

Appendix 7 Bore Completion Details

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1. OVERVIEW

During groundwater investigations between 2003 and 2007 a total of forty-six (46) piezometers were installed across thirty-seven (37) sites, to facilitate the separate sampling, testing and monitoring of the principal coal seams, and the overburden and interburden sediments, within the deposit, downdip from the deposit, and along strike to the north-east and the south-west. These sites form the basis of Bickham's groundwater monitoring network.

In addition, two production bores were completed, adjacent to the bulk sample pit, designed to serve as dewatering bores. A further four uncased coal exploration bores were also included in the monitoring network.

A current Bore Licence under Part 5 of the Water Act 1912 is held for all piezometers and dewatering bores.

Summary completion details of the piezometers and test bores are provided in below in **Table 1**. Copies of the piezometer and test bore borelogs are included in **Annexure 7A**. The locations of all piezometer, test production and exploration bores are shown in **Figure 1**.

1.1 PIEZOMETER COMPLETION

Some piezometers were installed in existing exploration drill-holes, but most were specifically drilled for the purpose of gathering information on the hydrogeological environment within the Project area, and to form the basis of the monitoring network. Each piezometer was designed with a screen installed at a specific depth interval, sealed above and below, to isolate the zone to be separately sampled and tested.

Bores were generally cased with 50mm PVC casing, with the exception of OH56 which was cased with 100mm.bl

The piezometers were designed to allow separate monitoring, sampling and testing of aquifers in the main coal seams, as well as in the overburden and interburden sediments. Some were installed at locations within the coal deposit, others at locations beyond the deposit, either down dip (to the north-west), or along strike to the north-east and south-west. A small number of piezometers have been installed in the Werrie Basalt and the Upper Coal Measures to provide regional data and allow regional monitoring.

1.2 TEST BORE COMPLETION

Two test bores were completed to facilitate the dewatering of the Permian formations during bulk sampling, and to provide sites at which further hydraulic pumping tests could be undertaken.

Both bores were completed with 200 mm casing, with screened / slotted sections between 63 and 83 mbgl (Bore DW1), and 69 and 89 mbgl (Bore DW2).

Table 1: Summary Completion Details of Groundwater Piezometers and Dewatering Bores

Piezometer/ Bore Number	Datum (TOC) (m AHD)	Date Drilled	Depth Drilled (m)	Screen Interval (m depth)	Aquifer Screened	Casing Diameter	Water Level (m depth)	Water Level (m AHD)
Dewatering Bores								
DW1	429.820		83.7	63 – 83	G Seam and F/G interburden	200mm	53.63	376.19
DW2	425.605		89.6	69 – 89	G Seam and F/G interburden	200mm	38.77	386.84
Piezometers								
OH38	494.095		154	87 – 107	G seam	50mm	48.65	445.45
OH56	464.420		56	47 – 56	Igneous Intrusive	100mm	28.01	436.41
OH57	424.509		97	52 – 71	F/G interburden	50mm	37.56	386.95
OH65	432.146		91	74 – 83	G seam	50mm	54.65	377.50
OH69A	380.144		37	21 – 29	G seam & F/G interburden	50mm	4.71	375.43
OH69B	380.184		15	9 – 14	F/G interburden	50mm	4.71	375.47
OH70A	384.523		211	193 – 205	G Seam	50mm	4.75	380.17
OH70B	384.614		140	133 – 139	E seam	50mm	4.70	379.91
OH70C	384.065		40	34 – 39	Bickham Formation	50mm	3.78	380.29
OH71A	454.534		166	146 – 160	G seam	50mm	17.35	437.18
OH71B	454.278		35	30 – 34	A seam	50mm	5.44	448.84
OH71C	454.130		97	86 – 94	E seam	50mm	14.56	439.57
OH72	443.670		142	137 – 141	Bickham Formation	50mm	1.28	442.90
OH73	451.528		140	128 – 139	A seam & siltstone below	50mm	6.08	445.45
OH75A	379.470		8.25	6 – 8	Alluvium and G Seam	50mm	6.36	373.11
OH75B	379.216		18.0	16 – 18	G Bottoms	50mm	6.59	372.63

Piezometer/ Bore Number	Datum (TOC) (m AHD)	Date Drilled	Depth Drilled (m)	Screen Interval (m depth)	Aquifer Screened	Casing Diameter	Water Level (m depth)	Water Level (m AHD)
OH77	491.530		148.0	110 – 116	? E Seam ¹	50mm	45.96	445.45
OH78	383.577		28.2	12 – 18	G Seam	50mm	10.10	373.48
OH79	383.452		22.8	12 – 18	? G Seam ²	50mm	8.46	374.99
DDH85B	405.473		60.2	42 – 60	G Seam and F/G interburden	50mm	17.55	387.92
OH86	463.612		20.1	15 – 21	A Seam	50mm	12.96	450.65
OH87	461.323		21.3	15 – 21	A Seam	50mm	11.44	449.88
OH88	458.268		28.5	22.5 – 28.5	A Seam	50mm	16.32	441.95
OH89	468.165		30.5	24.5 – 30.5	A Seam	50mm	15.66	452.51
OH90	454.022		34	28 – 34	Bickham Formation	50mm	-	Bore collapsed?-
OH91	459.203		31	25 – 31	A Seam	50mm	15.92	443.28
OH92	404.056		125	113 – 125	G Seam	50mm	27.27	376.79
OH93	403.749		40	33 – 40	C Seam	50mm	26.43	377.32
OH94	392.132		21	15 – 21	Alluvium and U Coal Measures	50mm	4.11	388.02
OH95	381.352		17	11 – 17	G Bottoms	50mm	7.84	373.51
OH97	446.349		242	85 – 91	Bickham Formation	50mm	20.31	426.04
OH102	476.502		207.0	74 – 80	Bickham Formation	50mm	27.43	449.07
OH105	463.284		235	111 – 117	Bickham Formation	50mm	34.24	429.04
OH106	466.936		113	105 – 111	G Seam to Werrie Basalt	50mm	39.74	427.20

Piezometer/ Bore Number	Datum (TOC) (m AHD)	Date Drilled	Depth Drilled (m)	Screen Interval (m depth)	Aquifer Screened	Casing Diameter	Water Level (m depth)	Water Level (m AHD)
OH110	498.422		168	69 – 75	B Seam	50mm	52.78	445.64
OH111A	380.279		30	23.5 – 29.5	Werrie Basalt	50mm	5.56	374.72
OH111B	380.510		20	12.5 – 18.5	Werrie Basalt	50mm	8.29	372.22
OH113A	366.832		203	79 – 91	Upper Coal Measures	50mm	6.74	360.09
OH113B	366.832		203	129 – 141	Upper Coal Measures	50mm	5.24	361.59
OH114	499.290		204	77 – 83	Upper Coal Measures	50mm	55.16	444.13
OH115	470.724		206	56 – 62, 194 – 200	Upper Coal Measures	50mm	41.03	429.69
TP01	387.89		6.3	3.3 – 6.3	Alluvium	50mm	Dry	-
TP02	386.42		6.5	3.5 – 6.5	Alluvium	50mm	7.09	381.53
TP03	387.62		6.3	3.3 – 6.3	Alluvium	50mm	Dry	-
TP05	388.03		6.8	3.8 – 6.8	Alluvium	50mm	7.18**	380.85
TP06	385.39		6.5	3.5 – 6.5	Alluvium	50mm	5.18	379.58
DDH99	444.046		333.3	Open Hole	A Seam, Bickham Formation	Uncased	-	-
OH100	482.778		198.5	Open Hole	Bickham Formation, A-G Seams and Werrie Basalt	Uncased	36.00	446.78
OH108	472.222		78	Open Hole	CM and Werrie Basalt	Uncased	44.77	427.45
OH112	479.422		185.5	Open Hole	Intersects A to G Seams	Uncased	52.40	427.02

¹ Coal seam identification uncertain, probably the E Seam.

¹ Coal seam highly weathered, probably the G Seam.

Latest available water level data provided (January 2009). Early data provided for some sites as indicated by shading.

Annexure 7A

Bore Logs

BORE: DW1

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 429.820mAHD Ground Level:	Project No: 02-0096
Location: Bickham South	Date Started: 23/01/2003	Date Finished: 10/02/2003
Drilling Contractor / Method: Cameron Drilling	Hole depth: 83.7m	Supervised By: T Veness
Description	Depth (metres)	Well Construction Details:
	0	Ground Surface
Sandstone		Cement 0-2m
Conglomerate		
Sandstone		
	10	
Conglomerate		Blank 200 mm PVC Casing:
Sandstone		
Coal (E Seam)		
	20	
Sandstone, minor Siltstone		
	30	
Siltstone		
Sandstone		
Conglomerate		
Sandstone		
Coal (F Seam)		
Shale, minor Coal		
Sandstone		
Siltstone		
Sandstone		
	50	
		SWL - 375 mAHD
Siltstone		
Sandstone		
Siltstone		
Sandstone		
Siltstone, Shale		
Coal (G Seam)		
	80	
		Slotted 200mm PVC Casing: 63 - 83m
Carbonaceous Mudstone		
	90	
	100	
		Total Depth: 83.7m

Date: 19 March 2009	Scale: as indicated
Initials: PJD	Job No: S02
Drawing No: S02-604b	Rev: A

Bickham Coal Mining Company Ltd

**BICKHAM COAL PROJECT
BORE CONSTRUCTION LOG
DW1**

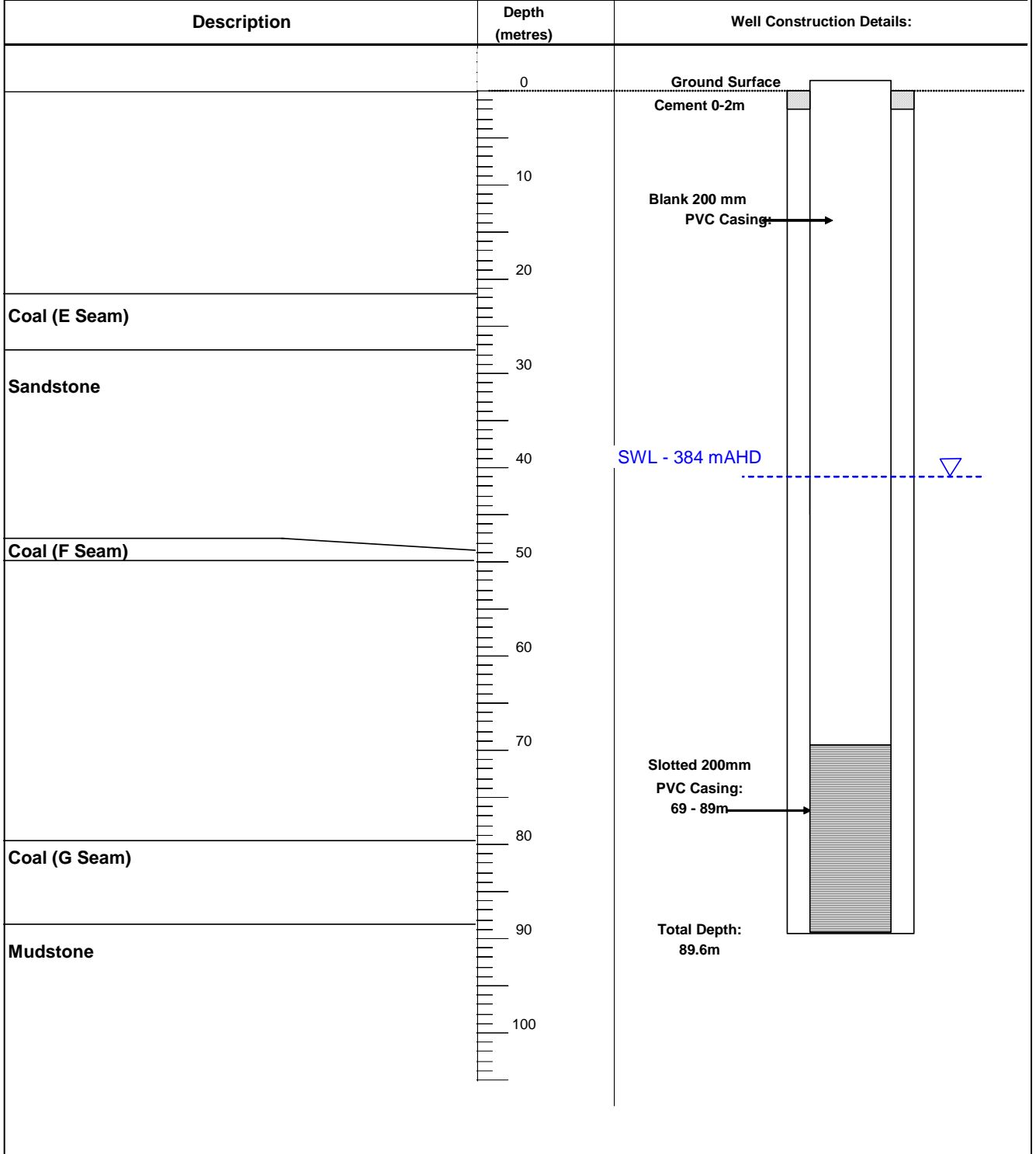
aquaterra

Figure 1

BORE: DW2

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 425.605 mAHD Ground Level:	Project No: 02-0096
Location: Bickham South	Date Started: 28/11/2003	Date Finished: 1/12/2003
Drilling Contractor / Method: Hunter Drilling Services	Hole depth: 89.6 m	Supervised By: R Davis / T Veness

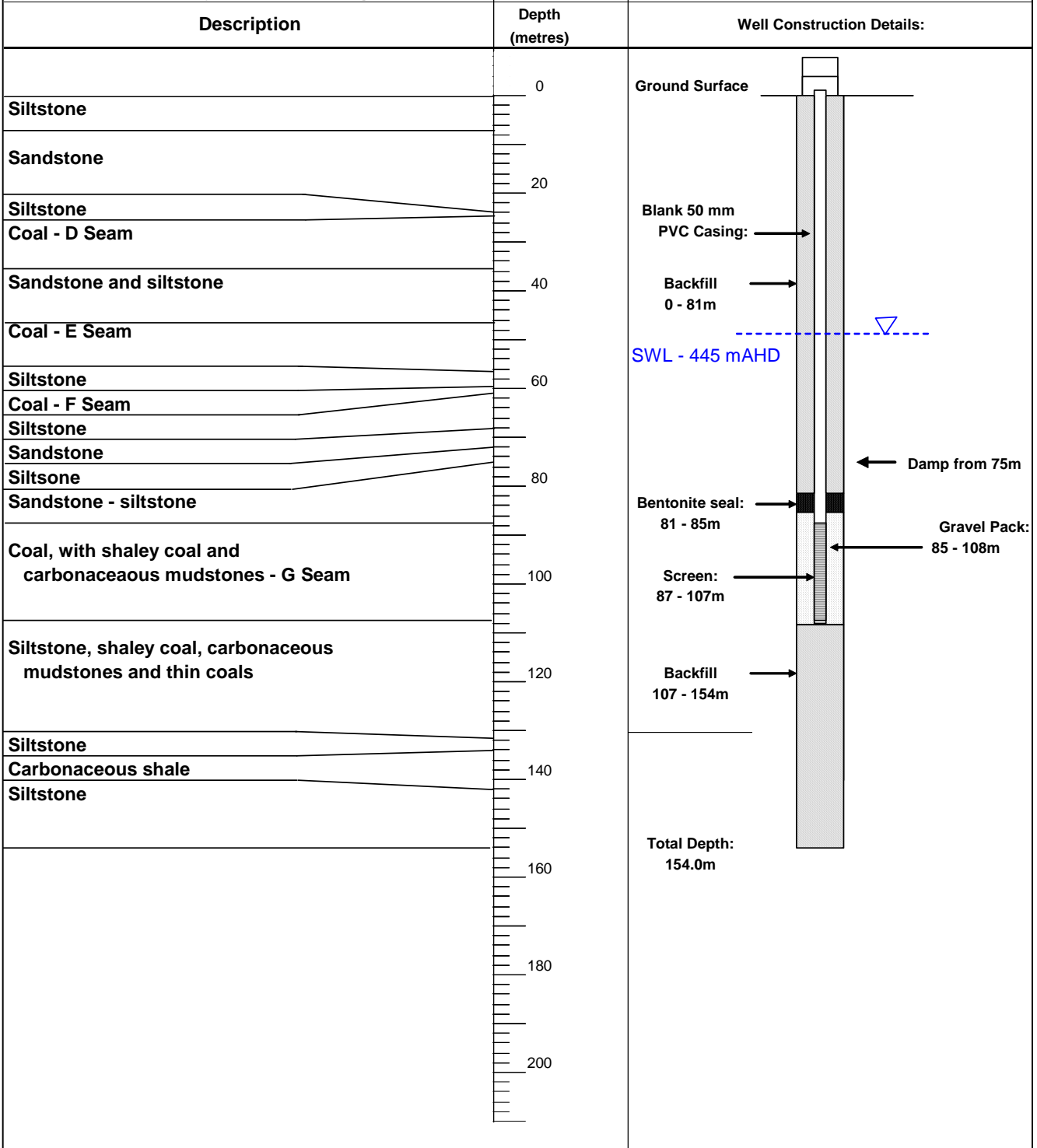


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-605b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG DW2
		Figure 2

