



MCL

Ref.No: MCL/GM/LKPA/AEO/2024-25/ 89

Date: 19.11.2024

To
Divisional Forest Officer
Jharsuguda Forest Division.

Sub: Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha

Ref. No. 8-280/1989.FC Vol and FE-DIV-FLD-0412-2021-643-FE&CC, Bhubaneswar, dated:10.01.2024

Dear Sir,

Please find the attached herewith Compliance of Conditions stipulated in "In-Principal approval" accorded U/s 2(ii) of Forest (Conservation) Act,1980 (Presently Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980) granted by MoEF&CC vide No-8-280/1980-FC Vol Dated:27.12.2023 in favour of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in district Jharsuguda, Odisha along with all Annexure.

Submitted for kind information and needful action.

Thanking You

Yours faithfully


महानदी क्षेत्र
General Manager
एम.सी.एल., लखनपुर क्षेत्र
MCL General Manager
Lakhanpur Area

Copy to

1. D(I/P&P) for kind information
2. GM(E&F), MCL
3. Office Copy

Sl.No.	CONDITIONS	COMPLIANCE
1.	Legal status of the diverted forest land shall remain unchanged;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-1.
2.	Status of the court cases booked against the MCL shall be provided.	The precaution report in the violation cases OR case No.113 of 96/97, OR case No.120 of 97/98, OR case No.125 of 97/98, OR case No.17 of 1999/2000, OR case No.18 of 1999/2000 of Belpahar Range have been booked against the MCL authorities at that time. Further, the DFO, Jharsuguda Forest division has reported that as per available records of his office, no prosecution report has been filed in the court and the reason for the same is unknown as per the available records. As informed by DFO, Jharsuguda the prosecution report will be filed in the court as soon as possible after obtaining relevant records from the Divisional Forest Officer, Sambalpur Forest Division.
3.	Compensatory Afforestation:	
a.	The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation as per the approved CA Scheme at the current wage rate in consultation with State Forest Department in the account of CAMPA of the concerned State through online portal;	Complied. Compensatory Afforestation for an area of 417.073 ha in Keonjhar Division as per the approved CA Scheme at the current wage rate for an amount of Rs. 10,83,57,300 has been deposited as per the demand Letter No.2313/6F-Mining-49/2016 Dated:14.03.2024. (Demand Letter and Transaction slip enclosed in Annexure-2) Additional Compensatory Afforestation for an area of 100 ha in Degraded Forest land in Bamra Wildlife Division as per the approved ACA Scheme at the current wage rate for an amount of Rs. 3,11,70,800 has been deposited as per the demand Letter No.5172/4F-

		(Misc.) Dated:23.09.2024. (Demand Letter and Transaction slip enclosed in Annexure-3). The details of payment verified in CAMPA portal is enclosed as Annexure-A.
b.	The land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act. 1927 or under the relevant Section (s) of the local Forest Act, as the case may be, before the Stage-II approval;	The land identified for raising Compensatory Afforestation has been alienated in State Forest Department and copy of RoR issued has been enclosed as Annexure-4 . Regarding the notification as PF, the proposal has been forwarded from DFO, Keonjhar Division to PCCF and the same has been enclosed as Annexure-5 . An undertaking to the condition regarding notification as PF is enclosed as Annexure-6 .
c.	The cost of survey, demarcation and erection of permanent pillars, if required on the identified CA land, shall be deposited in advance with the Forest Department by the user agency. The CA will be maintained for 10 years. The scheme may include afforestation of indigenous species with appropriate provision for anticipated cost increase for works scheduled for subsequent years;	The survey, demarcation and erection of permanent pillars have been completed in identified CA land and maintenance amount for a period of 10 years land have been included in the CA scheme for Non-Forest CA land identified in Keonjhar Division and Degraded Forest land in Bamra Wildlife Division. The approved schemes include Afforestation of indigenous species with appropriate provision for anticipated cost increase for works scheduled for subsequent years.
d.	The compensatory afforestation over non-forest land, equal in extent to the forest land being diverted i.e. 417.073 ha, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval;	Compensatory Afforestation Scheme over non-forest land, equal in extent to the forest land being diverted i.e. 417.073 ha have been identified in Keonjhar Division and an amount of Rs.10,83,57,300 has been deposited. An undertaking in compliance of this condition is enclosed as Annexure-6(A). (Demand Letter and Transaction slip enclosed in Annexure-2)
e.	Afforestation on degraded forest land to be	A scheme for Afforestation one and a half times the

	selected elsewhere, measuring one and a half times the area under safety zone, shall also be done at the project cost under the supervisions of the State Forest Department and afforestation will be done within three years from the date of Stage-II clearance and maintained thereafter in accordance with the approved Plan in consultation with the State Forest Department;	area of forest land under safety zone has been identified in degraded forest land of Belpahar forest range of Jharsuguda forest division and has been approved by RCCF, Sambalpur Circle (Enclosed as Annexure-7) and amount of Rs.2,48,80,485 has been deposited in CAMPA as per demand letter 6354/4F(Misc.) Dated:13.09.2024 . (Demand Letter and Transaction slip enclosed in Annexure-7(A)) The details of payment uploaded in CAMPA portal is enclosed as Annexure-A.
f.	User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease. The plan for plantation and SMC activities will be prepared and submitted to MoEF &CC before Stage-II Clearance;	A scheme for gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease and has been approved by RCCF, Sambalpur Circle (Enclosed as Annexure-8) and amount of Rs.11,50,32,500 has been deposited in CAMPA as per demand letter 6354/4F(Misc.) Dated:13.09.2024. (Demand Letter and Transaction slip enclosed in Annexure-8(A)) The details of payment uploaded in CAMPA portal is enclosed as Annexure-A.
g.	25% of the CA cost additionally will be spent towards soil and moisture conservation activities in the proposed CA area as per site requirement and deposited in CAF;	Soil and moisture conservation activities in the proposed CA area as per site requirement has approved in the CA scheme for Non-Forest CA land identified in Keonjhar Division and Degraded Forest land in Bamra Wildlife Division for an amount of Rs. 10,83,57,300 and Rs. 3,11,70,800 and the same has been deposited respectively. Further if any additional cost raised as per site

		requirement the appropriate amount will be deposited. An undertaking in this effect has been enclosed as Annexure-9. The details of payment verified in CAMPA portal is enclosed as Annexure-A.
4.	NPV:	
a.	The User Agency shall transfer the funds towards the cost of Net Present Value (NPV) of the forest land being diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 06.01.2022 read with 22.03.2022 through online portal of CAMPA account of the State Concerned;	Net Present Value (NPV) amount of Rs. 51,24,11,717 for an area of 417.073 Ha has been deposited in CAMPA portal as per the demand letter issued vide no.310/4F(Misc.) Dated:12.01.2024. (Demand Letter and Transaction slip enclosed in Annexure-10) The details of payment verified in CAMPA portal is enclosed as Annexure-A.
b.	At the time of payment of the Net Present Value (NPV) at the present rate, the user agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;	Agreed for the condition. An undertaking to the condition has been enclosed as Annexure-11.
c.	The penalty for reported violation shall be equal to NPV of forest land per hectare for each year of violation from the date of actual diversion as reported by the inspecting officer with five (5) times the NPV plus 12 percent simple interest till the deposit is made. The required admissible 8-280/1989-FC Vol. I/61084/2023 amount	Penalty NPV for reported violation area for an amount of Rs. 16,66,27,381 has been deposited as per the demand letter No.2415/4F(Misc.) Dated:18.04.2024. (Demand Letter and Transaction slip enclosed in Annexure-12) The details of payment verified in CAMPA portal is enclosed as Annexure-A.

	shall be paid by the UA.	
5.	Compensatory levies to be realized from the User Agency under the project shall be transferred/ deposited, through e-challan, in to the account of CAMPA pertaining to the State concerned through e-portal (https://parivesh.nic.in/);	In compliance to the condition, all the funds have been deposited in CAMPA account through e-challan. The details of payment made are enclosed as Annexure-13 . The details of payment verified in CAMPA portal is enclosed as Annexure-A .
6.	The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area shall be uploaded on the e-Green watch portal with all requisite details prior to Stage-II approval;	The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area has been enclosed needful action.
7.	Following activities, as per approved plan / schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:	Noted and shall Complied. Plans and Schemes have been prepared and duly approved by RCCF, Sambalpur.
a.	Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;	Noted and shall be Complied. A scheme for Mitigative measures to minimize soil erosion and choking of stream have been prepared and duly approved by RCCF, Sambalpur Circle the scheme has been attached as Annexure-14 . An undertaking to the condition has been enclosed as Annexure-15 .
b.	Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;	Noted and shall be Complied. A scheme for Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion have been prepared and duly approved by RCCF, Sambalpur Circle the scheme has been attached as

		Annexure-16. An undertaking to the condition has been enclosed as Annexure-17.
c.	Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;	Noted and shall be Complied. A scheme for Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour have been prepared and duly approved by RCCF, Sambalpur Circle the scheme has been attached as Annexure-18. An undertaking to the condition has been enclosed as Annexure-19.
d.	Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and	Noted and shall be Complied. A scheme for Stabilize the overburden dumps by appropriate grading/benching have been prepared and duly approved by RCCF, Sambalpur Circle the scheme has been attached as Annexure-20. An undertaking to the condition has been enclosed as Annexure-21.
8.	Safety Zone Management: Following activities, at project cost, shall be undertaken by the user agency for the management of safety zone as per relevant guidelines issued by the Ministry's guidelines:	Noted and shall be Complied.
a.	User agency shall ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying	Noted and shall be Complied. Demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), by erecting RCC boundary pillars inscribed with DGPS coordinates has been completed. The photographs for the compliance have been enclosed as Annexure-22. Further demarcation of Safety Zone by barbed wire fencing and deploying adequate number of watchers

	adequate number of watchers under the supervision of the. State Forest Department;	under the supervision of the. State Forest Department will be undertaken. An undertaking to the condition has been enclosed as Annexure-23.
b.	Boundary of the safety zone of the mining lease, adjacent to habitation/roads, should be properly fenced by the user agency;	Noted. An undertaking to the condition as been enclosed as Annexure-24.
c.	Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by the user agency at project cost under the supervision of the State Forest Department;	Noted. An undertaking to the condition as been enclosed as Annexure-25.
d.	The State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms;	Noted. An undertaking to the condition as been enclosed as Annexure-26.
9.	No damage shall be caused to the top-soil and the user agency will follow the top soil management plan;	Noted and shall be Complied. Topsoil Management has been covered in condition 7(a) and appropriate measures prescribed in the approved scheme will be carried out. An undertaking to the condition as been enclosed as Annexure-26 (A)
10.	The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such 8-280/1989-FCVol.	Noted and shall be Complied. A scheme for desilting of identified ponds and water bodies to be prepared in consultation with forest department have been prepared and duly approved by RCCF, Sambalpur Circle the Scheme has been attached as Annexure-27. An undertaking to the condition has been enclosed as Annexure-28.

	I/61084/2023 tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF& CC before Stage-II approval;	
11.	The cost of felling of trees shall be deposited by the User Agency with the State Forest Department;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-29.
12.	Trees should be felled in phased manner as per the requirement in the approved Mining Plan with prior permission of concerned DFO;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-30.
13.	The User Agency shall undertake that afforestation of the non-mineralized virgin forest land within the mining area shall be taken up at project cost;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-31.
14.	The user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department.	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-32.
15.	A site-specific Wildlife Management Plan shall be prepared by the State Government in consultation with the PCCF (Wildlife) for the protection and conservation of wildlife of the area. A copy of approved Plan shall be submitted to the Ministry along with the compliance of Stage-I approval. Entire cost of implementation of	Site-specific Wildlife Management Plan based on landscape management has been approved and an amount of Rs. 31,09,38,400 and has been deposited in CAMPA portal. Further, an amount of Rs. 1,41,33,600 has been deposited in "The Wildlife Odisha" as per the demand letter No.4523/4F(Misc.) Dated:12.08.2024. (Demand Letter and Transaction slip enclosed in Annexure-33). (Plan enclosed as Annexure-33(A))

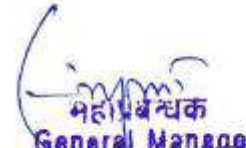
	the provisions of the Wildlife Management Plan shall be deposited into the account of CAMPA of the State;	The details of payment verified in CAMPA portal is enclosed as Annexure-A .
16.	State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence, along with compliance of Stage-I approval, as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-34 .
17.	The User Agency shall undertake that user agency and the State Forest Department shall create and maintain from funds to be provided by the user agency alternate habitat/ home for the avifauna, whose nesting trees are to be cleared in this project as per the plan duly approved by the Principal Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden Odisha. Bird nests artificially made out of eco-friendly materials shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-35 .
18.	The User Agency shall undertake that the project authority needs to take up works for construction and cleaning of garland drains, stabilizing retaining walls, proper	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-36 .

	terracing of OB dumps and checking gully formation resulting in soil erosion;	
19.	The User Agency shall undertake that plants which are having lowest translocation factor can be preferred under afforestation on the OB dumps and fruit trees to be avoided in planting during biological stabilization of OB dumps;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-37.
20.	The User Agency shall undertake that prevention of fall of wild animals into mining pit by fencing the open pit area;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-38.
21.	The User Agency shall undertake that the angle of repose in OB dumps to be maintained to ensure stability and safety;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-39.
22.	The User Agency shall undertake that vetiver grass can be planted at the lower reaches of the dump to bind the soil and prevent soil erosion giving better stability to the dump;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-40.
23.	The User Agency shall undertake mining in a phased manner after taking due 8-280/1989-FCVol. I/61084/2023 care for reclamation of the mined over area. The concurrent reclamation plan as per the approved mining plan shall be executed by the User Agency from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, in the concerned State Government and the concerned Regional Office of the Ministry. If it is found from the annual report that	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-41.

	the activities indicated in the concurrent reclamation plan are not being executed by the User Agency, the Nodal Officer or the concern Addl. Principle Chief Conservator of Forests (Central) may direct that the mining activities shall remain suspended till such time, such reclamation activities area satisfactorily executed;	
24.	The User Agency shall comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-42.
25.	Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-43.
26.	The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-44.
27.	No labour camp shall be established on the forest land and the User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-45.

	pressure on the nearby forest areas;	
28.	The boundary of the diverted forest land, mining lease and safety zone, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-46.
29.	The layout plan of the mining plan/ proposal shall not be changed without the prior approval of the Central Government and the forest land shall not be used for any purpose other than that specified in the proposal;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-47.
30.	The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-48.
31.	No damage to the flora and fauna of the adjoining area shall be caused;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-49.
32.	The User Agency shall submit the annual self -compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly;	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-50.
33.	Any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation,	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-51.

	protection and development of forests & wildlife; and	
34.	The user agency shall comply all the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-52.
35.	Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5-2/2017-FC 8-280/1989-FCVol. I/61084/2023 dated 28.03.2019.	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-53.
36.	The compliance report shall be uploaded on e-portal (https://parivesh.nic.in/).	Noted and shall be Complied. An undertaking to the condition has been enclosed as Annexure-54.


 महाप्रबन्धक
 General Manager
 एम.सी.एल. लखनपुर क्षेत्र
 MCL, Lakhanpur Area

Annexure-1

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

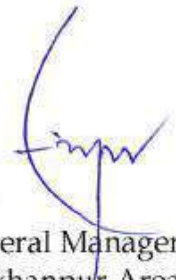
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 1

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the legal status of 417.073 Ha of forest land proposed for diversion and 171.774 ha forest land proposed for Re-diversion (Change of Land use) shall remain unchanged.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

AGENCY COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 28-03-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355742
MoEF/SG File No.	B-280/1989-FC VOL.
Location.	ORRISA
Address.	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha Jharsuguda
Amount (in Rs)	108357300/-

Amount in Words: Ten Crore Eighty-Three Lakh Fifty-Seven Thousand Three Hundred Rupees Only

NEFT/RTGS to be made as per following details;

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355742 Valid only for this challan amount
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelitta Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 28-03-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355742
MoEF/SG File No.	B-280/1989-FC VOL.
Location.	ORRISA
Address:	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha Jharsuguda
Amount (in Rs)	108357300/-

Amount in Words: Ten Crore Eighty-Three Lakh Fifty-Seven Thousand Three Hundred Rupees Only

NEFT/RTGS to be made as per following details;

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355742 Valid only for this challan amount
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelitta Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: fcsblr@unionbankofindia.bank, epurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank

SIBNR52024033012591257

D.V. B. Sankar
Authorised Officer
MCL LAKHANPUR AREA



R. B. Sankar
Authorised Officer
MCL LAKHANPUR AREA



Handwritten signature and initials.



OFFICE OF THE DIVISIONAL FOREST OFFICER, KEONJHAR DIVISION

Phone No- 06766-254315, email ID- dfp.keonjhar@odisha.gov.in

Letter No. 2313

/6F-Mining-49/2016

Dated, Keonjhar the

14th March, 2024

To

The General Manager,
Mahanadi Coalfields Limited,
Lakhanpur area, P.O- Bandhabahal Colony
District- Jharsuguda

Sub: Proposal for non-forestry use of 417.073 ha & re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur Belpahar-111ari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha of Mahanadi Coalfield Limited.

X-Sub: Revised financial outlay of CA Scheme.

Ref: Memo No. 5557 dated 06.03.2024 of Chief Conservator of Forests (Nodal), O/o the PCCF & HoFF, Odisha, Bhubaneswar.

Sir

With reference to the aforementioned memo on the captioned subject, the Principal Chief Conservator of Forests, FD & NO, FC Act, O/o the PCCF & HoFF, Odisha, Bhubaneswar has approved the CA scheme under Keonjhar District with revised financial outlay of Rs 10,83,57,300/-. Hence, you are requested to deposit the approved amount of Rs.10,83,57,300/- (Rupees ten crore eighty-three lakh fifty-seven thousand three hundred) only towards the cost of Compensatory Afforestation Scheme through e-portal of MoEF&CC, Govt. of India as provided in the <https://parivesh.mca.in/> and the proof /evidence of the deposit of fund be submitted to this office for further necessary action at this end.

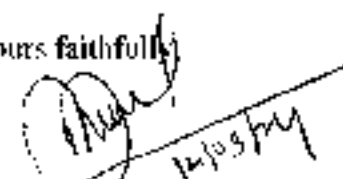
Details approved of CA Scheme

Sl. No.	Particulars	Amount to be deposited.
1.	Scheme for Compensatory Afforestation over 417.073 ha of non-forest Govt. land identified in Vill- Sudonga under Banspal Tahasil of BJP Range, Keonjhar District.	10,83,57,300.00
	Total	10,83,57,300.00

(Rupees ten crore eighty-three lakh fifty-seven thousand three hundred) only.

Further, Scorpio vehicle (SUV) with all accessories, including RTO, insurance, Driver wages and other charges are to be provided to the O/o the undersigned, Keonjhar under infrastructure in kinds in consultation with the undersigned.

Yours faithfully,

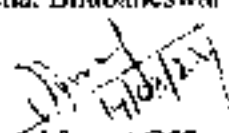

Divisional Forest Officer,
Keonjhar Division.


10/3

PTO

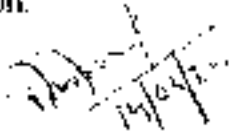
Memo No. 2314 /Dated 11-03-2024

Copy forwarded to the Divisional Forest Officer, Jharsuguda Division for information and necessary action with reference to the memo No. 5556 dt. 06.03.2024 of Chief Conservator of Forests, (Nodal), O/o the PCCF&HoFF, Odisha, Bhubaneswar


**Divisional forest Officer,
Keonjhar Division.**

Memo No. 2315 /Dated 14-03-2024

Copy forwarded to the Regional Chief Conservator of Forests, Rourkela Circle, Rourkela for favour of kind information and necessary action.


**Divisional forest Officer,
Keonjhar Division.**

Memo No. 2316 /Dated 14-03-2024

Copy forwarded to the Principal Chief Conservator of Forests, FD & NO, FC Act, O/o the PCCF&HoFF, Odisha, Bhubaneswar for favour of kind information and necessary action with reference to his memo No. 5555 dt. 06.03.2024.


**Divisional forest Officer,
Keonjhar Division.**



STATE FOREST HEADQUARTERS, ODISHA
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS & HoFF
PLOT NO. GD-2/12, ARANYA BHAWAN, CHANDRASEKHARPUR
BHUBANESWAR-751023

E-mail:- nodal.pccfhoff@odisha.gov.in / nodal.pccfodisha@gmail.com

Memo No. 5554 /9F (MG) - 372/2021
Dated, Bhubaneswar the 06 March' 2024

To

The Divisional Forest Officer
Jharsuguda Forest Division

Sub: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha of Mahanadi Coalfields Limited – Revised Financial Outlay of CA & Addl.CA regarding.**

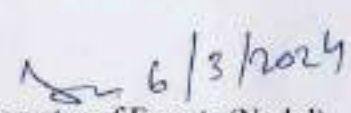
Ref:- This office Memo No.2270 dated 06.02.2024.

In continuation to this office memo cited above on the captioned subject, I am directed to enclose herewith the revised financial outlay for Compensatory Afforestation Scheme over an area of **417.073 ha of Non-Forest land** identified in Village Sudonga under Banspal Tahasil of BJP Range of **Keonjhar Forest Division** pertaining to the above project which has been approved by PCCF (FD & Nodal Officer, FC Act) for **Rs 11,03,57,300/-** (Rupees eleven crores three lakhs fifty seven thousand and three hundred) only (includes Rs.20,00,000/- towards infrastructure to be supplied by the User Agency in kind) at wage rate @ Rs.352/- per manday.

Further, the revised financial outlay for Additional Compensatory Afforestation Scheme over an area of **100.00 ha of degraded forest land** identified in Chaitra RF in Kuchinda Wildlife Range under Bamra (WL) Division to accommodate the balance seedling pertaining to the above project has been approved by PCCF (FD & Nodal Officer, FC Act) for **Rs 3,25,44,100/-** (Rupees three crores twenty five lakhs forty four thousand and one hundred) only at wage rate @ Rs.352/- per manday which is enclosed.

In this context, I am directed to request you to furnish the compliance to the conditions imposed in the above said letter through RCCF, Sambalpur Circle for onward transmission to the GoI, MoEF & CC (FC Division), New Delhi and also raise demand on the user agency for payment of the differential amount through web portal of MoEF & CC and submit the deposit particulars of the amount paid in prescribed CAMPA format alongwith the Stage-I compliance.

Encl-As above


Chief Conservator of Forests (Nodal)

Memo No.

5555

Dt

06-03-2024

Copy alongwith the its financial outlay forwarded to the DFO, Keonjhar Forest Division / DFO, Bamra (WL) Division for information & necessary action in continuation to this office Memo No.2271 dated 06.02.2024.

6/3/2024

Chief Conservator of Forests (Nodal)

Memo No.

5556

Dt

06-03-2024

Copy alongwith the its financial outlay forwarded to the RCCF, Sambalpur Circle / RCCF, Rourkela Circle for information & necessary action in continuation to this office Memo No. 2272 dated 06.02.2024.

6/3/2024

Chief Conservator of Forests (Nodal)

Memo No.

5557

Dt

06-03-2024

Copy alongwith the its financial outlay forwarded to the General Manager, Lakhanpur area, Mahanadi Coalfields Limited, PO-Bandhabahal Colony, Dist-Jharsuguda for information and necessary action in continuation to this office Memo No.2273 dated 06.02.2024.

6/3/2024

Chief Conservator of Forests (Nodal)

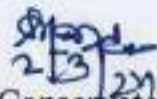
Financial Outlay for Addl. Compensatory Afforestation Scheme over 100.00 ha of degraded forest land identified in Chaitra RF in Kuchinda Wildlife Range under Bamra (WL) Division to accommodate the balance seedling against Integrated Lakhanpur-Belpahar-Lilari OCP of M/s Mahanadi Coalfields Ltd.

(Wage Rate @ Rs.352/- per MD)

Sl. No.	Description	Amount (Rs.)
1.	Cost of ANR Plantation @ 1000 plants per ha with 18 months old seedlings and without provision of fencing over 100 ha @ Rs.1,89,210.00 per ha with 10 years maintenance (As proposed by DFO, Bamra (WL) Division)	1,89,21,000.00
2.	Cost of Vegetative fencing @ 250 Mtr/ ha over 100 ha with maintenance @ Rs.151.10 per RMT	37,77,500.00
	Total	2,26,98,500.00
3.	Eradication of weeds @ 20 MD per ha over 30 ha (as proposed by DFO, Bamra (WL) Division)	2,11,200.00
4.	Soil Conservation Measures:	
	(i) L.B.C.D. 1 mtr. span size 6 nos. @ Rs.3987.45 LBCD	23,925.00
	(ii) L.B.C.D. 2 mtr. span size 12 nos. @ Rs.8165.60 LBCD	97,987.00
	(iii) L.B.C.D. 3 mtr. span size 5 nos. @ Rs.17,530.08 LBCD	87,650.00
	(iv) Digging of 1 nos. water body of size 40 mt. X 30 mt. (As proposed by DFO, Bamra (WL) Division)	5,96,000.00
5.	15% of total plantation cost towards EPA/ incentive to VSS	34,04,775.00
	Total	2,71,20,037.00
6.	Add Escalation Cost (20%)	54,24,007.00
	Grand Total	3,25,44,044.00 Or rounded off to 3,25,44,100.00

(Rupees Three crore Twenty five lakhs forty four thousand and one hundred) only

Approved



Principal Chief Conservator of Forests
Forest Diversion & Nodal Officer, FC Act

Principal Chief Conservator of Forests
(Forest Diversion & Nodal Officer FC Act)
O/o. the P.C.C.F Odisha, Bhubaneswar

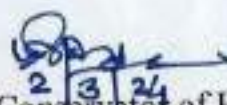
Financial Outlay for revised **Compensatory Afforestation Scheme** over **417.073 ha** of **non-forest land** identified in **village Sudonga** under Banspal Tahasil of B.J.P Range of Keonjhar Forest Division against Integrated Lakhanpur-Belpahar-Lilari OCP of M/s Mahanadi Coalfields Ltd (MCL)

(Wage Rate @ Rs.352/- per MD)

Sl. No.	Description	Amount (Rs.)
1.	Cost of Block Plantation @ 1600 Plants/ Ha with 18 months old seedling without provision of fencing over 170.00 Ha @ Rs.2,44,000.05 Per ha with 10 years maintenance	4,14,80,009.00
2.	Cost of ANR Plantation @ 400 plants per ha with 18 months old seedlings over 247.073 ha @ Rs.89,588.94 per ha with 10 years maintenance	2,21,35,008.00
	Total	6,36,15,017.00
3.	(i) Cost of LBCD structure of size 10'x10'x5' for 418 nos. @ Rs.9345.60 Per LBCD	39,06,461.00
	(ii) Cost of 2 Nos. Water Body of size of 40 mt. 30 mt. x 3 mt. in the Plantation Site @ Rs.6,06,800/- per structure in lump sum (As proposed by DFO, Keonjhar Division)	12,13,600.00
4.	Cost of G.I. Chain Link Mesh fencing over 15.56 Kms. With maintenance @ Rs.4,26,657/- per RKM with 10 years maintenance	66,38,783.00
5.	Cost of construction of 2 Nos. Watcher Shed and their maintenance for 9 years in lump sum (as proposed by DFO, Keonjhar Division)	1,90,000.00
6.	Loading, up-loading & transportation cost of seedling to planting place for 3,70,829 seedlings @ Rs.14,000/- per 1000 seedling in lump sum (as proposed by DFO, Keonjhar Division)	51,91,606.00
7.	15% of total plantation cost towards EPA/ incentive to VSS	95,42,252.00
	Total	9,02,97,719.00
8.	Add Escalation (20%)	1,80,59,544.00
	Grand Total	10,83,57,263.00 Or rounded off to 10,83,57,300.00
9	Infrastructure: (to be supplied by User Agency in kind) One four wheeler vehicle for monitoring by DFO, Keonjhar (Mahindra Scorpio S11)	20,00,000.00
		11,03,57,300.00

(Rupees Eleven crore three lakhs fifty seven thousand and three hundred) only

Approved



Principal Chief Conservator of Forests
Forest Division & Nodal Officer, FC Act
Principal Chief Conservator of Forests
(Forest Division & Nodal Officer FC Act)
O/o. the P.C.C.F Odisha, Bhubaneswar

AGENCY COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 16-10-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355858
MoEF/SG File No.	8-280/1989-FC VOL.
Location.	ORRISA
Address.	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha Jharsuguda
Amount(in Rs)	31179800/-

Amount in Words : Three Crore Eleven Lakh Seventy Thousand Eight Hundred Rupees Only

NEFT/RTGS to be made as per following details:

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355858 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jalitta Towers, Mission Road, Bengaluru-560027

• This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 16-10-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
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Address:	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha Jharsuguda
Amount(in Rs)	31170800/-

Amount in Words : Three Crore Eleven Lakh Seventy Thousand Eight Hundred Rupees Only

NEFT/RTGS to be made as per following details:

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355858 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jalitta Towers, Mission Road, Bengaluru-560027

• This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: fcsblr@unionbankofindia.bank, epurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank

Ch 767743 / 18.10.24

58200
Authorised Officer
MCL, LAKHANPUR AREA

D.V.G. Sankar
Authorised Officer
MCL, LAKHANPUR AREA

44611691A P. SORENG
380, BAMNAGADATTA BRANCH
18 OCT 2024
CASH
TR
704
JOURNED No
18 OCT 2024
8704

532NR520241018560
85465

महाप्रबन्धक
General Manager
म.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area



ଜଙ୍ଗଲ, ପରିବେଶ ଓ ଜଳ ବାଣ୍ଟ ପରିବର୍ତ୍ତନ ବିଭାଗ, ଓଡ଼ିଶା ସରକାର

ଖଣ୍ଡାସ ବନାୟାବାଇକ କାର୍ଯ୍ୟାଳୟ ଝାରସୁଗୁଡ଼ା ବନଖଣ୍ଡ ।

ଇମେଲ:- dfo.jharsuguda@odisha.gov.in, ଦୂର ଗାଷ/ ପ୍ୟା.ନଂ-୦୭୭୪୫-୨୯୫୦୪୦ ।

No. 5172 /4F (Misc.),
Dated Jharsuguda the ୨୩rd Sept, 2024.

To,

The General Manager, MCL,
Lakhanpur Area, Bandhbahal.

Sub: - Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 Ha & Re-diversion (Change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.Reg-demand for ACA cost.

Ref: - (i) Stage -I / in principle Order No. 8-280/1989-FC Vol. dt.27.12.2023 of the Govt. of India, Ministry Environment, Forests and Climate Change (Forest Conservation Division), New Delhi.

(ii) Memo No.5554/9F(MG)-372/2021 dt.06.03.2024 & Memo No.18925/9F(MG)-372/2021, dt.19.09.2024 of the Chief Conservator of Forests (Nodal), O/o the PCCF & HoFF, Odisha, Bhubaneswar.

(iii) This Office Memo No.5021, dt.05.09.2024.

Sir,

With reference to the letters cited above on the captioned subject, this is to inform you that, the Principal Chief Conservator of Forests, Forest Diversion & Nodal Officer, FC Act has been technically approved the Addl. Compensatory Afforestation Scheme over an area 100 ha of degraded forest land identified in Chaitra RF in Kuchinda Wildlife Range under Bamra Wildlife Division to accommodate the balance seedling against the above proposed project with a total financial outlay of Rs.3,11,70,800.00 at current wage rate @Rs.450/- per man-day.

In this regard, you are requested to deposit of amount Rs.3,11,70,800.00 (*Rupees Three Crore Eleven Lakh Seventy Thousand Eight Hundred*) only towards the cost of Addl. Compensatory Afforestation in the CAMPA Account through e-portal (<https://parivesh.nic.in/>). The evidence of depositing the amount may be forwarded to the undersigned for further needful action at this end.

Encl: as above.

Yours faithfully,

Divisional forest officer,
Jharsuguda forest division.

Memo No 5173 / Dated. 23.09.2024.

Copy forwarded to the Principal Chief Conservator of Forests (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha, BBSR for favour of kind information & necessary action.


Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No 5174 / Dated. 23.09.2024.

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur Circle for favour of kind information & necessary action.


Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No 5175 / Dated. 23.09.2024.

Copy forwarded to the Divisional Forest Officer, Bamra Wildlife Division for information & necessary action.


Divisional Forest Officer,
Jharsuguda Forest Division.



STATE FOREST HEADQUARTERS, ODISHA
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS & HoFF
PLOT NO. GD-2/12, ARANYA BHAWAN, CHANDRASEKHARPUR
BHUBANESWAR-751023

E-mail:- nodal.pccfedisha@gmail.com

Memo No. 18925 /9F (MG) - 372/2021
Dated, Bhubaneswar the 19th September' 2024

To

The Divisional Forest Officer
Jharsuguda Forest Division

Sub: Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha of Mahanadi Coalfields Limited – Revised Financial Outlay of Addl. CA Scheme regarding.

Ref: This office Memo No. 5554 dated 06.03.2024.

In continuation to this office memo cited above on the captioned subject, I am directed to enclose herewith the revised financial outlay for Additional Compensatory Afforestation Scheme over an area of 100.00 ha of degraded forest land identified in Chaitra RF in Kuchinda Wildlife Range under Bamra (WL) Division to accommodate the balance seedling pertaining to the above project which has been approved by PCCF (FD & Nodal Officer, FC Act) for Rs 3,11,70,800/- (Rupees three crores eleven lakhs seventy thousand and eight hundred) only at wage rate @ Rs 450/- per manday.

In this context, I am directed to request you to raise demand on the user agency for payment of the amount through web portal of MoEF & CC and submit the deposit particulars of the amount paid in prescribed CAMPA format alongwith the Stage-I compliance.

Encl-As above

Memo No. 18926

DE 19.09.2024

Chief Conservator of Forests (Nodal)

Copy alongwith the financial outlay forwarded to the DFO, Bamra (WL) Division for information & necessary action in continuation to this office Memo No. 5555 dated 06.03.2024.

Encl-As above

Chief Conservator of Forests (Nodal)

Memo No. 18927

Dt 19.09.2024

Copy alongwith the financial outlay forwarded to the RCCF, Sambalpur Circle for information & necessary action in continuation to this office Memo No. 5556 dated 06.03.2024.

15/9/2024

Chief Conservator of Forests (Nodal)

Memo No. 18928

Dt 19.09.2024

Copy alongwith the financial outlay forwarded to the General Manager, Lakhanpur area, Mahanadi Coalfields Limited, Po-Bandhabahal Colony, Dist-Jharsuguda for information and necessary action in continuation to this office Memo No. 5557 dated 06.03.2024.

15/9/2024

Chief Conservator of Forests (Nodal)

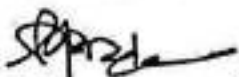
Revised financial outlay for Addl. Compensatory Afforestation Scheme over 100.00 ha of degraded forest land identified in Chaitra RF in Kuchinda Wildlife Range under Bamra (WL) Division to accommodate the balance seedling against Integrated Lakhanpur-Belpahar-Lilari OCP of M/s Mahanadi Coalfields Ltd.

(Wage Rate @ Rs.450/- per MD)

Sl. No.	Description	Amount (Rs.)
1.	Cost of ANR Plantation @ 500 plants per ha with 18 months old seedlings and without provision of fencing over 100 ha @ Rs.1,59,290.13 per ha with 10 years maintenance (As proposed by DFO, Bamra (WL) Division)	1,59,29,013.00
2.	Cost of Vegetative fencing @ 250 Mtr/ ha over 100 ha with maintenance @ Rs.193.00 per RMT	48,25,000.00
	Total	2,07,54,013.00
3.	Eradication of weeds @ 20 MD per ha over 60 ha (as proposed by DFO, Bamra (WL) Division)	5,40,000.00
4.	Soil Conservation Measures:	
	(i) L.B.C.D. 1 mtr. span size 9 nos. @ Rs.4646.40/ LBCD	41,818.00
	(ii) L.B.C.D. 2 mtr. span size 18 nos. @ Rs.9515.00/ LBCD	1,71,270.00
	(iii) L.B.C.D. 3 mtr. span size 8 nos. @ Rs.20,427.00/ LBCD	1,63,416.00
	(iv) Digging of 2 nos. water body of size 40 mt. X 30 mt. (As proposed by DFO, Bamra (WL) Division)	11,92,000.00
5.	15% of total plantation cost towards EPA/ incentive to VSS	31,13,102.00
	Total	2,59,75,619.00
6.	Add Escalation Cost (20%)	51,95,124.00
	Grand Total	3,11,70,743.00 Or rounded off to 3,11,70,800.00

(Rupees Three Crore Eleven Lakhs Seventy Thousand and Eight Hundred) only

Approved



Principal Chief Conservator of Forests
Forest Diversion & Nodal Officer, FC Act

Principal Chief Conservator of Forests
(Forest Diversion & Nodal Officer, FC Act)
O/o the PCCF & HoFF, Odisha, Bhubaneswar

Annexure-A

Online payment history made by User Agency under CAMPA

Help



[illegible]

5	PRCA/MIN/29355/2019 C:\Users\govt\app\pad-fp\PRCA/MIN/29355/2019	MIN/29355/01/01/29355/2019	Dec 2023	CA: PCAL: 0/- Safety Zone: 0/- Other: 0/- Charged1: 0/- Charged2: 0/- Charged3: 0/- Total: 10000000/-	ADD CA: 0/- CAT: 0/- Add PA: 0/- Other: 0/- Charges: 0/-	☒	Fund Demand 15 Mar Verified by 2024 Officer On Bank Name OF India Mode of Payment (Challan) Challan Generated On Transaction Date 20 Mar 2024	Payment Letter C:\Users\govt\app\pad-fp\PRCA/MIN/29355/2019_Live_Fund_Demand_77011.pdf Generated Challan (C:\Users\govt\app\pad-fp\PRCA/MIN/29355/2019)
6	PRCA/MIN/29355/2019 C:\Users\govt\app\pad-fp\PRCA/MIN/29355/2019	MIN/29355/01/01/29355/2019	Dec 2023	CA: PCAL: 0/- Safety Zone: 0/- Other: 0/- Charged1: 0/- Charged2: 0/- Charged3: 0/- Total: 10000000/-	ADD CA: 0/- CAT: 0/- Add PA: 0/- Other: 0/- Charges: 0/-	☒	Fund Demand 15 Mar Verified by 2024 Officer On Bank Name OF India Mode of Payment (Challan) Challan Generated On Transaction Date 20 Mar 2024	Payment Letter C:\Users\govt\app\pad-fp\PRCA/MIN/29355/2019_Live_Fund_Demand_77011.pdf Generated Challan (C:\Users\govt\app\pad-fp\PRCA/MIN/29355/2019)

(HTTPS://SWACHH BHARAT.MYGOV.IN/)



(WWW.DIGIT.AUNDIA.GOV.IN)



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(HTTPS://INDIA.GOV.IN/)



(HTTPS://WWW.MYGOV.IN/)



(HTTP://MEITY.GOV.IN/)



(HTTP://WWW.PRABHIA.GOV.IN/EN/)



(HTTP://WWW.MEC.IN/)

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(contact.aspx)

For any Technical support, Please Contact (PRCA)
MCC, New Delhi, mentioning "fo(online)ec(online)"

General Manager
MCL, Lucknow Area

Schedule I Form No.39-A

Annexure- 4

ଖତିୟାନ

ମୌଜା : ପୁରୀ

ଚହୁସିଲ : ବାଂଶପାଳ

ଥାନା : ନୟାଗୋବିନ୍ଦ

ଚହୁସିଲ ନମ୍ବର : 05

ଥାନା ନମ୍ବର : 2

ଜିଲ୍ଲା : କେନ୍ଦୁଝର

ଖତିୟାନର କ୍ରମିକ ନଂ : 87/1

ଜମିଦାରଙ୍କ ନାମ ଓ ଖୋସାଟ ବା ଖତିୟାନର କ୍ରମିକ ନମ୍ବର	ଓଡ଼ିଶା ସରକାର ପ୍ରଥମ ଭାଗ ଖୋସାଟ ନମ୍ବର 1
୧) ଖତିୟାନର କ୍ରମିକ ନଂ	87/1
୨) ପ୍ରଜାର ନାମ, ପିତାଙ୍କ ନାମ, ଜାତି ଓ ବାସସ୍ଥାନ	ରାଜ୍ୟ ଜଙ୍ଗଲ, ପରିବେଶ ଓ କଳବାୟୁ ପରିବର୍ତ୍ତନ ବିଭାଗ, ଓଡ଼ିଶା ।

ମାସ/ବର୍ଷ					
୪) ବେର	ଜଳକର	ଖାଜଣା	ସେର	ନିଷ୍କାର ଦେବ ଓ ଅନ୍ୟାନ୍ୟ ସେର ଯଦି କିଛି ଥାଏ	ମୋଟ
		0.00	0.00	0.00	0.00
					୫) ପ୍ରମାଣିତ/ଅନୁମତି ବିବରଣୀ

୬) ବିଶେଷ ଅନୁସନ୍ଧାନ ଯଦି କିଛି ଥାଏ	Alienation Case No. 03/2024 (ବା.ଖା କେଶ ନଂ 140/2024) ଓ ଜିଲ୍ଲାପାଳ, କେନ୍ଦୁଝରଙ୍କ ଆଦେଶ ସଂଖ୍ୟା 2153/Rev.Dt. 07.10.2024 ହିସାବୁ ପୁଟ ନଂ 1 ଉକ୍ତା ହେ 13.3551, ପୁଟ ନଂ 3 ଉକ୍ତା ହେ 16.1880, ପୁଟ ନଂ 4 ଉକ୍ତା ହେ 16.1880, ପୁଟ ନଂ 5 ଉକ୍ତା ହେ 14.1645, ପୁଟ ନଂ 6 ଉକ୍ତା ହେ 16.7000, ପୁଟ ନଂ 7 ଉକ୍ତା ହେ 15.1762, ପୁଟ ନଂ 8 ଉକ୍ତା ହେ 14.0000, ପୁଟ ନଂ 46 ଉକ୍ତା ହେ 16.0000, ପୁଟ ନଂ 47 ଉକ୍ତା ହେ 17.0000, ପୁଟ ନଂ 48 ଉକ୍ତା ହେ 16.0000, ପୁଟ ନଂ 49 ଉକ୍ତା ହେ 26.0000, ପୁଟ ନଂ 50 ଉକ୍ତା ହେ 34.0000, ପୁଟ ନଂ 455 ଉକ୍ତା ହେ 15.0000, ପୁଟ ନଂ 456 ଉକ୍ତା ହେ 15.0000, ପୁଟ ନଂ 457 ଉକ୍ତା ହେ 13.1528, ପୁଟ ନଂ 458/920 ଉକ୍ତା ହେ 16.2994, ପୁଟ ନଂ 459 ଉକ୍ତା ହେ 16.7833, ପୁଟ ନଂ 460 ଉକ୍ତା ହେ 16.7833, ପୁଟ ନଂ 461 ଉକ୍ତା ହେ 15.0000, ପୁଟ ନଂ 462/921 ଉକ୍ତା ହେ 14.0674, ପୁଟ ନଂ 463 ଉକ୍ତା ହେ 16.0000, ପୁଟ ନଂ 464 ଉକ୍ତା ହେ 15.0000, ପୁଟ ନଂ 465 ଉକ୍ତା ହେ 16.0000, ପୁଟ ନଂ 466 ଉକ୍ତା ହେ 16.0000, ପୁଟ ନଂ 467/922 ଉକ୍ତା ହେ 17.2150 ଖା.ଖା 87 ରୁ ।

BLANK SPACE FOR STAMPING

ଅନ୍ତିମ ପ୍ରକାଶନ ତାରିଖ : 24/09/1981

ଖାଜଣା ଆୟାସ୍ ତାରିଖ :



21/10/2024
ADDL. TAHASILDAR
BANSPAL

ଖବରଦାତା କ୍ରମିକ ନଂ : ୫୭/୧		ନୌକା : ପୁରୁଷ			ବିଭା : ବେଲୁଝର
ପୁର ନମ୍ବର ଓ ଚକ୍ର ନାମ	ବିସମ ଓ ପୁରର ଖରଣା	ବିସମର ବିସ୍ତାରିତ ବିବରଣୀ ଓ ଗୋଟି	ରକମ		
			ଏକକ	ଫି	ବେଲୁଝର
୨	୮	୯	୧୦	୧୧	୧୨
1	ହୁଡ଼ି		33001	13.3551	
3	ହୁଡ଼ି		40001	16.1880	
4	ହୁଡ଼ି		40001	16.1880	
5	ହୁଡ଼ି		35001	14.1645	
6	ହୁଡ଼ି		41266	16.7000	
7	ହୁଡ଼ି		37501	15.1762	
8	ହୁଡ଼ି		34594	14.0000	
46	ହୁଡ଼ି		39536	16.0000	
47	ହୁଡ଼ି		42007	17.0000	
48	ହୁଡ଼ି		39536	16.0000	
49	ହୁଡ଼ି		64247	26.0000	
50	ହୁଡ଼ି		84015	34.0000	
455	ହୁଡ଼ି		37065	15.0000	
456	ହୁଡ଼ି		37065	15.0000	
457	ହୁଡ଼ି		32501	13.1528	
458/920	ହୁଡ଼ି		40276	16.2994	
459	ହୁଡ଼ି		41472	16.7833	
460	ହୁଡ଼ି		41472	16.7833	
461	ହୁଡ଼ି		37065	15.0000	
462/921	ହୁଡ଼ି		34761	14.0674	
463	ହୁଡ଼ି		39536	16.0000	
464	ହୁଡ଼ି		37065	15.0000	
465	ହୁଡ଼ି		39536	16.0000	
466	ହୁଡ଼ି		39536	16.0000	
467/922	ହୁଡ଼ି		42539	17.2150	
25 ପୁର			1030595	417.0730	

ରାଷ୍ଟ୍ରୀୟ ପୁରନା ବିଜ୍ଞାନ କେନ୍ଦ୍ର, ଓଡ଼ିଶା

ପ୍ରମୁଖ୍ୟ ମାନ୍ୟତା (ବିଶ୍ୱାସ)

21/10/2024


 21/10/2024
 ADDL. TAHASILDAR
 BANSPAL


OFFICE OF THE DIVISIONAL FOREST OFFICER, KEONJHAR DIVISION

 Phone No- 06766-254315, email ID- dfo.keonjhar@odisha.gov.in

 Memo No. 8642 /6F-Mining-13/2022

 Dated, Keonjhar the 25th October, 2024

To

 The Principal Chief Conservator of Forests,
 Forest Diversion and Nodal Officer, F C Act,
 O/o- the PCCF, HOFF, Odisha, Bhubaneswar.

Sub:

Draft Notification for declaring non-forest land mutated in favour of State Forest, Environment & Climate Change Department for compensatory afforestation in Village Sudanga under Banspal Tahasil against diversion of 417.0730 ha forest land in respect of Integrated Lakhanpur-Belahar- Liliari Opencast Project of Lakhanpur area in the District of Jharsuguda in Odisha of as "Protected Forest" under section 33 of Orissa Forest Act, 1972.

Ref:

- 1.No. 8-280/1989-FC(Vol) dated 07.12.2023 of the Government of India, Ministry of Environment, Forest & Climate Change, New Delhi.
2. No. 485/Rev dated 14.05.2019, No.919/Rev dated 18.07.2019 & No. 2153/Rev dated 07.10.2024 of Collector, Keonjhar.
3. Letter No.2309/Rev dated 22.10.2024 Tahasildar, Banspal Tahasil.

With reference to the subject cited above this is to intimate that, the following non-forest Govt. land situated in Village- Sudanga under Banspal Tahasil of Keonjhar District has been mutated and transferred in favour of State Forest, Environment & Climate Change Department for raising of compensatory afforestation therein against diversion of 417.0730 ha forest land in respect of Integrated Lakhanpur-Belahar- Liliari Opencast Project of Lakhanpur area in the District of Jharsuguda in Odisha. Accordingly the draft PF Notification in triplicate, Map of Village- Sudanga in triplicate and the Xerox copy of RoR are submitted herewith for favour of your kind information and onwards transmission to the Government for declaration of PF Notification.

Name of the Village	Area to be notified	Project related
Vill-Sudanga, Tahsil- Banspal	417.0730	Diversion of 417.0730 ha forest land in respect of Integrated Lakhanpur-Belahar-Liliari Opencast Project of Lakhanpur area in the District of Jharsuguda in Odisha

Encl:-

1. Alienation Sanction Order No. 2153/Rev dated 07.10.2024 of Collector, Keonjhar & Letter No.2309/Rev dated 22.10.2024 of Tahasildar, Banspal.
2. Draft PF Notification along with Map & RoR of Vill- Sudanga.
3. Stage-I approval order dated 07.12.2023 of MoEF&CC, GoI, New Delhi.

[Signature]
 Divisional Forest Officer,
 Keonjhar Division.

PTO

Memo No. 8643 /Dated 25.10.2024
Copy forwarded to the Regional Chief Conservator of Forests, Rourkela Circle /
Sambalpur Circle for favour of kind information and necessary action.


25/10/24
Divisional Forest Officer,
Keonjhar Division.

Memo No. 8644 /Dated 25.10.2024
Copy forwarded to the Divisional Forest Officer, Jharsuguda Forest Division for
information and necessary action.


25/10/24
Divisional Forest Officer,
Keonjhar Division.

**GOVERNMENT OF ODISHA
FOREST, ENVIRONMENT & CLIMATE CHANGE DEPARTMENT**

NOTIFICATION

No. /FE & CC, Dated, the 2024

In exercise of the powers conferred under Section -33 of the Odisha Forest Act, 1972 (Odisha Act 14 of 72), the State Government do hereby declare that the following land situated in Vill-Sudanga under Bansapal Tahasil of Keonjhar District mutated and transferred in favour of State Forest, Environment and Climate Change Department for raising of Compensatory Afforestation purpose against the approved diversion of 417.073 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district of Jharsuguda vide Letter No. 8-280/1989-FC (Vol) dated 07.12.2023 of the Government of India, Ministry of Environment, Forest & Climate Change, New Delhi under Section 2 of the Forest Conservation Act, 1980, the limits of which are specified below and the area of which is 13.3190 ha. Shall be Protected Forests with effect from the date of issue of the Notification and shall be known as **Sudanga Protected Forests**.

Forest Block : Sudanga PF
Name of the Protected Forest : Sudanga PF
Area in Ha. : 417.0730 ha.
Name of the Village : Sudanga
Name of the P.S. : Nayakote
Name of the Tahasil : Bansapal
Name of the Sub-Division : Keonjhar
Name of the District : Keonjhar

Land Schedule

Site No.	Village	Khata No.	Plot No.	Kissam	Total Area In ha.	Boundary description (Plot No. existing)			
						North	South	East	West
1	Sudanga	\$7/1	1	Hudi	13.3551	Batagoan Village Boundary, Sundargarh	PLOT-3	PLOT-2	Raisuan and Batagoan village boundary Sundargarh
2	-do-	-do-	3	Hudi	16.1880	PLOT-1	PLOT-4	PLOT-2	Raisuan village boundary Sundargarh
3	-do-	-do-	4	Hudi	16.1880	PLOT-3	PLOT-5 & 6	PLOT-2	Raisuan village boundary Sundargarh
4	-do-	-do-	5	Hudi	14.1645	PLOT-4	PLOT-6 & 7	PLOT-4&6	Raisuan village boundary Sundargarh
5	-do-	-do-	6	Hudi	16.7000	PLOT-4 & 5	PLOT-8 & 9	PLOT-2	PLOT-5 & 7
6	-do-	-do-	7	Hudi	15.1762	PLOT-5	PLOT 457 & 456	PLOT-6&8	Raisuan village boundary Sundargarh
7	-do-	-do-	8	Hudi	14.0000	PLOT-6	PLOT 456 & 455	PLOT-9	PLOT-7
8	-do-	-do-	46	Hudi	16.0000	PLOT-47	PLOT-41, 44 & 45	PLOT-55 & 56	PLOT-41
9	-do-	-do-	47	Hudi	17.0000	PLOT-48, 49	PLOT-46	PLOT-54 & 55	PLOT-2
10	-do-	-do-	48	Hudi	16.0000	PLOT-49	PLOT-47	PLOT- 53 & 54	PLOT-49 & 47
11	-do-	-do-	49	Hudi	26.0000	PLOT-50	PLOT-48, 47	PLOT-52 & 53	PLOT-2
12	-do-	-do-	50	Hudi	34.0000	Kadakala	PLOT-49	PLOT-51	PLOT-2

						No.1, Village Boundary		& 52	
13	-do-	-do-	455	Hudi	15.0000	PLOT- 8 & 9	PLOT 461, 454/12,454 /17,454/21 &454/6	PLOT-451, 451/1&451 /2	PLOT-456
14	-do-	-do-	456	Hudi	15.0000	PLOT -7 & 8	PLOT- 458/920 & 461	PLOT-455	PLOT-457
15	-do-	-do-	457	Hudi	13.1528	PLOT-7	PLOT- 458/920, 458	PLOT-456	Raisuan village boundary Sundargarh
16	-do-	-do-	458/920	Hudi	16.2994	PLOT- 456 & 457	PLOT-459	PLOT-461	PLOT-458
17	-do-	-do-	459	Hudi	16.7833	PLOT- 458/920	PLOT-460	PLOT-461	Raisuan village boundary Sundargarh
18	-do-	-do-	460	Hudi	16.7833	PLOT-459	PLOT-473 & 472	PLOT -461 & 472	Raisuan village boundary Sundargarh
19	-do-	-do-	461	Hudi	15.0000	PLOT-455 & 456	PLOT-472	PLOT- 454/12, 454/17,462 ,462/921, 463	PLOT- 458/920, 459 &460
20	-do-	-do-	462/921	Hudi	14.0674	PLOT-462	PLOT-463	PLOT-437	PLOT-461
21	-do-	-do-	463	Hudi	16.0000	PLOT- 462/921	PLOT-465	PLOT-437 & 464	PLOT-461 & 472
22	-do-	-do-	464	Hudi	15.0000	PLOT-437	PLOT467/ 922	PLOT-434	PLOT-463,465 & 466
23	-do-	-do-	465	Hudi	16.0000	PLOT-463	PLOT-466	PLOT-464	PLOT-472
24	-do-	-do-	466	Hudi	16.0000	PLOT-465	PLOT- 467/922&4 70	PLOT-464	PLOT-471
25	-do-	-do-	467/922	Hudi	17.2150	PLOT-466 & 464	PLOT-467	PLOT-431	PLOT-470
Total			25 plots		417.9730				

Prepared & Verified


Divisional Forest Officer,
Keonjhar Division.
 Divisional Forest Officer
 Keonjhar Division

BY ORDERS OF THE GOVERNOR OF ODISHA

ADDL. CHIEF SECRETARY
GOVERNMENT OF ODISHA
FOREST, ENVIRONMENT &
CLIMATE CHANGE DEPARTMENT

Memo No _____/Dated

Copy forwarded to the Director of Printing, Stationery and Publication, Odisha, Cuttack for publication in an extra ordinary issue of the Odisha Gazette and supply 10 copy of each to this Department/ Director of land Records and Survey, Odisha, Cuttack/ Collector, Keonjhar/Divisional Forest Officer, Keonjhar / Tahsildar, Banspal.

The Notification is a Statutory may be assigned S.R.O number.

Deputy Secretary to Government.

Memo No _____/Dated

Copy forwarded to the Revenue and Excise Department / Director of Land Records and Surveys, Odisha, Cuttack/ R.D.C (ND), Sambalpur for information and necessary action.

Deputy Secretary to Government.

Memo No _____/Dated

Copy forwarded to the Principal Chief Conservator Forest and HoFF, Odisha Bhubaneswar/ Principal Chief Conservator of Forest, Forest Diversion and Nodal Officer, O/o -the PCCF&HoFF, Odisha, Bhubaneswar / Regional Chief Conservator of Forest, Rourkela Circle / Sambalpur Circle for information and necessary action.

Deputy Secretary to Government.

Annexure-6

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

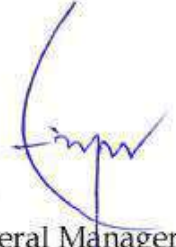
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 3(b)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act. 1927 or under the relevant Section (s) of the local Forest Act, as the case may be, before the Stage-II approval;**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 3(d)

I Divisional Forest Officer, Keonjhar Forest Division do hereby undertake that on receipt of funds from competent authority **The compensatory afforestation over non-forest land, equal in extent to the forest land being diverted i.e. 417.073 ha, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval**

Place :Keonjhar.
Dated: 25.11.2024


Divisional Forest Officer,
Keonjhar Division.
Office Seal.....
Divisional Forest Officer
Keonjhar Division



OFFICE OF THE DIVISIONAL FOREST OFFICER, KEONJHAR DIVISION
Phone No- 06766-254315, email ID- dfo.keonjhar@odisha.gov.in

Letter No. _____ 9589 /6F-Mining- 49/2019
Dated, Keonjhar the 26th November, 2024

To

The General Manager,
Mahanadi Coalfields Limited, Lakhanpur area,
Po-Bandhabahal Colony, District-Jharsuguda.

Sub:

Proposal for non-forestry use of 417.073 ha & re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha of Mahanadi Coalfield Limited.

Ref:

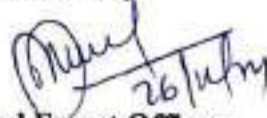
Your letter No.MCL/GM/LKPA/AEO/2024-25/92 dated 23.11.2024.

Sir,

With reference to your letter cited above on the captioned subject, the required undertaking on raising of Compensatory Afforestation is sent herewith for necessary action at your end.

Encl: As above

Yours faithfully


26/11/24
Divisional Forest Officer,
Keonjhar Division.


**SCHEME FOR
AFFORESTATION OVER ONE AND A HALF TIMES THE AREA OF
FOREST LAND UNDER SAFETY ZONE I.E. 24.095×1.5 TIMES =
 $36.1425 \approx 37$ HA ON DEGRADED FOREST LAND OF BELPAHAR
FOREST RANGE OF JHARSUGUDA FOREST DIVISION**

For

**Diversion of 417.073 hectares of Forest land & Re-diversion (Change in
Land use) of 171.774 Ha**

in respect of

Integrated Lakhanpur-Belpahar-Lilari Opencast Project

In favour of

Lakhanpur Area

Mahanadi Coalfields Limited,

Jharsuguda District, Odisha

In compliance with the

Condition No – 3 (e) of

Stage - I Forest Clearance granted vide

Letter No. 8 – 280/1989-FC vol dated 27.12.2023, of Govt. of India,

Ministry of Environment, Forests and Climate Change,

New Delhi

1. INTRODUCTION

Ib-Valley coalfield is located in Jharsuguda, Sambalpur and Sundargarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway stations are Belpahar railway station Jharsuguda Railway Station.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project of M/s Mahanadi Coalfields Ltd. located in the Ib-Valley Coalfield. The project falls in the villages -Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khaikuni, Ubuda, Darlipali, Kirarama, Jurabaga, Kusraloi, Karlajori, Khaliapali, Kudaloi, Lakhanpur and Soldia villages of Lakhanpur Tehsil, Jharsuguda District, Odisha. The project area is covered under Survey of India Topo Sheet No 64O/13 & 64O/14 (RF 1:50,000) and is bounded by the geographical coordinates ranging from Latitude 21°42'25.89"N to 21°47'24.82"N and Longitudes 83°49'38.9"E to 83°49'53"E.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs. The existing projects have been integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura seam by open cast mining. The capacity of the Integrated Lakhanpur-Belpahar-Lilari Opencast Project is 40.0 MTY with mine lease area of 4399.246 Ha and total project area of 4742.877 Ha. The life of the project is 41 years.

Total Forest land involved in the Integrated project is 958.695 Ha out of which Forest Clearance has been obtained for 541.622 Ha. Details are given below.

The details of the existing Forest Clearances:

1. Lakhanpur OCP (233.43 Ha): Forest Clearance was obtained for forest land 233.43 Ha vide letter no. 8/280/89-FC dated 08.10.1990.

2. Belpahar OCP (123.220 Ha + 22.772 Ha):

- a) 123.220 Ha - Diversion of Forest land was obtained for 103.52 Ha vide No. 8-104/91-FC dated 02.06.2000 and 19.70 Ha vide no. 8-104/1991-FC dated 15.09.2014.
- b) 22.772 Ha - Forest diversion for 22.772 Ha (10.453 Ha + 13.630 Ha) has been done by OPGC. OPGC has taken forest clearance of 159.616 Ha vide letter no. E.No.8-93/2012-FC dated 19.01.2015 in which 10.453 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP and further Stage-II forest clearance of 13.630 Ha obtained vide letter no. 5-ORA155/2012-BHU dated 10-01-2020 in which 12.319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

3. Lilari OCP (162.20): Forest Clearance was obtained for forest land 162.20 Ha vide letter no 8 281/8-FC dated 31/07/1990.

For the remaining forest land area of 417.073 Ha and out of 541.622 Ha diverted forest land; Re-division (change in land use pattern) of 171.774 Ha (Belpahar OCM: 0.745 Ha, Lakhanpur OCP: 42.389 Ha and Lilari OCP: 128.640 Ha) is required for mining, 7.5m safety zone and temporary topsoil storage yard. So, an application was submitted to MoEF&CC vide proposal no. FP/OR/MIN/39355/2019 dated 16.03.2019 and the Stage -I FC was granted vide No. 8-280/1989-FC Vol. Dated:27.12.2023.

In the Stage -I order certain stipulated conditions has been set out to be fulfilled by the user agency. The condition no. 3(e) reads as follows:

"Afforestation on degraded forest land to be selected elsewhere measuring one and a half times the area under safety zone, shall also be done at the project cost under the supervisions of the State Forest Department and afforestation will be done within three years from the date of Stage-II clearance and maintained thereafter in accordance with the approved plan in consultation with the State Forest Department"

In compliance of the above condition 3(e) stipulated by MoEF&CC, a detailed scheme has been prepared and is enclosed herewith for further consideration.

2. OBJECTIVES OF THE SCHEME

The objectives of this scheme are:

- i) To restock the degraded forest land by planting trees of suitable species
- ii) To improve the micro-edaphic condition by undertaking suitable soil and moisture conservation measures
- iii) To protect the area against encroachment, illicit felling of trees, fire occurrences, grazing etc, so as to arrest further degradation of the area.
- iv) To arrest soil erosion and to improve the soil-moisture regime of the area which will ultimately recharge the ground water.

3. SITE DESCRIPTION:

Suitable degraded forest land measuring one and half times the area of forest land under safety zone area i.e. an area of $24.095 \times 1.5 = 36.1425 \approx 37$ Ha, has been selected in Amkhaman Sagarpali RF of Belpahar Forest Range which falls under Jharsuguda Forest Division. District-Jharsuguda. The location map showing the proposed afforestationd Site under Amkhaman Sagarpali RF is shown in Plate No.I (enclosed with the scheme). The shape file of the site of Amkhaman Sagarpali RF is also enclosed with the scheme.

The Coordinates of the above Degraded Forest patch are given below:

Sl. No.	Latitude	Longitude
1	21°45'30.93"N	83°43'24.64"E
2	21°45'50.95"N	83°43'24.97"E
3	21°45'56.97"N	83°43'26.76"E
4	21°46'5.78"N	83°43'18.03"E
5	21°46'5.78"N	83°43'13.18"E
6	21°45'7.29"N	83°43'8.29"E
7	21°45'3.183"N	83°43'5.99"E
8	21°45'55.70"N	83°43'0.91"E
9	21°45'47.46"N	83°43'4.32"E
10	21°45'35.32"N	83°43'1.71"E
11	21°45'35.25"N	83°43'5.11"E
12	21°45'45.84"N	83°43'6.82"E
13	21°45'54.30"N	83°43'10.62"E
14	21°45'57.71"N	83°43'13.89"E
15	21°45'55.76"N	83°43'17.76"E
16	21°45'52.83"N	83°43'18.95"E
17	21°45'42.56"N	83°43'18.81"E
18	21°45'36.71"N	83°43'17.63"E
19	21°45'34.92"N	83°43'20.70"E
20	21°45'31.74"N	83°43'22.41"E

4. CROP COMPOSITION:

The existing vegetation in the site are like Sal (*Shorea robusta*) crop and its associate species like Dhaura (*Anogeissus latifolia*), Mahul (*Madhuca indica*), Char (*Buchanania Lanza*), (*Buchanania lanzan*), Kendu (*Diospyros Melanoxylon*), Siris (*Albizia Lebek*), Amla (*Emblica officinalis*), Bahada (*Terminalia Bellerica*) etc. in bushy and pole stages are found in the identified degraded forest land. The slope is moderate and is suitable for carrying out plantation activities. The density of the vegetation is blank in patches. The crop affords block plantation which can be filled through ANR activities @ 500 plants/ha over 37 ha can be planted as per the crown density of the proposed area.

5. SOIL AND TOPOGRAPHY

The topography of Amkhaman Sagarpari RF is mainly plain with gentle slope and sometimes varies from gentle to moderate. The soil is sandy loam and gritty, hard compact and slightly slope. Depth of the soil is adequate. The soil is devoid of much humus. Soil erosion is occasionally noticed in the site for which the

scheme proposes to dovetail adequate soil and moisture conservation measures into the afforestation programme.

6. TEMPERATURE

The area experiences sub-tropical climate. It is characterized by very hot summer and cool winter. Maximum temperature during summer rises up to 35 - 48 degree Celsius and in winter it goes down to 10-15 degree Celsius.

7. RAINFALL

The annual rain fall varies from 1200 mm to 1500 mm mostly received during rainy season from July to September. The area gets rain from South-East monsoon, which breaks during second fortnight of June and continues until last week of September. The bulk of precipitation occurs during July-August.

8. PROPOSED TECHNIQUES:

In view of the soil, water & existing vegetation conditions in the selected afforestation site and as the forest block has become degraded due to biotic interference, it is proposed to raise the plantation in the ANR plantation mode by planting seedlings @ 500 per Ha at a spacing available in the gaps. The said plantation work will be completed within three years from the date of Stage-II approval and shall be followed by maintenance for 10 years. The detailed expenditure statement/ cost norms for plantation in ANR plantation mode has been kept in the scheme. As far as possible, species suitable for the site shall be planted as detailed below:

Amla (<i>Emblica Officinalis</i>)	Siris (<i>Albaizzia Lebbeck</i>)
Karanja (<i>Pongamia Pinnata</i>)	Sisoo (<i>Dalbergia Sisso</i>)
Asan (<i>Terminalia Tomentosa</i>)	Gambhar (<i>Gmelina Arborea</i>)
Bel (<i>Aegle Marmelos</i>)	Arjuna (<i>Terminalia Arjuna</i>)
Sunari (<i>Cassia Fistula</i>)	Bija (<i>Pterocarpus Marsupium</i>)
Sal	Ficus species

The following items of work will be taken up for planting the area:

- I. Raising of Nursery : Seedlings for plantation will be raised in a temporary nursery to the site where water source is available. 10% more seedling than the actual requirement will be raised in the nursery to meet the casualties and damage due to transportation and unforeseeable causes. Seedlings will be raised in bio-degradable polybags of dimension 9" x 5" by following the standard nursery procedure.
- II. Clearing of Site: The miscellaneous unwanted growths in the degraded forest area will be cleared before pitting work.
- III. Alignment and pitting: Alignment and pitting will be taken up in March-April. Pits of size 45 cm x 45 cm x 45 cm will be dug in the spaces available between the gaps.
- IV. Actual Planting: Planting will be carried out just after 1st monsoon shower and will be completed by 3rd week of July. A basal dose of NPK fertilizer @ 50 gms per plant will be applied at the time of

plantation. Insecticide will be applied to each pit to protect the plants against termite attack. Casualties noticed, if any, will be replaced.

- V. Weeding, Soil working and manuring: For establishment and better growth of the planted seedlings, weeding and manuring are necessary. It is prescribed to carry out two weeding during first year, and one weeding each during second year and third year. After each weeding, soil working will be done around each plant up to radius by manuring @ 70gms of Urea per plant.
- VI. Application of Insecticides: To get rid of insect attack, application of insecticides will be taken up inside the plantation area, as and when required. Spraying of insecticides shall be done preferably on a sunny day in the forenoon.
- VII. Fire line tracing, Blower and maintenance: There is a possibility of occurrence of fire in the plantation area due to habitations in the nearby area, which cannot be ruled out. Hence, it is proposed that the boundary of the planted area will be scrapped off to a width of 3 meters to preclude occurrence of fire. It is observed that fire lines maintained to obstruct the spread of fire.
- VIII. Soil and Moisture Conservation : Since the area is undulating at places, so soil and moisture conservation measures will be taken by constructing structures like Staggered Trench, Percolation pit, Contour trench, Graded Earthen Bund, LBCD, Wire mesh LBCD, Sub surface Dyke & WHS as per the slope & sire requirement on LS.
- IX. Watering Provisions: Watering to the plants will be carried out by setting up Borewell and Diesel Pumps.
- X. Fencing: Fencing work will be carried out by using Bamboo twigs.
- XI. Executing Agency: The proposed scheme shall be executed and monitored by the Divisional Forest Officer, Jharsuguda Forest Division. Nursery and plantation journals shall be maintained regularly to facilitate monitoring and evaluation of the project.

Financial Forecast:

For implementation of the above scheme an amount of Rs.24880485.00 will be required as detailed below. The above scheme has been prepared as per one-time cost norm with current wise @452/- Per MD & revised seedling cost.

DETAILS OF ITEM-WISE FINANCIAL OUTLAY

(As Per One-Time Cost Norm @ 452 Per MD)

Sl. No.	Item of Work	Financial outlay	Remarks
1.	Cost of ANR plantation @ 500plants per ha over 37 ha of degraded forest land @ Rs. 190851/ Ha with 10 th Year Maintenance (at current wage rate of Rs. 452 Per MD)	Rs. 7061487.00	Annexure -I
2	Cost for SMC Works as per SMC Model -C @ Rs.51791/Ha.	Rs. 1916267.00	Annexure -II
3	Cost for Watering Provisions as per Watering Model - W-II (Rs. 600312/1000 Plants) i.e. Rs.600312/1000 Plants x 500 Plants x 37.0 ha	Rs. 11105772.00	Annexure -III
4.	Cost for Fencing as per Fencing Model F-1@ Rs.120105/Ha.	Rs.4443885.00	Annexure-IV
	Total	Rs.24527411.0	
6	Contribution towards VSS (5%) of total plantation cost.	Rs. 353074.35	
	Total	Rs. 24880485.35 or 24880485.00	

(Two Crore Forty Eight Lakh Eighty Thousand Four Hundred Eighty Five) Only.

Divisional Forest Officer,
Jharsuguda Forest Division.

Technically Approved

Regional Chief Conservator of Forests
Sambalpur

Base Cost Norms for Compensatory Afforestation through Aided Natural Regeneration (ANR) @ 500 Seedlings/ Ha.						
WAGE RATE Rs. 452/- PER MANDAY						
Sl. No.	Item of work	Preferable Period of Execution	No. of Mandays	Labour Cost @ 452.00/- per Mandays (In Rs.)	Material cost (In Rs.)	Total Cost (in Rs.)
0th Year (Advance work) Pre-Planting Operations						
1	Survey, Demarcation and Pillar Posting	Nov/Dec	2	904	0	904
2	Preparation of Treatment Map (Digital Map)	Nov/Dec	1	452	100	552
3	Site preparation	Nov/Dec	2	904	0	904
4	Silvicultural Operation including clearance of weed, cutting of climber, high stump cutting, singling of shoots & removal of cut out after drying from the field to blank space.	Jan/Feb	15	6780	0	6780
5	Alignment and stacking for digging of pits	Feb/Mar	1	452	0	452
6	Digging of pits (45 cm x 45 cm x 45 cm) in hard and gravelly soil	Feb/Mar	20	9040	0	9040
	Total		41	18532	100	18632
1st Year/ Planting Year						
1	Refilling of Pits by altering the dugout soil of the pits, application of organic compounds/CDM/FYM & mixing the same perfectly.	June/Jul	4	1808	2500	4308
2	Transportation of 18 months old polythene bag seedlings in hired truck/tractor from the permanent /Mega nursery to planting site including Loading & Unloading . (Average Lead of 10 RKm) & Stacking the seedling @ Rs.6/- Seedling , (550 Nos.)	Jul/Aug	0	0	3300	3300
3	Watering polythene bag seedling at stacking site of plantation	Jul/Aug	1	452	0	452

4	Conveyance of polythene bag seedling on head load from the stacking site to individual dugout pits within the planting site, applying insecticide, fertilizer & planting after scooping the soil with other applied materials and pressing the soil perfectly around the planted seedling.	Jul/Aug	11	4972	0	4972
5	<u>Cost of Fertilizer & Insecticide</u> (a) NPK/Bio-fertilizer @ 50 gms/plant as basal dose = 25 Kg @ Rs. 30/- per Kg = Rs. 750.0 (b) Urea/Vermicompost /Mo Khata/any other fertilizer @ Rs. 375.00 (c) Insecticide/Bio-Fertilizer @ 5 gms/plant = 2.5 kg @ Rs. 150/- per kg = Rs. 375/-	Jul/Aug	0	0	1500	1500
6	Casualty Replacement @ 10% (50 nos.)	Jul/Aug	1.5	678	0	678
7	1st Weeding & Manuring	Aug/Sept	5	2260	0	2260
8	2nd Weeding, Soil working (1mt. diameter around the plants) & Manuring	Oct/Nov	8	3616	0	3616
9	Fire line tracing & inspection path	Feb/Mar	3	1356	0	1356
10	Watch & Ward including watering as per requirement	Aug-Mar	8	3616	0	3616
	Total		41.5	18758	7300	26058
2nd Year maintenance						
1	Transportation of 50 seedling from Nursery to plantation site including loading, unloading & conveyance by Tractor @ Rs.6/- per Seedlings	Jul	0	0	300	300
2	Casualty Replacement	Jul	1.5	678	0	678

1	Fire Line tracing (2 m. wide Fire Line) & Inspection Path	Feb/Mar	3	1356	0	1356
2	Watch & Ward including watering as per requirement	Apr/Mar	12	5424	0	5424
Total			15	6780	0	6780
6 th Year maintenance						
1	Fire Line tracing (2 m. wide Fire Line) & Inspection Path	Feb/Mar	3	1356	0	1356
2	Watch & Ward including watering as per requirement	Apr/Mar	12	5424	0	5424
Total			15	6780	0	6780
7 th Year maintenance						
1	Fire Line tracing (2 m. wide Fire Line) & Inspection Path	Feb/Mar	3	1356	0	1356
2	Watch & Ward including watering as per requirement	Apr/Mar	12	5424	0	5424
Total			15	6780	0	6780
8 th Year maintenance						
1	Fire Line tracing (2 m. wide Fire Line) & Inspection Path	Feb/Mar	3	1356	0	1356
2	Watch & Ward including watering as per requirement	Apr/Mar	12	5424	0	5424
Total			15	6780	0	6780
9 th Year maintenance						
1	Fire Line tracing (2 m. wide Fire Line) & Inspection Path	Feb/Mar	3	1356	0	1356
2	Watch & Ward including watering as per requirement	Apr/Mar	12	5424	0	5424
Total			15	6780	0	6780
10 th Year maintenance						
1	Fire Line tracing (2 m. wide Fire Line) & Inspection Path	Feb/Mar	3	1356	0	1356
2	Watch & Ward including watering as per requirement	Apr/Mar	12	5424	0	5424
Total			15	6780	0	6780

Year wise Abstract of Cost Norm (Showing seedling cost separately)							
Sl. No.	Year	No. Person days	Labour Cost @ Rs. 452/- per day (Rs.)	Material Cost	Monitoring Evaluation, Learning, Documentation and Other Contingency (5%) of (4+5)	Cost of Seedlings @ Rs. 67.8645 per seedlings	Total Cost
1	0th year	41	18532	100	931.6	0	19563.6
2	1st year	41.5	18758	7300	1302.9	37326	64686.9
3	2nd year	24.5	11074	1737.5	640.575	3394	16846.075
4	3rd year	23	10396	1400	589.8	0	12385.8
5	4th year	15	6780	0	339	0	7119
6	5th year	15	6780	0	339	0	7119
7	6th year	15	6780	0	339	0	7119
8	7th year	15	6780	0	339	0	7119
9	8th year	15	6780	0	339	0	7119
10	9th year	15	6780	0	339	0	7119
11	10th year	15	6780	0	339	0	7119
Total		235	106220	10537.5	5837.875	40720	163315.375

Divisional Forest Officer,
Jharsuguda Forest Division.

Matrix for Model-1/A (ANN-500 Phasor/ta.)

Sl. No.	Commence ment year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost 190851
1	2024-25	19564	67921	18773	14338	8653	9086	9540	10017	10518	11044	11596											

Divisional Forest Officer,
Marsingudi Forest Division

Annexure-II

SMC Works Model -C			
Cost Norms for creation of Compensatory Afforestation with Stabilization of Soil & Conservation of Moisture			
Wage Rate Rs. 452/- per day			
Sr. No.	Item of Works	Preferable Period of Execution	Total Cost (Rs.)
0th Year (Pre-Planting Operation)			
1	Nil		0
1st Year			
2	Soil Conservation measures structures like Staggered Trench, Percolation pit, Contour trench, Graded Earthen Bund, LBCD, Wiremesh LBCD, Sub surface Dyke & WHS as per the slope & sirc requirement on LS	Apr/Sept	29380
2nd Year			
3	Maintenance od SMC structures @ 15% of initial year cost	Apr/July	4407
3rd Year			
4	Maintenance od SMC structures @ 15% of initial year cost	Apr/July	4407
4th Year			
5	Maintenance od SMC structures @ 15% of initial year cost	Apr/July	4407
5th Year			
5	Maintenance od SMC structures @ 15% of initial year cost	Apr/July	4407
Total			47008

Divisional Forest Officer,
Jharsuguda Forest Division.

Matrix for SMC

Sl. No.	Commence ment year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost.
1	2024-25	0	30849	4859	5102	5357	5625																51791

Divisional Forest Officer,
Jharsuguda Forest Division

In Rupees

Watering Model -W-II			
Watering provisions to CA Plantation			
Diesel pump set with Bore well (1 pump set + Bore well for 5 Ha Plantation), Wage rate @ Rs. 452/-			
Year of Installation (0th Year)			
1	Cost of Borewell	150000	
2	Cost of Diesel pump set 5HP	60000	
3	Diesel pump set & accessories like commander, pipes, etc.	30000	
4	Water Storage Tanks/Flexible pipes	15000	
		255000	
Cost of Water per Ha. = Rs. 2,55,000/5 = Rs. 51,000/-			51000
1st year Watering			
1	Recurring expenditure i.e. Diesel, Mobil, Engine Oil, etc. for pumping Water - 21 x 1000		21000
2	Watering 1000 Plants (Nov-Mar.) @ 200 plants/MD with 7 days rotation 20 MD x 5 months = 100 MD x 452		45200
	Total		66200
2nd year Watering			
1	Recurring expenditure i.e. Diesel, Mobil, Engine Oil, etc. for pumping Water - 21 x 1000		21000
	Maintenance Diesel pump set etc. @ 15% of the installation cost		7650
2	Watering 1000 Plants (April-June & Nov-March: 8 months) @ 200 plants/MD with 7 days rotation 20 MD x 8 months = 160 MD x 452		72320
	Total		100970
3rd year Watering			
1	Recurring expenditure i.e. Diesel, Mobil, Engine Oil, etc. for pumping Water - 21 x 1000		21000
	Maintenance Diesel pump set etc. @ 15% of the installation cost		7650
2	Watering 1000 Plants (April-June & Nov-March: 8 months) @ 200 plants/MD with 7 days rotation 20 MD x 8 months = 160 MD x 452		72320
	Total		100970
4th year Watering			
1	Recurring expenditure i.e. Diesel, Mobil, Engine Oil, etc. for pumping Water - 21 x 1000		21000
	Maintenance Diesel pump set etc. @ 15% of the installation cost		7650

2	Watering 1000 Plants (April-June & Nov-March: 8 months) @ 200 plants/MD with 7 days rotation 20 MD x 8 months = 160 MD x 452	72320
Total		100970
5th year Watering		
1	Recurring expenditure i.e. Diesel, Mobil, Engine Oil, etc. for pumping Water - 21 x 1000	21000
	Maintenance Diesel pump set etc. @ 15% of the installation cost	7650
2	Watering 1000 Plants (April-June & Nov-March: 8 months) @ 200 plants/MD with 7 days rotation 20 MD x 8 months = 160 MD x 452	72320
Total		100970

Abstract					
Sl. No.	Year	No. of person days	Labour Cost @ Rs. 452/- per day	Material Cost (Rs.)	Total (Rs.)
1	0th year	0	0	51000	51000
2	1st year	100	45200	21000	66200
3	2nd year	160	72320	28650	100970
4	3rd year	160	72320	28650	100970
5	4th year	160	72320	28650	100970
6	5th year	160	72320	28650	100970
	Total	740	334480	186600	521080


 Divisional Forest Officer,
 Jharsuguda Forest Division.

Matrix for Watering Model-W-II (Diesel Pumpset Fitted with Solarwell)

Sl. No.	Commence ment year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost.
1	2024-25	31000	69510	111319	116885	122729	128168																600312

Divisional Forest Officer,
Jharsuguda Forest Division

Fencing Model F-1						
Fencing for Compensatory Plantation raised inside the Forest Areas using Bamboo Twigs & Thorns						
Wage Rate Rs. 452/- per day						
Sl. No.	Item of Work	Preferable Period of Execution	Man Days	Wages	Material Cost (Rs.)	Total Cost (Rs. per Ha.)
0th year Maintenance						
1	Nil					
1st Year Maintenance						
1	Taking an Average perimeter of 250 Rmt./Ha. @ 93.85/ mt. (Half Bundle Bamboo Twigs/mt @ 120.Bundle) Labour: Material = 40:60 (approx)	Sept/Oct	30	13560	14133	27693
2	Bamboo Poles of 8' Height at a distance of 2mt spacing to be fixed (2" under soil & 2" above soil) $250/2 = 125+1 = 126$ Nos. of Bamboo Poles 1 Bamboo (approx) 24" height = 3 poles $126/3 = 42$ Bamboos @ 200/ Bamboo	Sept/Oct		0	8400	8400
3	Preparation of Bamboo poles. Digging of holes of 2 ft. depth & fixing Bamboo poles @ 20 poles / MD	Sept/Oct	6.5	2938		2938
4	Cost of Bamboo for tying the Bamboo twigs row fence with double side two strand Bamboo batten (One 6" above ground and other one 4ft. above ground) $(250 \times 2)/24 = 21$ Bamboo @ 200/ Bamboo	Sept/Oct		0	4200	4200
5	Making Bamboo batten, Finishing the Batten & tying the same on double strand on coir rope etc. @ Rs. 11/Rmt.	Sept/Oct	9	4068		4068
6	Cost of Coir rope @ Rs.0.125 Kg/Rmt $500 \times 0.125 \text{ kg} = 62.5 \text{ kg}$ @ Rs. 70/Kg	Sept/Oct		0	4375	4375
7	Making one Bamboo Twigs gate with Bamboo Frame	Sept/Oct		0	500.5	500.5
	Total		45.5	20566	31608.5	52174.5
Rate per running mt. $52174.5/250 = 208/\text{Rmt}$						

2nd Year Maintenance						
1	Repair & Maintenance of Bamboo Twigs fence including Material Cost	Feb/Mar	20	9040	1500	10540
Rate per running mt. 10540/250 = 42.16/Rmt						
3rd Year Maintenance						
1	Repair & Maintenance of Bamboo Twigs fence including Material Cost	Feb/Mar	20	9040	5675	14715
Rate per running mt. 14715/250 = 58.86/Rmt						
4th Year Maintenance						
1	Repair & Maintenance of Bamboo Twigs fence including Material Cost	Feb/Mar	20	9040	5675	14715
Rate per running mt. 14715/250 = 58.86/Rmt						
5th Year Maintenance						
1	Repair & Maintenance of Bamboo Twigs fence including Material Cost	Feb/Mar	20	9040	5675	14715
Rate per running mt. 14715/250 = 58.86/Rmt						

Abstract					
Sl. No.	Year	No. of person days	Labour Cost @ Rs. 452/- per day	Material Cost (Rs.)	Total (Rs.)
1	0th year	0	0	0	0
2	1st year	45.5	20566	31608.5	52174.5
3	2nd year	20	9040	1500	10540
4	3rd year	20	9040	5675	14715
5	4th year	20	9040	5675	14715
6	5th year	20	9040	5675	14715
	Total	125.5	56726	50133.5	106859.5


 Divisional Forest Officer,
 Jharsuguda Forest Division.

Matrix for Model F-1 Fencing (Barbed Wire)

SL. No.	Commence month year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost
	Base Month	0	52175	105460	14715	14715	14715																
1	2024-25	0	54783	11620	17034	17886	18781																120105

Divisional Forest Officer,
Jhauraguda Forest Division


16.10

In Rupees

AGENCY COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 18-11-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355262
MoEF/SG File No.	B-280/1989-FC VOL.
Location.	ORRISA
Address.	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha, Jharsuguda
Amount (in Rs)	139912985/-

Amount in Words: Thirteen Crore Ninety-Nine Lakh Twelve Thousand Nine Hundred and Eighty-Five Rupees. Only

NEFT/RTGS to be made as per following details:

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0998335
Pay to Account No.	150825839355262 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelita Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 18-11-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355262
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* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: fcablr@unionbankofindia.bank, epurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank

SBINR520 24 111 86 3270 55

Authorised Officer
MCL, LAKHANPUR AREA

44611691A, P. SORENG
SBI, BANDHABAHAL BRANCH
18 NOV 2024
CASH
3704
Journal No.
Cheque No.

Authorised Officer
MCL, LAKHANPUR AREA

7409982 NINIYA MAJHI
SBI, BANDHABAHAL BRANCH
18 NOV 2024
CASH
3704
Journal No.
Cheque No.

General Manager



ଜଙ୍ଗଲ, ପରିବେଶ ଓ ଜଳ ବାୟୁ ପରିବର୍ତ୍ତନ ବିଭାଗ, ଓଡ଼ିଶା ସରକାର

ଖଣ୍ଡଗିରି ଜଙ୍ଗଲବାନି କର୍ମାଳୟର ଶାସନାବଳୀ ବିଭାଗ ।

ଇମେଲ୍- dfo.jharsuguda@odisha.gov.in, ଫୁର ଗାସ /ଫା.ନଂ-୦୭୭୪୫-୨୯୫୦୪୦ ।

Memo No. **6354** /4F (Misc.),
Dated Jharsuguda the **13th** Nov, 2024.

To,

The General Manager, MCL,
Lakhanpur Area, Bandhbahal.

Sub: - Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 Ha & Re-diversion (Change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref: - (i) Stage -I / in principle Order No. 8-280/1989-FC Vol. dt.27.12.2023 of the Govt. of India, Ministry of Environment, Forests and Climate Change (Forest Conservation Division), New Delhi.

(ii) Memo No.25474/9F(MG)-372/2021 dt.29.12.2023 of the Conservator of Forests (Nodal), O/o the PCCF & HoFF, Odisha, Bhubaneswar.

(iii) Memo No.2559/3F(M)-/2024, dt.14.10.2024 & Memo No.2796/3F(M)-/2024 dt.12.11.2024 of the RCCF, Sambalpur.

Sir,

In inviting a reference to the letter cited above on the captioned subject, this is to inform you that, the following scheme has been technically approved by the Regional Chief Conservator of Forests, Sambalpur Circle, the financial outlay is mentioned below:

Sl No.	Name of the Scheme	Condition No. in Stage-I/in-principle approval letter.	Financial Outlay (in Rs.)
1	Gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease.	3(f)	115032500.00
2	One and half times safety zone in degraded forest land.	3(e)	24880485.00
Total:-			139912985.00

Hence, you are requested to deposit of amount **Rs.139912985.00 (Rupees Thirteen Crore Ninety Nine Lakh Twelve Thousand Nine Hundred Eighty Five)** only towards the cost of above schemes in the CAMPA Account through e-portal (<https://parivesh.nic.in/>). The evidence of depositing the amount may be forwarded to the undersigned for further needful action at this end.

Yours faithfully,

Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. 6355

Date. 13.11.2024

Copy forwarded to the Principal Chief Conservator of Forests (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha, Bhubaneswar for favour of kind information & necessary action.



Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. 6356

Date. 13.11.2024

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information & necessary action.



Divisional Forest Officer,
Jharsuguda Forest Division.

4F
North
15/11/2024
OFFICE OF THE



REGIONAL CHIEF CONSERVATOR OF FORESTS, SAMBALPUR
CIRCLE, SAMBALPUR

Motijharan, Sambalpur, Pin-768001

Email id- rccf.sambalpur@odisha.gov.in

Memo No. 2559 3F(M)- /2024

Dated, Sambalpur the 14th. October, 2024.



To

The Divisional Forest Officer,
Jharsuguda Forest Division.

Sub:- Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 ha. & Re-Diversion (Change of Land use) of 171.774 ha. of forest land in respect of Integrated Lakhanpur- Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref:- Your memo No.4670 dt.17.08.2024.

With reference to the memo cited above on the captioned subject, scheme for "Gap planting and soil & moisture conservation activities to restock rejuvenate the degraded open forests" to fulfill the conditions No.3(f) imposed in Stage-I/ in-principal approval order of the Ministry of Environment, Forest & Climate Change, Govt. of India (FC Division), New Delhi in lieu of diversion of 417.073 ha. & Re-Diversion (Change of Land use) of 171.774 ha. of forest land in respect of Integrated Lakhanpur- Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda which comes to Rs.11,50,32,500/- (Rupees Eleven Crore Fifty Lakhs Thirty two Thousand Five Hundred) only as submitted by you is here by Technically Approved and returned here with for taking necessary action at your end.

Encl- As above (2 sets).

Regional Chief Conservator of Forests,
Sambalpur Circle.

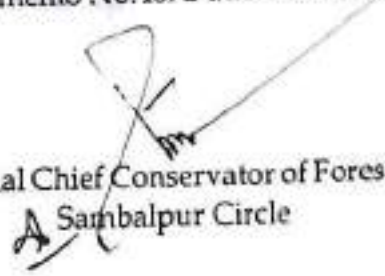
Memo No. 2560 /Dt. 14.10.2024

Copy forwarded to the Principal Chief Conservator of Forest (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha for favour of information and necessary action with reference memo No.4671 dt.17.08.2024 of DFO, Jharsuguda Forest Division.

Regional Chief Conservator of Forests

Memo No. 2561 /Dt. 14.10.2024

Copy forwarded to the General Manager, MCL, Lakhanpur Area, Bandhbahal,
for information and necessary action with reference to memo No.4672 dt.17.08.2024 of
DFO, Jharsuguda Forest Division.


Regional Chief Conservator of Forests
Sambalpur Circle



**OFFICE OF THE REGIONAL CHIEF CONSERVATOR OF FORESTS, SAMBALPUR
CIRCLE, SAMBALPUR**

Motijharan, Sambalpur, Pin-768001

Email id- rcct.sambalpur@odisha.gov.in

Memo No. 2796 3F(M)- /2024.

Dated, Sambalpur the 12 th. Nov., 2024.

To

The Divisional Forest Officer,
Jharsuguda Forest Division.

Sub:- Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 ha. & Re-Diversion (Change of Land use) of 171.774 ha. of forest land in respect of Integrated Lakhanpur- Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref:- Your memo No.6202 dt.05.11.2024.

With reference to the memo cited above on the captioned subject, scheme as per Stage-I/in-principle approval order of the ministry of environment, forests and climate change, government of India(FC Division, New Delhi) vide their F.No. 8-280/1989-FC Vol. dt.27.12.2023 in lieu of diversion of 417.073 Ha & Re-diversion (change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda as submitted by you is here by Technically Approved and returned here with for taking necessary action at your end.

Sl	Name of the Schemes	Condition No. in Stage- I/ in principle approval letter.	Final Outlay (in Rs.)
1	One and a half times safety zone in degraded forest land.	3(e)	24880485.00
2	Mitigative measures to minimize soil erosion and choking of stream	7(a)	909010908.00
3	Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within lease to arrest soil erosion.	7(b)	4494686.40
4	Construction of check dams, retention/toe walls to arrest siding down of the excavated material along contour	7(c)	123000000.00

Stabilize the over burden dumps by appropriate grading/benching	7(d)	Covered in condition NO.7(a) and 7(b).
De-siltation of village tanks and other water bodies within 5 km.	10	376531716.70

Encl- As above.

Regional Chief Conservator of Forests,
Sambalpur Circle.

Memo No. 2797 /Dt 12/11/2024

Copy forwarded to the Principal Chief Conservator of Forest (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha for favour of information and necessary action with reference memo No.6203 dt.05.11.2024 of DFO, Jharsuguda Forest Division.

Regional Chief Conservator of Forests
Sambalpur Circle

Memo No. 2798 /Dt 12/11/2024

Copy forwarded to the General Manager, MCL, Lakhanpur Area, Bandhbahal for information and necessary action with reference to memo No.6204 dt.05.11.2024 of DFO, Jharsuguda Forest Division.

Regional Chief Conservator of Forests
Sambalpur Circle

DETAILS OF ITEM-WISE FINANCIAL OUTLAY**(As Per One-Time Cost Norm @ 452 Per MD)**

Sl. No.	Item of Work	Financial outlay	Remarks
1.	Cost of ANR plantation @ 500plants per ha over 37 ha of degraded forest land @ Rs. 190851/ Ha with 10 th Year Maintenance (at current wage rate of Rs. 452 Per MD)	Rs. 7061487.00	Annexure -I
2	Cost for SMC Works as per SMC Model -C @ Rs.51791/Ha.	Rs. 1916267.00	Annexure -II
3	Cost for Watering Provisions as per Watering Model - W-II (Rs. 600312/1000 Plants) i.e. Rs.600312/1000 Plants x 500 Plants x 37.0 ha	Rs. 11105772.00	Annexure -III
4.	Cost for Fencing as per Fencing Model F-1@ Rs.120105/Ha.	Rs.4443885.00	Annexure-IV
	Total	Rs.24527411.0	
6	Contribution towards VSS (5%) of total plantation cost.	Rs. 353074.35	
	Total	Rs. 24880485.35 or 24880485.00	

(Two Crore Forty Eight Lakh Eighty Thousand Four Hundred Eighty Five) Only

Divisional Forest Officer,
Jharsuguda Forest Division.

Technically Approved

Regional Chief Conservator of Forests
Sambalpur

6.8 COST ESTIMATE: Year wise Abstract of SMC Measures

Sl No	Year	Total Cost for the SMC work with GST (In Rs.)	Maintenance of SMC structures @ 15% without GST (In Rs.)	Total Cost including GST (In Rs.)	Monitoring & Supervision @ 5% (In Rs)	GRAND TOTAL COST including GST and 5% Supervision (In Rs.)	Cost for POL and Driver Wages for Proposed Vehicle for Monitoring & Supervision	Cost for Long Term Monitoring and Assessment	Total (Rs)
1	1st Year (2024-25)	6,11,13,158.00		6,11,13,158.00	30,55,658.00	6,41,68,816.00	4,20,000.00		6,45,88,816.00
2	2nd Year (2025-26)		91,66,974.00	91,66,974.00	4,58,349.00	96,25,323.00	4,41,000.00		1,00,66,323.00
3	3rd Year (2026-27)		96,25,322.00	96,25,322.00	4,81,256.00	1,01,06,588.00	4,63,050.00	25,00,000.00	1,30,69,638.00
4	4th Year (2027-28)		1,01,06,589.00	1,01,06,589.00	5,05,329.00	1,06,11,918.00	4,86,202.50		1,10,99,120.50
5	5th Year (2028-29)		1,06,11,918.00	1,06,11,918.00	5,30,596.00	1,11,42,514.00	5,10,513.00	27,56,250.00	1,44,09,277.00
	Total	6,11,13,158.00	39510803	10,06,23,961.00	50,31,198.00	10,56,55,159.00	23,20,765.50	52,56,250.00	11,32,32,174.50

Cost of the Proposed vehicle for Monitoring & Supervision (In Kind):

Sl No.	Year	Description	No.	Cost (Rs.)
1	1st Year (2024-25)	4-Wheeler	1	1500000
2		2-Wheeler	2	300000
Total cost for Vehicle (In Kind)				1800000

Grand Total for SMC Work (Rs. 11,32,32,174.50 + Rs. 1800000) =

Rs. 11,50,32,174.50 = 11,50,32,500.00 (Say)

Technically Approved

VI-28

Regional Chief Conservator of Forests
SambalpurDivisional Forest Officer
Jharsuguda Forest Division

I/61084/2023

Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)

Indira Paryavaran Bhawan,
Jorbagh Road, Aliganj
New Delhi – 110003

Dated: 27th December, 2023

To

The Addl. Chief Secretary (Forests),
Government of Odisha,
Bhubaneswar.

Sub: Proposal for seeking prior approval under Section 2 (ii) of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha– (Online proposal No. FP/OR/MIN/39355/2019) reg.

Madam/Sir,

I am directed to refer to the State Government of Odisha's letter No. FE-DIV-FLD-0142-2021-20500/ FE&CC dated 24.11.2021, letter no. 9084/9F (MG)-372/2021 dated 29.04.2022, letter No. 13830/9F (MG) 372/2021 dated 11.07.2023 and vide letter No. 21861/9F (MG) 372/2021 dated 08.11.2023 on the above subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980. The proposal was considered by the Advisory Committee (AC) in its meeting held on 29.11.2023 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section - 3 of the aforesaid Act.

2. After careful examination of the proposal of the State Government and on the basis of the recommendations of the Advisory Committee, and approval of the same by the competent authority of the MoEF&CC, New Delhi, the Central Government hereby accords '***in-principle***' approval under Section - 2 of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha subject to fulfilment of the following conditions:

1. Legal status of the diverted forest land shall remain unchanged;
2. *Status of the court cases booked against the MCL shall be provided.*
3. **Compensatory Afforestation:**
 - a. The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation as per the approved CA Scheme at the current wage rate in consultation with State Forest Department in the

account of CAMPA of the concerned State through online portal;

- b. The land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act. 1927 or under the relevant Section (s) of the local Forest Act, as the case may be, before the Stage-II approval;
- c. The cost of survey, demarcation and erection of permanent pillars, if required on the identified CA land, shall be deposited in advance with the Forest Department by the user agency. The CA will be maintained for 10 years. The scheme may include afforestation of indigenous species with appropriate provision for anticipated cost increase for works scheduled for subsequent years;
- d. The compensatory afforestation over non-forest land, equal in extent to the forest land being diverted i.e. 417.073 ha, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval;
- e. Afforestation on degraded forest land to be selected elsewhere, measuring one and a half times the area under safety zone, shall also be done at the project cost under the supervisions of the State Forest Department and afforestation will be done within three years from the date of Stage-II clearance and maintained thereafter in accordance with the approved Plan in consultation with the State Forest Department;
- f. User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease. The plan for plantation and SMC activities will be prepared and submitted to MoEF &CC before Stage-II Clearance;
- g. 25% of the CA cost additionally will be spent towards soil and moisture conservation activities in the proposed CA area as per site requirement and deposited in CAF;

4. NPV:

- a. The User Agency shall transfer the funds towards the cost of Net Present Value (NPV) of the forest land being diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 06.01.2022 read with 22.03.2022 through online portal of CAMPA account of the State Concerned;
- b. At the time of payment of the Net Present Value (NPV) at the present rate, the user agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;
- c. *The penalty for reported violation shall be equal to NPV of forest land per hectare for each year of violation from the date of actual diversion as reported by the inspecting officer with five (5) times the NPV plus 12 percent simple interest till the deposit is made. The required admissible*

amount shall be paid by the UA.

5. Compensatory levies to be realized from the User Agency under the project shall be transferred/ deposited, through e-challan, in to the account of CAMPA pertaining to the State concerned through e-portal (<https://parivesh.nic.in/>);
6. The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area shall be uploaded on the e-Green watch portal with all requisite details prior to Stage-II approval;
7. Following activities, as per approved plan / schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:
 - a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;
 - b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;
 - c. Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;
 - d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and
8. **Safety Zone Management:** Following activities, at project cost, shall be undertaken by the user agency for the management of safety zone as per relevant guidelines issued by the Ministry's guidelines:
 - a. User agency shall ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the. State Forest Department;
 - b. Boundary of the safety zone of the mining lease, adjacent to habitation/roads, should be properly fenced by the user agency;
 - c. Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by the user agency at project cost under the supervision of the State Forest Department;
 - d. The State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms;
9. No damage shall be caused to the top-soil and the user agency will follow the top soil management plan;
10. The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such

tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF & CC before Stage-II approval;

11. The cost of felling of trees shall be deposited by the User Agency with the State Forest Department;
12. Trees should be felled in phased manner as per the requirement in the approved Mining Plan with prior permission of concerned DFO;
13. The User Agency shall undertake that afforestation of the non-mineralized virgin forest land within the mining area shall be taken up at project cost;
14. The user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department.
15. A site-specific Wildlife Management Plan shall be prepared by the State Government in consultation with the PCCF (Wildlife) for the protection and conservation of wildlife of the area. A copy of approved Plan shall be submitted to the Ministry along with the compliance of Stage-I approval. Entire cost of implementation of the provisions of the Wildlife Management Plan shall be deposited into the account of CAMPA of the State;
16. State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence, along with compliance of Stage-I approval, as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof;
17. The User Agency shall undertake that user agency and the State Forest Department shall create and maintain from funds to be provided by the user agency alternate habitat/ home for the avifauna, whose nesting trees are to be cleared in this project as per the plan duly approved by the Principal Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden Odisha. Bird nests artificially made out of eco-friendly materials shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project;
18. The User Agency shall undertake that the project authority needs to take up works for construction and cleaning of garland drains, stabilizing retaining walls, proper terracing of OB dumps and checking gully formation resulting in soil erosion;
19. The User Agency shall undertake that plants which are having lowest translocation factor can be preferred under afforestation on the OB dumps and fruit trees to be avoided in planting during biological stabilization of OB dumps;
20. The User Agency shall undertake that prevention of fall of wild animals into mining pit by fencing the open pit area;
21. The User Agency shall undertake that the angle of repose in OB dumps to be maintained to ensure stability and safety;
22. The User Agency shall undertake that vetiver grass can be planted at the lower reaches of the dump to bind the soil and prevent soil erosion giving better stability to the dump;
23. The User Agency shall undertake mining in a phased manner after taking due

care for reclamation of the mined over area. The concurrent reclamation plan as per the approved mining plan shall be executed by the User Agency from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, in the concerned State Government and the concerned Regional Office of the Ministry. If it is found from the annual report that the activities indicated in the concurrent reclamation plan are not being executed by the User Agency, the Nodal Officer or the concern Addl. Principle Chief Conservator of Forests (Central) may direct that the mining activities shall remain suspended till such time, such reclamation activities area satisfactorily executed;

24. The User Agency shall comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner;
25. Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under;
26. The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required;
27. No labour camp shall be established on the forest land and the User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas;
28. The boundary of the diverted forest land, mining lease and safety zone, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates;
29. The layout plan of the mining plan/ proposal shall not be changed without the prior approval of the Central Government and the forest land shall not be used for any purpose other than that specified in the proposal;
30. The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government;
31. No damage to the flora and fauna of the adjoining area shall be caused;
32. The User Agency shall submit the annual self -compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly;
33. Any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation, protection and development of forests & wildlife; and
34. The user agency shall comply all the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.
35. Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5-2/2017-FC

I/61084/2023

dated 28.03.2019.

36. The compliance report shall be uploaded on **e-portal** (<https://parivesh.nic.in/>).

3. After receipt of compliance report on fulfilment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980. Transfer of forest land shall not be affected till final approval is granted by the Central Government in this regard.

Yours Sincerely,

Signed by

Charan Jeet Singh

Date: 27-12-2023 17:35:47

Sd/

(Charan Jeet Singh)

Scientist 'D'

Copy to:

1. PCCF (HoFF), State Forest Department, Government of Odisha, Bhubaneswar
2. PCCF & Nodal Officer (FCA), O/o PCCF, State Forest Department, Government of Odisha, Bhubaneswar
3. DDGF (Central), Regional Office of MoEF&CC at Bhubaneswar.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF&CC, New Delhi
6. Guard File.



