PROJECT REPORT

ON

REVISION OF

SATPURA MINE No. I & II

(PATHAKHERA AREA)

WESTERN COALFIELDS LTD.

VOLUME - ONE

TEXT

APPENDICES

&

CHECK LIST

Coal India

JUNE 1979

Regional Institute,

Central Mine Planning & Design Institute Ltd.

(A Subsidiary of Coal India Limited)

BYRAMJI TOWN, NAGPUR - 440 013

PROJECT REPORT
ON
REVISION OF SATPURA MINE NO.I&II
(PATHARA RA COALFIELD)
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A C K N O W L E D G E M E N T

The Project Report has been prepared and finalised after detailed discussion held over draft Project Report on 20.4.79 at Regional Institute in the Planning Committees meeting.

Author gratefully acknowledges the comments, views, the valuable guidance and help afforded by Shri S.P.Ganguli, Dy.Director General Mines Safety, S/Shri G.S.Dhaliwal and A.R.Reddy, Dy.Directors of Mines Safety, Shri B.R.S.Bhatnagar, GM(Plg.), S/Shri M.V.Bijapurkar, Addl.C.M.E.(Const), G.S.Palkar, Dy. Supdt.Geologist and A.Chakravati, Dy.CME(SC&T) of W.C.L. Thanks are also due to Shri M.L.Duggar, GM(Pathakhera) Shri S.Y.Vakharc, Staff Officer(Mining) Pathakhera Shri S.R.Mamidwar, Supdt.(Mines), Satpura Mine No.II and Shri H.N.Sinha Roy, Manager, Satpura Mine No.I for the help rendered in preparation of this report. Special thanks are due to Shri A.D.Deshpande Supdt.(Mines) WCL, Planning for giving valuable comments and suggestions in making of this report.

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PROJECT REPORT
ON
REVISION OF SATPURA MINE NO.1&II
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SUMMARISED DATA

S.No.	Particulars	Unit	As per approved PR	As Existing	As per Revised P.R.
1.	2.	3.	4.	5.	6.
1.	TECHNICAL INDICES				
1.	RESERVES				
i)	Geological (net)	m.te.	20.71	-	27.966
ii)	Mineable	m.te.	-	-	25.759
iii)	Extractable	m.te.	13.81	-	15.939
2.	TARGET OUTPUT PER ANNUM	m.te.	0.45	-	0.60 for 20yrs. 0.45 subsequently.
3.	LIFE OF MINE	years	30	-	30
4.	THICKNESS OF SEAMS				
i)	Upper Workable Seam	metres	1.5-2		
ii)	Lower Workable Seam	-do-	2.5-3.5		
iii)	Bagdona Seam	-do-	1.5-1.8		
5.	GRADIENT OF SEAMS	Degrees	Mostly 3 to 5° upto 12° in Satpura Mine No.I		
6.	QUALITY OF SEAMS				
i)	Upper Workable Seam	K.Cal/Kg	3670-5210	(Exclusive of band)	
ii)	Lower Workable Seam	-do-	4020-5280	-do-	
iii)	Bagdona Seam	-do-	4420-6020	-do-	

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7.	EXPECTED QUALITY OF COAL DESPATCHED (H.G.Mx)	K.Cal/K	3400-3500	DECLARED GRADE 'E'	
II.	ECONOMIC INDICES				
1.	INITIAL CAPITAL OUTLAY				
i)	Total	M.Lakhs	181.18	207.24	715.19
ii)	Per te. of rated annual production	Rs.	84.71	88.35	119.20
iii)	Additional capital now required for Revision (over Capital upto Mar. 1978)	M.Lakhs	-	-	507.95
2.	CAPITAL REQUIREMENT FOR PLANT & MACHINERY				
i)	Total	M.Lakhs	194.10	54.37	356.91
ii)	Per te. of rated annual production	Rs.	43.10	22.61	59.49
3.	CAPITAL REQUIREMENT OF TOWNSHIP ETC.				
a)	Total				
i)	Initial	M.Lakhs	97.78	34.34	146.08
ii)	Net	-do-	73.55		97.41
b)	Per Tonne				
i)	Initial	Rs.	21.73		24.35
ii)	Net	Rs.	16.34		16.24
4.	ESTIMATED COST OF PRODUCTION				
i)	At 100% Capacity level	Rs.	32.94	Progressive Oct.'78 to Mar.79	61.12
ii)	At 85% -do-	Rs.	37.48	56.03	70.86

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5.	NET PROFIT/LOSS FOR THE YEAR	Rs.	(+) 0.06		(+)13.88
6.	PROFIT/LOSS FOR THE YEAR				
i)	At 100% Capacity level	Rs.	(-) 4.48	(-) 14.49	(+)4.62
ii)	At 85% -do-				
7.	RETAINED ANNUAL PROFITABILITY				
i)	At 100% Capacity level	Rs.Lakhs	(+)0.27	(-)45.68	(+)63.28
ii)	At 85% -do-	-do-	(-)20.16		(+)23.56
8.	MINIMUM SELLING PRICE TO EARN 12% RETURN ON EQUITY				
i)	At 100% Capacity level	Rs.	39.33	-	69.73
ii)	At 85% -do-	Rs.	44.99	-	80.51
9.	MANPOWER	NO.	1251	1476	1729
10.	OUTPUT FOR CAPACITY				
i)	At 100% capacity level	te.	1.31	0.96 (Mar.'79)	1.321
ii)	At 85% -do-	te.	1.11		1.122
11.	MANSHIFT REQUIRED PER 1000 TNS. PRODUCTION	NO.	764	1042	757
12.	ESTIMATED YEAR OF ACHIEVING TARGET PRODUCTION		1977-78	-	1982-83

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PROJECT REPORT
ON
REVISION OF SATPURA MINE NO.II&II
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C H E C K L I S T

I. INTRODUCTION

Satpura Project comprises of two independent working underground units - Satpura Mine No. I and Satpura Mine No.II. These mines are located in Pathakhera Coalfield. The project is captive to Satpura Thermal Power Station which is about 6 km away to east of the Project. The nearest rail head, Choradongri railway station on Nagpur-Itarsi main line of Central Railway, is 16 km away from the Project and is connected by tarred road.

Feasibility Report for Pathakhera II Colliery Project subsequently named as Satpura Project for target capacity of 0.45 m.t. per annum (Mine No.I & II), was drawn in March 1973 and was approved by Govt. of India for capital outlay of Rs. 381.18 lakhs. The investment upto 31.3.78 has been Rs. 207.24 lakhs. The production envisaged for 1978-79 is 0.38 m.tes.

The Revision of the Feasibility Report has been considered necessary for the following major reasons :

1) With the increase in demand of Satpura Thermal Power Station it is required to enhance the production capacity of the Project from 0.45 million tonnes to 0.6 million tonnes per annum.

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ii) Change in technology for exploitation of deposits.

II. Extraction

1. RESERVES
a) Total Net Reserves : 27.966 million tons.
b) Total Minable Reserves : 25.759 -do-
c) Total Extractable Reserves : 15.839 -do-

2. TARGET OUTPUT PER ANNUM : 0.6 million tons. for 10yrs.0.45 m.to.subsequently.

3. GRADE
The exported Useful Heat Value : 3400-3500 K.Cal/Kg

4. INFRASTRUCTURE

5. POWER

a) Existing

Satpura Mine No.I & II receive power at 3.3 KV by means of an overhead line from the Central substation (33/3.3KV) at Pathakhera I. The central substation is supplied power at 33 KV by MPEB from their Semi Power House situated at a distance of about 3.5 km from the Central substation.

The approximate connected load at Satpura Mine No. I & II is 1600 KW.

b) Proposed Arrangements

The total connected load after revision is estimated at 3600 KW. Estimated maximum demand is projected as 1500 KW i.e. 1600 KVA with the corrected power factor at 0.9 to 0.95.

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it is proposed to install a new 33 KV main sub-station at Satpura Mine No.II. The capacity of substation will be 2x2 MVA. The necessary provisions for control and protection have been made. The energy consumption is expected to be 15.95 kwh/tonne. Arrangements for telecommunication have been kept in the Report.

B. WATER SUPPLY

The Project is catered by an integrated water supply arrangements having capacity of 0.4 M.G.D. The existing arrangements are adequate to deal with the water demand required for the Project.

C. COAL HANDING ARRANGEMENTS

(a) Existing

At present R.O.M. coal from both the mines of the project is transported by tipping trucks onto MPEB bunker near Pathakhera Mine No.I.

(b) Proposed Arrangements

Coal from Satpura Mine No.I & II, after picking stone pieces would be discharged onto 200 tonnes over-head and 1000 tonnes ground bunkers respectively. Coal from these bunkers is proposed to be fed into M.P.E.B. surface belt conveyor system.

D. TRANSPORT

(a) Existing

Existing Transport arrangement in Satpura Mine No.I is by Rope haulages. In Satpura Mine No.

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II belt conveyor is installed in Incline No. 7. System of underground transport in this case again is by Rope haulages.

(b) Proposed Arrangements

Existing transport system is proposed to be retained in Satpura Mine No. I. In Satpura Mine No. II as at present, the trunk transport system will be belt conveyor installed in series in Lower Workable Seam. Coal from Upper Workable Seam is proposed to be discharged to trunk transport system through staple bunkers. Coal from Bagdona seam will be hauled up by direct haulage (for Sector 'g') Belt Conveyor (for Sector 'D') to the trunk transport system. Gate Belt Conveyor will be used as gate transport for L.W.S. and endless haulage, has been envisaged as gate transport for Upper Workable Seam. Light and Medium duty Chain conveyors are the face transport equipments. Face and gate transport equipment for Bagdona Seam have not been spelt out at this stage.

Material transport will be through a system of direct/endless haulages.

5. SAND STOWING ARRANGEMENTS

NOT REQUIRED

6. MANPOWER

		Existing	Proposed
a)	Officers	12	29
b)	Monthly Paid	98	198
c)	Daily Rated		
	i) Unskilled(Cat.I&II)		528
	ii) Semi-skilled(Cat.III)	671	429
	iii) Skilled (Cat.IV to VI)		285
d)	Piece rated	616	260
e)	Others	79	-
	TOTAL	1476	1729

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7.	Grade	at various percentage as under			
		80%	85%	90%	100%
	i) Underground	1.34	1.42	1.50	1.67
	ii) Overall	1.057	1.122	1.188	1.321

8.	SCHEDULE OF PRODUCTION	79-80	80-81	81-82	82-83
	a) Production Schedule Production Capacity (in m.te.)	0.45	0.50	0.55	0.60
	Production at 85% of capacity(in m.te)	0.38	0.43	0.47	0.51
	b) Year of opening Revenue Account	-	Already in Revenue Account		

III. TECHNOLOGY

1. AVERAGE STRIPPING RATIO : NOT APPLICABLE
2. LIFE IN YEARS : 30
3. TOPOGRAPHY AND GEOLOGY :

Pathakhera Coalfield is flanked on its eastern border by Satpura hills. The area slopes towards west, the elevation ranges from [illegible] 450.0 metres. Tawa river forms the principal drainage system of the area.

The rocks of the Lower Gondwana formations comprising of Sandstones, shales and coal seams exist in Pathakhera coalfield. The coal deposits belong to Barakar Measures. The total thickness of Barakars is around 500 metres. The middle 150 metres of Barakars is composed predominantly of sandstone with shale and coal seams. All the three workable seams of the area occur in this zone.

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The property is traversed by three number of basic intrusives of dolerite dykes. There are numerous strike step faults and few oblique faults.

4. SEAMS TO BE WORKED

There are three workable coal seams in the area. These are :

i) Upper Workable Seam (U.W.S.)
ii) Lower Workable Seam (L.W.S.)
iii) Bagdona Seam

5. AVERAGE THICKNESS OF THE SEAMS

The seams, their thickness and nature of parting is given in Table 'A' below :

TABLE - A

Seam	Thickness	Parting
Upper Workable Seam	1.5 - 2.0 m	20.0 metres mostly consists of sandstone
Lower Workable Seam	2.5 - 3.5 m	50.0 metres mostly consists of alternate layers of sandstone, shale and coal bands.
Bagdona Seam	1.5 - 1.8 m	

6. DIP OF THE SEAMS

There is variation in the strike and dip within the area. The general dip is in south to south westerly direction. The dip is low in general (2^{o} to 3^{o}). Dips are steep 1 in 4 to 1 in 5 (10^{o} to 12^{o}) in the limited part i.e. south of fault F4F4 and east of dyke 'B'.

7. TYPE

Non-coking coal.

8. AVERAGE ASH PERCENTAGE

U.W.S.	:	23.0 to 31.5 (Excluding band) 30.0 to 40.0 (Including band)
L.W.S.	:	22.0 to 28.0 (excluding band) 28.0 to 39.0 (Including band)
Bagdona	:	19.0 to 27.0 (excluding band) 20.0 to 32.0 (Including band).

9. WASHABILITY

Washability characteristics have not been studied so far.

10. MINING TECHNOLOGY

(A) MODE OF ENTRY

The Lower Workable Seam has already been approache at both the units of the Project through a separate pair of inclines. In addition, Bagdona Seam in Sub-sector f_2 of Satpura Mine No.II has been separately entered throug an incline and a pair of airshaft. An additional openi by way of an Incline to meet the ventilation requiremen has been proposed in Sector 'D'. U.W.S. and Bagdona Seams of different Sectors/sub-sectors are proposed to be entered by suitable drifts/staple shafts of adeq cross section for ventilation purposes and for coal, material and men transport.

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(x) Nature of Roof

Coal is found in nature and occurs in layers. It is very hard. The immediate roof of U.W.S. is soft earth, shale of variable thickness ranging from 0.6 to 1.2 metres and would have to be dressed down thoroughly thereby increasing the average height of galleries in U.W.S. above 2.5 metres. The immediate roof of L.W.S. is sandstone and at places it is shale. The immediate roof above Bagdona Seam is fairly strong shale and may need to be supported occasionally. The U.W.S. in the major portion of the area is at shallow depth. In most of the area there are no important surface features and as such caving is possible in major area of the property except under built up area where partial extraction or even development as the final operation has been recommended. The gradient of seams and their roof conditions are suitable for winning coal by mechanised means.

As discussed above because of shallow depth of U.W.S. coupled with higher working thickness (more than 2.5 mt) of U.W.S. and L.W.S., Bord and Pillar method of mining has been proposed for both the seams. On techno-economic consideration (Ref. Para 12,5.4.1/2 and Annexure development and depillaring by side loaders has been envisaged in this report. Production from one such panel would be 0.135 m.te. per annum.

Bagdona seam is suitable for longwall by caving due to suitable seam thickness and shale as immediate roof which caves in more easily than sandstone.

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The present experience of working longwall faces with caving props in W.C.L. mines is not encouraging and W.C.L. has expressed doubts about the success of this method of mining. The longwall faces are proposed to be worked with powered supports as well as hydraulic props or with Powered Supports as face support in near future. The technology which would give better production and economics in consistent with safety would then be selected accordingly for Sayduna Seam. Longwall advancing face, if proposed for Sayduna seam, has a faster rate of advance compared to advance of upper and lower workable seams proposed to be won by mechanised bord and pillar method of mining. The reserves of this bottom most seam are low and till the upper seams are worked out longwall panel in Sayduna Seam cannot be started. As such longwall panel may be required to be worked after about 15 to 20 years. Hence winning of this seam with longwall system of mining is not being considered at this stage. The area proposed to be worked by longwall system of mining is demarcated in Plate No.VI and would be left at this stage. No face winning, support or transport equipment has been considered in this report.

(C) PRODUCTION PARAMETERS

Satpura Mine No.I (From two manual Bord & Pillar panels)	0.15 m.te. per annum.
Satpura Mine No.II (from three mechanised development/depillaring panels -0.378 m.te.per annum and at atleast two dip development panels 0.072 m.te.per annum)	0.45 m.te. per annum.
	0.60 m.te per annum.

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6. VENTILATION

The total quantity of air required for Ramguda Mine No.I is 4410 cu.m/min. The axial flow fan, capable of dealing with the quantity of air required, exists.

The total quantity of air required for Ramguda Mine No.II is 7320 cum/min. The main mechanical ventilator with the capacity of 7800 cu.m/min and 150 mm w.g. has been provided for. Auxiliary fan with necessary supplements of ducting etc. have also been provided for ventilating development headings.

7. WINDING

Not Applicable

IV. CAPITAL INVESTMENT REQUIREMENTS

1.	Capital Investment (Rs.Lakhs) (Break ups detailed in Annexure A)	: 715.19
2.	Foreign Exchange Requirement	: Nil
3.	Capital Requirement for Plant and Machinery (Rs. lakhs)	: 356.91
4.	Capital Requirement for Plant and Machinery per te (Rs.)	: 59.49

V. FINANCE

1.	Reference of provision for fund in the budget if any				
2.	Levels of Production	80%	85%	90%	100%
	Production in M.tes.	0.48	0.51	0.54	0.60
3.	Variable Cost per te,				
	i) Stores				: 5.75
	ii) Power				: -

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	iii) Royalty	:	0.88
	iv) Misc. expenditure	:	0.44
	v) Interest on working capital	:	0.41
			6.82
	Total :		
	Less :		
	i) Subsidy for sand stowing	:	-
	ii) Grossness	:	-
4.	Fixed cost per tonne	:	51.56
5.	Capital investment per tonne of annual output (Rs.)	:	61.12
6.	Equity capital per te. (Rs.)	:	119.20
7.	Return on equity @ 12%	:	71.72
8.	Minimum selling price to yield the above return (Rs.)	:	8.61
9.	Present selling price per tonne (Rs.)	:	69.73
10.	Profit/Loss per tonne (Rs.)	:	75.00
11.	B.C.R.	:	13.80
12.	B.C.R. Gross i.e. before charging interest on loan capital	:	19.33
13.	Net Profit (Rs. per tonne) after charging interest on loan capital	:	15.82
14.	Net Annual Profit/Loss at Production level (Rs.Lakhs)	:	13.88

80%	85%	90%	100%
3.40	23.36	43.47	83.28

VI. MARKETING

1.	Linkage	:	Satpura Thermal Power Station (M.P.E.B.)
2.	Marketability/Result of Market Survey/ Demand.	:	Fully linked to above Power Station.
3.	Current Market Price(Rs.per tonne)	:	Rs. 75.00

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VII. Social Consideration and Overheads

The Project is expected to give employment to 1729 persons in all against the existing manpower strength of 1476 (as on 31.3.1979).

VIII. CONCLUSION

It would be necessary to revise the project on two counts.

i) The part requirement of Satpura Thermal Power Station would be met from the local source.

ii) The need to change the technology for exploitation of the deposits from methods envisaged in the earlier approved feasibility Report.

The Project is economically viable at the selling price of Rs. 75.00 per tonne. Also keeping overall national economy in view, it is advantageous to M.P.E.B. to take coal from nearby source rather than getting supplies from far off sources.

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PROJECT REPORT
OF
REVISION OF KATTURA MINE NO.1631
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ANNEXURE-A

CHECK LIST

HEADWISE BREAK-UP OF CAPITAL EXPENDITURE

A/C Head	Particulars	Expenditure as on 31st March 1978	Amt. in lakhs
01	Land	-	7.50
02	Buildings		
	a) Service	34.34	142.28
	b) Residential	54.17	356.91
	Sub-total of 02	-	0.75
03	Plant and Machinery	-	-
04	Furniture & Fittings	5.12	6.47
05	Railway Siding		6.00
06	Vehicles		
07	Prospecting & Boring		
08	Development	113.41	195.28
	081 Capital outlay in mines		
	082 Roads & Culverts		
	083 Water Supply		
	084 Pilot Schemes, R&D, P.R. Preparations		
	SUB-TOTAL OF 07 & 08		
	TOTAL CAPITAL (INITIAL)	207.24	715.19
	LESS SUBSIDY(miners Quarters		48.67
	TOTAL NET CAPITAL		666.52

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PROJECT REPORT

ON

REVISION OF BATPURA MINE NO. I & II

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PROJECT REPORT
ON
EXPANSION OF KIRUNA MINE NO.IA II
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LIST OF APPENDICES

S.No.	PARTICULARS	APPENDIX NO.
1.	Statement showing estimated phased capital investment and depreciation	A
2.	Statement showing estimated capital investment on land	A.1
3.	Statement showing estimated additional capital investment on buildings.	A.2
4.	Statement showing the estimated capital expenditure on additional service buildings.	A.2.1
5.	Statement showing the estimated capital investment on additional residential buildings(permanent construction)	A.2.2
6.	Statement showing the Building Index.	A.2.3
7.	Statement showing abstract cost of B.P.E. type of quarters	A.2.4
8.	Statement showing additional capitalrequirement for plant and machinery	A.3
9.	Statement showing additional capital requirement for electrical plant and machinery	A.3.1
10.	Statement showing estimated capital expenditureon Coal handling arrangements.	A.3.2

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PROJECT REPORT
ON
REVISION OF SATPURA MINE NO.I&II

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LIST OF ANNEXURES

S.No.	PARTICULARS	ANNEXURE NO.
1.	Necessity of additional mine opening and its suitable location for Satpura Mine No.II	I
2.	Techno-economic comparison of different methods of development	II
3.	Protodyknov strength Index of Lower Workable coal.	III
4.	Additional Investment required to achieve the target capacity of 0.45 m.te. per annum as per the earlier approved Feasibility Report and its impact on the existing cost of production.	IV

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PROJECT REPORT
ON
REVISION OF SATPURA MINE NO. I & II
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LIST OF PLATES

S.No.	PARTICULARS	Plate No.	Drawing No.
1.	Location cum Geological Plan	I	3-00195
2.	Borehole Section showing analytical data	II	1-00332
3.	General Layout of Mine	III	1-00341
4.	Working Plan of Upper Workable Seam, showing F.R.L., existing workings, proposed panel layout, transport system etc.	IV	1-00356
5.	Working Plan of Lower Workable Seam showing F.R.L., existing workings, proposed panel lay-out, transport system etc.	V	1-00357
6.	Working plan of Bagdona Seam showing F.R.L., existing workings, proposed panel layout, transport system etc.	VI	1-00358
7.	Layout of Development and depillaring panels with side loaders (U.W.S. & L.W.S.)	VII	2-00229
8.	Schematic diagram showing system of supports in mechanised depillaring panel (For Seam thickness more than 3.0 metres.)	VIII	3-00205

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		IX	3-00203
9.	C.H.P.flow diagram		
10.	Schematic Diagram of Power Distribution, Satpura Mine No.I	X	2-00348
11.	Schematic diagram of power Distribution. Satpura Mine No.II	XI	1-00349
		XII	1-00390
12.	Harmonogram		

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PROJECT REPORT ON REVISION OF SATPURA MINE NO. I & II

CHAPTER-I

I. INTRODUCTION:

1.1 Feasibility Report for Pathakhera II Colliery Project, subsequently named as Satpura Project (Mine No.I and II), was drawn in March,73. The Project is located in Pathakhera Coalfield of Betul District in Madhya Pradesh.

1.2 Initially, Feasibility Report for Satpura Project (I and II) having two mines with openings through a pair of inclines for each unit was drawn for additional requirement of coal for the adjoining Satpura Thermal Power Station. The annual capacity of the Project was envisaged to be 0.45 million tonnes.

1.3 The Project was approved by Government of India vide letter No.C5-5(2)/73-Vol.III dated ~~19th September~~ 1973 for a capital outlay of Rs.381.18 lakhs. The production from the project for the year 1977-78 and 1978-79 was about 0.24 m.tes. and 0.32m.tes. respectively. The production envisaged for the year 1979-80 is 0.38 m.tes.

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CHAPTER-II

MARKET AND JUSTIFICATION FOR REVISION

2.1 The revision of the feasibility report has been considered for the following major reasons:

(i) with the increase in demand of Satpura Thermal Power Station it is required to enhance the production capacity of the project from 0.45 m.tes. to 0.60 m.tes. per annum.

(ii) Change in technology for exploitation of deposits.

2.2 DEMAND:

2.2.1 Satpura Thermal Power Station of M.P.E.B. has already been sanctioned for the increased capacity upto 722.5 MW by the Government. Central Electricity Authority has even cleared 8th and 9th sets thereby increasing the installed capacity upto 1142.50 MW. The linkage to the 8th and 9th sets has not been finalised but the sets sanctioned by the Government call for increased coal demand on Pathakhera area. The ultimate demand of coal in 1983-84 as worked out by the Standing Linkage Committee (Feb.1978) comes to 2.12 m.tes. including for Phase-I extension. The yearwise demand for existing and sanctioned 6th and 7th sets is indicated in Table No.I below as linked by Standing Linkage Committee.

TABLE No.I

Fig. in m.tes.

