

Mining Plan - Bagru

REVIEW OF MINING PLAN

PREPARED UNDER RULE - 17(2) OF MINERAL (OTHER THAN ATOMIC AND HYDRO CARBONS ENERGY MINERALS) CONCESSION RULE, 2016

INCLUDING PROGRESSIVE MINE CLOSURE PLAN
(PREPARED UNDER RULE - 23 OF MCDR, 2017)

OF

BAGRU BAUXITE MINE

MINE CODE :- 07BHR33003

CATEGORY - 'A' MINES (FULLY MECHANISED)

AREA - 75.41 HECTARES

PLAN PERIOD - 2019-20 TO 2023-24

IN VILLAGE - BAGRU, P.S - KISKO

DISTRICT - LOHARDAGA, STATE - JHARKHAND



अनुमोदित

APPROVED



TYPE OF LAND USE	AREA IN HECTARES
FOREST LAND	19.56
AGRICULTURE LAND	53.94
WASTE LAND	1.91
TOTAL	75.41



LESSOR

HINDALCO INDUSTRIES LIMITED
P.O. & DISTRICT - LOHARDAGA - 835 302,
JHARKHAND.

IBM REGISTRATION NO. IBM/935/2011
E-mail ID - bjesh.jha@adityabirla.com

PREPARED BY

PRADIP KUMAR SEN
QUALIFIED PERSON
KALI MANDIR ROAD,

P.O.:- DORANDA, RANCHI.
Email:- pkxenranchi@gmail.com

पत्र संख्या द्वारा RAN/LOH/BX/MP-25/2018-19
Vide letter No. Date - 14.02.2019

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14/02/19
क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines

LESSEE

HINDALCO INDUSTRIES LIMITED
P.O. & DISTRICT - LOHARDAGA - 835 302,
JHARKHAND.
IBM REGISTRATION NO. IBM/935/2011
E-mail ID - bijesh.jha@adityabirla.com

PREPARED BY

PRADIP KUMAR SEN
QUALIFIED PERSON
KALI MANDIR ROAD,
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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES
OFFICE OF THE REGIONAL CONTROLLER OF MINES

E-MAIL/SPEED POST

Telephone: (0651) 2242889
(0651) 2242903
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E-mail: rcmin@ibm.gov.in

No. RAN/LOH/BX/MP-25/2018-19,

318-B, Road No.- 3,
Ashok Nagar,
Ranchi - 834 002.
Date: 14/02/2019

To: ✓ Shri A. K. Agarwala,
Nominated Owner,
M/s Hindalco Industries Ltd.,
At - Court Road, P.O. - Lohardaga,
Dist - Lohardaga (Jharkhand),
PIN - 835302.
E-mail: hindalco@adityabirla.com / bjesh.jha@adityabirla.com

Sub: Approval of Review of Mining Plan alongwith progressive mine closure plan in respect of BAGRU Bauxite mine over an area of 75.41 hectares located in Mouza - Bagru, P.S.- Kisko, District- Lohardaga, Jharkhand state submitted under Rule-17(2) of Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016.

Ref: Your letter ref nos.: (1) HIL/LHD/MP/IBM/229, Dated 26/05/2018,
(2) HIL/LHD/MP/IBM/347, Dated 16/01/2019 and
This office letter no. राँची/लोहार्दगा/बॉक्स/ईट/एमपी-25/2018-19, दिनांक: 02/01/2019.

Sir,

In exercise of the powers conferred by the Clause (b) of Sub-section (2) of Section 5 of Mines and Minerals (Development and Regulation) Act, 1957 read with Government of India Order no.: S.O.1857(E), dated 18/05/2016, I hereby approve the above said review of Mining Plan in respect of BAGRU Bauxite mine over an area of 75.41 hectares of M/s Hindalco Industries Ltd. submitted under Rule 17(2) of Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016. This approval is subject to the following conditions:

- (i) The mining plan is approved without prejudice to any other laws applicable to the mine/area from time to time whether made by the Central Government, State Government or any other authority and without prejudice to any order or direction from any court of competent jurisdiction.
- (ii) The proposals shown on the plates and/or given in the document is based on the lease map/sketch submitted by the applicant/lessee and is applicable from the date of approval.
- (iii) It is clarified that the approval of aforesaid mining plan does not, in any way, imply the approval of the Government in terms of any other provision of the Mines & Minerals (Development & Regulation) Act, 1957 or the Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 and any other laws including Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 or the rules made thereunder, Mines Act, 1952 and Rules & Regulations made thereunder.
- (iv) Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding correctness of boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant/lessee.

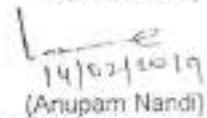
Contd. ... 2/-

No.: RAN/LOH/BX/MP-25/2018-19.

- (v) At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.
- (vi) The detailed exploration (G1 level) over the entire potentially mineralised area under the mining lease shall be carried out within a period of five years of lease execution as required under sub rule 4 of Rule 12 of MGDR, 2017.
- (vii) The approval of Mining Plan is subject to submission of copy of the lease area plan i.e., Cadastral Map (Khasra Plan) & DGPS surveyed map duly authenticated by the State Government, Jharkhand within 6 (six) months from the date of approval to this office.
- (viii) Next Financial Assurance shall be due for submission on or before 31/03/2024.
- (ix) An Environmental monitoring cell should be constituted to carry out regular monitoring of environmental parameters (Air, Water & Noise level) and quarterly report of Environmental monitoring should be submitted to the Regional Controller of Mines, Indian Bureau of Mines, Ranchi. Further, daily monitoring report should be displayed on display board near mine/mine office.
- (x) If the approval conflicts with any other law or court order/direction under any statute, it shall be revoked immediately.
- (xi) After re-opening of the mine, the Lessee should carry out Ground vibration study, Bulk density & Recovery factor, Powder factor etc. to be assessed by deploying a NABL approved laboratory as committed by the lessee by submitting undertakings in Annexure - 30. The report of the same should be invariably be submitted to this office within six month.

Encl: One Copy of approved
Mining Plan.

Yours faithfully


14/02/2019

(Anupam Nandi)
Regional Controller of Mines

Copy forwarded for information to :-

1. The Director (Mines), Directorate of Mines, Government of Jharkhand, 3rd Floor, Yojna Bhawan, Jharkhand Mantralaya, Doranda, Ranchi-834002 along with a copy of approved mining plan.
2. Shri P.K. Sen, Qualified Person, Kali Mandir Road, Doranda, Ranchi - 834002.
E-mail: pksearranchi@gmail.com

(Anupam Nandi)
Regional Controller of Mines



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P.K. Sen
Qualified person

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अनुमोदित
APPROVED


P.K. Sen
Qualified person

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P.K. Sen
Qualified person

**BAGRU BAUNITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

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P. K. Sen
Qualified person



INTRODUCTION

The Mining Plan of Bagru Bauxite Mines over an area of 75.41 hectare in Mouzir - Bagru Thana - Kisko, District - Lohardaga, State - Jharkhand is approved under rule 24A of MCR, 1960 by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2004 - MCCM (CZ)/MP-19 dated 03.05.2005 (Photocopy of approval letter is enclosed as Annexure -1) and the validity of the approved Mining Plan is up to 31.03.2009. The modification in approved mining plan is made under rule 10 of MCDR, 1988 for the change of the name of the lessee and it is approved by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2010 - MCCM (CZ)/MP-17 dated 09.11.2010 (Photocopy of approval letter is enclosed as Annexure - 1A).

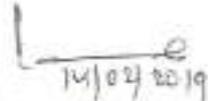
The scheme of mining was prepared under rule 12 of MCDR, 1988 for the plan period from 2009-10 to 2013-14 and duly approved by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2011 - MCCM (CZ)/MS-20 dated 21.12.2011 (Photocopy of approval letter is enclosed as Annexure -1B).

The next scheme of mining was prepared under rule 12 of MCDR, 1988 for the plan period from 2014-15 to 2018-19 and duly approved by the Regional Controller of Mines Indian Bureau of Mines, Ranchi vide letter No. RAN/LOH/BX/MP-05/2014-15 dated 16.04.2015 (Photocopy of approval letter is enclosed as Annexure -14).

The original lease was granted in the year 1944 for a period of 30 years and the lease is renewed by the State Government for a further period of 30 years and was valid up to 21.01.2004. The photocopy of the lease deed is enclosed as Annexure -2.

Originally the lease was granted for an area of 96.84 Ha. On 20.01.2003 the lessee has applied for 2nd renewal of the Bagru Lease for an area of 75.41 ha, after surrendering the Forest land of 21.43 Ha to the Department of Forest. The surrendered forest area was on non-mineralized zone. The Final Mine Closure Plan for the surrendered area of 21.43 Ha was duly prepared under rule 23C of MCDR, 1988 and approved by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2012 - MCCM (CZ)/FMCP-04 dated 23.05.2013 (Photocopy of approval letter is enclosed as Annexure -1C). The photocopy of the Renewal application is enclosed as Annexure -2A. The 75.41 Ha Lease area contains 19.56 ha of Forest land where the Ropeway infrastructure is installed.


P. K. SEN
QUALIFIED PERSON


14/02/2019
क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 in Bagru lease as per the provisions of Rule - 24A (6) of M.R.R 1960 notified vide GSR 510 (E) dated 18.07.2014.

The State Govt. of Jharkhand extended the mining lease period on 18.03.2017 for the extended period as per the MMDR Amendment Act 2015 up to 31.03.2030. Photocopy of the lease deed is enclosed as annexure -10.

Jharkhand Bauxite Mines Division of Hindalco Industries Ltd met Bauxite from captive Mines located in Jharkhand and Chhatisgarh for its alumina refineries located All Mines are well connected by road to its nearest Railway siding mainly Lohardaga, Tori and Richughuta.

Presently no PL is granted to the company. There are 16 mining lease hold areas within the State of Jharkhand and the details of the leasehold are appended below as per the format given.

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Presently no PL is granted to the company. There are 16 mining lease hold areas within the State of Jharkhand and the details of the leasehold are appended below as per the format given.

Sl. No.	Lease ref. No. & Date	Area in Ha.	Postal address/Location	Type of Minerals
1.	Pakhar Bauxite Mine	115.13	Vill. Pakhar, P.S. Kisko, Dist. Lohardaga	Bauxite
2.	Pakhar Bauxite Mine	35.12	Vill. Pakhar, P.S. Kisko, Dist. Lohardaga	Bauxite
3.	Pakhar Bauxite Mine	8.09	Vill. Pakhar, P.S. Kisko, Dist. Lohardaga	Bauxite
4.	Bagru Bauxite Mine	75.41	Vill. Bagru, P.S. Kisko, Dist. Lohardaga	Bauxite
5.	Bhusar Bauxite Mine	65.31	Vill. Bhusar & Kokrang, P.S. Kisko, Dist. Lohardaga	Bauxite
6.	Hisri(Old) Bauxite Mine	13.38	Vill. Hisri P.S. Kisko, Dist. Lohardaga	Bauxite
7.	Hisri(New) Bauxite Mine	14.55	Vill. Hisri P.S. Kisko, Dist. Lohardaga	Bauxite


QUALIFIED PERSON

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



8.	Sherengdag Bauxite Mine	155.81	Vill. Serengdag , P.S. Ghaghra, Dist.Gumla	Bauxite
9.	Jalim Sanai Bauxite Mine	38.45	Vill. Jalim & Sanai P.S. Bishunpur, Dist.Gumla	Bauxite
10.	Sherengdag Bauxite Mine	140.07	Vill. Serengdag , P.S. Ghaghra, Dist. Gumla	Bauxite
11.	Gurdari Bauxite Mine	584.19	Vill. Gurdari, P.S. Bishunpur, Dist. Gumla	Bauxite
12.	Antipani Bauxite Mine	190.95	Vill. Antipani , P.S. Bishunpur, Dist.Gumla	Bauxite
13.	Kujam-I Bauxite Mine	80.87	Vill. Kujam , P.S. Bishunpur, Dist.Gumla	Bauxite
14.	Kujam - II Bauxite Mine	157.38	Vill. Kujam, P.S. Bishunpur, Dist.Gumla	Bauxite
15.	Chiro Kukud Bauxite Mine	152.57	Vill.Chiro & Kukud, P.S. Mahuadand, Dist. Latehar	Bauxite
16.	Orsa Bauxite Mine	196.36	Vill.Orsa, P.S. Mahuadand, Dist.Latehar	Bauxite

**अनुमोदित
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The lease area does not fall within 10 km radius buffer zone of any National Forest , sanctuary & biodiversity. Lessee already obtained Environment clearance, NOC & CTO from the competent authority. Photocopies are enclosed as annexure - 13, 15 & 15A respectively.

Now Review of Mining Plan along with Progressive Mine Closure Plan is prepared & submitted under Rule 17 (2) of (Other than Atomic and Hydro Carbons Energy) Minerals Concession Rule, 2016 with the proposed plan period 2019-20 to 2023-24.


QUALIFIED PERSON



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CHAPTER - I
GENERAL

a) **Name of Applicant/Lessee:-**

M/s Hindalco Industries Limited

Address : Court Road
P.O. : Lohardaga
District : Lohardaga
State : Jharkhand
PIN : 835 302.
Phone No. : 06526-224015, 224016, 224446.
Fax No. : 06526-24112

Nominated Owner - Sri A.K. Agarwala, Director

b) **Status of Applicant/lessee:** Hindalco Industries Limited is a flagship company of Aditya Birla Group & is non ferrous power house. Hindalco Industries Limited is engaged in manufacturing of Aluminium & its semis. The sources of Bauxite is met from captive Mines located in Jharkhand and Chhatisgarh for its Muri & Renukoot plants.

c) **Mineral(s) which is / are included in the prospecting license (For Fresh grant):**
Not applicable

d) **Mineral(s) which is / are included in the letter of Intent / lease deed:** Bauxite

e) **Mineral(s) which is the applicant /lessee intends to mine:** Bauxite

f) **Name of Qualified Person preparing Mining Plan:-**

Name : Pradip Kumar Sen
Address : Kali Mandir Road, Doranda, Ranchi, Jharkhand - 834002
Phone : 0651 2481110
Email : pksenranchi@gmail.com
Mobile No. : 09431106275 / 08235816865

(Photocopy of experience certificate enclosed as Annexure -7)


P. K. SEN
QUALIFIED PERSON

CHAPTER - II
LOCATION AND ACCESSIBILITY



Lease Details (Existing Mine)

Name of mine: BAGRU BAUXITE MINE
VILL : BAGRU
P.S. : KSKO
DIST : LOHARDAGA
STATE : JHARKHAND.
PIN : 835302
PHONE : 06526295526
FAX : 06526224118
Mine code : 07BHR33003
Email - : bijesh.jha@adityabirla.com / hindalco@adityabirla.com
IBM Registration Number : IBM/935/2011.
Mobile Number : +91-9431708756 (Manager Mines),
+91- 9617779670 (Gm, Mine operation)

Lat/Long of any boundary point: BP-1 - Latitude : 23° 28' 54.519" N
Longitude: 84° 35' 41.579" E

Date of grant of lease: N.A.

Period/Expiry Date: The original lease was granted in the year 1944 for a period of 30 years and the lease is renewed by the State Government for a further period of 30 years and was valid up to 21.01.2004. The photocopy of the lease deed is enclosed as Annexure - 2

The State Govt. of Jharkhand extended the mining lease period on 18.03.2017 for the extended period as per the MMDR Amendment Act 2015 up to 31.03.2030. Photocopy of the lease deed is enclosed as annexure - 10.

Name of lease holder: M/s Hindalco Industries Limited

Address : Court Road
P.O. : Lohardaga
District : Lohardaga
State : Jharkhand
PIN : 835 302.
Phone No. : 06526-224015, 224016, 224446.
Fax No. : 06526-24112
Nominated Owner - Sri A.K.Agarwala, Director


QUALIFIED PERSON

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



b) Details of applied /lease area with location map (fresh area /mine)

Types of Land:

The types of land of the originally granted lease area

Forest		Non-forest	
Forest(specify)	Area(ha)	Types of land	Area(ha)
Forest land	40.99	Agriculture Land	42.51
		Waste Land	2.51
		Waterways	0.03
		Roads & Common land	1.70
		Rajyati Land	9.10
Total Granted lease area			96.84
Surrendered forest area			21.43
Retained lease area			75.41

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The Khasra map of the area is given in Plate 2, for Bagru lease. Supplementary lease deed gives plot-wise details for this lease area.

Mining operations were started in Bagru lease in late 1940's to feed bauxite to the first alumina plant in India located at Muri, set up by the company. In early 1960's, the mine was converted into a fully mechanized mine by introducing deep-hole blasting and shovel-dumper combination. A crushing and screening plant was also installed at the hill top.

Total lease area /applied area: 75.41 Hectares

in Mouza – Bagru, Thana - Kisko, District – Lohardaga, State – Jharkhand

Whether the area falls under Coastal Regulation Zone(CRZ)? if yes, details thereof :

Not Applicable

Existence of public road/railway line, if any nearby and approximate distance:

Location and Approach:

The lease is located on a Plateau known as "Bagru Pat" which has an elevation of 400-415 m above the level of the surrounding valley i.e, 1,000-1150m above MSL. The area is approachable form the district town of Lohardaga by a 16 km all-weather motorable road, 10 km of this road, up to the foothill of the plateau, is metalled while the remaining 6 km of hill section constitute an all-weather kutchu road, maintained by the Company.

Lohardaga town is located at a distance of 75 km from Ranchi, on State Highway No. 51.

Lohardaga is also a rail-head and the terminus for the Ranchi-Lohardaga narrow gauge line of


K. S. SEN
QUALIFIED PERSON



South Eastern Railway. Two passenger trains run daily between Lohardaga and Ranchi. Ranchi has an airport with daily air service connecting Kolkata, Patna, Delhi and Mumbai.

Power Supply:

Two 300 and 500 KVA substations located on the hill-top gets supply at 11 KV from the Lohardaga Substation of the Jharkhand State Electricity Board. Since power supply situation in Jharkhand is very poor and there are very frequent shutouts, The Company has installed at the hill top two diesel generators of its own, of 250 KVA and 250 KVA capacities.

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Water Supply:

As there are no perennial sources of water on the hill-top, the Company has constructed an earthen dam on the perennial local Charpi Nallah in the valley between the Hisri and the Bagru plateaus creating a capacity of 10 MI. Water from here is pumped by two pumps, of 60 m³/ph capacity each, to Hill top where arrangements for its treatment and distribution have been made.

Transportation of Ore from the Mine: The ore is transported from mine faces by 25-T dumpers to the Crushing Plant also located at the Hill Top. The crushed ore is transported by a 10-km long mono-cable ropeway from the Hill top to the Railway Siding at Lohardaga.

Toposheet No. : 73A/11 (Open series map no - F45A11)

Latitude and Longitude of all corners Boundary Pillars is attached as annexure - 24

e) Attach a general location map showing area and access routes. It is preferred that the area be marked on a Survey of India topographical map or a cadastral map or forest map as the case may be. However, if none of these are available, the area may be shown on an administrative map.

The Key Plan (Plate No. - 1) on Toposheet No. 73 A/11 (Scale 1:50000) is enclosed.


P. K. SEN
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CHAPTER - III
DETAILS OF APPROVED MINING PLAN /
SCHEME OF MINING (if any)

3.1 Date and reference of earlier approved MP/SOM

The Mining Plan of Bagru Bauxite Mines over an area of 75.41 hectare in Mouza - Bagru, Thana - Kisko, District - Lohardaga, State - Jharkhand is approved under rule 24A of MCR, 1960 by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2004 - MCCM (CZ)/MP-19 dated 03.05.2005 (Photocopy of approval letter is enclosed as Annexure -1) and the validity of the approved Mining Plan is up to 31.03.2009.

The scheme of mining was prepared under rule 12 of MCDR, 1988 for the plan period from 2009-10 to 2013-14 and duly approved by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2011 - MCCM (CZ)/MS-20 dated 21.12.2011 (Photocopy of approval letter is enclosed as Annexure -1B).

The next scheme of mining was prepared under rule 12 of MCDR, 1988 for the plan period from 2014-15 to 2018-19 and duly approved by the Regional Controller of Mines Indian Bureau of Mines, Ranchi vide letter No. RAN/LOH/BX/MP-05/2014-15 dated 16.04.2015 (Photocopy of approval letter is enclosed as Annexure -14).

3.2 Details of last modifications if any (for the previous approved period) of approved MP/SOM, indicating date of approval, reason for modification.

