PROPOSAL FOR PRELIMINARY EXPLORATION
(G-3 STAGE) FOR COAL

BRAHMANI NORTH BLOCK

NMET FUNDED PROJECT

TALCHER COALFIELD

DISTRICT– DHENKANAL,

ODISHA

JUNE - 2022

PROPOSAL FOR PRELIMINARY EXPLORATION
(G-3 STAGE) OF COAL IN BRAHMANI NORTH BLOCK, TALCHER COALFIELD, DIST-DHENKANAL (ODISHA)

1.0 Introduction:

1.1 Talcher coalfield is south-eastern extremity of Lower Gondwana basins within Mahanadi Valley graben. The coalfield occupies an area of about 1800 sq. km with potential coal bearing area of about 1000 sq. km. It is located between Latitude $20^{o}53'00"$ & $21^{o}12'00"$ North and Longitude $84^{o}20'00"$ & $85^{o}23'00"$ East. Major part of the coalfield falls in Angul district and the rest in neighboring districts of Dhenkanal, Deogarh and Sambalpur within the state of Odisha. Talcher coalfield being one of the largest store house of power grade coal in India, plays a major role in the socio-economic development of Odisha State as well as of the nation. The occurrence of economically minable coal seams has been well known in the south-eastern part of the coalfield for over a century. In the recent past, the investigation carried out by the GSI, MECL, DG (O) and CMPDI have revealed the occurrence of thick quarriable coal seams in the northern and south-central part of the coalfield as well

1.3 Stratigraphy of Talcher coalfield comprises thick sediments of Lower Gondwana Group, deposited over faulted and denuded metamorphics. Geology of Talcher coalfield has changed substantially consequent upon exploration carried out in central and eastern part.

1.2 The present block forms a part of Talcher coalfield where prominent geological formations are Pre-Cambrian as base over which Talchir, Karharbari & Barakar Formations were deposited. The proposed Brahmani North Block in which Regional exploration is envisaged comprises an area of about 21.73 sq.km and is located in south eastern part of Talcher coalfield in the state of Odisha. Brahmani Block, in the south and Sakhigopal B and Northern Extn. Block in the west of proposed block area are partially Explored. Exploration data of both the block suggests possibility of workable quantity of coal resources in shallow depth in the present block area.

1.4 The area of the block is about 21.73 sq.km. Western boundary of block is limited by eastern bank of Brahmani River and southern boundary of block is northern boundary of Brahmani Block. Northern and Eastern boundary of the block are limited by arbitrary lines.

1.5 Proposal of G4 Level exploration for coal in Brhmani North Block was presented in 43rd TCC held on 28/29 July 2022. TCC has recommended to resubmit the

proposal for G3 stage of exploration in the block after incorporating the geological data of previously drilled boreholes of GSI.

1.6 Accordingly CMPDI has drawn proposal for G3 stage of exploration for coal in Brahmani North Block, involving 2200m of drilling in 5 boreholes.

Objective:

G-3 stage of Exploration in the block is proposed to fulfill following objectives:

- To establish the existence and continuity of coal seams of Barakar and Karharbari formations occurring in the block.
- To establish lay & disposition of coal seams in Block.
- To assess the coal resources of the block by G3 level of exploration.

2 Location & Accessibility:

The proposed Brahmani North block is located in eastern part of Talcher coalfield. Southern boundary of block is limited by Brahmani block and western boundary of block is limited by Brahmani river. Northern and eastern boundary of block is an arbitrary line. Brahmani North block comes under Parjang Tehsil in Dhenkanal District of Odisha State.

The nearest railway station is Talcher, which is about 15 Km from the block on Sambalpur-Talcher-Bhubaneswar railway line. The Biju Pattanaik International Airport, located at 140km from the block in the state capital Bhubaneswar.

3 Area & Boundary of the Block:

The area of the block is about 21.73 sq.km and is bounded by longitude 85º14'34.606"E to 85º19'54.304"E and latitude 20º58'10.140"N to 21º0'9.883"N in WGS84 coordinate system. The proposed block area falls within Survey of India toposheet nos. 73G/8, 73H/5 on RF: 1: 50,000.

Limit of the block the block is as follows:

North **:** An arbitrary line. (Probable contact of Talchir & Barakars)

East : An arbitrary line. (Probable contact of Talchir & Barakars)

South : Northern boundary of Brahmani Block.

West : Eastern boundary of Brahmani River.

4 Physiography and drainage:

The surface topography is generally flat around most of the area, which is being used for cultivation purposes by the villagers. The major river Brahmani, which forms the western boundary of the block, is flowing from north to south. It controls the drainage and topographical pattern around south and western parts, the surface topography is mildly undulating and slopes towards the nala. The general elevation of ground level is about 100m with maximum elevation of 120 m above mean sea level. Small ponds and dug wells are common in this block which are utilised for irrigation and drinking purpose. Kankurupal RF in south-western part of the block covers an area of about 4.13sq.km.

5 Previous work:

Regional exploration was carried out by the Coal Wing, G.S.I. in the eastern extension of Talchir coalfield (Kualo Area i.e. to the east of the Brahmani river) during 1978 -1981 for an appraisal of the potentiality of coal available in this virgin tract. A grand total of 1748.85m distributed in five boreholes was drilled and total of 90.303 million tonnes of coal resouces were estimated as per then prevailing I.S.P. norms. Among the above five drilled boreholes of GSI, three boreholes (TCK-3,4 & 5) are falling within the limit of proposed Brahmani North Block.