Thermal Power Unit	1979-80	80-81	81-82	82-83	83-84
Existing 5x62.5 MW	1.02	1.02	1.02	1.02	1.02
Extension Phase-I					
(i) 6th set 1x200MW(being commissioned)	0.46	0.00	1.00	1.10	1.10
(ii)7th set 1x210MW(to be commissioned in Aug/ Sept.79)					
	1.48	1.02	2.02	2.12	2.12

2.3.2 *The coal demand mentioned in Table No.I has been worked out based on Gr.III Coal having G.C.V. of about 3200 K.Cal/Kg. but the joint samples taken by Pathakhera Mines and M.P.S.B. authorities indicate an uncrated coal having average G.C.V. of about 3800 K.Cal/Kg. Hence the expected demand would go up by a ratio of 3800/3200 i.e. 1.20. The yearwise anticipated demand of coal, therefore, will be as shown in Table No.II.

TABLE No.II

	1979-80	80-81	81-82	82-83	83-84
Satpura T.P.S.	1.78	2.18	2.42	2.55	2.55

2.3 COAL AVAILABILITY:

2.3.1 To meet the above coal demand production from Pathakhera Coalfield has been envisaged from the existing mines and also by opening new mines as shown in Table No. III below:

TABLE No.III (Figs.in m.tes.)

Name of Collieries	Capacity	1979-80	80-81	81-82	82-83
Pathakhera I & II	0.90	0.77	0.77	0.77	0.77
Satpura I & II (before revision)	0.45	0.38	0.38	0.38	0.38
Shobhapur	0.95	0.20	0.30	0.40	0.52
Sarni project (new mine)	0.42	-	0.06	0.17	0.21
t o t a l :	2.72	1.35	1.51	1.72	1.9

2.3.2 Table No.II and III indicate that there is sho fall in supplies from Pathakhera Coalfield to the tune of 0.43 m.tes. in 1979-80 to 0.63 m.tes. in 1982-83 (ref.Ta No.IV below):

TABLE NO.IV

	1979-80	80-81	81-82	82-83
	1.78	2.18	2.42	2.55
Demand	1.35	1.51	1.72	1.92
Availability	(-) 0.43	(-) 0.67	(-) 0.70	(-) 0.63
Surplus/Shortage				

..3..

2.3.3 Standing Linkage Committee [illegible] per annum from adjoining Pench/Kanhan Coalfield for Satpura Thermal Power Station, but only 0.25 m.te./annum of coal supply [illegible] has been feasible from Kanhan Coalfield so far. The declining trend of production of this coalfield would, however, be made good by middlings from Nandan Washery of Kanhan area from 1982-83.

2.3.4 Even with the envisaged linkage of Pench/Kanhan coal the net shortfall is assessed as under:

TABLE No.V

	1979-80	80-81	81-82	82-83
Shortfall	0.43	0.67	0.70	0.63
Supplies from Pench/Kanhan	0.46	0.46	0.46	0.46
Net surplus/shortage	(+)0.03	(-)0.21	(-)0.24	(-)0.17

2.3.5 To make up the anticipated shortfall in supplies from Pathakhera, it is proposed to revise Satpura-I and II mines for the ultimate capacity of 0.60 m.tes./annum instead of 0.45 m.tes./annum as envisaged earlier.

2.3.6 The balance shortfall is marginal and may be covered by little improvement in the production of the existing mines.

2.4 CHANGE IN TECHNOLOGY:

2.4.1 The approved feasibility report had envisaged winning of lower workable coal seam by Room and Pillar method and upper workable and Bagdona seam by retreat longwall with flight loading in Satpura Mine No.II in Incline No.7 and 8. Lower workable and upper workable seams are now proposed to be won by Bord and Pillar with side loaders. Major portion of Bagdona Seam is proposed to be worked by retreating longwall by caving

...e in technology is due to the following

...sine is Cat.II in gassiness. The ventilation of long blind headings of rooms and ventilation of such a panel would pose of problems viz. ventilation ducting would the scraper path and during extraction of from different rooms the return air of room would be intake of the next room.

scrapers had been used during development of lower workable seam and their performance had not been satisfactory. In addition to the poor performance of the scrapers, if the gallery with scraper is driven leaving about 0.6 to 1.0 m of coal along floor, the floor coal is ripped and galleries are heightened beyond 3.0 m in contravention of Reg.99 of CMR 1967. In the past an attempt was also made to leave coal along roof and develop upto about 2.5 m height, leave aside the deterioration in quality because of shale floor ripping, the coal does not stick to the roof and parts thereby again increasing the height beyond statutory limits.

(iii) In major part of the property upper workable seam occurs at shallow depth i.e. less than 60 m. It may not be possible to exploit upper workable seam by longwall system consistent with safety.

(b) In the original report, the trunk transport system was envisaged to be by two endless haulages whereas 900 mm belt conveyor has been installed in Incline No.7 of Satpura Mine No. II as this was found to be more reliable transport system by the colliery authorities

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It is proposed to retain this change in trans-
portation system.

(c) It had been proposed to drive three inclines and
an air shaft for Saturn Mine No.II. At present
two inclines and an air shaft have been driven
upto lower workable seam in Sector'F'. Another
intake-cum-haulage incline and two air shafts (one
as intake and other as return) have been driven
upto Bagdona Seam for Sector 'F'. To meet the
ultimate production capacity (even for the present
envisaged targets) another opening would be re-
quired as has been brought out in para 11.1.2 and
para 16.3.3. This opening is now proposed to be
provided north of dyke i.e. in Sector 'D'.

CHAPTER - III

LOCATION

3.1 Satpura I and II Mines are located in Pathakhera Coalfield. Pathakhera-I and Pathakhera Expansion lie in the east and Shobhapur Project lies in the north. The Satpura Power House of M.P.E.B. lies about 6 kilometres away to East of the Project. The nearest rail head is at Ghoradongri on the Nagpur - Itarsi Main line of Central Railways, 16Km from the project. The Nagpur - Bhopal State Highway is about 30 kilometres west of the project. An all weather road connecting Nagpur - Bhopal State Highway and Ghoradongri railway station to Satpura Power Station passes 2 kilometres to the south of the area.

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CHAPTER-IV

TOPOGRAPHY, DRAINAGE & CLIMATE

4.1 TOPOGRAPHY:

Pathakhera coalfield is flanked on its eastern [illegible] by Satpura hills. The area slopes towards the west, the elevation ranging from about 422 m to 450 m. There are small mounds distributed in the east central portion of the property. Towards the west of the coalfield, the country unto Ghoradongri is almost a level plain. The southern part of the area is mostly open cultivated country.

4.2 DRAINAGE:

Tawa river forms the principal drainage system of the area. There are number of small streams and nalas within the field, but they are generally dry except during monsoon. Tawa river, however, retains water during dry season also. The highest flood level recorded in nala 'X'(refer Plate-III) south of incline no.8 of Satpura No.II is 427.40 m. (1978). The mine openings are more than 3 m above H.F.L.

4.3 CLIMATE:

The climate is tropical. During summer the temperature in general varies from 41° to 24°C and in winter the temperature ranges from 24° to 10°C. Monsoon starts towards middle of June and continues unto September end. The annual rainfall varies from 1750 mm to 2100 mm.

CHAPTER-V

DRILLING AND PROSPECTING

5.1 The area was known to be coal bearing since 1867 and certain mining activities were carried in the past. The north-central part of the coalfield was prospected in 1962-64 by I.B.M. The area further in the north was further prospected in 1968-69 by N.C.D.C. All the three major coal seams have been proved to occur in the area.

5.2 A total of 82 boreholes were drilled by I.B.M. and N.C.D.C. in the whole block. The total meterage drilled is about 7800 metres. Almost entire part of the area has been prospected. Though the number of holes are adequate for interpreting the geological structure fairly accurately, yet 7 - 8 number of boreholes totalling about 2000 metres may be necessary for precisely locating the fault F16F16 and for interpreting the structure around that area in Sector 'D'.

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CHAPTER - II

GEOLOGY

6.1 Geological map of Pathakhera Coalfield reveals that the Barakar formation covering about 46.60 sq.km. showing its maximum development along longitude 78°7'. The width is 5.79 km. To the northwest it continues as a narrow strip of hardly 0.80 km. width and joins the Talchir coalfield and towards northeast it has a tongue shaped extension. Talchir forms the boundary of Barakar formation on east, west and south excepting a part of southeast corner, where Barakars are directly in contact with metamorphics.

6.2 STRATIGRAHY:

The generalised stratigraphic sequence in and around the area under consideration is given in Table No.VI.

TABLE NO.VI

Formation	Lithology	Remarks
Recent to sub-recent	soil and sub-soil	
Upper cretaceous	Dolerite dykes	intrusive phase of Deccan trap
------ UNCONFORMITY- - - - - - - -		
Damuda series: Bijori (Raniganj)	Sandstone	Not exposed in the area
Moturs (Barren measures)	Greenish sandstone with minor mottled greenish and pink shale bands.	
Barakars (Coal measures)	Coarse sandstone shales and coal seams.	
Talchirs	Greenish shales and fine grained Khaki sandstone.	Not exposed the area.
- - - - - - - - UNCONFORMITY- - - - - - - -		
Pre-cambrian	Metamorphics, Gneisses, schists, Quartzites, crystaline limestones	Not exposed the area.

Most of the western, southern and eastern boundaries are faulted against the Talchirs and metamorphics. The contact between motura and Barakars on north appears to be a normal disposittional contact.

6.3 LOCAL GEOLOGY:

The formations encountered in different boreholes drilled within the area is given in Table-VII below:

TABLE NO. VII

Formation	Generalised thickness in metres.	Remarks
Soil and sandy soil	0.00 to 13.00	
Dolerite dykes	20.0 to 60.0	
Motura		
Greenish to greyish sandstone with thin mottled shale and clay bands.	Over 60	Clay band thickness not being more than 0.80 metres.
Mottled shale(marker horizon)	1 - 3	Base of motur.
Barakar		
Med.to coarse grained sandstone with few thin shale bands.	70 to 80	
Coal horizon IX	0.30 to 0.55	
Predominently sandstone	7.00 to 13.00	
Coal horizon VIII	0.11 to 1.18	Usually 0.4to0.5m
Med.grained sandstone with an impersistent shale band at the base	16 to 20	
Coal horizon VII (UPPER WORKABLE SEAM)	1.41 to 2.44	Average thickness 1.5 to 2.0 metres.
Med.to coarse grained sandstone with a few shale streaks.	9 to 23	Usually 18.0 to 20
Coal horizon VI (LOWER WORKABLE SEAM)	1.72 to 4.46	Generally 2.5 to 3.5m thick inclusive of carb.shal band.

Sandstone & shales	7.0 to 12.0 0.11 to 0.82	
Coal horizon V		
Intercalation of shale and sandstone.	2.0 to 6.0 0.1 to 0.5	
Coal horizon IV	6.0 to 10.0	
Sandstone with shalebands	0.16 to 0.65	
Coal horizon III		
Intercalation of sandstone and shale	2.22 to 8.53 0.16 to 0.55	Impersistent
Coal horizon II	6.13 to 26.45	
Shales and sandstones		
Coal horizon I (Bagdona seam)	0.62 to 2.29	Generally 1.50 to 1.8

The area considered is situated on the north central part of the field and is underlain by Barakars and Moturs. Talchir exposures are completely absent.

Talchirs unconformably overlies the pre-cambrian. The Talchirs are mainly composed of greenish shale and fine sandstone. The Barakar formations overlie Talchirs. The total thickness of Barakars is around 500 m. The lower 250 m is composed of garnetiferous sandstone with thin coal (less than 0.5 m) and shale layers. The middle 150 m of Barakars is composed predominantly of sandstone with shale and coal seams. All the three workable seams of the area occur in this zone. The upper 75 m is coarse grained sandstone with thin shale and clay bands. 1.0 to 3.0 m thick mottled shale at the base of Motur is taken as marker horizon demarcating the boundary between Moturs and the Barakars. Moturs representing the barren measures are confined to the northern part of the area and include green to grey sandstones with minor clay and shale bands. Unlike thick plastic clay bands in moturs of Kamptee coalfield these moturs have minor clay band not more than 0.8 m thick.

6.4 INTRUSIVES:

6.4.1 The property is traversed by three number of basic intrusives of dolerite dykes. These generally trend along NE-SW direction. These dykes A,B and C are conceived on the basis of borehole data as well on surface exposures (refer Plate No.III).

6.4.2 The dolerite dyke 'A' is about 55 to 65 m thick. This dyke has been cut across from underground workings of Satpura No.I at two places (refer Plate No.III Drg.No. 1-00341). The presence of dolerite dyke 'B' has been postulated on the basis of dolerite encountered in bore-hole PK 13, PK 43 and PK 89. The dolerite dyke 'C',shown in the northern portion of the area, has been conceived on the basis of boreholes PK-59, PK-139,PK-106 and PK-127. Geological mapping reveals that the thickness of Dyke 'C' varies from 40.0 to 60.0 metres. The northern part of the area beyond dyke 'C' is free from intrusives.

6.4.3 These dykes have intruded into the Barakars causing horizontal displacement of coal seams on either side and thereby acting as a fault which will be evident from the floor contours of Lower workable seams in Plate No.III Drawing No.1-00341.

6.5 STRUCTURE:

6.5.1 The variation in the strike and dip within the area is reflected in the floor contours of lower workable seam (Ref.Plate No.III). The strike in general is east-west and changing to NE-SW in the north-eastern part of the block and NW-SE in the western part. In the northern side of the area west of fault F8F8,the strike shows an anti-clinal swing from NW-SE to EW and finally to NE-SW. The dip is very low, in the anticlinal area being 1 in 18 to 1 in 28 (2° to 3°) at this point. Fault F16F16 demarcate

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th western edge of the swing. The direction of dip is northerly in general with variation according to the change in the strike in different regions of the limbs. The dips are gentler in the area west of fault F7F7 and south of dyke 'C'. The dips vary in gradient from 1 in 10 to 1 in 18 (3° to 5°). Dips are however steep(upto 1 in 4 to 1 in 5) in a limited part south of fault F4F4 and east of dyke 'B'.

6.5.2 The swing in the floor contours in area, in general is in reality not very acute, considering low dip of the beds.

6.6 FAULTS:

6.6.1 There are numerous strike step faults and few oblique faults. The faults in the area are deciphered mainly on the basis of borehole data. The details of faults are given below. Some of the faults are associated with dyke while others appear to be independent of the dykes.

6.6.2 FAULTS INDEPENDENT OF DYKES:

(i) FAULT F1F1:

This fault, at present, is south eastern limit of the property. This is also a major strike fault and runs almost in E-W direction. The fault is not encountered in any borehole. Hence its position shown should be considered as tentative only. The fault is hading towards south and its throw is not known.

(ii) FAULT F4F4:

Fault F4F4, separating the southern part of the area from the northern part, is a major strike fault hading towards south. The throw of this fault in the west near borehole PK-87 is few metres but increases to about 150 metres near borehole PK-2.

(iii) FAULT F7F7 :

It is an oblique fault and runs in a NE-SW direction between boreholes PK-71, PK-129, PK-118, PK-24, PK-98 and PK-59A. The hade of the fault is towards south east and the throw is 10 m in southwest corner and increases to 40 m towards north. Further north of dyke 'C' the throw is likely to be around 90 metres.

(iv) FAULT F8F8 :

This is a traverse fault trending NNW-SSE with downthrow of about 40 to 50 m towards west. The fault is not met in any of the boreholes, but from the floor contour plan (ref. Plate No. III) a break is noticed between PK-60 and PK-45 in the south and NCP-32 and PK-45A in the north. In the southern part, the fault abuts against the dyke 'C' close to fault F7F7.

(v) FAULT F16F16:

This traverse fault is situated in the west side of the area. The trend is towards NE and the throw is about 95 m towards NW. The fault is not encountered in any borehole. Hence its position shown should be regarded as tentative only.

In addition to the above mentioned faults, there are a few small faults which have been met during the workings of L.W.S. These small faults have been shown in Plate No. III.

6.8 FAULTS ASSOCIATED WITH DYKES:

Intrusives 'B' and 'C' of dolerite dykes in this block have emplaced into the strata by fracturing and pushing apart more or less horizontally, the blocks on either side.

(i) DYKE - 'B' :

This dyke is located along the southern p The displacement across the main dyke is probably about 10 m, the eastern side being the downthrown.

(ii) DYKE - 'C' :

Dyke 'C' is located in the northern part of the block. The displacement of seams on either side of dyke 'C' is not uniform and varies from 10 to 22 metres the northern side being upthrow side.

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CHAPTER - VII

COAL SEAMS & THEIR QUALITY

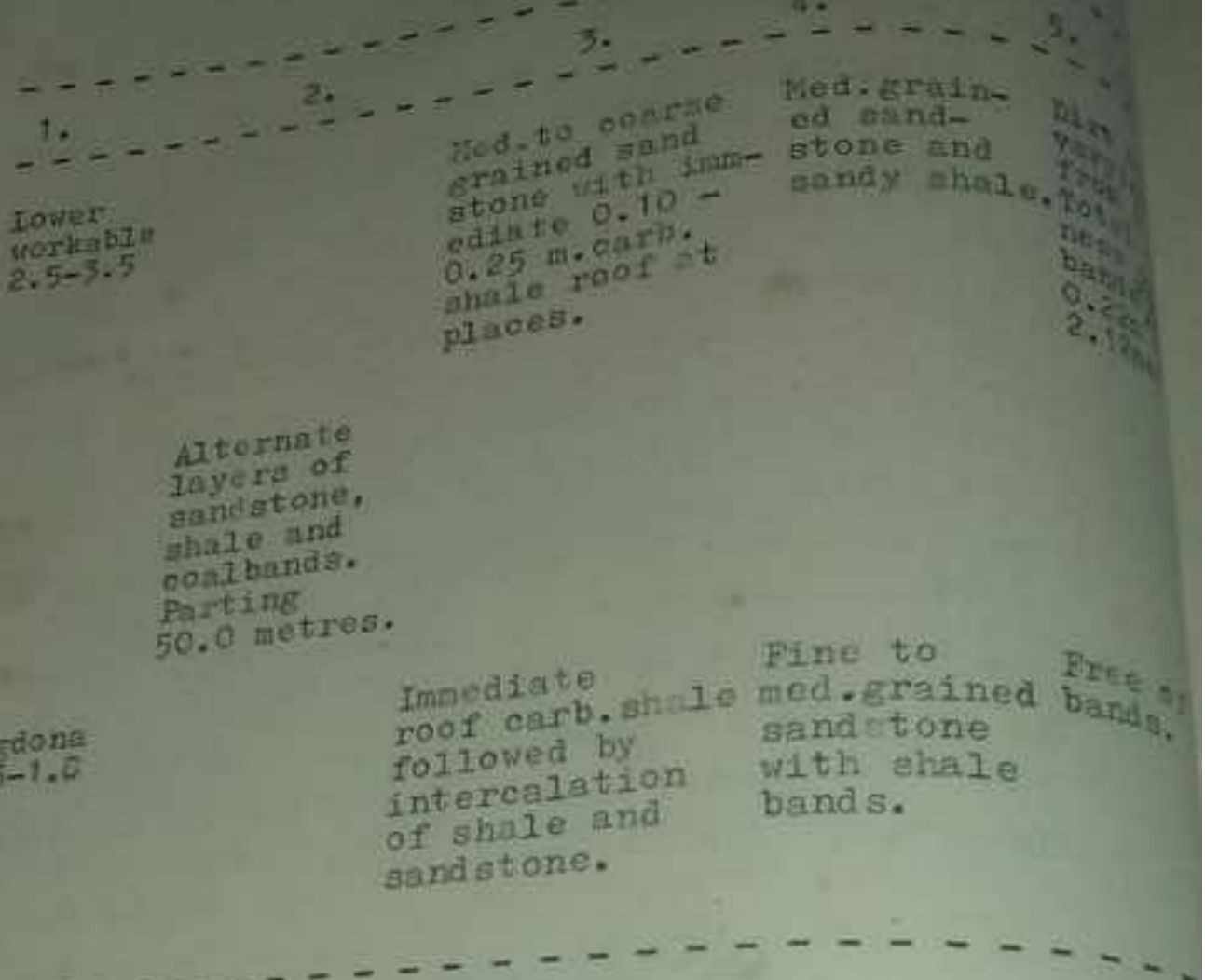
7.1 COAL SEAMS:

7.1.1 There are in all nine coal horizons in the Barakars in the area. The numbering of seams is bottom upwards. Out of these only two coal horizons namely lower workable seam (Seam-VI) and upper workable seam (Seam-VII) have attained persistence thickness above the working limit of 1.2 m in the entire block. One coal horizon namely Bagdona Seam (Seam-I) has developed thickness above the working limit in certain parts of the area only. These three seams only have been considered for economic exploitation.

7.1.2 The sequence of seams, their nature of parting and general range of thickness etc. is given in Table No.VIII (refer Plate No.II Drg.No.1-00332).

TABLE NO.VIII

Seam & General range of thickness in metres.	Nature of parting & thickness of parting in metres.	Roof of Seams	Floor of Seam	Remarks
1.	2.	3.	4.	5.
Upper workable 1.5-2.0	Med.to coarse grained sand-stone 9to23m.	Generally compact med.to coarse grained sandstone foll-owed by grey shale as the immediate roof. At places soft carb.shale or clay horizon as an immediate roof.	Generally sandy shale followed by med.grained sandstone.	Number of dirt bands vary from 1to4 dis-tributed throughout. Total thick-ness varies from 0.12m to 0.38m.



Bagdona Seam:

7.1.3 Bagdona seam is the oldest workable seam in the a This coal seam lies beneath the lower workable seam with parting of more or less 50 metres. This seam has thick varying from 0.62 to 2.29 m., the average thickness bei to 1.8 m. South of dyke 'C' i.e. in part of Sector 'B' seam is less than 1.2 m. thick and is quite promising area north of Dyke 'C', as the thickness is more than The immediate roof of the seam is carb.shale band of v thickness with the intercalation of shale and sandstor lying the carb.shale. The floor of the seam is compo fine to med.grained sandstone with shale bands. This free of dirt bands.

Lower Workable Seam:

7.1.4 This is the main workable seam of this coalfield. This underlies upper workable seam after a parting of about 9 to 20 m and overlies Bagdona Seam after a parting of about 45 m to 53 m. The seam is uniform in thickness, usual range being 2.5 to 3.5 m. In the area north of dyke 'C' seam generally improves the thickness from east to west (thickness 4.28 m PK 115). Medium to coarse grained slightly compact sandstone forms the roof, except in few cases where 0.1 m to 0.25 m thick carb. shale forms the immediate roof. The floor is characterised by medium grained sandstone and sandy shale. The seam is nowhere clean in the area and the number of dirt bands vary from 1 to 7. The total thickness of dirt band ranges from 0.22 m to 2.12 m.

Upper Workable Seam:

7.1.5 This is the topmost workable coal horizon. The seam occurs above lower workable seam separated by parting of 9 to 20 m. The parting generally increases from east to west. The thickness of seam ranges from 0.37 to 3.59 m, the average thickness being 1.5 to 2.0 metres. In this property, the seam has attained workable thickness almost throughout the area. Generally, the roof of upper workable seam is comprised of slightly compact medium to coarse grained sandstone followed by grey shale as the immediate roof. In places soft carb. shale varying in thickness from 0.19 to 1.61 m is found as immediate roof of the seam and may cause mining troubles. The floor of the seam is generally sandy shale followed by med.grained sandstone. The number of bands in the seam varies from 1 to 4 distributed throughout the seam. The total thickness of dirt band shows variation from 0.12 to 0.38 metres with ash content varying from 30% to 70%.

7.2 QUALITY OF COAL:

7.2.1 The assessment of the coal qualities of these seams are based on the studies of proximate analysis and ash fusion tests carried out by the Regional Coal Survey Station. The studies are confined only to three seams namely the Lower and Upper Workable Seams.

7.2.2 Bardoni Seam:

Bardoni seam is superior in quality to both lower and upper workable seams, being mostly Gr.II. Proximate analysis on air dried basis indicate that moisture and ash percentages vary between 1.4 to 4.2 and 13.7 to 31.5 respectively. The seam is comparatively free of dirt band. On equilibrated basis, the volatile matter (VM) content (excluding dirt band) of seam varies from 26.9 to 29.7%. Including dirt band, the volatile contents of seam ranges from 24.0 to 27.8%. The caking index varies from 7 to 12. The G.C.V including dirt band varies from 4100 to 5250 K.Cal/Kg. and the UHV including dirt band varies from 4420 to 6020 K.Cal/Kg. The S. value is 44. No ash fushion data are available for the present area. In Pathakhera-I and extension area, the ash fusion temperature range (in mildly reducing atmosphere) from 1170°C to over 1400°C.

