F. No. MPS-34011/24/2018-CPAM
Government of India
Ministry of Coal
******

Room No. 622-A, Shastri Bhawan
New Delhi, the 28th September, 2020

To,

Shri Prakash Chand,
General Manager (Mines),
M/s Gujarat Industries Power Corporation Limited, Gujarat.
E-mail: avgupta@gipcl.com, genbaroda@gipcl.com

Subject: Approval of Mining Plan (3rd Revision) (including Mine Closure Plan) of Mangrol-Valia Lignite Mine, District- Surat and Bharuch, Gujarat of M/s Gujarat Industries Power Company Ltd - reg.

Sir,

In accordance with the deliberations in the Internal Committee meeting held on 10.8.2020, I am directed to convey the approval of the Ministry of Coal under MMDR Act. 1957 for the Mining Plan (3rd Revision) (including Mine Closure Plan) of Mangrol-Valia Lignite Mine, District- Surat and Bharuch, Gujarat of M/s Gujarat Industries Power Company Ltd.

2. The above approval is subject to the following conditions-

(a) The Project Proponent shall take all necessary precautions regarding safety of mine workings and persons deployed therein;

(b) All the mining operations shall be carried out within mining lease are only. Mining lease of this block shall not encroach into any other adjacent block;

(c) The cost of abandonment for carrying out the closure activities envisaged in the Mine closure plan is indicative; the actual cost for carrying out the activities at the time of final closure may be higher. The actual cost of abandonment will have to be borne by the Project Proponent for carrying out the closure activities;

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

(e) Typographical error in respect of the value of WPI as on April'2020 should be corrected in Executive Summary J(a)(B). However, since the value of WPI as on April'2020 is less than that of April '2019 (i.e. 121.1, notified base-rate month), the base rate shall not to be de-escalated. As per the new guidelines, the base-rate is to be escalated for calculation of modified rate for change in WPI and the same cannot be less than the notified base rate. The correct calculation should be ensured at the time of opening Escrow Account.

3. Two copies of the approved Mining Plans (including Nine Closure Plan), as mentioned in Para-1 above, duly signed by the competent authority, are enclosed herewith with the request that a copy of the approved mining plan may be submitted to the concerned State Government for necessary action and also a copy of the

approved Mining Plan May be sent to the Coal Controller for monitoring the block under intimation to this Ministry.

This issues with the approval of the Competent Authority.

Encl.: As above.

Yours Sincerely,

(Hitlar Singh)
Under Secretary to the Govt. of India
Tel: 23382269
E-mail: hitlar.singh85@nic.in

Copy to-

1. The Principal Secretary, Department of Mines, Gujarat Government
2. The CMD, M/s Gujarat Industries Power Company Ltd, Gujarat
3. The Coal Controller, Kolkata
4. Dy. Secretary (CBA-I), MoC.
5. Dy. Secretary (CBA-II)/Member Secretary, MoC.
6. Dy. Secretary (NA), MoC
7. PS to Director (T), MoC

M/S GUJARAT INDUSTRIES POWER COMPANY LTD.

SLPP, AT & Post Nani Naroli; Taluka: Mangrol, District: Surat, Gujarat.
Phone: 02629-261087; Email: cgmminesoffice@gipcl.com

MINING PLAN (3rd REVISION)
(INCLUDING MINE CLOSURE PLAN)
FOR
MANGROL-VALIA LIGNITE MINE
(MANGROL & VALIA LIGNITE FIELD)
AT
VILLAGES: MANGROL, SHAH, CHERETHA, AMANDERA, HARSANI, TIMBERWA, BHILWADA, NANI PARDI, LUNA, DANSOLI, RAJGARH AND KOSMADI
DISTRICTS: SURAT AND BHARUCH
STATE: GUJARAT

(Under Rule 22A(2) of Mineral Concessions Rules, 1960)

(EXTENT: 2059.6829 HA.; CAPACITY: 5.4 MTPA)

[Re-submitted after incorporation of clarifications to observations of Technical Members of the Standing Committee constituted under MMDR Act, 1957 vide MOC Letter No. 34011-24-2018-CPAM dt. 15-01-2020 & Internal Committee dt. 19-08-2020]

(VOLUME-I: TEXT & ANNEXURES)

BASE DATE : 01-04-2020
DATE OF SUBMISSION : AUGUST 2020

हिटलर सिंह / HITLAR SINGH
अवर सचिव / Under Secretary
कोयला मंत्रालय / Ministry of Coal
भारत सरकार / Govt. of India
शास्त्री भवन / Shastri Bhawan
नई दिल्ली / New Delhi

Prepared by:

B.D. SHARMA
RQP NO. 34012/03/2014-CPAM

B.D.SHARMA
(Recognized Qualified Person)
(No. 34012(03)/2014-CPAM Dt. 29th May 2015, valid upto May 2025)

MIN MEC CONSULTANCY PVT. LTD.
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Estb. 1983

An ISO 9001:2015 approved company

Compliance to the observations of the Internal Committee held on 10th August, 2020 through Video Conference to consider the Mining Plan (3rd Revision) (including Mine Closure Plan) for Mangrol Valia Lignite Mine of M/S GIPCL issued vide letter no. 34011-24-2018-CPAM, DT. 19-08-2020.

<table>
<tr><th>Sl. No.</th><th>Observations</th><th>Compliance</th></tr>
<tr><td>5(b)</td><td>Shri Sujoy Mazumder CCO pointed out that in compliance at page no. 6 (CL 12.14) amount already deposited into Escrow Account "Rs. Cr." has been shown as 38.915. But this figure is not tallied with CCO figure, which is to be corrected. Also on 11.06.2020 an amount of Rs. 77.72 Lac has been reimbursed as partial payment from Escrow fund. This is to be mentioned in the Mining Plan.</td><td>The deposits have been made into the Escrow Account as follows {Annexures-18(d) enclosed}:
<table><tr><th>Sl. No.</th><th>Calendar year</th><th>Amount deposited (Rs Cr.)</th></tr><tr><td>1</td><td>2014-15</td><td>5.9383</td></tr><tr><td>2</td><td>2015-16</td><td>6.2352</td></tr><tr><td>3</td><td>2016-17</td><td>6.5469</td></tr><tr><td>4</td><td>2017-18</td><td>6.8743</td></tr><tr><td>5</td><td>2018-19</td><td>7.2180</td></tr><tr><td>6</td><td>2019-20</td><td>6.1023</td></tr><tr><td></td><td>Total</td><td>38.915</td></tr></table>
An amount of Rs. 77.71 Lakh has been reimbursed as partial payment from Escrow fund on 02/06/2020 (Annexures-18(o) enclosed).</td></tr>
<tr><td>5(c)</td><td>Director, CMPDI pointed out that the total closure cost is Rs 368.85 Cr whereas amount to be deposited in Escrow account is Rs 303.6323 Cr. Clarification/declaration for balance amount shall be provided.
It was clarified by the Project Proponent that reimbursement details of Escrow Account have already been included in the Mine Plan. It was further clarified that rate of calculation of Escrow account and actual expenditure are different and therefore, does not match.</td><td>As clarified in the observation.</td></tr>
<tr><td>5(d)</td><td>The base date of closure cost shall be taken as April' 2020 in place of Jan'2020 and accordingly amount to be deposited in Escrow account annually shall be furnished.</td><td>As suggested, the date of closure cost has now been modified as April 2020, and corresponding changes in escrow amount have also been made in Chapter 1 (1.14), Chapter 11 (para 11.5b,Table 11.10, Table 11.11), Executive Summary {J.a).(B)} and K.a) and the Checklist (12.14).</td></tr>
<tr><td>5(e)</td><td>The observations related with plates as Sl. No. 11, 14 & 15 of compliance status has not been</td><td>The compliance status has now been corrected and complied as follows:</td></tr>
</table>

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<table>
<tr><th>Sl. No.</th><th>Observations</th><th>Compliance</th></tr>
<tr><td></td><td>complied, which needs to be corrected".</td><td>
<table>
<tr><th>Observation No.</th><th>Plate No. as observed in MP (Jan 2018) version</th><th>Plate No. as corrected and included in current MP (Aug 2020) version</th></tr>
<tr><td>11</td><td>XVIII-B</td><td>V-A and V-B</td></tr>
<tr><td>14</td><td>VII</td><td>X</td></tr>
<tr><td>15</td><td>Comment without mentioning the Plate number</td><td>IV and VII</td></tr>
</table>
</td></tr>
<tr><td>5(f)</td><td>As per Para 3.2 of DGMS(Tech) Circular No 03 of 2020, minimum factor of safety to be considered for design of pit, bench & dump slope shall be in any case not be less than 1.50 for permanent or long-standing slopes and 1.30 for all other cases. GIPCL carried out a scientific study from CMRI, Dhanbad regarding the same in Sept' 2007, where factor of safety is considered as 1.30. Before starting of mining operation, a fresh scientific study may be carried out to comply the provision of DGMS circular</td><td>The mine has been already operating for over 10 years as per the approved mining Plan and external dumps formed earlier have already been stabilised. As the quarry is being continuously advanced and backfilled up to the surface because of shallow depths, there is no longstanding slopes at present. Other slopes have been planned at 1.3 factor of safety.

Any change in mine profile will change the extractable reserve also, as can be understood from the fact explained (in Chapter 4, table 4.8 footnote under Para 4.2.3.2) that the blockage of reserves in the batter increased from 9.6 Mt with batter of 45 degrees to 55.59 Mt with the batter angle 23 degrees as prescribed by CMRI study.

However, the mine has a balance life of 27 years. And a study, as suggested will be taken up within 3 years, and in case any change is suggested in mine or dump profile by the study, the same will be implemented.
(This statement has been included in Chapter 4, table 4.8 footnote under Para 4.2.3.2)</td></tr>
<tr><td>5(g)</td><td>As per calendar program, target capacity will be achieved in 6th year, but in Text, Executive Summary page no ES-9, it is mentioned as 9th year.</td><td>Target capacity will be achieved in 6th year, and the error at Executive Summary page no ES-9 has been corrected.</td></tr>
<tr><td>5(h)</td><td>In Table 5.8 of Text, in foot note it is written that South pit will be operated from 5th to 18th year but as per calendar program it is being operated from 1st to 15th year.</td><td>The calendar program shows that the South pit will be operated from 2nd to 15th year and the same has now been mentioned in the footnote under Table 5.8 of Chapter 5.</td></tr>
</table>

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CHECKLIST FOR MINING PLAN AND MINE CLOSURE PLAN MANGROL-VALIA LIGNITE MINE

Sl. No.	Parameters	Details		Observation
1	DETAILS OF THE BLOCK			
a.	Name of Coal / Lignite Block	Mangrol-Valia Lignite Block		
b.	Name of the Coalfield/ Coal belt	Mangrol & Valia Lignite Field		
c.	Particulars of adjacent blocks: North, South, East, West	The Mangrol Valia block covers an area of 2625 Ha. The particulars of adjoining blocks/MLs/ features are as given below: North - E, F and G lignite mine leases (applied) of GIPCL East - Bhaga Nadi and non-lignite bearing area South - Vastan Lignite mine mine lease (sanctioned) of GIPCL West - Tokari Nadi The executed ML of Mangrol-Valia covers an area of 2059.6829 Ha for which the current Mining Plan has been prepared.		
d.	Topo sheet No with latitude and longitude	Vesting Order	Mining Plan/Mine Closure plan	
	Topo sheet No	Allotment was not through Vesting Order (refer para CL 3(c) below}	No. 46G/2&3	
	Latitudes (N):	Not applicable	21°26' 19.47''N to 21°31' 29.90''N	
	Longitude (E):	Not applicable	73°07' 12.19''E to 73°12' 53.16''E (Source: No. G.S./Mining Lease/Geo Reference/20/21/686 dt 04-03-2020 from G&M Office, Surat and No. AG./BH/M L/ Geo Reference /19-20/780 dt 19-03-2020 from G&M Office, Bharuch)	

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Sl. No.	Parameters	Details	Observation
e.	Location of the Block District / State	Districts: Surat and Bharuch, State: Gujarat	
f.	CMPDIL Certificate of the project boundary of the Mining Plan	- In persuasion of MOC letter No. 34011/(48)/2009-CPAM dt. 15-07-2015, GIPCL had requested M/s Central Mine Planning and Design Institute Ltd. (CMPDIL) vide their letter No. SLPP/GMM/2015-16 dt. 12-01-2016 to certify the coordinates of the Mining Lease but CMPDI has communicated their inability to do it (vide CMPDI email dt 27-01-2016) and they undertake the certification of coal blocks only. As Mangrol-Valia is a lignite block, this assignment does not pertain to CMPDIL. (**Annexure II-A**). - Geo-reference coordinates and KML Plan duly certified by G&M Office, Surat and G&M Office, Bharuch are attached (**Annexure II-B2** and **II-C2**) in compliance with MOC Observation {Ref. Para 1(f)}. - Conceptual Plan by RQP certifying that the Mining Plan is confined within the allotted lignite block and no encroachment issue is involved, is attached as **Annexure XVIII-K** in compliance with MOC Observation {Ref. Para 1(f)}.	
g.	Type of the Project (Operating / under Implementation)	The Mine is being operated since December 2009.	
2	**DETAILS OF THE PRESENT PROPOSAL**		
a.	Base date of Mining Plan/Mine Closure Plan	Base date for this Mining Plan (3rd Revision) (including Mine Closure Plan), Balance reserve estimates and balance life has now been adopted as 1.4.2020. For the Escrow amount calculation, WPI as on April 2020 has been considered	
b.	Scope of The mining plan	(i) 1st Mining Plan (2000 version approved on 23/01/2001 by MoC) was approved for a production of 4.2 MTPA over an area of 2080 Ha. (ii) Mining plan (1st Revision) for enhanced production from 4.2 MTPA to 7.4 MTPA, approved by Ministry of Coal, Govt. of India, New Delhi vide letter no. 48024/3/98-Lig (Part) dated 08.06.2010 has not yet received the approval from MOEF&CC. (iii) The decision for expansion of 2 x 300 MW has been deferred indefinitely on account of	

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Sl. No.	Parameters	Details		Observation
		acquisition of additional 959.00 Ha areas of the additional applied leases. (iv) Now GIPCL has decided for expansion of 2 x 125 MW only by restriction of the mining operations within 2067.68 Ha by keeping the pit area same subject to the land acquisition of balance area. (v) Hence, Mining Plan (3rd Revision) (including Mine Closure Plan), for extent area of 2067.68 Ha and to meet the lignite requirement of EUPs for 750 MW. (Production Capacity: Reduction from 7.4 MTPA to 5.4 MTPA) has been submitted.		
3	ALLOTTEE COMPANY DETAILS			
a.	Name the Mine Allottee	M/s Gujarat Industries Power Company Ltd (GIPCL)		
b.	Status of the Applicant Company	GIPCL is a generating Public Limited Company incorporated under Companies Act, Controlled by Gujarat Government.		
c.	Details of allotment/vesting order	- Allotment of this block is not through Vesting Order, as at the time of approval of 1st Mining Plan (on 23-01-2001), this project was one of the old cases termed as "Pipeline projects" by the Lignite Section prior to the revision of the Screening Committee to deal with allotment of lignite blocks along with coal blocks. (refer MoM attached to **Annexure-IV**-A). - Approval to grant Mining Lease was conveyed by MOC to Industries and Mines Deptt., Govt. of Gujarat vide letter no. 48024/3/98-Lig.(Pt) dt 31-10-2001 under Section 5(1) and Section 6(i) of MMRD Act,1957 (**Annexure-I**). - The ML was granted by "Industries and Mines Department", Govt. of Gujarat vide letter no MCR-1098-1108-CHH-1 dated 06/04/2004) (**Annexure XVI-A**).		
d.	Name and address of the applicant	<u>Regd Office</u> M/s Gujarat Industries Power Company Ltd. P.O. Petrofils - 391 347.Dist. Baroda	<u>Office</u> M/s Gujarat Industries Power Company Ltd. SLPP, At & Post : Nani Naroli,	

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Sl. No.	Parameters	Details		Observation
		Phone: 0265-372768, 373213, 373159 Fax: 0265 - 373207 Email: genbaroda@gipcl.com	Taluka: Mangrol, District: Surat, Gujarat. Phone: 02629-261087 Email: cgmminesoffice@gipcl.com	
e.	Relationship between the applicant and allottee company	Both are same		
f.	Name and address of RQP with registration No	Name : Mr. B. D. Sharma Address : A-121, Paryavaran Complex, IGNOU Road New Delhi – 110030 Phone : 91-11-29532236, 29535891; 29532568 E-mail : mining@minmec.com; minmec@gmail.com Web site : http://www.minmec.com Registration Number : No. 34012(03)/2014-CPAM Date of grant / renewal : 29th May, 2015, valid up to 28th May, 2025		
g.	Name of the Previous allottee of the Block	M/s Gujarat Industries Power Company Ltd.		
4	DETAILS OF THE PREVIOUS APPROVAL OF MINING PLAN			
a.	Date of Approval	Particulars / 1st Mining Plan, 2000 / Revised Mining Plan (1st Revision) / Revised Mining Plan (2nd Revision) Approved on: 23/01/2001 / 08/06/2010 / 23/11/2015 Lignite Production, MTPA: 4.2 / 7.4 / 7.4 Mining Lease in Ha: 2080.00 / 3710.00 / 3019.00		
b.	Conditions if any	The conditions imposed with the approval letter no. F.no.48024/3/98-Lig. Dt 23rd November 2015 of {Revised Mining Plan (2nd Revision), 2015 version} is reproduced below: (i) The mining company shall take all necessary precautions regarding safety of mine		

HITLAR SINGH / Under Secretary / Ministry of Coal / Govt. of India / Shastri Bhawan / New Delhi

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Sl. No.	Parameters	Details	Observation
		workings, persons deployed therein : Shall be complied (ii) Mining lease to be acquired shall not encroach into any other Lignite block: Shall be complied (iii) The approval of the mining plan is without prejudice to the requirement of approvals from competent/prescribed authority under the relevant rules/regulations etc. (For conditions imposed in earlier approvals and their compliance refer Chapter 2 and 11)	
c.	Scheduled year of start of production	Already in production since 2009-10	
d.	Proposed year of achieving the targeted production	1st Year (2014-15) (as per RAMP 2015 version)	
e.	Date of actual commencement of mining operations, if operations already started	December 2009	
f.	Likely date of mining operations, if operations not yet started & reasons for non-commencement of operations	Already in operation	
g.	Planned production and actual levels achieved in last 3 years (Coal in MTe, OB in MM^3, SR in M^3/te)		

Year		Planned*		Actual Lignite Production "MTe"				
		Lignite	OB "MM3	UG	OC	Total	OB "MM3"	SR
Y-4	2017-18	7.4	43.60	0	3.00	3.00	18.85	6.28
Y-5	2018-19	7.4	43.60	0	3.60	3.60	22.00	6.11
Y-6	2019-20	7.4	39.20	0	3.60	3.60	22.00	6.11

** (Refer Calendar Table 4.1 under Para 4.13.5 of AMP & MCP-2015)*

Sl. No.	Parameters	Details	Observation
h.	Reasons for difference between the planned and actual production levels	Due to procedural delay in the Land Acquisition	
5	DETAILS OF CHANGES IN THE NEW MINING PLAN COMPARED TO EARLIER APPROVAL		
		Previous Mining Plan(2015) / Current Mining Plan (May 2020)	
a.	Lease area "Ha"	3019.00 / 2059.68.29	
b.	Project Area "Ha"	3019 (Refer Para 2.6 of Chapter II of AMP) / 2059.6829 (ML already available)	
c.	Life of the Project "Yrs"	35 years (production) + 3 years for final closure of mine including re-handling, Total 38 years / 27 years considering 2020-21 as the 1st year. (38 years since the start of production, an increase due to reduced production target)	
d.	Minimum and Maximum Depth of working "m"	(i) Minimum: 14.6 (ii) Maximum: 150m	Depth: Valia area (North Pit): Minimum 53, Maximum 150; Mangrol area (Central Pit): Minimum 125, Maximum 140; Mangrol area (South Pit): Minimum 55, Maximum 150	
e.	Geological Block "Ha"	2625 (refer Summarised Data, Location d) in RAMP 2015) / 2625 (1778.3629 ha within the allotted ML/ Block of 2059.6829 ha)	
f.	Production Target "MTPA"	7.4 / 5.4	
g.	Seams Available "As per GR"	Three horizons: H-1 (No. of lignite seams: 1 to 5), H-2 (1 to 14), H-3 (1 to7). Ref. Table at page 3-6 of RAMP-2015 / No change	
h.	Seams not considered for Mining with Reasons	All seams considered / No change	

Sl. No.	Parameters	Details	Observation
i.	Geological Reserve "Mt"	1 Geological reserves as per approved revised mine plan (2nd revision) and mine closure plan-2015 (7.4 MTPA, 3019 HA) — 341.79 3 The geological reserves as calculated from the model works. (refer AMP 2015, Para 3.7 of Chapter III)& para 4.6.1 of Chapter IV — 336.43	**258.67** (out of 341.79 Mt in Geological block, 258.67 Mt falls within the allotted block/ML and 83.12 Mt outside the ML/allotted block) Refer Table 4.8 of Chapter 4	
j.	Blocked Reserve "Mt"	**Total Reserves Blocked: 136.56**	95.38 Refer Table 5.3	
k.	Minable Reserve "Mt"	199.87	163.29	
l.	Extractable Reserves "Mt"	199.87	163.29 (Refer para 5.3.2, Table 5.3)	
m.	% of Extraction/recovery	59.41	(163.29/258.67)*100= 63.13 %	
n.	Reserve Depleted (till the base date) Reserves " Mt"	15.01	24.01 (Extracted Lignite up to 31-03-2020)	
o.	Balance Extractable reserve "Mt"	184.86	139.28 (as on 01-04-2020)	
p.	Average Grade	Grade as per GR: / GCV in K Cal/Kg / UHV in Kcal/Kg Range: 1610 – 4000 / 105 – 1423 Mean: 2500 – 3250 / 206 - 1227	No change	
q.	OB in MM^3	1204.12	819.88 (Balance as on 01-04-2020)	

Sl. No.	Parameters	Details		Observation
r.	SR MM^3/te	6.02 (1204.12/199.87)	5.78 (since inception) (943.69/163.29) 5.89 (balance) (819.88/139.28)	
s.	Mining Technology	Mechanized opencast mining with HEMM like diesel hydraulic shovels/dumpers for waste removal and lignite production.	No change	
t.	Coal Beneficiation envisaged	Lignite beneficiation not envisaged	No change	
u.	Handling of Rejects	Not applicable	No change	
v.	Land use pattern " Ha"	As follows: Refer Chapter XIII (Proposed land use) of RAMP and MCP-2015	Refer Chapter 9, Table 9.4 (under Para 9.1.3) of Current MP and MCP-2020	
1	Excavation Area	Mining : 1838.21	1453	
2	Top Soil Dump	50.00	30.00	
3	External Dump	Dumping : 394.00	156.71	
4	Safety Zone			
5	Other use	(i) Lignite stacking : 10.00 (ii) Settling pond : 0.00 (iii) Road : 0.00 (iv) Area for rationalization*: 723.99	(i) Embankment : 0.00 (ii) Settling Pond : 10.00 (iii) Road : 9.92 (iv) Explore Magazine : 0.00 (v) Drain : 0.00 (vi) Road diversion : 6.30	
6	Infrastructure area	2.80	3.90	
7	Green Belt	0.00	151.82	
8	Undisturbed Area	--	238.033	
	Total	**3019.00**	**2059.6829**	

Sl. No.	Parameters	Details	Observation
w.	Reasons for Revision	Reasons are as follows: (i) Capacity of the approved (RAMP-2015) end use plants- Existing Station 1 Surat Lignite Power Plant (SLPP): 2 x 125 MW Phase-2, Station 2, commissioned in 2010 SLPP: 2 x 125 MW Proposed, Station 3 SLPP: 600 MW* **Total: 1100 MW** The decision for expansion of 2x300 MW* has been deferred indefinitely on account of acquisition of additional 959.00 Ha areas of the additional applied leases. Hence, GIPCL has decided for expansion of SLPP Station-3 of 2X125 MW, near the mine only by restriction of the mining operations within 2059.6829 Ha by keeping the pit area same subject to the land acquisition of balance area. Total capacity of EUPs will reduce to 750 MW from 1100 MW for which the requirement of lignite will also reduce to 5.4MTPA from 7.92 MTPA	
6	END USE OF COAL/LIGNITE		
a.	End Use of Coal/Lignite as per approval by the Competent Authority	Sl. No. 1 — Company Name: Gujarat Industries Power Corporation Ltd — End Use plant, Name, location, Production capacity & distance: Existing: Surat Lignite Power Plant (SLPP) Station-1 of 2X125 MW at Nani Naroli, Dist. Surat SLPP Station-2 of 2X125 MW,	

Sl. No.	Parameters	Details	Observation
		Proposed Expansion: SLPP Station-3 of 2X125 MW, near the mine subject to the land acquisition of balance area.	

b. Norms adopted for calculating ROM quantity requirement in case it differs from the quantity indicated in the allotment order

Norms were not indicated in while Allotment. The Norms adopted are as given below.

Particulars	Klinker "MTPA"	Power Plant "MW"						Blast Furnace "Mtpa"
MTPA							Total	
Capacity of the end use plant		125x6					750	
Capacity of the Project "MTPA"	5.40							
Raw Coal/lignite availability from this project "MTPA"		5.40					5.4	
Washed coal/lignite availability "MTPA"		0.00					0.00	
Reject "MTPA"		0.00					0.00	
Station Heat Rate "K Cal/Kwhr		2710					2710	
Avg Calorific Value of Coal "Kcal/Kg"		2900						
Raw coal/lignite		2800					2800	
Washed coa/lignite I								

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Sl. No.	Parameters	Details	Observation

Rejects								
Specific consumption "Kg/Kwhr"		0.97					0.97	
Plant Load Factor/ Capacity Utilisation		0.85					0.85	
Coal Requirement "MTPA"		**5.40**					5.40	

Total requirement for the end use plants "MTPA"	5.40

Source of coal requirement

Coal/lignite from this project "MTPA"	5.40
Linkages/ E-auction from CIL "MTPA"	
Other block of the Company "MTPA"	0.00
Total availability "MTPA"	5.40

* ***Presently, 0.60MTPA is supplied from Vastan Lignite Mine of GIPCL which will exhaust by 2024-25, production phasing accordingly done.***

c.	Percentage of end use requirement to be met from this mine	100%	
d.	If washing / beneficiation of the coal/ lignite is planned to be conducted on site or adjacent to the extraction area, briefly describe the nature of the beneficiation and recovery rate, consumption of water etc.	N/A	

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Sl. No.	Parameters	Details	Observation
e.	Proposed Use of Rejects/Middling's	N/A	
f.	Distance of End use plant from the pit head of the project in "km"	The distance of the proposed power plant from South Pit (Mangrol area) and North Pit (Valia mine) is 6 KM and 18 KM respectively.	
g.	Mode of Coal Transport	Lignite transport by road	
7	EXPLORATION AND GEOLOGY		
a.	Geological Block Area "Ha"	2625	
b.	Status of Exploration of the block	Explored in detail	
c.	Area covered by 'detailed' exploration within the block (sq. km)	17.783629 (allotted block)	
d.	Whether entire lease area has been covered by 'detailed' exploration.	Yes,	
e.	No. of boreholes drilled within the block	122 (allotted block)	
f.	Whether any further exploration/study is required or suggested and time frame in which it is to be completed	No	
g.	Overall borehole density within the block (no./ sq. km) approx	5.9 (122/20.596829) (within allotted block)	
h.	No of Seams available as per GR	Three nos. of lignite horizons (Upper H-1, Middle H-2, Lower H-3). The number of split seams encountered in horizons is as under.	
i.	Seams not considered for Mining with	None	

Three horizons	H-1	H-2	H-3
No. of lignite seams	1 to 5	1 to 14	1 to7

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	Reasons		
j.	Dip of the Seam	Generally 2 degrees to 5 degrees towards north-west. However, in extreme cases less than 1 degree and 10 degree	
k.	*Seam wise Thickness and Depth with Reserve assessment:*		

Seam	Thickness range, m	Depth Range, m	Net Geological Reserves 'Mt'	Blocked Reserves below, MT					Mineable Reserves 'Mt'		
				Highwall/ Batter	Nallah/ River/ Road	Embank-ment	Un-economic	Total Blocked	UG	OC	Mining Losses
Upper Horizon	0.60 -27.5	14.6 –143.8	99.76	16.88	16.49		0.00	33.37		66.39	
Middle Horizon	0.80- 30.0	21.0—168.6	115.65	24.56	16.59		0.00	41.15		74.50	
Lower Horizon	0.20-28.6	25.50-203.0	43.26	14.15	6.71		0.00	20.87		22.39	
Total			258.67	55.59	39.79	0	0.00	95.38	0	163.29	0

Seam	Ext Res "MTe"			As on base date "MTe"							Reason not considered for mining
				Depletion of Reserve			Balance Reserve				
	UG	OC	Highwall	UG	OC	Total	UG	OC	Highwall	Total	
Upper Horizon	0.00	66.39			24.01			139.28		139.28	
Middle Horizon	0.00	74.50									
Lower Horizon	0.00	22.39									
Total	0.00	163.29			24.01			139.28		139.28	

Sl. No.	Parameters	Details	Observation
l.	Average GCV	GCV range "KCal/kg: 2500-3250 (Refer Table 4.10, Chapter 4 of Current MP) Average GCV adopted 2800 kcal/kg	
m.	Gross Geological Reserve of the block "MTe"	341.79 (as per Current Mining Plan and Mine Closure Plan)	
n.	Net Geological Reserve of the block "MTe"	258.67 (allotted block)	
o.	Minable Reserve "MTe"	258.67 (Mining losses considered as zero percent)	
p.	Blocked Reserve "MTe	**95.38**	
q.	Corresponding Extractable reserve "MTe"	163.29 (Mining losses zero percent)	
r.	Percentage of Extraction	(163.29/ 258.67)*100=**63.12**	
s.	Reserve already depleted (Base date of Mining Plan)	24.01 (Reserves extracted up to 31-03-2020)	
t.	Balance Reserve (As on Base Date)	139.28 (as on 01-04-2020)	
8	MINING		
a.	Existing and proposed method of mining	The mine is being worked by mechanized opencast with Shovel-dumper combination	
b.	Proposed method of mining with justification on suitability of method of mining	Mechanised OC mining with Shovel-dumper combination In an Opencast Mining Method, the soil covering the mineral is stripped to expose the mineral and make it available for exploitation. This method of mining has several advantages over underground method of mining. Some of them are discussed below: 1. An opencast mine can be designed for a high rate of output by deploying large capacity excavators. 2. Difficult strata conditions can be tackled more easily. 3. Existence of water bearing aquifers below or above the seam can be tackled effectively by	

Sl. No.	Parameters	Details	Observation
		deep hole pumping in a predesigned pattern. However, in the present case there is no confined aquifer encountered and as such there will not be any upward hydrostatic pressure control problems. 4. Mining losses can be kept very low with proper design of the mine. 5. Seams liable to spontaneous heating are more easily exploited. 6. Health hazards are minimum and safety standards can be maintained at high level. 7. Although weather influence will be more predominant in an opencast mine, its effect can be minimized. 8. Due to the above advantages such as higher percentage of mineral recovery, safety and need for large scale lignite production, opencast method will be adopted for this mine.	
c.	Coal production capacity proposed "Mtpa"	Lignite: 5.40	
d.	Justification for optimisation Coal production capacity	The geo-mining parameters and requirement of EUPs (5.4 MTPA)	
e.	Calendar year from which the production will start	It is an operational mine since December, 2009.	
f.	Year of Achieving rated production	6th year as per current Mining Plan and Mine Closure Plan	
g.	Lignite production Plan "MT"		

Sl. Year	Calendar Year	Lignite Production		OB MCUM	SR Progr.
		UG	OC		
Y-1	2020-21		3.60	17.00	4.72
Y-2	2021-22		4.60	28.18	6.13
Y-3	2022-23		4.60	28.18	6.13

Sl. No.	Parameters			Details				Observation
		Y-4	2023-24		4.60	28.18	6.13	
		Y-5	2024-25		4.60	28.18	6.13	
		Y-6	2025-26		5.40	36.20	6.70	
		Y-7	2026-27		5.40	34.79	6.44	
		Y-8	2027-28		5.40	34.79	6.44	
		Y-9	2028-29		5.40	34.79	6.44	
		Y-10	2029-30		5.40	34.79	6.44	
		Y-11	2030-31		5.40	34.80	6.44	
		Y-12	2031-32		5.40	38.20	7.07	
		Y-13	2032-33		5.40	38.20	7.07	
		Y-14	2033-34		5.40	38.22	7.08	
		Y-15	2034-35		5.40	29.66	5.49	
		Y-16	2035-36		5.40	25.00	4.63	
		Y-17	2036-37		5.40	28.08	5.20	
		Y-18	2037-38		5.40	28.08	5.20	
		Y-19	2038-39		5.40	33.08	6.13	
		Y-20	2039-40		5.40	33.08	6.13	
		Y-21	2040-41		5.40	38.08	7.05	
		Y-22	2041-42		5.40	38.08	7.05	
		Y-23	2042-43		5.40	34.40	6.37	
		Y-24	2043-44		5.40	25.44	4.71	
		Y-25	2044-45		5.40	25.43	4.71	

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Sl. No.	Parameters	Details	Observation
	Y-26 2045-46	5.40 20.00 3.70	
	Y-27 2046-47	3.88 6.97 1.80	
	Total Current MP	**139.28 819.88 5.89**	
	Total Incl. Past Prodn.	**163.29 943.69 5.78**	
i.	Peak/Rated Capacity		
	- By opencast:	5.40 MTe	
	- By Underground:	0	
	- Overall	5.40 MTe	
j.	Life of the mine :		
	- By opencast:	The balance life as per this Revised MP will be 27 years.	
	- By Underground:	0.00	
	- Overall	27 years	
k.	Whether the proposed external OB dump site is coal/ lignite bearing: If so, whether coal/lignite below waste disposal area is extractable.	No new surface dump has been proposed on lignite bearing area for future OB dumping. All the OB to be generated during the life of mine is now planned to be accommodated within the excavated area except during the 1st year. During the 1st year, out of total 16.94 mcum pure OB (generated from North Pit), 7.57 Mcum OB will be disposed of into Dump D4 already existing over lignite bearing area (by extending it by 17.72 ha) as void area in North Pit or dumping place over non-coal bearing area nearby is not available.	
l.	Whether negative proving for coal / lignite in the proposed site for OB dump/ infrastructure has been done.	Yes	
m.	Whether the mining operations to be	MDO mode	

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Sl. No.	Parameters	Details	Observation
	carried out through departmental equipment/ MDO/ outsourcing.		
n.	Operations that are proposed to be outsourced	Through MDO mode except statutory	
o.	Proposed configuration of HEMM for OC (Coal & OB) & Major Equipment for UG.	OB: Hydraulic Excavators of 3.2 cum bucket with 35T dumpers. Lignite: Hydraulic Excavators of 1.75/3.2 cum bucket with 35T dumpers.	
p.	Mode of entry for underground mines (shaft, incline, edit,):	N/A	
q.	Results of any investigation carried out for scientific mining, conservation of minerals and protection of environment; future proposals.	(i) "Hydrology & Hydrogeology of Mangrol-Valia Opencast Mine Project, January 2015 by M/s Srushti Seva, Nagpur. (**Annexure XVII**) (ii) "Advice on optimum slope design of ultimate pit Slope up to 150m depth and 50m High Dump at Mangrol Valia Lignite Mine, Surat Gujarat, GIPCL" by CMRS, Dhanbad, September-2007 (**Annexure XVIII-B**). (ii) External dump slope study by CMRI, 2007 (**Annexure XVIII-C**).	
9	**IMPORTANT SAFETY ASPECTS** - Covering slope stability, overall slope of the quarry and OB dump, dump height, strata control, fire and spontaneous heating, gas monitoring, disaster management, danger from inrush of water etc	1. The maximum depth the mine is will be 150m. Slope of opencast mine with such depth can some time cause pit slope failures thus endangering the safety of the mine. The strata above lignite are mostly weathered mantle. For stability of other benches, good drainage practice will be adopted. 2. The slope of the ultimate batter of the pit quarry has been adopted 23 degrees 3. Fire and Spontaneous Heating: i. Prevent the happening or presence of any external source of fire in the vicinity of lignite stockpiles i.e. naked fire, electric fire and fuel oil fire. ii. Restrict the stacking height of the lignitel to below two meters. Higher height may only be attempted for shorter interval of stacking.	

Sl. No.	Parameters	Details	Observation
		iii. The time and height shall be established with respect to spontaneous combustion which will help in restricting to safe parameters. iv. Appropriate arrangement will be made by inserting pipes in the stack to monitor the internal temperature of lignite. In case, temperature is found to shoot above safe limits, the lignite from the part of stack shall be immediately dug out and disposed safely. v. In certain mines, the in-situ lignite exposed in lignite bench catches fire due to spontaneous heating which has to be kept under vigil. Under such circumstances the affected area of lignite shall be separately dug up and disposed off safely. Sufficient number of water hydrants with sufficient hose pipes will be made available in the surface for fire protection. 4. Inrush of Water i. Storm water:Control measures to be adopted are briefly discussed below: - Check dams will be provided to prevent solids from wash off and screen if any from the mine related activities. - Peripheral bunds will be erected on the outer edge of the abandoned benches before reclamation so that the soil is not carried away by storm water. - A water gradient of about 1 in 100 will be kept at every bench towards inside of the bench to prevent formation of gullies in the bench slopes causing serious erosion. - Chutes will be constructed by using local stone or masonry to guide the water in areas with loose soil to prevent erosion and uncontrolled descent of water wherever necessary. - Construction of garland drains around freshly excavated and dumped areas so that flow of water with loose material is prevented. The mine water will be passed through specially constructed settling ponds to arrest any loose material	

Sl. No.	Parameters	Details	Observation
		being carried away with water. - Any areas with loose debris within the lease hold will be planted.	
10	**STATUS OF LEASE**		
a.	Status of Lease	Execution of Mining Lease agreements with Government of Gujarat on 06/10/2004 for 507.48 Ha (district Bharuch), 03/12/2004 for 342.36.89 Ha (district Surat) and 24/04/2006 for 1209.83.40 Ha (district Surat), totaling to 2059.68.29 for 30 years.	
b.	Existing Lease Area "Ha"	**2059.6829**	
c.	Period for which Mining Lease has been granted/is to be renewed/ is to be applied for.	30 years (refer answer to sl no 10a)	
d.	Date of expiry of earlier Mining Lease, if any	Leases not expired and are Valid till: 05/10/2034 for 507.48 Ha (district Bharuch), 02/12/2034 for 342.36.89 Ha (district Surat) 23/04/2036 for 1209.83.40 Ha (district Surat), Totaling to 2059.68.29 Ha for 30 years.	
e.	Whether the lease boundary/ required boundary is same as demarcated by CMPDI/ SCCL/ NLC for delineating block/sub-block	Yes by NLC, refer **Annexure II-D and II-E** The block is also connected to National grid by Survey of India vide letter dt 02-11-2012 (**Annexure XVIII-G**).	
f.	Lease Area (applied/ required) as per the Mining Plan under consideration (Ha)	**2059.6829 (already in place)**	

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Sl. No.	Parameters	Details	Observation
g.	Whether the applied lease area falls within the allotted block	Yes	
i.	Area (Ha) of lease which falls outside the block/sub-block delineated by CMPDI/SCCL/NLC.	Nil	
j.	Details of outside area:		
	▪ Whether forms part of any other coal block	No	
	▪ Whether it contains any coal/lignite reserves	No	
	▪ Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/ colony/ safety zone/ others (specify)	NA	
k.	Whether some part(s) of the allotted block has not been applied for mining lease.	No (Available ML has been considered as allotted block)	
	- Total area in Ha of such part(s).	Nil	
	- Total reserves in such part(s). (Mt)	Nil	
	- Brief reasoning for leaving such part(s)	NA	

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Sl. No.	Parameters	Details	Observation
11	ENVIRONMENTAL MANANGEMENT		
a.	Land use pattern in Ha		

PRE- MINING, DURING MINING, END OF MINING AND POST MINE CLOSURE LAND USE

Sl. No.	Pre(Mining Landuse "Ha"			Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
							Agricul-tural Land	Planta-tion	Water body	Public/ Company Use	Forest Land (Returned)	Undist-rubed	Total
1	Tenancy	Agricultural	1953.3426	Excavation Area	1453.00								0.00
2		Township		Backfilled Area		1243.00	159.82	1083.18					1243.00
3		Grazing		Excavated Void		210.00			210.00				210.00
4		Barren	23.5393	Without plantation			0.00						0.00
5		Water body	0.5	Top Soil Dump	30.00	30.00	30.00						30.00
6		Road		External Dump	156.71	156.71	80.14	76.57			0.00		156.71
7		Community		Safety Zone		0.00							0.00
8		Inhabitated		Haul Road between quarries		0.00							0.00
9		Village		Road diversion	6.30	6.30				6.30			6.30
		Sub Total	1977.3819	Diversion/ below River/Nala/ canal									0.00
1	Govt. Non Forest	Agricultural		Settling pond	10.00	10.00	10.00						10.00
2		Township		Road & Infrastructure area	13.820	13.820	10.929			2.891			13.82
3		Grazing/ others	67.3818	Rationalisation area		0.00							0.00

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	4		Road	10.1192*	Garland drains		0.00							0.00
	5		Water body		Embankment		0.00							0.00
	6		Others		Green Belt	156.62#	156.62		151.82			4.80		156.62
			Sub Total	77.501	Water Reservoir near pit		0.00							0.00
	1	Forest	Reserve		UG entry		0.00							0.00
	2		Protected Forest	4.8000**	Undisturbed/Mining right for UG	233.233	233.233						233.233	233.233
			Sub Total	4.8	Resettlement		0.00							0.00
					Pit head power plant		0.00							0.00
					Water harvesting		0.00							0.00
					Agricultural land		0.00							0.00
			Grand Total	2059.683	Total	2059.683	2059.683	290.889	1311.57	210.00	9.191	4.80	233.233	2059.683
	Note: *The total agriculture area available out of the backfill 159.82 ha + surface dump 80.14 ha + Settling pond 10 Ha + Road & Infrastructure area 10.929 ha+ Top Soil Dump 30 ha will be 290.889 ha* * *10.1192 ha road area includes 2.68 ha area of SH166.* ** *4.80 ha social forestry along the existing SH166* # 156.62 *ha includes 4.80 ha social forestry along the existing SH166*													
b.	Surface features over the block area				The area in general is more or less flat with some minor undulations. Moti Nadi is a seasonal stream and flows in the middle of the property.									
c.	No. of villages/Houses to be shifted				There are no inhabited villages to be rehabilitated as only small clusters of houses named Vadsol hamlets with 83 hutments and Kosmadi Faliya (Rajgarh Gram Panchayat) with 35 hutments in the approved 2080 Ha Mine lease area are proposed to be shifted as per the R & R Policy. The land losers have largely been compensated in the past.									

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<table>
<tr><th>Sl. No.</th><th colspan="2">Parameters</th><th colspan="2">Details</th><th>Observation</th></tr>
<tr><td>d.</td><td></td><td>Population to be affected by the project</td><td colspan="2">Approximately 300. (Refer Exec. Summary, Environment Mgmt (e) of RAMP-2015, page 11)</td><td></td></tr>
<tr><td>e.</td><td></td><td>Monitoring schedules for different environmental components after the commencement of mining and other related activities.</td><td colspan="2"><table><tr><th>Sl. No.</th><th>Description of parameters</th><th>Schedule and duration of monitoring</th></tr><tr><td>1.</td><td>Air quality in the vicinity of the mine – PM 10, PM 2.5, SO_2, and NO_x</td><td>8 stations. Twice a week for three months</td></tr><tr><td>2.</td><td>Water quality (all parameters as per drinking water standards IS:10500)</td><td>14 samples once in a season</td></tr><tr><td>3.</td><td>Ambient noise levels</td><td>8 stations once in a season</td></tr><tr><td>4.</td><td>Study of Flora and Fauna</td><td>Within the study area</td></tr><tr><td>5.</td><td>Soil quality</td><td>One sample from core zone and one from study area</td></tr></table>(Refer Table 10.1 of Chapter 10)</td><td></td></tr>
<tr><td>12</td><td colspan="4">PROGRESSIVE & FINAL MINE CLOSURE PLAN</td><td></td></tr>
<tr><td>12.1</td><td colspan="4">Parameters of Mining Plan vis-a-vis Mine Closure plan
(When only Mine Closure Plan is being placed for approval details of approved mining plan must be provided):
Item 12.1 is not applicable as it is " Mining Plan (3rd Revision) and Mine Closure Plan"</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Approved Mining Plan</td><td>Revised Mining Plan & Mine Closure plan</td><td></td></tr>
<tr><td>a.</td><td></td><td>Lease area "Ha"</td><td></td><td>NA as it is a Composite Mining Plan ad Mine closure Plan</td><td></td></tr>
<tr><td>b.</td><td></td><td>Project Area "Ha"</td><td></td><td></td><td></td></tr>
<tr><td>c.</td><td></td><td>Life of the Project in Years</td><td></td><td></td><td></td></tr>
<tr><td>d.</td><td></td><td>Minimum and Maximum Depth of working "m"</td><td></td><td></td><td></td></tr>
</table>

Sl. No.	Parameters	Details		Observation
e.	Geological Block "Ha"			
f.	Production Target "MTPA"			
g.	Seams Available "as per GR"			
h.	Seams not considered for mining with reasons			
i.	Geological Reserve "MTe"			
j.	Minable Reserve "MTe"			
k.	Blocked Reserve "MTe"			
l.	Extractable Reserves " MTe"			
m.	% of recovery			
n.	OB MM3			
o.	SR MM3/te			
p.	Mining Technology			
q.	Coal Beneficiation envisaged			
r.	Handling of Rejects			
s.	Land use pattern " Ha"			
1	Excavation Area			
2	Backfilled Area			
3	Excavated Void			
4	Top Soil Dump			
5	External Dump			

Sl. No.	Parameters	Details	Observation
6	Safety Zone		
7	Other Use		
8	Infrastructure area		
9	Green Belt		
10	Undisturbed Area		
	Total		
12.2	Statutory obligations	Various Statutory letters/clearance have been obtained in respect of this mine. The conditions imposed there in have been detailed and complied (Ref. Para 1.1. 2 under Chapter 11)	
12.3	Waste Management	Refer para 11.3.4 of Chapter 11	
12.4	Biological and technical reclamation of mined out land (cumulative area, "Ha")		

Stage/year		Land Degraded				Technically Reclaimed Area			
		Excavation	Dump (Extn + Top Soil)	Infra / others	Total	Backfill	Dump (Extn+Top Soil)	Others	Total
Up to Base year 2009-20		339.610	319.090	147.240	805.940	0.000	0.000	129.970	**129.970**
Y-1	2020-21	349.320	336.810	158.160	844.290	0.000	76.570	134.340	**210.910**
Y-3	2022-23	400.090	295.780	174.100	869.970	63.000	76.570	150.280	**289.850**
Y-5	2024-25	494.770	186.710	182.840	864.320	194.360	76.570	159.020	**429.950**
Y-10	2026-30	765.250	186.710	182.840	1134.800	445.000	76.570	159.020	**680.590**
Y-15	2031-35	993.900	186.710	182.840	1363.450	699.000	76.570	159.020	**934.590**
Y-20	2036-40	1226.530	186.710	186.740	1599.980	888.000	76.570	162.920	**1127.490**
Y-25	2041-45	1430.310	186.710	186.740	1803.760	1095.000	76.570	162.920	**1334.490**
Y-27	2046-47	1453.000	186.710	186.740	1826.450	1125.000	76.570	162.920	**1364.490**
Post Closure									
Y-30	2048-50	1453.000	186.710	186.740	1826.450	1243.000	156.710	426.740	**1826.450**

Sl. No.	Parameters	Details	Observation

BIOLOGICAL RECLAMATION (CUMULATIVE AREA 'HA')

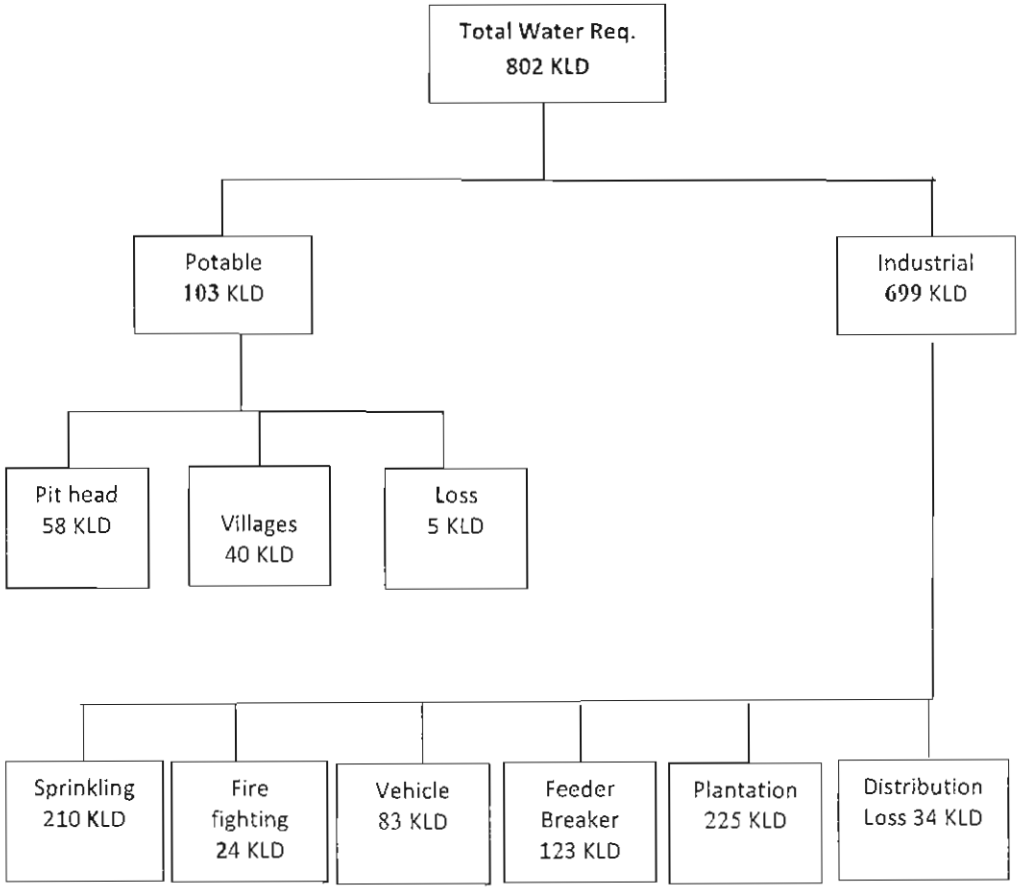
Stage/year		Biologically Reclaimed Area					Forest land (Retrun)	Un Disturbed/ to be left for Public/ com Use	Total
		Agriculture	Plantation	Water body	Public / Company Use	Total			
Up to Base year 2009-20			129.970			129.970		233.233	**363.203**
Y-1	2020-21		210.910			210.910		233.233	**444.143**
Y-3	2022-23		275.440			275.440		235.633	**511.073**
Y-5	2024-25		398.850			398.850		235.633	**634.483**
Y-10	2026-30		633.190			633.190		235.633	**868.823**
Y-15	2031-35		898.190			898.190		235.633	**1133.823**
Y-20	2036-40		1073.190			1073.190		239.533	**1312.723**
Y-25	2041-45		1288.190			1288.190		239.533	**1527.723**
Y-27	2046-47		1316.370			1316.370		239.533	**1555.903**
Post Closure									
Y-30	2048-50	290.889	1311.570	210.000		1812.459	4.800	242.424	**2059.683**

* *290.889 ha area will be the total agriculture area available in PMC, comprising 159.82 ha out of the backfill area + 80.14 ha out of surface dump area + 10 ha settling pond area + 10.929 ha out of road & infrastructure area + 30 ha top soil dump.*

** *1311.57 ha area will be the total plantation area available in PMC, comprising 1083.18 ha out of backfilled area + 76.57 ha out of external dump + 151.82 ha out of green belt. Besides 4.80 ha plantation will be returned to Forest.*

\# *242.424 ha area will be the total area under "Un Disturbed/To be left for Public/com Use" in PMC, comprising 233.233 ha (Undisturbed on base date 31-3-2020) + 2.400 ha (SH Rd diversion in 3rd yr) +3.900 ha North Rd diversion in 20th year + 2.891 ha (Company facilities retained for Public use in PMC)*

12.5	Water Quality management : (Existing water bodies available in the lease hold area; Measures to be taken for protection of the same including control	Refer para 10.2.5 (iii) under Chapter 10 for water quality. "Hydrology & Hydrogeology of Mangrol-Valia Opencast Mine Project, January 2015 by M/s Srushti Seva, Nagpur. **(Annexure XVII).**	

Sl. No.	Parameters	Details	Observation
	of erosion, sedimentation, siltation, water treatment, diversion of water course if any; Measures for protection of contamination of ground water from leaching etc; Quality of surface water bodies and measures proposed to meet the water quality; Report of hydrological study of the area ; Water Balance Chart etc)	Water Balance Chart is given below (Refer Table 5.16 in Chapter 5): 	

