CONCEPT SITE INVESTIGATIONS

Site Name:	Northern Line Extension	**Job No.**	10/2254
Client:	REO Powerstation Ltd	**Date:**	30/06/10

Determination of Moisture Content and Liquid and Plastic Limits

Borehole No	Sample type	Sample No.	Depth m	Description	Natural Moisture Content %	[1] Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH01	U	17	11.00	Extremely closely fissured brownish grey CLAY with occasional pockets of dark brownish grey silty sand (10x5mm)	28	100	78	27	51
BH01	U	26	17.00	Grey slightly sandy CLAY with frequent pockets of light brownish grey sand (100x80mm) and occasional tabular pyrite nodules (35x25mm)	24	99	65	24	41
BH01	U	35	23.00	Extremely closely fissured grey CLAY with occasional pockets of dark grey sand (20x10mm) and bioturbation	26	100	72	27	45
BH01	U	38	25.00	Extremely closely fissured grey CLAY with rare pockets of dark grey silty fine sand (5x3mm) and rare bioturbation	27	100	78	28	50
BH01	U	44	29.00	Very closely fissured grey CLAY with occasional pockets of dark grey sand (80x60mm), light brownish grey sand (40x30mm) and bioturbation	23	100	77	25	53
BH02	U	06	1.20	Very soft greenish brown mottled reddish brown peaty CLAY with occasional angular to rounded coarse flint gravel, frequent rootlets and semi-decayed wood fragments	104	85	161	46	115
BH02	U	28	9.50	Very closely fissured greyish brown CLAY with occasional black staining	27	100	73	24	49
BH02	U	37	15.50	Extremely closely fissured grey CLAY with occasional pockets of light brownish grey sand (80x50mm), light grey sand (60x60mm) and rare bioturbation	26				
BH02	U	40	17.50	Extremely closely fissured grey slightly micaceous CLAY with rare shell fragments	28	100	75	28	47
BH02	U	46	21.50	Extremely closely fissured grey CLAY with occasional bioturbation and rare fossilised wood fragments (10x5mm)	28	100	82	29	52
BH02	U	52	25.50	Very closely fissured grey CLAY with occasional bioturbation and pockets of dark grey fine sand (60x30mm)	23	100	74	22	53
BH02	U	69	35.70	Extremely closely extremely closely fissured brown mottled bluish grey CLAY	16	100	47	21	27

BS 1377: Part 2: Clause 4.4: 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index.

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Date - samples received: 08/06/2010
Date - samples tested: 30/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS

Site Name:	Northern Line Extension	**Job No.**	10/2254
Client:	REO Powerstation Ltd	**Date:**	30/06/10

Determination of Moisture Content and Liquid and Plastic Limits

Borehole No	Sample type	Sample No	Depth m	Description	Natural Moisture Content %	[1] Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH03	U	32	11.00	Extremely closely fissured grey CLAY with occasional bioturbation and pockets of dark grey sand (10x20mm)	29	100	80	28	53
BH03	U	41	17.00	Extremely closely fissured grey CLAY with occasional pockets of light grey sand (50x40mm) and dark grey sand (10x5mm) with rare bioturbation	24	100	66	22	44
BH03	U	50	23.00	Extremely closely fissured thinly bedded grey CLAY with rare pockets of dark grey sand (70x50mm) and occasional bioturbation	27	100	82	27	56
BH03	U	53	25.00	Brownish grey slightly sandy CLAY with occasional bioturbation and rare pockets of grey silt (10x5mm)	25	100	78	23	55
BH03	U	61	31.00	Extremely closely fissured grey CLAY with frequent bioturbation and occasional pyrite nodules (45x25x25mm), pyritised wood fragments (10x5mm) and pockets of light brownish grey sand (80x90mm)	21	97	60	21	40
BH08	U	26	11.50	Extremely closely fissured grey CLAY with occasional bioturbation, rare pockets of cemented silt and pyrite nodules (20x10mm)	27	99	76	26	51
BH08	U	46	18.50	Very closely fissured slightly sandy grey CLAY with frequent pockets of light grey sand (30x20mm) and rare bioturbation	22	100	71	21	49

BS 1377: Part 2: Clause 4.4: 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index.

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Date - samples received: 08/06/2010
Date - samples tested: 30/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

Form Lab 002A
Rev 04/10 14 January 2010

G::/0-Labs/Excel templates/Output/002A-PI (SI).xls

CONCEPT SITE INVESTIGATIONS

Site Name:	Northern Line Extension	**Job No.**	10/2254
Client:	REO (Powerstation) Ltd	**Date:**	11/06/10

Determination of Moisture Content and Liquid and Plastic Limits

Borehole No	Sample type	Sample No.	Depth m	Description	Natural Moisture Content %	[1] Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH04	U	13	7.50	Grey locally thinly laminated slightly micaceous CLAY with closely spaced laminations of light brown and greenish grey fine sand	25				
BH04	U	19	11.50	Grey locally thinly laminated slightly sandy CLAY with closely to medium spaced laminations of light brown sand and rare pockets of dark grey fine sand (55x20mm) and rare bioturbation	22				
BH04	U	28	17.50	Grey thinly laminated slightly CLAY with occasional bioturbation	27				
BH04	U	31	19.50	Extremely closely fissured grey CLAY with occasional bioturbation	28	100	83	28	55
BH04	U	37	23.50	Grey slightly sandy CLAY with frequent pockets of light grey sand (50x60mm) rare pockets of dark grey fine sand (80x20mm) and occasional bioturbation	19	100	68	21	47
BH04	U	40	25.50	Grey slightly sandy CLAY with pockets of light brown sand (10x10mm) and occasional bioturbation	21				
BH04	U	46	29.50	Grey thinly to thickly laminated slightly sandy CLAY with occasional pockets of light brown silty fine sand (30x45mm) occasional bioturbation and rare tabular pyrite nodules (70x55mm)	23	99	75	24	52
BH04	U	50	31.50	Dark grey locally thinly laminated shelly CLAY	25	100	65	21	44
BH04	D	55	33.50	Strong, grey slightly clayey generally coarse gravel sized fragments of shelly/organic LIMESTONE	8				NP
BH05	B	6	1.00	Dark brown locally mottled yellowish brown slightly sandy slightly gravelly CLAY with occasional pockets of black carbonaceous material (10x10mm) . Gravel is subangular to subrounded fine and coarse flint and occasional brick fragments (MADE GROUND)	17	83	35	16	19
BH05	U	22	10.00	Extremely closely fissured grey CLAY with occasional pockets of light brownish grey sand (80x80mm) and rare bioturbation	27	100	70	23	47
BH05	U	34	18.00	Very closely fissured grey CLAY with occasional pockets of light grey sand (10x10mm) and dark grey sand (50x30mm)	24	100	58	20	38
BH05	U	54	26.90	Brownish grey slightly sandy CLAY with occasional pockets of light brown fine sand (10x15mm) and occasional bioturbation	19	100	54	17	37
BH05	B	67	30.20	Grey slightly clayey slightly silty fine and medium SAND	18	97			NP
BH05	U	73	32.00	Reddish brown mottled bluish grey friable CLAY	22	100	85	24	61

BS 1377: Part 2: Clause 4.4: 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index.

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Date - samples received:	26/05/2010
Date - samples tested:	11/06/2010
Checked by:	J.Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS

Site Name:	Northern Line Extension	**Job No.**	10/2254
Client:	REO (Powerstation) Ltd	**Date:**	11/06/10

Determination of Moisture Content and Liquid and Plastic Limits

Borehole No	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	[1.] Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH06	D	15	8.50	Grey CLAY with rare pockets of dark grey silty fine sand (3x5mm) and bioturbation	27	100	74	25	50
BH06	U	26	16.00	Grey slightly sandy CLAY with occasional bioturbation	25	100	79	26	53
BH06	U	46	23.50	Grey CLAY with occasional pockets of light brown fine sand (20x10mm) and bioturbation	21	100	65	22	43
BH06	U	54	25.50	Extremely closely fissured grey CLAY with occasional pockets of light grey silty sand (30x30mm) and frequent shell fragments	25	100	71	24	47
BH06	U	67	27.75	Reddish brown mottled bluish grey CLAY	22	100	69	26	44
BH07	D	08	1.20	Greyish brown iron stained sandy gravelly CLAY with rare pockets of black carbonaceous material (15x10mm), rare brick fragments and roots of live appearance (3-4mm). Gravel is angular to subrounded flint and rare granite (MADE GROUND)	17	56	49	20	28
BH07	U	32	8.00	Very closely fissured grey CLAY with occasional pockets of light brownish grey sand (40x20mm) and pockets of dark grey silty sand (5x30mm)	26	100	62	24	37
BH07	U	35	10.00	Grey slightly micaceous CLAY with rare bioturbation	27	100	72	23	49
BH07	U	38	12.00	Extremely closely fissured grey CLAY with rare pockets of light brownish grey sand (40x30mm)	28				
BH07	U	44	16.00	Extremely closely fissured grey CLAY with occasional bioturbation and rare pockets of dark grey silt (20x3mm)	30				
BH07	U	50	20.00	Grey CLAY with frequent pockets of dark grey fine sand (80x50mm) and occasional bioturbation	24	100	69	23	45
BH07	U	58	22.00	Very closely fissured grey slightly sandy CLAY with frequent bioturbation	25	100	81	25	56
BH07	U	66	24.00	Grey slightly sandy CLAY with frequent pockets of light grey sand (20x10mm) and occasional bioturbation	18				
BH07	U	76	26.50	Extremely closely fissured grey CLAY with occasional pockets of light brownish grey sand (100x80mm) rare pyrite nodules (10x3mm) and occasional bioturbation	23				
BH07	U	80	27.50	Very closely fissured grey CLAY with rare partings of light grey sand and occasional bioturbation	21				

BS 1377: Part 2: Clause 4.4: 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index.
BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Date - samples received:	26/05/2010
Date - samples tested:	11/06/2010
Checked by:	J.Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS

Site Name:	Northern Line Extension	**Job No.**	10/2254
Client:	REO Powerstation Ltd	**Date:**	30/06/10

Determination of Moisture Content and Liquid and Plastic Limits

Borehole No	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	[1.] Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH09	U	25	10.00	Extremely closely fissured grey CLAY with a rare tabular claystone fragments and rare bioturbation	28	98	78	27	52
BH09	U	39	16.50	Very closely fissured grey CLAY with occasional bioturbation, rare pockets of dark grey sand (10x10mm) and pyrite nodules (25x10mm)	26	99	77	26	52
BH09	U	55	20.50	Grey CLAY with rare bioturbation	26	100	81	27	54
BH09	U	59	21.50	Extremely closely fissured slightly sandy grey CLAY with frequent pockets of light grey sand (100x50mm) and pyrite nodules (40x30x10mm) and rare pyritised wood fragments(20x10mm)	20	99	58	19	40
BH09	U	65	23.00	Very closely fissured grey CLAY with occasional pockets of light brownish grey sand (50x30mm) and pyrite nodules (30x10mm) and light grey sand (20x30mm) with rare bioturbation and fossilised wood fragments	21	99	66	19	48
BH09	U	75	25.50	Extremely closely fissured grey CLAY with occasional shell fragments	19	100	48	17	31

BS 1377: Part 2: Clause 4.4: 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index.
BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Date - samples received:	08/06/2010
Date - samples tested:	30/06/2010
Checked by:	J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS

Site Name:	Northern Line Extension	**Job No.**	10/2254
Client:	REO Powerstation Ltd	**Date:**	30/06/10

Determination of Moisture Content and Liquid and Plastic Limits

Borehole No	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	[1.] Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH08	U	50	19.50	Grey slightly sandy CLAY with occasional pockets of light brown and dark grey fine sand (20x15mm) and occasional bioturbation	21	100	62	21	41
BH08	U	58	21.50	Very closely fissured grey CLAY with occasional pockets of light brownish grey sand (70x30mm), dark grey sand (30x20mm), rare bioturbation and pyritised wood fragments (10x3mm)	24	100	69	22	47
BH08	U	72	25.00	Grey slightly sandy CLAY with occasional bioturbation, pockets of light brownish grey sand (60x20mm) and rare fossilised wood fragments (70x10mm)	21	100	65	23	42
BH10	U	21	11.00	Extremely closely fissured grey CLAY with occasional fragments of orangish brown siltstone and rare pyrite nodules (20x10x10mm)	28	98	84	27	58
BH10	U	27	15.00	Very closely fissured grey CLAY with occasional bioturbation and pockets of light grey sand (15x30mm)	25	100	78	26	51
BH10	U	45	19.40	Grey CLAY with occasional pockets of dark grey silt (3x5mm) and occasional bioturbation	26	100	77	27	51
BH10	U	53	21.40	Extremely closely fissured thinly bedded grey CLAY with occasional pockets of light brownish grey sand (40x20mm)	23	100	71	27	43

BS 1377: Part 2: Clause 4.4: 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index.

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Date - samples received:	08/06/2010
Date - samples tested:	30/06/2010
Checked by:	J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

PARTICLE SIZE DISTRIBUTION

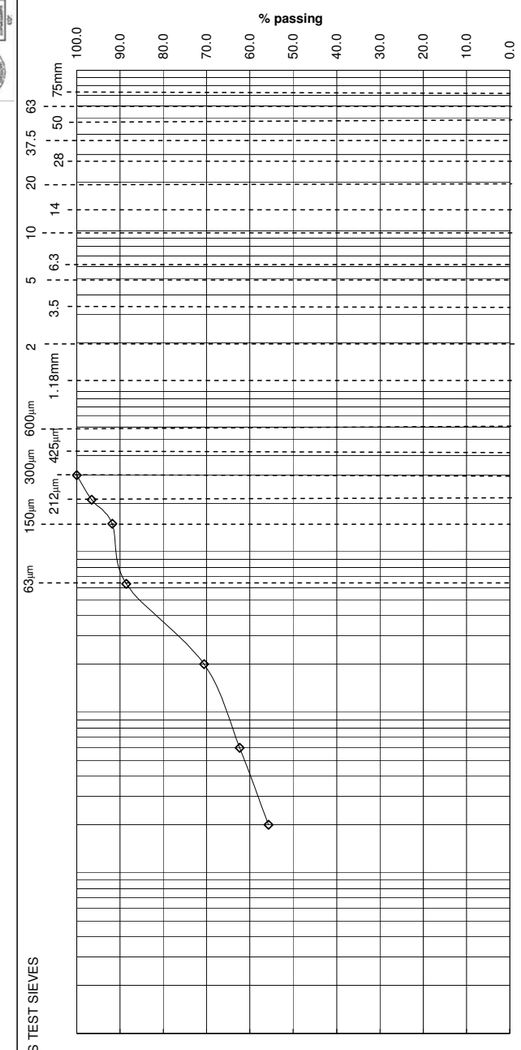
JOB NO: 10/2254
DATE:

LOCATION: Northern Line Extension
CLIENT: REO (Powerstation) Ltd

Depth 20.00 m

Borehole No. BH04 Sample No. D 32

BS TEST SIEVES



CLAY			SILT		SAND		GRAVEL		COBBLES
FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	

SOIL DESCRIPTION: Grey slightly sandy CLAY with occasional bioturbation

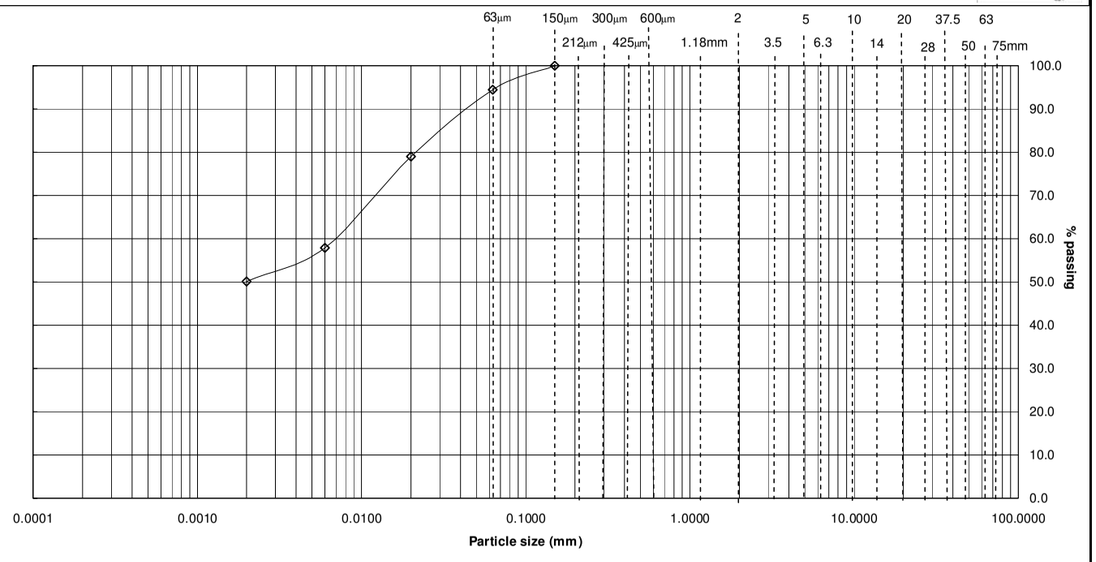
Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

G://0-Labs/Excel Templates/Output/PSD Output

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH04 Sample No. D 38 Depth 24.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

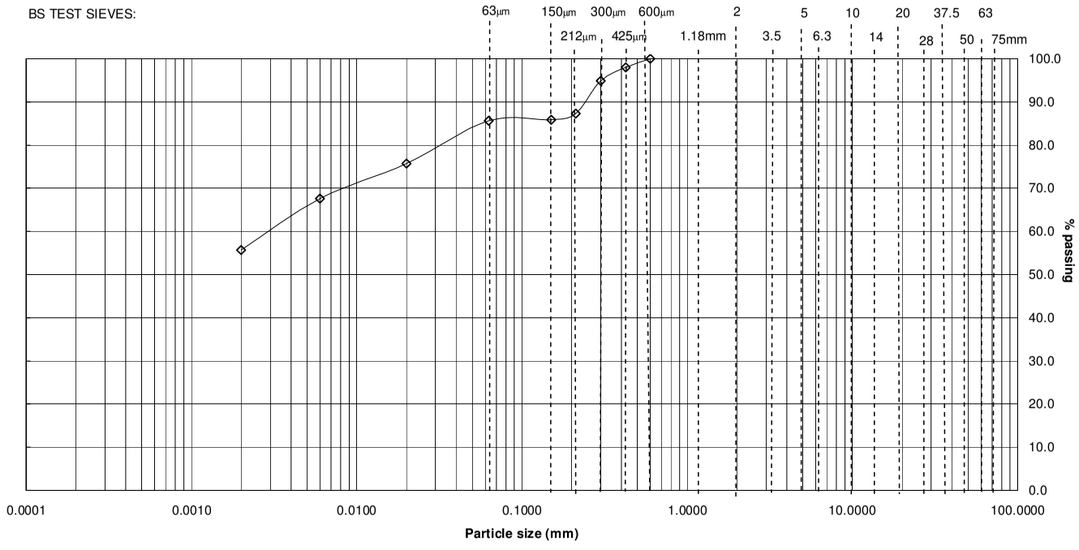
SOIL DESCRIPTION: Grey slightly sandy CLAY with pockets of light brown sand (5x15mm) and occasional bioturbation

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH04 Sample No. D 48 Depth 30.50 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

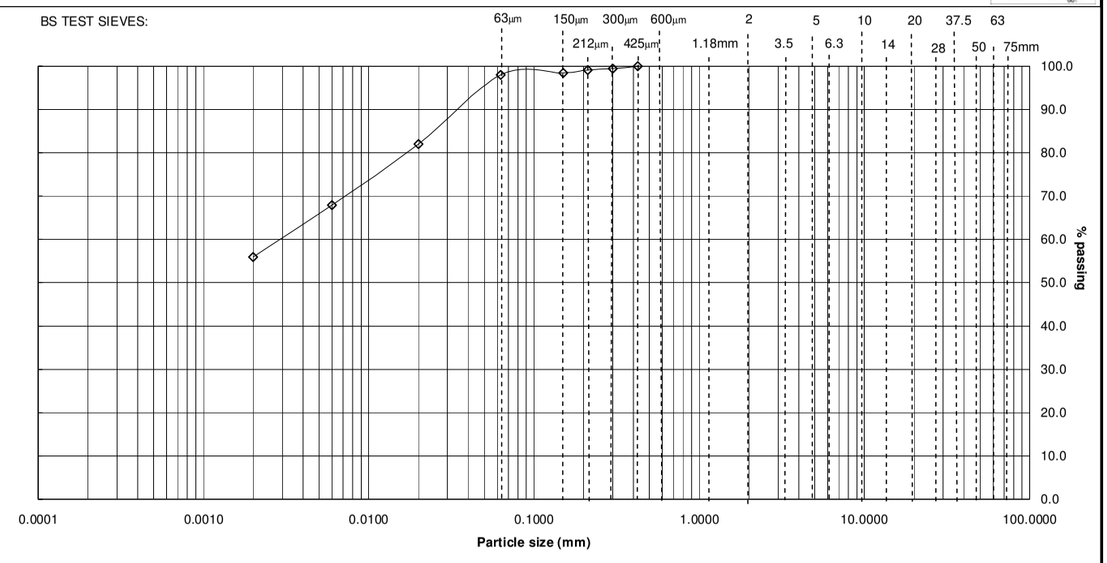
SOIL DESCRIPTION: Grey slightly sandy CLAY with pockets of light brown sand (5x10mm)

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH04 Sample No. D 53 Depth 32.50 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

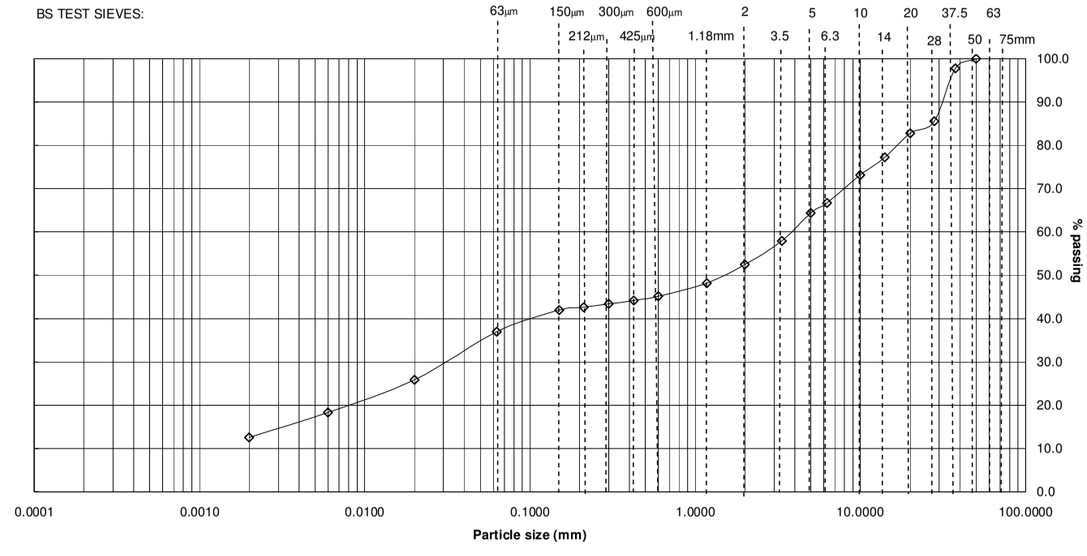
SOIL DESCRIPTION: Grey slightly sandy CLAY with pockets of light grey sand (10x13mm)

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH04 Sample No. B 54 Depth 33.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

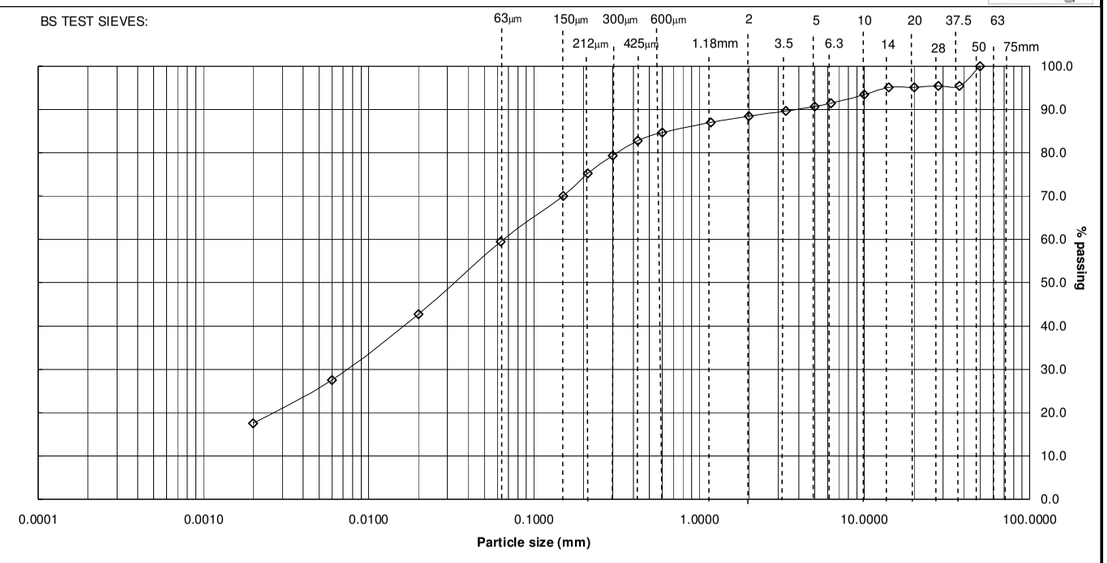
SOIL DESCRIPTION: Grey slightly sandy CLAY with occasional gravel sized fragments of strong shelly/organic limestone

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. B 6 Depth 1.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

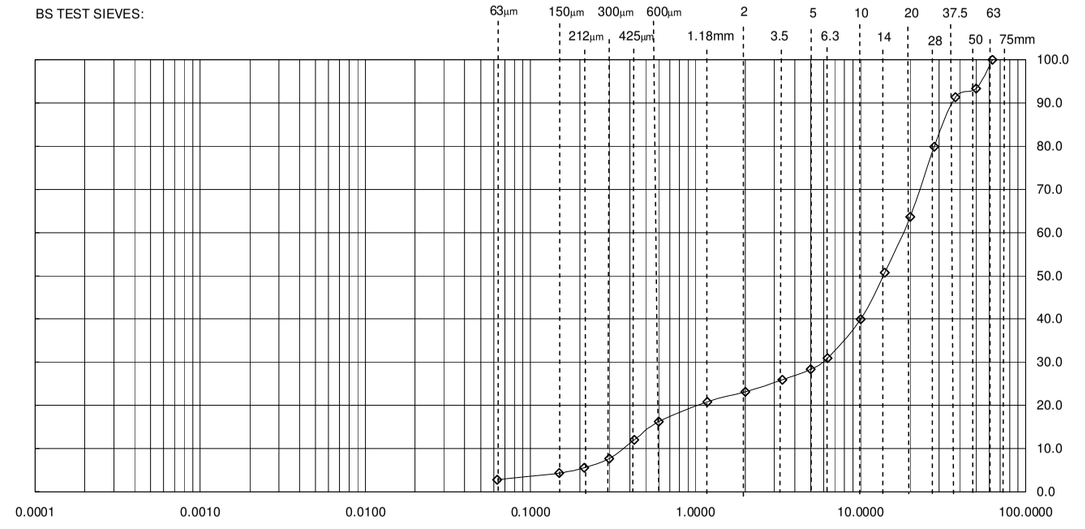
SOIL DESCRIPTION: Dark brown locally mottled yellowish brown slightly sandy slightly gravelly CLAY with occasional pockets of black carbonaceous material (10x10mm) . Gravel is subangular to subrounded fine and coarse flint and occasional brick fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. B 13 Depth 3.20 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

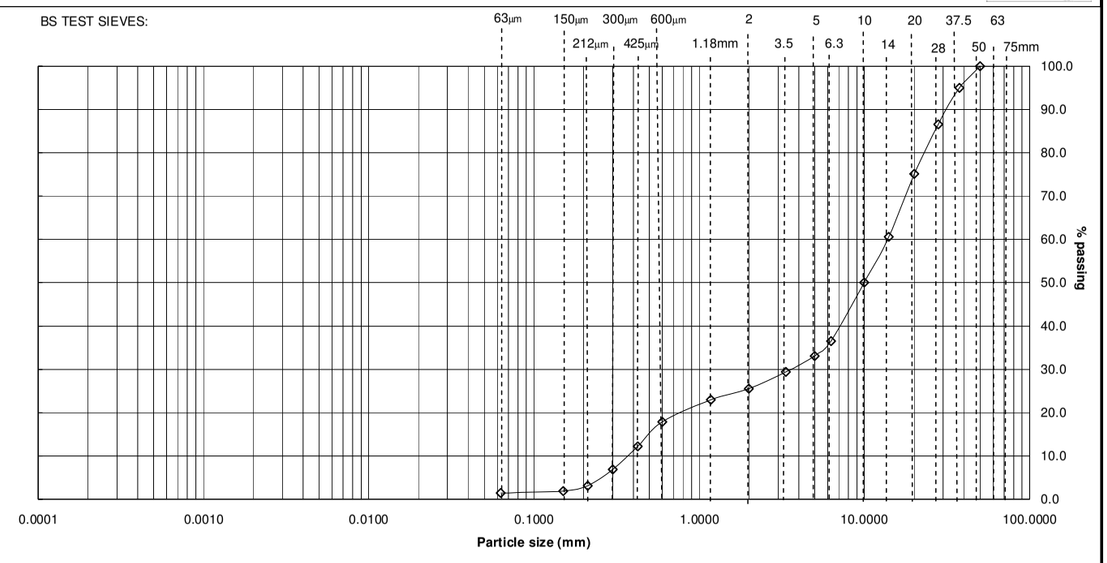
SOIL DESCRIPTION: Brown slightly silty very sandy subangular to well-rounded fine to coarse flint GRAVEL with rare clods of soft brown clay

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. B 16 Depth 6.20 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

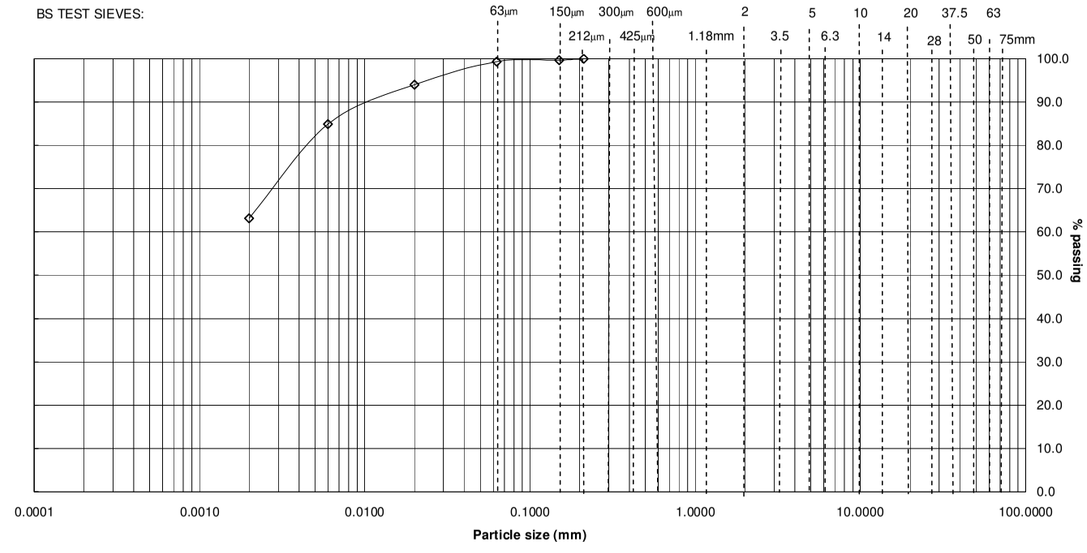
SOIL DESCRIPTION: Brown and light brown sandy subangular to well-rounded fine to coarse flint GRAVEL with rare clods of soft brown clay

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. D 24 Depth 11.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

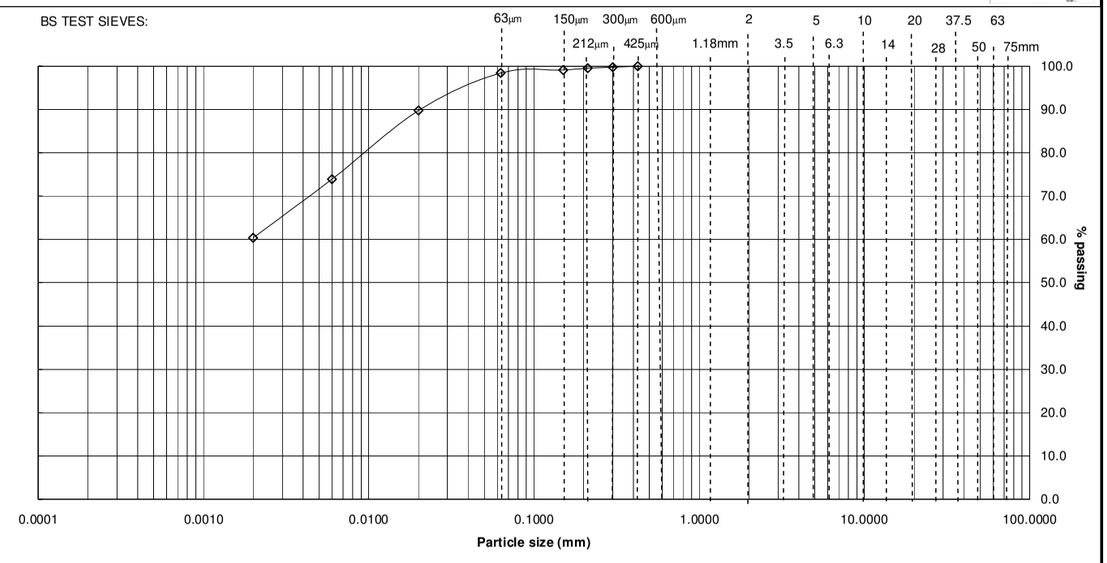
SOIL DESCRIPTION: Grey CLAY

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. D 33 Depth 17.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SOIL DESCRIPTION: Grey CLAY with occasional bioturbation

Test Method: BS1377: PART 2: 9.2/9.3/9.4

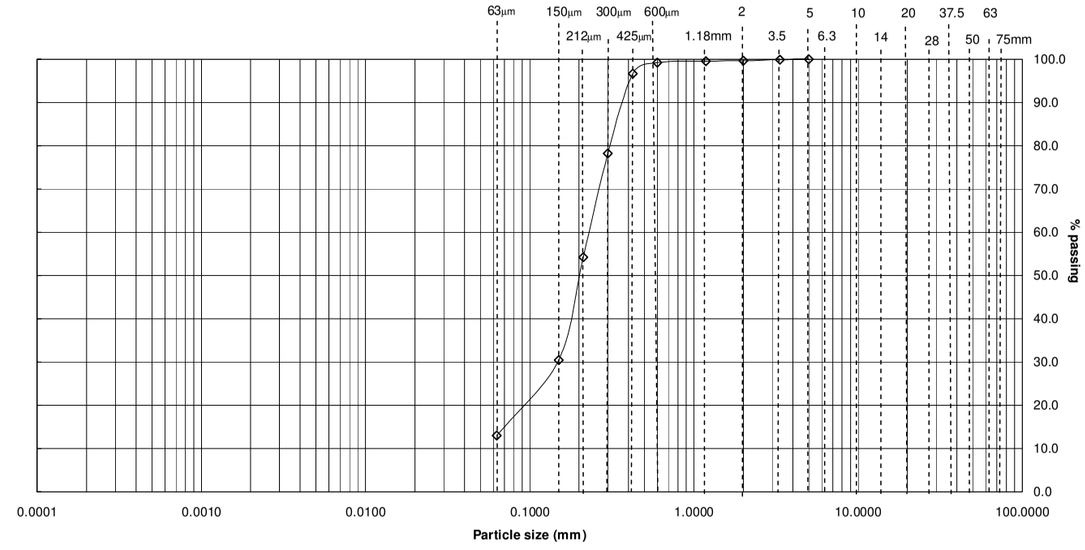
CONCEPT SITE INVESTIGATIONS

Form Lab 013B
Rev 3/06 21 March 2006

G://0-Lab/Excel Templates/PSD Output

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. B 67 Depth 30.20 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SOIL DESCRIPTION: Grey slightly clayey slightly silty fine and medium SAND

Test Method: BS1377: PART 2: 9.2/9.3/9.4

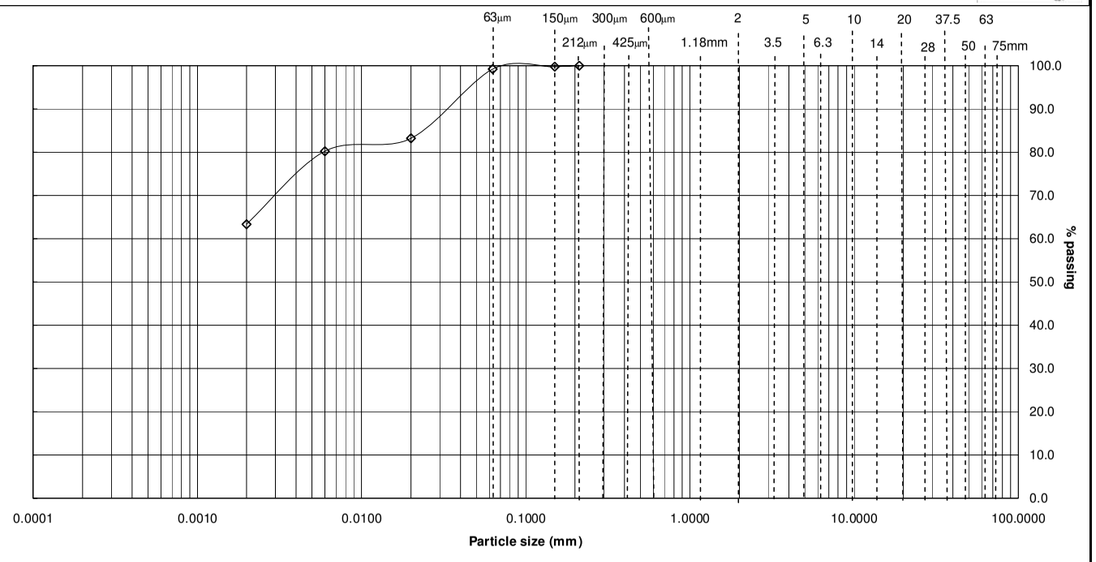
CONCEPT SITE INVESTIGATIONS

Form Lab 013B
Rev 3/06 22 Marchr 2006

G://0-Labs/Excel Templates/PSD Output

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH05 Sample No. D 74 Depth 32.50 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

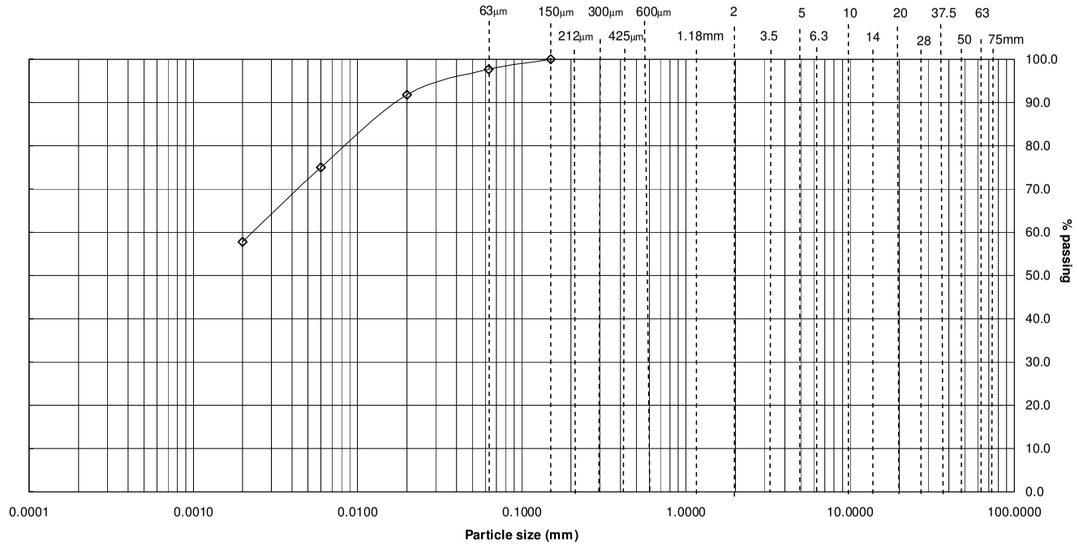
SOIL DESCRIPTION: Bluish grey mottled brown CLAY

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH06 Sample No. B 16 Depth 9.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SOIL DESCRIPTION: Grey CLAY with rare cobble and coarse gravel sized fragments of very strong calcareous claystone (~20%)

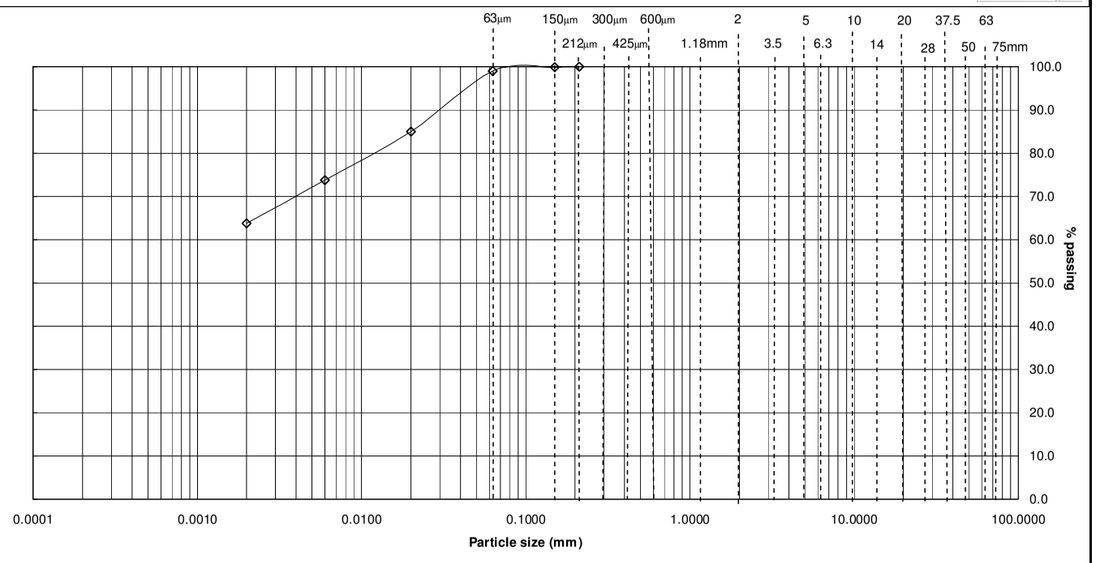
Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO:	10/2254
CLIENT:	REO (Powerstation) Ltd	DATE:	

PARTICLE SIZE DISTRIBUTION

Borehole No. BH06 Sample No. D 28 Depth 17.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SOIL DESCRIPTION: Grey slightly sandy slightly micaceous CLAY with rare pockets of light brown fine sand (10x10mm) rare pyrite nodules (<1mm) and occasional bioturbation

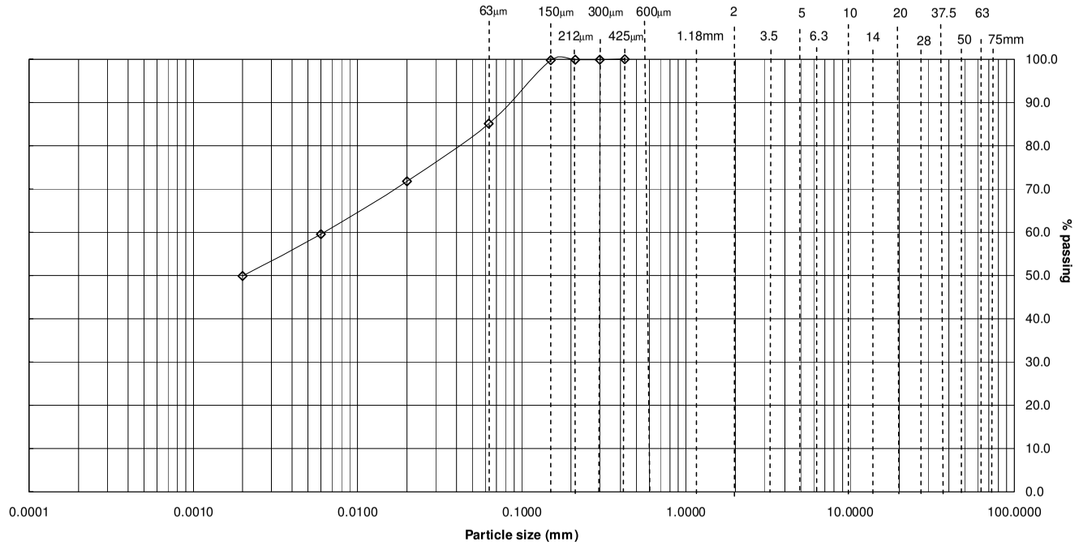
Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO:	10/2254
CLIENT:	REO (Powerstation) Ltd	DATE:	

PARTICLE SIZE DISTRIBUTION

Borehole No. BH06 Sample No. D 43 Depth 23.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

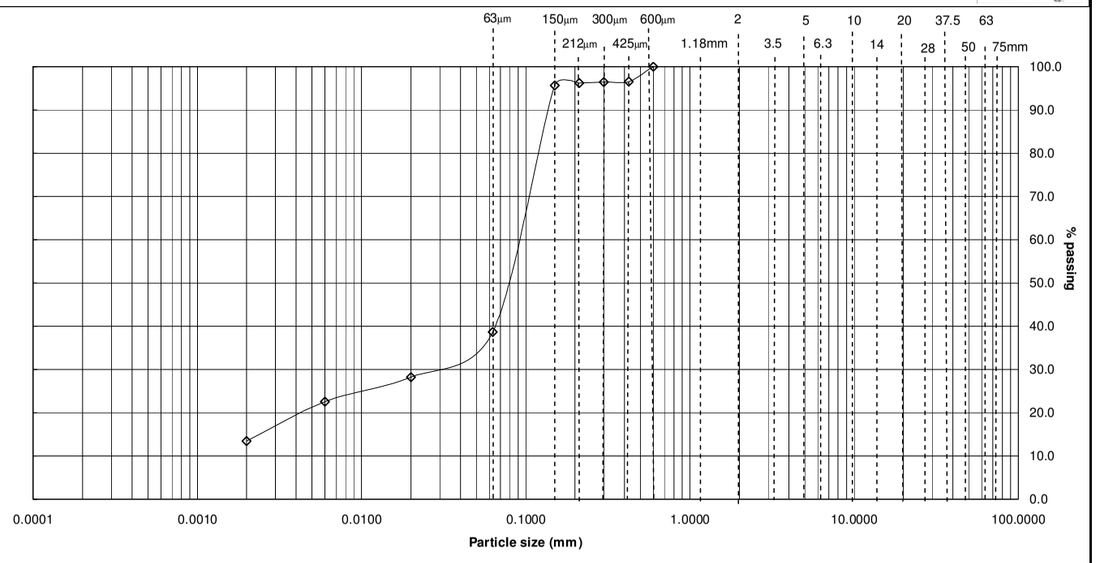
SOIL DESCRIPTION: Grey slightly sandy CLAY with occasional pockets of light brown fine sand (5x5mm) and occasional bioturbation

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH06 Sample No. D 49 Depth 24.50 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

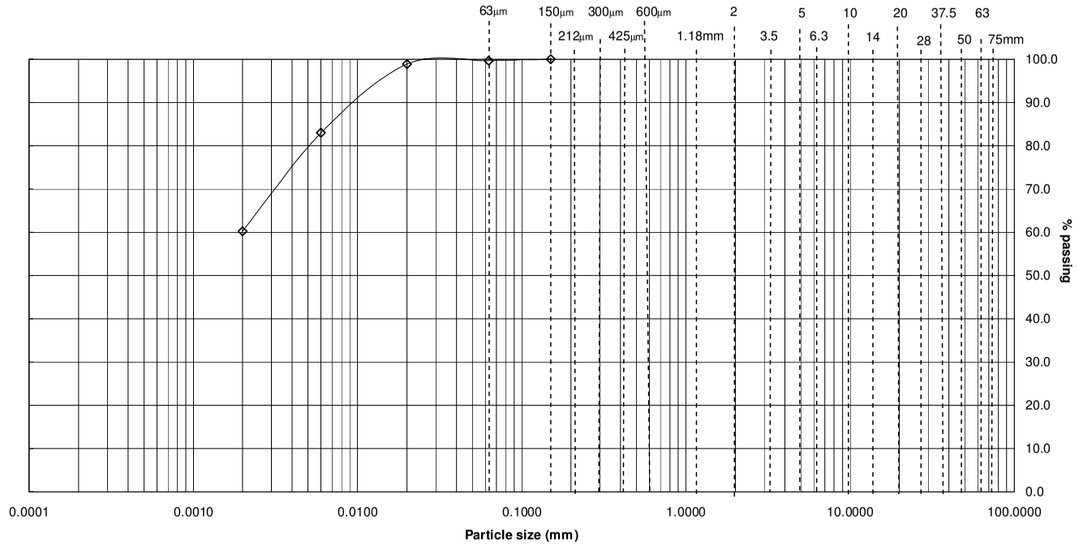
SOIL DESCRIPTION: Grey clayey generally fine SAND with occasional shell fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH06 Sample No. D 72 Depth 29.05 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

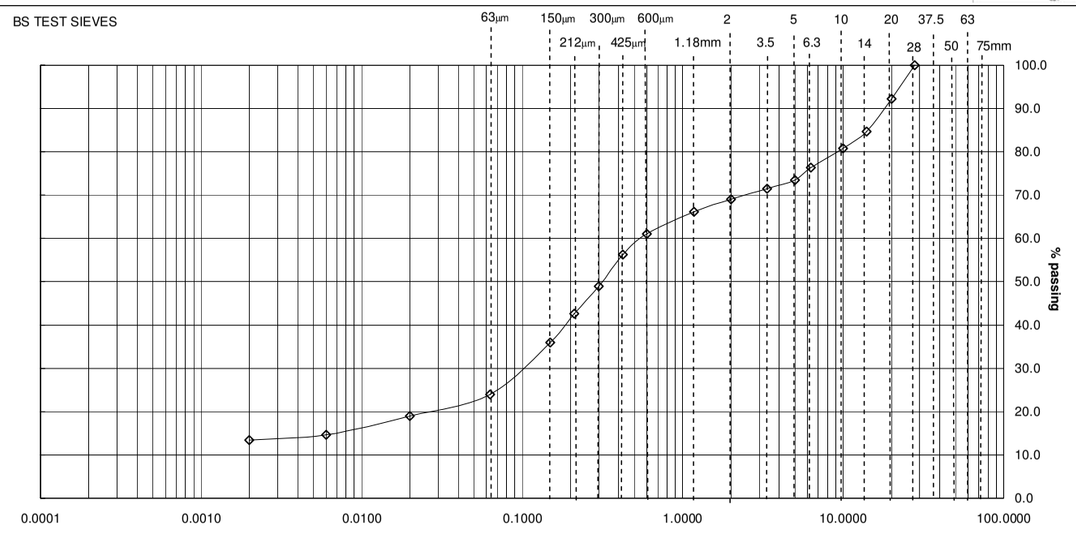
SOIL DESCRIPTION: Yellowish grey mottled grey mottled red CLAY

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH07 Sample No. B 09 Depth 1.20 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

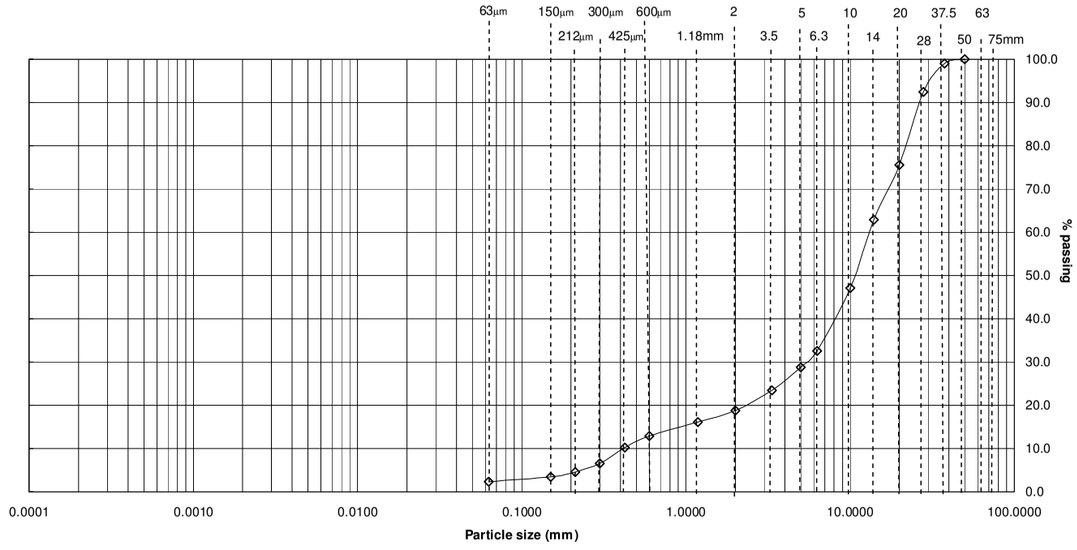
SOIL DESCRIPTION: Greyish brown iron stained sandy gravelly CLAY with rare pockets of black carbonaceous material (15x10mm), rare brick fragments and roots of live appearance (3-4mm). Gravel is angular to subrounded flint and rare granite (MADE GROUND)

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH07 Sample No. B 22 Depth 3.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

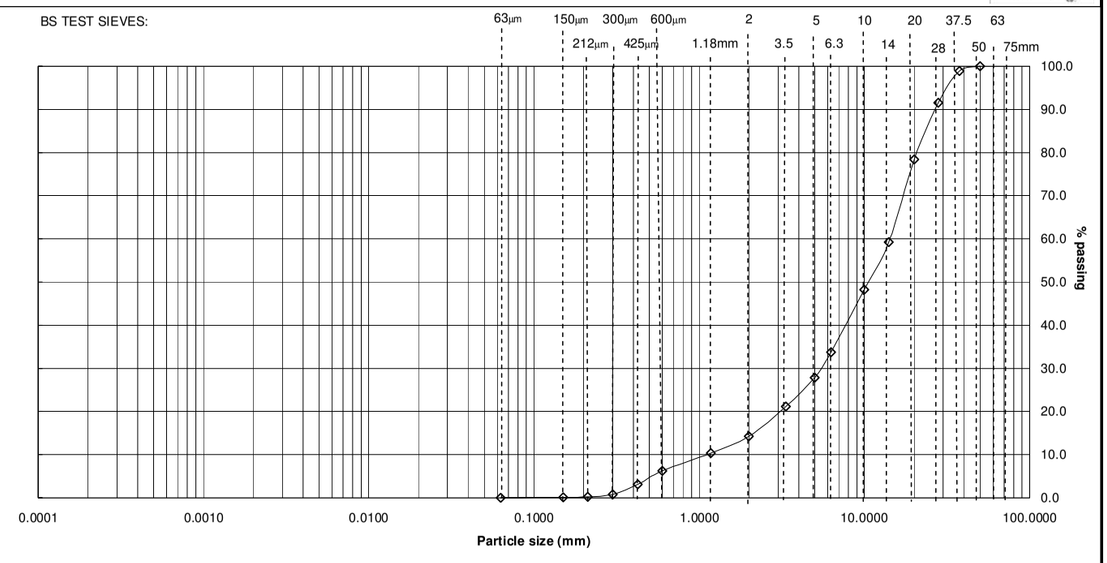
SOIL DESCRIPTION: Yellowish brown slightly silty sandy subrounded to well-rounded fine to coarse flint GRAVEL with rare sandstone fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO:	10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:		

Borehole No. BH07 Sample No. B 26 Depth 5.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

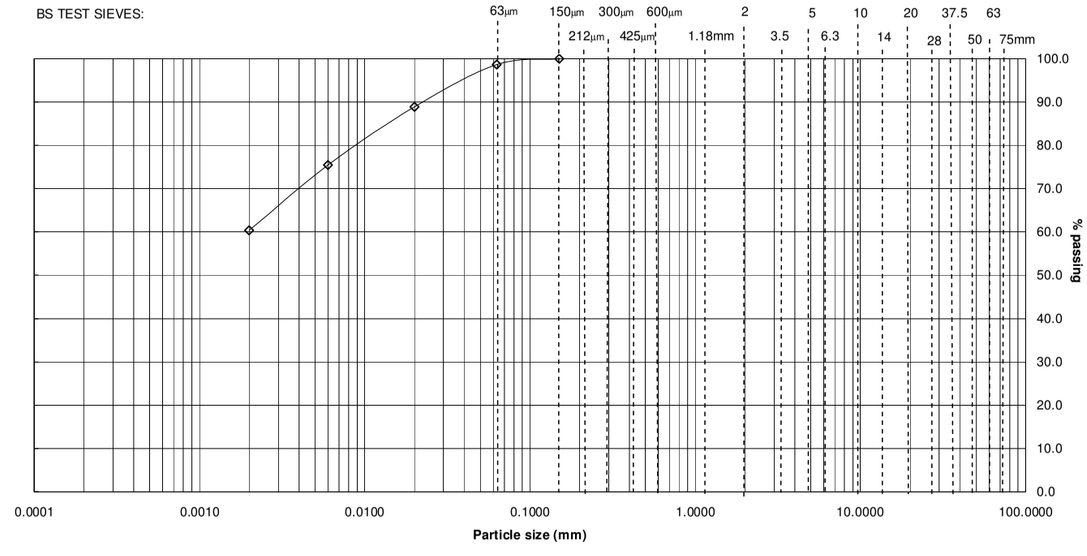
SOIL DESCRIPTION: Orangish brown sandy angular to well-rounded fine to coarse flint GRAVEL with rare sandstone fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO:	10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:		

Borehole No. BH07 Sample No. D 34 Depth 9.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

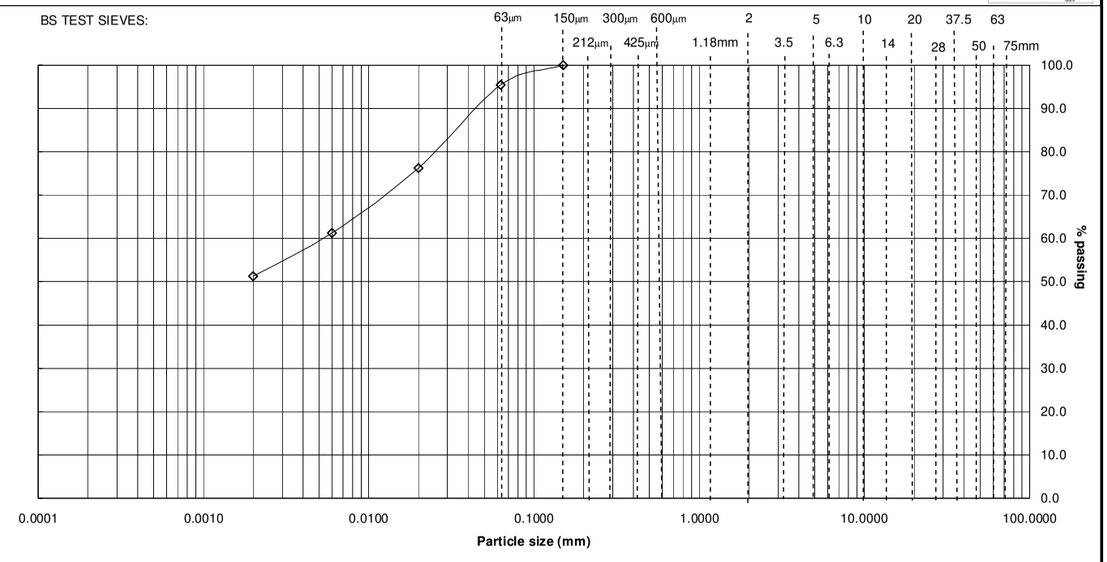
SOIL DESCRIPTION: Grey slightly micaceous CLAY with rare bioturbation

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH07 Sample No. D 53 Depth 20.95 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

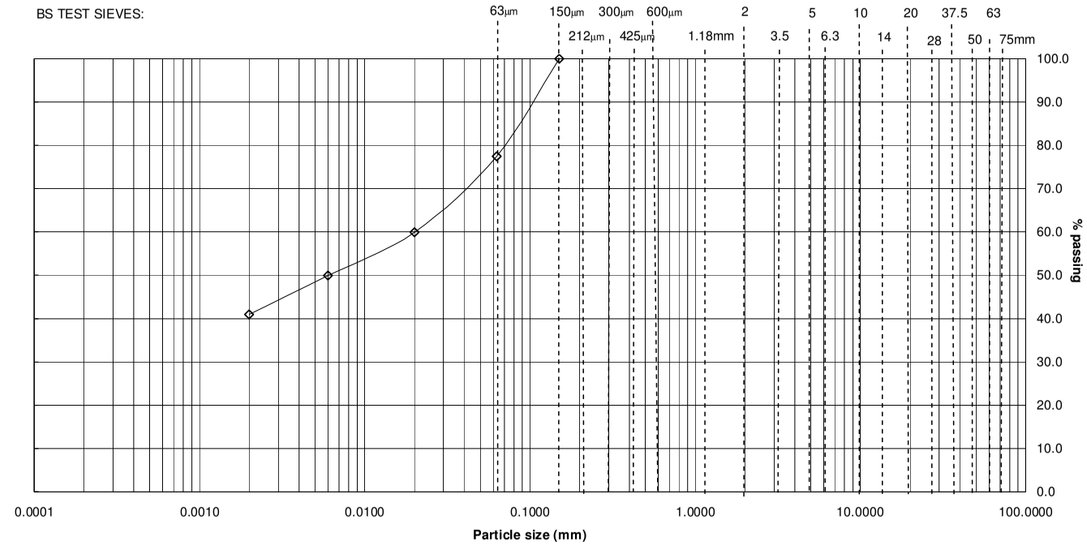
SOIL DESCRIPTION: Grey slightly sandy CLAY with occasional pockets of dark grey silty fine sand (5x5mm) and rare bioturbation

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO (Powerstation) Ltd	DATE:	

Borehole No. BH07 Sample No. D 61 Depth 22.95 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

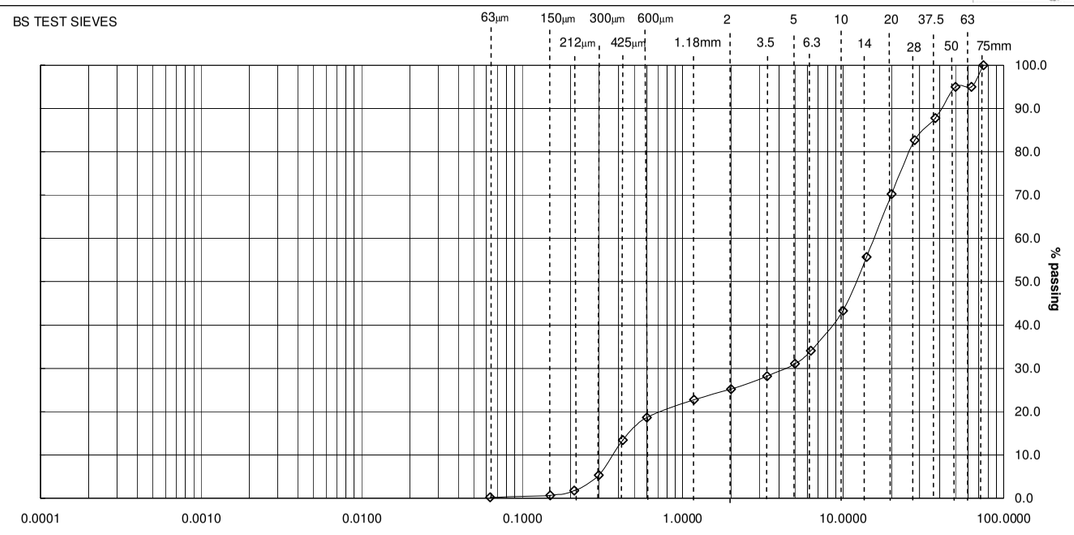
SOIL DESCRIPTION: Brownish grey slightly sandy CLAY with occasional bioturbation

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO Powerstation Ltd	DATE:	

Borehole No. BH01 Sample No. B 10 Depth 6.00 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

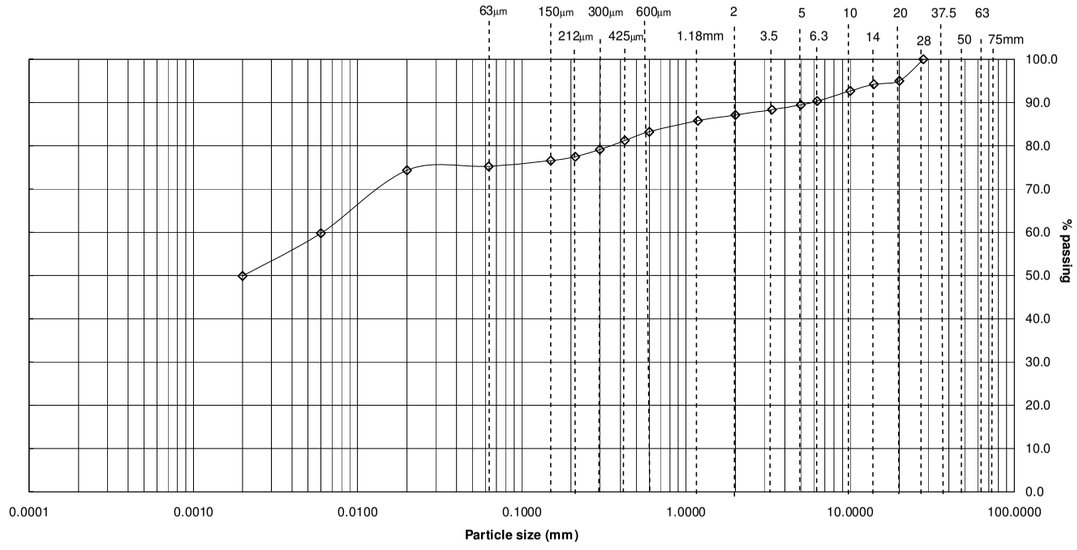
SOIL DESCRIPTION: Orangish brown very sandy angular to well-rounded fine to coarse flint GRAVEL with rare sandstone fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO Powerstation Ltd	DATE:	

Borehole No. BH01 Sample No. B 13 Depth 8.30 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

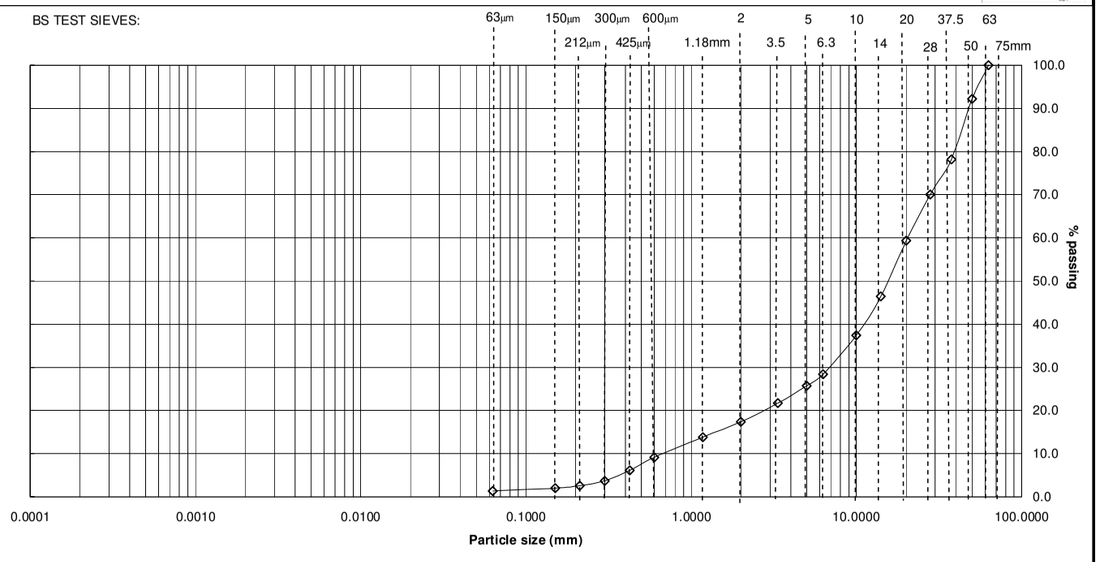
SOIL DESCRIPTION: Stiff grey slightly sandy slightly gravelly CLAY. Gravel is angular to well-rounded fine to coarse flint

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO Powerstation Ltd	DATE:	

Borehole No. BH02 Sample No. B 19 Depth 3.70 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

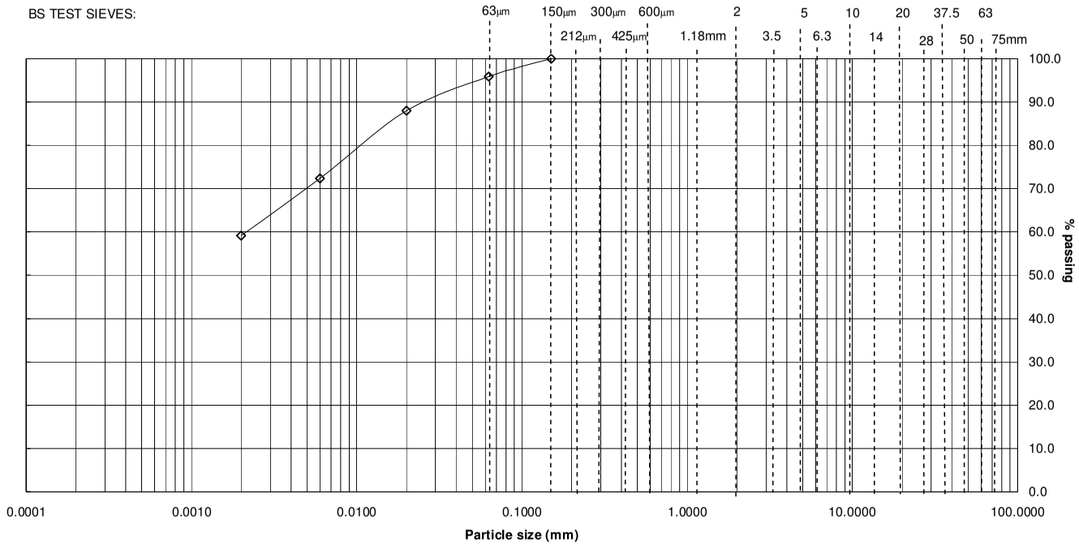
SOIL DESCRIPTION: Grey sandy subangular to subrounded fine to coarse flint GRAVEL

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO Powerstation Ltd	DATE:	

Borehole No. BH02 Sample No. D 27 Depth 8.50 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

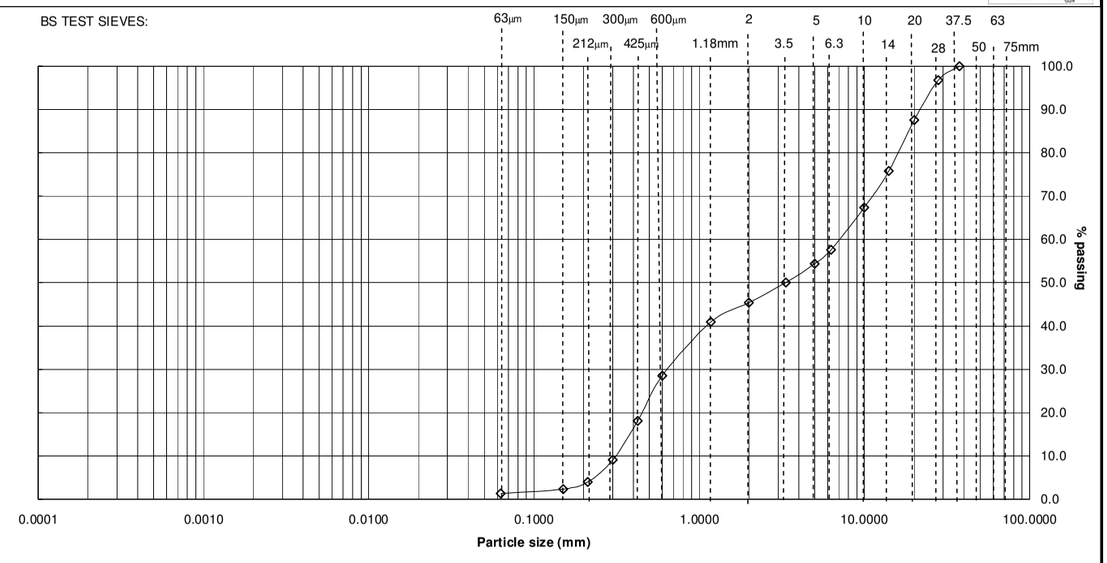
SOIL DESCRIPTION: Grey slightly sandy CLAY

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO Powerstation Ltd	DATE:	

