is tabulated at **Table 6.1** below:

Table 8.2: Comprehensive Conservation Plan Budget

(Rs.in Lakhs)

Sr. No.	Particulars	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total
A	Plantation of native species in blank spaces/ degraded	10	10	10	5	5	40
B	Development of pasture area	10	10	10	5	5	40
C	Support to forest department vehicle for research contineous monitoring , rescue and rehabilitaiton of wildlife	25	5	5	5	5	45
D	Construction of waterholes and restoring old water hole/ ponds	10	10	2	2	2	26
E	Sign boards for alert/ speedlimit/mine pits direction Etc	10	5	0.5	0.5	0.5	16.5
F	Awaress camps for protection	2	2	2	2	2	10
	TOTAL FOR CONSERVATION PLAN	67	42	29.5	19.5	19.5	177.5

Chapter 9

Prediction of Impacts of Opencast Mining on Wildlife

9.1 IMPACTS OF PROPOSED MINING ON FLORA, FAUNA AND ECOSYSTEM

The project has several impacts on the Flora fauna as well as the ecosystem.

These are as follows:

- Direct loss of habitat at intersection locations particularly on account of damage to the existing vegetation due to construction activities and transport.
- Interference of noise generated due to mining operation with Heavy Earth Machinery and transport of OB and Coal by heavy trucks in haul roads and transport of coal to the the wildlife.
- Lighting effect from the vehicles during their movements will affect the wildlife which will result behavioural change, collision of animals and road kills.
- Fragmentation to the forest and other important habitat areas may reduce home range and cause isolation of the wildlife species.
- Decline in wildlife population, their flow and movement.
- Injury and accidents to a lesser extent as the project has largely elevated fencing leading to mortality of wildlife.
- Reduced access to summer and winter ranges of ungulates, breeding sites and nesting habitats of birds

9.1.1. Direct loss in the form of Removal of Trees

Due to implementation of this project approximately 113425 nos. of trees will be felled which might have significant effect on the current ecosystem. The impacts of tree cutting on the environmental quality will be as follows.

- The loss of trees will lead to higher degree of soil erosion. This has to be compensated by re-plantation of trees in the first priority, at the preconstruction stage.
- The loss of trees will reduce the ambient air quality since trees act as adsorbent of air pollutants thereby improving the air quality.
- The reduction in number of trees, especially in or near mine operation will enhance the raising of noise level.
- Loss of such a large number of trees may affect severely to the ecosystem in the form of change in the micro habitat. Species currently living in that particular area will either perish or shift their presence to the nearest available habitat which might cause a temporary imbalance in the community level.
- The other impacts of felling of such trees will have a negative impact on shade, availability of fruits etc. till the new trees grow up and compensate.

9.1.2 Interference of noise generated due to construction and transport to the wildlife.

The impact of noise on wild animals is a contentious issue. Loud noise interferes with the communication systems of wild animals, brings out a 'flight or fight' response, and interferes with the behaviour of both predator and prey. During mining and OB removal, the heavy earth moving equipment used for excavation, loading, unloading and transport will be the main noise sources which will have temporary and reversible impact on the noise level of the area. Whereas after the completion of the construction and during operation of mine project the regular movement of vehicles will also generate noise that have adverse impact on the ambient noise levels.

9.1.3 Lighting effect from the vehicles during their movements will affect the wildlife which will result behavioural change, collision of animals and road kills.

Artificial lights may contribute to disturbance of wildlife near roads. It may disorient birds, disturb breeding and foraging behaviour in birds, repel spiders and beetles,

and influence the behaviour of nocturnal frogs. It is also thought that a flash of artificial light causes an animal to become temporarily blind, popularly called the 'deer-in-the headlights' effect, reducing its chances of avoiding collisions with vehicles. Headlight glare can interfere with the flights of birds and bats. It can disrupt homing behaviour and mating calls (croaking) of amphibians in wetland habitats, and influence navigational ability and decline in population of reptiles. For migrating and dispersing animals, highway lights can be disorienting. During construction phase, a number of lights will be illuminated in the Project area for different purpose like visibility, safety or security of the work force. Besides movement of vehicles after the completion of the project will add up illumination in the area. The above activities will increase the stress condition. Animals exposed to light exhibit erratic behaviour pattern, expressed in their deflected movement and aggressive behaviour.

9.1.4 Fragmentation to the forest and other important habitat areas may reduce home. Range and cause isolation of the wildlife species

Mining project may form of habitat fragmentation due to deforestation. These developmental infrastructures dissect contiguous habitat patches, resulting in smaller patch sizes and higher edge-to interior ratios, making them increasingly vulnerable to outside disturbance. The fragmentation of habitat into spatially isolated parts is a major cause of the decline of biodiversity; e.g. habitat loss and fragmentation of amphibian populations worldwide has led to a substantial decline in their numbers during the last century (Stuart et al. 2004). The fragmentation process initiates a shrinking in available habitat, which in turn leads to a progressive reduction in species diversity in the landscape, with consequent isolation of species. The contraction in available habitat together with isolation becomes the most important impact. Hence, implementation of this project without adequate mitigation measures may obstruct the movement of wild animals in this area. In addition habitat disturbance in the buffer zone is predicted by implementation of this project as the increase in human population, continuous noise production and regular movement of heavy vehicle will disturb the nearest habitat

9.1.5 Decline in wildlife population, their flow and movement

Due to these above impacts of the proposed project such as direct loss and fragmentation of habitat, noise, sound and anthropogenic effect the decline of the wildlife are anticipated particularly for the small creatures that living in that proposed mining and its adjoin areas. The continuous movement of vehicle during operation and transportation of ore of the proposed mining project will also act as a barrier for the movement and flow of animals if proper mitigations are not planned and executed.

9.1.6 Reduced access to summer and winter ranges of ungulates, breeding sites and nesting habitats of birds

As discussed above the project have several impacts on the wildlife and their habitats such as habitat loss and fragmentation, noise and light effect, barrier of movement, road kill and collision etc. Such combinations of direct impacts also have much indirect impact to the wildlife. This may affect the migration and dispersal pattern of many species. The proposed project might act as barrier to the migration and dispersal and which may reduce access of different species to their nesting habitats, breeding ground etc. if proper mitigations will not plan.

Chapter 10

Mitigation Measures

Habitat is natural home for wildlife confined in forest areas. Habitat or natural home is territory in which wild animal can walk without fear, enjoy independent breeding activities with availability of food/fodder and water even in Pinch Period and also take rest without disturbance. In the degraded forest, planting in open patches have to be taken to develop the forest areas. Anicuts will be constructed for water availability in forest areas under the guidance of Forest department. To overcome soil erosion, check dams and Guli plugging have to be constructed in the buffer area. It is observed that Village Forest Protection Committees are playing a good role in protection of flora and fauna. It communicates with the local people to protect wild animals because wild animals are our friends and good wealth. Wild animals provide us a healthy environment. Village forest protection & management committee (VFPMC) supports local people in uplifting their economy, health and livelihood. These committees watch the forest day and night and protect against fire and hunting of wild animals in the area.

10.1 Flora and fauna Conservation and Mitigation Measures

Wildlife management is an attempt to balance the needs of wildlife with the needs of people using the best available science. It consists of promoting welfare factors, arresting or reducing the impacts of decimating factors and neutralizing harmful effects of limiting factors by effectively planning of mitigation measures that helps in maintaining balance in the ecosystem and create sustainable developments. Before planning of appropriate mitigation measure assessments of habitat quality, extent and analysis of usage and problems are essential prerequisite.

On considering the above-mentioned threat to the wildlife and their habitat the following measures are planned and should be effectively implemented and monitored scientifically.

10.2 Management of Activities:

To compensate the direct habitat loss due to this project, large numbers of indigenous trees should be planted in consultation with the concern authority. There should be provision for at least a thrice in numbers of tree plantations as of the total tree to be felled due to implementation of this project. Secondly to minimize the fragmentation effect and to ensure smooth passage of wildlife the following mitigation measures should be planned.

- Different measures such as installation of rambler, florescent signage, and speed breakers to be adopted to control the speed of vehicle.
- Strict measures to be adopted such as regular patrolling by the staffs and spreading of awareness amongst the villagers for safety of animals
- Regular movement path of the animals shall be identified on consultation with the Divisional Forest officer of the region for non-disturbance of the habitat vis a vis movement of the wild animals
- Necessary high elevated animal-proof fencing will be erected to prevent animals from entering in to the mine.
- The impacts due to tree cutting & felling will be minimized by opting for plantation with locally available varieties of species to make up for the lost vegetation.
- As the density of CA land provided by the company at Mauje Ratambi is more than 0.4, Govt. of Maharashtra Forest division imposed a condition to do the CA plantations on degraded forest land available in the vicinity of project to improve the vegetation for the formation of habitat for wildlife which will be strictly obeyed by the user agency.
- There is no reported migratory path of wildlife or bird species of threatened or protected species. The transport route of the mineral also lies away from these areas. Plantation activities and creation of water reservoir at the conceptual stage will help to improve the biodiversity of the area.

10.3 Control of Noise Pollution

Wild animals rely on sound for effective navigation, intra and inter-specific communication, avoiding danger and finding food for survival. Excessive noise caused by heavy machineries in the mine and movement of vehicles transporting OB during the construction phase will have multiple effects on ecosystems. Hence,

we proposed the following mitigation measure reduce the predicted noise level below the threshold level.

- Establishment of vegetation as the noise barriers is proposed at along the mine as a safety zone vegetation, if it is high enough, wide enough, dense enough and opaque, may reduce noise during construction and operation of mine.
- There must be also provision for the establishment of signboard alongside
- of the transportation road, particularly at the sensitive zone to warn the drivers not to sound horn.
- to control noise pollution, operation of heavy machinery and blasting in the mining area which produces large amount of sound may cause disturbance to wild animals. Periodic maintenance of these machines is important to control the noise levels. No mining, blasting or transportation shall be allowed from 6 pm to 6 am. Control Blasting may be resorted and need to be monitoring on daily basis and keep record for surveillance. Development of green belt along the project area is an effective strategy to control the noise pollution. It is suggested that a green belt needs to be developed in the safety zone of 7.5m along the mine lease area. Only native trees must be planted in the safety area. No mining operation should be carried out in this zone; rather dense plantation of evergreen trees must be carried out. This will provide a natural screen between the mine and the adjoining area thus reducing the nuisance caused by noise and dust in the vicinity of the mine.

Additional measures to reduce noise pollution are as follows:

- Secondary blasting will be minimized to the extent possible;
- Systematic blasting with proper spacing, burden and stemming will be carried out;
- Minimum quantity of detonating fuse will be consumed by using non-electrical initiation system;
- Blasting will be carried out during favorable atmospheric conditions and also when human activities are at their minimum;
- Prime movers/diesel engines will be properly maintained;
- A buffer barrier of tree belt will be provided in phased manner along the periphery of the mine to attenuate noise;

- At transfer points, free fall material will be minimized and suitable lining material will be provided
- Isolation/enclosure of noisy machines/equipment, wherever possible.
- Reducing idling time of machines/equipment's.
- Provision of enclosures, silencers, etc. to the possible extent to control noise propagation.
- Use of adequate silencers and practicing speed limit for material transport vehicles

Similarly, **Zone-wise analysis of noise generation from mining and allied activities, its impact on wildlife, and mitigation measures in 1 km, 5 km, and 10 km zones and given in the table below**

Table 10.1

Zone-wise Analysis of Noise generation

Zone	Noise Sources	Approx. Noise Level (dB)	Wildlife Impact	Sensitive Species	Mitigation Measures
0-1 km (Core Mining Zone)	Drilling, blasting, truck movement, crushers	85-110 dB	Acute stress- Hearing damage- Abandonment of den/nest sites	Tiger, Leopard, Sloth Bear, Birds (e.g. peafowl, parakeets)	Controlled blasting (timing + charge)- Dust + noise suppression cabins- Green belt within 100 m- Real-time noise monitoring
1-5 km (Buffer Zone)	Conveyor belts, vehicular traffic, occasional blasting resonance	65-85 dB	Avoidance behavior- Disruption of foraging- Reduced breeding success	Deer, Wild Boar, Jackal, Owls	Restrict heavy equipment movement to daylight- Roadside plantations (double rows)- Speed regulations- Use of low-noise machinery
5-10 km (Periphery & Habitat Linkage)	Haul roads, processing units, secondary traffic	50-65 dB	Interference with prey detection- Habitat marginalization	Barking deer, Civet, Porcupine, Jungle cat	- Buffer plantation belts- Night traffic ban (6 pm-6 am)- Wildlife crossing signage- Solar fencing to limit stray animal entry

- **Wildlife Hearing Range:** Many species (e.g. leopards, birds, deer) are sensitive to noise above 60 dB.
- **Threshold of Disturbance:** Chronic exposure above 70 dB can lead to behavioral shifts and habitat abandonment.
- **NTCA & CPCB Guidelines:** Noise in forest areas must not exceed 45 dB (night) and 55 dB (day).

References:

- ***Wildlife Institute of India (WII) – Guidelines on Mining Impacts on Tiger Habitat***
- ***Corridors***
- ***CPCB Environmental Standards (Noise Rules, 2000)***
- ***NTCA Technical Protocols – Linear Infrastructure and Mining in Forests***
- ***MoEFCC Noise Pollution Mitigation Toolkit (2022)***

10.4 Control of Light pollution:

Light pollution near mining areas can negatively impact local wildlife, human health, and even the efficiency of mining operations. To mitigate these effects, the following measures can be implemented- Use fully shielded, downward-facing lights to prevent light from scattering into the sky and surrounding environment, Use low-intensity, warm-colored LED lights to reduce blue light emissions, which are more disruptive to wildlife, Focus lighting only on necessary work areas and avoid over-illumination of roads and non-essential spaces, Use glare-reducing fixtures and visors to limit excessive brightness that can disturb workers and animals, Plant trees and vegetation buffers around the site to block light from spreading to nearby habitats, Limit artificial lighting during late-night hours in non-essential areas, Educate workers and nearby communities on the importance of reducing light pollution.

10.5 Forest Fire prevention:

Fire hazard needs to be prevented for survival of Forest as well as Wildlife. Steps will be taken for prevention of forest fire. The user agency shall create awareness among the truck drivers and their labors not to through cigarette of bidi butts in the forest area.

This being a tropical forest with open scrub dominant with grass and sparse shrubs and forest with moist deciduous and dry deciduous forest type, it is prone to fire each year between mid-February to June (until onset of rains). Fire lines are to be cleared around the project area, inside and along the forest boundaries, in addition to clearing along the roads, footpaths and nullahs to prevent fire. This can be part of the duties of the temporary guards mentioned in the section on

tiger and previous section. It is important that these guards should be trained to fight fire and also carry out the fire line clearance/development and maintenance and use of different firefighting equipment's. These fire fighters should be provided with appropriate firefighting equipment's / tools including wireless sets. Based on discussion with the local people and forest department, forest fire map must be prepared so as to identify areas which are prone to frequent fire that are to be treated under the above said management plans. This can be a short project as part of research and monitoring.