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**REPORT
ON
SOIL MOISTURE CONSERVATION (SMC)
MEASURES**

In

Compliance to

**Stage-I Forest Clearance Granted vide File No. 8-280/1989-FC Vol.
I/61084/2023 FC Dated: 27th December, 2023**

by

**Ministry of Environment, Forest and Climate Change (Forest
Conservation Division) of Govt. of India, New Delhi.**

for

**Non-forestry use of 417.073 Ha & Re-diversion (Change of
Land use) of 171.774 Ha Forest land within total Mining
Lease of 4399.246 Ha**

of

**Integrated Lakhanpur Belpahar Lilari OCP
(Capacity 40.0 Mty)**

**Lakhanpur Area - Ib Valley Coalfield
M/s Mahanadi Coalfield Limited (MCL)**

(May 2024)



Central Mine Planning & Design Institute Ltd.

(A Subsidiary of Coal India Ltd.)

Regional Institute-VII, Bhubaneswar

&

**Environment Division, Kanke Road
Ranchi - 834008 (Jharkhand), India**

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CHAPTER-1

INTRODUCTION

1. INTRODUCTION

1.1 BRIEF HISTORY & PURPOSE OF THE REPORT

Ib-valley coalfield is located in Jharsuguda, Sambalpur and Sundergarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway station is Belpahar railway station.

In the present proposal, existing Lakhanpur, Belpahar and Lilari OCPs have been proposed to be integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura by open cast mining. The capacity of the proposed project is 40.0 MTY with mine lease area of 4399.246 Ha and total project area of 4742.877 Ha. The mine life is 41 years.

Belpahar OCP was planned in Belpahar Block-I & II to exploit the lower seams (Ib and Rampur), whereas Lakhanpur OCP and Lilari OCP were planned further dip side in Belpahar block-III to exploit upper Lajkura seam. Both the mines were planned for open cast mining. The lower seams (Ib and Rampur) below Lakhanpur OCP and Lilari OCP were not planned due to thick parting between Lajkura and Rampur seam resulting in adverse economics.

For Lakhanpur OCP (21.0 MTY), EC was granted by MoEF&CC Govt. of India vide letter No J-11015/391/2012-IA.II (M) dated 10.01.2020.

For Belpahar OCP (9.0 MTY), EC was granted by MoEF&CC Govt. of India vide letter No J-11015/189/2008-IA.II (M) dated 15.01.2021.

For Lilari OCP (0.80 MTY), EC was granted by MoEF, Govt. of India vide letter No. J-11015/27/89-IA dated 30.07.1990.

The CIL Board in its 364th meeting held on 22.05.2018, approved the Project Report for Integrated Lakhanpur-Belpahar-Lilari OCP. Mining Plan for Integrated Lakhanpur-Belpahar-Lilari OCP (40.0 MTY) was approved by MCL Board in its 205th meeting held on 23.10.2018.

The proposed project is an integration of 3 different existing mines i.e. Lakhanpur OCP, Belpahar OCP and Lilari OCP. Total Forest land involved in proposed project is 958.695 Ha. Out of which FC has been obtained for 541.622 Ha whose details are given below.

The details of the existing FC letters are letter:

a. Lakhanpur OCP (233.43 Ha):

Forest Clearance was obtained for forest land 233.43 Ha vide letter no. 8-280/89-FC dated 08.10.1990 Government of India MoEF&CC.

b. Belpahar OCP (123.220 Ha + 22.772 Ha):

a) 123.220 Ha - Diversion of Forest land was obtained for 103.52 Ha vide No. 8-104/91-FC dated 02.06.2000 and 19.70 Ha vide no. 8-104/1991-FC dated 15.09.2014 by Government of India, MoEF&CC.

b) 22.772 Ha – Forest diversion for 22.772 Ha (10.453 Ha + 13.630 Ha) has been done by OPGC. OPGC has taken forest clearance of 159.616 Ha vide letter no. F.No.8-93/2012-FC dated 19.01.2015 in which 10.453 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP and further Stage-II forest clearance of 13.630 Ha obtained vide letter no. 5-ORA155/2012-BHU dated 10-01-2020 in which 12.319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

c. Lilari OCP (162.20):

Forest Clearance was obtained for forest land 162.20 Ha vide letter no 8-281/8-FC dated 31/07/1990.

For the remaining forest land area of 417.073 Ha, application is under process. The application has been submitted to MoEF&CC vide proposal no. FP/OR/MIN/39355/2019 dated 16.03.2019. And, out of 541.622 Ha diverted forest land; Re-diversion (change in land use pattern) of 171.774 Ha (Belpahar OCP: 0.745 Ha, Lakhanpur OCP: 42.389 Ha and Lilari OCP: 128.640 Ha) is required for mining, 7.5m safety zone and temporary top soil yard.

1.2 GENERAL INFORMATION

1.2.1 NAME AND ADDRESS OF THE PROJECT

(a)	Name & size of the project	:	Integrated Lakhanpur-Belpahar-Lilari OCP (40.0 MTY)
(i)	Name of the project proponent	:	V.K.Singh Project Officer, Lakhanpur OCP, Lakhanpur Area, MCL.
(ii)	Mailing Address	:	GM (Env&Forest) Mahanadi Coalfields Limited, P.O- Jagruti Vihar, Burla Dist- Sambalpur, Odisha-768020
(iii)	E-mail	:	gmenvt2018@gmail.com , gm-env.mcl@coalindia.in
(iv)	Telephone	:	0663-2542084 , 06621-286137
(v)	Fax No.	:	0663-2542257 , 06621-286144
(vi)	Legal Status	:	Central Public Sector Enterprise
(b)	Objective of the project	:	To bridge the over all deficit of coal availability over demand of MCL.
(c)	Nature of the project	:	
	(i)	New mine	: Yes (The new project is an Integration of Lakhanpur OCP, Belpahar OCM and Lilari OCP)
	(ii)	Expansion	: No
		• Increase in ML area	: Not Applicable
		• Increase in annual production	: Not Applicable
	(iii)	Renewal of ML	: No
	(iv)	Modernisation	: No
(d)	Location of the Project	:	
	(i)	Name of the Villages	: Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khairkuni, Ubuda, Darlipali, Kirarama,

			Jurabaga, Kusraloi, Karlajori, Khaliapali, Kudaloi, Lakhanpur and Soldia.
(ii)	Tehsil	:	Lakhanpur
(iii)	District	:	Jharsuguda
(iv)	State	:	Odisha
(v)	Pincode	:	768211
(vi)	Latitude	:	21° 42' 25.89" to 21° 47' 24.82" N
(vii)	Longitude	:	83° 49' 38.9" to 83° 49' 53" E
(viii)	Topo sheet No.	:	64 O/13 & 64 O/14 (RF 1:50000) Survey of India Special Toposheet Nos. C-4,C-5,B-4, B-5 and D-4 on R.F, 1:10000
(ix)	Max. elevation above MSL	:	252 m
(x)	Seismic Zone	:	Zone - II
(xi)	Nearest revenue town & Dist. HQ	:	Town – Belpahar Distance 5 km District – Jharsuguda , Distance – 30 km
(xii)	Connection to the State Capital	:	350 km to Bhubaneswar via NH-55
(xiii)	Connection to the company HQs, Burla	:	70 km via Jharsuguda, Sambalpur
(xiv)	Nearest railhead	:	Belpahar Railway station (5 kms)
(xv)	Nearest Airport	:	Jharsuguda Airport (30 Kms)
(xvi)	Local Body	:	Village/P.O: Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khairkuni, Ubuda, Darlipali, Kirarama, Jurabaga, Kusraloi, Karlajori, Khaliapali, Kudaloi, Lakhanpur, Soldia. Executive Officer, Belpahar municipality. Dist.: Jharsuguda
(e)	Details of Coal Linkage	:	Power Houses and Basket Linkage

(f)	Co-ordinates of the project boundary (at each node)	: Reference of nodes are given in figure 1. Co-ordinates of the project is given below: A: 21°47'24.77"N, 83°49'52.84"E B: 21°46'49.47"N, 83°52'44.88"E C: 21°42'37.16"N, 83°50'40.86"E D: 21°45'22.74"N, 83°47'52.95"E

1.3 MAPS

Detailed maps are enclosed as Plate I, II, III and IV in this report, in which location plan and other infrastructure of nearby area of mines are shown. In figure 1, google map has been shown describing the extent of mine boundary.



Figure-1.1: Google map showing the nodes of mine boundary

1.4 BRIEF DESCRIPTION OF PROJECT

SI No.	Item		Details
1	Name of the project/s.	:	Integrated Lakhanpur- Belpahar- Lilari OCP
2	S. No. in the schedule.	:	1(a) Mining of Minerals (Coal Mining)
3	Proposed capacity/ area/ length/tonnage to be handled/command area/lease area/number of wells to be drilled.	:	40 MTY Lease Area: 4399.246 Ha Total Project Area: 4742.877 Ha (Includes residential colony)
4	New/ Expansion/ Modernization	:	New (The new project is an integration of Lakhanpur OCP, Belpahar OCP and Lilari OCP)
5	Existing Capacity/ ML Area etc.	:	1. Lakhanpur OCP (21.0 MTY) – 2240.00 Ha 2. Belpahar OCP (9.0 MTY) – 1444.053 Ha 3. Lilari OCP (0.80 MTY) – 201. 00 Ha
6	Category of Project i.e. 'A' or 'B'.	:	'A'
8	Details of Alternative Sites examined, if any. Location of these sites should be shown on a topo-sheet.	:	Coal is site specific, hence only coal bearing areas are proposed to be worked for coal production.
9	Forest land involved (Ha).	:	958.695 Ha
10	Whether there is any litigation pending against the project and/or land in which the project is propose to be set up? a) Name of the Court b) Case No. c) Orders/directions of the Court, if any and its relevance with the proposed project.	:	Case regarding Violation of Environment Protection Act u/s 15 and 16 of Belpahar Opencast Mine. a) Sub Divisional Judicial Magistrate, Jharsuguda b) 2C(CC) No-170/2013 c) Pending at Sub Divisional Judicial Magistrate, Jharsuguda

SI No.	Item		Details					
11	Land especially undeveloped or agricultural land (ha)	:	The Total Project Area is 4742.877 Ha, out of which Mine Lease Area is 4399.246 Ha including 958.695 Ha of forest land.					
			Following are the land details: (Area in Ha)					
			SI No	Particulars	Integrated Lakhanpur- Belpahar- Lilari mine (Ha)			
					Forest	Govt.	Tenancy	Total
			A	Mining Lease	958.695	1723.649	1716.902	4399.246
			B	Outside Lease	37.693	227.752	78.186	343.631
C	PROJECT AREA (Ha)	996.388	1951.401	1795.088	4742.877			
12	Minerals (MT)	:	Mineable coal reserve is 1262.86 Mt (as on 01.04.2018)					
13	Mine Life (Years)	:	41					

1.5 Condition for compliance report for seeking Stage-II approval

Scientist 'D' of Forests, MoEF&CC submitted a letter to File No. 8-280/1989-FCVol. I/61084/2023 Dated: 27th December, 2023 to the The Addl. Chief Secretary (Forests), Government of Odisha, Bhubaneswar regarding the Proposal for seeking prior approval under Section 2 (ii) of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur -Belpahar- Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha– (Online proposal No. FP/OR/MIN/39355/2019).

As per the directive of the Government of Odisha's letter No. FEDIV- FLD-0142-2021-20500/ FE&CC dated 24.11.2021, letter no. 9084/9F (MG)- 372/2021 dated 29.04.2022, letter No. 13830/9F (MG) 372/2021 dated 11.07.2023 and vide letter No. 21861/9F (MG) 372/2021 dated 08.11.2023 on the above subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980. The proposal was considered by the Advisory

Committee (AC) in its meeting held on 29.11.2023 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section - 3 of the aforesaid Act.

After careful examination of the proposal of the State Government and on the basis of the recommendations of the Advisory Committee, and approval of the same by the competent authority of the MoEF&CC, New Delhi, the Central Government hereby accords ***'in-principle'*** approval under Section - 2 of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha subject to fulfilment of the several conditions: ***The conditions related to soil-moisture conservation (SMC) are as under:***

"A. Conditions which need to be complied with prior to submission of compliance report for seeking Stage-II approval Point:

- 3) f.** User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease. The plan for plantation and SMC activities will be prepared and submitted to MoEF &CC before Stage-II Clearance.
- 6.** The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area shall be uploaded on the e-Green watch portal with all requisite details prior to Stage-II approval;

1.6 CONSULTATION WITH FOREST OFFICIALS

A formal meeting between an official of MCL, Team of CMPDI, and DFO, Jharsuguda was held on 04.03.2024 in the office of DFO, Jharsuguda to discuss the fulfillment of the compliance laid down by the Scientist 'D' of Forests, MoEF&CC

submitted a letter to File No. 8-280/1989-FCVol. I/61084/2023 Dated: 27th December, 2023.

The study area has been selected after a discussion with DFO ,Jharsuguda dated 04.03.2024.

In Lakhanpur Belpahar Lilari coal block CMPDI undertook UAV based survey for generation of high resolution orthomosaic image, DTM, DSM, and contour map of the proposed area for SMC study. The study area has been selected after a discussion with respected DFO. The total area covered by two kml files were 336 Ha near Simlibahal & Pikol area and two small patches of 19.75 ha & 12.86 Ha area near Beheramal. The first area lies in the dense forest area of Simlipal whereas the second area or the two small patches lies near the coal mines of Khaliapali.

1.7 SCOPE AND OBJECTIVE OF THE WORK

- ❖ Existing Land Use Pattern & Satellite imaginary analysis.
- ❖ Soil characterization of the area in terms of the type of soil, depth of soil, water holding capacity, humus, and other organic/inorganic ingredients, a key vulnerability for soil erosion.
- ❖ Micro watershed concept and soil and moisture conservation technique in the concerned area.
- ❖ Preparation of SMC plan.

CHAPTER-2

SOIL MOISTURE CONSERVATION: AN OVERVIEW

2.1 SOIL MOISTURE

Soil moisture is “the total amount of water, including the water vapor, in an unsaturated soil.” Soil moisture—sometimes also called soil water—represents the water on inland surfaces that are not in rivers, lakes, or groundwater, but instead resides in the pores of the soil. In turn, soil moisture levels affect a range of soil and plant dynamics. Surface soil moisture is the water that is in the upper 10 cm of soil, whereas root zone soil moisture is the water that is available to plants—generally considered to be in the upper 200 cm of soil.

Water that enters a field is removed from a field by runoff, drainage, evaporation, or transpiration. Runoff is the water that flows on the surface to the edge of the field; drainage is the water that flows through the soil downward or toward the edge of the field underground; evaporative water loss from a field is that part of the water that evaporates into the atmosphere directly from the field's surface; transpiration is the loss of water from the field by its evaporation from the plant itself.

Water affects soil formation, structure, stability, and erosion but is of primary concern with respect to plant growth. Water is essential to plants for four reasons:

1. It constitutes 80%-95% of the plant's protoplasm.
2. It is essential for photosynthesis.
3. It is the solvent in which nutrients are carried to, into and throughout the plant.

4. It provides the turgidity by which the plant keeps itself in the proper position.

In addition, water alters the soil profile by dissolving and re-depositing mineral and organic solutes and colloids, often at lower levels, a process called leaching. In a loam soil, solids constitute half the volume, gas one-quarter of the volume, and water one-quarter of the volume of which only half will be available to most plants, with a strong variation according to matric potential.

Water moves in soil under the influence of gravity, osmosis and capillarity. When water enters the soil, it displaces air from interconnected macropores by buoyancy and breaks aggregates into which air is entrapped, a process called slaking. The rate at which soil can absorb water depends on the soil and its other conditions. As a plant grows, its roots remove water from the largest pores (macropores) first. Soon the larger pores hold only air, and the remaining water is found only in the intermediate- and smallest-sized pores (micropores). The water in the smallest pores is so strongly held to particle surfaces that plant roots cannot pull it away. Consequently, not all soil water is available to plants, with a strong dependence on texture. When saturated, the soil may lose nutrients as the water drains. Water moves in a draining field under the influence of pressure where the soil is locally saturated and by capillarity pulls to drier parts of the soil. Most plant water needs are supplied from the suction caused by evaporation from plant leaves (transpiration) and a lower fraction is supplied by suction created by osmotic pressure differences between the plant interior and the soil solution. Plant roots must seek out water and grow preferentially in moister soil microsites, but some parts of the root system are also able to remoisten dry parts of the soil. Insufficient water will damage the yield of a crop. Most of the available water is used in transpiration to pull nutrients into the plant.

2.2 SOIL EROSION

Soil erosion has affected land all over the world from small residential landscaped properties to large forests and deserts. Due to the action of rain and wind, some portion of soil gets eroded and transported naturally and at the same time disintegration of rocks goes on naturally at some places to form the soil. These are continuous processes that naturally balance the erosion and formation of soil.

Soil erosion is described as soil particles being shifted around due to the devastating impact of

- Rainfall
- Wind and
- Ice melts

It is a natural process but, in most cases, human activity speeds up the process. Description of different types of soil erosion has been enumerated below in which the above agencies have the major role: -

2.3 RAINFALL EROSION

The investigation has shown that most of the soil erosion done by water is due to the impact of falling raindrops. The erosion capacity of surface runoff is small and it acts only as a partner.

The water erosion process starts as soon as the rain starts. The two principal erosive agents that become active during the rain storm are:

- (a) Falling rain drops.
- (b) Flowing run-off

2.3.1 FALLING RAINDROPS

When a raindrop strikes the soil surface, it breaks down the clods and the aggregates of the soil and thus, the soil particles are torn loose from their

moorings in the soil mass. The energy of the falling water is applied from the above and is utilized in detaching the soil particles, while the energy of the surface runoff is applied parallel to the surface and is made used in transporting the dislodged soil particles.

The erosion caused by rain storms is also known as ***Splash-Erosion-Process***. Another important fact that we must mention here is that the amount of erosion from hilly catchments is always more than that from flat catchments (provided all other conditions remain the same).

This is, because, when rain falls over the flat area, the incoming splash balances the outgoing splash; while when the raindrops strike the sloping land surfaces, a major proportion of the splash moves down. Hence, relatively larger quantities of soil are transported when catchments are sloping than the catchments is flatter.`

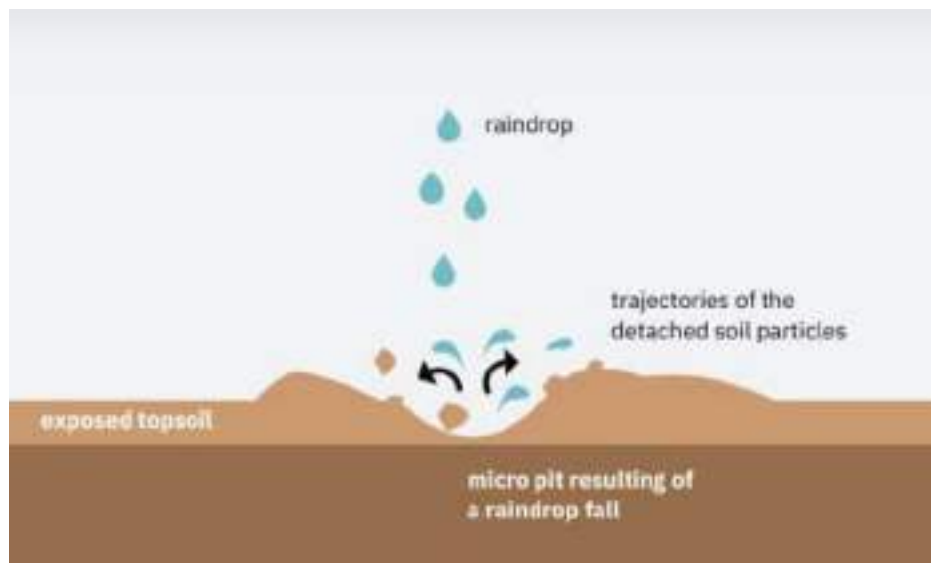


Fig No. 2.1: Figure showing splash erosion

2.3.2 FLOWING RUN-OFF

The fraction of the rainfall which does not infiltrate (soak into) the soil will flow downslope under the action of gravity; it is then known as runoff or overland flow.

If the rain continues, the increasing depth of water will eventually increase. Overland flow that is released in this way is likely to flow downslope more quickly and in greater quantities (i.e. possess more flow power as a result of its kinetic energy), and so may be able to begin transporting and even detaching soil particles. Where it does so, the soil's surface will be lowered slightly. Lowered areas form preferential flow paths for subsequent flow, and these flow paths are in turn eroded further.

2.4 WIND EROSION

Soil erosion by wind may occur wherever dry, sandy, or dusty surfaces, inadequately protected by vegetation, are exposed to strong winds. Erosion involves the picking up and blowing away of loose fine-grained material within the soil. Damage from wind erosion is of numerous types. The most serious and significant by far, however, is the change in soil texture caused by wind erosion. Finer soil fractions (silt, clay, and organic matter) are removed and carried away by the wind, leaving the coarser fractions behind. This sorting action not only removes the most important material from the point of productivity and water retention, but leaves a more sandy, and thus a more erodable soil than the original. Wind erosion mainly depends upon the type of storm, speed, and duration.

2.5 ICE EROSION

Snow and glacier melt occur only in areas cold enough for these to form permanently. Typically, snowmelt will peak in the spring and glacier melt in the summer, leading to pronounced maximum flow in rivers affected by them. The determining factor in the rate of melting of snow or glaciers is both air temperature and the duration of sunlight. In high mountain regions, streams frequently rise on sunny days and fall on cloudy ones for this reason. Soil erosion due to ice melting is not applicable in this region because it is a tropical region and temperatures do not go down to the freezing point.

2.6 CONSEQUENCES OF SOIL EROSION

Damage from soil erosion is of numerous types however the most serious and significant consequences are mentioned below-

- 1) Water Pollution
- 2) Improper water availability
- 3) Chocking of Streams
- 4) Change in soil texture

2.6.1 WATER POLLUTION

Water is the most essential requirement after air for the survival of any kind of life which needs more or less some quantity of water. It holds a pivotal position in the total environment so that if its availability is in optimum quantity, it can protect all aspects of the environment and if availability is less or more than the requirement then the quality of all aspects of the environment gets endangered. Water is made available by nature in good quantity and quality in the form of rainwater, underground water, and through the river, Nala, ponds etc. This water gets affected due to disturbance in nature using man's activities associated with construction, mining activities, etc.

Mainly two types of actions cause water pollution.

- a) Mixing foreign substances with natural water causes physical and chemical changes.
- b) Interception or diversion of full or part of any waterway.

The operation of mining and allied activities of this project would have an impact on water quality through the generation of wastewater in the surrounding area in many ways. The source of such a polluted liquid effluent has an impact on water quality and these are discussed elaborately in the EMP report.

2.6.2 IMPROPER WATER AVAILABILITY

A lesser amount of the soil is covered with vegetation, mulches, crop residues, etc., the more the soil is exposed to the impact of raindrops. When a raindrop hits bare soil, the energy of the velocity detaches individual soil particles from soil clods. These particles can clog surface pores and form many thin, rather impermeable layers of sediment at the surface, referred to as surface crusts. They can range from a few millimeters to one cm or more, and they are usually made up of sandy or silty particles. These surface crusts obstruct the passage of rainwater into the ground reservoir and reduce the water holding capacity of the earth a consequence surface runoff increases and cause more soil erosion. This eroded soil is transported and settled at depressed land, pond, streams/Nala, etc, and reduces the water holding capacity. Moreover, due to the low infiltration rate groundwater reservoir does not get a full recharge. So overall water holding capacity of the area gets reduced to a large extent and resulting in a shortage of water in the region during the dry time.

In another scenario, the increased speed and volume of the surface runoff generate at these places create a flood-like situation anywhere on the downstream side. These create improper water availability in the region.

2.6.3 CHOKING OF STREAMS

Rainfall water that does not infiltrate into the soil starts to flow downhill under the action of gravity. Initially, run-off moves down the slope as a thin diffused film of water that has lost virtually all the kinetic energy which it possessed as falling rain. Thus, it moves only slowly, has a low flow power, and is generally incapable of detaching or transporting soil particles.

If the rain continues, the increasing depth of water will eventually increase. Overland flow that is released in this way is likely to flow downhill more quickly and in greater quantities (i.e. possess more flow power as a result of its

kinetic energy), and so it may be able to begin transporting and even detaching and picking up the soil particles. When the speed of runoff is decreased, the carrying capacity of the runoff gets reduced, subsequently, sedimentation takes place, causing the choking of the stream. Following are the main area where maximum soil erosion takes place.

2.6.4 CHANGE IN SOIL TEXTURE

The most serious and significant effect of soil erosion, by far, is the change in soil texture caused by wind/water erosion. Finer soil fractions (silt, clay, and organic matter) are removed and carried away by the wind, leaving the coarser fractions behind. This sorting action not only removes the most important material from the standpoint of productivity and water retention but leaves a more sandy soil and thus a more erodible soil than the original. Successive removals eventually create such a soil condition wherein plant growth is minimized and erodibility is greatly increased. Damage results both from water erosion and the consequent dust storms. Control becomes more and more difficult. In the extreme, the sand begins to drift and form unstable dunes which encroach on better surrounding lands. Throughout recorded history, huge agricultural areas have been ruined for further agricultural use in this manner

2.7 ESTIMATION OF SOIL EROSION

Erosion is a natural geomorphic process occurring continually over the earth's surface and it largely depends on topography, vegetation, soil, and climatic variation and, therefore, exhibits pronounced spatial variability due to catchments heterogeneity and climatic variation.

Soil erosion is a three-stage process:

- (1) Detachment,
- (2) Transport, and

(3) Deposition of soil.



Fig No. 2.2: Figure showing stages of soil erosion processes

Different energy source agents determine different types of erosion. There are five principal sources of energy that affect erosion such as wind, water, gravity, chemical reactions, and anthropogenic, such as tillage. Soil erosion begins with detachment, which is caused by the breaking down of aggregates by raindrop impact, sheering, or drag force of water and wind. Detached soil particles are transported by flowing water (overland flow and inter-flow) and wind, and deposited when the velocity of water or wind decreases by the effect of slope or ground cover. Three processes viz. dispersion, compaction, and crusting accelerate the natural rate of soil erosion. These processes decrease structural stability, reduce soil strength, exacerbate erodibility and accentuate susceptibility to transport by overland flow, interflow, wind, or gravity. These processes are accentuated by soil disturbance (by tillage, vehicular traffic), lack of ground cover (bare fallow, residue removal or burning), and harsh climate (high rainfall intensity and wind velocity).

The above problems can be circumvented by describing the catchments into approximately homogeneous sub-areas using the Geographic Information System (GIS). In this study, the remote sensing and GIS techniques (through Satellites Imagine and interrelated software) were used for the derivation of spatial information, catchments description, data processing, etc.

2.8 SOIL AND MOISTURE CONSERVATION IN THE FOREST AREAS

The forest is the origin of the streams and rivers; therefore, it is very important to conserve soil and moisture in its catchment area. Soil and moisture Conservation works have become an integral part of Forest Development. Soil Moisture Conservation works in the forest area marked for the plantation activity are carried out on a micro- watershed basis. This approach is aimed at enhancing land productivity and increasing soil moisture availability for a longer period.

2.9 NATURE OF SMC WORKS

Emphasis is to be given to the drainage line treatment. SMC works on the site are carried out as per the site-specific approved treatment plan. Emphasis is to be given to contour line treatment with small and medium SMC works. The SMC and area development works are concerned, the entire area is to be treated as a unit. In an area prone to Soil Erosion and degraded forest, following measures are suggested to increase moisture level:

- Earthen Pits
- Contour Trenches
- Check Dams
- Earthen Ponds
- Grassing

➤ Mulching

Various plantation models such as mangrove plantation, coastal border plantation, plantation as per the provision in different areas, soil and moisture conservation works of forest and plantation areas, maintenance & up-keep of plantation areas with different models are formulated for different areas.

CHAPTER-3

Soil Characterization & Ecological Survey

CHAPTER-3

SOIL CHARACTERIZATION & ECOLOGICAL SURVEY

3. INTRODUCTION

3.1 SOIL QUALITY

Soil is one of the most significant ecological factors on which plants depend for their nutrients; water and mineral supply. Indiscriminate deforestation, digging for minerals, and destruction of grazing lands for human habitation have done irreparable damage to the environment and even led to harsh climatic change. Some of the dangers posed by soil pollution are due to the fact that while the number of the earth's inhabitants are increasing, the earth's natural resources are by and large fixed as well as limited. Thus, the soil gets heavily polluted day by day by rapid anthropogenic activities and population explosion in developing countries.

Further, major mining activities affect the soil regime of the surrounding areas directly or indirectly. Hence, it becomes important to study soil quality as knowledge of soil parameters is essential for the planning and implementation of afforestation. Keeping the above aspects in view, four locations were selected to represent the entire area study area, and samples were collected from two depths viz. 0-30 and 30-60 cm during the study period.

3.2 METHODOLOGY

Soil samples were collected by digging a pit at the appropriate location from depths 0-30 and 30-60 cm with the help of a spade/ AGAR and a ' Khurpi'. The samples were brought to the CMPDI's laboratory at Ranchi and air-dried for a

few days. The air-dried samples were then ground in an agate mortar with the help of a wooden hammer and passed through a 2 mm (10 mesh) sieve. The coarser materials were rejected and the sieved material was sampled by the standard Coning & quartering method (Ref. Jackson, M.L., 'Soil chemical analysis', Prentice Hall, India 1958).

The processed samples were analyzed for the different parameters according to the standard methods as described under Jackson, M.L., 'Soil Chemical Analysis, Prentice Hall, India 1958; millar, CE, turk, L.M. Foth, H.D. Fundamentals of Soil Science, John Wiley & Sons, Inc., New York, 1962, Indian Council of Agricultural Research, New Delhi, ' Hand Book of Agriculture', IS:2720 (Part IV), 1975 and IS:2720, Part (V), 1970; Methods of Soil Analysis, Part I & II, Black, CA et.al. American society of Agronomy, Inc. USA, 1965.

3.3 EQUIPMENT AND INSTRUMENTS USED

- a. Ion Chromatograph
- b. AAS
- c. pH Meter
- d. Conductivity Meter
- e. Double-Beam Spectrophotometer
- f. Standard Sieves
- g. Oven
- h. Muffle Furnace, etc.

3.4 RATIONALE BEHIND SAMPLING

The main aim of the soil testing is to assess the soil quality of the area for assessment of the production potential, selection of suitable species of plants for the green belt and afforestation as an anti-pollution measures. Thus, to assess the soil quality, nine nos. of samples were collected from three different locations at the

rate of three samples per project from the depths of 0-30 and 30-60 cm for the study period. These sampling locations were selected in consultation with CMPDIL officials.

3.5 SAMPLING LOCATIONS

Details of sampling location are given below:

Table-3.1

Sampling location for soil quality assessment

Sl. No.	Name of Sampling Locations	X	Y
01.	S-1	83.8104	21.719
02.	S-2	83.8288	21.7104
03	S-3	83.7535	21.8096
04	S-4	83.7671	21.8143
05	S-5	83.746	21.8172



Fig. 3.1: Soil Sampling locations

3.6 OBSERVATIONS

The observed characteristics of soil samples collected from four different locations are presented hereunder:

Table-3.2

Characteristics of soil: Sampling location: S-1

GPS-01					
Date of Sampling: 12.03.2024					
Sl. No.	Parameters		Depth of sampling		
		Unit	(0-30 cm)	(30-60 cm)	(60-90 cm)
1	pH	-	5.8	5.6	5.5
2	Organic Carbon	%	0.68	0.63	0.61
3	Available Phosphorus	kg/ha	27.84	26.15	24.10
4	Electrical Conductivity	ms /cm	0.16	0.14	0.11
5	Water Holding Capacity	%	30.5	29.1	28.6
6	SAR	-	0.35	0.31	0.28
7	Cation Exchange Capacity	Meq/100gm	14	12	11
8	Texture (Clay)	%	7.5	8.5	15
9	Texture (Sand)	%	76.5	75	62.50
10	Texture (Silt)	%	16.00	16.5	22.5
11	Soil Texture		Sandy Loam	Sandy Loam	Sandy Loam
12	Specific Gravity	-	1.61	1.58	1.56
13	Field Capacity	%	15.9	15.3	14.8
14	Wilting Coefficient	%	0.68	0.63	0.57
15	Available Potash	kg/ha	264.06	261.01	257.61
16	Available Nitrogen	kg/ha	270.31	265.27	258.43
17	Porosity	%	39.25	40.38	41.13

Table-3.3

Characteristics of soil: Sampling location: S-2

GPS-02					
Date of Sampling: 12.03.2024					
Sl. No.	Parameters		Depth of sampling		
		Unit	(0-30 cm)	(30-60 cm)	(60-90 cm)
1	pH	-	6.3	6.2	5.9
2	Organic Carbon	%	0.48	0.45	0.42
3	Available Phosphorus	kg/ha	18.49	16.23	13.91
4	Electrical Conductivity	ms /cm	0.21	0.19	0.15
5	Water Holding Capacity	%	30.5	28.3	27.4
6	SAR	-	0.30	0.27	0.21
7	Cation Exchange Capacity	Meq/100gm	21	18	15
8	Texture (Clay)	%	11.5	9.5	9.0
9	Texture (Sand)	%	59.5	61.5	62.5
10	Texture (Silt)	%	29.0	29.0	28.5
11	Soil Texture		Sandy loam	Sandy loam	Sandy loam
12	Specific Gravity	-	1.59	1.53	1.50
13	Field Capacity	%	17.1	15.3	14.9
14	Wilting Coefficient	%	0.65	0.60	0.58
15	Available Potash	kg/ha	283.21	280.49	277.37
16	Available Nitrogen	kg/ha	307.06	291.37	289.81
17	Porosity	%	40.00	42.26	43.40

Table-3.4
 Characteristics of soil: Sampling location: S-3

GPS-16					
Date of Sampling: 12.03.2024					
Sl. No.	Parameters	Depth of sampling			
		Unit	(0-30 cm)	(30-60 cm)	(60-90 cm)
1	pH	-	6.4	6.3	6.0
2	Organic Carbon	%	0.70	0.68	0.62
3	Available Phosphorus	kg/ha	25.23	16.75	15.23
4	Electrical Conductivity	ms /cm	0.25	0.24	0.24
5	Water Holding Capacity	%	33.1	30.9	29.1
6	SAR	-	0.29	0.24	0.20
7	Cation Exchange Capacity	Meq/100gm	24	21	19
8	Texture (Clay)	%	12.5	9.5	7.5
9	Texture (Sand)	%	53.0	5.0	60.0
10	Texture (Silt)	%	34.5	35.5	32.5
11	Soil Texture		Sandy Loam	Sandy Loam	Sandy Loam
12	Specific Gravity	-	1.55	1.52	1.50
13	Field Capacity	%	16.6	15.9	15.2
14	Wilting Coefficient	%	0.61	0.57	0.53
15	Available Potash	kg/ha	273.08	267.65	261.37
16	Available Nitrogen	kg/ha	267.53	263.90	259.25
17	Porosity	%	41.51	42.64	43.40

Table-3.5
Characteristics of soil: Sampling location: S-4

GPS-17					
Date of Sampling: 12.03.2024					
Sl. No.	Parameters	Depth of sampling			
		Unit	(0-30 cm)	(30-60 cm)	(60-90 cm)
1	pH	-	6.2	5.8	5.5
2	Organic Carbon	%	0.59	0.54	0.49
3	Available Phosphorus	kg/ha	20.77	16.53	14.06
4	Electrical Conductivity	ms /cm	0.15	0.12	0.09
5	Water Holding Capacity	%	30.48	28.03	27.51
6	SAR	-	0.20	0.17	0.13
7	Cation Exchange Capacity	Meq/100gm	24	22	19
8	Texture (Clay)	%	12.5	11.0	9.5
9	Texture (Sand)	%	62.5	63.5	65.0
10	Texture (Silt)	%	25.0	25.5	25.5
11	Soil Texture		Sandy loam	Sandy loam	Sandy loam
12	Specific Gravity	-	1.60	1.55	1.50
13	Field Capacity	%	15.64	13.01	11.71
14	Wilting Coefficient	%	0.52	0.49	0.46
15	Available Potash	kg/ha	282.27	279.63	272.09
16	Available Nitrogen	kg/ha	265.32	261.12	259.51
17	Porosity	%	39.62	41.51	43.40

Table-3.6
Characteristics of soil: Sampling location: S-5

CORE ZONE					
Date of Sampling: 13.03.2024					
Sl. No.	Parameters	Unit	Depth of sampling		
			(0-30 cm)	(30-60 cm)	(60-90 cm)
1	pH	-	5.5	5.3	5.0
2	Organic Carbon	%	0.85	0.81	0.78
3	Available Phosphorus	kg/ha	22.08	21.21	20.31
4	Electrical Conductivity	ms /cm	0.55	0.51	0.48
5	Water Holding Capacity	%	32.12	31.45	29.07
6	SAR	-	0.29	0.23	0.19
7	Cation Exchange Capacity	Meq/100gm	35	32	29
8	Texture (Clay)	%	15.5	13.0	11.5
9	Texture (Sand)	%	65.5	68.5	70.0
10	Texture (Silt)	%	19.0	18.5	18.5
11	Soil Texture		Sandy Loam	Sandy Loam	Sandy Loam
12	Specific Gravity	-	1.58	1.52	1.48
13	Field Capacity	%	17.1	16.9	14.8
14	Wilting Coefficient	%	0.48	0.45	0.41
15	Available Potash	kg/ha	266.08	261.37	258.19
16	Available Nitrogen	kg/ha	246.89	242.25	240.38
17	Porosity	%	40.38	42.64	44.15

Table-3.7
Soil Fertility Quality Standard w.r.t C:N:P: K

Sl. No.	PARAMETERS	QUALITY STATUS		
		Poor	Medium	Fertile
1	Organic Carbon %	<0.5	0.5 to 0.75	>0.75
2	Nitrogen as N, kg/ha	<280	280 to 560	>560
3	Phosphorus as P ₂ O ₅ , kg/ha	<23	23 to 57	>57
4	Potash as K ₂ O, kg/ha	<133	133 to 337	>337

3.7 HIGHLIGHTS OF ANALYTICAL RESULTS

The highlights of some of the parameters as depicted in analytical results presented in Tables – 3.2 to 3.6 are given hereunder:

(i) Texture

The texture of the soils was Sandy Loam.

(ii) pH

The pH of the soils ranged between 5.0 to 6.4.

(iii) Electrical Conductivity

The electrical conductivity varied from 0.11 to 0.55 ms /cm at 20°C.

(iv) Organic Carbon

The organic carbon ranged between 0.48 to 0.85 %. Organic carbon is one of the important characteristics of the soil represents for fixation of nitrogen and survival of the various macro and microorganisms. It has been found in the range of poor quality the degraded forest land.

(v) Phosphorus as P₂O₅

The concentration of Phosphorous varied between 13.91 to 27.84 Kg/ha.

(vi) Potash as K₂O

The concentration of Potash ranged between 257.61 to 283.21 Kg/ha.

(vii) Nitrogen as N

The concentration of Nitrogen varied between 240.38 to 307.06 Kg/ha.

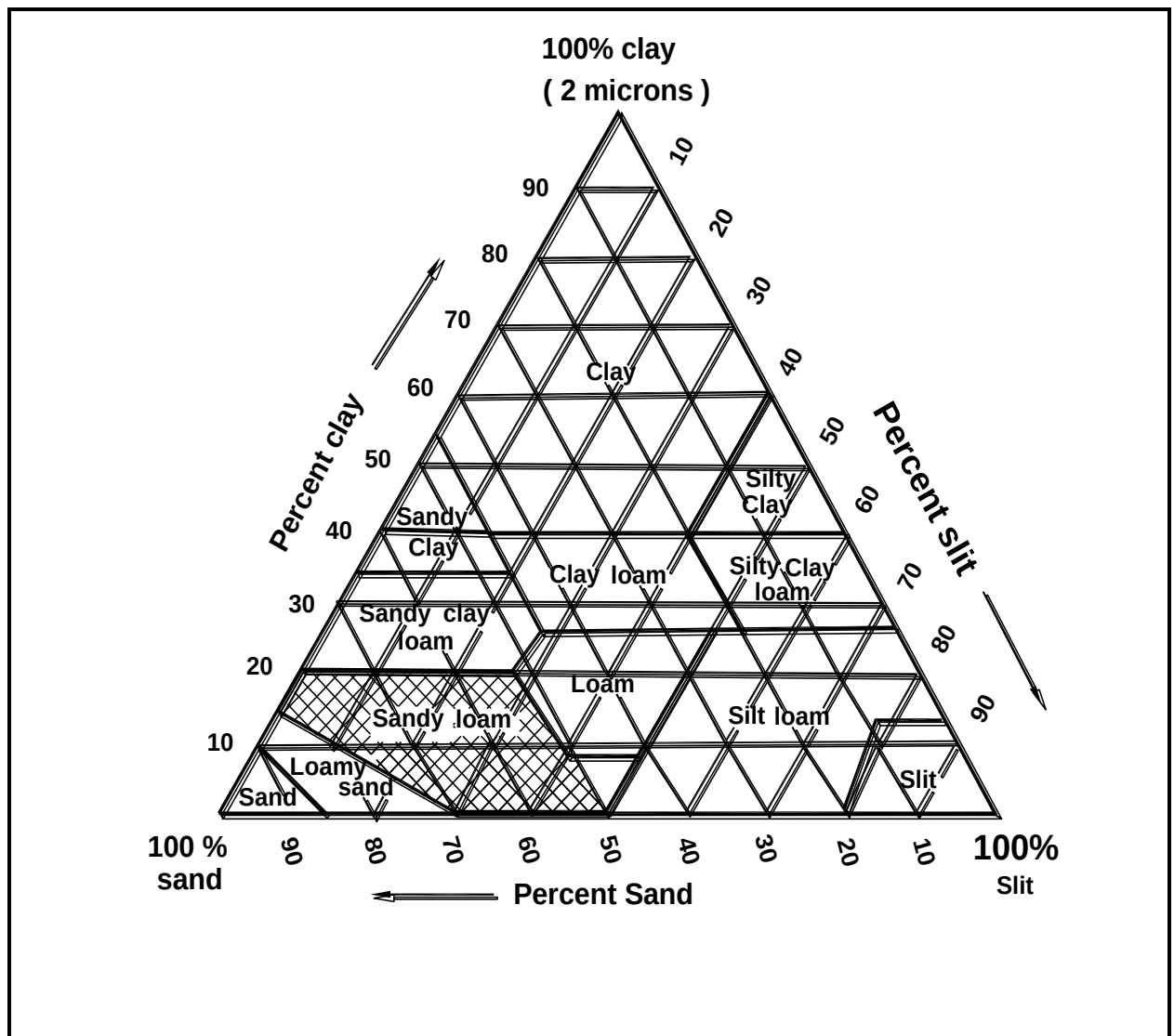
3.8 SOIL TEXTURE DIAGRAM

Fig 3.2 Soil Texture Diagram

3.9 FLORA DETAILS WITH REFERENCE TO TREE SPECIES.

The current report is the survey and listing of common floral-faunal species noticed in the Core and Buffer Zone of Integrated Lakhanpur- Belpahar- Lilari OCP of MCL .This is as per field observation and personal interaction with local people and in consultation with Jharsuguda Forest Division.

The forest types in the study area are mainly North Indian Moist deciduous forest and Northern dry mixed deciduous forest. The growth and quantity of crops depend upon the local environmental conditions. All classes of trees exist in this area. The composition of the vegetation is suitable for the wildlife. The density of crops varies due to the adjoining environmental influence and the fertility of the soil. Sal, the dominant species fully established and abundant in these areas varying from a fairly pure to a mixed crop and occurs throughout the area the main association under North Indian deciduous forests are *Shorea robusta*, *Buchanania lanzan*, *Diospyros melanoxylon*, *Anogeissus latifolia*, *Cleistanthus collinus*, *Madhuca latifolia*, *Terminalia bellerica*, *Garuga pinnata*, *Terminalia tomentosa* and *ziziphus xylopyrus* etc. The other notes worthy tree species are *Buchanania*, *Semecarpus*, *Terminalia*, *Cassia* and *Adina* etc. and in some studied patches, it is classified as northern dry mixed deciduous type Mixed with these species *Chloroxylon swietenia*, *Buchanania lanzan*, *Cleistanthus collimus*, *Lannea coromandelica*, *Diospyrus melonoxylon*, *Anogeissus latifolia*, *Pterocarpus marsupium*, *Lagerstroemia parviflora*, *Boswellia serrate*, *Emblica officinalis* etc. are seen. On most of the hills, sal ascends to the top, either predominantly or mixed with its other associates like, Bija, Ashan, Bandhan, Kurum, Kasi, Bamboo, Dhaura, Sisoo, Kendu, Haldu, etc. The regeneration is purely natural and distributed inadequately over the area. The growth and quantity of crops depend upon the local environmental conditions. All classes of trees exist in this zone. The composition of the vegetation is suitable for the wildlife. The density of crops varies due to the adjoining environmental influence and the fertility of the area.

The total flora observed and recorded during field survey or interaction with local people is comprised of 210 species, of which 85 are tree species, 80 are Herbs & Shrubs, 28 types of grass/ climbers/ bamboo, and 17 agriculture crops. Sal (*Shorea robusta*) is the most dominant singular forest species, for which it is also the southernmost range of distribution. Representative forest plants include *Artocarpus heterophylla*, *Syzygium cuminii*, *Terminalia tomentosa*, *Adina cordifolia*, *Dalbergia paniculata*, *Madhuca indica*, *Diospyros melanoxylon*, etc.

Table 3.8 List of observed tree species

Sr.No.	Common Name	Botanical Name	Family	IUCN Status
1	Aam	<i>Mangifera indica</i>	Anacardiaceae	DD
2	Agasthi	<i>Sesbania grandiflora</i>	Fabaceae	
3	Akasia	<i>Acacia auriculaeformis</i>	Mimosaceae	LC
4	Ambada	<i>Spondias mangifer</i>	Anacardiaceae	LC
5	Ambata	<i>Bauhinia racemosa</i>	Caesalpinaceae	
6	Aonla	<i>Emblia officinalis</i>	Euphorbiaceae	LC
7	Arjun, Kahwa	<i>Terminalia arjuna</i>	Combretaceae	
8	Asan	<i>Terminalia tomentosa</i>	Combretaceae	
9	Babul	<i>Acacia Arabica</i>	Mimosaceae	LC
10	Bahada	<i>Terminalia belerica</i>	Combretaceae	
11	Banakapas	<i>Kydia calycina</i>	Malvaceae	
12	Bara	<i>Ficus benghalensis</i>	Moraceae	
13	Bel	<i>Aegle marmelos</i>	Rutaceae	NT
14	Ber	<i>Ziyphus jujube</i>	Rhambaceae	LC
15	Bheru	<i>Chloroxylon swietenia</i>	Meliaceae	VU
16	Bija	<i>Pterocarpus marsupium</i>	Papilionaceae	NT
17	Borda, Kuliari	<i>Bauhinia purpurea</i>	Caesalpinaceae	LC
18	Chakundi	<i>Cassia siamea</i>	Caesalpinaceae	LC
19	Champa	<i>Michelia champaca</i>	Mangoliaceae	
20	Chhatian	<i>Alstonia scholaris</i>	Apocynaceae	LC
21	Dekamali	<i>Gardenia gummiifera</i>	Rubiaceae	
22	Dhaura	<i>Anogeissus latifolia</i>	Combretaceae	LC
23	Dhuben	<i>Dalbergia paniculata</i>	Papilionaceae	
24	Dimiri, Dumer	<i>Ficus glomerata</i>	Moraceae	LC

Sr.No.	Common Name	Botanical Name	Family	IUCN Status
25	Gambhar	<i>Gmelina arborea</i>	Verbenaceae	LC
26	Genduli	<i>Sterculia urens</i>	Sterculiaceae	LC
27	Ghanto	<i>Zizyphus xyloria</i>	Rhamnaceae	
28	Gohira	<i>Acacia leucophloeae</i>	Mimosaceae	
29	Halda	<i>Diospyros montana</i>	Ebenaceae	
30	Harida	<i>Terminalia chebula</i>	Combretaceae	
31	Imli	<i>Tamarindus indica</i>	Caesalpinaceae	LC
32	Jamun	<i>Syzygium cumini</i>	Myrtaceae	LC
33	Kadam	<i>Anthocephalus cadamba</i>	Rubiaceae	
34	Karanja	<i>Pongamia pinnata</i>	Papilionaceae	LC
35	Kathal	<i>Artocarpus heterophyllus</i>	Moraceae	
36	Kendu	<i>Diospyros melanoxylon</i>	Ebenaceae	
37	Khair	<i>Acacia catechu</i>	Mimosaceae	
38	Khais, Kasi	<i>Bridelia retusa</i>	Euphorbiaceae	LC
39	Khajuri	<i>Phoenix sylvestris</i>	Palmaceae	LC
40	Khirna	<i>Wrightia tinctoria</i>	Apocynaceae	LC
41	Kumbhi	<i>Cereya arborea</i>	Lecythidaceae	
42	Kurum, Haldu	<i>Adina cordifolia</i>	Rubiaceae	
43	Mahanim	<i>Ailanthus exelsa</i>	Simarubaceae	LC
44	Munuga	<i>Moringa oleifera</i>	Moringaceae	LC
45	Neem	<i>Azadiracta indica</i>	Meliaceae	LC
46	Nilgiri	<i>Eucalyptus spp.</i>	Myrtaceae	
47	Pahari sisssoo	<i>Dalbergia latifolia</i>	Papilionaceae	
48	Palas	<i>Butea monosperma</i>	Papilionaceae	LC
49	Pha kurjei	<i>Wrightia tomentosa</i>	Apocynaceae	LC
50	Pipal	<i>Ficus religiosa</i>	Moraceae	
51	Piyar	<i>Buchanania lanzan</i>	Anacardiaceae	NE
52	Potua, Mohana, Sarla	<i>Randia dumetorum</i>	Rubiaceae	
53	Saguan	<i>Tectona grandis</i>	Verbenaceae	
54	Sal, Sargi, Rengal	<i>Shorea robusta</i>	Dipterocarpaceae	LC
55	Sidha	<i>Legerstroemia parviflora</i>	Lythraceae	
56	Simal	<i>Bombax ceiba</i>	Bambacaceae	LC
57	Siris	<i>Albizzia lebek</i>	Mimosaceae	LC
58	Sunari	<i>Cassia fistula</i>	Caesalpinaceae	LC
59	Talwarfali	<i>Oroxylon indicum</i>	Bignoniaceae	
60	Tentra, Dhala siris	<i>Albizzia procera</i>	Mimosaceae	

Sr.No.	Common Name	Botanical Name	Family	IUCN Status
61	Safedsirish	Albizia procera (Roxb.) Benth.	Leguminosae	
62	Saptarni, Chitvan	Alstonia scholaris (L.) R.Br	Apocynaceae	
63	Dhonkda	Anogeissus latifolia (Roxb. ex DC.) Wall. ex Guillem. & Perr	Combretaceae	
64	Salaidhoop	Boswellia serrata Roxb. ex Colebr.	Burseraceae	
65	Chhar	Buchanania cochinchinensis (Lour.) M.R. Almeida	Anacardiaceae	
66	Bhirra	Chloroxylon swietenia DC.	Rutaceae	
67	Bargad	Ficus benghalensis L.	Moraceae	
68	Son pakhad	Ficus mollis Vahl	Moraceae	
69	Goolar	Ficus racemosa L.	Moraceae	
70	Karam	Haldina cordifolia (Roxb.) Ridsdale	Rubiaceae	
71	Arjan	Holoptelea integrifolia (Roxb.) Planch	Ulmaceae	
72	Kotogandal	Ixorapa parviflora Lam	Rubiaceae	
73	Dawra	Lagerstroemia parviflora Roxb.	Lythraceae	
74	Mohin	Lannea coromandelica (Houtt.) Merr	Anacardiaceae	
75	Mahua	Madhuca longifolia var. latifolia (Roxb.) A. Chev.	Sapotaceae	
76	Amla	Phyllanthus emblica L.	Phyllanthaceae	
77	Ganga imli	Pithecellobium dulce (Roxb.) Benth.	Leguminosae	
78	Golenchi	Plumeria rubra L.	Apocynaceae	
79	Salmale	Salma malabarica (DC) Schott & Endl.	Bombacaceae	
80	Kusum	Schleichera oleosa (Lour.) Oke	Sapindaceae	
81	sarai	Shorea robusta Gaertn.	Dipterocarpaceae	
82	Sihora	Streblus asper Lour.	Moraceae	
83	Bahera	Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	
84	Kutajau	Wrightia tinctoria R.Br.	Apocynaceae	

Table 3.9 List of observed Herb and shrub Species

Sl No	Local Name	Botanical Name	Family
1	Akwan	<i>Calotropis procera</i>	Asclepidaceae
2	Bhuinim	<i>Phyllanthus amarus</i>	Euphorbiaceae
3	Chakundi	<i>Cassia tora</i>	Caesalpinaceae
4	Dhatki, Dhawai	<i>Woodfordia fruticosa</i>	Lythraceae
5	Dhatura	<i>Datura spp.</i>	Solanaceae
6	Gajar Ghass	<i>Parthenium hysterophorus</i>	Asteraceae
7	Girel phul	<i>Indigofera pulchella</i>	Papilionaceae
8	Gokharu	<i>Tribulus terrestris</i>	Zygophyllaceae
9	Harsingar	<i>Nyctanthes arbortristis</i>	Oleaceae
10	Jharnuli	<i>Antidesma ghaesembilla</i>	Euphorbiaceae
11	Jungle vendi	<i>Thespesia populnea</i>	Malvaceae
12	Kamini	<i>Murraya exotica</i>	Rutaceae
13	Kath jamun	<i>Eugenia heyneana</i>	Myrtaceae
14	Kerenda koli	<i>Carissa inermis</i>	Apocynaceae
15	Kumbhatua, kumti	<i>Clerodendrum infortunatum</i>	Verbenaceae
16	Kurei	<i>Hallarrhena antidysenterica</i>	Apocynaceae
17	Natibara	<i>Zizyphus fruticosa</i>	Rhamnaceae
18	Nirgundi	<i>Vitex negundo</i>	Verbenaceae
19	Pili kateri	<i>Argemone Mexicana</i>	Papavaraceae
20	Pitabaranga	<i>Helicteres isora</i>	Sterculiaceae
21	Poksunghau	<i>Ageratum conyzoides</i>	Asteraceae
22	Putus	<i>Lantana camara</i>	Verbenaceae
23	Sida	<i>Sida acuta</i>	Malvaceae
24	Siju	<i>Euphorbia nivulia</i>	Euphorbiaceae
25	Sisal	<i>Agave sisalana</i>	Amaryllidaceae
26	Tari	<i>Caesalpinia digyna</i>	Caesalpinaceae
27	Thethar	<i>Ipomea carnea</i>	Convolvulaceae
28	Tilei	<i>Wendlandia tinctoria</i>	Rubiaceae
29	Vasaka	<i>Adhatoda vasica</i>	Acanthaceae
30	Vilayati tulsi	<i>Hyptis suaveolens</i>	Lamiaceae
31	Custard apple	<i>Annonasquamosa</i> L.	Annonaceae
32	Indian mader	<i>Calotropis gigantea</i> (L.) R.Br.	Apocynaceae
33	Jack in the bush	<i>Chromolaena odorata</i> (L.) R.M.King & H. Rob.	Asteraceae
34	besharam	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae
35	Lantana	<i>Lantana camara</i> L.	Lamiaceae
36	Kanbojini	<i>Phyllanthus reticulatus</i> L.	Phyllanthaceae
37	Arandi	<i>Ricinus communis</i> L.	Euphorbiaceae
38	Biswal	<i>Senegalia pennata</i> Mizo	Leguminosae
39	Ergaj	<i>Senna alata</i> (L.) Roxb.	Leguminosae
40	Peelikaner	<i>Thevetia nerifolia</i> Juss. ex Steud.	Apocynaceae
41	Guhbabool,	<i>Vachellia farnesiana</i> (L.) Wight & Arn.	Leguminosae
42	Nirgundi	<i>Vitex negundo</i> L.	Verbenaceae
43	Dhaiphool	<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae

Sl No	Local Name	Botanical Name	Family
44	Makora	<i>Zizyphus oenoplia</i> (L.) Miller	Rhamnaceae
45	Chirchita	<i>Achyranthus aspera</i> L.	Amaranthaceae
46	Chauli/Sauri	<i>Alysicarpus vaginalis</i> (L.) DC	Leguminosae
47	Satyanashi	<i>Argemonemexicana</i> L.	Papavaraceae
48	Creeping blumea	<i>Blumea oxydonta</i> DC	Asteraceae
49	Not available	<i>Blumea axillaris</i> (Lam.) DC.	Asteraceae
50	Kilwar	<i>Canscora diffusa</i> (Vahl) R.Br. ex Roem. &Schult.	Gentianaceae
51	Panwar	<i>Cassia tora</i> L.	Leguminosae
52	Common Cockscomb	<i>Celosia argentea</i> L.	Amaranthaceae
53	Tripunkhi	<i>Coldenia procumbens</i> L.	Boraginaceae
54	Indian millet	<i>Dactyloctenium aegyptium</i> (L.) Willd.	Poaceae
55	Kudalia	<i>Desmodium triflorum</i> (L.) DC	Leguminosae
56	Bringaraj	<i>Eclipta prostrata</i> (L.) L.	Asteraceae
57	Laldudhi	<i>Euphorbia hirta</i> L.	Euphorbiaceae
58	Vishnugrantha	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae
59	Not available	<i>Evolvulus nummularius</i> (L.)L.	Convolvulaceae
60	Dronapushpi	<i>Leucas indica</i> (L.) R.Br ex Vatke	Lamiaceae
61	Lajjalu	<i>Mimosa pudica</i> L.	Leguminosae
62	Jharasi	<i>Mollugo pentaphylla</i> L.	Molluginaceae
63	Kali angedi	<i>Peristrophe bicalyculata</i> (Retz.) Nees	Acanthaceae
64	ishwarjata	<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze	Lamiaceae
65	Mithipatti.	<i>Scoparia dulcis</i> L.	Scrophulariaceae
66	Baraira	<i>Sida acuta</i> L.	Malvaceae
67	Bariar	<i>Sida cordifolia</i> L.	Malvaceae
68	Madanaghanti	<i>Spermacoce hispida</i> L.	Rubiaceae
69	Not available	<i>Spermacoce cymoides</i> Burm.f	Rubiaceae
70	Sharpunka	<i>Tephrosia purpurea</i> (L.) Pers	Leguminosae
71	Chikti	<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae
72	perasara	<i>Vanda tessellata</i> (Roxb.) Hook. Ex G.Don	Orchidaceae
73	Chota Dhatura,	<i>Xanthium strumarium</i> L.	Asteraceae

Table 3.10 List of observed Grasses/ climbers/ bamboo species

Sl.	Local Name	Botanical Name	Family
1	Arkawla	Milletia auriculata	Papillionaceae
2	Atundi	Combretum decandum	Combretaceae
3	Badi chand	Symphorema	Verbenaceae
4	Budel, latapalas	Butea superb	Papillionaceae
5	Duba	Cynodom dactylon	Poaceae
6	Gapkanu	Cryptolepis buchanani	Asclepidaceae
7	Ghodalenji, Sinkula	Arsitida setaceae	Gramineae
8	Khar	Cymbopogon martini Poaceae	Poaceae
9	Khas khas	Vetiveria zizanioides	Gramineae
10	Osta, Gila	Entada scandens	Mimosaceae
11	Penga, Kharsan	Celastrus paniculata	Celastraceae
12	Pitalu	Dioscorea bulbifera	Dioscoreaceae
13	Sabai, panasi	Eulaliopsis binata	Poaceae
14	Salia bans	Dendrocalamus strictus	Gramineae
15	Siali	Bauhinia vahlii	Caesalpinaceae
16	Ratti	Abrus precatorius L.	Leguminosae
17	Kankarej,	Caesalpinia bonduca (L.) Roxb.	Leguminosae
18	ardanda	Capparis zeylanica L.	Capparaceae
19	Padh	Cissampelos pareira L.	Menispermaceae
20	Kantaalu,	Dioscorea pentaphylla L.	Dioscoreaceae
21	Anantmul	Hemidesmus indicus (L.) R. Br. ex Schult.	Apocynaceae
22	Kali doddee	Ichnocarpus frutescens (L.) R.Br.	Apocynaceae
23	Not available	Quisqualis indica L.	Combretaceae
24	Giloy	Tinospora sinensis (Lour.) Merr.	Menispermaceae
25	Not available	Vallaris solanacea (Roth) Kuntze	Apocynaceae
26	Pitti	Ventilago maderaspatana Gaertn.	Rhamnaceae
27	Dugdhive	Wattakakavolubilis (L.f) Stap f	Apocynaceae

Table 3.11 List of observed medicinal plant species

Sl.	Local Name	Botanical Name	Family
1	Aam	<i>Mangifera indica</i>	Anacardiaceae
2	Achhu	<i>Morinda tinctoria</i>	Rubiaceae
3	Akwan	<i>Calotropis gigantean</i>	Asclepiadaceae
4	Ambada	<i>Spondian pinnata</i>	Anacardiaceae
5	Aonla	<i>Emblica officinalis</i>	Euphorbiaceae
6	Arjuna	<i>Terminalia arjuna</i>	Coabretaceae
7	Asan	<i>Terminalia tomentosa</i>	Combretaceae
8	Babul	<i>Acacia Arabica</i>	Mimosaceae
9	Bahada	<i>Terminalia bellerica</i>	Combretaceae
10	Banakhajuri	<i>Phoenix sylvestris</i>	Arecaceae
11	Barakoli	Rhambaceae	Rhambaceae
12	Bargad	<i>Ficus bengalensis</i>	Moraceae
13	Begunia	<i>Vitex negundo</i>	Verbenaceae
14	Bel	<i>Aegle marmelos</i>	Rutaceae
15	Bhuin aonal	<i>Phyllanthus niruri</i>	Euphorbiaceae
16	Chakunda	<i>Cassia siamea</i>	Caesalpinaceae
17	Chhatian	<i>Alstonia scholaris</i>	Apocynaceae
18	Dhaura	<i>Anogeissus latifolia</i>	Combretaceae
19	Dutura	<i>Datura fastusa</i>	Solanaceae
20	Ghitkaunari	<i>Aleo vera</i>	Liliaceae
21	Harida	<i>Terminalia chebula</i>	Combretaceae
22	Harsingar	<i>Nyctanthes arbortristis</i>	Oleaceae
23	Imli	<i>Tamarindus indica</i>	Caesalpinaceae
24	Jamun	<i>Syzygium cumini</i>	Myrtaceae
25	Kadamba	<i>Anthocephalus cadamba</i>	Rubiaceae
26	Karanja	<i>Pongamia pinnata</i>	Papilionaceae
27	Kathal	<i>Artocarpus heterophyllus</i>	Moraceae
28	Mohua	<i>Madhuca indica</i>	Sapotaceae
29	Neem	<i>Azadirachta indica</i>	Meliaceae
30	Palas	<i>Butea monosperma</i>	Fabaceae
31	Pipal	<i>Ficus religiosa</i>	Moraceae
32	Piyar	<i>Buchanania lanzan</i>	Anacardiaceae
33	Sal	<i>Shorea robusta</i>	Dipterocarpaceae
34	Siris	<i>Albizia lebbek</i>	Mimosaceae
35	Sissoo	<i>Dalbergia sissoo</i>	Fabaceae
36	Sunari	<i>Cassia fistula</i>	Caesalpinaceae

Table 3.12 List of observed ecologically important plant species

SL.	Common Name	Botanical Name	Family	Habit	Status	Parts Used
1	Aam	<i>Mangifera indica</i>	Anacardiaceae	Tree	Native	Flower and Fruits
2	Amaltas	<i>Cassia fistula</i>	Leguminosae	Tree	Native	Fruits
3	Arjun	<i>Terminalia arjuna</i>	Combretaceae	Tree	Native	Fruits and flowers
4	Baherae	<i>Terminalia belerica</i>	Combretaceae	Tree	Native	Fruits
5	Bar	<i>Ficus benghalensis</i>	Moraceae	Tree	Native	Fruits
6	Bel	<i>Aegele marmelos</i>	Rutaceae	Tree	Native	Fruits
7	Dhaora	<i>Anogeissus latifolia</i>	Sapotaceae	Tree	Native	Fruits
8	Gular	<i>Ficus glomerata</i>	Moraceae	Tree	Native	Fruits
9	Imli	<i>Tamarindus indica</i>	Leguminosae	Tree	Native	Fruits
10	Kala-siris	<i>Albizia lebbek</i>	Leguminosae	Tree	Native	Flower and Fruits
11	Karanj	<i>Pongamia pinnata</i>	Leguminosae	Tree	Native	Seeds
12	Mahua	<i>Madhuca longifolia</i>	Euphorbiaceae	Tree	Native	Flower and Seeds
13	Pipal	<i>Ficus religiosa</i>	Moraceae	Tree	Native	Fruits
14	Piyar	<i>Buchanania latifolia</i>	Anacardiaceae	Tree	Native	Fruits
15	Sagon	<i>Tectona grandis</i>	Verbenaceae	Tree	Native	Flowers
16	Sal	<i>Shorea robusta</i>	Dipterocarpaceae	Tree	Native	Leaf, Fruits, Seeds & Gum
17	Semal	<i>Bombax ceiba</i>	Malvaceae	Tree	Native	Flowers
18	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae	Tree	Native	Leaf & Fruits

Table 3.13 List of observed Agriculture crops

Sr. No.	Common Name	Scientific Name	Family	Buffer zone
1	Banana	<i>Musa acuminata</i>	Musaceae	+
2	Brinjal	<i>Solanum melongena</i>	Solanaceae	+
3	Cashew nut	<i>Anacardium Occidentale</i>	Anacardiaceae	+
4	Chilli	<i>Capsicum annuum</i>	Solanaceae	+
5	Citrus	<i>Citrus spp.</i>	Rutaceae	+
6	Garlic	<i>Allium sativa</i>	Lilliaceae	+
7	Ground nut	<i>Arachis hypogaea</i>	Fabaceae	+
8	Guava	<i>Psidium Guajava</i>	Myrtaceae	+
9	Maize	<i>Zea mays</i>	Poaceae	+
10	Mango	<i>Mangifera indica</i>	Anacardiaceae	+
11	Onion	<i>Allium cepa.</i>	Lilliaceae	+
12	Paddy	<i>Oryza sativa</i>	Poaceae	+
13	Potato	<i>Solanum tuberosum</i>	Solanaceae	+
14	Sesame	<i>Sesamum indicum</i>	Pedaliaceae	+
15	Tomato	<i>Lycopersicon esculentum</i>	Solanaceae	+
16	Turmeric	<i>Curcuma long</i>	Zingiberaceae	+
17	Wheat	<i>Triticum aestivum</i>	Poaceae	+



Fig 3.3: Field Photograph



Fig 3.4: Field Photograph



Fig 3.5: Field Photograph

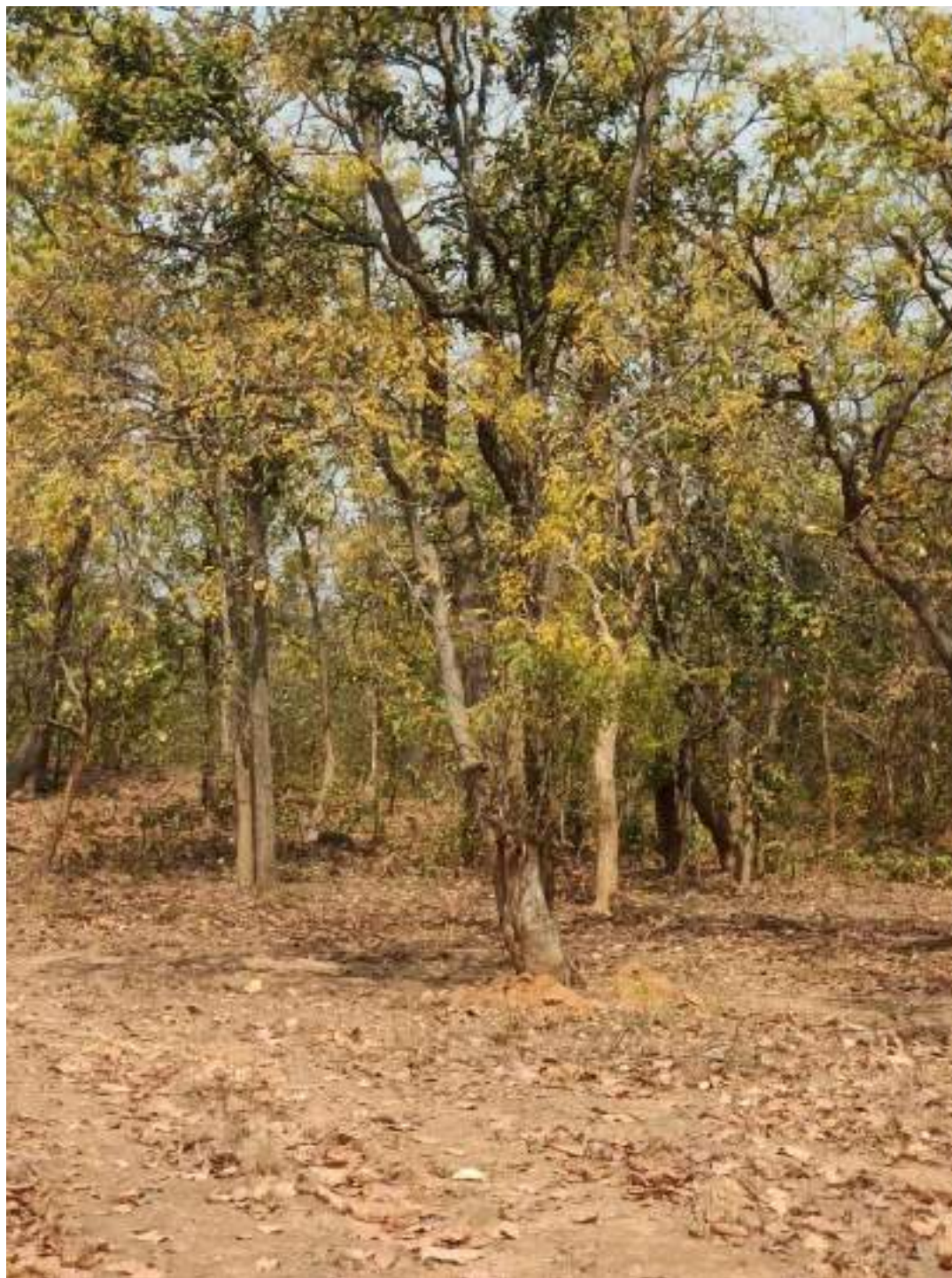


Fig 3.6: Field Photograph



Fig 3.7: Field Photograph



Fig 3.8: Field Photograph



Fig 3.9 Field Photograph



Fig. 3.10: Image of VTOL fixed wing UAV



Fig. 3.11 Team at Site



Fig. 3.12 Team at Site

CHAPTER-4

Hydrogeological Studies

CHAPTER- 4

HYDROGEOLOGICAL STUDY

4.1 GROUNDWATER OCCURRENCE

The study patch is located within the 10KM buffer zone of Integrated project, it lies in the northwest quadrant in the 10km buffer area. The groundwater occurs under phreatic or unconfined and semi-confined conditions. The Phreatic or unconfined aquifer in the entire study area is tapped by means of dug wells. The depth of the dug wells ranges from 10m bgl to 20 m bgl. During the field visit in the study area, almost every village in the study area is found to have at least one surface water pond. These surface water ponds are the life lines for community in the study area, for these structures feed the groundwater bearing structures in their surroundings. These structures are used to fulfil only the domestic requirement of local population. The semi-confined aquifer in the study area is tapped by means of bore wells. They are mostly 60 to 80 m in depth. The bore wells also are used to fulfil the domestic requirement of individual household only.

The groundwater occurrence, its movement and storage in any area are mainly controlled by the geological setup of the area. The ability of geological formation to store and transmit water is dependent on parameters such as porosity and hydraulic conductivity. Based on these parameters, the rock formations generally are classified as hard and soft rocks. Based on studies conducted in and around the area the hydraulic conductivity is found to be in the range of 0.099 to 0.158 m/day. Accordingly, value for the hydraulic conductivity is considered to be 0.16 for the estimation of mine seepage. The saturated thickness of aquifer in the areas estimated from the borehole log and is considered to be 55m up to the depth of 122 m bgl and thus, the transmissivity is estimated to be $8.8 \text{ m}^2/\text{day}$.

4.2 TOPOGRAPHY AND DRAINAGE

The area exhibits undulating topography with moderately dissecting hills and valleys. The general elevation of the project site is RL 332 m to RL 275 m.

Drainage of the study area is mainly controlled by easterly flowing seasonal streams. There is a Lilari stream towards south of the site area which drains into Hirakud reservoir. The Ib River on the eastern side of the coalfield mainly controls drainage in the area.

4.3 CLIMATE AND RAINFALL

The climate of the area is tropical type characterized by hot summer and mild winter. The bulk of the precipitation is received from South-West monsoon. The monsoon breaks out in the third week of June and gradually withdraws towards the mid of September. Autumn season starts in the first week of October and lasts till the end of November. Winter is experienced in the month of December- Mid February followed by dry and scorching summer from March to Mid June. The maximum temperature goes up to 49 oC and minimum temperature up to 9oC. The winds are generally light to gentle breeze. Annual mean wind velocity is 7 Km/hr with maximum speed of more than 20km/ hr has also been recorded. The average annual rainfall is 1232 mm. Almost 70% of the total rainfall is recorded during monsoon (July to August.) period. Humidity ranges (monthly mean of daily RH) are observed as Minimum 26% and Maximum 83%.

4.4 GEOLOGY AND STRUCTURE

The study area falls under the Lakahnpur block and is covered with mostly sandstone. The present block forms a part of Ib Valley coalfield where prominent geological formations are Pre-Cambrian as base over which Talchir, Karharbari & Barakar Formations were deposited. The Pre-Cambrian rocks are exposed along the margin of the basin above which Talchir, Karharbari & Barakar rest successively as per the depositional sequence. Barakar and Karharbari are the two potential coal bearing formations in Ib Valley coalfield with Barakar being the store house of

majority of coal seams. The coalfield occupies an area of 1460 Sq. km and with potential coal bearing area (excluding Kamthis, non coal bearing Lower Karharbari Formation) of about 300 sq. km stretching along the south, east and northern periphery of the coalfield. The beds strike in a NE-SW direction in the northern part, assume a N-S trend in the central part and SSE-NNW in the southern part. The overall configuration is thus of a broad antiform. The dip of strata is towards NW in the northern part, due west in the central part and towards WSW in the southern part. Amount of dip of strata varies from 4° - 6° .

The generalized geological/stratigraphic succession of the study area as available from exploratory boreholes in the area is compiled below in table 4.1.

Table 4.1 Stratigraphic succession of Study area

Age	Lithology	Formation
Recent / Sub-Recent		Soil, alluvium, Lateritic soil and sub soil.
Lower Permian	Barakar	Fine to coarse grained sandstone, micaceous at places, carbonaceous shale, grey shale, fire clay, sandy shale, shaly sandstone, alternate shale and sandstone and thick coal seams. (300 – 350 mt)
Lower Permian	Karharbari	Coarse grained to pebbly and gritty sandstone, carbonaceous sandstone with undecomposed feldspar pieces with thin good quality coal seams. (3 – 35 mt)
Upper Carboniferous and green shale. (+ 82m)	Talchir	Fine to medium grained greenish sandstone
-----Unconformity-----		
Pre-Cambrian	Archean	Granite, mica schist & gneisses
Source : CMPDI		

Geological Map of the in and around the study area with respect to mining lease area of Lakahanpur OCP is given in Figure 4.1

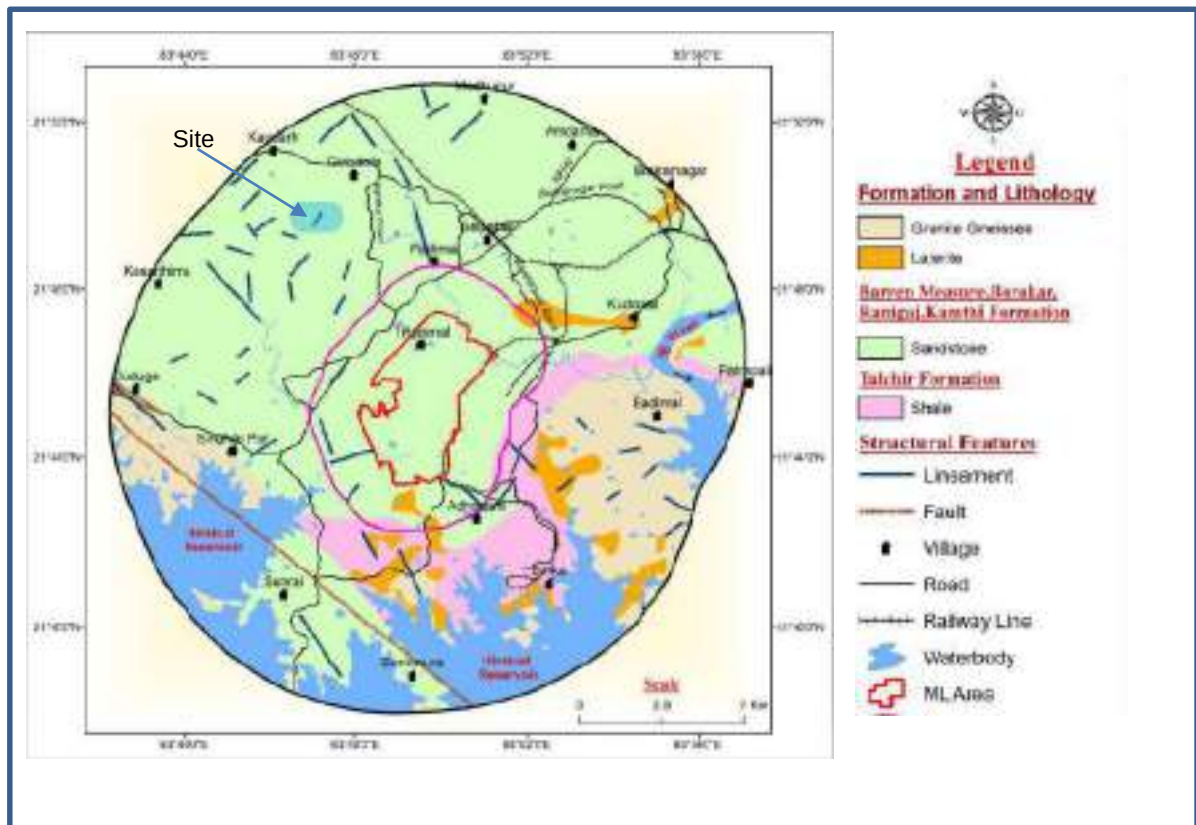


Figure 4.1: Geological Map of the study area

4.5 AQUIFER DESCRIPTION

Based on the rock types occurring in the study area/ forest patch mainly Sandstone belonging to Talcher, Barakar and Kamthi formations of Gondwana Super Group along with Shale and Granitic gneiss. In principle, the study area and in around is made up of two rock types viz. sandstone along western half and metamorphic rocks like granitic gneiss, with minor phyllite and quartzite in the eastern half. The ground water movement in the sandstone takes place through the primary porosity, while in the gneissic rocks, it is transmitted through fractures, joints, cleavage planes and bedding planes. The ground water occurs in both formations under phreatic or unconfined and semi-confined conditions.

The hydrogeology Map with major groundwater elevation contour is given for the study area and in around with respect to Lakhanpur mines in Figure 4.2.

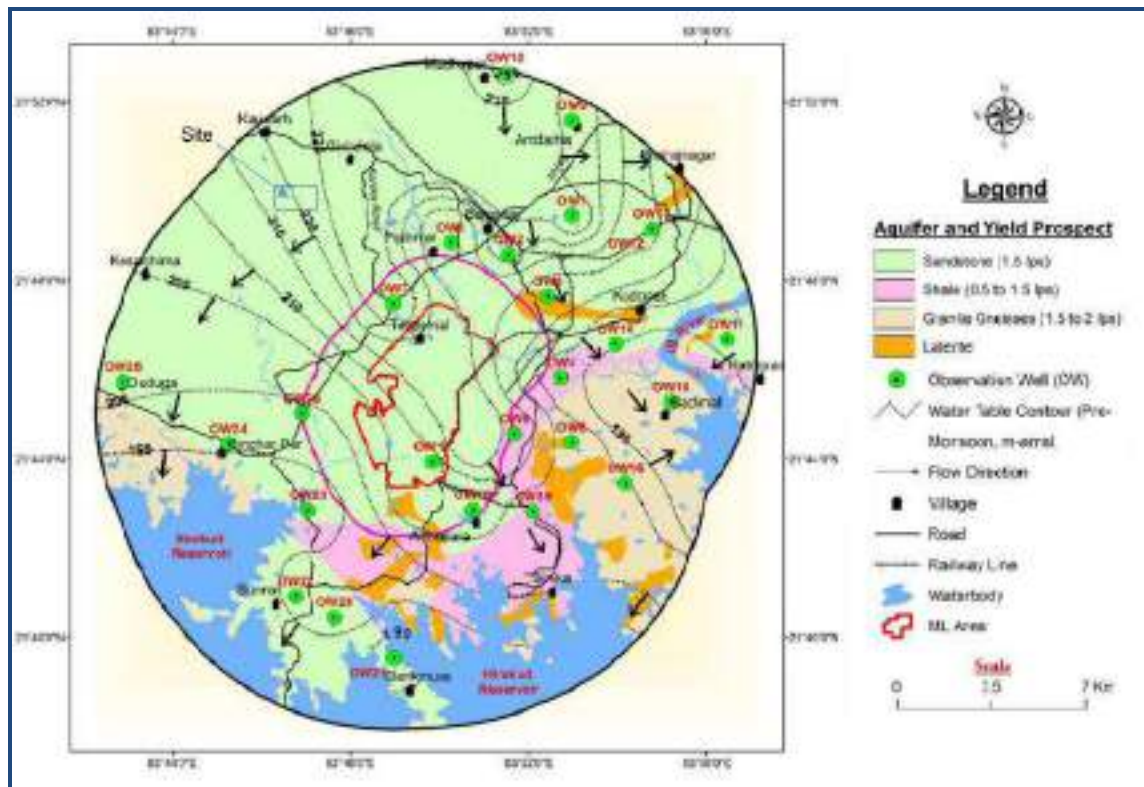


Figure 4.2: Hydrogeology Map of the study area

4.6 GROUNDWATER FLOW AND AQUIFER INTERACTION

Groundwater is a dynamic system. It always remains under the influence of periodic recharging and discharging factors. Due to this continuous influence, water levels of the aquifer system fluctuate and the range depends on the period of influence. The recharge to the ground water system is controlled by many factors such as rainfall, seepage from reservoirs, lakes, ponds, rivers and irrigation, etc. The output from the ground water system includes ground water withdrawal, natural seepage to rivers, evaporation from shallow water table and transpiration through vegetation.

Present ground water scenarios of the area are assessed from the open dug wells used for domestic water consumption in the area around the forest patch. The details of selected hydrograph stations in and around Study area are given in Table 4.2. The water level in these wells represents hydraulic head of water table aquifers. The hydraulic heads of all observed wells are calibrated to reduced level. The hydraulic head of all hydrograph stations are connected to construct water table contour map. The generic groundwater flow direction is North east to South West. The average depth to groundwater level varies between 3-5 m below round level in and around the forest patch.

Table 4.2: Details of hydrograph stations around Study area

VILLAGE	LATITUDE (N)	LONGITUDE (E)	PRE-MON WATER LEVEL (mbgl)	POST-MON WATER LEVEL (mbgl)
Chauliberna	21°49'27.30"	83°52'58.50"	0.5	0.1
Belpahar	21°48'34.30"	83°51'32.60"	3.4	0.5
Muchbahal	21°47'38.40"	83°52'26.10"	4.7	0.5
Kirarama	21°45'49.00"	83°52'43.00"	4.5	0.5
Sarandamal	21°44'22.40"	83°52'57.70"	6.0	0.5
Dalgaon	21°43'27.10"	83°54'10.10"	4.5	0.5
Kusraloi	21°43'56.00"	83°49'50.00"	6.6	1.0
Adhapala	21°42'51.00"	83°50'45.00"	7.0	2.4
Piplimarai	21°48'51.20"	83°50'14.70"	7.1	1.0
Madhupur	21°52'38.80"	83°51'28.90"	4.0	0.5
Badimal	21°45'16.20"	83°55'11.30"	5.6	0.5

4.7 GROUNDWATER LEVEL TRENDS

In the present report, the monitored data has been presented and the overall picture of ground water storage behavior due to continuous abstraction of ground water has been analyzed for the period April 2013 to Nov. 2022 (total 10 years) (Data Source: India WRIS). The water level data of the month of April/May and November are taken as level of pre-monsoon and post-monsoon respectively.

- **Lakhanpur village dug well (21° 45' 40"N, 83°46' 25" E)**

The Pre monsoon water level trend shows decreasing trend and post monsoon shows a neutral to positive treand which signifies that the groundwater is affected by the overall groundwater utilization with the increasing population and increase in ground water draft for irrigation, domestic or other purposes only. The long-term pre monsoon water level varies from 4.15 to 14.2 mbgl and post monsoon water level varies from 1.75 to 5.39 mbgl.

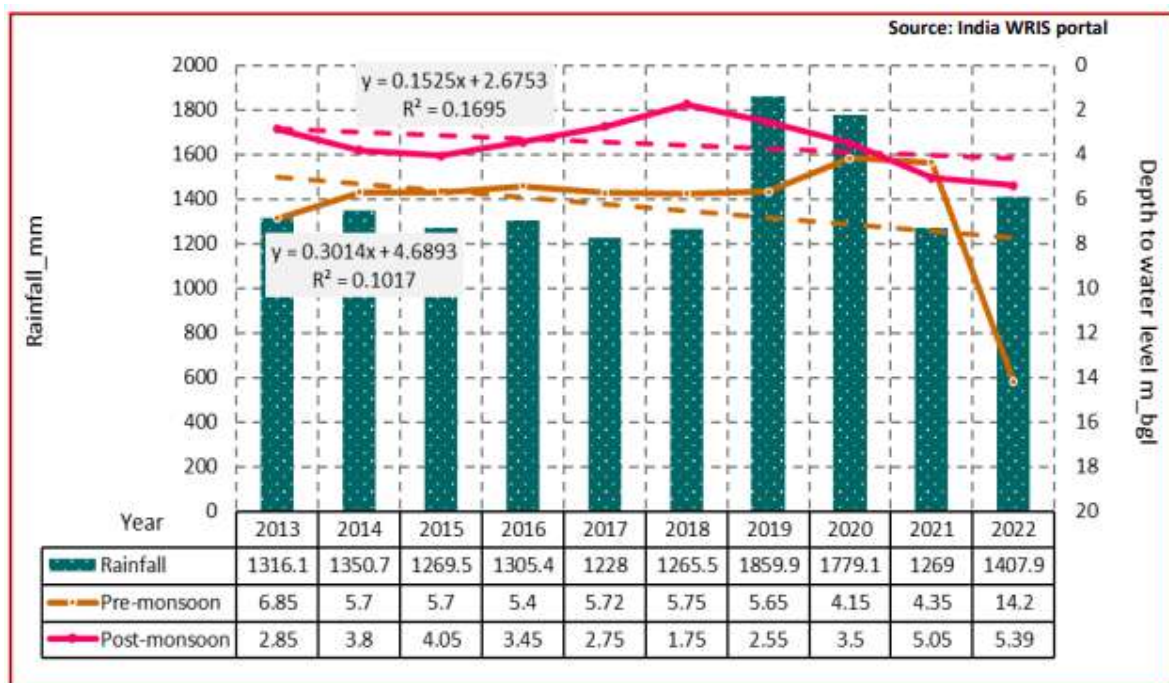


Figure 4.5: Hydrograph of Lakhanpur dug well

4.8 WATER ENVIRONMENT

The water quality characterization has been conducted by collecting water samples from the surface water of the forest area. The various purposes of surface water monitoring are to assess the water quality characteristics for critical parameters; to facilitate predication of the impact on water quality by the area.

4.8.1 METHODOLOGY

The grab sampling method was adopted for the collection of the surface water samples from different sources of water bodies.

Surface water and mine water were collected as representative samples to assess the water quality of the area during the study period. The sampling locations were selected from the available water body in the area. These samples were analyzed as per the “Standard Method for the Examination of Water & Waste Water” published by the American Public Health Association (APHA: 23rd Edition).

Samples for chemical analysis were collected in polyethylene containers. Samples collected for metal content were acidified with 1 ml. Conc. HNO_3 per liter. Samples for bacteriological analysis were collected in sterilized glass bottles. Some of the parameters such as temperature, pH, DO, alkalinity, total hardness and chloride, etc., which were liable to change with time were analyzed at the site with the help of an analytical kit, and one set of “Preserved” samples were brought to CMPDI’s laboratory at Ranchi for detailed analysis of the remaining parameters stated in the tables.

4.8.2 MAJOR INSTRUMENTS USED

- Double-Beam Spectrophotometer
- Nephelometer
- Atomic Absorption Spectro - Photometer
- Conductivity Meter
- pH Meter

- Analytical Balance (Mettler)
- BOD Incubator
- High Speed Centrifuge
- Oven
- Muffle Furnace
- Ion Chromatography etc.

4.8.3 RATIONALE BEHIND SAMPLING

Any adverse impact or pollution consequence of water will have a serious effect on the environment. Thus, to assess the surface water quality, samples from different water bodies were collected from 3 different locations and analyzed for physicochemical and heavy metal parameters.

4.8.4 Sampling Locations

Details of sampling location are given :

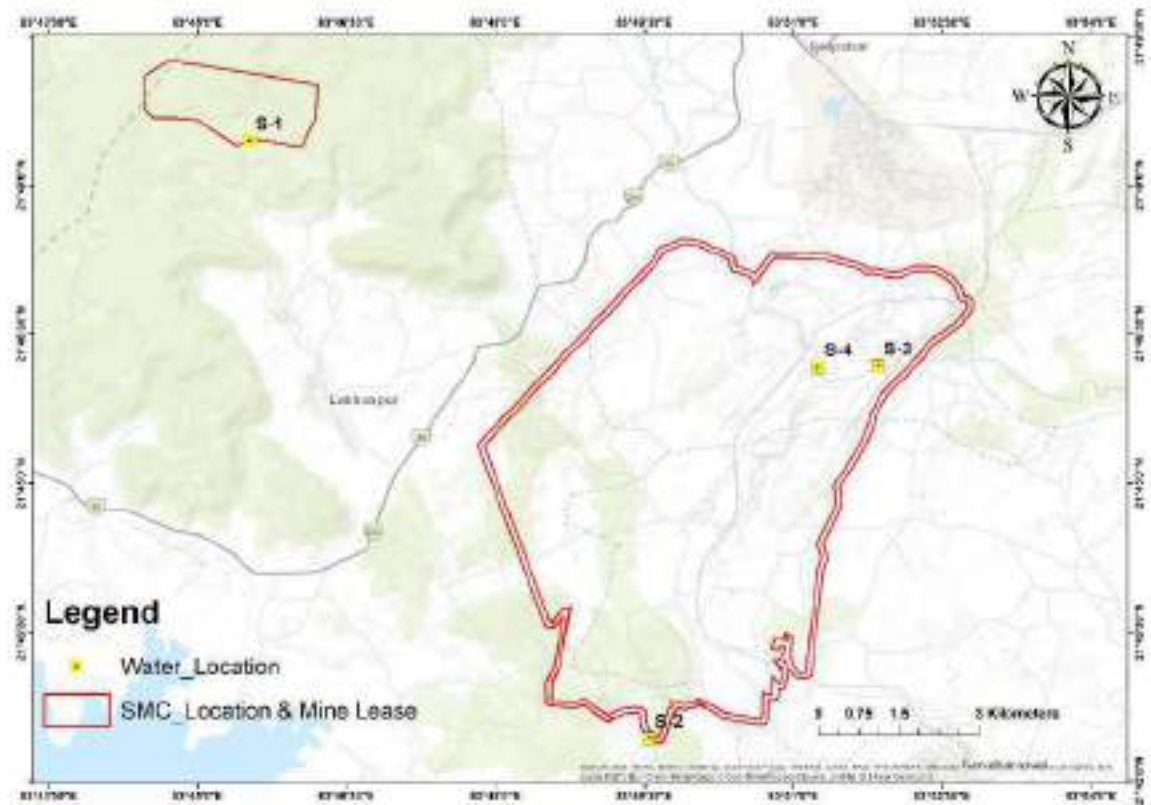
Sampling Location for Surface Water

Sl. No	Name of Sampling Locations	Latitute	Longitude
01.	S-1	83.7588	21.8075
02.	S-2	83.8258	21.7072
03.	S-3	83.8642	21.7698
04	S-4	83.8542	21.7695

Fig 4.6: Water Sampling locations

4.8.5 CHARACTERISTICS OF SURFACE WATER SAMPLES

The Physicochemical characteristics of water samples collected locations have been presented here under:



➤ **Physico-Chemical Characteristics Of Water Quality**

Table 4.4 : Analysis result of Mine Water and Surface water**Area :
Stations:****Lakhanpur****Project:****Lakhanpur****Date of Sampling:**

1. Lakhanpur Mine Water Darlipali

14/03/2024

2. Lakhanpur Mine Water

14/03/2024

Sl.No.	Parameter	Sampling Stations			Detection Limit	MOEF -SCH-VI STANDARDS Class 'A'	BIS Standard & Method
		1	2				
1	Ammonical Nitrogen, mg/l	0.30	0.23		0.02	50.0, Max	IS 3025/34:1988, R : 2009, Nessler's Method
2	Arsenic (as As), mg/l	<0.002	<0.002		0.002	0.2 , Max	IS 3025/37:1988 R : 2003, AAS-VGA
3	B.O.D (3 days 27°C), mg/l	<2.00	<2.00		2.00	30.0 , Max	IS 3025 /44:1993, R:2003 3 day incubation at 27°C
4	Cadmium(as Cd), mg/l	<0.0004	<0.0004		0.0004	2.0, Max	APHA, 23rd Edition 3120 B ICP Method, 2017
5	COD, mg/l	16	8		4.00	250.0, Max	APHA, 23rd Edition, Closed Reflux, Titrimetric Method: 2017
6	Copper (as Cu), mg/l	<0.02	<0.02		0.02	3.0 , Max	IS 3025/42: 1992, R : 2009, AAS (Air-Ac-Flame)
7	Dissolved Phosphate (as PO_4^{3-}) mg/l	<0.30	<0.30		0.30	5.0 , Max	APHA, 23rd Edition Molybdovanadate Method, 2017
8	Fluoride (as F^-) mg/l	0.38	0.22		0.02	2.0 , Max	APHA, 23rd Edition, SPADNS Method, 2017
9	Free Ammonia, mg/l	<0.02	<0.02		0.02	5.0 , Max	IS:3025/34:1988, Nessler's
10	Hexavalent Chromium (as Cr^{+6}), mg/l	<0.01	<0.01		0.01	0.1, Max	APHA, 23rd Edition, Diphenylcarbohydrazide
11	Iron (as Fe), mg/l	<0.04	<0.04		0.04	3.0 , Max	IS 3025 /53: 2003, R : 2009 , AAS-(Air-Ac-Flame)
12	Lead (as Pb), mg/l	<0.001	<0.001		0.001	0.1, Max	APHA, 23rd Edition 3120 B ICP Method, 2017
13	Manganese(as Mn), mg/l	<0.01	0.87		0.01	2.0 , Max	IS-3025/59:2006, AAS (Air-Ac-Flame)
14	Nickel (as Ni), mg/l	<0.003	<0.003		0.003	3.0 , Max	APHA, 23rd Edition 3120 B ICP Method, 2017
15	Nitrate Nitrogen (as $\text{NO}_3\text{-N}$) mg/l	0.50	0.70		0.50	10.0 , Max	APHA, 23rd Edition, UV-Spectrophotometric Method, 2017
16	Oil & Grease, mg/l	<2.00	<2.00		2.00	10.0, Max	IS 3025/39:1991, R : 2003, Partition Gravimetric Method
17	pH value	7.51	7.59		1.0	5.5 to 9.0	IS-3025/11:1983, R-1996, Electrometric Method
18	Phenolic compounds (as $\text{C}_6\text{H}_5\text{OH}$),mg/l	<0.001	<0.001		0.001	1.0 , Max	APHA, 23rd Edition, 4- Amino Antipyrine Method, 2017
19	Selenium (as Se), mg/l	<0.0005	<0.0005		0.0005	0.05, Max	APHA, 23rd Edition 3120 B ICP Method, 2017
20	Sulphide (as S^{2-}), mg/l	<0.005	<0.005		0.005	2.0 , Max	APHA, 23rd Edition Methylene Blue Method, 2017
21	Temperature (°C)	24.3	24.5		Shall not exceed 5° C above the receiving temp.		IS-3025/09:1984, R;2002, Thermometric
22	Total Chromium (as Cr), mg/l	<0.002	<0.002		<0.002	2.0 , Max	APHA, 23rd Edition 3120 B ICP Method, 2017
23	Total Kjeldahl Nitrogen, mg/l	2.8	1.4		1.00	100.0 , Max	APHA, 23rd Edition, Kjeldahl Method: 2017
24	Total Residual Chlorine, mg/l	<0.02	<0.02		0.02	1.0 , Max	APHA, 23rd Edition, DPD Method, 2017
25	Total Suspended Solids, mg/l	33	27		10.00	100.0 , Max	IS 3025/17:1984, R :1996, Gravimetric Method
26	Zinc (as Zn), mg/l	<0.005	0.012		0.005	5.0 , Max	IS 3025 /49: 1994, R : 2009, AAS (Air-Ac-Flame) 1984

Area :	Amrapali	Project:	Amrapali
Stations:	1. Pikot River Water 2. Lakhanpur River Water	Date of Sampling:	13/03/2024 14/03/2024

Sl.No	Parameter	Sampling Stations				Detection Limit	BIS Standard & Method
		1	2	3	4		
1	Arsenic (as As), mg/l	<0.002	<0.002			0.002	IS 3025/37:1988 R : 2003, AAS-VGA, Method
2	BOD (3 days 27°C), mg/l	<2.0	<2.0			2.00	IS 3025 /44: 1993, R: 2003 3 day incubation at 27°C
3	Cadmium(as Cd), mg/l	<0.0004	<0.0004			0.0004	APHA, 23rd Edition AAS-GTA Method, 2017
4	Chlorides (as Cl ⁻), mg/l	2	10			2.00	IS-3025/32:1988, R-2007, Argentometric Method
5	Copper (as Cu), mg/l	<0.02	<0.02			0.02	IS 3025/42: 1992, R : 2009, AAS (Air-Ac-Flame)
6	Disolved Oxygen	6.7	6.0			0.10	IS 3025/38: 1989, R:2003, Winkler Azide Method
7	Fluoride (as F ⁻) mg/l	0.07	0.22			0.02	APHA, 23rd Edition, SPADNS Method, 2017
8	Hexavalent Chromium, mg/l	<0.01	<0.01			0.01	APHA, 23rd Edition, Diphenylcarbohydrazide, 2017
9	Iron (as Fe), mg/l	0.10	<0.04			0.04	IS 3025 /53: 2003, R : 2009, AAS (Air-Ac-Flame)
10	Lead (as Pb), mg/l	<0.001	<0.001			0.001	APHA, 23rd Edition AAS-GTA Method, 2017
11	Nitrate (as NO ₃ ⁻), mg/l	0.50	3.72			0.50	APHA, 23rd Edition, UV - Spectrophotometric, 2017
12	pH value	7.3	7.2			1.0	IS-3025/11:1983, R-1996, Electrometric Method
13	Phenolic compounds (as C ₆ H ₅ OH), mg/l	<0.001	<0.001			0.001	APHA, 23rd Edition, 4- Amino Antipyrine Method, 2017
14	Selenium (as Se), mg/l	<0.0005	<0.0005			0.0005	IS 3025/56:2003 AAS-VGA Method
15	Sulphate (as SO ₄ ⁻²) mg/l	20	551			2.00	APHA, 23rd Edition Turbidity Method, 2017
16	Total Dissolved Solids, mg/l	34	663			25.00	IS 3025 /16:1984 R : 2006, Gravimetric Method
17	Total Suspended Solids, mg/l	11	18			10.00	IS 3025 /17:1984, R :1996, Gravimetric Method
18	Zinc (as Zn), mg/l	0.006	0.030			0.005	IS 3025 /49: 1994, R : 2009, AAS (Air-Ac-Flame)

4.8.6 RESULTS & DISCUSSION

The physicochemical characteristics of the surface water samples collected from the 3 locations have shown great resemblance with respect to the characteristics like temperature, turbidity, pH, color, odor, chloride, sulphate, total alkalinity, total hardness, TDS and heavy metals, etc.

From the results presented above in, it may safely be concluded that the Physico-chemical characteristics of the surface water samples had a good

resemblance with respect to almost all the parameters.

4.8.7 Groundwater Quality

The suitability of groundwater for drinking/irrigation/industrial purposes is determined keeping in view the effects of various chemical constituents present in water. The ranges of different chemical constituents present in groundwater in nearby villages are given in Table 4.5.

Table – 4.5 : Groundwater Quality Data

	Lakhanpur Block	Indian Drinking Standards (IS-10500):2012	
	Village Kanaktura Dug well	Acceptable	Permissible
Date of Sampling	Apr-2019		
p H	7.9	6.5-8.5	No Relaxation
EC ($\mu\text{S}/\text{cm}$ at 25 °C)	250	-	-
TDS (mg/L)	130	500	2000
TH (mg/L as CaCO_3)	94	200	600
TA (mg/L as Ca CO_3)	44	200	600
Ca (mg/L)	24	75	200
Mg (mg/L)	8	30	100
Na (mg/L)	12	-	-
K (mg/L)	2.4	-	-
CO_3 (mg/L)	0	-	-
HCO_3 (mg/L)	54	-	-
Cl (mg/L)	36	250	1000
F^- (mg/L)	0.1	1	1.5

Source: CGWB

It is observed from the table below, shows that groundwater in both the stations are fit to be used for drinking purposes.

The suitability of groundwater for Irrigation purposes is an important aspect in this study. Good water quality promotes better plant growth. But when concentration of ions, are found in excess in the water, it affects the plant growth and reduces the plant yield. Sodium Adsorption Ratio (SAR) SAR is an expression pertaining to cation makes up of water and soil solution and is used for characterizing the sodium hazard of irrigation water. The main problem with high sodium concentration is its effect on soil permeability & water irrigation. Sodium also

contributes directly to the total salinity of the water and may be toxic to sensitive crops such as fruit trees. SAR is calculated from the following equation-

$$SAR = Na^+ / ((1/2)(Ca^{2+} + Mg^{2+}))^{1/2},$$

where Na^+ , Ca^{2+} and Mg^{2+} are all measured in meq/L (milliequivalents per liter).