Borehole No. BH09 Sample No. B 11 Depth 3.50 m



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

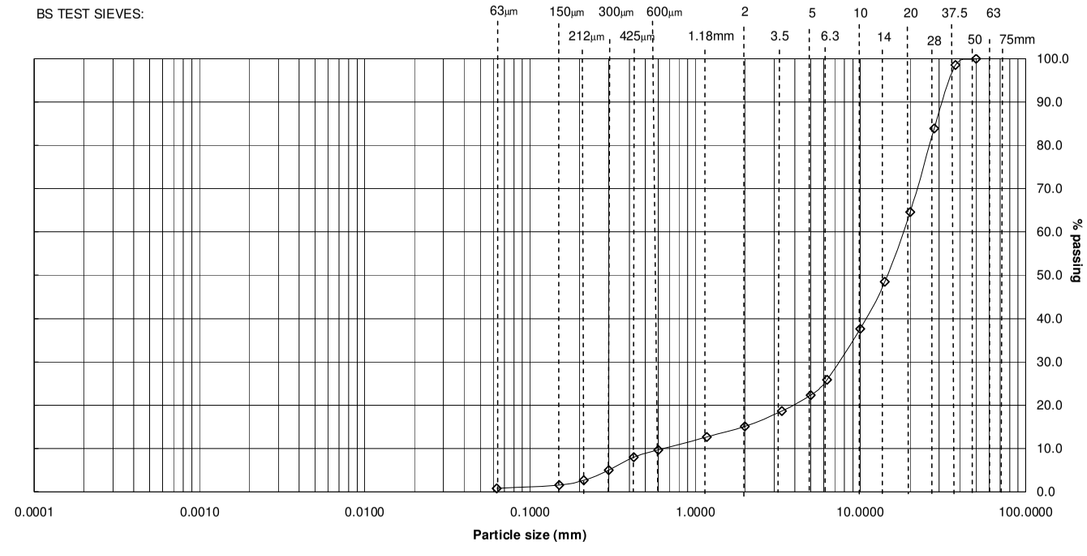
SOIL DESCRIPTION: Orangish brown very sandy angular to rounded generally fine and medium flint GRAVEL with rare sandstone fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

LOCATION:	Northern Line Extension	JOB NO: 10/2254	**PARTICLE SIZE DISTRIBUTION**
CLIENT:	REO Powerstation Ltd	DATE:	

Borehole No. BH09 Sample No. B 15 Depth 5.50 m



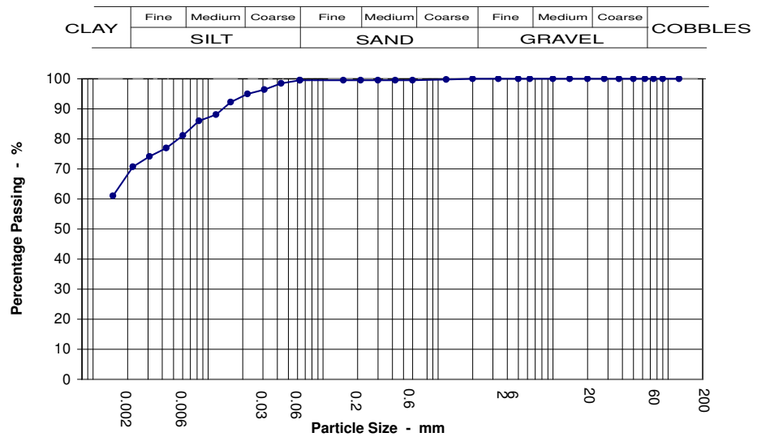
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SOIL DESCRIPTION: Orangish brown sandy angular to well-rounded fine to coarse flint GRAVEL with rare sandstone fragments

Test Method: BS1377: PART 2: 9.2/9.3/9.4

CONCEPT SITE INVESTIGATIONS

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH01
Location	Northern Line Extension	Sample No	19
		Depth	12.00 - 12.45 m
Visual Soil Description	Dark grey CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.043	98
90	100	0.031	96
75	100	0.022	95
63	100	0.016	92
50	100	0.012	88
37.5	100	0.008	86
28	100	0.006	81
20	100	0.004	77
14	100	0.003	74
10	100	0.002	71
6.3	100	0.001	61
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	100		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	0.7
Silt	31.5
Clay	67.8

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

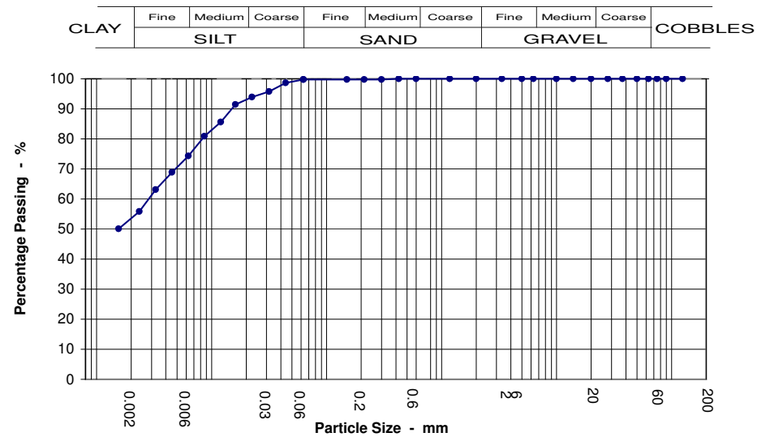
Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING 2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH01
Location	Northern Line Extension	Sample No	31
		Depth	20.00 - 20.45 m
Visual Soil Description	Dark grey silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.044	99
90	100	0.032	96
75	100	0.023	94
63	100	0.016	91
50	100	0.012	86
37.5	100	0.009	81
28	100	0.006	74
20	100	0.005	69
14	100	0.003	63
10	100	0.002	56
6.3	100	0.002	50
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	100		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	0.4
Silt	46.3
Clay	53.3

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

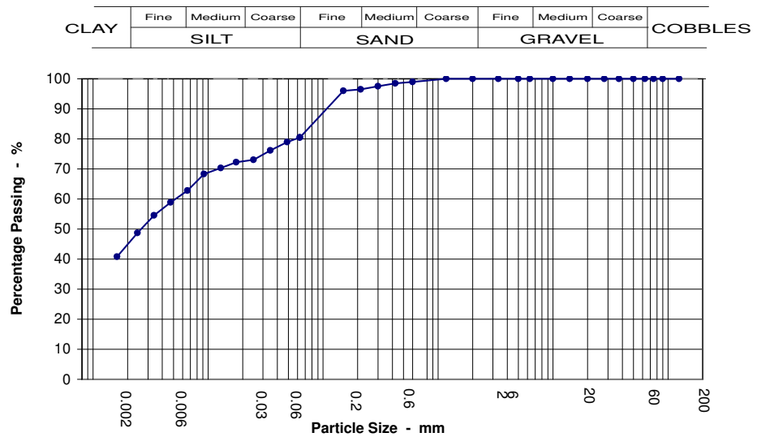
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING 2519

All samples connected with this report, incl any on 'hold' will be disposed off according to company policy. A copy of this policy is available on request. Sheet 3/3 MSF-11/R9

OONOEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH01
Location	Northern Line Extension	Sample No	43
		Depth	28.00 - 28.45 m
Visual Soil Description	Dark grey slightly sandy silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.049	79
90	100	0.035	76
75	100	0.025	73
63	100	0.018	72
50	100	0.013	70
37.5	100	0.009	68
28	100	0.007	63
20	100	0.005	59
14	100	0.003	55
10	100	0.002	49
6.3	100	0.002	41
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	97		
0.15	96		
0.063	81		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	19.8
Silt	35.6
Clay	44.5

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

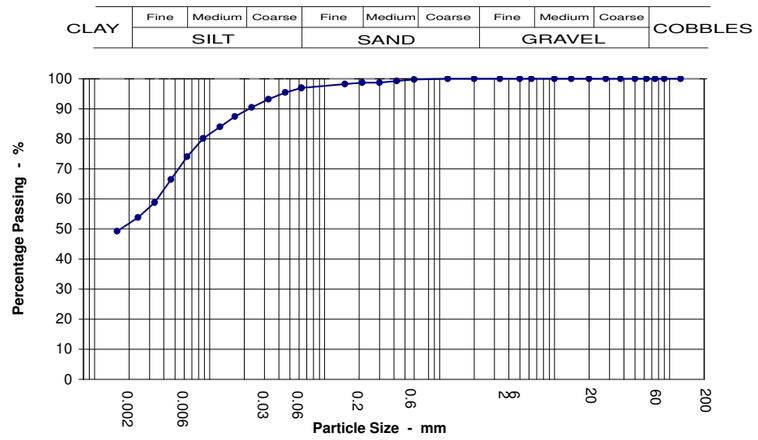
K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

OONOEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH02
Location	Northern Line Extension	Sample No	36
		Depth	14.50 - 14.95 m
Visual Soil Description	Dark grey silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.046	95
90	100	0.033	93
75	100	0.023	91
63	100	0.017	87
50	100	0.012	84
37.5	100	0.009	80
28	100	0.006	74
20	100	0.005	66
14	100	0.003	59
10	100	0.002	54
6.3	100	0.002	49
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	99		
0.212	99		
0.15	98		
0.063	97		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	3.3
Silt	45.1
Clay	51.7

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

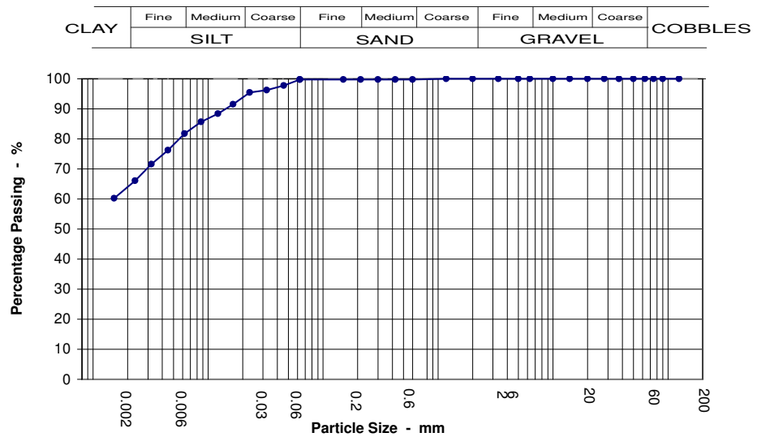
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

All samples connected with this report, incl any on 'hold' will be disposed off according to company policy. A copy of this policy is available on request. Sheet 3/3 MSF-11/R9

2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH02
Location	Northern Line Extension	Sample No	45
		Depth	20.50 - 20.95 m
Visual Soil Description	Dark grey silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.046	98
90	100	0.032	96
75	100	0.023	95
63	100	0.016	92
50	100	0.012	88
37.5	100	0.009	86
28	100	0.006	82
20	100	0.004	76
14	100	0.003	72
10	100	0.002	66
6.3	100	0.002	60
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	100		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	0.6
Silt	35.6
Clay	63.8

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

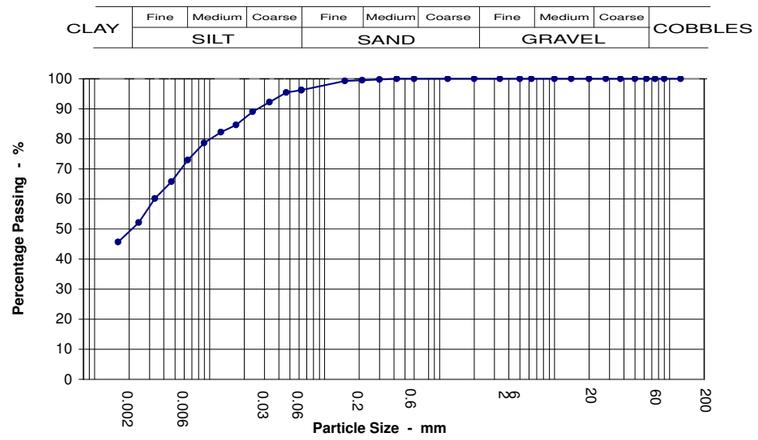
Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH02
Location	Northern Line Extension	Sample No	54
		Depth	26.50 - 26.95 m
Visual Soil Description	Dark grey slightly sandy silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.046	95
90	100	0.033	92
75	100	0.024	89
63	100	0.017	85
50	100	0.013	82
37.5	100	0.009	79
28	100	0.006	73
20	100	0.005	66
14	100	0.003	60
10	100	0.002	52
6.3	100	0.002	46
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	99		
0.063	96		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	3.9
Silt	47.2
Clay	48.9

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

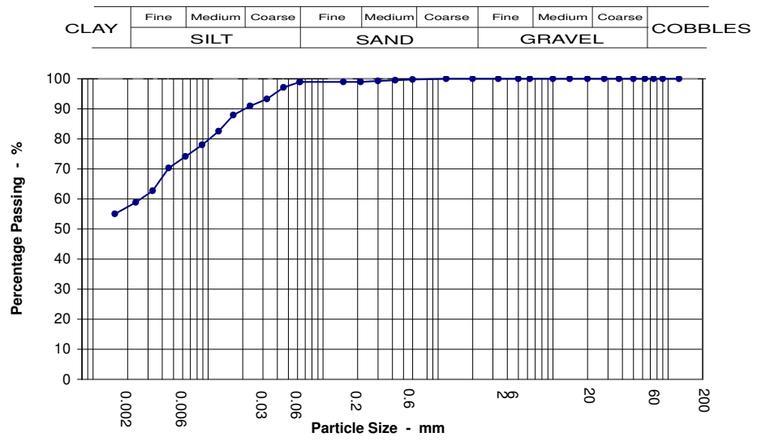
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

All samples connected with this report, incl any on 'hold' will be disposed off according to company policy. A copy of this policy is available on request.
Sheet 3/3 MSF-11/R9

2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH03
Location	Northern Line Extension	Sample No	28
		Depth	8.00 - 8.45 m
Visual Soil Description	Dark grey and pale grey very silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.045	97
90	100	0.033	93
75	100	0.023	91
63	100	0.017	88
50	100	0.012	83
37.5	100	0.009	78
28	100	0.006	74
20	100	0.005	70
14	100	0.003	63
10	100	0.002	59
6.3	100	0.002	55
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	99		
0.15	99		
0.063	99		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	1.3
Silt	41.5
Clay	57.2

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

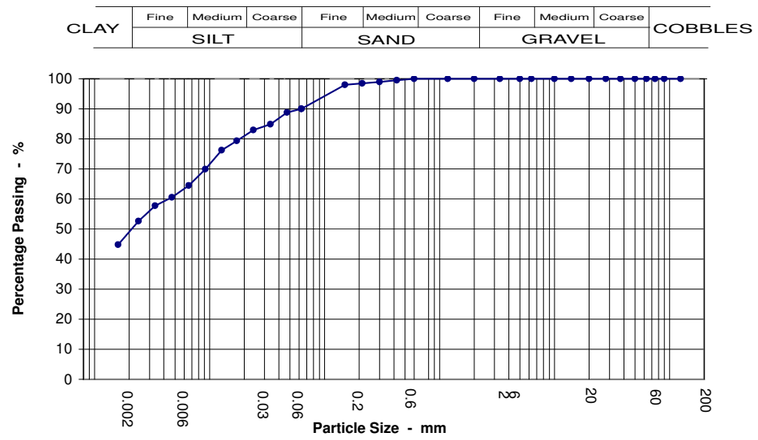
K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH03
Location	Northern Line Extension	Sample No	40
		Depth	16.00 - 16.45 m
Visual Soil Description	Dark grey slightly sandy silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.047	89
90	100	0.034	85
75	100	0.024	83
63	100	0.017	79
50	100	0.013	76
37.5	100	0.009	70
28	100	0.007	64
20	100	0.005	61
14	100	0.003	58
10	100	0.002	53
6.3	100	0.002	45
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	99		
0.15	98		
0.063	90		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	10.2
Silt	41.1
Clay	48.7

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

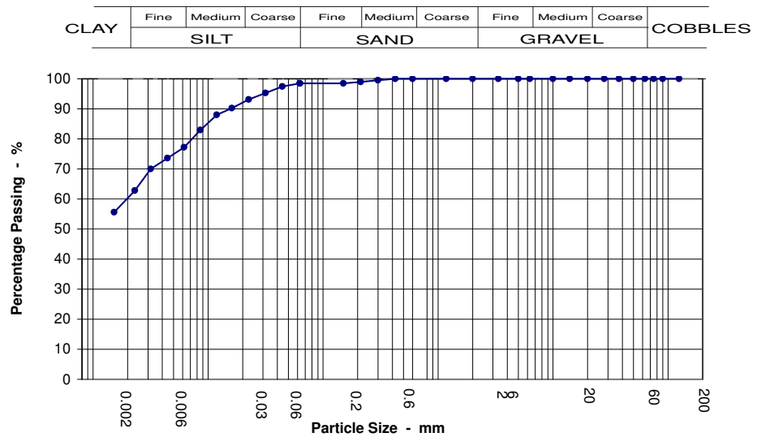
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

All samples connected with this report, incl any on 'hold' will be disposed off according to company policy. A copy of this policy is available on request. Sheet 3/3 MSF-11/R9

2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH03
Location	Northern Line Extension	Sample No	49
		Depth	22.00 - 22.45 m
Visual Soil Description	Dark grey silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.044	97
90	100	0.032	95
75	100	0.023	93
63	100	0.016	90
50	100	0.012	88
37.5	100	0.009	83
28	100	0.006	77
20	100	0.004	74
14	100	0.003	70
10	100	0.002	63
6.3	100	0.002	56
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	99		
0.15	99		
0.063	99		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	1.7
Silt	38.4
Clay	60.0

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

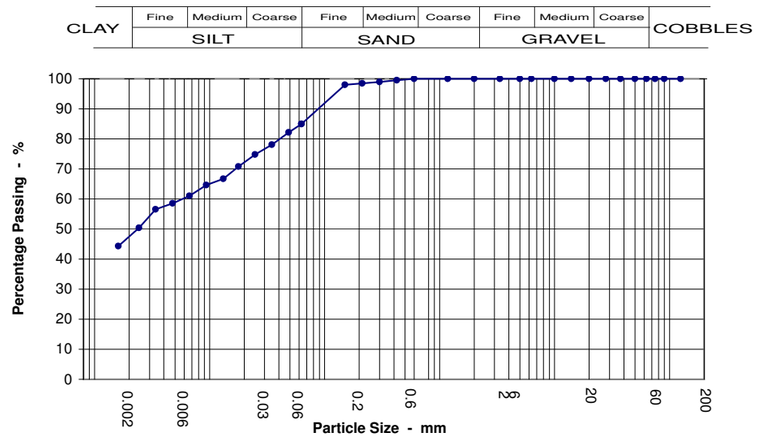
K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH03
Location	Northern Line Extension	Sample No	57
		Depth	28.00 - 28.45 m
Visual Soil Description	Dark grey slightly sandy silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.049	82
90	100	0.035	78
75	100	0.025	75
63	100	0.018	71
50	100	0.013	67
37.5	100	0.009	65
28	100	0.007	61
20	100	0.005	59
14	100	0.003	57
10	100	0.002	50
6.3	100	0.002	44
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	99		
0.15	98		
0.063	85		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	15.6
Silt	37.2
Clay	47.2

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

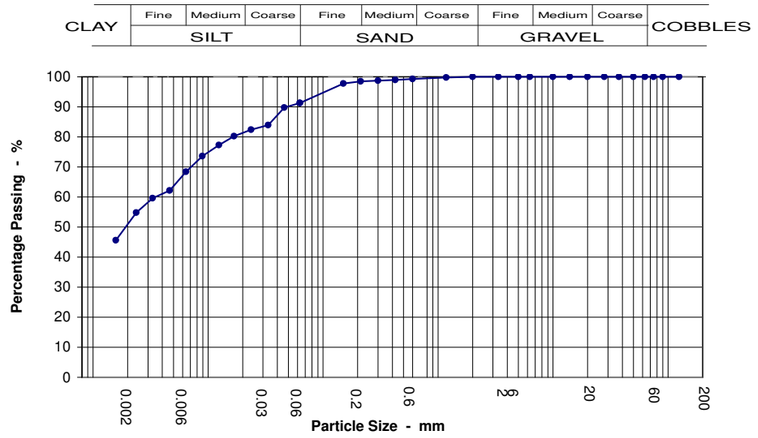
K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH03
Location	Northern Line Extension	Sample No	66
		Depth	34.00 - 34.45 m
Visual Soil Description	Dark grey slightly sandy silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.046	90
90	100	0.033	84
75	100	0.024	82
63	100	0.017	80
50	100	0.012	77
37.5	100	0.009	74
28	100	0.006	68
20	100	0.005	62
14	100	0.003	60
10	100	0.002	55
6.3	100	0.002	46
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	99		
0.15	98		
0.063	91		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	9.0
Silt	40.5
Clay	50.5

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

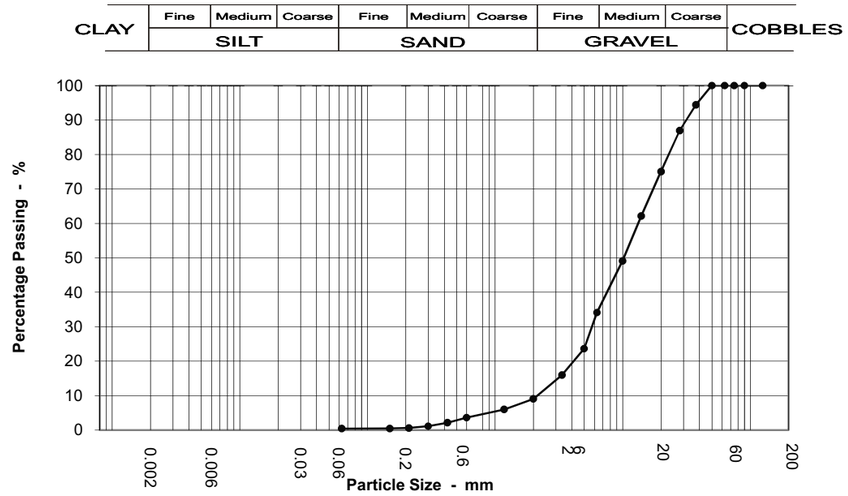
K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING
2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH08
Location	Northern Line Extension	Sample No	13
		Depth	3.70 - 4.20 m
	Brown sandy GRAVEL (gravel is fmc and sub angular to sub rounded)	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	94		
28	87		
20	75		
14	62		
10	49		
6.3	34		
5	24		
3.35	16		
2	9		
1.18	6		
0.6	4		
0.425	2		
0.3	1		
0.212	1		
0.15	0		
0.063	0		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	N/A

Sample Proportions	
Cobbles	0.0
Gravel	90.9
Sand	8.6
Silt & Clay	0.5

Grading Analysis	
D100	125.0
D60	13.3
D10	2.2
Uniformity Coefficient	6

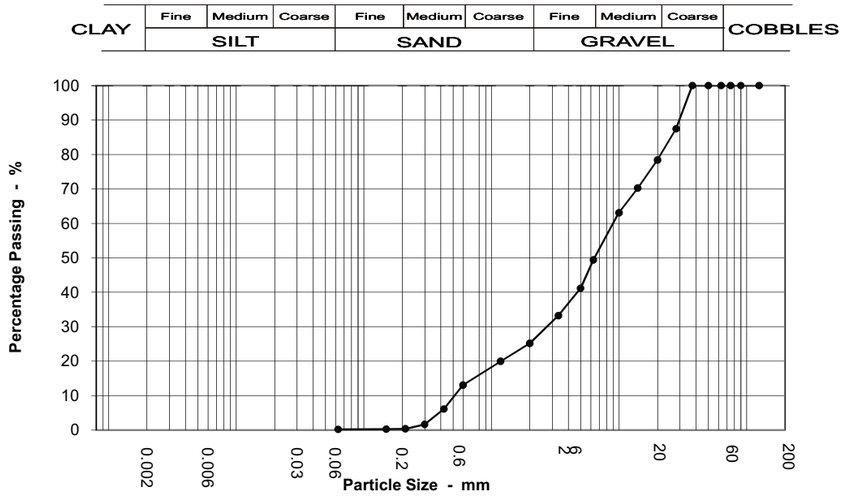
K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 12/07/2010

UKAS TESTING
2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH08
Location	Northern Line Extension	Sample No	17
		Depth	6.70 - 7.20 m
Visual Soil Description	Brown sandy GRAVEL (gravel is fmc and sub angular to rounded)	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	87		
20	78		
14	70		
10	63		
6.3	49		
5	41		
3.35	33		
2	25		
1.18	20		
0.6	13		
0.425	6		
0.3	2		
0.212	0		
0.15	0		
0.063	0		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	N/A

Sample Proportions	
Cobbles	0.0
Gravel	74.8
Sand	25.0
Silt & Clay	0.2

Grading Analysis	
D100	125.0
D60	9.2
D10	0.5
Uniformity Coefficient	18

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

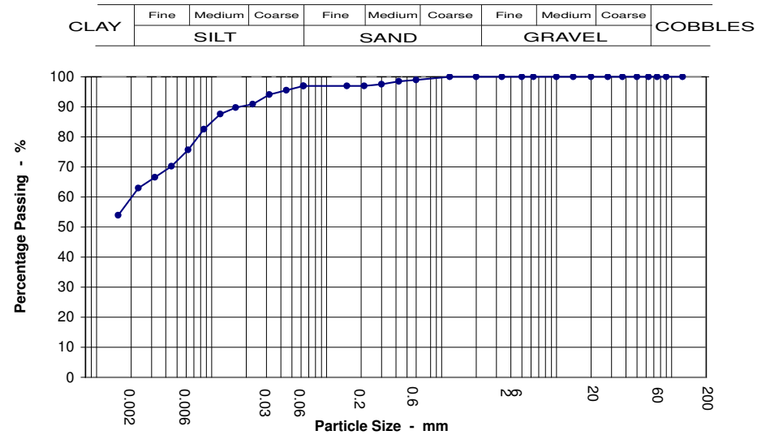
Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 12/07/2010

UKAS TESTING 2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH08
Location	Northern Line Extension	Sample No	28
		Depth	12.50 - 12.95 m
Visual Soil Description	Dark grey silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.045	96
90	100	0.032	94
75	100	0.023	91
63	100	0.016	90
50	100	0.012	88
37.5	100	0.009	83
28	100	0.006	76
20	100	0.004	70
14	100	0.003	67
10	100	0.002	63
6.3	100	0.002	54
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	97		
0.15	97		
0.063	97		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	3.2
Silt	37.3
Clay	59.4

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

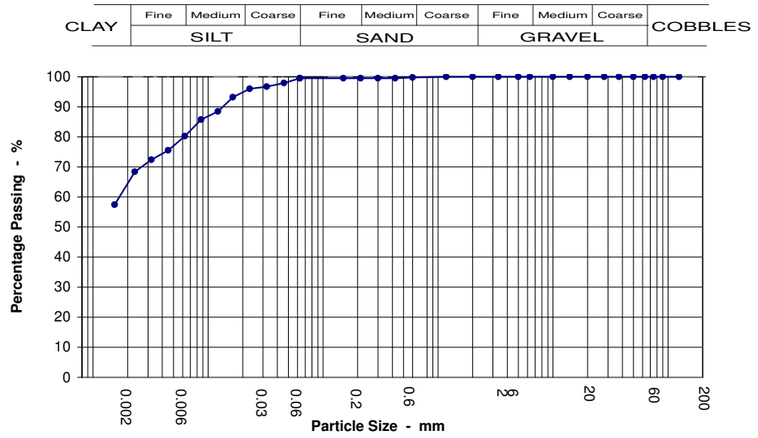
Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING 2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH09
Location	Northern Line Extension	Sample No	27
		Depth	11.00 - 11.45 m
Visual Soil Description	Dark grey CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.046	98
90	100	0.032	97
75	100	0.023	96
63	100	0.016	93
50	100	0.012	88
37.5	100	0.009	86
28	100	0.006	80
20	100	0.005	76
14	100	0.003	72
10	100	0.002	68
6.3	100	0.002	57
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	100		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	0.8
Silt	35.2
Clay	64.1

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

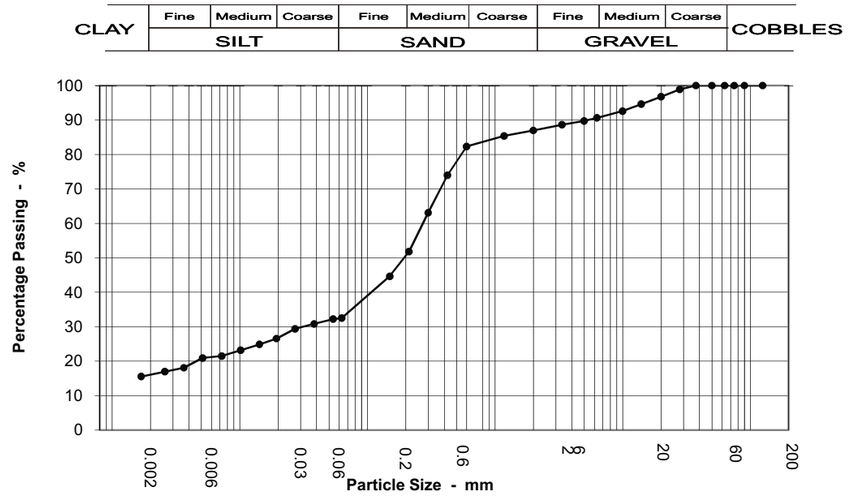
Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING
2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH10
Location	Northern Line Extension	Sample No	11
		Depth	3.20 - 3.70 m
Visual Soil Description	Brown slightly gravelly clayey SAND (gravel is fmc and sub angular to sub rounded)	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.054	32
90	100	0.038	31
75	100	0.027	29
63	100	0.019	27
50	100	0.014	25
37.5	100	0.010	23
28	99	0.007	21
20	97	0.005	21
14	95	0.004	18
10	93	0.003	17
6.3	91	0.002	16
5	90		
3.35	89		
2	87		
1.18	85		
0.6	82		
0.425	74		
0.3	63		
0.212	52		
0.15	45		
0.063	33		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	13.0
Sand	54.6
Silt	16.4
Clay	16.0

Grading Analysis	
D100	125.0
D60	0.3
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

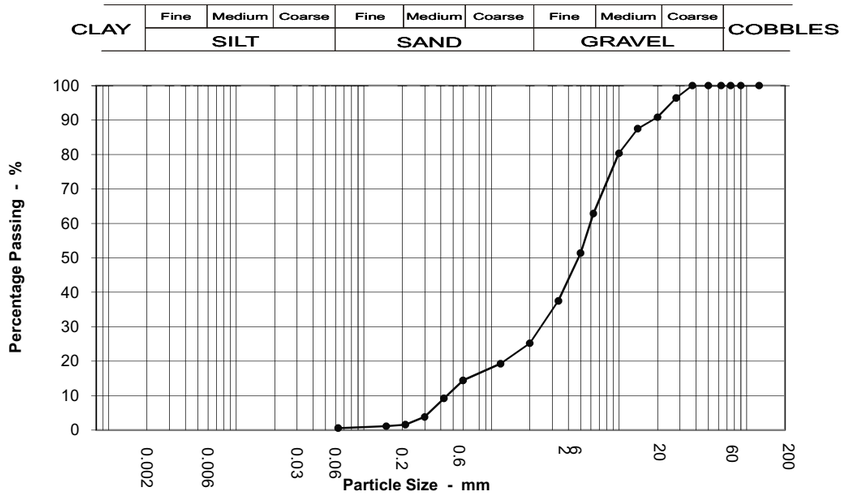
Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 12/07/2010

UKAS TESTING
2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH10
Location	Northern Line Extension	Sample No	14
		Depth	6.20 - 6.70 m
Visual Soil Description	Brown sandy GRAVEL (gravel is fmc and sub angular to rounded)	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	96		
20	91		
14	87		
10	80		
6.3	63		
5	51		
3.35	38		
2	25		
1.18	19		
0.6	14		
0.425	9		
0.3	4		
0.212	2		
0.15	1		
0.063	1		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	N/A

Sample Proportions	
Cobbles	0.0
Gravel	74.8
Sand	24.6
Silt & Clay	0.6

Grading Analysis	
D100	125.0
D60	6.0
D10	0.5
Uniformity Coefficient	13

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

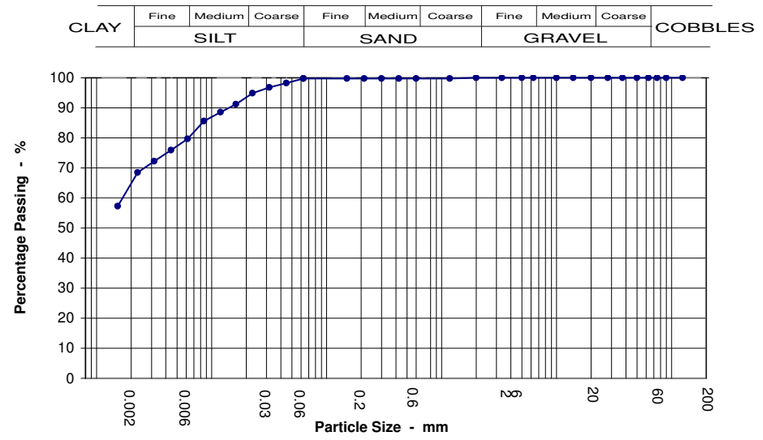
Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 12/07/2010

UKAS TESTING 2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH10
Location	Northern Line Extension	Sample No	20
		Depth	10.00 - 10.45 m
Visual Soil Description	Dark grey silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.045	98
90	100	0.032	97
75	100	0.023	95
63	100	0.016	91
50	100	0.012	89
37.5	100	0.009	86
28	100	0.006	80
20	100	0.004	76
14	100	0.003	72
10	100	0.002	68
6.3	100	0.002	57
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	100		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	0.5
Silt	35.1
Clay	64.4

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

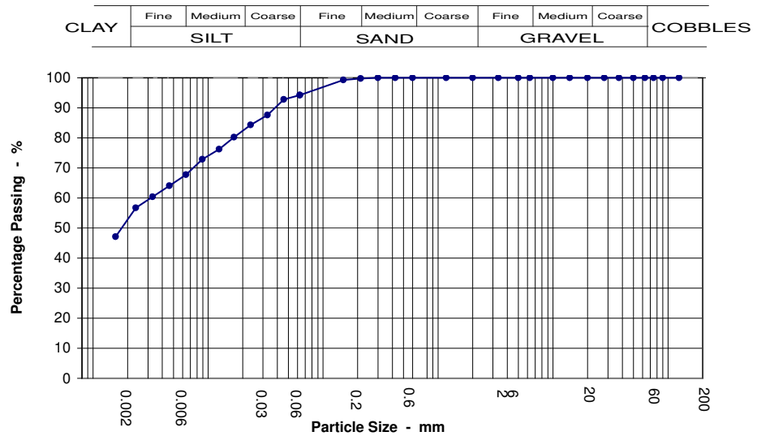
Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING 2519

CONCEPT	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Job/report no:	9597
		Borehole / Pit No	BH10
Location	Northern Line Extension	Sample No	26
		Depth	14.00 - 14.45 m
Visual Soil Description	Dark grey slightly sandy silty CLAY	Sample type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.045	93
90	100	0.033	88
75	100	0.023	84
63	100	0.017	80
50	100	0.012	76
37.5	100	0.009	73
28	100	0.006	68
20	100	0.005	64
14	100	0.003	60
10	100	0.002	57
6.3	100	0.002	47
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	99		
0.063	94		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	6.0
Silt	41.6
Clay	52.4

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 02/07/2010

UKAS TESTING 2519

Project Name:	NLE			Samples Received:	07/06/2010	CONCEPT
				Project Started:	08/06/2010	
Client:	REO (Powerstation) Ltd			Testing Started:	10/06/2010	
Project No:	10/2254	Our Job/report no:	9502	Date Reported:	30/06/2010	

BH / TP No :	Sample no / ref :	Sample depth (m):	Soil Description	Specific gravity Mg/m3
BH04	40	25.5	Dark grey fissured CLAY	2.68
BH05	34	18	Grey fissured CLAY	2.67
BH07	35	10	Grey heavily fissured CLAY	2.73
BH07	58	22	Grey fissured CLAY	2.70

Summary of Testing

BS 1377 : Part 2 : Clause 8 : 1990

Determination of the Particle Density

Checked and Approved
Initials : kp
Date : 30/06/2010

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU.

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

UKAS TESTING 2519

Project Name:	Northern Line Extension			Samples Received:		
				Project Started:	24/06/2010	CONCEPT
Client:	REO (Powerstation) Ltd			Testing Started:	24/06/2010	
Project No:	10/2254	Our Job/report no:	9502a	Date Reported:	12/07/2010	

BH / TP No :	Sample no / ref :	Sample depth (m):	Soil Description	Specific gravity Mg/m3
BH01	38	25	Very stiff fissured dark grey CLAY	2.75
BH02	40	17.5	Stiff fissured dark grey CLAY	2.73
BH03	53	25	Stiff dark grey fissured CLAY	2.71
BH08	50	19.5	Very stiff dark grey silty CLAY	2.69
BH09	55	20.5	Very stiff fissured dark grey CLAY	2.73
BH10	45	19.4	Very stiff dark grey fissured CLAY	2.73

Summary of Testing

BS 1377 : Part 2 : Clause 8 : 1990

Determination of the Particle Density

Checked and Approved

Initials : kp

Date : 12/07/2010

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU.

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

All samples connected with this report, incl any on 'hold' will be stored and disposed off according to company policy. A copy of this policy is available on request.

UKAS TESTING 2519

---

scientifics

Scientifics
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

Our Ref: EFS/103924 (Ver. 1)
Your Ref: 10/2254
July 7, 2010

Ms J Fokt
Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

For the attention of Ms J Fokt

Dear Ms Fokt

SOIL Sample Analysis - Northern Line Extension

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 09/08/10 when they will be discarded. Please call 01283 554547 for an extension of this date.
Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Scientifics) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for Scientifics

J Colbourne
Project Co-ordinator
01283 554547

TEST REPORT
SOIL SAMPLE ANALYSIS

UKAS TESTING 1252

Report No. EFS/103924 (Ver. 1)

Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

Site: Northern Line Extension

The 10 samples described in this report were logged for analysis by Scientifics on 28-Jun-2010.
The analysis was completed by: 07-Jul-2010

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by Scientifics.

The following tables are contained in this report:

On behalf of Scientifics :
Andrew Timms
Operations Manager

Date of Issue: 07-Jul-2010

Tests marked '^' have been subcontracted to another laboratory.

Scientifics accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

---

scientifics
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name: Concept Consultants
Contact: Ms J Fokt

Northern Line Extension

Soils Sample Analysis

Date Printed: 07-Jul-10
Report Number: EFS/103924
Table Number: 1

		SO4-- (acid sol)	SO4-- (H2O sol) mg/l	pH units (AR)
	Units :	mg/kg	mg/l	pH Units
	Method Codes :	ICPACIDS	ICPWSS	PHSOIL
	Method Reporting Limits :	20	10	
	UKAS Accredited :	yes	yes	yes
Laboratory ID Number CL/	**Client Sample Description**			
1017660	BH01 15.5	1070	691	7.8
1017661	BH01 23.5	1590	1100	7.7
1017662	BH02 18.5-18.95	1200	908	8.0
1017663	BH02 22.5-22.95	1650	943	7.5
1017655	BH03 20.0-20.45	1210	629	7.6
1017656	BH03 26.0-26.45	3000	1950	7.4
1017657	BH08 10.5-10.95	847	431	8.1
1017658	BH08 20.5	2790	1570	7.1
1017664	BH09 8.0-8.45	1880	874	7.4
1017659	BH10 9.5	1140	618	7.8

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Air Dried	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Air Dried	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NADIS Denotes No Asbestos Detected In Sample
NBFO Denotes No Bulk Fibres Observed

Symbol Reference

^ Sub-contracted analysis
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Our Ref: EFS/103528 (Ver. 1)
Your Ref: 10/2254
June 24, 2010

Scientifics
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

Ms J Fokt
Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

For the attention of Ms J Fokt

Dear Ms Fokt

SOIL Sample Analysis - Northern Line Extension

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 26/07/10 when they will be discarded. Please call 01283 554458 for an extension of this date.
Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Scientifics) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for Scientifics

D Simpson
Project Co-ordinator
01283 554458

TEST REPORT
SOIL SAMPLE ANALYSIS

1252

Report No. EFS/103528 (Ver. 1)

Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

Site: Northern Line Extension

The 7 samples described in this report were logged for analysis by Scientifics on 14-Jun-2010.
The analysis was completed by: 24-Jun-2010

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by Scientifics.

The following tables are contained in this report:

On behalf of
Scientifics :
Andrew Timms Operations Manager

Date of Issue: 24-Jun-2010

Tests marked '^' have been subcontracted to another laboratory.

Scientifics accepts no responsibility for any sampling not carried out by our personnel.

Units :		mg/kg	mg/l	pH Units																				
Method Codes :		ICPACIDS	ICPWSS	PHSOIL																				
Method Reporting Limits :		20	10																					
UKAS Accredited :		yes	yes	yes																				
Laboratory ID Number CL/	Client Sample Description	SO4-- (acid sol)	SO4-- (H2O sol) mg/l	pH units (AR)																				
1015847	BH04 28.5-28.95	2280	1810	7.5																				
1015848	BH04 35.0-35.95	373	108	9.5																				
1015849	BH05 15.0-15.45	1940	1070	7.6																				
1015850	BH05 30.2-30.65	340	134	8.6																				
1015851	BH06 28.65	355	102	9.2																				
1015852	BH07 18.45	1870	973	6.5																				
1015853	BH07 23.45	2620	170	5.6																				

scientifics
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name: Concept Consultants
Contact: Ms J Fokt

Northern Line Extension

Soils Sample Analysis

Date Printed: 24-Jun-10
Report Number: EFS/103528
Table Number: 1

EFS/103528 Ver. 1

Where individual results are flagged see report notes for status.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NADIS Denotes No Asbestos Detected In Sample
NBFO Denotes No Bulk Fibres Observed

Symbol Reference

^ Sub-contracted analysis
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Where individual results are flagged see report notes for status.

Our Ref: EFS/103962 (Ver. 1)
Your Ref: 10/2254
July 12, 2010

Scientifics
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

Ms J Fokt
Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

For the attention of Ms J Fokt

Dear Ms Fokt

SOIL Sample Analysis - Northern Line Extension

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 10/08/10 when they will be discarded. Please call 01283 554547 for an extension of this date.
Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Scientifics) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for Scientifics

J Colbourne
Project Co-ordinator
01283 554547

TEST REPORT
SOIL SAMPLE ANALYSIS

UKAS TESTING 1252

Report No. EFS/103962 (Ver. 1)

Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

Site: Northern Line Extension

The 2 samples described in this report were logged for analysis by Scientifics on 29-Jun-2010.
The analysis was completed by: 12-Jul-2010

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by Scientifics.

The following tables are contained in this report:

On behalf of
Scientifics :
Andrew Timms Operations Manager

Date of Issue: 12-Jul-2010

Tests marked '^' have been subcontracted to another laboratory.

Scientifics accepts no responsibility for any sampling not carried out by our personnel.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Air Dried	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Air Dried	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.

Units :		mg/kg	mg/l	pH Units
Method Codes :		ICPACIDS	ICPWSS	PHSOIL
Method Reporting Limits :		20	10	
UKAS Accredited :		yes	yes	yes
Laboratory ID Number CL/	Client Sample Description	SO4-- (acid sol)	SO4-- (H2O sol) mg/l	pH units (AR)
1017888	BH9 19.95	689	324	8.7
1017887	BH10 20.9	1080	<10	8.7

scientifics
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name: Concept Consultants
Contact: Ms J Fokt

Northern Line Extension

Soils Sample Analysis

Date Printed	12-Jul-10
Report Number	EFS/103962
Table Number	1

Where individual results are flagged see report notes for status.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NADIS Denotes No Asbestos Detected In Sample
NBFO Denotes No Bulk Fibres Observed

Symbol Reference

^ Sub-contracted analysis
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
* All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Attention: Jon Roberts

CERTIFICATE OF ANALYSIS

Date: 18 June 2010
Customer: H_CONSIT_LON-2
Sample Delivery Group (SDG): 100617-60 **Report No.:** 87635
Your Reference: 10/2254
Location: NLE

We received 5 samples on Thursday June 17, 2010 and 5 of these samples were scheduled for analysis which was completed on Friday June 18, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton
Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100617-60	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87635

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1700248	BH10 1		15/06/2010
1700180	BH5 1		15/06/2010
1700199	BH6 1		15/06/2010
1700221	BH7 1		15/06/2010
1700233	BH9 1		15/06/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG: 100617-60 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NLE Report No: 87635

LIQUID

Results Legend	Lab Sample No(s)	1700180	1700199	1700221	1700233	1700248	Total
X Test	Customer Sample Ref.	BH5	BH6	BH7	BH9	BH10	
■ No Determination Possible	Depth (m)						
	Container	1litreplas	1litreplas	1litreplas	1litreplas	1litreplas	
Anions by Kone (w)	All	X	X	X	X	X	0 5
pH Value	All	X	X	X	X	X	0 5

Validated

ALcontrol Laboratories Analytical Services

SDG: 100617-60 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NLE Report No: 87635

Test Completion dates

SDG reference: 100617-60

Lab Sample No(s)	1700180	1700199	1700221	1700233	1700248
Customer Sample Ref.	BH5	BH6	BH7	BH9	BH10
Depth					
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Anions by Kone (w)	17/06/2010	17/06/2010	17/06/2010	17/06/2010	17/06/2010
pH Value	18/06/2010	18/06/2010	18/06/2010	18/06/2010	18/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG: 100617-60 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NLE Report No: 87635

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Customer Sample Ref.	BH10	BH5	BH6	BH7	BH9
Depth (m)					
Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
Date Sampled	15/06/2010	15/06/2010	15/06/2010	15/06/2010	15/06/2010
Date Received	17/06/2010	17/06/2010	17/06/2010	17/06/2010	17/06/2010
SDG Ref	100617-60	100617-60	100617-60	100617-60	100617-60
Lab Sample No.(s)	1700248	1700180	1700199	1700221	1700233
Component	**LOD/Units**	**Method**			
Sulphate	3 mg/l	TM184	499 #	474 #	355 #	263 #	562 #
pH	<1 pH Units	TM256	8.31 #	8.18 #	8.06 #	8.1 #	8.15 #

Table of Results - Appendix

SDG Number : 100617-60 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample ¹
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers	
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter	

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries –** Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses –** Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

CONCEPT SITE INVESTIGATIONS

Undrained Triaxial Compression
BS 1377 : Part 7: 1990 Clause 8

Date: 22/06/2010
Job No. 10/2254

Site Location: Northern Line Extension
Client: REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH01	U	17	11.00	Extremely closely fissured brownish grey CLAY with occasional pockets of dark brownish grey silty sand (10x35mm)	330	4.8	1.972	1.542	28	273	137	Brittle
BH01	U	26	17.00	Grey slightly sandy CLAY with frequent pockets of light brownish grey sand (100x80mm) and occasional tabular pyrite nodules (35x25mm)	510	7.1	2.036	1.643	24	387	194	Plastic / brittle
BH01	U	35	23.00	Extremely closely fissured grey CLAY with occasional pockets of dark grey sand (20x10mm) and bioturbation	690	5.4	2.000	1.592	26	447	223	Brittle
BH01	U	44	29.00	Very closely fissured grey CLAY with occasional pockets of dark grey sand (80x60mm), light brownish grey sand (40x30mm) and bioturbation	870	4.4	1.993	1.627	23	741	371	Brittle

Date samples received: 25/05/2010
Date samples tested: 22/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880. Fax: 020 8811 2881

G:\0-Labs\Excel Templates\Output\028A-Triaxial Output

CONCEPT SITE INVESTIGATIONS	Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8	Date:	22/06/2010
		Job No.	10/2254

Site Location: Northern Line Extension **Client:** REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH02	U	28	9.50	Very closely fissured greyish brown CLAY with occasional black staining	290	5.3	1.971	1.555	27	284	142	Brittle
BH02	U	37	15.50	Extremely closely fissured grey CLAY with occasional pockets of light brownish grey sand (80x50mm), light grey sand (60x60mm) and rare bioturbation	470	19.7	2.000	1.593	26	302	151	Plastic / brittle
BH02	U	46	21.50	Extremely closely fissured grey CLAY with occasional bioturbation and rare fossilised wood fragments (10x5mm)	660	10.0	1.969	1.532	28	401	201	Plastic / brittle
BH02	U	52	25.50	Very closely fissured grey CLAY with occasional bioturbation and pockets of dark grey fine sand (60x30mm)	770	6.4	2.019	1.644	23	788	394	Brittle
BH02	U	69	35.70	Extremely closely fissured thickly laminated brown mottled bluish grey CLAY	1080	4.4	1.907	1.643	16	258	129	Brittle

Date - samples received: 25/05/2010
Date - samples tested: 22/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS	Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8	Date:	25/06/2010
		Job No.	10/2254

Site Location: Northern Line Extension **Client:** REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH03	U	32	11.00	Extremely closely fissured grey CLAY with occasional bioturbation and pockets of dark grey sand (10x20mm)	300	3.2	1.999	1.551	29	249	124	Brittle
BH03	U	41	17.00	Extremely closely fissured grey CLAY with occasional pockets of light grey sand (50x40mm) and dark grey sand (10x5mm) with rare bioturbation	510	11.1	2.040	1.649	24	403	201	Brittle
BH03	U	50	23.00	Extremely closely fissured thinly bedded grey CLAY with rare pockets of dark grey sand (70x50mm) and occasional bioturbation	690	4.9	1.996	1.571	27	477	239	Brittle
BH03	U	61	31.00	Extremely closely fissured grey CLAY with frequent bioturbation and occasional pyrite nodules (45x25x25mm), pyritised wood fragments (10x5mm) and pockets of light brownish grey sand (80x90mm)	930	4.5	2.060	1.696	21	450	225	Brittle (pyrite nodule >20% diameter (45x25x25mm)) found after test

Date - samples received: 25/05/2010
Date - samples tested: 25/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

Form Lab 028-A
Rev 2/10 15 January 2010
G://0-Labs/Excel Templates/Output/028A-Triaxial Output

CONCEPT SITE INVESTIGATIONS	Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8	Date:	14/06/2010
		Job No.	10/2254

Site Location: Northern Line Extension **Client:** REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH04	U	25	15.50	Extremely closely fissured grey CLAY with rare bioturbation and rare partings of silty sand with pyrite nodules (10x15mm)	480	3.0	1.995	1.581	26	354	177	Brittle
BH04	U	31	19.50	Extremely closely fissured grey CLAY with occasional bioturbation	600	4.1	2.005	1.569	28	560	280	Brittle
BH04	U	37	23.50	Grey slightly sandy CLAY with frequent pockets of light grey sand (50x60mm) rare pockets of dark grey fine sand (80x20mm) and occasional bioturbation	720	6.4	2.059	1.725	19	1138	569	Brittle
BH04	U	43	27.50	Very closely fissured grey CLAY with occasional bioturbation and pockets of light brownish grey sand (100x80mm)	840	3.2	2.054	1.658	24	737	369	Brittle
BH04	U	57	34.00	Very stiff, brown mottled bluish grey CLAY	1020	20.4	2.077	1.723	21	518	259	Plastic with some brittle deformation

Date - samples received: 25/05/2010
Date - samples tested: 14/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS | Undrained Triaxial Compression
BS 1377 : Part 7: 1990 Clause 8 | Date: 14/06/2010 | Job No. 10/2254
Site Location: Northern Line Extension Client: REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH05	U	22	10.00	Extremely closely fissured grey CLAY with occasional pockets of light brownish grey sand (80x80mm) and rare bioturbation	300	7.1	2.065	1.623	27	240	120	Plastic / Brittle. Tabular pyrite nodule (50x40) present at top of sample (not included in test sample)
BH05	U	28	14.00	Extremely closely fissured grey CLAY with occasional bioturbation	420	2.3	1.963	1.518	29	231	115	Brittle
BH05	U	34	18.00	Very closely fissured grey CLAY with occasional pockets of light grey sand (10x10) and dark grey sand (50x30mm)	540	7.2	2.005	1.618	24	631	315	Brittle
BH05	U	40	22.00	Grey slightly sandy CLAY with frequent bioturbation and occasional pockets of light grey sand (10x20mm)	660	7.1	2.082	1.732	20	758	379	Brittle with slight plastic deformation
BH05	U	48	25.50	Grey slightly sandy CLAY with occasional pockets of light grey sand (30x20mm) and frequent bioturbation	750	9.1	2.115	1.766	20	1035	517	Brittle with some plastic deformation
BH05	U	63	28.95	Thinly laminated grey CLAY with frequent shell fragments					21			Sample broke up on extrusion due to multiple laminations
BH05	U	73	32.00	Reddish brown mottled bluish grey friable CLAY	960	19.3	2.053	1.684	22	386	193	Plastic with brittle deformation

Date - samples received: 25/05/2010
Date - samples tested: 14/06/2010
Checked by: J. Fokt Lab Manager
CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

Form Lab 028-A
Rev 2/10 15 January 2010
G://0-Labs/Excel Templates/Output/028A-Triaxial Output

CONCEPT SITE INVESTIGATIONS	Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8	Date:	15/06/2010
		Job No.	10/2254

Site Location: Northern Line Extension **Client:** REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH06	U	17	10.00	Extremely closely fissured grey CLAY with occasional pyrite nodules (10x20mm) and rare bioturbation	300	4.8	1.956	1.518	29	229	115	Brittle
BH06	U	23	14.00	Extremely closely fissured grey CLAY with occasional bioturbation and pockets of light brownish grey sand (40x20mm)	420	4.3	1.989	1.589	25	473	236	Brittle
BH06	U	38	21.50	Extremely closely fissured grey CLAY with occasional bioturbation, pyrite nodules (20x10mm) and rare pyritised wood fragments	650	19.9	1.989	1.607	24	306	153	Plastic with brittle deformation
BH06	U	54	25.50	Extremely closely fissured grey CLAY with occasional pockets of light grey silty sand (30x30mm) and frequent shell fragments	780	6.8	2.010	1.609	25	264	132	Brittle
BH06	U	67	27.75	Reddish brown mottled bluish grey CLAY	840	18.8	2.083	1.705	22	482	241	Plastic with brittle deformation
BH06	U	85	31.70	Extremely closely fissured grey CLAY with a band of shell fragments at 31.80m and rare partings of light grey silty sand	960	4.7	2.092	1.719	22	682	341	Brittle
BH06	U	96	33.70	Bluish grey mottled red mottled yellowish brown CLAY	1020	3.9	2.085	1.755	19	461	231	Brittle with slight plastic deformation

Date - samples received: 26/05/2010
Date - samples tested: 15/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS	Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8	Date:	16/06/2010
		Job No.	10/2254

Site Location: Northern Line Extension **Client:** REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH07	U	32	8.00	Very closely fissured grey CLAY with occasional pockets of light brownish grey sand (40x20mm) and pockets of dark grey silty sand (5x30mm)	240	4.5	2.019	1.603	26	206	103	Brittle
BH07	U	38	12.00	Extremely closely fissured grey CLAY with rare pockets of light brownish grey sand (40x30mm)	360	7.8	1.969	1.535	28	191	96	Brittle
BH07	U	44	16.00	Extremely closely fissured grey CLAY with occasional bioturbation and rare pockets of dark grey silt (20x3mm)	480	17.7	1.955	1.503	30	272	136	Brittle
BH07	U	50	20.00	Grey CLAY with frequent pockets of dark grey fine sand (80x50mm) and occasional bioturbation	600	4.8	2.026	1.635	24	738	369	Brittle
BH07	U	66	24.00	Grey slightly sandy CLAY with frequent pockets of light grey sand (20x10mm) and occasional bioturbation	720	6.7	2.074	1.756	18	982	491	Brittle
BH07	U	76	26.50	Extremely closely fissured grey CLAY with occasional pockets of light brownish grey sand (100x80mm) rare pyrite nodules (10x3mm) and occasional bioturbation	810	3.7	2.015	1.637	23	526	263	Brittle
BH07	U	80	27.50	Very closely fissured grey CLAY with rare partings of light grey sand and occasional bioturbation	830	7.8	2.053	1.699	21	804	402	Brittle with some plastic deformation

Date - samples received: 26/05/2010
Date - samples tested: 16/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

Form Lab 028-A
Rev 2/10 15 January 2010
G://0-Labs/Excel Templates/Output/028A-Triaxial Output

CONCEPT SITE INVESTIGATIONS	Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8	Date:	25/06/2010
		Job No.	10/2254

Site Location: Northern Line Extension **Client:** REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH08	U	26	11.50	Extremely closely fissured grey CLAY with occasional bioturbation, rare pockets of cemented silt and pyrite nodules (20x10mm)	350	4.1	1.993	1.569	27	285	143	Brittle
BH08	U	46	18.50	Very closely fissured slightly sandy grey CLAY with frequent pockets of light grey sand (30x20mm) and rare bioturbation	560	4.5	2.014	1.652	22	882	441	Brittle
BH08	U	58	21.50	Very closely fissured grey CLAY with occasional pockets of light brownish grey sand (70x30mm), dark grey sand (30x20mm), rare bioturbation and pyritised wood fragments (10x3mm)	650	7.5	2.053	1.659	24	481	241	Brittle
BH08	U	72	25.00	Grey slightly sandy CLAY with occasional bioturbation, pockets of light brownish grey sand (60x20mm) and rare fossilised wood fragments (70x10mm)	750	6.5	2.060	1.703	21	1026	513	Brittle

Date - samples received: 25/05/2010
Date - samples tested: 25/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

CONCEPT SITE INVESTIGATIONS | Undrained Triaxial Compression BS 1377 : Part 7: 1990 Clause 8 | Date: 25/06/2010 | Job No. 10/2254

Site Location: Northern Line Extension Client: REO (Powerstation) Ltd

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH09	U	25	10.00	Extremely closely fissured grey CLAY with a tabular claystone fragment at 10.30m and rare bioturbation	300	6.0	1.980	1.547	28	250	125	Brittle
BH09	U	39	16.50	Very closely fissured grey CLAY with occasional bioturbation, rare pockets of dark grey sand (10x10mm) and pyrite nodules (25x10x10mm)	500	5.4	2.005	1.590	26	648	324	Brittle
BH09	U	59	21.50	Extremely closely fissured grey slightly sandy CLAY with frequent pockets of light grey sand (100x50mm), pyrite nodules (40x30x10mm) and rare pyritised wood fragments(20x10mm) and fossilised sharks tooth (10x5mm)	650	5.9	2.080	1.732	20	761	380	Brittle
BH09	U	65	23.00	Very closely fissured grey CLAY with occasional pockets of light brownish grey sand (50x30mm) and pyrite nodules (30x10mm) and light grey sand (20x30mm) with rare bioturbation and fossilised wood fragments	690	10.3	2.077	1.716	21	545	273	Plastic
BH09	U	75	25.50	Extremely closely fissured grey CLAY with frequent shell fragments at 25.60m	770	22.1	2.165	1.819	19	894	447	Plastic

Date - samples received: 25/05/2010
Date - samples tested: 25/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

Form Lab 028-A
Rev 2/10 15 January 2010
G://0-Labs/Excel Templates/Output/028A-Triaxial Output

CONCEPT SITE INVESTIGATIONS

Undrained Triaxial Compression
BS 1377 : Part 7: 1990 Clause 8

Client: REO (Powerstation) Ltd

Site Location: Northern Line Extension

Date: 28/06/2010
Job No. 10/2254

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
BH10	U	21	11.00	Extremely closely fissured grey CLAY with occasional fragments of orangish brown siltstone at 11.25m and rare pyrite nodules (20x10x10mm)	330	5.8	1.940	1.513	28	266	133	Brittle. Void present on side of sample (40x20mm)
BH10	U	27	15.00	Very closely fissured grey CLAY with occasional pockets of light grey sand (15x30mm) and bioturbation	450	5.3	1.996	1.597	25	558	279	Brittle
BH10	U	53	21.40	Extremely closely fissured thinly bedded grey CLAY with occasional pockets of light brownish grey sand (40x20mm)	630	5.1	1.996	1.616	23	454	227	Brittle

Date - samples received: 25/05/2010
Date - samples tested: 28/06/2010
Checked by: J. Fokt Lab Manager

CONCEPT
Unit 8 Warple Mews Warple Way London W3 0RF
Tel: 020 8811 2880 Fax: 020 8811 2881

Form Lab 028-A
Rev 2/10 15 January 2010

G:\10-Labs\Excel Templates\Output\028A-Triaxial Output

Client name & address:		**Samples Received**	07/06/2010
REO (Powerstation) Ltd		**Project Started**	08/06/2010
Project Name:	Northern Line Extension	**Testing Started**	23/06/2010
Project No:	10/2254 **Our Job / report no:** 9502a	**Date Reported:**	12/07/2010
Sample description:		**Sample no/ type:**	U
Very stiff fissured dark grey CLAY			

CONCEPT

BH no: BH01
Depth (m): 25.00

Test details

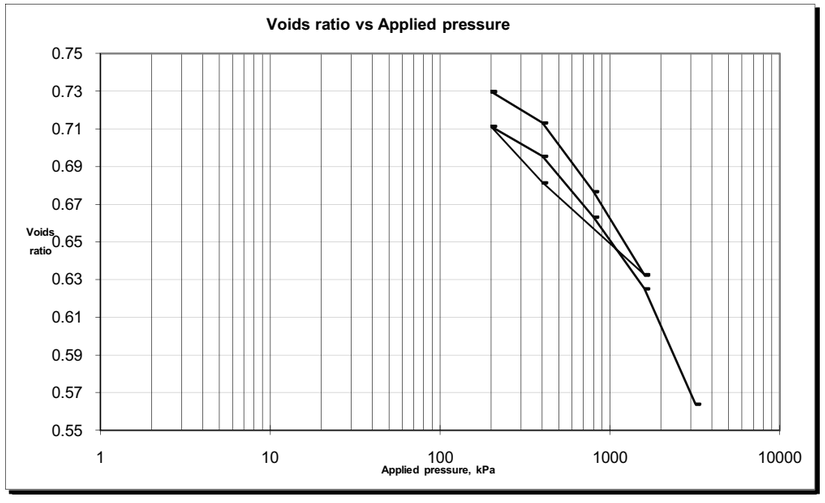
Depth within original sample m : 25.10 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	20	17.8
Diameter	mm :	75	-
Bulk density	Mg/m3 :	1.99	2.17
Moisture content	% :	27	24
Dry density	Mg/m3 :	1.57	1.76
Voids Ratio	:	0.75	0.56
Degree of saturation	% :	97.8	-
Particle density	Mg/m3 :	2.75	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.7297	6.95	0.068	11				
2	400	0.7132	3.48	0.048	12				
3	800	0.6767	0.37	0.053	13				
4	1600	0.6325	0.36	0.033	14				
5	400	0.6814	0.07	0.025	15				
6	200	0.7112	0.33	0.089	16				
7	400	0.6955	0.58	0.046	17				
8	800	0.6632	0.47	0.048	18				
9	1600	0.6251	0.31	0.029	19				
10	3200	0.5639	0.47	0.024	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by
Initials : kp
Date : 12/07/2010

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford WD18 9RU

Client name & address:			**Samples Received**	07/06/2010	**CONCEPT**
REO (Powerstation) Ltd			**Project Started**	06/08/2010	
Project Name:	Northern Line Extension		**Testing Started**	23/06/2010	
Project No:	10/2254	**Our Job / report no:** 9502a	**Date Reported:**	12/07/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH02
Stiff fissured dark grey CLAY					**Depth (m):** 17.50

Test details

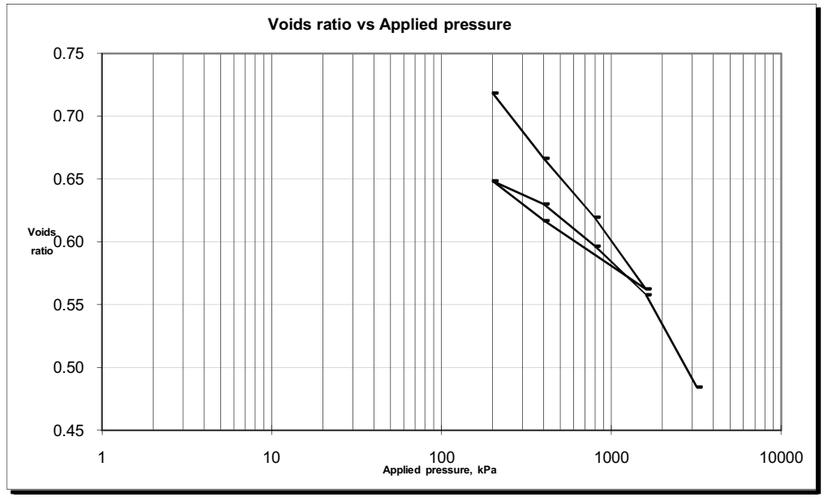
Depth within original sample m : 17.60 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	19	16.1
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.00	2.26
Moisture content	% :	28	23
Dry density	Mg/m3 :	1.56	1.84
Voids Ratio	:	0.75	0.48
Degree of saturation	% :	103.2	-
Particle density	Mg/m3 :	2.73	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.7184	7.41	0.097	11				
2	400	0.6664	0.37	0.151	12				
3	800	0.6195	0.47	0.070	13				
4	1600	0.5625	0.74	0.044	14				
5	400	0.6170	0.43	0.029	15				
6	200	0.6485	0.38	0.098	16				
7	400	0.6301	0.35	0.056	17				
8	800	0.5967	0.34	0.051	18				
9	1600	0.5579	0.82	0.030	19				
10	3200	0.4843	0.84	0.030	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 12/07/2010

Client name & address:			**Samples Received**	07/06/2010	**CONCEPT**
REO (Powerstation) Ltd			**Project Started**	08/06/2010	
Project Name:	Northern Line Extension		**Testing Started**	23/06/2010	
Project No:	10/2254	**Our Job / report no:** 9502a	**Date Reported:**	12/07/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH03
Stiff dark grey fissured CLAY					**Depth (m):** 25.00

Test details

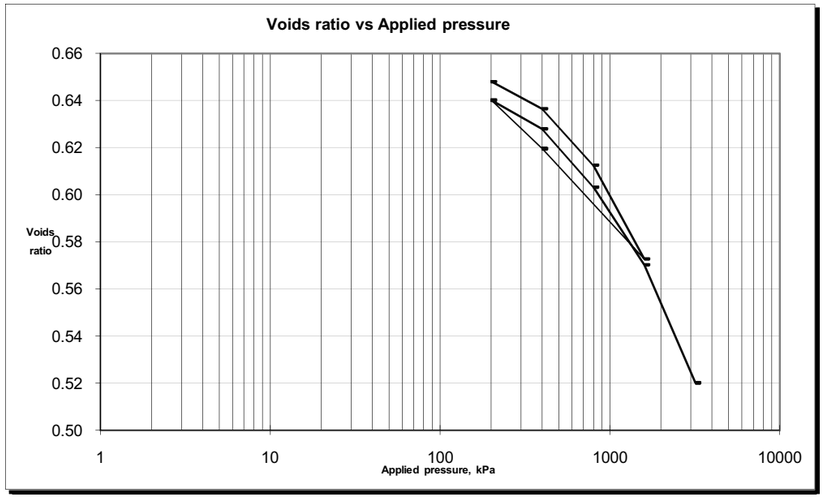
Depth within original sample m : 25.10 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	20	18.1
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.03	2.20
Moisture content	% :	26	23
Dry density	Mg/m3 :	1.61	1.78
Voids Ratio	:	0.68	0.52
Degree of saturation	% :	102.5	-
Particle density	Mg/m3 :	2.71	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.6481	9.91	0.091	11				
2	400	0.6365	2.53	0.035	12				
3	800	0.6125	0.51	0.037	13				
4	1600	0.5727	0.42	0.031	14				
5	400	0.6195	0.52	0.025	15				
6	200	0.6402	0.17	0.064	16				
7	400	0.6279	0.66	0.037	17				
8	800	0.6033	0.35	0.038	18				
9	1600	0.5702	0.27	0.026	19				
10	3200	0.5202	0.40	0.020	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 12/07/2010

Client name & address:			**Samples Received**	07/06/2010	CONCEPT
REO (Powerstation) Ltd			**Project Started**	08/06/2010	
Project Name:	NLE		**Testing Started**	09/06/2010	
Project No:	10/2254	**Our Job / report no:** 9502	**Date Reported:**	30/06/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH04
Dark grey fissured CLAY					**Depth (m):** 25.50

Test details

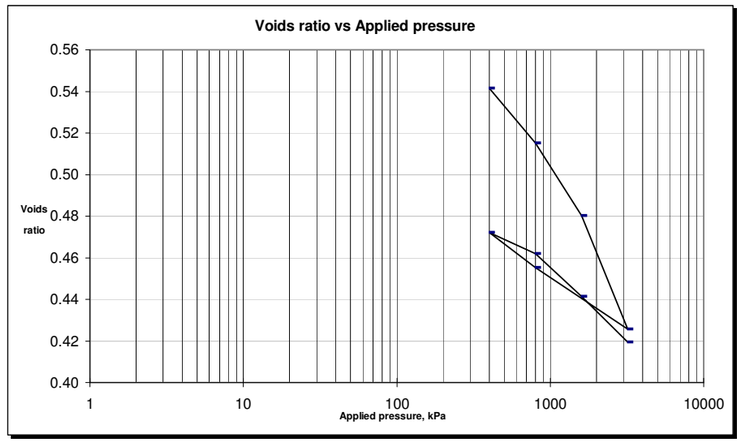
Depth within original sample m : 25.60 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	19	17.0
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.02	2.23
Moisture content	% :	20	18
Dry density	Mg/m3 :	1.69	1.89
Voids Ratio	:	0.59	0.42
Degree of saturation	% :	89.7	-
Particle density	Mg/m3 :	2.68	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	400	0.5415	17.27	0.077	11				
2	800	0.5151	1.83	0.043	12				
3	1600	0.4803	1.42	0.029	13				
4	3200	0.4257	1.34	0.023	14				
5	800	0.4553	1.09	0.009	15				
6	400	0.4721	0.47	0.029	16				
7	800	0.4620	1.36	0.017	17				
8	1600	0.4414	0.59	0.018	18				
9	3200	0.4195	1.30	0.010	19				
10					20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 30/06/2010

Client name & address:			**Samples Received**	07/06/2010	CONCEPT
REO (Powerstation) Ltd			**Project Started**	08/06/2010	
Project Name:	NLE		**Testing Started**	09/06/2010	
Project No:	10/2254	**Our Job / report no:** 9502	**Date Reported:**	30/06/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH05
Grey fissured CLAY					**Depth (m):** 18.00

Test details

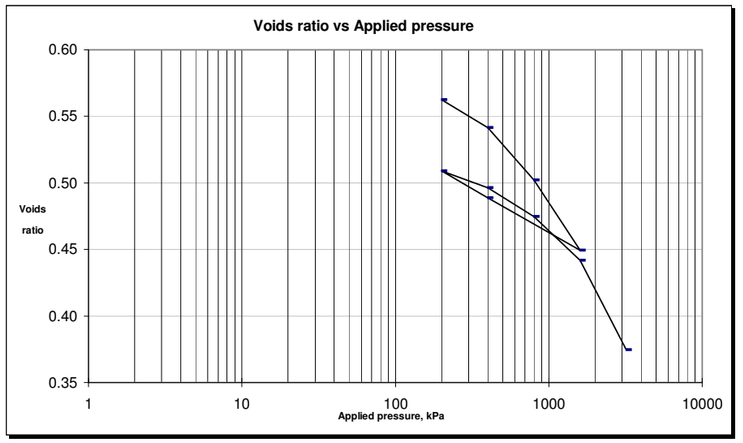
Depth within original sample m : 18.10 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	19	16.4
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.06	2.33
Moisture content	% :	23	20
Dry density	Mg/m3 :	1.67	1.94
Voids Ratio	:	0.60	0.37
Degree of saturation	% :	103.8	-
Particle density	Mg/m3 :	2.67	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.5625	9.80	0.107	11				
2	400	0.5414	0.90	0.067	12				
3	800	0.5019	0.86	0.064	13				
4	1600	0.4493	0.53	0.044	14				
5	400	0.4887	3.01	0.023	15				
6	200	0.5088	0.15	0.068	16				
7	400	0.4962	0.49	0.042	17				
8	800	0.4747	0.48	0.036	18				
9	1600	0.4419	0.52	0.028	19				
10	3200	0.3747	0.26	0.029	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 30/06/2010

Client name & address:			**Samples Received**	07/06/2010	CONCEPT
REO (Powerstation) Ltd			**Project Started**	08/06/2010	
Project Name:	NLE		**Testing Started**	09/06/2010	
Project No:	10/2254	**Our Job / report no:** 9502	**Date Reported:**	30/06/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH07
Grey heavily fissured CLAY					**Depth (m):** 10.00