7.2.3 Lower Workable Seam:

The moisture and ash contents (at 60% R.H. and 40°C) of coal from this seam (excluding dirt bands) vary between 2.5 and 3.4 and 22.1 and 28.10 respectively. Moisture and ash content including dirt band (on 60% RH and 40°C) vary between 2.6 and 3.7 and 28.0 to 34.1) as observed from the analyses of boreholes PK-1,4,5,8,10 and 11 etc. The proximate analysis on air dried basis excluding bands indicate moisture and ash percentages vary between 1.6 to 4.0% and 21.0 to respectively. V.M. range on equilibriated basis is from to 28.8%. The coal seams near dyke 'C' are devolatalised

to varying degree. The caking index varies from 5 to 11. The U.H.V. including dirt band varies from 3550to 4760 K.Cal/Kg. and U.H.V. excluding dirt band varies from 4020 to 5280 K.Cal/Kg. The H.G.I. value is 43. No ash fusion data are available for the area under consideration. In Pathakhera-I and extension area, the ash fusion temperature range from around 1160 - 1290°C to over 1400°C in mildly reducing atmosphere.

7.2.4 Upper Workable Seam:

The moisture and ash contents (at 60% RH and 40°C) of coal (excluding bands) vary between 3.0 to 4.0% and 24.0 and 30.0% respectively. Moisture and ash percentage including dirt bands (on 60% RH and 40°C) vary between 2.5 and 3.9% and 28.4 and 35.2%. The proximate analysis on air-dried basis excluding dirt bands indicate variation in moisture from 1.5 to 4.0% and for ash from 22.6 to 32.0%. The V.M. of the seam varies from 24.3 to 28.2% in equilibriated basis. The caking index of the seam varies from 3 to 11. The U.H.V. including dirt band varies from2130 to 3600 K.Cal/Kg. and UHV excluding dirt band varies from 3670 to 5210 K.Cal/Kg. H.G.I. value is not available for the present area. In the area in Pathakhera-I and extension HGI ranges from 47 to 51. The ash fusion range is from 1130 to 1250°C to over 1400°C. (mildly reducing atmosphere) in Pathakhera-I and extension area.

TABLE NO.IX

Seam	Proximate analysis at 60% R.H. and 40°C. M%	Ash%	VM%	U.H.V. in K.Cal/Kg	Ash fusion temp. °C	Caking Index	
Bagdona Seam	1.4 to 4.2	13.7to 31.5 (20.0to 34.0)	26.9to 29.7 (24.0 to27.8)	4420 to 6020	1170 to 1400	7 - 12	
Lower Workable Seam	2.5 to 3.4 (2.6to 3.7)	22.1 to 28.1 (28.0to 39.1)	26.5to 28.8	4020 to 5280	1160to 1240 to over 1400	5 - 11	
Upper Workable Seam	2.1 to 4.9 (2.5to 3.9)	23.0to 30.0 (28.4to 35.2)	24.3to 28.2	3670 to 5210	1130 - 1250to over 1400	3 - 11	

7.3 QUALITY OF COAL SUPPLY:

From the above table No.IX, it is seen that the likely grade of lower and upper workable seams would vary between Grade D and E and that of Bagdona Seam would be Gr.C/D. As mentioned in para 7.1, the immediate soft carb./grey shale would have a tendency to part during mining operations thereby deteriorating the quality of coal supply. At present, the major share of production is from lower workable seam and the balance is from upper workable seam. The present declared grade of upper and lower workable seams of Pathakhera Areas as per the new grade classifications, is grade 'E'. It is expected that in future also the present despatch grade of coal would be maintained.

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CHAPTER-VIII

DELINEATION OF MINE COMPARTMENTS

8.1 For the purpose of this project report, the whole property has been divided into three sectors.

8.1.1 Sector 'F':

This is bounded by fault F4F4 in the north, fault F1F1 in the south and tentative outcrop of Bagdona Seam in West. Dyke 'A' and 'B' cross through the western and central portion of this Sector. This Sector has been further divided into sub-sectors.

(i) Sub-Sector f1:

This sub-sector is bounded by fault F4F4 in north, tentative outcrop of Bagdona Seam in west and south and dyke 'B' in east.

(ii) Sub-Sector f2:

This sub-sector is bounded by dyke 'B' in west, fault F4F4 in north, dyke 'A' in east and tentative outcrop of Bagdona Seam or fault F1F1 in south.

(iii) Sub-Sector f3:

Sub-sector f3 is bounded by dyke 'A' in west, fault F4F4 in north and north east and fault F1F1 in south and south east.

8.1.2 Sector 'E':

This is bounded by fault F4F4 in south and south west Fault F7F7 in the east, dyke 'C' in north and northwest.

8.1.3 Sector 'D':

This sector is limited by dyke 'C' in the south, Fault F8F8 in east and north east. Fault F16F16 is the western and north western limit of the sector. This sector has also been divided further into sub-sectors:

(i) Sub-Sector 411

This sub-sector is proved reserves. It is the southern limit, the eastern southern limit is fault F4F4 and F1F1 respectively. northern limit is the proved limit line of this sector.

(ii) Sub-Sector 421

This triangular sub-sector is bounded by fault F4F4 in west, fault F16F16 in west and limit line of this sector in south.

(iii) Sub-Sector 431

On west and north west this sub-sector is bounded by fault F16F16. On south the tentative extension of fault F4F4 is the limit. On south east, it is bounded by dyke 'C'. The eastern limit of this sub-sector is the proved limit of this sector.

8.2 SIZES OF INDIVIDUAL MINES:

The property was being worked by two pairs of inclines. Another incline and a pair of air shaft has been added upto work Bagdona Seam of Sector 'F'. As proposed in the earlier feasibility report, the property will be worked in two units:

(i) Satpura Mine No.I i.e. Incline No.5 and 6:

The area to be worked by this pair of inclines is part of Sector 'F' bounded by fault F4F4 in north, dyke 'B' in west and fault F1F1 in south i.e. sub-sector f2, f3.

(ii) Satpura Mine No.II i.e. Incline No.7 & 8 and Ba Incline:

The remaining area i.e. except the area already considered to be worked by Satpura Mine No.I, would be by Satpura Mine No.II.

8.3 The total leasehold area of the project was 39 hectares. The area now considered for revision of the ject is 492.0 hectares.because of addl.area consider

CHAPTER - IX

RESERVES, TARGET OUTPUT & LIFE

9.1 RESERVES:

9.1.1 The reserves for individual areas have been estimated by taking their average thickness and specific gravity. The reserves for each area for each sector have been calculated separately. The reserves standing on pillars have been calculated by reducing the gross reserves by 35% due to coal taken out during the development stage. For arriving at net total reserves a deduction of 10% of proved geological reserves and 20% of indicated reserve respectively has been effected from the gross reserves to account for any geological disturbances.

9.1.2 The net proved and extractable reserves of the three seams for Sectors D,E and F have been given in Table No.X below:

TABLE NO. X

Sector/ sub-sector.	Seam	Avg. thickness in m.	Net proved geological reserves			Minenable reserves in m.tes.	Extractable reserves in m.tes.
			Standing on pillars in m.t.	Virgin area in m.	Net total reserves in m.tes.		
1.	2.	3.	4.	5.	6.	7.	8.
Sub-sector	U.V.S.	1.80	-	3.340	3.340	3.314	2.154
	L.V.S.	3.30	-	6.12	6.12	5.708	3.700
	Bugdons Seam	1.60	-	2.823	2.823	2.656	1.859
Sub-total				12.283	12.283	11.678	7.723

					6.	7.	
			5.				
		4.					
	3.			2.101	2.101	1.9	
1.	2.			3.548	4.279	3.815	
	U.V.S.	1.70	0.750	1.071	1.071	0.9	
	L.V.S.	3.35	-				
1	Bagdona	1.60	-	6.721	7.451	6.603	
	sub-total		0.750	0.250	0.358	0.334	
				1.000	1.148	1.047	
f1		1.7	0.140	0.555	0.555	0.506	
f2	U.V.S.	1.7	-	1.821	1.961	1.771	
f3		1.7	0.140				
	sub-total				0.416	0.416	
		1.7	0.416	-	1.750	1.750	
f1		3.5	1.75	-	1.143	1.036	
f2	L.V.S.	3.5	-	1.143	3.309	3.196	
f3		3.5	2.168				
	sub-total			1.143	0.771	0.632	
				0.771	1.702	1.361	
f1		1.6	-	1.702	0.489	0.442	
f2	Bagdona	1.6	-	0.489			
f3		1.5	-	1.962	2.962	2.435	
	sub-total						

9.1.3 The total net, mineable and extractable reserves of the area for each seam and for each mine i.e. for Satpura Mine No.I and Satpura Mine No.II are given in table XI be

TABLE NO.XI

Mine	Seams	Total net reserves in m.tons.	Total mineable reserves in m.tons.	Total extractable
Satpura Mine No.I i.e. Incline 546	U.V.S.	1.703	1.547	0.
	L.V.S.	2.093	2.780	1.
	Bagdona	2.191	1.803	0.
	sub-total	6.787	6.130	3.
Satpura Mine No.II i.e.Incline 788 Bagdona incline	U.V.S.	5.699	5.440	3.
	L.V.S.	10.815	9.937	6.
	Bagdona	4.665	4.252	2.
	sub-total	21.179	19.629	12.
	G.Total	27.966	25.759	15.

9.1.4 The area further on north and west and beyond the proved limits (refer Plate No.III) would have to be worked from Satpura Mine No.II. The non indicated reserves available in both the blocks E and F would be about 1.75 m.tons. and the extractable reserves would be about 1 m.tons.

9.2 TARGET OUTPUT:

9.2.1 The total extractable reserves are estimated to be 15.839 m.tes. The project was originally planned for the production capacity of 0.45 m.tes. per annum. As brought out in Chapter-II, there is shortage of coal supplies to Satpura Thermal Plant. To wipe out part of this short-fall the project is now proposed to initially have the increased capacity upto .60 m.tes. per annum. With the closure of Satpura Mine No.I/A i.e.after 20 years, the project capacity would be reduced to 0.45 m.tes. per annum.

9.2.2 Satpura Mine No.I with a pair of inclines is designed to have capacity of 0.15 m.tes. per annum.

9.2.3 Satpura Mine No.II including Bagdona Incline is envisaged to have production capacity of 0.45 m.tes. per annum.

9.3 LIFE:

9.3.1 The extractable reserves of Satpura Mine No.I being 3.039 m.tes., with the target rate of production the life of the mine works out to about 20 years. At 85% level of production, the life comes to about 24 years.

9.3.2 The extractable reserves of Satpura Mine No.II are 12.80 m.tes. The reserves envisaged to be extracted in first three years i.e.1979-80,80-81 and 81-82 would be 0.90 m.tes. The balance reserves available for Satpura Mine No.II would be 11.90 m.tes. The life of Satpura Mine No.II with target production of 0.45 m.tes./annum would be about 30 years. The life of Satpura Mine No.II and that the project would thus be about 30 years at 100% level of production and about 34 years at 85% level of production.

CHAPTER - V

PRESENT METHOD OF MINE

5.1 Mine opening:

Satpura project has two mines - Satpura mine No.I and Satpura mine No.II. The details of mine entries with its dimensions, length, gradient etc. of both the mines are given in Table No.XII below:

TABLE NO.XII

S.No.	Name of mines.	Name of entries & purpose	Length/ depth	Grad-ient	Cross section area in sq.mts.
1.	2.	3.	4.	5.	6.
1.	Satpura Mine No.I	Incline No.5	45	1in4	4.2x2.6 = 10.92
		Incline No.6	45	1in4	4.2x2.5 = 10.5
		Airshaft	22	vertical	15.91
2.	Satpura Mine No.II	Incline No.7	90	1in4.5	4.2x2.5 = 10.5
		Incline No.8	94	1 in 6	4.8x2.8 = 13.44
		Air Shaft	21.25	Vertical	18.10
		Bagdona incline	106 m	1 in 4	3.60x1.80 = 6.48
		Airshaft1	23 m	-	dia4.50
		Airshaft2	18 m	-	dia4.80

10.2 Panels being worked:

10.2.1 Satpura Mine No.I:

At present, the work is confined in upper workable and lower workable seams. In part of the area upper workable seam has been developed on Bord and Pillar and the extraction of already developed panel on Bord and Pillar pattern is being done in one panel. Development by Bord and Pillar is being practised in lower workable seam.

10.2.2 Satpura Mine No.II:

Three development panels including main dip development (in lower workable seam only) are being worked by Bord and Pillar.

10.2.3 Bagdona Incline:

The inter connection has just been established and the sub-sector f1 of Sector 'F' is envisaged to be worked by Bord and Pillar.

10.3 Ventilation:

The mines are Category II in gassiness. In Satpura Mine No.I in boreholes and at faces and in cavities near dyke at times upto 5% of gas had been found, but in general body i.e. in district and main return the percentage of methane is negligible. In Satpura-II even in boreholes negligible quantity may be available ocassionally.

10.3.1 Satpura Mine No.I:

The incline no.5 and 6 is being ventilated by an axial fan (PV 200 type) installed at air shaft of 4.5 m dia. The fan has the capacity to deal with 5600 cu.m/min of air. At present it is dealing with 4800 cu.m/min. of air. It is driven by 150 HP motor. Both the inclines a acting as intakes and air shaft is acting as the main return.

10.3.2 Satpura Mine No.II:

The mine is using ventilator of 150 HP capa
fan (FV 300) installed at the top of air shaft. The
dealing with 56.4 cu.m/min. of air ... developa ... mm
gauge. At present, both the inclines ... 10.6
6 are acting as intakes - 2100 cu.m/min. and 3040 cu.m/
of air is passing through in the belt and haulage incl...
respectively.

10.4 Pumping and Drainage:

10.4.1 Satpura Mine No.I:

The existing main sump is in 15th level (refer
Plate No.III). Through various pumps water from differ...
seams/districts is pumped to the main sump. One main p...
(500 gpm capacity)conveniently deals with the make of ...
water and 2nd pump acts as standbye. There are adequat...
number of pumps, pipes and pipe fittings to deal with t...
existing make of water.

10.4.2 Satpura Mine No.II:

The existing main sump is in 8th level e st in
lower workable seam. Two DSM 3 main pumps (each of 250 g...
capacity) deal withthe existing make of mine water. Thro...
adequate number of pumps water from different districts ...
pumped to the main sump.

10.5 Power Supply:

Satpura Mines No.I and II receive power at 3.3
by means of an overhead line from central sub-station(3...
KV) at Pathakhera I. The central sub-station is suppli...
power from their Sarni Power House situated at a dista...
about 3.5 km. The existing connected load for Satpur...
No.I and II is 735 KW and 877 KW respectively. Each m...
has separate sub-station at surface and as well in un...
und.

10.6 Underground transport arrangements:

10.6.1 Satpura Mine No.I:

At present one development panel namely in lower workable and one depillaring panel in upper workable seam are being worked in Incline No.5 and 6. 150 HP direct haulage is installed at the Incline No.5. The district transport system consists of endless and direct haulage combination.

10.6.2 Satpura Mine No.II:

Two panels namely E-3 and W-1 and one main dip panel are being worked in this mine. The coal from this mine is being transported out by 900 mm truck belt conveyor installed in Incline No.7. In each case the district transport system consists of endless (50 KW) and direct haulage (target -250 KW).

10.6.3 In addition one district is proposed to be worked in Bagdona Incline i.e. [illegible] in Bagdona seam for working part of Sector 'F'.

10.7 Surface transport and Despatch:

Coal from Satpura No.I and II is received onto 24 tes. and 8 tes. overhead bunkers respectively. Coal from Bagdona incline is also proposed to be discharged onto 24 te. overhead bunker. Coal from these openings is transported upto M.P.E.B. Hopper through tipping trucks. From here coal is transported to Satpura Power Station by M.P.E.B. belt conveyor.

10,8 Current Production and its cost:

10.8.1 Satpura Project produced .24 m.tes. (Satpura No.I 0.105 and Satpura No.II 0.135) in 1977-78. The production for 1978-79 was 0.32 m.tes. (Satpura Mine No.I 0.125 + Satpura Mine No.II 0.20 m.tes.). The production envisaged for 79-80 is 0.38 m.tes. (Satpura Mine No.I 0.13+Satpura Mine No.II 0.25).

10.8.2 The cost of production per ton (combined) for six months i.e. October,78 to March,79 with the progressive cost from Oct.,78 to March,79 is given in table No.XIII below:

TABLE NO.XIII

Combined Cost of Production of Satpura Mine No.I and No.II.

S. No.	Particulars	Oct. 78	Nov. 78	Dec. 78	Jan. 79	Feb. 79	Mar. 79	Progressive cost Oct., 78 to March, 79
	Production in tes.	21069	23144	26223	29083	29511	30959	159
1.	Wages in Rs.	33.04	31.20	30.04	28.62	28.34	28.17	
2.	Stores in Rs.	9.27	9.44	9.17	8.17	8.28	8.14	
3.	Power in Rs.	5.00	4.68	3.55	3.31	4.30	4.67	
4.	Interest in Rs.	3.49	3.18	2.81	3.29	2.54	2.38	
5.	Depreciation in Rs.	5.14	4.68	4.13	3.73	3.74	3.51	
6.	Other expenditure in Rs.	8.40	6.65	6.40	4.81	5.82	6.52	
	Total:	64.34	59.83	56.70	51.93	53.02	53.39	56.

10.8.3 Table No.XIV gives the progressive cost of production from April,78 to March,79 for Satpura Mine I and II separately.

TABLE NO.XIV

Name of Mine	Prodn. in tes.	Wages in Rs.	Stores in Rs.	Power in Rs.	Interest in Rs.	Dept.Oth in Rs.
Satpura Mine-I	124425	31.74	8.25	3.86	3.89	5.00
Satpura Mine-II	200000	29.49	8.77	3.79	2.24	3.75

10.8.4 Tables No.XIII and XIV reveal the existing progressive cost of production for Satpura Mine No.I and II to be Rs. 59.81 and Rs.53.60 per tonne respectively. The overall cost of the project is Rs.56.03 per tonne (Oct.78 to March.79)

10.9 Manpower and Productivity:

10.9.1 The existing total manpower is 1476. The manpower in Satpura Mine No.I is 612 and that in Satpura Mine No.II is 864. The details of manpower as per the earlier approved feasibility report is given in Appendix-B.

10.9.2 The average output per manshift of Satpura Mine No.I is 0.82 and that of Satpura Mine No.II is 1.06 . The overall O.M.S. of the project is 0.96 .

10.10 Existing welfare amenities:

Basic welfare amenities like houses, roads etc. are meagre and need augmentation. Such other amenities like Workers Institute, Pit head bath, dispensary, shopping centre etc. are not existing.

CHAPTER-XI

MODE OF ENTRIES & METHOD OF OF E DEVELOPMENT

11.1 MODE OF ENTRIES:

11.1.1 SATPURA MINE NO.I:

As mentioned in Para 10.1, Satpura-I has two in- clines and an air shaft. From the point of view of vent tion, transport etc. the exi ting openings are adequa deal with the production capacity upto 0.15 m.tes. per

11.1.2 SATPURA MINE NO.II:

This mine has also two inclines and an air shaf mode of entries. From the existing openings, from the letion st ndard alone, it is not possible to reach the lier envisaged production capacity i.e. 0.45 m.tes./an To revise the mine upto ultimate production capacity o 0.45 m.tes/annum another opening is needed to act as i The maximum quantity of air (intake) the mine openings would be required to d l , works out to be 7500 cu.m/ Within the recommended velocity limit of 4 m/sec.(becau of belt conveyor being installed in one of the incline other incline being in parallel), the existing incline deal upto maximum of 5480 cu.m/min. The additional ope is requi ed to cater for the vent l tion requirements (para 16.3.3). On techno-econo ic consideration (ref.pa 11.3.3) an incline 300 m dipping at gradient of 1 in 4 proposed to be driven in Sector 'D' (refer Plate No.III The existing air shaft acting as return, would be in a tion to meet the ultimate requirement of the mine.

11.1.3 BAGDONA INCLINE:

With an incline and an air shaft as intake and second airshaft as return, the openings envisaged for t roduction capacity of 0.06 m.tes./annum are considere dequate.

11.2 METHOD OF DEVELOPMENT OF AREA IN BATTURA BLOCK NO.II

11.2.1 SUB-SECTOR f2:

The pair of inclines no.5 and 6 had been driven near the outcrop of lower workable seam and do not cut across the upper workable seam. Approach to upper workable and Bagdona seams exist in this sub-sector.

11.2.2 SUB-SECTOR f3:

(a) Approach to lower workable seam:

The area south east of dyke 'A' is being approached through two drifts (ref.Plate No.III and V) one of the drifts, 52 metres in length, has touched lower workable across the dyke. This drift would be the main return. The second drift, to act as an endless haulage roadway, is about 70 m in length and would be intake roadways. Air shafts 3.6 m in dia is proposed to be driven, which will act as another intake. An air shaft would be 70 m in depth and would be driven upto lower workable seam. The return drift would act as travelling roadways. The location of different drifts and air shaft has been shown in Plate No.III and V.

(b) Approach to upper workable seam:

A drift and staple shaft are proposed to be driven. The drift will be as intake and coal raising-cum-material supply drift. The air shaft would be the second intake for this seam. The haulage roadway is also proposed to act as a travelling roadway. The special permission would be required from DGMS in this regard. The drift will be rising 1 in 4 in the same direction as the true dip of the strata. The length of drift would be about 50 m. The proposed dimensions of the drift are 4.2 x 2.5 m. Staple shaft 3.0 m dia will be the main return. The proposed location of the drift and staple shaft have been shown in Plate III (Drg.No. 1-00341) and Plate No.IV (Drg.No. 1-00356)

(c) Approach to Bagdona Seam:

The low... seam is proposed to be approa... by two drifts, dipping 1 in 4 against the dip of the ... The dimensions of the drifts are proposed to be 4.2 ... Both the drifts are proposed to be intakes. One of the ... drift would be fitted with haulage and would be utilis... coal raising and material supply. The second drift ... used as travelling drift. The length of drifts would ... 105 m each. The main return is proposed to be through ... dia staple shaft. The location of drifts and staple ... have been shown in Plate No.III and Plate No.VI.

11.3 METHOD OF DEVELOPMENT OF SEAMS IN SATPURA MINE...

11.3.1 ENTRY TO SECTOR I1:

The pair of inclines no.7 and 8 touch lower ... seam.

(a) Approach to upper workable seam:

The upper workable seam in this sector is being approached by driving two short dipping drifts from lower workable seam from Sector 'E' (refer Plate No.III). The drifts would be intakes and dimensions of the drifts would be 4.2 x 2.5 m. One of these drifts would be used materiel supply. 3.0 m dia staple shaft is proposed to the return airway. One more staple shaft is proposed to driven. This staple shaft will act as a bunker for the of upper workable seam. The length of drift will be ... 12 m and the dimensions are proposed to be 1.8 x 2.4 m. staple shaft would be inverted truncated pyramid at its bottom with foot wall slightly sloping so that the coal on its does not directly hit chute. The capacity of staple would be approximately 50 tonnes. The proposed location ... staple bunker and air shaft and as well the location of ... ting two drifts is shown in Plate No.III.

11.3.2 Access to sector 'B':

(a) Approach to lower workable seam:

Through three drifts lower workable seam in Sector 'B' has been approached. Two of these drifts are intakes and third is acting as return. One of the intake drifts is used for material supply and in other intake drift belt conveyor has been installed. The belt conveyor and material supply drifts are rising at 1 in 100 in the direction of the general dip of the strata. The main return drift is rising at 1 in 25 also in the direction to the dip of the strata. For ultimate requirements from ventilation standards one more drift to act as the main return would be needed. The tentative location of the proposed drift is shown in Plate No.III. This drift is proposed to be rising at 1 in 2.5. The length of this proposed drift would be about 50.0 metres and dimensions would be 4.2 x 2.5 metres.

(b) Approach to upper workable seam:

For working this seam two rising drifts, both acting as intakes and staple shaft (as return) are proposed to be driven. One of the drifts will be used for material supply and the second drift will be used for travelling. Both the drifts are proposed to be driven at a gradient of 1 in 4 (rising). The length of drifts would be about 70 m. The dimensions of the drifts would be 4.2x2.5m. The staple shaft is proposed to be of 3.6m diameter. For coal transp from upper to lower workable four staple shafts to act as bunkers are proposed to be driven. These bunkers would be of the type as mentioned in para 11.3.1 except that the dimentions would be 2.4x2.4x20 m. The bunkerage capacity o the staple bunker would approximately be 100 tonnes. In addition, two more drifts are proposed to be driven for t area below 21st level east. Both the drifts will be int and air shaft proposed earlier will be return airway. T dimensions and the gradient of the drifts will be the sa as stated above. The drivage of these drifts and staple

would be done first and dip side area of deeper workable is this sector would be extracted. This would be done the extraction of lower workable seam possible. The ... ion of different drifts and staple shaft have been ... Plate No.III.