Sl. No.	Parameters	Details	Observation
12.6	Top Soil Management – (Including Action plan for Top Soil management)		

Year/ Stage	Top Soil generated, MCUM	Top Soil Used "MM3"					
		Embankment	Spreading over the backfilled area	Spreading over the OB dump area	Spreading over the GB	Total	Top soil balance in stack
PAST (2009-20)	2.04	0	0.00	0.50	0.00	0.50	**1.54**
Y-1 (2020-21)	2.10	0	0.00	0.98	0.00	0.98	**1.12**
Y-3 (2022-23)	2.40	0	0.39	0.98	0.00	1.37	**1.03**
Y-5 (2024-25)	2.97	0	1.21	0.98	0.00	2.19	**0.78**
Y-10 (2026-30)	4.59	0	2.77	0.98	0.00	3.75	**0.84**
Y-15 (2031-35)	5.96	0	4.35	0.98	0.00	5.33	**0.63**
Y-20 (2036-40)	7.36	0	5.53	0.98	0.00	6.51	**0.85**
Y-25 (2041-45)	8.58	0	6.82	0.98	0.00	7.80	**0.78**
Y-27 (2046-47)	8.72	0	7.01	0.98	0.00	7.99	**0.73**
Post Mine Closure,2048-50	8.72	0	**7.74**	0.98	0.00	8.72	**0.00**

12.7	Coal beneficiation and management of Coal Rejects, proposal regarding future maintenance and dismantling of structures, slurry pond and rejects	Lignite benificiation not envisaged	
12.8	Infrastructure to be retained and to be dismantled and measures to be taken for their physical stability and	Infrastructure to be retained and dismantled:	

Sl. No.	Parameters	Details	Observation
	maintenance for the retained infrastructure facilities;		

Sl. No.	Particulars	Area (in Ha)	To be Retained (in Ha)	To be Dismantled (in Ha)
1	Site office	0.017		0.017
2	Site office	0.128	0.128	
3	Contractor camp	1.501		1.501
4	Feeder breaker and stack yard	0.769		0.769
5	Workshop and store	1.019		1.019
6	Site office	0.128	0.128	
7	Sub Station	0.085	0.085	
8	High mast tower	0.04		0.04
9	Light switch	0.006		0.006
10	Security camp	0.05	0.05	
11	Other (Parking, open storing etc.)	0.157		0.157
	Sub Total (Facilities 1 to 11))	**3.900**	**0.391**	**3.509**
12	Transport roads	9.92	2.50	7.42
13	Road Diversion	6.30	6.30	0.00
	Grand Total	**20.12**	**9.191**	**10.929**

Sl. No.	Parameters	Details	Observation
		It is proposed that a corpus fund of Rs 50.00 lakh will be provided which will easily earn an annual interest of about Rs 5.00 lakh to maintain the retained facilities.	
12.9	Decommissioning of mining equipment and their possible post mining use	Disposal of scrap and such machinery which are not in use in O / C mines will be disposed of towards the end of the mine operation. All working equipment in O/ C mine excepting such HEMM which will be required for some of the left out items need to be done for final closure of the mine will be disposed either by selling or transferring to some working mines after the mine operation comes to an end by the 32nd Year (during the post mine closure period of 2040-51)	
12.10	Safety measures to be implemented to prevent access to surface opening for underground working, excavation etc (fencing to be carried out by barbed wires)	There is no UG Mine. The mine operation is by OC operations. Fencing will be done around the pit limits and OB dumps. Toe walls will be made around the dumps. Post mine closure pit containing water body will be fenced with concrete wall.	
12.11	Economic Repercussions of closure of mine - Manpower retrenchment, compensation to be given, socio-economic repercussions and remedial measures consequent to closure	Provided under para11. 3.10 of Chapter 11	
12.12	Time scheduling for abandonment with bar chart for the life of the project plus 3 years	Provided under para 11.5 of Chapter 11	
12.13	Cost of Activities to be taken up for closure of the mine Estimated total capital expenditure for mine closure activities is will be Rs. 368.85 Cr as given below		

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Sl. No.	Parameters	Details	Observation

Heads	ACTIVITIES	Unit	Volume of work	Rate Rs./unit	Total Cost, Rs. Crore
Progressive Closure	Water quality management	LS	-		1.48
	Air quality management	LS	-		1.48
	Barbed wire fencing around dump	m	12440.00	212	0.57
	Barbed wire fencing around pit	m	33875.00	212	0.72
	Top soil management	Mcum	7.99	60000000	47.94
	Technical and biological reclamation of mined out land and OB dump	Ha.	1335.32	400000	53.41
	Plantation over virgin area including Green Belt	Ha.	1391.71	400000	47.80
	Manpower cost and supervision	LS	-		0.90
	Toe wall around the dump	m	12187.00	1000	1.22
	Garland drain around the dump	m	27822.00	500	1.39
	Any other activity(Settling pond)	Ha.	-	800000	1.18
	Sub Total		-		158.09
FINAL CLOSURE					
Dismantling of infrastructure, disposal/ rehabilitation of mining machinery	Dismantling of workshop	LS	-		0.90
	Rehabilitation of dismentaled facilities	Ha.	2.40	400000	0.10
	Dismantling of pumps and pipes	LS	-		0.60
	Re-arranging of water pipelines to dump top, park and agricufture land	LS	-		0.50
	Dismantling of facilities	LS	-		1.50
	Dismantling of power line	LS	-		0.15
	Sub-Total		-		3.75
Safety and Security	Concrete wall fencing around the water body		9524.00	2500	2.38
	Boundary wall around the water body		13377.00	2500	3.34
	Stabilisation (viz. Benching, pitching etc) of side walls of the water body		-		1.00
	Sub-Total		-		6.73
Technical and biological reclamation of mined out land and OB dump	Top soil management	MCum	0.74	60000000	4.44
	OB rehandling for backfilling	mcum	21.62	60000000	129.72
	Peripheral road, gates, view point, cemented steps on bank	LS	-		1.50
	Expenditure on development of Agricultural land		290.89	400000	11.64
	Landscaping and plantation	Ha.	-	400000	0.50
	Sub-Total		-		147.80
Post closure management and supervision	Power cost	LS	-		0.20
	Post mining Water quality management	LS	-		0.15
	Post mining Air quality management	LS	-		0.15
	Manpower cost and supervision	LS	-		0.50
	Sub-Total		-		1.00
Others	Entrepreneurship development (vocational skill development, training for sustainable income of affected people	LS	-		1.50
	Continuation of othe services like runing of schools etc. (corpus fund deposits)	LS	-		50.00
	Sub-Total		-		51.50
	TOTAL COST				368.85

Sl. No.	Parameters	Details	Observation
12.14	Amount to be deposited in Escrow account as a security against the mine activities to be carried out for the closure of the mine		

WPI as on Base date	01-04-2019)		121.1
WPI as on April 2020		119.20	
Escalation rate of Closure cost			0.98431

		OC	UG
Base rate of closure cost (Cr. Rs./Ha.)		0.09	0.015
Closure cost as on base date 01/04/2020 (Cr. Rs./Ha.)		0.0886	
Project Area (Ha.)	2059.6829	2059.6829	
Amount to be deposited into Escrow Account "Rs.Cr."		182.4631	
Amount already deposited into Escrow Account "Rs. Cr."		38.915	
Net Amount to be deposited into Escrow Account "Rs. Cr."		143.5481	
Rate of compounding of annual closure cost		5%	
Balance Life of the project For Escrow Account "in Yrs"		27	
Annual Closure Cost (Rs. Cr.)		5.3166	
Amount to be deposited into Escrow Account after compounding @ of 5% "Rs in Crs"		290.6536	

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Sl. No.	Parameters	Details	Observation

AMOUNT TO BE DEPOSITED IN ESCROW ACCOUNT ANNUALLY

Amount (Rs. Cr.)				
Year	OC	Year	UG	Total
1	5.3166	1	-	5.3166
2	5.5824	2	-	5.5824
3	5.8615	3	-	5.8615
4	6.1546	4	-	6.1546
5	6.4624	5	-	6.4624
6	6.7855	6	-	6.7855
7	7.1247	7	-	7.1247
8	7.4810	8	-	7.4810
9	7.8550	9	-	7.8550
10	8.2478	10	-	8.2478
11	8.6602	11	-	8.6602
12	9.0932	12	-	9.0932
13	9.5478	13	-	9.5478
14	10.0252	14	-	10.0252
15	10.5265	15	-	10.5265
16	11.0528	16	-	11.0528
17	11.6055	17	-	11.6055
18	12.1857	18	-	12.1857
19	12.7950	19	-	12.7950
20	13.4348	20	-	13.4348

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Sl. No.	Parameters	Details	Observation

21	14.1065	21	-	14.1065
22	14.8118	22	-	14.8118
23	15.5524	23	-	15.5524
24	16.3300	24	-	16.3300
25	17.1466	25	-	17.1466
26	18.0039	26	-	18.0039
27	18.9041	27	-	18.9041
Total	290.6536		-	290.6536

Reimbursement claimable in 6th year for 80% of total deposited in last 5 year will be applicable. Year-wise details of amount to be submitted are given in Table 11.10 & Table 11.11 in Chapter 11 of the current Report.

An amount of Rs. 77.71 Lakh has been reimbursed as partial payment from Escrow fund on 02/06/2020 (Annexures 18-O Enclosed).

13	RESPONSIBILITY OF MINE OWNER	It is the responsibility of the mine owner to ensure that the protective measures contained in the Mine Closure Plan including reclamation and rehabilitation works have been carried out in accordance with the approved Mine Closure Plan and Final Mine Closure Plan. The owner shall submit a yearly report to the Coal Controller before 1st July of every year setting forth the extent of protective and rehabilitative works carried out as envisaged in the Approved Mine Closure Plan (Progressive and Post mine Closure Plan).	
14	PROVISION OF MINE CLOSURE	1. The mine owner will be required to obtain a Mine Closure Certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the Approved Mine Closure Plan/Final Mine Closure Plan have been carried out by the mine owner for surrendering the reclaimed land to the State Govt. concerned. 2. The balance amount at the end of the final Mine Closure shall be released to mine owner	

Sl. No.	Parameters	Details	Observation
		on compliance of all provisions of Closure Plan duly signed by the mine owner to the effect that said closure of mine complied with all statutory rules, regulations and orders made by the Central or State Government, statutory organisations, court, etc. and duly certified by the Coal Controller. This should also indicate the estimated extractable coal reserves and coal actually mined out. 2. If the Coal Controller has reasonable grounds for believing that the protective, reclamation and rehabilitation measures as envisaged in the approved mine closure plan in respect of which financial assurance was given has not been or will not be carried out in accordance with mine closure plan, either fully or partially, the Coal controller shall give the mine owner a written notice of his intention to issue the orders for forfeiting the sum assured at least thirty days prior to the date of the order to be issued after giving an opportunity to be heard. 4. The mine owner will be required to obtain a mine closure certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the approved mine closure plan/ Final mine Closure Plan have been carried out by the mine owner.	
15	ANNEXURES		
I	Copy of allotment order /Vesting order.	**Mandatory**	- Allotment of this block is not through Vesting Order, as at the time of approval of 1st Mining Plan (on 23-01-2001), this project was one of the old cases termed as "Pipeline projects" by the Lignite Section prior to the revision of the Screening Committee to deal with allotment of lignite blocks along with coal blocks.(refer

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Sl. No.	Parameters	Details		Observation
			MoM attached to Annexure-IVA). - Approval to grant Mining Lease was conveyed by MOC to Industries and Mines Deptt., Govt. of Gujarat vide letter no. 48024/3/98-Lig.(Pt) dt 31-10-2001 under Section 5(1) and Section 6(i) of MMRD Act,1957 (**Annexure-I**). - The ML was granted by "Industries and Mines Department", Govt. of Gujarat vide letter no MCR-1098-1108-CHH-1 dated 06/04/2004) (**Annexure XVI-A**);	
II	Certificate of CMPDIL that the project boundary considered for the Mining plan is in coherence with the block boundary vested with the allottee.	**Mandatory**	**Annexure II**	
III	Approvals of Mine Closure plan form the Board of the company.	**Mandatory**	**Annexure III**	
IV	Copy of earlier approval of mining plan.	**Mandatory**	**Annexure IV-A, IV-B & IV-C**	
V	Copy of MOC's Letter granting recognition to RQP for preparation of Mining plan.	**Mandatory**	Annexure V	
VI	Letter of authorisation by the Block allottee for formulation of Mining Plan & Mine Closure Plan by the RQP.	MP & MCP	**Annexure VI**	

Sl. No.	Parameters	Details		Observation
VII	Certificate of acceptance of the RQP to formulate the Mining Plan & Mine Closure Plan on behalf of the project proponent.	MP & MCP	Annexure VII	
VIII	A certificate by the RQP that he has been duly authorized by the mining company to prepare Mining plan & MCP on their behalf and that he has a valid recognition from MOC under MCR, 1960 to prepare the Mining plan and that provisions of all relevant rules and regulations made there under have been observed in the preparation of mining plan.	MP & MCP	Annexure VIII	
IX	The Mining plan/ Mine Closure plan has been prepared considering the guidelines pertaining to mining plan/ mine closure plan issued by MoC, GOI & wherever specific permission will be required the applicant will approach the concerned authorities.	MP & MCP	Annexure IX	
X	Confirmation from RQP that he has verified the block area with the relevant plans supplied by CMPDI/ SCCL / NLC and area covered by the mining plan does not encroach on any other coal lignite block.	MP	Annexure X	
XI	Certificate from empowered representative of / or Block allottee/	MP	Annexure XI	

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Sl. No.	Parameters	Details		Observation
	applicant that he mine will be developed as per the approval of the mining plan from Ministry of coal and all other approvals, as required will be obtained from relevant authorities			
XII	Copy of the document to establish that the geological report has been duly purchased from CMPDI, GSI/ MECL as the case may be	MP	Annexure XII The exploration got done by the proponent	
XIII	Certificate of RQP that the project boundary considered for the Mining Closure Plan has been verified by RQP. It is in coherence with the block boundary of vesting order and approved mining plan and no discrepancy has been found.	MP & MCP	Annexure XIII	
XIV	Certificate that the Mine Closure plan has been prepared in line with the approved Mining plan and the mine parameters considered for formulation of mine closure plan is exactly the same, which has been approved in the Mining plan.	MP & MCP	Annexure XIV	
XV	Certificate from empowered representative of / or Block allottee/ applicant that he mine that the reclamation & rehabilitation work shall be carried out in accordance with the approved mine closure plan and any	MP & MCP	Annexure XV	

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Sl. No.	Parameters	Details		Observation
	modification /amendments which may be made in the mine Closure Plan by Ministry of Coal, from time to time.			
XVI	Documents in support of Mining Lease, in case the lease has already been granted.	**MP & MCP**	**Annexure XVI-A (Grant of ML) & XVI-B (Execution of ML)**	
XVII	Hydrological study carried out if any.	**MP & MCP**	**Annexure XVI**	
XVIII	Other document	**MP & MCP**	**Annexure XVIII-A to Annexure XVIII-K**	
XIX	Environment Clearance to previous allottee & Transfer to current allottee	**MP & MCP**	**Annexure XIX**	
XX	Stage – I FC diversion approval from MoEF & CC to the previous allottee & Transfer to current allottee	**MP & MCP**	A stretch of land totaling to 4.48 ha along the existing State Highway (SH166) (Kosamba-Vankal measuring about 2.0 KM) between Mosali Chokri and Ukai-Kankrapar Main canal, passing through the block has been planted by Social Forestry Department and has been booked under protected forest in the records. This stretch of the road is to be re-aligned parallel to the existing Narrow Gauge Kosamba- Zankhvav railway line passing through the block, within the proposed surface barrier against the railway line from the quarry edge. Accordingly, 4.48 ha green belt will be developed along the proposed diverted alignment of the SH166.	

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Sl. No.	Parameters	Details		Observation
			The forest clearance is under process.	
16	LIST OF PLANS			
I	Location plan	MP & MCP	Plate I	
II	Reference no. of plan of block boundary issued by CMPDI/ SCCL/ NLC (A copy of the Plan also to be annexed)	MP	**Annexure XVI** (CMPDI has communicated that they undertake certification of coal blocks only) Plate II-A: Geo-Reference co-ordinates certified by G & M Dept., Surat Plate II-B: Geo-Reference co-ordinates certified by G & M Dept., Bharuch Plate II-C: Mining Lease Boundary certification by NLC Plate II-D: Conceptual plan certified by RQP	
III	Plan in scale of not less than 1: 10000 showing approved block boundary vis-à-vis proposed/existing mining lease & Mine boundary superimposed over it in distinct colour.	MP & MCP	Plate III	
IV	Geological plan showing all the boreholes drilled and proposed to be drilled showing allotted block boundary and required lease area	MP & MCP	Plate IV	
V	Graphic Litholog	MP & MCP	Plate V-A & Plate V-B	
VI	Surface Plan showing drainage system, Contour, at minimum 3m interval,	MP & MCP	Plate VI	

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Sl. No.	Parameters	Details		Observation
	location of BH			
VII	Conceptual plan showing infrastructure facilities including colony, boundary of mining area, mine entries, roads including road diversion alignment etc.	**MP & MCP**	Plate VII	
VIII	Land use plan showing Govt., forest and Tenancy land	**MP & MCP**	Plate VIII	
IX	Floor contour plan and seam folio plan, iso-grade plan	**MP & MCP**	**Horizon** – **Plate No.** Upper – IX-A Middle – IX-B Lower – IX-C	
X	X-section showing coal/Lignite seams	**MP & MCP**	Plate X	
XI	Plan showing existing and proposed surface layout	**MP & MCP**	Plate XI	
XII	Post mining land use plan	**MP & MCP**	**Plate XII**	
XIII	Progressive mine closure plan/ stage plan indicating stages at 1st, 3rd, 5th, 10th, and 20th interval (showing area, volume, dump height etc. for OC and seam-wise layout projects and ventilation system in UG)	**MP & MCP**	Year – Plate No. Present as on 31-03-2020 – XIII-A 1st – XIII-B 3rd – XIII-C 5th – XIII-D 6th – XIII-E 10th – XIII-F 15th – XIII-G	

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Sl. No.	Parameters	Details			Observation
			20^{th}	XIII-H	
			25^{th}	XIII-I	
			27^{nd}	XIII-J	
			X-Section showing stages	XIII-K	
XIV	Reclamation plan	MP & MCP	Plate XIV (at end of mine 27^{th} year)		
	OPENCAST MINES				
XV	Plan showing total coal thickness and overburden thickness and stripping ratio	OC	Plate XV		
XVI	Final stage quarry plan showing haul road alignment	OC	Plate XVI		
	UNDERGRAOUND MINES				
XVII	Plan showing mode and location of entries and surface layouts	UG	NA		
XVIII	Layout of the panel for each system Longwall, Board & Piilar, road header should be given)	UG	NA		
XIX	Layout of pillar extraction	UG	NA		
XX	Support system	UG	NA		
XXI	Haulage and transport system	UG	NA		

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LIST OF ANNEXURES

Annexure No.	Description
I	Copy of allotment order /Vesting order: - Allotment of this block is not through Vesting Order, as at the time of approval of 1st Mining Plan (on 23-01-2001), this project was one of the old cases termed as "Pipeline projects" by the Lignite Section prior to the revision of the Screening Committee to deal with allotment of lignite blocks along with coal blocks.(refer MoM attached to Annexure-IVA). - Approval to grant Mining Lease was conveyed by MOC to Industries and Mines Deptt., Govt. of Gujarat vide letter no. 48024/3/98-Lig.(Pt) dt 31-10-2001 under Section 5(1) and Section 6(i) of MMRD Act,1957.(Annexure-I). - The ML was granted by "Industries and Mines Department", Govt. of Gujarat vide letter no MCR-1098-1108-CHH-1 dated 06/04/2004) (Annexure XVI-A);
II	Certificate of CMPDIL that the project boundary considered for the Mining plan is in coherence with the block boundary vested with the allottee A Coordinates certification by CMPDI not done B1 CGM Surat Letter B2 Certified Plan/KML from CGM, Surat C1 CGM Bharuch Letter C2 Certified Plan/ KML from CGM, Bharuch D Certified Plan from NLCIL E Boundary Certification by NLCIL
III	Approval of Mine Closure Plan from the board of the company
IV	Copy of earlier approval of mining plan A. Mining Plan of 4.2 MTPA, approval letter by Ministry of Coal, Government of India, New Delhi vide letter no. 48024/3/98-Lig dated 23-01-2001. B. Revised Mining Plan expansion (1st Revision) from 4.2 MTPA to 7.4 MTPA over 3710 ha area, approval letter by Ministry of Coal, Government of India, New Delhi vide letter no. 48024/3/98-Lig dated 08-06-2010. C. Revised Mining Plan expansion (2nd Revision) from 4.2 MTPA to 7.4MT over reduced area of 3019 ha, approval letter by Ministry of Coal, Government of India, New Delhi vide letter No. 48024/3/98-Lig dated 23-11-2015.
V	Copy of MOC's Letter granting recognition to RQP for preparation of Mining plan

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Annexure No.	Description
VI	Letter of authorisation by the Block allottee for formulation of Mine Closure Plan by the RQP
VII	Certificate of acceptance of the RQP to formulate the Mining Plan and Mine Closure plan on behalf of the project proponent.
VIII	A certificate by the RQP that he has been duly authorized by the mining company to prepare Mining plan on their behalf and that he has a valid recognition from MOC under MCR, 1960 to prepare the Mining plan and that provisions of all relevant rules and regulations made there under have been observed in the preparation of mining plan.
IX	The Mining plan/ Mine Closure plan has been prepared considering the guidelines pertaining to mining plan/ mine closure plan issued by MoC, GOI & wherever specific permission will be required, the applicant will approach the concerned authorities.
X	Confirmation from RQP that he has verified the block area with the relevant plans supplied by CMPDI/ SCCL / NLC and area covered by the mining plan does not encroach on any other coal lignite block
XI	Certificate from empowered representative of / or Block allottee/ applicant that the mine will be developed as per the approval of the mining plan from Ministry of coal and all other approvals, as required will be obtained from relevant authorities
XII	Copy of the document to establish that the geological report has been duly purchased from CMPDI, GSI/ MECL as the case may be
XIII	Certificate of RQP that the project boundary considered for the Mining Closure Plan has been verified by RQP, It is in coherence with the block boundary of vesting order and approved mining plan and no discrepancy has been found.
XIV	Certificate that the Mine Closure plan has been prepared in line with the approved Mining plan and the mine parameters considered for formulation of mine closure plan is exactly the same, which has been approved in the Mining plan.
XV	Certificate from empowered representative of / or Block allottee/ applicant that the mine reclamation & rehabilitation work shall be carried out in accordance with the approved mine closure plan and any modification /amendments which may be made in the mine Closure Plan by Ministry of Coal, from time to time
XVI	Documents in support of Mining Lease, in case the lease has already been granted A. Order to sanction the grant of ML for Mangrol Valia Lignite Block by Govt. of Gujarat vide letter no dated MCR-1098-1108-CHH-1 dated 06/04/2004 for 350 Ha., MCR-1098-1109-CHH- dated 06-04-2004 for 507.48 ha and MCR-1092-(G-8)-3626-CHH-1 dated 25/10/2005 for 1210 Ha.

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Annexure No.	Description
	B. Mining Lease Deed Agreement with Government of Gujarat executed on 06/10/2004 for 507.48 ha, 03/12/2004 for 350 ha and 24/04/2006 for 1210 ha.
XVII	Report on Hydrology and Hydrogeology study for Mangrol – Valia Opencast Lignite Mine
XVIII	Other document A. Khasra wise land use of mine lease B. Pit Slope Design of UPS-CMRI September 2007 C. External Dump Slope Design-CIMFR August 2011 D. Escrow amount paid during 2014-2015, 2015-2016, 2016-2017, 2017-18, 2018-19 and 2019-20 E. Compliance to mining lease agreement conditions F. Environment monitoring statement of period Jan to June 2014 G. SOI Letter connecting the block to National Grid dt. 02-11-2012 H. Tri-Party agreement for Escrow Account I. Social impact assessment survey, 2013-2014 J. Bore hole exploration data K. Certificate of RQP that the Conceptual Plan is certified and attached as Plate II-D, volume-II of Current MP L. MOC Observation dt. 15-01-2020 and Compliance M. MOC Letter dt. 4-6-2020 asking Processing fee N. Receipt of payment for processing MP O. Reimbursement of part Escrow on 11.06.2020 P. Observations of the Internal Committee held on 10th August, 2020
XIX	Environment Clearance from the Ministry of Environment and Forests vide their letter ref no. J-11015/38/99-IA.II (m) dated 21/07/2003 with Compliance
XX	Stage – I FC diversion approval from MoEF&CC to the previous allottee & Transfer to current allottee

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Plate No.	Title	Scale
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XIII-K	Cross sections showing position of different mine stages and at mine closure stage	H=1 : 6,000 V=1:3000
XIV	Reclamation plan at the end of mine 27th year	1 : 12,000
XV	Plan showing total Coal thickness and total Overburden thickness & stripping ratios	1 : 12,000
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ABBREVIATIONS

AMSL	-	Above Mean Sea Level
bgl	-	Below ground level
CV	-	Calorific Value
CSM	-	Continuous Surface Miner
CMPDIL	-	Central Mine Planning and Design Institute Ltd.
cum	-	Cubic metre
DGMS	-	Directorate General of Mine Safety
DGM	-	Directorate of Geology and Mining
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
E&M	-	Electrical and Mechanical
FE Loader	-	Front End Loader
FC	-	Fixed Carbon
GT	-	Grand Trunk
GR	-	Geological Report
GSI	-	Geological Survey of India
HFL	-	High Flood Level
HEMM	-	Heavy Earth Moving Machinery
Ha	-	Hectare
IB	-	Interburden
IMD	-	India Meteorological Department
K.Cal/kg	-	Kilo Calorie per Kilogram
Ltd.	-	Limited
LTPA	-	Lakh Tonne Per Annum
LHD	-	Load Haul Dump
MTPA	-	Million Tonne Per Annum
MCPA	-	Million Cubic Metre Per Annum
M cum	-	Million cubic metre
MBCM	-	Million Bank Cubic Metre
m	-	Metre
Mt	-	Million tonne
ML	-	Mining Lease
Mty	-	Million tonne per year
MOC	-	Ministry of Coal

mcum	-	Million cubic metre
Mil. Te.	-	Million Tonne
MoEF&CC	-	Ministry of Environment, Forest & Climate Change
NTU	-	Units of measurement
NH	-	National Highway
OC	-	Opencast
OB	-	Overburden
PA	-	Per Annum
R&R	-	Rehabilitation & Resettlement Plan
RQP	-	Recognised Qualified Person
ROM	-	Run of Mine
RH	-	Relative Humidity
RPM	-	Respirable Particulate Matter
SDL	-	Side Discharge Loader
SPM	-	Suspended Particulate Matter
SC	-	Scheduled Cast
SH	-	State Highway
ST	-	Scheduled Tribe
TPD	-	Tonne Per Day
TS	-	Topsoil
UG	-	Under Ground
UHV	-	Useful Heat Value
VM	-	Volatile Matter

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EXECUTIVE SUMMARY

C. SUMMARISED DATA

1. GENERAL		
a)	Name and address of the Applicant Company	**Registered Office**: M/s Gujarat Industries Power Company Ltd.; Address: P.O. Petrofils - 391 347. DIST. Baroda; Phone: 0265-372768, 373213, 373159; Fax: 0265 - 373207; Email: genbaroda@gipcl.com **Office**: M/s Gujarat Industries Power Company Ltd.; SLPP, AT & Post : Nani Naroli, Taluka: Mangrol, District: Surat, Gujarat.; Phone: 02629-261087; Fax: 02629-261112; Email: cgmminesoffice@gipcl.com
b)	Name and address of the Block Allottee	Same as above
c)	Relationship between the applicant and allottee company	Both are same
d)	Status of the Applicant Company : Central /Public Sector Undertaking/State Government Undertaking/JV Company/ Pvt. Company/Public Co/Others (Specify)	State Government Undertaking
e)	Name of the Coal Block together with name of Coalfield & State where located	Mangrol-Valia Lignite Block, Mangrol & Valia Lignite Field in the administrative districts of Surat and Bharuch, Gujarat
f)	Date of allotment	- Allotment of this block is not through Vesting Order, as at the time of approval of 1st Mining Plan (on 23-01-2001), this project was one of the old cases termed as "Pipeline projects" by the Lignite Section prior to the revision of the Screening Committee to deal with allotment of lignite blocks along with coal blocks. (refer MoM attached to **Annexure-IV-A**). - Approval to grant Mining Lease was conveyed by MOC to Industries and Mines Deptt., Govt. of Gujarat vide letter no. 48024/3/98-Lig.(Pt) dt 31-10-2001 under Section 5(1) and Section 6(i) of MMRD Act,1957 (**Annexure-I**). - The ML was granted by "Industries and Mines Department", Govt. of Gujarat vide letter no

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<table>
<tr><td></td><td></td><td>MCR-1098-1108-CHH-1 dated 06/04/2004) (Annexure XVI-A).</td></tr>
<tr><td>g)</td><td>End Use of Coal/Lignite as per Approval by the Competent Authority</td><td>Name with location of end use plant
<table>
<tr><th>Sl. No.</th><th>Company Name</th><th>End Use plant, Name, location, Production capacity & distance</th></tr>
<tr><td>1</td><td>Gujarat Industries Power Corporation Ltd</td><td>Existing: Surat Lignite Power Plant (SLPP) Station -1 of 2X125 MW at Nani Naroli, Dist. Surat
SLPP Station-2 of 2X125 MW,
Proposed Expansion: SLPP Station-3 of 2X125 MW, within the existing SLPP Stations subjected to the land acquisition of balance area.</td></tr>
</table></td></tr>
<tr><td>h)</td><td>ROM Quantity proposed to be produced as per Mining Plan</td><td>5.4 MTPA</td></tr>
<tr><td>i)</td><td>Norms adopted for calculating ROM quantity requirement in case it differs from the quantity indicated in the Allotment Order.</td><td>The norms adopted for calculations of coal requirement are based on followings:
1. Average Calorific value: 2800.00 Kcal/Kg
2. Station Heat Rate: 2710 Kcal/ KWhr for 6X125 MW
3. P.L.F of Plant: 85%
Total Lignite requirement for all SLPPs = 5.4 MTPA.
Complete calculations in minute details can be seen in Table under item no. H.b) below.</td></tr>
<tr><td>j)</td><td>Beneficiation required – Yes/No</td><td>No</td></tr>
<tr><td>k)</td><td>Requirement of Beneficiated Coal & expected availability thereof.</td><td>Not applicable</td></tr>
<tr><td>l)</td><td>Period for which Mining Lease has been granted/is to be renewed/ is to be applied for.</td><td>30 years</td></tr>
<tr><td>m)</td><td>Date of Expiry of earlier Mining Lease, if any</td><td>ML existing</td></tr>
<tr><td>n)</td><td>RQP who has prepared the Mining Plan

Name
Address

Phone No.
Fax
Email ID</td><td>

Mr. B. D. Sharma
A-121, Paryavaran Complex,
IGNOU Road, New Delhi – 110030
29534777, 29532236, 29535891
091-011-29532568
mining@minmec.com; min_mec@vsnl.com; minmec@bol.net.in</td></tr>
</table>

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	Web site	http://www.minmec.com
	Registration No & date till valid	Reg. no. No. 34012(03)/2014-CPAM
	Date of grant/Renewal of RQP Status	Date of grant / renewal: 29th May, 2015
	Validity	Valid up to 28th May, 2025

D.	INFORMATION REGARDING EARLIER APPROVED MINING PLANS, IF ANY.	
a)	Approval Letter no. and Date	<table><tr><th>Mining Plan</th><th>Approval date</th></tr><tr><td>1st Mining plan, 2000</td><td>23/01/2001</td></tr><tr><td>Revised Mining plan (1st Revision)</td><td>08/06/2010</td></tr><tr><td>Revised Mining plan (2nd Revision)</td><td>23/11/2015</td></tr><tr><td>Current Mining Plan (3rd Revision) (including Mine Closure Plan), June 2020</td><td>Submitted to MOC for approval</td></tr></table>
b)	Lease Area	2080 Ha
c)	Date of grant of Lease	Execution of Mining Lease agreements with Government of Gujarat on 06/10/2004 for 507.48 Ha (district Bharuch), 03/12/2004 for 342.36.89 Ha (district Surat) and 24/04/2006 for 1209.83.40 Ha (district Surat), totalling to 2059.68.29 for 30 years.
d)	Date of Expiry of Lease	Expiry dates: on 05/10/2034 for 507.48 Ha (district Bharuch), 02/12/2034 for 342.36.89 Ha (district Surat) and 23/04/2036 for 1209.83.40 Ha (district Surat), Totalling to 2059.68.29 for 30 years.
e)	Targeted Production	7.4 MTPA (RAMP, 2015)
f)	Proposed date of start of Production	The mine is operational since December, 2009.
g)	Proposed date of achieving the targeted production level	From 6th year as per calendar Table 4.1 of AMP-2015.
h)	Envisaged life of the mine (in years)	35 yrs (production) + 3 yrs for final closure of mine Total = 38 years since inception
i)	Date of actual commencement of Mining Operations, if operations already started	2009-2010
j)	Likely date of Mining Operations, if operations not yet started & reasons for non-commencement of operations	Already operational

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k)	Planned production and actual levels achieved in last 3 years	

Year	Planned		Actual		
	Lignite Mte	OB "MM3	Lignite Mte	OB "MM3"	SR Cum/te
2017-18	7.40	43.60	3.00	18.85	6.28
2018-19	7.40	43.60	3.60	22.00	6.11
2019-20	7.40	39.20	3.60	22.00	6.11

l)	Coal :- U/G O/Cast OB	UG: N/A Opencast: As above
m)	Reasons for difference between the planned and actual production levels	Land Acquisition. Also, EC and ML not granted for additional area/ production
n)	Reason for revision of the Mining Plan	The decision for expansion of 2 x 300 MW has been deferred indefinitely on account of constraints in acquisition of additional 959.00 Ha areas of the additional applied leases. Hence, GIPCL has decided for expansion of 2 x 125 MW only; and restriction of the mining operations within 2059.68.29 Ha of available ML.
o)	Details of changes in the new mining plan compared to earlier approval	
	(i) Lease Area	(i) Applied as per AMP 2015: 3019 Ha (now changed to 2059.6829 ha), Executed 2059.6829 Ha (no change)
	(ii) Block Boundary	(ii) Geological Block : 2625 Ha (no change)
	(iii) Production level	(iii) Production changed from 7.4 MTPA to 5.4 MTPA
	(iv) Reserves	(iv) Geological reserves reduced from 341.79 Mt to 258.67 Mt as the block area has been restricted to existing lease now and the additional area applied after the last approval of mining plan did not materialise.
	(v) Mining Technology(Additional sheets to be used, if required)	(v) Opencast method by mechanized mining through conventional equipment/ machinery. No change

E. LOCATION	
a) Location of the Block Taluka/ Village/ Khasra/ Plot / Block Range / etc. District / State	Mangrol-Valia Lignite Mine in villages Mangrol, Shah, Charetha, Amandera, Harsani, Timberwa, Bhilwada, Nani Pardi, Luna, Dansoli, Rajgarh and Kosmadi in Mangrol and Valia Taluka of Surat and Bharuch Districts of Gujarat

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b) Name of the Coalfield/ Coal belt	Mangrol & Valia Lignite Field.
c) Particulars of adjacent blocks: North, South, East, West	The particulars of adjoining blocks /MLs/ features are as given below: North – E, F & G Block lignite mine leases (applied) of GIPCL East –Bhaga Nadi and non-lignite bearing area. South –Vastan Lignite mine mine lease (sanctioned) of GIPCL West – Tokari Nadi
d) Area of the Allotted Block (hectares) i Geological block area ii Mining Block Area	 i. 2625 Ha ii. 2059.68.29 Ha
e) Reference no. of plan of block boundary issued by CMPDI/ SCCL/ NLC (A copy of the Plan also to be annexed)	The certification from NLC (Lr. No. DGM/Geo/NLCIL/GIPCL/2020 dt 22-04-2020) is attached as **Annexure II-D and II-E**.
f) Whether the lease boundary/ required boundary is same as demarcated by CMPDI/ SCCL/ NLC for delineating block/sub-block	Yes
g) Existing mining Lease Area in case of existing mines, (hectares)	2059.68.29
h) Applied/ required Lease Area as per the Mining Plan under consideration (hectares)	2059.68.29
i) Whether the applied lease area falls within the allotted block	yes
j) Area (hectares) of lease which falls outside the block/sub-block delineated by CMPDI/SCCL/NLC.	Nil
k) Details of outside area: - Whether forms part of any other coal block - Whether it contains any coal/lignite reserves - Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/	NA

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colony/ safety zone/ others (specify)	
l) Whether some part(s) of the allotted block has not been applied for mining lease. - Total area in Ha. of such part(s). - Total reserves in such part(s). - Brief reasoning for leaving such part(s),	No (Available ML has been considered as allotted block)
m) Type of Land involved in Hectares	Pre-Mining land use of ML/ Project Area:

Particulars	Area in Hectares
Protected Forest land	4.80
Agricultural land	1953.34.26
Waste land	23.53.93
Nallah / River	00.50.00
Road	10.11.92
Gaucher/ Others	67.3818
Total	**2059.68.39**

n) Broad Land Use Pattern (Forest, Township, Industrial, Agricultural, Grazing, Barren etc.)

Present Land Use of ML area as on 01-04-2020

Sl. No.	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
1	Mining Pit	205.29	0.00	134.32	339.61
2	Dumps including top soil dump**	208.95	0.00	80.14	289.09
3	Infrastructure (Site office, Contractor's Camp, First Aid Centre, Shelters, Pumping Station, Lignite Crusher, Lignite Stack, Weighbridge, Electric Substation)	0.42	0.00	3.48	3.90
	Sub Total (1 to 3)	**441.66**	**0.00**	**217.94**	**632.60**
4	Green Belt (common for all pits)	129.97			129.97
5	Service Road, Lignite Transport Road (Common for all pits)*	9.92			9.92
6	Settling Pond	3.45			3.45
	Sub Total (4 to 6)	**143.34**			**143.34**
	Total Disturbed Area (1 to 6)	775.94			708.94
7	Undisturbed area (out of 2059.6829 ha)	1283.74.29			1283.74.29
	Total ML/ Project area	**2059.68.29**			**2059.68.29**

* *Out of 9.92 Ha, 3.00 Ha belongs to North pit and 6.92 Ha belongs to South pit.*

** *Top soil dump area near North Pit is 20 Ha (part of OB dump) and near South pit is 10 Ha (Part of OB dump).*

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o)	Proximity of public road / railway line/major water body if any and approximate distance	Public Road: - It is about 55 kms away by road from Surat, the district head quarter and about 48 km south of Rajpardi. The site could be approached from NH-8 connecting Bombay-Ahmedabad from Kim Four Road Junction (Kim Char Rasta), which lies between Surat and Bharuch. Mangrol, the Taluka headquarters, is situated East of the Mining Lease Area. The State Highway is about 10 kms from the mining site, on the Tadkeshwar - Areth Road. The major road connecting Mangrol and Kim via Tadkeshwar passes through the property. Water body: Moti River is a seasonal river and flows in the middle of the property. Besides, Tokri River which flows just outside the North- Eastern corner of the lease area, there is another water course namely Bhukhi River flowing in the South -Western boundary of the lease flowing from East to West and joins with Moti River. These three rivers/streams generally control the drainage of the area. Railway: Kosamba is the nearest Rly station (about 28 km west) on Baroda-Mumbai railway line of western railway.
p)	Toposheet No. with latitude and longitude	The area is covered in the Survey of India Toposheet No. 46G/2 & 3 (RF 1:50,000) and is bounded by Latitudes (N) : 21°26' 19.47"N to 21°31' 29.90"N Longitudes (E) : 73°07' 12.19"E to 73°12' 53.16"E

F.	GEOLOGY AND EXPLORATION	
a)	Name of the Geological Block and area in hectares	Name of Block: Mangrol-Valia Lignite Block in Mangrol & Valia Lignite Field. Area = 2625 Sq.Km (as per RAMP 2015)
b)	Name of the Geological Report (GR) with year of preparation	1. Exploration in and around Vastan village to confirm the occurrence of lignite deposit, 1987-88. 2. Report on detailed exploration by closed space drilling for **LIGNITE IN NORTH AND NORTH-EAST OF VILLAGE SHAH**, Taluka Mangrol, Distt Surat (Topo sheet G/3), 1996. 3. Final geological report on the exploration of lignite (**MANGROL EXTENSION LIGNITE BLOCK**), Distt Surat, Gujarat, September 1997 by MECL. 4. Exploration report of northern and southern extension of Mangrol-Valia Lignite Mine lease of GIPCL, 2008.

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<table>
<tr><td>c) Name of the agency which conducted exploration and prepared GR</td><td>1. Directorate, Geology and Mining, Gujarat.
2. Mineral Exploration Corporation Ltd, MECL
3. Khanna Associates</td></tr>
<tr><td>d) Period of conducting exploration</td><td>1. 1987-88
2. 1994-98
3. 2013-15</td></tr>
<tr><td>e) Details of drilling (by all agencies)</td><td>
<table>
<tr><th>Name of Agency</th><th>No of BHs lying in and around the ML area</th><th>No. of Bore Holes lying within the ML area</th></tr>
<tr><td>MECL</td><td>83</td><td>50</td></tr>
<tr><td>DGM</td><td>65</td><td>56</td></tr>
<tr><td>Khanna Associates</td><td>20</td><td>16</td></tr>
<tr><td>Total</td><td>168</td><td>122</td></tr>
</table>
Besides, 42 BHs were also drilled during 2013-15 for production support in Valia area</td></tr>
<tr><td>f) No. of boreholes drilled within the block</td><td>122 (allotted block)</td></tr>
<tr><td>g) Overall borehole density within the block (no./ sq. km)</td><td>5.9 (122/20.596829)
(within allotted block)</td></tr>
<tr><td>h) Whether entire lease area has been covered by 'detailed' exploration.</td><td>Yes</td></tr>
<tr><td>i) Whether any further exploration is required or suggested and timeframe in which it is to be completed</td><td>No</td></tr>
<tr><td>j) Number of coal/lignite seams/horizons
- Thickness range of coal seams
- Mean Thickness of total coal horizon
- Standard Deviation of thickness
- Minimum & maximum depth of coal seams</td><td>Three nos. of lignite horizons (Upper H-1, Middle H-2, Lower H-3). The number of split seams encountered in horizons is as under.
<table>
<tr><td>Three horizons</td><td>H-1</td><td>H-2</td><td>H-3</td></tr>
<tr><td>No. of lignite seams</td><td>1 to 5</td><td>1 to 14</td><td>1 to7</td></tr>
</table>
<table>
<tr><th>Lignite Seams</th><th>Thickness range, m</th><th>Depth Range, m</th></tr>
<tr><td>Horizon-I (Top)</td><td>0.60 -27.5</td><td>14.6 –143.8</td></tr>
<tr><td>Horizon-II (Middle)</td><td>0.80- 30.0</td><td>21.0—168.6</td></tr>
<tr><td>Horizon-III (Bottom)</td><td>0.20-28.6</td><td>25.50-203.0</td></tr>
</table></td></tr>
<tr><td>k) Gross Calorific Value (GCV in K Cal/kg)</td><td>Calorific value of lignite in this blocks in mostly in 2500-3250 Kcal/Kg range.</td></tr>
<tr><td>l) Quality (Grade) of coal as per GR :</td><td>Calorific value of lignite in this block is mostly in range of 2500-3250 Kcal/Kg range.</td></tr>
</table>

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m)	Total geological reserves in the block, MT	258.67 (in allotted block, 341.79 in Geological block)
n)	Corresponding Extractable reserves: by Opencast by Underground	 163.29 MT Nil
o)	Reserves depleted	24.01 (till 31.3.2020
p)	Balance Reserve (As on Base Date)	139.28 (as on 01-04-2020)
q)	Percentage of recovery w.r.t. geological reserves: by Opencast by Underground	 (163.29/258.67)*100= 63.13% N/A

G.	MINING	
a)	Existing and proposed method of mining (Opencast for OB & coal separately with dragline/ shovel/ surface miners/ manual/ etc.) (Underground by longwall/ board & pillar/ continuous miners/LHD/ SDL/ manual/ etc.)	It is an operational mine. Opencast method by mechanized mining through conventional equipment/ machinery (Shovel-Dumper combination) has been adopted for OB & Lignite.
b)	Targeted capacity in MTPA when the mine is fully developed and the year in which proposed to be achieved By Underground : By Opencast : Total:	The mine is presently operational. Target capacity of expansion project is 5.4 MT to be achieved in 6th year as per current Mining plan and Mine Closure Plan as follows: UG = N/A OC = **5.4** MT(Peak 5.4MT) **Total = 5.4 MT**
c)	Life of the mine Underground workings: Opencast workings : Overall:	 N/A 27 years (Balance) 27 years
d)	Indicate quantum of production and expected grade* as in table below:-	

Furnish the detailed calendar programme of coal production year wise and seam wise along with OB removal in the relevant chapter:	Detailed calendar programme of lignite production, year wise and pit wise along with OB removal is given below.

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Sl. Year	Calendar Year	North Pit						South Pit						Central Pit						Total North + South+Central Pits					
		LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.	LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.	LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.	LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.
Y-1	2020-21	3.60	3.60	17.00	17.00	4.72	4.72	0.00	0.00	0.00	0.00	0.00								3.60	3.60	17.00	17.00	4.72	4.72
Y-2	2021-22	3.60	7.20	17.00	34.00	4.72	4.72	1.00	1.00	11.18	11.18	11.18	11.18							4.60	8.20	28.18	45.18	6.13	5.51
Y-3	2022-23	3.60	10.80	17.00	51.00	4.72	4.72	1.00	2.00	11.18	22.36	11.18	11.18							4.60	12.80	28.18	73.36	6.13	5.73
Y-4	2023-24	3.60	14.40	17.00	68.00	4.72	4.72	1.00	3.00	11.18	33.54	11.18	11.18							4.60	17.40	28.18	101.54	6.13	5.84
Y-5	2024-25	3.60	18.00	17.00	85.00	4.72	4.72	1.00	4.00	11.18	44.72	11.18	11.18							4.60	22.00	28.18	129.72	6.13	5.90
Y-6	2025-26	3.60	21.60	18.00	103.00	5.00	4.77	1.80	5.80	18.20	62.92	10.11	10.85							5.40	27.40	36.20	165.92	6.70	6.06
Y-7	2026-27	3.60	25.20	18.00	121.00	5.00	4.80	1.80	7.60	16.79	79.71	9.33	10.49							5.40	32.80	34.79	200.71	6.44	6.12
Y-8	2027-28	3.60	28.80	18.00	139.00	5.00	4.83	1.80	9.40	16.79	96.50	9.33	10.27							5.40	38.20	34.79	235.50	6.44	6.16
Y-9	2028-29	3.60	32.40	18.00	157.00	5.00	4.85	1.80	11.20	16.79	113.29	9.33	10.12							5.40	43.60	34.79	270.29	6.44	6.20
Y-10	2029-30	3.60	36.00	18.00	175.00	5.00	4.86	1.80	13.00	16.79	130.08	9.33	10.01							5.40	49.00	34.79	305.08	6.44	6.23
Y-11	2030-31	3.60	39.60	18.00	193.00	5.00	4.87	1.80	14.80	16.80	146.88	9.33	9.92							5.40	54.40	34.80	339.88	6.44	6.25
Y-12	2031-32	3.60	43.20	25.00	218.00	6.94	5.05	1.80	16.60	13.20	160.08	7.33	9.64							5.40	59.80	38.20	378.08	7.07	6.32
Y-13	2032-33	3.60	46.80	25.00	243.00	6.94	5.19	1.80	18.40	13.20	173.28	7.33	9.42							5.40	65.20	38.20	416.28	7.07	6.38
Y-14	2033-34	3.60	50.40	25.00	268.00	6.94	5.32	1.80	20.20	13.22	186.50	7.34	9.23							5.40	70.60	38.22	454.50	7.08	6.44
Y-15	2034-35	4.10	54.50	25.00	293.00	6.10	5.38	1.30	21.50	4.66	191.16	3.58	8.89							5.40	76.00	29.66	484.16	5.49	6.37
Y-16	2035-36	5.40	59.90	25.00	318.00	4.63	5.31		21.50		191.16		8.89							5.40	81.40	25.00	509.16	4.63	6.26
Y-17	2036-37	5.40	65.30	28.08	346.08	5.20	5.30		21.50		191.16		8.89							5.40	86.80	28.08	537.24	5.20	6.19
Y-18	2037-38	5.40	70.70	28.08	374.16	5.20	5.29		21.50		191.16		8.89							5.40	92.20	28.08	565.32	5.20	6.13
Y-19	2038-39	5.40	76.10	28.08	402.24	5.20	5.29		21.50		191.16		8.89		0.00	5.00	5.00			5.40	97.60	33.08	598.40	6.13	6.13
Y-20	2039-40	5.20	81.30	28.08	430.32	5.40	5.29		21.50		191.16		8.89	0.20	0.20	5.00	10.00	25.00	50.00	5.40	103.00	33.08	631.48	6.13	6.13
Y-21	2040-41	4.80	86.10	28.08	458.40	5.85	5.32		21.50		191.16		8.89	0.60	0.80	10.00	20.00	16.67	25.00	5.40	108.40	38.08	669.56	7.05	6.18
Y-22	2041-42	4.80	90.90	28.08	486.48	5.85	5.35		21.50		191.16		8.89	0.60	1.40	10.00	30.00	16.67	21.43	5.40	113.80	38.08	707.64	7.05	6.22
Y-23	2042-43	4.80	95.70	25.40	511.88	5.29	5.35		21.50		191.16		8.89	0.60	2.00	9.00	39.00	15.00	19.50	5.40	119.20	34.40	742.04	6.37	6.23
Y-24	2043-44	5.03	100.73	25.40	537.28	5.05	5.33		21.50		191.16		8.89	0.37	2.37	0.04	39.04	0.11	16.47	5.40	124.60	25.44	767.48	4.71	6.16
Y-25	2044-45	5.40	106.13	25.43	562.71	4.71	5.30		21.50		191.16		8.89		2.37		39.04		16.47	5.40	130.00	25.43	792.91	4.71	6.10
Y-26	2045-46	5.40	111.53	20.00	582.71	3.70	5.22		21.50		191.16		8.89		2.37		39.04		16.47	5.40	135.40	20.00	812.91	3.70	6.00
Y-27	2046-47	3.88	115.41	6.97	589.68	1.80	5.11		21.50		191.16		8.89		2.37		39.04		16.47	3.88	139.28	6.97	819.88	1.80	5.89
Total Current MP		115.41		589.68		5.11		21.50		191.16		8.89		2.37		39.04		16.47		139.28		819.88		5.89	
Total incl. Past Prodn.		132.91		667.61		5.02		28.01		237.04		8.46		2.37		39.04		16.47		163.29		943.69		5.78	

The lignite ROM is expected to have an average CV of 2800 kcal/kg.

e)	Whether the proposed external OB dump site is coal/ lignite bearing: - If so, whether coal/lignite below waste disposal area is extractable.	Fresh surface dump has been proposed on lignite bearing area at site D4, which is proposed to be re-handled and backfilled during the mining operations.
f)	Whether negative proving for coal / lignite in the proposed site for OB dump/ infrastructure has been done.	NA
g)	Proposed configuration of HEMM for OC (Coal & OB)	NUMBER OF EQUIPMENT AS CALCULATED COMBINDLY FOR NORTH AND SOUTH PIT

	Size of Equipment	No. as Per Calculation	Stan dby	Total
Lignite	3.2 CuM shovel	5	1	6
	35 T Dumper	31	3	34
	1.75 CuM shovel	**1**	**0**	**1**
OB	3.2 CuM shovel	37	4	41
	35 T Dumper	145	15	160
	Total	**219**	**23**	**242**

***Note:** These equipment will be adequate to operate all the pits including the Central pit except during 21st to 23rd year when load of 4 shovel and 17 dumpers will be required to be outsourced.*

The major common ancillary equipment:

Sl. No.	Name of equipment's	Numbers		
		South pit (Mangrol)	North pit (Valia)	Total
1.	Motor grader	1	2	3
2.	Water sprinkler	2	2	4
3.	Diesel tanker	1	2	3
4.	Mini bus	1	2	3
6.	Personnel carrier	3	4	7
7.	Tractor trailer	3	4	7
8.	Fire engine	1	1	2
9.	Transport lorry	8	4	12
10.	Jeep	8	10	18
11.	Canteen van	2	3	5
12.	Ambulance	1	2	3
13.	Dozer 320 HP	5	9	14
14.	Crane 5 - 15 tonnes	2	3	5
15.	Crane 20 tonnes	1	2	3

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Major Equipment for UG	There is no UG mining,
h) Mode of entry for underground mines (shaft, incline, edit,):	N/A
i) Operations that are proposed to be outsourced	Through MDO mode except statutory operations
j) Proposed coal evacuation facilities: (i) Face to Surface (ii) Surface to end use plants	1. ROM lignite from hydraulic shovels will be transported by 35T body trucks up to pit head where feeder breakers are installed. 2. Sized lignite from the Mine feeder breaker will be transported to the Power Plants. 3. Lignite from the North Pit to TPP will be transported through the internal road and Public Road which is black topped and is capable to transport the lignite. The internal roads are fenced with drains on either side. The distance of the TPP from South Pit (Mangrol area) and North Pit (Valia mine) is 6 KM and 18 KM respectively.

