

EXECUTIVE SUMMARY FOR MAHANADI COALFIELDS LIMITED (MCL)

**SUBHADRA OPENCAST COAL MINE FOR RATED CAPACITY
25.0 MTPA OVER AN AREA OF 1111.85 HA.**

**At VILLAGEs KANKAREI, PIRAKHAMAN, BALICHANDRAPUR,
RAIJHARAN, KAUNSIDHIPA, GOLAGADIA, CHHOTABERENI,
KUMUNDA, BHALUGADIA, BAGHUABOL VILLAGES AND
JAIPUR RF, TEHSIL – TALCHER AND CHHENDIPADA, DISTRICT-
ANGUL, ODISHA**

BASELINE STUDY PERIOD: OCT TO DEC 2022

**(Project is listed under activities 1(a) Mining of Minerals under the Schedule of
EIA Notification, 2006 and categorized as Category-A.)**

2023

APPLICANT

**M/s MAHANADI COALFIELDS LIMITED
JAGRITI VIHAR, BURLA, SAMBALPUR, 768020, ODISHA**

**ENVIRONMENT CONSULTANT
VARDAN ENVIRONET
(QCI/NABET ACCREDITED NO. (NABET/EIA/2326/RA0284)**

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

PROJECT DESCRIPTION

Subhadra Open Cast Coal mine is a Greenfield opencast mining project spread over a lease area of 1111.85 Ha. at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol Villages and Jaipur RF, Tehsil Talcher & Chhendipada, District Angul (Odisha).

The Government of India launched the auction process of Commercial Coal Mining through MMDR Act, 1957. In view of the global market demand scenario and technological advancement, efforts have been made by the Company to undertake this project and to bridge the demand – supply gap. The Subhadra Coal Block has been allotted to MCL by Ministry of Coal vide order no NA-103/1/2021-NA dated 18.11.2021.

The proposed production rated capacity of the mine is 25.0 MTPA with provisions of Coal Handling plant. Accordingly, the mining plan has been prepared and duly approved for the rated capacity.

The project envisages;

- I. Production of coal with production capacity 25.0 MTPA.
- II. Installation of coal handling plant, The CHP comprises of 20 nos. over ground truck receipt hoppers of 100 t capacity each situated two different places and very small amount of coal produced by feeder breaker (2 nos.) of capacity 400t. Two nos. of over ground bunker of 20000t capacity each and dispatching through the Rapid loading system (RLS).

The proposed project is listed under activities 1(a) under the Schedule of EIA Notification, 2006 and categorized as Category-A.

Necessary application has been filled before respective competent authority for obtaining statutory approvals applicable for operation of the coal mine. The status of the statutory approvals is given below.

STAGES OF CLEARANCE	DATE
The Subhadra Open Cast Coal Mine has been allotted by Ministry of Coal vide order no NA-103/1/2021-NA.	18.11.2021

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuaboli villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

STAGES OF CLEARANCE	DATE
Mining plan (including Progressive Mine closure plan) has been approved by the MCL Board vide letter no. MCL/SBP/CS/BD-257/Exct/2023/13262 dt-13.05.2023	13.05.2023
Application for Forest Clearance has been submitted vide Proposal No. FP/OR/MIN/150133/2021	25.01.2022
R&R Plan for the project affected people is prepared and will be done as per the provisions and recommendations mentioned in RTFCTLARRA, 2013	
Terms of Reference (TOR) issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC) letter no. IA-J-11015/72/2021- IA-II (M)	22.11.2021
Amendment to TOR issued by Ministry of Environment, Forest and Climate Change (MoEF&CC)	28.02.2022