(c) Approach to Bagdona Seam:

Bagdona Seam is proposed to be entered by two drifts and staple shaft, starting point of both the drifts would be from Sector 'F' so that advantage of three ... fault is taken. One of the drifts will be intake-cum-... age roadway and the 2nd drift, will be intake-cum-travel roadway. Haulage drift is proposed to be started about above the roof of lower workable seam. Through a small ... to. bunker coal is proposed to be discharged onto trunk conveyor. The gradient of drifts is proposed to be 1 in 4. length of drifts would be 180 m and the dimensions would 4.2 x 2.5 m. Staple shaft 3.6 m dia from lower workable Bagdona Seam is proposed to be driven and would act as ... to airway. The proposed locations of drifts and staple shaft have been shown in Plate No.III.

II.3.5 ENTRY TO SECTOR 'D':

The following different alternatives for exploiting various seams of this sector were considered:

(A) Working of this sector as separate mine having two inclines and a air shaft.

(B) Working of this sector from Shobapur project by taking advantage of almost juxta-positioning of Bagdona Seam (in Shobapur) with lower workable seam in Sector 'D'.

(C) Working of this sector by cutting across the dyke 'G' at three places (two of the drifts to be intakes and third one as return) with proposed air shaft in Sector 'D' to act as the main return for the mine. The existing three openings i.e. both the inclines and air shaft would act as intakes.

(b) Working of this sector by driving three drifts (two drifts /noperative for ventilation purpose and third to be return drift) across the dyke 'C'. Incline in Sector 'D' to act as intake, material-cum-travelling ... proposed. Both the existing inclines and air shaft would continue to act as intake and return airways respectively.

On techno-economic considerations (refer Annexure -I), it is proposed to enter this sector by driving three drifts across dyke 'C'. For travelling and material supply an incline is proposed to be driven about 200 metres east of borehole PK106. The incline would be driven upto lower workable seam. The length of incline would be 300 m and is proposed to be driven at the gradient of 1 in 4. The dimension of the incline are proposed to be 4.5 x 2.4 m. The special permission to use such an incline as travelling roadway would/have to be sought from D.C.M.S.

(a) Approach to upper workable seam:

In addition to material supply-cum-travelling intake incline, one more drift is proposed to be driven as second intake airway ... at the gradient of 1 in 3 in same direction as dip of the bed. The length of drift would be about 48 m and the dimensions are proposed to be 3.0x2 3.6 m dia staple shaft is proposed to act as return airway For coal transport four staple bunkers of the type mentioned in para 11.3.2(b) would be driven. Location of different drifts and staple shaft is shown in Plate No.III and Plate No.IV, Drg.No.1-00356.

(b) Approach to lower workable seam:

In addition to an incline, three drifts will be driven across the dyke. The return drift would be 4.8 x 2.5 m. The other two drifts would be 4.2 x 2.5m. The proposed return drift would be driven first (rising at gradient of 1 in 5). The length of drift would approx. be 80 m belt conveyor drift is proposed to be driven at the up

tion50.

rising gradient of/. The length of the drift would be
/area about 70 m. The coal from across Sector 'D' is proposed
be transported to the trunk belt conveyor of Sector 'C'
bunker (refer Plate No. V Drg.No. I-00357). The
drift about 80 m in length would be driven at the gradient
of 1 in 4 and would be used for material supply between
Sectors 'D' & 'E'. The proposed location of drifts is
in Plate No.III.

(c) Approach to Bagdoma Seam:

3.0 x 2.4 m intake drift dipping at 1 in 3 against
the general dip of the beds is proposed to be driven from
lower workable seam to Bagdoma for material supply purpose
The length of drift would be about 110 m. In addition, a
supply drift (intake) dipping at 1 in 4 against the dip of
the beds is proposed to be driven from about 5 m above the
lower workable seam. The drift is proposed to be extended
upto 5 m below Bagdoma Seam. The length of drift would be
about 180 m. The belt conveyor is proposed to be installed
in the drift. At each end there would be 5 m staple bottom.
The dimension of drifts are proposed to be 4.2 x 2.5m. The
coal supply drift would also be used as travelling roadway.
The return airways for Bagdoma Seam is proposed to be through
3.6 m air shaft. The proposed location of drifts and
staple shafts is indicated in Plate No.III.

11.4 DEVELOPMENT OF BAGDOMA SEAM IN SECTOR 'F':

This seam is being entered through an incline and
two air shafts (ref.para 10.1). The location of incline &
air shafts is also shown in Plate No.III. It is also pro-
posed to drive one 2.4m x 2.1m drift dipping at 1 in 3
against the dip of the beds so that statutorily Bagdoma
cline would be treated as part of Satpura Mine No.II. The
length of the proposed drift would be about 110 metres.

CHAPTER-XII

METHOD OF WORK

12.1 As brought out in Chapter-VIII, the leasehold area of the property is divided into three sectors and is being worked by two separate mines.

1. Satpura Mine No.I
2. Satpura Mine No.II including Bagdona Inclines.

12.2 The extractable reserves of Satpura Mine No.I is approximately one fifth of total extractable reserves. Lower workable Seam has mostly been developed in Satpura Mine No. I and part of upper workable seam has been developed on Bord and Pillar and is being extracted by caving. Lower Workable Seam has partly been developed by Bord and Pillar in Satpura Mine No.II. Development by Bord and Pillar has been taken up in Bagdona Seam in Sub-Sector f1. The reserves in the virgin area and the reserves standing on pillars have been brought in Table-X.

12.3 SPECIAL PHYSICAL PROPERTIES OF COAL AND STRATA:

12.3.1 Before deciding the method of work to be adopted in the project, it is considered necessary to spell out the physical properties of the coal and strata which have great bearing on selecting the face machinery and planning the mine.

12.3.2 Coal is banded in nature and occurs in layers. It is very hard. The protodyknov index of hardness of lower workable seam has been found to be 2.5. From the experience gained in actual mining operations, the performance of coal cutting machines have not been satisfactory. The immediate roof of upper workable seam is soft carb.shale of variable thickness ranging fr m 0.6 to 1.2 m and would have to be dressed down or thoroughly supported. The immediate roof of lower workable seam is sandstone and at places it is shale. This coal seam is more than 3.0 m thick; but the development is done along the roof (as experienced in

12.3.3 Coal seams have low volatile matter varying from 13 to 19%. The coal is not likely to spontaneously heat and there is no history of fire even in the caved areas of the adjoining Pathakhera No.I.

12.3.4 Satpura-I and II are Cat.II in gassiness as compared to Pathakhera-I and II. Satpura Mine No.I is Cat.II. This may be because of presence of dyke 'A' and 'B'. No gas in serious fouls. Though gas is not been found in any quantity in the district or coal return, it faces, [illegible] cavity or near the dyke upto 5% of fire damp has been found in Satpura No.I.

12.3.5 The mine is fairly dry. During development hardly any water seepages are noticed but during depillaring operations, on an average 250 g.p.m. of make of water has been observed in a panel in Pathakhera-I.

12.3.6 Partar beds are present in the northern part of the mine only (ref para 6.3.3 page). These beds are very thin clay band. The parting (consisting of [illegible] shale and thin coal seams of Barakar measures) between [illegible] and topmost workable coal seam i.e. upper working [illegible] Pathakhera area is about 100 metres. These beds have very thin [illegible] mine. So far no problem whatsoever has been encountered [illegible]

12.4 FACTORS TO BE CONSIDERED FOR SELECTING METHOD OF WORK:

12.4.1 At present Bord and Pillar system of mining is being followed in Satpura-I and II and adjoining Pathakhera I and II mines. Extraction of these developed pillars is being done by caving in Pathakhera Mine No.I and also in Satpura Mine No.I. In Bhobna-Sur Project Longwall system by caving has been recommended for upper workable seam

Seams. Also Tandull seam is found to be opened in Nagpur Zone in Extension area No.I.

12.4.2 In most of the area there are no important surface features except in the south eastern part of the area. In this part there are surface buildings and other infrastructure of Bhabhehra-I and II, Saipura-I and II etc.

12.4.3 Sandstone beds in the area in general are very hard and tough to be massive, specially the sandstone beds above lower workable seam do not cave in easily and at times the roof has to be brought down by blasting. The upper workable seam in the major portion of the area is at shallow depth. The physico-mechanical properties of the strata immediately above the three seams should be studied in collaboration with CMRS. The tests will also help in establishing the support density at the face and goaf edge.

12.4.4 The surface contouring has been done for sectors 'E' and 'F' and most of the area is free from surface structures. Surface contouring of the area over Sector 'D' is to be done. Almost entire area can be extracted by caving.

12.4.5 As discussed above, extraction by caving is possible in major area of the property except under built up area where partial extraction could have been possible with hydraulic sandstowing. But because of non-availability of sand in the area partial extraction/development as the final operation is recommended for such a sector.

12.5 PROPOSED METHOD OF COAL & FACE MACHINERY:

12.5.1 Because of higher thickness of lower workable seam, this seam is suitable for Bord and Pillar. The tendency of immediate carb.shale/grey shale just above upper workable seam is to part off easily. Supporting of this immediate roof either in Bord and Pillar or in longwall is fairly difficult. The height of coal seam after dressing of this carb.shale is above 2.5 m. Also in the major part of the area the seam being at shallow depth, the possibili

of longwall system ... proportion of the seams ... longwall mining is ... and Pillar method of ... work.coals recommended for ... of seams and direct roof sandstone are suitable ... coal by mechanised means.

12.3.7 Bandpur Seam is suitable for longwall by ... due to suitable seam thickness and stable ... which serve in more easily than sandstone. There are ... thin areas where due to several reasons longwall ... recommended. These reasons are -

(i) Occurrence of seam in small patches.
(ii) Shallow depth of seam.
(iii) Shape of the areas due to which ... and systematic longwall panels cannot be formed.
(iv) Working under surface features, such ... roads, buildings etc.

12.3.8 The seams and the sectors where different ... of work are to be followed have been spelt out in ... and 12.7, the same has also been shown in Plate-IV.7 ... The method of mining coal from the face including ... face machinery is being dwelt herewith.

12.3.4 DEVELOPMENT METHODS:

12.3.4.1 Number of development panels will be needed ... be worked out at the mine by Bord and Pillar. Four ... natives have been considered for such drivages.

Alt.I Cutting, drilling, blasting and manually ... ing the blasted coal into coal tubs.

Alt.II Cutting, drilling, blasting and manually ... ing the blasted coal onto chain conveyor ... would deliver coal onto coal tubs.

Alt.III Cutting, drilling, blasting and loading the ... blasted coal by side loaders onto chain ...

which would feed coal to a to belt conveyor/ surface haulage.

Alt.IV Cutting, drilling, timbering and loading the blasted coal by load haul dumper onto steigler which would feed coal to gate belt conveyor.

12.5.4.2 As brought out in para 2.4.1(a) (ii), the development by sumpers has not been considered. The approximate indices of each of the methods described above has been shown in Annexure-II. Table No.XV below gives the district cost/te. for each of the methods listed above.

TABLE NO.XV

RELATIVE MERITS OF DIFFERENT ALTERNATIVES OF DEVELOPMENT

S.No.	Particulars	Alt.I	Alt.II	Alt.III	Alt.IV	Remarks
1.	Coal production/day s.tes.	300	450	450	480	
2.	Coal production/annum s.tes.	0.09	0.135	0.135	0.144	
3.	Manshifts/day.	205	736	152	120	
4.	O.M.S.(Rs.)	41.0	41.0	41.0	41.0	
5.	O.M.S. (tes.)	1.38	1.91	3.41	4.00	
6.	Wages cost/te(Rs)	27.70	21.47	12.09	10.25	
7.	Int.and depreciation per te.of coal output (Rs).	7.40	9.21	13.55	12.91	
8.	Power cost/te.of coal output.	1.50	2.00	2.00	2.00	
9.	Stores cost/te.of coal output.	5.00	5.50	6.00	6.00	
	District cost/te. of coal output.	41.60	38.18	33.57	31.16	

12.5.4.3 Though the last alternative is the cheapest, it has not been preferred on the ground that for the present mechanised pillar extraction is not feasible with this system. The third alternative is costlier than the last alternative but is cheaper compared to other two alternatives. In actu

performance with this system the results are fairly satisfactory. This system may be extended even for thick seams of pillars. As such this alternative is suggested for Satpura Mine No.II. The different capacity of size of are available in the market. The one with 0.6 m.m. capacity has been preferred so that would suit the duty requirements. The layout of one such panel is given in Plate VII Drg.No.2-000209.

12.5.4.4 In Satpura Mine No.I leasing limited resources and low production level the existing method i.e. All is proposed to be continued. The miner size for both mines would be as per statute. The gallery width is proposed and to be kept upto 4.8 m.

12.5.4.5 Six headings development panel is proposed for upper and lower workable coal seams. The sequence of operation of side loaders panel has been shown in Plate VII. The dip and rise galleries are proposed to be driven first and level headings would be driven after dip rise connections are established. The dips would be driven to one third and rises for two third of length of pillars. This would help in keeping the chain conveyors extended inbye sufficiently thereby minimising the side loader movement.

12.5.4.6 One each mechanised panel is envisaged to produce 450 tes./day i.e. 0.135 m.tes. per annum (refer page 55 para 13.2.3). The production envisaged from manually developed panel is 240 tes./day i.e. 0.072m.tes. per annum. In addition to panel development, dip heading in different seams will also be worked. Coal from these dip headings is proposed to be manually loaded onto coal tubs.

12.5.5 METHOD OF EXTRACTION BY BORD AND PILLAR:

(1) Partial extraction under built up areas:

(a) Residential colony and other infrastructures exist in southern and south-eastern part of Satpura Mine No.I. In such an area development/partial extraction of different seams as final operation may have to be done.

by stressing permission from D.G.M.S. Two alternatives outside for partial extraction have been considered. In the first alternative, larger pillars are formed and then split into smaller pillars on retreat. In the second alternative the virgin block is developed with the boundary with three headings and on the retreat form the pillars of smaller dimensions. In this report, the first alternative has been proposed as this would yield higher production from the initial stage.

(b) Upper workable seams are proposed to be split and lower workable and Bandhan Seams are proposed to be developed only. With the factor of safety of 2.5(as per Salamon's formula), it is envisaged to have 45% extraction in upper workable. By forming pillars as per statute about 30% extraction in lower workable and Bandhan seams is contemplated. The pillar size, size of stook after splitting or final pillar size after widening, the width of gallery in first and final workings, height of workings and final %age extraction at different depths of workings have been given in Table No.XVI below:

TABLE NO.XVI

SIZE OF PILLARS FOR PARTIAL EXTRACTION

IN UPPER WORKABLE SEAMS

Depth of upper workable seam (upto floor) in ft.(H).	Width of galleries in ft. (B)	Height of galleries (total of G.W.S.)in ft. (h)	Width of pillars in ft. (W)	%age extraction of mineable reserves.
230 (70.0m)	16 (4.8m)	8 (2.4m)	28 (8.4m)	59.5
330 (100.0m)	16 (4.8m)	8 (2.4m)	38 (11.5m)	50.5
400 (120.0m)	16 (4.8m)	8 (2.4m)	50 (15.0m)	42.6
550 (170.0m)	16 (4.8m)	8 (2.4m)	70 (21.0m)	33.7
A V E R A G E :				46.5 say45.0

The formula considered is as follows:

$$S = \frac{1200 \times W^{0.46}}{p \times h} \qquad (1)$$

where
S = factor of safety
W = width of pillars in feet
h = height of galleries in feet
p = load on pillar in lbs/sq.ft.

(c) The value of 'p' is to be deduced from the following formula and the value substituted in equation (1).

$$p = 1.1\, H \left[\frac{W + B}{2}\right]^2 \qquad (2)$$

where
H = depth of seam in feet
W = width of pillar in feet
B = breadth of galleries in feet.

(d) For determining the size of pillars in the upper workable seam, depth of upper workable seam has been taken and for height of galleries has been taken as 7

(e) Salomon's formula is based on the assumption of the crushing strength of coal as 350 kg/cm^2 to 420 kg/cm^2. The mean crushing strength of lower workable seam as determined by C.M.R.S.(ref.Annexure-III) varies from 540 kg/cm^2 to 572 kg/cm^2. Therefore permanency of the area with the dimensions of pillars and galleries is almost a certainty. It is also suggested that studies are made by Research and Development wing of Limited with Central Mining Research Station, Dhanbad, for determining the efficiency of the proposed method.

(ii) Extraction by Caving:

During final extraction of Bord and Pillar Panels, coal is proposed to be won by blasting off the solid and manually/mechanically loading the blasted coal onto tubs/chain conveyor. The method of extraction

pillars would be on diagonal pattern and three pillars would be under attack at a time. Each pillar would be split into two halves by dip rise split. During final extraction, if required, the pillars under attack is proposed to be heightened upto full seam thickness and the split gallery is driven to full thickness of seam. Wooden props - cogs / 40 te. friction props with girders or channels as cross bars would be used as supports. Plate No.VII shows the sequence of extraction, district transport and support system of a typical mechanised depillaring panel. The ribs left during slicing are proposed to be robbed judiciously on retreat. One such manual/mechanised depillaring panel is envisaged to produce 335/450 tes. per day i.e. 0.10/0.135 m.tes. per annum.

12.5.6 LONGWALL PANELS

As mentioned in Para 12.5.2 Bagdona Seam is suitabl for longwall by caving. The area proposed to be worked by longwall system of mining is demarcated in Plate No.VI. /The present experience of working longwall faces with friction props in W.C.L.mines is not encouraging and W.C.L has also expressed doubts about the success of this method of support system at longwall face at other mines of W.C.L. The longwall faces are proposed to be worked with shearer either with individual hydraulic props or with Powered supports as face support in near future. Longwall shearer face, if proposed for Bagdona Seam, has a faster rate of advance compared to advance of upper and lower workable seams proposed bo be won

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by mechanised bord and pillar method of mining. The reserves of this bottom most seam are low. Till the upper seams are mined longwall panels by caving at Bagdona Seam cannot be worked. As such longwall panels may be required to be worked after about 15 to 20 years. Hence, the selection of face equipment for working this seam with longwall system of mining is not being considered at this stage.

12.6 WORKING OF SEAMS IN SATPURA MINE NO.I

12.6.1 Sub-Sector f2

At present development work(by Bord and Pillar) is mainly concentrated in lower workable seam. Towards West of main inclines upper workable seam developed on B and Pillar is being extracted by caving. The remaining virgin area of upper and lower workable and the entire B dome Seam in Sub-Sector f2 is proposed to be worked manua by Bord & Pillar and finally extracted by caving. Under built up area upper workable seam would be split as a fi operation. No further extraction is proposed to be done lower workable and Bagdona seams at this stage. However, it is suggested that model studies are made by Central Mining Research Station, Dhanbad for assessing the furth increase in extraction percentage of Lower Workable and Bagdona Seams.

12.6.2 Sub-Sector f3

As almost the entire property is under built up area and the property is virgin, it is proposed to do pa ial extraction in upper workable seam and only develop lower workable and Bagdona Seams. The final pillar size

for U.N.P. would be as mentioned in Table No.XVI. The pillar size of the area to be developed only would be kept as per statute.

12.7 WORKING OF SEAMS IN SATPURA MINE NO.II AND BAGDONA INCLINES

12.7.1 Sub-Sector f1

Lower workable seam has been developed by Bord and Pillar. Bagdona Seam, worked separately from Bagdona Incline and upper workable proposed to be worked from Satpura Mine No.II are also proposed to be worked manually by Bord and Pillar. Final extraction is also envisaged to be by manual means.

12.7.2 Sector 'E' and 'D'

i) Upper Workable seam:

It is proposed to be developed and depillared by Bord and Pillar with side loaders. The dip side area is proposed to be developed and extracted first and then the area on the rise side would be worked.

ii) Lower Workable Seam:

Quite a substantial portion of area has already been developed on Bord and Pillar. It is proposed to develop the remaining virgin area and extract the entire property with side loaders. The production expected per panel would be 450 tes. per day (with three side loaders and the annual production works out to be 0.135 m.tes.).

iii) Bagdona Seam:

This seam is not having workable thickness all over in sectors 'E' and 'D'. In the workable thickness zone it is envisaged to be worked by longwall retreating by caving except in small patches (refer Plate No.VI)

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where development and final extraction by bord and pillar has been contemplated. As stated in Para 12.5.6 the of winning this seam has not been dwelt at this in this report. However, the area earmarked for bord and pillar has been shown in the Plate No.VI. the essential developmental work for the part of the to be worked at later stage would be taken up and for the same has been kept in the report.

12.6 SEQUENCE OF EXTRACTION

12.6.1 The method of extraction of seams is by caving in most of the sectors and hence the sequence of extraction is in the descending order. Almost entire production in first 15 to 20 years would be from upper and Lower Workable Seams. Subsequently after exhaustion of reserves of upper seams, the major share of production would be from Bagdona Seam.

12.6.2 (i) Satpura Mine No.I

Sub-Sector f3 of this mine is proposed to be worked first followed by complete extraction of sub-sector f2, wherever feasible.

(ii) Satpura Mine No.II

Eastern part of Sector 'E' is proposed to be extracted first. In the meantime Sector 'D' is approached and developed. After exploitation of reserves in this sector western part of Sector 'E' is proposed to be extracted.

Sub-Sector f1 is proposed to be worked at the last stage. The development work in upper workable seam is proposed to be done after the development work in Bagdona Seam has been completed in sub-sector f1.

12.9 FUTURE METHOD

The longwall faces are proposed ~~to~~ be worked with shearer either with individual hydraulic props or with Powered supports as face support in mines of Western Coalfields Limited in near future. The technology which would give better production and economics in consistent with safety would then be selected accordingly for Bagdona Seam.

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CHAPTER-XIII

PRODUCTION PARAMETER & PRODUCTION PHASING

13.1 MINEWISE PRODUCTION TARGET

13.1.1 Based on the reserves of coal in this property [illegible] demand, the target for Satpura Project has been kept at 0.6 m.tes/annum. Out of this, the target proposed for Satpura Mine No.I would be about 0.15 m.tes/annum and the ance would be from Satpura Mine No.II. Subsequently on exhaustion of rqserves in Mine No.I, the production would be from Satpura Mine No.II only.

13.1.2 To achieve the production target of Satpura Mine No.I i.e. 0.15 m.tes./annum, two panels(one development - one depillaring or two development or depillaring) are visaged to be worked. In addition, one dip or panel development headings would also be opened.

13.1.3 The production from Satpura Mine No.I & II including Bagdona Incline is envisaged to be achieved by ing one or two Bord and Pillar mechanised development pa and one or two Bord and Pillar mechanised depillaring panels. On an average three panels are proposed to be w In addition to three panels, development drivages for ne headings (2 to 3 sets) would also be done. Upper Workable Seam is mostly virgin and in the initial stages major po roduction would be from UWS so that Lower Workable Seam ubsequently be extracted. Major portion of Bagdona sec worked by longwall at later date for which method of s not been spelt out in the report and so the productiv ters forthe panels to be worked on longwall has not be tioned at this stage.

2 PRODUCTION PARAMETERS:

2.1 Bord and Pillar Development Panel (Manual)

No. of galleries	6
No. of faces	11
Size of galleries	4.8 x 3m
Advance per cut	1.2
Production per cut (Factor 0.8,Sp.Gr.1.55)	4.8x3x1.2x1.5x0.8 = 21.47 tes. Say 21

No. of cuts per shift	4
Production per shift	80 tes.
Production per day	240 tes.
Production per month	6000 tes.
Production per year	0.072 m.tes./annum

15.2.2 Bord and Pillar Depillaring:

(a) Splitting:

No. of pillars to be split	2
Height of split	3.0 m
Width of split	4.5 m
Total advance of both the splits in 3 shifts (0.9 m.t/round)	2.7 m.tes.
Production/day from splits (Factor 0.8, Sp.Gr.1.5)	3.0x4.5x2.7x1.55 x0.8 = 45.2 say 45.00 tes.

) Slicing and stooks:

No. of stooks worked (max.)	3
Height of stook	3.5m
Width of stook	5 m
Total advance of all three stooks in 3 shifts.	13.5 m
Total production/day from stooks (Factor 0.8, Sp.Gr.1.55)	3.5x5x13.5x1.55 x0.8 = 292.95 say 290 tes.
Production per day	335 tes.
Production per month	8375 tes.
Production per annum	0.10 m.tes.

Bord and Pillar Development Panel (Side Loader):

No. of Galleries	6
No. of faces	11
Size of galleries	4.8 x 3 m
Advance per cut	1.2
Production per cut	4.8x3x1.2x1.55x0.8 = 21.43tes.say20tes
No. of cuts per shift	8
Production per shift	150 tes.