H. END USE OF COAL/ LIGNITE

a) Capacity of the approved end use plants

The total capacity of EUP will be 750MW as follows:

Sl. No.	Company Name	End Use plant, Name, location, Production capacity & distance
1	Gujarat Industries Power Corporation Ltd	Existing: SLPP Station*-1 of 2X125 MW, SLPP Station-2 of 2X125 MW, Proposed Expansion: SLPP Station-3 of 2X125 MW, near the mine subject to the land acquisition of balance area.

** SLPP: Surat Lignite Power Plant*

b) Coal/ lignite requirement for end use plant with grade/ quality

Calculation of Requirement of Lignite Based on Station Heat Rate:

Particulars	Klinker "MTPA"	Power Plant "MW"						Blast Furnace "Mtpa"
							Total	
Capacity of the end use plant		125x6					750	

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Capacity of the Project "MTPA"	5.40						
Raw Coal availability from this project "MTPA"		5.40				5.4	
Washed coal availability "MTPA"		0.00				0.00	
Reject "MTPA"		0.00				0.00	
Station Heat Rate "K Cal/Kwhr		2710				2710	
Avg Calorific Value of Coal "Kcal/Kg"							
Raw coal		2800				2800	
Washed coal							
Rejects							
Specific consumption "Kg/Kwhr"		0.97				0.97	
Plant Load Factor/ Capacity Utilisation		0.85				0.85	
Coal Requirement "MTPA"		5.40				5.40	

Total requirement for the end use plants "MTPA"	5.40

Source of coal requirement

Coal from this project "MTPA"	5.40
Linkages/ E-auction from CIL "MTPA"	
Other block of the Company "MTPA"	0.00*
Total availability "MTPA"	5.40

* *Presently, 0.60MTPA is supplied from Vastan Lignite Mine of GIPCL which will exhaust by 2024-25*

c)	% age of end use requirement to be met from this mine	100%
d)	If washing / beneficiation of the coal/ lignite is planned to be conducted on site or adjacent to the extraction area, briefly describe the nature of the beneficiation and recovery rate.	Not required as sized lignite is directly useable in Power Plant
e)	Proposed Use of Rejects/ Middlings.	No reject will be there as no washing involved

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I. ENVIRONMENTAL MANAGEMENT

a) Existing land use pattern

PRESENT LAND USE OF 2059.68.29 HA ML AREA AS ON 01-04-2020:

Sl. No	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
1	Mining Pit	205.29	0.00	134.32	339.61
2	Dumps including top soil dump**	208.95	0.00	80.14	209.09
3	Infrastructure (Site office, Contractor's Camp, First Aid Centre, Shelters, Pumping Station, Lignite Crusher, Lignite Stack, Weighbridge, Electric Substation)	0.42	0.00	3.48	3.90
	Total Disturbed area (1 to 3)	**414.66**	**0.00**	**217.94**	632.60
4	Green Belt (common for all pits)	129.97			129.97
5	Service Road, Lignite Transport Road (Common for all pits)*				9.92
6	Settling Pond	9.92			3.45
	SubTotal (4 to6)	3.45			**143.34**
	Total Disturbed Area (1 to 6)	**775.94**			**775.94**
7	Undisturbed area (out of 2059.6829 ha)	1283.74.29			1283.74.29
	Total ML area)	**2059.68.29**			**2059.68.29**

* *Out of 9.92 Ha, 3.00 Ha belongs to North pit and 6.92 Ha belongs to South pit.*

** *Top soil dump area near North Pit is 20 Ha (Part of OB Dump) and near South Pit is 10 Ha (Part of OB Dump).*

b) Land area indicating the area likely to be degraded due to mining, dumping, roads, workshop, washery, township etc.

BREAKUP AS PER PROPOSED LAND USE

Sl. No.	Particulars	At the end of Last Year of Mine Operation (27th Year)
1.	Excavation	1453.00
2.	Surface Dump	156.71
3.	Top Soil Dump	30.00
4.	Settling pond	10.00
5.	Feeder Breaker, Site office, Attendance office, Driver rest room, parking, substation, workshop and store, Lignite stack yard	3.90
6.	Magazine	0
7.	Lignite-OB transport road	9.92
8.	Green belt along ML 7.5 m and around the dump 10m	156.62
9.	Road diversion	6.30
	Sub Total Disturbed area including Green Belt	**1826.45**
10.	Undisturbed area / Indirectly affected area/ area for exploration	**233.233**
	Total ML area	**2059.683**

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c) Surface features over the block area	Surface features over the Block Area: 1. The mine is already operational and is proposed to be expanded to 5.4 MTPA. Road network is already in place and is capable to take care of additional production and if required it will be further strengthened to take care of the additional about 30% production. Since all the three Pits are away from each other, it is proposed to have three sets of service facilities i.e. one set for each Pit. 2. The major surface features present in the area (2080 Ha) are: ➢ Vadsol hamlet and Kosmadi Faliya hamlet (Rajgarh Gram Panchayat) ➢ Kosamba – Zankhvav, NG Railway line ➢ Moti River and Tokri River ➢ Panchayat Road from Rajgarh to Mangrol ➢ Cart Tracks ➢ Kosamba Zankhvav SH No.166 3. Moti Nadi is a seasonal river and flows in the middle of the property. Besides, Tokri Nadi which flows just outside the North- Eastern corner of the lease area, there is another water course namely Bhukhi Nadi flowing in the South -Western boundary of the lease flowing from East to West and joins with Moti Nadi. 4. A stretch of land totalling to 4.48 ha along the existing State Highway (SH166) (Kosamba-Vankal measuring about 2.0 KM) between Mosali Chokri and Ukai-Kankrapar Main canal, passing through the block has been planted by Social Forestry Department and has been booked under protected forest in the records. This stretch of the road is to be re-aligned parallel to the existing Narrow Gauge Kosamba- Zankhvav railway line passing through the block, within the proposed surface barrier against the railway line from the quarry edge. Accordingly 4.48 ha green belt will be developed along the proposed diverted alignment of the SH166. 5. Following power lines are passing through the block. • Two 220 KV Transmission lines belonging to GETCO and PGCIL.

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		• 11 KV Transmission line belonging to DGVCL.
d)	No. of villages/Houses to be shifted	There are no inhabited villages to be rehabilitated. There are Vadsol hamlets with 83 hutments and Kosmadi Falia (Rajgarh Gram Panchayat) with 35 hutments in the executed ML lease area which are proposed to be shifted as per the R & R policy.
e)	Population to be affected by the project	Approximately 300. (Refer Exec. Summary, Environment Mgmt (e) of AMP-2015

f) Year wise proposal for reclamation of land affected by mining activities, Ha

LAND DEGRADATION AND TECHNICAL RECLAMATION (CUMULATIVE AREA 'HA')

Stage/year		Land Degraded				Technically Reclaimed Area			
		Excavation	Dump (Extn + Top Soil)	Infra / others	Total	Backfill	Dump (Extn+Top Soil)	Others	Total
Up to Base year 2009-20		339.610	319.090	147.240	805.940	0.000	0.000	129.970	129.970
Y-1	2020-21	349.320	336.810	158.160	844.290	0.000	76.570	134.340	210.910
Y-3	2022-23	400.090	295.780	174.100	869.970	63.000	76.570	150.280	289.850
Y-5	2024-25	494.770	186.710	182.840	864.320	194.360	76.570	159.020	429.950
Y-10	2026-30	765.250	186.710	182.840	1134.800	445.000	76.570	159.020	680.590
Y-15	2031-35	993.900	186.710	182.840	1363.450	699.000	76.570	159.020	934.590
Y-20	2036-40	1226.530	186.710	186.740	1599.980	888.000	76.570	162.920	1127.490
Y-25	2041-45	1430.310	186.710	186.740	1803.760	1095.000	76.570	162.920	1334.490
Y-27	2046-47	1453.000	186.710	186.740	1826.450	1125.000	76.570	162.920	1364.490
Post Closure									
Y-30	2048-50	1453.000	186.710	186.740	1826.450	1243.000	156.710	426.740	1826.450

BIOLOGICAL RECLAMATION (CUMULATIVE AREA 'HA')

Stage/year		Biologically Reclaimed Area					Forest land (Retrun)	Un Disturbed/ To be left for Public/com Use	Total
		Agricul -ture	Plantation	Water body	Public / Company Use	Total			
Up to Base year 2009-20			129.970			129.970		233.233	363.203
Y-1	2020-21		210.910			210.910		233.233	444.143
Y-3	2022-23		275.440			275.440		235.633	511.073
Y-5	2024-25		398.850			398.850		235.633	634.483
Y-10	2026-30		633.190			633.190		235.633	868.823
Y-15	2031-35		898.190			898.190		235.633	1133.823
Y-20	2036-40		1073.190			1073.190		239.533	1312.723
Y-25	2041-45		1288.190			1288.190		239.533	1527.723
Y-27	2046-47		1316.370			1316.370		239.533	1555.903
Post Closure									
Y-30	2048-50	290.889	1311.570	210.000		1812.459	4.800	242.424	2059.683

* *290.889 ha area will be the total agriculture area available in PMC, comprising 159.82 ha out of the backfill area + 80.14 ha out of surface dump area + 10 ha settling pond area + 10.929 ha out of road & infrastructure area + 30 ha top soil dump.*

** *1311.57 ha area will be the total plantation area available in PMC, comprising 1083.18 ha out of backfilled area + 76.57 ha out of external dump + 151.82 ha out of green belt. Besides 4.80 ha plantation will be returned to Forest.*

\# *242.424 ha area will be the total area under "Un Disturbed/To be left for Public/com Use" in PMC, comprising 233.233 ha (Undisturbed on base date 31-3-2020) + 2.400 ha (SH Rd diversion in 3rd yr) +3.900 ha North Rd diversion in 20th year + 2.891 ha (Company facilities retained for Public use in PMC)*

g)	Monitoring schedules for different environmental components after the commencement of mining and other related activities.	Refer Table 10.1 of Chapter 10

Sl. No.	Description of parameters	Schedule and duration of monitoring
1.	Air quality in the vicinity of the mine – PM 10, PM 2.5, SO_2, and NO_X	8 stations. Twice a week for three months

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2.	Water quality (all parameters as per drinking water standards IS:10500)	14 samples once in a season
3.	Ambient noise levels	8 stations once in a season
4.	Study of Flora and Fauna	Within the study area
5.	Soil quality	One sample from core zone and one from study area

J. PROGRESSIVE AND FINAL MINE CLOSURE PLAN: Separate Chapter No.11 is given:

a) Estimated total capital expenditure for mine closure activities

Capital expenditure for mine closure:

Heads	ACTIVITIES	Unit	Volume of work	Rate Rs./unit	Total Cost, Rs. Crore
Progressive Closure	Water quality management	LS	-		1.48
	Air quality management	LS	-		1.48
	Barbed wire fencing around dump	m	12440.00	212	0.57
	Barbed wire fencing around pit	m	33875.00	212	0.72
	Top soil management	Mcum	7.99	60000000	47.94
	Technical and biological reclamation of mined out land and OB dump	Ha.	1335.32	400000	53.41
	Plantation over virgin area including Green Belt	Ha.	1391.71	400000	47.80
	Manpower cost and supervision	LS	-		0.90
	Toe wall around the dump	m	12187.00	1000	1.22
	Garland drain around the dump	m	27622.00	500	1.39
	Any other activity(Settling pond)	Ha.	-	800000	1.18
	Sub Total		-		158.09
FINAL CLOSURE					
Dismantling of infrastructure, disposal/ rehabilitation of mining machinery	Dismantling of workshop	LS	-		0.90
	Rehabilitation of dismentaled facilities	Ha.	2.40	400000	0.10
	Dismantling of pumps and pipes	LS	-		0.60
	Re-arranging of water pipelines to dump top, park and agriculture land	LS	-		0.50
	Dismantling of facilities	LS	-		1.50
	Dismantling of power line	LS	-		0.15
	Sub-Total		-		3.75
Safety and Security	Concrete wall fencing around the water body		9524.00	2500	2.38
	Boundary wall around the water body		13377.00	2500	3.34
	Stabilisation (viz. Benching, pitching etc) of side walls of the water body		-		1.00
	Sub-Total		-		6.73
Technical and biological reclamation of mined out land and OB dump	Top soil management	MCum	0.74	60000000	4.44
	OB rehandling for backfilling	mcum	21.62	60000000	129.72
	Peripheral road, gates, view point, cemented steps on bank	LS	-		1.50
	Expenditure on development of Agricultural land		290.89	400000	11.64
	Landscaping and plantation	Ha.	-	400000	0.50
	Sub-Total		-		147.80
Post closure management and supervision	Power cost	LS	-		0.20
	Post mining Water quality management	LS	-		0.15
	Post mining Air quality management	LS	-		0.15
	Manpower cost and supervision	LS	-		0.50
	Sub-Total		-		1.00
Others	Entrepreneurship development (vocational skill development, training for sustainable income of affected people	LS	-		1.50
	Continuation of othe services like runing of schools etc. (corpus fund deposits)	LS	-		50.00
	Sub-Total		-		51.50
	TOTAL COST				368.85

(B) DERIVATION OF ESCROW AMOUNT RELATED TO OC MINING

WPI as on Base date 01-04-2019)		121.1
WPI as on April 2020	119.20	
Escalation rate of Closure cost		0.98431
	OC	UG

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Base rate of closure cost (Cr. Rs./Ha.)	0.09	0.015
Closure cost as on base date 01/01/2020 (Cr. Rs./Ha.)	0.0886	
Project Area (Ha.)	2059.6829	
Amount to be deposited into Escrow Account "Rs.Cr."	182.4631	
Amount already deposited into Escrow Account "Rs. Cr."	38.915	
Net Amount to be deposited into Escrow Account "Rs. Cr."	143.5481	
Rate of compounding of annual closure cost	5%	
Balance Life of the project For Escrow Account "in Yrs"	**27**	
Annual Closure Cost (Rs. Cr.)	5.3166	
Amount to be deposited into Escrow Account after compounding @ of 5% "Rs in Crs"	**290.6536**	

AMOUNT TO BE DEPOSITED IN ESCROW ACCOUNT

Amount (Rs. Cr.)				
Year	OC	Year	UG	Total
1	5.3166	1	-	5.3166
2	5.5824	2	-	5.5824
3	5.8615	3	-	5.8615
4	6.1546	4	-	6.1546
5	6.4624	5	-	6.4624
6	6.7855	6	-	6.7855
7	7.1247	7	-	7.1247
8	7.4810	8	-	7.4810
9	7.8550	9	-	7.8550
10	8.2478	10	-	8.2478
11	8.6602	11	-	8.6602
12	9.0932	12	-	9.0932
13	9.5478	13	-	9.5478
14	10.0252	14	-	10.0252
15	10.5265	15	-	10.5265
16	11.0528	16	-	11.0528
17	11.6055	17	-	11.6055
18	12.1857	18	-	12.1857
19	12.7950	19	-	12.7950
20	13.4348	20	-	13.4348
21	14.1065	21	-	14.1065
22	14.8118	22	-	14.8118
23	15.5524	23	-	15.5524
24	16.3300	24	-	16.3300
25	17.1466	25	-	17.1466
26	18.0039	26	-	18.0039
27	18.9041	27	-	18.9041
Total	290.6536		-	290.6536

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K. Others	
a) Base date for WPI, Balance Reserves calculation	(i) For WPI: April, 2020 (ii) For Balance Reserves: 31-03-2020
b) Calendar year from which the production will start	The mine is in operation since 2009-10. Under this Revised Mining Plan (3rd Revision) & Mine Closure Plan, 1st year of Calendar Year is counted from 2020-21
c) Results of any investigation carried out for scientific mining, conservation of minerals and protection of environment; future proposals.	(i) "Hydrology & Hydrogeology of Mangrol-Valia Opencast Mine Project, January 2015 by M/s Srushti Seva, Nagpur. (**Annexure XVII**) (ii) "Advice on optimum slope design of ultimate pit Slope up to 150m depth and 50m High (iii) Dump at Mangrol Valia Lignite Mine, Surat Gujarat, GIPCL" by CMRS, Dhanbad, September-2007 (**Annexure XVIII-B**). (iv) External dump slope study by CMRI, 2007 (**Annexure XVIII-C**).
d) Signature of RQP Date Place	

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE BLOCK

The Geological block area of Mangrol-Valia Lignite Mine is 2625 Ha. M/s Gujarat Industries Power Company Ltd. had applied for three mining leases, situated north of Vastan lease, covering 1210 Ha in Mangrol area, 350 Ha in Mangrol North area, both in Surat & Bharuch Districts, and 520 Ha in Valia Taluka of Bharuch District totaling to 2080 Ha, which contains potential lignite reserves to meet the increased requirement of lignite. But, MOC approval (dt. 31.10.2001, **Annexure I**) for grant of Mining Lease was given for 2067.48.00 Ha only. However, the actual lease executed with the Gujarat Government (2004/2006) is for 2059.68.29 Ha.

The 1st Mining Plan (2000 version approved on 23/01/2001 by MoC) was for a production of 4.2 MTPA over an area of 2080 Ha. (**Annexure IV-A**), on basis of which an ML of 2059.68.29 Ha was granted by Gujarat Govt. (Annexure XVI-A). This was, then, being the old case on pipeline, before the new procedure of allotment of lignite blocks, the Mining Plan was approved prior to the Revision of Screening Committee to deal with allotment of lignite block along with coal blocks.

Till date three Mining Plans have been approved by MOC. The first revision (2009 version, 3710 HA) for expansion from 4.2 to 7.4 MTPA, was approved by MOC on 08.06.2010.

The 2nd revision Mining Plan & Mine Closure (2015 version, 7.4 MTPA, with reduced area 3019 HA, reducing dump area as suggested by EIA committee) was approved by MOC on 23/11/2015 for production capacity of 7.4 MTPA, here after it is being referred as RAMP (2015).

The current Mining Plan (3rd Revision) (including Mine Closure Plan) for a reduced production capacity of 5.4 MTPA (as one of the EUP not coming up due to land acquisition issues in land for mining) is the 4th Mining Plan. This MP envisages the ML area of 2059.68.29 HA, which has already been granted to GIPCL.

1.2 NAME OF APPLICANT WITH COMPLETE ADDRESS

The name and address of the applicant Company is given in Table 1.1 below:

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TABLE 1.1
NAME AND ADDRESS OF THE COMPANY

Registered Office	Office
M/s Gujarat Industries Power Company Ltd.	**M/s Gujarat Industries Power Company Ltd.**
Address: P.O. Petrofils - 391 347. DIST. Baroda	SLPP, At & Post : Nani Naroli, Taluka: Mangrol, District: Surat, Gujarat.
Phone: 0265-372768, 373213, 373159	Phone: 02629-261087
Fax: 0265 - 373207	Fax: 02629-261112
Email: genbaroda@gipcl.com Website: www.gipcl.com	Email: cgmminesoffice@gipcl.com

1.3 STATUS OF THE APPLICANT

Gujarat Industries Power Company Ltd. (GIPCL) is a Public Limited Company incorporated under Companies Act, in 1985, under Gujarat Government.

1.4 BACKGROUND OF THE COMPANY

Gujarat Industries Power Company Limited (GIPCL) is a Public Limited Listed Company incorporated in 1985 having its Registered Office at P.O.: Petrochemicals – 391 346, Dist.: Vadodara. GIPCL was promoted under the auspices of the Govt. of Gujarat (GoG) by Gujarat Urja Vikas Nigam Limited (GUVNL) (erstwhile Gujarat Electricity Board – GEB), Gujarat Alkalies & Chemicals Limited (GACL), Gujarat State Fertilizers & Chemicals Limited (GSFC) and Petrofils Co-operative Limited (in Liquidation). The Company was conceived to cater electricity requirements of the Promoting Power Intensive Companies. The total installed capacity of GIPCL is 959.4 MW.

1. GIPCL installed its first 145 MW Neptha / Natural Gas based Power Plant at Vadodara in February 1992.

2. GIPCL expanded its Power generation capacity by installing 165 MW Neptha / Natural Gas based Power Plant at Vadodara in November 1997, as Independent Power Producer (IPP).

3. Further, It expanded its capacity by installing Lignite based Phase – I, 125 MW X 2 Units in February 2000 and Phase – II, 125 MW X 2 Units in April 2010, at Village Nani Naroli, Tal.: Mangrol, Dist.: Surat, known as Surat Lignite Power Plant (SLPP). Power generated by GIPCL is supplied to State grid (GUVNL) and a part of it is given to the promoting

companies through the State Grid. GIPCL has its captive Lignite Mines in Mangrol Taluka, Dist.: Surat and Valia Taluka, Dist.: Bharuch.

4. In addition, GIPCL is operating 5 MW Photo Voltaic Solar Power Plant which is located on the top of Over Burden Soil Dump at Vastan Lignite Mine. GIPCL has also successfully commissioned 1 MW Distributed Solar Power Pilot Plants (DSPP) with novel concept of Agriculture activities, at two locations in Gujarat viz. at Village Amrol, Tal.: Ankalav, Dist.: Anand and at Village Vastan, Tal.: Mangrol, Dist.: Surat.

5. GIPCL is also set up 2x 40 MW PV Based Solar Power plant at Gujarat Solar Park, Charanka, Dist.: Patan, Gujarat. PPA for the project has been signed with Solar Energy Corporation of India Ltd (SECI).

6. GIPCL has also commissioned 112.4 MW Wind power projects in the State of Gujarat. The projects are in operation since 2016.

Lignite for the Power Plant is obtained from a Captive Lignite Mines operated by GIPCL at Vastan and Mangrol-Valia in Surat District and Bharuch District respectively.

1.5 MINERALS WHICH ARE OCCURING IN THE AREA AND WHICH THE APPLICANT INTENDS TO MINE

Lignite

1.6 PERIOD FOR WHICH MINING LEASE IS REQUIRED

30 years (already in place).

1.7 REFERENCE NO. AND DATE OF LETTER FROM THE MINISTRY OF COAL

MOC approval (dt.31.10.2001) for grant of Mining Lease was given for 2067.48.00 Ha vide Letter No. 48024-Lig.(Pt.), dt. 31.10.2001 **(Annexure I)**.

Separate letter of allotment was not issued, as per the then practice for lignite blocks. This was, then, being one of the old cases before coming into effect of the new procedure of allotment of lignite blocks through standing committee. Lignite section had termed these projects as pipeline projects (ref. **Annexure IV-A**).

The Mangrol-Valia Lignite Block has been granted ML by "Industries and Mines Department", Govt. of Gujarat vide letters no. MCR-1098-1108-CHH-1 dated 06/04/2004 for 350 Ha; MCR-1098-1109-CHH- dated 06/04/2004 for 507.48 Ha and MCR-1092-(G-8)- 3626-CHH-1 dated 25/10/2005 for 1210 Ha totalling to **2067.48 Ha** (Copy enclosed as **Annexure XVI-A**).

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However, the Execution of Mining Lease agreements with Government of Gujarat was done for 2059.68.29 Ha only (on 06/10/2004 for 507.48 Ha, district Bharuch; on 03/12/2004 for 342.36.89 Ha, district Surat; and on 24/04/2006 for 1209.83.40 Ha, district Surat) **(Annexure II)**.

1.8 LOCATION OF END USE PLANTS (EXISTING AND/OR PROPOSED), THEIR REQUIREMENT AND SOURCE TO FILL THE GAPS

The details of the existing EUP are given in Table 1.2.

TABLE 1.2
NAME WITH LOCATION OF END USE PLANT AND REQUIREMENT OF LIGNITE AS PER ALLOTMENT LETTER

Sl. No.	Company Name	End Use plant, Name, location, Production capacity & distance
1	Gujarat Industries Power Corporation Ltd	Surat Lignite Power Plant (SLPP) Station-1 of 2X125 MW at Nani Naroli, Dist. Surat SLPP Station-2 of 2X125 MW, Proposed Expansion: SLPP Station-3 of 2X125 MW, near the mine.

The distance of the proposed power plant from South Pit (Mangrol area) and North Pit (Valia mine) is 6 KM and 18 KM respectively.

1.9 NORMS USED FOR COMPUTING CONSUMPTION

The norms of calculation are given in Table 1.3.

TABLE 1.3
CALCULATION OF REQUIREMENT OF LIGNITE BASED ON STATION HEAT RATE

Particulars	Klinker "MTPA"	Power Plant "MW"						Blast Furnace "Mtpa"
							Total	
Capacity of the end use plant		125x6					750	
Capacity of the Project "MTPA"	5.40							
Raw Coal/ lignite availability from this project "MTPA"		5.40					5.4	
Washed coal/ lignite availability "MTPA"		0.00					0.00	
Reject "MTPA"		0.00					0.00	

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Particulars	Klinker "MTPA"	Power Plant "MW"					Blast Furnace "Mtpa"
Station Heat Rate "K Cal/Kwhr		2710				2710	
Avg Calorific Value of Coal / lignite "Kcal/Kg"							
Raw coal/ lignite		2800				2800	
Washed coal							
Rejects							
Specific consumption "Kg/Kwhr"		0.97				0.97	
Plant Load Factor/ Capacity Utilisation		0.85				0.85	
Coal Requirement "MTPA"		**5.40**				5.40	

Total requirement for the end use plants "MTPA"	5.40

Source of coal requirement

Coal/ lignite from this project "MTPA"	5.40
Linkages/ E-auction from CIL "MTPA"	
Other block of the Company "MTPA"	0.00*
Total availability "MTPA"	5.40

* ***Presently, 0.60MTPA is supplied from Vastan Lignite Mine of GIPCL which will exhaust by 2024-25.***

1.10 LIGNITE BENEFICIATION

No Lignite beneficiation plant is proposed as the ROM is directly useable.

1.11 NAME OF RQP PREPARING MINING PLAN AND MINE CLOSURE PLAN

Name	:	Mr. B. D. Sharma
Address	:	A-121, Paryavaran Complex, IGNOU Road New Delhi – 110030
Phone	:	91-11-29532236, 29535891; 29532568
E-mail	:	mining@minmec.com; minmec@gmail.com
Web site	:	http://www.minmec.com
Registration Number	:	No. 34012(03)/2014-CPAM
Date of grant / renewal	:	29th May, 2015, valid up to 28th May, 2025

The certificate of RQP is enclosed as **Annexure V.**

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1.12 STATUS OF THE PROJECT

All conditions annexed with the following documents or otherwise, and the directives issued by the State/Central Govt. /statutory authorities shall be complied with by the mine owner as detailed under Post Mine Closure Plan (Chapter 11).

(i) Mine is under operation.

(ii) MOC approval (dt.31.10.2001) for grant of Mining Lease was given for 2067.48.00 Ha vide Letter No. 48024-Lig.(Pt.), dt. 31.10.2001 **(Annexure I)**.

(iii) The Mangrol Valia Lignite Block was granted ML vide letter no dated MCR-1098-1108-CHH-1 dated 06/04/2004 for 350.00 Ha, MCR-1098-1109-CHH-1 dated 06/04/2004 for 507.48.00 Ha and MCR-1092-(G-8)-3626-CHH-1 dated 25/10/2005 for 1210.00 Ha.; totalling to 2067.48 Ha.

(iv) Execution of Mining Lease agreements with Government of Gujarat on 06/10/2004 for 507.48 Ha (district Bharuch), 03/12/2004 for 342.36.89 Ha (district Surat) and 24/04/2006 for 1209.83.40 Ha (district Surat), totalling to 2059.68.29 for 30 years.

(v) Environment Clearance by the Ministry of Environment and Forests vide their letter Ref No J-11015/38/99-IA.II (M) dated 21/07/2003 in lieu of the 1st Mining Plan (2000) for 4.2 MTPA.

(vi) Mining Plan of 4.2 MTPA, approved by Ministry of Coal, Government of India, New Delhi vide letter No.48024/3/98-Lig dated 23.01.2001.

(vii) Mining plan for Expansion from 4.2 MTPA to 7.4 MTPA, approved by Ministry of Coal, Govt. of India, New Delhi vide letter no. 48024/3/98-Lig (Part) dated 08.06.2010 has not yet received the approval from MOEF&CC.

(viii) Revised Mining Plan (2nd Revision) and Mine Closure Plan was approved by MOC on dt. 23/11/2015 for 7.4 MTPA for reduced area of 3019 Ha but has not yet received the approval from MOEF&CC.

1.13 DETAILS AND SCOPE OF THE PRESENT PROPOSAL

After the first approval, the Mining Plan was revised twice (increase in area and production) but neither of them could be implemented due to pending environmental clearance.

One of the approved EUP, viz. Phase-2 SLPP 2X300MW is not coming up, as the decision has been deferred indefinitely on account of non acquisition of additional 959.00 Ha areas of the additional applied leases.

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Instead, GIPCL has decided to setup 2 x 125 MW units as Phase-2 expansion of SLPP. Therefore, lignite requirement has been revised downwards to 5.4 MTPA. This Mining Plan (3rd Revision) (including Mine Closure Plan) has been planned for 5.4 MTPA with reduced land requirement of 2059.68.29 Ha i.e. within the existing leasehold area.

1.14 BASE DATE OF MINING PLAN/ MINE CLOSURE PLAN

Base date for this Mining Plan (3rd Revision) (including Mine Closure Plan), and Balance reserve estimates and balance life is 1.4.2020, for the Escrow Account calculation WPI as on April, 2020 has been considered.

CHAPTER 2

DETAILS OF EARLIER APPROVAL OF MINING PLAN

2.1 INFORMATION REGARDING EARLIER APPROVED MINING PLANS

2.1.1 Comparison of main parameters of all the Mining Plans approved in the past

Till date three Mining plans have been approved by MOC and the current Mining Plan (3rd Revision) (including Mine Closure Plan) will be 4th one.

The 1st (2000 version), Mining Plan for the Proposed Lignite Mine (Valia and Mangrol Areas) was approved by MOC vide letter no. 48024/3/98-Lig. dt. 23/01/2001 for a production of 4.2 MTPA over an area of 2080 Ha (**Annexure IV-A**).

However, the actual ML granted by the Gujarat Government was for only 2059.68.29 Ha.

The first revision (2009 version, 3710 Ha), Mining Plan for Mangrol Valia Lignite Mine Expansion (from 4.2 to 7.4 MTPA), was approved by MOC vide letter no. 48024/3/98-Lig. (Part) dt. 08.06.2010, on the basis of which an ML of 2059.68.29 Ha was granted and additionally applied lease area of 1630.00 Ha.

Mining Plan for Mangrol Valia Lignite Mine (2nd Revision) & Mine Closure Plan (7.4 MTPA) (26th February, 2015 version with reduced area 3019 HA, reducing dump area as suggested by EIA committee) was approved by MOC vide letter no. 48024/3/98-Lig. (Pt II) dt. 23/11/2015 for production capacity of 7.4 MTPA. It is being referred as RAMP (2015).

This Mining Plan (3rd Revision) (including Mine Closure Plan) has been planned for 5.4 MTPA with reduced land requirement of 2059.68.29 Ha, i.e. the ML actually granted.

The salient features of the Current and the Approved the Mining Plans are compared and tabulated below in Table 2.1.

TABLE 2.1
SALIENT FEATURES OF THE CURRENT AND THE APPROVED MINING PLANS

Sl. No.	Particulars	1st Mining Plan, 2000	Revised Mining Plan (1st Revision)	Revised Mining Plan (2nd Revision)	Current Mining Plan (3rd Revision) (including mine closure plan), 2020
	Latitude Longitude	21°21' to 21°31' 73°06' to 73°11'	21°25' to 21°31' 73°06' to 73°09'	21°26'03" to 21°31'10" 73°06'58" to 73°13'44"	21°26' 19.47"N to 21°31' 29.90"N 73°07' 12.19"E to 73°12' 53.16"E (Source: No. G.S./ Mining Lease/Geo Reference/20/21/686 dt 04-03-2020 from G&M Office, Surat and No. AG./BH/M L/ Geo Reference /19-20/780 dt 19-03-2020 from G&M Office, Bharuch)
1	Approved on	23/01/2001	08/06/2010	23/11/2015	to be approved
2	Lignite Production, MTPA	4.2	7.4	7.4	5.4
3	Mining Lease in Ha	2080.00	3710.00	3019.00	2059.6829
4	Reason for revision of Mining Plan	For Power Plant of 750 MW	Envisaged expansion of Power Plant from 750 MW to 1100 MW (2x125 MW existing + 2x125 MW commissioned in 2010 + 2x 300 MW)	During the presentation on 18.04.2011 to EIA for grant of EC the committee suggested to reduce the external dump area	Phase-2 SLPP 2X300MW is not coming up, as the decision has been deferred indefinitely on account of non acquisition of additional 959.00 Ha areas of the additional applied leases. Instead, GIPCL has decided to setup 2 x 125 MW units as Phase-2 expansion of SLPP. This Revised Mining Plan with reduced land requirement of 2059.68.29 Ha, the mining lease for which had already been granted.

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Sl. No.	Particulars	1st Mining Plan, 2000	Revised Mining Plan (1st Revision)	Revised Mining Plan (2nd Revision)	Current Mining Plan (3rd Revision) (including mine closure plan), 2020
5	Power plant capacity to be supported, MW	500 MW as per Mining Plan with an expansion of another 250 MW as per Mining Plan approval letter of 16-01-2001	1100	1100	750
6	Geological Reserves considered out of the total 341.79, MT	265.43 *	336.43	336.43	258.67
7	Extractable Reserves, Mt	170.39*	199.87	199.87 (including coal extracted)	163.29 (139.28 excluding 24.01 Mt already extracted)
8	Depth, m	110	150	150	150
9	OBR, MCuM	957.57	1204.12	1204.12	943.69 (819.88 excluding 123.81 MCuM already removed)
10	Stripping Ratio, Cum/T	5.62	6.02	6.02	5.78 (5.89 for balance reserves)
11	Life	-	35 years (Mine Operation)	35 years mine operation + 3 years for final closure including re-handling, Total 38 years	27 years for balance reserves (Mine Operation)

**Note: Refer item 2 and 3 of GIPCL letter dt. 16-10-2000 to MOC which forms an integral part of the Approved Mining Plan of 2000 (Annexure IV-A Cont..).*

2.1.2 Comparison with the RAMP (2015) with current Revised Mining Plan (3rd Revision) (including Mine Closure Plan

Comparison of parameters of AMP (2015), 2nd revision with current Revised Mining Plan (3rd Revision) (including Mine Closure Plan is given below in Table 2.2.

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TABLE 2.2
DETAILS OF CHANGES IN THE NEW MINING PLAN (REVISION 3) COMPARED TO EARLIER APPROVED MINING PLAN (REVISION 2), 2015

Sl. No.	Parameters	Previous Mining Plan(2015)	Current Mining Plan (May 2020)	
a.	Lease area "Ha"	**2060** The Mining Plan (2000 version) approval and environmental clearance (EC) are for 2080 Ha. The MOC recommended, ML area of 2067.48 ha vide letter dt. 31-10-2001(refer **Annexure I** of current MP&MCP) The ML was finally executed for 2059.68.29 ha (507.48 ha dt 06-10-2004, 342.3689 dt 03-12-2004 and 1209.8340 ha dt. 24-04-2006). (refer **Annexure XVI-A** of current MP&MCP)	**2059.6829**	
b.	Project Area "Ha"	**3019 (Refer Para 2.6 of Chapter II of AMP)**	**2059.6829 (ML already available)**	
c.	Life of the Project "Yrs"	35 years (production) + 3 years for final closure of mine including re-handling, Total 38 years	27 Year + 3 years for final closure of mine including re-handling, Total 30 years	
d.	Minimum and Maximum Depth of working "m"	(i) Minimum: 14.6 (ii) Maximum: 150m	**Depth** / **Valia area** – **North Pit**: Minimum 53, Maximum 150; **Mangrol area** – **Central Pit**: Minimum 125, Maximum 140; **South Pit**: Minimum 55, Maximum 150	Refer Table 5.15
e.	Geological Block "Ha"	2625	2625 (2308.35 ha lignite bearing+316.65 ha non-lignite bearing area) (ML not granted for entire lignite bearing area	(refer Summarised Data, Location d at page 5 of RAMP

Sl. No.	Parameters	Previous Mining Plan(2015)	Current Mining Plan (May 2020)	
			but granted for1630.59 ha lignite bearing + 148.3729 ha non lignite bearing of the geological block +280.7200 ha non lignite bearing outside the geological block = 2059.6829 ha.)	2015)
f.	Production Target "MTPA"	**7.4**	**5.4**	
g.	Seams Available "As per GR"	Three horizons: H-1 | H-2 | H-3 No. of lignite seams: 1 to 5 | 1 to 14 | 1 to7	No change	
h.	Seams not considered for Mining with Reasons	Nil	No change	
i.	Geological Reserve "Mt"	1 Geological reserves as per approved revised mine plan (2nd revision) and mine closure plan-2015 (7.4 MTPA, 3019 HA) — 341.79 3 The geological reserves as calculated from the model works. (refer AMP_2015, Para 3.7 of Chapter III & para 4.6.1 of Chapter IV) — 336.43	1 Geological Reserve within exploration area / Geological Block, — 341.79 2 Geological reserves outside the allotted block area, — 83.12 3 Vertical Reserve in allotted block area (1-2) — 258.67	Refer Table 4.8 of Chapter 4 of current MP
j.	Blocked Reserve "Mt"	**Total Reserves Blocked: 136.56**	**Total Reserves Blocked:** 95.38 **(allotted block)**	
k.	Minable Reserve "Mt"	**199.87**	163.29	

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Sl. No.	Parameters	Previous Mining Plan(2015)	Current Mining Plan (May 2020)	
l.	Extractable Reserves "Mt"	199.87	163.29 (allotted block)	Refer para 5.3.2, Table 5.3
m.	% of Extraction/recovery	59.41	(163.29/258.67)*100= 63.13	
n.	Reserve Depleted (till the base date) Reserves " Mt"	15.01	24.01 (Extracted Lignite up to 31-03-2020)	
o.	Balance Extractable reserve "Mt"	184.86	139.28 (as on 01-04-2020)	
p.	Average Grade	Grade as per GR: / GCV in K Cal/Kg / UHV in Kcal/Kg Range: 1610 – 4000 / 105 – 1423 Mean: 2500 – 3250 / 206 - 1227	No change	
q.	OB in MM^3	**1204.12**	819.88 (Balance as on 01-04-2020)	
r.	SR MM^3/te	**6.02 (1204.12/199.87)**	5.78 (since inception) (943.69/163.29) 5.89 (balance) (819.88/139.28)	
s.	Mining Technology	Mechanized opencast mining with HEMM like diesel hydraulic shovels/dumpers for waste removal and lignite production.	No change	
t.	Coal Beneficiation envisaged	Lignite beneficiation not envisaged	No change	
u.	Handling of Rejects	Not applicable	No change	
v.	Land use pattern " Ha"	As follows: Refer Chapter XIII (Proposed land use) of AMP and MCP-2015	Refer Chapter 9, Table 9.4 (under Para 9.1.3) of Current MP	

Sl. No.	Parameters	Previous Mining Plan(2015)	Current Mining Plan (May 2020)	
1	Excavation Area	Mining : 1838.21	1453	
2	Top Soil Dump	: 50.00	30.00	
3	External Dump	Dumping : 394.00	156.71	
4	Safety Zone			
5	Other use	(i) Lignite stacking : 10.00 (ii) Settling pond : 0.00 (iii) Road : 0.00 (iv) Area for rationalization* : 723.99	(i) Embankment : 0.00 (ii) Settling Pond : 10.00 (iii) Road : 9.92 (iv) Explore Magazine : 0.00 (v) Drain : 0.00 (vi) Road diversion : 6.30	
6	Infrastructure area	2.80	3.90	
7	Green Belt	0.00	151.82	
8	Undisturbed Area	--	238.033	
9	**Total**	**3019.00**	**2059.6829**	
w.	Reasons for Revision	Reasons are as follows: (i) Capacity of the approved end use plants-		

Existing Station 1 Surat Lignite Power Plant (SLPP)	2 x 125 MW
Phase-2, Station 2, commissioned in 2010 SLPP	2 x 125 MW
Proposed, Station 3 SLPP	600 MW*
Total	**1100 MW**

Sl. No.	Parameters	Previous Mining Plan(2015)	Current Mining Plan (May 2020)	
		The decision for expansion of 2x300 MW* has been deferred indefinitely on account of acquisition of additional 959.00 Ha areas of the additional applied leases. Hence, GIPCL has decided for expansion of SLPP Station-3 of 2X125 MW. This Revised Mining Plan (3rd Revision) and Mine Closure plan has been planned for 5.4 MTPA with reduced land requirement of 2059.68.29 Ha, the mining lease for which had already been granted subsequent to the approval of 1st Mining Plan (2000) Total capacity of EUPs will reduce to 750 MW from 1100 MW for which the requirement of lignite will also reduce to 5.4 MTPA from 7.92 MTPA (ref. Table at page of Summarised data in RAMP 2015).	

 # The chronology of land area related documents has been prepared and given below:

Sl. No.	Document	Approval date	Area, Ha	
				Total
1	1st Mining Plan	MOC letter dt. 23-01-2001		2080
2	Approval for Grant of Mining Lease	MOC letter dt. 31-10-2001		2067.48
3	Environmental Clearance (4.24 MTPA)	MOEF letter dt. 21-07-2003		2080
4	Mine Lease Grant by State Govt.	(Taluka Valia, Dist. Bharuch), 06/10/2004	507.48	2059.68.29
		(Taluka Mangrol, Dist. Surat), 03/12/2004	342.36.89	
5		(Taluka Mangrol, Dist. Surat) 24.04.2006	1209.83.40	

2.2 DEFICIENCIES THAT EXISTED, COMPLIANCE OF CONDITION (S) IMPOSED

Sl. No.	Particulars	Remarks
a)	Deficiencies, if any, that existed in the approved mining plan and their rectification proposals	No deficiency. However, following rectification is needed. i) AMP (2000 Version) (refer **Annexure IV-A for MOC approval letter**) proposed ML of 2080 Ha. But the grants of Mining Lease vide MOC letter no. 48024 /3 /98 -Lig. (pt) dt. 31-10-2001 (refer **Annexure I**) was of 2067.48 Ha. ii) Mine Lease executed by State Govt. was 2059.68.29 Ha (Refer **Annexure XVI-B**) iii) The proposed ML as per RAMP (2015 version) was 3019 Ha. Now in the current Mining Plan (3rd Revision) (including Mine Closure Plan), the ML has been revised to 2059.68.29 Ha, the actually executed. The mine parameters are to be accordingly revised.
b)	Compliance of Condition(s) imposed if any with approval of the Mining Plan is to be annexed in a tabular format	Compliance of conditions imposed in the approved Revised Mining plan (2nd Revision) and Mine Closure Plan of dt. 23rd November, 2015 has been given in the following Para 2.2 and also under Chapter 11, Para 11.1.2 E

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2.3 SALIENT FEATURES OF THE APPROVED MINING PLAN VIS-A-VIS THAT DURING ACTUAL OPERATION

<table>
<tr><th>Sl. No.</th><th>Particulars</th><th>As per Mining Plan approved</th><th>As during actual operation</th><th>Deviations and Remarks</th></tr>
<tr><td>1</td><td>Lignite production</td><td>
<table>
<tr><th rowspan="2">Year</th><th colspan="4">Lignite production*, Mt</th></tr>
<tr><th>Shah Pit</th><th>Mangrol Pit</th><th>Valia Pit</th><th>Total</th></tr>
<tr><td>1</td><td>0.90</td><td>0</td><td>0</td><td>0.90</td></tr>
<tr><td>2</td><td>1.80</td><td>0</td><td>0</td><td>1.80</td></tr>
<tr><td>3</td><td>1.80</td><td>0</td><td>0</td><td>1.80</td></tr>
<tr><td>4</td><td>1.80</td><td>0</td><td>0.60</td><td>2.40</td></tr>
<tr><td>5</td><td>2.40</td><td>0</td><td>2.70</td><td>5.10</td></tr>
<tr><td>6</td><td>2.40</td><td>0.80</td><td>4.20</td><td>7.40</td></tr>
<tr><td>7</td><td>2.40</td><td>0.80</td><td>4.20</td><td>7.40</td></tr>
<tr><td>8</td><td>2.40</td><td>0.80</td><td>4.20</td><td>7.40</td></tr>
<tr><td>9</td><td>2.40</td><td>0.80</td><td>4.20</td><td>7.40</td></tr>
<tr><td>10</td><td>2.40</td><td>0.80</td><td>4.20</td><td>7.40</td></tr>
<tr><td>11</td><td>2.40</td><td>0.80</td><td>4.20</td><td>7.40</td></tr>
<tr><td>Total</td><td>23.10</td><td>4.80</td><td>28.50</td><td>56.40</td></tr>
</table>
As per Para 4.13.5, Table 4.1 of Chapter 4
</td><td>
<table>
<tr><th rowspan="2">Year</th><th colspan="3">Lignite production, Mt</th></tr>
<tr><th>Mangrol</th><th>Valia</th><th>Total</th></tr>
<tr><td>(1)2009-10</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>(2)2010-11</td><td>0.68</td><td>0.00</td><td>0.68</td></tr>
<tr><td>(3)2011-12</td><td>1.33</td><td>0.00</td><td>1.33</td></tr>
<tr><td>(4)2012-13</td><td>2.40</td><td>0.00</td><td>2.40</td></tr>
<tr><td>(5)2013-14</td><td>1.74</td><td>0.60</td><td>2.34</td></tr>
<tr><td>(6)2014-15</td><td>0.36</td><td>2.41</td><td>2.77</td></tr>
<tr><td>(7)2015-16</td><td>0.00</td><td>2.68</td><td>2.68</td></tr>
<tr><td>(8) 2016-17</td><td>0.00</td><td>2.81</td><td>2.81</td></tr>
<tr><td>(9) 201-18</td><td>0.00</td><td>2.91</td><td>2.91</td></tr>
<tr><td>(10) 2018-19</td><td>0.00</td><td>3.03</td><td>3.03</td></tr>
<tr><td>(11) 2019-20</td><td>0.00</td><td>3.06</td><td>3.06</td></tr>
<tr><td>Total</td><td>6.51</td><td>17.50</td><td>24.01</td></tr>
</table>
</td><td>1. The rated lignite production capacity of 7.4 MTPA was to be achieved by 6th year (2014-15) (including construction year) but it has not been achieved.

2. The cumulative lignite produced till 2019-20 should have been 56.40 MT but only 24.01 Mt could be produced due to procedural delay in land acquisition.</td></tr>
<tr><td>2</td><td>OB production</td><td>
<table>
<tr><th rowspan="2">Year</th><th colspan="4">OB/Waste*, Mcum</th></tr>
<tr><th>Shah Pit</th><th>Mangrol Pit</th><th>Valia Pit</th><th>Total</th></tr>
<tr><td>1</td><td>15.0</td><td>0</td><td>0</td><td>15.0</td></tr>
<tr><td>2</td><td>15.0</td><td>0</td><td>0</td><td>15.0</td></tr>
<tr><td>3</td><td>15.0</td><td>0</td><td>0</td><td>15.0</td></tr>
<tr><td>4</td><td>15.0</td><td>0</td><td>8.0</td><td>23.0</td></tr>
<tr><td>5</td><td>20.0</td><td>0</td><td>14.0</td><td>34.0</td></tr>
<tr><td>6</td><td>20.0</td><td>10.0</td><td>20.0</td><td>50.0</td></tr>
</table>
</td><td>
<table>
<tr><th rowspan="2">Year</th><th colspan="3">Over Burden/inter burden, MCuM</th></tr>
<tr><th>Mangrol</th><th>Valia</th><th>Total</th></tr>
<tr><td>(1)2009-10</td><td>5.30</td><td>0.00</td><td>5.30</td></tr>
<tr><td>(2)2010-11</td><td>15.23</td><td>0.00</td><td>15.23</td></tr>
<tr><td>(3)2011-12</td><td>11.59</td><td>0.00</td><td>11.59</td></tr>
<tr><td>(4)2012-13</td><td>6.73</td><td>2.75</td><td>9.48</td></tr>
<tr><td>(5)2013-14</td><td>6.09</td><td>8.00</td><td>14.09</td></tr>
<tr><td>(6)2014-15</td><td>0.94</td><td>11.76</td><td>12.70</td></tr>
</table>
</td><td>1. The rated OB removal capacity of 50 MCuM was to be achieved by 6th yea (2014-15) (including construction year) but it has not been achieved.

2. The cumulative OB removal till 2019-20 should have been 375.6 MCuM but only 123.81 MCuM could be produced due to</td></tr>
</table>

Sl. No.	Particulars	As per Mining Plan approved	As during actual operation	Deviations and Remarks
		7 20.0 5.0 20.0 45.0 8 20.0 5.0 20.0 45.0 9 20.0 5.0 20.0 45.0 10 20.0 5.0 20.0 45.0 11 20.0 5.60 18.0 43.60 Total 200.0 35.60 140.0 375.60 **As per Para 4.13.5, Table 4.1 of Chapter 4*	(7)2015-16 0.00 11.77 11.77 (8)2016-17 0.00 9.82 **9.82** (9) 201-18 0.00 8.94 **8.94** (10) 2018-19 0.00 10.70 **10.70** (11) 2019-20 0.00 14.19 **14.19** Total **45.88** **77.93** **123.81**	procedural delay in land acquisition.
3	Location of starting the mining operations	The mining scheme for a targeted Lignite production of 7.4 MTPA for about initial 20 years which is to taper down subsequently. For this, two options were considered. Working two mines at a time, one, Pit- 1 (Shah Pit) followed by Pit- 4 (Valia Pit) producing 4.2 MTPA and another, Pit - 3 (Mangrol Pit) producing 3.2 MTPA (working Four Pits at a time), first Pit- 1(Shah Pit) producing 2.4 MTPA, second, Pit – 4 (Valia Pit) producing 4.2vMTPA and third Pit (Mangrol Pit) producing 0,80 MTPA which will be scaled up to 3.2 MTPA after exhaustion of Pit-1. Considering high production capacity, deposit characteristics, requirement of operational flexibility, etc., it is proposed to have four working mines at a time initially.	The AMP (2015 version) could not be implemented due to want of EC. And the operation is being done as per Original AMP (2000 version)	Deviations already occurred will be adopted as such and the mining operations will be advanced further.

Sl. No.	Particulars	As per Mining Plan approved	As during actual operation	Deviations and Remarks
		1. The location for the IMC in **Valia area** was selected after giving due consideration to various criteria and ultimately it has been decided to be located near Bore Hole No.15 A towards Bore Hole No.15 on the western boundary of the mine running along North-west to South-east direction as shown in FIGURE 4-1 of approved Mining Plan. 2. The IMC in **Mangrol area** has been located near Bore Hole No.218A running along North-west to South-east direction on the Western side of the mine boundary.		
4	Sequence of operation	The overall advance of the North pit was proposed from NE to SW. The overall advance of the South pit was proposed from S to N. As stated above, target production of 7.4 MTPA will be met from four pits workings concurrently at a time for initial years. Pit-1(Shah- Pit) will produce 2.4 MTPA. Pit-3 (Mangrol Pit) 0.8 MTPA and Pit-4 (Valia Pit) 4'2MTPA. After Exhaustion of Pit -1, production from Pit -3 will be increased to 3.2 MTPA.	The overall advance is proposed to be similar as in the earlier approved Mining plan	During the presentation to EIA for grant of environmental clearance on 18th April 2011 for 7.4 MTPA expansion, the committee had suggested to reduce the proposed external dump area to save the agricultural land and also suggested to maximize the back filling of the mine voids left after the mine operation. Keeping in view the above two observation of the EIA committee, the RAMP (2015 version) was prepared due to the changes in mining sequence for

<table>
<tr><th>Sl. No.</th><th>Particulars</th><th>As per Mining Plan approved</th><th>As during actual operation</th><th>Deviations and Remarks</th></tr>
<tr><td></td><td></td><td></td><td></td><td>optimization of dump area and utilizing the mine voids for back-filling keeping the pit area same.

