

**STRICTLY RESTRICTED
FOR COMPANY USE ONLY**

The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL/Government.

MINING PLAN AND MINE CLOSURE PLAN FOR BHARATPUR OCP EXPN. (20MTY)

(REVISION - 3)

**Area in hectare : Mining Lease Area - 1556.94 ha
Project Area - 1618.34 ha**

TALCHER COALFIELD

Dist. Angul, State: Odisha

**Applicant : GENERAL MANAGER, BHARATPUR AREA
MAHANADI COALFIELDS LIMITED, ODISHA
Email – gm-bharatpur.mcl@coalindia.in**

Targeted Capacity:

(a) Rated capacity: 20.00 Million Tonnes per year (Mty)

**Name of the Accredited Mining Plan Preparing Agency (MPPA)
Preparing the mining plan with details:**



cmpdi
A Mini Ratna Company

April, 2022

**CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED
(A Subsidiary of Coal India Ltd.)
REGIONAL INSTITUTE-VII**

Plot – E, 4; At: Samantapuri, P.O. – RRL; Bhubaneswar – 751013.

DOCUMENTS ENCLOSED

(i) **Copy of the Allotment Order.**

- The proposed Bharatpur Expansion OCP lies in 'Bharatpur South', 'Bharatpur North', part of 'Padma' and north-eastern part of 'Kalinga east' geological blocks which belong to MCL and where Bharatpur opencast mine is being operated. For the purpose of planning for this expansion OCP, a fresh report named "Revised Geological Report on Coal Exploration Bharatpur Reorganization Block" was prepared in February 2014, which excludes Bharatpur South Block as it is fully exhausted, separated by rail line and no mining activity is carried out. Bharatpur South Quarry void is now used as water reservoir for various purposes of adjoining mines of MCL.

(ii) Copies of earlier approvals of the Mining Plan, if any.

- a) Letter of approval for Mining Plan of Bharatpur OCP Expansion (20 Mty) approved in April 2008.

No. 43012/(1)/2008-CPAM
Government of India
Ministry of Coal
Shastri Bhawan
.....

New Delhi, Dated 21st April 2008

To,
Chairman-cum-Managing Director
Mahanadi Coalfields Limited,
AT/P O, Jagriti Vihar,
Burla, Dist. Sambalpur
ORISSA.

D(T) Secretariat
By. No. 3821 dt. 21/4

Subject :- Approval of Mining Plan in respect of Bharatpur OCP Expn.- 20 Mty, Belpahar OCP Expn -3.50 Mty, Lakhanpur OCP Expn. -15.0 Mty, and Talabira OCP - 20 Mty of Mahanadi Coalfields Limited.

Sir,

You may please refer to letter No. MCL/CP&P/08/56 dated 17.04.2008 on the subject mentioned above. This is to convey approval to the Mining Plans of Bharatpur OCP Expn.- 20 Mty, Belpahar OCP Expn -3.50 Mty, Lakhanpur OCP Expn. -15.0 Mty, and Talabira OCP - 20 Mty of Mahanadi Coalfields Limited subject to following conditions :-

- i) The mining company shall take all necessary precautions regarding safety of mine workings persons deployed therein.
- ii) The approval of the Mining Plans is without prejudice to the requirement of approval from competent/prescribed authority under relevant rules / regulations etc

2. Three copies of the approved mining plan are enclosed herewith.

Yours faithfully,
[Signature]
(P.R. Mandali)
Adviser (Projects)

D(T) / D(P)

[Circular Stamp: MAHANADI COALFIELDS LTD. 9986, 21/4/08, RECORDS SECTION, SAMBALPUR, P. 12]

[Handwritten: 21/4/08]

[Handwritten: 06632542767]

[Handwritten: Mar 09 11 05:22p]

(ii) Copies of earlier approvals of the Mining Plan, if any.

- (b) Letter of approval for Mine Closure Plan of Bharatpur OCP Expansion (20 Mty) approved in August 2011.



गोपनीय/CONFIDENTIAL

ମହାନଦୀ କୋଲ୍‌ଫିଲ୍ଡ୍‌ସ୍ ଲିମିଟେଡ୍
महानदी कोलफील्ड्स लिमिटेड
Mahanadi Coalfields Limited
(A Subsidiary of Coal India Limited)
P.O.- Jagruti Vihar, Burla,
Dist. Sambalpur-768020(Orissa)
Fax : 0663-2542366
Phone : PBX - (0663) 2542977

Ref. No. MCL/SBP/CS/Bd-130/Exct/2011/ 6144

Date : July 07, 2011

To
The General Manager(CP&P)
Mahanadi Coalfields Limited,
Sambalpur.

Sub : Extract from the Minutes of 130th meeting of the Board of Directors of MCL held at 11.00 AM on Wednesday the 22nd June, 2011 at MCL Office, Bhubaneswar

Dear Sir,

Reproduced below is the extract of minutes of the above meeting of the Board of Directors for your information and necessary action, if any.

130.C/5 Approval of Mine Closure Plan as per MoC guidelines in respect of 16 projects.

5.1 The Board deliberated on the subject and in consideration of the facts highlighted in the agenda note, approved the proposal of mine closure plan for 16 Projects as per MoC guidelines.

- | | |
|-----------------------------------|-----------------------------------|
| 1) Lingaraj OC Expn.(16Mty) | 2) Lakhanpur OC Expn.(15Mty) |
| 3) Lajkura OCP (2.5Mty) | 4) Samleswari OCP (7Mty) |
| 5) Ananta OCP (15Mty) | 6) Hingula OCP (15Mty) |
| 7) Bharatpur OCP (20Mty) | 8) Bhubaneswari OCP (20Mty) |
| 9) Belpahar OCP (3.5Mty) | 10) Natraj U/G (0.64Mty) |
| 11) Talcher West U/G (0.52Mty) | 12) Orient-4 U/G (0.5Mty) |
| 13) Talahira II & III OCP (20Mty) | 14) Kaniha OCP (10Mty) |
| 15) Gopalprasad OCP (15Mty) | 16) Hirakhand-Bundi U/G (0.95Mty) |

Yours faithfully,


Company Secretary

File
2
81
P-3



06632542767

MCL C P & P

May 07 15 08:25p

(ii) Copies of earlier approvals of the Mining Plan, if any.

(c) Letter of approval for Mining Plan & Mine Closure Plan of Bharatpur OCP Expansion (Revision-1) (20 Mty) approved in May 2018.

<p>ମହାନଦୀ କୋଲ ଫିଲ୍ଡ୍‌ସ୍ ଲିମିଟେଡ୍ महानदी कोलफील्ड्स लिमिटेड Mahanadi Coalfields Limited (A subsidiary of Coal India Limited)</p>	<p>Office of the Company Secretary At/Po. Jagruti Vihar, Burla, MCL Dist. Sambalpur – 768020 (Odisha) CIN: U10102OR1992GOI003038 TeleFax No. 06632542977 Email id: cosecymcl@gmail.com Website: www.mahanadicoal.in</p>	 <p>25  MCL Years of Innovative Mining Excellence</p>
Ref. No. MCL/SBP/CS/BD-202/Exct/2018/226		Date: 10.06.2018
गोपनीय/CONFIDENTIAL		
<p>सेवा में, GM(P&P) महानदी कोलफील्ड्स लिमिटेड</p>		
<p>Sub: <u>Extract from the Minutes of the 202nd Board meeting of MCL held at 11.30 AM on Thursday, the 24th May, 2018 at MCL Office, Plot No. G-3, Gadakana, Chandrasekharpur, Bhubaneswar.</u></p>		
<p>प्रिय महोदय, आप के सूचनार्थ एवं उचित कार्यवाही हेतु एम.सी.एल. निदेशक मण्डल की 202 वी बैठक का उद्धृत दिया जा रहा है।</p>		
202.C/6	<p><u>Approval of proposed Capital Budget BE 2018-19 of Rs.1600.00 Crore for MCL.</u></p>	
6.1	<p>GM(P&P) apprised the Board about the salient points of the Capital Budget BE 2018-19. It was raised by the Independent Directors Dr Rajib Mall and Shri H S Pati that the capex for MCL should be increased substantially as this will set the company on a growth and expansion mode besides retaining the funds with the company in the form of assets. This was also echoed by the Chairman and he directed that investments in the subsidiaries maybe stepped up for expanding railway network, setting up own power plants etc. D(F) stated that that at the time of preparation of Revised Estimate 2018-19, the investments in power (through MBPL) and Railway Lines (through MCRL) would be considered.. Chairman also stated that setting up of JV in the power area should be expedited.</p>	
6.2	<p>Thereafter, the Board deliberated on the proposal in detail and based on the clarification offered by GM(P&P), approved the proposal as per the following: i) Capital Budget Estimate for 2018-19 amounting Rs 1600.00 Crs. ii) Approval for Estimates / Indents / Proposals for projects with insufficient balance fund in approved PR in anticipation of approval of RPR / Completion Reports / Dovetailed PRs etc.</p>	
6.3	<p>The Board further directed to forward the proposal of Capital Budget BE 2018-19 amounting to Rs.1600.00 Crore to CIL Board as per prevailing practice.</p>	
202.C/7	<p><u>Approval of Revised Mining Plan and Mine Closure Plan for Bharatpur OC Expansion Project (20 Mty) with total mine closure cost of Rs.448.561 lakh compounded @ 5% annually for 07 years.</u></p>	
7.1	<p>The Board deliberated on the subject in detail and based on the facts brought out in the agenda note and clarification offered by GM (P&P), approved the Mining Plan and Mine Closure Plan for Bharatpur OC Expansion Project (Rated Capacity 20.0Mty) with total mine closure cost of Rs. 523.68 lakh compounded @ 5% annually for 07 years as per the details brought out in the agenda note.</p>	

(iii) **Copy of MOC's letter granting recognition to RQP for preparation of Mining Plan.**

22-09-2010 15:15 FROM: cmpdi

+918512291447

T-243 P.002/002 F-783



By Registered Post.

No. 34011/(22)/2005-CPAM
Government of India
Ministry of Coal
Shastri Bhawan

New Delhi, 7th September 2010

✓ To	Chairman-cum-Managing Director, Central Mine Planning & Design Institute Limited, Gondwana Place, Kanke Road, Ranchi-834 031 (JHARKHAND).
---------	---

Subject	Grant of recognition to technically qualified executive of CMPDI as competent person to prepare Mining Plan for Coal/Lignite block(s).
---------	--

Sir,

I am directed to refer to your letter No. Nil dated 15.7.2010 on the above mentioned subject and to convey the approval of the Central Government to the grant of recognition in favour of Shri Debashis Roy and Shri R.K. Das, technically qualified executives of CMPDI **as competent person to prepare Mining Plan for the assignment/jobs undertaken only by CMPDI for 'OC Mines' under Rule 22© of Mineral Concession Rule, 1960 from the date of issue of this letter.**

2. The application for grant of recognition as RQP in respect of Shri Shri Sanjay Kumar Bhar could not be considered due to incomplete application.

3. Your attention is also invited towards the decision of Standing Committee that "additional area beyond the block boundary may be considered in a mining plan subject to the condition that proper justification is given in the mining plan, and that annexed area is non-coal bearing and does not intringe upon any already allotted or identified coal/lignite blocks".

Yours faithfully,



(L.S. JANOTI)
Section Officer

cc. GMS
✓
GMS
Pl issue letter
to them.
13/9/10
RES/COO
26
11/9/10

COPY SENT
ON 13-09-10

(iv) **Letter of Authorization by the Block Allottee/Applicant to the RQP for preparing Mining Plan.**

- a. MCL's (applicant) letter to CMPDI for preparation of Mining Plan & Work Order From MCL to P&D Department of CMPDI RI-VII.

ମହାନାଦୀ କୋଲ ଫିଲ୍ଡସ୍ ଲିମିଟେଡ୍
ମହାନାଦୀ କୋଲଫିଲ୍ଡସ୍ ଲିମିଟେଡ୍
Mahanadi Coalfields Limited
(A subsidiary of Coal India Limited)



ମହାପ୍ରବନ୍ଧକ(ପରିଯୋଜନାଏବଂ ଯୋଜନା)କାର୍ଯ୍ୟାଳୟ
Office of the General Manager (P&P)
At/Po: JagrutiVihar, Burla, Dist.: Sambalpur-768020(Odisha)
Phone-(0663) 2950562,
E-mail:gm-cmpdi.mcl@coalindia.in/ gmprojectsmcl@gmail.com
Web site:www.mahanadicoal.in
CIN No.: U10102OR1992GOI003038

ସନ୍ଦର୍ଭ ସଂଖ୍ୟା: ଏମସିଏଚ/ମୁଖ୍ୟାଳୟ/ମହାପ୍ରବନ୍ଧକ(ପରିଯୋଜନାଏବଂ ଯୋଜନା)/22/ 22-H ଦିନାଙ୍କ: 27/04/2022

ସେବା ସ୍ଥେ,
କ୍ଷେତ୍ରିୟ ନିର୍ଦ୍ଦେଶକ,
କ୍ଷେତ୍ରିୟ ମଂସ୍ଥାନ- 7,
ମେଡୁଲ ମାଉନ ଫ୍ଲାସିଂ ଏଣ୍ଡ ଡିଜାଇନ ଇଞ୍ଜିନିୟରିଂ ଲିମିଟେଡ୍ (ସି.ଏମ୍.ସି.ଡି.ଆର୍.ଏନ୍),
ସାମନ୍ତପୁରୀ (ସାମନ୍ତୀ ପାର୍କ କେ.ଏମ୍.ଏନ୍.ଏନ୍), ଆର୍. ଆର୍. ଏନ୍,
ଭୁବନେଶ୍ୱର -751 013 (ଓଡିଶା)
ବିଷୟ: Work Order for "Modification of Mining plan & Mine Closure Plan of Bharatpur Expansion OCP from 26 MTY to 20 MTY" under approved Annual Work Programme 2022-23 for CMPDI.
ସନ୍ଦର୍ଭ: Computer No: 684408 File No: 00HENV/14/13/0001/2022-MINING, BHARATPUR

ମହୋଦୟ,
With reference to the above, this is to inform you that the Competent Authority of MCL has accorded the financial approval for the work "Modification of Mining plan & Mine Closure Plan of Bharatpur Expansion OCP from 26 MTY to 20 MTY" under the approved Annual Work Programme 2022-23 for CMPDI for an amount of Rs. 91,19,040 /- (Rupees Ninety-One Lakh Nineteen Thousand Forty only).

Details of value of job:

- Total EDs assigned for the job: 300
- Total amount for EDs - Rs. 77,28,000.00 (300ED, @25760/-, ED rate of 2022-23)
- GST- Rs. 13,91,040.00 (@ 18% of Rs. 77,28,000.00)
- Grand Total: Rs. Rs. 91,19,040 /- (Rupees Ninety-One Lakh Nineteen Thousand Forty only).

FC Details:

FC No:-FC/MCL/SBP/2022-23/CAP/C-55/TCR/OTHER MINING INFRASTRUCTURE(MINE DEVELOPMENT)/BHARATPUR OCP, BHARATPUR AREA/Rs.91,19,040/- Dt.27.04.2022.

Note: Work must be completed within this financial year and subsequently submitting the bills within the current Financial Year i.e. 2022-23

Please acknowledge and arrange to complete the job at the earliest.

ସ୍ୱାକ୍ଷର
27/04/2022
(ଏମ୍ ଏସ୍ ଶର୍ମା)
ମହାପ୍ରବନ୍ଧକ (ପରିଯୋଜନା ଏବଂ ଯୋଜନା)

ସୂଚନା:

- ନିର୍ଦ୍ଦେଶକ (ତଦ୍ବିନୀତ) / ମଂସ୍ଥାନ)
- ନିର୍ଦ୍ଦେଶକ (ବିକ୍ର)
- ନିର୍ଦ୍ଦେଶକ (ତଦ୍ବିନୀତ) / ପରିଯୋଜନା ଏବଂ ଯୋଜନା)

ପ୍ରତିଲିପି:

- GM(BD), CMPDI , Ranchi
- TS to CMD, MCL
- GM(Finance - Commercial Accounts) / HOD MCL HQ
- GM(Finance - Corporate Accounts) / HOD MCL HQ
- GM(Finance - C & B) / HOD MCL HQ
- GM, Bharatpur Area
- Project Officer, Bharatpur OCP
- Sri. Sunil Tripathi, Sr. Manager(Min), P&P, MCL, HQ
- Office copy

Corporate Office : JagrutiVihar, Burla, Sambalpur, Odisha - 768 020, Phone: (PXX) +91 (663) 2542461-65, Website : www.mahanadicoal.in

Scanned with CamScanner

- (v) A certificate by the RQP that he has been duly authorized by the mining company to prepare mining plan on their behalf and that he has a valid recognition from MOC under MCR, 1960 to prepare the mining plan and that provisions of all relevant rules and regulations have been considered while preparing the mining plan.

Certified that-

1. Upon receiving Annual Job Assignment of P&D Department of CMPDI, RI-VII which includes preparation of Statutory Mining Plan & Mine Closure Plan for Bharatpur OC Expansion, Revision-3, 20 Mty, work on Mining Plan was started.
2. The provisions of Mineral Conservation and Development Rules, 1988 and MCR, 1960 have been observed in the preparation of “Mining Plan for Bharatpur OC Expansion, Revision-3, 20 Mty” and wherever specific permissions are required, the applicant will approach the concerned authorities.
3. The provisions of Mines Act, 1952 and of the Rules and Regulations made there under have been observed in the preparation of this Mining Plan and that wherever specific permission is required the applicant will approach Director General of Mines Safety in the matter.
4. The undersigned has a valid recognition from Ministry of Coal under Rule 22 of MCR 1960 to prepare Mining Plan for the assignment/jobs undertaken only by CMPDI for ‘OC Mines’ from the date of issuance of letter of approval. Copy attached.

DEBASHIS ROY
(RQP Ref.34011/(22)/2005 CAPM dt.07.09.2010)

Place: Bhubaneswar
Date:

(vii) Confirmation from RQP that he has verified the Block area with the relevant plans supplied by CMPDI/SCCL/NLC and area covered by the Mining Plan does not encroach on any other Coal/Lignite Block.

- This is to confirm that the proposed area has been verified with the relevant plans available in CMPDI and the area under consideration is under jurisdiction of MCL.

- (viii) **Copy of the document to establish that the Geological Report has been duly purchased from CMPDI, GSI/MECL as the case may be.**

The Geological Report named “Revised Geological Report on Coal Exploration Bharatpur Reorganization Block” was prepared in February 2014 by CMPDIL on full payment basis from Mahanadi Coalfields Limited.

(ix) Index of chapters contained in the Mining Plan.

INDEX OF CHAPTERS

1. CHAPTER – 1	PROJECT INFORMATION	Page 1-2
2. CHAPTER – 2	DETAILS OF EARLIER APPROVAL OF MINING PLAN	Page 1-5
3. CHAPTER – 3	LOCATION, TOPOGRAPHY & COMMUNICATION	Page 1-3
4. CHAPTER – 4	EXPLORATION, GEOLOGY, SEAM SEQUENCE, COAL QUALITY & RESERVES	Page 1-28
5. CHAPTER – 5	MINING	Page 1-18
6. CHAPTER – 6	MANPOWER, SUPERVISION & SAFETY	Page 1-9
7. CHAPTER – 7	COAL HANDLING & MODE OF DISPATCH	Page 1-3
8. CHAPTER – 8	INFRASTRUCTURE FACILITIES & PORPOSED LOCATIONS	Page 1-3
9. CHAPTER – 9	LAND REQUIREMENT	Page 1-6
10. CHAPTER-10	ENVIRONMENT MANAGEMENT	Page 1-1
11. CHAPTER-11	PROGRESSIVE AND FINAL MINE CLOSURE PLAN	Page 1-25

(x) Number of volumes in the Mining Plan and their Contents

CONTENTS OF VOLUMES

VOLUME – I	Documents Enclosed, Summarized Data, Chapters, Annexures.
VOLUME-II	Plans/Drawings.

(xi) List of Plans/drawings.

LIST OF PLATES

Sl. No	Particulars	Plate No
1	Bharatpur Location Plan – Talcher Coalfield	1
2	Plan in support of Documents Enclosed (vii)	2
3	KML File WGS84	3
4	Existing & proposed Mining Lease & Block Boundary	4
5	Geological Plan	5
6	Representative Graphic Litholog	6
7	Topographical Plan	7
8	Conceptual Surface Plan	8
9	Pre-mining Land Use	9
10	Floor Contour – II Bottom	10 (a)
11	Floor Contour – II Top	10 (b)
12	Floor Contour – III Top	10 (c)
13	Floor Contour – IV	10 (d)
14	Floor Contour – VIB	10 (e)
15	Floor Contour – VIII	10 (f)
16	Floor Contour – IX	10 (g)
17	Folio – II Bottom	11 (a)
18	Folio – II Combined	11 (b)
19	Folio – II Top	11 (c)
20	Folio – III Top	11 (d)
21	Folio – IV	11 (e)
22	Folio – VIB	11 (f)
23	Folio – VIII	11 (g)
24	Folio – IX	11 (h)
25	Isoparting – II Bottom & II Top	12 (a)
26	Isoparting – II & Local 2	12 (b)
27	Isoparting – II Top & Local 2	12 (c)
28	Isoparting – III Top & IV	12 (d)

29	Isoparting – IV & VA	12 (e)
30	Isoparting – VA & VB	12 (f)
31	Isoparting – VIB & VII	12 (g)
32	Isoparting – VIII & IX	12 (h)
33	OB above Seam - IX	12 (i)
34	Cross Sections	13
35	Surface Layout Proposed at Start of Base Year 01-04-2022	14
36	Surface Layout Proposed at End of life	15
37	Final Stage Mine Plan	16
38	Post Mining Land Use	17
39	Mine Stage 1 st Year (2022-23)	18 (a)
40	Mine Stage 3 rd year (2024 - 2025)	18 (b)
41	Mine Stage 5 th Year (2026 - 27)	18 (c)
42	Mine Stage 15 th Year (2036-37)	18 (d)
43	Reclamation plan - 3 rd year	19 (a)
44	Reclamation plan – 5 th year	19 (b)
45	Reclamation plan – 10 th year	19 (c)
46	Reclamation plan - 15 th year	19 (d)
47	Final Reclamation Plan	19 (e)
48	Coal flow diagram	20
49	Line Diagram – Electrical Layout	21
50	Workshop Layout	22

(xii) List of Annexures.

- a. Approval of Mining Plan and Mine Closure Plan for Bharatpur OC Expansion, Revision-2, 26 Mty by The Board of Mahanadi Coalfields Limited.

Other Annexures as per Guidelines issued on 16-12-2019 are placed as below-

- (1) Copy of Allotment order / Vesting order: Page-1 of "Documents Enclosed".
- (2) Certificate of authorized agency whether the project is confined within the allotted block: "Documents Enclosed".
- (3) Copies of earlier approvals of Mining Plan: "Documents Enclosed".
- (4) Plan/chart showing schedule of implantation of Mine Closure activities (progressive & final) with duration of important activities: Chapter-11.

(xii) List of Abbreviations used:

- MoC : Ministry of Coal
- MoEFCC : Ministry of Environment, Forest and Climate Change
- CMPDIL : Central Mine Planning and Design Institute Limited.
- MCL : Mahanadi Coalfields Limited.
- NCDC: National Coal Development Corporation.
- FCI: Fertilizer Corporation of India
- OC : Opencast
- IBM : Indian Bureau of Mines
- MECL: Mineral Exploration Corporation Limited
- RH: Relative Humidity
- UHV: Useful Heat Value
- PR : Project Report
- CBA(A&D) Act: Coal Bearing Areas (Acquisition & Development) Act.
- BG method: Blasting Gallery Method
- RPE method: Rib Pillar extraction Method
- Yr 1,2,3: Production year 1,2,3
- Mt: Million Metric tonnes
- Mty: Million Metric tonnes per year
- OB: Overburden
- TPD: Tonnes per day
- kW: kilo watt
- kV: kilo volt
- FLP: Flame Proof
- lps: liters per second
- CO: Carbon Monoxide
- CH₄ : Methane
- CHP: Coal Handling Plant
- MTK room: Mine Time Keeper Room
- RPM: Rounds per Minute
- SPM: Suspended Particulate Matter
- NO_x: Nitrogen Oxide/s
- EMP: Environmental Management Plan
- RCE: Revised Cost estimate.

(xiv) Copies of approvals regarding the setting up of end use plant

- MCL, the applicant does not have any End Use Plant of its own and is authorized to sale coal to pre-decided customers.
- 5.0 Mt RoM coal annually from this project is dispatched to M/s NALCO for their captive Power Plants through conveyor and MGR rail system.
- 15.0 Mt coal annually will be sent by rail to various power plants across India which are under Standing Linkage decided by MoC and Coal India Limited. Two automated loading systems with silos have been constructed for 15 Mt per year.

(xv) Certificate from CMPDI that the Geological Coordinates (Longitude and Latitude) used in preparation of Mining Plan is in accordance with the Vesting Order and Geological Coordinates covered by the Mining Plan do not encroach into any other/adjacent coal block.

Area under this project are notified under CBA long back for coal mining by Coal India limited through its production subsidiaries. There is no Vesting Order for the blocks falling in the project. Also, all surrounding blocks are in command area of MCL.

(xvi) Letter of Intent from the respective state government for the area included in the project which is outside the block allocated by vesting order to the project proponent.

Area being notified under CBA Act for coal mining by Coal India Limited, there is no Vesting Order from MoC. Land required is already vested with MCL, a subsidiary of Coal India Limited.

SUMMARISED DATA

1. General	
a) Name and address of the Applicant Company	Mahanadi Coalfields Ltd.(MCL) Jagriti vihar, Burla Dist: Sambalpur (Odisha) - 768020
b) Name and address of the Block Allottee	Mahanadi Coalfields Ltd.(MCL)
c) Relationship between the applicant and allottee company	Same organization
d) Status of the Applicant Company : Central /Public Sector Undertaking/State Government Undertaking/JV Company/ Pvt. Company/Public Co/Others (Specify)	Central Public Sector Undertaking
e) Name of the Coal Block together with name of Coalfield & State where located	“Bharatpur Reorganization Block” Talcher Coalfield, Odisha.
f) Date of allotment	Block is being worked by Mahanadi Coalfields Limited since long back
g) End Use of Coal/Lignite as per Approval by the Competent Authority	5.0 Mty to CPP of M/s NALCO. 15 Mty to other power plants through Basket linkage.
h) ROM Quantity proposed to be produced as per Mining Plan	20.0 Mty
i) Norms adopted for calculating ROM quantity requirement in case it differs from the quantity indicated in the Allotment Order.	Not Applicable
j) Beneficiation required – Yes/No	No
k) Requirement of Beneficiated Coal & expected availability thereof.	Not Applicable
l) Period for which Mining Lease has been granted/is to be renewed/ is to be applied for.	Land acquired under CBA(A&D), Act, 1957
m) Date of Expiry of earlier Mining Lease, if any	N/A
n) QP who has prepared the Mining Plan Name Address Phone No/Fax/Email ID Registration No & date till valid Date of grant/Renewal of RQP Status Validity	DEBASHIS ROY MPPA: Central Mine Planning and Design Institute limited, RI-VII, Plot No. E-4, At-Samantapuri P.O.-RRL, Bhubaneswar-751013 Phone No. 0674-2301271 E-Mail- debashis.roy@coalindia.in

D. Information regarding earlier approved Mining Plans, if any.

a)	Approval Letter no. and Date	<u>Mining Plan Phase-III (26 Mty):</u> <u>MCL/SBP/CS/CR-20/2020-21/</u> <u>11618 dated 27-03-2021</u> <u>Modified by The Board of MCL</u>		
		<u>Mining Plan Phase-III (20 Mty):</u> 43012/(1)/2008/CPAM dated 21-04-2008 by MoC <u>Mine Closure Plan for above:</u> 130 th meeting of Board of Directors of MCL on 22-06-2011 <u>Mining Plan & Mine Closure Plan Phase-III Reorganization:</u> 202 nd meeting of Board of Directors of MCL on 10-06-2018		
b)	Lease Area	1556.94 ha		
c)	Date of grant of Lease	Perpetual		
d)	Date of Expiry of Lease	Not applicable		
e)	Target Production	20.0 Mty		
f)	Proposed date of start of Production	Operating mine		
g)	Proposed date of achieving targeted production level	31 st March 2023		
h)	Envisaged life of the mine (in years)	22 years from 01-04-2022		
i)	Date of actual commencement of Mining Operations, if operations already started	1984-85		
j)	Likely date of Mining Operations, if operations not yet started & reasons for non-commencement of operations	Operating mine		
k)	Planned production and actual levels achieved in last 3 years	19-20	20-21	21-22
	Coal-Open Cast planned (no U/G operation)	20.00 Mt	20.00 Mt	20.00 Mt
	Coal-Open Cast actual	4.78 Mt	7.34 Mt	9.25 Mt
	OB actual (Mcum)	6.51	8.58	11.29
l)	Reasons for difference between the planned and actual production levels	Delay in land acquisition		
m)	Reason for revision of the Mining Plan	(i) Area and coal resource added from Kalinga East block to continue mining in the name of Bharatpur project.		
n)	Details of changes in the new mining plan compared to earlier approval	Old Plan Jan'20	New Plan April'22	
		1556.94	1556.94	
(i)	Lease Area (ha)	North-eastern part of Kalinga East block added	North-eastern part of Kalinga East block added	
(ii)	Block Boundary			
(iii)	Production level	26.0 Mty	20.0 Mty	
(iv)	Reserves	448.33 Mt (01-04-20)	431.74 Mt (01-04-22)	
(v)	Mining Technology (Additional sheets to be used, if required)	No change		

E LOCATION	
a) Location of the Block Taluka/ Village/ Khasra/ Plot / Block Range / etc. District / State	Angul District, Odisha
b) Name of the Coalfield/ Coal belt	Talcher Coalfield
c) Particulars of adjacent blocks: North, South, East, West	North- Subhadra West block South- Bharatpur South block East- Part of Padma Block in Jagannath mine West- Western part of Kalinga East block
d) Area of the Allotted Block (hectares) i Geological block area (Bharatpur Reorganization) ii Excavation Area	1365.40 excluding Bharatpur South. (69.93 ha is common with Balaram Expansion OCP block) 1334.05 ha
e) Reference no. of plan of block boundary issued by CMPDI/ SCCL/ NLC (A copy of the Plan also to be annexed)	"Revised Geological Report on Coal Exploration Bharatpur OCP Reorganization Block" prepared by CMPDI, RI-7 in February 2014 for MCL
f) Whether the lease boundary/ required boundary is same as demarcated by CMPDI/ SCCL/ NLC for delineating block/sub-block	No. Lease boundary includes Bharatpur South Quarry area required for infrastructure.
g) Existing mining Lease Area in case of existing mines, (hectares)	994.85 Ha (approved in 2021-22)
h) Applied/ required Lease Area as per the Mining Plan under consideration (hectares)	1556.94 Ha.
i) Whether the applied lease area falls within the geological block	No. Lease boundary includes Bharatpur South Quarry area required for infrastructure. Present lease includes Bharatpur South Quarry area.
j) Area (hectares) of lease which falls outside the geological block delineated by CMPDI/SCCL/NLC.	355.471 in Bharatpur South mine
k) Details of outside area: - Whether forms part of any other coal block - Whether it contains any coal/lignite reserves - Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/ colony/ safety zone/ others (specify)	-Bharatpur South block, exhausted -Fully exhausted by South Quarry -Workshop, store, roads, rails, CHP, water reservoir of this project.
l) Whether some part(s) of the geological block has not been applied for mining lease. -Total area in Ha of such part(s). -Total reserves in such part(s). -Brief reasoning for leaving such part(s)	Yes 23.87 ha transferred to Jagannath mine. 9.08 ha to avoid Barpali & Kandhabareni villages. 140.68 ha in Balaram & expansion project, not attempted now to extract barrier coal. Nil Mentioned above.
m) Type of Land involved in Hectares (Mining Lease) Outside Mining Lease	Forest land - 222.41 ha Non-forest land - 1334.53 ha Non-forest area Residential Colony 20.00 ha Resettlement site 41.40 ha

n) Broad Land Use Pattern (Forest, Township, Industrial, Agricultural, Grazing, Barren etc.)	Agriculture, forest and Barren.
o) Proximity of public road / railway line/major water body if any and approximate distance	Nearest rail station Talcher—14km, Angul-17km District HQ town Angul is at a distance of 17km by road.
p) Latitude and longitude	<u>Bharatpur North & Padma Block</u> Lat-20°56'35" and 20°58'40"N Long-85°06'30" and 85°08'40" <u>Kalinga East Block</u> Lat-20°56'33" and 20°59'05"N Long-85°03'56" and 85°06'57"
q) Survey of India Toposheet	73 H / 1 on R.F. 1:50,000

F GEOLOGY AND EXPLORATION				
a) Name of the Geological Block and area in hectares	Bharatpur OCP Re-organization block; 1365.40 ha			
b) Name of the Geological Report (GR) with year of preparation	“Revised Geological Report on Coal Exploration – Bharatpur Re-organization Block, Talcher Coalfield” prepared by CMPDI in February 2004.			
c) Name of the agency which conducted exploration and prepared GR	Boreholes by CMPDIL, NCDC, MECL & Dir Geo (O); GR by CMPDIL (RI-VII)			
d) Period of conducting exploration	1964 – 2005			
e) Details of drilling (by all agencies)	Agency	No. of BHs	Meter	
	CMPDIL	280	41951.16	
	NCDC	37	3296.18	
	MECL	10	2588.80	
	Dir Geo (Odisha)	14	3349.95	
	Total	341	51186.09	
f) No. of boreholes drilled within the block	341			
g) Overall borehole density within the block (no./ sq. km)	25 BH/ Sq.Km.			
h) Area covered by ‘detailed’ exploration within the block (hectares)	1365			
i) Area covered by ‘detailed’ exploration outside the block (hectares) - No. of boreholes drilled outside the block. - Bore hole density for outside area (no./sq. km)	Data of 56 boreholes outside this block but within MCL command area has been used for interpretation. Outside area is not defined.			
j) Whether entire lease area has been covered by ‘detailed’ exploration.	Yes			
k) Whether any further exploration is required or suggested and timeframe in which it is to be completed	The drilling done so far is adequate for placing the reserves in "proved" category. However, to predict the faults precisely, about 20 holes may be required from 2023.			
l) Number of coal/lignite seams/horizons - thickness range of coal seams	14. II seam is split into two sections towards west			
	Seam	Thickness range		Depth
		Minimum	Maximum	From To
	IX	3.20	23.21	9.00 76.01
	VIII	10.40	121.03	2.17 10.67
	VII	8.17	133.85	0.88 6.89
	VIB	12.86	164.57	0.08 3.72
	VB	12.63	190.44	0.03 5.88
	VA	10.15	194.20	0.10 3.35
	IV	9.15	201.16	1.18 11.62
	III Top	9.24	222.37	0.20 12.49
	III Mid	13.52	231.34	0.03 7.84
	III Bot	10.58	238.15	0.07 10.67

- Minimum & maximum depth of coal seams	Local	16.10	255.30	0.03	3.85
	II Top	46.30	276.59	18.90	34.80
	II Bot	67.33	303.94	0.25	7.43
	II Top+Bot	10.80	115.80	17.68	46.90
m) Gross Calorific Value (GCV in K Cal/kg) and Useful Heat Value(UHV in K.Cal/Kg), of coal as per GR : Range	Coal Seam	I ₁₀₀ GCV (K.cal/kg)			
	IX	3022-3548			
	VIII	2998-3508			
	VII	3078-3642			
	VIB	2920-3268			
	VB	2847-3791			
	VA	3606-4372			
	IV	3085-3791			
	III Top	3819-4177			
	III Mid	3496-3902			
	III Bot	3712-4502			
	Local	3948-4602			
	II Top	3895-4151			
	II Bot	3015-3821			
	II Top+Bot	3830-4186			
n) Quality (Grade) of coal as per GR : Range (as per GCV) Mean GCV (kcal/kg)	G-11 to G-12 3923 (upper level in G-12)				
o) Total geological reserves in the block (South Quarry excluded)	Gross Reserve: 920.918 Mt Net reserve 828.826 Mt Gross reserve has been considered for this Mining Plan				
p) Depletion of reserves (in case of running mine)	238.53 Mt (Gross geological) as on 01-04-22				
q) Additional reserves established (if any for running mine)	No				
r) Geological reserves considered for mining: by Opencast (without barrier & slope)	Out of 850.25 Mt, 19.08 Mt is by Balam Expansion OCP. Balance reserve 831.17 Mt Out of 831.17 Mt, 774.605 Mt lies within excavation pit, without barrier/slope. 456.57 Mt to remain as on 01-04-2022				
s) Corresponding Extractable reserves: by Opencast mining	431.74 Mt as on 01-04-2022				