The modification in approved mining plan is made under rule 10 of MCDR, 1988 for the change of the name of the lessee and it is approved by the Controller of Mines (Central Zone), Indian Bureau of Mines, Nagpur vide letter No. 314(3)/2010 - MCCM (CZ)/MP-17 dated 09.11.2010 (Photocopy of approval letter is enclosed as Annexure - 1A).

Reason for modification:-

Modification made for changing in the name of the lessee, Indian Aluminium Company Limited is merged in Hindalco Industries Limited and due to merger of the Indian Aluminium Company Limited with Hindalco Industries Limited the renewal of mining lease is asked for over an area of 75.41 hectares in favour of Hindalco Industries Limited. The approval of change/transfer of name of the lessee (company) is already been approved by the Ministry of Mines, Government of India New Delhi. Further the Government of Jharkhand by its letter No. 1512/M dated 23.08.2010 has also granted the transfer of name in favour of M/s Hindalco industries Limited.

2.3 Give review of earlier approved proposal (if any) in respect of exploration, excavation, reclamation etc.

i) Exploration:

Proposed exploration as per approved scheme of mining	Actual exploration work done by the lessee during this scheme period	Remarks
It was stated that Exploration in the leasehold was done on a close grid of 45.7 m (150 ft) x 45.7 m grid. This placed the estimated reserves in the proved category. Future exploration by drilling boreholes in the virgin portion of the lease including the colony area will be taken up for establishment of additional reserve in proved category for future mining.	It has been noticed that during the last plan period the approved proposed exploration was not carried out.	The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 in Bagru lease as per the provisions of Rule - 24 A (6) of MCR 1960 notified vide GSR 510 (E) dated 18.07.2014. The lessee yet not start mining operation the same colony area will be explored during this plan period.

ii) Mine Development:

Development work proposed as per approved mining plan	Actual Development work done by the lessee during this plan period	Remarks
It was mentioned in the approved scheme of mining that the mining operation in Bagru Hill Bauxite Mines is fully mechanized. The quarry is developed using the benching pattern and there are separate benches for soil/Murum, laterite and bauxite. The bench height varies depending on the concerned strata. The maximum height is kept below 6 m, and where the thickness exceeds 6.0 m or blending if required additional bench is opened. In case of extraction of china clay bench height is kept restricted to 6m X 9 m. Height of benches will be maintained below 6 m and the bench width always kept 9m. The proposed generation of OB & waste is tabulated below:-	It has been found that during the plan period lessee could not start the mining operation due to statutory clearance from concerned authorities.	The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 & lessee could not start the mining operation due to statutory clearance from concerned authorities.



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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Year	Total generation of OB & waste
2014-15	Actual (Nil)
2015-16	57288
2016-17	98438
2017-18	154517
2018-19	77874
Total	388116



iii) Exploitation:-

Proposed quantity of ore as per approved scheme of mining	Actual quantity of ore achieved by the lessee during this scheme period	Remarks																					
<p>The production target for the period from 2014-15 to 2018-19 as proposed in the approved scheme of mining was about 320567 tonnes of Bauxite & 78796 tonnes of China clay.</p> <p>The details of proposed production is tabulated below:-</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Quantity of bauxite in tonnes</th> <th>Quantity of china clay in tonnes</th> </tr> </thead> <tbody> <tr> <td>2014-15</td> <td colspan="2">Actual (nil)</td> </tr> <tr> <td>2015-16</td> <td>80200</td> <td>19240</td> </tr> <tr> <td>2016-17</td> <td>80617</td> <td>19543</td> </tr> <tr> <td>2017-18</td> <td>80330</td> <td>19853</td> </tr> <tr> <td>2018-19</td> <td>79420</td> <td>20160</td> </tr> <tr> <td>Total</td> <td>320567</td> <td>78796</td> </tr> </tbody> </table>	Year	Quantity of bauxite in tonnes	Quantity of china clay in tonnes	2014-15	Actual (nil)		2015-16	80200	19240	2016-17	80617	19543	2017-18	80330	19853	2018-19	79420	20160	Total	320567	78796	<p>It has been found that during the plan period lessee could not start the mining operation due to statutory clearance from concerned authorities.</p>	<p>The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 & lessee could not start the mining operation due to statutory clearance from concerned authorities.</p>
Year	Quantity of bauxite in tonnes	Quantity of china clay in tonnes																					
2014-15	Actual (nil)																						
2015-16	80200	19240																					
2016-17	80617	19543																					
2017-18	80330	19853																					
2018-19	79420	20160																					
Total	320567	78796																					

iv) Afforestation:

Afforestation work proposed as per approved scheme of mining	Actual afforestation work done by the lessee	Remarks																					
<p>It was stated that plantation will be done of the backfilled area for rehabilitation of the worked out area. Details of afforestation is tabulated below:-</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Area (Ha)</th> <th>Number of Plants</th> </tr> </thead> <tbody> <tr> <td>2014-15</td> <td colspan="2">Actual (nil)</td> </tr> <tr> <td>2015-16</td> <td>1.15</td> <td>2875</td> </tr> <tr> <td>2016-17</td> <td>1.4</td> <td>3500</td> </tr> <tr> <td>2017-18</td> <td>3.06</td> <td>7650</td> </tr> <tr> <td>2018-19</td> <td>1.2</td> <td>3000</td> </tr> <tr> <td>Total</td> <td>6.81</td> <td>17025</td> </tr> </tbody> </table>	Year	Area (Ha)	Number of Plants	2014-15	Actual (nil)		2015-16	1.15	2875	2016-17	1.4	3500	2017-18	3.06	7650	2018-19	1.2	3000	Total	6.81	17025	<p>It has been found that during the plan period lessee could not achieve the proposed plantation as per the approved scheme of mining.</p>	<p>The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 & lessee could not start the mining operation due to statutory clearance from concerned authorities. Hence plantation over the backfilled / reclaimed area was not done by the lessee.</p>
Year	Area (Ha)	Number of Plants																					
2014-15	Actual (nil)																						
2015-16	1.15	2875																					
2016-17	1.4	3500																					
2017-18	3.06	7650																					
2018-19	1.2	3000																					
Total	6.81	17025																					


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v) Land Reclamation and Rehabilitation:																							
proposed as per approved scheme of mining	Actual work done by the lessee	Remarks																					
<p>It was stated that all overburden is backfilled in mined-out areas concurrently & plantation will done over these backfilled areas for rehabilitation of the area. Details of Reclamation and Rehabilitation are tabulated below:-</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Proposed Area to be reclaimed (ha)</th> <th>Number of Plants will be planted</th> </tr> </thead> <tbody> <tr> <td>2014-15</td> <td colspan="2">Actual (nil)</td> </tr> <tr> <td>2015-16</td> <td>1.15</td> <td>2875</td> </tr> <tr> <td>2016-17</td> <td>1.4</td> <td>3500</td> </tr> <tr> <td>2017-18</td> <td>3.06</td> <td>7650</td> </tr> <tr> <td>2018-19</td> <td>1.2</td> <td>3000</td> </tr> <tr> <td>Total</td> <td>6.81</td> <td>17025</td> </tr> </tbody> </table>	Year	Proposed Area to be reclaimed (ha)	Number of Plants will be planted	2014-15	Actual (nil)		2015-16	1.15	2875	2016-17	1.4	3500	2017-18	3.06	7650	2018-19	1.2	3000	Total	6.81	17025	<p>It has been found that during the plan period lessee could not achieve the proposed Land Reclamation and Rehabilitation as per the approved scheme of mining.</p>	<p>The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 & lessee could not start the mining operation due to statutory clearance from concerned authorities. Hence plantation over the backfilled / reclaimed area was not done by the lessee.</p>
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Total	6.81	17025																					



3.4 Give status of compliance of violations pointed out by IBM

Photocopies of violations were pointed out under MCDR 1988 & MCDR 2017 during last five years is attached as annexure -3

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3.5 Indicate and give details of any suspension /closure/ prohibitory order issued by any Government agency under any rule or Court of law

The mining operation was prohibited by the District Mining Office, Lohardaga vide letter No.430/M dated 09/09/2014 in Bagru lease as per the provisions of Rule - 24 A (6) of MCR 1960 notified vide GSR 510 (E) dated 18.07.2014.

3.6 In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 22(6) of the MCR'1960 for approval of modification, specify reason and justification for modification under these rules.

Not applicable.


P. S. Jaiswal
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PART - A
1.0 GEOLOGY AND EXPLORATION:

- 8) Briefly describe the topography, drainage pattern, vegetation, climate, rainfall of the area applied/mining lease area.

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Topography:

The bauxite deposits of Lohardaga occur on a Paleo paneplane. The Archean rock formations attained a mature topography with extensive paneplanation at a level of 1,000-1150 m above MSL. Later rejuvenation of erosion cycle resulted in the dissection of the paneplanes, as remnants of old paneplanes. The plateaus are mostly elongated in the N-S to NNW-SSE direction. Escarpment faces of the plateaus are scarred by numerous small nallahs. The seasonal flow of these small nallahs is collected by bigger nallahs and streams, which in turn discharge into rivers.

The Bagru, Bhusar, Hisri and Pakhar plateaus occupy the eastern part of the highland and look over an extensive plain which extends east wards from Lohardaga (elevation 655 mSL) for a distance of 56 km to Ranchi (elevation 609 mSL) i.e. a drop of only 46m over this long distance.

Drainage:

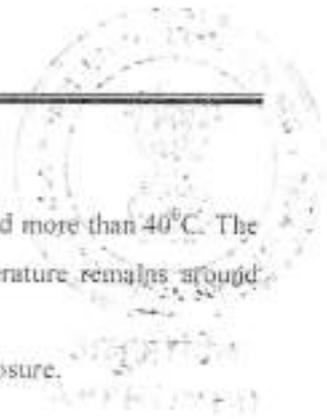
In a typical bauxite-bearing plateau located on hilltop, no water is to be found even at depth. During monsoons, rainwater drains down the escarpments, the natural slope of plateau acts as the drainage system.

Several SE-flowing nallahs and streams originate from the highland and flow to the South Koel River which controls the surface drainage in this region. The Serangdag Plateau lies in the Western part of the area from where nallahs and streams discharge into the North Koel River. Thus, bauxite-capped plateaus in this region have a distinctive topographical feature forming part of the "divide" between north-flowing North Koel River in the west, and south-flowing South Koel River in the east.

Vegetation:

The flat-topped plateaus are fairly well populated by small villages. This population cultivates these plateaus in part as rainfed cultivation. Escarpments of the plateau area are mostly covered by protected forests. Within the 500 hundred meters of leasehold forest exists and got thick vegetation of Sal trees. Thorny bushes are also available. Density of vegetation is 0.2 to 0.3.


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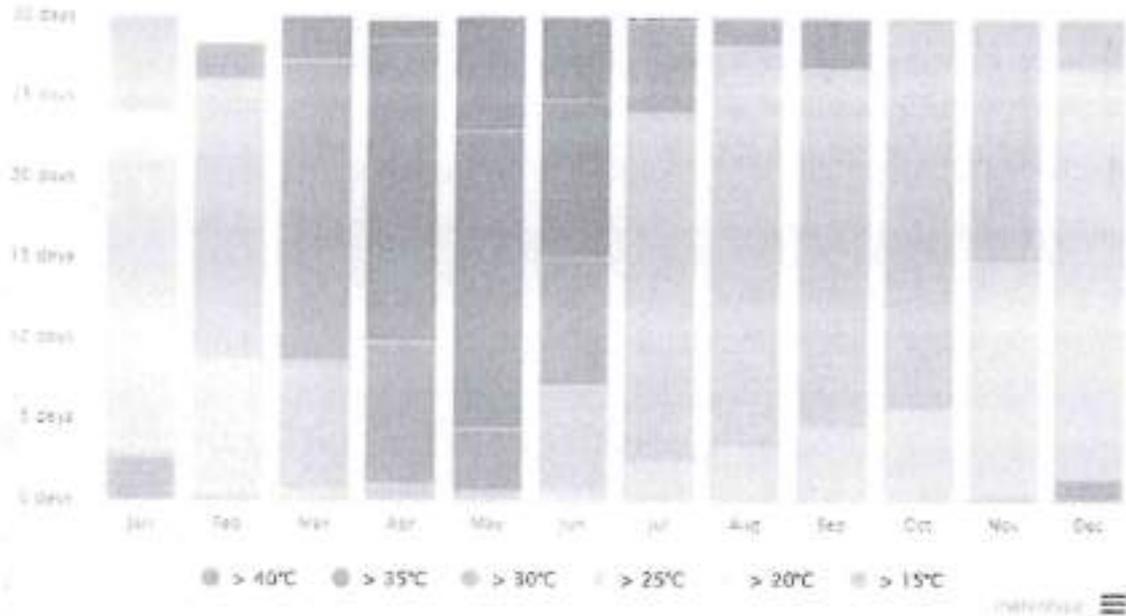


Climate:

The hottest months are May and June when temperature remains around more than 40°C. The coldest months are January and February when the maximum temperature remains around 15°C.

The area is devoid of large variability of temperature and free from exposure.

Maximum temperatures



Rain fall:-

Year wise rain fall data (in mm) of Lohardaga district of collected from Customized Rainfall Information System (CRIS), Hydromet Division, India Meteorological Department under Ministry Of Earth Sciences (<http://www.imd.gov.in>) for the is tabulated below:-

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2014	8.3	72.4	39.8	17.2	118.2	47.5	217.2	210.8	318.4	15.8	0	0	1065.6
2015	22.6	4.6	56.2	30.3	13.7	149.6	480.8	278.7	68.8	20.1	0	1.1	1126.5
2016	7.9	0.9	37.9	0	41.2	114.2	358.3	465	294.6	56.2	0	0	1376.2
2017	7.9	0	3.1	0	19.6	167.1	591	217.1	180.4	75.1	11	0	1272.3
Average													1210.15

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b) Brief descriptions of Regional Geology with reference to location of lease/applied area.

The bauxite bearing areas of Jharkhand belongs to the Indian Peninsula. It consists mainly of Chotanagpur Granite Gneiss associated with intrusions of quartzite, older rocks and Deccan traps. Ranchi plateau is the main topographic unit in the area with altitudes between 960 m And 1075 m above MSL, capped with laterite and bauxite. Bauxite deposits are the result of Silica leaching process of alumina rich rocks and it occurs in forms of an extensive blanket below the laterite cover on the flat topped. It also occurs as segregation, discontinuous boulders and in blanket form over laterite residuum. The thickness of the deposits in the ranges from 1 m -12 m with an average thickness of 6 meters. Under suitable condition of weathering, Chemical alteration and leaching through geological time, the parent rocks have giving rise laterite and bauxite residuum. The parent rocks which may give rise to bauxite are silicate rocks with high alumina and less of silica. Granite -Gneiss in association with intrusions of quartzite and older basic rocks is the main source rock in the area. The Gondwana formation is present in the northern part of the Ranchi upland. The Pre Cambrian rocks in Singhbhum lie in the south. At the western side of Jharkhand, Deccan trap is exposed where Laterite / Bauxite have been reported as cappings. At the eastern side, Laterite appears on the peneplained surface of older rocks. The oldest rock belongs to Dharwar. It is in turn intruded by the batholithic mass of Chotanagpur granite and further metamorphosed into various schistose and gneissic rocks. The generalized stratigraphy of the study area is illustrated below (Roy Chodhury ,1958)

Recent		Alluvium ,Conglomerate & Carbonaceous shale
Tertiary to Recent		Laterite, Bauxite and Lithomerge
Upper Cretaceous	Deccan Trap	Basaltic lavas
	Intratrappean	Calcified - Silicified rocks and grit
Cuddapah and Earlier	Chotanagpur Granite Gneiss	Newer Dolerite Vein rocks , Pegmatite or Graphic granite Aplite ,Quartzveins and quartz-tourmaline rock Pseudo-Diorite
Archean		Granites and Gneisses Diorite Ultrabasic igneous rocks
	Dharwar	Phyllites, Mica-schist, Quartzites, Lime-Silicate rocks and Basic rocks.



Archeans :-

The oldest geological formation of the region is represented by Older Metamorphites comprising of metasediments, Phyllites, mica-schists and quartzite are the predominant rock types of the area.

The hills are generally composed of Chotanagpur granite gneiss, which exhibits a wide variation from fine to coarse grained and to porphyritic types. Pegmatite and quartz veins are extensively present in the granite gneiss. Kaolinite has been observed as an alteration product of the gneiss at a few places.

Deccan traps:

Basaltic lava flow has been observed in the Western part of the area near the Netarhat Plateau. However, Deccan trap exposure in the region is not conspicuous.

Recent to Sub-Recent:

Laterite, bauxite and lithomarge occur in the plateau top of the area as capping of Chotanagpur granite gneiss in the form of 'high level laterites'. These are a product of residual weathering of the country rocks, and occur as blankets forming flat-topped plateaus locally known as 'pat'. Bauxite developed as levels and bands in the laterite profile while lithomarge formed its base.

- c) Detailed description of geology of the lease area such as shape and size of the mineral/ore deposit, disposition various litho-units indicating structural features if any etc. (Applicable for Mining Plan for grant & renewal and not for Scheme of Mining/Modifications in the approved mining plan/scheme of Mining).

Local Geology:

The Bagru leasehold occurs on the Bagru Hill plateau, with a NW-SE elongation, has a maximum length of 2,900 m and a maximum width of 1,200 m. The general elevation of the major part of the leasehold varies from 1,040 m to 1,057 m above MSL. The area of highest elevation lies in the Central part of the area in the Bhusar leasehold. The Geodetic Triangulation Station, GTS, (RL 1057.04), is also located in this area.

The laterite profile of the plateau is underlain by Chotanagpur granite gneiss. The major part of the plateau is covered by a soil-murum mantle of variable thickness. The laterite is exposed in the downslope of the plateau, particularly in the escarpment faces. Bauxite exposures in the Bagru leasehold have mostly been mined out.


ALFRED PEARSON

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Visual lithologs of boreholes drilled in the leasehold as also examination of the quarry faces reveal that the laterite profile in the leasehold is of variable thickness and is underlain by lithomargic clay. However, in the Bagru lease, occurrence of china clay has been encountered. Bauxite occurs in irregular thickness and shape in the laterite profile, overlain by laterite and underlain by clay. The maximum thickness of different units of the profile as ~~shown~~ by drilling and observed in mine faces, is tabulated below:

Soil & Murrum	-	10-15 m.
Laterite	-	4-5m.
Bauxite	-	8-10 m.
Lithomargic Clay	-	2-4 m.
China Clay	-	8-9 m.



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Litho units are covered by a mantle of soil and murrum on the plateau, the surface lay of laterite and bauxite projected below a maximum of 0.91 m (3.0 ft) soil mantle is shown in the geological plan.

The geomorphological dispositions of the bauxite deposits of Bagru-Bhusar leaseholds indicate the genetic relation of bauxite with the Chotanagpur granite gneiss which directly underlies the laterite profile of the plateau. However, high titania (TiO_2 7% to 11%) content of the bauxite strongly suggest the source as basalt, though no remnant Deccan trap has been observed in the area.

The bauxite of the area is light pinkish to buff in colour, and massive, with subordinate botryoidal texture. Gibbsite over the boehmite in the mineralogical composition of the bauxite in the area.

Chemically, the bauxite is high-alumina ($Al_2O_3 >52\%$) and high-titania ($TiO_2 >9\%$). The SiO_2 content is 7% in the residual part of the Bagru lease. Reactive silica as constituent of kaolinite is predominantly present in bauxite, while free silica is of minor proportion. Fe_2O_3 is mostly present in the form of goethite & hematite. Other minerals present are rutile and minor amounts of kaolinite, quartz and muscovite.

Data on detailed chemical analysis of 'Ore Zone' bauxite is given in Annexure for the Bagru leasehold area.

Occurrences of china clay pockets have been encountered in the central part of the Bagru leasehold.


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4) (i) Name of prospecting /exploration agency --

M/s Hindalco Industries Limited

Address : Court Road
P.O. : Lohardaga
District : Lohardaga
State : Jharkhand
PIN : 835 302.
Phone No. : 06526-224015, 224016, 224446.
Fax No. : 06526-24112.

4) Details of prospecting/exploration already carried out :

Exploration in Bagru lease: The first realistic assessment of the grade and tonnage of the primary ore available at Bagru lease as on 1st July 1958 was done by Dr. E.W.Graig. Accordingly, a report was prepared and released on 5 November 1959. The assessment was based on the data collected by Mr. G. V. Bhatt during the forties by drilling holes on a grid interval of 600 ft. Later on, Indal carried out 300 ft. grid fill-in drilling during the early sixties and further assessment was done by Indal. Based on the same, mining was being carried out at Bagru lease till early seventies when it was found proper to make a review of whole situation. It was observed that if more data are collected by closer drilling at 150 ft. grid intervals, better would be the control on quality of bauxite mined. (Maximum depth, Minimum depth & average depth not available)

After a careful study of all the relevant data, it was decided to make a reassessment of the bauxite deposit and detailed programme was chalked out in April 1973 for carrying out exploratory drilling of the entire deposit at 150 ft. grid interval.