In general, there is no major difference in sequence of operation as per the current Mining Plan.</td></tr>
<tr><td>5</td><td>Existing land use pattern</td><td><table><tr><td>Agricultural land</td><td>2674.69 Ha (Private)</td></tr><tr><td>Waste land</td><td>344.31 Ha (Govt.)</td></tr><tr><td>Total</td><td>3019.00 Ha</td></tr></table></td><td><table><tr><td>Agricultural land</td><td>1953.34.26 Ha (Private)</td></tr><tr><td>Waste land</td><td>23.53.93 Ha (Govt.)</td></tr><tr><td>Water body</td><td>0.50.00</td></tr><tr><td>Grazing and others</td><td>72.18.18</td></tr><tr><td>Road</td><td>10.11.92</td></tr><tr><td>Total</td><td>2059.68.29 Ha</td></tr></table></td><td></td></tr>
<tr><td>6</td><td>Land likely to be degraded</td><td><table><tr><td>Mining</td><td>1838.21 Ha</td></tr><tr><td>Dumping</td><td>394.00 Ha</td></tr><tr><td>Top soil stacking</td><td>50.00 Ha</td></tr><tr><td>Lignite stacking</td><td>10.00 Ha</td></tr><tr><td>Infrastructure</td><td>2.80 Ha</td></tr><tr><td>Area for rationalization</td><td>661.36 Ha</td></tr><tr><td>Total</td><td>3019.00 Ha</td></tr></table></td><td><table><tr><td>Mining</td><td>1453.00</td></tr><tr><td>Dumping</td><td>156.71</td></tr><tr><td>Top soil stacking</td><td>30.00</td></tr><tr><td>Lignite stacking</td><td>0.00</td></tr><tr><td>Infrastructure</td><td>3.90</td></tr><tr><td>Area for rationalization / undisturbed</td><td>238.033</td></tr><tr><td>Settling Pond</td><td>10.00</td></tr><tr><td>Road</td><td>9.92</td></tr><tr><td>Green Belt</td><td>151.82</td></tr><tr><td>Road diversion</td><td>6.30</td></tr><tr><td>Total</td><td>2059.6829</td></tr></table></td><td></td></tr>
</table>

2.4 REASON FOR REVISION

Sl. No.	Particulars	Reason
1	Why the revision in mining plan is required.	After the first approval, the Mining Plan was revised twice (increase in area and production) but neither of them could be implemented due to pending environmental clearance. One of the approved EUP, viz. Phase-2 SLPP 2X300MW is not coming up, as the decision has been deferred indefinitely on account of non-acquisition of additional 959.00 Ha areas of the additional applied leases. Instead, GIPCL has decided to setup 2 x 125 MW units as Phase-2 expansion of SLPP. Therefore, coal requirement has been revised downwards to 5.4 MTPA. This Revised Mining Plan and Mine Closure plan (3rd Revision) has been planned for 5.4 MTPA with reduced land requirement of 2059.68.29 Ha, i.e. within the existing leasehold area. The revision of the Mining Plan is also required due to changes in the mining sequence.

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CHAPTER 3

LOCATION, TOPOGRAPHY & COMMUNICATION

3.1 LOCATION

Mangrol-Valia Lignite Mine of M/s Gujarat Industries Power Company Ltd. is located in villages Mangrol, Shah, Charetha, Amandera, Harsani, Timberwa, Bhilwada, Nani Pardi, Luna, Dansoli, Rajgarh and Kosmadi in Mangrol and Valia Taluka of Surat and Bharuch Districts of Gujarat between Latitudes 21°26' 19.47"N to 21°31' 29.90"N Longitudes 73°07' 12.19"E to 73°12' 53.16"E (Source: No. G.S./Mining Lease/Geo Reference/20/21/686 dt 04-03-2020 from G&M Office, Surat and No. AG./BH/M L/ Geo Reference /19-20/780 dt. 19-03-2020 from G&M Office, Bharuch) (**Annexure II-B1 & II-C1)** and Plate II-A and II-B, respectively). The block is also connected to National Grid, (**Annexure XVIII-G**) and is covered under Survey of India Toposheet No. 46 G/2 and G/3 (Ref. Para 2.8.1 of RAMP, 2015). A map showing the location of the projects is enclosed as Plate I.

3.2 MINING LEASE BOUNDARY

The Mangrol Valia block covers an area of 2625 Ha. The particulars of adjoining blocks /MLs/ features are as given below:

North	-	E, F and G lignite mine leases (applied) of GIPCL
East	-	Bhaga Nadi and non-lignite bearing area
South	-	Vastan Lignite mine mine lease (Sanctioned) of GIPCL
West	-	Tokari Nadi

The executed ML of Mangrol-Valia covers an area of 2059.6829 Ha for which the current Mining Plan has been prepared.

Fig 3.1 shows superimposition of ML boundary over the block area as well as adjoining blocks/ features.

Block boundary vis-a-vis existing ML boundary is shown in Plate III. The Fig.3.1 below shows adjoining Mining Leases.

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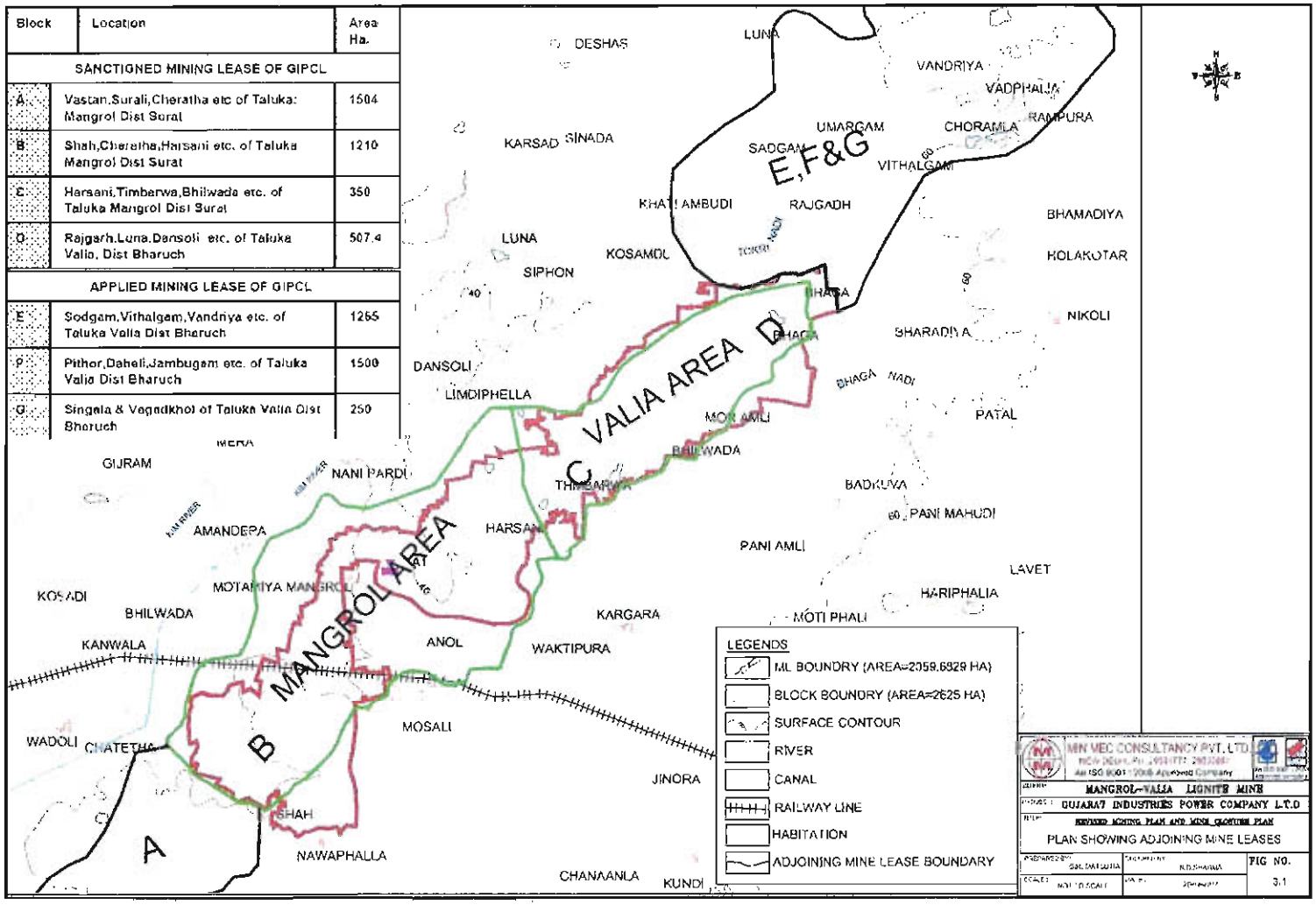
FIG 3.1: PLAN SHOWING ADJOINING MINE LEASES

Block	Location	Area Ha.
SANCTIONED MINING LEASE OF GIPCL		
A	Vastan,Surali,Cheratha etc of Taluka: Mangrol Dist Surat	1504
B	Shah,Cheratha,Harsani etc. of Taluka Mangrol Dist Surat	1210
C	Harsani,Timbarwa,Bhilwada etc. of Taluka Mangrol Dist Surat	350
D	Rajgarh,Luna,Dansoli etc. of Taluka Valia, Dist Bharuch	507.4
APPLIED MINING LEASE OF GIPCL		
E	Sodgam,Vithalgam,Vandriya etc. of Taluka Valia Dist Bharuch	1265
F	Pithor,Daheli,Jambugam etc. of Taluka Valia Dist Bharuch	1500
G	Singala & Vagadkhol of Taluka Valia Dist Bharuch	250



In persuasion of MOC letter No. 34011/ (48)/2009-CPAM dt. 15-07-2015, GIPCL had requested M/s Central Mine Planning and Design Institute Ltd. (CMPDIL) vide their letter No. SLPP/GMM/2015-16 dt. 12-01-2016 to certify the coordinates of the Mining Lease but CMPDI has communicated their inability to do it as they undertake the certification of coal blocks only. As Mangrol-Valia is a lignite block, this assignment does not pertain to CMPDIL. The communication is attached as **Annexure II-A**.

In persuasion of MOC Observation no.12, NLC has certified the Geo-Reference Co-ordinates of Mining Lease boundary used in the preparation of the Mining Plan (3rd Revision) (Including Mine Closure Plan) of Mangrol-Valia Lignite Mine (**Plate II-C**) and issued the certificate (**Annexure II-D**).

3.3 COMMUNICATION/ ACCESSIBILITY

The SH 166 passes through the property and runs almost along the railway line and joins Bombay-Ahmedabad NH8 (towards west) at Kosamba at a distance of about 23 km on west.

The district HQ Surat is about 55 km by road and Bharuch about 50km. Rajpardi is at about 48 km south. Kosamba is the nearest Rly station (about 28 km west) on Baroda-Mumbai railway line of western railway. Location is shown vide Plate I.

3.4 TOPOGRAPHY AND DRAINAGE

The area in general is more or less flat with some minor undulations. The general elevation of the area is in the range of 30 to 50 m above M.S.L. The general slope of the area is towards Kim river (North-East to South-West).

The area is more or less flat with minor undulations. The general ground elevation is in the range of 36m to 46 m above MSL. However, in the North-Eastern part of the Block the elevation is in the range of 45m to 52m above MSL. The general slope of the area is from north-East to south-west. Topography of the area is shown vide Plate VI (Surface plan).

Bhaga Nadi and Tokri Nadi flowing southeastery on eastern and western side of the block respectively. Tokri Nadi joins Kim river, which after confluence continues to flow South westerly.

Bhaga Nadi, after joining a nallah, becomes known as Moti Nadi, which then flows eastwards and passes through the property and joins Kim River. Another water course namely Bhukhi Nadi flowing east to west in the south -west joins Kim River. These three rivers/streams generally control the drainage of the area.

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3.5 CLIMATE & RAINFALL

3.5.1 Climate

The area is warm & humid and is having sub-tropical climate. The meteorological observation of details at Mangrol and authentic details collected form concerned authority give information of general climatic condition of the area.

3.5.2 Rainfall

The rainfall data collected for a period of 26 years from 1981 to 2011 are as given below in Table 3.1.

TABLE 3.1
MONTHLY RAINFALL DATA (IN MM)

Year	May	June	July	August	Sept	Oct.	Nov.	Dec.	Total
1981	0	218	457.8	290.3	248.9	52.3	19.5	0	1286.8
1982	7.1	14	363.9	147	101.9	15.1	61.7	0	710.7
1983	0	342.1	495.2	658.5	243.8	176.3	0	0	1915.9
1984	0	200.7	212.4	251.3	159	0	0	0	823.4
1985	0	0	352.3	338.8	3.5	119	0	0	813.5
1986	0	412	46.5	280.5	2.5	0	43	0	784.5
1987	0	92.3	264.2	104.5	8.2	19	47	3.5	538.7
1988	0	134.3	111.4	232.8	402.5	`0	0	0	881
1989	0	180.3	537.3	182.8	37.5	0	0	0	937.9
1990	0	25.5	49.3	632.5	390.7	9	0	0	1107
1991	0	17	462.4	231.6	65	0	0	0	776
1992	0	188	592	650.2	702	178	0	0	2310.2
1993	0	120.7	670	180.5	80	61.2	0	0	1112.4
1994	0	85.2	378.2	240.2	120.8	18.2	42	0	884.6
1995	0	186	428.6	170.8	33.8	0	0	0	819.2
1996	0	328.6	52.5	260.2	3	0	42	0	686.3
1997	0	224	232	626	228	22	0	0	1332
1998	0	117.3	355.4	181.6	524.6	34.4	0	0	1213.3
1999	0	274.8	461.1	115.7	99.1	105.4	0	0	1056.1
2000	0	97.2	322.8	134.9	19.6	0	0	0	574.5
2001	0	325.4	465.6	244.8	36	0	0	0	1071.8
2002	0	252.7	40.4	373.8	147.6	0	0	0	814.5
2003	0	344.2	769.2	335.8	32.2	0	0	0	1481.4
2004	0	217.2	309.2	846	123.6	2.4	0	0	1498.4
2005	0	884.7	228.4	222.2	422.7	0	0	0	1758
2006	9.8	467.6	997.8	523.2	80	12.6	26.6	0	2117.6
2007	0	72.5	445.7	218.1	189.6	0	0	0	925.9
2008	0	47.1	267.7	226.3	209.7	2.8	0.9	0	754.5

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Year	May	June	July	August	Sept	Oct.	Nov.	Dec.	Total
2009	0	12.0	250.8	81.2	44.7	38.4	3.3	0	430.4
2010	0	47.4	290.5	247.1	286.5	11.8	19.3	0	902.6
2011	0	18.9	151.3	309.2	130.6	0.5	0	0	610.5
Total	**16.9**	**5947.7**	**11061.9**	**9538.4**	**5177.6**	**878.4**	**305.3**	**3.5**	**32929.6**
Avg.	**0.5**	**191.9**	**356.8**	**307.7**	**167.0**	**29.3**	**9.8**	**0.1**	**1062.2**

Maximum rainfall is between June to August. In a month highest average recorded is 997.8 mm in July 2006. The annual average rain fall is 1062.2 mm. Average monthly rainfalls in different months are placed in Table 3.1 from 1981-2011.

Temperature:

Temperature variations as studied for the period from 1992 to 2006 show that the temperature is as high as 40.20°C in summer and as low as 12.60°C in winter. However, the normal summer temperature varies from 33.0^0 C to 40.0°C and winter temperature from 14.0°C to 17.0°C.

Relative Humidity:

Relative humidity as observed at Surat Observatory shows a value of about 60% humidity in the morning in all months except November when it was marginally lower at 59%. In the evening, except for the months from May to September, the values are less than 50%.

Wind Direction:

The wind direction is mostly from South and South-West in summer and North and North-East in winter but occasionally from other direction depending on prevailing atmospheric conditions.

3.6 VEGETATION

Most of the land within the lease area is agricultural and crops such as Sugar-cane, Bajra and Wheat etc. are grown. The analysis of the topsoil contains nutrients and micro-nutrients which are fertile for almost all the crops.

3.7 LAND USE AND OWNERSHIP / OCCUPANCY

The area of Mangrol Valia Lignite geological Block is 2625 ha. The Mining Lease was executed for 2059.68.29 ha out of which 1778.3629 ha (1630.59 ha Lignite bearing + 148.3729 ha non-lignite bearing) falls within the geological block and the remaining 280.72 ha outside the geological block in non-lignite bearing area.

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An area of 846.6371 Ha of the block has not been considered in the current Mining Plan on account of problem being faced in land acquisition.

The project has been planned within the executed ML of 2059.68.29 ha. The details of project areas related to the AMP (2015) and current MP (2020) are illustrated below with the help of Fig 3.2, 3.3 and 3.4.

Particulars	Geological Block	Allotted Block area	AMP 2015	MP 2020
Lignite Bearing Area	2308.35	1630.5900	1924.33	1630.59
Non-Lignite Bearing area within the Geological Block	316.65	148.3729	227.31	148.3729
Non-Lignite Bearing area Outside the Geological Block	0	280.7200	867.36	280.7200
Total	**2625.00**	**2059.6829**	**3019.00**	**2059.6829**

FIG 3.2: PLAN SHOWING AMP (2015) PROJECT AREA DETAILS

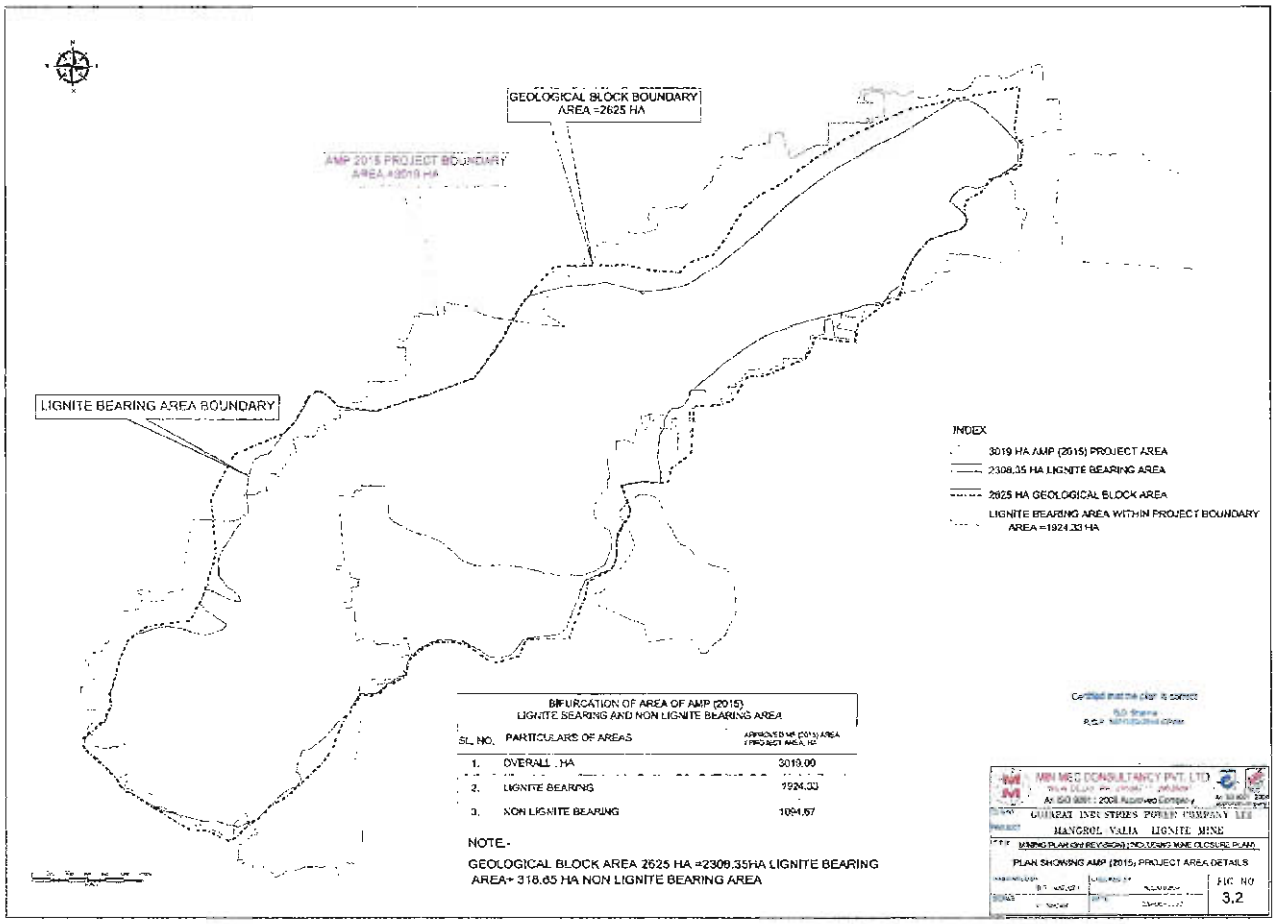

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FIG 3.3: PLAN SHOWING CURRENT MP (2020) PROJECT AREA DETAILS

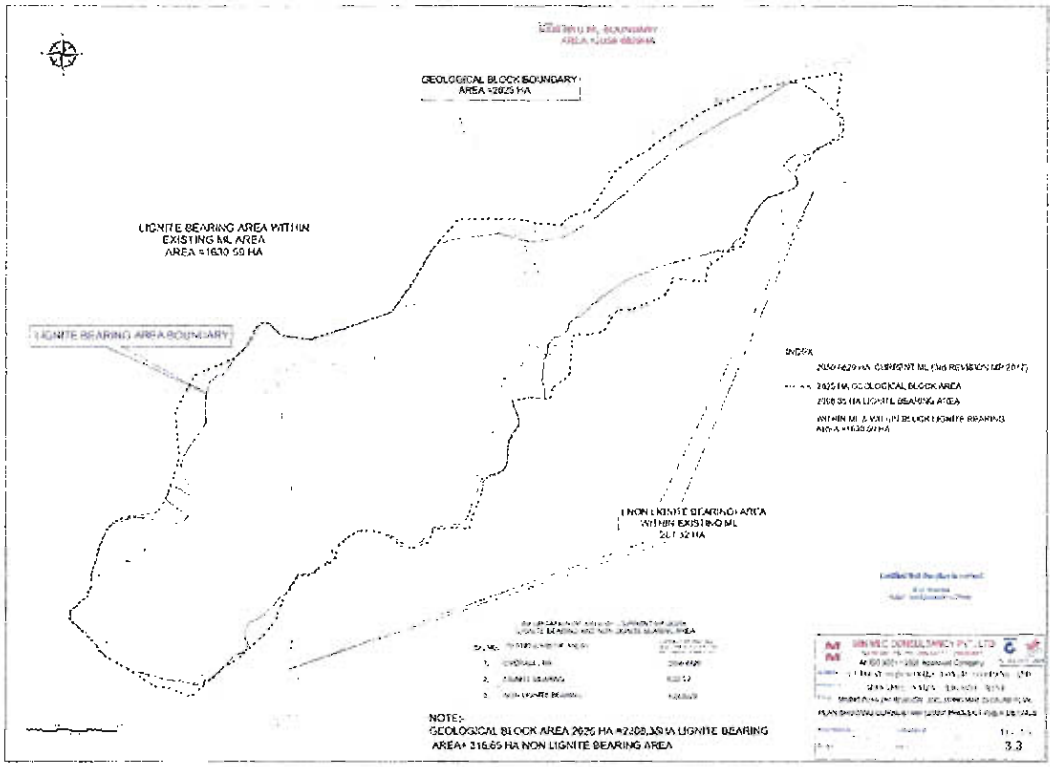
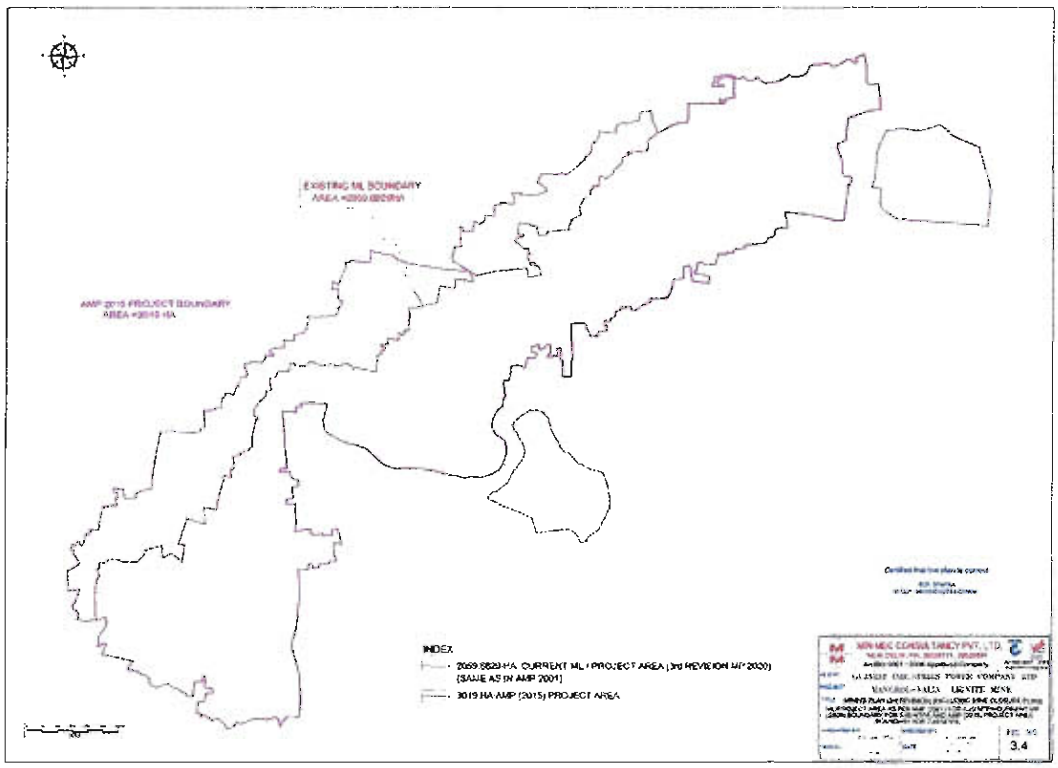


FIG 3.4: PLAN SHOWING CURRENT MP (2020) AND AMP (2015) PROJECT AREA BOUNDARY



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The pre-mining land use of this area is given below in Table 3.2 (refer Plate VIII).

TABLE 3.2
PRE-MINING LAND USE OF ML/ PROJECT AREA

Particulars	Area in Hectares
I. ML area within the Block	
Protected Forest land`(social forestry along SH166)	4.80
Agricultural land	1953.3426
Waste land	23.5393
Nallah / River	00.5000
Road	10.1192
Gaucher/ Others	67.3818
Sub Total	**2059.6829**

Khasra wise land use is given in **Annexure XVIII-A** for 2059.68.29 ha. Present land use of this area is given below in Table 3.3. (Updated as per Email of Aug 22, 2017).

TABLE 3.3
PRESENT LAND USE OF ML AREA AS ON 01-04-2020

Sl. No.	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
1	Mining Pit	205.29	0.00	134.53	**339.61**
2	Dumps including top soil dump**	208.95	0.00	80.14	**289.09**
3	Infrastructure (Site office, Contractor's Camp, First Aid Centre, Shelters, Pumping Station, Lignite Crusher, Lignite Stack, Weighbridge, Electric Substation)	0.42	0.00	3.48	**3.90**
	Sub Total (1 to 3)	**414.66**	**0.00**	**218.15**	**632.60**
4	Green Belt (common for all pits)	129.97			129.97
5	Service Road, Lignite Transport Road (Common for all pits)*	9.92			9.92
6	Settling Pond	3.45			3.45
	Sub Total (4 to 6)	**143.34**			**143.34**

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Sl. No.	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
7	**Total Disturbed Area (1 to 6)**	775.94			775.94
	Rationalisation area/ Undisturbed area (out of 2059.6829 ha)	1283.7429			1283.7429
	Total ML/ Project area	2059.6829			2059.6829

* *Out of 9.92 ha, 3.00 ha belongs to North pit and 6.92 ha belongs to South pit.*

** *Top soil dump area near North Pit is 20 Ha (part of OB dump) and near South pit is 10 Ha (part of OB dump).*

3.8 IMPORTANT SURFACE FEATURES

The major surface features present in the ML/Project area are:

- Vadsol hamlet with 83 hutments and Kosmadi Faliya (Rajgarh Gram Panchayat) with 35 hutments
- Kosamba – Zankhvav, NG Railway line passes through property
- Moti Nadir and Tokri Nadi
- Panchayat Road from Rajgarh to Mangrol
- Cart Tracks
- Kosamba Zankhvav SH No.166 passes through property
- Two 220 KV Transmission lines belonging to GETCO and PGCIL.
- 11 KV Transmission line belonging to DGVCL

As per the present Mining Plan the railway line and Moti Nadi are not to be diverted. However, State Highway 166 will be diverted after 5th year but before 10th year.

There are no additional inhabited villages to be rehabilitated for increase in production. There are Vadsol hamlets with 83 hutments and Kosmadi Faliya (Rajgarh Gram Panchayat) with 35 hutments in the executed ML area of 2059.6829 ha, which are proposed to be shifted as per the R & R Policy.

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CHAPTER 4

EXPLORATION, GEOLOGY, SEAM SEQUENCE, LIGNITE QUALITY AND RESERVES

4.1 EXPLORATION

4.1.1 Exploratory drilling

Initially, Directorate of Geology & Mining, Gujarat took up test drilling for lignite in the year 1987-88 in Vastan – Mangrol area and found promising reserves in the region. Initially, DGM undertook extensive drilling in this area followed by MECL in the Mangrol Valia region.

The total area of Mangrol-Valia lignite geological block is 2625 Hectares. The location of bore-holes and exploration block details are shown in Plate IV (Geological plan).

The exploration details including the location, no. of bore holes and year of exploration are given in Table 4.1.

TABLE 4.1
SUMMARY OF THE EXPLORATORY BORE HOLES LYING IN AND AROUND THE ML AREA

Nomenclature of BHs	Period	No of BHs lying Within block area	No. of BHs within Lignite bearing Area of Geological Block	No. of Bore Holes lying within the ML area	Drilling Agency	Location
Area Ha		**2625**	**2308.35**	**2059.6829**		
MMG	1995-97	83	72	50	MECL	Mangrol & Mangrol extension area
BH/DGM	1994-95	65	60	56	DGM	DGM South-West are
KAV	1998	20	17	16	Khanna Associates	Valia area
Total		**168***	**149***	**122***		
BH / Density		6.4/ sq km	6.45	5.9		

Besides, 42 BHs were also drilled subsequently during 2013-15 for production support in Valia area.

4.1.2 Sufficiency of exploration

Considering, the exploration already carried out and also the mine is already under operation, the exploration is adequate.

4.1.3 Analysis of drilling data

Data of all the bore-holes have been processed for preparation of base plans, geological cross-sections (Plate X), and seam structure. Consolidated statement showing Bore-hole wise exploration data used for preparation of various maps are given in **Annexure XVIII-J**. Graphic lithologs of bore holes are given in Plate V-A and V-B.

The details are explained in subsequent paragraphs

Structural Features of the Block:

In the absence of prominent exposure in the block, the general strike of the formations, interpreted based on subsurface data, is observed to be NE-SW with local swivels at places. The inclination of strata is generally varying between 2 degrees to 5 degrees towards north-west. However, in extreme cases less than 1 degree and 10 degree inclination has also been observed.

Five faults namely F1-F1, F2-F2, F3-F3, F4-F4, F5-F5 in Mangrol and Mangrol extension block and four faults renamed as F6-F6, F7-F7, F8-F8, F9-F9 in Valia block are tentatively interpreted by MECL in their Geological Report. This interpretation has been mainly made depending on omission of correlatable strata in the boreholes and sudden change in datum of lignite horizon.

The particulars of these faults are detailed in Table 4.2.

TABLE 4.2
DESCRIPTION OF FAULTS INTERPRETED BY MECL IN MANGROL BLOCKS

Fault	Trend	Throw and direction	Description
F1-F1	NE – SW	50m towards NW	Based on datum difference between boreholes MMG 15-MMG 10, MMG 29-MMG 7, MMG 3-MMG 6, Then this bifurcates towards north in F1a-F1a and F1b-F1b. Datum difference further in continuation of the earlier set of boreholes is also observed between MMG 33-MMG 31, MMG 38-MMG 57 and MMG 62& MMG 64. This fault has also caused omission of strata in borehole MMG 42.
F2-F2	W-E which swerves to	0-32m towards N to	Interpretation based on:- 1) Omission of horizon II (part) in

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Fault	Trend	Throw and direction	Description
	NE-SW	NW	MMG-2 and datum difference between MMG-1 and MMG-3. 2) Omission of horizon II in MMG-55 and part thickness of horizon III in MMG-39. 3) Also there in marked difference in datum of horizon I between MMG-55 and MMG-68.
F3-F3	N-S	0 to 15m towards East	Interpreted based on the datum difference between MMG-41 and MMG-49 in horizon II and MMG-20 and MMG-29.
F4-F4	NNE-SSW	0 to 22m towards West.	Datum difference in Horizon III between MMG-59 and MMG-71.
F5-F5	NW-SE	0-20m towards SW	Based on datum difference in strata between MMG-76 and MMG-81.
F6-F6	NE-SW	25m towards NW	Fault interpreted based on the datum difference between MVL-34 and MVL-27 in horizon-II.
F7-F7	NE-SW	27m towards NNW	Interpreted based on the datum difference in horizon-II between set of boreholes MVL-30-33, MVL-27-30 & MVL-27-6.
F8-F8	NE-SW	28m towards WNW	This is the curvilinear fault where fault plane swerves from N-S to SW. interpreted based on the datum difference of lignite horizon-II between borehole MVL-19-8, MVL-3-17 and MVL-11-17.
F9-F9	NE-SW	9m towards SE.	A minor fault, interpreted based on the datum difference between MVL-3 & MVL-11.

Source: MP (2nd Revision) & MCP-2015, Para 3.6.2 of Chapter 3

4.1.4 Description of Litho Units

Trap formations

The lignite seams in the area are confined to Cambay shales of Lower Tertiary clays (Eocene) overlying the traps. Hence the traps form the basal configuration for the overlying sub-surface Eocene sedimentaries including lignite and also control and influence their floor, thickness and other structural features. The general trend of contact between trap and the overlying sediment is in NE-SW direction.

The Deccan traps are exposed in the east of Vastan village.

The structural roof of the trap is encountered at about +20m MSL all along the southern boundary of the study area and dips down at a general inclination of 2 to 5° to -120 to -130m MSL in the northern portion on the up throw side of the fault F1-F1 along the western lease hold boundary. This roof is thrown to greater depth of -150m MSL on the other side of the fault. However local steep variations and swerves in the roof are observed along faults F3-F3 & F4-F4 marked by MECL and around bore-hole MMG 61 and some other bore-holes.

The northern fault F1-F1 identified by MECL could extend down south-west in DGM block between the lines of boreholes connecting BH 209 to 252 and 210 and 246. The roof falls down along this line from -110m to -120m MSL to -160 to > -190m MSL further west.

This dispositional feature of the trap also controls the depth of occurrence of lignite, throwing it to deeper levels, wherever the roof also falls down steeply.

In the north-east Valia portion also, a probable fault line in trap could occur in the extreme fringes of the boundary along the lines joining bore-holes KAV-2 & KAV-17 and the western extreme bore-hole KAV-1.

It is also possible that the fault line F1-F1 of MECL could extend all along the western lease boundary from DGM bore-holes 209-210 to running close to MMG/8,32 & 29 and extreme north bore-hole MMG 64 of MECL. This could be traced further north-east up to KAV-1 cutting across KAV/1 & KAV/2.

On a close examination of the structural contours for the roof of traps and the disposition of lignite horizons, it is observed that in the study area. Lignite development starts generally at about – 20m. MSL level of the roof of the trap. Even at this level, in some cases either one or two horizons could be absent as in MMG 83, 36 and 50.

4.1.5 Overburden formation

The over-burden in this block constitutes black cotton soil at the top, followed by variegated clay and sands with grey clay underlying them. In almost all cases grey clay is immediately above the first lignite horizons.

The over-burden formations in Mangrol Valia blocks are generally covered by upper weathered mantle constituting black cotton soil and Kankar formations of recent to sub-recent age. The black cotton soil is probably developed in low lying areas, as a result of weathering of basal trap rock exposed due east of the area and transported to the present place.

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The general view of over-burden strata in the area is as below:

TABLE 4.3
GENERAL VIEW OF OVER-BURDEN STRATA IN THE AREA

Sl. No.	Litho units particulars	Mangrol Block MMG 1 to 32	Mangrol Ext Block (MMG 33 to 83)	Valia Block
1.	Black Cotton Soil	0.0m to 8.0m.	0.0 to 2.0m	0.0 to 2.0m
2.	Kankar	8.0m to 20.0m	1.0 to 15.0m	1.0m to 2.0m
3.	Brown calcareous clay/Bentonitic clay		2.0 to 25.0m	2.0m to 22.0m
4.	Sand/Friable Sandstone			16.0m to 24.0m
5.	Clay with occasional friable sandstone and/ or sideritic silt stone bands	35.0m to the first lignite horizon	10.0 to 40.0m	22.0m to 30.0m

4.1.6 Description of Lignite Seams

The general picture emerging from the exploratory work in this area has revealed that the multiple lignite seams intersected in the bore-holes could be broadly grouped into three district horizons designated as Horizon-I (Top) Horizon-II (Middle) and Horizon-III (Bottom). This is based on the disposition of the roof and floor of each group of seams.

The general features of lignite seam are as below:

TABLE 4.4
GENERAL FEATURES OF LIGNITE HORIZONS

Sl. No.	Litho units Particulars	Mangrol Block MMG 1 to 32			Mangrol Ext Block MMG 33 to 83			Valia Block		
		H-I	H-II	H-III	H-I	H-II	H-III	H-I	H-II	H-III
1.	No of seams	1 to 4	1 to 7	1 to 3	2 to 5	5 to 10	1 to 7	1 to 3	5 to 14	Nil
2.	Thickness (m)	4.3 to 9.0	1.0 to 20.8	0.5 to 15.0	0.6 to 27.5	1.90 to 30.0	0.20 to 28.60	2.6 to 14.6	0.8 to 24.8	Nil
3.	General parting (m)	25.0		15.0 to 18.0	8.0 to 10.0		10.0 to 14.0	12.0 to 15.0		Nil
4.	No of BH inter sector	-	27	21	-	37	33	-	37	Nil
5.	Depth of occurrence (m)	40.0-80.0	60.0-120.0	100.0-140.0	14.6-143.8	21.0-168.6	25.5-203.0	40.0-65.0	30.0-80.0	ABS

Source: Table under para 3.6.2.3 at page 3-6 of RAMP 2015.

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The above data is summarized below for the whole block depicting the horizon-wise lignite thickness range and depth range of the horizon from surface.

TABLE 4.5
HORIZON-WISE LIGNITE THICKNESS RANGE AND DEPTH RANGE

Lignite Seams	Thickness range, m	Depth Range, m
Horizon-I (Top)	0.60 -27.5	14.6 –143.8
Horizon-II (Middle)	0.80- 30.0	21.0—168.6
Horizon-III (Bottom)	0.20-28.6	25.50-203.0

The general features of each horizon such as depth of occurrence of roof and floor, number of lignite seams their thickness, inter-burden, partings, are described below block-wise.

4.1.6.1 Upper Horizon

A) Roof of the Upper Horizon

DGM Block (ref. Table 4.1):

The roof of the upper horizon in the block occurs between +21.48 m m.s.l in BH 212 and -8.46m m.s.l in BH 259 in south-north direction on the eastern fringes. The general variation in the roof in the east-west direction is from + 10m to -40m m.s.l up to the line joining the bore hole 209 to 245, just close to the probable southern extension of fault the F1-F1. Beyond the fault line, it drops down steeply to -77.13m m.s.l in BH 210 and to -112.4m m.s.l in the north western borehole BH 241.

Mangrol and its Extension Block of MECL

The roof in this block generally occurs at about +20m m.s.l in the east middle portion and dips down to about -30 to -35 m m.s.l in the last line of bore holes just south of the fault F1-F1. On the other side of the fault and close to it, the roof, as expected shows a sudden drop to about -80 m m.s.l. and further north, it goes down to -167.98 m m.s.l in the bore hole MMG-16.

Valia Block

In this block, the roof of upper horizon is generally traceable from +20m m.s.l in the south to about -20 m m.s.l in the north.

B) Floor of Upper Horizon:

The variation in floor level as seam from these contours is as follows:-

DGM Block

The floor level traced around +10 m m.s.l in the eastern line of bore holes drops down to -45 m to -48 m m.s.l in the west up to the probable fault line. Immediately beyond the fault, it occurs between -84 m to -110 m m.s.l and in extreme west, it is encountered at -110.47m m.s.l in BH 25.4, going down to -126.12 m m.s.l in BH 247.

Mangrol Blocks

In this block, the floor of upper horizon is observed around +10m m.s.l in the south dipping down to -35 to -45 m m.s.l towards north near fault line F1-F1. In the northwest, along the line forming bore holes MMG 3, 5 & 9, it occurs between 100m and -120 m m.s.l. in the bore hole MMG 16 in the northwest corner, the floor level is intersected at 176.38 m m.s.l. In the Mangrol extension block the minimum floor level is +21.07m m.s.l in MMG 73 and the maximum level -155.38 m m.s.l in MMG57 in the north east corner of Mangrol Block.

Valia Block

The floor contours are seen ranging mostly from +10m in the south to -20 m m.s.l. in the northern part of this block, though it occurs at lower levels of around -49 msl in Valia block mostly on north eastern fringes.

C) Lignite Seams in Upper Horizon:

The seam folio of the upper horizon for the total area are presented in Plate IX-A. The block wise details are given below.

DGM Block

In this block, the upper horizon is most developed and the maximum cumulative thickness intersected is 9.65 m in BH 216 in the south west close to the lease boundary. A single seam of 5 to 8m is encountered in about 36 bore holes and thickness between 4 & 6m in 11 bore holes. The total number of seams is generally 1 to 2, while 3 to 4 seams are also encountered in more than 10 bore holes. The bore-holes 205 B, 212 A, 218 B and 226 B in extreme east have proved barren.

Mangrol Block

In this block, generally a thick seam of 6 to 8m is observed. At placed development of as many as four lignite seams is also found.

The upper horizon is best developed in this block on a thick single seam consideration. The general trend of deposition is NE-SW having inclination

towards NW of a general magnitude of 2° to 5°. There faults F1-F1 to F3-F3 occur in the central and western portions of the block.

The general calorific value of lignite for this horizon in this block is in the range of 2500-3000 kcal/kg.

Mangrol Extension Block

The upper horizon in this block generally consists of 2 to 5 seams with development of as many as 9 seams at places. This horizon is developed in two patches in this block with one large patch in the north and a small patch in the south. It has the general trend of deposition in NE-SW direction with inclination towards NW.

The cumulative thickness of the upper horizon in this block is between 4 and 6m in the south middle. In the north it is between 6 & 8m. in the north eastern side, the thickness ranges from 4 m in the south to 9m in the north near lease boundary.

Five faults F1-F1, to F5-F5 are recorded in the central western and northern parts.

The general calorific value, in general, is between 2500-3000 kcal and kg.

Valia Block

The cumulative thickness of lignite in the upper horizon in this block generally ranges from 4 to 10m in 2 to 5 seams. While the bore-holes KAV/8, 10 & 12 have proved barren, the development of upper horizon is absent in bore-hoe sl KAV/11, 15, 2, 18 & 12.

4.1.6.2 Lower Horizon

Floor and folio contours of lower horizon are given in Plate IX-C. The general features of this zone are discussed below:

A) Roof & Floor of Lower Horizon:

DGM Block:

The roof level of lower horizon in the above block is generally occurring fro m-25 to -40 m m.s.l in the east along the bore holes BH 212 to 234. In the west near the lease boundary, the roof occurs from -93m to -100m m.s.l along the bore holes BH 209 to 239. In the central portion, the roof generally found between -50m and -95m m.s.l.

The floor contours for this block show a general variation in level from -40m m.s.l in the east to -100m msl in the west near lease boundary. In the

central portion, the floor occurs generally between -60 and -100 m m.s.l. in the extreme west it is at – 147.58 m msl BH 217 and -179.79m msl BH 233.

Mangrol blocks

The roof level of lower horizon has a general variation in Mangrol blocks (Mangrol and Mangrol Extension Blocks) from -20m to -80 m m.s.l in south-north direction up to lease and fault F1-F1. Beyond the fault, the roof falls steeply and the levels are -168.88m m.s.l in MMG 33 and -196.38 m m.s.l in MMG/2.

The floor contours in the central portion show a variation in level from -25 to -30m m.s.l in the south to about -90m m.s.l in the north near the fault line. Beyond the fault it is encountered at deeper levels.

Valia Block

The roof level of lower horizon in Valia block is -50 m m.s.l in the north, while the floor level variation is generally from -10m to -55 to -60 m m.s.l in same direction. The roof dips to -79.58 m m.s.l in KAV/18 and -69.61 m m.s.l in KAV/1 in the north and the floor also correspondingly drops down to -85.88m and -104.85m m.s.l in KAV/18 and KAV/1 respectively.

B) Lignite Seams in Lower Horizon:

Floor and folio contours of lower horizon are given in Plate VI-C.

In DGM block, the lignite seams are not well developed and is generally between 1 and 2m in most portion.

West Mangrol block also shows a poor development of lignite in lower horizon and thickness is varying mostly from 0.5 to 3.0m. However around bore holes MMG 50, 73041 in the south bottom, it is 4.6 to 5.80m.

In the extension block to east of Mangrol block, a total of 7 seams could be traced in some bore holes. However, 1 to 4 seams are of common occurrence. However the thickness situation is more encouraging in the north-east part close to the lease boundary, where a range from 5 to 9m is seen around bore-holes MMG 37 in the west to MMG 40 in the east and MMG 44 in the south to MMG 42 & 38 in the north beyond the lease boundary.

In the Valia Block, the cumulative thickness of lower horizon in the above area ranges from 3m in KAV/5 in south to around 8m in KAV/19 & 20 in the north. In the northeast the thickness is generally around 5m in bore-holes KAV 16, 6, 3, 15, 2 & 18. The north-east corner bore whole KAV/1 has recorded a high thickness of 27.39m.

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C) Partings/Intercalation Thickness in Lower Horizon:

Partings between lignite seams in DGM block have a thickness from < 1 to 2 m in most parts. However higher thickness of 9.97m and 13.42 m are seen in BH 238 & 244 respectively.

In the northern part BH 252 & 260 have a thickness of 10.67 m and 10.92 m respectively. In Mangrol blocks the thickness of partings ranges generally between 2 & 4 m in south-north direction in the central portion of the block. In the north east the thickness is > 12 m in a patch from MMG 37 in the west to MMG 51 in the east. Also, a small patch covering MMG 70 in the south and MMG 48 and 68 in the north has a thickness of 12 to 13m.

In Valia area, the general range is 4 to 6 m in the central part. However bore holes KAV/13 & 19 in the west record 123.66 & 12.03 m thickness respectively. The north-eastern b ore-hole KAV/1 has a thickness as high as 35.24 m.

The contours for total waste and lignite up to floor of lower horizon are shown in Plate XV.

The total waste includes over-burden, intercalations in all the three horizons and also the inter-burden between two successive horizons. The contours for total waste for DGM Block show a range from 60 m in the east to 130 m in the west near the lease boundary and beyond this, the thickness goes up to 210 m.

In Mangrol block, the total waste thickness varies from 30 m southern- most area to 120 m in the north near the lease boundary. Further north, the thickness increases to 160 m.

The thickness of waste is generally between 30 m in the south to 80 m in the north though higher thickness 102 to 18 m occurs in the north-east.

The thickness for total lignite contained up to the floor of lower horizon occurring in the total lease hold area and outside is shown as contours for the area. These contours show a general total thickness of 10 to 12 m in the central portion of DGM block.

Mangrol block, shows maximum cumulative thickness lignite in the north-east portion with thickness range of 20 to 28m. in the central south, the thickness of 10 to 14 m occurs in major portion. Northern part in central portion has a thickness of 16 to18 m and western part also has same thickness range with in the lease boundary.

In Valia block there is an increase in thickness from south to north. The southern bore-holes KAV/5 and 11 have a thickness of around 5m in the middle portion bore hole KAV/143 in the west and KAV/13 in the centre

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record a thickness of 24 to 26m. Further north of the line forming KAV/13 & KAV/17 in west-east direction, the thickness increases from 24 m to 38m in KAV/1 in the north east corner.

ISO- Ratio lines up to total depth:

Plate XV presents the iso-ratio lines for the total waste and lignite (m:m) occurring up to bottom of the bore holes.

These lines actually give an over-all picture of the ratios between total waste and lignite distributed over the area. These lines would therefore give a preliminary idea for initially freezing the mine limits as well as its depth.

However actual boundaries and final depth will be ultimately determined based on the geometry of the deposit occurring under most favourable mining parameters considered, the area being limited by lease- boundary.

The total thickness of lignite includes all seams including localized split seams above upper seam with in the three horizons, in between the horizons and also the seams below the lower seam up to the bottom of the bore hole.

The ratio lines show a general variation of 5:1 to 9:1 (Waste: Lignite) in the middle of DGM block. In the Mangrol block, the variation in ratio generally ranges from 4:1 in the south to 7:1 in the north up to the lease boundary. In the north east there is a patch of ratio of less than 5:1 along the line of boreholes MMG 45 to MMG 38 in the west to the line of boreholes MMG 70 to MMG 67 in the east.

In the Valia block, the ratio range is from 6:1 in the south to 3:1 towards west. In general, the ratios are favourable for total horizons as development of lignite is more conspicuous in the lower horizon in this area.

4.2 GEOLOGY

4.2.1 General

Lignite is found associated with the Lower Eocene formation in Gujarat State. Although, lignite was first located in Kutch region, major discoveries were made in Bharuch and Surat districts during eighties. In the year 1984, Gujarat Ground Water Board, while drilling tube wells around Vastan village encountered lignite which raised hopes of getting new lignite fields in the entire tertiary basin. The strike wise extent of the Lower Tertiary Basin in likely to be about 50 kms. The Directorate of Geology & Mining, Gujarat took up test drilling for lignite in the year 1987-88 in Vastan – Mangrol area and found promising reserves in the region. Initially, DGM undertook extensive drilling in this area followed by MECL in the Mangrol Valia region.

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4.2.2 Regional geological setting

The Mangrol – Valia lignite block, which has been extensively explored by DGM Gujarat and other agencies, falls at the southern tip of the Cambay Megha-Basin. In the North, the Cambay Basin extends from Gujarat to Barmer district in western Rajasthan encompassing Barmer, Sanchor, Patan, Tarapur and Broach sub-basins from North to South in a linear stretch. This linear stretch of sedimentary hosts extensive lignite deposits in both the above states, along the Eocene shore-lines.

The geological scenario also reveals the occurrence of thick lignite deposits in Mehsana-Kalol regions – though at deeper horizons – besides the other potential blocks in Kutch, Bhavnagar, Surat and Baruch districts in Gujarat.

Geological Setting of Vastan-Mangrol-Valia Blocks:

Generally, significant lignite deposits are associated with thick tertiary sedimentary deposited in the paleo – depressions of traps. Geological setting is given in Table 4.6 below:

TABLE 4.6
GEOLOGICAL SETTING OF VASTAN-MANGROL-VALIA BLOCKS

Formations		Age
Alluvium	-	Recent
Nummulitic limestone & Marls	-	U. Eocene (Ammravati formations)
Gypseous clays/shales, Grey clay/shales Fossiliferous shales/carbonaceous shales with lignite lenses	-	L. Eocene (Cambay shales)
Lithomargic clay/laterite	-	L. Eocene to Paleocene (Vagadkhol formation)
Deccan Trap	-	Upper Cretaceous.

In the Mangrol and its extension area in Valia explored by MECL, the lithological sequence as intersected in the exploratory boreholes is as follows:-

	Formations		Age
i.	Black Cotton Soil	-	Recent
ii.	Kankar/Brown Calcareous clay/ Bentonitic Clays	-	Sub-recent
iii.	Sand stone/sand stone (friable)		
iv.	Clay with occasional friable sandstone and/or sideritic-siltstone Bands with carbonaceous zones and Lignite	-	Lower Eocene
v.	Basalt – Deccan Trap	-	Upper Cretaceous

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As the study area is covered by thick cover of alluvium/black cotton soil masking the sub-surface underlying litho-units, the different units are interpreted from drill-hole data at different locations. However, small isolated exposures of weathered limestone/Kankar could be seen in the east part and also in the river bed.

4.2.3 Reserves estimation & Overburden

The total geological reserves in the 4 explored blocks as per AMP (2nd Revision) and MCPare as below:

TABLE 4.7
GEOLOGICAL RESERVES

Particulars	Geological Lignite Reserves in M.tes			
	Horizon-I	Horizon-II	Horizon-III	Total
DGM block	49.88			**49.88**
Mangrol block	57.11	45.95	15.99	**119.05**
Mangrol Ext. block	46.81	72.11	28.58	**147.50**
Valia block	3.01	22.35		**25.36**
Total				**341.79**

Thus, the total geological reserves in this geological block as per the exploration reports work out to 341.79 M.tes.

M/s Nircon in the approved Mining plan prepared by them, considered the total geological reserves of 341.79 M.tes in the total area and 265.43 M.tes within the 2080 Ha. of lease hold area.

In RAMP-2015, reserve estimation was done through model. The basic factors considered for reserves estimation were:

1. The lease hold boundaries as demarcated by GIPCL, form the aerial limits.
2. All lignite/carbonaceous layers identified and designated as lignite by the exploration agencies in their lithologs have been taken as lignite.
3. Even the thickness of small, thin and discontinuous seams intersected in the bore-holes occurring above or below, or in between the identified three lignite horizon have been added up to the lignite contained within each of the three horizons to arrive at total thickness.
4. Cut-off thickness, of 0.5m is taken for lignite.
5. Carbonaceous Formations, though have some heat rate, occurring at the roof and floor of the seams, are not considered.
6. The bulk density of the lignite seam is taken as 1.16 gm/cc for In-situ conditions.

Based on the above criteria, the geological reserves as calculated from the model work out to 336.43 M.tes.