BORE: OH38

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 494.095mAHD Ground Level: 493.270mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 17/06/2001	Date Finished: 18/06/2001 (Piezo installed June 2002)
Drilling Contractor / Method: Drilled by J D Drilling Piezometer Installed by Cameron Drilling	Hole depth: 154.0m	Supervised By: T Sercombe



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd	
Initials: PJD	Job No: S02		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH38
Drawing No: S02-606b	Rev: A		
aquaterra		Figure 3	

BORE: OH56

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 464.420mAHD Ground Level: 463.972mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 16/07/2002	Date Finished: 17/07/2002
Drilling Contractor / Method: Cameron Drilling	Hole depth: 56.0m	Supervised By: T Sercombe
Description	Depth (metres)	Well Construction Details:
<p>Claystone</p> <p>Siltstone</p> <p>Claystone</p> <p>Sandstone Siltstone</p> <p>Sandstone (50%), igneous intrusive (50%)</p> <p>Claystone</p> <p>(G seam from 72 to 80m in OH56)</p>	<p>0</p> <p>10</p> <p>20</p> <p>30</p> <p>40</p> <p>50</p> <p>60</p> <p>70</p> <p>80</p> <p>90</p> <p>100</p>	<p>Ground Surface</p> <p>Blank 100 mm PVC Casing: 0 - 41m</p> <p>Backfill 0 - 41m</p> <p>SWL - 435 mAHD</p> <p>Bentonite seal: 41 - 45m</p> <p>Water Inflow</p> <p>Screen: 47 - 56m</p> <p>Gravel Pack: 45 - 56m</p> <p>Total Depth: 56.0m</p>

Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT
Drawing No: S02-607b	Rev: A	BORE CONSTRUCTION LOG
aquaterra		OH56
		Figure 4

BORE: OH57

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 424.509mAHD Ground Level: 423.775mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed June 2002)
Drilling Contractor / Method: Drilled by Cameron Drilling Piezometer Installed by Cameron Drilling	Hole depth: 97.0 m	Supervised By: T Sercombe
Description	Depth (metres)	Well Construction Details:
Sandstone	0	<p>The diagram illustrates the well construction from the ground surface down to a total depth of 97.0 m. Key features include: <ul style="list-style-type: none"> Ground Surface: Indicated by a horizontal line at 0 m. Blank 50 mm PVC Casing: Extends from the surface down to 46 m. Backfill: Applied in two sections: 0-46 m and 71-97 m. Bentonite seal: Located between 46 m and 50 m. Screen: Located between 52 m and 71 m. Gravel Pack: Located between 50 m and 71 m. Water Inflow: Indicated by an arrow pointing into the well at the screen level. SWL - 385 mAHD: Static Water Level indicated by a dashed blue line with an inverted triangle symbol at approximately 43 m depth. Total Depth: 97.0 m. </p>
	10	
Siltstone		
Sandstone Conglomerate	20	
Coal (E Seam)		
Siltstone	30	
Sandstone	40	
Coal (F Seam) Sandstone	50	
Siltstone	60	
Sandstone	70	
Siltstone	80	
Coal (G Seam)		
Siltstone Mudstone, Shale	90	
	100	

Date: 19 March 2009	Scale: as indicated
Initials: PJD	Job No: S02
Drawing No: S02-608b	Rev: A
aquaterra	

Bickham Coal Mining Company Ltd

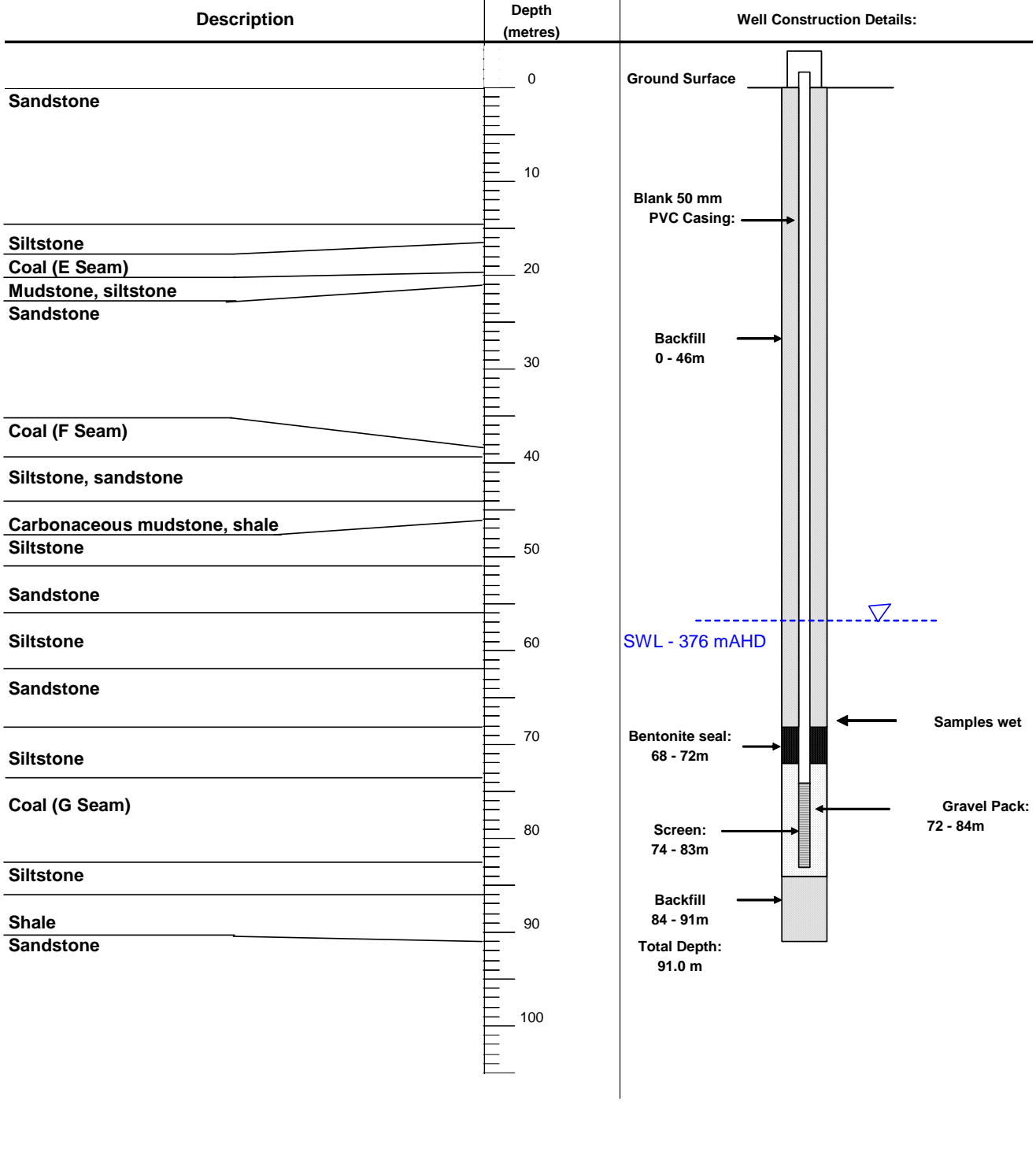
**BICKHAM COAL PROJECT
BORE CONSTRUCTION LOG
OH57**

Figure 5

BORE: OH65

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 432.146mAHD Ground Level: 431.490mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 12/03/2002	Date Finished: (Piezometer installed June 2002) 12/03/2002
Drilling Contractor / Method: Drilled by Cameron Drilling Piezometer Installed by Cameron Drilling	Hole depth: 91.001 m	Supervised By: T Sercombe



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH65
Initials: PJD	Job No: S02	
Drawing No: S02-609b	Rev: A	
		Figure 6

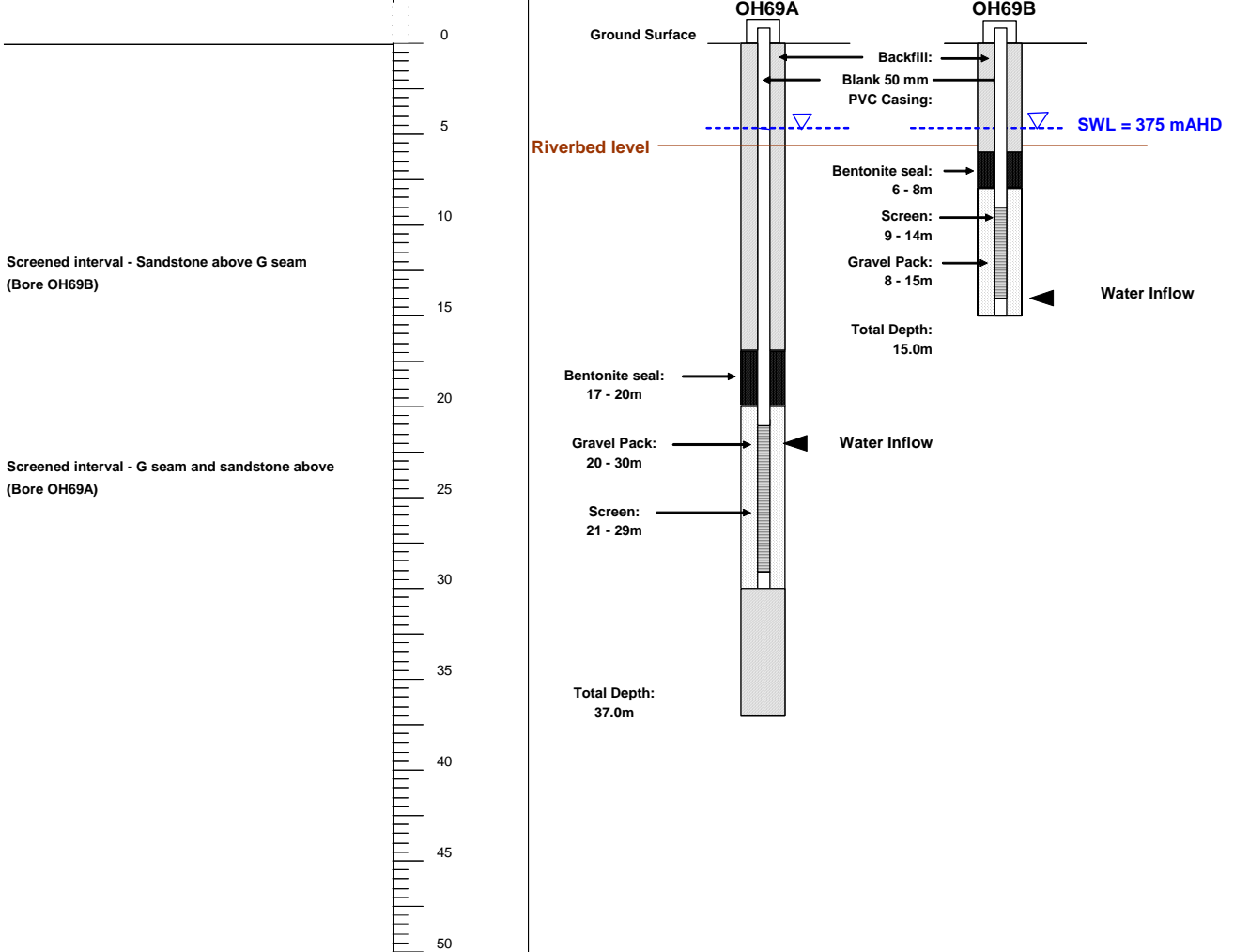
BORES: OH69A and OH69B

Logging Sheet

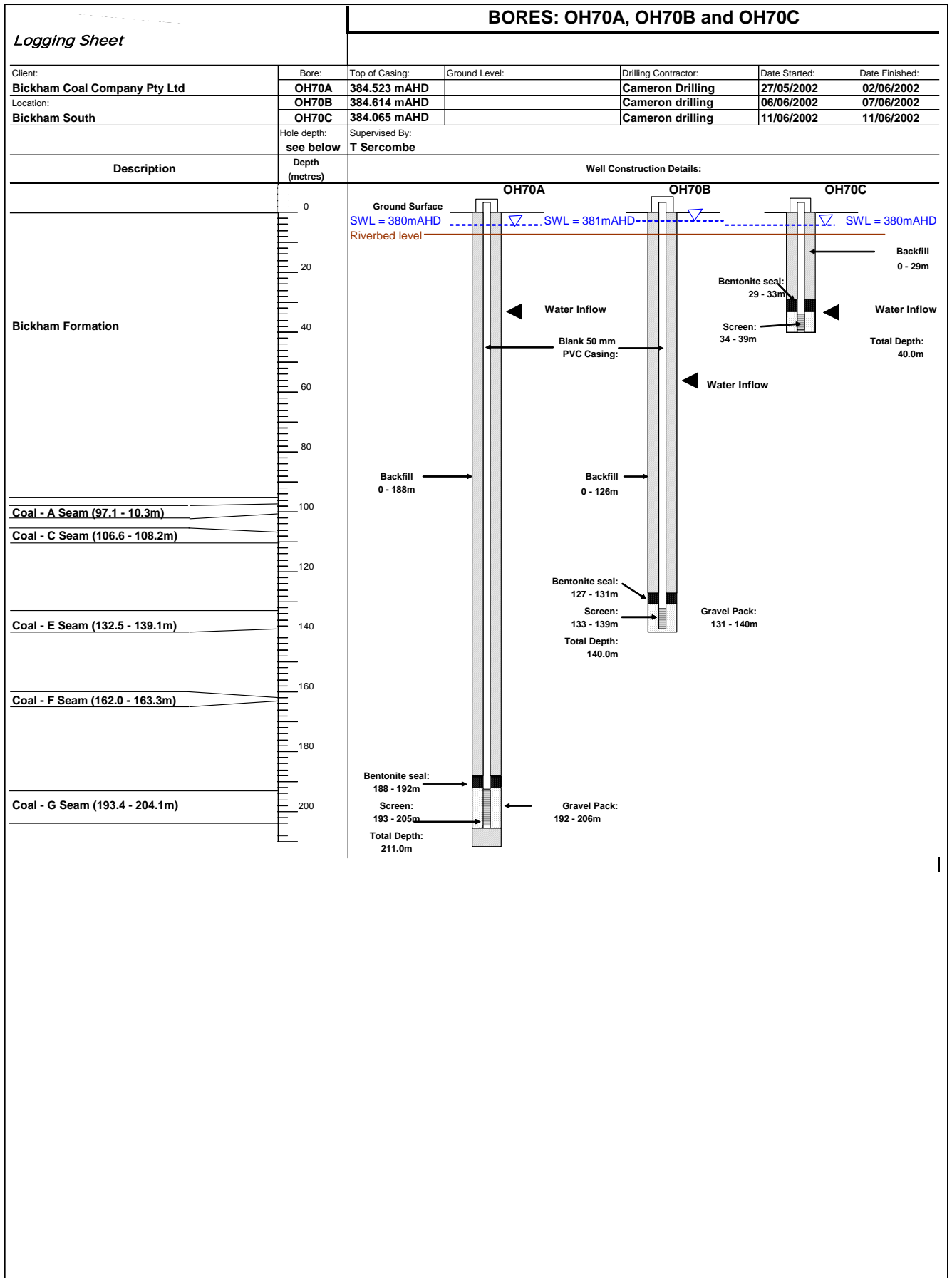
Client:	Bore:	Top of Casing:	Ground Level:	Drilling Contractor:	Date Started:	Date Finished:
Bickham Coal Company Pty Ltd	OH69A	380.144 mAHD		Cameron Drilling	23/05/2002	23/05/2002
Location:	OH69B	380.184 mAHD		Cameron drilling	24/05/2002	24/05/2002
Bickham South						

Hole depth:	Supervised By:
see below	T Sercombe

Description	Depth (metres)	Well Construction Details:
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Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-610b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH69A AND OH69B
		Figure 7