Semi detailed exploration has been carried out in the southern adjacent block Brahmani by Directorate of Mining and Geology, Odisha (DGO) and submitted the geological finding entitled “Geological report on exploration for coal in Brahmani, Talcher coalfield, Orissa”, March 1999. CMPDI has also drilled 4 nos. of boreholes in the block previously and 21 no. of boreholes in 2019 and 2020. Besides, GSI had also drilled one borehole.

Thus, 46 no. of boreholes have been drilled in adjacent Brahmani block spreading over 13.20 sq.km area. Similarly, in west of Brahmani North block exploration has also

been carried out by CMPDI in Sakhigopal-B & Its Northern Extn. Block and Geological report has been prepared.

7.0 Broad Geological Set up:

7.1. Stratigraphic sequence

Generalized stratigraphic succession in Talcher coalfield as per GSI is given below:

Table: II

Generalized stratigraphic succession of Talcher coalfield

Group	Age	Formation	Thickness (m)		Lithology
			From	To	
	Quarternary	Quarternary deposits (Recent)	-	40+	Colluvial fills, sand, silt deposits and clay of older alluvium, older and younger floodplain deposits, channel fills etc.
	Cenozoic	Laterite	-	40+	Laterites, lateritised detrital pebble bed.
GONDWANA SUPER GROUP	Upper Permian to Lower Triassic	Undifferentiated Kamthi Formation	-	575+	Fine to medium grained light grey to reddish sandstone and shale at the base and pale greenish sandstone with rare shale and pink clay bands, ferruginous coarse grained to pebbly sandstone at top.
	Unconformity				
	Upper Permian	Barren Measures	-	50+	Greenish grey to buff coloured pebbly, coarse to medium grained highly ferruginous sandstone with variable proportions of fresh K-feldspar.
	Lower Permian	Barakar Formation	-	500+	Medium to coarse grained greyish feldspathic sandstone, grey to dark grey shale and coal seams.

	Lower Permian	Karharbari Formation	-	270+	Pale brownish yellow coloured massive medium to coarse grained sandstone containing clasts of Talchir shale and coal seams.
	Upper Carboniferous to Lower Permian	Talchir Formation	-	170+	Diamictite, sandstone, needle shale, turbidite, rhythmites and varves.
Unconformity					
	Archaean(?) to Lower Protero-zoic	Pre-Cambrian Metamorphics			Granites, gneisses and associated supracrustals.

As per available surface and sub-surface data of boreholes drilled in and around the block, a generalized stratigraphic succession for the study area is given below (based on Brahmani Block):

Table: III

Generalized Expected stratigraphic succession of the block/area

Group	Age	Formation	Depth of Occurrence (m)		Lithology
			Min	Max	
	Recent	Recent deposits	0.00	20.00	Soil, Sub-soil etc.
	Lower Permian	Barakar Formation	2.94	250.50	Medium to coarse grained greyish feldspathic sandstone, grey to dark grey shale and coal seam V to LOC1 in descending order with oligomictic conglomerate (around 60m) at bottom.
	Lower Permian	Karharbari Formation	22.21	172.93	Pale brownish yellow coloured massive medium to coarse grained sandstone, containing clasts of Talchir shale and coal seams I (Occurs in 3 splits).
	Upper Carboniferous to Lower Permian	Talchir Formation	67.00		Diamictite, sandstone, needle shale, turbidite, rhythmites and varves with khaki green tint.
	Unconformity				

Group	Age	Formation	Depth of Occurrence (m)		Lithology
			Min	Max	
	Archae-an(?) to Lower Protero zoic	Pre-Cambrian Metamorphics	Not encountered in any of the BHs drilled in the block		Granites, gneisses and associated supracrustals

7.2 Coal Seams:

As per boreholes drilled by CMPDI/GSI/DGO in the adjacent Brahmani and Sakhigopal-B and Northern Extension block, seam VII to I group of seams are expected to be present in the present block area. Probable average Grade of Coal in the block is expected to be ranging from G-9 to G10. Following table shows a tentative sequence of coal seams and parting in the block area:

Table: IV

Tentative Expected sequence of coal seams & parting of the block area

Coal Seam/Parting between seams	Thickness range		Depth range		Formation
	Min (m)	Max (m)	Min (m)	Max (m)	
W.M	2	26.2			
VII	**0.19**	**4.85**	**20**	**70**	Barakar
Parting	17.17	68.2			
VIB	**0.17**	**10.66**	**30**	**100**	Barakar
Parting	3	35.11			
VIA	**0.16**	**11.42**	**40**	**130**	Barakar
Parting	2.35	33.54			
V	**0.09**	**13.59**	**50**	**150**	Barakar
Parting	3.17	37.5			
L2	**0.1**	**3.99**	**65**	**155**	Barakar
Parting	3.49	31.98			
IV	**0.68**	**19.02**	**70**	**180**	Barakar
Parting	0.7	26.38			
L1	**0.14**	**5.1**	**85**	**195**	Barakar
Parting	1.12	33.26			
III	**0.25**	**15.86**	**100**	**210**	Barakar
Parting	3	43.33			

II	**2.24**	**46.22**	**110**	**250**	Barakar
Parting	3	24.67			
II B	**0.28**	**4.58**	**130**	**300**	Barakar
Parting	70	100			
I T	**0.35**	**2.84**	**200**	**370**	Karaharbari
Parting	10	22			
I M	**0.12**	**2.28**	**210**	**390**	Karaharbari
Parting	10	24			
I B	**0.20**	**1.56**	**220**	**450**	Karaharbari

7.3 Structure:

The general strike of the Geological units in Brahmani North block is expected to be E-W with about 6^0 to 8^0 dip towards North in the southern part of the block. The dip of the block in northern part is expected to be towards South. The interpretation of geological structure in Brahmani North block is based on the sub-surface data available in adjacent blocks. Based on the data available in adjacent blocks tentative floor contour plan has been attempted to decipher the geological structure of North of Parbelia block.