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The above assumptions have also been considered in the current Mining Plan.

However, these entire geological reserves in the block may not be available for mining due to the following reasons:

- Greater depth of occurrence
- Reserves locked under surface features like Mangrol village, railway line, Moti river, etc.
- The possible reserves locked under the batters in each of the lignite horizons in each block up to the designated floor of the mine.

4.2.3.1 Estimation of mineable reserves

The entire geological reserves will not be mineable due to various constraining factors like design of mine optimally, batter losses, necessity to leave barriers of lignite deposit under rivers, roads, villages, railway lines, etc., type of mining machineries to be deployed and overall economics. Very thin seams less than 0.50 m thick and deep seated seams become un-mineable due to economics.

After giving due allowances for above constraining factors and based on deposit parameters like thickness of seams, depth of occurrence, continuity of seam, fault/wash-out conditions, etc., of the deposit, the mine movement and working design as well as the choice of the most economical and cost-effective mining equipment configurations have been arrived at, so that maximum quantity of lignite can be exploited with minimum cost.

The limiting factors in respect to correct assessment of mineable reserves are briefly described here under:

Due to number of encounters of lignite seams in wide ranging variation as described above, only independent seams of 0.50 m thickness and above have been included in assessment of mineable reserves. The second limiting factor is the total depth from surface to floor. This maximum depth will be 150 m. Lignite occurring below this is not considered viable presently.

The study of the lignite seam disposition as per exploratory borehole configurations and evaluations of various environmental and techno-economic aspects have indicated that the mining depth has to be restricted to 150 m from ground level. The limiting factors in this respect are as below:

1. With deepening of mine workings beyond 150 m, additional ramp length has to be made and with the restricted area available at such depths within the present mining area formation of ramps will pose great logistic problems.

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2. With workings extending beyond 150 m depth, the external overburden dump quantity will get enlarged, involving more land lock for overburden dump, which will eventually cause more environmental degradation. As per environmental statutes, minimum land-lock for waste dumps are insisted upon.

3. With deeper workings than 150 m in, the haulage and pumping problems will also correspondingly increase.

4.2.3.2 Estimation of Extractable lignite reserves

While assessing the extractable reserves out of the mineable reserves in the Mangrol area, the following constraints arise, which will reduce the mineable reserves to considerable extent.

a) While working the Mangrol area, provision of 100 m barrier against railway line has to be made both on Southern and Northern sides of the railway line, considering the major road from Vankal to Kosamba which also have to be diverted later into this 200 m corridor.

b) Provision of 100 m. barrier against seasonal river (Kim river) boundary on the Southern & Northern side of the block.

c) Zone which is erratic and with extraordinary thin seams at greater depth is considered un-mineable on grounds of very limited reserves.

d) Losses due to batter.

Complete statement of reserves as per fresh calculations and as adopted in the Current Mining Plan (m.tes.) is given in Table 4.8 below.

TABLE 4.8
COMPLETE STATEMENT OF RESERVES AS PER FRESH CALCULATIONS AND AS ADOPTED IN THE CURRENT MINING PLAN (M.TES.)

Sl. No.	Particulars	As calculated by RQP (B.D. Sharma)	
		Lignite	OB
1.	Geological Reserve within exploration area (Geological Block), MT	341.79	2613.31
2.	Geological Reserves outside the Allotted Block/ existing ML area	83.12	1060.78
3.	Vertical Reserve in allotted Block/ existing ML area (1-2)	258.67	1552.53
4.	Blocked in barrier and unworkable patches including railway boundary	39.79	
5.	Vertical Reserve within pit boundary up to 150m depth ex barrier, >0.5m thickness (3-4)	218.88*	
6.	Blocked in Batter	55.59**	
7.	Mineable/extractable Reserve as per RQP (5-6)#	163.29 (Mining losses considered 0%)	943.69
8.	Mineable Reserves as per approved Mining Plan	-	-

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Sl. No.	Particulars	As calculated by RQP (B.D. Sharma)	
		Lignite	OB
9.	Stripping Ratio	5.78	
10.	Reserves extracted up to 31-03-2020	24.01	123.81
11.	Balance as on 01-04-2020#	139.28	819.88

* *Vertical reserves within pit boundary as per RQP (BD Sharma) are 218.88 m up to 150 m depth (all lignite extracted) whereas AMP(2000) indicated 209.79 MT, only up to 110m depth.*

** *The lignite reserves blocked in batter as per RQP (BD Sharma) are 55.59 MT in line with 23 degree batter slope prescribed by CMRI study whereas as per Nircon AMP (2000) there are only 9.6 MT erroneously calculated at 45 degree angle. This reference of AMP (2000) is relevant as the pit area (excavated area) is same (1453.00ha) in the current mine plan as it was in AMP 2000.*

\# *The current Mining Plan (3rd Revision) (including Mine Closure plan) has been prepared on the basis of these freshly calculated reserves and OB as explained above.*

Observation No. 5(f) of MOC letter dt 19-08-2020: As per Para 3.2 of DGMS(Tech) Circular No 03 of 2020, minimum factor of safety to be considered for design of pit, bench & dump slope shall be in any case not be less than 1.50 for permanent or long-standing slopes and 1.30 for all other cases. GIPCL carried out a scientific study from CMRI, Dhanbad regarding the same in Sept'2007, where factor of safety is considered as 1.30. Before starting of mining operation, a fresh scientific study may be carried out to comply the provision of DGMS circular.

Compliance: The mine has been already operating for over 10 years as per the approved mining Plan and external dumps formed earlier have already been stabilised. As the quarry is being continuously advanced and backfilled up to the surface because of shallow depths, there is no longstanding slope at present. Other slopes have been planned at 1.3 factor of safety.

Any change in mine profile will change the extractable reserve also, as can be understood from the fact explained in 2nd foot note below Table 4.8 above that the blockage of reserves in the batter increased from 9.6 Mt with batter of 45 degrees to 55.59 Mt with the batter angle 23 degrees as prescribed by CMRI study.

However, the mine has a balance life of 27 years. And a study, as suggested will be taken up within 3 years, and in case any change is suggested in mine or dump profile by the study, the same will be implemented.

The Appendix Nos. II, III, IV, V, VI, VII shows the Borehole wise as well as total geological, mineable and extractable lignite reserves, total quantity of waste rock and the stripping Ratio for the Mangrol as well as Valia area.

Horizon wise thickness and depth with reserve assessment details are given below in Table 4.9.

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TABLE 4.9
SEAM WISE THICKNESS AND DEPTH WITH RESERVE ASSESSMENT

Seam	Thickness range*, m	Depth Range*, m	Net Geological Reserves 'Mt'	Blocked Reserves below					Mineable Reserves 'Mt'		
				Highwall/ Batter	Nallah/ River/Road	embankment	Un-economic	Total Blocked	UG	OC	Mining Losses
Upper Horizon	0.20-12.03	12.98-204.15	99.76	16.88	16.49	0.00	0.00	33.37		66.39	
Middle Horizon	0.6-19.23	26.09-224.98	115.65	24.56	16.59	0.00	0.00	41.15		74.50	
Lower Horizon	0.20-27.39	31.63-240.39	43.26	14.15	6.71	0.00	0.00	20.87		22.39	
Total			**258.67**	**55.59**	**39.79**	**0.00**	**0.00**	**95.38**	**0**	**163.29**	**0**

** Refer Table under para 3.6.2.3 of RAMP 2015 and Tables 4.4 and Table 4.5 of Chapter 4 of Current MP*

Seam	Ext Res "MTe"			As on base date "MTe"							Reason not considered for mining
				Depletion of Reserve up to 31.03.2020			Balance Reserve				
	UG	OC	Highwall	UG	OC	Total	UG	OC	Highwall	Total	
Upper Horizon	0.00	66.39			24.01			139.28		**139.28**	
Middle Horizon	0.00	74.50									
Lower Horizon	0.00	22.39									
Total	**0.00**	**163.29**			**24.01**			**139.28**		**139.28**	

4.3 QUALITY OF LIGNITE

The qualitative assessment of the lignite seams is as important as their quantitative assessment. The chemical characteristics of lignite have profound influence on its utilization potentials and in the present case its combustion properties. Fuel properties influence the design of the pulverizing & firing systems and combustion chamber. There is a close relationship between milling and firing equipment, burner layout, range of control of operation of firing and problems to be taken care of with regard to fouling, slagging, erosion and corrosion.

The calorific value of the deposit determines the lignite potentials in terms of energy units and also the specific consumption index. These are necessary to estimate the total life of the power station at the targeted power generation level. The other properties like moisture, Volatile matter, fixed carbon, sulphur etc., also influence the combustion potentials. Higher moisture than the design value, indicates that lignite temperature will decrease and flame length will increase. Also, the chemical composition of inherent constituents in the ash and possible contaminations from external sources during mining determine the slagging fouling, erosion and corrosion problems likely to arise. The ash fusion temperature both initial and fluid state and their differential indicate the tendency for slag build up.

Hard grove index is the factor considered for designing the pulverizing units. Hence a thorough understanding of the characteristics of the lignite deposit has become a sine-quo-non.

The present quality assessment is extended to lignite seams beyond the demarcated mining depth and boundary to facilitate drawing up specification for total lignite. This is to facilitate accommodation of higher production level or longer production period in case the mine is expanded to operate at later stage beyond the presently adopted mining limits depth wise & area wise.

The quality of lignite is generally assessed from the results of Proximate, Ultimate and other analysis conducted on lignite core samples recovered from the exploratory boreholes. Though such a study would from the main basis, still the actual quality of mined – out lignite may show some variations due to possible contamination from other formations associated with lignite. The contamination factor also plays a significant role in combustion properties especially in the case of thin irregular multiple seams with partings as encountered in the project area. With wide variations in the disposition of lignite seams, it is difficult to assess to possible extent of contamination in the mined – out lignite.

However, in the present case, there is a distinct advantage in that the lignite actually mined-out from similarly placed lignite seams in the nearby Vastan mine is being successfully burnt in the power station for some years. Hence

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the quality problems likely to be faced due to possible external contamination during mining are already known to certain extent and corrective measure taken.

The result of 668 band by band samples of lignite cores collected from the DGM area, 372 samples from the Mangrol bocks in I phase, 682 samples of in II phase of exploration in total Mangrol block and 558 samples in Valia block reveal the following:

The result of the proximate analysis of lignite is given below:

TABLE 4.10
PROXIMATE ANALYSIS OF LIGNITE

Parameters	Mangrol Block			Mangrol Ext Block			Valia Block		
	Min	Max	M.F	Min	Max	M.F	Min	Max	M.F
Moisture %	37.2	58.8	45-55	28.6	55.0	45.0-52.5	37.0	54.2	50.0-52.5
Ash %	2.5	35.3	<5-10	2.3	24.6	5.0-10.0	1.8	24.8	2.0-10.0
V.M%	9.8	36.9	20-30	17.2	37.0	20.0-27.5	16.5	30.6	20.0-25.0
F.C%	1.7	23.0	10-20	10.6	29.1	17.5-22.5	10.7	25.8	17.5-22.5
C.V (k.cal/kg)	1610	4000	2500-3250	2010	3980	2500-3250	2010	3630	2500-3250

From the above it is evident that the calorific value of lignite in this block is mostly in 2500-3250 Kcal/Kg range.

Ultimate analysis:-

Ultimate analysis was also carried out on composite lignite samples and the results are as follows:-

TABLE 4.11
ULTIMATE ANALYSIS OF LIGNITE

Contributions	Mangrol Block		Mangrol Extension Block		
	Min	Max	Min	Max	Most Frequent Range
In-situ M %	48.12	54.86	-	-	-
Mineral Matter	5.17	23.89	-	-	-
Carbon	13.17	30.25	13.91	41.93	27.5 to 35.0
Hydrogen	0.84	2.52	1.07	3.28	1.5 to 2.70
Nitrogen	0.08	0.35	0.05	1.75	0.26 to 0.36
Sulphur	0.16	3.50	0.05	1.72	< 0.28 to 0.75
Oxygen	3.82	12.17	4.07	13.57	8.0 to 12.0

Hard grove Grindabality index (HGI)

Results of HGI tests conducted on 15 samples for Mangrol block show that in 8 samples the values is between 130-150 and in 5, between 100-120.

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The HGI values for Mangrol extension block show the following ranges as per the results of analysis carried out on 125 composite samples:

TABLE 4.12
THE HGI VALUES FOR MANGROL EXTENSION BLOCK

Class limits	Frequency	% Frequency	% Cumulative Frequency
< 105	35	36.00	36.00
105-125	46	36.80	72.80
125-145	28	22.40	95.20
145-155	6	4.80	100.00
Minimum	76		
Maximum	161		
Most Frequent Range	95-135		

Ash Composition:-

Results of analysis of lignite ash conducted on composite samples show the following values for minimum, maximum and most common range for Mangrol extension block.

TABLE 4.13
RESULTS OF ANALYSIS OF LIGNITE ASH

Constitutions	Most common range %	Min %	Max %
SiO_2	20.0-30.0	10.80	70.08
Al_2O_3	5.0-25.0	3.32	26.39
Fe_2O_3	10-15.0	2.0	40.80
TiO_2	0.30-5.0	0.30	16.00
CaO	7.50-20.0	4.30	43.40
MgO	1.0-3.0	0.10	10.40
Na_2O	1.0-3.0	0.22	4.05
K_2O	0.05-0.25	0.03	8.41
SO_3	5.0-25.0	0.05	29.0
P_2O_5	-------- Less than -0.05 --------		

4.4 FLOOR CONTOUR PLANS, SEAM FOLIO (ISO THICKNESS) PLANS ISO GRADE PLANS ARE PROVIDED BELOW

Floor contour plans (folio) are given in Plates IX-A, IX-B and IX-C.

4.5 HYDRO-GEOLOGICAL STUDY

Hydrology & Hydrogeology of Mangrol - Valia Opencast Lignite Mine Project, District Surat & Bharuch, Gujarat of GIPCL was prepared by Srushti Sewa, Nagpur in January 2015 (**Annexure XVII**).

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CHAPTER 5

MINING

5.1 OPTIMISATION OF TARGETED CAPACITY

Considering, the available lease area, reserves, seam disposition, gradient, depth, available strike length for opencast mining and feasibility to deploy large size equipment in opencast operation, and the requirement of EUPs, the capacity of the mine, has been kept as 5.4 MTPA through opencast operation.

The 1st Mining Plan (2000 version) was approved for a production of 4.2 MTPA over an area of 2080 ha, on the basis of which an ML of 2059.68.29 ha was granted.

Subsequently, with the increased forecast of demand of the additional 600 MW TPS, the additional area was sought and the 2nd (2009 version) and the 3rd (2015 version) Mining Plans were approved for 7.4 MTPA for an area of 3710 ha and 3019 ha respectively. The lesser area in the 3rd Mining Plan was arrived by reducing dump area as suggested by EIA committee.

The Mining Plans for the expansion capacity could not be implemented due to pending environmental clearance; and on account of non acquisition of additional 959.00 Ha areas of the additional applied leases, the decision for one of the approved EUP, viz. Phase-2 SLPP 2X300MW, has been deferred indefinitely.

Now, GIPCL has decided to setup additional 2 x 125 MW units instead of 2x 300 MW as Phase-2 expansion of SLPP. Therefore, Lignite requirement has been revised downwards to 5.4 MTPA.

Therefore, this Revised Mining Plan (3rd Revision) (including Mine Closure Plan) has been planned for 5.4 MTPA with reduced land requirement of 2059.68.29 Ha, the mining lease for which had already been granted subsequent to the approval of 1st Mining Plan (2000). However, the depth of Mining has been increased from 110 m to 150 m in line with the RAMP (2015).

The production phasing has been kept considering the lignite presently being supplied from Vastan mine also to the linked EUP units. The Vastan mine is likely to exhaust during 2024-25, and accordingly the peak rated capacity of Mangrol Valia mine is envisaged to be achieved during 2025-26 (6th year).

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5.1.1 Mine boundaries

The mine boundaries of the Mangrol Valia Opencast Mine have been fixed considering available leasehold boundary, various surface constraints, river boundary, geological Information and topography of the area.

5.1.2 Statement of Geological Reserves

The geological reserves in Mangrol and Valia Blocks and that within the ML area are given in Table 5.1.

TABLE 5.1
GEOLOGICAL RESERVES WITHINTHE BLOCK AND WITHIN ML AS PER CURRENT MINING PLAN

(1)	Geological reserves lying within the lignite field (Geological Block) area as mentioned in in the approved Mine Plan	341.79 MT
(2)	Geological reserves outside executed ML*	83.12 MT
(3)	Geological reserves vertically within ML area of 2059.68.29 ha considered for preparing the Mining Plan (3rd Revision) (including Mine Closure Plan)	258.67 MT

**** executed ML is same as allotted block, hence 83.12 MT reserves do not lie within the allotted block***

5.2 CHOICE OF MINING METHOD

For exploiting any deposit, the choice can be underground or opencast method depending upon the disposition and other salient parameters of the mineral deposit.

Considering the nature of the Mangrol-Valia Lignite deposit, parameters like depth of occurrence, gentle dip, thin seam thickness, split seam occurrence, environmental characteristics, etc., the lignite deposits will be worked by Mechanized Opencast Mining through Conventional Mining Equipment/ Machinery.

In an Opencast Mining Method, the soil covering the mineral is stripped to expose the mineral and make it available for exploitation. This method of mining has several advantages over underground method of mining. Some of them are discussed below:

1. An opencast mine can be designed for a high rate of output by deploying large capacity excavators.
2. Difficult strata conditions can be tackled more easily.

3. Existence of water bearing aquifers below or above the seam can be tackled effectively by deep hole pumping in a pre-designed pattern. However, in the present case there is no confined aquifer encountered and as such there will not be any upward hydrostatic pressure control problems.
4. Mining losses can be kept very low with proper design of the mine.
5. Seams liable to spontaneous heating are more easily exploited.
6. Health hazards are minimum and safety standards can be maintained at high level.
7. Although weather influence will be more predominant in an opencast mine, its effect can be minimized.

Due to the above advantages such as higher percentage of mineral recovery, safety and need for large scale lignite production, opencast method will be adopted for this mine.

5.3 OPENCAST METHOD

5.3.1 Extractable reserves, waste quantity and stripping ratio within outer pit boundary

Three pits have been planned, South Pit and Central Pits in Mangrol Area separated by Moti River; and North Pit in Valia area separated by the railway line.

The pit wise estimated extractable reserves, waste quantity and stripping ratio is summarised in Table 5.2 below.

TABLE 5.2
EXTRACTABLE RESERVES WITHIN PIT BOUNDARY AS PER CURRENT MINING PLAN

	NORTH PIT			SOUTH PIT			CENTRAL PIT			TOTAL		
	Lignite (Mt)	OB (MCuM)	SR Cum/t)	Lignite (Mt)	OB (MCuM)	SR Cum/t)	Lignite (Mt)	OB (MCuM)	SR Cum/t)	Lignite (Mt)	OB (MCuM)	SR Cum/t)
Extracted till 31-03-2020	17.5	77.93	4.45	6.51	45.88	7.05				24.01	123.81	5.15
Current Mining Plan	115.41	589.68	5.11	21.5	191.16	8.89	2.37	39.04	16.47	139.28	819.88	5.89
Total	132.91	667.61	5.02	28.01	237.04	8.46	2.37	39.04	16.47	163.29	943.69	5.78

5.3.2 Derivation of extractable reserves from geological reserves

Derivation of extractable reserves from geological reserves, depleted reserves and balance reserves as on 01-04-2020 are tabulated in the following Table 5.3.

TABLE 5.3
DERIVATION OF EXTRACTABLE RESERVES FROM GEOLOGICAL RESERVES, DEPLETION OF RESERVES AND BALANCE RESERVES AS ON 01-04-2020 WITHIN ALLOTTED BLOCK AREA/ML

Seam	Thickness range, m	Depth Range, m	Net Geological Reserves 'Mt'	Blocked Reserves below, Mt					Mineable Reserves 'Mt'		Mining Losses
				Highwall/ Batter	Nallah/ River/ Road	Embankment	Un-economic	Total Blocked	UG	OC	
Upper Horizon	0.20-12.03	12.98-204.15	99.76	16.88	16.49	0.00	0.00	33.37	0.00	66.39	0.00
Middle Horizon	0.6-19.23	26.09-224.98	115.65	24.56	16.59	0.00	0.00	41.15	0.00	74.50	0.00
Lower Horizon	0.20-27.39	31.63-240.39	43.26	14.15	6.71	0.00	0.00	20.87	0.00	22.39	0.00
Total			**258.67**	**55.59**	**39.79**	**0.00**	**0.00**	**95.38**	**0.00**	**163.29**	**0.00**

Seam	Ext Res "MTe"			As on base date "MTe"							Reason not considered for mining
				Depletion of Reserve			Balance Reserve				
	UG	OC	Highwall	UG	OC	Total	UG	OC	Highwall	Total	
Upper Horizon	0.00	66.39			24.01			139.28		139.28	
Middle Horizon	0.00	74.50									
Lower Horizon	0.00	22.39									
Total	**0.00**	**163.29**			**24.01**			**139.28**		**139.28**	

Percentage of Extraction **63.12%** **Including past production of 24.01 MT**

The block allotted to GIPCL is only 2059.6829 ha for which ML is in place. The 83.12 MT reserves, lying outside the existing ML/ allotted block (part of the 341.79 Mt Net Reserves considered in the previous AMP), have not been considered in this table due to land acquisition problems and hence the additional ML (containing 83.12 MT reserves) has not been considered.

5.3.3 Production Schedule/ Calendar Programme of production

The Pit wise, year wise calendar Programme of Excavation, is furnished in Table 5.4.

TABLE 5.4
CALENDAR PROGRAMME OF LIG. MINING AND OB (INCLUDING TS) EXCAVATION FROM NORTH, SOUTH AND CENTRAL PITS (LIG. IN MT, OB IN MBCUM)

Sl. Year	Calendar Year	North Pit						South Pit						Central Pit						Total North + South+Central Pits					
		LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.	LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.	LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.	LIG. Prgr.	LIG. Cumul.	OB Progr.	OB Cumul.	SR Progr.	SR Cumul.
Past upto 2019-20		17.50		77.93		4.45		6.51		45.88		7.05								24.01		123.81		5.16	
Y-1	2020-21	3.60	3.60	17.00	17.00	4.72	4.72	0.00	0.00	0.00	0.00	0.00								3.60	3.60	17.00	17.00	4.72	4.72
Y-2	2021-22	3.60	7.20	17.00	34.00	4.72	4.72	1.00	1.00	11.18	11.18	11.18	11.18							4.60	8.20	28.18	45.18	6.13	5.51
Y-3	2022-23	3.60	10.80	17.00	51.00	4.72	4.72	1.00	2.00	11.18	22.36	11.18	11.18							4.60	12.80	28.18	73.36	6.13	5.73
Y-4	2023-24	3.60	14.40	17.00	68.00	4.72	4.72	1.00	3.00	11.18	33.54	11.18	11.18							4.60	17.40	28.18	101.54	6.13	5.84
Y-5	2024-25	3.60	18.00	17.00	85.00	4.72	4.72	1.00	4.00	11.18	44.72	11.18	11.18							4.60	22.00	28.18	129.72	6.13	5.90
Y-6	2025-26	3.60	21.60	18.00	103.00	5.00	4.77	1.80	5.80	18.20	62.92	10.11	10.85							5.40	27.40	36.20	165.92	6.70	6.06
Y-7	2026-27	3.60	25.20	18.00	121.00	5.00	4.80	1.80	7.60	16.79	79.71	9.33	10.49							5.40	32.80	34.79	200.71	6.44	6.12
Y-8	2027-28	3.60	28.80	18.00	139.00	5.00	4.83	1.80	9.40	16.79	96.50	9.33	10.27							5.40	38.20	34.79	235.50	6.44	6.16
Y-9	2028-29	3.60	32.40	18.00	157.00	5.00	4.85	1.80	11.20	16.79	113.29	9.33	10.12							5.40	43.60	34.79	270.29	6.44	6.20
Y-10	2029-30	3.60	36.00	18.00	175.00	5.00	4.86	1.80	13.00	16.79	130.08	9.33	10.01							5.40	49.00	34.79	305.08	6.44	6.23
Y-11	2030-31	3.60	39.60	18.00	193.00	5.00	4.87	1.80	14.80	16.80	146.88	9.33	9.92							5.40	54.40	34.80	339.88	6.44	6.25
Y-12	2031-32	3.60	43.20	25.00	218.00	6.94	5.05	1.80	16.60	13.20	160.08	7.33	9.64							5.40	59.80	38.20	378.08	7.07	6.32
Y-13	2032-33	3.60	46.80	25.00	243.00	6.94	5.19	1.80	18.40	13.20	173.28	7.33	9.42							5.40	65.20	38.20	416.28	7.07	6.38
Y-14	2033-34	3.60	50.40	25.00	268.00	6.94	5.32	1.80	20.20	13.22	186.50	7.34	9.23							5.40	70.60	38.22	454.50	7.08	6.44
Y-15	2034-35	4.10	54.50	25.00	293.00	6.10	5.38	1.30	21.50	4.66	191.16	3.58	8.89							5.40	76.00	29.66	484.16	5.49	6.37
Y-16	2035-36	5.40	59.90	25.00	318.00	4.63	5.31		21.50		191.16		8.89							5.40	81.40	25.00	509.16	4.63	6.26
Y-17	2036-37	5.40	65.30	28.08	346.08	5.20	5.30		21.50		191.16		8.89							5.40	86.80	28.08	537.24	5.20	6.19
Y-18	2037-38	5.40	70.70	28.08	374.16	5.20	5.29		21.50		191.16		8.89							5.40	92.20	28.08	565.32	5.20	6.13
Y-19	2038-39	5.40	76.10	28.08	402.24	5.20	5.29		21.50		191.16		8.89		0.00	5.00	5.00			5.40	97.60	33.08	598.40	6.13	6.13
Y-20	2039-40	5.20	81.30	28.08	430.32	5.40	5.29		21.50		191.16		8.89	0.20	0.20	5.00	10.00	25.00	50.00	5.40	103.00	33.08	631.48	6.13	6.13
Y-21	2040-41	4.80	86.10	28.08	458.40	5.85	5.32		21.50		191.16		8.89	0.60	0.80	10.00	20.00	16.67	25.00	5.40	108.40	38.08	669.56	7.05	6.18
Y-22	2041-42	4.80	90.90	28.08	486.48	5.85	5.35		21.50		191.16		8.89	0.60	1.40	10.00	30.00	16.67	21.43	5.40	113.80	38.08	707.64	7.05	6.22
Y-23	2042-43	4.80	95.70	25.40	511.88	5.29	5.35		21.50		191.16		8.89	0.60	2.00	9.00	39.00	15.00	19.50	5.40	119.20	34.40	742.04	6.37	6.23
Y-24	2043-44	5.03	100.73	25.40	537.28	5.05	5.33		21.50		191.16		8.89	0.37	2.37	0.04	39.04	0.11	16.47	5.40	124.60	25.44	767.48	4.71	6.16
Y-25	2044-45	5.40	106.13	25.43	562.71	4.71	5.30		21.50		191.16		8.89		2.37		39.04		16.47	5.40	130.00	25.43	792.91	4.71	6.10
Y-26	2045-46	5.40	111.53	20.00	582.71	3.70	5.22		21.50		191.16		8.89		2.37		39.04		16.47	5.40	135.40	20.00	812.91	3.70	6.00
Y-27	2046-47	3.88	115.41	6.97	589.68	1.80	5.11		21.50		191.16		8.89		2.37		39.04		16.47	3.88	139.28	6.97	819.88	1.80	5.89
Total Current MP		115.41		589.68		5.11		21.50		191.16		8.89		2.37		39.04		16.47		139.28		819.88		5.89	
Total Incl. Past Prodn.		132.91		667.61		5.02		28.01		237.04		8.46		2.37		39.04		16.47		163.29		943.69		5.78	

Presently, 0.60MTPA is supplied from Vastan Lignite Mine of GIPCL which will exhaust by 2024-25

5.3.4 Mining area

The selection of mining area has to be carefully done on an optimal basis, after giving due weightage to various relevant factors mentioned below:

- The method of mining, type of equipment to be deployed.
- Number of seams, seam thickness
- Geological & Structural constraints
- Overburden thickness
- Production Capacity and future needs
- Economic viability based on the available lignite reserves and its quality
- Hydrological conditions of the area
- Natural boundaries like rivers, roads, villages, etc., which are uneconomical for diversion or for rehabilitation and against which barriers of mineral has to be left from safety angle as per statutes.
- While deciding the mining lease boundaries in Mangrol and Valia areas for the three proposed mining leases in a contiguous block, for which integrated mining operations to achieve a total of about 4.2 MTPA lignite production are planned, all above factors have been fully taken into review for optimal choice.

5.3.5 Development activities

These activities will relate to the following areas:

1. Phasing and procurement of various conventional mining equipment mentioned earlier.
2. Formation of feeder roads.
3. Cutting of drainage channels along proposed mine edge for at least 3 years in advance and also around the proposed dump yard.
4. Laying of power transmission lines and providing temporary power supply initially, till sub-station is established for permanent supply.
5. Preparation of approach ramps for the initial Mine Cut.

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5.3.5.1 Initial mine cut

The most important point from the view of development cost of a mine is the proper location of the Initial Mine Cut at the optimal level. The following points were considered for identifying the IMC in the Approved Mining Plan.

a. Initial Mine Cut is to be located in a place where the OB thickness is minimum so that maximum lignite exposure is achieved with minimum stripping of OB.

b. Initial Mine Cut location should facilitate full mine development with minimum re-arrangements and sweep the selected mine blocks with a more or less uniform bench length

c. The location should be so selected so that there is no immediate necessity to divert any big river or canal or reroute railway line or road or rehabilitate villages etc.,

d. It should be located in an area where the lignite seam is practically thinning out and mining of the same will not be economical. This is with a view not to leave lignite that could be mined later.

e. This site should have a low ratio of overburden to lignite.

f. Its location should involve minimum quantity of overburden removal.

In keeping with the above objectives, the details of the location of IMC in the case of the Valia field are described below:

5.3.5.2 Location of initial mine cut and haul road

The IMC in Mangrol area (south pit which is under operation from 2009-10) has been located near Bore Hole No. 218 A running along North-East to South-West direction.

The IMC in Valia area (north Pit which is in operation from 2012-13) was done from the line joining BH no. KAV-17 to KAV-1 and then heading towards NE direction.

The access trench (Haul Road) to IMC for Mangrol and Valia area has an overall gradient of 1 in 16.

5.3.6 Selection of OC mining technology

5.3.6.1 Mining equipment and machinery

The shovel dumper combination was approved in the mining plan (2000 version) for 4.2 MTPA Capacity. Though the Mining Plan has been revised twice afterwards with higher capacity of 7.4 MTPA but none of the revisions

has been implemented due to various reasons. The current Mining plan with a 5.4 MTPA is comparable with the 1st AMP with higher production level.

The following equipment is operational at present in the mining operation.

5.3.6.2 *Existing list of Machinery*

List of Machines deployed for OB & Lignite extraction is given below in Table 5.5.

TABLE 5.5
HEMM DEPLOYED FOR O/B & LIGNITE EXTRACTION

I. Excavators:-				
Sl. No	**Model**	**Make**	**Capacity (m^3)**	**NO.'s**
1	Volvo-480 Excavators	Volvo	3.1	3
2	Volvo-460 Excavators	Volvo	3.1	10
3	Tata Hitachi-350 Excavators	Tata	3.0	3
4	Tata Hitachi-220 Excavators	Tata	1.0	1
	Total-I			**17**
II. Dumpers:-				
Sl. No.	**Model**	**Make**	**Capacity (Te)**	**No.'s**
1	Volvo FM 400 Trucks	Volvo	35	20
2	Scania-380 Trucks	Scania	35	21
3	Scania-410 Trucks	Scania	35	14
4	Tata Prim-2528 Trucks	Tata	25	11
	Total-II			**66**
III. Other Equipment's:				
Sl. No.	**Model**	**Make**	**No.**	
A	**Dozer**			
1	BD65, 165 HP	BEML	1	
2	K85, 264 HP	Komatsu	2	
3	B275,449 HP	Komatsu	1	
	Total		**4**	

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B	**Motor Grader**		
1	G930,175 HP	Volvo	1
2	GD-535, 205 HP	Komatsu	2
	Total		**3**
C	**LOADER**		
1	966H CAT, 3.6 cum	Cat	1
2	LG938SDLG,1.9 cum	Liugong	1
3	Hindustan 20201, 1.7-3 cu.m	Hind.	1
	Total		**3**
D	**Water Tanker**		
1	TATA Novus 2530	Tata	3
2	Tata 2516	Tata	2
3	Diesel tanker	Tata	4
4	Hywa service van		1
	Total		**10**
E	**Other Vehicle**		
1	Bolero Camper for men transportation		4
2	Tata mobile Van		1
3	Quails & Enova		2
4	Loader caterpillar 966 H		1
	Total		**8**
	Total-III		**28**
	Grand Total (I+II+III)		**111**

5.3.6.3 Excavation and transportation aspects

Equipment has been provisioned based on the peak rated capacity of 5.4 MTPA coal production with 38.22 MCuM of OBR.

Similar capacity equipment (as presently existing) have been envisaged to be utilized. Thus, the capacities of the main equipment are provided accordingly which will fulfill the requirements. The requirement of number of shovels and trucks/ dumpers have been estimated based on productivity calculations as given in the following Table 5.6 and Table 5.7.

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TABLE 5.6
CALCULATION FOR PRODUCTIVITY OF SHOVEL

PROJECT : MANGROL VALIA LIGNITE MINE EXPANSION			
I	**Calculation for Annual Working Hours**		
1	Annual working days	270	
2	Working hours per shift	8	
3	Total working hours per annum for 3 shift-working	6480	
4	Availability of the machine in %	0.85	
5	Utilization of the machine in %	0.66	0.69
6	Effective working hours per annum	4276.80	4471.20
II	**Productivity of Shovel**	**1.75 m^3**	**3.2 m^3**
1	Bucket capacity in m^3	1.75	3.2
2	Bucket fill factor	0.9	0.9
3	Swell factor for waste and lignite(1/1.3)	0.77	0.77
4	Swell cum fill factor (2*3)	0.693	0.693
5	Solid Bucket capacity in m3(1*4)	1.21275	2.21760
6	Bucket cycle time in min.	0.5	0.5
7	Dumper size T	35	35
8	Dumper Pay load	31.752	31.752
9	dumper Struck Capacity cum	16.5	16.5
10	No. of Passes	13	7
11	Direct Loading Time	6.500	3.500
12	Time for placement of each dumper	0.5	0.5
13	Total Loading time	7.000	4.000
14	Hourly Output	141.4286	247.5
15	Factor for positioning	0.85	0.85
16	Annual productivity of shovel in MM^3	**0.51**	**0.94**

TABLE 5.7
CALCULATION FOR REQUIREMENT OF TRUCKS

Sl. No.	Particulars	35T Trucks for 18 HRS Operation				
1	**3.2 M^3 SHOVEL**	**1**	**1**	**1**	**1**	**1**
I	**Calculation for Requirement of Trucks**					
1	Lead in km	**2.5**	**3***	**4**	**5**	**6**
2	Loading time in min derived from:	4	4	4	4	4
	2A. Number of passes	6	6	6	6	6
	2B. Loading time per pass in Sec.	40	40	40	40	40
3	Hauling time @ 25 KMPH-Full Load in Min.	6	7.2	9.6	12	14.4

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Sl. No.	Particulars	35T Trucks for 18 HRS Operation				
1	3.2 M^3 SHOVEL	**1**	1	1	**1**	1
4	Hauling time @ 40 KMPH-empty load in Min.	3.75	4.5	6	7.5	9
5	Unloading time in Min.	3	3	3	3	3
6	Total Cycle Time Including 10% Allowance	18.43	20.57	24.86	29.15	33.44
7	Number of Shift Per Day	3	3	3	3	3
8	Number of Active Working Hours Per Day	**18**	**18**	**18**	**18**	**18**
9	Number of Trips Per Day	59	53	43	37	32
10	Truck capacity in m3.	**16.5**	**16.5**	**16.5**	**16.5**	**16.5**
11	Quantity per truck per day in m^3.	970.5	871.85	707.35	608.65	526.4
12	Daily volume from 3.2M^3 Shovel in m^3	3481	3481.5	3481.5	3481.5	3481.5
13	Number of trucks required per shovel	4	4	6	7	9

Average lead has been adopted as 3 km for dumper calculations.

Summary of excavators and dumpers required:

The summary of No. of excavators and dumpers required for Mangrol and Valia area are furnished hereunder in Table 5.8 and Table 5.9 based on the calendar program.

TABLE 5.8
NUMBER OF EQUIPMENT AS CALCULATED SEPARATELY FOR NORTH AND SOUTH PIT

Name of Pit		Size of Equipment	No. as per Calculation	Standby	Total
North pit (Valia area)	LIGNITE	3.2 CuM shovel	5	1	6
		35 T Dumper	31	3	34
		1.75 CuM shovel	**1**	**0**	**1**
South pit* (Mangrol area)		3.2 CuM shovel	2	1	3
		35 T Dumper	10	1	11
		1.75 CuM shovel	**1**	**0**	**1**
North pit (Valia area)	OB	3.2 CuM shovel	30	3	33
		35 T Dumper	120	12	132
South pit* (Mangrol area)		3.2 CuM shovel	20	2	22
		35 T Dumper	87	9	96
Grand Total			**307**	**32**	**339**

* *The south pit is operated from 2nd to 15th years, contributing 1.8 MTPA (peak) out of the total production of 5.4 MTPA.*

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TABLE 5.9
NUMBER OF EQUIPMENT AS CALCULATED COMBINDLY FOR NORTH AND SOUTH PIT

	Size of Equipment	No. as per Calculation	Standby	Total
LIGNITE	3.2 CuM shovel	5	1	6
	35 T Dumper	31	3	34
	1.75 CuM shovel	**1**	**0**	**1**
OB	3.2 CuM shovel	37	4	41
	35 T Dumper	145	15	160
	Total	**219**	**23**	**242**

Note: These equipment will be adequate to operate all the pits including the Central pit except during 21st to 23rd year when load of 4 shovel and 17 dumpers (based on productivity given in Table 5.7) will be required to be outsourced.

5.4 COMMON ANCILLARY EQUIPMENT

The major common ancillary equipment required for the project for Mangrol and Valia area is furnished here under in Table 5.10.

TABLE 5.10
AUXILIARY EQUIPMENT

Sl. No.	Name of equipment	Numbers		
		South pit (Mangrol)	North pit (Valia)	Total
1.	Motor grader (2 nos. of 205HP and 1 no. of 185HP)	1	2	3
2.	Water sprinkler (20 KL)	2	2	4
3.	Diesel tanker (18KL and 8KL)	1	1	2
4.	Mini bus	1	2	3
5.	Personnel carrier	3	4	7
6.	Tractor trailer	3	4	7
7.	Fire engine	1	1	2
8.	Transport lorry	8	4	12
9.	Jeep	8	10	18
10.	Canteen van	2	3	5
11.	Ambulance	1	2	3
12.	Dozer 320 HP	5	9	14
13.	Crane 5 - 15 tonnes	2	3	5
14.	Crane 20 tonnes	1	2	3

5.4.1 Sequence of OC mining

South Pit (Mangrol Area) started operation from the year 2009-10 and the North Pit (Valia Area) started operation from 2012-13. These pits will last till 2034-35 and 2047-48 respectively.

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The Central Pit which also falls in Mangrol area will start operation from the year 2038-39 and last till 2043-44.

The annual targeted production of 5.4 MTe will be achieved from the year 2025-26 (6th year).

5.4.2 Year/ stage wise Lignite production and OB generation

Year/ stage wise and Pit wise Lignite production and OB generation has been given in Table 5.11.

TABLE 5.11
YEAR/ STAGE WISE OB AND TOP SOIL GENERATION (MCUM BANK)

Year	Excavation Area		OB+TS removal		Topsoil Generated From Excavation		Pure OB from Excavation	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
PAST (2009-20)	339.61	339.61	123.81	123.81	2.04	2.04	121.77	121.77
Y-1 (2020-21)	9.71	349.32	17.00	140.81	0.06	2.10	16.94	138.71
Y-3 (2022-23)	50.77	400.09	56.36	197.17	0.30	2.40	56.06	194.77
Y-5 (2024-25)	94.68	494.77	56.36	253.53	0.57	2.97	55.79	250.56
Y-10 (2026-30)	270.48	765.25	175.36	428.89	1.62	4.59	173.74	424.29
Y-15 (2031-35)	228.65	993.90	179.08	607.97	1.37	5.96	177.71	602.00
Y-20 (2036-40)	232.63	1226.53	147.32	755.29	1.40	7.36	145.92	747.93
Y-25 (2041-45)	203.78	1430.31	161.43	916.72	1.22	8.58	160.21	908.13
Y-27 (2046-47)	22.69	1453.00	26.97	943.69	0.14	8.72	26.83	934.97
Post Mine Closure, 2048-50	0.00	1453.00	0.00	943.69	0.00	8.72	0.00	934.97
Total	**1453.00**		**943.69**		**8.72**		**934.97**	

5.4.3 Year/ stage wise disposal of OB into surface dump and backfill dump along with re-handling details

No new surface dump has been proposed on lignite bearing area for future OB dumping. All the OB to be generated during the life of mine is now planned to be accommodated within the excavated area except during the 1st year.

During the 1st year, out of total 16.94 mcum pure OB (generated from North Pit), 7.57 Mcum OB will be disposed of into Dump D4 already existing over lignite bearing area (by extending it by 17.72 ha) as void area in North Pit or dumping place over non-coal bearing area nearby is not available.

Pit wise OB disposal into surface dump and backfill dump has been given in Table 5.12A, 5.12B and 5.12C along with re-handling details.

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TABLE 5.12A
YEAR/ STAGE WISE DISPOSAL OF OB INTO SURFACE DUMP, BACKFILL DUMP AND CROWN DUMP ALONGWITH REHANDLING DETAILS (MCUM BANK)

Year	Excavation Area		Bund	Backfilled into Mangrol Mine N & S Pit (from N & S Pits and Surface Dumps D3 & D4)		Direct Surface Dump		Direct Crown Dump		Rehandle Crown Dump		Rehandle Sur Dump D3 in South pit and D4 in North PIT, mil.cum		Direct Backfilling in Vastan pit OB, mil.cum		Top Soil		Total OB Including Rehandling	
	Prog.	Cuml.	Prog.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
Past (2009-20)	339.61	339.61	0.00	24.63	24.63	71.38	71.38	2.30	2.30	0.00	0.00	0.00	0.00	23.45	23.45	0.50	0.50	122.27	122.27
Y-1 (2020-21)	9.71	349.32	0.00	9.38*	34.01	7.57	78.95	0.00	2.30	0.00	0.00	0.00	0.00	0.00	23.45	0.48	0.98	17.42	139.69
Y-3 (2022-23)	50.77	400.09	0.00	33.59*	67.60	-19.13	59.82	19.31	21.61	0.00	0.00	19.13	19.13	22.29	45.74	0.39	1.37	75.58	215.26
Y-5 (2024-25)	94.68	494.77	0.00	78.26	145.86	-22.47	37.35	0.00	21.61	0.00	0.00	22.47	41.60	0.00	45.74	0.82	2.19	79.08	294.34
Y-10 (2026-30)	270.48	765.25	0.00	173.74	319.60	0.00	37.35	0.00	21.61	0.00	0.00	0.00	41.60	0.00	45.74	1.56	3.75	175.30	469.64
Y-15 (2031-35)	228.65	993.90	0.00	177.71	497.30	0.00	37.35	0.00	21.61	0.00	0.00	0.00	41.60	0.00	45.74	1.58	5.33	179.29	648.93
Y-20 (2036-40)	232.63	1226.53	0.00	145.92	643.23	0.00	37.35	0.00	21.61	0.00	0.00	0.00	41.60	0.00	45.74	1.18	6.51	147.10	796.04
Y-25 (2041-45)	203.78	1430.31	0.00	160.21	803.44	0.00	37.35	0.00	21.61	0.00	0.00	0.00	41.60	0.00	45.74	1.29	7.80	161.50	957.53
Y-27 (2046-47)	22.69	1453.00	0.00	26.83	830.27	0.00	37.35	0.00	21.61	0.00	0.00	0.00	41.60	0.00	45.74	0.19	7.99	27.02	984.55
Post Mine Closure, 2048-50	0.00	1453.00	0.00	21.62	851.89	-21.62	15.73	0.00	21.61	0.00	0.00	21.62	63.22	0.00	45.74	0.74	8.72	22.35	1006.91
Total	**1453.00**		**0.00**	**851.89**		**15.73**		**21.61**		**0.00**		**63.22**		**45.74**		**8.72**		**1006.91**	

**disposal only into North Pit*

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TABLE 5.12B
CUMULATIVE WASTE DISPOSAL WITHOUT REHANDLING (MCUM BANK)

Year	Direct Backfilling in Mangrol Mine North & South Pit	Direct surface dump	Direct crown dump	Direct backfilling in Vastan pit	Top soil utilised	Top soil balance in stack	Total OB
Past (2009-20)	24.63	71.38	2.30	23.45	0.50	1.54	123.81
Y-1 (2020-21)	34.01	78.95	2.30	23.45	0.98	1.12	140.81
Y-3 (2022-23)	67.60	59.82	21.61	45.74	1.37	1.03	197.17
Y-5 (2024-25)	145.86	37.35	21.61	45.74	2.19	0.78	253.53
Y-10 (2026-30)	319.60	37.35	21.61	45.74	3.75	0.84	428.89
Y-15 (2031-35)	497.30	37.35	21.61	45.74	5.33	0.63	607.97
Y-20 (2036-40)	643.23	37.35	21.61	45.74	6.51	0.85	755.29
Y-25 (2041-45)	803.44	37.35	21.61	45.74	7.80	0.78	916.72
Y-27 (2046-47)	830.27	37.35	21.61	45.74	7.99	0.73	943.69
Post Mine Closure, 2048-50	851.89	15.73	21.61	45.74	8.72	0.00	943.69

TABLE 5.12C
TOPSOIL UTILISATION

Year/ Stage	Top Soil generated, MCUM	Top Soil Used "MM3"					
		Embankment	Spreading over the backfilled area	Spreading over the OB dump area	Spreading over the GB	Total	Top soil balance in stack
PAST (2009-20)	2.04		0.00	0.50	0.00	0.50	**1.54**
Y-1 (2020-21)	2.10	0	0.00	0.98	0.00	0.98	**1.12**
Y-3 (2022-23)	2.40	0	0.39	0.98	0.00	1.37	**1.03**
Y-5 (2024-25)	2.97	0	1.21	0.98	0.00	2.19	**0.78**
Y-10 (2026-30)	4.59	0	2.77	0.98	0.00	3.75	**0.84**
Y-15 (2031-35)	5.96	0	4.35	0.98	0.00	5.33	**0.63**
Y-20 (2036-40)	7.36	0	5.53	0.98	0.00	6.51	**0.85**
Y-25 (2041-45)	8.58	0	6.82	0.98	0.00	7.80	**0.78**
Y-27 (2046-47)	8.72	0	7.01	0.98	0.00	7.99	**0.73**
Post Mine Closure, 2048-50	8.72	0	7.74	0.98	0.00	8.72	**0.00**

5.4.4 Mine stage development plans

Three Pits namely North Pit, Central Pit and South Pit have been carved out jointly from Valia area and Mangrol area. While South and Central Pits completely lie within Mangrol area, the North Pit partly lies in Valia area and partly in Mangrol area. Henceforth, only pits will be described without mentioning the Mangrol area and Valia area.

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Present working plan as on 31-03-2020 is shown in Plate XIII-A. Mine plans have been drawn for different stages (Refer Plate XIII-B to Plate XIII-I).

5.4.4.1 First year stage (2020-21)

South Pit

South Pit will not be operational during this year.

North Pit

17.00 MCuM overburden (including TS 0.06 mcum) will be excavated from North Pit producing 3.60 MTe of lignite. Out of which 9.38 MCuM pure OB will be disposed of directly into Mangrol-Valia North Pit while 7.57 Mcum will go to surface dump. The mine stage comprising position of mine workings and dumps can be seen in Plate XIII-B.

5.4.4.2 Third year stage (2021-23)

South Pit

22.36 Mcum OB (including 0.07 Mcum TS) will be generated during the 2 years from South Pit and will be producing 1.00 Mt of lignite in 2nd as well as in 3rd year. Pure OB of 22.29 Mcum will be disposed of into Vastan Pit.

North Pit

34.00 MM3 overburden including TS (0.23 Mcum) will be excavated from North pit during the 2nd and 3rd year producing 7.20 MTe of lignite.

Out of which 33.59 MCum pure OB will be backfilled into North Pit below surface level (50m RL) and 0.18 Mcum into Crown Dump of North Pit above surface level. Besides, 19.13 Mcum OB will be rehandaled from surface dump and filled into North Pit crown dump.

The mine stage position of mine workings and dumps can be seen in Plate XIII-C.

5.4.4.3 Fifth year stage (2023-25)

Total OB including TS from the mine will be 56.36 MCuM to produce 9.2 MT lignite.

South Pit

South Pit will be operational during 4th year and will produce 2.00MT lignite and 22.36 MM3 overburden (including TS) will be excavated. The pure OB (22.13 Mcum) will be disposed of into South Pit.

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North Pit

34.00 MM^3 overburden including TS (0.34 Mcum) will be excavated from North pit during the 4th and 5th year producing 7.20 MTe of lignite.

Out of which 33.66 Mcum pure OB will be disposed of into North Pit.

22.47 MCuM OB will be rehandled from surface dump D3 & D4 and backfilled into North Pit.

The mine stage comprising position of mine workings and dumps at end of 5th year can be seen in Plate XIII-D. The 6th year stage plan (achieving target capacity) is given in Plate XIII-E.

5.4.4.4 *7th to 10th year stage (2025-30)*

The mine stage comprising position of mine workings and dumps can be seen in Plate XIII-F.

5.4.4.5 *11th to 15th year stage (2030-35)*

The mine stage comprising position of mine workings and dumps can be seen in Plate XIII-G.

5.4.4.6 *16th to 20th year stage (2035-40)*

The mine stage comprising position of mine workings and dumps can be seen in Plate XIII-H.

5.4.4.7 *21st to 25th year stage (2040-45)*

The mine stage comprising position of mine workings and dumps can be seen in Plate XIII-I.

5.4.4.8 *26th to 27th year stage (2045-47)*

The mine stage comprising position of mine workings and dumps can be seen in Plate XIII-J.

Mine section showing position of all stages are shown in Plate XIII-K. Final Pit floor plan comprising position of mine workings and dumps can be seen in Plate XVI.

5.4.5 Design benches in mine area as well as dump - area

The lithological sequence of overburden strata as well as lignite seams of Mangrol and Valia area is similar to the strata at the adjacent Vastan lignite

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mine which is currently in operation. The overburden strata at Mangrol and Valia area are characterised by different types of clays which is a matter of concern for slope stability at these Mines. The slope stability studies of Mangrol mine pit were conducted by Central Mining Research Institute, Dhanbad in 2007. The findings of the CMRI (**Annexure XVIII-B)** with respect to the slope - stability is furnished here under:

1. The overall slope - angle shall be 25° for 150 mt depth and will be more than that for shallower depths.

2. The clays are of low plasticity index and with water, they loose their bearing capacity.

Influence of water over the clay strata is alarming and every attempt shall be taken to keep the water away from the slopes and dewatering scheme should be effectively maintained.

Monsoon season preparations (drain construction and drain cleaning etc.) should start quite before the start of the monsoon. Drain must be continued throughout its course and kept effective.

1. No undercutting of the slopes and no overhanging of benches since these unsafe practices will subsequently initiate slope failures. Excavator operator shall be told of the importance of their work by arranging HRD courses from time to time.

2. Continuous slope - monitoring by a competent Geo-technical Engineer is a must. Advance detection of slope failure will help in taking timely preventive action and where failure is unavoidable; the slope shall be brought down in a predictable manner.

3. Where ever the stratigraphic layers of different clays are dipping towards the pit-side, great care shall be taken to check slope stability in these vulnerable areas.

4. Waste dumps of 50 mt and 30m height shall be sloped at angle of 16° and 20.5° respectively.

5. The bench height at all contact places between basalt and Variegated clay as well as between clay and lignite shall be so adjusted that the contact is clearly exposed. A collector drain shall be made at the toe of the bench.

6. Whenever deep tension crack is detected, the crack shall be filled with the available weathered basaltic material which will facilitate free flow of water across the crack and which in turn will reduce heavy ground water pressure behind the slope. But, the top of the crack shall be, sealed with impervious clay to prevent entry of water inside the crack.

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7. Garland drains around the mine surface shall be steeply sloped to promote rapid movement of water and minimise chances of ponding. Drains shall be kept clear of silts and *debris*.
8. Horizontal drain hole on the slope at the base of a tension crack with an inclination of 5° and 10 to 15 m deep, and at 5 m intervals, will facilitate free flow of water. A pipes shall insert into the holes to prevent caving of hole.
9. Black cotton soil shall not be dumped at the base of the dump and shall be dumped separately.
10. Ponding of water in depressed area of dump is detrimental to the safety of spoil slopes. A proper gradient helps for quick run-off of rain water.
11. Black cotton soil at the dump foundation shall be excavated and removed before start of dump - operation.