Sl. No	Location	pH	EC	Na	K	Ca	Mg	HCO ₃	Cl	SO ₄	SAR	%NA	RSC	Mg Hazard
1	Charpali	7.6	402	43	12	27	6	150	50	17	1.94	54.06	0.61	27.03
2	Kanaktura	7.9	546	36	22	34	20	137	75	16	1.21	38.74	-1.12	49.50
3	Kandijharan	8.2	401	30	16	24	14	120	60	12	1.20	42.01	-0.40	49.30
4	bikampali	7.1	460	43	8	42	18	200	46	30	1.39	36.56	-0.32	41.67
5	Rengali	7.5	289	29	5	20	7	50	53	27	1.42	46.73	-0.76	36.84
6	Machida	8.3	951	90	65	60	30	315	195	56	2.36	50.36	-0.34	45.45
7	Jamgaon	7.3	640	60	25	52	9	150	110	38	2.02	49.24	-0.89	22.39
8	Kuremal	7.1	1390	118	4	114	41	330	305	15	2.40	36.47	-3.71	37.48
9	Kodapada	8	680	68	5	40	22	260	85	30	2.14	44.59	0.43	47.83
10	Durga	8.4	378	19	14	34	12	150	32	16	0.71	30.50	-0.24	37.04
11	Bagmunda	8.8	812	20	11	26	32	215	113	8	0.62	22.50	-0.44	67.23
12	Pandra	7.3	360	34	6	20	8	120	30	18	1.62	49.48	0.30	40.00
13	Lakhanpur	8.4	300	25	6	21	10	200	25	5	1.12	39.72	1.40	44.25
14	Kudloi	7.9	515	29	3	34	14	165	64	18	1.05	31.82	-0.16	40.70
15	Ubda	8.1	390	43	16	20	8	110	35	30	2.05	57.77	0.14	40.00
16	Kursoloi	8.6	195	16	4	28	1	100	23	4	0.81	34.99	0.16	5.62
17	Kumarbandha	7.5	220	14	6	20	6	90	25	9	0.70	33.70	-0.02	33.33
18	Piplikani	8	425	30	3	38	12	200	30	7	1.08	32.26	0.38	34.48
19	Sarandamal	7.1	656	47	10	50	22	225	45	12	1.39	34.67	-0.64	42.31
20	Karpabahal	7.2	467	36	6	45	8	120	30	30	1.30	37.08	-0.95	22.86

*All concentration are in mg/l, except pH, EC(μ S/cm), SAR and RSC (meq/l)

Source: Suitability of groundwater for irrigation in Lakhanpur Block, Pattnaik AK, Environment Conservation Journal, Pg 101-104, 2008

On the basis of above data and guidelines of groundwater quality for groundwater, the water in Lakhanpur Block is found to be suitable for agricultural purpose.

Figure 4.7 Chemical quality analytical results of major elements from all key wells, Lakhanpur Block (2019)

Block	VILLAGE	Long	Lat	EC $\mu\text{S}/\text{cm}$	Cl	NO_3^-	F	TDS*	Hardness	Alkalinity	Ca^{++}	Mg^{++}	Na^+	K^+	CO_3^{--}	HCO_3^-	SO_4^{--}
Lakhanpur	Kadamdihi	83.696	21.763	600	70	5	0.12	297	252	178	50	31	19	3.6	0	217	17
Lakhanpur	Machida	83.606	21.817	1260	187	43	0.28	688	327	302	46	52	82	95	0	368	46
Lakhanpur	Kandeikela	83.473	21.687	1870	352	6	0.29	981	589	322	54	110	108	83	0	393	81
Lakhanpur	Dhulunda	83.504	21.702	1840	223	38	0.33	969	520	440	107	61	115	115	0	537	85
Lakhanpur	Kanakatura	83.495	21.785	250	36	5	0.1	130	94	44	24	8	12	2.4	0	54	21
Lakhanpur	Beheramal	83.783	21.711	480	49	12	0.17	241	173	104	44	15	19	17	0	127	34
Lakhanpur	Remanda	83.828	21.693	2020	556	44	0.4	1093	703	109	123	96	136	5.7	0	133	111
Lakhanpur	Arhapada	83.846	21.712	960	141	46	0.1	477	337	188	50	52	53	20.6	0	229	49
Lakhanpur	Uburha	83.834	21.744	260	36	41	0.1	116	89	30	30	3	12	8.5	0	36	8
Lakhanpur	Kumbharabandh	83.919	21.696	1070	197	46	0.6	537	396	153	71	53	58	7.5	0	187	59
Lakhanpur	Govindpur	83.922	21.668	450	36	4	1.27	224	124	163	28	13	43	2.8	0	199	4
Lakhanpur	Tilia	83.929	21.640	550	27	1	0.44	267	218	228	54	20	24	2	0	278	3.5
Lakhanpur	Singhaipali	83.906	21.622	1270	168	46	1.18	630	475	262	62	78	70	3.3	0	320	92

Source: CGWB

CHAPTER-5

Soil Moisture Index and Soil loss estimation

CHAPTER-5

SOIL MOISTURE INDEX AND SOIL LOSS ESTIMATION

5.0 DRONE SURVEY

In Lakhanpur Belpahar Lilari coal block, CMPDI undertook UAV based survey for generation of high resolution orthomosaic image, DTM, DSM, and contour map of the proposed area for SMC study. The study area has been selected after a discussion with DFO, Jharsuguda. The total area covered by two .kml files were 336 Ha near Simlibahal & Pikol area and two small patches of 19.75 ha & 12.86 Ha area near Beheramal. The first area lies in the dense forest area of Simlipal whereas the second area or the two small patches lies near the coal mines of Khaliapali.

Location of study area for UAV survey has been illustrated in the map (Fig 5.1). GCPs has been precisely measured on the ground using Leica DGPS, and the post-processing of the data has been done using Survey office software. As the area lies in the forest, number of GCPs had been restricted by approachability issues.





Fig 5.1: Location map and GCP plan of the study area

5.1 METHODOLOGY FOR DRONE SURVEY

Small category Vertical take-off and Landing VTOL 25V battery operated fixed wing UAV with more than 60 min endurance along with bottom mounted photogrammetry camera as payload has been used by CMPDI for this project (Fig 5.2). The total weight of the drone was near about 10 kg. Considering the topography and forest cover in the area, drone based optical sensor was used for accurate results.

Flight planning has to be executed prior to drone survey. For this, KML of study area has been prepared using Google Earth (Fig -5.1). Then GCPs planned in such a way that it should be approachable and well distributed within the study area. Proper marking of GCPs has been done in the ground, so that later they could be identified in the drone image.



Fig 5.2: Image of VTOL fixed wing UAV

The take-off location or the home location has been chosen in a flat open surface, on the bridge, near the study area (Fig – 5.2). The radio antenna with the signal range of 5 km and ground control station has been set up near the home location. The two areas were quite far from each other. Hence, two take off locations, for two areas has been carefully chosen in such a way that UAV can cover the entire area, without having signal loss with the Ground Control Stations (GCS). After planning and placing all the GCPs in the ground, flight planning has been done using GCS software. For this project, the flying height has been kept at 120 m. A sample drone image showing the trees has been shown below (Fig 5.3).



Fig 5.3: Sample drone image of the area

The final flight plan has been uploaded in the drone auto pilot before every single flight. After completion of a single flight, the POS data, which stores the positional information and image timing in excel format has been downloaded from the drone autopilot. The images from memory card have also been copied and stored sequentially in a folder. All the images acquired through UAV survey has been processed using Pix 4D software. DGPS location of the GCPs has been used during data processing for geo-referencing of the images and generation of orthomosaic as well as DTM (Fig 5.4). DEM extraction has been done by Global Mapper software.

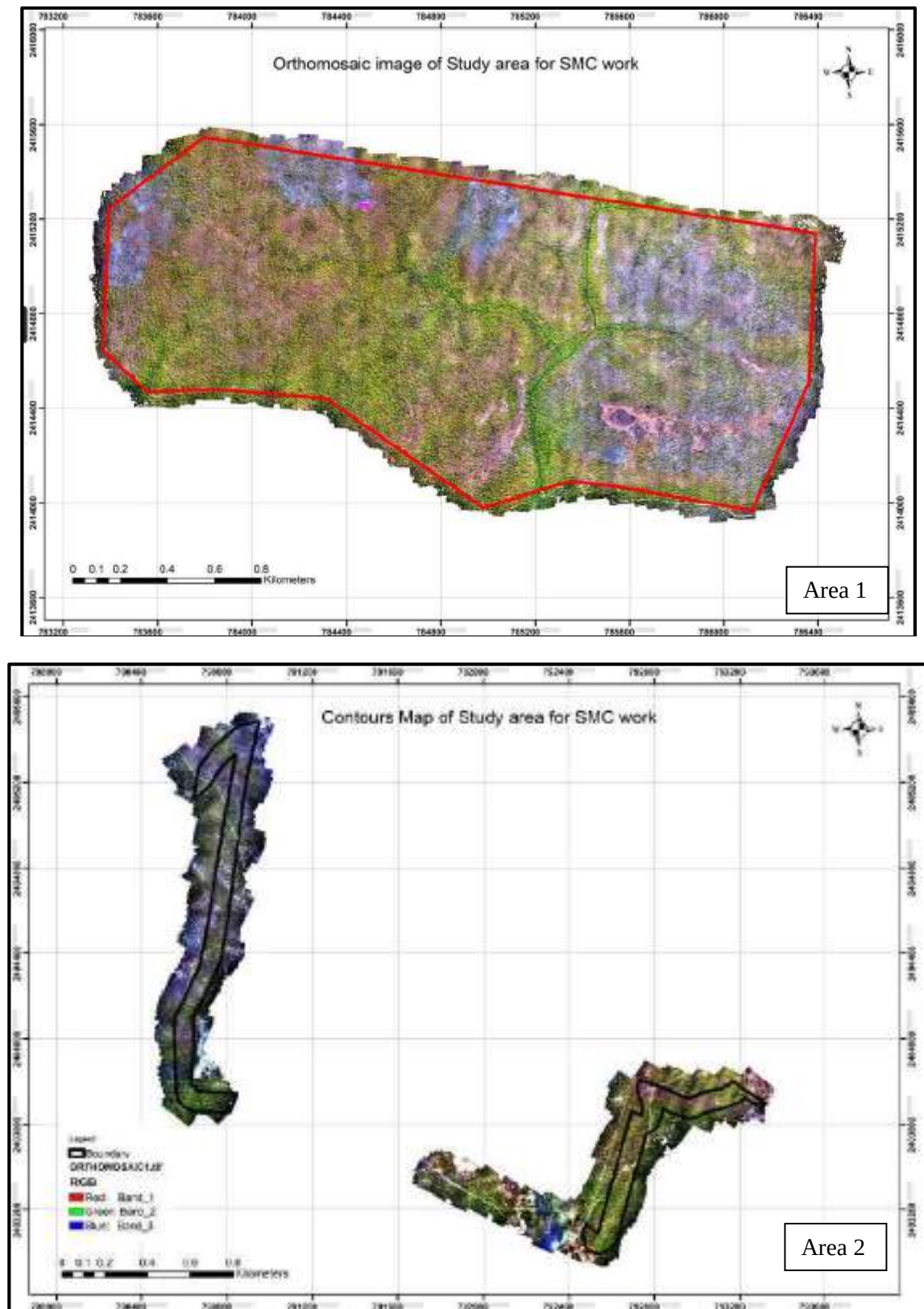


Fig 5.4: Orthomosaic of the study area

Contour map of 5 m interval has also been generated as the final output (Fig 5.5).

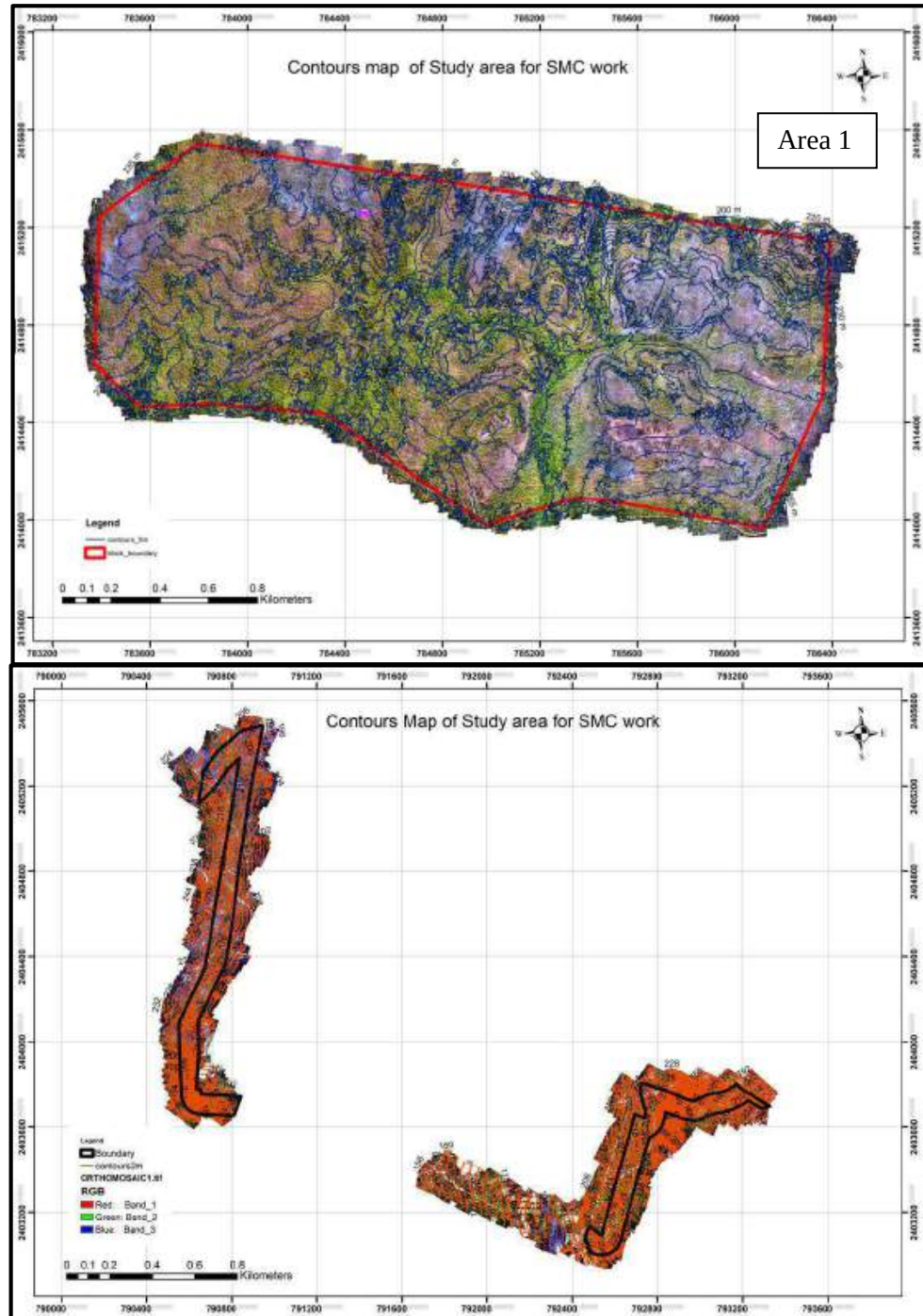


Fig 5.5: contour map of the study area

5.2 LAND USE OF STUDY AREA

The proposed area for soil moisture conservation is 332 Ha of land which can be categorized into three main categories based on signatures got through LISS-IV images (Fig-5.6) having a resolution of 5.5 m. The image was taken on 23-02-24. Based on assessment of satellite data, a total of 283 ha of land falls in the dense forest land category where some high vegetation was available, 45 ha of land falls under degraded land where less vegetation has been noticed and 4 ha of land falls under the open land area where very less or no vegetation was available. Although in the study area seasonal stream was also present but it cannot be deducted as the waterbody as they were covered under the green-cover of forest which cannot be distinguished for land use & land cover purpose. Although in orthomosaic image which was taken in April-2024 had shown heavy degraded land where soil conservation is needed. The reason for this difference is 1) the resolution of drone survey data is very fine and it could easily differentiate the objects on the surface. 2) In the April period many of seasonal plant growth get diminished due to the harsh weather condition.

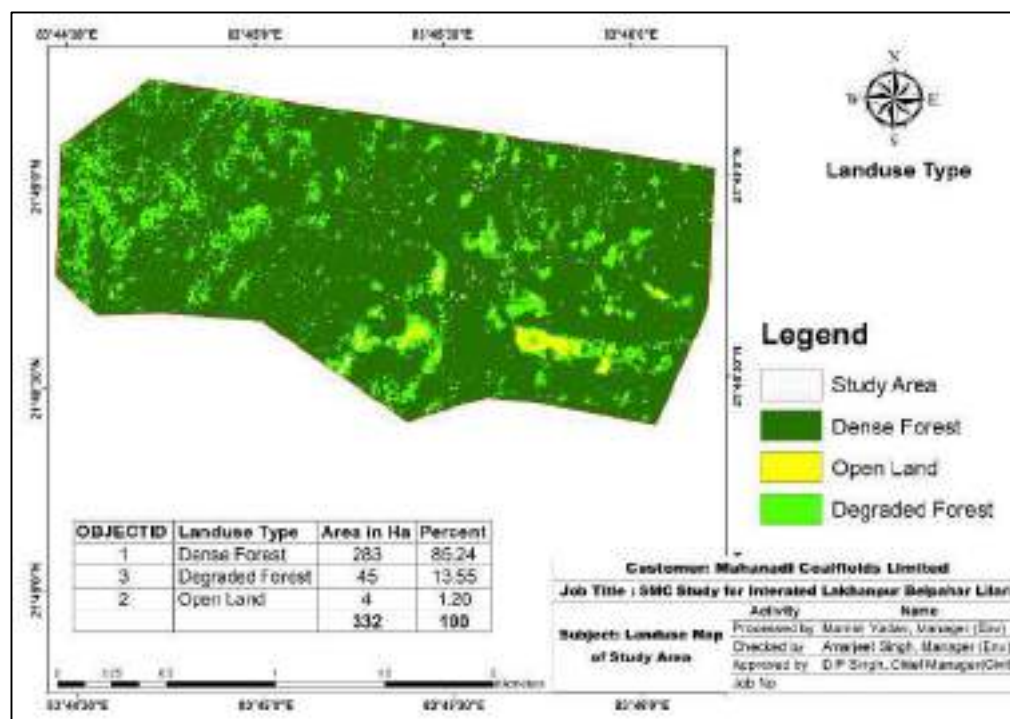


Fig-5.6 Land use map of the study area using LISS-IV satellite image (23-02-2024)

The drainage map of the study area has been shown in fig-5.7-a. It can be depicted from the figure 5.7-a that the flow direction of all the streams is from the north direction to the south direction. Majorly one stream is flowing from north to south direction in the proposed study area which is mainly either of fourth order or third order, all other streams are of first order or second order.

The topography of study area is hilly type. The elevation in study area varies from 293 m to 175 m (fig-5.7-b&c). East side of study area is elevated and slope is towards the west side.

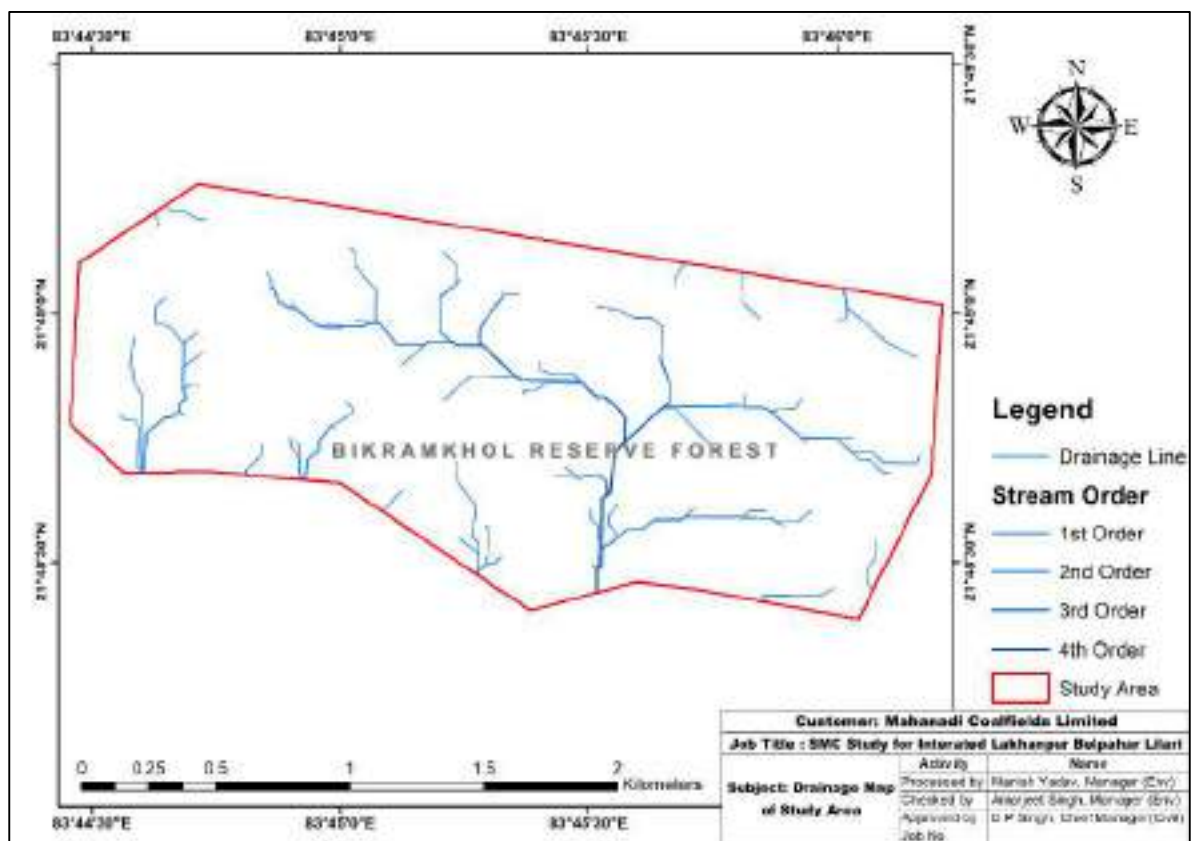


Fig-5.7(a): Drainage map of the study area

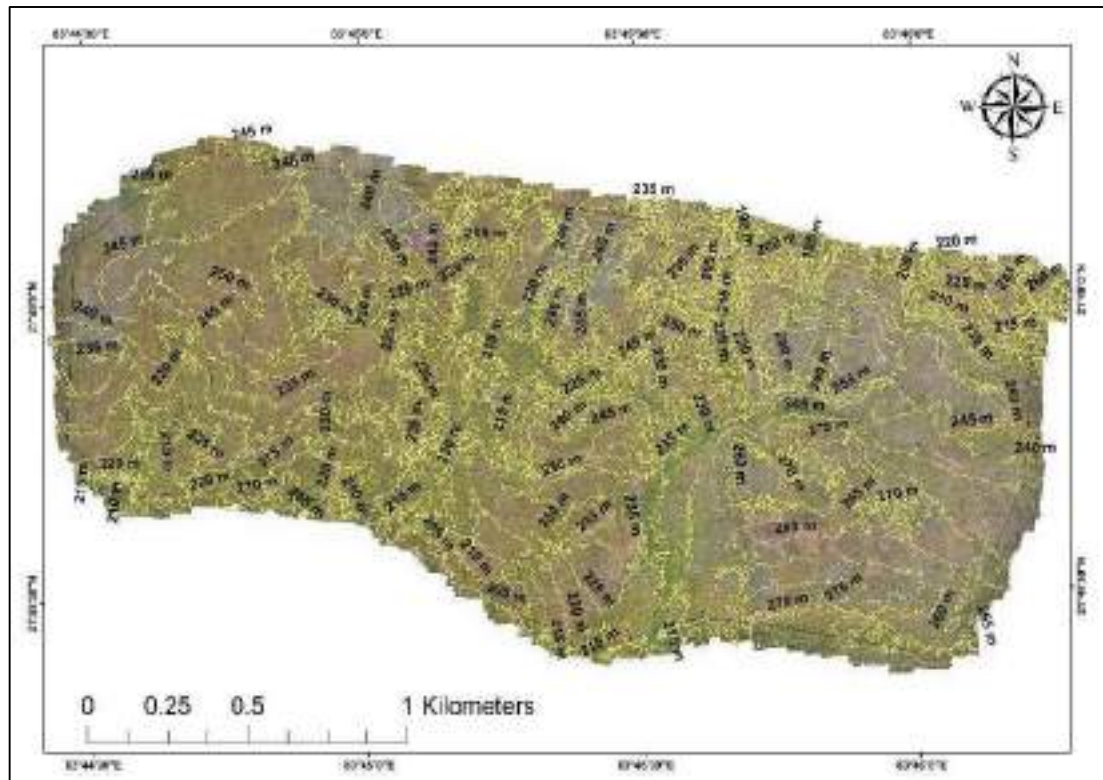


Fig-5.7(b): Contour map of the study area

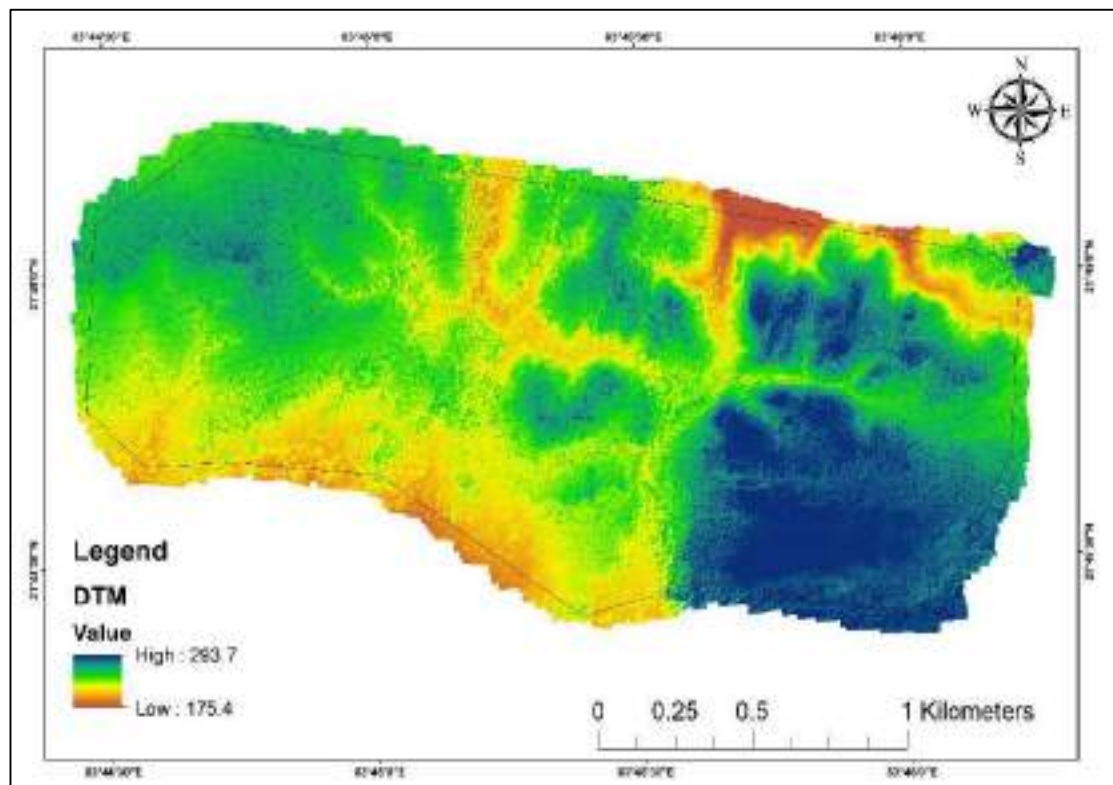


Fig-5.7(C): Digital Terrain Model of Study Area

5.3 SOIL MOISTURE INDEX

5.3.1 INTRODUCTION

Soil moisture is a key parameter that directly or indirectly influences the water cycle. The existence of forest cover and agriculture production mainly depend on rain fed areas as well as irrigation practices of the area. Climate change and the trend of increasing temperatures have a significant impact on forest cover. It is linked to various hydrological phenomena, such as drought, climate, and vegetation. The data collected for soil moisture analysis taken below the surface over the long term as well as higher temporal and spatial resolution data are valuable for assessing the extent and severity of drought quite accurately. Surface soil moisture is very sensitive and varies with space and time. Various studies have been done to assess soil moisture. Two methods of soil moisture measurement through remote sensing are based on the microwave part of the electro-magnetic spectrum and thermal, infrared observation.

In situ measurements can provide an accurate estimation of soil moisture, but they are both time-consuming and expensive, and only represent a small area (a few square decimeters). Nevertheless, a number of strategies can be adopted to upscale the spatially sparse ground-based observations, which are invaluable for calibrating and validating land surface models and satellite-based soil moisture retrievals.

The soil moisture index (SMI) is defined as the proportion of the difference between the current soil moisture and the permanent wilting point to the field capacity and the residual soil moisture. The index values range from 0 to 1 with 0 indicating extreme dry conditions and 1 indicating extreme wet conditions.

5.3.2 METHODOLOGY

The soil moisture index is based on empirical parameterization of the relationship between land surface temperature (LST) and normalized difference vegetation index (NDVI) and calculated using Equation (5.1)

$$SMI = (LST_{max} - LST) / (LST_{max} - LST_{min}) \quad 5.1)$$

where LST_{max} and LST_{min} are the maximum and minimum surface temperature for a given NDVI and LST is Land Surface Temperature. The surface temperature of a pixel for a given NDVI is derived using remote sensing data. LST_{max} and LST_{min} are calculated using Equations (5.2) and (5.3), respectively.

$$LST_{max} = a1 * NDVI + b1 \quad 5.2)$$

$$LST_{min} = a2 * NDVI + b2 \quad 5.3)$$

where $a1$, $a2$, $b1$, and $b2$ are the empirical parameters obtained by the linear regression (a present slope and b present intercept) defining both warm and cold edges of the data. First step in SMI calculation is the conversion of digital number (DN) to spectral radiance (L W/m²/sr/μm) using Equation (5.4):

$$L = LST_{min} + (((LST_{max} - LST_{min}) / (QCAL_{max} - QCAL_{min})) * (DN - QCAL_{min})) \quad \text{---(5.4)}$$

where, LST_{min} and LST_{max} are spectral radiance calibration constants (Table 5.1); $QCAL_{max}$ and $QCAL_{min}$ are the highest and lowest quantized calibration pixel values, and DN is the Digital Number.

Table 5.1

Spectral radiance (L_{min} and L_{max}) values for thermal bands of Landsat imagery.(May-2022)

Landsat 5 (Band 6)		Landsat 8 (Band 10 and 11)	
Radiance maximum	Radiance minimum	Radiance maximum	Radiance minimum
1.238	15.303	0.1003	22.0018

Two inputs must be calculated (LST and $NDVI$) to be able to calculate LST_{max} and LST_{min} . LST (K) is calculated using Landsat 5 and Landsat 8 Thermal bands using Equation (5.5):

$$LST = Tb / [1 + (\lambda * Tb / C2) * \ln(\epsilon)] \quad (5.5)$$

where Tb (Equation (5.6)) is At-Satellite Brightness Temperature, λ is the wavelength of emitted radiance, $C2 = 1.4388 * 10^{-2}$ m K and it is presented with

Equation (5.7) and ϵ is emissivity (typically 0.95).

$$Tb = (K2/(\ln (K1 * \epsilon/L + 1))) \quad (5.6)$$

where $K1$ is the sensor-dependent calibration constant 1 and $K2$ is the sensor-dependent calibration constant 2 (Table 5.2). E is emissivity (typically 0.95), and L is the spectral radiance.

$$C2 = h * c/s \quad (5.7)$$

where, h is Planck's constant = 6.626×10^{-34} J s; c is the velocity of light = 2.998×10^8 m/s, and s is the Boltzmann constant = 1.38×10^{-23} J/K.

Table 5.2
Landsat 5 and 8 thermal infrared (TIRS) thermal constant

Landsat 8 (Band 10)		Landsat 8 (Band 11)	
K1	K2	K1	K2
774.89	1321.08	480.89	1201.14

The ratio of the reflectivity differences for the NIR and the red band to their sum (NDVI) is calculated using Equation (5.8) :

$$NDVI = (NIR - Red)/(NIR + Red) \quad (5.8)$$

The final step in the data collecting is the determination of empirical parameters by linear regression. To do so, statistical software was developed which was able to process the data for the same pixel from two raster sets, LST and NDVI.

5.3.3 RESULTS AND DISCUSSION

NDVI (Figure 5.8) and LST (Figure 5.9) are calculated based on essential data to obtain SMI calculation. NDVI values vary in the range of -1 to 1 where negative value indicate the absence of vegetation or poor vegetative cover, while positive values show dense and good vegetative cover. LST values are the temperature of the surface which is measured in $^{\circ}\text{C}$. The SMI result is accessible

with the values range within 0 to 1, where values close to 1 are regions with a lower vegetation cover and surface temperature which indicates that the surface has low infiltration and present a higher amount of soil moisture. the values close to 0 are the areas with a major vegetation cover and surface temperature and present a low level of soil moisture and increased infiltration capacity of the soil surface.

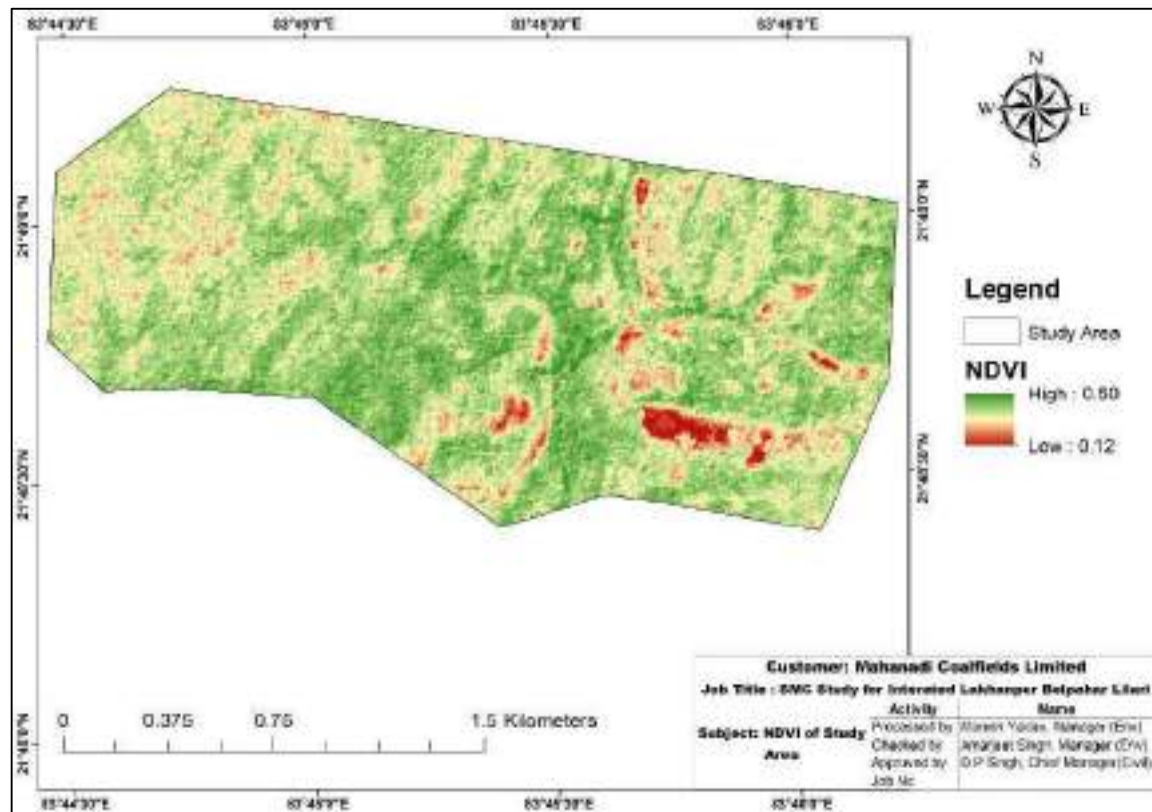


Figure 5.8: Normalized difference vegetation index (NDVI) map.

NDVI value in the study area is within the range of 0.12 to 0.50 as shown in Figure 5.8. Land surface temperature (Fig-5.9) value varies between a minimum of 28.84°C and a maximum of 34.76 °C. The results of the soil moisture index map (Fig-5.10) indicate the soil moisture index was in the range of 0.62 to 0.79 as classified in different color gradients. Most of the study area, as shown in Figure 5.10 (red and yellow color), has a value having moisture stressed compared to blue color. Although, the soil moisture index is showing better moisture condition but hilly terrain might be the reason for high

erosion of soil which further lead to degradation of green cover. Overall, it is better to provide conservation measures to the red zone identified in fig-5.10 for the better results.

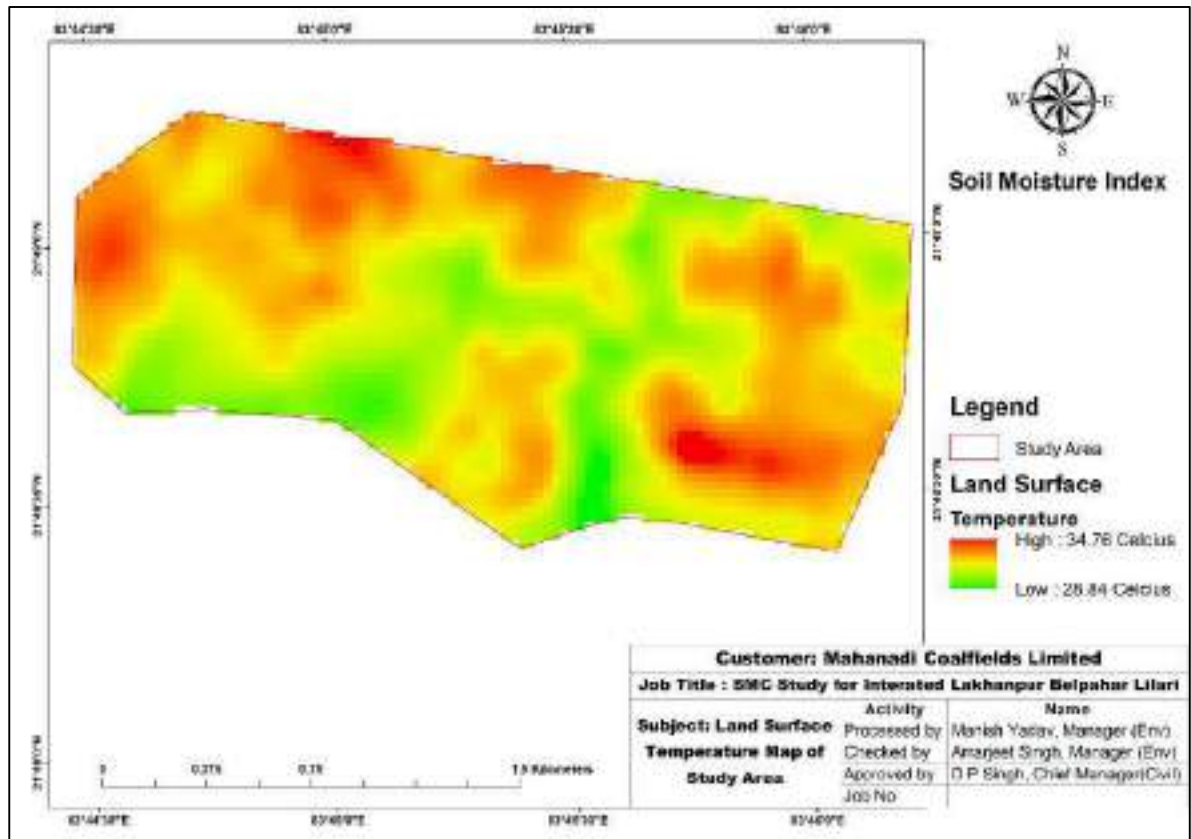


Figure 5.9: Land surface temperature (LST) map.

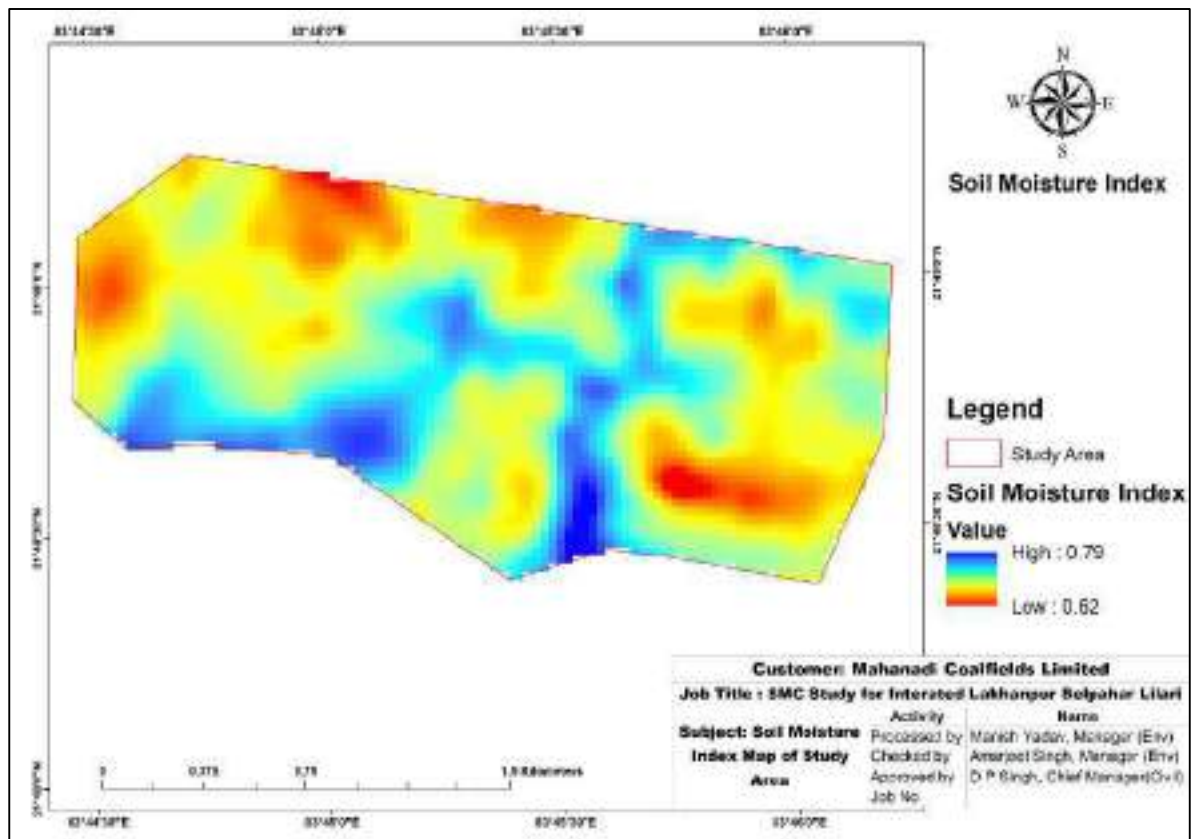


Figure 5.10.: Soil moisture index map of the study area

5.4 REVISED UNIVERSAL SOIL LOSS

5.4.1 SOIL EROSION PROCESS

Soil erosion is a quite complex phenomenon that is governed by some natural processes where the end result is decreased soil fertility, depleted water quality, and above all reduced crop yields or loss in vegetation. Biophysical factors that comprise soil, climate, ground cover, terrain, and their interactions modify the soil erosion process. Terrain characteristics that affect soil erosion include slope gradient, slope length, aspect, and shape. The runoff mechanism is greatly influenced by the slope gradient impact and aspect. As the slope gradient increases, the infiltration component reduces, and generated runoff runs down the slope, the end result is more erosion. Soil erosion is described as a natural geomorphic (both ends process whose occurrence on the land's surface is quite continuous, and above all, it is more frequent and well distributed. This is because

the surface of the Earth is exposed to water, wind, ice action, and gravitational forces at various spatiotemporal scales. Soil erosion process is accelerated by anthropogenic perturbations and improper land use practices, whose impacts are felt on soil and environment. Farming, habitation, terracing, deforestation, and overgrazing are some of the activities which lead to increased soil erosion rates. Soil erosion process has three distinct phases: detachability, transportability, and deposition. Soil erosion process begins with detachment, where breakdown of soil particles occurs due to raindrop impact, shearing, and/or the drag force possessed by wind or even through forces that result from tillage activities. Detached soil particles are transported and thereafter get deposited as the force of the eroding agent subsides.

Water-induced soil erosion is reported to be the most extensive among the other soil erosion causes. This form of erosion is much dependent on land cover, surface gradient, and type of soil. Water erosion has a significant contribution to depletion of organic matter content and important soil nutrients; hence, the functionality of the soil is largely affected. According to Pimentel, farmlands are washed at a rate of between 10 and 40 tonnes, which is much more than the rate of soil replacement. Water erosion has been identified as a worldwide problem because of the interrelationship between natural resources, population, and climate change.

5.4.2 SOIL EROSION MODELS

Soil erosion models make use of mathematical expressions so as to relate dominant parameters and processes that occur on land's surface. The parameters involved include terrain characteristics, soil properties, land use/land cover, and weather variables. Soil erosion models describe detachment, transport, and deposition phases, which comprise the soil erosion process. Soil erosion models serve as important tools for planning because they enable the prediction of soil loss. Above all, models create a clear understanding of the entire soil erosion phenomenon and the resulting impacts. However, the choice of appropriate models for a particular soil erosion study is based on the objectives, catchment

characteristics, and data available on the model's efficiency. Consequently, models differ based on complexity, involved processes, and data required to calibrate and use the model. In this study empirical model Revised Universal Soil Loss Equation (RUSLE).

5.4.3 REVISED UNIVERSAL SOIL LOSS EQUATION (RUSLE)

RUSLE model is a good example of an empirical model which is well recognized, widely accepted, and very much implemented in soil erosion studies. It is derived from the USLE model, and its application spans over 40 years. The model was designed and developed by a team of high-ranking scientists and some soil conservationists having vast experience in matters relating to soil erosion. It comprises mathematical equations that quantify the average soil loss on an annual basis at different geospatial scales. Many researchers had cited it as the best technology ever for estimation of soil loss in undisturbed areas characterized by overland flow, land surface experiencing disturbance, and recently or already reclaimed lands. Additionally, the model is very well applicable in ungauged catchments, its demand for data is quite moderate, and above all, it integrates well with GIS enabling upscaling of the soil erosion process. The results of the RUSLE model are a representation of the sediment amount lost from a user-defined landscape. The superiority of the model is brought about by its prowess in accounting for different control management actions with minimal data requirements. The basic assumption that forms the foundation of the RUSLE model is that detachability and deposition processes are a function of sediment content. It is argued that until sediment load attains threshold capacity, soil detachment cannot occur. Therefore, the process of soil erosion is influenced by the flow carrying capacity and not by its source. Recent breakthroughs in spatial information technologies have augmented the prevailing methods in monitoring, analyzing, and above all managing resources. The spatial variation of soil erosion risk is brought about by heterogeneity in topography, geomorphology, geology, land cover, soil types, and land use. Such spatial variability of soil erosion parameters is easily and efficiently handled by geographic information systems

(GIS). The trend has improved the accuracy, costs, and scales of application. The state-of-the-art technology geographic information system provides essential mapping interpolation techniques for creating a database that comprises input datasets for modeling soil erosion. Management of large datasets is made easier with the use of GIS; therefore, such spatial techniques provide a basis for the management of land upon the estimation of soil loss rates. In RUSLE, soil loss is predicted by converting the input data (rainfall data, soil data, digital elevation model, and land use) into a geographical information system format, following which it is implemented in the geospatial framework.

Many researchers worldwide have adopted this methodology to carry out soil erosion studies at different spatial scales. For instance, the following researchers studied soil loss in catchment areas by applying the RUSLE model, GIS, and remote sensing. The studies revealed that, apart from estimating soil erosion, the methodology was found to be satisfactory in identifying areas that had higher soil erosion risks. Further, geospatial tools facilitated the extraction of important information, which was deemed critical in implementing plans for soil conservation.

5.4.4 RUSLE Model Parameterization.

The model quantifies average annual soil loss (A) using five important factors, notably rainfall erosivity (R), soil erodibility (K), slope length and slope steepness (LS), cover management (C), and support practice (P).

$$A = R \times K \times LS \times C \times P \quad (5.9)$$

Where, A is the mean annual soil loss in t/ha/yr, R is the rainfall erosivity (MJ mm/ha/yr), K is the soil erodibility factor (t-ha-h/ MJ/mm), LS is the slope length and slope steepness factor (dimensionless), C is the cover management factor (dimensionless), and P is the support practice factor (dimensionless).

Rainfall is a precondition for any form of water erosion to materialize. The amount and even intensity of rainfall are the two important attributes of rainfall. Waterborne erosion is more pronounced when the two rainfall attributes are on the higher side. The rainfall erosivity factor (R) quantifies the erosive power possessed

by rainfall, and it much depends on the rainfall's intensity and amount. The R factor is expressed as the sum of EI-values for each particular storm for a year and averaged over long periods of time (more than 20 years) so as to accommodate discernible recurring rainfall patterns. The abbreviation EI refers to the product of energy and maximum intensity of rainfall in 30 minutes. The amount of soil loss is proportional to the product of the total storm's energy, E (MJ/ha), and the storm's maximum intensity in a time of 30 min, I₃₀ (mm/h). The resulting product is known as the EI₃₀ index or commonly as the storm erosivity index expressed in MJmm/ha/h. The storm erosivity index reflects the amalgamated effect of soil particle dislodgement and runoff transportability to cause net erosion. The mean of the annual sums for the period under consideration gives the rainfall erosivity factor (R factor). Different researchers have developed equations from which the R factor has been derived and applied in different regions. For India following equation (5.10) can be used:

$$R = 50 + 0.389 \times P \quad (5.10)$$

Where, P is annual rainfall in mm

Table: 5.3 Annual rainfall of Jharsuguda as per IMD
(30-year average)

Month	Rainfall in mm
January	14.4
February	16.2
March	14.1
April	17.5
May	32.4
June	205.6
July	362.6
August	393.8
September	226.3
October	57.1
November	11.4
December	9.3
Total	1360.7

5.4.5 SOIL ERODIBILITY FACTOR (K).

Different soils show varying degrees of resistance to water-related erosion. Soil erodibility is an essential requirement when estimating soil loss and also when implementing soil conservation activities. The characteristics of soil and its properties have a pronounced influence on soil erosion. There is effect is well represented by the soil erodibility factor. Hence, the K factor is affected by a variety of the soil's physicochemical properties. The K factor is simply defined as the inherent susceptibility of soil-to-soil erosion. The RUSLE model identifies the distribution of particle size, permeability, organic matter content, and structure of the soil as the critical physicochemical properties which affect erodibility. Quantitative determination of physicochemical properties of soils is carried out using conventional procedures in laboratories. Generally, soils that have low silt levels have less erodibility regardless of high fractions of both sand and clay. Different K factor algorithms have been developed and applied based on suitability and requirement (Table 5.4).

Table: 5.4: K-Factor for different soil type

Sl no	Type of soil	K - Factor
1	Sand	0.02
2	Low Clay	0.05
3	High Clay	0.15
4	Sandy Soil	0.1-0.2
5	Silty Clay	0.26
6	Silty Loam	0.25-0.4
7	Silty Soil	0.4

5.4.6 TOPOGRAPHIC (LS) FACTOR

Slope length and slope steepness is the other main factor for estimating the soil loss which measures the sediment transport capacity of the flow. LS does not consider the 3D complexity of the topography but simply assumes soil loss increases with slope length and/or upslope contributing area. The LS- factor is calculated based on Eq. (5.11):

$$LS = \left(\text{Flow Accumulation} \times \frac{\text{CellSize}}{22.13} \right)^{0.4} \times \left(\frac{\sin(\text{Slope})}{0.0896} \right)^{1.3} \quad \text{-- 5.11}$$

The slope length (L) and slope steepness (S) define the landscape's topography, which mostly influences the extent of soil erosion. L and S are the two most important parameters with regard to soil erosion modeling and most importantly when calculating the transporting power of surface runoff. The LS factor, therefore, combines the effects of slope length and slope steepness, both of which account for the landscape's topographical effects on erosion. Hence, terrain effects on erosion processes are accounted for by the LS factor within the RUSLE model. Soil erosion is noted to increase when both the slope angle and length increase. This explains the sensitivity of terrain effects on soil erosion, and therefore determination of the LS factor needs to be accurate.

5.4.7 COVER MANAGEMENT FACTOR (C).

Vegetation cover ranks second behind terrain effects in influencing soil erosion rate. The parameters that define vegetation cover are mainly ground cover and plant canopy cover, respectively. Spatial distribution of vegetation cover fraction requires accurate estimation and is of utmost importance in soil erosion matters. Vegetation cover prevents the soil from the impact of raindrops by dissipating the amount of energy they possess before reaching the soil surface. Moreover, vegetation cover intercepts rainfall, thereby encouraging more infiltration. In the RUSLE model, vegetation cover effects are accounted for by the cover management factor (C). The C factor is defined as the ratio of soil lost from cropped land under specified conditions to that lost from bare soil. It is much influenced by vegetation type, growth stage, and percent cover. The crop management factor is indicative of the influence of vegetation cover and specified management practices on soil erosion. The values have a range of between 0 and 1 depending on land cover types. C factor strongly relates to vegetation cover because it can be influenced by human beings to reduce erosion. The C factor is derived based on prior land uses, canopy shading factor, percent soil cover by crop

remains, soil surface roughness, and above all soil moisture. Within the RUSLE model, the crop management factor is calculated using some empirical relationships that contain ground cover information. Satellite image information is an important input in the preparation of land cover maps, and as such, it has become an integral component in natural resources management. Traditionally, the C factor values have been spatially estimated by assigning values to land cover classes identified using remote sensing. Researchers have developed numerous methods for estimating the C factor based on normalized difference vegetation index (NDVI) for the assessment of soil loss using the RUSLE model. These methods make use of regression analysis to establish the correlation between C factor values (obtained from fieldwork or developed guide tables) and NDVI values obtained from remote sensing images. The regression equations (linear/ nonlinear) are generated by correlating NDVI values with corresponding C factor values (Eq-5.12).

$$C = 0.431 - 0.805 \text{ NDVI} \quad \text{-- 5.12}$$

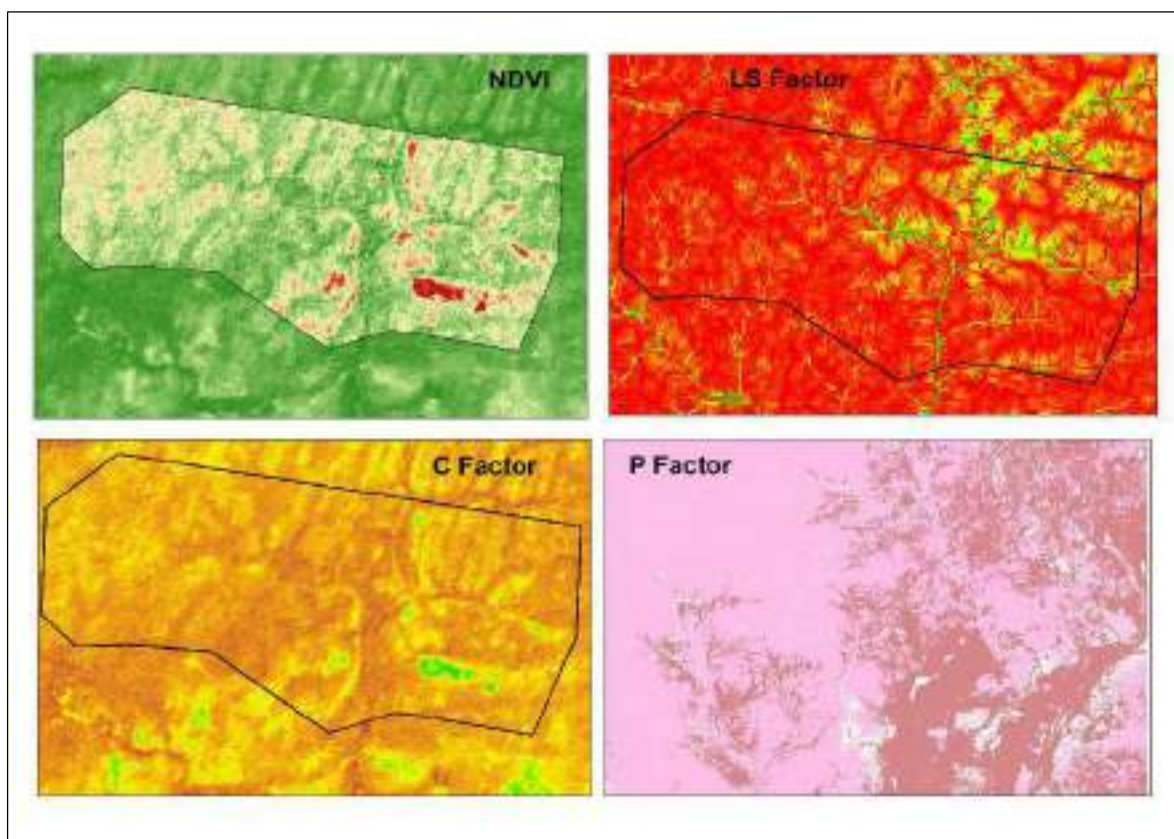
5.4.8 SUPPORT PRACTICE FACTOR (P).

Support Practice Factor (P). The support practice (P) factor is regarded as one of the most uncertain factors of the RUSLE model. &e support practice factor relates strongly to the cover management factor because both reflect positive impacts resulting from management interventions in controlling soil erosion. The two factors differ in that the support practice factor quantifies the effects of some implementation that targets reducing the runoff and eventual soil loss. The most common support practices include the use of contours, terraces, crop strips, grassed waterways, and cross-slope cultivation. The P factor is expressed as the ratio between the rate and the amount of soil lost when a specific support practice is used and similar soil loss when row farming is executed in an up-and downslope manner. Typical P factor values range between 0 and 1. A value of 1 corresponds to lands without any support practice (especially grasslands and bare lands), while values which approach 0 are indicative of lands under specified support practices. Lower P factor values are indicative of effectiveness in conservation practices.

Table:5.5

Values of Crop Management factor

S.No	Cover %	Factor
1.	10	0.7
2.	20	0.5
3.	30	0.36
4.	40	0.26
5.	50	0.20
6.	60	0.15
7.	70	0.12
8.	80	0.10
9.	90	0.085
10.	100	0.075
11.	Waffle wall/ counterling	0.45
12.	Grass	0.17
13.	Terracing	0.9

**Fig 5.11** Derived factors for the study area

5.4.9 SOIL EROSION ESTIMATION.

The soil erosion severity map (Figure-5.12) was generated by overlaying all the parameter layers of RUSLE. Results indicated that the proposed area has a soil loss with a range of 0 to more than 100 t/ha/yr. Based on the soil erosion classification used, the estimated soil erosion was classified into four classes, namely, very slight (<5 t/ha), slight (5–15 t/ha), moderate (15-30 t/ha), sever (30-50 t/ha) and very severe (>50 t/ha) per annum. 64% of the area falls in the very slight to slight erosion zone although 36 % area comes under the moderate to extreme severe erosion zone where conservation is required.

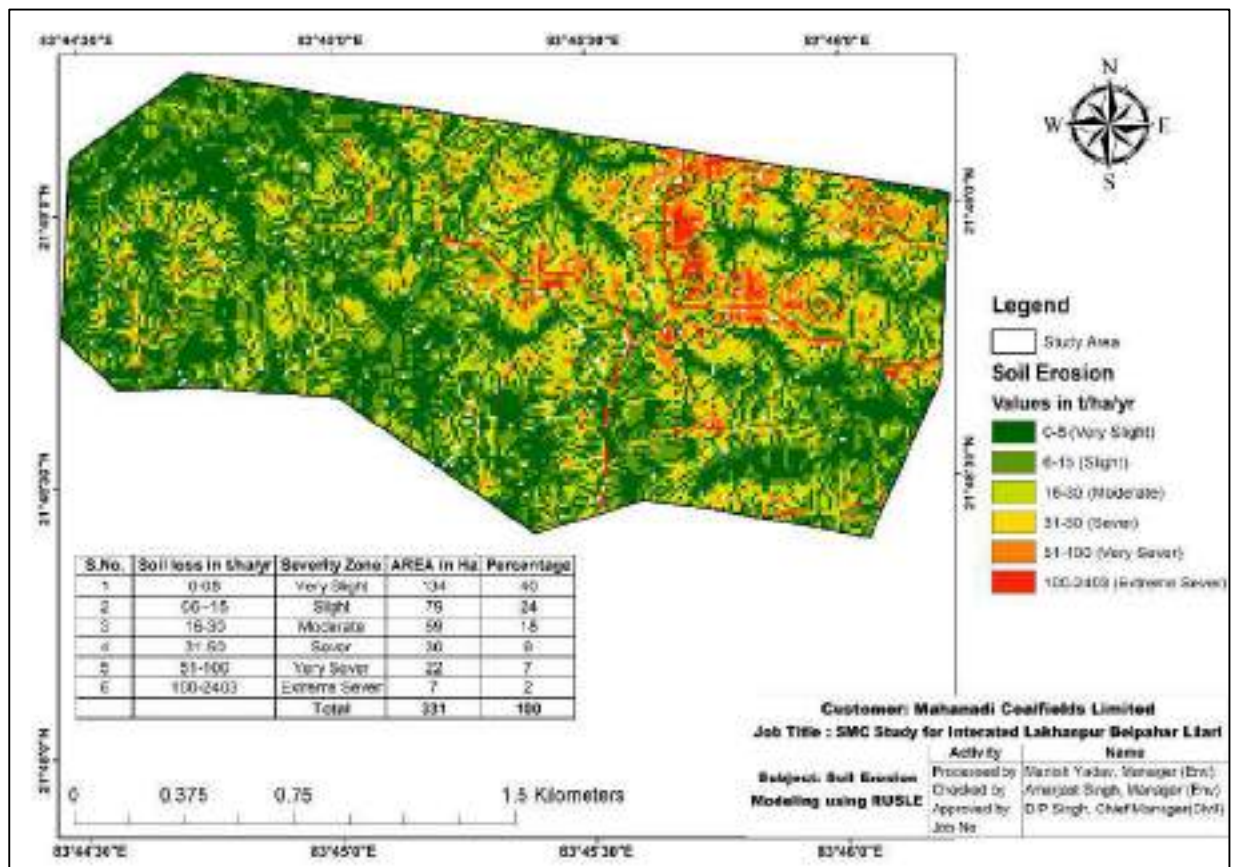


Fig 5.12 Soil loss from the study area

Table:5.6

Classification of soil loss from the study area

S.No.	Soil loss in t/ha/yr	Severity Zone	Area in Ha	Percentage
1	0-5	Very Slight	134	40
2	6-15	Slight	79	24
3	16-30	Moderate	59	18
4	31-50	Sever	30	9
5	51-100	Very Sever	22	7
6	>100	Extreme Sever	7	2
		Total	331	100

CHAPTER-6

MITIGATION MEASURES AND COST ESTIMATION

6.1 MITIGATIVE MEASURES

There are three methods for Soil Moisture Conservation (SMC) in the catchments, namely,

1. Agronomical Measures
2. Mechanical Measures
 - Catchment conservation works other than water harvesting structures: Those are implemented to minimize the soil erosion around the structures. In addition, those are also implemented to prolong the life span of water harvesting structures (check dams). Representative conservation works are as follows: Gully plugging works, contour trench works, terrace works, contour bunding works, mulching, plantation and filter strip works along the river, river/stream bank protection works etc.
 - Water harvesting structures: check dams (construction of embankment)
3. Non-structural measures: Land use regulation, public awareness for the forest, livelihood assistance/poverty alleviation, etc.

6.2 MECHANICAL MEASURES

- I. **Contour Bund:** Contour bunds are mechanical barriers built across the slope for the safe diversion of excess runoff and retention of eroded soil. The land area in between the two bunds get levelled in due course of time. Due to the deposition of eroded soil along the bund, the latter takes the shape of a riser. These risers should be planted with grasses to check their erosion.

- II. **Graded Bunds:** The graded bund is a small earthen bund with a slight grade constructed across the slope for safe disposal of runoff. The graded bunds are recommended up to to 10% slope for areas where annual rainfall exceeds 800 mm, particularly on clayey and black soils with poor drainage. However, the efficacy of graded bunds gets reduced gradually beyond the 4% slope. The purpose of grading is to reduce the velocity of runoff water, for in-situ conservation of rainwater, and to minimize soil erosion.
- III. **Bench Terrace:** Bench terraces are flat beds constructed on the hills across the slope. The height of the riser should not be more than one meter and the width of the bench terrace depends on the degree of slope. The bench terraces are important because they promote uniform distribution of soil moisture, irrigation water, etc. and control soil erosion. The bench terrace may be table top (level), outward sloping or inward sloping, with or without mild longitudinal grades. On steep slopes, it is better to construct terraces on the foothills for agricultural crops when soil depth is more than one meter.
- IV. **Half Moon terrace:** Half-moon terraces are semi-circular beds of appropriate diameter with a shape resembling a half-moon. These terraces are recommended for fruit trees or other plantation crops on steep slopes.
- V. **Grassed Waterways:** Grasses are well-known for their soil binding characteristics. They are most effective in moderating the flow and reducing the erosive velocity of runoff water, particularly on the rolling topography. The runoff water moves with high velocity down the slope, carrying with it soil and nutrients. If some suitable grasses are planted on the runoff route or natural channels, the soil and nutrient losses can be reduced. These grassed waterways are laid on the natural drainage lines in the watershed. Stilling basins or water ponds are constructed *en route* at appropriate locations, with earthen

and boulder pitched bunds for the retention of runoff water. By reducing the velocity of runoff water, erosion losses can be minimized.

- VI. Water Harvesting Ponds:** Water harvesting structures can be dug out for retaining runoff water on a seasonal or perennial basis. These are generally constructed down the slope. Earthen dams should be used for retaining silt load at an appropriate location on the slope of a watershed. The water thus harvested or stored can be used for pisciculture and other purposes.
- VII. Conservation Bench Terraces (CBT):** These are used to stabilize the yield of rainfed - crops by inter-field water harvesting. A part of the field is leveled to retain the runoff originating from the rest of the field.
- VIII. Gully Control Structures:** Gully control structures are provided to (i) reduce the erosive velocity of runoff water, (ii) facilitate the establishment of vegetation, and (iii) provide protection at points that cannot be adequately protected by other methods. Loose boulder check-dams perform well in gullies that do not carry much runoff and it also helps in silt deposition, thereby helping the stabilization of gully beds. Permanent gully control strati-fifes are constructed to control the overfalls either at the gully head or in the gully bed. Erosion from the extending heads and sides of the gully and main channel are the major sources of sediment. There is also a need to construct diversion bunds to divert surplus water to water harvesting structures or to the grassed waterways.
- IX. Contour Trenches:** Contour trenches are dug out, piling up the dugout earth on the lower side of the trench, for trapping, sediment, and runoff at the early stage of their movement. These trenches also improve soil moisture and favor the quick growth of trees and grasses.

- X. **Stream Bank and Torrents Control:** The vulnerable stream banks should be protected by providing spurs and retaining walls, etc. To control torrents, structures like bar-rages, paved channels, etc. need to be provided.

6.3 AGRONOMICAL MEASURES:

For preventing soil erosion on cultivated lands, proper choice of crops and cropping patterns is necessary, particularly on hill slopes. The protection through the vegetative shield, forest cover, grasses, crops and mulches, etc. are some important measures to prevent soil erosion. Such protection by absorbing the energy of rain impact prevents the loss of both water and soil. The following crop management practices can be useful in minimizing the erosion of soil and nutrients.

- I. **Cropping Systems** — Crops with the ability to develop canopy quickly provide early protection to the soil. Inter-planting of erosion-resistant crops like cowpea, soybean, etc. are also useful. Strip cropping of erosion-resistant legumes along with cereals can conserve rainwater and reduce the velocity of runoff.
- II. **Crop Geometry** — It is essential to manipulate the crop layout in the field in a manner that may prevent soil erosion. Closer spacing of rows across the slope can help in this regard.
- III. **Contour Cultivation** — Contour cultivation reduces the runoff to a large extent, thereby reducing the soil and nutrient losses. Contour cultivation, as well as furrows and ridges, have been found useful.
- IV. Low-intensity tillage favors the consolidation of soil through better structure, infiltration, and pore distribution. This imparts erosion resistance. A study of the conventional method of cultivation of maize 'with- zero tillage, with or without live mulch, has shown that runoff and soil losses are greatly

reduced with low-intensity tillage.

- V. **Grasses** - Grasses are perhaps the best friend of soil conservationists. Low and evenly distributed canopy and fibrous root systems with much binding capacity make grasses highly effective in controlling soil erosion. The performance of various grass species in controlling filling soil erosion and runoff losses at 9% and 11% slopes. The selection of grasses should be based on their production potential considering edaphic conditions and local preferences.
- VI. **Mulching:** Mulching is the placement of any organic or inorganic material over the top of a soil surface to protect it. Some of the benefits include reduced soil erosion, less compaction, moisture conservation, increased control of soil temperature, and a reduction in weed growth.

6.4 CONTOUR TRENCH WORKS

6.4.1 OBJECTIVE/FUNCTION

The contour trench works are the method of constructing the trenches along the contour lines of the slope. The objectives of the trench works are to retain water and sediment on the slope, to increase the water infiltration, to improve local soil moisture, and as the result, to reduce the runoff discharge and sediment to the downstream watershed.

There are three (3) types of contour trenches, that is continuous trenches, and interrupted (line and staggered) trenches. The continuous contour trenches are essentially used for moisture conservation in low rainfall areas. The staggered trenches are commonly used in Forest, in consideration of the rainfall condition of the study area.

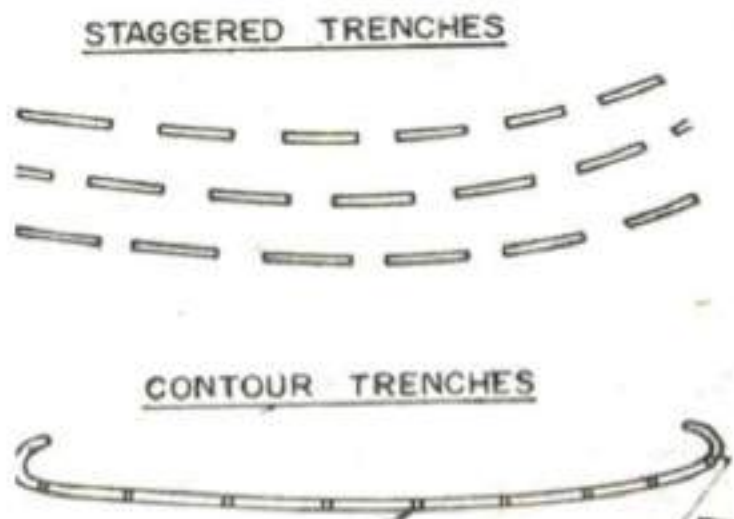


Fig. 6.1 Continuous and Staggered Contour Trenches

6.5 MULCHING

Mulching is an SMC practice in which a covering of cut grass, crop residues, or other organic materials is spread over the ground between rows of crops or around the trunks of trees. This practice helps to retain soil moisture to intercept the direct impact of raindrops on bare soil to reduce runoff and soil loss, to prevent weed growth, to reduce labor costs of weeding and enhance soil structure.

6.5.1 CLASSIFICATION OF MULCHES

(A) On the basis of organic matter

- a. **Organic mulches:** Organic mulches can be made of naturally occurring various substances which contain organic matter in it. Common examples of organic mulching are bark clippings, grass clippings, compost, dry leaves, straw etc.
- b. **Inorganic mulches:** Inorganic mulches are made up of inorganic substances which do not contains organic matter in it. Inorganic mulches include stones and gravels, polyethylene films, landscape materials, and rubbers.

(B) On the basis of living matter

- a. **Natural mulches:** Natural mulches are generally made up of naturally occurring materials. Organic mulches are also known as natural mulches. No prerequisite for the replacement of natural mulches because it decomposes readily.
- b. **Synthetic mulches:** Synthetic mulches are made of artificial non-living substances. Various types of synthetic mulch materials are available in the market for use in crop fields such as plastic films, plain and oiled paper, spun materials etc.

6.5.2 ORGANIC MULCHES

Organic mulches comprise materials like animal compost, grass clippings, straw of various crops, dried leaves, tree bark clippings and sawdust. It has an easily degradable capacity because nature of appealing slugs, insects, and worms that eat them and help them in rapid degradation, which results in the addition of some quantity of nutrient and organic material in the soil. Organic mulch has a large number of helpful features. Some of them are: soil moisture conservation by reducing the rate of evaporation, moderates soil temperature, lessening soil erosion, hindering the growth of weeds, cheers the growth of beneficial soil bio-organisms, and diminishing the blowout of soil-borne pathogens. Organic mulches after decomposition over time improve soil structure and increase the nutrient content of the soil. The illustration of different organic mulches and their usages are given below:

(A) Bark clippings

Bark clippings are long-lasting materials and permit appropriate aeration of the soil. It can be used properly in dry as well as wet regions and has more water holding capacity. In the wet region, if rain is too much the wood bark will reduce waterlogging condition after absorbing the excess water and if rain is too little, the wood bark will release the holding water, providing water to the plants in dry times also.

I. Bark (hardwood):

Hardwood bark clipping is the derivative of paper and timber industries and differs in sizes ranging from chips to bigger nuggets. It is mostly used nearby the shrubs and trees. Both colored and natural varieties of bark are obtainable. Colored varieties are generally a mixture of recycled wood waste comprising non-natural peroxides. Hardwood bark clippings have more nutrients than softwood but bark clippings are not effortlessly and plentifully

available and also phytotoxicity is caused by some bark products. These barks are slightly alkaline in nature.

II. Bark (softwood):

It is similarly a derivative of the wood and paper industries. A common example is pine bark and it is commonly used under large shrubs and trees. It is somewhat acidic in behaviour and takes more time to decay. These barks are obtainable in several sizes and generally applied to 2 to 4 inches of depth.

(B) Tree waste:

Generally, this mulch outcome from larger lumps of timbers. At the time of decomposition, the fresh tree chunks will utilize larger sums of nitrogen inside the soil. This type of mulch is specifically useful for making pathways.

(C) Leaf mulch:

Leaves are decent for mulching which is easily and profusely available. However, leaves are good for shielding inactive plants during the winter season by keeping them warm and it helps in starting germination throughout the winter season but they may be blown away even by the little speed of wind due to its lightweight. Bark, stone, or any other material which are useful in reducing wind speed, should be used to lessen these problems. It can be made at home by composting shredded leaves. Leaf mulch can be used in all types of gardens. Leaves infected with disease should be disposed instead of composting. The proper thickness of the leaf mulching is about 3 to 4 inches.

(D) Grass clippings:

Grass clippings are effortlessly and profusely available mulch materials in agriculture. It provides some quantity of nitrogen and

organic material into the soil if freshly incorporated in the soil. If green grass clippings are added to the soil, it can develop its root system and can create damage to the growth and development of crops. So, the use of dry grass is more favourable as mulch material. Grass clippings should be spread in thin layers for better results across perennial and vegetable beds and concave at the end of the growing season. Before adding extra layers let every layer dry. Grass clippings will mat if a thick layer of clipping is applied instead of thin layers. Grass clippings were taken from lawns which are treated with insecticides or herbicides never be used. It should apply at a depth of 2 to 3 inches.

(E) Composted animal manure:

The composted animal manure is an excellent choice for mulching material which advances the soil health, increases the population of microbes or bio-organisms, and adds nutrients to the soil. Compost is slightly acidic in nature. Compost does not have a better capability of weed suppression which is one noticeable drawback of composted animal manure. The use of fresh manure in crop fields sometimes results in the burning of plant roots. Before using as mulch manure should be well decomposed at temperatures between 54°C to 60 °C for a minimum of one week and 4 to 6 months of composting to eradicate potential disease micro-organisms. It is too used as mulching material in various nutrient-consuming floras like roses. 3-4 inches of depth is favourable for compost used as a mulch.

(F) Newspaper:

Newspaper mulching is helpful in adding some organic matter to the soil and controlling weeds. A thickness of 1 to 2 cm of newspaper sheet is required for mulching and the edge of the paper should be fastened with stones, gravel, pebbles, etc. Suppression of weed is done by the layers of white and black newspapers. Apply 2 to 3

layers of newspaper at a time and cover it with leaf mulch or grass clippings or any other organic materials so that it cannot blow away by the winds. Newsprint will ultimately decay and can be merged into the soil.

(G) Straw mulches:

Some examples of straw mulches are groundnut shells, cotton shells, Straws of paddy and wheat, crop stubbles, etc. which are used as mulches for moisture conservation on the soil surface. Even though nutrient content is less in straw but soil converts more productive after the decomposition of straw mulches. Straw mulches reduce the amount and rate of evaporation and lessen the amount of energy captivated by the soil.

(H) Sawdust:

Sawdust is obtained from the wood and furniture-making industry and is very deprived of nutritive value. It is slowly decomposable. It is acidic in nature so it should not be used in acidic soils.

6.5.3 BENEFITS OF ORGANIC MULCHING

A vital role is played by organic mulch in reflecting solar radiation. It reduces the rate of evaporation and keeps soil cooler. Prevent germination and growth of weeds, lessens erosion of soil, reduces runoff, increases moisture-retaining power of the soil, improves infiltration and percolation of water, advances the soil condition, makes soil porous, and augments better growth of roots. It can also maintain the soil temperature.

6.5.4 INORGANIC MULCHES

Inorganic mulches are commonly used to obstruct the germination of weeds and are also used for decoration. Inorganic mulches like stones, gravel, and rocks do not decompose voluntarily, so they do not participate in improving soil conditions but bio-degradable and photo-degradable plastic mulches are

readily decomposable and improve the soil condition as well after decomposition, because they are made from plant sugar or starches. Heat can be absorbed and reflected by rocks which are useful in dry and hot environmental conditions.

6.5.5 DISADVANTAGE OF INORGANIC MULCHING

Inorganic mulches, except in biodegradable plastic mulches, do not augment any nutrient in the soil because they do not decompose. In several cases, inorganic mulch will get damaged by the sun in several cases and starts looking damaged with time. It can increase the temperature of soil if established in large areas. Inorganic mulches like rubber may create harm to plants as it is toxic in nature.

6.6 Jute Geotextile

Jute geotextile being a natural fabric is biodegradable and environment-friendly. It has good hygroscopic and hydrophilic properties. It can absorb moisture upto about 5 times its dry weight and form mulch to promote a quick growth of vegetation. JGT possesses good drapability, i.e. it can shape itself well to the ground topography on which it is laid. It helps controlled extremes of temperature and thus additionally supports growth of vegetation.

These properties make JGT suitable in areas where natural treatment of a soil surface for control of erosion is called for. Adequate growth of vegetation is possible during the lifetime of JGT provided the right type of species of vegetation is chosen and planted, considering the soil and climatic ambience.

Generally use of Jute Geotextile (JGT) or Coir Geotextile which are made from natural jute/coir fiber is quite economical and effective for erosion control on slopes.

6.7 SUGGESTIONS AND RECOMMENDATIONS

The soil of the proposed forest area is having less organic content which results in less soil moisture. Therefore, it is proposed to use an agronomical measure like mulching from locally available materials like straw, dry leaves, stubble, or similar materials.

6.7.1 MECHANICAL MEASURES

- A. **Contour Trench:** 70 number of trenches of size $L_m \times 1m \times W \times 0.6m$ D shall be constructed along the specified contour as shown in (Fig. 6.2). The details about the length and latitude and longitude of stating point and end point is given in table no-6.1.

Table: -6.1 Details of contour trenches with GPS location

S. No	Name	Length in m	Length+20% (m)	X_Start	Y_Start	X_End	Y_End
1	CT-1	267	321	83.7607	21.8071	83.7614	21.8094
2	CT-2	346	416	83.7646	21.8106	83.7613	21.8108
3	CT-3	174	209	83.7612	21.8109	83.761	21.8124
4	CT-4	240	288	83.7613	21.8126	83.7632	21.8113
5	CT-5	76	91	83.7634	21.8116	83.764	21.8112
6	CT-6	223	268	83.7625	21.8129	83.7641	21.8115
7	CT-7	129	155	83.7629	21.813	83.7642	21.8129
8	CT-8	187	225	83.7643	21.8129	83.7653	21.8114
9	CT-9	179	214	83.7655	21.8113	83.7669	21.8103
10	CT-10	90	108	83.7668	21.8103	83.7663	21.8096
11	CT-11	164	197	83.7663	21.8096	83.7677	21.8089
12	CT-12	162	194	83.7677	21.8088	83.7668	21.8076
13	CT-13	264	316	83.7666	21.8076	83.7641	21.8074
14	CT-14	401	482	83.7642	21.807	83.7681	21.8068
15	CT-15	620	745	83.7648	21.8169	83.7697	21.8136
16	CT-16	261	314	83.7646	21.8168	83.7621	21.8165
17	CT-17	644	772	83.7478	21.8201	83.7421	21.8176
18	CT-18	472	566	83.7435	21.8175	83.7473	21.8151
19	CT-19	251	301	83.7479	21.816	83.7474	21.8182
20	CT-20	105	126	83.7473	21.8149	83.7482	21.8153
21	CT-21	155	186	83.7435	21.8177	83.7423	21.8167
22	CT-22	84	101	83.742	21.8175	83.7422	21.8168
23	CT-23	98	117	83.7474	21.8183	83.7482	21.8187
24	CT-24	247	296	83.7481	21.8203	83.7496	21.8185
25	CT-25	80	95	83.7495	21.8181	83.7488	21.8178

S. No	Name	Length in m	Length+20% (m)	X_Start	Y_Start	X_End	Y_End
26	CT-26	94	113	83.7484	21.8186	83.7488	21.8179
27	CT-27	363	435	83.7411	21.8154	83.7446	21.8156
28	CT-28	147	177	83.7449	21.8157	83.7459	21.8148
29	CT-29	169	203	83.7457	21.8142	83.7473	21.8137
30	CT-30	348	418	83.7473	21.8138	83.7505	21.8149
31	CT-31	132	159	83.7491	21.816	83.7504	21.8157
32	CT-32	78	93	83.7504	21.8156	83.7505	21.8149
33	CT-33	704	845	83.7493	21.8163	83.7525	21.817
34	CT-34	259	311	83.7526	21.8171	83.7528	21.8194
35	CT-35	64	77	83.7528	21.8194	83.7522	21.8196
36	CT-36	33	40	83.7522	21.8196	83.7524	21.8198
37	CT-37	257	308	83.7546	21.814	83.7544	21.8117
38	CT-38	303	363	83.7545	21.8116	83.7574	21.8121
39	CT-39	105	126	83.7575	21.8121	83.7584	21.8116
40	CT-40	180	215	83.7563	21.8192	83.7552	21.8179
41	CT-41	153	183	83.7554	21.818	83.7568	21.8175
42	CT-42	228	274	83.7567	21.8175	83.7554	21.8158
43	CT-43	517	620	83.7555	21.8157	83.7601	21.8137
44	CT-44	225	271	83.7586	21.8188	83.7586	21.8168
45	CT-45	244	293	83.7592	21.8165	83.7604	21.8146
46	CT-46	364	436	83.7411	21.813	83.7444	21.8142
47	CT-47	264	317	83.7446	21.8141	83.7448	21.8117
48	CT-48	462	554	83.7449	21.812	83.749	21.8137
49	CT-49	123	148	83.7494	21.8132	83.7505	21.8136
50	CT-50	127	153	83.7505	21.8135	83.7506	21.8123
51	CT-51	250	300	83.7507	21.8124	83.7531	21.8123
52	CT-52	112	134	83.7531	21.8124	83.7532	21.8134
53	CT-53	714	857	83.7533	21.8132	83.7569	21.8077
54	CT-54	260	312	83.7571	21.8079	83.7583	21.8099
55	CT-55	343	412	83.7547	21.8195	83.7542	21.8164
56	CT-56	185	222	83.7545	21.8163	83.7557	21.8175
57	CT-57	205	246	83.7559	21.8173	83.755	21.8157
58	CT-58	328	394	83.7576	21.8141	83.7544	21.8141
59	CT-59	176	211	83.7535	21.8154	83.753	21.8139
60	CT-60	147	176	83.7527	21.8155	83.7519	21.8144
61	CT-61	255	307	83.7514	21.8172	83.7511	21.8149
62	CT-62	339	407	83.7616	21.8171	83.7613	21.814
63	CT-63	311	373	83.7699	21.8155	83.7673	21.817
64	CT-64	155	186	83.7698	21.8149	83.7684	21.8153
65	CT-65	172	206	83.7682	21.8156	83.7667	21.8163
66	CT-66	137	164	83.7666	21.8164	83.7661	21.8175
67	CT-67	242	290	83.762	21.8174	83.7643	21.8178
68	CT-68	87	105	83.766	21.8175	83.7652	21.8177
69	CT-69	330	396	83.7605	21.8184	83.7605	21.8154
70	CT-70	847	1016	83.7476	21.8122	83.755	21.8089

S. No	Name	Length in m	Length+20% (m)	X_Start	Y_Start	X_End	Y_End
	Total	17459	20951				

The length of the contour trenches (CT1 to CT-70) has been increased by @20% for the meandering as per site conditions. Further, gap between the trenches should be maintained as per the site condition so that no trees or structure coming between the trenches should be affected.

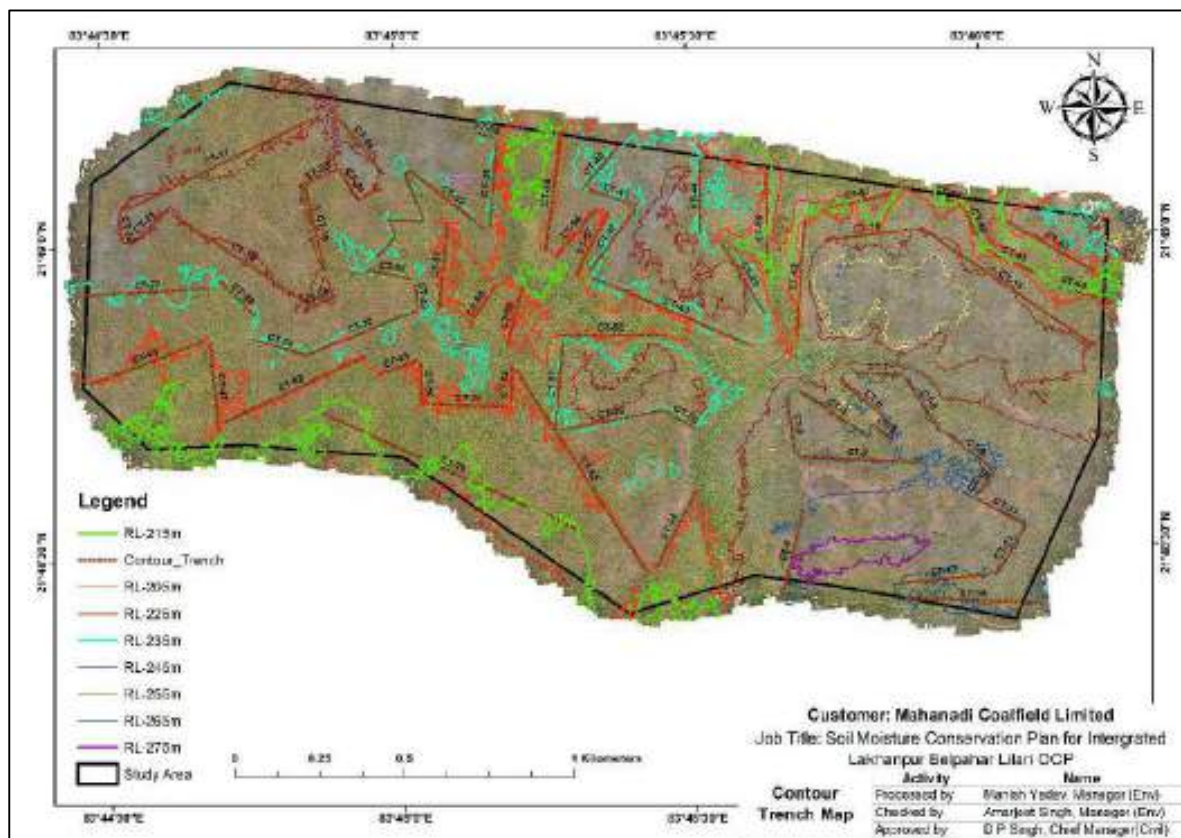


Fig 6.2: Figure showing proposed location of Contour trench

- B. **Check Dam:** 22 nos. of check dam of different size have been suggested L (10-20 m) × 0.5 m W × (0.6) m H shall be constructed across the stream at the location specified in table 6.2 and also shown in Fig.6.3. The provision of apron size (10-25 m) L x (1.5 m)

W x 0.15 m has been kept for the control of erosion. The length of check dams are as given below:

A) 10 m- 9 Nos

B) 15 m- 12 Nos

C) 20 m- 1 Nos

Spacing between check dams:

The spacing of check dams should be so placed that, the line joining the top of the lower check dam and the bottom of the successive upper check dam gives the gradient. This gradient will give a non-erosive velocity of flow. This gradient is known as a compensation gradient. For general practice, the compensation gradient is taken as 3 to 5% of the slope. The horizontal distance between successive check dams is given by:

$$S = \frac{h \times 100}{(S_o - S_e)}$$

Where,

S = spacing between two check dams

h = Height of check dam up to the notch

S_o = Existing bed slope in percentage

S_e = Establishing slope of the bed in percentage

Table-6.2: Calculation for spacing between the dam

Sl. No	Streams	Existing Slope (S_o) in %	Established Slope (S_e) in %	Average height (h) in m	Spacing of Dam (S) in m
1.	Stream-1	2.96	2.35	0.6	98
2.	Stream-2	1.07	0.80	0.6	221

In the study area ten major streams are present for each streams calculation for spacing between the dams are shown in table 6.3.

Number of Check Dams

The number of check dams required is determined from the following formula:

number of check dams (N)

$$N = \frac{(a - b)}{H}$$

where,

a =total vertical distance between first and last dam in meters

$$b = \frac{S_e \times d}{100}$$

d =horizontal distance between first and last dam in meters

H =average height in meters

Table-6.3: Calculation for the required number of Check Dam

S.No	Streams	Initial RL in m	Final RL in m	a in meters	Horizontal Distance in m	b in m	Number of Check Dam
1.	Stream-1	230	190	40	1350	31.725	14
2.	Stream-2	245	230	15	1400	11.2	8

Based on formula in equation, total 22 number of dams are required.

Table: -6.4 Details of Check Dams with GPS location

S.No	Name	X_Centroid	Y_Centroid	Length in m	Breath in m	Height in m
1	CD-1	83.7587	21.8074	10	0.5	0.6
2	CD-2	83.7588	21.8083	15	0.5	0.6
3	CD-3	83.7587	21.8094	15	0.5	0.6
4	CD-4	83.7586	21.8104	15	0.5	0.6
5	CD-5	83.7585	21.8112	15	0.5	0.6
6	CD-6	83.7591	21.8119	15	0.5	0.6
7	CD-7	83.7601	21.8125	15	0.5	0.6
8	CD-8	83.7608	21.8132	15	0.5	0.6
9	CD-9	83.7611	21.8139	15	0.5	0.6
10	CD-10	83.7608	21.815	15	0.5	0.6
11	CD-11	83.7608	21.816	10	0.5	0.6
12	CD-12	83.7609	21.8168	10	0.5	0.6

S.No	Name	X_Centroid	Y_Centroid	Length in m	Breath in m	Height in m
13	CD-13	83.7611	21.8178	10	0.5	0.6
14	CD-14	83.7614	21.8182	10	0.5	0.6
15	CD-15	83.7593	21.813	10	0.5	0.6
16	CD-16	83.7579	21.8142	10	0.5	0.6
17	CD-17	83.7559	21.8143	10	0.5	0.6
18	CD-18	83.7545	21.8152	10	0.5	0.6
19	CD-19	83.7625	21.8134	15	0.5	0.6
20	CD-20	83.7642	21.8133	15	0.5	0.6
21	CD-21	83.7663	21.8125	15	0.5	0.6
22	CD-22	83.7675	21.8119	20	0.5	0.6

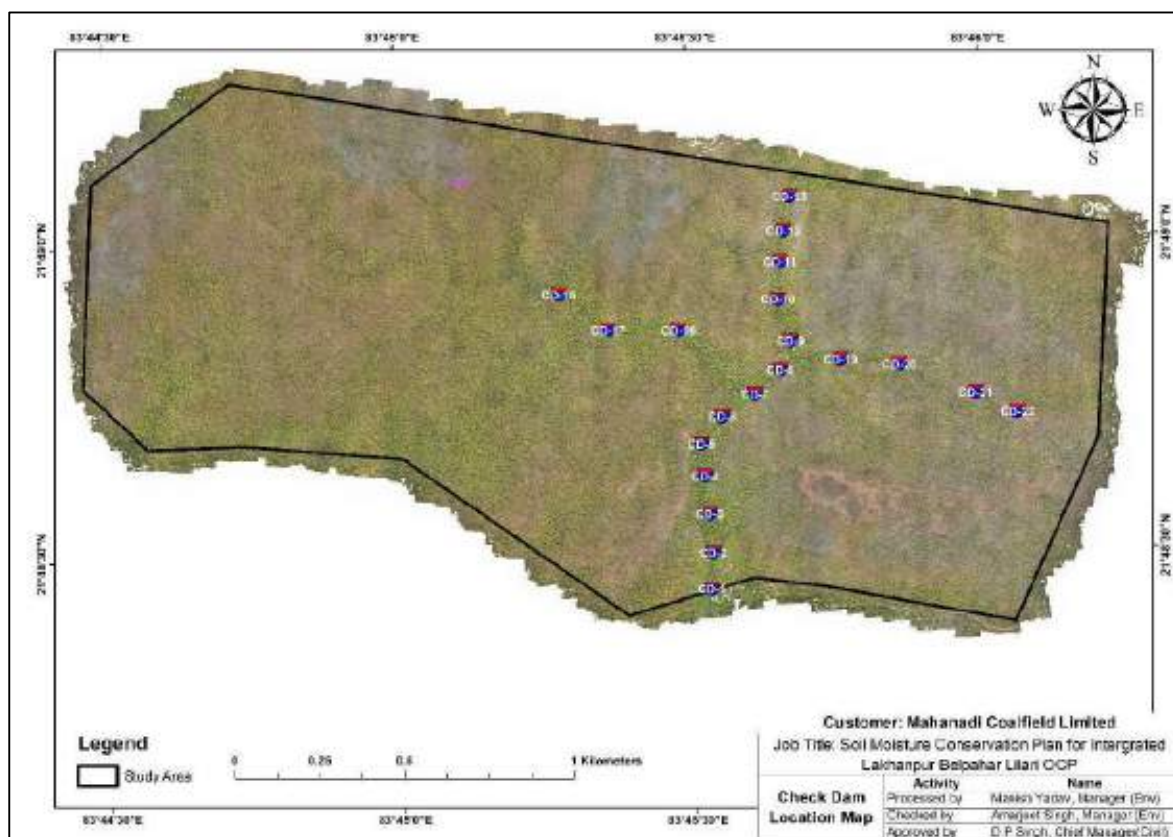


Fig 6.3: Figure showing proposed location of check dams

- C. **Catch Pit/Recharge Pit:** A total of 3600 Pit of size 2 m L × 1m W × 0.5 m D shall be constructed across the slope at a spacing of 10 m and vertical/cross interval of 100m approx. Typical arrangement of recharge pit has been shown in figure-6.4(a) & 6.4(b). The catch pits may be dug in the staggered manner for achieving maximum efficiency to trap surface runoff.

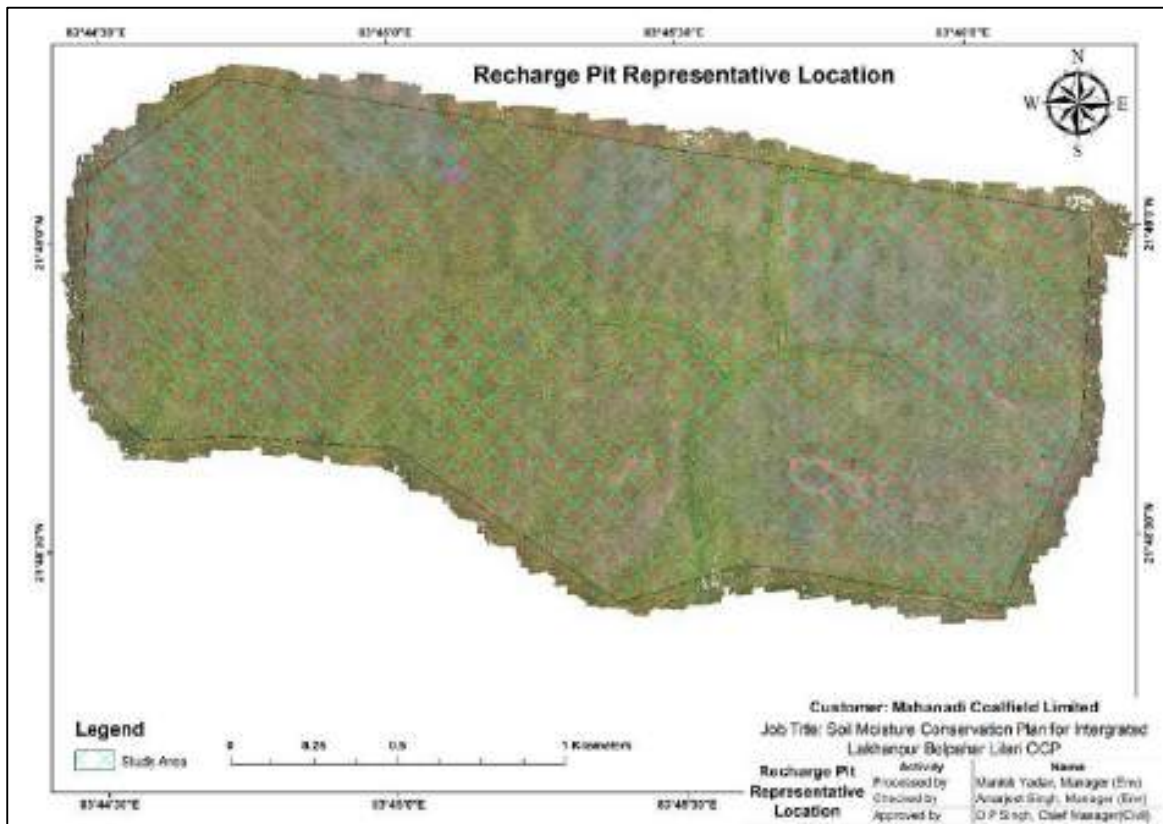


Fig 6.4(a) Figure showing typical arrangement of recharge pit at site-1 (not to scale).

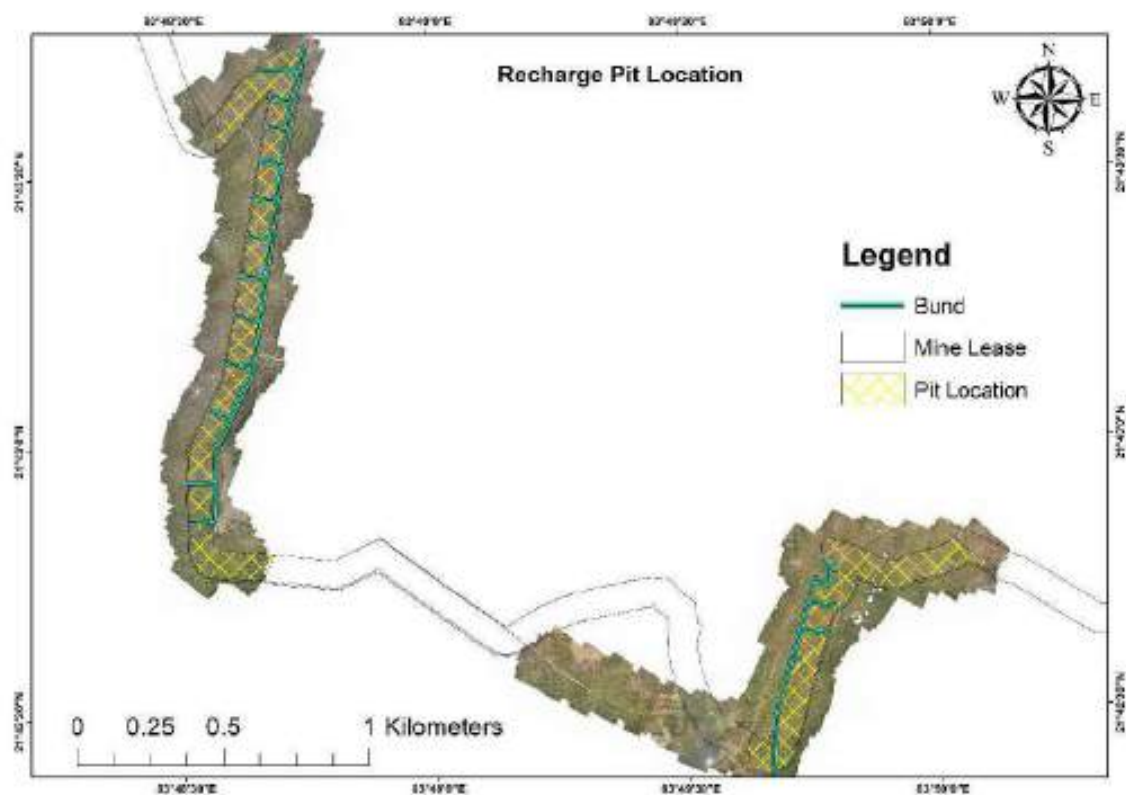


Fig 6.4(b) Figure showing typical arrangement of recharge pit at site-1 (not to scale).

- D. **Surface Pond:** Four (4) nos. of surface pond with stone pitching of size 50 m L × 30 m W × 2.5 m D shall be constructed at the location specified in table 6.5 and also shown in Fig.6.5

Table: -6.5 Details of Ponds with GPS location

S.No	Name	X_Centroid	Y_Centroid
1	P-1	83.7487	21.8176
2	P-2	83.7538	21.8096
3	P-3	83.7648	21.8169
4	P-4	83.742	21.8123

Design Criteria

Pond in study area has been suggested of capacity of 3300 cum capacity (free board of 30 cm). The total water collected in the proposed ponds through rainfall will be around 204 cum/year. The calculation has been shown in table 6.6

Table 6.6: Capacity of Proposed Ponds

Pond	C	A (in m²)	I (in m annually)	Q (m³/year)
P1	1.00	1500	0.1360	204
P2	1.00	1500	0.1360	204
P3	1.00	1500	0.1360	204
P4	1.00	1500	0.1360	204

The rest water in pond will come through surface run-off from the micro-watershed. The calculation for each micro-watershed is given in table no- 6.7. Inlet for each is proposed in south direction considering the slope of the micro-watershed. The excess water of micro watershed will join the stream through natural slope of the area.

Table 6.7: Water discharge from micro-watershed.