G. MINING				
a) Existing and proposed method of mining (Opencast for OB & coal separately with dragline/ shovel/ surface miners/ manual/ etc.)		Shovel-Dumper and Dragline for OB and Surface Miner, front end loader and dumper for coal		
b) Targeted capacity in mtpa when the mine is fully developed and the year in which proposed to be achieved By Opencast : Year :		20.0 Mty Year-1 (2022-23)		
c) Life of the mine (balance on 01-04-2022) Opencast workings : Overall :		22 Years 22 years <i>Subject to scheduled production</i>		
d) Indicate quantum of production and expected grade as in table below :				
	Year	OC Production Mt	Grade	Washery rejects (Mt)

	Yr 1 (2022-23)	20.00	G-11 to G-12 (Mostly)	Not Applicable
	Yr 2 (2023-24)	20.00		
	Yr 3 (2024-25)	20.00		
Detailed calendar programme of coal production year wise and seam wise along with OB removal have been furnished in Chapter-5.				
e)	Whether the proposed external OB dump site is coal/ lignite bearing: - If so, whether coal/lignite below waste disposal area is extractable.		No new external dumping is proposed. OB is backfilled concurrently.	
f)	Whether negative proving for coal / lignite in the proposed site for OB dump/infrastructure has been done.		Yes	
g)	Proposed configuration of HEMM for OC (Coal & OB) & Major Equipment for OC.		<p><u>COAL (Contractual)</u> SURFACE MINER 3.8 m wide : 5 FRONT END LOADER (7-7.5 cum) : 5 DUMPER (60 T) : 73 WHEEL DOZER (450 HP) : 2</p> <p><u>OB (Departmental)</u> ELECTRIC ROP SHOVEL (10 cum): 4 ELECTRIC ROP SHOVEL (5 cum) : 3 HYDRAULIC SHOVEL (9.5 cum) : 0 HYDRAULIC SHOVEL (6.5cum) : 1 HYDRAULIC SHOVEL (6.1cum) : 1 HYDRAULIC Backhoe (4-5 cum) : 1 REAR DUMPER 100 T : 32 REAR DUMPER (60T) : 38 DOZER 860 HP : 2 DOZER (410 HP) : 5 DOZER (320 HP) : 7 DRILL(250MM) : 4 DRILL(160MM) : 7</p> <p><u>OB (Contractual)</u> Diesel Hydraulic Shovel 6-7 cum : 14 Rear Dumper (60 T) : 126 DRILL (160mm) : 28</p>	
h)	Mode of entry for underground mines (shaft, incline, adit):		N/A	
i)	Operations that are proposed to be outsourced		Total coal production & additional OB in excess of departmental capacity	
j)	Proposed coal evacuation facilities Face to Surface (In-pit, at surface level) Surface to end use plants		Dumpers inside mine and 400m on surface Conveyor, silo, rapid loading on rail	

H. END USE OF COAL/ LIGNITE		
a)	Capacity of the approved end use plants	5.0 Mty to CPP of M/s NALCO. 15 Mty to other power plants.
b)	Coal/ lignite requirement for end use plant with grade/quality	
c)	%age of end use requirement to be met from this mine	
d)	If washing / beneficiation of the coal/ lignite is planned to be conducted on site or adjacent to the extraction area, briefly describe the nature of the beneficiation and recovery rate.	N/A
e)	Proposed Use of Rejects/Middlings	N/A

I. ENVIRONMENTAL MANAGEMENT																						
a) Existing land use pattern (Mining Lease)	Forest land- 177.77 ha (Revision-1, Phase-I) 44.64 ha addl. (Revision-2) Total forest: 222.41 ha Non-forest land– 749.65 ha (Revision-1, Phase-I) 584.88 ha additional (Revision-2) Total non-forest: 1334.53 ha Total Mining Lease: 1556.94 ha																					
b) Land area indicating the area likely to be degraded due to mining, dumping, roads, workshop, washery, township etc.	<table><tr><th colspan="2">Area in ha</th></tr><tr><th></th><th>Total</th></tr><tr><td>Excavation area</td><td>1334.05</td></tr><tr><td>Safety Zone</td><td>3.53</td></tr><tr><td>External dump</td><td>49.50</td></tr><tr><td>Infrastructure (Workshop, store, CHP, etc.)</td><td>148.74</td></tr><tr><td>Rationalization of project boundary</td><td>21.12</td></tr><tr><td>Mining Lease</td><td>1556.94</td></tr><tr><td>Residential/Rehabilitation colony</td><td>61.40</td></tr><tr><td>Project Area:</td><td>1618.34</td></tr></table>		Area in ha			Total	Excavation area	1334.05	Safety Zone	3.53	External dump	49.50	Infrastructure (Workshop, store, CHP, etc.)	148.74	Rationalization of project boundary	21.12	Mining Lease	1556.94	Residential/Rehabilitation colony	61.40	Project Area:	1618.34
Area in ha																						
	Total																					
Excavation area	1334.05																					
Safety Zone	3.53																					
External dump	49.50																					
Infrastructure (Workshop, store, CHP, etc.)	148.74																					
Rationalization of project boundary	21.12																					
Mining Lease	1556.94																					
Residential/Rehabilitation colony	61.40																					
Project Area:	1618.34																					
c) Surface features	CHP, Workshop, rail, roads etc. are located on non-coal bearing area.																					
d) No. of villages/Houses to be shifted	11 villages under Phase-III expansion namely Lachhmanpur, Baideswar, Jamubahal, Pabitrapur, Anantabereni, Chintamanipuri, Padmabatipur, Dasarathipur, Nakeipasi (part), Danra (part) and Rakas (part) have been shifted or are being processed. 6 villages namely Saranga, Khajuria, Kishorechandrapur, Teleipasi, Niladripur and Satyabadipur are to be shifted totally. Remaining parts of Nakeipasi, Danra, Solda and Prasannagar falling in additional area are to be shifted in due course. Very small parts of Joragadia and Kuriahan are falling in the additional area to be worked in the last stage. Processing may be taken up after 15 years.																					
e) Additional Population to be affected by	In the additional area, 1093 families are likely to be affected.																					
f) Monitoring schedules for different environmental components after the commencement of mining and other related activities.	<table><tr><td>For air quality</td><td>Two days in a month at each station (once in a fortnight).</td></tr><tr><td>For water and effluent quality</td><td>Once in a month for each station (for drinking water quality), once in a fortnight (for 4 parameters) and once in a year (23 parameters) (for effluent quality)</td></tr><tr><td>For ground water level monitoring</td><td>4 times in a year (i.e. April/May, August, November & January)</td></tr><tr><td>For noise level</td><td>Once in a day-time and once in a night-time in fortnight from each station.</td></tr></table>		For air quality	Two days in a month at each station (once in a fortnight).	For water and effluent quality	Once in a month for each station (for drinking water quality), once in a fortnight (for 4 parameters) and once in a year (23 parameters) (for effluent quality)	For ground water level monitoring	4 times in a year (i.e. April/May, August, November & January)	For noise level	Once in a day-time and once in a night-time in fortnight from each station.												
For air quality	Two days in a month at each station (once in a fortnight).																					
For water and effluent quality	Once in a month for each station (for drinking water quality), once in a fortnight (for 4 parameters) and once in a year (23 parameters) (for effluent quality)																					
For ground water level monitoring	4 times in a year (i.e. April/May, August, November & January)																					
For noise level	Once in a day-time and once in a night-time in fortnight from each station.																					

J. PROGRESSIVE AND FINAL MINE CLOSURE PLAN (A separate chapter has been incorporated)	
a) Estimated total capital expenditure for mine closure activities	
b) Major closure Activities with proposed Capital	

expenditure	
Preparation of survey and disposal reports	<p>Balance Mine closure cost of Bharatpur OCP Revision-3 (20 Mty) Apr. 2022 is Rs.9590.392 lakhs (As on Apr.2022).</p> <p>Life of the mine is 22 years as on Apr.2022, accordingly total Cumulative deposit amounts for balance life @ 5% compounding rate is Rs.16785.436 Lakhs</p>
Subsidence Area study	
Disposal of P&M items	
Subsided Area (Technical & biologically reclaimed)	
Dismantling of Industrial Structure	
Leveling & gradient	
Fencing of subsided area	
Cleaning of coal stock and infrastructure area	
Disposal / Dismantling of Residential colony	
Plantation and landscaping on subsided/backfilled area	
Plantation over cleaned land of infrastructure	
Environmental monitoring	
Permanent lighting arrangement in and around mine periphery	
Total	

K. OTHERS	
a) Base date of Mining Plan.	1st April, 2022
b) Calendar year from which the production will start	This is a running mine.
c) Results of any investigation carried out for scientific mining, conservation of minerals and protection of environment; future proposals.	Not Applicable
d) Details of approval as MPPA Certificate No. NABET/APA-MPPA/IA010 Valid up to: Oct 06, 2024 Conveyed through letter no. QCI/NABET/APA&MPPA/ACO/21/010 dated October 20, 2021	<p>As per Annexure-II of this letter, the undersigned is listed at serial 7 as Project Coordinator</p> <p>DEBASHIS ROY</p>

ମହାନଦୀ କୋଲ୍ ଫିଲ୍ଡ୍‌ସ୍ ଲିମିଟେଡ୍
महानदी कोलफील्ड्स लिमिटेड
Mahanadi Coalfields Limited
(A subsidiary of Coal India Limited)

Office of the Company Secretary
At/Po. Jagruti Vihar, Burla, MCL
Dist. Sambalpur – 768020 (Odisha)
CIN: U10102OR1992GOI003038
TeleFax No. 06632542977
Email id: cosecymcl@gmail.com
Website: www.mahanadicoal.in



MCL

Ref. No. MCL/SBP/CS/CR-20/2020-21/ 10993

Date: 10.06.2020

गोपनीय/CONFIDENTIAL

सेवा में,
महाप्रबंधक (P&P)
महानदी कोलफील्ड्स लिमिटेड
सम्बलपुर-768020

विषय: Circular Resolutions under Section 175 of the Companies Act, 2013 – Approval for Mining Plan and Mine Closure Plan for Bharatpur OC Expansion Project (26.0 MTY) OCP (Revision-2) with a total closure cost of Rs.13095.63 lakhs (Rs.11936.38 Lakhs for 26.0 MTY Project starting from 01.01.2022 for a period of 17 years compounded @ 5% annually and Rs.1159.25 Lakh for the existing 20.0 MTY Project for the FY: 2019-20, 2020-21 & 2021-22).

Dear Sir,

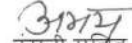
Reproduced below is the resolution approved by majority of Members of MCL Board by way of Circulation under Section 175 of the Companies Act, 2013. The same is forwarded herewith for your information and further necessary action.

Quote

The Board of Directors considered the agenda note sent in circulation and based on the facts brought out in the agenda note, approved the proposal by passing the following resolution:-

"Resolved that the Mining Plan and Mine Closure Plan for Bharatpur OC Expansion Project (26.0 MTY) OCP (Revision-2) with a total closure cost of Rs.13095.63 lakhs (Rs.11936.38 Lakhs for 26.0 MTY Project starting from 01.01.2022 for a period of 17 years compounded @ 5% annually and Rs.1159.25 Lakh for the existing 20.0 MTY Project for the FY: 2019-20, 2020-21 & 2021-22) be and is hereby approved as per the details brought out in the agenda note."

Unquote

भवदीय,

कंपनी सचिव.

Chapter- 1

PROJECT INFORMATION

1.1 BACKGROUND OF THE MINING COMPANY

Owner of the mine is Mahanadi Coalfields Limited (MCL), a subsidiary of Coal India Limited, a Central Public Sector company. MCL has its corporate office at Burla near Sambalpur town. The mine is operated by Bharatpur Opencast Project having office near the mine site, which is administratively controlled by Bharatpur Area Office located nearby.

With a few coal mines initially in Odisha, the coalfields were under Western Coalfield Limited of Nagpur, Maharashtra. With expansion, the coalfields came under a new subsidiary called South Eastern Coalfields Limited at Bilaspur, Chhattisgarh. Later with further production enhancement and more number of mines, Mahanadi Coalfields Limited came into existence.

MCL operates its coal mines within the State of Odisha. The State has two major coalfields, Talcher & Ib-valley. Bharatpur mine is in Talcher coalfield, situated on the western part of Brahmani River, in the Mahanadi River basin.

1.2 LOCATION OF ENDUSE PLANTS

This mine supplies 5 Mt coal per annum to M/s NALCO for its Captive Power Plant at Angul through 3.2 km long conveyor and MGR system of rail transport. Supplied coal partly satisfies 8 units, 120 MW each. Balance production of this mine goes to power plants under basket linkage through Indian Railways. Coal is transported to Paradip port for supply to power plants in southern India.

As yet, washing of coal is not envisaged.

1.3 PARTICULARS OF BLOCK AREA AND RESERVES

Sl.No.	Parameters	Proposed Mining Plan
1	Block Area	13.65 sq.km.
2	Net Geological Reserve-Block	828.826 Mt
3	Blocked Reserve	213.656 Mt ⁽¹⁾
4	Mineable Reserve	663.016 Mt ⁽²⁾
5	Extractable Reserve	639.491 Mt ⁽³⁾

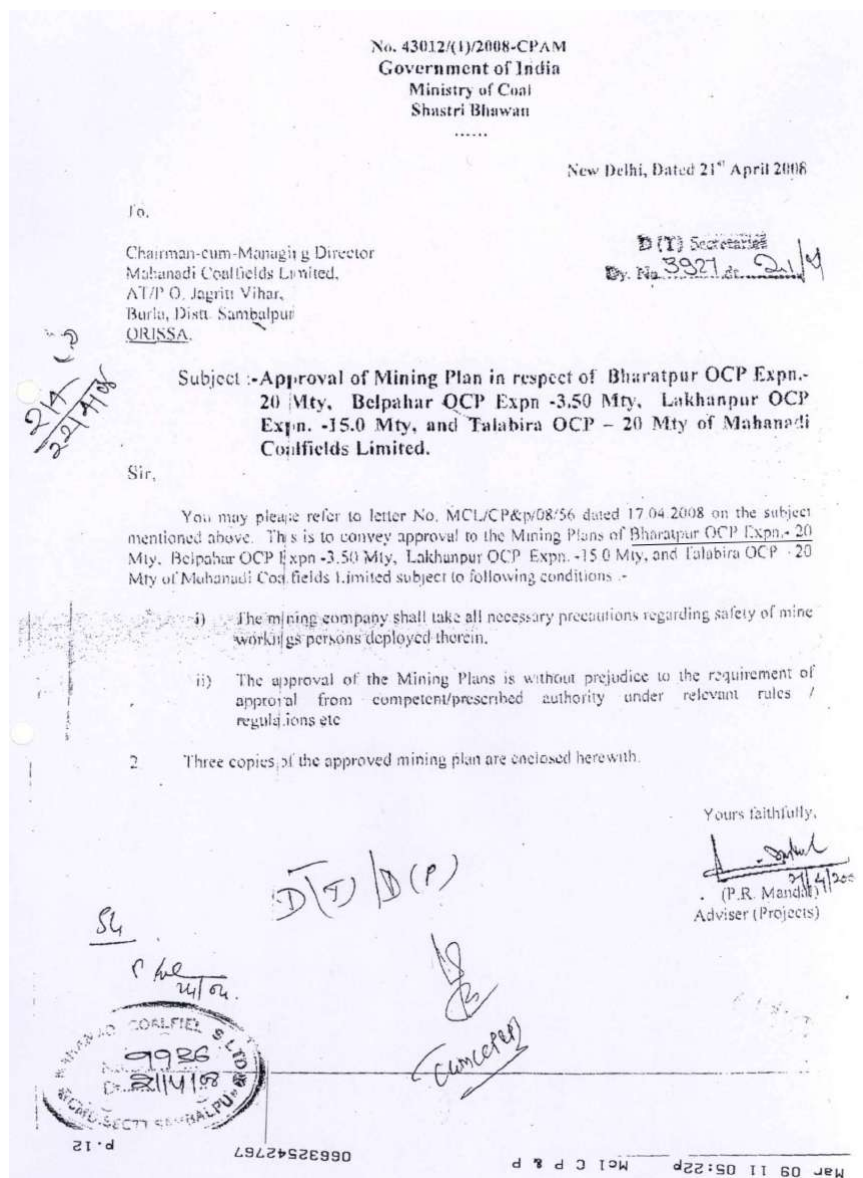
- (1) 80.78 Mt in barriers and 132.876 Mt in slopes.
- (2) Within Quarry profile but with reduced geological loss to 3% in view of very high borehole density.
- (3) After considering mining loss, average 3.55%.

Chapter- 2

DETAILS OF EARLIER APPROVALS OF MINING PLANS

2.1 MINING PLAN 20 Mty – April 2010

Ministry of Coal vide letter number 43012/(1)/2008-CPAM dated 21st April 2008, approved the Mining Plan. Copy of the approval letter is shown below.



Mining Lease of 1324.80 ha consisted of South Quarry, infrastructure around South Quarry and North Quarry. South Quarry was exhausted in 1992. A rail line was built between North & South Quarries.

The Mine Closure Plan corresponding to the Mining Plan as above was approved by the Board of Directors of MCL in 130th meeting on 22nd June 2011.

गोपनीय/CONFIDENTIAL



**Mahanadi
Coalfields
Limited**
(A Subsidiary of Coal India Limited)
A Mini Ratna Company

ମହାନଦୀ କୋଲଫିଲ୍ଡସ୍ ଲିମିଟେଡ୍
ସମ୍ବଲପୁର କୋଲଫିଲ୍ଡସ୍ ଲିମିଟେଡ୍
Mahanadi Coalfields Limited
(A Subsidiary of Coal India Limited)
P.O.- Jagruti Vihar, Burla,
Dist. Sambalpur-768020(Orissa)
Fax : 0663-2542366
Phone : PBX - (0663) 2542977

Ref. No. MCL/SBP/CS/Bd-130/Exct/2011/ 6144

Date : July 07, 2011

To
The General Manager(CP&P)
Mahanadi Coalfields Limited,
Sambalpur.

Sub : Extract from the Minutes of 130th meeting of the Board of Directors of MCL held at 11.00 AM on Wednesday the 22nd June, 2011 at MCL Office, Bhubaneswar

Dear Sir,

Reproduced below is the extract of minutes of the above meeting of the Board of Directors for your information and necessary action, if any.

130.C/5 Approval of Mine Closure Plan as per MoC guidelines in respect of 16 projects.

5.1 The Board deliberated on the subject and in consideration of the facts highlighted in the agenda note, approved the proposal of mine closure plan for 16 Projects as per MoC guidelines.

- | | |
|-----------------------------------|-------------------------------------|
| 1) Lingaraj OC Expn.(16Mty) | 2) Lakhanpur OC Expn.(15Mty) |
| 3) Lajkura OCP (2.5Mty) | 4) Samleswari OCP (7Mty) |
| 5) Ananta OCP (15Mty) | 6) Hingula OCP (15Mty) |
| 7) Bharatpur OCP (20Mty) | 8) Bhubaneswari OCP (20Mty) |
| 9) Belpahar OCP (3.5Mty) | 10) Natraj U/G (0.64Mty) |
| 11) Talcher West U/G (0.52Mty) | 12) Orient-4 U/G (0.5Mty) |
| 13) Talahira II & III OCP (20Mty) | 14) Kaniha OCP (10Mty) |
| 15) Gopalprasad OCP (15Mty) | 16) Hirakhand-Buridua U/G (0.95Mty) |

Yours faithfully,


Company Secretary

P-3

06632542767

MCL C P & P

May 07 15 08:25p

2.2 MINING PLAN – 20 MTY; REVISION-1; MAY 2018

Jagannath open cast mine is on the eastern side of Bharatpur mine. Jagannath mine was going to be exhausted. In order to add life to Jagannath mine, a part of planned Bharatpur mine was transferred to Jagannath mine. In order to obtain environmental clearance for extended Jagannath mine, the boundaries of Bharatpur mine had to be adjusted as per new common boundary and obtain approval of revised mining plan.

It was also found that required land boundary for Bharatpur project (P.R. Phase-III) was drawn adding 300m blasting zone from excavation boundary, which overlaps with adjacent mining lease areas of Ananta Extension Project (towards north) and Jagannath mine (towards east).

These boundaries were re-organized, excavation area reduced from east but extended towards west and northern boundary was restricted to Bangaru Jhor stream.

A revised mining plan was submitted in May 2018 with mining lease area of 994.85 ha but at same mine capacity. This Mining Plan and Mine Closure Plan was approved by the Board of MCL in its 202nd meeting on 24th May 2018.

ମହାନଦୀ କୋଲ ଫିଲ୍ଡ୍‌ସ୍ ଲିମିଟେଡ୍
महानदी कोलफील्ड्स लिमिटेड
Mahanadi Coalfields Limited
(A subsidiary of Coal India Limited)

Office of the Company Secretary
At/Po. Jagruti Vihar, Burla, MCL
Dist. Sambalpur – 768020 (Odisha)
CIN: U10102OR1992GOI003038
TeleFax No. 06632542977
Email id: cosecymcl@gmail.com
Website: www.mahanadicoal.in



Ref. No. MCL/SBP/CS/BD-202/Exct/2018/226

Date: 10.06.2018

गोपनीय/CONFIDENTIAL

सेवा में,
GM(P&P)
महानदी कोलफील्ड्स लिमिटेड

Sub: Extract from the Minutes of the 202nd Board meeting of MCL held at 11.30 AM on Thursday, the 24th May, 2018 at MCL Office, Plot No. G-3, Gadakana, Chandrasekharapur, Bhubaneswar.

प्रिय महोदय,

आप के सूचनार्थ एवं उचित कार्यवाही हेतु एम.सी.एल. निदेशक मण्डल की 202 वी बैठक का उद्धृत दिया जा रहा है।

202.C/6 Approval of proposed Capital Budget BE 2018-19 of Rs.1600.00 Crore for MCL.

- 6.1 GM(P&P) apprised the Board about the salient points of the Capital Budget BE 2018-19.
It was raised by the Independent Directors Dr Rajib Mall and Shri H S Pati that the capex for MCL should be increased substantially as this will set the company on a growth and expansion mode besides retaining the funds with the company in the form of assets. This was also echoed by the Chairman and he directed that investments in the subsidiaries maybe stepped up for expanding railway network, setting up own power plants etc. D(F) stated that that at the time of preparation of Revised Estimate 2018-19, the investments in power (through MBPL) and Railway Lines (through MCRL) would be considered.. Chairman also stated that setting up of JV in the power area should be expedited.
- 6.2 Thereafter, the Board deliberated on the proposal in detail and based on the clarification offered by GM(P&P), approved the proposal as per the following:
i) Capital Budget Estimate for 2018-19 amounting Rs 1600.00 Crs.
ii) Approval for Estimates / Indents / Proposals for projects with insufficient balance fund in approved PR in anticipation of approval of RPR / Completion Reports / Dovetailed PRs etc.
- 6.3 The Board further directed to forward the proposal of Capital Budget BE 2018-19 amounting to Rs.1600.00 Crore to CIL Board as per prevailing practice.

202.C/7 Approval of Revised Mining Plan and Mine Closure Plan for Bharatpur OC Expansion Project (20 Mty) with total mine closure cost of Rs.448.561 lakh compounded @ 5% annually for 07 years.

- 7.1 The Board deliberated on the subject in detail and based on the facts brought out in the agenda note and clarification offered by GM (P&P), approved the Mining Plan and Mine Closure Plan for Bharatpur OC Expansion Project (Rated Capacity 20.0Mty) with total mine closure cost of Rs. 523.68 lakh compounded @ 5% annually for 07 years as per the details brought out in the agenda note.

2.3 MINING PLAN – 26 MTY; REVISION-2; MARCH 2020

Within the mining lease of Revision-1, balance mine life as on 01-04-2018 was only 7 years. MCL has coal bearing property under its command area towards north (dip side) and west (Kalinga East geological block). So, an expansion project with area addition was taken up by MCL. The eastern part of Kalinga East block was added and previous northern boundary was extended up to southern boundary of Subhadra West block.

As per proposal of MCL, the Board of CIL also advised to obtain environment clearance for 26 Mty. In view of this, the Mining Plan is prepared for 26 Mty capacity.

The change in area of mining lease and level of production necessitates preparation of revised Mining Plan. So, Revision-2 of the Mining Plan with expanded area and capacity was taken up and the report is submitted in January 2020.

Time required to obtain all permissions including preparation of land schedule, preparation of EMP, Stage-I & Stage-II forest clearances, R&R activities etc, was taken as two years from 01-04-2020. So, base date for start of this mining plan is 01-04-2022.. This Mining Plan includes Mine Closure Plan as a separate chapter.

This Mining Plan and Mine Closure Plan was approved, vide letter no.MCL/SBP/CS/CR-20/2020-21/10993 Dt. 10th June 2020 by MCL Board. (Copy Annexed).

2.3 MINING PLAN – 20 MTY; REVISION-3; APRIL 2022

MP&MCP of Bharatpur OCP (Revision-2) has been approved by MCL Board and subsequently placed before EAC for EC and the same was returned with observations. As per the observations of 21st EAC meeting held on 27/10/21, MCL proposed to prepare MP&MCP of Bharatpur OC Expansion (20Mty),Revision-3 with in the same Mining Lease Area of 1556.94 ha and Project Area of 1618.34 ha.
(work order annexed in documents enclosed)

Chapter – 3

LOCATION, TOPOGRAPHY & COMMUNICATION

3.1 LOCATION

3.1.1 BROAD LOCATION OF PROJECT AREA IN RELATION TO GEOLOGICAL BLOCK AND COALFIELD WITH LATITUDES AND LONGITUDES

The proposed Bharatpur OC Expansion (20.0 Mty), Revision-3 has been carved out from Bharatpur North, partly from Padma and partly from Kalinga East block in southeastern part of Talcher coalfield of Odisha. Bharatpur North and Padma block lie between Latitude 20°56'35" to 20°58'40" and longitude 85°06'30" to 85°08'40". Kalinga East block lies between Latitude 20°56'33" and 20°59'05" N & Longitude 85°03'56" and 85°06'57" E. The area is covered under Survey of India Toposheet No.73 H / 1 on R.F. 1:50,000 and falls in Angul district of Odisha.

3.1.2 AREA OF THE BLOCK IN SQ. KMS.

The Bharatpur OC Expansion, (20Mty), Revision-3 block area comprises mainly Bharatpur North, part of Padma block and Eastern / North eastern part of Kalinga East geological blocks. Some part of Padma block from the present Bharatpur OCP Expansion (Phase-III) mine (6.81sqkm) has been released for /annexed to Jagannath OCP Extension and about 8.09 sq.km area from the eastern/ north eastern part of The Kalinga East block (comprising an area of 19.8 sq. Kms) has been annexed/ included in the present Bharatpur OC Expansion, Revision-3 block. Thus, the area of the Bharatpur OC Expansion, (20Mty), Revision-3 block is about 13.65 sq.km. This comprises 3.01 sq.km area of Bharatpur north block (this includes 2.73 sq.km of Bharatpur north block and 0.28 sq.km. area in between Bharatpur north block and Padma block), 2.55 sq.km of Padma (*4.61 sq.km*) block and 8.09 sq.km of Kalinga East block (*19.84sq km*).

3.1.3 LIMITING BOUNDARIES OF THE PROJECTISED AREA

Adopted quarry surface boundaries are described below:

- North : Northern and eastern block boundary of Kalinga East geological block (western part) and south-eastern boundary of Subhadra West block (eastern part). A barrier of 7.5m will be maintained between block boundary and excavation boundary.
- East : Common boundary with Jagannath OCP and road connecting Rakas village with Padmabatipur village.
- West : Western boundary of Teleipasi village as also the common boundary with Balaram Expansion OCP.
- South : Southern boundary fault (Fault F1-F1 in G.R.) between Bharatpur North & South blocks.

3.2 TOPOGRAPHY WITH DRAINAGE PATTERN OF AREA

The area is predominantly soil covered and gently undulating with paddy fields. The general slope of the ground is towards north. The general elevation varies from 92m to 137m above MSL.

The main drainage of the area is controlled by southerly flowing Brahmani River on the eastern side of the coalfield. There is one seasonal stream named Bangaru Jhor that originates within Kalinga East block and flows from south-western part to north-eastern part of the block. Ultimately this drains into Brahmani River near north of Talcher town. There are some very small seasonal streams in the block which develop along the local gradient of the area. The area also has numbers of man made ponds and wells utilized by local villagers for irrigation as well as for drinking purposes.

3.3 ACCESSIBILITY AND COMMUNICATION

The project area is connected by an all-weather road to Talcher town which is about 9km away. NH no.23, passes near Talcher town and connects with NH 42, the distance being about 13 km. The nearest rail head, Talcher railway station (SE

Rly.), is about 12 km by road. The state capital Bhubaneswar is about 155 km by road from Talcher.

Distance of Paradeep and Dhamra ports of Odisha are about 200 and 160 km respectively from Talcher.

3.4 CLIMATE AND RAINFALL DATA

The climate in the area under consideration is tropical. The summer is severe during May-June with temperature as high as 49°C accompanied by high humidity. A pleasant winter prevails from December to January. The minimum temperature recorded during January is 9°C. Monsoon breaks towards the end of June and continues upto end of October. The relative humidity varies from 46% to 93% in September.

Data on rainfall for 22 years (1960-81) shows that the annual rainfall varies between 67 cm. to 214 cm. The maximum rainfall recorded so far is 15.4 cm. over 24 hours on 9.9.77. A continuous period of rainfall reported to be is of 13 days in the area with a total rainfall of 28.5 cm. However, data on average monthly rainfall for 1979-92 shows that rainfall varies from 1.5 cm. in January to 33.1 cm. in August.

Chapter – 4

EXPLORATION, GEOLOGY, SEAM SEQUENCE, COAL QUALITY AND RESERVES

4.1 QUANTUM OF TOTAL EXPLORATION INPUTS

As mentioned above, the **Bharatpur Re-organization block** is formulated by constituting mainly Bharatpur North, Western/North Western part of Padma and Eastern/North eastern part of Kalinga East block and comprises an area of about **13.65 sq. km**. The exploration in the respective constituting geological blocks were carried out over a period from **1964 to 2013**.

The total quantum of exploratory drilling for coal carried out in Bharatpur OCP re-organization block in different phases by different agencies is about **51186.09m** drilled through **341 nos of boreholes** covering an area of about **13.65 sq km**. with borehole density of about **25 B.H./sq.km**.

Table-4.1
Agency-wise & Borehole-wise meterage drilled in
Bharatpur OCP Re-organization block,
Talcher Coalfield, Odisha

Sl. No.	Name of agency	No. of boreholes drilled	Meterage drilled (m)	Remarks
1	CMPDIL	280	41951.16	<i>Boreholes falling inside the present block</i>
2	NCDC	37	3296.18	<i>Boreholes falling inside the present block</i>
3	MECL	10	2588.80	<i>Boreholes falling inside the present block</i>
4	DGO	14	3349.95	<i>Boreholes falling inside the present block</i>
TOTAL		341	51186.09	<i>Boreholes falling inside the present block</i>

4.2 GEOLOGICAL STRUCTURE

GENERAL

As mentioned earlier, the Bharatpur OCP Re-organization block is made up off / created mainly out of three geological blocks viz. Bharatpur, Padma & Kalinga

east. The faults as interpreted in respective GR have different nomenclature. Bharatpur mine has also been undergone through various phases of expansion & extension by annexing the area from the adjoining blocks mainly Padma geological block. During the process of revision of GR / and structure, some faults have been omitted / modified and some more faults have been interpreted depending upon the exploration data of the boreholes drilled in phases for structure delineation.

STRIKE AND DIP

The general strike of the formations in **Bharatpur OCP Re-organization block** is East-West with local swings to NE-SW in the northern, western and south-eastern part of the block. The direction of dip is generally towards north with local variations towards NW and NE. The minimum and maximum dip amount ranges between 3° to around 10° (in the NW and North-central part). However, the general dip amount varies between 4° to 6°. The general gradient in the block ranges from 1 in 7 to 1 in 14 with resultant steepening and widening of the stratum contours.

PATTERN OF FAULTING

Bharatpur OCP Re-organization block is highly disturbed and complicated, as established on the basis of the sub-surface data generated by drilling 340 boreholes and their interpretation made in the form of structural plans showing variation in floor levels of respective seams, incrop plan, geological cross-sections etc. Structure of the block continues along strike direction in the adjacent Kalinga East /Kalinga west block towards west, Ananta & Jagannath OC mine block in the east and Bharatpur south OC to the south. **Generally two sets of faults are interpreted in this block. One set of fault trends WNW-ESE and the trend of other set is along the strike and are curvilinear as shown in the west and south central/central parts of the block.** The strike faults are primarily responsible for the preservation of the younger strata/coal seams at shallow depth and also for the repetition of the incrops of some of the coal seams. Horst and Graben structure has been observed and reflected in the cross-sections drawn through the block.

In Bharatpur OCP Re-organization block, a sum total of **23 nos. of faults** named F1-F1 to F23-F23 varying in throw and direction have been interpreted. Name of the faults have been assigned keeping in view the nomenclature as adopted / prevailing in the Bharatpur OC mine. However, during the process, the nomenclature of the faults as given in respective Geological Reports have been partially or fully changed/modified.

4.3 COAL SEAMS & CORRELATION

Bharatpur OCP Re-Organization block is carved out from Kalinga East, Padma and Bharatpur North geological blocks. Therefore, the correlation / nomenclature of coal seams encountered in the boreholes drilled by different exploration agencies in different period of time have been done as per the prevailing practice at that point of time. As a result the correlation of coal seams (**especially of the seam-II and III**) in different constituting geological blocks as documented in the respective GRs are different and needs further reconsideration for the Bharatpur OCP Reorganizations block keeping into consideration the mining status of various coal seam in the existing Bharatpur OC mine and structural continuity within the entire re-organized block boundary.

Therefore attempts have been made to modify the nomenclature / correlation of coal seams as adopted in different GRs of the constituting blocks and evolve a general nomenclature / correlation and structure for the Bharatpur OCP Re-organization block.

The coal seam II is the lower most coal horizon occurring in Barakar formation. Seam II had been correlated as a combined seam i.e. Seam II in Bharatpur North & Padma block and also is being mined as a single seam in the existing Bharatpur OC mine whose boundary has been re-organized to give additional life to the running mine at a rated capacity of 20 Mty.

However, in Kalinga East block, seam II has been considered as split seam and correlated as seam IIA, IIB, IIC, IID+IIE.

Similarly coal seam III which is occurring above seam II had been correlated in Padma & Bharatpur North Block as composite and as well as split and named as III, III TOP, III BOT and IIIC (III combined), IIIT & IIIB respectively in Padma & Bharatpur North block.

In Kalinga East block, coal seam III has been considered to occur in splits and named as Seam IIIA, IIIB, IIIC, IIID & IIIE. Out of these, some split sections have either not developed consistently throughout the block or their thickness is not workable hence, not considered for any detailed description in the respective GRs.

Moreover, in Subhadra East block (Ananta Extn. Phase – III) and adjoining Arkhapal block – there has been some development of thin / very thin coal horizon between seam II & seam III which have been correlated and named as local-1, 2 etc.

Therefore, to make a uniformity in correlation and structural continuity of the coal horizon as being mined in the existing Bharatpur OC mine, a necessary / suitable correlation of coal seams have been done for the block under reference.

The details of the correlation adopted for Bharatpur OCP Re-organization block along with the existing correlation of different constituting geological blocks is given below in table-4.3.