Accordingly, additional prospecting by drilling was carried out during the field season 1973-74. From time to time and as soon as the relevant analyses were completed the analytical data of each sample of all the fill holes and also the composite analyses of each drill hole were dispatched to the Mines for their study and use. In this report the revised estimate of ore-reserve and statements of each hole incorporating all the relevant data which were forwarded separately earlier had been included.

In Bagru lease, 154 Bore-holes were drilled totaling 2798 m (9, 180 ft) of drilling. Maximum depth is 20.7 m & lowest depth is 14.50m. The average depth of bore-holes was thus 18.17 m. During this five years period 5 bore holes coring type is drilled during the year 2013-14. Total 89.50 m drilling is done. Maximum depth is 20.70m & lowest depth is 14.50m. The average depth is 17.90m. (Photocopy of borehole logs are enclosed as Annexure -8)


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Analysis of exploratory data:

In the absence of any bauxite exposure in the area, borehole data were relied upon for extrapolating and projecting bauxite lenses in the influence zones of boreholes, and for ascertaining their quality.

The non mineralised area established by boreholes data have been shown on the geological Plan, Plate 4. As may be seen, bauxitisation is quite extensive in the Bagru leasehold. However, the presence of non mineralised area and the disposition & variation of thickness of the ore-body indicate irregular nature of the bauxite body.

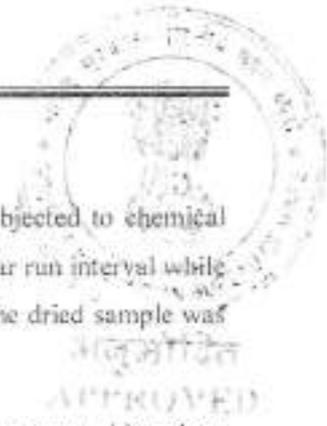
Excavation work in the opencast mine has made it possible to examine the exposed sections where the bauxite body is characterized by irregular shape and size. The roof of the ore is composed of murrum/ laterite while the floor is constituted of lithomarge clay. A few laterite / clay pockets occur in the ore body itself. Swelling and pinching of the ore-body are also common. The exposed sections of the quarry broadly confirm the finding of exploration.

An analysis of the exploration data has established reserve of high silica, high alumina bauxite in the residual part of the Bagru lease. The excavation carried out so far in the Bagru mines confirm the quality-assessment and reserves- estimation that had been arrived at on the basis of borehole data.

A comparative analysis of the data emanating from the mined-out area, with details of structure, reserves and quality of ore as postulated for the same area on the basis of earlier exploration, establishes the high degree of accuracy of exploration.

- Length width of the Existing quarries:** - Mining operation is carried out since 1944, mostly exhausted quarry is reclaimed and rehabilitated. However the length and width of the existing quarry is given below:-

Quarry no	Length width
Old quarry no 1	290mX110m
Old quarry no 2	700mX140m
China clay Pit 1	70mX84m
China clay Pit 2	145mX66m
Old quarry no 3	300mX190m
Old quarry no 4	300mX150m
Working quarry 2	150mX50m
Old quarry no 5	500mX250m
Working quarry 1	190mX156m



Sampling:

The core and sludge recovered from the prospecting bore holes were subjected to chemical analysis. Core samples from drill holes were taken at 0.77 m (2.5 ft) regular run interval while green samples were also drawn from the sampling pump and sun dried. The dried sample was crushed and screened on 10 mesh sieve.

The powder was thoroughly mixed by rolling it (for a fixed number of times) on rubber sheet where after the bulk was reduced by passing through a riffler, by coning and quartering method. Of the sample so obtained, 80-100 gm was sent to the Laboratory at Muri for analysis and 250-300 gm preserved as reserve sample for future reference.

Analysis:

Samples for details analysis were selected on the basis of L.O.I. (Loss on ignition) determined as first run; samples analyzing more than 20% L.O.I. being subjected to further chemical analysis for SiO₂ %, TiO₂% and Fe₂O₃%, the percentage of Al₂O₃ being determined by differences.

Samples having lower L.O.I. than 20% were also analysed in a few selected cases as a precautionary measure.

When the analysis results of all the samples in the bore holes became available, the thickness of 'ore zone' in that boreholes demarcated by grouping continuous runs of bauxite having generally less than 10% SiO₂. the quality of the Ore zone has been arrived at by the weighted average of the quality of all the bauxite bands in that ore zone.

Analysis report is attached as annexure – 23 & 23A

Bauxite		China clay	
Parameters	Result	Parameters	Result
LOI	21.28 %	LOI	22.16%
SiO ₂	4.15 %	SiO ₂	9.87%
Al ₂ O ₃	43.78 %	Al ₂ O ₃	45.19%
Fe ₂ O ₃	20.98 %	Fe ₂ O ₃	13.67%


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BAGRU BAUXITE MINE (76.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED



f) The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1:2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 32(1)(a) of MCDR 2017.

The surface plan is prepared on a Scale of 1:2000 with 1.5 m contour interval is enclosed as Plate No. 3.

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g) For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various lithounits along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 32(1)(b) of MCDR 2017.

The Geological plan is prepared on a Scale of 1:2000 with 1.5 m contour intervals enclosed as Plate No. 4.

h) Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary.

18 Nos. of Geological Sections have been prepared at suitable interval, depending on spatial location of the boreholes, on a scale of 1:2000 and is enclosed as Plate No 5.

i) Broadly indicate the future programme of exploration with due justification(duly marking on Geological plan year wise location in different colours) taking into consideration the future tentative excavation programme planned in next five years as in table below: -

Meanwhile the lessee has proposed to drill further 10 vertical coring boreholes drill holes remaining un explored colony / infrastructure area, at 50m intervals, to get the precise information about the deposit in remaining virgin areas as per Rule 12(4) of MCDR 2017 during the year 2020-21.

The allocation of boreholes is shown in the Geological Plan (Plate No. 4) and the average depth of these boreholes would be up to the mineralization or 25m. The allocation of the boreholes is given in the following table:-

Year	No. of boreholes	(Core/RC/DTH)	Grid interval	Explored area	meterage
2020-21	10	coring	50m X 50m	5.76 ha	250


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PBH No	Easting	Northing	PBH No	Easting	Northing
BH-1	254341.874	2599488.55	BH-6	254467.911	2599296.884
BH-2	254341.873	2599438.549	BH-7	254545.286	2599284.851
BH-3	254412.461	2599434.375	BH-8	254544.958	2599209.934
BH-4	254408.042	2599363.787	BH-9	254611.699	2599210.089
BH-5	254483.772	2599363.964	BH-10	254355.271	2599159.962

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Reserves and Resources as per UNFC with respect to the threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/resources estimation may also be marked on geological cross sections). Submit a feasibility/pre-feasibility study report along with financial analysis for economic viability of the deposit as specified under the UNFC field guidelines may be incorporated.

The boreholes were drilled on a close grid of 45.7 m (150 ft) × 45.7 m. Therefore the category of resources was calculated based on the existence of bauxite & Al-laterite in the boreholes for the measured mineral resources & proved reserve with the recovery percentages 90% Cut-off grade was considered Al₂O₃ = +30% & SiO₂ = -5%. China Clay resources have been calculated on the basis of bore-hole data. The thickness of 'ore zone' determined on the basis of chemical analysis for core samples was utilized for resource estimation.

Category wise Reserves estimated for the bauxite, Al-laterite & china clay (In-situ) in the earlier approved Scheme of Mining as on 01.04.2015

Details of ore	Measured mineral resources in Tonnes (331)	Blocked / remaining resources in Tonnes (UPL/LB) (211)	Mineable reserve / proved reserve in Tonnes (111)
	A+B+C	B	C
Bauxite	674441	240930	433511
Al-laterite (Subgrade)	213468	202388	11080
China clay	1267018	178995	1088023

Depletion in Mineable Reserve:

Details of ore	Total mineable Reserve in tonnes as per approved scheme of mining as on 01.04.2015	Less Depletion during the approved scheme of mining up to 30.09.2018 in tonnes.	Balance Proved Mineable Reserve as on 01.10.2018 in tonnes
Bauxite	433511	Nil	433511
Al-laterite (Subgrade)	11080	Nil	11080
China clay	1088023	Nil	1088023



Feasibility study based on the geographical conditions and operating conditions:

Infrastructure: Road and railways and is very close to the working site. Manpower is cheaply available.

Geology: Geologically the area is potential and the deposit with grade as per requirements of the consuming party.

Legal matters: Leasehold area is valid as per the rule of M.C.R. 2016. There will be no displacement. Land will be acquired as per the rule. Environment clearance is also obtained.

Operating: The Company has all the mining equipments used for the scientific mining. The mine is eco-friendly.

Economic:-

Economically the ore is mineable as compared to overburden thickness. The grade of the ore is also suitable for the captive Alumina industry. The ore is also economically viable for its consuming party.

Thus the economic axis (E) is categorized as - 1.

Feasibility:-

Feasibility report is attached as annexure - 25

Thus the entire proved reserve as estimated is categorized as 111

BALANCE RESERVES AND RESOURCES AS ON 01.10.2018 FOR BAUXITE

Classification	Code	Quantity in Tonnes	Average Grade	Threshold value
A. Total Mineral Reserve				
Proved Mineral Reserve	111	433511	Al ₂ O ₃ : +40.00% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ :- 5.00%
Probable Mineral Reserve	121	-----	-----	-----
	122	-----	-----	-----
B. Total Remaining Resources				
Feasibility Mineral Resource	211	240930	Al ₂ O ₃ : +40.00% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ :- 5.00%
Pre-feasibility Mineral Resource	221	-----	-----	-----
	222	-----	-----	-----
Measured Mineral Resource	331	-----	-----	-----
Indicated Mineral Resource	332	-----	-----	-----
Inferred Mineral Resource	333	-----	-----	-----
Reconnaissance Mineral Resource	334	-----	-----	-----
Total Reserves + Resources		674441	Al ₂ O ₃ : +40.00% SiO ₂ :- 5.00%	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00%



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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

BALANCE RESERVES AND RESOURCES AS ON 01.10.2018 FOR AL. LATERITE

Classification	Code	Quantity in Tonnes	Average Grade	Threshold value
A. Total Mineral Reserve				
Proved Mineral Reserve	111	11080	Al ₂ O ₃ : 30 to 40% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ :-5.00%
Probable Mineral Reserve	121	-----	-----	-----
	122	-----	-----	-----
B. Total Remaining Resources				
Feasibility Mineral Resource	211	202388	Al ₂ O ₃ : 30 to 40% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ :-5.00%
Pre-feasibility Mineral Resource	221	-----	-----	-----
	222	-----	-----	-----
Measured Mineral Resource	331	-----	-----	-----
Indicated Mineral Resource	332	-----	-----	-----
Inferred Mineral Resource	333	-----	-----	-----
Reconnaissance Mineral Resource	334	-----	-----	-----
Total Reserves + Resources		213468	Al ₂ O ₃ : 30 to 40% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ :-5.00%



BALANCE RESERVES AND RESOURCES AS ON 01.10.2018 FOR CHINA CLAY

Classification	Code	Quantity in Tonnes	Average Grade
A. Total Mineral Reserve			
Proved Mineral Reserve	111	1088023	Al ₂ O ₃ > 37%
Probable Mineral Reserve	121	-----	-----
	122	-----	-----
B. Total Remaining Resources			
Feasibility Mineral Resource	211	178995	Al ₂ O ₃ > 37%
Pre-feasibility Mineral Resource	221	-----	-----
	222	-----	-----
Measured Mineral Resource	331	-----	-----
Indicated Mineral Resource	332	-----	-----
Inferred Mineral Resource	333	-----	-----
Reconnaissance Mineral Resource	334	-----	-----
Total Reserves + Resources		1267018	Al ₂ O ₃ > 37%

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BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED



Furnish detailed calculation of reserves/resources section wise (When the mine is fully mechanized and deposit is of complex nature with variation of size, shape of mineralized zones, grade due to intrusion within ore zone etc, an attempt may be made to estimate reserves/resources by slice plan method). In case of deposits where underground mining is proposed, reserve/resources may be estimated by level plan method, as applicable, for the proposed mining parameters.

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Category wise (Proved, Probable and Possible) Reserves estimated in the Mining Plan with grade

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Category wise Reserves estimated for the bauxite, Al-laterite & china clay (In-situ) in the earlier approved Scheme of Mining as on 01.04.2015

Details of ore	Measured mineral resources in Tonnes (331)	Blocked / remaining resources in Tonnes(UPL/LB) (211)	Mineable reserve / proved reserve in Tonnes (111)
	A=B+C	B	C
Bauxite	674441	240930	433511
Al-laterite (Subgrade)	213468	202388	11080
China clay	1267018	178995	1088023

Depletion in Mineable Reserve:

Details of ore	Total mineable Reserve in tonnes as per approved scheme of mining as on 01.04.2015	Less Depletion during the approved scheme of mining up to 30.09.2018 in tonnes.	Balance Proved Mineable Reserve as on 01.10.2018 in tonnes
Bauxite	433511	Nil	433511
Al-laterite (Subgrade)	11080	Nil	11080
China clay	1088023	Nil	1088023


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Additional reserves established category wise (with basis and parameters considered)

As per the approved scheme of mining dated 16.04.2015.

The reserve estimated above is based on the quality required by the alumina plant (Al_2O_3 - >45% SiO_2 - <5%) at that time and the cut off grade (Al_2O_3 - >45% SiO_2 - <5%) was on higher side and not based on the threshold value. It was observed that during the mining operation some high silica Bauxite is produced which are blended with the low silica bauxite and confirmed to the feed grade and send to the plant. During the last scheme of mining the high silica Bauxite was not considered in the estimation of reserve. But this high silica Bauxite are blended with low silica Bauxite and despatched. Now, the resources and reserves are estimated based on the current cut off grade for the remaining boreholes and 5 new boreholes given in the UNFC Classification is introduced to assess the resources as well as mineable reserve on the basis of feasibility study. Therefore, the resources and reserves are assessed afresh.

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A. Estimation of resources of bauxite and sub grade (Al-laterite):

The area is mostly covered by a soil-murum-laterite mantle, bauxite being exposed only in a part of Bagru area. As the bauxite deposits occur in bands and lenses in the laterite profile, it shows irregular dimensions.

Bauxite resources have been calculated on the basis of bore-hole data. The thickness of 'ore zone' determined on the basis of chemical analysis for core samples was utilized for resource estimation. This thickness was noted against the corresponding bore-hole. Thus adopting surface area method for resource estimation.

The area of bauxite mineralization was demarcated on the geological plan (Plate 4) by clubbing the areas of influence of consecutive positive boreholes, taking half-distance between two adjacent boreholes as the area of influence of each borehole. The area of influence of a negative hole has been marked as non mineralised area. All these details have been shown in the geological plan.

The resources have been estimated for 'ore zones' identified on the basis of the aforesaid parameters. The area of influence of each potential borehole was multiplied by the ore thickness in that borehole to get the ore volume.

To arrive at the in-situ measured resources of bauxite, the ore volume was multiplied by the tonnage factor of 2.01 for bauxite. (1 Cubic feet block weighs 0.0283MT hence one cubic meter block weighs =0.057MT, therefore Tonnage factor= 0.057/0.0283=2.01) As the resources have been calculated on the basis of systematic exploration data, the entire resources may be categorized as measured mineral resources category.

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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



The quality of bauxite resources was established on the basis of analytical detail of the ore zone in the influencing boreholes.

Details of resources and quality parameters of bauxite and of the volume of overburden in the areas of influence of all the potential boreholes in the Bagru lease are furnished in Annexure-9.

MEASURED MINERAL RESERVE CATEGORY FOR NEW BOREHOLES:

Category of Reserve	Code	Total Resource in non forest area in tonnes	Resources Blocked in UPL and non Mineable area (Vicinity of Dwellings etc.)	Total Reserve in leasehold area in tones (111)	Average Grade
Measured Mineral Resource	331	356699	240930	115769	Al ₂ O ₃ - +40% SiO ₂ - <5%

MEASURED MINERAL RESERVE CATEGORY FOR OLD BOREHOLES:

Category of Reserve	Code	Total Resource in non forest area in tonnes	Resources Blocked in UPL and non mineable area (Vicinity of Dwellings etc.)	Total Reserve in leasehold area in tones (111)	Average Grade
Measured Mineral Resource	331	317742	00	317742	Al ₂ O ₃ - +40% SiO ₂ - <5%

MEASURED SUB GRADE MINERAL (ALUMINOUS LATERITE) RESERVE CATEGORY:

Category of Reserve	Code	Total Resource in non forest area in tonnes	Resources Blocked in UPL and non mineable area (Vicinity of Village etc.)	Total Reserve in leasehold area in tonnes	Average Grade
Measured Mineral Resource	331	213468	202388	11080	Al ₂ O ₃ - 40%-30% SiO ₂ - <5%


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Mineable reserve:-

Mineable ore reserve for Bauxite & Sub-grade Ore has been calculated from the resources in the area considering the ore which is not mineable in view of blocked ore in benches, safety barrier and ultimate pit slope as calculated from the Geological plan & sections. The mineable reserve estimated under proved category is as submitted below.

Mineable Reserves in tonnes for Bauxite	UNFC CODE
433511	111

Mineable Reserves in tonnes for Sub-grade Ore	UNFC CODE
11080	111



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B. Estimation of resources of china clay:-

China Clay resources have been calculated on the basis of bore-hole data. The thickness of 'ore zone' determined on the basis of chemical analysis for core samples was utilized for resource estimation. This thickness was noted against the corresponding bore-hole.

The area of China Clay mineralization was demarcated on the geological plan (Plate 4) by clubbing the areas of influence of consecutive positive boreholes, taking half-distance between two adjacent boreholes as the area of influence of each borehole. Already-mined-out areas have been excluded from the calculation of reserves. The area of influence of a negative hole has been marked as non mineralised area. All these details have been shown in the geological plan.

The resources have been estimated for 'China Clay zones' identified on the basis of the aforesaid parameters. The area of influence of each potential borehole was multiplied by the China Clay thickness in that borehole to get the ore volume.

To arrive at the in situ measured resources of China Clay, the China Clay volume was multiplied by the tonnage factor of 2.1 for China Clay. As the resources have been calculated on the basis of systematic exploration data, the entire resources may be categorized as measured mineral resources category.

The quality of China Clay resources was established on the basis of analytical detail of the China Clay zone in the influencing boreholes.


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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



Details of resources and quality parameters of China Clay and of the volume of overburden in the areas of influence of all the potential boreholes in the Bagru lease are furnished in

Annexure-9

MEASURED MINERAL RESERVE CATEGORY FOR CHINA CLAY:

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Category of Reserve	Code	Total Resource in non forest area in tonnes	Resources Blocked in UPL and non mineable area (Forest & Safety Barrier etc.)	Total Reserve in leasehold area in tones (111)	Average Grade
Measured Mineral Resource	331	1267018	178995	1088023	Al ₂ O ₃ - >37%

Mineable reserve:

Mineable reserve for China Clay has been calculated from the resources in the area considering the ore which is not mineable in view of blocked ore in benches, safety barrier and ultimate pit slope as calculated from the Geological plan & sections. The mineable reserve estimated under proved category is as tabulated below.

Mineable Reserves in tonnes for China clay	UNFC CODE
1088023	111

C. Mineable reserve:

Mineable ore reserve for Bauxite & Sub-grade Ore has been calculated from the resources in the area considering the ore which is not mineable in view of blocked ore in benches, safety barrier and ultimate pit slope as calculated from the Geological plan & sections. The mineable reserve estimated under proved category is as tabulated below.

Mineable Reserves in tonnes for Bauxite	UNFC CODE
433511	111

Mineable Reserves in tonnes for Sub-grade Ore	UNFC CODE
11080	111


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Mineable Reserves in tonnes for China clay	UNFC CODE
1088023	111

Anticipated life of the mine on the Basis of Reserve of Bauxite:

The total proved balance mineable ore (ROM) including sub grade ore would be 444591 tonnes. Out of the total ROM 10% is considered as intercalated waste. Thus the recoverable reserve would be 400132 tonnes. This reserve will be exhausted in this five years plan period. The life of the mine is about 5 years based on the present balance reserve quantities of bauxite (bauxite + sub-grade). Future exploration by drilling boreholes in the virgin portion of the lease including the colony area will be taken up for establishment of additional reserve in proved category for future mining thus the life of the mine may also be enhanced.

