

Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

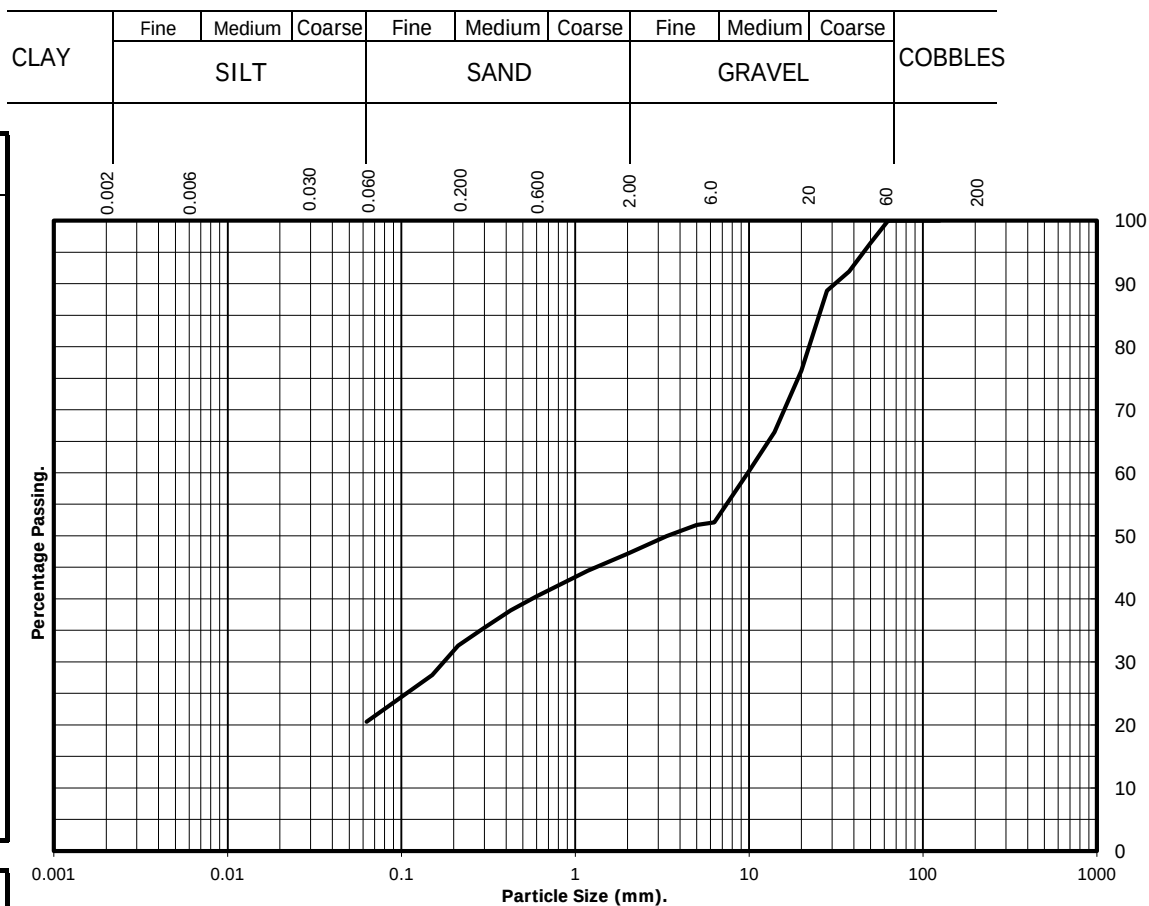
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH3**

Sample Number: **1**
 Depth from (m): **1.2**
 Depth to (m): **2**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey sandy fine to coarse GRAVEL.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	96
37.5	92
28	89
20	76
14	66
10	60
6.3	52
5.0	52
3.35	50
2.00	47
1.18	44
0.60	40
0.425	38
0.300	35
0.212	33
0.150	28
0.063	20

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	20	27	53	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

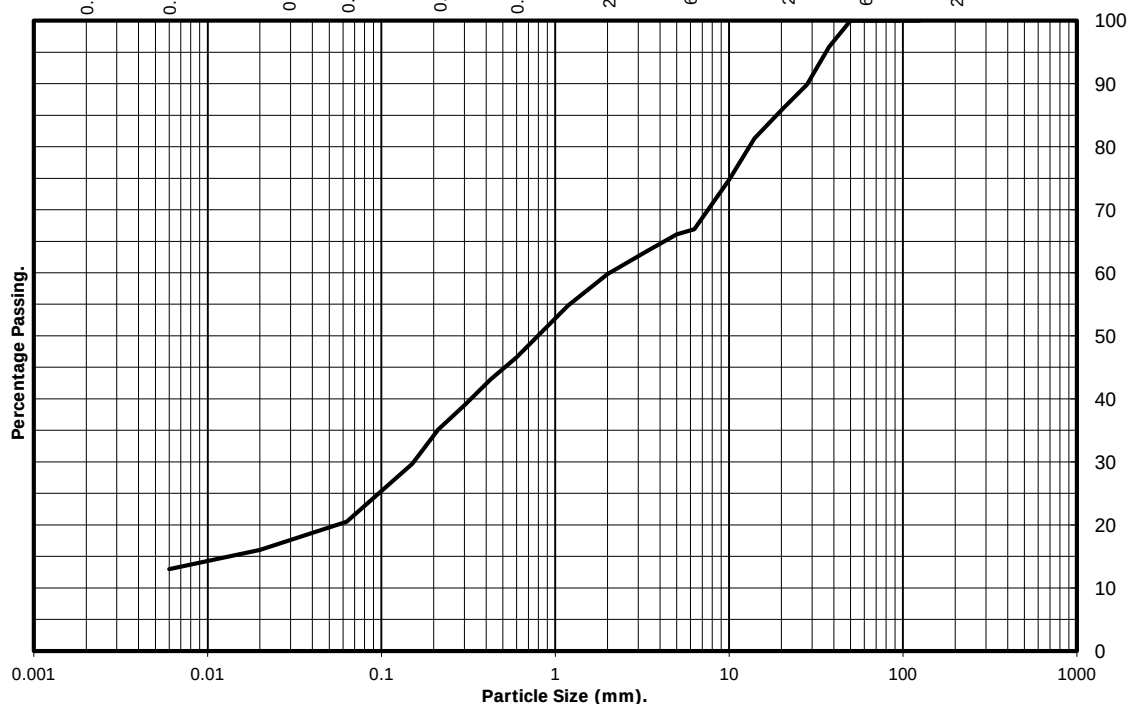
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH3**

Sample Number: **2**
 Depth from (m): **2**
 Depth to (m): **3**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey sandy fine to coarse GRAVEL.**

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	96
28	90
20	86
14	81
10	75
6.3	67
5.0	66
3.35	63
2.00	60
1.18	55
0.60	47
0.425	43
0.300	39
0.212	35
0.150	30
0.063	20



Particle Diameter	% Passing
0.02	16
0.006	13
0.002	11

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
11	9	40	40	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**

Signature



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

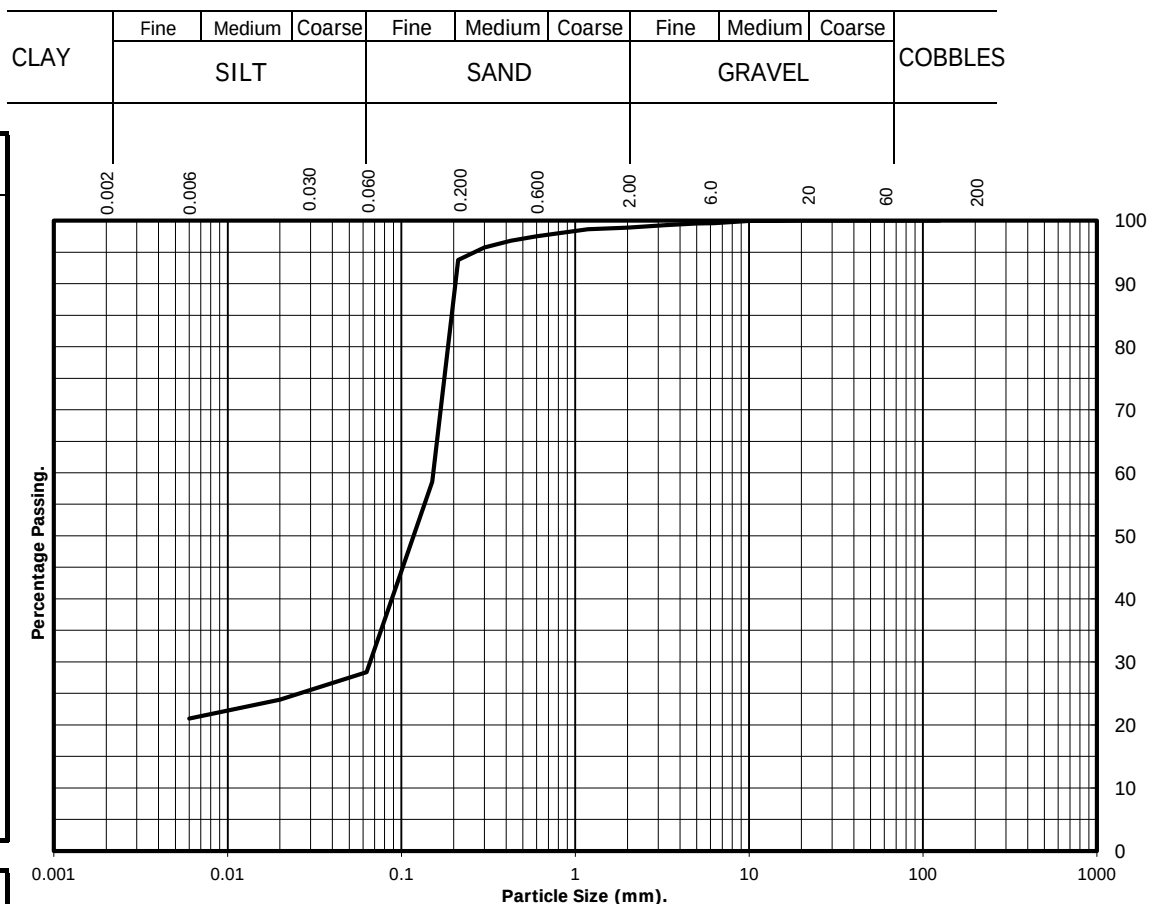
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH3**

Sample Number: **5**
 Depth from (m): **5**
 Depth to (m): **6**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown gravelly silty clayey fine to medium SAND.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	100
5.0	100
3.35	99
2.00	99
1.18	99
0.60	98
0.425	97
0.300	96
0.212	94
0.150	59
0.063	28

Particle Diameter	% Passing
0.02	24
0.006	21
0.002	16



Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
16	12	71	1	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

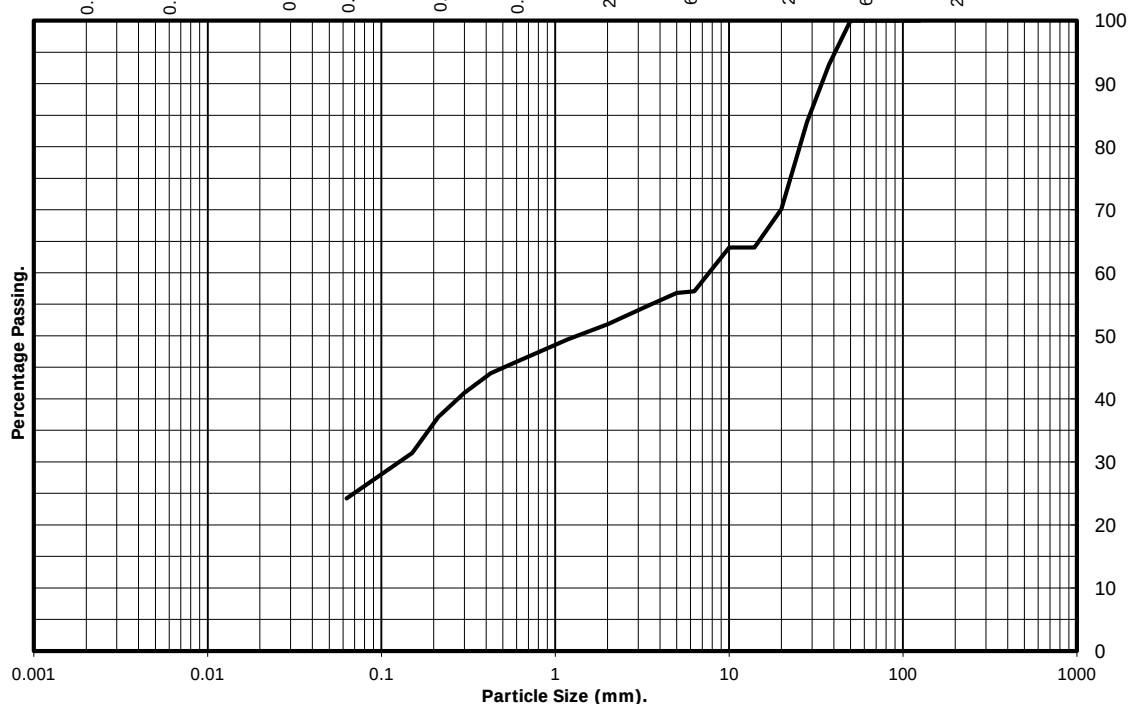
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH4**

Sample Number: **1**
 Depth from (m): **1.7**
 Depth to (m): **2**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey sandy fine to coarse GRAVEL.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	93
28	84
20	70
14	64
10	64
6.3	57
5.0	57
3.35	55
2.00	52
1.18	49
0.60	46
0.425	44
0.300	41
0.212	37
0.150	31
0.063	24



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	24	28	48	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH4**

Sample Number: **5**
 Depth from (m): **5.3**
 Depth to (m): **6**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey gravelly fine to medium SAND.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	95
20	91
14	87
10	84
6.3	79
5.0	79
3.35	77
2.00	74
1.18	72
0.60	71
0.425	71
0.300	70
0.212	69
0.150	40
0.063	21



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	21	53	26	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

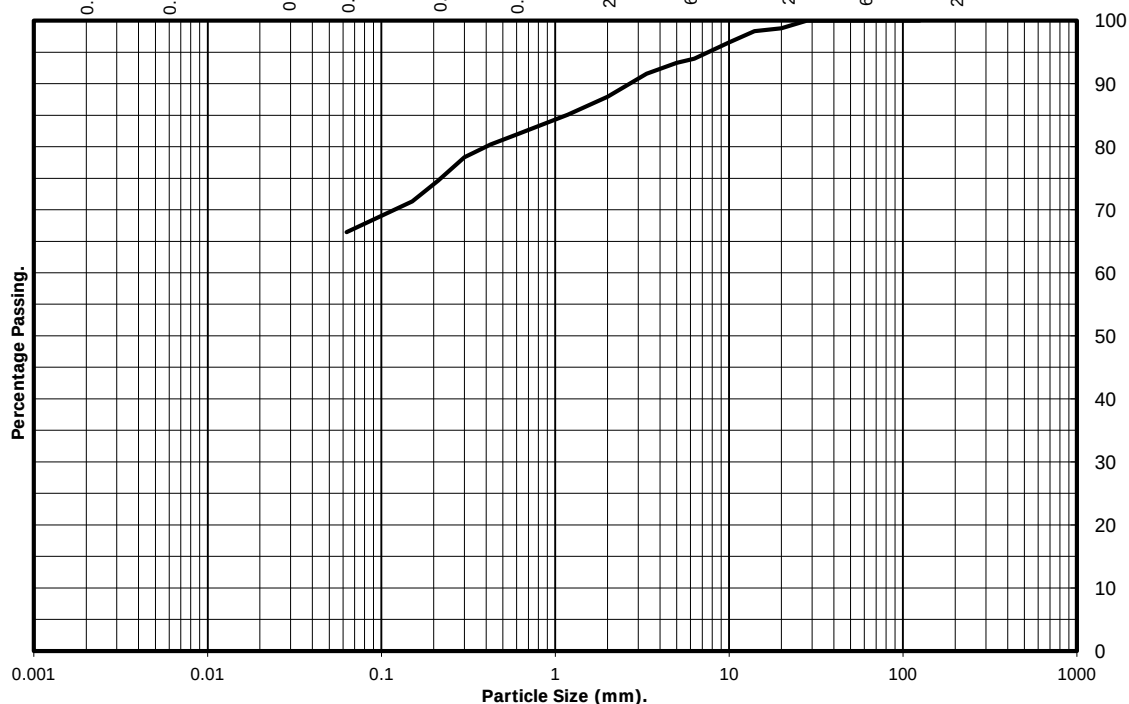
Client ref: A088137
Contract Number: 26216-240315
Hole Number: BH5

Sample Number: 1
Depth from (m): 1.2
Depth to (m): 1.7
Sample Type: B

Location: Cardigan FAS
Description: Brown gravelly sandy fine to medium silty CLAY.

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	99
14	98
10	97
6.3	94
5.0	93
3.35	92
2.00	88
1.18	85
0.60	82
0.425	80
0.300	78
0.212	75
0.150	71
0.063	66



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	66	22	12	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Williams (Office Manager)

Date: 9.4.15



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

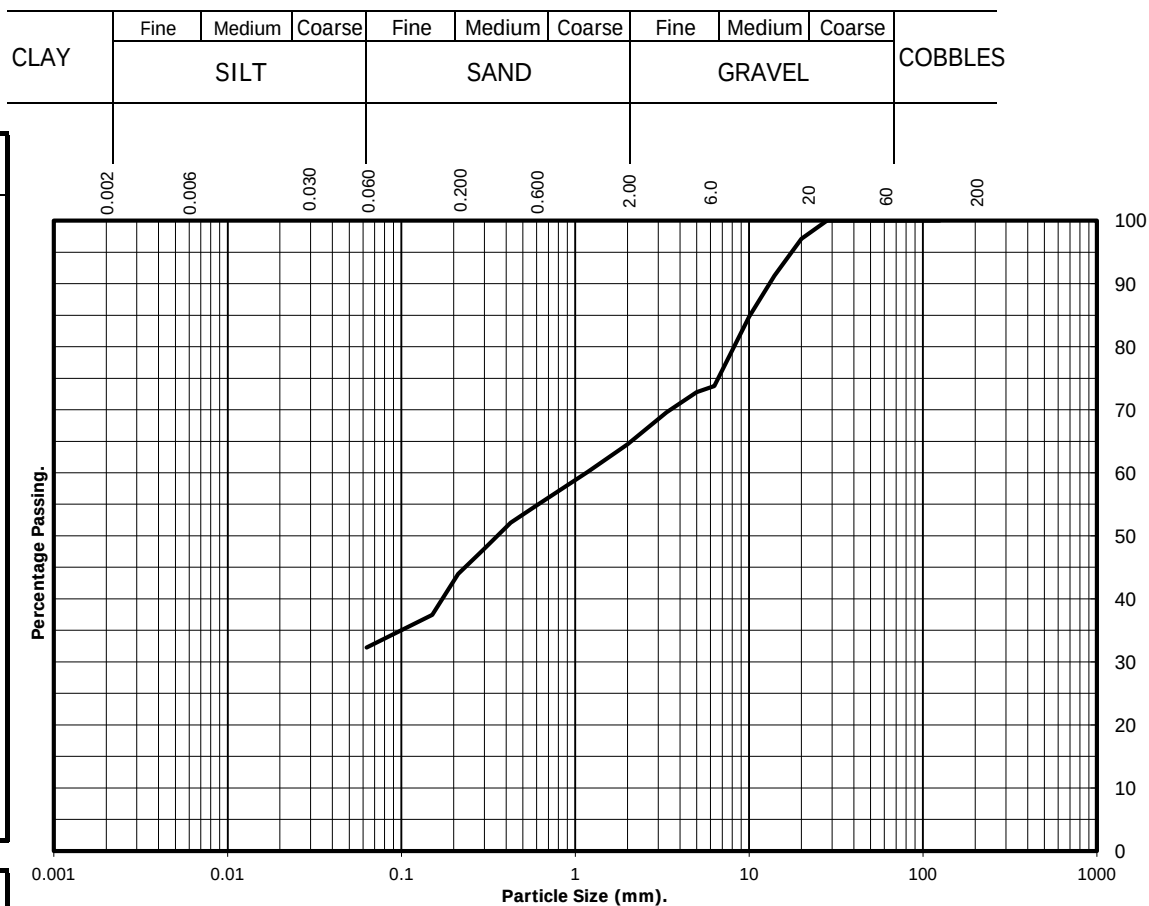
Wet Sieve, Clause 9.2

Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH6**

Sample Number: **1**
 Depth from (m): **1.4**
 Depth to (m): **1.8**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey sandy fine to coarse GRAVEL.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	97
14	91
10	85
6.3	74
5.0	73
3.35	70
2.00	64
1.18	60
0.60	55
0.425	52
0.300	48
0.212	44
0.150	37
0.063	32



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	32	32	36	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

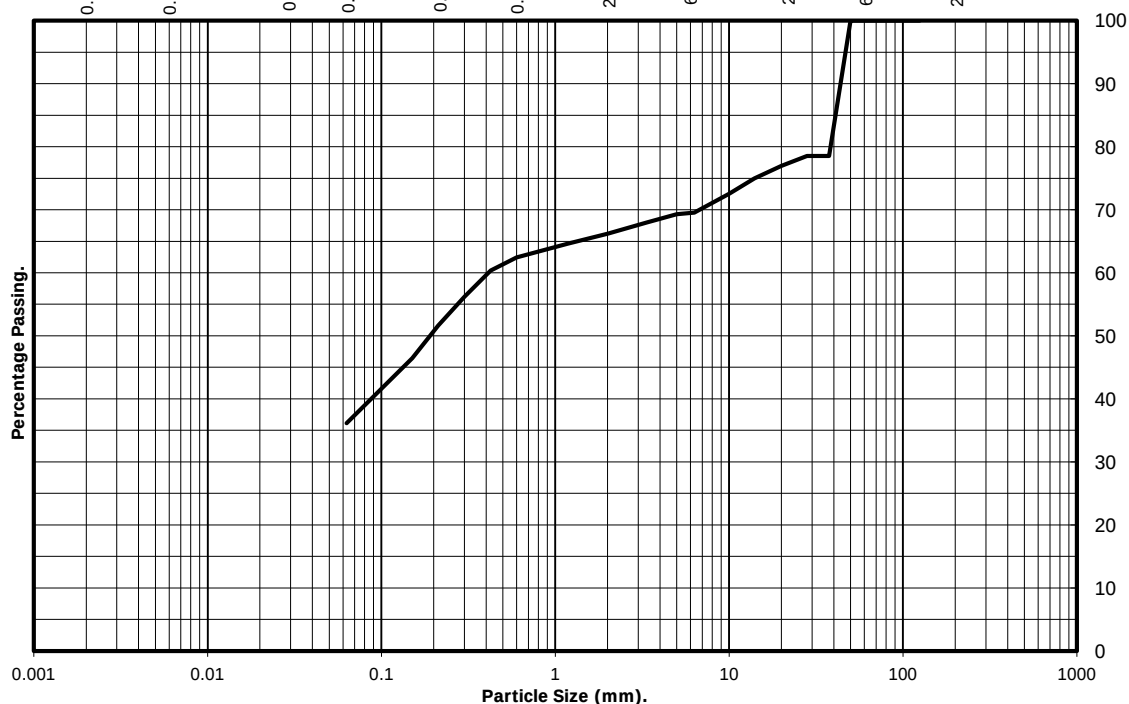
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH6**

Sample Number: **2**
 Depth from (m): **2**
 Depth to (m): **2.6**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown sandy gravelly fine to medium silty CLAY.**