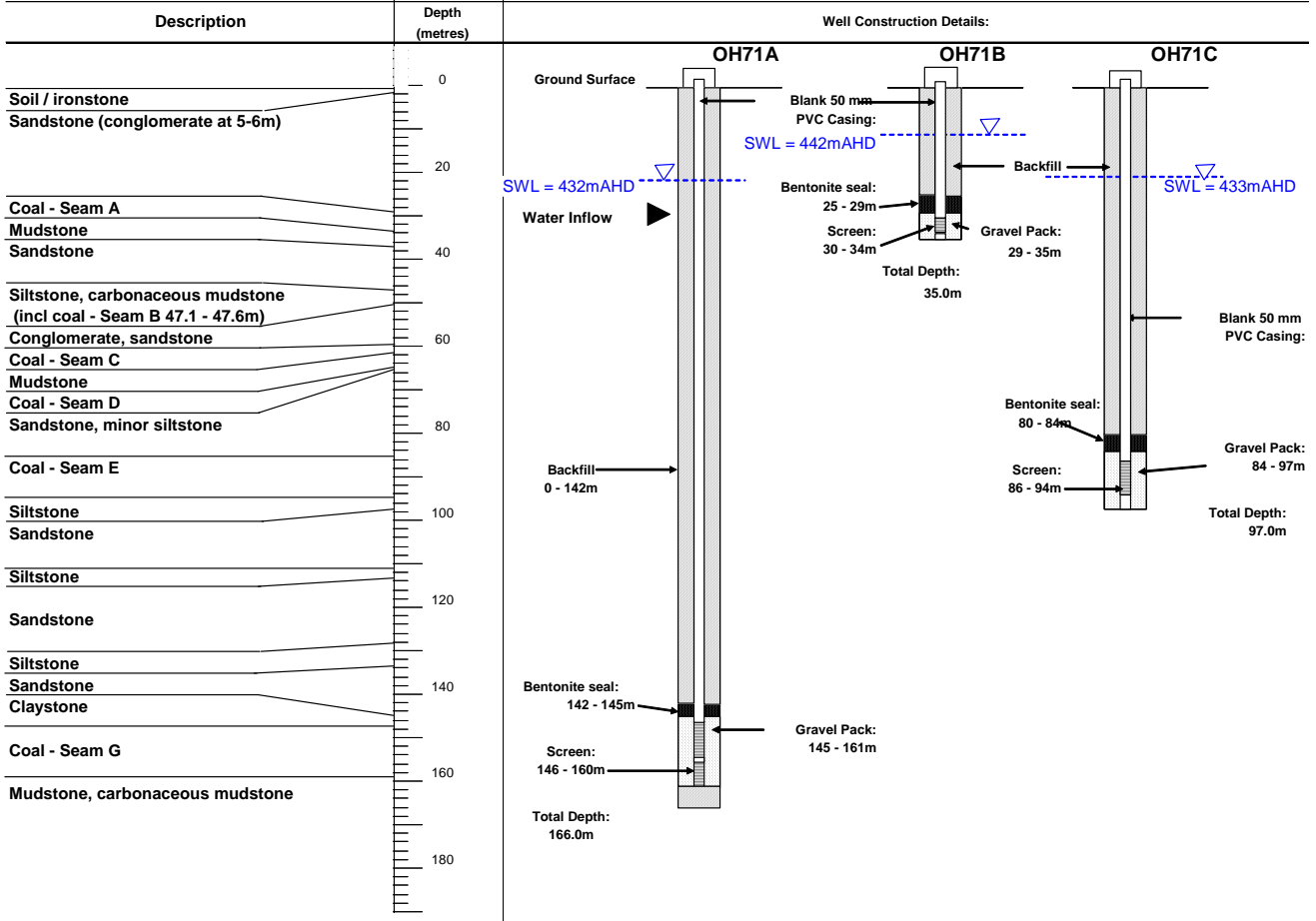


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-611b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH70A, OH70B AND OH70C
		Figure 8

BORES: OH71A, OH71B and OH71C

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Bore: OH71A	Top of Casing: 454.534 mAHD	Ground Level:	Drilling Contractor: Cameron Drilling	Date Started: 12/06/2002	Date Finished: 13/06/2002
Location: Bickham South	OH71B	454.278 mAHD		Cameron drilling	24/06/2002	24/06/2002
	OH71C	454.130 mAHD		Cameron drilling	25/06/2002	25/06/2002
	Hole depth: see below	Supervised By: T Sercombe				

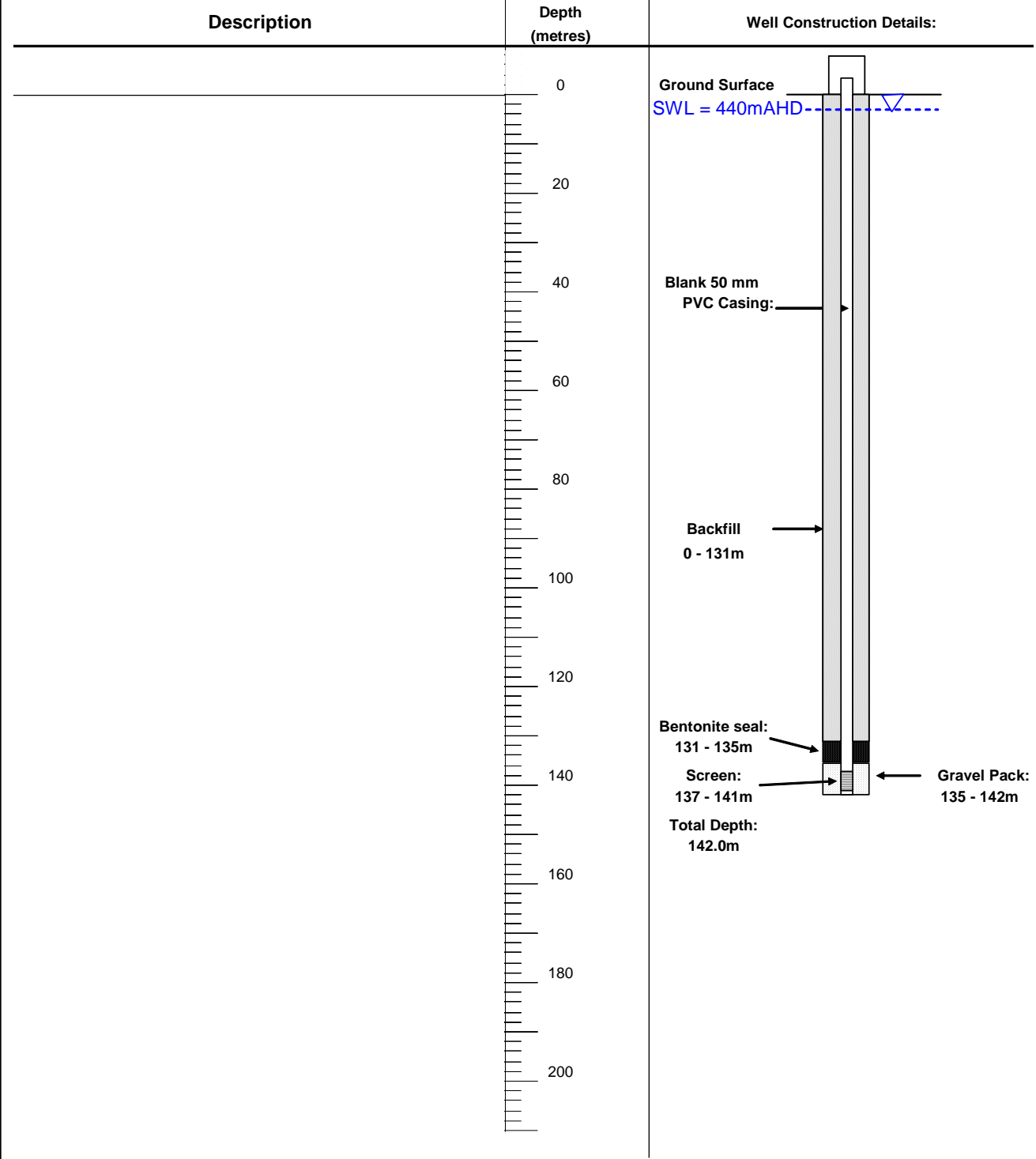


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH71A, OH71B AND OH71C
Drawing No: S02-612b	Rev: A	
aquaterra		Figure 9

BORE: OH72

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 443.760 mAHD Ground Level:	Project No: 02-0096
Location: Bickham South	Date Started: 27/06/2002	Date Finished: 28/06/2002
Drilling Contractor / Method: Cameron Drilling	Hole depth: 142.0m	Supervised By: T Sercombe

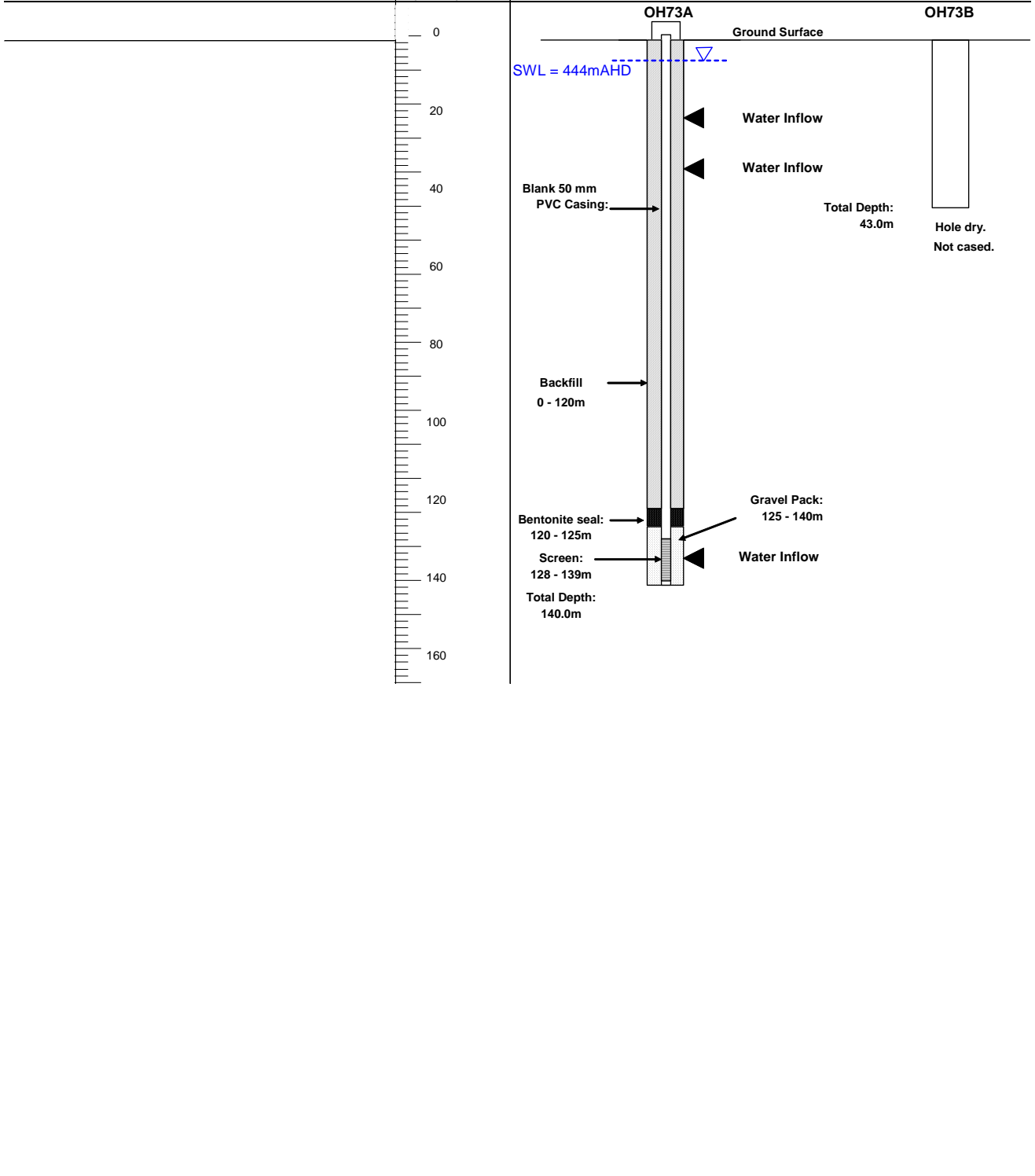


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-613b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH72
		Figure 10

BORES: OH73A and OH73B

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 451.528 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 2/07/2002	Date Finished: 9/07/2002
Drilling Contractor / Method: Cameron Drilling	Hole depth: as shown	Supervised By: T Sercombe

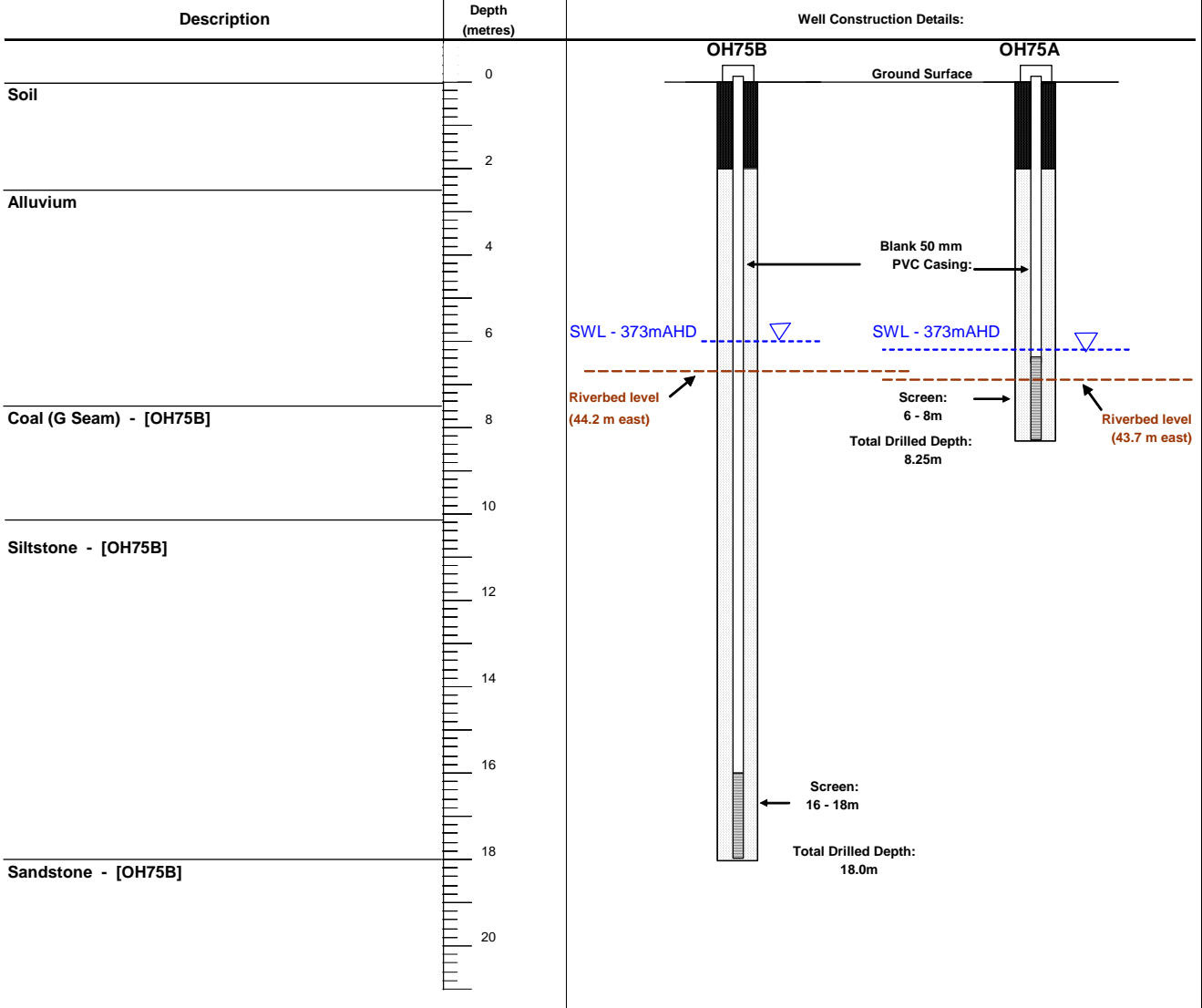


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-614b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH73A AND OH73B
		Figure 11