Anticipated life of the mine on the Basis of Reserve of China Clay:

The total proved balanced mineable China clay would be 1088023 tonnes. Recovery of China Clay would be 100%. Considering the production of China Clay in this plan period would be 98927 tonnes. The balance reserve would be 989096 tonnes. Considering the targeted production 20160 tonnes per annum, the balance reserve will sustain for 49 years. Thus, the life of the mine would be about 5 years + 49 years i.e., 54 years.

Mineral Reserves/Resources: (Mineral resources may be estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

Details	Level of Exploration	Resources in tonnes	Average Grade
Bauxite	G1	674441	Al ₂ O ₃ - +40% SiO ₂ - <5%
Al- Laterite (Sub grade)	G1	213468	Al ₂ O ₃ - <40% >30% SiO ₂ - <5%
China clay	G1	1327352	Al ₂ O ₃ ->37%


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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



Area explored under G1-G4 as on 01.04.2014 & 01.04.2018 and balance area to be explored as on 01.04.2018 to be furnished

Level of Exploration	Area explored in ha as on 01.4.2014	Area explored in ha as on 01.4.2018	Area to be explored in ha	Total area explored in ha
G1 - Detailed Exploration	69.65	Nil	5.76	75.41
G2- General Exploration	Nil	Nil	Nil	Nil
G3 - Prospecting	Nil	Nil	Nil	Nil
G4- Reconnaissance	Nil	Nil	Nil	Nil

Feasibility study based on the geographical conditions and operating conditions:

Infrastructure: Road and railways and is very close to the working site. Manpower is cheaply available.

Geology: Geologically the area is potential and the deposit with grade as per requirement by the consuming party.

Legal matters: Leasehold area is valid as per the rule of M.C.R. 2016. There will be no displacement. Land will be acquired as per the rule. Environment clearance is also obtained.

Operating: The Company has all the mining equipments used for the scientific mining. The mine is eco-friendly.

Economic:-

Economically the ore is mineable as compared to overburden thickness. The grade of the ore is also suitable for the captive Alumina industry. The ore is also economically viable for its consuming party.

Thus the economic axis (E) is categorized as - 1.

Feasibility:-

Feasibility report is attached as annexure - 25

Thus the entire proved reserve as estimated is categorized as 111


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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

BALANCE RESERVES AND RESOURCES AS ON 01.10.2018 FOR BAUXITE

Classification	Code	Quantity in Tonnes	Average Grade	Threshold value
A. Total Mineral Reserve				
Proved Mineral Reserve	111	433511	Al ₂ O ₃ : +40.00% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ : -5.00%
Probable Mineral Reserve	121	-----	-----	-----
	122	-----	-----	-----
B. Total Remaining Resources				
Feasibility Mineral Resource	211	240930	Al ₂ O ₃ : +40.00% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ : -5.00%
Pre-feasibility Mineral Resource	221	-----	-----	-----
	222	-----	-----	-----
Measured Mineral Resource	331	-----	-----	-----
Indicated Mineral Resource	332	-----	-----	-----
Inferred Mineral Resource	333	-----	-----	-----
Reconnaissance Mineral Resource	334	-----	-----	-----
Total Reserves + Resources		674441	Al ₂ O ₃ : +40.00% SiO ₂ :- 5.00%	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00%



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BALANCE RESERVES AND RESOURCES AS ON 01.10.2018 FOR AL. LATERITE

Classification	Code	Quantity in Tonnes	Average Grade	Threshold value
A. Total Mineral Reserve				
Proved Mineral Reserve	111	11080	Al ₂ O ₃ : 30 to 40% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ : -5.00%
Probable Mineral Reserve	121	-----	-----	-----
	122	-----	-----	-----
B. Total Remaining Resources				
Feasibility Mineral Resource	211	202388	Al ₂ O ₃ : 30 to 40% SiO ₂ :- 5.00%	Al ₂ O ₃ : +30.00% SiO ₂ : -5.00%
Pre-feasibility Mineral Resource	221	-----	-----	-----
	222	-----	-----	-----
Measured Mineral Resource	331	-----	-----	-----
Indicated Mineral Resource	332	-----	-----	-----
Inferred Mineral Resource	333	-----	-----	-----
Reconnaissance Mineral Resource	334	-----	-----	-----
Total Reserves + Resources		213468	Al ₂ O ₃ : 30 to 40% SiO ₂ :- 5.00%	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00%

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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

BALANCE RESERVES AND RESOURCES AS ON 01.10.2018 FOR CHINA CLAY

Classification	Code	Quantity in Tonnes	Average Grade
A. Total Mineral Reserve			
Proved Mineral Reserve	111	1088023	Al ₂ O ₃ > 37%
Probable Mineral Reserve	121	-----	-----
	122	-----	-----
B. Total Remaining Resources			
Feasibility Mineral Resource	211	178995	Al ₂ O ₃ > 37%
Pre-feasibility Mineral Resource	221	-----	-----
	222	-----	-----
Measured Mineral Resource	331	-----	-----
Indicated Mineral Resource	332	-----	-----
Inferred Mineral Resource	333	-----	-----
Unassessable Mineral Resource	334	-----	-----
Total Reserves + Resources		1267018	Al₂O₃ > 37%



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2.0 MINING

2.1 OPEN CAST MINING:

Briefly describe the existing as well as proposed method for excavation with all design parameters indicating on plans /sections.

Past development and production:-

Mining operation was started in Bagru lease since 22.01.1944, to feed bauxite to the first alumina plant in India located at Muri, set up by Indian Aluminium Co Ltd. Currently the mine is running by means of fully mechanized system by introducing deep hole blasting and shovel loader combination. A crushing and screening plant was also installed at the hill top.

The production figure the last 5 year plan period is tabulated here under:

Year	Production of Bauxite (Tonnes)	Production of China clay (Tonnes)
2014-15	Nil	Nil
2015-16	Nil	Nil
2016-17	Nil	Nil
2017-18	Nil	Nil
2018-19	Nil	Nil
Total	Nil	Nil

Proposed method of Mining:

Since the deposit in this area is surficial in nature with continuous boulders interspersed with soil & laterite, it is proposed to carry out only opencast fully mechanized mining for this plan period.

Bench Design and parameters:

In the Bagru Hill Mine, The height of the bench is usually kept below 6.0 m, inconsonance with the DGMS permission granted in 2014, being lower than the boom height of the excavator used. The bench width is maintained at 6 m or larger. The slope angle of bench is below 60° when a bench approaches its terminal Position its height is reduced to below 6 m as required by DGMS. (Photocopy of permission letter from DGMS is attached as annexure – 19)

A total of 4 benches are generally worked simultaneously for bauxite mining, 2 or 3 for soil & Murrum and laterite and 1 or 2 for bauxite. At times when the thickness of bauxite exceeds 6


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BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED



in or blending requirements so require, two bauxite benches are worked. Generally only 1 overburden bench is worked at any given time, either in soil & Murrum or laterite.

In case of extraction of china clay bench height is kept restricted to 6m X 9 m. benches will be maintained below 6 m and the bench width always kept 9m.

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Method of Mining:

The mining operation in Bagru Hill Bauxite Mines is fully mechanized. The quarry is developed using the benching pattern. And there are separate benches for soil/Murrum, laterite and bauxite. The bench height varies depending on the concerned strata. The maximum height is kept below 6 m. And where the thickness exceeds 6.0 m or blending if required additional bench is opened.

The sequences of operations currently followed in the mine is

- (a) Drilling holes using DTH in harder strata,
- (b) Charging and blasting of holes, and
- (c) Loading of material using Hydraulic excavators and dumpers.

Dumpers transport the loaded material to the crushing and screening plant. The overburden consists of Soil, Murrum and laterite. The average thickness of OB is nearly 1.5 times to that of bauxite. Soil and Murrum is soft and is directly excavated using combination of hydraulic excavator and dumpers. The harder OB is drilled, blasted and then finally loaded onto dumpers by excavators to use in area.

The percentage recovery of mineable ore is difficult to assess but the losses are estimated to be of the order of 10% . Besides losses in drilling, blasting and loading, some ore is occasionally lost due to sudden changes in the dimensions of ore body. It is estimated that 90% of in-situ ore is recovered during Mining. Additional loss during screening, crushing and ropeway loading is minimal .Since the size specification permits all lower size of ore to be dispatched, there is no loss on account of size.


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Indicate year-wise tentative Excavation in Cubic Meters indicating development ROM, as per year as in table below.

Bauxite Tentative Excavation

The details of overburden removal, generation of Wastes, production targets for bauxite for the past period are as under:-

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Tentative Excavation for bauxite ore:-

Sl. No.	Plt. no.	Total tentative Excavation (Cum)	Soil & morrum (Cum)	OB/SB/B (Cum)	ROM (Cum)		Mineral reject	ROM / Waste Ratio
					Ore (Cum)	Mineral reject (Cum)		
	2	3	4	5	6	7	8	9
2018-19	1	98220	44730	8622	40381	00	4487	3.08:1
2019-20	1	140151	64648	30447	40550	00	4506	1.16:1
2020-21	1	194482	95991	54085	39965	00	4441	0.68:1
2021-22	1	120731	78585	0	37931	00	4215	9.00:1
2022-23	1	202286	104043	53562	40213	00	4468	0.69:1
Total		755870	387997	146716	199040	00	22117	1.18:1

Quarry waste/ intercalated waste (Intercalation between bauxite boulders) interspersed intercalated waste between bauxite boulders as in this area bauxite is boundary deposit.

Tentative Excavation for china clay ore:-

Sl. No.	Plt. no.	Total tentative Excavation (Cum)	Soil & morrum (Cum)	OB/SB/B (Cum)	ROM (Cum)		Mineral reject	ROM / Waste Ratio
					Ore (Cum)	Mineral reject (Cum)		
	2	3	4	5	6	7	8	9
2018-19	2	16952	00	7790	9162	00	00	1:0.85
2019-20	2	14860	00	5554	9306	00	00	1:0.60
2020-21	2	9454	00	0	9454	00	00	1:0.00
2021-22	2	15033	00	5433	9600	00	00	1:0.57
2022-23	2	13847	00	4261	9586	00	00	1:0.44
Total		70146	00	23038	47108	00	00	1:0.49


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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Production target of Bauxite & China clay

Year	Quantity of bauxite in tonnes	Quantity of Sub-grade (Al-laterite) in tonnes	Quantity of bauxite ore after blending in tonnes	Quantity of China clay in tonnes
2020-21	81166	00	81166	19240
2021-22	81506	00	81506	19543
2022-23	80330	00	80330	19853
2023-24	65667	10575	76242	20160
2024-25	80828	00	80828	20131
Total	389497	10575	400072	98927

II. Dump rehandling:- *

Year	Dump name	Surface area in m2	Height of dump in m	Volume in m3
2020-21	Soil dump	3158	3	9474
2021-22		2063	3	6189
2022-23		839	2	1678
Total				17341



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Year	Dump name	Year wise handling (cum)	Estimated recovery of saleable material (Cum)	Waste (cum)
2020-21	Soil dump	9474	Nil	Nil
2021-22	Soil dump	6189	Nil	Nil
2022-23	Soil dump	1678	Nil	Nil
Total		17341	Nil	Nil

- (C) Enclose Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc in case of 'A' category mines. Composite development plans showing pit layouts, dumps, stacks of mineral reject, if any, etc. and year wise sections in case of 'B' category mines.

Bench Development over the next five years:

The mining activities in Bagru has been planned to be concentrated in the central and northern part of the lease. The overburden here consists of soil & Murrum and laterite. A total of 4 benches are generally worked simultaneously for bauxite mining. 2 or 3 for soil & Murrum and laterite and 1 or 2 for bauxite. At times when the thickness of bauxite exceeds 6 m or blending requirements so require, two bauxite benches are worked. Generally only 1 overburden bench is worked at any given time, either in soil & Murrum or laterite.


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In case of extraction of china clay bench height is kept restricted to 6m X 9 m. Height of benches will be maintained below 6 m and the bench width always kept 9m.

Year 2019-20

Bauxite:

During the year 2019-20, there is a planning to produce bauxite from B.H.No. RBN 128, RBN 87 and PBH 4. The maximum thickness of S&M is around 7.66 m which has been planned to work in 2 benches i.e., 1st & 2nd bench. Again there will be two laterite benches having a thickness of 1.00m and 2.26m respectively. 3rd & 4th bench is the laterite bench. The quantity of Soil & Murrum to be removed is 44730 m³ from 5694m² and 6365 m² area and laterite to be removed will be 8622 m³ from 5609m² & 1333m² areas. The bauxite will also be worked in 2 benches having a thickness of 6m & 6m. A total of 81166 MT of bauxite will be produced from the bench so designed covering 6662m² & 816m² areas. During the exploitation of ore a quantity 4487m³ will be found as intercalated waste.

All excavated Overburden & waste will be used for concurrent back filling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees.

China Clay:

During the year 2019-20, there is a planning to produce china clay from B.H.No. RCN-26, 27, 28, 23, 4 and 37 in Pit 2. The maximum thickness of lithomarge is around 2.74 m which has been planned to work in 1 bench i.e., 1st bench. The quantity of lithomarge to be removed is 7790 m³ from 2843m² area. A total of 19240 MT of china clay will be produced from one bench having 6m thickness so designed covering 1527m². The lithomarge produced as overburden is disposed off as backfill in the adjacent void area where bauxite is removed.


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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Details of quarry face to be advanced along with bench dimensions are listed below:-

Quarry name	Details	Bench no	Average height of benches	Average Length & width of benches in m
Pit no 1	Soil & morrum	i	6m	82X69
		ii	1.66m	87X73
	Laterite	iii	1m	88X64
		v	2.26m	45X30
	bauxite	ix	6m	82X81
		vi	6m	45X81
Pit no 2	Lithomarge	i	2.74m	60X47
	China clay	ii	6m	40X38



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The details of production of soil, morrum, laterite, quarry waste & Bauxite are given below:

Year	Details of Ore	Soil & morrum (Cum)	OB/SB/B (Cum)	ROM (Cum)		Ore (Tonnes)	Sub-grade In tonnes
				Ore (Cum)	Mineral reject (Cum)		
2020-21	Bauxite	44730	8622	40381	4487	81166	00
2020-21	China clay	00	7790	9162	00	19240	00

Year 2020-21:

Bauxite:

During the year 2020-21, there is a planning to produce bauxite from B.H.No. RBN-120, 87, 102, PBH-4. The average thickness of S&M is around 8.8 m which has been planned to work in 2 benches i.e., 1st & 2nd bench. Again there will be one laterite bench having a thickness of 4.1m. 3rd bench is the laterite bench. The quantity of Soil & Morrum to be removed is 64648 m³ from 7213m² and 7632 m² area and laterite to be removed will be 30447 m³ from 7426m² area.

During this year a part of soil dump will be re-handled having 3m height covering 3158m² area. During this year 9474 cu.m. soil from the dump will be re-handled. The bauxite will also be worked in 1 bench having a thickness of 5.45m. A total of 81506 tonnes of bauxite will be produced from the bench so designed covering 8267m² areas. During the exploitation of ore a quantity 4506m³ will be found as intercalated waste.

All excavated Overburden & waste will be used for concurrent back filling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by

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mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be sown, followed by plantation of fast-growing shrubs and trees.

China Clay:

During the year 2020-21, there is a planning to produce china clay from B.H.No. 35, 36 in Pit 2. The maximum thickness of lithomarge is around 2.74m. It is planned to work in 1 bench i.e., 1st bench. The quantity of lithomarge to be removed is 9306 m³ from 2027m² area. A total of 19543 MT of china clay will be produced from one bench having 6m thickness so designed covering 1551m². The lithomarge produced as overburden is disposed off as backfill in the adjacent void area where bauxite is removed.

Details of quarry face to be advanced along with bench dimensions are listed below:-

Quarry name	Details	Bench no	Average height of benches	Average length & width of benches in m
Pit no 1	Soil & morrum	i	6m	14X51
		ii	2.8m	128X60
	Laterite bauxite	iii	4.1m	116X64
		iv	5.45m	104X79
Pit no 2	Lithomarge	i	2.74m	72X28
	China clay	ii	6m	63X25

The details of production of soil, morrum, laterite, quarry waste & Bauxite are given below:

Year	Details of Ore	Soil & morrum (Cum)	OB/SB/l B (Cum)	ROM (Cum)		Ore (Tonnes)	Sub-grade In tonnes
				Ore (Cum)	Mineral reject (Cum)		
2020-21	Bauxite	64648	30447	40550	4506	81506	00
21	China clay	00	5554	9306	00	19543	00

Year	Dump name	Surface area in m ²	Height of dump in m	Volume in m ³
2020-21	Soil dump	3158	3	9474

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2021-22:

Bauxite:

During the year 2021-22, there is a planning to produce bauxite from B.H.No. RBN 98, RBN 99, RBN 84, RBN 101 and RBN 76. The maximum thickness of S&M is around 6m which has been planned to work in 2 benches i.e., 1st & 2nd bench. Again there will be laterite benches having a thickness of 5.9 m. 3rd bench is the laterite bench. The quantity of Soil & Murrum to be removed is 95991 m³ from 9722 m² and 9462 m² area and laterite to be removed will be 54085 m³ from 9167m² areas. The bauxite will also be worked in 1 bench having a thickness of 6m. A total of 80330 MT of bauxite will be produced from the bench so designed covering 7401m² areas. During the exploitation of ore a quantity 4441 m³ will be found as intercalated waste. Adjacent soil dump will be re-handled having area 2063 m², thickness 3m, and volume 6189 m³. All types of overburden and waste are disposed off as backfill in the adjacent void area.

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China Clay:

During this year, there is a planning to produce china clay from B.H.No. RCN-26, 27, 28, 23, 4, 37, 36 in Pit 2. A total of 19853 MT of china clay will be produced from one bench having 5.2m thickness so designed covering 1818m² areas.

Details of quarry face to be advanced along with bench dimensions are listed below:-

Quarry name	Details	Bench no	Average height of benches	Average Length & width of benches in m
Pit no 1	Soil & morrum	i	6m	120X81
		ii	3.98m	112X84
		iii	5.9m	100X92
		iv	6m	88X84
Pit no 2	China clay	ii	5.2m	50X36

The details of production of soil, morrum, laterite, quarry waste & Bauxite are given below:

Year	Details of Ore	Soil & morrum(Cum)	OB/SB/IB (Cum)	ROM (Cum)		Ore (Tonnes)	Sub-grade In tonnes
				Ore (Cum)	Mineral reject (Cum)		
2021-22	Bauxite	95991	54085	39965	4441	80330	00
	China clay	00	0	9454	00	19853	00

Year	Dump name	Surface area in m ²	Height of dump in m	Volume in m ³
2021-22	Soil dump	2063	3	6189

2022-23:

Bauxite:

During the year 2022-23, there is a planning to produce bauxite from B.H.No. PBH- 1, 2, 3. The average thickness of S&M is around 9.98 m which has been planned to work in 2 benches i.e., 1st & 11nd bench. There is no laterite bench. The quantity of Soil & Murrum to be removed is 78585 m³ from 8626m² and 6741 m² areas. The bauxite will also be worked in 1 bench having a thickness of 4.15m. A total of 65667 MT of bauxite will be produced from the bench so designed covering 8747m². During the exploitation of ore a quantity 3630 m³ will be found as intercalated waste. Adjacent soil dump will be re-handled having area 839m², thickness 2m, and volume 1678 m³.

There is a sub-grade Bauxite layer (Al. Laterite) which will also be removed from one bench and blended with the Bauxite so produced. A quantity 10575 MT of sub-grade Bauxite layer (Al. Laterite) will be produced from 2002m² areas having a thickness of 2.92m.

All excavated Overburden & waste will be used for concurrent back filling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees.

China Clay:-

During the year 2022-23, there is a planning to produce china clay from B.H.No. RCN-26, 27, 28, 23, 4, 37, 36 in Pit 2. The average thickness of lithomarge is around 2.74 m which has been planned to work in 1 bench i.e., 1st bench. The quantity of lithomarge to be removed is 5433 m³ from 1983m² area. A total of 20160 MT of china clay will be produced from one bench having 6m thickness so designed covering 1600m² areas. The lithomarge produced as overburden is disposed off as backfill in the adjacent void area where bauxite is removed.