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	79
28	79
20	77
14	75
10	73
6.3	70
5.0	69
3.35	68
2.00	66
1.18	65
0.60	62
0.425	60
0.300	56
0.212	52
0.150	46
0.063	36



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	36	30	34	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH6**

Sample Number: **4**
 Depth from (m): **5**
 Depth to (m): **5.5**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey gravelly fine to medium SAND.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	96
14	92
10	88
6.3	79
5.0	79
3.35	77
2.00	73
1.18	71
0.60	68
0.425	66
0.300	64
0.212	62
0.150	58
0.063	40



Particle Diameter	% Passing
0.02	34
0.006	29
0.002	23

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
23	17	33	27	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

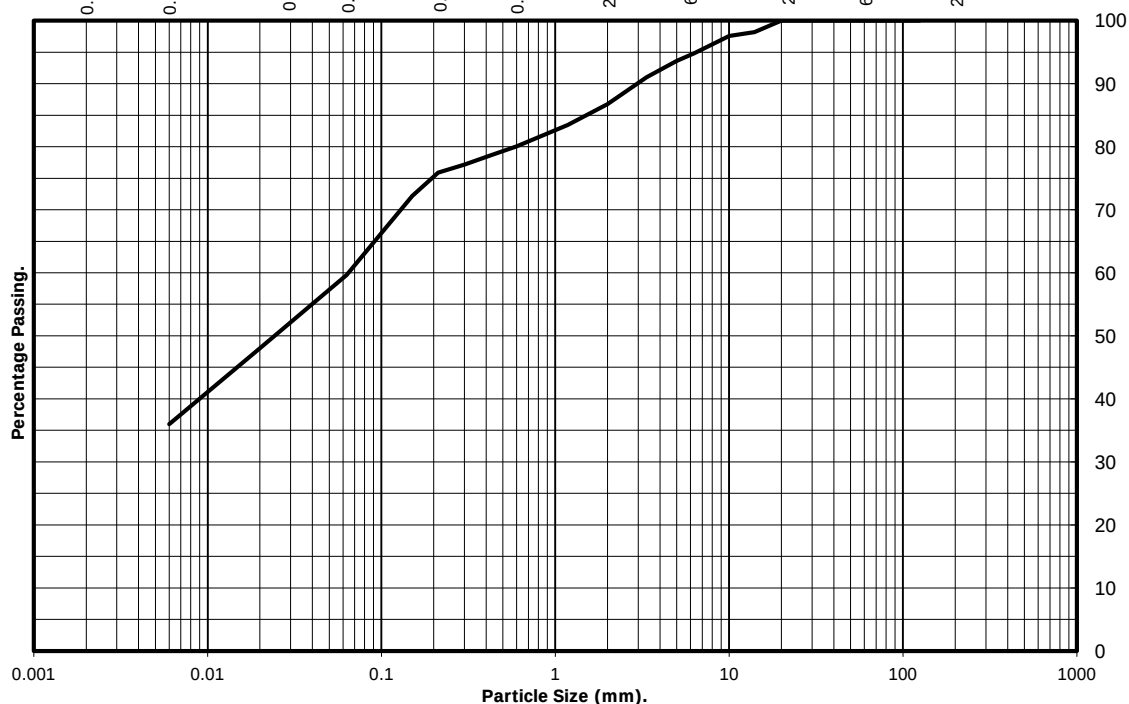
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH7**

Sample Number: **2**
 Depth from (m): **5**
 Depth to (m): **5.7**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown gravelly silty sandy fine to medium CLAY.**

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	98
10	98
6.3	95
5.0	94
3.35	91
2.00	87
1.18	83
0.60	80
0.425	79
0.300	77
0.212	76
0.150	72
0.063	60



Particle Diameter	% Passing
0.02	48
0.006	36
0.002	33

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
33	27	27	13	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

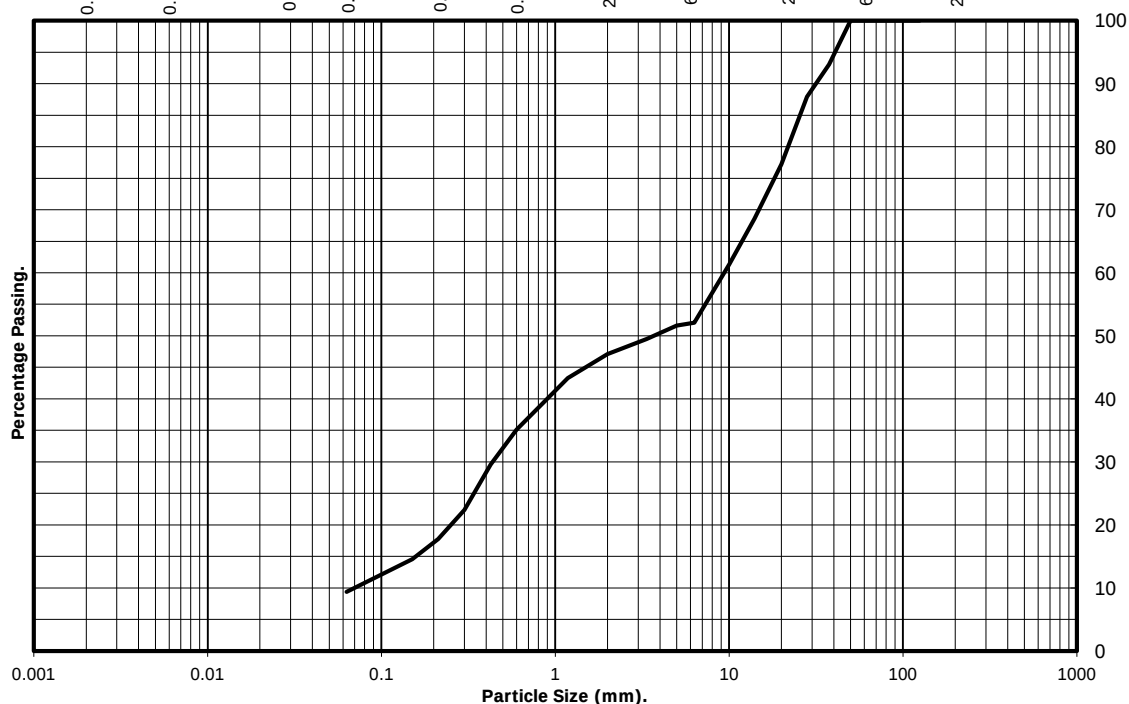
Client ref: A088137
Contract Number: 26216-240315
Hole Number: BH7

Sample Number: 2
Depth from (m): 6.5
Depth to (m): 7
Sample Type: 8

Location: Cardigan FAS
Description: Brown silty clayey sandy fine to coarse GRAVEL.

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	93
28	88
20	77
14	69
10	61
6.3	52
5.0	52
3.35	49
2.00	47
1.18	43
0.60	35
0.425	30
0.300	22
0.212	18
0.150	15
0.063	9



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	9	38	53	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Williams (Office Manager)

Date: 9.4.15



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

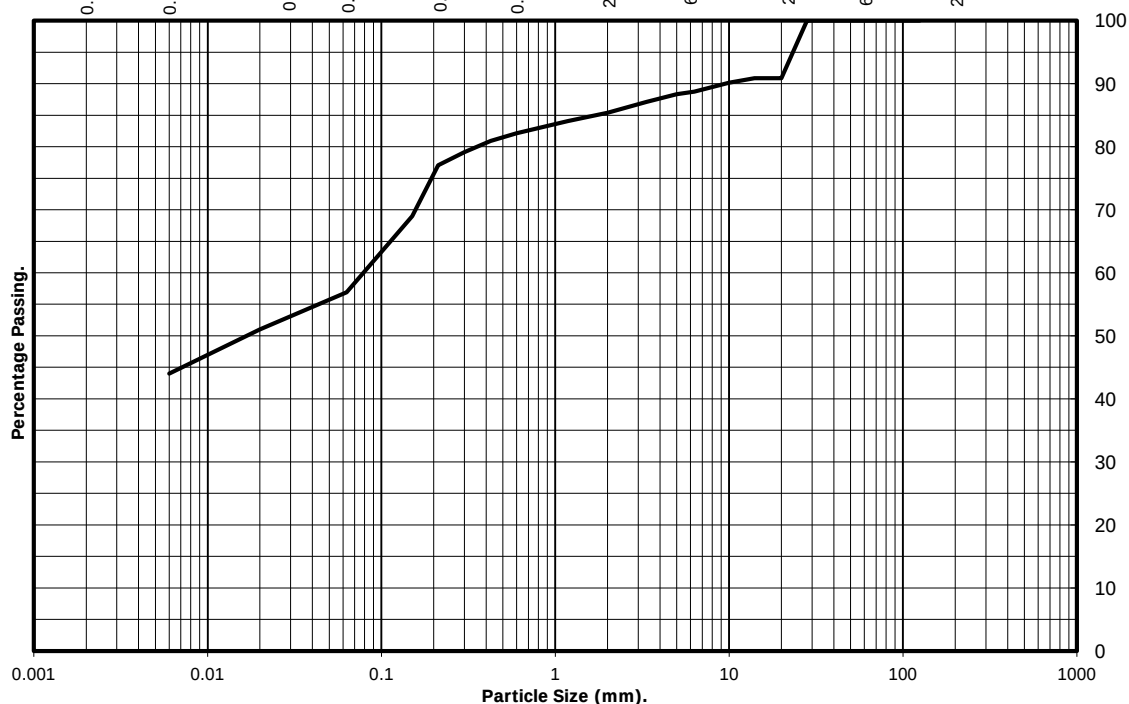
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH8**

Sample Number: **4**
 Depth from (m): **3**
 Depth to (m): **3.8**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown gravelly silty sandy fine to medium CLAY.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	91
14	91
10	90
6.3	89
5.0	88
3.35	87
2.00	85
1.18	84
0.60	82
0.425	81
0.300	79
0.212	77
0.150	69
0.063	57



Particle Diameter	% Passing
0.02	51
0.006	44
0.002	34

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
34	23	28	15	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH8**

Sample Number: **6**
 Depth from (m): **4**
 Depth to (m): **5**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey gravelly fine to medium SAND.**

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	97
20	91
14	86
10	82
6.3	78
5.0	77
3.35	73
2.00	64
1.18	54
0.60	43
0.425	40
0.300	36
0.212	34
0.150	30
0.063	27



Particle Diameter	% Passing
0.02	22
0.006	19
0.002	16

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
16	11	37	36	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

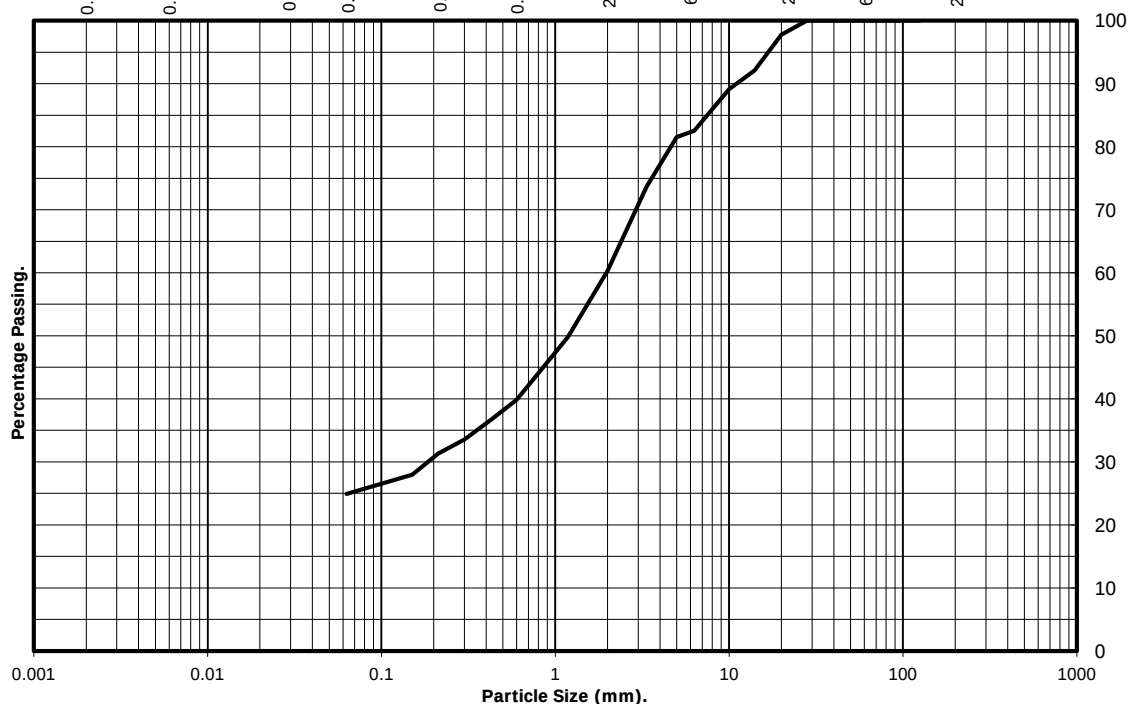
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH8**

Sample Number: **7**
 Depth from (m): **5**
 Depth to (m): **5.7**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey sandy fine to coarse GRAVEL.**

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	98
14	92
10	89
6.3	83
5.0	82
3.35	74
2.00	60
1.18	50
0.60	40
0.425	37
0.300	34
0.212	31
0.150	28
0.063	25



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	25	35	40	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

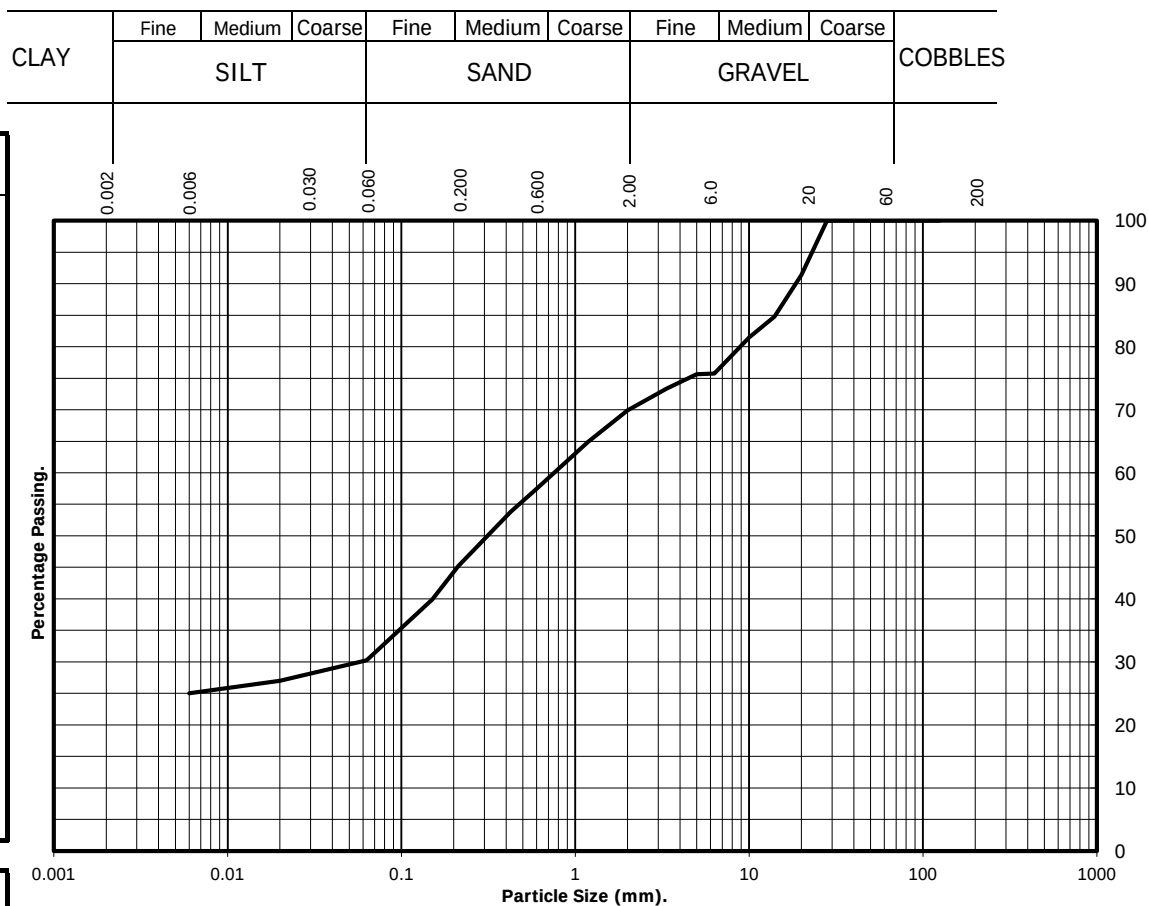
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH8**

Sample Number: **9**
 Depth from (m): **6**
 Depth to (m): **7**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey gravelly fine to medium SAND.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	91
14	85
10	81
6.3	76
5.0	76
3.35	73
2.00	70
1.18	65
0.60	57
0.425	54
0.300	49
0.212	45
0.150	40
0.063	30

Particle Diameter	% Passing
0.02	27
0.006	25
0.002	18


Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

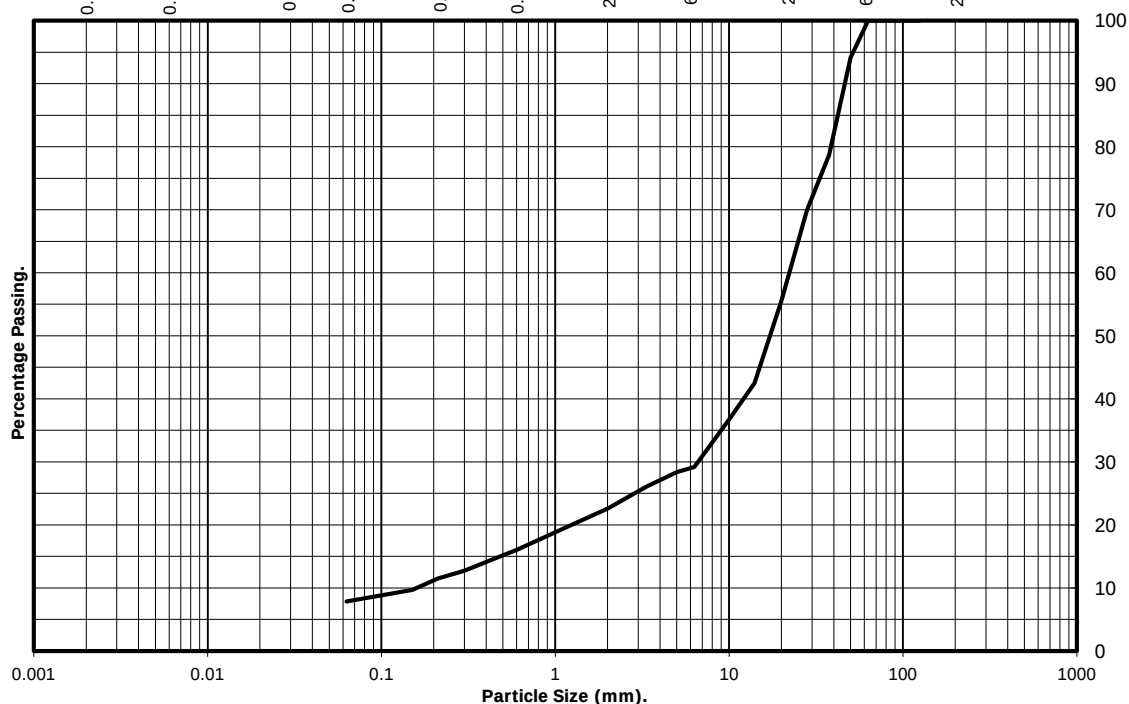
Client ref: A088137
Contract Number: 26216-240315
Hole Number: BH9

Sample Number: 1
Depth from (m): 1
Depth to (m): 1.4
Sample Type: B

Location: Cardigan FAS
Description: Brown silty clayey sandy fine to coarse GRAVEL.

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	94
37.5	79
28	70
20	56
14	42
10	37
6.3	29
5.0	28
3.35	26
2.00	23
1.18	20
0.60	16
0.425	14
0.300	13
0.212	12
0.150	10
0.063	8



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	8	15	77	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Williams (Office Manager)

Date: 9.4.15



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

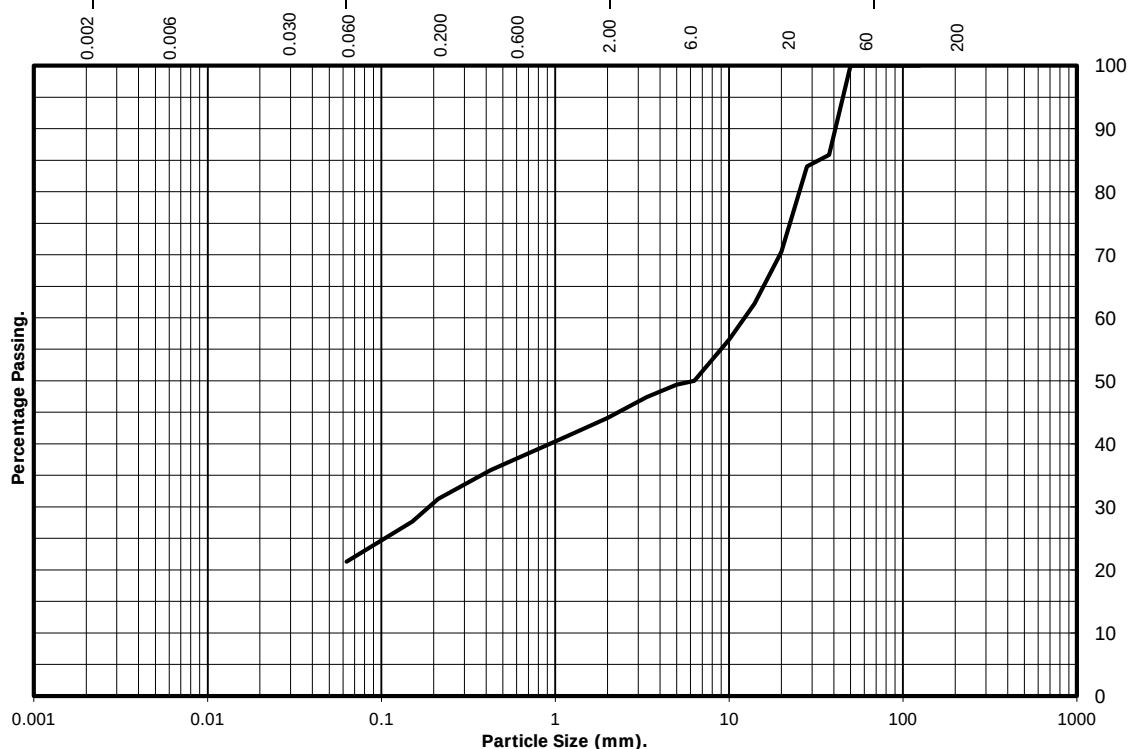
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH9**

Sample Number: **2**
 Depth from (m): **1.6**
 Depth to (m): **2**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown clayey silty sandy fine to coarse GRAVEL.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	86
28	84
20	70
14	62
10	57
6.3	50
5.0	49
3.35	47
2.00	44
1.18	41
0.60	38
0.425	36
0.300	34
0.212	31
0.150	28
0.063	21

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			



Particle Diameter	% Passing
0.02	13
0.006	10
0.002	7

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
7	14	23	56	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

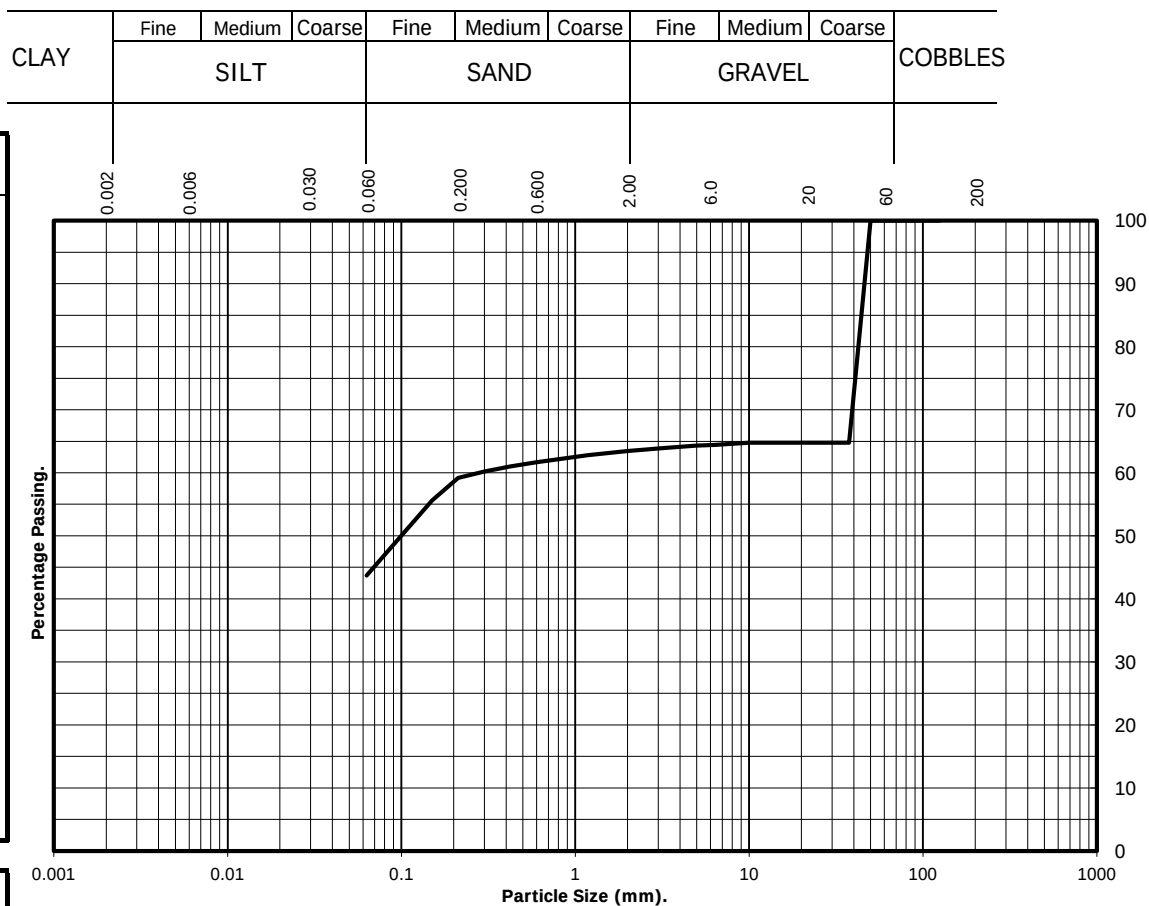
Client ref: A088137
 Contract Number: 26216-240315
 Hole Number: BH9

Sample Number: 2
 Depth from (m): 4
 Depth to (m): 4.6
 Sample Type: B

Location: Cardigan FAS
 Description: Brown sandy gravelly fine to medium silty CLAY.