BORES: OH75A and OH75B

Logging Sheet

Client:	Bore:	Top of Casing:	Ground Level:	Drilling Contractor:	Date Started:	Date Finished:
Bickham Coal Company Pty Ltd	OH75A	379.470 mAHD		Cameron Drilling	13/02/2003	13/02/2003
Location:	OH75B	379.216 mAHD		Cameron drilling	14/02/2003	14/02/2003
Bickham South						
Drilling Contractor / Method:	Hole depth:				Supervised By:	
Cameron Drilling	as shown				T Veness	



Date: 19 March 2009	Scale: as indicated
Initials: PJD	Job No: S02
Drawing No: S02-615b	Rev: A

Bickham Coal Mining Company Ltd

**BICKHAM COAL PROJECT
BORE CONSTRUCTION LOG
OH75A AND OH75B**



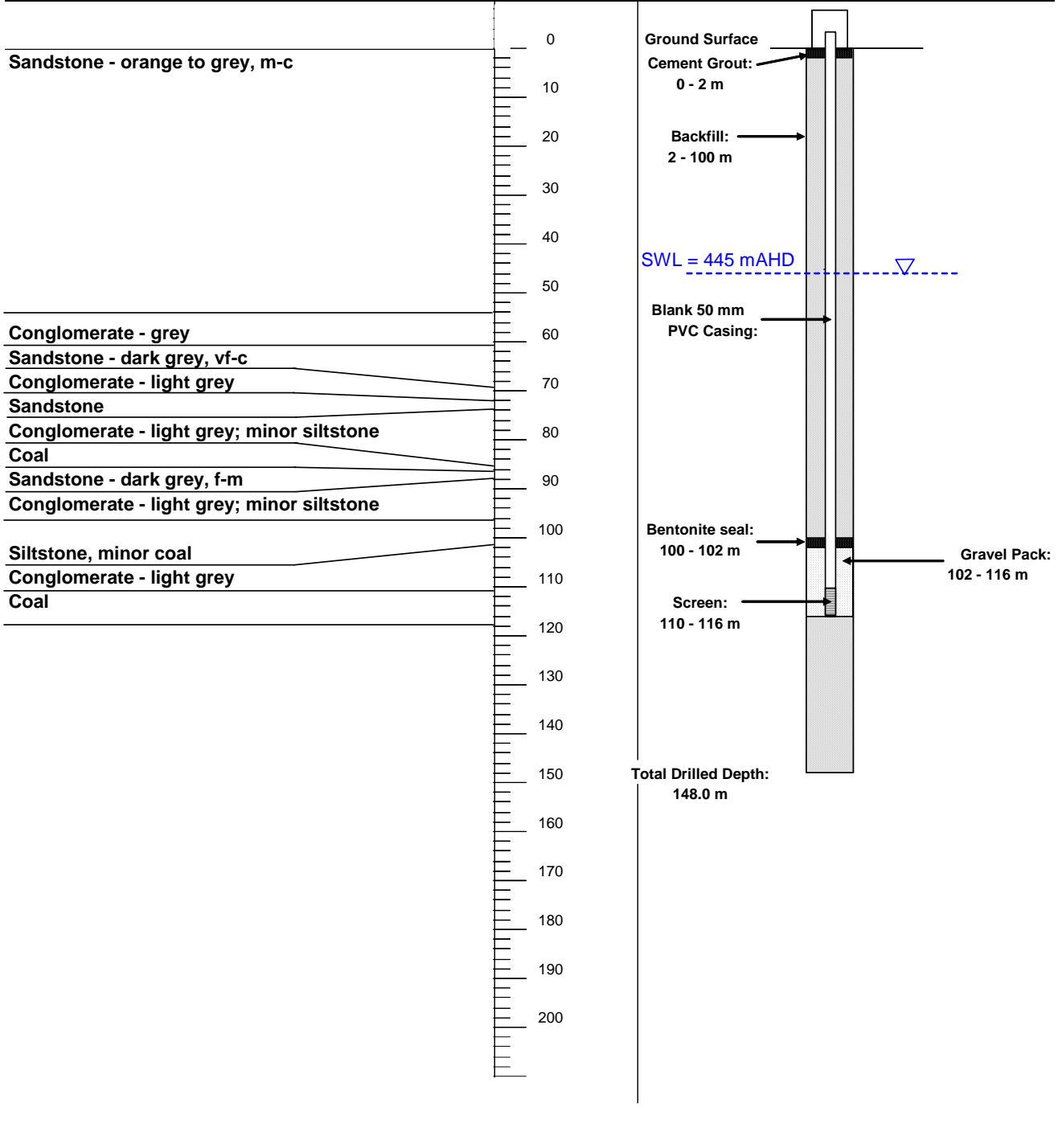
Figure 12

BORE: OH77

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 491.530 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 18/02/2003	Date Finished: 21/02/2003
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 148.0 m	Supervised By: T Veness

Description	Depth (metres)	Well Construction Details:
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Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd	
Initials: PJD	Job No: S02		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH77
Drawing No: S02-616b	Rev: A		
aquaterra		Figure 13	

BORE: OH78

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 383.577 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 27/02/2003	Date Finished: 27/02/2003
Drilling Contractor / Method: Hunter Drilling	Hole depth: 28.2m	Supervised By: R Davis

Description	Depth (metres)	Well Construction Details:
Alluvium	0	
Coal (G Seam)	5	
	10	
	15	
	20	
Shale	25	
	30	
	35	
	40	
	45	
	50	

Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH78
Initials: PJD	Job No: S02	
Drawing No: S02-617b	Rev: A	
		Figure 14

BORE: OH79

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 383.452 mAHD	Project No: 02-0096
Location: Bickham South	Ground Level:	Date Started: 27/02/2003
Drilling Contractor / Method: Hunter Drilling	Hole depth: 22.75m	Date Finished: 27/02/2003
		Supervised By: R Davis

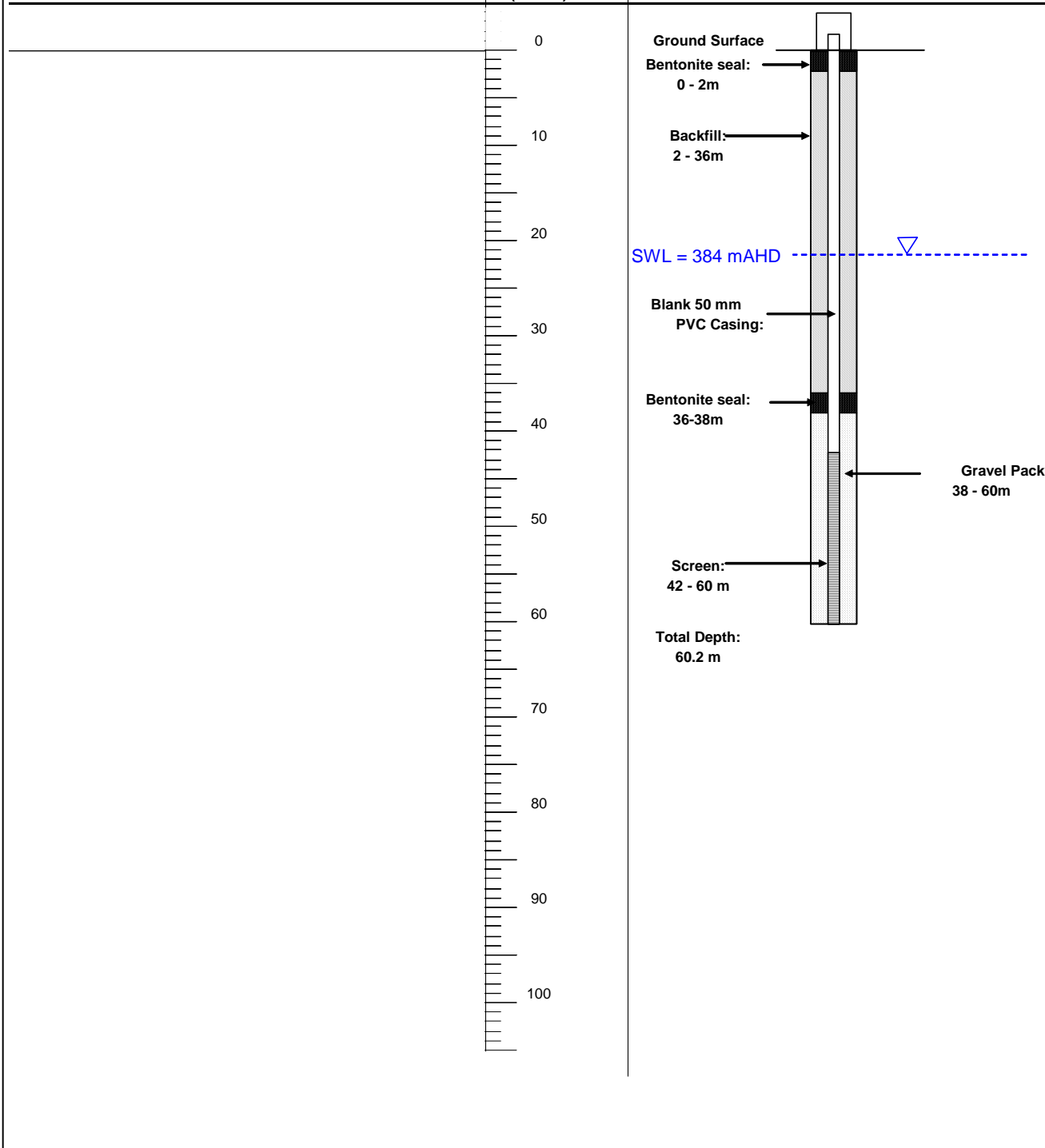
Description	Depth (metres)	Well Construction Details:
Alluvium	0	
Coal (undifferentiated)	5	
Coal (undifferentiated)	10	
Coal (undifferentiated)	15	
Shale	20	
	25	
	30	
	35	
	40	
	45	
	50	

Date: 18 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH79
Drawing No: S02-618b	Rev: A	
		Figure 15

BORE: DDH85B

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 405.473 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling	Hole depth: 60.2 m	Supervised By: ?
Piezometer Installed by J D Drilling	Depth (metres)	Well Construction Details:



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-619b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG DDH85B
		Figure 16

BORE: OH86

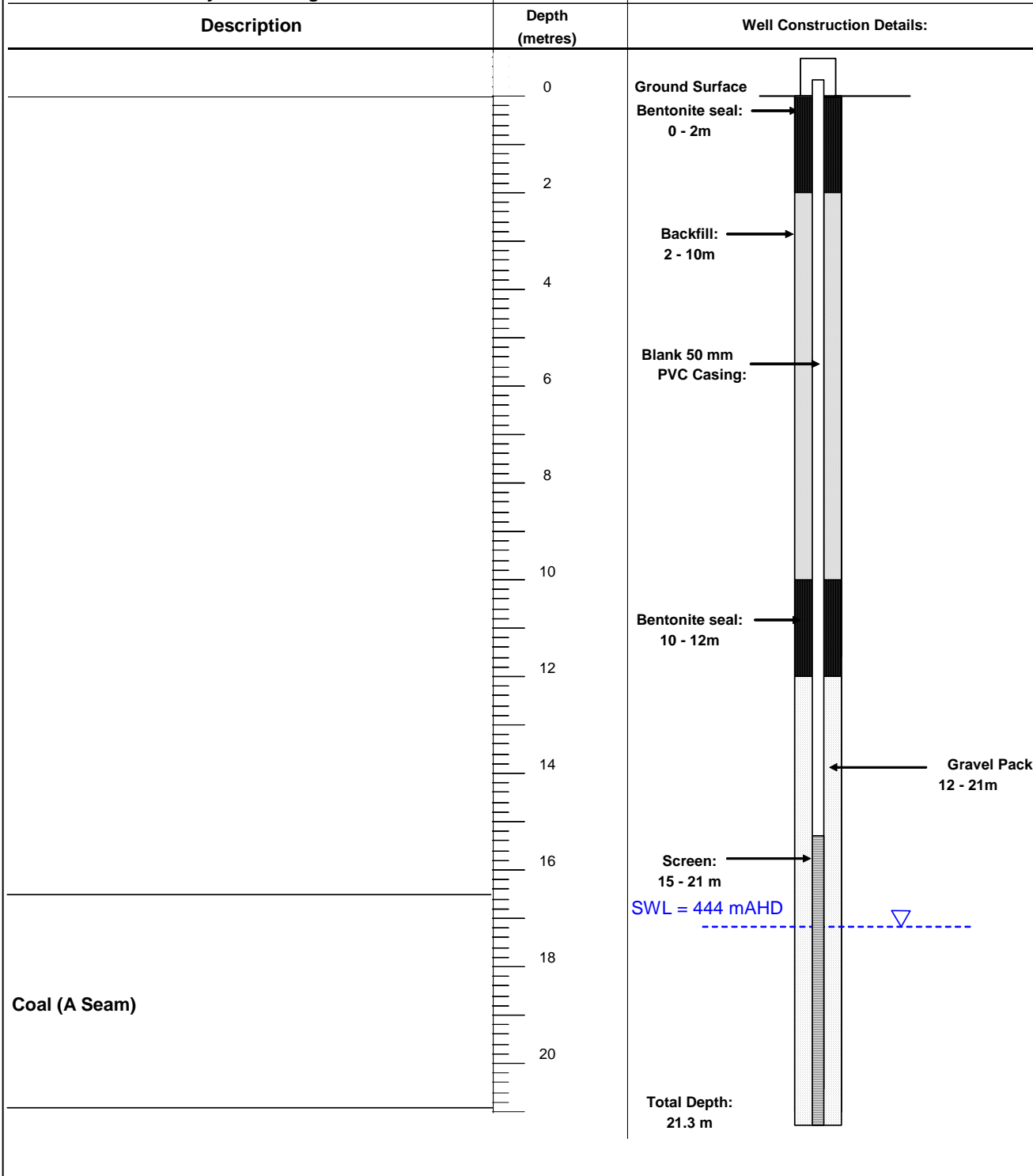
Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 463.612 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling Piezometer Installed by J D Drilling	Hole depth: 20.1 m	Supervised By: ?
Description	Depth (metres)	Well Construction Details:
<div style="position: absolute; bottom: 0; left: 0; width: 100%; padding: 5px;"> Coal (A Seam) </div>		<p>Ground Surface</p> <p>Bentonite seal: 0 - 2m</p> <p>Backfill: 2 - 10m</p> <p>Blank 50 mm PVC Casing:</p> <p>Bentonite seal: 10 - 12m</p> <p>Gravel Pack: 12 - 21m</p> <p>Screen: 15 - 21 m</p> <p>SWL = 445 mAHD</p> <p>Total Depth: 21.0 m</p>

Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH86
Initials: PJD	Job No: S02	
Drawing No: S02-620b	Rev: A	
		Figure 17

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 461.323 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling	Hole depth: 21.3 m	Supervised By: ?



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-621b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH87
		Figure 18

BORE: OH88

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 458.268 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling	Hole depth: 28.5 m	Supervised By: ?

Description	Depth (metres)	Well Construction Details:
	0	Ground Surface
	2	Bentonite seal: 0 - 2m
	4	
	6	Backfill: 2 - 15m
	8	
	10	
	12	Blank 50 mm PVC Casing:
	14	
	16	Bentonite seal: 15 - 17m
	18	
	20	SWL = 438 mAHD
	22	Gravel Pack: 17 - 28.5m
	24	
Coal (A Seam)	26	Screen: 22.5 - 28.5 m
	28	
	30	Total Depth: 28.5 m
	32	
	34	
	36	
	38	
	40	

Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-622b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH88
		Figure 19

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 468.165 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling Piezometer Installed by J D Drilling	Hole depth: 30.5 m	Supervised By: ?