Production per annum 0.135 m.tns.

3.2.4 Board and Pillar Depillaring Panel/Section

The production from mechanised depillaring would be the same as from the development districts tes. per day. Coal preparation in depillaring pose a problem as can be seen from time cycle study.

(A) CYCLE TIME:

Drilling time in slice/shift	20 minutes
Charging, stemming and blasting	30 minutes
Waiting time	10 minutes
Dressing time	30 minutes
Supports and loading (inclusive of overlapping time)	60 minutes
	150 minutes
Slack time	50 minutes
	200 minutes

In eight hours shifts two cycles per shift is possible any one time three pillars are proposed to be under extraction. In one pillar, one slice would be under extraction a time.

Production obtainable from one round of blasting in one slice = 4.8 x 1 x 3.5 x 1.55 x 0.8 = 20.6 tonnes

Where Width of slice/split = 4.8 m
pull per round = 1.0 m
Height of seam = 3.5 m
Sp. Gravity = 1.55
Reserve Factor = 0.8

Production per shift from extraction of pillars is - No. of pillars x No. of cycles x Prodn. per round

= 3 x 2 x 20

= 120 tonnes.

About 40% of production would come from splitting, widening etc. So the production/day = 120x1.4x3=504

On an average consistent production of 400 tons/day would be available from dumpering districts with side loaders.

13.2.5 Dip Development Headings (Manual)

At a time four dip headings are proposed to be driven.

No. of galleries	= 4
No. of faces	= 7
Size of galleries	= 4.8x2.5 (avg) metres.
Average daily advance	= = 1.2 m
Average daily production	= 7x4.8x2.5x1.2x1.55 x0.8 = 124.99 tes. Say 120 tes.
Production per month	= = 3000 tes.
Production per annum	= 0036 m.tes.

13.3 The production of 0.45 million tonnes per annum for Satpura Mine NO.II is proposed to be achieved by working three panels with mechanised Bord & Pillars and atleast two dip development headings. It would not be possible to separately fix up seamwise production per annum. However, in confirmity with the reserves of each seam, the seamwise production to achieve the target for Satpura Mine II at the stage when only Upper and Lower Seams are being exploited would approximately be as follows

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Upper Workable Seam	0.15 m.te/annum	One S&P Dev/Dep + Dip/Panel heading.
Lower Workable Seam	0.30 m.te/annum	Two S&P Dev/Dep panel + Dip/Panel Dev. headings.

* Being comparatively thin seam, the production per mechanised panel in Upper Workable Seam is envisaged to be around 0.12 m.te. per annum.

13.4 PRODUCTION PHASING

The minewise production phasing to achieve the targets have been worked out as under :-

Mine	1979-80	1980-81	1981-82	1982-83
Satpura Mine No.I	0.15	0.15	0.15	0.15
Satpura Mine No.II including Bagdona Incline	0.30	0.35	0.40	0.45
T O T A L :	0.45	0.50	0.55	0.60

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CHAPTER-XIV

MINE SUPPORTS

14.1 GENERAL ROOF CONDITIONS:

Roof condition in general is good except for the immediate shale roof of upper workable seam. This shale roof above U.W.S. does not stick and parts off. It would be difficult to support such a roof. This shale roof is being dressed down at present. The roof exposed subsequent to dressing is good and practically needs no support. In this report also it is suggested to continue with this system.

14.2 ROOF SUPPORTS:

14.2.1 Permanent, Semi-Permanent Roadways and Development panels:

The roof in general being good, permanent and semi-permanent roadways do not need regular support. At places, where roof is bad, girders with suitable lagging material are proposed for permanent roadways. In semi-permanent roadways such as gatetransport, district intake and return roadways, the roof may be supported by roof bolting etc., if required.

14.2.2 Depillaring panels:

(i) In manually operated depillaring panel wooden props, cogs and cross bars would be used to support the roof as per statute.

(ii) In a mechanised depillaring panel, the support system of the galleries upto two pillars ahead of pillar under extraction would be by having conventional wooden supports. For seam upto 3.0 m thick in the dip splits of the pillars under extraction and also in the slices being extracted two rows of 40 te. friction props set at 1.20 m apart in the same rows would be provided. The rows of props would be erected 2.0 to 2.4 m apart with girders or chanels as cross bars. This would provide adequate

support density while at the same time providing adequate clearance (min 2.0 m preferably 2.4 m) for movement of side loaders. With this arrangement of supports, the loader operator would always work under supported strata. The arrangement of supports are shown in Plate No.VII (Drg.No.2-00209). In a mechanised depillaring panel having more than 3.0 m thick, the proposed supports arrangements is shown in Plate No.VIII (Drg.No.3-00205). Two types of support system has been proposed.

(a) In the first system of support slices will be supported by one row of cogs on solid pillar side i.e. rise side of slice and other row of props on rib side. The distance between props in the same row will be 1.2 m whereas distance between cogs in the same row will be 1.2 m. In between cogs, props will be set. The clear distance between rows of props and cogs will be 2.4 m. Splits will be supported by two rows of props. Clear distance between the props in the same row will be 1.2 m and distance between the rows of props will be 2.4 m as at times of weighting side loaders can be brought in splits. The width of side loaders is 1.8 mts. and as such there will not be much difficulty in flitting of side loaders between row of props (in splits). Junctions will be supported by cogs and girders (150 mm x 75 mm). Legs will be supported by cogs. This type of support system will be used till the preliminary sign for first fall is indicated.

(b) The second type of support system is proposed to be used after preliminary indication of first fall

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are observed (refer Plate No.VIII.) In this case, slices and junctions will be supported in the similar manner as described earlier but in splits row of cogs (2.4 m interval in the same row) and row of props (1.2 m interval in the same row) will be provided. Clear distance between rows of cogs will be 2.2 m. In between two cogs props will also be given.

14.3 Adequate provision of manpower has been kept for the support work needed in the project and has been detailed in Appendix-B.

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15.1 Coal Transport

15.1.1 Satpura Mine No.I

Face Transport	:	Direct Haulage
Gate Transport	:	Endless Haulage
Trunk Transport	:	Direct Haulage

The existing face, gate and trunk transport system is proposed to be retained.

15.1.2 Satpura Mine No.II

The trunk transport roadways are proposed to be in lower workable seam and coal from Upper Workable and Bagdona Seam is proposed to be fed on to trunk transport system in Lower Workable Seam via bunker and drifts. The coal transport system envisaged for each seam is as under :-

(i) Bagdona Seam

Face Transport and Gate Transport	:	Endless/direct haulage for Bord and Pillar panels
Trunk Transport	:	Belt Conveyor/ Direct Haulage

(ii) Upper Workable and lower workable seam:

Face Transport	Chain conveyor mechanised panels.	Direct/endless haulage as face
Gate Transport	Belt conveyor for LWS and endless haulage for U.W.S.	& endless haulage as gate transport for manual panels.
Trunk transport	Belt conveyor.	

15.2 Material Supply:

15.2.1 Satpura Mine No.I:

Through the haulage system for coal transport, material is envisaged to be transported in this mine.

15.2.2 Satpura Mine No.II:

(a) Along main incline - Direct haulage

(b) Along main dip and along gate roadways - Endless haulage for [redacted] mechanised panels. This endless haulage envisaged is single track reversible endless haulage.

15.3 Men Transport:

Mechanical arrangements for transportation of men have not been considered necessary for this project for the following reasons:

(i) An additional entry through an incline in Sector 'D' for Satpura Mine No.II, will be driven.

(ii) The seams in general have flat gradient.

(iii) The average working height is 1.8 m and above.

(iv) The max. travelling distance envisaged for Satpura Mine No.II would be about 1.5 kms.

15.4 Adequate provisions in respect of plant and machinery has been kept and detailed in Appendix-A.3. Also adequate provision for transport shafts, staples/bunkers required for transport, purpose etc. have been kept (Refer Appendix A.8.1).

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16.1 **Ventilation**

The ventilation requirement for the present production for both Satpura Mine No.I and II has been worked in para 10.3. The different openings, their cross-section area, quantity of air etc. are given below:

TABLE-XVII

Mine	Type of openings	Nos.	Effective cross sectional area in Sq.m.	Purpose	Quantity of air in Cu.m/min.
Satpura Mine-I.	Incline	No.5	9.56	Haulage road & intake	4614
	Incline	No.6	9.11	Travelling-cum-intake	
	Airshaft		15.91	Return	
	Incline	No.7	9.40	Conveyor belt-cum-travelling -cum-intake.	2111
Satpura Mine-II.	Incline	No.8	73.44	Haulageroad -cum-intake	9037
	Airshaft		18.10	Return	5664
Bagdona -	Incline		6.48	Haulage-cum-intake.	-
	Airshaft	No.I	15.91	Intake & Travelling	-
	Airshaft	No.II	18.10	Return	-

16.2 Ventilation requirements

16.2.1 As per ventilation standards, quantity of 2.5 cu.m./minute per tonne of daily production or 3.0 cu.m. per manshift, the largest shift whichever is larger is to be kept circulated in the mine.

16.2.2 Sarpura Mine No.I

Output to be achieved from this mine is 0.15 M. tes. per annum i.e. 500 tes. per day. The air requirement would be (assuming ventilation efficiency to be 50%).

$$\frac{500 \times 2.5}{0.5} = 2500 \text{ cu.m/min.}$$

Hence adequate quantity of air is being circulated.

16.2.3 Sarpura Mine No.II:

With the revision, output to be achieved is 0.45 M.tes. per annum i.e.37500 tes. per month i.e. 1500 tes. per day. The air requirement is as follows:

Quantity of air for : 1500 x 2.5
Bord and Pillar methods = 3750 cu.m./min
Total: 3750 cu.m/min.

Assuming ventilation efficiency to be 50% (taking into account ventilation of pump houses, sub-station etc.), the total quantity - 7500 cu.m/min.

16.2.4 The above quantity of air should also ensure dilution of methane concentration at district return to 0.75% as per statute. For planning prupoises, it is considered to take the methane dilution level at 0.5%. Considering the

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rate of emission of methane in the mine and the product thereof is the maximum quantity of air required to be circulated in the mine worked out by formula as under:

$$Q \text{ min.} = 1.2\ Q = \text{cu.m/min } Q = \frac{100 \times W \times A}{24 \times 60 \times 0.5}$$

where 1.2 is the reserve factor

K = the safety factor (underground leakages, utilisation of reserve faces, ventilation at remote, inequality in gas emission rate, production and number of panels working line).

Value of K = 1.7 for bord and pillar with

W is the quantity of CH_4 liberated from 1 ton coal in cum.m/te.

A is production in tes.per day.

(a) Seturu Mine No.I:

The quantity of air required to be circulated the mine works out as under by formula

$$Q \text{ min} = 1.2\ K.Q \text{ cum/min.}$$

$$= \frac{1.2 \times 1.7 \times 100 \times 10 \times 500}{24 \times 60 \times 0.5}$$

$$= 1416.6 \text{ say } 1420 \text{ cu.m/min.}$$

(b) Seturu Mine No.II:

The quantity of air required to be circulated the mine to keep CH_4 below permissible limit works out under:

$$Q = 1.2\ K.Q \text{ cu.m/min.}$$

$$= \frac{1.2 \times 1.7 \times 100 \times 10 \times 1500}{24 \times 60 \times 0.5}$$

$$= 4250 \text{ cu.m/min.}$$

16.2.5 It is thus observed that quantity of air fo the mines of the project as worked out in para 16.2. 16.2.3 would be sufficient for the rated production

16.3 Mine openings

16.3.1 Entrance Mine No.III

The mine openings are adequate to deal with the ultimate production envisaged for this mine.

16.3.2 Entrance Mine No.III

The increased air quantity, as brought out in para 16.2.3. cannot be handled by the two existing intake openings due to limitation in the recommended permissible air velocity. The following study shows the maximum quantity which can be handled by the existing openings.

TABLE NO.XVIII

S.No.	Openings	Effective cross section area in sq.m.	Purpose	Recommended permissible velocity m/sec.	Max. Quantity allowable cum/ min. kg
1.	Incline No.7	9.40	Belt conveyor -cum- intake	4	2256
2.	Incline No.8	13.44	Haulage-cum-intake.	4	3224
				sub-total	5480
3.	Air shaft	18.10	Return airshaft	10	10860

16.3.3 Table XVIII above reveals that the main return airway is adequate to deal with ultimate air requirements. A theoretical exercise of increasing the velocity of air in the haulage roadways to 8 cum/sec. by inserting regulator in belt roadways (with the assumption of erecting ventilator stoppings between haulage and belt roadways) was made. The approximate cross section of regulator works out to 1.64 sq.m. (refer Annexure-I). Leave aside the ventilation loss as because of this additional resistance, it is not possib

to regulate belt roadway to such a cross section. [illegible]
existing intake would not be adequate to cater for [illegible]
ventilation requirements. The new opening, acting [illegible]
take should be completed by 1981.

16.3.4 The maximum quantity of air required to be [illegible]
by the proposed new opening works out to be (7500-5480)
2020 cu.m/min. in case the intake air from Sector 'E' [illegible]
Sector 'D'. The maximum quantity of air required in [illegible]
intake air of Sector 'E' is not allowed to enter sector
as proposed in this report (ref r 16.5 para), would be
$\frac{1000 \times 2.5}{0.5}$ = 5000 cu.m/min. (This is based on assumpti
that at the most two panels and one dip developmetn ne
etc. is being worked in Sector 'D'.). With the maximum
permissible velocity being 8.0 m/sec.(being proposed mec
supply), the effective cross section of the new opening
out to be

$$= \frac{5,000}{80 \times 8} = 10.42 \text{ sq.m.}$$

e proposed dimension of the new incline would be 4.5x2

4 FAN :

.1 Satpura Mine No.I:

The existing ventilator is adequate to deal w
entilation requirements.

2 Satpura Mine No.II:

The existing fan cannot cope up with the ulti
ment of the mine. As discussed in para 16.2.3,
e necessary to install a fan capable of dealing
m/min and capable of developing 150 mm of W.G.

16.5 <u>Ventilation circuit</u>

Ventilation circuit of Satpura Mine No.II, with addition of intake in Sector 'D', needs to be further sub-divided. The net work of proposed ventilation circuit is given below :

Paths A,B,C and E,F,B,C are independent and path C,D is common for both. Three doors between B and E separate both the paths. In case it is not done, there would be tendency of intake air from F i.e. incline to follow the path E, B,C, being a path of least resistance. Hence it is proposed that the drifts across the dyke would be so designed that short circuiting of air current as discussed above does not take place. To achieve this three ventilation stoppings fitted with doors would be made in the material supply drift. In another drift i.e. belt conveyor drift, it is proposed to discharge coal from Sector 'D' through staple bunker onto belt conveyor in Sector 'E', so that this path is inoperative for the ventilation circuit (Refer Plate No.V Drawing No.1-300357).

16.6 <u>GENERAL</u>

In working out details, it is envisaged that minimum of two seams shall be worked to cope with the required production, specially in Satpura Mine No. II. The production is to be achieved from number of panels, It is important that proper ventilation survey is conducted for proper distribution of air quantity for each panel. The adequate provision for different ventilation appliances etc. has been provided (Ref.Appendix A.3)

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17.1 Belpara mine No. I and II and neighbouring mines. As mines No.I and II are moderately watery mines, the project may be required to deal with about 2000 g.p.m. (150 litres per sec. of water.

17.2 Belpara Mine No.II

The make of water expected in this mine would about 80 l.p.s. Assuming that pumping is done for eight hours, the pumping capacity should be 100 l.p.s. Through boreholes and auxiliary sumps water from various seams at present there are two 38 l.p.s., 150 m head pumps installed. Out of these two one is running and the other acting as standbye. In the final stage one more pump is required. The existing main sump would continue to be main sump.

17.3 Belpara Mine No.II:

The make of water expected would be about 100 The pumping capacity required to be installed would be around 200 l.p.s. At present, the main sump is in 15th ul. Two sumps in lower workable seam are proposed and location of the proposed sumps have been shown in Plate .III. One of the sumps would be in Sector 'E' and ot Sector 'D'. The specification etc. of the pumps pro be installed in Sector 'D' and 'E' are given below:

	Head	Capacity	No.	Remarks
r 'D'	80 m	28 l.p.s.	2	1 standbye
r 'E'	150 m	38 l.p.s.	2	1 standbye

Auxiliary sumps would be located in different therefrom water shall be pumped to the main sump ups have been provided for dip drivages.

10.6 The total capital investment is estimated to be Rs. 2.20 lakhs. The details of the investment are given in Annexure 5.3.3.

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CHAPTER-XVIII

CIVIL CONSTRUCTION & WATER SUPPLY

CIVIL CONSTRUCTION:

18.1

18.1.1 *Life of Buildings:*

The life of the project at 100% level or [illegible] would be 30 years. Therefore all buildings with [illegible] construction have been envisaged in this report.

18.1.2 *Service Buildings:*

Appendix A.7.1 shows the list of additional [illegible] buildings provided for the project. Provision has also been made for such amenities like rest shelter, workers [illegible] shopping centre etc.

18.1.3 *Residential Buildings:*

The total employment in the project at the [illegible] rate of production would be 1729. The residential buildings as scale and type as per the norms laid down by the B.P.E. have been provided in the project. The residential [illegible] proposed as a percentage of the strength of employees [illegible] such group would be as under:

(i) Daily rated employees ... 50%

(ii) Monthly paid staff ... 75%

(iii) Executives ...100%

A total of 732 additionnal residental houses would be required for housing the employees. The overall percentage satisfaction level works out to be 53.67. The details of residential accommodation has been given in Appendix-A.7.

18.1.4 Appendices A.2.3 and A.2.4 show the building index Fethakhera and the abstract cost for B.P.E. type quarters respectively. The index is based on the cost as in March

18.1.5 The subsidy for residential buildings have been taken into account for calculation of economics of the project.

10.2 ROADS AND DRAINAGE:

Approach road to the site etc. and partly for the colony already exists. The provision of additional roads sent for colony roads and culverts have been kept. A provision of Rs.8.17 lakhs has been made to meet the investment on roads and culverts (refer Appendix-A.8.2).

10.3 WATER SUPPLY:

The project is catered by an integrated water supply arrangements having capacity of 0.4 M.G.D. The existing arrangements are adequate to deal with the water demand required for the project. Hence no additional provision has been made here in this project report.

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POWER SUPPLY ARRANGEMENTS:

EXISTING POWER SUPPLY ARRANGEMENTS:

19.1 Baroora mine No.I and II receive power at 3.3 KV

19.1.1 Baroora mine No.I and II receive power at 3.3 KV by means of an overhead line from the central substation (33/3.3 KV) at Pathakhera-I. The central substation is fed power at 33 KV by NTPC from their Sarni Power Plant situated at a distance of about 3.5 Km from the Central sub-station at Pathakhera-I.

19.1.2 Major connected loads of installations existing in the collieries at present are briefly given below for No.I and II separately:

(a) BARROOA MINE NO. I :

		No.	Voltage	
(i)	Surface:			
	Main ventilator		550 V	93 KW
	Belt conveyor		550 V	26 KW
	Haulage			125 KW
	W/shop. lighting etc.			50 KW
(ii)	Underground:			
	Coal drills	6	110 V	
	Auxiliary fans	2	550 V	8 KW
	Compressor	1	"	22 KW
	Dugger haulage/ winches.	4	"	50 KW
	EH/Eh		"	95 KW
	Face pumps	3	"	117 KW
	Main pumps.	2	"	34 KW
				165 KW
				715 KW

(i) Surface-Substation:

The surface substation which receives power at 3.3 KV from Pathakhera central substation consists of one transwitch unit and one mining type transformer each of 250 KVA, 3300/550V. There are three circuit breakers two of them functioning as primary control

two transformers and mine controlling power to underground feeder. There are nine five circuit breakers, 550V, four of which are employed to distribute power to surface equipments and the rest one controls power to an underground feeder 440 V.

(iv) Underground:

One number transwitch unit 315 KVA, 3300/965 V is used underground for facilitating power supply to face equipments. Some of the underground equipment are directly supplied power at 550V from surface.

(b) SURFACE MINE NO. II:

The major connected loads at these inclines are as follows:

(i) Surface:

Main ventilator	550V	112KW
Belt conveyor	550V	112KW
Haulage	550V	112KW
Haulage (Bagdona)	550V	65KW
Workshop, lighting etc.		50KW

(ii) Underground:

		Nos.	
Coal drills	110V	10	10KW
Jugger haulage/winches		1	26KW
SH/DH-other haulages		7	272KW
Belt conveyor		1	11KW
Pumps		4	137KW
Aux. fans and pumps at Bagdona inclines			20KW
			927KW

(iii) Surface Substation:

The surface substation consists of five circuit breakers, 3.3KV panel switch board and three mining type transformer 250 KVA 3300/550V. The transformers mainly cater to surface equipments. One of the circuit breakers controls the power supply to 3.3KV underground feeders, th
as primary control of transformers and one as spare.

(iv) [illegible] ... [illegible] KVA.

19.2 **PROPOSED REORGANISATION** [illegible]

The mines are proposed to be reorganised for a production capacity of 0.6 m.tcs. per annum. The major connected loads after reorganisation would be as follows:

19.2.1 **SATPURA MINE NO.I:**

(a) **Surface:**

Main ventilator	1 no.	550V	93 KW
Belt conveyor	1 no.	550V	26 KW
Haulage	1 no.	550V	125 KW
W/shop, lighting etc.			50 KW

(b) **Underground:**

Coal drills	8 nos.		8 KW
Coal cutting machines	2 nos.		100 KW
Aux. fan	2 nos.		22 KW
Face pumps	2 nos.		22 KW
Haulages	7 nos.		375 KW
Main pumps	3 nos.		225 KW
			1046 KW

19.2.2 **SATPURA MINE NO.II :**

(a) **Surface:**

Main ventilator	1 no.	550V	330 KW
Belt conveyor	1 no.	550V	112 KW
Haulage	1 no.	550V	112 KW
Haulage(Bagdona)	1 no.	550V	65 KW
Haulage(new incline)	1 no.	550V	75 KW
Lighting			50 KW

Underground:

Coal drills	12nos.	110V	12 KW
Coal cutting machines	4nos.	550V	200 KW
Side loaders	6nos.	550V	300 KW
Aux. fans	6nos.	550V	65 KW
Belt conveyors	2nos.	550V	150 KW
Chain conveyors	20nos.	550V	500 KW
Haulages	4nos.	550V	250 KW
Pumps	6nos.	550V	460 KW
Haulages, pumpsetc. for Bagdona Incline.	-	-	100 KW
			2781 KW

19.2.3 The total connected load for Satpura Mines comes to about 8000 KW. Taking into consideration the diversity and demand factors, max. demand has been estimated to be about 7000 KW. The power demand would be about 1600 KVA in view of the necessity of achieving a high power factor in the range of 0.9 to 0.95 by employing capacitor banks.

19.3 POWER AND SUPPLY LINES:

Pathakhera central sub-station 33/3.3KV has no spare capacity at 3.3KV to cater to the additional power demand of Satpura I and II. Therefore, if power supply to Satpura I and II is to be continued at 3.3KV after revision of the mines from the central sub-station, its capacity has to be augmented. Number of 3.3KV feeders required is atleast two. When Bhojpur starts drawing power from its own 33/3.3KV substation, Pathakhera central substation may be relieved of a portion of its present load. But this will be offset by Sarni Project, whose power requirement is also proposed to be met at 3.3 KV from Pathakhera central sub-station.

The alternative solution to the problem is to feed power to Satpura Mines at 33 KV. In that case 33/3.3KV substation should be established at Satpura Mine No.II. Initially (say for the next 5 years or so) it may be alright to continue to feed power to Satpura mines at 3.3KV, but in due course it may be advantageous to establish a 33 KV substation at Satpura Mine No.II and receive power at 33 KV.

19.4 MAIN SUBSTATION:

19.4.1 As indicated in para 19.3, it is proposed to establish a 33 KV main substation at Satpura Mine No.II. The capacity of the substation will be 2x2MVA. This gives 100% standby capacity. This is necessary due to degree II gassiness of the mine and also for future expansion of the mine. The substation will facilitate receipt of power at 33 KV, transformation of the voltage to 3.3 KV and distribution of power at

5.5 KV ex main compound/
will mainly consist of (i) 33 KV
air breaks, switchgears and transformers 33/5.5 KV,
5.5KV/415V (ii) indoor installations comprising
5.5KV and 415 V switchboards, control panels etc.

19.4.2 5.5KV switch board will consist of 10 circuit
breakers. Main functions are as follows:

Incoming feeder (control of load voltage side of 33/3.3KV transformers)	2 nos.
Underground feeder(Satpura Mine No.II)	1 no.
Feeder to Satpura Mine No.I	1 no.
Main ventilator	2 nos.
Primary control of 250 KVA 3300V/565V transformer capacitor bank control	1 no.
Reserve.	1 no.