Table-4.2
Correlation of the coal seams in Bharatpur OCP Re-organization block,
Talcher Coalfield, Odisha

Sl. No.	Name of Coal Seam	NAME OF THE BLOCK				Remarks
		Bharatpur OCP Re-organisation Block	Kalinga East Block	Padma Block	Bharatpur North Block	
1	XI	XI	XI	ND	ND	
2	X	X	X	ND	ND	

Sl. No.	Name of Coal Seam	NAME OF THE BLOCK				Remarks
		Bharatpur OCP Re-organisation Block	Kalinga East Block	Padma Block	Bharatpur North Block	
3	IX	IX	IX	ND	ND	
4	VIII	VIII	VIII	ND	ND	
5	VII	VII	VII	ND	ND	
6	VI B	VI B	VI B	VI B	ND	
7	VI A	VI A	VI A	VI A	ND	
8	V B	VB	VB	VB	ND	
9	V A	VA	VA	VA	ND	
10	IV	IV	IV B IVA	IV	IV	
11	III	III TOP	III E	III TOP	III T	
12		III MID	III D			
13		III BOT	III C	III BOT	III B	
				III-Comb.	III C	
14	Local	Local 3	III B	ND	ND	
15		Local 2	III A	ND	ND	
16		Local 1	ND	Not correlated	ND	
17	Seam II	II TOP	II D+E II C	II	II	
18		II BOT	II B			
19		II	II A			
20		I TOP	Not drilled	I TOP	I TOP	
21	Seam I	I MID	Not drilled	I MID	I MID	
22		I BOT	Not drilled	I BOT	I BOT	

NOTE: - ND - not developed

4.4 SEQUENCE OF COAL SEAMS

In Bharatpur OCP Re-organization block altogether, 11 coal seams have been regionally correlated viz., seam I of Karharbari Formation and seams II to XI in Barakar Formation. Seam I occurs as three distinct splits, viz., seams I Top, I Middle and I Bottom. However, information on seam I is limited in **Bharatpur OCP Re-organization**

block as only 26 boreholes have been drilled in Karharbari Formation to intersect Seam-I. Moreover, most of the boreholes in which Seam-I has been encountered are falling towards that part of the block/ area where coal has already been mined or is being mine. Hence detail study on seam I is not made in this report as it is beyond the preview of the report. The present report dealt with the opencast potentiality of the coal seam for the existing Bharatpur OC mine within the block under reference. Remaining 10 coal seams of Barakar Formation occurs as 19 distinct splits/combination in ascending order, viz. II, II Bot, II Top, Local-1, Local-2, Local-3, III Bot, III Middle, III Top, IV, V A, V B, VI A, VI B, VII, VIII, IX, X and XI. Out of these, 5 coal seams, viz. seams Local-1, Local-3, VI A, X and XI have been identified as either not so potential or having localized development and hence, are not dealt in details. Seam X and XI are developed towards the northern boundary of the block over a very limited area and encountered only in 9-10 boreholes. Hence, though these seams are potential but due to limited occurrence are not considered in the report.

Bharatpur OCP Re-organization block is covered by soil varying in thickness generally from 5 m to 16 m. It consists of sandy soil, clay and lateritic soil. The weathered mantle ranges up to 34 m and consists of laterite, sandstone, sandy shale, intercalation of shale and sandstone, carbonaceous shale etc.

The sequence of coal seams and their intervening partings found to occur within the block, as per borehole data, is given below in Table 4.3:

Table: - 4.3
Sequence of Coal Seams and intervening Parting,
Bharatpur OCP Re-organization Block, Talcher Coalfield

Seam/ Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		RRL		FRL		GENERAL THICKNESS		No. of Bh
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	No.
SOIL	0.00	0.00	1.00	15.33	1.00	15.33					3.0	8.0	326
	CMTB-001	CMTB-001	CMTB-031	CMTB-063	CMTB-031	CMTB-063							
WM	1.50	15.33	6.00	31.10	0.00	28.10					3.0	14.0	326
	CMTB-002	CMTB-063	CMTB-D63	CMTB-D57	CMTB-080	CMTB-D57							

Seam/ Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		RRL		FRL		GENERAL THICKNESS		No. of Bh
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	No.
Part Parting above XI	13.50	23.00	21.65	35.57	0.00	22.07						20.0	3
	CMTK-218	CMTK-288	CMTK-248	CMTK-218	CMTK-248	CMTK-218							
XI	21.65	35.57	22.25	36.28	0.52	0.71	81.14	93.07	80.43	92.47	0.5	1.0	3
	CMTK-248	CMTK-218	CMTK-248	CMTK-218	CMTK-288	CMTK-218	CMTK-218	CMTK-248	CMTK-218	CMTK-248			
Parting between XI & X	22.25	36.28	32.12	60.29	8.32	24.01					9.0	25.0	3
	CMTK-248	CMTK-218	CMTK-288	CMTK-218	CMTK-288	CMTK-218							
X	20.19	65.44	21.00	66.47	0.51	1.77	47.16	89.74	46.13	88.93	0.6	1.0	7
	CMTK-215	KR-016	CMTK-215	KR-016	CMTK-288	CMTK-245	KR-016	CMTK-215	KR-016	CMTK-215			
Parting between X & IX	14.10	66.47	18.89	76.01	4.79	25.87					3.0	17.0	8
	CMTK-203	KR-016	CMTK-203	CMTB-D81	CMTK-203	CMTK-288							
IX	9.00	76.01	14.71	98.30	3.20	23.21	33.82	102.91	14.30	93.97	13.0	23.0	25
	CMTK-224	CMTB-D81	CMTK-300	KR-016	CMTK-229	KR-016	CMTB-D81	CMTK-310	KR-016	CMTK-300			
Parting between IX & VIII	9.72	98.30	27.98	121.03	9.10	25.06					18.0	23.0	53
	CMTK-194	KR-016	CMTK-194	KR-016	CMTK-218	CMTK-258							
VIII	10.40	121.03	16.62	131.37	2.17	10.67	-8.43	100.11	-18.77	97.17	7.0	10.0	72
	CMTK-220	KR-016	CMTB-D74	KR-016	METS-020	CMTK-187	KR-016	CMTB-D74	KR-016	CMTB-D74			
Parting between VIII&VII	13.30	131.37	15.76	133.85	1.25	5.81					2.0	4.0	81
	SW-005	KR-016	CMTK-184	KR-016	CMTK-044	CMTB-D85							
VII	8.17	133.85	9.47	138.54	0.88	6.89	-21.25	94.63	-25.94	91.80	3.0	5.0	85
	SW-006	KR-016	SW-006	KR-016	CMTK-300	CMTK-263	KR-016	CMTB-D74	KR-016	CMTB-D74			
Parting between VII&VIB	9.00	138.54	19.16	164.57	9.69	34.66					25.0	33.0	87
	CMTK-267	KR-016	SW-006	CMTB-D81	SW-006	CMTK-183							
VI B	12.86	164.57	14.41	166.30	0.08	3.72	-54.74	95.57	-56.47	95.49	0.7	2.0	107
	CMTB-006	CMTB-D81	CMTB-D80	CMTB-D81	CMTK-145	CMTB-006	CMTB-D81	CMTK-145	CMTB-D81	CMTK-145			
Parting between VIB&VIA	9.26	166.30	12.86	168.16	0.34	18.57					4.0	12.0	112
	CMTB-D86	CMTB-D81	CMTB-053	CMTB-D81	CMTB-D72	CMTB-D85							
VI A	10.95	168.16	12.03	168.27	0.06	1.86	-58.33	92.33	-58.44	91.89	0.1	1.0	119

Seam/ Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		RRL		FRL		GENERAL THICKNESS		No. of Bh
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	No.
	CMTK-056	CMTB-D81	CMTK-056	CMTB-D81	CMTB-D73	CMTK-258	CMTB-D81	CMTK-145	CMTB-D81	CMTK-145			
Parting between VIA&VB	12.03	168.27	17.52	190.44	1.86	30.04							
	CMTK-056	CMTB-D81	CMTK-063	CMTB-D81	CMTK-063	CMTB-D72					12.0	22.0	1090
V B	12.63	190.44	13.32	191.91	0.03	5.88	-80.61	94.49	-82.08	93.96			
	CMTK-108	CMTB-D81	CMTK-108	CMTB-D81	CMTK-096	CMTB-D87	CMTB-D81	CMTK-116	CMTB-D81	CMTK-116	0.5	2.0	118
Parting between VB&VA	13.32	191.91	15.88	194.20	0.30	11.02							
	CMTK-108	CMTB-D81	CMTK-108	CMTB-D81	CMTK-164	SW-005					2.0	6.0	124
V A	10.15	194.20	11.00	195.85	0.10	3.35	-84.37	100.13	-86.02	99.58			
	CMTK-058	CMTB-D81	CMTK-058	CMTB-D81	CMTK-187	CMTK-204	CMTB-D81	CMTK-025	CMTB-D81	CMTK-025	0.6	2.0	141
Parting between VA&IV	11.00	195.85	19.22	201.16	1.46	19.35							
	CMTK-058	CMTB-D81	CMTK-058	CMTB-D81	CMTK-080	CMTK-025					4.4	10.0	142
IV	9.15	201.16	11.37	209.96	1.18	11.62	-91.33	103.43	-100.13	96.28			
	CMTK-106	CMTB-D81	CMTK-106	CMTB-D81	NCTB-205	CMTK-249	CMTB-D81	NCTB-285	CMTB-D81	NCTB-285	5.0	9.0	170
Parting between IV&III TOP	10.55	209.96	15.85	222.37	1.52	30.83							
	NCTB-202	CMTB-D81	NCTB-147	CMTB-D81	CMTB-D50	NCTB-205					8.0	15.0	197
III TOP	9.24	222.37	13.17	228.36	0.20	12.49	-112.54	104.40	-118.53	100.20			
	CMTB-D71	CMTB-D81	CMTB-D71	CMTB-D81	CMTB-068	CMTB-012	CMTB-D81	CMTB-D60	CMTB-D81	CMTB-D60	3.0	6.0	212
Parting between III TOP&III MIDDLE	13.17	228.36	0.00	231.34	0.14	13.12							
	CMTB-D71	CMTB-D81	CMTB-029	CMTB-D81	CMTB-029	METS-033					1.0	10.0	186
III MID	13.52	231.34	14.00	231.59	0.03	7.84	-121.51	100.92	-121.76	100.52			
	CMTB-D71	CMTB-D81	CMTB-D71	CMTB-D81	CMTB-014	CMTB-D32	CMTB-D81	CMTB-D58	CMTB-D81	CMTB-D58	0.3	1.0	159
Parting between III MIDDLE&II BOT	0.00	231.59	14.13	238.15	0.13	42.30							
	CMTB-029	CMTB-D81	CMTB-D71	CMTB-D81	CMTB-D71	CMTB-D76					2.0	11.0	187
III BOT	10.58	238.15	13.04	238.30	0.07	10.67	-128.32	104.93	-128.47	101.78			
	CMTK-021	CMTB-D81	CMTK-021	CMTB-D81	CMTK-123	CMTB-022	CMTB-D81	NCTB-296	CMTB-D81	CMTB-077	0.5	5.0	224
	10.91	238.30	13.07	244.40	0.90	19.25					4.0	11.0	185

Seam/ Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		RRL		FRL		GENERAL THICKNESS		No. of Bh
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	No.
Parting between III BOT& LOCAL3	CMTB-010	CMTB-D81	CMTB-010	KR-016	NCTB-163	CMTK-016							
LOCAL 3	13.07	244.40	13.25	244.53	0.04	2.00	-132.17	93.53	-132.47	93.35	0.1	1.0	184
	CMTB-010	KR-016	CMTB-010	KR-016	CMTB-028	CMTK-215	CMTB-D81	CMTB-010	CMTB-D81	CMTB-010			
Parting between LOCAL3& LOCAL2	13.25	244.53	24.98	255.30	0.87	19.51					3.0	11.0	179
	CMTB-010	KR-016	CMTB-D70	CMTB-D81	CMTK-248	CMTK-018							
LOCAL 2	16.10	255.30	16.70	256.79	0.03	3.85	-145.47	85.92	-146.96	85.50	0.4	2.0	181
	NCTB-201	CMTB-D81	NCTB-201	CMTB-D81	CMTK-125	CMTK-266	CMTB-D81	CMTB-D61	CMTB-D81	CMTB-D61			
Parting between LOCAL2& LOCAL1	16.70	179.10	28.45	199.20	3.92	20.93					7.0	18.0	29
	NCTB-201	CMTK-261	NCTB-201	CMTK-261	CMTK-024	CMTK-120							
LOCAL 1	27.46	199.20	27.53	199.60	0.07	1.67	-93.15	88.50	-93.55	88.43	0.1	1.0	57
	CMTB-067	CMTK-261	CMTB-067	CMTK-261	CMTB-067	CMTK-012	CMTK-261	CMTB-067	CMTK-261	CMTB-067			
Parting between LOCAL1& II TOP	15.55	199.60	17.34	200.25	0.65	14.47					4.0	11.0	58
	CMTK-026	CMTK-261	CMTK-026	CMTK-261	CMTK-261	CMTK-020							
II TOP	46.30	276.59	73.41	302.40	18.90	34.80	-166.76	64.68	-192.57	35.49	25.0	29.0	149
	CMTK-238	CMTB-D81	CMTK-238	CMTB-D81	CMTK-123	NCTB-159	CMTB-D81	CMTK-232	CMTB-D81	CMTK-232			
Parting between II TOP&II BOT	61.30	298.28	67.33	303.94	0.15	20.35					3.0	10.0	141
	CMTK-059	KR-016	CMTK-059	KR-016	CMTK-232	CMTK-010							
II BOT	67.33	303.94	73.00	305.48	0.25	7.43	-191.34	43.06	-192.88	37.39	1.0	4.0	141
	CMTK-059	KR-016	CMTK-059	KR-016	CMTK-016	CMTB-D83	KR-016	CMTK-059	KR-016	CMTK-059			
II	10.80	115.80	33.83	148.55	17.68	46.90	-19.13	110.84	-51.88	88.87	31.0	37.0	95
	CMTB-018	CMTB-053	CMTB-018	CMTB-053	CMTB-D35	NCTB-279	CMTB-053	CMTB-018	CMTB-053	CMTB-D35			
Parting between II BOT &INDEX	143.34	194.36	215.75	255.07	60.71	72.41					60.0	70.0	

Seam/ Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		RRL		FRL		GENERAL THICKNESS		No. of Bh
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	No.
	CMTB-057	SW-027	CMTB-057	SW-027	SW-027	CMTB-057							
INDEX SEAM	112.86	215.75	113.64	217.51	0.09	3.03	-118.42	1.83	-120.18	1.05	0 . 6	2.0	26
	DGOP-007	CMTB-057	DGOP-007	CMTB-057	CMTB-017	CMTB-037	CMTB-057	DGOP-007	CMTB-057	DGOP-007			
Parting between INDEX&I TOP	17.34	217.51	52.03	257.38	28.55	55.24					3 4 . 0	50.0	51
	CMTJ-026	CMTB-057	CMTJ-026	CMTB-057	CMTB-004	DGOP-006							
I TOP	139.70	257.38	148.75	265.59	1.87	10.18	-160.05	-20.46	-168.26	-29.51	4.0	8.0	30
	CMTB-016	CMTB-057	CMTB-016	CMTB-057	CMTB-026	DCOP-015	CMTB-057	CMTB-016	CMTB-057	CMTB-016			
Parting between TOP&I MID	17.34	265.59	52.03	272.35	0.59	32.88					1.4	1 . 4	52
	CMTJ-026	CMTB-057	CMTJ-026	CMTB-057	DGOP-007	CMTJ-026							
I MID	152.25	272.35	154.30	273.10	0.30	5.82	-175.02	-33.01	-175.77	-35.06	0.3	2.9	26
	CMTB-016	CMTB-057	CMTB-016	CMTB-057	DCOP-010	CMTJ-026	CMTB-016	CMTB-057	CMTB-057	CMTB-016			
Parting between I MID&I BOT	0.00	273.10	0.00	283.81	0.00	32.88					0.1	1 2 . 0	52
	DGOP-005	CMTB-057	DGOP-005	CMTB-057	DGOP-005	CMTJ-026							
I BOT	158.90	283.81	162.55	287.45	0.58	6.43	-86.48	-39.66	-90.12	-43.31	1.5	5.0	26
	CMTB-016	CMTB-057	CMTB-016	CMTB-057	DGOP-020	CMTB-006	CMTB-057	CMTB-016	CMTB-057	CMTB-016			

4.5 QUALITY OF COAL SEAMS

The coal of the block is high moisture non-coking coal suitable for power generation. Seam wise coal quality is given in the table-4.4.

Table No.4.4
QUALITY OF COAL SEAMS

Seam Name	Bhs. Considered (Det. & Cal.)	No. of Determined Boreholes	Type of Samples	General Seam Thickness (>=1m)		Range of Proximate Analysis on 60% RH & 40°C						Range of CV in kcal/kg		Range of Ultimate analyses							
						M%		Ash%		VM%		Gross CVAR		C%		H%		N%		S%	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
IX	48	17	BCS	7.4	21.2	5.6	9.2	19.8	46.9	25.4	28.8	3327	5382	38.20	41.60	2.50	2.80	1.00	1.10	0.40	0.50
						CMTK-260	CMTK-258	SW-034	CMTK-260	CMTK-309	CMTK-181	CMTK-260	SW-034	CMTK-313	CMTK-185	CMTK-313	CMTK-185	CMTK-313	CMTK-185	CMTK-313	CMTK-185
IX	48	15	I100	7.4	21.2	5.1	7.6	33.3	50.9	23.7	28.6	2979	4345								
						CMTK-313	CMTK-185	CMTK-316	CMTK-309	CMTK-309	CMTK-316	CMTK-309	CMTK-316								
VIII	75	28	BCS	6.5	10.3	5.4	9.6	22.1	48.0	24.0	30.3	3252	5209	41.70	43.70	2.70	2.80	0.90	1.00	0.50	0.50
						METS-020	CMTK-258	CMTK-080	METS-020	CMTK-310	CMTK-188	METS-020	CMTK-080	CMTK-313	CMTK-245	CMTK-313	CMTK-245	CMTK-245	CMTK-313	CMTK-245	CMTK-245
VIII	75	23	I100	6.5	10.3	4.8	8.1	27.1	54.2	20.7	28.1	2683	4826								
						CMTK-197	CMTB-D74	CMTB-D74	CMTK-309	CMTK-309	CMTK-188	CMTK-309	CMTB-D74								
VII	79	31	BCS	3.3	5.1	6.2	10.6	22.4	42.3	25.4	30.4	3569	5181	41.40	46.20	2.79	2.80	1.00	1.14	0.59	0.60
						CMTK-288	CMTK-188	KR-001	CMTK-288	CMTK-266	CMTK-192	CMTK-266	KR-001	CMTK-313	SW-003	SW-003	CMTK-313	CMTK-313	SW-003	SW-003	CMTK-313
VII	79	27	I100	3.3	5.1	4.8	9.2	27.1	52.8	23.2	27.9	2888	4826								
						CMTK-260	CMTK-185	SW-005	CMTK-260	CMTK-310	CMTK-236	CMTK-260	SW-005								
VIB	65	16	BCS	1.4	2.5	5.5	9.3	25.2	48.0	22.4	28.0	3078	4976	33.60	34.50	2.30	2.30	0.80	0.80	0.60	0.80
						CMTK-250	CMTK-181	SW-005	CMTK-309	CMTK-245	CMTK-181	CMTK-309	SW-005	CMTK-245	CMTK-313	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-313
VIB	65	22	I100	1.4	2.5	4.8	9.0	34.6	58.1	19.1	26.1	2287	4266								
						CMTB-006	CMTK-185	CMTK-080	CMTK-251	CMTK-251	CMTK-185	CMTK-251	CMTK-080								

Seam Name	Bhs. Considered (Det. & Cal.)	No. of Determined Boreholes	Type of Samples	General Seam Thickness (>=1m)		Range of Proximate Analysis on 60% RH & 40°C						Range of CV in kcal/kg		Range of Ultimate analyses							
						M%		Ash%		VM%		Gross CVAR		C%		H%		N%		S%	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
V B	24	10	BCS	0.6	2.6	5.7	9.9	22.7	46.1	23.0	30.4	3315	5167	39.30	39.30	2.40	2.40	1.00	1.00	0.40	0.40
						CMTK-192	CMTK-249	CMTK-080	CMTK-264	CMTK-264	CMTK-236	CMTK-264	CMTK-080	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245
V B	24	12	I100	0.6	2.6	4.7	9.9	22.7	53.8	20.4	30.4	2732	5167								
						CMTK-010	CMTK-249	CMTK-080	CMTK-010	CMTK-264	CMTK-236	CMTK-264	CMTK-080								
V A	82	28	BCS	1.2	2	0.5	11.2	18.2	47.4	24.1	30.6	3663	6552	40.30	40.30	2.70	2.70	1.20	1.20	0.50	0.50
						CMTB-D72	CMTK-185	CMTK-006	CMTB-D79	CMTK-250	CMTK-233	CMTK-250	CMTK-006	CMTK-177	CMTK-177	CMTK-177	CMTK-177	CMTK-177	CMTK-177	CMTK-177	CMTK-177
V A	82	29	I100	1.2	2	0.5	11.2	26.6	47.4	22.6	30.6	3385	5941								
						CMTB-D72	CMTK-185	CMTK-264	CMTB-D79	CMTK-266	CMTK-233	CMTK-266	CMTK-007								
IV	166	15	BCS	5.1	8.6	5.2	8.1	29.2	48.4	22.5	29.2	3244	4745	35.10	43.70	2.30	2.80	0.90	1.30	0.50	1.10
						CMTK-164	CMTB-012	CMTB-014	CMTK-164	CMTB-068	CMTB-075	CMTK-164	CMTK-083	CMTK-185	CMTK-313	CMTK-185	CMTK-313	CMTK-185	CMTK-177	CMTK-177	CMTK-313
IV	166	18	I100	5.1	8.6	4.0	8.6	34.6	56.6	20.1	29.2	2647	4428								
						CMTK-226	CMTB-019	CMTB-019	CMTK-226	CMTK-309	CMTB-075	CMTK-226	CMTK-056								
III TOP	178	47	BCS	3.4	5.9	5.6	9.3	18.6	43.4	24.7	31.2	3656	5568	43.10	47.10	2.80	3.00	1.10	1.20	0.60	0.90
						KR-016	CMTK-185	CMTK-080	KR-016	CMTK-310	CMTK-055	KR-016	CMTK-080	CMTK-185	CMTK-313	CMTK-185	CMTK-313	CMTK-245	CMTK-185	CMTK-185	CMTK-313
III TOP	178	49	I100	3.4	5.9	4.9	8.5	25.0	49.4	23.2	29.5	3193	5067								
						CMTK-145	CMTK-255	CMTK-080	CMTK-145	CMTK-309	CMTK-055	CMTK-145	CMTK-080								
III MID	8	4	BCS	0.2	5.5	5.4	8.1	35.1	45.4	23.8	26.3	3497	4292	41.60	41.60	2.80	2.80	1.00	1.00	0.50	0.50

Seam Name	Bhs. Considered (Det. & Cal.)	No. of Determined Boreholes	Type of Samples	General Seam Thickness (>=1m)		Range of Proximate Analysis on 60% RH & 40°C						Range of CV in kcal/kg		Range of Ultimate analyses							
						M%		Ash%		VM%		Gross CVAR		C%		H%		N%		S%	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
						CMTB-D32	CMTK-247	CMTB-D33	CMTB-D32	CMTK-250	CMTB-D32	CMTB-D33	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245	CMTK-245
III MID	8	4	I100	0.2	5.5	5.0	7.4	35.1	48.8	23.8	24.0	3235	4292								
						CMTK-291	CMTK-247	CMTB-D33	CMTK-291	CMTK-250	CMTK-245	CMTK-291	CMTB-D33								
III BOT	127	21	BCS	1.3	5.6	4.9	8.0	25.8	45.4	23.5	32.2	3497	5007	47.60	47.60	3.00	3.00	1.00	1.00		
						CMTK-164	CMTB-014	CMTK-083	CMTB-D84	CMTK-164	CMTB-077	CMTB-D84	CMTK-083	CMTB-013	CMTB-013	CMTB-013	CMTB-013	CMTB-013	CMTB-013	CMTB-013	CMTB-013
III BOT	127	26	I100	1.3	5.6	4.7	8.6	27.6	50.6	22.5	32.2	3109	4866								
						SW-005	CMTP-020	CMTK-125	SW-005	CMTP-022	CMTB-077	SW-005	CMTK-125								
LOCA L 2	77	30	BCS	1	2.1	2.8	8.9	24.1	56.3	21.1	30.7	2850	5138	46.80	46.80	3.00	3.00	1.00	1.00	2.20	2.20
						CMTK-164	CMTK-255	CMTK-145	CMTK-164	CMTK-164	CMTK-181	CMTK-164	CMTK-145	CMTK-313	CMTK-313	CMTK-313	CMTK-313	CMTK-313	CMTK-313	CMTK-313	CMTK-313
LOCA L 2	77	32	I100	1	2.1	2.8	8.9	24.1	56.3	21.1	30.7	2850	5138								
						CMTK-164	CMTK-255	CMTK-145	CMTK-164	CMTK-164	CMTK-181	CMTK-164	CMTK-145								
II TOP	126	5	BCS	25.5	29.2	5.1	8.2	26.5	40.0	26.1	28.0	3860	4883	42.60	46.90	2.70	3.10	1.00	1.20	0.50	0.90
						CMTK-198	CMTK-080	CMTK-062	CMTK-164	CMTK-171	CMTK-238	CMTK-164	CMTK-062	CMTK-245	CMTK-185	CMTK-245	CMTK-185	CMTK-245	CMTK-177	CMTK-185	CMTK-313
II TOP	126	8	I100	25.5	29.2	5.0	7.7	30.2	45.8	25.7	28.0	3416	4593								
						CMTK-198	CMTK-062	CMTK-062	CMTK-123	CMTK-171	CMTK-237	CMTK-123	CMTK-062								
II BOT	95	15	BCS	1.2	4.4	4.0	7.4	22.8	50.7	19.1	29.3	2954	5333	40.50	44.60	2.50	2.66	0.80	1.08	0.50	0.80
						CMTK-239	NCTB-159	NCTB-159	CMTK-170	CMTK-257	CMTK-058	CMTK-170	NCTB-159	CMTK-185	SW-003	CMTK-185	SW-003	CMTK-313	SW-003	CMTK-185	CMTK-313
II BOT	95	18	I100	1.2	4.4	4.0	7.4	22.8	53.9	19.1	27.9	2712	5333								

Seam Name	Bhs. Considered (Det. & Cal.)	No. of Determined Boreholes	Type of Samples	General Seam Thickness (>=1m)		Range of Proximate Analysis on 60% RH & 40°C						Range of CV in kcal/kg		Range of Ultimate analyses							
						M%		Ash%		VM%		Gross CVAR		C%		H%		N%		S%	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
						CMTK-239	NCTB-159	NCTB-159	CMTK-170	CMTK-257	CMTK-238	CMTK-170	NCTB-159								
II	73	21	BCS	31.2	35.2	5.2	8.0	29.2	40.6	25.0	29.1	3920	4832	47.80	48.30	3.10	3.30	1.00	1.00		
						CMTB-065	CMTB-D53	CMTB-054	CMTB-077	CMTB-D52	CMTB-006	CMTB-077	CMTB-054	CMTB-013	CMTB-006	CMTB-013	CMTB-006	CMTB-006	CMTB-006		
II	73	19	I100	31.2	35.2	5.2	7.8	33.5	46.2	22.8	28.4	3349	4486								
						CMTB-065	CMTB-019	CMTB-064	CMTB-022	CMTB-022	CMTB-073	CMTB-022	CMTB-064								

Note: Analytical data in Italics represents the data for the seam, where roof and floor do not tally with the present correlation

4.6 GEOLOGICAL RESERVES

GENERAL

The Bharatpur OCP Re-organization block covers an area of 13.65sq. km where ELEVEN regionally correlate-able coal seams are established viz. seam I of Karharbari Formation and seams II to XI in Barakar Formation.

10 coal seams of Barakar Formation occur as 19 distinct splits/combination in ascending order, viz. II, II Bot, II Top, Local-1, Local-2, Local-3, III Bot, III Middle, III Top, IV, V A, V B, VI A, VI B, VII, VIII, IX, X and XI. Out of these, 5 coal seams, viz. seams Local-1, Local-3, VI A, X and XI have been identified as either not so potential or having localized development and hence, are not dealt in details. Seam X and XI are developed towards the northern boundary of the block over a very limited area and encountered only in 3-7 boreholes. Hence, though these seams are potential but due to limited occurrence are not considered in the report. Therefore only 14 coal seams/splits are considered for reserve estimation in the block under reference.

GRADE ESTIMATION

The coal seams of Barakar Formation in **Bharatpur OCP Re-Organization block** are of high moisture, high ash and high volatile non-coking coal, as such the grading of these coals is done on the basis of GCV Bands as desired under the changing Geo-Mining environment. The coal seams generally possess long flame characteristics of B₄ / B₅ groups, i.e. M₁₀₀ and Unit GCV ranges between 11 & 13 and 6816 & 9603 Kcal/kg respectively and unit VM% over 32.

GCV value for the effective thickness (excluding in-seam dirt bands of 1 m and above thickness, if any) of different seams are calculated from seam overall proximate analysis on 60% RH & 40°C (determined and calculated-where determined values are not available) by using the following formula:

$$\text{Gross CV in kcal/kg} = \frac{154x\{100-(1.1xA+M)\}-108x}{1.8}$$

Where A = Ash% and M = Moisture % on equilibrated basis, determined as per IS 1350, Part I, 1984.

These GCV values are used for drawing isograd for different GCV Bands for different seams.

All coal seams yielding GCV Band/Grade-from G-1 to G17 have been considered for reserves estimation.

In some areas, coal seams, which have been deteriorated to carbonaceous shale i.e., GCV becomes less than 2200kcal/kg are marked as Ungraded coal and are excluded from reserves estimation of respective coal seams, but its volumes are added to respective waste.

No barrier has been taken into consideration while estimating the reserves and overburden / parting.

As such standard specific gravity for resource calculation under GCV bands (G1 to G17) has not been finalized so far and a formula has been used for calculation of reserves. The following formula, considered for high moisture non-coking coal, by taking average ash% for each grade:

$$\text{Sp. Gr.} = 1.29 + 0.01 \times \text{Ash\%}$$

GEOLOGICAL RESERVE

Total Reserves of 828.826 million tonnes have been estimated up to seam II BOT for the entire block. **This includes the reserves for mined out area also.** The volumes of less than 1.0 m coal seams, Ungraded coal i.e. the GCV is less than 2200

Kcal/Kg and In-seam dirt bands of 1 me & above in thickness have been deduced from respective seam and added to the volumes of respective overburden / parting above to arrive at total waste. The reserves for the entire block are categorized as proved reserve and 10% deduction is made for geological disturbances.

WASTE (OVERBURDEN / PARTING)

Total volume of 1224.186 million cubic m of waste has been estimated for the entire area up to bottom most quarry-able seam i.e., Seam –II BOT/II in Bharatpur OCP Re-Organization block with corresponding net proved coal reserve of 828.826Mt. The vertical stripping ratio is 1:1.48. The seam wise geological reserve is given below:

Table-4.5
Seam-wise Total Geological Proved Reserves,
Bharatpur OCP Re-Organization block,
Talcher Coalfield

Seam name	Gross geological proved coal reserves (in mt)	Net proved coal reserves (in mt)
IX	34.550	31.095
VIII	32.450	29.205
VII	18.300	16.470
VI B	6.847	6.163
V B	2.431	2.188
V A	8.440	7.596
IV	89.321	80.389
III TOP	69.559	62.604
III MID	1.528	1.374
III BOT	40.002	36.001
LOCAL 2	7.642	6.878
II TOP	335.504	301.953
II BOT	30.710	27.639
II	243.634	219.271
TOTAL RESERVES	920.918	828.826

In view very high bore hole density of 25 per sq.km., the GROSS GEOLOGICAL RESERVE has been considered for planning purpose.

Table4-6
GCV Grade/Band-wise Geological Proved Reserves,
Bharatpur OCP Re-Organization block,
Talcher Coalfield

SL NO.	GCV RANGE/BAND	BAND NAME	TOTAL GROSS RESERVES	TOTAL NET RESERVES	GCV BANDWISE PERCENTAGE OF RESERVES
1	Exceeding 7000	G-1	0.000	0.000	0.00%
2	Exceeding 6700 and not exceeding 7000	G-2	0.000	0.000	0.00%
3	Exceeding 6400 and not exceeding 6700	G-3	0.000	0.000	0.00%
4	Exceeding 6100 and not exceeding 6400	G-4	0.000	0.000	0.00%
5	Exceeding 5800 and not exceeding 6100	G-5	0.016	0.014	0.00%
6	Exceeding 5500 and not exceeding 5800	G-6	0.250	0.225	0.03%
7	Exceeding 5200 and not exceeding 5500	G-7	0.987	0.888	0.11%
8	Exceeding 4900 and not exceeding 5200	G-8	2.339	2.105	0.25%
9	Exceeding 4600 and not exceeding 4900	G-9	7.207	6.486	0.78%
10	Exceeding 4300 and not exceeding 4600	G-10	45.677	41.109	4.96%
11	Exceeding 4000 and not exceeding 4300	G-11	426.146	383.531	46.27%
12	Exceeding 3700 and not exceeding 4000	G-12	252.568	227.311	27.43%
13	Exceeding 3400 and not exceeding 3700	G-13	84.317	75.885	9.16%
14	Exceeding 3100 and not exceeding 3400	G-14	80.421	72.379	8.73%
15	Exceeding 2800 and not exceeding 3100	G-15	19.963	17.967	2.17%
16	Exceeding 2500 and not exceeding 2800	G-16	0.977	0.879	0.11%
17	Exceeding 2200 and not exceeding 2500	G-17	0.052	0.047	0.01%
	TOTAL		920.918	828.826	100.00%

Table-4.7
Seam-wise Grade/Band-wise Net Proved Geological Reserves,
Bharatpur OCP Re-Organization block,
Talcher Coal Field

Seam-Wise, GCV Band/Grade-wise Net Proved Reserves in million tonnes																		Seam-wise total reserves	SEAM-WISE PERCENTAGE OF NET PROVED RESERVES
SEAM	G-1	G-2	G-3	G-4	G-5	G-6	G-7	G-8	G-9	G-10	G-11	G-12	G-13	G-14	G-15	G-16	G-17		
IX	0	0	0	0	0	0	0	0	0	0	0.306	2.502	8.883	19.39	0.018	0	0	31.095	3.75%
VIII	0	0	0	0	0	0	0	0	0.027	0.045	0.522	2.025	8.1	12.43	5.976	0.081	0	29.205	3.52%
VII	0	0	0	0	0	0.018	0.018	0	0.027	0.063	0.945	4.356	6.75	3.771	0.513	0.009	0	16.47	1.99%
VI B	0	0	0	0	0	0	0.004	0.008	0.024	0.02	0.155	0.858	1.471	2.473	0.974	0.129	0.047	6.163	0.74%
V B	0	0	0	0	0	0	0.003	0.022	0.048	0.067	0.086	0.379	0.626	0.59	0.364	0.003	0	2.188	0.26%
V A	0	0	0	0	0.014	0.206	0.785	1.45	1.603	1.492	1.205	0.602	0.224	0.015	0	0	0	7.596	0.92%
IV	0	0	0	0	0	0	0	0	0	0.178	3.274	18.28	18.78	29.29	9.932	0.657	0	80.389	9.70%
III TOP	0	0	0	0	0	0	0	0.047	2.167	16.43	30.111	12.475	1.333	0.045	0	0	0	62.604	7.55%
III MID	0	0	0	0	0	0	0	0	0.027	0.102	0.262	0.495	0.484	0.004	0	0	0	1.374	0.17%

Seam-Wise, GCV Band/Grade-wise Net Proved Reserves in million tonnes																		Seam-wise total reserves	SEAM-WISE PERCENTAGE OF NET PROVED RESERVES
SEAM	G-1	G-2	G-3	G-4	G-5	G-6	G-7	G-8	G-9	G-10	G-11	G-12	G-13	G-14	G-15	G-16	G-17		
III BOT	0	0	0	0	0	0	0	0	0.608	6.607	17.049	10.171	1.452	0.114	0	0	0	36.001	4.34%
LOCAL 2	0	0	0	0	0	0	0	0.065	1.003	2.326	2.513	0.875	0.062	0.02	0.014	0	0	6.878	0.83%
II TOP	0	0	0	0	0	0	0	0	0.014	9.679	180.66	104.53	7.069	0	0	0	0	301.953	36.43%
II BOT	0	0	0	0	0	0.001	0.056	0.167	0.304	0.934	5.562	9.496	9.05	1.893	0.176	0	0	27.639	3.33%
II	0	0	0	0	0	0	0.022	0.346	0.634	3.17	140.88	60.266	11.6	2.353	0	0	0	219.271	26.46%
ALL SEAMS	0	0	0	0	0.014	0.225	0.888	2.105	6.486	41.109	383.531	227.311	75.885	72.379	17.967	0.879	0.047	828.826	100%
GRADE-WISE PERCENTAGE	0.00 %	0.00 %	0.00 %	0.00%	0.00%	0.03%	0.11%	0.25 %	0.78 %	4.96 %	46.27%	27.43%	9.16%	8.73%	2.17%	0.11%	0.01 %	100.00%	

4.7 SPECIAL STUDIES CARRIED OUT NEAR BY PHYSICO-MECHANICAL STUDIES

No borehole from **Bharatpur OCP Re-organization block** was subjected to physico-mechanical studies. However one borehole from adjoining Revised Kalinga West block and one borehole from Padma block (the constituting block of the Bharatpur OCP Reorganization block) have been studied for physico-mechanical properties which are reproduced below for references:-

The borehole cores of **KW-041** and **CMTB-25** drilled in Revised Kalinga West and Padma block respectively were identified and sent for physico-mechanical studies at CMPDI laboratory, Ranchi.