Description	Depth (metres)	Well Construction Details:
	0	Ground Surface
	0 - 2	Bentonite seal: 0 - 2m
	2 - 18	Backfill: 2 - 18m
	18 - 20	Blank 50 mm PVC Casing: 18 - 20m
	20 - 30.5	Bentonite seal: 18 - 20m
	20 - 30.5	Gravel Pack: 20 - 30.5m
	24.5 - 30.5	Screen: 24.5 - 30.5 m
	30.5	Total Depth: 30.5 m
Coal (A Seam)	24.5 - 30.5	
	22	SWL = 446 m/

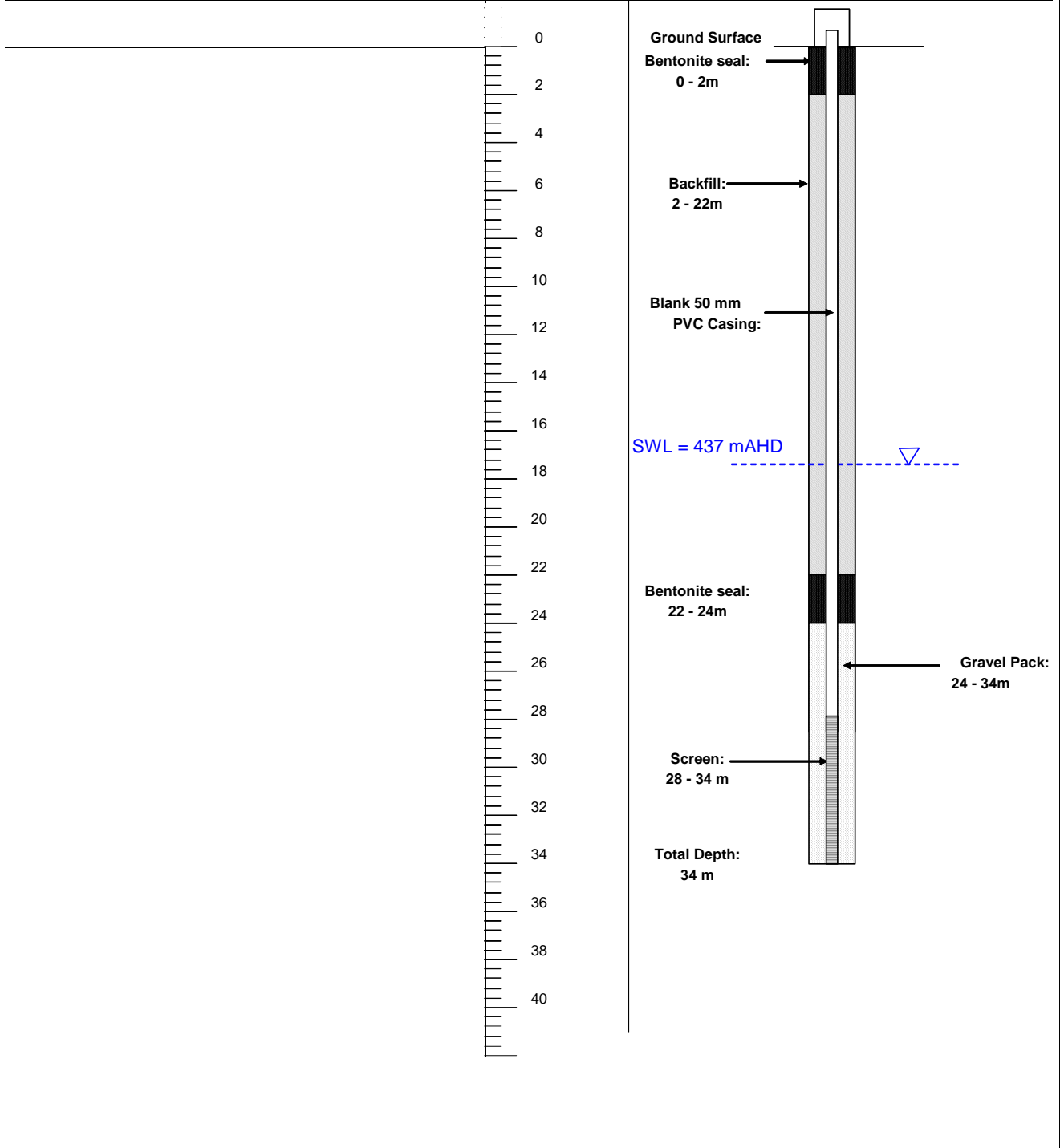
Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-623b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH89
		Figure 20

BORE: OH90

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 454.022 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling	Hole depth: 34 m	Supervised By: ?

Description	Depth (metres)	Well Construction Details:
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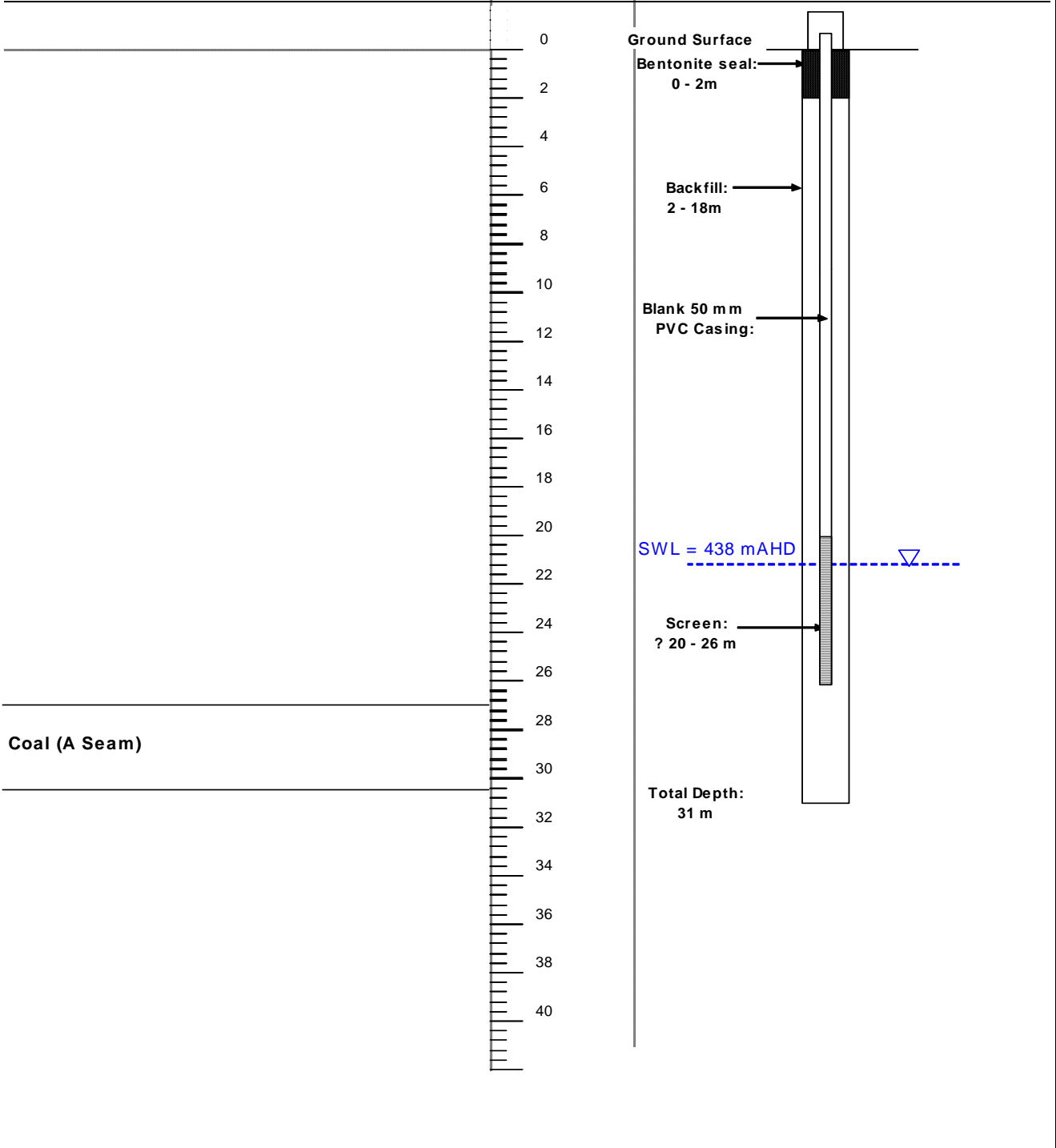
Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-624b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH90
		Figure 21

Logging Sheet

BORE: OH91

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 459.203 mAHD	Project No: 02-0096
Location: Bickham South	Date Started:	Date Finished: (Piezometer installed November 2004)
Drilling Contractor / Method: Drilled by JD Drilling	Hole depth: 31 m	Supervised By: ?

Description	Depth (metres)	Well Construction Details:
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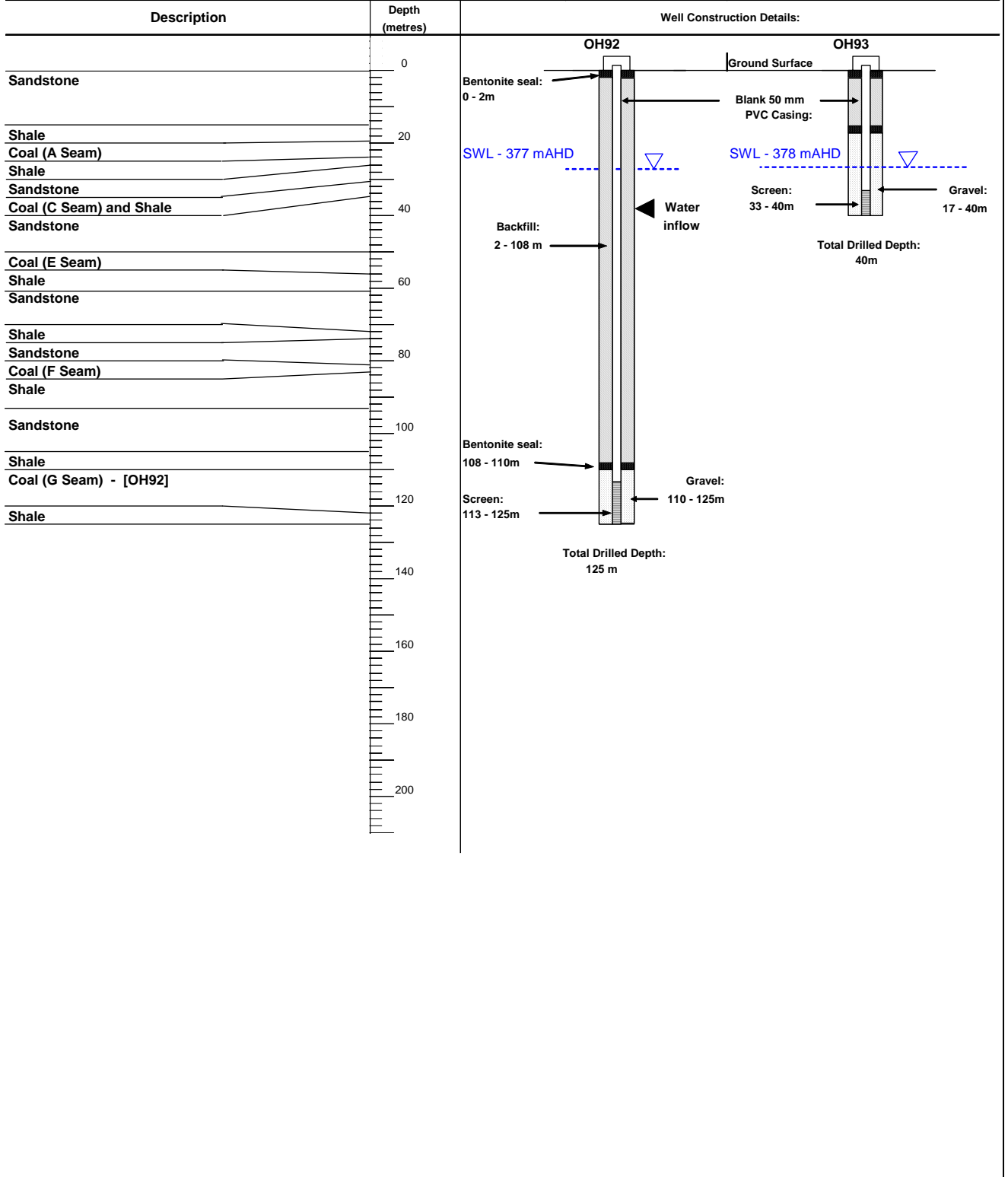


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-625b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH91
		Figure 22

BORES: OH92 and OH93

Logging Sheet

Client:	Bore:	Top of Casing:	Ground Level:	Drilling Contractor:	Date Started:	Date Finished:
Bickham Coal Company Pty Ltd	OH92		404.056 mAHD	J D Drilling	31/01/2005	31/01/2005
Location:	OH93		403.749 mAHD	J D Drilling	31/01/2005	31/01/2005
Drilling Contractor / Method:		Hole depth:		Supervised By:		
J R Drilling		as shown		R Davis		

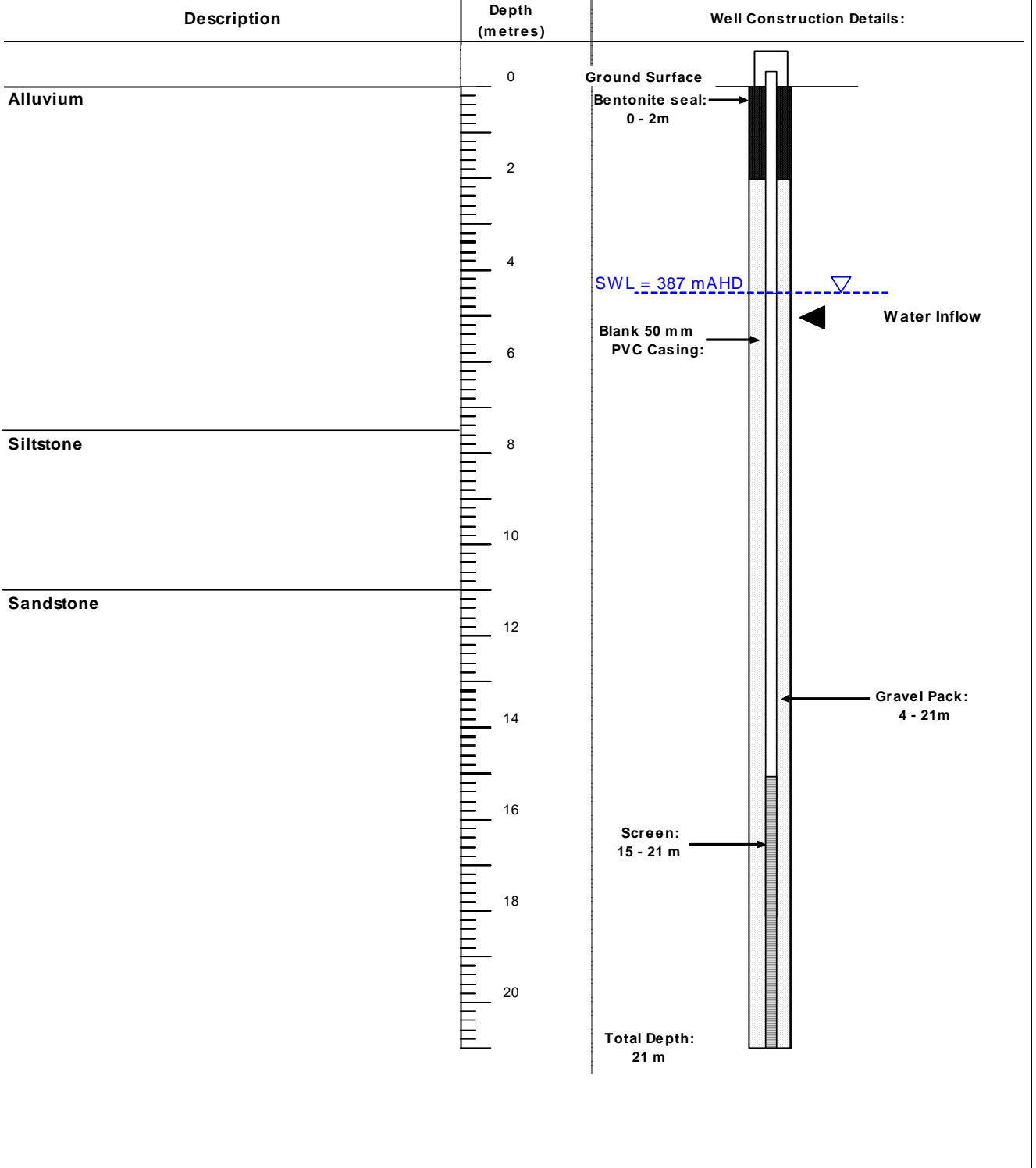


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH92 AND OH93
Drawing No: S02-626b	Rev: A	
aquaterra		Figure 23

Logging Sheet

BORE: OH94

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 392.132 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 1/02/2005	Date Finished: (Piezometer installed February 2005) 1/02/2005
Drilling Contractor / Method: Drilled by J D Drilling Piezometer Installed by J D Drilling	Hole depth: 21 m	Supervised By: R Davis