Pond ID	Runoff Coefficient (C)	Area of watershed (in m²)	Rainfall (I) (in m annually)	Q (m³/year)
P1&P4	0.30	2350560	0.1360	9,59,02.84
P2 & P3	0.30	849129	0.1360	34,644.46

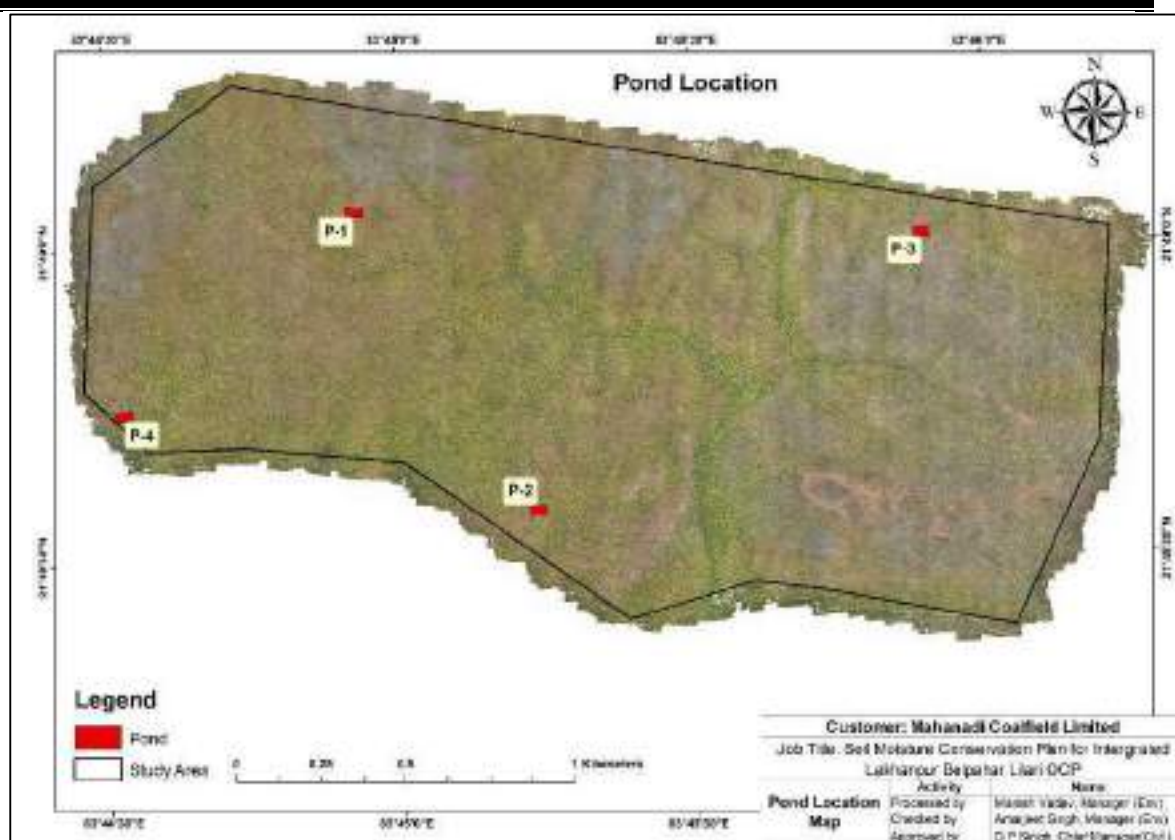


Fig 6.5: Figure showing proposed locations of Ponds

E Earthen Bund:

Total 18 bunds have been proposed of different length and of 0.6 m height at the down slope part of the proposed site to control the erosion and surface runoff (Fig 6.9). The details are given below:

Table 6.8: Earthen Bund Details

S.No	Name	Lenth	X_Start	X_End	Y_Start	Y_End
1	B-1	1750	83.8085	83.8126	21.7144	21.729
2	B-2	155	83.8124	83.8109	21.7283	21.7283
3	B-3	80	83.8122	83.8114	21.7273	21.7274
4	B-4	80	83.812	83.8112	21.7265	21.7266
5	B-5	75	83.8118	83.811	21.7254	21.7255
6	B-6	80	83.8116	83.8108	21.7243	21.7244
7	B-7	80	83.8113	83.8106	21.7231	21.7232

S.No	Name	Lenth	X_Start	X_End	Y_Start	Y_End
8	B-8	90	83.8112	83.8103	21.7219	21.722
9	B-9	90	83.811	83.8101	21.7206	21.7208
10	B-10	100	83.8107	83.8098	21.7191	21.7193
11	B-11	80	83.8099	83.8092	21.7176	21.7178
12	B-12	95	83.8094	83.8085	21.7156	21.7156
13	B-13	285	83.8276	83.828	21.7064	21.7089
14	B-14	520	83.828	83.8294	21.709	21.713
15	B-15	30	83.8283	83.8286	21.7099	21.7099
16	B-16	95	83.8286	83.8295	21.7108	21.7106
17	B-17	95	83.8289	83.8298	21.7116	21.7115
18	B-18	40	83.8295	83.8299	21.7126	21.7126

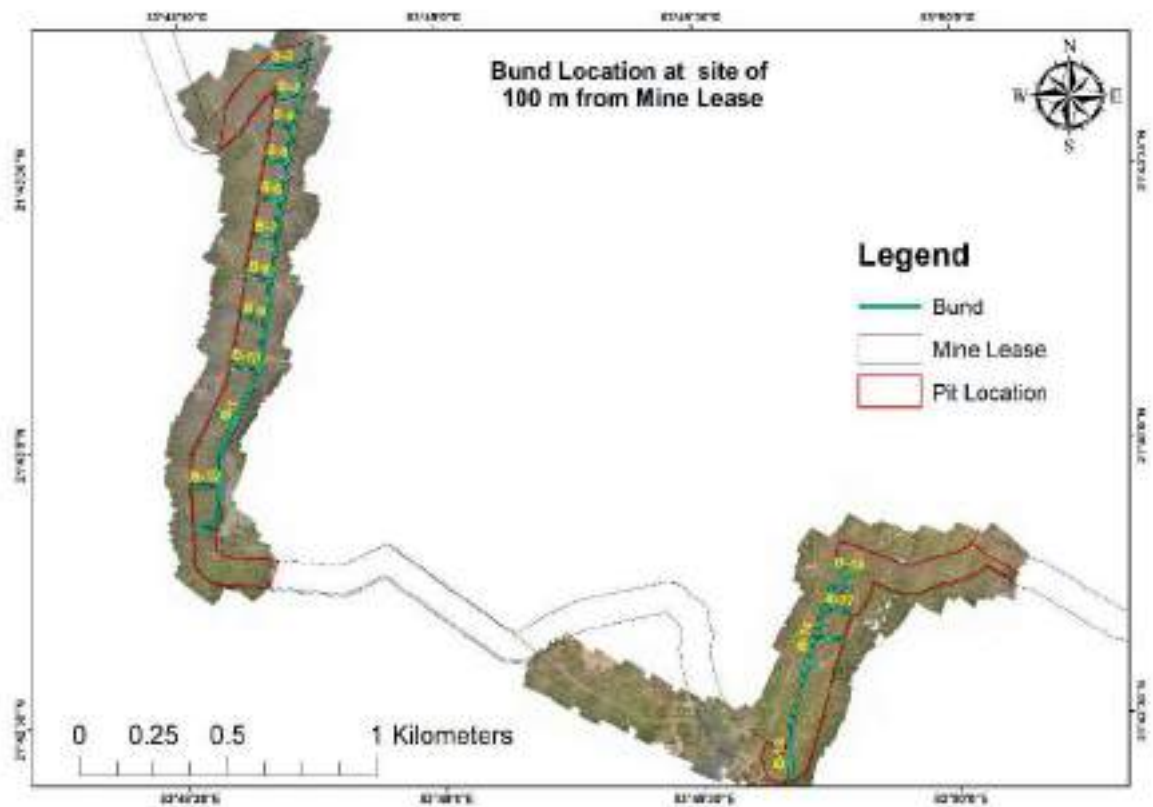


Fig 6.9: Figure showing the location of Earthen bunds

6.7.2 AGRONOMICAL MEASURES:

- A. Mulching:** Organic mulches comprising of materials like animal compost, cow dung, straw of various crops, dried leaves, or similar locally available material of 50 mm thickness shall be applied over an area of 128.74 ha land specified in table: 6.8 and also shown in **Fig.6.6**. Mulching may be carried out in patches of 4-5 ha for ease of monitoring and supervision.

Table 6.9: Mulching Area

S.No	Name	Area in Ha
1	M-1	25.232
2	M-2	47.100
3	M-3	9.734
4	M-4	8.830
5	M-5	10.538
6	M-6	15.670
7	M-7	11.639
Total		128.742

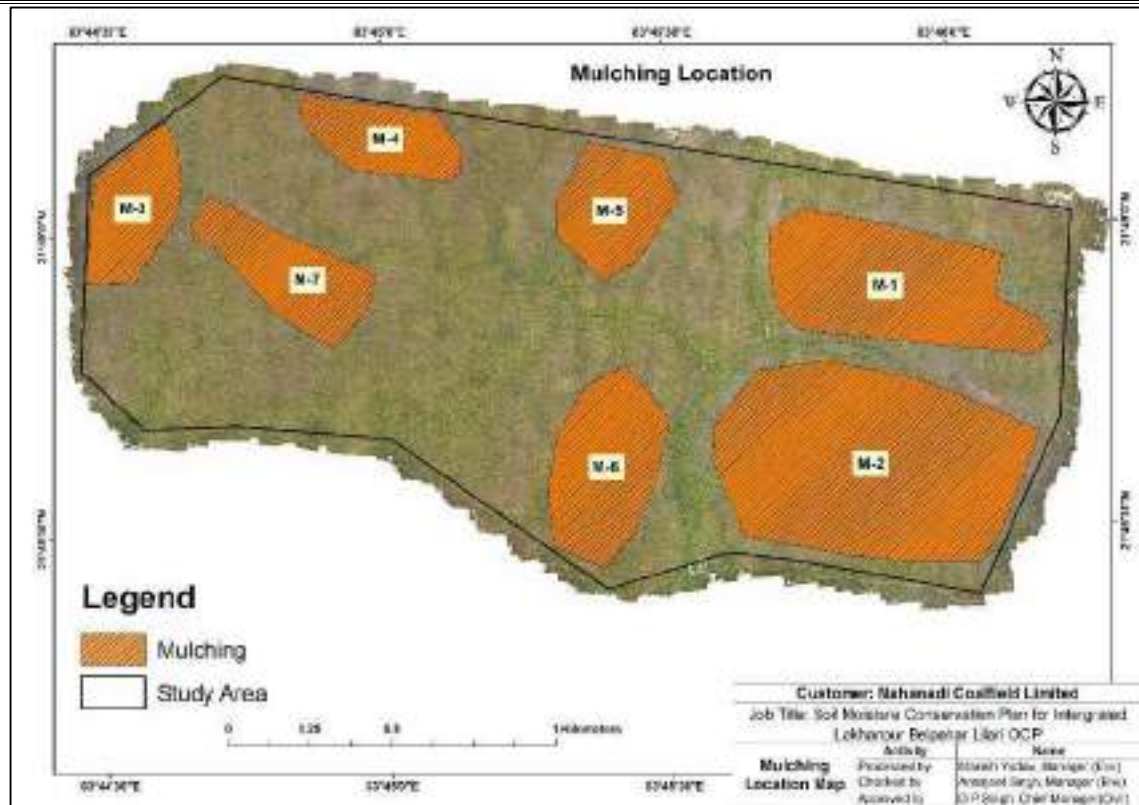


Fig 6.6: Figure showing the location of mulching

- B. Grassing:** Grassing with indigenous grass species (*Axonopus compressus* (Tropical Carpet Grass), *Cyanodon dactylon* (Dhoob Grass)) over hatched area (46.06 ha) of degraded and open land as specified in **Fig.6.7**. Grassing may be carried out in patches of 3-4 ha for ease of monitoring and supervision.

Table 6.10: Grassing Area

S.No.	Name	Area in Ha
1	P-1	7.19
2	P-2	2.50
3	P-3	3.99
4	P-4	3.50
5	P-5	19.42
6	P-6	5.58
7	P-7	3.89
Total		46.06

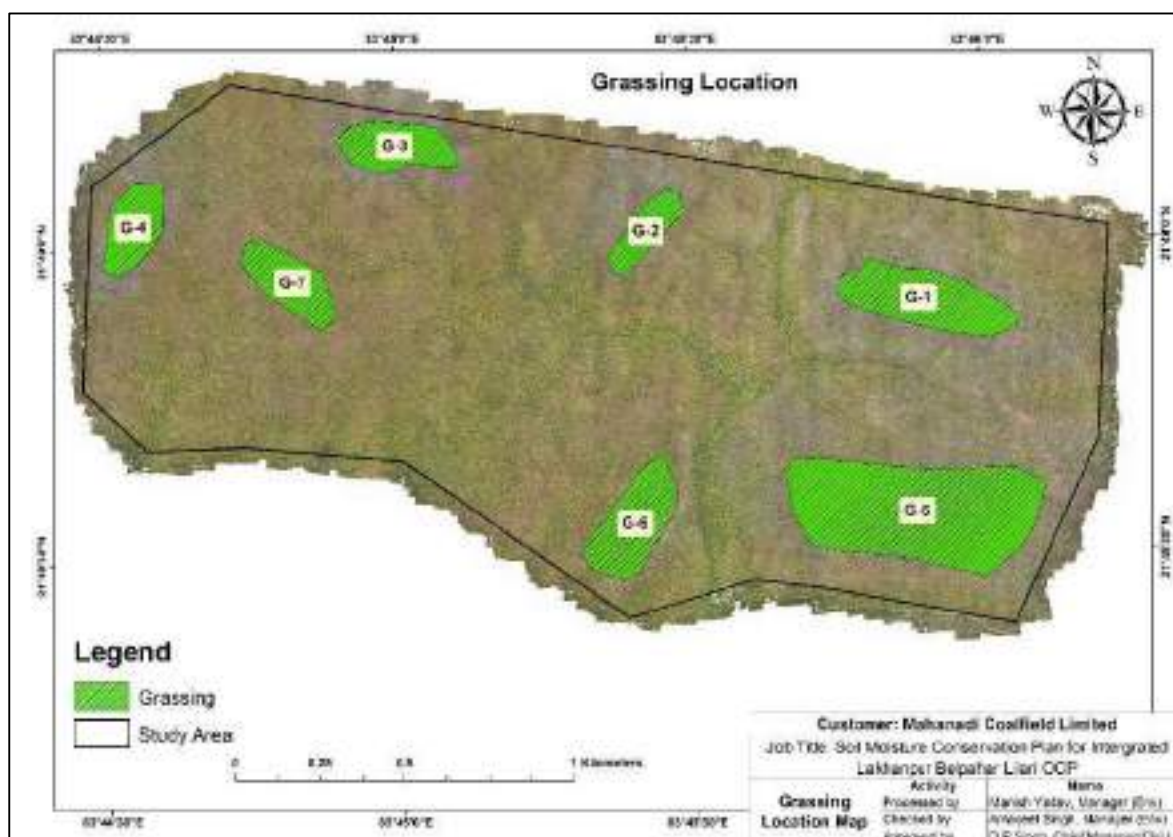


Fig 6.7: Figure showing the location of grassing

6.8 COST ESTIMATE: Year wise Abstract of SMC Measures

SI No	Year	Total Cost for the SMC work with GST (In Rs.)	Maintenance of SMC structures @ 15% without GST (in Rs.)	Total Cost including GST (in Rs.)	Monitoring & Supervision @ 5% (in Rs)	GRAND TOTAL COST including GST and 5% Supervision (in Rs.)	Cost for POL and Driver Wages for Proposed Vehicle for Monitoring & Supervision	Cost for Long Term Monitoring and Assessment	Total (Rs)
1	1st Year (2024-25)	6,11,13,158.00		6,11,13,158.00	30,55,658.00	6,41,68,816.00	4,20,000.00		6,45,88,816.00
2	2nd Year (2025-26)		91,66,974.00	91,66,974.00	4,58,349.00	96,25,323.00	4,41,000.00		1,00,66,323.00
3	3rd Year (2026-27)		96,25,322.00	96,25,322.00	4,81,266.00	1,01,06,588.00	4,63,050.00	25,00,000.00	1,30,69,638.00
4	4th Year (2027-28)		1,01,06,589.00	1,01,06,589.00	5,05,329.00	1,06,11,918.00	4,86,202.50		1,10,98,120.50
5	5th Year (2028-29)		1,06,11,918.00	1,06,11,918.00	5,30,596.00	1,11,42,514.00	5,10,513.00	27,56,250.00	1,44,09,277.00
	Total	6,11,13,158.00	39510803	10,06,23,961.00	50,31,198.00	10,56,55,159.00	23,20,765.50	52,56,250.00	11,32,32,174.50

Cost of the Proposed vehicle for Monitoring & Supervision (In Kind):

SI No.	Year	Description	No.	Cost (Rs.)
1	1st Year (2024-25)	4-Wheeler	1	1500000
2		2-Wheeler	2	300000
	Total cost for Vehicle (In Kind)			1800000

**Grand Total for SMC Work (Rs. 11,32,32,174.50 + Rs. 1800000) =
Rs. 11,50,32,174.50 =11,50,32,500.00 (Say)**

Table 6.11: Year Wise Implementation Cost for Soil Moisture Conservation Measures

Sl. No.	Description	Item of Works	Unit	Quantity	Rate (DSR 2023)	Total Cost	Location Reference
1st Year (2024-25)							
1	Contour Trench	Earth Work in Soil	Cum	6285	179.73	11,29,615.40	CT1 to CT70
		Earth Work in Ordinary Rock	Cum	6285	505.17	31,75,014.79	
2	Surface Pond	Earth Work in Soil	Cum	7500	179.73	13,47,989.74	P1, P2,P3,P4
		Earth Work in Ordinary Rock	Cum	7500	505.17	37,88,800.46	
		Stone Pitching	SqMtr	2259.20	894.26	20,20,301.19	
3	Catch Pit	Earth Work in Soil	Cum	2053	179.73	3,68,989.73	3600 Catch Pit
		Earth Work in Ordinary Rock	Cum	2053	505.17	10,37,120.98	
4	Check Dams	LBCD	Cum	174.00	4626.71	8,05,046.81	CD1 to CD22
5	Grassing	Grassing	SqMtr	478059.21	54.81	2,62,01,414.70	P1 to P7
6	Mulching/ Manuring	Mulching	Cum	64375.00	131.37	84,57,076.60	M1 to M7
		Manure	Cum	23902.96	326.22	77,97,528.74	
		Manure Spreading	Cum	23902.96	67.19	16,06,140.58	
7	Earthen Bund	Earthwork	Cum	2514.60	476.47	11,98,123.69	B1 to B 18
8	Survey/ Demarcation	Survey/Demarcation	L/s			4,00,000.00	
	Sub Total (As on April 2024)					5,93,33,163	
	Contengecies @ 3%					17,79,995.00	
	Sub Total-A for SMC structures as on April 2024 with GST					6,11,13,158.00	
	Supervision & Monitoring , Evaluation & Documentation Cost @ 5%					30,55,658.00	
	Grand Total (For 1st Year)					6,41,68,816.00	
2nd Year (2025-26)							
9	Maintenance of SMC structures @ 15% of initial year cost		L/s			91,66,973.70	
	Sub Total (A) with GST					91,66,974.00	
	Supervision & Monitoring , Evaluation & Documentation Cost @ 5%					4,58,349.00	
	Grand Total (For 2nd Year)					96,25,323.00	

Sl. No.	Description	Item of Works	Unit	Quantity	Rate (DSR 2023)	Total Cost	Location Reference
3rd Year (2026-27)							
10	Maintenance of SMC structures @ 15% of initial year cost (Considering 5% inflation per year)		L/s			96,25,322.39	
	Sub Total (A) with GST					96,25,322.00	
	Supervision & Monitoring , Evaluation & Documentation Cost @ 5%					4,81,266.00	
	Grand Total (For 3rd Year)					1,01,06,588.00	
4th Year (2027-28)							
11	Maintenance of SMC structures @ 15% of initial year cost (Considering 5% inflation per year)		L/s			1,01,06,588.50	
	Sub Total (A) with GST					1,01,06,589.00	
	Supervision & Monitoring , Evaluation & Documentation Cost @ 5%					5,05,329.00	
	Grand Total (For 4th Year)					1,06,11,918.00	
5th Year (2028-29)							
12	Maintenance of SMC structures @ 15% of initial year cost (Considering 5% inflation per year)		L/s			1,06,11,917.93	
	Sub Total (A) with GST					1,06,11,918.00	
	Supervision & Monitoring , Evaluation & Documentation Cost @ 5%					5,30,596.00	
	Grand Total (For 5th Year)					1,11,42,514.00	

Table No. 6.12: Cost of the Proposed Monitoring Mechanism:

SI No.	Parameters	Frequency	Year of Monitoring	Cost Per Year
A	Land use cover of the study area.	Yearly	3 rd and 5 th Year	12,00,000/-
B	Soil Moisture Index of the area.	Yearly	3 rd and 5 th Year	5,00,000/-
C	Analysis of soil quality parameters	Yearly	3 rd and 5 th Year	3,00,000/-
D	Report Preparation	Yearly	3 rd and 5 th Year	5,00,000/-
	Cost for 3rd Year			25,00,000/-
	Cost for 5th Year			2,756,250/-
	Total Cost for Monitoring			52,56,250/-

Table 6.13: Proposed Estimate for Soil Moisture Conservation Structures

Sl. No.	Description	Unit	Qty.	Rate including GST(Rs.)	Current Rate including GST (Rs.)	Amount (Rs.)
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. All kinds of soil	Cum	15838.00	177.50	179.73	2846594.87
2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-incharge.	Cum	15838.00	498.90	505.17	8000936.23
3	Dry stone pitching 22.5 cm thick including supply of stones and preparing surface complete.	Sqm	2259.20	883.15	894.26	2020301.19
4	Providing & making Gabion structure with Mechanically Woven Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes as per IS 16014:2012,MORTH Clause 2500, of required size, Mesh Type10x12(D=100 mm with tolerance of $\pm 2\%$) Zinic+ PVC coated, Mesh wire diameter2.7/3.7mm, mechanically edged/selvedged with partitions at every 1m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, tying with lacing wire of diameter 2.2/3.2mm(ID/OD), supplied @3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm, as per drawing, all complete as per directions of Engineer-incharge.	Cum	174.00	4569.25	4626.71	805046.81
5	Providing & laying Selection no. 1 grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with required tools wooden and then rolling the surface with light roller make the surface smoothen and light watering the same including maintenance for 30 days or more till the grass establish properly, as per direction of officer in charge.	Sqm	478059.21	42.70	54.81	26201414.70
6	Mulching of land using cow dung/dry leaves/straw or similar items as per direction of officer in charge	Cum	64375.00	102.35	131.37	8457076.60
7	Supplying and stacking at site dump manure from approved source, including carriage upto 5 km lead complete	Cum	23902.96	254.15	326.22	7797528.74
8	Spreading of sludge, dump manure and/or good earth in required thickness as per direction of officer-in-charge (cost of sludge, dump manure and/ or good earth to be paid separately).	Cum	23902.96	52.35	67.19	1606140.58
9	Banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with $\frac{1}{2}$ tonne roller, or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal banks, and guide banks etc., lead upto 50 m and lift upto 1.5 m : All kinds of soil	Cum	2514.60	470.55	476.47	1198123.69
10	Survey/demarcation cost	LS				400000.00
	SUB-TOTAL as on April 2024 including GST:					59333163.00
	Contingencies @3%					1779995.00
	GRAND TOTAL					61113158.00
Note: Estimate is based on DSOR 2023 & Horticulture DSOR 2020						
	WPI as on April 2020		119.2			
	WPI as on April 2023		151.1			
	WPI as on April 2024		153			
	% Increase w.r.t. April 2023		1.2574			
	% Increase w.r.t. April 2020		28.356			

Table 6.14: Detailed calculation of Items Proposed

Description	Nos.	Length (m)	Coefficient	Breadth (m)	Depth (m)	Quantity	Unit	Sub-Total	Rate	Amount
Earthwork										
Contour trench	1.00	267.25	1.20	1.00	0.60	192.42				
	1.00	346.44	1.20	1.00	0.60	249.44				
	1.00	174.22	1.20	1.00	0.60	125.44				
	1.00	239.88	1.20	1.00	0.60	172.71				
	1.00	75.91	1.20	1.00	0.60	54.65				
	1.00	223.12	1.20	1.00	0.60	160.64				
	1.00	129.21	1.20	1.00	0.60	93.03				
	1.00	187.39	1.20	1.00	0.60	134.92				
	1.00	178.71	1.20	1.00	0.60	128.67				
	1.00	90.19	1.20	1.00	0.60	64.94				
	1.00	164.29	1.20	1.00	0.60	118.29				
	1.00	161.55	1.20	1.00	0.60	116.31				
	1.00	263.59	1.20	1.00	0.60	189.79				
	1.00	401.31	1.20	1.00	0.60	288.94				
	1.00	620.43	1.20	1.00	0.60	446.71				
	1.00	261.29	1.20	1.00	0.60	188.13				
	1.00	643.74	1.20	1.00	0.60	463.49				
	1.00	472.01	1.20	1.00	0.60	339.85				
	1.00	250.55	1.20	1.00	0.60	180.39				
	1.00	105.29	1.20	1.00	0.60	75.81				
	1.00	154.69	1.20	1.00	0.60	111.38				
	1.00	83.78	1.20	1.00	0.60	60.32				
	1.00	97.50	1.20	1.00	0.60	70.20				
	1.00	246.94	1.20	1.00	0.60	177.79				
	1.00	79.52	1.20	1.00	0.60	57.25				
	1.00	94.44	1.20	1.00	0.60	67.99				
	1.00	362.63	1.20	1.00	0.60	261.10				
	1.00	147.28	1.20	1.00	0.60	106.04				
	1.00	169.10	1.20	1.00	0.60	121.75				
	1.00	347.94	1.20	1.00	0.60	250.51				
	1.00	132.43	1.20	1.00	0.60	95.35				
	1.00	77.84	1.20	1.00	0.60	56.05				
	1.00	703.76	1.20	1.00	0.60	506.71				
	1.00	259.10	1.20	1.00	0.60	186.55				
	1.00	64.31	1.20	1.00	0.60	46.31				
	1.00	33.24	1.20	1.00	0.60	23.93				
	1.00	257.08	1.20	1.00	0.60	185.10				
	1.00	302.83	1.20	1.00	0.60	218.04				
	1.00	105.12	1.20	1.00	0.60	75.68				
	1.00	179.52	1.20	1.00	0.60	129.25				
	1.00	152.61	1.20	1.00	0.60	109.88				
	1.00	228.11	1.20	1.00	0.60	164.24				
	1.00	516.62	1.20	1.00	0.60	371.97				
	1.00	225.43	1.20	1.00	0.60	162.31				
	1.00	244.13	1.20	1.00	0.60	175.77				
	1.00	363.73	1.20	1.00	0.60	261.88				
	1.00	264.24	1.20	1.00	0.60	190.25				
	1.00	461.88	1.20	1.00	0.60	332.55				
	1.00	123.37	1.20	1.00	0.60	88.83				
	1.00	127.16	1.20	1.00	0.60	91.55				
	1.00	250.40	1.20	1.00	0.60	180.29				
	1.00	111.79	1.20	1.00	0.60	80.49				
	1.00	714.39	1.20	1.00	0.60	514.36				
	1.00	260.15	1.20	1.00	0.60	187.31				
	1.00	343.42	1.20	1.00	0.60	247.26				
	1.00	185.00	1.20	1.00	0.60	133.20				
	1.00	204.96	1.20	1.00	0.60	147.57				
	1.00	328.09	1.20	1.00	0.60	236.22				

Chapter-6

Mitigation Measures and Cost Estimation

Description	Nos.	Length (m)	Coefficient	Breadth (m)	Depth (m)	Quantity	Unit	Sub-Total	Rate	Amount
	1.00	175.83	1.20	1.00	0.60	126.60				
	1.00	146.85	1.20	1.00	0.60	105.73				
	1.00	255.44	1.20	1.00	0.60	183.92				
	1.00	339.50	1.20	1.00	0.60	244.44				
	1.00	311.06	1.20	1.00	0.60	223.97				
	1.00	155.11	1.20	1.00	0.60	111.68				
	1.00	171.86	1.20	1.00	0.60	123.74				
	1.00	136.90	1.20	1.00	0.60	98.57				
	1.00	241.50	1.20	1.00	0.60	173.88				
	1.00	87.22	1.20	1.00	0.60	62.80				
	1.00	330.23	1.20	1.00	0.60	237.76				
	1.00	846.84	1.20	1.00	0.60	609.72		12570.63	342.45	4304847
Catch Pit	4105.00	2.00		1.00	0.50	4105.00		4105.00	342.45	1405768
Surface Pond	4.00	50.00		30.00	2.50	15000.00		15000.00	342.45	5136790
					Total	31675.63				
					Say	31676.00	Cum			
Earthwork in soil	50 % of	31676.00				15838.00	Cum		179.73	2846595
Earthwork in ordinary rock	50 % of	31676.00				15838.00	Cum		505.17	8000936
Stone pitching										
Surface Pond	8.00	50.00		3.53		1412.00	Sqm			
	8.00	30.00		3.53		847.20	Sqm			
					Total	2259.20	Sqm		894.26	2020301
Gabion Check Dam										
LBCD	9.00	10.00		0.60	1.00	54.00	Cum			
	12.00	15.00		0.60	1.00	108.00	Cum			
	1.00	20.00		0.60	1.00	12.00	Cum			
					Total	174.00	Cum		4626.71	805046.8
Grassing										
Contour Trench		17459.21			1.00	17459.21	Sqm			
As shown in map					Total	46.06	Hectare			
						478059.21	Sqm		54.81	26201415
Mulching										
As per Map shown		1287500.00		0.05		64375.00	Cum		131.37	8457077
Manure		478059.21		0.05		23902.96	Cum		326.22	7797529
Manure Spreading		478059.21		0.05		23902.96	Cum		67.19	1606141
Earthen Bund	3810.00	1.70	0.50	0.50	0.60	2514.60	Cum		476.47	1198124

CHAPTER-7

Long-Term Monitoring and Assessment of the Proposed Mitigative Measures

CHAPTER-7

LONG TERM MONITORING AND ASSESSMENT OF THE PROPOSED MITIGATIVE MEASURES

7.1 PROPOSED MITIGATIVE MEASURES

Based on the field visits, soil sample analysis, Drone Survey based Orthomosaic image and contour map of the area, following Mechanical and Agronomical mitigation measures have been suggested to increase moisture level of the study area:

1. Contour Trenches
2. Check Dams
3. Catch Pit/Recharge Pit
4. Surface Pond
5. Bund
6. Mulching:
7. Grassing

7.1.1 CONTOUR TRENCHES

- A. **Contour Trench:** 70 number of trenches of size $L_m \times 1m \text{ W} \times 0.6m \text{ D}$ shall be constructed along the specified contour as shown in (Fig. 6.2). The details about the length and latitude and longitude of stating point and end point is given in table no-6.1.

Table: -7.1 Details of contour trenches with GPS location

S. No	Name	Length in m	Length+20% (m)	X_Start	Y_Start	X_End	Y_End
1	CT-1	267	321	83.7607	21.8071	83.7614	21.8094
2	CT-2	346	416	83.7646	21.8106	83.7613	21.8108
3	CT-3	174	209	83.7612	21.8109	83.761	21.8124
4	CT-4	240	288	83.7613	21.8126	83.7632	21.8113
5	CT-5	76	91	83.7634	21.8116	83.764	21.8112

S. No	Name	Length in m	Length+20% (m)	X_Start	Y_Start	X_End	Y_End
6	CT-6	223	268	83.7625	21.8129	83.7641	21.8115
7	CT-7	129	155	83.7629	21.813	83.7642	21.8129
8	CT-8	187	225	83.7643	21.8129	83.7653	21.8114
9	CT-9	179	214	83.7655	21.8113	83.7669	21.8103
10	CT-10	90	108	83.7668	21.8103	83.7663	21.8096
11	CT-11	164	197	83.7663	21.8096	83.7677	21.8089
12	CT-12	162	194	83.7677	21.8088	83.7668	21.8076
13	CT-13	264	316	83.7666	21.8076	83.7641	21.8074
14	CT-14	401	482	83.7642	21.807	83.7681	21.8068
15	CT-15	620	745	83.7648	21.8169	83.7697	21.8136
16	CT-16	261	314	83.7646	21.8168	83.7621	21.8165
17	CT-17	644	772	83.7478	21.8201	83.7421	21.8176
18	CT-18	472	566	83.7435	21.8175	83.7473	21.8151
19	CT-19	251	301	83.7479	21.816	83.7474	21.8182
20	CT-20	105	126	83.7473	21.8149	83.7482	21.8153
21	CT-21	155	186	83.7435	21.8177	83.7423	21.8167
22	CT-22	84	101	83.742	21.8175	83.7422	21.8168
23	CT-23	98	117	83.7474	21.8183	83.7482	21.8187
24	CT-24	247	296	83.7481	21.8203	83.7496	21.8185
25	CT-25	80	95	83.7495	21.8181	83.7488	21.8178
26	CT-26	94	113	83.7484	21.8186	83.7488	21.8179
27	CT-27	363	435	83.7411	21.8154	83.7446	21.8156
28	CT-28	147	177	83.7449	21.8157	83.7459	21.8148
29	CT-29	169	203	83.7457	21.8142	83.7473	21.8137
30	CT-30	348	418	83.7473	21.8138	83.7505	21.8149
31	CT-31	132	159	83.7491	21.816	83.7504	21.8157
32	CT-32	78	93	83.7504	21.8156	83.7505	21.8149
33	CT-33	704	845	83.7493	21.8163	83.7525	21.817
34	CT-34	259	311	83.7526	21.8171	83.7528	21.8194
35	CT-35	64	77	83.7528	21.8194	83.7522	21.8196
36	CT-36	33	40	83.7522	21.8196	83.7524	21.8198
37	CT-37	257	308	83.7546	21.814	83.7544	21.8117
38	CT-38	303	363	83.7545	21.8116	83.7574	21.8121
39	CT-39	105	126	83.7575	21.8121	83.7584	21.8116
40	CT-40	180	215	83.7563	21.8192	83.7552	21.8179
41	CT-41	153	183	83.7554	21.818	83.7568	21.8175
42	CT-42	228	274	83.7567	21.8175	83.7554	21.8158
43	CT-43	517	620	83.7555	21.8157	83.7601	21.8137
44	CT-44	225	271	83.7586	21.8188	83.7586	21.8168
45	CT-45	244	293	83.7592	21.8165	83.7604	21.8146
46	CT-46	364	436	83.7411	21.813	83.7444	21.8142
47	CT-47	264	317	83.7446	21.8141	83.7448	21.8117
48	CT-48	462	554	83.7449	21.812	83.749	21.8137
49	CT-49	123	148	83.7494	21.8132	83.7505	21.8136

S. No	Name	Length in m	Length+20% (m)	X_Start	Y_Start	X_End	Y_End
50	CT-50	127	153	83.7505	21.8135	83.7506	21.8123
51	CT-51	250	300	83.7507	21.8124	83.7531	21.8123
52	CT-52	112	134	83.7531	21.8124	83.7532	21.8134
53	CT-53	714	857	83.7533	21.8132	83.7569	21.8077
54	CT-54	260	312	83.7571	21.8079	83.7583	21.8099
55	CT-55	343	412	83.7547	21.8195	83.7542	21.8164
56	CT-56	185	222	83.7545	21.8163	83.7557	21.8175
57	CT-57	205	246	83.7559	21.8173	83.755	21.8157
58	CT-58	328	394	83.7576	21.8141	83.7544	21.8141
59	CT-59	176	211	83.7535	21.8154	83.753	21.8139
60	CT-60	147	176	83.7527	21.8155	83.7519	21.8144
61	CT-61	255	307	83.7514	21.8172	83.7511	21.8149
62	CT-62	339	407	83.7616	21.8171	83.7613	21.814
63	CT-63	311	373	83.7699	21.8155	83.7673	21.817
64	CT-64	155	186	83.7698	21.8149	83.7684	21.8153
65	CT-65	172	206	83.7682	21.8156	83.7667	21.8163
66	CT-66	137	164	83.7666	21.8164	83.7661	21.8175
67	CT-67	242	290	83.762	21.8174	83.7643	21.8178
68	CT-68	87	105	83.766	21.8175	83.7652	21.8177
69	CT-69	330	396	83.7605	21.8184	83.7605	21.8154
70	CT-70	847	1016	83.7476	21.8122	83.755	21.8089
	Total	17459	20951				

The length of the contour trenches (CT1 to CT-70) has been increased by @20% for the meandering as per site conditions. Further, gap between the trenches should be maintained as per the site condition so that no trees or structure coming between the trenches should be affected.

7.1.2 CHECK DAM

Check Dam: 22 nos. of check dam of different size have been suggested L (10-20 m) × 0.5 m W × (0.6) m H shall be constructed across the stream at the location specified in table 6.2 and also shown in Fig.6.3. The provision of apron size (10-25 m) L x (1.5 m) W x 0.15 m has been kept for the control of erosion.

Table No.- 7.2 Details of Check Dams with GPS location

S.No	Name	X_Centroid	Y_Centroid	Length in m	Breath in m	Height in m
1	CD-1	83.7587	21.8074	10	0.5	0.6
2	CD-2	83.7588	21.8083	15	0.5	0.6
3	CD-3	83.7587	21.8094	15	0.5	0.6
4	CD-4	83.7586	21.8104	15	0.5	0.6
5	CD-5	83.7585	21.8112	15	0.5	0.6
6	CD-6	83.7591	21.8119	15	0.5	0.6
7	CD-7	83.7601	21.8125	15	0.5	0.6
8	CD-8	83.7608	21.8132	15	0.5	0.6
9	CD-9	83.7611	21.8139	15	0.5	0.6
10	CD-10	83.7608	21.815	15	0.5	0.6
11	CD-11	83.7608	21.816	10	0.5	0.6
12	CD-12	83.7609	21.8168	10	0.5	0.6
13	CD-13	83.7611	21.8178	10	0.5	0.6
14	CD-14	83.7614	21.8182	10	0.5	0.6
15	CD-15	83.7593	21.813	10	0.5	0.6
16	CD-16	83.7579	21.8142	10	0.5	0.6
17	CD-17	83.7559	21.8143	10	0.5	0.6
18	CD-18	83.7545	21.8152	10	0.5	0.6
19	CD-19	83.7625	21.8134	15	0.5	0.6
20	CD-20	83.7642	21.8133	15	0.5	0.6
21	CD-21	83.7663	21.8125	15	0.5	0.6
22	CD-22	83.7675	21.8119	20	0.5	0.6

A. **Catch Pit/Recharge Pit:** A total of 3600 Pit of size 2 m L × 1m W × 0.5 m D shall be constructed across the slope at a spacing of 10 m and vertical/cross interval of 100m approx. Typical arrangement of recharge pit has been shown in figure-6.4(a) & 6.4(b). The catch pits may be dug in the staggered manner for achieving maximum efficiency to trap surface runoff.

7.1.3 SURFACE POND

Four (4) nos. of surface pond with stone pitching of size 50 m L × 30 m W × 2.5 m D shall be constructed at the location specified in table 6.5 and also shown in Fig.6.5

Table: -7.3 Details of Ponds with GPS location

S.No	Name	X_Centroid	Y_Centroid
1	P-1	83.7487	21.8176
2	P-2	83.7538	21.8096
3	P-3	83.7648	21.8169
4	P-4	83.742	21.8123

7.1.5 Earthen Bund:

Total 18 bunds have been proposed of different length and of 0.6 m height at the down slope part of the proposed site to control the erosion and surface runoff (Fig 6.9). The details are given below:

Table 6.10: Earthen Bund Details

S.No	Name	Lenth	X_Start	X_End	Y_Start	Y_End
1	B-1	1750	83.8085	83.8126	21.7144	21.729
2	B-2	155	83.8124	83.8109	21.7283	21.7283
3	B-3	80	83.8122	83.8114	21.7273	21.7274
4	B-4	80	83.812	83.8112	21.7265	21.7266
5	B-5	75	83.8118	83.811	21.7254	21.7255
6	B-6	80	83.8116	83.8108	21.7243	21.7244
7	B-7	80	83.8113	83.8106	21.7231	21.7232
8	B-8	90	83.8112	83.8103	21.7219	21.722
9	B-9	90	83.811	83.8101	21.7206	21.7208
10	B-10	100	83.8107	83.8098	21.7191	21.7193
11	B-11	80	83.8099	83.8092	21.7176	21.7178
12	B-12	95	83.8094	83.8085	21.7156	21.7156
13	B-13	285	83.8276	83.828	21.7064	21.7089
14	B-14	520	83.828	83.8294	21.709	21.713
15	B-15	30	83.8283	83.8286	21.7099	21.7099
16	B-16	95	83.8286	83.8295	21.7108	21.7106
17	B-17	95	83.8289	83.8298	21.7116	21.7115
18	B-18	40	83.8295	83.8299	21.7126	21.7126

7.1.6 MULCHING

Mulching: Organic mulches comprising of materials like animal compost, cow dung, straw of various crops, dried leaves, or similar locally available material of 50 mm thickness shall be applied over an area of 128.74 ha land specified in table: 6.8 and also shown in **Fig.6.6**. Mulching may be carried out in patches of 4-5 ha for ease of monitoring and supervision.

Table 7.4: Mulching Area

S.No	Name	Area in Ha
1	M-1	25.232
2	M-2	47.100
3	M-3	9.734
4	M-4	8.830
5	M-5	10.538
6	M-6	15.670
7	M-7	11.639
Total		128.742

7.1.7 GRASSING

Grassing with indigenous grass species (Axonopus compressus (Tropical Carpet Grass), Cyanodon dactylon (Dhoob Grass)) over hatched area (46.06 ha) of degraded and open land as specified in **Fig.6.7**. **Grassing may be carried out in patches of 3-4 ha for ease of monitoring and supervision.**

S.No.	Name	Area in Ha
1	P-1	7.19
2	P-2	2.50
3	P-3	3.99
4	P-4	3.50
5	P-5	19.42
6	P-6	5.58
7	P-7	3.89
Total		46.06

7.2 EXPECTED OUTCOME IN THE STUDY AREA AFTER IMPLEMENTATION OF THE PROPOSED CONTROL MEASURES

- I. After construction of contour trenches, Percolation pit, Check Dams, and Surface ponds, the soil moisture content in the study area will increase.
- II. During the soil testing of the study area, different nutrients like Organic Carbon, Phosphorus, Potash Nitrogen etc were found deficient.
- III. After the implementation of the proposed Agronomic control measures like Mulching and Grassing the water holding capacity of the study area will increase. It will also help in the improvement in soil quality parameters.
- IV. The land use of the study area will change due to increase in moisture content and increase in soil fertility which further will increase the green cover.
- V. The above mechanical (Contour trenches & Check Dam) and agronomical control (Grassing) measures will help in the control soil erosion.
- VI. The proposed control measures will help in the improvement of the soil moisture index of the degraded forest area.

7.3 MONITORING MECHANISM FOR PROGRESS OF THE OUTCOMES

For preparation of the Soil Moisture Conservation (SMC) report, following studies were done:

7.3.1 LAND USE OF STUDY AREA

The proposed area for soil moisture conservation is 332 Ha of land which can be categorized into three main categories based on signatures got through LISS-IV images (Fig-5.6) having a resolution of 5.5 m. The image was taken on 23-02-24. Based on assessment of satellite data, a total of 283 ha of land falls in the dense forest land category where some high vegetation was available, 45 ha of land falls under degraded land where less vegetation has been noticed and 4 ha of land falls under the open land area where very less or no vegetation was available. Although in the study area seasonal stream was also present but it cannot be deducted as the waterbody as they were covered under the green-cover of forest which cannot be distinguished for land use & land cover purpose.

Table No. 7.5 Land use of the Study area

Sl. No.	Land Use	Area in Ha	Percentage
1.	Forest Land	283	85.24
2.	Degraded Land	45	13.55
3.	Open Land	4	1.20
	Total	332	100

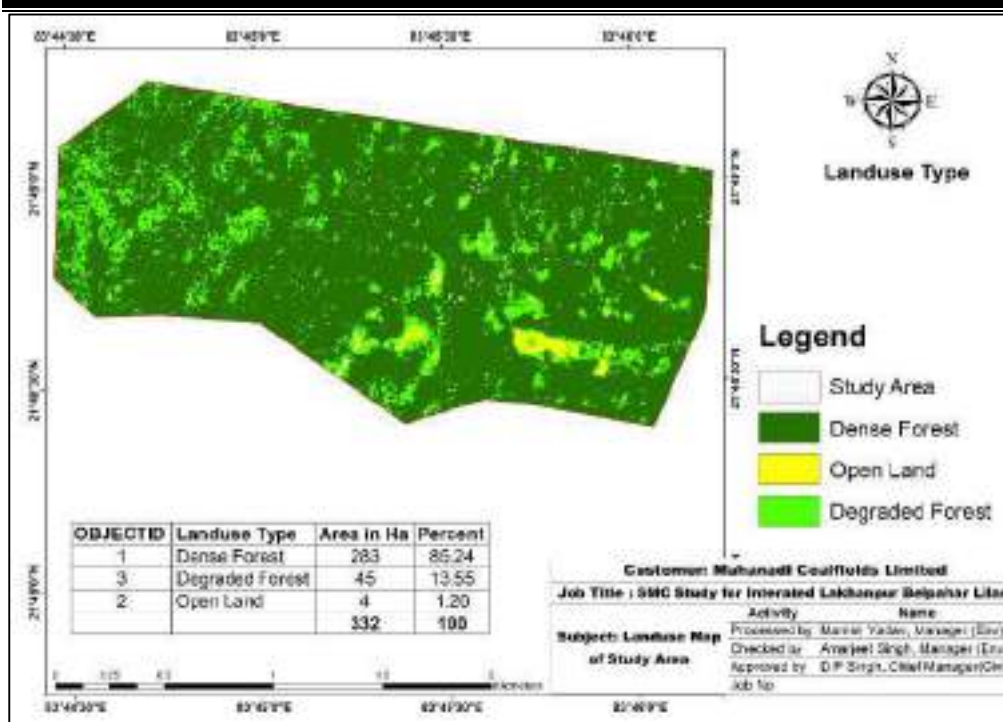


Fig-7.1 Land use map of the study area using LISS-IV satellite image (23-02-2024)

7.3. 2 SOIL MOISTURE INDEX

Soil moisture is a key parameter that directly or indirectly influences the water cycle. The existence of forest cover and agriculture production mainly depend on rain fed areas as well as irrigation practices of the area. Climate change and the trend of increasing temperatures have a significant impact on forest cover. It is linked to various hydrological phenomena, such as drought, climate, and vegetation. The data collected for soil moisture analysis taken below the surface over the long term as well as higher temporal and spatial resolution data are valuable for assessing the extent and severity of drought quite accurately. Surface soil moisture is very sensitive and varies with space and time. Various studies have been done to assess soil moisture. Two methods of soil moisture measurement through remote sensing are based on the microwave part of the electro-magnetic spectrum and thermal, infrared observation.

In situ measurements can provide an accurate estimation of soil moisture, but they are both time-consuming and expensive, and only represent a small area (a few square decimeters). Nevertheless, a number of strategies can be adopted to upscale the spatially sparse ground-based observations, which are invaluable for calibrating and validating land surface models and satellite-based soil moisture retrievals.

The soil moisture index (SMI) is defined as the proportion of the difference between the current soil moisture and the permanent wilting point to the field capacity and the residual soil moisture. The index values range from 0 to 1 with 0 indicating extreme dry conditions and 1 indicating extreme wet conditions.

On applying proposed interventions, the soil moisture of area will increase. This will be monitored by the satellite image in subsequent years.

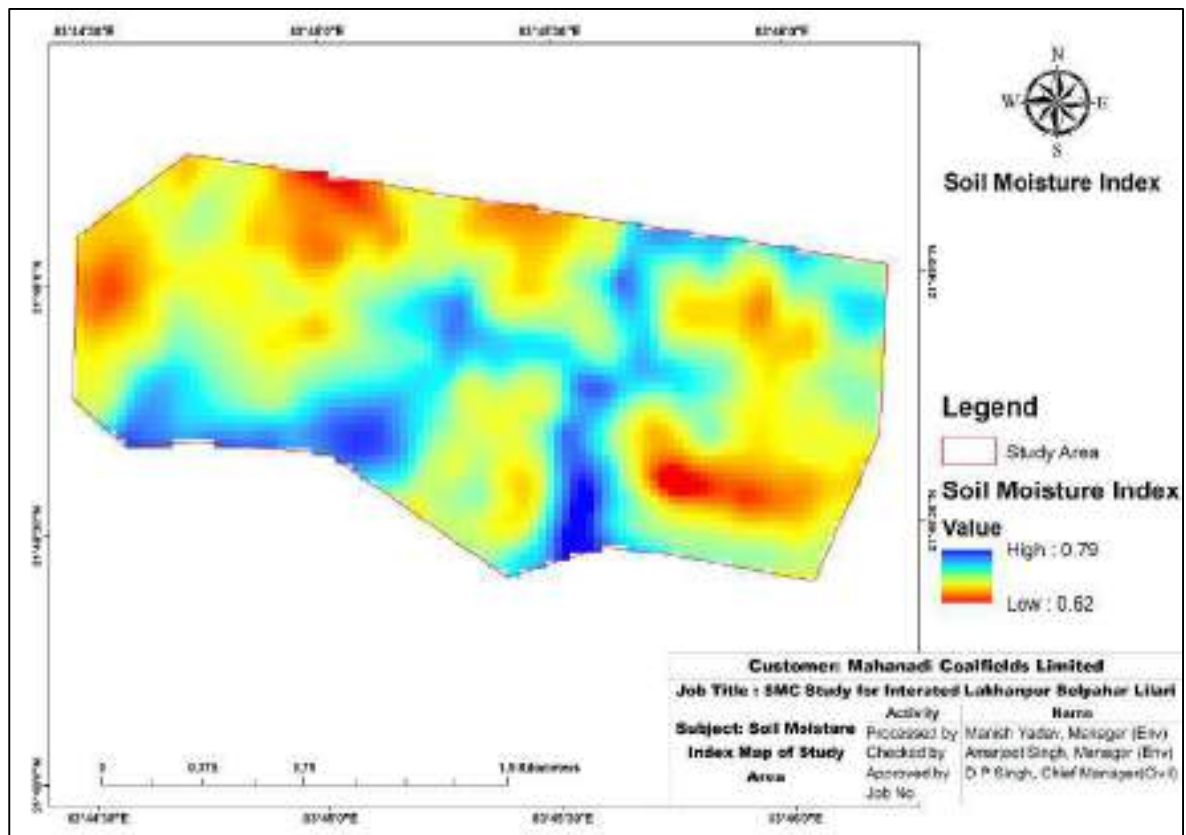


Figure 7.2.: Soil moisture index map of the study area

7.3.3 ANALYSIS OF SOIL QUALITY PARAMETERS:

The highlights of some of the parameters as depicted in analytical results are given hereunder:

The highlights of some of the parameters as depicted in analytical results presented in Tables above are given hereunder:

Texture

The texture of the soils was Sandy Loam.

(ii) pH

The pH of the soils ranged between 5.0 to 6.4.

(iii) Electrical Conductivity

The electrical conductivity varied from 0.11 to 0.55 ms /cm at 20°C.

(iv) Organic Carbon

The organic carbon ranged between 0.48 to 0.85 %. Organic carbon is one of the important characteristics of the soil represents for fixation of nitrogen and survival of the various macro and microorganisms. It has been found in the range of poor quality the degraded forest land.

(v) Phosphorus as P₂O₅

The concentration of Phosphorous varied between 13.91 to 27.84 Kg/ha.

(vi) Potash as K₂O

The concentration of Potash ranged between 257.61 to 283.21 Kg/ha.

(vii) Nitrogen as N

The concentration of Nitrogen varied between 240.38 to 307.06 Kg/ha.

7.4 PARAMETERS REQUIRED TO BE MONITORED FOR MEASURING THE EFFECTIVENESS OF THE PROPOSED CONTROLLED MEASURES:

The following parameters are required to be monitored for measuring the effectiveness of the proposed controlled measures:

- A. Land use cover of the study area.
- B. Soil Moisture Index of the area.
- C. Analysis of soil quality parameters

Table No. 7.6 Monitoring Frequency and Time Line:

SI No.	Parameters	Frequency	Year of Monitoring	Remarks
A	Land use cover of the study area.	Yearly	3 rd and 5 th Year	Season – Pre-Monsoon
B	Soil Moisture Index of the area.	Yearly	3 rd and 5 th Year	Season – Pre-Monsoon
C	Analysis of soil quality parameters	Yearly	3 rd and 5 th Year	Season – Pre-Monsoon

The result of the above parameters monitored for measuring the effectiveness of the proposed controlled measures may be compared with the baseline data of the study area.

The work of the monitoring the effectiveness of the proposed controlled measures may be carried out by the reputed organization dully accredited by Quality Council of India (QCI-NABET). The laboratory work may be carried out by NABL accredited /Central Pollution Control Board (CPCB) recognized laboratory.

The estimated cost for the same is as given in the Table below:

Table No. 7.7: Cost of the Proposed Monitoring Mechanism:

SI No.	Parameters	Frequency	Year of Monitoring	Cost Per Year
A	Land use cover of the study area.	Yearly	3 rd and 5 th Year	12,00,000/-
B	Soil Moisture Index of the area.	Yearly	3 rd and 5 th Year	5,00,000/-
C	Analysis of soil quality parameters	Yearly	3 rd and 5 th Year	3,00,000/-
D	Report Preparation	Yearly	3 rd and 5 th Year	5,00,000/-
	Cost for 3rd Year			25,00,000/-
	Cost for 5th Year			2,756,250/-
	Total Cost for Monitoring			52,56,250/-

CHAPTER-8

Disclosure of the Consultant Engaged

CHAPTER-8

DISCLOSURE OF THE CONSULTANT ENGAGED

About CMPDI



FIG. – 8.1 CMPDI Corporate Office, Ranchi

Central Mine Planning & Design Institute Limited (CMPDIL) is a Government of India enterprise having its corporate headquarters at Ranchi in India. It is a fully owned subsidiary of Coal India Limited (CIL) and a Schedule – B Company. It is a Mini Ratna (Category I) company since June, 2019. CMPDI is also an ISO 9001: 2015 certified since 28th March, 2017. There are seven Regional Institutes (Asansol, Dhanbad, Ranchi, Nagpur, Bilaspur, Singrauli & Bhubaneswar) headed by Regional Directors. The highest authority of CMPDI is Chairman cum Managing Director (CMD).

Its registered Corporate office is situated at Gondwana Place, Kanke Road, Ranchi-834 008, a capital city of Jharkhand state. It operates through seven strategically located Regional Institutes over six states territories of India.

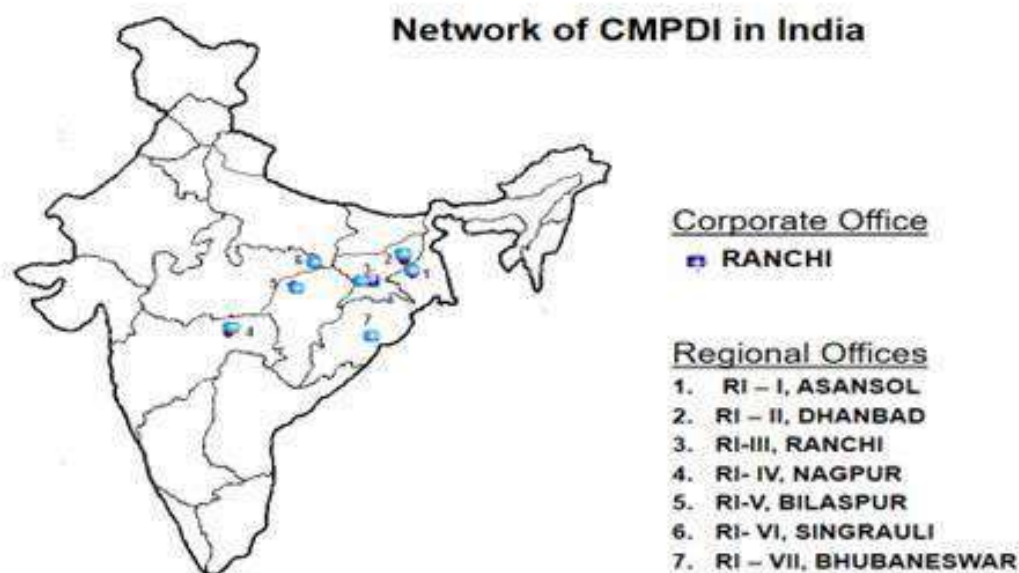


FIG. – 8.2 Locations of Regional Institute of CMPDI

Details of all the seven institutes including its corporate office are given as below:

Sl. No.	Offices	Addresses		Tel / Fax
		Postal	Website	
1	Corporate, Ranchi	Gondwana Place, Kanke Road, Ranchi-834 008, Jharkhand	http://www.cmpdi.co.in	+91 651 2230483, 2230116 / +91 651 2231447, 2232249
2	Regional Institute-I, Asansol	West End, GT Road. Asansol-713 301, West Bengal.	http://www.cmpdi.co.in	+91 341 2253504 / +91 341 2250935
3	Regional Institute-II, Dhanbad	Koyala Bhawan, Koyla Nagar, Dhanbad-826 005, Jharkhand	http://www.cmpdi.co.in	+91 326 2230789, 2230850, 2230103, 2230105/+91326 2265575

Sl. No.	Offices	Addresses		Tel / Fax
		Postal	Website	
4	Regional Institute-III, Ranchi	Gondwana Place, Kanke Road, Ranchi-834 008, Jharkhand	http://www.cmpdi.co.in	+91 6512231506 / +91 651 2231501
5	Regional Institute-IV, Nagpur	Kasturba Nagar, Jaripatka, Nagpur-440 014, Maharashtra.	http://www.cmpdi.co.in	+91 0712 2642134 / +91 0712 2643231
6	Regional Institute-V, Bilaspur	SECL Complex, Seepat Road, Bilapur, Chhattisgarh.	http://www.cmpdi.co.in	+91 7752 246482 / +91 7752 246481
7	Regional Institute-VI, Singrauli	CWS Colony, P.O. Jayant Colliery, Sidhi-486 890, Madhya Pradesh.	http://www.cmpdi.co.in	+91 7805 222172 / +91 7805 277600
8	Regional Institute-VII, Bhubaneswar	Samantapuri, Near Janta Maidan, Bhubaneshwar-751 013, Orissa.	http://www.cmpdi.co.in	+91 0674 2394760, 2394357, / +91 0674 2395128

All the above regional institutes are dedicated to rendering services to seven subsidiaries of the CIL as flows:

Sl. No.	Institutes	Dedicated to
1	Regional Institute-I, Asansol	Eastern Coal fields Ltd.(ECL)
2	Regional Institute-II, Dhanbad	Bharat Coking Coal Ltd.(BCCL)
3	Regional Institute-III, Ranchi	Central Coalfields Ltd(CCL)
4	Regional Institute-IV, Nagpur	Western Coalfields Ltd(WCL)
5	Regional Institute-V, Bilaspur	South Eastern Coalfields Ltd(SECL)
6	Regional Institute-VI, Singrauli	Northern Coalfields Ltd.(NCL)
7	Regional Institute-VII, Bhubaneshwar	Mahanadi Coalfields Ltd(MCL)

CMPDI (HQ.) Ranchi renders services to NEC & Non-CIL clients and specialized assignments for both CIL & non-CIL clients.

Establishment background

The company was formerly known as Coal Mines Authority Limited. And, the Central Mine Planning & Design Institute Limited (herein after called as CMPDI) is a planning & design division of Coal India Limited (hereinafter called as CIL) as per Memorandum of Association of the company. The CIL is a holding company since November 01, 1975, and the CMPDIL is one of its subsidiaries since then. It is under Ministry of Coal, Government of India.

It has multidisciplinary technical executive professionals who combine innovation and initiative to deliver faster and effective solutions in planning, implementation and management of projects.

Resources

CMPDI is equipped with modern laboratory facilities for undertaking various analytical works to supplement its services. It has well equipped network of six environmental laboratories located in various coalfields to regularly monitor air, water, Soil and noise parameters. **The Environment Laboratory at Ranchi is accredited with NABL (National Accreditation Board for Testing and Calibration Laboratories).** The environment lab is also having recognition of CPCB since 1997 and also working under ISO-9001:2015 Certification. Besides its own strength, CMPDI has access to the vast resources with its principal, CIL, India's largest coal producer and a **Maharatna Company**.

Environment Laboratory at a glance



Fig: 8.3 Environment Laboratory at CMPDI HQ, Ranchi

Recognition

CMPDI is recognized as preferred consultant by Indian and overseas clients, United Nation agencies and international financial institutions, and the company is registered with

- World Bank
- Asian Development Bank
- African Development Bank
- United Nations Development Programme

Main Functional area

The main functional area of the CMPDI is to provide adequate and up-to-date planning, design and technological supports to the CIL and its coal producing subsidiaries to enable them to produce the planned quantity of coal efficiently and economically with due attention to safety, conservation, quality and environment. In addition to these, CMPDI also provides necessary consultancy for clients outside the CIL in India and abroad. The Quality Management System of CMPDI, Ranchi is certified under international standard-ISO 9001:2015, Services covered under are as follows:

1. Consultancy in Mineral Exploration and Environmental Management.
2. Planning & Design in Mining, Civil & Architectural Engineering, Coal Preparation & Utilization, Electrical & Mechanical Engineering, Mining Electronics, Geomatics and Mine Construction.
3. Laboratory testing facilities for the above.
4. Technical & Management Training in Mineral & Mining Sector.

Nature of consultancy rendered

CMPDI has been offering services in the fields enumerated in table below:

Sl.No.	Services offered
1	Exploration & Resource Evaluation
2	Mine Planning & Design Services
3	Infrastructures Engineering
4	Environmental Services
5	Beneficiation Services

Sl.No.	Services offered
6	Management Services
7	Specialized Services
8	Laboratory Services
9	ITC in Mining
10	Research & Development

Exploration & resource Evaluation

New generation exploration technology coupled with skilled manpower has made CMPDI a twenty first century leader in mineral exploration, deposit modeling, resource evaluation, resource management, mining geology, hydro-geological & geophysical studies, engineering geological investigations, etc. Services rendered under this head are described in brief :

Sl. No.	Subheads of Services	Services rendered in
1	Geological Support for mining	Production support or mine development drilling and prediction of faults and pinch / wash outs
		Delineation of roof / floor and dirt bands
2	Drilling	Coring-Diamond rotary drills up to a capacity of 1280 m depth
		Non-coring-Direct rotary and DTH drills for hydro-geological investigations, dewatering, etc.
3	Deposit modelling	Using geo-statistical and geological software packages including MINEX and in-house developed CEMPGEODOC and SASLINT software
4	Resource Evaluation	Deposits of coal, lignite, manganese, iron ore (magnetite and hematite), phosphorite, coal bed methane, etc.
5	Resource Management	Strategic planning for future exploration depending upon market demand.
		Updating of reserve / resource of individual blocks or coalfields.
6	Hydro-geological studies	Systematic ground water investigations.
		Mining hydro-geological studies.

Sl. No.	Subheads of Services	Services rendered in
7	Geo-engineering works	Determination of strength properties of rocks and coal and RQD (Rock Quality Designation) to assess strength characteristics of strata.
8	Master Planning for assessment of resource potential-with respect to CBM (Coal Bed Methane) globally an emerging environment friendly alternate energy source.	Creation of data packages of potential CBM blocks
		Resource evaluation of CBM / CMM / AMM.
		Formulation of policy guidelines for harnessing CB resources.
		Implementation of CIL-ONGC Consortiums venture in developing CBM in coalfields.

To provide quality services, CMPDI is effectively utilizing technology like remote sensing, combination drilling (coring and non-coring), multi-probe geophysical borehole logging, seismic refraction survey, etc.

CMPDI has already undertaken over 500 integrated exploration projects in varying geological and terrain conditions.

Mine Planning & Design Services

CMPDI is a premier consultant in open pit and underground mine planning & design in coal, lignite and other minerals. It has prepared more than 950 mining project reports with individual capacity up to 70 Million tonne per annum. CMPDI uses advance software like MINEX for resource modeling, mine planning and scheduling of open cast and underground mine projects. It has helped its subsidiaries to achieve unprecedented production growth from open cast mines in their organizations. Its experience in mechanized underground mining technology spans exploitation of coal seams from 1.00 m to 20 m thickness, at different gradients from flat to 75°; with soft to extremely hard coal; liable to spontaneous heating and gassiness and under varying roof strata conditions. Services offered to are manifold and are enumerated briefly blow:

SI No.	Services Offered
1	Master planning of coalfield
2	Perspective planning
3	Conceptual engineering studies
4	Techno-economic feasibility studies
5	Detailed project reports
6	Detailed engineering with working drawings
7	Mine ventilation and transport planning
8	Operational planning
9	Mining plans for mining lease
10	Mine capacity assessment
11	Performance analysis of equipment
12	Prediction of surface subsidence through numerical modeling software.
13	Geo-physical logging, Seismic survey, Resistivity survey etc.

Infrastructure Engineering

CMPDI provides engineering logistic or support services for development of infrastructure. It has developed multi-disciplinary engineering skills for implementing projects of various complexities. In particular, it has offered complete planning and design services for architectural planning, civil, structural, electrical and mechanical engineering in various projects; important of them are enumerated here:

SI No.	Services Offered
1	Planning of large capacity, high speed bulk material handling plants.
2	Turnkey execution of coal handling plants.
3	Planning of high voltage sub-stations.
4	Planning of workshops of various types and capacities.
5	Township planning including roads, water supply, water supply system, drainage, water / sewerage treatment plants and detailed planning and design of all township infrastructure.
6	Site selection for pit head thermal power plants based on remote sensing data.
7	Rail corridor alignment through remote sensing

8	Techno-economic feasibility study of captive power plants based on pulverized coal and FBC technology.

Environmental Services

CMPDI holds a position of eminence in the field of environmental planning, impact assessment, management and environmental engineering in coal and other sectors. **CMPDI is accredited by National Board of Education and Training (NABET), an organ of Quality Council of India (QCI), New Delhi as an EIA consulting organization for four sectors namely Mining of Minerals including opencast/underground mining, Offshore and Onshore oil and Gas exploration, development & production, Thermal power plants and Coal Washeries.** CMPDI has prepared more than 600 EMPs for coal mining projects (incl. washery & clusters) and obtained Environment Clearance for more than 450 projects. Also, CMPDI has prepared Mine Closure Plans for more than 425.

Environmental Services Rendered by CMPDI:

- Environmental Impact Assessment/ Environmental Management Plan
- Regional Environmental Management Plan
- Routine Environmental Monitoring and Base data generation.
- Planning & design of Sewage Treatment Plants (STPs)
- Design of Effluent Treatment Plants (ETPs) for coal projects
- Schemes for Rainwater Harvesting
- Environmental Statements (Audit Report)
- S&T / R&D studies
- Final Mine Closure Plan for UG & OC projects
- OB Dump Reclamation Action Plan for OC projects
- Study of Environmental Problems of Eco-Sensitive Regions
- Studies related to disposal of fly ash in abandoned mines

A few of the new areas in which CMPDI has diversified are environmental & hydrogeological studies for disposal of fly ash, development of air quality model,

bio-treatment of industrial effluents, carrying capacity base development planning, watershed modeling and rain water harvesting. Services offered with respect to environmental quality; monitoring, engineering, management and planning are briefly given as below:

Sl. No.	Subheads of Services	Services rendered
1	Environmental Monitoring	Air quality
		Water quality
		Noise level
		Soil Quality
		Micro-meteorological studies
		Stack monitoring
2	Environmental Laboratory facilities	Air Analysis:
		Suspended Particulate Matter Respirable Particulate Matter (PM ₁₀ & PM _{2.5}) Oxides of Sulphur (SO _x) Oxides of Nitrogen (NO _x) Carbon Monoxide (CO) Total Hydro Carbon (C _n H _n) Total Dust (Settleable)
		Water Analysis:
		Physical Parameter - pH, Colour, Temp, Turbidity Suspended Solids, Dissolved Solids, etc. Chemical and Biological (BOD, COD, Heavy Metals and trace elements as per statutory requirement)
		Soil: Soil Texture, Porosity, Bulk Density, pH Elect. Conductivity, Water holding capacity, Infiltration Rate Cation Exchange Capacity, Organic Carbon, Phosphorous, Potash Nitrogen etc.
		Noise:
		Noise Intensity Survey Leq Value of Noise
3	Environmental Engineering	Water treatment plants
		Industrial / Municipal effluent treatment and recycling plants
		Hazardous waste disposal site engineering
		Municipal effluent disposal site engineering
4	Natural Resource management	Land use planning
		Rain water harvesting
		Watershed management plans

Sl. No.	Subheads of Services	Services rendered
5	Regional planning	Regional environment management plans
		Regional environment status plans
6	Environment Assessment plans	Environment Assessment plans
7	Special studies	Review of existing mining and environment policies, legislations, standards and mechanisms for monitoring compliance, institutional strengthening for regulatory and counterpart institutions.
		Study of environmental problems and action plan for restoration of environmental quality. Mine closure planning.

Beneficiation Services

CMPDI specializes in planning, design and construction of new washeries and modification of existing washeries for coal and mineral beneficiation. Services with respect to beneficiation offered to are given as below:

SI No.	Services Offered to for
1	Planning of coal and mineral beneficiation plants.
2	Preparation of feasibility / project reports including macro level analysis, washability studies, environmental impact assessment and techno-economic analysis.
3	Technical studies, performance evaluation and operation & maintenance related consultancy for existing washeries.
4	Pilot scale studies and trials.

Management Services

Following descript management services enumerated in table below, have been offered by CMPDI to different organizations or bodies.

Sl. No.	Subheads of Services	Services rendered for
1	Coal Investment promotion Services	Assistance to Government of India in identification and assessment of coal mining properties for investments through private sector participation.
2	Quality Management Services	Consultancy for implementation, certification and maintenance of ISO 9001 Quality Management System and its industry specific translations
3	Human Resource Management	Creating knowledge and skill based workforce, CMPDI through its Staff Training College (STC) imparts training to its clients' personnel. Under UNDP, CMPDI has trained professionals from Nigeria, Sultanate of Oman and North Korea. Through its STC it has organized training programmes under five major categories such as (i) Technical (ii) Managerial (iii) Computer application, (iv) Quality Skills, (v) Quality System, etc. It has also organized & conducted off-campus training programmes with respect to Quality System at various subsidiaries of the CIL

CMPDI diversified into management system consultancy in 1998. While continuing to provide consultancy for ISO 9001 Quality Management System (QMS) and ISO 14000 Environmental Management System (EMS), it made forays into consultancy for ISO 17025:2017 (Testing and calibrating laboratories) under consultancy scope as:

- Creation of Management system.
- Providing training support.
- Implementation, certification and post certification support.

Specialized Services

With a view to catering to specific requirements of clients, CMPDI has been providing field oriented specialized services to its clients. Descript services rendered under this category have been remote sensing, terrestrial survey, blasting, ventilation design & gas assessment in underground mines, energy

audit and non-destructive testing. Main services rendered are described in brief here:

Sl. No.	Subheads of Services	Services rendered in
1	Geomatics	Geomatics services in mining sector ranging from topographical survey, base line data generation and monitoring of land use / land cover for environmental management, water resource survey and coal mine fire mapping. It has also imparted expertise services in the fields of remote sensing applications, terrain mapping, co-relation survey for underground mines, GPS / GIS survey, cartography and digital image processing.
2	Blasting	Carrying out controlled blasting & ground vibration study, vibration monitoring, fragmentation improvement studies, random sampling and testing of explosive and accessories and performance evaluation of new explosives with sophisticated testing equipment in both coal and non-coal sectors.
3	Non-destructive Testing (NDT)	Services for Non-destructive testing of components of machinery, installations and other structural elements have been provided on site during periodic maintenance to avoid accidental failure.
4	Ventilation and Gas Survey	CMPDI has been offering services for ventilation monitoring, planning and design of ventilation system including gas assessment and testing for underground mines.
5	Energy Audit	CMPDI is empaneled as an accredited energy auditor with Govt. of West Bengal and Petroleum Conservation Research Association (PCRA) under ministry of Petroleum and Natural Gas, Govt. of India. Over 130 reports on electrical and diesel energy conservation have been prepared.
6	Inspection Services	CMPDI has been rendering pre-dispatch third party inspection services for plants and equipment at the manufacturers workstations for materials procured by its clients.
7	Captive power plants	Reports on optimum utilization, conceptual notes and tender documents.

Laboratory Services

CMPDI has well-equipped laboratories for carrying out investigations and analysis for geo-chemical, petrography, coal washability and geo-mechanic

properties.

For coal and lignite characterization, CMPDI has laboratories with highly skilled manpower and state of art equipment. The data generated by these laboratories form basis for characterization and grading of coal in exploration, mine feasibility reports, washery designs and down-stream utilization. Brief description of Laboratory Services rendered by CMPDI is given as below:

Sl. No.	Subheads of Services	Services rendered in
1.	Environment Laboratory	CMPDI has a well-equipped environmental laboratory to undertake the entire spectrum of environmental studies. The environmental laboratory is recognized by NABL & Central Pollution Control Board, Ministry of Environment & Forests, Government of India and accredited with ISO-9001:2015 certification.
2	Geo-chemical Laboratory	CMPDI has been rendering geo-chemical analysis like proximate & ultimate analysis, GCV determination of coal and lignite and other special tests through microprocessor based automatic calorimeter and analyzer.
3	Petrographic Laboratory	CMPDI has been carrying out evaluation for hydro carbons, oil shales and coal bed methane for coal coke and source rock through sophisticated microscopes, identifying mineral phases in coal, rocks and metals through X-Ray diffractometer, and Micro-area analysis & cleat studies for CBM through Scanning Electron Microscope accredited by International Committee for Coal and Organic Petrology (ICCP).
4	Mining Laboratory	CMPDI has been determining physico-mechanical properties of rocks for design inputs for mine planning and other technical services and undertaking testing of roof supports and building materials for design support systems for underground workings.
5	Washery Laboratory	CMPDI has been determining washability characteristics of course, small and fine coal and shattering & pulverizing characteristics of coal for assistance in planning and design of coal beneficiation plants.

ITC Services in Mining

CMPDI has been gearing up itself fully meet challenges of IT sector requisite for mining industries as per IT implementation scheme with a view to revolutionizing

mining industry and mining operations in coming years. IT services provided by CMPDI have been as tabulated here:

SI No.	Services Offered to for
1	Mine communication and mine safety systems
2	Establishing internet and internet facilities
3	Real time fleet management system for large opencast mines using GIS & GPS.
4	Land information system using enterprise GIS.

R & D Services

The Research & Development activities in coal and lignite is being administered through the Scientific Advisory Committee (SSRC) with Secretary (Coal) as its Chairman. The committee is entrusted with the task of planning, budgeting and overseeing the implementation of R & D programme in coal & lignite sector and also for application of research findings. And, CMPDI is the Nodal Agency to coordinate S & T / R &D activities in coal and lignite Sector and assist SSRC in areas mentioned herein after.

CMPDI applied research and development in the field of mining, beneficiation, utilization, environment, exploration, etc. serving as nodal agency for all S & T schemes funded by Ministry of Coal and R & D schemes funded by R & D Board of the CIL (constituted in August 1995). Field oriented research projects including transfer and absorption of new technology concerning main areas of coal research have been as follows:

- Production, productivity and safety.
- Coal beneficiation and utilization.
- Environment and Ecology.

ANNEXURE-1

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Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)

Indira Paryavaran Bhawan,
Jorbagh Road, Alliganj
New Delhi – 110003

Dated: 27th December, 2023

To
The Addl. Chief Secretary (Forests),
Government of Odisha,
Bhubaneswar.

Sub: Proposal for seeking prior approval under Section 2 (II) of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha– (Online proposal No. FP/OR/MIN/39355/2019) reg.

Madam/Sir,

I am directed to refer to the State Government of Odisha's letter No. FE-DIV-FLD-0142-2021-20500/ FE&CC dated 24.11.2021, letter no. 9084/9F (MG)-372/2021 dated 29.04.2022, letter No. 13830/9F (MG) 372/2021 dated 11.07.2023 and vide letter No. 21861/9F (MG) 372/2021 dated 08.11.2023 on the above subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980. The proposal was considered by the Advisory Committee (AC) in its meeting held on 29.11.2023 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section - 3 of the aforesaid Act.

2. After careful examination of the proposal of the State Government and on the basis of the recommendations of the Advisory Committee, and approval of the same by the competent authority of the MoEF&CC, New Delhi, the Central Government hereby accords '***in-principle***' approval under Section - 2 of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha subject to fulfilment of the following conditions:

1. Legal status of the diverted forest land shall remain unchanged;
2. Status of the court cases booked against the MCL shall be provided.
3. **Compensatory Afforestation:**
 - a. The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation as per the approved CA Scheme at the current wage rate in consultation with State Forest Department in the

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- account of CAMPA of the concerned State through online portal;
- b. The land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act, 1927 or under the relevant Section (s) of the local Forest Act, as the case may be, before the Stage-II approval;
- c. The cost of survey, demarcation and erection of permanent pillars, if required on the identified CA land, shall be deposited in advance with the Forest Department by the user agency. The CA will be maintained for 10 years. The scheme may include afforestation of indigenous species with appropriate provision for anticipated cost increase for works scheduled for subsequent years;
- d. The compensatory afforestation over non-forest land, equal in extent to the forest land being diverted i.e. 417.073 ha, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval;
- e. Afforestation on degraded forest land to be selected elsewhere, measuring one and a half times the area under safety zone, shall also be done at the project cost under the supervisions of the State Forest Department and afforestation will be done within three years from the date of Stage-II clearance and maintained thereafter in accordance with the approved Plan in consultation with the State Forest Department;
- f. User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease. The plan for plantation and SMC activities will be prepared and submitted to MoEF &CC before Stage-II Clearance;
- g. 25% of the CA cost additionally will be spent towards soil and moisture conservation activities in the proposed CA area as per site requirement and deposited in CAF;

4. NPV:

- a. The User Agency shall transfer the funds towards the cost of Net Present Value (NPV) of the forest land being diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 06.01.2022 read with 22.03.2022 through online portal of CAMPA account of the State Concerned;
- b. At the time of payment of the Net Present Value (NPV) at the present rate, the user agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;
- c. *The penalty for reported violation shall be equal to NPV of forest land per hectare for each year of violation from the date of actual diversion as reported by the inspecting officer with five (5) times the NPV plus 12 percent simple interest till the deposit is made. The required admissible*

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amount shall be paid by the UA.

5. Compensatory levies to be realized from the User Agency under the project shall be transferred/ deposited, through e-challan, in to the account of CAMPA pertaining to the State concerned through e-portal (<https://parivesh.nic.in/>);
6. The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area shall be uploaded on the e-Green watch portal with all requisite details prior to Stage-II approval;
7. Following activities, as per approved plan / schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:
 - a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;
 - b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;
 - c. Construction of check dams, retention / toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;
 - d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28o; and
8. **Safety Zone Management:** Following activities, at project cost, shall be undertaken by the user agency for the management of safety zone as per relevant guidelines issued by the Ministry's guidelines:
 - a. User agency shall ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the State Forest Department;
 - b. Boundary of the safety zone of the mining lease, adjacent to habitation/roads, should be properly fenced by the user agency;
 - c. Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by the user agency at project cost under the supervision of the State Forest Department;
 - d. The State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms;
9. No damage shall be caused to the top-soil and the user agency will follow the top soil management plan;
10. The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such

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- tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF & OC before Stage-II approval;
11. The cost of felling of trees shall be deposited by the User Agency with the State Forest Department;
 12. Trees should be felled in phased manner as per the requirement in the approved Mining Plan with prior permission of concerned DFO;
 13. The User Agency shall undertake that afforestation of the non-mineralized virgin forest land within the mining area shall be taken up at project cost;
 14. The user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department.
 15. A site-specific Wildlife Management Plan shall be prepared by the State Government in consultation with the PCCF (Wildlife) for the protection and conservation of wildlife of the area. A copy of approved Plan shall be submitted to the Ministry along with the compliance of Stage-I approval. Entire cost of implementation of the provisions of the Wildlife Management Plan shall be deposited into the account of CAMPA of the State;
 16. State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence, along with compliance of Stage-I approval, as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof;
 17. The User Agency shall undertake that user agency and the State Forest Department shall create and maintain from funds to be provided by the user agency alternate habitat/ home for the avifauna, whose nesting trees are to be cleared in this project as per the plan duly approved by the Principal Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden Odisha. Bird nests artificially made out of eco-friendly materials shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project;
 18. The User Agency shall undertake that the project authority needs to take up works for construction and cleaning of garland drains, stabilizing retaining walls, proper terracing of OB dumps and checking gully formation resulting in soil erosion;
 19. The User Agency shall undertake that plants which are having lowest translocation factor can be preferred under afforestation on the OB dumps and fruit trees to be avoided in planting during biological stabilization of OB dumps;
 20. The User Agency shall undertake that prevention of fall of wild animals into mining pit by fencing the open pit area;
 21. The User Agency shall undertake that the angle of repose in OB dumps to be maintained to ensure stability and safety;
 22. The User Agency shall undertake that vetiver grass can be planted at the lower reaches of the dump to bind the soil and prevent soil erosion giving better stability to the dump;
 23. The User Agency shall undertake mining in a phased manner after taking due

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care for reclamation of the mined over area. The concurrent reclamation plan as per the approved mining plan shall be executed by the User Agency from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, in the concerned State Government and the concerned Regional Office of the Ministry. If it is found from the annual report that the activities indicated in the concurrent reclamation plan are not being executed by the User Agency, the Nodal Officer or the concern Addl. Principle Chief Conservator of Forests (Central) may direct that the mining activities shall remain suspended till such time, such reclamation activities area satisfactorily executed;

24. The User Agency shall comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner;
25. Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under;
26. The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required;
27. No labour camp shall be established on the forest land and the User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas;
28. The boundary of the diverted forest land, mining lease and safety zone, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates;
29. The layout plan of the mining plan/ proposal shall not be changed without the prior approval of the Central Government and the forest land shall not be used for any purpose other than that specified in the proposal;
30. The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government;
31. No damage to the flora and fauna of the adjoining area shall be caused;
32. The User Agency shall submit the annual self -compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly;
33. Any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation, protection and development of forests & wildlife; and
34. The user agency shall comply all the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.
35. Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5-2/2017-FC

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dated 28.03.2019.

36. The compliance report shall be uploaded on **e-portal** (<https://parivesh.nic.in/>).

3. After receipt of compliance report on fulfilment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980. Transfer of forest land shall not be affected till final approval is granted by the Central Government in this regard.

Yours Sincerely,

Signed by

Charan Jeet Singh

Date: 27-12-2023 17:35:47

Sd/

(Charan Jeet Singh)

Scientist 'D'

Copy to:

1. PCCF (HoFF), State Forest Department, Government of Odisha, Bhubaneswar
2. PCCF & Nodal Officer (FCA), O/o PCCF, State Forest Department, Government of Odisha, Bhubaneswar
3. DDGF (Central), Regional Office of MoEF&CC at Bhubaneswar.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF&CC, New Delhi
6. Guard File.

ANNEXURE-2: Model Estimate for SMC Work

Table A- 1. Catch Pit (Size 2 m X1m X 0.5 m)

S.No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Update Cost as on April 2024	Amount (Rs.)
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. All kinds of soil	Cum	0.50	177.50	179.73	89.87
2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-incharge. Ordinary rock	Cum	0.50	498.90	505.17	252.59
Total Per Catch Pit						342.45

WPI as on April 2023	151.1
WPI as on April 2024	153
% Increase	1.257445

Table A- 1.1 Detailed Estimate: Catch Pit (Size 2 m X1m X 0.5 m)

S. No.	Description	Nos.	Length	Breadth	Depth	Quantity	Unit
	Catch Pit	1.00	2.00	1.00	0.50	1.00	
					Say	1.00	Cum
1	Earthwork in soil	50 % of	1.00			0.50	Cum
2	Earthwork in ordinary rock	50 % of	1.00			0.50	Cum

Table A- 2 Contour Trench (Size 1 m X 1m X 0.6 m)

S.No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Update Cost as on April 2024	Amout (Rs.)
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. All kinds of soil	Cum	0.30	177.50	179.73	53.92
2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-incharge. Ordinary rock	Cum	0.30	498.90	505.17	151.55
Total Per meter Contour Trench						205.47

WPI as on April 2023

151.1

WPI as on April 2024

153

% Increase

1.257445

Table A- 2.1 Detailed estimate Contour Trench (Size Lm X 1m X 0.6 m)

S. No.	Description	Nos.	Length	Breadth	Depth	Quantity	Unit
	Earthwork						
	Contour trench	1.00	1.00	1.00	0.60	0.60	
					Total	0.60	
					Say	0.60	Cum
1	Earthwork in soil	50 % of	0.60			0.30	Cum
2	Earthwork in ordinary rock	50 % of	0.60			0.30	Cum

Table A- 3. Surface Pond (Size 50 m X 30 m X 2.5 m)

S. No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Updated Cost as on April 2022	Amount (Rs.)
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. All kinds of soil	Cum	1875.00	177.50	179.73	336997.44
2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-incharge.	Cum	1875.00	498.90	505.17	947200.12
3	Dry stone pitching 22.5 cm thick including supply of stones and preparing surface complete.	Sqm	564.80	883.15	894.26	505075.30
					Total for one Surface Pond	1789272.85

WPI as on April 2023

151.1

WPI as on April 2024

153

% Increase

1.257445

Table A- 3.1 Detailed estimate Surface Pond (Size 50 m X 30 m X 2.5 m)

S. No.	Description	Nos.	Length	Breadth	Depth	Quantity	Unit
	Earthwork						
	Surface Pond	1.00	50.00	30.00	2.50	3750.00	
					Total	3750.00	
					Say	3750.00	Cum
1	Earthwork in soil	50 % of	3750.00			1875.00	Cum
2	Earthwork in ordinary rock	50 % of	3750.00			1875.00	Cum
3	Stone pitching						
	Surface Pond	2.00	50.00	3.53		353.00	Sqm
		2.00	30.00	3.53		211.80	Sqm
					Total	564.80	Sqm

Table A- 4 Check Dam (Size 10 m X 1 m X 0.6 m)

S. No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Updated Cost as on April 2024	Amount (Rs.)
1	Providing & making Gabion structure with Mechanically Woven Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes as per IS 16014:2012, MORTH Clause 2500, of required size, Mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc+PVC coated, Mesh wire diameter 2.7/3.7mm, mechanically edged/selvedged with partitions at every 1m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, tying with lacing wire of diameter 2.2/3.2mm (ID/OD), supplied @3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm, as per drawing, all complete as per directions of Engineer-in-charge.	Cum	6.00	4569.25	4626.71	27760.23
					Total for one Check Dam	27760.23

WPI as on April 2023

151.1

WPI as on April 2024

153

% Increase

1.257445

Table A- 4.1 Check Dam (Size 15 m X 1 m X 0.6 m)

S. No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Updated Cost as on April 2024	Amount (Rs.)
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. All kinds of soil	Cum	9.00	4569.25	4626.71	41640.35
					Total for one Check Dam	41640.35

WPI as on April 2023

151.1

WPI as on April 2024

153

% Increase

1.257445

Table A- 4.2 Detailed estimate Check Dam (Size 20 m X 0.6 m X 1 m)

S.No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Updated Cost as on April 2022	Amount (Rs.)
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. All kinds of soil	Cum	12.00	4569.25	4626.71	55520.47
					Total for one Check Dam	55520.47

WPI as on April 2023

151.1

WPI as on April 2024

153

% Increase

1.257445

Table A- 5 Grassing (Size 1 m X 1 m)

S.No.	Description	Unit	Qty.	Rate as on April 2020 including GST	Updated Cost as on April 2024	Amount (Rs.)
1	Providing & laying Selection no. 1 grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with required tools wooden and than rolling the surface with light roller make the surface smoothen and light watering the same including maintenance for 30 days or more till the grass establish properly,as per direction of officer in charge	Sqm	1.00	42.70	54.81	54.81
					Total for one Sqm Grassing	54.81

WPI as on April 2020	119.2
WPI as on April 2024	153
% Increase	28.3557

Table A- 6 Mulching/ Manuring per Cum

S. No.	Description	Unit	Qty.	Rate as on April 2020 including GST	Updated Cost as on April 2024	Amount (Rs.)
1	Mulching of land using cow dung/dry leaves/straw or similar items as per direction of officer in charge	Cum	1.00	102.35	127.85	127.85
2	Supplying and stacking at site dump manure from approved source, including carriage upto 5 km lead complete	Cum	1.00	254.15	317.48	317.48
3	Spreading of sludge, dump manure and/or good earth in required thickness as per direction of officer-in-charge (cost of sludge, dump manure and/ or good earth to be paid separately).	Cum	1.00	52.35	65.39	65.39
					Total for one Cum	510.73

WPI as on October 2018

122

WPI as on August 2023

152.4

% Increase

24.91803

Table A- 7 Earthen Bund (Size 0.6 m height, 1.7 m bottom width): Cost for one metre

S. No.	Description	Unit	Qty.	Rate as on April 2023 including GST	Updated Cost as on August 2023	Amount (Rs.)
1	Banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller, or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal banks, and guide banks etc., lead upto 50 m and lift upto 1.5 m : All kinds of soil	Cum	0.66	470.55	476.47	314.47
					Sub-Total	314.47
					Add GST @18%	56.60
					Total for one Sqm Grassing	371.07

WPI as on April 2023	151.1
WPI as on April 2024	153
% Increase	1.257445

Plate -1: Location of SMC Site

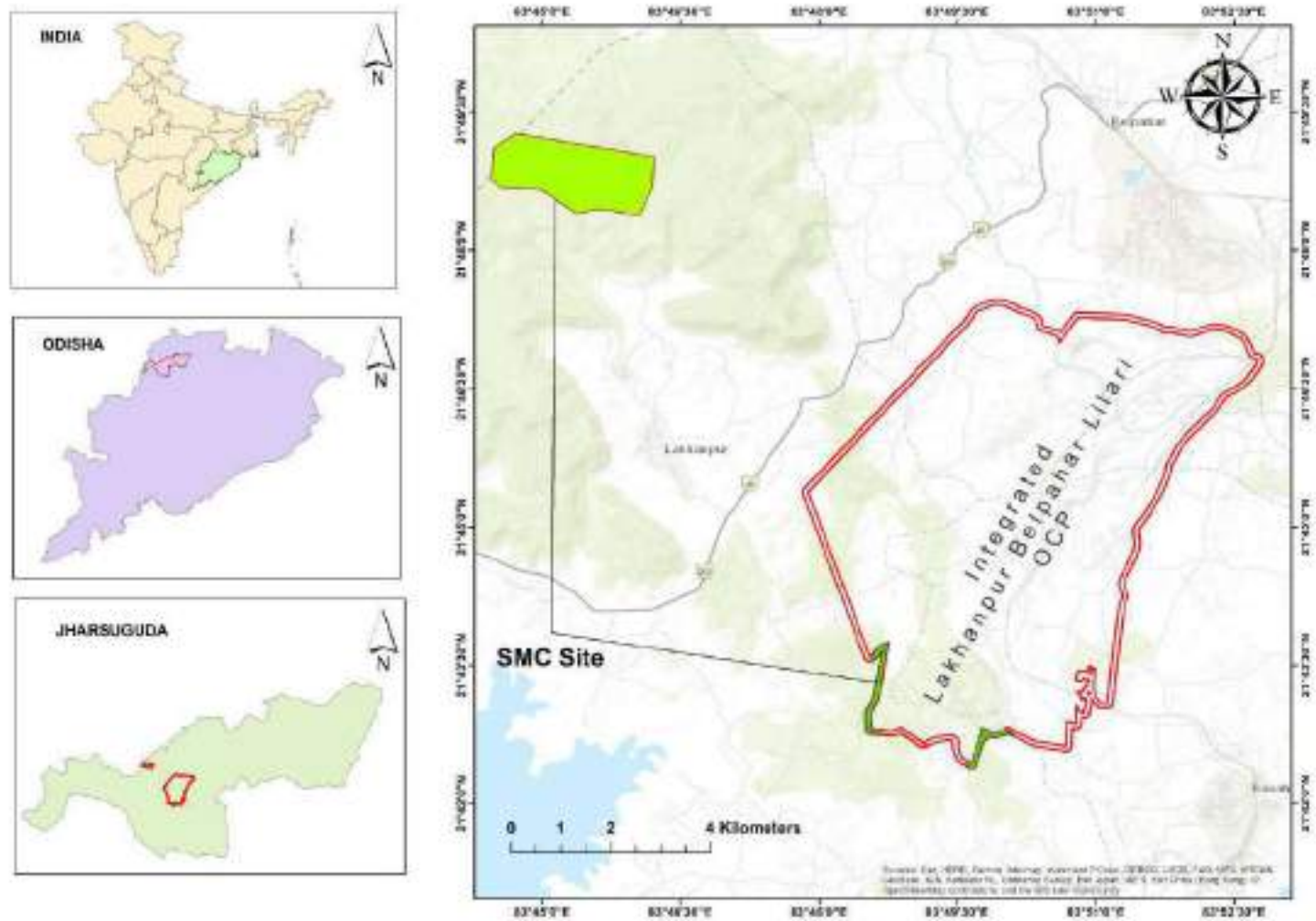


Plate-2 Orthomosaic Image

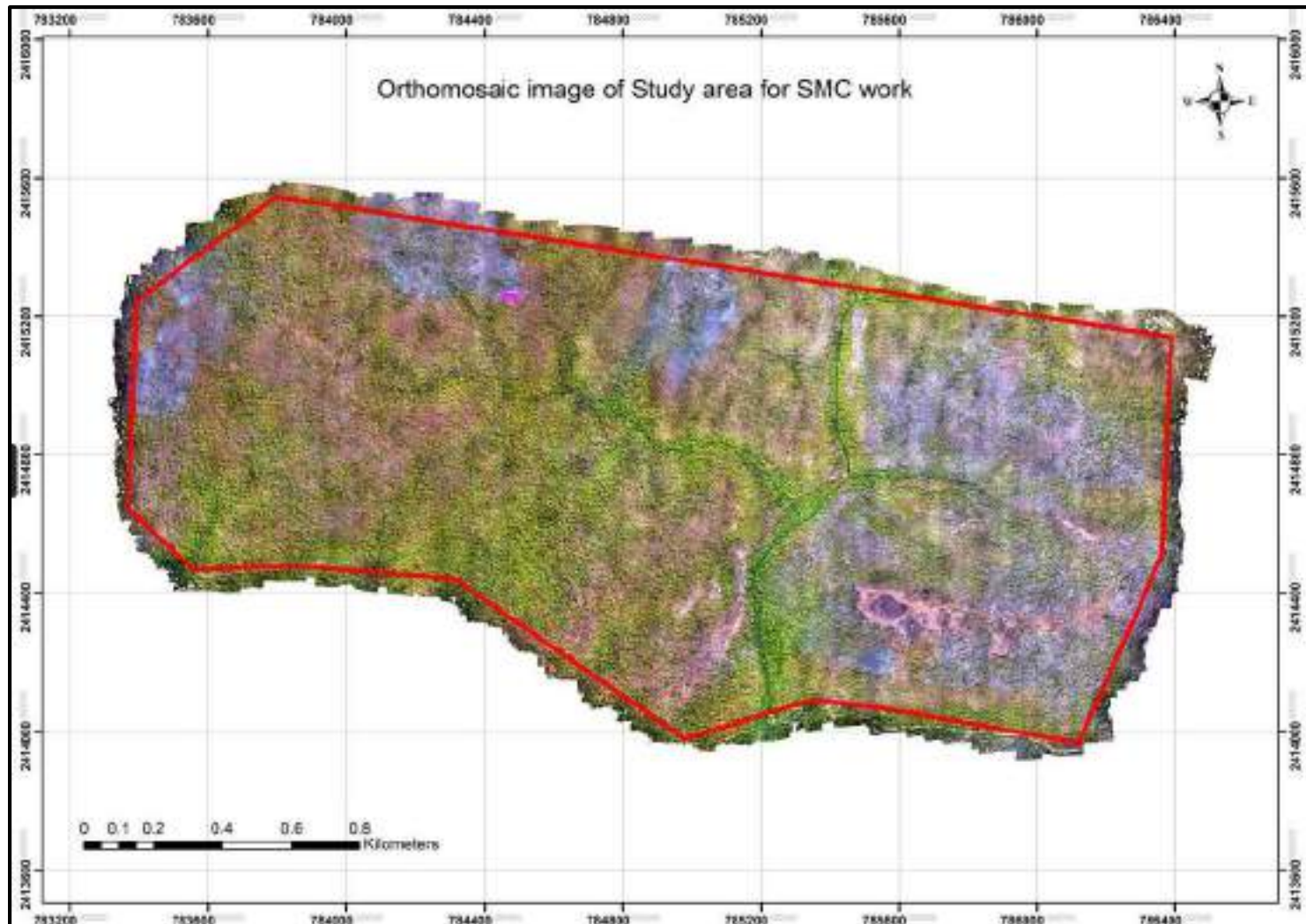


Plate -3: Contour Map

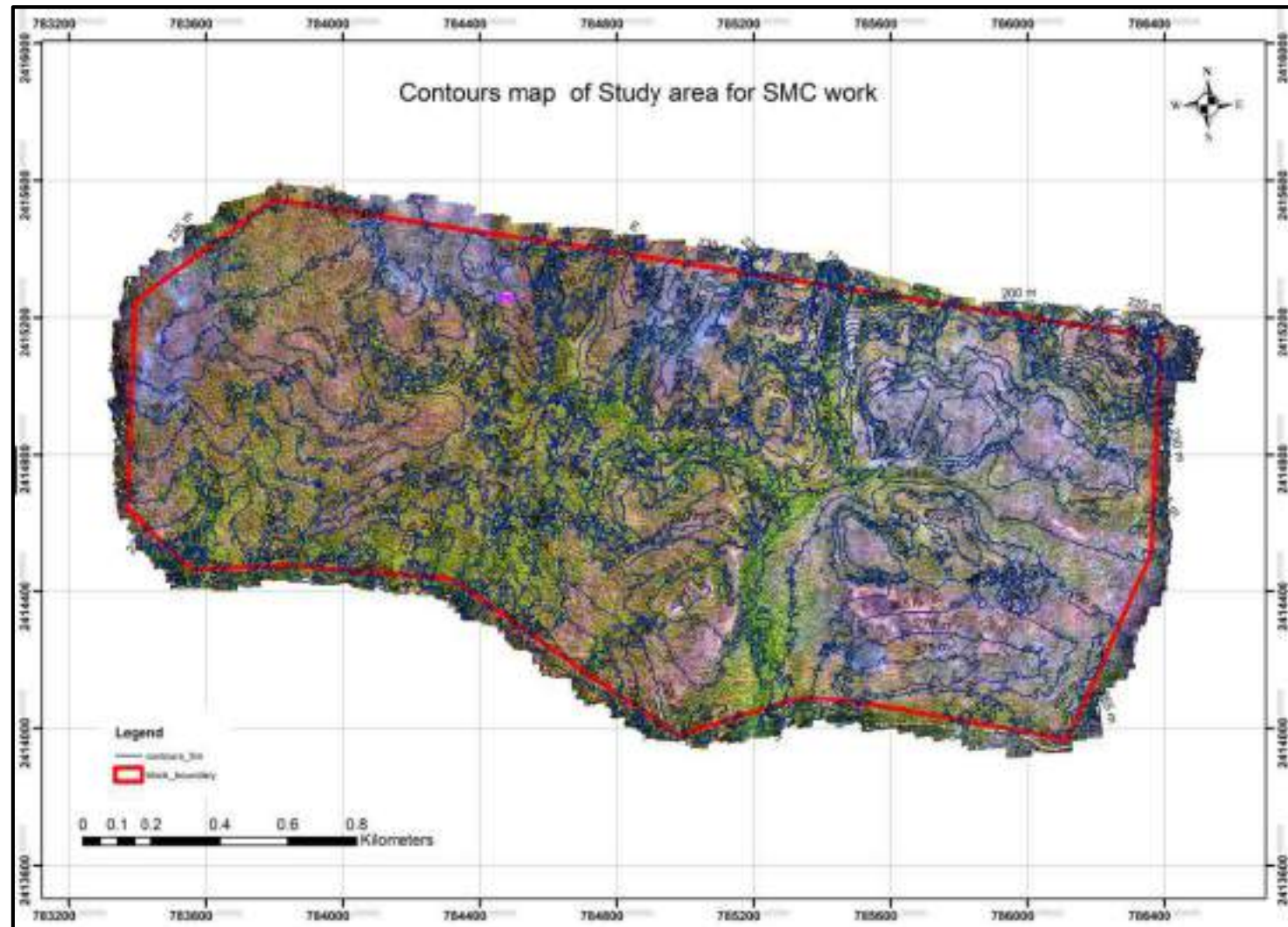


Plate 3-A :Contour Map

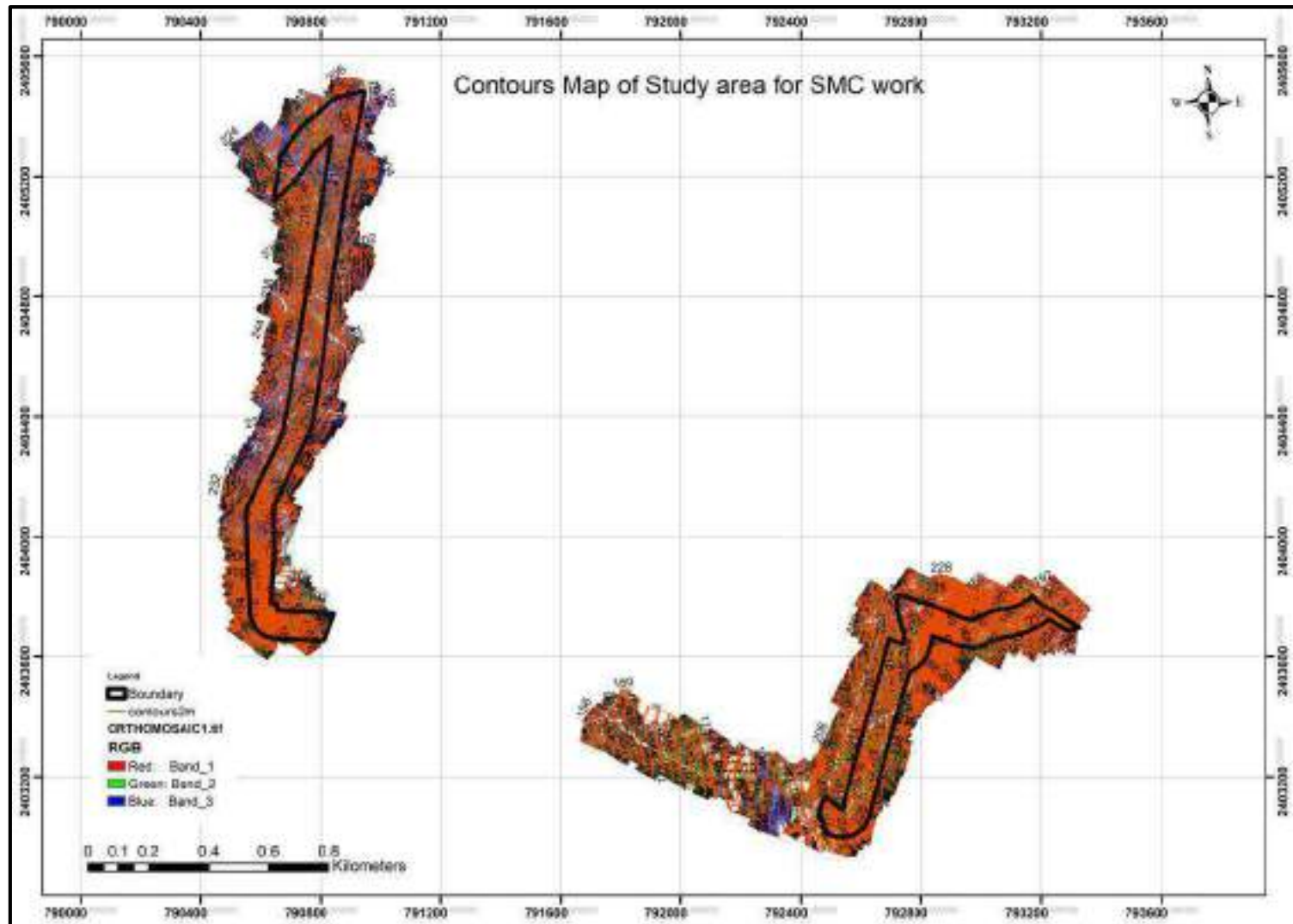


Plate 4: Location of Proposed Contour Trenches

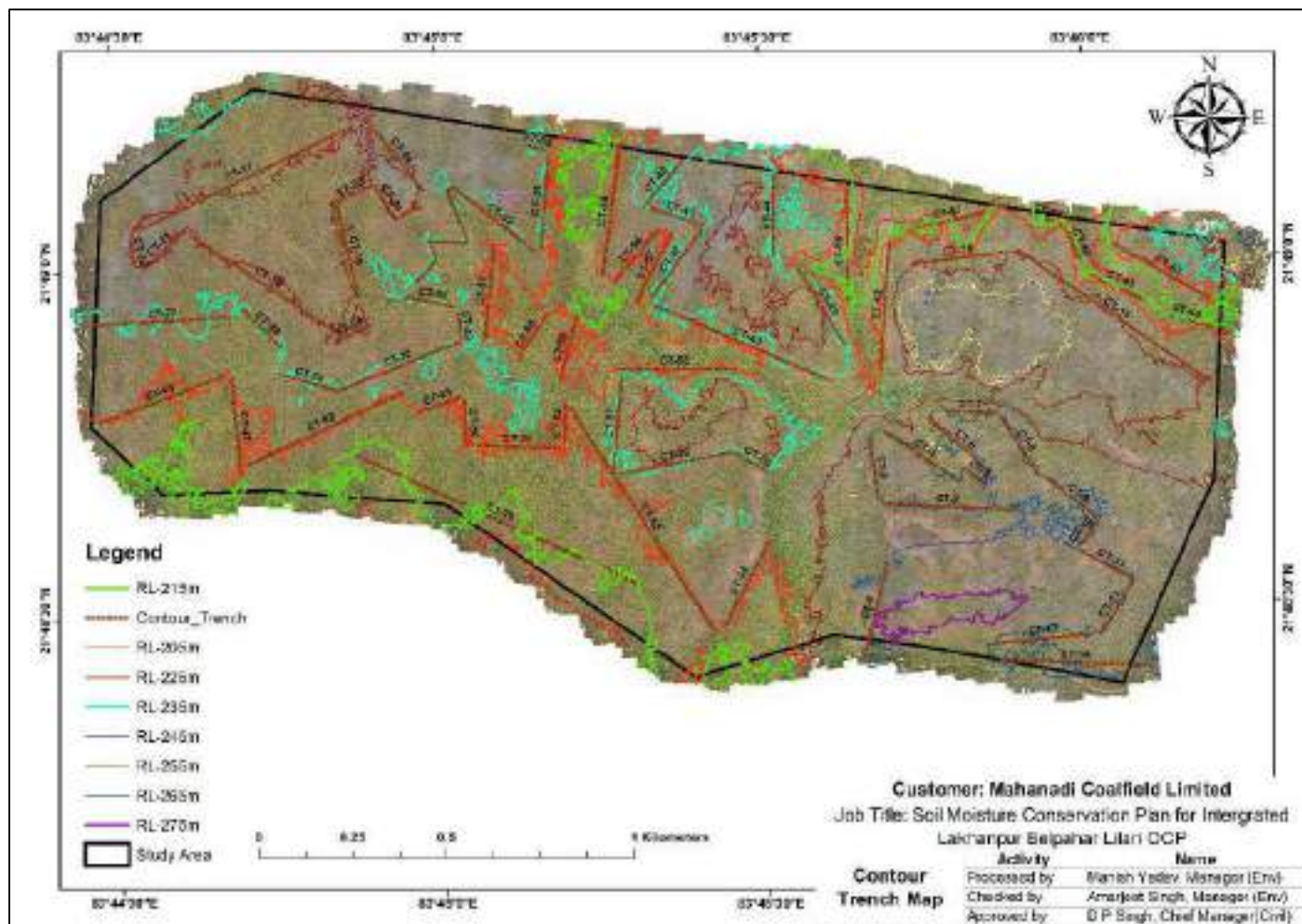


Plate 5: Location of Proposed Check Dams

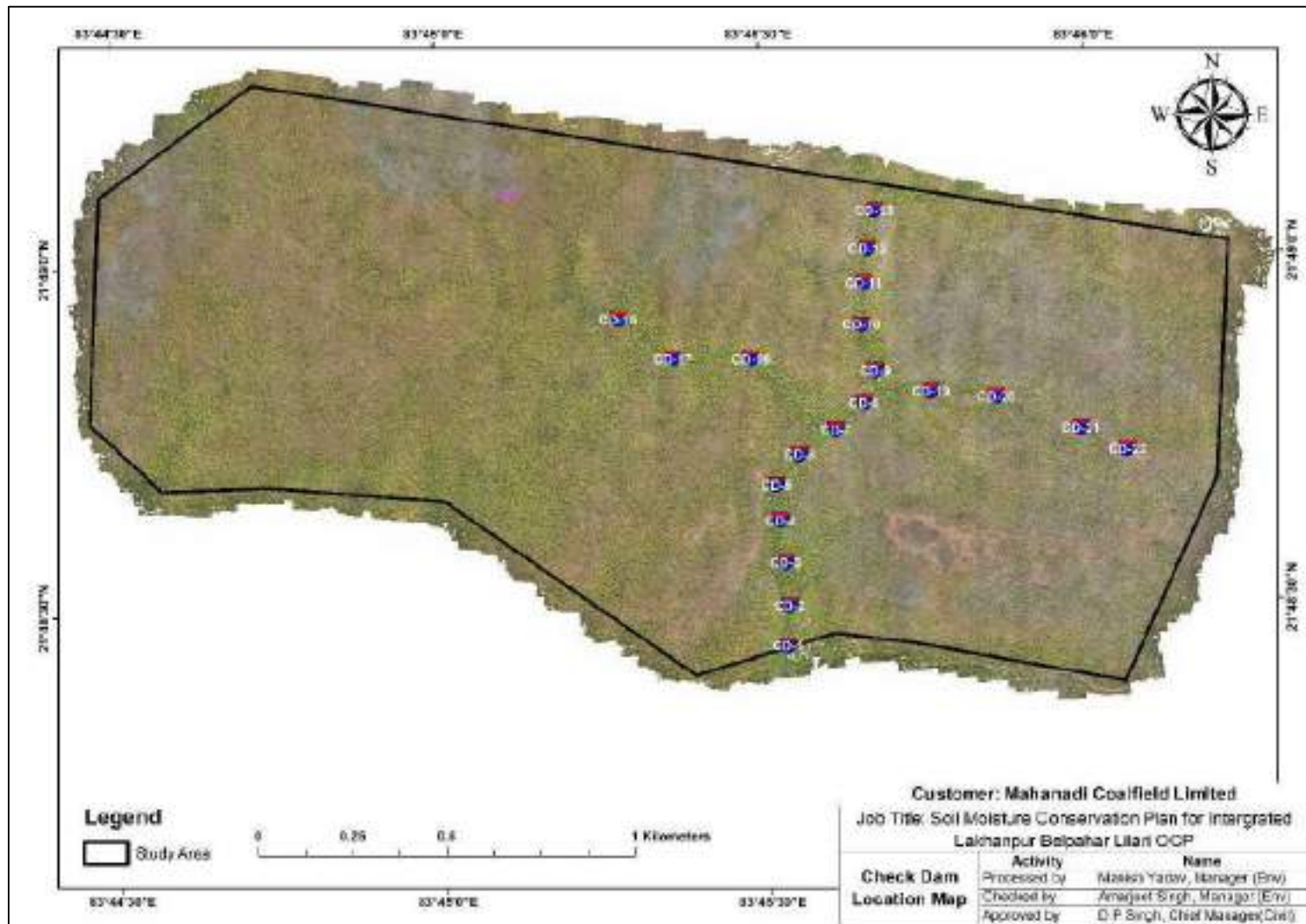


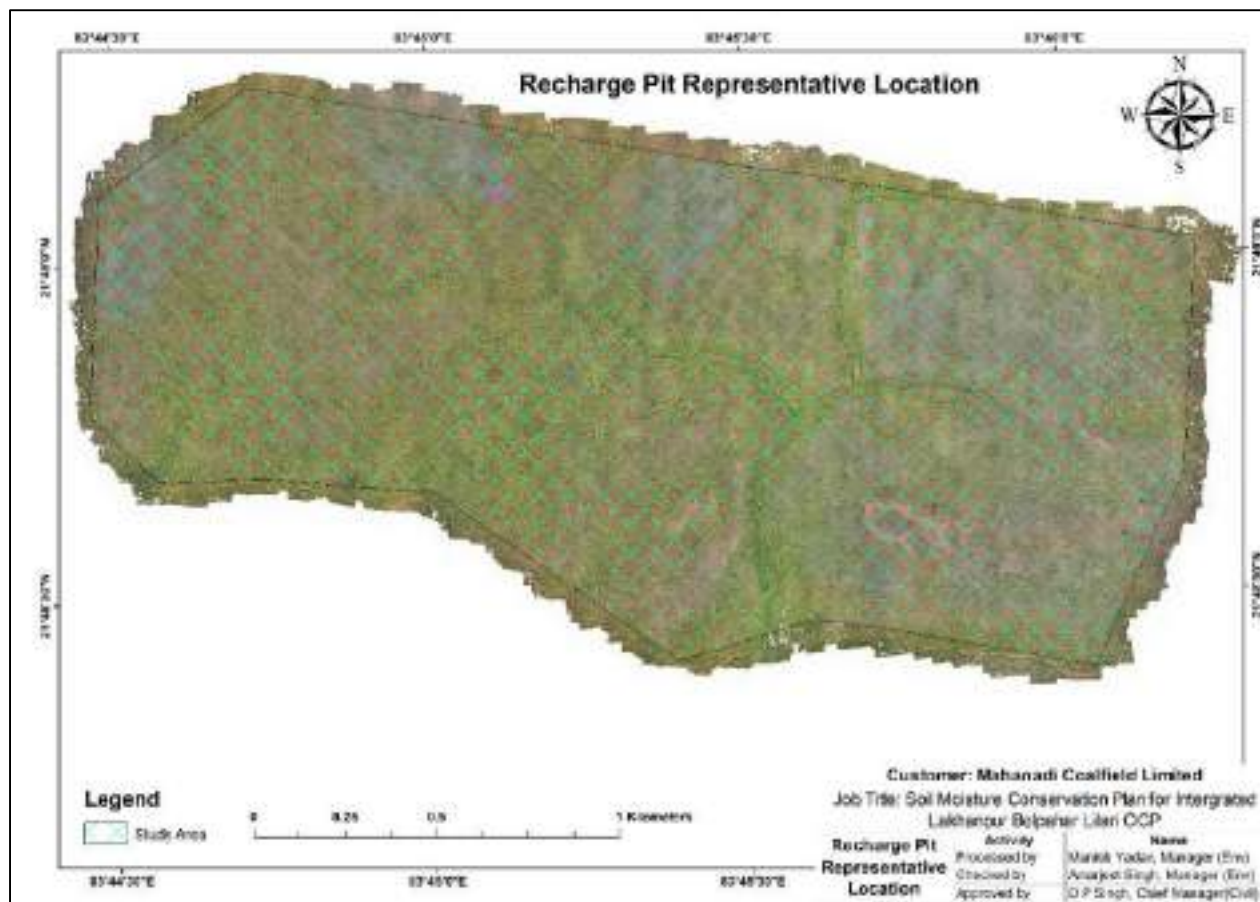
Plate 6: Recharge Pit (Representative Location)