*Table-4.8
Summary of Physico-mechanical Properties of
coal seams / Intervening parting encountered in borehole KW-041 in
Revised Kalinga West block, Talcher coalfield*

Correlation of seams	Depth (m)			Rock type	Bulk density GMS/cc	Comp strengt h Dry/KG F/ SQCM	Comp strengt h wet KGF/ SQCM	Tensile strengt h KGF/ SQCM	Shear strengt h KGF/ SQCM	Young Modul us 10 E 4 KGF/ SQCM	PSI
	From	To	Thick- ness								
Roof V B	17.15	21.75	4.60	Grey shale/ Carb shale	-	-	-	-	-	-	1.26- 2.12
V B	21.79	24.63	2.88	Coal/Shaly coal/Carb. Sh.	-	-	-	-	-	-	0.69- 1.63
Parting	24.63	26.00	1.37	Coal/Shale/ Carb. Shale	-	-	-	-	-	-	1.75- 1.95
V A	26.00	29.95	3.95	Coal/Shaly coal/Carb. Shale/Grey shale	3.19	560.10	-	99.9	-	6.35	0.84- 1.55
Parting	29.95	35.38	5.43	Coal/Shaly coal/Carb. Sh.	-	-	-	-	-	-	1.36- 2.00
IV - A+B Comb.	35.38	38.81	3.43	Coal/Shaly coal/Carb. Sh.	-	-	-	-	-	-	1.34- 1.95
Parting	38.81	56.59	17.78	Sandstone/ Grey Sh./Carb. Sh.	1.91- 2.27	68.0- 169.5	54.5- 61.8	3.3-20.7	9.5- 27.0	2.44	0.19- 1.59
III - E	56.59	62.15	5.86	Coal/Shaly coal/Carb. Sh.	-	-	-	-	-	-	0.77- 1.73
Parting	62.15	67.42	5.27	Sandstone/ Grey Sh./Carb. Sh.	2.27	-	-	23.9	14.9- 21.2	-	0.33- 1.67
III - D	67.42	68.84	1.42	Coal/Shaly coal/Carb. Sh.	-	-	-	-	-	-	0.99- 1.35
Parting	68.84	80.10	11.26	Sandstone/	1.95- 2.17	103.30	-	5.3-17.0	11.0- 17.3	-	0.14- 1.56

Correlation of seams	Depth (m)			Rock type	Bulk density GMS/cc	Comp strength Dry/KG F/ SQCM	Comp strength wet KGF/ SQCM	Tensile strength KGF/ SQCM	Shear strength KGF/ SQCM	Young Modulus 10 ⁴ KGF/ SQCM	PSI
	From	To	Thickness								
				Grey Sh./Carb. Sh.							
III - C	80.10	80.35	0.25	-	-	-	-	-	-	-	-
Parting	80.35	87.69	7.34	Sandstone/ Shale	2.11- 2.27	247.50	-	14.0- 32.5	12.0- 26.7	-	0.11- 1.85
III - A	87.69	89.21	1.52	Coal/Shaly coal	-	-	-	-	-	-	1.12- 1.28
Parting	89.21	110.35	21.14	Sandstone/ Shale	1.98- 2.23	139.3- 241.6	72.0- 123.5	4.0-30.0	12.6- 32.8	-	0.14- 2.79
II (E+D)	110.35	127.26	16.91	Coal/Shaly coal	-	-	-	-	-	-	0.85- 2.33
Parting	127.26	134.90	7.64	Sandstone/ Shale/Carb Sh.	2.12- 2.22	-	-	7.6-17.0	-	-	0.54- 2.33
II - C	134.90	137.35	2.45	Coal/Carb. Shale	-	-	-	-	-	-	1.10- 1.91
Parting	137.35	150.20	12.85	Sandstone/S./ Carb Sh.	2.06- 2.25	114.9- 321.0	171	8.5-5.34	-	1.10- 2.55	0.19- 1.91
II (A+B)	150.20	151.31	1.11	Coal/Carb. Shale/S. Coal	-	-	-	-	-	-	1.61- 1.95

Table-4.9

Range of various Physico-mechanical parameters based on first dominant rock-type-wise (throughout the depth of borehole no CMTB – 025 of Padma block, Talcher coalfield

SL. NO.	ROCK TYPE	BULK DENSITY		COMP. STRENGTH		COMP. STRENGTH		TENSILE STENGTH		SHEAR STRENGTH		P.S.I	
		GMS/CC		DRY KGF/SQ.CM		WET KGF/SQ.CM		KGF/SQ.CM		KGF/SQ.CM			
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
1	Sandstone Fgd.	1.842	2.328	55.5	377.4	-	-	12.4	24.5	13.13	43.9	0.203	1.132
2	Sandstone Mgd.	1.953	2.311	94.9	288.4	-	-	10.8	23.3	11.2	39.9	0.484	0.701
3	Sandstone Cgd./Vgd	1.913	2.589	55.2	279.7	-	-	3.0	46.4	7.9	32.7	0.135	0.586
4	Conglomerate	-	-	-	-	-	-	20.1	-	-	-	6.186	8.108
5	Grey shale	2.169	2.219	183.8	-	-	-	29	42.3	1.3	36.3	0.89	3.067
6	Sandy shale	2.227		-	372.4	-	-	36.1		6.8	33.4	1.161	2.326
7	Shaly sst.	2.101	2.674	144.9	-	-	-	18.5	48.7	21.8	35.5		1.061
8	Alternating shale & sst.	1.204	2.189	208.9	375.8	-	-	-	26.8	12.1	38	0.856	2.577
9	Carb shale	-	-	-	418	-	-	-	-	17.6		1.889	2.366
10	Shaly coal	-	-	-	-	-	-	-	-	22.7		1.651	1.992
11	Coal Seam-IV	-	-	-	-	-	-	-	-	16.6			1.329
12	Coal Seam - III		2.058	288.3	326.5	-	-	21.8		10.3	28.5	0.926	1.855
13	Coal Seam - II	1.204	2.189	288.9	418	-	-	18.5	26.8	12.1	38.7	1.117	2.198
14	Index Seam	-	-	-	-	-	-	-	-	22.7			1.651
15	Coal Seam-I top & mid. Comb.	1.76	2.674	372.4	430.9	-	-	35.1	48.7	15.2	37	1.186	1.917
16	Coal Seam-I Bot.	1.115		351.9		-	-	26.7			20		1.145

4.8 WASHABILITY STUDY

Borehole coal cores of CMTK-001, 002, 008, 013, 020, 025, 034 and 051 along with the coal cores of 6 no. of boreholes of adjoining Revised Kalinga West block viz., KW-005, 018, 028, 030, 062 & 063 were subjected to washability study after due seam correlation. The details are provided in table-4.10.

Table-4.10
Broad Parameters of Washability Study Results in
Revised Kalinga West and Kalinga East blocks, Talcher Coalfield

Seam	Raw Coal Ash %	Detailed Products			
		Cleans		Rejects	
		Wt%	Ash%	Wt%	Ash%
IX	45.6-46.0	54.7-61.4	32.7-35.1	38.6-45.3	61.9-62.3
VIII	46.6-50.4	46.0-50.0	26.2-29.2	50.0-54.0	67.0-68.6
VII B	44.4	62.9	37.7	37.1	62.5
VIII A	42.1	77.5	33.9	22.5	70.4
VI A+B (Splitted)	53.1-58.9	36.2-40.7	26.2-36.7	60.9-63.8	72.2-77.7
V A+B (Splitted)	44.2-56.4	34.5-66.9	24.7-34.0	33.1-65.5	64.8-73.1
IV A+B (Splitted)	48.2-52.1	37.1-53.4	38.1-41.3	46.6-62.9	55.8-61.5
III E	33.7-39.0	70.5-86.1	27.0-34.5	13.9-32.0	52.3-71.7
III D	30.9-37.4	85.4-94.0	27.6-34.5	6.0-15.3	52.1-82.6
III C	33.4	77.1	26.0	22.9	56.6
III A	36.3-46.8	41.1-46.7	29.7-36.6	23.3-58.9	55.5-83.7
II D+E	38.9-43.6	64.5-78.1	33.1-36.5	21.9-35.5	57.3-62.8
II C+D+E	37.8-44.3	64.9-75.7	30.9-33.5	24.3-35.1	56.2-66.2
II C	37.9-42.3	62.7-83.7	31.2-33.0	16.3-34.0	56.9-63.1
II Comb	45.0	66.9	36.0	33.1	63.2
II A+B	51.6-59.8	31.7-51.1	35.8-37	48.9-68.3	

Borehole-wise seam-wise test results for both the blocks are also provided in the following Table-4.11.

Table-4.11
Borehole-wise seam-wise Washability Study Results in
Revised Kalinga West and Kalinga East blocks, Talcher Coalfield

Note: Suffix “+” denotes roof / floor not tallying

BOREHOLE NO.	SEAM NAME	DEPTH		ASH % ON RAW COAL (100 SAMPLE)	CLEANS		REJECTS	
		FROM	THICKNESS		WT. %	ASH %	WT. %	ASH %
CMTK-001	II C+D+E +	30.40	25.02	42.4	69.2	33.5	30.8	62.4
CMTK-002	II C+D+E +	41.70	24.58	44.3	64.9	32.7	35.1	65.7
CMTK-002	II A+B +	75.50	2.50	42.3	76.7	32.8	23.3	73.6
CMTK-008	II D+E	71.39	15.78	43.1	64.5	33.4	35.5	60.7
CMTK-008	II C	99.67	3.19	38.1	76.1	32.2	23.9	56.9
KW-005	II D+E +	131.45	14.71	42.3	66.0	31.7	34.0	62.8
KW-005	II C +	150.85	4.50	43.5	62.7	31.2	37.3	64.2
KW-005	II A+B +	165.43	1.71	51.6	51.1	37.0	48.9	66.8
CMTK-025	II C+D+E +	97.36	27.04	40.8	75.7	32.2	24.3	67.5
CMTK-025	II A+B +	128.15	3.01	44.4	62.1	34.2	37.9	61.1
CMTK-020	II A+B +	162.08	1.67	48.3	53.9	33.9	46.1	65.1
CMTK-013	II C+D+E +	185.50	25.05	37.8	75.7	31.9	24.3	56.2
CMTK-034	II A+B+C+D+E +	118.75	35.35	45.0	66.9	36.0	33.1	63.2
KW-018	II D+E +	63.40	14.70	39.3	78.0	33.8	22.0	58.8
KW-018	II C	92.07	3.16	37.9	83.7	33.8	16.3	63.1
KW-030	II D+E +	154.95	15.18	39.8	72.3	33.1	27.7	57.3
KW-030	II C	176.90	4.89	35.3				
KW-062	II D+E +	146.83	15.93	38.9	78.1	33.4	21.9	58.5
CMTK-008	III E	22.52	4.53	38.0	70.5	29.6	29.5	58.1
KW-028	III E	23.55	4.45	37.1	85.4	34.5	14.6	52.3
KW-028	III D	31.59	1.03	36.0	84.7	33.1	15.3	52.1
KW-028	III A +	51.95	3.79	43.8	50.2	31.8	49.8	55.5
KW-005	III E	82.60	5.28	28.7				
KW-005	III D	94.75	1.90	32.7	86.0	28.2	14.0	60.3
KW-005	III A +	110.30	2.25	42.9	56.9	30.0	43.1	59.9
CMTK-025	III E	41.05	4.40	34.8	85.4	28.5	14.6	71.1
CMTK-025	III C	54.97	2.99	36.0				
CMTK-020	III E	72.30	5.49	39.0	68.0	28.5	32.0	61.3
CMTK-020	III C	92.80	1.50	34.5				
CMTK-013	III E	134.60	4.40	35.2	70.1	27.0	29.9	54.5
CMTK-013	III A	161.68	1.74	36.3	76.7	30.2	23.3	56.4
CMTK-034	III E	64.98	5.27	34.8	81.0	28.9	19.0	60.1

BOREHOLE NO.	SEAM NAME	DEPTH		ASH % ON RAW COAL (1100 SAMPLE)	CLEANS		REJECTS	
		FROM	THICKNESS		WT. %	ASH %	WT. %	ASH %
CMTK-051	III E	171.71	6.49	33.7	86.1	28.6	13.9	65.2
CMTK-051	III D	184.63	1.95	36.1	89.1	30.8	10.9	79.3
CMTK-051	III A	207.03	2.42	40.2	74.6	32.3	25.4	63.4
KW-018	III E	15.35	4.95	33.6	86.2	28.6	13.8	64.8
KW-018	III A +	42.32	3.31	30.9				
KW-030	III A +	136.20	4.78	42.9				
KW-062	III D	121.10	4.30	37.4	94.0	34.5	6.0	82.6
KW-062	III A	128.90	3.89	43.8	68.3	36.6	31.7	59.3
KW-063	III E +	162.85	9.35	38.6	72.7	28.7	27.3	64.9
KW-063	III D	174.65	2.09	30.9	88.6	27.6	11.4	56.4
KW-063	III A +	187.14	4.11	46.8	41.1	29.7	58.9	83.7
CMTK-025	IV A +	30.95	3.92	43.3	62.3	32.0	37.7	62.0
CMTK-013	IV A+B +	116.01	9.80	48.7	49.0	41.3	51.0	55.8
CMTK-034	IV A+B +	45.16	7.96	52.1	39.5	38.1	60.5	61.2
KW-030	IV A+B +	89.55	7.35	50.9	37.1	38.9	62.9	61.5
KW-062	IV A+B +	88.75	8.45	48.5	53.4	40.7	46.6	57.4
KW-063	IV A+B +	141.86	6.07	48.2	55.1	41.3	44.9	56.7
CMTK-020	IV+V +	42.05	19.06	52.3	44.8	32.5	55.2	68.3
CMTK-013	IV+V +	105.53	20.28	52.1	39.4	34.4	60.6	63.6
KW-005	V A +	55.90	3.00	50.7	45.1	29.1	54.9	68.5
KW-005	V B	50.55	1.50	33.3	92.3	31.5	7.7	55.0
CMTK-013	V +	105.53	6.33	56.4	34.5	24.7	65.5	73.1
CMTK-034	V A+B +	31.30	7.20	53.4	42.5	31.4	57.5	69.6
CMTK-020	VI B +	18.57	3.03	54.7	37.3	29.3	62.7	69.5
CMTK-013	VI A+B +	80.05	4.50	53.1	40.7	26.7	59.3	71.2
KW-030	VI B +	71.71	4.43	58.9	39.1	29.5	60.9	77.7
KW-063	VI B +	121.55	4.25	55.8	36.2	26.7	63.8	72.3
KW-030	VII A +	42.34	1.49	44.4	62.9	33.7	37.1	62.6
KW-030	VII B +	30.90	5.93	42.1	77.5	33.9	22.5	70.4
CMTK-013	VII+VIII +	32.92	16.38	46.8	54.7	29.8	45.3	67.3
CMTK-051	VII+VIII +	63.23	18.86	48.2	49.8	28.6	50.2	67.7
KW-030	VIII	18.96	10.39	50.4	46.0	29.0	54.0	68.6
KW-062	VIII +	10.47	11.88	46.6	50.0	26.2	50.0	67.0
CMTK-013	IX_INC	12.32	4.14	37.9	73.8	29.2	26.2	62.5
CMTK-051	IX	27.07	25.44	46.0	54.7	32.8	45.3	61.9
KW-062	IX_INC	3.00	2.46	40.0	75.0	30.7	25.0	67.9
KW-063	IX +	34.99	22.44	45.6	61.4	35.1	38.6	62.3

4.9 WASHABILITY STUDIES FOR NALCO

As per the requirement of NALCO authorities detailed washability studies were carried out on coal cores on BH no. CMTB – 60, 61 & 62 from adjoining Bharatpur South block. The coal cores of seam II from these boreholes having thickness of 34.35m (CMTB-60), 34.5 (CMTB-61) and 22.1 (CMTB-62) were thoroughly mixed to get a representative sample of Seam II and also to have sufficient quantity (988 Kg). The whole quantity was subjected to screening and subsequent float & Sink test.

Result of Screen Analysis and yield of washed product at 1.80 sp.gr. cut are given in Table-4.12 and 4.13.

Table-4.12
Screen Analysis, Seam – II

Size (mm)	Weight (%)	Ash (%)
100-25	94.7	40.2
25-6.3	3.9	35.3
6.3-1	0.8	32.4
Less than 1	0.6	39.5
	100.00	39.9

Table-4.13
Yield of washed products, Seam-II

Raw Coal			Washed products			
Size Fraction (mm)	W% of Coal as 1000.00	Ash%	Cleans		Sinks	
			Wt%	Ash%	Wt%	Ash%
100-25	94.7	40.2	80.04	32.0	19.96	73.2
25-1	4.7	34.8	76.38	24.0	23.62	69.9
100-1	99.4	40.0	79.87	31.6	20.13	73.0

The washability studies have shown that on washing the raw coal having ash content of 40%, at 1.80 sp. gravity the yield of clean will be around 80% at 31.6% ash level. Detailed analysis of raw coal and cleans and rejects at 1.80 sp.gr. are given below in Table-4.14.

Table-4.14
Coal Characteristics of Raw Coal, Cleans and Reject at 1.80 sp.gr.cut.
Bharatpur North Block

Particulars	Raw Coal	Cleans at 1.80 Sp.Gr.	Rejects at 1.80 Sp.Gr.
Size (mm)	100-1	100-1	100-1
Wt%	100	79.87	20.13
Proximate Analysis (60% RH 40°C)			
M%	6.3	7.2	2.8
Ash%	40.2	32.1	72.9
VM%	25.6	27.9	-
CV (K.Cal/Kg)	3,805	4,250	-
C%	-	46.1	-
H%	-	3.1	-
N%	-	1.0	-
S%	-	0.8	-
HGI	-	55	-
Ash Fusion Range			
Softening temp	1,180	1,180	-
Hemispherical temp	Over 1400	Over 1400	-

The detail results of washability test and analysis of ash composition are given along with observations in the Geological Report of Bharatpur block March'82.

Chapter- 5

MINING

5.1 MINING METHOD

The proposed mining block represents presence of moderately flat coal seams with intermediate varying parting. Thick seams occur at shallow depth in wide area having power grade coal reserve. So this will make the project most viable by adopting opencast mining method.

5.2 CHOICE OF TECHNOLOGY

Different technologies like shovel-dumper mining, dragline mining, bucket wheel excavator mining and surface miner-pay loader-truck mining are available for opencast mining. Sometimes combination of several methods of mining is adopted to suit particular type of mining situations.

For coal deposit in block under consideration, bucket wheel excavator mining is not applicable due to presence of abrasive sandstone and hard carb-shale strata and many faults with varying throw and directions. The seam gradient varies from 2° to 10°.

Shovel-dumper system of mining for overburden removal has been adopted for running mine. This system is very flexible and also offers convenient mining operations to deal with sudden occurrences of unworkable or poor quality patches and change of floor position due to repeated faulting and varying seam gradient and thickness. It also offers flexibility for easy transition to any other technology or equipment configuration. The technology is well known and advantageous to get skilled manpower. So shovel-dumper mining method has been adopted for overburden removal and the same has been suggested for remaining life of the mine. Considering the annual target capacity of 20.0Mt and corresponding yearly overburden removal, higher capacity of shovel and dumpers are suggested for overburden removal.

At present, coal is mostly extracted by using surface miner in windrowing method through outsourcing agencies. Operation of surface miner by outsourcing agencies is found to be successful and environment friendly as it does not require drilling, blasting and crushing of coal. In windrowing mode the cut material is directly discharged behind the machine without using a conveyor. Therefore the cutting operation is independent from the truck loading operation, but the coal has to be re-handled by the front end loader which in turn loads the coal into the dump truck. For many reasons, the higher productivity in windrowing method compensates the re-handling cost. In addition, no belt wear and operating cost for conveyor will arise when working with windrowing mode of operation.

Any new technology in future which may yield to higher productivity or may be environment friendly should be considered as and when it is felt necessary.

5.3 TARGET CAPACITY

An annual target capacity of 20 Mt is proposed. There are two Rapid Loading Systems with silos with a capacity to dispatch 15 Mt coal per year by rail transport. Dispatch arrangement for 5 Mt coal to M/s NALCO is also well established. So, 20 Mty target production is justified.

The technical aspect of traffic density was studied. Total dumpers working will be 207. There will be 20 working horizons and 6 flank roads. Working width is about 2 km. Average dumper lead is about 4 km. Hence, Traffic density is just optimum.

5.4 ASSUMPTIONS

1. This Mining Plan is based on modified boundaries given in Revision-1, Phase-I 20 Mty, May 2018.
2. Stage-II forest clearance and other statutory approvals for additional land will be obtained by June 2023.
3. R&R for displaced persons can be successfully implemented so that private land can be acquired and vacated.

4. Balaram Expansion OCP (15 Mty) will be executed as per Project Report. About 100 Mt coal reserve lies in barrier between Bharatpur and Balaram mines. As Bottom most seam in Bharatpur mine is downthrown along adjacent Balaram mine, coal blocked in barrier should be attempted from Bharatpur mine. Necessary revision is required for change in operating area in future.
5. Bangaru Jhor stream will be shifted in phases from 4th year with advance of mine working. A draft report for diversion of Bangaru Nala has been prepared by CMPDIL (HQ) for Ananta Mine of MCL and is now under consideration. A similar exercise is required to be carried out for Bharatpur mine and combined with that of Ananta Mine. It is important to note that area in between Ananta and Bharatpur expansion mines (Subhadra West geological block) is not yet notified.

5.5 SEQUENCE OF MINING

Total available area within quarry limits as described in earlier section will be mined. The total strike of the block is around 3.50km, so the mine is proposed to be worked in a single quarry.

Present mine working is limited within central and eastern part of Bharatpur north block, mine surface towards north has already entered into Padma geological block. Eastern part of Padma geological block has been transferred to Jagannath OCP, causing shortening of strike length towards end. So further advance of existing Bharatpur OCP towards north has to be restricted, this can be done only when land towards west of present mine working can be made available. In this report it has been planned to extend the mine working towards west into Kalinga East geological block.

5.6 ACCESS TRENCH

At present existing central road is in operation. Concurrently, an inclined road will be developed on southern batter originating at a distance of about 350m east of central road and touching mine floor at about (-)15m near south central boundary. This

inclined road will be used for balance life from April 2032 till end. The central road has to be filled up to provide backfilling without further external dumping.

5.7 MINE DEVELOPMENT

At present, coal from south-western part is transported to surface by southern side. Coal from northern part is transported by central haul road laid over internal dump and connected to working benches through dump-bells at various places.

Eastern batter has been filled up and no transport is done by eastern batter. There are many transport roads over internal dumps, which are sloping down towards working benches. Presence of so many roads over internal dump will restrict backfill and heightening of internal dump. Transport is proposed only by eastern and western flanks. With increase in stripping ratio, additional OB has to be accommodated inside quarry. Mine is proposed for faster advance towards west initially. It is assumed that Danra forest area and remaining part of Danra village will be available in near future. So, it is proposed to develop transport roads initially on southern batter and later, on eastern and north-eastern batters. The southern roads on batter are essential to reach deep seated part of the quarry near west-central edge at a depth of about 190m.

Two sets of receiving hoppers are already built near south-east of quarry over backfilled OB dump. 15 Mty ROM coal will be received at these hoppers for silo loading and rail transport to basket linkages. 5 Mty ROM coal will be transported to existing CHP, to be transported to NALCO's MGR system through cross country conveyor.

5.8 MINING SYSTEM

Working benches are planned to be aligned along general strike. A gradient of 1:200 is proposed on mine floor towards north-east for natural drainage of mine water, which will be stored in mine sump and may be discharged after treatment to outside streams after meeting prescribed water quality. Bench floor should follow own seam floor/roof or that of adjacent seam. Main bench parameters for above mentioned equipment are:

Maximum bench height	: 10cum Rope Shovel – 15m 9.5cum hydraulic shovel – 11m 6.1cum hydraulic shovel – 9.5m
Working Bench width	: Shovels with 100T dumpers – 42m Shovels with 60T dumpers – 36m Surface miner with pay loader & 60T – 50m
Working angle	: 70° with horizontal for individual working bench with shovel and 63° for surface miner bench.

With due regards to safety and environment, It is recommended to adopt same equipment sizes for contractual working also.

5.9 EXTRACTABLE RESERVES

5.9.1 MINE BOUNDARIES

Considering the present mine working and continuity of geological block towards west, it is envisaged to work the total area in single quarry. The area up to fault F5-F5 which was named as Quarry-1 in previous project report of 20 Mty will remain same. Future working will be advanced towards west into Kalinga East block instead of earlier quarry-2 of previous project report.

Adopted quarry surface boundaries are described below:

North	: Northern and eastern block boundaries of Kalinga East geological block (western part) and south-eastern boundary of Subhadra West block (eastern part). A barrier of 7.5m will be maintained between block boundary and excavation boundary.
East	: Common boundary with Jagannath OCP and road connecting Rakas village with Padmabatipur village.
West	: Western boundary of Teleipasi village as also the common boundary with Balaram Expansion OCP.
South	: Southern boundary fault (Fault F1-F1 in G.R.) between Bharatpur North & South blocks.

In view of long term safety from slope failure and transport roads on mine batters, the side slopes are provided with 18m flat berm at every 30m vertical interval. The 30m vertical interval is again divided into 10m benches at 70° angle with 3m flat berm in between. On the southern batter, one inclined road is also provided to facilitate transport of coal from lowest seam to surface at quarry mouth. Overall pit slope varies between 32° and 37°, which is considered safe. For internal OB dump, the 30m benches are designed at 37° with 30m flat berms in between. The overall slope will be about 27°. However, it is advised to get slope stability analysis done to ascertain risk from slope failure.

5.9.2 EXTRACTABLE RESERVE AND STRIPPING RATIO

Balance Coal and OB as on 31.03.2020 has been estimated using three dimensional digital structural model of the reorganization block was prepared by the Exploration department of CMPDIL, RI-7. Mine models of various stages were prepared using mine planning software. Coal reserves and OB to be removed have been estimated by the same software. Lowest seam is Seam-II or II-Bottom as per occurrence. Quantities given below are within the mine surface boundary with inward slopes and mine floor as described above. The details are given below in Table-5.1.

Table-5.1

	Coal (Mt)	OB (Mcum)
Estimated balance as on 31.03.2020	448.33	728.64
Actual Extraction from 01.04.2020 to 31.3.2022	16.59	19.87
Mineable reserve as on 01.04.2022 (Zero date)	431.74	708.77

Stripping ratio of balance coal as on 01-04-2022 is 1.642 cum OB per tonne of coal. Balance life of the mine is 22 years from 01-04-2022.

Grade wise coal volume was estimated using MINEX software. This volume was multiplied by specific gravities of respective grades of coal. Specific gravities considered for GCV based grades of coal is given below in table no. 5.2.

Table - 5.2

Grade	Specific Gravity
G1	1.37
G2	1.41
G3	1.43
G4	1.47
G5	1.50
G6	1.53
G7	1.57
G8	1.60
G9	1.62
G10	1.66
G11	1.70
G12	1.72
G13	1.75
G14	1.78
G15	1.82
G16	1.86
G17	1.88

Due to uncertainties of assessment of coal reserve, 3% was deducted on Gross Geological coal quantity as **geological loss** to arrive at Net Geological coal quantity. An average of 3.55% deduction has been made on Net Geological coal quantities for **mining losses** to arrive at Mineable coal quantities.

5.10 GRADEWISE MINEABLE RESERVE

Estimation of grade wise coal & overburden was made on plan as anticipated on 01-04-2022 using MINEX software on digital geological model prepared at CMPDIL. Plate MIN-I shows anticipated mine stage as on 31-03-2020. Plate 14(b) shows mine position as on 01-04-2022, the start date for this Mining Plan. Grade wise coal quantities of extractable seams within quarry profile as on 01-04-2022 are given below in table 5.3.

Table 5.3
GRADEWISE RESERVE FOR BALANCE QUARRY (as on 01.04.2022)

Figures in Million tonnes

	IX	VIII	VII	VIB	VB	VA	IV	III Top	III Mid	III Bot	L-2	II	II Top	II Bot	TOTAL
G4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G6	0	0	0.01	0	0	0.1	0	0	0	0	0	0	0	0	0.11
G7	0	0	0	0	0	0.57	0	0	0	0	0	0	0	0	0.57
G8	0	0	0	0.01	0.02	1.23	0	0.05	0	0	0.06	0	0	0	1.37
G9	0	0.04	0.04	0.02	0.04	1.18	0	1.68	0	0.32	0.75	0	0	0	4.07
G10	0	0.04	0.08	0.02	0.06	0.92	0.2	11.33	0.01	2.73	1.29	0.63	7.42	0.14	24.87
G11	0.1	0.55	0.76	0.15	0.07	0.59	0.88	17.16	0.01	6.11	1.1	31.46	117.08	3.35	179.37
G12	1.56	1.61	2.9	0.71	0.25	0.15	9.96	4.64	0.07	7	0.41	6.22	69.56	5.05	110.09
G13	9.19	7.04	5.48	1.24	0.44	0.04	15.15	0.24	0.03	1.02	0.02	1.05	3.74	5.42	50.1
G14	11.04	10.46	2.85	1.99	0.24	0	21.06	0.05	0.01	0.08	0	0.1	0	0.85	48.73
G15	0.02	2.65	0.27	0.66	0.14	0	8.11	0	0	0	0	0	0	0.03	11.88
G16	0	0	0	0.15	0.01	0	0.36	0	0	0	0	0	0	0	0.52
G17	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0.06
TOTAL	21.91	22.39	12.39	5.01	1.27	4.78	55.72	35.15	0.13	17.26	3.63	39.46	197.8	14.84	431.74

Parting and overburdens corresponding to respective seams are given in Table 5.4.

Table 5.4
Partings/Overburden (as on 01-04-2022)

Partings/Overburden	Quantity (Mcum)
OB above IX	27.06
Prt. IX/VIII	40.83
Prt. VIII/VII	7.47
Prt. VII/VIB	79.75
Prt. VIB/VB	99.10
Prt. VB/VA	25.73
Prt. VA/IVB	52.25
Prt. IVB/III TOP	60.18
Prt. III TOP/MID	32.53
Prt. III MID/BOT	43.28
Prt. III BOT/L-2	88.90
Prt. L-2/II	17.66
Prt. L-2 / II TOP	103.37
Prt. II TOP/II BOT	30.66
Total	708.77

5.11 COAL RESOURCE RECONCILIATION

It is originally conceived that coal in batter of Balaram OCP will be extracted by Bharatpur mine. The 300m blasting safety zone of Balaram OCP was also planned to be taken by Bharatpur mine. Accordingly, the block boundary of Bharatpur Re-organization block was drawn including batter area of Balaram OCP. The Project Report for Bharatpur Re-organization OCP (20 Mty) is also approved with this concept. During preparation of Mining Plan, it was decided to leave aside the overlapping land with Balaram mine at present. Extraction of barrier coal will be taken up at a later time. Land falling under villages Barpali & Kandhabareni were also excluded as these villages are not notified under any mining project. Accordingly, the boundaries were modified compared to that of Project Report.

Gross Geological Reserve within originally conceived boundary is 920.918 Mt as reported in Geological Report for Bharatpur Reorganization block (Excluding South Quarry).

As per reduced boundary, Gross Geological Reserve vertically is 831.17 Mt.

Gross reserve exhausted by 31-03-2022 is 261.87 Mt.

Gross reserve for balance quarry as on 01-04-2022 is 569.30 Mt.

Total Gross Reserve within quarry (excluding south quarry) is 461.48 Mt.

Gross Reserve blocked in barrier and batter is 147.65 Mt. Attempted extraction is 82.24%. With 3% geological loss and 3.55% mining loss, expected extraction is 431.74 Mt, which is 81.06% of remaining vertical gross reserve.

5.12 QUARRY PARAMETERS

This is an operating mine and it is proposed to expand the mine with same benches and slopes. South Quarry situated towards south and separated by a huge fault, is operationally not connected. South Quarry is exhausted since long. So, parameters of South Quarry have not been included in the following table, though details of land under South Quarry have been accounted for in “Land Required” chapter.

Table – 5.5
Quarry Parameters

Sl	Particulars	Unit	Value
1	Total Quarry Surface area (North Quarry only)	Ha	1179.02
2	Total Quarry Floor area (North Quarry only)	Ha	939.84
3	Quarry Surface Area 31-03-2022 (North Quarry only)	Ha	438.52
4	Quarry Floor Area 31-03-2022 (North Quarry only)	Ha	358.44
5	Quarry depth Maximum Minimum	m	298 12
6	Strike length along floor Maximum Minimum	m	3352 1987
7	Strike length along surface Maximum Minimum	m	3774 2402
8	Rated Capacity	Mty	20
9	Life of the Mine (as on 01.04.2022)	Years	22
10	Avg. Gradient	degrees	4 ⁰ -6 ⁰
11	Dip-rise length	m	2430-3348
12	Perimeter – Total Quarry	m	15700

5.13 SEQUENCE OF COAL SEAMS AND PARTINGS WITH DEPTHS AND THICKNESSES

In Bharatpur OCP Re-organization block, altogether 11 coal seams have been regionally correlated viz., seam I of Karharbari Formation and seams II to XI in Barakar Formation. Seam I occurs as three distinct splits, viz., seams I Top, I Middle and I Bottom. However, information on seam I is limited in **Bharatpur OCP Re-organization block** as only 26 boreholes have been drilled in Karharbari Formation to intersect Seam-I. Moreover, most of the boreholes in which Seam-I has been encountered are falling towards that part of the block/ area where coal has already been mined or is being mined. Hence detailed study on seam I is not made in this report as it is beyond the scope of the report. The present report deals with the opencast potentiality of the coal seams for the existing Bharatpur OC mine within the block under reference. Remaining 10 coal seams of Barakar Formation occurs as 19

distinct splits/combination in ascending order, viz. II (or II Bot & II Top), Local-1, Local-2, Local-3, III Bot, III Middle, III Top, IV, VA, VB, VIA, VIB, VII, VIII, IX, X and XI. Out of these, 5 coal seams, viz. seams Local-1, Local-3, VI A, X and XI have been identified as either not so potential or having localized development and hence, are not dealt in details. Seam X and XI are developed towards the northern boundary of the block over a very limited area and encountered only in 9-10 boreholes. Hence, though these seams are potential but due to limited occurrence are not considered in the report.

Bharatpur OCP Re-organization block is covered by soil varying in thickness generally from 5 m to 16 m. It consists of sandy soil, clay and lateritic soil. The weathered mantle ranges up to 34 m and consists of laterite, sandstone, sandy shale, intercalation of shale and sandstone, carbonaceous shale etc. For purpose of estimate of OB without drilling & blasting, 10m thickness is considered.