19.4.3 Storage battery installation complete with ste
batteries, charging sets and control board etc. will be
vided at the substation for dccontrol power for operat
protection and signalling circuits of 33 KV equipments.

19.4.4 Control and Protection:

19.4.4.1 Control:

33 KV air break switches on primary side of m
transformers will have usual interlock with the corresp
33 KV circuit breakers. 33 KV bus air break switches in
substation will interlock each other, so that the two in
cannot be switched on together. 33 KV circuit breakers w
be fitted with motor wound spring charging mechanism and
- by gears for manual operation. Electrical interlock wi
be installed between the two incoming feeder control bre
so that parallel operation of the transformer is avoided.
Primary and secondary control circuit breakers of main t
ormers will be connected for inter tripping i.e. the sec
y control circuit breaker will trip automatically when
mary circuit breaker trips.

19.4.4.2 Protection

Lightning arrestors will be installed to protect the equipments against high voltage surge arising from or travelling across. Lightning masts are also to be employed to prevent direct stroke of lightning from reaching the equipments in the substation. Suitable earthing system will be established and all metallic frames, coverings, etc. that, may be, joint boxes transformers etc. will be earthed by connection to the earthing system.

19.4.4.3 Protection of 2000 KVA, 33KV/3.3KV Transformers:

(i) Over temperature protections:

The transformers are to be provided with temperature indicators having two alarms. One alarm is to ring a bell as a warning of rising temperature and the second alarm system will trip the circuit breaker controlling the transformers.

(ii) Overload protection and earth leakage protection:

Inverse definite minimum time lag (IDMT) relays will be incorporated on the primary and secondary control circuit breakers to provide overload protection. Primary side winding will be protected against earth leakage by installing IDMT type relays in collaboration with the over current units on the two phases. Earth leakage protection installed at the L.V. sides will be restricted type so that the relay will respond to a fault occuring within the zone from the secondary winding of the transformer to 3.3 KV circuit breaker. It will not respond to a fault occuring outside this zone.

iii) The Gas Oil actuated protection (Buchholz):

The upper float of the Buchholz relay would normally initiate audible and visible alarm whilst the lower float would trip the transformer from the supply when there is a serious fault.

18.5 POWER DISTRIBUTION AT 3.3KV AT MINE AREA

It is proposed to extend the 3.3 KV switch
the addition of two circuit breakers. The
being will comprise five circuit breakers. For
incoming feeder, two KV/ transformer
two capacitor bank and one to serve as stand-by.

18.6 OVER DISTRIBUTION UNDERGROUND

Each mine is to be provided with a 3.3KV
mine underground for facilitating underground power
bution. The 3.3KV switch bo re is the switch room
ceive power from surface and distribute it to the
semi-permanent/mobile sub-stations situated in the
districts.

18.7 POWER FACTOR CORRECTION - CAPACITOR BANK:

It is proposed to maintain a power factor of
- 0.95 at 3.3KV bus at main substation at Mine No.II.
capacitor banks will be installed for power factor imp
ment. Arrangement for connecting or disconnecting a
units from the bank for getting required power factor
be provided on the capacitor bank.

18.8 ENERGY CONSUMPTION:

The expected pattern of energy consumption is
indicated as in Table below:

Coal cutting machines	250	150	3000	0.45x10^6
Underground excavators	1190	600	3000	1.8 x10^6
Dumping	660	400	4000	1.6 x10^6
Ventilation	650	390	8700	3.39 x10^6
C&P+Workshop	600	300	3500	1.05 x10^6
Pumping, water supply.	200	150	2500	0.38 x10^6
Others	500	250	3600	0.9 x10^6
				9.57 x10^6
				15.95KVA/T

19.9 TELECOMMUNICATION:

19.9.1 For improving surface telephone communication, provision for a 50 line auto exchange has been made. Industrial operation centres such as CHP, workshop, substation, stores etc. and offices and residences of officials will be provided with telephones.

19.9.2 For providing good telecommunication among various underground control points such as coal faces, gate transfer points, trunk transfer points, pit bottom, main pumping stations, main underground substations/switch room etc. etc. and with the related operation centres/offices on surface, it is proposed to install a 20 line capacity intrinsically safe telephone communication system. Intrinsically safe telephone with loud speaking arrangements will be deployed at various centres. The system will be such that in an emergency, it would permit sending of an alarm tone or speech to all lines or group of lines simultaneously.

[illegible] show the proposed [illegible]
[illegible] distribution for Saipura King Ba.[illegible]
[illegible] respectively.

The project investment is estimated to be [illegible]. The details of the investment are [illegible]

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CHAPTER-X

COAL HANDLING AND TRANSPORT SYSTEM

20.1 EXISTING ARRANGEMENTS:

20.1.1 Satpura Mine No.I:

Coal from the mine is hauled up in tubs by direct haulage installed at surface. The coal is tipped onto belt conveyor which in turn discharges onto 24 tes. overhead bunker. The coal from the bunker is fed into tipping trucks which in turn discharge coal onto MPEB bunker near Pathakhera Mine No.I.

20.1.2 Satpura Mine No.II :

Coal from this mine is conveyed to the surface through 900 mm belt conveyor installed in no.7 incline. This conveyor feeds coal into 80 tes.overhead bunker. Coal from the bunker is fed into tipping trucks which in turn transpo coal into M.P.E.B. coal transport system near Pathakhera Mi No.I.

20.2 PROPOSED ARRANGEMENTS:

20.2.1 Satpura Mine No.I :

The coal is tipped onto belt conveyor which in t is proposed to discharge onto 24 tes. overhead bunker. T picking arrangement is proposed to be provided on this b conveyor. Coal from overhead bunker is proposed to be fe into M.P.E.B. surface belt conveyor system (to be commis d) by another belt conveyor. A hopper of 200 te. will nstalled over the MPEB conveyor system for receiving co rom Satpura Mine No.I.

20.2.2 Satpura Mine No.II :

Coal from the mine truck belt conveyor is to be discharged onto 1200 mm wide picking belt conveyor through two way chute coal would be discharged to 1300 tes. ground bunker or 80 tes. overhead bunker for transport whenever required. M.P.E.P. would receive coal through their conveyor going in the reclaim tunnel of 1000 tes. ground bunker which would be part of their surface vayor transport system (to be commissioned). Coal from Satpura incline would be transported departmentally by tipping trucks onto the ground bunker near Satpura Mine II.

20.3 Arrangement for belt weighmeter and a sampler proposed to be provided.

20.4 Plate No.IX (Drg.No.3-00203) shows the flow of the proposed coal handling arrangements for Satpura No.I and II.

20.5 The total capital requirement for the proposed arrangement would be Rs.18 lakhs. The details of this must have been given in Appendix A.3.2.

CHAPTER-XXI

NOTE :OF

21.1 For day to day repair, maintenance and overhauls unit workshop facilities are proposed to be provided. Such facilities for such repair works are already in existence. The additional plant and equipment has been estimated at Rs.2.89 lakhs and the provision for the same has been kept in the report (Refer Appendix -B.2).

21.2 The proposed workshop would provide equipments for machine shop, electrical repair shop, smithy shop, etc.

21.3 The adequate provision of manpower has been kept in this report (refer Appendix-B). The workshop would run in general shift with the limited staff in the second shift.

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CHAPTER-XXII

SAFETY MEASURES, PRECAUTION AND RESCUE

22.1 SAFETY MEASURES:

22.1.1 Inflammable Gas:

Both the Satpura Mine No.I and II have been declared degree mine. Inflammable gas has been detected in both the working and roof cavities near the faces in Satpura Mine No.I. Nothing gas has also been found near the dykes. The inflammable gas has not been found in detectable quantity, in general body of the district or main returns. Flame-proof equipments have been provided for in the report.

22.1.2 Mechanised depillaring:

Mechanised depillaring with side loaders has been proposed in Satpura Mine No.II. The side loaders would be manually operated and as such need proper support in the path of travel. It would also need adequate side clearance. Instead of conventional two rows of wooden props at 1.5 m. it is proposed to erect two rows of 40 te. friction props at 2.0 to 2.4 m interval in the pillars under attack. Slots or channels would be used no cross bars over these friction props. Split and gallery junctions would also be provided with adequate clearance for manouvrability of side loader.

22.1.3 Partial extraction:

Under built up areas partial extraction of pillars in the upper workable seams and development of lower seams and Bagdona Seams as final operation has been envisaged in this report. It is stressed that the size of pillars be strictly followed.

22.1.4 General Safety:

Adequate manpower has been provided for dealing coal dust cleaning, stone dusting, stone dust barriers spraying etc.

22.2 PERMISSION FROM D.G.M.S.

22.2.1 Mechanised depillaring has been envisaged with 40 ton friction prop and girders/channels as cross bars at faces. The special permission has to be obtained in this regard.

22.2.2 The mine being cat.II in gassiness as per reg.135 (3) each sector or sub-sector has been proposed to be approached by two intake and one return airways. The special permission for approaching small sub-sectors by single intake and single return may be sought. However, in the report adequate provision for drivage of two intakes and a return have been kept except in a single cases. In this case, special permission to use intake-cum-haulage drift from IM3 to UM2 in sub-sector f3 for travelling purposes is to be sought from the D.G.M.S. The reserves are limited and production is also limited from the panel. Investment on additional drift purely for the purpose of travelling is not proposed.

22.2.3 The new incline in Sector 'D' is proposed to be used for travelling and for material supply by haulage. Permission for using material supply incline as travelling roadways should be obtained from D.G.M.S. authorities.

22.2.4 Special permission for partial extraction of upper workable seam under built up area would have to be obtained from the Directorate General of Mines Safety.

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23. [illegible] PRODUCTIVITY, FACILITIES AND SCIENTIFIC MANAGEMENT

23.1 MANPOWER:

23.1.1 The manpower requirement [illegible] the project with [illegible] aggregate production capacity of 0.6 m.tes. per annum has been estimated at 1729 against the existing strength as per the approved feasibility report had kept manpower requirement at 1251 for 0.45 m.tes. per annum production. The phased requirement of personnel is estimated as under:

1979-80	80-81	81-82	82-83
1525	1600	1700	1729

Personnel

23.1.2 The above manpower requirement has been arrived at keeping a provision of additional manpower @ rate of [illegible] against leave and sick. For essential category staff in various such as pump khalasi, fan house attendants, [illegible] searchers, mining sirdars etc., an additional manpower rate of 16% has been kept. Manpower analysis, also the existing manpower and manpower as provided in the original [illegible] have been given in Appendix-B.

23.1.3 The district manpower of the mechanised panel is proposed as under(per day):

1.	C.C.M. Driver ...	6
2.	C.C.M. Helper ...	12
3.	Driller ...	6
4.	Driller helper ...	6
5.	Side Loader Operator ...	6
6.	Side Loader " helper ...	6
7.	Conveyor operator ...	15
8.	Conveyor Extension men..	6
9.	Aux. fan Khalasi ...	6

10.	Spray welder	...	3
11.	Electrical fitter	...	3
12.	Elec.fitter helper	...	3
13.	Mech.fitter	...	3
14.	Chemist/testing staff	...	4
15.	Fuse Khalasi	...	3
16.	Shotfirer	...	6
17.	Mining Sirdar	...	3
18.	Overmen	...	5
19.	Foreman	...	1½
20.	Under Manager	...	1½
			110

23.2 PRODUCTIVITY:

An overall output per man shift (O.M.S) at its full rated capacity has been worked out at 1.32. The productivity at various stages of production of the project would be:

	1979-80	1980-81	1981-82	1982-83
Productivity	1.12	1.19	1.23	1.32

23.3 ORGANISATION:

To operate a mechanised mine at its optimum efficiency it is essential that high standard of organisation is evolved and practised. It is essential that the personnels are trained in operation and maintenance of such machines. Preventive maintenance of plant and machinery is done. Motivation of workmen to develop team spirit and production incentive is introduced.

23.4 TRAINING:

23.4.1 Mechanised development and depillaring by ... loaders has been proposed for Satpura Mine No.II. ... be necessary to impart practical training in operati... such an equipment. Side loaders are being worked ... Chirmiri Colliery. It is, therefore, proposed to ... cross section of workers, staff and officers to this ... for training.

23.4.2 All category of workmen shall be trained in ... Group Vocational Training Centre at Pathakhera.

23.5 SCIENTIFIC RESEARCH:

23.5.1 The mechanised extraction of pillars by side ... loaders with 40 to. friction props with girder/channel ... cross bars has been envisaged for Satpura Mine No.II. ... roof behaviour during extraction has to be studied be... resorting to splitting as final operation under the b... up area. It is suggested that model studies are made, ... would call for the association of R & D Department of ... and other research agencies. Physico-mechanical prope... of the strata is required to be determined for establi... the support density at the face and goaf edge. A sum ... Rs.5 lakhs has been provided for the same.

CHAPTER-XXIV
DEVELOPMENT

24.1 MAJOR DEVELOPMENT ACTIVITIES:

The development activities identified for creating production potentials have been discussed in various chapters and are shown in Appendix-A.8.1. The estimated additional expenditure for the outlay in mines is estimated to be Rs.66.20 lakhs. The major developmental activities are -

(i) Drivage of drifts across the dykes/faults.
(ii) Drivage of main dip and trunk and gate roadways in coal.
(iii) Drivage of incline.
(iv) Drivage of staple shafts to act as return.
(v) Drivage of staple shaft to act as coal bunker.
(vi) Drivage of air shaft in sub-sector f3.
(vii) Preparation of B & P panel for development and extraction with side loaders to give annual production of 0.135 m.te. per panel per annum.
(viii) Construction of coal handling arrangements etc.

24.2 PHASING OF ACTIVITIES:

The project is proposed to achieve the full production in the year 1982-83. Hence all major development activities should be completed in logical and phased manner. Attempt would also be made to see that the capital input is uniformly spread out.

The schedule of various important activities is shown in the enclosed harmonogram (Plate No.XII and Drawing No.1 - 00790).

2.4.3 Methods of work:

Pathakhera area mines are moderately watery, sloping gently and the strata does not pose any major problem except while crossing of dykes. The average rate of drivages have been taken as under:

(i)	Staple shaft drivage	10 m per month.
(ii)	Inclines and stone drifts including crossing of fault	20 m per month.
(iii)	Stone drifts crossing dykes	10 m per month.
(iv)	Dip hendings in coal	30 m per month.

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CHAPTER-XXV
CAPITAL INVESTMENT & ECONOMICS

25.1 CAPITAL INVESTMENT

25.1.1 The total capital requirement works out to Rs.715.19 lakhs initial and Rs. 666.52 lakhs net. The additional initial capital investment estimated for this revision is Rs. 507.95 lakhs for the capacity increase of 0.25 m.tes. per annum. The net additional capital investment is Rs. 459.26 lakhs only.

25.1.2 The total capital investment per tonne of annual output capacity of the project works out to Rs.119.20 only. This capital is required not only for the increased production but also for the developmental and civil works required.

25.1.3 The capital investment on plant and machinery works out to Rs.356.31 lakhs or Rs.59.49 per tonne of the annual capacity. This is considered justifiable keeping in view the method of working, degree of mechanisation and transport system deployed in the mine.

25.1.4 The additional investment on capital outlay in the project works out to Rs.66.20 lakhs and this investment has to be done whether the mine is revised or not.

25.1.5 The additional investment on account of civil works i.e. buildings, roads and culverts amounts to Rs.116.11 lakhs (initial) or Rs. 67.44 lakhs (net). This works out to Rs.46.44 (initial) or Rs.26.98(net) per tonne of annual increase in output. The major portion of this investment is required to be done to meet the social obligations whether the mine is revised or not.

25.2.2 For construction of ... and ... and also for underground ... the surface to level for 10 years works out to be ... taken, the details of ... appendix-3.1.

25.2 ASSUMPTIONS

25.2.1 Cost Estimates

The estimated cost of production per tonne at ... and 85% have been worked out as Rs.61.12 and Rs. 70.16 ... respectively. The details of cost estimates are given in ... Appendix 'C' and 'C1'. The life of Sattpura Mine No.1 ... 20 yrs. when the production target would go down from ... to 0.45 m.te./annum. The cost estimates as worked out ... would hold good for first 20 years of the project only ... and would have to be worked out afresh subsequently.

25.2.2 Sale price

At present the major share of production is from ... upper and Lower workable Seams. The present declared ... grade of these seams of Pathakhera area, as per the ... grade classification, is Grade 'E'. It is expected that ... in future also the present despatch grade would be main... tained. The sale price of this coal is taken as Rs.75.... per tonne.

25.2.3 Profit and Loss

The profit at 100% and 85% of the target capacity ... with the average realisation of Rs.75.00 per tonne is ...s.13.88 and Rs.4.62 per tonne. The total annual profit ... Rs. 83.28 lakhs and Rs.23.56 lakhs at 100% and 85% of ... target production respectively. The sales price ne... get a return of 12% on equity at 100% and 85% produc... el is estimated at Rs.69.73 and Rs.80.51 per tonne ... pectively.

25.3 PROJECTED PRODUCTION

25.3.1 The feasibility report was originally approved by Government of India for a capital outlay of Rs.101.18 lakhs. Till March,'88, the capital spent was Rs.207.24 lakhs i.e. 58.36% of the total approved capital and the project was built upto the production capacity of 53% of the ultimate capacity. As discussed in Chapter-II, the change in technology for exploitation of deposits has been envisaged in this report from ore contemplated in the earlier approved feasibility report. Also the project has been identified to increase its production capacity from 0.45 to 0.60 m.tes. For change in technology and for increasing the production to this level, additional investment is called for.

25.3.2 The objective of the reorganisation is also to reduce the cost of production per tonne and thereby increase the profit too by increasing production and productivity. The progressive cost per tonne at the then wage level is Rs.56.03 (refer para 10.3.2 Table No.XIII). To achieve even the earlier envisaged target capacity as per the approved feasibility report, an additional investment of Rs.330.23 lakhs would be required as detailed in Annexure-IV. The total cost due to this factor and also due to difference in wage levels (as taken in the Project Report and as actually charged now) works out to Rs.72.86 per tonne. Thus there is considerable reduction in the cost of production envisaged in this Project Report.

25.3.3 No provision for Plant and Machinery (face equipment only) for Bagdona Seam has been kept in the report as the method of winning Bagdona seam has not been spelt out at this stage. As discussed in Para 12.5.6, being bottom

...96/-

most seam, Saddona seam is likely to be worked after
15 to 20 years. With the advancement in technology by
from safety, conservation and techno-economic considera
the suitable method of winning the seam would be selected
and the report would then be revised accordingly. With
present production target, the life of upper and lower
workable seams would be more than 18 years. The equip
now suggested in the report shall be fully utilised.

****

CHAPTER-XVI

CONCLUSION

20.1 It would be necessary to revise the project on two counts :

(i) The part requirement of Satpura Thermal Power Station would be met from the local source.

(ii) The need to change the technology for exploitation of the deposits from methods envisaged in the earlier approved feasibility report.

.1 The project is economically viable at the selling-ce of Rs.75/- per tonne. Also keeping overall nationa nomy in view, it is advantageous to M.P.E.B. to take from nearby source rather than getting supplies fro off sources.

****

CHAPTER-XXVII

REFERENCES

(1) Feasibility report for Pathakhera-II Colliery Project.

(2) Interim Geological Report on the northern part of Pathakhera Coalfield, N.C.D.C. Ltd.

(3) Geological Report on Area North of Pathakhera Mine No.I and II, Pathakhera Coalfield, N.C.D.C.

(4) Report for depillaring with side londers at Chirimiri Colliery, C.M.P.D.I., Ranchi.

(5) Basic data as made available by Colliery and Area authorities in February and May, 79.

(6) Record note of discussions of Planning Committee Meeting on Draft Project Report at CMPDI (HQ.) on 20.4.1979

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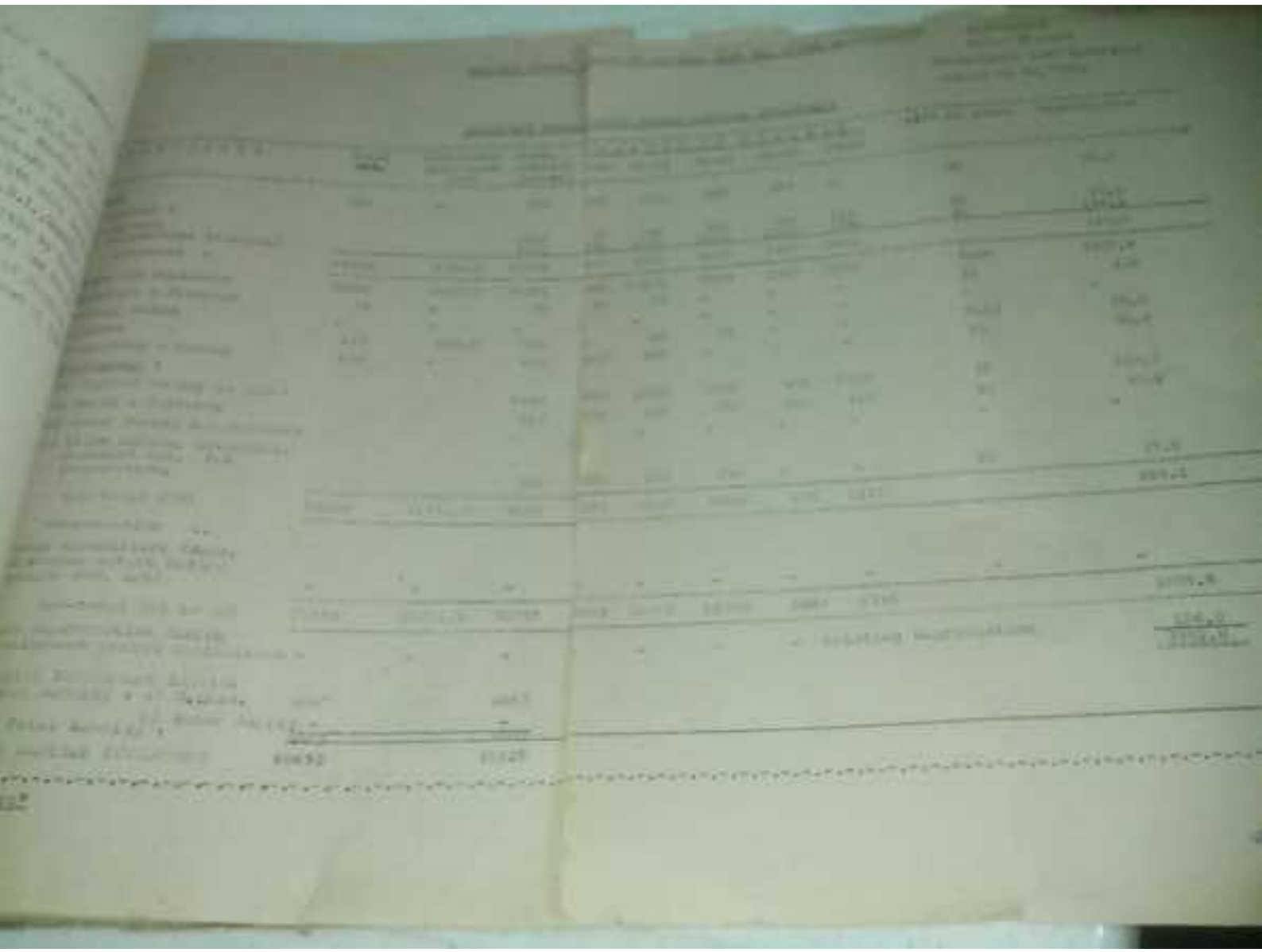
*

Sd/-



APPENDIX-A.1

PROJECT REPORT
ON
REVISION OF SAPTGRA I & II

STATEMENT SHOWING REQUIREMENT OF LAND
COST ETC. FOR 10 years

(Amount in Rs.'000)

A/c code	Particulars	Quantity in acres	Rate per acre	Amount	Remarks.
1.	Land	100	5	500	
2.	Payment of compensation against damage due to subsidence		L.S.	250	
	T O T A L			750	

Capital outlay on other
Roads & Culverts 6020
Water Supply 700

Estimated additional capital is mentioned as the following heads.

i) Production of the project will be kept at 0.65 million tonnes per annum.

ii) To achieve the production additional investment on R&M items such as OCR, belt conveyor cables, CHP etc. is required. This includes third mechanised reef development/depillaring panels.

iii) The existing O.M.S. is 0.56. As no change in mining the policy except addition of one longwall face is envisaged, the O.M.S. contemplated is 1.00. Hence the manpower required would be about 1642.

iv) Houses etc. required for the above additional manpower as per B.P.E. norms would be 887. The existing houses are 195. Investment on additional houses would be 692 x 0.135 = 93.20 lakhs. Additional investment on statutory and essential service buildings estimated to be Rs.5.00 lakhs.

v) Additional investment on capital outlay in mine is required whether the revision of the Project takes place or not.