MINE SITE DETAILS

S. No.	Description	Particulars
1.	Name of the Project	Subhadra Opencast Coal Mine of Mahanadi Coalfield Ltd
2.	Type of the Project	Opencast Mechanized Coal Mining
3.	Mining lease area	1111.85 Ha
4.	Forest Area	<p>Reserve Forest & Land: 0.75 Ha Govt. Revenue Forest area: 124.49 Ha Non-Forest land: Private Land- 696.95 ha Govt Non-Forest Land- 289.66 ha.</p> <p>Application for Forest Clearance has been submitted vide Proposal No. FP/OR/MIN/150133/2021 dated.25.01.2022. which has been successfully recommended from Addl. Chief Secretary, F&E Dept. GoO. To MOEF&CC, New Delhi</p>
5.	New / Expansion	New
6.	Category as per EIA Notification	"A"

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars
7.	Location	
8.	Villages	Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF
	Tehsil	Talcher and Chhendipada
	District	Angul,
	State	Odisha
	Latitude	20°55'56.225" N and 20°58'47.344" N
	Longitude	84°58'42.383" E and 85°0'50.476" E
	Toposheet No.	F45S13 & F45T1
9.	Name of the Organization	Mahanadi Coalfields Limited (MCL)
10.	Coal Field	Talcher Coal Field
11.	Coal Block	Utkal-A and West of Gopalprasad (West) Coal Block
12.	No. of coal seams	A total of 9 coal seams are present in block – 1. Seam XI, 2. Seam X, 3. Seam IX, 4. Seam VIII, 5. Seam VII, 6. Seam V, 7. Seam IVB, 8. III, 9. Seam II.
13.	Seams considered for mining	Seam-IID to XI are considered for opencast mining.
14.	Seams not considered for mining	VIB, IIC, IIB & IIA VIB, IIC, IIB & IIA are not developed within working area of the quarry, attains >1m thickness only below northern quarry slope and barrier
15.	Maximum Thickness of seams	IID-0.06m IX-75.90 m
16.	Gross Geological reserve	1142.67 MT
17.	Net Geological Reserves	1108.39 MT
18.	Mineable Reserves	790.95 MT

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuaboli villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars
	Extractable Reserves	768.83 MT
19.	Percent of extraction	97.19%
20.	Average GCV & Grade of Coal	GCV based Up to G-11:17.2% G-12: 25.5% G-13: 34.3% G-14 & below: 23% Wt. Avg. G-13
21.	Total OB/Inter burden to be excavated	In-situ: 613.18 Mcum Re-handling: 103.72Mcum Total Handling: 716.90 Mcum
22.	Average Stripping Ratio (Cum/t)	Only In-situ: 0.80 With Re-handling: 0.93.
23.	Slope of angle of the working benches	40° for depth up to 50m and may be about 35° for depth of about 200m
24.	Peak Production Capacity	25 MTPA
25.	End Use of Coal	No end use plant identified. Block is vested to M/s MCL for Sale of Coal. Basket linkage to consumers all over India. Coal is to be transported by rail/ship to various power plants all over India as part of overall Coal India Limited.
26.	Life of the Mine	36 Years, including 2 years of construction
27.	Forestland requirement	Reserve Forest Land: 0.75 Ha Govt. Revenue Forest area: 124.49 Ha Total Forest Land: 125.24 Ha
	Non-forestland within ML Area	986.61 Ha
	Total Land requirement	1111.85 ha