Details of quarry face to be advanced along with bench dimensions are listed below:-


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**BAGRU BAUXITE MINE (75.41 HECTARES)
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Quarry name	Details	Bench no	Average height of benches	Average Length & width of benches in m
Pit no 1	Soil & morrum	i	6m	141X61
	Al laterite	ii	3.98m	135X50
	Bauxite	iii	2.92m	90X22
Pit no 2	lithomarge	i	4.15m	129X68
	China clay	ii	2.74m	85X24
			6m	65X25

The details of production of soil, morrum, laterite, quarry waste & Bauxite are given below:

Year	Details of Ore	Soil & morrum (Cum)	OB/SB/I B (Cum)	ROM (Cum)		Ore (Tonnes)	Sub-grade In tonnes
				Ore (Cum)	Mineral reject (Cum)		
2022-23	Bauxite	78585	0	37931	4215	65667	10575
2022-23	China Clay	00	5433	9600	00	20160	00

Year	Dump name	Surface area in m ²	Height of dump in m	Volume in m ³
2022-23	Soil dump	839	2	1678

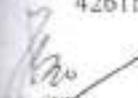
2023-24:

Bauxite:

During the year 2023-24, there is a planning to produce bauxite from B.H.No. RBN-98, 100, 101, PBH-3, PBH-4. The maximum thickness of S&M is around 9.5 m which has been planned to work in 2 benches i.e., 1st & IInd bench. Again there will be one laterite bench having a thickness of 6.00m. IIIrd bench is the laterite bench. The quantity of Soil & Murrum to be removed is 104043 m³ from 10995m² and 10878 m² areas respectively and laterite to be removed will be 53562 m³ from 8927m² areas. The bauxite will also be worked in 1 bench having a thickness of 4.3. A total of 80828 MT of bauxite will be produced from the bench so designed covering 10391m² areas. During the exploitation of ore a quantity 4468m³ will be found as intercalated waste.

China Clay:

During the year 2023-24, there is a planning to produce china clay from B.H.No. RCN-36, 37, 38, 39 in Pit 2. The maximum thickness of lithomarge is around 2.74 m which has been planned to work in 1 bench i.e., 1st bench. The quantity of lithomarge to be removed is 4261m³ from 1555m² area. A total of 20131 MT of china clay will be produced from two


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bench having 7.75m thickness so designed covering 1157m² & 1511m² areas. The lithomarge produced as overburden is disposed off as backfill in the adjacent void area where bauxite is removed.

Details of quarry face to be advanced along with bench dimensions are listed below:-

Quarry name	Details	Bench no	Average height of benches	Average Length & width of benches in m
Pit no 1	Soil & morrum	i	6m	180X61
		ii	3.5m	172X63
	Laterite	iii	6m	166X53
	Bauxite	iv	4.3m	166X63
Pit no 2	lithomarge	i	2.74m	61X26
	China clay	ii	6m	47X25
	China clay	iii	1.75m	17X32



The details of production of soil, morrum, laterite, quarry waste & Bauxite are given below:

Year	Details of Ore	Soil & morrum (Cum)	OB/SB/l B (Cum)	ROM (Cum)		Ore (Tonnes)	Sub-grade In tonnes
				Ore (Cum)	Mineral reject (Cum)		
2023-24	Bauxite	104043	53562	40213	4468	80828	00
	China clay	00	4261	9586	00	20131	00

4. Describe briefly giving salient features of the proposed method of working indicating Category of mine.

It is a mechanized (FM) opencast mine.

The mining operation in Bagru Hill Bauxite Mines is fully mechanized. The quarry is developed using the benching pattern. And there are separate benches for soil/Murum, laterite and bauxite. The bench height varies depending on the concerned strata. The maximum height is kept below 6 m. And where the thickness exceeds 6.0 m or blending if required additional bench is opened.

The sequences of operations currently followed in the mine is

- Drilling holes using DTH in harder strata,
- Charging and blasting of holes, and
- Loading of material using Hydraulic excavators and dumpers.


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Dumpers transport the loaded material to the crushing and screening plant. The overburden consists of Soil, Murrum and laterite. The average thickness of OB is nearly 1.5 times that of bauxite. Soil and Murrum is soft and is directly excavated using combination of hydraulic excavator and dumpers. The harder OB is drilled, blasted and then finally loaded into dumpers by excavators to use in area.

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The percentage recovery of mineable ore is difficult to assess but the losses are estimated to be of the order of 10%. Besides losses in drilling, blasting and loading, some ore is occasionally lost due to sudden changes in the dimensions of ore body. It is estimated that 90% of in-situ ore is recovered during Mining. Additional loss during screening, crushing and ropeway loading is minimal. Since the size specification permits all lower size of ore to be dispatched, there is no loss on account of size.

The overburden and waste will be backfilled at the worked out quarry as proposed in the development plan.

The recovery percentage of ore is about 90% of the ore zone will constitute dispatch-able Bauxite. Taking mining losses at low figure of 10% overall recovery will of the order of only about 90% of the ore zone. Forked shovels will be used to recover smaller pieces of bauxite and minimize mining losses.

e) Describe briefly the layout of mine workings, pit road layout, the layout of faces and sites for disposal of overburden/waste along with ground preparation prior to disposal of waste, reject etc. A reference to the plans and sections may be given. UPL or ultimate size of the pit is to be shown for identification of the suitable dumping site.

method of Mining:

Since the deposit in this area is surficial in nature with continuous boulders interspersed with soil & laterite, it is proposed to carry out only opencast fully mechanized mining for this plan period.

Bench Design and parameters:

In the Bagru Hill Mine, The height of the bench is usually kept below 6.0 m, in consonance with the DGMS permission granted in 2014, being lower than the boom height of the excavator used. The bench width is maintained at 6 m or larger. The slope angle of bench is below 60° when a bench approaches its terminal Position its height is reduced to below 6 m as required by DGMS. (photocopy of permission letter from DGMS is attached as annexure -

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A total of 4 benches are generally worked simultaneously for bauxite mining, 2 or 3 for Murrum and laterite and 1 or 2 for bauxite. At times when the thickness of bauxite exceeds 6 m or blending requirements so require, two bauxite benches are worked. Generally overburden bench is worked at any given time, either in soil & Murrum or laterite.

In case of extraction of china clay bench height is kept restricted to 6m X benches will be maintained below 6 m and the bench width always kept 9m.

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Method of Mining:

The mining operation in Bagru Hill Bauxite Mines is fully mechanized. The quarry is developed using the benching pattern. And there are separate benches for soil/Murrum, laterite and bauxite. The bench height varies depending on the concerned strata. The maximum height is kept below 6 m. And where the thickness exceeds 6.0 m or blending if required additional bench is opened.

The sequences of operations currently followed in the mine is

- (a) Drilling holes using DTH in harder strata.
- (b) Charging and blasting of holes, and
- (c) Loading of material using Hydraulic excavators and dumpers.

Dumpers transport the loaded material to the crushing and screening plant. The overburden consists of Soil, Murrum and laterite. The average thickness of OB is nearly 1.5 times to that of bauxite. Soil and Murrum is soft and is directly excavated using combination of hydraulic excavator and dumpers. The harder OB is drilled, blasted and then finally loaded onto dumpers by excavators to use in area.

The overburden and waste will be concurrently backfilled at the worked out quarry as proposed in the development plan & section. (Ref Plate no 5, 6, 7 & 8)

The recovery percentage of ore is about 90% of the ore zone will constitute dispatch-able Bauxite. Taking mining losses at low figure of 10% overall recovery will of the order of only about 90% of the ore zone. Forked shovels will be used to recover smaller pieces of bauxite and minimize mining losses.

Road

Considering safety regulations and the size of dumper selected, the haulage road shall have a minimum width of three times the maximum width of the largest moving equipment excluding the safety berm and the ditch for drainage. The road width is not a constraint for mine designs in this case. The horizontal benches themselves act as roads for most of their length: specific


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roads for dumper haulage are to be maintained only in certain portion of the lease. Gradient of haul roads shall be 1:16.

Extent of Mechanization

Since it is proposed mechanized (FM) mining is to be done, powered equipment will be employed. The following machinery is deployed in the mechanized quarries at Bagru Hill Bauxite Mines consisting of Bagru, Bhusar and Hisri Leases for Excavation of Bauxite & simultaneous removal of Overburden also. All equipments are diesel powered.

S.No.	Heads	M/C	Capacity	Nos.
1	EXCAVATORS	Hyd. Excavator, EX-350 LCH	1.87 m ³	1
2		Hyd. Excavator, EX-210	0.90 m ³	1
3		Volvo - 300 LCH	1.85 m ³	1
4		L&T Komatsu- 210	0.90 m ³	1
5	DUMPERS	HINDUSTAN TEREX MODEL 1025	25 Tonnes	3
6	DRILLS	DTH Drill, Atlas Copco	110 mm dia.	3
7		Compressor, Atlas Copco	186 cfm	3
8		Auger Drill, CLO Zironi(Brazil)	5 mm dia	3
9		Compressor (IR-400 fhm)	410 cfm	3
10		Wagon Drill (Atlas Copco)	110 mm	3
11	DUMPERS	Dumper(Hyva)-TATA	25 MT	15
12	PAYLOADER	Wheel Loader	4.3m ³ , 3.2m ³ & 2 m ³	3
13	OTHERS	Explosive Van		1
14		Rock breaker- TATA HITACHI		
15		Maintenance Van(Ashok Leyland)		1
16		Jaw crusher CATERPILLAR	120 & 60 tph	2
17		Ropeway, BRECO made	41.6 tph	1
18		Ambulance, MAHINDRA		1
19		DISEL BROWSER	3000 LTS	1
20		MOBILE CRANE, ESCORTS MAKE	10 MT	1

Justifications for the deployment of machineries are given in annexure -12

Blasting:

Blasting will be done only in the harder patches, which cannot be cut by excavator. Holes of 100 mm diameter will be drilled by Crawler Mounted Drill to a depth of 5.5 M and charged with ANFO and emulsion. Yield per kg of explosive is expected to be 5 Tonnes in the case of ROM.


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However, the frequency of blasting will be very less and blasting is practiced only in case of harder rocks. About 10-20 deep holes will be blasted per blast to produce Bauxite at the rated capacity.

Method of Blasting

In this mine, deep hole will be in practice. Holes are done in hard formation by crawler mounted drill having diameter 100 mm dia up to depth 5.5 m. Burden and spacing will be 2.5m x 3m. Depending upon the compactness of the strata/formation. On this basis hole will hold 90 tonnes.

The holes are charged with Explosives. Short firing is done usually with help of O.D and (V.F.) safety fuse. The powder factor works out to be 7 Tonnes/kg of explosives.

The following parameters for blasting will be adopted:

Blasting Parameters

Burden: Burden is the perpendicular distance from the hole to the nearest free face in the direction where the displacement is required. The burden is required between 30% - 60% of the bench height.

For OB Removal:

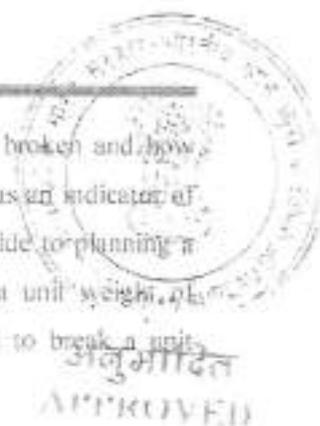
Bench Height	: 6 m
Burden	: 2 m
Spacing	: 2.5 m
Bulk Density insitu	: 2 MT/m ³
Depth of hole	: 5.5 m
Tonnage per hole	= 5.5x2x2.5x2

= 55 tonnes

Powder factor	= 5 Tonnes/ kg.**
Charge per hole	= 55/5 = 11 kg

For Bauxite Production

Bench Height	: 6m
Burden	: 2m
Spacing	: 2.5 m
Bulk Density in-situ	: 2.01 MT/m ³
Depth of hole	: Bench height- 5.5 m
Tonnage per hole	= 5.5x2x2.5x2.01 = 55.275 Tonnes say 56 Tonnes
Powder factor	= 7 Tonnes/ kg. **
Charge per hole	= 56 /7 = 8 kg



The POWDER FACTOR is a relationship between how much rock is broken and how much explosive is used to break it. It can serve a variety of purposes, such as an indicator of how hard the rock is, or the cost of the explosives needed, or even as a guide to planning a shot. Powder factor can be expressed as a quantity of rock broken by a unit weight of explosives. Or, alternatively, it can be the amount of explosives required to break a unit measure of rock.

$$PF = W_r / W_e$$

PF – powder factor, W_r – Total weight of rock generated in blast, W_e – Total weight of explosive used in blast.

In this area from the daily practice it is found that about 7 tonnes of bauxite is removed by used of 1 KG explosives to blast as well as 5 tonnes of hard OB is removed by used of 1 KG explosives to blast.

So Powder factor for bauxite = 7 Tonnes/ kg.

Powder factor for Hard OB = 5 Tonnes/ kg.

	Overburden	Bauxite
Explosive	ANFO and emulsion	ANFO and emulsion
Bench height	6m	6 m
Depth of hole	5.5m	5.5 m
Burden	2 m	2 m
Spacing	2.5 m	2.5 m
Volume	$5.5 \times 2 \times 2.5 = 27.5$ cum	$5.5 \times 2 \times 2.5 = 27.5$ cum
Specific Gravity	2.0	2.01
Tonnage per hole	55 tonnes	55,275 Tonnes say 56 tonnes
Daily production / OB removal	108170/ 295 = 366.68 MT (295 working days)	85000 /295 = 288.14 MT say 288 MT
Numbers of holes per day	$366.68/55 = 6.67$ say 7 holes	$288/56 = 5.14$ say 6 holes
Charge hole	11 kg	8 kg
Method of blasting	1 row of 7 holes in one round	1 row of 6 holes in one round
Explosive	77 kg of explosives	48 kg of explosives

Blasting is usually done during the lunch interval, i.e. from 1.00 to 2.00 pm. Use of Rock breaker is also in practice for the breaking of the harder laterite & bauxite benches in this area.

SAFE PRACTICES DURING SHOT FIRING

Taking required precautionary measures to avoid Kinking during firing. Drilling and charging of holes could not be carried out in the same area in same time. A detailed record of the hole of the hole positions, type of explosives, quantity of explosives, hole depth, charge column and stemming could be maintained for finding



the depth of the charge in case of a misfire. Before firing any shot all persons should be withdrawn from the blasting site to a safe place, i.e. more than 100m away.

Blasting time is generally fixed after consultation with neighboring mines after the working shift-taking all required precautions, like marking the danger zone with red flags, use of warning signals and providing blasting shelters etc.

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Conceptual Mine planning upto the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.

While preparing a conceptual mining plan for the Bagru Lease, the following points and concepts have been kept in view:

The ore bodies in the leasehold not being continuous extraction of bauxite in a new block would be started only after exhausting the block under operation.

The removal of overburden as well as breaking and heaping of bauxite would be done with excavator. As space become available in the excavated area, the overburden generated during mining would be concurrently pushed into voids as backfill.

During the plan period of Bagru mining lease will be backfilled by mechanized landscaping, followed by vegetation. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees. During the conceptual plan period concurrent back filling shall be continued in the area. The level of the backfilling shall be maintained up to a moderate height which is practicable and under practice in other mines of the company. During the conceptual plan period these reclaimed areas will be afforested with suitable varieties of plants. The other voids so left will be filled with rain water and shall be treated as water reservoir.

Anticipated life of the mine on the Basis of Reserve of Bauxite:

The total proved balance mineable ore (ROM) including sub grade ore would be 444591 tonnes. Out of the total ROM 10% is considered as intercalated waste. Thus the recoverable reserve would be 400132 tonnes. This reserve will be exhausted in this five years plan period. Thus life of the mine is about 5 years based on the present balance reserve quantities of bauxite (bauxite + sub-grade). Future exploration by drilling boreholes in the virgin portion of the lease including the colony area will be taken up for establishment of additional reserve in proved category for future mining thus the life of the mine may also be enhanced.


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**BAGRU BAUXITE MINE (75.41 HECTARES)
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Anticipated life of the mine on the Basis of Reserve of China Clay:

The total proved balanced mineable China clay would be 1088023 tonnes. Recovery of China Clay would be 100%. Considering the production of China Clay in this plan period would be 20160 tonnes. The balance reserve would be 989096 tonnes. Considering the projected production 20160 tonnes per annum, the balance reserve will sustain for 49 years. Thus, the life of the mine would be about 5 years + 49 years i.e., 54 years.

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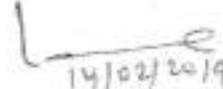
Production target of Bauxite & China clay

Year	Quantity of bauxite in tonnes	Quantity of Sub-grade (Al-laterite) in tonnes	Quantity of bauxite ore after blending in tonnes	Quantity of China clay in tonnes
2019-20	81166	00	81166	19240
2020-21	81506	00	81506	19543
2021-22	80330	00	80330	18853
2022-23	65667	10575	76242	20160
2023-24	80828	00	80828	20131
Total	389497	10575	400072	98927

The overall average grade of ore in this area is estimated to be +40% on the basis of sampling of boreholes / quarry samples.

After the conceptual mining period, on the basis of proposed production planning and available reserve position, the ultimate pit area, ultimate pit depth, ultimate generation of waste, final pits slope, afforestation programme is given in the following table:

Ultimate pit area	56.35 Ha
Average Ultimate pit depth	22 m
Ultimate generation of waste	Five years(2019-20 TO 2023-24) = 579868 m ³ and Up to the life of The mine = 248810 m ³
Total No. of plantation during the plan period	22075 saplings
Total No. of plantation at the conceptual Stage	20000 saplings


 14/02/2019
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 Regional Controller of Mines
 भारतीय खान ब्यूरो
 Indian Bureau of Mines



Generation and rehabilitation -

Generation of waste during this plan period:

Year	Soil & morrum (Cum)	Laterite (Cum)	Lithomarge (Cum)	Quarry waste (IW) (Cum)	Total OB & waste
2019-20	44730	8622	7790	4487	65629
2020-21	64648	30447	5554	4506	105155
2021-22	95991	54085	0	4441	154517
2022-23	78585	0	5433	4215	88233
2023-24	104043	53562	4261	4468	166334
Total	387997	146716	23038	22117	579868

Generation of lithomarge during the life of the mine:

During the conceptual mining period, on the basis of proposed production planning and available pit location, the ultimate pit area, ultimate pit depth, ultimate generation lithomarge is given below. (china clay is found below the layers of soil Morrum Laterite Bauxite and lithomarge, but in the top layers expect lithomarge is already excavated during the excavation of bauxite. So only lithomarge exist top of the china clay layers.)

Year	Total generation of lithomarge during the course of excavation of ore. (m ³)
2019-20	7790
2020-21	5554
2021-22	00
2022-23	5433
2023-24	4261
Total	23038
During conceptual period *	225772
Total	248810
After considering 20 % swelling factor	298572

* The Generation of waste & lithomarge during conceptual period is calculated based on the average stripping ratio from five years plan period.

There are four stabilized old O.B. dumps in the Bagru lease area. All these dumps were created when mining was started in this leasehold. Out of the four old O.B. dumps two are soil dumps which will be removed and reclaimed during the plan period and conceptual stage. It is not possible to remove two O.B. Dumps during the plan or conceptual period as these dumps are stabilised with the plantation. Currently, all overburden is backfilled in mined-out areas concurrently.

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These backfills were started a little away from edge of the plateau and are suitably bermed for stability. The height of backfills in the Bagru lease varies from 10 m to 12m.

The year wise area to be reclaimed is as under:

Year	Area to be backfilled In Ha	Location of Backfilled area
2019-20	1.15	Working Quarry no. 1 by concurrent backfilling.
2020-21	1.40	Working Quarry no. 1 by concurrent backfilling.
2021-22	3.06	Working Quarry no. 1 by concurrent backfilling.
2022-23	1.2	Working Quarry no. 1 by concurrent backfilling.
2023-24	2.02	Working Quarry no. 1 by concurrent backfilling.
Total	8.83	



During the conceptual plan period four water reservoirs will be created in the worked out area near the central part of the area. The area covered by this water reservoir would be 6.20 Ha. Bund will be created all around the reservoir to protect the reservoir.