5.4.5.1 Bench – Parameters

In line with the above recommendations of the CIMFR for Vastan Mine, the over burden and lignite benches as well as waste dump at Mangrol and Valia mines were deigned suitably and the details are furnished here under.

a. Mine excavation - OB and Lignite benches

The bench heights (Both over burden and lignite) shall be 3.00 m to 6.0 m which is commensurate with the cutting height of the excavators to be deployed i.e. 3.2 m^3 hydraulic excavators for both OB and 3.2 M^3 hydraulic excavators for lignite. Bench width shall be 9.0 to 12.00 m, and individual Bench slopes shall be 45° to 60° depending upon the nature of strata. However, overall Bench slope will be maintained at 23° to 27°.

In the initial mine cut, the number of benches at South pit will be 3 on the rise side, and this will increase to a maximum of 11 on the dip side at the ultimate stage.

b. Dump Area

Fresh surface dump has been proposed on lignite bearing area at site D4, which is proposed to be re-handled and backfilled during the mining operations. 21.62 Mcum OB will be rehandaled from Surface Dump and backfilled into the void to reclaim the land.

The study of slope stability of dump was carried out by CIMFR in August, 2011 (**Annexure XVIII-C**). The ultimate dump heights of External dump area were assumed up to 50 m i.e. 30 m (with 3 lifts of 10m each) and 48m (with additional upper 3 lifts of 6m each). Waste dumps of 50 m and 30m height shall be sloped at angle of 16° and 20.5° respectively.

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The top soil dump will have a max height of 6 m and will have an angle of slope at 37° (Angle of Repose).

c. **Others**

The design of slope angles and height of Benches and waste dumps are as recommended by CMRI/CIMFR, which specially mentions these values are applicable only when we take into consideration good drainage and continuous slope monitoring. Hence it is imperative that all safety precautions regarding drainage and slope monitoring as recommended by the institute (and which are enumerated in earlier paragraphs of this chapter) shall be scrupulously carried out during the operation of the mine

5.4.6 External overburden dump

The overburden and Interburden from the initial mine workings was kept on the Mineral and Non-Mineral bearing area separately in dumps.

During the presentation to EIA for grant of environmental clearance on 18th April 2011 the committee has suggested to reduce the external dump area to save the agricultural land and also suggested to maximize the back filling of the mine voids left after the mine operation. Keeping in view the above two observation of the EIA committee, a fresh Mining Plan has been prepared due to the changes in mining sequence for optimization of dump area and utilizing the mine voids for back-filling has been done. The ultimate height of dumps (external or internal) will be restricted to 50.00 m

5.4.6.1 Topsoil

The excavated top soil from Mangrol and Valia areas will be kept an area of 30 Ha as earmarked. The height of the dump will be maintained 6.00 m. The angle of slope will be maintained at 37° (Angle of Repose).

This top soil will be utilised afterwards for laying a cover over the internal overburden/ Interburden dumps to make the dump surface suitable for biological reclamation. This is a requirement as per environmental regulations.

5.4.6.2 Plantation and drainage around dumps

Suitable drainage system by way of garland drains will be made around the external waste dump for collection of washouts from the outside OB dump. Suitable retention wall will be erected around the waste dump area to prevent wash-outs degrading the nearby areas.

Besides, suitable chutes will be laid along the side slopes of OB dump to control the water flow from the top of the dump area, which will be made saucer-shaped to prevent sudden uncontrolled overflows of water.

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Plantation will be grown on the slopes and at the base of the dump to prevent aesthetic and visual pollution as well as dust menace and washouts.

5.4.7 Inside fill

In order to avoid a large external dump with more land lock which is not desirable from environmental angle, it is proposed to bring back and fill the mined out area in a systematic manner. The inside filling will start from the Eastern side of the mine bearing a lignite corridor of at least 50 m. The inside fill will also be in two or more benches depending upon the total refill height. It may be necessary to fill above the ground level also up to a height of 5.00 m as the reclaimed voids will not be sufficient to accommodate the excavated material due to swelling and thin seam thickness of lignite.

Inside dump will be systematically blanketed by bringing the top soil and spreading over the inside dump and reclaimed after using latest biological techniques. The void left out at the end of mining (27th year) will be 293.65 Ha and will become 210 ha in post mine closure stage.

5.4.8 Transportation from mine stock yard to TPS

The mine is already operational and road transport by tippers has been in use for this project since inception (December, 2009) and the same has been proposed to be continued.

Lignite from the North Pit will be transported through the internal road and Public Road which are black topped and are capable to transport the lignite. The internal roads are fenced with drains on either side. The distance of the power plant from South Pit (Mangrol area) and North Pit (Valia mine) is 6 KM and 18 KM respectively.

5.4.8.1 Geo-mining Characteristics for OC

The geo-mining characteristics are given in Table 5.13.

TABLE 5.13
GEO-MINING CHARACTERISTICS OF OC MINING

Particulars	Unit	Value
Extractable Reserve	MTe	163.29 (Since inception) 139.28 (balance as on 01-04-2020)
Overburden	MCuM	943.69 (Since inception) 819.88(balance as on 01-04-2020)
Stripping Ratio without re-handling	CuM/t	5.78(Since inception) 5.89 (balance as on 01-04-2020)

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Particulars	Unit	Value			
Total number of seams	Nos.	14 splits clustered in 3 horizons			
Area of Excavation	Ha	North Pit	Central Pit	South Pit	Total
		1033	71	349	1453
		1453			
Perimeter	M	North Pit	Central Pit	South Pit	Total
		19944	3723	7748	31415
Angle of dip		Gentle dip			
		North Pit	Central Pit	South Pit	
Dip-rise length along floor	m				
i) Minimum	M	254	124	986	
ii) Maximum	M	1662	254	1070	
Dip-rise length along surface	m				
i) Minimum	M	669	505	1456	
ii) Maximum	M	1915	948	1572	
Quarry depth					
i) Minimum	M	53	125	55	
ii) Maximum	M	150	140	150	
Strike length along floor	M				
i) Minimum	M	6715	195	1998	
ii) Maximum	M	7398	250	2732	
Strike length along surface	M				
i) Minimum	M	7107	989	1542	
ii) Maximum	M	7965	1084	2268	

5.5 DRILLING AND BLASTING

The major overburden as well as the entire Interburden consists of Black cotton soil, Kankar, Brown Calcareous/Bentonite clay, grey to greenish grey clays. The overburden formations are predominantly argillaceous in nature with arenaceous bands.

As the Overburden and Interburden in these areas are soft and medium hard in nature it can be excavated directly by shovels / hydraulic excavators. As such no drilling and blasting operations are envisaged for

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the proposed mine except that drilling is required to facilitate breaking of some Stone Layers (encountered in the pit) by stone breaker.

5.6 DRAINAGE & PUMPING

5.6.1 General

Mine Water Control Operations or Mine Drainage Schemes are an integral part of Mining Operations and are of paramount importance in an opencast mine. This is because of the possibilities of water entering the mines from the peripheral zones, or due to direct rainfall over the mine cut area or ground water seepage from the exposed mine benches and slopes. One or more of these sources, could result in water problem by way of water accumulation/stagnation within the mines, flooding, soil erosion etc., the magnitude of which depends on the nature and quantum of water entering the mines. In turn, these water problems will adversely affect the mining operations and also the safety of men and materials. As such, the mine water control arrangements should be planned concurrent to mine planning and should be dove-tailed to the progress and advancement of mining at every stage, by proper revision or modification to suit the prevailing conditions. The first step towards this objective is to identify the sources and quantum of water entering the mines.

5.6.2 Sources of water

Normally the main sources of water which require controlling or tackling in an opencast mine are the following.

A	Surface Water	-	Water bodies & surface run-off of rain water around the mines
B	Ground Water	-	Seepage from the unconfined and confined strata exposed within the mine cut
C	In-Pit Water	-	Rain water falling directly over the mine cut

Geohydrological information and data available pertaining to the proposed Mangrol and Valia mining area and environs have indicated that out of these three sources, the problem will be mainly due to in-pit water. Hence mine water control operations will be focused predominantly towards tackling the rain water entering the mines during the monsoon season, and forming as in-pit water or storm water.

5.6.3 Water control arrangements

Mine water control scheme, planned for implementation for the proposed Mangrol and Valia lignite mine areas, towards controlling surface water, ground water and in-pit water are briefly described below.

5.6.3.1 *Surface water*

Surface water includes both stagnant and flowing water bodies like ponds, reservoirs, lakes, rivers, channels, located over the peripheral area of the mines and also within the mining area. Besides, the rainfall run-off water comes within the category of surface water, as all these types of surface waters could enter the mines during the process of mining.

5.6.3.2 *Stagnant water bodies*

The first step of surface water control scheme is to drain off any water bodies which are located within the limits of area required to be excavated in near future. At all future stage, as the mine progresses, the water bodies situated at the advancing side could be drained.

5.6.3.3 *Flowing water sources*

Kim River is the only water body traversing on the Southern side of the Mining Lease area, which is a seasonal river, carrying water only during monsoon. As per the mining scheme planned, this river will not be diverted and suitable statutorily prescribed barriers will be left for safe mining.

Another small stream, Tokri River, is passing outside the North-Western side of the Mangrol-Valia Mining lease area, Bhaga River is passing outside the South-Eastern of the Mangrol-Valia Mining lease area and Shah Nallah is passing through the South-Western side of the Mangrol-Valia Mining lease area.

5.6.3.4 *Surface run-off water*

As already mentioned, Mangrol Taluka receives average about 1000 mm during the Monsoon months from middle of June to September last week. Nearly 75% of the rainfall flows as surface run-off, following the general gradient of the surface terrain which is from East to West. If not controlled, there is every possibility of this run-off water entering the mines. So, it is proposed to divert the surface run-off away from the mine cut and thereby avoid flooding of the mines during the Monsoon season.

By making Peripheral Drains or Garland Canals around the mine pit, runoff water during the rains, can be prevented from entering the mine. The design and construction of these diversion structures can be planned based on the catchment area and rainfall intensities.

These peripheral drains are constructed with a width of about 3 m and depth of 1 to 1.5 m. The soil excavated is utilised to form a protective bund between the drain and mine boundary.

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This gives an additional protection against any possible in-rush of surface run-off into the mine.

5.6.4 Ground water

As already mentioned, seepage of ground water from the confined and unconfined strata could create problems in an opencast mine, when excavation proceeds beyond the hydrostatic levels governed by the aquifer parameters.

5.6.4.1 Confined water

Investigations so far undertaken on the Geohydrological conditions prevailing within the mining area and environs do not indicate any possibility of occurrence of a confined aquifer system which will induce upward seepage of water during the mining operations.

5.6.4.2 Unconfined water

Alluvium composed of silty loam, black cotton soil and also Bentonitic clay or Kankar constitute the unconfined or phreatic aquifer system in the Mangrol North and Valia mining areas.

The hydrological parameters such as porosity and permeability of these formations depend on the clay and sand content. These parameters, in turn, govern the seepage of water from the formations during the mining operations.

The phreatic water surface or water table within the mining area is around 5 to 10 m from the ground surface. That means, when the mine excavation reaches this depth, unconfined water seepage is expected to take place and continue throughout the saturated thickness of the unconfined aquifer formation which is the zone just above the lignite seam.

However, as the hydraulic conductivity or permeability of the formations is only less than 1 m/day and the hydraulic gradient is 1 in 500 to 1 in 1000, the seepage from the exposed benches and slopes in the mines beyond the water table level will not be significant.

For tackling this water, drains are constructed at the bottom of each of the slopes between two benches. Such drains are termed as toe drains. The seepage water flowing through the toe drains is led into a sump constructed at the lowest elevation in the mine floor. From here, water is pumped out periodically by means of the pumping set-up which is maintained for in-pit water control purposes and is discharged into Natural Nallah after passing through the settling ponds.

5.6.4.3 *In-pit water*

Rain water falling directly within the mine cut area is referred as in-pit water. As accumulation of water inside the mines require draining out in a significant manner which takes place only during heavy rainy days or "Stormy" days, and hence this source of water is also referred as storm water.

5.6.4.4 *Source of water*

The rain water flowing around the mine cut/pit is prevented from entering the mines by adopting the methodology described. However, the rain water falling directly within the perimeter of the mine cut cannot be avoided or prevented. The only solution is to drain out or pump out this "in-pit water" which gets accumulated inside the mine cut area. The first step towards this objective is to fix the parameters for quantity estimation and then calculate the inflow insides the mines i.e. in-pit water at different stages of mining operations, these aspects are briefly described below:

5.6.4.5 *Parameters for inflow estimation*

For the purpose of predicting what could be the maximum inflow of water due to rainfall and thereby planning mine water control arrangements, it is necessary to study the pattern of rainfall and the daily intensity of rainfall. Study of rainfall record of Mangrol area shows that more than 90% of the total annual rain falls within 4 months viz. June to September. In general, this rainfall is also more or less uniformly spread over these months. Daily intensity during the rainy days of peak monsoon normally ranges between 20 mm to 80 mm. however, for predicting the maximum amount of water that will accumulate in the mines, it is advisable to take the maximum intensity within 24 hours recorded during the preceding 50 years. Scrutiny of the rainfall data has revealed that the maximum recorded intensity for a period of 24 hours is 459 mm.

However, analyses of the rainfall data and other considerations outlined below have indicated that assuming such a high value for designing the pumping capacity and mine water control arrangement, is neither practical nor warranted.

a. High intensity of 459 mm in 24 hours has occurred only once in 50 years and so, it is of very rare occurrence.

b. For 8 months in a year, rainfall is negligible with almost zero inflow inside the mines. So, pumping will be only a bare minimum during most part of the year.

c. Number of days in a year where intensity of rainfall exceeds 100 mm in 24 hours in only one or two days.

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d. Designing pumping capacity for 459 mm rainfall will necessitate very elaborate pumping arrangements and very high capital cost towards equipments and the total mine water control set-up.

e. Because such an intensity of rainfall is a remote possibility within the life period of the mines, an elaborate set-up at a huge cost will be idle throughout the year, except perhaps for a week or so during the monsoon season and that too, only a fraction of the designed/installed capacity will be utilised.

Under the above circumstances, it is sufficient if inflow estimation and accordingly water control arrangements are planned for a maximum intensity rainfall of 250 mm in 24 hours. However, estimation of actual quantity of in-pit water and accordingly planning of water control measures depend not only on the rainfall but also on the mine cut-pit area at different stages of mine progress.

5.6.4.6 Quantity estimation

After deciding upon the most realistic value for the rainfall intensity based on the logistics enumerated above, the next step towards estimating the rain water inflow or quantity of in-pit water was to calculate the mine cut area from the initial mine cut stage to maximum exposure stage.

As benches and slopes will intercept or retard *only* negligible amount of rain water, the "Run-off Co-efficient" (Rc) can be assumed as Rc 0.90. That means 90% of the quantum of rainfall falling directly within the mine pit perimeter will flow towards the sumps as run-off water inside the mines.
The stage-wise water calculations are given below n Table 5.14

TABLE 5.14
CALCULATION OF MAKE OF WATER AND PUMPING REQUIREMENT

Sl. Year	Void area, Ha	Rainfall in 24 Hrs (mm)	Run off Co-efficient (Rc)	In-Pit Water Accumulation (m^3/day)	Pumping Capacity* (m^3/min.)	Pumping Head (m)
Present	310.30	250	0.9	698175	323	119
1	292.73	250	0.9	658643	305	130
3	272.82	250	0.9	613845	284	125
5	267.66	250	0.8	535320	248	125
10	275.00	250	0.8	550000	255	110
15	250.73	250	0.8	501460	232	111
20	293.28	250	0.8	586560	272	112

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Sl. Year	Void area, Ha	Rainfall in 24 Hrs (mm)	Run off Co-efficient (Rc)	In-Pit Water Accumulation (m^3/day)	Pumping Capacity* (m^3/min.)	Pumping Head (m)
25	295.06	250	0.8	590120	273	113
27	293.65	250	0.8	587300	272	115
Post Mine	210.00	250	0.8	420000	194	116

* *Calculated assuming 18 hours daily operation for pumps and water accumulation to be evacuated in 2 days.*

5.6.4.7 Pumping arrangements

Prior to the onset of monsoon, the mine slopes are trimmed and the benches are properly levelled and graded so that the rain water falling over the slopes and benches easily flows towards the toe drains, which ultimately leads the entire water towards the main sump located at the deepest portion of the mine flow where the major pumping installation erected.

In order to eliminate the possibility of storm water disposal pumps getting submerged, if necessary, they are mounted in tanks known as 'Pontoons'.

The existing pumps are as follows:

Capacity, Cum/min	HP	Head, m	No
5.5	200	130	3
5.0	100	100	3

Each Pontoon is fitted with main Submersible/ Centrifugal Pumps

The pontoon pumps discharge the water directly to the surface through a 225 mm dia HDPE Pipe through a 225 mm dia high pressure flexible rubber hose.

Additionally, Face Pumps of 22 LPS and Diesel pumps of 38 LPS complete with engines and accessories are also be provided.

The above provision is adequate to take care of the pumping in future stages also.

5.6.5 Requirement of Industrial water and potable water

The net water requirement of the project is 736 KLD out of which 633 KLD is industrial water requirement and 103 KLD is the potable water requirement.

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The basis of calculation (assumptions) is given below in Table 5.15.

TABLE 5.15
ASSUMPTION FOR WATER REQUIREMENT CALCULATIONS

Sl. No.	Particulars	Values
1.	Manpower	1279
2.	Annual Lignite production, MTe	5.4
3.	Life of mine	30
4.	Max lead	5.00
5.	Road length for sprinkling (assume 2 km more than lead)	7.00
6.	No of working days in the year	270.00
7.	No of vehicles on project	230
8.	Factor for vehicles to be washed	0.70
9.	Frequency of washing a vehicle/week	2
10.	No. of vehicles to be daily washed	46
11.	Total Plantation in life (backfills. dump+G belt	1420
12.	Av yearly plantation	45
13.	Water required for washing one vehicle, litres	1.8
14.	Factor for water losses considered during distribution	0.05
15.	Water assumed for watering the plantation, KLD/ha	5
16.	Water for sprinkling CHP area etc as per CMPDI norms, KLD/MTPA	22.7
17.	Water for fire fighting as per CMPDI norms, KLD/MTPA	45
18.	Factor for water loss due to evaporation in case of no-fire	0.1

The calculation is given below in Table 5.16.

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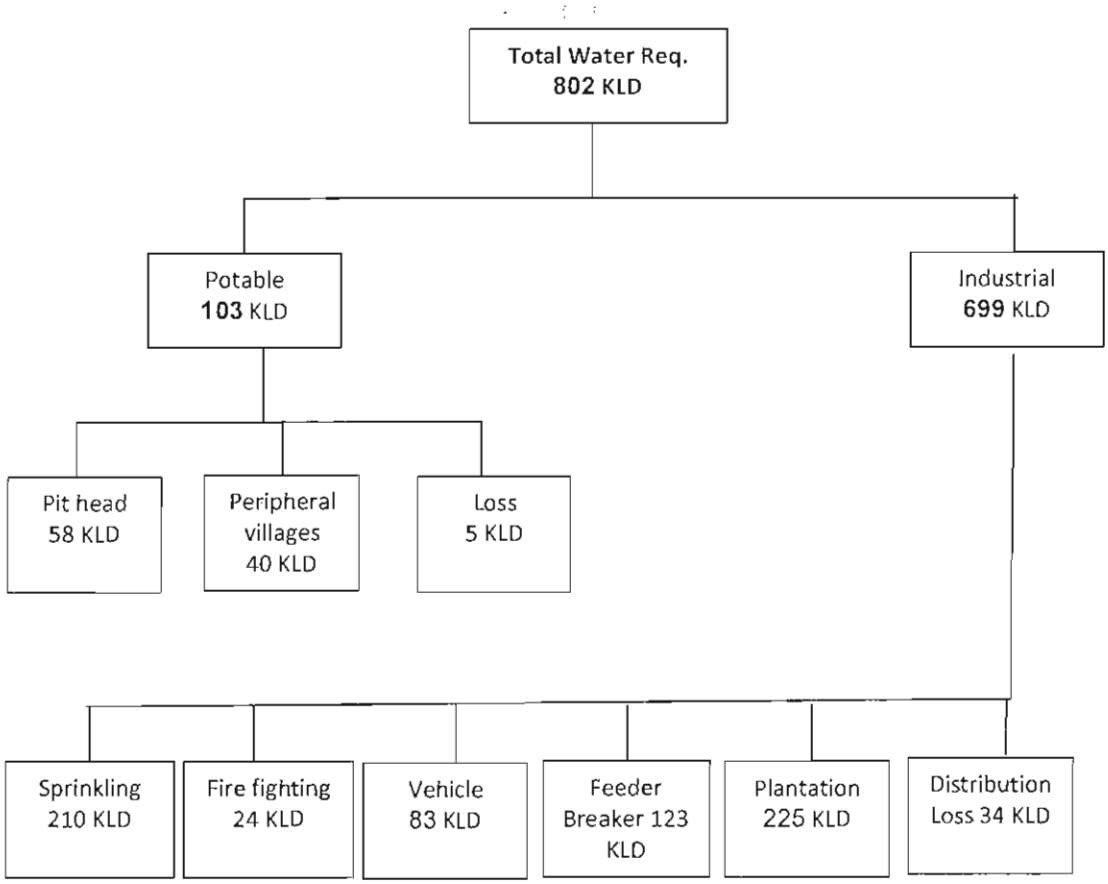
TABLE 5.16
WATER REQUIREMENT AND WATER BALANCE CALCULATIONS

Sl. No.	Particulars	Basic number	Rate (KL/ head)	KLD	water lost During Use, %	Water lost in process, kL	Balance water for recircul-ation /reuse, kL	Comment	Disposal point
I	**Potable water**								
I.1	Drinking water for working place manpower @ 45 LPD/head	1279	0.045	58	100	58	0	Disposed into individual soak pits of buildings	Not applicable
I.2	Water for Colony (@ 5 persons/ family) @ 135 lpd	0	0.135	0	30	0	0	30% water evaporated and the rest 70 % reclaimed	For watering the green belt, plantation, horticulture, agriculture etc. within colony
I.3	For peripheral villages (assumed)			40	100	40	0	Consumed by villagers	Not applicable
I.4	Losses			5		5			
	Sub Total (I)			**103**		**103**	**0**		
II	**Industrial water**								
II.1	Sprinkling @ 30 m3/km of road length, km	7.00	30	210	100	210	0	Evaporated	Not applicable
II.2	Watering the Plantation, cum/ha	45	5	225	100	225	0	Used by Plantation and evaporated	Not applicable
II.3	Vehicles washing @ 1.8 m3/vehicle/day {washable vehicles assumed 10/day)	46	1.8	83	20	16.6	66.4	20% water evaporated and the rest 80 % reclaimed	Re-circulated into ETP of workshop
II.4	Feeder Breaker are sprinkling, KLD/MT	5.4	22.7	123	100	123	0	Evaporated	Not applicable
II.5	Fire fighting, cum/MTPA (Evaporation factor 0.1 accounted)	5.4	4.5	24	100	24	0	Evaporated	Not applicable
II.6	Distribution Losses			34	100	34	0	Consumed	Not applicable
	Sub Total (II) Gross Water Requirement			**699**		**633**	**66**		
	(-) Recirculated water from vehicles washing			**66**					
	Balance Net Water Requirement			**633**					
	Total Net water requirement I+II)			**736**		**736**	**66**		
	Gross Water Requirement for project (I+II)			**802**					

WATER BALANCE



The level/stage of ground water development has been computed in ground water balance study which shows 18%. This can be categorized under 'Safe', 'White' with less than 70% value. The stage of groundwater development of Mangrol Block estimated by CGWB (2012) is 21 %. Mangrol-Valia Lignite Mine is under the Safe Category.

5.6.6 Power supply & illumination

5.6.6.1 Source of supply

The mine will receive power from 11/ 440 KV DGVCL's Mangrol & Valia Sub- Station to cater to the power requirement.

5.6.6.2 Electric load

Most of the HEMM Equipment are and will be diesel operated. Electrical power supply will be needed for workshop, Feeder Breakers, illumination, pumping, office, stores, canteen etc.

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5.6.6.3 *Illumination*

The mine working areas is and shall be illuminated by group of 2 X 400W, 250W and 150W High Pressure Sodium Vapour (HPSV) lamps mounted on 11m and 30m high mobile masts.

Entire haul road area is and shall be illuminated by 150W HPSV lamps mounted on steel tubular/FRP poles erected along the haul roads.

The Spoil dump illumination is and shall be done by 2 X 400W HPSV lamps mounted on steel tubular poles/ High Mast. General Illumination shall be made by 250W HPSV lamps near substation, roads and other strategic places. Workshop and Feeder Breaker will have their own independent illumination systems.

Besides, provision shall be made for portable emergency lights, during power failure, for illuminating the important locations, such as, project office, substation, store, hospital, security and time office, etc.

5.6.6.4 *Emergency lighting*

Provision of DG set has been made for emergency power supply to essential services.

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CHAPTER 6

MANPOWER, SAFETY AND SUPERVISION

6.1 GENERAL

Manpower Planning is an important task for successful implementation of the Project. Hence adequate importance is bestowed in planning the manpower and organizational setup.

Although all the mining machineries will be outsourced/ hired as being practiced at present, for manpower estimation, three shift-working for all the seven days of a week has been envisaged for operating the main equipment required as shown in chapter- 5. Office and allied functions are already computerized. Security, canteen and some other services are also out-sourced. Modern communication facilities are adopted. The manpower for 5.4 MTPA productions works out to about 1009 persons.

6.2 ORGANISATION

Executive Director/ CGM (Mines), SLPP will be the overall head of this mine also. He will be assisted by AGM (Mines)/DGM (Mines), Mines Managers and adequate number of executives of different disciplines. The organization set up of mines will comprise of Mines Manager, Under Manager, Asst. Manager, Overman, Safety Officer etc. and fulfill all statutory requirements as per the Mines Legislation. The functions generally catered to by skilled/unskilled workers shall be outsourced. The manpower has been kept to minimum focusing on safety, environment and production supervision. The details of manpower are given in Table 6.1.

TABLE 6.1
MANGROL VALIA LIGNITE MINE EXPANSION
STATEMENT OF MAN POWER

Sl. No.	Designation	Strength
A	**HEMM Operators**	
1.	3.2 CuM shovel	145
2.	35T Dumper	607
3.	1.75 CuM shovel	3
4.	Motor grader	10
5.	Water sprinkler	17
6.	Diesel tanker	10
7.	Mini bus	10
8.	Personnel carrier	24

Sl. No.	Designation	Strength
9.	Tractor trailer	24
10.	Fire engine	7
11.	Transport lorry	41
12.	Jeep	62
13.	Canteen van	17
14.	Ambulance	10
15.	Dozer 320 HP	48
16.	Crane 5 - 15 tonnes	17
17.	Crane 20 tonnes	10
	Sub-total (A)	**1062**
B	**Feeder Breaker Operations**	
1.	Engineer (E &M)	3
2.	Feeder Breaker Operator	8
3.	Chute Gate operator	8
4.	Conveyor Attendant	8
5.	Roll crusher operator	8
6.	Weigh bridge clerk	8
	Sub-total (B)	**43**
C	Dispatch, Loading & Quality Control	6
D	Excavation Supervision	12
E	Excavation P&M Maintenance	24
F	E&M Maintenance including CHP	12
G	Operational Manpower for Pumping & Sub-station	10
H	Project Office/Manager's Office	25
I	Training	3
J	Admin & Accounts	15
K	Stores & Purchase	6
L	Civil & Water Supply	5
M	Medical & Sanitation	3
N	Survey	6
O	Land Reclamation ENV. & R/R	4
	Total	**1279**

6.3 IMPORTANT SAFETY ASPECTS, INCLUDING DISASTER MANAGEMENT, PRECAUTIONS AND RECOMMENDATIONS

6.3.1 Important safety aspects

All types of industries face certain types of hazards which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery, explosion to name a few. Similarly lignite mines also have impending dangers or risk which need be investigated addressed, disaster

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management plan formulated with an aim of taking precautionary steps to avert disaster and also to take such action after the disaster which limits the damage to the minimum.

6.3.2 Disaster management

As opencast mining operations in this lignite mine can, at times, result in risky and dangerous situations, due to mine slope failures, spontaneous fires from lignite stocks, electrical hazards, inundations, etc, comprehensive advance planning steps to table all above risk situations without any harm to staff, local community, natural features of the area, etc, have to be spelt out through preparation of a Disaster Management plan, both for ongoing mining operations and during and after mine closure time frames. The brief aspect in this respect is detailed below:

(a) Inundation

An action plan is needed to be drawn as a contingency measure in case of inrush of water.

Mine Water Control Operations or Mine Drainage Schemes are an integral part of Mining Operations and are of paramount importance in an opencast mine. This is because of the possibilities of water entering the mines from the peripheral zones, or due to direct rainfall over the mine cut area or ground water seepage from the exposed mine benches and slopes. One or more of these sources, could result in water problem by way of water accumulation/stagnation within the mines, flooding, soil erosion etc., the magnitude of which depends on the nature and quantum of water entering the mines. In turn, these water problems will adversely affect the mining operations and also the safety of men and materials. As such, the mine water control arrangements should be planned concurrent to mine planning and should be dove-tailed to the progress and advancement of mining at every stage, by proper revision or modification to suit the prevailing conditions. The first step towards this objective is to identify the sources and quantum of water entering the mines.

(b) Disaster due to failure of pit slope

The mine is planned for future 30 years period operation. The ultimate depth at the end of mining operation will be up to about 160m, the general elevation of the area is in the range of 37.25 to 55.36 m above M.S.L. The general slope of the area is towards Kim river (North-East to South-West).

The operational mine will have depths of maximum160mm which is not expected to trigger any pit slope failure but still danger cannot be totally ruled out, thus, endangering the safety of the mine.

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Strict vigil will be kept by reconnaissance surveys (especially in rainy season) to detect any impending danger so that the men and equipment can be accordingly moved out of danger area in time.

***(c) Disaster due to surface fire**/lignite stack fires*

The potential locations of fire are the HSD storage, lignite storage and electrical Sub-stations/transformers. Sufficient fire extinguishers will be installed at selected locations on surface like Electrical Sub-stations, work-shop, Garage, Diesel Depot, Stores etc. Besides, sufficient number of water hydrants with sufficient hose pipes will be made available in the surface for fire protection.

In order to prevent fire hazards in lignite stock piles, following types of precaution shall be taken.

(i) Prevent the happening or presence of any external source of fire in the vicinity of lignite stockpiles i.e.

- naked fire
- electric fire
- fuel oil fire

In case of electric equipment operating in the vicinity of fuel oil being used or stored in the vicinity of the lignite stock piles, appropriate types of fire extinguishers will be provided on or near such equipment in order to extinguish the fire at the nascent stage.

(ii) Restrict the stacking height of the lignite to below two meters. Higher height may only be attempted for shorter interval of stacking.

The time and height shall be established with respect to spontaneous combustion which will help in restricting to safe parameters.

(iii) Appropriate arrangement will be made by inserting pipes in the stack to monitor the internal temperature of lignite. In case, temperature is found to shoot above safe limits, the lignite from the part of stack shall be immediately dug out and disposed safely.

(iv) In certain mines, the in-situ lignite exposed in lignite bench catches fire due to spontaneous heating which has to be kept under vigil. Under such circumstances the affected area of lignite shall be separately dug up and disposed off safely.

(d) Dust hazard

Dust hazard can be due to following reasons:

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a. Material handling with conventional shovel – dumper combination at production face.
b. Movement/Hauling/Periodical shifting of HEMMs
c. Lignite stockpile and lignite loading at mine site.
d. Material handling at lignite loading/transport point (railway siding)
e. OB/spoil/Topsoil unloading at Dump yard.
f. Spillage of material from overloaded dump trucks.

Following safety measures will be ensured to minimize the dust hazard:

1. Regular water spraying/sprinkling at all the Haul roads, loading point(s) and working face(s), unloading point(s) at Dump / lignitetransport point(s)
2. Use of water mist in-built sprinklers or other coagulating agents (if applicable) during drilling Operations.
3. Usage of in-built dust enclosures with Drilling operations are also helpful in Controlling dust Pollutions
4. Proper monitoring of dust prone areas with measuring of PM_{10} and $PM_{2.5}$.
5. Optimum loading in loader (bucket) during material handling at face and optimum loading on dump trucks

6.3.3 Precautions and recommendations

(i) Slope stability analysis for high wall slopes and external dumps is in place.

(ii) Adequate fire fighting arrangements to be made

(iii) For preventing mine inundation, sufficient pumping arrangements have been made to pump out the pit water continuously.

(iv) Garland drains have been proposed around the mine pit to intercept surface run-off.

All the terms and conditions of Mines Act, 1952 and relevant Coal Mines Regulations, 2017 as well as directives of safety issued by Director General of Mine Safety shall be followed during mining operations and during mine closure time frames.

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CHAPTER 7

LIGNITE HANDLING, WASHING & MODE OF DISPATCH

The lignite will be fed into the Power Plant without any beneficiation except for crushing, etc. However, waste contamination will be reduced to a minimum to limit the ash contents.

ROM lignite will be sized to (-) 250mm size in the feeder breaker arrangements, to be provided in each of the three Pits. Sized lignite from the Feeder Breaker will be transported to the Power Plant. Physical processing such as sizing and removal of impurities if required will be resorted to at plant site before use of lignite as fuel. No other beneficiation / washing are proposed at mines site.

Mode of Dispatch:

Lignite from the North Pit to TPP will be transported by trucks through the internal road and Public Road which is black topped and is capable to transport the lignite. The internal roads are fenced with drains on either side. The distance of the TPP from South Pit (Mangrol area) and North Pit (Valia mine) is 6 KM and 18 KM respectively.

CHAPTER 8

MINE INFRASTRUCTURE

The proposed Mining area covers the mining lease areas of 2059.6829 Ha.

The mine is already operational as per the 1st Mining Plan (2000 version approved on 23/01/2001 by MoC) for a production of 4.2 MTPA. It is proposed to be operated at enhanced capacity of 5.4 MTPA. The facilities are already in place. However, they will be further strengthened to take care of the additional about 30% of excess production.

However, as the Centre Pit will be started after 3 years of exhaustion of the South Pit, only shifting of location will be required.

The list of site service facilities is given below:

Sl. No.	Particulars	Area (in Ha)
1	Site office	0.017
2	Site office	0.128
3	Contractor camp	1.501
4	Feeder breaker and stack yard	0.769
5	Workshop and store	1.019
6	Site office	0.128
7	Sub Station	0.085
8	High mast tower	0.04
9	Light switch	0.006
10	Security camp	0.05
11	Other (Parking, open storing etc.)	0.157
	Sub Total (Facilities 1 to 11)	**3.900**
12	Transport roads	9.92
13	Road Diversion	6.30
	Grand Total	**20.12**

For access to the buildings, good roads have been planned with proper paving, drainage system and good landscaping through barriers of green belt, which help abate pollution levels as well as help easy operability.

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The mine receives power from 11 KV DGVCL's Mangrol & Valia Sub-Station to cater to the power requirement arising from workshop machinery and the lighting needs of office buildings, Stores, Canteen, etc.

For maintenance of HEMM and other equipment, provision of workshop and store has been made. The excavation workshop would have facilities for daily washing, major over-haul and scheduled maintenance including lubrication and inspection of HEMM and reconditioning of some worn out parts.

The E&M work shop is equipped with washing station for light motor vehicle (LMV), minor repair shop, Feeder Breaker equipment repair shop, electrical and mechanical repair shop, structural welding shop and carpentry shop. All the shops have necessary equipment and machinery. Conceptual plan showing infrastructure facilities including colony, boundary of mining area, mine entries, roads including road diversion alignment etc. and Plan showing proposed surface layout are shown in Plate VII and XI, respectively.

CHAPTER 9

LAND REQUIREMENT

9.1 PRESENT OWNERSHIP AND OCCUPANCY OF THE AREA AND LAND INCLUDING FOREST LAND

9.1.1 Pre-mining land use of this area is as follows

Mining Lease was granted by MoC for 2067.48.00 (Refer **Annexure** I) Ha but the Mining lease execution was done by Govt. of Gujarat only for 2059.68.29 Ha (refer **Annexure XVI-B**).

TABLE 9.1
PRE-MINING LANDUSE AS PER MINE LEASE DEED

Particulars	Area in Hectares
Protected Forest land (Social Forestry along SH166)	4.80
Agricultural land	1953.3426
Waste land	23.5393
Nallah / River	00.5000
Road	10.1192
Gaucher	67.3818
Total ML	**2059.68.29**

9.1.2 Present land use

The breakup as per present land use (as on 31-03-2020) is as follows:

TABLE 9.2
PRESENT LAND USE OF ML AREA AS ON 31-03-2020

Sl. No.	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
1	Mining Pit	205.29	0.00	134.32	**339.61**
2	Dumps including top soil dump**	208.95	0.00	80.14	**289.09**
3	Infrastructure (Site office, Contractor's Camp, First Aid Centre, Shelters, Pumping Station, Lignite Crusher, Lignite Stack, Weighbridge, Electric Substation)	0.42	0.00	3.48	**3.90**
	Sub Total (1 to 3)	414.66	**0.00**	217.94	632.60

Sl. No.	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
4	Green Belt (common for all pits)	129.97			129.97
5	Service Road, Lignite Transport Road (Common for all pits)*	9.92			9.92
6	Settling Pond	3.45			3.45
	Sub Total (4 to 6)	**143.34**			**143.34**
7	**Total Disturbed Area (1 to 6)**	**775.94**			**775.94**
	Rationalisation area/ Undisturbed area (out of 2059.6829 ha)	**1283.7429**			**1283.7429**
	Total ML/ Project area	**2059.6829**			**2059.6829**

* ***Out of 9.92 ha, 3.00 ha belongs to North pit and 6.92 ha belongs to South pit.***

** ***Top soil dump area near north pit is 20 ha (part of OB dump) and near south pit is 10 ha (part of OB dump).***

9.1.3 Total land requirement and its breakup during Post -Mining closure stage

The total land requirement and its breakup during Post -Mining closure stage is given in the Table 9.3 below.

TABLE 9.3
LAND REQUIREMENT AND ITS BREAKUP DURING POST MINE CLOSURE

Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
			Agricultural Land	Plantation	Water body	Public/ Company Use	Forest Land (Returned)	Undis-trubed	Total
Excavation Area	1453.000		0.000						0.000
Backfilled Area		1243.000	159.820	1083.180					1243.000
Excavated Void		210.000	0.000		210.000				210.000
Without plantation			0.000						0.000
Top Soil Dump	30.000	30.000	30.000						30.000
External Dump	156.710	156.710	80.140	76.570					156.710
Safety Zone									0.000
Haul Road between quarries									0.000
Road diversion	6.300	6.300				6.300			6.300
Diversion/ below River/Nala/ canal									0.000
Settling pond	10.000	10.000	10.000	0.000	0.000	0.000	0.000	0.000	10.000
Road & Infrastructure area	13.820	13.820	10.929	0.000	0.000	2.891	0.000	0.000	13.820

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Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
			Agricultural Land	Plantation	Water body	Public/ Company Use	Forest Land (Returned)	Undis-trubed	Total
Rationalisation area	0.000	0.000							0.000
Garland drains									0.000
Embankment									0.000
Green Belt	156.620	156.620		151.820			4.800		156.620
Water Reservoir near pit									0.000
UG entry									0.000
Undisturbed/Mining right for UG	233.233	233.233						233.233	233.233
Resettlement									0.000
Pit head power plant									0.000
Water harvesting									0.000
Agricultural land									0.000
Total	2059.683	2059.683	290.889	1311.570	210.000	9.191	4.800	233.233	2059.683

** Social forestry along SH166.*

TABLE 9.4
BIFURCATION OF LAND REQUIREMENT RELATED TO VARIOUS PITS WITHIN THE ML

Break-up as per proposed land use	Area in Hectares				
	Mangrol Area		Valia Area (North Pit)	Common for the project	Total Area
	South Pit	Central Pit			
I. Disturbed Area					
1. Mining Pit Excavation	348.65	71.41	1032.94	-	1453.00
2. OB Dumps including Black cotton soil	80.14	0.00	76.57	-	156.71
3. Top Soil Stacking (included in OB dump)**	0	30.00	0	0	30.00
4. Infrastructure i.e. Site office, Contractor's Camp, First Aid Rooms, Shelters, Pumping Station, Feeder Breaker, Weighbridge, Electric Substation	0.42	0.00*	3.48	0	3.90
5. Service Road, Lignite Transport Road	3.00	0.00*	6.92		9.92
6. Settling ponds combined	0		0	10.00	10
7. Green Belt combined	0		0	151.82	151.82
8. Road diversion	6.30	0	0	0	6.30
Sub Total (I)	**438.51**	**101.41**	**1119.91**	**161.82**	**1821.65**
II. Undisturbed Area					**238.0329**
Grand Total (I+II) equal to ML granted					**2059.68.29**

* *Area common with South Pit*

** *Top soil stack area is common with OB dump areas (10 ha in Mangrol area) South Pit, 20 ha in Valia Area (north pit).*

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9.2 FOREST LAND

A stretch of land totalling to 4.48 Ha along the existing State Highway (SH166) (Kosamba-Vankal measuring about 2.0 KM) between Mosali Chokri and Ukai-Kankrapar Main canal, passing through the block has been planted by Social Forestry Department and has been booked under protected forest in the records. This stretch of the road is to be re-aligned parallel to the existing Narrow Gauge Kosamba- Zankhvav railway line passing through the block, within the proposed surface barrier against the railway line from the quarry edge. Accordingly, 4.48 Ha green belt will be developed along the proposed diverted alignment of the SH166.

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CHAPTER 10

ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION

This captive Mangrol-Valia lignite mine over an ML of 2059.68.29 Ha, is being operated by GIPCL since December' 2009 under necessary approval of the 1st Mining Plan (2000 version) for a production of 4.2 MTPA.

Mining Plan by Ministry of Coal was obtained on 23/01/2001 followed by environmental clearance (EC) on 21/07/2003.

Though the company had ambitious plan of further expansion of this mine up to 7.4 MTPA for an expanded area of 3710 Ha for which the Revised Mining Plan, 1st Revision and 2nd Revision was prepared and got approved from MOC on 08.06.2010 and 23/11/2015 respectively, neither of them could be implemented due to pending environmental clearance.

One of the approved EUP, viz. Phase-2 SLPP 2X300MW is not coming up, as the decision has been deferred indefinitely on account of non acquisition of additional 959.00 Ha areas of the additional applied leases.

Instead, GIPCL has decided to setup 2 x 125 MW units as Phase-2 expansion of SLPP. Therefore, Lignite requirement has been revised downwards to 5.4 MTPA. This **Mining Plan (3rd Revision) (including Mine Closure Plan)** has been planned for 5.4 MTPA with reduced land requirement of 2059.68.29 Ha, the mining lease for which had already been granted subsequent to the approval of 1st Mining Plan (2000).

As the expansion in terms of capacity will be less than 30%, the environmental impact is not expected to worsen if the control measures are implemented as envisaged. Various facets of environmental parameters/activities are described below in line with the guidelines of MOC prescribed for preparation of Mining plans and Mine Closure Plans.

10.2 BASELINE DATA (STATUS OF ENVIRONMENT)

Pre-project assessment of various environmental parameters is essential as this form the base line data for study of impact due to the project on these environmental parameters. As already indicated the mining project is in operation for 4.2 MTPA Capacity for which the required Environmental Clearance has been obtained and mine is monitoring various environmental impacts of the existing operation. EIA for 7.4 MTPA was prepared by Geomin Consultants Private Limited, Bhubaneswar in June 2013. This

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forms a part of the base line information. Environment monitoring is regularly being done (Refer **Annexure XVIII-F**).

The schedules adopted for sampling/ monitoring the area are indicated in Table 10.1.

TABLE 10.1
MONITORING SCHEDULE AND PARAMETERS

Sl. No.	Description of parameters	Schedule and duration of monitoring
1.	Air quality in the vicinity of the mine – PM 10, PM 2.5, SO_2, and NO_X	8 stations. Twice a week for three months
2.	Water quality (all parameters as per drinking water standards IS:10500)	14 samples once in a season
3.	Ambient noise levels	8 stations once in a season
4.	Study of Flora and Fauna	Within the study area
5.	Soil quality	One sample from core zone and one from study area

Secondary data sources were utilized for collection of information about hydro-geological conditions, socio-economics, seismicity and important places and industries in surrounding areas.

10.2.1 Existing land use pattern and Pre-mining land use

The Pre-Mining Land Use is given in Table 3.2 of Chapter 3. Most of the land is agriculture land (1953.34.26 ha) out of total area of 2059.68.29 Ha. The present land use of ML area as on 31-03-2020 of the Mine is also given in Table 3.2 of Chapter 3 and Table 9.2 of Chapter 9 of this report.

10.2.2 Soil quality

Soil characteristic

To study the soil characteristics like physical, chemical and natural status, 6 soil samples were collected from the area and tested in laboratory.

With the above aspects in view, the following 6 locations were selected:

S1 - Charetha Village
S2 -Kanwara Village
S3 -Nani Paredi (Core Zone)
S4 - Asarma Village
S5 - Bhaga Village
S6 - Chormala Village

The most important chemical property of the soil as a medium of plant growth is the pH of the soil. Results of the soil samples show that the pH values are normal (not alkaline or acidic). Soil conductivity of all the

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samples are below 1.0 which is normal for crop response. The soil samples are generally silty or loamy, which is good for crops. The organic matter of all samples is low in nature which would require attention. Analysis data of samples of 6 locations analysed in winter season are placed in Table 10.2.

TABLE 10.2
SOIL QUALITY DATA

Parameter	S1	S2	S3	S4	S5	S6
pH	7.4	7.9	7.3	7.2	7.5	7.6
EC MS/CM	0.05	0.08	0.18	0.10	0.12	0.07
Available N KG/Acre	77	78	58	59	71	73
Available P205 KG/Acre	3	2	3	2	2	3
Available K20 KG/Acre	156	123	242	130	235	58
Calcium	9	5	19	12	83	24
Sulphur PPM	43	45	34	21	17	15
Physical Characters						
Soil Texture	Loam	Silty loam	Silty loam	Loam	Loam	Loam
Clay%	13	11	17	10	15	16
Silt%	35	54	50	42	30	30
Sand%	52	35	33	48	55	54
Organic Carbon%	0.49	0.48	0.50	0.53	0.49	0.52
Organic Matter %	0.85	0.83	0.87	0.92	0.85	0.90
Micronutrient Status						
Copper PPM	4	2.8	3.4	3.2	1.7	2.5
Manganese PPM	16.6	11.4	0.10	29.2	26	7.7
Zinc PPM	1.6	0.9	0.32	0.9	0.5	0.30
Iron PPM	11.9	15.8	5.5	15.15	13.12	15.05

10.2.3 Water regime

a) Surface water regime

Kim river is the only water body traversing on the Southern side of the Mining Lease area, which is a seasonal river, carrying water only during monsoon. As per the mining scheme planned, this river will not be diverted and suitable statutorily prescribed barriers will be left for safe mining.

Another small stream, Tokri River, is passing outside the North-Western side of the Mangrol-Valia Mining lease area, Bhaga River is passing outside the North Eastern of the Mangrol-Valia Mining lease area and Shah Nallah is passing through the South Western side of the Mangrol-Valia Mining lease area.

These rivers/streams generally control the drainage of the area.

b) Ground water

A detailed hydrological investigation including pump test was conducted in the area and from the hydrological investigation the following observations are made for preparation of the Mining Plan.

Salient points are placed below:

- There are three hydrological horizons in the area viz. Deccan Traps, Tertiary Limestone and Sandstone and Quaternary Alluvial formations. Although, clay is present in large part of the area, but do not form aquifer.
- The depth of water table varies from 2.10m bgl to 19.10 m bgl.
- The general slope of water table in the area is from Mangrol to Rajgarh (from NE to SW)
- The pumping test reveal the following;
  - In Deccan Traps/Basalt, the movement of ground water is controlled by the presence of fractures and joints at moderately shallow depth.
  - The specific capacity in the Deccan Trap is 0.056 m^3/min/m: Transmissivity is of 59-66 m^2/day and Permeability is 0.938-1.110 m/day.
  - The Sand stone / Limestone of Tertiary age also form an aquifer at moderately shallow depth, but in limited area. The specific capacity in this formation is 0.260m^3/min/m: Transmissivity is of 471 m^2/day and Permeability is 11.7 m/day.
- The total ground water reserves in the entire area are estimated to be 10.68MCM.

10.2.4 Ecology

The leasehold area can be demarcated under Agricultural land, Waste land, Road and Gaucher. 4.80 Ha Protected Forest land is also involved in allotted area in the form of social forestry along both sides of SH166.

a) Flora

The study area comprises of agricultural lands, waste lands, Moti River, Bhukhi River etc.

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The project area comprises predominantly agricultural lands and partly waste lands. In the agricultural lands, Maize (Sorghum vulgare), Wheat (Triticum vulgare), Rice (Oryza sariva), Groundnut (Arachis hypogea), Black gram (Vigna mingo) etc. are the main crops in this area. In partly waste lands covered with trees like, Cassia, Eucalyptus, Leuceana, Pithecelobium, Prosophis, etc, Shrubs like Abutilon, Cereas, Convolvulus, Euphorbia, Lantana etc, and herbs like Alternanthera, Amaranthus, Boerhaavia, Cassia, Cleome, Corchorus, Gompherena, Indigofera, Leucas, Acacia, Alibizzia, Azadirachta, Butea, Achyranthus, Calotrophis, Mullugo, Tephrosia, Croton, Cyperus, and Tridax, besides in the revenue lands, the speices of Eucalyptus, Casuarina etc are found.

The situation in the surrounding area (upto 10 km) is as described in following paragraph. In the agricultural lands, cotton (Gosypim hirsutum), Chillie (Capsiumannum), Castor (Ricinus cummunis), Sugarcane (Saccharum officinarum), Maize (Sorghum Vulgare), Wheat (Triticum vulgare), Rice, (Oryxa sativa), Groundnut (Arachis hupogeal), Bengal gram (Cajanum cajan), Black gram (Vigna mungo) etc. are in the main crops in this area.

The area covers wide variety of trees like Pithecelobium dulce, Cocosnucifera, polialthia lingifolia, Morinda tomentosa, Ficus sps, Zizypus, Casuarinasaman, Butea, Tamarindus, Prosophis, Techtona grandis, Acasia sps, Syzygium, Mangifera, Peltophorus, Delonix, Eucalyptus etc.

Shrubs like Medicago, toddalia, Mantana, Cereas, Largestromia, Lawsonia, Abutilon, Sida etc. and ground flora like Ocimum, Leucas, Cyanadon, Cyperus, Euphorbia, Ecilipta, etc. are also recorded here. The occurrence of Ocimum gratissium is on a wider scale.

b) Fauna

Domestic animals like cows, buffalos, sheep, goat, gods etc. are seen in the area with reptitles like snakes, lizards etc. from the study, it is observed that there are no endangered animal species [(Sch – 1 of Wild Life Protection Act (1972)] present in the core zone.

There are no endangered animal species [(Sch – 1 of Wild Life Protection Act (1972)] present in the buffer zone.

10.2.5 Quality of air, ambient noise and water

(i) Ambient Air Quality

The following parameters were analysed at the sampling locations established in the study area and expressed in $\mu g/m^3$.

- Suspended Particulate Matter
- Sulphur Dioxide
- Oxides of Nitrogen
- Respirable Particulate Matter
- Carbon Monoxide

Ambient air quality monitoring study was covered at 16 locations and the results are given below in Table 10.3.