10.6 Invasive Species Management:

An invasive species is an introduced species that harms its new environment. Invasive species adversely affect habitats and bioregions, causing ecological, environmental, and/or economic damage. The major invasive floral species found in the study area are *Lantana camara*, *Parthenium hysterophorus* and *Prosopis juliflora*. The most effective method of managing the these species are manual uprooting of Lantana and Parthenium in core and buffer areas and using heavy machinery for Prosopis removal, especially in grassland ecosystems. Post removal of invasive it is important to replant native species to restore ecosystem balance and assisted natural regeneration in degraded areas. Community Participation & Awareness also plays an important role in controlling the invasive species. Engaging local communities, especially through eco-development committees, will help in invasive species removal. Conducting awareness programs on the ecological impacts of invasive plants.

10.7 Solid waste Management:

The significant solid waste in mine is overburden and is fully utilized in Backfilling and Dumps. Detail Management of the OB and associated pollution is as under

10.7.1 Overburden dumps management:

The management of overburden dumps involves the following:

1. Stabilization of overburden dumps;
2. Construction of retaining boulder walls;
3. Construction of garland drains for drainage;

4. Provision of jute mesh/ Geotex lining to facilitate grass or vegetative growth on slopes;
5. Provision of good soil mixed with manure and subsequent watering for growth of grass for anchorage on slopes. Plantation mixed with indigenous and fast-growing plant species;
6. Degraded area will be reclaimed and rehabilitated in a phased manner with local plant species;
7. Transport roads will be planted with trees on either side.
8. The Sand Segregation Plant will be having fully covered crusher units, fully covered vibrating screens to reduce air borne dust.
9. In addition, the processing of OB to sand involves use of hydrocodone's wherein water is used and thus eliminating the sources of air pollution.
10. Transportation of sand is proposed in tarpaulin covered trucks, thereby making the pollution from this transportation insignificant.
11. Some successful control techniques used for haul roads are dust suppressant application, paving, route modifications, and soil stabilization; for conveyors, covering and wet suppression; for storage piles, wet suppression, windbreaks, enclosure, and soil stabilizers; for conveyor and batch transfer points, wet suppression and various methods to reduce freefall distances (e. g., telescopic chutes, stone ladders, and hinged boom stacker conveyors); and for screening and other size classification, covering and wet suppression.
12. Wet suppression techniques include application of water, chemicals and/or foam, usually at crusher or conveyor feed and/or discharge points. Such spray systems at transfer points and on material handling operations have been estimated to reduce emissions 70 to 95 percent. Mist Spray systems can also reduce loading and wind erosion emissions from storage piles of various materials 80 to 90 percent. Control efficiencies depend upon local climatic conditions, source properties and duration of control effectiveness. Wet suppression has a carryover effect downstream of the point of application of water or other wetting agents, as long as the surface moisture content is high enough to cause the fines to adhere to the larger rock particles.

10.8 Strategies/Mitigative measures delineated to minimize the impacts on wildlife within the project area

Soil and moisture conservation:

Soil moisture conservation is crucial for wildlife conservation as it supports healthy ecosystems by ensuring plant growth and water availability, ultimately providing habitat and food resources for various species. By retaining moisture, soil conservation helps reduce erosion, improves soil fertility, and promotes water infiltration, all of which benefit plant life and, by extension, the wildlife that depends on them.

Mining activity in the proposed area will involve clearing of vegetation. Mining activity will also involve removal of top soil. Due to removal of vegetation cover and top soil, moisture in the soil tends to reduce. The following strategies will be useful in mitigating and to conserve the essential moisture.

- Garland drains will be constructed around the mine to arrest any soil from the mine area being carried away by the rain water.
- Toe drains with suitable baffles will be provided all along the toe of the soil dumps to arrest any soil from the dump slopes being carried away by the rain water.
- Bench levels will be provided with water gradient against the general pit slope, to decrease the speed of storm water and prevent its uncontrolled descent.
- Gully formations, if any, on sides of the benches will be provided with check dams of local stone or sand filled bags. The inactive slopes will be planted with bushes, grass, shrubs and trees after applying top soil to prevent soil erosion.
- Loose material slopes will be covered by plantation by making contour trenches at 2 m interval to check soil erosion both due to wind and rain.
- Retaining walls (concrete or local stone) will be constructed, around the stockpile or wherever required, to support the benches or any loose material as well as to arrest sliding of loose debris.
- Regular addition of manure and vegetative mulches in soil.
-

10.9 ZONEWISE SOIL MOISTURE CONSERVATION PLAN

Comprehensive plan for Soil and Moisture Conservation (SMC) measures to be implemented in 1 km, 5 km, and 10 km zones from a coal mine over a 5-year period, integrated with Progressive Mine Closure Planning (PMCP) are given as under.

Table 10.2
Soil & Moisture Conservation Measures: Zone-wise Strategy

Zone Distance from Mine	Landscape Type	Primary Issues	SMC Objective
0-1 km	Mined-out area, OB dumps	Loose soil, erosion, poor retention	Stabilize and improve water holding
1-5 km	Agricultural + forest edge	Runoff, minor gully erosion	Retain water and reduce siltation
5-10 km	Natural forest/catchment	Seasonal stream flow, soil loss	Recharge aquifers, improve biodiversity

Table 10.3
Proposed Measures, Techniques, and Unit Costs for implementation of SMC

Measure	Technique Description	Where (Zone)	Cost/Unit (INR)	Spacing/Scale
Contour Trenches	0.45 x 0.6 m, 3-5% slope	5-10 km	₹25,000/ha	30-40 m interval
Staggered Trenches (OB Dumps)	Staggered pits on slopes of reclaimed areas	0-1 km	₹30,000/ha	On benches/slopes
Gully Plugs	Earthen or rubble structures across shallow gullies	1-5 km	₹15,000/unit	Every 50-100 m
Check Dams / Loose Boulder Dams	Across seasonal naals for water retention	5-10 km	₹1.5 lakh/unit	1/km depending on slope
Recharge Pits	1.2m dia, 2m deep for groundwater recharge	1-5 km	₹5,000/pit	5-10 pits/ha
Vetiver/Grass Hedgerows	Along contours for bund stabilization	All zones	₹10,000/ha	Every 5-10 m vertically
Mulching and Organic Amendments and bio-remediation	Paddy straw, compost, biochar	0-1 km	₹8,000/ha	Before monsoon
Afforestation Support	Moisture pits, water harvesting per plantation block	1-10 km	₹20,000/ha	In degraded forest/agri

Monitoring & Integration

- o Use GIS tracking for contour measures & vegetative growth.
- o Align with Progressive Mine Closure Plan targets and satellite verification.

- o Partner with Forest Department, Watershed Committees, and local SHGs for implementation.

10.10 Preventive steps for the animals not to fall in the Mine Pits

Company shall strictly observe the mitigation to protect wildlife in the area by fixing a Chain link fencing around the mine of height 2.5 to 3 meter to prevent wild life from falling into the mine pit. Additional fencing at inner side of the 7.5m green belt is also proposed to develop green belt to reduce dusts from mining activities. Cattle trench around the mine outside the leasehold boundary would help in this direction besides chain link fencing.

10.10.1 Restoration of soil dump

In line with the provision of regulation 106(2) of CMR and the circular issued by DGMS, Gol company have carried out a slope stability study by Vishveshwariya National Institute of Technology (VNIT), Nagpur for planning, designing and safety of the overburden dumps created during mining operations and also to ensure Slope stability to reduce soil erosion through bio-engineering, terracing with grassing of slopes besides plantation of native species having deep root systems and besides use of Geo-synthetic fabrics for slope stabilization. Similarly, company has an allied project of crushing & screening of overburden to manufacture sand. The overburden will also use to backfill the broken area for winning of minerals.

10.10.2 Control of siltation

Construction of Toe drains are proposed along with Gabion wall to control siltation. A series of open drains and sedimentation tanks will be provided on dump body to arrest surface run-off and prevent siltation. In addition to checking siltation, the water from sedimentation tank would be tested for heavy metals and sulphides, alongwith other chemical parameters to assess the water quality and potability. **Parameters need to be tested** for water quality and potability are given below and shall include....

10.10.2.1 Physical Parameters

Like PH values of all ground water and surface water to ensure the values are within the acceptable pH range of 6.5 to 8.5 as per IS 10500:2012 standards for drinking water. Ambient temperature and turbidity shall also test to make the water drinkable and to use for plantations after processing if the values are not within the permissible limits.

10.10.2.2 Chemical Parameters

Like Dissolved Oxygen, Dissolved Solids, Suspended Solids, Chlorides, Sulphates, and Total Hardness shall also be test periodically to ensure a safe water for consumption.

10.10.2.2.1 Health Related Parameters

Like fluorides, nitrates, Trace metals viz. Arsenic, Cadmium, Chromium, Mercury, Selenium, lead similarly copper iron manganese and zink shall also be tested periodically to ascertain the results within standards.

10.10.2.3 Wildlife encounter in the project area

Small animals like squirrel, mongoose, and snakes may enter in to the area. The user agency will educate the labors and staff to protect these animals and not to harm them. Contact details of snake rescuers in the area will be available with the security room. In case on snake encounter the staff will be trained to report the sighting to the security room for safe resque.

10.10.3 Strategies/Mitigative measures delineated to minimize the impacts on wildlife outside the project area

10.10.3.1 Plantation in Buffer Zone

Trees will be planted in the buffer zone floral development. This plantation will be done at selected places and local species only will be used in the plantation. Some of the tree species includes **Saja** (*Terminalia tomentosa*), **Baheda** (*Terminalia bellerica*), **Bija** (*Pterocarpus masupium*), **Bargad** (*Ficus benghalensis*), **Peepal** (*Ficus religiosa*), **Mahua** (*Madhuca latifolia*), **Sal** (*Shorea robusta*), etc. Care will be taken to include some fruit bearing trees like **Gular** (*Ficus glomerata*), **Aonla** (*Emblica officinalis*), **Aam** (*Mangifera indica*) and such trees to provide food to the herbivores which in turn will

be the food source for the carnivores to maintain the biodiversity of the area.

10.10.3.2 Creation of water holes and water sheds at appropriate places

Water is the only mandatory need of every living animal on this earth. If water is available and accessible, then it is an indication of presence and survival of the wild life in any forested area. Therefore, it is suggested that the user agency in association with the forest department will identify strategic locations for development of water holes at least 1000m away from the mine lease boundary.

10.10.4 Establishment of Joint Forest Management and Biodiversity Committees

The sense of ownership of the forest and its resources amongst the villagers is very important. This can be done by establishing Joint Forest Management and Biodiversity Committees in the nearby villages. This will also help to understand the indigenous knowledge of the locals and accordingly the plantation of locally important trees and shrubs can be carried out.

10.11 Nursery development

It is proposed to enhance the forest area around the mine by carrying out plantation of native trees and shrubs. This activity must be done simultaneously with the mining, so that by the end of mining operation good forest cover is developed adjacent to the mine. Thus user agency is committed for planning and implementation of the mitigation measures suggested by WII and incorporated in this report.

10.12 Surface Water Pollution Control Measures:

Mining activities—especially coal, lead, zinc, and gold—release toxic metals like arsenic (As), mercury (Hg), cadmium (Cd), lead (Pb), selenium (Se), copper (Cu), and chromium (Cr) into surface water and sediment. These pollutants leach into streams, impacting aquatic and terrestrial

wildlife. Based on regional studies and coal chemistry typical to Vidarbha coalfields (where Marki Mangli II coal project is located), the following toxic and heavy metals are commonly leached from coal mining areas:

Table 10.4

Likely Toxic/Heavy Metals Leached from Coal Block with special reference to environment / health risks

Sr. No	Heavy	Primary Source	Environmental /	Recommended Mitigation
1	Iron (Fe)	Pyrite oxidation in OB & pit walls	Acid Mine Drainage (AMD), ecosystem stress	- AMD neutralization with lime or limestone drains - Construct oxidation ponds
2	Manganese (Mn)	Coal washery and OB leachate	Neurological and reproductive effects in humans	- Phytoremediation with <i>Pteris vittata</i> - Lime treatment of acidic leachate
3	Lead (Pb)	Trace in coal, lubricants/oil spills	Neurotoxin, soil contamination	- Filter strips with lead-accumulating plants - Geomembrane lining of waste
4	Chromium (Cr)	Coal combustion and washery byproducts	Carcinogenic, mutagenic effects	- Cr(VI) reduction using iron sulfate - Constructed wetlands with iron-rich
5	Nickel (Ni)	Coal seams, overburden	Toxic to plants, carcinogenic	- Lime application to neutralize acidic soils -
6	Zinc (Zn)	Coal washery slurry	Affects aquatic species and soil	- Compost application to immobilize Zn - Biochar-
7	Arsenic (As)	Pyritic coal seams, acid leachate	Highly toxic, causes groundwater	- Use of zero-valent iron (ZVI) barriers - Arsenic-selective adsorbents in filters
8	Selenium (Se)	Trace element in coal, ash residues	Reproductive harm to fish, birds	- Phytoremediation with <i>Brassica Juncea</i> - Use of constructed wetlands
9	Cadmium (Cd)	Coal washery tailings, OB	Kidney damage, bioaccumulates in crops	- Amend soil with phosphates or organic matter - Restrict agriculture in high Cd zones
10	Aluminium (Al)	Acidified mine water runoff	Toxic in low pH to aquatic life	- Neutralization with limestone drains - Maintain pH >6.5 in discharge areas

Leaching of toxic metals into the stream shall be mitigated by construction of Retaining walls at the toe of dumps to prevent wash off from dumps and sliding of material from benches. This will help in preventing siltation of water drains/channels;

- Water channels/drain carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids;

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

- Worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes. This will help in preventing wash-off of dump from these slopes;
- The mine water will be regularly tested and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB.
- Seepage water and rain water collected in the open pits will be pumped out and used for dust suppression, plantation and in beneficiation process. Excess water, if any, will be discharged into natural drainage system after de-silting in settling ponds.
- The probable cause of surface water pollution in the proposed mining area will be soil erosion and wash off from the waste dumps and mineral stock yards in monsoon season. The run-off water during monsoon season flows through natural water courses into nallas. The surface water entering into the mine during rainy season will be diverted through suitable drains to reduce the wash off of soil. The general drainage direction in the working area will be towards the mine sump, for collection of water. The water will be utilized for greenbelt development, mining operation, which will reduce the fresh water requirement.
- Adequate measures to protect the mine during rains will be taken by providing garland drains around the mine excavations and also providing suitable drainage gradients for mine benches. Sumps of adequate capacity will be provided on the quarry floor.

Following control measures will be adopted to check the wash-off from soil erosion:

- Plantation of shrubs on down slope of overburden dump;
- Stabilizing road cutting
- Providing suitable drainage system to prevent surface water from entering into mines directly;
- Providing sufficient number of retaining walls/check walls at OB dump
- Diverting natural drains through the undisturbed areas and connecting to local natural nalla.

