



nkc Geotech Ltd

engineering geologist specialising in the investigation and treatment of disused mineworkings

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Coal Mining Investigation

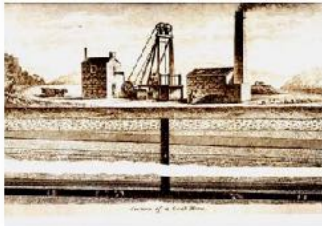


Draycott Cross Road, Cheadle

Balance Power Projects Ltd
107 Mere Grange
Leaside
St Helens
WA9 5GG

2223

15 August 2024



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Site

The site is for the construction and operation of a temporary Battery Energy Storage System, associated infrastructure, and access on land at Draycott Cross Road, Cheadle. Planning approval was obtained on January 5th 2024 under reference SMD/2023/0263.

Summary of relevant mining information

CIRIA Special Publication C758D 'Abandoned Mineworkings Manual'

Coal Authority Report 51003315206001 dated 30th September 2022

NCB Opencast plans for Harplow and New Haden

Ordnance Survey 1:2500 First Edition 1875

Geological Survey 1:10560 plans

Geology of the Cheadle Coalfield by George Barrow, Geological Survey 1901

Nkc Geotech Ltd CMRA 2223 dated 16 January 2023

Geology

The site lies on Westphalian B rocks of Carboniferous age at the top of the Productive Coal Measures that form the self-contained and isolated Cheadle Coalfield. The strata forming rockhead under the site was formerly known locally as the Upper Pale Group, confined to this western part of the Cheadle Coalfield. The white and pale grey colour of the sandstones and shales were attributed to weathering during the arid climate of the subsequent Triassic period, and hard Triassic sandstones form the high ground which surrounds the coalfield. George Barrow described the Upper Pale Group in 1903 as being especially 'soft' and referred to former miners describing their workings as having weak roofs and floors, the voids in older workings closing up soon after abandonment.

The rocks dip to the south-west at 1 in 7.

The predominantly shales and sandstones contain seams of coal in this coalfield of upto 2.1m in thickness at vertical intervals typically varying from 4.0m to 20.0m. Those coal seams which were of economic importance were given an identity when they were of sufficient quality and thickness to justify extraction by mining from the surface or at depth from mineshafts. Typical names for local coal seams reflect primarily on locality and thickness, for example Yard Coal, Delphouse Coal and Litley Coal.

Past underground coal mining

Coal mining in Cheadle is recorded in 1290 when the area was gifted to the Abbott of Croxden. Industrial mining deeper than the outcrop workings and simple bell pits was taking place in the 18th century. Steam power was employed from the mid 18th century onwards although some of the local mining was from adits driven into the hillsides. Coal mining is recorded in the Four Foot Coal at Brookhouses, 100m north of the site, in 1655 and may be the origin of the colliery spoil heaps visible in the field north of the site. The last coal mining in Cheadle was in 1965 at Foxfield Colliery, 2.0km north-west of the site, again working the Four Foot Coal..

The shaft section of the No.8 Shaft of New Haden Colliery, 300m south of the site and abandoned in 1943, records rockhead at a depth of 4.1m and passed through the coal seams relevant to the site on sinking in 1901 (Plan C). This early mining from New Haden Colliery unexpectedly found both the Litley and the Four Foot coals had been mined previously and the colliery closed temporarily in 1906 before more finance was raised to deepen the shafts to lower seams. The coal seams relevant to the development on the site in descending order above the Upper Dilhorne Coal are

Yard Coal

18m shales and sandstones

Litley Coal

10m shales and sandstones

Four Feet Coal

48m shales and sandstones

Upper Dilhorne Coal

deeper seams have no relevance to the development



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The **Yard Coal** is shown on the Geological Survey as outcropping south-west of the site. Outcrop workings in the Yard Coal were visible in the wood west of the site by both the Geological Survey in 1898 and local mining surveyor George Barrow in 1901.

The **Litley Coal** seam, a distinctive double seam split into the thin Upper Litley Coal and the 1.0m thick Lower Litley Coal, is shown as outcropping immediately north of the site, dipping south-west, and repeated eastwards by two parallel north-south faults of 10m downthrow to the east. The Litley Coal was therefore inferred to be present at shallow depth under the entire site.