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuaboh villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars								
28.	Details of Wildlife Sanctuaries, National Park, eco-sensitive Zones, within 10 km radius?	None								
29.	R & R Involved	The total Family is going to be displaced is about 1853 Approx (PAFs). R&R Plan for the project affected people is prepared. The displaced families are proposed to be rehabilitated and resettled as per the R&R Plan.								
30.	No. of affected families	The total Family is going to be displaced is about 1853 Approx (PAFs)								
31.	Technology	Opencast Mechanized mining is proposed. Coal-Surface Miner OB- shovel-dumper combination								
32.	Area of Excavation	881.28 Ha								
33.	Depth of the quarry	23-215 M								
34.	Details of Temporary External OB Dumps	<p>The total volume of external dump has been estimated as 103.72 Mm³.</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Area in ha</th> <th>Max. Height</th> <th>OB Quantity In M.Cum</th> </tr> </thead> <tbody> <tr> <td>External Dump at Northern Side (Temporary)</td> <td>24.17</td> <td>88m</td> <td>103.72</td> </tr> </tbody> </table>	Location	Area in ha	Max. Height	OB Quantity In M.Cum	External Dump at Northern Side (Temporary)	24.17	88m	103.72
Location	Area in ha	Max. Height	OB Quantity In M.Cum							
External Dump at Northern Side (Temporary)	24.17	88m	103.72							
35.	Details of Internal OB Dumps	<p>The total volume of Internal dump has been estimated as 613.18 Mm³</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Area in ha</th> <th>Max. Height</th> <th>OB Quantity In M.Cum</th> </tr> </thead> <tbody> <tr> <td>Internal Dump</td> <td>715.24</td> <td>184.50m</td> <td>613.18(Insitu) 103.72(Rehandling)</td> </tr> </tbody> </table>	Location	Area in ha	Max. Height	OB Quantity In M.Cum	Internal Dump	715.24	184.50m	613.18(Insitu) 103.72(Rehandling)
Location	Area in ha	Max. Height	OB Quantity In M.Cum							
Internal Dump	715.24	184.50m	613.18(Insitu) 103.72(Rehandling)							

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuaboli villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars			
		(Back filling)			
36.	Details of backfilling (at the end of mine)	Area in ha	Max. Height		
		715.24	Up to 30m		
37.	Details of Final Mine Void (at the end of mine)	At final stage			
	Area	130.68 ha			
	Depth	Out of total lease area (1111.85 ha) 715.24 ha of excavated area will be backfilled up to a level of 160 mRL			
38.	Details of afforestation	-			
	Total Afforestation area	346.15 Ha			
	i. Plantation on Backfilled area	182.52 Ha			
	ii. Plantation on diverted forest land including green belt area	125.24 Ha			
	iii. Safety Zone	11.79 Ha			
	iv. Plantation on Other area	26.6 Ha			
39.	Density of Plantation	2500 No./ha			
40.	Coal Evacuation				
	In-Pit	Dumpers			
	In-Pit conveyor to CHP	Belt Conveyors			
	Surface to Railway Siding	From Surface hopper by belt conveyors			

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars
	Siding to loading	Through Rapid Loading System (2 nos.)
41.	Working Regime	330 days/ year, 3 shifts/day, 8 hours/shift
42.	Mineral Processing	A Coal Handling Plant is proposed.
43.	Employment potentiality	Project will generate employment for about 2108 persons directly. In addition, more than 5000 people will be benefited indirectly
44.	Power requirement	This project will receive power at 33 kV by double circuit overhead transmission line from 120 MVA, 132KV/33KV Nadira - substation of MCL for length of 15 km. Electrical Energy (MKwh/annum)-104.83
45.	Water requirement	Domestic Water Requirement: 0.83 MLD Industrial Requirement: 4.28MLD Total Water Requirement (Peak): 5.11 MLD Source: Bore Well and Mine Water & Singhada Jhor stream. However, initially till the mine is fully developed water requirement will be as follow. Domestic Requirement: 10 KLD Greenbelt requirement: 50 KLD Dust Suppression: 100 KLD. During initial period source of water are bore wells, dug wells, ponds and Singhada Jhor stream along north boundary. Later on, industrial water demand will also be met from mine sump water.
46.	Fuel consumption	Diesel Consumption would be around 52102 KL/Annum of vol. handled. Specific Diesel consumption may be reduced by proper maintaining gradient of haul road and reducing waiting time of dumper as well as proper