10.13 Ground Water Pollution Control Measures:

- The domestic sewage from the canteen and toilets will be routed to Sewage Treatment Plant (STP). Adequate maintenance of the STP will be carried out to avoid choking with sludge.
- Regular monitoring of water levels and quality of water in the existing open wells and bore well in the project area to study the hydrology of the area. If necessary, additional observation wells will be sunk for monitoring the water table levels and water quality around the mine both in the upstream and downstream. Opencast mine will act as natural rain water harvesting structure. Rain water falling within the active mine area shall be collected in the mine sump and treated for reuse.

**Table 10.5
Zone-wise magnitude of impacts on water bodies**

Buffer Distance	Key Features	Wildlife Presence	Water Bodies Affected	Land Use
Within 1 km	Core mining pits, washery units	Minimal	Groundwater & mine pit seepage	Barren/mining zone
1-5 km	Agricultural fields, villages	Moderate (e.g., jackals, wild boar)	Streams and shallow wells	Kharif cropping, scrub
5-10 km	Reserved forest areas, part of corridor zone	High (leopards, small carnivores)	Tributaries of Wardha River	Open forest, dense forest

Zone (Distance from Mine)	Magnitude of Water Pollution	Wildlife Risk Level	Remarks
0-1 km	Very High (Direct discharge, pit seepage)	Low (Habitat loss already occurred)	Mainly operational zone
1-5 km	Moderate to High (surface runoff)	Medium (edge of corridor zones)	Needs buffer zone enforcement
5-10 km	Moderate (via tributary pollution)	High (Core corridor usage)	Most ecologically sensitive zone

Methods of Treatment Before Disposal into Streams

Effective treatment of mining effluent is essential before disposal into natural water bodies:

Table 10.6

Methods of Treatment Before Disposal into Streams

10.6.1 Physical-Chemical Methods

Method	Description
Precipitation & Coagulation	Add lime or hydroxides to precipitate metals as sludge (e.g., for Fe, Al, Zn).
Adsorption (Activated Carbon,	Adsorbs dissolved metals like arsenic and lead.
Ion Exchange	Removes specific metal ions using synthetic resins.
Membrane Filtration (RO, UF)	Physically separates metal ions from water (effective but costly).

10.6.2 Passive/Green Methods

Method	Description
Constructed Wetlands	Use plants, microbes, and sediment processes to remove metals naturally. Suitable for low-flow systems.
Bioremediation	Use of sulfate-reducing bacteria to convert metals into insoluble sulfides.
Phytoremediation	Aquatic plants (e.g., water hyacinth, vetiver) absorb and store metals in tissues.

References:

- Younger (2001) – *Passive treatment systems for acid mine drainage.*
- Mohan & Pittman (2007) – *Review of adsorption and phytoremediation for heavy metals.*

- **USEPA Mine Drainage Technology Initiative (MDTI) reports**

Monitoring and Compliance

- Regular effluent quality testing (as per CPCB/EP Act): pH, TDS, heavy metal content (Pb, Cr, Cd, Hg).
- Installation of online monitoring systems at discharge points (mandatory under EC conditions in India).
- Zero Liquid Discharge (ZLD) policies are being explored in sensitive zones.

Conclusion

Toxic metal leaching from mining is a major ecological threat to both aquatic and terrestrial wildlife. Implementing a combination of engineering, green, and monitoring solutions is key to balancing mining operations with biodiversity conservation.

10.14 Water Security Plan (WSP):

Agriculture in the area is characterized by wasteful use of groundwater through low-efficiency irrigation practices, leading to drinking water shortage even in normal summers. The area with single crop farming, has failed to utilize its groundwater resources. The agricultural drought is often the result of cropping patterns, which are determined on anticipation of average rainfall and rarely factor rainfall variations. The pattern of rainfall indicates that there is rainfall of 50-60 days/year. 90% of the rainfall is received during the months of June-August of every year. The intensity of rainfall at this time is high leading to high surface runoff. There is considerable scope to improve the out-put per ha in agriculture sector in the project area by integrating the development of land and water resource. The water harvesting on the principles of watershed management and groundwater recharge techniques need to be implemented in these regions. It is proposed to prepare Water Security Plan for adjoining villages (three villages namely Bhendala, Savali, and Ruikot) WSP aims for drinking water security in selected villages by means of

- Ensuring Quality and quantity of water supply, storage management (aquifer management, demand management), capacity building and training.

- Providing futuristic plan in maintaining sustainable use of water for at least for next 10 years.
- Avoid duplicity of different schemes and provide scope of participation of the local public for their self-reliance.
- The objectives of WSP will include current requirement of water for the villages, practices of water management, and overall development of the selected village in terms of water management.

10.15 Dust Generation and Wildlife Impact from Mining – Zone-wise Assessment

10.15.1 Sources of Dust in Mining and Related Activities

- Drilling and blasting of overburden and coal
- Crushing, screening, and coal handling plants (CHPs)
- Haul roads and vehicle movement
- Overburden (OB) dumping and dozing
- Wind erosion from exposed soil, dumps, and stockpiles
- Coal transportation (conveyor belts, trucks, rail siding loading)

10.15.2 Zone wise dust load and impacts on wildlife and mitigations

Zone	Primary Dust Sources	Dust Load	Wildlife Impacts	Sensitive Species	Mitigation Measures
0-1 km (Core Zone)	Drilling, blasting, OB handling, CHPs	High (>200 µg/m ³)	Respiratory distress, nesting abandonment, poor visibility	Tigers, Leopards, Ground-nesting birds	Water sprinklers, fog cannons, green belts (30m+), enclosures for crushers
1-5 km (Buffer Zone)	Haul roads, wind-blown dust, vehicle movement	Moderate (100-150 µg/m ³)	Avoidance behavior, reduced foraging, eye irritation	Spotted Deer, Wild Boar, Peafowl	Black-topped roads, avenue plantations, water tankers, controlled traffic flow
5-10 km (Influence Zone)	Transport roads, stockyard emissions	Low to Moderate (75-100 µg/m ³)	Chronic exposure, reduced prey population, habitat marginalization	Jackals, Civets, Birds of prey	Check-dams to trap dust, vegetation barriers, dust screens at loading sites

References and Standards

- CPCB National Ambient Air Quality Standards (PM10 & PM2.5)
- Wildlife Institute of India (WII) – Impacts of Linear Projects
- NTCA Guidelines – Mitigation of Non-Point Pollution in Mining Landscapes
- MoEFCC Dust Control Guidelines (2022)

In addition to above, the other mitigative measures for management of wildlife involve

10.16 Non-formal Education:

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

10.17 Institutional Infrastructure:

The prime requisite for building up an understanding and awareness about wildlife and conservation is to develop an appreciation, respect and love for nature. Most people lack the curiosity to know even the names of animals and plants they come across in their day-to-day life. Development of an inquisitive mind, a keen sense of observation and curiosity about the fauna and flora are, therefore, very important. Concern for conservation can only emanate from a love for nature and awareness about the interdependence of all species of animals and plants, including the man. To arouse curiosity about the wildlife in the young mind some quiz and essay competitions will be arranged in the schools and colleges of the buffer zone and some nearby areas.

10.18 Indian Tradition of Conservation:

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

also like the Chipko and Appiko movements. These conservation themes will be popularized through pamphlets and posters.

10.19 Role of the Individual:

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

10.20 Improvement of Water availability:

“Water” is the daily requirement of all wild animals. The scarcity of water leads to the migration of wild animals from forest area towards population and thus increasing dangers to their life by way of man animal conflict and attracts poaching also. This includes Repair of existing Anicuts, Talai and water pond will be provided every year before rainy season in consultation with forest department. Development of small mud ponds and ensuring the availability of water in pond and tankis (Drinking Water body for Cattle) should be ensured during the pinch period.

10.21 Eco-Development Works:

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

10.22 Horticultural Nursery:

There will be demand for seedling for horticultural species in and around Wani/Mukutban. Nurseries can be raised by villagers for selling the same to different farmers and also to the people in the nearby townships. For this purpose, skill of grafting and budding can also be developed. Ornamental tree species can also be grown for beautification.

10.23 Controlled grazing:

Over grazing affects the habitat of wild animals, hence controlled grazing is must to conserve and preserve the habitats of the wild animals. For this, villagers will be made educated regarding the negative impacts of over grazing under the guidance of Forest department.

10.24 Protection against fire:

Generally, fire occurs in summer season. The local people use to take smoking bidi and cigarettes into the forest & throw them there which cause fire. The dry grass catches the fire and in no time, fire spreads in the area. However, fire accidents in forest is severe, it destroys the forest as well as the habitat of wild animals. Fire kills the innocent wild animals and their cubs and chinks specially in nesting and breeding season. Similarly project agency has undertaken for not to establish any labor camps in mining lease as well as forest area (**Annexure 7**) .

Salt is a very important requirement of most wildlife, which they often meet from natural salt licks available in different forests. A survey of the area revealed that such salt licks are badly needed in the area. Hence, artificial Salt licks must be provided at suitable locations, preferably near water holes, where proper watch & ward is possible. Otherwise these spots shall be misused for poaching animals.

10.25 Protection against hunting:

Hunting of the wild animals is prohibited in forest and also outside the forest. The local people hunt this wild animal which is a punishable offence. Hunting must not be allowed in the study area. Awareness Camps will be arranged under the guidance of Forest department for labors working in the industry regarding offences against wild animals such as trapping, driving, snaring, capturing, killing, poisoning. They will be made aware that taking any part of the body of wild

animals is restricted and is a nonbailable offense. Offended person could be punished with an imprisonment of 7 years. One cause of depletion of wildlife status is due to poaching by local people. Hence, it is necessary both to improve enforcement and create awareness among the people for eliminating poaching and consequently improve the status of wild animals. For this the protection has to be strengthened at project cost. Towards this end the project proponents may need to send their staff to be properly trained by the forest department and also help local forest protection committee youths'. Necessary equipment like a walkie talkie or mobile handsets would also need to be provided to mine security-men to report to the forest department of any poachers or unsocial looking elements in the jungle or its surroundings. The Project staff should also help the Forest staff to prevent poaching and illicit felling whenever needed.

10.26 Checks and control on the Movement of Vehicle:

Due to movement of vehicles injury to animals and reptiles may take place. For this reason, speed limit of vehicles will be fixed and operators will be educated and advised regularly to drive vehicle safely and slowly. All operators will also be advised to stop the vehicle on seeing such reptiles or animals and let it go away before moving the vehicle further.

10.27 Pressure horn:

Noise generated by pressure horn disturbs the wildlife and forces them to leave the place. No pressure horn will be fixed on vehicle plying in the area. All the drivers will be advised to make minimum use of horn while working hours.

10.28 Vehicles head lights:

Efforts will be made to cover the lights suitably with paint so that strong beam of head light is not formed and light falls in front of the vehicle only.

10.29 People Participation:

With the help of the local people and employees of the Company watch will be kept on the wild life as well as illegal tree felling. Forest and police department will be informed if such incident occurs, to take legal action against the offenders. For this they will be trained for motivation. Organizing awareness activities for the wildlife and nature during Wildlife Week (1st Oct to 7th Oct.), on 21 st March (The

World Forestry day) and on 5th June (The Environment day) every year, Activities may include painting, photography competition, Essay Writing, Slogan writing, trees and bird's identification etc. – During the Camps, Publication of Brochure/ Pamphlets regarding Nature and wild life Protection shall be distribution and guidance for protection of Wildlife and environment shall be provided. – Display of slogans and signage in the entire core zone and 10-km radius shall be provided and displayed especially along road side regarding Wildlife and Nature.

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

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

10.31 Reducing Environmental Pollution:

To keep the environment free from smoke, cooking gas cylinders will be provided to all the project workers particularly. To control pollution from project measure outlined in EMP will be followed.

10.32 Provide employment to the villagers:

On the basis of their suitability, jobs in project will be provided to the nearby villagers. As a result, their economic condition will improve. This will keep them busy also, so they will not be tempted/compelled to cause destruction to forest which will help improve the status of wildlife.

10.33 Integrating Biodiversity Enhancement with Mining Activity

10.33.1 During Project Development

In the early stages of exploration, impacts on biodiversity are limited, although they can become more significant as exploration progresses. At a macro-level, however, assuming exploration efforts identify economically viable mineral deposits, the initial choice of exploration area can have a profound long-term influence on the impacts on biodiversity. Therefore even at this very early stage it

is critically important to have some appreciation of likely long-term interfaces with biodiversity. At this stage, companies should begin to develop an appreciation of the overall biodiversity importance of the area within which exploration is being undertaken by reviewing legal provisions relating to biodiversity and mapping the occurrence of protected areas.

Following practices are proposed for limiting impacts on biodiversity during exploration include:

1. Limiting land clearing by using technologies and mining practices that minimize habitat disturbance; Keeping mandatory safety zone of 7.5 meter is sound practice to create green belt to reduce noise and arrest dust from getting airborne outside the work area,
2. Avoiding road building wherever possible by using existing tracks – Incidentally mine area is well connected to pucca road and hence no new road is required to be constructed for transportation of ore;
3. Using lighter and more efficient equipment to reduce impacts on biodiversity;
4. Positioning drill holes and trenches away from sensitive areas;
5. Capping or plugging of drill holes to prevent small mammals from becoming trapped;
6. Removing and reclaiming roads and tracks that are no longer needed;
7. Using native vegetation to revegetate land cleared during exploration.

10.33.2 During Mining Operation

The major potential impacts of ancillary infrastructure occur during design and construction, although a number of operational considerations are also relevant to biodiversity. The potential impacts associated with water and sanitation infrastructure are also present during operations and were dealt with earlier. While the major impacts occur during construction, the continuing presence of physical barriers can present a threat to migratory animal species.

Biodiversity may also be affected by maintenance activities, particularly weed and pest control. This can be minimized by implementing an integrated pest management or integrated vector management approach for all pest management activities. This advocates the use of alternative approaches to chemical controls in the first instance.

The primary impacts on biodiversity result from land clearance for the pit, access routes, and progressive expansion into new areas. Typically, mines undergo many expansions in area and capacity, generating a sequence of events that can be the equivalent of new mines being started, so there may also be a requirement to conduct a new Environmental and Social Impact Assessment or update the initial ESIA.

10.33.3 During Closure

Achievable objectives and targets for biodiversity re-establishment are essential to give the company a framework on which to base its rehabilitation program and to provide measurable standards against which regulatory authorities and other stakeholders can determine whether the company has met all necessary requirements prior to mine closure and lease relinquishment.