Unrecorded old workings were found in this seam during the NCB opencast works at Harplow in 1964, the initial workings from New Haden Colliery in 1901, and also during the 1926 coal mining strike workings at Litley and Harplow.

The **Four Foot Coal** was the principal seam worked in the Cheadle Coalfield.

The next seam below the Four Feet Coal is the **Little Dilhorne Coal**, 48m below the Four Foot Coal, too deep to affect the site development.

Recorded mine entries on or within 20m of the site boundary

There are no recorded mine entries on or within 20m of the site. The nearest recorded mineshafts are the pair of Old Haden Colliery shafts with Coal Authority references 399342-014 and -015, located 30m east of the site, on the opposite side of Draycott Cross Road according to the First Edition Ordnance Survey. The colliery worked the Four Foot Coal prior to 1850 from a recorded depth of 47m.

Current intrusive investigation

A total of 10 rotary air-mist open-holes were drilled to upto 30m on the site under Coal Authority Permit PER-28507. See borehole logs by Rotary Test Drilling Ltd and Plan A attached.

The **Yard Coal** was proved as solid coal at outcrop in Bh J and the seam lies under the proposed battery units in the southern part of the site. The presence of this localised outlier of the Yard Coal on the site, 70m north-east of the Geological Survey position, is due to faulting.

The **Litley Coal**, characterised by being a double seam with a shale parting, was encountered in unworked condition in Bhs A, B, C, E, G and H, whereas old workings were proved in Bhs D, F and I. A distinctive yellow sandstone is present above the seam, and was also recorded in the New Haden Colliery shaft section.

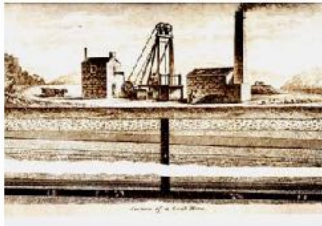
The **Four Foot Coal** lies 10m below the Litley Coal and was recorded in Bhs A, C, E, G, H, and J.

Three north-south faults were proved on the site, all with easterly downthrows, and with vertical displacements of 10m, 5m and 3m. The faults cause the Litley Coal and the Four Foot Coal to be present at shallow depth under the entire site.

Mitigation measures

Mineshafts

There are no recorded mineshafts or evidence of mineshaft spoil on the site, but as on any coalfield site where coal is present at shallow depth, unrecorded shafts may be present and may be encountered during construction. Any shaft discovered in the construction phase will require capping on the shallow rockhead to a design by the structural engineers and approved by the Coal Authority. A typical shaft cap would be 5.0m square and 500mm thick containing T20 rebar.



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Shallow mineworkings

The risk to the development from shallow mineworkings is subsidence caused by the collapse of any open workings in the coal seam. As the roof of the workings collapse the voids migrate upwards until choked by bulking on the floor of the rising voids. The calculation for a safe depth of cover to shallow mineworkings is 10 x seam thickness, with a minimum thickness of 1.5m due to haulage roadways in the seam. On this site a safe depth would be 15m of rock cover, calculated to be 17m under most of the site and increasing to 19m in the vicinity of Bhs D, E, G and I.

Stabilisation of mineworkings by grouting where there is insufficient safe rock cover is the recommended remedial method for developments over shallow mineworkings.

The **Yard Coal** outcrops under part of the southern development area, 70m north-east of the Geological Survey position.

The **Litley Coal** is present under the entire site and has been mined at shallow depth.

The **Four Foot Coal** lies 10m below the Litley Coal and solid coal was encountered in all the boreholes.

Unrecorded shallow mineworkings have been proved to be present in the Litley Coal and a conventional building development would require remedial stabilisation by grouting prior to construction where the solid rock cover is less than 17m.

On this site, the majority of the proposed development is for integral battery storage units and a sub-station, all with shallow foundations and placed on concrete bases/slabs.

In addition to these units, it is proposed to construct two longer units measuring 15m x 4m for Control Room & Welfare, Substation, and a 4m square DNO Room in the vicinity of Bhs C, D, E, and F (see attached Plan B).