The sequence of coal seams and their intervening partings found to occur within the block, as per borehole data, is given in table below:

Table – 5.6
Sequence of Coal Seams and intervening Parting

Seam / Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		GENERAL THICKNESS	
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)
SOIL	0.00	0.00	1.00	15.33	1.00	15.33	3.0	8
WM	1.50	15.33	6.00	31.10	0.00	28.10	3.0	14
Parting above IX	14.10	66.47	18.89	76.01	4.79	25.87	3	17
IX	9.00	76.01	14.71	98.30	3.20	23.21	13	23
Parting between IX & VIII	9.72	98.30	27.98	121.03	9.10	25.06	18	23
VIII	10.40	121.03	16.62	131.37	2.17	10.67	7	10
Parting between VIII & VII	13.30	131.37	15.76	133.85	1.25	5.81	2	4
VII	8.17	133.85	9.47	138.54	0.88	6.89	3	5
Parting between VII & VIB	9.00	138.54	19.16	164.57	9.69	34.66	25	33
VI B	12.86	164.57	14.41	166.30	0.08	3.72	0.7	2
Parting between VIB & VIA	9.26	166.30	12.86	168.16	0.34	18.57	4	12
VI A	10.95	168.16	12.03	168.27	0.06	1.86	0.1	1
Parting between VIA & VB	12.03	168.27	17.52	190.44	1.86	30.04	12	22
V B	12.63	190.44	13.32	191.91	0.03	5.88	0.5	2
Parting between VB & VA	13.32	191.91	15.88	194.20	0.30	11.02	2	6
V A	10.15	194.20	11.00	195.85	0.10	3.35	0.6	2
Parting between VA & IV	11.00	195.85	19.22	201.16	1.46	19.35	4.4	10
IV	9.15	201.16	11.37	209.96	1.18	11.62	5	9

Seam / Parting between seams	ROOF DEPTH		FLOOR DEPTH		THICKNESS		GENERAL THICKNESS	
	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)	MIN (M)	MAX (M)
Parting between IV & III TOP	10.55	209.96	15.85	222.37	1.52	30.83	8	15
III TOP	9.24	222.37	13.17	228.36	0.20	12.49	3	6
Part btwn III TOP & III MIDDLE	13.17	228.36	0.00	231.34	0.14	13.12	1	10
III MID	13.52	231.34	14.00	231.59	0.03	7.84	0.3	1
Part btwn III MIDDLE & III BOT	0.00	231.59	14.13	238.15	0.13	42.30	2	11
III BOT	10.58	238.15	13.04	238.30	0.07	10.67	0.5	5
Part btwn III BOT & LOCAL3	10.91	238.30	13.07	244.40	0.90	19.25	4	11
LOCAL 3	13.07	244.40	13.25	244.53	0.04	2.00	0.1	1
Part btwn LOCAL3 & LOCAL2	13.25	244.53	24.98	255.30	0.87	19.51	3	11
LOCAL 2	16.10	255.30	16.70	256.79	0.03	3.85	0.4	2
Part btwn LOCAL2 & LOCAL1	16.70	179.10	28.45	199.20	3.92	20.93	7	18
LOCAL 1	27.46	199.20	27.53	199.60	0.07	1.67	0.1	1
Part btwn LOCAL1 & II TOP	15.55	199.60	17.34	200.25	0.65	14.47	4	11
II TOP	46.30	276.59	73.41	302.40	18.90	34.80	25	29
Part btwn II TOP & II BOT	61.30	298.28	67.33	303.94	0.15	20.35	3	10
II BOT	67.33	303.94	73.00	305.48	0.25	7.43	1	4
II	10.80	115.80	33.83	148.55	17.68	46.90	31	37

5.14 PRODUCTION SCHEDULE

5.14.1 DESIGN CRITERIA

The Expansion Project Report has been approved for a Variant: “Existing equipment to continue, total coal and additional OB by contractual means”. Contractual excavator size assumed is 6.5 cum hydraulic shovel with 60 T dumper for OB and surface miner 100t class with 7.45 cum loader and 60 T dumper for coal. The following design criteria has been adopted for mining operations as per prevalent norms of mine design considered in CIL mine:

- No of annual working days : 330 days
- No of daily shifts : 3
- Duration of shift hours : 8

EXCAVATION CATEGORY

- Coal : CAT-III
- Hard Overburden & partings : 50% CAT-III+50% CAT-IV
- Weathered Mantle : CAT-III
- Soil : CAT-II

INSITU VOLUME WEIGHT

- For coal : 1.72 t/cum (weighted average)
- For overburden : 2.4 t/cum
- Weathered mantle : 2.2 t/cum

5.14.2 EQUIPMENT PRODUCTIVITY

Design parameters are same as approved standards of CMPDI. The annual productivities considered for excavators and dumpers are given below:

Table – 5.7
ANNIAL PRODUCTIVITY OF EXCAVATORS
Figures in Mcum

Sl.No	Shovel and Dumper Combination Overburden Shovel	Annual Productivity (M.cum)
1	10.5 cum hydraulic shovel with 100 T Dumper	2.96
2	10 cum Rope shovel with 100T Dumper	2.05
3	9.5 cum Hyd. shovel with 100T Dumper	2.65
4	6.5 cum Hydraulic shovel with 60T dumper	1.78
5	6.1 cum Hydraulic shovel with 60T Dumper	1.75
6	5.0 cum Rope shovel with 60T Dumper	1.00
Excavators in COAL		
1	Surface miner 3.8 m wide drum windrowing	1.73
2	F.E.L. 7.45cum with 60 T Dumper	2.22

Table – 5.8
ANNUAL PRODUCTIVITY OF DUMPERS
Figures in Mcum

HEMM Combination	Annual Productivity (Mcum)					
<u>Overburden</u>	<u>1.75km</u>	<u>2.00km</u>	<u>2.25km</u>	<u>2.50km</u>	<u>2.75km</u>	<u>3.00km</u>
100T with 10.5 cum hydraulic shovel	0.4369	0.4136	0.3945	0.3787	0.3596	0.3430
100T with 10 cum rope shovel	0.3749	0.3556	0.3398	0.3265	0.3106	0.2967
100T with 9.5 cum hydraulic shovel	0.3912	0.3703	0.3532	0.3390	0.3219	0.3071
60T with 6.5 cum hydraulic shovel	0.2628	0.2486	0.2370	0.2273	0.2157	0.2057
60T with 6.1 cum hydraulic shovel	0.3245	0.3078	0.2942	0.2828	0.2691	0.2571
60T with 5 cum rope shovel	0.2084	0.1979	0.1893	0.1821	0.1734	0.1657
<u>Coal</u>						
60T with 7.45 cum Loader	0.3658	0.3465	0.3307	0.3175	0.3017	0.2879

5.14.3 CALENDER PROGRAMME OF EXCAVATION

Mine stage plans were prepared using MINEX software by the same conventions as used in preparing geological report. Coal volumes for “ungraded”, “in-seam band” and “less-than-1m” criteria were added to respective overlying partings. Volumes of “Top overburden” and “Partings” were also calculated using same method. Standard factor for “geological loss” and “mining losses” as mentioned earlier were applied.

Stage wise coal quantities are given in Table 5.9 while partings or overburden volumes are given in Table 5.10.

Table 5.9
Seam wise mineable coal of Mining Stages (from 01-04-2022)
Figures in Million tonne

Seam Name	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-6	Stage-7	Total
IX	0.00	0.00	0.00	0.00	0.04	12.50	8.18	20.72
VIII	0.00	0.00	0.00	0.00	2.10	15.66	3.43	21.19
VII	0.00	0.00	0.02	0.01	1.63	8.41	1.66	11.73
VIB	0.08	0.01	0.08	0.01	1.20	2.71	0.73	4.82
VB	0.00	0.00	0.01	0.00	0.39	0.57	0.26	1.23
VA	0.00	0.00	0.00	0.00	1.94	1.94	0.64	4.52
IV	2.66	3.72	8.06	3.77	20.06	12.62	4.44	55.33
III Top	2.85	2.29	4.89	3.32	11.98	7.55	3.20	36.08
III Mid	0.00	0.00	0.00	0.00	0.00	0.07	0.05	0.12
III Bot	2.00	2.23	4.24	2.82	5.74	1.14	0.09	18.26
Local-2	0.00	0.00	0.03	0.08	0.94	1.41	0.99	3.45
II Top	0.46	2.05	19.93	26.12	78.80	33.54	26.56	187.46
II Bot	0.02	0.21	1.47	2.12	6.44	2.20	1.60	14.06
II Comb.	16.01	13.63	23.02	0.00	0.00	0.06	0.05	52.77
Total	24.08	24.14	61.75	38.25	131.26	100.38	51.88	431.74

Table 5.10
Overburden & Partings related to coal seams of Mining Stages (from 01-04-2022)
Figures in Million cubic meter

	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-5	Stage-5	Total
OB above IX	0.00	0.00	0.00	0.00	0.20	14.26	11.30	25.76
Prt. IX/VIII	0.00	0.00	0.01	0.17	4.04	28.34	6.32	38.88
Prt. VIII/VII	0.00	0.00	0.18	0.59	1.87	3.75	0.72	7.11
Prt. VII/VIB	0.69	0.02	4.37	5.39	21.27	36.74	8.21	76.69
Prt. VIB/VB	1.72	1.88	12.81	5.38	37.44	29.22	8.70	97.15
Prt. VB/VA	1.09	2.50	3.80	2.76	9.22	4.92	1.39	25.68
Prt. VA/IVB	4.57	3.90	9.25	6.34	18.84	8.74	3.39	55.03
Prt. IVB/III TOP	4.09	2.77	6.54	6.51	21.53	14.09	6.43	61.96
Prt. III TOP/MID	1.11	0.90	2.60	4.01	11.45	8.50	3.68	32.25
Prt. III MID/BOT	1.58	1.70	7.50	6.31	14.94	7.29	3.71	43.03
Prt. III BOT/L-2	6.15	5.48	16.67	11.48	28.63	14.98	8.28	91.67
Prt. L-2/II	0.39	1.58	13.43	15.84	39.70	16.77	11.13	98.84
Prt. L-2 /II TOP	0.03	0.13	1.01	3.29	13.02	6.03	5.73	29.24
Prt. II TOP/II BOT	6.72	6.54	12.10	0.08	0.03	0.00	0.01	25.48
Total	28.14	27.40	90.27	68.15	222.18	193.63	79.00	708.77
Stripping Ratio (cum/t)	1.17	1.14	1.46	1.78	1.69	1.93	1.52	1.64

Based on the quantities of stages as above, the yearly schedule was prepared by interpolation and necessary adjustment for tapering towards end of mine life. Production schedule for coal and overburden are given in tables 5.11.

Table – 5.11
OB REMOVAL SCHEDULE (TOTAL COAL AND ADDITIONAL OB CONTRACTUAL)

		Total Quarry			Departmental				Contractual			
		COAL	Total O.B.	S.R.	COAL	Total O.B.	O.B. with Drilling	O.B. without drilling	COAL	Total O.B.	O.B. with Drilling	O.B. without drilling
		Mt	Mcum	Cum/t	Mt	Mcum	Mcum	Mcum	Mt	Mcum	Mcum	Mcum
Year-1	2022-23	20.00	26.26	1.31	0.00	15.57	15.57	0.00	20.00	10.69	5.86	4.83
Year-2	2023-24	20.00	26.46	1.32	0.00	15.57	15.57	0.00	20.00	10.89	5.01	5.88
Year-3	2024-25	20.00	26.12	1.31	0.00	15.57	15.57	0.00	20.00	10.55	4.67	5.88
Year-4	2025-26	20.00	26.58	1.33	0.00	15.57	15.57	0.00	20.00	11.01	5.50	5.51
Year-5	2026-27	20.00	27.04	1.35	0.00	15.57	15.57	0.00	20.00	11.47	5.96	5.51
Year-6	2027-28	20.00	31.38	1.57	0.00	15.57	15.57	0.00	20.00	15.81	11.22	4.59
Year-7	2028-29	20.00	36.22	1.81	0.00	15.57	15.57	0.00	20.00	20.65	16.06	4.59
Year-8	2029-30	20.00	34.22	1.71	0.00	15.57	15.57	0.00	20.00	18.65	14.06	4.59
Year-9	2030-31	20.00	33.50	1.68	0.00	15.57	15.57	0.00	20.00	17.93	13.34	4.59
Year-10	2031-32	20.00	33.74	1.69	0.00	15.57	15.57	0.00	20.00	18.17	13.58	4.59
Year-11	2032-33	20.00	33.82	1.69	0.00	15.57	15.57	0.00	20.00	18.25	15.48	2.77
Year-12	2033-34	20.00	38.40	1.92	0.00	15.57	15.57	0.00	20.00	22.83	20.06	2.77
Year-13	2034-35	20.00	38.40	1.92	0.00	15.57	15.57	0.00	20.00	22.83	20.06	2.77
Year-14	2035-36	20.00	38.86	1.94	0.00	15.57	15.57	0.00	20.00	23.29	20.52	2.77
Year-15	2036-37	20.00	38.80	1.94	0.00	15.57	15.57	0.00	20.00	23.23	20.46	2.77
Year-16	2037-38	20.00	38.40	1.92	0.00	15.57	15.57	0.00	20.00	22.83	20.06	2.77
Year-17	2038-39	20.00	38.60	1.93	0.00	15.57	15.57	0.00	20.00	23.03	20.26	2.77
Year-18	2039-40	20.00	38.60	1.93	0.00	15.57	15.57	0.00	20.00	23.03	20.26	2.77
Year-19	2040-41	20.00	38.20	1.91	0.00	15.57	15.57	0.00	20.00	22.63	19.86	2.77
Year-20	2041-42	20.00	32.01	1.60	0.00	14.57	14.57	0.00	20.00	17.44	17.44	0.00
Year-21	2042-43	20.00	23.97	1.20	0.00	13.57	13.57	0.00	20.00	10.40	10.40	0.00
Year-22	2043-44	11.74	9.19	0.78	0.00	2.25	2.25	0.00	11.74	6.94	6.94	0.00
Post Start Date		431.74	708.77	1.642	0.00	326.22	326.22	0.00	431.74	382.55	307.06	75.49

The production schedule shown in the table above may get disrupted due to non-availability of land, dispatch problem, accidents, natural calamities etc. The schedule may be remade if there is major difference of actual from target.

5.15 EQUIPMENT POPULATION AND PHASING

Table – 5.12
HEMM PHASING (TOTAL COAL & ADDITIONAL OB OUTSOURCED)

Equipment Name	Size/Spec.	Total Required	Expected as on Apr'22	Balance Required	YR-1	YR-2	YR-3	YR-4	YR-5	YR-6	YR-7	Beyond
Parting & Top OB												
Hydraulic Shovel	6-7 cum	14	10	4	1	1	1	1				
Electric Rope Shovel	10 cum	4	4	0								
Electric Rope Shovel	5 cum	3	3	0								
Diesel Hydraulic Shovel	9.5 cum	0	0	0								
Diesel Hydraulic Shovel	6.5 cum	1	1	0								
Diesel Hydraulic Shovel	6.1 cum	1	1	0								
Electric Hydraulic	3.7 cum	1	1	0								
Rear Dumper	100 T	32	12	20	8	8				2		2
Rear Dumper	60 T	126	80	46	12	12	12	10				
Rear Dumper	60 T	38	38	0								
Electric Drill	250 mm	4	4	0								
Diesel Drill	160 mm	28	20	8	1	1	1	1	2	2		
Diesel Drill	160 mm	7	7	0								
Crawler Dozer with Ripper	850-900 HP	2	2	0								
Crawler Dozer	410 HP	5	2	3		1	1	1				
Crawler Dozer	320 HP	7	7	0								
Crawler Dozer	410 HP	14	9	5	2		2		1			
Coal												
Surface Miner	Drum>=3.8m	5	3	2	2							
Loader (Contractual)	7-7.5 cum	5	3	2	2							
Rear Dumper	60 T	73	42	31	6	7	2	2	2	2	2	8
Wheel Dozer	450-470 HP	2	0	2	2							

5.16 DRILLING AND BLASTING

Soil and weathered mantle will not require drilling. Hard OB will be drilled. Thick partings and OB will be drilled by 250mm electric drills and thinner partings of 3-8m height will be drilled by 160 mm diesel drills. Drilling and blasting parameters are to be arrived after conducting a series of trial blasts. Following blasting pattern is tentatively suggested based on the assumed powder factors of 0.35 kg/cum for OB and is given in Table-5.13.

Table – 5.13
Blasting pattern

Description	Bench height	Blasting pattern
Overburden	13-15m	9.5m x 7.5m
Overburden	11-13m	8.5m x 6.5m
Overburden	9-11m	7.5m x 5.5m
Overburden	3-9m	6.5m x 5m

Sight-mix-slurry explosives will be used for better contact inside blast hole. Explosives may be outsourced but blasting will be done mandatorily under supervision of owner's competent persons.

Chapter- 6

MANPOWER, SAFETY & SUPERVISION

6.1 MANPOWER

No additional manpower is required, the project is to continue with the existing manpower.

6.2 TRAINING

Training of personnel is proposed to be carried out from the existing training centers in MCL. No additional provision has been made for the same in the present proposal.

6.3 SAFETY AND SUPERVISION

6.3.1 PREAMBLE

Opencast mining operation in general is associated with a number of hazards/risks.

Some of the various anticipated sources of danger are enumerated as under:

- ☞ Slope failure.
- ☞ Dangers due to handling and use of explosives.
- ☞ Accidents due to fly-rocks and air-blasts following a faulty heavy blast.
- ☞ Hazards associated with use of electricity.
- ☞ Accidents due to unruly operation of HEMM.
- ☞ Dust hazards.
- ☞ Fire hazards due to spontaneous heating of coal in stockpiles and exposed benches.
- ☞ Fire hazards in stores & workshops where inflammable & highly inflammable materials are stored or used.
- ☞ Danger of inundation from surface and/or ground water.
- ☞ Danger of failure of OB dump, spoil heaps etc.

Adequate provisions have been made for safe working of the mine in form of design of operational systems, provision of safety measures for safe use of explosives, electricity and HEMM etc. Sufficient financial provisions have been made under different heads for procurement of necessary safety equipment.

Adequate skilled & trained manpower has also been provided, for compliance of safety provisions. Regular training/refresher courses, "on job" training shall be conducted & mock rehearsals shall be made to make the manpower conversant with various rules, regulations, methods of prevention & combat with hazards.

6.3.2 INUNDATION

Due care has been taken while formulating the PR to prevent water ingress during mining operations from the higher ground &/or through local streams.

6.3.3 DUST SUPPRESSION

INVENTORY OF DUST GENERATION SOURCES

The likely dust generation sources due to various mining operations in the project are envisaged as under:

- ☞ Drilling, blasting, excavation and transportation of overburden material ;
- ☞ Drilling, blasting, excavation, crushing and transportation of run-of-mine (ROM) coal ;
- ☞ Construction and demolition activities like land clearing, material/debris storage and handling, etc.;
- ☞ Loading of coal at stockpile, reclaiming from pile and movement of vehicle and loading equipment ;
- ☞ Wind erosion ;
- ☞ Movement of vehicles on haul roads (black topped/concreted and non-black topped) for transportation of coal and overburden.

DUST POLLUTION CONTROL MEASURES

Systematic and regular air quality monitoring is necessary to examine objectively the status of compliance with the statutory standards and for making a real assessment of ambient air quality.

The following measures are suggested in the PR to contain the pollution arising out of dust emission, within the limits:

- ☞ All the drills are provided with well-designed dust extraction/suppression system ;
- ☞ Blasting operations are designed in such a way so that these produce minimum dust;
- ☞ Fog canons have been provided;
- ☞ Effective use of sprinklers and dust suppression units during loading, transportation and handling of ROM/processed coal and overburden;
- ☞ Dust extraction/suppression system is installed in coal handling plant;
- ☞ Provision of greenbelt around quarry, industrial and residential areas and avenue plantation along the haul roads on surface;
- ☞ Black-topping/concreting of permanent service roads besides proper maintenance.

Wetting of the surface by deploying water tankers/sprinklers to reduce dust generation from haul roads.

6.3.4 FIRE AND SPONTANEOUS HEATING

FIRE DUE TO SPONTANEOUS HEATING IN COAL BENCHES & GROUND STOCKS

The following measures will be taken to avoid spontaneous heating:

- a) Coal bench slopes and seam outcrops will be overlain with an impervious layer of soil/clay.
- b) Treatment of exposed coal seams & outdoor coal stocks with anti-pyrogenic substances.
- c) Exposure of coal benches for long time shall be avoided.

FIRE IN PROJECT STORES & WORKSHOPS

Sufficient provision has been made in the approved PR for the prevention & control of fire in the project store, both E&M & HEMM workshops & sub-stations by way of installing fire extinguishers of right type & size. Timely inspection & refilling of fire extinguishers will be done.

Systematic layout of both stores & workshops has been made so that inflammable & highly inflammable materials do not come in contact with any spark or flame. Adequate number of cautions in the form of hoardings will be displayed near such places.

6.3.5 SLOPE STABILITY COAL/OB BENCHES

The exposed ends of the coal seams and OB shall be left with a safe slope to avoid slope failure and collapse of benches. Similarly, at the end of mining operation, safe terminal pit slope is provided to avoid pit failure. Detailed site specific tests for slope stability shall be carried out and site specific parameters determined. Present provision is a broad guideline.

Considering the gradient of 1 in 7 to 1 in 9 in the proposed quarry area, it is proposed to excavate coal and most of the parting benches by inclined slicing and top overburden and thick parting by horizontal slicing method. Based on the above consideration the following parameters have been adopted in the PR:

FOR OB:	<u>5cum ERS, 9.5cum DHS, 6.5cum DHS</u>
Maximum bench height	8-10m
Working bench width	32m
Bench slope	70°
	<u>10Cum ERS</u>
Maximum bench height	15m
Working bench width	44m
Bench slope	70°

FOR COAL SEAMS

Generally surface miner working slopes are comparatively flatter than shovel working.

Maximum bench height	15 m
Working bench width	50 m
Bench slope	63 degrees

OB DUMP

At present, entire overburden is backfilled and no overburden is required to be dumped externally.

For better stability of internal dumps it is suggested to rip the mine floor in strips before backfilling. It is suggested to level the dumps and grade them outward properly to avoid water accumulation.

HAZARD AND RISK ASSESSMENT OF OB DUMPS

Hazard of OB dump failure is mainly governed by following factors:

1. Height of benches.
2. Slope of benches.
3. Nature of material.
4. Slope of foundation rock.
5. Nature of foundation rock.
6. Drainage of foundation.
7. Depth of ground water table.

The following precautions will be taken to reduce the risk of dump failure:

1. OB benches will be made of $\leq 30\text{m}$ height in each tier.
2. The angle of repose of individual bench (of a height of 30m or less) of OB dump will be around 37° and overall slope will be within 27° including the berms.
3. Soil should be scraped separately, so that it is not mixed in OB rock.
4. The slope of ground is very mild and will have no adverse effect.
5. The soil from the foundation ground should be scraped before starting of OB dumping.

6. Garland drain to be made around OB dump area to avoid water flow during monsoon below the OB dump.
7. Ground water table is generally 3-5m below ground level hence may have no adverse impact.
8. Levelling, grading and drainage arrangement for top of OB dumps will be done.
9. Technical & biological reclamation will be done.

6.3.6 HAUL ROAD MAINTENANCE

For proper haul road maintenance, following aspects have to be considered and implemented:

- i) Proper design and maintenance of the haul roads
- ii) Formulation, approval and enforcement of traffic rules regarding :
 - a) Speed limit
 - b) Parking and standing
 - c) Overtaking
- iii) One way traffic, otherwise width should not be less than 3 times the width of the largest vehicle.
- iv) Gradient should not be greater than 1 in 16.
- v) Berm should not be less than 3 m in width.
- vi) Separate machines and personnel for maintenance of haul road.

During rainy season soil erosion will take place and it will deteriorate the haul road corridor and therefore.

- i) Proper drainage arrangement shall be made along the haul road.
- ii) Cross slopes (1 in 50 to 1 in 25) shall be provided on the haul road so that water flows into the drain.
- iii) Water barrier, cross drains, relief drains etc. should be constructed and maintained properly.

Culverts shall be designed, installed and maintained to withstand the vertical soil pressure, weight of the vehicles plying over the road etc.

6.3.7 BLASTING

SAFE USE OF EXPLOSIVES

Site mixed slurry (SMS) has been proposed to be used for good fragmentation and obviate storage of bulk quantum of explosives.

For proper blasting and minimizing the adverse side effects due to blasting viz. noise, ground vibration, back-breaks, air blast and fly rocks etc., the optimal blast design parameters are suggested to be used, after field trials. A tentative drilling and blasting pattern is given in Chapter-5 (MINING).

Provision has been made in the PR for qualified blasting-in-charge with requisite number of assistants. Adherence to relevant statutory safety provisions as stipulated by DGMS, Chief Controller of Explosives and others shall be made.

It is suggested to resort to controlled blasting near railway line, built-up areas and surface features, within the safety zone.

6.3.8 SCIENTIFIC STUDIES

It is proposed that scientific studies in respect of effects of vibration and flying fragments on surface buildings/ structures due to blasting is carried out.

Studies regarding slope stability should also be carried out.

Scientific studies may be carried out on Agro-Forestry over backfilled OB dumps for better biological reclamation.

Study on diversion of Bangaru Jhor may be taken up at early stage.

6.3.9 ADDITIONAL PERMISSION/RELAXATIONS REQUIRED FROM DGMS

For the purpose of usage of bulk explosive, following permission from the competent authority will be required:

- i) Permission will be required under CMR 161 clause (1) and CMR 168(5) for usage of explosive in other than cartridge form and other type of explosive.
- ii) Permission for sleeping of holes shall be obtained.

6.3.10 USE OF ELECTRICITY

To prevent shock hazards, proper earthing system has been envisaged. It has been proposed to use restricted earthed neutral system of power supply and adoption of fail-safe electronic relays to minimize shock hazards.

Moving towers/posts shall be provided for mine illumination in addition to fixed towers.

It is suggested to strictly comply with the relevant provisions of Indian Electricity Rules, 1956 to obviate hazards due to use of electricity. Provision of Electrical Supervisors has been provided in the manpower requirement to fulfill the statutory needs as per the rules, regulations pertaining to mining industry.

Provision for proper illumination of quarry faces, haul roads and other working places have also been made as per the statutory guidelines.

6.3.11 USE OF HEMM

Based on the excavation requirement of the mine and envisaged calendar programme, adequate number of HEMM has been envisaged in the PR.

A well-equipped workshop is suggested in the PR to cater to the maintenance needs of HEMM and other equipment besides provision of necessary maintenance crew. A project store is provided for storage of slow and fast- moving spares and other necessary spares of vital importance.

Adequate number of trained/skilled operators and maintenance crew are provided in the PR with due consideration of leave/sick provisions.

Properly designed haul roads are envisaged in the PR, away from the general and traffic congestion. The traffic rules as enforced by the DGMS shall be strictly followed by the operators of mobile equipment like rear dumpers, water sprinklers, tippers and other light motor vehicles. All mobile equipment shall be provided with audio-visual alarms.

Safety devices like fire alarm and control, operated by sensors should be inbuilt in the equipment/HEMM. Flashers should be fitted in relevant HEMM. The haul roads should be sufficiently wide to prevent accidents.

Inter-locking of starting with normal positioning of dumper body should be provided, so that dumper cannot be started when the body is in lifted position beyond a certain limit.

Chapter- 7

COAL HANDLING, WASHING AND MODE OF DISPATCH, PUMPING

7.1 COAL RECEIPT

Rated capacity of Bharatpur OC Expansion, Revision-3 is 20 Mty. It is proposed to produce (-)100 mm size coal at the face itself by deployment of surface miners. 15 Mty Coal will be hauled by 60 T dumpers to the receiving hoppers located inside excavated quarry. 5 Mty coal will be hauled up to CHP at surface.

7.2 DISPATCH (Coal Flow diagram shown in Plate -20) 15 Mty through silo near the mine

2 sets of receiving hoppers of 20 bins, each of 60 t capacity are located inside M.L of the mine to receive 15 Mty of coal. The crushed coal from the hoppers will be collected and transported up to the silo through a system of six sets (12 Nos) belt conveyors C1 & C1A, C2 & C2A, C3& C3A (Tripper conveyor), C4 & C4A (Reclaim Conveyor) C5 & C5A (Silo loading), and silo bridge conveyors C6 & C6A.

The coal from the over ground type truck receipt hopper shall be loaded onto belt conveyor C1 & C1A and C2 & C2A through electro-mechanical vibro-feeders of 400tph capacity each. Coal carried by conveyor C1 & C1A shall be loaded to conveyor C2 & C2A at a suitable position. The same shall be collected by another set of conveyors C3 and C3A fitted with a traveling tripper which shall evenly spread coal in the over ground bunker of 15,000 t capacity.

Coal will be reclaimed from the over ground bunker by plough feeders and in turn discharge the coal onto the reclaim conveyors C4 & C4A of 1800mm wide to further discharge coal onto Silo loading conveyors C5 and C5A of same width.

Conveyor C5 and C5A shall discharge coal either into the SILO-1 underneath it or onto other conveyors C6 and C6A (1800mm wide) respectively to load the coal into the SILO-2. For further loading into the wagons, two pre-weigh hoppers shall be installed underneath each silo to load pre-determined quantities of coal into the wagons as well as with the help of in-motion rail weigh bridges. The discharge chutes installed to silo feed conveyors (C5/C5A) shall be provided with electro-hydraulically operated flap gate. Simultaneously two rakes can be loaded at a time from the two Silos.

7.3 FUTURE RAILWAY INFRASTRUCTURE

MCL have proposed various schemes/proposals in consultation with RITES/Eco Railways to strengthen the overall rail movement of Talcher coalfield. As the proposed rail infrastructure will benefit other projects, the cost has been distributed among three projects namely, Bharatpur OCP, Ananta OCP and Bhubaneswari OCP.

7.4 WASHING

There is no proposal of washing coal of this project.

7.5 PUMPING

In the proposed report of Bharatpur opencast mine for 20 Mty, the area and the maximum depth of the mine will be more than previous mining plan area. The existing pumps as well as the pumps provided in the approved PR of Bharatpur 20 Mty will be utilized for the revised report. To deal with larger area and greater depth of the expansion mine area, additional pumps and pipe fittings will be required in later years.

7.5.1 BASIC CONSIDERATION

Considering the basic requirements as well as based on continuous rainfall of 150mm covered in 24 hours and with proper back filling as per increased exposed area, the make of water has been assessed.

In the proposed revised project for the subsequent increase in quarry exposed area as well as for maximum depth, additional requirement of 2 numbers main pumps (2+0) of 225lps, 260m head with 840kW power (6.6kV electricals) and 4 nos. (2+2) of 225lps, 310m head with 1000kW power (6.6kV electricals) pumps have been provided including pipes and pipe fittings at the beyond target year.

Chapter - 8

INFRASTRUCTURE FACILITIES AND LOCATIONS

8.1 ENERGY CONSERVATION

Most of the energy conservation measures are simple in nature and require more commitment than any major technological innovations. Energy transformation is not possible without certain losses.

While formulating the schemes of power supply, illumination, pumping, CHP, etc. for this project, due considerations have been given towards energy conservation. Since reduced energy consumption per unit of product means reduced cost of the project as well as environmental pollution, appropriate weightage for the same has also been given while making investment decisions.

8.2 POWER SUPPLY OVERHEAD LINE

Adequate sizes of overhead conductors have been selected while deciding the distribution network, to minimize line losses and voltage drop.

TRANSMISSION/UTILISATION VOLTAGES

33kV system has been provided for the incoming supply and 6.6kV distribution system has been adopted for HEMM and other power consumers to reduce line losses and conductor sizes.

TRANSFORMER CAPACITY

The capacity of the transformers has been selected considering the optimum efficiency and considering that the transformer losses are minimum. It is also recommended that all HEMM equipment shall be equipped with soft starting devices.

Power supply arrangements given in previous approved Project Report (Ph-III) are adequate. Single Line Diagram for distribution is given at Plate – 21.

8.3 WORKSHOP AND STORES

Additional provision has been made towards construction of additional sheds, E&M workshop and other service buildings due to increased capacity of CHP. Workshop Layout is given at Plate – 22.

8.4 RESIDENTIAL BUILDING

8.4.1 PROVISION OF HOUSES

No additional provision of quarters has been made.

8.5 ROADS CULVERTS

8.5.1 COLONY ROADS AND CULVERTS

As no new residential accommodations proposed in this report , no colony road has been envisaged.

8.5.2 SERVICE ROADS AND CULVERTS

No additional roads and culverts required.

8.6 WATER SUPPLY AND SEWAGE DISPOSAL ARRANGEMENT

Additional provisions are not required

8.6.1 COLONY WATER SUPPLY

Additional provisions are not required

8.6.2 INDUSTRIAL WATER SUPPLY

It as has been envisaged that water from nearby sumps shall be collected through intake well. Raw water shall be stored in a bulk water reservoir from which water shall be treated and stored in a separate reservoir. From this reservoir, water will be taken to individual overhead tanks for consumption through pipe network at different points through gravity flow.

For firefighting purposes in the industrial areas like workshops, stores and quarry area, separate distribution networks have been proposed from the ground reservoir. Provision towards requirement of water for public utilities like garden, afforestation etc. has been made in this report. It has been envisaged that the distribution network for fire-fighting purposes shall also be utilized for these purposes.

8.6.3 COLONY SEWERAGE

Additional provisions are not required.

8.6.4 INDUSTRIAL EFFLUENT SEWERAGE

It has been considered that the industrial wastes from workshop and other industrial establishments would be led through oil & grease traps. The effluent coming out of the industrial premises is proposed to be treated and led to the settling tank and to be recycled for various industrial uses of this project. The domestic sewage generated in the industrial premise has been considered to be dealt through sewerage disposal system.

Chapter – 9

LAND REQUIREMENT & SURFACE REORGANISATION

9.1 LAND REQUIREMENT

Bharatpur South Quarry was planned in Bharatpur South geological block. It was started in FY 1984-85 and was exhausted at around 1997. Bharatpur North geological block is adjacent northern block, separated by downthrown fault and surface barrier of 100-150m. Bharatpur North Quarry was planned in this block. Coal extraction started in 1995. Padma block on the north was added to Bharatpur North Quarry excluding a patch already acquired for Jagannath Quarry. Land requirement was 1324.80 ha.

After carving out transferred land to Jagannath Mine (7.5 Mty) and common safety zone areas with adjacent projects, the Revised Mining Plan for Bharatpur Mine (Revision-1, Phase-1, May 2018) was prepared with reduced Mining Lease area of 927.42 ha. The purpose of Revision-1 was to re-organize land transfer to Jagannath and Ananta mines. This Mining Plan was approved by the Board of M.C.L. on 10.06.2018.

Minor modification in change in land type was made in March 2021, in which Forest Land increased from 200.01 Ha to 222.41 Ha, the total mining lease area remaining same. This modification being “Minor” in nature as per Guidelines of Ministry of Coal, only one note was prepared, which was approved by the Board of M.C.L. on 16.03.2021. Basis of additional land required in Revision-2 is the revised land types approved in March 2021.

In Revision-2 , details of additional land shown is beyond Phase-I of Revision-1. MP&MCP of Bharatpur OCP (Revision-2) has been approved by MCL Board and subsequently placed before EAC for EC and the same was returned with observations. As per the observations of 21 st EAC meeting held on 27/10/21, MCL proposed to

prepare MP&MCP of Bharatpur OC Expansion (20Mty), Revision-3 with in the same Mining Lease Area of 1556.94 ha and Project Area of 1618.34 ha.

(work order annexed in documents enclosed)

Main difference between Revision-2 and Revision-3 is rated capacity of the mine. Revision-2 is for 26 Mty and Revision-3 is for 20Mty, though the mining lease, land use, land type and project area are same.