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	65
28	65
20	65
14	65
10	65
6.3	64
5.0	64
3.35	64
2.00	63
1.18	63
0.60	62
0.425	61
0.300	60
0.212	59
0.150	56
0.063	44

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	44	19	37	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: 9.4.15

Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

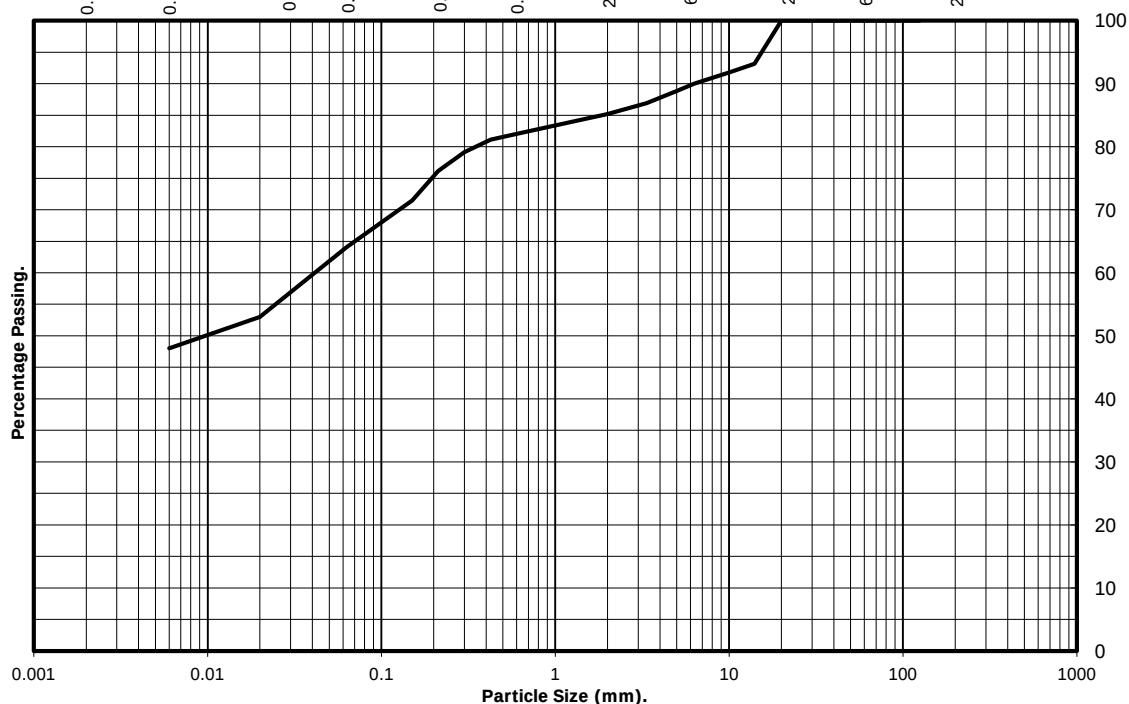
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH9**

Sample Number: **3**
 Depth from (m): **7**
 Depth to (m): **7.7**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown gravelly sandy fine to medium silty CLAY.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	93
10	92
6.3	90
5.0	89
3.35	87
2.00	85
1.18	84
0.60	82
0.425	81
0.300	79
0.212	76
0.150	72
0.063	64



Particle Diameter	% Passing
0.02	53
0.006	48
0.002	35

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
35	29	21	15	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

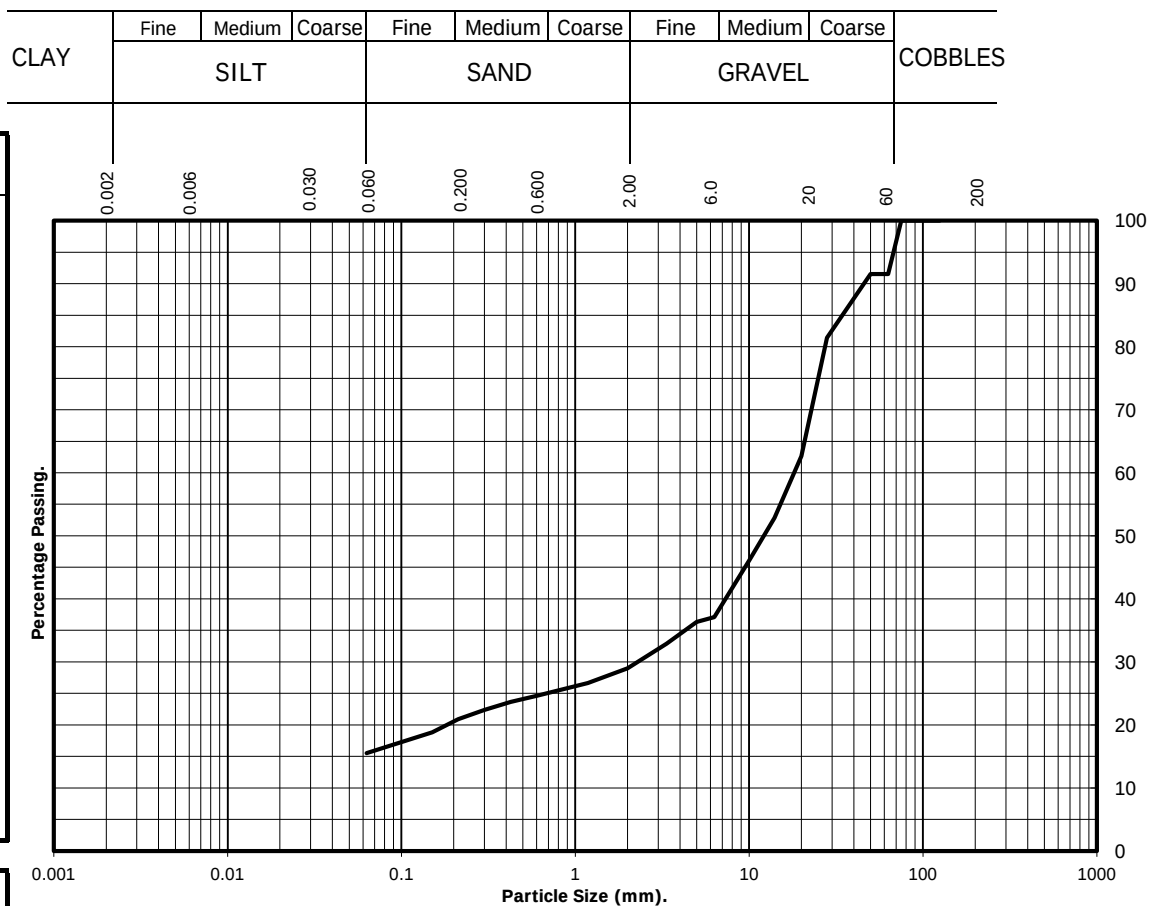
Wet Sieve, Clause 9.2

Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH10**

Sample Number: **1**
 Depth from (m): **1.2**
 Depth to (m): **2**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown sandy silty clayey fine to coarse GRAVEL with few cobbles.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	92
50	92
37.5	87
28	81
20	63
14	53
10	46
6.3	37
5.0	36
3.35	33
2.00	29
1.18	27
0.60	25
0.425	24
0.300	22
0.212	21
0.150	19
0.063	15



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	15	14	63	8	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: A088137
Contract Number: 26216-240315
Hole Number: BH10

Sample Number: 3
Depth from (m): 4
Depth to (m): 4.7
Sample Type: B

Location: Cardigan FAS
Description: Brown gravelly silty clayey fine to medium SAND.

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	99
6.3	96
5.0	96
3.35	93
2.00	88
1.18	82
0.60	72
0.425	67
0.300	60
0.212	48
0.150	36
0.063	22



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	22	66	12	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Williams (Office Manager)

Date: 9.4.15



Test Report:

Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: A088137
Contract Number: 26216-240315
Hole Number: BH10

Sample Number: 5
Depth from (m): 5
Depth to (m): 5.5
Sample Type: B

Location: Cardigan FAS
Description: Brown silty clayey gravelly fine to medium SAND.

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	97
6.3	93
5.0	93
3.35	91
2.00	86
1.18	66
0.60	36
0.425	26
0.300	18
0.212	11
0.150	8
0.063	5



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	5	81	14	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Williams (Office Manager)

Date: 9.4.15



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

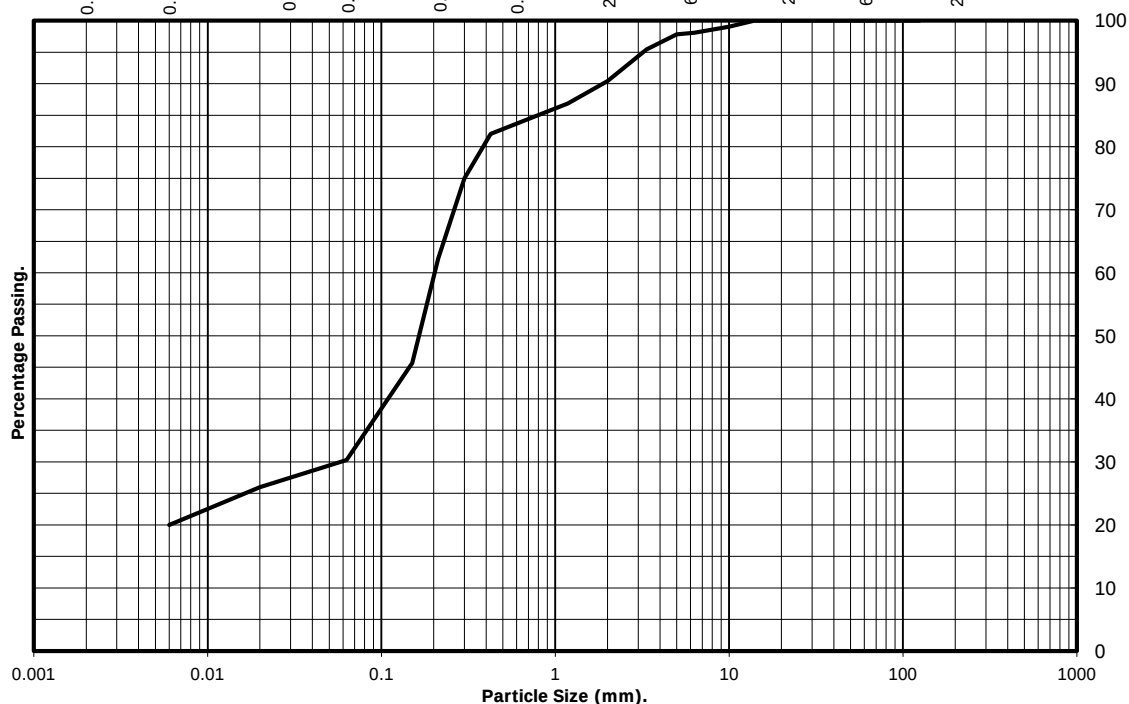
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH10**

Sample Number: **6**
 Depth from (m): **5.6**
 Depth to (m): **6**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Greyish brown gravelly clayey silty fine to medium SAND.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	99
6.3	98
5.0	98
3.35	95
2.00	90
1.18	87
0.60	84
0.425	82
0.300	75
0.212	62
0.150	46
0.063	30

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			



Particle Diameter	% Passing
0.02	26
0.006	20
0.002	14

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
14	16	60	10	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH10**

Sample Number: **8**
 Depth from (m): **7**
 Depth to (m): **8**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown silty clayey gravelly fine to medium SAND.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	95
20	95
14	93
10	92
6.3	84
5.0	83
3.35	78
2.00	72
1.18	63
0.60	50
0.425	43
0.300	34
0.212	26
0.150	18
0.063	10



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	10	62	28	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**



Test Report:

Particle Size Distribution Test **BS 1377 Part 2:1990.**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

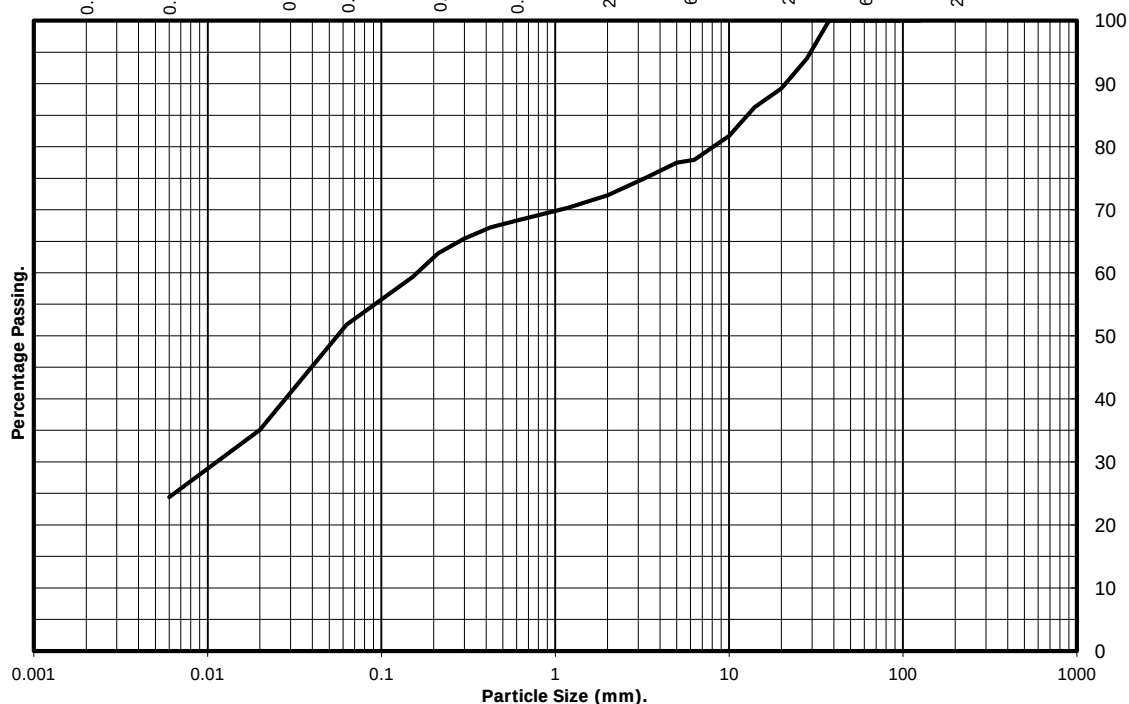
Client ref: **A088137**
 Contract Number: **26216-240315**
 Hole Number: **BH10**

Sample Number: **9**
 Depth from (m): **8**
 Depth to (m): **9**
 Sample Type: **B**

Location: **Cardigan FAS**
 Description: **Brown clayey sandy gravelly fine to medium SILT.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	94
20	89
14	86
10	82
6.3	78
5.0	77
3.35	75
2.00	72
1.18	70
0.60	68
0.425	67
0.300	65
0.212	63
0.150	59
0.063	52



Particle Diameter	% Passing
0.02	35
0.006	24
0.002	17

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
17	35	20	28	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Emma Williams (Office Manager)

Date: **9.4.15**





Unit 4
Heol Aur
Dafen Ind EstateDafen
Carmarthenshire
SA14 8QN
Tel: 01554 784040
01554 750752
Fax: 01554 770529
01554 784041
Web: www.geo.uk.com

Certificate of Analysis

Date: 31/03/2015

Client: WYG

Our Reference: 26216-240315

Client Reference: A088137

Contract Title: Cardigan Fas

Description: (Total Samples) 25

Date Received: 24/03/2015

Date Started: 26/03/2015

Date Completed: 31/03/2015

Test Procedures: (B.S. 1377 : PART 3 : 1990 AND BRE CP2/79)

Notes:

Solid samples will be disposed 1 month and liquids 2 weeks
after the date of issue of this test certificate

Approved By:

Authorised Signatories:

Emma Williams
Laboratory Office Manager

Dafydd Simon
Laboratory Team Leader

Paul Evans
Quality Manager

Date: 31/03/2015

(B.S. 1377 : PART 3 : 1990 AND BRE CP2/79)

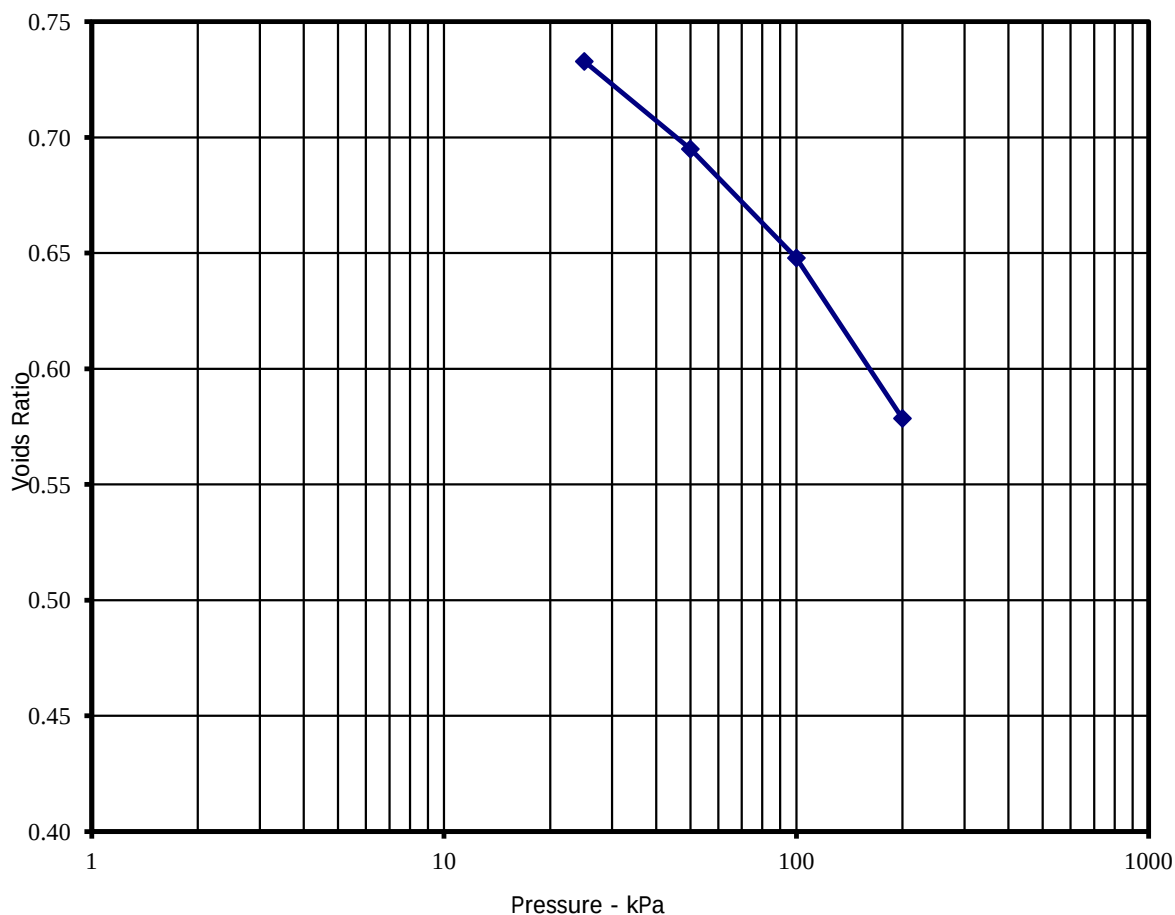
NCP - No Chloride present

Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **A088137**
Location: **Cardigan FAS**
Contract Number: **26216-240315**
Hole/Sample Number: **PBH6**
Depth (m) : **4.00 - 4.65**
Sample Type: **U**
Sample Description: **Greyish brown silty clayey SHALE**

Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	27	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.85	0 - 25	1.9	1.7	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.46	25 - 50	0.87	1.5	20°C
Voids Ratio:	0.8169	50 - 100	0.56	2.6	Location of specimen with sample
Degree of saturation:	87.8	100 - 200	0.42	5.8	Greyish brown silty clayey SHALE
Height (mm):	19.91				Remarks:
Diameter (mm)	75.09				
Particle Density (Mg/m3)	2.65				
Assumed					