According to the Coal Authority published Guidance for Planning Applications as amended on June 1st 2023, the battery storage units and the sub station will be exempt from the necessity to carry out remedial works because of the minimal disturbance of the ground. The design of the Control Room & Welfare, Substation, and the DNO Room units are similar in that no foundations are to be constructed and they are integral lightweight prefabricated units placed on simple concrete bases, these units would also fall under the Coal Authority exemptions at the discretion of the Local Planning Officer.

Planning Condition 17 on the Planning Approval SMD/2023/0263 for this site refers to the necessity to carry out an intrusive mining investigation to establish the risks arising from historic coal mining, but according to the Coal Authority Guidance for Planning Applications a development for temporary storage units placed on simple concrete bases would be exempt from their requirement to carry out remedial works.

For Nkc Geotech Ltd

A handwritten signature in black ink, appearing to read 'Neil Catlow'.

Neil Catlow, B.Sc, F.G.S

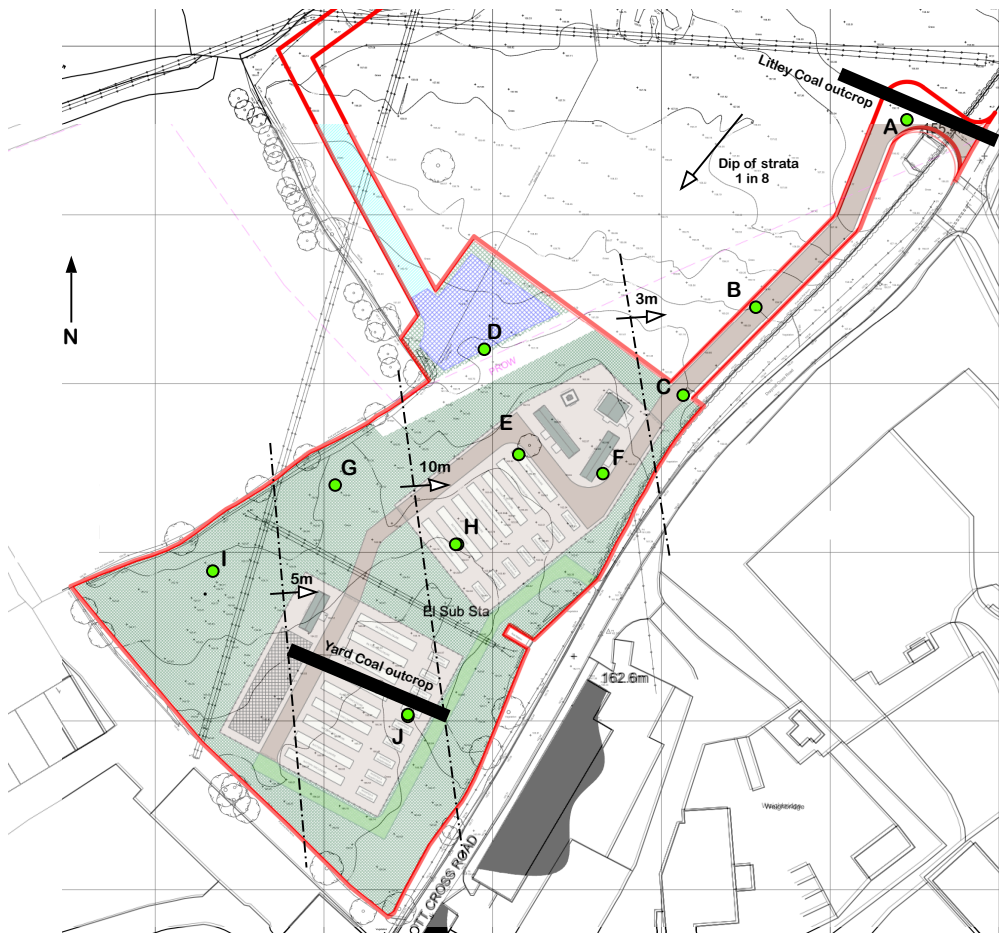


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Plan A