Pre-mining land type based on present use for Mining Lease Area is given below:

Table 9.1: Pre-mining Land Types

Main Head	Sub Head	Area (Ha)
Tenancy	Agricultural	488.73
	Township	62.60
	Grazing	11.20
	Barren	343.03
	Water Bodies	19.02
	Road	14.28
	Community	27.97
	Sub-Total	966.83
Government Non-Forest	Agricultural	126.49
	Township	68.16
	Grazing	27.60
	Barren	126.79
	Water Bodies	18.66
	Sub-Total	367.70
Forest	Reserve	3.00
	Revenue	219.41
	Sub-Total	222.41
Total		1556.94

Mining Lease area in Phase-I of Revision-1 is 927.42. Details of use of land during mining and post mine closure is given below:

Table 9.2: During Mining Land Use Details

		Total Land as per Revised MP & MCP of Bharatpur OCP (Revision-1) (Phase-I) June 2018			Total Land as per MP & MCP of Bharatpur OC Expn. (Revision-3) April- 2022		
		Forest	Non-forest (Govt. & tenancy)	Total (ha)	Forest	Non-forest (Govt. & tenancy)	Total (ha)
1	Quarry excavation	161.16	539.47	700.63	205.66	1128.399	1334.05
2	Safety Zone 7.5m	0.27	7.16	7.43	0.41	3.12	3.53
3	OB dump (external)	-	49.50	49.50	-	49.50	49.50
4	Infrastructure & Coal Corridor	16.34	127.52	143.86	16.34	132.40	148.74
5	Rationalization of project boundary	-	26.00	26.00	-	21.12	21.12
MINING LEASE (A)		177.77	749.65	927.42	222.41	1334.53	1556.94
6	Residential colony	-	20.00	20.00	-	20.00	20.00
7	Rehabilitation site	-	41.40	41.40	-	41.40	41.40
Sub-total (B)		-	61.40	61.40	-	61.40	61.40
Total PROJECT AREA (A+B)		177.77	811.05	988.82	222.41	1395.93	1618.34

Life of the mine from 01.04.2022 is Twenty two (22) years.

Table 9.3: Post-Closure land use – Mining Lease

Category	Type of Use	Land use (ha)	Index letter
Plantation/ Rehabilitation/ Farmland (A)	Internal Dump Top - Plantation	463.18	(a)
	Internal Dump Top - Agriculture	364.06	(b)
	Internal Dump Slope	264.07	(c)
	External Dump - Plantation	49.50	(d)
	Green Belt	11.70	(e)
	Plantation on Unused Land	57.36	(f)
	Plantation on Infrastructure	35.79	(g)
	Sub-total	1245.66	
Without Plantation (B)	Infrastructure of the Coalfield	47.42	(h)
	Quarry bottom & Quarry slope	195.29	(i)
	Water body inside Quarry	47.45	(j)
	Sub-total	290.16	
Undisturbed (C)		21.12	(k)
Mining Lease	(A+B+C)	1556.94	

Quarry Excavation area of 1334.05 ha is addition of (a), (b), (c), (i) & (j)

Infrastructure & coal corridor of 148.74 ha consists of (f), (g), (h) & 'Green belt' around infrastructure apart from '7.5m Safety Zone' [11.70-3.53=8.17].

21.12 ha under 'Rationalization of Project Boundary' in Table – 9.2 is shown as 'Undisturbed' in Table – 9.3.

External OB dump area is shown as 'External Dump – Plantation' in Table 9.3.

7.5m Safety Zone is proposed to be converted to 'Green belt' included in 11.70 ha and its status is to remain same.

Land rights of Resettlement site will be vested with displaced persons at the Resettlement site. MCL will retain colony for future coal or other projects. Plantations proposed in these places are as below:

Table – 9.4

Category	Type of Use	Land use (in ha)
Plantation/ Rehabilitation/ Farmland	Plantation at Colony	2.00
	Plantation at Resettlement site	4.40
	Sub-total	6.40
Without Plantation	Built-up area at Colony	18.00
	Built-up area at Resettlement	37.00
	Sub-total	55.00
	Area outside Mining Activity	61.40

Green area consisting of Forests, Agricultural & Grazing lands - pre-mining:
876.44 ha

Plantation/Farmland area post Closure: 1590.73 ha

- **Green cover enhancement ratio = $1590.73/876.44 = 1.82$**

9.2 Villages Affected

11 villages under Revision-1 namely Lachhmanpur, Baideswar, Jamubahal, Pabitrapur, Anantabereni, Chintamanipur, Padmabatipur, Dasarathipur, Nakeipasi (part), Danra (part) and Rakas (part) have been shifted or are being processed.

6 villages namely Saranga, Khajuria, Kishorechandrapur, Teleipasi, Niladripur and Satyabadipur are to be shifted totally under Revision-3. Remaining parts of Nakeipasi, Danra, Solda and Prasannagar falling in additional area are to be shifted in due course.

Small parts of Kuriahan and Joragadia villages are also included in the Phase-I of Revision-1 of Mining Plan of Bharatpur Mine. The status is retained.

Very small parts of Kandhabereni and Barpali villages fall under previously approved area. As these villages are not in the notified area of CBA Act and forest land is involved, these villages have been removed from Revision-3.

Table – 9.5 Status of Resettlement & Rehabilitation of PAFs

Sl. No.	Name of the village	No. of employment given (Rehabilitation benefit given)	No. of families resettled	Schedule of implementation of R & R
1	Anantabereni	270	284	Completed
2	Lachmanpur	49	65	Completed
3	Baideswar	56	22	Completed
4	Pabitrapur			Completed
5	Padmabatipur	181	212	Partly shifted
6	Dasarathipur			
7	Rakas	33	0	Shifted to Jagannath OCP
8	Nakeipasi	364	No displacement of family is involved	7 th year
9	Danara	766	- do -	Completed
10	Chintamanipur		- do -	Completed
11	Jambubahali	126	- do -	Completed
12	Tileipasi	44	47	Advanced stage
13	Khajuria	25	36	Advanced stage
14	Kishorechandra pur	Under process	No displacement of family is involved	
15	Sarang	-do-	0	
16	Niladripur	-do-	No displacement of family is involved	
17	Satyabadipur		0	

Table – 9.5 Status of Resettlement & Rehabilitation of PAFs

Sl. No.	Name of the village	No. of employment given (Rehabilitation benefit given)	No. of families resettled	Schedule of implementation of R & R
18	Prasannanagar	246	No displacement of family is involved	Implemented by Hingula Area
19	Solada			
20	Kurihan	Under process	-do-	Being implemented by Jagannath Area
21	Joragadia			
Total		2160	666	

Besides the above families, major married son, unmarried daughters of 30 years of age, divorcee/deserted women/widows, physically & mentally handicapped and/or mentally retarded persons irrespective of age & sex and unmarried daughters/sisters/brothers/sons whose parents are not alive, will be resettled and/or rehabilitated socially, culturally and economically as per the latest norms of Govt. of Odisha.

The displaced families who are not provided with employment or self-employment or who do not want to avail of such employment/self-employment will be entitled to one time cash grant as per the above norms.

Chapter – 10

ENVIRONMENTAL MANAGEMENT

	PARTICULARS	DETAILS
CHAPTER -7 : ENVIRONMENTAL MANAGEMENT		
7.1	Commitment from the project proponent that the company will comply environment and forest condition stipulated in the respective clearances.	Will be provided by MCL

Chapter – 11

PROGRESSIVE AND FINAL MINE CLOSURE

11.1 LEGISLATIVE REQUIREMENTS

- All coal mines shall adopt Mine Closure Plan comprising progressive closure plan and final closure plan duly approved by the competent authority as per circular No.55011-01-2009-CPAM, Govt. of India, Ministry of Coal, dated 27th August, 2009 and as per subsequent updation dated 07.01.2013. This plan provides an indication of the cost and guideline to the process that will be implemented to close the Mine.
- Coal projects who has been accorded approval of Mining Plan / Project Report without mine closure plan are required to prepare and obtained the approval of Mine closure plan within a period of 1 year as per the circular.

OBJECTIVES OF MINE CLOSURE PLANNING

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

VARIOUS ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects:

- (a) Technical aspects;
- (b) Environmental aspects;
- (c) Social aspects;
- (d) Safety aspects;
- (e) Financial aspects.

MINE CLOSURE OBLIGATION

There is a need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the mine management are as follows:

- (a) **Health & Safety:** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;
- (b) **Environment**
 - (i) Water (Prevention & Control of Pollution) Act, 1974;
 - (ii) Air (Prevention & Control of Pollution) Act, 1981;
 - (iii) Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000;
 - (iv) DGMS Directives on Noise & Ground Vibration;
- (c) **Forest**

Forest (Conservation) Act, 1980.
- (d) **Rehabilitation**

CIL's Policy and Orissa State Govt. Policy. Latest Policy / Norms of Govt. of Orissa is followed for this project.
- (e) **Decommissioning/asset disposal, etc.**

Decommissioning of infrastructure is done, the land occupied by the infrastructure will be restored to some useful purpose. The salvaging and shifting operation of mining machinery and other equipment will be done considering the ground realities existing during the period 1 year advance of final closure of the mine.

TYPES OF MINE CLOSURE PLAN

There are two types of mine closure plan:

- Progressive mine closure plan
- Final mine closure plan

PROGRESSIVE MINE CLOSURE PLAN

This is a progressive plan for the purpose of providing protective reclamation and rehabilitation measures in a mine or part there of.

FINAL MINE CLOSURE PLAN

This plan means for the purpose of decommissioning rehabilitation and reclamation in the mine or part there of after cessation of mining and its related activities that has been prepared in the manner to address all environmental aspects taking into consideration.

The final mine closure activities would start towards the end of mine life, and may continue even after the reserves are exhausted and / or mining is discontinued till the mining area is restored to an acceptable level to create a self sustained ecosystem.

ASPECTS FOR PREPARATION OF MINE CLOSURE PLAN

The following points will be incorporated while preparing mine closure plan.

TECHNICAL ASPECTS

1. Mine description
2. Reason for closure
3. Management of mined out land
 - a. Present land use
 - b. Final stage and post operation stage.
4. Management of top soil.
5. Management of wastes.
6. Management / decommissioning of infrastructure.
7. Management of disposal of mining machinery.

ENVIRONMENTAL ASPECTS

1. Management of hydrology & hydrogeology during mine period and post mining closure period.
2. Drainage arrangement for external OB dump.
3. Reclamation of dump(s) & adjoining areas.
4. Rehabilitation & resettlement.
5. Management of air quality.

SOCIAL ASPECTS

1. Redeployment of workforce
2. Management of community facilities
3. Management of association and consultation with stake holders.

SAFETY AND SECURITY ASPECTS

1. Disaster management
2. Care and maintenance during temporary discontinuance
3. Management of fire

FINANCIAL ASPECTS

COST OF MINE CLOSURE INVOLVED

1. Cost of reclamation of mined out area.
2. Cost of air quality protection measure.
3. Decommissioning cost of infrastructure
4. Cost of safety & security
5. Socio-economic cost
6. Cost of organization for executing the closure activities.
7. Cost of post project monitoring for five years.

11.2 TECHNICAL ASPECTS

11.2.1 SAFETY HAZARDS INCLUDING MANAGEMENT OF FIRE

Keeping in view the three basic principles i.e. prevention, preparedness (both pro-active and reactive) and mitigation of effect through rescue, recovery, relief and

rehabilitation; a comprehensive blue print for risk assessment and management has been drawn-up for the project incorporating the following:

- Identification and assessment of risks.
- Recommendation of measures to prevent damage to life and property against such risks.

MINE SLOPE FAILURE MANAGEMENT

While mining operations are in progress, the working slope where drills, excavators, loaders and dumpers are deployed, are designed with multiple benches, minimum dimensions of which are given in Chapter-5. Overall working slope will vary from 22° to 18°.

The side slopes are designed for coal and OB transportation by dumpers. Overall side slopes will vary from 37° to 40°. Part of slope lower than the lowest transport berm will be filled with OB, reducing chance of slope failure. However, field study will be carried out prior to final mining operation to ascertain factor of safety of final slope.

Laser based slope monitoring equipment has been proposed for round-the-clock monitoring of undesired movement of pit slopes.

BLASTING

For proper blasting and minimizing the adverse side effects due to blasting, viz. noise, ground vibration, back-breaks, air blast, fly rocks, etc., the following precautions have been suggested to avoid dangerous situations:

- A safety zone for blasting has been provided around the quarry.
- Before blasting is done, warning sound will be given so that people can move to safe places.

- Controlled blasting with site mixed slurry. Use of millisecond delay detonators that are initiated by shock tube initiation system, between rows and between holes in same row.
- Optimisation of quantity of explosive in a blast hole.
- Blasting shall be carried out in conformity of extant laws with closer control of blasting parameters including blasting results like desire fragmentation, permitted vibration, etc.

EXPLOSIVE HANDLING

The present day technology of blasting with site mixed slurry (SMS) explosive shall be used with milli second delay detonators that are initiated by shock tube initiation system. SMS is stored by the supplier as per GOI Notification. Further, transport and charging are also done by the supplier on the spot. Only priming will be done by the project authority. For storage of explosives meant for priming, detonating fuse and detonators, one service magazine have been provided.

SAFETY RULES

Mining operations follow statutory mine safety rules administered by the Directorate General of Mine Safety (DGMS), Chief Controller of Explosives and others. Planning and design of electrical installations will take into account the existing electricity rules to obviate the hazards due to use of electricity.

For creating safety awareness and imparting education on safe practices, the following steps shall be taken:

- Holding annual safety weeks.
- Imparting basic and refresher training to new and old employees respectively as per Vocational Training Rules.

MINE INUNDATION

Provisions in Coal Mine Regulations shall be followed. The mine pit would receive water from three sources namely, direct precipitation over excavated area, surface run-off from the surrounding area and seepage from the strata. During heavy rainstorms, there may be a situation when mine may get flooded. This may cause loss of human life and equipment, etc. All the necessary precautions will be taken against such eventuality through out the life of the project.

FIRE

Adequate fire fighting arrangement has been provided. Adequate number of fire extinguishers will be provided for stores and other service buildings. While calculating total water demand for the project, provision for fire fighting has also been made.

ROAD ACCIDENTS

Sufficient arrangements for illumination of roads including haul roads will be made. Road crossings has been properly planned and designed to prevent vehicular accidents.

MANAGEMENT OF FIRE

The measures for management of fire at coal faces in the mine and coal stockyard will be adopted / to be adopted and there will be no safety hazards for the neighbouring community after the mine closure.

11.2.2 MANAGEMENT OF WASTE DUMPS

EXTERNAL OB DUMPS

Bharatpur mine have small external dumps which were created during mining of Bharatpur South Quarry. South Quarry is fully exhausted and dumps are properly reclaimed with vegetation. No further external dumping will be required.

INTERNAL DUMP

Major part of the quarry will be backfilled with overburden. The backfilling will be carried out in a phased manner. Once the backfilling has reached a certain predetermined reduced level, the plots will be levelled, graded and cleared of large stone pieces lying on the surface. The slope of the ground will be made very gentle as far as possible (preferably less than 2%). The graded and levelled area will be divided into small sectors and small check bunds will be constructed to retain moisture and humus in the soil. The outer slope of each bench will be kept at the natural angle of repose of the spoil material and at overall slope angle of 27° considering all benches.

Table 11.1
Land Degradation and Technical Reclamation (Including South Quarry)
Cumulative area in Ha

Year/Stage		Land Degraded				Technically Reclaimed Land			
		Exca- vation	Dumps (External +Top Soil)	Infra & Others	Total	Backfill	Dumps (External +Top Soil)	Others	Total
Up to Base Year*		642.13	49.50	64.04	755.67	494.80	49.50	22.45	566.75
Yr-1	2022-23	691.77	49.50	60.82	802.09	532.56	49.50	23.52	605.58
Yr-3	2024-25	812.14	49.50	60.82	922.46	614.59	49.50	27.76	691.85
Yr-5	2026-27	925.33	49.50	60.82	1035.65	700.89	49.50	27.38	777.77
Yr-10	2031-32	1161.54	49.50	54.97	1266.01	916.50	49.50	31.62	997.62
Yr-15	2036-37	1334.05	49.50	79.00	1462.55	1055.48	49.50	35.81	1140.79
Yr-22	2043-44	1334.05	49.50	79.00	1462.55	1090.86	49.50	38.46	1178.82
Post Closure									
Yr-23 to 25	2044-47	1334.05	49.50	79.00	1462.55	1091.31	49.50	83.24	1224.05

**considering Base Date as 01-04-2022*

Note: Residential colony and Rehabilitation sites measuring 61.40 ha will be retained by respective owners

In "Others" under "Technically Reclaimed Land", 'Water Body inside Quarry' is included, causing higher figure than "Others" under "Land Degraded"

Infrastructure for future use (43.21), Quarry Bottom (7.55) & Quarry Slope (187.74) totalling 238.50 Ha is not reclaimed.

Green belt (11.70) and Undisturbed Land (57.36 & 25.33) added with Degraded Land (1462.55) makes Mining Lease (1556.94).

***Apart from above , as per MoEF&CC Gazette notification Dt.31.12.2021 for fly ash disposal, fly ash of NALCO is being disposed in de-coaled quarry of Bharatpur OCP. South quarry of void capacity 13.30 Mcum is being filled with fly ash through pipe line in lean slurry mode by following code of practices.**

Table 11.2
Biological Reclamation (Cumulative area in Ha)

Year/Stage		Biologically reclaimed Area					Forest land (Returned)	Undisturbed/to be left for public or common use	Total
		Agri-culture	Plantation	Water Body	Public/com-pany use ¹	Total			
Up to Base Year*		30	147.95	47.45	6.4	231.8		236.31	468.11
Yr-1	2022-23	40	154.2	47.45	6.4	248.05		236.31	484.36
Yr-3	2024-25	60	176.53	47.45	6.4	290.38		236.31	526.69
Yr-5	2026-27	90	232.88	47.45	6.4	376.73		236.31	613.04
Yr-10	2031-32	120	300.68	47.45	6.4	474.53		236.31	710.84
Yr-15	2036-37	180	363.92	47.45	6.4	597.77		236.31	834.08
Yr-22	2043-44	300	509.6	47.45	6.4	863.45		236.31	1099.76
Post Closure									
Yr-23 to 25	2044-47	364.06	834.15	47.45	6.4	1252.06		236.31	1488.37
Total Biologically reclaimed area is 1252.06 Ha (with in Project area)									
Total Biologically reclaimed area is 1245.66 Ha (with in Mining Lease area)									

* Apart from this Grass carpeting/shrubbing will be done Internal Dump Slope area

¹ Refer to Table – 9.3, plantation in residential colony and resettlement site

◆ DRAINAGE ARRANGEMENT FOR INTERNAL OB DUMPS

Large part of the quarry will be backfilled with overburden. The backfilling will be carried out in a phased manner. Once the backfilling has reached a certain predetermined level, the tops will be levelled graded and cleared of large stone pieces lying on the surface. Top soil preserved and freshly extracted will be spread uniformly over the dump tops. The slope of the ground will be made very gentle as far as possible (preferably less than 2%). The graded and leveled area will be divided into small sectors and small check bunds will be constructed to retain moisture and humus in the soil. The drainage arrangements for precipitation run-off are as follows:

- During working stage, the run-off will be collected from internal dump by foot drain for diverting to mine sump for pumping.
- In the post-mining period, the drainage pattern of the reclaimed area will be such that the run-off will be diverted to final void of the quarry which will

be developed as a water reservoir for **water harvesting** and also recharging the aquifer in the surrounding area.

There is an intricate relationship between surface water and ground water. In the monsoon period, till the aquifer attains its original ground water level, surface water bodies like stream, ponds & lakes recharge the aquifer. As soon as ground water recoups and attains its level, it contributes again to surface water bodies. After post-monsoon period, this process is reversed again as ground water level gets lowered from the original level.

The mine dewatering brings down ground water level in the immediate vicinity of the mine. Maximum effort will be made to recycle or reuse the treated mine discharge water totally to the extent possible by keeping the make up water in different sumps or low lying areas of the project. In unusual situations during monsoon, mine discharge water will be allowed to go as recharge/run-off in the same basin of the area.

As such, this area is having an average annual rainfall of 1241mm. This rainfall replenishes the annual ground water draft every year. This will enhance the recharge of the aquifer in the area for mitigating the lowering of ground water level in the area surrounding the mine.

11.2.3 **MANAGEMENT OF HYDROLOGY AND HYDRO-GEOLOGY**

- Assessment of hydrology and hydro-geology of the area

Investigations have been carried out in and around the area comprising of core and buffer zones of this project. The matter has been dealt.

- Estimation of ground water availability of the area

Ground water availability of the area comprising of core and buffer zones of this project has been assessed.

- Water demand, dewatering of the mine and waste water management

The above details have been given in this report.

- Impact of the mine on ground water and surface water

11.2.4 DETAILS OF DE-COMMISSIONING OF THE INFRASTRUCTURES AND PLANT AND MACHINERY

MANAGEMENT / DECOMMISSIONING OF INFRASTRUCTURE

The infrastructure like workshop, office buildings, residential colony, roads and transmission lines, etc., will be provided for the project. Considering the ground realities existing during the period just 1 year before mine closure, plan for reutilization in neighbouring mines or decommissioning will be made. If decommissioning of infrastructure is done, the land occupied by the infrastructure will be restored for some useful purpose.

MANAGEMENT OF DISPOSAL OF MINING MACHINERY

The salvaging and shifting operation of mining machinery and other equipment will be planned considering the ground realities existing during the period 1 year advance of final closure of the mine.

11.2.5 FENCING AROUND MINED OUT AREAS

Fencing will be provided through out the periphery of the proposed mine for safety and security.

11.3 ENVIRONMENTAL ASPECTS

11.3.1 LAND MANAGEMENT

The proposed mining plan area comprises mostly of land already acquired for the three operating mines. Area expansion is mostly towards south. The area of different types of land and their present and proposed usage is given in the table below:

Table-11.3

Sl. No.	Particulars	Approved Land for Phase-I, Revision-1 (20 Mty), May 2018			Required Land for Expansion, Revision-3 (20 Mty), Apr. 2022		
		Forest	Non-forest	Total	Forest	Non-forest	Total
1	Excavation Area within Mining Lease	138.76	561.87	700.63	183.26	1150.79	1334.05
2	Safety Zone 7.5m	0.27	7.16	7.43	0.41	3.12	3.53
3	External OB Dump	0.00	49.50	49.50	0.00	49.50	49.50
4	Infrastructure & Adjoining Area	16.34	127.52	143.86	16.34	132.40	148.74
5	Rationalization of Project Boundary	0.00	26.00	26.00	0.00	21.12	21.12
A	Mining Lease	155.37	772.05	927.42	200.01	1356.93	1556.94
6	Residential Colony	0.00	20.00	20.00	0.00	20.00	20.00
7	Rehabilitation site	0.00	41.40	41.40	0.00	41.40	41.40
B	Outside Lease	0.00	61.40	61.40	0.00	61.40	61.40
C	PROJECT AREA	155.37	833.45	988.82	200.01	1418.33	1618.34

11.3.2 MANAGEMENT OF FINAL VOIDS

About 13.61 Mcum OB has been dumped externally by the operating mines long back. The objective is to accommodate all OB removed during balance life inside the excavated mine void. In this project proposal, no additional external dumping is proposed. But to keep the entire OB internally, it is absolutely necessary to raise part of the dump top level to 30 m above surrounding ground level. There are some patches in the backfill area with low heights and depressions. It is suggested to fill and level the top as suggested. It is better as soon as done to avoid longer lead distance later.

It was found that internal dump capacity just matches with OB removal of the whole mine at the end of 12th year with central road opened. In subsequent years, the central road is to be completely filled up and coal evacuation routes will be built on western and southern batter.

While calculating OB accommodation in the dumps, swell factor of 1.15 has been applied on in-situ volume to arrive at dump volume. These dumps do not include washery rejects or any other waste.

The dumps have been 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 degrees. Overall slope of full dump face is about 27 degrees.

Top level of northern part of internal dump proposed is 130m above mean sea level, which is 30-35m above surrounding ground level. Top level of southern part is 100m above mean sea level.

Coal seams continue to occur in dip direction towards north. Mine may be expanded in Subhadra West and Konark blocks, if found economically feasible. So, mine life may extend beyond projected life in this report. If it decided to not extend further north, final reclamation activities will start. Final reclamation plan will be prepared 3 years prior to end of mine life. The post reclamation land use is given in the following table-

Table-11.4
Proposed details Post-Closure Land use (Ha)

A. Mining Lease	
Internal Dump Top - Plantation	463.18
Internal Dump Top - Agriculture	364.06
Internal Dump Slope – Grass carpet/shrub	264.07
External Dump	49.50
Green Belt	11.70
Plantation on Undisturbed Land	57.36
Plantation on Infrastructure	35.79
Surface area under plantation/agriculture (A)	1245.66
Undisturbed area	21.12
Quarry bottom & slope	195.29
Water body inside quarry as reservoir	47.45
Rail & Road Infrastructure required for coalfield to be retained	47.42
Surface area other than plantation (B)	311.28
Mining Lease Area (A)+(B)	1556.94
B. Outside Mining Lease	
Plantation in Residential colony and Resettlement site	6.40
Build-up area in Residential colony and Resettlement site	55.00
Area Outside Mining Lease	61.40
Total Project Area	1618.34

** Rights of land for Rehabilitation site will be vested with the displaced persons.
Residential colony will be retained by the The Company*

Table-11.5
Information on Dump & Water Body Dimensions

Average Height of external dump above surrounding surface	(m)	25-30
Volume of external dump	(Mcum)	13.61
Average Height of internal dump above surrounding surface	(m)	0-30
Volume of internal dump – South Quarry (approximate)	(Mcum)	37.77
Volume of internal dump – North Quarry	(Mcum)	818.26
Maximum depth of Water Body	(m)	30

11.3.3 WASTE MANAGEMENT

(Voumes in Million cubic meter)

		OB Removal cumulative			Exteral Dump cumulative		Internal Backfilling cumulative		Temp. Top soil storage
		Top soil	OB	Total	Top soil	OB	Top soil	OB	
Up to Base Year		2.15	237.49	239.64	0.15	46.23	1.80	191.26	0.20
Yr-1	2022-23	2.29	264.17	266.46	0.15	46.23	1.94	217.94	0.20
Yr-3	2024-25	2.65	338.05	340.70	0.15	46.23	2.30	291.82	0.20
Yr-5	2026-27	2.99	420.95	423.94	0.15	46.23	2.64	374.72	0.20
Yr-10	2031-32	3.69	640.35	644.04	0.15	46.23	3.34	594.12	0.20
Yr-15	2036-37	4.27	872.37	876.64	0.15	46.23	3.92	826.14	0.20
Yr-22	2043-44	4.27	910.37	914.64	0.15	46.23	3.92	864.14	0.20

Assumed 0.3m top soil from degraded land

11.3.4 MANAGEMENT OF RECHARGE AREAS

Mining operation of this project will create voids or depressions, which will induce / accelerate rainfall recharge and decrease run-off in the mining area. Maximum effort will be made to recycle or reuse the treated mine discharge water totally to the extent possible by keeping the make of water in different sumps or low lying areas of the mine. The remaining water will be discharged to the natural drainage for ground water recharge in the same basin. The final voids of the quarry will be left as a water reservoir for water harvesting and also recharging the aquifer in the surrounding area.

11.3.5 ACCEPTABLE SURFACE AND GROUND WATER FLOWS

The drainage arrangement for smooth disposal of storm water from OB dump will be made to avoid gully formation on the dump body and also siltation problem of the nearby natural drains.

11.3.6 **ALTERNATIVE USE OF LAND**

There are several options available for land use pattern of the reclaimed land. The following factors have been considered for selection of appropriate land use pattern:

- Pre-mining land use pattern
- Topsoil/sub-soil quality
- Socio-economic parameters of the area
- Availability of technology for land reclamation
- Climatic conditions of the area
- Local flora.

The alternatives available for utilising the reclaimed land are :

- ❖ Agricultural use
- ❖ Afforestation

The option for using the reclaimed backfilled area for agricultural purpose immediately is ruled out due to the following reasons :

- The reclaimed land is very different from its pre-mining conditions. It cannot sustain crops as the soil has poor fertility status. So the agriculture may prove uneconomic venture compared to afforestation.
- The development of soil regime for agriculture will take a considerable time.
- Reclamation is proposed to be done progressively and concurrently with mining operation. Carrying out agriculture within mining activity area by releasing reclaimed area in a phase-wise manner, may not be advisable from safety point of view.

In view of the above, it is suggested to utilise the reclaimed land for afforestation purpose which will help improve the soil status i.e texture and nutrient levels, etc.

11.4 SOCIAL ASPECT

11.4.1 RE-DEPLOYMENT OF WORK FORCE

The peak workforce required for mine operations is in the first few years of the mine when construction activities as well as operational activities achieve their peak. This workforce slowly goes down with completion of development and when only the operational work remains. Again, near the end of mine life say, 5 years advance of closure, the activity of the mine starts getting reduced and therefore, management will get opportunity to taper the operational manpower. After closure, skeleton service people will be left for continuing the actual closer operations. The reduction of manpower will be effected by following options:

- ⊕ Retraining and redeployment of younger group upto 40 years of age.
- ⊕ Transfer of experienced middle aged groups between 40-50 years to the other projects.
- ⊕ Implementation of VRS for age group of above 50.
- ⊕ Retrenchment with suitable compensation after exhausting the above.

11.4.2 MANAGEMENT OF COMMUNITY FACILITIES

The peripheral village community facilities developed by the Mine Authority will be left to the Local Body / State Govt. for management.

11.4.3 CHANNELISATION OF AVAILABLE WATER

11.4.4 EMANCIPATION FROM PAPs

- ◆ The resettlement site shall be named suitably.

- ♦ If any place of worship like temple, church, etc. are acquired, the same shall be provided on the replacement basis.
- ♦ A community of a particular caste, creed and religion shall be allowed to resettle in a particular area in the resettlement colony to foster the communal harmony.
- ♦ Training facilities shall be extended to the woman folk to give adequate access to income generating opportunities for raising their social status.

11.5 FINANCIAL ASPECT

11.5.1 COST OF CLOSURE ACTIVITIES

1. Cost of reclamation of mined out area.
2. Cost of air quality protection measure.
3. Decommissioning cost of infrastructure
4. Cost of safety & security
5. Socio-economic cost
6. Cost of organization for executing the closure activities.
7. Cost of post project monitoring for five years.

Table 11.7

Activity wise Progressive & Final Mine Closure cost distribution

S.No	ACTIVITY	Closure Cost (percentage weightage)	Remarks
A	Dismantling of Structures		To be included in final mine closure plan
	Service Buildings	0.20	
	Residential Buildings	2.67	
	Industrial structures like CHP, Workshop, field sub-station, etc.	0.30	
B	Permanent Fencing of mine void and other dangerous area		To be included in final mine closure plan
	Random rubble masonry of height 1.2 metre including leveling up in cement concrete 1:6:12 in mud mortar	1.50	
C	Grading of highwall slopes		To be included in final mine closure plan
	Levelling and grading of highwall slopes	1.77	
D	OB Dump Reclamation		71% for progressive and 17.66% for final mine closure.
	Handling/Dozing of OB Dump and backfilling	88.66	
E	Landscaping		Equal weightage throughout the life of the mine.
	Landscaping of the open space in leasehold area for improving its esthetics and eco value	0.30	

S.No	ACTIVITY	Closure Cost (percentage weightage)	Remarks
F	Plantation & Bio-Reclamation		
	Plantation over cleared area obtained after dismantling	0.50	To be included in final mine closure plan
	Plantation around the quarry area and in safety zone and external OB dump	0.22	Equal weightage throughout the life of the mine.
	Plantation over the external OB DumpBio-reclamation including plantation and post care	0.40	Equal weightage throughout the life of the mine.
G	Post Closure Env. Monitoring / testing of parameters for three years		For three years after mine closure
	Air Quality	0.22	
	Water Quality	0.20	
H	Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people	0.26	Equal weightage throughout the life of the mine.
I	Miscellaneous and other mitigative measures	2.00	Equal weightage throughout the life of the mine.
J	Post Closure Manpower cost for supervision	0.80	To be included in final mine closure plan
	TOTAL	100.00	

11.5.2 COST OF ORGANIZATION FOR EXECUTING THE CLOSURE ACTIVITIES

An organization with necessary manpower and vehicle support will be needed. The manpower required for the closure activities and then post-project monitoring are given below:

Table-11.8
Manpower for closer activities and post-project monitoring

Sl.No.	Designation	No.
1.	Asst.Colliery Manager	1
2.	Overman	1
3.	Mining Sirdar	1
4.	Watchman	2
	Total :	5

TIME SCHEDULE FOR DIFFERENT ACTIVITIES FOR MINE CLOSURE

The closure of mines evolves environmental, technical, social aspect and financial assurance for implementing activities will run for three years. The following activities will be implemented as per bar chart. The details of time schedule for all closure

operation which are applicable for both Progressive and Final Mine Closure Plan has been described with bar chart.

Activity	Time frame	Yr-1 to Yr-5	Yr-6 to Yr-10	Yr-11 to Yr-15	Yr-16 to Yr-22	Post Closure Phase		
						PC1	PC2	PC3
A Permanent Fencing of mine area and other dangerous area Random rubble masonry of height 1.2 metre including leveling up in cement concrete 1:6:12 in mud mortar	Execute wherever not done yet. To complete in 14 years							
B OB Dump Reclamation								
Handling/Dozing of OB Dump and backfilling	Throughout the life of the mine including 3 years after cessation of mining operation							
Technical and Biological reclamation including plantation and post care	Throughout the life of the mine including 3 years after cessation of mining operation							
C Landscaping								
D Plantation								
Plantation around the quarry and Infrastructure	During initial 10 years	This is a very old mine running from 1984. Unused areas around old quarry have been planted.						
Plantation over cleared area obtained after dismantling	3 years post mining							
E Dismantling of Structures								
Service Buildings & Other Buildings	2 years							
Industrial structures like CHP, Workshop, field sub-station, etc.	2 & ½ years							
F Grading of highwall slopes								
Levelling and grading of highwall slopes	2 years							
G Post Closure Env Monitoring / testing of parameters for three years								
Air Quality	3 years							
Water Quality	3 years							
H Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people)	Throughout the life of the mine							
I Miscellaneous and other mitigative measures	Throughout the life of the mine including 3 years after cessation of mining operation							

PC1 : Post Closure Year 1 PC2 : Post Closure Year 2 PC3 : Post Closure Year 3

11.5.3 MINE CLOSURE COST

The cost of the mine closure of the project has been estimated comprising of cost of reclamation of mined out area, cost of air quality protection measure, decommissioning cost of infrastructure, cost of safety & security, socio-economic cost, cost of organization for executing the closure activities, cost of post project monitoring for three years, rehabilitation of mining machinery (disposal of mining machinery), arboriculture and land scaping including biological reclamation and cost of barbed wire fencing all around working area. Annual closure cost has been computed considering the total project area as per guide line. The Money to be leived per hectar of mining lease is to be deposited every year after commencement of any activity on the land for the mine after opening an **Escrow Account**. Mining Company/owner including all Public Sector Unertakings will deposite the yearly amount in a Schdeluded Bank. The details of the final mine Closure Plan along with the details of the cost estimate for various mine closure activites and Escrow Account already set up shall be submitted to the Ministry of Coal for approval atleast five years before the intended final closure of the mine. Up to 50% of the total deposited amount including interest accrued in the ESCROW account may be released after every five years in line with the periodic examination of the Closure Plan as per Clause 3.1 of the Annexure of the Guidelines. The amount released shall be equal to expenditure incurred on the progressive mine closure in past five years or 50% whichever is less. The balance amount at the end of the final Mine Closure shall be released to mine owner/leaseholder at the end of final Mine Closure on compliance of all provisions of Closures Plan duly signed by the lessee and certify that the said closure of mine compiled all statutory rules, regulations, orders made by the Central or State Government, statutory organisations, court etc. and duly certified by the Coal Controller.

This cost involved barbed wire fencing all and around the working area, dismantling of the structure / demolition and cleaning of sites, rehabilitation of mining machinery, plantation, physical / biological reclamation, landscaping, post-environmental monitoring, supervision for 3 years, power cost, etc. The closure cost will be updated with respect to WPI.

As per the guidelines, the closure cost for opencast mine will be nine lakhs per hectare (at 01-04-2019) of total project area and this rate will stand modified based on the whole sale price index as notified by Government of India from time to time.