Plate 6-A :Recharge Pit (Representative Location)

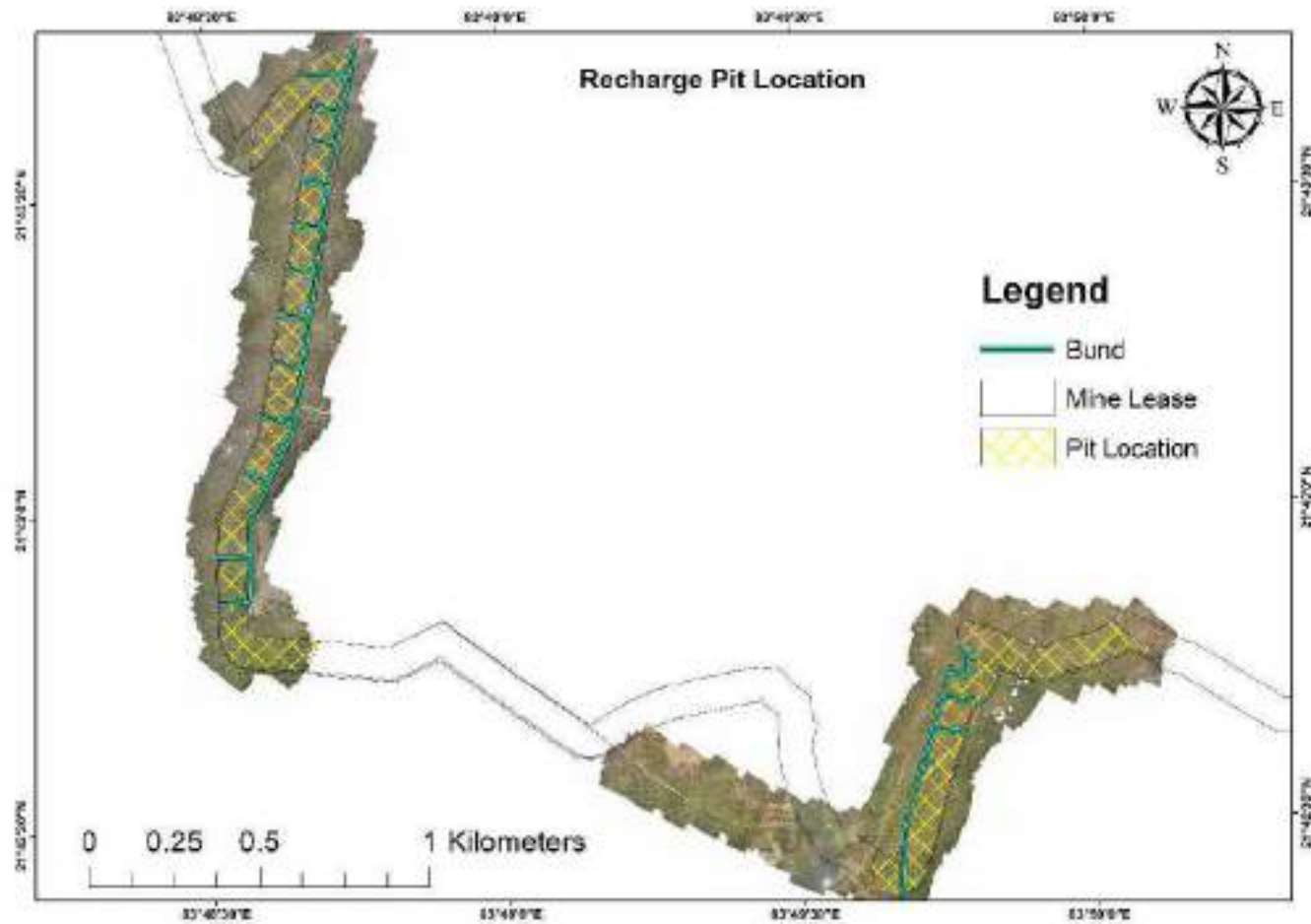


Plate 7: Surface Pond

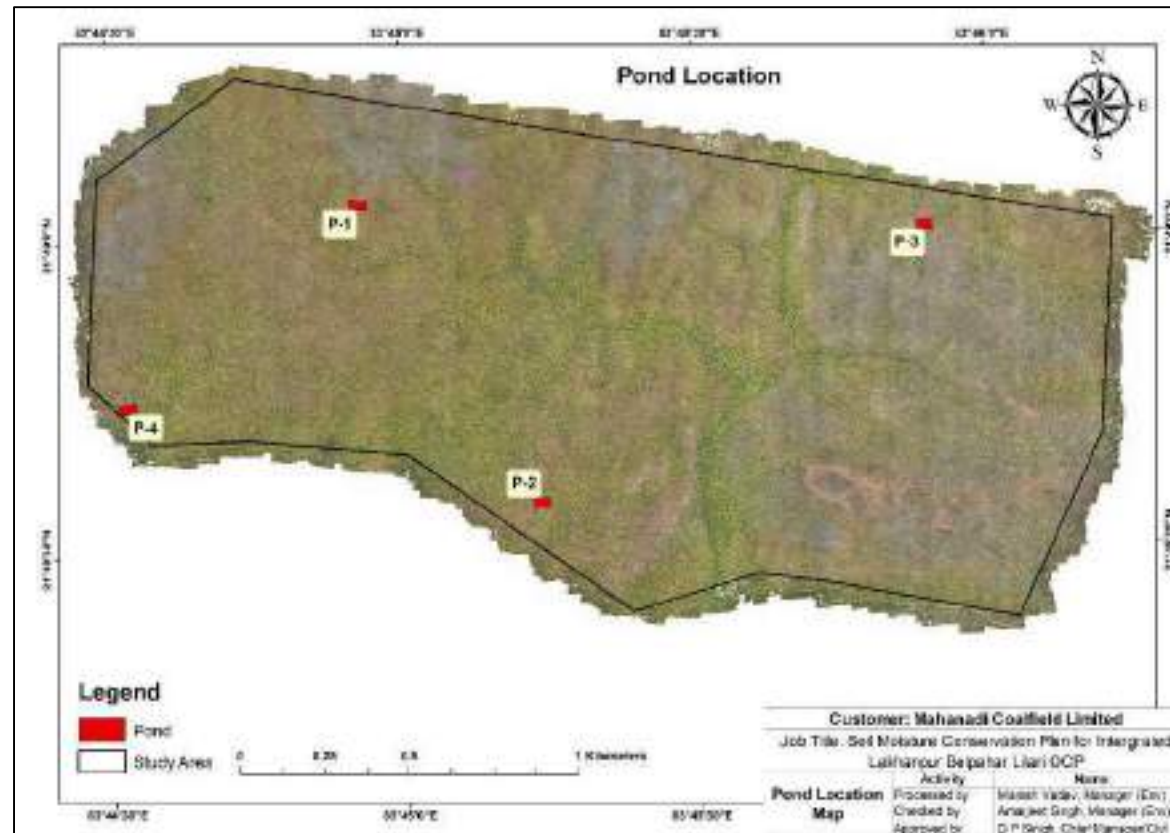


Plate 8 : Bund Location

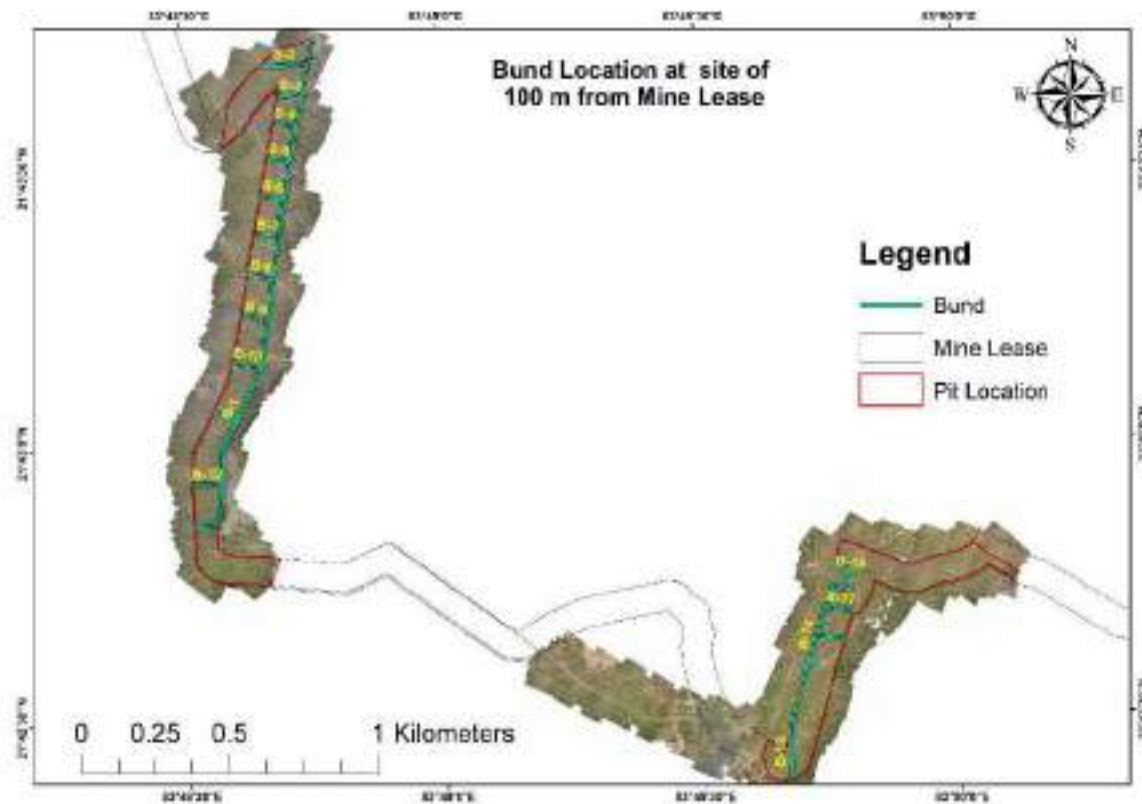


Plate 9: Proposed Location for Mulching

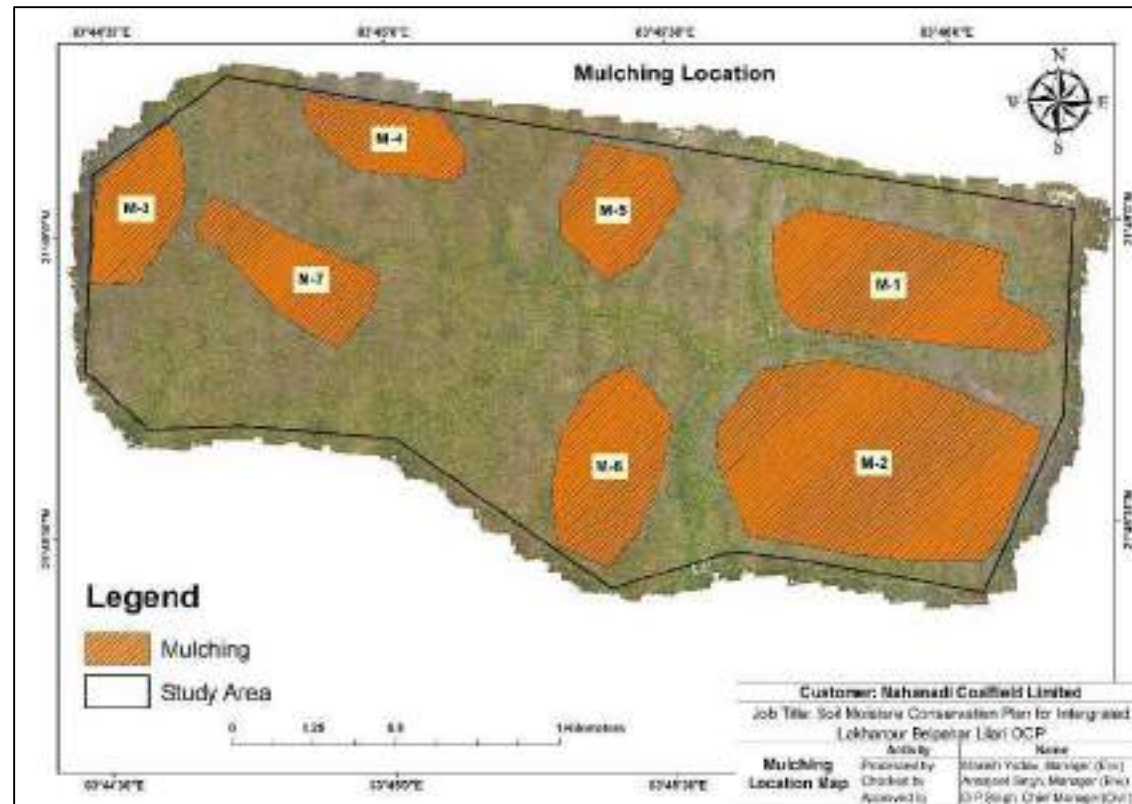


Plate 10: Proposed Location for Grassing

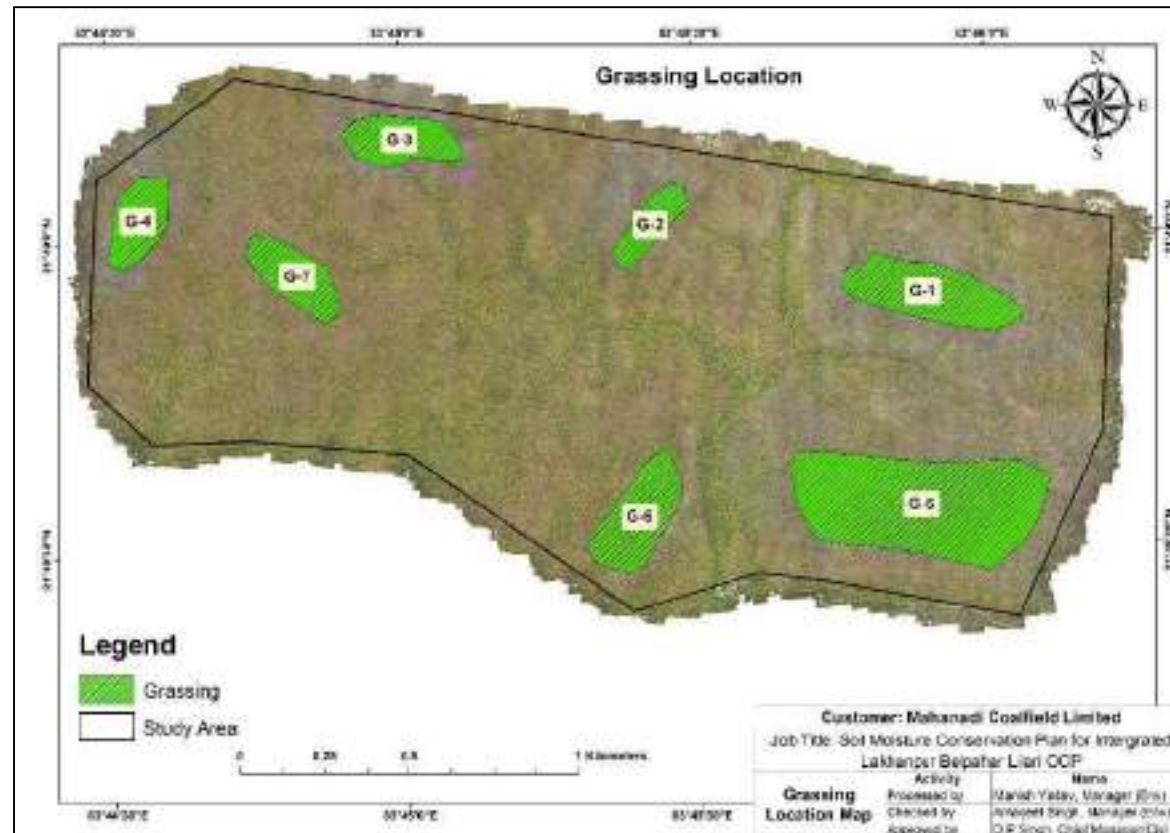
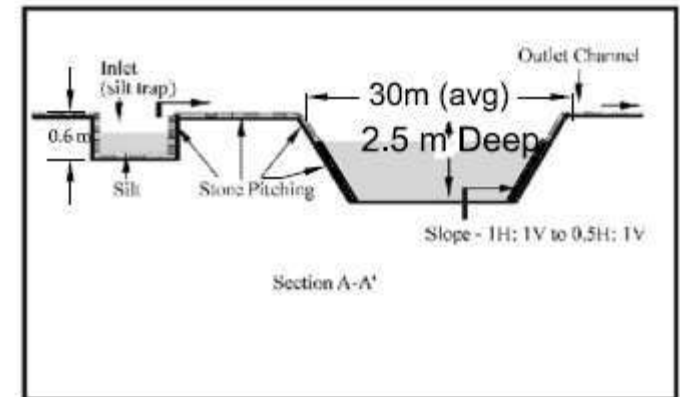
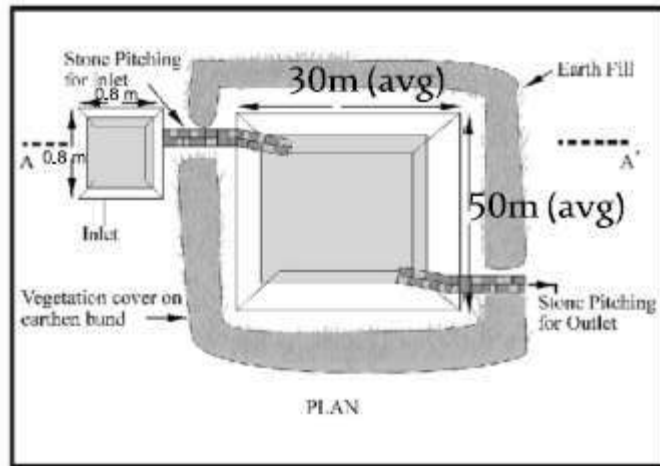


Plate 11: Typical Section of Surface Pond



TYPICAL SECTION OF SURFACE POND

AGENCY COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 18-11-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355262
MoEF/SG File No.	B-280/1989-FC VOL.
Location.	ORRISA
Address.	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha, Jharsuguda
Amount(in Rs)	139912985/-

Amount in Words: Thirteen Crore Ninety-Nine Lakh Twelve Thousand Nine Hundred and Eighty-Five Rupees. Only

NEFT/RTGS to be made as per following details:

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0998335
Pay to Account No.	150825839355262 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelita Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 18-11-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
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Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelita Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: fcablr@unionbankofindia.bank, epurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank

SBINR520 24 111 86 3270 55

Authorised Officer
MCL, LAKHANPUR AREA

44611691A. P. SORENG
SBI, BANDHABAHAL BRANCH
18 NOV 2024
CASH
3704
Journal No.
Cheque No.

Authorised Officer
MCL, LAKHANPUR AREA

7409982 NINIYA MAJHI
SBI, BANDHABAHAL BRANCH
18 NOV 2024
CASH
3704
Journal No.
Cheque No.

General Manager



ଜଙ୍ଗଲ, ପରିବେଶ ଓ ଜଳ ବାୟୁ ପରିବର୍ତ୍ତନ ବିଭାଗ, ଓଡ଼ିଶା ସରକାର

ଖଣ୍ଡୀୟ ବନାୟତ୍ତାବଳୀ କାର୍ଯ୍ୟାଳୟ ଝାରସୁଗୁଡ଼ା ବନଖଣ୍ଡ ।

ଇମେଲ୍- dfo.jharsuguda@odisha.gov.in, ଫୁଲ ଭାଷା /ଫା.ନଂ-୦୭୭୪୫-୨୯୫୦୪୦ ।

Memo No. **6354** /4F (Misc.),
Dated Jharsuguda the **13th** Nov, 2024.

To,

The General Manager, MCL,
Lakhanpur Area, Bandhbahal.

Sub: - Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 Ha & Re-diversion (Change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref: - (i) Stage -I / in principle Order No. 8-280/1989-FC Vol. dt.27.12.2023 of the Govt. of India, Ministry of Environment, Forests and Climate Change (Forest Conservation Division), New Delhi.

(ii) Memo No.25474/9F(MG)-372/2021 dt.29.12.2023 of the Conservator of Forests (Nodal), O/o the PCCF & HoFF, Odisha, Bhubaneswar.

(iii) Memo No.2559/3F(M)-/2024, dt.14.10.2024 & Memo No.2796/3F(M)-/2024 dt.12.11.2024 of the RCCF, Sambalpur.

Sir,

In inviting a reference to the letter cited above on the captioned subject, this is to inform you that, the following scheme has been technically approved by the Regional Chief Conservator of Forests, Sambalpur Circle, the financial outlay is mentioned below:

Sl No.	Name of the Scheme	Condition No. in Stage-I/in-principle approval letter.	Financial Outlay (in Rs.)
1	Gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease.	3(f)	115032500.00
2	One and half times safety zone in degraded forest land.	3(e)	24880485.00
Total:-			139912985.00

Hence, you are requested to deposit of amount **Rs.139912985.00 (Rupees Thirteen Crore Ninety Nine Lakh Twelve Thousand Nine Hundred Eighty Five)** only towards the cost of above schemes in the CAMPA Account through e-portal (<https://parivesh.nic.in/>). The evidence of depositing the amount may be forwarded to the undersigned for further needful action at this end.

Yours faithfully,

Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. 6355

Date. 13.11.2024

Copy forwarded to the Principal Chief Conservator of Forests (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha, Bhubaneswar for favour of kind information & necessary action.



Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. 6356

Date. 13.11.2024

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information & necessary action.



Divisional Forest Officer,
Jharsuguda Forest Division.

4F
North
15/11/2024
OFFICE OF THE



REGIONAL CHIEF CONSERVATOR OF FORESTS, SAMBALPUR
CIRCLE, SAMBALPUR

Motijharan, Sambalpur, Pin-768001

Email id- rccf.sambalpur@odisha.gov.in

Memo No. 2559 3F(M)- /2024

Dated, Sambalpur the 14th. October, 2024.



To

The Divisional Forest Officer,
Jharsuguda Forest Division.

Sub:- Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 ha. & Re-Diversion (Change of Land use) of 171.774 ha. of forest land in respect of Integrated Lakhanpur- Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref:- Your memo No.4670 dt.17.08.2024.

With reference to the memo cited above on the captioned subject, scheme for "Gap planting and soil & moisture conservation activities to restock rejuvenate the degraded open forests" to fulfill the conditions No.3(f) imposed in Stage-I/ in-principal approval order of the Ministry of Environment, Forest & Climate Change, Govt. of India (FC Division), New Delhi in lieu of diversion of 417.073 ha. & Re-Diversion (Change of Land use) of 171.774 ha. of forest land in respect of Integrated Lakhanpur- Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda which comes to Rs.11,50,32,500/- (Rupees Eleven Crore Fifty Lakhs Thirty two Thousand Five Hundred) only as submitted by you is here by Technically Approved and returned here with for taking necessary action at your end.

Encl- As above (2 sets).

Regional Chief Conservator of Forests,
Sambalpur Circle.

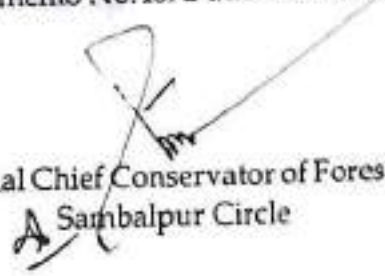
Memo No. 2560 /Dt. 14.10.2024

Copy forwarded to the Principal Chief Conservator of Forest (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha for favour of information and necessary action with reference memo No.4671 dt.17.08.2024 of DFO, Jharsuguda Forest Division.

Regional Chief Conservator of Forests

Memo No. 2561 /Dt. 14.10.2024

Copy forwarded to the General Manager, MCL, Lakhanpur Area, Bandhbahal,
for information and necessary action with reference to memo No.4672 dt.17.08.2024 of
DFO, Jharsuguda Forest Division.


Regional Chief Conservator of Forests
Sambalpur Circle



**OFFICE OF THE REGIONAL CHIEF CONSERVATOR OF FORESTS, SAMBALPUR
CIRCLE, SAMBALPUR**

Motijharan, Sambalpur, Pin-768001

Email id- rcct.sambalpur@odisha.gov.in

Memo No. 2796 3F(M)- /2024.

Dated, Sambalpur the 12 th. Nov., 2024.

To

The Divisional Forest Officer,
Jharsuguda Forest Division.

Sub:- Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 ha. & Re-Diversion (Change of Land use) of 171.774 ha. of forest land in respect of Integrated Lakhanpur- Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref:- Your memo No.6202 dt.05.11.2024.

With reference to the memo cited above on the captioned subject, scheme as per Stage-I/in-principle approval order of the ministry of environment, forests and climate change, government of India(FC Division, New Delhi) vide their F.No. 8-280/1989-FC Vol. dt.27.12.2023 in lieu of diversion of 417.073 Ha & Re-diversion (change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda as submitted by you is here by Technically Approved and returned here with for taking necessary action at your end.

Sl	Name of the Schemes	Condition No. in Stage- I/ in principle approval letter.	Final Outlay (in Rs.)
1	One and a half times safety zone in degraded forest land.	3(e)	24880485.00
2	Mitigative measures to minimize soil erosion and choking of stream	7(a)	909010908.00
3	Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within lease to arrest soil erosion.	7(b)	4494686.40
4	Construction of check dams, retention/toe walls to arrest siding down of the excavated material along contour	7(c)	123000000.00

Stabilize the over burden dumps by appropriate grading/benching	7(d)	Covered in condition NO.7(a) and 7(b).
De-siltation of village tanks and other water bodies within 5 km.	10	376531716.70

Encl- As above.

Regional Chief Conservator of Forests,
Sambalpur Circle.

Memo No. 2797 /Dt 12/11/2024

Copy forwarded to the Principal Chief Conservator of Forest (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha for favour of information and necessary action with reference memo No.6203 dt.05.11.2024 of DFO, Jharsuguda Forest Division.

Regional Chief Conservator of Forests
Sambalpur Circle

Memo No. 2798 /Dt 12/11/2024

Copy forwarded to the General Manager, MCL, Lakhanpur Area, Bandhbahal for information and necessary action with reference to memo No.6204 dt.05.11.2024 of DFO, Jharsuguda Forest Division.

Regional Chief Conservator of Forests
Sambalpur Circle

DETAILS OF ITEM-WISE FINANCIAL OUTLAY**(As Per One-Time Cost Norm @ 452 Per MD)**

Sl. No.	Item of Work	Financial outlay	Remarks
1.	Cost of ANR plantation @ 500plants per ha over 37 ha of degraded forest land @ Rs. 190851/ Ha with 10 th Year Maintenance (at current wage rate of Rs. 452 Per MD)	Rs. 7061487.00	Annexure -I
2	Cost for SMC Works as per SMC Model -C @ Rs.51791/Ha.	Rs. 1916267.00	Annexure -II
3	Cost for Watering Provisions as per Watering Model - W-II (Rs. 600312/1000 Plants) i.e. Rs.600312/1000 Plants x 500 Plants x 37.0 ha	Rs. 11105772.00	Annexure -III
4.	Cost for Fencing as per Fencing Model F-1@ Rs.120105/Ha.	Rs.4443885.00	Annexure-IV
	Total	Rs.24527411.0	
6	Contribution towards VSS (5%) of total plantation cost.	Rs. 353074.35	
	Total	Rs. 24880485.35 or 24880485.00	

(Two Crore Forty Eight Lakh Eighty Thousand Four Hundred Eighty Five) Only

Divisional Forest Officer,
Jharsuguda Forest Division.

Technically Approved

Regional Chief Conservator of Forests
Sambalpur

6.8 COST ESTIMATE: Year wise Abstract of SMC Measures

Sl No	Year	Total Cost for the SMC work with GST (In Rs.)	Maintenance of SMC structures @ 15% without GST (In Rs.)	Total Cost including GST (In Rs.)	Monitoring & Supervision @ 5% (In Rs)	GRAND TOTAL COST including GST and 5% Supervision (In Rs.)	Cost for POL and Driver Wages for Proposed Vehicle for Monitoring & Supervision	Cost for Long Term Monitoring and Assessment	Total (Rs)
1	1st Year (2024-25)	6,11,13,158.00		6,11,13,158.00	30,55,658.00	6,41,68,816.00	4,20,000.00		6,45,88,816.00
2	2nd Year (2025-26)		91,66,974.00	91,66,974.00	4,58,349.00	96,25,323.00	4,41,000.00		1,00,66,323.00
3	3rd Year (2026-27)		96,25,322.00	96,25,322.00	4,81,256.00	1,01,06,588.00	4,63,050.00	25,00,000.00	1,30,69,638.00
4	4th Year (2027-28)		1,01,06,589.00	1,01,06,589.00	5,05,329.00	1,06,11,918.00	4,86,202.50		1,10,99,120.50
5	5th Year (2028-29)		1,06,11,918.00	1,06,11,918.00	5,30,596.00	1,11,42,514.00	5,10,513.00	27,56,250.00	1,44,09,277.00
	Total	6,11,13,158.00	39510803	10,06,23,961.00	50,31,198.00	10,56,55,159.00	23,20,765.50	52,56,250.00	11,32,32,174.50

Cost of the Proposed vehicle for Monitoring & Supervision (In Kind):

Sl No.	Year	Description	No.	Cost (Rs.)
1	1st Year (2024-25)	4-Wheeler	1	1500000
2		2-Wheeler	2	300000
Total cost for Vehicle (In Kind)				1800000

Grand Total for SMC Work (Rs. 11,32,32,174.50 + Rs. 1800000) =

Rs. 11,50,32,174.50 = 11,50,32,500.00 (Say)

Technically Approved

VI-28

Regional Chief Conservator of Forests
SambalpurDivisional Forest Officer
Jharsuguda Forest Division

I/61084/2023

Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)

Indira Paryavaran Bhawan,
Jorbagh Road, Aliganj
New Delhi – 110003

Dated: 27th December, 2023

To

The Addl. Chief Secretary (Forests),
Government of Odisha,
Bhubaneswar.

Sub: Proposal for seeking prior approval under Section 2 (ii) of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha– (Online proposal No. FP/OR/MIN/39355/2019) reg.

Madam/Sir,

I am directed to refer to the State Government of Odisha's letter No. FE-DIV-FLD-0142-2021-20500/ FE&CC dated 24.11.2021, letter no. 9084/9F (MG)-372/2021 dated 29.04.2022, letter No. 13830/9F (MG) 372/2021 dated 11.07.2023 and vide letter No. 21861/9F (MG) 372/2021 dated 08.11.2023 on the above subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980. The proposal was considered by the Advisory Committee (AC) in its meeting held on 29.11.2023 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section - 3 of the aforesaid Act.

2. After careful examination of the proposal of the State Government and on the basis of the recommendations of the Advisory Committee, and approval of the same by the competent authority of the MoEF&CC, New Delhi, the Central Government hereby accords '***in-principle***' approval under Section - 2 of the Forest (Conservation) Act, 1980 in favour of M/s Mahanadi Coalfields Limited for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha subject to fulfilment of the following conditions:

1. Legal status of the diverted forest land shall remain unchanged;
2. *Status of the court cases booked against the MCL shall be provided.*
3. **Compensatory Afforestation:**
 - a. The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation as per the approved CA Scheme at the current wage rate in consultation with State Forest Department in the

account of CAMPA of the concerned State through online portal;

- b. The land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act. 1927 or under the relevant Section (s) of the local Forest Act, as the case may be, before the Stage-II approval;
- c. The cost of survey, demarcation and erection of permanent pillars, if required on the identified CA land, shall be deposited in advance with the Forest Department by the user agency. The CA will be maintained for 10 years. The scheme may include afforestation of indigenous species with appropriate provision for anticipated cost increase for works scheduled for subsequent years;
- d. The compensatory afforestation over non-forest land, equal in extent to the forest land being diverted i.e. 417.073 ha, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval;
- e. Afforestation on degraded forest land to be selected elsewhere, measuring one and a half times the area under safety zone, shall also be done at the project cost under the supervisions of the State Forest Department and afforestation will be done within three years from the date of Stage-II clearance and maintained thereafter in accordance with the approved Plan in consultation with the State Forest Department;
- f. User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meter from outer perimeter of the mining lease. The plan for plantation and SMC activities will be prepared and submitted to MoEF &CC before Stage-II Clearance;
- g. 25% of the CA cost additionally will be spent towards soil and moisture conservation activities in the proposed CA area as per site requirement and deposited in CAF;

4. NPV:

- a. The User Agency shall transfer the funds towards the cost of Net Present Value (NPV) of the forest land being diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 06.01.2022 read with 22.03.2022 through online portal of CAMPA account of the State Concerned;
- b. At the time of payment of the Net Present Value (NPV) at the present rate, the user agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;
- c. *The penalty for reported violation shall be equal to NPV of forest land per hectare for each year of violation from the date of actual diversion as reported by the inspecting officer with five (5) times the NPV plus 12 percent simple interest till the deposit is made. The required admissible*

amount shall be paid by the UA.

5. Compensatory levies to be realized from the User Agency under the project shall be transferred/ deposited, through e-challan, in to the account of CAMPA pertaining to the State concerned through e-portal (<https://parivesh.nic.in/>);
6. The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area shall be uploaded on the e-Green watch portal with all requisite details prior to Stage-II approval;
7. Following activities, as per approved plan / schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:
 - a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;
 - b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;
 - c. Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;
 - d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and
8. **Safety Zone Management:** Following activities, at project cost, shall be undertaken by the user agency for the management of safety zone as per relevant guidelines issued by the Ministry's guidelines:
 - a. User agency shall ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the. State Forest Department;
 - b. Boundary of the safety zone of the mining lease, adjacent to habitation/roads, should be properly fenced by the user agency;
 - c. Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by the user agency at project cost under the supervision of the State Forest Department;
 - d. The State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms;
9. No damage shall be caused to the top-soil and the user agency will follow the top soil management plan;
10. The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such

tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF & CC before Stage-II approval;

11. The cost of felling of trees shall be deposited by the User Agency with the State Forest Department;
12. Trees should be felled in phased manner as per the requirement in the approved Mining Plan with prior permission of concerned DFO;
13. The User Agency shall undertake that afforestation of the non-mineralized virgin forest land within the mining area shall be taken up at project cost;
14. The user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department.
15. A site-specific Wildlife Management Plan shall be prepared by the State Government in consultation with the PCCF (Wildlife) for the protection and conservation of wildlife of the area. A copy of approved Plan shall be submitted to the Ministry along with the compliance of Stage-I approval. Entire cost of implementation of the provisions of the Wildlife Management Plan shall be deposited into the account of CAMPA of the State;
16. State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence, along with compliance of Stage-I approval, as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof;
17. The User Agency shall undertake that user agency and the State Forest Department shall create and maintain from funds to be provided by the user agency alternate habitat/ home for the avifauna, whose nesting trees are to be cleared in this project as per the plan duly approved by the Principal Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden Odisha. Bird nests artificially made out of eco-friendly materials shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project;
18. The User Agency shall undertake that the project authority needs to take up works for construction and cleaning of garland drains, stabilizing retaining walls, proper terracing of OB dumps and checking gully formation resulting in soil erosion;
19. The User Agency shall undertake that plants which are having lowest translocation factor can be preferred under afforestation on the OB dumps and fruit trees to be avoided in planting during biological stabilization of OB dumps;
20. The User Agency shall undertake that prevention of fall of wild animals into mining pit by fencing the open pit area;
21. The User Agency shall undertake that the angle of repose in OB dumps to be maintained to ensure stability and safety;
22. The User Agency shall undertake that vetiver grass can be planted at the lower reaches of the dump to bind the soil and prevent soil erosion giving better stability to the dump;
23. The User Agency shall undertake mining in a phased manner after taking due

care for reclamation of the mined over area. The concurrent reclamation plan as per the approved mining plan shall be executed by the User Agency from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, in the concerned State Government and the concerned Regional Office of the Ministry. If it is found from the annual report that the activities indicated in the concurrent reclamation plan are not being executed by the User Agency, the Nodal Officer or the concern Addl. Principle Chief Conservator of Forests (Central) may direct that the mining activities shall remain suspended till such time, such reclamation activities area satisfactorily executed;

24. The User Agency shall comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner;
25. Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under;
26. The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required;
27. No labour camp shall be established on the forest land and the User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas;
28. The boundary of the diverted forest land, mining lease and safety zone, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates;
29. The layout plan of the mining plan/ proposal shall not be changed without the prior approval of the Central Government and the forest land shall not be used for any purpose other than that specified in the proposal;
30. The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government;
31. No damage to the flora and fauna of the adjoining area shall be caused;
32. The User Agency shall submit the annual self -compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly;
33. Any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation, protection and development of forests & wildlife; and
34. The user agency shall comply all the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.
35. Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5-2/2017-FC

I/61084/2023

dated 28.03.2019.

36. The compliance report shall be uploaded on **e-portal** (<https://parivesh.nic.in/>).

3. After receipt of compliance report on fulfilment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980. Transfer of forest land shall not be affected till final approval is granted by the Central Government in this regard.

Yours Sincerely,

Signed by

Charan Jeet Singh

Date: 27-12-2023 17:35:47

Sd/

(Charan Jeet Singh)

Scientist 'D'

Copy to:

1. PCCF (HoFF), State Forest Department, Government of Odisha, Bhubaneswar
2. PCCF & Nodal Officer (FCA), O/o PCCF, State Forest Department, Government of Odisha, Bhubaneswar
3. DDGF (Central), Regional Office of MoEF&CC at Bhubaneswar.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF&CC, New Delhi
6. Guard File.

Annexure-9

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

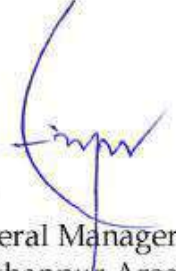
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 3(g)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **25% of the CA cost additionally will be spent towards soil and moisture conservation activities in the proposed CA area as per site requirement and deposited in CAF in any raised.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
✓ Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

AGENCY COPY

यूनियन बैंक ऑफ इंडिया Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 29-01-2024

Agency Name	INTEGRATED LAKHANPUR- BELPAHAR-LILARI OCP
Application No.	583935751
NEFT/RTGS File No.	8-280/1989-FC VOL.
Location	ORRISA
Address	Office of the General Manager, Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha, Jharsuguda
Amount (in Rs.)	51241171/-

Amount in Words: Fifty-One Crore Twenty-Four Lakh Eleven Thousand Seven Hundred and Seventeen Rupees Only

NEFT/RTGS to be made as per following details:

Beneficiary Name	ORRISA CAMPA
IFSC Code	UBIN0956335
Pay to Account No.	15082583935751 Valid only for this challan amount
Bank Name & Address	Union Bank Of India FCS Centre 21/1, III Floor, Jalita Towers, Mission Road, Bengaluru-560027

- This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक ऑफ इंडिया Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 29-01-2024

Agency Name	INTEGRATED LAKHANPUR- BELPAHAR-LILARI OCP
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Amount (in Rs.)	51241171/-

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- This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

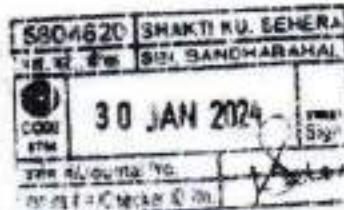
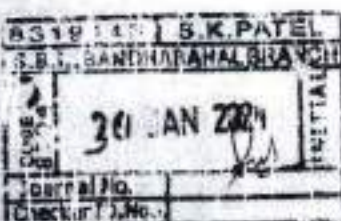
Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: itsbin@unionbankofindia.bank, epurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank

335800C1KB38PM6Y1L95-3 LEI no.

SBINR52024013093929729

Signature

D. V. Sankar



Signature
General Manager
MCL, Lakhanpur Area



ଜଙ୍ଗଲ, ପରିବେଶ ଓ ଜଳ ସମ୍ବଳ ପରିଚାଳନା ବିଭାଗ, ଓଡ଼ିଶା ସରକାର

ଝାରସୁଗୁଡ଼ା ଜଙ୍ଗଲ ବିଭାଗର ଶାଖାପରିଚାଳନା ବିଭାଗ ।

ଇମେଲ୍- dfo.jharsuguda@odisha.gov.in, ଦୂର ଗାନ୍ଧୀ ପଥ/ ପ୍ୟା.ନଂ-୦୭୭୪୫-୨୯୫୦୪୦ ।

No. 310 /4F (Misc.),

Dated Jharsuguda the 12th January, 2024.

To,

The General Manger, MCL,
Lakhanpur Area, Bandhbahal.

Sub: - Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 Ha & Re-diversion (Change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref: - (i) Stage -I / in principle Order No. 8-280/1989-FC Vol. dt.27.12.2023 of the Govt. of India, Ministry Environment, Forests and Climate Change (Forest Conservation Division), New Delhi.

(ii) Memo No.25474/9F(MG)-372/2021 dt.29.12.2023 of the Conservator of Forests(Nodal), O/o the PCCF & HoFF, Odisha, Bhubaneswar.

Sir,

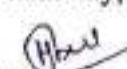
In inviting a kind reference to the letters cited above on the captioned subject, you are requested to deposit of amount *Rs.51,24,11,717.00 (Rupees Fifty One Crore Twenty Four Lakh Eleven Thousand Seven Hundred Seventeen)* only toward the cost of Net Present Value (NPV) in the CAMPA account through using online portal. The calculation of Net Present Value is furnished below:

Sl No.	Particulars	To be diverted of forest land (in Ha.)	Stage-I /in-principle Condition No.	Eco-Value Class of the forest crop.	Canopy density of the forest crop.	NPV/ per Ha(in Rs.)	Amount applicable, (in Rs.) (Col No.3x7=8)
1	2	3	4	5	6	7	8
1	NPV	417.073	4(a)	Class-III	0.55%	12,28,590.00	51,24,11,717.07 or 51,24,11,717.00

Further, the evidence of depositing the amount may be forwarded to the undersigned for further needful action at this end.

Encl: as above.

Yours faithfully,


Divisional forest officer,
Jharsuguda Forest Division.

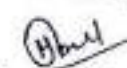
Memo No 311 / Dated. 12.01.2024.

Copy forwarded to the Principal Chief Conservator of Forests (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha, BBSR for favour of kind information & necessary action.


Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No 312 / Dated. 12.01.2024.

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information & necessary action.


Divisional Forest Officer,
Jharsuguda Forest Division.

Annexure-11

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

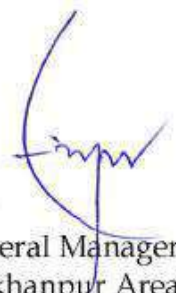
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 4 (b)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake **to pay any additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
✓ Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

NEFT RTGS CHALLAN

AGENCY COPY

यूनियन बैंक Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 22-06-2024

Agency Name,	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.,	5830355134
MoEF/SG File No.,	B-2801989-FC VOL
Location,	ORRISA
Address,	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharuguda Odisha, Jharuguda
Amount(In Rs)	166627381/-

Amount In Words : Sixteen Crore Sixty-Six Lakh Twenty-Seven Thousand Three Hundred and Eighty-One Rupees Only

NEFT/RTGS to be made as per following details;

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355134 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelita Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 22-06-2024

Agency Name,	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.,	5830355134
MoEF/SG File No.,	B-2801989-FC VOL
Location,	ORRISA
Address:	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharuguda Odisha, Jharuguda
Amount(In Rs)	166627381/-

Amount In Words : Sixteen Crore Sixty-Six Lakh Twenty-Seven Thousand Three Hundred and Eighty-One Rupees Only

NEFT/RTGS to be made as per following details;

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355134 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCS Centre, 21/1, III Floor, Jelita Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: fcsblr@unionbankofindia.bank, epurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank

Authorised Officer
MCL, LAKHANPUR AREA



Authorised Officer
MCL, LAKHANPUR AREA

महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

SBINR 52024062531324387



ଉତ୍କଳ, ପରିବେଶ ଓ ଜଳ ସମ୍ବଳ ପରିଚାଳନା ବିଭାଗ, ଓଡ଼ିଶା ସରକାର

ଅଣାନ୍ତ ବନାଧିକାରୀଙ୍କ କାର୍ଯ୍ୟାଳୟ ଆନନ୍ଦପୁରା ବଜାର ।

ଇମେଲ:- dfo.jharsuguda@odisha.gov.in, ଦୂର ଭାଷ/ ଫ୍ୟାକ୍ସ:- ୦୬୭୪୫-୨୯୫୦୪୦ ।

No. 2115 /4F (Misc.),
Dated Jharsuguda the 18th April, 2024.

To,

The General Manager, MCL,
Lakhanpur Area, Bandhabahal.

Sub: - Proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfields Limited for non-forestry use of 417.073 Ha & Re-diversion (Change of land use) of 171.774 Ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area in district Jharsuguda in Odisha.

Ref: - Stage -I / in principle Order No. 8-280/1989-FC Vol. dt.27.12.2023 of the Govt. of India, Ministry Environment, Forests and Climate Change (Forest Conservation Division), New Delhi.

Sir,

In inviting a kind reference to the letters cited above on the captioned subject, you are requested to deposit of amount **Rs. 16,66,27,381.00 (Rupees Sixteen Crore Sixty Six Lakh Twenty Seven Thousand Three Hundred Eighty One)** only toward the cost of Penal Net Present Value (PNPV) for earlier violation 34.45 ha of forest land in respect to diversion of 162.20 ha of forest land for Lilari Open Cast Project of South Eastern Coal Field Ltd. in Sambalpur District(now Jharsuguda District) in the CAMPA account through using online portal. The Penal NPV is calculated as per consolidated guidelines and clarification issued by the Govt. of India, MoEF & CC, New Delhi vide their order dt.29.12.2023 as mentioned in Point No.1.16, ii (a) of Chapter-I. The calculation of Penal Net Present Value is furnished below:

Sl No.	Particulars	Remarks
1	Violation Area in Ha inspect to earlier diverted 162.20 ha of forest land for Lilari OCP as available record.	34.45 ha.
2	Stage-I /in-principle Condition No. in respect to diversion of 417.073 Ha & Re-diversion (Change of land use) of 171.774 Ha forest land for Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur area of MCL.	4 (c) of stage-I
3	As per previous demand raised by the DFO, Jharsuguda for 149.50 ha of forest land =(162.20 ha.-12.70 ha) for Lilari OCP vide letter No.2115 dt.24.06.2010, the Eco-Value Class of the forest crop (copy enclosed in Annexure-I)	III
4	As per previous demand raised by the DFO, Jharsuguda for 149.50 ha of forest land =(162.20 ha.-12.70 ha) for Lilari OCP vide letter No.2115 dt.24.06.2010, the Canopy density of the forest crop (copy enclosed in Annexure-I)	35%
5	NPV per Ha as per applicable rate (in Rs.)	957780.00
6	Penal NPV for 34.45ha. per year	32995521.00=(957780.00 x 34.45)
7	Penal NPV (maximum ceiling of 5 years)	164977605.00=(32995521.00 x 5 times)
8	12% simple interest for 30 days	1649776.05
Total:-(7 +8)		166627381.05 or 166627381.00

Further, the evidence of depositing the amount may be forwarded to the undersigned for further needful action at this end.
Encl: as above.

Yours faithfully,

Divisional forest officer,
Jharsuguda Forest Division.

Memo No 2416 / Dated. 18 .04.2024.

Copy forwarded to the Principal Chief Conservator of Forests (Forest Diversion & Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha, BBSR for favour of kind information & necessary action.

Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No 2417 / Dated. 18 .04.2024.

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information & necessary action.

Divisional Forest Officer,
Jharsuguda Forest Division.

Appendix D

1851

To
The General Manager, MCL, Ib-Valey Area, Brajrajnagar/ Likhampur Area, Bandhabahal

Ref: This office letter No.2078 dt.22.06.2010 address to G.M. Lakhampur Area.

01. Where as the total area of the following Coal mines have been ascertained with reference to the available records and the classification of the same is given below.

03. Where as the Divisional Forest Officer has been vested with the authority by the Apex Court to issue demand by 24th of June, 2010 at the appropriate rate depending on Eco-value class and the canopy density of the Forest area in question.

05. Now therefore, the undersigned, by virtue of authority vested by the Apex Court, hereby issue demand notice for payment NPV as calculated in respect of each mines and indicated below to be deposited within 30 days of issue of this order.

07. It is further ordered that in the event of upward revision of NPV, an undertaking to pay the differential amount is to be submitted by the lessee.

Calculation of NPV

₹ 5 V to be paid by G.M. IB-Valley Area, Brajrajnagar.

DLC Forest	1	—	Nil

Eco value class	III class
1	1
2	2
3	3
4	4
5	5
6	6
7	7
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98	98
99	99
100	100

Rate of NPV	—	6.26.000/- per ha.

$$\text{--- } 379.959 \text{ ha} \times 6.26.000 = 23.7854.334/-$$

Rs. 23,78,54,340/-
(Rupees twenty three Crores seventy eight lakhs fifty four thousand three hundred thirty four) only

PO. BODI/2102
A6A 3440

23/7

f

1) Belpahad OCP

✓ to be paid by G.M. Lakhanpur Area

Reserve Forest	.....	Nil
Revenue Forest	.....	277.874 ha.
DLC land	.....	Nil
NPV paid earlier	.....	Nil
Eco value class	.....	III
Canopy density	.....	35%
Rate of NPV	.....	6,26,000/- per ha.
NPV to be paid	.....	$277.874 \times 6,26,000 = 17,39,49,124/-$ (Rupees seventeen Crores thirty nine lakhs forty nine thousand one hundred twenty four) only.

Nilari OCP (Revised calculation of NPV) in reference to memo No.2113 -A

24.6.2010

NPV to be paid by G.M. Lakhanpur Area

Reserve Forest	.....	Nil
Revenue Forest	.....	162.20 ha. - 12.70 = 149.50
DLC land	.....	Nil
NPV paid earlier	.....	for 12.70 Ha
Eco value class	.....	III
Canopy density	.....	35%
Rate of NPV	.....	6,26,000/- per ha.
NPV to be paid	.....	$149.50 \times 6,26,000 = 9,35,87,000/-$ (Rupees nine Crore thirty five lakhs eighty seven thousand) only.

Yours faithfully,

[Signature]

Divisional Forest Officer
Sambalpur North Forest Division.

Memo No. 2115-A /Dated. 24.06.2010

Copy forwarded to the Principal Chief Conservator of Forests, Orissa, Bhubaneswar/ Regional Chief Conservator of Forests, Sambalpur Circle, Sambalpur for favour of information and necessary action.

[Signature]

Divisional Forest Officer
Sambalpur North Forest Division.

Memo No. 2115-B Dated. 24.06.2010

Copy forwarded to the Deputy Director of Mining Officer, Sambalpur/ Range Officer, Brajrajnagar Belpahad Range for information and necessary action.

[Signature]

Divisional Forest Officer
Sambalpur North Forest Division

Annexure-13
Details of Funds deposited in CAMPA

Cond. No.	Name of the Activities	Mode of payment	Cheque or UTR No. & date.	Amount deposited (Rs.)	Date of transaction	Name of Bank from which amount transferred to account of CAF.	Bank Account of CAF managed by CAMPA in which fund deposited	Reference Annexure No.
3 (a)	Compensatory Afforestation	RTGS	SBINR52024033 012591257 Dt:28.03.2024	10,83,57,300	30.03.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355742	Annexure-2
3 (a)	Additional Compensatory Afforestation	RTGS	SBINR52024101 856085465 Dt:16.10.2024	3,11,70,800	18.10.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355858	Annexure-3
3(e)	1.5 Times Safety Zone Plantation	RTGS	SBINR52024111 86327055 Dt:18.11.2024	2,48,80,485	18.11.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355262	Annexure-7(a)
3(f)	Soil Moisture Conservation Measures	RTGS	SBINR52024111 86327055 Dt:18.11.2024	11,50,32,500	18.11.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355262	Annexure-8(a)
4(a)	Net Present Value	RTGS	SBINR52024013 098929729 Dt:29.01.2024	51,24,11,717	30.01.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355751	Annexure-11
4(c)	Penal Net Present Value	RTGS	SBINR52024062 531324387 Dt:22.06.2024	16,66,27,381	25.06.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355134	Annexure-11
15	Site Specific Wildlife Plan	RTGS	SBINR52024083 045046430 Dt:30.08.2024	31,09,38,400	30.08.2024	State Bank of India	ORISSA CAMPA Saving Bank Account No. 150825839355313	Annexure-3


General Manager
 रा.नी.परा.संरक्षण क्षेत्र
 MCL, Lakhmapur Area

**SCHEME FOR
MITIGATIVE MEASURES TO MINIMIZE SOIL
EROSION AND CHOCKING OF STREAM**

For

**Diversion of 417.073 hectares of Forest land & Re-
diversion (Change in Land use) of 171.774 Ha**

in respect of

Integrated Lakhanpur-Belpahar-Lilari Opencast Project

In favour of

**Mahanadi Coalfields Limited,
Jharsuguda District, Odisha**

In compliance with the

Condition No - 7 (a) of

Stage - I Forest Clearance granted vide

Letter No. 8 - 280/1989-FC vol dated 27.12.2023, of Govt. of India,

Ministry of Environment, Forests and Climate Change,

New Delhi

1. INTRODUCTION

Ib-Valley coalfield is located in Jharsuguda, Sambalpur and Sundargarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway stations are Belpahar railway station Jharsuguda Railway Station.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project of M/s Mahanadi Coalfields Ltd. located in the Ib-Valley Coalfield. The project falls in the villages - Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khairkuni, Ubuda, Darlipali, Kirarama, Jurabaga, Kusraloi, Karlajori, Khaliapali, Kudaloi, Lakhanpur and Soldia villages of Lakhanpur Tehsil, Jharsuguda District, Odisha. The project area is covered under Survey of India Topo Sheet No 64O/13 & 64O/14 (RF 1:50,000) and is bounded by the geographical coordinates ranging from Latitude 21°42'25.89"N to 21°47'24.82"N and Longitudes 83°49'38.9"E to 83°49'53"E.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs. The existing projects have been integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura seam by open cast mining. The capacity of the Integrated Lakhanpur-Belpahar-Lilari Opencast Project is 40.0 MTY with mine lease area of 4399.246 Ha and total project area of 4742.877 Ha. The life of the project is 41 years.

Total Forest land involved in the Integrated project is 958.695 Ha out of which Forest Clearance has been obtained for 541.622 Ha. Details are given below.

The details of the existing Forest Clearances:

1. Lakhanpur OCP (233.43 Ha): Forest Clearance was obtained for forest land 233.43 Ha vide letter no. 8 280/89-FC dated 08.10.1990.
2. Belpahar OCP (123.220 Ha + 22.772 Ha):
 - a) 123.220 Ha - Diversion of Forest land was obtained for 103.52 Ha vide No. 8-104/91-FC dated 02.06.2000 and 19.70 Ha vide no. 8-104/1991-FC dated 15.09.2014.
 - b) 22.772 Ha - Forest diversion for 22.772 Ha (10.453 Ha + 13.630 Ha) has been done by OPGC. OPGC has taken forest clearance of 159.616 Ha vide letter no. F.No.8-93/2012-FC dated 19.01.2015 in which 10.453 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP and further Stage-II forest clearance of 13.630 Ha obtained vide letter no. 5-ORA155/2012-BHU dated

10-01-2020 in which 12.319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

3. Lilari OCP (162.20): Forest Clearance was obtained for forest land 162.20 Ha vide letter no 8 281/8-FC dated 31/07/1990.

For the remaining forest land area of 417.073 Ha and out of 541.622 Ha diverted forest land; Re-diversion (change in land use pattern) of 171.774 Ha (Belpahar OCM: 0.745 Ha, Lakhanpur OCP: 42.389 Ha and Lilari OCP: 128.640 Ha) is required for mining, 7.5m safety zone and temporary topsoil storage yard. So, an application was submitted to MoEF&CC vide proposal no. FP/OR/MIN/39355/2019 dated 16.03.2019 and the Stage -I FC was granted vide No. 8-280/1989-FC Vol. Dated:27.12.2023.

In the Stage -I order certain stipulated conditions has been set out to be fulfilled by the user agency. The condition no. 7 reads as follows:

"7. Following activities, as per approved plan/schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:

a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;

b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;

c. Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;

d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°;

In compliance of the above condition 7(a) stipulated by MoEF&CC, a detailed scheme has been prepared and is enclosed herewith for further consideration.

2. OBJECTIVES OF THE SCHEME

The objectives of this scheme are:

- To check soil erosion within the Lease area of 4399.246 hectare including the OB dumps through grassing and agave plantation on OB dumps and slopes, construction of toe walls and gabion walls.
- To arrest the silts in the runoff through catch drains, siltation tanks, loose boulder check dams and water harvesting structures.
- De-siltation of the drains to reduce outgoing of silts to Lilari Nalla/ Ib River and Hirakud Reservoir.

3. LAND USE PATTERNS

Details of Land usage are as follows:

1. Pre mining land use (Area in Ha)

Sl. No.	Particulars	Within ML Area (ha)	Outside Lease Area (ha)	Total Area (ha)
1	Agricultural land (tenancy)	1651.551	69.037	1720.588
2	Forest land	958.695	37.693	996.388
3	Wasteland (non-Forest)	1621.228	50.413	1671.641
4	Grazing land	87.906	12.526	100.432
5	Surface water bodies	14.515	0.00	14.515
6	Settlements	65.351	173.962	239.313
	Total	4399.246	343.631	4742.877

2. During Mining land use (Area in Ha)

Sl. No.	Particulars	Within ML Area (ha)	Outside ML Area (ha)	Total Area for 40 MTY (ha)
a)	Excavation area	3565.484	0.00	3565.484
b)	Safety Zone 7.5 m	24.095	0.00	24.095
c)	External OB dump	22.650	0.00	22.650
d)	Temp. topsoil storage	41.994	0.00	41.994
e)	Temp. Washery reject storage	124.002	0.00	124.002
f)	Infrastructure	495.018	0.00	495.018
g)	300/500 m blasting zone and	126.003	0.00	126.003

	others			
	In Mining Lease (ML)	4399.246	0.00	4399.246
h)	Outside blasting Zone, now outside ML	0.00	169.669	169.669
i)	Residential Colony / Rehabilitation Site	0.00	173.962	173.962
	Outside ML	0.00	343.631	343.631
	Total Project Area	4399.246	343.631	4742.877

3. Post Mining land use

Sl. No.	Category	Plantation	Unfilled void	Quarry Bottom & Slope	Undisturbed / Built up area	Total
1	Quarry excavation	3105.033	23.871	436.58	0.00	3565.484
2	OB dumps (external)	22.65	0.00	0.00	0.00	22.65
3	Infrastructure	495.018	0.00	0.00	0.00	495.018
4	Blasting danger zone/Green belt	150.098	0.00	0.00	0.00	150.098
5	Other areas incl. temporary soil dump & rejects storage	165.996	0.00	0.00	0.00	165.996
6	Mine Lease Area	3938.795	23.871	436.58	0.00	4399.246

4. SOIL

The Physio-Chemical properties of the soil are as:

Texture of the soil is mostly Silt loam and Loamy sand. Water holding capacity is in the range of 10.2% - 28.0%. Specific gravity ranges from 2.5 - 2.8 gm/cm³. Slightly acidic to neutral in nature having pH in the range of 6.1 to 6.95. Organic carbon for the soil is in the range of 0.12-0.55%. Organic carbon in the barren land varies from less to very less with increase in depth, whereas organic carbon in agricultural land varies from average, medium & to very less with increase in depth.

5. TOPOGRAPHY WITH DRAINAGE

Topography of the block is plain to moderately undulating. The area is gently sloping towards east. The highest and lowest elevations of the area are 250 m and 198 m above mean sea level respectively. The drainage is controlled by Lilari nallah which discharges into IB River. One tributary (seasonal) of Lilari nallah namely, Pulijhore flows from west to east within the mine area with its catchment area to the west of the block.

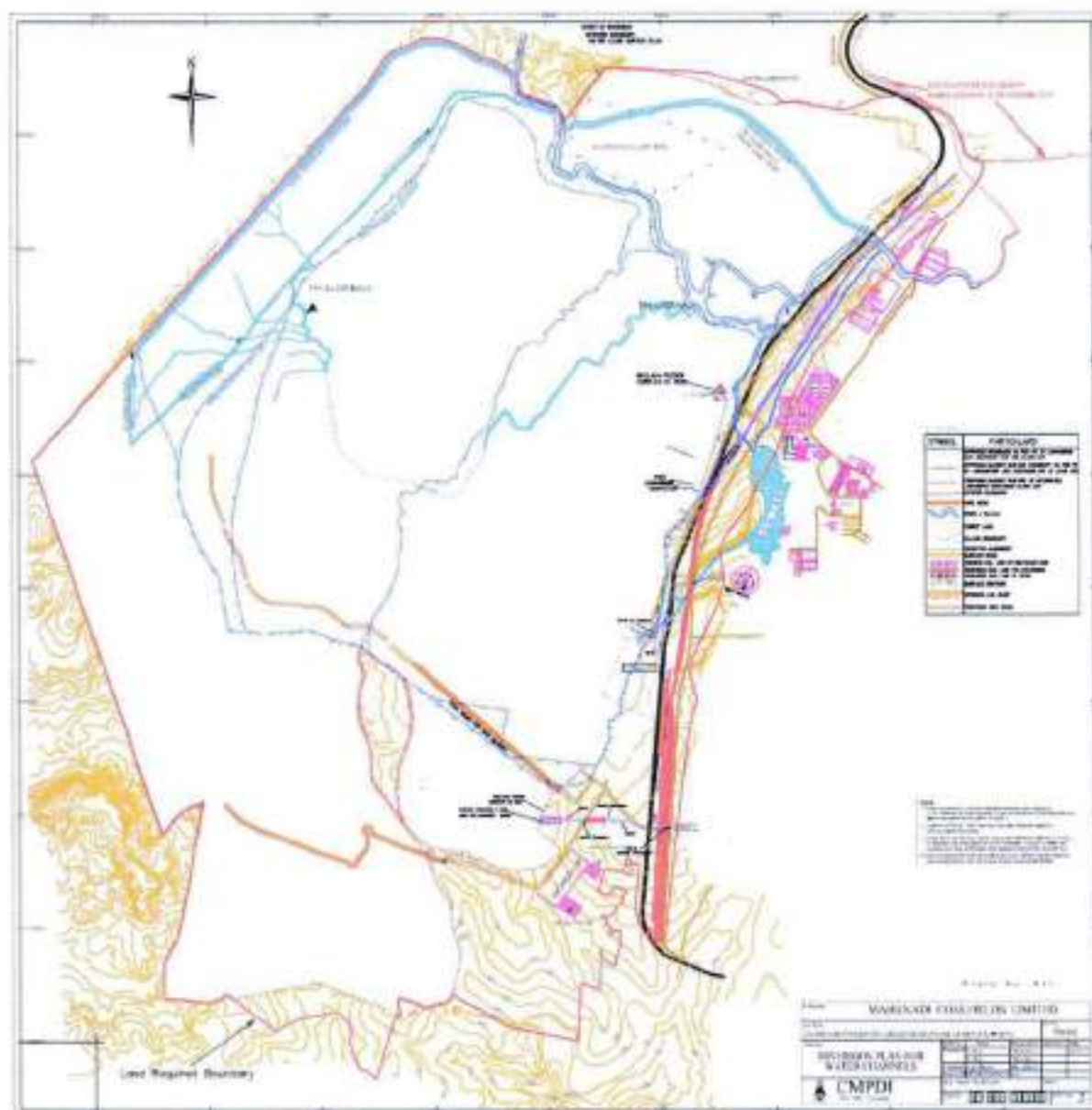
The Ib River on the eastern side of the coalfield mainly controls drainage in the area. Apart from Ib River, Lilari nalla flows along the west and southern margin of the block. The Lilari stream is a perennial in nature. It originates near Chhengapahar and soon forms a 2nd order stream in Chhengapahar village, Lilari nala forms 3rd order stream near Lamiharia village and continues to drain south-easterly. At Tangardihi village, Lilari nala becomes a 4th order stream. Hereafter, it continues south-easterly and near Mundaparha village, it is joined by the Pandren jhor, a 4th order stream (flows almost in a northwest-southeast orientation in the study area), hereafter the Lilari nala attains 5th order, before meeting Ib river. Lilari Nala traverses approximately 30.8 km from its place of origin at Ghhengapahar Reserve Forest before it meets the Ib river.

The distance of water bodies from the mine lease area of Integrated Lakhanpur-Belpahar-Lilari OCP are as follows:

Name of the Water Bodies	Distance
Lilari Nallah	Within mine lease area
Phulijhor Nallah	Within mine lease area
Pandren Jhor	0.90 km
Bagdia Jhor	1.70 km
Hirakud Reservoir (backwater)	2.40 km
Kandhal Jhor	3.30 km
Ib River	3.90 Km

Stream orders and stream lengths of Lilari nala basin:

Stream Order	Numbers of segments (Nu)	Log (Nu)	Length (kms) (Lu)	Mean length of channel (Lu)
1	384	2.584	154.550	0.402
2	73	1.863	70.837	0.97
3	22	1.342	28.701	1.304
4	2	0.301	17.473	8.736
5	1	0.000	2.580	2.58



Summary of Hydrological parameters of the sub basins in the mine lease area:

Name of Basin	Lilari Nala
Area of Basin in KM ² (Au)	188.14
Perimeter of Basin in KM (P)	66
Basin length in KM (L)	23.5
Diameter of Circle with basin area in KM (D)	21
Area of the circle having the same perimeter of the basin in KM ² (AC)	314
Form Factor $R_f = A_u / L^2$ (RF)	0.34
Circularity ratio $R_c = A_u / A_c$ (Rc)	0.60
Elongation ratio $R_e = d / L$ (Re)	0.89

6. MEASURES SUGGESTED IN THE "IN PRINCIPLE APPROVAL" & SCHEME FOR ITS COMPLIANCE.

7 a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;

7. PROBABLE SOURCES OF SOIL EROSION & MANAGEMENT:

In course of mining activities, excavation will be taken up over an area of 3565.484 Ha during the complete mining operation. The mine will be divided mainly in the Lakhanpur Running Quarry, Belpahar & Central Quarry, South Quarry, North Quarry, South-East Quarry and Quarry Below Diverted Lilari Nala.

There will be internal dumps and one External dump. The external dump will be over an area of 22.65 ha with a height of 15-20 m from surrounding surfaces and with the slope angles of less than 28°.

The quarry area will be protected by a boundary/Garland Drains all around the quarry and it will prevent water inrush towards quarry pit.

Adequate management strategy has been prescribed in the mining plan to check soil erosion from dumps. The management practices prescribed is as follows.

(i) For Topsoil Management:

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs for which already excavated and backfilled area is need to be rehandled, while area in additional lands is covered with thick vegetation and therefore topsoil from these areas should be ripped out and stored at temporary storage site. In Mining Plan of Integrated Project an area of 41.994 Ha near South Quarry is allocated for temporary storage of Topsoil. The soil and rejects/boulders will be stacked separately to increase the cohesion and avoid sliding of topsoil dump. The topsoil will be utilized by spreading out on backfilled area for technical and biological reclamation. The unutilized topsoil dump will be covered with quick growing grass and vegetation cover. Its management will be governed as per scheme for condition no (7)(a) of Stage -I Forest Clearance.

(ii) For Coal Storage Stack:

The coal after transportation from quarry faces to pit head it will go to the coal stockyards for temporary storage till dispatch or to Washery, Railway sidings, Reclaim feeders to directly dispatch to consumers. Some coal is dispatched through local road sale from coal stock yard. Baffle walls and catch drains would be provided around the coal dumps to intercept the surface runoff coming out from it and also to

collect runoff from the surrounding area. This drain will convey the intercepted water into the mine sump.

(iii) For Over Burden Dump:

Newly formed and barren OB dumps are the main culprit for the soil erosion particularly active and new OB dumps. Surface of the OB dump is easily eroded by both wind and water because it is in un-vegetated and in loose conditions. Following preventive measures can reduce the chances of soil erosion/water contamination arises at overburden sites.

- Gabion walls, depending upon the prevailing condition, of stone boulders all around the OB dump should be constructed. This measure will check the soil of OB dump from the spreading out beyond the Gabion wall.
- Catch Drains will be provided along the gabion wall of size 1.5m (width) x 1.0m (depth) to check the surface run-off coming out from the OB dump. This drain is to convey the intercepted run-off water into mine sumps. This measure will prevent the surface run-off to carry out the eroded soil beyond the mine sumps.
- Sedimentation tanks of sufficient size will be constructed so as having the at least one hour detention period most of the time. This act will arrest at least 90% of suspended soil particles that flow out with surface run-off.
- Overflow effluent from the sedimentation tank would be allowed to discharge in the nearby natural stream. A series of gully plug will be provided if the speed of discharge water is above the scouring speed of soil. This will protect the stream bed and sides from being scoured. Thus, there could be more than 95% reduction in soil erosion.
- Quick growing grass and vegetation cover will be done on the part of inactive dump all along the inclined and top portion of the dump. This will protect the soil particle from being detached due to action of rain fall and hard wind blowing. Thus, there would be reduction in soil erosion.
- Quick growing grass and vegetation will be planted on the route of water ways. This will act as a speed breaker for flowing water.
- 3 tier plantation on OB dump and slopes should be carried out.
- Garland drain and all flow channels should be cleaned regularly specially before the onset of the monsoon.

The following Prescriptions for dump management have been provided in the Mining plan.

1. The dumps will be designed with multiple tiers. Levels of these tiers are matched with horizontal road levels on quarry slope, for easy transportation

from working benches to dump benches. Maximum height of each tier is 30m and slope of each individual tier is 37. Overall slope of full dump face is about 26.

2. Topsoil should be scraped separately, so that it does not mixed in OB rock/rejects.
3. The slope of ground is kept mild so that it will not have any adverse effect. The soil from the foundation ground should be scrapped before starting of OB dumping.
4. Garland drain to be made around OB dump area to avoid water flow during monsoon below the OB dump.
5. Levelling, grading and drainage from all angles for top of OB dumps will be done.
6. Technical & Biological reclamation will be done.
7. Pitching of Stone / Retaining wall (Toe wall) will be constructed all around the OB dump.
8. Settling tank will be made to receive the run-off water from garland drain to settle the sediments and release clean water to natural drainage.
9. Retaining wall will be made up of waste rock / boulders. Random Stones will be arranged as dry wall to retain the earth.
10. Garland drain / Catch drain will be developed all along the lower side of the waste dump.

(iv) For Construction sites

Presently no major civil or any other type of construction works is going on in the project. In future, if any construction work starts, the following preventive measures would be taken up to reduce the opportunity of soil erosion/water contamination arises at construction site.

- Site to be taken for construction at different time horizon should be clearly marked.
- Vegetation removal and breaking of earth would be controlled and confined to site which is immediately required for construction.
- Catch Drain will be provided around the township/construction sites during construction period to intercept water flowing out.
- Surface Run off from construction site would be channelised to sedimentation tanks. The clear overflow water from lagoon will flow into nearby natural streams
- Site for storage of rubbish, excavated earth etc. would be identified and drainage arrangements will be provided around these and connected to sedimentation lagoon to avoid pollution of natural streams.

- As soon as construction is over, all sites would be vegetated & planted with trees.

(v) For Built up areas

Open drains would be provided along the roads, workshop, township and other service buildings. These drains will collect the water from built up area which is not much polluted except the normal suspended particles, garbage, silt and sand. This water would be diverted into sedimentation tank.

8. SUMMARY OF ACTIVITIES PROPOSED & COST ESTIMATION:

- 1) The temporary topsoil storage dump has a total area of 41.994 Ha. The unutilized area of topsoil dump and slope of the dump will be covered with quick growing grass and vegetation cover. Gabion wall of 3200 m length around the periphery of topsoil dump will be made up of waste rock/Boulders. Catch drains will be provided along the gabion wall of size 1.0m (width) x 1.0m (depth) x 3200m to check the surface run-off coming out from the dump.
- 2) The Internal OB dumps have a total periphery of around 33.44 Km. Gabion walls and Garland drains 1.0m (width) x 1.0m (depth) will be constructed all along the periphery of Internal OB dumps. 3-tier plantation will be carried out all along the technically reclaimed areas of overburden dumps. OB top Plantation of 1787.36 Ha and OB slope plantation of 1317.673 Ha will be carried out on Internal OB dumps.
- 3) A series of gully plug will be provided if speed of discharge water is above the scouring speed of soil.
- 4) The External dump have a total area of 22.65 Ha and completely biologically reclaimed and well stabilized with vegetation. Catch drains around the periphery of External OB dump of around 4100 m length and size of 1m x 1m will be provided.
- 5) There will be drainage along the Haul Road of size 1m x1m over a length of around 9.92 km with a gently slope to natural drainage.
- 6) Loose Boulder Check Dams at an interval of 100m alternatively in the garland drains all along the Mine lease area.
- 7) 02 nos. of Siltation tank of 40x30mx3m size will be provided at the end of channels. Drainage to natural line thereof.

Cost Estimation:

Sl. No.	Parameters	Size	Volume of earth work involved	Rate per Cum of Earth work including compacting	Total Amount (Rs.)	Reference
1.	Grassing on topsoil dump	41.994 Ha			49,61,340.00	Annexure -1
2.	Gabion wall around the topsoil sump	2m x 1m x 3200 m	6400 Cum	Rs. 283.43/Cum	18,13,952.00	Annexure -2
3.	ANR Plantation on top of Internal OB dumps	1787.36 Ha			49,75,87,976.30	Annexure -3
4.	ANR Plantation on slope of Internal OB dumps	1317.673 Ha			36,68,30,544.20	Annexure -3
5.	Gabion wall around the internal dumps	2m x 1m x 33440m	66880 Cum	Rs. 283.43/Cum	1,89,55,798.4	Annexure -2
6.	Construction of Siltation tank	40m x 30m x 3m (02 nos.)			18,22,992.00	Annexure-5
7.	Loose Boulder Check Dams (334 nos.)	1m x 1m x 2m	2 Cum x 334 nos. = 668 Cum	Rs. 4011.59/Cum	26,79,742.12	Annexure -4
8.	Garland drains and catch drains		50660 Cum	Rs. 283.43/Cum	1,43,58,563.8	Annexure -6
	Total				90,90,10,908.80	

A total estimated cost of Rs. 90,90,10,908 is required for this scheme.

Technically Approved

Regional Chief Conservator of Forests
Sambalpur

Divisional Forest Officer
Jharkhand Forest Division

महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhnupur Area

Physical components approved

Annexure-1

COST OF GRASS FIELD CREATION PER Ha. (LABOUR RATE RS.452/DAY)

SL No.	Purpose	No of Labour/ Quantity of materials	Rate in Rs	Amount in Rs
1st year				
1	Nurturing the land by ploughing & leveling	10	452/labour	4520
2	Adding FYM and good earth	2TL FYM 2TL good earth	500/TL FYM 500/TL Good Earth	2000
3	Cost of grass seed 1kg per ha	-	500/kg	500
4	Broadcast, Sowing and leveling	4	452/labour	1808
5	Water and ward	30	452/labour	13560
6	Sprinkling of water intermittently till the grass seed germinates	60	452/labour	27120
7	Weeding of unwanted grass	4	452/labour	1808
	Total	108		51316
2nd Year				
1	Weeding the land by removal of unwanted grass and replacing grass on patches devoid of grass	5	452/labour	2260
2	Adding FYM and good earth	1.0TL FYM 10TL good earth	500/TL FYM 500/TL Good Earth	1000
3	Cost of grass sleeves to replace failures		On LS	2000
4	Replacing sleeves on failure patches	4	452/labour	1808
5	Watch and ward	30	452/labour	13560
6	Sprinkling of water intermittently till the grass seed germinates established	60	452/labour	27120
	Total	99		47748

3 rd Year				
1	Weeding the land by removal of unwanted grass and replacing grass on patches devoid of grass	10	452/labour	4520
2	Adding FYM and good earth	1.0TL FYM 1.0TL good Earth	500/TL FYM 500/TL Good Earth	1000
3	Watch and ward	30	452/labour	13560
	Total	40		19080

ABSTRACT

1st year - Rs. 51,316.00

2nd year - Rs. 47,748.00

3rd year - Rs. 19,080.00

Total Rs. 1,18,144.00

Cost of grass-field creation per Ha = Rs 1,18,144.00

Total cost for grass field creation for 41.994 Ha area =Rs. 1,18,144 x 41.994 ha = Rs. 49,61,339.136 (Say Rs 49,61,340)

(Rupees Forty Nine lakh Sixty One thousand Three hundred and Forty only)

Annexure-2

Rate per Cum of Earth work including compacting

Sl. No	Description	Unit required	Rate (Rs.)	Amount (Rs.)
i.	Earth work in hard soil or gravelly soil within 50m Initial lead and 1.5m initial lift including rough dressing and breaking clods to maximum 5cm to 7cm and laying in layers not exceeding 0.3m in depth and as per the direction of the Engineer-in-charge.	Labour Man Mulia 21.5 nos	452	9718
		Woman Mulia 21.5 nos	452	9718
	Sub total (Labour)			19436
ii.	Overhead Charges@ 10 % on (i).			1943.6
iii.	2% Sundries and T & P etc. on (i)			388.72
iv.	Total for Earth Work			21768.32
v.	Add. 20% excess for foundation / trenches etc			4353.66
vi.	Sub Total			26121.98
vii.	Contractor profit @ 7.5%			1959.15
viii.	Add Labour cess @ 1%			261.22
	Total per 100 Cum of Earth work			28342.36
	Per Cum			283.43

Rate per Cum of earth work for construction of Stone Gabion wall around the topsoil dump = Rs. 283.43 per Cum

Total Cost of construction of Gabion wall around the topsoil dump = 6400 Cum x Rs. 283.43 per Cum = Rs. 18,13,952.00

Total Cost of construction of Gabion wall around the internal dumps = 66880 Cum x Rs. 283.43 per Cum = Rs. 1,89,55,798.40

Annexure-3

Cost Norm for ANR per @ 2500 Plants per ha. For mixed plantation module					
2500 seedlings per ha. @452/day- labour cost.					
Sl. No.	Item of work	Person days	Labour cost @Rs.452/day-	Material cost in Rs.	Total cost in Rs.
0th YEAR OF CREATION:					
1	Survey & demarcation	2	904	0	904
2	Site preparation	2	904	0	904
3	Silvi-cultural operation including clearance of weed, climber cutting, high stump cutting, singling of shoots etc.	8	3616	0	3616
4	Nursery cost (6 month old seedling) @ 18.551p/- seedling (Rs. 12.72p in 0th year + 5.831p in 1st year) for 2750 seedlings (2500+250)	68.75	31075	51015.25	82090.25
	Total	80.75	36499	51015.25	87514.25
1st Year/Planting Year					
1	Nursery cost (6 months old seedling) balance @ Rs.5.831 for 2750 seedlings	33.5	15142	16035.25	31177.25
2	Pitting 30 Cm Cub size	62.5	28250	0	28250
3	Carriage and planting including Casualty replacement	32.5	14690	0	14690
4	Complete weeding, Soil working, manuring	75	33900	0	33900
5	Cost of vermi-compost 200gms/plant @ Rs. 20/- per Kg = Rs. 10000.00 and granular insecticide 5gms/plant @ Rs.80/- per Kg = Rs. 1000.0	0	0	11000	11000

6	Cost of Chemical fertilizer a) Urea 70 gms/plant in two subsequent doses @Rs.6/- per Kg = Rs.1050.00 b) NPK 50 gms/plant @ Rs. 24/- per Kg = Rs. 3000.00 as basal dose	0	0	4050	4050
7	Fire line tracing & inspection path	3	1356	0	1356
8	Silvi-culture operation involving clearance of weeds and cutting of climbers, singling of shoots on each stools etc.	15	6780	0	6780
9	Soil conservation measure(Staggered trenches of dimension 2m x 0.5m x 0.5m @ 60 nos. per Ha) or its equivalent	20	9040	300	9340
10	Watch & Ward	7	3164	0	3164
	Sub-Total:-	248.5	112322	31385.25	143707.25

SECOND YEAR MAINTENANCE:

1	Casualty replacement (10%) with nursery cost of seedling, carriage & planting	6.25	2825	2000	4825
2	Complete weeding & cultural operations	9.35	4226.2	0	4226.2
3	Soil working & manuring	25	11300	0	11300
4	Cost of biofertilizer / insecticides a) Vermicompost 200gms/plant @ Rs. 20/- per Kg = Rs. 10000.00 b) Granular Insecticides 5gms/plant @ Rs. 80/- per Kg = Rs.1000.00	0	0	11000	11000
5	Fire line tracing & inspection path	1	452	0	452
6	Soil conservation measure	8	3616	0	3616
7	Watch & ward	7	3164	0	3164
	Sub-Total:-	56.6	25583.2	13000	38583.2

THIRD YEAR MAINTENANCE:					
1	Complete Weeding and pruning	4	1808	0	1808
2	Soil working	4	1808	0	1808
3	Fire line tracing & inspection path	1	452	0	452
4	Watch & ward	7	3164	0	3164
	Sub-Total:-	16	7232	0	7232
FOURTH YEAR MAINTENANCE:					
1	Fire line tracing & inspection path	1	452	0	452
2	Watch & ward	2	904	0	904
	Sub-Total:-	3	1356	0	1356

Year	No. of Man days	Labour Cost @ Rs. 452/ man day	Material Cost (Rs.)	Total
0 th Year	80.75	36499	51015.25	87514.25
1 st Year	248.5	112322	31385.25	143707.25
2 nd Year	56.6	25583.2	13000	38583.2
3 rd Year	16	7232	0	7232
4 th Year	3	1356	0	1356
Grand Total	404.85	182992.2	95400.5	278392.70

Total Cost of ANR Plantation per hectare Rs. 2,78,392.70

Cost for 1787.36 Ha ANR Plantation on top of Internal OB Dumps = 1787.36 Ha x Rs. 2,78,392.70/Ha = Rs. 49,75,87,976.30

Cost for 1317.673 Ha ANR Plantation on slope of Internal OB Dumps 1317.673 Ha x Rs. 2,78,392.70/Ha = Rs. 36,68,30,544.20

Annexure-4**Estimate for construction of Loose Boulder Check Dams (LBCD)**

Sl. No.	Description	Unit	Amount (Rs.)
1.	Dry stone masonry or rough stone dry masonry for guardwall and retaining wal with stone other than granite quarried, broken and stacked from 0.0015 Cum to 0.003 Cum in size including cost, conveyance& royalty of all materails and complete work and as per direction of the Department / Engineer-in Charge	1.00 Cum X Rs. 3366.00	Rs. 3366.00
2.	Add. 1% Labour Cess		Rs. 33.66
3.	Add 18% GST		Rs. 611.93
	Total		Rs. 4011.59

Construction cost of 1 Cum of Loose Boulder Check Dam = Rs. 4011.59

Construction cost of 334 nos. of Loose Boulder Check Dams of size 1m x 1m

2m x 334 = 668 Cum = Rs. 4011.59 x 668 = Rs. 26,79,742.12

Annexure-5

DETAIL ESTIMATE FOR CONSTRUCTION OF SILTATION TANK								
Sl. No.			No	Length (m)	Width (m)	Depth (m)	Quantity (Cum)	Amount (Rs.)
1	2		3	4	5	6	7	8
1	Clearing Of Grass and removal of Rubbish up to a distance of 50 mtr outside the periphery of the area 55mtr x 45mtr	Site	1	55	45			
			10	Labour Days		@	Labour cost Rs.452/day-	Rs. 4520.0
2	Earthwork in stony earth and gravel mixed with stone and boulder not exceeding 0.014 Cum in volume within 50m initial lead and 1.50 m initial lift including rough dressing and breaking clods to maximum 5cm to 7cm and laying in the layers not exceeding 0.3 m in depth and as per direction of engineer-in-charge.	Level 1	1	40	30	1	1200	
		Level 2	1	38	28	1	1064	
		Level 3	1	36	26	1	936	
				Total	3200 Cum	@	Rs. 283.43/Cum	Rs. 9,06,976
Gross Total							Rs. 9,11,496.00	

Total cost for Construction of 1 No. of 40 m x 30 m x 3 m size of of Siltation Tank = Rs. 9,11,496.00

Cost for construction of 2 No. of Siltation tanks = 2 x Rs. 9,11,496.00 = Rs. 18,22,992.00

Annexure -6

Construction cost of garland drains and catch drains

Sl. No.	Details of work	Volume of earth work involved	Rate per Cum of Earth work including compacting	Amount (Rs.)
	Earthwork in stony earth and gravel mixed with stone and boulder not exceeding 0.014 Cum in volume within 50m initial lead and 1.50 m initial lift including rough dressing and breaking clods to maximum 5cm to 7cm and laying in the layers not exceeding 0.3 m in depth and as per direction of engineer-in-charge.	1m x 1m x 1m = 1Cum	Rs. 283.43/Cum	283.43
1	Catch drains around the topsoil dump	1m x 1m x 3200 m = 3200 Cum	Rs. 283.43/Cum	906976
2	Garland drains around the internal OB dumps	1m x 1m x 33440 m = 33440 Cum	Rs. 283.43/Cum	9477899.2
3	Catch drains around the External OB Dump	1m x 1m x 4100 m = 4100 Cum	Rs. 283.43/Cum	1162063
4	Drainage along the haul roads	1m x 1m x 9920 m = 9920 Cum	Rs. 283.43/Cum	2811625.6
Total		50660 Cum	Rs. 283.43/Cum	1,43,58,563.8


Divisional Forest Officer
Jharkhand Forest Division

physical
components
approved

Annexure-15

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

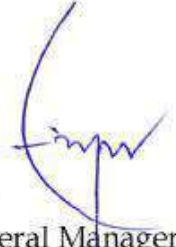
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 7(a)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एच.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

**SCHEME FOR
PLANTING OF ADEQUATE DROUGHT
HARDY PLANT SPECIES AND SOWING OF
SEEDS IN THE APPROPRIATE AREA WITHIN
THE MINING LEASE TO ARREST SOIL
EROSION**

For

**Diversion of 417.073 hectares of Forest land & Re-
diversion (Change in Land use) of 171.774 Ha**

in respect of

Integrated Lakhanpur-Belpahar-Lilari Opencast Project

In favour of

**Mahanadi Coalfields Limited,
Jharsuguda District, Odisha**

In compliance with the

Condition No - 7 (b) of

Stage - I Forest Clearance granted vide

Letter No. 8 - 280/1989-FC vol dated 27.12.2023, of Govt. of India,

Ministry of Environment, Forests and Climate Change,

New Delhi

1. INTRODUCTION

Ib-Valley coalfield is located in Jharsuguda, Sambalpur and Sundargarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway stations are Belpahar railway station Jharsuguda Railway Station.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project of M/s Mahanadi Coalfields Ltd. located in the Ib-Valley Coalfield. The project falls in the villages - Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khairkuni, Ubuda, Darlipali, Kirarama, Jurabaga, Kusraloi, Karlajori, Khaliapali, Kudaloi, Lakhanpur and Soldia villages of Lakhanpur Tehsil, Jharsuguda District, Odisha. The project area is covered under Survey of India Topo Sheet No 64O/13 & 64O/14 (RF 1:50,000) and is bounded by the geographical coordinates ranging from Latitude 21°42'25.89"N to 21°47'24.82"N and Longitudes 83°49'38.9"E to 83°49'53"E.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs. The existing projects have been integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura seam by open cast mining. The capacity of the Integrated Lakhanpur-Belpahar-Lilari Opencast Project is 40.0 MTY with mine lease area of 4399.246 Ha and total project area of 4742.877 Ha. The life of the project is 41 years.

Total Forest land involved in the Integrated project is 958.695 Ha out of which Forest Clearance has been obtained for 541.622 Ha. Details are given below.

The details of the existing Forest Clearances:

1. Lakhanpur OCP (233.43 Ha): Forest Clearance was obtained for forest land 233.43 Ha vide letter no. 8 280/89-FC dated 08.10.1990.
2. Belpahar OCP (123.220 Ha + 22.772 Ha):
 - a) 123.220 Ha - Diversion of Forest land was obtained for 103.52 Ha vide No. 8-104/91-FC dated 02.06.2000 and 19.70 Ha vide no. 8-104/1991-FC dated 15.09.2014.
 - b) 22.772 Ha - Forest diversion for 22.772 Ha (10.453 Ha + 13.630 Ha) has been done by OPGC. OPGC has taken forest clearance of 159.616 Ha vide letter no. F.No.8-93/2012-FC dated 19.01.2015 in which 10.453 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP and further Stage-II forest clearance of 13.630 Ha obtained vide letter no. 5-ORA155/2012-BHU dated 10-

01-2020 in which 12.319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

3. Lilari OCP (162.20): Forest Clearance was obtained for forest land 162.20 Ha vide letter no 8 281/8-FC dated 31/07/1990.

For the remaining forest land area of 417.073 Ha and out of 541.622 Ha diverted forest land; Re-diversion (change in land use pattern) of 171.774 Ha (Belpahar OCM: 0.745 Ha, Lakhanpur OCP: 42.389 Ha and Lilari OCP: 128.640 Ha) is required for mining, 7.5m safety zone and temporary topsoil storage yard. So, an application was submitted to MoEF&CC vide proposal no. FP/OR/MIN/39355/2019 dated 16.03.2019 and the Stage -I FC was granted vide No. 8-280/1989-FC Vol. Dated:27.12.2023.

In the Stage -I order certain stipulated conditions has been set out to be fulfilled by the user agency. The condition no. 7 reads as follows:

"7. Following activities, as per approved plan/schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:

a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;

b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;

c. Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;

d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°;

In compliance of the above condition 7(b) stipulated by MoEF&CC, a detailed proposal has been prepared and is enclosed herewith for further consideration.

2. OBJECTIVES OF THE SCHEME

Planning for plantation is done keeping the following objectives in mind:

- To arrest the soil erosion
- Compensate the damage to the vegetation due to setting up and operation of the mine.
- Prevent the spread of fugitive dust generated due to mining and allied activities.
- Help stabilize the slope of external overburden dumps.
- Increases green cover and improve aesthetics.

Green belt development and afforestation will be carried out inside the mining lease area to restore and increase the green cover of the region. Progressive Green Belt development and plantation in and around the mining complex shall continue to Improve the control of soil erosion. Progressive green belt development and plantation in the available areas will be carried out in a phase-wise manner till end of the work.

Saplings will be planted at the rate of 2500 trees/ha in ANR plantation mode in external/internal dumps and backfilled areas and in other areas & green belt. Stretches of un-worked areas in the mining lease, which will not be covered by any activity, will also be selected for afforestation. Plantation will commence there from the initial years of excavation and plantation will be expanded in such areas in progressive stages.

Integrated Lakhanpur-Belpahar-Lilari Opencast Project will carry out the plantation on some of the dumps, quarries, vacant areas not proposed for mining activities. Attempts will be made for plantation of drought resistant plant such as Neem (*Azadirachta indica*), Karanja (*Pongamia glabra*), Asan (*Terminalia alata*), Kurum (*Sleicheria oleosa*), Amla (*Emblica officinalis*), Mundi (*Mitragyna parviflora*), Baigoba (*Jatropha curcas*), grass like *Vetiveria zizanioides* and leguminous species like *Stylosanthes hamata*, will be selected for degraded lands, which will improve the environment. Plantation of Murga (*Agave sisilana*) will be undertaken along toe of dump slopes. These will be grown as a boundary fence or live hedge and can be used to reclaim eroded areas. The species for draught hardy species, if any more, will be selected in consultation with the State Forest Department. Phase-wise plantation activities on the OB dumps and excavated / mined out areas are dealt in the progressive mine closure plan. It is proposed to take the extensive plantation of vetiver on the dump slopes for stabilization and moisture conservation.

The plantation details is given as follows:

Plantation Details	Quantity
Plantation of draught hardy species in consultation with the Forest Department within the lease area	Over the OB Dumps OB top Plantation of 1787.36 Ha and OB slope plantation of 1317.673 Ha
Agave plantation around the plantation area.	20 Ha on topsoil dump and other technically reclaimed areas
Sowing of grass seeds	41.994 Ha Over topsoil dump and internal OB dumps
Vetiver plantation on dump slopes for control of soil erosion	20 Ha along the slopes of the internal OB dumps

3. CHOICE OF SPECIES

The choice of species will be based on the following parameters:

i. Drought hardy.

ii. Prevent soil erosion.

iii. Inventory of the local forest species like Kusuma, Bel, Karanja, Kurum, Amla, Begunia etc. Some soil / binding grasses will be introduced. The grass seeds to be sown are given in the following table. Plant species suitable for plantation should not only be able to flourish in the area but must also have rapid growth rate, evergreen habitat, large crowns and small leaves with smooth surfaces. All these traits are difficult to get in a single species. Therefore a combination of these is sought while selecting trees for green-belt / vegetation cover.

Name of Grass Species	Usage	Habitat/Soil
Chrysopogon fulvus	Fodder	Red soil/Back cotton soil
Saccharum spontaneous	Fodder	Red soil/Back cotton soil
Sporobolus marginatus	Fodder	Sandy soil
Heteropogon contortus	Non- Fodder	Eroded soil
Cynodon dachylon	Fodder	Wide range soil
Eulaliopsis binnata	Fodder	Red soil
Themeda triandra	Fodder	Red soil

4. METHODOLOGY

It is proposed to plant the seedlings in pits at about 2.5 m intervals along the contours. The pits shall be filled with a mixture of good quality soil and organic manure (cow dung, agricultural waste, kitchen waste). Saplings shall be planted just after the commencement of monsoon to ensure maximum survival. The species selected for plantation must be locally growing varieties with fast growth rate and ability to flourish even in poor quality soils. Common species noticed in the area are Khair (*Acacia Catech*), Piasal (*Pterocarpus marsupium*), Sal (*Shorea robusta*), Sisoo (*Dalbergia sissoo/ latifolia*), Gambhar (*Gmelina arboria*), Bandhan (*Ougeinia oogeinenesis*), Kurum (*Adina Cordifolia*), Jamun (*Syzygium cumini*), Kendu (*Diospyrus melanoxylon*), Asan (*Terminalia alata*), Mango (*Mangifera indica*), Dhaura (*Anogeissu latifolia*), Bamboo (*Dendrocalamus strictus*) etc. The species for green belt development will be selected in consultation with the State Forest Department.