Test details

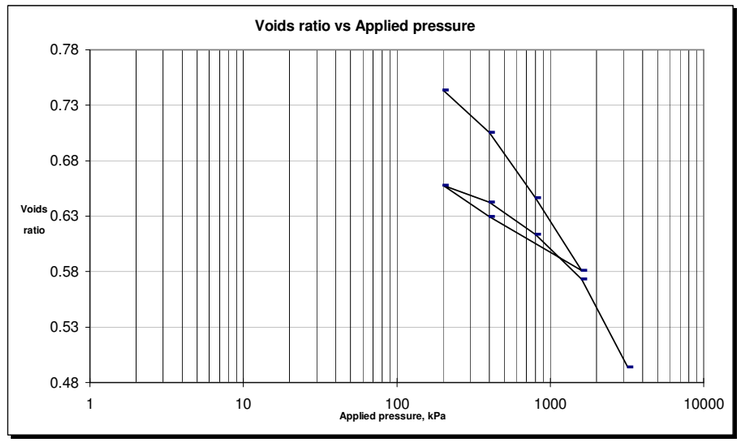
Depth within original sample m : 10.10 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	19	15.8
Diameter	mm :	75	-
Bulk density	Mg/m3 :	1.93	2.24
Moisture content	% :	27	23
Dry density	Mg/m3 :	1.52	1.83
Voids Ratio	:	0.79	0.49
Degree of saturation	% :	91.9	-
Particle density	Mg/m3 :	2.73	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.7436	17.31	0.141	11				
2	400	0.7053	1.48	0.110	12				
3	800	0.6466	0.71	0.086	13				
4	1600	0.5812	0.66	0.050	14				
5	400	0.6294	0.57	0.025	15				
6	200	0.6577	0.12	0.087	16				
7	400	0.6428	0.34	0.045	17				
8	800	0.6137	0.30	0.044	18				
9	1600	0.5731	0.44	0.031	19				
10	3200	0.4938	0.36	0.032	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 30/06/2010

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford WD18 9RU

Client name & address:			**Samples Received**	07/06/2010	CONCEPT
REO (Powerstation) Ltd			**Project Started**	08/06/2010	
Project Name:	NLE		**Testing Started**	09/06/2010	
Project No:	10/2254	**Our Job / report no:** 9502	**Date Reported:**	30/06/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH07
Grey fissured CLAY					**Depth (m):** 22.00

Test details

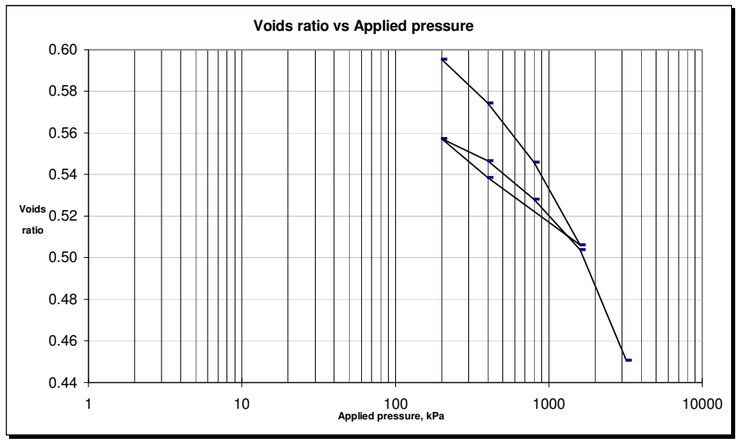
Depth within original sample m : 22.10 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	19	16.8
Diameter	mm :	75	-
Bulk density	Mg/m3 :	1.98	2.21
Moisture content	% :	20	19
Dry density	Mg/m3 :	1.64	1.86
Voids Ratio	:	0.64	0.45
Degree of saturation	% :	85.8	-
Particle density	Mg/m3 :	2.70	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.5953	17.28	0.149	11				
2	400	0.5744	5.96	0.066	12				
3	800	0.5458	1.17	0.045	13				
4	1600	0.5060	0.82	0.032	14				
5	400	0.5386	2.15	0.018	15				
6	200	0.5573	0.32	0.061	16				
7	400	0.5467	0.84	0.034	17				
8	800	0.5282	0.83	0.030	18				
9	1600	0.5038	0.61	0.020	19				
10	3200	0.4506	0.57	0.022	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 30/06/2010

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford WD18 9RU

Client name & address:				Samples Received	07/06/2010	CONCEPT	
REO (Powerstation) Ltd				Project Started	08/06/2010		
Project Name:	Northern Line Extension			Testing Started	23/06/2010		
Project No:	10/2254	Our Job / report no:	9502a	Date Reported:	12/07/2010		
Sample description:				Sample no/ type:	U	BH no:	BH08
Very stiff dark grey silty CLAY						Depth (m):	19.50

Test details

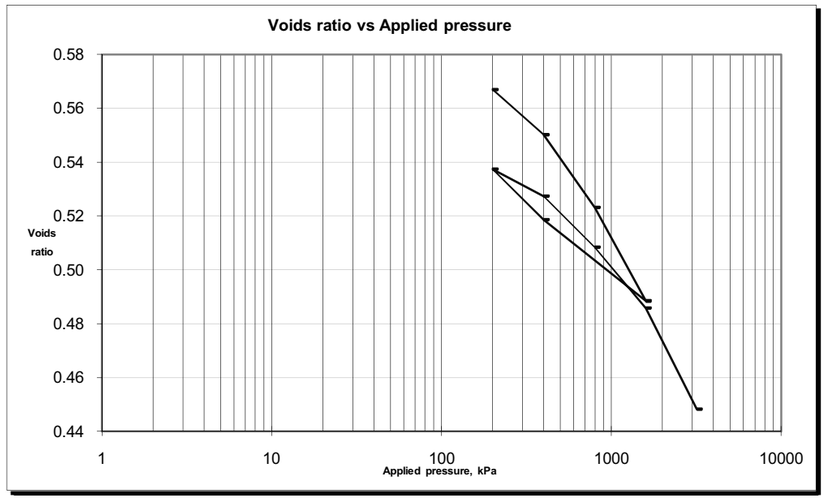
Depth within original sample m : 19.60 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	19	17.3
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.05	2.22
Moisture content	% :	21	20
Dry density	Mg/m3 :	1.69	1.86
Voids Ratio	:	0.59	0.45
Degree of saturation	% :	97.3	-
Particle density	Mg/m3 :	2.69	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.5669	12.32	0.080	11				
2	400	0.5501	2.40	0.053	12				
3	800	0.5231	1.84	0.044	13				
4	1600	0.4884	0.56	0.028	14				
5	400	0.5186	0.40	0.017	15				
6	200	0.5374	0.43	0.062	16				
7	400	0.5273	0.70	0.033	17				
8	800	0.5084	0.81	0.031	18				
9	1600	0.4858	0.79	0.019	19				
10	3200	0.4482	0.73	0.016	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 12/07/2010

Client name & address:				Samples Received	07/06/2010	CONCEPT	
REO (Powerstation) Ltd				Project Started	08/06/2010		
Project Name:	Northern Line Extension			Testing Started	23/06/2010		
Project No:	10/2254	Our Job / report no:	9502a	Date Reported:	12/07/2010		
Sample description:				Sample no/ type:	U	BH no:	BH09
Very stiff fissured dark grey CLAY						Depth (m):	20.50

Test details

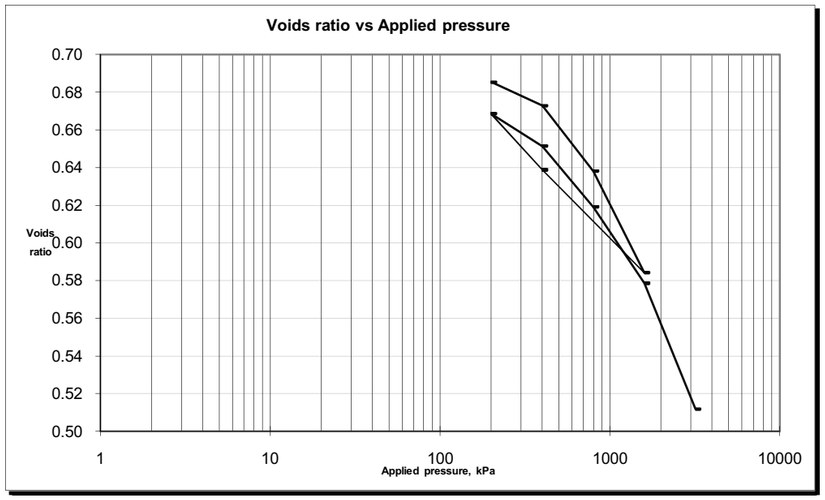
Depth within original sample m : 20.60 Orientation within original sample : Vertical

Specimen details

		Initial	Final
Height	mm :	20	0.0
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.00	
Moisture content	% :	26	22
Dry density	Mg/m3 :	1.59	
Voids Ratio	:	0.72	
Degree of saturation	% :	98.8	-
Particle density	Mg/m3 :	2.73	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.6854	43.53	0.099	11				
2	400	0.6728	3.65	0.037	12				
3	800	0.6381	1.86	0.052	13				
4	1600	0.5841	0.48	0.041	14				
5	400	0.6388	0.50	0.029	15				
6	200	0.6685	0.24	0.091	16				
7	400	0.6513	0.55	0.052	17				
8	800	0.6190	0.50	0.049	18				
9	1600	0.5786	0.35	0.031	19				
10	3200	0.5119	0.36	0.026	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 12/07/2010

Client name & address:			**Samples Received**	07/06/2010	
REO (Powerstation) Ltd			**Project Started**	08/06/2010	**CONCEPT**
Project Name:	Northern Line Extension		**Testing Started**	23/06/2010	
Project No:	10/2254 **Our Job / report no:**	9502a	**Date Reported:**	12/07/2010	
Sample description:			**Sample no/ type:**	U	**BH no:** BH10
Very stiff dark grey fissured CLAY					**Depth (m):** 19.40

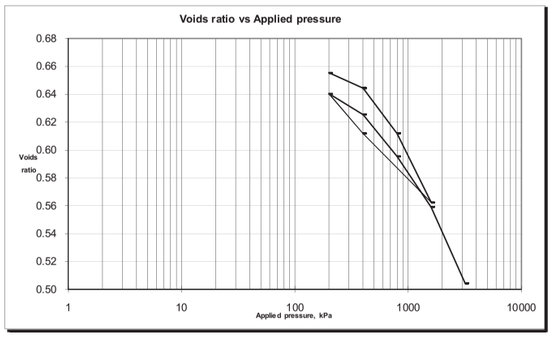
Test details

Depth within original sample m : 19.50 Orientation within original sample : Vertical

Specimen details		Initial	Final
Height	mm :	19	17.0
Diameter	mm :	75	-
Bulk density	Mg/m3 :	2.03	2.20
Moisture content	% :	25	21
Dry density	Mg/m3 :	1.63	1.82
Voids Ratio	:	0.68	0.50
Degree of saturation	% :	99.4	-
Particle density	Mg/m3 :	2.73	-
Swelling pressure	kPa :	0	-

Consolidation Stage

Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN	Stage number	Applied Pressure kPa	Voids Ratio	Coefficient of Consolidation m2/year	Coefficient of Compressibility m2/MN
1	200	0.6553	23.23	0.073	11				
2	400	0.6444	2.68	0.033	12				
3	800	0.6118	0.71	0.049	13				
4	1600	0.5625	0.41	0.038	14				
5	400	0.6118	0.22	0.026	15				
6	200	0.6403	0.44	0.088	16				
7	400	0.6254	0.48	0.045	17				
8	800	0.5954	0.65	0.046	18				
9	1600	0.5591	0.35	0.028	19				
10	3200	0.5043	0.58	0.022	20				



UKAS TESTING 2519

One-Dimensional Consolidation Test

BS 1377 : Part 5 : Clause 3 & 4 : 1990

Determination of the one-dimensional consolidation properties

Approved by

Initials : kp

Date : 12/07/2010

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford WD18 9RU

Sheet 2/2

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

All samples connected with this report ,incl any on 'hold' will be stored and disposed off according to Company policy.Acopy of this policy is available on request.

CONCEPT SITE INVESTIGATIONS

10. CHEMICAL TEST RESULTS

Our Ref: EFS/103962 (Ver. 1)
Your Ref: 10/2254

July 12, 2010

Scientifics
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

Ms J Fokt
Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

For the attention of Ms J Fokt

Dear Ms Fokt

SOIL Sample Analysis - Northern Line Extension

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 10/08/10 when they will be discarded. Please call 01283 554547 for an extension of this date.
Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Scientifics) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for Scientifics

J Colbourne
Project Co-ordinator
01283 554547

TEST REPORT
SOIL SAMPLE ANALYSIS

UKAS TESTING 1252

Report No. EFS/103962 (Ver. 1)

Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

Site: Northern Line Extension

The 2 samples described in this report were logged for analysis by Scientifics on 29-Jun-2010.
The analysis was completed by: 12-Jul-2010

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by Scientifics.

The following tables are contained in this report:

On behalf of Scientifics :
Andrew Timms Operations Manager

Date of Issue: 12-Jul-2010

Tests marked '^' have been subcontracted to another laboratory.

Scientifics accepts no responsibility for any sampling not carried out by our personnel.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Air Dried	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Air Dried	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.

Units :		mg/kg	mg/l	pH Units
Method Codes :		ICPACIDS	ICPWSS	PHSOIL
Method Reporting Limits :		20	10	
UKAS Accredited :		yes	yes	yes
Laboratory ID Number CL/	Client Sample Description	SO4-- (acid sol)	SO4-- (H2O sol) mg/l	pH units (AR)
1017888	BH9 19.95	689	324	8.7
1017887	BH10 20.9	1080	<10	8.7

scientifics
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name: Concept Consultants
Contact: Ms J Fokt

Northern Line Extension

Soils Sample Analysis

Date Printed	12-Jul-10
Report Number	EFS/103962
Table Number	1

Where individual results are flagged see report notes for status.

EFS/103962 Ver. 1

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NADIS Denotes No Asbestos Detected In Sample
NBFO Denotes No Bulk Fibres Observed

Symbol Reference

^ Sub-contracted analysis
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
* All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Our Ref: EFS/103924 (Ver. 1)
Your Ref: 10/2254

July 7, 2010

Scientifics
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

Ms J Fokt
Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

For the attention of Ms J Fokt

Dear Ms Fokt

SOIL Sample Analysis - Northern Line Extension

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 09/08/10 when they will be discarded. Please call 01283 554547 for an extension of this date.
Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Scientifics) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for Scientifics

J Colbourne
Project Co-ordinator
01283 554547

TEST REPORT
SOIL SAMPLE ANALYSIS

UKAS TESTING 1252

Report No. EFS/103924 (Ver. 1)

Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

Site: Northern Line Extension

The 10 samples described in this report were logged for analysis by Scientifics on 28-Jun-2010.
The analysis was completed by: 07-Jul-2010

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by Scientifics.

The following tables are contained in this report:

On behalf of
Scientifics :
Andrew Timms

Operations Manager

Date of Issue: 07-Jul-2010

Tests marked '^' have been subcontracted to another laboratory.

Scientifics accepts no responsibility for any sampling not carried out by our personnel.

scientifics
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name	Concept Consultants
Contact	Ms J Fokt

Northern Line Extension

Soils Sample Analysis

Date Printed	07-Jul-10
Report Number	EFS/103924
Table Number	1

		SO4-- (acid sol)	SO4-- (H2O sol) mg/l	pH units (AR)
	Units :	mg/kg	mg/l	pH Units
	Method Codes :	ICPACIDS	ICPWSS	PHSOIL
	Method Reporting Limits :	20	10	
	UKAS Accredited :	yes	yes	yes
Laboratory ID Number CL/	**Client Sample Description**			
1017660	BH01 15.5	1070	691	7.8
1017661	BH01 23.5	1590	1100	7.7
1017662	BH02 18.5-18.95	1200	908	8.0
1017663	BH02 22.5-22.95	1650	943	7.5
1017655	BH03 20.0-20.45	1210	629	7.6
1017656	BH03 26.0-26.45	3000	1950	7.4
1017657	BH08 10.5-10.95	847	431	8.1
1017658	BH08 20.5	2790	1570	7.1
1017664	BH09 8.0-8.45	1880	874	7.4
1017659	BH10 9.5	1140	618	7.8

Report Number: EFS/103924

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Air Dried	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Air Dried	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15°C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NADIS Denotes No Asbestos Detected In Sample
NBFO Denotes No Bulk Fibres Observed

Symbol Reference

^ Sub-contracted analysis
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
* All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Our Ref: EFS/103528 (Ver. 1)
Your Ref: 10/2254
June 24, 2010

scientifics
Scientifics
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

Ms J Fokt
Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

For the attention of Ms J Fokt

Dear Ms Fokt

SOIL Sample Analysis - Northern Line Extension

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 26/07/10 when they will be discarded. Please call 01283 554458 for an extension of this date.
Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Scientifics) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for Scientifics

D Simpson
Project Co-ordinator
01283 554458

TEST REPORT
SOIL SAMPLE ANALYSIS

UKAS TESTING 1252

Report No. EFS/103528 (Ver. 1)

Concept Consultants
Unit 8
Warple Mews
Warple Way
Acton
London
W3 ORF

Site: Northern Line Extension

The 7 samples described in this report were logged for analysis by Scientifics on 14-Jun-2010.
The analysis was completed by: 24-Jun-2010

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by Scientifics.

The following tables are contained in this report:

On behalf of
Scientifics :
Andrew Timms Operations Manager

Date of Issue: 24-Jun-2010

Tests marked '^' have been subcontracted to another laboratory.

Scientifics accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

scientifics
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: +44 (0) 1283 554400
Fax: +44 (0) 1283 554422

Client Name	Concept Consultants	Soils Sample Analysis	
Contact	Ms J Fokt	Date Printed	24-Jun-10
		Report Number	EFS/103528
		Table Number	1

Northern Line Extension

Laboratory ID Number CL/	Client Sample Description	SO4-- (acid sol)	SO4-- (H2O sol) mg/l	pH units (AR)
Units :		mg/kg	mg/l	pH Units
Method Codes :		ICPACIDS	ICPWSS	PHSOIL
Method Reporting Limits :		20	10	
UKAS Accredited :		yes	yes	yes
1015847	BH04 28.5-28.95	2280	1810	7.5
1015848	BH04 35.0-35.95	373	108	9.5
1015849	BH05 15.0-15.45	1940	1070	7.6
1015850	BH05 30.2-30.65	340	134	8.6
1015851	BH06 28.65	355	102	9.2
1015852	BH07 18.45	1870	973	6.5
1015853	BH07 23.45	2620	170	5.6

Where individual results are flagged see report notes for status.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NADIS Denotes No Asbestos Detected In Sample
NBFO Denotes No Bulk Fibres Observed

Symbol Reference

^ Sub-contracted analysis
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Where individual results are flagged see report notes for status.

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Attention: Jon Roberts

CERTIFICATE OF ANALYSIS

Date:	17 June 2010		
Customer:	H_CONSIT_LON-2		
Sample Delivery Group (SDG):	100611-48	**Report No.:**	87492
Your Reference:	10/2254		
Location:	NLE		

We received 5 samples on Friday June 11, 2010 and 2 of these samples were scheduled for analysis which was completed on Thursday June 17, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100611-48	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	320345
Location:	NLE	**Report No:**	87492

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1675784	BH02 1	0.10	17/05/2010
1675705	BH02 1	0.50	17/05/2010
1675730	BH02 1	1.00	17/05/2010
1675746	BH02 1	2.00	17/05/2010
1675768	BH02 1	3.00	17/05/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100611-48	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	320345
Location:	NLE	**Report No:**	87492

SOLID

Results Legend

X Test

N No Determination Possible

		Lab Sample No(s)	1675730	1675746	Total
		Customer Sample Ref.	BH02	BH02	
		Depth (m)	1.00	2.00	
		Container	1kg TUB	250g Amber Jar	60g VOC	1kg TUB	60g VOC	
% Stones Greater than 10mm	All		X		X		0 2
Asbestos Presence Screen	All	X			X		0 2
Cyanide Comp/Free/Total/Thiocyanate	All	X			X		0 2
Easily Liberated Sulphide	All	X			X		0 2
EPH by FID	All		X		X		0 2
GRO BTEX MTBE GC (S)	All			X		X	0 2
Metals by iCap-OES (Soil)	Arsenic		X		X		0 2
	Cadmium		X		X		0 2
	Chromium		X		X		0 2
	Copper		X		X		0 2
	Lead		X		X		0 2
	Mercury		X		X		0 2
	Nickel		X		X		0 2
	Selenium		X		X		0 2
	Zinc		X		X		0 2
PAH by GCMS	All		X		X		0 2
pH	All	X			X		0 2
Phenols by HPLC (S)	All	X			X		0 2
Sample description	All		X		X		0 2
Stone count >2.00mm on dry sample	All	X			X		0 2
Total Organic Carbon	All		X		X		0 2

Validated

ALcontrol Laboratories Analytical Services

SDG: 100611-48 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.: 320345
Location: NLE Report No: 87492

Sample Descriptions

Grain Sizes:
<0.063mm very fine,
0.063mm - 0.1mm fine,
0.1mm - 2mm medium,
2mm - 10mm coarse,
>10mm very coarse

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions
1675730	BH02	1.00	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	None
1675746	BH02	2.00	Light Brown	Silty Clay	0.063 - 0.1 mm	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100611-48	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	320345
Location:	NLE	**Report No:**	87492

Test Completion dates

SDG reference: 100611-48

Lab Sample No(s)	1675730	1675746
Customer Sample Ref.	BH02	BH02
Depth	1.00	2.00
Type	SOLID	SOLID
% Stones Greater than 10mm	14/06/2010	14/06/2010
Asbestos Containing Material	14/06/2010	14/06/2010
Cyanide	15/06/2010	15/06/2010
Easily Liberated Sulphide	15/06/2010	15/06/2010
EPH by FID	17/06/2010	17/06/2010
GRO BTEX MTBE GC (S)	15/06/2010	15/06/2010
Metals by iCap-OES (Soil)	16/06/2010	17/06/2010
Moisture	15/06/2010	15/06/2010
PAH by GCMS	15/06/2010	15/06/2010
pH	14/06/2010	14/06/2010
Phenols by HPLC (S)	15/06/2010	15/06/2010
Sample description	14/06/2010	14/06/2010
Stone count >2.00mm on dry	14/06/2010	15/06/2010
Total Organic Carbon	16/06/2010	16/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG:	100611-48	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	320345
Location:	NLE	**Report No:**	87492

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH02	BH02
			Depth (m)	1.00	2.00
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	17/05/2010	17/05/2010
			Date Received	11/06/2010	11/06/2010
			SDG Ref	100611-48	100611-48
			Lab Sample No.(s)	1675730	1675746
Stones > 2 mm	0.1 %	PM024		<0.1	44.1
Material Passing a 2mm Sieve	<0.1 %	PM024		100	55.9
Moisture content ratio, Natural	%	PM024		66	41
Asbestos Containing Material Screen	-	TM001		No ACM Detected	No ACM Detected
Stones > 10 mm	%	TM008		0	5.21
EPH Surrogate % recovery**	%	TM061		101	101
EPH Band >C28-C40	<35 mg/kg	TM061		105	39.9
EPH Band >C10-C28	<35 mg/kg	TM061		53.4	49.3
EPH Range >C10 - C40	<35 mg/kg	TM061		158 M	89.3 M
Phenols, Total monohydric	<0.22 mg/kg	TM062 (S)		<0.22 M	<0.22 M
Organic Carbon, Total	<0.2 %	TM132		1.72 #	0.646 #
Fraction Organic Carbon (FOC)	<0.002 -	TM132		0.0172 #	0.00646 #
Soil Organic Matter (SOM)	<0.35 %	TM132		2.97 #	1.11 #
pH	1 pH Units	TM133		7.42 M	7.46 M
Cyanide, Total	<1 mg/kg	TM153		<1 M	<1 M
Sulphide, Easily liberated	<15 mg/kg	TM180		29.9 #	<15 #
Arsenic	<0.6 mg/kg	TM181		14.2 M	7.01 M
Cadmium	<0.02 mg/kg	TM181		1.15 M	0.83 M
Chromium	<0.9 mg/kg	TM181		51.5 M	45.2 M
Copper	<1.4 mg/kg	TM181		14 M	15.2 M
Lead	<0.7 mg/kg	TM181		24.3 M	14.9 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		33 M	41.5 M
Selenium	<1 mg/kg	TM181		1.81 #	<1 #
Zinc	<1.9 mg/kg	TM181		73.4 M	90.9 M

Validated

ALcontrol Laboratories Analytical Services

SDG:	100611-48	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	320345
Location:	NLE	**Report No:**	87492

GRO BTEX MTBE GC (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH02	BH02
			Depth (m)	1.00	2.00
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	17/05/2010	17/05/2010
			Date Received	11/06/2010	11/06/2010
			SDG Ref	100611-48	100611-48
			Lab Sample No.(s)	1675730	1675746
GRO >C5-C12	<44 µg/kg	TM089		<44	<44
Benzene	<10 µg/kg	TM089		<10 M	<10 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10 M	<10 M
BTEX, Total	<10 µg/kg	TM089		<10 M	<10 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #
GRO >C5-C10	<10 µg/kg	TM089		<10	<10
GRO >C10-C12	<10 µg/kg	TM089		<10	<10

Validated

ALcontrol Laboratories Analytical Services

SDG: 100611-48 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.: 320345
Location: NLE Report No: 87492

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH02	BH02
			Depth (m)	1.00	2.00
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	17/05/2010	17/05/2010
			Date Received	11/06/2010	11/06/2010
			SDG Ref	100611-48	100611-48
			Lab Sample No.(s)	1675730	1675746
Naphthalene-d8 % recovery**	%	TM218		93.6	99.4
Acenaphthene-d10 % recovery**	%	TM218		87.5	94
Phenanthrene-d10 % recovery**	%	TM218		82.5	90
Chrysene-d12 % recovery**	%	TM218		70.2	84.1
Perylene-d12 % recovery**	%	TM218		70.6	80.7
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M
Fluoranthene	<17 µg/kg	TM218		<17 M	40.2 M
Pyrene	<15 µg/kg	TM218		<15 M	35.7 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	24.2 M
Chrysene	<10 µg/kg	TM218		<10 M	35 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	33 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	22.7 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M
Polyaromatic hydrocarbons, Total USEPA 16	<118 µg/kg	TM218		<118 M	191 M

Table of Results - Appendix

SDG Number : 100611-48 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM008	BS 1377:Part 1977	Particle size distribution of solid samples	Wet
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	Dry
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM132	In - house Method	ELTRA CS800 Operators Guide	Dry
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	Wet
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique	Wet
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Extractable Petroleum Hydrocarbons (EPH) By GC-FID
EPH (DRO) (C10-C40)

SDG Number	100611-48	**Client**	H_CONSIT_LON
Matrix (Units)	mg/kg	**Client Ref**	10/2254

Sample No	Customer Sample Ref.	Depth	Matrix	EPH	Interpretation
1688548	BH02	1.00	SOLID	158	Biodegraded Diesel/Humic Acids
1688256	BH02	2.00	SOLID	89.3	Humic Acids

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Last updated 1 April 2010

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Last updated 1 April 2010

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Last updated 1 April 2010

ALcontrol Laboratories

Heron Drive
Langley
Slough
SL3 8XP
Tel: +44 (0)1753 212500
Fax: +44 (0)1753 212501
E-Mail: langley@alcontrol.com
Website: www.alcontrol.com

Concept Site Investigations
Unit 8
Warple Mews
Warple Way
London
W3 0RF

Attention: Kasia Mazerant

CERTIFICATE OF ANALYSIS

Date:	03 June 2010		
Customer:	L_CONSIT_LON-18		
Sample Delivery Group (SDG):	100423-76	**Report No.:**	85868
Your Reference:	10/2254		
Location:	NORTHERN LINE EXTENSION		

We received 4 samples on Friday April 23, 2010 and 1 of these samples were scheduled for analysis which was completed on Thursday June 03, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100423-76	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Kasia Mazerant
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	85868

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1441770	BH07	0.00 - 0.20	20/04/2010
1441795	BH07	0.00 - 0.50	20/04/2010
1441822	BH07	0.00 - 1.00	20/04/2010
1441784	BH07	0.00 - 1.20	20/04/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100423-76	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Kasia Mazerant
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	85868

SOLID

Results Legend

X Test

N No Determination Possible

		Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Container	Total
		1441784	BH07	0.00 - 1.20	1kg TUB / 250g Amber Jar / 60g VOC	
% Stones Greater than 10mm	All			X		0 1
Asbestos Presence Screen	All	X				0 1
Cyanide Comp/Free/Total/Thiocyanate	All	X				0 1
Easily Liberated Sulphide	All	X				0 1
EPH by FID	All		X			0 1
GRO BTEX MTBE GC (S)	All				X	0 1
Metals by iCap-OES (Soil)	Arsenic		X			0 1
	Cadmium		X			0 1
	Chromium		X			0 1
	Copper		X			0 1
	Lead		X			0 1
	Mercury		X			0 1
	Nickel		X			0 1
	Selenium		X			0 1
	Zinc		X			0 1
PAH by GCMS	All		X			0 1
pH	All	X				0 1
Phenols by HPLC (S)	All	X				0 1
Sample description	All		X			0 1
Stone count >2.00mm on dry sample	All	X				0 1
Total Organic Carbon	All		X			0 1

Validated

ALcontrol Laboratories Analytical Services

SDG: 100423-76 Customer: Concept Site Investigations
Job: L_CONSIT_LON-18 Attention: Kasia Mazerant
Client Reference: 10/2254 Order No.:
Location: NORTHERN LINE EXTENSION Report No: 85868

Sample Descriptions

Grain Sizes:
<0.063mm very fine,
0.063mm - 0.1mm fine,
0.1mm - 2mm medium,
2mm - 10mm coarse,
>10mm very coarse

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions
1441784	BH07	0.00 - 1.20	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100423-76	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Kasia Mazerant
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	85868

Test Completion dates

SDG reference: 100423-76

Lab Sample No(s)	**1441784**
Customer Sample Ref.	**BH07**
Depth	**0.00 - 1.20**
Type	**SOLID**
% Stones Greater than 10mm	27/05/2010
Asbestos Presence Screen	27/05/2010
Cyanide	28/05/2010
Easily Liberated Sulphide	28/05/2010
EPH by FID	01/06/2010
GRO BTEX MTBE GC (S)	03/06/2010
Metals by iCap-OES (Soil)	01/06/2010
Moisture	28/05/2010
PAH by GCMS	28/05/2010
pH	28/05/2010
Phenols by HPLC (S)	01/06/2010
Sample description	27/05/2010
Stone count >2.00mm on dry	28/05/2010
Total Organic Carbon	01/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG:	100423-76	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	85868

Results Legend	
#	**ISO17025 accredited.**
M	**mCERTS accredited.**
aq	**Aqueous / settled sample.**
diss.filt	**Dissolved / filtered sample.**
tot.unfilt	**Total / unfiltered sample.**
*	**subcontracted test.**
**	**% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.**

Customer Sample Ref.	BH07
Depth (m)	0.00 - 1.20
Sample Type	Soil/Solid
Date Sampled	20/04/2010
Date Received	23/04/2010
SDG Ref	100423-76
Lab Sample No.(s)	1441784

Component	**LOD/Units**	**Method**	
Stones > 2 mm	0.1 %	PM024	100
Material Passing a 2mm Sieve	<0.1 %	PM024	<0.1
Moisture content ratio, Natural	%	PM024	17
Asbestos, Presence screen	-	TM001	No ACM Detected
Stones > 10 mm	%	TM008	4.55
EPH Surrogate % recovery**	%	TM061	105
EPH Band >C28-C40	<35 mg/kg	TM061	45.5
EPH Band >C10-C28	<35 mg/kg	TM061	73.2
EPH Range >C10 - C40	<35 mg/kg	TM061	119 **M**
Phenols, Total monohydric	<0.22 mg/kg	TM062 (S)	<0.22 **M**
Organic Carbon, Total	<0.2 %	TM132	1.28 **#**
Fraction Organic Carbon (FOC)	<0.002 -	TM132	0.0128 **#**
Soil Organic Matter (SOM)	<0.35 %	TM132	2.21 **#**
pH	1 pH Units	TM133	7.28 **M**
Cyanide, Total	<1 mg/kg	TM153	<1 **M**
Sulphide, Easily liberated	<15 mg/kg	TM180	<15 **#**
Arsenic	<0.6 mg/kg	TM181	12.3 **M**
Cadmium	<0.02 mg/kg	TM181	0.155 **M**
Chromium	<0.9 mg/kg	TM181	24.2 **M**
Copper	<1.4 mg/kg	TM181	20.4 **M**
Lead	<0.7 mg/kg	TM181	77.6 **M**
Mercury	<0.14 mg/kg	TM181	0.17 **M**
Nickel	<0.2 mg/kg	TM181	20.1 **M**
Selenium	<1 mg/kg	TM181	<1 **#**
Zinc	<1.9 mg/kg	TM181	56.4 **M**

Validated

ALcontrol Laboratories Analytical Services

SDG:	100423-76	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	85868

GRO BTEX MTBE GC (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH07
			Depth (m)	0.00 - 1.20
			Sample Type	Soil/Solid
			Date Sampled	20/04/2010
			Date Received	23/04/2010
			SDG Ref	100423-76
			Lab Sample No.(s)	1441784
GRO >C5-C12	<44 µg/kg	TM089		<44
Benzene	<10 µg/kg	TM089		<10 M
Ethylbenzene	<3 µg/kg	TM089		<3 M
Toluene	<2 µg/kg	TM089		<2 M
m,p-Xylene	<6 µg/kg	TM089		<6 M
o-Xylene	<3 µg/kg	TM089		<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10 M
BTEX, Total	<10 µg/kg	TM089		<10 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #
GRO >C5-C10	<10 µg/kg	TM089		<10
GRO >C10-C12	<10 µg/kg	TM089		<10

Validated

ALcontrol Laboratories Analytical Services

SDG: 100423-76 Customer: Concept Site Investigations
Job: L_CONSIT_LON-18 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NORTHERN LINE EXTENSION Report No: 85868

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH07
			Depth (m)	0.00 - 1.20
			Sample Type	Soil/Solid
			Date Sampled	20/04/2010
			Date Received	23/04/2010
			SDG Ref	100423-76
			Lab Sample No.(s)	1441784
Naphthalene-d8 % recovery**	%	TM218		98.9
Acenaphthene-d10 % recovery**	%	TM218		98.4
Phenanthrene-d10 % recovery**	%	TM218		96.4
Chrysene-d12 % recovery**	%	TM218		93.1
Perylene-d12 % recovery**	%	TM218		96
Naphthalene	<9 µg/kg	TM218		18.1 M
Acenaphthylene	<12 µg/kg	TM218		<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M
Fluorene	<10 µg/kg	TM218		12.3 M
Phenanthrene	<15 µg/kg	TM218		115 M
Anthracene	<16 µg/kg	TM218		24.6 M
Fluoranthene	<17 µg/kg	TM218		141 M
Pyrene	<15 µg/kg	TM218		113 M
Benz(a)anthracene	<14 µg/kg	TM218		82.8 M
Chrysene	<10 µg/kg	TM218		66.8 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		89.1 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		42.3 M
Benzo(a)pyrene	<15 µg/kg	TM218		65 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		37.2 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		52.6 M
Polyaromatic hydrocarbons, Total USEPA 16	<118 µg/kg	TM218		<118 M

Table of Results - Appendix

SDG Number : 100423-76 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample ¹
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM008	BS 1377:Part 1977	Particle size distribution of solid samples	Wet
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	Dry
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM132	In - house Method	ELTRA CS800 Operators Guide	Dry
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	Wet
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique	Wet
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Extractable Petroleum Hydrocarbons (EPH) By GC-FID
EPH (DRO) (C10-C40)

SDG Number	100423-76	**Client**	L_CONSIT_LON
Matrix (Units)	mg/kg	**Client Ref**	10/2254

Sample No	Customer Sample Ref.	Depth	Matrix	EPH	Interpretation
1615239	BH07	0.00 - 1.20	SOLID	119	PAHS/Humic Acids

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Last updated 1 April 2010

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Last updated 1 April 2010

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Last updated 1 April 2010

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Attention: Jon Roberts

CERTIFICATE OF ANALYSIS

Date:	18 June 2010		
Customer:	H_CONSIT_LON-2		
Sample Delivery Group (SDG):	100430-91	**Report No.:**	87489
Your Reference:	10/2254		
Location:	NLE		

We received 4 samples on Friday April 30, 2010 and 1 of these samples were scheduled for analysis which was completed on Thursday June 17, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100430-91	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87489

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1481390	BH09	0.30 - 0.30	26/04/2010
1481430	BH09	0.50 - 0.50	26/04/2010
1481462	BH09	1.20 - 1.20	26/04/2010
1481491	BH09	1.50 - 1.50	26/04/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100430-91	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87489

SOLID

Results Legend

X Test

N No Determination Possible

		Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Container	Total
		1481491	BH09	1.50 - 1.50	1kg Tub / 250g Amber Jar / 60g VOC	
% Stones Greater than 10mm	All				X	0 1
Asbestos Presence Screen	All	X				0 1
Cyanide Comp/Free/Total/Thiocyanate	All	X				0 1
Easily Liberated Sulphide	All	X				0 1
EPH by FID	All			X		0 1
GRO BTEX MTBE GC (S)	All				X	0 1
Metals by iCap-OES (Soil)	Arsenic			X		0 1
	Cadmium			X		0 1
	Chromium			X		0 1
	Copper			X		0 1
	Lead			X		0 1
	Mercury			X		0 1
	Nickel			X		0 1
	Selenium			X		0 1
	Zinc			X		0 1
PAH by GCMS	All			X		0 1
pH	All	X				0 1
Phenols by HPLC (S)	All	X				0 1
Sample description	All			X		0 1
Stone count >2.00mm on dry sample	All	X				0 1
Total Organic Carbon	All			X		0 1

Validated

ALcontrol Laboratories Analytical Services

SDG: 100430-91 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NLE Report No: 87489

Sample Descriptions

Grain Sizes:
<0.063mm very fine,
0.063mm - 0.1mm fine,
0.1mm - 2mm medium,
2mm - 10mm coarse,
>10mm very coarse

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions
1481491	BH09	1.50 - 1.50	Light Brown	Sandy Clay Loam	0.1 - 2 mm	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100430-91	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87489

Test Completion dates

SDG reference: 100430-91

Lab Sample No(s)	1481491
Customer Sample Ref.	BH09
Depth	1.50 - 1.50
Type	SOLID
% Stones Greater than 10mm	14/06/2010
Asbestos Containing Material Screen	14/06/2010
Cyanide Comp/Free/Total/Thiocyanate	15/06/2010
Easily Liberated Sulphide	15/06/2010
EPH by FID	17/06/2010
GRO BTEX MTBE GC (S)	16/06/2010
Metals by iCap-OES (Soil)	16/06/2010
Moisture	15/06/2010
PAH by GCMS	15/06/2010
pH	15/06/2010
Phenols by HPLC (S)	16/06/2010
Sample description	14/06/2010
Stone count >2.00mm on dry sample	15/06/2010
Total Organic Carbon	16/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG	100430-91	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87489

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Customer Sample Ref.	BH09
Depth (m)	1.50 - 1.50
Sample Type	Soil/Solid
Date Sampled	26/04/2010
Date Received	30/04/2010
SDG Ref	100430-91
Lab Sample No.(s)	1481491

Component	LOD/Units	Method	
Stones > 2 mm	0.1 %	PM024	67.6
Material Passing a 2mm Sieve	<0.1 %	PM024	32.4
Moisture content ratio, Natural	%	PM024	10
Asbestos Containing Material Screen	-	TM001	No ACM Detected
Stones > 10 mm	%	TM008	28
EPH Surrogate % recovery**	%	TM061	103
EPH Band >C28-C40	<35 mg/kg	TM061	<35
EPH Band >C10-C28	<35 mg/kg	TM061	78.2
EPH Range >C10 - C40	<35 mg/kg	TM061	104 M
Phenols, Total monohydric	<0.22 mg/kg	TM062 (S)	<0.22 M
Organic Carbon, Total	<0.2 %	TM132	0.353 #
Fraction Organic Carbon (FOC)	<0.002 -	TM132	0.00353 #
Soil Organic Matter (SOM)	<0.35 %	TM132	0.609 #
pH	1 pH Units	TM133	8.52 M
Cyanide, Total	<1 mg/kg	TM153	<1 M
Sulphide, Easily liberated	<15 mg/kg	TM180	<15 #
Arsenic	<0.6 mg/kg	TM181	18 M
Cadmium	<0.02 mg/kg	TM181	0.485 M
Chromium	<0.9 mg/kg	TM181	19.3 M
Copper	<1.4 mg/kg	TM181	12 M
Lead	<0.7 mg/kg	TM181	44.9 M
Mercury	<0.14 mg/kg	TM181	<0.14 M
Nickel	<0.2 mg/kg	TM181	15.2 M
Selenium	<1 mg/kg	TM181	<1 #
Zinc	<1.9 mg/kg	TM181	30.1 M

Validated

ALcontrol Laboratories Analytical Services

SDG	100430-91	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87489

GRO BTEX MTBE GC (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH09
			Depth (m)	1.50 - 1.50
			Sample Type	Soil/Solid
			Date Sampled	26/04/2010
			Date Received	30/04/2010
			SDG Ref	100430-91
			Lab Sample No.(s)	1481491
GRO >C5-C12	<44 µg/kg	TM089		<44
Benzene	<10 µg/kg	TM089		<10 M
Ethylbenzene	<3 µg/kg	TM089		<3 M
Toluene	<2 µg/kg	TM089		<2 M
m,p-Xylene	<6 µg/kg	TM089		<6 M
o-Xylene	<3 µg/kg	TM089		<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10 M
BTEX, Total	<10 µg/kg	TM089		<10 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #
GRO >C5-C10	<10 µg/kg	TM089		<10
GRO >C10-C12	<10 µg/kg	TM089		<10

Validated

ALcontrol Laboratories Analytical Services

SDG 100430-91 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NLE Report No: 87489

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH09
			Depth (m)	1.50 - 1.50
			Sample Type	Soil/Solid
			Date Sampled	26/04/2010
			Date Received	30/04/2010
			SDG Ref	100430-91
			Lab Sample No.(s)	1481491
Naphthalene-d8 % recovery**	%	TM218		98.7
Acenaphthene-d10 % recovery**	%	TM218		93.4
Phenanthrene-d10 % recovery**	%	TM218		90.3
Chrysene-d12 % recovery**	%	TM218		84.4
Perylene-d12 % recovery**	%	TM218		80.5
Naphthalene	<9 µg/kg	TM218		17.9 M
Acenaphthylene	<12 µg/kg	TM218		<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M
Fluorene	<10 µg/kg	TM218		<10 M
Phenanthrene	<15 µg/kg	TM218		125 M
Anthracene	<16 µg/kg	TM218		23.3 M
Fluoranthene	<17 µg/kg	TM218		147 M
Pyrene	<15 µg/kg	TM218		119 M
Benz(a)anthracene	<14 µg/kg	TM218		56.6 M
Chrysene	<10 µg/kg	TM218		53.3 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		78.2 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		32.9 M
Benzo(a)pyrene	<15 µg/kg	TM218		51.3 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		34 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		44.6 M
Polyaromatic hydrocarbons, Total USEPA 16	<118 µg/kg	TM218		783 M

Table of Results - Appendix

SDG Number : 100430-91 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample ¹
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM008	BS 1377:Part 1977	Particle size distribution of solid samples	Wet
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	Dry
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM132	In - house Method	ELTRA CS800 Operators Guide	Dry
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	Wet
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique	Wet
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Extractable Petroleum Hydrocarbons (EPH) By GC-FID
EPH (DRO) (C10-C40)

SDG Number	100430-91	**Client**	L_CONSIT_LON
Matrix (Units)	mg/kg	**Client Ref**	10/2254

Sample No	Customer Sample Ref.	Depth	Matrix	EPH	Interpretation
1688617	BH09	1.50 - 1.50	SOLID	104	Kerosene Type Residues/PAHS

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Last updated 1 April 2010

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Last updated 1 April 2010

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Last updated 1 April 2010

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Attention: Jon Roberts

CERTIFICATE OF ANALYSIS

Date:	15 June 2010		
Customer:	H_CONSIT_LON-2		
Sample Delivery Group (SDG):	100507-123	**Report No.:**	87144
Your Reference:	10/2254		
Location:	NLE		

We received 3 samples on Friday May 07, 2010 and 1 of these samples were scheduled for analysis which was completed on Tuesday June 15, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100507-123	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87144

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1511935	BH08	0.25 - 0.25	04/05/2010
1511953	BH08	0.50 - 0.50	04/05/2010
1511967	BH08	1.00 - 1.00	04/05/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100507-123	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87144

SOLID

Results Legend

X Test

N No Determination Possible

		Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Container			Total
		1511967	BH08	1.00 - 1.00	1kg TUB	250g Amber Jar	60g VOC	
% Stones Greater than 10mm	All					X		0 1
Asbestos Presence Screen	All				X			0 1
Cyanide Comp/Free/Total/Thiocyanate	All				X			0 1
Easily Liberated Sulphide	All				X			0 1
EPH by FID	All					X		0 1
GRO BTEX MTBE GC (S)	All						X	0 1
Metals by iCap-OES (Soil)	Arsenic					X		0 1
	Cadmium					X		0 1
	Chromium					X		0 1
	Copper					X		0 1
	Lead					X		0 1
	Mercury					X		0 1
	Nickel					X		0 1
	Selenium					X		0 1
	Zinc					X		0 1
PAH by GCMS	All					X		0 1
pH	All				X			0 1
Phenols by HPLC (S)	All				X			0 1
Sample description	All					X		0 1
Stone count >2.00mm on dry sample	All				X			0 1
Total Organic Carbon	All					X		0 1

Validated

ALcontrol Laboratories Analytical Services

SDG: 100507-123 Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 Attention: Jon Roberts
Client Reference: 10/2254 Order No.:
Location: NLE Report No: 87144

Sample Descriptions

Grain Sizes:
<0.063mm very fine,
0.063mm - 0.1mm fine,
0.1mm - 2mm medium,
2mm - 10mm coarse,
>10mm very coarse

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions
1511967	BH08	1.00 - 1.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100507-123	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87144

Test Completion dates

SDG reference: 100507-123

Lab Sample No(s)	1511967
Customer Sample Ref.	BH08
Depth	1.00 - 1.00
Type	SOLID
% Stones Greater than 10mm	10/06/2010
Asbestos Containing Material	10/06/2010
Cyanide	11/06/2010
Easily Liberated Sulphide	11/06/2010
EPH by FID	15/06/2010
GRO BTEX MTBE GC (S)	14/06/2010
Metals by iCap-OES (Soil)	15/06/2010
Moisture	11/06/2010
PAH by GCMS	14/06/2010
pH	11/06/2010
Phenols by HPLC (S)	11/06/2010
Sample description	10/06/2010
Stone count >2.00mm on dry	11/06/2010
Total Organic Carbon	11/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG: 100507-123 | Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 | Attention: Jon Roberts
Client Reference: 10/2254 | Order No.:
Location: NLE | Report No: 87144

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref. BH08
			Depth (m) 1.00 - 1.00
			Sample Type Soil/Solid
			Date Sampled 04/05/2010
			Date Received 07/05/2010
			SDG Ref 100507-123
			Lab Sample No.(s) 1511967
Stones > 2 mm	0.1 %	PM024	46.7
Material Passing a 2mm Sieve	<0.1 %	PM024	53.3
Moisture content ratio, Natural	%	PM024	17
Asbestos Containing Material Screen	-	TM001	No ACM Detected
Stones > 10 mm	%	TM008	5.32
EPH Surrogate % recovery**	%	TM061	101
EPH Band >C28-C40	<35 mg/kg	TM061	96.1
EPH Band >C10-C28	<35 mg/kg	TM061	175
EPH Range >C10 - C40	<35 mg/kg	TM061	271 M
Phenols, Total monohydric	<0.22 mg/kg	TM062 (S)	<0.22 M
Organic Carbon, Total	<0.2 %	TM132	1.53 #
Fraction Organic Carbon (FOC)	<0.002 -	TM132	0.0153 #
Soil Organic Matter (SOM)	<0.35 %	TM132	2.64 #
pH	1 pH Units	TM133	7.65 M
Cyanide, Total	<1 mg/kg	TM153	<1 M
Sulphide, Easily liberated	<15 mg/kg	TM180	<15 #
Arsenic	<0.6 mg/kg	TM181	15.9 M
Cadmium	<0.02 mg/kg	TM181	0.277 M
Chromium	<0.9 mg/kg	TM181	19.3 M
Copper	<1.4 mg/kg	TM181	31.9 M
Lead	<0.7 mg/kg	TM181	169 M
Mercury	<0.14 mg/kg	TM181	0.206 M
Nickel	<0.2 mg/kg	TM181	16.1 M
Selenium	<1 mg/kg	TM181	<1 #
Zinc	<1.9 mg/kg	TM181	58 M

Validated

ALcontrol Laboratories Analytical Services

SDG:	100507-123	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87144

GRO BTEX MTBE GC (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Customer Sample Ref.	BH08
Depth (m)	1.00 - 1.00
Sample Type	Soil/Solid
Date Sampled	04/05/2010
Date Received	07/05/2010
SDG Ref	100507-123
Lab Sample No.(s)	1511967

Component	LOD/Units	Method	
GRO >C5-C12	<44 µg/kg	TM089	<44
Benzene	<10 µg/kg	TM089	<10 M
Ethylbenzene	<3 µg/kg	TM089	<3 M
Toluene	<2 µg/kg	TM089	<2 M
m,p-Xylene	<6 µg/kg	TM089	<6 M
o-Xylene	<3 µg/kg	TM089	<3 M
m,p,o-Xylene	<10 µg/kg	TM089	<10 M
BTEX, Total	<10 µg/kg	TM089	<10 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 #
GRO >C5-C10	<10 µg/kg	TM089	<10
GRO >C10-C12	<10 µg/kg	TM089	<10

Validated

ALcontrol Laboratories Analytical Services

SDG:	100507-123	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87144

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Customer Sample Ref.	BH08
Depth (m)	1.00 - 1.00
Sample Type	Soil/Solid
Date Sampled	04/05/2010
Date Received	07/05/2010
SDG Ref	100507-123
Lab Sample No.(s)	1511967

Component	LOD/Units	Method	
Naphthalene-d8 % recovery**	%	TM218	98.5
Acenaphthene-d10 % recovery**	%	TM218	97.3
Phenanthrene-d10 % recovery**	%	TM218	94.9
Chrysene-d12 % recovery**	%	TM218	103
Perylene-d12 % recovery**	%	TM218	109
Naphthalene	<9 µg/kg	TM218	18.2 M
Acenaphthylene	<12 µg/kg	TM218	14.8 M
Acenaphthene	<8 µg/kg	TM218	20.9 M
Fluorene	<10 µg/kg	TM218	25.6 M
Phenanthrene	<15 µg/kg	TM218	218 M
Anthracene	<16 µg/kg	TM218	50.8 M
Fluoranthene	<17 µg/kg	TM218	243 M
Pyrene	<15 µg/kg	TM218	198 M
Benz(a)anthracene	<14 µg/kg	TM218	126 M
Chrysene	<10 µg/kg	TM218	111 M
Benzo(b)fluoranthene	<15 µg/kg	TM218	172 M
Benzo(k)fluoranthene	<14 µg/kg	TM218	72.8 M
Benzo(a)pyrene	<15 µg/kg	TM218	144 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	82.5 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	33.3 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218	99.5 M
Polyaromatic hydrocarbons, Total USEPA 16	<118 µg/kg	TM218	1630 M

Table of Results - Appendix

SDG Number : 100507-123 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample ¹
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM008	BS 1377:Part 1977	Particle size distribution of solid samples	Wet
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	Dry
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM132	In - house Method	ELTRA CS800 Operators Guide	Dry
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	Wet
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique	Wet
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Extractable Petroleum Hydrocarbons (EPH) By GC-FID
EPH (DRO) (C10-C40)

SDG Number	100507-123	**Client**	ANO
Matrix (Units)	mg/kg	**Client Ref**	10/2254

Sample No	Customer Sample Ref.	Depth	Matrix	EPH	Interpretation
1675758	BH08	1.00 - 1.00	SOLID	271	PAHS

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Last updated 1 April 2010

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Last updated 1 April 2010

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Last updated 1 April 2010

ALcontrol Laboratories

Heron Drive
Langley
Slough
SL3 8XP
Tel: +44 (0)1753 212500
Fax: +44 (0)1753 212501
E-Mail: langley@alcontrol.com
Website: www.alcontrol.com

Concept Site Investigations
Unit 8
Warple Mews
Warple Way
London
W3 0RF

Attention: Kasia Mazerant

CERTIFICATE OF ANALYSIS

Date:	15 June 2010		
Customer:	L_CONSIT_LON-18		
Sample Delivery Group (SDG):	100514-66	**Report No.:**	87240
Your Reference:	10/2254		
Location:	NORTHERN LINE EXTENSION		

We received 8 samples on Friday May 14, 2010 and 4 of these samples were scheduled for analysis which was completed on Tuesday June 15, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100514-66	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Kasia Mazerant
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	87240

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1545074	BH05	0.25	06/05/2010
1545039	BH05	0.50	06/05/2010
1545011	BH05	1.00	06/05/2010
1544953	BH05	2.00	06/05/2010
1544858	BH10	0.25	11/05/2010
1544996	BH10	0.50	11/05/2010
1544787	BH10	1.00	11/05/2010
1544817	BH10	2.00	11/05/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100514-66	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Kasia Mazerant
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	87240

SOLID

Results Legend

X Test

N No Determination Possible

		Lab Sample No(s)	1544787	1544817	1544953	1545011	Total
		Customer Sample Ref.	BH10	BH10	BH05	BH05	
		Depth (m)	1.00	2.00	2.00	1.00	
		Container	1kg TUB	250g Amber Jar	60g VOC	1kg TUB	250g Amber Jar	60g VOC	1kg TUB	250g Amber Jar	60g VOC	1kg TUB	250g Amber Jar	60g VOC	
% Stones Greater than 10mm	All			X			X			X			X		0 4
Asbestos Presence Screen	All	X			X			X			X				0 4
Cyanide Comp/Free/Total/Thiocyanate	All	X			X			X			X				0 4
Easily Liberated Sulphide	All	X			X			X			X				0 4
EPH by FID	All		X			X			X			X			0 4
GRO BTEX MTBE GC (S)	All			X			X			X				X	0 4
Metals by iCap-OES (Soil)	Arsenic		X			X			X			X			0 4
	Cadmium		X			X			X			X			0 4
	Chromium		X			X			X			X			0 4
	Copper		X			X			X			X			0 4
	Lead		X			X			X			X			0 4
	Mercury		X			X			X			X			0 4
	Nickel		X			X			X			X			0 4
	Selenium		X			X			X			X			0 4
	Zinc		X			X			X			X			0 4
PAH by GCMS	All		X			X			X			X			0 4
pH	All	X			X			X			X				0 4
Phenols by HPLC (S)	All	X			X			X			X				0 4
Sample description	All		X			X			X			X			0 4
Stone count >2.00mm on dry sample	All	X			X			X			X				0 4
Total Organic Carbon	All		X			X			X			X			0 4

Validated

ALcontrol Laboratories Analytical Services

SDG: 100514-66 Customer: Concept Site Investigations
Job: L_CONSIT_LON-18 Attention: Kasia Mazerant
Client Reference: 10/2254 Order No.:
Location: NORTHERN LINE EXTENSION Report No: 87240

Sample Descriptions

Grain Sizes:
<0.063mm very fine,
0.063mm - 0.1mm fine,
0.1mm - 2mm medium,
2mm - 10mm coarse,
>10mm very coarse

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions
1544787	BH10	1.00	Dark Brown	Loamy Sand	0.1 - 2 mm	Vegetation
1544817	BH10	2.00	Light Brown	Clay Loam	0.063 - 0.1 mm	Vegetation
1544953	BH05	2.00	Beige	Loamy Sand	0.1 - 2 mm	Stones
1545011	BH05	1.00	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100514-66	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Kasia Mazerant
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	87240

Test Completion dates

SDG reference: 100514-66

Lab Sample No(s)	1544787	1544817	1544953	1545011
Customer Sample Ref.	BH10	BH10	BH05	BH05
Depth	1.00	2.00	2.00	1.00
Type	SOLID	SOLID	SOLID	SOLID
% Stones Greater than 10mm	10/06/2010	10/06/2010	27/05/2010	27/05/2010
Asbestos Containing Material	10/06/2010	10/06/2010	27/05/2010	27/05/2010
Cyanide	11/06/2010	11/06/2010	28/05/2010	28/05/2010
Easily Liberated Sulphide	11/06/2010	11/06/2010	28/05/2010	28/05/2010
EPH by FID	15/06/2010	15/06/2010	01/06/2010	01/06/2010
GRO BTEX MTBE GC (S)	15/06/2010	15/06/2010	03/06/2010	03/06/2010
Metals by iCap-OES (Soil)	14/06/2010	14/06/2010	01/06/2010	01/06/2010
Moisture	11/06/2010	11/06/2010	28/05/2010	28/05/2010
PAH by GCMS	12/06/2010	12/06/2010	28/05/2010	28/05/2010
pH	11/06/2010	11/06/2010	28/05/2010	28/05/2010
Phenols by HPLC (S)	11/06/2010	11/06/2010	01/06/2010	01/06/2010
Sample description	10/06/2010	10/06/2010	27/05/2010	27/05/2010
Stone count >2.00mm on dry	11/06/2010	11/06/2010	28/05/2010	28/05/2010
Total Organic Carbon	11/06/2010	11/06/2010	01/06/2010	01/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG:	100514-66	**Customer:**	Concept Site Investigations
Job:	L_CONSIT_LON-18	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NORTHERN LINE EXTENSION	**Report No:**	87240

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH05	BH05	BH10	BH10		
			Depth (m)	1.00	2.00	1.00	2.00		
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
			Date Sampled	06/05/2010	06/05/2010	11/05/2010	11/05/2010		
			Date Received	14/05/2010	14/05/2010	14/05/2010	14/05/2010		
			SDG Ref	100514-66	100514-66	100514-66	100514-66		
			Lab Sample No.(s)	1545011	1544953	1544787	1544817		
Stones > 2 mm	0.1 %	PM024		74.7	62.8	51.9	104		
Material Passing a 2mm Sieve	<0.1 %	PM024		25.3	37.2	48.1	<0.1		
Moisture content ratio, Natural	%	PM024		15	8.5	12	23		
Asbestos Containing Material Screen	-	TM001				No ACM Detected	No ACM Detected		
Asbestos, Presence screen	-	TM001		No ACM Detected	No ACM Detected				
Stones > 10 mm	%	TM008		7.9	5.41	19.4	10.8		
EPH Surrogate % recovery**	%	TM061		105	104	109	110		
EPH Band >C28-C40	<35 mg/kg	TM061		<35	<35	<35	<35		
EPH Band >C10-C28	<35 mg/kg	TM061		36.6	52.3	45.6	<35		
EPH Range >C10 - C40	<35 mg/kg	TM061		53 M	61.2 M	75 M	53 M		
Phenols, Total monohydric	<0.22 mg/kg	TM062 (S)		<0.22 M	<0.22 M	<0.22 M	<0.22 M		
Organic Carbon, Total	<0.2 %	TM132		1.64 #	0.281 #	2.61 #	0.468 #		
Fraction Organic Carbon (FOC)	<0.002 -	TM132		0.0164 #	0.00281 #	0.0261 #	0.00468 #		
Soil Organic Matter (SOM)	<0.35 %	TM132		2.83 #	0.484 #	4.5 #	0.807 #		
pH	1 pH Units	TM133		8.44 M	5.24 M	8.51 M	8.06 M		
Cyanide, Total	<1 mg/kg	TM153		<1 M	<1 M	<1 M	<1 M		
Sulphide, Easily liberated	<15 mg/kg	TM180		<15 #	<15 #	<15 #	<15 #		
Arsenic	<0.6 mg/kg	TM181		17.3 M	14.1 M	21.6 M	16.2 M		
Cadmium	<0.02 mg/kg	TM181		0.658 M	0.19 M	0.506 M	5.02 M		
Chromium	<0.9 mg/kg	TM181		24.7 M	23.6 M	12.1 M	46.5 M		
Copper	<1.4 mg/kg	TM181		75.6 M	14 M	139 M	19.2 M		
Lead	<0.7 mg/kg	TM181		216 M	29.7 M	596 M	46.3 M		
Mercury	<0.14 mg/kg	TM181		0.411 M	<0.14 M	1.49 M	<0.14 M		
Nickel	<0.2 mg/kg	TM181		20.2 M	19.9 M	13.5 M	26.4 M		
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #		
Zinc	<1.9 mg/kg	TM181		198 M	92.9 M	183 M	72.8 M		

Validated

ALcontrol Laboratories Analytical Services

SDG: 100514-66
Job: L_CONSIT_LON-18
Client Reference: 10/2254
Location: NORTHERN LINE EXTENSION

Customer: Concept Site Investigations
Attention: Jon Roberts
Order No.:
Report No: 87240

GRO BTEX MTBE GC (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH05	BH05	BH10	BH10
			Depth (m)	1.00	2.00	1.00	2.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	06/05/2010	06/05/2010	11/05/2010	11/05/2010
			Date Received	14/05/2010	14/05/2010	14/05/2010	14/05/2010
			SDG Ref	100514-66	100514-66	100514-66	100514-66
			Lab Sample No.(s)	1545011	1544953	1544787	1544817
GRO >C5-C12	<44 µg/kg	TM089		<44	<44	<44	<44
Benzene	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M	<2 M	<2 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M	<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M
BTEX, Total	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #	<5 #	<5 #
GRO >C5-C10	<10 µg/kg	TM089		<10	<10	<10	<10
GRO >C10-C12	<10 µg/kg	TM089		<10	<10	<10	<10

Validated

ALcontrol Laboratories Analytical Services

SDG: 100514-66
Job: L_CONSIT_LON-18
Client Reference: 10/2254
Location: NORTHERN LINE EXTENSION

Customer: Concept Site Investigations
Attention: Jon Roberts
Order No.:
Report No: 87240

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	BH05	BH05	BH10	BH10
			Depth (m)	1.00	2.00	1.00	2.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	06/05/2010	06/05/2010	11/05/2010	11/05/2010
			Date Received	14/05/2010	14/05/2010	14/05/2010	14/05/2010
			SDG Ref	100514-66	100514-66	100514-66	100514-66
			Lab Sample No.(s)	1545011	1544953	1544787	1544817
Naphthalene-d8 % recovery**	%	TM218		100	90.5	92.3	89.6
Acenaphthene-d10 % recovery**	%	TM218		99	88.7	90.8	88.5
Phenanthrene-d10 % recovery**	%	TM218		97.4	88.9	93.3	90.3
Chrysene-d12 % recovery**	%	TM218		93.8	86.8	88	83.8
Perylene-d12 % recovery**	%	TM218		96.1	81.9	93.8	87.1
Naphthalene	<9 µg/kg	TM218		26.4 M	<9 M	51.9 M	<9 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	29.7 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		58.9 M	30.6 M	211 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	41.2 M	<16 M
Fluoranthene	<17 µg/kg	TM218		37.9 M	22.3 M	318 M	<17 M
Pyrene	<15 µg/kg	TM218		39.1 M	24.4 M	289 M	<15 M
Benz(a)anthracene	<14 µg/kg	TM218		45.9 M	<14 M	241 M	<14 M
Chrysene	<10 µg/kg	TM218		51.5 M	15.5 M	221 M	<10 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		91.2 M	24.8 M	396 M	<15 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		32.3 M	17.2 M	162 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		52.3 M	23.3 M	315 M	<15 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		33.5 M	<18 M	199 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	70.4 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		47.6 M	<24 M	246 M	<24 M
Polyaromatic hydrocarbons, Total USEPA 16	<118 µg/kg	TM218		<118 M	158 M	2790 M	<118 M

Table of Results - Appendix

SDG Number : 100514-66 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample ¹
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM008	BS 1377:Part 1977	Particle size distribution of solid samples	Wet
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	Dry
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM132	In - house Method	ELTRA CS800 Operators Guide	Dry
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	Wet
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique	Wet
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Extractable Petroleum Hydrocarbons (EPH) By GC-FID
EPH (DRO) (C10-C40)

SDG Number	100514-66	**Client**	L_CONSIT_LON
Matrix (Units)	mg/kg	**Client Ref**	10/2254

Sample No	Customer Sample Ref.	Depth	Matrix	EPH	Interpretation
1675089	BH10	1.00	SOLID	75.0	PAHS/Humic Acids
1675040	BH10	2.00	SOLID	53.0	Humic Acids
1615121	BH05	2.00	SOLID	61.2	Kerosene Type Residues/Humic Acids
1615147	BH05	1.00	SOLID	53.0	Possible PAHS/Humic Acids

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Last updated 1 April 2010

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Last updated 1 April 2010

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Last updated 1 April 2010

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Attention: Jon Roberts

CERTIFICATE OF ANALYSIS

Date:	18 June 2010		
Customer:	H_CONSIT_LON-2		
Sample Delivery Group (SDG):	100617-60	**Report No.:**	87635
Your Reference:	10/2254		
Location:	NLE		

We received 5 samples on Thursday June 17, 2010 and 5 of these samples were scheduled for analysis which was completed on Friday June 18, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland

1291
GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	100617-60	**Customer:**	Concept Site Investigations
Job:	H_CONSIT_LON-2	**Attention:**	Jon Roberts
Client Reference:	10/2254	**Order No.:**	
Location:	NLE	**Report No:**	87635

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Sampled Date
1700248	BH10 1		15/06/2010
1700180	BH5 1		15/06/2010
1700199	BH6 1		15/06/2010
1700221	BH7 1		15/06/2010
1700233	BH9 1		15/06/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG: 100617-60 | Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 | Attention: Jon Roberts
Client Reference: 10/2254 | Order No.:
Location: NLE | Report No: 87635

LIQUID

Results Legend	Lab Sample No(s)	1700180	1700199	1700221	1700233	1700248	Total
X Test	Customer Sample Ref.	BH5	BH6	BH7	BH9	BH10	
■ No Determination Possible	Depth (m)						
	Container	1liplastic	1liplastic	1liplastic	1liplastic	1liplastic	
Anions by Kone (w)	All	X	X	X	X	X	0 5
pH Value	All	X	X	X	X	X	0 5

Validated

ALcontrol Laboratories Analytical Services

SDG: 100617-60 | Customer: Concept Site Investigations
Job: H_CONSIT_LON-2 | Attention: Jon Roberts
Client Reference: 10/2254 | Order No.:
Location: NLE | Report No: 87635

Test Completion dates

SDG reference: 100617-60

Lab Sample No(s)	1700180	1700199	1700221	1700233	1700248
Customer Sample Ref.	BH5	BH6	BH7	BH9	BH10
Depth					
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Anions by Kone (w)	17/06/2010	17/06/2010	17/06/2010	17/06/2010	17/06/2010
pH Value	18/06/2010	18/06/2010	18/06/2010	18/06/2010	18/06/2010

Validated

ALcontrol Laboratories Analytical Services

SDG: 100617-60
Job: H_CONSIT_LON-2
Client Reference: 10/2254
Location: NLE

Customer: Concept Site Investigations
Attention: Jon Roberts
Order No.:
Report No: 87635

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Customer Sample Ref.	BH10	BH5	BH6	BH7	BH9
Depth (m)					
Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
Date Sampled	15/06/2010	15/06/2010	15/06/2010	15/06/2010	15/06/2010
Date Received	17/06/2010	17/06/2010	17/06/2010	17/06/2010	17/06/2010
SDG Ref	100617-60	100617-60	100617-60	100617-60	100617-60
Lab Sample No.(s)	1700248	1700180	1700199	1700221	1700233

Component	LOD/Units	Method									
Sulphate	3 mg/l	TM184	499	#	474	#	355	#	263	#	562	#
pH	<1 pH Units	TM256	8.31	#	8.18	#	8.06	#	8.1	#	8.15	#

Table of Results - Appendix

SDG Number : 100617-60 **Client :** Concept Site Investigations **Client Ref :** 10/2254

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers	
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter	

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries –** Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses –** Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

I4: Bomb Damage Maps

I4.1: Battersea Park
I4.2: Kennington
I4.3: Battersea
I4.4: Clapham
I4.5: Wandsworth

Environmental Statement

Volume II

MAP 89

Colour Key

References
(for guidance only)

Black
Total
destruction

Purple
Damaged beyond
repair

Dark Red
Seriously damaged,
doubtful if
repairable

Light Red
Seriously damaged,
but repairable
at cost

Orange
General blast
damage – not
structural

Yellow
Blast damage,
minor in nature

Light Blue
Clearance
areas

Light Green
Clearance
areas

V1 flying bomb

V2 long
range rocket

MAP 88

Colour Key

References
(for guidance only)

Black
Total
destruction

Purple
Damaged beyond
repair

Dark Red
Seriously damaged,
doubtful if
repairable

Light Red
Seriously damaged,
but repairable
at cost

Orange
General blast
damage – not
structural

Yellow
Blast damage,
minor in nature

Light Blue
Clearance
areas

Light Green
Clearance
areas

V1 flying bomb

V2 long
range rocket

MAP 101

Colour Key
References
(for guidance only)

Black
Total destruction

Purple
Damaged beyond repair

Dark Red
Seriously damaged, doubtful if repairable

Light Red
Seriously damaged, but repairable at cost

Orange
General blast damage – not structural

Yellow
Blast damage, minor in nature

Light Blue
Clearance areas

Light Green
Clearance areas

V1 flying bomb

V2 long range rocket

MAP 100

Colour Key
References
(for guidance only)

Black
Total destruction

Purple
Damaged beyond repair

Dark Red
Seriously damaged, doubtful if repairable

Light Red
Seriously damaged, but repairable at cost

Orange
General blast damage – not structural

Yellow
Blast damage, minor in nature

Light Blue
Clearance areas

Light Green
Clearance areas

V1 flying bomb

V2 long range rocket

MAP 114

Colour Key References
(for guidance only)

Black
Total destruction

Purple
Damaged beyond repair

Dark Red
Seriously damaged; doubtful if repairable

Light Red
Seriously damaged, but repairable at cost

Orange
General blast damage – not structural

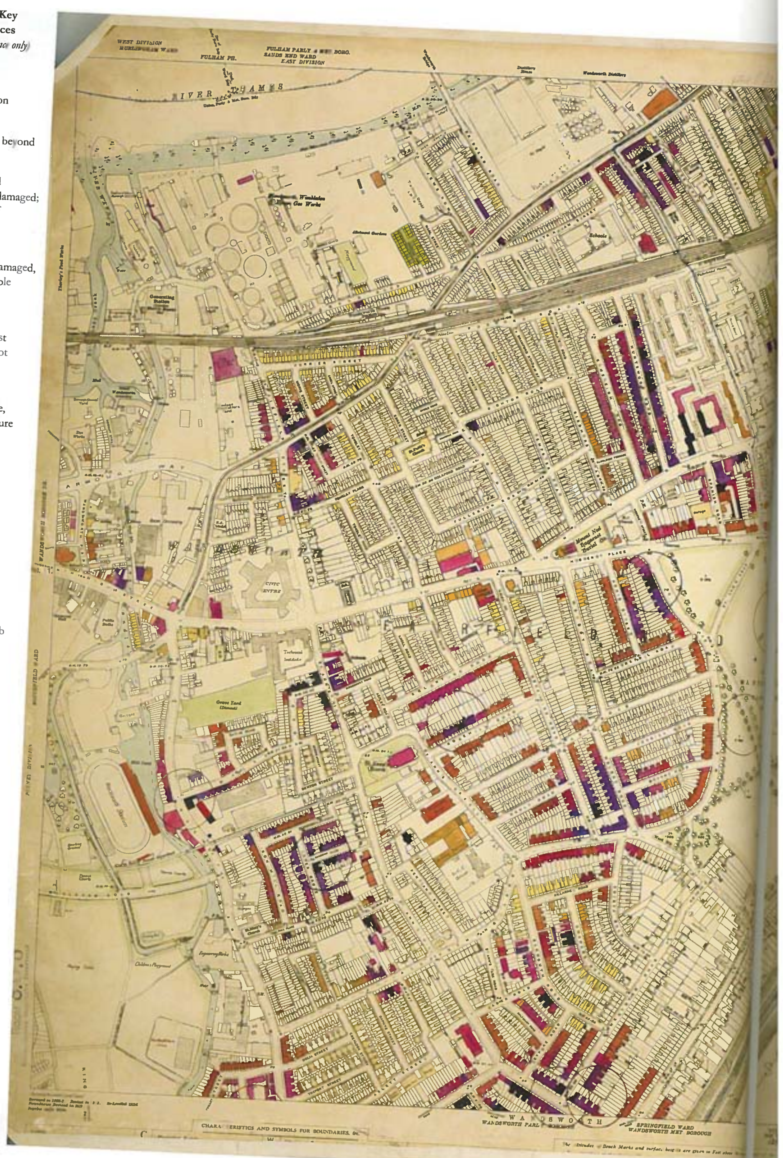
Yellow
Blast damage, minor in nature

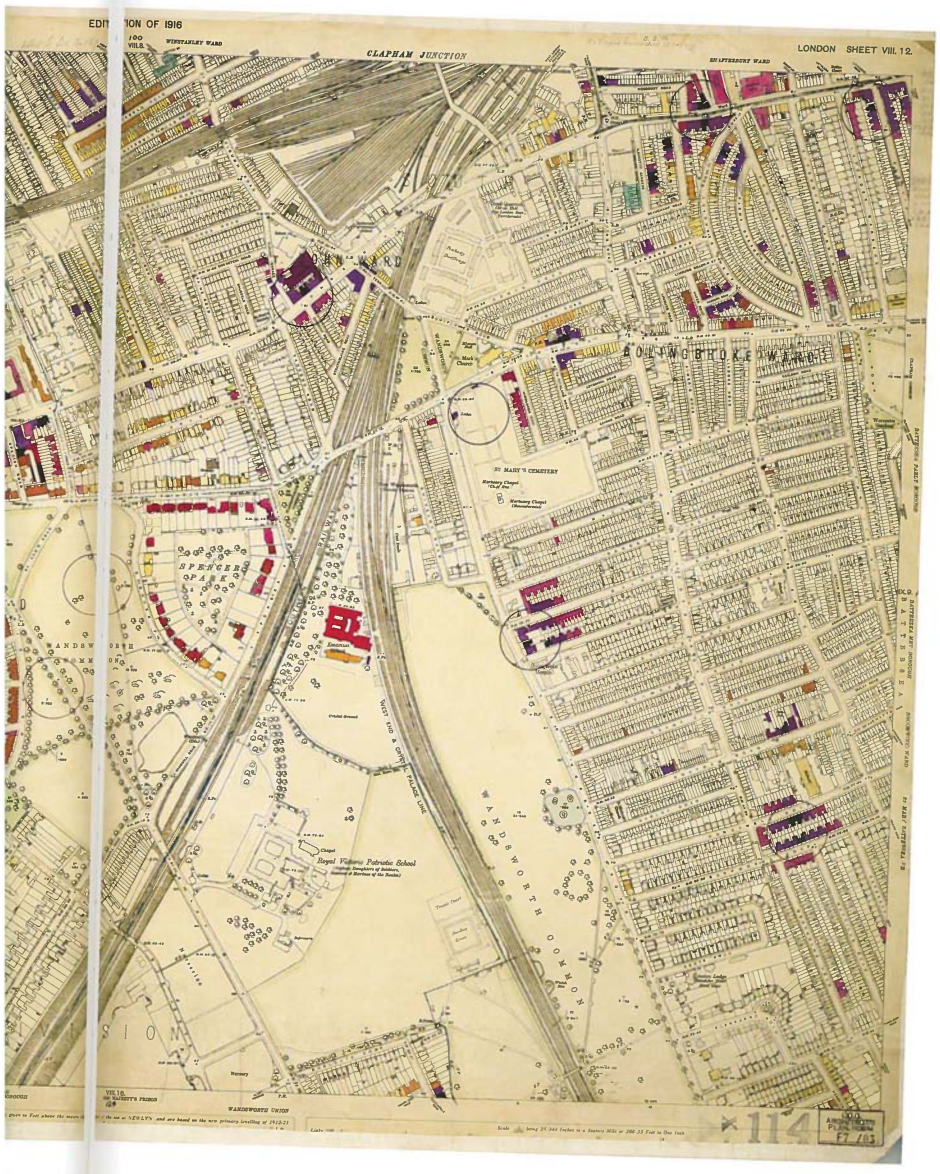
Light Blue
Clearance areas

Light Green
Clearance areas

V1 flying bomb

V2 long range rocket





I5: Buro Happold – Battersea Redevelopment Geoenvironmental Interpretative Summary Report

Environmental Statement

Volume II

Buro Happold

`

023000 Battersea Power Station

Geoenvironmental Interpretative

Summary Report

July 2009

Revision 00

Buro Happold

Revision	Description	Issued by	Date	Checked
00	Final	TS	28/07/09	GG

O:\023000 Battersea Powerstation -THL\F09 - Geotech + SI\Reports\Phase 1 and 2 Summary Report\090727 JB 023000 Geoenvironmental Interpretative Summary Report 00.doc

This report has been prepared for the sole benefit, use and information of REO (Powerstation) Ltd for the purposes set out in the report or instructions commissioning it. The liability of Buro Happold Limited in respect of the information contained in the report will not extend to any third party.

author	**James L Boyle**
signature	
date	**28/07/2009**
approved	**Gary Graveling**
signature	
date	**28/07/2009**

Contents

Appendix A: Analytical Summary Tables

Appendix B: Previous Investigations (CD)

Executive Summary

General

Buro Happold Limited was requested by REO (Powerstation) (REO) to undertake a summary of the previous land contamination reports undertaken at the proposed Battersea Power Station site (hereafter referred to as 'the site'). The summary contaminated land risk assessment and geotechnical assessment for the proposed development at Battersea is in support of the outline planning application.