8.0 EXPLORATION SCHEME

G3 level of exploration is proposed in the block. Following are the attributes of exploration scheme.

8.1 Drilling:

A total of 5 boreholes placed on 1600m X 1600m Grid spacing involving 1950m of drilling are proposed for regional exploration up to seam-I/Talchir Formation. Following tables shows the details of proposed boreholes:

Table: V

Details of proposed boreholes in the block

Sl. No	PROPOSED BOREHOLE NAME	PROPOSED TOTAL DEPTH (m)	REMARKS
1	P-1	550	Upto Talchir Fm.
2	P-2	550	Up to Seam I
3	P-3	450	Up to Seam I
4	P-4	450	Up to Seam I
5	P-5	200	Upto Talchir Fm.
	Total	2200	

8.2 Laboratory Studies:

Band by Band analysis, Overall analysis, special test & Petrographic Studies are proposed to carry out on coal samples of all seams.

8.3 Quantum of work:

Following table shows the details of proposed work for G3 stage of exploration in the block:

Table: VI

Quantum of Work

S. No.	Activity	Quantity
1.	Geological Mapping	21.73sq. km
2.	Drilling:	
	i) Boreholes	5 BHs.
	ii) Meterage	2200m
3.	i) Levelling and Triangulation	As per requirement
	ii) RL and Co-ordinates	5 BHs.
4.	Drill Core Logging	2200m
5.	Geophysical Logging:	5 boreholes 2200m
7.	Chemical Analysis:	
	i) Band by Band	5 BHs (about 800 samples)
	ii) Overall (for I100,I30,BCS)	5 BHs (about 100 samples)
	iii) Calorific Value	5 BHs (about 100 samples)
8.	Special Tests (Ultimate analysis, Sulphur, phosphorous content, Petrography, AFT, Ash Analysis, HGI)	1 Bh for all seams i.e 12 seams

11.0 LIMITATIONS

11.1 Depth of the proposed boreholes were inferred as per data from adjacent block assuming geological continuity of coal seams. Hence, proposed depth of boreholes is tentative and likely to very during the

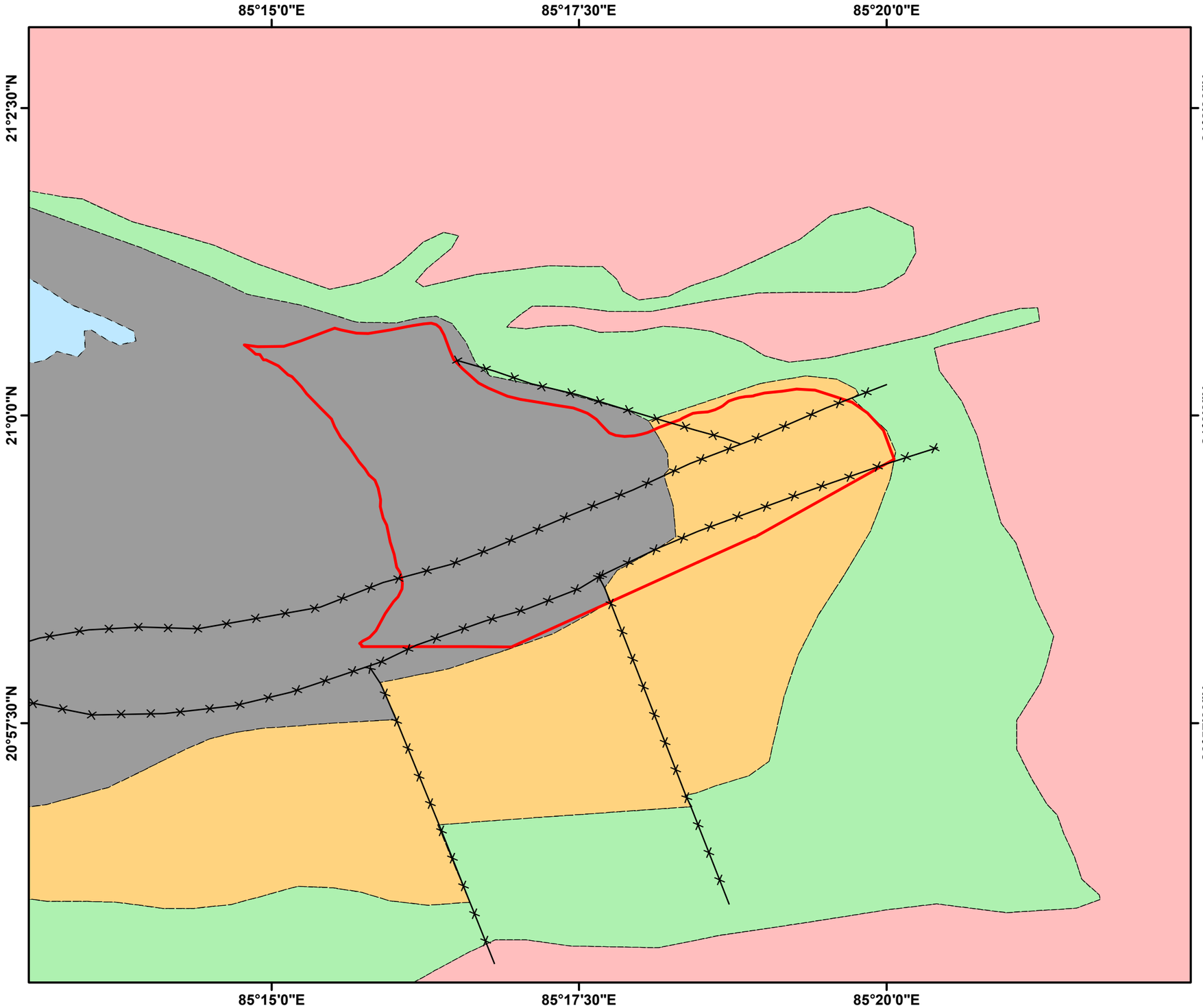
course of investigation. Relevant Geophysical studies are also likely to change based on the actual drilling meter.

