2.4 Coal Beds in Ngao Basin

The coal seam in the Ngao coal basin contains many shale partings and varies its thickness quickly. Coal is classified as "lignite" and consists mainly of dull coal. There are rarely massive dull beds without any shale partings in the coal bed, however coal beds usually include thin layers of coaly-shale or shale. The Ngao coal was formed at peat swamps in an intermontane basin as other coal basins in Thailand. Type of peat swamp in Ngao is interpreted as "planar peat" mentioned by Cecil et al in 1985. Characteristics of peat types are shown in Table 2-4. It is presumed that frequent rising of water level had caused inflow of mud into a swamp and interruption of peat deposition.

The following two reasons make correlation of coal seam difficult throughout the area. One reason is that previous core logging works have been carried out on the base of different standards on coal and carbonaceous shale. Another is that a marker or key bed has not been identified yet. However, it becomes clear that boreholes in a same block divided by faults have a similar pattern of coal and partings.

Top part of the coal seams, which is relatively correlatable, is designated as "Zone I" according to the DMR's report. Lower part of the coal seams, designated "Zone II", has not been interpreted enough, because only a small number of boreholes penetrated the lower part. Judging from the available borehole data, coal seams in Zone II are present more sparsely than those in Zone I so that the potential for open cut mining seems to be low.

The exploration area is divided into ten (10) blocks by faults based on the interpretation of the data of previous boreholes, seismic survey and new boreholes. The characteristics of each block are shown in Table 2-5. Correlation chart are

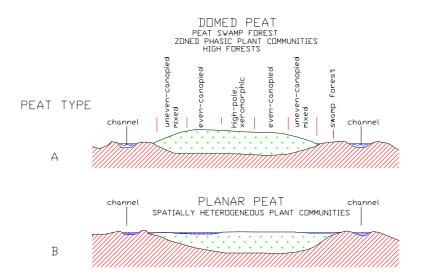
shown in Figure 2-8, Structure contour map of the top of Zone I in Figure 2-9, and Cross section in Figure 2-10.

Average dip of each block is not more than 18 degrees. Because difference between apparent thickness and true thickness is small at this angle, apparent thickness is used for calculation of coal resources. (for example: True thickness(2.85m) = apparent thickness(3m) x Cos 18° (0.95))

Characteristic(ピートスワンプの型)	Type A (Domed Type)	Type B (Planar Type)
climate	ever-wet tropical	seasonal tropical
water source	ombrogenous	topogenous
nutrient content	oligotrophic	mesotrophic to eutropical
surface morphology	domed	planar
pH	< 4	4 to 7
Eh	?	?
floral communities	low diversity	high diversity
	zoned;xeromorphic	random;luxuriant
microbial activity	low (cellulose preserved)	low (cellulose degraded)
mechanism of degradation	primarily chemical	primarily microbial
ash content	low, uniform	high, variable
sulfur content	low, uniform	low, variable
nitrogen content	low, uniform	low, variable
cation exchange capacity	high	low
specific conductivity	low	high
base saturation	low	high
[Ca ²⁺]	low	high
fiber content	fibric	hemic to sapric
biogenic sulfide	low	high
biogenic methane	low	high

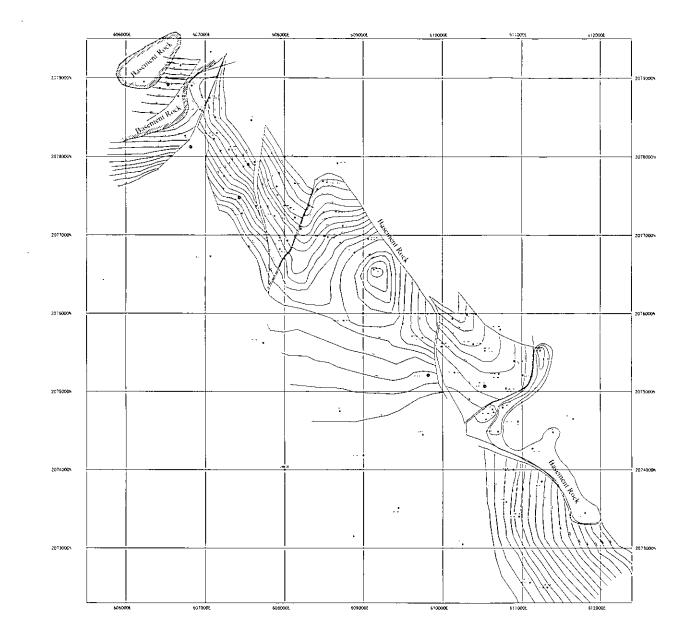
Table 2-4 Characteristics of Generalized Types of Peat-forming Environments

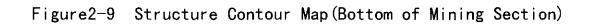
Cecil,C.B., Santon,R.W., Neuzil,S.G., Dulong,F.T., Ruppert,L.F. and Pierce,B.C., 1985. Paleoclimate controls on the Paleozoic sedimentation and peat formation in the central Appalachian basin(USA). Inter. J. of Coal Geology, 5: 195-230.



Generalized cross-sections of domed and planar peat deposits

	Table 2	-5 Characteristic of Blocks
Block		Characteristic
	Drill holes	2
	Zone I	Shale partings interbeded at the middle, become as thick as 5m.
Α	Zone II	No drill hole has penetrated the zone.
	Dip	15°
	Remarks	
	Drill holes	4
	Zone I	Relatively thick, while there are partings at the middle area.
В	Zone II	becoming toward the south-west. Thickness at NG13/31 is more than zone I
	Dip	5°~13°
	Remarks	
	Drill holes	1
	Zone I	Indistinct due to only one drill hole
С	Zone II	Indistinct due to only one drill hole
-	Dip	8°~12°
	Remarks	Contacting the west and the east with faults,whose throw is 200m
	Drill holes	7
	Zone I	Well-developed, however there are many partings.
ם	Zone II	No drill hole has penetrated the zone.
	Dip	8° ∼18°
	Remarks	
	Drill holes	7
	Zone I	Thick at the middle and thinning toward the north and the south.
E	Zone II	thick at the middle area.
	Dip	10° ~14°
	Remarks	
	Drill holes	12
	Zone I	Becoming thick only at the middle area.
F	Zone II	Becoming thick at the middle and the south areas, while there are few drill holes.
•	Dip	$4^{\circ} \sim 13^{\circ}$
	Remarks	Coal zones become deeper toward the center of the block.
	Drill holes	10
	Drill Holes	well-developed throughout the block. 5m-thick parting is observed at the middle
	Zone I	part of the zone in the north area
G	Zone II	well-developed at the middle and south areas.
G		$3^{\circ} \sim 8^{\circ}$
	Dip Domorko	
	Remarks	Basement rock tends to be shallower than periphery.
	Drill holes Zone I	Very thick coal more than 30m is observed.
н	Zone I Zone II	
п		Inferior coal
	Dip Domoulus	Ggentle dipping
	Remarks	This block is limited with the high basement rock (monadonock).
	Drill holes	
	Zone I	same as Block H
I	Zone II	One drill hole shows the good coal zone.
	Dip	Ggentle dipping
	Remarks	The coal is correlated with zone II's coal, however the block is isolated with the
<u> </u>		high basement (monadonock) and a fault.
	Drill holes	4
.	Zone I	same as Blocks H and I at the north area.
J	Zone II	This zone is observed at the north area, while no data at the south area.
	Dip	8°~14°
1	Remarks	Exploration work for this block is not enough.