Borehole plan with geology on proposed site layout

Scale 1:5000 @ A4



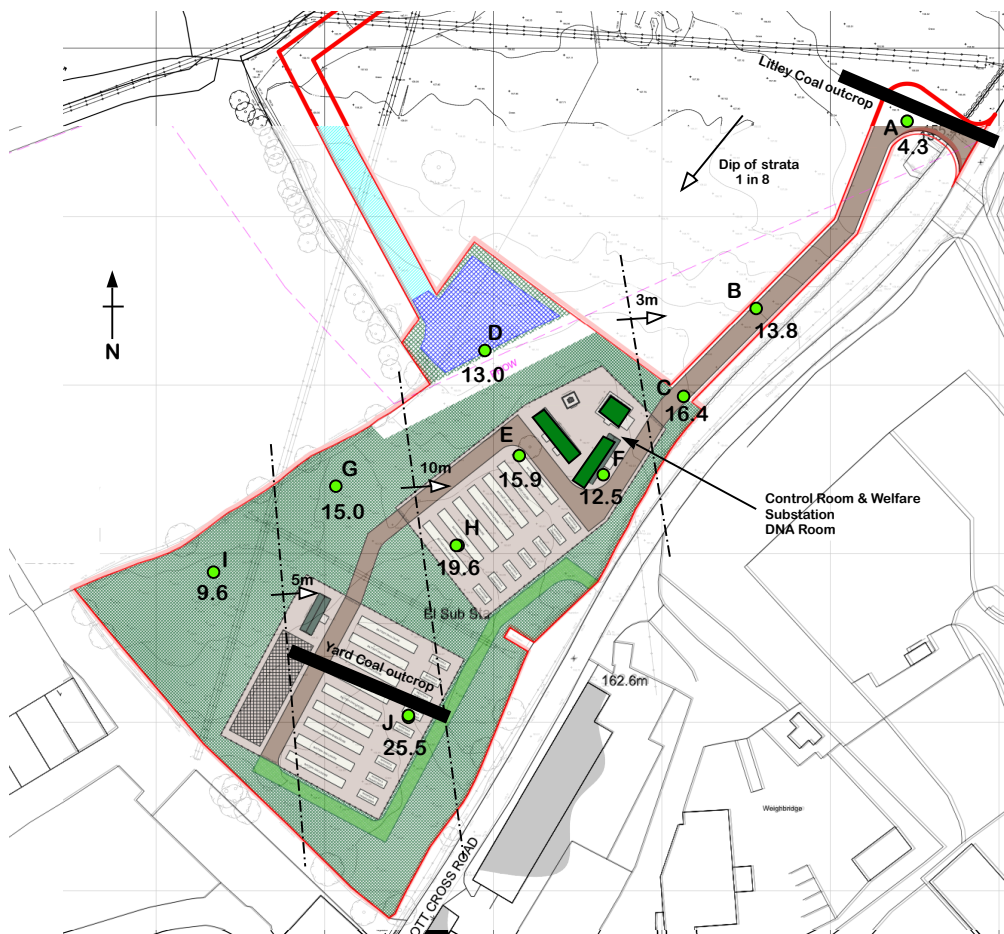


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Plan B

Borehole plan with depths to Litley Coal floor on proposed site layout

Scale 1:5000 @ A4





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Plan C

New Haden Colliery Shaft No.8 section

Yard Coal to Four Foot Coal

Columns are thicknesses in feet and inches and depths in feet and inches

grey shale	12	1	77	10
Yard coal	3	4	97	(29.81m)
blunch	6	.	103	10
Roach	11	.	114	10
Roach	15	.	129	10
Roach	9	.	138	10
Grey shale	14	.	152	10
Gritty coal	2	8	155	6
blunch	1	.	156	(47.34m)
coal	1	6	158	0
blunch	2	.	160	(48.15m)
Four Feet Roach	12	.	172	0
Roach with rock binds	16	3	188	3
Black shale	.	3	188	6
Four Feet coal	3	8	192	2
Harder coal	.	3	192	(58.51m)
Fireclay	1	3	193	8
Grey rock	5	6	199	2
Porton Rock	2	.	201	-2
Soft grey rock	3	2	204	4
Hard blue shale	4	6	208	10
Hard gritty rock	7	7	216	5

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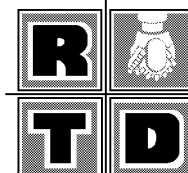
Date	09/07/24
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Symbols	TCR	-	TOTAL ROCK RECOVERY
	SCR	-	SOLID ROCK RECOVERY
	RQD	-	ROCK QUALITY DESIGNATION

Air mist.