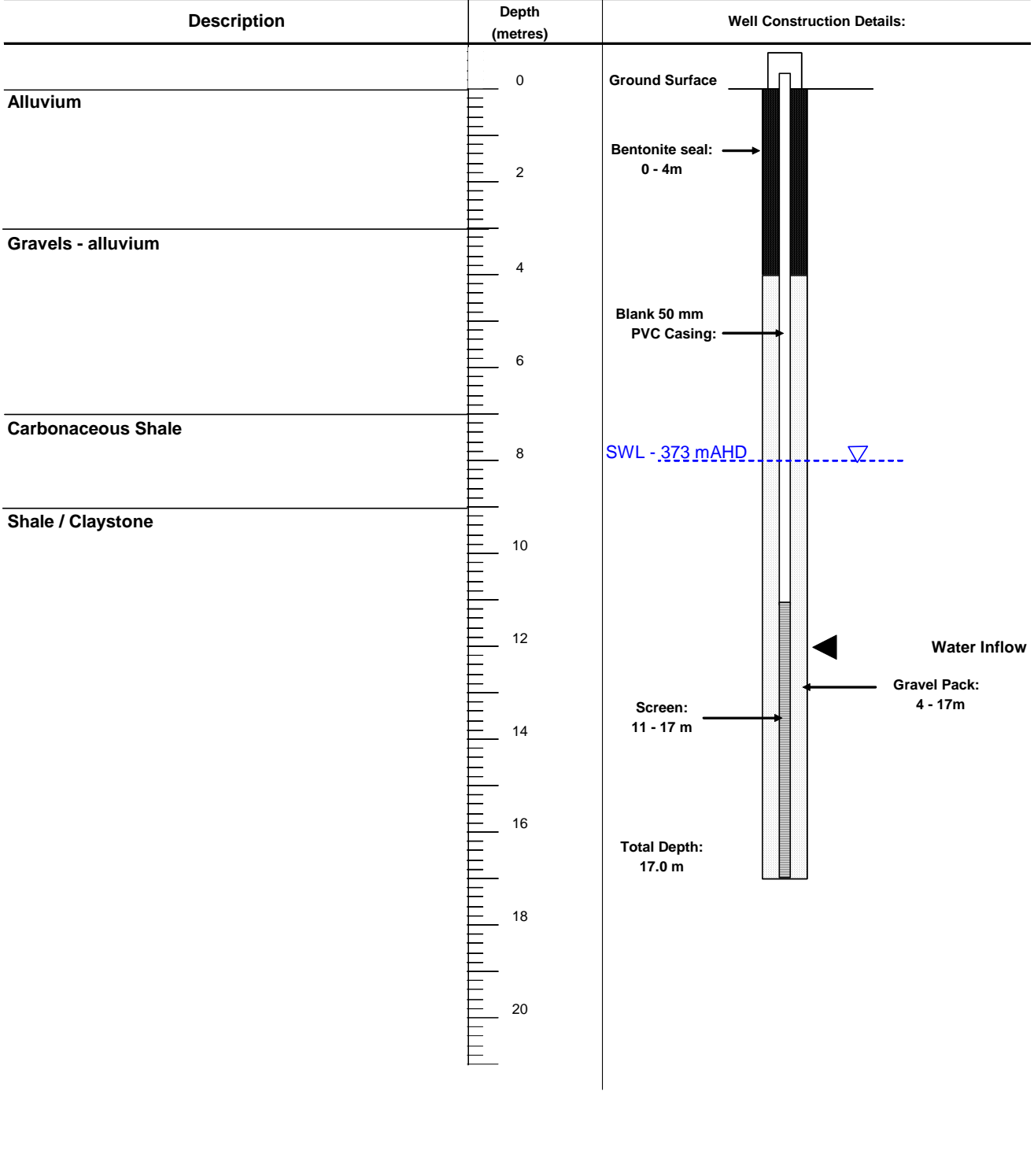


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-627b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH94
		Figure 24

BORE: OH95

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 381.352 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 31/01/2005	Date Finished: 31/01/2005
Drilling Contractor / Method: Drilled by J D Drilling	Hole depth: 17.0 m	Supervised By: R Davis
Piezometer Installed by J D Drilling		



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH95
Drawing No: S02-628b	Rev: A	
		Figure 25

BORE: OH97

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 446.349 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 28/02/2005	Date Finished: 7/03/2005
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 242 m	Supervised By: M Lorenz

Description	Depth (metres)	Well Construction Details:
	0	Ground Surface ▽
Soil - orange brown sandy loam		SWL - 447 mAHD (before casing)
	10	
Pebble Conglomerate - light grey		
	20	▽
Siltstone - grey to dark grey		SWL - 427 mAHD (after casing)
Pebble Conglomerate - light grey		
	30	
Siltstone - grey to dark grey		
Pebble Conglomerate - light grey		
	40	
Claystone - light grey		
Pebble Conglomerate - light grey		
	50	
	60	
Core Loss		
	70	
Pebble Conglomerate - light grey		
	80	
Core Loss		
	90	
Pebble Conglomerate - light grey, with 20% light grey to white f-m sandstone		
	100	
Siltstone		

The diagram illustrates the well construction details. It shows a vertical borehole with a casing. Key features include:

- Ground Surface:** Indicated by a dashed line at the top.
- SWL - 447 mAHD (before casing):** Static water level before casing installation.
- SWL - 427 mAHD (after casing):** Static water level after casing installation.
- Blank 50 mm PVC Casing:** A section of casing without screen.
- Bentonite seal: 75 - 79m:** A seal installed between 75m and 79m depth.
- Gravel Pack: 79 - 91m:** A gravel pack installed between 79m and 91m depth.
- Screen: 85 - 91m:** A screen installed between 85m and 91m depth.
- Drilled Depth: 242 m:** The total depth of the borehole.

Date: 13 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH97
Drawing No: S02-629b	Rev: A	
aquaterra		Figure 26

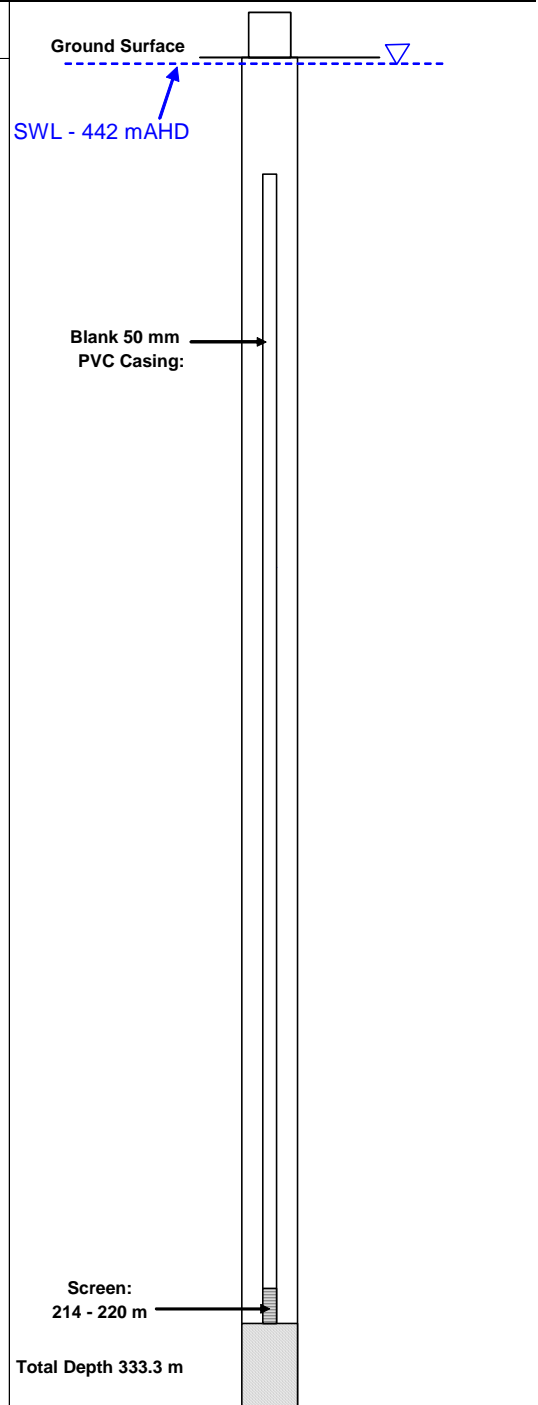
BORE: DDH99

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 446.046 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: ??	Date Finished: 18/03/2005
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 333.3 m	Supervised By: M Lorenz

Description	Depth (metres)	Well Construction Details:
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	0
Soil - brown sandy loam	0 - 10
Siltstone - grey to dark grey	10 - 20
Pebble Conglomerate with minor siltstone	20 - 25
Sandstone - light grey, f-m	25 - 30
Pebble Conglomerate	30 - 35
Sandstone, light grey, minor pebble conglomerate	35 - 50
	40
	50
Pebble Conglomerate, minor sandstone	50 - 60
Sandstone - light grey, f-m	60 - 70
	70
	80
	90
	100
	110
	120
	130
	140
	150
	160
	170
	180
	190
Pebble Conglomerate, minor sandstone	190 - 210
	200
	210
Sandstone - light grey, m-vc	210 - 220
Mudstone	220 - 225
Coal - A Seam	225 - 230
Shale, mudstone, siltstone, minor coal	230 - 333.3
	230



Date: 19 March 2009	Scale: as indicated
Initials: PJD	Job No: S02
Drawing No: S02-630b	Rev: A

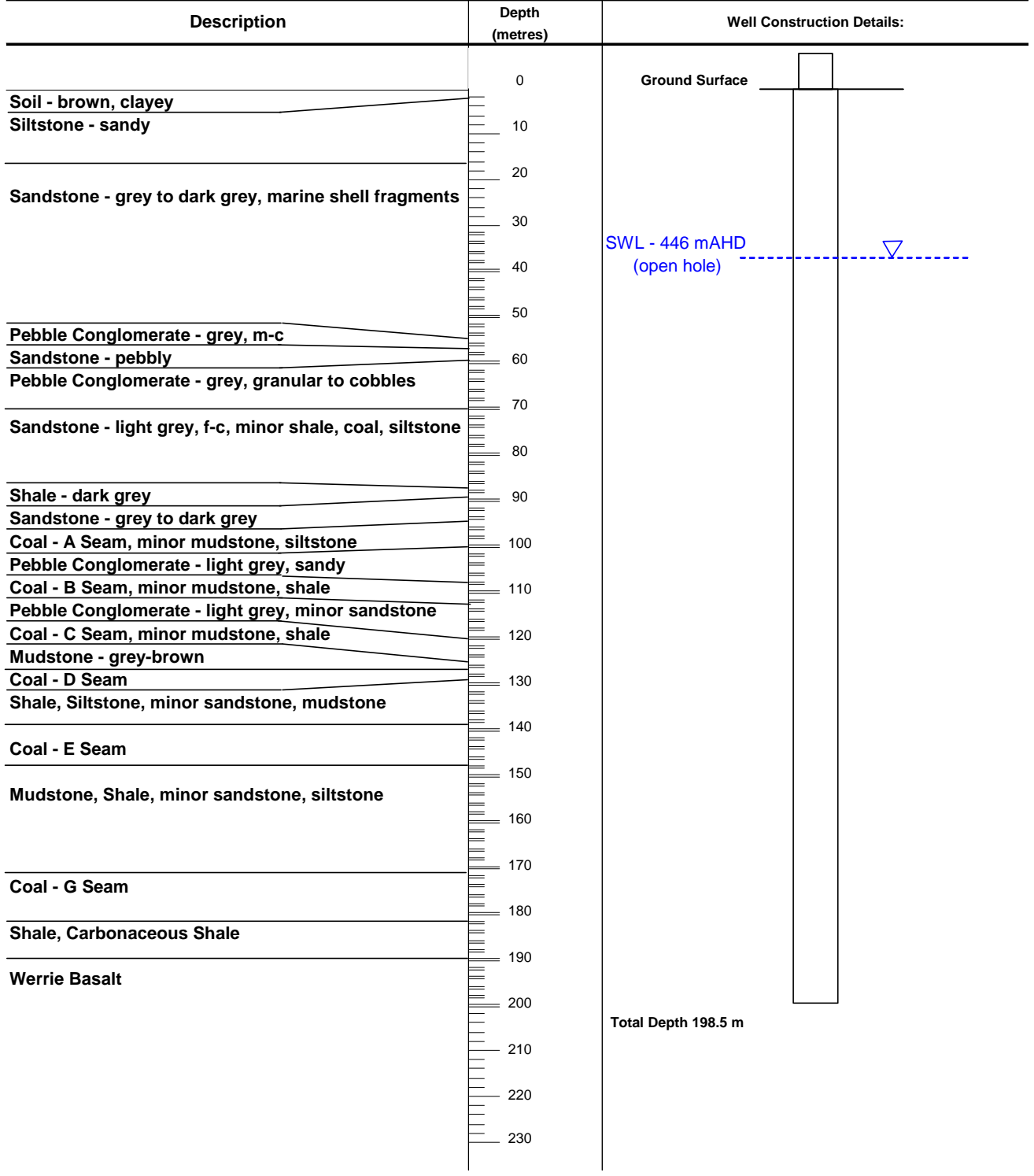
Bickham Coal Mining Company Ltd


**BICKHAM COAL PROJECT
BORE CONSTRUCTION LOG
DDH99**

BORE: DDH100

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 482.778 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 26/04/2005	Date Finished: 24/05/2005
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 198.5 m	Supervised By: M Lorenz

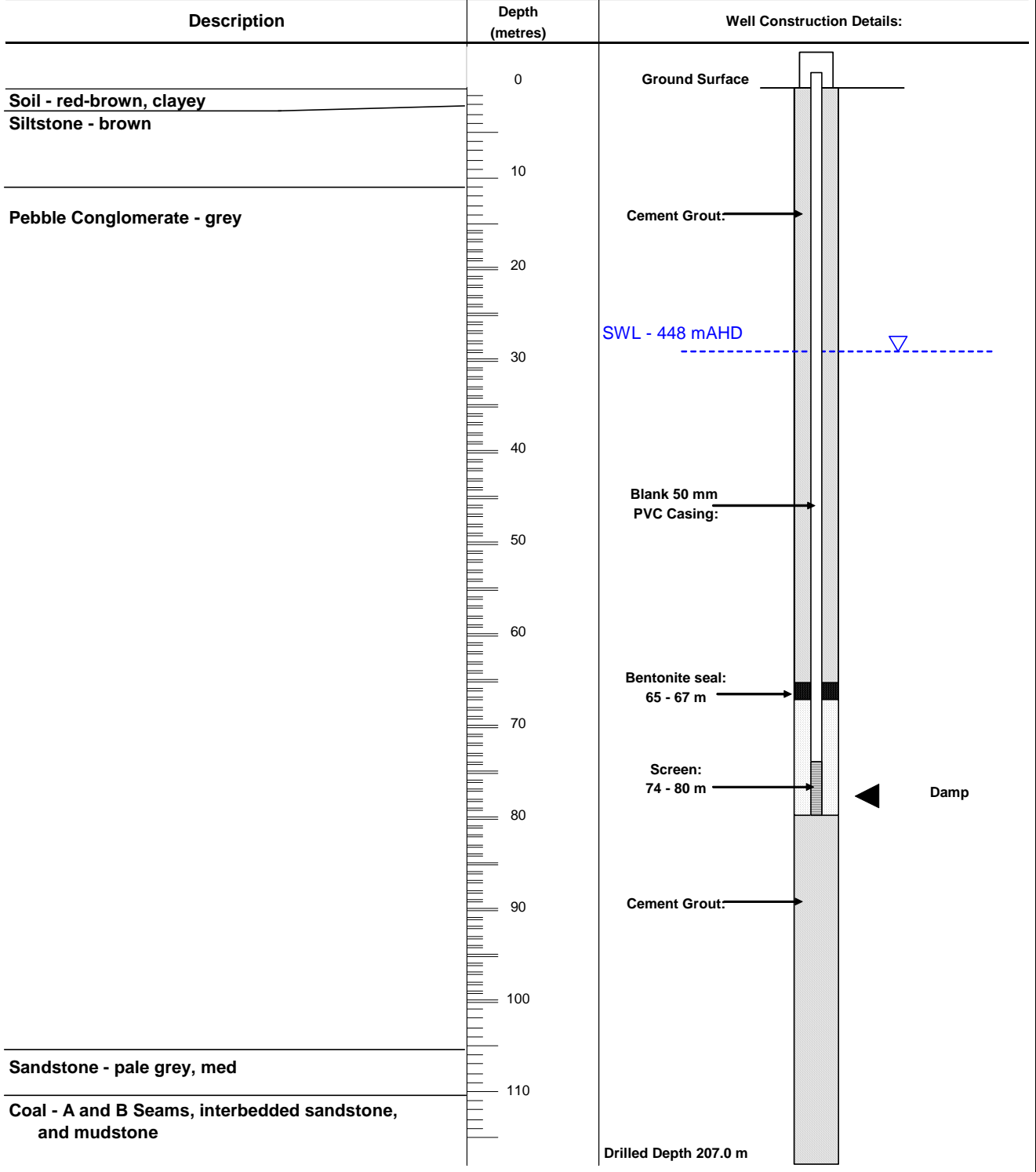


Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG DDH100
Initials: PJD	Job No: S02	
Drawing No: S02-631b	Rev: A	
		Figure 28