Monthly Wholesale Price Index on April 2019	: 121.1
Monthly Wholesale Price Index on March 2022 (Index=100 at Base 2011-12)	: 148.8
Mine Closure cost on April 2019 as per MoC	: Rs.9.00 lacs/ha
Mine Closure cost on March 2022	: Rs.11.059 lacs/ha

(WPI has been obtained from the official website of Office of the Economic Adviser to the Government of India, ministry of Commerce and Industry for "All Commodities".
Website address: http://eaindustry.nic.in/display_data.asp)

Total Project area involved	: 1618.34 Ha
Total Mine Closure Cost (as on April 2022)	: Rs.17897.222 lakhs
Deposits made to Escrow Account of the running mine till 31-03-2022 (without interest):	Rs.6946.29 Lakhs

Balance amount of Mine Closure Cost (from 2022-23) : Rs.9590.392 Lakhs

PHASING OF MINE CLOSURE COST

As per the guidelines, the annual closure cost has been computed considering the total project area at the above mentioned rate and dividing the same by the entire life of the mine in years. An amount equal to the annual cost is to be deposited each year throughout the mine life compounded @5% annually.

Estimated Balance Mine closure cost (from April 2022)	: Rs.9590.392 lakhs
Life of the mine	: 22 years
Annual amount to be deposited with the Coal Controller in the 1 st year:	Rs.435.927 lakhs

Annual deposit amounts for balance life @ 5% compounding rate is given the table.

Table 11.9
(2022-23 is considered as Yr-1)

Year	Mine closure cost (Rs. in lakhs)
Yr-1	435.927
Yr-2	457.723
Yr-3	480.609
Yr-4	504.639
Yr-5	529.871
Yr-6	556.365
Yr-7	584.183
Yr-8	613.392
Yr-9	644.062
Yr-10	676.265
Yr-11	710.078
Yr-12	745.582
Yr-13	782.861
Yr-14	822.004
Yr-15	863.104
Yr-16	906.259
Yr-17	951.572
Yr-18	999.151
Yr-19	1049.109
Yr-20	1101.564
Yr-21	1156.642
Yr-22	1214.474
TOTAL	16785.436

It may be noted that present payment towards escrow account is based on mining lease of 1324.80 ha and 27.00 ha for R&R site (total 1351.80 ha). After reorganization and reconcilliation of area with Jagannath mine, Project Area is supposed to reduce to 988.82 ha as given in Mining Plan, Revision-1, Phase-I (May 2018). So, the yearly payment towards escrow account will reduce according to revised mining plans. The payment schedule towards Escrow Account of the existing mine will be discontinued on 31-03-2022 and new payment schedule will be adhered to from F.Y. 2022-23, subject to approval of the Board of MCL, all statutory clearances and the Office of the Coal Controller. The mine closure cost will be deposited as per guidelines issued by Ministry of Coal vide letter No. 34011/28/2019-CPAM, Dt.16/12/2019.

11.6 FINANCIAL ASSURANCE

1. MCL will open an Escrow Account with the Coal Controller Organization (on behalf of the Central Government) as exclusive beneficiary.
2. MCL shall cause payments to be deposited in the Escrow Account per year as per the table-11.8. The amount being deposited will be reviewed with such periodicity as deemed fit by the Coal Controller. A copy Board Resolution for approval of Mine Closure Plan and closure cost is enclosed as Annexure-1 after approval of the same.
3. Mining will be carried out in a phased manner initiating afforestation/ reclamation work in the mined out area of the first phase while commencing the mining in the second phase i.e. continuation of mining activities from one phase to other indicating the sequence of operations depending on the geo-mining conditions of the mine. Up to 50% of the total deposited amount including interest accrued in the ESCROW account may be released after every five years in line with the periodic examination of the Closure Plan as per Clause 3.1 of the Annexure of the Guidelines. The amount released may be equal to expenditure incurred on the progressive mine closure in past five years or 50% whichever is less. The balance amount at the end of the final Mine Closure may be released to MCL on compliance of all provisions of Closure Plan duly signed by MCL to the effect that said closure of mine compiled all statutory rules, regulations, orders made by the Central or State Government, statutory organizations, court etc. and duly certified by the Coal Controller.
4. An Agreement outlining detailed terms and conditions of operating the Escrow Account shall be executed amongst MCL, Coal Controller and the concerned bank in order to give effect to this.

11.7 RESPONSIBILITIES OF THE MINE OWNERS

1. It is the responsibility of MCL to ensure that the protective measures contained in the mine closure plan including reclamation and rehabilitation works have been carried out in accordance with the approved mine closure plan and final mine closure plan.

2. MCL shall submit to the Coal Controller a yearly report before 1st July of every year setting forth the extent of protective and rehabilitative works carried out as envisaged in the mine closure plans.
3. The details of the final Mine Closure plan along with the details of the updated cost estimates for various mine closure activities and the Escrow account already set up shall be submitted to the Ministry of Coal for final approval at least five years before the intended final closure of the mine.

11.8 PROVISIONS OF MINE CLOSURE

1. MCL shall be required to obtain a mine closure certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the approved mine closure plan/final mine closure plan have been carried out by the mine owner for surrendering the reclaimed land to the State Government concerned.
2. The balance amount at the end of the final Mine Closure may be released to MCL on compliance of all provisions of Closure Plan duly signed by MCL to the effect that said closure of mine complied with all statutory rules, regulations, orders made by the Central or State Government, statutory organizations, court etc. and duly certified by the Coal Controller. This will also indicate the estimated extractable coal reserves and coal actually mined out.

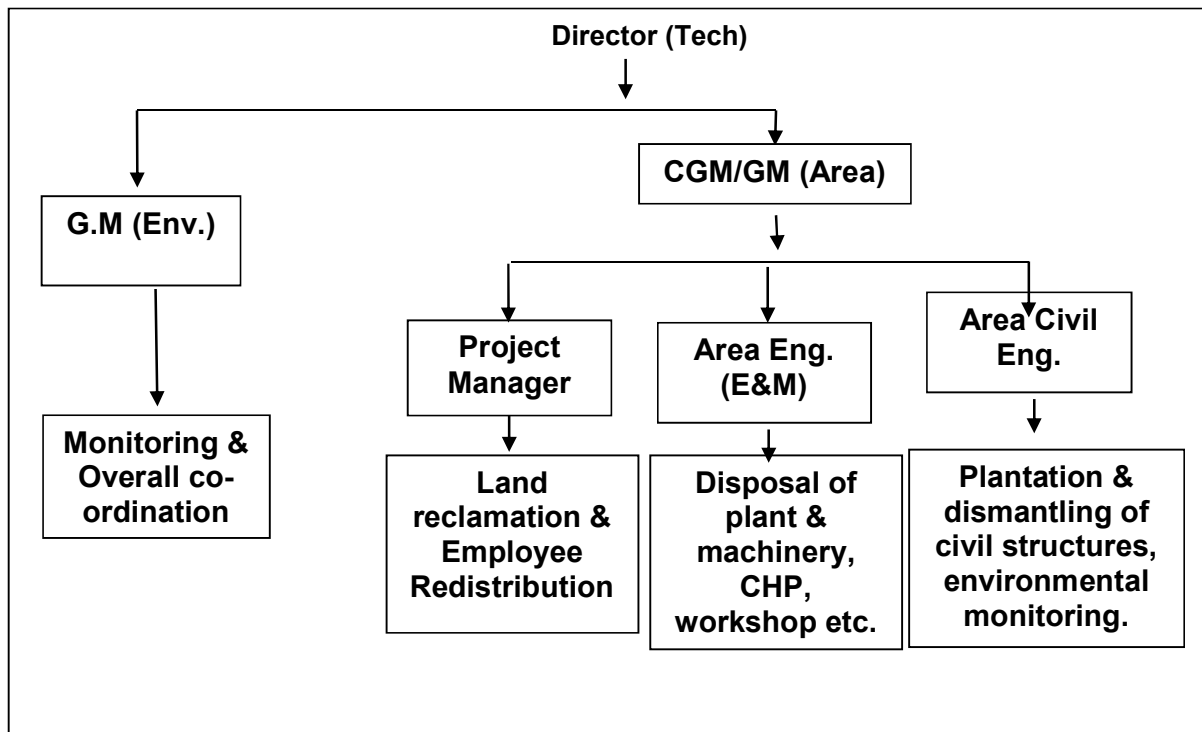
If the Coal Controller has reasonable grounds for believing that the protective, reclamation and rehabilitation measures as envisaged in the approved mine closure plan in respect of which financial assurance was given has not been or will not be carried out in accordance with mine closure plan, either fully or partially, the Coal Controller shall give MCL a written notice of his intention to issue the orders for forfeiting the sum assured at least thirty days prior to the date of the order to be issued after giving an opportunity to be heard.

MCL will open an Escrow Account with the Coal Controller Organization (on behalf of the Central Government) as exclusive beneficiary.

An Agreement outlining detailed terms and conditions of operating the Escrow Account shall be executed amongst MCL, Coal Controller and the concerned bank in order to give effect to this.

11.10 IMPLEMENTATION PROTOCOL

For implementing the mine closure activities, the following organizational structure has been proposed:



Environmental monitoring for three years after closure of mine will be carried out to evaluate the environmental quality of the area. If need be proper mitigation measures will be taken up after evaluating the environmental quality. The funds for this have been provided in the cost estimate. Before closure of the mine, Area GM will prepare survey and disposal report and the same will be submitted to DGMS for acceptance.

Central Mine Planning and Design Institute Limited

(A Subsidiary of Coal India Limited)

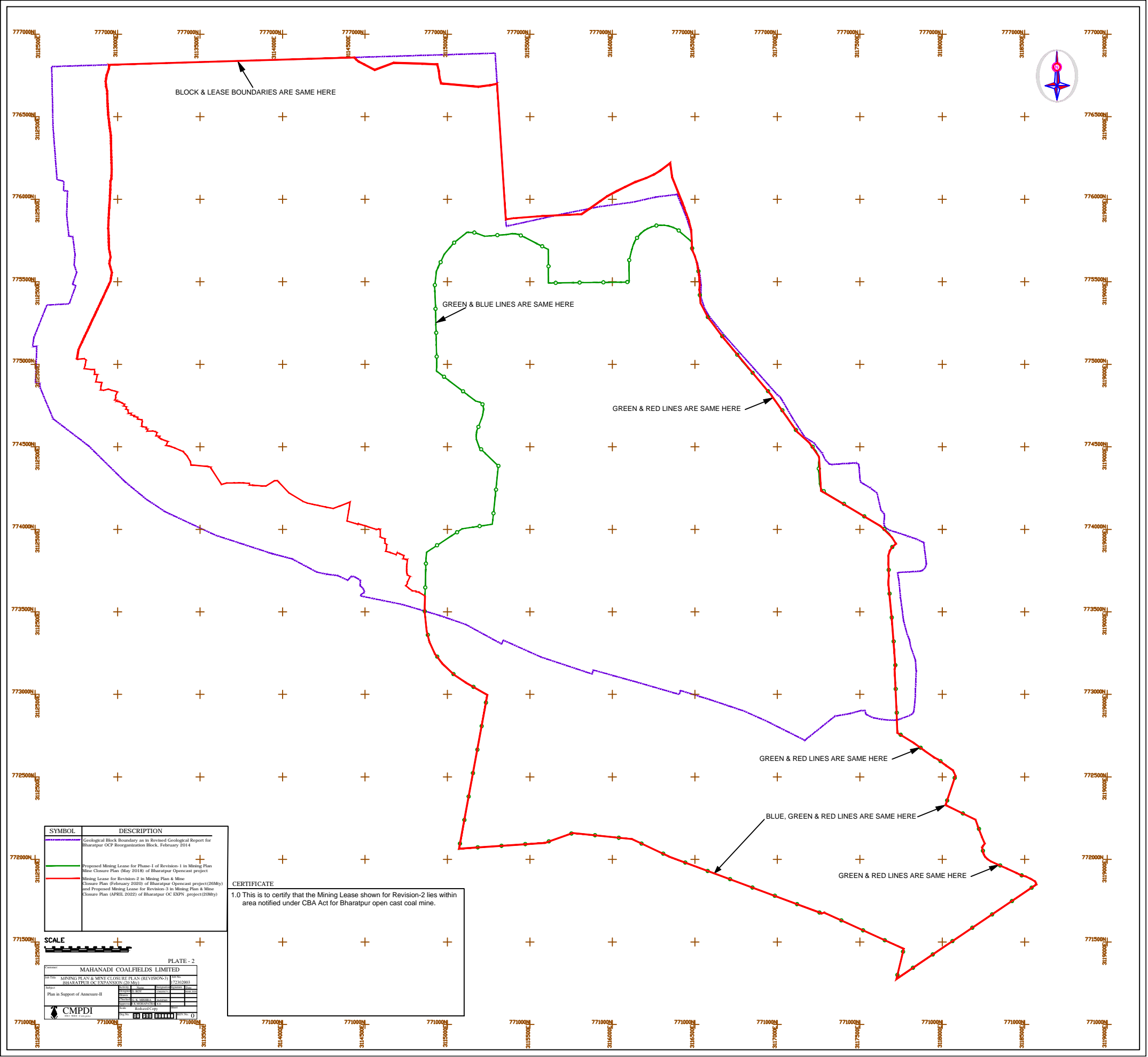
Regional Institute – VII

**Plot No.E-4, Opp. Gandhi Park, Samantapuri, P.O.:RRL,
Bhubaneswar – 751013, Odisha, India**

Phone (+91-0674)2392627, 2394143 (EPBX) and 2393471

Fax(+91-0674)2394357

Cable MINEPLAN, E-Mail:ri7@cmpdi.co.in



SYMBOL	DESCRIPTION
	Geological Block Boundary as in Revised Geological Report for Bharatpur OCP Reorganization Block, February 2014
	Proposed Mining Lease for Phase-1 of Revision-1 in Mining Plan Mine Closure Plan (May 2018) of Bharatpur Opencast project
	Mining Lease for Revision-2 in Mining Plan & Mine Closure Plan (February 2020) of Bharatpur Opencast project (200Mtpa) and Proposed Mining Lease for Revision-3 in Mining Plan & Mine Closure Plan (APRIL 2022) of Bharatpur OCP EXPN -project (200Mtpa)

SCALE

MAHANADI COALFIELDS LIMITED

MINING PLAN & MINE CLOSURE PLAN (REVISION-3)
BHARATPUR OCP EXPANSION (200 Mtpa)

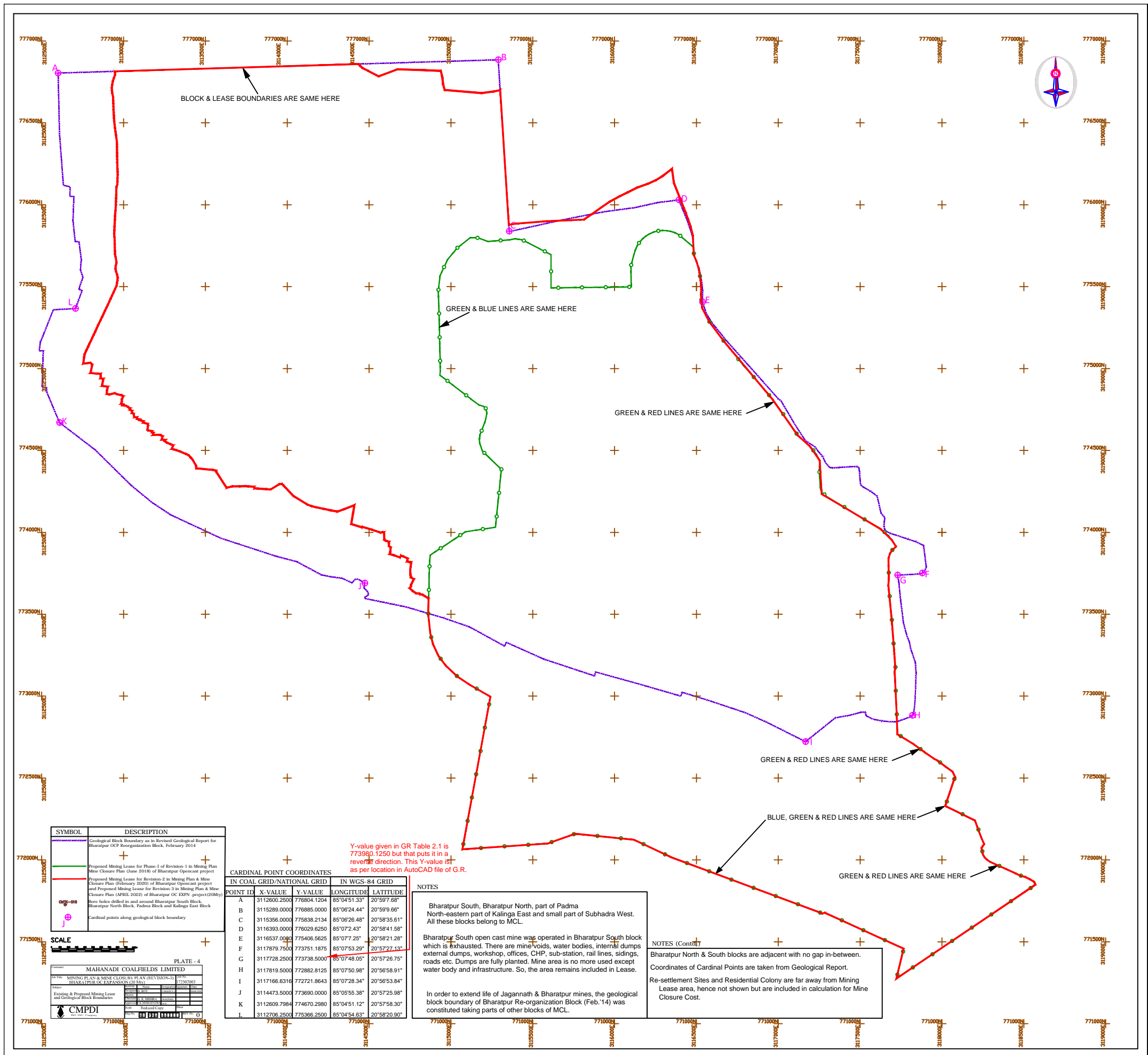
Plan in Support of Annexure-II

CMPDI

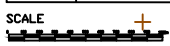
CHHATTISGARH

INDIA

CERTIFICATE
1.0 This is to certify that the Mining Lease shown for Revision-2 lies within area notified under CBA Act for Bharatpur open cast coal mine.



SYMBOL	DESCRIPTION
	Geological Block Boundary as in Revised Geological Report for Bharatpur C/P Reorganization Block, February 2014
	Proposed Mining Lease for Phase 1 of Revision 1 in Mining Plan Mine Closure Plan (June 2018) of Bharatpur Open-cast project
	Proposed Mining Lease for Revision 2 in Mining Plan & Mine Closure Plan (February 2020) of Bharatpur Open-cast project and Proposed Mining Lease for Revision 3 in Mining Plan & Mine Closure Plan (April 2022) of Bharatpur OC EXPN. project (20Mtpa)
	Cardinal points along geological block boundary



MAHANADI COALFIELDS LIMITED	
MINING PLAN & MINE CLOSURE PLAN (REVISION-3)	
BHARATPUR BLOCK EXPANSION (20 Mtpa)	
Project	2020
Prepared by	2020
Checked by	2020
Approved by	2020
Scale	1:5000
Sheet No.	01
Sheet Count	01
Revision	0

CARDINAL POINT COORDINATES			
IN COAL GRID/NATIONAL GRID		IN WGS-84 GRID	
POINT ID	X-VALUE	Y-VALUE	LATITUDE
A	3112600.2500	776804.1204	85°04'51.33"
B	3115289.0000	776885.0000	85°06'24.44"
C	3115356.0000	775838.2134	85°06'26.48"
D	3116393.0000	776029.6250	85°07'2.43"
E	3116537.0000	775406.5625	85°07'7.25"
F	3117879.7500	773751.1875	85°07'53.29"
G	3117728.2500	773738.5000	85°07'48.05"
H	3117819.5000	772882.8125	85°07'50.98"
I	3117166.6316	772721.8643	85°07'28.34"
J	3114473.5000	773690.0000	85°05'55.38"
K	3112609.7984	774670.2980	85°04'51.12"
L	3112706.2500	775366.2500	85°04'54.63"

NOTES

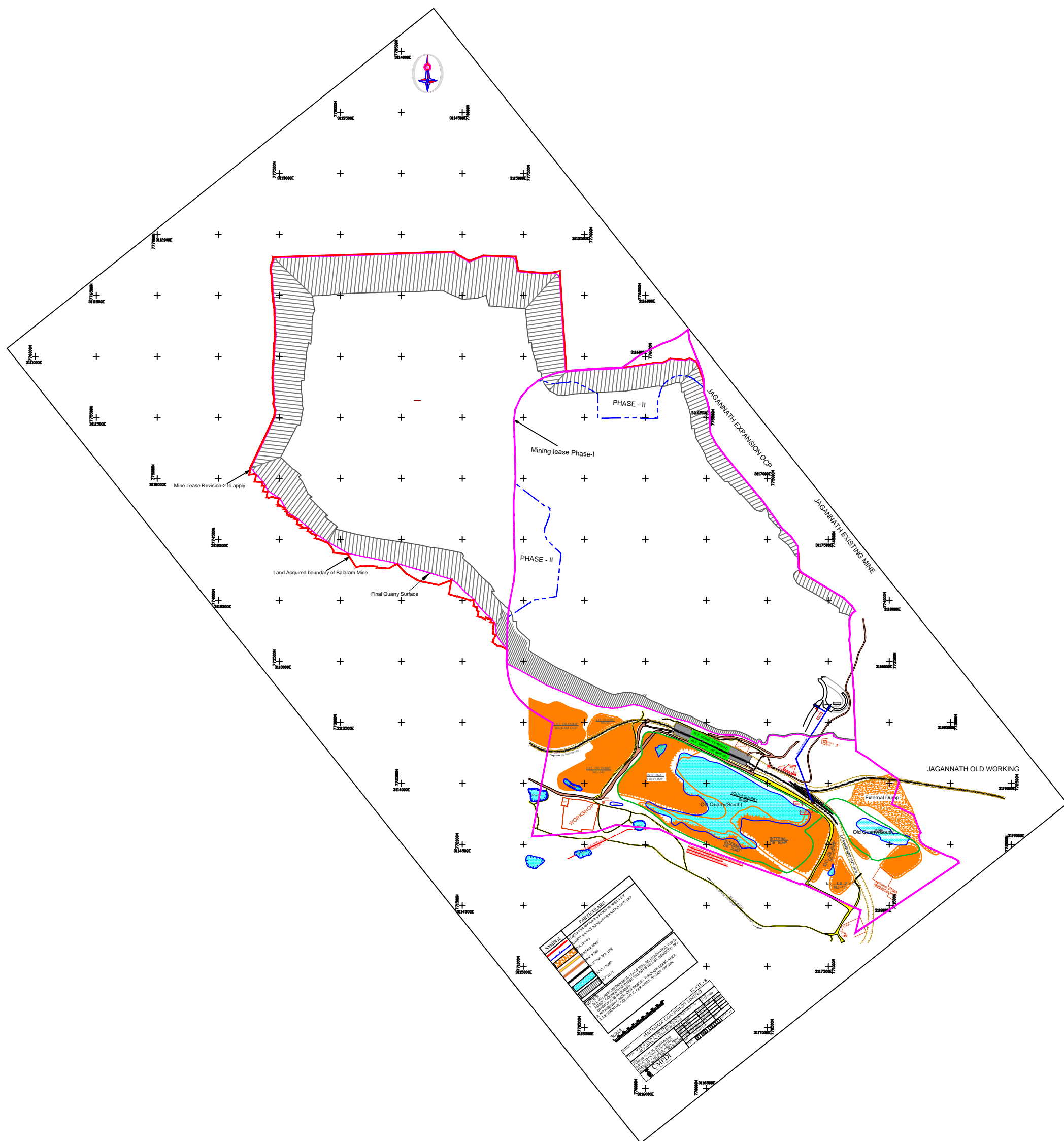
Bharatpur South, Bharatpur North, part of Padma North-eastern part of Kalinga East and small part of Subhadra West. All these blocks belong to MCL.

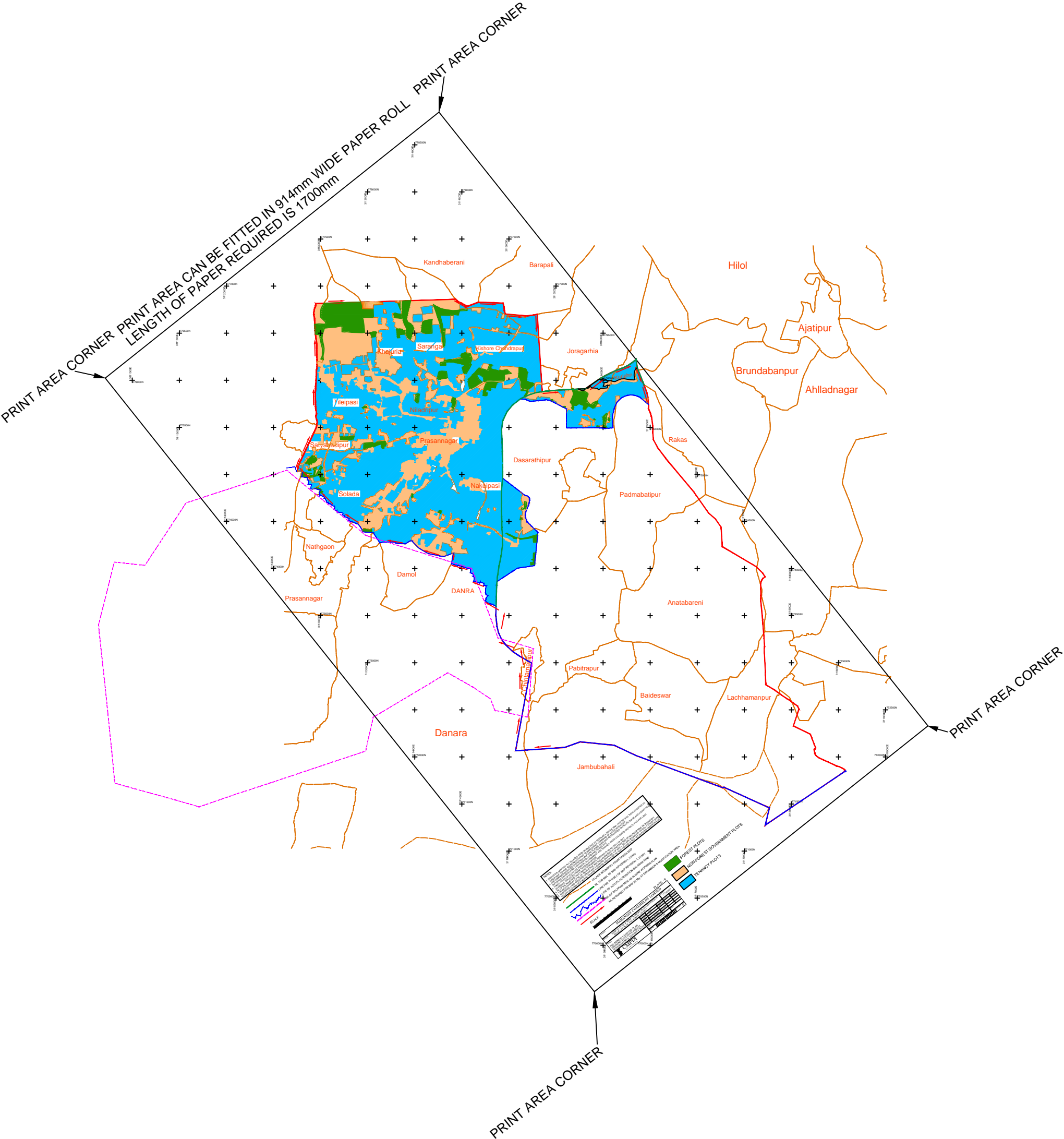
Bharatpur South open cast mine was operated in Bharatpur South block which is exhausted. There are mine voids, water bodies, internal dumps external dumps, workshop, offices, CHP, sub-station, rail lines, sidings, roads etc. Dumps are fully planted. Mine area is no more used except water body and infrastructure. So, the area remains included in Lease.

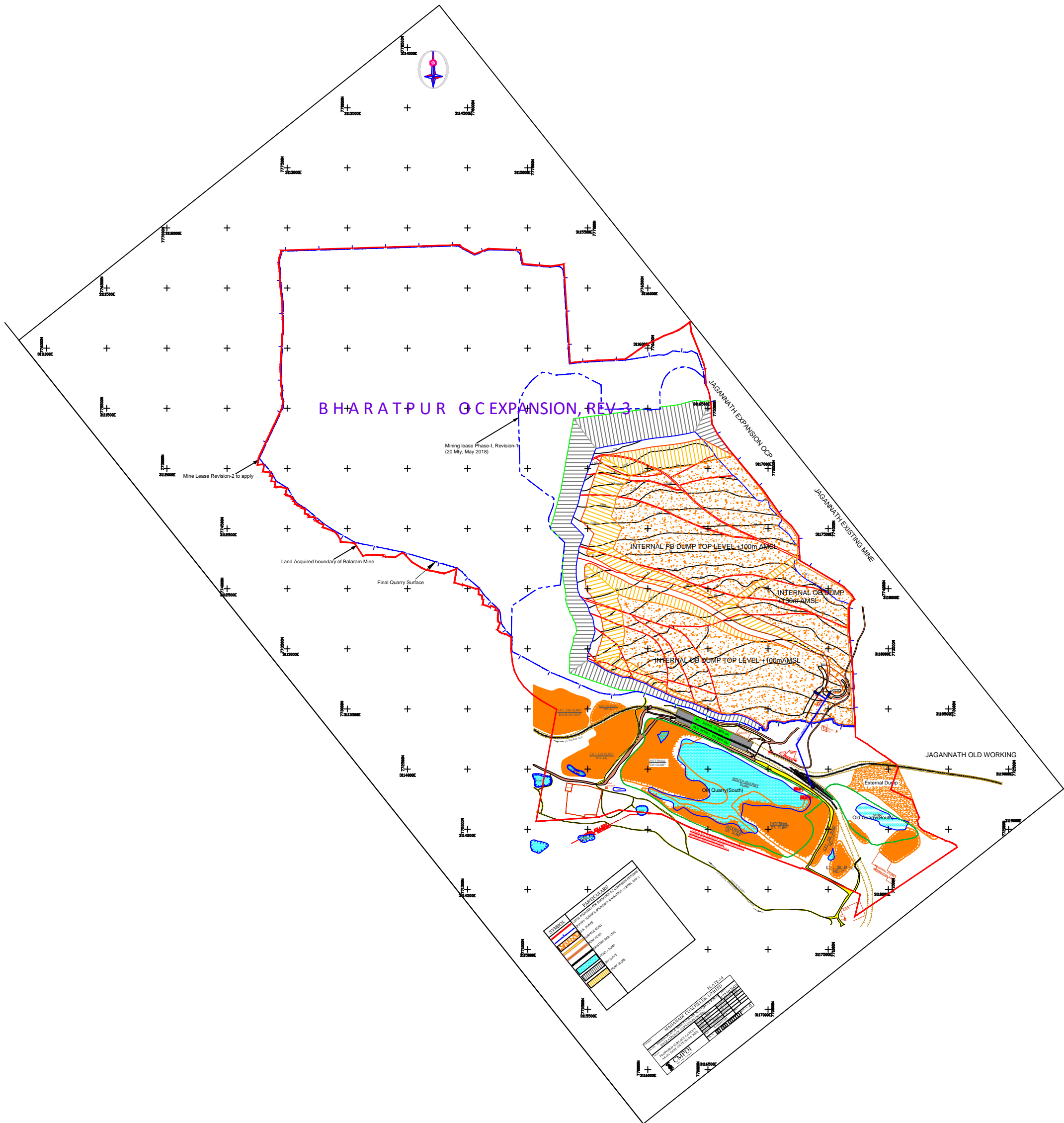
In order to extend life of Jagannath & Bharatpur mines, the geological block boundary of Bharatpur Re-organization Block (Feb.'14) was constituted taking parts of other blocks of MCL.

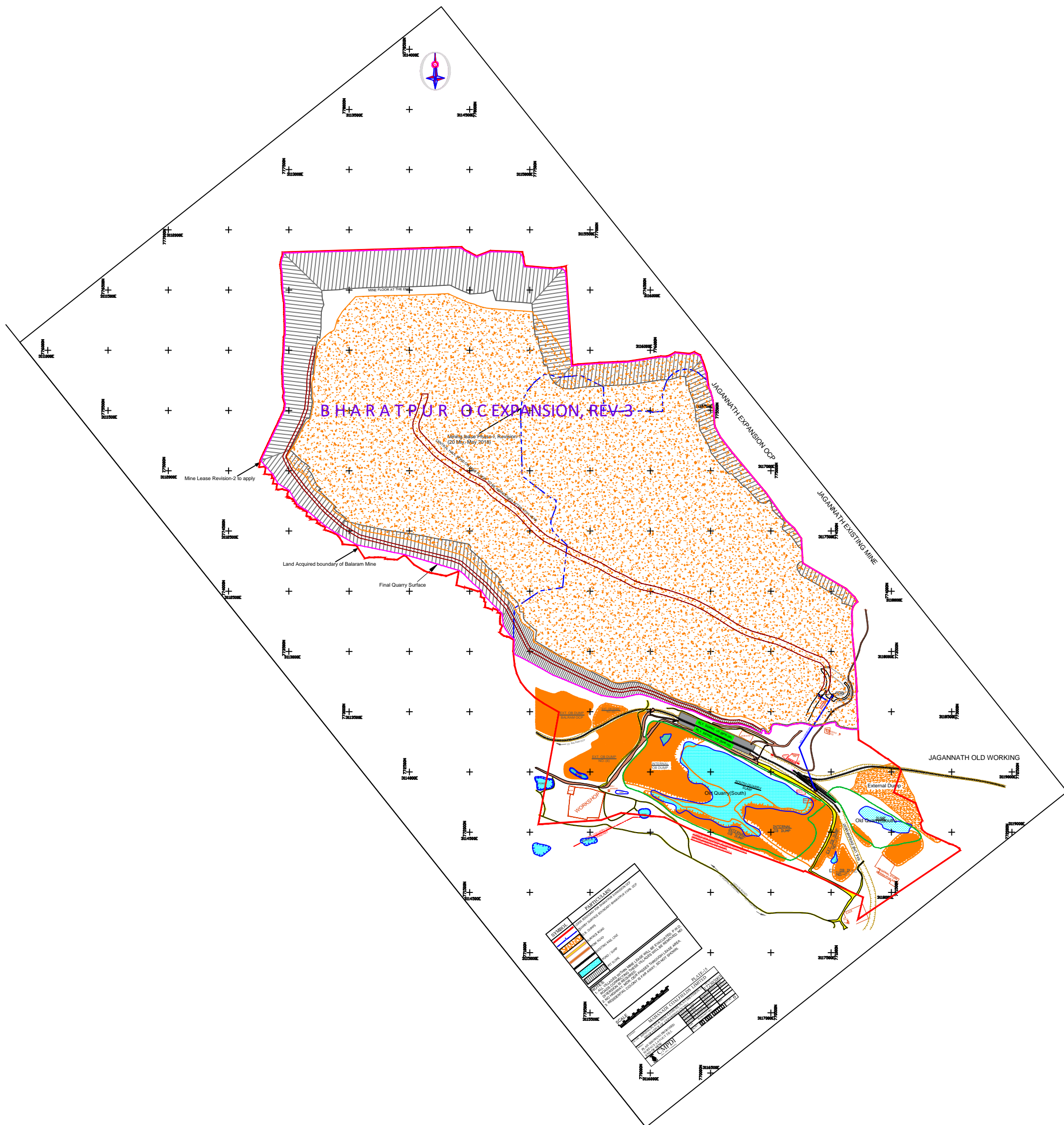
NOTES (Contd.)