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars
		training to the HEMM operators.
47.	Explosive Requirement	11520 Tonnes of explosives shall be used per annum
48.	Transportation	The ROM coal shall be produced from the mine by blast free techniques i.e.; by surface miners. Coal of (-) 100 mm brought by dumpers from the quarry shall be unloaded into any of the 20 nos. over ground truck receipt hoppers of 100 t capacity each situated at two different places. The coal from the hoppers will be collected and transported up to the rapid loading system through a system of nine sets (18 Nos.) belt conveyors C1A & C1B, C2A & C2B, C3A & C3B (Tripper conveyor), C4A & C4B, C5A & C5B, C6A & C6B, C7A & C7B (Tripper conveyor), C8A & C8B and bridge conveyors (reversible conveyor) C9A & C9B. There is a provision of two over ground bunkers of capacity 20000t each and coal will be dispatch through two rapid loading system (RLS).
49.	Surface features over the block area	<ul style="list-style-type: none"> There are 10 villages (Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol) located within the Block boundary. The drainages of the block are controlled by the seasonal nallahs, Ghurudia Nallah and Singhada Jhor
50.	Infrastructure	Requisite infrastructure will be developed for mining operation & allied activities such as Rest shelters, blasting shelters, Fast-aid center, drinking water supply, Site-offices, Stores, Workshop for HEMM, Explosive magazine and toilets within the mining lease as per requirement.
51.	Total cost of the project	Rs 3955.65 Crores

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuaboli villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

S. No.	Description	Particulars
52.	Fund Provision for EMP	Capital-1205 Lakhs Recurring- 178 Lakhs Total- 7613 Lakhs (During the life of Mine i.e., 36 years)
53.	Name of the EIA Consultant Organization	M/s Vardan EnviroNet
54.	QCI / NABET Accreditation	Certificate No. QCI/NABET/EIA/2326/RA 0284, Valid up to 04.05.2026

Need of Project:

Coal is the primary source of energy supply in India. About 55% of the current commercial energy use is met by coal. Rising demand for energy and coal as the primary energy source make it a significant resource in the country. Opening of Subhadra Open cast coal mine will have the following benefits:

- Increase supply of coal for India's power programme.
- Reduces power shortages hindering growth, foreign investment and productivity.
- Generate additional employment, both direct and indirect which will lead to economic growth of the industrial sector as well as country.
- Improvement of the quality of life of local villagers due to company's community development programmes.

MACHINERY TO BE DEPLOYED IS LISTED BELOW:

	Equipment Type	Size/Specs
A:	OVERBURDEN	
1	Hydraulic Shovel	10-11 cum
2	Hydraulic Shovel	6-7 cum
3	Rear Dumper	100T
4	Rear Dumper	60T
5	Electric Drill	250mm
6	Diesel Drill	160mm



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuaboli villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

7	Crawler Dozer with Ripper	850 HP
8	Crawler Dozer	410 HP
B.	COAL	
1	Surface Miner	50t Class
2	Front End Loader	7.4-7.7 cum
3	Wheel Dozer	450 HP
4	Rear Dumper	60T
C.	COMMON	
1	Rough Terrain Crane	75T
2	Tyre Mounted Telescopic Crane	25T
3	Pick-n-Carry Crane	10T
4	Fork Lift Truck	ST
5	Water Sprinkler	28KL
6	Diesel Hyd.Backhoe	1.5 cum
7	Truck Mounted Mobile Canon/Atomizer	
8	Tyre Handler for up to 100T Dumper	
9	Vibratory Compactor	10t
10	Motor Grader	280 HP
11	Fire Tender	14 KL
12	Fuel Bowser	20 KL

BASELINE STUDY:

Parameters	Baseline Status
Ambient Air Quality	PM ₁₀ – 74.6 to 51.2 µg/m ³
	PM _{2.5} – 51.9 to 28.1 µg/m ³
	SO ₂ – 46.9 to 21.2 µg/m ³
	NO _x – 41.2 to 20.5 µg/m ³
	CO – 1.19 to 0.5 mg/m ³
	O ₃ – 29.6 to 15.1 µg/m ³
	NH ₃ – 39.1 to 25.2 µg/m ³
Noise Level	The Leq values for day time was observed to be 49.88 to 54.06 dB (A) in residential area, while during night time 40.34 to 43.96 dB (A). The Leq values for day time and night time at industrial area was 69.5 and 64.52 dB (A).