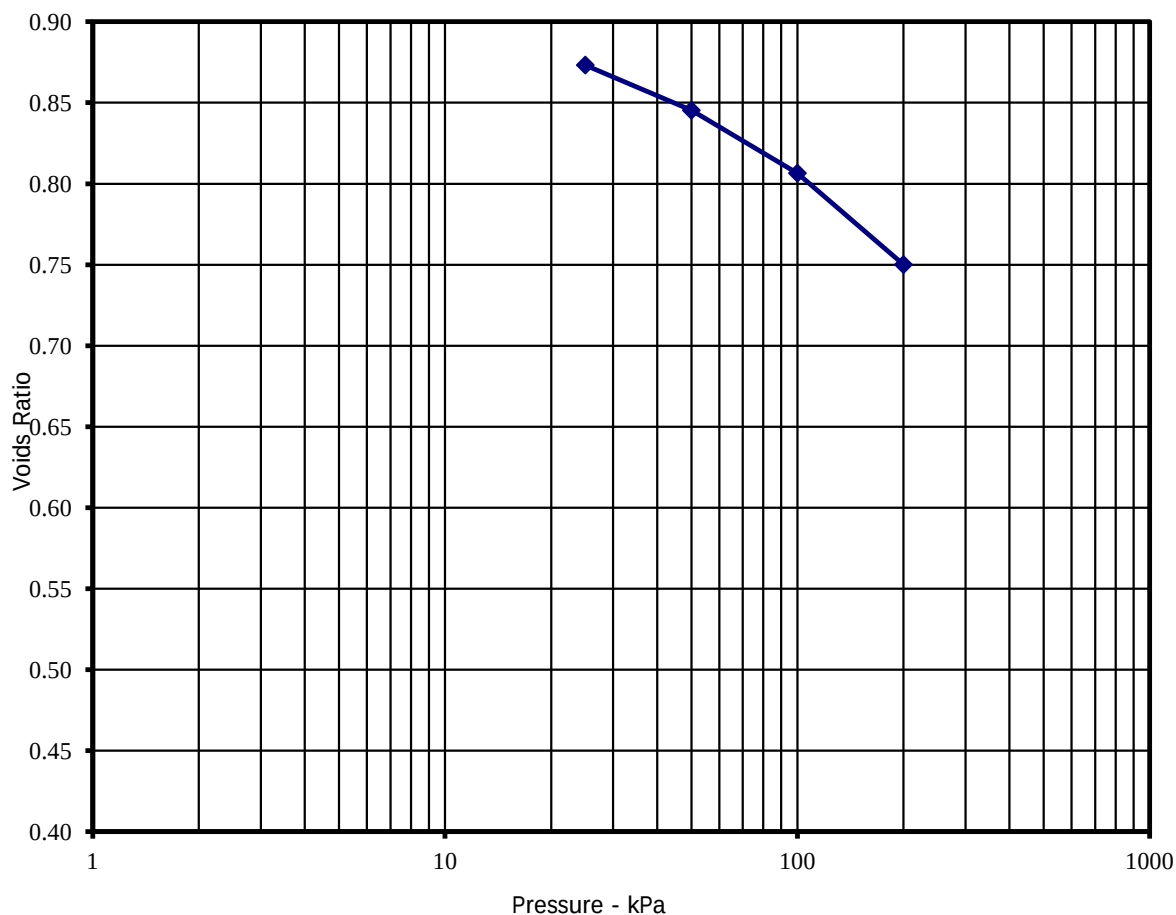


Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: A088137
Location: Cardigan FAS
Contract Number: 26216-240315
Hole/Sample Number: PBH7
Depth (m) : 5.00 - 5.65
Sample Type: U
Sample Description: Greyish brown silty clayey SHALE

Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	41	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.93	0 - 25	1.3	2.7	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.37	25 - 50	0.6	4.8	20°C
Voids Ratio:	0.9347	50 - 100	0.42	6.6	Location of specimen with sample
Degree of saturation:	115.0	100 - 200	0.31	5.3	Greyish brown silty clayey SHALE
Height (mm):	19.88				Remarks:
Diameter (mm)	75				
Particle Density (Mg/m3)	2.65				
Assumed					

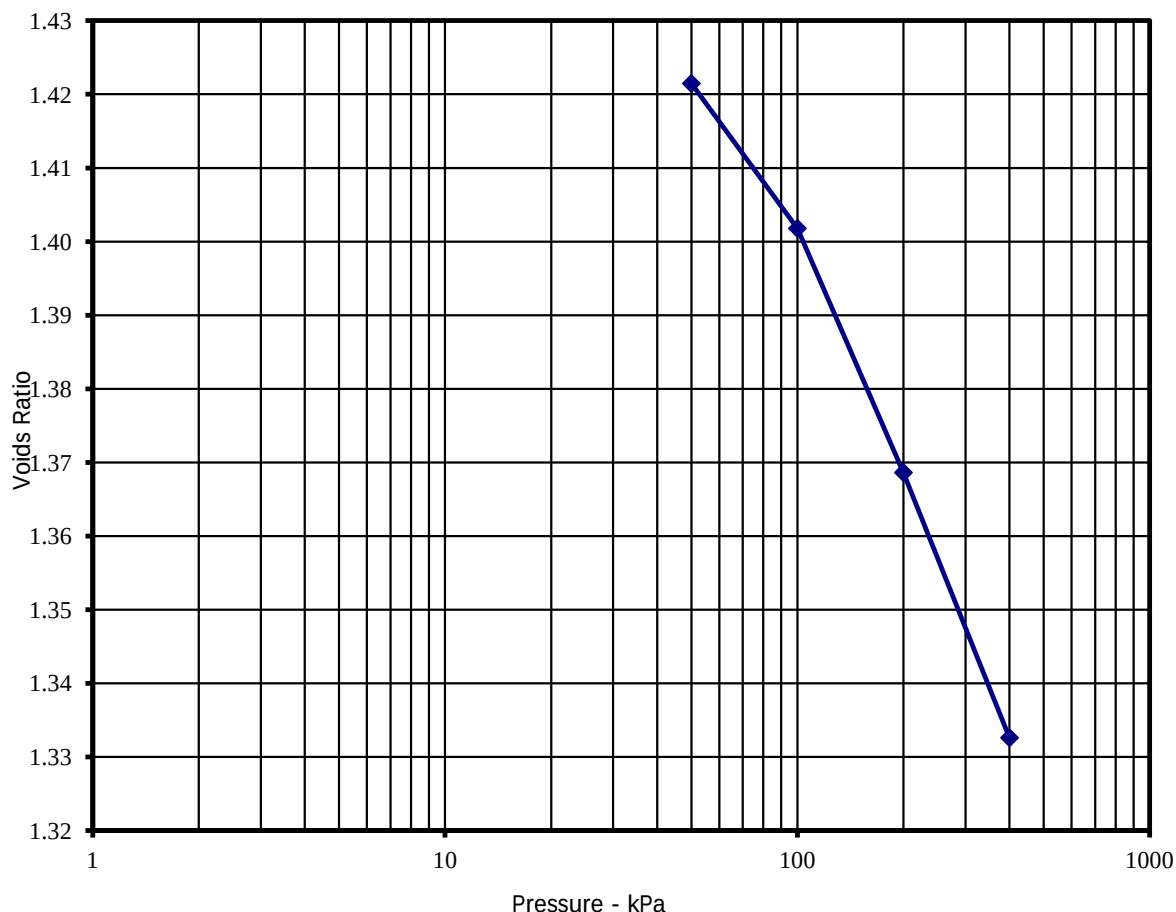


Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

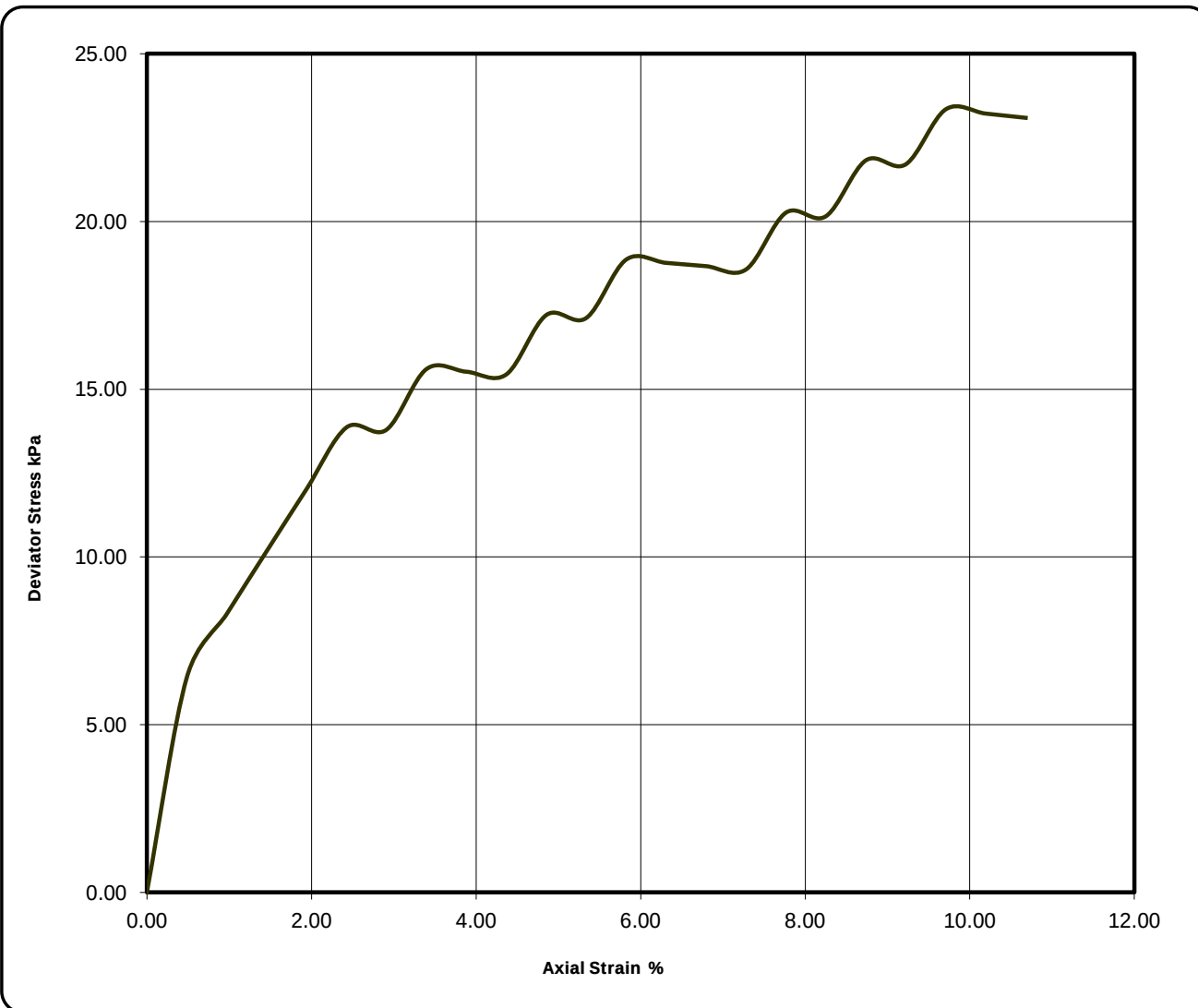
Client ref: **A088137**
 Location: **Cardigan FAS**
 Contract Number: **26216-240315**
 Hole/Sample Number: **PBH9**
 Depth (m) : **7.00 - 7.65**
 Sample Type: **0**

Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	19	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.30	0 - 50	0.13	32	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.09	50 - 100	0.16	4.4	20°C
Voids Ratio:	1.4374	100 - 200	0.14	2.8	Location of specimen with sample
Degree of saturation:	35.8	200 - 400	0.076	4.2	top
Height (mm):	19.69				Remarks:
Diameter (mm)	75.05				
Particle Density (Mg/m3)	2.65				
Assumed					



Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part 7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure

Client ref: A088137
Location: Cardigan FAS
Contract Number: 26216-240315
Hole Number: PBH6
Sample Number: 1
Depth (m) : 4.00 - 4.65
Sample Description : Soft Greyish brown fine sandy gravelly silty CLAY.



Diameter (mm):		103	Height (mm):		200	Test: 100mm Multistage			
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	11.9	1.95	1.74	50	16	8	3.4	Plastic	Sample taken from Top of tube Rate of strain = 2 %/min Latex Membrane used mm thickness
				100	19	9	5.8		
				200	23	12	9.7		



[Signature]

Checked By

[Signature]

Approved By:



Date Approved: 14.15

Test Report:**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure**

Client ref: A088137
Location: Cardigan FAS
Contract Number: 26216-240315
Hole Number PBH6
Sample Number: 1
Depth (m) : 4.00 - 4.65

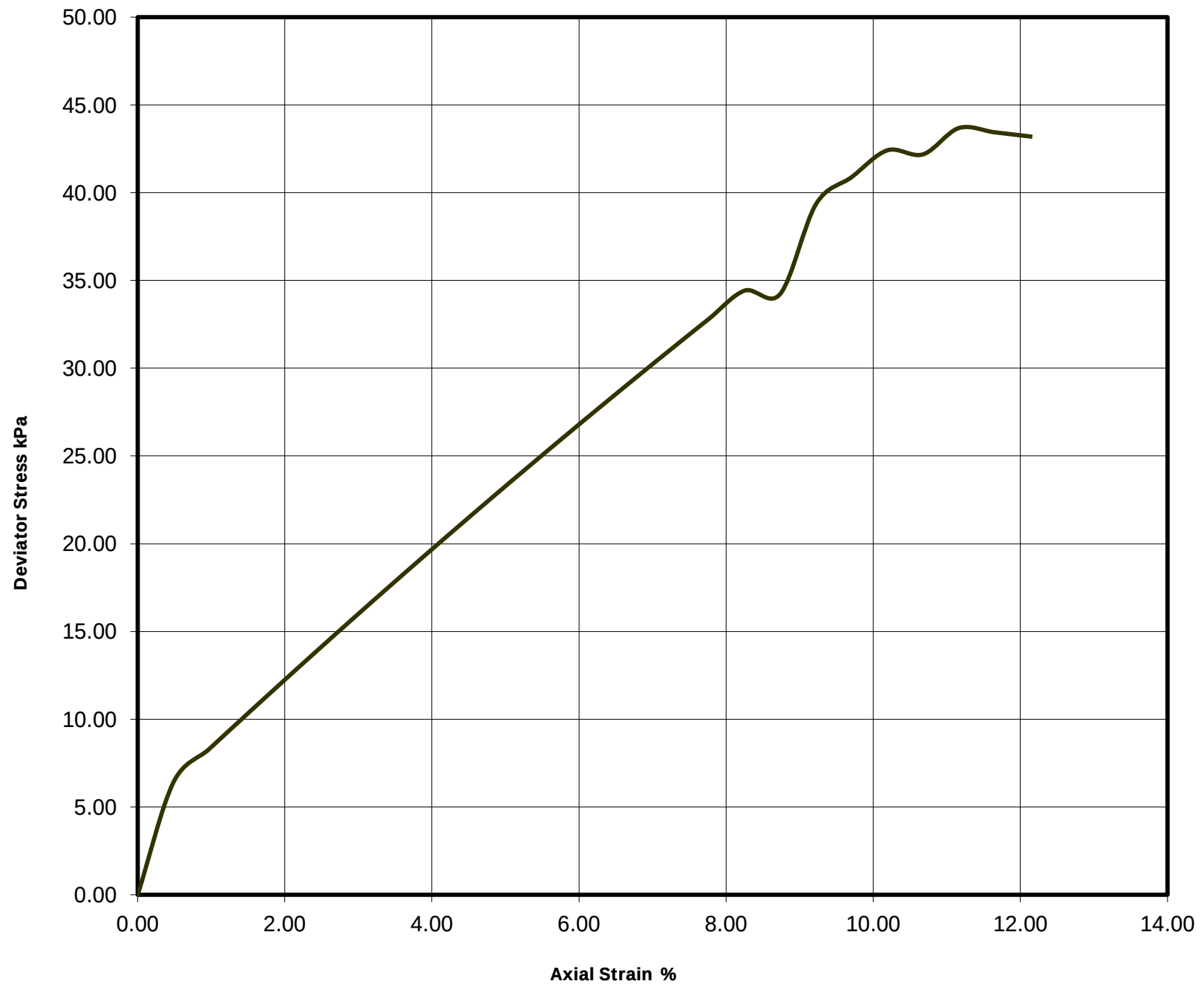
**Post Test Specimen****Specimen Split**

Diameter (mm):		103	Height (mm):		200	Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	11.9	1.95	1.74	50	16	8	3.4	Plastic	Sample taken from Top of tube
				100	19	9	5.8		Rate of strain = 2 %/min Latex Membrane used mm thickness
				200	23	12	9.7		

Checked By

Approved By:

Date Approved: 9.4.15



Test Report:**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure**

Client ref: A088137
Location: Cardigan FAS
Contract Number: 26216-240315
Hole Number PBH7
Sample Number: 2
Depth (m) : 5.00 - 5.65

**Post Test Specimen****Specimen Split**

Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
									Sample taken from Top of tube		
A	41.2	1.91	1.35	50	24	12	5.3	Plastic	Rate of strain = 2 %/min		
				100	34	17	8.3		Latex Membrane used mm		
				200	44	22	11.2		thickness		



Appendix D – Environmental Laboratory Testing Results



Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

WYG
5th Floor
Longcross Court
47 Newport Road
Cardiff
CF24 0AD

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention : Chris Pugh
Date : 27th March, 2015
Your reference : A088137
Our reference : Test Report 15/4357 Batch 1
Location : Cardigan FAS
Date samples received : 4th March, 2015
Status : Final report
Issue : 2

Four samples were received for analysis on 4th March, 2015 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Jones Environmental Laboratory

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh
JE Job No.: 15/4357

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12							Please see attached notes for all abbreviations and acronyms		
Sample ID	PBH7	PBH7	PBH7	PBH6									
Depth	1.00-1.60	2.45-2.65	4.40-4.60	0.50									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	02/03/2015	02/03/2015	02/03/2015	03/03/2015									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	04/03/2015	04/03/2015	04/03/2015	04/03/2015							LOD/LOR	Units	Method No.
Arsenic ^{#M}	-	12.5	10.9	7.1							<0.5	mg/kg	TM30/PM15
Arsenic	9.7	-	-	-							<0.5	mg/kg	TM30/PM62
Cadmium ^{#M}	-	<0.1	<0.1	0.1							<0.1	mg/kg	TM30/PM15
Cadmium	0.1	-	-	-							<0.1	mg/kg	TM30/PM62
Chromium ^{#M}	-	55.3	57.2	52.3							<0.5	mg/kg	TM30/PM15
Chromium	22.4	-	-	-							<0.5	mg/kg	TM30/PM62
Copper ^{#M}	-	41	23	23							<1	mg/kg	TM30/PM15
Copper	42	-	-	-							<1	mg/kg	TM30/PM62
Lead ^{#M}	-	26	26	29							<5	mg/kg	TM30/PM15
Lead	143	-	-	-							<5	mg/kg	TM30/PM62
Mercury ^{#M}	-	<0.1	<0.1	<0.1							<0.1	mg/kg	TM30/PM15
Mercury	0.2	-	-	-							<0.1	mg/kg	TM30/PM62
Nickel ^{#M}	-	42.9	33.6	20.4							<0.7	mg/kg	TM30/PM15
Nickel	28.7	-	-	-							<0.7	mg/kg	TM30/PM62
Selenium ^{#M}	-	<1	<1	<1							<1	mg/kg	TM30/PM15
Selenium	1	-	-	-							<1	mg/kg	TM30/PM62
Water Soluble Boron ^{#M}	-	1.5	2.4	0.4							<0.1	mg/kg	TM74/PM32
Water Soluble Boron	0.3	-	-	-							<0.1	mg/kg	TM74/PM61
Zinc ^{#M}	-	153	144	77							<5	mg/kg	TM30/PM15
Zinc	174	-	-	-							<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene ^{#M}	<0.04	<0.04	<0.04	0.04							<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	<0.05	<0.05	<0.05	<0.05							<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	<0.04	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	0.08	<0.03	<0.03	0.12							<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	0.08							<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	0.15	<0.03	0.07	0.20							<0.03	mg/kg	TM4/PM8
Pyrene #	0.13	<0.03	0.04	0.18							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.10	<0.06	<0.06	0.11							<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	0.14	<0.02	0.04	0.18							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	0.23	<0.07	<0.07	0.27							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.15	<0.04	<0.04	0.13							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	0.09	<0.04	<0.04	0.07							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.08	<0.04	<0.04	0.06							<0.04	mg/kg	TM4/PM8
PAH 16 Total	1.2	<0.6	<0.6	1.4							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.17	<0.05	<0.05	0.19							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.06	<0.02	<0.02	0.08							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	95	96	89	88							<0	%	TM4/PM8
EPH >C10-C40	375	423	77	318							<30	mg/kg	TM5/PM8

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:

[Signature]

Ryan Butterworth
Asbestos Team Leader

[illegible]

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4357

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes



Jones Environmental Laboratory

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Cardiff
CF24 0AD

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention : Chris Pugh
Date : 11th March, 2015
Your reference : A088137
Our reference : Test Report 15/4357 Batch 2
Location : Cardigan FAS
Date samples received : 6th March, 2015
Status : Final report
Issue : 1

Two samples were received for analysis on 6th March, 2015 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Jones Environmental Laboratory

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh
JE Job No.: 15/4357

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	13-15	16-18											
Sample ID	PBH 9	PBH 10 ES1											
Depth	0.5-1.0	0.5											
COC No / misc													
Containers	V J T	V J T											
Sample Date	04/03/2015	04/03/2015											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	06/03/2015	06/03/2015											
											Please see attached notes for all abbreviations and acronyms		
											LOD/LOR	Units	Method No.
Arsenic ^{#M}	21.6	22.9									<0.5	mg/kg	TM30/PM15
Cadmium ^{#M}	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Chromium ^{#M}	62.1	46.9									<0.5	mg/kg	TM30/PM15
Copper ^{#M}	43	53									<1	mg/kg	TM30/PM15
Lead ^{#M}	77	1170									<5	mg/kg	TM30/PM15
Mercury ^{#M}	<0.1	0.2									<0.1	mg/kg	TM30/PM15
Nickel ^{#M}	37.7	34.3									<0.7	mg/kg	TM30/PM15
Selenium ^{#M}	1	<1									<1	mg/kg	TM30/PM15
Water Soluble Boron ^{#M}	1.1	1.5									<0.1	mg/kg	TM74/PM32
Zinc ^{#M}	139	223									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene ^{#M}	<0.04	0.05									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	0.05	0.42									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.11									<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	0.07	0.95									<0.03	mg/kg	TM4/PM8
Pyrene #	0.06	0.71									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.07	0.55									<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	0.08	0.64									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	0.13	0.92									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.08	0.55									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	0.05	0.31									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.07									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.04	0.20									<0.04	mg/kg	TM4/PM8
PAH 16 Total	0.6	5.5									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.09	0.66									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.04	0.26									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	95	91									<0	%	TM4/PM8
EPH >C10-C40	69	266									<30	mg/kg	TM5/PM8
GRO (>C4-C8) ^{#M}	<100	<1000 _A									<100	ug/kg	TM36/PM12
GRO (>C8-C12) ^{#M}	<100	<1000 _A									<100	ug/kg	TM36/PM12
GRO (>C4-12) ^{#M}	<100	<1000 _A									<100	ug/kg	TM36/PM12
MTBE #	<5	<50 _A									<5	ug/kg	TM31/PM12
Benzene #	<5	<50 _A									<5	ug/kg	TM31/PM12
Toluene #	<5	<50 _A									<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	<50 _A									<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<50 _A									<5	ug/kg	TM31/PM12
o-Xylene #	<5	<50 _A									<5	ug/kg	TM31/PM12

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
Asbestos Team Leader

[illegible]