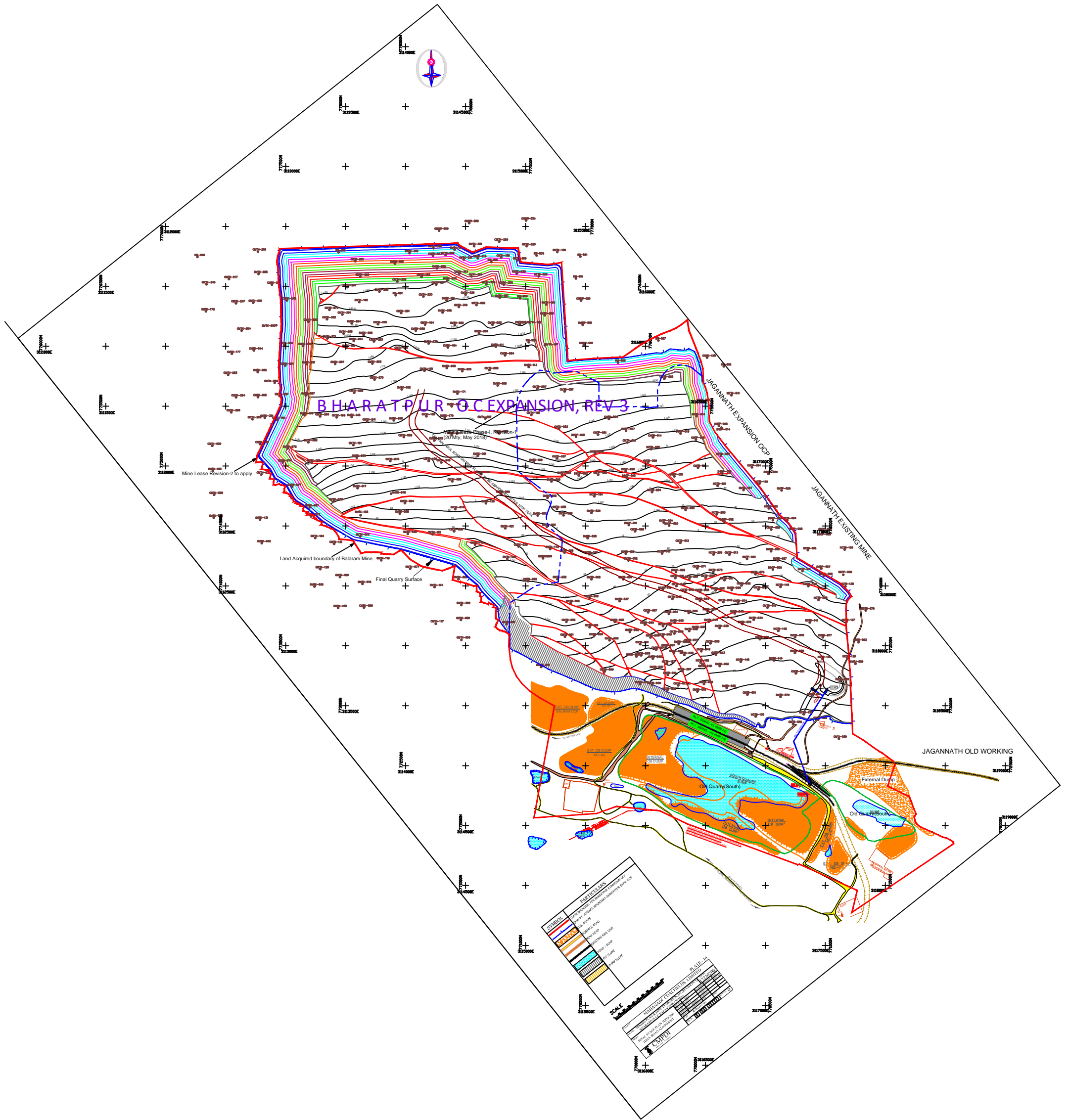
Bharatpur North & South blocks are adjacent with no gap in-between. Coordinates of Cardinal Points are taken from Geological Report. Re-settlement Sites and Residential Colony are far away from Mining Lease area, hence not shown but are included in calculation for Mine Closure Cost.

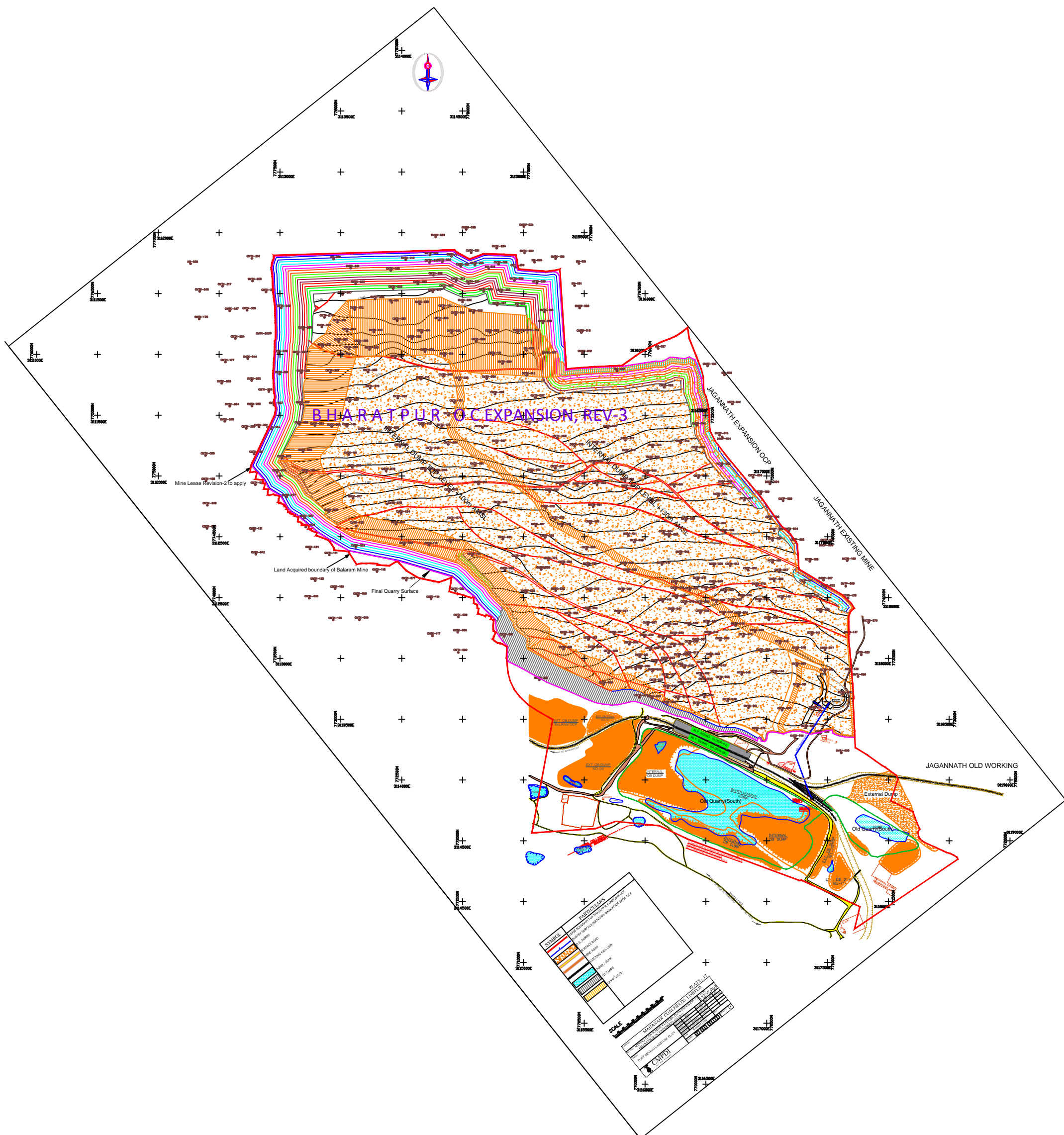


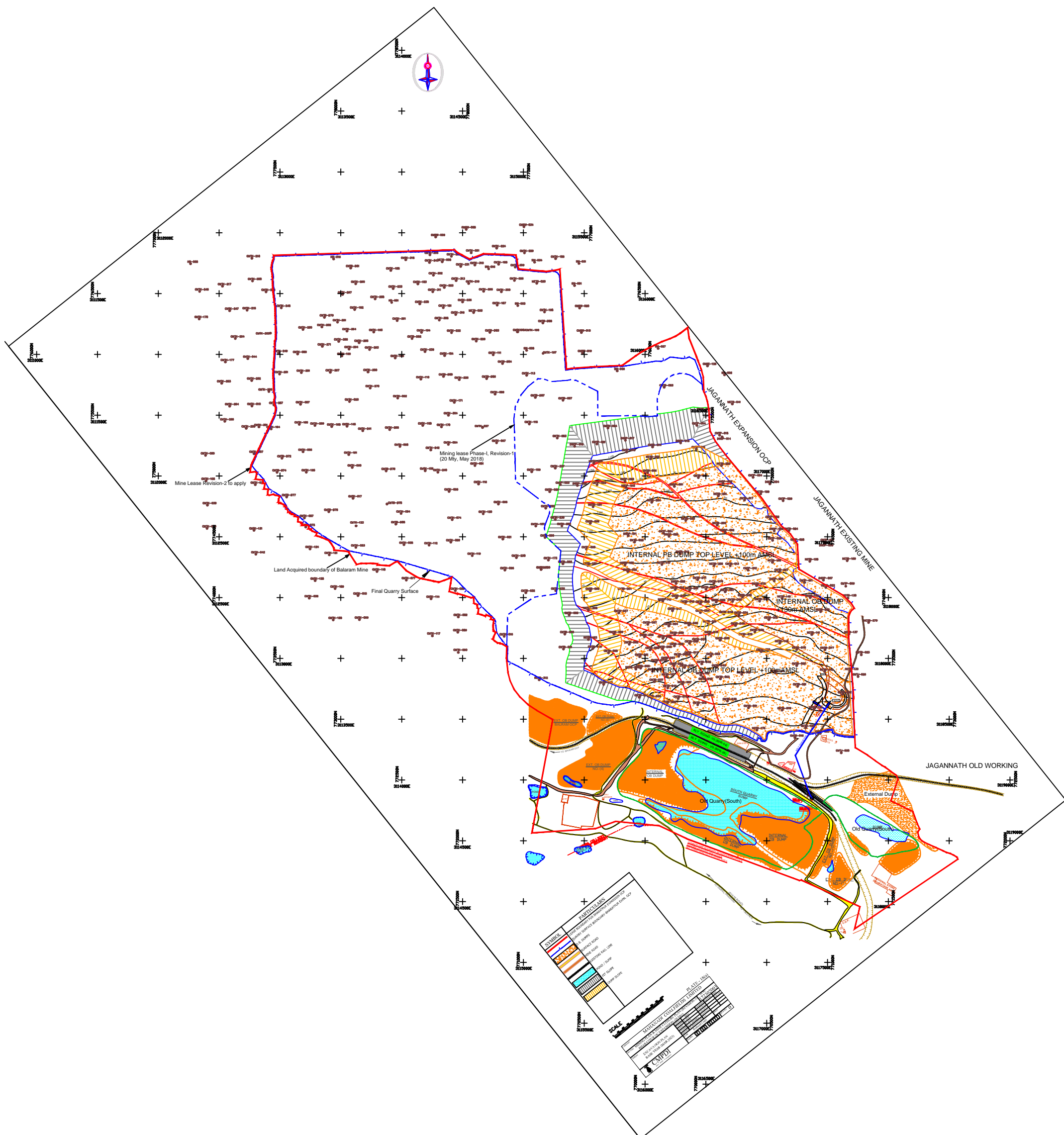


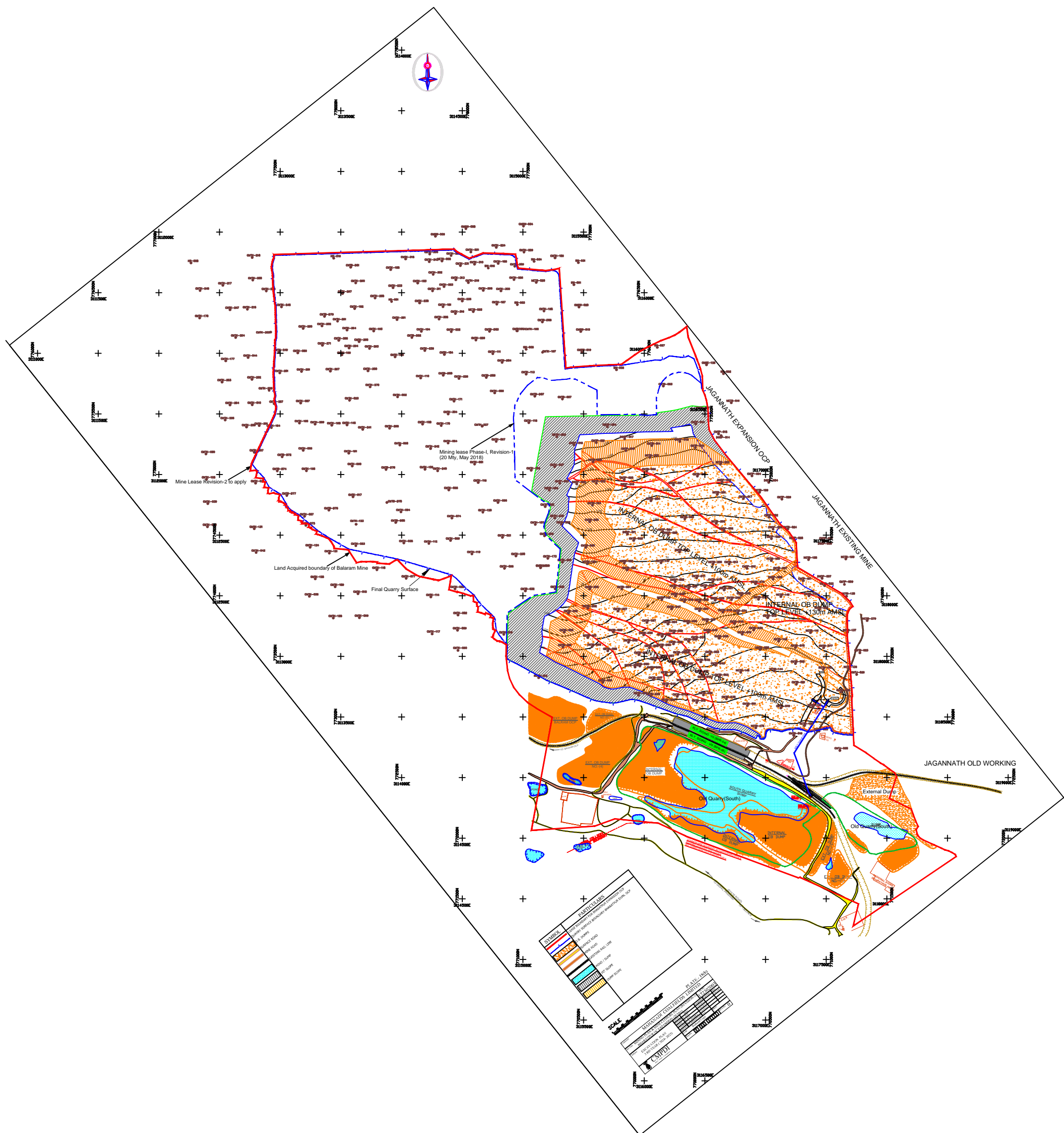


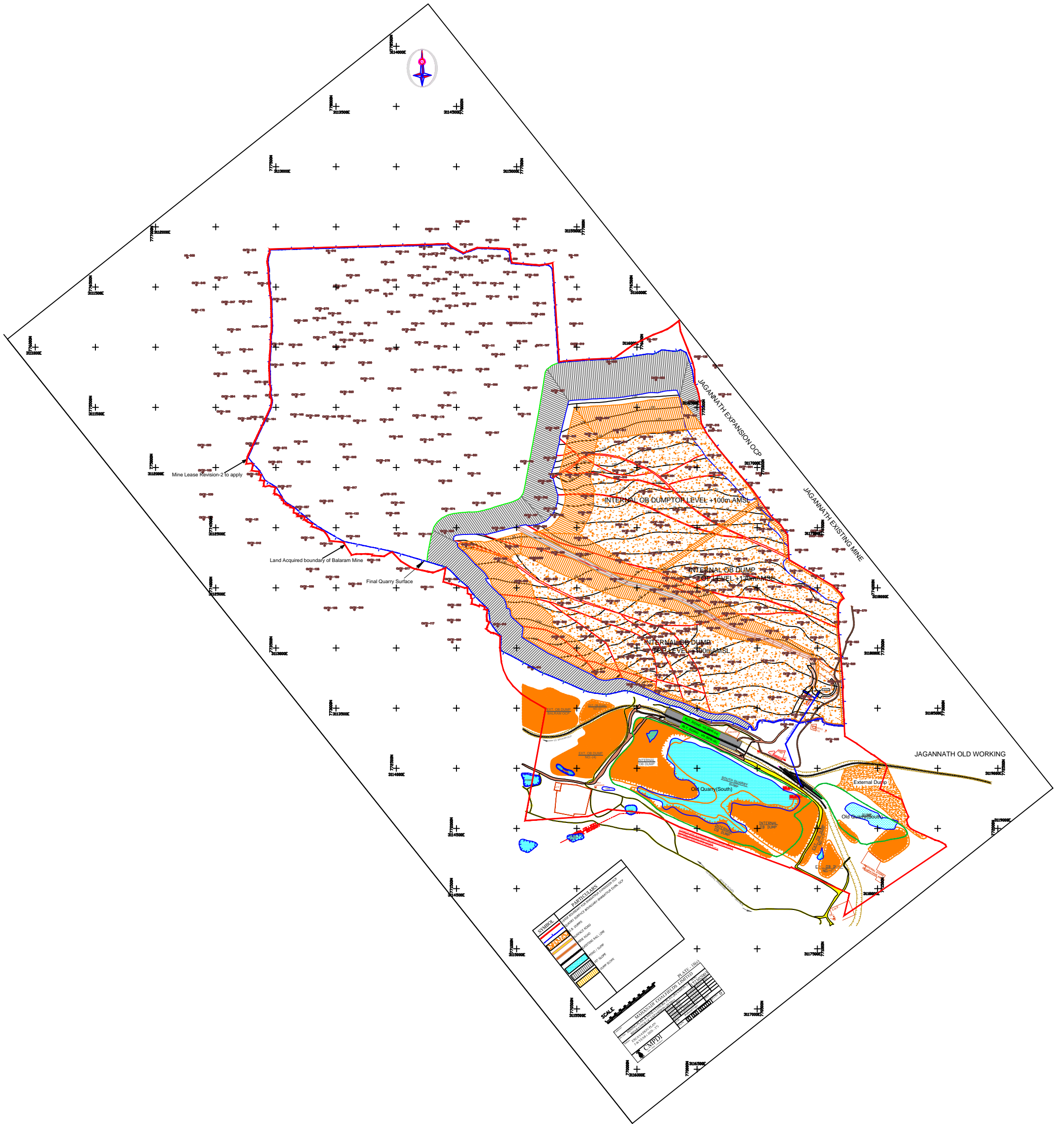


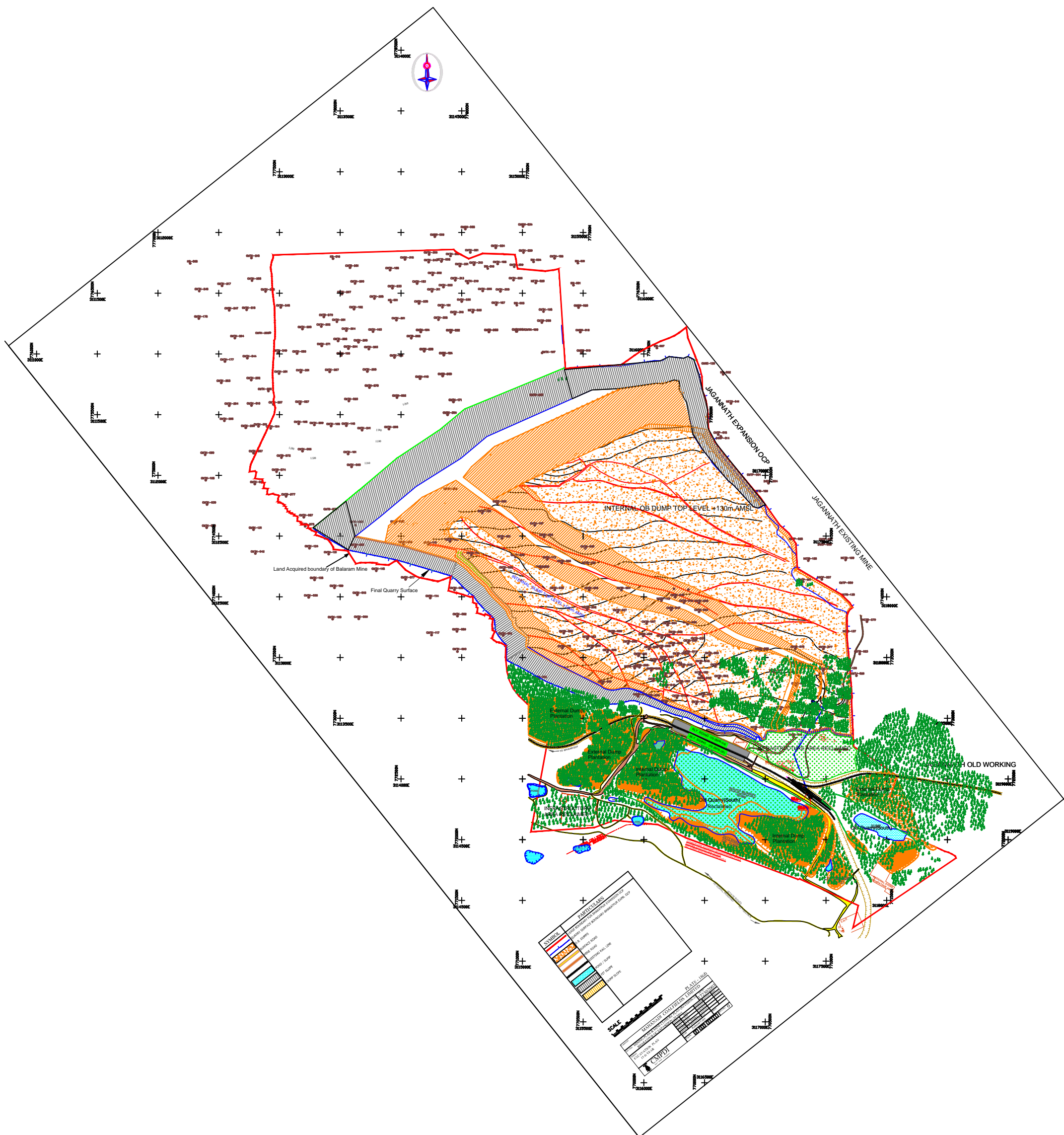


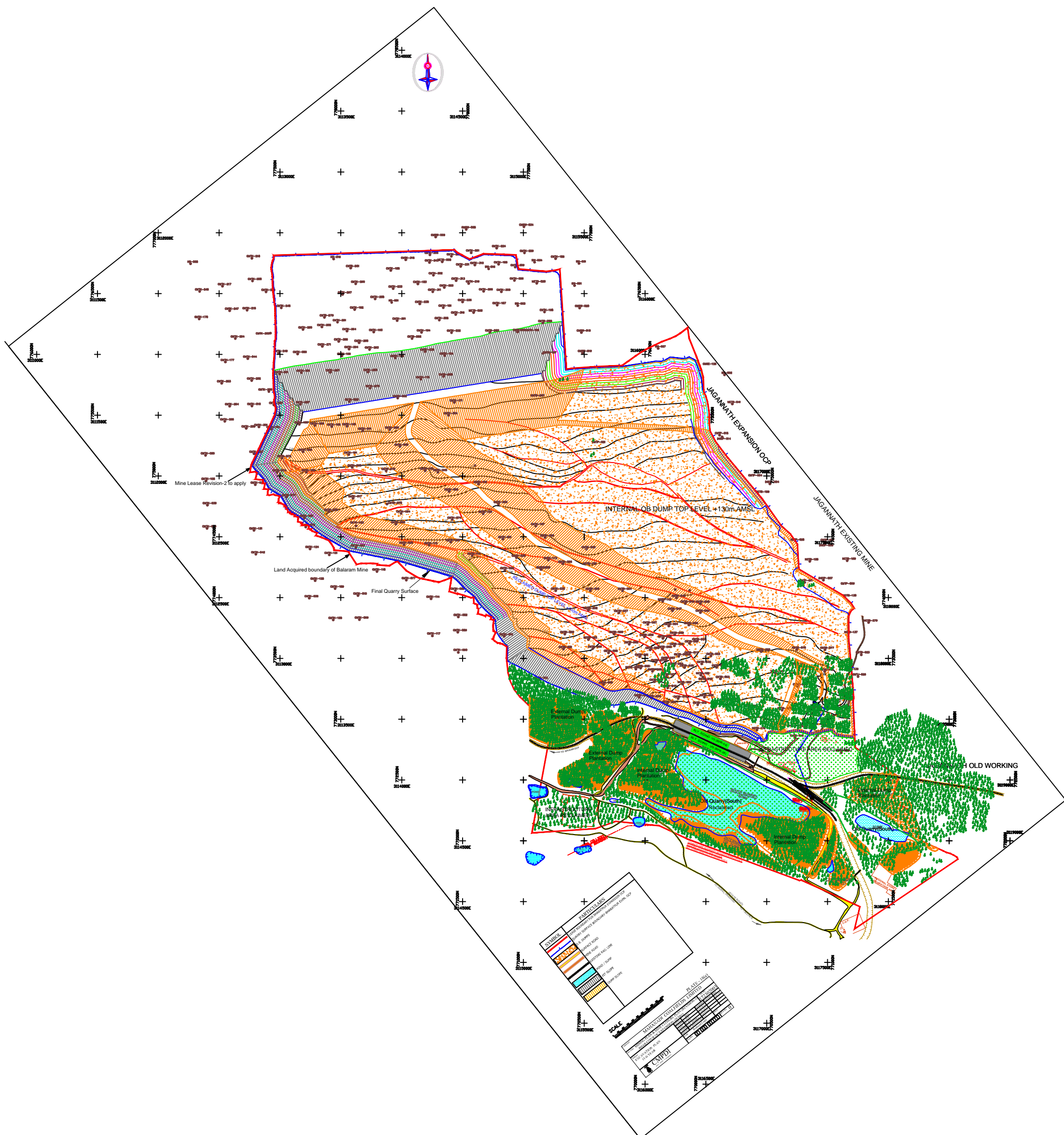


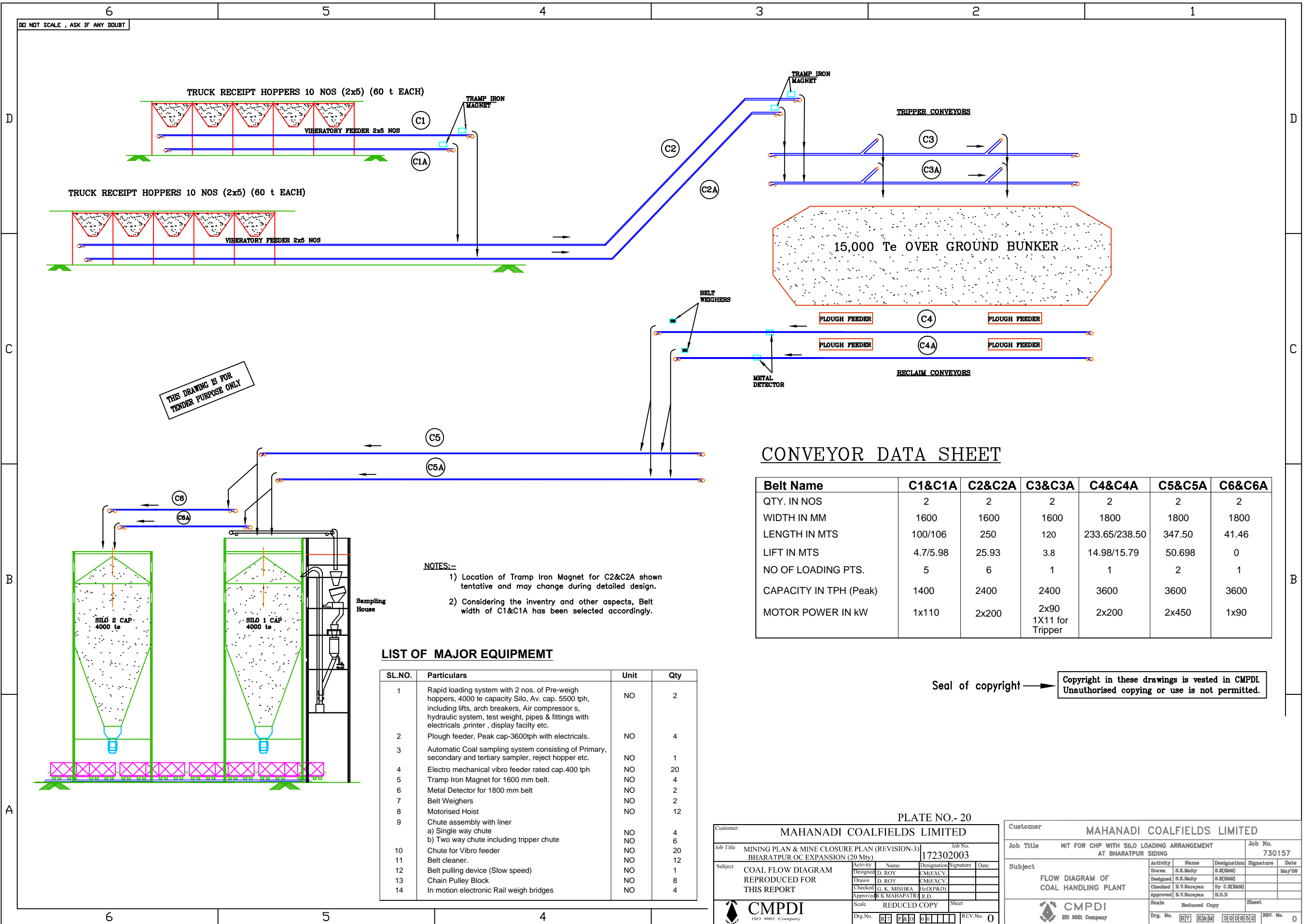






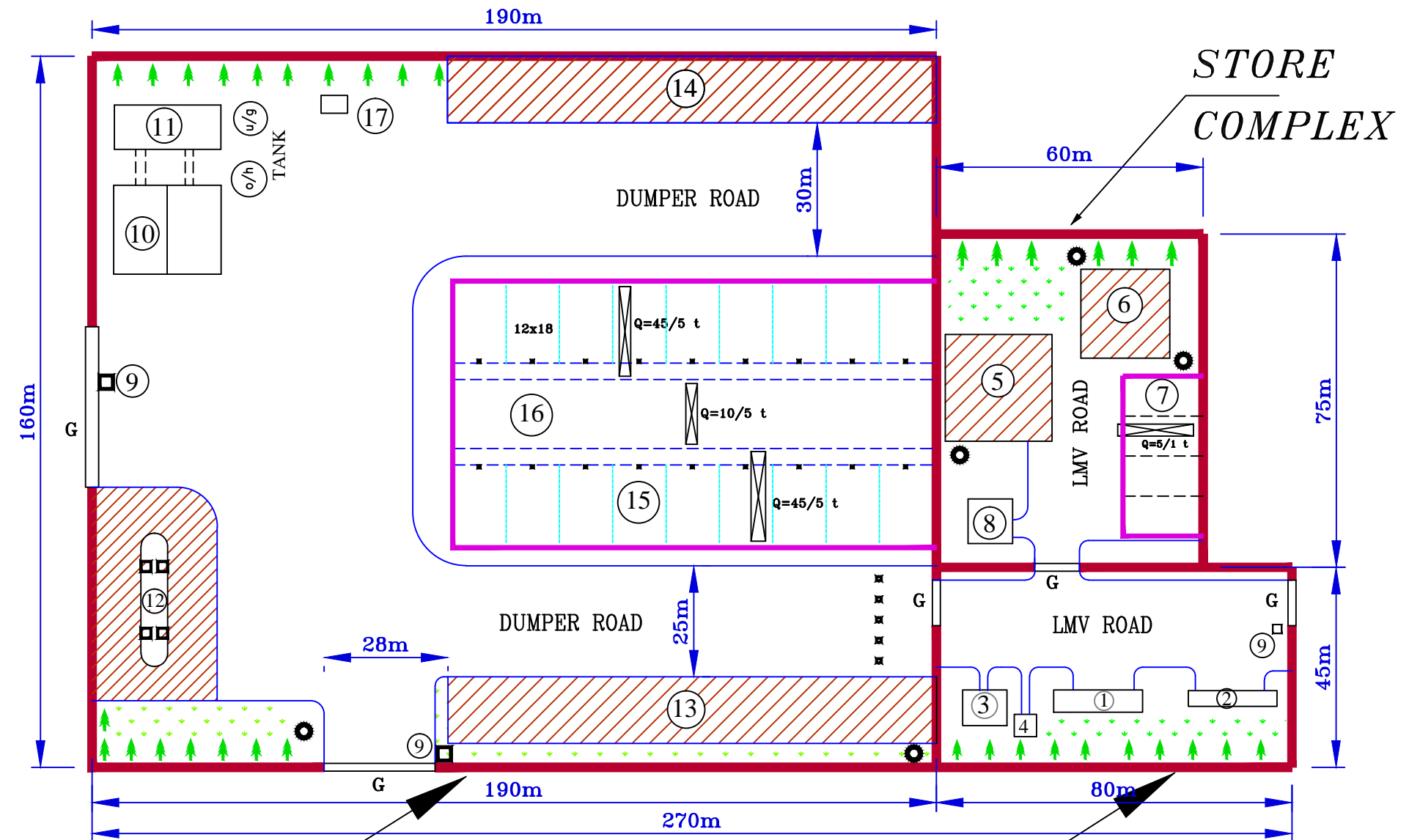






LEGEND

Sl. No.	DESCRIPTION	AREA (m x m)
I. COMMON FACILITIES		
1	Car Parking	20 x 5
2	Scooter/Cycle Stand	20 x 3.5
3	Canteen cum Rest Room	10X 8
4	Toilet	5 x 5
II STORE COMPLEX		
5	Store Yard	24 x 24
6	Scrap Yard	20 x 20
7	Store covered Shed	18 x 36
III EXCAVATION WORKSHOP		
8	Office	10 x 10
9	Security Post	3(2 x 2)
10	Dumper Washing Station	20 x 24
11	Settling Tank	--
12	Diesel Filling Station	4(3 x 3)
13	Dumper Parking Space	110 x 15
14	Dumper Parking Space	110 x 15
15	Dumper Repair Complex	(18x12)x18
16	Dumper Repair Complex (Extra)	108 x 23
17	Pump House	6 x 4



Sl. No.	SYMBOL	ABBREVIATION
1		PAVEMENT
2		WALKWAY
3		E.O.T CRANE
4		BAYS
5		GREEN LAND
6		GATE
7		BOUNDARY
8		MAIN SHOP
9		LIGHT TOWER
10		ROAD
11		STOPPER
12		TREE PLANTATION

NOTE:

1. ALL DIMENSIONS ARE IN METRE IF UNIT NOT MENTIONED.
2. SHOP OFFICES SHALL BE LOCATED ON MEZZ. FLOOR.
3. SUITABLE RAMPS SHOULD BE PROVIDED AT DUMPER & DOZER ENTRY.
4. STORE SHED IS PROVIDED WITH ISSUE COUNTER FOR WORKSHOP.
5. A TENTATIVE SPACE FOR SETTLING TANKS IS PROVIDED IN LAYOUT.
6. THIS DRAWING MAY REQUIRE SOME MODIFICATION AT THE TIME OF DETAIL DESIGN.

Customer MAHANADI COALFIELDS LIMITED					
Job Title MINING PLAN & MINE CLOSURE PLAN (REVISION-3) BHARATPUR OC EXPANSION (20 Mty)				Job No. 172302003	
Subject GENERAL LAYOUT DRAWING FOR EXCAVATION WORKSHOP WITH STORE COMPLEX	Activity	Name	Designation	Signature	Date
	Designed	S.K.MAITY	Sr.Mngr.(E&M)		Jan 2020
	Drawn	S.K.MAITY	Sr.Mngr.(E&M)		
	Checked	S.K.MAITY	Sr.Mngr.(E&M)		
	Approved	P.SAXENA	H.O.D		
Scale N.T.S				Sheet	
Drg. No. R7 E&M 300				REV. No.	