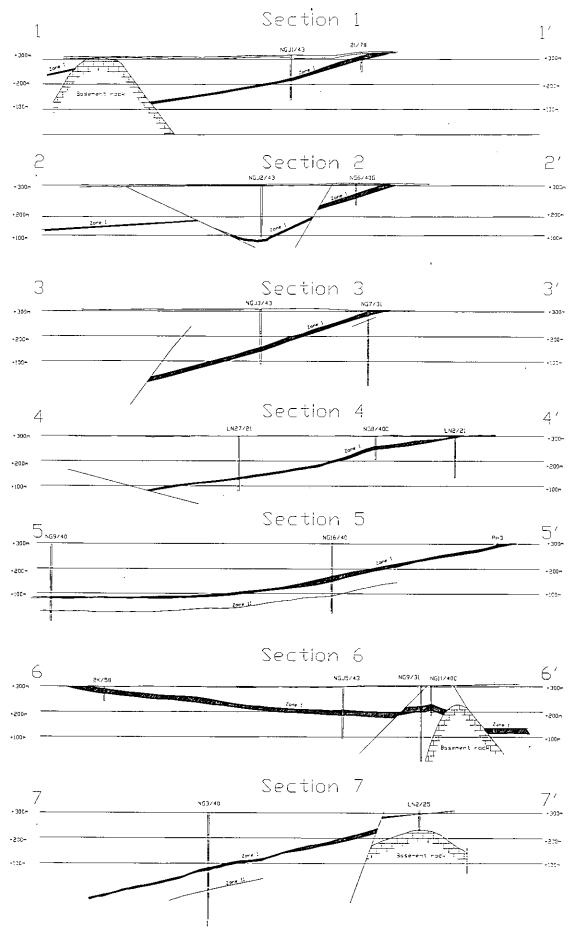


Fig2-10 Cross section

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2.5 Coal Resources and Reserves

Estimation of coal resources depends on a category of the resources. Table 2-6 shows a classification system made by United Nation, "United Nation International Framework Classification for Reserves and Resources on Solid Fuels and Mineral commodities". DMR follows basically the classification.

	Solid Fuels and N	lineral Commoditie	s	
UN International	Detailed	General	Prospecting	Reconnaissance
Framework	Exploration	Exploration		
Feasibility Study	Proved Mineral			
and/or Mining	Reserve(111)	Usually		
Report	Feasibility Mineral			
	Reserve(211)		Not	
Pre-feasibility	Probable Mineral F	Reserve		
Study	(121)	(122)		Relevant
	Pre-feasibility Min	eral Resource		
	(221)	(222)		
Geological	Measured Mineral	Indicated Mineral	Inferred Mineral	Reconnaissance
Study	Resource (331)	Resource (332)	Resource (333)	Resource (334)

Table 2-6 UN International Framework Classification for Reserves/Resources

"Coal Resources", estimated at the present exploration, is classified as "Measured Mineral Resources (331)" and "Indicated Mineral Resources (332)". "Coal Reserves for Mining" comes under "Pre-feasibility Mineral Resources (221) (222)".

2.5.1 Coal Resources

This quantity shows the magnitude of coal potential in the exploration area. The estimation was made basically in accordance with the DMR's standard. The following are the criteria adopted for coal resources estimation in the present study.

- Mining coal thickness: ≥ 20 cm
- Specific gravity: 1.50 (estimated from results of Float Sink Test)

Table 2-7	
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Coal Resources

S.G.= 1.50

					5.G.=	1.50
	Total coal	Meas	ured	Indica	ated	Demonstrated
	thickness	Area(1,000m2)	(1,000t)	Total (1,000m2)	(1,000t)	(1,000t)
NG11/40	11.46	125.6	2,159.1	315.4	5,421.7	7,580.8
NG10/31	10.85	125.6	2,044.1	315.4	5,133.1	7,177.2
NGJ1/43	2.69	125.6	506.8	303.9	1,226.2	1,733.0
NG1/31	7.60	90.8	1,035.1	156.9	1,788.7	2,823.8
NG5/40G	13.24	83.0	1,648.4	31.4	623.6	2,272.0
LN28/21	6.68	71.7	718.4	56.7	568.2	1,286.6
NG13/31	41.17	124.5	7,688.5	213.0	13,153.8	20,842.3
NG6/40G	3.05	86.6	396.2	29.2	133.6	529.8
NG7/40G	13.99	98.5	2,067.0	102.6	2,153.1	4,220.1
LN26/21	11.11	64.8	1,079.9	25.7	428.3	1,508.2
NG7/31	12.31	75.4	1,392.3	90.4	1,669.2	3,061.5
LN11/21	0.93	99.3	138.5	46.4	64.7	203.2
LN2/21	0.30	90.3	40.6	81.6	36.7	77.3
NGJ3/43	18.07	125.6	3,404.4	200.2	5,426.4	8,830.8
NG2/31	14.31	98.3	2,110.0	70.4	1,511.1	3,621.1
NG8/40C	4.58	64.4	442.4	2.6	17.9	460.3
LN1/21	6.00	114.9	1,034.1	194.7	1,752.3	2,786.4
LN3/21	15.09	81.0	1,833.4	38.6	873.7	2,707.1
LN27/21	2.11	125.6	397.5	241.6	764.7	1,162.2
NG16/40	12.97	125.7	2,445.5	216.7	4,215.9	6,661.4
NG10/40	9.95	125.5	1,873.1	219.6	3,277.5	5,150.6
NG8/31	5.20	125.5	978.9	267.2	2,084.2	3,063.1
NG8/40	0.24	125.6	45.2	376.8	135.6	180.8
NG9/40	0.80	125.6	150.7	371.5	445.8	596.5
NGG4/40	8.55	112.4	1,441.5	235.8	3,024.1	4,465.6
NG5/31	4.05	122.7	745.4	239.9	1,457.4	2,202.8
NG4/40C	8.35	109.7	1,374.0	52.6	658.8	2,032.8
NG3/40C	3.48	93.4	487.5	21.0	109.6	597.1
NGG1/40	8.45	92.1	1,167.4	58.0	735.2	1,902.6
NG3/31	9.12	122.9	1,681.3	140.4	1,920.7	3,602.0
NGJ5/43	7.46	93.0	1,040.7	40.4	452.1	1,492.8
NG13/40	1.72	107.9	278.4	172.6	445.3	723.7
NG1/40G	3.72	69.0	385.0	0.9	5.0	390.0
NGG2/40	2.05	88.6	272.4	57.4	176.5	448.9
NG9/31	39.37	56.9	3,360.2	42.6	2,515.7	5,875.9
NG11/40C	25.67	64.6	2,487.4	87.2	3,357.6	5,845.0
NGG3/40	19.68	120.5	3,557.2	195.6	5,774.1	9,331.3
NG5/40	19.92	125.6	3,752.9	307.4	9,185.1	12,938.0
NG3/40	3.23	125.6	608.5	337.7	1,636.2	2,244.7
NG11/31	12.31	106.2	1,961.0	232.2	4,287.6	6,248.6
NG12/40	6.17	106.2	982.9	232.2	2,149.0	3,131.9
Total		4,216.7	61,213.8	6,422.4	90,796.0	152,009.8

- Area: divided by Polygon method
- Area by geologic assurance

Measured area: Radius≤ 200m from observation point Indicated area: Between the radius of 200m and 400m Demonstrated area = Measured area + Indicated area

Coal Resources = Area x accumulated coal thickness of each borehole \times Specific gravity (1.50)

Figure 2-11 shows the conception of the coal resources calculation. The calculation result is summarized in Table 2-7. Figure 2-12 shows the influence area of individual boreholes. This coal resource was not divided by depth. The quantity by elevations is considered in the coal reserves for mining.