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4357

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range
A	x10 Dilution

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes



Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Attention : Chris Pugh
Date : 31st March, 2015
Your reference : A088137
Our reference : Test Report 15/4357 Batch 3
Location : Cardigan FAS
Date samples received : 10th March, 2015
Status : Final report
Issue : 2

Four samples were received for analysis on 10th March, 2015 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Jones Environmental Laboratory

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh
JE Job No.: 15/4357

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	19-21	22-24	25-27	28-30							Please see attached notes for all abbreviations and acronyms		
Sample ID	PBH4	TT4	PBH5	PBH5									
Depth	0.5-1.0	0.5-0.6	0.5	1.0									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	06/03/2015	04/03/2015	09/03/2015	09/03/2015									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	3	3	3	3									
Date of Receipt	10/03/2015	10/03/2015	10/03/2015	10/03/2015							LOD/LOR	Units	Method No.
Arsenic ^{#M}	-	-	11.4	13.5							<0.5	mg/kg	TM30/PM15
Arsenic	15.6	12.8	-	-							<0.5	mg/kg	TM30/PM62
Cadmium ^{#M}	-	-	<0.1	<0.1							<0.1	mg/kg	TM30/PM15
Cadmium	0.6	0.3	-	-							<0.1	mg/kg	TM30/PM62
Chromium ^{#M}	-	-	61.3	61.5							<0.5	mg/kg	TM30/PM15
Chromium	27.0	17.8	-	-							<0.5	mg/kg	TM30/PM62
Copper ^{#M}	-	-	32	31							<1	mg/kg	TM30/PM15
Copper	57	36	-	-							<1	mg/kg	TM30/PM62
Lead ^{#M}	-	-	40	28							<5	mg/kg	TM30/PM15
Lead	218	133	-	-							<5	mg/kg	TM30/PM62
Mercury ^{#M}	-	-	<0.1	<0.1							<0.1	mg/kg	TM30/PM15
Mercury	0.3	<0.1	-	-							<0.1	mg/kg	TM30/PM62
Nickel ^{#M}	-	-	23.2	40.8							<0.7	mg/kg	TM30/PM15
Nickel	40.0	19.7	-	-							<0.7	mg/kg	TM30/PM62
Selenium ^{#M}	-	-	<1	<1							<1	mg/kg	TM30/PM15
Selenium	<1	<1	-	-							<1	mg/kg	TM30/PM62
Water Soluble Boron ^{#M}	-	-	0.3	0.2							<0.1	mg/kg	TM74/PM32
Water Soluble Boron	1.4	1.9	-	-							<0.1	mg/kg	TM74/PM61
Zinc ^{#M}	-	-	92	114							<5	mg/kg	TM30/PM15
Zinc	361	327	-	-							<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene ^{#M}	<0.04	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.05	<0.60 _A	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	<0.05	<1.00 _A	<0.05	<0.05							<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	<0.04	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	0.34	2.45 _A	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Anthracene [#]	0.13	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	0.96	2.49 _A	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Pyrene [#]	0.82	2.01 _A	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene [#]	0.87	<1.20 _A	<0.06	<0.06							<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	0.92	1.24 _A	<0.02	<0.02							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	1.42	<1.40 _A	<0.07	<0.07							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene [#]	0.71	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	0.51	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene [#]	0.21	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene [#]	0.56	<0.80 _A	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
PAH 16 Total	7.5	<12.0 _A	<0.6	<0.6							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	1.02	<1.00 _A	<0.05	<0.05							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.40	<0.40 _A	<0.02	<0.02							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	114	94 _A	107	114							<0	%	TM4/PM8
EPH >C10-C40	273	780	<30	<30							<30	mg/kg	TM5/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
Asbestos Team Leader

[illegible]

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4357

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range
A	x20 Dilution

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes



Jones Environmental Laboratory

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Attention : Chris Pugh
Date : 25th March, 2015
Your reference : A088137
Our reference : Test Report 15/4357 Batch 4
Location : Cardigan FAS
Date samples received : 12th March, 2015
Status : Final report
Issue : 1

Three samples were received for analysis on 12th March, 2015 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Jones Environmental Laboratory

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh
JE Job No.: 15/4357

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	31-33	34-36	37-39							Please see attached notes for all abbreviations and acronyms		
Sample ID	PBH3	PBH2	PBH2									
Depth	0.4	0.4	1.8									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	10/03/2015	11/03/2015	11/03/2015									
Sample Type	Soil	Soil	Soil									
Batch Number	4	4	4									
Date of Receipt	12/03/2015	12/03/2015	12/03/2015							LOD/LOR	Units	Method No.
Arsenic ^{#M}	-	15.1	13.9							<0.5	mg/kg	TM30/PM15
Arsenic	17.5	-	-							<0.5	mg/kg	TM30/PM62
Cadmium ^{#M}	-	0.1	<0.1							<0.1	mg/kg	TM30/PM15
Cadmium	0.3	-	-							<0.1	mg/kg	TM30/PM62
Chromium ^{#M}	-	40.7	48.1							<0.5	mg/kg	TM30/PM15
Chromium	31.0	-	-							<0.5	mg/kg	TM30/PM62
Copper ^{#M}	-	34	35							<1	mg/kg	TM30/PM15
Copper	41	-	-							<1	mg/kg	TM30/PM62
Lead ^{#M}	-	287	21							<5	mg/kg	TM30/PM15
Lead	105	-	-							<5	mg/kg	TM30/PM62
Mercury ^{#M}	-	0.2	<0.1							<0.1	mg/kg	TM30/PM15
Mercury	<0.1	-	-							<0.1	mg/kg	TM30/PM62
Nickel ^{#M}	-	23.1	40.4							<0.7	mg/kg	TM30/PM15
Nickel	28.2	-	-							<0.7	mg/kg	TM30/PM62
Selenium ^{#M}	-	<1	<1							<1	mg/kg	TM30/PM15
Selenium	<1	-	-							<1	mg/kg	TM30/PM62
Water Soluble Boron ^{#M}	-	2.7	0.6							<0.1	mg/kg	TM74/PM32
Water Soluble Boron	0.9	-	-							<0.1	mg/kg	TM74/PM61
Zinc ^{#M}	-	121	117							<5	mg/kg	TM30/PM15
Zinc	188	-	-							<5	mg/kg	TM30/PM62
PAH MS												
Naphthalene ^{#M}	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	<0.05	<0.05	<0.05							<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	0.29	0.15	<0.03							<0.03	mg/kg	TM4/PM8
Anthracene [#]	0.05	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	0.76	0.73	<0.03							<0.03	mg/kg	TM4/PM8
Pyrene [#]	0.61	0.63	<0.03							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene [#]	0.57	0.70	<0.06							<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	0.55	0.74	<0.02							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	0.83	1.11	<0.07							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene [#]	0.42	0.58	<0.04							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	0.25	0.31	<0.04							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene [#]	<0.04	0.08	<0.04							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene [#]	0.21	0.31	<0.04							<0.04	mg/kg	TM4/PM8
PAH 16 Total	4.5	5.3	<0.6							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.60	0.80	<0.05							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.23	0.31	<0.02							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	110	104	103							<0	%	TM4/PM8
EPH >C10-C40	107	224	<30							<30	mg/kg	TM5/PM8

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:

[Handwritten signature]

Ryan Butterworth
Asbestos Team Leader

[illegible]

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4357

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes



Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

WYG
5th Floor
Longcross Court
47 Newport Road
Cardiff
CF24 0AD

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention : Chris Pugh
Date : 2nd April, 2015
Your reference : A088137
Our reference : Test Report 15/4357 Batch 5
Location : Cardigan FAS
Date samples received : 21st March, 2015
Status : Final report
Issue : 1

Three samples were received for analysis on 21st March, 2015 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Jones Environmental Laboratory

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh
JE Job No.: 15/4357

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	40-42	43-45	46-48								Please see attached notes for all abbreviations and acronyms		
Sample ID	PBH8	PBH8	PBH8										
Depth	0.50-1.20	2.10-3.00	0.20-0.50										
COC No / misc													
Containers	V J T	V J T	V J T										
Sample Date	19/03/2015	19/03/2015	19/03/2015										
Sample Type	Soil	Soil	Soil										
Batch Number	5	5	5										
Date of Receipt	21/03/2015	21/03/2015	21/03/2015								LOD/LOR	Units	Method No.
Arsenic ^{#M}	13.7	21.2	11.2								<0.5	mg/kg	TM30/PM15
Cadmium ^{#M}	0.3	0.1	<0.1								<0.1	mg/kg	TM30/PM15
Chromium ^{#M}	45.6	55.2	45.9								<0.5	mg/kg	TM30/PM15
Copper ^{#M}	53	29	29								<1	mg/kg	TM30/PM15
Lead ^{#M}	75	54	36								<5	mg/kg	TM30/PM15
Mercury ^{#M}	<0.1	<0.1	<0.1								<0.1	mg/kg	TM30/PM15
Nickel ^{#M}	35.9	29.8	30.3								<0.7	mg/kg	TM30/PM15
Selenium ^{#M}	<1	1	<1								<1	mg/kg	TM30/PM15
Water Soluble Boron ^{#M}	0.7	0.8	0.4								<0.1	mg/kg	TM74/PM32
Zinc ^{#M}	167	123	97								<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene ^{#M}	<0.04	<0.04	0.15								<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.23	0.25								<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	<0.05	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	<0.04	0.04	0.10								<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	0.09	0.31	1.53								<0.03	mg/kg	TM4/PM8
Anthracene #	0.06	0.48	1.05								<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	0.50	2.63	10.64								<0.03	mg/kg	TM4/PM8
Pyrene #	0.51	1.65	8.83								<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.32	2.17	6.02								<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	0.45	2.21	5.70								<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	0.92	2.34	8.84								<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.60	1.35	5.96								<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	0.29	0.76	3.15								<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.06	0.30	0.60								<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.25	0.50	2.55								<0.04	mg/kg	TM4/PM8
PAH 16 Total	4.1	15.0	55.4								<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.66	1.68	6.36								<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.26	0.66	2.48								<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	92	93	98								<0	%	TM4/PM8
EPH >C10-C40	67	56	100								<30	mg/kg	TM5/PM8
GRO (>C4-C8) ^{#M}	<100	<100	<100								<100	ug/kg	TM36/PM12
GRO (>C8-C12) ^{#M}	<100	<100	<100								<100	ug/kg	TM36/PM12
GRO (>C4-12) ^{#M}	<100	<100	<100								<100	ug/kg	TM36/PM12
MTBE #	<5	<5	<5								<5	ug/kg	TM31/PM12
Benzene #	<5	<5	<5								<5	ug/kg	TM31/PM12
Toluene #	<5	<5	<5								<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	<5	<5								<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<5	<5								<5	ug/kg	TM31/PM12
o-Xylene #	<5	<5	<5								<5	ug/kg	TM31/PM12

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
Asbestos Team Leader

[illegible]

Client Name: WYG
Reference: A088137
Location: Cardigan FAS
Contact: Chris Pugh

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4357

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

JE Job No: 15/4357

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes



Appendix E – Variable Head Permeability Testing

FIELD PERMEABILITY TEST - FALLING HEAD

Calculated by	NEB
Checked by	PV

Borehole **PBH2**

Test date **11/03/2015**

READINGS

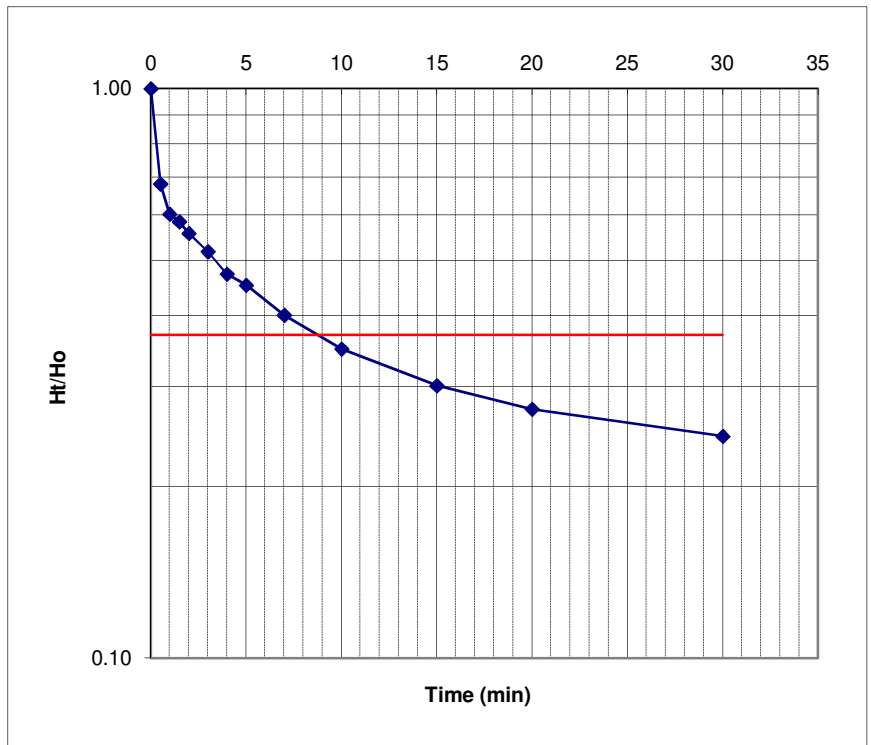
Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0.88	1.00
0.5	1.94	0.68
1	2.2	0.60
1.5	2.26	0.58
2	2.35	0.56
3	2.48	0.52
4	2.63	0.47
5	2.7	0.45
7	2.87	0.40
10	3.04	0.35
15	3.2	0.30
20	3.29	0.27
30	3.385	0.25

RESPONSE ZONE DETAILS INPUT VALUES

Top of test section (m below ground)	Bottom of test section (m below ground)	Height of casing above ground (m)	Casing or standpipe diameter (m)	Test section diameter (m)	Depth to water table (m below ground)
6.90	10.30	0.60	0.11	0.11	3.60

CALCULATED VALUES

Length of test section, L	3.40
Initial head of water, H_0	3.32



INPUT

BASIC TIME LAG, T (min to reach $H_t/H_0=0.37$)	3.7
BASIC TIME LAG (seconds)	222

RESULTS

PERMEABILITY (m/s)	8.8E-06
--------------------	---------

WYG Environment
5th Floor, Longcross Court,
47 Newport Road, Cardiff
Tel: 02920 829200 Fax: 02920 455321
Environmental Consultancy
Ground Engineering Services



Project Cardigan FAS	Drawing Title FIELD PERMEABILITY TEST RESULTS
Client NRW	Drawing No. PBH2

FIELD PERMEABILITY TEST - FALLING HEAD

Calculated by	NEB
Checked by	PV

Borehole **PBH3**

Test date **10/03/2015**

READINGS

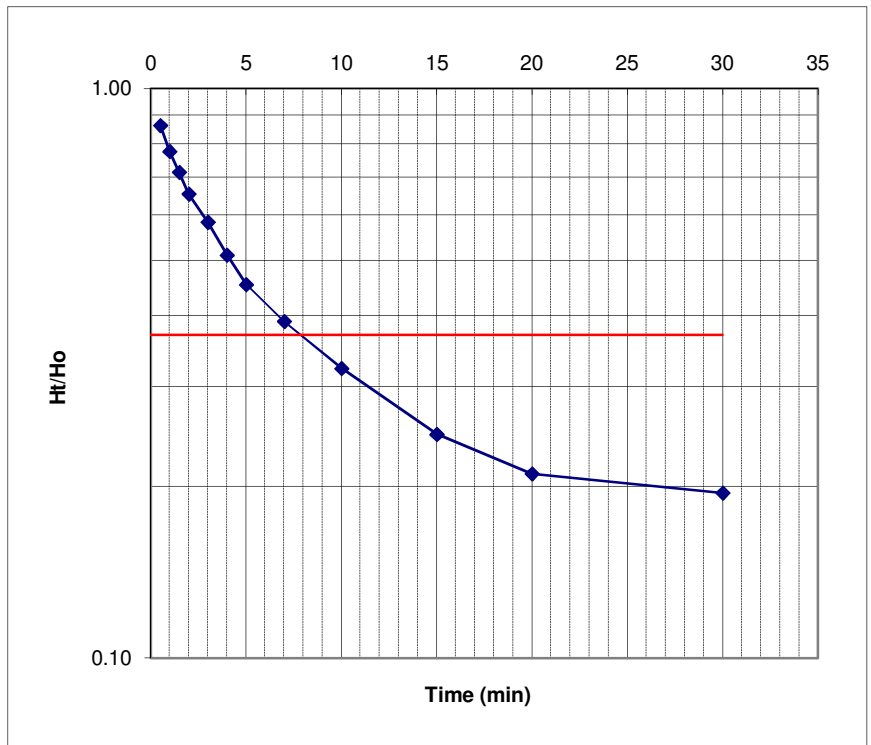
Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0	
0.5	0.53	0.86
1	0.86	0.78
1.5	1.1	0.71
2	1.33	0.65
3	1.6	0.58
4	1.88	0.51
5	2.1	0.45
7	2.34	0.39
10	2.6	0.32
15	2.89	0.25
20	3.03	0.21
30	3.09	0.20

RESPONSE ZONE DETAILS INPUT VALUES

Top of test section (m below ground)	Bottom of test section (m below ground)	Height of casing above ground (m)	Casing or standpipe diameter (m)	Test section diameter (m)	Depth to water table (m below ground)
5.35	5.90	0.65	0.11	0.11	3.19

CALCULATED VALUES

Length of test section, L	0.55
Initial head of water, H_0	3.84



INPUT

BASIC TIME LAG, T (min to reach $H_t/H_0=0.37$)	3.7
BASIC TIME LAG (seconds)	222

RESULTS

PERMEABILITY (m/s)	3.0E-05
--------------------	---------

WYG Environment
5th Floor, Longcross Court,
47 Newport Road, Cardiff
Tel: 02920 829200 Fax: 02920 455321
Environmental Consultancy
Ground Engineering Services



Project Cardigan FAS	Drawing Title FIELD PERMEABILITY TEST RESULTS
Client NRW	Drawing No. PBH3

FIELD PERMEABILITY TEST - FALLING HEAD

Calculated by	NEB
Checked by	PV

Borehole **PBH3B**

Test date **10/03/2015**

READINGS

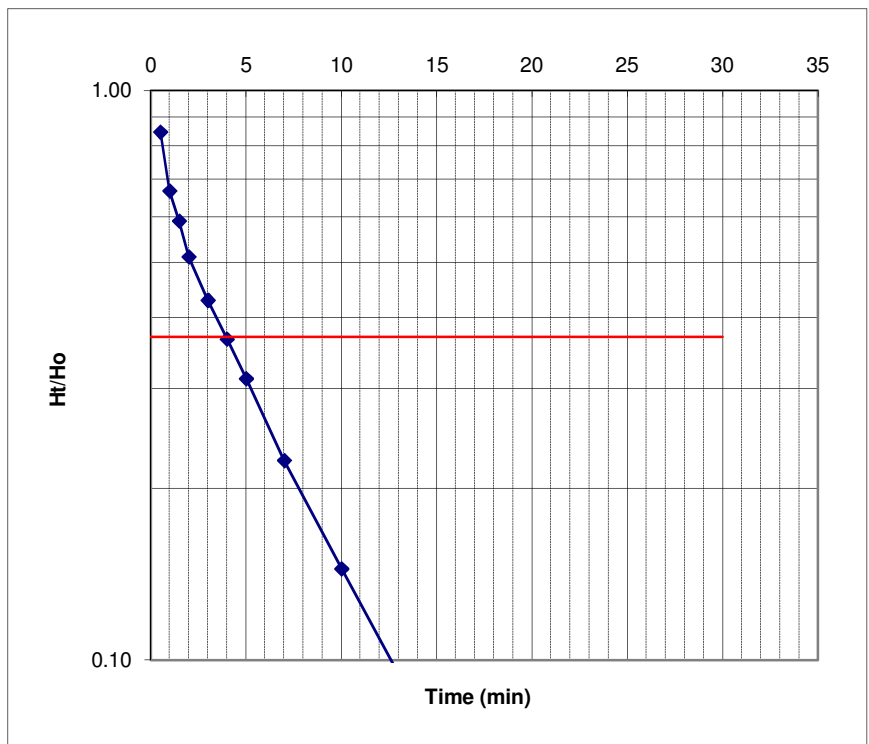
Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0	
0.5	0.54	0.85
1	1.17	0.67
1.5	1.44	0.59
2	1.72	0.51
3	2.01	0.43
4	2.23	0.37
5	2.42	0.31
7	2.73	0.22
10	3.01	0.14
15	3.27	0.07
20	3.42	0.03
30	3.54	-0.01

RESPONSE ZONE DETAILS INPUT VALUES

Top of test section (m below ground)	Bottom of test section (m below ground)	Height of casing above ground (m)	Casing or standpipe diameter (m)	Test section diameter (m)	Depth to water table (m below ground)
8.00	8.40	0.42	0.11	0.11	3.10

CALCULATED VALUES

Length of test section, L	0.40
Initial head of water, H_0	3.52



INPUT

BASIC TIME LAG, T (min to reach $H_t/H_0=0.37$)	3.7
BASIC TIME LAG (seconds)	222

RESULTS

PERMEABILITY (m/s)	3.6E-05
--------------------	---------

WYG Environment
5th Floor, Longcross Court,
47 Newport Road, Cardiff
Tel: 02920 829200 Fax: 02920 455321
Environmental Consultancy
Ground Engineering Services



Project Cardigan FAS	Drawing Title FIELD PERMEABILITY TEST RESULTS
Client NRW	Drawing No. PBH3B

FIELD PERMEABILITY TEST - FALLING HEAD

Calculated by	NEB
Checked by	PV

Borehole **PBH10**

Test date **03/03/2015**

READINGS

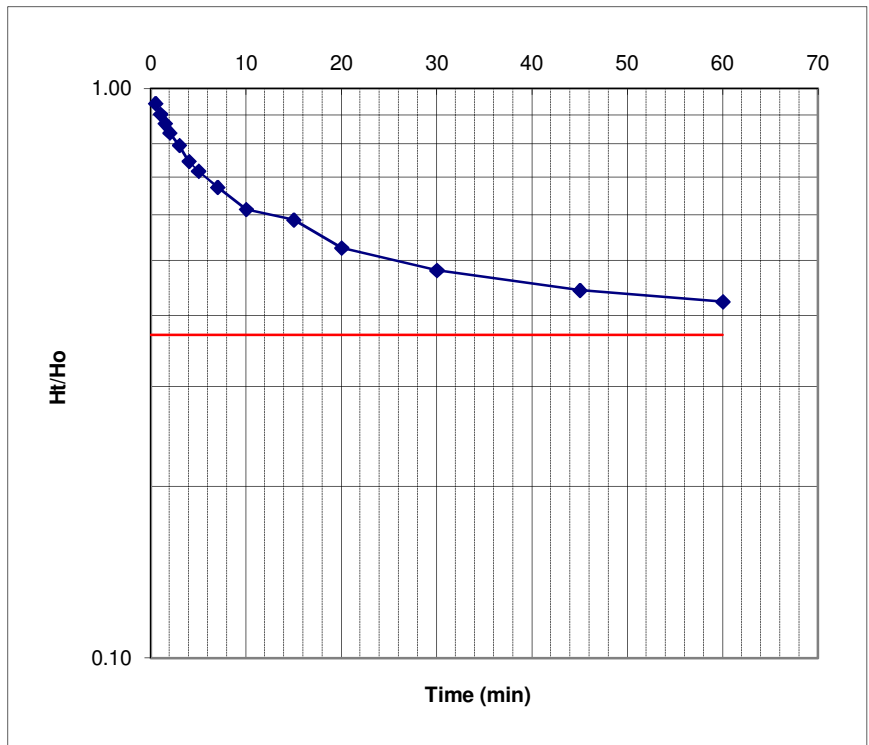
Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0	
0.5	0.2	0.94
1	0.34	0.90
1.5	0.46	0.87
2	0.57	0.84
3	0.715	0.80
4	0.89	0.75
5	0.99	0.72
7	1.15	0.67
10	1.35	0.61
15	1.44	0.59
20	1.66	0.53
30	1.82	0.48
45	1.95	0.44
60	2.02	0.42