Land Use Pattern:

Existing land Use Pattern is as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
all quarries including reclaimed area	40.91 {14.28 Quarry(1.80 Reservoir) +26.63 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	51.9 {20.04 quarry(1.80Reservoir) + 31.86 reclaimed area}
Road	1.33	1.29	2.62
Stabilised O.B. Dump	1.58	1.06	2.64
Topsoil Dump	1.10	NIL	1.10
Infrastructure	0.35	0.26	0.61
Township	1.00	NIL	1.00
TOTAL :	46.27	13.60	59.87
Balance area not in use	9.58	5.96	15.54
Total Lease area	55.85	19.56	75.41


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Year wise Land use:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)				
	After 2019-20	After 2020-21	After 2021-22	After 2022-23	After 2023-24
For all quarries including reclaimed area	41.38 (1.80 Reservoir) + 27.78 Reclaimed Area)	42.14 (1.80 Reservoir) + 29.18 Reclaimed Area)	43.15 (1.80 Reservoir) + 32.24 Reclaimed Area)	44.45(1.80 Reservoir) + 33.44 Reclaimed Area)	45.36 (1.80 Reservoir) + 33.46 Reclaimed Area)
Road	1.33	1.33	1.33	1.33	1.33
Sanctified O.B. Dump	1.58	1.58	1.58	1.58	1.58
Open Dump	0.10	0.10	0.10	0.10	0.10
Infrastructure	0.35	0.35	0.35	0.35	0.35
Ownership	1.00	1.00	1.00	1.00	1.00
TOTAL :	45.74	46.5	47.51	48.81	49.72

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Land use after plan period :

Land Use Pattern at the end of 5 years plan period will be as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
For all quarries including reclaimed area	45.36 {9.9 Quarry(1.80 Reservoir) + 35.46 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	56.35 {15.66 quarry(1.80 Reservoir) + 40.69 reclaimed area}
Road	1.33	1.29	2.62
Sanctified O.B. Dump	1.58	1.06	2.64
Open Dump	0.10	NIL	0.10
Infrastructure	0.35	0.26	0.61
Ownership	1.00	NIL	1.00
TOTAL :	49.72	13.60	63.32
Balance area not in use	6.13	5.96	12.09
Total Lease area	55.85	19.56	75.41

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**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



Years wise Land use:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)				
	After 2019-20	After 2020-21	After 2021-22	After 2022-23	After 2023-24
For all quarries including reclaimed area	41.38 (1.80 Reservoir) + 27.78 Reclaimed Area)	42.14 (1.80 Reservoir) + 29.18 Reclaimed Area)	43.15 (1.80 Reservoir) + 32.24 Reclaimed Area)	44.45 (1.80 Reservoir) + 33.44 Reclaimed Area)	45.36 (1.80 Reservoir) + 33.86 Reclaimed Area)
Road	1.33	1.33	1.33	1.33	1.33
Quarries O.B.	1.58	1.58	1.58	1.58	1.58
Waste Dump	0.10	0.10	0.10	0.10	0.10
Infrastructure	0.35	0.35	0.35	0.35	0.35
Township	1.00	1.00	1.00	1.00	1.00
TOTAL :	45.74	46.5	47.51	48.81	49.72

Land use after plan period :

Land Use Pattern at the end of 5 years plan period will be as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
For all quarries including reclaimed area	45.36 (9.9 Quarry (1.80 Reservoir) + 35.46 Reclaimed Area)	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	56.35 (15.66 quarry (1.80 Reservoir) + 40.69 reclaimed area)
Road	1.33	1.29	2.62
Quarries O.B. Dump	1.58	1.06	2.64
Waste Dump	0.10	NIL	0.10
Infrastructure	0.35	0.26	0.61
Township	1.00	NIL	1.00
TOTAL :	49.72	13.60	63.32
Balance area not in use	6.13	5.96	12.09
Total Lease area	55.85	19.56	75.41

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Land use after Conceptual plan period :

Land Use Pattern after conceptual plan period will be as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND
all quarries reclaimed	45.36 {8.72 Quarry(6.20 Reservoir)+ 36.64 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	56.35 {14.48 quarry(6.20 Reservoir) + 41.87 reclaimed area}
road	1.33	1.29	2.62
landfill O.B. Dump	1.58	1.06	2.64
landfill Dump	0.10	NIL	0.10
infrastructure	0.35	0.26	0.61
settlement	1.00	NIL	1.00
TOTAL :	49.72	13.60	63.32
Balance area not in use	6.13	5.96	12.09
Total Lease area	55.85	19.56	75.41

Environment – With rapid industrialization and consequent deleterious impact of pollutants on environment, values of environmental protection offered by trees are becoming clear. Trees are very suitable for detecting, recognizing and monitoring air pollution effects. Monitoring of biological effects of air pollutant by the use of plants as indicators has been applied on local, regional and national scale. Trees function as sinks of air pollutants, besides their bio-esthetical values, owing to their presence in large numbers. Annual need of oxygen for one person is met by 150 m² of leaf surfaces i.e. 30-40 m² of greenery. So, it is necessary to develop green belt in and around the polluted site with suitable species to combat the air pollution effectively.

The green belt development not only functions as a foreground and background landscape feature resulting in harmonizing and amalgamating the physical structures of the mines with surrounding environment, but also acts as a pollution sink as indicated above. Thus, implementation of afforestation program is of paramount importance. In addition to augmenting existing vegetation, it will also check soil erosion, make the ecosystem more complex and functionally more stable and make the climate more conducive.

General Guide Lines for Plantations

- Trees growing up to 10 m or more in height should be planted around the mine;
- Plantation of trees should be done in appropriate circular rows around the mine in alternate rows to prevent horizontal pollution dispersion;
- Trees should also be planted along road sides, to arrest vehicular exhaust and noise pollution and in such a way that there is no direct line of sight to the mine when viewed from a point outside the foliage perimeter;
- Since tree trunks are normally devoid of foliage (up to 3 m), it would be appropriate to have shrub near such trees to give coverage to this portion;
- Fast growing trees with thick perennial foliage should be grown in order to attain more height and canopy in less time.

Species for Arresting Dust

Trees, particularly having compact branching, closely arranged leaves, broad leaves of simple elliptical and hairy structure, shiny or waxy leaves and hairy twigs are efficient filters for dust. The leaf surface of plants is 10-20 times greater than the earth surface occupied by them. It is known that particles up to 80 milli micron may stick to vertical surfaces. It is found that 8 m wide green belt reduces the dust fall by 2-3 times. The following species are chosen to filter the dust pollution:

Cassia fistula - Amaltaas

Bauhinia purpurea - Purple Orchid Tree

Cassia siamea - Kassod tree

Polyalthialongifolia - Debdaru Tree.

Ficus religiosa - peepul Tree.

Tamarindus indica - Tamarind Tree or Imli Tree.

Meliazedarach - Chinaberry tree or Bakain tree.

Azadirachta indica - Neem Tree.

Terminalia arjuna - Arjun Tree.

Recommended Plant Species

On the basis earlier experiences in this area, the following plant species are recommended for greenery of the applied mine lease area.

Alstoniascholaris- Scholar Tree, Dita bark, Devil tree,

Cassia fistula- Amaltaas

Cassia siamea- kassod tree

Polyalthialongifolia- Debdaru Tree.

Ficus religiosa- peepul Tree.

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Tamarindus indica - Tamarind Tree or Imli Tree.

Azadirachta indica - Neem Tree.

Terminalia arjuna - Arjun Tree.

Anthocephalus cadamba - Kadam Tree.

Michelia champaca - Champa Tree.

Cassia siamea - Kassod Tree.

Dalbergia sissoo - Shisham Tree.



DETAILS OF AFFORESTATION SCHEME

Sr. No.	Year	Area (Ha)	Number of Plants
1	2019-20	1.15	2875
2	2020-21	1.4	3500
3	2021-22	3.06	7650
4	2022-23	1.2	3000
5	2023-24	2.02	5050
Total		8.83	22075

Precautionary measures will be taken for carrying of the afforestation made by regular watering in the afforested area, to protect from grazing animals and proper manuring. Man will be deployed for protecting and doing the above.

All excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees.



3.0 MINE DRAINAGE

3.1 Minimum and maximum depth of water table based on observations from nearby wells and water bodies

In a typical bauxite-bearing plateau located on hilltop, no water is to be found even at depth. During monsoons, rainwater drains down the escarpments, the natural slope of plateau acts as the drainage system. From the nearby villages water table studied below 30m from the ground level.

3.2 Indicate maximum and minimum depth of Workings.

In a typical bauxite-bearing plateau located on hilltop, mining of bauxite is subsurface mining up to depth of 15 m to 20 m.

3.3 Quantity and quality of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged

As indicated above, there is no possibility of mining encountering any surface/subsurface water body. However, during the course of mining, rain water in the form of surface run off will be there during monsoons only, which will eventually get discharged into the north Koyal River through innumerable water cut channels on hill slopes or find its way through cracks, joints and fissures in rocks and finally reach to valley or plain land. Thus no accumulation of water is likely to remain within the ML area.

3.4 Describe regional and local drainage pattern. Also indicate annual rain fall, catchments area, and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.

Drainage pattern:

In a typical bauxite-bearing plateau located on hilltop, no water is to be found even at depth. During monsoons, rainwater drains down the escarpments, the natural slope of plateau acts as the drainage system.

Several SE-flowing nallahs and streams originate from the highland and flow to the South Koel River which controls the surface drainage in this region. The Serangdag Plateau lies in the Western part of the area from where nallahs and streams discharge into the North Koel River. Thus, bauxite-capped plateaus in this region have a distinctive topographical feature forming part of the "divide" between north-flowing North Koel River in the west, and south-flowing South Koel River in the east.



Annual Rain fall:-

Long term rain fall data (in mm) of Lohardaga district of collected from Customized Rainfall Information System (CRIS), Hydromet Division, India Meteorological Department, under Ministry Of Earth Sciences (<http://www.imd.gov.in>) for the is tabulated below:-

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
83	72.4	39.8	17.2	118.2	47.5	217.2	210.8	318.4	15.8	0	0	1065.6
22.6	4.6	56.2	30.3	13.7	149.6	480.8	278.7	68.8	20.1	0	1.1	1126.5
7.9	0.9	37.9	0	41.2	114.2	358.3	465	294.6	56.2	0	0	1376.2
7.9	0	3.1	0	19.6	167.1	591	217.1	180.4	75.1	11	0	1272.3
												1210.15

Estimation of runoff using Rational Method:-

Annual rainfall (mm) , A	1210.15
Area (sqm) , l	754100
Rational runoff coefficient, C	0.5
Runoff(cum)= C x l x A	456230

During the plan period of working, the mining will be restricted up to a moderate depth & the water table of the area is far below the ground. So, no seepages could be seen and entrance of surface water is not possible. Except during rainy season water could be clogged in the quarry. The efforts will be taken to treat this water for reducing suspended solid matters and other ingredients within the permissible limit as per IS-2490 before discharging from the leasehold. The drinking water will be supplied from natural springs situated near village and the quality of drinking water will be maintained as per IS-10500. The surface water during the rainy season will accumulate inside the pit limit and outside it goes through the natural stream/nallah. The quarry floor of bauxite horizon is limited up to the level of lithomarge clay, which is good aquifer for water storage. This lithomarge clay will not be disturbed and during the course of mining and backfilling will be carried out over it with laterite boulders having good absorbing capacity for holding water and wastes. Thus the ground water table will not be disturbed and all attempts will be taken that contamination of surface water polluted if any could be avoided to mix up with ground water at any stage.


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Open pit mining at Bagru bauxite mine will be started from the lower level towards higher level. Water will drain out naturally. The quarry floor will slope inwards, and a ditch would be dug on one side to drain out water into a natural watercourse. While backfilling mined-out areas, suitable conduit would be installed for mine water to drain out, if required the pumps would be used for pumping out. During rainy season garland channel around the quarry face will be developed to avoid inflow of water into the quarry.



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**4.0 STACKING OF MINERAL REJECT /
 SUB GRADE MATERIAL AND DISPOSAL OF WASTE**

Topsoil, murrum, overburden & waste :-

Approx 579868 Cu.m. of overburden & waste is excavated in the 5 years of mining in the Bagru Bauxite Mine during the course of excavation of Bauxite & china clay. This overburden consists of soil, murrum, hard laterite and quarry waste and lithomarge. These wastes are utilized in backfilling the areas from where bauxite has been extracted. Backfill is done sequentially; hard laterite is dumped in void first, it is then covered by murrum; and finally soil is spread on top.

The soil is removed separately and used immediately to cover the backfill filled area of laterite and murrum. The soil is not stacked separately, as with proper planning; it is possible to use it simultaneously.

The year wise quantum of soil, overburden, quarry waste & Lithomarge is as under:

Year	Soil & murrum (Cum)	Laterite (Cum)	Lithomarge (Cum)	Quarry waste (IW) (Cum)	Total OB & waste
2019-20	44730	8622	7790	4487	65629
2020-21	64648	30447	5554	4506	105155
2021-22	95991	54085	0	4441	154517
2022-23	78585	0	5433	4215	88233
2023-24	104043	53562	4261	4468	166334
Total	387997	146716	23038	22117	579868

Year	Top Soil (Cum)		Mineral Rejects (Cum)			
	Reuse / spreading	Storage	Backfilling	Storage	Blending	Beneficiation
2019-20	44730	Nil	Nil	Nil	Nil	Nil
2020-21	64648	Nil	Nil	Nil	Nil	Nil
2021-22	95991	Nil	Nil	Nil	Nil	Nil
2022-23	78585	Nil	Nil	Nil	Nil	Nil
2023-24	104043	Nil	Nil	Nil	Nil	Nil
Total	387997	Nil	Nil	Nil	Nil	Nil

The proposed dumping ground within the lease area be proved for presence of absence of mineral and be outside the UPL unless simultaneous backfilling is proposed or temporary dumping for a short period is proposed in mineralized area with technical constraints & justification:-

Exhausted Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees. No dump will be created. Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise build up of dumps along with the proposals for protective measures.

There are four stabilized old O.B. dumps in the Bagru lease area. All these dumps were created when mining was started in this leasehold. Out of the four old O.B. dumps two are soil dumps which will be removed and reclaimed during the plan period and conceptual stage. It is not possible to remove two O.B. Dumps during the plan or conceptual period as these dumps are stabilized with the plantation. Currently, all overburden is backfilled in mined-out areas concurrently.

These backfills were started a little away from edge of the plateau and are suitably benched for stability. The height of backfills in the Bagru lease varies from 10 m to 12m.

The year wise area to be reclaimed is as under:

Year	Area to be backfilled In Ha	Location of Backfilled area
2019-20	1.15	Working Quarry no. 1 by concurrent backfilling.
2020-21	1.40	Working Quarry no. 1 by concurrent backfilling.
2021-22	3.06	Working Quarry no. 1 by concurrent backfilling.
2022-23	1.2	Working Quarry no. 1 by concurrent backfilling.
2023-24	2.02	Working Quarry no. 1 by concurrent backfilling.
Total	8.83	

Sub-Grade Mineral:

Low/sub-grade minerals area hand sorted and suitably blended to ensure metal grade requirement of the plant. Also mechanical screening of the fraction above 1" in size is utilized for blending, if meeting the overall specification of the grade. Thus all possible efforts like hand sorting, hand screening, bulk sampling followed time to time chemical analysis are systematically followed to ensure that ore is not mixed with the waste.

So far as the fines below 1" in size are concerned it is established that the average silica in it is + 10% and - 30% alumina and hence is below the prescribed threshold value; therefore, not suitable at all for

BAGRU BAUXITE MINE (75.41 HECTARES)
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soil conservation and hence they form a part of the waste and is backfilled to reclaim the mined areas concurrent to mine development.

Details of sub grade material to be blended with high grade bauxite are given below:-

Year	Quantity of sub grade (Al laterite) in tonnes	Grade (Al_2O_3 %, SiO_2)
2022-23	10575	$Al_2O_3 = 38.215$, $SiO_2 = 4.50$



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5.0 USE OF MINERAL AND MINERAL REJECT

Bauxite occurrence as established on the basis of exploration data is within the laterite profile of the Plateau top. The entire bauxite ore, produced from this mine is meant for captive consumption at the alumina plant at Muri. No ore is sold to the outside agencies and hence the entire mineral is used for extraction of alumina and aluminium metal of the company.

The ROM grade as obtained above at the mines is up graded by blending some better quality waste at the siding suitably before the rail transport. The average feed grade of the ore dispatched to the plant is as given below:

Al ₂ O ₃ -	(+) 40%
SiO ₂ -	(-) 5%

As the bauxite of the area is mixed type with predominantly gibbsitic i.e. tri-hydrate alumina (Al₂O₃. 3H₂O) in the range of 70% to 75% and balance 20% is Boehmite i.e. mono-hydrate alumina. The ore is ideally suitable for alumina plant at Muri designed by the KAISER ENGINEERING OF USA basing on BAYER'S PROCESS OF ALUMINIUM EXTRACTION ADOPTING DOUBLE DIGESTION TECHNOLOGY SUITED WELL FOR DIGESTION OF GIBBSITE & BOEHMITE BOTH.

Low/sub-grade minerals area hand sorted and suitably blended to ensure metal grade requirement of the plant. Also mechanical screening of the fraction above 1" in size is utilized for blending, if meeting the overall specification of the grade. Thus all possible efforts like hand sorting, hand screening, bulk sampling followed time to time chemical analysis are systematically followed to ensure that ore is not mixed with the waste.

So far as the fines below 1" in size are concerned it is established that the average silica in it is + 10% and - 30% alumina and hence is below the prescribed threshold value; therefore, not suitable at all for whatsoever conservation and hence they form a part of the waste and is backfilled to reclaim the mined out area concurrent to mine development.

China Clay: The crude china clay produced from the mine will be sold out directly to the paints, ceramic and rubber and other industries.



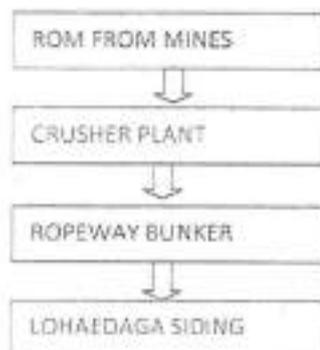
6.0 PROCESSING OF ROM AND MINERAL REJECT

Only crushing of ore is done at mine site. The ore is delivered from the quarries by dumpers to a hopper at the Crushing Plant. Two jaw-type crushers crush the ore to 25 mm size, and the crushed ore taken by a 900 mm wide belt conveyor to the Loading Bunker.

Crushing, Screening & washing of low grade / sub-grade bauxite minerals will be carried out as & when required for optimum use of mineral resources.

The crushed (and screened) ore is loaded into the 0.60-t buckets of the mono-cable ropeway. This 10-km long ropeway transports the ore from the hill top to the Lohardaga railway siding in about 75 min. A total of 300 buckets are on the rope at any given time.

At the railway siding, the buckets unload directly into broad-gauge railway wagons if available. If the wagons are not available in the siding, the ore is dumped on the ground, to be reclaimed later (as required) by FE loaders and taken to the Company's own alumina plant at Mari.



Disposal Method of Tailing/ Mineral Beneficiation:

Tailings/ rejects generated if any, will be dealt in environmental friendly manner such as backfilling etc.



7.0 OTHER

Other Services:

At present there is a regular mine office within the lease area, a rest shelter, canteen, Health Centre, Club, Creche, Canteen etc. as per the statutory provision. Offices, staffs and labourers are also situated within the leasehold area. A substation located on the hill-top gets supply at 11 KV from the Lohardaga Substation of Jharkhand State Electricity Board. Since power supply situation in Jharkhand is very erratic, there are very frequent shutouts, the Company has installed at the hill top two diesel generators of 250 KVA and 250 KVA capacities.

Water Supply: As there are no perennial sources of water on the hill-top, the Company has constructed an earthen dam on the perennial local Champi Nallah in the valley between the Bagru and the Bagru plateaus creating a capacity of 10 ML. Water from here is pumped by two pumps, of 60 m³/ph capacity each, to Hill top where arrangements for its treatment and distribution have been made.

At the final closure stage the infrastructure shall be handed over to the local authority after negotiation. In case of failure, which has very remote chances, the infrastructure shall be dismantled.

Employment Potential:

MANPOWER REQUIREMENT:-

Departmental:

Skilled = 57 No.

Semi Skilled = 35 No.

Un-Skilled = 25 No.

Managerial & Supervisory Staff = 17 No.

Total: 134 No.

Contractual:

Skilled = 12 No.

Supervisory Staff = 01 No.

Total: 13 No.



PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR'2017

Environment Base line information: Attach a note on the status of baseline information with regard to the following.

The types of land of the originally granted lease area

Forest		Non-forest	
Forest(specify)	Area(ha)	Types of land	Area(ha)
Forest land	19.56	Agriculture Land	42.51
		Waste Land	2.51
Surrendered Forest land	21.43	Waterways	0.03
		Roads & Common land	1.70
		Rajyati Land	9.10
Total Granted lease area			96.84
Surrendered area			21.43
Retained lease area			75.41

The Khata map of the area is given in Plate 2 & 15 for Bagru lease. Annexure 2 gives plot-wise details for Bagru lease.