This report collates and summarises the methodologies, results, conclusions and recommendations of all the historic contaminated land reports at the Battersea Power Station site. The summary and review of the previous contaminated land risk assessments is the basis for the revised Generic Quantitative Risk Assessment (GQRA) presented in this report. The GQRA is undertaken in general accordance with CLR11 (ref 1).

The objective of this report is to assess the identified potential risks to both human health and environmental receptors from contaminants identified within the Made and Natural Ground both during construction and for the finished site development in line with the current masterplan. The summary comprises an updated contaminated land risk assessment, based on the reviewed data, for the proposed development.

A preliminary quantitative risk assessment (ref 2) report has been recently undertaken for the adjacent 88 Kirtling St site. This report incorporates a preliminary quantitative risk assessment, based on a desk study, for the 88 Kirtling Site, therefore this area of the development has been excluded from this interpretative geoenvironmental summary report.

Background

The Battersea Power Station site is located in Battersea, London. The majority of the site is currently occupied with the derelict Battersea Power Station building. The eastern portion of the site is occupied by REO (Powerstation) offices and Thames Water. The site is surrounded by commercial and residential properties, and a gas works. The northern boundary of the site is bounded by the river Thames.

The proposed development will involve the redevelopment of land and buildings, including alterations to Battersea Power Station and the demolition of existing buildings and development of new buildings for a mix of uses including retail, leisure/open space, residential, business, Energy Centre, Cinema, and community/civic areas.

Ground conditions

The site is underlain by Made Ground material of variable composition, generally described as clayey sandy gravel, but varying to a sandy gravely clay. The gravel and cobbles are composed of flint, brick and concrete,

with occasional ash, clinker, metal and timber. The Made Ground is underlain by Alluvium and River Terrace Deposits which in turn rest upon the London Clay Formation. There is the presence of a scour filled hollow within the near surface deposits within the footprint of the Power Station.

Soil samples from Made Ground recorded average concentrations of cadmium exceeding residential screening criteria, and individual concentrations of naphthalene benzo(a)pyrene, arsenic, chromium, lead, mercury, nickel and total cyanide exceeding the residential screening criteria. Occasional exceedences of commercial/industrial criteria were noted for benzo(a)pyrene and lead. Soil contamination is generally restricted to the Made Ground. The soil gas regime is characterised by slightly elevated concentrations of methane and carbon dioxide (although gas flow rates are generally low).

Water quality

Groundwater (minor aquifer) beneath the site is interpreted to flow north towards the River Thames and Central London. The minor aquifer is separated from the underlying Major Aquifer by a relatively impermeable clay layer (London Clay Formation) and is influenced by tidal fluctuations. Groundwater (minor aquifer in River Terrace Deposits) recorded slightly elevated contamination concentrations, particularly ammoniacal nitrogen. Water quality is likely to improve based on the proposed site use, as significant sources of contamination would be removed during the development.

Risk assessment

A Generic Quantitative Risk Assessment carried out on the basis of existing data indicates that there are potentially significant risks to human health and the environment under the currently existing conditions. The proposed development of the site will also give rise to some potential temporary, short term risks, most notably to controlled water (specifically the River Thames) and construction workers during its development. This is particularly relevant in the northern part of the site, adjacent the River Thames.

In the long term, provided the proposed mitigation measures are appropriately constructed and the recommendations adopted, the risks to people and the environment related to the former industrial use of the site, can all be mitigated to acceptably low levels

Proposed mitigation

These potential risks to construction workers and adjacent site users during construction can be mitigated by means of an appropriately rigorous health and safety/hygiene regime.

Potential risks to future site users from soil contamination in areas of soft landscaping can be mitigated by the placement of a capping layer of clean-fill of sufficient thickness.

- Remaining hydrocarbon hotspots identified as part of the risk assessment are located within the proposed basement footprint and will therefore be removed as part of the standard building design.

These areas of hydrocarbon contamination are likely to require selective excavation followed by remediation/off-site disposal to hazardous landfill.

- Stockpiling of grossly contaminated soils should be avoided if possible and where necessary, stockpiles should be covered when not in use. All hazardous/non-hazardous soils requiring off-site disposal will require pre-treatment prior to disposal to landfill. The waste classification of the soils requiring off-site disposal will be confirmed with the earthworks contractor.
- Buildings (included service trenches) in those areas where Made Ground is to remain should be provided with specific protection measures (as per CS2). The proposed redevelopment included deep basements, up to two storeys below ground level, being employed for storage and/or car parking. Below ground car parks will require venting measure to prevent accumulation of carbon monoxide and other harmful gases from exhaust emissions. These venting measures should be adequate in most cases to prevent any accumulation of ground gases. Although the permanent forced ventilation of the deep car parks should be sufficient to reduce risks in the main ventilated areas to acceptable levels it is important that any enclosed spaces (e.g. switch gear rooms) are permanently ventilated, service entries are sealed, and that drainage cavities in the peripheral walls are ventilated.

In addition to these measures the following further investigations are scheduled to be undertaken post-planning:

- The risks and possible mitigation measures regarding the likelihood of piling to cause contamination in the major aquifer will be discussed further once piling specifications are determined. These risks will be explored in a foundations works risk assessment in due course;
- If unforeseen significant contamination is encountered during the enabling works further characterisation, risk assessment and/or remedial works may be required in accordance with the Model Procedures for the management of land contamination, 2004, CLR11 (ref.1);
- An Construction phase Environmental Management Plan (CEMP) should be prepared and agreed with the regulatory authorities prior to commencement of the enabling works;
- Further ground investigation is required prior to construction work following consultations with remedial contractors and potential exempt sites. This ground investigation will provide more detail for waste characterisation and allow approximately delineation of contaminated ‘hotspot’ areas; and
- Provision is made for a Verification Report following remediation. This Report will be prepared in general accordance with the Model Procedures for the management of land contamination, 2004, CLR11 (ref.1). It will need to take into account both the amount of data that will be obtained over the course of the work, but also the longevity of the work programme.

1 Introduction

Buro Happold Limited was requested by REO Powerstation (REO) to undertake a summary of the previous land contamination reports undertaken at the proposed Battersea Power Station site (hereafter referred to as 'the site'). The summary contaminated land risk assessment and geotechnical assessment for the proposed development at Battersea is in support of the detailed planning application. The site location plan is shown on Figure 1, and the current site layout is shown on Figure 2.

This report collates and summarises the methodologies, results, conclusions and recommendations of all the historic contaminated land reports at the site. The summary and review of the previous contaminated land risk assessments is the basis for the revised generic quantitative risk assessment (GQRA) presented in this report. The GQRA is undertaken in general accordance with CLR11-'Model Procedures for the Management of Land Contamination', Environmental Agency (UK), September 2004 (ref 1).

The objective of this report is to assess the identified potential risks to both human health and environmental receptors, including controlled waters, from contaminants identified within the Made and Natural Ground both during construction and for the finished site development in line with current masterplan. The summary comprises an updated contaminated land risk assessment, based on the reviewed data, for the proposed development.

This report should be read in conjunction with the following two documents:

- Phase 1 Preliminary Quantitative Risk Assessment (ref 2) report for 88 Kirtling St site (ref 2). This report incorporates a preliminary quantitative risk assessment, based on a desk study, for the 88 Kirtling Site, therefore this area of the development has been excluded from this interpretative geoenvironmental summary report; and
- Spoil Management Plan (ref 3). This report details excavation volumes and waste management issues.

It should be noted that the scope and design of this report has been based upon the known history of the site, the results of previous studies and investigations and on the development plan. On this basis the spacing of the exploratory holes and the sampling and analysis plan for this investigation is considered to have provided a reasonable level of certainty relating to the ground conditions. However it is important to recognise that contamination can be both widespread and relatively localised, depending upon its source and nature etc. No investigation, however comprehensive can be expected to determine absolutely the nature and extent of all the contamination which could be present on any site. There will always be an element of uncertainty about the ground conditions including contamination. This potential for currently undetected contamination to be present must therefore be taken into account in consideration of future development activities, for example, in the design of the remedial strategy, the health and safety planning, the financial planning and financial risk management and in the implementation of the below ground works during construction

1.1 Proposed Development

The proposed development will involve the redevelopment of land and buildings, including alterations to Battersea Power Station and the demolition of existing buildings and development of new buildings for a mix of uses including:

- Retail;
- Leisure/Open Space;
- Residential;
- Business;
- Nursery;
- Energy Centre;
- Accommodation (Hotel); and
- Community/Civic facilities.

The Development will comprise a number of standalone and linked buildings, the existing Battersea Power Station will be renovated and utilised for residential and retail use(s).

Access to the site will be improved, particularly along Battersea Park Road and will include public transport facilities (such as a bus depot and underground tube station in the southern portion of the site).

Areas adjacent the river will be re-landscaped and used as public open space. An energy centre will be constructed in the northern portion of the site and will provide majority of the energy for the proposed development. Although not part of the current planning application, an underground tube station is proposed in the south-western corner of the site.

Enabling works include extensive basement excavation across the site to enable construction of sub-basement car parking facilities. Proposed masterplan diagrams are shown in Figures 3 and 4.

1.2 Proposed Development Schedule

The construction phase plan (ref 4) indicates that site establishment are scheduled to begin in the start of 2011. This will be followed by renovation works within the Power Station building and the construction of the energy centre (in mid 2012) and residential buildings in 2014 to 2019, followed by construction of the underground station and landscaping areas from 2013. The site is scheduled for completion by 2024.

2 Site Description

The site is located at Battersea, London at the approximate National Grid Reference TQ 290 775 (Figure 1) and occupies an area of about 3 ha. The layout of the site is presented in Figure 2.

2.1 Main Power Station Site

Most of the ground around the outside of the Power Station comprises tarmac, concrete hard standing and exposed Made Ground. There are some above ground heaps of soil-materials. Many of the structures that once surrounded the main Power Station building have been removed, but their foundations and/or below surface structures remain intact in places. Some of the structures associated with the Power Station are still present or have obvious physical expression at the current ground surface e.g. the coal bunker perimeter to the north of the Power Station and access shafts associated with the cooling water tunnels.

For the most part, the site outside of the main Power Station building comprises tarmac, concrete hardstanding and exposed Made Ground where haulage and access roads have been trafficked. Many of the structures that once surrounded the main Power Station building have been removed, but their foundations and/or below surface structures remain intact in places. Some of the structures associated with the Power Station are still present or have obvious physical expression at the current ground surface, e.g. the coal bunker perimeter to the north of the Power Station and access shafts associated with the cooling water tunnels.

The river wall is a mass concrete gravity retaining type structure. A separate condition survey was conducted by Buro Happold Ltd's Infrastructure, Transport and Environment departments in July 2002 (ref 4). The wall was found to be in generally good condition with localised deformations or structural defects, none of which were thought to affect the overall structural integrity of the wall.

Prior to the most recent site investigations conducted by Buro Happold Ltd in 2004, many of the structures associated with Great Western Railway and Thames Water had been demolished either in part or totally. Only listed buildings and those reused by REO Powerstation are present.

Ground levels outside the main Power Station building are between + 4.5m OD and + 5.2m OD. The current working level within the Boiler House of Battersea Power Station is about 0.0m OD.

2.2 28 Kirtling Street

28 Kirtling Street is located on the eastern edge of the site, and is a rectangular lot that currently comprises Tarmacadam hardstanding (placed in late 2008) and leased to Thames Water for storage purposes. The site is separated from the main power station site by Kirtling Street.

2.3 2 Battersea Park Road

The site at 2 Battersea Park Road is located to the southeast of the main power station site at the intersection of Kirtling Street and Battersea Park Road (grid reference 529302, 177473). The site is roughly triangular in shape and up until recently was used as a fuel station by Esso.

3 Historical Land Use

The history of the Power Station Site, 28 Kirtling Street and 2 Battersea Park Road has been determined using previous desk study information (ref 5 and ref 6). Relevant site history information sourced from these reports is summarised below. Locations of former structures are shown in Figure 5.

3.1 Pre Power Station Era

The earliest map (1746) depicts the site as an open expanse of land labelled as 'Battersea Common Field' (most of the surrounding land is shown as fallow or farmland);

An outbreak of cholera in 1832 saw the 'Clean Water Directive' created and the Vauxhall and Southwark. Water companies both coming under scrutiny for the particularly poor quality of the water they supplied. This resulted in the development of the northern part of the site as a water supply and treatment works from about 1845 on (primarily a series of water storage reservoirs and filtering beds). The southern half of the Battersea site at this time was occupied by market gardens. The western boundary was formed by the railway that feeds into Battersea Park Station and across Victoria Bridge into the Victoria Rail Terminus.

Two "town" gasworks existed in the Battersea area from 1862, one approximately 400m to the east and one immediately to the south-west of the site (this site is currently used for gas storage in multi-stage gasometers).

The water treatment works were upgraded and expansion of the water treatment works was conducted in 1869, the Market Gardens giving way to two new filter beds.

The land around the gasworks to the south-west was used as a ballooning ground and a number of small aeronautical engineering companies that displayed their wares on these grounds had their premises in the arches underneath the railway bridge along the western site boundary. The map dated 1894 shows the final development of the water treatment works (one large reservoir is shown to occupy the entire southern boundary of the Battersea site);

By 1916 railway lines and goods sheds had replaced the water treatment works. The railway land remained operational until the early 1960s. By 1916 the water works reduced in size with the filter bed to the north and north-west of the site shown as marsh. Another filter bed on the western boundary and half the largest central reservoir are marked as disused. Rails and buildings owned by the Great Western Railway then covered the southern half of the Battersea site with numerous lines branching off the main line that continues into the Victoria terminus across the river. A number of weighing points and small buildings are shown located around a larger rectangular building marked as being the 'South Lambeth Goods Depot'.

3.2 Power Station Era

The construction of the coal-fired power station took place in two phases splitting the one giant building into two north-south oriented halves dubbed Station 'A' & 'B'. The westernmost Station 'A' was designed to form exactly one half of the proposed station and consisted of (from west to east) switch room 'A', turbine hall 'A' and half of the central boiler house (boiler house 'A') with one chimney at either end of the boiler house. Power Station 'B' would more or less mirror Station construction of Battersea 'A' began in 1929 and was completed in 1933.

The jetty was built in four sections, each section at a time being built inside a cofferdam. Large pad foundations were constructed for the main jetty piers and were situated 3.0 to 3.5m into the London Clay Formation (approx. –4.27mOD). The coaling jetty carried two large Stothert & Pitt cranes (still present) which unloaded the coal, brought by barges, onto conveyor belts where it could be transferred between a series of towers and other conveyors to either the coal bunker or directly into hoppers within the Power Station itself.

Two cooling water intake/outlet chambers were also constructed within the jetty; one at the west end between the main jetty structure and a dolphin, the other in the centre. Together they account for a fifth of the jetty's total length. The intake chamber in the centre of the jetty connected to a 4m external diameter culvert with a crown level rising from –10.3mOD at the junction with the chamber to –8.2mOD at the suction chamber in the Power Station. The outlet chamber was connected to an outlet culvert approximately 6m in diameter (externally) with a crown level of –5.5mOD at the outlet chamber, rising to –5.0mOD as it joined with shaft B (to the west of the north-west corner of Power Station A). From shaft B the outlet culvert continued at a slope of 1 in 150m into turbine hall A where it joined with shaft A underneath one of the giant turbo-alternators.

The cable tunnels that run through both Station A and B are 3m square box tunnels with cable racks on both sidewalls internally. These cable tunnels form an almost complete ring inside the Power Station with two branches going outside beyond the footprint of the Power Station, one branch south-east and the other heading north. The branch that heads north does so from a junction that is on the centre line of Power Station A and B at the north end of the boiler halls. Once this branch passes under the jetty it continues north until it gets roughly half way across the Thames where it turns to form an arc heading west 90° and terminates at a manhole under Grosvenor Road on the north bank. The other branch leaves the Power Station from the south-east corner where it heads east to the site of the former Central Electricity Board's transformer station. Before the cable tunnel reaches the transformer station it splits forming a Y-shape where one leg goes to the transformer station and the other follows the main access road of the site until it leaves the site and enters Kirtling Street. A basement pump-house room was located in the north-western corner of the Power Station building. Locations of existing cable tunnels are shown on Figure 6. The room was used for storage of oils (such as lubricants) within sumps and tanks, all of which was removed in the late 1980's. Minor seepage of groundwater occurred in the basement, during which one of the pumps would automatically pump the water out into the river (ref 7).

A number of ancillary buildings and structures also built at the same time as Station A. These included: sludge filtering plant to the west, ash sumps and handling plant immediately to the south, workshops building east of the power station building and a number of smaller buildings such as a canteen adjacent to the south-west corner of the main Power Station building. Two north-south trending oil drains were each located on the eastern and western side of the Power Station building. These drains were installed to receive oil leakages from power station equipment (such as pumps, capacitors and turbines). The drains led into underground oil sumps, located along the southwest and northeast corners of the Powerstation exterior wall. It is noted that the northeast oil sump was not observed during a recent (2008) site visit.

During its working life the whole of the Power Station was circled by railway tracks that were used to bring coal in by train to supplement the stock brought in by Thames barges and to take away ash and other waste products.

Battersea 'B' was constructed between 1937 and 1953, the construction works being interrupted by World War II. The southeast corner of Power Station "A" was bombed during this time.

Battersea Power Station "A" and "B" were decommissioned in 1975 and 1983, respectively. The main Power Station buildings were given a Grade II listed building status in October 1980.

3.3 Post Power Station Decommissioning

Attempts were made by a previous owner in the 1980s to redevelop the Power Station building but this failed in the early 1990s due to a lack of capital. During this period the Boiler Halls were almost completed stripped, including the removal of some of the structural steelwork.

Remnant buildings associated with the Railway Land and Water Treatment industries (sited in the western and eastern parts of the site respectively) were demolished in 2002.

The coal store bunker north of the Power Station the bunker was emptied during decommissioning and backfilled with a variety of materials of unknown provenance.

The Power Station was bombed during WWII but a separate munitions survey in 2002 (ref 8) concluded that the risk from encountering unexploded munitions during construction, and to the completed development including the Jetty, was low.

Restoration works have recently been undertaken on the main Battersea power station building.

3.4 28 Kirtling Street

28 Kirtling Street was used as an engineering works in the late 19th and early 20th centuries. The specific purpose of the works is unknown. An ordinance survey plan from this era detailed the presence of two tanks within the site boundary. An electrical substation was located in the north-eastern portion of the site from at least 1961 until circa 2006.

Surrounding historical land-uses included gasworks to the east and west, town baths to the east, paint works to the north, landfilling and cement works to the north west, Battersea Power Station to the west and garages to the south.

3.5 2 Battersea Park Road

The site at 2 Battersea Park Road remained undeveloped until circa 1916 when it was utilised as part of a garage based on Kirtling Street immediately to the northwest. Bedfore this, the area has been almost always associated with the transportation network, firstly in circa 1975 when it was associated with a Transport Depot located to the northwest, and more recently as an Esso fuel station; which has now been decomissioned.

Surrounding historical land-uses circa 1916 included the South Lambeth Goods Depot to the west, as well as public baths and an electrical substation. In circa 1975 a Transport Depot and a car park were located to the north and northwest of the site and post 1991 to the present, the site is surrounded by Brooks Court to the northwest and unspecified works, depots and an electrical substation to the north.

3.6 Other Information

Council planning records were viewed on the Council website (www.wandsworth.gov.uk) on 11 September 2008. The on-line planning history containing planning files from 1986.

Based on a review of council planning files, an application was submitted for the site in 2001 for the erection of a five storey building on the site. The proposed building was comprised of offices, including an information centre for the former Battersea Power Station development plan. Subsequent applications related to changes to the proposed development; i.e. the removal of a condition relating to the requirement of an archaeological assessment on-site, and a renewal application in 2006 for the erection of a five storey building. The latest 2006 submission granted approval for the construction of the building, with the condition that the construction should commence within three years (i.e. June 2009).

No mention of remedial works was made in the council record, furthermore, Council online records do not mention any planning restrictions or conditions relating to contaminated land.

4 Previous Investigations

A number of ground investigations for geoenvironmental purposes have been undertaken at the site. The locations of the exploratory holes detailed in the reports listed below are shown on Figure 7. The Buro Happold 2002 and 2006 reports (refs 9 & 10, respectively) relate to a previous masterplan (as discussed in the reports). The extent of the basement in the current masterplan (see Figure 3A) is slightly larger in lateral extent (notably incorporating 28 Kirtling Street and the coal bunker area) than the previous masterplan presented in the reports.

The reports carried out at the site that have been reviewed as part of this study are as follows:

- **Site Investigation for Battersea Power Station** (Soil Mechanics 1988, ref 11). Drilling of 16 boreholes to depths ranging between 4-28.5m begl, with limited contamination. This factual report was incorporated into an interpretative report (**Report on Ground Contamination**, Allot and Lomax, April 1996, ref 7);
- **Geotechnical and Environmental Investigation** (LBH Geotechnical and Environmental, July 1993 Ref 12), undertaken at 28 Kirtling Street Included four boreholes to depths ranging between 10-20m below existing ground level (begl), four trial pits excavated, two gas standpipes installed (in Made Ground and River Terrace Deposits) , limited soil samples and one round of gas monitoring undertaken;
- **Archaeological and Geotechnical Desk Study, Battersea Power Station Site** (Ove Arup & Partners, September 1997, ref 5). Historical desk study (from a ground contamination perspective) on the main Battersea Power Station Site**;**
- **Factual Report on Phase One and Two Contamination Ground Investigation** (Foundation and Exploration Services (FES), December 1997, Ref 13). Undertaken across the main power station site. Included 16 boreholes to depths ranging between 4m and 30m begl, 37 trial pits excavated, nine groundwater samples collected, seven gas standpipes within Made Ground, contamination soil sampling and two rounds of gas/groundwater monitoring. This factual report was incorporated into '**Battersea power Station Ground Investigation Report**, (Ove Arup & partners, December 1997 ref 14);
- **Geotechnical and Contamination Statement, Battersea Power Station 28 Kirtling Street.** (Buro Happold Ltd, January 2001, ref 6). Summarises previous historical desk studies for 28 Kirtling Street. The report incorporates a ground investigation (undertaken by Norwest Holst in 2000), which included the drilling of two boreholes, subsequent ground gas and groundwater monitoring, several trial pits, and soil sampling for contamination purposes;

- **Ground Investigation at Battersea Power Station, Geotechnical and Geoenvironmental Factual Report**. (Geotechnics Ltd, August 2002, ref 15).Factual ground investigation consisting of 51 boreholes (drilled to depths between 0.4m to 50mbgl), four drill holes (to depths ranging between 46m and 75m begl), 96 trial pits, and subsequent sampling/monitoring for soil, groundwater and ground gas. This information was incorporated into the '**Desk Study and Contamination Interpretative Report'** (Buro Happold Ltd, January 2003, ref 19);
- **Report on Spoil Volumes and Spoil Management Strategy**, Battersea Power Station Site. (Rev 2, Buro Happold Ltd, October 2004 ref 16). This report details spoil excavation volumes based on the previous owner's masterplan, classifies soil for off-site disposal, and outlines spoil management issues to be considered. The former masterplan does not incorporate 88 Kirtling St or 28 Kirtling St.
- **Geotechnical Ground Investigation Factual report**, Battersea Power Station. (Fugro Engineering services, formerly Foundation and Exploration Services (FES) Ref 17). Investigation consisted of drilling 91 boreholes (to depths ranging between 4m to 75mbgl), 120 trial pits, groundwater and ground gas monitoring, and soil sampling and analysis. The results were incorporated in the '**Further Contamination Assessment following the 2004 Ground Investigation'** report (Rev 2, Buro Happold Ltd, and February 2006. Ref 10); and
- **Contaminated Land preliminary Risk Assessment, 88 Kirtling Street**. (Buro Happold Ltd, December 2008, ref 2). Details site history information for 88 Kirtling St, primarily sourced from a Groundsure report for the site (ref 18), which also incorporated 28 Kirtling St and the main Powerstation Site. Includes a preliminary risk assessment based on the potential sources. It is noted that as there are no existing contamination or intrusive investigations/reports (as far as Buro Happold Ltd is aware) for 88 Kirtling Street, any contamination issues (including site history and description) relating to this site is included solely in the preliminary risk assessment report.

NB: This following assessment is based on contamination data obtained during historic ground investigations and as such the contamination assessment is based on superseded guideline values for soil, groundwater and ground gas. Previous soil and groundwater contamination data from the 2001 (ref 6), 2003 (ref 19) and 2004 (ref 9 and 10) ground investigations has been used in this report. Inorganic data for soils and groundwater from the 1997 (ref 5) ground investigation has also been used, however organic data prior to 2000 has not been used due to the age of the data and likelihood of natural attenuation of the organic determinands. The following sections summarise the findings of the reports and attempt to update these findings based on the most recent guidance/assessment criteria.

4.1 Investigation in 1997 (Ove Arup & Partners)

One of the main objectives of this investigation was "To provide quantitative information on the type, severity and general extent of contamination of the overlying Made Ground and underlying groundwater, sufficient for an appropriate and cost effective remediation strategy to be developed."

The emphasis of contamination soil sample collection was placed on the 37 trial pits. Gas and/or groundwater monitoring standpipes were also installed in all 17 boreholes. The testing suite employed by Arup for soils was as follows:

- Phytotoxic (toxic to plants) metals: copper, nickel, zinc and boron (water soluble);
- Zootoxic (toxic to humans and animals) metals: arsenic, cadmium, chromium, lead, mercury; and
- Other determinands: pH, sulphate (total), cyanide (total), Toluene Extractable Matter (TEM).

Any samples containing large amounts of rubble were tested for the presence of asbestos fibres. A second round of testing on soil samples was carried out according to the following triggers: If TEM concentration exceeded 1000mg/kg the sample was tested for PAHs and mineral oils. If total cyanide concentration exceeded 25mg/lg then the sample was tested for free cyanide, complex cyanide and thiocyanate.

Water samples collected from borehole installations during monitoring visits were tested for:

- Metals: arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc;
- Organics: phenols, polycyclic aromatic hydrocarbons (PAHs), mineral oils, polychlorinated biphenyls (PCBs) and Volatile Organic Compounds (VOCs); and
- Other determinands: sulphate, cyanide and chloride, Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD).

Gases measurements taken in-situ during monitoring visits consisted of:

- Methane, Carbon Dioxide and Oxygen;
- Atmospheric and gas pressure; and
- Gas flow rates.

Arup targeted the Made Ground for their contamination sampling. In particular any samples that displayed large volumes of ash (to give their 'worst case scenario') or displayed any obvious hydrocarbon contamination were selected for analysis. Arup also noted the possibility of PCBs being abundant around transformer bay areas and selected samples taken from these areas for PCB testing.

Only trial pit TP55 is mentioned as having any obvious signs of contamination present. This trial pit was situated in front of the retained building on an area next to the main power station site entrance. The log for

this exploratory hole noted a hydrocarbon odour to emanate from the Made Ground. The odour increased in intensity once in the Alluvium and then increased once again in the River Terrace Deposits. The Arup report later states that "the results failed to indicate a significant degree of contamination at this location. It is possible that the volatile fraction causing the odour may have been lost during the excavation process of the trial pit.

The Arup contamination assessment of the site concluded that past uses of the site have not resulted in contamination of the ground or groundwater of a severity that will require local or site-wide remediation in advance of the building contracts. The report further indicated that the general level of contamination is below levels that require specific treatment or off-site disposal, for the type of end use planned." It then added "…the general visual appraisal of the materials (Made Ground) as typical inert fill and sandy backfill. There was no evidence of domestic refuse or hazardous industrial waste having been deposited as backfill in the former water treatment reservoirs and filtering beds" It should be noted however that plastics, paper and "refuse" were noted as being used as backfill to the coal bunker.

It is noted that recent statutory guidelines were not in place during the Arup/FES 1997 investigation. Additionally, the Arup report does not provide information on to what analysis methods were used in the analytical laboratory. Whilst the Arup gas results are mentioned in further Sections, the soil and groundwater data (particularly for organics) would be subject to significant variation due to possible analysis method changes and natural attenuation. The Arup 1997 laboratory results have not been included in interpretative sections of this report.

4.2 Investigation in 2002 (Buro Happold)

The report prepared by Buro Happold Ltd in January 2003 (ref 19) presented the results of a desk study, ground investigation and contamination assessment. Prior to preparation of the report Buro Happold carried out the following:

- a desk study;
- developed a preliminary conceptual model (PCM) and preliminary risk assessment (PRA) based on the desk study information;
- designed a ground investigation (GI) based on the PCM and PRA;
- used the results of the GI to refine the conceptual model and to prepare risks assessments for three scenarios:
    - current conditions (receptors as in the Preliminary Conceptual Model);
    - during construction – including short term risks to construction workers, occupiers and users of neighbouring properties, and the water environment; and

- following completion of development – including long term risks to occupants and users of the site and neighbouring properties and other receptors, and short-term risks to future maintenance workers.

The report made recommendations regarding remedial and protective measures, and management of the construction process so as to eliminate or reduce any identified significant risks to acceptable levels.

The study area for the desk study was the Power Station Site with further consideration of surrounding industries and land uses within approximately 250 metres of the site. The sources of desk study information (including Envirocheck report, historical mapping, previous reports and Environmental Agency information) are mentioned in the report).

The findings of the desk study were used to develop the scope and extent of ground investigation, which was based on the conceptual model derived from the desk study and the proposed form of the previous development, including the proposed layout of the buildings and anticipated depths of excavation on various parts of the main Power Station Site.

The GI works (undertaken in mid 2002) were both targeted and non-targeted. The targeted investigation re-examined 'hotspots' (i.e. areas where concentrations of one or more contaminants were above those in surrounding areas) noted in previous investigations and the non-targeted investigation provided a sample grid spacing commensurate with the conceptual model. The locations determined for sample testing were selected to give a maximum spread across the Power Station Site and the different soil strata taking into account the coverage provided by previous investigations. The investigation was also designed to identify the nature of any materials encountered that were identified as potential contaminants of soil or groundwater.

The GI involved the excavation of machine dug trial pits and cable percussion boreholes. Representative soil and groundwater samples were taken for laboratory analysis.

The coal bunker was found to have water resting at approximately the same level as the water table outside the bunker, i.e. approx. 2.5 and 3.5mbgl. Borehole BH901 and other historical boreholes have penetrated the bunker floor and therefore it is reasonable to assume that the coal bunker is no longer structurally intact against the ingress/egress of groundwater. Water samples collected from the nearby borehole BH902A and tested as part of the gas and groundwater monitoring process have revealed no elevated levels of the contaminants present in the backfill in the coal bunker.

The analytical suites employed in the sample analysis included a standard list of contaminants identified in industry recognised guidelines, and provision for samples to be tested for specific potential contaminants identified at the desk study stage, including PCBs (polychlorinated biphenyls), mineral oils and solvents.

Soil samples obviously contaminated with hydrocarbons were subjected to additional contaminant-specific tests. A proportion of assumed uncontaminated natural soil samples were tested to provide 'background' concentrations.

4.3 Investigation in 2004 (Buro Happold)

The further investigations carried out in 2004 was intended to provide better definition on the full extent of the identified hotspots. The further investigations were also intended to:

- close the spacing on existing sampling points within areas of proposed excavation to refine existing assumptions regarding the distribution of hazardous and non-hazardous materials; and identify their re-use potential in proposed landscape areas (if required);
- provide further information on the ground gas regime;
- provide further information on groundwater quality; and
- provide supporting information for a Spoil Management Strategy for the site.

The 2004 investigation used a wider test suite than the 2002 work, and some of the less reliable tests such as screening tests for oils and PAHs were dropped in favour of more accurate tests such as Diesel Range Organics (DRO) and determination of speciated PAHs by GC-MS(16 USEPA). Testing for PRO and BTEX (petrol range organics, benzene, toluene, ethyl benzene or xylene) was considered. However, there was no visual or olfactory evidence noted during field observations suggesting that volatile contamination might be present; and subsequent diesel range organics (DRO) testing confirmed that the majority of the hydrocarbon contamination comprised heavier-end compounds. In addition to testing of the soils for 'total' contaminants, selected soil samples were tested for leachable contaminants in accordance with the CEN standard leaching test, and "Waste Acceptance Criteria" (WAC). A larger number of samples were analysed using the Environment Agency standard (NRA-style) leaching procedure to give indicative data. It should be noted that the NRA (National Rivers Agency – now defunct) testing method has been superseded by BSEN 12457-2 one stage leaching test.

4.4 Addendums to 2004 Investigation (2006)

The 2006 addendum to the 2004 Investigation responded to the planning queries received from Wandsworth Borough Council regarding the previous 2004 Buro Happold Report (ref 19). The query centred on a strip of land that was previously marked for residential development, and required the addendum to compare the data with residential guideline criteria. The addendum compared data in this area to 'residential without plant uptake' and concluded that findings did not indicate any significant difference from existing conclusions.

5 Ground Conditions

Ground Conditions information has been primarily sourced from the 2001 and 2002 Buro Happold Ltd reports (refs 6 and 9, respectively), and Envirocheck Report (ref 20), and is summarised below., and a geological cross section across the site is included in Figure 4.

5.1 Geology

The geological map records Recent Alluvium (over the northern part of the site), underlain by River Terrace Deposits which in turn rest upon the London Clay Formation. The map highlights the presence of a scour filled hollow within the near surface deposits within the footprint of the Power Station. Other scour filled hollows are shown in surrounding areas. Beneath the London Clay Formation the geology comprises in descending order the Lambeth Group, Thanet Sands and Upper Chalk deposits. Site specific geological information based on the findings of the 2002 and 2004 ground investigations is summarised in Table 3.1.

Table 5.1: Typical strata sequence, elevations and thickness

Strata	Range of elevation of top of strata where encountered, (average) (m A.O.D)	Range of thickness where encountered, (average) (m)	General Soil Description
Made Ground	3.1 to 5.3 (4.1)	0.5 to 4.9 (2.9)	Variable composition, generally described as clayey sandy gravel, but varying to a sandy gravely clay. The gravel and cobbles were composed of flint, brick and concrete, with occasional ash, clinker, metal and timber. Concrete obstructions were noted at several exploratory locations
Alluvium	3.0 to –2.2 (0.5)	0.5 to 5.2 (2.1)	Very soft to soft clays of high plasticity. Notable peat bands.
River Terrace Deposits	3.0 to –3.9 (-0.4)	2.6 to 7.0 (4.6)	Medium dense sand and gravel (Note comments on scour feature below)
London Clay Formation	-3.1 to –7.0 (-5.2)	30.4 to 37.0 (33.7)	Firm becoming stiff clay, with local sand bands
Lambeth Group	-37.0 to –41.6 (-38.5)	16.5 to 18.9 (17.4)	Interbedded very dense sands and very stiff clays
Thanet Sand Formation	-54.7 to –56.8 (-56.0)	8.5 to 11.9 (10.1)	Very dense silty Sand
Upper Chalk	-64.6 to –68.5 (-66.2)	Not penetrated	Moderately weak to moderately strong white chalk with flint bands

5.1.1 Made Ground

Made Ground was generally present across the entire site. Made Ground has been described both in terms of material constituents and below ground man made features.

In terms of material constituents the Made Ground was variable in composition, ranging between clayey sandy gravel with occasional cobbles to a sandy gravely clay. Clayey Made Ground was more common in areas nearer to the river wall. The gravel and cobbles were composed of flint, brick and concrete, with occasional ash, clinker, metal and timber.

Granular Made Ground deposits exhibit a variable density from loose to dense and reflect various states of compaction/infill. When clayey, Made Ground is typically described as having a soft or firm consistency.

The composition of the Made Ground is highly variable and likely to collapse in shallow excavations. Poorly compacted Made Ground may also provide a potential source of collapse compression if the groundwater regime or support changes.

Throughout the history of the site it is likely that natural materials have been excavated and filled across the area resulting in re-worked layers. These layers may not be easy to identify and may have been mistakenly identified as natural materials within boreholes logs. This may well be the case where layers of Alluvium have been encountered above an elevation of approximately +1 to +2 m OD.

Exploratory holes (trial pits and boreholes) were excavated with irregular grid spacing in the order of 30m. Given the highly variable nature of the Made Ground further obstructions may be present in areas between exploratory holes.

5.1.2 Alluvium

Alluvium was encountered beneath the Made Ground at many locations across the site, decreasing in thickness away from the River Thames. Due to the reduced ground level, Alluvium is absent within the Power Station. At 27 locations across the site Alluvium was recorded at an elevation greater than +2mOD.

This is unlikely to represent natural deposits given the recorded age and mode of deposition of alluvial soils. Alluvial soils represent the deposition of very recent soil bearing deposits associated with minor fluctuations in plan and depth of the course of the River Thames since the last major glacial event (c. 10,000 years ago). It is typical for alluvial soils to be deposited in an environment closely associated with river levels, which in this case would be less than +2.0m OD before the development of flood control measures that have artificially created a channel of the river within London. The geological environment of formation suggests that ‘alluvium’ recorded above +2m OD is more likely to be associated with reworked soils (i.e. Made Ground) during the construction of the Power Station and Vauxhall and Southwark Company. Such confusion between natural and reworked soils is likely to be most prevalent in proximity to the existing river edge where alluvial soils are more widespread.

Alluvium as described in the boreholes typically comprises soft grey clay with varying quantities of organic matter and is highly compressible. Locally bands of fibrous peat were recorded.

5.1.3 River Terrace Deposits

River Terrace Deposits were encountered at all locations overlying the London Clay Formation. They typically comprise loose to dense brown sandy gravel varying to sand and (flint) gravel or locally very gravely sand. Particle size distribution (PSD) testing has been carried out on numerous samples. The results show a large variability in composition between sandy gravel and a gravely sand. Generally, the unit has less than 10% fines.

Within the Power Station, the boundary between the London Clay Formation and the overlying deposits is marked by a series of closely spaced conical depressions within the surface of the London Clay Formation. The material within these conical features has been considered separately as drift-filled hollows.

The gravels may have beneficial re-use options as an aggregate. Commercial disposal options are currently being investigated.

5.1.4 London Clay Formation

The London Clay Formation was encountered at all borehole locations underlying the River Terrace Deposits or drift-filled hollow infill material. Generally it comprises grey brown locally slightly (fine) sandy clay. It is also typically highly plastic and is generally recorded as stiff from the upper surface, becoming very stiff from around -12.0mOD.

Typically the London Clay Formation was found to be variably laminated or thinly bedded with sand or silt, bioturbated and fissured. It also often contained frequent evidence of bioturbation, calcareous nodules or thin bands (‘claystones’), shell fragments, pyrite or selenite and fragments of organic matter or lignite.

Claystone bands were noted in most boreholes, described as moderately weak, locally moderately strong and typically between 0.1 and 0.5m thick. The upper surface of the London Clay Formation is generally easily identifiable from the overlying River Terrace Deposits. However, around the edge of the drift-filled hollow reworked London Clay Formation was observed within the undisturbed borehole samples.

Within these samples the structure of fissuring and laminae within the samples appeared to be disturbed and was also notable for being slightly gravely. Towards the base of the London Clay Formation the sand content of the prevailing clay generally increases.

5.2 Groundwater

Groundwater strikes were generally recorded in the River Terrace Deposits at or near the top of the stratum with the water level rising approximately 1.0 m above this level. Water levels recorded across the site are generally in the range 0.5 to 1.0m OD (approximately 3.5m below ground level). The major exception to this is

within the Power Station which it is understood is partially cut-off by the cofferdam installed during construction. The water level within the Power Station was generally encountered within the boreholes and trial pits in the range –2.9 to –4.0m OD.

Hourly monitoring of groundwater at the site (over a twenty four hour period) indicated there was a tidal response up to approximately 200m south of the River Thames. The range measured to the north of the Power Station was between 2 and 3m. Inferred groundwater contours presented in the 2003 and 2006 Buro Happold Ltd reports (ref 19 and 10) indicated variable groundwater flow direction, generally flowing south from the site. This monitoring may have been undertaken over the space of several hours, thereby the water level would have changed across the site due to tidal influences. Disregarding these inferred contours, data logging of groundwater levels (presented in the 2002 Buro Happold report) indicates that the minor aquifer (Thanet Sands) is influenced by tidal fluctuations of the adjacent River Thames.

Perched groundwater was recorded locally within the cohesive Made Ground, notably in the north east of the site which it is understood may be due to some leaking water pipes beyond the site boundary.

Water strikes were also recorded within the London Clay Formation and the Lambeth Group. Within the London Clay Formation seepages were noted in many of the boreholes within slightly sandy layers or around claystone bands. Generally the flows were only recorded as minor seepages. Two pneumatic piezometers were installed in the London Clay Formation at nominally 25.0m depth. They indicate the head to be approximately at the level of the top of the London Clay Formation, at 7.5 m depth.

The soil strata underlying the Battersea site is classified by the EA (Groundwater Vulnerability Map Sheet 39, West London, ref 21) as a Minor Aquifer. Minor Aquifers noted on Sheet 39 include the River Terrace Deposits (for Battersea), the London Clay Formation, The Reading and Woolwich Beds and the Thanet Sands. There is no connectivity between the gravels and the aquifer – they are separated by the London Clay Formation.

In terms of vulnerability and leaching potential, due to the lack of data available for urban soils, the EA assesses the soils of the Battersea site to be high leaching potential. The groundwater vulnerability map does not indicate the general direction of groundwater flow across the site.

There is a hydrometric survey borehole (named TQ27/88) maintained by the EA in the Battersea area, with response zones within the Thanet Sands. The data for 2007 shows that the groundwater level was generally rising until 2001, however levels have gradually decreased since this time, with a level of –40m OD recorded in January 2007 (ref 22).

5.3 Hydrology

Tidal data (October 2008) obtained from the Port of London Authority (PLA) indicated that tidal ranges (in the vicinity of central London) ranges from 0.4mOD to 7.5mOD (ref 23). The EA designated the water quality of the stretch of the River Thames adjacent to the site as River Quality B (‘Good’) based on 2007 data (ref 24). The

EA provided Buro Happold Ltd with Thames Water quality data collected from London Bridge (approximately 5km downstream). The water quality data indicated that this area of the river Thames has a varied conductivity (ranging between 376µS/cm and 7,840µS/cm), indicating brackish tidal waters.

5.4 Unexploded Ordnance

The site escaped damage during the bombing raids of World War I and all buildings present on maps dated 1916 are still present on the maps dated 1929. It is therefore reasonable to assume that the site was not extensively bombed during World War 1. World War II saw the completed Power Station A receive blast damage from a bomb impact off the south west corner and there are anecdotal reports of another bomb penetrating the walls of Power Station A and skidding into an air raid shelter in the boiler house.

There are two recorded bomb impacts during World War II, and many more may have gone unrecorded given the suitability of the Power Station as an air raid target. There is also the possibility that a bomb that pierced the ground surface in an adjacent site may have deflected and passed through relatively soft soil strata and into the Battersea site itself.

With the identification of a risk due to unexploded ordnance, Fellows International Ltd (FIL) was consulted in their capacity as munitions clearance specialists (ref 8). A preliminary sweep of the site, including an area of the Thames surrounding the Jetty, was conducted in March 2002 by FIL to enable as much of the site to be issued an 'Explosives Free Certificate' as would enable ground investigation works to proceed safely. Unfortunately there were some areas of the site (shown in Figure 8) which the equipment employed by FIL was unable to penetrate or other metallic obstructions that hindered the effectiveness of their equipment. An 'Explosives Free Certificate' was issued for the waterfront and the majority of the site.

6 Soil data assessment - contaminant source characterisation

6.1 Previous Approach

Site-specific assessment criteria (SSACs) were derived using the CLEA (Contaminated Land Exposure Assessment) or SNIFFER methodologies (ref 25 & 26) for some determinands for which there was no published Soil Guideline Values (SGVs) at that time. In other cases, appropriate criteria were drawn from other authoritative sources. The withdrawn ICRCL threshold limits for those elements regarded as toxic to plants (phytotoxic) were used, as they were deemed to remain a sound basis for initial assessments in the previous reports. They are comparable in magnitude to the values governing the disposal of sewage sludge to land and were derived taking these and other published information into account.

Assessment criteria EPH (DRO) and mineral oil were selected by reference to generic guidelines used in other countries, particularly New Zealand and were deemed applicable to residential developments. Screening criteria relating to the potential for impact of soil contamination on groundwater were derived in a similar way

6.2 Current Approach

The current land use of the 2009 Masterplan site is varied and includes public open space, community/civic areas, hospital, retail and high density residential and commercial properties. An assessment of soil contaminant concentrations (from previous investigations) in relation to the current condition has been carried out to assess potential risks to human receptors using the site.

Analytical data derived from the investigation has been put into context by comparison with published guidance or derived thresholds values. Current UK guidance published thresholds comprise Soil Guideline Values (SGVs), which are available for a limited number of determinands (Ref 27 to 34) and land uses. For contaminants without published SGVs or where soil conditions are different to those assumed for the published SGVs (6% soil organic matter content and sandy loam soil), Generic Assessment Criteria (GAC) have been derived. The derivation of GACs has been carried out based on published statutory guidance documents (Ref 35 and 36) and with consideration of the most sensitive receptors in the respective CLEA standard land-uses scenarios (the 0 to 6 year old child for the residential with and without plant uptake scenarios and the adult for the commercial / industrial land-use scenario) using the software model 'CLEA 1.04 and associated handbook (Ref 37 and 38). The software model (CLEA 1.04) was issued by the Environment Agency in January 2009 and replaces all the previously issued software versions.

When deriving assessment criteria for contaminants for which updated tox reports are not currently available, health criteria value (HCV) model input parameters have been adopted as issued in the 'old style tox reports'. The old style tox reports will in due course be superseded by new tox reports derived in line with the new

guidance. However, in the interim the Environment Agency advice is to use the old style tox reports as changes associated with the new guidance are unlikely to result in significantly different HCVs.

Assessment criteria for aliphatic and aromatic hydrocarbons bands have been derived also in line with the EA publication 'The UK approach for evaluating human health risks (Ref 39).

In the near future assessment criteria for lead are to be derived using the CLEA 1.04 model. However, in the absence of HCV value for this contaminant, assessment criteria for lead have been adopted as derived and detailed in the old style lead SGV report (Ref 40). Lead assessment criteria as detailed in the old style SGV report had been derived on the basis of a response of the blood lead versus soil and dust lead relationship in line with a model developed by the Society for Environmental Geochemistry and Health (residential) and USEPA (commercial) respectively.

The SGVs have been derived assuming soil type as 'sandy loam' and a soil organic matter (SOM) content of 6%. However as some soil types (such as the Made Ground or River Terrace Deposits) have sandy soils rather then sandy-loam and soil organic matter contents lower than 6%. For these soils we have used a second set of generic assessment criteria that have been derived conservatively assuming sandy soil and 1% soil organic matter content.

Statistical analysis of the soil analytical results has been carried out in general accordance with the EA's 'Guidance on Comparing Soil Contaminant Data with a Critical Concentration' (ref 34) to enable an estimate of the true population mean to be calculated (upper confidence limit of the sample mean, (US95) from the data. The computer package 'ProUCL 4.0' has been used to calculate the US95 value, however the resulting data has also been interrogated to ensure it complies with EA guidance with respect to the distribution chosen to represent the data set. The Maximum Value Test or Outlier Test has also been calculated using ProUCL 4.0 to determine whether or not the data-point is likely to form part of the same statistical distribution. Where a maximum value has been determined as an outlier (confirmed by visual/olfactory evidence as being part of a different soil population) this concentration has not been included in the US95 calculation.

When considering contamination with hydrocarbons such as fuel oils and petroleum it is important to take note of site observations (e.g. regarding odours, the appearance of samples and on-site measurement of vapour concentrations) as well as analytical results. It should also be noted that it is difficult to obtain entirely reliable results for volatile organic compounds such as benzene using disturbed samples, particularly when these are taken from trial pits and there is ample opportunity for loss of vapours to occur.

Assessments are commonly made using broad parameters such as EPH/DRO (extractable petroleum hydrocarbons/diesel range organics), mineral oils and PRO (petroleum range organics) and/or individual compounds such as the BTEX (benzene, toluene, ethyl benzene, xylenes) compounds and MTBE (methyl-*tertiary*-butyl-ether). The use of the broad parameters is made difficult because different analytical methods

give different results, the carbon ranges reported sometime differ and the terminology is not necessarily used in a consistent way. For example, "mineral oil" is sometimes taken as the aliphatic components of EPH but may be determined directly, for example by thin-layer chromatography. A combination of methods has been used in the investigations of the Battersea site. Individual petroleum hydrocarbons have not generally been determined. Where speciation testing has been undertaken for TPHs, assessment criteria for aliphatic (chain) and aromatic (branched) hydrocarbon bands have been derived also in line with the EA publication 'The UK approach for evaluating human health risks' (Ref 35). For samples with no TPH speciation testing undertaken (i.e. 'mineral oil' or TPH C1—C40 concentrations only), these have conservatively been compared with the Inert Waste Acceptance Criteria (WAC) guidelines (ref 36)

Division relevant to receptor

The chemical results from the recent ground investigations have been characterised as Made or Natural Ground and then sub-divided accordingly. The data has been assessed with respect to;

The analytical data from the previous investigations has been assessed with respect to:

- Chronic risks to human health;
- Acute risks to human health;
- Risks to *flora*;
- Risks to buildings/structures; and
- Risks to controlled waters (considered in Sections 8 and 9).

6.2.1 Reporting of data

Chemical testing results are described below and presented in Appendix A of this report as follows;

Table A1 Soil results from Made Ground and Natural Soils (Buro Happold 2001, 2002 and 2004 data);

Table A2 Soil results from Made Ground and Natural Soils (Ove Arup & Partners 1997 data);

Table A3 Soil leachate results;

Table A4 Groundwater results (Buro Happold 2001, 2002 and 2004 data);

Table A5 Groundwater results (Ove Arup & Partners 1997 data);

Table A6 Assessment of Gas Monitoring Results; and

Table A7 Waste classification based on soil values.

7 Data Assessment – Soil

7.1 Chronic risks to human health

7.2 Inorganic soil results – Made Ground

A maximum of 247 soil samples were analysed for inorganic determinands in Made Ground as listed in Appendix A – Tables A.1 & A.2 and summarised in Table 7.1 below. Locations of contamination samples are shown in Figure 9, and concentrations of zinc, lead and arsenic exceeding adopted criteria are shown in Figure 10.

Table 7.1 – Inorganic determinands – Soils

Determinand	No of samples	SGV/GAC samples exceeding SGV / GAC) (No of			Max	Min	UCL95	Outliers (Excluded)
		Commercial / industrial	Residential (without Plant Uptake	Residential (With Plant Uptake)				
Arsenic	247	640	35 (**18**)	32 (**21**)	122	<0.5	13	-
Cadmium	247	300	30 (**1**)	10 (**1**)	140	<0.5	1	TP16/0m (140mg/kg)
Chromium	247	330	38 (**63**)	37 (**68**)	138	4	31	-
Lead	247	750 (**9**)	450 (**52**)	450 (**52**)	15,140	<1	202	TP224A 2.1-2.3 (15,540mg/kg)
Mercury	247	26 (0)	0.4 (**40**)	0.4 (**40**)	41.7	<0.5	0.8	-
Nickel	247	1800 (0)	130 (**2**)	130 (**2**)	172	<1	31	-
Total Cyanide	84	16000 (0)	760 (**1**)	4.5 (**1**)	1314	<1	1	TP201 0.4 (1,134mg/kg)
pH		9.5 (**58**)			6.6	12.9	-	-

All concentrations in mg/kg

With the exception of lead, inorganic determinand concentrations in all samples were below the relevant SGVs/GACs for commercial/industrial land use in Made Ground. Occasional samples recorded elevated concentrations of several inorganic determinands, although not at grossly elevated concentrations.

Some soil samples from Made Ground recorded concentrations of arsenic, mercury, chromium and lead above the SGV or GAC for residential without plant uptake. Occasional exceedences of the residential without plant uptake SGV were recorded for cadmium, total cyanide and nickel. The US95 for arsenic, chromium, cadmium, lead, nickel and total cyanide was below residential without plant uptake SGVs/GACs. The US95 concentrations for mercury exceeded the residential with and without plant uptake GACs. As the datasets were non-normal distribution, the Chebyshev (95%) UCL method was used.

Three samples (TP16/0m, TP224A/2.1-2.3m, TP201/0.4m and TP255/0.5m) recorded the maximum concentrations of cadmium, lead and total cyanide, respectively, with statistical assessment indicating these data as outliers to the main population. The borehole logs for TP224A indicate the presence of hydrocarbon odours and green sheen, indicating the lead could be sourced from localised contamination and are not part of site wide Made Ground soil population. Cadmium and mercury contamination identified at TP16/0m and TP255/0.5m, respectively, is likely to be sourced from Power Station activities at the site and not the Made Ground. Therefore these soil samples were excluded from US95 calculations.

Other potential outliers were identified by ProUCL, however as no localised visual or olfactory evidence of contamination was recorded at the identified location these potential outliers were not excluded from the dataset. It is considered that these samples are representative of the heterogeneity of the Made Ground and are therefore included in the statistical analysis of the data set.

7.3 Organic soil results – Made Ground

A maximum of 148 soil samples were analysed for organic determinands in Made Ground as listed Appendix A – Table A.1 & A.2 and summarised in Table 7.2 below. Due to the age of the data (>10years) and the likelihood of an unknown degree of natural attenuation of hydrocarbons and/or organics, soil concentrations included in the Arup (1997) report have not been included in this report.

Table 7.2 – Organic determinands – Soils (Made Ground)

Determinand	No of samples	SGV/GAC (No of samples exceeding SGV / GAC)			Max	Min	US95	Outliers (Excluded)
		Commercial / industrial	Residential (Without Plant Uptake)	Residential (With Plant Uptake)				
Phenols*	107	970,000 (0)	22,000 (0)	400 (0)	0.54	<0.01	-	-
EPH C10-C12	5	900 (0)	6 (1)	6 (1)	12	2	-	-
EPH >C12 –C16	5	4400 (0)	30 (**1**)	30 (**1**)	71	4	-	-
EPH >C16-C21	5	20,000(0)	350 **(2)**	174 (**2**)	417	103	-	-
EPH C>21-C40	5	28,000 (0)	1300 **(1)**	880 (**4**)	7812	677	-	-
TPH C10-C40	36	500 **(23)**			38,340	20	-	-
Naphthalene	148	110 (0)	0.7 **(53)**	0.7 (**53**)	61.17	0.034	2.832	TP4 0.6m (30mg/kg), TP226D 1.6m (54mg/kg), TP226E 1.3m (61mg/kg)
Benzo(a)pyrene	148	14 (**11**)	1 **(88)**	0.7 (**89**)	152	0.006	5.98	TP4 0.6m (152mg/kg), TP136 0m (93mg/kg), TP226E 1.3m (109mg/kg)

All concentrations in mg/kg

Benzo(a)pyrene concentrations exceeded residential without access to soil GACs in majority of samples, with occasional exceedences of the commercial/industrial GAC also noted. Occasional exceedences of adopted residential GACs for naphthalene were recorded in various samples. No exceedences above adopted commercial/industrial GAC were recorded for naphthalene.

Only one sample exceeded the EPH C10-C12, C12-C16, C16-C21 and C21-C40 adopted GACs for residential (without plant uptake). TPH C10-C40 concentrations (as mineral oils) exceeded Inert WAC criteria in 65% of the soil samples analysed.

The US95 concentrations for benzo(a)pyrene and naphthalene exceeded the residential with and without plant uptake GACs but was less the than commercial/industrial GAC. As the datasets were non-normal distribution, the Chebyshev (95%) UCL method was used. EPH and Mineral Oil concentrations were not included in the

US95 statistical analysis as majority of these samples were targeted for this analysis, therefore a US95 value maybe higher than actual present in a random based dataset was used.

Five samples (TP4 (0.6m), TP136 (B-a-P only) TP226D (1.6m) (naphthalene only) TP226E (2.1-2.3m) and TP201 (0.4m)) recorded the highest concentrations of naphthalene and benzo (a) pyrene with statistical recorded visual and olfactory observations of hydrocarbon contamination or significant quantities of anthropogenic materials (such as clinker, brick and ceramic etc). Other potential outliers were identified by ProUCL, however as no localised visual or olfactory evidence of contamination was recorded at the identified location, it is considered that these samples are representative of the heterogeneity of the Made Ground and are therefore included in the statistical analysis of the data set.

Locations of TPH soil contamination at the site is shown in Figure 11.

7.4 Natural Materials

A maximum of 30 samples of natural materials were analysed for a suite of inorganic and organic determinands in the 1997, 2001, 2002 and 2004 investigations. The large majority of samples recorded concentrations of all determinands below relevant screening values. As for Made Ground samples, organic results for soil samples analysed for the Arup 1997 investigation were excluded from this review. Results are presented in Tables A1 and A2 in Appendix A and summarised in Table 7.3 below.

Table 7.3 – Organic and Inorganic determinands – Soils (Natural)

Determinand	No of samples	SGV/GAC (No of samples exceeding SGV / GAC)			Max	Min	US95 (All)	US95 (RTD)	Outliers (Excluded)
		Commercial / industrial	Residential (Without Plant Uptake)	Residential (Without Plant Uptake)					
Arsenic	21	640 (0)	35 (**1**)	32 (**1**)	72	<0.5	14	13	BH901, BH1100, and BH1002
Chromium	21	330 (0)	38 (**7**)	37 (**8**)	132	15	45	39	
Lead	21	750 (**1**)	450 **(2)**	450 **(2)**	1,468	<1	148	43	
Mercury	21	26 (0)	1.0**/0.4* (0)	1.0**/0.4* (0)	3.6	<0.3	-	-	
TPH C10-C40	15	500 **(3)**			1,659	<500	-	-	

Samples from boreholes BH901, BH1100 and BH1002 were excluded from the dataset as the methods used to collect these soil samples (i.e. cable percussion) may cause cross-contamination by overlying fill layers. Outside of these boreholes, inorganic and organic contaminants (with the exception of chromium) were less than the adopted SGVs/GACs. Concentrations of lead and TPH C10-C40 exceeding adopted SGVs/GACs for commercial/industrial were from BH1100 and BH1002, respectively.

Concentrations of chromium exceeded the adopted criteria for residential (with and without access to soil). These chromium concentrations are likely to represent background concentrations. US95 calculations were less for determinands analysed in River Terrace Deposits than Alluvium.

7.5 Acute Risks to Human Health

There are no guidance values for assessing acute risk related to soil contamination. Because such risks are associated with short term exposure, consideration of maximum concentrations (and not the "average" concentration which is relevant to chronic or long term risk) is required. Comparison of these maximum concentrations has been made with the various SGVs/GACs and other screening values which will provide a conservative benchmark for such short term risks (as the GACs/SGVs are based upon a long term exposure).

In general, the maximum values recorded for both inorganic and organic determinands within Made Ground are not highly elevated. More highly elevated maximum concentrations were recorded for lead, benzo(a)pyrene and TPH.

Potential acute risks could be associated with benzo(a)pyrene and lead in soils. The maximum recorded concentration of lead was up to approximately 30 times the adopted GAC for residential without plant uptake

in and 20 times the adopted SGV for commercial/industrial. The maximum recorded concentration of benzo(a)pyrene was up to approximately 140 times the adopted GAC for residential without plant uptake and over 12 times the adopted GAC for commercial/industrial land use. These elevated concentrations appear to be isolated/localised within the upper 1.3m of Made Ground in the vicinity of the Power Station building. Based on the isolated nature of contamination and the current lack of human receptor (other than occasional site visitors) in this area of the site, the acute human health risk is assessed as low.

7.6 Asbestos

Asbestos screening was undertaken on several soil samples from within Made Ground soil samples in the previous investigations, and no asbestos fibres were detected in the samples. However this does not preclude the trace presence of bonded/cemented fragments of potential asbestos containing materials (ACM) being present across the site as significant amounts of ACM were likely to have been utilised in the construction of power station; for instance, asbestos containing materials were recovered in 1987 as part of the original leisure development (ref 7).

7.7 Risks to *Flora*

Phytotoxic effects with respect to *flora* have been assessed by statistical evaluation of the datasets of the phytotoxic elements copper and zinc from the previous (i.e. post 2000) investigation data. Values were compared to Dutch Intervention Values (DIVs, ref 37). Results are summarised in Table 7-4.

Table 7.4 - Phytotoxicity assessment

Material	Determinand (mg/kg)	No of samples	Dutch Intervention Value (DIV)	Max	Min	US95 (exc. Outliers)	Outliers
Made Ground	Copper	315	190 **(27)**	5,808	<1	56	TP4 0.6m (5,808mg/kg),
	Zinc	315	720 **(14)**	4,094	10	150	TP4 0.6m (4,094mg/kg), TP16/0m (4,161mg/kg)
Alluvium	Copper	13	190 **(2)**	429	<1	-	BH1100 and BH1002
	Zinc	13	720 **(1)**	990	28	-	
River Terrace Deposits	Copper	12	190 **(0)**	21	<1	-	-
	Zinc	12	720 **(0)**	147	21	-	-

All concentrations in mg/kg

Occasional samples of Made Ground recorded elevated concentrations of copper and zinc above relevant thresholds. Two statistical outliers, TP4/0.6m and TP16/0m, were excluded from the US95 calculations. Heavy metal contamination identified at TP16/0m is likely to be sourced from Power Station activities at the site. Significant quantities of anthropogenic materials (such as clinker, brick, ceramic etc) were noted at 0.6m at TP4, and are likely to be acting as a local source of contamination. Therefore these two samples were excluded from statistical analysis. Other potential outliers were identified by ProUCL, however as no localised visual or olfactory evidence of contamination was recorded at the identified location. It is considered that these samples are representative of the heterogeneity of the Made Ground and are therefore included in the statistical analysis of the data set. The US95 for copper and zinc was below the DIV in all soil units.

Two samples (BH1100/4.5m, BH1001/10m) recorded the maximum concentrations of zinc and copper in natural soils. Samples from boreholes BH1100 and BH1002 were excluded from the dataset as the methods used to collect these soil samples (i.e. cable percussion methods) may cause cross-contamination by mixing overlying fill layers. Excluding these outliers, zinc and copper concentrations in natural ground were less than the adopted DIV.

8 Soil leachability and groundwater data assessment - contaminant source characterisation

8.1 Approach

Potential risks to controlled waters have been assessed by examining soil leachability data as well as groundwater data from the site. For the initial data assessment the principal thresholds adopted for assessing potential risks to the Major Aquifer were the UK Drinking Water Standards (DWS) (ref 38). World Heath Organisation (WHO) guidelines (ref 39) have been used where no UK DWS are available. Based on background information supplied by the EA, monitoring points along the River Thames at Barnes Bridge and London Bridge (both approximately 500m west and east of the site, respectively) recorded conductivity readings indicating a fluctuating salinity from fresh to brackish. Therefore, for assessing potential risks to River Thames, Marine/Coastal Environmental Quality Standards (EQS's) derived under the requirements of the EC Dangerous Substances Directive (ref 40) have been adopted. EQS's have been selected, where necessary, to be protective of *Cyprinid* fish. The Environment Agency non-statutory EQS (operational EQS) (ref 41) with UK DWS and the Water Framework Directive (WFD) Environmental Quality Standards for Annex VIII substances (ref 42) have been adopted where no EQS is available.

8.2 Leachability Data

Soil leachability testing has been undertaken on representative samples from the previous investigations following guidance within Environment Agency (2006) Remedial Targets Methodology (ref 43), specifically:

- BSEN 12457 Part 3 (Two Stage Test using a liquid to solid ratio of 2:1 in the first stage and a liquid to solid ratio of 8:1 in the second stage [Where 2:1 and 8:1 results are available for a sample the higher result of the two is used (which is generally the 2:1 result) in the following assessment]; and
- BSEN 12457 Part 2 (One Stage Test using a liquid to solid ratio of 10:1).

Majority of the leachate samples collected and analysed in the previous investigations were analysed using superseded analytical methodology (NRA leachate test, which doesn't take into account moisture content as per the BSEN tests). These leachate results have not been looked at in this report. Eight soil samples were analysed under BSEN 12457 Part 3, and a summary of results in presented in table 8.1 and Appendix A.

Table 8.1 Determinands showing exceedences of thresholds in groundwater

Soil Determinand	No of samples	Adopted Screening Criteria (No. of samples exceeding adopted criteria)		Max	Min
		Marine water EQS Standards	Relevant to Major Aquifer		
Arsenic	8	0.025 **(1)**	0.01 **(1)**	0.025	<0.001
Copper	8	0.005 (**6**)	2 (0)	0.031	0.001
Zinc	8	0.04 (**5**)	-	0.367	0.013
Ammoniacal Nitrogen as N	8	0.6 **(2)**	0.5 **(2)**	5.6	<0.04
Sulphate	8	400 **(4)**	250 **(5)**	1502	14
EPH (Mineral Oil)	8	-	600 **(5)**	22,248	107
Benzo (a) pyrene	8	0.03 (0)	0.01 **(2)**	1.804	<0.01
PAH (UK 4)	8	-	0.1 **(2)**	5.674	<0.01

All results in mg/L unless otherwise stated

All other determinands recorded concentrations below these thresholds.

Potential risks to controlled waters have been assessed by examining the soil leachability data as well as groundwater data. A total of eight soil samples (from Made Ground) were scheduled for leachability testing as described above. Groundwater was sampled from several locations at part of the 1997, 2002 and 2004 ground investigations. Soil leachability data and groundwater data are presented as Table A.3 and A.4 in Appendix A respectively.

River Thames is located along the northern boundary of the site, and is upstream of the tidal Thames estuary. Based on a review of the data, zinc concentrations in leachate samples were less than the (hardness corrected) surface water directive screening levels for cyprinid fish.

8.2.1 Leachability

The leachate from several soil samples recorded concentrations of arsenic, copper, zinc, ammoniacal nitrogen, SO4, EPH (Mineral Oil) & B(a)P above the screening thresholds. These exceedences represented approximately 50% of samples analysed for these analytes, indicating copper, zinc, PAH, B(a)P, ammoniacal

nitrogen are reasonably leachable within Made Ground soils across the site. The source of metals is likely to originate from ashy material within the Made Ground. Furthermore, the soil analytical results for B(a)P determinands in Made Ground are highly elevated, acting as the source of relatively highly leachable B(a)P.

8.2.2 Groundwater

8.2.2.1 Field observations

During groundwater sampling, approximately 3cm to 5cm of Light Non-Aqueous Phase Liquid (LNAPL) was observed in BH2020 (and was sampled). No LNAPL (with the exception of the sheen described above) or dense non-aqueous phase liquids (DNAPL) were detected in any of the boreholes during the monitoring periods. Determinands with one or more exceedences of relevant screening criteria are summarised in Table 8.2 below. Locations of groundwater samples are shown in Figure 12. Locations of Ammoniacal Nitrogen and PAH contamination is shown in Figures 13 and 14, respectively.

Table 8—2 Determinands showing exceedences of thresholds in groundwater

Determinand	No of sampling locations	Adopted Screening Criteria (No. of samples exceeding adopted criteria)		Max	Min
		Relevant to Marine water EQS	Relevant to Minor Aquifer		
Mercury	39	0.0003 **(1)**	0.001 (0)	0.0004	<0.0001
Arsenic	49	0.025 (**1**)	0.01 (**5**)	0.026	0.01
Copper	46	0.005 **(1)**	2 (0)	0.140	<0.001
Nickel	39	30 (**1**)	20 (**2**)	0.03	<0.001
Zinc	53	0.04 **(1)**	-	0.243	<0.003
Ammoniacal Nitrogen as N	36	0.6 (**15**)	0.5 **(18)**	53.1	<0.2
pH units	52	6.0-9.0	>6.5 **(1)**	8.21	6.4
Benzo(a)pyrene*	29	0.00003 **(3)**	0.00001 **(4)**	0.066	<0.00001
PAHs (UK4)	29	-	0.0001 **(3)**	0.03413	0.00001
EPH (DRO) C10-C40	26	-	-	425	<0.01

All results in mg/L *Does not include Arup 1997 data for organic compounds.

8.2.2.2 Metals / Inorganics

Occasional samples of groundwater recorded slightly elevated concentrations of arsenic, mercury, nickel, copper and zinc. Most wells recorded all determinands less than adopted screening criteria. Arsenic concentrations were recorded at higher levels (and exceeding relevant criteria) in the 1997 Arup investigation compared to Arsenic concentrations from samples collected in 2002 and 2004 investigations. The laboratory limit of detection for some determinands (specifically zinc and copper) is higher than the marine water EQS in the 2002 data. This is attributable to the analysis preceding the guideline criteria; therefore the laboratory detection limits were higher than what is available at present for this analytes. This is not considered significant as generally concentrations of these metals in soil samples were not at significantly high levels.

Concentrations of ammoniacal nitrogen were elevated above adopted screening criteria relevant to the Minor Aquifer and River Thames in majority of groundwater samples. In particular, a significant concentration of ammoniacal nitrogen was detected in BH 2018. This borehole is situated adjacent buried putrescible waste, which could be contributing to high ammoniacal concentrations. Ammoniacal nitrogen contamination is likely to originate from breakdown of organic material (possibly natural organic soils) beneath the site or degrading petroleum hydrocarbon at the site. Another source of ammoniacal nitrogen could be potential petroleum hydrocarbon contamination within the groundwater beneath the gasworks located along the southern site boundary. The site is down hydrogeological gradient from the gasworks, particularly during a low tide, resulting in the potential migration of ammoniacal nitrogen (a by-product of hydrocarbon degradation in groundwater) onto the site.

8.2.2.3 Organics

Concentrations of benzo(a)pyrene and PAHs (UK4) were above adopted screening criteria in groundwater wells BH2011 and BH2020, with concentrations detected in BH2020 significantly exceeding the criteria by over three orders of magnitude.