RESPONSE ZONE DETAILS INPUT VALUES

Top of test section (m below ground)	Bottom of test section (m below ground)	Height of casing above ground (m)	Casing or standpipe diameter (m)	Test section diameter (m)	Depth to water table (m below ground)
5.50	6.00	0.50	0.11	0.11	3.00

CALCULATED VALUES

Length of test section, L	0.50
Initial head of water, H_0	3.50



INPUT

BASIC TIME LAG, T (min to reach $H_t/H_0=0.37$)	3.7
BASIC TIME LAG (seconds)	222

RESULTS

PERMEABILITY (m/s)	3.2E-05
--------------------	---------

WYG Environment
5th Floor, Longcross Court,
47 Newport Road, Cardiff
Tel: 02920 829200 Fax: 02920 455321
Environmental Consultancy
Ground Engineering Services



Project Cardigan FAS	Drawing Title FIELD PERMEABILITY TEST RESULTS
Client NRW	Drawing No. PBH6

FIELD PERMEABILITY TEST - FALLING HEAD

Calculated by	NEB
Checked by	PV

Borehole **PBH10**

Test date **03/03/2015**

READINGS

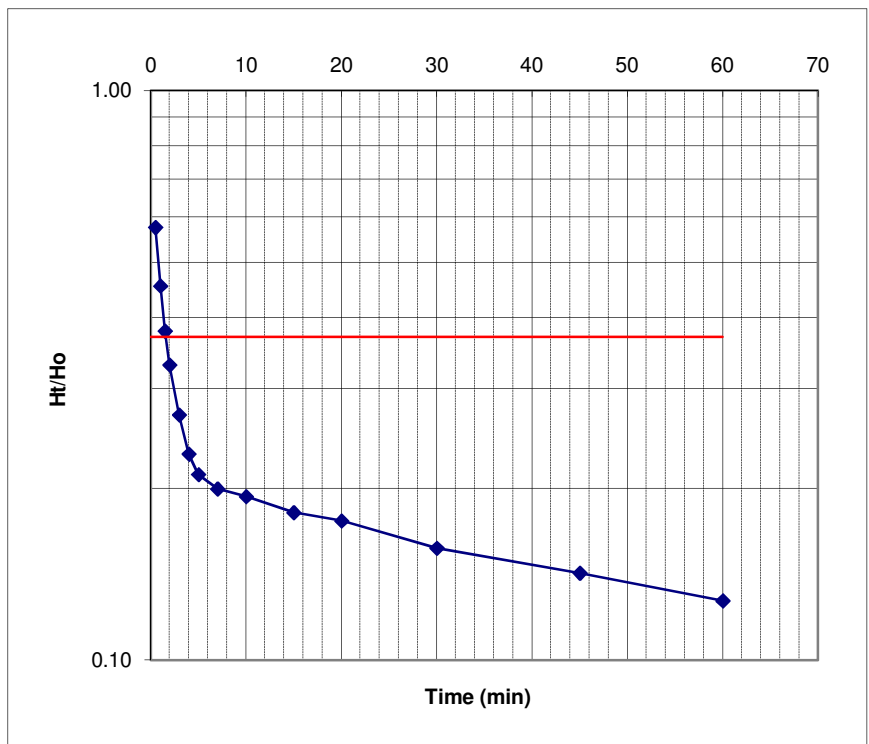
Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0	
0.5	1.4	0.58
1	1.8	0.45
1.5	2.05	0.38
2	2.21	0.33
3	2.41	0.27
4	2.54	0.23
5	2.6	0.21
7	2.64	0.20
10	2.66	0.19
15	2.7	0.18
20	2.72	0.18
30	2.78	0.16
45	2.83	0.14
60	2.88	0.13

RESPONSE ZONE DETAILS INPUT VALUES

Top of test section (m below ground)	Bottom of test section (m below ground)	Height of casing above ground (m)	Casing or standpipe diameter (m)	Test section diameter (m)	Depth to water table (m below ground)
4.00	4.20	0.50	0.11	0.11	2.80

CALCULATED VALUES

Length of test section, L	0.20
Initial head of water, H_0	3.30



INPUT

BASIC TIME LAG, T (min to reach $H_t/H_0=0.37$)	3.7
BASIC TIME LAG (seconds)	222

RESULTS

PERMEABILITY (m/s)	4.6E-05
--------------------	---------

WYG Environment
5th Floor, Longcross Court,
47 Newport Road, Cardiff
Tel: 02920 829200 Fax: 02920 455321
Environmental Consultancy
Ground Engineering Services



Project Cardigan FAS	Drawing Title FIELD PERMEABILITY TEST RESULTS
Client NRW	Drawing No. PBH10



Appendix F – Land gas and groundwater monitoring results

White Young Green Environmental

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cardigan FAS

Job No.: A088137

Client: Natural Resources Wales

Date Monitored: 13/04/15

Monitoring Engineer: LK

Weather: dry, sunny spells

EQUIPMENT USED											
Type	Make			Serial			Last Calibrated				
Gas Analyser	GA5000			G502044			11.11.2014				
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS ³											
Exploratory Hole No	Peak ¹		Steady ²								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	LEL (%)	H ₂ S (ppm)	CO (ppm)	Time		
PBH02	<0.1	0.1	<0.1	0.1	20.9	79	<1	<1	15:28:00		
PBH03	<0.1	0.1	<0.1	0.1	20.9	79		<1	15:11:00		
PBH06	0.1	0.1	<0.1	<0.1	20.7	79.2		1	13:09:00		
PBH07	<0.1	0.1	<0.1	0.1	20.8	79		<1	11:04:00		
PBH08	<0.1	0.1	<0.1	0.1	20.9	79		1	13:43:00		
PBH10	<0.1	0.1	<0.1	0.1	20.8	79.1		<1	14:19:00		
LANDGAS - PHYSICAL PARAMETERS ³											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak ¹ (l/hr)	Steady ² (L/hr)	Peak ¹ (mbar)	Steady ² (mbar)					
PBH02	1031.0	nt	0.0	0.2	0.4	0.4					
PBH03	1029.0	nt	-2.6	0.2	0.4	0.4	BH Flow dropped from -2.6 to +0.2 in 3:30mins				
PBH06	1031.0	nt	0.5	0.4	7.0	5.7					
PBH07	1028.0	nt	0.6	0.6	-0.1	-0.1					
PBH08	1029.0	nt	-1.6	0.1	-3.0	3.0	BH flow dropped steadily to +0.1 in 7mins				
PBH10	1029.0	nt	0.3	0.2	1.7	0.4					
							Atmospheric pressure conditions below from days previous and following monitoring from Boncath ca. 9km south of Cardigan				
AMBIENT ATMOSPHERIC CONDITIONS ³						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring	After Monitoring								
CH ₄ (% vol)		0.0	0.0		3 days prior (m bar)			995			
CO ₂ (% vol)		0.1	0.1		2 days prior (m bar)			1000			
O ₂ (% vol)		21.0	21.1		1 day prior (m bar)			1002			
					during (m bar) am,midday,pm			1008.7, 1009.7, 1008.7			
Atmos Press. (m bar)		1028	1029		1 day post (m bar)			1006			
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS ³											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					Eh (mV)	EC (µs)	Ph (value)	DO (ppm)	Temp (°C)	TDS (ppm)	
PBH02	2.11	5.36	nt	nt	nt	nt	nt	nt	nt	nt	
PBH03	2.33	4.11	nt	nt	nt	nt	nt	nt	nt	nt	
PBH06	2.37	4.06	nt	nt	nt	nt	nt	nt	nt	nt	
PBH07	2.74	4.14	nt	nt	nt	nt	nt	nt	nt	nt	
PBH08	2.62	3.95	nt	nt	nt	nt	nt	nt	nt	nt	
PBH10	2.52	3.72	nt	nt	nt	nt	nt	nt	nt	nt	

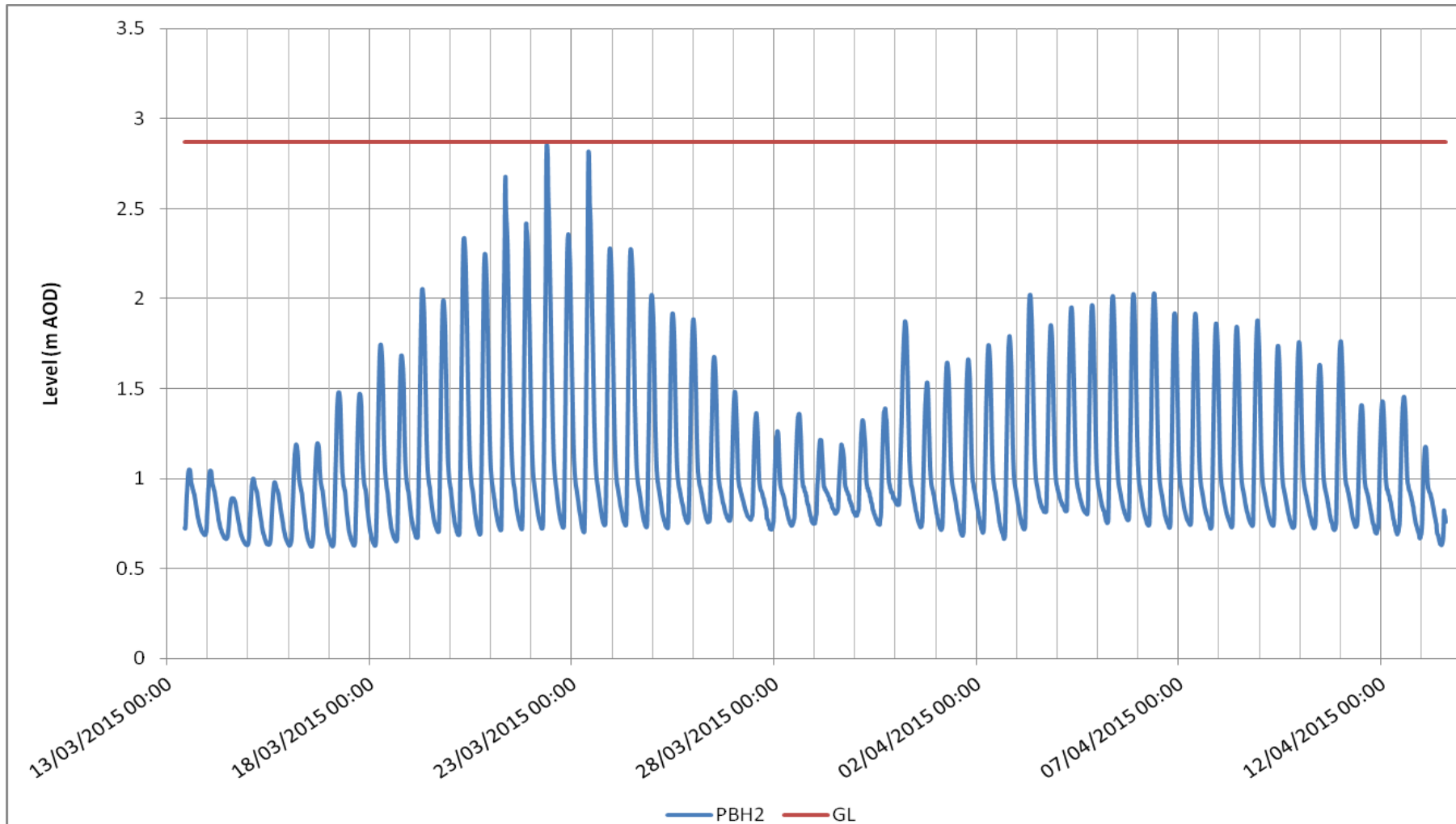
Notes

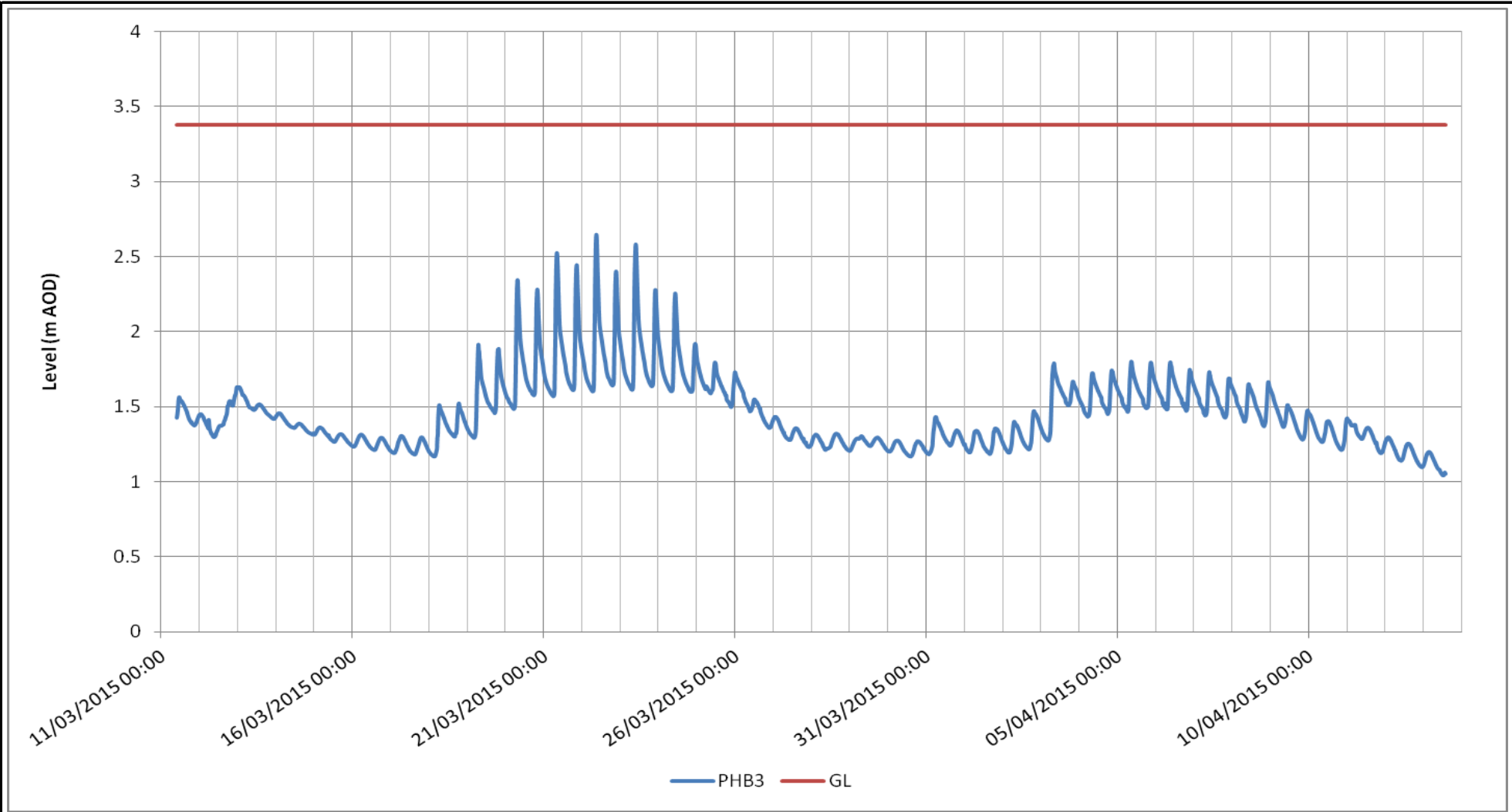
nt = not tested
nd = not detected

Data Compiled by: LK
Data Checked by: PV



Appendix G – Levellogger groundwater monitoring results





WYG Environment

6th Floor, Longcross Court, 47 Newport Road, Cardiff

Tel: 02920 829201

Fax: 02920 455322

Environmental Consultancy
Ground Engineering Services



Project

Cardigan FAS

Client

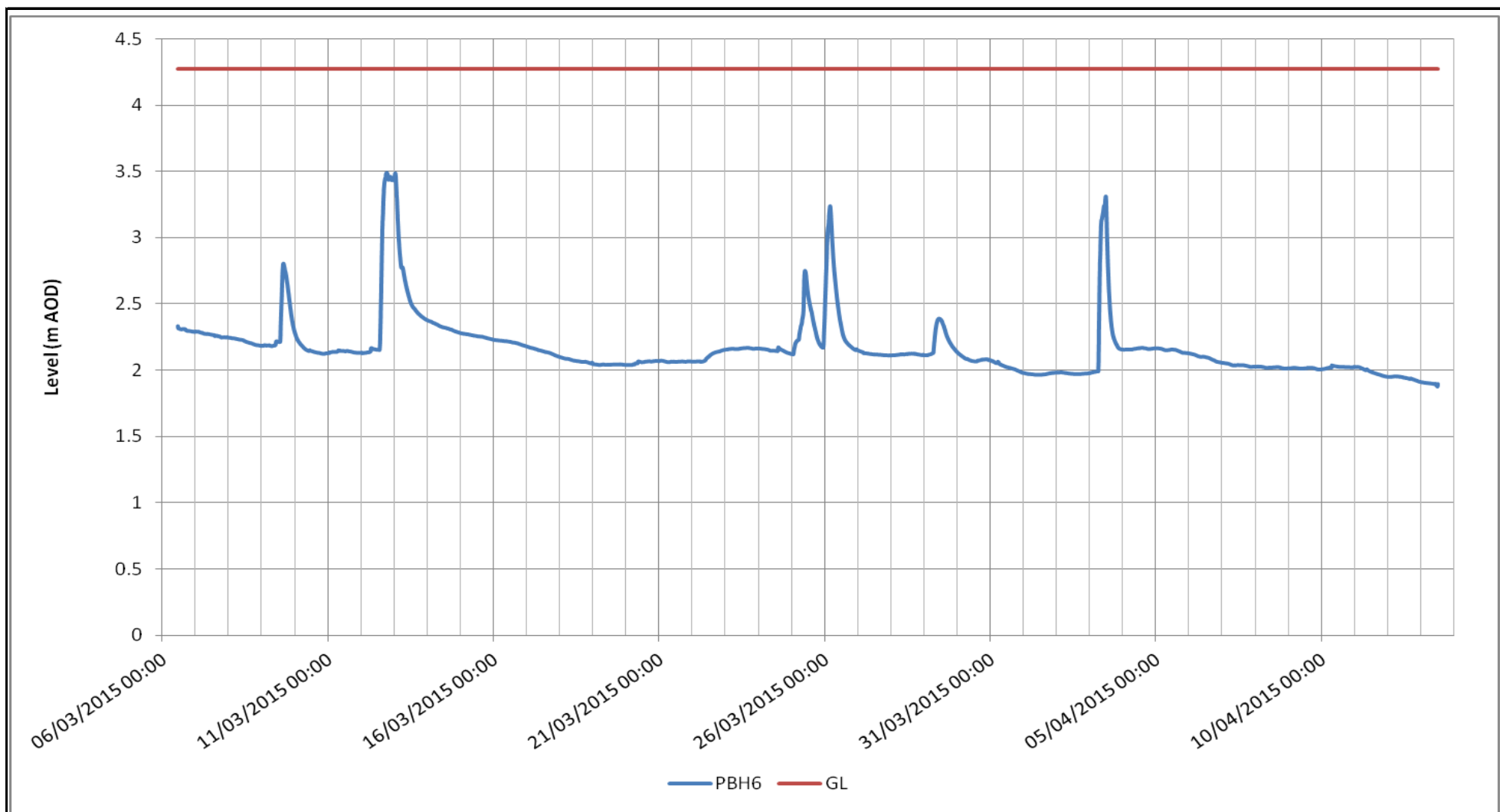
Natural Resources Wales

Checked by

LK

Waterlevel and Groundlevel at PBH03

Appendix G2

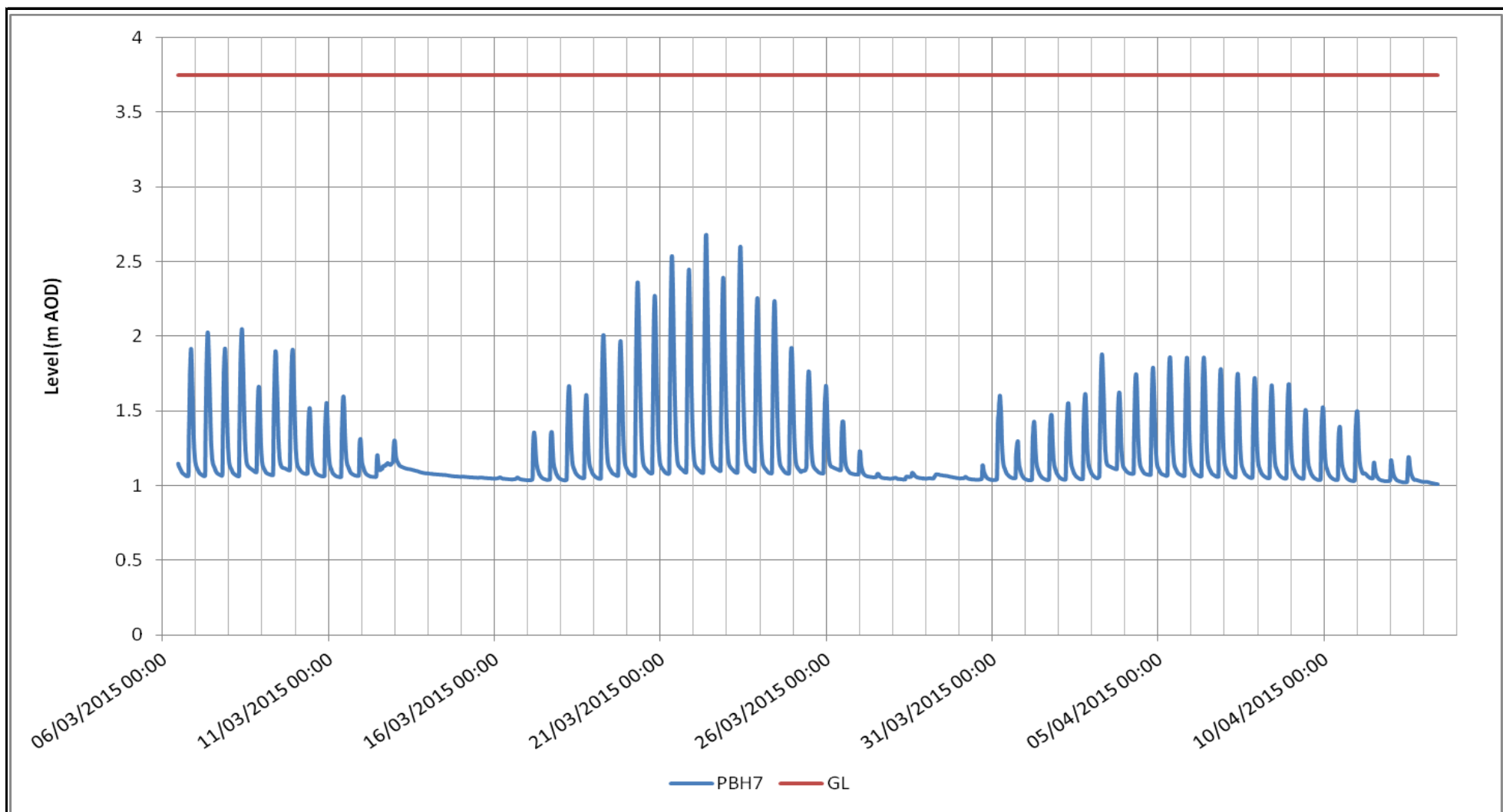


WYG Environment
 7th Floor, Longcross Court, 47 Newport Road, Cardiff
 Tel: 02920 829202
 Fax: 02920 455323
 Environmental Consultancy
 Ground Engineering Services