TABLE 10.3
RESULTS OF AMBIENT AIR QUALITY MONITORING

	PM2.5	PM10	SO_2	NO_x	PM2.5	PM10	SO_2	NO_x	PM2.5	PM10	SO_2	NO_x	PM2.5	PM10	SO_2	NO_x
	Mangrol Vil. (A1)				Shah Vil. (A2)				Timberva Vil. (A3)				Vastan Vil. (A4)			
Max.	29	47	20.0	20.0	31	52	22.0	20.0	24	41	13.0	14.5	27	45	14.0	14.5
Min.	25	35	18.0	17.0	26	39	18.5	17.5	19	30	9.0	10.0	22	34	10.5	11.0
Avg.	27	40.4	18.92	18.54	28	44.6	20.3	18.6	21	34.9	11.0	12.1	24	38.7	12.0	12.6
98%tile	28.5	46.5	19.95	19.85	30.5	51.5	21.95	19.9	23.5	40.5	12.75	14.2	26.5	44.5	13.85	14.4
	Charetha Vil. (A5)				Mosali Vil. (A6)				Luna Vil. (A7)				Kosadi Vil. (A8)			
Max.	26	45	17.0	19.0	31	53	19.0	20.0	22	37	13.0	12.0	21	35	12	11.0
Min.	21	31	13.5	16.0	26	41	15.0	16.8	18	26	11.0	10.0	16	22	10	9.0
Avg.	23.4	38.3	14.9	17.3	27.8	46.2	16.9	18.1	19.5	30.8	12.0	10.9	18.0	28.5	10.9	10.0
98%tile	25.5	44.5	16.85	18.9	30.5	52.5	18.90	19.8	21.5	36.5	12.9	11.9	20.5	34.5	11.9	10.9
	Nogama Vil. (A9)				Vasravi Vil. (A10)				Jhagadia Vil. (A11)				Wankal Vil. (A12)			
Max.	17	29	11	10.5	24	39	13.0	12.0	18	32	10.0	11.0	22	37	13.0	14.0
Min.	11	16	9	7.5	19	26	11.0	10.0	12	20	8.0	9.0	17	25	11.0	12.0
Avg.	13.5	21.9	9.9	8.8	20.7	31.5	11.8	10.9	14.3	26.3	9.0	9.9	18.8	29.6	12.0	12.9
98%tile	16.5	28.5	10.9	10.4	23.5	38.5	12.9	11.9	17.5	31.5	9.9	10.9	22.0	36.5	12.9	13.9
	Bodkuva Vil. (A13)				Bhaga Vil. (A14)				Bhamadiya Vil. (A15)				Sodgam Vil. (A16)			
Max.	20	34	12.0	11.8	22	36	13.0	13.0	19	32	11.0	12.0	20	34	13.0	13.0
Min.	15	20	10.0	9.3	18	23	10.0	10.1	14	22	9.0	9.2	15	21	10.0	11.0
Avg.	16.8	27.7	10.8	10.6	19.3	29.7	11.3	11.2	16.1	26.5	9.8	10.5	16.9	26.4	11.3	11.8
98%tile	19.5	33.5	11.9	11.7	21.5	35.5	12.9	12.9	18.5	31.0	10.9	11.9	19.5	33.5	12.9	12.9

The Indian Ambient Air Quality Standards permitting the maximum concentration of contaminants for ambient air quality, set for different categories of areas are given in Table 10.4 for the sake of comparison.

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TABLE 10.4
AMBIENT AIR QUALITY STANDARDS

Area	Category	24 hours average concentrations, µg/m^3				
		PM10	PM2.5	SO_2	NO_X	CO (8 hourly)
A	Industrial, Residential, Rural and Other Area	100	60	80	80	02 mg/m^3
B	Ecologically Sensitive Area (notified by Central Government)	100	60	80	80	02 mg/m^3

Source: ***National Ambient Air Quality Standards vide CPCB Notification B-29016/20/90/PCI-L dated 18th November 2009***

As is apparent from the analytical data, the ambient air quality in the region is well within the standards specified as per the Air (Prevention & Control of Pollution) Act, 1981.

(ii) Ambient Noise

Noise Level

Ten locations were selected for measuring noise level.

The noise equivalent values for all the 10 locations are shown in a comparative chart given in Table 10.5. It is seen that the day equivalent, night equivalent and day and night equivalent for all the observed seasons ranged from 47.7 to 60.3 dB(A), 36.8 to 47.6 dB(A) and 58.5 dB(A) respectively. The noise levels in all the observed locations are generally within the Environment Protection Rules 1986 norms prescribed by MoEF.

TABLE 10.5
NOISE LEVEL DATA (IN dBA)

Sl. No.	Parameters / Village	Day equiv.	Night equiv	Day & night equiv.	Min	L_{10}	L_{50}	L_{90}	Max
N1	Mangrol	60.3	41.8	58.5	40.6	40.1	42.4	62.8	63.9
N2	Shah	61.2	42.5	57.6	41.8	41.2	44.5	57.6	65.2
N3	Timberva	52.5	38.3	52.1	38.1	38.4	41.4	57.0	60.3
N4	Vastan	58.2	47.9	50.8	47.8	48.5	50.2	55.3	62.1
N5	Charetha	56.8	46.9	51.9	39.5	39.8	46.9	61.0	62.2
N6	Mosali	57.2	43.0	55.2	42.5	42.9	48.5	60.3	65.6
N7	Luna	54.1	39.3	52.4	38.8	40.3	44.8	57.5	61.0
N8	Kosadi	48.1	41.5	46.6	41.0	41.8	43.6	52.0	60.2
N9	Nogama	51.8	37.9	42.3	37.5	38.8	43.3	56.1	58.0
N10	Vasravi	52.0	41.6	44.2	41.0	41.3	46.5	57.2	60.1

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(iii) Water Quality

On the basis of 8 surface water samples and 6 groundwater samples collected from the area, the water in general is observed to be good with a few samples showing higher TDS, Cl, hardness & Ca.

The quality of water monitored during winter of 2012 (refer EIA Study carried out by M/s Geomin Consultants Pvt. Ltd., 2012) is given in Table 10.6 and 10.7 below.

TABLE 10.6
SURFACE WATER QUALITY DATA

Sl. No.	Parameters	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Limit IS : 10500
	A. Physical Quality									
1	Colour (Hazen units)	<10	<10	<10	<10	<10	<10	<10	<10	25
2	Odour	Odourless	Odourless	Odourless	Odourless	Odourless	Odourless	Odourless	Odourless	
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity (NTU)	5	<1	<1	<1	<1	<1	<1	<1	10
5	pH	7.3	7.4	7.6	7.6	7.4	7.5	7.6	7.3	6.5 - 8.5
6	Electrical conductivity (micromhos/cm)	1045	1230	2020	2230	1870	1490	1830	1520	--
	B. Chemical Quality (in mg/l.)									
7	Total Dissolved Solids	1130	1240	1460	1670	1500	1350	1450	1400	2000
8	Total Hardness ($CaCo_3$)	330	220	210	320	325	350	270	290	600
9	Calcium hardness ($CaCo_3$)	120	105	140	175	210	240	210	205	
10	Magnesium Hardness ($CaCo_3$)	110	115	70	145	105	110	65	85	
11	Chlorides (Cl)	90	75	150	220	160	175	165	130	1000
12	Total Residual Chlorine	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	***0.2min
13	Sulphates (SO_4)	40	20	45	40	45	75	70	60	400**
14	Nitrite-Nitrogen (NO_3)	3.5	6.7	7.2	8.5	5.6	7.3	6.8	7.2	45
15	Fluorides (F)	0.30	0.40	0.35	0.50	0.30	0.40	0.25	0.35	1.5
16	Total Iron as Fe	BDL (D.L-05)	BDL (D.L-05)	BDL (D.L-05)	BDL (D.L-05)	BDL (D.L-05)	BDL (D.L-05)	BDL (D.L-05)	BDL (D.L-05)	1
17	Copper as Cu	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-03)	BDL (D.L-03)	BDL (D.L-0.03)	BDL (D.L-0.03)	1.5
18	Zinc (Zn)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-03)	BDL (D.L-03)	BDL (D.L-0.03)	BDL (D.L-0.03)	
19	Lead (Pb)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
20	Total Chromium (Cr)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
21	Hexavelent Chromium (Cr^{+6})	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	

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Sl. No.	Parameters	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Limit IS : 10500
22	Manganese as Mn	0.1	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	0.1	BDL (D.L-0.1)	0.3
23	Calcium as Ca	45	35	40	40	30	50	60	45	200
24	Magnesium as Mg	20	25	15	30	20	35	35	30	100
25	BOD (5 days at 20°C)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
26	COD	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
27	Phenolic Compound (C_6H_5OH)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
28	Oil & grease	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
29	Coliform (MNP)	5	7	5	5	6	5	7	17	

NOTE : IS 10500 R.03 in the absence of alternate source
*** Is applicable only when water is chlorinated
** If Magnesium does not exceed 30
DL - Detectable Limit
BDL – Below Detectable Limit

SW1 – Varsavi Village
SW2 – Amabavadi Village
SW3 – Bhaga River
SW4 – Tokri River
SW5 –Moti River
SW6 – Charetha Village
SW7 –Kim River
SW8 – Shah Village (Pond Water)

TABLE 10.7
GROUND WATER QUALITY DATA

Sl. No.	Parameters	GW1	GW2	GW3	GW4	GW5	GW6	Limit IS : 10500
	A. Physical Quality							
1	Colour (Hazen units)	<10	<10	<10	<10	<10	<10	25
2	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Turbidity (NTU)	6	<1	<1	<1	<1	<1	10
4	pH	7.9	7.8	7.5	7.4	7.7	7.8	6.5 - 8.5
5	Electrical conductivity (micromhos/cm)	1300	1740	2250	2450	1250	1650	--
	B. Chemical Quality (in mg/l.)							
6	Total Dissolved Solids	835	1105	1250	1550	745	1235	2000
7	Total Hardness (CaCo3)	240	121	118	240	159	353	600
8	Calcium hardness (CaCo3)	125	63	80	105	63	180	
9	Magnesium Hardness (CaCo3)	115	58	38	135	96	173	
10	Total Alkalinity as CaCo3	442	456	489.5	501	338	402	600
11	Chlorides (Cl)	82	68	239	423	156	211	1000
12	Total Residual Chlorine	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	***0.2min
13	Sulphates (SO4)	52	25	49.2	230	29	82	400**
14	Nitrite-Nitrogen (NO_3)	1.96	5.3	4.75	20.5	1.25	35.7	45
15	Fluorides (F)	0.85	0.75	0.72	0.84	0.72	0.56	1.5
16	Total Iron as Fe	0.378	0.201	0.21	0.059	BDL (D.L-05)	BDL (D.L-05)	1

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Sl. No.	Parameters	GW1	GW2	GW3	GW4	GW5	GW6	Limit IS : 10500
17	Copper as Cu	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-03)	BDL (D.L-03)	1.5
18	Zinc (Zn)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-0.03)	BDL (D.L-03)	BDL (D.L-03)	
19	Lead (Pb)	BDL	BDL	BDL	BDL	BDL	BDL	
20	Total Chromium (Cr)	BDL	BDL	BDL	BDL	BDL	BDL	
21	Hexavelent Chromium (Cr^{+6})	BDL	BDL	BDL	BDL	BDL	BDL	
22	Manganese as Mn	0.1	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	BDL (D.L-0.1)	0.3
23	Calcium as Ca	50	25	32	42	35	72	200
24	Magnesium as Mg	30	15	10	35	25	45	100
25	BOD (5 days at 20^0C)	BDL	BDL	BDL	BDL	BDL	BDL	
26	COD	BDL	BDL	BDL	BDL	BDL	BDL	
27	Phenolic Compound (C_6H_5OH)	BDL	BDL	BDL	BDL	BDL	BDL	
28	Oil & grease	BDL	BDL	BDL	BDL	BDL	BDL	
29	Coliform	Nill	Nill	Nill	Nill	Nill	Nill	

Note :

GW1 – Mangrol Village (Borerwell) : GW2–Mosali Village (Borewell)
GW3 – Charetha Village (Borewell) : GW4–Varsavi Village (Borewell)
GW5 – Bharodia Village (Borewell) : GW6–Shah V (Borewell)

10.2.6 Climatic conditions

The area is warm and humid having sub- tropical climate. Temperature in general varies from 33°C to 40°C in summer and 14°C to 17°C in winter. Wind direction is from S & SW in summer and N & NE in winter. Humidity varies between 50 to 60%. Average rainfall between, 1981-2006 is around 1127 mm and during last 5 years (2007-2011) it is less around 724.78 mm. During the period from January to May the rainfall is quite negligible while maximum rainfall is between June to August. In a month highest average recorded is 998mm in July 2006. Average monthly rainfalls in different months are placed in Table 10.8 in from 1981-2011.

TABLE 10.8
MONTHLY RAINFALL DATA (IN MM)

Year	May	June	July	August	Sept	Oct.	Nov.	Dec.	Total
1981	0	218	457.8	290.3	248.9	52.3	19.5	0	1286.8
1982	7.1	14	363.9	147	101.9	15.1	61.7	0	710.7
1983	0	342.1	495.2	658.5	243.8	176.3	0	0	1915.9
1984	0	200.7	212.4	251.3	159	0	0	0	823.4
1985	0	0	352.3	338.8	3.5	119	0	0	813.5
1986	0	412	46.5	280.5	2.5	0	43	0	784.5
1987	0	92.3	264.2	104.5	8.2	19	47	3.5	538.7

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Year	May	June	July	August	Sept	Oct.	Nov.	Dec.	Total
1988	0	134.3	111.4	232.8	402.5	`0	0	0	881
1989	0	180.3	537.3	182.8	37.5	0	0	0	937.9
1990	0	25.5	49.3	632.5	390.7	9	0	0	1107
1991	0	17	462.4	231.6	65	0	0	0	776
1992	0	188	592	650.2	702	178	0	0	2310.2
1993	0	120.7	670	180.5	80	61.2	0	0	1112.4
1994	0	85.2	378.2	240.2	120.8	18.2	42	0	884.6
1995	0	186	428.6	170.8	33.8	0	0	0	819.2
1996	0	328.6	52.5	260.2	3	0	42	0	686.3
1997	0	224	232	626	228	22	0	0	1332
1998	0	117.3	355.4	181.6	524.6	34.4	0	0	1213.3
1999	0	274.8	461.1	115.7	99.1	105.4	0	0	1056.1
2000	0	97.2	322.8	134.9	19.6	0	0	0	574.5
2001	0	325.4	465.6	244.8	36	0	0	0	1071.8
2002	0	252.7	40.4	373.8	147.6	0	0	0	814.5
2003	0	344.2	769.2	335.8	32.2	0	0	0	1481.4
2004	0	217.2	309.2	846	123.6	2.4	0	0	1498.4
2005	0	884.7	228.4	222.2	422.7	0	0	0	1758
2006	9.8	467.6	997.8	523.2	80	12.6	26.6	0	2117.6
2007	0	72.5	445.7	218.1	189.6	0	0	0	925.9
2008	0	47.1	267.7	226.3	209.7	2.8	0.9	0	754.5
2009	0	12.0	250.8	81.2	44.7	38.4	3.3	0	430.4
2010	0	47.4	290.5	247.1	286.5	11.8	19.3	0	902.6
2011	0	18.9	151.3	309.2	130.6	0.5	0	0	610.5
Total	**16.9**	**5947.7**	**11061.9**	**9538.4**	**5177.6**	**878.4**	**305.3**	**3.5**	**32929.6**
Avg.	**0.5**	**191.9**	**356.8**	**307.7**	**167.0**	**29.3**	**9.8**	**0.1**	**1062.2**

10.2.7 Human settlements

There are no inhabited villages to be rehabilitated as only small clusters of houses named Vadsol hamlets with 83 hutments and Kosmadi Faliya (Rajgarh Gram Panchayat) with 35 hutments in the approved 2080 Ha Mine lease area are proposed to be shifted as per the R & R Policy. The land loosers have largely been compensated in the past.

10.3 ENVIRONMENTAL IMPACT ASSESSMENT

10.3.1 Land Environnent

a) Land degradation and aesthetic environment

The disturbed area within ML will comprise excavated land, external dumps, area occupied by infrastructure, diverted road, green belt etc. The

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anticipated land use during mining (End of Life) and Post Closure is given in the Next Chapter 11 under Table 11.6.

There are 4 dumps existing at present, D1, D2, D3 and D4. Dumps D1, D2 and D4 belong to North pit. Dumps D1 and D2 are located on the east of the North Pit over non- lignite bearing area and will not be re-handled but Dump D4 is located on the SW of North pit over the lignite bearing area and will have to be re-handled later.

Dump D3 is created by South Pit and is located on the SE of this Pit.

Total area under surface dumps at present (31-03-2020) is 289.09 Ha which will increase to 306.81 Ha by the end of 1st year. Later, it will reduce to 156.71 ha by the end of life of mine due to rehandling of D4 (by 5th year) as its 150.10 Ha area will be re-handled and backfilled into North Pit. However, during post mine closure, the surface dump D3 (area 80.14) will also be rehandaled and backfilled into South Pit and the ultimate area under surface dump will remain as 76.57 ha.

Top soil dump:

Presently, the top soil is stored within the surface dump premises. In future, separate provision has been made for stacking the top soil which will become 20 Ha by the end of 5th year and 30 Ha by the end of life of mine.

b) Land profile

Presently, the core zone comprises of three Pits (North Pit, Central Pit and South Pit), four dumps D1, D2, D3 and D4 along with surface infrastructures, the rest being undisturbed area.

c) Visual intrusion

Visual intrusion is due to the surface dumps which are having heights of up to 50 m. This will remain in case of 3 dumps up to the end of the life of the mine except that fourth dump D3 will be re-handled before 10th year.

10.3.2 Impact on air quality

The principal sources of Air pollution due to the proposed Lignite mine are:

i. Dust Particulates.
ii. Gaseous pollutants.

The sources of dust generation in the mine are:

a. Extraction of over-burden and lignite by Shovels.

b. Movement of HEMM, such as Shovels, dumpers etc.
c. Loading and unloading operation,
d. Over-burden / Lignite conveying,
e. Material handling operation in the feeder breakers,
f. Wind erosion of dumps

Gas emission can occur as a result of:

a. Spontaneous heating of lignite and lignite stockpile fire.

b. Emission of SO_2 from diesel driven mining equipments, compressors, generator sets, etc.

The Particulate Matter (PM10) especially that below 5-micron size is a serious air pollutant, which can lead to lung disorder and other diseases like Bronchitis, Emphysema, Bronchial Asthma, Irritation of mucus membranes of eyes etc.

During impact assessment for this reason, the parameters like PM_{10}, $PM_{2.5}$, SO_2, NOx and CO have been assessed in ambient air quality at various location around the project area and particularly with emphasis given for measurement along the prominent wind directions. The results don't indicate any higher values of considerable serious nature even at less than 1 km which is close to the working mines of 4.2 MTPA and adjacent Vastan mines. The identical results are also observed in the monitoring reports of these mines.

The project doesn't propose any drilling and blasting and would adopt the same practice being adopted by these existing mines. Excavation, feeder breaker and transport system would also be similar type.

As such within the project area dust generating points are distributed over a larger area to cause any heavy pollution at a particular location. The marginal increase in production of less than 30% from 4.2 MTPA to 5.4 MTPA is not anticipated to contribute pollutants to the air as can render it polluted beyond acceptable limits.

10.3.3 Impact on water quality

Impact on water quality due to the project operations can occur due to:

a) Generation of industrial effluent water from workshop, service building and pumped out mine water with suspended particles,

b) Washouts from over-burden, lignite stockpile etc.

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c) Changes in the hydrological cycle of the area.

d) Sudden outburst of confined or semi confined aquifer which may be present in the area.

The direct impact on human beings due to poor water quality can lead to diarrhea, jaundice, dysentery, etc.

The surface water and ground water data of the area indicate that the samples are quite normal and free of any pollution of serious nature. In spite of operating mines in this area the water quality doesn't indicate adverse impact and pollution due to the mining. This is also confirmed from the monitoring reports.

Due to predominant presence of clay in the area, the ground water inflow into the mine will be less. Adequate pumping system has been planned to deal with the mine water. The working benches have been designed at a gradient of 1 in 100, so that the entire water from these benches would flow towards the sump. This would ensure that working faces and haul roads will remain dry as far as possible. Layout of quarry provides suitable gradient along quarry floor and benches to facilitate self drainage of water to lower level of quarry. Proper drains shall be dug along both sides of haul roads to keep them dry. Main sump at lowest point of quarry will have sufficient capacity to accommodate entire make of water.

The oil and grease contaminated water can contaminate the ground water if appropriate control measures are not taken. Calculations of water make in the excavated pits as a result of rainfall is given in Table 5.11 in Chapter 5 for the purpose of pumping. The water requirement calculations for the mine are given in Table 5.13 of Chapter 5.

10.3.4 Impact on noise level quality

Mining operations such as excavation, loading and dumping, workshop activities etc. will generate significant noise especially in the work environments unless proper remedial measures are adopted.
Prolonged exposure to a high noise level is harmful to the human auditory system and can create mental fatigue, rebellious attitude, annoyance, and carelessness, which may lead to neglect of work and also result in accidents.

The Directorate General of Mines Safety vide circular No. DG (Tech)/18 of 1975, has prescribed the noise level in mining occupations (TLV) for workers, in an 8 hour shift period with unprotected ear as 90 dBA or less.

Noise will be produced due to operation and movement of Heavy Earth Moving Machinery, various other allied equipment and transport vehicles. The impact on the surrounding population in the buffer zone will be minimal

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from propagated noise levels from the mining area, due to adoption of following control measures.

1. The operator's cabin of equipments like dumpers, shovel, etc. would be made sound proof.
2. Proper and regular maintenance of equipments may lead to less noise generation.
3. Manufacturers of equipment will be advised to provide in-built mechanism for reducing sound emissions.
4. Where noise level exposure is more, workers will be provided with earmuffs.
5. Regular health check-up of workers will be undertaken.
6. Accordingly, noise level status of operational machinery may be displayed on the machines to enable control measures to be taken in this respect.

This will enable to know the extent of noise level and to control the time to which the worker is exposed to higher noise levels.

10.3.5 Effect on vibration level (due to blasting)

For the mining operation of lignite, no blasting envisaged, vibration study is not required to be undertaken.

10.3.6 Impact on water regime

The past experience has shown that there has been no adverse impact on the ground water regime. As the mining operations will be more or less of similar scale with only less than 30% increase in production, no adverse impact on the ground water regime is anticipated.

10.3.7 Impact on socio-economic environment

The directly affected people will be compensated as per R&R under preparation. The villagers of the surrounding villages will be benefited by the direct employment as well as by indirect employment. The social impact assessment survey has been done by Dr. Sheetal Tamakuwala in 2013-2014) (**Annexure XVIII-I**).

10.4 ENVIRONMENTAL MANAGEMENT PLAN

The environmental impact assessment made in the preceding section has identified the areas where certain control measures are called for to

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minimise the negative impacts. Subsequent paragraphs deals with effective measures proposed to be taken up with regard to the following aspects so that the proposed mining and allied activities can be continued in an environment-friendly manner:

- Land use planning – Afforestation and landscape development
- Air pollution control
- Noise control
- Water pollution control
- Socio-economic aspects

10.4.1 Land use planning

i. Land degradation control measures

Land degradation is one of the major adverse outcomes of opencast mining activities and any effort to control adverse impacts is considered incomplete when appropriate land reclamation strategy is not adopted. Since the land degradation in this mine is partly in the form of excavated void and partly in the form of external and internal dumps, the reclamation strategy must include a programme for the reclamation of the disturbed land.

a) Mined area reclamation

The lessee will have to take necessary steps to keep the area under disturbance at any stage of mining operation to a minimum. This can be achieved by carrying out the reclamation programme simultaneously with excavation. The gap can be reduced between degradation and the reclamation by this programme. The post mining land use of core zone shows that all the disturbed areas will be reclaimed before abandoning the mine.

b) Reclamation procedure

Reclamation procedure has been described stage wise in the following paragraphs. Year wise reclamation programme is as shown in Table 10.9.

TABLE 10.9
PROGRAMME OF EXCAVATED AND BACKFILLED AREA, CUMULATIVE (HA)

Stage/year		Excavated, Ha	Backfilled, Ha
Up to Base year 2009-2020		339.61	29.31
Y-1	2020-21	349.32	56.59
Y-3	2022-23	400.09	127.27
Y-5	2024-25	494.77	227.11

Stage/year		Excavated, Ha	Backfilled, Ha
Y-10	2029-30	765.25	490.25
Y-15	2034-35	993.90	743.17
Y-20	2039-40	1226.53	933.25
Y-25	2044-45	1430.31	1135.25
Y-27	2046-47	1453.00	1159.35
Y-30 PMC	2049-50	1453.00	1243.00

ii. Top soil management

The total topsoil generated will be 8.72 MCuM (B) during the life of the mine. Un-utilized part of the same will be stacked separately in a soil stack pile located near the pits as shown in the respective mine stage plans.

The top soil stockpile will be low height not exceeding 30.00 m and will be grassed to retain fertility. Besides this, there would be temporary stacks near the excavation area and area to be reclaimed which will be made use of for concurrent filling without bringing the topsoil to the soil stack near the OB dump. The generation and disposal of total waste quantities for the life of the mine are shown in Table 10.10.

TABLE 10.10
GENERATION AND DISPOSAL OF TOP SOIL MCUM (BANK)

Year/ Stage	Top Soil generated, MCUM	Top Soil Used "MM3"					
		Emban-kment	Spreading over the backfilled area	Spreading over the OB dump area	Spreading over the GB	Total	Top soil balance in stack
Past (2009-2020)	2.04		0.00	0.50	0.00	0.50	**1.54**
Y-1 (2020-21)	2.10	0	0.00	0.98	0.00	0.98	**1.12**
Y-3 (2022-23)	2.40	0	0.39	0.98	0.00	1.37	**1.03**
Y-5 (2024-25)	2.97	0	1.21	0.98	0.00	2.19	**0.78**
Y-10 (2029-30)	4.59	0	2.77	0.98	0.00	3.75	**0.84**
Y-15 (2034-35)	5.96	0	4.35	0.98	0.00	5.33	**0.63**
Y-20 (2039-40)	7.36	0	5.53	0.98	0.00	6.51	**0.85**
Y-25 (2044-45)	8.58	0	6.82	0.98	0.00	7.80	**0.78**
Y-27 (2046-47)	8.72	0	7.01	0.98	0.00	7.99	**0.73**
Y-30; PMC, 2049-50	8.72	0	7.74	0.98	0.00	8.72	**0.00**

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iii. Post reclamation land use

The post mine reclamation stage land use with reclamation is covered in detail in Table 11.8 of Chapter 11 "Progressive and Post Mine Closure Plan".

iv. Soil conservation measures

The following control measures to prevent soil erosion and wash off of fines from freshly excavated benches and dumps will be adopted:

- Garland drains will be provided around the mine whenever required to arrest any soil from the mine area being carried away by the rain water.
- The bench levels will be provided with water gradient against the general pit slope to decrease the speed of storm water and prevent its uncontrolled descent.
- Special local stone paved chutes and channels will be provided wherever required, to allow controlled descent of water, especially from external dumps.
- Gullies formed, if any, on side of the benches shall be provided with check dams of local stone or sand filled bags.
- The inactive dump slopes will be planted with bushes, grass, shrubs and trees to prevent soil erosion after applying top soil.
- Retaining walls (with gabion, concrete or local stone) will be provided, wherever required, to support the benches or any loose material and also to arrest sliding of loose debris.

v. Afforestation

a) Compensatory afforestation

There is protected forest land involved along the SH166 which is proposed to be diverted and similar social forestry will be developed along the proposed diverted road.

b) Plantation during mining

A plantation program over life of the mine has been planned in a phase wise manner. The mine is already operational and the plantation has already been started.

Details of "land degradation and technical reclamation" and that of "biological reclamation" are given below in Table 10.11 and Table 10.12 respectively.

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TABLE 10.11
LAND DEGRADATION AND TECHNICAL RECLAMATION (CUMULATIVE AREA 'HA')

Stage/year		Land Degraded				Technically Reclaimed Area			
		Excavation	Dump (Extn + Top Soil)	Infra / others	Total	Backfill	Dump (Extn+Top Soil)	Others	Total
Up to Base year 2009-2020		339.61	319.09	147.24	**805.94**	0.00	80.14	129.97	**210.11**
Y-1	2020-21	349.32	336.81	181.94	**868.07**	0.00	156.71	134.34	**291.05**
Y-3	2022-23	400.09	295.78	181.94	**877.81**	63.00	156.71	145.48	**365.19**
Y-5	2024-25	494.77	186.71	181.94	**863.42**	194.36	156.71	154.22	**505.29**
Y-10	2029-30	765.25	186.71	181.94	**1133.90**	445.00	156.71	154.22	**755.93**
Y-15	2034-35	993.90	186.71	181.94	**1362.55**	699.00	156.71	158.12	**1013.83**
Y-20	2039-40	1226.53	186.71	181.94	**1595.18**	888.00	156.71	158.12	**1202.83**
Y-25	2044-45	1430.31	186.71	181.94	**1798.96**	1095.00	156.71	158.12	**1409.83**
Y-27	2046-47	1453.00	186.71	181.94	**1821.65**	1125.00	156.71	158.12	**1439.83**
Post Closure									
Y-30	2049-50	1453.00	186.71	181.94	**1821.65**	1243.00#	156.71	421.94	**1821.65**

TABLE 10.12
BIOLOGICAL RECLAMATION (CUMULATIVE AREA 'HA')

Stage/year		Biologically Reclaimed Area					Forest land (Return)	Un Disturbed/To be left for Public/com Use	Total
		Agriculture	Plantation	Water body	Public / Company Use	Total			
Up to Base year 2009-2020			210.11			**210.11**		238.033	**448.143**
Y-1	2020-21		291.05			**291.05**		240.433	**531.483**
Y-3	2022-23		350.78			**350.78**		244.333	**595.113**
Y-5	2024-25		474.19			**474.19**		244.333	**718.523**
Y-10	2029-30		708.53			**708.53**		244.333	**952.863**
Y-15	2034-35		973.53			**973.53**		244.333	**1217.863**
Y-20	2039-40		1148.53			**1148.53**		244.333	**1392.863**
Y-25	2044-45		1363.53			**1363.53**		244.333	**1607.863**
Y-27	2046-47		1391.71			**1391.71**		244.333	**1636.043**
Post Closure									
Y-30	2049-50	290.889	1311.57	210.00		**1812.46**	4.8	242.424	**2059.683**

 # Out of 1243 ha backfill, 1083.18 ha will be planted while 159.82 will be converted into agriculture.

Out of total Surface OB dump 156.71 ha, 76.57 ha will be planted and 80.14 ha will be converted into agriculture.

^ Besides 151.82 ha of green belt will also be planted. Thus total plantation area will be 1311.57 ha (refer Table 11.6).

** The total agriculture area available out of the backfill 159.82 ha + surface dump 80.14 ha + settling pond 10 ha + road & infrastructure area 10.929 ha+ top soil dump 30 ha will be 290.889 ha*

The common species used for plantation in the region are Pithecelobium dulce, Cocosnucifera, polialthia lingifolia, Morinda tomentosa, Ficus sps, Zizypus, Casuarinasaman, Butea, Tamarindus, Prosophis, Techtona grandis, Acasia sps, Syzygium, Mangifera, Peltophorus, Delonix, Eucalyptus etc.

10.4.2 Air and dust pollution control measures

The SPM, CO, SO_2 and NO_x concentrations are within limits as already discussed earlier. The mining operations and related activities are anticipated to increase the levels of SPM and gaseous pollutants to a limited extent. The control measures to be adopted are mentioned in the following paragraphs:

i. Controlling fugitive dust

Dust particles, which are normally generated during mining operation and transportation, deteriorate the ambient air quality. Adequate control measures are, therefore, proposed to be taken during mining operations, transportation and loading operations. These control measures are discussed as follows:

(a) Mines

a) Dust suppression systems (like water spraying) will be adopted at:
   - Faces while loading

b) Dust extraction systems will be used in Feeder.

(b) Haul roads and stock-piles

- Dust suppression system (like water spraying by Water Tankers) would be adopted at roads, which are used for transportation. Transport vehicles shall be maintained leak proof.
- Suitable dust suppression systems such as mist sprays with or without chemical will be provided at appropriate places for preventing dust pollution during handling and stockpiling of Lignite.
- Transfer points of lignite will be provided with appropriate hoods/chutes to prevent fugitive dust emission.

ii. Preventing dispersal of air borne dust

In addition to the control measures proposed during mining and transportation operations, following steps will be taken to prevent air pollution due to airborne dust:

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- Dense tree belts will be planted around the mine and sites housing handling/ loading facilities.
- Plantation over already mined out area will be done after backfilling as per schedule (with minimum gap between excavation and afforestation)
- Dust masks will be provided as safety measure to the workers, engaged at dust generation points like drills, loading/unloading points, etc.

iii. Measures to mitigate CO levels

It has already been discussed that the concentration of CO in the ambient air is negligible and is far below the prescribed limit of CPCB and is not anticipated to exceed it in future.

Still all heavy and light vehicles shall be tested for pollutants concentration in their exhausts regularly and well maintained. Strict vigil will be kept in and around the operational area for any fire which shall be immediately controlled.

iv. Measures to mitigate NO_x levels

The use of explosives in the mining industry is the main reason of NOx pollution. As the proposed mining operations do not use drilling and blasting, NOX concentration increase is not anticipated.

10.4.3 Noise pollution

a) Measures to control noise pollution

The following control measures will be adopted to keep the ambient noise levels below permissible limits of 75 dB (A).

i. Provision and maintenance of thick tree belts to screen noise.

ii. Avenue plantation within the project area to dampen the noise.

iii. Proper maintenance of noise generating machinery including the transport vehicles will be ensured.

iv. Provision of the air silencer to modulate the noise generated by the machines will be made wherever required.

To protect the workers from exposures to higher noise levels, the following measures will be adopted:

i. Provision of protective devices like ear muffs/ear plugs to those workers who cannot be isolated from the source of noise.

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ii. Confining the noise by isolating the source of noise.

iii. Reducing the exposure time of workers to the higher noise levels.

b) Measures to reduce ground vibrations due to blasting and prevent fly rocks

For the mining operation of lignite, no blasting is required. Hence question of ground vibrations due to blasting does not arise.

10.4.4 Water pollution control measures

a) Effluent from mine

i. To prevent surface and ground water contamination by oil/grease and sewage waste, following control measures are proposed to be implemented:

- Leak proof containers will be used for storage and transportation of oil/grease. In the store also, the container containing oil/grease will be kept in empty, safe and open containers of higher volume than the containers to avoid oil/grease spillage. The area over which oil/grease is handled will be kept effectively impervious. Any wash off from the oil/grease handling area or workshop will be drained through impervious drains, collected in specially constructed pit and treated appropriately to remove any oil/grease and the water will be recycled. The oil grease will be sold to authorized vendors and sludge disposed off in specially constructed pit.
- The sewage waste generated will be drained by underground impervious drains, lead to appropriately design septic tanks and soak pits to prevent any pollution of surface or ground water.

ii. The surface and ground water in and around the mine, loading plant and infrastructure will be regularly tested and appropriate control measures adopted in case of any pollutant is detected above the prescribed limit.

iii. All stacking and loading areas will be provided with proper garland drains equipped with baffles to prevent wash offs from reaching the downstream natural channels.

iv. Septic tanks and soak pits are being adopted for treating the domestic waste water in mine office area and the practice will be continued in future.

b) Storm water

Control measures to be adopted are briefly discussed below:

- Check dams will be provided to prevent solids from wash off and screen if any from the mine related activities.
- Peripheral bunds will be erected on the outer edge of the abandoned benches before reclamation so that the soil is not carried away by storm water.
- A water gradient of about 1 in 100 will be kept at every bench towards inside of the bench to prevent formation of gullies in the bench slopes causing serious erosion.
- Chutes will be constructed by using local stone or masonry to guide the water in areas with loose soil to prevent erosion and uncontrolled descent of water wherever necessary.
- Construction of garland drains around freshly excavated and dumped areas so that flow of water with loose material is prevented. The mine water will be passed through specially constructed settling ponds to arrest any loose material being carried away with water.
- Any areas with loose debris within the lease hold will be planted.

c) Measures to minimise adverse effects on water regime

During the process of mine rehabilitation and with the completion of backfilling, a water body will be created in the mined out pit which will act as water reservoir improving the ground water recharge, source of attraction for fauna and will help in the maintenance of afforested areas. To enhance aesthetic appearance, parks and lawns will be made around the water body.

10.4.5 Socio-economic aspects including resettlement and benefits

The mine expansion will have a positive impact on the socio-economic factors due to the creation of additional jobs, consequent migration of population etc. and improvement of the economic living standards. The manpower required to run the mine at increased capacity of 5.4 MTPA will require total manpower of 1279. The mining operations will result in direct additional employment of more than 200 people and indirectly about 300 persons in employment of these people in associated trading, transportation from mines, afforestation and other contract works. The employment will be given preferably to local people.

As the ML area granted over which the mine has been operation over a long period has mostly settled all the issues of compensation and rehabilitation.

However, GIPCL has formed a trust named DEEP, in which important local persons of eminence are also associated as members, for planning out good rehabilitation and resettlement packages in case of land oustees,

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home oustees (if any) or any other affected persons and neighboring communities. This trust has been doing yeoman services in this respect for almost a decade and numerous socio economic developmental schemes have been successfully implemented by them along with the local population. It is proposed to extent their operations for this mine also.

Besides, there will be additional facilities available to the local population by way of better communication, postal services, higher educational facilities, advanced medical facilities etc. The State and the Central Government will benefit through financial revenues worth Crores of rupees by pay of taxes, royalty etc. from the direct and indirect operations in the project area.

10.5 MONITORING SCHEDULE OF EMP

i. In order to keep a watch on the environmental control measures discussed about air quality, water quality and noise level monitoring shall be done regularly every year by taking measurements near the mine and residential areas preferably close to some of the earlier stations so as to keep a comparative check with respect to the base line data. For air quality monitoring, continuous monitoring on 24 hours sampling basis should be done for two days per week and analytical checks made for SPM, SO_2, NO_x and CO.

ii. For effective management of the environment, it is envisaged to have an organisational set-up under the administrative supervision of the Mines Management where responsibilities can be delegated to technical personnel like Mining Engineer, Geologist/Chemist and Horticulturist with regard to specific aspects of environment management plan.

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CHAPTER 11

MINE CLOSURE PLAN

11.1 INTRODUCTION

1st the Mining Plan for Mangrol-Valia Lignite Mine was approved on 23-01-2001 by MoC for production capacity of 4.20 MTPA and the ML area proposed in approved Mining Plan was 2080 Ha comprising of 1210 Ha (Block-B) Mangrol and 870 ha (Block C+D) Valia.

MOC approval for Grant of Mining Lease for Mangrol-Valia Lignite Mine was given vides MOC letter no. 48024/3/98-Lig. (pt.) dt. 31-10-2001 and mentioned reduced ML area of 2067.48 Ha comprising 1210 Ha (Block-B) Mangrol and 857.48 Ha (Block C+D) Valia.

However, the actual lease granted (agreement signed) by the Gujarat Government (2004/ 2006) is for 2059.68.29 Ha.

Till date, three Mining plans have been approved by MOC. The first revision (2009 version, 3710 HA) for expansion from 4.2 to 7.4 MTPA, was approved by MOC on 08.06.2010.

The 2nd revision Mining Plan & Mine Closure (2015 version, 7.4 MTPA, with reduced area 3019 HA, reducing dump area as suggested by EIA committee) was approved by MOC on 23/11/2015 for production capacity of 7.4 MTPA.

The first and the 2nd revision could not be implemented due to pending environmental clearance. Now, one of the approved EUP, viz. Phase-2 SLPP 2X300MW is not coming up, as the decision has been deferred indefinitely on account of non acquisition of additional 959.00 Ha areas of the additional applied leases.

The current Mining Plan (3rd Revision) (including Mine Closure Plan) is for a reduced production capacity of 5.4 MTPA (as one of the EUP not coming up) is the 4th Mining Plan. This MP envisages the ML area of 2059.68.29 Ha, which has already been granted to GIPCL.

i. Name of applicant with complete address:

The name and address of the applicant Company is given in Table 11.1 below:

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TABLE 11.1
NAME AND ADDRESS OF THE COMPANY

Registered Office	Office
M/s Gujarat Industries Power Company Ltd.	**M/s Gujarat Industries Power Company Ltd.**
Address: P.O. Petrofils - 391 347 District Baroda	SLPP, AT & Post : Nani Naroli, Taluka: Mangrol, District: Surat, Gujarat.
Phone: 0265-372768, 373213, 373159	Phone: 02629-261.87
Fax: 0265 - 373207	Fax: 02629-261112
Email: genbaroda@gipcl.com Website: www.gipcl.com	Email: cgmminesoffice@gipcl.com

ii. Status of the Applicant:

Gujarat Industries Power Company Ltd.GIPCL is a Public Limited Company incorporated under Companies Act, in the year 1985 under Gujarat Government.

iii. Minerals which are occurring in the area and which the applicant intends to Mine:

Lignite

iv. Location of End Use Plant (Existing and/or Proposed), their requirement and source to fill the gaps

The details of the existing EUP are given in Table 11.2.

TABLE 11.2
NAME WITH LOCATION OF END USE PLANT AND REQUIREMENT OF LIGNITE AS PER ALLOTMENT LETTER

Sl. No.	Company Name	End Use plant, Name, location, Production capacity & distance
1	**Gujarat Industries Power Corporation Ltd.**	Existing: Surat Lignite Power Plant (SLPP) Station -1 of 2X125 MW at Nani Naroli, Dist. Surat SLPP Station-2 of 2X125 MW, Proposed Expansion: SLPP Station-3 of 2X125 MW, within the existing SLPP Stations.

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v. Norms used for Computing Consumption:

The norms of calculation are given in Table 11.3.

TABLE 11.3
CALCULATION OF REQUIREMENT OF LIGNITE BASED ON STATION HEAT RATE

Particulars	Klinker "MTPA"	Power Plant "MW"						Blast Furnace "Mtpa"
MTPA							Total	
Capacity of the end use plant		125x6					750	
Capacity of the Project "MTPA"	5.40							
Raw Coal availability from this project "MTPA"		5.40					5.4	
Washed coal availability "MTPA"		0.00					0.00	
Reject "MTPA"		0.00					0.00	
Station Heat Rate "K Cal/Kwhr		2710					2710 0	
Avg Calorific Value of Coal "Kcal/Kg"								
Raw coal		2800					2800	
Washed coal								
Rejects								
Specific consumption "Kg/Kwhr"		0.97					0.97	
Plant Load Factor/ Capacity Utilisation		0.85					0.85	
Coal Requirement "MTPA"		**5.40**					5.40	

Total requirement for the end use plants "MTPA"	5.40

Source of coal requirement

Coal from this project "MTPA"	5.40
Linkages/ E-auction from CIL "MTPA"	
Other block of the Company "MTPA"	0.00*
Total availability "MTPA"	5.40

* ***Presently, 0.60MTPA is supplied from Vastan Lignite Mine of GIPCL which will exhaust by 2024-25, production phasing accordingly done.***

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vi. Annual target Lignite production

Target production capacity is 5.40 MTPA

vii. Name of RQP preparing Mining Plan and Mine Closure Plan:

The particulars of RQP are given below:

Name	:	Mr. B. D. Sharma
Address	:	A-121, Paryavaran Complex, IGNOU Road New Delhi – 110030
Phone	:	29534777, 29532236, 29535891
Fax	:	091-011-29532568
E-mail	:	mining@minmec.com; minmec@gmail.com
Web site	:	http://www.minmec.co.in
Registration Number	:	No. 34012(03)/2014-CPAM

Date of grant / renewal: 29th May, 2015, valid up to 28th May, 2025

(Copy of RQP certificate is attached as **Certificate V**).

viii. Location of Mine:

Mangrol-Valia Lignite Mine of M/s Gujarat Industries Power Company Ltd. is located in villages Mangrol, Shah, Charetha, Amandera, Harsani, Timberwa, Bhilwada, Nani Pardi, Luna, Dansoli, Rajgarh and Kosmadi in Mangrol and Valia Taluka of Surat and Bharuch Districts of Gujarat between Latitudes 21°26'19.47"N to 21°31'29.90"N Longitudes 73°07'12.19"E to 73°12' 53.16"E (Source: No. G.S./Mining Lease/Geo Reference/20/21/686 dt 04-03-2020 from G&M Office, Surat and No. AG./BH/M L/ Geo Reference /19-20/780 dt. 19-03-2020 from G&M Office, Bharuch) (**Annexure II-B1 & II-C1**) and Plate II-A and II-B, respectively). The block is also connected to National Grid, (**Annexure XVIII-G**) and is covered under Survey of India Toposheet No. 46 G/2 and G/3 (Ref. Para 2.8.1 of RAMP, 2015). A map showing the location of the projects is enclosed as Plate I.

ix. Communication & accessibility:

This block is about 55 Kms from Surat, the District Head Quarter and about 48 kms South of Rajpardi. The site can be approached from National Highway (NH-8) connecting Kim Four Road Junction (Kim Char-Rasta), which lies between Surat and Bharuch to Mumbai and Ahmedabad. The major road connecting Mangrol and Kim via Tadkeshwar passes through

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the property. Kosamba is the nearest Rly station (about 28km west) on Baroda-Mumbai railway line of western railway.

x. Summary details of the Lignite Block Area:

Present land use of ML area is given below in Table 11.4 (Updated as per Email of August 22, 2017).

TABLE 11.4
PRESENT LAND USE OF ML AREA AS ON 01-04-2020

Sl. No.	Particulars	Area in Hectares			
		North Pit	Central Pit	South Pit	Total Area
1	Mining Pit	205.29	0.00	134.32	**339.61**
2	Dumps including top soil dump**	208.95	0.00	80.14	**289.09**
3	Infrastructure (Site office, Contractor's Camp, First Aid Centre, Shelters, Pumping Station, Lignite Crusher, Lignite Stack, Weighbridge, Electric Substation)	0.42	0.00	3.48	**3.90**
	Sub Total (1 to 3)	**414.66**	**0.00**	**217.94**	**632.60**
4	Green Belt (common for all pits)	129.97			129.97
5	Service Road, Lignite Transport Road (Common for all pits)*	9.92			9.92
6	Settling Pond	3.45			3.45
	Sub Total (4 to 6)	**143.34**			**143.34**
7	**Total Disturbed Area (1 to 6)**	**775.94**			**775.94**
	Rationalisation area/ Undisturbed area (out of 2059.6829 ha)	**1283.7429**			**1283.7429**
	Total ML/ Project area	**2059.6829**			**2059.6829**

* ***Out of 9.92 ha, 3.00 ha belongs to North pit and 6.92 ha belongs to South pit.***
** ***Top soil dump area near North Pit is 20 ha (part of OB dump) and near South pit is 10 ha (part of OB dump).***

11.1.1 Reasons for Closure

Mangrol-Valia Lignite Mine is in operation since December 2009. Therefore Progressive Mine Closure Plan is described along with the coverage of

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activities to be taken care of at the closure stage. Reasons for Mine Closure can be exhaustion of mineral, lack of demand, uneconomic operations, natural calamity or directives from a statutory organization.

11.1.2 Statutory obligations

It is an operational mine.

I. **Clearances/ permissions already received:** Following Statutory letters have been already obtained:

A. Grant of ML for Mangrol Valia Lignite Block by Govt. of Gujarat vide letter no dated MCR-1098-1108-CHH-1 dated 06/04/2004 for 350 Ha, MCR-1098-1109-CHH-dated 06-04-2004 for 507.48 Ha and MCR-1092-(G-8)-3626-CHH-1 dated 25/10/2005 for 1210 Ha. **(Annexure XVI-A)**

B. Mining Lease Deed agreement with Government of Gujarat executed on 06/10/2004 for 507.48 Ha, 03/12/2004 for 342.3689 Ha and 24/04/2006 for 1209.8340 Ha. **(Annexure XVI-B)**

C. Environment Clearance from the Ministry of Environment And Forests vide their letter ref no. J-11015/38/99-IA.II (m) dated 21/07/2003 in lieu of the 1st Mining Plan (2000) for 4.2 MTPA Copy of the EC attached as **Annexure XIX.**

D. The 1st (2000 version), Mining Plan for the Proposed Lignite Mine (Valia and Mangrol Areas) was approved by MOC vide letter no. 48024/3/98-Lig. dt. 23/01/2001 for a production of 4.2 MTPA over an area of 2080 Ha (**Annexure IV-A**).

E. The 1st revision (2009 version, 3710 HA), Mining Plan for Mangrol Valia Lignite Mine Expansion (from 4.2 to 7.4 MTPA), was approved by MOC vide letter no. 48024/3/98-Lig. (Part) dt. 08.06.2010. (**Annexure IV-B**).

F. The 2nd revision (26th February, 2015, 3019 HA), Mining Plan for Mangrol Valia Lignite Mine (2nd Revision) & Mine Closure Plan for Production of 7.4 MTPA was approved by MOC vide letter no. 48024/3/98-Lig. (Pt II) dt. 23-11-2015 (**Annexure IV-C**).

G. MoC Approval for grant of ML for 2067.48 ha ML dt. 31-10-2001 (**Annexure I**)

The Statutory Obligations under above letters and corresponding compliance are as follows:

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A. Grant of ML for Mangrol Valia Lignite Block by Govt. of Gujarat vide letter no dated MCR-1098-1108-CHH-1 dated 06/04/2004 for 350 Ha, MCR-1098-1109-CHH- dated 06-04-2004 for 507.48 Ha and MCR-1092-(G-8)-3626-CHH-1 dated 25/10/2005 for 1210 Ha. (Annexure XVI-A)

Sl. No.	Conditions	Compliance
I	For ML Deed of 350 ha and for ML Deed of 507.48 ha	
a)	Mining Lease shall be in respect of Lignite only. If any other minerals are found in association with this mineral, they should be brought to the notice of the Government, and if the lessee desires to mine these minerals along with the mineral for which lease is grant he should do so only, after the consent of the State Government is obtained in writing.	Shall be complied
b)	Royalty at the rate specified for the mineral Lignite Schedule IInd of the Mines and Minerals (Regulation and Development) Act, 1957 as amended from time to time and dead rent at the rates mentioned in the IIIrd Schedule of the said, act, as amended from time to time whichever is greater shall be charged, provided that the dead rent shall not be payable for the first year of the lease.	Shall be complied
c)	Surface rent and water rate at such rate not exceeding land revenue, water rate and cesses assessable in the land shall be charged.	Noted
d)	If Beryl or any other substances prescribed under section 3 of the Atomic Energy Act, 1948 (XXIX of 1948) is found to occur in the property under the lease the lessee shall make available such Mineral to Government.	Shall be complied
e)	The lease shall be subject to the provisions of the Mines and Minerals (regulation and Development) Act.1957 (67 of 1957), the Mineral Concession Rules, 1960 and the Minerals Conservation and Development Rules, 1958 as amended from time to time.	Noted
f)	The lessee shall furnish to the Collector of Surat an accurate map of the area sanctioned under the lease together with the description giving the situation and boundaries duly attested by the District Inspector of Land Records. The Collector is authorized to get the area demarcated before execution of the Mining Lease and recover the cost	Shall be complied

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Sl. No.	Conditions	Compliance
	from the deposit of Rs. 1000/- paid for preliminary expenses.	
g)	The lessee shall pay to the Collector, necessary security deposit of Rs. 2000/- for the observance of the terms and conditions of the Lease in accordance with rule 32 of the Mineral Concessions Rules, 1960 before the Lease is issued to him.	Shall be complied
h)	The lessee shall submit confidentially from time to time or when required progress report to the Commissioner of Geology and Mining, Gujarat or to an officer authorized by him along with the samples of the Ores collected during mining operations together with the analysis report.	Shall be complied
i)	The lessee shall not use or sell the said Mineral or deal with it in whatsoever manner or knowingly allow anyone to use or sell said mineral or deal with it in whatsoever manner as a minor mineral.	Shall be complied
j)	The lessee shall use all the Lignite excavated from the said area for captive use in his existing proposed power plant in Surat District in Gujarat state.	Shall be complied
k)	The lessee shall establish power plant within a period of two years. If the plant is not established within a stipulated period, the Lease will be Liable for cancellation without notice.	Plant is already existing
l)	If the area is likely to be submerged on account of the Loan to be considered in near future the lessee shall on demand by Government or an Officer authorized by the Government or the Collector, surrender the Mining Lease forthwith without claiming any compensation of any kind including inter-alia any claims for land, minerals, machineries, equipments or for loss of business or trade.	Shall be complied
(2)	The lessee shall also abide by the following additional conditions viz.	Compliance as follows
(a)	The undertaking given by the applicant party in the undertaking-cum-indemnity bond are fully compiled with and	Shall be complied
(b)	The mining of lignite shall be undertaken by the applicant party themselves and the lignite mined out shall be for an exclusive generation of power.	Shall be complied

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Sl. No.	Conditions	Compliance
(c)	The lessee shall also take the effective implementation of the environmental safeguards as laid down in the office Memorandum No. J-11015/38/99-I (A).II (M) dated 21/7/2003 of Ministry of Environment and Forests, Government of India	Shall be complied
(d)	The lessee shall transfer Land into non agriculture before lease agreement for Mining of Lignite.	Lease agreement already done
(e)	The lessee shall undertake Mining/Excavation for Lignite through Gujarat Mineral Development Corporation Limited.	Shall be complied
II	**For an area of 1210 ha**	**Compliance**
a)	The mining lease shall be in respect of Lignite only. If any other minerals are found in association with this mineral, they should be brought to the notice of the Government, and if the lessee desires to mine these minerals along with the mineral for which lease is granted he should do so only, after the consent of the State Government is obtained in writing.	Shall be complied
b)	Royalty at the rate specified for the mineral Lignite Schedule IInd of the Mines and Minerals (Regulation and Development) Act, 1957 as amended from time to time and dead rent at the rates mentioned in the IIIrd Schedule of the said, Act, as amended from time to time whichever is greater shall be charged, provided that the dead rent shall not be payable for the first year of the lease.	Shall be complied
c)	Surface rent and water rate at such rate not exceeding land revenue, water rate and cesses assessable in the land shall be charged.	Shall be complied
d)	If Beryl or any other substances prescribed under section 3 of the Atomic Energy Act, 1948 (XXIX of 1948) is found to occur in the property under the lease the lessee shall make available such mineral to Government.	Shall be complied
e)	The lease shall be subject to the provision of the following Act and Rules:	
i)	The MMDR Act, 1957 and MCR Rules, 1960	Shall be complied
ii)	The Mineral Conservation and Development Rules, 1988	Shall be complied
iii)	The Mines Act, 1952 and Rules made thereunder.	Shall be complied

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Sl. No.	Conditions	Compliance
iv)	Environment (Protection) Act, 1986 and Rules framed thereunder	Shall be complied
v)	Forest (Conservation) Act, 1980 and Rules framed thereunder	Shall be complied
vi)	Environmental Impact Assessment Notification dated 27.1.1994 and orders/notifications issued thereafter in this regard by Ministry of Environment & Forest	Shall be complied
vii)	Bombay Land Revenue Code – (1869)	Shall be complied
viii)	Gujarat Panchayat Act, 1961	Shall be complied
ix)	Indian Registration Act, 1908	Shall be complied
x)	Bombay Stamp Act, 1958 and any laws implemented in area by respective department of the State Government/Central Government as amended from time to time.	Shall be complied
f)	The lessee shall furnish to the Collector of Surat an accurate map of the area sanctioned under the lease together with the description giving the situation and boundaries duly attested by the District Inspector of Land Records. The Collector is authorized to get the area demarcated before execution of the Mining Lease and recover the cost from the deposit of Rs. 1000/- paid for preliminary expenses.	Shall be complied
g)	The lessee shall pay to the Collector, Surat necessary security deposit of Rs. 10,000/- for the observance of the terms and conditions of the lease in accordance with rule 32 of the Mineral Concessions Rules, 1960 before the lease is issued to him.	Shall be complied
h)	The lessee shall submit confidentially from time to time or when required progress report to the Commissioner of Geology and Mining, Gujarat State, Gandhinagar or to an officer authorized by him along with the samples of the ores collected during mining operations together with the analysis report.	Shall be complied
i)	The lessee shall not use or sell the said Mineral or deal with it in whatsoever manner or knowingly allow anyone to use or sell said mineral or deal with it in whatsoever manner as a minor mineral.	Shall be complied

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Sl. No.	Conditions	Compliance
j)	If the area is likely to the submerged on account of the dam to be considered in near future the lessee shall on demand by Government or the Collector surrender the mining lease forthwith without claiming any compensation of any kind including inter-alia any claim for land, minerals, machineries, equipments or for loss of business or trade.	Shall be complied
k)	The lessee also undertakes that if the lignite won from the leased area is not required for an industrial unit to be set up himself, the shall deliver the lignite for utilization in any industrial plant set up by any other party within Gujarat to whom the State Government (on notice of not less than six months) may direct the lessee to deliver the Bauxite and in such event the price and other terms of such supply arrangement on long term basis shall be mutually agreed upon, between the lessee and such other party in regard to the said supply arrangements, the point at dispute shall be settled by the State Government and in case the lessee is still aggrieved by the decision of the State Government on such point, the lessee shall have the right to appeal to the Central Government.	Shall be complied
l)	The lessee shall use all the Lignite excavated from the said area for captive use in his proposed/existing plant in Surat District in Gujarat State.	Shall be complied
m)	The lessee shall obtain Non-Agriculture permission from the competent authority and lessees shall obtain consent of the private land owners before lease-deed executed.	Shall be complied

B. **Mining Lease Agreement with Government of Gujarat on 06/10/2004 for 507.48 Ha, 03/12/2004 for 350 Ha and 24/04/2006 for 1210 Ha. (Annexure XVI-B).**

Compliance: Compliance to the conditions is attached as **Annexure XVI-B.**

C. **Environment Clearance from Ministry of Environment and Forests, New Delhi vide their letter ref no. J-11015/38/99-IA.II (M) dated 21/07/2003. Copy of the EC attached as Annexure XIX).**

Compliance: **"Certification of** Compliance" to conditions of EC dt. **21/07/2003** is issued by Bhopal Office of Ministry of Environment, Forest

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& Climate Change regional office, vide letter no. 3-32I20I21ENV)/ I 3 I, dt. 10.3.2015 and is attached (**Annexure XIX**).