BORE: OH102

Logging Sheet

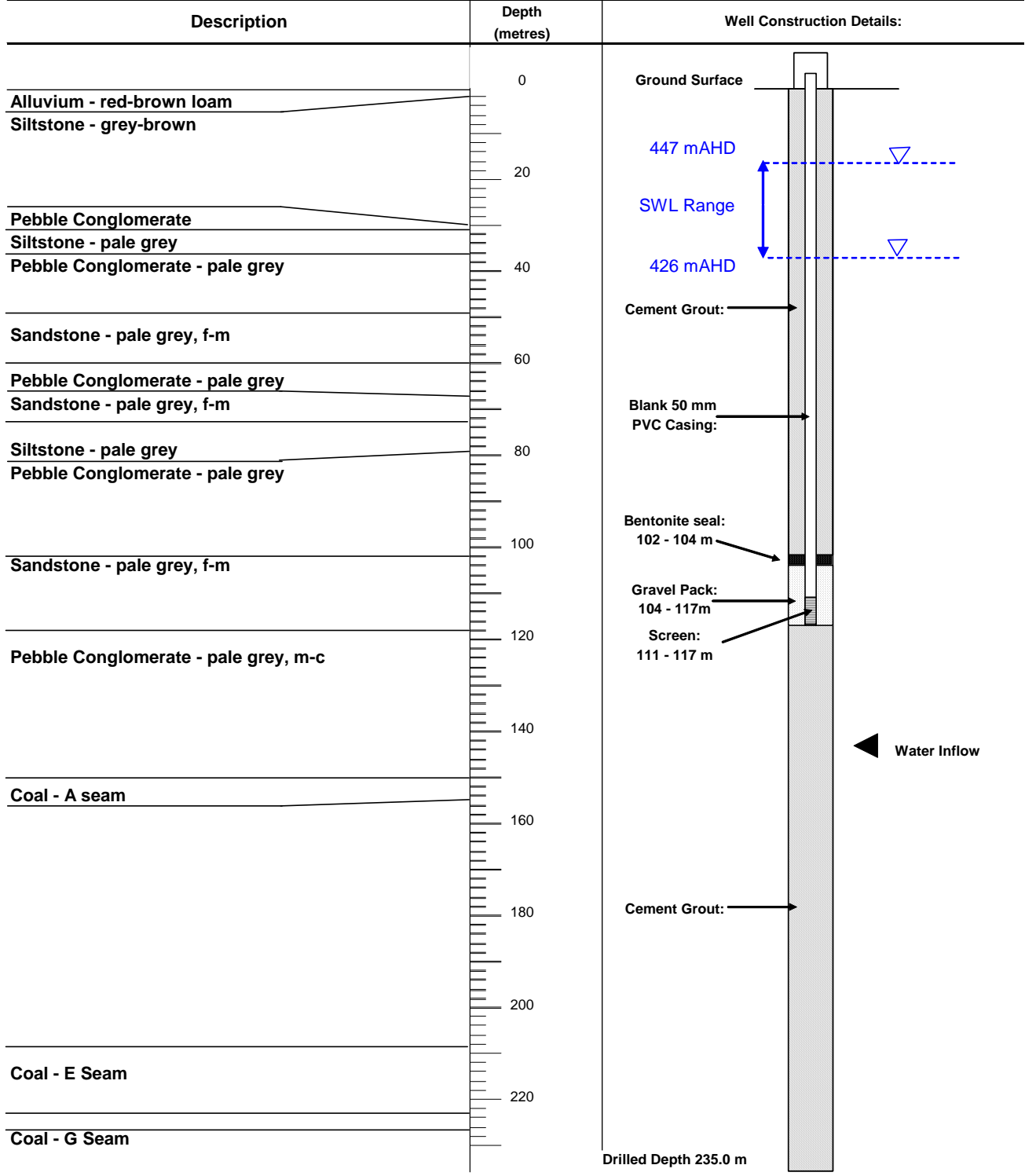
Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 476.502 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 1/06/2005	Date Finished: 7/06/2005
Drilling Contractor / Method: Hunter Drilling	Hole depth: 207 m	Supervised By: M Lorenz



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH102
Initials: PJD	Job No: S02	
Drawing No: S02-632b	Rev: A	
		Figure 29

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 463.284 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 20/06/2005	Date Finished: 23/06/2005
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 235 m	Supervised By: M Lorenz



Date: 19 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-633b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH105
		Figure 30

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 466.936 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 27/06/2005	Date Finished: 29/06/2005
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 113 m	Supervised By: M Lorenz

Description	Depth (metres)	Well Construction Details:
	0	Ground Surface
Alluvium - red-brown gravel	0 - 2	
Pebble Conglomerate - red-brown to grey	2 - 10	
Sandstone - grey-brown, med	10 - 15	
Pebble Conglomerate - grey	15 - 20	
Siltstone - grey, minor coal	20 - 25	
Pebble Conglomerate - pale grey	25 - 28	
Siltstone - grey, minor coal	28 - 30	
Pebble Conglomerate - pale grey	30 - 32	
Siltstone - grey, minor coal	32 - 34	
Pebble Conglomerate - pale grey	34 - 36	
Coal - A Seam, siltstone, shale	36 - 40	
Pebble Conglomerate - pale grey	40 - 42	
Coal - B Seam	42 - 45	
Pebble Conglomerate - pale grey cream, minor shale	45 - 50	
Coal - C and D Seams	50 - 65	
Siltstone and Sandstone, minor shale	65 - 75	
Shale	75 - 80	
Siltstone	80 - 85	
Coal - E Seam	85 - 95	
Carbonaceous Mudstone, minor coal	95 - 100	
Coal - G Seam	100 - 105	
Mudstone - cream-grey	105 - 110	
Igneous - olive-purple, very hard	110 - 113	

Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH106
Initials: PJD	Job No: S02	
Drawing No: S02-634b	Rev: A	
		Figure 31

BORE: OH108

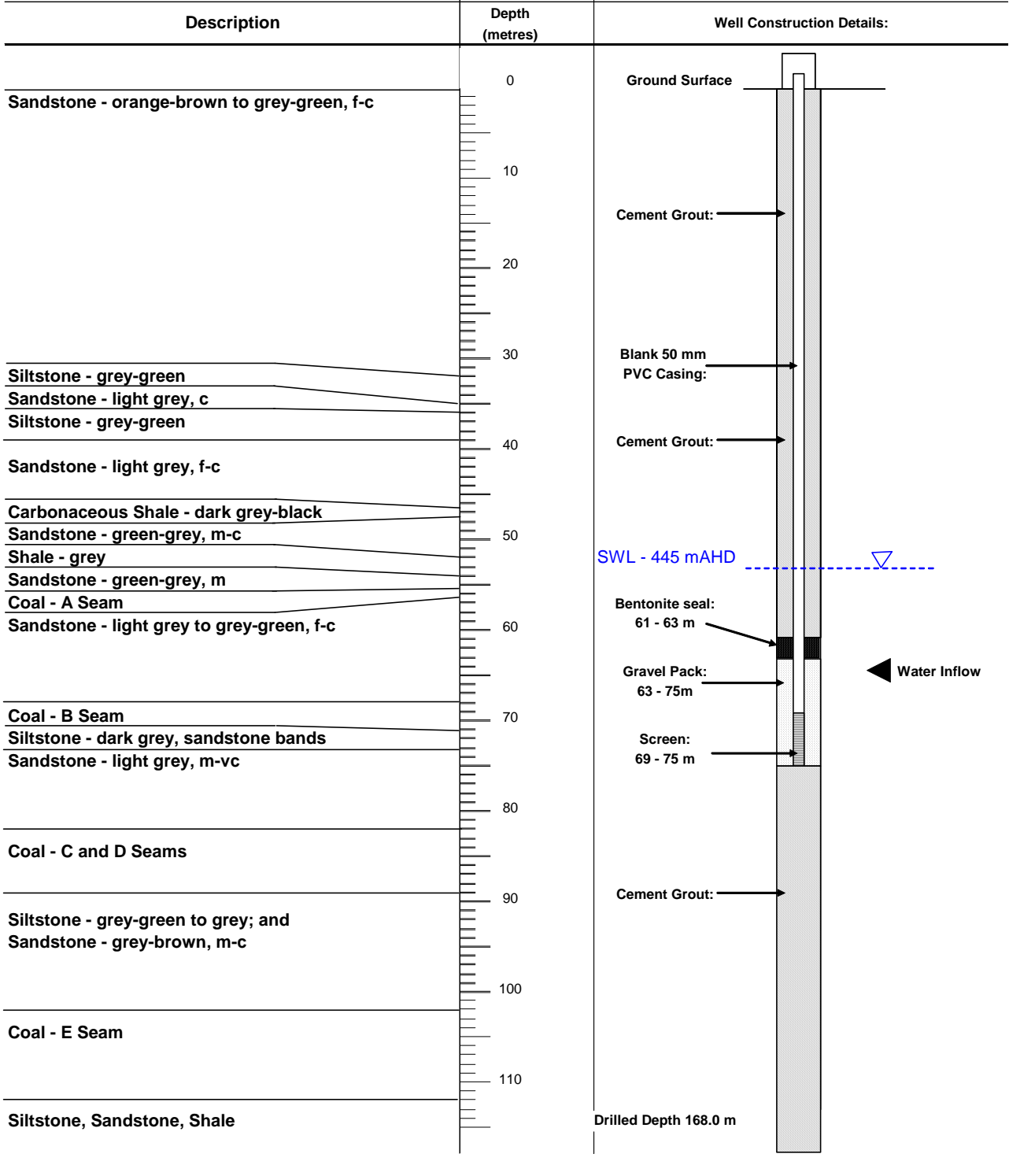
Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 472.222 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 15/08/2005	Date Finished: 18/08/2005
Drilling Contractor / Method: Hubter Drilling	Hole depth: 78 m	Supervised By: M Lorenz
Description	Depth (metres)	Well Construction Details:
	0	Ground Surface
Soil		<p>SWL - 427 mAHD (open hole)</p> <p>Drilled Depth 78.0 m</p>
Coal - undifferentiated		
Conglomerate	10	
Coal - undifferentiated		
Conglomerate		
	20	
	30	
Coal - undifferentiated		
Carbonaceous shale		
Coal - undifferentiated	40	
Sandstone		
Coal - undifferentiated, minor shale	50	
Sandstone		
Coal - undifferentiated, minor shale		
Shale	60	
Igneous		
	70	
	80	
	90	
	100	
	110	

Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH108
Initials: PJD	Job No: S02	
Drawing No: S02-635b	Rev: A	
		Figure 32

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 498.422 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 19/07/2005	Date Finished: 20/07/2005
Drilling Contractor / Method: Drilled by Hunter Drilling	Hole depth: 168.0 m	Supervised By: M Lorenz



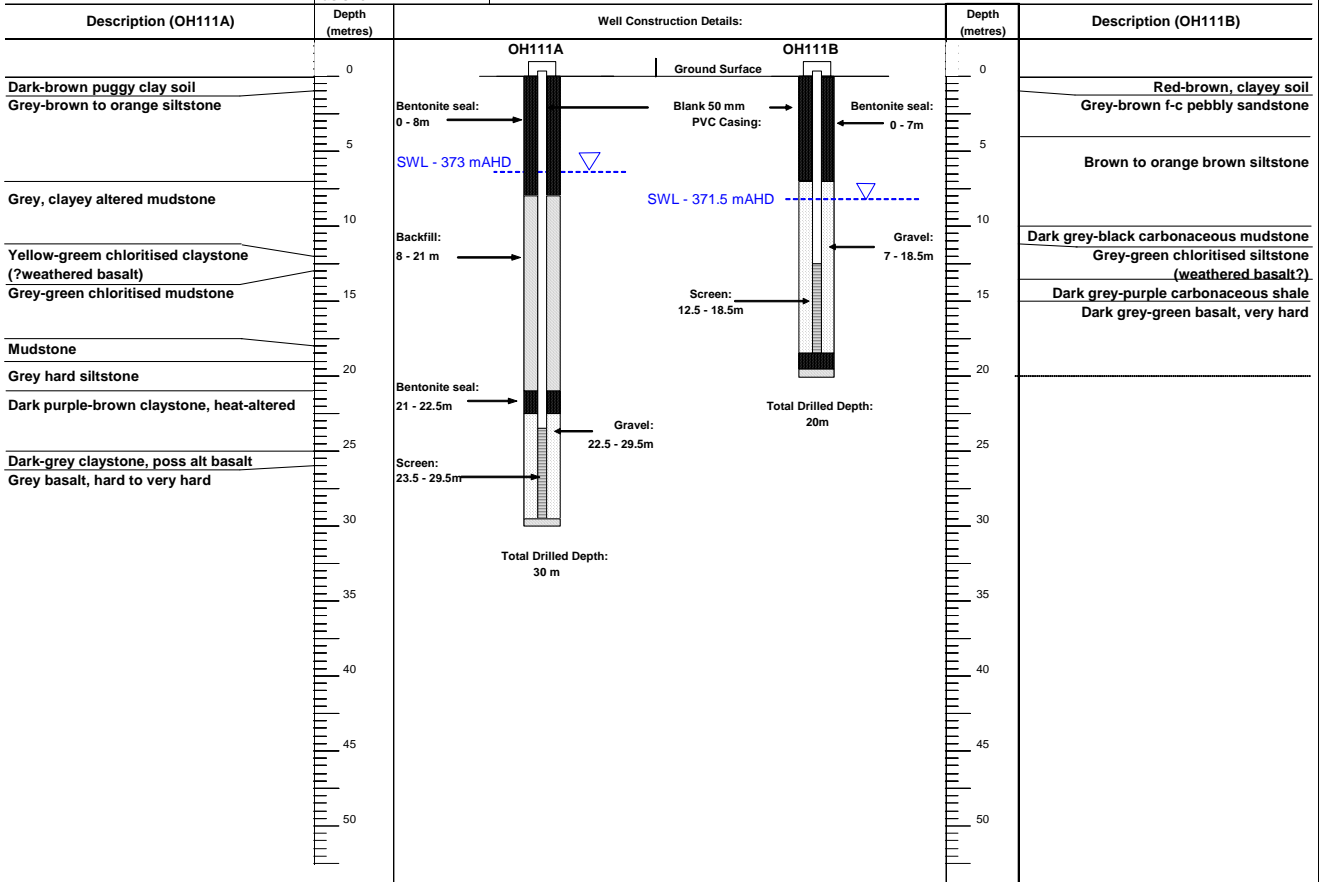
Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	
Drawing No: S02-636b	Rev: A	
aquaterra		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH110
		Figure 33

BORES: OH111A and OH111B

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Bore: OH111A	Top of Casing: 380.279 mAHD	Ground Level: 379.617 mAHD	Drilling Contractor: Hunter Drilling	Date Started: 21/07/2005	Date Finished: 21/07/2005	Supervised By: M Lorenz
Location: Bickham South	OH111B	380.510 mAHD	379.696 mAHD	Hunter Drilling	21/07/2005	21/07/2005	