Gas = normal
100% flush
Backfill BH



ROTARY TEST DRILLING Marshes Farm, Coach Road, off Wigan Road, Hart Common, West Houghton, Bolton BL5 2BT Tel: 01942 - 810348 Fax: 01942 - 840543				Site Dracott Cross Road, Chaedle				Job No. 22/24			
				Client NKC				Borehole RBHB			
				Date 09/07/24 - 10/07/24		O.D. Level		Page 1 of 1			
Day	Casing Depth	Strata Depth	Description of Strata	Legend	Inst.	Reduced Level	Flush Returns	Core Depths	TCR %	SCR %	RQD %
		G.L. 0.40	Grass over TOPSOIL (0.40)								
			Brown GRAVEL/COBBLES (2.10)								
	3M	2.50	Yellow/brown SANDSTONE (4.50)								
		7.00	Grey MUDSTONE (4.60)								
		11.60	20% flush in COAL interbedded with MUDSTONE (2.20)								
		13.80	Grey MUDSTONE (10.20)								
		24.00	Base of Drillhole								
Symbols TCR - TOTAL ROCK RECOVERY SCR - SOLID ROCK RECOVERY RQD - ROCK QUALITY DESIGNATION											
Drilling Methods Air mist											
Remarks 20% loss of flush at 11.6m bgl 10/7/24 Loss of flush in likely workings 11.6 - 13.8m bgl, unable to drill beyond 24m bgl Backfill BH											

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				Client NKC				Borehole			
				Date 04/07/24		O.D. Level		RBHC Page 1 of 1			
Day	Casing Depth	Strata Depth	Description of Strata	Legend	Inst.	Reduced Level	Flush Returns	Core Depths	TCR %	SCR %	RQD %
	3M	G.L. 0.40	Grass over TOPSOIL (0.40)								
			Brown GRAVEL/COBBLES (1.70)								
		2.10	Yellow SANDSTONE (3.40)								
		5.50	Grey MUDSTONE (7.60)								
		13.10	COAL & Black MUDSTONE (0.90)								
		14.00	50% loss of flush dark grey MUDSTONE & COAL, steady drilling/No fast drilling (2.40)								
		16.40	Grey MUDSTONE, 100% flush returns (5.70)								
		22.10	COAL (1.20)								
		23.30	Grey MUDSTONE (6.70)								
			30.00	Base of Drillhole							
Symbols TCR - TOTAL ROCK RECOVERY SCR - SOLID ROCK RECOVERY RQD - ROCK QUALITY DESIGNATION											
Drilling Methods Air mist											
Remarks Gas = normal 50% loss of flush at 14.0m bgl/steady drilling throughout Backfill BH											

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				ClientNKC				Borehole RBHD Page 1 of 1			
				Date 03/07/24 - 04/07/24		O.D. Level					
Day	Casing Depth	Strata Depth	Description of Strata	Leg- end	Inst.	Reduced Level	Flush Returns	Core Depths	TCR %	SCR %	RQD %
	3M	G.L. 0.50	Grass over TOPSOIL (0.50)								
			Brown GRAVEL/COBBLES (2.00)								
		2.50									
			Grey/brown CLAY/clayey MUDSTONE (0.60)								
		3.10									
			Yellow/brown SANDSTONE (1.90)								
		5.00									
			Grey MUDSTONE (5.50)								
			10.50								
			10.90	COAL (0.40)							
				Grey MUDSTONE (0.70)							
		11.60									
			COAL, 50% loss of flush, broken/fast drilling (1.40)								
		13.00									
			TOTAL LOSS OF RETURNS, fast drilling (0.60)								
		13.60									
			Steady drilling, likely MUDSTONE (1.40)								
		15.00									
			Base of Drillhole								
Symbols											
TCR - TOTAL ROCK RECOVERY											
SCR - SOLID ROCK RECOVERY											
RQD - ROCK QUALITY DESIGNATION											
Drilling Methods											
Air mist											
Remarks											
Gas = normal Loss of flush at 11.6m bgl, pull rods at 15.0m bgl, BH collapsed Backfill BH											
R T D											