Table 2-8 shows the comparison of the coal resources in this study and those in previous reports. It indicates that increase in exploration works made coal potential area and tonnage of coal resources large

	Demon	strated	Meas	sured	Indic	cated
	Area	Tonnage	Area	Tonnage	Area	Tonnage
DMR(1988)	5,28	99,096	2,627	48,399	2,611	50,697
DMR(1998)#			3,044	124,571		
This Report	10,639	136,809	4,217	55,092	6,422	81,717

Table 2-8Comparison of Coal Resources in Ngao Coal Basin

DMR(1988): The Master Plan for Coal Resources Management of Thailand, DMR DMR(1998): DMR report 98/2540

The tonnage of DMR(1998) was calculated with the thickness including carbonaceous shale and interburden.

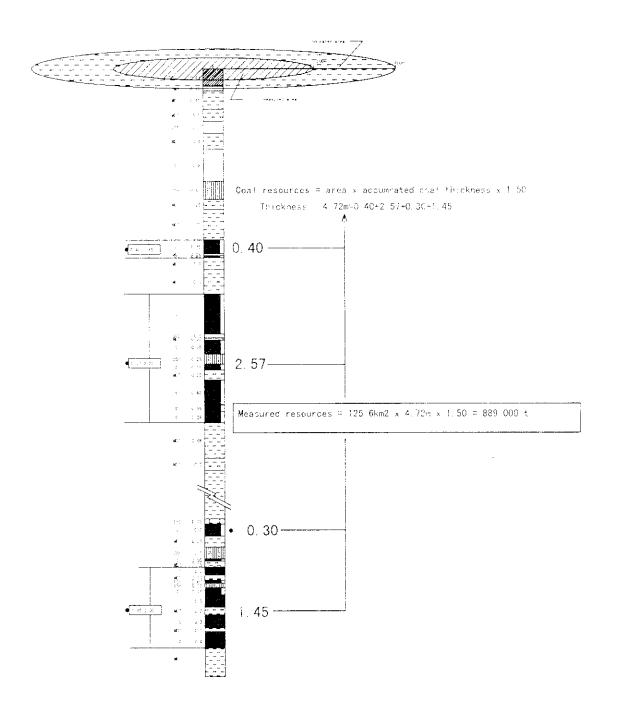


Figure2-11 General Idea of Coal Resources Calculation

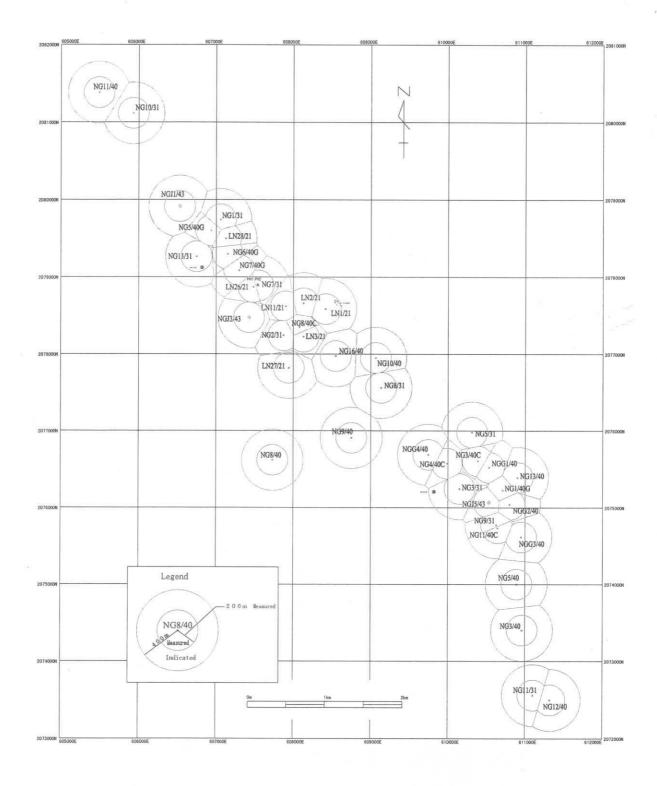


Figure2-12 Calculation Map of Coal Resources

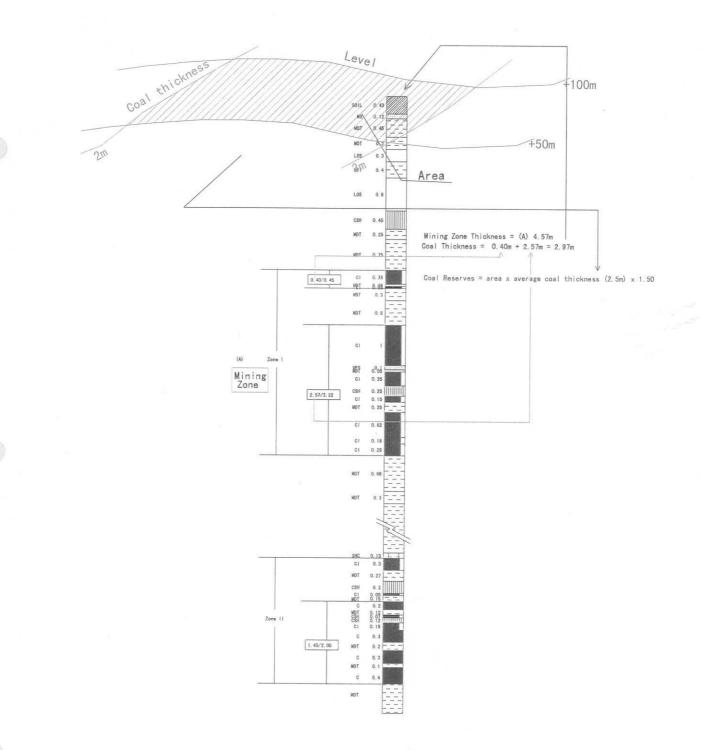
2.5.2 Coal Reserves for Mining

Coal Reserves for Mining were estimated with a geologic structure contour map of the bottom of mining sections and an isopach map of accumulated coal thickness of the individual coal sections. Figure 2-13 shows the conception of the coal reserves calculation. Table 2-9 summarizes depth, thickness of mining section and accumulated coal thickness in the mining section at individual boreholes. Figure 2-9 shows a structure contour map of the bottom of mining sections (Zone I). Figure 2-14 shows isothickness map of mining section and Figure 2-15 shows isothickness map of accumulated coal thickness in the mining section.