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Gologadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Parameters	Baseline Status
Water Quality	Ground Water: All the Parameters Like pH varies from 7.54 to 7.93, Total Hardness varies from 215.26 to 329.43 mg/l, Total Dissolved Solids varies from 225 to 300 mg/L, Chlorides – 56.84 to 79.24 mg/l etc. are found within the permissible limits. Bacteriological studies revealed the absence of Total coliform.
	Surface Water: All the Parameters Like pH varies from 7.39 to 7.82, Total Hardness varies from 186.25 to 493 mg/L, Total Dissolved Solids varies from 240 to 899 mg/L, Dissolved Oxygen – 5.6 mg/l to 6.7 mg/l etc. are found within the permissible limits. Total Coliform count is measured 570 to 1600 MPN/100ml.
Soil Quality	<p>pH- 7.31 to 7.56</p> <p>Organic matter- 0.76% to 0.88%</p> <p>Electrical Conductance - 0.186 μS/cm to 0.271 μS/cm</p> <p>Available Nitrogen - 152.66 Kg/ha to 192.18 Kg/ha</p> <p>Available Phosphorous - 19.52 kg/ha to 28.25 kg/ha</p> <p>Available Potassium - 146.28 Kg/ha to 176.19 Kg/ha</p>
Ecology And Biodiversity	No National Park, Wild Life Sanctuary, Bio-sphere Reserve, Elephant Reserve, Tiger Reserve. is present within 10 km of mining lease area. There are two Mammals i.e <i>Elephant</i> , & <i>Pangolin</i> , two reptiles i.e <i>Bengal Monitor Lizard</i> , <i>Python</i> and two birds i.e <i>Indian Peafowl</i> , <i>King Vulture</i> , Schedule-I species present in the study area. However, a site specific WLCP will be prepared by DFO for conservation of Wildlife.
Socio Economic	The proposed project will provide positive impact to the nearby area. The project will provide direct and indirect employment to nearby villagers.

ECONOMIC PROVISION FOR BASIC AMENITIES (CER)

The project cost is 3955.65 Crores. The activities to be undertaken under CER shall be as per issues which will be raised during the public hearing.

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

ECONOMIC PROVISION FOR ENVIRONMENTAL MANAGEMENT

Sl. No.	Environmental Protection Measures	Capital Cost	Recurring Cost
		(Rs. In lakhs)	(Rs. In lakhs/year)
1	Air Pollution Control Measures	200.00	30
2	Water Pollution Control Measures	150.00	30
3	Noise Pollution Control Measures	100.00	20
4	Reclamation & Nursery Development	250.00	35
5	Fire Fighting Equipment	400.00	35
6	Occupational Health	55.00	20
7	Miscellaneous	50.00	8
Total		1205	178

WATER REQUIREMENT:

Domestic Water Requirement: 0.83 MLD

Industrial Requirement: 4.28MLD

Total Water Requirement: 5.11 MLD

Source: Bore Well and Mine Water & Singhada Jhor stream.

For initial few years from second year onwards till the mine is fully developed water requirement will be as follow.

Domestic Requirement: 10 KLD

Greenbelt requirement: 50 KLD

Dust Suppression: 100 KLD.

During initial period source of water are bore wells, dug wells, ponds and Singhada Jhor stream along north boundary. Later industrial water demand will also be met from mine sump water.

MAN POWER REQUIREMENT:

Estimated direct manpower requirement for the project will be 2108 persons. In addition, more than 5000 people will be benefited indirectly.



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environment Management Plan:

The environment management plan is prepared with a view to facilitate effective environment management of the project, in general and implementation of the mitigation measures. The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted for all project works. For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each operation, which could otherwise give rise to impact, the following EMP is programmed at Subhadra OCP coal mine:

(Anticipated Environmental impacts and mitigation)

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
Air Quality	Drilling and Blasting	PM ₁₀ , PM _{2.5} , SO ₂ and NO ₂	Adverse	Use of dust aprons by drillers and adopting wet drilling methods. A. The production of blast fumes containing noxious gases will be reduced by the following methods: <ul style="list-style-type: none">• Use of adequate booster/primer; and• Proper stemming of the blast hole.• Scientific design of blast. B Drills fitted with dust collection system will be deployed or using wet drilling method. C. Development of greenbelt.
	Overburden	Increase in	Adverse	<ul style="list-style-type: none">• Sprinkling of water on haul roads at regular intervals.