Elevated TPH C10-C40 concentrations were detected in groundwater wells (BH2020, BH1100, BH203, BH702, BH2005, BH2018, BH2024A, BH2039B and BHAW01) sampled, and with the exception of BH2020 all TPH C10-C40 concentrations in groundwater samples were less than 1,100µg/L. BH2020 is situated immediately west of one of the oil drains. Inconsistent readings of TPH were recording between some groundwater monitoring rounds in 2004. This could be attributed to tidal influences or poor decontamination techniques during sampling. TPH C4-C12 and BTEX concentrations were less than the laboratory lower limit of reporting.

Hydrocarbon contaminants (i.e. MTBE and BTEX) were detected in groundwater samples in the FES 1997 field investigation at concentrations less than adopted EQS Given the age of this groundwater data and the likelihood of natural attenuation of hydrocarbons since 1997, organic analytes (i.e. phenols, PAHs, BTEX, VOCs, MTBE, Mineral Oil) has not been included as part of this assessment. In addition, the laboratory lower

limit of reporting for several inorganic compounds (copper, lead and cyanide) analysed in the 1997 investigation are higher than the adopted guideline criteria.

8.3 Risks to Buildings/Services

An assessment of the risk to buried concrete and other building materials from ground contamination is included in the Buro Happold Ltd 2006 addendum Report (ref 10). The site was classified as a DS-2 classification based on SD1- Concrete in Aggressive Ground (ref 44).

As conventional water pipe work in the proposed development is likely to be laid within natural soils (River Terrace Deposits and London Clay Formation), contaminant concentrations have been compared against threshold values derived by Water Regulations Advisory Scheme (WRAS) (ref 45). Where soil concentrations exceed these threshold values, it is likely that special consideration of material selection will be required. Numerous concentrations of arsenic, sulphate and pH were elevated above WRAS material selection threshold values in River Terrace Deposits. Arsenic is classed as a toxic contaminant, whereas pH and sulphate are corrosive.

With reference to Table 3 of WRAS Information and Guidance Note: No 9-04-03 (ref 45), suitable pipe materials for organic and corrosive environments include wrapped iron or polythene/aluminium/polythene. Suitable pipe materials for toxic contaminants include metal or plastic.

9 Data Assessment – Ground Gas

9.1 Programme

Ground gas monitoring was undertaken at 47 locations across the site, majority of which were installed within Made Ground soils, since 1993. This monitoring programme comprised between three and ten visits over a total ten month period Majority of gas wells were monitored over 3 to 4 monitoring rounds in 2004 and/or 2002. Gas wells at 28 Kirtling Street were monitored over two rounds only in 2001. Table 9-1 shows a summary of elevated results from the previous investigations. Locations of ground gas measurements are shown on Figure 15.

Table 9-1 Summary of elevated ground gas monitoring results from previous investigations

Borehole	Date	Geological Units Screened	Max. Carbon dioxide (%v/v)	Max. Methane (% v/v)	Min. Oxygen (% v/v)	Max Flow (l/hr)
BH102	1997	MG/RTD	5.2	0.1	4.2	-
BH201	2002	MG, ALL, RTD	6.7	<0.1	10.4	0
BH602A	2002	MG, ALL(?), RTD, LC	6.0	<0.1	2.0	0
BH2015	2004	MG, RTD, LC	6	<0.1	15.7	3.8
BH2020	2004	MG, ALL, LC	5.5	<0.1	11	0.4
BHGW01	2004	MG, RTD	11.6	3.9	3	3

MG = Made Ground, ALL = Alluvium, RTD = River Terrace Deposits, LC = London Clay Formation

Elevated concentrations of methane up to 3.9% v/v and up to 11.6% v/v carbon dioxide were recorded in BHGW01, which is located in the north-west corner of the power station and is associated with recently placed fill containing putrescible matter. Methane was also detected in BH2026, which is located southeast of the Power Station building. Borehole logs for this well indicate 4m of Made Ground containing organic matter and slag and other anthropogenic material in a sandy matrix.

Concentrations of carbon dioxide varied across the site, with elevated concentrations up to 11.6% recorded in BHGW01. Sixteen other locations recorded carbon dioxide concentrations over 1% during the 2002 or 2004 monitoring rounds.

A photo-ionisation detector (PID) was used to provide a screen for Volatile Organic Compounds (VOCs) present in the soil gas during the 2002 and 2004 monitoring rounds. Two locations (BH201 and BH203) recorded minor concentrations of VOCs (between 50ppm and 195ppm) in the 2002 monitoring round. Negligible VOC readings were recorded in other monitoring wells during this period.

Variable flow rates were observed, ranging from -2.5l/hr up to 2.7/hr but did not differ significantly between response zone stratum. Hydrogen sulphide concentrations were not recorded in the 2002 monitoring round, and carbon monoxide concentrations were not recorded in either monitoring round or the 28 Kirtling Street monitoring round. Gas samples were not collected for laboratory analysis.

Gas wells screened within alluvium units did not record methane concentrations, and methane concentrations are likely to be associated with Made Ground.

9.2 Assessment of methodology

The soil data has been assessed with reference to CIRIA report C665 (ref 46) and British Standard 8485 (ref 47) Consideration has therefore been given to both methane and carbon dioxide concentrations as well as emission (flow) rates. The Gas Screening Value (GSV) is defined as the product of gas concentration multiplied by flow rate. The GSV is then considered with other parameters/limiting conditions to define a Characteristic Situation. The Characteristic Situation in turn identifies the need for and scope of any necessary gas protection measures. Assessment of the ground gas results for each monitoring round is provided in Appendix A as Table A6.

Borehole BHGW01 recorded a GSV of 0.19 l/hr indicating the ground gas regime in Made Ground falls within Characteristic Situation 2 (Table 8.5, CIRIA Report C665, ref 46) which would require protective measures for office/commercial/industrial development. Majority of the Made Ground and alluvium soils will be excavated as part of the redevelopment works, and remaining in-situ soils will not be occupied by buildings. Based on existing data from gas monitoring wells screened in the London Clay Formation (which we be the unit beneath the proposed buildings), the site may not require gas protection measures, however this could only be confirmed by further testing.

10 Contaminated Land Risk Assessment

10.1 General approach

In the UK, the assessment of risk from contamination follows the source=>pathway=>receptor approach. If one of these three elements is absent it is considered that there is no risk of harm. If, however, there is considered to be a linkage between any given source and any given receptor then a risk-based approach is used to assess the significance or impact of any such linkage.

Source – The contaminants that have the potential to have an adverse affect on human health and/or the health of the environment, including controlled waters (i.e. the hazard);

Pathway – The potential route by which a receptor may come into contact with the source; and

Receptor – The specific group of human beings or aspect of the environment (e.g. controlled waters) that could be affected by the source.

Risks are defined as the probability of an event occurring combined with the severity of the consequence of that event occurring. Particularly, to assess the risk to site end-users posed by any given source, the sensitivity of each receptor is considered. For example, the concentration of contamination acceptable at a site to be developed as a residential property with a garden used to grow vegetables and accessible to young children is set lower than that for a commercial site where soil is exposed in minor areas of landscaping and the only long-term users of the site are adults. Similarly, a site overlying a major aquifer supplying potable water to a large population will be considered more stringently than a site overlying impermeable geology with only minor seepages of groundwater from site soils.

10.2 Sub division of chemical data

Receptors taken into account in the assessment of the Power Station Site include;

1. in its present condition:
    - site users including: trespassers, casual visitors, maintenance workers and ground workers.
2. during construction:
    - construction and ground workers;
    - site users;
    - occupiers and users of neighbouring properties;
    - groundwater; and

    - surface water (The River Thames).
3. when development has been completed:
    - future users of commercial premises and landscaped areas;
    - groundwater;
    - surface water;
    - building materials and services; and
    - landscape planting.

It has generally been assumed in the assessment that any Made Ground that is left in place will be either covered by buildings or hardstanding (i.e. there will be no access by site users). Any soft landscaping areas created will be separated from the Made ground by a suspended slab.

The general issues related to specific analytes are summarised in Table 10.1 below.

Table 10.1 Contaminant Toxicity

Contaminant(s)	Principal Hazard/Reasons for Concern	Secondary Concerns
Lead and PAHs	Potentially harmful to human health. Some PAHs are human carcinogens.	Potential water pollutants.
Petroleum hydrocarbons including mineral oils, DROs, PROs, kerosene residues etc.	Potentially harmful to human health but risks are difficult to assess for these composite parameters. List I substances that are not permitted to enter groundwater.	Hydrocarbons may attack or penetrate plastics (e.g. water supply pipes)
Sulphate	Water-soluble sulphate aggressive to cement based materials such as concrete. Potential water pollutants.	Water soluble sulphate also toxic to plants and a water pollutant.
Copper, nickel, zinc	Toxic to plants and soil micro-organisms (note some other contaminants may also be toxic to the latter). Potential water pollutants.	

10.3 Conceptual Site Model

The potential risks posed to human health and the environment by ground contamination at this site have been evaluated using a detailed quantitative risk assessment which incorporates the ‘source-pathway-receptor’ identification and assessment methodology in accordance with CLR 11 (ref 1). The risk assessment process therefore involves the identification of each site specific source based on both desk based and chemical

information obtained from the site investigation together with identification of each relevant exposure pathway and each potential receptor. The potential risks to the receptor are then assessed by considering the potential effect of the source on the receptor as well as the likelihood of a pathway linking the two, i.e. a pollutant linkage as discussed above. A conceptual site model for each stage (i.e. current state, during construction and proposed site use) are presented in Figures 16 to 18.

10.3.1 Potential Sources

Based on the desk based and site investigation data obtained to date, the potential sources of contamination that may reasonably affect receptors on the site are summarised in Table 10.2 below.

Table 10.2 Potential Contamination Sources

Potential Source(s)	Location	Potential Contaminants of Concern/Comments
Made Ground	Across Site	Heavy metals, asbestos, polycyclic aromatic hydrocarbons (PAHs), Total petroleum hydrocarbons (TPH), Polycyclic Biphenyls (PCBs), carbon dioxide, methane. Potential method of contamination is from historical leaks and spillages across site.
Oil Storage Sumps/Drains	Along Eastern and Western side of Power Station	*TPH, PAHs, Phenols, Mineral oils.* Residual oils (from former Power Station activities) may be present within the drains and sumps.
Ash Sumps	Along Southern Site Boundary	*TPHs, Heavy Metals, PAHs, Phenols.* Ash was not noted in sampling locations within the sump, however ash material could be encountered during excavation in this area.
Former Thames Water Depot	28 Kirtling Street	*TPHs, Heavy Metals, PAHs.* From spillages/leakages associated with the former depot.
Hazardous construction materials	Across Power Station Site	*Asbestos Fibres.* ACM materials have been removed from the site, however trace amounts may remain.
Off-site Gas Works	Located 50m south of main Power Station Site	*TPH, BTEX, PAHs, methane, carbon dioxide.* Victorian era gas station, featuring gasometers.

During operation of the Power Station, there were several contaminative activities occurring (as identified in Section 3 and Figure 5). With the exception of the ash sumps, oil sumps and oil drains, majority of these sources (i.e. railway, water treatment area, gas washing tower, tippler house, coal storage, turbines, pumps,

boilers, capacitors, transformers and workshops) have been removed. Contamination from these (former) activities is predominantly located within the Made Ground. In addition, based on the nature of the development (i.e. large scale Made Ground excavation), contamination arising from these former sources is likely to be dispersed within the excavated Made Ground.

Based on this the Made Ground has been classed as a contamination source rather than dividing up the source into several (redundant) sources. As the oil drains/sumps and ash sumps are a significant (and currently in-situ) contamination source that could significantly impact in all three stages (i.e. current use, construction and proposed site use), these structures are listed as individual potential contamination sources.

10.3.2 Potential Receptors and Pathways

Site specific pathway receptor linkages have been identified for the site (Table 10.3 below) with respect to the sources outlined above with respect to the anticipated future uses of the site as described in Section 1.1.

Table 10.3 Potential Receptors/Pathways

Receptor		Pathway
Human Health	Current site users (recreational users, children attending local secondary school)	Direct contact and dermal uptake, soil ingestion, gas and vapour inhalation (outdoor air)
	Enabling works and construction phase workers.	Direct contact and dermal uptake, soil and dust ingestion including asbestos fibres, gas and vapour inhalation.
	Site end users (users of commercial areas)	Direct contact and dermal uptake, soil and dust ingestion including asbestos fibres, gas and vapour inhalation. Ingestion of contaminated water supplies.
	Offsite users (specifically commercial and high density residential areas south and east of the site)	Soil and dust ingestion during enabling works/construction including asbestos fibres, gas and vapour inhalation, ingestion of contaminated water supplies.
Controlled Waters	River Thames	Leaching and groundwater transport/surface runoff
	River Terrace Deposits Aquifer	Leaching and groundwater transport.
	Thanet Sand Aquifer	Leaching and groundwater transport.
Flora		Direct contact and up-take *via* root system.
Buildings/Services	On site structures (including water supply pipes)	Direct contact/ permeation of plastic pipe work by contaminants in soil and leachate.
	Offsite structures (including water supply pipes)	Direct contact/ permeation of plastic pipe work by contaminants in leachate.

10.3.3 Risk Assessment

The details of the Generic Quantitative Risk Assessment are presented in Tables 10.4 (existing site condition), 10.5 (enabling works/construction phase condition), and 10.6 (proposed site condition) and the results/ conclusions discussed in Section 12.

It should be noted this risk assessment has been completed without consideration of potential remedial measures however does assume use of standard site health and safety procedures and appropriate personal protective equipment (PPE) and site management practices (stockpile management, surface drainage etc). A summary of key details with respect to the existing, construction phase and proposed development conditions is provided below prior to the risk assessment:

Existing condition: Derelict commercial/industrial use [Table 10.4];

Enabling works/construction phase: Significant excavation phases including stockpiling on-site and transport off site by barge and road, renovation of existing structures (e.g. Battersea power Station), demolition of existing structures (such as 28 Kirtling Street), construction of proposed buildings and landscaping[Table 10.5]; and

Proposed development: Mixed use development including retail blocks, basement car parking, hospital, public open space and residential uses [Table 10.6].

Table 10.4. Generic Quantitative Risk Assessment: Current site condition

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
Made Ground	Site Wide	Locally elevated heavy metals, B(a)P, PAH, ammonia & TPHs						**Generally sourced from historical leakages and spillages associated with former site uses associated with the Power Station. Includes buried putrescible waste located north of Power Station building.** **Occasional concentrations of metals (As, Cd, Cr, Pb, Ni) > SGVs/GACs for residential without plant uptake, concentrations of Pb exceeding commercial/industrial SGVs. Conservative US95 > SGV for residential with plant uptake for Cr and Pb, remainder of US95 calcs for metals < GACs for residential (with & without plant uptake). Elevated concentrations of B (a) P > GAC for residential with plant uptake and commercial/industrial.** **Occasional concentrations of metals (predominantly arsenic, copper, and lead) and B (a) P slightly elevated in soil leachate. Soil leachability considered to be high.**
			Existing site users	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Metal and hydrocarbon contamination present in surface soils across site. Period of exposure unlikely to be prolonged as majority of the site is not occupied. 28 Kirtling Street is tarmac paved, therefore Thames Water workers have no contact with contaminated ground. No ground disturbance in existing condition.
			Adjacent site users	Dust ingestion/inhalation.	Medium	Low Likelihood	Moderate / Low	Lack of grass and tree cover may not prevent soil dust generation. No ground disturbance in existing condition. Metal contamination on ground surface,
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Likely	Moderate	Direct pathway between source and receptor (aquifer lies beneath Made Ground), leachable soils. Majority of site exposed soil allowing high levels of infiltration. Benzo(a)pyrene mobile or present at high concentrations. Minor aquifer is likely connected with River Thames. Site overlies a Major Aquifer which is separated from the minor aquifer by an aquitard (London Clay Formation). The site is not within a source protection zone. Groundwater abstraction located in northern portion of site, and adjacent NE site (within Thames Water Treatment Plant)
			River Thames	Migration of potential contamination via underlying permeable strata and runoff.	Medium	Likely	Moderate	Majority of site exposed soil allowing high levels of infiltration. Benzo(a)pyrene mobile or present at high concentrations. Minor aquifer is likely connected with River Thames. Site overlies a Major Aquifer which is separated from the minor aquifer by an aquitard. The site is not within a source protection zone. No surface water abstraction points within 500m of the site.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
		Soil Gas (VOC, hydrogen sulphide, Methane and Carbon Dioxide)						Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%) near Power Station building. The site falls under characteristic situation 2. Negligible levels of VOCs recorded. Putrescible waste noted northwest of power station building. Minimal organic component in mMade Ground etc
			Existing site users	Inhalation (indoor/outdoor air)	Severe	Unlikely	Moderate/Low	Potential for build up to hazardous concentrations in existing buildings onsite (particularly within service tunnels), however gas flow rates consistently low (<3.8l/hr) over monitoring period.
			Offsite users and structures	Migration into and build up/possible explosion in occupied buildings	Severe	Unlikely	Moderate/Low	Residential properties located to the south and east of site. No known evidence/records/complaints of odours by offsite users/residents.
		Phytotoxic metals	Flora	Direct contact, up-take via root system	Minor	Unlikely	Very Low	**US95 soil results for copper and zinc > DIV.** Minimal Vegetation on-site (mostly invasive weeds).
Alluvium	Site Wide	Soil Gas (hydrogen sulphide, Methane and Carbon Dioxide)						Alluvium clay layers noted across site. Variable in thickness across site. Gas monitoring during site investigations recorded slightly elevated concentrations of CO2 (max 11.9% in BH2020). Low flow rates. Gas wells screened through alluvium recorded minimal (i.e. <0.1%v/v) CH4 concentrations. Characteristic Situation 2. Negligible concentrations of H_2S recorded. Made Ground and hydrocarbon contamination also likely to contribute to ground gas regime more than alluvium.
			Existing site users	Inhalation (indoor/outdoor air)	Severe	Unlikely	Moderate/Low	Low gas concentrations recorded in wells screened in alluvium. Potential for gas ingress into tunnels, possibly from a combination of alluvium, Made Ground and hydrocarbon contamination sources.
Oil drains and sumps	Drains located either side of the Power Station building, sumps located SW and NE corner of building.	PAHs (including B(a)P), PCBs, hydrocarbons,						Oil sumps and drains located along SW and NE of the site. Sumps contain oil/water mixture. Hydrocarbon contamination (in soil and groundwater) noted in the vicinity of oil sumps/drains (particularly around TP264 and TP54 series of test pits). Hydrocarbon contamination detected in groundwater wells (BH2020 and BH2024) adjacent drains. PCBs in soil recorded at concentrations less than the laboratory limit or reporting.
			Existing site users	Dermal uptake, soil and dust ingestion.	Medium	Low Likelihood	Moderate / Low	Hydrocarbon contamination based on this source is predominantly sub-surface. Oil/water mixture in sumps and drains can be accessed. Period of exposure unlikely to be prolonged as site is not occupied. No ground disturbance in existing condition.
			Adjacent site users	Dust ingestion/inhalation	Medium	Unlikely	Low	Hydrocarbon contamination in soils/groundwater, possibly associated from oil sumps/drains, does not migrate off-site. Adjacent Thames Water borehole is located in different aquifer. Majority of surrounding properties have minimal access to water.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Likely	Moderate	Direct pathway between source and receptor. High infiltration potential (minimal hardstanding adjacent oil drains/sumps) leachable soils. Site is not within a source protection zone. Significant TPH contamination detected in groundwater wells adjacent western and eastern oil drains (wells BH2020 and BH2024, respectively) in 2004. Possibility of natural attenuation unlikely given source is still present on-site. Secondary contamination source associated with hydrocarbon contaminated soils.
			River Thames	Migration via underlying permeable strata and runoff.	Severe	Low Likelihood	Moderate	Groundwater wells located between source and River Thames did not detected significant concentrations of hydrocarbons. Groundwater contamination may migrate towards river Thames over time. Possibility of surface run-off containing hydrocarbons from impacted soils not significant given heavier fraction hydrocarbon contamination binding to soils. No surface water abstractions within 500m of site.
		Soil Gases (VOCs, methane, carbon dioxide)						Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%). Site falls within CS2 within main. Negligible levels of VOCs recorded. Likely associated with other sources (i.e. Made Ground, alluvium).
			Existing site users	Inhalation (indoor/outdoor air)	Severe	Low-likelihood	Moderate	Low potential for build up to hazardous concentrations in existing buildings based on this source. No buildings situated in adjacent sumps/drains. Possibility for gas build up in service tunnels, drains and sumps.
			Adjacent site users and structures	Migration into and build up/possible explosion in occupied buildings	Severe	Low-likelihood	Moderate	Residential properties located to the south and east of site. Low likelihood of gas building up in off-site sources due to hydrocarbon contamination associated with this source.
Underground Ash Sump	South of Power Station Building	Metals, PAHs, Hydrocarbons						Underground ash sump located south of the power station. Boreholes BH302 series (A, B and C) drilled within sump- sump filled with heterogeneous Made Ground. Base of sump not proved (anecdotally thought to be -16mOD)-concrete obstructions struck at 4.0mbgel to 8.0mbegl). No significant hydrocarbon contamination observed (i.e. odours, free phase). No groundwater samples collected in vicinity (i.e. 50m) of Ash Sump.
			Existing site users	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Hydrocarbon contamination based on this source is predominantly sub-surface. Period of exposure unlikely to be prolonged as site is not occupied. No ground disturbance in existing condition.
			Adjacent site users	Dust ingestion/inhalation	Medium	Unlikely	Low	Hydrocarbon contamination in soils/groundwater, possibly associated from oil sumps/drains, does not migrate off-site. Adjacent Thames Water borehole is located in different aquifer (Thanet Sands). Majority of surrounding properties have minimal access to water.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Low Likelihood	Moderate	Direct pathway from leachate/groundwater within sump. Integrity of concrete sump unknown (it is noted that boreholes were extended to 8mbgel in sump without striking groundwater). Impacts of ash sump of minor aquifer unknown, however groundwater wells in the southern area of the site do not show significant contamination (that could be attributed solely to the ash sump). .
			River Thames	Migration via underlying permeable strata	Medium	Unlikely	Low	Basement foundations of Battersea Power Station would inhibit groundwater flow from around the ash sump to the river Thames (located north of the site). No surface water abstractions within 500m of site.
Hazardous construction materials	Across Site	Asbestos						Asbestos containing materials used in Power Station construction. Asbestos was removed in 1987 (ref 7). Soil samples analysed for asbestos did not detect any fibres. Possibility for relict asbestos to be present on-site.
			Existing site users	Dust ingestion/inhalation.	Severe	Unlikely	Moderate	No excavation of site during present use. Asbestos fibres not detected in previous field investigations. Minimal personnel currently on-site. Any asbestos present will likely be in cement bonded form.
			Adjacent site users	Dust ingestion/inhalation.	Severe	Unlikely	Moderate	No excavation of site during present use. Asbestos fibres not detected in previous field investigations. Any asbestos present will likely be in cement bonded form.
Off-site gas Works	Southern area of site	Petroleum hydrocarbons, BTEX, PAHS, oils						Large gasholders are located off-site, adjacent the south-western corner of the site. Sampling locations (BH401, TP271, TP272) adjacent the SW boundary of the site did not record significant (i.e. >GAC) hydrocarbon/PAH impact at depth (i.e.>1mbgel) that could be attributed to gas works. Groundwater sampling in BH401 did not record TPH/PAH contamination > EQS guidelines.
			Existing site users	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	No significant contamination attributable to the gas holder station. Isolated PAH soil contamination in the upper 1m of soils in the south-western corner of the site likely to be attributed to historical on-site spillages rather than the gas works. Minimal personnel currently on-site in this area.
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Unlikely	Low	Groundwater sampled from nearby well (BH401) did not record hydrocarbon contamination in 2004. No on-site groundwater abstractions in this corner of the site.
		Soil Gases (VOCs, methane, carbon dioxide)	Existing site users	Inhalation (indoor/outdoor air)	Severe	Unlikely	Moderate / Low	Low potential for build up to hazardous concentrations in existing buildings based on this source as no buildings are situated in adjacent gas works. Ground gas (specifically CH_4, VOC and CO_2) concentrations in this area of the site are

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	Affected	Contaminants of Concern			Consequence	Probability	Risk	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
								relatively low (CS1/2).

10.4 Summary of risk assessment under current conditions

Risks to people

The human receptors potentially at risk under current conditions are the people who visit/use the site together with residents of neighbouring properties. The potential risks to people both on and off-site associated with ground gases are assessed as Moderate to Moderate/ Low. This reflects the nature of the soil gas regime and the lack of hardstanding across the site (which has the potential to cause lateral migration of gas). The assessment of the potential risks to visitors/users of the site associated with solid contamination (primarily in Made Ground materials) vary from Moderate/Low to Low, reflecting the recorded concentrations, limited period of exposure and the lack of widespread hardstanding across the site. The potential risks to adjacent site users are generally Moderate/Low, based on risks associated with the possibility of dust inhalation associated with the potential generation of dust (from contaminated soils).

Risks to *flora*

The potential risks to *flora* associated with the presence of phytotoxic metals in the Made Ground are assessed as Low reflecting the lack of the existing (native) *flora*, the recorded levels of contamination, but also the unsuitable nature of the made ground soils as a growing medium.

Risks to controlled waters

There are currently potentially significant risks to both groundwater and surface waters related to both the contaminated soils (mostly in made ground) and leachate. The risks to groundwater (the Minor Aquifer) are typically Moderate reflecting the presence of contamination hotspots, the absence of any barrier to rainfall infiltration in some areas, the shallow depth to groundwater and the proven presence of isolated hotspots of contaminants in the groundwater/leachate. Although the site is not within a Source Protection Zone, there are local abstractions (albeit in areas currently not significantly contaminated), and groundwater is likely to be hydraulically connected to River Thames. Groundwater wells adjacent to the river Thames did not contain significant concentrations of contaminants in the previous 2004 monitoring round, however the presence of a secondary source (i.e. contaminated, leachable soils) indicates that future contamination of River Thames from migrating contaminated groundwater at the site cannot be precluded. Therefore, based on the current site use, the risks to surface water (River Thames) are generally moderate reflecting the potential for contamination. The risks to major aquifer are considered very low reflecting contamination present in the minor aquifer and presence of aquitard (i.e. London Clay Formation) between the minor and Thanet Sand aquifers.

Table 10-5- Generic Quantitative Risk Assessment: Construction Phase

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
Made Ground	Site Wide	Locally elevated heavy metals, B(a)P, PAH, ammonia & TPHs						Generally sourced from historical leakages and spillages associated with former site uses associated with the Power Station. Includes buried putrescible waste located north of Power Station building. Made Ground to be removed across most of the site during excavation works. Occasional concentrations of metals (As, Cd, Cr, Pb, Ni) > SGVs/GACs for residential without plant uptake, concentrations of Pb exceeding commercial/industrial SGVs. Conservative US95 > SGV for residential with plant uptake for Cr and Pb, remainder of US95 calcs for metals < GACs for residential (with & without plant uptake). Elevated concentrations of B (a) P > GAC for residential with plant uptake and commercial/industrial. Occasional concentrations of metals (predominantly arsenic, copper, and lead) and B (a) P slightly elevated in soil leachate. Soil leachability considered to be high.
			Enabling/ construction phase workforce	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Potential for exposure during excavation/ earthworks. Period of exposure relatively limited. Very low possibility for max concentrations to produce acute effects. Standard health & safety precautions likely.
			Adjacent site users	Dust ingestion/inhalation.	Medium	Low Likelihood	Moderate / Low	Potential for dust generation during excavation/earthworks. Scale of earthwork is likely to generate dusts. Standard good construction practice restricting dust generation likely. Residential land use in close proximity to site.
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Low Likelihood	Moderate / Low	Potential for enhanced mobilisation of contaminants during earthworks. Majority of Made Ground will be removed during earthworks.
			Thanet Sands (Major Aquifer)	Migration of dissolved phase contamination via underlying permeable strata.	Severe	Low Likelihood	Moderate	Potential for migration of contaminants from minor to major aquifer. Petroleum contamination in minor groundwater in vicinity. Majority of contaminated soils will be removed prior to piling.
			River Thames	Migration of potential contamination via underlying permeable strata and runoff. Directly spillages of soil during barge loading.	Medium	Likely	Moderate	Potential for enhanced leaching of contaminants from stockpiles during earthworks. Potential for spillages of soil directly into river during loading of barges.
		Soil Gas (VOC, hydrogen sulphide, Methane and Carbon Dioxide)						Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%) near Power Station building. The site falls under characteristic situation 2. Negligible levels of VOCs recorded. Putrescible waste noted northwest of power station building. Minimal organic component in Made Ground at other locations.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
			Enabling/ construction phase workforce	Outdoor vapour/gas inhalation Migration into and build up/possible explosion in occupied buildings	Medium	Unlikely	Low	Potential for exposure during excavation/earthworks in any confined spaces. Standard health & safety precautions likely.
			Adjacent site users	Migration via underlying permeable strata Inhalation (indoor/outdoor air)	Severe	Unlikely	Moderate/ Low	Potential for gas migration during dynamic compaction onto adjacent sites. Majority of Made Ground will be removed from site.
Alluvium	Site Wide	Soil Gas (hydrogen sulphide, Methane and Carbon Dioxide)						Alluvium clay layers noted across site. Variable in thickness across site. Gas monitoring during site investigations recorded slightly elevated concentrations of CO2 (max 11.9% in BH2020). Low flow rates. Gas wells screened through alluvium recorded minimal (i.e. <0.1%v/v) CH4 concentrations. Characteristic Situation 2. Negligible concentrations of H_2S recorded. Made Ground and hydrocarbon contamination also likely to contribute to ground gas regime more than alluvium. Majority of alluvium will be removed during excavation works.
			Enabling/ construction phase workforce	Outdoor vapour/gas inhalation Migration into and build up/possible explosion in occupied buildings	Medium	Unlikely	Low	Potential for exposure during excavation/earthworks in any confined spaces. Majority of Alluvium soils will be removed. Standard health & safety precautions likely.
Oil drains and sumps	Drains located either side of the Power Station building, sumps located SW and NE corner of building.	PAHs (including B(a)P), PCBs, hydrocarbons,						Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%). Site falls within CS2 within main. Negligible levels of VOCs recorded. Likely associated with other sources (i.e. Made Ground, Alluvium).
			Enabling/ construction phase workforce	Dermal uptake, soil and dust ingestion.	Medium	Low Likelihood	Moderate / Low	Hydrocarbon contamination based on this source is predominantly sub-surface. Oil/water mixture in sumps and drains can be accessed. Possibility of exposure during decommissioning of sumps/drains
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata.	Medium	Likely	Moderate	Potential for leakage of oil/water mixture from drains/sumps during removal.
			Thanet Sands (Aquifer)	Migration of dissolved phase contamination via underlying permeable strata.	Medium	Low Likelihood	Moderate /Low	Not classed as a major aquifer. Potential for migration of contaminants from minor to Thanet Sand aquifer. Minor aquifer contamination in this area of the site is not attributed to oil sumps/drains
			River Thames	Migration of potential contamination via underlying permeable strata and runoff. Directly spillages of soil during barge loading.	Severe	Likely	High	Potential for run-off from excavated sump and drains if stored in vicinity (i.e. 50m) of River Thames, or if hydrocarbon contaminated soil falls into the river during barge loading.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	Affected	Contaminants of Concern			Consequence	Probability	Risk	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
		Soil Gases (VOCs, methane, carbon dioxide)	Enabling/ construction phase workforce	Inhalation (indoor/outdoor air)	Severe	Low-likelihood	Moderate	Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%). Site falls within CS2 within main. Negligible levels of VOCs recorded. Likely associated with other sources (i.e. Made Ground, Alluvium).
Underground Ash Sump	South of Power Station Building	Metals, PAHs, Hydrocarbons	Enabling/ construction phase workforce	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Potential for exposure during excavation/earthworks in any confined spaces. Standard health & safety precautions likely.
			Minor Aquifer	Migration via underlying permeable strata.	Medium	Likely	Moderate	Potential for leakage of ash material from sump during removal.
			River Thames	Migration via underlying permeable strata and runoff.	Medium	Low Likelihood	Moderate / Low	Potential for run-off from excavated fill soils if stored in vicinity (i.e. 50m) of River Thames. Made Ground soils tested within sump not highly contaminated.
Hazardous construction materials	Across Site	Asbestos	Enabling/ construction phase workforce Adjacent Site Users	Dust ingestion/inhalation.	Severe	Unlikely	Moderate	Minor potential for exposure during excavation/earthworks. Standard health & safety precautions likely.
Off-site gas Works	Southern area of site	Petroleum hydrocarbons, BTEX, PAHS, oils	Enabling/ construction phase workforce	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Large gasholders are located off-site, adjacent the south-western corner of the site. Sampling locations (BH401, TP271, TP272) adjacent the SW boundary of the site did not record significant (i.e.>GAC) hydrocarbon/PAH impact at depth (i.e.>1mbegl) that could be attributed to gas works. Groundwater sampling in BH401 did not record TPH/PAH contamination > EQS guidelines.
								No significant contamination encountered (attributable to the gas holder station). Minor potential for exposure during excavation/earthworks. Standard health & safety precautions likely.

10.5 Summary of risk assessment during development.

Risks to Human health

During the development of the site, the human receptors potentially at risk are the construction workers and residents of neighbouring properties. It has been assumed that during development, the active part of the site will be secured by the contractor.

The potential risks to construction workers from soil contaminants in Made Ground, are assessed as Low, whereas the risk to construction workers from the oil sumps and drains is considered low to moderate. This assessment reflects both the nature of the materials, presence of hazardous oils in drains/sumps, ground gas regime and construction methods, but also the potential for direct contact, dust inhalation etc.

All of theses potential risks are capable of mitigation by means of an appropriately rigorous health and safety/hygiene regime.

The potential risks to adjacent site users and people on adjacent parts of the site are generally assessed as Low. However, there are potential risks greater than Low related to migration of contamination (*via* dust inhalation etc), particularly during the storage of contaminated soils on-site. These potential risks can be mitigated by covering of stockpiles, soil wetting to limit dust generation etc.

Risks to controlled waters.

During development there are potentially significant risks to both groundwater and River Thames related to the excavation and temporarily stockpiling of contaminated soils, including leachate run-off. The potential risks to the Minor Aquifer are assessed as Low to Moderate reflecting the current absence of any barrier to rainfall infiltration (although this potential will reduce as the new cover/landscaping is progressively developed). It also reflects the presence of recorded contaminants in the soil and in the groundwater/leachate, the possible temporary local increase in leachate migration due to excavations, dynamic compaction and potential introduction of migration pathways during piling.

The risks to the minor aquifer (Thanet Sands) are assessed as Low to Moderate. This reflects the discussion above regarding minor aquifer groundwater and the potential transport pathway created by through piling. These risks to the major aquifer can be mitigated by the adoption of safe piling measures (such as using cast piles and/or double drilling etc). The risks and possible mitigation measures regarding the likelihood of piling to cause contamination in the major aquifer will be discussed further once piling specifications are determined. These risks will be presented in an upcoming groundwater risk assessment relating to piling works (Foundation Works Risk Assessment).

The risks to River Thames are assessed as Moderate to High. This reflects the discussion above regarding groundwater, the potential for enhanced leaching of contaminants from stockpiles, the close proximity of the river to proposed earthworks the likely use of barges to transport soil off-site and the scale of the proposed

earthworks. These risks can be mitigated by the adoption of safe working practices such as pre-planned stockpile management, measures to control run off, leachate collection, enclosed conveyors to the barges etc.

Care must be exercised when draining and dismantling/decommissioning structures such as the oil drain and oil sump. The biodegraded oil and lubricant in these structures are in a liquid state and therefore highly mobile. All fuel and chemicals associated with construction works to be kept in bunded or otherwise sealed containers to avoid leaks and spills. If spilt, the clean up of these materials will be complex, time consuming and expensive. Accumulation of rainfall in excavations should be avoided. Where possible temporary retaining wall such as steel sheet piles should be driven at least 3m into the London Clay Formation to create an effective groundwater cut off and prevent a hydraulic gradient being created

Table 10.6. Generic Quantitative Risk Assessment: Proposed development condition

Source			**Receptor**	**Pathway**	**Risk assessment following CIRIA C552**			**Comment**
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
Made Ground	Site Wide	Locally elevated heavy metals, B(a)P, PAH, ammonia & TPHs						Generally sourced from historical leakages and spillages associated with former site uses associated with the Power Station. Includes buried putrescible waste located north of Power Station building. Made Ground to be removed across most of the site during excavation works. Occasional concentrations of metals (As, Cd, Cr, Pb, Ni) > SGVs/GACs for residential without plant uptake, concentrations of Pb exceeding commercial/industrial SGVs. Conservative US95 > SGV for residential with plant uptake for Cr and Pb, remainder of US95 calcs for metals < GACs for residential (with & without plant uptake). Elevated concentrations of B (a) P > GAC for residential with plant uptake and commercial/industrial. Occasional concentrations of metals (predominantly arsenic, copper, and lead) and B (a) P slightly elevated in soil leachate. Soil leachability considered to be high. Majority of Made Ground will be removed as part of the final development, with remaining areas with be capped with hardstand or covered with an inert soil layer.
			Future Site Users	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Majority of proposed development will be hardstanding. Potential for uncontrolled exposure in areas of soft landscaping <10%. Landscaped areas will be covered by imported inert topsoil/re-used inert/treated excavated material.
			Adjacent site users	Dust ingestion/inhalation.	Mild	Unlikely	Very Low	Majority of proposed development will be hardstanding preventing dust generation, and majority of Made Ground around the site periphery will be removed during excavation. No ground disturbance in future condition.
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Unlikely	Low	Majority of site to be covered in hard standing limiting rainwater infiltration-in areas of exposed soil the underlying (contaminated) will have been removed as part of the basement excavation. Majority of contaminated material will be removed during construction. Minor aquifer is likely connected with River Thames. Site overlies a Major Aquifer which is separated from the minor aquifer by an aquitard (London Clay Formation). The site is not within a source protection zone. Groundwater abstraction located in northern portion of site, and adjacent NE site (within Thames Water Treatment Plant)
			River Thames	Migration of potential contamination via underlying permeable strata and runoff.	Medium	Unlikely	Low	Majority of site to be covered in hardstanding limiting rainwater infiltration, in open areas the underlying Made Ground will have either been removed or capped. Majority of contamination will be removed. Proposed central power plant will operate within concrete enclosure. Groundwater flow is westerly (towards River Thames and is relatively shallow (~4m begl). No surface water abstractions within 800m of site.
			Buildings and Services.	Direct Contact	Medium	Unlikely	Low	Majority of Made Ground will be removed, DS-2 classification of London Clay Formation materials.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
		Soil Gas (VOC, hydrogen sulphide, Methane and Carbon Dioxide)						Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%) near Power Station building. The site falls under characteristic situation 2. Negligible levels of VOCs recorded. Putrescible waste noted northwest of power station building will be removed as part of the excavation.
			Future site users	Inhalation (indoor/outdoor air)	Severe	Unlikely	Moderate/Low	Potential for build up to hazardous gas concentrations in future buildings onsite located over residual alluvium, residual hydrocarbon contamination and Made Ground material (such as the interior of the Power Station). Very low potential for hazardous gas concentrations in future buildings overlying London Clay Formation / River Terrace Deposits
			Offsite users and structures	Migration into and build up/possible explosion in occupied buildings	Severe	Unlikely	Moderate/Low	Commercial properties located to the south and east of site. Hardstand may cause gases to migrate laterally, however there will be minimal gas generation as Made Ground will be removed in areas of hardstanding. Underground car park to be ventilated.
		Phytotoxic metals	Flora	Direct contact, up-take via root system	Minor	Unlikely	Very Low	Imported topsoil soils and/or treated/inert excavated soils will be re-used as landscaping topsoil. If these soils are not of significant thickness, residual contaminated soils may cause die back of deep rooted flora.
Alluvium	Site Wide	Soil Gas (hydrogen sulphide, Methane and Carbon Dioxide)						Alluvium clay layers noted across site. Variable in thickness across site. Gas monitoring during recent site investigations recorded elevated concentrations of CO_2 (max 5.5% in BH2020). Low flow rates. Gas wells screened through alluvium recorded minimal (i.e. <0.1%v/v) CH_4 concentrations. Characteristic Situation 2. Negligible concentrations of H_2S recorded. Alluvium will be removed beneath building footprints.
			Future site users	Inhalation (indoor/outdoor air)	Medium	Unlikely	Low	Majority of alluvium located beneath building footprints will be removed as part of the basement excavation however some areas may remain directly beneath the basement excavation. Underground car parking will be ventilated.
			Offsite users and structures	Migration into and build up/possible explosion in occupied buildings	Medium	Unlikely	Low	Residential properties located to the south and east of site. Hardstand may cause gases to migrate laterally, however there will be minimal gas generation as majority of alluvium will be removed in building footprints.
Oil drains and sumps	Drains located either side of the Power Station building, sumps located SW and NE corner of	PAHs (including B(a)P), PCBs, hydrocarbons,						Oil sumps and drains located along SW and NE of the site. Sumps contain oil/water mixture. Hydrocarbon contamination (in soil and groundwater) noted in the vicinity of oil sumps/drains (particularly around TP264 and TP54 series of test pits). Hydrocarbon contamination detected in groundwater wells (BH2020 and BH2024) adjacent drains. PCBs in soil recorded at concentrations less than the laboratory limit of reporting. Oil sumps and drains will be decommissioned and/or removed as part of the development.

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	**Affected**	**Contaminants of Concern**			**Consequence**	**Probability**	**Risk**	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
	building.		Future site users	Dermal uptake, soil and dust ingestion.	Medium	Unlikely.	Low	Paved and water features located above the drain and sump footprint- no direct contact. Imported/re-used inert soil will be used in landscaping.
			Adjacent site users	Dust ingestion/inhalation	Minor	Unlikely	Very low	Source of contamination will be removed and majority of site covered with inert landscaping soils or hardstanding.
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Minor	Low likelihood	Low	Primary source removed, however secondary source (TPH contaminated soils) will remain in inaccessible areas beneath the Power Station building. Excavation dig will sufficient remove majority of TPH contaminated soils. High infiltration potential in landscaped areas, leachable soils. Site is not within a source protection zone. Natural attenuation will gradually reduce groundwater hydrocarbon contamination over time.
			River Thames	Migration via underlying permeable strata and runoff.	Minor	Unlikely	Low	Groundwater wells located between source and River Thames did not detected significant concentrations of hydrocarbons in 2004 investigation. Groundwater contamination reduced significant due to basement excavation and source removal.
			Flora	Direct contact, up-take via root system	Minor	Unlikely	Very Low	Imported topsoil soils and/or treated/inert excavated soils will be re-used as land raising soils and landscaping topsoil around Power Station building. If these soils are not of significant thickness, residual contaminated soils may cause die back of deep rooted flora.
		Soil Gases (VOCs, methane, carbon dioxide)						**Gas monitoring recorded slightly elevated concentrations of CO_2 (11.6%) and CH_4 (3.9%). Site falls within CS2 within main. Negligible levels of VOCs recorded. Likely associated with other sources (i.e. Made Ground, Alluvium).**
			Future site users	Inhalation (indoor/outdoor air)	Severe	Unlikely	Moderate/Low	Potential for build up to hazardous gas concentrations in future buildings onsite located over residual alluvium, residual hydrocarbon contamination and Made Ground material (such as the interior of the Power Station. . Very low potential for hazardous gas concentrations in future buildings overlying London Clay Formation / River Terrace Deposits.
			Adjacent site users and structures	Migration into and build up/possible explosion in occupied buildings	Medium	Unlikely	Low	Commercial properties located to the south and east of site. Hardstand may cause gases to migrate laterally, however there will be minimal gas generation as Made Ground will be removed in areas of hardstanding.
Underground Ash Sump	South of Power Station Building	Metals, PAHs, Hydrocarbons						**Underground ash sump located south of the power station. Boreholes BH302 series (A, B and C) drilled within sump-sump filled with heterogeneous Made Ground. Base of sump not proved (anecdotally thought to be -16mOD)-concentre obstructions struck at 4.0mbgel to 8.0mbegl). No significant hydrocarbon contamination observed (i.e. odours, free phase). No groundwater samples collected in vicinity**

Source			Receptor	Pathway	Risk assessment following CIRIA C552			Comment
Origin	Affected	Contaminants of Concern			Consequence	Probability	Risk	**Description of source [bold text].** **Comment on hazard realisation** [normal text]
								(i.e. 50m) of Ash Sump. **Ash sump will be decommissioned and/or removed as part of the development works.**
			Future site users	Dermal uptake, soil and dust ingestion.	Minor	Unlikely	Very Low	Majority of ash sump will be removed, and hardstand (as part of the basement) will overlie ash sump.
			Adjacent site users	Dust ingestion/inhalation	Minor	Unlikely	Very Low	Majority of area covered with hardstanding preventing dust generation.
			River Terrace Deposits (Minor Aquifer)	Migration of dissolved phase contamination via underlying permeable strata	Medium	Low Likelihood	Moderate / Low	Impacts of ash sump of minor aquifer unknown, however groundwater wells in the southern area of the site do not show significant contamination (that could be attributed solely to the ash sump). Exposure of potential ash fill in unexcavated fill materials within ash sump may be contaminated and highly leachable. If these are left in-situ, and the destruction of the ash sump enables minor aquifer access, these potential contaminants may be mobilised into the minor aquifer.
			River Thames	Migration via underlying permeable strata	Mild	Low-Likelihood	Low	Basement foundations of Battersea Power Station would inhibit groundwater flow from around the ash sump to the river Thames (located north of the site). No surface water abstractions within 500m of site. Contaminated soil will be removed or treated.
		Petroleum hydrocarbons, BTEX, PAHS, oils						**Large gasholders are located off-site, adjacent the south-western corner of the site.** **Sampling locations (BH401, TP271, TP272) adjacent the SW boundary of the site did not record significant (i.e. >GAC) hydrocarbon/PAH impact at depth (i.e.>1mbgel) that could be attributed to gas works. Groundwater sampling in BH401 did not record TPH/PAH contamination > EQS guidelines.**
	Southern area of site		Future site users	Dermal uptake, soil and dust ingestion.	Medium	Unlikely	Low	Majority of this area of the site will be covered with Hardstanding, limiting dermal contact.
Off-site gas Works								

10.6 Summary of risks on completion of the final development

Risk to human health

In the final development, the majority of Made Ground surrounding the Power Station will be covered with hardstanding or imported/re-used inert landscaping topsoil. The interior of the Power Station will be paved and used for car parking. This effectively separates the future site users from any residual contaminated soils left on-site. On this basis, there is no plausible exposure pathway and thus no risks to site users and occupiers of adjacent sites from contamination present in the Made Ground in this area.

Across the rest of the site, a small percentage of soft landscaping is proposed, some of these areas are located on contaminated ground, which it may not be feasible to excavate (due to engineering constraints presented by the Power Station Building). However any soft landscaped areas will be separated from the underlying contaminated materials by a suspended slab. The potential risks to site users are assessed as Moderate/Low to Low reflecting the removal of majority of the contamination material, and the residual contamination left over (in the vicinity of the Power Station building. This risk can be further mitigated by the treatment of localised hotspots within and immediately surrounding the Power Station building, and the emplacement of inert soil capping layer (either from off-site sources or treated soil from the basement excavation) outlined in BRE 465 (ref 48).

Risks from ground gas

Risks to the site users and users of adjacent sites related to gases are assessed as Moderate to Moderate/Low. This reflects the severity of the hazard, the removal of majority of Made Ground and Alluvium, and the proposed development, but also the consistently low flow rates recorded. Gas protection measures (as per CS 2) will be required within buildings located on alluvium or Made Ground material (particularly in northern portion of the site).

A number of the new buildings or basements included in the proposed redevelopment works are to be constructed in direct contact with this Made Ground. The floor constructions and other protective measures described in the BRE report and other relevant guidance (CIRIA C665 ref 46) should be employed to ensure adequate ventilation of the carbon dioxide emitted by this stratum. In most cases, the floor constructions required would simply be a gas-proof membrane laid over a granular venting layer. At time of writing this report the buildings included in the proposed redevelopment included deep basements, up to -3mOD, being employed for storage and/or car parking. Below ground car parks will obviously require venting measure to prevent accumulation of carbon monoxide and other harmful gases from exhaust emissions. These venting measures should be adequate in these areas to prevent any accumulation of ground gas. The assessment in relation to gas is based on monitoring over a limited period of time. Gas production rates can be affected by changing ground conditions (i.e. excavation of soils etc), however as basement areas are situated over the London Clay Formation, it is deemed that the risk presented by ground gas is considered low.

Risks to *flora*

The potential risks to *flora* associated with the presence of phytotoxic metals in the proposed development are assessed as Very Low reflecting the recorded contaminant concentrations, the proposed hardstanding across the majority of the site, and the emplacement of soft landscaping topsoil. This risk can be further mitigated by treating underlying contaminated soil and/or using a capping layer (as per BRE 465, ref 48) prior to emplacement of landscape soils.

Risks to Controlled Waters

Majority of the site will be covered with impermeable hardstanding (either car parking, concrete forecourts or building footprints); including the base of the power station building which will be used as a car parking complex. This cover will reduce infiltration and therefore the potential for leachate formation. On completion of the new development, risks to the Minor Aquifer and River Thames from contaminated material are assessed as moderate to low, reflecting this reduction in infiltration, hydraulic connectivity between groundwater and the river and reduction in contaminated soils across the site as part of the basement excavation. Groundwater within areas not included in the basement dig did not record significant contamination. Risks will be mitigated as any with residual contamination outside the basement footprint (e.g. within and adjacent the Power Station) where appropriate, will be treated to reduce contaminant concentration thereby limited the secondary contamination source potential from the minor aquifer.

A Remedial Options Appraisal will outline and assesses different options for mitigating risks to controlled waters. Further assessment of remedial options is currently underway and will be designed following consultation with the Local authority and Environmental Agency.

11 Waste Management

11.1 Approach

Waste management options have been included in the accompanying 'Spoil Management Report' (Buro Happold). A summary is provided below.

In order to determine the likely waste classes, soil and leachate test results from previous investigations have been assessed using:

- Values indicating Hazardous Waste according the 'Environment Agency (2004) Framework for the Classification of Contaminated Soils as Hazardous Waste, Version 1, July 2004'(ref 49);
- Technical Guidance WM2 – Hazardous Waste, Interpretation of the definition and classification of hazardous waste'(ref 50); and
- Waste Acceptance Criteria (WAC) limit values for inert and hazardous waste (ref 36).

The majority of the contamination data from the investigations did not fulfil the minimum data requirements for determining granular WAC to landfill (ref 36). The majority of leachate samples were analysed using NRA techniques. The EA will only consider two stage leachate testing as per BS EN12457-3 in the calculation of waste acceptance criteria, therefore soil samples were not compared to WAC limit values and no division between inert and non-hazardous waste types has been made.

The Hazardous waste risk categories are based on a greater range of analytes than majority of soil samples have been analysed for. The soil samples were analysed prior to the introduction of EA hazardous waste guidelines (ref 50), therefore some analytes included in the EA Hazardous waste spreadsheet (such as PCBs) are not extensively analysed across the soil samples. However, the major contaminates of concern (i.e. heavy metals and petroleum hydrocarbons) present at the site have been analysed in majority of soil samples. It is unlikely that additional analysis of other analytes (such as PCBs) included in the current Hazardous waste spreadsheet would result in significant increases in the amount of hazardous soil samples at the site. Areas of suspected hazardous waste is shown in Figure 19.

As a conservative estimate, an allowance should be made for approximately 15% of Made Ground waste soils to be classed as hazardous. Additional ground investigations of greater density of data should be undertaken on a per excavation basis, which may allow delineation of 'inert' and 'non-hazardous' areas and 'Hazardous' waste hotspots. It is understood that the remediation contractor is likely to dispose of practically all of the material at exempt sites, which have site specific waste criteria. Based on review of contamination data (presented in the forthcoming contaminated land risk assessment) Made Ground materials may not be suitable

for re-use on-site from a contamination perspective unless these soils are treated; this may also be required to improve geotechnical parameters.

Given that enough data exists to identify the presence of hazardous waste areas on site, this highlights the need for soil treatment prior to disposal for treatment purposes. In addition, available data has indicated that significant volumes of natural ground (specifically the London Clay Formation and River Terrace Deposits units), are likely to be classified as inert. Further analysis for a more comprehensive range of analytes will give a more accurate delineation between hazardous/non-hazardous/inert waste volumes across the site. This would be undertaken at remediation contractor tendering stage when more information is known about destination landfills and exempt sites.

During excavation of Made Ground, it is recommended that a watching brief is undertaken for ACM, with removal and separate disposal to an appropriately license facility. All Made Ground is therefore considered unsuitable for use in soft landscaping areas unless it treated or is beneath a suitable capping layer.

Further details on waste management (including management of existing stockpiles on-site and groundwater seepages during excavation) are included in the spoil management plan and will be discussed in the Remediation Strategy.

12 Conclusions

12.1 Ground conditions

The site is underlain by Made Ground material of variable composition, generally described as clayey sandy gravel, but varying to a sandy gravely clay. The gravel and cobbles are composed of flint, brick and concrete, with occasional ash, clinker, metal and timber. Concrete obstructions were noted at several exploratory locations. The Made Ground is underlain by Alluvium and River Terrace Deposits which in turn rest upon the London Clay Formation. There is the presence of a scour filled hollow within the near surface deposits within the footprint of the Power Station. Other scour filled hollows are shown in surrounding areas. Beneath the London Clay Formation the geology comprises in descending order the Lambeth Group, Thanet Sands and Upper Chalk deposits.

Groundwater strikes were generally recorded in the River Terrace Deposits at or near the top of the stratum with the water level rising approximately 1.0 m above this level. Water levels recorded across the site are generally in the range 0.5 to 1.0m OD (approximately 3.5m below ground level). The major exception to this is within the Power Station which it is understood is partially cut-off by the cofferdam installed during construction. There is a tidal response in groundwater up to approximately 200m south of the River Thames. The range measured to the north of the Power Station was between 2 and 3m. Inferred groundwater contours indicated variable groundwater flow direction, generally flowing south from the site. This monitoring may have been undertaken over the space of several hours, thereby the water level would have changed across the site due to tidal influences. Disregarding these inferred contours, the minor aquifer is likely to flow toward the River Thames.

12.2 Soil Contamination

Soil samples from Made Ground recorded average concentrations of cadmium exceeding residential screening criteria, and individual concentrations of naphthalene benzo(a)pyrene, arsenic, chromium, lead, mercury, nickel and total cyanide exceeding the residential screening criteria. Occasional exceedences of commercial criteria were noted for benzo(a)pyrene and lead. Soil contamination is generally restricted to the Made Ground.

12.3 Controlled waters

Copper, zinc, PAHs, benzo(a)pyrene and ammoniacal nitrogen are reasonably leachable in Made Ground soil across the site. The source of metals is likely to originate from Made Ground materials. Furthermore, the soil analytical results for benzo(a)pyrene.

Occasional samples of groundwater (minor aquifer in River Terrace Deposits) recorded slightly elevated concentrations of arsenic, mercury, nickel, copper and zinc at levels exceeding the adopted screening criteria, however concentrations are not deemed to present an acute risk to controlled waters. Most wells recorded all

determinands less than adopted screening criteria. Concentrations of benzo(a)pyrene and PAHs (UK4) were above adopted screening criteria in two boreholes. Generally volatile organic contamination in groundwater has reduced over time.

Concentrations of ammoniacal nitrogen were elevated above adopted screening criteria relevant to the Minor Aquifer and River Thames in majority of groundwater samples, with one groundwater well recording significant concentrations. This groundwater well is situated adjacent buried putrescible waste, which could be contributing to high ammoniacal concentrations. Ammoniacal nitrogen contamination is likely to originate from breakdown of organic material (including putrescible material within the coal bunker area) beneath the site or degrading petroleum hydrocarbon at the site.

12.4 Ground gas

The soil gas regime is characterised by slightly elevated concentrations of methane and carbon dioxide (although gas flow rates are generally low). Majority of ground gas wells are screened within the Made Ground and Alluvium, majority of which will be removed as part of the basement excavation. Gas protection measures typical of CS2 were recommended at this site for building areas overlying any residual Made Ground material (if any). The remainder of areas overlying the London Clay Formation will not require gas protection measures, however as a preventative measure further gas monitoring will be undertaken in the London Clay Formation material during additional ground investigation works.

12.5 Risk assessment

A summary of the risk assessment for each of the three scenarios (current, during development and future use) is presented in Table 12.1 and discussed in more detail in the following text.

Table 12.1 Summary of risk assessment

Receptor	Source	Current risk	Risk during construction	Future risk
People onsite	Made Ground	Moderate/Low	NA	Moderate/Low
	Alluvium	Moderate/Low	NA	Low
	Oil Drains/Sumps	Moderate/Low	NA	Moderate/Low
	UG Ash Sump	Low	NA	Very Low
	Offsite Gas Works	Low	NA	Low
	Hazardous Building Materials	Moderate	NA	NA
People offsite	Made Ground	Moderate/Low	Moderate/Low	Very Low
	Oil Drains/Sumps	Low	Low	Low
	UG Ash Sump	Low	Moderate/Low	Very Low
	Hazardous Building Materials	Moderate	Moderate	Very Low
Construction	Made Ground	NA	Moderate/Low	NA
Workers	Alluvium	NA	Low	NA
	Oil Drains/Sumps	NA	Moderate/Low	NA
	UG Ash Sump	NA	Low	NA
	Offsite Gas Works	NA	Moderate	NA
	Hazardous Building Materials	NA	Low	NA
Flora	Made Ground	Very Low	NA	Very Low
	Oil Drains/Sumps	NA	NA	Very Low
Minor Aquifer	Made Ground	Moderate	Moderate/Low	Low
	Oil Drains/Sumps	Moderate	Moderate	Low
	UG Ash Sump	Moderate	Moderate	Moderate/Low
	Offsite Gas Works	Moderate	NA	Moderate
Major Aquifer	Made Ground	Very Low	Moderate	NA*
	Oil Drains/Sumps	Very Low	Moderate/Low	NA*
River Thames	Made Ground	Moderate	Moderate	Low
	Oil Drains/Sumps	Moderate/Low	High	Low
Buildings &	UG Ash Sump	Low	Moderate/Low	Low
Services	Made Ground	NA	NA	Low

* Will be assessed in upcoming controlled waters risk assessment during piling works.

The generic quantitative risk assessment carried out on the basis of existing data indicates that there are potentially significant risks to human health and the environment under the existing conditions at the site.

The proposed development of the site will give rise to a temporary increase in risk(s), most notably to construction workers and controlled waters. This is particularly relevant in the areas within and around the Battersea Power Station and the 28 Kirtling Street areas. Short-term risks to the Minor Aquifer and River Thames are also likely to increase during the excavation works. This is primarily because of the potential for runoff and leaching from stockpiles, and potential spillages during loading of barges etc.

In the long term however, provided appropriate mitigation measures are employed and the recommendations in Section 13 adopted, the risks to human health and the environment can all be mitigated to acceptably low levels.

Risks to the Minor Aquifer and River Thames are considered to be partially mitigated by the proposed development, which will consist of a change from soft to hard landscaping. By reducing rainwater infiltration across the site this will limit potential contaminant leaching from the remaining Made Ground into groundwater. In addition, the primary source (i.e. oil sumps/drains and ash sump, putrescible materials in the former coal bunker) and the majority of the secondary source material (i.e. contaminated Made Ground material) will be removed as part of the basement excavation. Further mitigation is not considered necessary due to the following:

- The maximum recorded concentrations of 'persistent' contaminants (i.e. metals etc) in groundwater are not highly elevated (within one order of magnitude of adopted screening criteria);
- The main contaminants of concern (B(a)P and PAH) are largely degradable under natural attenuation processes. (B(a)P has a very slow biodegradation rate however a very high partition coefficient. Thus meaning that in groundwater bodies it is predominantly attached to the aquifer matrix and migrates very slowly, lowering the risk to adjacent receptors).
- Areas of B(a)P and PAH contamination are limited in extent, and are associated with source material that will be removed as part of the excavation works;
- Concentrations of hydrocarbon contaminants in monitoring wells adjacent the River Thames were less than laboratory limits of reporting; and
- A considerable thickness of low permeability London Clay Formation is present across the site limiting vertical migration of contaminants from the Terrace Gravels Minor into the underlying Major Aquifer.

12.6 Waste Management

Several hazardous waste hotspots were recorded in Made Ground materials highlighting the need for soil treatment prior to disposal for treatment purposes. In addition, available data has indicated that significant

volumes of natural ground (specifically the London Clay Formation and River Terrace Deposits), are likely to be classified as inert.

During excavation of both Made Ground, it is recommended that a watching brief is undertaken for ACM, with removal and separate disposal to an appropriately license facility. All Made Ground is therefore considered unsuitable for use in soft landscaping areas unless it treated or is beneath a suitable capping layer.

Further details on waste management (including management of existing stockpiles on-site and groundwater seepages during excavation) are included in the spoil management plan and will be discussed in the Remediation Strategy.

13 Recommendations

The proposed development includes a number of measures necessary to mitigate the potential risks. In summary these comprise:

- The implementation of a rigorous Health & Safety regime (including PPE, welfare and personal hygiene) by the construction work force;
- Construction workers should remain vigilant of ground conditions at all times and should report any suspect areas of potential contamination (especially asbestos);
- Surface asbestos fragments/fabric (if encountered) should be removed by a competent/licensed contractor. All material should be segregated and disposed of in line with the waste regulations;
- Remaining hydrocarbon hotspots identified as part of the risk assessment are located within the proposed basement footprint and will therefore be removed as part of the standard building design. These areas of hydrocarbon contamination are likely to require selective excavation followed by remediation/off-site disposal to hazardous landfill;
- Stockpiling of grossly contaminated soils should be avoided if possible and where necessary, stockpiles should be covered when not in use. All hazardous/non-hazardous soils requiring off-site disposal will require pre-treatment prior to disposal to landfill. The waste classification of the soils requiring off-site disposal be confirmed by the earthworks contractor;
- All service trenches should be backfilled with clean inert material;
- A risk to potential future receptors from the underlying Made Ground has been identified. It is recommended a capping layer is constructed within areas of soft landscaping to prevent contact between future receptors and the underlying Made Ground. The clean capping layer is likely to be 0.6m thick and will geotextile require a marker layer between the Made Ground and overlying capping layer (as outlined in BRE 465);
- Groundwater remediation is not considered necessary as the groundwater contamination is not considered at significantly high concentrations as to warrant immediate remediation, primary contamination sources (such as the oil drains and sumps) and majority of the secondary sources (i.e. Made Ground) will be effectively removed as part of the earthworks. Groundwater removed as part of the excavation works is likely to require treatment prior to discharge to sewer, or the River Thames; and
- Buildings (including service trenches) in those areas where Made Ground is to remain should be provided with specific protection measures (as per Characteristic Situation 2) .The floor constructions and other protective measures described in the BRE report 414 (ref 51) and other relevant guidance

(CIRIA report C665 (ref 46) and British Standard 8485 (ref 47)) should be employed to ensure adequate mitigation of ground gas.

In addition to these measures the following further investigations are scheduled to be undertaken post-planning:

- The risks and possible mitigation measures regarding the likelihood of piling to cause contamination in the major aquifer will be discussed further once piling specifications are determined. These risks will be explored in a foundations works risk assessment in due course;
- If unforeseen significant contamination is encountered during the enabling works further characterisation, risk assessment and/or remedial works may be required in accordance with the Model Procedures for the management of land contamination, 2004, CLR11 (ref.1);
- An Construction phase Environmental Management Plan (CEMP) should be prepared and agreed with the regulatory authorities prior to commencement of the enabling works;
- Further ground investigation is required prior to construction work following consultations with remedial contractors and potential exempt sites. This ground investigation will provide more detail for waste characterisation and allow approximately delineation of contaminated ‘hotspot’ areas; and
- Provision is made for a Verification Report following remediation. This Report will be prepared in general accordance with the Model Procedures for the Management of Land Contamination, 2004, CLR11 (ref.1). It will need to take into account both the amount of data that will be obtained over the course of the work, but also the longevity of the work programme.

.

References

1. CLR 11: Model Procedures, for the management of land contamination, Environmental Agency (2004).
2. Contaminated Land Preliminary Risk Assessment, 88 Kirtling Street. Buro Happold Ltd, December 2008.
3. Spoil Management Report, Battersea Powerstation Redevelopment, Buro Happold Ltd, December 2008.
4. Battersea Power Station River Wall Survey, Buro Happold Ltd, January 2003.
5. Archaeological and Geotechnical Desk Study, Battersea Power Station Site, Ove Arup & Partners, September 1997.
6. Geotechnical and Contamination Statement, Battersea Power Station 28 Kirtling Street. Buro Happold Ltd. January 2001.
7. Report on Ground Contamination, Allot and Lomax, April 1996.
8. Report of Proceedings on the munitions contamination survey, Battersea power Station and water frontage, August 2002.
9. 2004 Ground Investigation Additional Trial Pit Logs. Buro Happold Ltd, July 2004.
10. Further Contamination Assessment following the 2004 Ground Investigation' report (Rev 2, Buro Happold Ltd, and February 2006.
11. Site Investigation for Battersea Power Station Report, Soil Mechanics 1988.
12. Geotechnical and environmental investigation, LBH Geotechnical and Environmental, July 1993.
13. Factual Report on Phase One and Two Contamination Ground Investigation (Foundation and Exploration Services (FES), December 1997.
14. Battersea power Station Ground Investigation Report, Ove Arup & partners, December 1997.
15. Ground Investigation at Battersea Power Station, Geotechnical and Geoenvironmental Factual Report., Geotechnics Ltd, August 2002.
16. Report on Spoil Volumes and Spoil Management Strategy, Battersea Power Station Site. (Rev 2, Buro Happold Ltd, October 2004.
17. Geotechnical Ground Investigation Factual report, Battersea Power Station. Fugro Engineering services, 2004.
18. Groundsure Report, 88 Kirtling Street, August 2008.
19. Desk Study and Contamination Interpretative Report, Buro Happold Ltd, January 2003.

20. Envirocheck Report, Battersea, March 2001 (presented in Buro Happold 2003 Report).
21. Groundwater Vulnerability Map Sheet 39, West London, British Geological Survey, 1990.
22. Groundwater levels in the Chalk-Basal Sands Aquifer of the London Basin, Groundwater, Report, Environmental Agency, 2007.
23. Tidal Data from Port Of London Website. http://www.pla.co.uk/display_fixedpage.cfm/id/11/site/maritime Accessed 9 December 2008.
24. Environmental Agency, Water Quality Information. http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&lang=_e&textonly=off&topic=riverquality Accessed on 9 December 2008.
25. Contaminated Land Exposure Assessment, 2004.
26. SNIFFER, A Guidance Manual for Assessing Potential Adverse Effects of Substances in Soil on Designated Terrestrial Ecosystems, 1999.
27. Environment Agency. 2009. Soil Guideline Values for nickel in soil - Science Report SC050021 / Nickel SGV. Bristol: Environment Agency.
28. Environment Agency. 2009. Soil Guideline Values for toluene in soil - Science Report SC050021 / toluene SGV. Bristol: Environment Agency.
29. Environment Agency. 2009. Soil Guideline Values for selenium in soil - Science Report SC050021 / Selenium SGV. Bristol: Environment Agency.
30. Environment Agency. 2009. Soil Guideline Values for inorganic arsenic in soil - Science Report SC050021/ arsenic SGV. Bristol: Environment Agency.
31. Environment Agency. 2009. Soil Guideline Values for xylene in soil - Science Report SC050021 / xylene SGV. Bristol: Environment Agency.
32. Environment Agency. 2009. Soil Guideline Values for benzene in soil - Science Report SC050021 / benzene SGV. Bristol: Environment Agency.
33. Environment Agency. 2009. Soil Guideline Values for ethylbenzene in soil - Project SC050021 / ethylbenzene SGV. Bristol: Environment Agency.
34. Environment Agency. 2009. Soil Guideline Values for mercury in soil - Science Report SC050021 / Mercury SGV. Bristol: Environment Agency.
35. Environment Agency. 2009. Updated technical background to the CLEA model. Science Report – SC050021/SR3. January 2009.

36. Environment Agency. 2009. Human health toxicological assessment of contaminants in soil. Science Report – SC050021/SR2. January 2009.
37. Environment Agency 2009. CLEA Software Version 1.04, Retrieved from the internet: http://www.environment-agency.gov.uk/research/planning/40397.aspx
38. Environment Agency. 2009. CLEA Software (Version 1.04) Handbook. Science Report – SC050021/SR4. January 2009.
39. Environment Agency. 2005. The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. Science Report P5-080/TR3. February 2005.
40. DEFRA and Environment Agency. 2002. Soil Guideline Values. Lead, R & D Publication SGV 10 (document withdrawn by the Environment Agency in August 2008).
41. Guidance on Comparing Soil Contaminant Data with a Critical Concentration. CL:aire May 2008.
42. The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils Science Report P5-080/TR3, February 2005
43. Guidance on Sampling and testing of waste to meet landfill waste acceptance criteria, Version 1.
44. Swartjes, F.A. 1999. Risk-based Assessment of Soil and Groundwater Quality in the Netherlands: Standards and Remediation Urgency. Risk Analysis 19(6): 1235-1249.
45. UK Drinking Water Inspectorate, 2000. The Water Supply (Water Quality) Regulations.
46. World Health Organisation: Guidelines for Drinking Water-quality, Third Edition, Volume 1, Recommendations 2004.
47. EC Dangerous Substances Directive, 76/464/EEC.
48. Environment Agency: Non-Statutory (Operational) Environmental Quality Standards.
49. UK Technical Advisory Group on the Water Framework Directive (Jan 2008). Proposals for Environmental Quality Standards for Annex VIII Substances. Final Draft to brief Ministers.
50. Environment Agency, 2006. Remedial Targets Methodology: Hydrogeological Risk assessment for Land Contamination.
51. Concrete in aggressive ground. BRE Special Digest 1: 2005.
52. No 9-04-03 Issue 1 Information And Guidance Note The Selection Of Materials For Water Supply Pipes To Be Laid In Contaminated Land. WRAS, October 2002.
53. Assessing risks posed by hazardous ground gases to buildings, CIRIA Report C665, 2007.

54. Code of practice for the characterization and remediation from ground gas in affected developments. BS8485:2007.
55. BRE Report BRE 465 – Cover Systems for Land Regeneration.
56. Framework for the classification of Contaminated Soils as Hazardous Waste, Environment Agency, 2004.
57. Technical Guidance WM2 – Hazardous Waste, Interpretation of the definition and classification of hazardous waste (second edition, version 2.1).
58. BRE Report BRE 414 - Protective measures for housing on gas-contaminated land.