The following are the criteria adopted for coal reserves estimation.

- Reserves for open pit mining are calculated down to the depth of 250m from the surface. The surface elevation in the potential area is 300m above sea level, so that the depth 250m means 50m above sea level
- Coal seam in Zone I, having 30cm or more in thickness, are the target part for mining.
- Specific gravity: 1.50 (estimated from results of Float Sink Test)
- Coal thickness: the average thickness between the two neighboring isopach lines.(for example: average coal thickness is 3m in a area between 2m and 4m lines)
- Area: each area was divided with the line of 50m-vertical-interval and isopach lines at 2m-interval of accumulated coal thickness in the mining section.

Coal Reserves = Area \times Coal thickness \times Specific gravity (1.50)

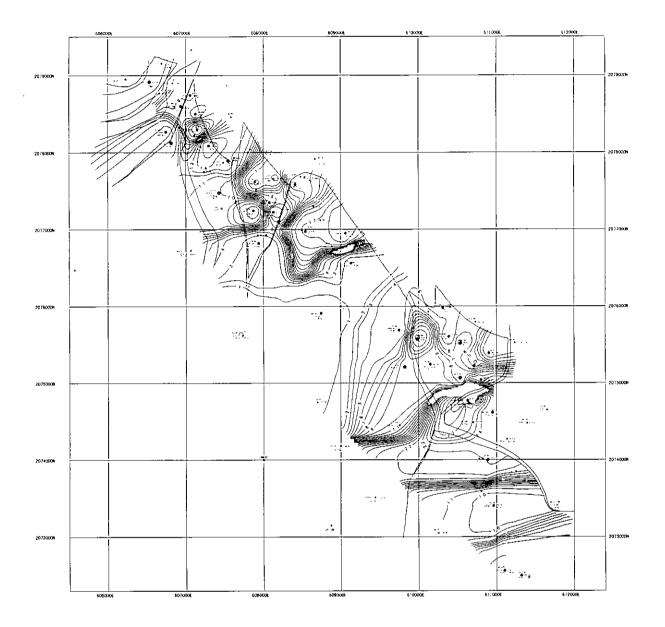




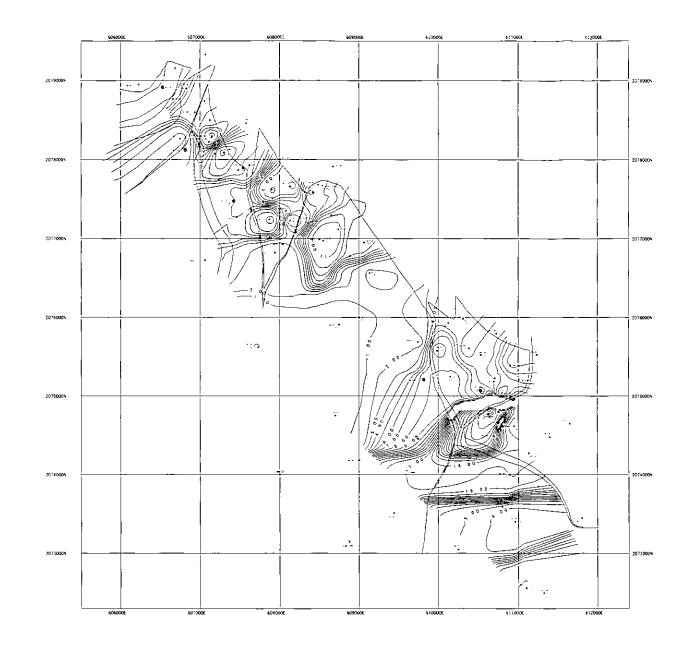
	AL	F			Zone I				Zone [[
	Northing	Easting	Elevation	Overburden I	稚行丈 (m)	炭 丈 累計 (m)	Zone I 下盤 標高	稼行丈 (m)	炭丈累計 (m)	Zone II 下動 標高
NG11/40	2080384.7	605490.8	317.40	109.90	_					
NG10/31	2080118.2	605933.4	313.42	8.40						
NGJ1/43	2078914.9	606531.3	316.50	91.85	2.80	2.22	214.50			
NG5/40G	2078601.0	606934.1	316.60	6.18	9.10	7.49	291.60		·	
NG13/31	2078265.8	606746.6	312.08	9.30	15.75	13.57	274.08			
NG1/31	2078743.6	607057.2	305.58	23.80	8.90	7.60	266.40			
LN28/21	2078500.0	607125.0	301.47	3.96	10.64	6.68	281.40			
NG6/40G	2078297.5	607148.2	307.40	39.85	3.25	3.05	250.90			
NG7/40G	2078086.5	607295.9	303.20	8.00	15.53	13.99	252.20			
LN26/27	2077870.0	607480.0	不明	3.58	14.75	8.69				
NG7/31Ne	2077889.4	607545.3	304.50	4.45	13.30	11.05	282.00	1.99	1.26	261.3
NGJ3/43	2077475.5	607425.0	306.30	149.75	10.84	7.10	138.75	10.95	8.89	118.70
LN11/21	2077620.0	607900.0	301.33	52.78	thin					
LN2/21	2077660.0	608130.0	303.27	3.83	thin					· _
NG2/31	2077243.9	607871.5	298.19	114.90	14.63	11.11	164.26	4.90	3.20	145.09
NG8/40C	2077349.8	608076.7	300.80	41.00	5.48	4.20	247.54	thin		
LN3/21	2077225.0	608130.0	298.80	36.97	2.17	1.26	230.21			
LN27/21	2076820.0	607940.0	298.51	164.10	2.11	2.11	127.10			
LN1/21	2077585.0	608415.0	300.90	2.64	9.50	6.00	281.81			<u> </u>
NG16/40	2076973.8	608546.5	302.50	131.55	17.22	11.87	149.50	1.10	1.10	88.65
NG10/40	2076951.0	609063.6	303.90	179.75	18.75	8.45	98.88	0.90	0.90	48.60
NG8/31	2076561.6	609133.1	300.39	289.50	1.40	0.90	9.49	4.30	4.30	-45.11
NG8/40	2075621.0	607730.6	291.10	271.71	thin					
NG9/40	2075909.2	608749.5	294.70	211.50	0.80	0.80	82.40			
NGG4/40	2075688.9	609746.1	297.20	156.30	4.10	1.80	136.80	6.05	3.50	71.60
NG5/31	2075979.6	610310.2	304.55	24.80	4.60	4.05	276.05			
NG4/40C	2075576.1	609984.9	300.30	91.70	14.02	8.35	192.50			
NG3/40C	2075607.2	610384.9	311.70	57.36	4.27	3.48	242.40			
NGG1/40	2075522.6	610531.7	312.60	74.30	7.10	4.90	229.25	4.05	3.55	174.25
NG3/31	2075245.1	610148.6	296.42	106.63	9.32	8.15	177.47	1.80	1.30	125.37
IGJ5/43	2075068.2	610528.8	299.30	93.20	7.30	4.99	188.05	2.90	2.47	130.20
IG13/40	2075389.7	610899.8	306.50	99.25	0.35	0.00	206,90	2.25	1.52	158.60
IG1/40G	2075226.1	610707.8	304.40	74.50	4.68	3.72	219.00			
IGG2/40	2075039.6	610796.8	303.60	96.80	10.60	1,60	196.20	0.70	0.45	121.60
IG9/31	2074772.7	610624.9	304.79	56,90	42.00	35.62	201.29			
IG11/40C	2074734.9	610640.8	305.70	50.00	25.67	31.45	206.70			
IGG3/40	2074615.5	610946.9	300.10	156.60	23.35	17.58	112.95	2.60	2.10	34.60
IG5/40	2074001.3	610888.6	298.80	236.53	23.15	16.93	35.25	2.67	2.52	-32.92
IG3/40	2073402.2	610959.5	301.30	215.20	9.35	3.23	74.20			
IG11/31	2072559.4	611101.0	305.21	272.35	19.30	12.10	10.56			
G12/40	2072497.3	611319.5	310.00	247.14	7.69	6.17	46.72			