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
	removal	SPM levels in ambient air due to dust generation and NO ₂ , HC, SO ₂ and CO concentration levels in ambient air due to vehicular emissions.		<ul style="list-style-type: none"> Installing permanent water sprinklers at strategic areas/locations/stretch. Regular maintenance of vehicles and machinery will be carried out. Cabins for shovel and dumpers and dust respirators to workmen will be provided. All HEMM cabins will be air-conditioned. Dust suppression will be done on exposed area using water sprinkler. Greenbelt development will be taken up all along the haul roads. Separate storage of top soil for progressive reclamation of dumps and mined out area backfilled with overburden material. Re-vegetation of mined out area and inactive dumps and A good housekeeping and proper maintenance will be practiced which will help in controlling pollution.
	Transportation of overburden	-do-	Adverse	<ul style="list-style-type: none"> Use of tarpaulin covered trucks for transportation of coal outside the ML area. Regular water sprinkling on haul, access roads and all transfer points. Haul roads to be maintained by surface grading to minimize excessive road surface wearing. Roads no longer required will be re-vegetated as soon as possible.
	General equipment operations	Increase in SPM, NO ₂ and CO	Adverse	<ul style="list-style-type: none"> Regular maintenance of all equipment to minimize particulate matter and gaseous emissions from diesel driven vehicles & equipment. Use of non-electric initiation and computerized blast design to maximize the explosive energy for fragmentation and minimum fume generation in



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
		concentrations in ambient air.		blast.
	All activities	Excessive exposures to airborne particulate matter.	Adverse	Personal protective equipment (PPE) will be provided to all workers working in dusty environment.
Noise Levels and Ground Vibrations	Drilling and Blasting	High impulsive noise levels, overpressure and ground vibrations impacts and noise related community annoyance	Adverse	➤ Noise Control Measures <ul style="list-style-type: none"> Controlled blasting with proper spacing, burden and stemming will be maintained; NONEL will be used for initiation of explosives in blasting The blasting will be carried out during favorable atmospheric condition and less human activity timings; Provision of sound insulated chambers for the workers deployed on machines (HEMM) Green belt has been developed all along the lease boundaries to attenuate noise. A thick green belt will be provided in phased manner around the periphery of the mine to attenuate noise; Trees will be planted on both sides of haul roads.
	Machine and transportation of overburden within the ML	Increase in noise levels occupational hazard due to	Adverse	



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
	area.	noise exposures and increase in ambient noise levels.		<ul style="list-style-type: none"> • Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM; and • Reducing the exposure time of workers to the higher noise levels. • Regular monitoring of Noise level will be carried out. ➤ Measures to Control Ground Vibration • Proper quantity of explosive, suitable stemming materials and appropriate delay system are to be adopted for safe blasting. Computerized blast design to be used. • A safe blasting zone is kept around the periphery of the quarry. • Overcharging will be avoided; • The charge per delay will be minimized and preferably more number of delays will be used per blasts;
Water Resources and Quality	Mining will intersect the ground water table.	Depletion of ground water	Adverse	<p>Main source of water will be through borewells, singhada Jhor stream, pond and mine water.</p> <ul style="list-style-type: none"> ➤ Mine Drainage: • The garland drains will be developed in advance for each mine stage such that water is collected in these garland drains and discharged