Glossary

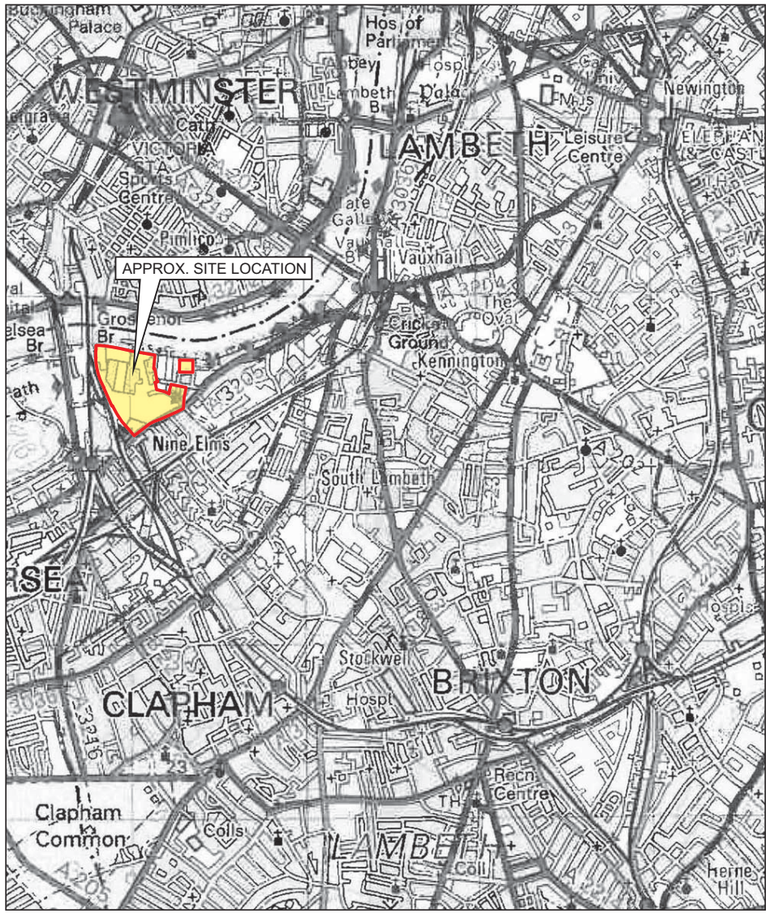
ACM	Asbestos Containing Material
ALL	Alluvium
As	Arsenic
B (a) P	Benzo (a) pyrene
BH	Borehole
BOD	Biological Oxygen Demand
BRE	Building Research Establishment
BTEX	Benzene, Toluene, Ethylbenzene, & total Xylenes
Cd	Cadmium
CH_4	Methane
CIRIA	Construction Industry Research and Information Association
CLEA	Contaminated Land Exposure Assessment
CLR	Contaminated Land Report
COD	Chemical Oxygen Demand
CO_2	Carbon Dioxide
Cr	Chromium
CS2	Characteristic Situation (as per CIRIA c449)
Cu	Copper

DIVs	Dutch Intervention Values
DNAPL	Dense, Non-Aqueous Phase Liquid
DRO	Diesel Range Organic Compounds
EA	Environmental Agency
EQS	Environmental Quality Standard
FES	Fugro Engineering Services
FIL	Fellows International Ltd
GACs	Generic Acceptance Criteria
GI	Ground Investigation
GQRA	Generic Quantitative Risk Assessment
Hg	Mercury
LC	London Clay Formation
LNAPL	Light Non-Aqueous Phase Liquid
MG	Made Ground
mbegl	Metres Below Existing Ground Level
mOD	Metres above o Ordnance Datum
MTBE	methyl tertiary butyl ether
Ni	Nickel
NRA	National Rivers Agency

PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
PCM	Preliminary Conceptual Model
PID	Photoionisation Detector
PPE	Personal Protective Equipment
PRA	Preliminary Risk Assessment
RTD	River Terrace Deposits
SGV	Soil Guideline Values
SNIFFER	Scotland & Northern Ireland Forum for Environmental Research
TEM	Toluene Extractable Matter
TP	Trial Pit
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VOCs	Volatile Organic Compounds
WAC	Waste Acceptance Criteria
WRAS	UK Water Regulations Advisory Scheme
Zn	Zinc

Figures

N

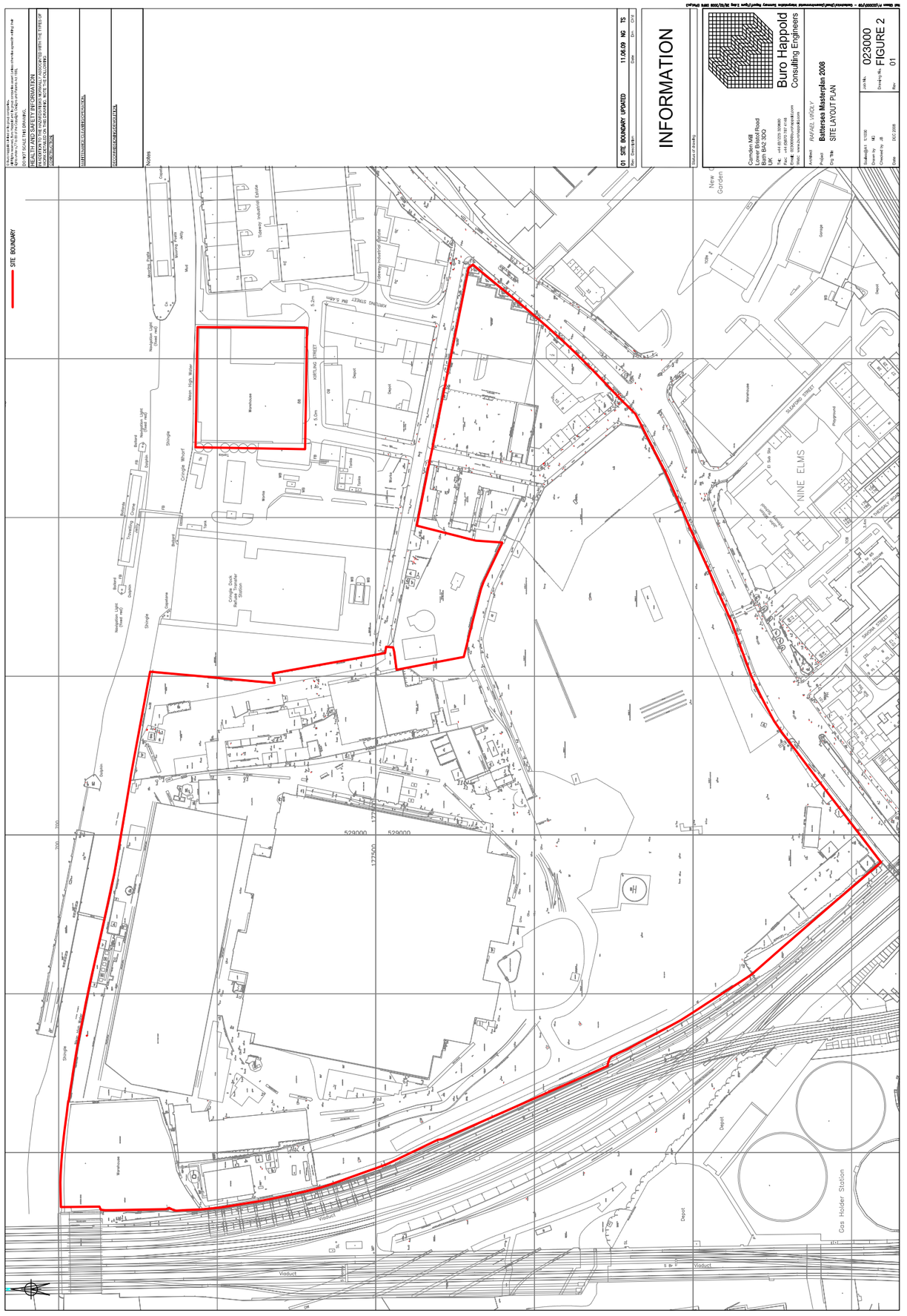


Project: Battersea Masterplan

SITE LOCATION PLAN

Scale: NTS	Drawn: NG	Chk: JB	Date: Dec 2008	Job No: 023000	Drawing No: Figure 1	Rev: 01

Buro Happold
Consulting Engineers



HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes
REF: RAFAEL VIÑOLY, DRAWING NO. A11004
REV 09, 30.06.09

Rev	Description/Date	Drn/Chk
02	MASTERPLAN UPDATED 20.07.09	NG/TS
01	MASTERPLAN UPDATED 11.06.09	NG/TS

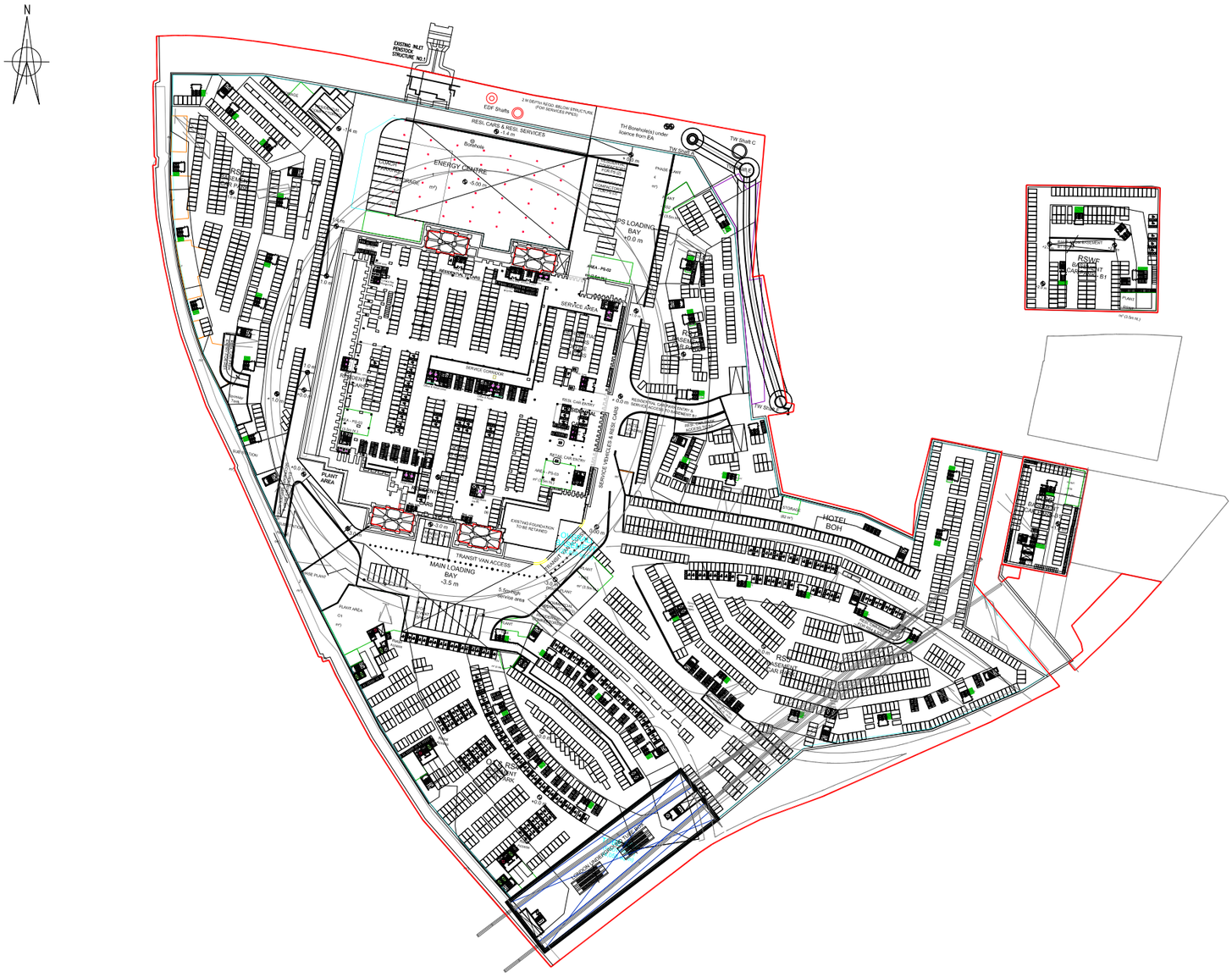
INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
email: 023000@burohappold.com
Web: www.burohappold.com
Buro Happold
Consulting Engineers

Architect	*RAFAEL VIÑOLY*
Project	**Battersea Masterplan**
Drg Title	PROPOSED MASTERPLAN SITE USES
Scales@A3	1:2000
Drawn by	NG
Checked by	JB
Date	DEC 2008
Job No.	023000
Drg No.	FIGURE 3A
Rev	02

Neil Gibson P:\023000\709 - Geotechnics\Sheet\Geoenvironmental Interpretative Summary Report\Figure 3A.dwg 29/02/2008 BMP6 EPlotJpc3



HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes
REF: RAFAEL VIÑOLY, DRAWING NO. A11003
REV 08, 30.06.09

Rev	Description/Date	Drn/Chk
02	MASTERPLAN UPDATED 20.07.09	NG/TS
01	MASTERPLAN UPDATED 11.06.09	NG/TS

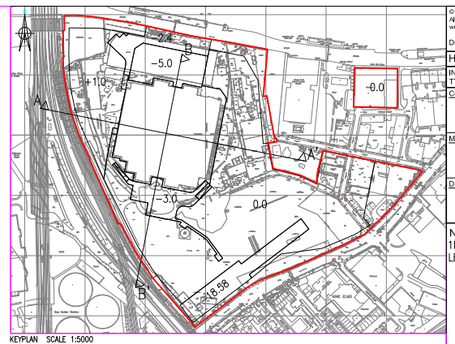
INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
email: 023000@burohappold.com
Web: www.burohappold.com
Buro Happold
Consulting Engineers

Architect	*RAFAEL VIÑOLY*
Project	**Battersea Masterplan**
Drg Title	PROPOSED MASTERPLAN BASEMENT LAYOUT
Scales@A3	1:2000
Drawn by	NG
Checked by	JB
Date	DEC 2008
Job No.	023000
Drg No.	FIGURE 3B
Rev	02

Neil Gibson P:\023000\709 - Geotechnics\Sheet\Geoenvironmental Interpretative Summary Report\Figure 3B.dwg 29/02/2008 BMP6 EPlotJpc3



KEYPLAN SCALE 1:5000

DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

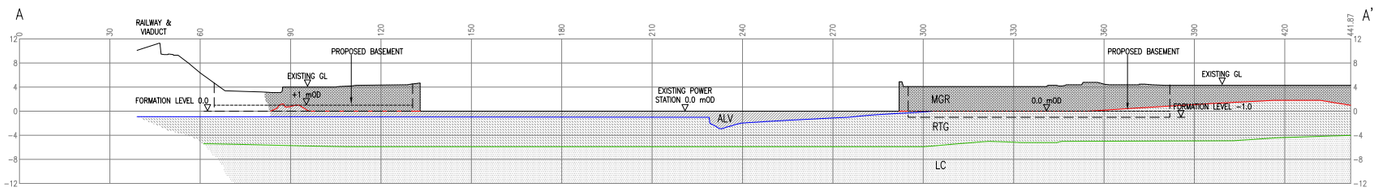
Notes

1M ALLOWED FOR SITE BUILD UP I.E PROPOSED FINISHED LEVEL OF −3 MOD EQUALS FORMATION LEVEL OF −4 MOD

Rev	Description	Date	Drn	Ch'd
01	SITE BOUNDARY UPDATED BASEMENT LEVELS UPDATED	11.06.09	NG	TS

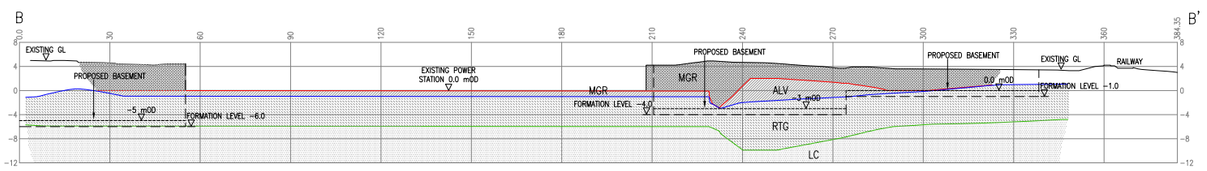
SECTION A–A'

SCALES
HORIZ. 1:1000
VERT. 1:500



SECTION B–B'

SCALES
HORIZ. 1:1000
VERT. 1:500



MGR	MADE GROUND
ALV	ALLUVIUM
RTG	RIVER TERRACE DEPOSITS
LC	LONDON CLAY

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect RAFAEL VIÑOLY

Project **Battersea Masterplan 2008**

Drg Title CROSS SECTIONS A-A' & B-B'

Scales@A2 AS SHOWN
Drawn by NG
Checked by JB
Date DEC 2008

Job No. 023000
Drawing No. FIGURE 4
Rev 01

DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

Rev	Description/Date	Drn/Chk

HISTORICAL LANDUSE

1. CRANES
2. JETTY
3. PETRESCIBLE WASTE – BURIED
4. COAL STORAGE BUNKER
5. RAIL STORAGE
6. AHS EMSTAR
7. PUMP ROOM
8. OIL DRAINS
9. TRANSFORMERS
10. TURBINE HALL A
11. BOILER ROOM A
12. BOILER ROOM B
13. TURBINE HALL B
14. PUMP ROOM
15. TRANSFORMERS
16. OIL SUMP
17. ASH SUMP
18. SUBSTATION
19. WORKSHOPS
20. FORMER THAMES STORAGE DEPOT
21. RAILWAY LINES
22. HELIPAD
23. STORAGE SHED
24. HOPPER

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect RAFAEL VIÑOLY

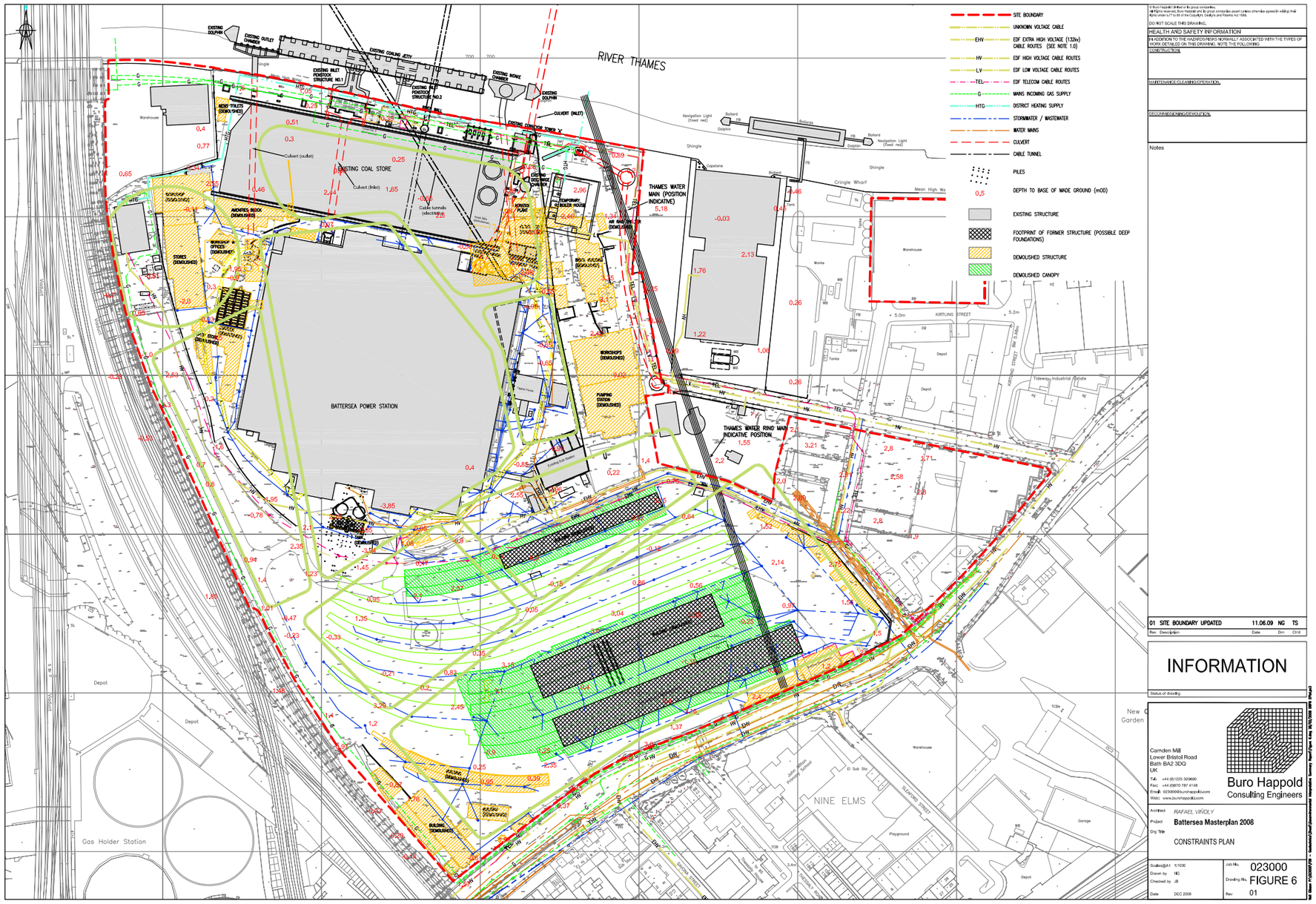
Project **Battersea Masterplan**

Drg Title HISTORICAL SITE USE

Scales@A3 1:2000
Drawn by NG
Checked by JB
Date DEC 2008

Job No. 023000
Drg No. FIGURE 5
Rev 00

Hei Gibson P:\023000\09 – Geotechnics\Sheet\Geoenvironmental Interpretative Summary Report\Figure 5.dwg 28/02/2008 DWF6 EPlot.pc3


RIVER THAMES
BATTERSEA POWER STATION
EXISTING COAL STORE
THAMES WATER MAIN (POSITION INDICATIVE)
THAMES WATER RING MAIN INDICATIVE POSITION
NINE ELMS
Gas Holder Station
Cringle Wharf
KIRTLING STREET
SITE BOUNDARY
UNKNOWN VOLTAGE CABLE
EHV EDF EXTRA HIGH VOLTAGE (132kv) CABLE ROUTES (SEE NOTE 1.0)
HV EDF HIGH VOLTAGE CABLE ROUTES
LV EDF LOW VOLTAGE CABLE ROUTES
TEL EDF TELECOM CABLE ROUTES
MAINS INCOMING GAS SUPPLY
DISTRICT HEATING SUPPLY
STORMWATER / WASTEWATER
WATER MAINS
CULVERT
CABLE TUNNEL
PILES
DEPTH TO BASE OF MADE GROUND (mOD)
EXISTING STRUCTURE
FOOTPRINT OF FORMER STRUCTURE (POSSIBLE DEEP FOUNDATIONS)
DEMOLISHED STRUCTURE
DEMOLISHED CANOPY
DO NOT SCALE THIS DRAWING.
HEALTH AND SAFETY INFORMATION
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING.
CONSTRUCTION.
MAINTENANCE/CLEANING/OPERATION.
DECOMMISSIONING/DEMOLITION.
Notes
01 SITE BOUNDARY UPDATED 11.06.09 NG TS
Rev Description Date Drn Chkd
INFORMATION
Status of drawing
Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com
Buro Happold
Consulting Engineers
Architect RAFAEL VIÑOLY
Project Battersea Masterplan 2008
Drg Title CONSTRAINTS PLAN
Scales@A1 1:1000
Drawn by NG
Checked by JB
Date DEC 2008
Job No. 023000
Drawing No. FIGURE 6
Rev 01

BOREHOLES
BH2004 FES 2004
56 LONDON POWER COMPANY 1920–30
BH1846/2 THAMES WATER 2002
BGS684 BRITISH GEOLOGICAL SURVEY
BH501 GEOTECHNICS 2002
SMBH13 SOIL MECHANICS 1998
LBHBH1 LBH GEOTECHNICAL 1993
SMDTBH5 SOIL MECHANICS 1989
NRBH1 NETWORK RAIL 1962
NGBH53A NATIONAL GRID 1989
NWHBH1 NORWEST HOLST 2000
FESBH101 FES 1997
TRIAL PITS
NW259 NORWEST HOLST 2004
TP227 FES 2004
GEOTECHNICS 2002
TP50 FES 1997
RIVER THAMES
BATTERSEA POWER STATION
NINE ELMS
Gas Holder Station
Cringle Wharf
KIRTLING STREET
TBH5
SMDTBH4
DO NOT SCALE THIS DRAWING.
HEALTH AND SAFETY INFORMATION
CONSTRUCTION.
MAINTENANCE/CLEANING/OPERATION.
DECOMMISSIONING/DEMOLITION.
Notes
01 SITE BOUNDARY UPDATED 11.06.09 NG TS
INFORMATION
Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Buro Happold
Consulting Engineers
Architect RAFAEL VIÑOLY
Project Battersea Masterplan 2008
Drg Title EXPLORATORY HOLE LOCATION PLAN
Scales@A1 1:1000
Drawn by NG
Checked by JB
Date DEC 2008
Job No. 023000
Drawing No. FIGURE 7
Rev 01

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

Rev	Description/Date	Dm/Chk
01	SITE BOUNDARY UPDATED 11.06.09	NG/TS

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect *RAFAEL VIÑOLY*
Project **Battersea Masterplan**
Drg Title STRATEGIC PLAN ADDRESSING RESIDUAL MUNITIONS CLEARANCE ISSUES

Scales@A3 1:2000
Drawn by NG
Checked by JB
Date DEC 2008

Job No. 023000
Drg No. FIGURE 8
Rev 01

Neil Gibson P:\023000\709 - Geotechnics\Sheet\Geoenvironmental Interpretative Summary Report\Figure 8.dwg 29/02/2008 DWF6 EPlot.pc3

SITE BOUNDARY

BOREHOLES
- BH2004 FES 2004
- BH501 GEOTECHNICS 2002
- NWBH1 NORWEST HOLST 2000
- FESBH101 FES 1997
- LBHBH1 LBH GEOTECHNICAL 1993

TRIAL PITS
- TP227 FES 2004
- GEOTECHNICS 2002
- TP50 FES 1997
- TP6 NORWEST HOLST 2000

© Buro Happold Limited or its group companies. All Rights reserved. Buro Happold and its group companies assert (unless otherwise agreed in writing) their rights under s.77 to 89 of the Copyright, Designs and Patents Act 1988.
DO NOT SCALE THIS DRAWING.
HEALTH AND SAFETY INFORMATION
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING
CONSTRUCTION.
MAINTENANCE/CLEANING/OPERATION.
DECOMMISSIONING/DEMOLITION.
Notes

Rev	Description	Date	Dm	Chk
01	SITE BOUNDARY UPDATED	11.06.09	NG	TS

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect *RAFAEL VIÑOLY*
Project **Battersea Masterplan 2008**
Drg Title LOCATIONS OF CONTAMINATION SAMPLES

Scales@A1 1:1000
Drawn by NG
Checked by JB
Date DEC 2008

Job No. 023000
Drawing No. FIGURE 9
Rev 01

N:\Buro P\023000\709 - Geotechnics\Sheet\Geoenvironmental Interpretative Summary Report\Figure 9.dwg 29/02/2008 DWF6 EPlot.pc3

DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING.

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

SITE BOUNDARY

BOREHOLES

- BH2004 FES 2004
- BH501 GEOTECHNICS 2002
- NWHBH1 NORWEST HOLST 2000
- FESBH101 FES 1997
- LBHBH1 LBH GEOTECHNICAL 1993

TRIAL PITS

- TP227 FES 2004
- GEOTECHNICS 2002
- TP50 FES 1997
- TP6 NORWEST HOLST 2000

0.8m DEPTH (MBGL)

22 ARSENIC CONCENTRATIONS > 19MG/KG

500 LEAD CONCENTRATIONS > 450MG/KG

01 SITE BOUNDARY UPDATED 11.06.09 NG TS

Rev Description Date Drn Chk'd

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect RAFAEL VIÑOLY

Project **Battersea Masterplan 2008**

Dig Title LOCATIONS OF ARSENIC & LEAD CONCENTRATIONS IN SOIL

Scales@A1 1:1000
Drawn by NG
Checked by JB
Date DEC 2008

Job No. 023000
Drawing No. FIGURE 10
Rev 01

DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING.

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

SITE BOUNDARY

BOREHOLES

- BH2004 FES 2004
- BH501 GEOTECHNICS 2002
- NWHBH1 NORWEST HOLST 2000
- FESBH101 FES 1997
- LBHBH1 LBH GEOTECHNICAL 1993

TRIAL PITS

- TP227 FES 2004
- GEOTECHNICS 2002
- TP50 FES 1997
- TP6 NORWEST HOLST 2000

1.0m DEPTH (MBGL)

815 TPH C_{10} – C_{40} CONCENTRATIONS > 500MG/KG

01 SITE BOUNDARY UPDATED 11.06.09 NG TS

Rev Description Date Drn Chk'd

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

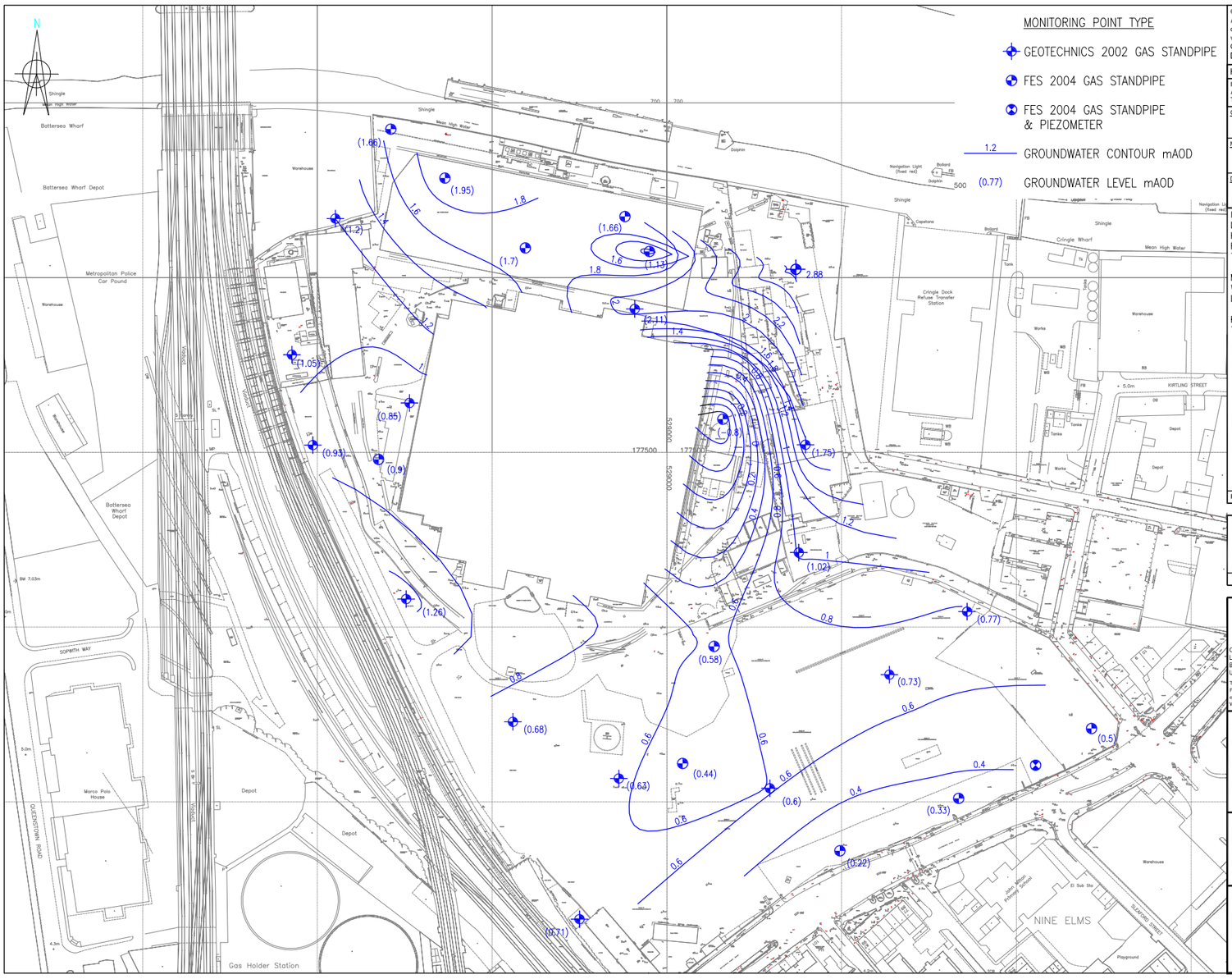
Architect RAFAEL VIÑOLY

Project **Battersea Masterplan 2008**

Dig Title LOCATIONS OF TPH CONCENTRATIONS IN SOIL

Scales@A1 1:1000
Drawn by NG
Checked by JB
Date DEC 2008

Job No. 023000
Drawing No. FIGURE 11
Rev 01



© Buro Happold Limited or its group companies. All Rights reserved. Buro Happold and its group companies assert (unless otherwise agreed in writing) their rights under s.77 to 89 of the Copyright, Designs and Patents Act 1988. DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

LEVELS SHOWN WITHIN THIS PLAN ARE THE HIGHEST RECORDED GROUNDWATER LEVELS FROM INSTALLATIONS WITHIN THE RIVER TERRACE GRAVELS.

MONITORING WAS GENERALLY CARRIED OUT WITHIN THE SUMMER MONTHS. WATER LEVELS ARE LIKELY TO VARY SEASONALLY.

PERCHED WATER LEVELS MAY EXIST ABOVE THE LEVELS SHOWN ON THIS PLAN.

Rev	Description/Date	Drn/Chk

INFORMATION

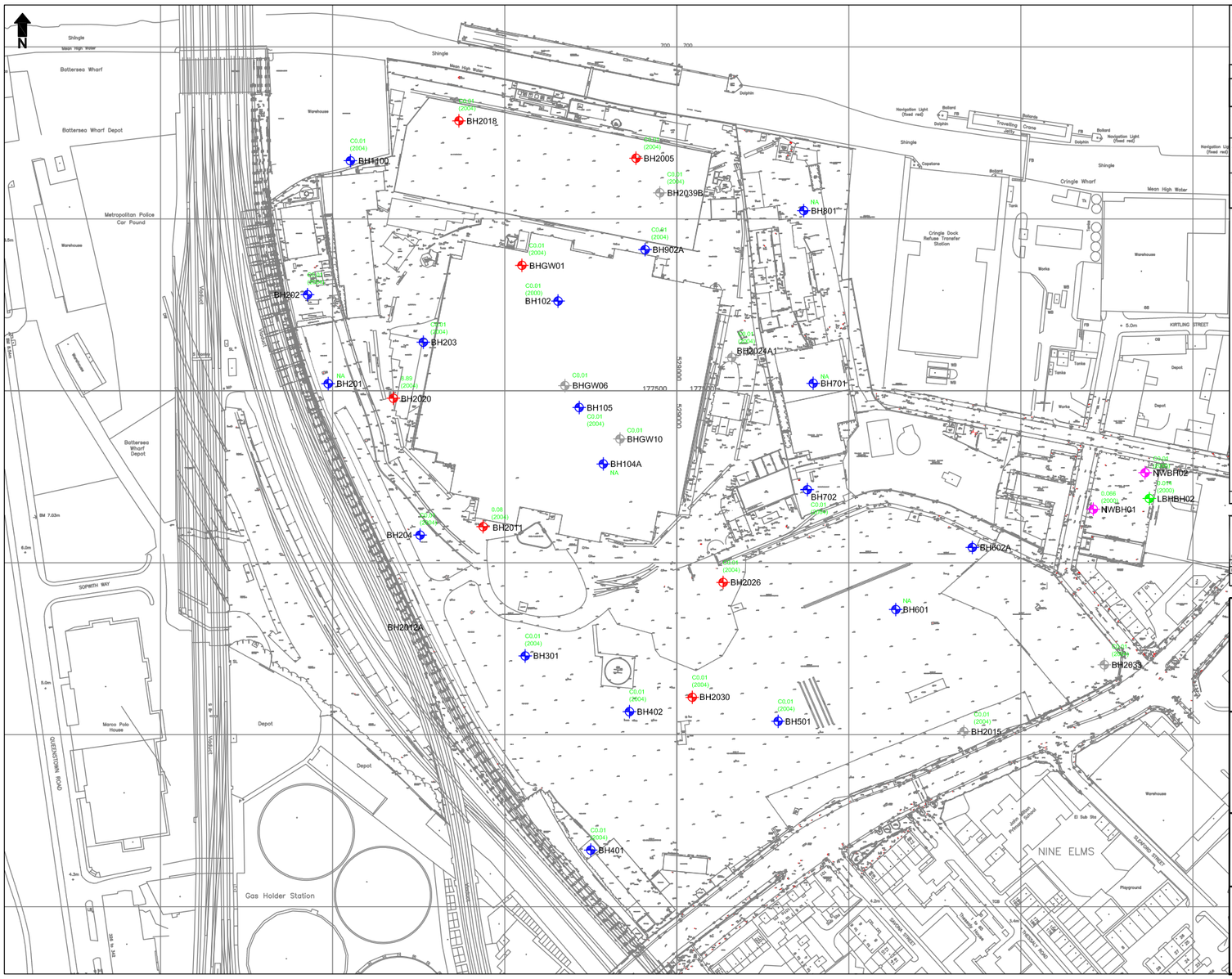
Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 309000
Fax: +44 (0)870 787 4148
email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect	*RAFAEL VIÑOLY*
Project	**Battersea Masterplan**
Drg Title	HIGHEST RECORDED GROUNDWATER LEVELS IN RIVER TERRACE GRAVELS
Scales@A3	1:2000
Drawn by	NG
Checked by	JB
Date	DEC 2008
Job No.	023000
Drg No.	FIGURE 12
Rev	00

Neil Gibson P:\023000\F09 - Geotechnics\Sheet\Geoenvironmental Interpretative Summary Report\Figure 12.dwg 28/02/2008 DWF6 EPlot.pc3



Notes

- Geotechnics Borehole - 2002
- FES Borehole - 2004
- FES Borehole - 2004
- NW 2001 - Groundwater well
- LBH 1993 - Groundwater well

Monitoring was generally carried out within the summer months. Water levels are likely to vary seasonally.

Perched water levels may exist above the levels shown on this plan

Rev	Description/Date	Drn/Chk
01	Final	22/12/08 JMB JB
00	First Issue	04/08/04 NG MK

Status of drawing

Buro Happold
Consulting Engineers

Architect	**FINAL**
Project	BATTERSEA MASTERPLAN 2008
Drg Title	CONCENTRATIONS OF BENZO (A) PYRENE IN GROUNDWATER (mg/l)
Scales@A3	1:2000
Drawn by	JMB
Checked by	JB
Date	22/12/08
Job No.	023000
Drg No.	13
Rev	01

Jean-Marc Barre C:\Documents and Settings\jmbarre\Desktop\concentrations of BENZ(A)P.dwg 28/02/2008 DWF6 EPlot.pc3

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

- Geotechnics Borehole - 2002
- FES Borehole - 2004
- FES Borehole - 2004
- NW 2001 - Groundwater well
- LBH 1993 - Groundwater well

Monitoring was generally carried out within the summer months. Water levels are likely to vary seasonally.

Perched water levels may exist above the levels shown on this plan

Rev	Description	Date	Drn/Chk
01	Final	22/12/08	JMB/JB
00	First Issue	04/06/04	NG/MB

Status of drawing

Buro Happold
Consulting Engineers

Architect **FINAL**

Project BATTERSEA MASTERPLAN 2008

Drg Title CONCENTRATIONS OF BENZO (A) PYRENE IN GROUNDWATER (mg/l)

Scales@A3 1:2000

Drawn by JMB

Checked by JB

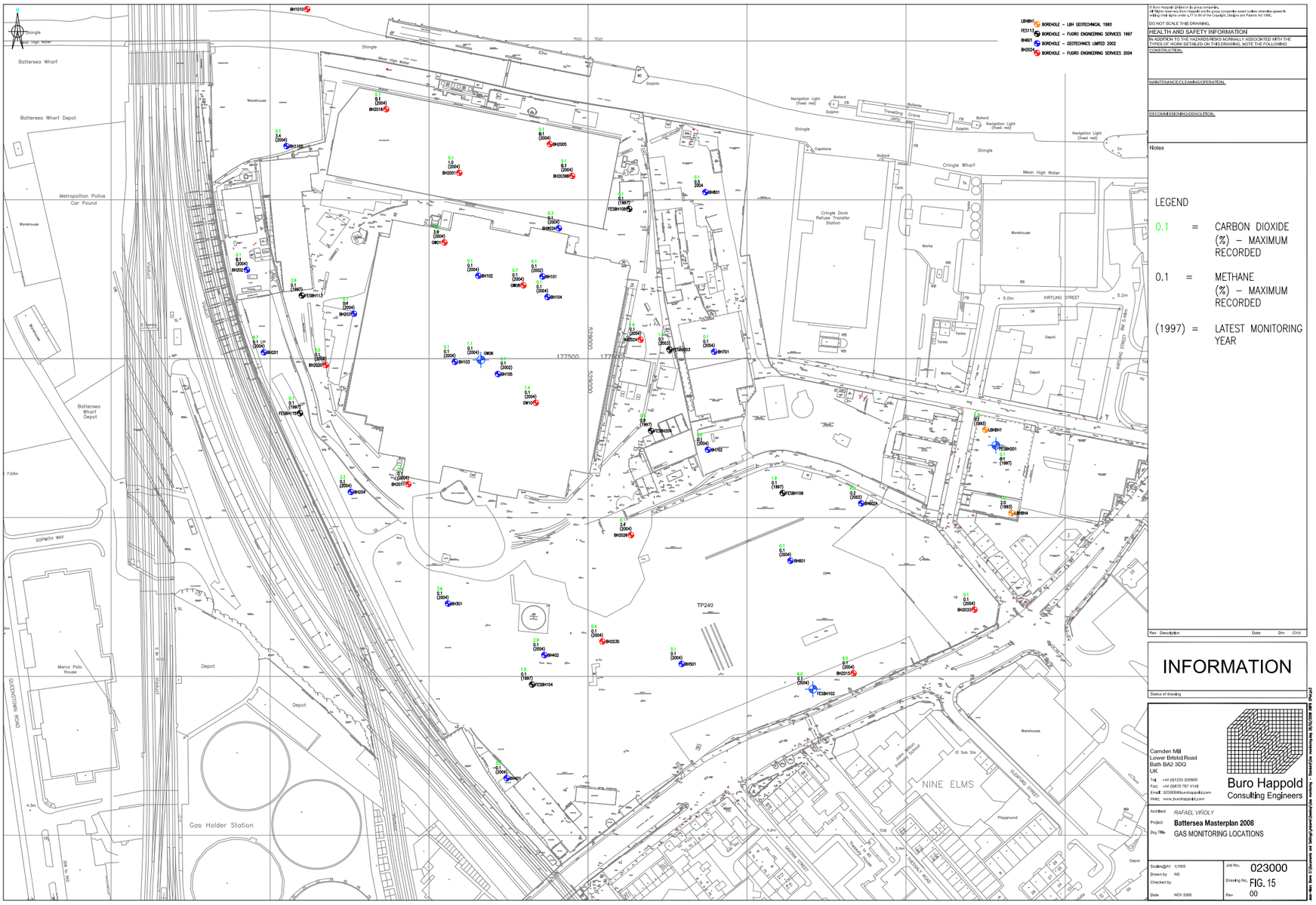
Date 22/12/08

Job No. 023000

Drg No. 14

Rev 01

Jean-Marc Burre C:\Documents and Settings\jmburre\Desktop\concentrations of BENZOAP.dwg 29/02/2008 DWF6 ePlot.pc3



Notes

Rev Description/Date Drn/Chk

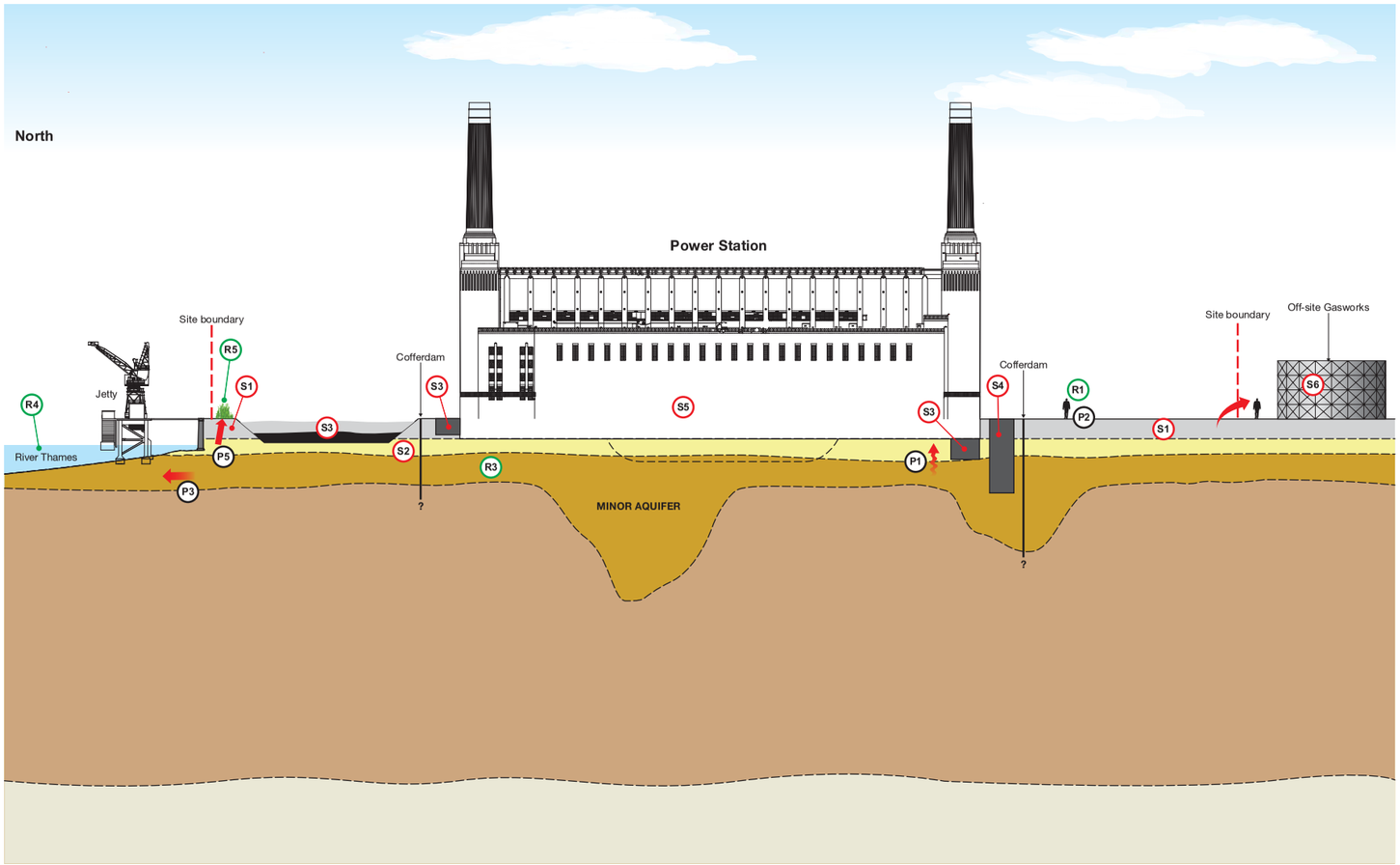
INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
Tel +44 (0)1225 320600
Fax +44 (0)870 787 4148
Email 023000@burohappold.com
Web www.burohappold.com

Buro Happold
Consulting Engineers

Architect	*RAFAEL VIÑOLY*
Project	Battersea Masterplan 2008
	CONCEPTUAL SITE MODEL
	CURRENT SITE USE
Scales@A3	NTS
Drawn by	NG
Checked by	JB
Date	DEC 2008
Job No.	023000
Drg No.	FIGURE 16
Rev	00



Sources

- S1 Made Ground
- S2 Alluvium
- S3 Oil drains/sumps
- S4 Ash Sump
- S5 Potential Hazardous materials
- S6 Offsite Gasworks

Pathways

- P1 Inhalation of ground gas
- P2 Dermal contact
- P3 Migration via permeable strata/runoff
- P4 Dust inhalation
- P5 Root uptake

Receptors

- R1 Existing site users
- R2 Adjacent site users
- R3 River Terrace Gravels (Minor Aquifer)
- R4 River Thames
- R5 Flora & Fauna

- Made ground
- Alluvium
- River Terrace Gravels
- London Clay
- Lambeth Group

Notes

Rev Description/Date Drn/Chk

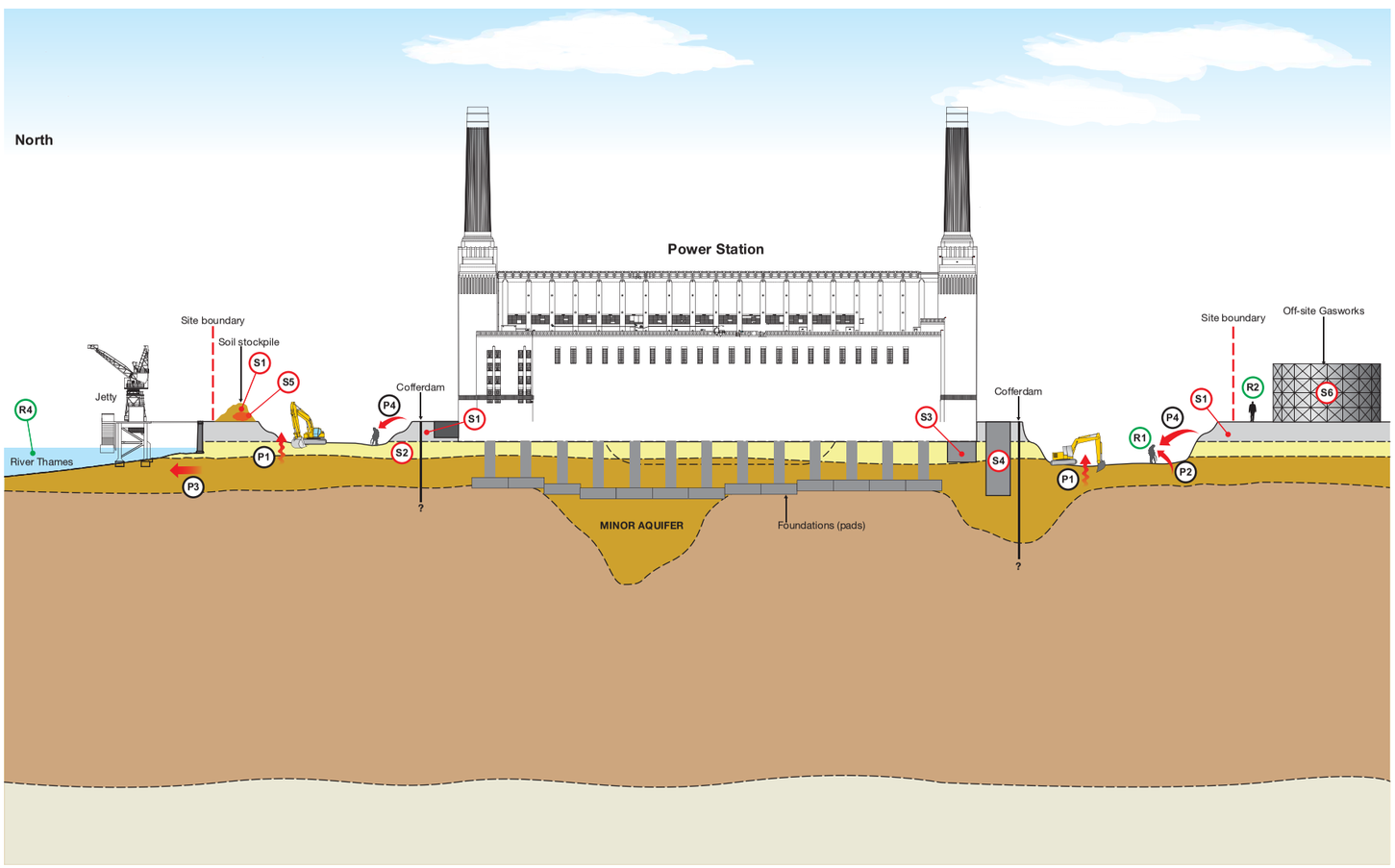
INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
Tel +44 (0)1225 320600
Fax +44 (0)870 787 4148
Email 023000@burohappold.com
Web www.burohappold.com

Buro Happold
Consulting Engineers

Architect	*RAFAEL VIÑOLY*
Project	Battersea Masterplan 2008
	CONCEPTUAL SITE MODEL
	DURING CONSTRUCTION
Scales@A3	NTS
Drawn by	NG
Checked by	JB
Date	DEC 2008
Job No.	023000
Drg No.	FIGURE 17
Rev	00



Sources

- S1 Made Ground
- S2 Alluvium
- S3 Oil drains/sumps
- S4 Ash Sump
- S5 Potential Hazardous materials
- S6 Offsite Gasworks

Pathways

- P1 Inhalation of ground gas
- P2 Dermal contact
- P3 Migration via permeable strata/runoff
- P4 Dust inhalation

Receptors

- R1 Construction workers
- R2 Adjacent site users
- R3 River Terrace Gravels (Minor Aquifer)
- R4 River Thames

- Made ground
- Alluvium
- River Terrace Gravels
- London Clay
- Lambeth Group

Notes

Rev Description/Date Drn/Chk

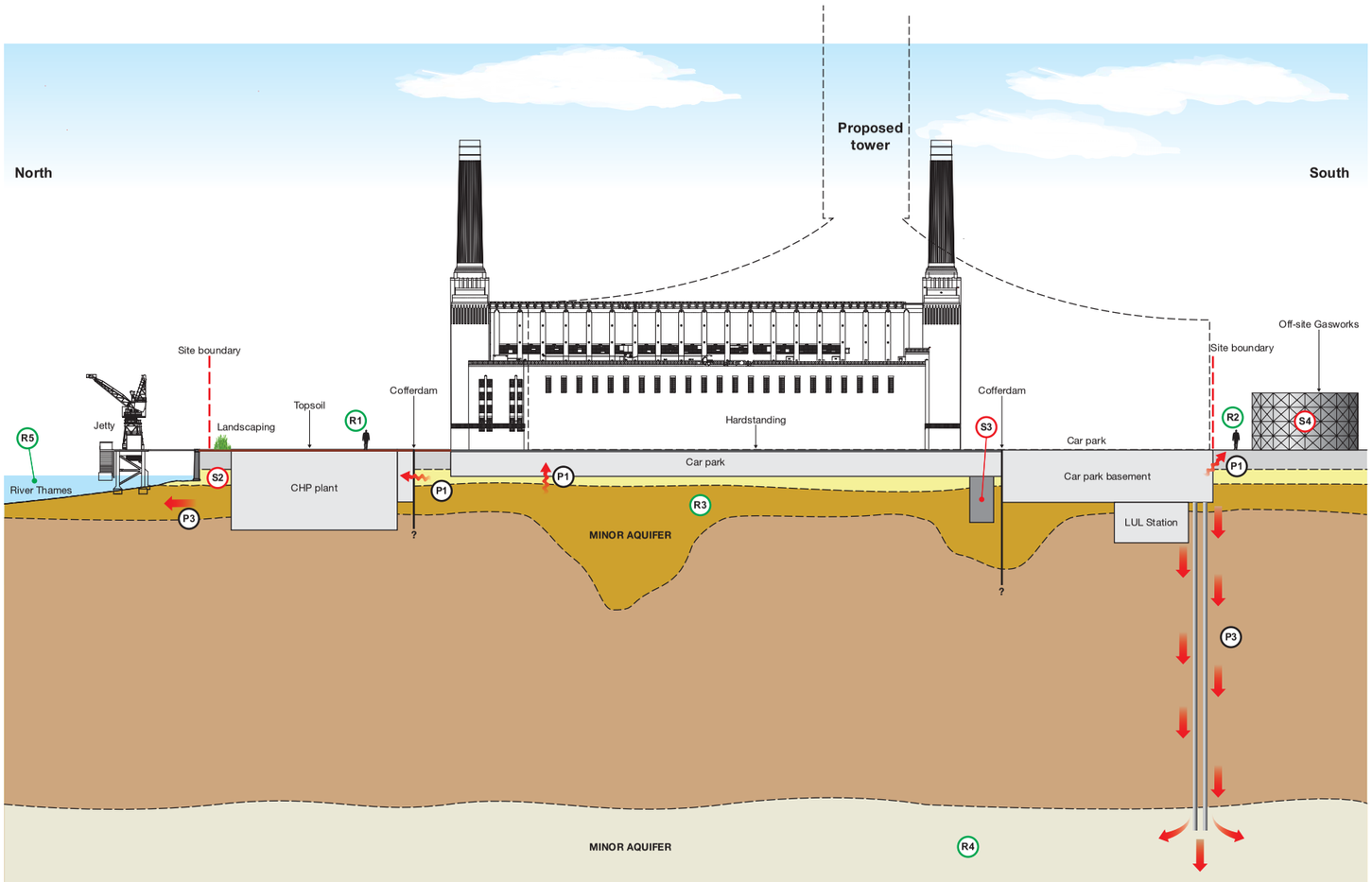
INFORMATION

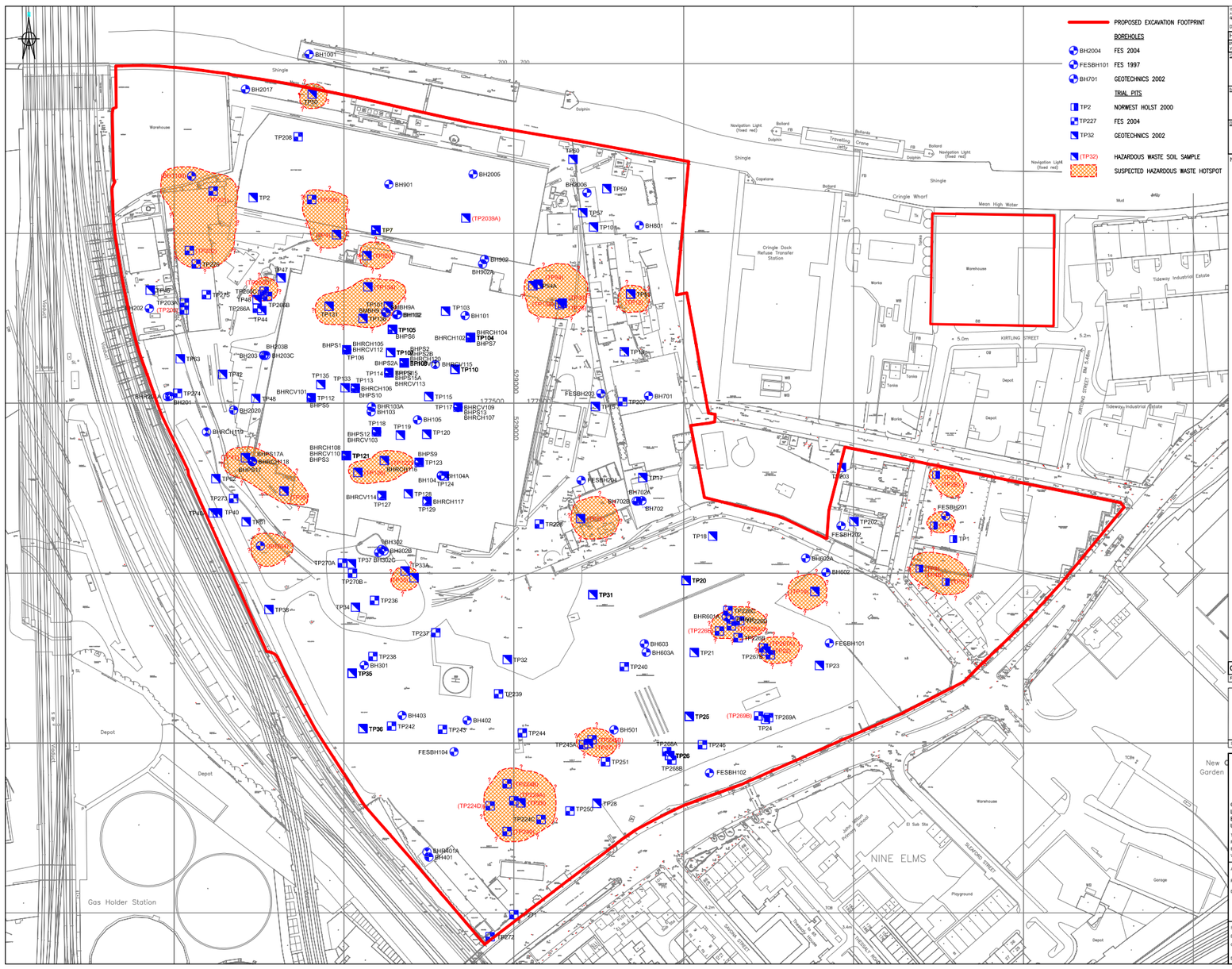
Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect	*RAFAEL VIÑOLY*
Project	Battersea Masterplan 2008
	CONCEPTUAL SITE MODEL
	PROPOSED LAND USE
Scales@A3	NTS
Drawn by	NG
Checked by	JB
Date	DEC 2008
Job No.	023000
Drg No.	FIGURE 18
Rev	00





Buro Happold

Appendix A: Analytical Summary Tables

Inorganics

Sample Identity	Depth (m)	Geology	Arsenic by IRIS	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	Total Sulphate	Acid Soluble Sulphide	Total Cyanide	% Stones Greater than 10mm	Asbestos *	Asbestos Presence Screen	Asbestos Type *	Chloride in Leachate	Natural Moisture Content Ratio	pH Value In Soil	Soluble Sulphate Extract as SO4	Total Sulphur
TP234	1.4	MGR	7.9	<0.5	42	30	104	<0.3	24	<0.5	75	-	<5	<1	17.8	-	nfd	-	-	15.400	7.8	-	-
TP234	0.5	MGR	5.6	<0.5	37	34	64	<0.3	21	<0.5	100	-	594	<1	48.9	-	nfd	-	-	14.5	8.9	-	-
TP24	2	MGR	7.0	<0.5	45	136	273	<0.3	26	<0.5	100	-	-	-	59	-	-	-	-	-	11.4	0.1	-
TP24	0.5	MGR	10.7	<0.5	30	143	215	<0.3	40	<0.5	193	-	-	-	56.3	-	-	-	-	-	8.1	0.1	-
TP240	0.5	MGR	12.5	2	40	311	862	<0.3	71	<0.5	860	-	83	<1	13.9	-	nfd	-	-	12.200	7.8	-	-
TP244	2	MGR	1.3	<0.5	9	23	53	<0.3	9	<0.5	74	-	<5	<1	27.5	-	nfd	-	-	15.1	7.9	-	-
TP244	1	MGR	11.9	<0.5	34	46	147	<0.3	26	<0.5	87	-	<5	<1	20.6	-	nfd	-	-	20.7000	7.9	-	-
TP245	1	MGR	18.8	0.6	60	99	297	<0.3	46	<0.5	254	-	84	<1	37.1	-	nfd	-	-	13.0	7.9	-	-
TP245	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	47.8	-	-	-	-	10.2	8.0	-	-
TP245A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	52.0	-	-	-	-	5.0	11.4	-	-
TP245B	0.5	MGR	15.5	0.6	42	35	841	<0.3	23	<0.5	203	-	11	<1	<0.1	-	nfd	-	-	6.3	9.3	-	-
TP245B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	78.0	-	-	-	-	3.4	11.8	-	-
TP246	1	MGR	7.5	<0.5	35	37	248	<0.3	24	<0.5	147	-	-	-		-	-	-	-	-	10.3	-	-
TP249	0.6	MGR	7.2	<0.5	28	40	1352	<0.3	23	<0.5	137	-	-	-		-	-	-	-	-	8.1	-	-
TP25	1	MGR	0.7	<0.5	20	186	130	<0.3	34	<0.5	141	-	-	-	28.4	-	-	-	-	-	8.3	0.7	-
TP25	1.5	MGR	3.3	<0.5	30	14	23	<0.3	49	<0.5	84	-	-	-	<0.1	-	-	-	-	-	8.0	0.4	-
TP25	0.6	MGR	<0.5	<0.5	47	16	88	<0.3	34	<0.5	136	-	-	-	31	-	-	-	-	-	9.7	0.3	-
TP250	0.7	MGR	8	<0.5	26	36	112	<0.3	21	<0.5	67	-	<5	<1	<0.1	-	nfd	-	-	15.0	8.3	-	-
TP250	0.3	MGR	6.8	<0.5	40	33	320	<0.3	24	<0.5	80	-	29	<1	43.4	-	nfd	-	-	14.4	11.1	-	-
TP251	0.2	MGR	5.1	<0.5	24	16	130	<0.3	14	<0.5	83	-	38	<1	47.5	-	nfd	-	-	11.2	10.4	-	-
TP254A	0.5	MGR	21.1	0.5	25	49	398	0.9	19	0.6	109	-	<50	-	10.8	NFD	-	-	-	-	8.0	-	-
TP254A	1.5	MGR	17.5	<0.5	14	52	509	0.9	20	<0.5	88	-	<50	-	12.2	NFD	-	-	-	-	8.1	-	-
TP254A	1	MGR	45.4	0.9	12	79	2053	1.8	28	<0.5	167	-	<50	-	8.1	NFD	-	-	-	-	8.0	-	-
TP255	0.5	MGR	17.6	<0.5	24	94	1151	11.8	20	<0.5	172	-	<50	-	14.7	NFD	-	-	-	-	7.9	-	-
TP255	3.6	MGR	9.1	<0.5	16	39	99	<0.3	15	<0.5	55	-	<50	-	11.4	NFD	-	-	-	-	8.1	-	-
TP255	4	MGR	8.2	<0.5	13	147	3811	5.5	15	0.5	89	-	1385	-	15.4	NFD	-	-	-	-	7.6	-	-
TP256	0.5	MGR	8.0	<0.5	15	25	82	2.4	13	0.6	51	-	139	-	7.4	NFD	-	-	-	-	8.1	-	-
TP256	2	MGR	7.8	<0.5	26	34	124	0.7	18	<0.5	65	-	<50	-	4.6	NFD	-	-	-	-	8.2	-	-
TP256	3	MGR	8.3	<0.5	31	40	111	0.3	30	0.5	57	-	<50	-	16.8	NFD	-	-	-	-	8.1	-	-
TP26	2	MGR	5.2	<0.5	25	16	204	<0.3	26	<0.5	101	-	-	-	46.4	-	-	-	-	-	11.6	0.0	-
TP264E	1	MGR	18.6	0.6	34	96	391	<0.3	37	<0.5	200	-	-	-	55.4	-	-	-	-	9.6	10.5	-	-
TP264E	2	MGR	17.4	0.7	38	444	2279	<0.3	29	<0.5	301	-	-	-	69.8	-	-	-	-	11.4	10.0	-	-
TP265B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	64.1	-	-	-	-	21.7	8.0	-	-
TP267A	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	59.0	-	-	-	-	9.1	10.7	-	-
TP267B	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	72.3	-	-	-	-	8.1	10.6	-	-
TP267B	0.8-1.0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	52.3	-	-	-	-	10.8	8.2	-	-
TP268A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	79.7	-	-	-	-	6.6	11.1	-	-
TP268B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	71.9	-	-	-	-	6.4	11.4	-	-
TP269A	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	52.5	-	-	-	-	7.4	11.0	-	-
TP269B	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	60.7	-	-	-	-	6.7	11.1	-	-
TP27	0.5	MGR	13.1	<0.5	60	59	171	<0.3	42	<0.5	145	-	-	-	34.1	-	-	-	-	-	9.8	0.5	-
TP27	2	MGR	7.6	<0.5	27	12	237	<0.3	24	<0.5	74	-	-	-	37.5	-	-	-	-	-	12.0	0.0	-
TP270A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	50.8	-	-	-	-	19.8	7.9	-	-
TP270B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	17.9	8.0	-	-
TP271 CD1	0.50	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	10.0	-	-
TP271 K2	0.50	MGR	9	<0.5	21	47	102	<0.3	15	<0.5	101	-	-	-	22.6	-	nfd	-	-	14	-	-	-
TP272 CD1	0.20	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	8.1	-	-
TP272 K2	0.20	MGR	3.5	<0.5	19	64	207	<0.3	40	<0.5	293	-	-	-	22.8	-	nfd	-	-	6.1	-	-	-
TP273 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	8.2	-	-
TP273 K2	SOIL H.	MGR	11.7	0.6	42	48	302	<0.3	22	<0.5	202	-	-	-	17.2	-	nfd	-	-	8.9	-	-	-
TP274 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	8.1	-	-
TP274 K2	SOIL H.	MGR	10.9	1.4	21	84	210	0.5	23	1.1	237	-	-	-	32.6	-	nfd	-	-	13.2	-	-	-
TP275 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	9.2	-	-
TP275 K2	SOIL H.	MGR	8.3	<0.5	23	73	144	<0.3	22	<0.5	437	-	-	-	22	-	nfd	-	-	11.4	-	-	-
TP276 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	78	<1	-	-	-	-	-	-	8.8	-	-
TP276 K2	SOIL H.	MGR	7.1	<0.5	22	36	126	<0.3	34	<0.5	131	-	-	-	22.1	-	nfd	-	-	11.5	-	-	-
TP277 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	8.5	-	-
TP277 K2	SOIL H.	MGR	9	<0.5	34	59	358	<0.3	23	<0.5	440	-	-	-	11.8	-	nfd	-	-	8	-	-	-
TP278 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	8.1	-	-
TP278 K2	SOIL H.	MGR	12.8	<0.5	26	66	386	<0.3	23	<0.5	296	-	-	-	15.7	-	nfd	-	-	10.2	-	-	-
TP279 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	57	<1	-	-	-	-	-	-	8.2	-	-
TP279 K2	SOIL H.	MGR	11.1	<0.5	32	123	308	0.6	24	<0.5	471	-	-	-	10.3	-	nfd	-	-	5.7	-	-	-
TP28	2.5	MGR	9.4	<0.5	36	11	52	<0.3	42	2.1	74	-	-	-	17	-	-	-	-	-	8.3	0.2	-
TP28	1	MGR	11.5	<0.5	27	28	132	<0.3	30	<0.5	94	-	-	-	53.6	-	-	-	-	-	9.7	0.3	-
TP29	2.5	MGR	17.2	<0.5	32	174	1015	0.7	31	2.5	304	2752	168	<2.5	<0.1	-	-	-	0.235	-	7.8	0.2	-
TP29	0	MGR	2.3	<0.5	39	8	59	<0.3	16	<0.5	54	-	-	-	34.2	-	-	-	-	-	9.4	0.3	-
TP29	3	MGR	15.7	0.6	25	170	754	<0.3	32	<0.5	562	2600	50	<2.5	28.6	-	-	-	0.125	-	7.7	0.4	-
TP29	1	MGR	0.9	<0.5	28	16	45	<0.3	44	<0.5	98	-	-	-	<0.1	-	-	-	-	-	7.9	0.5	-
TP30	0.5	MGR	52.7	0.8	28	368	260	<0.3	76	1.5	1965	-	-	-	13.7	-	-	-	-	-	8.3	0.2	-
TP30	0	MGR	3.9	0.8	38	34	204	<0.3	94	<0.5	202	-	-	-	22.8	-	-	-	-	-	8.5	0.2	-
TP30	1	MGR	3.0	<0.5	28	34	38	<0.3	46	<0.5	120	-	-	-	<0.1	-	-	-	-	-	8.1	0.1	-
TP301	2.5	MGR	10.2	0.6	25	700	768	0.6	21	<0.5	928	-	25	<1	37.0	-	nfd	-	-	14.2	7.7	-	-
TP301	3.8	MGR	3.4	0.8	31	47	354	<0.3	27	<0.5	580	-	69	<1	21.4	-	nfd	-	-	18.2	7.5	-	-
TP302	6	MGR	12.6	<0.5	36	47	145	0.4	21	2.3	135	-	<5	<1	30.4	-	NFD	-	-	14.6	8.1	-	-
TP302	2	MGR	-	-	-	-	-	-	-	-	-	-	326	<1	-	No asbestos detected	POS ASB	No asbestos detected	-	15.5	7.6	-	-
TP302	4.5-5.0	MGR	-	-	-	-	-	-	-	-	-	-	38	<1	-	No asbestos detected	POS ASB	No asbestos detected	-	12.5	7.6	-	-
TP307 CD7	1.80	MGR	-	-	-	-	-	-	-	-	-	-	<50	<1	-	-	-	-	-	-	7.4	-	-
TP307 K8	1.80	MGR	10.1	<0.5	60	44	181	<0.3	18	<0.5	54	-	-	-	14.5	-	nfd	-	-	15.3	-	-	-
TP309 CD3	1.00	MGR	-	-	-	-	-	-	-	-	-	-	72	<1	-	-	-	-	-	-	9.6	-	-
TP309 K4	1.00	MGR	8.3	<0.5	24	20	133	<0.3	15	<0.5	79	-	-	-	36.5	-	nfd	-	-	7.1	-	-	-
TP31	2	MGR	9.4	<0.5	32	20	192	<0.3	29	1.3	58	-	-	-	<0.1	-	-	-	-	-	8.3	0.2	-
TP31	0.7	MGR	<0.5	<0.5	33	37	31	<0.3	27	<0.5	43	-	-	-	36.1	-	-	-	-	-	8.2	0.2	-
TP32	1	MGR	13.2	<0.5	25	12	61	<0.3	31	2.2	60	-	-	-	11.9	-	-	-	-	-	8.5	0.0	-
TP33	0.1	MGR	19.2	<0.5	39	186	671	<0.3	53	<0.5	299	-	-	-	32.9	-	-	-	-	-	10.2	0.6	-
TP33A	0.5	MGR	11.5	<0.5	44	135	506	<0.3	55	<0.5	256	-	-	-	51.1	-	-	-	-	-	8.1	0.4	-
TP33A	2	MGR	5.4	<0.5	21	27	156	<0.3	20	<0.5	89	-	-	-	59.7	-	-	-	-	-	8.0	0.3	-
TP34	0.5	MGR	13.8	<0.5	22	41	274	<0.3	31	<0.5	152	-	-	-	3.3	-	-	-	-	-	7.9	0.9	-
TP35	1	MGR	9.8	<0.5	10	48	23	<0.3	33	<0.5	430	-	-	-	43.2	-	-	-	-	-	8.1	0.2	-
TP35	0.1	MGR	5.8	<0.5	19	15	53	<0.3	28	<0.5	73	-	-	-	9.7	-	-	-	-	-	10.4	0.5	-
TP36	3	MGR	4.1	<0.5	31	17	31	<0.3	47	<0.5	93	-	-	-	<0.1	-	-	-	-	-	8.1	0.3	-
TP36	1	MGR	<0.5	<0.5	33	27	112	<0.3	38	<0.5	93	-	-	-	<0.1	-	-	-	-	-	7.9	1.2	-
TP37	2	MGR	7.4	<0.5	24	88	192	<0.3	35	<0.5	197	-	-	-	34.1	-	-	-	-	-	7.9	-	-
TP38	2	MGR	4.8	<0.5	83	43	198	<0.3	33	<0.5	84	-	-	-	<0.1	-	-	-	-	-	9.9	0.1	-
TP39	1	MGR	54.2	1.2	43	614	1531	<0.3	64	<0.5	1979	13000	<10	<2.5	11.3	-	-	-	0.07	-	7.6	1.8	-
TP39	2	MGR	<0.5	<0.5	4	17	121	<0.3	5	<0.5	37	8600	14	<2.5	71.1	-	-	-	0.055	-	12.7	0.0	-
TP39	3	MGR	15.2	<0.5	25	167	833	0.4	36	<0.5	412	-	-	-	38.5	-	-	-	-	-	8.1	0.1	-
TP4	0.6	MGR	<0.5	<0.5	14	64	637	<0.3	20	<0.5	107	370000	<10	<2.5	46.1	-	-	-	0.02	-	7.9	1.6	-
TP4	1	MGR	81.6	4.4	62	5808	4811	0.6	63	-	4061	-	4	<1	39.9	-	nfd	-	-	-	8.1	0.270	-
TP4	0.6	MGR	5.8	<0.5	23	315	815	0.9	7	-	387	-	76	<1	0.1	-	nfd	-	-	-	12.9	0.057	-
TP4	1	MGR	18.9	<0.5	23	94	370	<0.3	28	<0.5	247	-	-	-	97.8	-	-	-	-	-	8.4	-	-
TP40	0.5	MGR	7.3	1.1	50	68	134	<0.3	37	<0.5	288	1383	74	<2.5	39.6	-	-	-	0.025	-	8.2	0.1	-
TP40	0	MGR	3.2	0.6	26	81	164	<0.3	38	<0.5	213	-	-	-	49	-	-	-	-	-	8.1	0.0	-
TP40	1	MGR	1.7	<0.5	21	40	56	<0.3	31	<0.5	87	-	-	-	<0.1	-	-	-	-	-	8.1	0.1	-
TP41	0.5	MGR	36.4	<0.5	30	793	1191	2.4	66	<0.5	593	-	-	-	15.3	-	-	-	-	-	8.9	0.2	-
TP42	3	MGR	3.0	<0.5	30	9	35	<0.3	40	<0.5	77	50	22	<2.5	<0.1	-	-	-	-	-	7.5	0.0	-
TP42	1	MGR	7.8	<0.5	21	24	131	0.4	35	<0.5	79	-	-	-	2.3	-	-	-	0.095	-	7.4	-	-
TP44	3.5	MGR	13.0	<0.5	19	45	148	0.3	27	<0.5	82	1200	111	<2.5	5.9	-	-	-	0.095	-	7.7	0.1	-
TP44	0	MGR	19.5	<0.5	50	262	256	0.4	56	<0.5	540	-	-	-	66.8	-	-	-	-	-	8.1	0.2	-
TP44	2	MGR	15.4	<0.5	20	123	169	<0.3	37	0.9	125	-	-	-	38.7	-	-	-	-	-	8.2	0.0	-
TP45	0.5	MGR	<0.5	<0.5	47	840	28	<0.3	38	1.4	32	-	-	-	20.8	-	-	-	-	-	8.3	0.1	-
TP45	1	MGR	16.6	<0.5	20	169	838	4.1	28	<0.5	231	2220	<10	<2.5	10.2	-	-	-	0.055	-	8.3	0.1	-
TP46	1	MGR	57.8	1.8	74	130	248	0.6	71	1.3	307	-	-	-	26.7	-	-	-	-	-	7.7	0.3	-
TP46	2	MGR	33.9	0.8	73	55	128	<0.3	51	<0.5	151	-	-	-	65	-	-	-	-	-	7.7	-	-
TP47	1.5	MGR	16.0	<0.5	11	12	61	0.5	19	<0.5	109	472	<10	<2.5	<0.1	-	-	-	0.03	-	8.5	0.0	-
TP47	0.7	MGR	66.1	2.1	71	241	482	<0.3	120	<0.5	834	1965	<10	<2.5	<0.1	-	-	-	0.06	-	7.9	0.1	-
TP48	0	MGR	10.3	<0.5	47	132	253	<0.3	36	<0.5	522	-	-	-	16.7	-	-	-	-	-	8.3	0.5	-
TP50	0.5	MGR	27.7	<0.5	39	18	143	<0.3	64	<0.5	126	-	-	-	<0.1	-	-	-	-	-	7.7	0.2	-
TP50	1.1	MGR	122.0	3	25	143	2630	1.4	56	<0.5	624	-	-	-	28.2	-	-	-	-	-	8.0	1.6	-
TP53	1.5	MGR	10.1	<0.5	80	12	98	<0.3	20	<0.5	48	-	-	-	9.1	-	-	-	-	-	7.8	0.1	-
TP54	1.7	MGR	<0.5	<0.5	14	21	46	<0.3	20	<0.5	67	33631	<10	<2.5	86.8	-	-	-	0.03	-	8.1	0.1	-
TP54	1	MGR	44.2	<0.5	33	80	70	<0.3	47	6	105	-	-	-	22.6	-	-	-	-	-	8.0	0.0	-
TP54	1.5	MGR	19.4	<0.5	52	120	54	<0.3	25	2.3	51	-	-	-	42.6	-	-	-	-	-	6.6	0.0	-
TP54	0.1	MGR	12.0	<0.5	28	30	130	<0.3	32	<0.5	108	-	-	-	52.7	-	-	-	-	-	8.1	0.6	-
TP54A	1.7	MGR	16.6	<0.5	22	55	280	8.8	32	<0.5	128	1400	<10	<2.5	20.5	-	-	-	0.69	-	8.4	0.0	-
TP54A	0.5	MGR	17.0	<0.5	49	167	465	<0.3	33	<0.5	439	-	-	-	25	-	-	-	-	-	8.6	0.4	-
TP54A	3.3	MGR	47.8	<0.5	25	91	978	1.2	61	<0.5	159	-	-	-	23.3	-	-	-	-	-	8.4	0.4	-
TP55	1	MGR	<0.5	0.6	138	9	39	<0.3	32	<0.5	38	-	-	-	76.9	-	-	-	-	-	12.4	0.0	-
TP57	2	MGR	8.5	<0.5	26	54	183	<0.3	30	<0.5	204	-	-	-	47.5	-	-	-	-	-	8.0	1.2	-
TP57	0	MGR	14.0	<0.5	26	58	321	<0.3	34	<0.5	211	-	-	-	52.5	-	-	-	-	-	8.2	0.4	-
TP58	2	MGR	11.4	<0.5	27	85	252	<0.3	30	<0.5	167	-	-	-	68.4	-	-	-	-	-	9.1	0.6	-
TP59	0	MGR	10.1	<0.5	33	55	191	<0.3	23	<0.5	218	2655	17	<2.5	29.7	-	-	-	0.095	-	8.0	1.0	-
TP6	2	MGR	6.9	<0.5	23	28	127	<0.3	29	<0.5	106	-	-	-	41.3	-	-	-	-	-	10.2	0.3	-
TP6	1	MGR	22.4	<0.5	35	55	174	<0.3	39	<0.5	170	-	-	-	52.3	-	-	-	-	-	10.0	0.6	-
TP60	2	MGR	13.4	<0.5	35	81	303	<0.3	27	<0.5	300	2763	36	<2.5	16.4	-	-	-	0.136	-	7.9	0.4	-
TP60	0	MGR	16.2	<0.5	27	78	308	<0.3	25	<0.5	390	3213	62	<2.5	31.6	-	-	-	0.06	-	7.9	0.3	-
TP61	0.5	MGR	3.7	<0.5	19	84	128	<0.3	39	<0.5	160	1087	21	<2.5	53.6	-	-	-	0.095	-	7.9	0.4	-
TP62	0.5	MGR	14.3	<0.5	44	114	274	<0.3	31	<0.5	458	1602	39	<2.5	48.3	-	-	-	0.04	-	8.0	0.1	-
TP63	1	MGR	10.4	<0.5	16	17	80	<0.3	11	<0.5	95	2380	59	<2.5	60.5	-	-	-	0.075	-	7.9	0.6	-
TP63	0	MGR	7.4	<0.5	23	22	128	<0.3	14	<0.5	119	2743	17	<2.5	53	-	-	-	0.23	-	7.6	0.1	-
TP7	2	MGR	14.4	<0.5	30	51	196	<0.3	25	<0.5	304	17290	<10	<2.5	<0.1	No asbestos detected	-	No asbestos detected	0.135	-	9.5	1.5	-
WS1	0.3-0.5	MGR	16.5	<0.5	23	46	359	1.8	15	-	144	-	133	-	38.8	-	nfd	-	-	-	7.4	-	-
WS3	0.8-1.0	MGR	20.2	2.7	56	131	198	2.8	36	-	333	-	<50	-	19.9	-	nfd	-	-	-	7.67	-	-
LoD/Units			<0.5 mg/kg	<0.5 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<0.3 mg/kg	<1 mg/kg	<0.5 mg/kg	<1 mg/kg	<50 mg/kg	<5 mg/kg	<1 mg/kg	<0.1 %	<0.01 %	NONE	NONE	<0.001 / <0.005 g/l	%	<1.00 pH Units	<0.003 g/l	<0.01 %
Method Code			TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM148	TM105#	TM153#M	TM008		TM001		TM097#	PM024	TM133#	TM098#	TM051#
Maximum			122	140	138	5808	15140	11.8	172	6	4094	370000	1385	1314	97.8	0	0	0	0.69	31.2	12.9	14.6	0.11
Minimum			0.6	0.5	4.0	1.0	4.0	0.3	5.0	0.5	10	50	2.0	1.0	0.1	0.0	0.0	0.0	0.02	3.400	6.6	0.00	0.01
SGV/GAC Commercial [1]			640	300	330		750	26	1800	13000				16000									
SGV/GAC Residential without plant uptake [1]			35	30	38		450	0.4*	130	600				760									
SGV/GAC Residential with plant uptake [1]			32	10*	37		450	0.4*	130	350				4.5*									
Dutch Intervention [2]						190					720			50*							9.5 (Judgement)		