Table 2-9 Factors for Coal Reserves for Mining

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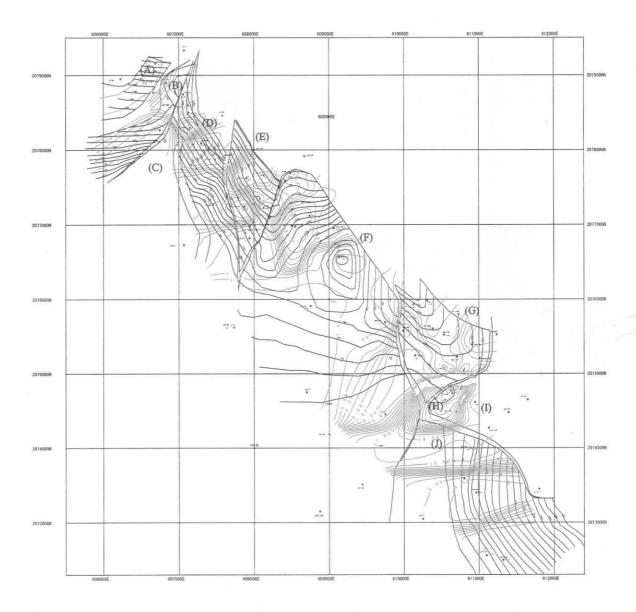
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Reserves calculation map is shown in Figure 2-16. Summary of the reserves and the details of each block are shown in Table 2-10 and Table 2-11 respectively.

	Area	Average coal	S.G	Tonnage
$\sim + 250$	1,499.3	6.2	1.50	13,992
+250m~ $+200m$	1,326.2	6.8	1.50	13,400
+200m~ $+150m$	1,910.7	7.2	1.50	23,156
$+150m\sim+100m$	1,554.7	7.1	1.50	13,904
$+100m\sim+50m$	2,627.9	3.3	1.50	13,013
Total	8,918.8	5.8	1.50	77,465