The establishment of closure targets and objectives is not a one-shot desk-based exercise; it should be developed through a dynamic and iterative process involving mining stakeholders. When setting biodiversity objectives and targets, the following aspects should always be taken into account:

- Relevant regulatory requirements and other guidelines
- Effective consultation with key stakeholders
- Competing interests need to be understood and reconciled
- All available information on biodiversity
- Technical limitations
- Pre-mining land uses and the extent of biodiversity degradation
- Whether mitigation or enhancement is intended
- Post-mining land tenure and land uses
- Minimizing secondary impacts
- Other opportunities for biodiversity improvement

10.33.4 Habitat Management for Wildlife:

Both regulatory (for human actions) and habitat management practices including engineering devices need be utilized for managing and improving habitats for wildlife. The landscape approach following decentralized collaborative management need be adapted for this purpose. The habitat

management practices such as, road-side plantation, trees around wetlands, rain water harvesting, fencing along road-side habitats, eradication of *Prosopis juliflora* regulated grazing by domesticated livestock at selected site away from wild animal foraging and nesting grounds) and making roads less attractive to birds can be adopted. For good governance in the interest of wildlife conservation and sustainable economic development, the following regulatory measures need be practiced equitably in case of common citizens, authorities and very important persons:

References: □

Wildlife (Protection) Act 1972 and amendments

The Forest Conservation Act 1980

The (Prevention and Control of Air Pollution) Act 1981

The (Prevention and Control of Water Pollution) Act 1974

Chapter-11

Cost estimate for the implementation of measures of mitigation of impacts of mining on Environment, Ecology and Habitat

11.1 Introduction:

Opencast mining has significant ecological impacts that extend beyond the physical lease area. The loss of tree cover due to land clearing, excavation, overburden dumping, and blasting affects biodiversity, habitat quality, microclimate, and ecological services. This para addresses zone-specific impacts and proposes scientifically grounded, cost-estimated mitigation strategies and responsibilities

1. Zone-Wise Impact and Mitigation Framework

The ecological impacts of mining are divided into three zones:

- Zone A: Within the lease area
- Zone B: Buffer zone (0–500 m outside lease boundary)
- Zone C: Influence zone (500 m – 5 km from lease boundary)

Each zone requires targeted habitat restoration and biodiversity recovery measures.

2. Zone-Wise Impacts, Mitigation Measures & Cost Estimates

Table 11.1

Zone-Wise Impacts, Mitigation Measures & Cost Estimate

Within Mining Lease Area			
Impacts of Mining	Impacts magnitude	Mitigation Measures	Estimated Cost per Ha (INR)
Land degradation and loss of topsoil	Loss of fertility, soil compaction, erosion	Soil decompaction, amendment with FYM/vermicompost, topsoil management	35000
Destruction of vegetation and wildlife habitat	Complete clearing of trees, shrubs, burrows	Technical and biological reclamation (grass + shrub + native tree species)	50000
Overburden and dump instability	Slope failure, runoff, dust	OB dump reshaping, slope stabilization, vetiver bunds, coir matting	45000
Water stagnation and pollution	Pit water, contamination of runoff	Sediment tanks, wetland creation, pit restoration for amphibian habitat	30000
Loss of faunal microhabitats	species, reptiles, small mammals Rock shelters, grassland patches,	Prey based reclamation interventions	48000
Dust and noise pollution	Impact on remaining fringe vegetation and wildlife	Peripheral green belt with 3-tier vegetation	25000
TOTAL PER HA			233000

Cost of Mitigation Measure for total lease area of 340 ha: 7,92,00,000/-

Responsibility of Implementation: Project Proponent

ZONE UPTO 100 METER			
Impacts of Mining	Impacts magnitude	Mitigation Measure	Mitigation cost
Loss of tree cover and buffer vegetation	Removal of protective forest cover	Dense green belt with multi-layered native species	48000
Soil erosion and runoff	Steep slopes and open patches	Contour trenches, mulching, native grass seeding Shrub corridors, small culvert passages (if linear infrastructure exists)	25000
Wildlife movement disruption	Barrier effect for reptiles, jackals, small fauna	Manual clearance and native competitive species planting	20000
Spread of invasive weeds	Colonization of Lantana, Parthenium, etc.	Flowering shrub strips, pollinator patches	10000
Decline in pollinators	Loss of flowering flora		8000
PER HA COST			111000

Cost of mitigation for estimated area of 85.87 ha in 100 meter outside lease considering estimated area of 400 ha : 4,48,00,000

ZONE UPTO 5 KM			
Impacts of Mining	Impacts magnitude	Mitigation Measure	Mitigation cost
Forest degradation and canopy thinning	Edge impact on nearby forest or agro-forest areas	Block plantation with native species, sacred grove revival	48,000
Corridor fragmentation	Interruption in wildlife dispersal routes	Wildlife corridors (native shrub belts, grassy strips, fruiting tree lines)	30,000
Impact on agriculture due to dust/debris	Yield loss, soil quality degradation	Peripheral green barriers, agroforestry with tolerant species	35,000
Decline in local biodiversity	Loss of bird, insect, and small fauna diversity	Biodiversity zones, waterholes, mixed NTFP plantations	40,000
Reduction in ecosystem services	Loss of pollination, seed dispersal, moisture regulation	Pollinator gardens, seed-disperser-attracting species (Ficus, Syzygium)	25,000
PER HA COST			178,000

Cost of implementation of wildlife conservation: 1,78,00,000/-

Table 11.2

SUMMARY OF COST OF IMPLEMENTATION OF WILDLIFE MITIGATION PLAN

Sr. No	Activity Head	Responsibility	Amount
1	Mitigation Measures to be implemented within leasehold area of project	Project Proponent	7.92 CR
2	Mitigation Measures to be implemented by FD in 500 meter buffer zone	Forest Department Pandharkawda	4.48 CR
3	Wildlife Conservation Measures in influence zone of 5 km from lease boundary as approved by PCCF (WL)	CAMPA	1.775 CR

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

4	4% of project cost in wildlife area to be deposited with Wildlife Conservation Trust as per advise of PCCF (WL) GOM	WL Conservation Trust of WLS as per advise of CWL GOM	3.289 CR
		TOTAL	17.47 CR

4. Conclusion

Mining-induced tree loss demands a multi-zonal, habitat-centric approach for ecological restoration. The tabulated mitigation actions with cost estimates provide a practical framework to integrate biodiversity conservation with post-mining land reclamation.

5. References

1. WII (2016) – Wildlife Corridor Assessment for Linear Infrastructure, Wildlife Institute of India
2. ICFRE (2020) – Manual on Biological Reclamation of Mined Out Lands, Indian Council of Forestry Research and Education
3. FAO (2018) – Pollination Services in Ecosystems: A Guide for Restoration
4. TERI (2019) – NTFP-based Livelihood Models in Forest Fringes, The Energy and Resources Institute
5. MoEF&CC (2021) – Guidelines for Ecological Restoration in Mining Areas

11.2 Timeline for implementation of wildlife mitigation plan

Table 11.3

Timeline for implementing wildlife mitigation plan

Sr. No	Activities under WMP	TIME LINE FOR IMPLEMENTATION OF WILDLIFE MITIGATION PLAN																				
		Year 1			Year 2					Year 3					Year 4					Year 5		Continue till mine closure
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	Fencing of proposed mine boundary																					
2	Maintenance and Repairing of Fencing																					
2	Establishing Nursery for saplings, maintenance and propagation																					
3	Construction of Waterholes and its maintenance																					
4	Habitat development and plantation away from the mine boundary																					
5	Plantation in safety zone including green belt development along the lease area																					
6	Watch tower Construction																					
7	Soil moisture conservation works																					
8	Construction of waterholes maintenance																					
9	Well with solar pumps																					
10	4% of the project cost to be deposited with wildlife trust as per State Government norm																					
11	Awareness and training of JFM and Biodiversity committee for wildlife protection and fire control. Workshops and campaign in consultation with stakeholder																					
12	Monitoring of Environmental Parameters as per approved																					

Annexure 1

Vesting Order

**GOVERNMENT OF INDIA MINISTRY OF COAL OFFICE OF THE NOMINATED AUTHORITY
(Constituted under Section 6 of The Coal Mines (Special Provisions) Act, 2015)**

Shastri Bhawan, New Delhi

VESTING ORDER

(under clause (b) of sub-rule (2) of rule 7 and sub-rule (1) of rule 13 of the Coal Mines (Special Provisions) Rules 2014 read with clause (b) of sub-section (3) of Section 6 and sub-section (3) of Section 8 of the Coal Mines (Special Provisions) Act, 2015)

In re: Marki Mangli II Coal Mine (the "mine") particulars of which is specified in Annexure 1

Order no. : NA-104/3/2020-NA

Date: March 03, 2021

In favour of: Yazdani International Private Limited, incorporated in India under the Companies Act, 1956 with corporate identity number U132090R2006PTC009009, whose registered office and principal place of business is at 7th Floor, C-Wing, Fortune Towers, Chandrasekhalpur, Bhubaneswar, Odisha 751023, India(the "successful bidder")

For the purpose of: Sale of coal, including sale to Affiliates and related parties, utilisation of coal for any purpose including but not limited to captive consumption, Coal Gasification, Coal Liquefaction and export of coal.

WHEREAS, the nominated authority has, in accordance with provisions of the Coal Mines (Special Provisions) Act, 2015 (the "Act") and the Coal Mines (Special Provisions) Rules

2014 (the "Rules") conducted the auction of the mine;

AND WHEREAS the successful bidder is eligible to receive this vesting order with respect to the mine including, inter-alia, -

(a) the coal bearing land acquired by the Plior allottee and the lands, in or adjacent to the coal mines used for coal mining operations acquired by the prior allottee; and



(b) any existing mine infrastructure as defined in clause (j) of sub-section (1) of section 3 of the Act;

AND WHEREAS the successful bidder has furnished a performance bank guarantee dated February 18, 2021 for an amount equal to INR 20,17,06,066.40 (Indian Rupees Twenty Crore Seventeen Lakh Six Thousand Sixty Six and Forty Paise) issued by Punjab National Bank in accordance with the tender document and in accordance with the provisions of sub-section

(6) of section 8 of the Act and sub-rule (4) of rule 13 of the rules.

AND WHEREAS the successful bidder has entered into a Coal Mine Development and Production Agreement dated January 11, 2021 ("CMDPA") (as amended) with the nominated authority in accordance with the provisions of sub-rule (5) of rule 13.

NOW, THE NOMINATED AUTHORITY DOES ORDER:

1. On and from March 03, 2021 ("vesting date") and in accordance with the provisions of sub-section (4) of section 8 of the Act, with respect to the mine, the following shall stand fully and absolutely transferred and vested in the successful bidder, namely: -

- (a) all the rights, title and interest of the prior allottee in and over the land and mine infrastructure free from all encumbrances;
- (b) entitlement to a prospecting license, mining lease or prospecting license-cum-mining lease to be granted by the State Government with the terms and conditions of CMDPA forming a part of it on making an application;
- (c) all statutory licences, permits, permissions, approvals or consents as per rules, required to undertake coal mining operations in the mine, if already issued by the Central Government, to the prior allottee on the same terms and conditions as were applicable to the prior allottee, as listed in the Annexure 2;
- (d) entitlement to any statutory licence, permit, permission, approval or consent required to undertake coal mining operations in the mine, if already issued by the Central Government, to the prior allottee on making an application on the same terms and conditions as were applicable to the prior allottee, as listed in the Annexure 3;
- (e) entitlement to any statutory licence, permit, permission, approval or consent required to undertake coal mining operations in the mine, if already issued by the State Government, to



the prior allottee on making an application on the same terms and conditions as were applicable to the prior allottee, as listed in the Annexure 4;

(f) rights appurtenant to the approved mining plan of the prior allottee;

(g) any subsisting contract in relation to coal mining operations, to which the prior allottee was a party and which is assumed, adopted and continued by the successful bidder and listed in the Annexure 5 shall stand novated (by virtue of a deemed consent from the relevant party(ies)), in accordance with the provisions of sub-section (1) of section 11 of the Act in favour of the successful bidder for the residual term or residual performance of such contract;

2. The successful bidder may seek any change in the terms and conditions attached to such licence, permit, permission, approval or consent by making an application in accordance with applicable laws;

3. Hereinafter, the successful bidder shall be entitled to take possession of the mine as specified in Annexure 1 without let or hindrance;

4. This vesting order is liable to be cancelled in accordance with the provision of sub-rule

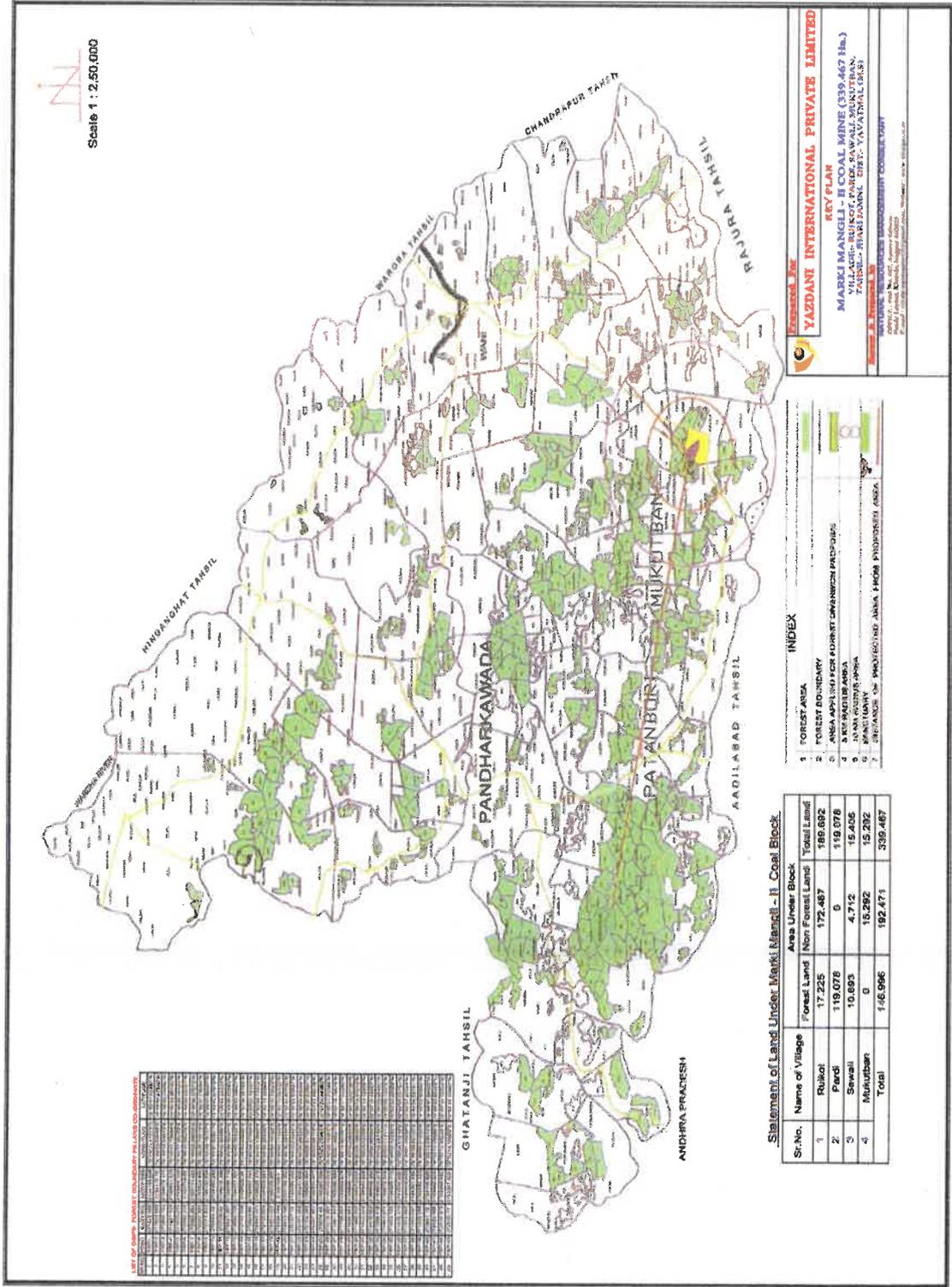
(6) of rule 13.