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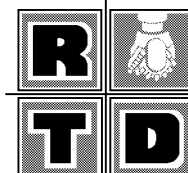
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Symbols	TCR	-	TOTAL ROCK RECOVERY
	SCR	-	SOLID ROCK RECOVERY
	RQD	-	ROCK QUALITY DESIGNATION

Air mist

Gas = normal throughout
100% Flush returns
Backfill BH



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					Client NKC				Borehole RBHF		
					Date 10/07/24		O.D. Level		Page 1 of 1		

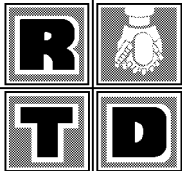
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		G.L.									
		0.50	Grass over TOPSOIL (0.50)								
			Grey/Brown CLAY (1.50)								
		2.00	Yellow SANDSTONE with abundant rounded GRAVEL, COBBLES (5.50)								
	3M										
		7.50	Grey MUDSTONE (2.00)								
		9.50	Very fast drilling TOTAL LOSS OF RETURNS, occ. voids (3.00)								
		12.50	Steady drilling, presumed MUDSTONE (17.50)								
		30.00	Base of Drillhole								

Symbols

TCR - TOTAL ROCK RECOVERY
 SCR - SOLID ROCK RECOVERY
 RQD - ROCK QUALITY DESIGNATION

Drilling Methods
 Air mist

Remarks
 Total loss of returns/fast drilling 9.5 - 12.5m bgl
 Gas = normal
 Backfill BH



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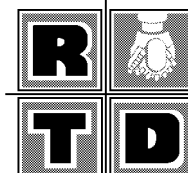
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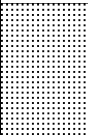
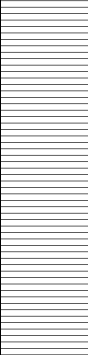
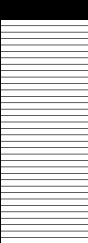
Symbols	TCR	-	TOTAL ROCK RECOVERY
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Air mist.

Gas = normal
100% Flush
Backfill BH



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					Client NKC				Borehole RBHH		
					Date 03/07/24		O.D. Level		Page 1 of 1		

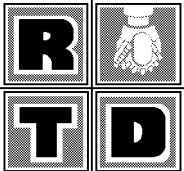
Day	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Flush Returns	Core Depths	TCR %	SCR %	RQD %
		G.L.									
		0.50	Grass over TOPSOIL (0.50)								
			Brown/grey CLAY (1.50)								
		2.00	Yellow/brown SANDSTONE (3.50)								
	3M										
		5.50	Grey MUDSTONE (2.00)								
		7.50	Yellow/brown SANDSTONE (1.50)								
		9.00	Grey MUDSTONE (9.60)								
		18.60	Shaley COAL, interbedded with								
		19.60	mudstone (1.00)								
			Grey MUDSTONE (3.40)								
		23.00	COAL (0.90)								
		23.90	Grey MUDSTONE (6.10)								
		30.00	Base of Drillhole								

Symbols

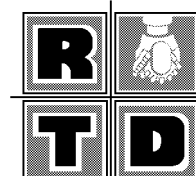
TCR - TOTAL ROCK RECOVERY
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Drilling Methods
 Air mist

Remarks
 Gas = normal
 100% Flush
 Backfill BH



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				Client NKC				Borehole			
				Date 02/07/24		O.D. Level		RBHI Page 1 of 1			
Day	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Flush Returns	Core Depths	TCR %	SCR %	RQD %
	3M	G.L. 0.40	Grass over TOPSOIL (0.40) Yellow/brown CLAY (3.50)								
		3.90	Grey MUDSTONE (3.70)								
		7.60	shaley COAL (0.40)								
		8.00	Grey MUDSTONE (0.40)								
		8.40	FAST BROKEN DRILLING, COAL 50% flush returns (1.20)								
		9.60	Steady drilling, 20% flush, grey MUDSTONE (5.40)								
		15.00	Base of Drillhole								
Symbols TCR - TOTAL ROCK RECOVERY SCR - SOLID ROCK RECOVERY RQD - ROCK QUALITY DESIGNATION											
Drilling Methods Air mist											
Remarks Gas = normal Loss of flush from 8.4m bgl Pull rods at 15m, unstable BH Backfill BH											



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Air mist.

Gas = normal
100% flush
Backfill BH