Table 2-10 Coal Reserves for Mining





(1000m2) (m) (1000h) A 250m - 200m 81.7 2.8 1.50 346.1 200m - 150m 197.3 2.3 1.50 220.6 200m - 150m 197.3 2.3 1.50 220.6 250m - 200m 149.1 11.0 1.50 2.461.8 250m - 200m 149.1 11.0 1.50 2.461.8 200m - 150m 88.5 1.2.6 1.50 1.667.9 100m -50m 0.0 0.0 0.0 0.0 0.0 Sub-total 653.7 10.4 1.50 1.667.9 250m - 200m 191.8 9.0 1.50 1.911.0 150m - 100m 140.8 9.0 1.50 1.911.0 150m - 100m 140.8 9.0 1.50 1.911.0 150m - 100m 129.4 5.7 1.50 1.911.0 150m - 100m 129.4 5.7 1.50 1.475.4 200m - 150m 198.7 6.1 1.50 1.47			Area	Thickness	SG	Reserves
A 250m - 200m 56.5 2.6 1.50 220.1 200m - 150m 197.3 2.3 1.50 692.6 Sub-total 335.5 2.5 1.50 1.258.8 250m - 200m 149.1 11.0 1.50 2.450.4 250m - 200m 149.1 11.0 1.50 2.464.9 250m - 200m 130.1 1.50 1.50 1.647.9 100m - 50m 0.0 0.0 0.0 0.0 250m - 200m 131.6 8.6 1.50 4.030.7 250m - 200m 191.8 9.0 1.50 2.597.8 200m - 150m 140.8 9.0 1.50 1.911.0 150m - 100m 166.9 7.3 1.50 1.819.5 100m -50m 446.1 4.0 1.50 1.2751.7 200m -150m 198.7 6.1 1.50 1.819.5 150m -100m 129.4 5.7 1.50 1.099.9 100m -50m 20.9 3.0 1.5			(1000m2)	(m)		(1000t)
A 200m - 150m 197.3 2.3 1.50 692.6 Sub-total 335.5 2.5 1.50 1.258.8 -250m 336.2 8.9 1.50 4.508.4 200m - 150m 88.5 12.6 1.50 1.667.9 150m - 100m 79.9 13.0 1.50 1.637.9 100m -50m 0.0 0.0 0.0 0.0 200m - 150m 140.8 9.0 1.50 2.997.8 200m - 150m 140.8 9.0 1.50 1.911.0 100m -50m 2.92.7 3.8 1.50 1.911.7 250m - 150m 140.8 9.0 1.50 1.911.7 200m - 150m 120.2 3.8 1.50 1.747.4 250m - 200m 120.2 3.8 1.50<		-250m	81.7	2.8	1.50	346.1
2001h 130th 177.3 2.3 1.30 6428.8 3ub-total 335.5 2.5 1.50 1.288.8 250m - 200m 149.1 11.0 1.50 2.450.4 200m - 150m 88.5 12.6 1.50 1.667.9 100m - 100m 79.9 13.0 1.50 1.647.9 100m - 50m 0.0 0.0 0.0 0.0 Sub-total 653.7 10.4 1.50 10.194.2 250m - 200m 191.8 9.0 1.50 1.914.2 250m - 200m 191.8 9.0 1.50 1.911.0 150m - 100m 166.9 7.3 1.50 1.818.5 100m -50m 486.9 3.3 1.50 1.2751.7 250m - 200m 120.2 3.8 1.50 1.418.5 100m -50m 198.7 6.1 1.50 1.819.5 100m -100m 120.2 3.8 1.50 1.442.2 200m -150m 20.9 3.0 1.50 <t< td=""><td>^</td><td>250m - 200m</td><td>56.5</td><td>2.6</td><td>1.50</td><td>220.1</td></t<>	^	250m - 200m	56.5	2.6	1.50	220.1
B -250m 336.2 8.9 1.50 4.506.4 200m 150m 149.1 11.0 1.50 2.461.8 200m 150m 79.9 13.0 1.50 1.667.9 100m 500 0.0 0.0 0.0 0.0 Sub-total 653.7 10.4 1.50 4.030.7 250m 311.6 8.6 1.50 4.030.7 250m 110.8 9.0 1.50 1.911.8 200m 191.8 9.0 1.50 1.911.9 250m 246.1 4.0 1.50 1.2751.7 3ub-total 1.298.0 6.5 1.50 12751.7 250m 246.1 4.0 1.50 1.475.4 250m 200m 129.2 3.8 1.50 6.77 100m<50m	~	200m - 150m	197.3	2.3	1.50	692.6
B B 250m - 200m 250m - 150m 250m 150m - 100m 250m 2		Sub-total	335.5	2.5	1.50	1,258.8
B 200m - 150m 88.5 12.6 1.50 1,667.9 150m - 100m 79.9 13.0 1.50 1,538.1 100m - 50m 0.0 0.0 0.0 3ub-total 653.7 10.4 1.50 10,194.2 -250m 311.6 8.6 1.50 4,030.7 250m - 200m 191.8 9.0 1.50 2,597.8 200m - 150m 140.8 9.0 1.50 1,217.1 150m - 100m 166.9 7.3 1.50 1,2781.7 -250m 246.1 4.0 1.50 1,475.4 250m - 200m 120.2 3.8 1.50 1,712.7 -250m 246.1 4.0 1.50 1,475.4 250m - 200m 120.2 3.8 1.50 1,475.4 250m 200m 120.2 3.8 1.50 1,489.5 100m -50m 20.9 3.0 1.50 1,422 250m 200m 162 5.9 1.50 <td></td> <td>-250m</td> <td>336.2</td> <td>8.9</td> <td>1.50</td> <td>4,506.4</td>		-250m	336.2	8.9	1.50	4,506.4
D 150m - 100m 79.9 13.0 1.50 1.558.1 100m -50m 0.0 0.0 0.0 0.0 Sub-total 653.7 10.4 1.50 10.194.2 250m 311.6 8.6 1.50 4.030.7 250m 100m 166.9 7.3 1.50 1.911.0 150m - 100m 166.9 7.3 1.50 1.291.7 30b-total 1.298.0 6.5 1.50 1.2751.7 30b-total 1.298.0 6.5 1.50 1.475.4 250m - 200m 120.2 3.8 1.50 677.1 200m - 150m 198.7 6.1 1.50 1.481.5 100m -50m 20.9 3.0 1.50 9.99.1 100m -50m 20.9 3.0 1.50 1.499.9 250m - 100m 1715.3 4.8 1.50 1.442.9 250m - 200m 1712 2.3 1.50 5.288.1 100m -50m 1.712 2.3		250m - 200m	149.1	11.0	1.50	2,461.8
Isouri - Ioum 7.9 13.0 1.30 1,388 100m - Som 0.0 0.0 Sub-total 653.7 10.4 1.50 10,194.2 -250m 311.6 8.6 1.50 4,030.7 250m - 200m 191.8 9.0 1.50 2,599.8 200m - 150m 140.8 9.0 1.50 1,911.0 150m - 100m 166.9 7.3 1.50 1,818.5 100m - 50m 486.9 3.3 1.50 2,391.7 Sub-total 1,298.0 6.5 1.50 12,751.7 -250m 246.1 4.0 1.50 1,475.4 -250m 246.1 4.0 1.50 1,475.4 -200m - 150m 198.7 6.1 1.50 1,475.4 -200m - 150m 162 5.9 1.50 1,442.9 250m - 200m 1712 2.3 1.50 1,442.9 250m - 200m 1.61 4.8 1.50 1,442.9 250m - 20	R	200m - 150m	88.5	12.6	1.50	1,667.9
Sub-total 653.7 10.4 1.50 10.194.2 -250m 311.6 8.6 1.50 4.030. 250m-150m 191.8 9.0 1.50 2.599.8 200m-150m 140.8 9.0 1.50 1.911.0 150m-100m 166.9 7.3 1.50 1.2391.7 Sub-total 1.298.0 6.5 1.50 1.2751.7 Sub-total 1.298.0 6.5 1.50 1.2751.7 -250m 246.1 4.0 1.50 1.475.4 200m-150m 198.7 6.1 1.50 1.081.5 150m-100m 129.4 5.7 1.50 1.099.9 100m-50m 20.9 3.0 1.50 94.1 Sub-total 715.3 4.8 1.50 5.166.0 -250m 162 5.9 1.50 1.442.0 200m-150m 341 6.6 1.50 5.298.1 100m-50m 1.712 2.3 1.50 5.208.1	D	150m - 100m	79.9	13.0	1.50	1,558.1
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-250m 246.1 4.0 1.50 1.475.4 250m - 200m 120.2 3.8 1.50 677.1 200m - 150m 198.7 6.1 1.50 1.819.5 150m - 100m 129.4 5.7 1.50 1.099.9 100m -50m 20.9 3.0 1.50 94.1 Sub-total 715.3 4.8 1.50 5.166.0 -250m 162 5.9 1.50 1.442.2 250m - 200m 177 7.4 1.50 2.004.1 200m - 150m 341 6.6 1.50 3.395.0 150m - 100m 710 4.9 1.50 5.796.4 Sub-total 3.104 3.8 1.50 1.149.0 250m - 200m 400 4.3 1.50 1.149.0 250m - 200m 400 4.3 1.50 1.149.0 250m - 200m 602 7.8 1.50 7.030.6 150m - 100m 0 0 0.0 0.0		100m -50m				
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250m - 200m 1,322.8 6.8 1.50 13,400.5 200m - 150m 1,986.2 7.8 1.50 23,156.3 150m - 100m 1,479.2 6.3 1.50 13,903.7 100m - 50m 2,627.9 3.3 1.50 13,012.9						
200m - 150m 1,986.2 7.8 1.50 23,156.3 150m - 100m 1,479.2 6.3 1.50 13,903.7 100m - 50m 2,627.9 3.3 1.50 13,012.9		-250m	1,499.3	6.2	1.50	13,991.9
Iotal 150m - 100m 1,479.2 6.3 1.50 13,903.7 100m - 50m 2,627.9 3.3 1.50 13,012.9		250m - 200m	1,322.8	6.8	1.50	13,400.5
150m - 100m 1,479.2 6.3 1.50 13,903.7 100m -50m 2,627.9 3.3 1.50 13,012.9	Total	200m - 150m	1,986.2	7.8	1.50	23,156.3
	TOTAL	150m - 100m	1,479.2	6.3	1.50	13,903.7
Total 8,915.4 5.8 1.50 77,465.3		100m -50m	2,627.9	3.3	1.50	13,012.9
		Total	8,915.4	5.8	1.50	77,465.3

Table 2-11 Datails of Coal Resources for Mining

AT: Calculation was not carried out on Block C and I due to out of mine planning.

3. Coal Quality

3.1 Tests on Bulk Sample

3.1.1 Crushing and Screening

Coal with bigger size than 100 mm in the bulk sample was crushed into smaller pieces by the use of Jaw Crusher. After weighing the whole sample, it was screened with the size of 50 mm, 25 mm, 10 mm, 3 mm and 0.5 mm.