Project
 Cardigan FAS
 Client
 Natural Resources Wales

Waterlevel and Groundlevel at PBH06
 Checked by
 LK
 Plate No.
 Appendix G3

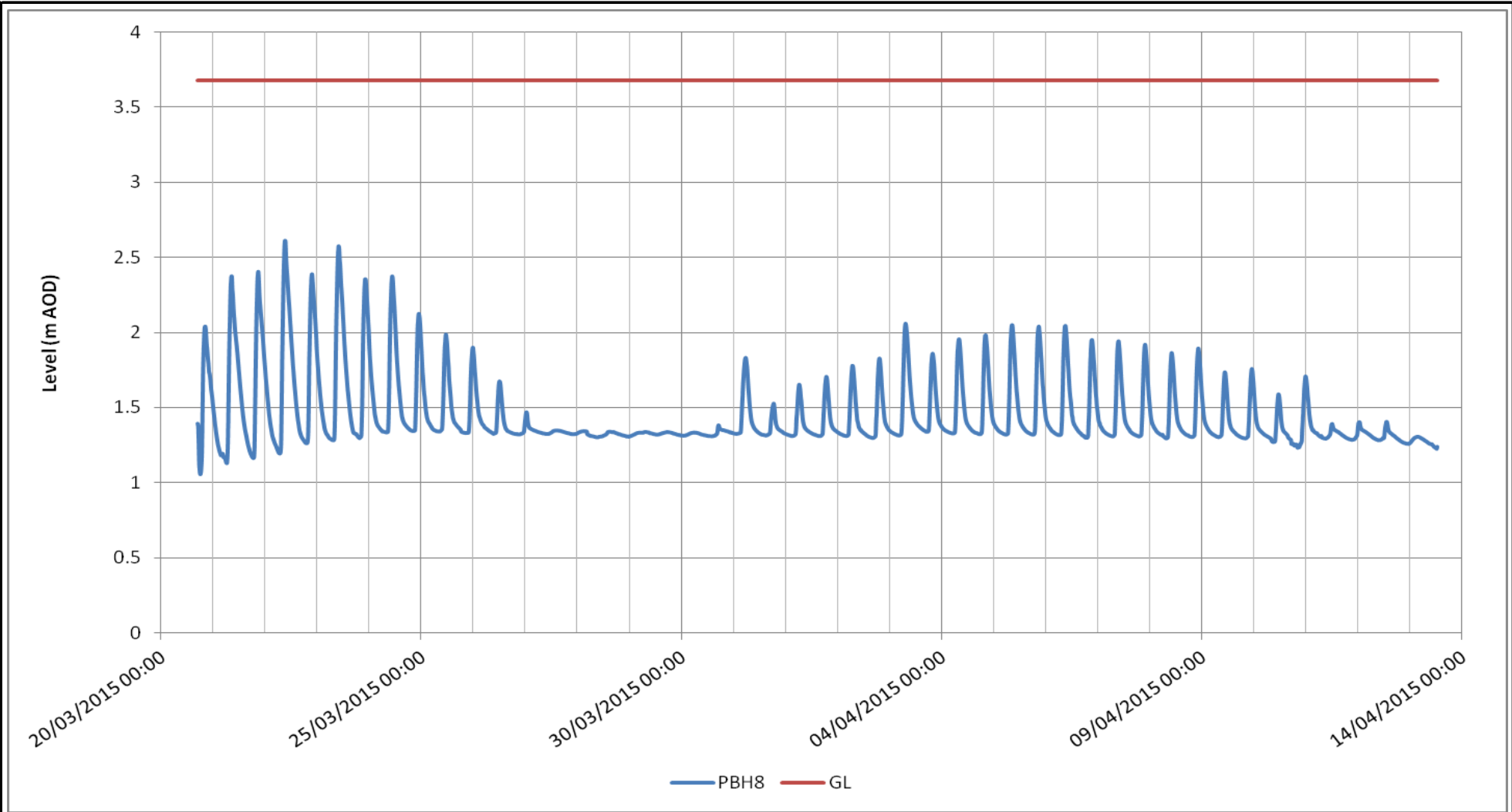


WYG Environment
 8th Floor, Longcross Court, 47 Newport Road, Cardiff
 Tel: 02920 829203
 Fax: 02920 455324
 Environmental Consultancy
 Ground Engineering Services

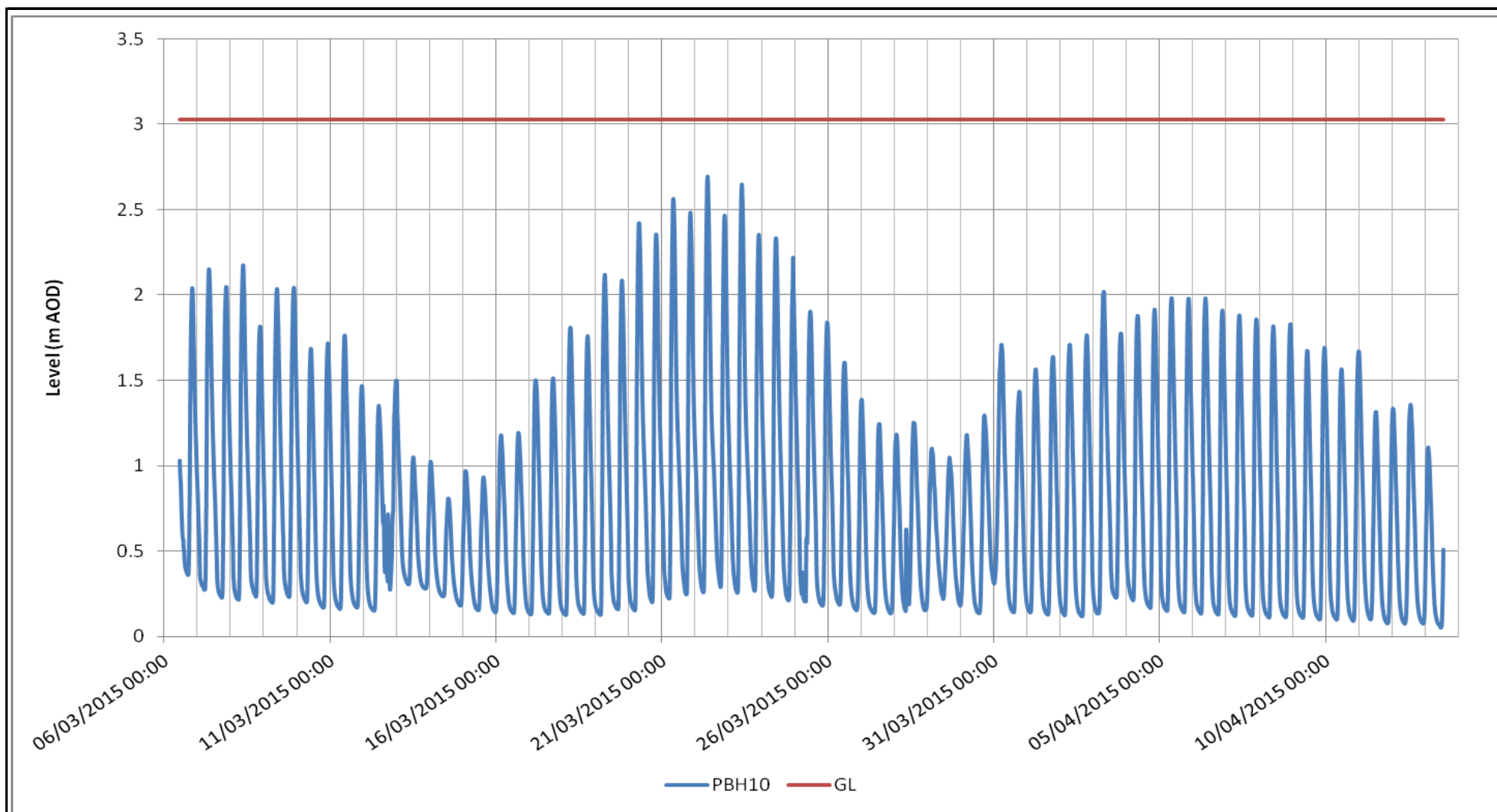


Project
 Cardigan FAS
 Client
 Natural Resources Wales

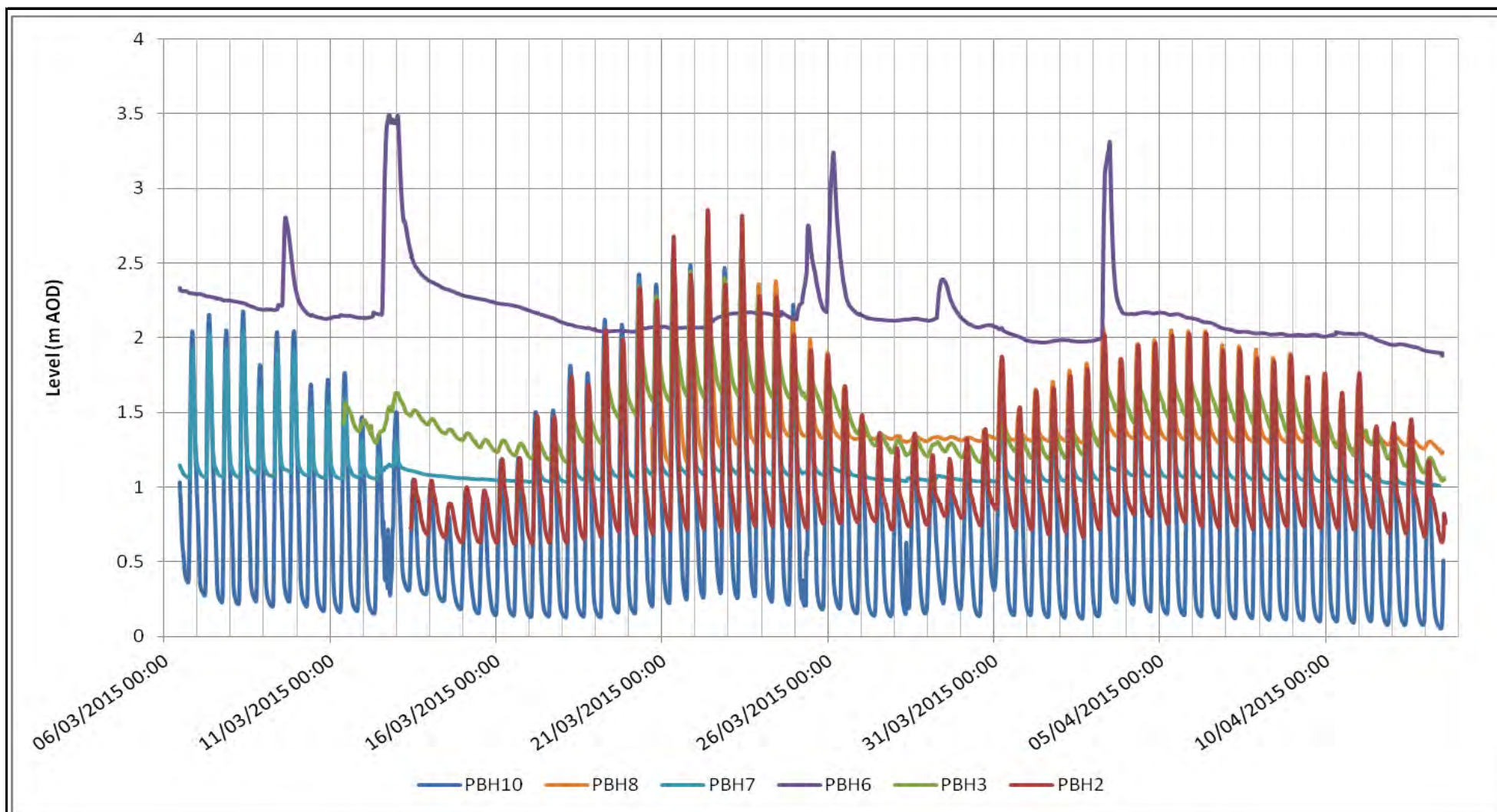
Waterlevel and Groundlevel at PBH07
 Checked by
 LK
 Appendix G4



WYG Environment 9 th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829204 Fax: 02920 455325 Environmental Consultancy Ground Engineering Services	Project	Cardigan FAS		Waterlevel and Groundlevel at PBH08	
	Client	Natural Resources Wales		Checked by LK	Appendix G5



WYG Environment 10 th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829205 Fax: 02920 455326 Environmental Consultancy Ground Engineering Services	Project Cardigan FAS	Waterlevel and Groundlevel at PBH10	
	Client Natural Resources Wales	Checked by LK	Appendix G6



WYG Environment

11th Floor, Longcross Court, 47 Newport Road, Cardiff

Tel: 02920 829206

Fax: 02920 455327

Environmental Consultancy
Ground Engineering Services

Project

Cardigan FAS

Client

Natural Resources Wales

Checked by

LK

Waterlevel at all boreholes

Appendix G7



Appendix C: CJ Associates Factual Report (2022)

[2071916 Cardigan Flood Risk Management Factual Report v2.pdf](#)

Ground Investigation No. 2071916
Factual Report
DRAFT

Cardigan Tidal Flood Risk Management

May 2022



Client:

Natural Resources Wales
Welsh Government Building
Rhodfa Padarn
Llanbadarn Fawr
Aberystwyth
Ceredigion
SY23 3UR



Engineer:

Binnies UK Limited
3rd Floor
One City Place
Queens Road
Chester
CH1 3BQ





Portview Road, Avonmouth, Bristol, BS11 9JE
Tel: 0117 982 1473 Fax: 0117 982 8200

Report Status:	Interim Draft	Draft	
Issue Number:	01	02	
Issue Date:	06/05/22	10/06/22	
Prepared By:	ME	IG	
Checked By:	SOF	SOF	
Signed:			

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Borehole Log Sheets

APPENDIX B: PHOTOGRAPHS

Dynamic Sampling and Rotary Core Photographs

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Monitoring Results

APPENDIX D: LABORATORY TESTING RESULTS

Geotechnical Testing Results

Geoenvironmental Testing Results

APPENDIX E: DRAWINGS

Site Location Plan

Borehole Location Plan

1 INTRODUCTION

1.1 Instruction

C.J. Associates Geotechnical Limited (CJA) were instructed by Binnies UK Limited (Engineer) to carry out a ground investigation, within the historic town of Cardigan in west Wales, on behalf of Natural Resources Wales (Client).

1.2 Brief and Report Scope

The purpose of the ground investigation is to provide information on the ground conditions including geotechnical, geoenvironmental and hydrogeological data to inform the design of proposed flood defence upgrades.

The specification for the works was provided by the Engineer and incorporated the brief to undertake an intrusive phase 2 ground investigation which included the following:

- 3 no. Dynamic Sample Borehole with Rotary Core Follow-on to a maximum of 15mbgl.
- Over water Cone Penetration Testing with dissipation testing.
- In-situ testing including standard penetration testing (SPT) and permeability testing.
- Logging and sampling.
- Installation of groundwater monitoring pipes.
- Post fieldworks groundwater monitoring.
- Geotechnical and geoenvironmental laboratory testing.
- Factual Report.

The report presents full factual records of the site work carried out, the ground conditions encountered in the exploratory holes, the in situ and laboratory test results and.

1.3 Limitations

CJA take no responsibility for conditions that have not been revealed by the exploratory holes, or which occur between them. Information provided from other sources is taken in good faith and CJA cannot guarantee its accuracy.

The report has been prepared exclusively for the Client, for the site area indicated, and for the purpose stated. CJA accepts no responsibility for any site, client or type of development not indicated in this report.

This report should be reviewed at all stages of construction by someone familiar with the terms and assumptions it contains. It is essential that a suitably qualified and experienced engineer be appointed for the design of the works and supervise construction.

2 THE SITE

2.1 Site Location & Description

The site is located within the historic town of Cardigan (*Aberteifi Welsh*) along the northern bank of the River Teifi in Ceredigion west Wales. The site is linear covering an area of approximately 500m from west to east starting at the National Grid Reference SN 17783 45866 and ending at SN 18109 45969.

The onshore investigation comprises of three distinct areas of investigation running west to east along the northern bank of the River (*Afon Welsh*) Teifi. The first is a car parking area (approximately 17.0m x 11.0m) located at the front of the Cardigan Bathroom Centre which is accessed off The Strand. This site area consists of asphalt hardstanding which slopes gently to the north and is bounded to the north and west by The Strand and to the south and east by the Bathroom Centre.

The second area of investigation is an approximately 25.0m x 20.0m grassed area within the grounds of the Scout Hall Boat House located at SN 17941 45959. The area is predominately flat and is bounded to the north by The Strand to the west and east by building associated with the boathouse and to the south by the River Teifi.

The third onshore area at the eastern end of the investigation limits consists of a rectangular area (15.0m x 25.0m) of grass land located immediately east of Gloster Row Car Park. The area is predominantly flat and further bounded to the south by the River Teifi and to the north and the east by the garden of a residential property.

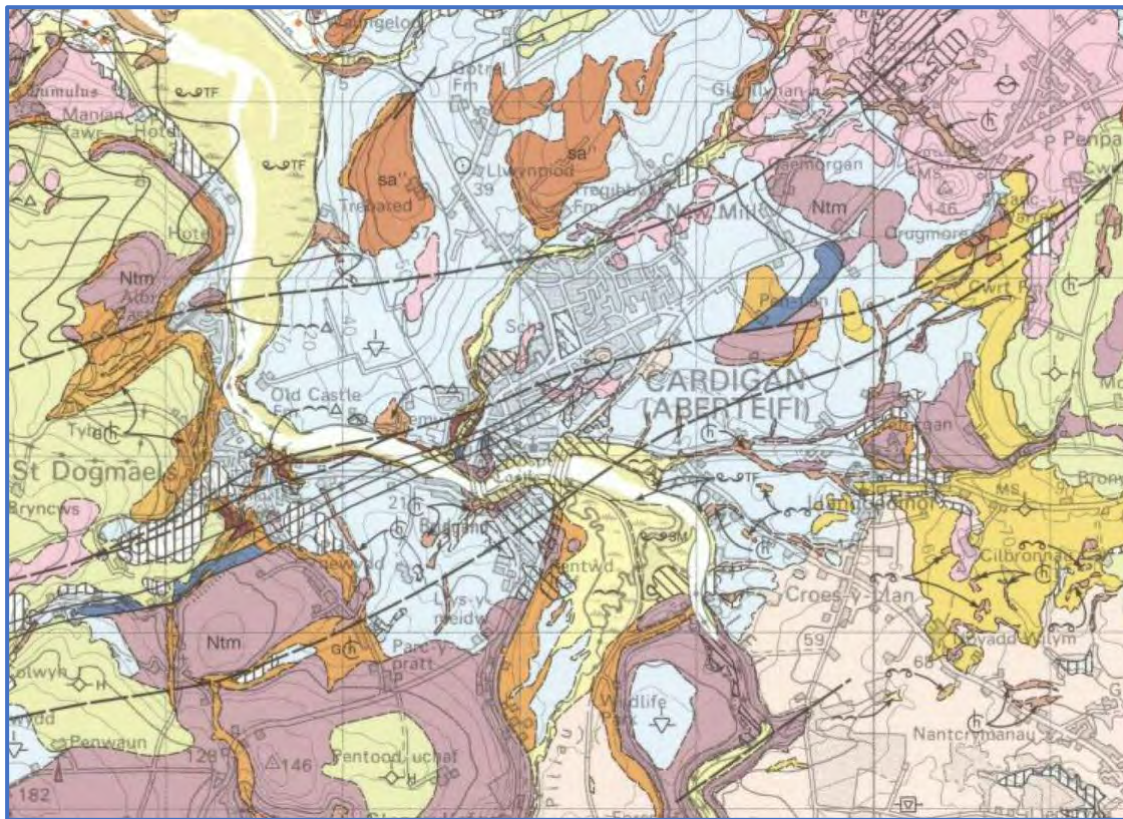
The over water investigation focussed on a linear area a maximum of 20.0m from the northern bank of the of the River Teifi extending from Castle Street Bridge in the west to Pont Y Priordy Priory Bridge to the east. The section of the river is within the tidally influenced area and low tide reveals intertidal mud and sand flats along with an area of salt marsh immediately southeast of Gloster Row Car Park. The Teifi River is designated as a Site of Special Scientific Interest.

The site location is shown on the Site Location Plan, included in the Appendices to this report.

2.2 Published Geology

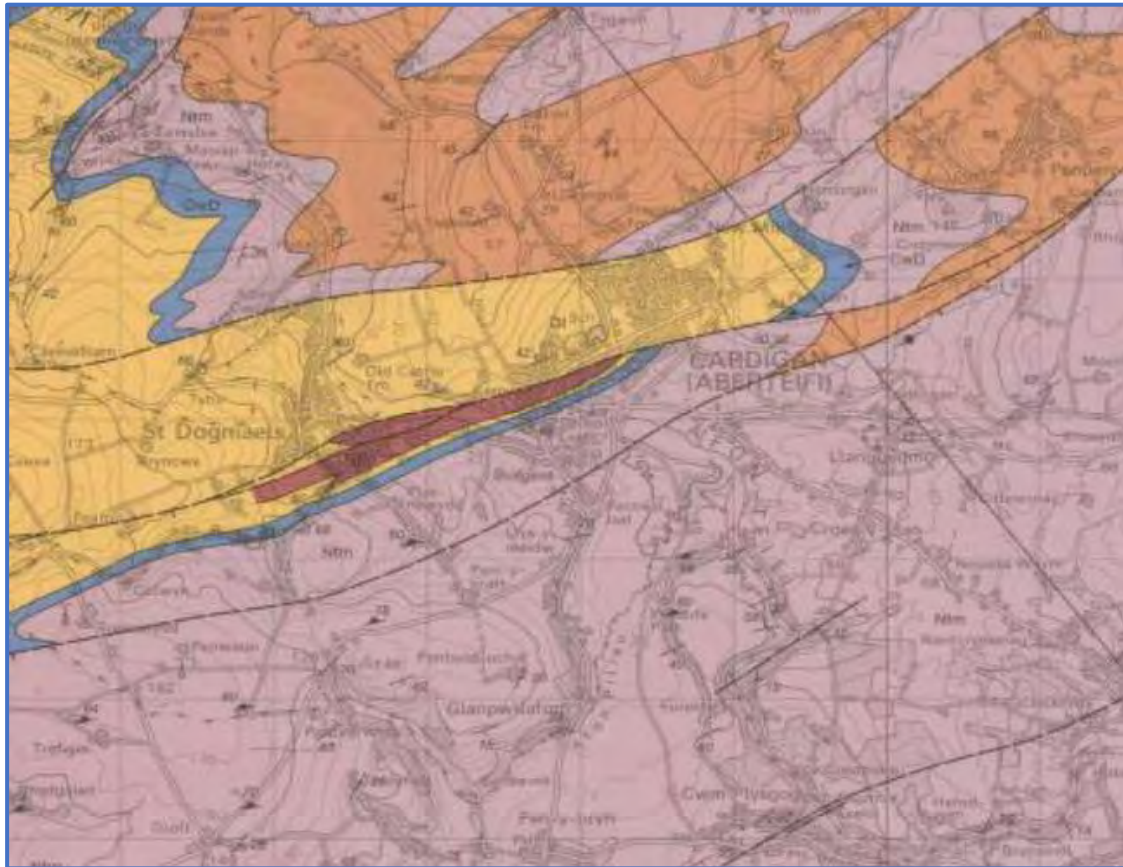
According to the British Geological Survey (BGS) digital geology map the site is indicated to be underlain by Tidal River or Creek Deposits comprising of clay, silt, and sand. Glacial Till Deposits are mapped immediately north of the site. The underlying solid geology is shown to consist of the Nantmel Mudstone Formation generally consisting of silty mudstones.