Organics

Sample Identity	Depth (m)	Geology	Total Phenols HPLC	Phenols Total Monohydric	EPH (DRO) (C10-C40)	EPH C10-12	EPH >C12-16	EPH >C16-21	EPH >21-40	Min. Oils by GC	Min. Oil / Paraffin by TLC (adjusted)	Min. Oil / Paraffin by TLC	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene
TP234	1.4	MGR	0.04	-	-	-	-	-	-	-	-	-	4.4	0.1	0.2	0.1
TP234	0.5	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.4	0.1	0.7	0.5
TP24	2	MGR	-	-	-	-	-	-	-	-	<500	360	-	-	-	-
TP24	0.5	MGR	-	-	-	-	-	-	-	-	<500	930	-	-	-	-
TP240	0.5	MGR	0.01	-	-	-	-	-	-	-	-	-	1.8	0.4	0.3	0.3
TP244	2	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.2	0.1	0.1	0.1
TP244	1	MGR	0.02	-	-	-	-	-	-	-	-	-	0.7	0.1	1.3	1.0
TP245	1	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.6	0.1	0.5	0.5
TP245	0.5	MGR	-	<0.01	996	-	-	-	-	-	-	-	1.7	0.8	1.0	1.5
TP245A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP245B	0.5	MGR	<0.01	-	1338	12	14	103	1209	-	-	-	0.2	0.0	0.0	0.0
TP245B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP246	1	MGR	-	-	-	-	-	-	-	-	-	-	1.1	0.2	11.2	1.7
TP249	0.6	MGR	-	-	-	-	-	-	-	-	-	-	0.5	0.5	0.6	1.1
TP25	1	MGR	-	-	-	-	-	-	-	-	<500	996	1.7	0.1	0.2	0.2
TP25	1.5	MGR	-	-	-	-	-	-	-	-	<500	16	-	-	-	-
TP25	0.6	MGR	-	-	-	-	-	-	-	-	<500	502	-	-	-	-
TP250	0.7	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.3	0.0	0.0	0.1
TP250	0.3	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.2	0.1	0.3	0.2
TP251	0.2	MGR	0.02	-	-	-	-	-	-	-	-	-	0.3	0.3	1.1	1.5
TP254A	0.5	MGR	-	<0.01	-	-	-	-	-	-	-	-	2.6	0.1	0.4	0.3
TP254A	1.5	MGR	-	<0.01	-	-	-	-	-	-	-	-	4.5	0.1	0.5	0.4
TP254A	1	MGR	-	<0.01	-	-	-	-	-	-	-	-	3.7	0.1	1.1	0.7
TP255	0.5	MGR	-	<0.01	-	-	-	-	-	-	-	-	6.8	0.1	0.3	0.2
TP255	3.6	MGR	-	<0.01	-	-	-	-	-	-	-	-	10.4	0.5	0.4	1.4
TP255	4	MGR	-	<0.01	-	-	-	-	-	-	-	-	8.4	0.0	0.5	0.3
TP256	0.5	MGR	-	<0.01	-	-	-	-	-	-	-	-	5.2	0.1	0.3	0.3
TP256	2	MGR	-	<0.01	-	-	-	-	-	-	-	-	7.8	0.1	0.4	0.2
TP256	3	MGR	-	<0.01	-	-	-	-	-	-	-	-	8.2	0.3	0.6	1.0
TP26	2	MGR	-	-	-	-	-	-	-	-	<500	364	-	-	-	-
TP264E	1	MGR	-	<0.01	290	-	-	-	-	-	290	-	0.3	0.1	0.1	0.1
TP264E	2	MGR	-	<0.01	116	-	-	-	-	-	116	-	1.7	2.4	0.7	1.6
TP265B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP267A	0.1	MGR	-	<0.01	1054	<1	71	306	677	-	-	-	0.2	0.3	0.3	0.4
TP267B	0.1	MGR	-	<0.01	450	-	-	-	-	-	-	-	0.4	0.5	0.2	0.4
TP267B	0.8-1.0	MGR	-	<0.01	8245	2	14	417	7812	-	-	-	6.4	4.4	0.8	3.9
TP268A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP268B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP269A	0.5	MGR	-	<0.01	1169	2	5	117	1045	-	-	-	0.4	0.2	0.2	0.3
TP269B	0.5	MGR	-	<0.01	1132	<1	4	141	987	-	-	-	0.4	0.3	0.2	0.4
TP27	0.5	MGR	-	-	-	-	-	-	-	-	538	1543	-	-	-	-
TP27	2	MGR	-	-	-	-	-	-	-	-	<500	604	-	-	-	-
TP270A	2	MGR	-	<0.01	497	-	-	-	-	-	-	-	0.2	0.2	0.1	0.1
TP270B	2	MGR	-	<0.01	450	-	-	-	-	-	-	-	0.4	0.2	0.1	0.2
TP271 CD1	0.50	MGR	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP271 K2	0.50	MGR	-	-	-	-	-	-	-	-	-	-	0.434	0.049	0.141	0.114
TP272 CD1	0.20	MGR	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP272 K2	0.20	MGR	-	-	-	-	-	-	-	-	-	-	0.382	0.029	0.035	0.03
TP273 CD1	SOIL H.	MGR	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-
TP273 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	0.516	0.099	0.388	0.303
TP274 CD1	SOIL H.	MGR	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-
TP274 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	0.484	0.04	0.371	0.29
TP275 CD1	SOIL H.	MGR	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP275 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	0.298	0.019	0.107	0.075
TP276 CD1	SOIL H.	MGR	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP276 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	0.909	0.084	0.507	0.386
TP277 CD1	SOIL H.	MGR	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP277 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	0.598	0.15	0.156	0.131
TP278 CD1	SOIL H.	MGR	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP278 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	1.211	0.078	0.693	0.366
TP279 CD1	SOIL H.	MGR	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-
TP279 K2	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	1.299	0.605	0.558	0.653
TP28	2.5	MGR	-	-	-	-	-	-	-	-	<500	91	-	-	-	-
TP28	1	MGR	-	-	-	-	-	-	-	-	<500	923	-	-	-	-
TP29	2.5	MGR	<0.01	-	-	-	-	-	-	223	768	2065	0.05	0.1	0.0	0.1
TP29	0	MGR	-	-	-	-	-	-	-	-	<500	684	0.3	0.3	0.3	0.5
TP29	3	MGR	<0.01	-	38340	-	-	-	-	28755	38340	-	0.4	0.1	3.6	2.7
TP29	1	MGR	-	-	-	-	-	-	-	-	<500	38	-	-	-	-
TP30	0.5	MGR	-	-	344	-	-	-	-	138	344	5299	2.2	0.2	0.2	0.2
TP30	0	MGR	-	-	25	-	-	-	-	<0.01	<500	817	0.3	0.1	0.3	0.2
TP30	1	MGR	-	-	-	-	-	-	-	-	<500	235	-	-	-	-
TP301	2.5	MGR	0.07	-	-	-	-	-	-	-	-	-	0.4	0.2	0.4	0.4
TP301	3.8	MGR	0.01	-	-	-	-	-	-	-	-	-	0.3	0.2	0.4	0.5
TP302	6	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.2	0.0	0.1	0.1
TP302	2	MGR	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-
TP302	4.5-5.0	MGR	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-
TP307 CD7	1.80	MGR	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP307 K8	1.80	MGR	-	-	907	-	-	-	-	-	-	-	1.654	0.08	0.143	0.163
TP309 CD3	1.00	MGR	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
TP309 K4	1.00	MGR	-	-	-	-	-	-	-	-	-	-	0.398	0.107	0.374	0.255
TP31	2	MGR	-	-	-	-	-	-	-	-	<500	78	-	-	-	-
TP31	0.7	MGR	-	-	-	-	-	-	-	-	<500	142	-	-	-	-
TP32	1	MGR	-	-	-	-	-	-	-	-	<500	76	-	-	-	-
TP33	0.1	MGR	-	-	1807	-	-	-	-	1355	1807	2763	0.4	0.1	0.2	0.1
TP33A	0.5	MGR	-	-	-	-	-	-	-	-	321	1051	2.8	0.1	0.2	0.1
TP33A	2	MGR	-	-	-	-	-	-	-	-	<500	570	-	-	-	-
TP34	0.5	MGR	-	-	-	-	-	-	-	-	<500	226	-	-	-	-
TP35	1	MGR	-	-	-	-	-	-	-	-	<500	183	-	-	-	-
TP35	0.1	MGR	-	-	-	-	-	-	-	-	<500	678	-	-	-	-
TP36	3	MGR	-	-	-	-	-	-	-	-	<500	140	-	-	-	-
TP36	1	MGR	-	-	-	-	-	-	-	-	<500	219	-	-	-	-
TP37	2	MGR	-	-	-	-	-	-	-	-	<500	410	-	-	-	-
TP38	2	MGR	-	-	-	-	-	-	-	-	<500	107	-	-	-	-
TP39	1	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.9	0.1	1.0	0.6
TP39	2	MGR	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
TP39	3	MGR	-	-	-	-	-	-	-	-	<500	366	-	-	-	-
TP4	0.6	MGR	0.01	-	-	-	-	-	-	-	-	-	0.5	0.0	0.0	0.0
TP4	1	MGR	<0.01	-	-	-	-	-	-	-	-	716	4.4	4.4	0.3	0.9
TP4	0.6	MGR	0.03	-	-	-	-	-	-	-	-	1768	29.7	113.4	14	102.9
TP4	1	MGR	-	-	-	-	-	-	-	-	<500	215	-	-	-	-
TP40	0.5	MGR	<0.01	-	-	-	-	-	-	-	<500	422	0.04	0.1	0.0	0.1
TP40	0	MGR	-	-	-	-	-	-	-	-	<500	245	-	-	-	-
TP40	1	MGR	-	-	-	-	-	-	-	-	<500	245	-	-	-	-
TP41	0.5	MGR	-	-	-	-	-	-	-	-	<500	464	-	-	-	-
TP42	3	MGR	<0.01	-	-	-	-	-	-	-	671	1845	0.03	0.0	0.0	0.0
TP42	1	MGR	-	-	-	-	-	-	-	-	<500	32	-	-	-	-
TP44	3.5	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1
TP44	0	MGR	-	-	-	-	-	-	-	-	435	1309	-	-	-	-
TP44	2	MGR	-	-	-	-	-	-	-	-	<500	147	-	-	-	-
TP45	0.5	MGR	-	-	-	-	-	-	-	-	<500	294	-	-	-	-
TP45	1	MGR	-	-	-	-	-	-	-	-	<500	925	-	-	-	-
TP46	1	MGR	<0.01	-	-	-	-	-	-	-	<500	10	4.1	0.1	0.3	0.4
TP46	2	MGR	-	-	-	-	-	-	-	-	<500	10	-	-	-	-
TP47	1.5	MGR	<0.01	-	74	-	-	-	-	<1	74	160	0.05	0.0	0.0	0.0
TP47	0.7	MGR	<0.01	-	249	-	-	-	-	87	249	177	0.1	0.0	0.1	0.0
TP48	0	MGR	-	-	0.02	-	-	-	-	<0.01	0.02	1383	-	-	-	-
TP50	0.5	MGR	-	-	-	-	-	-	-	-	<500	108	-	-	-	-
TP50	1.1	MGR	-	-	-	-	-	-	-	-	<500	210	-	-	-	-
TP53	1.5	MGR	-	-	-	-	-	-	-	-	<500	42	-	-	-	-
TP54	1.7	MGR	<0.01	-	-	-	-	-	-	-	<500	610	0.5	0.0	0.1	0.1
TP54	1	MGR	-	-	1920	-	-	-	-	1440	1971	4795	-	-	-	-
TP54	1.5	MGR	-	-	7199	-	-	-	-	5399	7199	7865	-	-	-	-
TP54	0.1	MGR	-	-	-	-	-	-	-	-	<500	663	-	-	-	-
TP54A	1.7	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.2	0.0	0.1	0.0
TP54A	0.5	MGR	-	-	-	-	-	-	-	-	<500	55	-	-	-	-
TP54A	3.3	MGR	-	-	-	-	-	-	-	-	<500	107	-	-	-	-
TP55	1	MGR	-	-	-	-	-	-	-	-	<500	173	-	-	-	-
TP57	2	MGR	-	-	-	-	-	-	-	-	<500	245	-	-	-	-
TP57	0	MGR	-	-	-	-	-	-	-	-	<500	287	-	-	-	-
TP58	2	MGR	-	-	-	-	-	-	-	-	<500	466	-	-	-	-
TP59	0	MGR	0.01	-	-	-	-	-	-	-	-	-	0.5	0.1	0.4	0.4
TP6	2	MGR	-	-	-	-	-	-	-	-	<500	643	-	-	-	-
TP6	1	MGR	-	-	-	-	-	-	-	-	<500	783	-	-	-	-
TP60	2	MGR	0.01	-	-	-	-	-	-	-	-	-	0.4	0.12	0.2	0.2
TP60	0	MGR	0.01	-	-	-	-	-	-	-	-	-	0.3	0.12	0.4	0.3
TP61	0.5	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.6	0.70	0.3	0.4
TP62	0.5	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.4	0.05	0.5	0.4
TP63	1	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.1	0.03	0.1	0.1
TP63	0	MGR	<0.01	-	-	-	-	-	-	-	-	-	0.3	0.04	0.2	0.2
TP7	2	MGR	<0.01	-	-	-	-	-	-	-	<500	710	0.5	0.05	0.1	0.1
WS1	0.3-0.5	MGR	-	0.02	-	-	-	-	-	-	-	-	2.30	0.19	3.10	1.72
WS3	0.8-1.0	MGR	-	0.01	-	-	-	-	-	-	-	-	0.91	0.22	0.28	0.51
LoD/Units			<0.01 mg/kg	<0.01 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg
Method Code			TM062#	TM062#	TM061#M	TM061#M	TM061#M	TM061#M	TM061#M	TM061#M	TM061#M	TM061#M	TM074#	TM074#	TM074#	TM074#
Maximum			0.54	0.05	38340	12	71	417	7812	28755	38340	47619	61	113	58	103
Minimum			0.01	0.01	0.02	2.00	4.00	103.00	677.00	87.0		5.0	0.03	0.001	0.003	0.01
SGV/GAC Commercial [1]			970000*	970000*	500[3]	600	4400	20000	17000	500[3]	500[3]	500[3]	110			
SGV/GAC Residential without plant uptake [1]			22000*	22000*	500[3]	6.0	30	350	1300	500[3]	500[3]	500[3]	0.7*			
SGV/GAC Residential with plant uptake [1]			400*	400*	500[3]	6.0	30	174	880	500[3]	500[3]	500[3]	0.7*			
Dutch Intervention [2]			40*													

Interpretative Geoenvironmental Summary Report,
Battersea Powerstation Redevelopment
Table A1: Laboratory Analytical Results for Soil
(Made Ground)

Sample Identity	Depth (m)	Geology	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(123cd)pyrene	Dibenzo(ah)anthracene	Benzo(ghi)perylene	PAH 16 Total	PAH 10Total	PCB Congener 28
BH 2020 CD5	3.5-4.0	MGR	9.2	2.2	9.2	7.2	3.8	3.5	3.1	1.4	3	1.3	0.4	1.5	48.3	30.6	-
BH101	4	MGR	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.5	0.3	-
BH102	2.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH1100	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH2006	4.3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	0.5	MGR	13.4	4.4	23.3	15.0	8.7	7.2	4.4	2.0	2.5	1.3	0.4	1.2	107.6	58.7	-
BH202	0.5	MGR	5.3	1.3	5.3	4.0	2.0	1.7	1.0	0.9	1.0	0.4	0.1	0.5	25.4	321.5	-
BH204	0.5	MGR	4.2	1.2	7.5	6.1	5.3	4.4	4.6	2.5	2.8	1.6	0.6	1.6	58.5	22.0	-
BH401	0.5	MGR	18.1	4.5	19.4	14.8	10.2	7.9	9.7	2.8	5.6	3.2	1.1	3.2	107.2	60.4	-
BH401	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH402	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH601	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	6775.3	-
BH701	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH902A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP1	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP1	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP1	0.6	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP1	0.25	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP2	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP2	0.55	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP2b	0.6	MGR	0.9	0.2	2.3	2.3	1.3	1.4	5.6	2	10	4.1	3.9	4.3	1808.70	14.1	-
Site C - TP2b	2.2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP2b	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP4	0.4	MGR	3.5	14.4	1.2	2.8	1.9	0.3	1.6	0.6	1.2	0.4	0.2	0.1	1935.50	18.3	-
Site C - TP4B	1.1	MGR	0.4	0.1	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	24.30	1.3	-
Site C - TP4B	2	MGR	0.5	0.1	0.4	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.1	0.1	32.00	1.6	-
Site C - TP4B	0.6	MGR	3.9	1.5	5.1	4.9	3.5	2.6	3.5	1	4.9	2.7	1.7	5.2	1335.30	23.8	-
Site C - TP4B	4.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP5	0.4	MGR	20.6	0.2	12.7	8.3	2.7	2.6	2.1	0.6	1.3	1	0.4	0.9	776.10	50.5	-
Site C - TP5	0.8	MGR	37.4	6.3	94	80.7	37.2	39.7	49.5	14.2	37.8	7.3	31.8	25.5	682.90	248.4	-
Site C - TP5	1.2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP5	2.2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C -TP3	0.6	MGR	0.7	0.2	2	2.9	1.6	1.9	3.6	3.6	3.5	2.2	0.7	2.1	1443.40	10.1	-
Site C -TP3	0.7	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C -TP3	1.6	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C -TP3	1.2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C -TP4	0.2	MGR	5.2	0.8	8.3	5.8	2.1	2.2	2.3	1.2	2.2	2.5	2.9	1	2124.80	24.1	-
TP 201 CD1	0.5	MGR	0.42	0.09	0.41	0.34	0.22	0.26	0.23	0.10	0.19	0.17	0.06	0.20	2.9	1.6	-
TP 203 CD1	0.5	MGR	0.11	0.03	0.06	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.8	0.3	-
TP 2039 A CD3	1	MGR	18.9	5.6	24.7	19.4	10.2	9.8	6.7	5.0	9.1	4.9	1.4	4.7	124.3	75.3	-
TP 2039 A CD6	1.6	MGR	23.5	9.1	41.4	28.7	15.9	14.1	8.3	5.9	11.6	5.5	1.7	5.3	176.8	107.7	-
TP 207 CD1	0.5	MGR	2.6	0.7	2.3	2.9	1.4	1.7	0.9	0.4	0.7	0.4	0.1	0.4	15.7	9.6	-
TP 207 CD7	1.4	MGR	0.3	0.1	0.3	0.3	0.2	0.2	0.3	0.1	0.2	0.1	0.0	0.1	2.5	1.3	-
TP 208 CD3	0.5	MGR	3.2	1.0	5.4	5.3	4.2	4.2	4.6	2.3	3.3	1.8	0.7	2.1	39.0	18.1	-
TP 209 CD1	0.2	MGR	1.8	0.4	2.9	2.6	2.4	2.2	3.4	1.7	2.0	0.8	0.3	1.0	22.3	9.3	-
TP 209 CD3	1	MGR	1.1	0.3	1.9	1.6	1.6	1.5	2.8	0.9	1.4	0.7	0.2	0.9	15.5	6.3	-
TP 219 CD1	0.3-0.5	MGR	0.6	0.2	1.1	1.1	0.9	0.9	1.1	0.6	0.805	0.4	0.2	0.5	8.8	3.8	-
TP 236 CD10	1.5	MGR	6.2	1.9	14.8	12.4	7.3	7.2	10.8	3.9	7.8	4.1	1.4	4.7	84.6	43.7	-
TP 236 CD4	0.5	MGR	5.8	2.1	15.5	13.3	7.8	8.5	11.4	4.8	8.8	4.1	1.4	4.9	91.1	45.6	-
TP 237 CD1	0.1-0.2	MGR	2.0	0.8	5.0	4.4	2.4	2.5	3.1	1.3	2.4	1.2	0.3	1.4	27.6	14.3	-
TP 237 CD4	0.4	MGR	4.0	0.1	0.5	0.6	1.1	2.6	0.7	0.3	0.4	0.0	0.1	0.2	13.8	6.0	-
TP 238 CD1	0.2	MGR	1.2	0.4	2.7	2.5	1.7	1.7	2.3	1.2	1.7	0.9	0.3	1.0	18.2	8.6	-
TP 239 CD5	1	MGR	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.9	0.5	-
TP 242 CD3	0.5	MGR	16.1	4.5	27.8	24.9	13.5	15.1	19.5	5.3	13.5	6.2	2.3	6.7	159.5	83.5	-
TP 243 CD1	0.3	MGR	0.4	0.1	0.5	0.5	0.3	0.3	0.4	0.2	0.3	0.2	0.1	0.2	3.6	1.8	-
TP 243 CD5	1	MGR	0.08	0.01	0.08	0.07	0.04	0.04	0.04	0.02	0.04	0.03	0.01	0.04	0.6	0.3	-
TP 263 CD1	0.7	MGR	23.6	4.4	38.5	27.0	31.2	28.8	40.7	11.2	19.7	7.2	3.7	8.1	252.8	107.2	-
TP 263 CD3	0.9	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP 263 K4	0.9	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP 264 C CD5	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP 264 C K6	1	MGR	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	366.4	-
TP 266 A CD3	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP 266 A K4	2	MGR	1.1	0.3	2.2	1.9	1.5	1.5	1.9	0.8	1.4	0.7	0.2	0.8	14.7	342.9	-
TP 266 D CD3	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP 266 D K4	2	MGR	1.6	0.4	3.4	3.1	2.3	2.4	2.8	1.5	2.3	1.1	0.4	1.3	23.1	279.7	-
TP10	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP101	0.5	MGR	0.2	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.12	0.1	0.0	0.1	1.7	0.9	-
TP101	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP101	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP102	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP103	4.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP104	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP104	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP104	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP105	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	485.6	-
TP105	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP106	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP107	0	MGR	0.7	0.2	1.1	0.9	0.6	0.6	0.5	0.2	0.4	0.3	0.1	0.3	6.8	3.5	-
TP107	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP108	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP110	0.5	MGR	1.4	0.4	1.9	1.4	1.4	1.1	1.3	0.5	1.0	0.6	0.2	0.6	12.7	6.1	-
TP110	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP110	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP112	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP113	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP114	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP115	1	MGR	0.9	0.3	1.4	1.2	0.9	0.8	0.8	0.4	0.7	0.4	0.1	0.4	9.0	819.7	-
TP115	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP117	1	MGR	2.8	0.7	4.5	3.6	2.4	2.0	1.9	1.0	1.4	1.0	0.3	1.1	23.6	13.3	-
TP117	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP118	1	MGR	0.9	0.2	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.1	3.4	1.8	-
TP118	0.4	MGR	0.5	0.1	0.4	0.3	0.3	0.3	0.5	0.2	0.3	0.2	0.1	0.2	6.6	1.9	-
TP118	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP119	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP120	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP121	2	MGR	2.7	3.8	4.7	4.5	2.5	2.4	3.9	2.1	2.8	2.4	0.6	2.5	37.1	17.4	-
TP121	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP121	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP122	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP122	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP122	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP123	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP124	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP124	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP126	0.3	MGR	6.1	2.7	20.3	51.4	12.8	17.9	31.1	15.4	20.9	17.6	6.2	19.2	227.9	33547.8	-
TP126	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP127	1	MGR	0.0	0.0	0.1	0.2	0.1	0.06	0.03	0.04	0.03	0.07	0.02	0.03	0.8	0.4	-
TP127	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP128	4	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP13	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP130	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP130	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP131	0.4	MGR	0.9	0.2	1.1	1.2	0.8	1.1	0.8	0.5	0.4	0.4	0.2	0.5	10.5	12681.4	-
TP131	3	MGR	2.6	1.2	3.6	2.7	1.1	1.2	1.1	0.4	0.6	0.4	0.1	0.5	20.7	10.3	-
TP131	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP132	2	MGR	9.9	2.2	16.7	14.0	8.8	8.3	9.6	3.0	7.2	4.9	1.4	4.5	92.1	50.5	-
TP132	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP133	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP134	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP134	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP135	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP135	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP136	0	MGR	472.6	123.9	511.7	383.9	235.9	143.5	241.0	47.2	92.9	55.0	16.1	40.6	2463.2	2796.4	-
TP136	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16	0.5	MGR	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	1.3	4327.7	<0.001
TP16	0.9	MGR	0.4	0.1	0.4	0.4	0.1	0.3	0.3	0.1	0.1	0.1	0.0	0.1	2.7	1959.5	<0.001
TP16	0	MGR	1.1	0.3	0.8	0.7	0.8	0.8	0.7	0.4	0.6	0.6	0.1	0.7	9.2	13300.0	-
TP17	0.2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18	0.6	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP2	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP20	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP20	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP201	0.4	MGR	1.2	0.2	0.9	0.7	0.7	0.4	0.5	0.2	0.4	0.2	0.1	0.2	6.7	3.5	-
TP201	0.4	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP202	1.1	MGR	2.4	0.1	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.7	-
TP202	2	MGR	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	1.5	1.0	-
TP202	1	MGR	0.6	0.1	0.6	0.5	0.3	0.3	0.3	0.1	0.2	0.2	0.0	0.2	4.4	2.2	-
TP202	0.5	MGR	3.1	0.7	5.6	5.0	3.4	3.1	3.4	1.9	2.5	1.7	0.6	1.9	34.7	17.7	-
TP202	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP203	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP203	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP21	0.5	MGR														-	-
TP21	2.7	MGR														-	-
TP22	0.1	MGR														586.1	-
TP22	1	MGR														-	-
TP22	1.6	MGR														-	-
TP224A	2.1-2.3	MGR	1.4	2.0	17.8	15.5	11.6	11.0	7.1	4.6	5.4	3.5	1.3	3.7	92.4	-	-
TP224B	2.5	MGR	61.4	15.7	82.5	67.3	24.7	34.4	33.5	18.9	35.4	13.2	4.1	14.6	430.7	250.5	-
TP224D	2.1	MGR	29.5	7.3	40.9	33.8	19.6	17.6	23.8	10.9	17.0	6.3	2.0	6.6	226.9	121.7	-
TP226A	1.5	MGR	96.1	24.9	92.3	79.3	37.2	37.0	32.3	17.0	31.8	12.3	4.5	13.3	533.7	310.0	-
TP226C	1.5	MGR	2.3	0.5	2.8	2.3	0.9	0.9	1.1	0.5	0.839	0.4	0.2	0.5	14.0	8.6	-
TP226D	1.6	MGR	16.3	4.1	15.7	12.9	7.0	6.4	5.6	3.4	6.2	2.4	0.8	2.7	145.3	53.7	-
TP226E	1.3	MGR	304.9	88.2	265.0	233.2	154.7	117.7	113.9	60.8	109.3	41.9	12.7	44.0	1722.9	946.0	-
TP228	0.5	MGR	1.4	0.3	3.2	2.8	1.8	1.9	2.4	0.9	2.3	1.0	0.3	1.1	20.4	10.1	-
TP23	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP23	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP23	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sample Identity	Depth (m)	Geology	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(123cd)pyrene	Dibenzo(ah)anthracene	Benzo(ghi)perylene	PAH 16 Total	PAH 10Total	PCB Congener 28
TP234	1.4	MGR	0.6	0.3	1.3	1.1	0.8	0.8	0.7	0.3	0.826	0.4	0.1	0.4	12.6	4.1	-
TP234	0.5	MGR	6.5	1.3	9.6	8.0	3.9	3.9	3.4	1.7	4.3	1.7	0.5	1.8	48.5	28.3	-
TP24	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP240	0.5	MGR	5.1	1.7	8.7	7.5	4.5	5.0	3.7	2.3	5.0	2.4	0.6	2.5	52.0	27.0	-
TP244	2	MGR	0.6	0.3	2.3	2.3	1.6	1.6	1.1	0.8	1.6	0.8	0.2	0.8	14.6	7.0	-
TP244	1	MGR	11.5	2.3	13.8	11.8	7.0	6.8	5.8	2.9	7.1	4.9	1.4	4.9	83.4	48.2	-
TP245	1	MGR	5.2	1.2	8.1	6.4	4.9	4.7	3.4	2.4	4.8	1.9	0.7	1.9	47.3	24.1	-
TP245	0.5	MGR	9.1	3.2	12.7	10.3	8.3	6.9	7.4	3.6	6.6	2.4	1.1	2.8	79.4	39.5	-
TP245A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP245B	0.5	MGR	0.5	0.1	1.3	1.4	0.7	0.7	0.6	0.3	0.6	0.3	0.1	0.3	7.3	1213.0	-
TP245B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP246	1	MGR	19.4	2.8	14.7	10.6	6.3	6.1	4.6	2.2	3.9	1.5	0.5	1.5	88.6	49.7	-
TP249	0.6	MGR	11.0	2.4	11.1	9.3	4.2	4.0	3.5	1.8	4.2	2.5	0.6	2.6	59.9	38.1	-
TP25	1	MGR	1.1	0.1	1.1	0.9	0.2	0.3	0.2	0.1	0.1	0.0	0.0	0.1	6.4	3.5	-
TP25	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP25	0.6	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP250	0.7	MGR	0.3	0.0	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0.0	0.1	2.3	1.1	-
TP250	0.3	MGR	2.1	0.4	2.9	2.6	1.6	1.6	1.3	0.7	1.9	0.9	0.2	1.0	18.0	9.8	-
TP251	0.2	MGR	9.4	2.1	9.1	7.5	3.9	3.7	2.2	1.7	3.7	1.4	0.4	1.4	49.8	30.5	-
TP254A	0.5	MGR	3.0	0.9	4.8	4.7	4.4	4.4	4.2	2.6	5.6	3.4	1.0	3.3	45.7	19.8	-
TP254A	1.5	MGR	3.4	1.0	5.0	4.4	6.4	5.8	5.1	3.1	6.4	2.4	0.8	2.2	51.4	17.9	-
TP254A	1	MGR	6.2	2.2	10.9	10.4	14.1	12.9	11.7	7.8	17.8	8.6	3.3	7.9	119.4	44.8	-
TP255	0.5	MGR	1.3	0.1	0.4	0.4	0.4	0.5	0.3	0.1	0.2	0.3	0.1	0.3	11.8	2.9	-
TP255	3.6	MGR	4.1	0.4	1.1	1.3	0.9	1.0	0.3	0.2	0.3	0.1	0.02	0.05	22.4	8.5	-
TP255	4	MGR	0.5	0.1	0.6	0.5	0.5	0.5	0.3	0.2	0.3	0.2	0.1	0.2	13.3	2.4	-
TP256	0.5	MGR	0.8	0.1	0.4	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.1	0.2	8.9	2.2	-
TP256	2	MGR	0.7	0.3	1.0	0.8	0.9	1.0	0.6	0.3	0.5	0.7	0.2	0.6	16.2	4.2	-
TP256	3	MGR	9.7	12.1	17.9	14.0	22.8	23.7	11.7	5.2	9.9	8.2	4.0	5.9	155.2	57.0	-
TP26	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP264E	1	MGR	1.4	0.3	2.6	2.3	1.6	1.6	2.1	0.9	1.6	0.8	0.3	0.9	17.0	298.1	-
TP264E	2	MGR	22.5	5.5	32.8	28.2	17.9	17.1	19.8	9.3	17.4	7.3	2.2	7.9	194.2	218.6	-
TP265B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP267A	0.1	MGR	5.0	1.3	9.1	8.9	5.4	4.7	7.0	2.6	4.4	1.6	0.5	1.8	53.7	704.1	-
TP267B	0.1	MGR	3.9	1.4	7.7	8.1	4.6	4.4	3.9	2.6	4.1	1.6	0.5	1.8	46.2	24.1	-
TP267B	0.8-1.0	MGR	11.7	6.9	13.8	11.4	5.9	6.7	7.0	3.3	5.1	1.7	0.6	2.1	91.6	7861.0	-
TP268A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP268B	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP269A	0.5	MGR	2.4	0.6	3.8	4.0	2.5	2.2	2.2	1.2	2.0	0.8	0.3	1.0	24.0	1057.4	-
TP269B	0.5	MGR	3.0	0.9	4.2	4.9	2.7	2.5	2.1	1.3	2.1	0.8	0.2	0.9	27.1	1001.6	-
TP27	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	538.1	-
TP27	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP270A	2	MGR	1.6	0.4	2.9	2.4	1.9	1.5	1.9	0.9	1.5	0.7	0.2	0.8	17.3	8.6	-
TP270B	2	MGR	1.7	0.4	2.8	2.4	1.6	1.5	1.8	0.9	1.5	0.7	0.2	0.8	17.3	8.7	-
TP271 CD1	0.50	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP271 K2	0.50	MGR	1.363	0.348	2.343	2.097	1.411	1.351	1.349	0.671	1.582	1.119	0.338	1.215	15.925	8.3	-
TP272 CD1	0.20	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP272 K2	0.20	MGR	0.3	0.076	0.654	0.578	0.329	0.413	0.355	0.159	0.239	0.08	0.025	0.099	3.783	1.8	-
TP273 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP273 K2	SOIL H.	MGR	4.664	1.153	7.14	6.102	3.959	3.647	3.162	1.501	3.323	2.697	0.856	3.329	42.839	24.3	-
TP274 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP274 K2	SOIL H.	MGR	3.4	0.683	4.488	3.884	2.678	2.562	2.018	1.063	2.387	1.855	0.627	2.172	29.002	16.1	-
TP275 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP275 K2	SOIL H.	MGR	0.776	0.148	1.065	0.877	0.57	0.674	0.936	0.361	0.881	0.848	0.235	1.098	8.968	4.8	-
TP276 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP276 K2	SOIL H.	MGR	4.605	0.995	7.397	6.888	2.996	2.953	2.243	1.185	2.929	1.707	0.444	2.095	38.323	23.2	-
TP277 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP277 K2	SOIL H.	MGR	1.434	0.314	2.24	2.152	1.198	1.351	1.538	0.677	1.607	1.111	0.275	1.228	16.16	8.4	-
TP278 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP278 K2	SOIL H.	MGR	5.079	0.743	5.055	4.169	2.931	2.775	2.278	1.052	2.291	1.961	0.65	2.584	33.916	19.3	-
TP279 CD1	SOIL H.	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP279 K2	SOIL H.	MGR	7.96	3.027	19.066	17.165	11.235	9.957	8.065	3.793	8.826	7.786	2.393	8.798	111.186	62.0	-
TP28	2.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29	2.5	MGR	1.9	0.3	2.2	1.7	1.0	0.7	1.2	0.4	0.6	0.5	0.2	0.4	11.3	775.0	-
TP29	0	MGR	6.2	1.3	6.3	4.8	3.1	2.5	2.4	1.4	2.0	1.3	0.4	1.3	34.4	20.6	-
TP29	3	MGR	27.4	6.1	21.1	16.0	8.7	5.9	30.4	2.3	5.9	4.1	1.4	3.9	139.9	38415.3	-
TP29	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30	0.5	MGR	1.1	0.1	0.7	0.7	0.3	0.3	0.2	0.1	0.1	0.1	0.0	0.1	6.6	347.0	-
TP30	0	MGR	3.6	0.8	6.6	5.6	3.2	3.1	2.7	1.7	2.7	1.8	0.5	2.0	35.2	19.9	-
TP30	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP301	2.5	MGR	3.9	0.8	6.4	5.3	3.1	3.2	2.6	1.3	3.4	1.5	0.4	1.5	34.9	19.2	-
TP301	3.8	MGR	4.0	1.1	7.4	6.1	3.6	3.4	2.3	1.6	3.6	1.6	0.5	1.6	38.2	21.5	-
TP302	6	MGR	0.8	0.2	1.6	1.5	0.9	0.9	1.0	0.4	0.9	0.4	0.1	0.4	9.7	4.9	-
TP302	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP302	4.5-5.0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP307 CD7	1.80	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP307 K8	1.80	MGR	0.946	0.408	1.546	1.192	0.934	1.106	0.841	0.31	0.657	0.084	0.034	0.142	10.24	4.2	-
TP309 CD3	1.00	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP309 K4	1.00	MGR	4.12	0.916	6.052	5.53	3.466	3.377	2.873	1.375	3.179	2.291	0.604	2.446	37.363	20.8	-
TP31	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP31	0.7	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP32	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP33	0.1	MGR	1.9	0.4	4.6	4.6	4.8	4.5	5.2	3.0	3.5	2.2	0.8	2.5	38.7	1822.9	-
TP33A	0.5	MGR	1.4	0.3	1.0	0.8	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.3	8.9	325.1	-
TP33A	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP34	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP35	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP35	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP37	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP38	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP39	1	MGR	10.1	1.9	10.9	8.5	5.9	4.0	19.8	1.9	4.5	3.9	1.0	4.1	79.1	38.2	-
TP39	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP39	3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP4	0.6	MGR	0.5	0.1	0.7	0.6	0.3	0.3	0.4	0.2	0.2	0.1	0.0	0.1	4.2	2.1	-
TP4	1	MGR	4.1	0.9	6	5.2	4.2	4.4	4.6	1.8	2.6	2.5	0.6	2.1	765.00	25.2	-
TP4	0.6	MGR	751.7	186.7	574.7	391.7	174.5	147.6	174.8	56.3	152.1	94.4	19.6	84.2	4836.30	2113.0	-
TP4	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP40	0.5	MGR	0.7	0.2	1.2	0.9	0.8	0.5	1.0	0.3	0.5	0.4	0.1	0.4	7.4	3.8	-
TP40	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP40	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP41	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP42	3	MGR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	671.2	-
TP42	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP44	3.5	MGR	0.6	0.2	2.7	2.6	1.2	1.1	4.0	0.5	1.1	0.9	0.3	0.9	16.5	7.8	-
TP44	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	434.9	-
TP44	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP45	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP45	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP46	1	MGR	0.9	0.1	0.6	0.5	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	7.5	2.5	-
TP46	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP47	1.5	MGR	0.1	0.0	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.1	1.5	74.7	<0.001
TP47	0.7	MGR	0.2	0.1	0.4	0.3	0.1	0.2	0.3	0.1	0.2	0.2	0.1	0.2	2.5	250.3	<0.001
TP48	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP50	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP50	1.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP53	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP54	1.7	MGR	1.0	0.2	1.1	0.9	0.6	0.7	0.6	0.2	0.4	0.3	0.1	0.3	7.2	3.8	-
TP54	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	1971.2	-
TP54	1.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	7199.0	-
TP54	0.1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP54A	1.7	MGR	0.4	0.1	0.7	0.6	0.3	0.3	1.4	0.1	0.3	0.2	0.1	0.2	4.9	2.1	-
TP54A	0.5	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP54A	3.3	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP55	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP57	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP57	0	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP58	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP59	0	MGR	4.8	1.4	9.6	7.8	4.8	4.0	4.6	1.5	3.6	2.3	0.6	2.3	48.8	27.4	-
TP6	2	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP6	1	MGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP60	2	MGR	2.8	0.7	4.6	3.7	2.4	2.2	3.7	1.0	2.1	1.4	0.3	1.5	27.3	14.3	-
TP60	0	MGR	3.9	1.0	5.7	4.6	2.8	2.5	3.9	1.2	2.3	1.5	0.4	1.5	32.6	17.8	-
TP61	0.5	MGR	7.4	1.6	9.4	7.5	4.7	3.9	6.5	2.2	3.6	2.7	0.7	2.9	55.3	31.1	-
TP62	0.5	MGR	4.5	1.1	5.7	4.4	2.6	2.6	3.6	1.4	2.4	1.6	0.4	1.6	33.2	18.2	-
TP63	1	MGR	1.1	0.3	1.8	1.4	1.0	0.9	1.1	0.5	0.7	0.5	0.1	0.5	10.1	5.3	-
TP63	0	MGR	2.0	0.4	2.6	2.1	1.3	1.3	1.9	0.5	1.1	0.8	0.2	0.8	15.6	8.5	-
TP7	2	MGR	0.9	0.2	1.4	1.1	0.7	0.8	1.0	0.6	0.829	0.6	0.1	0.6	9.5	4.6	-
WS1	0.3-0.5	MGR	6.39	2.50	26.74	22.99	13.48	13.30	9.60	4.85	10.47	6.92	1.69	6.48	132.7	71.4	-
WS3	0.8-1.0	MGR	2.56	0.65	4.31	3.49	2.10	2.49	2.13	1.07	2.22	1.48	0.39	1.56	26.4	14.1	-
LoD/Units			<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg
Method Code			TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#
Maximum			752	187	575	392	236	148	241	61	152	94	32	84	4836	38415	<0.001
Minimum			0.02	0.002	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.002	0.01	0.19	0.29	<0.001
SGV/GAC Commercial [1]											*14.0*						
SGV/GAC Residental without plant uptake [1]											*1.0*						
SGV/GAC Residental with plant uptake [1]											*0.9**						
Dutch Intervention [2]																	

Interpretative Geoenvironmental Summary Report
Battersea Powerstation Redevelopment
Table A1: Laboratory Analytical Results for Soil
Natural Materials

Sample Identity	Depth (m)	Geology	Inorganics	Arsenic by IRIS	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	Total Sulphate	Acid Soluble Sulphide	Total Cyanide	% Stones Greater then 10mm	Asbestos *	Asbestos Presence Screen	Asbestos Type *	Chloride in Leachate	Natural Moisture Content Ratio	pH Value In Soil	Soluble Sulphate Extract as SO4	Total Sulphur
Natural Soils																								
BH1002	10	ALV		4.1	8.6	132	265	485	3.6	54	<0.5	990	5660	-	-	52.2	-	-	-	-	-	8.0	-	0.42
BH1002	9	ALV		-	-	-	-	-	-	-	-	-	5307	-	-	-	-	-	-	-	-	-	-	0.48
BH1100	4.5	ALV		-	<0.5	30	429	1462	0.4	33	<0.5	115	-	-	-	15.6	-	-	-	-	-	7.5	0.2	-
BH2006	4.9	ALV		11.9	-	-	-	-	-	-	-	-	4263	-	-		-	-	-	0.026	-	7.0	0.7	0.04
BH201	1.8	ALV		9.6	-	-	-	-	-	-	-	-	1139	-	-		-	-	-	-	-	-	-	0.07
BH2017	3.9	ALV		-	-	-	-	-	-	-	-	-	1362	-	-		-	-	-	0.032	0.0	7.9	0.3	0.17
BH203	4.5	ALV		4.0	-	-	-	-	-	-	-	-	6139	-	-		-	-	-	-	-	-	-	0.54
BH701	5.5	ALV		-	-	-	-	-	-	-	-	-	2439	-	-		-	-	-	-	-	-	-	0.26
BH801	5.5	ALV		8.9	-	-	-	-	-	-	-	-	26340	-	-		-	-	-	-	-	-	-	1.38
BH901	6	ALV		12.0	<0.5	80	28	80	<0.3	39	<0.5	114	-	-	-	51.6	-	-	-	-	-	10.7	0.1	-
TP10	4	ALV		<0.5	<0.5	24	17	61	<0.3	33	0.8	95	-	-	-	<0.1	-	-	-	-	-	7.5	0.5	-
TP13	2	ALV		<0.5	<0.5	33	13	49	<0.3	47	<0.5	84	-	-	-	<0.1	-	-	-	-	-	7.2	0.7	-
TP16	1.5	ALV		18.6	<0.5	38	4	46	<0.3	41	<0.5	94	-	-	-	<0.1	-	-	-	-	-	7.4	0.1	-
TP201	1.6	ALV		-	-	-	-	-	-	-	-	-	1497	-	-		-	-	-	0.013	0.1	8.1	0.1	0.04
TP201	4	ALV		-	<0.5	26	<1	6	<0.3	23	1.6	28	-	-	-	25.3	-	-	-	-	-	7.5	0.0	-
TP201	2	ALV		-	<0.5	22	10	21	<0.3	25	2.5	49	-	-	-	24.5	-	-	-	-	-	8.4	0.0	-
TP236	3.2	ALV		-	-	-	-	-	-	-	-	-	1088	-	-		-	-	-	0.049	0.001	7.5	0.3	0.06
TP238	1.2	ALV		7.6	-	-	-	-	-	-	-	-	1406	-	-		-	-	-	0.011	0.004	7.6	0.0	0.01
TP34	3.8	ALV			<0.5	46	13	65	<0.3	38	1.3	71	-	-	-	<0.1	-	-	-	-	-	7.2	1.0	-
TP37	4	ALV		72.0	<0.5	43	9	20	<0.3	26	<0.5	56	-	-	-	<0.1	-	-	-	-	-	6.9	-	-
TP40	4.1	ALV		-	<0.5	15	2	4	<0.3	17	<0.5	33	-	-	-	<0.1	-	-	-	-	-	8.3	0.1	-
BH102	11.5	LC		-	-	-	-	-	-	-	-	-	2279	-	-		-	-	-	-	-	-	-	0.81
BH102	17	LC		-	-	-	-	-	-	-	-	-	2818	-	-		-	-	-	-	-	-	-	0.66
BH102	31	LC		-	-	-	-	-	-	-	-	-	4433	-	-		-	-	-	-	-	-	-	0.58
BH104A	15	LC		-	-	-	-	-	-	-	-	-	1928	-	-		-	-	-	-	-	-	-	0.23
BH104A	37	LC		-	-	-	-	-	-	-	-	-	2127	-	-		-	-	-	-	-	-	-	0.51
BH1100	9.5	LC		-	-	-	-	-	-	-	-	-	1450	-	-		-	-	-	-	-	-	-	0.21
BH201	9	LC		-	-	-	-	-	-	-	-	-	1029	-	-		-	-	-	-	-	-	-	0.09
BH201	23	LC		-	-	-	-	-	-	-	-	-	1223	-	-		-	-	-	-	-	-	-	0.25
BH402	14	LC		-	-	-	-	-	-	-	-	-	2595	-	-		-	-	-	-	-	-	-	0.25
BH402	26.5	LC		-	-	-	-	-	-	-	-	-	1860	-	-		-	-	-	-	-	-	-	0.26
BH602A	8	LC		-	-	-	-	-	-	-	-	-	1206	-	-		-	-	-	-	-	-	-	0.17
BH602A	30	LC		-	-	-	-	-	-	-	-	-	2500	-	-		-	-	-	-	-	-	-	0.31
BH801	17.5	LC		-	-	-	-	-	-	-	-	-	4126	-	-		-	-	-	-	-	-	-	0.63
BH801	39.5	LC		14.7	-	-	-	-	-	-	-	-	4193	-	-		-	-	-	-	-	-	-	0.49
BH105	8	RTD		11.4	-	-	-	-	-	-	-	-	640	-	-		-	-	-	-	-	-	-	0.02
BH105	17	RTD		11.7	-	-	-	-	-	-	-	-	599	-	-		-	-	-	-	-	-	-	0.17
BH105	23	RTD		-	-	-	-	-	-	-	-	-	551	-	-		-	-	-	-	-	-	-	0.04
BH202	5	RTD		7.6	<0.5	17	1	9	<0.3	17	<0.5	32	-	-	-	<0.1	-	-	-	-	-	8.4	0.0	-
BH202	5.5	RTD		16.1	-	-	-	-	-	-	-	-	516	-	-		-	-	-	-	-	-	-	0.03
Site C - TP1	3.5	RTD		18	<0.5	18	17	15	<0.5	10	-	37	-	-	-	-	-	-	-	-	-	8.5	-	-
Site C - TP1	2.3	RTD		13.4	<0.5	28	7	7	<0.5	13	-	25	-	-	-	-	-	-	-	-	-	8.1	-	-
Site C - TP2b	3.2	RTD		9.2	<0.5	29	6	6	<0.5	13	-	21	-	-	-	-	-	-	-	-	-	8.5	-	-
Site C - TP4B	3.5	RTD		16.8	<0.5	39	7	7	<0.5	11	-	21	-	<1	<1	61.3	-	nfd	-	-	-	8.0	0.026	-
Site C - TP4B	2.8	RTD		13.7	<0.5	27	18	31	<0.5	8	-	35	-	<1	<1	0.4	-	nfd	-	-	-	7.8	0.155	-
Site C - TP5	2.9	RTD		4.5	<0.5	34	16	18	<0.5	13	-	34	-	-	-	-	-	-	-	-	-	7.9	-	-
Site C - TP5	4.2	RTD		-	<0.5	19	14	19	<0.5	13	-	29	-	-	-	-	-	-	-	-	-	8.2	-	-
TP106	3	RTD		-	-	-	-	-	-	-	-	-	700	-	-		-	-	-	0.107	-	8.6	0.1	0.02
TP20	4	RTD		-	<0.5	73	<1	7	<0.3	31	<0.5	30	-	-	-	46.5	-	-	-	-	-	8.5	0.1	-
TP30	3	RTD		-	<0.5	16	<1	7	<0.3	21	<0.5	24	-	-	-	<0.1	-	-	-	-	-	8.6	0.0	-
TP45	3.6	RTD			<0.5	51	21	301	<0.3	23	<0.5	147	-	-	-	37.9	-	-	-	-	-	8.4	0.0	-
LoD/Units				<0.5 mg/kg	<0.5 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<0.3 mg/kg	<1 mg/kg	<0.5 mg/kg	<1 mg/kg	<50 mg/kg	<5 mg/kg	<1 mg/kg	<0.1 %	<0.01 %	NONE	NONE	<0.001 / <0.005 g/l	%	<1.00 pH Units	<0.003 g/l	<0.01 %
Method Code				TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM129#	TM148	TM105#	TM153#M	TM008		TM001		TM097#	PM024	TM133#	TM098#	TM051#
Maximum				72	9	132	429	1462	3.6	54	2.5	990	26340	0	0	61.3	0	0	0	0.11	0.0711	10.7	1.0	1.38
Minimum				4.0	8.6	15.0	1.0	4.0	0.4	8.0	0.8	21	516	0.0	0.0	0.4	0.0	0.0	0.0	0.01	0.001	6.9	0.02	0.01
SGV Commercial [1]				*640*	*300*	*330*		**750**	*26*	*1800*	*13000*				*16000*									
SGV Residental without plant uptake [1]				*35*	*30*	*38*		**450**	*1**/0.4**	*13*	*600*				*760*									
SGV Residental with plant uptake [1]				*32*	*10****	*37*		**450**	*1**/0.4**	*130*	*350*				*4.6** / 4.5**									
Dutch Intervention [2]							190					720			50*							9.5 (Judgement)		
WRAS [4]				2	3	600		500	1		3		250											

* - GAC for Aliphatic EC10-EC12
** - GAC for Aromatic EC12-EC16
***- GAC for Aromatic EC16-EC21
****-GAC for Aromatic EC21-EC40
- PAH 10 includes: Naphthalene, anthracene, phenatrene, fluoranthrene, benzo(a)anthracene, chrysene, benzo(a)pyrene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene. -
Note: WRAS screening criteria have only been applied to London Clay and River Terrace Gravel Deposits
1 - Soil Guideline Values - DEFRA & Environment Agency (2009). GACs - calculated using CLEA v1.04.
2 - Dutch Guidelines - Circular on Target Values and Intervention Values for Soil Remediation, Ministry of Housing, Spatial Planning and the Environment (2000)
3 - Waste Acceptance Criteria Limiting values for contaminants in inert waste according to the GUIDANCE ON SAMPLING AND TESTING OF WASTES TO MEET LANDFILL WASTE ACCEPTANCE PROCEDURES
Bold = Soil Guideline Values (SGVs) published by DEFRA
Italics = Generic Assessment Criteria (GACs) derived using CLEA UK (beta version) software published by DEFRA/EA
* = Assumes 1% soil organic matter, sandy soils (CLEA v1.04)
** = Assumes pH 7

cells highlighted blue exceed WRAS criteria
cells highlighted light blue exceed DIVs
cells highlighted red exceed SGVs/GACs for commercial/industrial
cells highlighted green exceed SGVs/GACs for residential (without plant uptake)
cells light orange exceed SGVs/GACs for residential (with plant uptake)

Interpretative Geoenvironmental Summa
Battersea Powerstation Redevelopment
Table A1: Laboratory Analytical Results
Natural Materials

Organics

Sample Identity	Depth (m)	Geology	Total Phenols HPLC	Phenols Total Monohydric	Min. Oil / Paraffin by TLC (adjusted)	Min. Oil / Paraffin by TLC	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(123cd)pyrene	Dibenzo(ah)anthracene	Benzo(ghi)perylene	PAH 16 Total	PAH 10Total
Natural Soils																								
BH1002	10	ALV	-	-	1659	4086	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH1002	9	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH1100	4.5	ALV	-	-	<500	439	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH2006	4.9	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	1.8	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH2017	3.9	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH203	4.5	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH701	5.5	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH801	5.5	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH901	6	ALV	-	-	<500	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10	4	ALV	-	-	<500	216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP13	2	ALV	<0.01	-	<500	328	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16	1.5	ALV	-	-	<500	552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP201	1.6	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP201	4	ALV	-	-	<500	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP201	2	ALV	-	-	<500	157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP236	3.2	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP238	1.2	ALV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP34	3.8	ALV	-	-	<500	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP37	4	ALV	-	-	<500	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP40	4.1	ALV	-	-	<500	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	11.5	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	17	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	31	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104A	15	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104A	37	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH1100	9.5	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	9	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	23	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH402	14	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH402	26.5	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH602A	8	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH602A	30	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH801	17.5	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH801	39.5	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	8	RTD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	17	RTD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	23	RTD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH202	5	RTD	-	-	<500	737	0.2	0.0	0.0	0.0	0.3	0.1	0.3	0.2	0.1	0.1	0.1	0.0	0.04	0.0	0.0	0.0	1.5	1.1
BH202	5.5	RTD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP1	3.5	RTD	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP1	2.3	RTD	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP2b	3.2	RTD	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP4B	3.5	RTD	<0.01	-	-	19	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	20.60	1
Site C - TP4B	2.8	RTD	<0.01	-	-	28	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	29.60	1
Site C - TP5	2.9	RTD	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site C - TP5	4.2	RTD	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP106	3	RTD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP20	4	RTD	-	-	<500	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30	3	RTD	-	-	<500	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP45	3.6	RTD	-	-	<500	475	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoD/Units			<0.01 mg/kg	<0.01 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg	<1 mg/kg
Method Code			TM062#	TM062#	TM061#M	TM061#M	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#	TM074#
Maximum			0	0	1659	4086	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	1
Minimum			0.00	0.00		5.0	0.10	0.009	0.031	0.03	0.10	0.078	0.10	0.10	0.08	0.07	0.06	0.04	0.04	0.02	0.005	0.03	1.46	1.00
SGV Commercial[1]			*825000*	*00000** / 97000*	500[3]	500[3]	*1200 / 110*												*14.0*					
SGV Residential without plant uptake[1]			*14100*	*3000** / 22000*	500[3]	500[3]	*9.3 / 0.7*												*1.0*					
SGV Residental with plant uptake[1]			*401*	*1900** / 400**	500[3]	500[3]	*9.3 / 0.7*												*1 / 0.9*					
Dutch Intervention[2]			40*																					
WRAS[4]			5		50	50																	50	50

* - GAC for Aliphatic EC10-EC12
** - GAC for Aromatic EC12-EC16
***- GAC for Aromatic EC16-EC21
****-GAC for Aromatic EC21-EC40
- PAH 10 includes: Naphthalene, anthracene, phenatrene, fluoranthrene, benzo(a)anthracene, chrysene, benzo(a)pyrene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene.

Note: WRAS screening criteria have only been applied to London Clay and River Terrace Gravel Deposits
1 - Soil Guideline Values - DEFRA & Environment Agency (2009). GACs - calculated using CLEA v1.04.
2 - Dutch Guidelines - Circular on Target Values and Intervention Values for Soil Remediation, Ministry of Housing, Spatial Planning and the Environment (2000)
3 - Waste Acceptance Criteria Limiting values for contaminants in inert waste according to the GUIDANCE ON SAMPLING AND TESTING OF WASTES TO MEET LANDFILL WASTE ACCEPTANCE PROCEDURES
Bold = Soil Guideline Values (SGVs) published by DEFRA
Italics = Generic Assessment Criteria (GACs) derived using CLEA UK (beta version) software published by DEFRA/EA

* = Assumes 1% soil organic matter, sandy soils (CLEA v1.04)
** = Assumes pH 7

cells highlighted blue exceed WRAS criteria
cells highlighted light blue exceed DIVs
cells highlighted red exceed SGVs/GACs for commercial/industrial
cells highlighted green exceed SGVs/GACs for residential (without plant uptake)
cells light orange exceed SGVs/GACs for residential (with plant uptake)

Geoenvironmental Summary Report, Battersea Power Station

Table A4 - Groundwater Results

Sample Identity			LBH BH 02	NWH BH 01		NWH BH 02		BH102			BH104	BH105			BH201		BH202			BH203				Marine water Environmental Quality Standard[1]	UK Drinking Water Standards[2]
Depth			-	3.8	-	4	-	0	4.2	4.64	4.2	0	4.2	4.22	0	4	2.58		2.75	4.6	3.63	3.73			
Sampled Date			29/12/00	21.12.00	29.12.00	21.12.00	29.12.00	2002	30.8.02	27.09.04	2002	2002	30.8.02	27.09.04	2002	29.08.02	02.09.04	16.09.04	17.09.04	29.08.02	02.09.04		16.09.04		
	Method	**Units**																							
Metals																									
Arsenic Dissolved	ICP-MS	ug/l	<5	-	<5	-	<5	10	-	2	-	3	-	<1	-	-	<1	2	3	4	<1	2	2	25	10
Boron Dissolved	ICP-MS	ug/l	-	-	-	-	-	-	-	252	-	-	-	326	-	-	252	247	76	-	231	207	295	7000	1000
Cadmium Dissolved	ICP-MS	ug/l	<0.4	<0.4	<0.4	<0.4	<0.4	-	-	<0.4	-	-	-	<0.4	-	-	<0.4	<0.4	<0.4	-	<0.4	<0.4	<0.4	2.5	5
Chromium Dissolved **	ICP-MS	ug/l	<1	<1	1	<1	3	-	5	2	5	-	6	2	6	-	2	<1	<1	5	2	3	2	15	50
Copper Dissolved	ICP-MS	ug/l	<50	140	60	<50	<50	-	-	4	-	-	-	2	-	-	8	1	<1	-	7	1	2	5	2000
Lead Dissolved	ICP-MS	ug/l	6	<5	<5	<5	<5	-	-	3	-	-	-	3	-	-	8	<1	<1	-	7	<1	<1	25	25
Nickel Dissolved	ICP-MS	ug/l	<10	<10	<10	<10	<10	-	-	4	-	-	-	4	-	-	1	2	4	-	1	2	4	30	20
Selenium Dissolved	ICP-MS	ug/l	<5	-	<5	-	<5	-	-	1	-	-	-	<1	-	-	<1	<1	6	-	<1	3	<1		10
Zinc Dissolved	ICP-MS	ug/l	<50	<50	<50	<50	<50	-	13	31	7	-	12	32	9	9	53	13	16	9	31	10	30	40	
Mercury Dissolved	CVAAS	ug/l	<0.05	-	<0.05	-	<0.05	-	-	<0.05	-	-	-	<0.05	0.08	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	0.3	1
Other inorganics																									
BOD (Unfiltered Sample)	TM045	mg/l	2	-	<1	-	6	-	-	5	-	-	-	3	-	-	<1	<1	<1		<1	<1	<1		
COD (Unfiltered Sample)	TM107	mg/l	169	220	529	1015	324	-	-	66	-	-	-	55	-	-	37	37	84		45	45	45		
Conductivity (at 25 deg.C)	TM120	ms/Cm	0.882	0.978	0.87	1.137	1.129	0.99	0.832	1.115	1.156	1.08	1.107	0.919	1.122	1.152	0.988	1.034	1.029	1.242	1.17	1.282	1.213		
Sulphate (soluble)	TM098	mg/l	81	105	85	218	309	367	301*	428	373	271	301*	268	249	347	238	242	228	194*	93	87	96	*400*	250
Chloride	TM097	mg/l	161	39	16	55	86	31	44	33	30	34	40*	43	46	62	44	24	41	179*	115	117	43		
Sulphide	TM101	mg/l	0.06	0.02	0.11	0.02	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Ammoniacal Nitrogen as N	TM099	mg/l	1.2	0.9	1.2	1.6	2.3	-	0.7	0.5	0.2	-	0.4*	0.3	0.9	0.6	0.5	<0.2	0.4	0.6*	0.5	0.3	0.3	0.6[4]	0.5
Total Organic Carbon	TM090	mg/l	16	9	10	8	9	-	-	7	-	-	-	5	-	-	5	5	4		15	15	14		
Phenols Monohydric	TM062	mg/l	0.02	<0.01	<0.01	<0.01	<0.01	0.06	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	*0.03*	0.03
Total Cyanide	TM153	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	110	-	<0.05	-	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	1[3]	
pH Value	TM133	pH Units	8.04	7.57	7.66	7.85	7.93	8.42	9.20	7.72	8.36	8.18	8.31*	7.83	8.01	7.64	8.12	8.31	8.21	8.27	8.21	7.50	8.26	6.0-8.5	>6.5
Hydrocarbons																									
EPH (DRO) (C10-C40) Aqueous	GC-FID	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	423	176	<10		
EPH (Mineral Oil)	GC-FID	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
Mineral Oils C10-C20	GC-FID	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
Mineral Oils > C20-C30	GC-FID	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
Mineral Oils > C30-C40	GC-FID	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
PRO (C4-C10)	TM089	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
PRO (C10-C12)	TM089	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	-	-	-	-	-	-	-		
Benzene	TM089	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10	30	1
Toluene	TM089	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10	40	700[5]
Ethyl benzene	TM089	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		300[5]
m & p Xylene	TM089	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
o Xylene	TM089	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
Total Xylenes	TM089	ug/l	<10	<10	<10	<10	<10	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10	30	
MTBE	TM089	ug/l	-	-	-	-	-	-	-	<10	-	-	-	<10	-	-	<10	<10	<10	-	<10	<10	<10		
PAHs																									
Naphthalene Aqueous	GC-MS	ug/l	4.538	0.07	0.431	0.753	1.546	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	5	
Acenaphthylene Aqueous	GC-MS	ug/l	0.38	0.017	0.076	0.013	0.149	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Acenaphthene Aqueous	GC-MS	ug/l	0.832	0.209	0.102	0.187	.383	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Fluorene Aqueous	GC-MS	ug/l	1.833	0.053	0.145	0.043	0.29	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Phenanthrene Aqueous	GC-MS	ug/l	3.056	0.132	0.165	0.117	.171	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Anthracene Aqueous	GC-MS	ug/l	0.653	0.036	0.036	0.026	.024	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Fluoranthene Aqueous	GC-MS	ug/l	0.566	0.132	0.136	0.07	.033	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Pyrene Aqueous	GC-MS	ug/l	0.315	0.173	0.169	0.092	.038	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Benz(a)anthracene Aqueous	GC-MS	ug/l	0.129	0.128	0.22	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Chrysene Aqueous	GC-MS	ug/l	0.063	0.057	0.082	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Benzo(b)fluoranthene Aqueous	GC-MS	ug/l	0.022	<0.01	0.069	<0.01	0.017	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Benzo(k)fluoranthene Aqueous	GC-MS	ug/l	0.028	<0.01	0.091	<0.01	0.016	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Benzo(a)pyrene Aqueous	GC-MS	ug/l	0.014	<0.01	0.066	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.03	0.01
Indeno(123cd)pyrene Aqueous	GC-MS	ug/l	0.014	<0.01	0.047	<0.01	0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Dibenzo(ah)anthracene Aqueous	GC-MS	ug/l	<0.01	<0.01	0.018	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
Benzo(ghi)perylene Aqueous	GC-MS	ug/l	0.023	<0.01	0.068	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
PAH 16 total	GC-MS	ug/l	12.466	1.007	1.922	0.81	2.676	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		
PAH (sum of 4)*	-		0.087	<0.01	0.275	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01		0.1

1. Environment Agency: EQS guideline criteria for marine water ecosystem protection. EQSs have been selected, where necessary, to be protective of *Cyprinid* fish.
2. UK Drinking Water Inspectorate: Water Supply (Water Quality) Regulations 2000.
3. Environmental Agency Non-Statutory (Operational) Environmental Quality Standards
4. UK Technical Advisory Group on the Water Framework Directive: Proposals For Environmental Quality Standards for Annex VIII Substances, 2008
5. World Health Organisation: Guidelines for Drinking Water-quality, Third Edition, Volume 1, Recommendations 2004.