The channel sample taken from the face of the trench was crushed to less than 25 mm.

The procedure of crushing, screening and float-sink test on the bulk sample and the laboratories are shown diagrammatically in Figure 3-1. Test results are in Appendix 5 and those works are seen in Ph-7, 8.

3.1.2 Float-Sink Test

Float-sink test was conducted on the channel sample at the specific gravity of 1.3, 1.35, 1.40, 1.45, 1.50, 1.55, 1.60, 1.70 and 1.80. Coal with bigger size than 100mm in the bulk sample was crushed into smaller pieces

Regarding the bulk sample, about 20 kg of samples were taken from each screened product of +50 mm, 25-50 mm, 10-25 mm, 3-10 mm and 5 kg from 0.5-3 mm after reduction with dividing apparatus. Those samples are provided for float-sink test in Thailand. The screened sample smaller than 0.5 mm was brought to Japan because there is no equipment of float-sink test on such fine coal in Thailand.

The following specific gravity was used for separation in float-sink test based on

the result of the preparatory test; 1.30, 1.35, 1.40, 1.50, 1.60, 1.70 and 1.80. The results of float-sink test of each screened sizes are shown in Appendix 5. The works are seen in Ph-9.

3.1.3 Analysis of Coal Quality

Ash and total sulfur was analyzed on each product of float and sink test. The result is shown in Appendix 5. Twenty-nine (29) samples from the product of 25-50mm in size and less than 1.3 in specific gravity were sent to the laboratory at EGAT's Mae Moh mine. They were analyzed on forms of sulfur. The result is shown in Appendix 8.

3.2 Coal Analysis and Tests on Drill Core Samples

Analysis and tests of coal sample from boreholes were conducted at the laboratories of Lanna Lignite Public Company and EGAT depending on the analytical items. The treatments and procedures are shown in a flow chart of Figure 3-2. Coal analysis items in EGAT were decided according to the amount of sample and the necessity as shown in Table 3-1 and Table 3-2.