...4/-

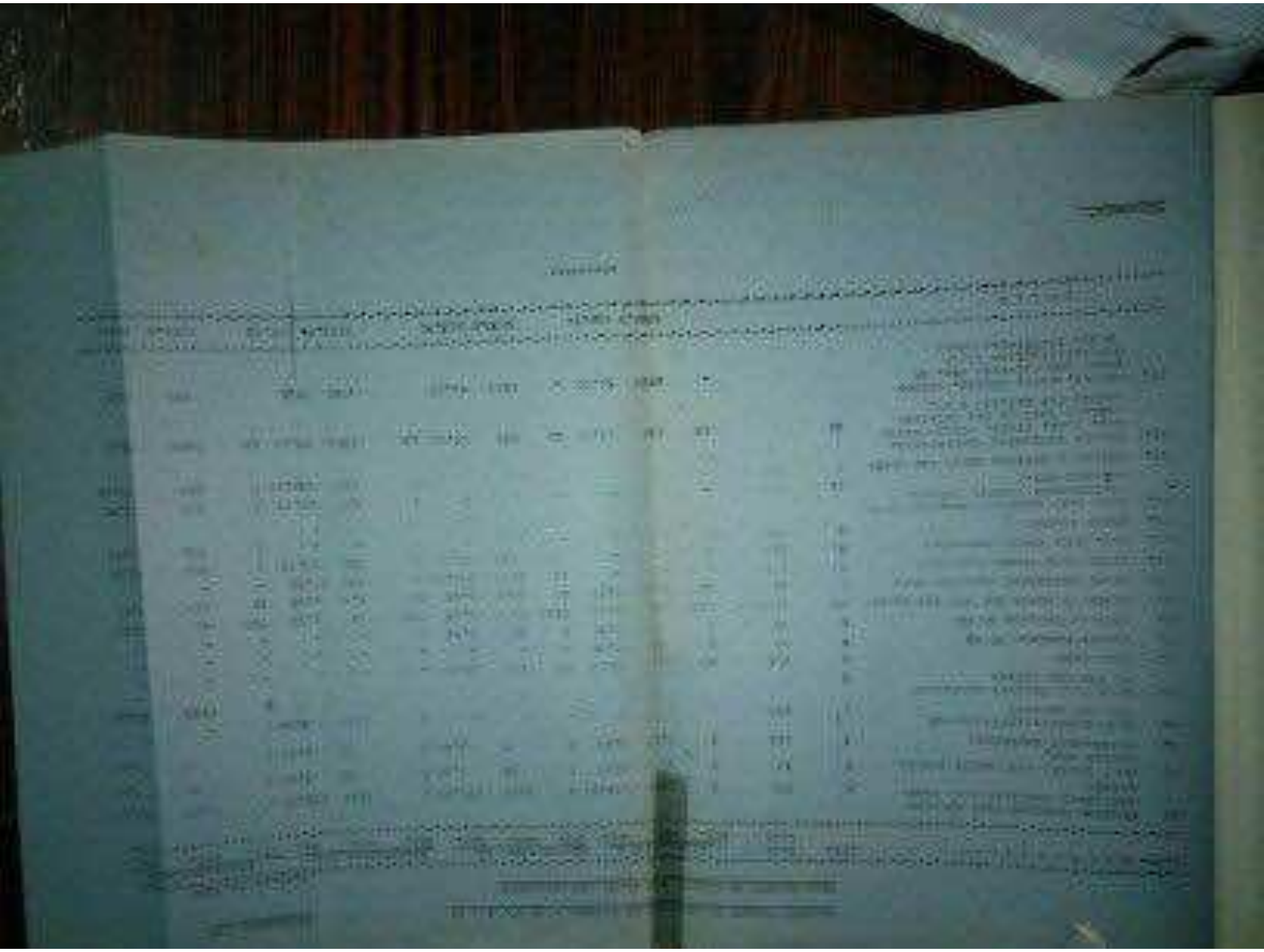
ANNEXURE XIV

[illegible]

S.No.	Particulars	Alt. I	Alt. II	Alt. III	Alt. IV	Remarks
1.	Agriculture	3.50	3.50	3.50	3.50	
2.	Forest	0.50	0.50	0.50	0.50	
3.	Miscellaneous Proj.	1.00	1.00	2.00	2.00	
	T O T A L :	5.00	5.00	6.00	6.00	

****

*Illegible.



1.	2.	3.	4.	5.	6.	7.
14.	Line Mistry Helpers	4+2***	2+2***	1***	1***	***For line repair work.
15.	Conveyor Cutter	-	12	12	6	
16.	Material supply, water spraying, cleaning, dusting, ventilation stoppings, etc.	12	15	12	12	
17.	Electric Fitter & Helpers	3	6	6	6	
18.	Mechanical Fitter & Helpers	3	6	6	6	
19.	Mining Sirdars	3	3	3	3	
20.	Overman	3	3	3	3	
21.	Sirdars	1+2	1+2	1+2	1+2	
22.	Undermanager	1+1	1+1	1+1	1+1	
	T O T A L :	203	236	132	120	

*****

"Chandra"

ANNEXURE-VIA

DAILY NUMBER OF WORKMEN UNDER EACH

Sl. No.	Designation	XIV.	XIII. II	XII. III	XI. IV	REMARKS
1.	2.	3.	4.	5.	6.	7.
1.	C.C.M. Operators and Helpers	9	18	18	18	
2.	Drillers and Drill Helpers	9	12	12	12	
3.	Shotsers	3	6	6	6	
4.	P/H Loaders @ 3 tonnes/hon	100	95*	-	-	@ 5 tes./hon *
5.	Side Loader/L.H.D. operators & Helpers	-	-	12	12	
6.	Conveyor Operators including gate belt conveyor operator	-	18	15	9	
7.	Haulage Khalasi	6	5	1*	1*	*for material supply only
8.	Trammers	24	15	1*	1*	
9.	Shotfirers	3	3	3	3	
10.	Shotfirer Helper	6	9	9	9	
11.	Timber Mistry	3	3	3	3	
12.	Timber Helper	6	6	6	6	
13.	Mine Mistry	1	1	-	-	

+/-2/-

[illegible]

[illegible]

[illegible]

The five alternatives considered for comparison purposes are -

Alt.I - Cutting, drilling, blasting and manual load of coal in mine.

Alt.II - Cutting, drilling, blasting and mechanical loading coal into dumpers by load haul dumper

Alt.III - Cutting, drilling, blasting and loading coal into dumpers by load haul dumper and haulage by rail mounted diesel locomotive.

Alt.IV - Cutting, drilling, blasting and loading coal into dumpers by load haul dumper and haulage by rail mounted diesel locomotive.

Alt.V - Cutting, drilling, blasting and loading coal into dumpers by load haul dumper and haulage by rail mounted diesel locomotive.

Sr.No.	Particulars	Alt.I	Alt.II	Alt.III	Alt.IV	Alt.V
1.	Coal production per day in tonnes.	500	600	650	680	[illegible]
2.	Coal production per annum in lakh tonnes.	0.99	0.11	0.139	0.144	[illegible]
3.	Manshifts per day	203	236	158	160	[illegible]
4.	R.L.A. (Rs.)	41.00	41.00	41.00	41.00	[illegible]
5.	O.M.S. (Rs/ton)	1.40	1.01	1.01	1.20	[illegible]
6.	Total cost/tonne(Rs)	23.70	23.43	19.05	18.23	[illegible]
7.	Depreciation per ton of coal extracted (Rs.)	2.04	3.09	6.09	6.21	[illegible]
8.	Interest rate of bank applied per Rs. of mine output (Rs.)	1.49	5.22	5.96	6.00	[illegible]
9.	Power cost per tonne of coal output (Rs.)	1.58	0.00	0.00	0.00	[illegible]
10.	Profit earned per tonne of coal output (Rs.)	0.69	2.48	3.47	3.41	[illegible]

- 9 -

E. [illegible]

Two different alternatives worked out in Para 11.33 to 11.38 are indicated below:

(a) [illegible]

For additional expenditure on different developmental activities (such as pair of bullocks, air shaft, surface infrastructure; additional expenditure on plant & machinery (such as van, surface haulage etc.) and additional manpower (i.e. [illegible] persons per day) for the new mine would be required. This makes this alternative very costly and hence rejected.

(b) [illegible]

Taking advantage of juxtapositioning of Khoit Sewar mine(s) in case of [illegible] by extending the working of existing Shoonkpar Project. Shoonkpar Project is designed for an output of 0.95 million tonne per annum. The existing infrastructure would not be in a position to cater for [illegible] without further modification. However this higher production would only be available after 1991-92 whereas higher production is needed from 1990-91 onwards. Even the approach to take Second Dip would be very circuitous and would not be conducive for safe and economical output. Also the extractable reserves of this section are 2.722 million tonnes which is about 6% of the total reserves of Shoonkpar Project. Therefore for meeting with the production of 0.25 million tonne per annum a [illegible]

...2/-

[illegible] passing [illegible] No.2 = [illegible]
Balance Quantity [illegible]
pass through [illegible] No. 8 = [illegible] cu.ft./min.
R = 0.0[illegible]
Q_3 = 7450 cu.ft/min
Pressure Drop $P_3 = R\,Q_3^2$

$$= 0.01[illegible] \times \left(\frac{7450}{60}\right)^2$$

$$= 207.[illegible] \text{ mm w.g.}$$

Taking 10% extra Pressure Drop = 226.00 mm w.g.

DIFFERENCE OF PRESSURE BETWEEN [illegible] I AND [illegible]

$$= 226.0 - 150.0 = 76 \text{ mm w.g.}$$

This pressure drop is [illegible] by the regulator

$\therefore P = R\,Q^2$

$$R = \frac{P}{Q^2} = \frac{76}{\left(\frac{[illegible]}{60}\right)^2}$$

$$= \frac{76}{[illegible]} = 0.0585$$

$$\text{Area } A = \frac{0.38}{\sqrt{R}} = \frac{0.38}{\sqrt{0.0585}} = \frac{0.38}{0.2[illegible]} = 1.6[illegible] \text{ sq.m.}$$

arising
[illegible] practical problem out of installation [illegible] in [illegible] of Regulator of such a [illegible] and [illegible] the life of the [illegible] tion losses per annum and [illegible] would be enormous. Hence it is proposed to [illegible] additional opening rather than [illegible] Regulator in [illegible] quantity by installing [illegible]

PROJECT REPORT
ON
REVIVING OF SAFFRON MILK NOVELTY
*****

ESTIMATED COST AND PROFITABILITY
AT VARIOUS LEVELS OF PRODUCTION.
*****

S.No.	Levels of Production	80%	85%	90%	100%
1.	Production in M.T.	0.48	0.51	0.54	0.6
2.	Variable Cost/T.(Rs.)	8.62	8.62	8.62	8.62
3.	Fixed Cost/T.(Rs.)	65.63	61.76	58.33	52.50
4.	Total Cost/T.(Rs.)	74.25	70.38	66.96	61.12
5.	Capital investment per Rs. of annual output (Rs.)	149.00	140.24	132.44	119.20
6.	Equity Capital (Rs.)	89.31	84.44	79.74	71.77
7.	Return on Equity @ 12% (Rs.)	10.77	10.13	9.57	8.61
8.	Minimum selling price to yield the above return (Rs.)	85.02	80.51	76.52	69.73
9.	Present selling price per tonne (Rs.)	75.00	75.00	75.00	75.00
10.	Profit/Loss per tonne (Rs.)	(-) 0.11	4.49	(+) 8.48	(+) 13.88
11.	B.C.R. (%)	9.84	5.49	10.10	19.33
12.	P.B.P. (before charging interest on Loan Capital)	5.58	5.47	11.22	15.84
13.	D.S.C.R. (%)				79.09

****

Promoter

PRODUCTION

ESTIMATE

PREPARATION OF ESTIMATE FOR WORKS

STATEMENT SHOWING THE TOTAL COST OF PRODUCTION

S.No.	Particulars	Cost per Unit	Variable Expenses Rs.	Fixed Cost Rs.
1.	Direct Material			
2.	Direct Labour			
3.	Power & Solvents			
4.	Repairs			
5.	Power			
6.	Depreciation on Plant, Building & Misc. Assets			
7.	Administration Charges			
8.	Depreciation			
9.	Interest on Working Capital			
10.	Interest on Loan Capital @			
	TOTAL			

Signature

APPENDIX-01 (Contd.)

1.	2.	3.	4.	5.
330-430	7	46916	16464	65380
330-450	3	21201	7119	28320
378-570	28	228928	74592	303520
378-614	5	42330	13700	56030
442-678	9	93799	26649	120448
442-734	4⅜	38720	12232	50952
520-792	4	42548	12860	54908
520-854	1	10921	3291	14212
592-992	7⅔	86611	24934	111545
726-1326	18	375058	111708	386766
1050-1650	7	336267	46951	382118
1360-1760	3⅓	71865	28382	100247
1550-2075	2	24731	8916	33647
	357	2759507	960643	3720150
BOUNDARY ANALYSIS				
UNDERGROUND	-			
SURFACE	-	1372	359464	12862025
		357	94605	3720150
		1729	454069	16582175
R.M.S. = Rs. 11.10				
P.M.D. = 1.321		Provisional increase in salaries & wages due to revision		2024800
Relative £ Wage = Rs. 31.10				18606975

****

ANNEXURE

ZP.O.Z.P. DISTRICT.

Of

REVISION OF RATES FOR ZONE NO. I & II

*****

STATEMENT SHOWING POPULATION OF MUNICIPAL VALLEY MAPPA AND DENSITY.

Strength	Males	Females	Total
1.	2.	3.	4.	5.
I	150	781560	264960	1046520
II	294	1842968	618682	2461650
III	336	2526975	801750	3328725
IV	152	1126668	363328	1491576
V	22	183370	97530	280900
VI	46	404819	122313	526932
Rs 4,00,000	260	1950000	488020	2438020
376-570	6	69997	21312	91272
476-614	30	271030	82200	353230
642-734	38	361510	107030	470540
510-954	10	221091	69529	290570
592-892	6	79918	21192	101110
	1312	9820819	3040806	12867025

SUBURBS

I	60	348320	122200	465000
II	44	261932	92532	354464
III	58	344607	119772	464451
IV	55	372860	126617	499677
V	14	110096	36810	146906
VI	1	27826	8970	36807
376-444	43	327954	94119	422093
510-610	8	53840	18016	71856

---/-

1.	2.	3.	4.	5.
4.	Plumber	IV	-	1
5.	Plumber Helper	I	-	1
6.	Valveman	I	2	3
7.	Chemical Mazdoor	I	-	1
8.	Mason	IV	-	1
9.	Mason Mazdoor	I	-	1
10.	Work Supervisor	440-754	2	-
11.	Carpenter	IV	-	1
12.	Carpenter Helper	II	-	2
13.	Fitter	IV	2	-
	Sub-total		6	16
	Total Surface Workers :		378	357

TOTAL MANPOWER

Proposed : 1729
Approved P.P. : 1911

: 170

SUMMARY OF TOTAL MANPOWER

	Daily Rated	Piece Rated	Monthly Officers		Total
Proposed	1243	340	198	28	1729
Existing	777	616	93	18	1504
Additional :	492	1-1 350	105	11	855

.....

1.	2.	3.	4.	5.
7.	Canteen Cleaner	I	2	2
8.	Pit Head Bath Attendant	I	3	3
9.	Mali	I	2	2
			10	10
(F)	MEDICAL & SANITATION			
1.	Medical Officer	725-1325	1	1
2.	Compounder	316-614	1	1
3.	Dresser	270-340	1	1
4.	Nurse	442-734	-	1
5.	Store Keeper	442-616	-	1
6.	Driver(Ambulance)	330-450	-	1
7.	Sanitary Inspector	442-734	-	1
8.	Sweeper	I	19	18
9.	Peon	270-340	1	1
10.	Lord Boy	I	1	1
	Sub-total		24	24
(G)	[illegible]			
1.	Training Officer	1200-1750	-	1
2.	Instructor	592-892	-	1
3.	Demonstrator	442-734	-	1
4.	Lab/Typist	270-590	-	1
	Sub-total :			4
H.	MAINE SURVEY & DEVELOPMENT MAINTENANCE			
1.	Head Mines Pump Attendant III		-	1
2.	Fitter Operator	II	-	1
3.	Diesel Mines Pump Attd.	III	-	1

...10/-

1.	2.	3.	4.	5.
(B)	DIRECTOR GUN-STORES			
1.	Store Keeper	510-990	1	1
2.	Explosive/sub-store keeper	270-570	3	5
3.	Store Assistant	I	6	5
	Sub-total		10	11
(C)	SECURITY			
1.	Head Watchman	315-420	-	1
2.	Armed Guard	210-480	-	4
3.	Watchmen	270-344	20	16
	Sub-total		20	21
(D)	SURVEY			
1.	Survey Officer	725-1325	*	1
2.	Head Surveyor	592-972	1	1
3.	Mine Surveyor	1192-990	2	2
4.	Draughtsmen	468-75	1	1
5.	Chainman/underground	510-600	3	3
6.	(3) Survey Headboy	I	2	2
	Sub-total		10	11
(E)	WELFARE			
1.	L.W.O.	725-1325	1	1
2.	Asstt. L.W.O.	725-1325		1
3.	Lab/Typist	270-570	1	1
4.	Canteen Clerk	270-570	1	1
5.	Canteen Cook	III	1	1
6.	Canteen Boy	I	3	3

...//-

1.	2.	3.	4.	5.
29	(A) Works Dept.			
(1)	Supdt. Asstt.	1550-2075	1	1
2.	Colliery Manager	1350-1750	2	2
3.	Safety Officer	1050-1650	2	2
4.	Asstt.Colly.Manager	1050-1650	-	2
5.	Ventilation Officer	1050-1650	2	2
6.	Under Manager	725-1325	6	9
7.	Dy.Ex.Engineer(Mkt)	1350-1750	-	1
8.	Ex.Engineer (Mkt)	1050-1650	1	1
9.	Asstt.Engineer(Mkt)	725-1325	4	4
10.	Asstt.Engineer(Civil)	725-1325	1	1
11.	Engineering Asstt.	590-990	2	1
12.	Overseer	482-754	-	1
13.	Personnel Officer	725-1325	-	1
14.	Administrative Officer	725-1325	1	-
15.	Office Supdt.	590-990	-	1
16.	Sr.Clerk	510-790	1	1
17.	U.D.C.	482-678	5	2
18.	LDC/Typist	378-510	24	9
19.	Cost Accounts Officer	725-1350	1	1
20.	Cost Accountant	590-990	1	1
21.	Cost Assistant	510-790	2	1
22.	Dr.Steno/Cl.	510-790	1	1
23.	Pr.Steno	482-678	1	1
24.	Jr. Steno	482-678	2	1
25.	Driver(Heavy Vehicle)	482-678	2	2
26.	Driver(Light Vehicle)	405-610	8	6
27.	Peon	378-510	5	5
28.	Cleaner/Sweeper	378-510	2	2
29.	Attendant	378-510	2	2
			82	59

1.				
II.	CARPENTER AND BLACKSMITH			
1.	Carpenter	IV	4	3
2.	Carpenter Helper	II	2	3
3.	Welder	V	2	2
4.	Blacksmith/Rope Splicer	IV	8	4
5.	Rammerman	III	8	4
6.	Blacksmith Helper	II	-	7
7.	Electrical Fitter	IV/V/VI	6	5
8.	Electrical Fitter Helper	II	6	4
9.	Mechanical Fitter	IV/V/VI	8	7
10.	Mechanical Fitter Helper	II	4	4
11.	Machinist	V	2	3
12.	Turner	V	-	2
13.	Gas Welder	IV	4	3
14.	Auto-Mechanic	V/VI	-	1
15.	-do- Helper	II	-	1
16.	Pedal Operator	I	2	2
17.	Cyclist	I	16	20
18.	W.C.Attendant	I	5	4
19.	Assistant Storekeeper	VI	-	1
20.	Foreman Mechanic	590-990	-	1
	Sub-total		76	78
III.	SOCIAL AMENITIES & PROGRAMME			
1.	Senior Attendant	III	-	1
2.	Community Organiser	III	14	2
3.	Cleaner	I	-	2
4.	Sports Pickers	I	16	20
5.	Junior Organisers	770-919	-	5
6.	Recreational Assistant	II	-	12
			30	42

4.	Vorsteer Incharge	552-792	4	2
5.	Fireman	510-654	4	4
6.	Sub-station Attendant	III	7	8
7.	Khalasi	378-578	10 ✓	8 ✓
8.	Dusting Incharge	510-654	2	2
9.	Dusting Incharge	510-654	2	2
	Sub-total		12	76
	Total(Unskilled Workers)		808	1312
12.	Repair			
(A)	Mechanical Section			
1.	Conveyor Khalasi	III	-	7
2.	Moulder Khalasi	IV	5	8
3.	Trimmer	III/IV	40	25
4.	Fireman(Electrical)	510-654	-	1
5.	Miners Pick Sharpener	510-660	7 ✓	11 ✓
6.	Body Shifter	II	7	12
7.	Sub-station Attendant	III	2	8
8.	Fan Khalasi	III/IV	7	8
9.	Lamp Room Incharge	442-670	2 ✓	1 ✓
10.	Lamp Fitter	IV	7	6 ✓
11.	Lamp Issuer	330-458	9 ✓	12 ✓
12.	Lamp Room Cleaner	II	-	4
13.	Telephone Attendant	IV/V/VI	-	1
14.	Telephone Switchboard Helper	II	-	1
15.	Electric Line Mazdoor	II	-	2
	Sub-total :		103	98

...5/-

4.	Roof Covering			
1.	Timber Slating			
2.	Timber Shingles	II		
3.	Thatch	II		
	Sub Total :	III		
5.	Ventilation & Lights			
1.	Fanlight	IV		
2.	Plain Skylight	I		
3.	Timber Sliding Ventilator and Top Hung Ventilator	IV		
4.	Timber Casement	II		
5.	Dormer	III		
6.	Semi Bow Fanlight	IV		
7.	Semi Bow Fixed Sash	II		
8.	Semi Bow Fanlight	I		
9.	Glazing & Puttying	I		
10.	Bow Casement	III		
	Sub-total :			
6.	Plumbing & Drainage			
1.	Rain Gutters			
2.	Rain Pipes & Soil Pipe			
	Sub-total :			
7.	Electrical Work			
1.	Electric Light			
2.	Switches			
3.	Wiring Circuit			

4.	Products	III	14	39
	Sub-total :			
5.	Shop Counters			
1.	Timber Mistry	IV/V	7	30
2.	Timber Mazdoor	II/III	7	85
	Sub-total		14	115
6.	Publicity Services			
7.	Transportation			
1.	Conveyor Khalasi	III	11	62
2.	Haulage Khalasi	III/IV	33	40
3.	Truckers	III/IV	147	155
4.	Oil Mazdoor	I	3	4
5.	Slip Mistry	IV	10	8
6.	Line Mazdoor	II	20	20
7.	Line Supervisor	IV	-	11
8.	Tanker Operator	III	-	10
9.	Belt Cleaner	I	-	20
10.	Electrical Fitter	IV/V/VI	5	15
11.	Elect. Fitter Helper	II	7	15
12.	Mechanical Fitter	IV/V/VI	7	15
13.	Mech. Fitter/Helper	II	7	15
14.	Operator Shifter	II	-	20
15.	Material Supply Clerk	I	8	20
16.	Line Sampling Mazdoor	I	10	15
17.	Sub-Engineer Elect.	IV	3	4
18.	Sub-Engineer Mechanical	I	3	4
			274	687

...3/4

ANNEXURE-II

[illegible] REPORT ON [illegible] OF BARODA
WITH RD. I & II

Statement showing job/wise/categorywise
total Manpower requirement

S.No.	Designation	Cat./ Scale	As per approval	Persons
1.	2.	3.	4.	5.
I.	[illegible]			
A.	COAL YARD			
a.	Setting & Loading			
1.	O.C.M. Driver	VI	22	14
2.	O.C.M.Helper/Crew	III	20	20
3.	Side Loader Operator	VI	-	01
4.	Side Loader Helper	II	-	01
5.	Shuttle Operator	IV	16	-
6.	Blacksmith Wedhoce	I	15	-
7.	Drawbell Mazdoor	V	60	-
8.	F.M.Loader	S.S.V&	120	280
	Sub-total :		294	336
b.	Drilling			
1.	Driller	IV	26	26
2.	Driller Helper	II	26	26
	Sub-total		52	52
c.	Blasting			
1.	Blast Firer	Highly	05	05
2.	Explosive Carrier/ Helper	II	62	62
	Sub-total		70	91

...2/-

ANNEXURE-[illegible]

PROJECT REPORT
ON
REVISION OF [illegible] NO.[illegible]
*****

STATEMENT SHOWING ADDITIONAL CAPITAL EXPENDITURES ON WATER SUPPLY

- N I L -

****

[illegible]

ANNEXURE-B.2

PROJECT REPORT
ON
REVISION OF MANDYA MINI NO. I & II

****

STATEMENT SHOWING ESTIMATED ADDITIONAL CAPITAL INVESTMENT ON ROAD AND DRAINAGE

*****

Colony Roads and Culverts

A&B1.Requirement for the new houses

(A) Grade 'A' Road

1) Specifications : Rs.