Plantation on the large overburden dumps cannot start till dumping activities have ceased at least in a part of the dump and the site is prepared for plantation. Once dumping is completed, a path will be cleared to the designated area so that the basic inputs (water, manure, and seedlings) can be carried up to the site. Next, a layer of top soil has to be spread over the area and roughly levelled. Grass seeds/ seedlings will be planted on the soil layer to stabilize the soil. Trenches of 45cm x 45cm will be dug on the flat top of the dumps and the excavated material used to form a bund on the dip side of the trenches to trap maximum water in the trenches during rains. 30cm x 30cm pits will be dug in the contour trenches at 2.5m intervals. The pits will be filled with a mixture of top soil, organic manure and phosphoric fertilizer. Saplings will be planted in these pits once monsoon has commenced to ensure maximum survival of the saplings.

5. POST PLANTATION CARE

Prescribed post plantation care shall be adopted to ensure maximum survival of the plants. Funds for maintenance of the plants for the first four years after the plantation shall be kept. Immediately after planting the seedlings, watering will be done. Further watering will depend on the rainfall. In the dry seasons, watering will be regularly done especially during March to June. Watering in one year planted saplings will be more frequent (thrice a week). Manuring will be done using organic manure (animal dung, agricultural waste, kitchen waste, etc.). Diseased and dead plants will be uprooted and destroyed and replaced by fresh saplings. Growth/ health and survival rate of saplings will be regularly monitored and remedial actions will be undertaken as required.

6. CLIMATE

The area generally experiences moderate Tropical climate with highest temperature ranging from 33°C to 43°C in summer and lowest from 06°C to 19°C in winter. The area experiences three distinct climate i.e. summer, rain and winter. The rain occurs from July to September due to South west monsoon. Cyclonic rain occurs during September / October.

i. Actual Rainfall (As per India Water Resources Information System)

Year	Monthly Rainfall Data of Jharsuguda District in mm.											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2019	2.74	32.64	20.14	27.21	17.19	165.75	300.77	594.01	319.4	128.11	7.11	1.8
2020	17.78	46.84	101.31	103.66	67.13	408.57	85.5	568.6	178.45	75.77	6.82	0.02
2021	7.89	8.62	17.98	6.53	164.37	221.16	257.9	132	213.97	42.82	37.34	60.92
2022	52.71	29.97	0	2.68	54.19	97.21	273.38	528.75	151.3	78.52	0	0
2023	0	0	32.17	47.09	29.27	267.03	348.8	398.92	347.62	125.18	31.4	46.27
Normal	14.1	24.7	22.1	0	0	224.9	399.9	420.7	230.8	61.5	5.9	4.8

7. PREPLANTING AND PLANTING OPERATION:

(i) Raising of nursery:

Seedling required for plantation shall be raised in a temporary nursery nearer to the planting site and perennial water sources. Nursery work will start one year before the year of plantation, so that second year seedlings will be available for plantation, Seeds shall be collected from trees and should be treated before dibbling. Polythene bag seedling should be raised 10% extra besides the actual requirement to compensate the casualties. Standard nursery practices will be followed for raising such polythene bag nursery.

(ii) Alignment and pitting:

Alignment and pitting will be taken up in the month of February to April, pits of size 30 cm x 30 cm x 30cm will be dug maintaining a spacing of 2.5 mtr x 2.5 mtr in 40 rows in zig-zag manner in one hectare land parcel. The area will be divided into 4 Ha plots.

(iii) Actual planting:

The seedling will be planted in the dugout pits of size 30cm x 30cm x 30 cm with a spacing of 2.5 mtr x 2.5 mtr in zig- zag matter. Plantation should be taken up after first regular shower of monsoon and should be completed by the end of July. Species should be planted as per the suitability of the soil condition. NPK fertilizer@ 30gms per plant should be given as basal dosage. Anti-termite insecticide should also be applied to each pit while planting. Casualties if any noticed should be replaced with

the excess seedling raised for the purpose. During second year also casualty replacement will be done for which seedling shall be raised.

(iv) Weeding, Soil working & manuring:

For establishment and better growth of the planted seedling, weeding soil working and manuring are necessary. It is prescribed that two weeding, soil working and manuring will be done during the first year and second year of plantation and one weeding and soil working during third year. During the first year and second year first weeding and manuring shall be carried out during August-September and the second one during October-November. First weeding shall be an area weeding and the second will be of strip weeding. The weeding of third year will be an area weeding which will be carried out during August. After each weeding, soil working will be done around each plant at a radius of 0.5 mtr and manuring of each plant will be done @ 30 gms of NPK per plant.

(v) Application of insecticides:

The plantation site after planting good healthy seedling may cause influx of insects, which usually eat and damage the tender leaves and shoots of the plants. To get rid of such insect attack application of the insecticides will be taken up in required doses at desired intervals. Spraying of insecticides shall be done preferably in a sunny day in the afternoon.

(vi) Fire line tracing and maintenance:

Fire causes heavy losses to the forest during fire season. To prevent incidence of fire, the area shall be divided in to suitable blocks by tracking fire lines. Boundaries of the plantation patches and these block lines will be scrapped of forest growth to width of 3.0 mtr during February-March and the cut back materials and the dry leaves stacked along these lines will be burnt under strict supervision. This operation shall be carried out for three years.

(vii) special soil conservation measure:

To check soil erosion and the rain water draining out of the area, it has been proposed to take up special soil conservation measures. This will be done all over the area. Depending on requirement tools like staggered trenches along the contour, gully plugging, mulching, loose boulders check dams etc will be done.

8. WATCH AND WARD:

To protect the area against grazing, fire accident and other biotic interference it is proposed to engage watchers for three years after planting. In addition, at strategic locations fencing will be done to check sudden intrusion of cattle.

9. INSPECTION, MONITORING & EVALUATION:

To have this Afforestation scheme quite success, intensive inspection of the plantation by forest field staff and the officers at the divisional level is necessary. Moreover, frequently monitoring & evaluation shall have to be done. Vehicles to be used for inspection of nursery and plantation shall be borne or arranged by the user agency.

10. EXECUTING AGENCY:

In all cases, the work shall be executed by the User Agency having specialized departments headed by qualified persons with outsourced man and machinery as and where required. To facilitate this, the User agency shall establish its own executing and supervision cells along with required infrastructural facilities. In order to maintain the quality of work, in house supervision through competent personnel shall be provided. The entire work shall be carried out through close coordination with the Forest Department.

11. REQUIREMENT OF FUNDS:

Sl. No.	Description of Work	Area (Ha)	Funds Required (In Rs.)	Remarks	
1	Grassing on topsoil dump	41.994	49,61,340.0	Annexure-1	covered in scheme 7(a)
2	ANR Plantation on top of Internal OB dumps	1787.36 Ha	49,75,87,976.30	Annexure -3	covered in scheme 7(a)
3	ANR Plantation on slope of Internal OB dumps	1317.673 Ha	36,68,30,544.20	Annexure -3	covered in scheme 7(a)
4	Agave Plantation (20 Ha on topsoil dump and other technically reclaimed areas)	20 Ha	32,18,366.40	Annexure -7	
5	Vetiver Plantation in 20 Ha	20 Ha	12,76,320.00	Annexure 8	
Total (of 4 & 5)			44,94,686.40		

Technically Approved

Regional Chief Conservator of Forests
Sambalpur

Deputy Forest Officer
Jharsuguda Forest Division

महानगरपालिका
General Manager
एम.सी.एल. लखनपुर क्षेत्र
MCL, Lakhnupur Area

Physical
Components
Approved

ANNEXURE - 7

COST NORM FOR AGAVE PLANTATION for 1 Ha (40x40 ROWS - 2.5m interval)

1600 nos. Of plants

(Wage Rate-452/-Per day)

Sl No	Name of the work	Person days	Labour Rate @ Rs @452/-	Material Cost (Rs.)	Total
0th YEAR OPERATION					
1	Survey and demarcation	2	904	0	904
2	Site clearance alignment and stacking	10	4520	0	4520
3	Digging pits and application of line	40	18080	0	18080
4	Nursery cost (6 month old seedling) @ 18.551p/- seedling (Rs. 12.72p in 0th year + 5.831p in 1st year) for 1760 seedlings (1600+160)	44	19888	32649.76	52537.76
	Sub-Total:	96	43392	32649.76	76041.76
1ST YEAR OPERATION					
1	Nursery cost (6 months old seedling) balance @ Rs.5.831 for 1760 seedlings	21.5	9718	10262.56	19980.56
2	Carriage & Planting, casualty replacement and application of insecticides, manure etc.	21	9492	0	9492
3	cost of insecticide and fertilizer (a) NPK @ 50 gms/plant as basal dose = 80 kg @ 24/- per kg = 1920.00 (b) Urea @ 70 gms/plant in two subsequent doses @ Rs. 6/- per kg = Rs. 672.00 (c) Granular insecticides (Thermet, Forate etc.) @ 5 gms/plant @ Rs. 80/- per Kg =Rs. 640.00	0	0	3232	3232
4	Complete weeding, Soil working, manuring	24	10848		10848
5	Fire line tracing & inspection path	3	1356	0	1356
6	Soil conservation measure(Staggered trenches of dimension 2m x 0.5m x 0.5m @ 60 nos. per Ha) or its equivalent	10	4520	300	4820
7	Watch & Ward	7	3164	0	3164
	Sub-Total:-	86.5	39098	13794.56	52892.56

(b)SECOND YEAR MAINTENANCE:

1	Casualty replacement (10%) with nursery cost of seedling, carriage & planting	4	1808	2000	3808
2	Complete weeding & cultural operations	6	2712	0	2712
3	Soil working (50 cms Radius around plants)	7	3164	0	3164
4	cost of fertilizer (NPK@ 70gms/plant (Rs. 24/- per kg & insecticides @ 5gms/plant for 160 plants 800 gms @ Rs. 80/- per Kg	0	0	2752	2752
5	Application of Fertilizers and insetcides	4	1808		1808
6	Fire line tracing & inspection path	1	452	0	452
7	Watch & ward	7	3164	0	3164
	Sub-Total:-	29	13108	4752	17860

(c)THIRD YEAR MAINTENANCE:

1	Complete Weeding and pruning	7	3164	0	3164
	Cost of fertilizer(NPK @ 50 gms/plant) @ Rs. 24 per Kg		0	1920	1920
2	Soil working	7	3164	0	3164
3	Fire line tracing & inspection path	3	1356	0	1356
4	Watch & ward	7	3164	0	3164
	Sub-Total:-	24	10848	1920	12768

(d)FOURTH YEAR MAINTENANCE:

1	Fire line tracing & inspection path	1	452	0	452
2	Watch & ward	2	904	0	904
	Sub-Total:-	3	1356	0	1356

Abstract				
Year	No. of Man days	Labour Cost @ Rs. 452/ man days (in Rs.)	Material Cost (Rs.)	Total
0 th Year	96	43392	32649.76	76041.76
1 st Year	86.5	39098	13794.56	52892.56
2 nd Year	29	13108	4752	17860
3 rd Year	24	10848	1920	12768
4 th Year	3	1356	0	1356
Grand Total	238.5	107802	53116.32	160918.32

Total Cost norm for Agave planting in one ha with 1600 plants in 40 rows at 2.5m x 2.5 interval
=Rs. 1,60,918.32

Cost of Agave plantation in 20 Ha = 20 Ha x Rs.1,60,918.32/Ha = Rs. 32,18,366.40

Estimate for Vetiver plantation on the OB Dump slope for 1 Ha. (Cost of Labour @Rs.452/day.)

Cost of Vetiver plantation for 20 Ha = Rs 63816 x 20 Ha = 12.76,320/-

The Journal's next Editor

Annexure-17

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

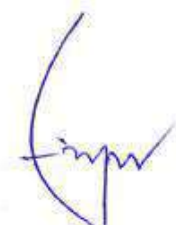
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 7(b)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme will be carried out.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एच.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

**SCHEME FOR
CONSTRUCTION OF CHECK DAMS, RETENTION /
TOE WALLS TO ARREST SLIDING DOWN OF THE
EXCAVATED MATERIALS ALONG THE CONTOUR
IN ACCORDANCE WITH THE APPROVED SCHEME**

For

**Diversion of 417.073 hectares of Forest land & Re-
diversion (Change in Land use) of 171.774 Ha**

in respect of

Integrated Lakhanpur-Belpahar-Lilari Opencast Project

In favour of

**Mahanadi Coalfields Limited,
Jharsuguda District, Odisha**

In compliance with the

Condition No - 7 (c) of

Stage - I Forest Clearance granted vide

Letter No. 8 - 280/1989-FC vol dated 27.12.2023, of Govt. of India,

Ministry of Environment, Forests and Climate Change,

New Delhi

1. INTRODUCTION

Ib-Valley coalfield is located in Jharsuguda, Sambalpur and Sundargarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway stations are Belpahar railway station Jharsuguda Railway Station.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project of M/s Mahanadi Coalfields Ltd. located in the Ib-Valley Coalfield. The project falls in the villages -Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khairkuni, Ubuda, Darlipali, Kirarama, Jurabaga, Kusraloi, Karajori, Khaliapali, Kudaloi, Lakhanpur and Soldia villages of Lakhanpur Tehsil, Jharsuguda District, Odisha. The project area is covered under Survey of India Topo Sheet No 64O/13 & 64O/14 (RF 1:50,000) and is bounded by the geographical coordinates ranging from Latitude 21°42'25.89"N to 21°47'24.82"N and Longitudes 83°49'38.9"E to 83°49'53"E.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs. The existing projects have been integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura seam by open cast mining. The capacity of the Integrated Lakhanpur-Belpahar-Lilari Opencast Project is 40.0 MTY with mine lease area of 4399.246 Ha and total project area of 4742.877 Ha. The life of the project is 41 years.

Total Forest land involved in the Integrated project is 958.695 Ha out of which Forest Clearance has been obtained for 541.622 Ha. Details are given below.

The details of the existing Forest Clearances:

1. Lakhanpur OCP (233.43 Ha): Forest Clearance was obtained for forest land 233.43 Ha vide letter no. 8 280/89-FC dated 08.10.1990.
2. Belpahar OCP (123.220 Ha + 22.772 Ha):
 - a) 123.220 Ha - Diversion of Forest land was obtained for 103.52 Ha vide No. 8-104/91-FC dated 02.06.2000 and 19.70 Ha vide no. 8-104/1991-FC dated 15.09.2014.
 - b) 22.772 Ha - Forest diversion for 22.772 Ha (10.453 Ha + 13.630 Ha) has been done by OPGC. OPGC has taken forest clearance of 159.616 Ha vide letter no. F.No.8-93/2012-FC dated 19.01.2015 in which 10.453 Ha falls within area of Integrated

Lakhanpur-Belpahar-Lilari OCP and further Stage-II forest clearance of 13.630 Ha obtained vide letter no. 5-ORA155/2012-BHU dated 10-01-2020 in which 12.319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

3. Lilari OCP (162.20): Forest Clearance was obtained for forest land 162.20 Ha vide letter no 8 281/8-FC dated 31/07/1990.

For the remaining forest land area of 417.073 Ha and out of 541.622 Ha diverted forest land; Re-diversion (change in land use pattern) of 171.774 Ha (Belpahar OCM: 0.745 Ha, Lakhanpur OCP: 42.389 Ha and Lilari OCP: 128.640 Ha) is required for mining, 7.5m safety zone and temporary topsoil storage yard. So, an application was submitted to MoEF&CC vide proposal no. FP/OR/MIN/39355/2019 dated 16.03.2019 and the Stage - I FC was granted vide No. 8-280/1989-FC Vol. Dated:27.12.2023.

In the Stage -I order certain stipulated conditions has been set out to be fulfilled by the user agency. The condition no. 7 reads as follows:

"7. Following activities, as per approved plan/schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:

a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;

b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;

c. Construction of check dams, retention/toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;

d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°;

In compliance of the above condition 7(c) stipulated by MoEF&CC, a detailed proposal has been prepared and is enclosed herewith for further consideration.

2. OBJECTIVES

To fulfill conditions no. 7 (c) of the Stage-I approval issued vide letter No. 8-280/1989-FC Vol. Dated:27.12.2023 of Ministry of Environment, Forest and Climate Change, New Delhi which provides for preparation of plan for construction of check dams, retention /toe walls to arrest sliding down of the excavated materials along the contour. The scope of objectives are as follows:

- I. To control soil erosion from OB dumps and coal stock yards.
- II. To prevent erosion of sediments due to surface runoff.
- III. To prevent the obstruction of natural water sources.
- IV. To complete construction activities efficiently before disturbed soils are exposed.
- V. To prevent overflow of eroded soil from the mining areas to the cultivable lands, natural streams and habitations.

3. Proposed methodology:

To achieve the above objectives, it has been proposed to take up both biological and structural measures for soil and water conservation.

In this scheme, considering the topography and contours of the area, emphasis has been given to arrest sliding down of excavated materials along the contour by constructing retention /toe walls at specified locations around the topsoil dump, external dump and internal dumps within the mining lease.

4. The salient features of the drainage management plan/scheme are as follows:

Topography of the block is plain to moderately undulating. The area is gently sloping towards east. The highest and lowest elevations of the area are 250 m and 198 m above mean sea level respectively. The drainage is controlled by Lilari nallah which discharges into Hirakud reservoir. One tributary (seasonal) of Lilari nallah namely, Pulijhore flows from west to east within the mine area with its catchment area to the west of the block.

The Ib River on the eastern side of the coalfield mainly controls drainage in the area. Apart from Ib River, Lilari nalla flows along the west and southern margin of the block. The Lilari stream is a perennial in nature. It originates near Chhengapahar and soon forms a 2nd order stream in Chhengapahar village, Lilari nala forms 3rd order stream near Lamiharia village and continues to drain south-easterly. At Tangardihi village, Lilari nala becomes a 4th order stream. Hereafter, it continues south-easterly and near Mundaparha village, it is joined by the Pandren jhor, a 4th

order stream (flows almost in a northwest-southeast orientation in the study area), hereafter the Lilari nala attains 5th order, before meeting Ib river. Lilari Nala traverses approximately 30.8 km from its place of origin at Ghhengapahar Reserve Forest before it meets the Ib river.

The distance of water bodies from the mine lease area of Integrated Lakhanpur-Belpahar-Lilari OCP are as follows:

Name of the Water Bodies	Distance
Lilari Nallah	Within mine lease area
Phulijhor Nallah	Within mine lease area
Pandren Jhor	0.90 km
Bagdia Jhor	1.70 km
Hirakud Reservoir (backwater)	2.40 km
Kandhal Jhor	3.30 km
Ib River	3.90 Km

Stream orders and stream lengths of Lilari nala basin:

	Numbers of segments (Nu)	Log (Nu)	Length (kms) (Lu)	Mean length of channel (Lu)
1	384	2.584	154.550	0.402
2	73	1.863	70.837	0.97
3	22	1.342	28.701	1.304
4	2	0.301	17.473	8.736
5	1	0.000	2.580	2.58

Summary of Hydrological parameters of the sub basins in the mine lease area:

Name of Basin	Lilari Nala
Area of Basin in KM ² (Au)	188.14
Perimeter of Basin in KM (P)	66
Basin length in KM (L)	23.5
Diameter of Circle with basin area in KM (D)	21
Area of the circle having the same perimeter of the basin in KM ² (AC)	314
Form Factor $Rf = Au/L^2$ (RF)	0.34
Circularity ratio $Rc = Au/AC$ (Rc)	0.60
Elongation ratio $Re = d/L$ (Re)	0.89

5. Measures proposed to be adopted

• Structural Measure:

Vegetative means of erosion control are the most feasible and economic measures. However, as the pressure on land is increasing, it is felt necessary to bring even highly eroded land underutilization. In these lands, vegetative measures are not adequate to keep down the erosion. Some structural measures, therefore, serve as supplementary to vegetative measures. The objective behind building toe walls/retaining walls structures is to reduce the degree and length of the slopes, reducing run-off and eventually, reducing soil erosion.

A. Construction of toe/retaining wall all along the garland drain of peripheral OB.

B. Stage-wise construction of catch drains on surface excavation periphery to collect surface run-off water

C. Construction of settling tanks along garland drains on excavation and OB areas.

D. Construction of catch drains at the foot of quarry and OB benches

Cost Estimation

Sl. No.	Parameters	Size	Volume of earth work involved	Rate per Cum of Earth work including compacting	Total Amount (Rs.)	Reference	
1.	Cabion wall around the topsoil sump	2m x 1m x 3200 m	6400 Cum	Rs. 283.43/Cum	18,13,952.00	Annexure -2	covered in scheme 7(a)
2.	Cabion wall around the internal dumps	2m x 1m x 33440m	66880 Cum	Rs. 283.43/Cum	1,89,55,798.4	Annexure -2	
3.	Construction of Siltation tank	40m x 30m x 3m (02 nos.)			18,22,992.00	Annexure-5	
4.	Loose Boulder Check Dams (334 nos.)	1m x 1m x 2m	2 Cum x 334 nos. = 668 Cum	Rs. 4011.59/Cum	26,79,742.12	Annexure -4	
5.	Garland drains and catch drains		50660 Cum	Rs. 283.43/Cum	1,43,58,563.8	Annexure -6	
6.	Retaining Walls	3.5 m x 1.8 m x 4100 m			12,30,00,000	Annexure-9	
	Total (Annexure 9)				12,30,00,000		

Technically Approved

Regional Chief Conservator of Forests
Sambalpur

Divisional Forest Officer
Bharatpur Forest Division

महाप्रबंधक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhnupur Area

Physically Compensated
approved

Annexure - 9

Construction of retaining wall all along garland drain

A retaining wall is a structure designed and constructed to resist the lateral pressure of soil.

Cost Estimation for construction of Retaining walls

Width of raft of retaining wall = 1.8 m

Depth below ground = 1.5 m

Height above ground = 2m

Total Height of Retaining wall = 3.5m

Length of Retaining wall = 1m

Cost for 1 m (Length) x 3.5 m (Height) x 1.8 m (width) = Rs. 30,000 (As per the SOR Manual 2023 of MCL)

Sl. No.	Location of Retaining Wall	Length (m)	Amount (Rs.)
1.	Ib Coal Washer	650	1,95,00,000
2.	10 MTPA SILO Loading facility	550	1,65,00,000
3.	Along the Ammonium Nitrate Plant	2050	6,15,00,000
4.	ILBL Workshop	850	2,55,00,000
	Total	4100	12,30,00,000


Divisional Forest Officer
Jharkhand Forest Division

Physical
components
approved

Annexure-19

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 7(c)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme will be carried out.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एच.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

**SCHEME FOR STABILIZATION OF THE OVER
BURDEN DUMPS BY APPROPRIATE
GRADING/BENCHING SO AS TO ENSURE THAT
ANGLE OF REPOSE AT ANY GIVEN PLACE IS LESS
THAN 28°**

For

**Diversion of 417.073 hectares of Forest land & Re-
diversion (Change in Land use) of 171.774 Ha**

in respect of

Integrated Lakhanpur-Belpahar-Lilari Opencast Project

In favour of

**Mahanadi Coalfields Limited,
Jharsuguda District, Odisha**

In compliance with the

Condition No - 7 (d) of

Stage - I Forest Clearance granted vide

Letter No. 8 - 280/1989-FC vol dated 27.12.2023, of Govt. of India,

Ministry of Environment, Forests and Climate Change,

New Delhi

1. INTRODUCTION

Ib-Valley coalfield is located in Jharsuguda, Sambalpur and Sundargarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway stations are Belpahar railway station Jharsuguda Railway Station.

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01-2020 in which 12,319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

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a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;

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c. Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;

d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°;

In compliance of the above condition 7(d) stipulated by MoEF&CC, a detailed proposal has been prepared and is enclosed herewith for further consideration.

2. OBJECTIVE OF THE SCHEME

The objectives of the proposed scheme are as follows: -

1. To meet the stipulation i.e. Condition No.7 (d) by preparing a plan for " Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28° ; given by MoEF&CC vide Letter No. 8-280/21989-FC Vol. dated 27.12.2023.
2. To adopt proper Management and scheduling of overburden materials so as to minimize external dumping.
3. To provide methodology and implement the proposed actions in time bound manner to prevent slope failures there by providing stable OB dump slopes.
4. Stabilization of the over burden dumps by plantation.
5. Prevention of overflow of eroded soils from the fines, OB dump area leading to siltation in the natural streams.

3. SOIL

The Physio-Chemical properties of the soil are as:

Texture of the soil is mostly Silt loam and Loamy sand. Water holding capacity is in the range of 10.2% 28.0%. Specific gravity ranges from 2.5 - 2.8 gm/cm³. slightly acidic to neutral in nature having pH in the range of 6.1 to 6.95. Organic carbon for the soil is in the range of 0.12-0.55%. Organic carbon in the barren land varies from less to very less with increase in depth, whereas organic carbon in agricultural land varies from average, medium & to very less with increase in depth.

4. TOPOGRAPHY & DRAINAGE

Topography of the block is plain to moderately undulating. The area is gently sloping towards east. The highest and lowest elevations of the area are 250 m and 198 m above mean sea level respectively. The drainage is controlled by Lilari nallah which discharges into Hirakud reservoir. One tributary (seasonal) of Lilari nallah namely, Pulijhore flows from west to east within the mine area with its catchment area to the west of the block.

The Ib River on the eastern side of the coalfield mainly controls drainage in the area. Apart from Ib River, Lilari nalla flows along the west and southern margin of the block. The Lilari stream is a perennial in nature. It originates near Chhengapahar and soon forms a 2nd order stream in Chhengapahar village, Lilari nala forms 3rd order stream near Lamiharia village and continues to drain south-easterly. At Tangardihi

village, Lilari nala becomes a 4th order stream. Hereafter, it continues south-easterly and near Mundaparha village, it is joined by the Pandren jhor, a 4th order stream (flows almost in a northwest-southeast orientation in the study area), hereafter the Lilari nala attains 5th order, before meeting Ib river. Lilari Nala traverses approximately 30.8 km from its place of origin at Ghhengapahar Reserve Forest before it meets the Ib river.

The distance of water bodies from the mine lease area of Integrated Lakhanpur-Belpahar-Lilari OCP are as follows:

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Kandhal Jhor	3.30 km
Ib River	3.90 Km

Stream orders and stream lengths of Lilari nala basin:

	Numbers of segments (Nu)	Log (Nu)	Length (Lu) (kms)	Mean length of channel (Lu)
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2	73	1.863	70.837	0.97
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4	2	0.301	17.473	8.736
5	1	0.000	2.580	2.58

Summary of Hydrological parameters of the sub basins in the mine lease area:

Name of Basin	Lilari Nala
Area of Basin in KM ² (Au)	188.14
Perimeter of Basin in KM (P)	66
Basin length in KM (L)	23.5
Diameter of Circle with basin area in KM (D)	21
Area of the circle having the same perimeter of the basin in KM ² (Ac)	314
Form Factor $R_f = A_u/L^2$ (RF)	0.34
Circularity ratio $R_c = A_u/A_c$ (Rc)	0.60
Elongation ratio $R_e = d/L$ (Re)	0.89

5. CLIMATE

The area generally experiences moderate Tropical climate with highest temperature ranging from 33°C to 43°C in summer and lowest from 06°C to 19°C in winter. The

area experiences three distinct climate i.e. summer, rain and winter. The rain occurs from July to September due to South west monsoon. Cyclonic rain occurs during September / October also.

i. Actual Rainfall (As per India Water Resources Information System)

Year	Monthly Rainfall Data of Jharsuguda District in mm.											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2019	2.74	32.84	20.14	27.21	17.19	165.75	300.77	594.01	319.4	128.11	7.11	1.8
2020	17.78	46.84	101.31	103.66	67.13	408.57	85.5	568.6	178.45	75.77	6.82	0.02
2021	7.89	8.62	17.98	6.53	164.37	221.16	257.9	132	213.97	42.82	37.34	60.92
2022	52.71	29.97	0	2.68	54.19	97.21	273.38	528.75	151.3	78.52	0	0
2023	0	0	32.17	47.09	29.27	267.03	348.8	398.92	347.62	125.18	31.4	46.27
Normal	14.1	24.7	22.1	0	0	224.9	399.9	420.7	230.8	61.5	5.9	4.8

6. EXISTING VEGETATION

The forest types in the study area are mainly North Indian Moist deciduous forest and Northern dry mixed deciduous forest. All classes of trees exist in this area. The composition of the vegetation is suitable for the wildlife. Sal, the dominant species fully established and abundant in these areas.

On most of the hills, sal ascends to the top, either predominantly or mixed with its other associates like, Bija, Ashan, Bandhan, Kurum, Kasi, Bamboo, Dhaura, Sisoo, Kendu, Haldu, etc.

7. PHASE WISE MINING ACTIVITY

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs. The existing projects have been integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura by open cast mining. The Lajkura Seam is topmost seam, Rampur is middle one and the Ib seam is the bottom most. In Belpahar Opencast mine Ib and Rampur seams are already excavated while in Lakhanpur OCP and Lilari OCP only Topmost Lajkura seam is being excavated. So, to excavated the Rampur and Ib Seams in Lakhanpur OCP and Lilari OCP, re-handling of already backfilled areas and Overburden need to carried out. The rehandled overburden will be backfilled into the voids of Belpahar OCM in Central Quarry and voids created in progressive working. Life of the project is 41 years from 2018-19 as per Mining Plan and Mine Closure Plan of Integrated Lakhanpur-Belpahar-Lilari OCP.

The Integrated Lakhanpur-Belpahar-Lilari OCP has a total quarry area of 3565.484 Ha. Further, the quarry area is divided into Lakhanpur Running Quarry, Belpahar & Central Quarry, South Quarry, North Quarry, South-East Quarry, and Below Diverted Lilari Nala.

The Year wise Coal and overburden production programme and re-handling of the OB in all the quarries is as follows:

Year	Quarry	Total Coal (Mt)	OB Re-handling (M m ³)	Total OB including Re-handled (M m ³)	Average S.R.
Year-1- Year-6	Lakhanpur Running Quarry	100.22	--	139.31	1.39
Year-1- Year-33	Belpahar & Central Quarry	933.84	277.76	3377.93	3.62
Year-7 - Year-16	South Quarry	92.57	--	234.47	2.53
Year-21 - Year-28	North Quarry	72.42	20.02	251.42	3.47
Year-28 - Year-31	South-East Quarry	13.55	--	93.94	6.93
Year-33 - Year-41	Below Diverted Lilari Nala	50.26	154.77	237.25	4.72

Production Programmed- Total Quarry

PRODUCTION PROGRAMME-TOTAL QUARRY										
Progressive Year	Coal (qty. in million tonne)						OB (Million cubic m)			S.R. cum/t
	IB	Rampur	Local	Lajkura	Parkhani	Total	In-situ OB	Rehand-ling	Total OB	
Year-1	3.95	5.05	0.00	21.00	0.00	30.00	52.00	0.00	52.00	1.73
Year-2	3.81	5.19	0.00	21.00	0.00	30.00	52.00	0.00	52.00	1.73
Year-3	2.72	9.27	0.01	21.00	0.00	33.00	52.00	0.00	52.00	1.58
Year-4	4.30	14.69	0.01	16.00	0.00	35.00	101.00	0.00	101.00	2.89
Year-5	5.89	20.09	0.02	11.00	0.00	37.00	92.00	0.00	92.00	2.49
Year-6	6.75	23.01	0.02	10.22	0.00	40.00	87.32	0.00	87.32	2.18
Year-7	9.80	24.56	1.39	4.25	0.00	40.00	109.00	20.00	129.00	3.23
Year-8	8.79	21.03	1.41	8.77	0.00	40.00	109.00	28.00	137.00	3.43
Year-9	7.70	18.40	1.24	12.66	0.00	40.00	107.00	36.00	143.00	3.58
Year-10	7.70	18.40	1.24	12.60	0.06	40.00	111.00	40.00	151.00	3.78
Year-11	7.37	17.29	1.57	13.50	0.27	40.00	115.00	48.00	163.00	4.08
Year-12	6.76	15.18	2.24	15.55	0.27	40.00	123.00	40.00	163.00	4.08
Year-13	6.77	15.16	2.24	15.55	0.28	40.00	116.00	30.00	146.00	3.65
Year-14	6.75	15.17	2.24	15.57	0.27	40.00	126.00	20.00	146.00	3.65

Year-15	7.97	17.88	2.64	11.35	0.16	40.00	121.00	10.00	131.00	3.28
Year-16	8.33	17.77	2.79	11.05	0.06	40.00	125.71	5.76	131.47	3.29
Year-17	6.34	10.69	2.28	20.69	0.00	40.00	126.00	0.00	126.00	3.15
Year-18	6.34	10.71	2.28	20.67	0.00	40.00	126.00	0.00	126.00	3.15
Year-19	6.34	10.71	2.28	20.67	0.00	40.00	126.00	0.00	126.00	3.15
Year-20	6.34	10.72	2.28	20.66	0.00	40.00	126.00	0.00	126.00	3.15
Year-21	7.63	12.03	2.43	17.91	0.00	40.00	108.00	0.00	108.00	2.70
Year-22	7.11	12.38	1.87	18.64	0.00	40.00	127.00	0.00	127.00	3.18
Year-23	6.69	12.10	1.73	19.48	0.00	40.00	124.00	3.00	127.00	3.18
Year-24	6.17	11.71	1.53	20.59	0.00	40.00	144.00	5.00	149.00	3.73
Year-25	5.71	11.36	1.36	21.57	0.00	40.00	143.00	7.00	150.00	3.75
Year-26	4.43	10.44	0.90	24.23	0.00	40.00	144.98	5.02	150.00	3.75
Year-27	4.44	10.43	0.91	24.22	0.00	40.00	164.00	0.00	164.00	4.10
Year-28	4.26	11.16	0.86	23.72	0.00	40.00	168.42	0.00	168.00	4.21
Year-29	2.79	9.04	0.78	22.39	0.00	35.00	163.00	0.00	163.00	4.66
Year-30	2.79	9.04	0.78	22.39	0.00	35.00	155.00	0.00	155.00	4.43
Year-31	1.90	5.68	0.76	21.66	0.00	30.00	125.94	0.00	125.94	4.20
Year-32	1.46	4.22	0.65	18.67	0.00	25.00	120.00	0.00	120.00	4.80
Year-33	2.80	4.76	0.33	4.71	0.00	12.60	26.14	15.79	41.93	3.33
Year-34	2.27	3.72	0.22	2.42	0.00	8.63	14.42	18.58	33.00	3.82
Year-35	1.32	2.15	0.13	1.40	0.00	5.00	8.60	24.40	33.00	6.60
Year-36	1.32	2.15	0.13	1.40	0.00	5.00	8.60	24.40	33.00	6.60
Year-37	1.32	2.15	0.13	1.40	0.00	5.00	8.60	24.40	33.00	6.60
Year-38	1.32	2.16	0.13	1.39	0.00	5.00	8.60	24.40	33.00	6.60
Year-39	1.32	2.15	0.13	1.40	0.00	5.00	6.20	22.80	29.00	5.80
Year-40	1.32	2.16	0.13	1.39	0.00	5.00	8.00	0.00	8.00	1.60
Year-41	0.45	0.72	0.04	0.42	0.00	1.63	2.25	0.00	2.25	1.38
TOTAL	199.54	442.68	44.11	575.16	1.37	1262.86	3881.78	452.55	4334.33	3.43

8. STABILIZATION OF OVER BURDEN DUMP

The Over Burden likely to be generated during life of the mine is 4334.33 M Cum and to be stored in two dumps i.e. external and internal dumps as follow:

Volume of external dump (in Mcum)	2.93
Average Height of external dump above surrounding surface (in meter)	15-20
External OB Dump area	22.65 Ha
Volume of internal dump (in Mcum)	4294.29
Swell Factor	1.15
Maximum Height of Internal Dumps	The dumps have been designed with multiple tiers. Maximum height of each tier is 30m and slope of each individual tier is 37 degrees. The Maximum Height of OB Dumps will be 290m

	above mean sea level, which is 75-90m above surrounding ground level.
Slope	Overall slope of full dump face is about 26 degrees.

Precautionary measures to be adopted during OB Disposal are as follows: -

1. A proper retaining wall will be provided around the dump at the toe of the dump to prevent not only uncontrolled rolling of stones/lumps but also to prevent slippage of the dump during precipitation.
2. A catch drain of adequate size will be provided outside the retaining wall to drain the dump properly and water lead to settling ponds for stagnation.
3. The ultimate dump slope should be maintained at less than 28° with individual tier / slopes not exceeding 37° .
4. Tiers will be created each with maximum 30 m height
5. Each tier should be inward slope with catch drain at the inward slope of tier.
6. Catch drain of the individual tier should be connected to the garland drain outside the periphery of dump. Catch drain preferably to be made up of half concrete open pipes followed by settling tanks to avoid wash offs and have provision berms at the outer side to reduce gully formation due to rainwater wash offs.
7. As retreating method of dumping has been proposed for dump stabilization dead terraces have to be planted along with dump slopes from first year onwards.
8. Dumping of subsoil will be avoided at the bottom of the dump as it leads to instability. Dumping of soil and clayey material will be done away from the working area that is on farther end of the dump so that formation of weak planes is avoided.
9. Special local stone paved chutes and channels will be provided wherever required, to allow controlled descent of water, especially from external dumps.
10. Gullies formed, if any, on side of the benches shall be provided with check dams of local stone or sand filled bags.
11. The ultimate slope of dumps will be kept below 28° .
12. The inactive dump slopes will be planned with bushes, grass, shrubs and trees to prevent soil erosion after applying top soil.
13. Top soil will be spread before carrying out grass seeding and plantation.

14. Afforestation by planting trees will help a lot in improving stability of dumps by preventing erosion. Plantation will be carried out on OB dump with indigenous and fast growing plants species.

9. PROPOSED METHODOLOGY

The objective is to accommodate all OB removed inside the excavated mine void. About 15 Mcum OB has dumped externally by the previous three operating mines long back. In Integrated project, no additional external dumping is proposed. But to keep the entire OB internally, it is absolutely necessary to raise the dump top level to 90 m above surrounding ground level. the internal dumps and external dumps will be higher than the adjoining ground level. The materials from the slopes of the dump are likely to flow during heavy rains and carry the soil substances on the slope of the overburden dumps forming gullies and disturb the topography of its adjoining land, till it is completely stabilized by biological means.

The proper design principles will avoid formation of gully and ameliorate the condition to germinate the seed dibbled /sowed and play a key role in stabilization of dump. In order to curb this situation, retaining walls of (2m+1m)/2 x 1m size have been planned all along the peripheral contour of the dumps to arrest the possibility of material running down on the hill slopes. The OB dumping has been planned in a manner such that backfilling can be maximized with a view to reclaim the degraded land as much as possible and at the same time in minimizing external dumping.

To meet the objectives of the Scheme for stabilization of OB dumps, the following methodology will be adopted:

A. Structural measures

- Terracing of Slopes, deck size.
- Plugging of gullies by construction of catch drain, Gabions, Cribbs etc
- Construction of Retaining walls, Garland drains around dumps
- Construction of drainage channels, check dams, settling tanks etc
- Putting topsoil mounds on top of decks and top soil layer on the slopes before biological measures

B. Biological Measures (Vegetative methods)

- Soil treatment & planting activities
- Undertaking plantation on the OB dump surface
- Broadcasting of seeds etc.

C. Bio-engineering measures

- Plantation of vetivera grass/ agave sucker

A. Structural measures

- Terracing of Slopes, deck size,
- Plugging of gullies by construction of catch drain, Gabions, Cribbs etc
- construction of Retaining walls, Garland drains around dumps
- construction of drainage channels, check dams, settling tanks etc

Benching/terracing across the OB dumps slope:

The slopes of external dumps has been planned at an overall angle of less than 28° with individual lifts at less than 37° . The overall angle of repose less than 28° can be attained by scientific design of the dump decks by leaving sufficient terrace on the decks. As the dumps attain final position, the slopes will be terraced and proper vegetation will be laid which will cause binding of the soil preventing any slope failure.

It is proposed to construct 4/5 step bench/terraces of the O.B dump to intercept the flow of materials during torrential rain and provide stability. The slope of individual terrace shall be confined within the permissible range considering the angle of repose of the soil and space available, thereby maintaining the overall angle of repose within 28° . The terracing will be done through the internal resources by deploying the operating mining equipment. The dumps are designed with forward sloping in which the run-off of the rainwater drain along the entire slope of the dump decks causing the formation of gullies and slope failure. Each terrace should be inward slope with each drain at the inward slope of terrace. The backward (inward) sloping of not less than 3° with catch drains at intervals will help in the stabilized dump. catch drain of individual terrace should be connected to the garland drain outside the periphery of dump. These catch drains should be made up of half concrete open pipes to avoid wash-offs. Gullies formed, if any, on side of the benches shall be provided with gabions /check dams of local stone or sand filled bags.

The terracing will be done through the internal resources by deploying the operating mining equipment. Apart from the common reclamation equipment like Dozer, grader, water sprinkler etc. Wash offs and rolling down of excavated materials from the dump slopes give way to slope failures and the dumps become unstable. Hence structural measures like construction of Garland Drains & Setting Pits etc should be adopted for prevention of wash offs and to arrest excavated material form OB dump. Garland drain will be built all-around the external dumps which will have weep holes for passage of storm water.

Conservation of soil moisture is important factor for successful plant growth. Moisture conservation can be made through dumping of top soil mounds creating the loose and undulating surface, contour trenches, construction of gabions, cribs, toe walls, check dams, percolation tanks etc. The top soil layer will be spread on the slopes and over the dump surface before carrying out plantation.

B. Biological Measures (Vegetative methods)

- Soil treatment & Planting activities
- Undertaking plantation on the OB dump surface
- Broadcasting of seeds etc.

Plantation on OB dumps:

It is proposed to undertake plantations over the dump. The area will be stocked by way of raising plantation at the rate 2500 plants per hectare in ANR plantation method. Taking into consideration the site-specific soil condition, indigenous species growing naturally are proposed to be planted. It is also proposed to plant hardy species such as Agave & Vetiver Plants as it can survive in degraded and poor soils along the slope & toe of O.B. dumps and prove to be most useful for controlling soil erosion.

The list of species to be chosen for plantation is as follows:

Sl	Local Name	Scientific Name
1	Amla	Emblica officinalis
2	Karanja	Pongamia pinnata
3	Asan	Terminalia tomentosa
4	Siris	Albizzia lebbek
5	Chhatian	Alstonia scholaris
6	Neem	Azadirachta Indica
7	Barakoli	Zizyphus gilopyrus
8	Badi Baunsa	Bombusa vulgaris
9	Bel	Aegle marmelos
10	Sunari	Cassia fistula
11	Dimiri	Ficus glumerata
12	Bada Chakunda	Samanea saman
13	Bara	Ficus bengalensis
14	Aswatha	Ficus religiosa

Sowing Seeds:

It is suggested to sow grass seed on the slope of terrace & at other barren place for preservation of topsoil. Grass seeds like *Stylo hamata* seeds will be broadcasted along the slopes of OB dumps. The grasses recommended are as per the following table:

List of grass seeds to be sown on surface of Overburden Dump and in vacant barren places for preservation of Topsoil.

Name of Species	Usage	Habitat / soil
<i>Chrysopogon fulvus</i>	Fodder	Red soil/ Back cotton soil
<i>Saccharum Spontaneous</i>	Fodder	Red soil/ Back cotton soil
<i>Sporobolus marginatus</i>	Fodder	Sandy soil
<i>Heteropogon contortus</i>	Non-Fodder	Eroded soil
<i>Cynodon dachylon</i>	Fodder	Wide range soil
<i>Eulaliopsis binnata</i>	Fodder	Red soil
<i>Themeda triandra</i>	Fodder	Red soil

Soil Treatment & Planting Activities:

The topsoil to be encountered during mining operation will be stored for utilization during plantation on OB dump area. Planting shall be done during July in pre-dug pits of size 30cm x 30cm x 30cm in zig - zag manner. A basal dose of NPK (Nitrogen, Phosphorous, and Potassium) fertilizer of 50g shall be applied at the time of planting, besides mixing with insecticides to prevent termites & insects. A minimum distance of 2.5 mt shall be maintained on every fourth plants in planting either of the species. Care should be taken to complete the planting during July while rains are still on during first or second week of July. The proposed biological measures along with the maintenance, works will also be executed with internal resources by the user agency in consultation with local Forest Dept. It is proposed to provide sufficient fuel/conveyance charges for technical experts for proper execution of these programs to the executing agency.

C. Bio-engineering measures:

Bio-engineering approach is proposed to be adopted by way of plantation of vetiver grass/ agave sucker with a view to retain loose spoils/ fines being transported to water course. Coal mine spoil are typically devoid of organic matter and the microflora count is not very conducive for plant. So in spite of plantation, survival and growth is observed to be very less. To combat this problem, actions are needed to supplement the organic carbon need and at the same time develop a micro ecosystem with organisms tolerant to harsh environment.

10. MAINTENANCE /MANAGERIAL MEASURE:

The conservation structures to be constructed around the dumps need maintenance work for their proper functioning. Structures will be constructed depending upon the requirement arising out of any increase in production and mine development. Steps will be taken for water sprinkling in critical areas prone to air pollution. The operation will continue from winter to summer. It will also take steps for de-siltation of small pond ages likely to be created due to check-dams, retaining walls & siltation tanks. it is suggested to take up de- siltation works at least thrice during rainy season in order to check overflow of silts to downstream.

11. INSPECTION, MONITORING AND EVALUATION

For successful implementation of the above mitigative measurer, intensive inspection and technical guidance from concerned technical wing is required. Sufficient fuel/conveyance charges for technical experts shall be provided by the user agency for proper execution of these programs. Infrastructural facilities like GIS software along with GPS equipment will be provided by the user agency for the above post implementation monitoring. Necessary facilities for carrying out R & D works by expert agencies on new technologies of OB/ fines dump management will be made by user agency.

12. EXECUTING AGENCY:

In all the cases, the works shall be executed by the User Agency having specialized department headed by qualified persons with outsourced man and machinery as and where required. To facilities this, the User Agency shall establish its own executing and supervision cells along with required infrastructural facilities. In order to maintain the quality of work, in-house supervision through competent personnel shall be provided.

13. REQUIREMENT OF FUNDS

Sl No	Description of the work	Size	Volume of earth work involved	Rate per Cum of Earth work including compacting	Fund Required (Rs)	Remarks	
A	Structural measures						
i)	Construction of Gabion wall around the topsoil dump	2m x 1m x 3200 m	6400 Cum	Rs. 283.43/Cum	18,13,952.00	Annexure -2	Already covered in the scheme 7(a)
ii)	Gabion wall around the internal dumps	2m x 1m x 33440m	66880 Cum	Rs. 283.43/Cum	1,89,55,798.4	Annexure -2	Already covered in the scheme 7(a)
B	Biological measures						
i)	ANR Plantation on top of Internal OB dumps	1787.36 Ha			49,75,87,976.30	Annexure -3	Already covered in the scheme 7(a)
ii)	ANR Plantation on slope of Internal OB dumps	1317.673 Ha			36,68,30,544.20	Annexure -3	Already covered in the scheme 7(a)
iii)	Grassing on topsoil dump	41.994 Ha			49,61,340.00	Annexure-1	Already covered in scheme 7(a)
iv)	Agro Plantation (20 Ha on topsoil dump and other technically reclaimed areas)	20 Ha			32,18,366.40	Annexure -7	Already covered in scheme 7(b)
	Veliver Plantation @Rs. 9,24,800	20 Ha			12,76,320.00	Annexure 8	Already covered in scheme 7(b)

Technically Approved

Annexure-21

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 7(d)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28° will be carried out.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....



Annexure-23

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

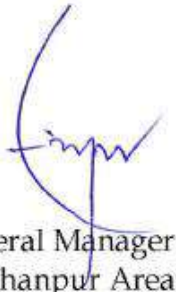
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 8(a)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the State Forest Department will be carried out.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-24

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

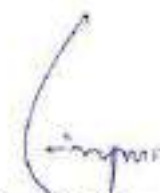
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 8 (b)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Boundary of the safety zone of the mining lease, adjacent to habitation/roads, will be properly fenced by the user agency.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-25

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

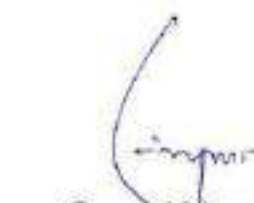
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 8 (c)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Safety zone will be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration will be taken up in this area by the user agency at project cost under the supervision of the State Forest Department.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-26

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 8 (d)

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-26 (A)

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 9

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **No damage shall be caused to the top-soil and the user agency will follow the top soil management plan.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

**SCHEME FOR DE-SILTATION OF VILLAGE TANKS AND
OTHER WATER BODIES WITHIN 5KM RADIUS OF
INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP**

For

**Diversion of 417.073 hectares of Forest land & Re-
diversion (Change in Land use) of 171.774 Ha**

in respect of

Integrated Lakhanpur-Belpahar-Lilari Opencast Project

In favour of

**Mahanadi Coalfields Limited,
Jharsuguda District, Odisha**

In compliance with the

Condition No - 10 of

Stage - I Forest Clearance granted vide

Letter No. 8 - 280/1989-FC vol dated 27.12.2023, of Govt. of India,

Ministry of Environment, Forests and Climate Change,

New Delhi

1. INTRODUCTION

Ib-Valley coalfield is located in Jharsuguda, Sambalpur and Sundargarh districts of Odisha between 21°42'12" N to 21°47'20" N Longitudes: 83°48'00" E to 83°52'41" E in toposheet 64O/13 & 64O/14 with Scale 1:50,000. The coalfield is named after the river IB, a tributary of the river Mahanadi. The Howrah-Mumbai railway line passes through the coalfield. The nearest railway stations are Belpahar railway station Jharsuguda Railway Station.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project of M/s Mahanadi Coalfields Ltd. located in the Ib-Valley Coalfield. The project falls in the villages - Chharla, Bandhbahal, Balput, Banjipali, Khuntmahul, Tingismal, Khairkuni, Ubuda, Darlipali, Kirarama, Jurabaga, Kusraloi, Karajori, Khaliapali, Kudaloi, Lakhanpur and Soldia villages of Lakhanpur Tehsil, Jharsuguda District, Odisha. The project area is covered under Survey of India Topo Sheet No 64O/13 & 64O/14 (RF 1:50,000) and is bounded by the geographical coordinates ranging from Latitude 21°42'25.89"N to 21°47'24.82"N and Longitudes 83°49'38.9"E to 83°49'53"E.

The Integrated Lakhanpur-Belpahar-Lilari Opencast Project is an amalgamation of the existing Lakhanpur OCP, Belpahar OCM and Lilari OCPs. The existing projects have been integrated into one mine to exploit all the three principal seams of the coalfield i.e. Ib, Rampur and Lajkura seam by open cast mining. The capacity of the Integrated Lakhanpur-Belpahar-Lilari Opencast Project is 40.0 MTY with mine lease area of 4399.246 Ha and total project area of 4742.877 Ha. The life of the project is 41 years.

Total Forest land involved in the Integrated project is 958.695 Ha out of which Forest Clearance has been obtained for 541.622 Ha. Details are given below.

The details of the existing Forest Clearances:

1. Lakhanpur OCP (233.43 Ha): Forest Clearance was obtained for forest land 233.43 Ha vide letter no. 8 280/89-FC dated 08.10.1990.
2. Belpahar OCP (123.220 Ha + 22.772 Ha):
 - a) 123.220 Ha - Diversion of Forest land was obtained for 103.52 Ha vide No. 8-104/91-FC dated 02.06.2000 and 19.70 Ha vide no. 8-104/1991-FC dated 15.09.2014.
 - b) 22.772 Ha - Forest diversion for 22.772 Ha (10.453 Ha + 13.630 Ha) has been done by OPGC. OPGC has taken forest clearance of 159.616 Ha vide letter no. F.No.8-93/2012-FC dated 19.01.2015 in which 10.453 Ha falls within area of Integrated

Lakhanpur-Belpahar-Lilari OCP and further Stage-II forest clearance of 13.630 Ha obtained vide letter no. 5-ORA155/2012-BHU dated 10-01-2020 in which 12.319 Ha falls within area of Integrated Lakhanpur-Belpahar-Lilari OCP.

3. Lilari OCP (162.20): Forest Clearance was obtained for forest land 162.20 Ha vide letter no 8 281/8-FC dated 31/07/1990.

For the remaining forest land area of 417.073 Ha and out of 541.622 Ha diverted forest land; Re-diversion (change in land use pattern) of 171.774 Ha (Belpahar OCM: 0.745 Ha, Lakhanpur OCP: 42.389 Ha and Lilari OCP: 128.640 Ha) is required for mining, 7.5m safety zone and temporary topsoil storage yard. So, an application was submitted to MoEF&CC vide proposal no. FP/OR/MIN/39355/2019 dated 16.03.2019 and the Stage -I FC was granted vide No. 8-280/1989-FC Vol. Dated:27.12.2023.

In the Stage -I order certain stipulated conditions have been set out to be fulfilled by the user agency. The condition no. 10 reads as follows:

"10. The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF&CC before Stage-II approval;

In compliance of the above condition stipulated by MoEF&CC, a detailed proposal has been prepared and is enclosed herewith for further consideration.

2. Objectives:

This scheme aims at the following aspects with respect to the Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur Area in district Jharsuguda. This is required to pave way for removal of siltation in various water bodies / village tanks around the project to ensure availability of water in village tanks & other water bodies within 5km from the lease hold area. The main objectives are:

- De-silting of village tanks and other water bodies located within 5km from the mining lease area of Integrated Lakhanpur-Belpahar-Lilari Opencast Project.
- By way of de-siltation, impact of siltation on ground water recharge can be checked and prevented.

- To ensure availability of water in the village tanks/water bodies to facilitate the villages for their requirement of water including that of livestock, wild animal & Birds.
- To ensure a congenial livelihood to the local people.

3. Factors Responsible for Siltation:

- a) Normally the ponds, water bodies do suffer from siltation due to sedimentation of soil / clay carried into the water bodies due to inflow of water during rains.
- b) Soil erosion attributed as a primary factor responsible for siltation in ponds.
- c) Rainfall with high intensity at higher altitude is the most common reason for soil erosion & hence causes siltation in nearby ponds / water bodies.
- d) Soil erosion also occurs from waste dumps, excavated areas & naturally denuded ground surface.
- e) Further siltation of ponds also takes place due to air borne sand and dust with other vegetative materials falling into the ponds. This adds to the process of siltation, hence by this phenomenon with passage of time, new layers of silt accumulate over the older layer of silt & become thicker. Ultimately the depth of the water source decreases & capacity of water storage reduces. De-silting becomes inevitable to ensure availability of more water in the pond/ water bodies for day to day requirement of the villages.
- f) The area is surrounded by opencast mines and RSPM (PM_{10} and $PM_{2.5}$) concentration is high. When dust particles settle on water bodies due to pluming effect, it also adds to sediment in water bodies.

4. Soil, Topography & Drainage Pattern:

a) Soil

The Physio-Chemical properties of the soil are as:

Texture of the soil is mostly Silt loam and Loamy sand. Water holding capacity is in the range of 10.2% - 28.0%. Specific gravity ranges from 2.5 - 2.8 gm/cm³. slightly acidic to neutral in nature having pH in the range of 6.1 to 6.95. Organic carbon for the soil is in the range of 0.12-0.55%. Organic carbon in the barren land varies from less to very less with increase in depth, whereas organic carbon in agricultural land varies from average, medium & to very less with increase in depth.

b) Topography & Drainage pattern

Topography of the block is plain to moderately undulating. The area is gently sloping towards east. The highest and lowest elevations of the area are 250 m and 198 m above mean sea level respectively. The drainage is controlled by Lilari nallah which discharges into Hirakud reservoir. One tributary (seasonal) of Lilari nallah namely, Pulijhor flows from west to east within the mine area with its catchment area to the west of the block.

The Ib River on the eastern side of the coalfield mainly controls drainage in the area. Apart from Ib River, Lilari nalla flows along the west and southern margin of the block. The Lilari stream is a perennial in nature. It originates near Chhengapahar and soon forms a 2nd order stream in Chhengapahar village, Lilari nala forms 3rd order stream near Lamiharia village and continues to drain south-easterly. At Tangardihi village, Lilari nala becomes a 4th order stream. Hereafter, it continues south-easterly and near Mundaparha village, it is joined by the Pandren jhor, a 4th order stream (flows almost in a northwest-southeast orientation in the study area), hereafter the Lilari nala attains 5th order, before meeting Ib river. Lilari Nala traverses approximately 30.8 km from its place of origin at Chhengapahar Reserve Forest before it meets the Ib river.

The distance of water bodies from the mine lease area of Integrated Lakhanpur-Belpahar-Lilari OCP are as follows:

Name of the Water Bodies	Distance
Lilari Nallah	Within mine lease area
Phulijhor Nallah	Within mine lease area
Pandren Jhor	0.90 km
Bagdia Jhor	1.70 km
Hirakud Reservoir (backwater)	2.40 km
Kandhal Jhor	3.30 km
Ib River	3.90 Km

Stream orders and stream lengths of Lilari nala basin:

	Numbers of segments (Nu)	Log (Nu)	Length (kms) (Lu)	Mean length of channel (Lu)
1	384	2.584	154.550	0.402
2	73	1.863	70.837	0.97
3	22	1.342	28.701	1.304
4	2	0.301	17.473	8.736
5	1	0.000	2.580	2.58

Summary of Hydrological parameters of the sub basins in the mine lease area:

Name of Basin	Lilari Nala
Area of Basin in KM ² (Au)	188.14
Perimeter of Basin in KM (P)	66

Basin length in KM (L)	23.5
Diameter of Circle with basin area in KM (D)	21
Area of the circle having the same perimeter of the basin in KM ² (AC)	314
Form Factor $R_f = A_u / L$ (RF)	0.34
Circularity ratio $R_c = A_u / A_c$ (Rc)	0.60
Elongation ratio $R_e = d / L$ (Re)	0.89

5. Principle of de-siltation:

In order to achieve the objectives mentioned in the beginning of the scheme, the best way is to resort to practice of de-siltation to ponds/ water bodies at regular intervals. The silts to be removed are to be used in enforcement of embankment and planting of trees on it for stabilization of the same.

6. List of ponds/ water bodies available within 5km of the project & selected.

To locate the ponds / water bodies within 5km radius of the project, field verification was taken up in the areas and the following tanks are found to be suitable for de-siltation:

Sl. No	Village name	Area (Sq.M)	Coordinate	
			Latitude (N)	Longitude (E)
1	Kusraloi	5400	21.717906	83.862112
2		2100	21.716063	83.853988
3		6100	21.713351	83.849423
4	Remnda	4400	21.697814	83.827521
5		2500	21.693406	83.827138
6		8900	21.690299	83.823813
7		4600	21.691364	83.824278
8	Bhutia	55000	21.696296	83.817802
9		35500	21.692949	83.837249
10		1500	21.793893	83.818027
11		4260	21.791243	83.813646
12	Kudaloi	28500	21.786497	83.816104
13		8500	21.785655	83.816945
14		38800	21.78536	83.817811
15	Lakhanpur	16500	21.771493	83.791509
16	Junion	1400	21.763002	83.799766
17		1650	21.762153	83.800902
18		1820	21.765758	83.803134
19		15900	21.762275	83.790794

20	Soldia	18900	21.729336	83.791797
21		18000	21.736958	83.793767
22	Jaybudia	9800	21.809311	83.813922
23	Bartap	2900	21.815835	83.804625
24		5000	21.819121	83.800002
25	Banjari	63000	21.821032	83.81687
26	Piplimal	3356	21.811046	83.837207
27	Sarandmal	55000	21.743416	83.891313
28		8000	21.743452	83.891233
29		2800	21.740909	83.899465
30		36000	21.736594	83.886064
31	Talibahal	6650	21.748258	83.895006
32		5400	21.753176	83.88861
33		5200	21.755938	83.888804
34		2500	21.747664	83.895073
35	Badimal	35900	21.747108	83.909447
36	Dalgaon	12250	21.729571	83.899199
37		8150	21.72886	83.898449
38		6100	21.725943	83.903477
39		40800	21.724491	83.899764
40	Negipali	5950	21.710834	83.892035
41		27760	21.724329	83.884169
42	Sehenmal	27800	21.728937	83.888185
43	Bandhbahal	13100	21.760802	83.875897
44		27500	21.746108	83.875106
45	Khadam	2765	21.739872	83.863952
46		7760	21.740182	83.863454
47		70400	21.735986	83.87127
48	Jagannath Nagar	2750	21.73275	83.862072

It is worth mentioning here that the above ponds need de-silting to an extent of 1m to 4m for the purpose.

7. Method of de-siltation:

- De-siltation to be taken up at regular intervals in dry months of the summer season to get best result & depth required to be maintained.
- The dried silts to be removed manually or mechanically based on the site condition/ quantity of silt accumulated.
- De-siltation may be taken up at 2 years cycle.

- The silts so excavated will be placed around the pond in an embankment design at about width of 3m and height of 2m simultaneously and compacting the soil.
- Grass tufting on both the side of the bund will be done. Concrete water inlet two numbers are to be provided.
- Similarly, to drain out the excess water concrete outlet two numbers are also to be fixed.
- Bathing Ghats of at least 3m wide with steps (Step height of 25cm) to be provided.
- On the embankment plants should be planted with gabion facilities.

8. Estimation of Work & Financial provisions.

Based on the parameters stated above the cost is estimated as below.

Sl. No	Village name	Area (Sq.M)	Depth of Silt to be removed in m	Quantum of Earth work m ³	Amount require for de-siltation @ Rs. 236.19/Cum of Earth work	No. of Bathing Chat to be constructed	Amount require for Bathing ghats @ Rs. 269911.85 per ghat	Funds for Other General facilities	Total requirement in Lakh Rs
1	Kusraloi	5400	1	5400	1275426	2	539824	100000	1915249.7
2		2100	1	2100	495999	0	0	100000	595999
3		6100	2	12200	2881518	2	539824	100000	3521341.7
4	Remnda	4400	3	13200	3117708	2	539824	100000	3757531.7
5		2500	1	2500	590475	2	539824	100000	1230298.7
6		8900	1	8900	2102091	1	269912	100000	2472002.85
7		4600	2	9200	2172948	2	539824	100000	2812771.7
8		55000	2	110000	25980900	4	1079647	100000	27160547.4
9	Bhutia	35500	2	71000	16769490	2	539824	100000	17409313.7
10	Kudaloi	1500	1	1500	354285	0	0	100000	454285
11		4260	1	4260	1006169.4	2	539824	100000	1645993.1
12		28500	1	28500	6731415	0	0	100000	6831415
13		8500	1	8500	2007615	1	269912	100000	2377526.85

14		38800	3	116400	27492516	4	1079647	100000	28672163.4
15	Lakhanpur	16500	2	33000	7794270	4	1079647	100000	8973917.4
16	Junion	1400	1	1400	330666	0	0	100000	430666
17		1650	3	4950	1169140.5	2	539824	100000	1808964.2
18		1820	3	5460	1289597.4	2	539824	100000	1929421.1
19		15900	2	31800	7510842	3	809736	100000	8420577.55
20	Soldia	18900	1	18900	4463991	1	269912	100000	4833902.85
21		18000	2	36000	8502840	3	809736	100000	9412575.55
22	Jaybadia	9800	3	29400	6943986	3	809736	100000	7853721.55
23	Bartap	2900	1	2900	684951	1	269912	100000	1054862.85
24		5000	1	5000	1180950	1	269912	100000	1550861.85
25	Benjari	63000	1	63000	14879970	2	539824	100000	15519793.7
26	Piplimal	3356	1	3356	792653.64	3	809736	100000	1702389.19
27	Saranimal	55000	2	110000	25980900	3	809736	100000	26890635.55
28		8000	2	16000	3779040	2	539824	100000	4418863.7
29		2800	3	8400	1983996	4	1079647	100000	3163643.4
30		36000	2	72000	17005680	4	1079647	100000	18185327.4
31	Talibahal	6650	1	6650	1570663.5	1	269912	100000	1940575.35
32		5400	1	5400	1275426	2	539824	100000	1915249.7
33		5200	2	10400	2456376	4	1079647	100000	3636023.4
34		2500	3	7500	1771425	3	809736	100000	2681160.55
35	Badimal	35900	1	35900	8479221	2	539824	100000	9119044.7
36	Dalgaon	12250	3	36750	8679982.5	3	809736	100000	9589718.05
37		8150	1	8150	1924948.5	2	539824	100000	2564772.2
38		6100	1	6100	1440759	1	269912	100000	1810670.85
39		40800	1	40800	9636552	1	269912	100000	10006463.85

40	Negipali	5950	2	11900	2810661	3	809736	100000	3720396.55
41		27760	1	27760	6356634.4	3	809736	100000	7466369.95
42	Sehenmal	27800	2	55600	13132164	2	539824	100000	13771987.7
43	Bandhbahal	13100	1	13100	3094089	3	809736	100000	4003824.55
44		27500	2	55000	12990450	5	1349559	100000	14440009.25
45	Khadam	2765	2	5530	1306130.7	2	539824	100000	1945954.4
46		7760	1	7760	1832834.4	1	269912	100000	2202746.25
47		70400	4	281600	66511104	3	809736	100000	67420839.55
48	Jagannath Nagar	2750	1	2750	649522.5	2	539824	100000	1289346.2
Total									37,65,31,716.7

9. Execution of the scheme:

The plan period of the scheme is 5 years i.e. from 2024-25 to 2028-29. De-siltation is to be carried out in a two cycle. In first cycle, digging will be done only up to half of the depth. All the ponds will be de-silted twice in the plan period of 5 years. In case any village pond could not be carried out in the assigned year, it may be taken up in the next year along with the assigned pond.

10. Planting saplings:

- It is suggested to select saplings of 2 year old promising seedlings (mainly fruit bearing of local species such as mango, jack fruit, Jamun, Bara (Ficus Sp.) etc.
- Pits of 45cm x 45cm x 45cm to be dug out for tree planting.
- Bamboo gabions/other type of tree guard to be provided to prevent damage by cattle.
- The required fertilizers/ insecticides to be provided.

11. Execution of Work:

The Scheme will be executed by the User Agency as per this approved scheme.

12. Inspection, Monitoring & Evaluation:

For successful implementation of this scheme, the User Agency is to execute & review the work periodically. Its effectiveness is to be reported to the Forest Department annually.

13. CONCLUSION:

With the above provisions, it is expected that local villagers will be benefited of wage earning, bathing facilities. The water percolation to ground water will also be enhancing in due course. The local animals / birds will also be getting water in hard summer.

Technically Approved

Regional Chief Conservator of Forest
Sambalpur

Divisional Forest Officer
Jharsuguda Forest Division

महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhenpur Area

Estimate for the work "Deepening of pond and construction of Bathing Ghats

Part - A (Deepening of Pond)				
Sl. No	Description	Unit required	Rate (Rs.)	Amount (Rs.)
i.	Earth work in hard soil or gravelly soil in embankment, roads etc. within 50m Initial lead and 1.5m initial lift including rough dressing etc. complete	Labour Man Mulia 21.5 nos	452	9718
		Woman Mulia 21.5 nos	452	9718
	Sub total (Labour)			19436
ii.	Overhead Charges@ 10 % on (i).			1943.6
iii.	2% Sundries and T & P etc. on (i)			388.72
iv.	Total for Earth Work			21768.32
3	Contractor profit @ 7.5%			1632.63
4	Add Labour cess @ 1%			217.68
	Total per 100 Cum of Earth work			23618.63
	Per Cum			236.19

Part - B (Construction of Bathing Ghat as per MCL SOR 2023)

Sl. No.	Description	Quantity of Earth work (Cum)	Rate (Rs. /Cum)	Amount (Rs.)
i.	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil.	31.72	216.05	6853.106
ii.	Supplying and filling in plinth with sand under floors, including watering, ramming, consolidating and dressing complete	9.03	864.6	7807.338
iii.	providing and laying in position cement concrete of specified grade excluding the cost of entering and shuttering - all work up to plinth level 1:3:6 (1 cement : 3 coarse and (zone -III) derived from natural sources : 6 graded stone aggregate 40 mm nominal size derived from natural sources).	9.03	5013.3	45270.099
iv.	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:1½:3 (1 Cement: 1½ coarse sand (zone-III) derived from natural sources: 3 graded stone aggregate 20 mm nominal size derived from natural sources)	24.07	6361.4	153118.898
v.	12 mm cement plaster of mix: 1:4 (1 cement: 4 fine sand)	146.25	232.15	33951.9375
vi.	Centering and shuttering including strutting, propping etc. and removal of form work for Foundations, footings, bases for columns	68.9	252.55	17400.695
vii.	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	31.72	173.7	5509.764
	Total cost of construction of 1 Bathing Ghat			2,69,911.85


 Divisional Forest Officer
 Jharuguda Forest Division

Physical components
 approved

Geotagged Photos of the Selected Ponds







12/20/01 11:30 AM
 Longitude: 81.603746
 Latitude: 33.111111
 Accuracy: 4.5 m
 Elevation: 107.940
 WGS 84
 Date: 12/20/2001 11:30
 User: J. H. H. H. H. H.



12/20/01 11:30 AM
 Longitude: 81.603746
 Latitude: 33.111111
 Accuracy: 4.5 m
 Elevation: 107.940
 WGS 84
 Date: 12/20/2001 11:30
 User: J. H. H. H. H. H.



12/20/01 11:30 AM
 Longitude: 81.603746
 Latitude: 33.111111
 Accuracy: 4.5 m
 Elevation: 107.940
 WGS 84
 Date: 12/20/2001 11:30
 User: J. H. H. H. H. H.



12/20/01 11:30 AM
 Longitude: 81.603746
 Latitude: 33.111111
 Accuracy: 4.5 m
 Elevation: 107.940
 WGS 84
 Date: 12/20/2001 11:30
 User: J. H. H. H. H. H.



Locality: 2101000
 Longitude: 82.83719
 Elevation: 220.000 m
 Area: 1.100 m²
 Forest: 100%
 Peak: 2.000 m
 Time: 10:00-11:00
 Date: 2000/10/01

Photo by: [illegible]



Locality: 2101000
 Longitude: 82.83719
 Elevation: 220.000 m
 Area: 1.100 m²
 Forest: 100%
 Peak: 2.000 m
 Time: 10:00-11:00
 Date: 2000/10/01



Locality: 2101000
 Longitude: 82.83719
 Elevation: 220.000 m
 Area: 1.100 m²
 Forest: 100%
 Peak: 2.000 m
 Time: 10:00-11:00
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Locality: 2101000
 Longitude: 82.83719
 Elevation: 220.000 m
 Area: 1.100 m²
 Forest: 100%
 Peak: 2.000 m
 Time: 10:00-11:00
 Date: 2000/10/01





Jharguda
Divisional Forest Officer
Jharguda Forest Division

Annexure-28

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 10

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that the User Agency will prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency will regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such 8-280/1989-FC Vol. I/61084/2023 tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF& CC before Stage-II approval.

Place :Jharsuguda.
Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एच.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-29

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 11

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the cost of felling of trees will be deposited by the User Agency with the State Forest Department.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-30

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 12

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **trees will be felled in phased manner as per the requirement in the approved Mining Plan with prior permission of concerned DFO.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-31

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 13

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **Afforestation of the non-mineralized virgin forest land within the mining area will be taken up at project cost.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-32

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 14

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department.**

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

AGENCY COPY

यूनियन बैंक Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 30-08-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
Application No.	5839355313
MoEF/SG File No.	8-280/1989-FC VOL.
Location.	ORRISA
Address.	Office of the General Manager Lakhanpur Area, MCL PO Bandhabahal Colony Jharsuguda Odisha, Jharsuguda
Amount (in Rs.)	310938400/-

Amount in Words : Thirty-One Crore Nine Lakh Thirty-Eight Thousand Four Hundred Rupees Only

NEFT/RTGS to be made as per following details;

Beneficiary Name:	ORRISA CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150825839355313 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India FCB Centre, 21/1, III Floor, Jalita Towers, Mission Road, Bengaluru-560027

* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 30-08-2024

Agency Name.	INTEGRATED LAKHANPUR-BELPAHAR-LILARI OCP
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* This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

Notes: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date and reference id to Email: fcblr@unionbankofindia.bank, opurse@unionbankofindia.bank, ubin0903710@unionbankofindia.bank



Authorized Officer

SBINR52024083045046430

Authorized Officer

General Manager

MCL, Lakhanpur Area



STATE BANK OF INDIA
BANDHABAHAL
AT P. BANDHABAHAL
DIST. JHARSUGUDA (S.B.I.)

NATIONAL ELECTRONIC FUNDS TRANSFER RTGS APPLICATION FORM

To be filled in by the Applicant in Block Letters
Details of Applicant / Remitter

BY CHEQUE / TRANSFER FOR NEFT / RTGS

1. Account Name MCL LAKHANPUR AREA
2. Account No., Type of Account C.A.
3. Mobile No. / E-mail ID 9490377326

DETAILS OF BENEFICIARY

1. Name H.D.F.C. Bank.
2. Branch BHUBANESWAR
3. Beneficiary Name THE WILDLIFE ODISHA
4. Account No. Saving / Current 50100516644769
5. IFSC Code HDFC0001252
6. Amount to be remitted 1,41,33,600/-
Bank Charges One crore forty One Lakh
Total thirtythree thousand Six hundred

Remittance amount as per above details of remittance, including the bank's remittance plus your charges

[Signature] [Signature]
Authorised Signatory Authorised Signatory
MCL, LAKHANPUR AREA MCL, LAKHANPUR AREA

FOR BANK'S USE ONLY

(Rupees) _____
Debited to Application _____
Date of Transfer _____

Remittance No. _____

SBINR5202408304504234

Authorised Signatory

Remitting Bank shall not be liable for any loss of damage arising or resulting from delay in transmission delivery or non-delivery of Electronic message of any mistake, omission, error, interruption or delay thereof or in deciphering the message from any cause whatsoever or from its transmission received at the action of the destination Bank or any act beyond our control
All payment instrument should be checked carefully by the remitter

4461169 A.P. SORENC
SB, BANDHABAHAL BRANCH
30 AUG 2024 CASH
3704 TR
Journal No. _____

382 NINITYA RAJANI
BANDHABAHAL BRANCH
30 AUG 2024
8704
Journal No. _____
Chequer ID No. _____



ଜଙ୍ଗଲ, ପରିବେଶ ଓ ଜଳ ବାୟୁ ପରିବର୍ତ୍ତନ ବିଭାଗ, ଓଡ଼ିଶା ସରକାର

ଖଣ୍ଡଗିରି ବନାୟତ୍ତାବାନ କାର୍ଯ୍ୟାଳୟ ଖାରସୁଗୁଡ଼ା ବନଖଣ୍ଡ ।

ଇମେଲ- dfo.jharsuguda@odisha.gov.in, ଦୂର ଭାଷ /ପ୍ଲାନ-୦୭୭୪୫-୨୯୫୦୪୦ ।

Memo No. 4523 /4F (Misc.),
Dated Jharsuguda the 12th August, 2024.

To

The General Manager, MCL,
Lakhanpur Area, Bandhbahal.

Sub: - Regarding demand for deposit of cost for Site Specific Wildlife Conservation Plan for the proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfield Limited for non-forestry use of 417.037 Ha. & Re-diversion (Change of land use) of 171.774 Ha. forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur Area in district Jharsuguda in Odisha.

Ref: - Memo No.8370, dt.22.07.2024 of the Principal Chief Conservator of Forests(Wildlife) & Chief Wildlife Warden, Odisha, Bhubaneswar.

Sir,

With reference to the memo cited above on the captioned subject, the site specific interventions pertaining to the project i.e. proposal for seeking prior approval under section 2(ii) of the Forest (Conservation) Act, 1980 in favour of M/s. Mahanadi Coalfield Limited for non-forestry use of 417.037 Ha. & Re-diversion (Change of land use) of 171.774 Ha. forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project of Lakhanpur Area in district Jharsuguda in Odisha is approved as part of the Site Specific Wildlife Conservation Plan based on Landscape Approach approved by the PCCF(WL) vide Memo No.8369/2024, dt.22.07.2024.

A soft copy of the plan is attached for your perusal. The interventions specific to your project are attached as part of Annexure-I.

The concerned experts aiding the preparation of the plan are directed to include the provisions of Annexure-I in Part-II of the standard format of SSWLCP as per extant guidelines. Fulfilment of other project specific conditions, if any, found in EC Terms of Reference or in Stage-I(in-principle approval) will be separately included in either Part I or Part II of the Plan and shall be further submitted for the approval of PCCF (WL).

Accordingly, you are requested to deposit of amount *Rs.3109.384 lakhs* in the State CAMPA fund through portal (<https://parivesh.nic.in>) as part of your Site Specific Wildlife Conservation Plan. If any additional liabilities arise due to the aforementioned fulfilment of

specific conditions, it shall be raised as a separate demand note after the approval of PCCF (WL).

Further, you are requested to deposit of amount **Rs.141.336 lakhs** in the following accounts-

1	Name of the A/c holder	THE WILDLIFE ODISHA
2	Account No:	50100516644769
3	Type of A/c:	980-Government Saving Account
4	Name & address of Bank	HDFC Bank, Chandrasekharpur Branch, Plot-10, District Centre, Chandrasekharpur, Bhubaneswar.
5	IFS Code:	HDFC0001252

Furthermore, the evidence of depositing the amount may be forwarded to the undersigned for further needful action at this end.

Encl: As above.

Yours faithfully,

Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. **4524** /Dated. **12.08.2024**.

Copy forwarded to the Chief Conservator of Forests (WL-III), O/o the PCCF(WL) & CWLW, Odisha, Bhubaneswar for favour of kind information and necessary action.

Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. **4525** /Dated. **12.08.2024**.

Copy forwarded to the Principal Chief Conservator of Forests (Forest Diversion and Nodal Officer, FC Act.), O/o the PCCF & HoFF, Odisha, Bhubaneswar for favour of kind information and necessary action.

Divisional Forest Officer,
Jharsuguda Forest Division.

Memo No. **4526** /Dated. **12.08.2024**.

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information and necessary action.

Divisional Forest Officer,
Jharsuguda Forest Division.

APPENDIX B: FUNDING FROM UPCOMING PROJECTS

B.1. MCL Integrated Lakhanpur-Belpahar-Lilari OCP with 417.07 Ha diversion and 171.774 Rediversion
Table:-B.1.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 2						YEAR 3						
					Bar	Hir	Sam	Red	Ba	Jsg	Bar	Hir	Sam	Red	Ba	Jsg	
1	Habitat improvement																
1.1	Weed eradication and removal of invasive species		Weed eradication at Rs 18,000/ha	Rs 18,000/ha								54					
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs								19.5		6.5	20	6.5	20

[illegible]

		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year	2	2	2	2	2	2	2								
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lakhs/unit + 5 x ranges															
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level	3	3	3	3	5	5	5								
4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and iWLMS, filing PR Reports, wildlife operations-tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/year	3	3	3	3	3	3	3								

[illegible]

2.4	Content Creation and Dissemination	Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Infrastructure																		
3.1	Watch tower cum Barracks	(3.1.1) New Towers Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	35						35	35	35	35	35	35	35	35	35	35
		(3.1.2) Upkeep of barrack/tower Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	5	3	3	4	2	5										
3.2	Boat and Jetties	(3.2.1) Floating Jetty (Hir) (3.2.1) Road repair and maintenance (Bamra)	40 lakhs/unit / 12 lakhs/RKM	40				24											

		(4.4.2) Training Programs for RO, ACF and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2 lakhs/year	2	2	4	2	2	2							
		(4.4.3) Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%)/month for research, animal treatment, documentation and other purposes	Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%)/month for research, animal treatment, documentation and other purposes	8.4L/year	8.4	8.4	8.4	8.4	8.4	8.4	8.4						
5	Community Engagement and Protection																
5.1	Solar lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	10 lakhs/year	10		10	10	10	10	10						

5.2	IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year	10		10	10	10	10	10						
5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year	10		10	10	10	10	10						
6	Division Level Augmentation																
		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year	8.4	8.4	8.4	8.4	8.4	8.4	8.4						
6.2	Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims,	5.04L/year	5.04	5.04	5.04	5.04	5.04	5.04	5.04						



**SITE SPECIFIC
WILDLIFE
CONSERVATION
PLAN BASED ON
LANDSCAPE
MANAGEMENT**

**Sambalpur Forest Circle
Odisha, India**

**SITE SPECIFIC WILDLIFE CONSERVATION PLAN
BASED ON LANDSCAPE**

Sambalpur Forest Circle, Odisha, India



**Forest & Environment Department
Government of Odisha**

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APPENDIX A: Fund Recast From Existing Approved Plans

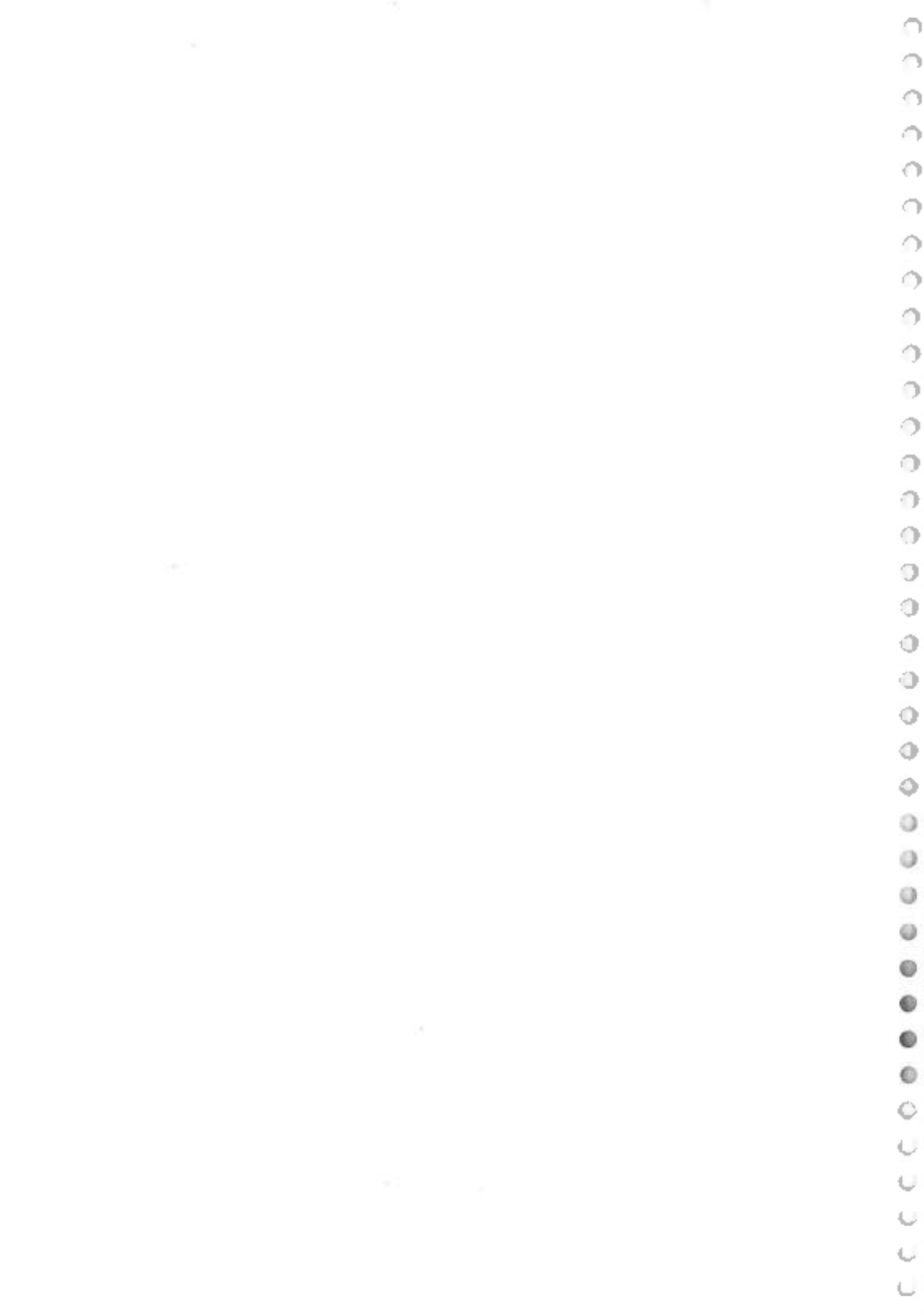
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1. Introduction

Jharsuguda territorial division is small territorially, with around two thousand square kilometers in area and with roughly only ten percent of that area coming under notified forest blocks. Across the decades, its rapid industrialization has reduced forest cover and isolated it as an industrial cluster and has cutoff traditional elephant and wildlife movement paths across Sundergarh-Sambalpur as well as Chhatisgarh-Odisha.

Despite its small size, it had more than 20 site-specific plans operational with more plans continuously coming up. Hence, a need was felt to utilize the plans fully by strengthening the landscape around it which had a higher presence of wildlife.

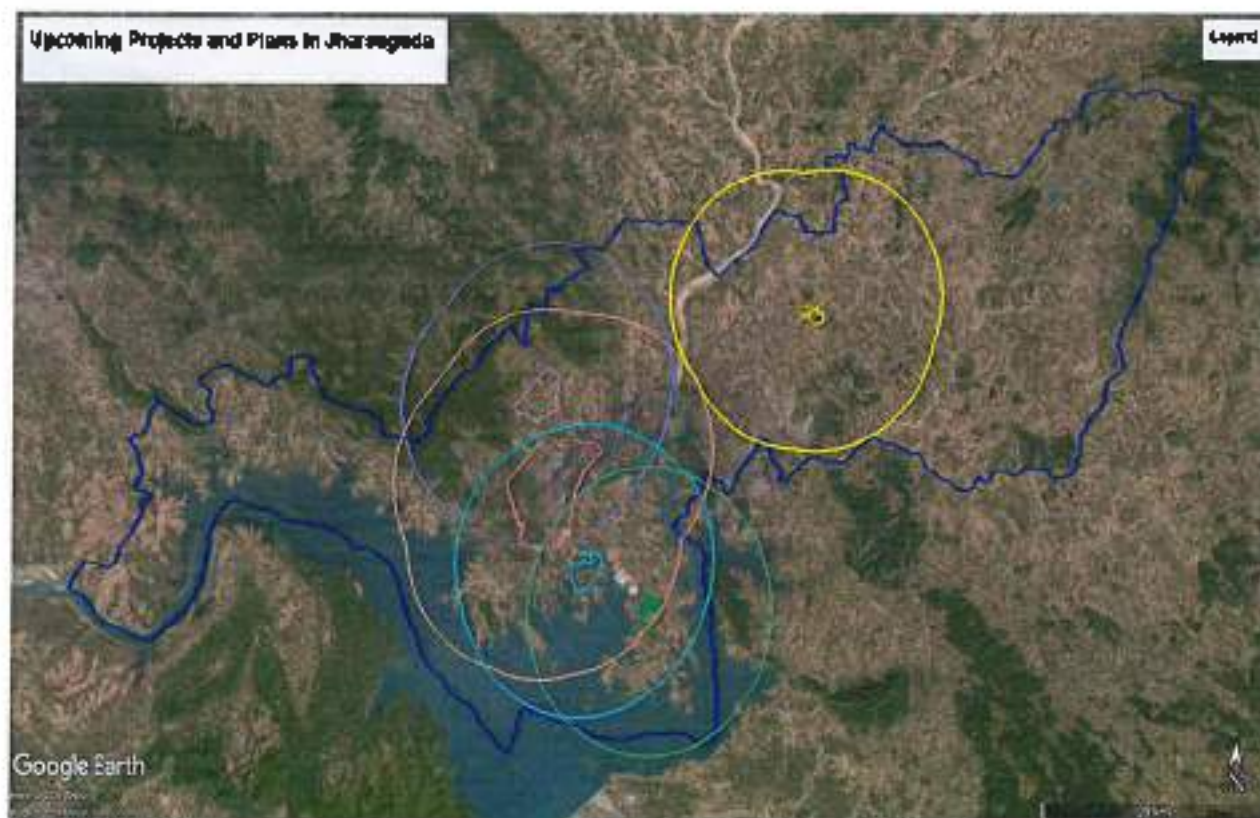


Fig:1.1. Upcoming projects and plans in Jharsuguda

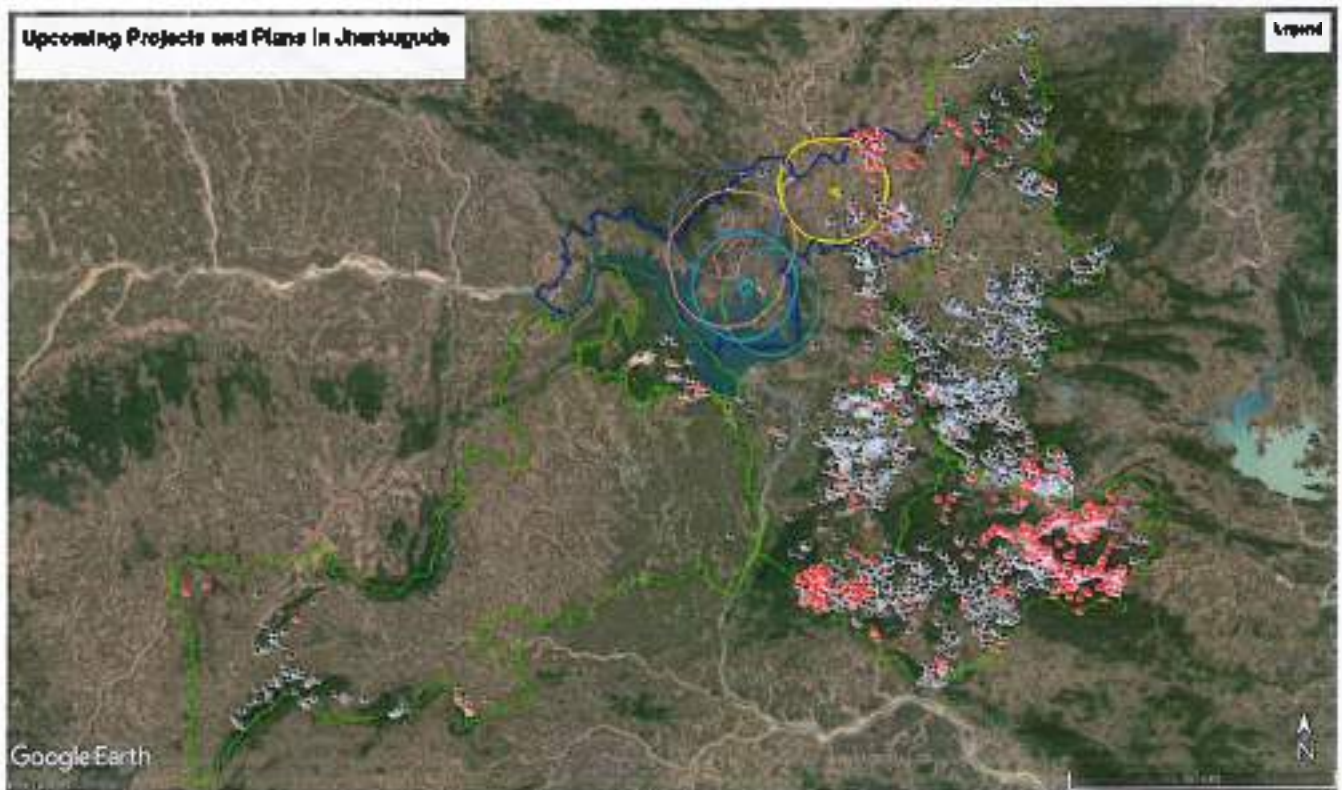


Fig: 1.2. The plans are where the wildlife is not

From a wildlife habitat shifting perspective, an industrial cluster is a “push” factor, while the forests around it are a “pull” factor. Hence, wildlife interventions being funded by the industrial area, which have itself become unviable to sustain a wildlife population should strengthen the nearest landscape areas for sustainability. This principle finds expression in the PCCF(WL), Odisha letter 2346 dated 21.02.24, which permits the extension of the Zone of Influence beyond 10 km in extraordinary cases. This case is justifiably one of them.

The projects under consideration are listed below. The colored cells correspond to the marked color on the map in Figure 1.2

Table:-I.1. Upcoming projects and plans in Jharsuguda

S No	PROJECT NAME (Color reference)	FOREST LAND (Y/N)
1	MCL Integrated Lakhanpur-Belpahar -lilari OCP with 417.07 diversion and 171.774 Rediversion	Yes
2	IBEUL 2x350 MW Coal based TPP with 34.63 Ha diversion	Yes
3	Kuraloi 'A' North Block with 213.37 Ha diversion	Yes
4	12,708 Ha for double Railway line flyover to MCL Railway siding and Dhutra Yard	Yes
5	Expansion of Coal Based TPP by addition of 2x660 MW by OPGC Ltd	No
		TOTAL

2. Plan Creation Methodology

The plan creation was based on three parts: gathering information, planning interventions on the basis of current cost norms and practices of the Forest Department and planning how the funding was to be made.

2.1. Gathering Information

The administrative territory of Sambalpur circle (out of a contiguous forest landscape that extends beyond into Athmalik, Deogarh and Sonpur divisions) was chosen as the focus of interventions. With the range level as the unit, GIS data of administrative boundaries, forest blocks, three years' elephant movement data from iWLMS, three years' forest fire data from FSI, three years' crop and house damage data from ANUKAMPA were compiled to study where the landscape was affected most. These were superimposed over cadastral maps to create a list of Vulnerable Villages.

2.2. Planning Interventions

The list of interventions proposed in the Comprehensive Action Plan for Human Wildlife Conflict (arising out of the Gita Rout vs State of Odisha case) which required financial support were drawn up. Each Division was consulted with the GIS based maps to decide the locations and extent of such interventions. An allotment of 25% or above was retained for habitat improvement and infrastructure was restricted to frontline staff with watchtowers or barracks. An escalation cost of 20% was imposed on this amount to account for inflation in the subsequent five years for which the plan was prepared. Over this, a lumpsum provision of 5% for Wildlife Society and 10% lump sum provision for ex-situ conservation centres has been considered.

2.3 Funding mechanism

The challenge was finding a funding mechanism for the plan that includes the funds of existing plans, tap into the plans under consideration as well as retain space for future funding. Thirteen operational site-specific plans of Jharsuguda Forest Division, which have been approved by PCCF(WL) and the funds have already been deposited into CAMPA and have substantial balance were recast into new components. The balance funding requirement has been made up by the remaining five projects under consideration in the same Division.

3. Proposed Interventions and Their Brief Description

The relevant maps as discussed in part 02 are displayed below. The following maps were discussed with each Division to come up with the location of the interventions. The Division-specific maps can be found in Appendix C.

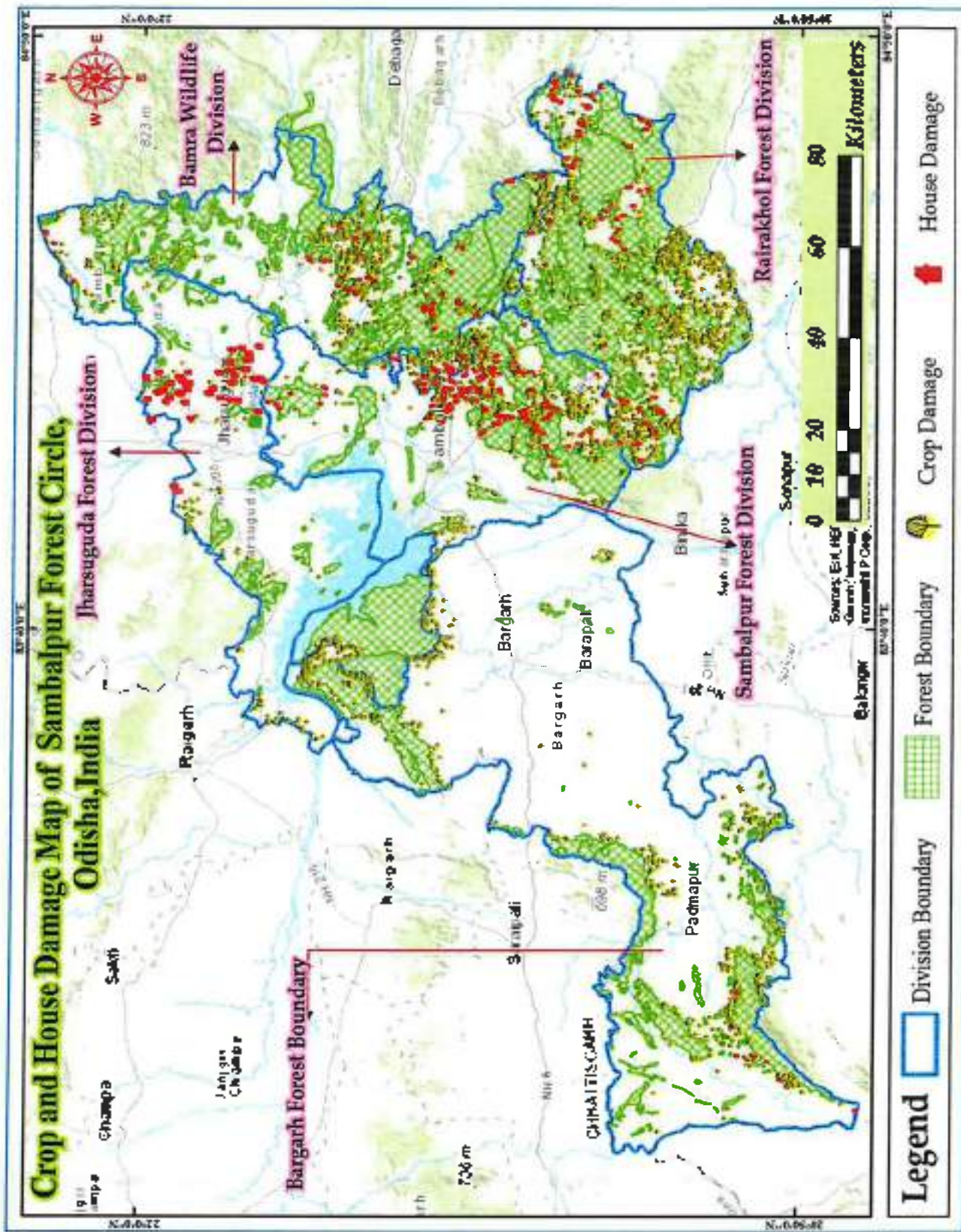


Fig: 3.2 Crop and House Damage Map of Sambalpur Forest Circle, Odisha, India

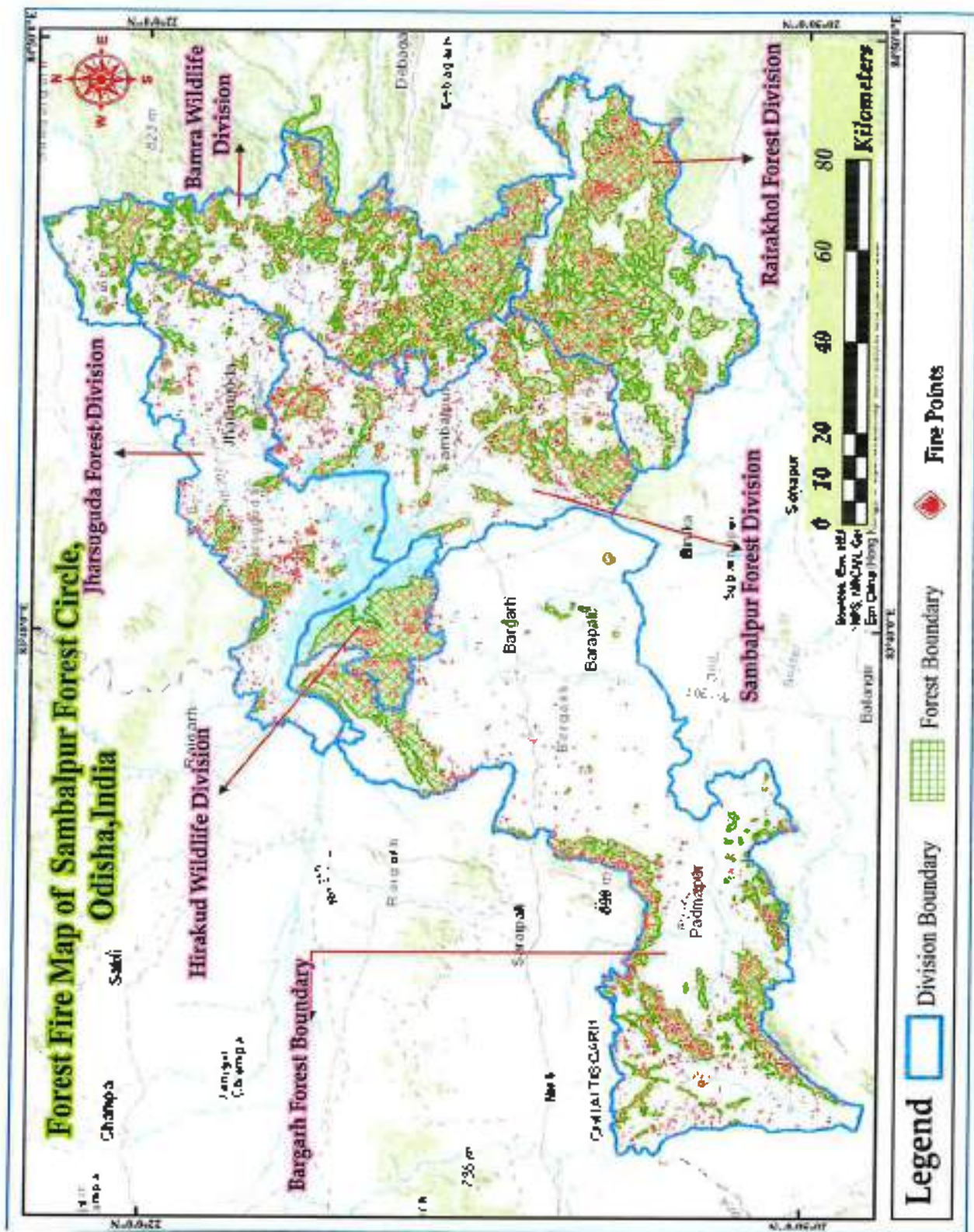


Fig: 3.3. Forest Fire Map of Sambalpur Forest Circle, Odisha, India

The interventions are serially coded in the Table as shown below. They vary slightly for specific divisions as per their need. This serial coding has been followed throughout the plan including financial allotment.

Table:- 3.1.