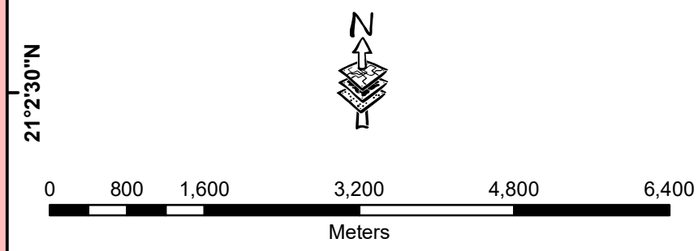
11.2 As the proposed meterage is based on tentative geological structure inferred from surrounding blocks, actual drilling meterage may vary due to structural complexities revealed during the course of exploration.

11.3 Boreholes locations may require some shifting due to non-approachability due to hills / gullies / villages/ forest cover, geological structure etc.

12.0 Enclosure:

1. Topographical Plan
2. Regional Geological plan of the area.
3. Graphic litholog of boreholes of adjacent blocks.
4. Proposed borehole location plan.





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Geological Map of A Part of Talchir Coalfield, Odisha

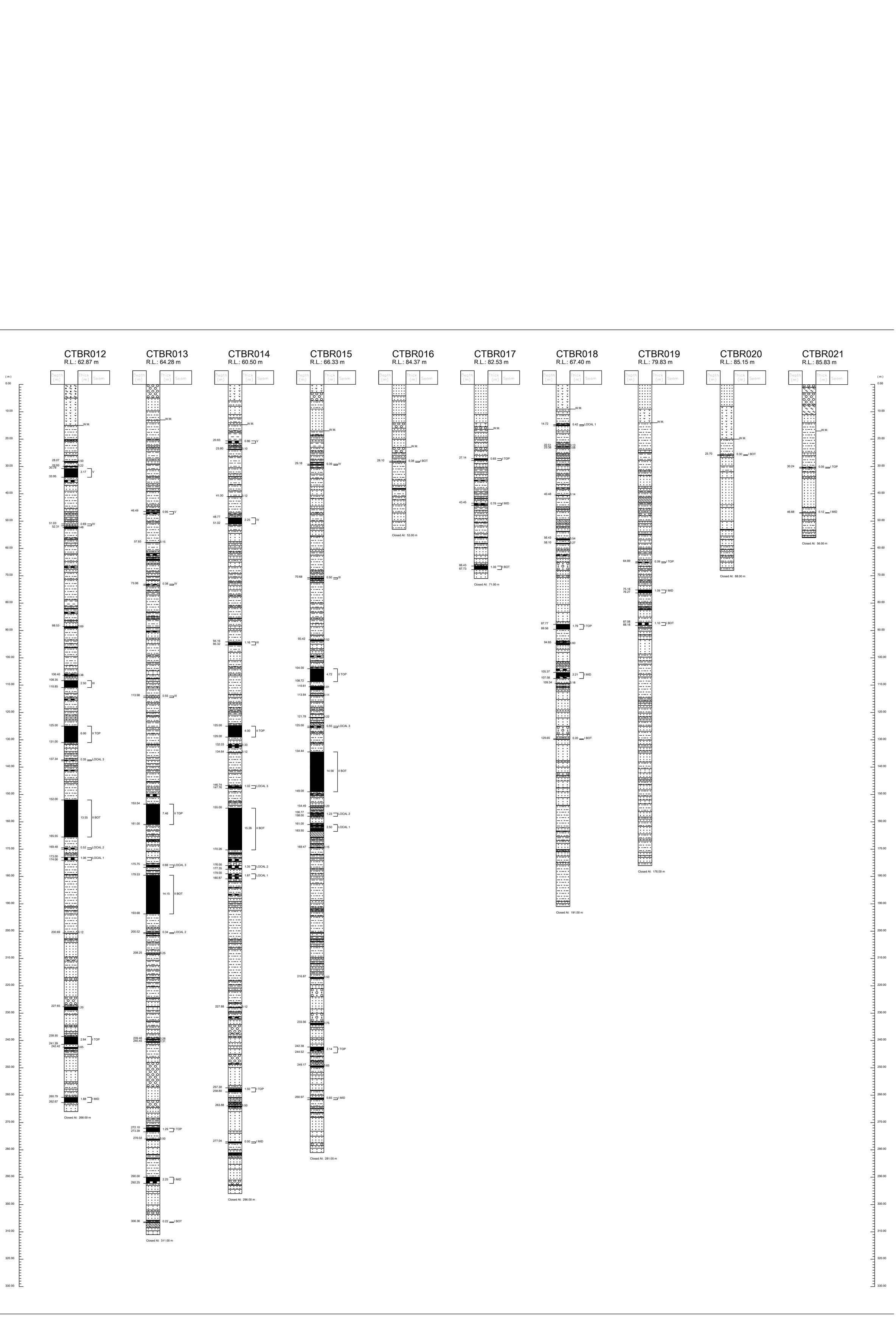
Source : Geological Map of Talchir CF , MApped by Geologists's of GSI