(By the nominated authority)

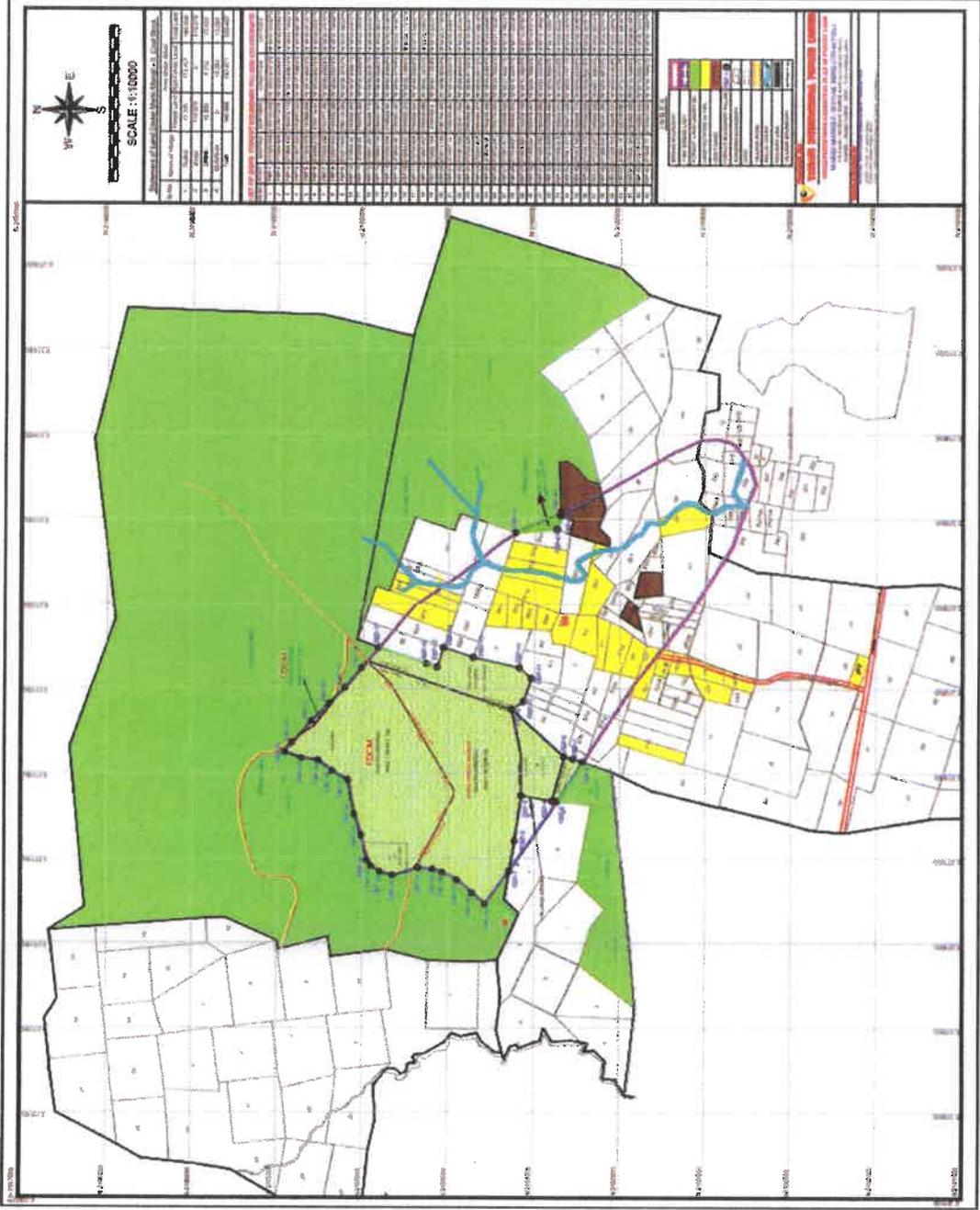
Annexure 2

Location of Marki Mangli II Mine



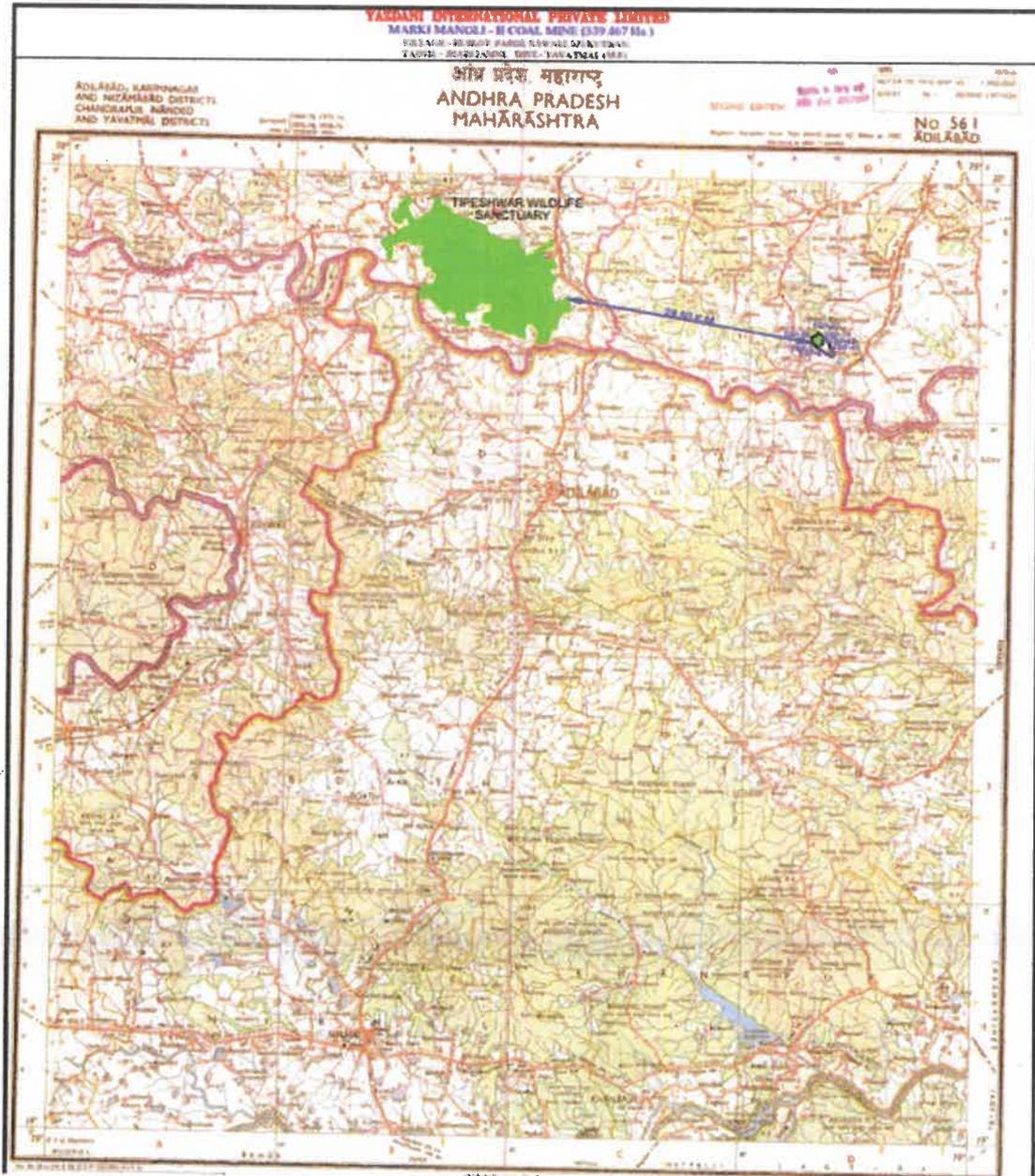
Annexure 3

Existing Land Ownership of Marki Mangli II Mine



Annexure 4

Distance of Marki Mangli II Mine from Wildlife Sanctuary



Authenticated list of flora and fauna for the study area by DFO

MARKI MANGLI OPENCAST COAL MINING PROJECT,
Project Area 339.467 Ha Village(s): Savli, Ruikot, Pardi and Mukutban
Taluk - Jhari Jamol, District - Yavatmal, Maharashtra,

LIST OF FLORA WITHIN CORE AND BUFFER ZONE

TREES:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Acacia catechu</i> (L.f.) Willd.	Khair	Fabaceae	*	*
2	<i>Acacia concinna</i> (Willd.) DC	Sikakai	Fabaceae	*	*
3	<i>Acacia leucophloea</i> (Roxb.) Willd.	Hiwar/Reunjha	Fabaceae	*	*
4	<i>Aegle marmelos</i> (L.) Correa	Bel	Rutaceae	*	*
5	<i>Allanthus excelsa</i> Roxb.	Maharukh/ Mahaneem	Simarubiaceae	*	*
6	<i>Albizia lebbek</i> (L.) Benth.	Kala siris	Fabaceae	*	*
7	<i>Albizia odoratissima</i> (L.f.) Benth.	Chichwa	Fabaceae	*	*
8	<i>Albizia procera</i> (Roxb.) Benth.	Safed Siris/ Karahi	Fabaceae	*	*
9	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr.	Dhaora/Dhawda	Combretaceae	*	*
10	<i>Azadirachta indica</i> A. Juss.	Necm	Meliaceae	*	*
11	<i>Balanites aegyptiaca</i> (L.) Del.	Hingot	Balanitaceae	*	*
12	<i>Bauhinia malabarica</i> Roxb.	Amli	Fabaceae	*	*
13	<i>Bauhinia purpurea</i> L.	Keolar	Fabaceae	*	*
14	<i>Bauhinia racemosa</i> Lam.	Asta/Aapta	Fabaceae	*	*
15	<i>Bauhinia variegata</i> L.	Kachnar	Fabaceae	*	*
16	<i>Bombax ceiba</i> L.	Semal	Malvaceae	*	*
17	<i>Boswellia serrata</i> Roxb. ex Colebr.	Salai/ Saliha	Burseraceae	*	*
18	<i>Bridelia retusa</i> (L.) A. Juss.	Kasai/Kasahi	Euphorbiaceae	*	*
19	<i>Buchanania lanzan</i> (Lour.) M.R. Almeida	Achar/ Char Chiraonji	Anacardiaceae	*	*
20	<i>Butea monosperma</i> (Lam.) Taub. (<i>Butea Monosperma</i> Kuntze)	Palash/ Parsa/Padas	Fabaceae	*	*
21	<i>Careya arborea</i> Roxb.	Kumbhi/ Bhui	Mayrtaeae	*	*
22	<i>Caryota urens</i> L.	Fish tail palm	Arecaceae	*	*
23	<i>Casaria graveolens</i> Dalzell	Giichi	Samydaceae	*	*
24	<i>Casaria tumentosa</i> Roxb.	Tondri	Samydaceae	*	*


District Conservator of Forest
Jharkhand

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
25	<i>Cassia fistula</i> L.	Amaltas/Bahnwa	Fabaceae	*	*
26	<i>Cassine glauca</i> (Rottb.) Kunze	Jamrasi	Celastraceae	*	*
27	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mainphal	Rubiaceae	*	*
28	<i>Chloroxylon swietenia</i> DC.	Bhirra	Meliaceae	*	*
29	<i>Cochlospermum religiosum</i> (L.) Aiton	Galgala	Bixaceae	*	*
30	<i>Cocos nucifera</i> L.	Nariyal	Areaceae		*
31	<i>Cordia macleodii</i>	Bhokar	Boraginaceae	*	*
32	<i>Dalbergia latifolia</i> Roxb.	Shisham	Fabaceae	-	*
33	<i>Dalbergia paniculata</i> (Roxb.) Thoth.	Dhobin	Fabaceae	*	*
34	<i>Dalbergia sissoo</i> DC.	Sissoo/Sisham	Fabaceae	-	*
35	<i>Diospyros melanoxylon</i> Roxb.	Tendu	Ebenaceae	*	*
36	<i>Diospyros montana</i> Roxb.	Bistendu	Ebenaceae	*	*
37	<i>Dolichandrone falcata</i>	Medsing	Bignoniaceae	*	*
38	<i>Ehretia laevis</i> Roxb.	Datranga	Boraginaceae	*	*
39	<i>Emblca officinulis</i>	Amla	Phyllanthaceae	*	*
40	<i>Erythrina indica</i> Lam.	Pangra	Fabaceae	*	*
41	<i>Eucalyptus</i> sp.	Nilgiri	myrtaceae	-	*
42	<i>Ficus benghalensis</i> L.	Bad	Moraceae	*	*
43	<i>Ficus mollis</i> Vahl	Gular	Moraceae	-	*
44	<i>Ficus racemosa</i> L.	Gular	Moraceae	-	*
45	<i>Ficus religiosa</i> L.	Pipal	Moraceae	*	*
46	<i>Gardenia latifolia</i> Aiton	Papra	Rubiaceae	-	*
47	<i>Garuga pinnata</i> Roxb.	Kekad	Burseracea	-	*
48	<i>Gmelina arborea</i> Roxb.	Khamhar	Verbenaceae	-	*
49	<i>Grewia tiliifolia</i> Vahl	Dhaman	Tilliaceae	*	*
50	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Haldu/Kalmi	Rubiaceae	-	*
51	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Bhanwannal	Rubiaceae	*	*
52	<i>Kydia calycina</i> Roxb.	Baranga	Malvaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
53	<i>Lagerstroemia parviflora</i> Roxb.	Lendia	Lythraceae	*	*
54	<i>Lannea coromandelica</i>	Jhingan/Movei	Anacardiaceae	*	*
55	<i>Limonia acidissima</i>	Kawat	Rutaceae	*	*
56	<i>Madhuca longifolia</i>	Mahua	Sapotaceae	*	*
57	<i>Mallotus philippensis</i> (Lam.) Müll. Arg.	Sinduri/ Rori	Euphorbiaceae	-	*
58	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Kalam/Kadam b	Rubiaceae	*	*
59	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Kadamb	Combretaceae	-	*
60	<i>Ougenia oojeinensis</i>	Tiwat	Fabaceae	*	*
61	<i>Peltophorum ferrugineum</i> (Decne.) Benth.	Peltaphorum	Fabaceae	*	*
62	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajur	Palmae	*	*
63	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	China ashok	Annonaceae		*
64	<i>Pongamia pinnata</i> (L.) Pierre	Karanj	Faboceae	*	*
65	<i>Prasopis juliflora</i> (Sw.) DC.	Khejdi	Fabaceae	*	*
66	<i>Psidium guajava</i> L.	Jam	myrtaceae	-	*
67	<i>Pterocarpus marsupium</i> Roxb.	Bijs	Fabaceae	*	*
68	<i>Saccopetalum tomentosum</i> Hook.f. & Thomson	Kari	Annonaceae	*	*
69	<i>Schleichera oleosa</i> (Lour.) Merr.	Kusum	Sapindaceae	*	*
70	<i>Schrebera swietenoides</i> Roxb.	Mokha	Oleaceae	*	*
71	<i>Semecarpus anacardium</i> L.f.	Bibba	Anacardiaceae	*	*
72	<i>Senna occidentalis</i> (L.) Link	Kasondi	Fabaceae	*	*
73	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Acacia	Fabaceae	*	*
74	<i>Soymida febrifuga</i> (Roxb.) A. Juss.	Rohan	Meliaceae	*	*
75	<i>Sterculia urens</i> Roxb.	Kulu	Sterculiaceae	-	*
76	<i>Stercospermum suaveolens</i> (Roxb.) DC.	Badapadar	Bignoniaceae	*	*
77	<i>Syzygium cumini</i> (L.) Skeels	Jamun	Myrtaceae	*	*
78	<i>Tamarindus indica</i> L.	Imli	Fabaceae	*	*
79	<i>Tamilnadia uliginosa</i> (Retz.) Tirveng. & Sastre	Kala Phetra	Rubiaceae	*	*
80	<i>Tectona grandis</i> L.f.	Sagaun	Verbenaceae	*	*