Superficial Deposits



BGS map sheet 193, scale 1:50,000, published 2003

Solid Geology



BGS map sheet 193, scale 1:50,000, published 2003

3 FIELDWORK

3.1 General

The fieldwork was carried out between the 21st March 2022 and the 25th March 2022 and comprised dynamic sampling with rotary core follow-on drilling and Cone Penetration Testing with associated in-situ testing and sampling.

The fieldwork was carried out in general accordance with BS 5930:2015+A1:2020 *Code of Practice for Site Investigations*, and Engineer's instructions, unless otherwise stated. The exploratory hole locations were determined by the Engineer and adjusted where necessary taking into account obstructions and buried services. The final location is shown on the Exploratory Hole Location Plan, included in the Appendices.

The exploratory hole logs are presented in Appendix A. These provide information including the equipment and methods used, samples taken, tests carried out, water observations and descriptions of the strata encountered

The holes were logged by an engineer in general accordance with the recommendations of BS 5930:2015+A1:2020 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1)

All exploratory hole locations were scanned for buried services using a Cable Avoidance Tool (CAT). Hand dug inspection pits were excavated to a maximum 1.20m depth before drilling commenced to check for underground services.

On completion all samples recovered from the site were taken to UKAS accredited laboratories for preparation and testing. Details of the depths and types of samples recovered are indicated on the log sheets. All samples were stored under controlled conditions in accordance with laboratory best practice methods.

3.2 Dynamic Sampling and Rotary Drilling

The boreholes (BH02, BH03) were sunk initially using dynamic sampling techniques where the sampling barrel is advanced percussively using a high frequency vibrating Krupp Hammer. Sections of the hole were drilled using open hole and rotary coring techniques.

For coring, a triple-tube core barrel, recovering cores of 93mm nominal diameter, in a semi rigid plastic liner, was utilised. Air and water (air mist) were used as the flushing medium. The cores were stored in boxes immediately on extraction.

Standard penetration tests (SPT's), as described below in the *In Situ Tests* section, were conducted in suitable materials.

Dynamic sample and rock core photographs are presented in Appendix B.

Details of ground water conditions were noted where possible. Water levels may have been affected by the installation of casing to the boreholes or the use of air mist as a flushing medium. In addition, water level observations are those at the time of the investigation and do not necessarily reflect seasonal fluctuations.

On completion of the boreholes 50mm diameter HDPE pipes were installed to 6.50mbgl (BH02) and 5.0mbgl (BH03) for post fieldwork groundwater monitoring. Details of the installations including response zones were specified by the engineer. The monitoring pipes were protected by end caps and 6-inch diameter steel flush lockable observation covers.

BH01 was removed from the scope of works due to access constraints. BH02 was terminated at 10.0m at the instruction of the engineer

Installation details are presented on the exploratory logs in Appendix A.

3.3 Standard Penetration Tests

Standard Penetration Tests (SPT's) were carried out in within the borehole at intervals specified by the engineer. The SPT test is undertaken using the percussive driving of a 450mm long, 50mm diameter "split-spoon" sampler, using a standard 63.5kg trip

hammer, falling over 760mm. The hammer anvil is connected to the sampler by steel boring rods. A small, disturbed sample is recovered from the split spoon sampler where possible. In very coarse-grained materials, or weak rocks, the sampler (or sampler shoe) is generally replaced by a 60° solid steel cone (referred to as SPT (c) tests). No samples are recovered using a solid cone.

The number of hammer blows required to drive the sampler or cone each consecutive 75mm is recorded and is shown on the attached borehole logs. The first 150mm is regarded as the seating penetration, and the last 300mm as the test drive. The result of the test, referred to as the “N-value”, consists of the total number of blows relating to the test drive. Conventionally, the test drive is terminated after 50 blows if the full 300mm penetration has not been achieved. In this case the N-value is stated as N > 50, and the actual penetration of the test drive is also recorded.

SPT results and N-Values are included on the borehole log in Appendix A of this report.

3.4 Monitoring

A programme of post fieldwork monitoring was specified by the engineer and included returning to site to measure groundwater levels, undertake permeability testing and along with the installation of 2 no. data loggers for continuous monitoring of water levels.

A post fieldwork monitoring visit was undertaken on 8th April 2022 at close to high tide at the instruction of the engineer. During this visit falling head tests were undertaken by pouring water into the 50mm diameter installation pipes to create a positive change in hydraulic head of water and recording the water levels at timed intervals until the water levels reach pre-test levels. Data loggers were then installed within the standpipes to take readings at 15-minute intervals. A further visit was undertaken on the 12th May 2022 to recover the data.

The permeability test and monitoring results are presented in Appendix C of this report.

3.5 Cone Penetration Testing (CPT)

10 no. Static Piezocone Penetration tests (CPTU) and 11no. dissipation tests were undertaken by In Situ Site Investigation Ltd between the 21st of March 2022 and 24th March 2022. The locations of the test were decided by the engineer and adjusted where necessary to avoid obstructions or ecological constraints. A focus of the investigation was to progress the cone to a sufficient depth to prove the thickness of the overlying soft compressible deposits and multiple test attempts were made where shallow obstructions were met.

Full details of the tests are included within the Static Cone Penetration Test Report in Appendix C.

4 LABORATORY TESTING

4.1 Geotechnical Testing

A programme of laboratory testing was carried out on samples taken from the various strata and groundwater to assist in classification and determine the engineering properties of the materials underlying the site. The testing was scheduled by Curtins and carried out by CJ Associates, Envirolab and Southwest Geotechnical Ltd. Geotechnical laboratory testing was generally carried out in accordance with the relevant part of BS1377: 1990, *Methods of Test for Soils for Civil Engineering Purposes*, or, where superseded, by the relevant part of BS EN ISO 17892:2014+ *Geotechnical investigation and testing – Laboratory Testing of Soil*.

The number of tests completed, and the test methods used are summarised below. Where non-standard procedures have been undertaken, this is recorded on the report sheet. The results are reported in tabular and/or graphical form and included as Appendix D of this report

TEST	STANDARD	No.
Moisture Content	BS1377: Part 2: 1990 clause 3.2	20
Atterberg Limits	BS 1377:1990 - Part 2: 4.3 & 5.3	2
Particle size distribution (wet)	Part 2, Clause 9.2	21
Sedimentation testing	BS EN ISO 17892-4: 2016, clauses 5.2 & 5.4	5
Point Load Determination (set of 10)	ISRM SM 1974–2006	1
Point Load Determination (individual)	ISRM SM 1974–2006	5
BRE SD1- Suite A	BRE Digest SD1	7

4.2 Geoenvironmental Testing

Geoenvironmental testing was scheduled by the engineer on selected samples recovered during the ground investigation. The samples were sent to Envirolab at their laboratory in Hyde, Chester.

All testing was carried out in accordance with the laboratory's UKAS accreditation. The number of tests completed, and the test methods used are summarised below

Completed chemical laboratory testing results are presented as Appendix D.

TEST	STANDARD	No.
Suite E	Soil samples Schedule S1.20.3	10
Suite H-Inert WAC	Inert waste landfill Schedule S1.20.5	7

5 LIST OF REFERENCES

British Standards Institute, *BS 5930:2015+A1:2020: Code of Practice for Site Investigations*, 2020.

BS EN 14688 - *Geotechnical Investigation and testing – Identification and classification of soil Part 1 Identification and description*, 2002.

BS EN 14688 - *Geotechnical Investigation and testing – Identification and classification of soil Part 2 Principles for a classification*, 2004.

BS EN 14689 - *Geotechnical Investigation and testing – Identification and classification of rock Part 1 Identification and description*, 2003

British Standards Institute, *BS 1377: British Standard Methods of Test for Soils for Civil Engineering Purposes*, Parts 1 - 9, 1990.

Institution of Civil Engineers, Site Investigation Steering Group, *Site investigation in construction series, Part 3: Specification for Ground Investigation*, Thomas Telford Ltd, 1993.

Appendix A- Log Sheets

Project No: 2071916	Location Details		Methodology & Plant			Scale: 1:50
Name: Cardigan Tidal Flood Risk Management GI	Easting: 217942.32	Northing: 245950.94	From (m)	Method	Plant Used	Checked: SOF
Location: Aberteifi, Cardigan	Elevation: 2.76mAOD	Final Depth: 10.00m	0.00 - 1.20 1.20 - 5.00 5.00 - 6.00 6.00 - 8.00 8.00 - 10.00	Inspection Pit Dynamic Sampling Rotary Coring Dynamic Sampling Rotary Open Holing	Hand Tools GEO 205 GEO 205 GEO 205 GEO 205	Approved: IG
Client: Natural Resources Wales	Logger: OD	Grid System: OSGB				Start Date: 24/03/2022
	Orientation: N/A	Inclination: 90°				End Date: 25/03/2022

Hole Diameter	
Depth (m)	Diam (mm)
10.00	121

Casing Diameter	
Depth (m)	Diam (mm)
10.00	143

Groundwater Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Installation / Instrument Details				
Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)
25/03/2022	Standpipe	6.50	5.00 - 6.50	50

If Methodology includes
Dynamic Sampling refer
to Runs table for info.

No Groundwater Encountered

Backfill	
Depth (m)	Legend Code
0.00 - 5.00	Bentonite
5.00 - 6.50	Gravel
6.50 - 10.00	Bentonite

Sample Summary			
Environmental Samples			
Soil	0	Water	0
Geotechnical Samples			
Bulk	8	Large Bulk	0
Disturbed	0	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with
0% Recovery

Standard Penetration Test Summary									
Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Cone	1.20	-	-	7	13	450	13	N=13 (3,4/4,3,3,3)	AR1100
Cone	2.00	2.00	-	1	8	450	8	N=8 (1,0/1,3,2,2)	AR1100
Cone	3.00	3.00	-	2	8	450	8	N=8 (2,0/1,2,2,3)	AR1100
Cone	4.00	4.00	-	1	4	450	4	N=4 (1,0/1,0,2,1)	AR1100
Cone	5.00	4.50	-	5	13	450	13	N=13 (3,2/3,4,3,3)	AR1100
Cone	6.00	6.00	-	5	7	450	7	N=7 (3,2/2,2,2,1)	AR1100
Cone	7.00	7.00	-	6	9	450	9	N=9 (3,3/2,2,3,2)	AR1100
Cone	8.00	8.00	-	5	8	450	8	N=8 (3,2/2,3,1)	AR1100
Cone	10.00	10.00	-	17	50	262		50 (9,8/50 for 112mm)	AR1100

SPT Hammer Ref.	Energy Ratio (%)
AR1100	67

* One count indicates an average
reported result of 3 tests carried out at
one depth where available.

Applicable to Cable Percussion Only	
Chiselling	
Depth (m)	Duration (mins)
Water Added	
Depth (m)	Litres

Applicable to Rotary Only			
Drilling Flush			
Depth (m)	Flush Type	Flush Colour	Return %
5.00 - 6.00	Air/Mist	Dark Grey	75
8.00 - 9.00	Air/Mist	Dark Grey	70
9.00 - 10.00	Air/Mist	Dark Grey	80

Applicable to Dynamic Sampling Only			
Dynamic Sampling Runs			
Depth (m)	Diam (mm)	Recovery %	Remarks
1.20 - 2.00	101	100	
2.00 - 3.00	101	100	
3.00 - 4.00	101	100	
4.00 - 5.00	101	100	
6.00 - 7.00	101	100	
7.00 - 8.00	101	100	

Project No: 2071916	Location Details		Methodology & Plant			Scale: 1:50
Name: Cardigan Tidal Flood Risk Management GI	Easting: 218047.48	Northing: 245967.82	From (m)	Method	Plant Used	Checked: SOF
Location: Aberteifi, Cardigan	Elevation: 3.98mAOD	Final Depth: 14.60m	0.00 - 1.20 1.20 - 11.00 11.00 - 14.60	Inspection Pit Dynamic Sampling Rotary Coring	Hand Tools GEO 205 GEO 205	Approved: IG
Client: Natural Resources Wales	Logger: OD	Grid System: OSGB				Start Date: 21/03/2022
	Orientation: N/A	Inclination: 90°				End Date: 23/03/2022

Hole Diameter	
Depth (m)	Diam (mm)
14.60	121

Casing Diameter	
Depth (m)	Diam (mm)
12.00	143

Groundwater Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Installation / Instrument Details				
Date	Instrument Details	To (m)	Resp. Zone (m)	Diam (mm)
23/03/2022	Standpipe	5.00	4.00 - 5.00	50

If Methodology includes
Dynamic Sampling refer
to Runs table for info.

No Groundwater Encountered

Backfill	
Depth (m)	Legend Code
0.00 - 4.00	Bentonite
4.00 - 5.00	Gravel
5.00 - 14.60	Bentonite

Sample Summary			
Environmental Samples			
Soil	11	Water	0
Geotechnical Samples			
Bulk	0	Large Bulk	0
Disturbed	2	Disturbed (NR)	0
Piston	0	Piston (NR)	0
Undisturbed	0	Undisturbed (NR)	0
Undisturbed Thin Wall			0
Undisturbed Thin Wall (NR)			0
Core Sample			0

(NR) Indicates sample undertaken but with
0% Recovery

Standard Penetration Test Summary									
Test Type	Depth (m)	Casing (m)	Water (m)	Seating Blows	Main Blows	Penetration Total (mm)	N	Reported Result	Hammer Ref
Cone	1.20	-	-	3	12	450	12	N=12 (1,2/2,3,4,3)	AR1100
Cone	2.00	2.00	-	2	13	450	13	N=13 (1,1/3,3,3,4)	AR1100
Cone	3.00	3.00	-	6	15	450	15	N=15 (3,3/3,4,4,4)	AR1100
Cone	4.00	4.00	3.40	7	14	450	14	N=14 (3,4/3,4,4,3)	AR1100
Cone	5.00	4.50	3.40	7	25	450	25	N=25 (4,3/4,6,7,8)	AR1100
Cone	6.00	4.50	3.40	1	8	450	8	N=8 (1,0/1,2,2,3)	AR1100
Split Spoon	8.00	8.00	3.20	2	3	450	3	N=3 (2,0/1,0,2,0)	AR1100
Split Spoon	9.00	9.00	3.20	2	9	450	9	N=9 (1,1/2,2,3,2)	AR1100
Cone	10.00	10.00	3.20	17	50	135		50 (4,13/50 for 85mm)	AR1100
Cone	11.00	11.00	3.20	17	50	196		50 (5,12/50 for 96mm)	AR1100

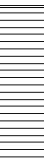
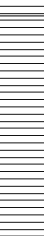
SPT Hammer Ref.	Energy Ratio (%)
AR1100	67

* One count indicates an average
reported result of 3 tests carried out at
one depth where available.

Applicable to Cable Percussion Only	
Chiselling	
Depth (m)	Duration (mins)
Water Added	
Depth (m)	Litres

Applicable to Rotary Only			
Drilling Flush			
Depth (m)	Flush Type	Flush Colour	Return %
11.00 - 12.00	Air/Mist	Grey	80
12.00 - 13.10	Air/Mist	Grey	80
13.10 - 14.60	Air/Mist	Grey	80

Applicable to Dynamic Sampling Only			
Dynamic Sampling Runs			
Depth (m)	Diam (mm)	Recovery %	Remarks
1.20 - 2.00	101	100	
2.00 - 3.00	101	100	
3.00 - 4.00	101	100	
4.00 - 5.00	101	100	
5.00 - 6.00	101	100	
6.00 - 7.00	101	100	
7.00 - 8.00	101	100	
8.00 - 9.00	101	100	
9.00 - 10.00	101	100	
10.00 - 11.00	101	100	

Project No: 2071916		Location Details				Methodology & Plant			Scale: 1:50										
Name: Cardigan Tidal Flood Risk Management GI		Easting: 218047.48	Northing: 245967.82		From (m)	Method		Plant Used	Checked By: SOF										
Location: Aberteifi, Cardigan		Elevation: 3.98mAOD	Final Depth: 14.60m		0.00 - 1.20 1.20 - 11.00 11.00 - 14.60	Inspection Pit Dynamic Sampling Rotary Coring		Hand Tools GEO 205 GEO 205	Approved By: IG										
Client: Natural Resources Wales		Logged By: OD	Grid System: OSGB						Start Date: 21/03/2022										
		Orientation: N/A	Inclination: 90°						Finish Date: 23/03/2022										
	Strata Description	Legend	Depth (m) (Stratum Thickness)	Reduced Level (mAOD)	Hole ø (mm) Depth (m)	Casing ø (mm) Depth (m)	Water Level (m)	Installation / Backfill	Samples & Testing			Method	Coring						
	Very dense dark to light grey angular to rounded fine to coarse GRAVEL of mudstone, quartzite and sandstone.		(1.00)						Depth (m)	Ref	Test Results		Core Run	TCR	SCR	RQD	If		
11	Weak to moderately strong thinly laminated dark to light grey MUDSTONE. Discontinuities are subvertical closely spaced stepped smooth open with partial ochrous staining, pyrite. (seepage present).		11.00 (1.00)	-7.02							SPT(C) 11.00m, 50 (5,12/50 for 96mm)	RC	11.00 12.00	50	30	0	8	11	
12	Weak to moderately strong thinly laminated dark to light grey MUDSTONE. Discontinuities are subvertical closely spaced planar smooth open with partial ochrous staining, pyrite and calcite. (seepage present).		12.00 (1.10)	-8.02		143 12.00							12.00 13.10	100	80	0	7	12	
13	Weak to moderately strong thinly laminated MUDSTONE. Discontinuities are subvertical closely spaced moderately open to open planar smooth with an ochrous staining. (Seepage present).		13.10 (1.50)	-9.12										13.10 14.60	86	80	24	4	13
14	EOH at 14.60m - Scheduled Depth		14.60	-10.62	121 14.60														14
15																		15	
16																		16	
17																		17	
18																		18	
19																		19	
20																		20	
Observations / Remarks		Misc.	Shift Information					Backfill			Installations								
		No Groundwater Encountered Casing Used Monitoring Point/s Installed	Date	Time	Depth (m)	Casing (m)	Water (m)	From (m)	To (m)	Material	Instrument Details		Resp. Zone	Depth (m)	Diameter				
			21/03	05:00	0.00	-	Dry	0.00	4.00	Bentonite	Standpipe		4.00 - 5.00	5.00	50				
			21/03	16:00	1.20	-	Dry	4.00	5.00	Gravel									
			22/03	08:00	1.20	-	Dry	5.00	14.60	Bentonite									
			22/03	16:00	7.00	4.50	3.40												
			23/03	08:00	7.00	4.50	3.20												
		23/03	17:00	14.60	12.00	6.10													
			Water Strikes																
			Strike (m)	Rises To (m)	Time (min)	Remarks													



Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling
Unit 8
Victory parkway
Victory rd
Derby
DE24 8ZF

Hammer Ref: AR1100
Test Date: 13/05/2021
Report Date: 14/05/2021
File Name: AR1100.spt
Test Operator: AP

Instrumented Rod Data

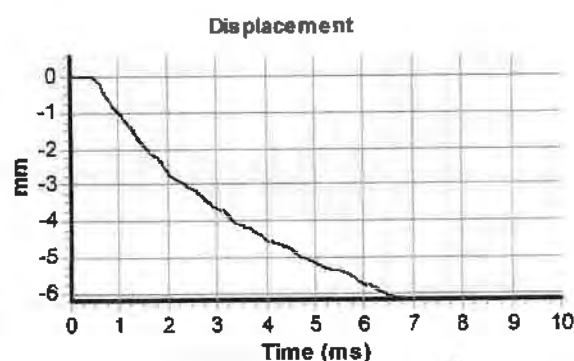
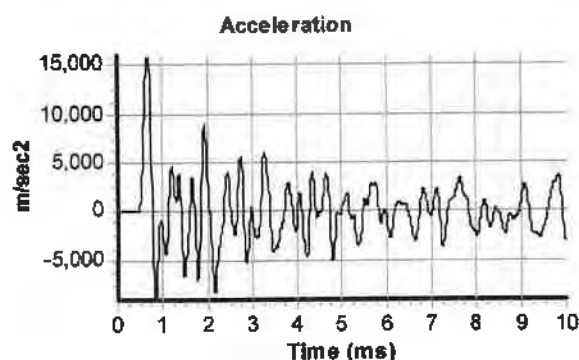
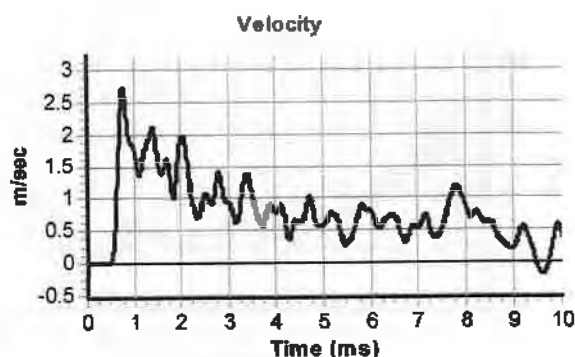
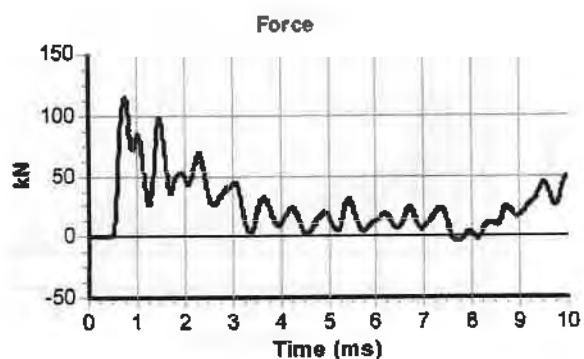
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.0
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 62901
Accelerometer No.2: 62902

Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
String Length L (m): 15.0

Comments / Location

C J associates hammer tested at Dynamic samplings yard.



Calculations

Area of Rod A (mm^2): 905
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 286

Energy Ratio E_r (%): **60**

Signed: A.parker
Title: Associate Director

The recommended calibration interval is 12 months

Appendix B- Photographs



CJAssociates

Portview Road,
Avonmouth,
Bristol. BS11 9JE
Tel: 0117 982 1473

Project

Cardigan Flood Risk
Management

Client

Natural Resources Wales

Drawing Title

BH02 Inspection pit

Project No.

2071916



CJAssociates Portview Road, Avonmouth, Bristol. BS11 9JE Tel: 0117 982 1473	Project Cardigan Flood Risk Management	Drawing Title BH02 Inspection pit (2)
	Client Natural Resources Wales	Project No. 2071916



CJAssociates

Portview Road,
Avonmouth,
Bristol. BS11 9JE
Tel: 0117 982 1473

Project

Cardigan Flood Risk
Management

Drawing Title

BH02 1.20m-3.0m

Client

Natural Resources Wales

Project No.

2071916



CJAssociates

Portview Road,
Avonmouth,
Bristol. BS11 9JE
Tel: 0117 982 1473

Project

Cardigan Flood Risk
Management

Drawing Title

BH02 3.0m-5.0m

Client

Natural Resources Wales

Project No.

2071916



CJAssociates

Portview Road,
Avonmouth,
Bristol. BS11 9JE
Tel: 0117 982 1473

Project

Cardigan Flood Risk
Management

Client

Natural Resources Wales

Drawing Title

BH02 6.0m-8.0m

Project No.

2071916