3.35 m. wide, 15 cm. thick boulder soling.

3.05 m. wide, 11.25 cm. thick metalling and 2 coats of bitumen painting.

11) Length of Road : 4500 @ Rs.61/RM R.M. = 274500

(B) Grade 'B' Road :

1) Specifications :

3.05 m.wide, 15 cm. thick boulder soling with 7.5 cm. thick moorum top.

11) Length of Road = 1000 @ Rs.32/RM R.M. = 32000

(C) Culverts (7.32 m. width)

1) 4.57 m. span R.C.C. slab culvert = 75000
= 2 Nos. @ Rs. 37500

11)5.05 m. span of RCC slab culvert = 50000
= 2 Nos. @ Rs. 25000

111).83 m span RCC slab culvert = 30000
= 2 Nos. @ Rs.15000

...2/-

Appendix-A.5.(Contd.)

1.	2.	3.	4.	5.	6.	7.
(a)	Return staple shaft from Lower Workable to Bagdona Seam 2.4 m dia.	1	50	50	3000	150
	BAGDONA HAULAGE IN SECTOR F					
	Intake cum travelling drift from Lower Workable to Bagdona Seam, grad.1 in 3 (against the dip of bed), dia. 2.4 x 2.) mtr.	1	110	110	2000	220
	Sump and Drainage arrangements.	10	10	10	10	100
	Subsidiary etc.	10	10	10	10	40
	Permanent support at roadways	15	15	15	15	75
	Borehole for cable, pipe etc. small drifts etc.	10	10	10	10	200
						6480

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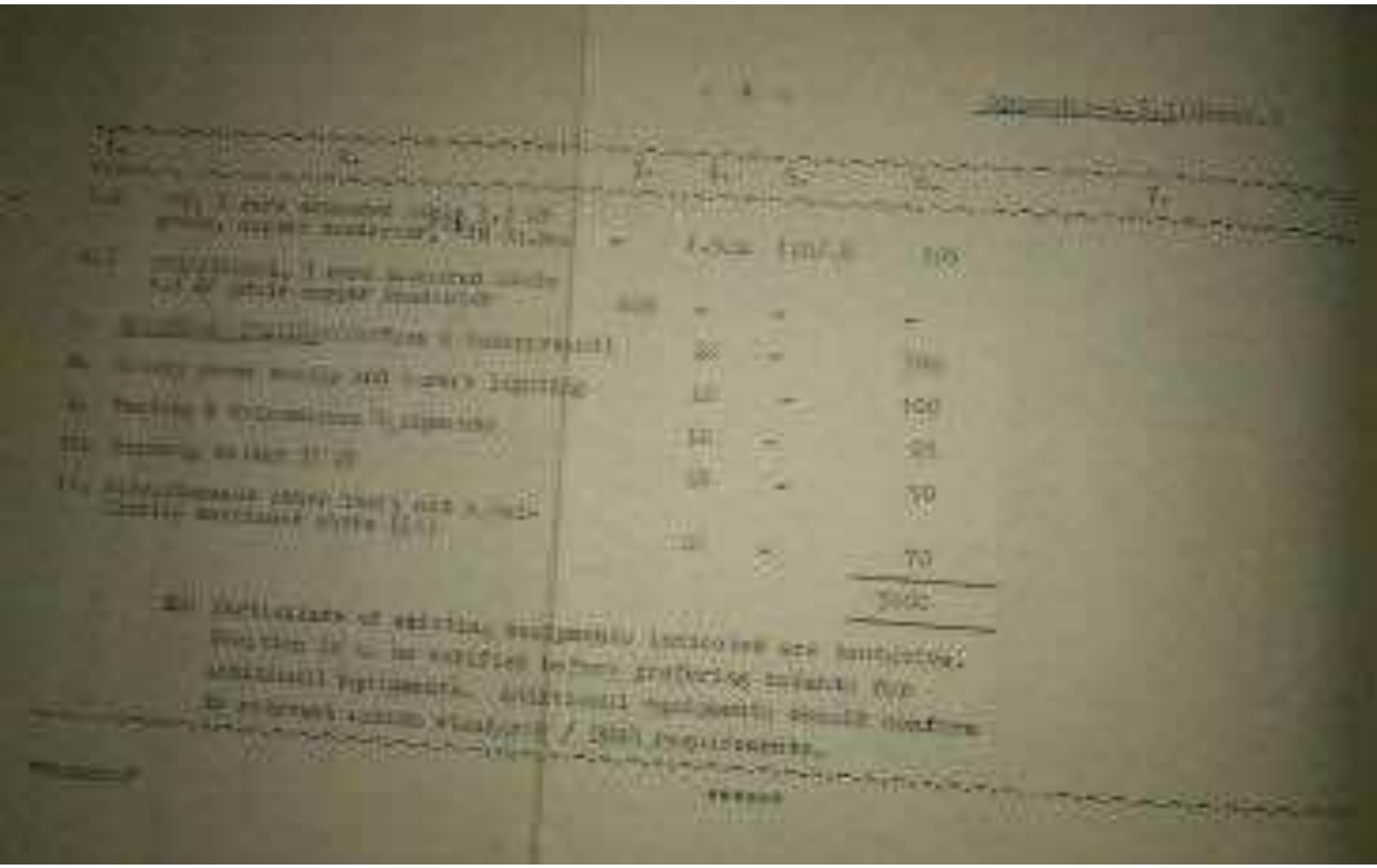
Contd.....

PROJECT REPORT
ON
REVISION OF SATPURA MINE RAILWAY

******

SATISFACTORY GROWING STRUCTURE
DEVELOPMENT ON RAILWAY SIDING

******



(d) Internal water supply & sanitary installation @ 15% of the building cost. = 900

(e) Internal electrification @ 10% of the building cost. = 600

(f) External sewerage connection @ 5% of the building cost. = 300

(g) Add extra for foundation in poor soil = 10.0 sqm. @ Rs. /sqm. = -

Total : 9062

(C) GARAGE :

(a) Plinth area = 18 m^2 @ Rs.200/m^2 = 3612

(b) Add extra for foundation in poor soil = 10 sq.m. @ Rs. /sqm. = -

Total : 3612

GRAND TOTAL OF (A),(B),(C) : = 83207

RATES' CHARTS :

Rate for Rajeev Gandhi Nagar Housing Scheme. = 11325

Add extra for foundation in poor soil 00.00 sqm. @ Rs. / sqm. = -

Total : 11325

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Bhandari

b. [illegible] :

(a) Building area = 95.01 m² @ Rs.333/m² = 31643

(b) Internal water supply & sanitary installations @ 12½% of the building cost. = 3955

(c) Internal electrification @ 10½% of the building cost. = 3321

(d) External service connection @ 3% of the building cost. = 1060

(e) Extra for foundation in poor soil = 95.01 sqm. @ Rs. /sqm. = -

Total : = 39979

c. [illegible]

(A) (a) Plinth area = 159.46 m² @ Rs.333/m² = 53092

(b) Internal water supply & sanitary installation @ 12½% of the building cost. = 6640

(c) Internal electrification @ 10½% of the building cost. = 5542

(d) External Service connections @ 3% of the building cost. = 1993

(e) Add extra for foundation in poor soil =159.46sq. mts. /m² = -

Total : 70429

(B) Harvest's Quarter (Annex- ure Plinth area rate and specifi- cation of Type-A)

(a) Plinth area = 10.16m² @ Rs.333/m² = 3384

ESTIMATED COST
OF
CONSTRUCTION OF QUARTERS (TYPE IV-VIII)
******

TOTAL COST OF TYPE IV-VIII QUARTERS WORKED OUT BELOW COMES TO Rs. 9,21,000/- AS PER SCHEDULE 'A' OF CENTRAL PWD.

1. TYPE 'A' :

		Rs.
(a) Plinth area = 37.00 m² @ Rs.333/m²	=	12315/-
(b) Internal Water Supply & Sanitary installations @ 15% of the building cost.	=	1787
(c) Internal electrification @ 10% of the building cost.	=	1192
(d) External service connection @ 5% of the building cost.	=	596
(e) Extra for foundations in poor soil = 37.00 m² @ Rs. /sqm.	=	-
Total :-		15890

2. TYPE 'B' :

(a) Plinth area = 59.76 m² @ Rs.333/m²	=	19900
(b) Internal Water Supply, Sanitary Installations @ 12½% of the building cost.	=	2537
(c) Internal Electrification @ 10% of the building cost.	=	1950
(d) External service connections @ 5% of the building cost.	=	929
(e) Extra for foundation in poor soil = 59.76 sqm. @ Rs. /m²	=	-
Total :-	=	25316

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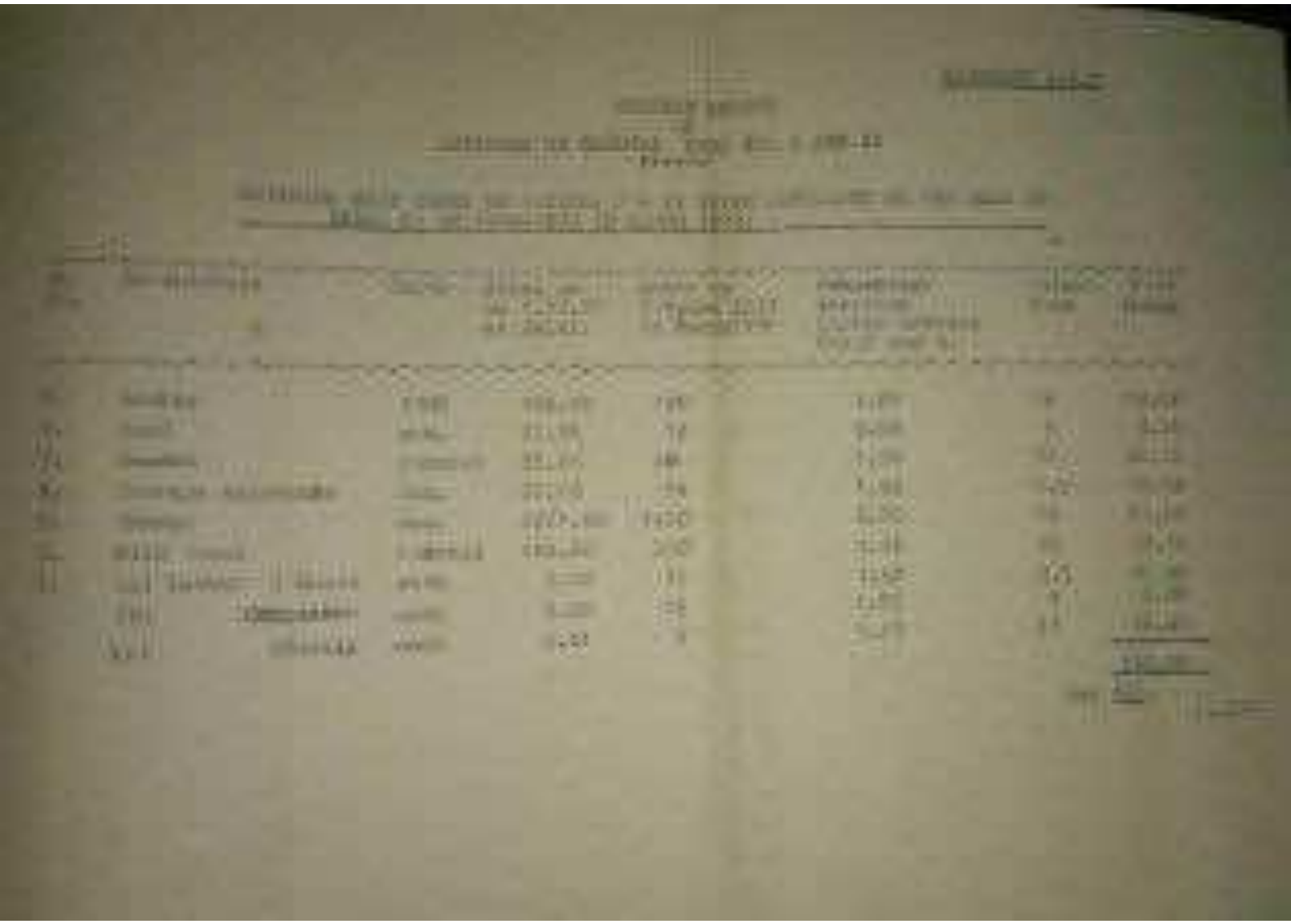

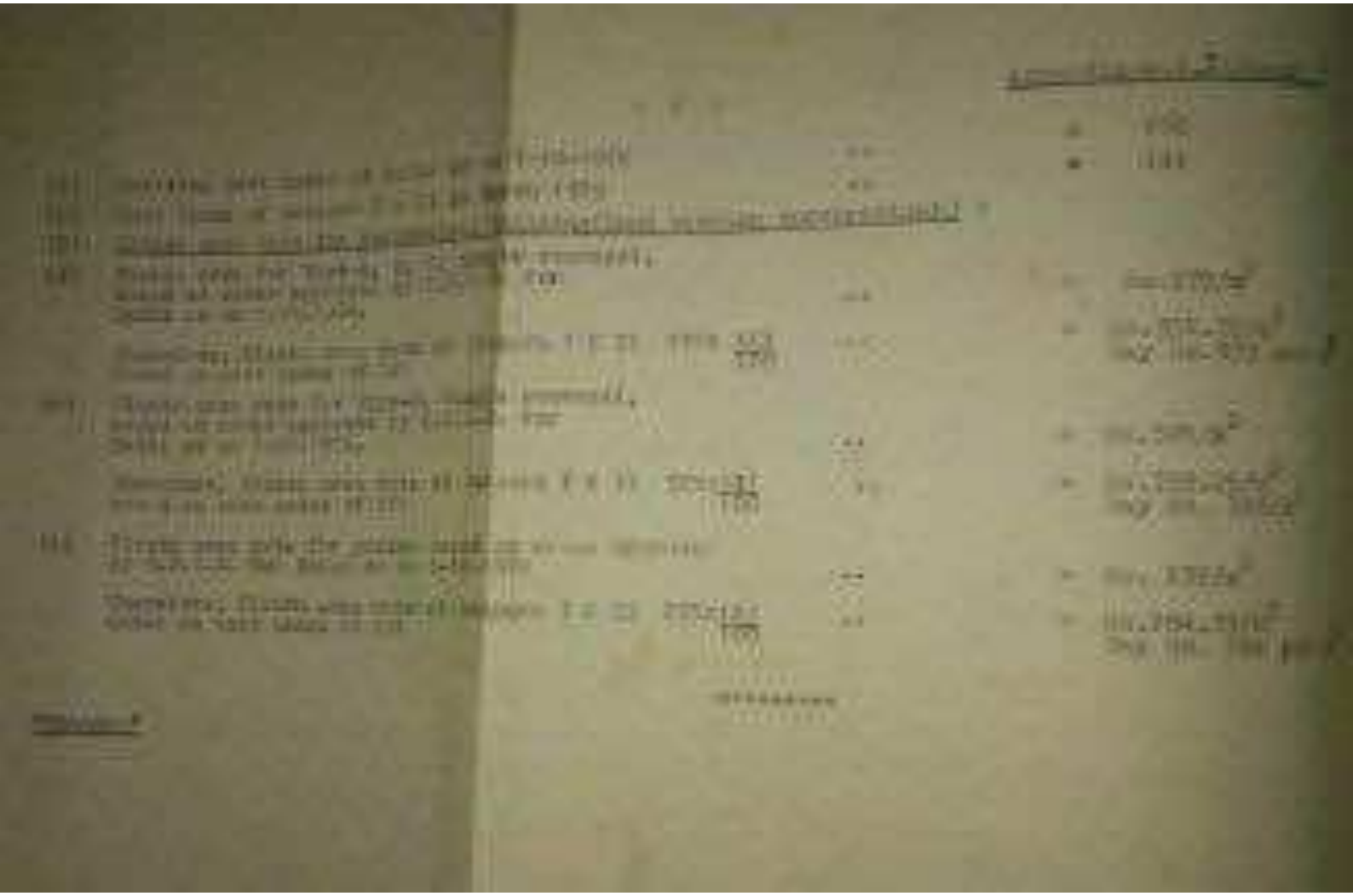

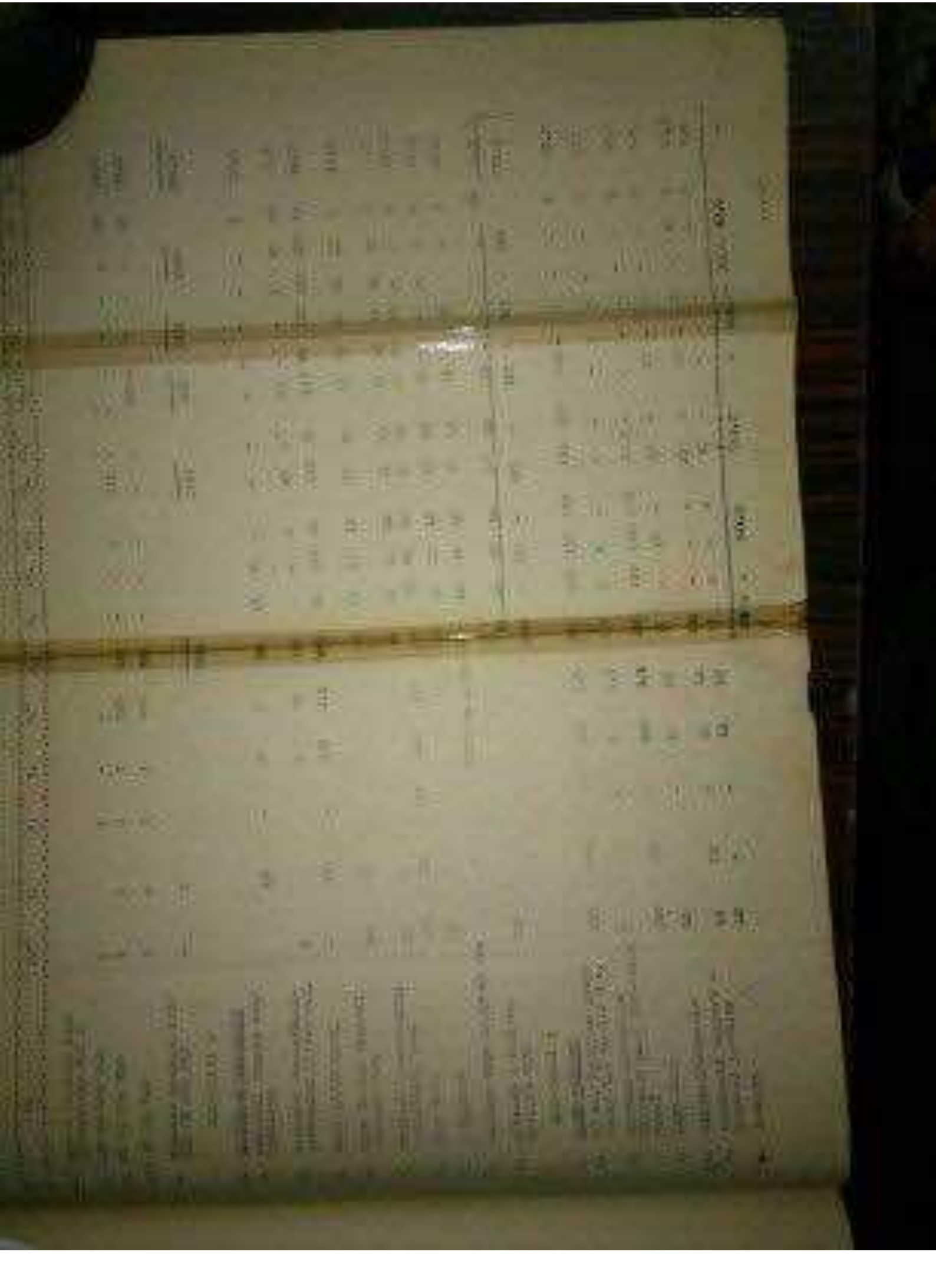

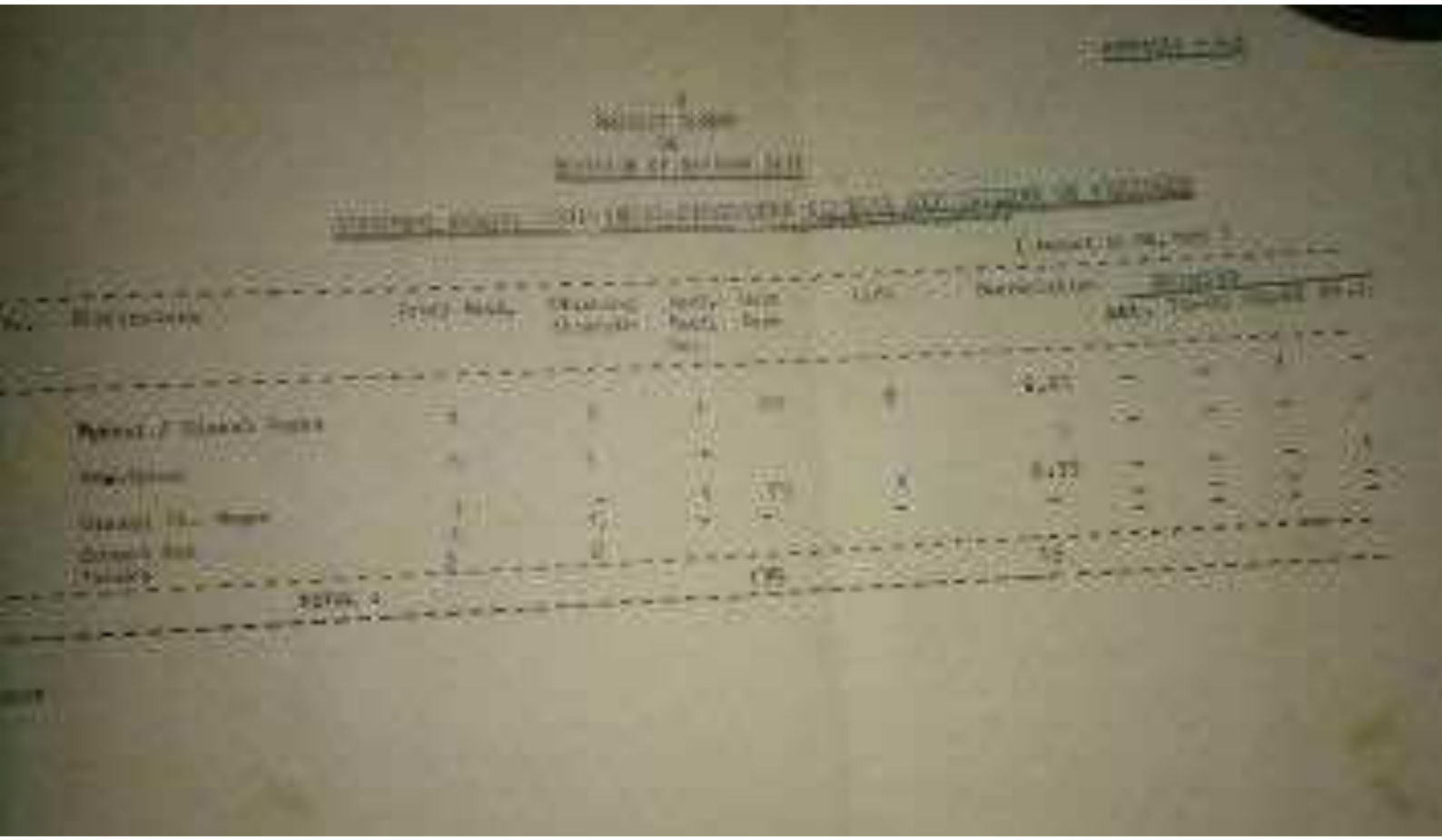

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BOARD NOTES
ON
QUESTION OF APPEAL NOS. 1 & 11
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[illegible]
[illegible]
[illegible]

(Amount in Rs.'000)

ITEM	AMOUNT
Pulse Schemes, Research & Development, Training and Demonstration	500
Oil Preparation	250
TOTAL	750

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*CONTD/-