D. Mining Plan of 4.2 MTPA, approved by Ministry of Coal, Government of India, New Delhi vide letter No. 48024/3/98-Lig dated 23-01-2001 (Annexure IV-A).

Sl. No.	Conditions	Compliance
1.	GIPCL will set up 750 MW capacity for which necessary approval already exists with the party.	500 MW capacity already set up. The decision for additional 125x2 MW already taken

E. Revised Mining Plan (1st Revision) expansion from 4.2 MTPA to 7.4 MTPA, approved by Ministry of Coal, Government of India, New Delhi vide letter No. 48024/3/98-Lig dated 08-06-2010. (Annexure IV-B).

Sl. No.	Conditions	Compliance
1.	The mining company shall take all necessary precautions regarding safety of mine workings, persons deployed therein.	Shall be complied
2.	Mining Lease to be acquired shall not encroach into any other coal block	Shall be Complied.
3.	The approval of the Mining Plan is without prejudice to the requirement of approvals from the competent/ prescribed authority under relevant rules/regulations etc.	Noted for compliance

F. Revised Mining Plan expansion (2nd Revision) from 4.2 MTPA to 7.4 MT over reduced area of 3019, approved by Ministry of Coal, Government of India, New Delhi vide Letter No. 48024/3/98-Lig dated 23-11-2015 (Annexure IV-C).

The conditions imposed with the Approval Letter no. F.no.48024/3/98-Lig. Dt 23rd November 2015 which is reproduced below:

Sl. No.	Conditions	Compliance
1.	The mining company shall take all necessary precautions regarding safety of mine workings, persons deployed their in	Shall be compiled
2.	Mining lease to be acquired shall not encroach into any other Lignite I block	Shall be complied
3.	The approval of the mining plan and mine	Noted

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Sl. No.	Conditions	Compliance
	closure plan is without prejudice to the requirement of approvals from competent/prescribed authority under the relevant rules/regulations etc.	

G. MoC Approval for grant of ML for 2067.48 Ha. ML dt 31-10-2001 (Annexure I).

Compliance: No condition imposed.

The clearance from State Board of Pollution Control has also been obtained.

The Environment Clearance for 4.2 MTPA was accorded on 21/07/2003.

This Mangrol Valia lignite mine with ML of 2059.6829 Ha, is being operated by GIPCL since December' 2009.

The current Mining Plan has been prepared for the existing ML but for an expanded capacity of up to 5.4 MTPA as against 4.2 MTPA of EC.

Statutory obligations still to be received

As the mine is operational since December, 2009, all the clearances/ permissions have been obtained for 4.2 MTPA. The environment and other clearance/ permission will be required and obtained in future for the increased targets.

11.1.3 Closure plan preparation

The Progressive Mine Closure Plan and Mine Closure Plan have the approval of the Board of Directors of the Company and the relevant document is attached as **Annexure III**.

11.2 MINE DESCRIPTION

Mine description comprises Geology, Reserves, Mining Method and Beneficiation. Geology and reserves are already covered under Chapter 4 and Mining method under Chapter 5.

11.3 MINE CLOSURE PLAN

11.3.1 Mined out land

a) Details of "land degradation and technical reclamation" and that of "biological reclamation" are given below in Table 11.5A and Table 11.5B respectively.

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TABLE 11.5A
LAND DEGRADATION AND TECHNICAL RECLAMATION (CUMULATIVE AREA 'HA')

Stage/year		Land Degraded				Technically Reclaimed Area			
		Excavation	Dump (Extn + Top Soil)	Infra / others	Total	Backfill	Dump (Extn+Top Soil)	Others	Total
Up to Base year 2009-20		339.610	319.090	147.240	**805.940**	0.000	0.000	129.970	**129.970**
Y-1	2020-21	349.320	336.810	158.160	**844.290**	0.000	76.570	134.340	**210.910**
Y-3	2022-23	400.090	295.780	174.100	**869.970**	63.000	76.570	150.280	**289.850**
Y-5	2024-25	494.770	186.710	182.840	**864.320**	194.360	76.570	159.020	**429.950**
Y-10	2026-30	765.250	186.710	182.840	**1134.800**	445.000	76.570	159.020	**680.590**
Y-15	2031-35	993.900	186.710	182.840	**1363.450**	699.000	76.570	159.020	**934.590**
Y-20	2036-40	1226.530	186.710	186.740	**1599.980**	888.000	76.570	162.920	**1127.490**
Y-25	2041-45	1430.310	186.710	186.740	**1803.760**	1095.000	76.570	162.920	**1334.490**
Y-27	2046-47	1453.000	186.710	186.740	**1826.450**	1125.000	76.570	162.920	**1364.490**
Post Closure									
Y-30	2048-50	1453.000	186.710	186.740	**1826.450**	1243.000	156.710	426.740	**1826.450**

TABLE 11.5B
BIOLOGICAL RECLAMATION (CUMULATIVE AREA 'HA')

Stage/year		Biologically Reclaimed Area					Forest land (Retrun)	Un Disturbed/ To be left for Public/ com Use	Total
		Agriculture	Plantation	Water body	Public / Company Use	Total			
Up to Base year 2009-20			129.970			**129.970**		233.233	**363.203**
Y-1	2020-21		210.910			**210.910**		233.233	**444.143**
Y-3	2022-23		275.440			**275.440**		235.633	**511.073**
Y-5	2024-25		398.850			**398.850**		235.633	**634.483**
Y-10	2026-30		633.190			**633.190**		235.633	**868.823**
Y-15	2031-35		898.190			**898.190**		235.633	**1133.823**
Y-20	2036-40		1073.190			**1073.190**		239.533	**1312.723**
Y-25	2041-45		1288.190			**1288.190**		239.533	**1527.723**
Y-27	2046-47		1316.370			**1316.370**		239.533	**1555.903**
Post Closure									
Y-30	2048-50	290.889	1311.570	210.000		**1812.459**	4.800	242.424	**2059.683**

* *290.889 ha area will be the total agriculture area available in PMC, comprising 159.82 ha out of the backfill area + 80.14 ha out of surface dump area + 10 ha settling pond area + 10.929 ha out of road & infrastructure area + 30 ha top soil dump.*

** *1311.57 ha area will be the total plantation area available in PMC, comprising 1083.18 ha out of backfilled area + 76.57 ha out of external dump + 151.82 ha out of green belt. Besides 4.80 ha plantation will be returned to Forest.*

\# *242.424 ha area will be the total area under "Un Disturbed/To be left for Public/com Use" in PMC, comprising 233.233 ha (Undisturbed on base date 31-3-2020) + 2.400 ha (SH Rd diversion in 3rd yr) +3.900 ha North Rd diversion in 20th year + 2.891 ha (Company facilities retained for Public use in PMC)*

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i). Surface OB Dump Reclamation

The surface dump will remain in place up to the last year of OC mine operation and will be planted/ afforested with trees. The surface dump trees will be cut with the permission of concerned authorities before rehandling it for backfilling during the post OC mine closure period (28th to 30th year).

ii). Proposal for reclamation (physical and biological) and rehabilitation of mined area

Reclamation procedure has been described stage wise in the following paragraphs.

The proposal is described step wise in following paragraphs:

- **Step-I: Disposal of OB waste**

The OB waste will be unloaded by dumpers at the edge of the spoil bench in the direction of the advance of the dumping. The material dumped will form heaps (dumper loads) of the dump material. This formation of undulating area will be restricted to about a 50m wide belt at the edge of the spoil bench.

- **Step-II: Levelling of spoil bench**

The heaps created by the OB disposed by dumpers will be levelled by dozers. Appropriate provision of dozers has been made. The dozers will level this area making it ready for the next step of rehabilitation of dumps.

- **Step-III: Transportation and unloading of top soil at reclamation dump site/spoil bank and levelling of top soil heaps**

After the leveling of OB heaps is completed by the dozers, laying of topsoil will be undertaken. The topsoil will preferably be directly brought from the freshly excavated area for the purpose of maximum benefit. In case it is not adequate, the top soil deficiency will be made up from the top soil stack, for which provision has been made. The top soil brought to the reclamation dump site and unloaded will also be in the form of heaps.

Dozers will be deployed for leveling the top soil. It is proposed to lay about 0.5m-1m thick layer of top soil during leveling.

iii). Step IV: Biological reclamation

After leveling of top soil, the technical reclamation is complete. The next step will be biological reclamation comprising plantation of grasses, legumes, herbs and trees. All these species will preferably be local. Before

planting the trees, dug pits will be made and filled with top soil mixed with manure. Thus the area will be prepared for plantation before the onset of monsoon. The plantation will then be done during June/July after the 1st rain showers.

All the above steps have been explained by a section presented in Fig 11.1 below:

DEPICTION OF METHOD OF PHYSICAL AND BIOLOGICAL RESTORATION/ RECLAMATION/ REHABILITATION

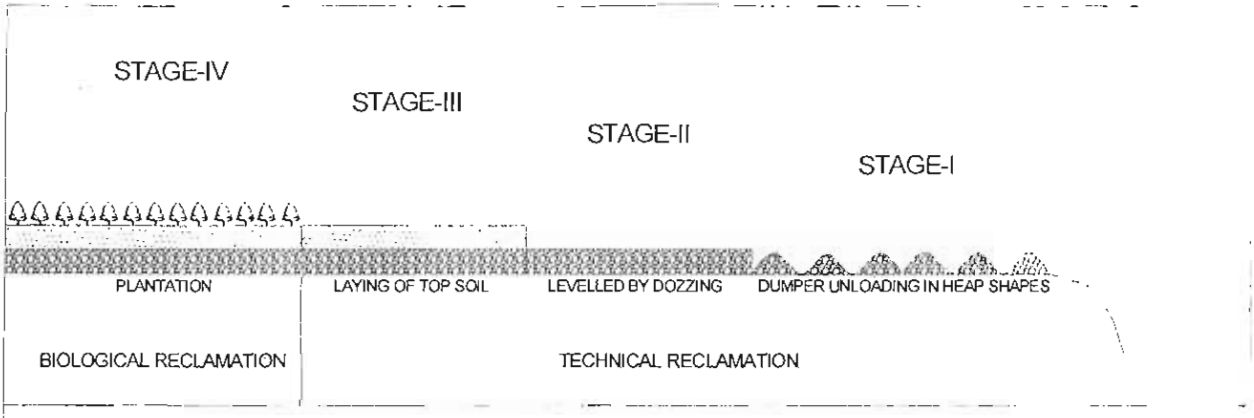

FIG 11.1: SECTION SHOWING VARIOUS STAGES OF RECLAMATION

b) Post reclamation land use

The first step in a successful reclamation programme is to decide the post reclamation land use.

The post mining land use with environment management is given in Table 11.6 which shows that in post mining stage, all the disturbed areas will be reclaimed before abandoning the mine excluding the small void.

The plan showing post mine land use is given in Plate XII while the reclamation plan at the end of mine is given in Plate XIV.

c) Afforestation

i) Compensatory afforestation

There is protected forest land involved along the SH166 which is proposed to be diverted and similar social forestry will be developed along the proposed diverted road.

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TABLE 11.6
PRE-MINING, DURING MINING, END OF MINING AND POST MINE CLOSURE LAND USE

Sl. No.	Pre[Mining Landuse "Ha"			Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
							Agricultural Land	Plantation	Water body	Public/ Company Use	Forest Land (Returned)	Undist-rubed	Total
1	Tenancy	Agricultural	1953.3426	Excavation Area	1453.00								0.00
2		Township		Backfilled Area		1243.00	159.82	1083.18					1243.00
3		Grazing		Excavated Void		210.00			210.00				210.00
4		Barren	23.5393	Without plantation			0.00						0.00
5		Water body	0.5	Top Soil Dump	30.00	30.00	30.00						30.00
6		Road		External Dump	156.71	156.71	80.14	76.57			0.00		156.71
7		Community		Safety Zone		0.00							0.00
8		Inhabitated		Haul Road between quarries		0.00							0.00
9		Village		Road diversion	6.30	6.30				6.30			6.30
		Sub Total	**1977.3819**	Diversion/ below River/Nala/ canal									0.00
1	Govt. Non Forest	Agricultural		Settling pond	10.00	10.00	10.00						10.00
2		Township		Road & Infrastructure area	13.820	13.820	10.929			2.891			13.82
3		Grazing/ others	67.3818	Rationalisation area		0.00							0.00
4		Road	10.1192*	Garland drains		0.00							0.00
5		Water body		Embankment		0.00							0.00
6		Others		Green Belt	156.62#	156.62		151.82			4.80		156.62
		Sub Total	**77.501**	Water Reservoir near pit		0.00							0.00

Sl. No.	Pre[Mining Landuse "Ha"			Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
							Agricultural Land	Plantation	Water body	Public/ Company Use	Forest Land (Returned)	Undist-rubed	Total
1	Forest	Reserve		UG entry		0.00							0.00
2		Protected Forest	4.8000**	Undisturbed/Mining right for UG	233.233	233.233						233.233	233.233
		Sub Total	**4.8**	Resettlement		0.00							0.00
				Pit head power plant		0.00							0.00
				Water harvesting		0.00							0.00
				Agricultural land		0.00							0.00
		Grand Total	2059.683	Total	2059.683	2059.683	290.889	1311.57	210.00	9.191	4.80	233.233	2059.683

Note: The total agriculture area available out of the backfill 159.82 ha + surface dump 80.14 ha + Settling pond 10 Ha + Road & Infrastructure area 10.929 ha+ Top Soil Dump 30 ha will be 290.889 ha

* *10.1192 ha road area includes 2.68 ha area of SH166.*

** *4.80 ha social forestry along the existing SH166*

\# 156.62 *ha includes 4.80 ha social forestry along the existing SH166*

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ii) Plantation during mining

A plantation program over life of the mine has been planned in a phase wise manner. The mine is already operational and the plantation has already been started. The plantation will be done during the future for each stage plan. The yearly/ stage wise reclamation during the various years and stages of the mining project is as shown under para 11.3.1 in Table 11.5A & 11.5B above.

The plan showing mine closure at the abandoned stage is given Plate XII along with cross sections at different stages (Plate XIII-K). Final pit floor is given in Plate XVI.

d) Green Belt details

The year/stage wise green belt details are given under para 11.3.1 of Table 11.5A & 11.5B above. The total area under green belt will be 151.82 Ha. To fulfill the requirements of nursery plants, a nursery will be established at the site. During peak requirements, additional plants will be transported from Govt. / Forest nurseries, located around the area.

11.3.2 Water quality management

The surface water and ground water data of the area indicate that the samples are quite normal and free of any pollution of serious nature. In spite of operating mines in this area the water quality doesn't indicate adverse impact and pollution due to the mining. This is also confirmed from the monitoring reports.

Due to predominant presence of clay in the area, the ground water inflow into the mine will be less. Adequate pumping system has been planned to deal with the mine water. The working benches have been designed at a gradient of 1 in 100 so that the entire water from these benches would flow towards the sump. This would ensure that working faces and haul roads will remain dry as far as possible. Layout of quarry provides suitable gradient along quarry floor and benches to facilitate self drainage of water to lower level of quarry. Proper drains shall be dug along both sides of haul roads to keep them dry. Main sump at lowest point of quarry will have sufficient capacity to accommodate entire make of water.

The oil and grease contaminated water can contaminate the ground water if appropriate control measures are not taken.

Impact on water quality

Impact on water quality due to the project operations can occur due to:

a) Generation of industrial effluent water from workshop, service building and pumped out mine water with suspended particles,

b) Washouts from over-burden, lignite stockpile etc.

c) Changes in the hydrological cycle of the area.

d) Sudden outburst of confined or semi confined aquifer which may be present in the area.

The direct impact on human beings due to poor water quality can lead to diarrhea, jaundice, dysentery, etc.

a) Surface water regime

Kim River is the only water body traversing on the Southern side of the Mining Lease area, which is a seasonal river, carrying water only during monsoon. As per the mining scheme planned, this river will not be diverted and suitable statutorily prescribed barriers will be left for safe mining.

Another small stream, Tokri River, is passing outside the North-Western side of the Mangrol-Valia Mining lease area, Bhaga River is passing outside the North Eastern of the Mangrol-Valia Mining lease area and Shah Nallah is passing through the South Western side of the Mangrol-Valia Mining lease area.

These rivers/streams generally control the drainage of the area.

b) Ground water

A detailed hydrological investigation including pump test was conducted in the area and from the hydrological investigation the following observations are made for preparation of the Mining Plan.

Salient points are placed below:

- There are three hydrological horizons in the area viz. Deccan Traps, Tertiary Limestone and Sandstone and Quaternary Alluvial formations. Although, clay is present in large part of the area, but do not form aquifer.
- The depth of water table varies from 2.10m bgl to 19.10 m bgl.
- The general slope of water table in the area is from Mangrol to Rajgarh (from NE to SW)
- The pumping test reveal the following:
  - In Deccan Traps/Basalt, the movement of ground water is controlled by the presence of fractures and joints at moderately shallow depth.

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- The specific capacity in the Deccan Trap is 0.056m^3/min/m: Transmissivity is of 59-66 m^2/day and Permeability is 0.938-1.110 m/day.
- The Sand stone / Limestone of Tertiary age also form an aquifer at moderately shallow depth, but in limited area. The specific capacity in this formation is 0.260m^3/min/m: Transmissivity is of 471 m^2/day and Permeability is 11.7 m/day.

➢ The total ground water reserves in the entire area are estimated to be 10.68 MCM.

c) Water quality

On the basis of 8 surface water samples and 6 groundwater samples collected from the area, the water in general is observed to be good with a few samples showing higher TDS, Cl, hardness & Ca.

The quality of water monitored during winter of 2012 (refer EIA Study carried out by M/s Geomin Consultants Pvt. Ltd., 2012) is given in Table 10.6 and 10.7 of Chapter 10.

i) Water balance

Calculation of make of water and pumping requirement in the quarries as a result of rainfall is given in Table 5.14 in Chapter. The water requirement and water balance for the mine are given in Table 5.15 and Table 5.14 of Chapter 5.

ii) Effluent from mine

i. To prevent surface and ground water contamination by oil/grease an sewage waste, following control measures are proposed to be implemented.

ii. Leak proof containers will be used for storage and transportation of oil/grease. In the store also, the container containing oil/grease will be kept in empty safe open containers of higher volume than the containers to avoid oil/grease spillage. The area over which oil/grease is handled will be kept effectively impervious. Any wash off from the oil/grease handling area or workshop will be drained through impervious drains, collected in specially constructed pit and treated appropriately to remove any oil/grease and the water will be recycled. The oil grease will be sold to authorized vendors and sludge disposed off in specially constructed pit.

iii. The sewage waste generated will be drained by underground impervious drains, lead to appropriately designed septic tanks and soak pits to prevent any pollution of surface or ground water.

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iv. The surface and ground water in and around the mine, loading plant and infrastructure will be regularly tested and appropriate control measures adopted in case of any pollutant is detected above the prescribed limit.

v. All stacking and loading areas will be provided with proper garland drains equipped with baffles to prevent wash offs from reaching the downstream natural channels.

vi. A domestic waste water treatment plant will be provided in colony so that the water after treatment can be reused.

iii) Storm water

Control measures to be adopted are briefly discussed below:

- Check dams will be provided to prevent solids from wash off and screen if any from the mine related activities.
- Peripheral bunds will be erected on the outer edge of the abandoned benches before reclamation so that the soil is not carried away by storm water.
- A water gradient of about 1 in 100 will be kept at every bench towards inside of the bench to prevent formation of gullies in the bench slopes causing serious erosion.
- Chutes will be constructed by using local stone or masonry to guide the water in areas with loose soil to prevent erosion and uncontrolled descent of water wherever necessary.
- Construction of garland drains around freshly excavated and dumped areas so that flow of water with loose material is prevented. The mine water will be passed through specially constructed settling ponds to arrest any loose material being carried away with water.
- Any areas with loose debris within the lease hold will be planted.

d) Measures to minimise adverse effects on water regime

During the process of mine rehabilitation and with the completion of backfilling, a water body will be created in the mined out pit which will act as water reservoir improving the ground water recharge, source of attraction for fauna and will help in the maintenance of afforested areas. To enhance aesthetic appearance, parks and lawns will be made around the water body.

The level/stage of ground water development has been computed in ground water balance study which shows 18%. This can be categorized under

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'Safe', 'White' with less than 70% value. The stage of groundwater development of Mangrol Block estimated by CGWB (2012) is 21 %. Mangrol-Valia Lignite Mine is under the Safe Category.

11.3.3 Air quality management

a. Air quality

The air quality related information has been given under pare 10.2.5 (i) of Chapter 10.

As is apparent from the analytical data, the ambient air quality in the region is well within the standards specified as per the Air (Prevention & Control of Pollution) Act, 1981.

i. Impact on air quality

The principal sources of Air pollution due to the proposed Lignite mine are:

i. Dust Particulates.

ii. Gaseous pollutants.

The sources of dust generation in the mine are:

a. Extraction of over-burden and lignite by Shovels.

b. Movement of HEMM, such as Shovels, dumpers etc.

c. Loading and unloading operation,

d. Over-burden / Lignite conveying,

e. Material handling operation in the handling plant,

f. Wind erosion of dumps

ii. Sources of Air Pollution

Gas Emission Can Occur as A Result of:

a. Spontaneous heating of lignite and lignite stockpile fire.
b. Emission of SO_2 from diesel driven mining equipments, compressors, generator sets, etc.

The Particulate Matter (PM10) especially that below 5-micron size is a serious air pollutant, which can lead to lung disorder and other diseases like Bronchitis, Emphysema, Bronchial Asthma, Irritation of mucus membranes of eyes etc.

During impact assessment for this reason, the parameters like PM_{10}, $PM_{2.5}$, SO_2, NOx and CO have been assessed in ambient air quality at various location around the project area and particularly with emphasis given for measurement along the prominent wind directions. The results don't indicate any higher values of considerable serious nature even at less than 1 km which is close to the working mines of 4.2 MTPA and adjacent Vastan mines. The identical results are also observed in the monitoring reports of these mines.

The project doesn't propose any drilling and blasting and would adopt the same practice being adopted by these existing mines. Excavation, handling and transport system would also be similar type.

As such within the project area dust generating points are distributed over a larger area to cause any heavy pollution at a particular location. The marginal increase in production of less than 30% from 4.2 MTPA to 5.4 MTPA is not anticipated to contribute pollutants to the air as can render it polluted beyond acceptable limits.

iii. Air and dust pollution control measures

The SPM, CO, SO_2 and NO_x concentrations are within limits as already discussed earlier. The mining operations and related activities are anticipated to increase the levels of SPM and gaseous pollutants to a limited extent. The control measures to be adopted are mentioned in the following paragraphs:

iii.1. Controlling fugitive dust

Dust particles, which are normally generated during mining operation and transportation, deteriorate the ambient air quality. Adequate control measures are, therefore, proposed to be taken during mining operations, transportation and loading operations. These control measures are discussed as follows:

(a) Mines

a) Dust suppression systems (like water spraying) will be adopted at Faces while loading.

b) Dust extraction systems will be used in Feeder Breaker.

(b) Haul Roads and Stock-Piles

a) Dust suppression system (like water spraying) would be adopted at roads, which are used for transportation.

b) Transport vehicles shall be maintained leak proof.

c) Suitable dust suppression systems such as mist sprays with or without chemical will be provided at appropriate places for preventing dust pollution during handling and stockpiling of lignite.

d) Transfer points of lignite will be provided with appropriate hoods/chutes to prevent fugitive dust emission.

iii.2. Preventing dispersal of air borne dust

In addition to the control measures proposed during mining and transportation operations, following steps will be taken to prevent air pollution due to airborne dust:

a) Dense tree belts will be planted around the mine and sites housing handling/ loading facilities.
b) Plantation over already mined out area will be done after backfilling as per schedule (with minimum gap between excavation and afforestation)
c) Dust masks will be provided as safety measure to the workers, engaged at dust generation points like drills, loading/unloading points, etc.

iii.3. Measures to mitigate CO levels

It has already been discussed that the concentration of CO in the ambient air is negligible and is far below the prescribed limit of CPCB and is not anticipated to exceed it in future.

Still all heavy and light vehicles shall be tested for pollutants concentration in their exhausts regularly and well maintained. Strict vigil will be kept in and around the operational area for any fire which shall be immediately controlled.

iii.4. Measures to mitigate NOx levels

The mine ambient air quality will be regularly tested to detect the presence of any pollutants above prescribed limits and appropriate measures will be adopted. Nox levels are not anticipated to increase as it is generally contributed by the use of explosives but explosives are not proposed to be used due to soft strata, hence the question of increase in NOx levels does not arise.

11.3.3.1 Noise

a) Ambient noise Levels

The Ambient Noise related information has been given under pare 10.2.5 (ii) of Chapter 10.

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b) Measures to control noise pollution

The following control measures will be adopted to keep the ambient noise levels below permissible limits of 75 dB (A).

- Provision and maintenance of thick tree belts to screen noise.
- Avenue plantation within the project area to dampen the noise.
- Proper maintenance of noise generating machinery including the transport vehicles will be ensured.
- Provision of the air silencer to modulate the noise generated by the machines will be made wherever required.

To protect the workers from exposures to higher noise levels, the following measures will be adopted:

i. Provision of protective devices like ear muffs/ear plugs to those workers who cannot be isolated from the source of noise.

ii. Confining the noise by isolating the source of noise.

iii. Reducing the exposure time of workers to the higher noise levels.

Measures to reduce ground vibrations due to blasting and prevent fly rocks

For the mining operation of lignite, no blasting is required. Hence question of ground vibrations due to blasting does not arise.

11.3.4 Waste management

i. The surface dumps

There are 4 dumps existing at present, D1, D2, D3 and D4. Dumps D1, D2 and D4 belong to North pit. Dumps D1 and D2 are located on the east of the North Pit over non- lignite bearing area, which will not be re-handled. But Dump D3 located on the SE of South Pit and Dump D4 located on the SW of North pit over the lignite bearing area, will have to be re-handled later.

Total area under surface dumps at present is 289.09 Ha which will increase to 306.81 Ha by the end of 1st year. Later it will reduce to 265.78 ha by 3rd year and 156.71 Ha by the end of 5th year due to rehandling of dump D4 as the northern Pit advances. Out of total Surface OB dump 156.71 ha, 76.57 ha will be planted and 80.14 ha will be converted into agriculture during post mine closure.

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Crown dump lying over the backfill in the north pit will remain in place and is not proposed to be re-handled during post mine closure stage.

ii. Backfill dump

Pit wise OB disposal into surface dump and backfill dump has been given in Table 5.14A of Chapter 5 along with re-handling details.

11.3.5 Top soil management

The total topsoil generated will be 8.72 MCuM (B) during the life of the mine. Unutilized part of the same will be stacked separately in a soil stack pile located near the pits as shown in the respective mine stage plans.

The top soil stockpile will be low height not exceeding 6 m and will be grassed to retain fertility. Besides this, there would be temporary stacks near the excavation area and area to be reclaimed which will be made use of for concurrent filling without bringing the topsoil to the soil stack near the OB dump.

The generation and disposal of total waste quantities for the life of the mine are shown in Table 11.7.

TABLE 11.7
GENERATION AND DISPOSAL OF TOP SOIL CUMULATIVE MCUM (BANK)

Year/ Stage	Top Soil generated, MCUM	Top Soil Used "MM3"					
		Embank-ment	Spreading over the backfilled area	Spreading over the OB dump area	Spreading over the GB	Total	Top soil balance in stack
PAST (2009-20)	2.04		0.00	0.50	0.00	0.50	**1.54**
Y-1 (2020-21)	2.10	0	0.00	0.98	0.00	0.98	**1.12**
Y-3 (2022-23)	2.40	0	0.39	0.98	0.00	1.37	**1.03**
Y-5 (2024-25)	2.97	0	1.21	0.98	0.00	2.19	**0.78**
Y-10 (2029-30)	4.59	0	2.77	0.98	0.00	3.75	**0.84**
Y-15 (2034-35)	5.96	0	4.35	0.98	0.00	5.33	**0.63**
Y-20 (2036-40)	7.36	0	5.53	0.98	0.00	6.51	**0.85**
Y-25 (2044-45)	8.58	0	6.82	0.98	0.00	7.80	**0.78**
Y-27 (2046-47)	8.72	0	7.01	0.98	0.00	7.99	**0.73**
Post Mine Closure, 2049-50	8.72	0	7.74	0.98	0.00	8.72	**0.00**

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11.3.5.1 The void

The remaining void area of 210 Ha will be left at the end of the OC mining (end of 30th year). In order to avoid a large external dump with more land lock which is not desirable from environmental angle, it is proposed to bring back and fill the mined out area in a systematic manner from the 1st year itself. The inside filling will be done leaving a space of at least 50 m at quarry floor between toe of backfill dump and the lowermost advancing bench.

Inside dump will be systematically blanketed by bringing the top soil and spreading over the inside dump and reclaimed after using latest biological techniques.

11.3.6 Beneficiation and Management of rejects

No other beneficiation / washing are proposed at mines site. Hence question of tailings dam management does not arise.

11.3.7 Infrastructure

The mine is operational and all surface infrastructures can be seen in Conceptual plan (Plate VII). The major surface features present in the area (2059.6829 Ha) are:

- Vadsol hamlet with 83 hutments and Kosmadi Falia (Rajgarh Gram Panchayat) with 35 hutments
- Kosamba – Zankhvav, NG Railway line
- Moti/ Kim River and Tokri River
- Panchayat Road from Rajgarh to Mangrol
- Cart Tracks
- Kosamba Zankhvav SH No.166
- Two 220 KV Transmission lines belonging to GETCO and PGCIL.
- 11 KV Transmission line belonging to DGVCL

As per the present Mining Plan, the railway line and Moti/Kim River are not to be shifted.

They are described in the following paragraphs.

i. Habitation within the ml:

There are Vadsol hamlets with 83 hutments and Kosmadi Falia (Rajgarh Gram Panchayat) with 35 hutments in the Mine lease area are proposed to be shifted as per the R & R policy.

ii. Road network lying within the block:

Road network is already in place and is capable to take care of additional production and if required it will be further strengthened to take care of the additional about 30% production.

Since all the three Pits are away from each other, it is proposed to have three sets of service facilities i.e. one set for each Pit.

iii. Drainage and canals lying within the block:

Moti River is a seasonal river and flows in the middle of the property. Besides, Tokri River which flows just outside the North- Eastern corner of the lease area, there is another water course namely Bhukhi River flowing in the South -Western boundary of the lease flowing from East to West and joins with Moti River. These three rivers/streams generally control the drainage of the area.

No Canal is lying within the block

iv Forest within Block

A stretch of land totalling to 4.48 ha along the existing State Highway (SH166) (Kosamba-Vankal measuring about 2.0 KM) between Mosali Chokri and Ukai-Kankrapar Main canal, passing through the block has been planted by Social Forestry Department and has been booked under protected forest in the records. This stretch of the road is to be re-aligned parallel to the existing Narrow Gauge Kosamba- Zankhvav railway line passing through the block, within the proposed surface barrier against the railway line from the quarry edge. Accordingly 4.48 ha green belt will be developed along the proposed diverted alignment of the SH166.

v. Power lines

Following power lines are passing through the block

- Two 220 KV Transmission lines belonging to GETCO and PGCIL and already been diverted along the eastern boundary of North Pit.
- 11 KV Transmission line belonging to DGVCL and already been diverted along the boundaries of Pit.

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vi. Surface Reorganization Required

- There will not be any need of surface re-organization as the mine is already operational.
- As already explained, the OC mining has been proposed in three patches which are favorable for OC mining- North Pit, South Pit and Central Pit. The South Pit had been in operation in the past and is not operational at present due to its advance restricted due to non-avaibility of land.

vii. Facilities to be Retained and Dismantled

The Northern Pit is now in operation. The Central Pit will be operational towards the end of life of the mine.

The following facilities will be retained/ dismantled at site as given in Table 11.8.

TABLE 11.8
FACILITIES TO BE RETAINED AND DISMANTLED

Sl. No.	Particulars	Total Area (in Ha)	To be Retained (in Ha)	To be Dismantled (in Ha)
1	Site office	0.017	0	0.017
2	Site office	0.128	0.128	0.00
3	Contractor camp	1.501	0	1.501
4	Feeder breaker and stack yard	0.769	0	0.769
5	Workshop and store	1.019	0	1.019
6	Site office	0.128	0.128	0
7	Sub Station	0.085	0.085	0
8	High mast tower	0.04	0	0.04
9	Light switch	0.006	0	0.006
10	Security camp	0.05	0.05	0
11	Other (Parking, open storing etc.)	0.157	0	0.157
	Sub Total (Facilities 1 to 11)	**3.900**	**0.391**	**3.509**

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Sl. No.	Particulars	Total Area (in Ha)	To be Retained (in Ha)	To be Dismantled (in Ha)
12	Transport roads	9.92	2.50	7.42
13	Road Diversion	6.30	6.30	0.00
	Grand Total	**20.12**	**9.191**	**10.929**

It is proposed that a corpus fund of Rs. 50.00 lakh will be provided which will easily earn an annual interest of about Rs. 5.00 lakh to maintain the retained facilities.

11.3.8 Disposal of Mining Machinery

After finishing the OC mining operation by the end of 27th year, a period between 28th and 30th year will be termed as post mine closure for the OC mine.

All other transportable HEMM, which have working life, will be removed from the leasehold and transferred to other mines of the company. Surveyed-off equipment will be auctioned out along with scrap which had accumulated over the years. All fixed equipment viz. Workshop P&M. HT transformers, Pumps etc. shall be transferred to other sister mines or auctioned off. Only a skeleton fleet of water sprinklers, utility vehicles and equipment for monitoring of the environment for the closing operation completion shall remain.

The activities involved are covered under bar chart (Table 11.9) along with duration, expenditure and manpower.

11.3.9 Safety and security

The life of the OC mine operations is 27 years. During mining operations some of the safety precautions will be implemented are as under:

i. Erecting barbed wire fencing around the areas being excavated

ii. Erecting barbed wire fencing around the areas being dumped

iii. Erecting bunds / toe walls around the surface dumps to prevent damage to property or injury to persons by rolling stones.

iv. After abandoning mine, the OC workings are to be effectively protected by a chain link with masonry pillars.

After finishing the mining operations, all areas which are inaccessible and are dangerous will be fenced. In the post mining scenario, proper approach

to the water body will be made for men and animals and the routes will be thrown open for the public.

11.3.10 Economic Repercussions of Closure of Mine and Manpower Retrenchment

Mine closure always has environmental, social and economic impacts associated with it. While the environmental impact is largely addressed, the socio-economic aspects do not receive the same degree of attention.
During the life of the mine, the communities in the surrounding villages come to depend on the same for some of their economic activities due to development of small business linked to the mine and its employees.

The closure of the mine brings about not only loss of jobs for the direct employees but also affects the likelihood of those who have come to depend upon it indirectly. We thus have two classes of affected people.

Retrenchment of people will not be applicable here as the development of the mine will be out-sourced and at the end of mine life, they will be transferred to another mine/ location by the out-sourced agencies.

The direct employees shall be offered jobs at alternate sites of the organization if available and those willing to relocate shall be transferred there. Skill up-gradation training would also be imparted to such willing employees to make them suitable for alternate jobs where required.
Mine closure is an inevitability and it is anticipated that by the time the closure occurs, the community shall have become self sustainable.

The indirectly affected persons would also be rehabilitated by offering them alternate means of livelihood by undertaking plantation and cultivation in the reclaimed land, poultry, craft, handloom etc.

To effectively implement the SHG projects, the company shall provide following facilities to the affected persons.

- Training for skill improvement
- Financial assistance for procurement of land, plant and machinery and raw material required, If any
- Assistance for undertaking market surveys, marketing of the finished products etc.

It is proposed to maintain the following facilities at the mine site post mine closure.

1. Training Center with required staff

2. Warehouse facility of storage of agriculture and other projects as and when required.

i. Number of local residents employed in the mine, status of the continuation of family occupation and scope of joining the occupation back

The project affected persons will have the possibility of continuation of their agriculture profession which can be practiced over the reclaimed area to be handed over to the State Govt. after post mine closure which, in turn, will pass it over to the PAPs in line with the rules applicable at that time

ii. Compensation given or to be given to the employees concerning their sustenance and their family members

Compensation will be given as per the prevailing law.

iii. Satellite occupations connected to the mining industry – Number of persons engaged therein – continuance of such business after mine closure:

Satellite occupations connected to mining industry will flourish in the area and skill development programme of the company will equip the people of the area to participate in economic activity on a sustainable basis. Local infrastructure will be developed to service social and economic needs. Social investment projects and employee welfare programs will cater effectively to human needs into the indefinite future.

Some of the satellite occupations connected to the mining industry are:

- Lignite transportation on cooperative basis
- Civil construction and maintenance on cooperative basis
- Hiring of bus services for school
- Hiring of jeep and taxis.
- Set up nursery for supply of sapling, flowering plants, bio-composts to garden and reclamation program for afforestation.
- Running services for mess and transit hostel
- Agro based production unit like Sericulture, Horticulture in unused mining and plantation area

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- Photocopying, typing and printing which are otherwise off loaded to outside agency.
- Supply of daily wages labourer on cooperative basis
- Electrical maintenance of the company
- Skill development programme
- Tyre repairing workshop
- Tea staff and hotels
- Private transportation
- Retail grocery shop
- Gardening and house keeping

iv. Continued engagement of employees in the rehabilitated status of mining lease area and any other remnant activities

While providing education to local youths and in the process of planning different agro based livelihood activities, it has been observed, in general, that the local population initiates different activities in the area like hotels, transportation, repairing shop and other allied activities. It is envisaged that these activities will flourish in days to come. Commitment to local economic development and capacity building will be provided by requiring that contractors also target their training and employment opportunities to the local community, and by giving preference to a local supply chain.

v. Envisaged expectation of the society on closure of mine

Agriculture and lignite mining are the basic sectors of employment of the people of the leasehold and adjoining area. People are engaged in lignite mines and lignite based industries. There are many Lignite based and other industries in nearby areas which provide many employment opportunities to these people.

11.4 TIME SCHEDULING FOR ABANDONMENT

Study Report of the existing status of the project and tasks required for final abandonment will be identified (starting from 23rd year) along with their possible time frame for implementation will be undertaken. Items among others could be as under:

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i) Disposal of HEMM and other equipment (electrical/mechanical) of the mine either through transfer to other working projects, sale or disposal as scraps.

ii) Dismantling schedule of permanent and temporary structures excepting few which may have utility in the revised scheme for managing abandoned area.

iii) Winding up all H. T & L.T electrical lines, delivery pipe lines for sprinklers and other varied uses other than those which may be required for development of the abandoned area.

iv) Part of the excavated area will be backfilled and the rest will be left to form a water reservoirs.

v) Scheme for undisturbed and recovered land development programme for making the land more fertile by use of fertilizers and other measures under expert's guidance to sustain affected population after abandonment of the mine.

vi) Related matter of land development is also developing irrigation system by following drip irrigation system.

vii) Any other matter related for gainful development.

The minute details will be worked out in the 25th year. The execution of abandonment activities of the OC mines will be started about four years before the mines get abandoned i.e. 26th Year. One year time is assigned for study of items as indicated above in i to vii and for preparation of detailed schemes and reports for implementation. Many of the required activities will be carried out during last four years of the mine operation. Some abandonment activities will have to be continued for about two to three years more after the mine operations get fully closed by retaining only few temporary essential office / residential structures.

The facilities to be dismantled and those to be retained are already given in Table 11.8 under Para 11.3.7 vii above.

11.5 ABANDONMENT COST

a) Activities and Cost

Detailed Final Mine Closure Plan will be prepared prior to the anticipated actual closure of the opencast mine. Tentative expenditure in implementation of mine closure activities is given below in Table 11.9 along with the schedule of implementation in bar chart form with duration of each activity. Tentative cost of implementation of each activity is calculated on the present estimated rate. Total comes to Rs. 368.85 Cr.

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Heads		25	26	27	28	29	30
Progressive Closure	Water qualit	6.00	7.00	8.00			
	Air quality m	6.00	7.00	8.00			
	Barbed wire	-	-	4.11 1638	-	-	-
	Barbed wire	3.03 1426	3.27 1540.5	5.28 2482.5	-	-	-
	Top soil ma	54.80 0.258	67.00 0.095	57.00 0.095	-	-	-
	Technical ar out land and	111.24 27.81	111.24 27.81	111.24 27.81	-	-	-
	Plantation o	72.00 43	56.36 14.09	56.36 14.09	-	-	-
	Manpower c	4.00	5.00	6.00			
	Toe wall arc	-	-	19.19 1918	-	-	-
	Garland drai	-	-	9.63 1925	-	-	-
	Any other ac	-	-	-	-	-	-
	Sub Total	7.07	246.87	264.79	-	-	-
FINAL CLOSURE							
Dismantling of Infrastructure, disposal/ rehabilitation of mining machinery	Dismantling	-	-	-	50.00	40.00	-
	Rehabilitatio	-	-	-	4.80 1.2	4.80 1.2	-
	Dismantling	-	-	-	30.00	30.00	
	Re-arrangin park and agi	-	-	-	25.00	25.00	-
	Dismantling	-	-	-	75.00	75.00	-
	Dismantling	-	-	-	7.50	7.50	-
	Sub-Total	-	-	-	192.30	182.30	-
Safety and Security	Concrete wa	-	-	-	119.05 4762	119.05 4762	-
	Boundary w	-	-	-	111.48 4459	111.48 4459	111.48 4459
	Stabilisation side walls o	-	-	-	35.00	35.00	30.00
	Sub-Total	-	-	-	265.53	265.53	141.48
Technical and biological reclamation of mined out land and OB dump	Top soil ma	-	-	-	148.00 0.247	148.00 0.247	148.00 0.247
	OB rehandli	-	-	-	6486.00 10.81	6486.00 10.81	-
	Peripheral r steps on ba	-	-	-	50.00	50.00	50.00
	Expenditure land	-	-	-	387.85 96.963	387.85 96.963	387.85 96.963
	Landscapin	-	-	-	16.67	16.67	16.67
	Sub-Total	-	-	-	7088.52	7088.52	602.52
Post closure management and supervision	Power cost	-	-	-	6.67	6.67	6.67
	Post mining	-	-	-	5.00	5.00	5.00
	Post mining	-	-	-	5.00	5.00	5.00
	Manpower i	-	-	-	16.67	16.67	16.67
	Sub-Total	-	-	-	33.33	33.33	33.33
Others	Entreprene developme of affected	-	-	-	50.00	50.00	50.00
	Continuatio schools etc	-	-	-	-	-	5000.00
	Sub-Total	-	-	-	50.00	50.00	5050.00
	TOTAL CC	7.07	246.87	264.79	7629.68	7619.68	5827.33

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Adoption of safety measures and monitoring of safety aspects for a maximum period of 3 years could be considered pertinent.

b) Escrow account amount

Para 2.6 of letter no. F. No. 34011/28/2019-CPAM Dt 29-05-2020, vide which Guidelines for preparation of Mining plan for the coal and lignite blocks were issued, states as follows:

"*The escalated rate (based on the current base year i.e. 01.04.2019) is Rupees Nine Lakh per hectare in opencast and Rupees one lakh fifty thousand per hectare for underground Mine. These rates will be considered as Base Rate to be applicable from 01.04.2019, which may change as specified from time to time by the Government of India*".

Accordingly, the calculations have been done.

WPI has been adopted from the web site of Chief Economic Advisor, Govt. of India.

The following Table 11.10 shows the calculations to reach at the payments to be deposited into the Escrow account year wise.

TABLE 11.10
DERIVATION OF ESCROW AMOUNT RELATED TO OC MINING

WPI as on Base date	(01-04-2019)		121.1
WPI as on April 2020		119.20	
Escalation rate of Closure cost			0.98431

	OC	UG
Base rate of closure cost (Cr. Rs./Ha.)	0.09	0.015
Closure cost as on base date 01/04/2020 (Cr. Rs./Ha.)	0.0886	
Project Area (Ha.)	2059.6829	
Amount to be deposited into Escrow Account "Rs.Cr."	182.4631	
Amount already deposited into Escrow Account "Rs. Cr."	38.915	
Net Amount to be deposited into Escrow Account "Rs. Cr."	143.5481	
Rate of compounding of annual closure cost	5%	

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Balance Life of the project For Escrow Account "in Yrs"	27	
Annual Closure Cost (Rs. Cr.)	5.3166	
Amount to be deposited into Escrow Account after compounding @ of 5% "Rs in Crs"	**290.6536**	

Annual deposits to be done in escrow account are given in Table 11.11 below:

TABLE 11.11
AMOUNT TO BE DEPOSITED IN ESCROW ACCOUNT

Amount (Rs. Cr.)				
Year	OC	Year	UG	Total
1	5.3166	1	-	5.3166
2	5.5824	2	-	5.5824
3	5.8615	3	-	5.8615
4	6.1546	4	-	6.1546
5	6.4624	5	-	6.4624
6	6.7855	6	-	6.7855
7	7.1247	7	-	7.1247
8	7.4810	8	-	7.4810
9	7.8550	9	-	7.8550
10	8.2478	10	-	8.2478
11	8.6602	11	-	8.6602
12	9.0932	12	-	9.0932
13	9.5478	13	-	9.5478
14	10.0252	14	-	10.0252
15	10.5265	15	-	10.5265
16	11.0528	16	-	11.0528
17	11.6055	17	-	11.6055
18	12.1857	18	-	12.1857
19	12.7950	19	-	12.7950
20	13.4348	20	-	13.4348
21	14.1065	21	-	14.1065
22	14.8118	22	-	14.8118
23	15.5524	23	-	15.5524
24	16.3300	24	-	16.3300
25	17.1466	25	-	17.1466
26	18.0039	26	-	18.0039
27	18.9041	27	-	18.9041
Total	290.6536		-	290.6536

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Total amount to be deposited in ESCROW account will be Rs. 290.6536 Crores.

The details of amount already deposited into Escrow Account "Rs. 38.915 Cr." Are attached as Annexure 18(d).

An amount of Rs. 77.71 Lakh has been reimbursed as partial payment from Escrow fund on 02/06/2020 (Annexures_18(o) enclosed).

11.6 FINANCIAL ASSURANCE

The tripartite agreement, as per the model draft suggested by CCO, was signed by GIPCL with Coal Controller, Kolkata, and Central Bank of India on 24-08-2012 and the Tripartite Agreement has been also signed by GIPCL with Coal Controller, Kolkata and Central Bank of India dated 15.09.2014.

Accordingly, GIPCL is depositing the Mine Closure Cost in Escrow Account, GIPCL-3197843910 for Mangrol-Valia Lignite Mine since 2014-15.

11.7 RESPONSIBILITY OF THE MINE OWNER

It is the responsibility of the mine owner to ensure that the protective measures contained in the Mine Closure Plan including reclamation and rehabilitation works have been carried out in accordance with the approved mine Closure Plan and Final Mine Closure Plan.

The owner shall submit yearly report to the Coal Controller before 1st July of every year setting forth the extent of protective and rehabilitative works carried out as envisaged in the approved Mine Closure Plan (Progressive and Post mine Closure Plan).

11.8 PROVISION FOR MINE CLOSURE

1. The mine owner will be required to obtain a Mine Closure Certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the Approved Mine Closure Plan/Final Mine Closure Plan have been carried out by the mine owner for surrendering the reclaimed land to the State Govt. concerned.

2. The balance amount at the end of the final Mine Closure shall be released to mine owner on compliance of all provisions of Closure Plan duly signed by the mine owner to the effect that said closure of mine complied with all statutory rules, regulations and orders made by the Central or State Government, statutory organisations, court, etc. and duly certified by the Coal Controller. This should also indicate the estimated extractable coal reserves and coal actually mined out.

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

11.9 CSR ACTIVITIES

Development Efforts for Rural Economy and People (DEEP) has been promoted by GIPCL to undertake Social Developmental Activities in the surrounding areas of SLPP.

DEEP is Secular, Non-Government and Not-for-Profit organization registered under Trusts Act.

It functions professionally & independently under the guidance of its Board.

It works at grass root level with the active participation of local people.

MD, GIPCL (Chairperson) MP, Mandvi, Speaker of Gujarat Legislative Assembly, Gandhinagar Collector, Surat, Collector, Bharuch, District Development Officer, Surat, District Development Officer, Bharuch AGM (SLPP), AGM (Finance), SLPP,	Company Secretary & DGM (Legal), GM (Mines), Director, District Rural Development Agency, Surat Project Administrator, Integrated Tribal Development Project (Tribal Sub Plan), Mandvi, Deputy General Manager (CSR) & Chief Executive Officer, DEEP

PROGRAMS UNDERTAKEN IN AND AROUND PROJECT AREA

(1) Health 1) Drinking Water 2) Sanitation 3) RCC Drain 4) Support to CHC 5) Mobile Medical Units 6) Medical Camps 7) Improved Health Care	**(4) Village infrastructures** 1) Roads 2) Culvert & Bridges 3) Infrastructures 4) Natural Resources Development **(5) Environment** 1) Plantation - Development & Maintenance

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(2) Education 1) Infrastructure Support 2) Resource & Equipment Support 3) Educational Events 4) Empowering Education 5) Support to Crèches **(3) Livelihood** 1) Self Help Group 2) Skill Enhancement Trainings 3) Livelihood 4) Strengthening of Panchayat Raj Institution 5) Support to Mass Marriage	**(6) Resource centre** 1) Training Centre 2) Nursery 3) Vermi-Compost **(7) Stake holder management** 1) Animal Husbandry 2) +69999999 Four wheeler vehicle on contract 3) Providing Fly – Bed Ash 4) Lignite Transportation 5) Free Education

* ***Expenditure of Rs. 442.39 Lakh up to FY 2016-17.***

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