S No	Major Component	Minor Component	Description	Unit Cost (in lacs)
1	Habitat Improvement			
1.1	Weed eradication and removal of invasive species		Weed eradication with machetes	0.18 lacs/ha
1.2	Excavation of water bodies	(1.2.1) New water bodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lacs
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lac
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35 MD/RKM
		(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @10,000/village for 10 units per Range	16 lakhs/year/unit@range
1.4	Meadow Development		Maintenance of existing meadows at the cost	0.2 lacs/ha
1.5	Soil and Moisture Conservation		SMC works such as LBCE, WLBCD, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks	50 lacs lumpsum
2	Awareness and Publicity			

2.1	Important Days Celebration		Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lacs/year
2.2	ANUKAMPA popularization		Popularization of application among public, posting signages & training of Jan Seva Kendra staff on the app in vulnerable villages	0.1 lacs/village
2.3	Targeted HEC Field Meetings		In vulnerable villages regarding animal behavior, cropping pattern changes, hooking and other problems in human-WL interface	0.1 lacs/village
2.4	Content Creation and Dissemination		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lac/year
3	Infrastructure			
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lacs/unit
		(3.1.2) Upkeep of barrack/tower	Provisions of Water, food, utensils, electricity and minor repairs	1 lac/year
3.2	Boat and Jetties	(3.2.1) Patrolling Boat		
		(3.2.2) Floating Jetty	Only for Hirakud Division	
4	Wildlife Field Operations			
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/year
4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lacs/year

		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liason with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs one-time
		(4.2.3)Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lacs/unit for large drone + 5 lacs for microdrone
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level
4.4	Training & Research	(4.4.1)Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and iWLMS, filing PR Reports, wildlife operations-tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lacs/year
		(4.4.2)Training Programs for RO, ACF and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2 lacs/year
		(4.4.3) Hiring of Vet/Paravet/Biologist for field guidance and research	Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%)/month for research, animal treatment, documentation and other purposes	8.4L/year
5	Community Engagement and Protection			
5.1	Solar lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	10 lacs/year

5.2	IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lacs/year
5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lacs/year
6	Division Level Augmentation			
6.1	GIS Cell	(6.1.1) GIS Cell Setup	One-time cost to setup 2 work stations, A3 color printer, subscription of required softwares etc.	10 lacs one-time
		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year
6.2	Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims, manning Control room, interpret GIS layers etc. @30,000/month (-40%) at Division level	5.04L/year
6.3	Equipment Purchases	IT equipment	IT equipment, inverters, provisions etc. at Division level	3L/year

Certain constraints need to be adhered to.

- Each User Agency should be able to track it's exact components and where it has been spent.
- Each Division must be able to track its components and which user agency has funded it.
- Office at the level of RCCF or PCCF have a clear picture of the components for annual requisition and allotment.
- It should not affect any DFO's flexibility to include any other component if necessary in any future Plan.
- All interventions of one User Agency cannot be prescribed in an area completely isolated from the project impact.

The above constraints are addressed through the following funding pattern. In chronological order, one particular intervention is funded across all the Divisions until the next intervention is reached or funds are exhausted. Once all items are funded, the spillover happens to the next year and so on. In this manner, any future plans can be accommodated within the fold of the plan.

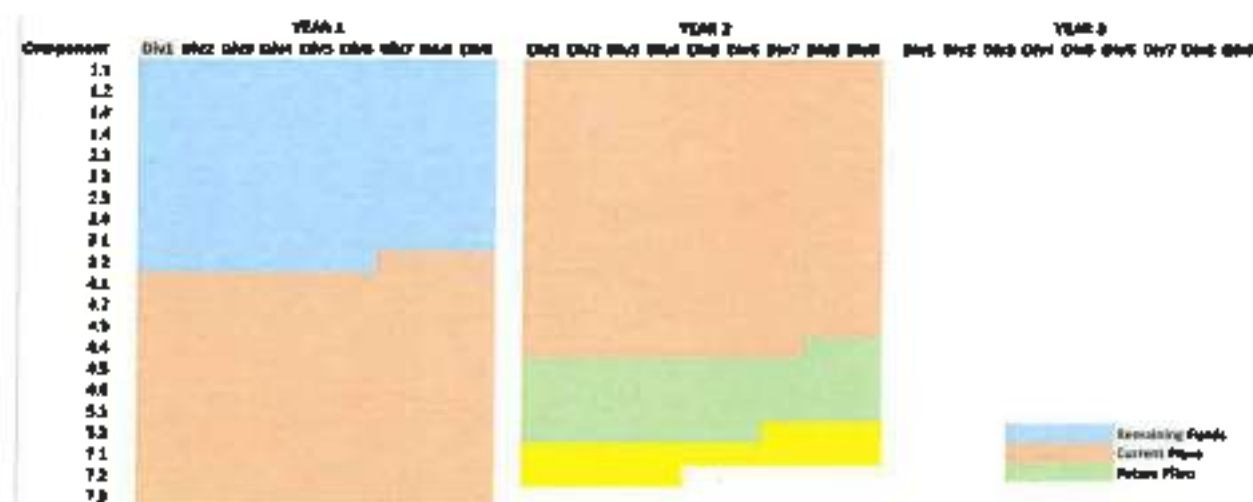


Fig:3.8. Certain constraints need to be adhered

The fund recast from existing plans are described in detail in APPENDIX A and the funding from projects under consideration are described in APPENDIX B.

3.4. Fund Distribution

3.4.1. The list of existing and approved plans of Jharsuguda Forest Division is shown here.
Table:- 3.2.

S No	Project Name	PCCF (WL) Approval Letter	Deposit	Expenditure	Balance	Balance (minus 20%)	Recast Amount	Reference Color Code
1	Lakhanpur OCP Re-diversion (\$4.239 ha forest land)	Memo No.3057 dt.05.05.2011	205		205	170.83	171	
2	MGR Railway Line OPGC(45.071 ha. of forest land)	Memo No.2875 dt.11.04.2014	357.91		357.91	298.25	298.21	
3	Belpahar OCP Expansion MCL(19.70 ha forest land)	Memo No.470 dt.15.01.2014	335.17		335.17	279.31	279	
4	Orient Mine No. 1,2 & 3 of MCL	Memo No.503 dt.17.01.2014	850.42		850.42	708.68	708.6	
5	Orient Mine No.4 of MCL	Memo No.537 dt.18.01.2014	296.76		296.76	247.3	247.4	
6	Samaleswari OCP Expansion (22.48 ha.)	Memo No.4729 dt.11.06.2014	272.16		272.16	226.8	225	
7	IR- Thermal Power Station of OPGC, Banhraspali(258.30 ha forest land)	Memo No.4759 dt.12.06.2014	662.92		662.92	552.43	551.4	
8	Lajkura OCP Expansion(159.18 ha forest land)	Memo No.917/1WL(C) SSP-422/2014 dt.06.02.2015	545.57	205.46	340.11	283.42	285	
9	Development of Jharsuguda Airport (3.885 ha forest land)	Memo No.110101 dt.23.12.2015	170.4		170.4	142	140.2	
10	Talabira OCP-II & III by NLC India Ltd.(845.561 ha forest land)	No.10353 dt.14.11.2018	366.774	191.69	175.084	145.9	146.94	
11	Samaleswari OCP Expansion (IV) (230.20 ha.)	Memo No.7928/ dt.01.10.2020	678	39	639	532.5	531.85	

12	Diversion of 65.4036 ha of forest land (0.7705 Jharsuguda Division) for gas pipeline with OFC of Jagadishpur--Dhamra by GAIL (India)	Memo No.8125 dt.24.08.2021	653.21	234.32	418.89			
						349.1	351.7	
13	Diversion of 26.994 ha. of forest land four lane coal corridor from Bankibahal by (R&B) Division, Sundargarh	Memo No.2711 dt.26.03.2022	241.2		241.2			
						201	200	

The balance amount in each plan is after the completion of FY 2023-24. The balance amount (after subtracting 20% from the same) has been recast into the following interventions. It is crucial to note the color scheme that corresponds to each recast.

Table:- 3.3.

		YEAR 1						YEAR 2					
Item	Sub-Item	Bar	Hir	Sam	Red	Bam	Isq	Bar	Hir	Sam	Red	Bam	Isq
1.1			54						54				
1.2	1.2.1	19.5		13	40	6.5	20	13		6.5	20	6.5	20
	1.2.2	4		2	4	4	4	4		2	4	4	4
1.3	1.3.1	33.75		33.75	50.57	17.14	27	11.25		11.25	16.85	5.71	9
	1.3.2	48		80	96	96	85	48		80	96	96	85
1.4			60						60				
1.5		50		50	50	50	50	50		50	50	50	50
2.1		2	2	2	2	2	2	2	2	2	2	2	2
2.2		2		2	2	2	2	2		2	2	2	2
2.3		2		2	2	2	2	2		2	2	2	2
2.4		2	2	2	2	2	2	2	2	2	2	2	2
3.1	3.1.1	35	35	35	35	35	35	35					35
	3.1.2	5	3	3	4	2	5	5	3	3	4	2	5
3.2	3.2.1		40			24			40			24	
	3.2.2					15							

4.1			70.8	47.2	118	141.6	118	118		70.8	47.2	118	141.6	118	118
4.2	4.2.1		2	2	2	2	2	2		2	2	2	2	2	2
4.3	4.2.2		11.4	11.4	11.4	11.4	11.4	11.4		8.4	8.4	8.4	8.4	8.4	8.4
	4.2.3		2	2	2	2	2	2		2	2	2	2	2	2
	4.3.1		25	25	35	40	35	45							
	4.3.2		3	3	3	5	5	5		3	3	3	5	5	5
4.4	4.4.1		3	3	3	3	3	3		3	3	3	3	3	3
	4.4.2		2	2	4	2	2	2		2	2	4	2	2	2
	4.4.3		8.4	8.4	8.4	8.4	8.4	8.4		8.4	8.4	8.4	8.4	8.4	8.4
5.1			10	300	10	10	10	10		10		10	10	10	10
5.2			10	215	10	10	10	10		10		10	10	10	10
5.3			10	35	10	10	10	10		10		10	10	10	10
6.1	6.1.1		10	10	10	10	10	10							
	6.1.2		8.4	8.4	8.4	8.4	8.4	8.4		8.4	8.4	8.4	8.4	8.4	8.4
6.2			5.04	5.04	5.04	5.04	5.04	5.04		5.04	5.04	5.04	5.04	5.04	5.04
6.3			3	3	3	3	3	3		3	3	3	3	3	3

The detailed breakdown for each project as per the schematic follows as part of this Appendix-A

3.4.2. Funding Scheme from Projects Under Consideration

The projects under consideration are listed below. The interventions in the landscape plan as per the color scheme is provided below the same.

Table:- 3.4.

S No	PROJECT NAME (Color reference)	FOREST LAND (Y/N)	COST (in lacs)
1	MCL Integrated Lakhanpur-Belpahar -Jilari OCP with 417.07 diversion and 171.774 Rediversion	Yes	3250.72
2	IBFUL 2x350 MW Coal based TPP with 34.63 Ha diversion	Yes	2492.4
3	Kuralor 'A' North Block with 213.37 Ha diversion	Yes	3105.246
4	12.708 Ha for double Railway line flyover to MCL Railway siding and Dhutra Yard	Yes	1440.16
5	Expansion of Coal Based TPP by addition of 2x660 MW by OPGC Ltd	No	592.522
		TOTAL	10881.05

Table:- 3.5.

		YEAR 2						YEAR 3						YEAR 4						YEAR 5							
Item	Sub-Item	Bar	Hlr	Sam	Red	Bam	Jsg	Bar	Hlr	Sam	Red	Bam	Jsg	Bar	Hlr	Sam	Red	Bam	Jsg	Bar	Hlr	Sam	Red	Bam	Jsg		
1.1			54					54						54						54							
1.2	1.2.1	13		6.5	2.0	6.5	20	19.5		6.5	2.0	6.5	20	13		6.5	2.0	6.5	20	13		6.5	2.0	6.5	20		
	1.2.2	4		2.4	4.4	4.4	4	4		2.4	4.4	4.4	4	4		2.4	4.4	4.4	4	4		2.4	4.4	4.4	4		
1.3	1.3.1	11.25		11.25	1.68	5.71	9	11.25		1.68	5.71	9	11.25		1.68	5.71	9	11.25		1.68	5.71	9	11.25		1.68	5.71	9
	1.3.2	48		80.6	9.9	9.9	85	48		80.6	9.9	9.9	85	48		80.6	9.9	9.9	85	48		80.6	9.9	9.9	85		
1.4			60					60						60						60							
1.5		50		50.0	5.0	5.0	50	50		50.0	5.0	5.0	50	50		50.0	5.0	5.0	50	50		50.0	5.0	5.0	50		
2.1		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
2.2		2		2	2	2	2	2		2	2	2	2	2		2	2	2	2	2		2	2	2	2		
2.3		2		2	2	2	2	2		2	2	2	2	2		2	2	2	2	2		2	2	2	2		
2.4		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
3.1	3.1.1	35					35	35	3.5	3.5	35	35	35	35					35	35	35	35			35		
	3.1.2	5	3	3	4	2	5	5	3	3	4	2	5	5	3	3	4	2	5	5	3	3	4	2	5		
3.2	3.2.1		40			2.4						24						24					24				
	3.2.2											15											15				
4.1		70.8	47.2	11.8	1.4	1.8	11	70.8	47.2	11.8	1.4	1.8	11	70.8	47.2	11.8	1.4	1.8	11	70.8	47.2	11.8	1.4	1.8	11		

Appendix A: Fund Recast from Existing Approved Plans

A.1 Samaleswari OCP Expansion (22.48 ha.)

Table:- A.1.

SL No	Major Component	Minor Component	Description	Unit Cost	Year I					
					Bar	Elr	San	Red	Bom	Jag
4	Wildlife Field Operations									
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/year				141.6		
4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lakhs/year				2	2	2
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liason with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs one-time						11.4
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year	2	2	2	2	2	2

4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lakhs/unit + 5 x ranges	25	25				
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3 Year at Division level	3	3				
	Sub Total				30	30	2	143.6	4	15.4
				TOTAL	225					
				Add 20% escalation	45					
				GRAND TOTAL	270					

Aben

Divisional Forest Officer
Jharsuguda Forest Division

[Signature]

Regional Chief Conservator of Forests
Sambalpur

Approved.

[Signature]
Principal Chief Conservator of Forests
(Wildlife) & Chief Wildlife Warden
Odisha, Bhub.

A.2 Lakahnapur OCP Re-dieversion (84.239 ha forest land)

Table:- A.2.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1					
					Bar	Hlr	Sam	Red	Bam	Jsg
1	Habitat Improvement									
1.1	Weed eradication and removal of invasive species		Weed eradication at Rs 18,000/ha	Rs 18,000/ha		54				
1.2	Excavation of water bodies	New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs	19.5		13	40	6.5	20
		Renovation of existing WBs	Silt removal and depth enhancement	1 lakh	4		2	4	4	4
	Sub Total				23.5	54	15	44	10.5	24
 Divisional Forest Officer Jharaguda Forest Division  Regional Chief Conservator of Forests Sambalpur										
					TOTAL	171				
					Add 20% escalation	34.2				
					GRAND TOTAL	205.2				

Approved

A.3 MGR Railway Line OPGC(45.071 ha. of forest land)

Table:- A.3.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1					
					Bar	Mr	Sam	Red	Bam	Jag
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MDRKM) and Maintenance (5MD x 4 years)	35 MDRKM	33.75		33.75	50.57	17.14	27
		(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @30,000/village for 10 units per Range	16 lakhs/year/unit @range	48		80			
2	Awareness and Publicity	(2.1) Important Days Celebration	Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lakhs/year	2	2	2	2		
		Sub Total			83.75	2	115.75	52.57	17.14	27
 Divisional Forest Officer Jharkhand Forest Division				TOTAL	298.21					 Regional Chief Conservator of Forests Sambalpur
				Add 20% escalation	59.642					
				GRAND TOTAL	357.85					
					2					

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Principal Wildlife Warden
Principal Forest Officer
(Wildlife)
Odisha, Bhubaneswar

A.4 Belpahar OCP Expansion MCL(19.70 ha forest land)

Table:- A.4.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR I					
					Bar	Hlr	Sam	Red	Bam	Jag
1.3	Fire Management	(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @10,000/village for 10 units per Range	16 lakhs/year/unit@range				96	96	85
2	Awareness and Publicity	(2.1) Importation Days Celebration	Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lakhs/year					2	
		Sub Total						96	98	85
				TOTAL						
				Add 20% escalation						
				GRAND TOTAL						

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Jharsuguda Forest Division

Regional Chief Conservator of Forests
Sambalpur

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(Wildlife) & Chief Wildlife Warden
Odisha, Bhubaneswar

A.5 Orient Mine No. 1,2 & 3 of MCL

Table:- A.5.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1				
					Bar	Hir	Sam	Red	Bana Jag
1.4	Maintenance of existing meadows		Maintenance of existing meadows at the cost of Rs.20,000/ha	Rs.20,000/ha		60			
1.5	Soil and Moisture Conservation		SMC works such as LBOD, WLBCD, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks		50		50	50	50
2	Awareness and Publicity								
2.1	Important Days Celebration		Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lakhs/year					2
2.2	ANUKAMPA popularization		Popularization of application among public, posting signages & training of Jan Seva Kendra staff on the app in vulnerable villages	Rs.10,000/village	2		2	2	2
2.3	Targeted HEC Field Meetings		In vulnerable villages regarding animal behavior, cropping pattern changes, hooking and other problems in human-WL interface	Rs.10,000/village	2		2	2	2
2.4	Content Creation		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year	2	2	2	2	2

[illegible]Regional Chief Conservator of Forests
Sambalpur

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(Wildlife) & Chief Wildlife Warden
Odisha, Bhubaneswar

A.6 Orient Mine No.4 of MCL

Tables A.6.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1					
					Bar	Hir	Sam	Red	Bam	Jag
4.1	Protection Squad	Protection Unit	MU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/year	70.8	47.2	118			
4.2	Enforcement	(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liaison with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs one-time					11.4	
			Sub Total		70.8	47.2	118		11.4	
				TOTAL	247.4					
				Add 20% escalation	49.48					
				GRAND TOTAL	296.88					

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A.7 IB- Thermal Power Station of OPGC, Banhrapali(258.30 ha forest land)

Table:- A.7.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1					
					Bar	Hir	Sa	Red	Bam	Jog
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/year					118	118
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lakhs/unit + 5 x ranges			35	40	35	45
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level			3	5	5	5
4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and iWLMs, filing PR Reports, wildlife operations-tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/year	3	3	3	3	3	3
		(4.4.2) Training Programs for RO, ACE and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2 lakhs/year	2	2	4	2	2	2

		(4.4.3) Hiring of Vet/Paravet/ Biologist for field guidance and research	Hiring of Vet/Paravet/Biologist for field guidance and research at Rs. 50,000 (+40%)/month for research, animal treatment, documentation and other purposes	8.4/year	8.4	8.4	8.4	8.4	8.4	8.4
5.1	Solar lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	10 lakhs/year	10	10	10	10	10	10
5.2	IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year	10					
			Sub Total		33.4	13.4	4	68.4	131.4	191.4
				TOTAL	551.4					
				Add 20% escalation	110.28					
				GRAND TOTAL	661.68					

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Odisha, Bhubaneswar

Regional Chief Conservator of Forests
Saktiwar, Jh

A.8 Lajkura OCP Expansion(159.18 hs forest land)

Table:- A.8.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1					
					Bar	Hlr	Samu	Red	Bamu	Jsg
5.2	IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year		215	10	10	10	10
5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year	10		10	10		
			Sub Total		10	215	20	20	10	10
				TOTAL	285					
				Add 20% escalation	57					
				GRAND TOTAL	342					


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A.9 Development of Jharsuguda Airport (3.885 ha forest land)

Table:- A.9.

S No	Major Component	Minor Component	Description/	Unit Cost	YEAR I					
					Bar	Hir	Sam	Red	Bam	Jag
5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year		35			10	10
6.1	GIS Cell	(6.1.1) GIS Cell Setup	One-time cost to setup 2 work stations, A3 color printer, subscription of required softwares etc.	10 lakhs	10	10	10	10		10
		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year	8.4	8.4	8.4			
		Sub Total			18.4	53.4	18.4	10	20	20
				TOTAL	140.2					
				Add 20% escalation	28.04					
				GRAND TOTAL	168.24					


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A.10 Talabira OCP-II & III by NLC India Ltd.(845,561 ha forest land)
Table- 5.10.

S.No	Major Component	Minor Component	Description	Unit Cost	YEAR 1						YEAR 2					
					Bar	Mr	Sam	Red	Bom	Jsg	Bar	Mr	Sam	Red	Jsg	
1	Habitat Improvement															
1.1	Weed eradication and removal of invasive species	*	Weed eradication at Rs 18,000/ha	Rs 18,000/ha								54				
1.2	Excavation of water bodies	New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs							13		6.5			
6.1		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year				8.4	8.4	8.4						
6.2	Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims, manning Control room, interpret GIS layers etc. @30,000/month (+40%) at Division level	5.04L/year	5.04	5.04	5.04	5.04	5.04	5.04						
6.3	Equipment Purchases	IT equipment	IT equipment, inverters, provision etc. at Division	3L/year	3	3	3	3	3	3						

A.11 Samaleswari OCP Expansion (IV) (230.20 ha.)

Table:- A.11.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 1						YEAR 2					
					Bar	Flr	Sam	Red	Bam	Jag	Bar	Flr	Sam	Red	Bam	Jag
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs										20	6.5	20
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lakh							4			2	4	4
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35 MD/RKM							11.2			16.5		
		(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG	16 lakhs/year/unit@range							48		80			

3.1. Site specific interventions for the Circle are displayed in the map below.

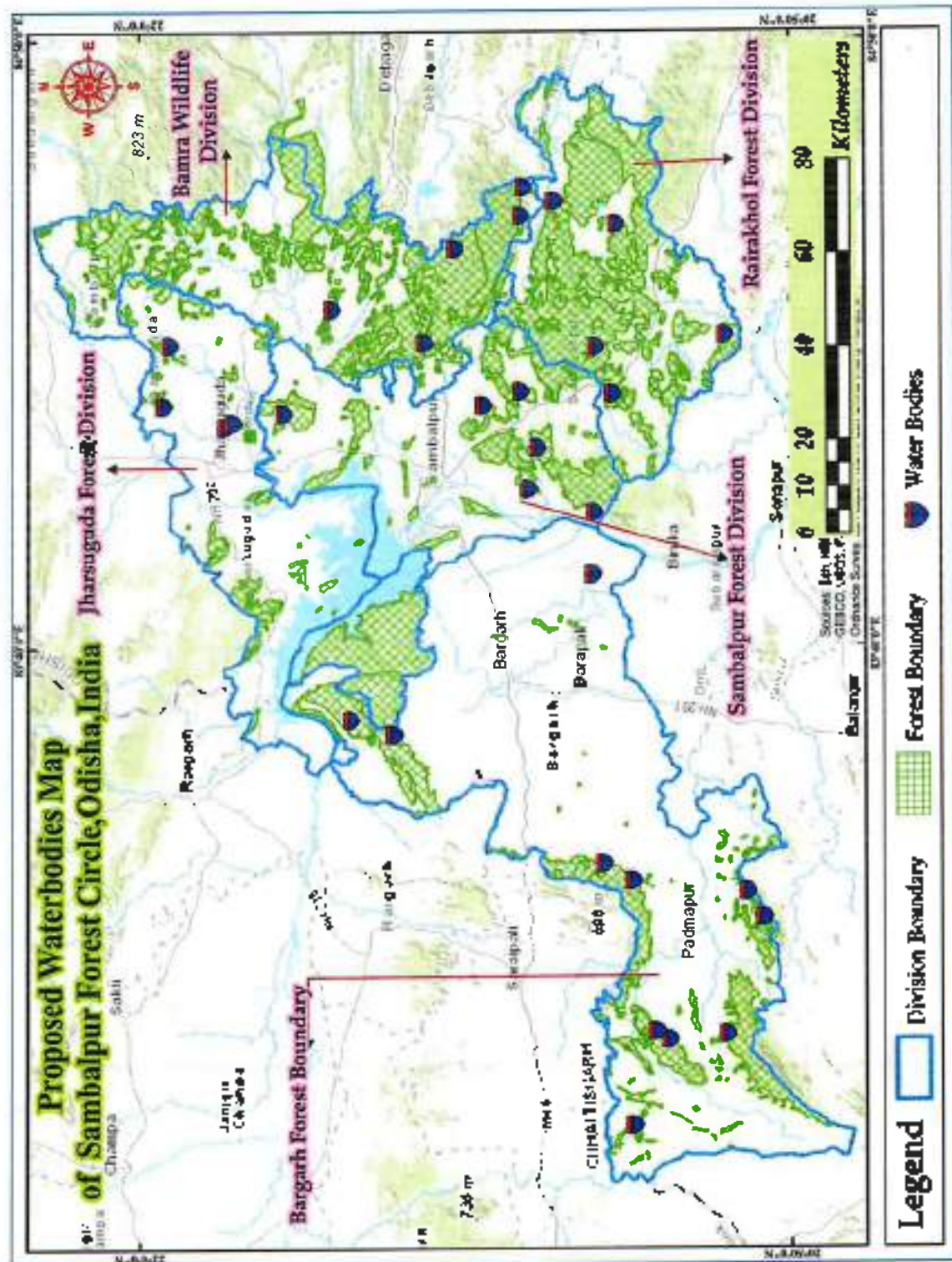


Fig.3.4. Proposed Waterbodies Map of Sambalpur Forest Circle, Odisha, India

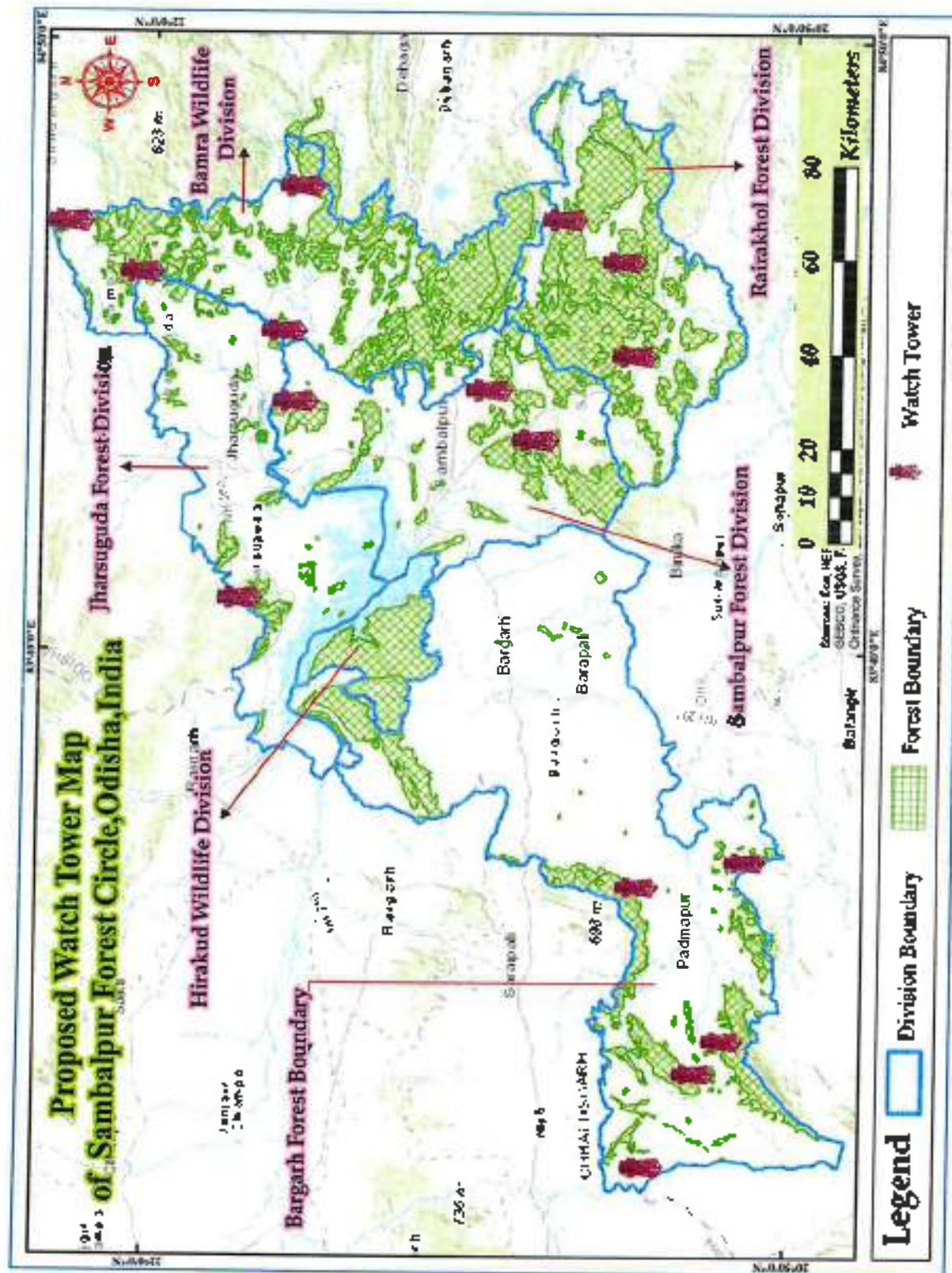


Fig: 3.5. Proposed Watch Tower Map of Sambalpur Forest Circle, Odisha, India

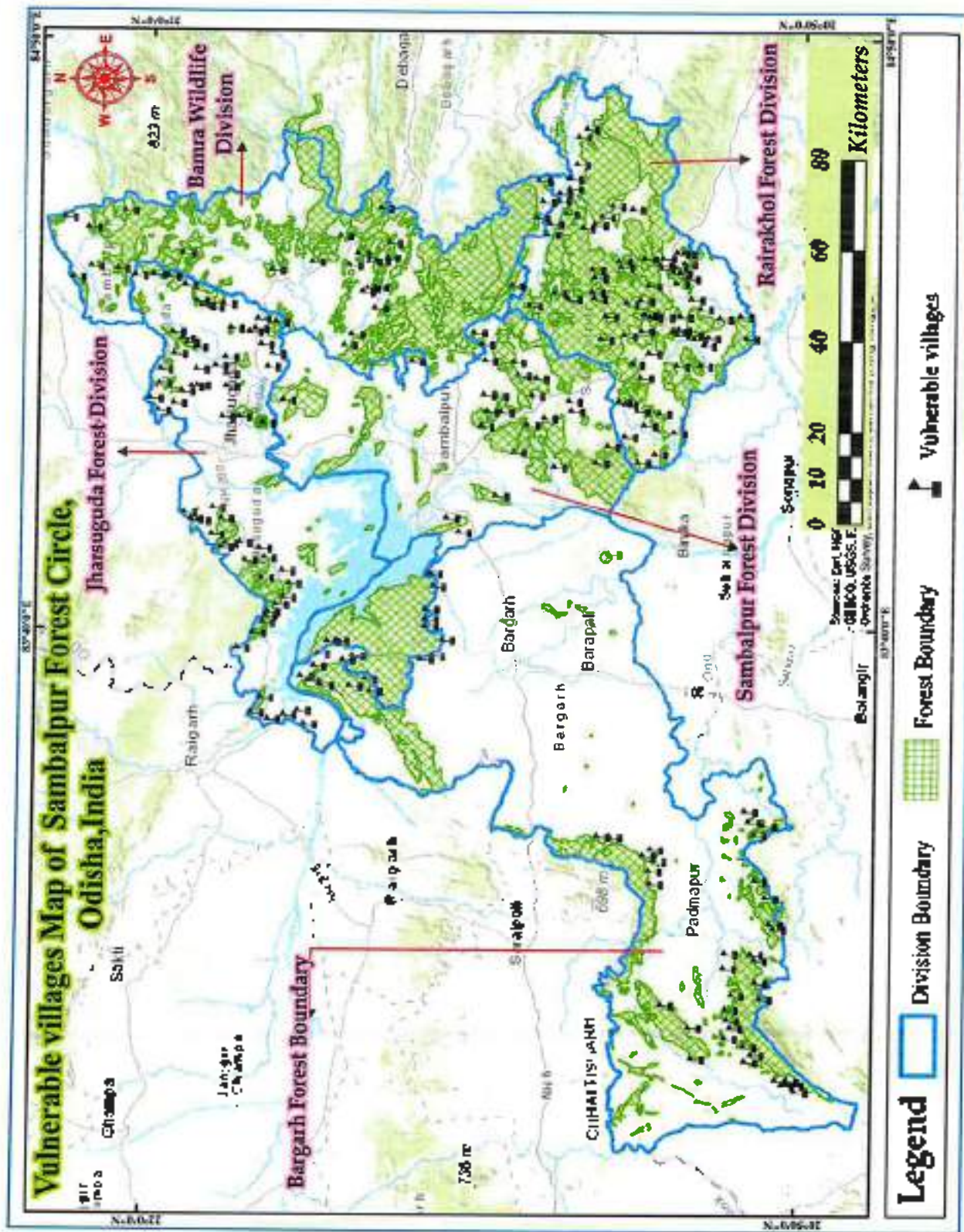


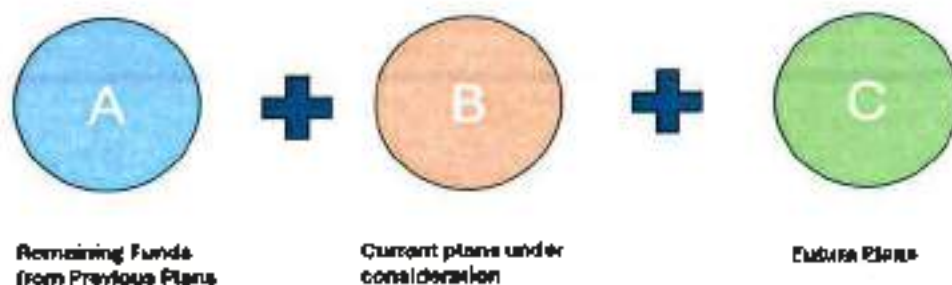
Fig.3.6. Vulnerable villages Map of Sambalpur Forest Circle, Odisha, India

3.2. Additional Remarks on the Interventions

1. For item 1.3.2 (Fire Unit) and item 4.1 (Protection), which involve squad members, a combined package of equipment, uniforms, safety kits or fire blowers has been included as part of the package to the Range. The additional items are a logical and natural requirement associated with each other and have been combined for easier requisition.
2. For item 1.5, lumpsum amount has been provided for Soil and Moisture conservation. As the items are site specific, each DFO has been retained the flexibility to create their own DPR before execution.
3. For items 4.2.2, 4.4.3 and 6.1.1 which involve hiring of experts, an additional 40% has been included with the base pay to account for expenses incurred of ESIC/EPF, GST and service provider charges.
4. For item 5 of community engagement with solar lights, Income Generating Activities and wildlife barriers; lumpsums have been provided with as the interventions are site and time-specific and are a useful tool with the administration to deal with poor relations in certain areas due to high wildlife conflict.

3.3. Devising The Funding Pattern

The funding of the Landscape Plan shall come from approved existing plans, current set of plans under consideration as well as future plans that can come up in the industrial cluster.



3.7. Devising The Funding Pattern

A.12 Diversion of 65.4036 ha of forest land (0.7705 Jharsuguda Division) for gas pipeline with OFC of Jagadishpur-Dhamra by GAIL (India)

Table:- A.12.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 2				
					Bar	Hlr	Ma	Red	Bana
1.3	Fire Management	(1.3.1) Fireline	Pipeline Creation (15 MD/RKM) and Maintenance (SMD x 4 years)	35 MD/RKM					5.71
		(1.3.2) Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @10,000/village for 10 units per Range	16 lakhs/year/mnit@dra nge				96	96
1.4	Maintenance of existing meadows		Maintenance of existing meadows at the cost of Rs.20,000/ha	Rs.20,000/ha		60			
			Sub Total			60		96	101.71
				TOTAL	351.71				
				Add 20% escalation	70.342				
				GRAND TOTAL	422.052				

19/04/2024

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Odisha, Bhubaneswar

A.13 Diversion of 26.994 ha. of forest land four lane coal corridor from Bankibahal by (R&B) Division, Sundargarh
Table:- A.13.

SNo	Major Component	Minor Component	Description	Unit Cost	YEAR 1					
					Bar	Hlr	Sam	Red	Bam	Jsg
1.5	Soil and Moisture Conservation		SMC works such as LBCE, WLBCD, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks	50 lakhs lumpsum per year	50			50	50	50
			Sub Total		50			50	50	50
					TOTAL	200				
					Add 20% escalation	40				
					GRAND TOTAL	240				
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APPENDIX B: FUNDING FROM UPCOMING PROJECTS

B.I. MCL Integrated Lakhampur-Belpahar-Litari OCP with 417.07 Ha diversion and 171.774 Rediversion
Table:-B.1.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 2						YEAR 3						
					Bar	Hir	Sam	Red	Ba	Jsg	Bar	Hir	Sam	Red	Ba	Jsg	
1	Habitat improvement																
1.1	Weed eradication and removal of invasive species		Weed eradication at Rs 18,000/ha	Rs 18,000/ha								54					
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs								19.5		6.5	20	6.5	20

		(1.2.2) Renovati on of existing WBs	Silt removal and depth enhancement	1 lakh								4	2	4	4	4
1.3	Fire Managem ent	(1.3.1) Fir eline	Fireline Creation (15 MD/RKM) and Maintenance (SMD x 4 years)	35 MD/RKM								11.2 5	11.2 5	16 85	5.71	9
		(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) – Fire-specific Awareness activities (1 lakh/year) and VSS/SIIG incentives @10,000/village for 10 units per Range	16 lakh/year/unit @range							48	80	96	96		85
1.4	Meadow Develop ment		Maintenance of existing meadows at the cost of Rs.20,000/ha	Rs.20,000/ha								60				

2.4	Content Creation and Dissemination		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Infrastructure																
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	35				35	35	35	35	35	35	35		
		(3.1.2) Upkeep of barrack/tower	Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	5	3	3	4	2	5							
3.2	Boat and Jetties	(3.2.1) Floating Jetty (Hirvi) (3.2.1) Road repair and maintenance (Bamra)		40 lakhs/unit / 12 lakhs/RKM	40				24								

		(4.2.3) Logistical costs	Transport of animal/carcase, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year	2	2	2	2	2	2	2								
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lakhs/unit 15 x ranges															
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level	3	3	3	3	3	3	3	5	5						
4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and iWLMS, filing PR Reports, wildlife operations-tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/year	3	3	3	3	3	3	3	3	3						

		(4.4.2) Training Programs for RO, ACF and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2 lakhs/year	2	2	4	2	2	2							
		(4.4.3) Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%)/month for research, animal treatment, documentation and other purposes	Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%)/month for research, animal treatment, documentation and other purposes	8.4L/year	8.4	8.4	8.4	8.4	8.4	8.4							
	5 Community Engagement and Protection																
5.1	Solar Lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	10 lakhs/year	10		10	10	10	10							

5.2	IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year	10		10	10	10	10	10						
5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year	10		10	10	10	10	10						
6	Division Level Augmentation																
		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year	8.4	8.4	8.4	8.4	8.4	8.4	8.4						
6.2	Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims,	5.04L/year	5.04	5.04	5.04	5.04	5.04	5.04	5.04						

R.2. IBEUL 2x350 MW Coal based TPP with 34.63 Ha diversion

Table-B.2.

S No	Major Component	Minor Component	Description	Unit Cost	YEAR 3						YEAR 4					
					Bar	Hlr	Sam	Red	Bam	Jog	Bar	Hlr	Sam	Red	Bam	Jog
1	Habitat improvement															
1.1	Weed eradication and removal of invasive species		Weed eradication at Rs 18,000/ha	Rs 18,000/ha								54				
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs							13		6.5	20	6.5	20
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lakh							4		2	4	4	4
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35							11.2		11.2	16.8	5.71	9

		(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 16 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @10,000/village for 10 units per Range	lakhs/year/unit@range									48		80	96	96	85
3	Infrastructure																	
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	4 35 lakhs/unit										35	35	35		
		(3.1.2) Upkeep of barrack/tower	Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	5	3	3	4	2	5								
3.2	Roads and Causeways	(3.2.1) Road repair and maintenance	Improvement of existing earthen forest roads to Grade 1 metalling for all weather communication	12 lakhs/RKM					24									
		(3.2.2) Causeways	Vented Causeway inside sanctuary for all weather protection	15 lakhs/unit					15									

4	Wildlife Field Operations																			
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/year	70.8	47.2	118	141.6	118	118	118									
4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lakhs/year	2	2	2	2	2	2	2									
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liaison with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs one-time	8.4	8.4	8.4	8.4	8.4	8.4	8.4									
		(4.2.3) Logistical costs	Transport of animal carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year	2	2	2	2	2	2	2									
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level	3	3	3	5	5	5	5									

4.4 Training & Research	(4.4.1) Training Programs for Field Staff	Handling technical equipment, app usage such as ANUKAMPA and iWLMS, filing PR Reports, wildlife operations- tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/year	3	3	3	3	3	3	3									
	(4.4.2) Training Programs for RO, ACF and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2 lakhs/year	2	2	4	2	2	2	2									
	(4.4.3) Hiring of Vet/Paravet/Biologist for field guidance and research	Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%) /month for research, animal treatment, documentation and other purposes	8.4L/year	8.4	8.4	8.4	8.4	8.4	8.4	8.4									
5 Community Engagement and Protection																			
5.1 Solar lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	10 lakhs/year	10		10	10	10	10	10									

S.2 IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year	10	10	10	10	10	10	10						
5.3 Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year	10	10	10	10	10	10	10						
6 Division Level Augmentation																
	(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year	8.4	8.4	8.4	8.4	8.4	8.4	8.4						
6.2 Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims, manning Control room, interpret GIS layers etc. @30,000/month (+40%) at Division level	5.04L/year	5.04	5.04	5.04	5.04	5.04	5.04	5.04						

B.3. Kuratol 'A' North Block with 213.37 Ha diversion

Table:-B.3.

SNo	Major Component	Minor Component	Description/	Unit Cost	YEAR 4						YEAR 5					
					Bar	Blr	Sam	Re d	Ba m	Js g	Ba r	HI r	Sam	Re d	Ba m	Js g
1	Habitat improvement															
1.1	Wood eradication and removal of invasive species		Weed eradication @ Rs 18,000/ha	Rs 18,000/h 2								54				
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs							13		6.5	20	6.5	0
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lakh							4		2	4	4	4
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35 MD/RKM							11.25		11.25	16.85	5.71	9
		(1.3.2) Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (31.) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) - Fire-specific	16 lakhs/ye ar/unit@ range							48		80	96	96	85

2.4	Content Creation and Dissemination		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year	2	2	2	2	2	2	2	2						
3	Infrastructure																	
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	35								3	5				
		(3.1.2) Upkeep of barrack/tower	Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	5	3	3	4	2	5								
3.2	Boat and Jetties	(3.2.1) Road repair and maintenance (Bamra)		12 lakhs/R KM					24									
4	Wildlife Field Operations																	
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with ADS (5.4L) + Equipment/uniforms (2L/year) = 23.6L/year	23.6L/unit/year	70.8	47.2	118	141.6	118	1	1	8						

4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked CR or Wildlife cases	2 lakhs/yr	2	2	2	2	2	2	2						
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track CR/WL cases, liaison with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/yr + one-time 3 lakhs one-time	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4					
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/yr	2	2	2	2	2	2	2	2					
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level	3	3	3	3	3	3	3	3					
4.4	Training & Research	(4.4.1) Training Program for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and IW.LMS, filing PR Reports, wildlife operations-transportation techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/yr	3	3	3	3	3	3	3	3					
		(4.4.2) Training Program for RO, ACF and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2 lakhs/yr	2	2	4	2	2	2	2	2					

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B.4. 12.708 Ha for double Railway line flyover to MCL Railway siding and Dhutra Yard
Table:-B.4.

S No	Major Component	Minor Component	Description/	Unit Cost	YEAR 5				
					Bar	Hlr	Sam	Red	Ham Jsg
1.5	Soil and Moisture Conservation		SMC works such as LBOD, WLBCD, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks	50 lakhs lumpsum per year				50	50
2	Awareness and Publicity								
2.1	Important Days Celebration		Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lakhs/year	2	2	2	2	2
2.2	ANUKAMPA popularization		Popularization of application among public, posting signages & training of Jan Seva Kendra staff on the app in vulnerable villages	Rs.10,000/village	2		2	2	2
2.3	Targeted HEC Field Meetings		In vulnerable villages regarding animal behavior, cropping pattern changes, hooking and other problems in human-WL interface	Rs.10,000/village	2		2	2	2
2.4	Content Creation and Dissemination		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakhs/year	2	2	2	2	2
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	35	35	35	35	35
		(3.1.2) Upkeep of barrack/h	Provisions of Water, food, utensils, electricity and minor repairs	1 lakhs/year	5	3	3	4	2

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Spunde

Regional Chief Conservator of Forests
Sambalpur

**Principal Chief Conservator of Forests
(Wildlife) & Chief Wildlife Warden**
Odisha, Bhubaneswar

B.5. Expansion of Coal Based TPP by addition of 2x660 MW by OPGC Ltd
Table:-B.5.

S No	Major Component	Minor Component	Description/	Unit Cost	YEAR 1					
					Bar	Hir	Sam	Red	Ben	Jag
4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lakhs/year	2	2	2	2	2	2
		(4.2.2) Hiring of Legal Expert	1 Legal expen @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liason with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4 L/year + one-time 3 lakhs one-time	8.4	8.4	8.4	8.4	8.4	8.4
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year	2	2	2	2	2	2
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3 L/year at Division level	3	3	3	3	3	3
4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and IWLMIS, filing PR Reports, wildlife operations- tranquilization techniques, arms	3 lakhs/year	3	3	3	3	3	3

5.2 IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year	10		10	10	10	10	10
5.3 Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year	10		10	10	10	10	10
6 Division Level Augmentation										
	(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year	8.4		8.4	8.4	8.4	8.4	8.4
6.2 Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims, manning Control room, interpret GIS layers etc. (@30,000/month (+40%) at Division level	5.04L/year	5.04		5.04	5.04	5.04	5.04	5.04
6.3 Equipment Purchases	IT equipment	IT equipment, inverters, provisions etc. at Division level	3L/year	3		3	3	3	3	3

Appendix C: Division Wise Interventions

C.1. Bargarh Forest Division
Table-C.1.

S No	Major Component	Minor Component	Description	Unit Cost	Total Units	Total Cost	Area of implementation	Y1	Y2	Y3	Y4	Y5
1	Habitat improvement							Y1	Y2	Y3	Y4	Y5
1.1	Weed eradication and removal of invasive species						NIL					
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs	12	78	Bhaili Range- Dechua RF, SDBR RF Bargarh- Papangra RF Ghess- Jhanjhpahar PRF (two), Ghens PRF Padampur- Budhadongor (two), Gandhamardan PRF, Paikmal- Adiwai PRF (two), Kandhadongar PRF	19, 13	13	13	13	13

		(1.2.2) Renovation of existing WBs	Silt removal and enhancement	depth 1 lakh	20	20	For waterbodies	4	4	4	4	4
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (SMD x 4 years) MD/RKM	35	500 RKM	78.75	200 RKM in Ghess, 200 RKM in Padampur, 100 RKM in Paikmal	33, 11, 11.2	25	5	5	11.2
		(1.3.2) 1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + range POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @10,000/village for 10 units per Range	16		240	Focus Ranges- Ghess, Padampur, Paikmal Ranges	48	48	48	48	48
1.4	Meadow Development						NIL					
1.5	Soil and Moisture Conservation		SMC works such as LBCE, WLBCE, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks	50 lakhs		250	Focus Ranges- Ghess, Padampur, Paikmal Ranges	50	50	50	50	50
	Sub Total					666.75						
2	Awareness and Publicity											

2.1	Important Days Celebration		Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lakhs/year		10	Focus Ranges	2	2	2	2	2	2
2.2	ANUKAMPA popularization		Popularization of application among public, posting signages & training of Jan Seva Kendra staff on the app in vulnerable villages	Rs.10,000/village		10	Focus Ranges	2	2	2	2	2	2
2.3	Targeted HEC Field Meetings		In vulnerable villages regarding animal behavior, cropping pattern changes, hooking and other problems in human-WL interface	Rs.10,000/village		10	Focus Ranges	2	2	2	2	2	2
2.4	Content Creation and Dissemination		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakhs/year		10	Focus Ranges	2	2	2	2	2	2
	Sub Total					40							
3	Infrastructure												
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	5	175	Padampur-Kamalapadar PRF Paikmal-Rajinderpur PRF, Adhwal PRF Ghess- Jhanjhpahar PRF Narsinghanath-Gandhamardan PRF	35	35	35	35	35	35

	(3.1.2) Upkeep of barrack/tower	Provisions of Water, food, 1 utensils, electricity and minor repairs	5 lakh/year	5	25	Respective barracks or watch towers	5	5	5	5	5
3.2	Boat and Jetties (3.2.1) Patrolling Boat					NIL					
	(3.2.2) Floating Jetty					NIL					
	Sub Total				200						
4	Wildlife Field Operations										
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS- cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/year in/year	3 Ranges for 5 years	Focus Ranges	70.8 \$	70.8 \$	70.8	70.8	70.8
4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lakh/year	10		2	2	2	2	2
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, time liason with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one- time 3 lakh	45		11.4	8.4	8.4	8.4	8.4
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakh/year	10		2	2	2	2	2

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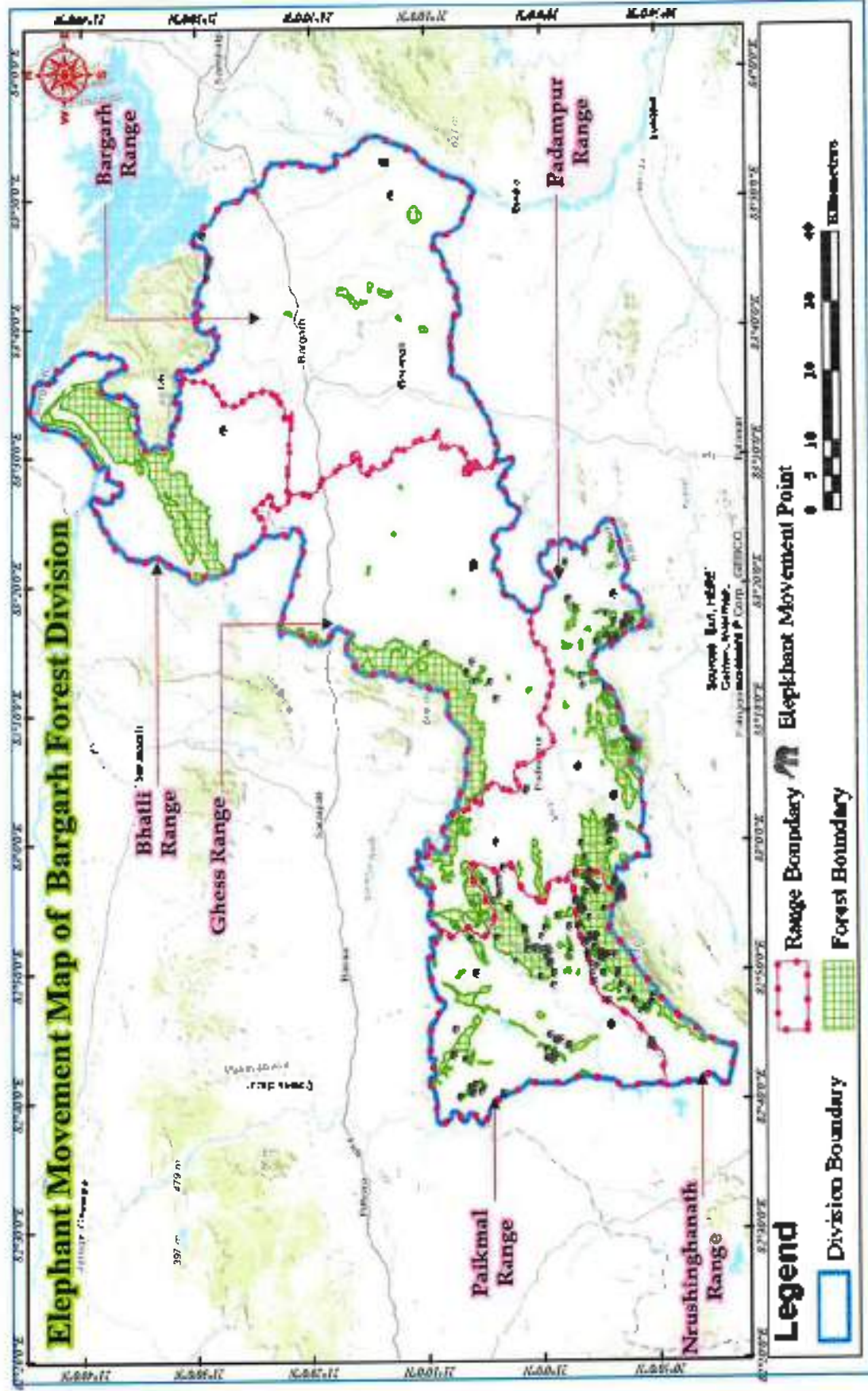


Fig-C.1. Elephant Movement Map of Bargharh Forest Division

Forest Fire Map of Bargarh Forest Division

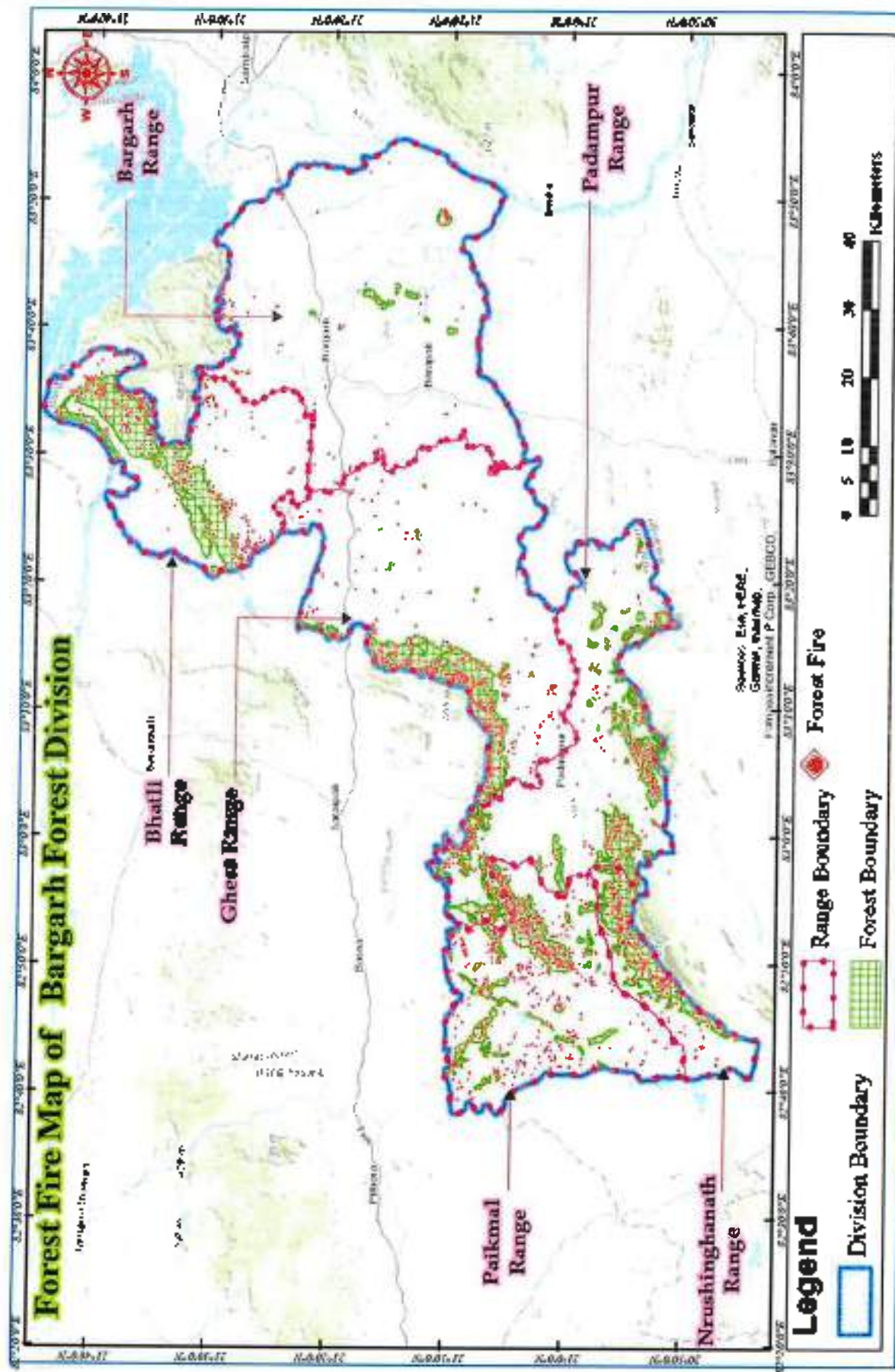


Fig.C.1. Forest Fire Map of Bargarh Forest Division

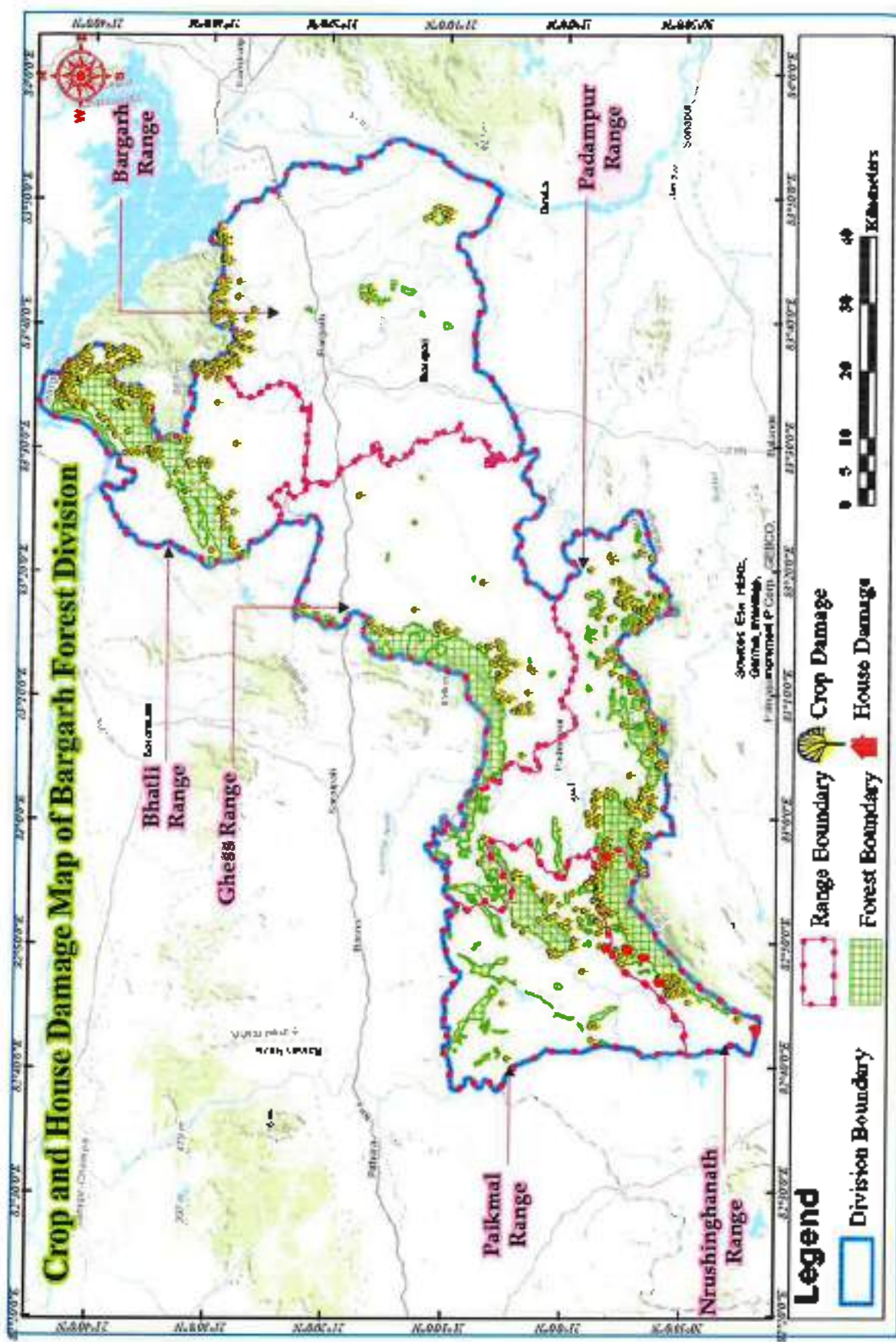


Fig:C.3. Crop and House Damage Map of Bargarh Forest Division

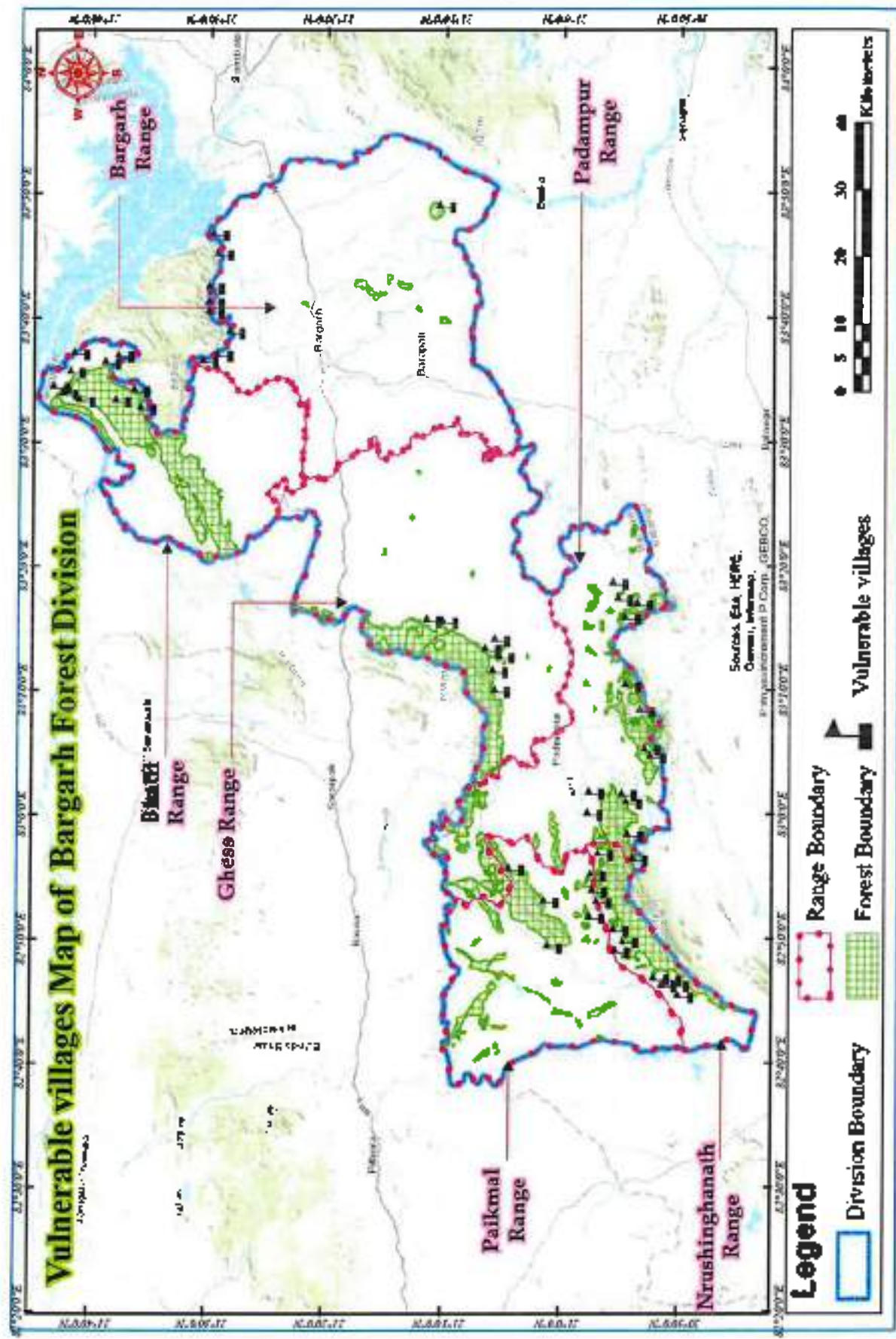


Fig.C.4. Vulnerable Villages Map of Bargarh Forest Division

Proposed Waterbodies Map of Bargarh Forest Division

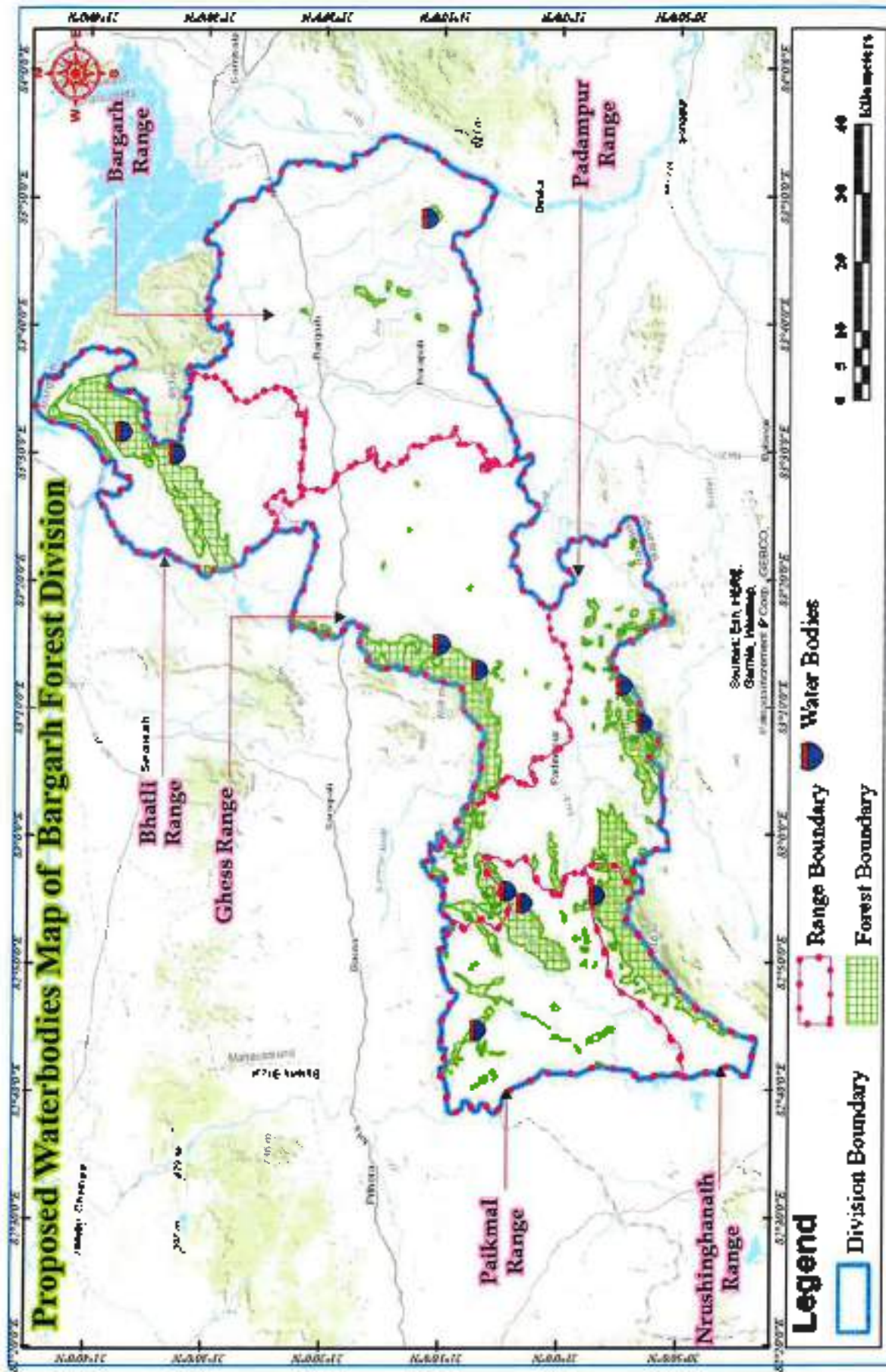


Fig: C.5. Proposed Waterbodies Map of Bargarh Forest Division

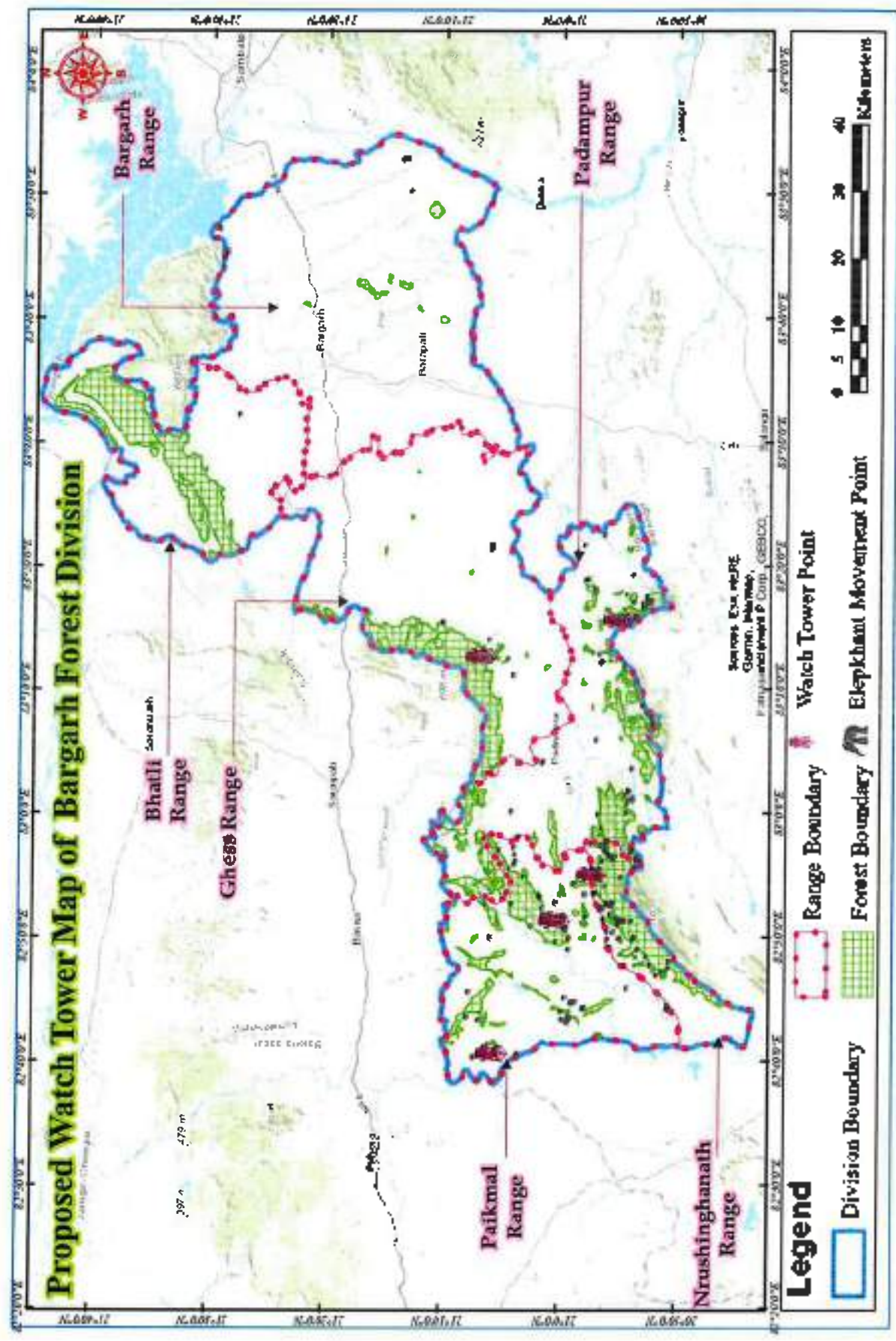


Fig:C.6. Proposed Watch Tower Map of Bargarh Forest Division

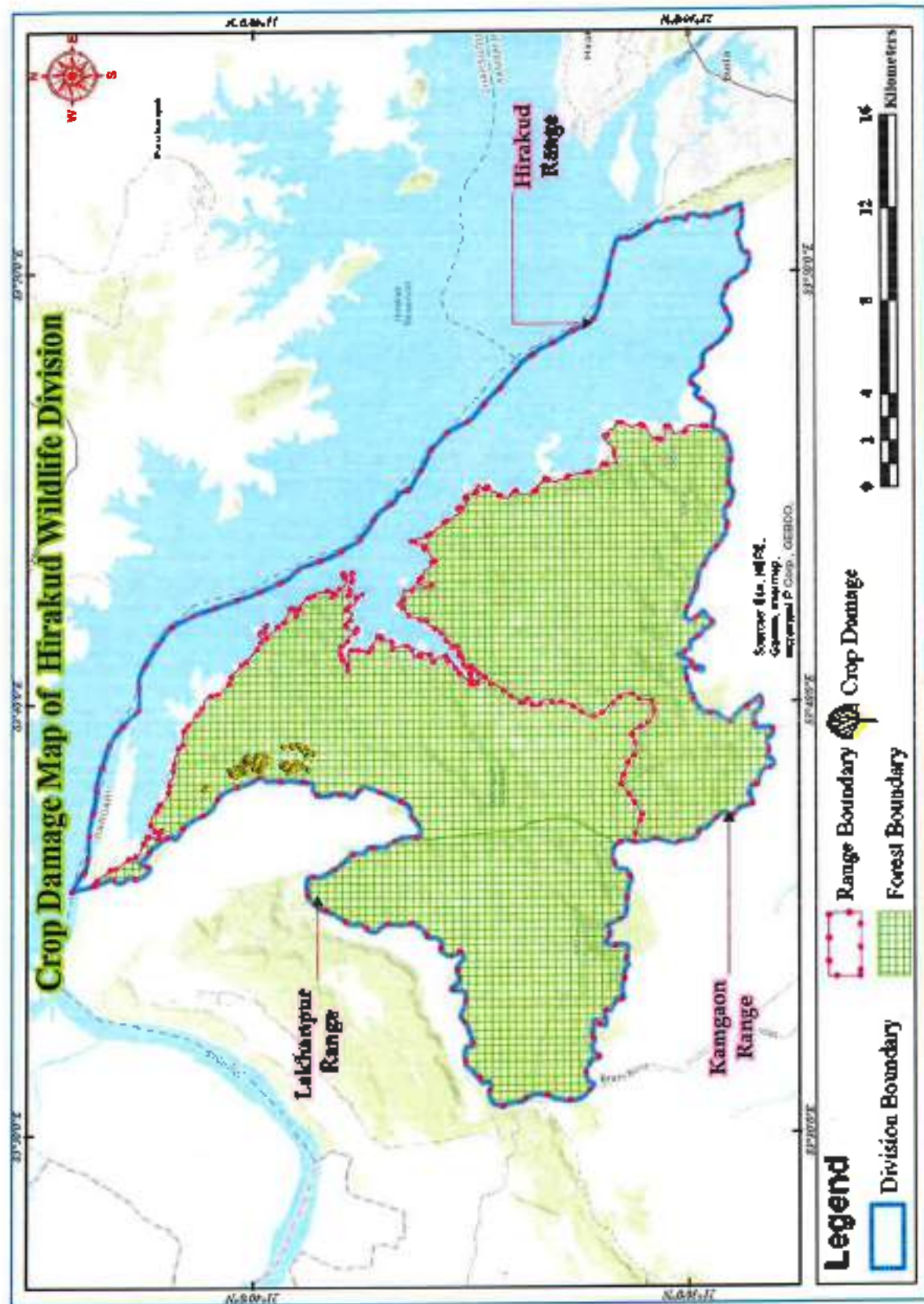
C.2. Hirakud W1 Division

Table: C.2.

SNo	Major Component	Minor Component	Description	Unit Cost	Total Units	Total Cost	Area of implementation	Y1	Y2	Y3	Y4	Y5
1	Habitat improvement											
1.1	Wood eradication and removal of invasive species		Wood eradication at Rs 18,000/ha	Rs 18,000/ha	300 ha annually	270	Chourasimal, Parbaitang, Sanctuary Road, Kadali Nala, Badduma Camp, Teteldhipa	54	54	54	54	54
1.2	Excavation of water bodies	New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs		NIL						
		Renovation of existing WBs	Silt removal and depth enhancement	1 lakh		NIL						
1.3	Fire Management	Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	3\$ MD/RKM		NIL						
		1 Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers ar/unit (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1	15 lakhs		NIL						

			lakh/year) + Awareness activities (1 lakh/year)															
			VSS and SHG incentives for Zero/Minimal Fire						NIL									
1.4	Maintenance of existing meadows		Maintenance of existing meadows at the cost of Rs.20,000/ha		Rs.20,0 00/ha	300 ha	300	Existing meadows of Chaurasimal, Lambipall, Barakhandia Chowk, Jhagatubehera, Karunkel, Gutantikira	60	60	60	60	60	60	60	60	60	60
1.5	Soil Moisture Conservation		SMC works such as LBCD, WLBCD, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks					NIL										
	Sub Total						570											
2	Awareness and Publicity																	
2.1	Important Days Celebration		Celebration of Tiger Day, 2 Elephant Day, Wildlife Week, lakhs/yr Environment Day				10	Focus Ranges	2	2	2	2	2	2	2	2	2	2

2.2	ANUKAMPA popularization	Popularization of application among public, posting signages & training of Jan Seva Kendra staff on the app in vulnerable villages	Rs.10,000/village		NIL	Focus Ranges						
2.3	Targeted HEC Field Meetings	In vulnerable villages regarding animal behavior, cropping pattern changes, hooking and other problems in human-WL interface	Rs.10,000/village		NIL	Focus Ranges						
2.4	Content Creation	Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakhs/year		10	Focus Ranges	2	2	2	2	2	2
	Sub Total				20							
3	Infrastructure											
3.1	Staff Barracks (3.1.1) New with solar power for self-sufficiency	For protection squad stay along with solar power for self-sufficiency	35 lakhs/unit		105	Lakshampur and Kangaon ranges	35	35	35	35	35	35
	(3.1.2) Upkeep of barracks/to wer	Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	3 units	15		3	3	3	3	3	3
3.2	Boat and Jetties (3.2.1) Floating Jetty		40 lakhs/unit	2 units	80	Zero point and Govindpur	40	40				
	Sub Total				200							



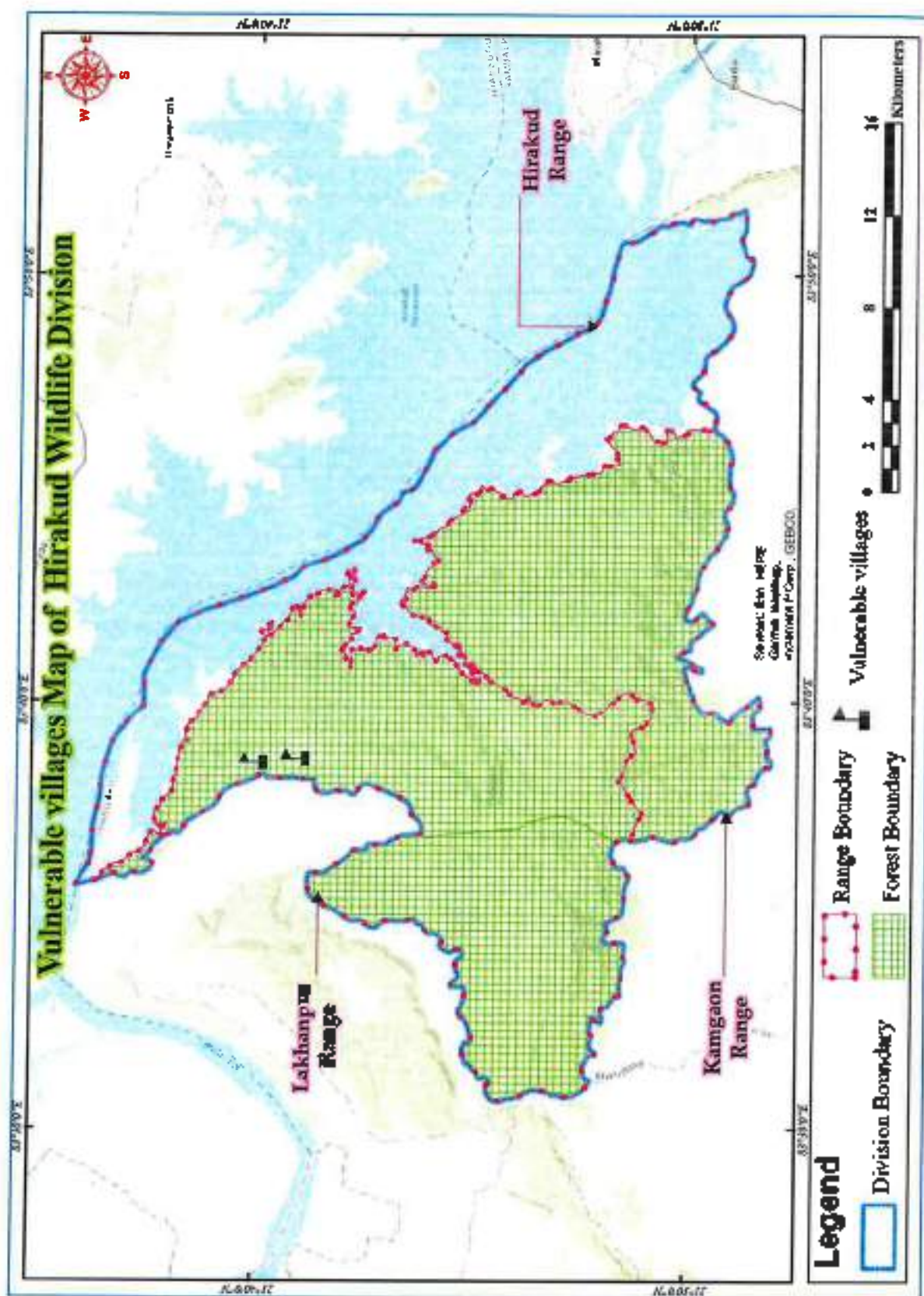


Fig.C.10. Vulnerable Villages Map of Hinkley W/L Division

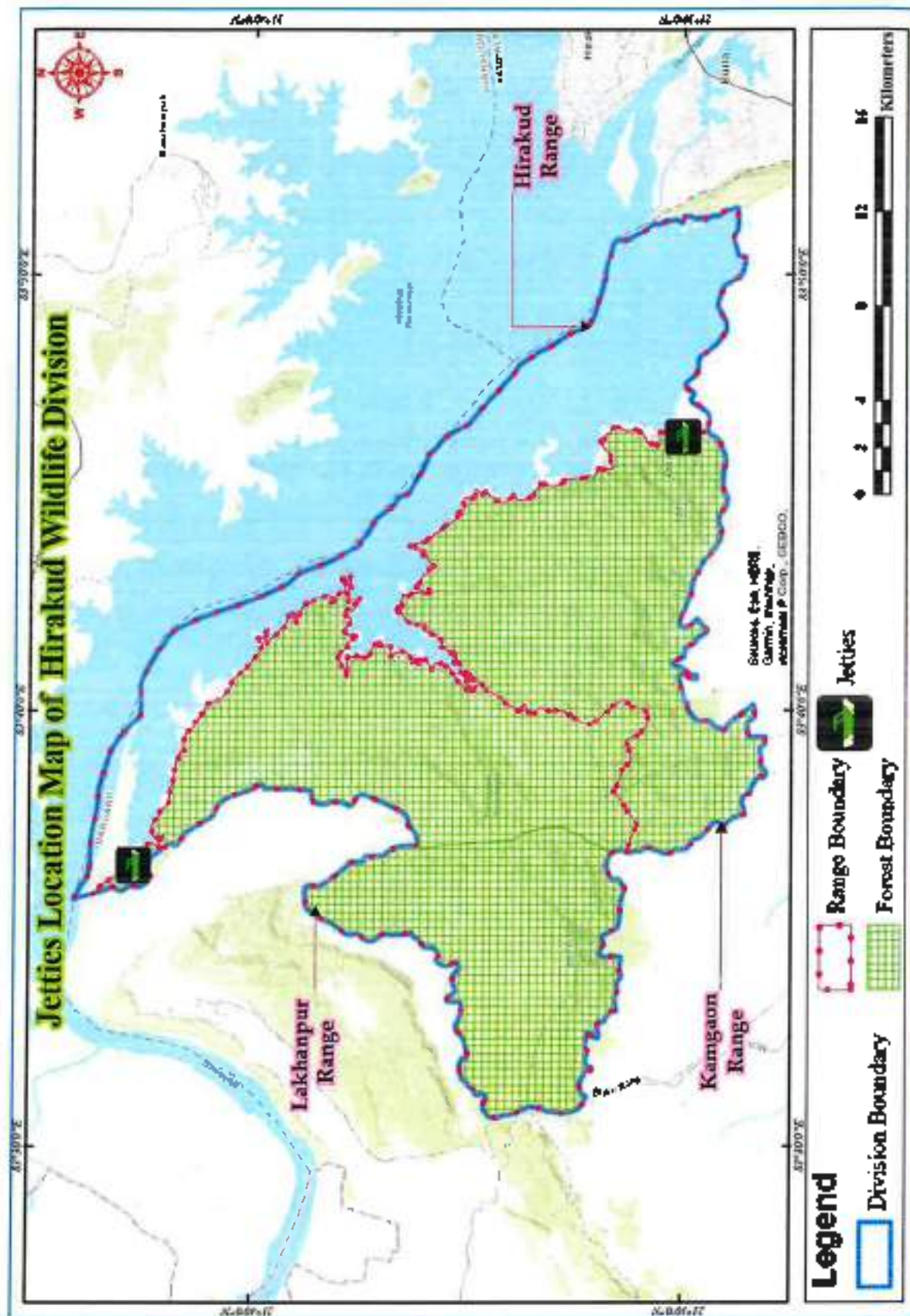


Fig: C.11. Jetties Location Map of Hirakud WL Division

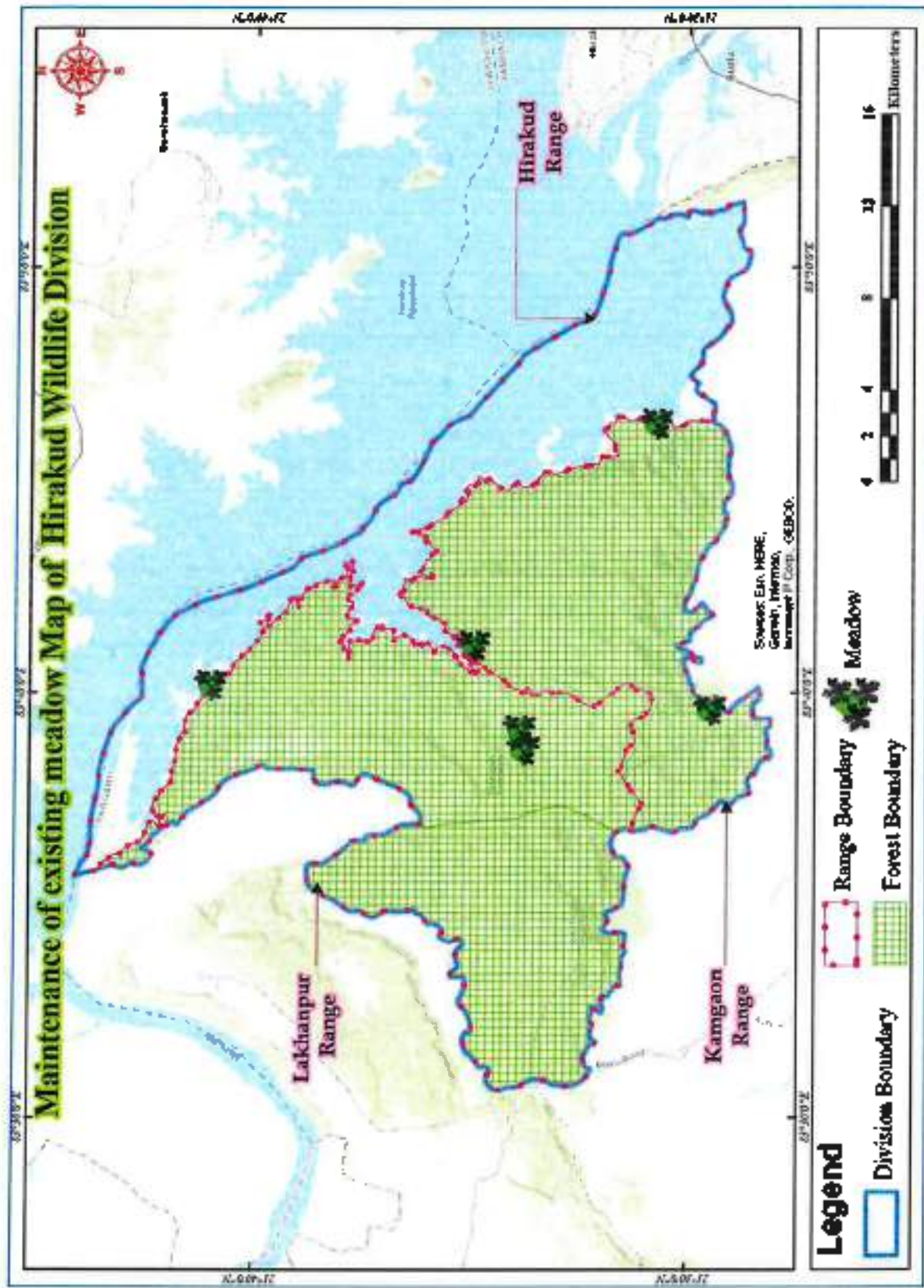


Fig.C.12. Maintenance of existing meadow Map of Hirakud WL Division

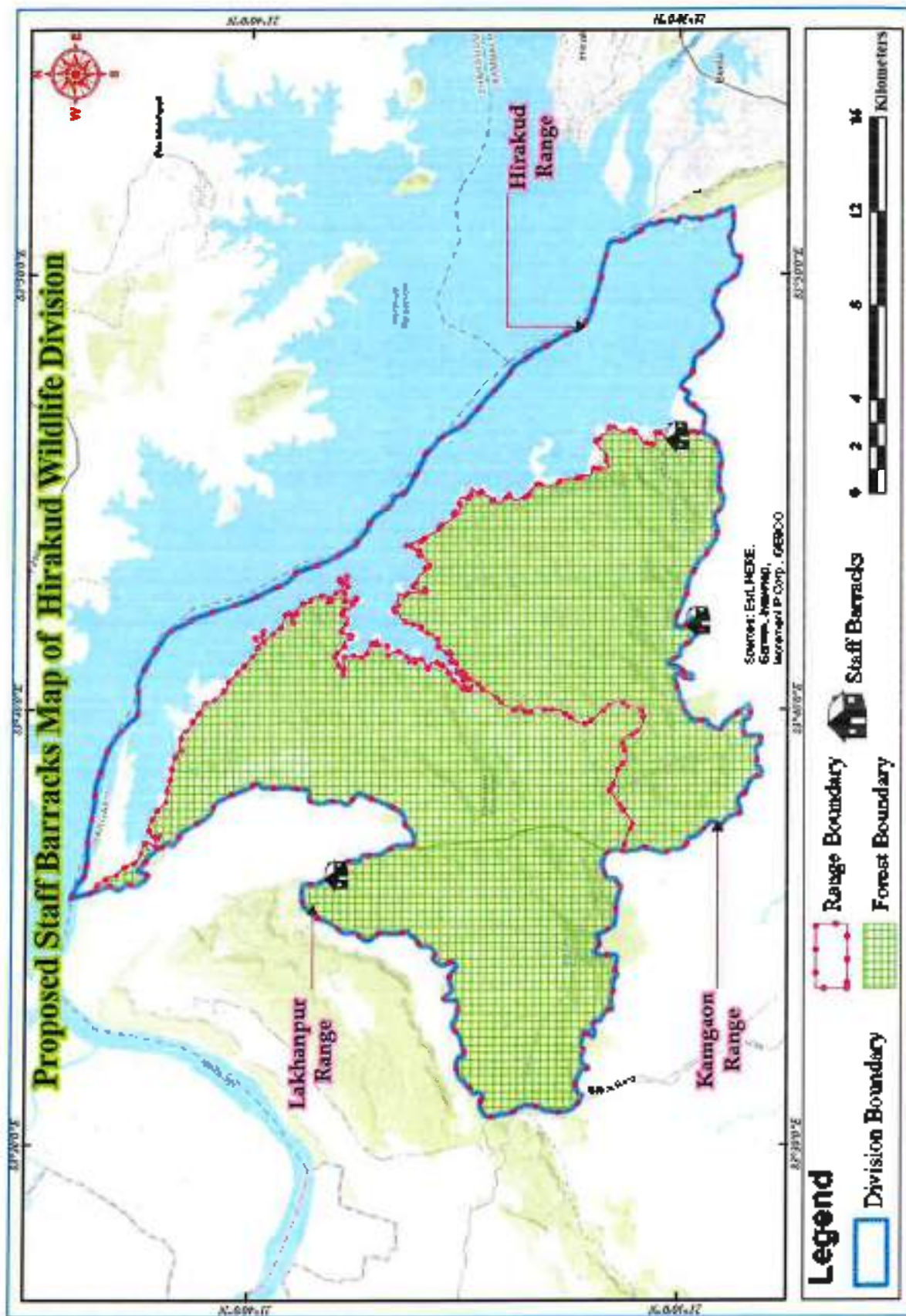


Fig.C.13. Proposed Staff Barracks Map of Hirakud WL Division

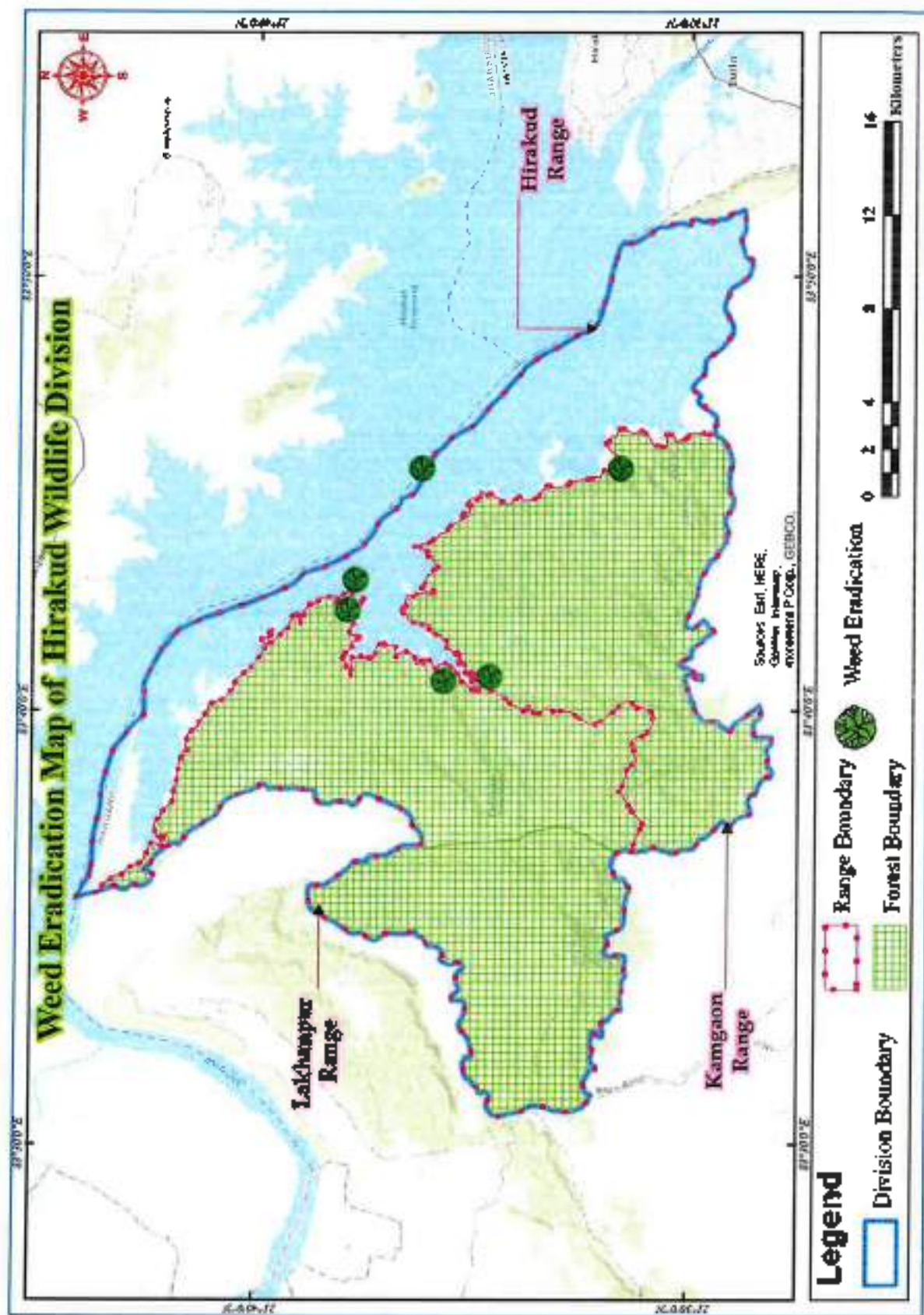


Fig.C.14. Weed Eradication Map of Hinked WL Division

C.3. Sambalpur Forset Division

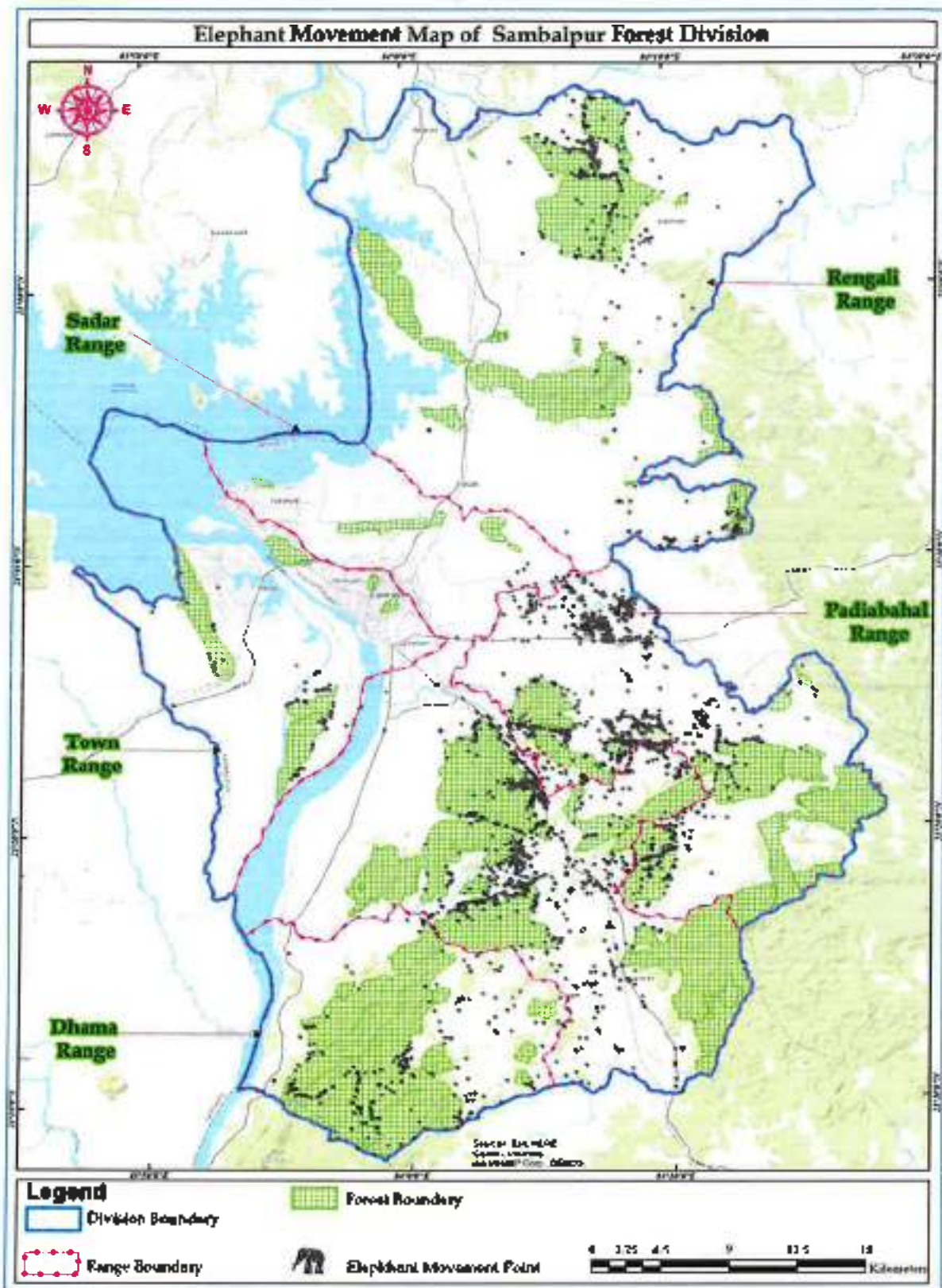
Table:-C.3.