Legend

- Proposed Boreholes
- GSI_Boreholes
- FAULT Trace
- Brahmani_North_Boundary

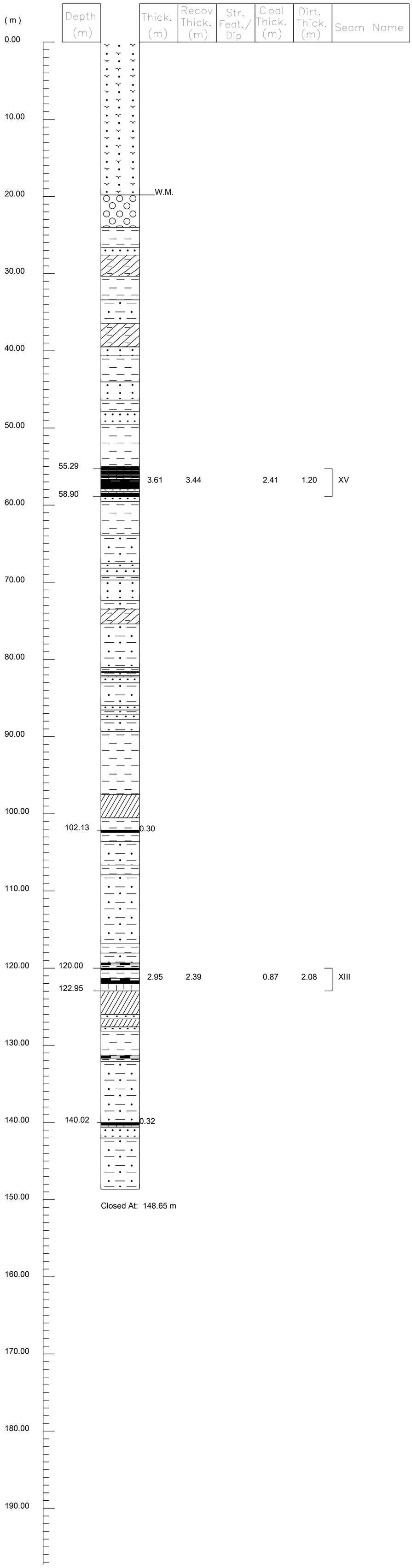
Formation

- RANIGANJ
- BARAKAR
- KARHARBARI
- TALCHIR
- METAMORPHICS


CTBR012
R.L.: 62.87 m
CTBR013
R.L.: 64.28 m
CTBR014
R.L.: 60.50 m
CTBR015
R.L.: 66.33 m
CTBR016
R.L.: 84.37 m
CTBR017
R.L.: 82.53 m
CTBR018
R.L.: 67.40 m
CTBR019
R.L.: 79.83 m
CTBR020
R.L.: 85.15 m
CTBR021
R.L.: 85.83 m
(m)
Depth (m)
Thick (m)
Seam
W.M.
Closed At: 53.00 m
Closed At: 71.00 m
Closed At: 191.00 m
Closed At: 176.00 m
Closed At: 68.00 m
Closed At: 56.00 m
Closed At: 266.00 m
Closed At: 311.00 m
Closed At: 296.00 m
Closed At: 281.00 m