Hole depth:
as shown



Date: 20 March 2009

Scale: as indicated

Bickham Coal Mining Company Ltd

Initials: PJD

Job No: S02

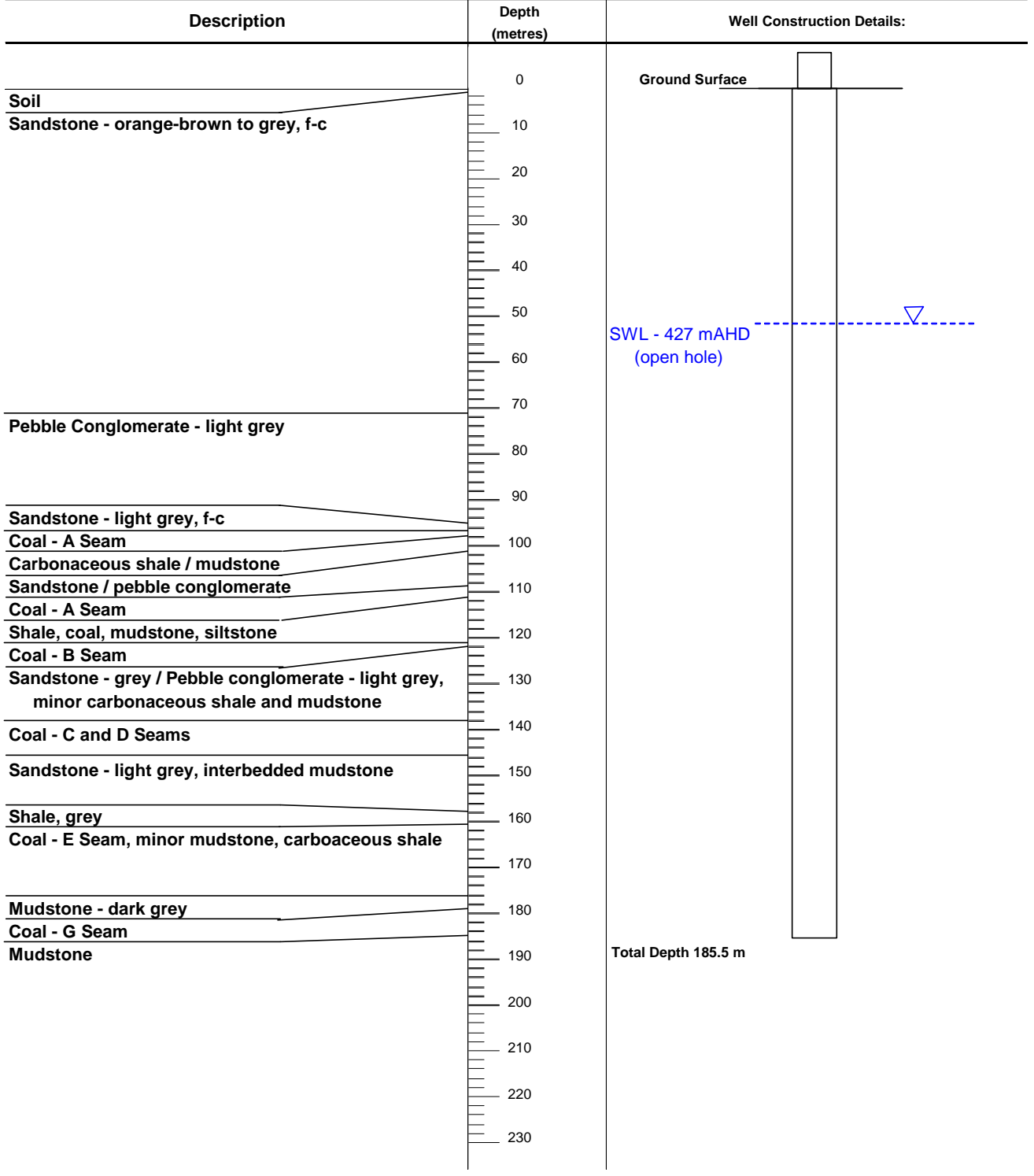
**BICKHAM COAL PROJECT
BORE CONSTRUCTION LOG
OH111A AND OH111B**

Drawing No: S02-637b

Rev: A

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: Ground Level: 479.422 mAHD	Project No: 02-0096
Location: Bickham South	Date Started: 22/07/2005	Date Finished: 9/08/2005
Drilling Contractor / Method: Hunter Drilling	Hole depth: 185.5 m	Supervised By: M Lorenz

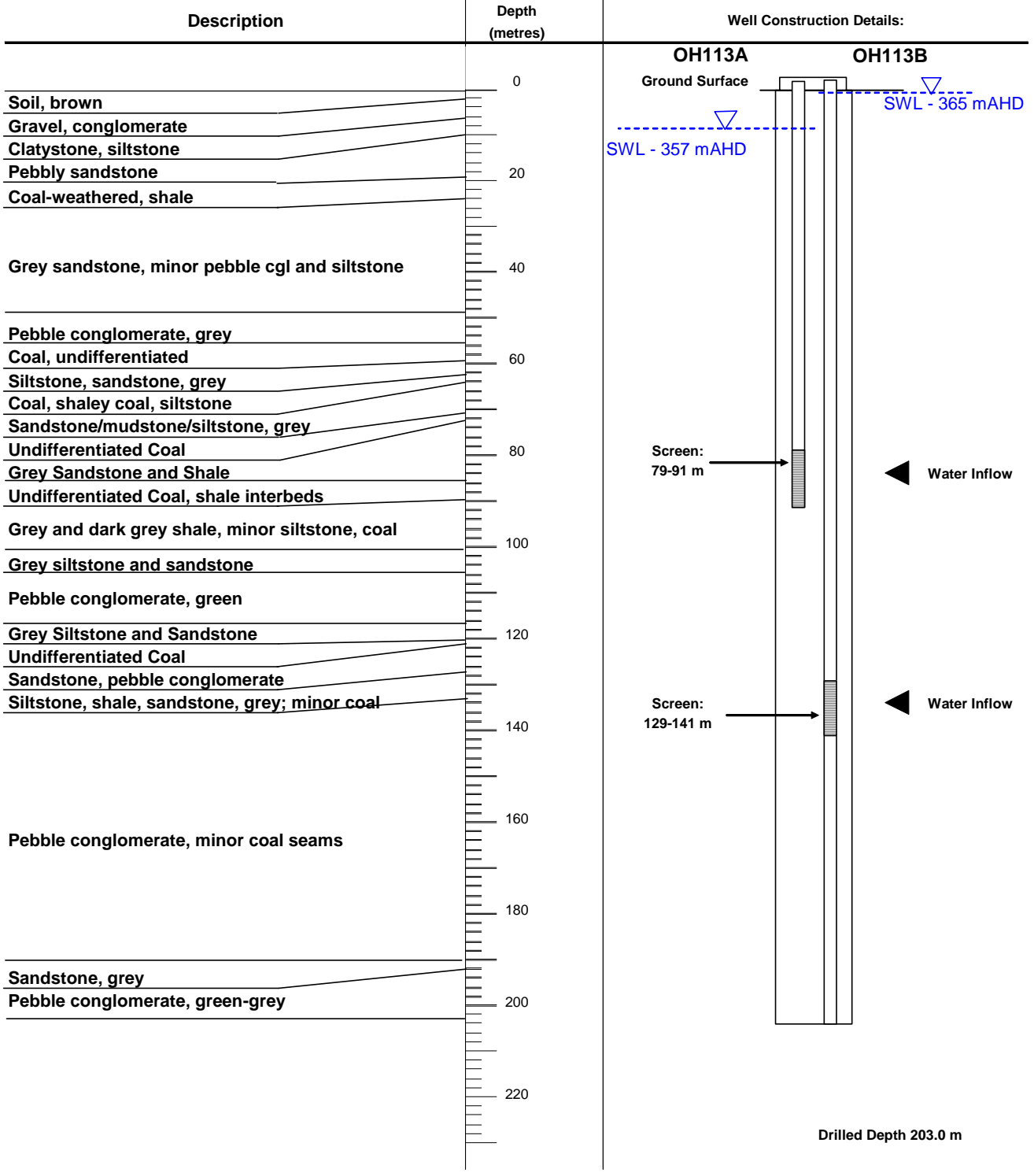


Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd	
Initials: PJD	Job No: S02		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG DDH112
Drawing No: S02-638b	Rev: A		
aquaterra			

BORE: OH113A and 113B

Logging Sheet

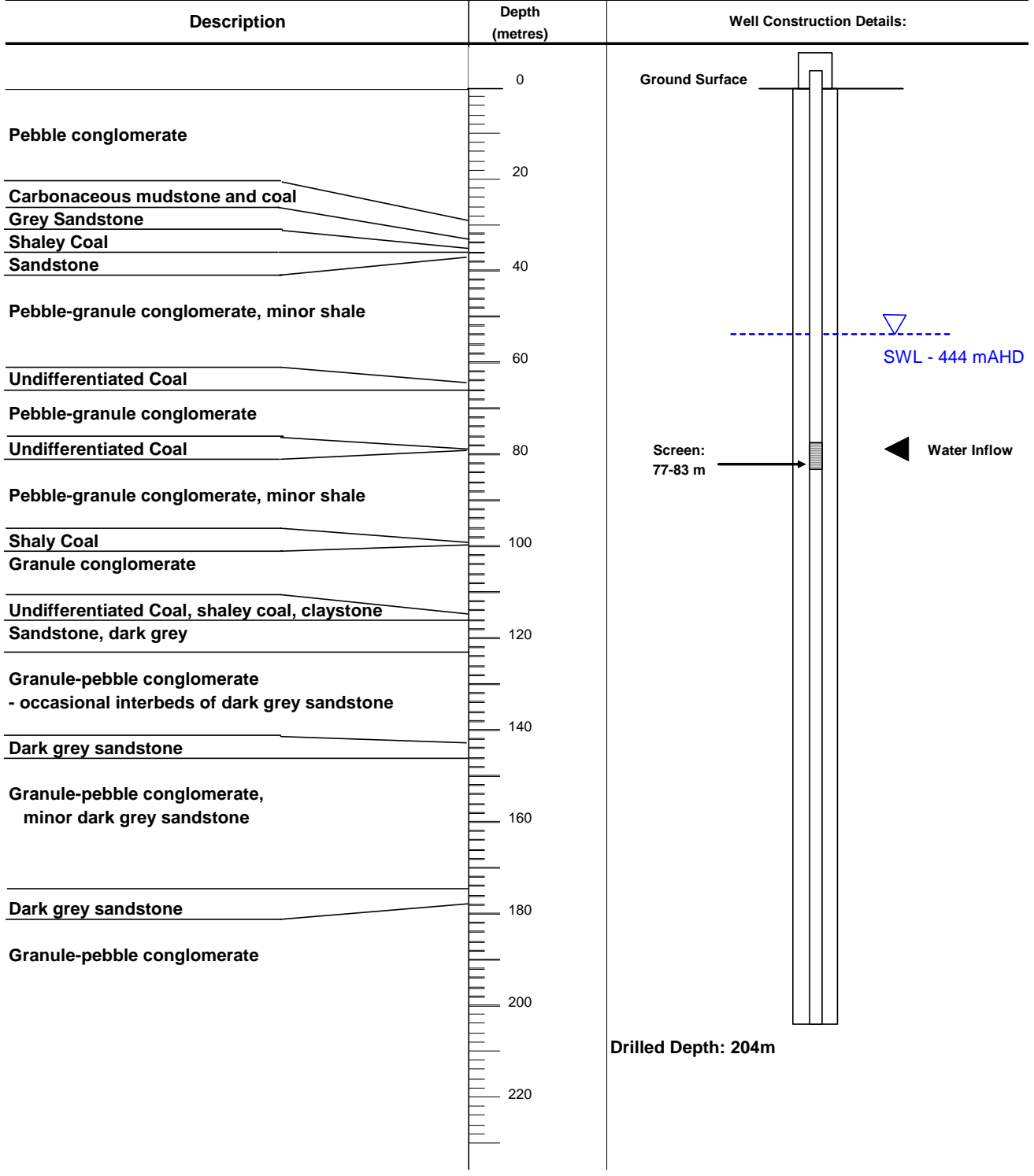
Client: Bickham Coal Company Pty Ltd	Top of Casing: 366.832 mAHD Ground Level: 365.646 mAHD	Project No: 02-0096
Location: Bickham - West of New England Hwy	Date Started: 4/04/2006	Date Finished: 4/04/2006
Drilling Contractor / Method: Mannion Drilling	Hole depth: 203.0 m	Supervised By: MEGS



Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd
Initials: PJD	Job No: S02	BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH113A AND OH113B
Drawing No: S02-639b	Rev: A	
aquaterra		Figure 36

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 499.290 mAHD	Project No: 02-0096
Location: Bickham - West of New England Hwy	Ground Level: 498.160 mAHD	Date Started: 6/04/2006
Drilling Contractor / Method: Mannion Drilling	Hole depth: 204.0 m	Date Finished: 7/04/2006
		Supervised By: MEGS

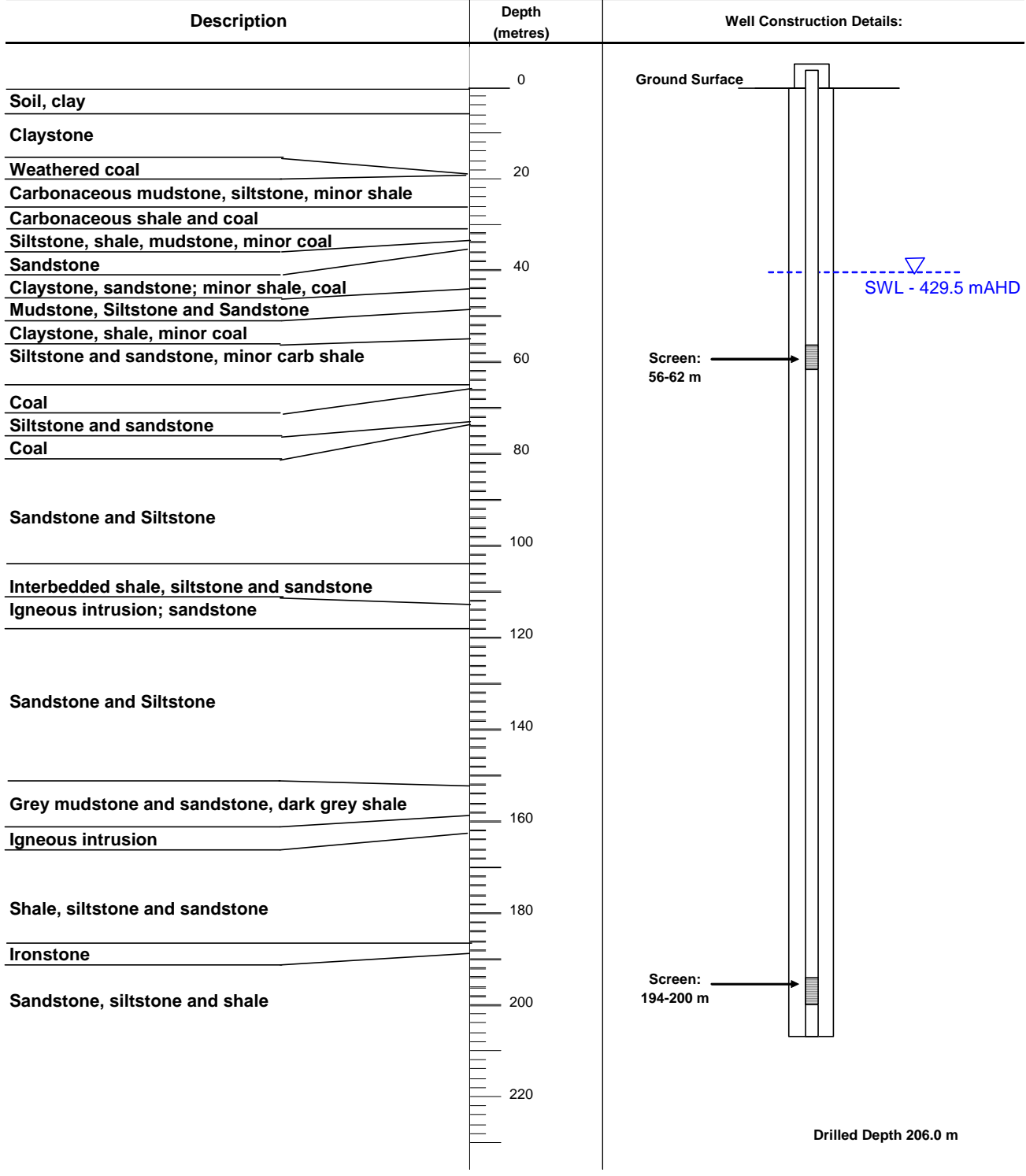


Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd	
Initials: PJD	Job No: S02		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH114
Drawing No: S02-640b	Rev: A		
aquaterra		Figure 37	

BORE: OH115

Logging Sheet

Client: Bickham Coal Company Pty Ltd	Top of Casing: 470.724 mAHD	Project No: 02-0096
Location: Bickham - West of New England Hwy	Ground Level: 469.723 mAHD	Date Started: 10/04/2006
Drilling Contractor / Method: Mannion Drilling	Hole depth: 204.0 m	Date Finished: 11/04/2006
		Supervised By: MEGS



Date: 20 March 2009	Scale: as indicated	Bickham Coal Mining Company Ltd	
Initials: PJD	Job No: S02		BICKHAM COAL PROJECT BORE CONSTRUCTION LOG OH115
Drawing No: S02-641b	Rev: A		
		Figure 38	