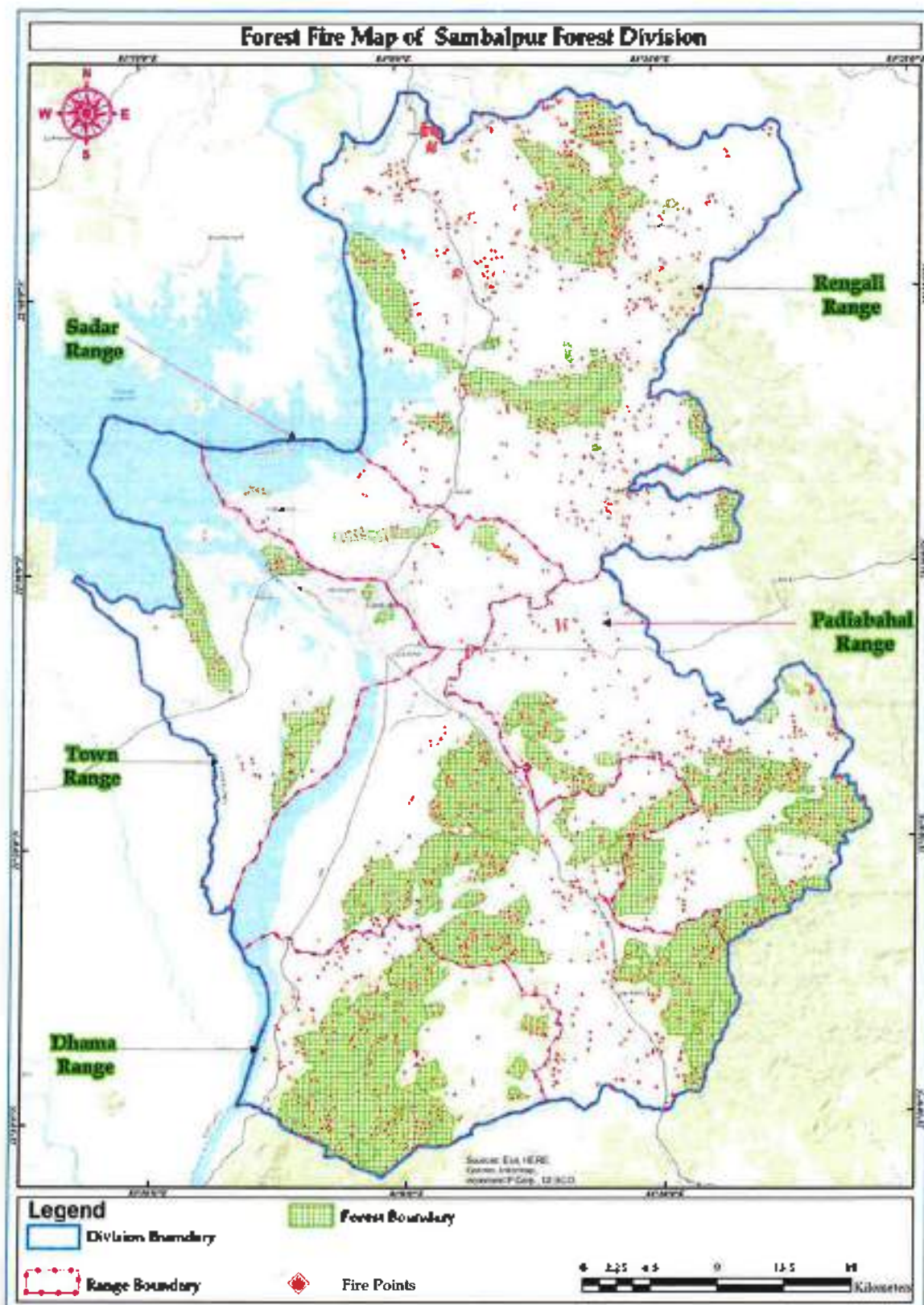
S No	Major Component	Minor Component	Description/	Unit Cost	Total Units	Total Cost	Area of implementation	Y1	Y2	Y3	Y4	Y5
1	Habitat improvement											
1.1	Weed eradication and removal of invasive species					NIL						
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs	6	39	Sadar-Labdera Bolbanga RF, Basiapada Birsingham RF, Rengali- Ghichamura RF, Padiabahal- Chhamunda Kusumara RF, Brahmadungri RF Dhama-Tablai Deogaon RF	10	6.5	6.5	6.5	6.5
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lakh	10	10	List of existing WBs	2	2	2	2	2

1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35 MD/RKM	500 RKM	78.75	100 RKM in each Range	33.75	11.25	11.25	11.25	11.25
		(1.3.2) Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1 lakh/year) + Fire-specific Awareness activities (1 lakh/year) and VSS/SHG incentives @10,000/village for 10 units per Range	16 lakhs/year/unit@range	5 units	400		80	80	80	80	80
1.4	Meadow Development					NIL						
1.5	Soil and Moisture Conservation		SMC works such as LBOD, WLBCD, Percolation Pits etc to augment groundwater retention and prevent soil erosion in forest blocks	50 lakhs lumpsum per year		250	Forest Blocks of Focus Ranges	50	50	50	50	50
	Sub Total					777.75						
2	Awareness and Publicity											
2.1	Important Days Celebration		Celebration of Tiger Day, Elephant Day, Wildlife Week, Environment Day	2 lakhs/year		10	Focus Ranges	2	2	2	2	2
2.2	ANUKAMP A popularization		Popularization of application among public, posting signages & village training of Jan Seva Kendra staff on the app in vulnerable villages	Rs.10,000/v		10	Focus Ranges	2	2	2	2	2

2.3	Targeted HEC Field Meetings	In vulnerable villages regarding animal behavior, cropping pattern changes, hooking and other problems in human-WL interface	Rs.10,000/village		10	Focus Ranges	2	2	2	2	2	2
2.4	Content Creation	Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year		10	Focus Ranges	2	2	2	2	2	2
	Sub Total			40								
3	Infrastructure											
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	3 units	105	Sadar Range, Rengali, Padiabahal	35	35			35
		(3.1.2) Upkeep of barracks/tower	Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	3 units	15	Existing towers and barracks	3	3	3	3	3
3.2	Boat and Jetties	Patrolling Boat				NIL						
		Floating Jetty				NIL						
	Sub Total					120						
4	Field Operations											
4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) year with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/ year		590	5 ranges	118	118	118	118	118

4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lakhs/year		10		2	2	2	2	2	2
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liaison with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs		45		11.4	8.4	8.4	8.4	8.4	8.4
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year		10		2	2	2	2	2	2
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lakhs/unit + 5 % ranges		35		35					
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level		15		3	3	3	3	3	3
4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and iWLMs, filing PR Reports, wildlife operations, tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/year		15		3	3	3	3	3	3
		(4.4.2) Training Programs for RO, ACF	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects.	4 lakhs/year		20		4	4	4	4	4	4





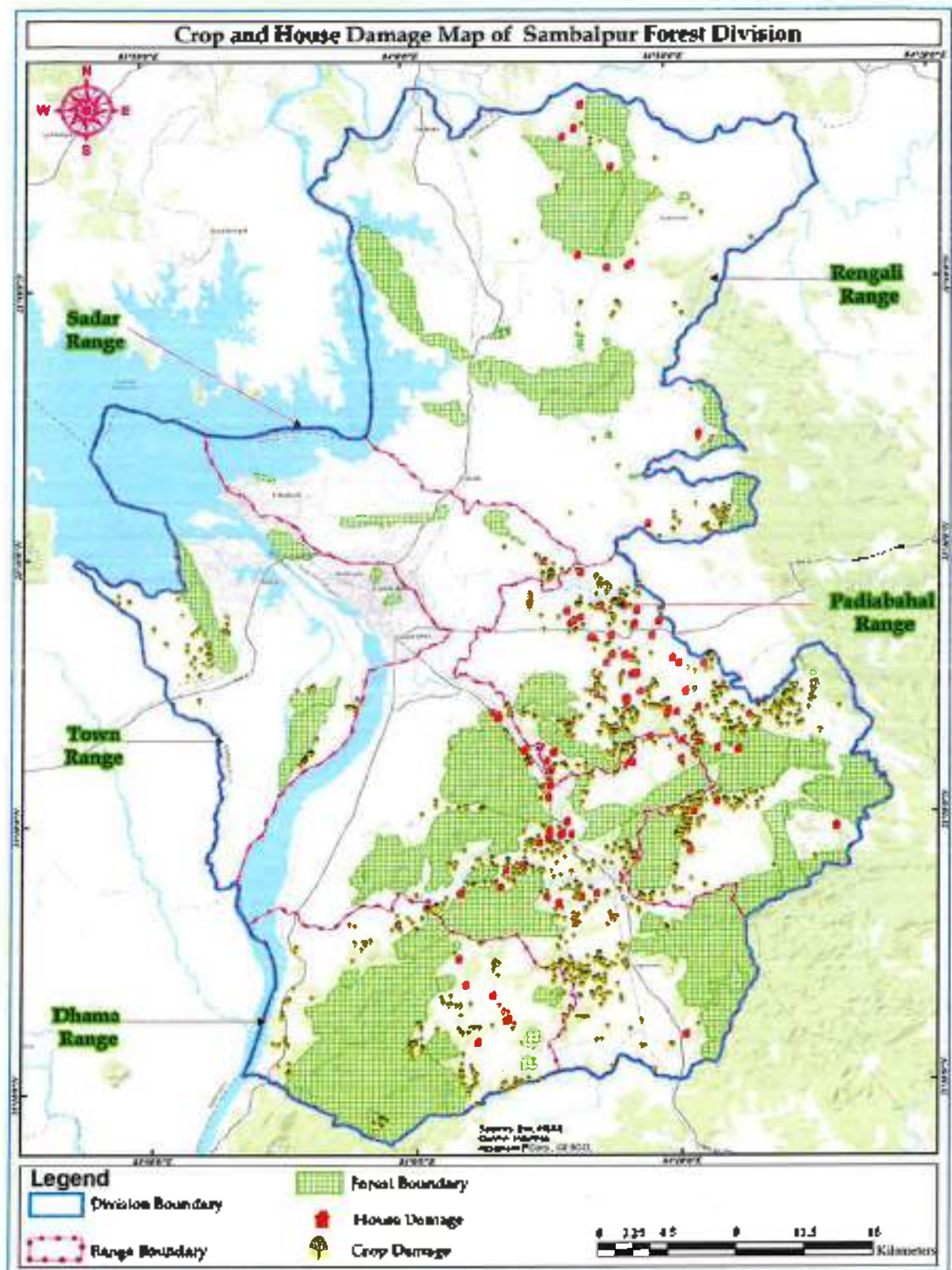
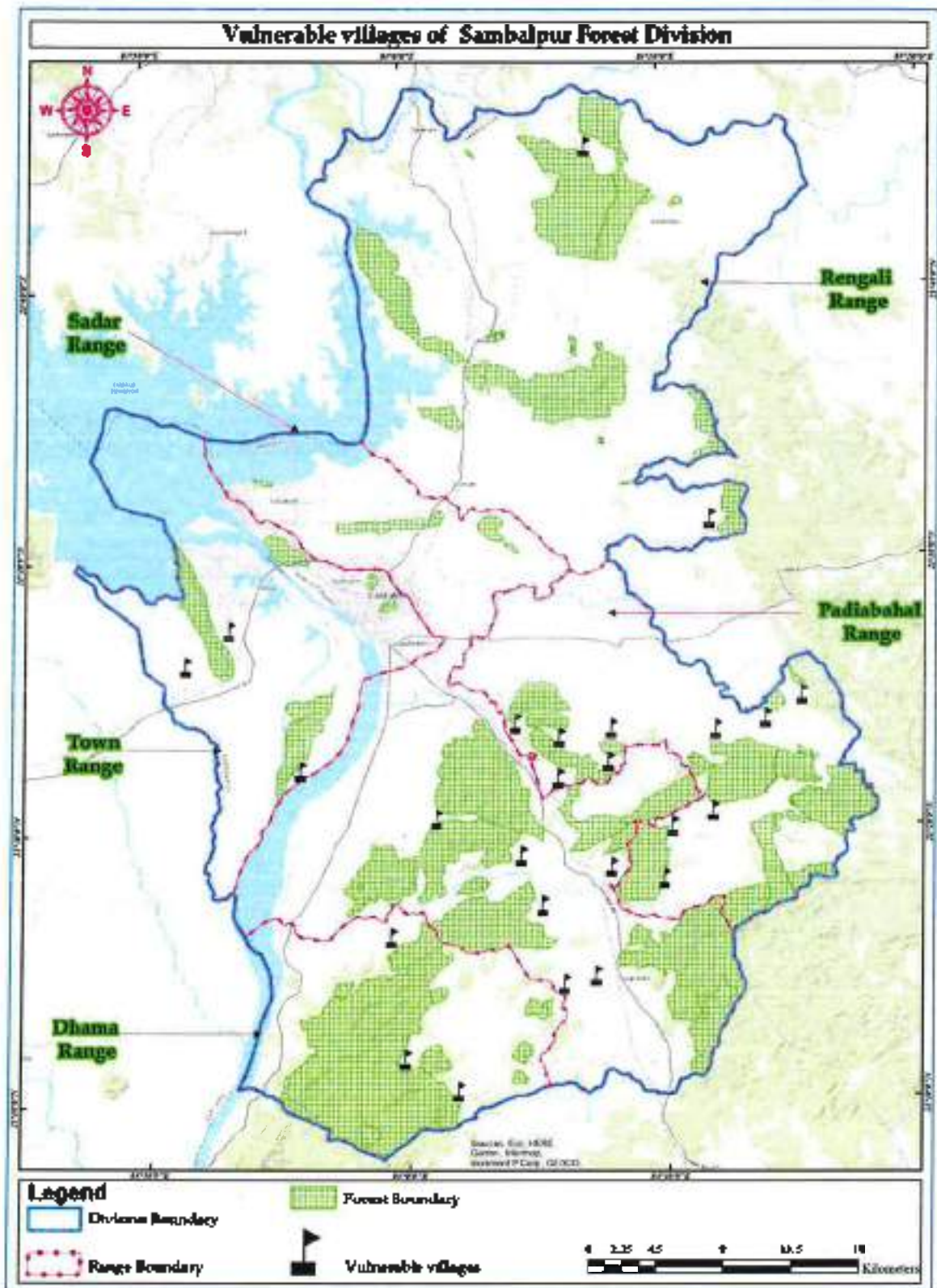
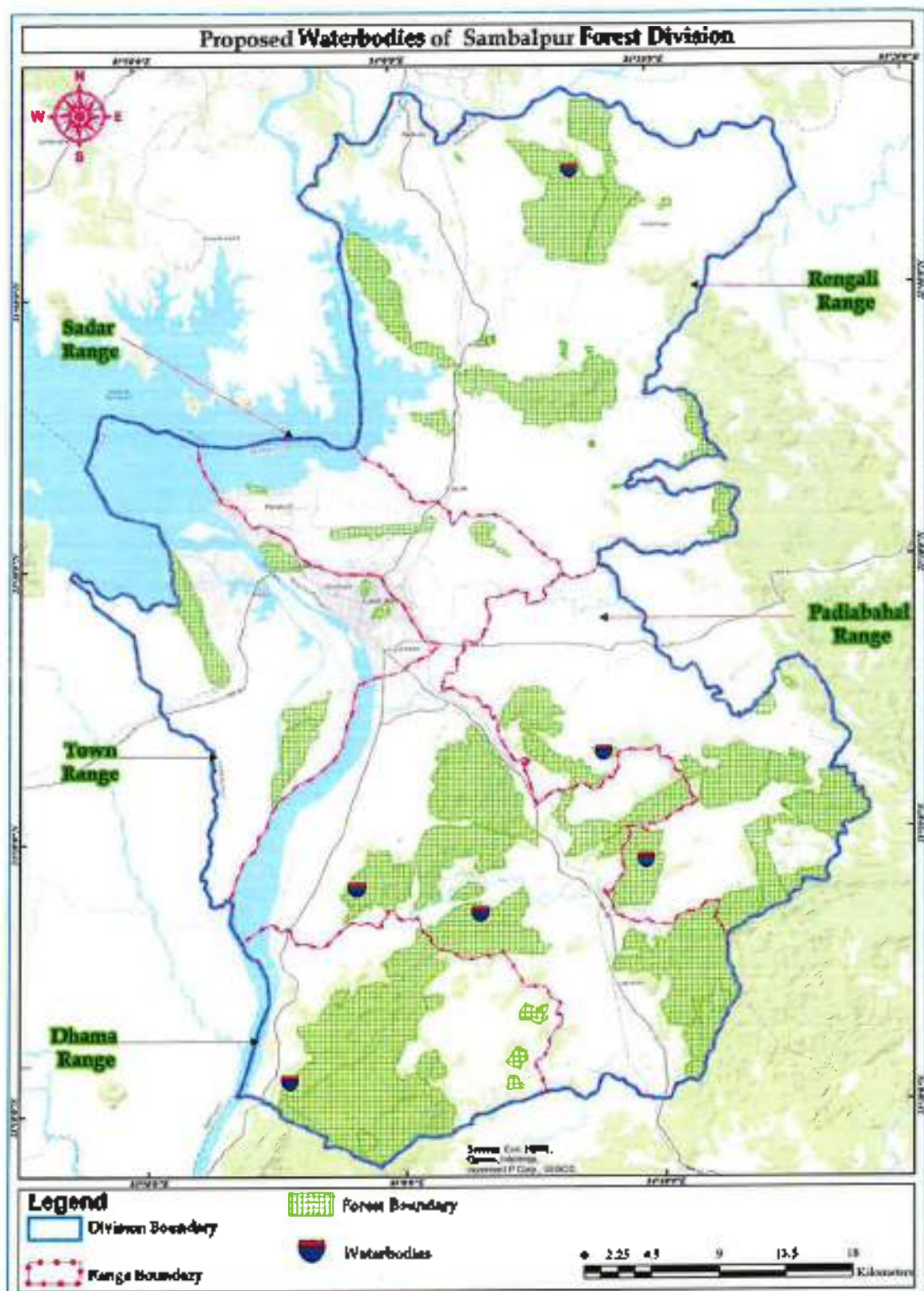
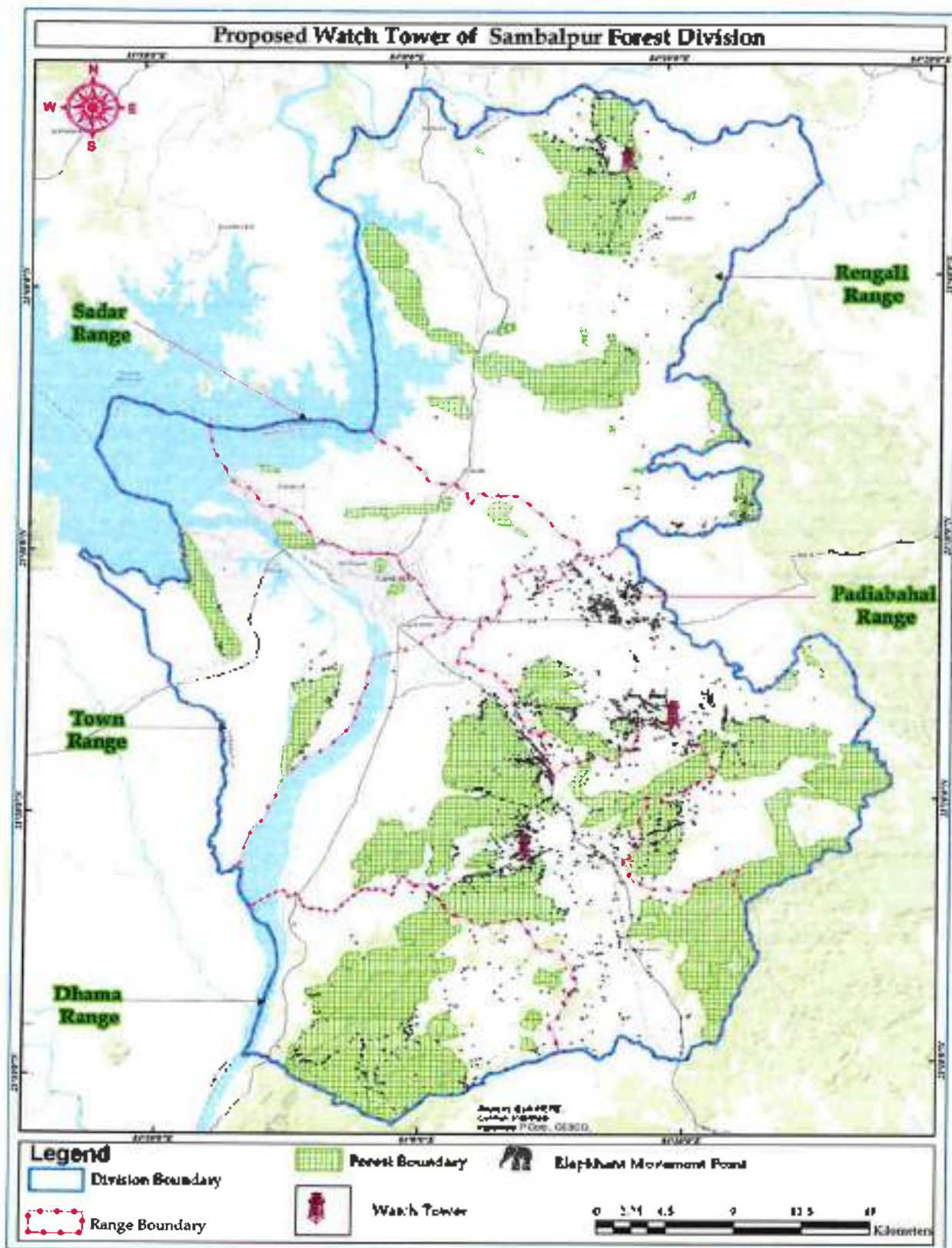


Fig.C.17. Crop and House Damage Map of Sambalpur Forest Division







C.4. Rairakhol Forst Division

Table:-C.4.

S No	Major Component	Minor Component	Description/	Unit Cost	Total Units	Total Cost	Area of implementation	Y1	Y2	Y3	Y4	Y5
1	Habitat improvement											
1.1	Wood eradication and removal of invasive species				NIL		NIL					
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 50x60x3 dimensions for provisioning of water in dry season	20 lakh	6	120	Girishchandra-RF, Redhakot-Hatidhara RF, Badabahal-Rahan RF, Badmal-Mochibahal PRF, Charnal-Landakut RF, Naktideul-Kholgol RF	40	20	20	20	20
		(1.2.2) Renovation	Silt removal and depth enhancement	1 lakh	20 units in 5 years	20		4	4	4	4	4

2.4	Content Creation	Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year		10	Focus Ranges	2	2	2	2	2
	Sub Total				40						
3	Infrastructure										
3.1	Watch tower cum Barracks	(3.1.1) New Towers Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	3 units	105	Chermal Range-01 Berhampur PRF Redhakhol Range-01- Kholgol RF Cpt 25 Naktideul-01-Kholgol RF Cpt 7	35	35			35
		(3.1.2) Upkeep of barracks/tower Provisions of Water, food, utensils, electricity and minor repairs	1 lakh/year	4 units	20	Girishchandra-2 units Badmal-1 Badabahal-1 NIL NIL	4	4	4	4	4
3.2	Boat and Jetties	Patrolling Boat Floating Jetty									
	Sub Total				125						
4	Field Operations										

4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-eum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/ year	All Ranges	708		141. 6	141. 6	141. 6	141. 6	141. 6
4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers in booked OR or Wildlife cases	2 lakhs/year		10		2	2	2	2	2
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (+40%) to help prepare case records, fast track OR/WL cases, liason with Court/PP and legal guidance during operations + 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs		45		11.4	8.4	8.4	8.4	8.4
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year		10		2	2	2	2	2
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape ranges documentation as one-time cost	10 lakhs/unit + 5 %		40		40				
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	5L/year at Division level		25		5	5	5	5	5

4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and IWLMs, filing PR Reports, wildlife operations-tranquilization techniques, arms handling, rescue and rehabilitation etc.	15			3	3	3	3	3	3
		(4.4.2) Training Programs for RO, ACF and DFO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	10			2	2	2	2	2	2
		(4.4.3) Hiring of Vet/Parave/Biologist for field guidance and research	Hiring of Vet/Parave/Biologist for field guidance and research at Rs.50,000 (+40%) month for research, animal treatment, documentation and other purposes	42			8.4	8.4	8.4	8.4	8.4	8.4
	Sub Total			905								
5	Community Engagement											
5.1	Solar lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	50		Vulnerable Villages	10	10	10	10	10	10

5.2	IGA Activities	IGA Activities	Lumpsum at DFO's discretion to contribute/augment existing activities of VSS/SHGs to win confidence of local public in troublesome areas	10 lakhs/year		50	As per Need	10	10	10	10	10	10
5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/year		50	Locations to be studied and decided as per Field Requirements	10	10	10	10	10	10
	Sub Total					150							
6	Division Level Augmentation												
6.1	GIS Cell	(6.1.1) GIS Cell Setup	One-time cost to setup 2 work stations, A3 color printer, subscription of required softwares etc.	10 lakhs		10		10					
		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/year		42		8.4	8.4	8.4	8.4	8.4	8.4
6.2	Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan or implementation, handle social media, process ANI/KAMPA claims, manning Control room, interpret GIS layers etc. @30,000/month (+40%) at Division level	5.04L/year		25.2		5.04	5.04	5.04	5.04	5.04	5.04

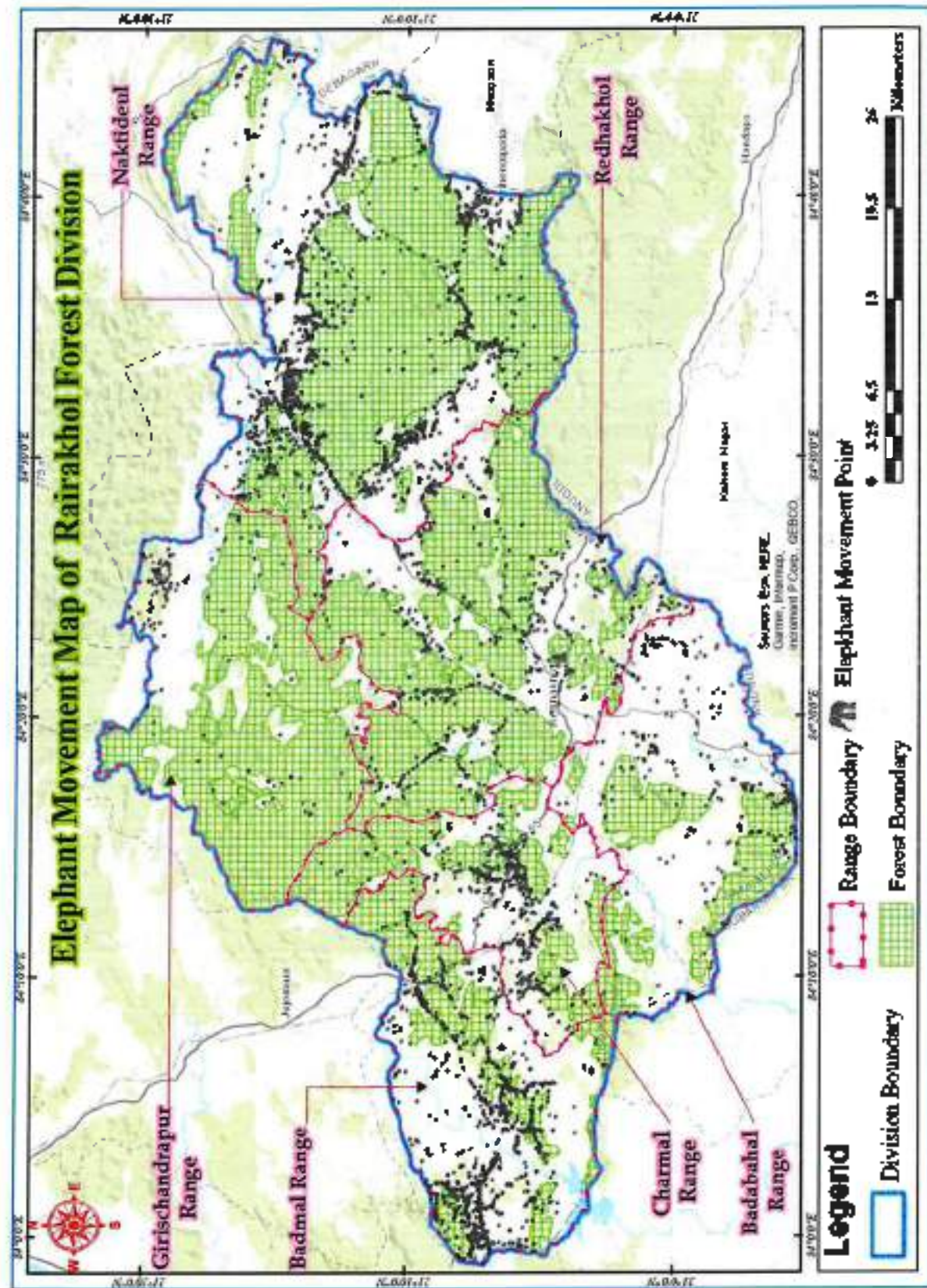


Fig:C.31. Elephant Movement Map of Ratnakhil Forest Division

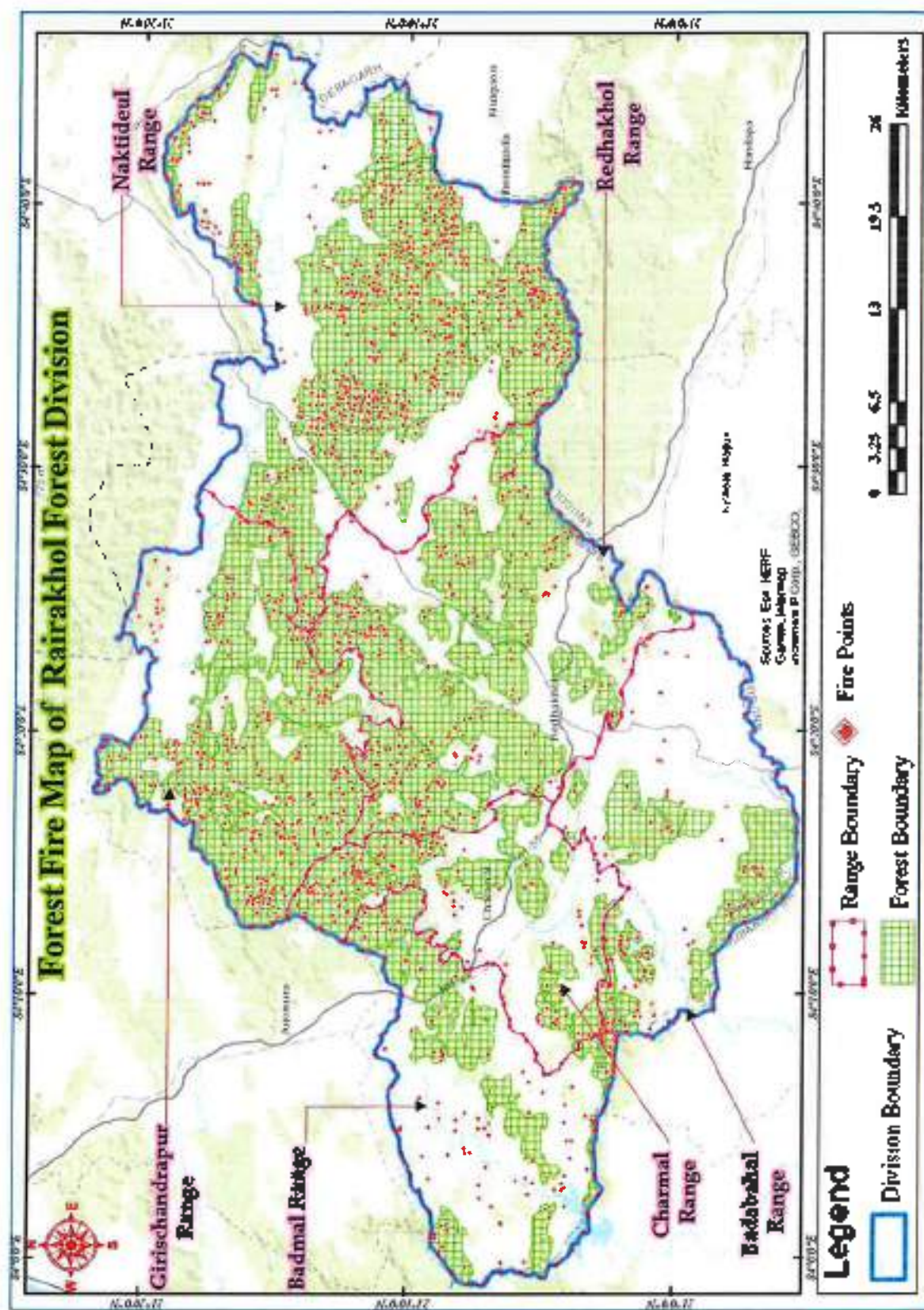


Fig. C.22. Forest Fire Map of Rainyvalley Forest Division

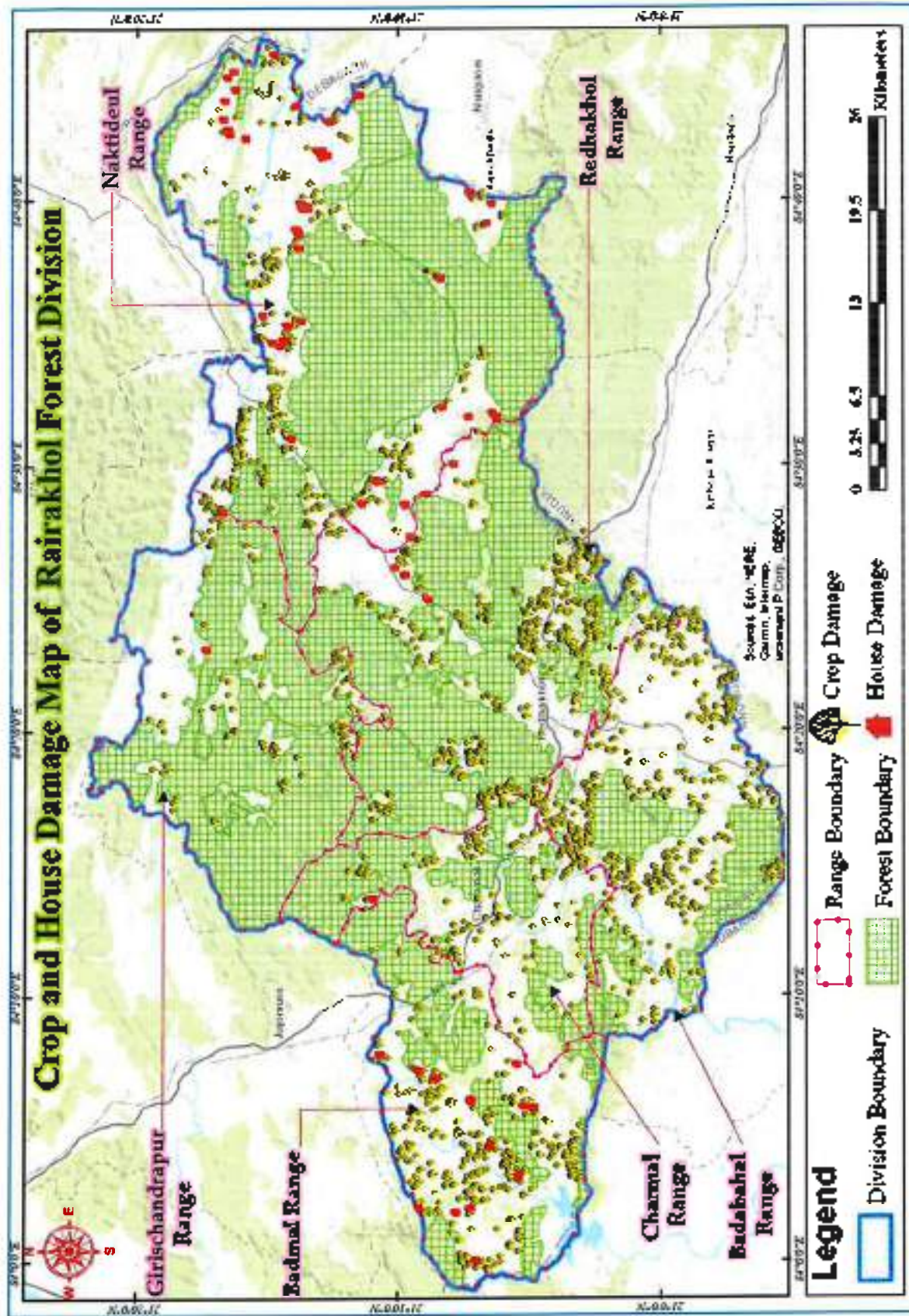


Fig:C.23. Crop and House Damage Map of Rairakhol Forest Division

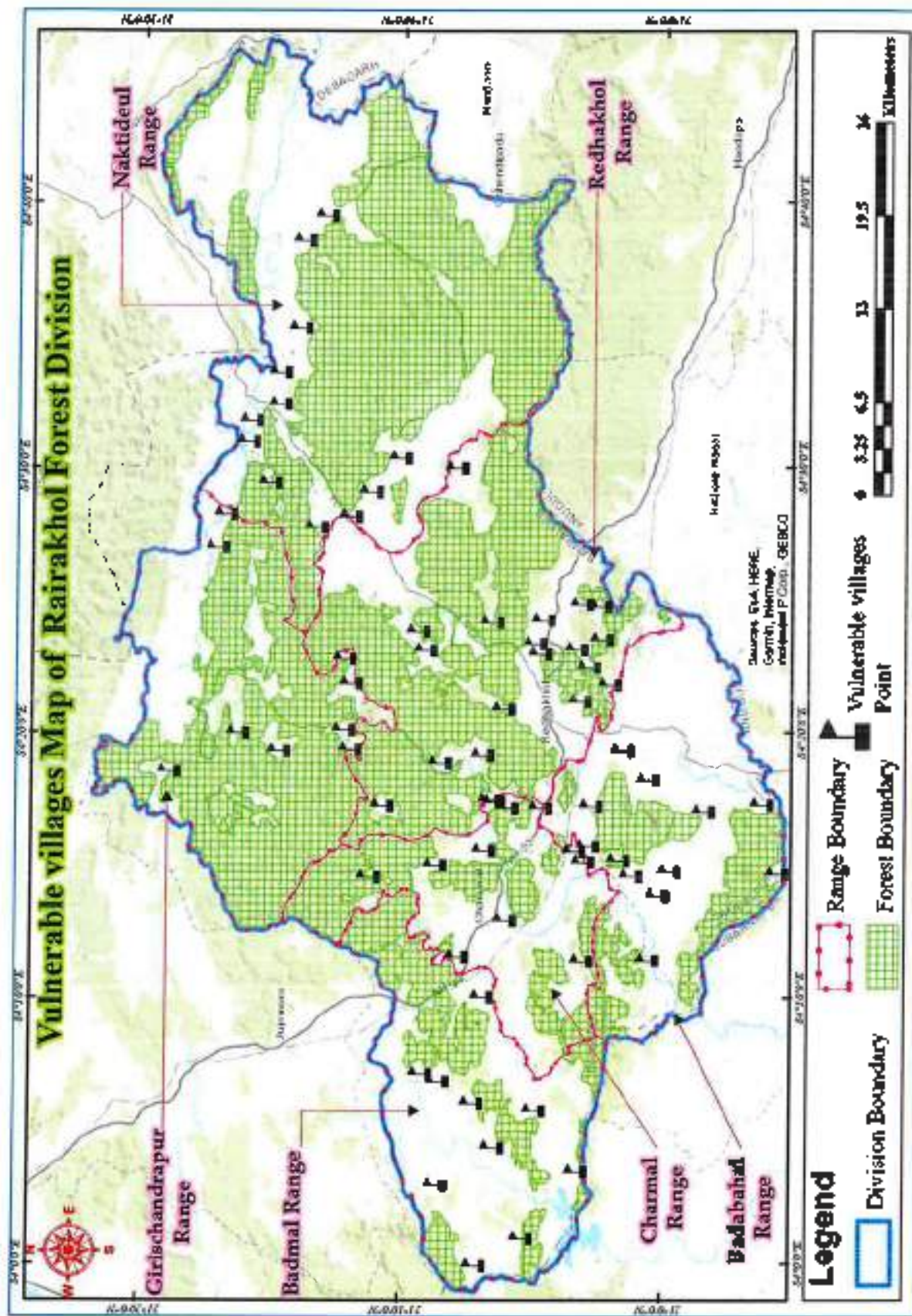


Fig.C.24. Vulnerable Villages Map of Rairakhol Forest Division

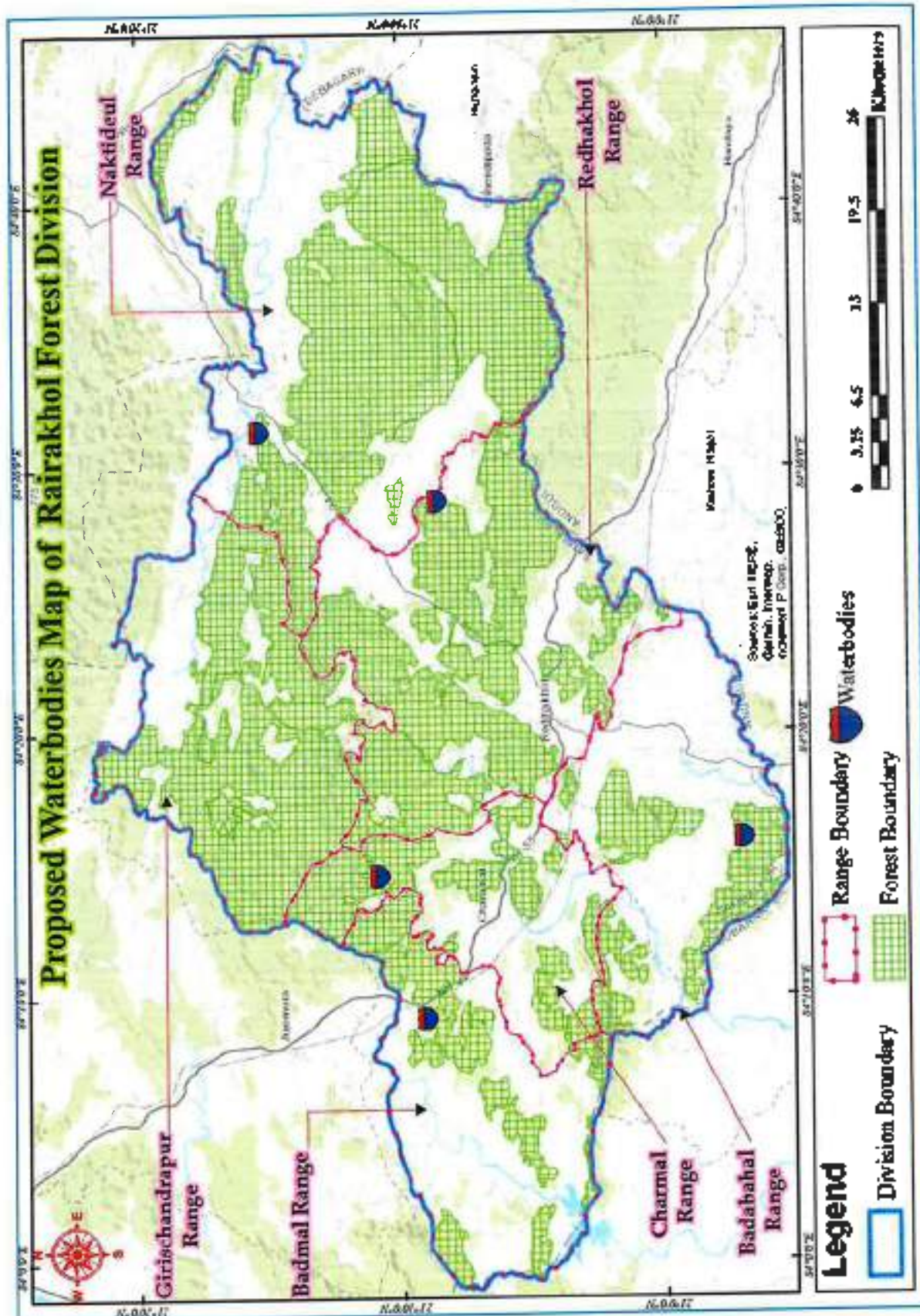


Fig:C.25. Proposed Waterbodies Map of Rairakhol Forest Division

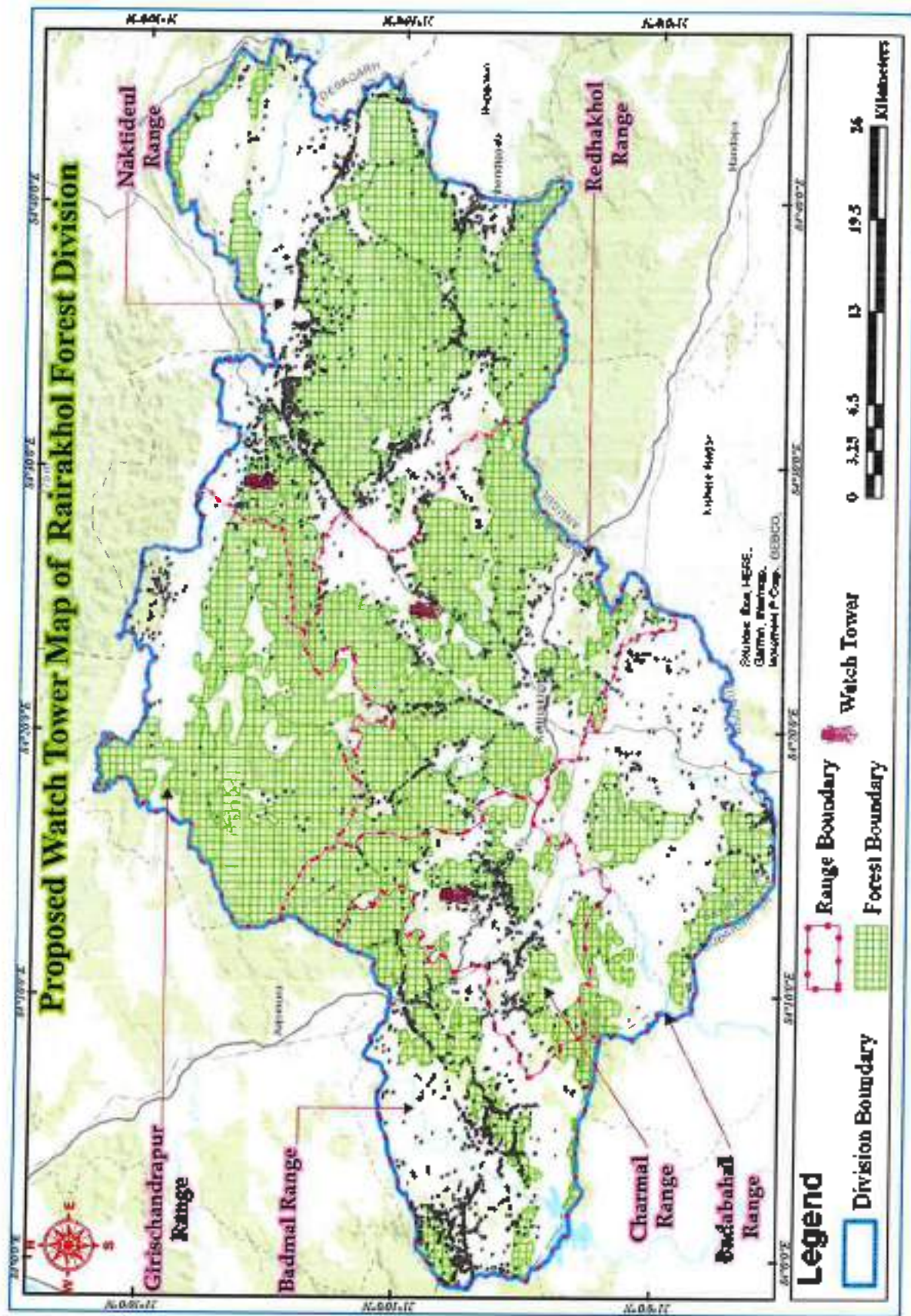


Fig.C.26. Proposed Watch Tower Map of Rairakhol Forest Division

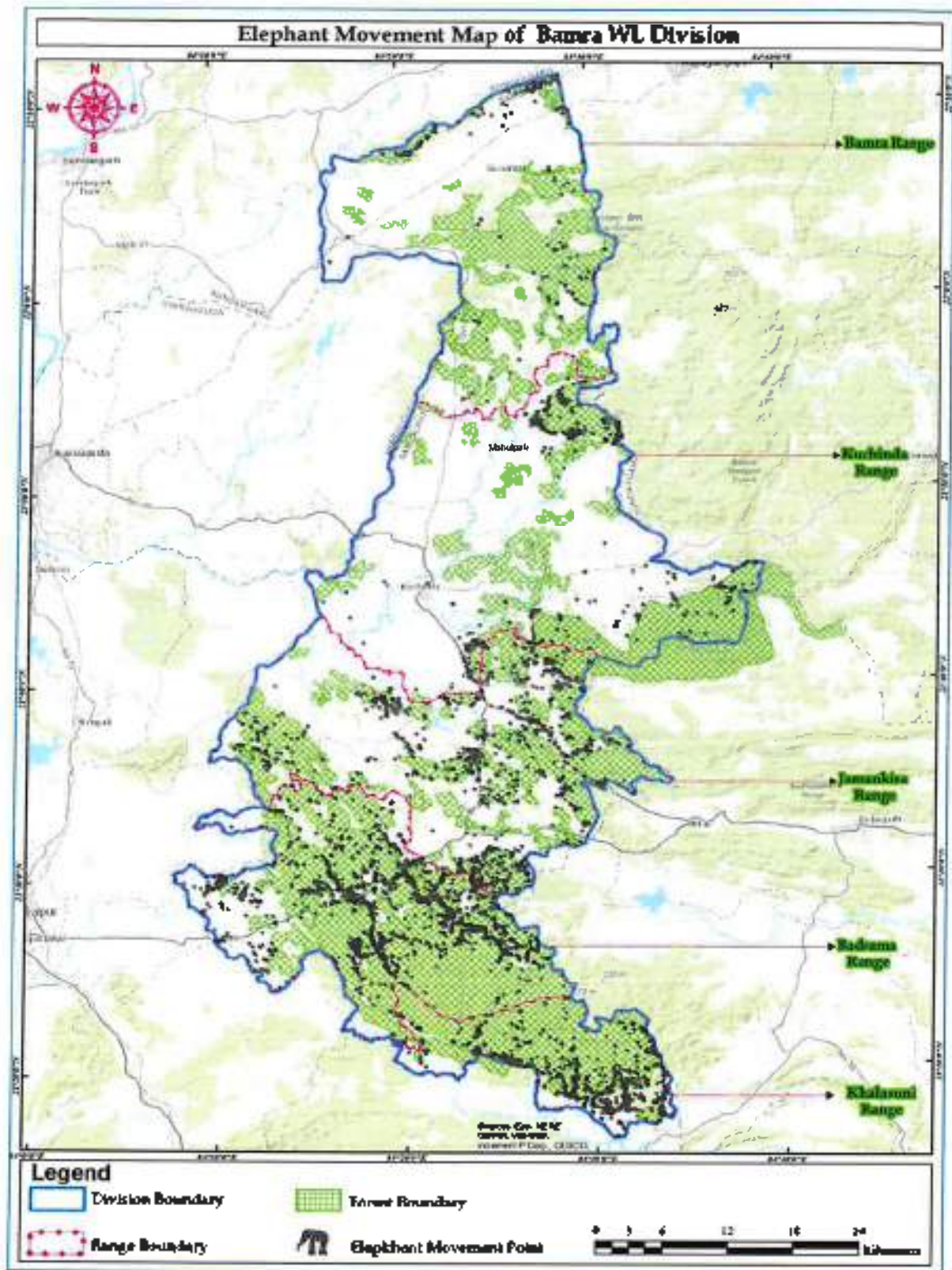
C-5. Bamra WI Division

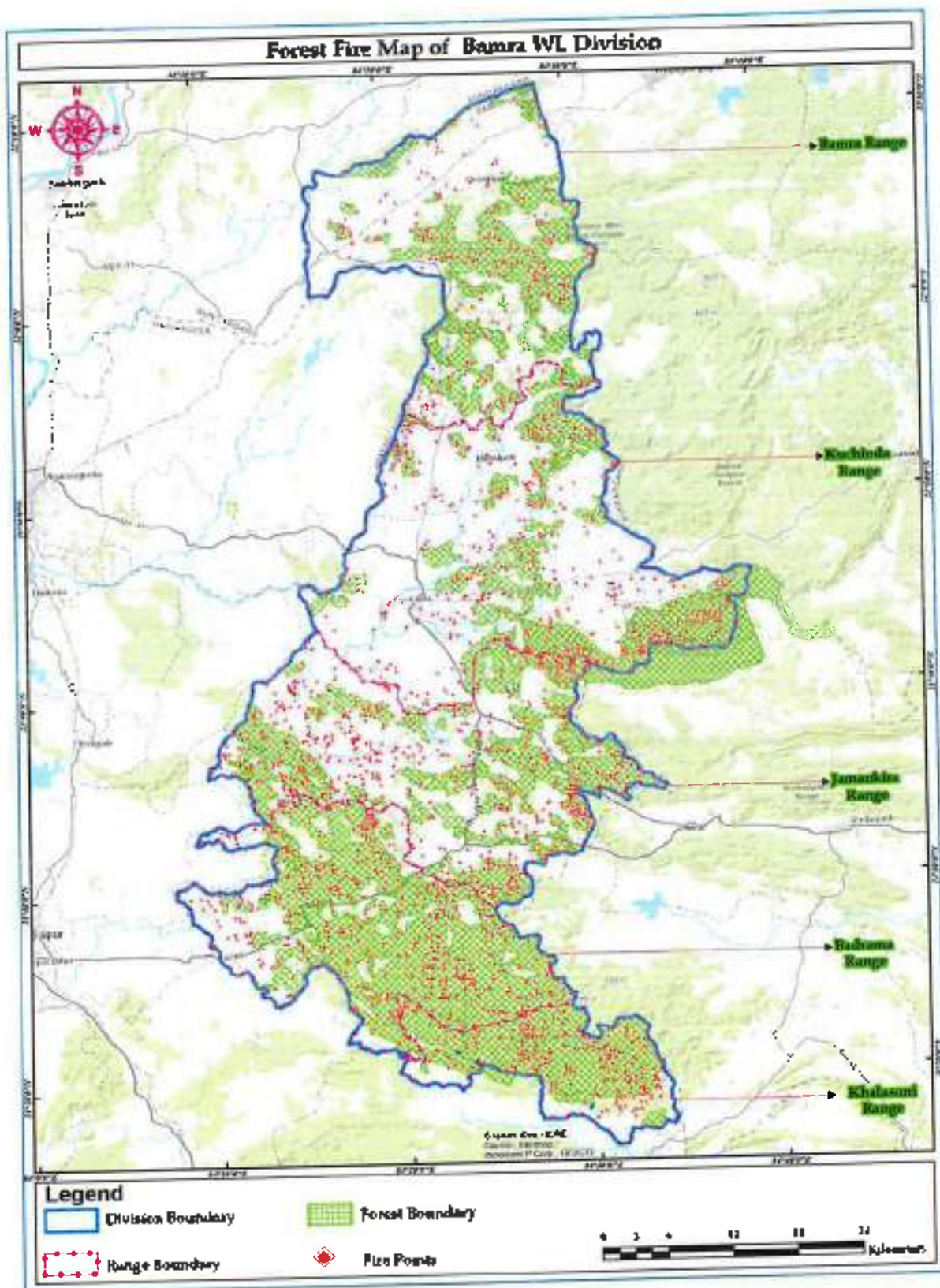
Table-C-5.

S No	Major Component	Minor Component	Description/	Unit Cost	Total Units	Total Cost	Area of implementation	Y1	Y2	Y3	Y4	Y5
1	Habitat improvement							Y1	Y2	Y3	Y4	Y5
1.1	Weed eradication and removal of invasive species					NIL						
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 30x40x3 (or other specified) dimensions for provisioning of water in dry season	6.5 lakhs	5	32.5	Khabasuni-2 Badrama-2 Jamankira-1	6.5	6.5	6.5	6.5	6.5
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lakh	20 units	20		4	4	4	4	4
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35	250 RKM	40	50 RKM each range	17.1 4	5.71	5.71	5.71	5.71
		(1.3.2) Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers (purchase/maintenance) (3L) + POL (1 lakh/year) + Safety Equipment/medicines (1	16		480	All Ranges	96	96	96	96	96

2.4	Content Creation		Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakhs/year		10	Focus Ranges	2	2	2	2	2
	Sub Total					40						
3	Infrastructure											
3.1	Watch tower cum Barracks	(3.1.1) New Towers	Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	2 units	70	Kuchinda-Khajuri RF near Bonai road Bamra- bordering Bonai	35	35			
		(3.1.2) Upkeep of barrack/tower	Provisions of Water, food, utensils, electricity and minor repairs	1 lakhs/year	2 units	10		2	2	2	2	2
3.2	Roads and Causeways	(3.2.1) Road repair and maintenance	Improvement of existing earthen forest roads to Grade 1 metalling for all weather communication	12 lakhs/RK	10 KM	120	Badrama and Khalasuni	24	24	24	24	24
		(3.2.2) Causeways	Vented Causeway inside sanctuary for all weather protection	15 lakhs/unit	3 units	45	Badrama and Khalasuni	15	15			15
	Sub Total					245						
4	Field Operations											

4.1	Protection Squad	Protection Unit	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	590			118	118	118	118	118
4.2	Enforcement	(4.2.1) Intelligence gathering (4.2.2) Hiring of Legal Expert	Intelligence to Informers in 2 booked OR or Wildlife cases lakhs/year 1 Legal expert @50,000/month (+40%) to help prepare case + one-time records, fast track OR/WL cases, liason with Court/PP and one-time legal guidance during operations + 1 time cost to setup a legal cell with resources	10	NIL		2	2	2	2	2
				45			11.4	8.4	8.4	8.4	8.4
		(4.2.3) Logistical costs	Transport of animal/carcass, 2 apprehending and lodging of offenders and other logistical costs during case operations	10			2	2	2	2	2
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at 10 Division level or other micro-drones (5L) at range level for tracking landscape ranges documentation as one-time cost	35			35				
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any level miscellaneous items	25			5	5	5	5	5





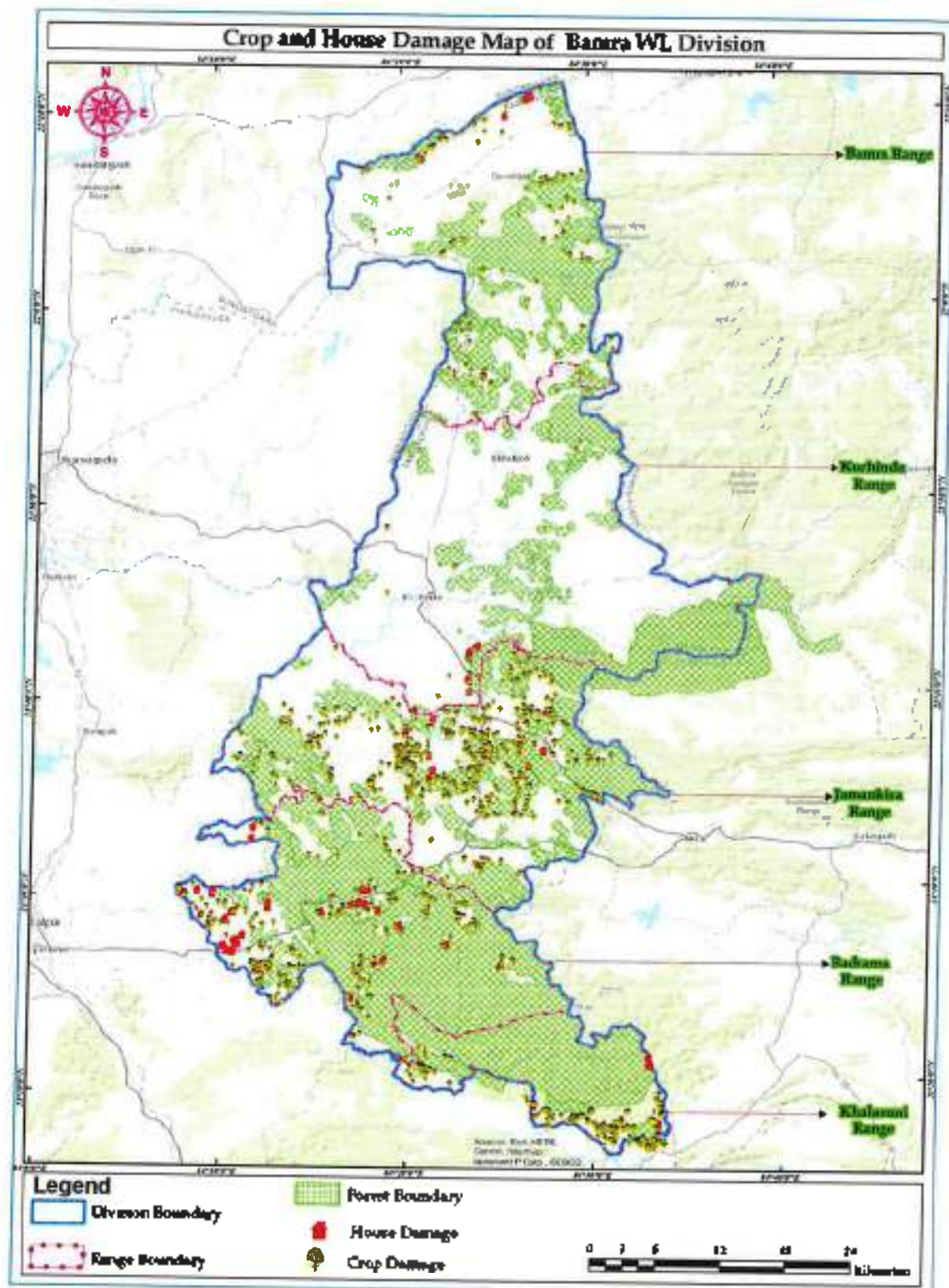
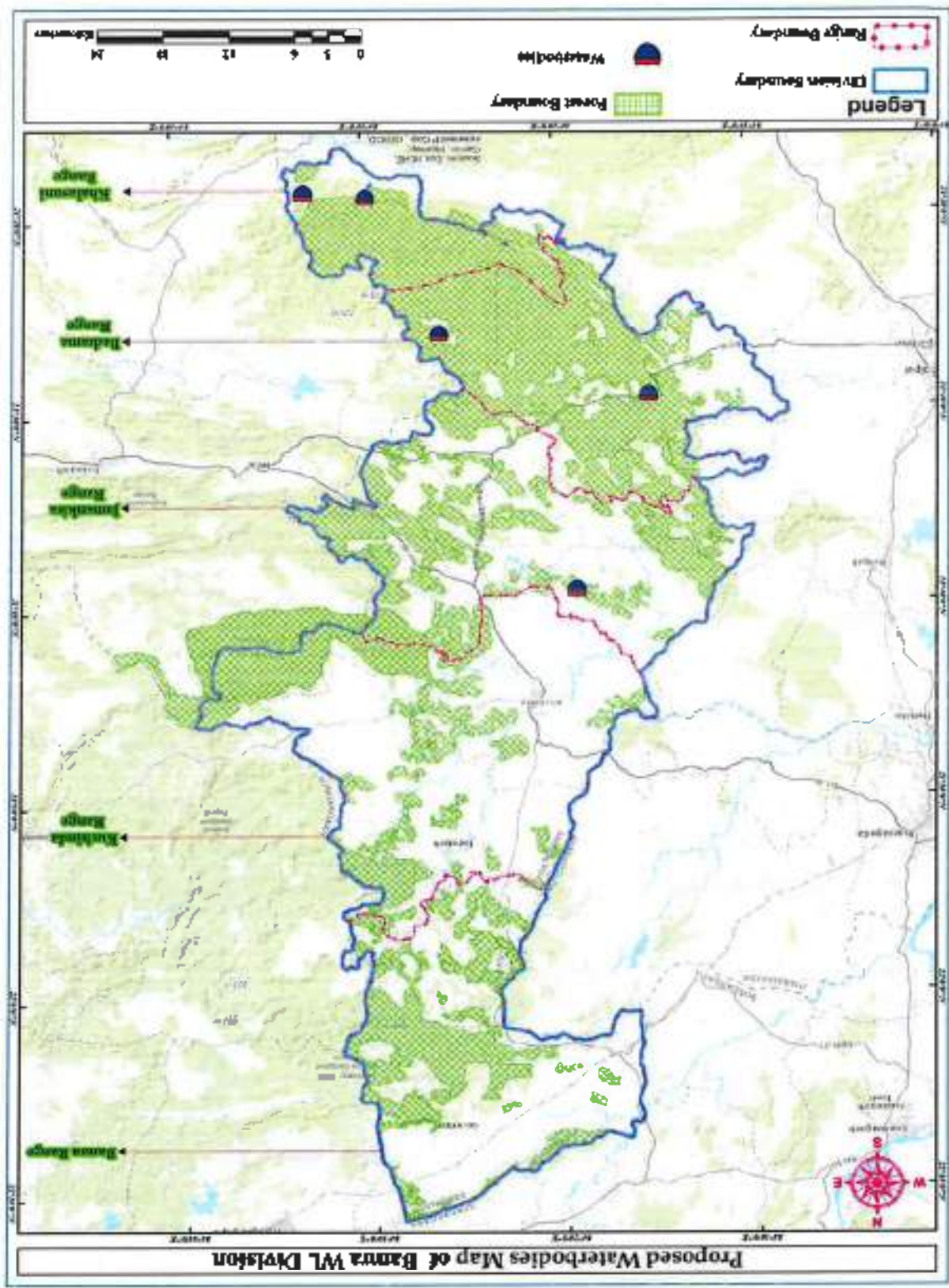
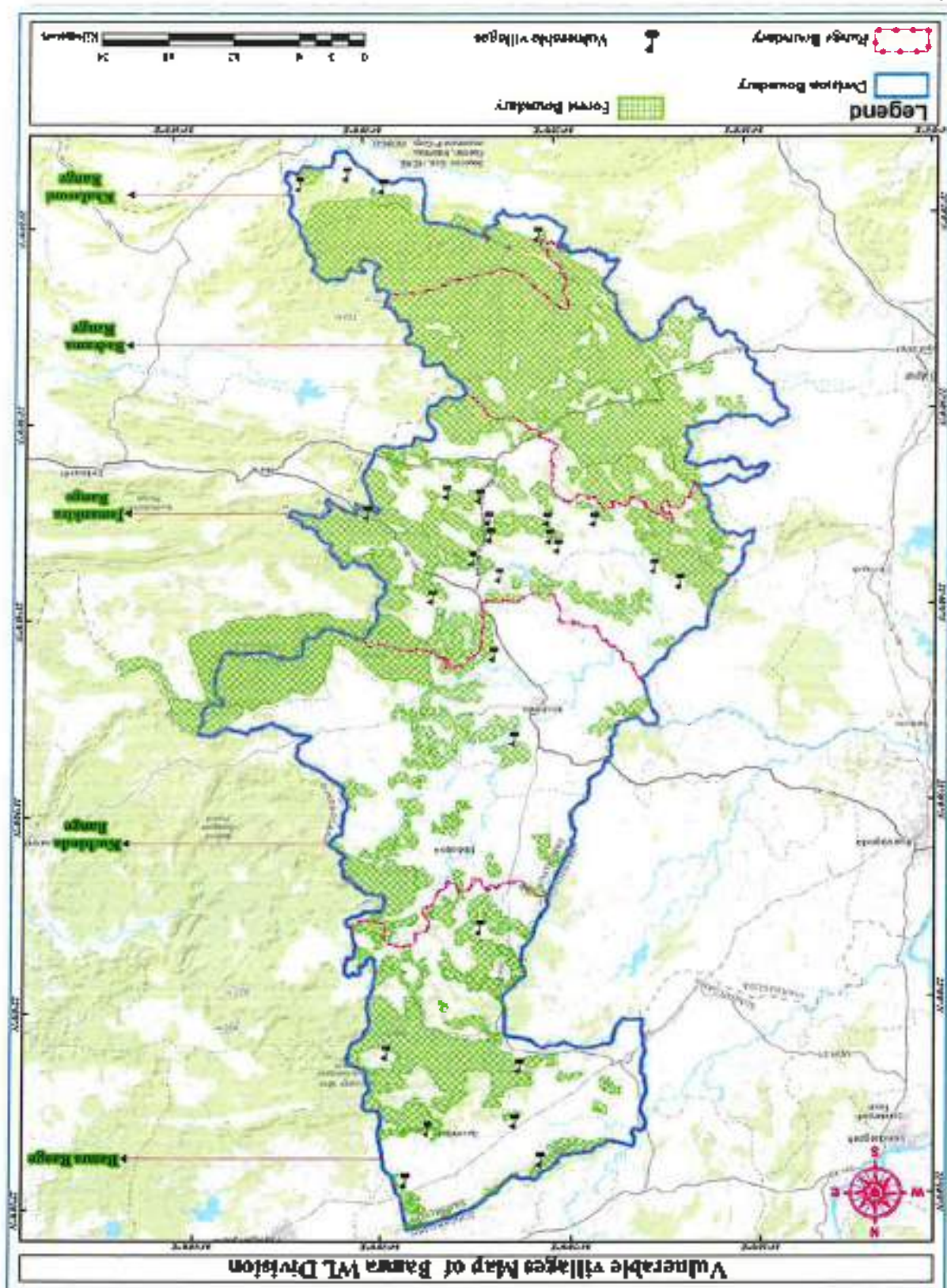
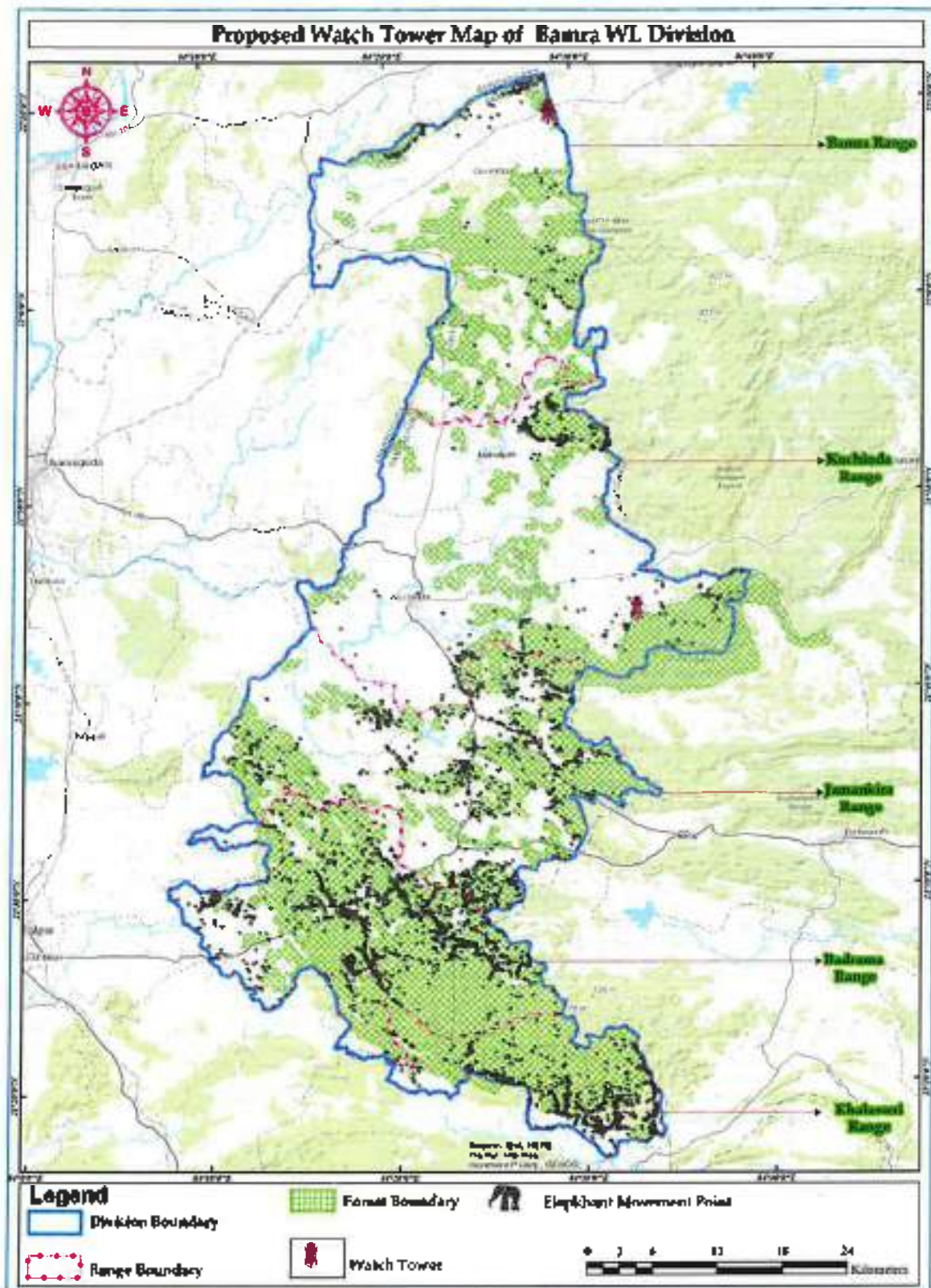


Fig:C.29. Crop and House Damage t Map of Banra WL Division

Fig:C-31. Proposed Watersheds Map of Banura WL Division







C.6. Jharsuguda Forest Division

Table: C.6.

S No	Major Component	Minor Component	Description/	Unit	Total Units	Total Cost	Area of Implementation	Y1	Y2	Y3	Y4	Y5
1	Habitat improvement											
1.1	Weed eradication and removal of invasive species					NIL						
1.2	Excavation of water bodies	(1.2.1) New waterbodies	Waterbody of 80x60x3 dimensions for provisioning of water in dry season	20 lakhs	4	80	Kolabira and Bagdini range	20	20	20	20	0
		(1.2.2) Renovation of existing WBs	Silt removal and depth enhancement	1 lakh	20	20		4	4	4	4	4
1.3	Fire Management	(1.3.1) Fireline	Fireline Creation (15 MD/RKM) and Maintenance (5MD x 4 years)	35 MD/RKM	400	63		27	9	9	9	9
		(1.3.2) Fire Unit	10 Squad members (6.75 L) + 1 vehicle with fuel (2.25) for 5 months + 5 blowers ar/unit@ (purchase/maintenance) (3L) + range POL (1 lakh/year) + Safety	17		425	All Ranges	85	85	85	85	85

2.4	Content Creation	Songs, Posters, Calendars, Magazines, Pamphlets and IEC materials	2 lakh/year	10	Focus Ranges	2	2	2	2	2
	Sub Total			40						
3	Infrastructure									
3.1	Watch tower cum Barracks	(3.1.1) New Towers Concrete tower with 4 attached rooms for squad stay along with solar power for self-sufficiency	35 lakhs/unit	175	5 Ranges	35	35	35	35	35
		(3.1.2) Upkeep of Water, food, utensils, electricity and minor repairs barrack/tower	1 lakh/year	25		5	5	5	5	5
3.2	Boat and Patrolling Jetties			NIL						
	Floating Jetty			NIL						
	Sub Total			200						
4	Field Operation									
4.1	Protection Squad	PU defined as 10 members ADS-cum-protection Squad (16.2L) with Vehicle with (5.4L) + ADS Equipment/uniforms (2L/year)= 23.6L/year	23.6L/unit/year	590	Focus Ranges	118	118	118	118	118

4.2	Enforcement	(4.2.1) Intelligence gathering	Intelligence to Informers booked OR or Wildlife cases	2 lakhs/year	10	NIL	2	2	2	2	2
		(4.2.2) Hiring of Legal Expert	1 Legal expert @50,000/month (~40%) to help prepare case records, fast track OR/WL cases, liaison with Court/PP and legal guidance during operations - 1 time cost to setup a legal cell with resources	8.4L/year + one-time 3 lakhs	45	NIL	11.4	8.4	8.4	8.4	8.4
		(4.2.3) Logistical costs	Transport of animal/carcass, apprehending and lodging of offenders and other logistical costs during case operations	2 lakhs/year	10		2	2	2	2	2
4.3	Monitoring Equipment	(4.3.1) Monitoring Equipment	Thermal Drones (10L) at Division level or other micro-drones (5L) at range level for tracking, landscape documentation as one-time cost	10 lakhs/unit (2 units) + 5 x ranges	45		45				
		(4.3.2) RRT Equipment	Animal handling equipment such as trap cages, dart guns, stun guns and any miscellaneous items	3L/year at Division level	15		5	5	5	5	5
4.4	Training & Research	(4.4.1) Training Programs for Field Staff	Handling drones and technical equipment, app usage such as ANUKAMPA and iWLMS, filing PR Reports, wildlife operations- tranquilization techniques, arms handling, rescue and rehabilitation etc.	3 lakhs/year	15		3	3	3	3	3

	(4.4.2) Training Programs for RO, ACF and DPO	Eminent resource persons to train in PR preparation, CDR analysis and techniques, legal aspects, surveillance, crime scene investigation	2	10	NIL	2	2	2	2	2
	(4.4.3) Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%/month for research, animal treatment, documentation and other purposes	Hiring of Vet/Paravet/Biologist for field guidance and research at Rs.50,000 (+40%/month for research, animal treatment, documentation and other purposes	8.4L/yea	42		8.4	8.4	8.4	8.4	8.4
	Sub Total			782						
5	Community Engagement									
5.1	Solar Lights	High Mast Solar lights	40 feet high masts to illuminate large public areas, typically one per village or 20 feet high to provide street lighting	10	Vulnerable Villages	10	10	10	10	10
5.2	IGA Activities	IGA Activities	Lumpsum at DPO's discretion to contribute/augment existing lakhs/ye activities of VSS/SHGs to win confidence of local public in troublesome areas	50	As per Need	10	10	10	10	10

5.3	Wildlife and HEC Barriers	Solar fencing and EPT	Solar fence built around habitation assets to prevent elephant ingress or EPT built parallel to elephant movement path at the edge of the forest blocks to discourage wandering	10 lakhs/ye	50	Locations studied as per Requirements	10	10	10	10	10
	Sub Total				150						
6	Division Level Augmentation										
6.1	GIS Cell	(6.1.1) GIS Cell Setup	One-time cost to setup 2 work stations, A3 color printer, subscription of required softwares etc.	10 lakhs	10		10				
		(6.1.2) GIS Technician	Salary @Rs. 50,000/month (+40%) for Masters qualified GIS experts	8.4L/ye	42		8.4	8.4	8.4	8.4	8.4
6.2	Multi-Tasking Squad	Highly skilled or more wages	Staff to monitor plan implementation, handle social media, process ANUKAMPA claims, manning Control room, interpret GIS layers etc. @30,000/month (+40%) at Division level	5.04L/ye	25.2	Focus Ranges	5.04	5.04	5.04	5.04	5.04
6.3	Equipment Purchases	IT equipment	IT equipment, inverters, provisions etc. at Division level	3L/year	15		3	3	3	3	3
	Sub Total				92.2						

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[Signature]
Divisional Forest Officer
Marsyuguda Forest Division

[Signature]
Regional Chief Conservator of Forests
Samahpur

Principal Chief Conservator of Forests
(Wildlife) & Chief Wildlife Warden
Odisha, Bhubaneswar

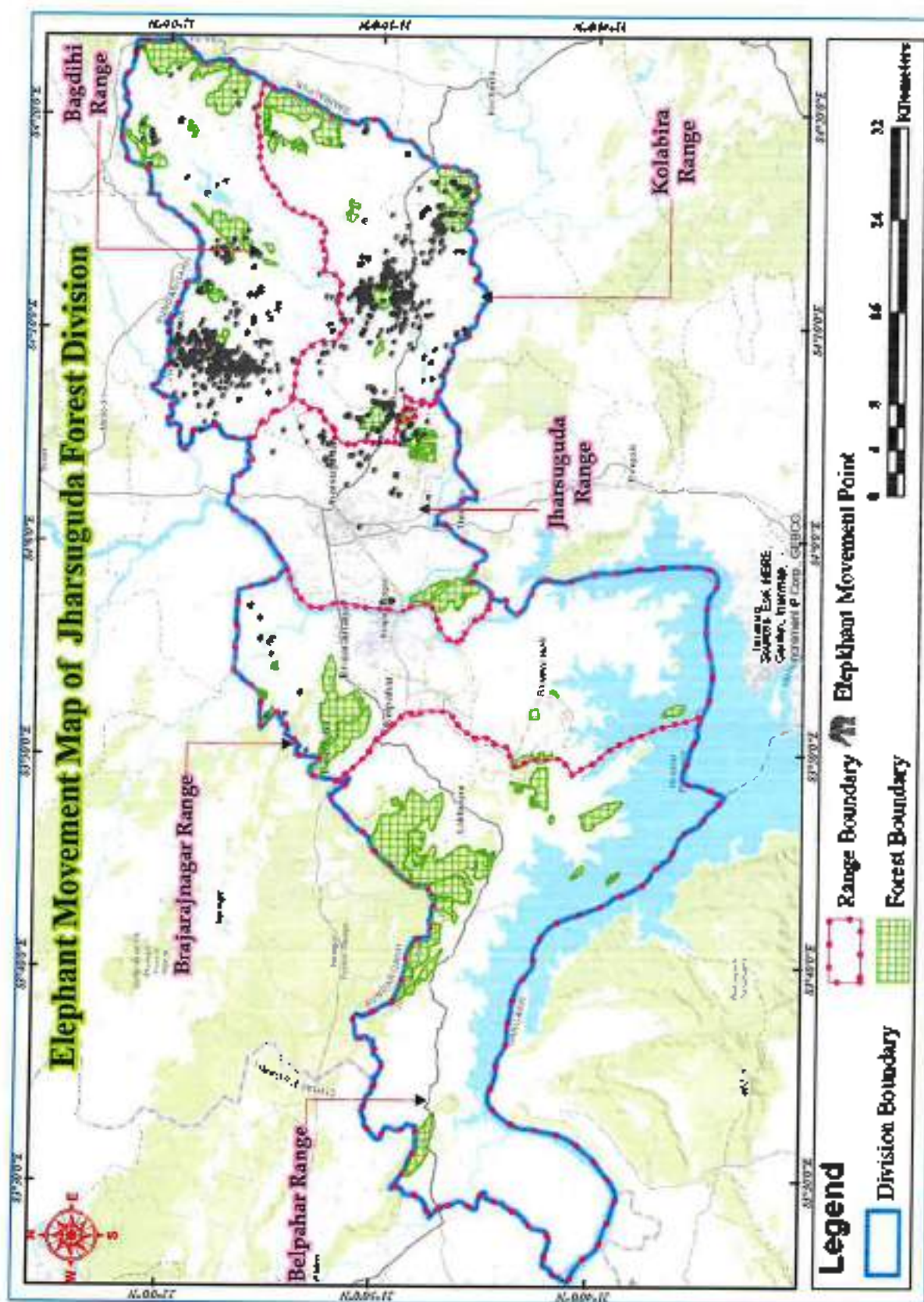


Fig:C-33. Elephant Movement Map of Jharuguda Forest Division

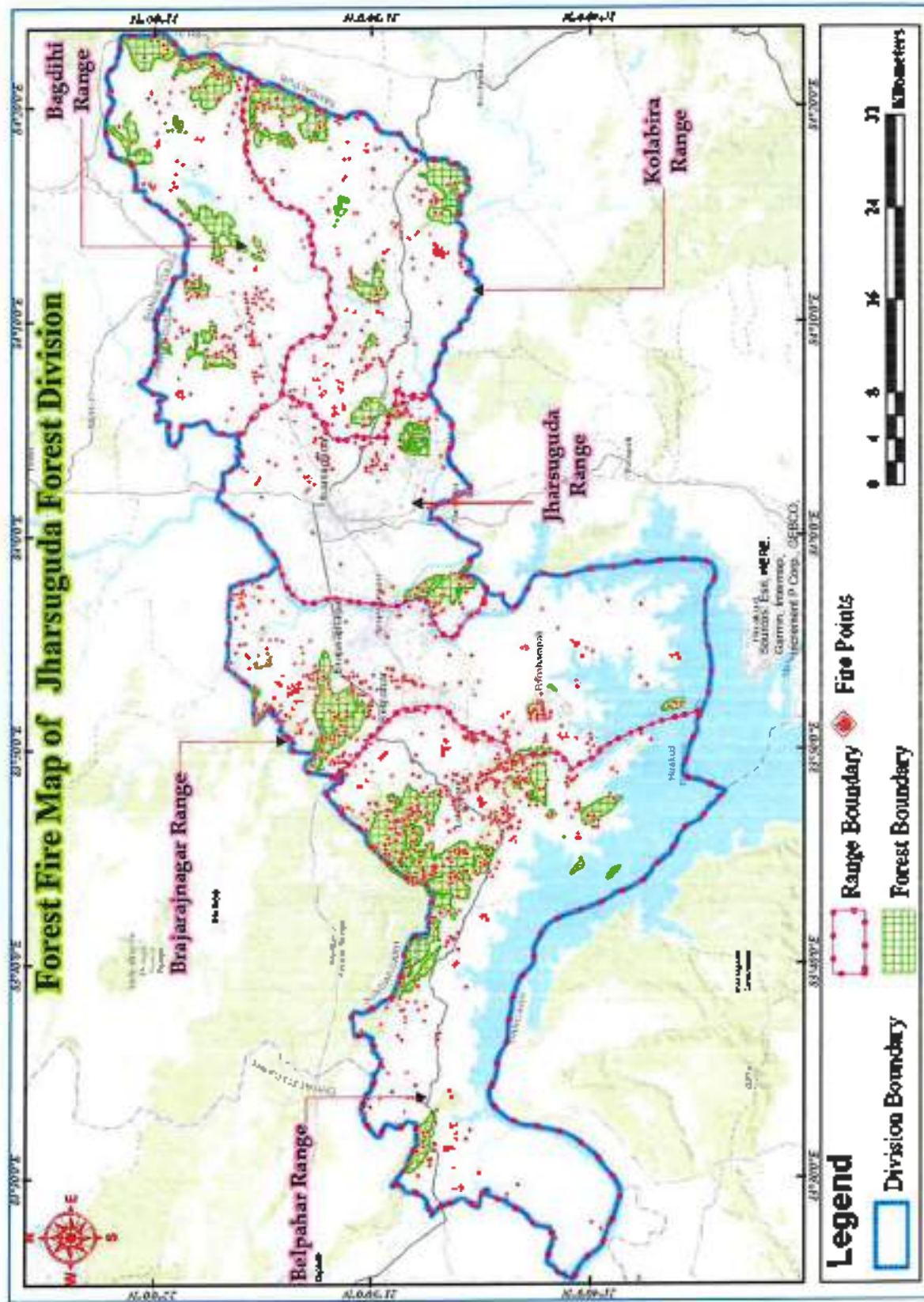


Fig:C-34. Forest Fire Map of Jharsuguda Forest Division

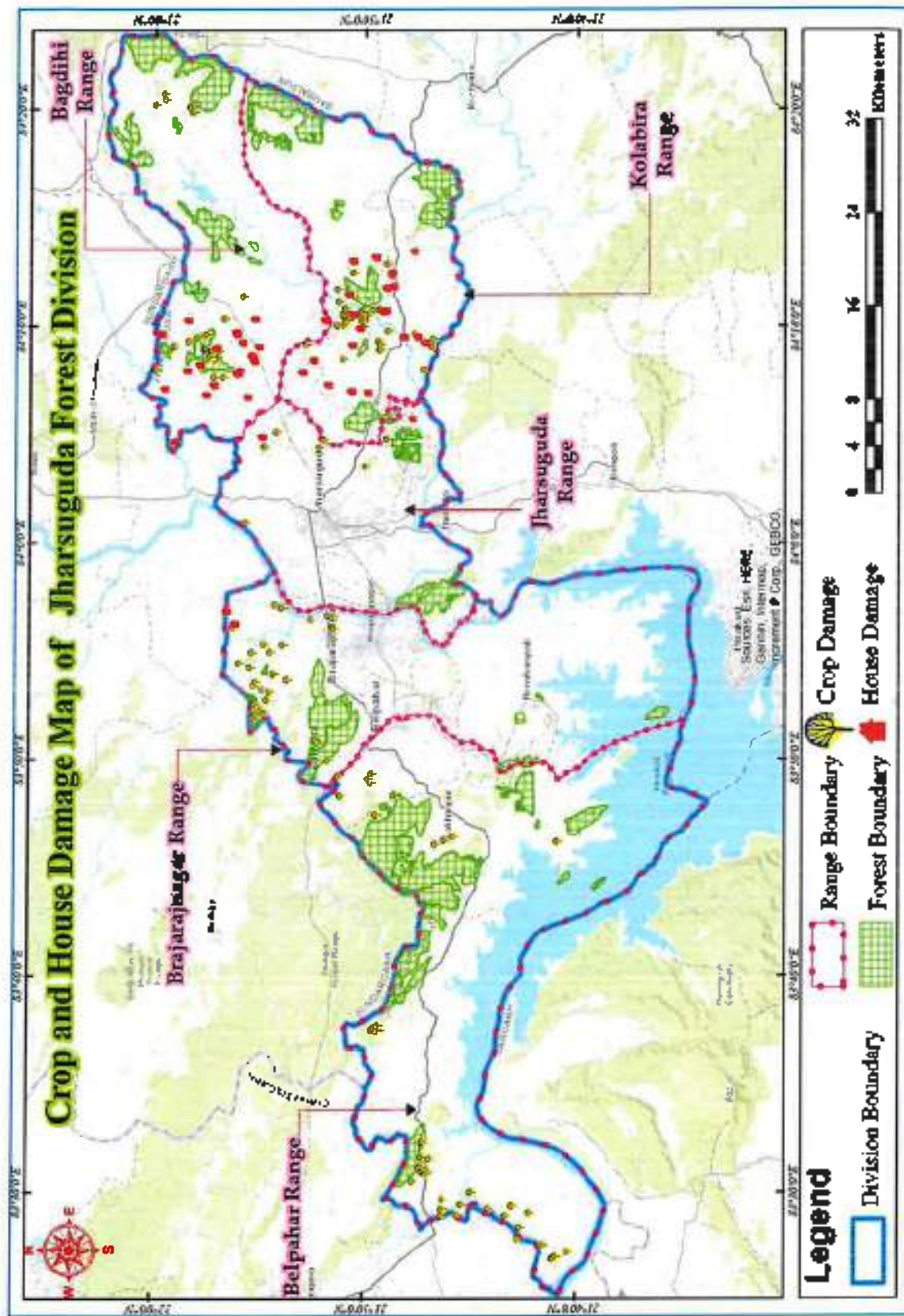


Fig:C.35. Crop and House Damage Map of Jharsuguda Forest Division

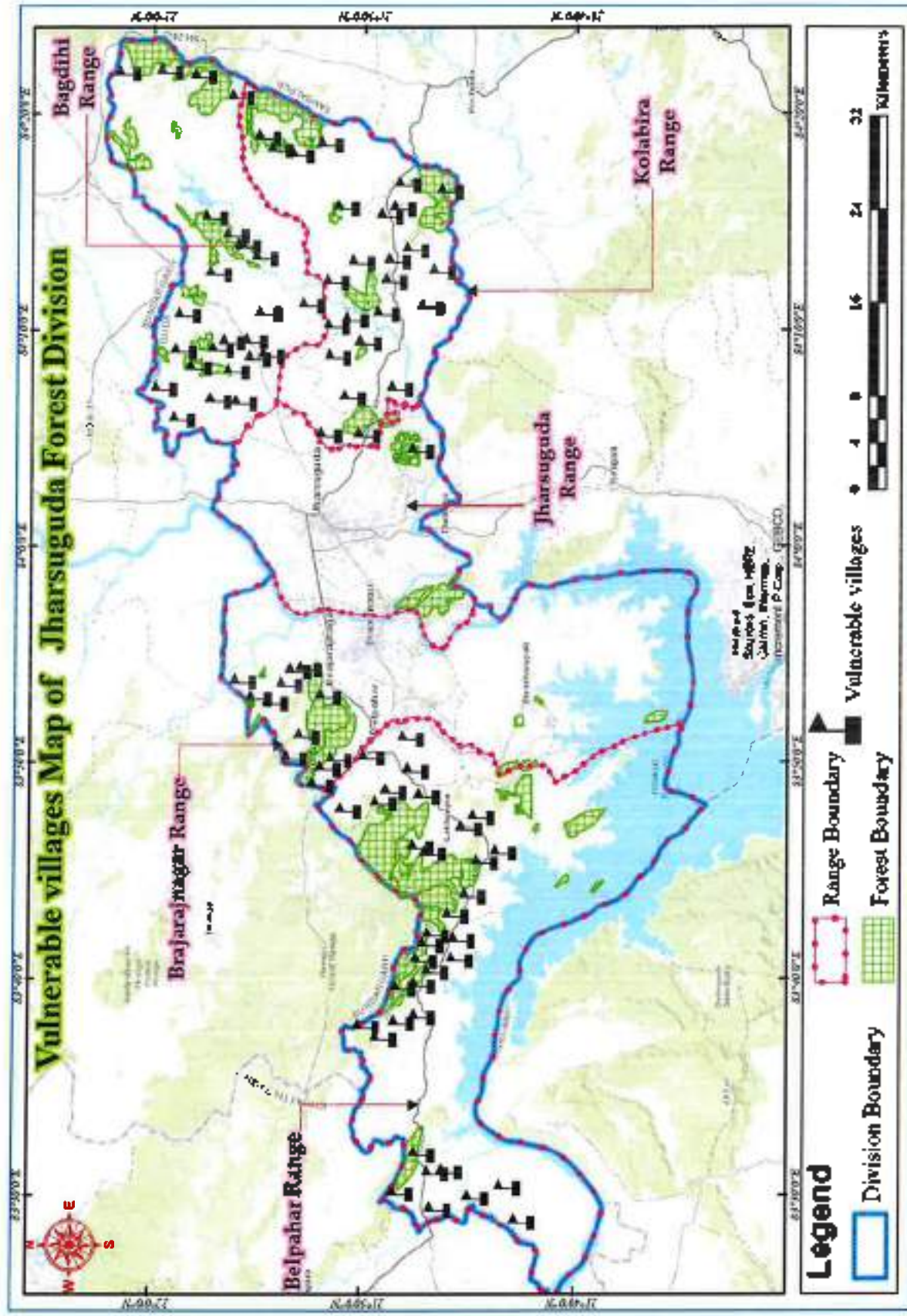


Fig.C.3.6, Vulnerable Villages Map of Jharsuguda Forest Division

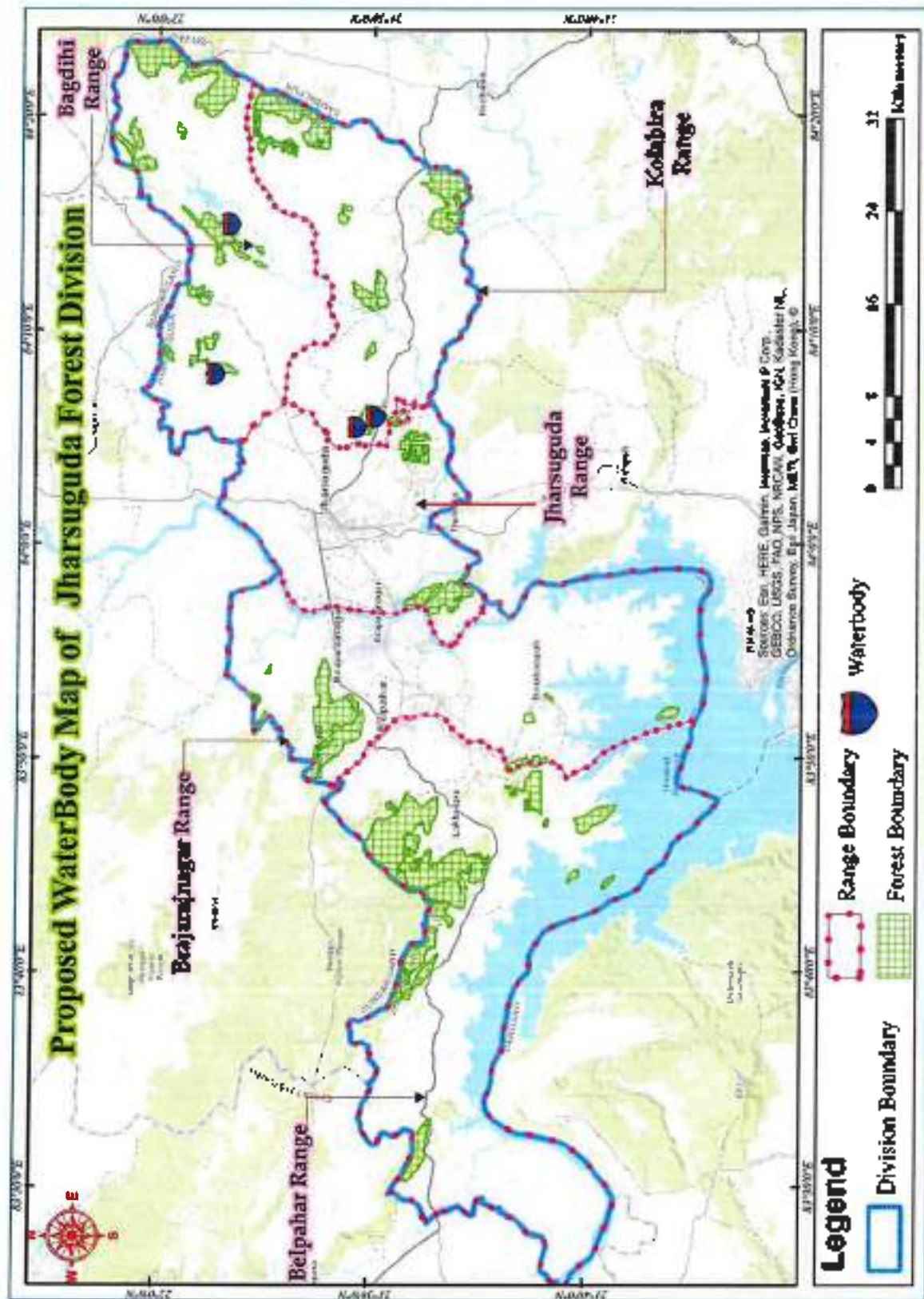


Fig:C-38. Proposed Waterbody Map of Jhatsuguda Forest Division

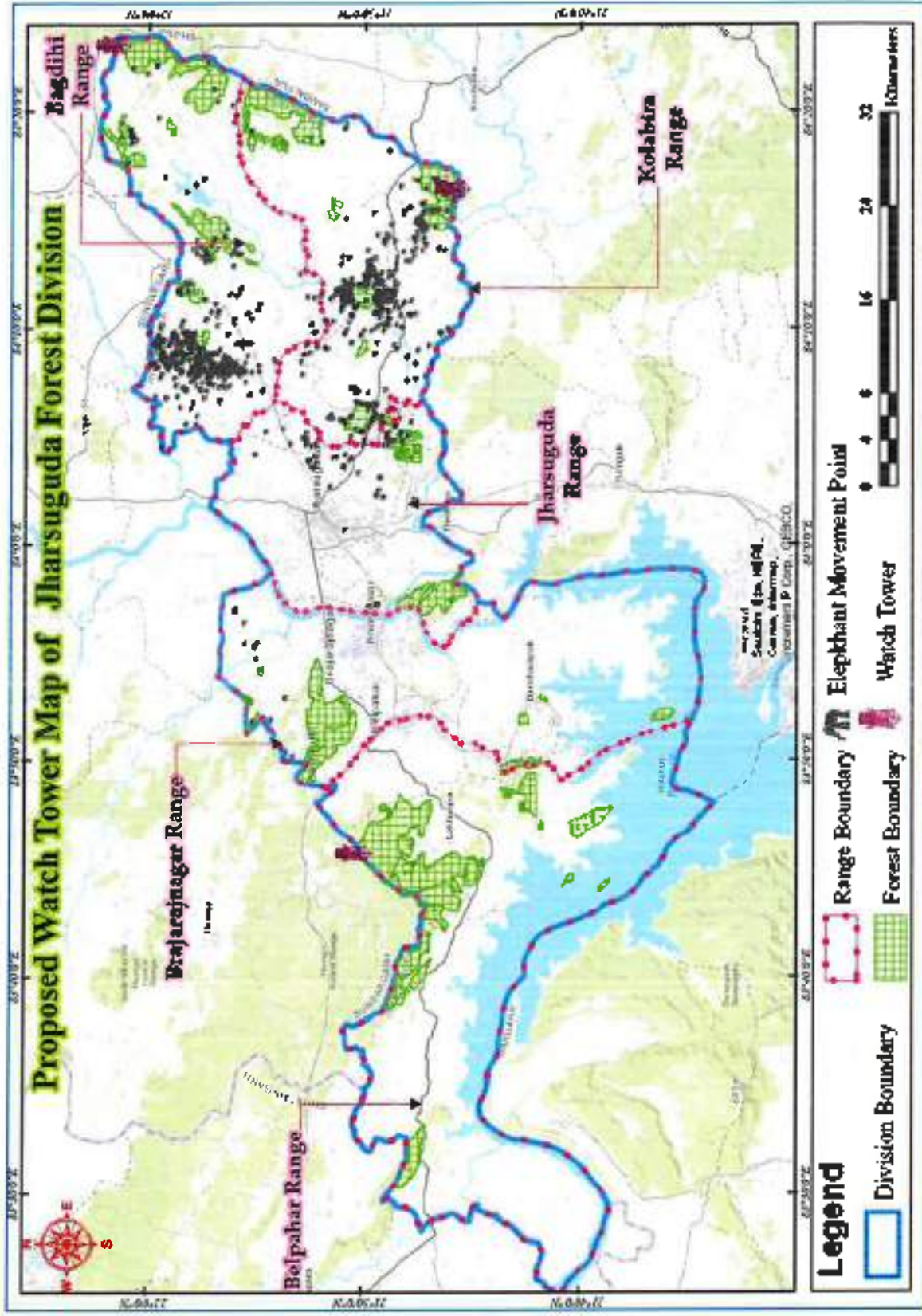


Fig:C.37. Proposed Watch Tower Map of Jharsuguda Forest Division

Annexure-34

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 16

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence, along with compliance of Stage-I approval, as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof.**

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-35

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

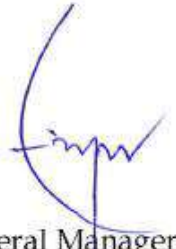
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 17

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **User agency and the State Forest Department will create and maintain from funds to be provided by the user agency alternate habitat/home for the avifauna, whose nesting trees are to be cleared in this project as per the plan duly approved by the Principal Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden Odisha. Bird nests artificially made out of eco-friendly materials shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-36

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 18

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that the **project authority will take up works for construction and cleaning of garland drains, stabilizing retaining walls, proper terracing of OB dumps and checking gully formation resulting in soil erosion.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-37

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 19

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **plants which are having lowest translocation factor will be preferred under Afforestation on the OB dumps and fruit trees to be avoided in planting during biological stabilization of OB dumps.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-38

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 20

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **prevention of fall of wild animals into mining pit by fencing the open pit area will be taken up.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-39

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 21

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **angle of repose in OB dumps will be maintained to ensure stability and safety.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-40

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 22

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **vetiver grass will be planted at the lower reaches of the dump to bind the soil and prevent soil erosion giving better stability to the dump.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-41

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 23

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **mining in a phased manner after taking due care for reclamation of the mined over area. The concurrent reclamation plan as per the approved mining plan will be executed by the User Agency from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, in the concerned State Government and the concerned Regional Office of the Ministry. If it is found from the annual report that the activities indicated in the concurrent reclamation plan are not being executed by the User Agency, the Nodal Officer or the concern Addl. Principle Chief Conservator of Forests (Central) may direct that the mining activities shall remain suspended till such time, such reclamation activities area satisfactorily executed.**

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एम.सी.एल. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-42

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 24

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that to **comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-43

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 25

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under.

Place :Jharsuguda.
Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
✓ Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-44

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 26

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that to **obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-45

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 27

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **No labour camp shall be established on the forest land and the User Agency will provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas.**

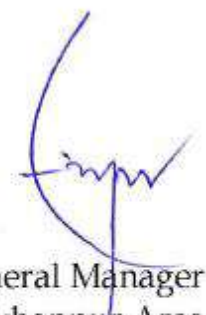
Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

L.



General Manager
Lakhanpur Area
Office Seal.....

महानदी कोयला
General Manager
एन.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-46

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 28

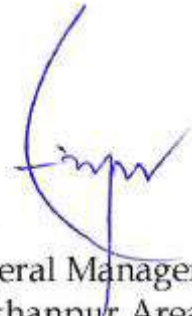
I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the boundary of the diverted forest land, mining lease and safety zone, as applicable, will be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates.**

Place :Jharsuguda.
Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

L.


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-47

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 29

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the layout plan of the mining plan/ proposal will not be changed without the prior approval of the Central Government and the forest land will not be used for any purpose other than that specified in the proposal.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-48

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 30

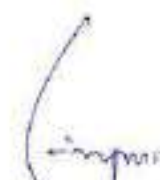
I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **the forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government.**

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-49

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 31

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **No damage to the flora and fauna of the adjoining area will be caused.**

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एन.सी.एस. लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-50

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 32

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **User Agency will submit the annual self - compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महाप्रबन्धक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-51

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

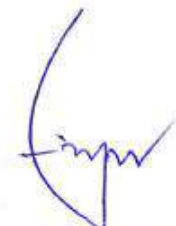
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 33

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation, protection and development of forests & wildlife will be complied.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
✓ Lakhanpur Area
Office Seal.....
महामानव्यक
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-52

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

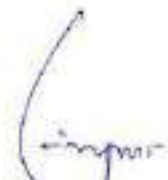
State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 34

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **user agency will comply all the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.**

Place :Jharsuguda.

Dated: 30.10.2024


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एम.सी.एल., लखनपुर क्षेत्र
MCL, Lakhanpur Area

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....

Annexure-53

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 35

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **agree the condition Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5-2/2017-FC 8-280/1989-FC Vol. I/61084/2023 dated 28.03.2019**

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area

Annexure-54

Full Title of the Project: **Proposal for non-forestry use of 417.073 ha & Re-diversion (Change of Land use) of 171.774 ha forest land in respect of Integrated Lakhanpur-Belpahar-Lilari Opencast Project, Lakhanpur area of M/s Mahanadi Coalfields Limited in district Jharsuguda in Odisha**

File No: **FP/OR/MIN/39355/2019**

State Sl. No.: **OR-044/2020, dt.17.06.2020**

UNDERTAKING AS PER CONDITION NO. 36

I Sri Sanjay Kumar Jha, General Manager, Lakhanpur Area, Mahanadi Coalfields Limited do hereby undertake that **compliance report will be uploaded on e-portal (<https://parivesh.nic.in/>)**.

Place :Jharsuguda.

Dated: 30.10.2024

Countersigned by,

Divisional Forest Officer,
Jharsuguda Forest Division.
Office Seal.....


General Manager
Lakhanpur Area
Office Seal.....
महानदी कोयला
General Manager
एम.सी.एल, लखनपुर क्षेत्र
MCL, Lakhanpur Area