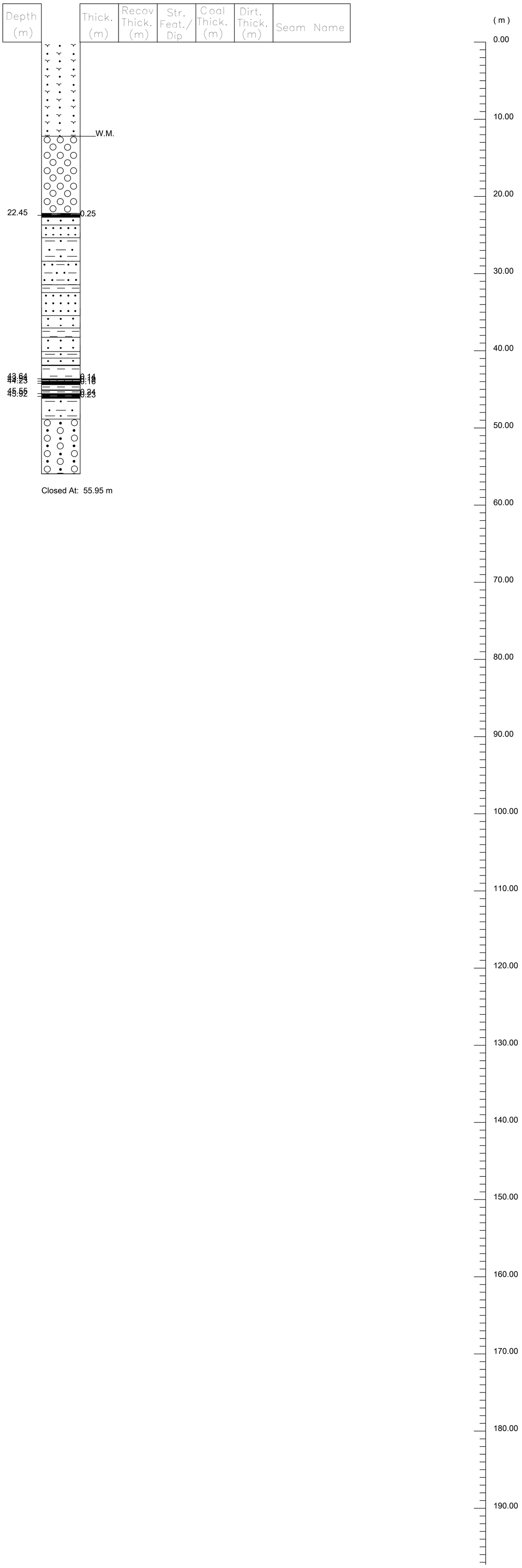
CMTS-015

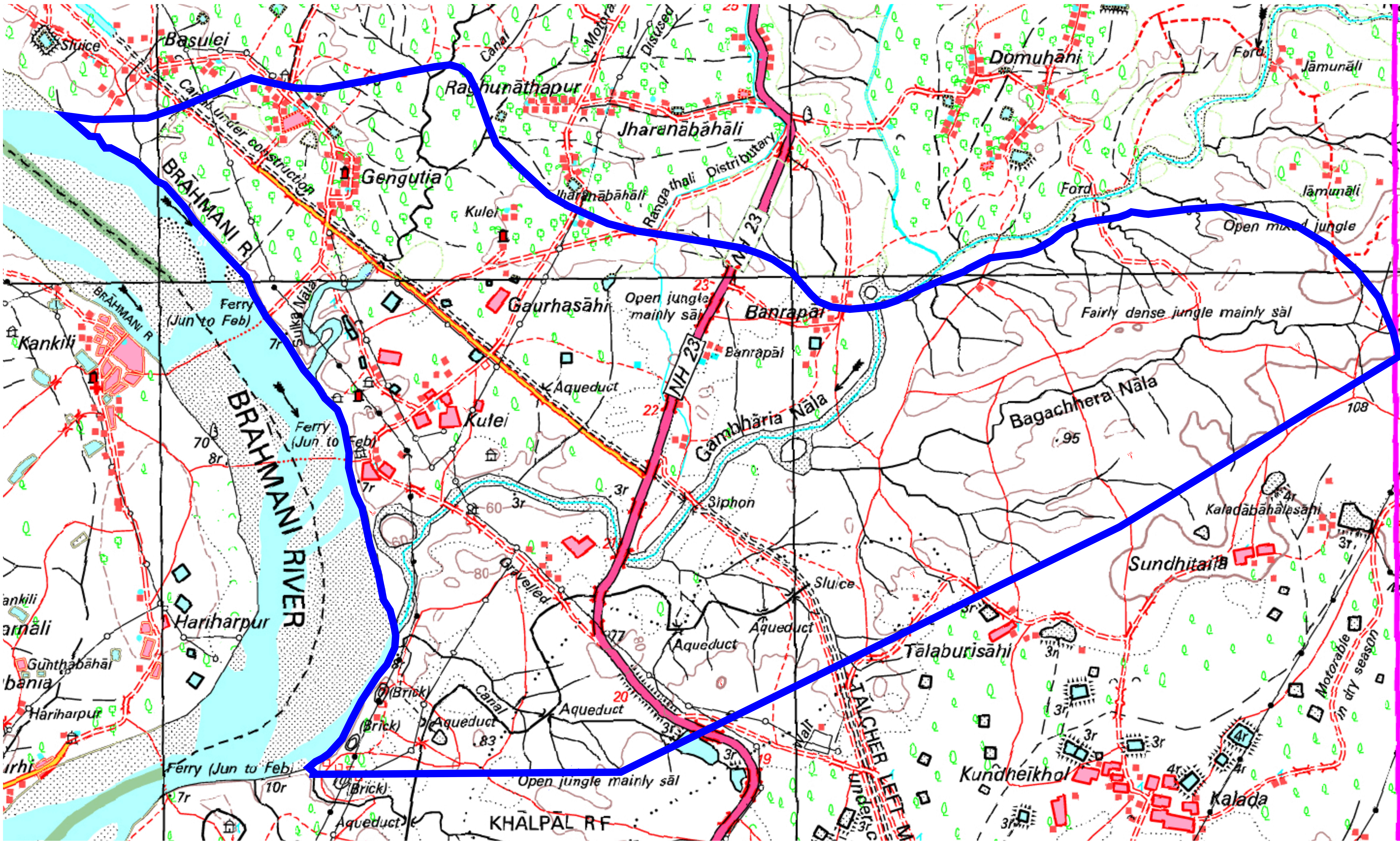
R.L.: 66.20 m

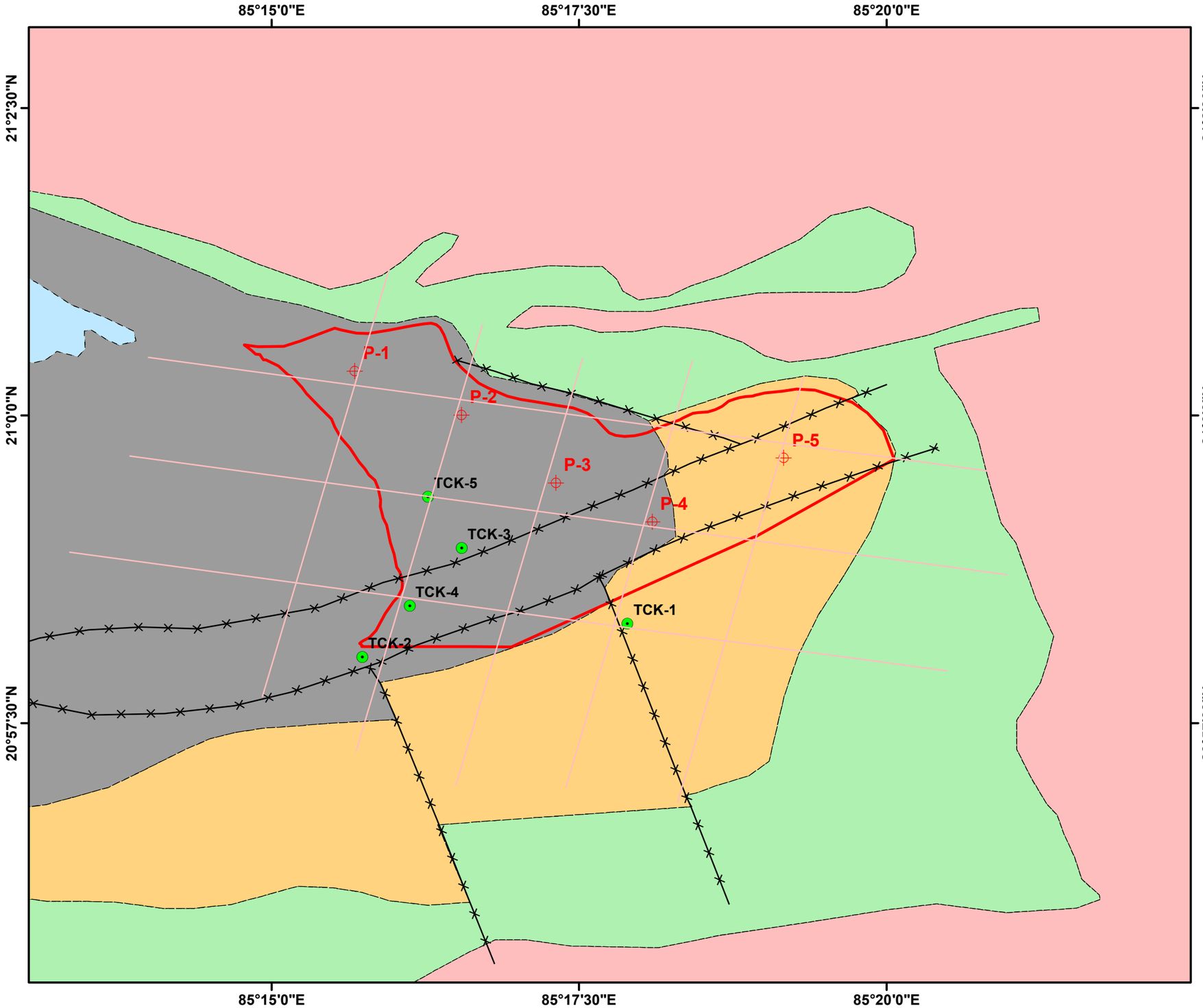


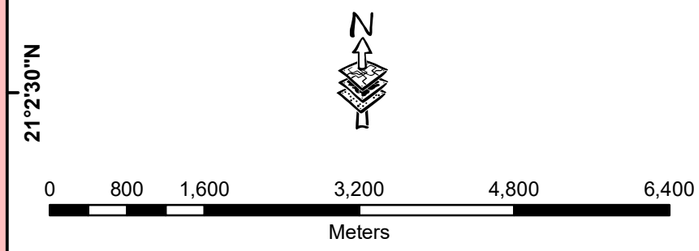
CMTS-005

R.L.: 62.77 m




Sluice
Basulei
Canal
Motorable
Disused
Raghunāthapur
Domuhani
Ford
Jāmunāli
Canal under construction
Jharanābāhāli
Gengutia
Kulei
Ranga thali Distributary
BRĀHMANI R
NH 23
Open mixed jungle
BRĀHMANI R
Ferry (Jun to Feb)
Gaurhasāhi
Open jungle mainly sāl
Banrapāl
Fairly dense jungle mainly sāl
Kankili
Sukta Nala
Aqueduct
Bagachhera Nala
Gambhāria Nāla
BRĀHMANI RIVER
Ferry (Jun to Feb)
Kulei
95
108
Siphon
Kaladābāhālasāhi
Sundhitaila
Gravelled
Sluice
Hariharpur
Aqueduct
Talaburisāhi
Gunthābāhāl
Hariharpur
(Brick)
Canal
Aqueduct
Motorable in dry season
Kundheikhol
Kalada
Ferry (Jun to Feb)
Open jungle mainly sāl
TALCHER LEFT M
KHĀLPAL R F





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Proposed Borehole Location Plan Brhmani North Block, Talchir CF

Source : Geological Map of Talchir CF , MApped by Geologists's of GSI

Legend

- Proposed Boreholes
- GSI_Boreholes
- FAULT Trace
- Brahmani_North_Boundary

Formation

- RANIGANJ
- BARAKAR
- KARHARBARI
- TALCHIR
- METAMORPHICS

Project Cost Estimate for Recconaisance Survey (G4 Stage) of Coal in Brahmni North , Talcher CF (Area-21.73 sq.km)