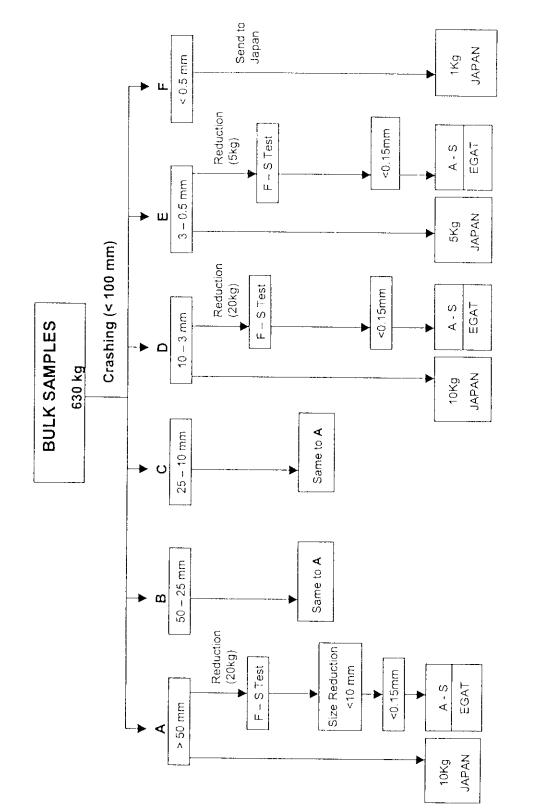


Figure3-1 Flow of Bulk Sample Preparation and Float-sink Test

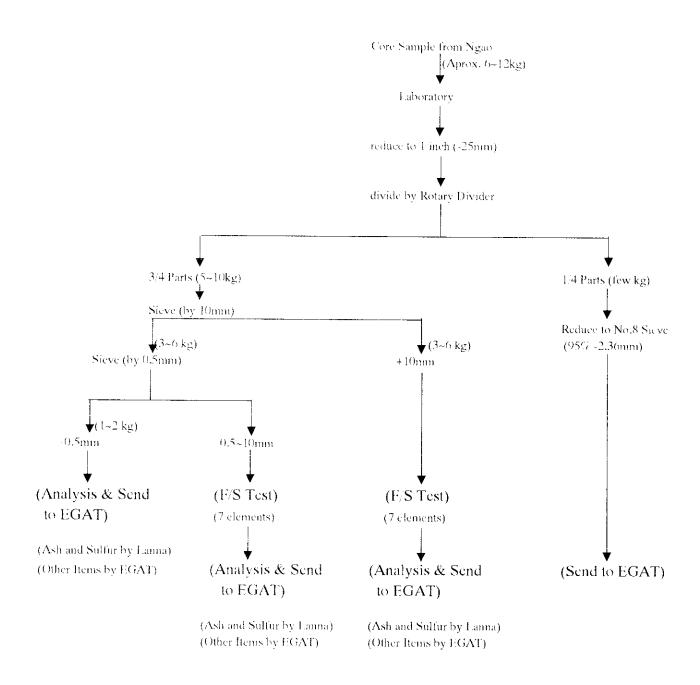


Figure 3-2 Flow of Core sample Preparation

Name of Sample ie: mm~-25mm, 1.30F mm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80F, 1.80S) hmm, 1.30F mm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80S, 1.80S) hmm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80S, 1.80S) hmm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80S, 1.80S) hmm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80F, 1.80S) hmmm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80F, 1.80S) hmmmm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80F, 1.80S) hmmmmm, (1.35F, 1.40F, 1.50F, 1.60F, 1.80F, 1.80S) hmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	Number Item of Analysis of Proximate Cal T.S. Climate H Cl Analysis Sunfo 8mple Analysis Sunfo Proximate Cal T.S. S.G. Ultimate H Cl Analysis Sunfo Bulk Sun 9 6 0 0 0 0 0 0 Sun oli Sun oli 60F.1 80F.1 80S) 6 0 0 0 0 0 0 Sun oli Sun oli 60F.1 80F.1 80S) 6 0 0 0 0 0 0 Sun oli	Table 3-1		COAL QUALITY ANALYSIS (By EGAT	ITY A	NAL (By E	NALYSIS (By EGAT)					NGAO P/J Team Jan.22, 2001
of of Proximate Sample Call T.S. S.G. Dilimate Innu-25nm, 1.30F Form of Analysis Form of Sample mm<-25nm, 1.30F	of manufactor of Sample of Analysis Soft TS SG. Uttimate H GI Ashi Sample Form of Analysis Suffer O Samdut mm, 1.30f mm, 1.30f 1 O O O O O O O Samdut mm, 1.30f tum, 1.30f tum, 1.30f 1 O O O O O O O O Samtut Samtut Samtut Samtut Samtut Samtut Sa	Name	Number		Item	of Ana	lysis					
ic. 29 29 70 0 <td>ic. 29 9 0</td> <td>of Sample</td> <td>of Sample</td> <td>Proximate Analysis</td> <td>Cal</td> <td>T.S.</td> <td>S.G.</td> <td>Ultimate Analysis</td> <td>ΗGΙ</td> <td>Ash Analysis</td> <td>Form of Sulfer</td> <td>Condition of Sample</td>	ic. 29 9 0	of Sample	of Sample	Proximate Analysis	Cal	T.S.	S.G.	Ultimate Analysis	ΗGΙ	Ash Analysis	Form of Sulfer	Condition of Sample
It O	Im. 1.30F Im. 1.30F 0	mple: -50mm~-25mm, 1.30F	29								0	Bulk Sample (Each 25g) Sent to EGAT on 10th Dec.
e: P3S Series hum, 1.307 (10mn, 1.357; 1407; 1.507; 1.607; 1.807) (10mn, (1.357; 1407; 1.507; 1.607; 1.807) (1.307) (1.307) (1.307; 1.407; 1.507; 1.607; 1.807; 1.805) (1.307) (1.307; 1.407; 1.507; 1.607; 1.807; 1.805) (1.307; 1.407; 1.507; 1.607; 1.805; 1.805) (1.307; 1.307; 1.307; 1.307; 1.10; 0.0; 0.0; 0.0; 0.0; 0.0; 0.0; 0.	e: P3S Series min. 1.30F min. 1.30F min. 1.30F form, (1.35F.1.40F.1.80F.1.80S) form, (1.35F.1.40F.1.50F.1.60F.1.80F.1.80S) form, (1.35F.1.40F.1.50F.1.60F.1.80F.1.80S) form, (1.35F.1.40F.1.50F.1.60F.1.80F.1.80S) form, (1.35F.1.40F.1.50F.1.60F.1.80F.1.80S) form, 1.30F form, 1.30F for 1.35F.1.40F.1.80F.1.80S) for 0 form, 1.30F for 1.35F.1.40F.1.80F.1.80S) for 0 form, 1.30F for 1.35F.1.40F.1.50F.1.60F.1.80F.1.80S) for 0 for 0		1	0	0	0	0	0	0	0	0	Standard: Few(2-3) Kg Sent to EGAT
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ic. N3-4 Series 1 0	Imm. 1.30F Imm. 1.30F 0	0.5~10mm, (1.35F,1.40F,1.50F,1.60F,1.80F,1.80S) -0.5mm	6	00	sо			00				
e: N3-4 Series 1 0	e: N3-4 Series 10mm, 1.30F 5-10mm, 1.30F 5-10mm, 1.30F 5-10mm, 1.30F 5-10mm, 1.30F 5-10mm, 1.30F 5-10mm, 1.30F 5-10mm, 1.35F, 1.40F, 1.80F, 1.80S, 1 5-10mm, 1.35F, 1.40F, 1.50F, 1.60F, 1.80S, 1 6 5-10mm, 1.35F, 1.40F, 1.50F, 1.60F, 1.80S, 1 6 6 7-10mm, 1.30F 1 7 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1	tS	1	0	0	0	0	0	0	0	0	Standard: Few(2-3) Kg Sent to EGAT
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ie: N3-6 Series 1 0	c: N3-6 Series 1 0	:: 0.5~10mm, (1.35F,1.40F,1.50F,1.60F,1.80F,1.80S) 40 5mm	9	00	οс			0 0				
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93 64 64 19 19 59 14 9 38	64 19 19 59 14 9 38 S. Sulfur	Coaly Shale Samples	5	0	0	0	0					Standard: Few(2-3) Kg
93 64 64 19 19 59 14 9	64 19 19 59 14 9 S•Sulfin	14, N3-15, N3-16, N3-17, N3-18										Sent to EGAT
		l Number of Samples	93	64	64	19	19	59	14	6	38	

Oct. Catoline values, 1.3., 10th Julia 200, Decure Oravity, 5., 3., Oct. Execution of Analysis O: Execution of Analysis HGI: No need to analysis in case that the volume of sample is not enough.

Ta	Table 3-2 (COAL QUALITY ANALYSIS	JALIT	Y AN	ALYS	IS				NGAO P/J Team
				(By EGAT)	GAT)					Jan. 26, 2001
Name	Number		Iten	Item of Analysis	lysis					
of Sample	of Sample	Proximate Analysis	Cal	T.S.	S.G.	Ultimate Analysis	H G I ∕	Ash Analysis	Form of Sulfur	Condition of Sample
N5-1S	1	0	0	0	0	0	0	0	0	Standard: Few(2-3) Kg From Lanna to EGAT
Example: N5-1 Series	-	C	C			C		C	C	Each 25g, From Lanna to EGAT
N5-1: +10mm, 1.50F, 1.40F, 1.50F, 1.60F, 1.80F, 1.80S)	9	00	0			0))	
N5-1: 0.5~10mm, 1.30F	1	0	0			0		0	0	
N5-1: 0.5~10mm, (1.35F,1.40F,1.50F,1.60F,1.80F,1.80S) N5-1: -0.5mm	6 1	00	00			00				
N5-13S	1	0	0	0	0	0	0	0	0	Standard: Few(2-3) Kg From Lanna to EGAT
Example: N5-13 Series	÷	(C			((C	Each 25g, From Lanna to EGAT
NO-13: +10mm, 1.30F	- `) () () (C	C	
N5-13: +10mm, (1.35F,1.40F,1.50F,1.60F,1.80F,1.80S)	9	00	00			00		C	C	
NJ-13: 0.2~10mm, 1.30F	1 \	5 0	0 0) (D	C	
N5-13: 0.5~10mm, (1.55F,1.40F,1.50F,1.60F,1.80F,1.80S) N5-13: -0.5mm	0 1	00	00			00				
N5-3, N5-5, N5-6, N5-8, N5-12, N5-14	9	0	0	0	0	0	0			Standard: Each Few(2-3) Kg
		Ċ	C	C	C					
N5: Coaly Shale Samples N5-2, N5-4, N5-7, N5-9, N5-10, N5-11	Q	C	C	C	C					Standard: Each Few(2-3) Kg Sent to EGAT on Jan.22
NI-3S	1	0	0	0	0	0	0	0	0	Standard: Few(2-3) Kg From Lanna to EGAT
Example: N1-3 Series										Each 25g, From Lanna to EGAT
N1-3: +10mm, 1.30F	1	0	0			0		0	0	
N1-3: +10mm, (1.35F,1.40F,1.50F,1.60F,1.80F,1.80S)	9	0	0			0			1	
N1-3: 0.5~10mm, 1.30F	-	0	0			0		0	0	
N1-3: 0.5~10mm, (1.35F,1.40F,1.50F,1.60F,1.80F,1.80S) N1-3: -0.5mm	6 1	00	00			00				
NI-1, NI-4, NI-5, NI-6	4	0	0	0	0	0	0			Standard: Each Few(2-3) Kg
	,	((((Will be sent to EGAT on Jan.30
N1: Coaly Shale Samples N1-2, N1-7	2	0	0	0	0					Standard: Each Few(2-3) Kg Will be sent to EGAT on Jan.30
Total Number of Samples	99	99	99	21	21	58	13	6	6	
Notes: Cal: Calorific Value, T.S.: Total Sulfur,		S.G.: Specific Gravity,		S.: Sulfur						