Deputy Conservator of Forest
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Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
81	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjun	Combretaceae	*	*
82	<i>Terminalia tomentosa</i>	Ain/Saja	Combretaceae	*	*
83	<i>Trema orientalis</i> (L.) Blume	Jivan	Urticaceae	-	*
84	<i>Vitex negundo</i> L.	Morphal	Verbenaceae	-	*
85	<i>Ziziphus jujuba</i> Mill.	Ber	Rhamnaceae	*	*
86	<i>Alangium lamareckii</i> , Lamk.	Ankura	Cornaceae		*
87	<i>Terminalia bellirica</i> , Linn.	Bahera	Combretaceae		*
88	<i>Fraxinus</i>	Ash Tree	Oleaceae		*
89	<i>Mangifera indica</i>	Aam	Anacardiaceae	*	*
90	<i>Terminalia Chebula</i>	Hirda	Combretaceae		*
91	<i>Salvadora persica</i>	Kharijal	Salvadoraceae		*
92	<i>Turnera ulmifolia</i>	Holly	Passifloraceae		*
93	<i>Celba pentandra</i>	Cotton	Malvaceae	*	*
94	<i>Casuarina equisetifolia</i>	Jhau	Casuarinaceae		*
95	<i>Streblus asper</i> , Lour.	Sheora	Moraceae		*
96	<i>Salix willow</i>	Osiers	Salicaceae		*
97	<i>Phyllanthus emblica</i> , Linn.	Amla	Phyllanthaceae	*	*
98	<i>Spondias mangifera</i> , Linn.	Amra	Anacardiaceae		*
99	<i>Hardwickia binata</i> , Roxb.	Anjan	Fabaceae		*
100	<i>Ficus hispida</i> , Linn.	Dumur	Moraceae		*
101	<i>Cochlospermum gossypium</i> , Kunth.	Gabdi	Cochlosperma ccae		*
102	<i>Cordia myxa</i> , Linn.	Lashora	Boraginaceae		*
103	<i>Erythrina stricta</i> , Linn.	Madar	Fadaceae		*
104	<i>Aglaia rexburghiana</i> , Lour.	Priyangu	Meliaceae		*
105	<i>Cassia siamea</i> , Linn.	Minijiri	Fabaceae		*
106	<i>Holoptelia integrifolia</i> planch.	Paperi	Ulmaceae		*
107	<i>Trewia nudiflora</i> , Linn.	Pitali	Euphorbiaceae		*
108	<i>Diospyos tomentose</i> , Linn.	Tamal	Ebenaceae		*
Total				68	108

Note: (*) indicates presence of species & (-) indicates absence

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

SHRUBS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Achyranthes aspera</i> L.	Chirchira	Amaranthaceae	*	*
2	<i>Balanites aegyptiaca</i> (L.) Del.	Hingol	Balanitaceae	*	*
3	<i>Calotropis gigantea</i> (L.) Dryand.	Aak	Asclepiadaceae	*	*
4	<i>Colebrookea oppositifolia</i> Sm.	Katabans	Labiatae	*	*
5	<i>Dodonaea viscosa</i> subsp. <i>Aungustifolia</i> (L.f.) J.G. WEST	sadabahar	Apocynaceae	*	*
6	<i>Eranthemum pulchellum</i> Andrews	Bantulsi	Acanthaceae	*	*
7	<i>Flacourtia indica</i> (Burm.f.) Merr.	Kakai	Bixaceae	*	*
8	<i>Gardenia gummifera</i> L.f.	Dikamali	Rubiaceae	*	*
9	<i>Grewia hirsuta</i> Vahl	Gutdukri	Tiliaceae	*	*
10	<i>Grewia rathii</i> DC.	Bansuli	Tiliaceae	*	*
11	<i>Gymnosporia spinosa</i> (Blanco) Merr. & Rolfe	Baikal	Celastraceae	*	*
12	<i>Helicteres isora</i> L.	Marophali	Sterculiaceae	*	*
13	<i>Hibiscus rosa-sinensis</i> L.	Gudhal	malvaceae	*	*
14	<i>Holarrhena antidiysenterica</i> (Roth) Wall. ex A.DC.	Dhudh	Apocynaceae	*	*
15	<i>Hyptis suaveolens</i> (L.) Poit.	Van Tulsi	Meliaceae	*	*
16	<i>Indigofera cassioides</i> DC.	Giol	Fabaceae	*	*
17	<i>Ixora parviflora</i>	Lokhandi	Rubiaceae	*	*
18	<i>Jasminum sambac</i> (L.) Aiton	Bela	Oleaceae	*	*
19	<i>Justicia adhatoda</i> L.	Adusa	acanthaceae	*	*
20	<i>Martynia annua</i> L.	Baghanakhu	Martiniaceae	*	*
21	<i>Mimosa pudica</i> L.	Chhuimui	Fabaceae	*	*
22	<i>Morinda tinctoria</i>	Bartondi/Aali	Rubiaceae	*	*
23	<i>Mucuna pruriens</i> (L.) DC.	Beeja	Fabaceae	*	*
24	<i>Nerium oleander</i> L.	Lal Kaner	Apocynaceae	*	*
25	<i>Phoenix acaulis</i> Roxb.	Chhind	Palmae	*	*
26	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Bilayati Iml	Fabaceae	*	*
27	<i>Prasopis cineraria</i> (L.) Druce	Sami/Gugurahi	Fabaceae	*	*
28	<i>Ricinus communis</i> L.	Arand	Euphorbiaceae	*	*
29	<i>Senna auriculata</i> (L.) Roxb.	Takhad	Fabaceae	*	*
30	<i>Solanum virginianum</i> L.	Bhatkataiya	Solanaceae	*	*
31	<i>Tephrosia purpurea</i> L.	Sarphonka	Fabaceae	*	*
32	<i>Triumfetta rhomboidea</i> Jacq.	Chipti	Malvaceae	*	*
33	<i>Urena lobata</i> L.	Chikti	Malvaceae	*	*
34	<i>Wrightia tinctoria</i>	Dudhi	Apocynaceae	*	*


Deputy Conservator of Forest
Pendharkawada Division, Pendharkawadga

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
35	<i>Xanthium strumarium</i> L.	Okharu	Asteraceae	*	*
36	<i>Zizyphus mauritiana</i>	Ber	Rhamnaceae	*	*
37	<i>Zizyphus xylopyrus</i>	Ghoti	Rhamnaceae	*	*
38	<i>Sapindus emarginatus</i>	Rithaz	Sapindaceae		*
39	<i>Calotropis gigantean</i>	Akanda	Apocynaceae		*
40	<i>Bauhinia vahlii</i> Linn	Maljsn	Fabaceae		*
41	<i>Lantana camera</i>	Common lantana	Verbenaceae		*
42	<i>Lawsonia inermis</i>	Mchandi	Lythraceae		*
43	<i>Cleridobdryn</i>	Bhant	Lamiaceae		*
44	<i>Asparagus racemosus</i> , Linn.	Satamuli	Asparagaceae		*
45	<i>Dalbergia volubilis</i> Linn.	Birmungo	Fabaceae		*
46	<i>Ephedra gerardiana</i>	Somlata	Ephedraceae		*
47	<i>Flacourtia cataphracta</i>	Common Sainchi	Salicaceae		*
48	<i>Jatropha curcus</i>	Poison nut	Euphorbiaceae		*
49	<i>Cardenia gunmifera</i>	Bhurur	Rubiaceae		*
50	<i>Ipemeca biloba</i>	Changalkhuri	Rubiceae		*
51	<i>Cassia pumila</i> , Linn.	Chota aura	Caesalpinaceae		*
52	<i>Abuilon hirtum</i> , Goertn.	Jhampi	Malvaceae		*
53	<i>Carissa spinarum</i> , Linn.	Karamcha	Apocynaceae		*
54	<i>Croton oblongifolium</i> , Linn.	Putri	Euphorbiaceae		*
55	<i>Flemingia strobilifera</i> , Roxb.	Stimbusak	Fabaceae		*
56	<i>Desmodium latifolium</i> , Desy.	Sunmathasura	Fabaceae		*
57	<i>Acacia pennata</i> , Willd.	Shembi	Fabaceae		*
58	<i>Millelia auriculata</i> , W & A.	Gaj	Fabaceae		*
59	<i>Vitis pedata</i> , Linn.	Colilata	Vitaceae		*
60	<i>Acacia caesia</i> (L.) Willd.	Kendrojanum	Mimosaceae		*
Total				37	59

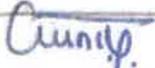
Note: (*) indicates presence of species & (-) indicates absence

HERBS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Phool ghans	Amaranthaceae	*	*
2	<i>Alysicarpus vaginalis</i> (L.) DC.	Chipti	Fabaceae	*	*
3	<i>Antidesma acidum</i> Retz.	Khatua	Euphorbiaceae	*	*
4	<i>Azanza lampas</i> (Cav.) Alef.	Bankapas	Malvaceae		*
5	<i>Boerhavia diffusa</i> L.	Punamava	Nictaginaceae	*	*
6	<i>Senna tora</i> (L.) Roxb.	Panwar	Fabaceae	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
7	<i>Andropogonis paniculata</i> (Burn.f.) Wall. Ex Nees	Kalmegh	Acanthaceae	*	*
8	<i>Curculigo orchitoides</i> Gaertn.	Kali mushli	Hypoxidaceae		*
9	<i>Cyperus scariosus</i> R.Br.	Motha	Cyperaceae	*	*
10	<i>Cyperus dubius</i> Roitb.	Motha	Cyperaceae	*	*
11	<i>Desmodium gangeticum</i> (L.) DC.	Chapti	Fabaceae	*	*
12	<i>Desmodium laxiflorum</i> DC.	Lakani	Fabaceae	*	*
13	<i>Desmodium triflorum</i> (L.) DC.	Tinpatiya	Fabaceae	*	*
14	<i>Enicostemma littorale</i> Blume	Naibuti	Gentianaceae	*	*
15	<i>Euphorbia hirta</i> L.	Dudhi	Euphorbiaceae	*	*
16	<i>Euphorbia thymifolia</i> L.	Choti dudhi	Euphorbiaceae	*	*
17	<i>Jatropha gossypifolia</i> L.	Jamal ghoti	Euphorbiaceae		*
18	<i>Merremia emarginata</i> (Burn. f.) Hallier f.	Muskani	Fabaceae		*
19	<i>Ocimum basilicum</i> L.	Barbari tulsi	Meliaceae	*	*
20	<i>Ocimum sanctum</i> L.	RamaTulsi	Meliaceae		*
21	<i>Petalidium angustitubum</i> P.G. Mey.	Indrajata	Acanthaceae		*
22	<i>Phyllanthus amarus</i> Schumacher & Thonn.	Bhui Aonla	Phyllanthaceae	*	*
23	<i>Sida acuta</i> Burn.f.	Khakhara	Malvaceae	*	*
24	<i>Sida cordifolia</i> L.	Bariyari	Malvaceae	*	*
25	<i>Sida rhombifolia</i> L.	Vishkhpadi	Malvaceae	*	*
26	<i>Tagetes erecta</i> L.	Genda	Asteraceae	*	*
27	<i>Tephrosia purpurea</i> (L.) Pers.	Sarphonka	Fabaceae	*	*
28	<i>Tridax procumbens</i> (L.) L.	Ghamara	Asteraceae	*	*
29	<i>Trigonella</i> sp.	Ban methi	Fabaceae	*	*
30	<i>Agave</i> spp	Meraba	Asparagaceae		*
31	<i>Aloe Vera</i>	Guar bhata	Aspodiaceae		*
32	<i>Rauwolfia serpentina</i>	White Sarpagandha	Apocynaceae		*
33	<i>Dioscorea humbularia</i> Linn	Shora alu	Dioscoreaceae		*
34	<i>Martynia diandra</i> , Linn.	Bagooki	Martyniaceae		*
35	<i>Datura stramonium</i> , Linn.	Dhutura	Solanaceae		*


 Deputy Conservator of Forest
 Pandharkwada Division, Pandharkwada

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
36	<i>Abrus precatorius</i> Linn.	Kunah	Fabaceae		*
37	<i>Girardinia zeylanica</i>	Gand Bichua	Urticaceae		*
38	<i>Casia absus</i> , Linn.	Chaksubanar	Fabaceae		*
39	<i>Cassia tora</i> , Linn.	Chakunda	Fabaceae		*
40	<i>Euphorbia microphylla</i> , Linn.	Chotakerui	Euphorbiaceae		*
41	<i>Euphorbia drounculoides</i> , Linn. Jychi	Khachar Dudhi	Euphorbiaceae		*
42	<i>Indigofera enneaphylla</i> , Linn.	Bhingule	Fabaceae		*
43	<i>Drosera burmanni</i> , Linn.	Mukhajali	Fabaceae		*
44	<i>Curcuma angustifolia</i>	Tikhur	Zingiberaceae		*
45	<i>Cuscuta reflexa</i> , Linn.	Algusi	Convolvulaceae		*
46	<i>Vitis latifolia</i> , Linn.	Gobila	Vitaceae		*
47	<i>Spatholobus exburghii</i> , Hassk.	Maula	Fabaceae		*
Total				23	46