Mining operations were started in Bagru lease in late 1940's to feed bauxite to the first alumina plant in India located at Muri, set up by the company. In early 1960's, the mine was converted into a fully mechanized mine by introducing deep-hole blasting and shovel-dumper combination. A crushing and screening plant was also installed at the hill top.

Land Use Pattern:

Existing land Use Pattern is as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
Quarries including reclaimed area	40.91 {14.28 Quarry(1.80 Reservoir) +26.63 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	51.9 {20.04 quarry(1.80Reservoir) + 31.86 reclaimed area}
Waste	1.33	1.29	2.62
Landfilled O.B. Dump	1.58	1.06	2.64
Open Dump	1.10	NIL	1.10
Infrastructure	0.35	0.26	0.61
Overseep	1.00	NIL	1.00
TOTAL :	46.27	13.60	59.87
Balance area not in use	9.58	5.96	15.54
Total Lease area	55.85	19.56	75.41



Water Regime:

There is no perennial nallah or water course on the hill top. The rain water during monsoon is channelised to mined out voids and stored to be used during dry seasons.

General SE-flowing nallahs and streams originate from the highland and flow to the South Koel River which controls the surface drainage in this region. The Serandag Plateau lies in the western part of the area from where nallahs and streams discharge into the North Koel River. Thus, bauxite-capped plateaus in this region have a distinctive topographical feature forming part of the 'divide' between north-flowing North Koel River in the west, and south-flowing South Koel River in the east.

Water Quality

Though the main pollutant of water in mining operations is suspended solids during the rainy season, its quantum is lower than that caused by natural rain-induced erosion.

Properly-graded garland drains of 1.0 m x 0.6 m size are being maintained around waste dumps to control rain wash-off.

Monitoring of water has been carried out on quarterly basis as per the MoEF norms and will be continued in near future. Water analysis will be carried out seasonally. In this area no acid mine drainage could be seen so no proposal is sought out for this purpose.

During the rainy season surface water percolates and retain above, as below the bauxite zone there is lithomarge, which acts as good aquifer. The water table is more than 20m below the surface.

Quality of air:-

Due to the comparative moderate mechanization in the Bagru Hill Mine, the principal pollutant of air would continue to be SPM, the main sources of dust generation being (a) haul road (b) drilling operations, (c) blasting operations, and (d) truck transport. The Crushing and Loading Plant would also continue to be a sensitive location from this aspect.

The water stored in the rainwater harvesting ponds is used for water sprinkling on haul roads. The drill machine is provided with dust suppression arrangements for minimizing dust during drilling operations.

Proper maintenance of truck & dumper bodies and covering the trucks with tarpaulin prevents spillage, which is a major source of SPM generation during road transport.

For reducing the high SPM-make at the Crushing and Loading Plant, water sprinkling is carried out in dry seasons in the crusher hopper.


AUTHORIZED PERSON



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Noise:

The area is clam, quite and silent. At night only the twittering of the crickets from the nearby fields and jungles can be heard. During daytime noise is produced due to movement of vehicles, drilling and blasting.

Flora:

The area does not have any rare species of flora. In fact, the flat plateau lands were being cultivated before the start of mining here. The trees and bushes occur mainly on the slopes or escarpments. The tree species found in the area includes Sal (*Shorea robusta*), Gambhar (*Samanea arboria*), Kend (*Diospyros Temensta*), Mahua (*Bassia Tatyfolira*), and Piar (*Buchania Lotyfolia*).

Berry bushes are also available. Density of vegetation is 0.2 to 0.3.

Fauna:

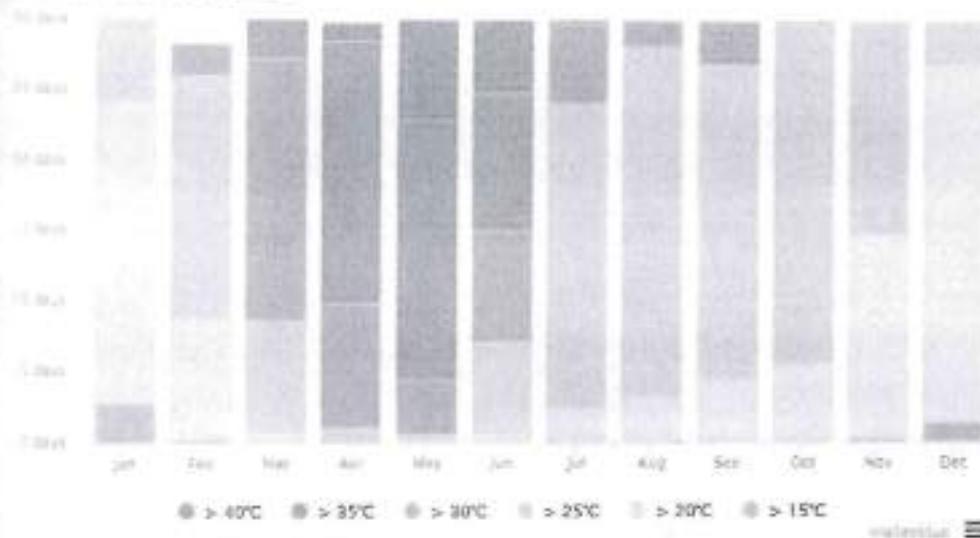
Evidence of fauna is not present in the mine area.

Climate:

The hottest months are May and June when temperature remains around more than 40°C. The coldest months are January and February when the maximum temperature remains around 15°C.

The area is devoid of large variability of temperature and free from exposure.

Maximum temperatures



**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



Annex fall:-

Year wise rain fall data (in mm) of Lohardaga district of collected from Custom Information System (CRIS), Hydromet Division, India Meteorological Department, under Ministry Of Earth Sciences (<http://www.imd.gov.in>) for the is tabulated below:

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Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2014	83	72.4	39.8	17.2	118.2	47.5	217.2	210.8	318.4	15.8	0	0	1065.6
2015	22.6	4.6	56.2	30.3	13.7	149.6	480.8	278.7	68.8	20.1	0	1.1	1126.5
2016	7.5	0.9	37.9	0	41.2	114.2	358.3	465	294.6	56.2	0	0	1376.2
2017	7.9	0	3.1	0	19.6	157.1	591	217.1	180.4	75.1	11	0	1272.3
Average													1210.15

Human Settlement and Demographic Profile :

No village or basti is located within the leasehold area. Villages are fall within in the 5 Km radius buffer zone of the lease along with population (Census 2011)Source:- www.censusindia.gov.in.) area are as follows.

Town / Village Name	No of Households	Persons	Males	Females
Agardihi	54	243	111	132
Bagru	443	2,260	1,141	1,119
Banpur	90	543	268	275
Bhusar	117	649	325	324
Charpi	51	305	149	156
Chhechhranawadih	30	142	78	64
Chotehorgain	92	502	252	250
Hisri	584	3,151	1,556	1,595
Kekrang	95	424	208	216
Korgo	63	325	170	155
Nawadih	570	3,011	1,517	1,494
Patgachha	111	556	268	288
Patratu	306	1,851	932	919
Rorad	277	1,485	764	721
Semartanr	56	295	137	158

Public Building etc:

There is no historical monument or place of archaeological interest within 50 km radius of the mine. However, the hill station of Netarhat lies within this distance. There is no other place of tourist or religious interest. The mining lease area does not lie within 10kms of national park/sanctuary.

Whether the area comes under notified any sanctuary:

There is no sanctuary within the 10 Km buffer zone.

8.2 Impact Assessment:

In such a shallow mine impact due to mining will be insignificant as given below:

Land Environment:

Land Scaper:

Isolated uplifted parts of lands and bound by steep scarps are the characteristic features of Chhotanagpur Plateau. The area under reference is also a part of Chhotanagpur Plateau with steep scarps on western sides. The Plateau ground is almost plane.

Mining will be from the ridge of the Plateau and advancing towards the center.

Overburden/ Wastes are regularly being used in backfilling and not allowing the heaps to rise. Mining here is sub-surface quarrying and as such there would not be any change in the natural landscape.

During the plan period of five years, the exhausted quarries will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. The level of the backfilling shall be maintained up to a moderate height which is practicable. During the conceptual plan period these reclaimed areas will be addressed with suitable varieties of plants. The other voids so left will be filled with rain water and shall be treated as water reservoir. Refer conceptual plan, Plate no 13.

Aesthetic Environment:

Visual perception is the most familiar area of aesthetic environment the assessment of which is made when viewed from a distance. The scary patch of the pit would hardly be visible as concurrent backfilling will be done followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. The degree of impact on the aesthetic environment cannot be quantified.

Soil and Land Use Pattern :

The soil in the area is gritty in nature. The quantum of soil removed during the mining will be use for rehabilitation by spreading over the backfilled areas. Soil will lose its compactness. Present land use pattern and Land use pattern after the plan period are given below:

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

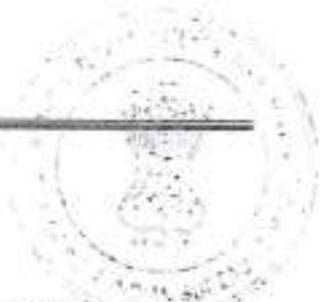
Land Use Pattern:

Existing land Use Pattern is as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA.
All quarries including reclaimed area	40.91 (14.28 Quarry(1.80 Reservoir) +26.63 Reclaimed Area)	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	51.9 (20.04 quarry(1.80Reservoir) + 31.86 reclaimed area)
Land	1.33	1.29	2.62
Stabilised O.B. Dump	1.58	1.06	2.64
Soil Dump	1.10	NIL	1.10
Infrastructure	0.35	0.26	0.61
Ownership	1.00	NIL	1.00
TOTAL :	46.27	13.60	59.87
Balance area not in use	9.58	5.96	15.54
Total Lease area	55.85	19.56	75.41

Years wise Land use:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)				
	After 2019-20	After 2020-21	After 2021-22	After 2022-23	After 2023-24
All quarries including reclaimed area	41.38 (1.80 Reservoir) + 27.78 Reclaimed Area)	42.14 (1.80 Reservoir) + 29.18 Reclaimed Area)	43.15 (1.80 Reservoir) + 32.24 Reclaimed Area)	44.45(1.80 Reservoir) + 33.44 Reclaimed Area)	45.36 (1.80 Reservoir) + 35.46 Reclaimed Area)
Land	1.33	1.33	1.33	1.33	1.33
Stabilised O.B. Dump	1.58	1.58	1.58	1.58	1.58
Soil Dump	0.10	0.10	0.10	0.10	0.10
Infrastructure	0.35	0.35	0.35	0.35	0.35
Ownership	1.00	1.00	1.00	1.00	1.00
TOTAL :	45.74	46.5	47.51	48.81	49.72



Scenario after plan period :

Land Use Pattern at the end of 5 years plan period will be as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
Quarries reclaimed	45.36 (9.9 Quarry + 35.46 Reservoir) + 35.46 Reclaimed Area]	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	56.35 (15.66 quarry + 1.80 Reservoir) + 40.69 reclaimed area]
Reclaimed O.B. Dump	1.33	1.29	2.62
Small Pump	1.58	1.06	2.64
Structure	0.10	NIL	0.10
Structure	0.35	0.26	0.61
Structure	1.00	NIL	1.00
TOTAL :	49.72	13.60	63.32
Lease area not in use	6.13	5.96	12.09
Total Lease area	55.85	19.56	75.41

iv. Quality of air:-

Mining area is considered to be dust prone, as dust is generated at various points of operations in the mines. Major sources of dust generations are drilling, blasting, excavation, transportation of materials, loading into trucks etc. Most of the dust generation is fugitive in nature and is normally localized near the generation points. In this aspect quarterly monitoring of air been done as per the MoEF norms & regular water sprinkling also done in this area to maintain the air quality.

The water stored in the rainwater harvesting ponds is used for water sprinkling on haul roads. The drill machine is provided with dust suppression arrangements for minimizing dust during drilling operations.

Proper maintenance of truck & dumper bodies and covering the trucks with tarpaulin prevents spillage, which is a major source of SPM generation during road transport.

v. Water Environment:

Surface Water:

As there is no seasonal nalla or water body within the leasehold area, therefore no change will be observed due to mining operation.



Ground Water:

Ground water level of the plateau area in general is too low. The mining activity will be restricted up to a depth of 10m -15m. Therefore, the mining activity in the leasehold area will not make any impact on ground water. The water table in the area is below 30m.

Water Quality:

No change will be noticed due to mining operation as the source of drinking water is far away from the area. In this aspect quarterly monitoring of water quality (surface water, drinking water) has been done as per the MoEF norms.

Noise:

The area is clam, quite and silent. At night only the twittering of the crickets from the nearby fields and jungles can be heard. During daytime noise is produced due to mining operation like drilling, blasting, movement of vehicles etc. In this aspect quarterly monitoring of noise has been done as per the MoEF norms.

Ground vibration due to blasting - In this mine, the vibrations are caused due to blasting. The vibrations by their mechanical effects act on existing rocks and subject them to tensile, compressive and shearing stresses, which spoil their mechanical characteristics with an immediate consequence.

Control of Vibrations:

1. Blast holes shall be initiated by non-electric (NONEL) down-the-hole (DTH) delay detonators.
2. Care is taken to ensure that effective burden is not excessive and the face shall be kept sufficiently long. The burden shall be kept at 3m & spacing is 3.5m
3. Optimum charge per delay shall be kept as low as possible.
4. The depth of the hole is normally 5 m, which includes about 0.5 meter of sub grade drilling, i.e. about 10% of the depth of hole. The diameter of the hole shall be kept at 100 mm.
5. Adoption of two row blasting and V pattern of firing.
6. The firing of maximum possible no. of blast holes towards free face.
7. Use of delay detonators between the holes and rows of blasting.

There will be no contamination of the water body as the water body is far away from the proposed area for working.

During the plan period of working, the mining will be restricted up to a moderate depth & the water table of the area is far below the ground. So, no seepages could be seen and entrance of surface water is not possible. Except during rainy season water could be clogged in the quarry.



The efforts will be taken to treat this water for reducing suspended solid matters and other ingredients within the permissible limit. The efforts will be taken to treat this water for reducing suspended solid matters and other ingredients within the permissible limit as per IS-2490 before discharging from the leasehold. The drinking water will be supplied from natural springs situated near village and the quality of drinking water will be maintained. The surface water during the rainy season will accumulate inside the pit limit and outside it goes through the natural stream/nallah. The quarry floor of bauxite horizon is limited up to the level of lithomarge clay, which is good aquifer for water storage. This lithomarge clay will not be disturbed and during the course of mining and backfilling will be carried out over it with granite boulders having good absorbing capacity for holding water and wastes. Thus the ground water table will not be disturbed and all attempts will be taken that contamination of surface water polluted if any could be avoided to mix up with ground water at any stage. Since mining at Kujam bauxite mine will be started from the lower level towards higher ground, water will drain out naturally.

iii) Acid mine drainage:-

There will be no such acid mine drainage as the only mining operation will be done in the area without any beneficiation.

iv) Socio – economic Environment:

Mining in this area has not shifted any settlement; on the other hand, workers are all local residents. Therefore, there is no question of any migration. Besides the lessee provides for basic facilities on medical, educational and recreational to the nearby areas.

Above all the employees are getting better wages which has increased the level of income of local people. Thus there is general improvements of the socio- economic conditions.

Social and Demographic Profile:

25 years back, the major inhabitants of the area were illiterate and used to live in hardship. Due to mining operation their livelihood has been uplifted and even literacy can be observed within them. Thus due to mining operation their traditional culture will be changed.

Recreation Facility:

Mining activity in the area will not affect the recreation facility of the local inhabitants. They will get more facility of recreation by library, play ground and other cultural programmes.



40 Historical Monuments etc

As there is no historical monument located in the buffer zone, there is no problem of impact to them by mining activities in the area.

Progressive Reclamation Plan:

To mitigate the impacts and ameliorate the condition, describe year wise steps to be phased restoration, reclamation of lands already/to be degraded in following items separately for 5 years period.

41 Mined-Out Land:

Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals may be supported with yearly plans and sections depicting progress in the activities for land restoration/ reclamation / rehabilitation, afforestation etc, called "Reclamation Plan".

While preparing a conceptual mining plan for the Bagru Lease, the following points and concepts have been kept in view:

- 41.1 The ore bodies in the leasehold not being continuous extraction of bauxite in a new block would be started only after exhausting the block under operation.
- 41.2 The removal of overburden as well as breaking and heaping of bauxite would be done with excavator. As space become available in the excavated area, the overburden generated during mining would be concurrently pushed into voids as backfill.
- 41.3 During the plan period of Bagru mining lease will be backfilled by mechanized landscaping, followed by vegetation. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees. During the conceptual plan period concurrent back filling shall be continued in the area. The level of the backfilling shall be maintained up to a moderate height which is practicable and under practice in other mines of the company. During the conceptual plan period these reclaimed areas will be afforested with suitable varieties of plants. The other voids so left will be filled with rain water and shall be treated as water reservoir.

Anticipated life of the mine on the Basis of Reserve of Bauxite:

The total proved balance mineable ore (ROM) including sub grade ore would be 444591 tonnes. Out of the total ROM 10% is considered as intercalated waste. Thus the recoverable reserve would be 400132 tonnes. This reserve will be exhausted in this five years plan period, thus life of the mine is about 5 years based on the present balance reserve quantities of bauxite



(sub-grade). Future exploration by drilling boreholes in the virgin area including the colony area will be taken up for establishment of additional reserve category for future mining thus the life of the mine may also be enhanced.

Anticipated life of the mine on the Basis of Reserve of China Clay:

The total proved balanced mineable China clay would be 1088023 tonnes. Recovery of clay would be 100%. Considering the production of China Clay in this plan period would be 98927 tonnes. The balance reserve would be 989096 tonnes. Considering the targeted production 20160 tonnes per annum, the balance reserve will sustain for 49 years. Thus, the life of the mine would be about 5 years + 49 years i.e., 54 years.

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Production target of Bauxite & China clay

Year	Quantity of bauxite in tonnes	Quantity of Sub-grade (Al-laterite) in tonnes	Quantity of bauxite ore after blending in tonnes	Quantity of China clay in tonnes
2014-20	81166	00	81166	19240
2015-21	81506	00	81506	19543
2016-22	80330	00	80330	19853
2017-23	65667	10575	76242	20160
2018-24	80828	00	80828	20131
Total	389497	10575	400072	98927

The overall average grade of ore in this area is estimated to be +40% on the basis of sampling of boreholes / quarry samples.

Generation and rehabilitation -

Generation of waste during this plan period:

Year	Soil & morrum (Cum)	Laterite (Cum)	Lithomarge (Cum)	Quarry waste (IW) (Cum)	Total OB & waste
2014-20	44730	8622	7790	4487	65629
2015-21	64648	30447	5554	4506	105155
2016-22	95991	54085	0	4441	154517
2017-23	78585	0	5433	4215	88233
2018-24	104043	53562	4261	4468	166334
Total	387997	146716	23038	22117	579868

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Total generation of lithomarge during the life of the mine:

After the conceptual mining period, on the basis of proposed production planning and available reserve position, the ultimate pit area, ultimate pit depth, ultimate generation lithomarge is given below: (china clay is found below the layers of soil Mountain laterite Bauxite and lithomarge, but in this the top layers of lithomarge is already excavated during the excavation of bauxite. So only lithomarge exist top of the china clay layers.)

Year	Total generation of lithomarge during the course of excavation of ore. (m ³)
2019-20	7790
2020-21	5554
2021-22	00
2022-23	5433
2023-24	4261
Total	23038
During conceptual period	225772
Total	248810
After considering 20 % swelling factor	398572

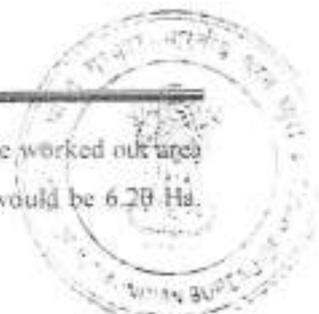
There are four stabilized old O.B. dumps in the Bagru lease area. All these dumps were created when mining was started in this leasehold. Out of the four old O.B. dumps two are soil dumps which will be removed and reclaimed during the plan period and conceptual stage. It is not possible to remove two O.B. Dumps during the plan or conceptual period as these dumps are stabilized with the plantation. Currently, all overburden is backfilled in mined-out areas concurrently.

These backfills were started a little away from edge of the plateau and are suitably benched for stability. The height of backfills in the Bagru lease varies from 10 m to 12m.