Sl. No	Item Work	Item no in Soc	Unit	Rates as per SoC of NMET	Rate (Rs)	Qty.	Amount (Rs)
	I- Field operations						
A	**DRILLING**						
1	Drilling	2.2.1.1b	m	5619	6775	2200	14905000
B	**GEOPHYSICAL STUDIES**						
1	Borehole Geophysical logging	3.11	m	656	470	2200	1034000
2							
	Field operations Total (A+B)						**15939000**
	II- Field Study						
A	**GEOLOGICAL WORK**						
1	Survey Work-1 surveyor	1.6.1a	Day	8300	8300	30	249000
2a	Geological Party days-Field (Mapping, Field work)- 1 Geologist	1.5.1a	Day	11000	11000	120	1320000
2b	Geological Party days-HQ 1 Geologist	1.5.1a	Day	9000	9000	30	270000
	Sub Total A						**1839000**
B	**GEOPHYSICAL STUDIES**						
2a	Geophysicst Party days-Field - - 1 Geophysict	3.19	Day	11000	11000	7	77000
2c	Geophysicst l Party days-HQ - 1 Geophysict	3.19	Day	9000	9000	10	90000
	Sub Total B						**167000**
	Field Work Total (A+B)						**2006000**
	III-Laboratory Studies						
1	***Band By Band Analysis***						
a	Ash+Moisture	4.2.6	per sample	700	700	800	560000
b	House Keeping	4.2.1	per sample	115	115	800	92000
c	Sample preparation for Band by Band Analysis	4.2.2	per sample	500	500	800	400000
2	***Overall analysis***						
a	Proximate analysis	4.2.7	per sample	935	935	100	93500
b	Moisture at 60% RH & 40C	4.2.8	per sample	1010	1010	100	101000
c	GCV	4.2.11	per sample	1505	1505	100	150500
d	Sample preparation & House Keeping	4.2.3	per sample	795	795	100	79500
3	***Special Test***						
a	Ultimate analysis	4.2.17	per sample	9945	9945	12	119340
b	Total Sulphur	4.2.14	per sample	1900	1900	12	22800
c	Distribution of Sulpher	4.2.15	per sample	3695	3695	12	44340
d	Phosphorus	4.2.21	per sample	2480	2480	12	29760
e	HGI including sample preparation	4.2.18	per sample	3805	3805	12	45660
f	AFT (Ash Fusion Temperature)	4.2.20	per sample	2745	2745	12	32940
g	Ash analysis	4.2.25	per sample	325	13644	12	163728
4	**Petrographic analysis**						
a	Pellet preparation	4.3.14a	per sample	1160	1160	12	13920
b	Maceral Analysis (with photomicrography)	4.3.14e	per sample	25000	25000	12	300000
c	Microlithotype Analysis (with photomicrography)	4.3.14g	per sample	25000	25000	12	300000
d	Mean Ro%	4.3.14j	per sample	16345	16345	12	196140
	Laboratory Studies Total						**2745128**
	IV. Miscellaneous Charges						
a	Preparation of Exploration Proposal	5.1	lump sum	380000	380000		375347
b	Geological Report preparation (3% of work value or 7.5 Lakh Max)	5.2					750000
c	Borehole pillaring	2.2.7	Per bh	2000	2000	5	10000
d	Land crop compensation	5.6	Per bh	20000	20000	5	100000
e	DGPS Survey of bundary, borehole points (5 boreholes & 10 boundary point)	1.6.2	per point	19200	19200	15	288000
f	Peer review			10000	10000		10000
	Miscellaneous Charges Total						**1533347**
	Total (I- Field op +II Field Study +III Lab+ IV Misc)						22223475
	GST (@18%)						4000226
	Grand Total						26223701

Note- 1) Above rate of drilling, GPL, Chemical are budgeted rates.

2) There are numerous items in chemical anlysis.The CIMFR rates will be applied for actual payment.

3) The Drilling rate for coal is Rs 6775/- is as per approved rate of Promotional exploration MoC.

4)For Geophysical Survey the approved rates of MoC for FY 2020-21 has been taken other rates are as per approved SoC rates.

5) GPL rates is Rs 470/- per meter of minimum 6 parameters, the break up is as follow

	Probe	SoC item No	Rate 2020-21 (in Rs)
1	Base Log	3.11a	162
2	Dual Density	3.11d	110
3	Natural Gamma	3.11h	96
4	Caliper	3.11g	20
5	SPR	3.11i	41
6	Resistivity	3.11c	41
	Total		**470**

6) Rs 10000/- for Peer review is budgeted rate.

Time Schedule/Action Plan for North of Brahmni Block, Talcher Coalfield														
S. No	**Activities**													**Remarks**
		Months	1	2	3	4	5	6	7	8	9	10	11	12	
1	Mobilising	Months	↔												1 months
2	Drilling (Nos of rigs-1 rigs)	Months		<---------->											2200 in 5 Bh
3	Borehole Geophysical logging	Days		<---------->											2200 in 5 Bh
4	Survey Party days (1 Party)	Days		<---------->											30 Days
5	Geologist Party days, Field (1 Party)	Days		<---------->											120 Days
6	Geophysict Party days, Field (1 Party)	Days		<---------->											7 Days
7	Laboratory Studies (Band By Band)	Nos.				<---------->									900 sample
8	Laboratory Studies (Overall)	Nos.						<--------->							100 sample
9	Laboratory Studies (Special) & (Petrography)	Nos.								↔					12 Sample
10	Geologist Party days, HQ (1 Party)	Days								<---------->					30 Days
11	Geophysict Party days, HQ (1 Party)	Days								<---------->					10 Days
12	Report Writing & Peer Review	Months								<---------->					4 Months

Note: Please add activities accordingly and timelime (months)

Total Time Period of Completion of Project- *12 months from Sanction of Project*