Note: (*) indicates presence of species & (-) indicates absence

CLIMBERS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Ampelocissus latifolia</i> (Roxb.) Planch.	Jangli angur	Vitaceae	*	*
2	<i>Antigonon leptopus</i> Hook. & Arn.		Polygonaceae	*	*
3	<i>Asparagus racemosus</i> Willd.	Stawar	Liliaceae		*
4	<i>Spatholobus parviflorus</i> (DC.) Kuntze	Nasbel	Fabaceae	*	*
5	<i>Butea superba</i> Roxb.	Palas bel	Fabaceae	*	*
6	<i>Capparis zeylanica</i>	Waghati	Capparidaceae	*	*
7	<i>Celastrus paniculatus</i> Willd.	Mai Kangni	Celastraceae	*	*
8	<i>Cocculus hirsutus</i> (L.) W.Theob.	Jaljamni	Menispermaceae	*	*
9	<i>Cryptolepis dubia</i> (Burm.f.) M.R.Almeida	Karanta	Asteraceae	*	*
10	<i>Dioscorea bulbifera</i> L.		Dioscoreaceae	*	*
11	<i>Dioscorea hispida</i> Dennst.	Baichandi	Dioscoreaceae	*	*
12	<i>Dioscorea pentaphylla</i> L.	Musalkand	Dioscoreaceae	*	*
13	<i>Diplocyclos palmatus</i> (L.) C. Jeffrey		Cucurbitaceae	*	*
14	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.		Apocynaceae	*	*
15	<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	Dhimar Bel	Apocynaceae	*	*
16	<i>Ipomoea pes-tigridis</i> L.		convolvulaceae	*	*
17	<i>Peripolaria daemia</i> (Forssk.) Chiov.	Kadukand	Apocynaceae	*	*
18	<i>Rhynchosia minima</i> (L.) DC.	Ban sem	Fabaceae	*	*
19	<i>Tinospora cordifolia</i> (Willd.) Miers	Giloy	Menispermaceae	*	*
20	<i>Tylophora indica</i> (Burm. f.) Merr.	Dambela	Apocynaceae	*	*

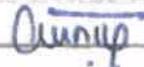
Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

S. No	Botanical Name	Local Name	Family	Core	Buffer
21	<i>Vallisneria spiralis</i> (Roth) Kuntze	Dudhbela	Alismaceae	*	*
22	<i>Ventilago denticulata</i> Willd.	Keoti	Rhamnaceae	*	*
23	<i>Ampelocissus indica</i> (L.) Planch.	Jangli angur	Vitaceae	*	*
24	<i>Ziziphus oenoplia</i> (L.) Mill.	Makor	Rhamnaceae	*	*
Total				23	24

Note: (*) indicates presence of species & (-) indicates absence

GRASSES & BAMBOOS:

S. No	Botanical Name	Local Name	Family	Core	Buffer
1	<i>Aristida setacea</i> Retz.	Bargi Ronda	Poaceae	*	*
2	<i>Arundinella setosa</i> Trin.	Sidi	Poaceae	*	*
3	<i>Bothriochloa pertusa</i> (L.) A. Camus	Bhond grass	Poaceae	*	*
4	<i>Cenchrus purpureus</i> (Schumacher) Morrone		Poaceae	*	*
5	<i>Cynodon dactylon</i> L.	Doob	Poaceae	*	*
6	<i>Dichanthium annulatum</i> (Forssk.) Stapf	Chhoti Marbel	Poaceae	*	*
7	<i>Eragrostis amabilis</i> (L.) Wight & Arn.	Bhurhusi	Poaceae	*	*
8	<i>Eulaliopsis binata</i> (Retz.) C.E. Hubb.	Bagui	Poaceae	*	*
9	<i>Heteropogon contortus</i> (L.) P. Beauv. ex Roem. & Schult.	Kushal, lampa	Poaceae	*	*
10	<i>Imperata cylindrica</i> (L.) R. Br.	Chhir	Poaceae	*	*
11	<i>Eulaliopsis binata</i> (Retz.) C.E. Hubb.	Sabai	Poaceae	*	*
12	<i>Ischaemum laxum</i> Hack.	Mushan	Poaceae	*	*
13	<i>Setaria nervosum</i> (Rottler) Stapf	Munsel	Poaceae	*	*
14	<i>Panicum antidotale</i> Retz.	Kosra	Poaceae	*	*
15	<i>Panicum sumatrense</i> Roth	Chire Kutik	Poaceae	*	*
16	<i>Panicum repens</i> L.		Poaceae	*	*
17	<i>Saccharum spontaneum</i> L.	Kans	Poaceae	*	*
18	<i>Setaria nervosum</i> (Rottler) Stapf	Sheda	Poaceae	*	*
19	<i>Setaria verticillata</i> (L.) P. Beauv.	Lalkani	Poaceae	*	*
20	<i>Sorghum halepense</i> (L.) Pers.	Baru	Poaceae	*	*
21	<i>Themeda quadrivalvis</i> (L.) Kuntze	Gunher	Poaceae	*	*
22	<i>Bambusa bambos</i> (L.) Voss	Kanta bans	Graminaceae	*	*
23	<i>Dendrocalamus strictus</i> (Roxb.) Nees	Bans	Graminaceae	*	*
24	<i>Echinochloa colona</i>	Sama	Poaceae	*	*
25	<i>Deschampsia</i>	Chhi	Poaceae	*	*
26	<i>Saccharum bengalense</i>	Munj	Poaceae	*	*
27	<i>Bambusa balcooa</i>	Baro bans	Poaceae	*	*
28	<i>Thysanotus agrostis</i>	Jharu/Broom grass	Poaceae	*	*
Total				23	28


Deputy Conservator of Forest
Pandharkwada Division, Pandharkwada

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

AQUATIC FLORA :

S. No	Botanical Name	Local Name	Family	Core	Buffer
1.	<i>Pistia stratiotes</i>	Water lettuce	Araceae		*
2.	Lemnoideae	Duckweeds	Araceae		*
3.	<i>Nelumbo nucifera</i>	Indian lotus	Nelumbonaceae		*
4.	<i>Nymphaea</i>	Water lilies	Nymphaeaceae		*
	Total			-	4

Note: (*) indicates presence of species & (-) indicates absence

(Source: Primary Survey Data)

MARKI MANGLI OPENCAST COAL MINING PROJECT,
Project Area 339.467 Ha Village(s): Savli, Ruikot, Pardi and Mukutban
Tahsil - Jhari Jamni, District - Yavatmal, Maharashtra,

LIST OF FAUNA WITHIN CORE AND BUFFER ZONE

MAMMALS:

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/ IUCN Status	Core Zone	Buffer Zone
1	<i>Antelope cervicapra</i>	Blackbuck	Deer	I	*	*
2	<i>Axis axis</i>	Cheetal	Deer	III/LC		*
3	<i>Boselaphus tragocamelus</i>	Nilgai	Blue bull	III/LC		*
4	<i>Canis aureus</i>	Kolha	Jackal	II/LC		*
5	<i>Canis lupus pallipes</i>	Indian Wolf	Kolha	I	*	*
6	<i>Cervus unicolor</i>	Sambar	Sambar	III/VU		*
7	<i>Cuon alpinus</i>	Dhol	Wild Dog	II/EN		*
8	<i>Felis chaus</i>	Ranmanjar	Jungle cat	II/LC	*	*
9	<i>Funambulus tristriatus</i>	Khar	Five striped palm squirrel	IV/LC	*	*
10	<i>Gazella bennettii</i>	Chinkara	Hiran	I	*	*
11	<i>Herpestes edwardsi</i>	Mongoose	Common mongoose	LC	*	*
12	<i>Hyaena hyaena</i>	Hyaena	Wild dog	III	*	*
13	<i>Hystrix indica</i>	Indian Porcupine	Salunki	II	*	*
14	<i>Lupus nigricollis</i>	Sasa	Indian hare	IV/LC		*
15	<i>Melursus ursinus</i>	Sloth bear	Bear	I	*	*
16	<i>Panthera tigris</i>	Tiger	Tiger	I		*
17	<i>Panthera pardus</i>	Tendua	Panther	I		*
18	<i>Presbytis entellus</i>	Langur	Bandar	II	*	*
19	<i>Presbytis pileatus</i>	Common langur	Bandar	II	*	*
20	<i>Rhesus macaque</i>	Bandar	Monkey	II/LC		*
21	<i>Sus scrofa cristatus</i>	Randukkar	Wild boar	III/LC	*	*
22	<i>Tetracerus quadricornis</i>	Four Horned Antelope	Hiran	I	*	*
23	<i>Vulpes bengalensis</i>	Indian Fox	Indian Fox	II/LC		*
24	<i>Funambulus palmarum</i>	Indian Palm Squirrel	Khar	IV	*	*
25	<i>Muntiacus muntjak</i>	Barking Deer	Harin	III	*	*
26	<i>Manis crassicaudata</i>	Indian Pangolin	Ant eater	I	*	*


Deputy Conservator of Forests
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Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/ IUCN Status	Core Zone	Buffer Zone
27	<i>Cynopterus sphinx</i>	Bat, short-nosed fruit	Bat	IV/LC	*	*
28	<i>Pteropus giganteus</i>	Bat, Indian Flying Fox	Bat	IV/LC	*	*
29	<i>Tatera indica</i>	Gerhille, India	Rat	IV/LC	*	*
30	<i>Lepus nigricollis</i>	Hare, Indian	Sasa	IV/LC	*	*
31	<i>Macaca mulatta</i>	Monkey	Macaque Rhesus	II/LC	*	*
32	<i>Herpestes javanicus</i>	Mongoose	Mongoose, Small Indian	II/LC	*	*
33	<i>Mus booduga</i>	Mouse	Mouse, Indian Field	II/LC	*	*
34	<i>Bandicota indica</i>	Rat	Rat, Bandicoot	IV/LC	*	*
35	<i>Gomanda ellioti</i>	Rat	Rat, Indian Bush	IV/LC	*	*
Total					25	35

AVES:

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/ IUCN Status	Core	Buffer
1	<i>Acridotheres tristis</i>	Saluuki	Indian myna	IV	*	*
2	<i>Alauda gulgula</i>	Turrebaj chandol	Oriental skylark	IV/LC		*
3	<i>Ardeola grayii</i>	Vanchak	Pond heron	IV/LC	*	*
4	<i>Columba livia</i>	Parva	Blue rock pigeon	LC	*	*
5	<i>Corvus splendens</i>	Kawala	House crow	LC	*	*
6	<i>Coturnix coturnix</i>	Rakhi durlav	Grey quail	IV/LC		*
7	<i>Francolinus pondicerianus</i>	Chitur	Grey francolin	IV/LC		*
8	<i>Lanius vittatus</i>	Khatik	Baybacked shrike	LC		*
9	<i>Passer domesticus</i>	Chimni	House sparrow	LC	*	*
10	<i>Pavo cristatus</i>	mor	Peacock	I	*	*
11	<i>Psittacula krameri</i>	Popat	Roseringed parakeet	IV/LC	*	*
12	<i>Saxicolaides fulcata</i>	Chirak	Indian robin	LC	*	*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/ IUCN Status	Core	Buffer
13	<i>Streptopelia senegalensis</i>	Hola	Laughing dove	IV/LC	*	*
14	<i>Phasianidae</i>		Jungle Fowl	IV/LC	*	*
15	<i>Estrilidae</i>		Munias	IV/LC	*	*
16	<i>Pycnonotidae</i>	Bulbul	Bulbul	IV/LC	*	*
17	<i>Cuculidae</i>	Cuckoo	Cuckoo	IV/LC	*	*
18	<i>Eudynamis</i>	Koel	Koel	IV/LC	*	*
19	<i>Milvus migrans</i>	Kite	Kite	IV/LC	*	*
20	<i>Anser anser</i>	Goose	Goose	IV/LC	*	*
21	<i>Anatidae</i>	Duck	Duck	IV/LC	*	*
22	<i>Turdoides caudata</i>	Common Babbler	Common Babbler	IV/LC	*	*
23	<i>Oriole oriolidae</i>	Golden Oriole	Haldya	IV/LC	*	*
24	<i>Picidae</i>	Woodpecker	Woodpecker	IV/LC	*	*
25	<i>Meropidae</i>	Bee-eater	Bee-eater	IV/LC	*	*
26	<i>Glaucidium radiatum</i>	Jungle Owlet	Jungle Owlet	IV/LC	*	*
27	<i>Neophron percnopterus</i>	Vulture	Egyptian Vulture	IV/LC	*	*
28	<i>Anatidae</i>	Teal	Teal	IV/LC	*	*
29	<i>Sterna aurantia</i>	River Tern	River Tern	VU		*
Total					23	29

HERPATOFAUNA:

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/IUCN Status	Core	Buffer
1	<i>Calotes versicolor</i>	Sargota	Common garden lizard	LC	*	*
2	<i>Eryx conicus</i>	Red sand boa	Ghonas	IV	*	*
3	<i>Mabuya carinata</i>	Sapsoli	Common skink	LC	*	*
4	<i>Naja naja</i>	Nag	Cobra	II/LC		*
5	<i>Ptyas mucosa</i>	Dhaman	Common rat snake	III/LC		*
6	<i>Python molurus</i>	Rock python	Ajgar	I	*	*
7	<i>Rana hexadactyla</i>	Beduk	Indian Pond Frog	IV/NA	*	*
8	<i>Rana tigerinus</i>	Beduk	Indian Bull Frog	IV/LC	*	*


Deputy Conservator of Forest
Pandharkwada Division, Pandharkwada

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular name	Common name	Schedules of Wildlife Act/IUCN Status	Core	Buffer
9	<i>Varanus bengalensis</i>	Monitor Lizard	Large Bengal Monitor Lizard	I	*	*
10	<i>Daboia russelii</i>	Viper	Russels Viper	II	*	*
11	<i>Bungarus fasciatus</i>	Krait	Banded Krait	IV	*	*
12	<i>Chameleon calcarata</i>	Lizard	Chameleon	II	*	*
13	<i>Bungarus caeruleus</i>	Snake	Common Krait	II/VU	*	*
Total					11	13

(Source: Primary Survey & Secondary Data)

Note:- NA= Not yet assessed, LC=Least Concern, VU= Vulnerable.