The year wise area to be reclaimed is as under:

Year	Area to be backfilled In Ha	Location of Backfilled area
2019-20	1.15	Working Quarry no. 1 by concurrent backfilling.
2020-21	1.40	Working Quarry no. 1 by concurrent backfilling.
2021-22	3.06	Working Quarry no. 1 by concurrent backfilling.
2022-23	1.2	Working Quarry no. 1 by concurrent backfilling.
2023-24	2.02	Working Quarry no. 1 by concurrent backfilling.
Total	8.83	

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



During the conceptual plan period four water reservoirs will be created in the worked out area near the central part of the area. The area covered by this water reservoir would be 6.20 Ha. Road will be created all around the reservoir to protect the reservoir.

Land Use Pattern:

Working land Use Pattern is as under:

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DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
All quarries including reclaimed area	40.91 {14.28 Quarry(1.80 Reservoir) +26.63 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	51.9 {20.04 quarry(1.80Reservoir) + 31.86 reclaimed area}
House	1.33	1.29	2.62
Controlled O.B. Dump	1.58	1.06	2.64
Controlled Dump	1.10	NIL	1.10
Structure	0.35	0.26	0.61
Overlapping	1.00	NIL	1.00
TOTAL :	46.27	13.60	59.87
Lease area not in use	9.58	5.96	15.54
Grand Lease area	55.85	19.56	75.41

Year wise Land use:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)				
	After 2019-20	After 2020-21	After 2021-22	After 2022-23	After 2023-24
All quarries including reclaimed area	41.38 (1.80 Reservoir) + 27.78 Reclaimed Area)	42.14 (1.80 Reservoir) + 29.18 Reclaimed Area)	43.15 (1.80 Reservoir) + 32.24 Reclaimed Area)	44.45(1.80 Reservoir) + 33.44 Reclaimed Area)	45.36 (1.80 Reservoir) + 35.46 Reclaimed Area)
House	1.33	1.33	1.33	1.33	1.33
Controlled O.B. Dump	1.58	1.58	1.58	1.58	1.58
Controlled Dump	0.10	0.10	0.10	0.10	0.10
Structure	0.35	0.35	0.35	0.35	0.35
Overlapping	1.00	1.00	1.00	1.00	1.00
TOTAL :	45.74	46.5	47.51	48.81	49.72

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



Land use after plan period :

The Land Use Pattern at the end of 5 years plan period will be as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
For all quarries including reclaimed area	45.36 {9.9 Quarry(1.80 Reservoir) + 35.46 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	56.35 {15.66 quarry(1.80 Reservoir) + 40.69 reclaimed area}
Road	1.33	1.29	2.62
Abandoned O.B. Dump	1.58	1.06	2.64
Topsoil Dump	0.10	NIL	0.10
Infrastructure	0.35	0.26	0.61
Township	1.00	NIL	1.00
TOTAL :	49.72	13.60	63.32
Balance area not in use	6.13	5.96	12.09
Total Lease area	55.85	19.56	75.41

Land use after Conceptual plan period :

The Land Use Pattern after conceptual plan period will be as under:

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)	LAND USE IN FOREST AREA (HECTARES)	TOTAL LAND USE IN HA
For all quarries including reclaimed area	45.36 {8.72 Quarry(6.20 Reservoir)+ 36.64 Reclaimed Area}	10.99 (5.76 Quarry + 5.23 Reclaimed Area)	56.35 {14.48 quarry(6.20 Reservoir) + 41.87 reclaimed area}
Road	1.33	1.29	2.62
Abandoned O.B. Dump	1.58	1.06	2.64
Topsoil Dump	0.10	NIL	0.10
Infrastructure	0.35	0.26	0.61
Township	1.00	NIL	1.00
TOTAL :	49.72	13.60	63.32
Balance area not in use	6.13	5.96	12.09
Total Lease area	55.85	19.56	75.41



With rapid industrialization and consequent deleterious impact of pollutants on environment, the need of environmental protection offered by trees are becoming clear. Trees are very suitable for detecting, recognizing and monitoring air pollution effects. Monitoring of biological effects of air pollutant by the use of plants as indicators has been applied on local, regional and national scale. Trees function as sinks of air pollutants, besides their bio-esthetical value owing to their presence in large numbers. Annual need of oxygen for one person is met by 150 m² of leaf surfaces i.e. 30-40 m² of greenery. So, it is necessary to develop green belt in and around the polluted site with suitable species to combat the air pollution effectively.

The green belt development not only functions as a foreground and background landscape feature resulting in harmonizing and amalgamating the physical structures of the mines with surrounding environment, but also acts as a pollution sink as indicated above. Thus, implementation of afforestation program is of paramount importance. In addition to supplementing existing vegetation, it will also check soil erosion, make the ecosystem more complex and functionally more stable and make the climate more conducive.

General Guide Lines for Plantations

- Trees growing up to 10 m or more in height should be planted around the mine;
- Plantation of trees should be done in appropriate circular rows around the mine in alternate rows to prevent horizontal pollution dispersion;
- Trees should also be planted along road sides, to arrest vehicular exhaust and noise pollution and in such a way that there is no direct line of sight to the mine when viewed from a point outside the foliage perimeter;
- Since tree trunks are normally devoid of foliage (up to 3 m), it would be appropriate to have shrub near such trees to give coverage to this portion;
- Fast growing trees with thick perennial foliage should be grown in order to attain more height and canopy in less time.

Species for Arresting Dust

Species, particularly having compact branching, closely arranged leaves, broad leaves of simple elliptical and hairy structure, shiny or waxy leaves and hairy twigs are efficient filters for dust. The leaf surface of plants is 10-20 times greater than the earth surface occupied by them. It is known that particles up to 80 milli micron may stick to vertical surfaces. It is found that 8 m wide green belt reduces the dust fall by 2-3 times. The following species are chosen to filter the dust pollution:



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- Cassia fistula* - Amaltaas
Bauhinia purpurea - Purple Orchid Tree
Cassia siamea - Kassod tree
Polyalthialongifolia - Debdaru Tree
Ficus religiosa - peepul Tree.
Tamarindusindica - Tamarind Tree or Imli Tree.
Meltoazedarach - Chinaberry tree or Bakain tree.
Azadirachtaindica - Neem Tree.
Terminaliaarjuna - Arjun Tree.
Recommended Plant Species

On the basis earlier experiences in this area, the following plant species are recommended for greenery of the applied mine lease area.

- Alstoniascholaris*- Scholar Tree, Dita bark, Devil tree.
Cassia fistula- Amaltaas
Cassia siamea- kassod tree
Polyalthialongifolia- Debdaru Tree.
Ficus religiosa- peepul Tree.
Tamarindusindica - Tamarind Tree or Imli Tree.
Azadirachtaindica - Neem Tree.
Terminaliaarjuna - Arjun Tree.
Anthocephaluscadamba - Kadain Tree.
Micheliachampaca - Champa Tree.
Cassia siamea - Kassod Tree.
Dalbergiasissoo - Shisham Tree.

DETAILS OF AFFORESTATION SCHEME

Sr. No.	Year	Area (Ha)	Number of Plants
1	2019-20	1.15	2875
2	2020-21	1.4	3500
3	2021-22	3.06	7650
4	2022-23	1.2	3000
5	2023-24	2.02	5050
Total		8.83	22075

Provisionary measures will be taken for carrying of the afforestation made by regular watering in the afforested area, to protect from grazing animals and proper manuring. Man will be deployed for protecting and doing the above.

All excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees.

3.3.2 Topsoil Management: The topsoil available at the site and its utilization may be described.

Topsoil, murrum, overburden & waste :-

About 579868 Cu.m. of overburden (including soil) & waste is excavated in the 5 years of mining in the Bagru Bauxite Mine during the course of excavation of Bauxite & china clay. The overburden consists of soil, murrum, hard laterite and quarry waste and lithomarge. These wastes are utilized in backfilling the areas from where bauxite has been extracted. Backfill is done sequentially; hard laterite is dumped in void first, it is then covered by murrum; and finally soil is spread on top.

The soil is removed separately and used immediately to cover the backfill filled area of laterite and murrum. The soil is not stacked separately, as with proper planning; it is possible to use it simultaneously.

The year wise quantum of soil, overburden, quarry waste & Lithomarge is as under:

Year	Soil & murrum (Cum)	Laterite (Cum)	Lithomarge (Cum)	Quarry waste (IW) (Cum)	Total OB & waste
2010-11	44730	8622	7790	4487	65629
2011-12	64648	30447	5554	4506	105155
2012-13	95901	54085	0	4441	154517
2013-14	78585	0	5433	4215	88233
2014-15	104043	53562	4261	4468	166334
Total	387997	146716	23038	22117	579868

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Year	Top Soil (Cum)		Mineral Rejects (Cum)			
	Reuse / spreading	Storage	Backfilling	Storage	Blending	Beneficiation
2019-20	44730	Nil	Nil	Nil	Nil	Nil
2020-21	64648	Nil	Nil	Nil	Nil	Nil
2021-22	95991	Nil	Nil	Nil	Nil	Nil
2022-23	78585	Nil	Nil	Nil	Nil	Nil
2023-24	104043	Nil	Nil	Nil	Nil	Nil
Total	387997	Nil	Nil	Nil	Nil	Nil

Excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees. No dump will be created.

There are four stabilized old O.B. dumps in the Bagru lease area. All these dumps were created when mining was started in this leasehold. Out of the four old O.B. dumps two are soil dumps which will be removed and reclaimed during the plan period and conceptual stage. It is not possible to remove two O.B. Dumps during the plan or conceptual period as these dumps are stabilised with the plantation. Currently, all overburden is backfilled in mined-out areas concurrently.

These backfills were started a little away from edge of the plateau and are suitably benched for stability. The height of backfills in the Bagru lease varies from 10 m to 12m.

The year wise area to be reclaimed is as under:

Year	Area to be backfilled In Ha	Location of Backfilled area
2019-20	1.15	Working Quarry no. 1 by concurrent backfilling.
2020-21	1.40	Working Quarry no. 1 by concurrent backfilling.
2021-22	3.06	Working Quarry no. 1 by concurrent backfilling.
2022-23	1.2	Working Quarry no. 1 by concurrent backfilling.
2023-24	2.02	Working Quarry no. 1 by concurrent backfilling.
Total	8.83	

8.3 Tailings Dam Management: The steps to be taken for protection and stability of tailing dam, stabilization of tailing material and its utilization, periodic desilting measures to prevent water pollution from tailings etc, arrangement for surplus water outflow along with detail design, structural stability studies, the embankment seepage into the receiving environment and ground water contaminant if any may be described.

Waste/ rejects generated if any, will be dealt in environmental friendly manner such as backfilling etc.

8.4 Acid mine drainage, if any and its mitigative measures.

There shall be no acid mine drainage in the area.

8.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism.

The information on protective measures for reclamation and rehabilitation works year wise is provided in the following table below.



TABLE OF YEARWISE PROPOSAL FOR ITEM NO. 8.3:- Year - 2019-20

	Details	Proposed	Actual	Remarks
Afforestation	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Rehabilitation	Area available for rehabilitation (ha)	Nil		
	Afforestation done(ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
Backfilling	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
	Void available for Backfilling (L x B x D) pit wise /slope wise	1.15 ha 127mX90mX7m		
	Void filled by waste /tailings	Nil		
Reclamation	Afforestation on the backfilled area	With 2875 numbers of plants		##
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 2691000/-		
Reclamation	Area available (ha)	Nil		
	Area rehabilitated	Nil		

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LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Method of rehabilitation	Nil		
Terracing in Waste Dump	Nil		
Terracing in Soil Dump	Nil		
Parapet/Retaining wall at toe of dumps	Nil		
Garland Drain & settling ponds, etc.	Nil		
Cost involved	Nil		
Environmental monitoring cost	Rs. 1,80,000/-		

Quarterly in 2 locations for air and 2 locations for water, 2 locations for noise & one location for soil will be monitored.

All excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be sown, followed by plantation of fast-growing shrubs and trees.

2020-21

Sl. No.	Details	Proposed	Actual	Remarks
1	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
2	Area available for rehabilitation (ha)	Nil		
	Afforestation done (ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
3	Cost including watch and care during the year	Nil		
	Void available for Backfilling (L x B x D) pit wise /slope wise	1.40 ha 149mX94mX9m		
4	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	With 3500 numbers of plants		##
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 3276000/-		
5	Area available (ha)	Nil		
	Area rehabilitated	Nil		

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



Method of rehabilitation	Nil		
Terracing in Waste Dump	Nil		
Terracing in Soil Dump	Nil		
Parapet/Retaining wall at toe of dumps	Nil		
Garland Drain & settling ponds, etc.	Nil		
Cost involved	Nil		
Environmental monitoring	Rs. 1,80,000/-		

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... in 2 locations for air and 2 locations for water, 2 locations for noise & one location for soil will be monitored.

... excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees.

	Details	Proposed	Actual	Remarks
Afforestation	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Rehabilitation	Area available for rehabilitation (ha)	Nil		
	Afforestation done (ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
Backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	3.06 ha 195mX51mX6m 325mX63mX6m		##
	Void filled by waste /tailings	Nil		
Rehabilitation of waste land	Afforestation on the backfilled area	With 7650 numbers of plants		##
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 7160400/-		
Rehabilitation of waste land	Area available (ha)	Nil		
	Area rehabilitated	Nil		

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE- M/S HINDALCO INDUSTRIES LIMITED**

Method of rehabilitation	Nil
Terracing in Waste Dump	Nil
Terracing in Soil Dump	Nil
Parapet/Retaining wall at toe of dumps	Nil
Garland Drain & settling ponds, etc.	Nil
Cost involved	Nil
Environmental monitoring cost	Rs. 1,80,000/-



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Quarterly in 2 locations for air and 2 locations for water, 2 locations for noise & one location for soil will be monitored.

All excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be sown, followed by plantation of fast-growing shrubs and trees.

2023-24

	Details	Proposed	Actual	Remarks
Afforestation	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Rehabilitation	Area available for rehabilitation (ha)	Nil		
	Afforestation done (ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
Backfilling	Cost including watch and care during the year	Nil		
	Void available for Backfilling (L x B x D) pit wise /slope wise	1.20 ha 125mX96mX9m		##
	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	With 3000 numbers of plants		##
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 2808000/-		
Rehabilitation of open land	Area available (ha)	Nil		
	Area rehabilitated	Nil		

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



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Method of rehabilitation	Nil		
Terracing in Waste Dump	Nil		
Terracing in Soil Dump	Nil		
Parapet/Retaining wall at toe of dumps	Nil		
Garland Drain & settling ponds, etc.	Nil		
Cost involved	Nil		
Environmental monitoring cost	Rs. 1,80,000/-		

Quarterly in 2 locations for air and 2 locations for water, 2 locations for noise & one location for soil will be monitored.

all excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by excavated landscaping, followed by soil spreading. Initially, grasses and legumes would be sown, followed by plantation of fast-growing shrubs and trees.

	Details	Proposed	Actual	Remarks
Plantation	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Rehabilitation	Area available for rehabilitation (ha)	Nil		
	Afforestation done (ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
	Void available for Backfilling (L x B x D) pit wise /slope wise	2.02 ha 222mX99mX9m		
Rehabilitation	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	With 5050 numbers of plants		##
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 4726800/-		
Rehabilitation	Area available (ha)	Nil		
	Area rehabilitated	Nil		

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**

Method of rehabilitation	Nil		
Terracing in Waste Dump	Nil		
Terracing in Soil Dump	Nil		
Parapet/Retaining wall at toe of dumps	Nil		
Garland Drain & settling ponds, etc.	Nil		
Cost involved	Nil		
Environmental monitoring cost	Rs. 1,80,000/-		

Quarterly in 2 locations for air and 2 locations for water, 2 locations for noise & one location for soil will be monitored.

All excavated Overburden & waste will be used for concurrent backfilling. The process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees.

8.3 Disaster Management and Risk Assessment: This may deal with action plan for high risk accidents like landslides, subsidence flood, inundation in underground mines, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority may also be described.

The working is being carried out at shallow depth, no risk assessment or disaster management is required.

High risk factors such as landslide, subsidence flood, fire, tailing dam failure etc are not encountered nor anticipated during proposed four years plan period. As such, emergency plan for quick evacuation, protective measures are not proposed. Also, no local habitant exists as the working area is far away from the locality.

The various safeguards to be taken to ensure the safety of the mine and that of employees are provided in the Mines Act, 1952 and are being followed at mines. All the Mines of Hindalco has management system approach implemented and accredited for ISO-14001:2004 & ISO-38001:2007 for their Environment Management Systems & Occupational Health & Safety Management Systems which also focuses on risk assessment and its management programme including that for Disaster Management. Thus, there is already a system in place for disaster management at all of its mines.

Mining and allied activities are associated with several potential hazards both to the employees and the public. A worker in a mine should be able to work under conditions that are adequately safe and healthy. At the same time the environmental conditions should be such as not to

maintain his working efficiency. The various safeguards to be taken to ensure the safety of the mine and that of employees are provided in the Mines Act, 1952.

Following facilities are available at the mine site:-

1. Telephone / Mobile
2. Runner / Messenger
3. Emergency alarm
4. Fire fighting equipments and accessories with trained manpower
5. Training Centre
6. Fire Extinguisher
7. Dispensary, First Aid & ambulance van
8. Jeep / Bolero.

Contact person in case of emergency

Mines Manager (Bagru Bauxite Mine)

Address	:	Bagru hill bauxite mine, PO-Bagru
Pin Code	:	835302
Phone no.	:	06526-223163
Fax	:	06526-224118
Nearest Fire station	:	Lohardaga,
Nearest Hospital	:	Lohardaga.
Nearest Police station	:	Kisko.



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6.2 Care and maintenance during temporary discontinuance: An emergency plan for the situation of temporary discontinuance due to court order or due to statutory requirements or any other unforeseen circumstances may indicate measures of care, maintenance and monitoring of status of discontinued mining operations expected to resume in near future.

Due to unforeseen reason the mine will be a closed temporarily then proper care of workers and staffs will be taken. Temporary discontinuance notice in the prescribed form E under rule 25 of M.C.D.R., 2017 will be sent to the concerned authority of Indian Bureau of Mines as well as in the prescribed form under MMR, 1961 to the authority of D.G.M.S., concerned State Government and concerned Labour Department within the stipulated time.

Security guards to take care of the infrastructure shall be kept under the roll of the management in case of any temporary discontinuation.

**BAGRU BAUXITE MINE (75.41 HECTARES)
LESSEE: M/S HINDALCO INDUSTRIES LIMITED**



6a Financial Assurance:

The financial assurance can be submitted in any encashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 27 of Mineral Conservation and Development Rules, 2017 for five years period expiring at the end of validity of the document. The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no. 4 dated 2006 as below.

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Table indicating the break-up of areas in the Mining Lease for calculation of financial assurance

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S. No.	Head	Area put on use at start of scheme of mining Ha.	Additional requirement during plan period Ha.	Total Area in Ha.	Area considered as fully reclaimed & rehabilitated Ha.	Net area considered for calculation Ha.
2.	B	C	D	E E=(C+D)	F	G G= (E-F)
1	Area under mining	51.90	4.45	56.35	26.63	28.50
2	Storage for top soil	1.10	-1.00 (Rehanded)	0.10	0.10	0
3	Waste Dump site	2.64	00	2.64	2.64	0
4	Mineral storage	00	00	00	00	00
5	Infrastructure (Workshop, administrative building etc.)	0.61	00	0.61	00	0.61
6	Roads	2.62	00	2.62	00	2.62
7	Railways	00	00	00	00	00
8	Tailing pond	00	00	00	00	00
9	Effluent treatment plant	00	00	00	00	00
10	Mineral separation plant	00	00	00	00	00
11	Township area	1.00	00	1.00	00	1.00
12	Others to specify	00	00	00	00	00
	Grand Total	59.87	3.45	63.32	29.37	33.95


AUTHORIZED PERSON

PART B

Certificates / Undertakings/ Consents (As detailed below)

CONSENT LETTER/UNDERTAKING/ CERTIFICATE FROM THE APPLICANT:

- 72 Consent Letter to Qualified person, Undertaking with regard to submission of geo referenced cadastral map, Certificate with regard to the Progressive Mine Closure plan & Certificate with regard to the Mines Act, Rules and Regulations.
- 73 Undertaking with regard to maintenance of boundary pillars.
- 74 declaration with regard to association with Co- operative Association /Private Company /Public limited Company /Public Sector Undertaking / Joint Sector Undertaking.
- 75 Certificate from Qualified person with regard to the implementation of provisions of the Mineral Conservation and Development Rules' 1988 & Mineral Conservation and Development Rules' 2017.