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarei, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
	Water required for mine, (dust suppression systems, workshop, domestic facilities and greenbelt development)	Except water demand for drinking & domestic purpose or quarry discharge.	Adverse	<p>properly into settling tanks to settle out suspended solids in the storm water. The clarified water is reused for green belt development.</p> <ul style="list-style-type: none"> The overall drainage planning will be done in such a manner that the existing drainage conditions should be maintained to the extent possible, so that run off distribution is not affected. Working faces will be laid such that the water from the working areas will flow into a sump by gravity from where it will be pumped out to settling ponds. The pumped-out water from mines shall be channelized through storm water drains
	Waste water generated from mine & domestic usage at mine.	Depletion of ground water level and soil quality when used untreated water for greenbelt development.	Adverse	<ul style="list-style-type: none"> Pumps of adequate capacity will be provided at sump to keep these areas dry. Stone pitching shall be made at suitable places to regulate water flow. The settling tank and drains are cleaned periodically, especially during monsoons. <p>➤ Surface Water Pollution Control Measures</p> <ul style="list-style-type: none"> Retaining walls of adequate dimensions will be provided at the toe of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels;



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
				<ul style="list-style-type: none"> The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water; The worked-out slopes will be stabilized by planting appropriate shrub/grass species on the slopes. This will help in preventing wash-off from these slopes; The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB; <p>➤ Ground Water Pollution Control Measures</p> <ul style="list-style-type: none"> The domestic sewage will be routed through STP. Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out.
Drainage pattern and Hydrogeology	Quarries, stack yards and waste dump	Catchment area inside the mine will be affected.	Adverse	A garland drain of suitable dimension will be made all around the dump to catch all the run off water of the dump and will be taken to a sedimentation pond for settling of silt. The water collected will be completely reused for dust suppression (except in monsoon). Gabion walls and Retaining wall will be made at the toe of dumps to arrest any silt due to runoff. Regular monitoring of water quality of the nearby water bodies will be done as per norms and MoEFCC conditions

Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
Landuse and Soil Characteristics	Mining & allied activities	Existing landuse of the core zone will alter. Land degradation due to disposal of waste materials.	Adverse	Following measures will be taken: <ul style="list-style-type: none"> • Construction/ Installation of diversion drains and settling ponds • Dust suppression on exposed areas using water tankers and automatic sprinkling systems. • Properly terracing of overburden dump to minimize erosion. • Plantation around service building, along road in and around the safety zone using native plant sapling. • Backfilling & re-handling of external OB dump as per approved Progressive Mine Closure Plan. • Compliance with mine decommissioning plan.
Flora and Fauna	Mine development and operations	Displacement of existing fauna.	Adverse	<ul style="list-style-type: none"> • Management of flora and fauna both at core and buffer zone shall be done as per the approved site specific wildlife conservation plan. Suitable reclamation, rehabilitation and restoration of the land shall be made to protect the biodiversity.



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
	Mineral Transportation	Loss of vegetation		<ul style="list-style-type: none">• However, progressive afforestation and green belt development in the ML area has been carried out and shall continue till the life of the mine.
Occupational Health & Safety	Overall Mining & allied activities	Occupational health problems due to dust & noise. Accident probability due to slope failure, movement of HEMM, handling of explosives.	Adverse	<ul style="list-style-type: none">• Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drilling etc.• Plantation• Avoid blasting during unfavorable wind & atmospheric conditions• Use of personal protective equipment.• Periodical training of workers• Compliance with DGMS circulars Emergency response plan that includes installation of emergency response equipment to combat events such as fire. All personnel required to handle hazardous materials will be provided with personal protective equipment. On-site first aid facilities have been provided to employees and are being extended to the local community in emergencies.



Project Summary

Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Kankarej, Pirakhaman, Balichandrapur, Rajjharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF, Tehsil Talcher & Chhendipada, Dist-Angul, Odisha State.

Environmental Component	Project Activities	Impacts	Adverse / Beneficial	Mitigative Measures
Socio-economic Aspects	Land acquisition for mine site	displacement of people & loss of properties.	-	Suitable R&R plan shall be implemented for the PDFs and PAFs as per the guidelines.
	Mining operations	Increase in economic status of local people & in the region due to Increase in employment opportunities both direct and indirect.	Beneficial	The project will provide opportunity to the local people for direct and in-direct employment. The proposed project will create opportunities for indirect employment in the field of transportation business, vehicle hiring, labours, trading of construction materials, carpenters etc.