PISCES:

Sr. No.	Scientific name	Vernacular Name	Common Name	Iucn status	Core	Buffer
1	<i>Ambassis nama</i>	Zanjad	Indian glassy fish	NA		*
2	<i>Ambassis ranga</i>	Zanjad	Indian glassy fish	NA		*
3	<i>Barilius barna</i>	Batri	River carp baril	LC		*
4	<i>Catla catla</i>	Katla	Major Carp	LC		*
5	<i>Channa striatus</i>	Dhadak	Banded snake head	LC		*
6	<i>Cirrhinus mrigala</i>	Naren	Major Carp	LC	*	*
7	<i>Clarius batracus</i>	Mangur	Magur	NA		*
8	<i>Cyprinus carpio</i>	Cipla	Cipla	VU		*
9	<i>Gambusia affinis</i>	Machar Machli	Mosquito fish	LC		*
10	<i>Glossigobius girus</i>	Kaddu	Tank gobi	NA		*
11	<i>Heteropneustes fossilis</i>	Ingur	Stinging cat fish	LC		*
12	<i>Labeo rohita</i>	Rohu	Common carp	LC	*	*
13	<i>Labeo calbasu</i>	Black rohu	Calbasu	LC		*
14	<i>Mastacembelus armatus</i>	Bamb	Spiny eel	LC		*
15	<i>Mystus cavasius</i>	Singara	Cat fish	LC		*

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular Name	Common Name	Iucn status	Core	Buffer
16	<i>Mystus seenghala</i>	Katwa	Gangatic mystus	LC		*
17	<i>Nandus nandus</i>	Dukkar	Leaf fish	LC		*
18	<i>Osteobrama cotio</i>	Bhundu	Cotio	LC		*
19	<i>Punctilus amphibious</i>	Ghuruti	Scarlet Banded barb	NA		*
20	<i>Rita rita</i>	Bhokhi	Rita	LC		*
21	<i>Salmostoma bacaila</i>	Chal	Silver fish	LC		*
22	<i>Tor khudree</i>	Mahseer	Deccan Mahaseer	LC		*
23	<i>Xenentodon cancilla</i>	Chocha	Needle fish	LC		*
Total					2	23

(Source: Primary Survey & Secondary Data) Note: NA= Not yet assessed, LC=Least Concern, VU= Vulnerable.

BUTTERFLIES:

Sr. No.	Scientific name	Vernacular name	Family	Iucn status	Core	Buffer
1	<i>Ariadne merione</i>	Common easter	Nymphalidae	NA	*	*
2	<i>Catopsilia pirantha</i>	Mottled emigrant	Pieridae	NA		*
3	<i>Catopsilia pomona</i>	Common emigrant	Pieridae	NA	*	*
4	<i>Cepora nerissa</i>	Common gul	Pieridae	NA		*
5	<i>Chilades pandav</i>	Plain cupid	Hesperiidae	NA	*	*
6	<i>Danaus chrysipus</i>	Plain tiger	Nymphalidae	LC		*
7	<i>Euploea core</i>	common indian crow	Nymphalidae	LC		*
8	<i>Eurema hecabe</i>	Common grass Yellow	Pieridae	NA		*
9	<i>Hypolimnas misippus</i>	DANNAID EGG FLY	Nymphalidae	NA	*	*
10	<i>Junonia arithya</i>	Blue pansy	Nymphalidae	NA		*
11	<i>Junonia iphita</i>	Chocolate pansy	Nymphalidae	NA		*
12	<i>Junonia lemonias</i>	Lemon pansy	Nymphalidae	NA		*
13	<i>Leptotes plinius</i>	Zebra blue	Lycaenidae	NA		*
14	<i>Melanitis leda</i>	Common evening brown	Nymphalidae	LC		*
15	<i>Pachliopta aristolochiae</i>	Common rose	Papilionidae	LC		*

Deputy Conservator
Panchakawada District, Panchakawada

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Sr. No.	Scientific name	Vernacular name	Family	Icon status	Core	Buffer
16	<i>Papilio demoleus</i>	Lime	Papilionidae	NA		*
17	<i>Papilio polytes</i>	Common mormon	Papilionidae	NA	*	*
18	<i>Prosotas nora</i>	common line blue	Hesperiidae	NA		*
19	<i>Tirumala limniace</i>	Blue tiger	Nymphalidae	NA	*	*
20	<i>Pachliopta hector</i>	Crimson Rose	Papilionidae	LC		*
21	<i>Virachola isocrates</i>	Guava Blue	Lycaenidae	II		*
22	<i>Castalius rosimon</i>	Common pierrot	Lycaenidae	NA		*
23	<i>Rapala manea</i>	Slate Flash	Lycaenidae	LC		*
24	<i>Synthia cardui</i>	Painted Lady	Nymphalidae	NA	*	*
25	<i>Ypthima asterope</i>	Common Three Ring	Nymphalidae	NA	*	*
26	<i>Catopsilia pomona</i>	Common emigrant	Pieridae	NA	*	*
27	<i>Cepora nerissa</i>	Common Gull	Pieridae	NA	*	*
28	<i>Eurema hecabe</i>	Common Grass yellow	Pieridae	NA	*	*
29	<i>Danaus chrysippus</i>	Plain Tiger	Nymphalidae	NA	*	*
30	<i>Danaus genutia</i>	Striped Tiger	Nymphalidae	NA	*	*
31	<i>Euploea core</i>	Common crow	Nymphalidae	NA	*	*
32	<i>Junonia lemonias</i>	Lemon Pansy	Nymphalidae	NA	*	*
33	<i>Junonia orithya</i>	Blue Pansy	Nymphalidae	NA	*	*
34	<i>Melanitis leda</i>	Common evening brown	Nymphalidae	NA	*	*
35	<i>Hypolimnas bolina</i>	Great eggfly	Nymphalidae	NA	*	*
36	<i>Tirumala septentrionis</i>	Dark Blue Tiger	Nymphalidae	NA	*	*
Total					19	36

(Source: Primary Survey & Secondary Data)

INSECTS :

Sr. No.	Scientific name	Common name	Iucn status	Core	Buffer
1	Poduridae	Podura	LC/UNS	*	*
2	Blatta orientalis	Cockroach	LC/UNS	*	*
3	Mantodea	Mantis	LC/UNS	*	*
4	Chinavia hilaris	Green Stink Bues	LC/UNS	*	*
5	Pyrrhocoridae	Red Bugs	LC/UNS	*	*
6	Formicidae	Ant	LC/UNS	*	*
7	Solenopsis spp.	Red Ant (Fire Ant)	LC/UNS	*	*
8	Paraponera clavata	Bullet Ant	LC/UNS	*	*
9	Apis dorsata	Giant Honey Bee	LC/UNS	*	*
10	Apis dorsata	Rock Bee	LC/UNS	*	*
11	Apis spp.	Honey Bee	LC/UNS	*	*
12	Andrenidae	Bee	LC/UNS	*	*
13	Bombus spp.	Black Bee	LC/UNS	*	*
14	Vespidae	Yellow Wasps	LC/UNS	*	*
15	Ichneumonidae	Wasps	LC/UNS	*	*
16	Chilomenes s. maculate	Ladybird	LC/UNS	*	*
17	Meloidae	Blister Beetle	LC/UNS	*	*
18	Honotricha serrate	Grubs	LC/UNS	*	*
Total				18	18

Note:- NA= Not yet assessed, LC=Least Concern, VU= Vulnerable, UNS=Unscheduled

Class	Core Zone	Buffer Zone	TOTAL
Mammals	23	33	33
Herpatofauna	11	13	13
Aves	23	29	29
Pisces	2	23	23
Butterfly	19	36	36
Insects	18	18	18
TOTAL	96	152	152


 Deputy Conservator of Forest
 Pandharkwada Division, Pandharkwada

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

LIST OF SCHEDULE -I SPECIES AS PER WPA, 1972

S. No.	Scientific Name	English / vernacular Name	WPA 72 Schedule	Class
1	<i>Panthera tigris</i>	Tiger	Schedule-I	Mammals
2	<i>Panthera pardus</i>	Leopard	Schedule-I	Mammals
3	<i>Pavo cristatus</i>	Indian Peafowl	Schedule-I	Aves
4	<i>Antelope cervicapra</i>	Blackbuck	Schedule-I	Mammals
5	<i>Canis lupus pallipes</i>	Indian Wolf	Schedule-I	Mammals
6	<i>Gazella bennetti</i>	Chinkara	Schedule-I	Mammals
7	<i>Melursus ursinus</i>	Sloth bear	Schedule-I	Mammals
8	<i>Tetracerus quadricornis</i>	Four Horned Antelope	Schedule-I	Mammals
9	<i>Python molurus</i>	Rock python	Schedule-I	Herpatofauna
10	<i>Varanus bengalensis</i>	Large Bengal Monitor Lizard	Schedule-I	Herpatofauna
11	<i>Manis crassicaudata</i>	Indian Pangolin	Schedule-I	Mammals

Cunup

**Undertaking for not establishing labour camps in mine lease and well as well as
forest land**



Sub: Diversion of 146.996 ha forest land under section 2(1) (ii) of the Van (Sanraksshn Evam Sawadhan) Adhiniyam 1980 for Integrated Coal Mining including post mine reclamation in Marki Mangli II coal Block in Yavatmal District, Maharashtra State in favor of Yazdani International Private Limited (Online number FP/MIN/145510/2021).

UNDERTAKING OF USER AGENCY

User Agency M/s Yazdani International Private Limited, hereby give and undertaking that no labour camps would be established either in the lease area nor any of the forest land outside the lease area to ensure that there is no illicit felling of trees and disturbing the wildlife habitat.

 03.03.2025

Ashok Kumar Pani
Vice President
Authorized Signatory

Annexure 8

Approval of mine Closure Plan from Competent Authority (MoC)

Application No.

MARKI MANGLI II COAL MINEMHMR0351APP00210/2021

Coal Controller Organization

A subordinate organization of

Ministry of Coal, Government of India,

Shastri Bhawan, New Delhi
2022-10-13

To

YAZDANI INTERNATIONAL PRIVATE LIMITED

Address:

YAZDANI INTERNATIONAL PRIVATE LIMITED State- Maharashtra District-

Yavatmal Email: meraj@yazdaniinternational.com Contact: 9776033333

Fax:

Subject: Approval of Mining Plan and Mine Closure Plan (first Modification) for MARKI MANGLI II COAL MINE of M/S

YAZDANI INTERNATIONAL PRIVATE LIMITED

Sir,

I am directed to refer to your application for approval of Mining Plan and Mine Closure Plan for MARKI MANGLI II

COAL MINE located in WARDHA VALLEY Coal Field Submitted through application number APP00210 of Single Window Portal of Ministry of Coal for approval of the Central Government under Rule 22E of MCR 1960 for a rated capacity of 0.30 Mtpa Peak capacity 0.4500 Mtpa, Lease area 339.467 Ha and Project area 339.467 Ha has been considered and approval of the Central Government there on is here by conveyed under Section 5(2)(b) of the Mines & Minerals (Development & Regulation) Act 1957 subject to the following conditions:

1. The project proponent should ensure implementation of all observations made by internal committee during actual operation.

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

2. Project Proponent shall take all necessary precautions regarding safety of mine workings and persons deployed therein.

3. Mining lease of this block shall not encroach into any other adjacent coal block.

4. The cost of abandonment for carrying out the closure activities envisaged in the Mine closure plan is indicative. The actual cost for carrying out the activities at the time of final closure may be higher. The actual cost of abandonment will have to be borne by the project proponent for carrying out the closure activities.

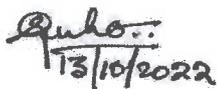
5. The approval of the Mining Plan (Including Mine Closure Plan) is without prejudice to the requirement of approvals from competent [prescribed authority under the relevant rules/ regulations etc.

6. Approval of Mining plan is technical in nature, which is granted with a view to facilitating further developmental activities by the allottee. This approval will have no effect on the penalty provisions of the agreement in case of nonachievement of Milestones.

7. Monitoring of milestone for development of mine will be as per efficiency parameters in CBDPA/CMDPA and appropriation of PBG will be done in case of failure/delay in compliance with the timelines of CBDPA/CMDPA.

8. Evacuation route/ roads/ water bodies/other surface features/infrastructure outside the Geological Block/Project Area shall not be part of the Mining Plan (in line with para 1.6 of OM F.No. 34011/28/2019-CPAM dated 29.05.2020 of MOC for guidelines for Preparation,

Formulation, Submission, Processing, Scrutiny, Approval and Revision of Mining Plan for coal and lignite blocks). 9. Where the backfilling of mining void is to be carried out as part of regular mining operation, it shall not be included as progressive mine closure activity. However, in case, where the backfilling of mine void is to be carried out specifically for closure of mine, quantum of such overburden and the mine closure fund earmarked for the purpose shall be considered for mine

closure.  13/10/2022

(in line with Para 2.3 of OM F.No. 34011/28/2019-CPAM dated 29.05.2020 of Moc for guidelines for Preparation,

Formulation, Submission, Processing, Scrutiny, Approval and Revision of Mining Plan for coal and lignite blocks).

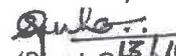
10. HFL determination of seasonal nala has been proposed in the year 2026 (refer Annexure-12 of the Mining Plan)..

All safety precautions against inundation shall be taken.

You are requested to download the copy of the mining plan and mine closure plan duly signed by the competent authority for needful actions and submissions at your end.

Wildlife Conservation & Mitigation Plan for Marki Mangli II Coal Mine

Yours Faithfully


(Shanta Guha) 13/10/2022

Deputy Assistant Coal Controller,
Coal Controller Organisation (A subordinate organization of

Ministry of Coal) Copy to:

1. Under Secretary, NA section, MoC
2. Under Secretary, NA section, MoC

Certified copy of approved mine closure plan from DFO

Mining Plan along with the mine closer plan enclosed herewith the WMP has been approved by Ministry of Coal and vetted by the DFO, Pandharkawda.

Enclosed: Mine Closer Plan of Marki Mangli II approved by competent authority



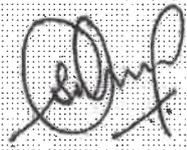
Sharad Satramwar
Dy. General Manager (Lease & Law)
Yazdani International Pvt Limited



Dy. Conservator of Forests (T)
Pandharkawda Forest Division
Dist. YAVATMAL

Certified budget from the DFO

Sr. No.	Particulars	Cost Rs.(lakhs)					
		1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	
	Wildlife Conservation / Mitigation Plan						
1	Fencing (2.5m height) 5200 meter	80					80
2	Cattle trench along the mine boundary with departmental HEMM	12		5		5	22
3.1	Habitat development and plantation	500	200	100	100	100	1000
3.2	Removal of invasive species	50	20	10	10	10	100
4	Nursery development and maintenance of safety zone including green belt development along the lease area	10	5	5	3	2	25
5	Watch tower	10	0	0	0	0	10
6	Soil moisture conservation works	50	20	10	10	10	100
7	Construction of waterholes maintenance	5	5	1	1	1	13
8	Well with solar pumps	0	10				10
9	4% of the project cost to be deposited with wildlife trust as per State Government norm	372	0	0	0	0	372
10	Awareness and training of JFM and Biodiversity committee for wildlife protection and fire control	3	3	3	3	3	15
	Total	1092	263	134	127	131	1747



Sharad Satramwar
Dy. General Manager (Lease & Law)
Yazdani International Pvt Limited




Dahanjay Waybhave
Dy. Conservator of Forests (T)
Pandharkawda Forest Division

Plate 1: Drone Images of the Proposed Site for Marki Mangli II Coal Mine