** Chromium III guideline criteria used in absence of total Chromium criteria
*** consists of benzo(b)fluoranthene, benzo(k)fluoranthene
benzo(ghi)perylene and Indeno(1,2,3-cd)pyrene.

cells highlighted purple exceed criteria for minor aquifer
cells highlighted light blue exceed marine water EQS
cells highlighted both criteria

Table A4 - Groundwater Results

Sample Identity			BH704			BH801		BH301			BH902A		BH902		BH1002			BH1102			BH2005			BH2011			BH5001			BH2015		BH2018			BH601			BH602A	BH701	Marine water Environmental Quality Standard[1]	UK Drinking Water Standards [2]
Depth			0	4.2	4.03	0	4	0	3.19	4.23	3.73	5.1	5.7	0	3.19	4.28	4.7	0	3.01	4.03	5.15	4.5	3.88	4.03	3.38	3.38	16.09.04												
Sampled Date			20/02/2002	30/06/2002	01/09/2004	20/02/2002	30/06/2002	20/02/2002	16/08/2004	29/09/2004	17/08/2004	30/08/2002	29/09/2004	20/02/2002	29/09/2004	14/09/2004	02/09/2004	20/02/2002	29/09/2004	16/08/2004	01/09/2004	15/09/2004	27/09/2004	16/08/2004	01/09/2004	15/09/2004	16/08/2004	01/09/2004	15/09/2004	16/08/2004	02/09/2004	29/08/2002	29/09/2004	16/08/2004	20/02/2002	29/09/2004	16/08/2004	30/08/2002	30/08/2002	16/08/2004	
Metals	**Method**	**Units**																																				
Arsenic Dissolved	ICPMS	µg/l	-	-	<1	1	1	4	-	<1	2	2	5	-	2	4	<1	2	<1	1	4	5	1	<1	1	<1	2	-	-	4	-	25	<1	10					
Boron Dissolved	ICPMS	µg/l	-	-	318	-	136	-	-	<1	42	93	334	-	253	350	181	<1	5	49	126	175	76	103	253	264	306	359	7000	1000								
Cadmium Dissolved	ICPMS	µg/l	-	-	<0.4	-	<0.4	-	-	<0.4	-	<0.4	<0.4	-	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	2.5	5								
Chromium (hexavalent) [3]	ICPMS	µg/l	5	-	1	-	4	-	-	<1	1	6	-	4	6	5	<1	2	<1	<1	3	<1	6	<1	<1	4	<1	<1	2000	50								
Copper Dissolved	ICPMS	µg/l	-	-	<1	-	2	-	-	<1	1	7	-	-	-	-	2	<1	5	<1	1	-	-	-	-	-	-	-	5	15								
Lead Dissolved	ICPMS	µg/l	-	-	<1	-	<1	-	-	<1	2	-	-	-	-	-	<1	<1	3	<1	1	-	-	-	-	-	-	-	25	50								
Selenium Dissolved	ICPMS	µg/l	-	-	1	-	-	-	-	<1	1	-	-	-	-	-	<1	2	3	<1	1	-	-	-	-	-	-	-	10	20								
Nickel Dissolved	ICPMS	µg/l	-	-	3	-	3	-	-	<1	1	-	-	-	-	-	<1	1	5	<1	1	-	-	-	-	-	-	-	30	20								
Zinc Dissolved	ICPMS	µg/l	9	9	25	-	11	16	<3	17	28	32	245	15	50	25	36	27	30	22	26	29	5	42	31	54	54	23	18	9	40	<3	15	20	40				
Mercury Dissolved	CVAAS	µg/l	-	0.06	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	0.3	0.11	1					
Other inorganics																																						
BOD (Unfiltered Sample)	TM045	mg/l	-	-	<1	-	-	-	-	<1	2	-	-	-	-	-	<1	<1	<1	1	<1	10	<1	<1	<1	<1	NDP	15											
Conductivity (at 25 deg C)	TM120	mS/cm	0.811	0.667	0.754	0.757	0.845	0.664	0.694	0.697	1.464	1.13	1.322	0.791	0.965	0.956	0.961	1.053	2.113	1.378	0.931	0.812	0.725	0.916	0.773	0.552	1.394	1.115	0.654	0.653								
COD (Unfiltered Sample)	TM107	mg/l	-	-	67	79	-	-	-	-	35	31	39	34	102	149	66	126	76	49	126	59	49	76	62	-	-	-	-	-	77								
Chloride	TM027	mg/l	19	19	31	39	37	46	43	19	39	46	20	35	40	43	44	48	44	70	46	56	41	51	47	159	49	38	47	52								
Sulphate (soluble)	TM038	mg/l	188	154	97	122	97	191	242	102	79	126	80	125	233	144	194	86	90	391	468	195	246	206	223	142	63	356	346	56	63	400	200	197	153	250		
Sulphide	TM101	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Organic Carbon	TM090	mg/l	-	-	6	7	7	10	10	8	8	-	-	-	-	-	8	10	5	22	22	4	59	4	4	40	5	159	<0.05	12	25	12	18	0.654	-	-			
Ammoniacal Nitrogen as N	TM099	mg/l	0.2	0.3	0.4	0.5	0.7	0.5	0.4	0.5	2.7	0.3	0.4	0.2	0.4	0.2	0.2	0.3	0.4	0.9	1.5	0.6*	0.4	0.2	0.2	0.5	0.6	0.3	0.5	0.5	0.6 *	0.5						
Phenols 4aminopyridyric	TM062	mg/l	-	-	<0.01	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.03	0.03						
Total Cyanide	TM153	mg/l	-	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1 †					
pH Value	TM133	pH Units	8.11	8.15	8.35	8.32	8.24	8.14	8.17	7.68	8.06	7.58	8.20	8.05	8.29	8.19	8.49	8.16	8.34	8.43	8.33	7.82	8.11	8.70	8.31	8.73	8.33	6.0-8.5	>6.5								
Hydrocarbons			8.48	8.00	8.53	7.68	9.70	8.70	8.20	8.51	8.02	8.52	8.51	8.03	8.29	8.19	8.49	8.16	8.34	8.43	8.33	7.82	8.16	7.92	7.43	7.97	7.78											
EPH (DRO) (C10-C40) Aqueous	GC-FID	µg/l	-	-	<10	-	-	-	-	<10	<10	-	493	601	-	<10	141	<10	493	335	<10	460	7060	42597	204300														
EPH (Mineral Oil)	GC-FID	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	1159	11639	146354	91242													
Mineral Oils > C20-C30	GC-FID	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	583	78691	501O7	0.29													
Mineral Oils C10-C20	GC-FID	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	325	44945	28859														
Mineral Oils C20-C40	GC-FID	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	251	22718	12176														
PRO (C10-C12)	TM089	µg/l	-	-	-	-	-	-	-	<10	<10	-	-	-	-	-	-	-	-	-	-	<10	-	-	-	-	-												
PRO (C4-C10)	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10												
Benzene	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	30	1										
Toluene	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	40	700 §										
Ethyl benzene	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		300 §										
m & p Xylene	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10												
o Xylene	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10												
Total Xylenes	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	30											
MTBE	TM089	µg/l	-	-	<10	-	-	-	-	<10	<10	-	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10												
PAHs																																						
Naphthalene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	0.71	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	1.1	0.13	0.13	5										
Acenaphthylene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01											
Acenaphthene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01											
Fluorene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01											
Phenanthrene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01											
Anthracene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01											
Fluoranthene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	0.06	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.056	0.049	1.96	0.29										
Benz(a)anthracene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	0.02	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.056	0.049	3.49	1.17										
Chrysene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	0.02	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	0.51	29.55	9.73											
Benzo(b)fluoranthene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.11	<0.01	<0.01	<0.01	0.5	26.31	8.93											
Benzo(k)fluoranthene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.226	11.46	7.04											
Benzo(a)pyrene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	14.47	11.58											
Indeno(123cd)pyrene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	5.52	3.3											
Dibenz(ah)anthracene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.045	2.69	1.86											
Benzo(ghi)perylene Aqueous	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	0.13	6.31	4.32											
PAH 16 total	GC-MS	µg/l	-	-	<0.01	-	-	-	-	<0.01	1	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	1.14	<0.01	<0.01	<0.01	3.7	137.53	73.8											
PAH (sum of 4)*	-	-	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.3	<0.01	<0.01	<0.01	0.64	34.13	23											0.1

1. Environment Agency. EQS guideline criteria for marine water ecosystem protection.
EQSs have been selected, where necessary, to be protective of Cprimid fish.
2. UK Drinking Water Inspectorate. Water Supply (Water Quality) Regulations 2000.
3. Environmental Agency Non-Statutory (Operational) Environmental Quality Standards
4. UK Technical Advisory Group on the Water Framework Directive: Proposals for Environmental Quality Standards for Annex VIII Substances. 2008
5. World Health Organisation. Guidelines for Drinking Water-quality, Third Edition, Volume 1, Recommendations 2004.

** Criterium B guideline criteria used in absence of total Chromium criteria
*** consists of benzo(b)fluoranthene, benzo(k)fluoranthene
benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

EQS highlighted purple exceed criteria for minor aquifer
EQS highlighted light blue exceed marine water EQS
EQS highlighted both criteria

Table A4 - Groundwater Results

Sample Identity			BH2024A			BH2026			BH2030			BH2033	BH2039B			BHAW01		BHGW06	BHGW10	GW01	Marine water Environmental Quality Standard[1]	UK Drinking Water Standards [2]
Depth			5.77	3.82	4.82	3.71			3.69			4.09	3.41	3.85		5.18	5.09	4.57	4.67	5.07		
Sampled Date			17.08.04	02.09.04	14.09.04	16.08.04	01.09.04	15.09.04	16.08.04	01.09.04	15.09.04	29.09.04	16.08.04	14.09.04		16.08.04	14.09.04	27.09.04	27.09.04	02.09.04		
	Method	Units																				
Metals																						
Arsenic Dissolved	ICP-MS	ug/l	<1	<1	2	<1	<1	<1	5	<1	<1	<1	5	4	2	1	<1	2	<1	25	10
Boron Dissolved	ICP-MS	ug/l	365	292	414	162	259	355	138	272	342	200	71	256	146	279	320	185	202	7000	1000
Cadmium Dissolved	ICP-MS	ug/l	<0.4	<0.4	<0.4	0.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	2.5	5
Chromium Dissolved **	ICP-MS	ug/l	<1	<1	<1	<1	<1	<1	<1	<1	3	3	1	<1	<1	<1	<1	1	1	15	50
Copper Dissolved	ICP-MS	ug/l	2	1	8	2	2	3	6	2	2	3	<1	2	<1	5	2	<1	1	5	2000
Lead Dissolved	ICP-MS	ug/l	<1	<1	3	<1	<1	<1	<1	<1	1	5	<1	<1	<1	<1	4	7	<1	25	25
Nickel Dissolved	ICP-MS	ug/l	4	2	6	2	1	5	6	3	3	6	37	14	5	6	5	5	4	30	20
Selenium Dissolved	ICP-MS	ug/l	<1	<1	<1	<1	1	<1	10	2	<1	<1	6	<1	5	1	2	<1	<1		10
Zinc Dissolved	ICP-MS	ug/l	17	10	52	<3	13	19	6	10	14	28	12	30	<3	15	44	25	8	40	
Mercury Dissolved	CVAAS	ug/l	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	0.06	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.3	1
Other inorganics																						
BOD (Unfiltered Sample)	TM045	mg/l	<1	3	<1	<1	<1	<1	<1	<1	3	10	<1	1	<1	2	3	19	<1		
COD (Unfiltered Sample)	TM107	mg/l	117	101	21	46	21	12	237	62	214	143	285	79	60	83	70	221	111		
Conductivity (at 25 deg.C)	TM120	ms/Cm	1.216	0.928	1.111	1.05	0.867	1.046	0.927	0.954	0.998	0.774	1.208	1.235	1.024	1.055	1	1.036	0.965		
Sulphate (soluble)	TM098	mg/l	373	206	265	308	236	311	136	164	176	152	391	429	230	233	395	283	225	*400*	250
Chloride	TM097	mg/l	16	15	20	21	24	216	31	40	16	54	67	75	45	56	57	73	51		
Sulphide	TM101	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05		
Ammoniacal Nitrogen as N	TM099	mg/l	0.9	0.5	0.5	0.4	0.2	<0.2	0.4	0.2	<0.2	0.5	0.8	0.7	1	1.2	0.5	1	0.9	0.6 [4]	0.5
Total Organic Carbon	TM090	mg/l	6	11	5	4	4	4	5	5	6	3	8	7	10	11	11	6	5		
Phenols Monohydric	TM062	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03	0.03
Total Cyanide	TM153	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1 [3]	
pH Value	TM133	pH Units	7.91	8.04	7.98	7.70	8.43	8.04	7.67	8.26	7.85	8.22	7.63	8.17	7.67	8.30	7.81	7.93	8.27	6.0-8.5	>6.5
Hydrocarbons																						
EPH (DRO) (C10-C40) Aqueous	GC-FID	ug/l	<10	1092	<10	<10	<10	<10	<10	<10	<10	<10	<10	190	<10	271	<10	<10	<10		
EPH (Mineral Oil)	GC-FID	ug/l	<10	5048	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
Mineral Oils C10-C20	GC-FID	ug/l	<10	3028	<10	<10	<10	41	<10	<10	60	<10	<10	<10	<10	<10	<10	<10	<10		
Mineral Oils > C20-C30	GC-FID	ug/l	<10	1514	<10	<10	<10	49	<10	<10	51	<10	<10	<10	<10	<10	<10	<10	<10		
Mineral Oils > C30-C40	GC-FID	ug/l	<10	506	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
PRO (C4-C10)	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
PRO (C10-C12)	TM089	ug/l	-	-	-	-	-	-	-	-	-	<10	-	-	-	-	<10	<10	-		
Benzene	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	30	1
Toluene	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	40	700 [5]
Ethyl benzene	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		300 [5]
m & p Xylene	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
o Xylene	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
Total Xylenes	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	30	
MTBE	TM089	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
PAHs																						
Naphthalene Aqueous	GC-MS	ug/l	<0.01	0.047	0.14	<0.01	<0.01	<0.01	1.8	<0.01	<0.01	<0.01	<0.01	0.18	<0.01	0.2	<0.01	<0.01	<0.01	5	
Acenaphthylene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Acenaphthene Aqueous	GC-MS	ug/l	<0.01	0.036	<0.01	<0.01	<0.01	<0.01	0.086	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Fluorene Aqueous	GC-MS	ug/l	<0.01	0.015	<0.01	<0.01	<0.01	<0.01	0.067	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Phenanthrene Aqueous	GC-MS	ug/l	<0.01	0.048	<0.01	<0.01	<0.01	<0.01	0.115	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Anthracene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.024	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Fluoranthene Aqueous	GC-MS	ug/l	<0.01	0.079	<0.01	<0.01	<0.01	<0.01	0.062	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Pyrene Aqueous	GC-MS	ug/l	<0.01	0.093	<0.01	<0.01	<0.01	<0.01	0.053	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Benz(a)anthracene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Chrysene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Benzo(b)fluoranthene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Benzo(k)fluoranthene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Benzo(a)pyrene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.01
Indeno(123cd)pyrene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Dibenzo(ah)anthracene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Benzo(ghi)perylene Aqueous	GC-MS	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
PAH 16 total	GC-MS	ug/l	<0.01	0.318	0.138	<0.01	<0.01	<0.01	2.26	<0.01	<0.01	<0.01	<0.01	0.177	<0.01	0.02	<0.01	<0.01	<0.01		
PAH (sum of 4)*	-		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.1

1. Environment Agency: EQS guideline criteria for marine water ecosystem protection. EQSs have been selected, where necessary, to be protective of *Cyprinid* fish.
2. UK Drinking Water Inspectorate: Water Supply (Water Quality) Regulations 2000.
3. Environmental Agency Non-Statutory (Operational) Environmental Quality Standards
4. UK Technical Advisory Group on the Water Framework Directive: Proposals For Environmental Quality Standards for Annex VIII Substances, 2008
5. World Health Organisation: Guidelines for Drinking Water-quality, Third Edition, Volume 1, Recommendations 2004.

cells highlighted purple exceed criteria for minor aquifer
cells highlighted light blue exceed marine water EQS
cells highlighted both criteria

** Chromium III guideline criteria used in absence of total Chromium criteria
*** consists of benzo(b)fluoranthene, benzo(k)fluoranthene benzo(ghi)perylene and Indeno(1,2,3-cd)pyrene.

Geoenvironmental Summary Report, Battersea Power Station

Table A5 - Groundwater Results (Arup 1997)

Sample Identity			Sampling Locations																	Marine water Environmental Quality Standard[1]	UK Drinking Water Standards [2]
			FESBH101	FESBH105	FESBH107	FESBH108	FESBH109	FESBH111	FESBH112	FESBH115	FESBH101	FESBH105	FESBH107	FESBH108	FESBH109	FESBH111	FESBH112	FESBH115	FESBH202		
Depth											3.62	3.4	3.22	2.79	4.03	3.67	3.56	2.91			
Sampled Date			22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997	22/08/1997		
	Method	Units																			
Metals																					
Arsenic Dissolved	unknown	ug/l	5	<5	8	14	19	20	26	11	<5	<5	<5	<5	<5	<5	<5	<5	<5	25	10
Boron Dissolved	unknown	ug/l	275	339	286	327	237	278	476	475	394	268	296	344	216	280	610	505	342	7000	1000
Cadmium Dissolved	unknown	ug/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.5	5
Chromium Dissolved **	unknown	ug/l	<20	<20	<10	<10	<10	<10	<10	<10	<20	<20	<20	<20	<20	<20	<20	<20	<20	15	50
Copper Dissolved	unknown	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	5	2000
Lead Dissolved	unknown	ug/l	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	25	25
Nickel Dissolved	unknown	ug/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	30	20
Zinc Dissolved	unknown	ug/l	23	14	<10	<10	17	<10	13	<10	<10	10	<10	<10	216	<10	12	13	<10	40	
Mercury Dissolved	unknown	ug/l	0.4	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	1
Other inorganics																					
BOD (Unfiltered Sample)	unknown	mg/l	-	-	<2	4	2	<2	<2	<2	4	4	2	3	4	7	4	4	<2		
COD (Unfiltered Sample)	unknown	mg/l	-	-	34	31	50	17	26	72	18	6	21	33	53	13	18	24	65		
Conductivity (at 25 deg.C)	unknown	mg/l	843	1055	735	1424	753	894	1121	1232	965	845	715	1255	776	753	1161	1163	-		
Sulphate (soluble)	unknown	mg/l	90	180	60	410	80	70	150	240	180	110	60	420	100	100	190	200	70	*400*	250
Chloride	unknown	mg/l	46	66	50	56	47	48	59	36	58	38	57	63	59	46	61	37	52		
Total Cyanide	unknown	mg/l	<5	5	<5	<5	<5	<5	<5	<5	<5	<5	5	<5	15	<5	<5	<5	<5	1 [3]	
pH Value	unknown	pH Units	7.60	7.80	7.87	7.61	7.60	7.10	7.56	7.23	7.65	7.55	7.69	6.80	7.58	7.62	7.34	7.31	-	6.0-8.5	>6.5

1. Environment Agency: EQS guideline criteria for marine water ecosystem protection. EQSs have been selected, where necessary, to be protective of *Cyprinid* fish.
2. UK Drinking Water Inspectorate: Water Supply (Water Quality) Regulations 2000.
3. Environmental Agency Non-Statutory (Operational) Environmental Quality Standards
4. UK Technical Advisory Group on the Water Framework Directive: Proposals For Environmental Quality Standards for Annex VIII Substances, 2008
5. World Health Organisation: Guidelines for Drinking Water-quality, Third Edition, Volume 1, Recommendations 2004.

cells highlighted purple exceed criteria for minor aquifer
cells highlighted light blue exceed marine water EQS
cells highlighted both criteria

** Chromium III guideline criteria used in absence of total Chromium criteria
Organics results have not been assessed in this report as concentrations are likely to have changed since the 1997 ground investigation.

Table A6: GROUND GAS ASSESSMENT	Job name:Battersea	Job number:023000

NOTES:

Assessment based on guidance published in CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings.'

Information from Table 8.5 of CIRIA C665

Characteristic Situation 1 conditions

Gas screening value (CH4 or CO2) < 0.07 l/h

Typically methane < 1 % by volume

Typically carbon dioxide < 5% by volume

Characteristic Situation 2 conditions

Gas screening value (CH4 or CO2) < 0.7 l/h

Borehole air flow rate < 70 l/h

Characteristic Situation 3 conditions

Gas screening value (CH4 or CO2) < 3.5 l/h

Key for shading	
(light green)	CO_2 > 5% in air
(orange)	CH4 > 1 % in air
(cyan)	GSV > or = 0.07 l/h
(yellow)	GSV> or = 0.7 l/h

Approach:

Maximum concentration and flow values are used in the assessment below (minimum values for oxygen).

Where no detectable flow is recorded the instrument limit of detection is used

Where concentrations are recorded below LoD, the instrument LoD is used in the assessment (0.5%)

SITE MONITORING DATA

Investigation & Year of installation	Exploratory Hole	Response zone stratum	Date Monitored/ Sampled	Flow Rate (l/hr)	Atmos Pres (mb)	Min O2 (%) air	Max CO2 (% air)	Max CH4 (% air)	CO2 as fraction	Gas screening value CO_2 (l/hr)	CH_4 as fraction	Gas screening value CH_4 (l/hr)	Characteristic Situation
LBH Geotechnical & Environmental 1993	BH4	MG	26-Jul-93	-	1007	6.8	1	2	0.010	0.0010	0.020	0.0020	**2**
FES 1997	BH106	MG	22-Aug-97	-	-	15.4	1.4	0.1	0.014	0.0014	0.001	0.0001	1
			29-Aug-97	-	-	14.8	1.9	0.1	0.019	0.0019	0.001	0.0001	1
FES 1997	BH113	MG	22-Aug-97	-	-	5.9	3.9	0.1	0.039	0.0039	0.001	0.0001	1
			29-Aug-97	-	-	21	0.1	0.1	0.001	0.0001	0.001	0.0001	1
FES 1997	BH203	MG	26-Sep-97	-	-	16.3	1.2	0.1	0.012	0.0012	0.001	0.0001	1
Geotechnics Limited 2002	BH101	MG	12-Aug-02	-	1011	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Fugro 2004	BH2001	MG	11-Aug-04	1.6	1005	8.4	1	0.1	0.010	0.0160	0.001	0.0016	1
			28-Aug-04	1	1008	11.2	0.1	0.1	0.001	0.0010	0.001	0.0010	1
			13-Sep-04	1.5	999	15.5	0.1	0.1	0.001	0.0015	0.001	0.0015	1
			24-Sep-04	4.2	1019	20.9	0.1	0.1	0.001	0.0042	0.001	0.0042	1
			11-Oct-04	4.1	1011	10.9	0.1	0.1	0.001	0.0041	0.001	0.0041	1
Fugro 2004	BH2005	MG	27-Sep-04	0.9	1021	20.9	0.1	0.1	0.001	0.0009	0.001	0.0009	1
			11-Oct-04	1.6	1014	20.9	0.1	0.1	0.001	0.0016	0.001	0.0016	1
Fugro 2004	GW10	MG	24/09/2004	0.3	1019	18.2	1.4	0.1	0.014	0.0042	0.001	0.0003	1
			11/10/2004	0.4	1015	18.8	1.4	0.1	0.014	0.0056	0.001	0.0004	1
FES 1997	BH204	MG / ALV	26-Sep-97	-	-	14.7	0.1	0.9	0.001	0.0001	0.009	0.0009	1
LBH Geotechnical & Environmental 1993	BH1	MG / RTG	26-Jul-93	-	1007	15.2	1.2	0.1	0.012	0.0012	0.001	0.0001	1
FES 1997	BH102	MG / RTG	22-Aug-97	-	-	8.6	4.5	0.1	0.045	0.0045	0.001	0.0001	1
			29-Aug-97	-	-	4.1	5.2	0.1	0.052	0.0052	0.001	0.0001	**2**
FES 1997	BH104	MG / RTG	29-Aug-97	-	-	19.5	1.5	0.1	0.015	0.0015	0.001	0.0001	1
FES 1997	BH201	MG / RTG	26-Sep-97	-	-	15.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH301	MG / RTG	01-Jul-02	-	1002	14.1	0.6	0.1	0.006	0.0006	0.001	0.0001	1
			08-Jul-02	-	1009	17.2	0.2	0.1	0.002	0.0002	0.001	0.0001	1
			12-Jul-02	-	1020	16.3	0.8	0.1	0.008	0.0008	0.001	0.0001	1
			17-Jul-02	-	1021	14	0.7	0.1	0.007	0.0007	0.001	0.0001	1
			22-Jul-02	-	1012	12.2	1.9	0.1	0.019	0.0019	0.001	0.0001	1
			25-Jul-02	-	1015	9.5	2	0.1	0.020	0.0020	0.001	0.0001	1
			30-Jul-02	-	1012	9.3	2.5	0.1	0.025	0.0025	0.001	0.0001	1
			05-Aug-02	-	1015	7.2	3.6	0.1	0.036	0.0036	0.001	0.0001	1
			12-Aug-02	-	1011	18.6	0.9	0.1	0.009	0.0009	0.001	0.0001	1
			27-Aug-02	-	1015	17	0.7	0.1	0.007	0.0007	0.001	0.0001	1
			11-Aug-04	0.9	1006	19.8	0.1	0.1	0.001	0.0009	0.001	0.0009	1
			28-Aug-04	0	1008	17.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			13-Sep-08	0	1000	19.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			07-Oct-04	0	1014	19	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH401	MG / RTG	12-Aug-02	-	1011	20.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			24-Sep-04	0.1	1019	12.4	2.9	0.1	0.029	0.0029	0.001	0.0001	1
			07-Oct-04	0	1014	16.8	3.5	0.1	0.035	0.0035	0.001	0.0001	1
Fugro 2004	BH2011	MG /RTG	11-Aug-04	0.7	1006	20.8	0.1	0.1	0.001	0.0007	0.001	0.0007	1
			28-Aug-04	0.2	1008	19.8	0.4	0.1	0.004	0.0008	0.001	0.0002	1
			13-Sep-04	0	999	20.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			11-Oct-04	1.4	999	20.6	0.3	0.1	0.003	0.0042	0.001	0.0014	1
Fugro 2004	BH2015	MG / RTG	24-Sep-04	0.2	1019	15.7	3.1	0.1	0.031	0.0062	0.001	0.0002	1
			07-Oct-04	3.8	1015	7.7	6	0.1	0.060	0.2280	0.001	0.0038	**2**
Fugro 2004	BH2026	MG / RTG	11/08/2004	2	1002	14.4	1.8	0.1	0.018	0.0360	0.001	0.0020	1
			28/08/2004	0.3	1009	9.7	3	0.1	0.030	0.0090	0.001	0.0003	1
			13/09/2004	3.8	1000	12.3	3.4	0	0.034	0.1292	0.000	0.0000	**2**
			07/10/2004	2.9	1014	14.8	2.6	0.1	0.026	0.0754	0.001	0.0029	**2**
Fugro 2004	GW06	MG / RTG	24/09/2004	2.1	1019	18.3	1.1	0.1	0.011	0.0231	0.001	0.0021	1
			11/10/2004	1	1014	19.6	0.8	0.1	0.008	0.0080	0.001	0.0010	1
Geotechnics Limited 2002	BH201	MG / ALV / RTG	01-Jul-02	-	1002	20.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			08-Jul-02	-	1009	20.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Jul-02	-	1020	20.5	1.4	0.1	0.014	0.0014	0.001	0.0001	1
			17-Jul-02	-	1021	12.9	6.7	0.1	0.067	0.0067	0.001	0.0001	**2**
			22-Jul-02	-	1012	13.1	4.9	0.1	0.049	0.0049	0.001	0.0001	1
			25-Jul-02	-	1015	14.7	4.2	0.1	0.042	0.0042	0.001	0.0001	1
			30-Jul-02	-	1012	13.6	5.8	0.1	0.058	0.0058	0.001	0.0001	**2**
			05-Aug-02	-	1015	10.4	6.2	0.1	0.062	0.0062	0.001	0.0001	**2**
			12-Aug-02	-	1011	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	19.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH204	MG / ALV / RTG	01-Jul-02	-	1002	16	1.4	0.1	0.014	0.0014	0.001	0.0001	1
			08-Jul-02	-	1009	16.1	2	0.1	0.020	0.0020	0.001	0.0001	1
			12-Jul-02	-	1020	14.5	1.7	0.1	0.017	0.0017	0.001	0.0001	1
			17-Jul-02	-	1021	16	1.4	0.1	0.014	0.0014	0.001	0.0001	1
			22-Jul-02	-	1012	15.1	3.1	0.1	0.031	0.0031	0.001	0.0001	1
			25-Jul-02	-	1015	13.7	3.1	0.1	0.031	0.0031	0.001	0.0001	1
			30-Jul-02	-	1012	14.1	3.2	0.1	0.032	0.0032	0.001	0.0001	1
			05-Aug-02	-	1015	12.9	2.2	0.1	0.022	0.0022	0.001	0.0001	1
			12-Aug-02	-	1011	10	2.8	**0.1**	0.028	0.0028	0.001	0.0001	1
			27-Aug-02	-	1015	12.1	3.6	0.1	0.036	0.0036	0.001	0.0001	1
Fugro 2004	BH2020	MG / ALV /RTG	28/08/2004	1.1	1009	12	5	0.1	0.050	0.0550	0.001	0.0011	1
			13/09/2004	1.2	1000	12.4	5.5	0.1	0.055	0.0660	0.001	0.0012	**2**
			11/10/2004	2.4	1013	20.4	0.5	0.1	0.005	0.0120	0.001	0.0024	1
Fugro 2004	BH2024A	MG / ALV / RTG	12/08/2004	0.6	1002	20.9	0.1	0.1	0.001	0.0006	0.001	0.0006	1
			28/08/2004	0.1	1009	6.8	1.6	0.1	0.016	0.0016	0.001	0.0001	1
			13/09/2004	0.3	999	19.9	0.4	0.1	0.004	0.0012	0.001	0.0003	1
Geotechnics Limited 2002	BH402	MG / RTG / LC	25-Jun-02	-	1027	20.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			01-Jul-02	-	1002	13.6	0.8	0.1	0.008	0.0008	0.001	0.0001	1
			08-Jul-02	-	1009	17	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Jul-02	-	1020	16.8	0.5	0.1	0.005	0.0005	0.001	0.0001	1
			17-Jul-02	-	1021	13.6	0.7	0.1	0.007	0.0007	0.001	0.0001	1
			22-Jul-02	-	1012	14.6	0.5	0.1	0.005	0.0005	0.001	0.0001	1
			25-Jul-02	-	1015	15.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	14	1.6	0.1	0.016	0.0016	0.001	0.0001	1
			12-Aug-02	-	1011	17.2	1.6	0.1	0.016	0.0016	0.001	0.0001	1
			27-Aug-02	-	1015	18.6	1	0.1	0.010	0.0010	0.001	0.0001	1
			24-Sep-04	2	1019	14.5	2.9	0.1	0.029	0.0580	0.001	0.0020	1
			07-Oct-04	2.9	1015	14.3	2.9	0.1	0.029	0.0841	0.001	0.0029	**2**
Geotechnics Limited 2002	BH501	MG / RTG/ LC	01-Jul-02	-	1002	15.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			08-Jul-02	-	1009	16.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Jul-02	-	1020	12	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			17-Jul-02	-	1021	15.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			22-Jul-02	-	1012	15.4	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	13.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	19	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1017	13.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	13.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			11-Aug-04	1.7	1003	14.9	0.1	0.1	0.001	0.0017	0.001	0.0017	1
			13-Sep-04	0.4	1000	17.4	0.1	0.1	0.001	0.0004	0.001	0.0004	1
			07-Oct-04	4.2	1015	16.2	0.1	0.1	0.001	0.0042	0.001	0.0042	1

Table A6: GROUND GAS ASSESSMENT	Job name:Battersea	Job number:023000

NOTES:

Assessment based on guidance published in CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings.'

Information from Table 8.5 of CIRIA C665

Characteristic Situation 1 conditions

Gas screening value (CH4 or CO2) < 0.07 l/h

Typically methane < 1 % by volume

Typically carbon dioxide < 5% by volume

Characteristic Situation 2 conditions

Gas screening value (CH4 or CO2) < 0.7 l/h

Borehole air flow rate < 70 l/h

Characteristic Situation 3 conditions

Gas screening value (CH4 or CO2) < 3.5 l/h

Key for shading	
(light green)	CO_2 > 5% in air
(orange)	CH4 > 1 % in air
(cyan)	GSV > or = 0.07 l/h
(yellow)	GSV> or = 0.7 l/h

Approach:

Maximum concentration and flow values are used in the assessment below (minimum values for oxygen).

Where no detectable flow is recorded the instrument limit of detection is used

Where concentrations are recorded below LoD, the instrument LoD is used in the assessment (0.5%)

SITE MONITORING DATA

Investigation & Year of installation	Exploratory Hole	Response zone stratum	Date Monitored/ Sampled	Flow Rate (l/hr)	Atmos Pres (mb)	Min O2 (%) air	Max CO2 (% air)	Max CH4 (% air)	CO2 as fraction	Gas screening value CO_2 (l/hr)	CH_4 as fraction	Gas screening value CH_4 (l/hr)	Characteristic Situation
Fugro 2004	GW01	MG / RTG / LC	12/08/2004	3	1002	3.4	10.1	3.9	0.101	0.3030	0.039	0.1170	**2**
			28/08/2004	0.7	1009	20.9	0.1	0.1	0.001	0.0007	0.001	0.0007	1
			14/09/2004	0	998	20.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			11/10/2004	1.9	1014	3	11.6	3.3	0.116	0.2204	0.033	0.0627	**2**
Geotechnics Limited 2002	BH702	ALV / RTG	22-Jul-02	-	1012	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	19.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	18.1	0.6	0.1	0.006	0.0006	0.001	0.0001	1
			27-Aug-02	-	1015	20.2	0.2	0.1	0.002	0.0002	0.001	0.0001	1
			11-Aug-02	0.3	1002	20.9	0.1	0.1	0.001	0.0003	0.001	0.0003	1
			28-Aug-04	0.1	1011	20.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH801	ALV / PEAT / ALV / RTG	25-Jul-02	-	1015	19.6	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	19.1	0.1	0.5	0.001	0.0001	0.005	0.0005	1
			12-Aug-02	-	1011	20.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH203	Peat / ALV / RTG	22-Jul-02	-	1012	20.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	19.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	18.4	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	19.6	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			11-Aug-04	0.2	1005	20.9	0.1	0.1	0.001	0.0002	0.001	0.0002	1
			28-Aug-04	0.1	1009	20.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			13-Sep-04	1	999	20.9	0.1	0.1	0.001	0.0010	0.001	0.0010	1
			11-Oct-04	0	1014	20.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Fugro 2004	BH1010		28/08/2004	0.3	1010	14.2	0.1	0.1	0.001	0.0003	0.001	0.0003	1
Geotechnics Limited 2002	BH1100	ALV / RTG / LC	25-Jul-02	-	1015	20.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	16.9	0.5	0.1	0.005	0.0005	0.001	0.0001	1
			05-Aug-02	-	1015	14.1	1.3	0.1	0.013	0.0013	0.001	0.0001	1
			27-Aug-02	-	1015	20.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-04	0.5	1002	20.9	0.1	0.1	0.001	0.0005	0.001	0.0005	1
			28-Aug-04	0	1009	16.7	2.6	0.1	0.026	0.0026	0.001	0.0001	1
			14-Sep-04	2.5	1000	19.3	1.6	0.1	0.016	0.0400	0.001	0.0025	1
			11-Oct-04	0.9	1013	15.9	3.4	0.1	0.034	0.0306	0.001	0.0009	1
Fugro 2004	BH2018	ALV / PEAT / LC	11-Aug-04	0	1005	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			28-Aug-04	0.3	1009	20.9	0.1	0.1	0.001	0.0003	0.001	0.0003	1
			13-Sep-04	0.8	999	20.9	0.1	0.1	0.001	0.0008	0.001	0.0008	1
			07-Oct-04	0.1	1014	20.6	0.1	0.1	0.001	0.0001	0.001	0.0001	1
FES 1997	BH108	RTG	29-Aug-97	-	-	20.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
FES 1997	BH115	RTG	29-Aug-97	-	-	20.6	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH102	RTG	22-Jul-02	-	1012	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	20.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			24-Sep-04	0.1	1019	20.4	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			11-Oct-04	0.3	1014	20.9	0.1	0.1	0.001	0.0003	0.001	0.0003	1
Geotechnics Limited 2002	BH104A	RTG	22-Jul-02	-	1012	18.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	20.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	20.4	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	20.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH105	RTG	17-Jul-02	-	1021	19.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			22-Jul-02	-	1012	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	20.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	19.6	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	19.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	21	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH202	RTG	25-Jul-02	-	1015	16.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	16.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	17	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	18.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-04	0.2	1003	20.9	0.1	0.1	0.001	0.0002	0.001	0.0002	1
			28-Aug-04	0.2	1009	19.4	0.4	0.1	0.004	0.0008	0.001	0.0002	1
			13-Sep-04	0.9	1000	20.7	0.2	0.1	0.002	0.0018	0.001	0.0009	1
			11-Oct-04	1.1	1013	20.9	0.1	0.1	0.001	0.0011	0.001	0.0011	1
Geotechnics Limited 2002	BH902A	RTG	08-Jul-02	-	1009	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Jul-02	-	1020	18.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			17-Jul-02	-	1021	20.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			22-Jul-02	-	1012	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	20.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	10.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	20	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27/08/2002	-	1015	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			29/09/2004	1.5	1017	20.9	0.1	0.1	0.001	0.0015	0.001	0.0015	1
			11/10/2004	1.6	1011	20.6	0.3	0.1	0.003	0.0048	0.001	0.0016	1
Geotechnics Limited 2002	BH601	RTG	17-Jul-02	-	1021	19.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			22-Jul-02	-	1012	19	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	19.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	19.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1017	19.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	17.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			24-Sep-04	0.3	1020	20.9	0.1	0.1	0.001	0.0003	0.001	0.0003	1
			07-Oct-04	0.4	1015	20.6	0.1	0.1	0.001	0.0004	0.001	0.0004	1
Geotechnics Limited 2002	BH701	RTG	17-Jul-02	-	1021	20.3	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			22-Jul-02	-	1012	20.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	19.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	19.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	20.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	20.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	18.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Fugro 2004	BH2030	RTG	12/08/2004	0.5	1003	20.9	0.1	0.1	0.001	0.0005	0.001	0.0005	1
			28/08/2004	1.1	1009	20.9	0.1	0.1	0.001	0.0011	0.001	0.0011	1
			13/09/2004	0	999	20.5	0.4	0.1	0.004	0.0004	0.001	0.0001	1
			07/10/2004	0.9	1015	20.6	0.1	0.1	0.001	0.0009	0.001	0.0009	1

Table A7: Waste classification based on soil values

Worst case substances			Xylene Dimercury Dichloride Calcium Sulphide Copper Sulphate	Benzene Phenol Naphthalene Cadmium Oxide	Arsenic Trioxide Calcium Cyanide	Nickel-carbonate	PRO (C6-C10)	DRO (C10-C25 or >C10 in absence of specific information)	Threshold value for carcinogenic PAH in whole oil	Sum of carcinogenic PAHs (percentage of whole oil)	Arsenic Trioxide	Calcium Chromate	Sum of PAH	Aromatic hydrocarbons (BTEX)	Cadmium Oxide	pH	Phenol Zinc Chloride Arsenic Trioxide	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Phenol	Calcium Cyanide	PCBs "To maintain consistency with international and UK legislation and guidance, the agencies consider that the level of 50mg/kg (0.005%) should be the defining threshold concentration for wastes containing PCBs and PCTs; above that concentration such waste should be considered as hazardous waste."	TPH (full range - C5-C40 etc.)	**Max of R50-53's** (Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs)	Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs
		Hazard	H4 - 'Irritant'	H6(H5) - 'Toxic'		H7 - 'Carcinogenic'										H8(H4) - 'Corrosive'		H10 - 'Toxic for reproduction'				H11 - 'Mutagenic'		H12 - Substances & preparations which release toxic gases in cont. with water air and acid		H14 - 'Ecotoxic'		
		Risk Phrase	R38	R23-25, R48	R26-28	R40		R45							R49		R34	R60	R61		R63	R46	R68	R32		R52/53	R50-53	R50-53/0.25 + R51-53/2.5 + R52-53/25
	Threshold value in %		20	3	0.1	1	0.1	0.1							0.1	<2 >11.5	5	0.5	0.5		5	0.1	1.0	0.2	0.005	2.5	0.25	1
	Maximum value		66.762	0.10	0.462	0.01	0.0	3.8			0.02	0.04	0.30682	0.000	0.0182	12.9	0.86	0.0752	2.271	0.0752	2.3	0.0752	0.0000	0.2365	0.0000	3.8340	3.8023	1.7
Sample identity	Sample depth (m)	Hazardous Waste																										
TP 236 CD10	1.5		0.14347	0.01421	0.001	0.000				0.0042	0.001	0.010	0.008457		0.00007	7.8	0.063	0.0015	0.083	0.0015	0.083	0.0015		0.0002			0.14	
TP 236 CD4	0.5		0.23086	0.01012	0.001	0.000				0.0047	0.001	0.011	0.009108		0.00007	8.8	0.059	0.0016	0.136	0.0016	0.136	0.0016		0.0002			0.23	
TP 237 CD1	0.1-0.2		0.03353	0.00259	0.000	0.000				0.0013	0.000	0.007	0.002762		0.00007	9.5	0.036	0.0005	0.019	0.0005	0.019	0.0005					0.04	
TP 237 CD4	0.4		0.00630	0.00761	0.000	0.000				0.0005	0.000	0.006	0.001382		0.00007	8.3	0.002	0.0004	0.001	0.0004	0.001	0.0004		0.0002			0.01	
TP 238 CD1	0.2		0.02993	0.00549	0.002	0.000				0.0010	0.001	0.011	0.001818		0.00007	8.9	0.034	0.0003	0.016	0.0003	0.016	0.0003		0.0002			0.04	
TP 239 CD5	1.0		0.01630	0.00257	0.001	0.000				0.0000	0.001	0.008	0.000090		0.00007	7.9	0.012	0.0000	0.008	0.0000	0.008	0.0000		0.0002			0.01	
TP 242 CD3	0.5		0.05990	0.00930	0.002	0.000				0.0075	0.001	0.009	0.015949		0.00012	8.4	0.066	0.0028	0.034	0.0028	0.034	0.0028		0.0002			0.08	
TP 242 CD5	1.0																											
TP 243 CD1	0.3		0.00213	0.00318	0.000	0.000				0.0002	0.000	0.014	0.000357		0.00007	8.8	0.015	0.0001	0.000	0.0001	0.000	0.0001		0.0002			0.02	
TP 243 CD5	1.0		0.00755	0.00237	0.000	0.000				0.0000	0.000	0.017	0.000063		0.00007	8.1	0.022	0.0000	0.001	0.0000	0.001	0.0000		0.0002			0.03	
TP224A	2.1-2.3	Yes	3.81015	0.03301	0.002	0.000		2.078	0.020782	0.0045	0.002	0.011	0.009245		0.00009	7.3	0.045	0.0018	2.271	0.0018	2.271	0.0018				2.08	3.80	
TP224B	2.5	Yes	0.07393	0.00495	0.001	0.000		0.162	0.001622	0.0164	0.001	0.009	0.043072		0.00007	7.7	0.019	0.0082	0.043	0.0082	0.043	0.0082				0.16	0.07	
TP224D	2.1	Yes	0.08957	0.00628	0.002	0.000		0.162	0.001615	0.0097	0.002	0.013	0.022690		0.00007	7.8	0.027	0.0041	0.052	0.0041	0.052	0.0041				0.16	0.09	
TP234	0.5		0.01854	0.00350	0.001	0.000				0.0020	0.001	0.011	0.004850		0.00007	8.9	0.022	0.0010	0.010	0.0010	0.010	0.0010		0.0002			0.02	
TP234	1.4		0.02894	0.00351	0.001	0.000				0.0004	0.001	0.013	0.001259		0.00007	7.8	0.017	0.0001	0.016	0.0001	0.016	0.0001		0.0002			0.03	
TP240	0.5	Yes	0.22484	0.03154	0.002	0.000				0.0024	0.002	0.012	0.005199		0.00026	7.8	0.181	0.0009	0.129	0.0009	0.129	0.0009		0.0002			0.22	1.72
TP244	1.0		0.03998	0.00474	0.002	0.000				0.0036	0.002	0.010	0.008342		0.00007	7.9	0.020	0.0014	0.022	0.0014	0.022	0.0014		0.0002			0.04	
TP244	2.0		0.01437	0.00238	0.001	0.000				0.0008	0.000	0.003	0.001460		0.00007	7.9	0.016	0.0002	0.008	0.0002	0.008	0.0002		0.0002			0.02	
TP245	0.5			0.00017				0.100		0.0036			0.007939			8.0		0.0013		0.0013		0.0013				0.10	0.00	
TP245	1.0		0.08000	0.01004	0.003	0.000				0.0023	0.002	0.018	0.004729		0.00008	7.9	0.056	0.0008	0.045	0.0008	0.045	0.0008		0.0002			0.07	
TP245A	2.0															11.4												
TP245B	0.5		0.21392	0.00359	0.002	0.000		0.134	0.001338	0.0003	0.002	0.013	0.000733		0.00008	9.3	0.044	0.0001	0.126	0.0001	0.126	0.0001		0.0002		0.13	0.21	
TP245B	2.0	Yes														11.8												
TP246	1.0		0.06511	0.00388	0.001	0.000				0.0025	0.001	0.011	0.008855		0.00007	10.3	0.032	0.0019	0.037	0.0019	0.037	0.0019					0.06	
TP249	0.6	Yes	0.34225	0.00412	0.001	0.000				0.0021	0.001	0.008	0.005987		0.00007	8.1	0.030	0.0011	0.203	0.0011	0.203	0.0011					0.34	
TP25	0.6		0.02610	0.00167	0.000	0.000					0.000	0.014			0.00007	9.7	0.028		0.013		0.013						0.03	
TP25	1.0		0.03665	0.01884	0.000	0.000				0.0001	0.000	0.006	0.000642		0.00007	8.3	0.030	0.0001	0.020	0.0001	0.020	0.0001					0.03	
TP25	1.5		0.01154	0.00147	0.000	0.000					0.000	0.009			0.00007	8.0	0.018		0.003		0.003						0.02	
TP250	0.3		0.08319	0.00339	0.001	0.000				0.0008	0.001	0.012	0.001799		0.00007	11.1	0.018	0.0003	0.048	0.0003	0.048	0.0003		0.0002			0.08	
TP250	0.7		0.03060	0.00369	0.001	0.000				0.0001	0.001	0.008	0.000230		0.00007	8.3	0.015	0.0000	0.017	0.0000	0.017	0.0000		0.0002			0.03	
TP251	0.2		0.03430	0.00170	0.001	0.000				0.0017	0.001	0.007	0.004983		0.00007	10.4	0.018	0.0009	0.020	0.0009	0.020	0.0009		0.0002			0.03	
TP26	2.0	Yes	0.05429	0.00167	0.001	0.000					0.001	0.008			0.00007	11.6	0.022		0.031		0.031						0.05	
TP268A	2.0															11.1												
TP268B	2.0															11.4												
TP27	0.5		0.04789	0.00597	0.002	0.000					0.002	0.018			0.00007	9.8	0.032		0.026		0.026						0.04	
TP27	2.0	Yes	0.06234	0.00127	0.001	0.000					0.001	0.008			0.00007	12.0	0.016		0.036		0.036						0.06	
TP270A	2.0			0.00002				0.050		0.0009			0.001731			7.9		0.0003		0.0003		0.0003				0.05	0.00	
TP270B	2.0			0.00004				0.045		0.0008			0.001727			8.0		0.0003		0.0003		0.0003				0.05	0.00	
TP271 CD1	0.50				0.000											10.0								0.0002			0.00	
TP271 K2	0.50		0.02738	0.00481	0.001	0.000				0.0008	0.001	0.006	0.001593		0.00007		0.022	0.0002	0.015	0.0002	0.015	0.0002					0.03	
TP272 CD1	0.20				0.000											8.1								0.0002			0.00	
TP272 K2	0.20		0.05669	0.00650	0.000	0.000				0.0002	0.000	0.006	0.000378		0.00007		0.062	0.0001	0.031	0.0001	0.031	0.0001					0.07	
TP28	1.0		0.03668	0.00287	0.001	0.000					0.001	0.008			0.00007	9.7	0.021		0.020		0.020						0.03	
TP28	2.5		0.01800	0.00117	0.001	0.000					0.001	0.011			0.00007	8.3	0.017		0.008		0.008						0.02	
TP29	0.0		0.01670	0.00089	0.000	0.000				0.0013	0.000	0.012	0.003435		0.00007	9.4	0.012	0.0006	0.009	0.0006	0.009	0.0006					0.01	
TP29	1.0		0.01648	0.00167	0.000	0.000					0.000	0.008			0.00007	7.9	0.021		0.007		0.007						0.02	
TP29	2.5	Yes	0.75392	0.01747	0.003	0.001				0.0004	0.002	0.010	0.001128		0.00007	7.8	0.066	0.0002	0.152	0.0002	0.152	0.0002		0.0005			0.25	
TP29	3.0	Yes	0.66112	0.01711	0.003	0.000		3.834	0.038340	0.0059	0.002	0.008	0.013989		0.00008	7.7	0.119	0.0030	0.113	0.0030	0.113	0.0030		0.0005		3.83	0.19	1.31
TP31	0.7		0.01096	0.00377	0.000	0.000					0.000	0.010			0.00007	8.2	0.009		0.005		0.005						0.01	
TP31	2.0		0.05163	0.00207	0.001	0.000					0.001	0.010			0.00007	8.3	0.013		0.029		0.029						0.05	
TP32	1.0		0.01897	0.00127	0.002	0.000					0.002	0.008			0.00007	8.5	0.014		0.009		0.009						0.02	
TP33	0.1	Yes	0.17475	0.01871	0.002	0.000		0.181	0.001807	0.0024	0.002	0.012	0.003869		0.00007	10.2	0.065	0.0005	0.101	0.0005	0.101	0.0005				0.18	0.17	
TP33A	0.5		0.13355	0.01384	0.001	0.000				0.0002	0.001	0.013	0.000893		0.00007	8.1	0.055	0.0001	0.076	0.0001	0.076	0.0001					0.13	
TP33A	2.0		0.04153	0.00277	0.001	0.000					0.001	0.006			0.00007	8.0	0.019		0.023		0.023						0.04	
TP34	0.5		0.07246	0.00417	0.002	0.000					0.002	0.007			0.00007	7.9	0.034		0.041		0.041						0.07	
TP35	0.1		0.01660	0.00157	0.001	0.000					0.001	0.006			0.00007	10.4	0.016		0.008		0.008						0.02	
TP35	1.0		0.00966	0.00487	0.001	0.000					0.001	0.003			0.00007	8.1	0.091		0.003		0.003						0.11	
TP36	1.0		0.03260	0.00277	0.000	0.000					0.000	0.010			0.00007	7.9	0.020		0.017		0.017						0.03	
TP36	3.0		0.01331	0.00177	0.001	0.000					0.001	0.009			0.00007	8.1	0.020		0.005		0.005						0.02	
TP37	2.0		0.05234	0.00887	0.001	0.000					0.001	0.007			0.00007	7.9	0.042		0.029		0.029						0.05	
TP38	2.0		0.05361	0.00437	0.001	0.000					0.001	0.025			0.00007	9.9	0.018		0.030		0.030						0.05	
BH701	5.5		0.43902																									
TP13	2.0		0.01784	0.00137	0.002	0.000					0.002	0.010			0.00007	7.2	0.019		0.007		0.007						0.02	
TP16	1.5		0.01638	0.00047	0.001	0.000					0.001	0.011			0.00007	7.4	0.020		0.007		0.007						0.02	
BH701	0.5		0.11204	0.00277	0.002	0.000					0.002	0.007			0.00007	8.6	0.031		0.065		0.065						0.11	
TP 207 CD1	0.5		0.03783	0.00159	0.001	0.000				0.0005	0.001	0.005	0.001572		0.00007	9.8	0.010	0.0003	0.022	0.0003	0.022	0.0003		0.0002			0.04	
TP 207 CD7	1.4		0.04199	0.00292	0.002	0.000				0.0001	0.002	0.008	0.000251		0.00010	8.9	0.036	0.0000	0.023	0.0000	0.023	0.0000					0.04	
TP 219 CD1	0.3-0.5		0.02942	0.00640	0.002	0.000				0.0005	0.002	0.008	0.000879		0.00007	9.4	0.034	0.0001	0.015	0.0001	0.015	0.0001		0.0002			0.04	
TP12	0.5	Yes	0.27727	0.00747	0.002	0.000					0.002	0.005			0.00007	10.7	0.021		0.164		0.164						0.27	
TP13	0.5		0.03512	0.00157	0.003	0.000					0.003	0.007			0.00007	8.2	0.014		0.020		0.020						0.03	
TP15	1.0		0.20316	0.01657	0.004	0.000					0.004	0.013			0.00007	9.6	0.085		0.118		0.118						0.20	
TP15	2.0		0.01411	0.00097	0.001	0.000					0.001	0.018			0.00007	8.3	0.009		0.007		0.007						0.02	
TP16	0.0	Yes	0.84046	0.07960	0.009	0.000				0.0004	0.009	0.026	0.000915		0.01817	7.3	0.864	0.0001	0.178	0.0001	0.178	0.0001					1.01	
TP16	0.5		1.96180	0.00155	0.003	0.000		0.433	0.004327	0.0001	0.003	0.008	0.000133		0.00014	7.8	0.063	0.0000	0.009	0.0000	0.009	0.0000				0.43	0.07	
TP16	0.9		3.23545	0.00638	0.004	0.000		0.196	0.001958	0.0001	0.003	0.015	0.000274		0.00007	7.5	0.100	0.0000	0.073	0.0000	0.073	0.0000		0.0005		0.20	0.12	0.95

Disclaimer: This spreadsheet does not take risk phrases into account that are applicable where an individual substance or the sum of substances exceed 25% (250g/kg or 250000mg/kg) of the total sample material.

Table A7: Waste classification based on soil values

Worst case substances			Xylene Dimercury Dichloride Calcium Sulphide Copper Sulphate	Benzene Phenol Naphthalene Cadmium Oxide	Arsenic Trioxide Calcium Cyanide	Nickel-carbonate	PRO (C6-C10)	DRO (C10-C25 or >C10 in absence of specific information)	Threshold value for carcinogenic PAH in whole oil	Sum of carcinogenic PAHs (percentage of whole oil)	Arsenic Trioxide	Calcium Chromate	Sum of PAH	Aromatic hydrocarbons (BTEX)	Cadmium Oxide	pH	Phenol Zinc Chloride Arsenic Trioxide	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Phenol	Calcium Cyanide	PCBs "To maintain consistency with international and UK legislation and guidance, the agencies consider that the level of 50mg/kg (0.005%) should be the defining threshold concentration for wastes containing PCBs and PCTs; above that concentration such waste should be considered as hazardous waste."	TPH (full range - C5-C40 etc.)	**Max of R50-53's** (Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs)	Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs
		Hazard	H4 - 'Irritant'	H6(H5) - 'Toxic'		H7 - 'Carcinogenic'										H8(H4) - 'Corrosive'		H10 - 'Toxic for reproduction'				H11 - 'Mutagenic'		H12 - Substances & preparations which release toxic gases in cont. with water air and acid		H14 - 'Ecotoxic'		
		Risk Phrase	R38	R23-25, R48	R26-28	R40		R45							R49		R34	R60	R61		R63	R46	R68	R32		R52/53	R50-53	R50-53/0.25 + R51-53/2.5 + R52-53/25
	Threshold value in %		20	3	0.1	1	0.1	0.1							0.1	<2 >11.5	5	0.5	0.5		5	0.1	1.0	0.2	0.005	2.5	0.25	1
	Maximum value		66.762	0.10	0.462	0.01	0.0	3.8			0.02	0.04	0.30682	0.000	0.0182	12.9	0.86	0.0752	2.271	0.0752	2.3	0.0752	0.0000	0.2365	0.0000	3.8340	3.8023	1.7
Sample identity	Sample depth (m)	Hazardous Waste																										
TP17	0.2		0.05415	0.00667	0.001	0.000					0.001	0.005			0.00007	8.7	0.023		0.029		0.029						0.05	
TP228	0.5		0.07264	0.02268	0.003	0.000				0.0011	0.002	0.011	0.002035		0.00007	8.3	0.032	0.0003	0.042	0.0003	0.042	0.0003		0.0002			0.07	
TP53	1.5		0.02696	0.00127	0.001	0.000					0.001	0.024			0.00007	7.8	0.011		0.015		0.015						0.02	
BH102	11.5		0.41022																									
BH102	17.0		0.50724																									
BH102	31.0		0.79794																									
BH104A	15.0		0.34704																									
BH104A	37.0		0.38286																									
BH101	4.0		0.12282	0.00017	0.002	0.000				0.0000	0.001	0.014	0.000050		0.00007	7.6	0.006	0.0000	0.001	0.0000	0.001	0.0000		0.0005			0.01	
BH102	2.5		0.02362	0.00317	0.001	0.000					0.001	0.008			0.00007	11.2	0.021		0.012		0.012						0.02	
TP101	0.0		0.05951	0.00527	0.002	0.000					0.002	0.012			0.00007	8.1	0.041		0.032		0.032						0.05	
TP101	0.5		0.02439	0.00167	0.001	0.000				0.0001	0.001	0.007	0.000170		0.00007	8.4	0.022	0.0000	0.013	0.0000	0.013	0.0000					0.02	
TP101	2.0		0.18000													8.6												
TP102	2.0		0.13354	0.00027	0.001	0.000					0.001	0.010			0.00007	8.8	0.006		0.002		0.002						0.01	
TP103	4.5		0.46800													8.9												
TP104	0.5		0.01068	0.00017	0.002	0.000					0.002	0.007			0.00007	8.3	0.010		0.004		0.004						0.01	
TP104	2.0		0.01696	0.00107	0.001	0.000					0.001	0.018			0.00007	8.5	0.014		0.008		0.008						0.02	
TP104	3.0		0.09360													8.4												
TP105	0.5		0.03246	0.00167	0.001	0.000					0.001	0.011			0.00007	10.6	0.022		0.017		0.017						0.03	
TP105	3.0		0.08640													8.6												
TP106	1.0		0.16165	0.00207	0.002	0.000					0.002	0.007			0.00007	8.0	0.082		0.095		0.095						0.16	
TP107	0.0		0.04640	0.00283	0.002	0.000				0.0003	0.002	0.008	0.000683		0.00007	8.7	0.036	0.0001	0.025	0.0001	0.025	0.0001					0.04	
TP107	3.0		0.13860													8.5												
TP108	3.0		0.07560													8.6												
TP110	0.0		0.48600													8.4												
TP110	0.5		0.10424	0.00612	0.002	0.000				0.0006	0.002	0.008	0.001274		0.00007	7.8	0.036	0.0002	0.060	0.0002	0.060	0.0002					0.10	
TP110	3.0		0.14040													8.6												
TP112	3.0		0.09360													8.5												
TP113	0.5		0.01562	0.00067	0.002	0.000					0.002	0.005			0.00007	8.4	0.016		0.008		0.008						0.02	
TP114	3.0															9.2												
TP115	1.0		0.00705	0.00141	0.001	0.000				0.0004	0.001	0.007	0.000899		0.00007	9.0	0.014	0.0001	0.002	0.0001	0.002	0.0001					0.02	
TP115	3.0		0.17100													8.6												
TP117	1.0		0.14265	0.00141	0.002	0.000				0.0010	0.002	0.012	0.002359		0.00007	8.6	0.019	0.0004	0.083	0.0004	0.083	0.0004					0.14	
TP117	2.0		0.27000													8.4												
TP118	0.4		0.14977	0.01135	0.007	0.000				0.0002	0.007	0.016	0.000659		0.00007	8.0	0.081	0.0001	0.084	0.0001	0.084	0.0001					0.14	
TP118	1.0		0.00445	0.00023	0.001	0.001				0.0001	0.001	0.006	0.000345		0.00007	7.9	0.010	0.0001	0.001	0.0001	0.001	0.0001					0.01	
TP118	2.0		0.08460													8.2												
TP119	3.0		0.19800													8.8												
TP120	2.0		0.14208	0.00017	0.004	0.000					0.004	0.016			0.00007	7.2	0.015		0.003		0.003						0.02	
TP121	0.5		0.00833	0.00017	0.002	0.000					0.002	0.009			0.00007	8.4	0.011		0.003		0.003						0.01	
TP121	2.0		0.11719	0.00208	0.002	0.000				0.0017	0.001	0.006	0.003705		0.00007	7.9	0.014	0.0005	0.005	0.0005	0.005	0.0005		0.0005			0.02	
TP121	3.0		0.17100													8.5												
TP122	0.5		0.01671	0.00379	0.003	0.000					0.003	0.008			0.00009	8.4	0.036		0.007		0.007						0.04	
TP122	1.0	Yes	0.41889	0.01357	0.009	0.000					0.009	0.020			0.00007	10.5	0.146		0.242		0.242						0.41	
TP122	3.0		0.10800													8.5												
TP123	3.0		0.08460													8.3												
TP124	1.0		0.01356	0.00097	0.001	0.000					0.001	0.009			0.00007	7.8	0.015		0.006		0.006						0.02	
TP124	2.0		0.09000													8.6												
TP126	0.3	Yes	0.50607	0.02081	0.009	0.000		3.343	0.033432	0.0122	0.008	0.014	0.022787		0.00016	7.0	0.157	0.0051	0.039	0.0051	0.039	0.0051		0.0005		3.34	0.18	
TP126	3.0		0.00719	0.00067	0.001	0.000					0.001	0.010			0.00007	8.6	0.009		0.002		0.002						0.01	
TP127	1.0		0.62735	0.00237	0.004	0.001				0.0000	0.003	0.007	0.000077		0.00007	8.8	0.029	0.0000	0.007	0.0000	0.007	0.0000		0.0005			0.03	
TP127	3.0		0.10260													8.3												
TP128	4.0		0.15480													8.6												
TP131	0.4	Yes	0.05199	0.00145	0.001	0.000		1.268	0.012677	0.0004	0.001	0.002	0.001048		0.00007	7.9	0.014	0.0001	0.030	0.0001	0.030	0.0001				1.27	0.05	
TP131	2.0		0.07963	0.00957	0.002	0.000					0.002	0.006			0.00007	8.5	0.053		0.045		0.045						0.08	
TP131	3.0		0.40344	0.01350	0.001	0.000				0.0005	0.001	0.010	0.002069		0.00007	8.2	0.072	0.0004	0.077	0.0004	0.077	0.0004					0.13	
TP133	2.0		0.00485	0.00017	0.001	0.000					0.001	0.007			0.00007	8.6	0.007		0.001		0.001						0.01	
TP134	0.0		0.08624	0.01947	0.003	0.000					0.002	0.007			0.00007	8.1	0.073		0.049		0.049			0.0008			0.08	
TP134	3.0	Yes	0.21189	0.10127	0.006	0.000					0.006	0.005			0.00017	7.6	0.379		0.125		0.125						0.44	
TP135	0.5		0.01957	0.00067	0.003	0.000					0.002	0.010			0.00007	8.0	0.017		0.009		0.009			0.0005			0.02	
TP135	2.0		0.01629	0.00047	0.002	0.000					0.002	0.008			0.00007	9.7	0.015		0.007		0.007						0.02	
TP136	0.0	Yes	0.03116	0.00442	0.000	0.000		0.347	0.003474	0.0832	0.000	0.007	0.246325		0.00007	7.8	0.064	0.0512	0.018	0.0512	0.018	0.0512				0.35	0.08	
TP136	1.5		0.01168	0.00037	0.001	0.000					0.001	0.017			0.00007	8.6	0.011		0.005		0.005						0.02	
TP301	2.5	Yes	0.19535	0.07012	0.002	0.000				0.0016	0.001	0.008	0.003490		0.00008	7.7	0.195	0.0006	0.115	0.0006	0.115	0.0006		0.0002			0.23	1.69
TP301	3.8		0.09208	0.00483	0.001	0.000				0.0017	0.000	0.009	0.003821		0.00010	7.5	0.122	0.0007	0.053	0.0007	0.053	0.0007		0.0002			0.14	
TP302	2.0				0.000											7.6								0.0002			0.00	
TP302	6.0		0.03889	0.00478	0.002	0.000				0.0005	0.002	0.011	0.000971		0.00007	8.1	0.030	0.0002	0.022	0.0002	0.022	0.0002		0.0002			0.04	
TP302	4.5-5.0				0.000											7.6								0.0002			0.00	
TP307 CD7	1.80				0.000											7.4								0.0002			0.00	
TP307 K8	1.80		0.04757	0.00463	0.001	0.000		0.091		0.0004	0.001	0.018	0.001024		0.00007		0.013	0.0002	0.027	0.0002	0.027	0.0002				0.09	0.05	
TP309 CD3	1.00				0.000											9.6								0.0002			0.00	
TP309 K4	1.00		0.03517	0.00210	0.001	0.000				0.0017	0.001	0.007	0.003736		0.00007		0.018	0.0006	0.020	0.0006	0.020	0.0006					0.03	
TP39	1.0	Yes	2.73203	0.06165	0.008	0.000				0.0041	0.007	0.013	0.007914		0.00016	7.6	0.421	0.0020	0.230	0.0020	0.230	0.0020		0.0005			0.49	
TP39	2.0	Yes	1.57898	0.00177	0.001	0.000					0.000	0.001			0.00007	12.7	0.008		0.018		0.018			0.0005			0.03	
TP39	3.0	Yes	0.21344	0.01677	0.002	0.000					0.002	0.008			0.00007	8.1	0.088		0.125		0.125						0.21	1.24

Disclaimer: This spreadsheet does not take risk phrases into account that are applicable where an individual substance or the sum of substances exceed 25% (250g/kg or 250000mg/kg) of the total sample material.

Table A7: Waste classification based on soil values

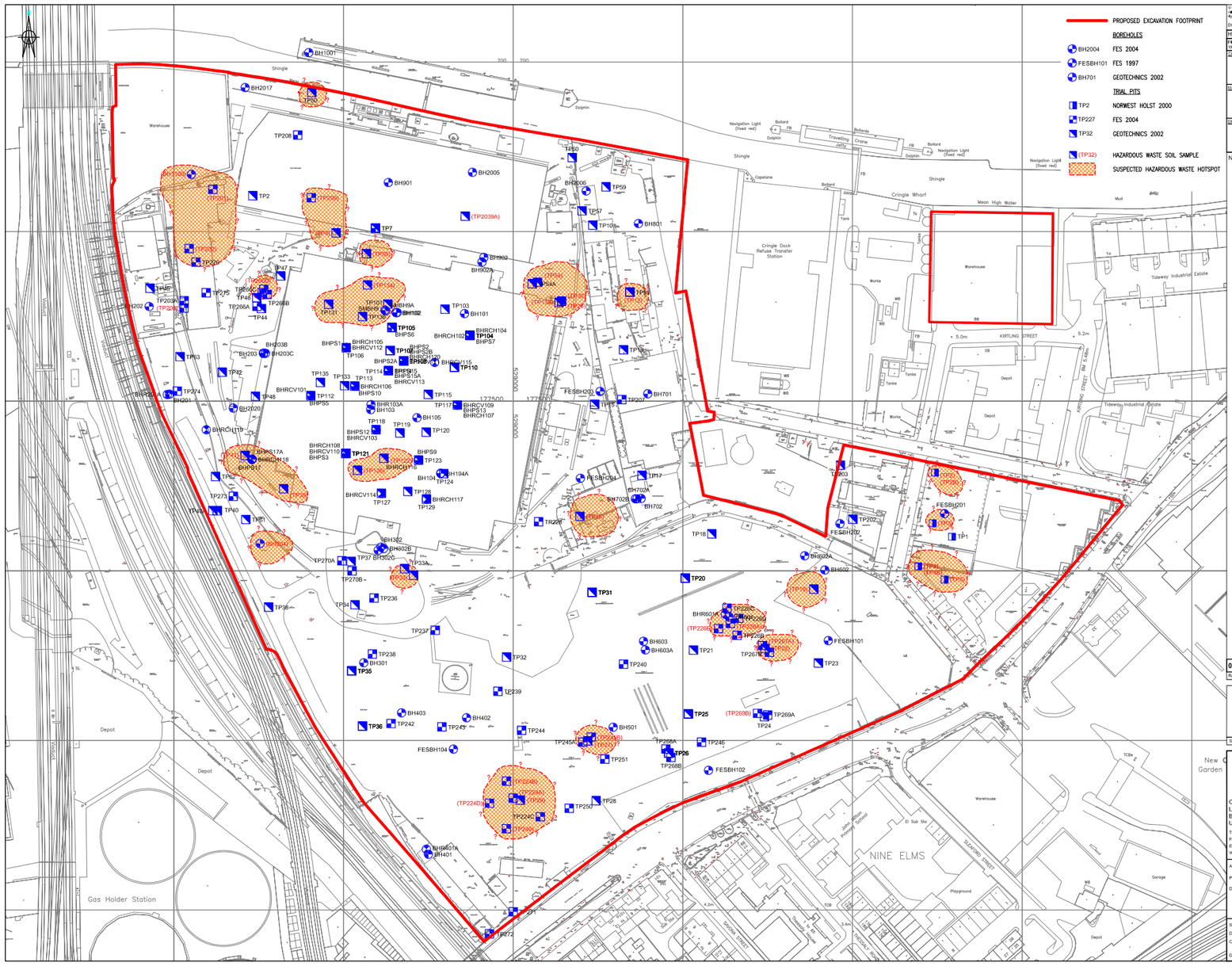
		Worst case substances	Xylene Dimercury Dichloride Calcium Sulphide Copper Sulphate	Benzene Phenol Naphthalene Cadmium Oxide	Arsenic Trioxide Calcium Cyanide	Nickel-carbonate	PRO (C6-C10)	DRO (C10-C25 or >C10 in absence of specific information)	Threshold value for carcinogenic PAH in whole oil	Sum of carcinogenic PAHs (percentage of whole oil)	Arsenic Trioxide	Calcium Chromate	Sum of PAH	Aromatic hydrocarbons (BTEX)	Cadmium Oxide	pH	Phenol Zinc Chloride Arsenic Trioxide	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Phenol	Calcium Cyanide	PCBs "To maintain consistency with international and UK legislation and guidance, the agencies consider that the level of 50mg/kg (0.005%) should be the defining threshold concentration for wastes containing PCBs and PCTs; above that concentration such waste should be considered as hazardous waste."	TPH (full range - C5-C40 etc.)	Max of R50-53's (Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs)	Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs
	Hazard		H4 - 'Irritant'	H6(H5) - 'Toxic'		H7 - 'Carcinogenic'										H8(H4) - 'Corrosive'		H10 - 'Toxic for reproduction'				H11 - 'Mutagenic'		H12 - Substances & preparations which release toxic gases in cont. with water air and acid		H14 - 'Ecotoxic'		
	Risk Phrase		R38	R23-25, R48	R26-28	R40		R45							R49		R34	R60	R61		R63	R46	R68	R32		R52/53	R50-53	R50-53/0.25 + R51-53/2.5 + R52-53/25
	Threshold value in %		20	3	0.1	1	0.1	0.1							0.1	<2 >11.5	5	0.5	0.5		5	0.1	1.0	0.2	0.005	2.5	0.25	1
	Maximum value		66.762	0.10	0.462	0.01	0.0	3.8			0.02	0.04	0.30682	0.000	0.0182	12.9	0.86	0.0752	2.271	0.0752	2.3	0.0752	0.0000	0.2365	0.0000	3.8340	3.8023	1.7
Sample identity	Sample depth (m)	Hazardous Waste																										
BH105	8.0		0.11520																									
BH105	17.0		0.10782																									
BH105	23.0		0.09918																									
TP106	3.0		0.12600													8.6												
BH602A	8.0		0.21708																									
BH602A	30.0		0.45000																									
BH601	1.5		0.02890	0.00117	0.001	0.000					0.001	0.006			0.00007	8.3	0.007		0.016		0.016						0.03	
TP18	0.6		0.01165	0.00177	0.000	0.000					0.000	0.008			0.00007	9.4	0.024		0.005		0.005						0.03	
TP18	3.0		0.09108	0.00497	0.002	0.000					0.002	0.005			0.00007	8.0	0.017		0.053		0.053						0.09	
TP19	2.0	Yes	0.29172	0.00447	0.002	0.000					0.002	0.012			0.00007	7.9	0.021		0.172		0.172						0.29	
TP20	0.1		0.02814	0.00177	0.001	0.000					0.001	0.008			0.00007	9.8	0.020		0.015		0.015						0.02	
TP20	2.0		0.02851	0.00167	0.001	0.000					0.001	0.007			0.00007	8.6	0.014		0.015		0.015						0.02	
TP21	0.5		0.01675	0.00107	0.001	0.000					0.001	0.011			0.00007	9.5	0.011		0.008		0.008						0.01	
TP21	2.7		0.14458	0.00467	0.001	0.000					0.001	0.013			0.00007	8.6	0.061		0.085		0.085						0.14	
TP22	0.1		0.02193	0.00097	0.001	0.000					0.001	0.013			0.00007	11.0	0.017		0.012		0.012						0.02	
TP22	1.0		0.02548	0.00767	0.001	0.000					0.001	0.007			0.00007	8.0	0.039		0.011		0.011						0.05	
TP22	1.6		0.01777	0.00067	0.000	0.000					0.000	0.007			0.00007	8.2	0.010		0.010		0.010						0.02	
TP226A	1.5	Yes		0.00242				0.609	0.006085	0.0172			0.053366			7.4		0.0096		0.0096		0.0096				0.61	0.01	
TP226C	1.5			0.00003				0.066		0.0005			0.001398			8.3		0.0003		0.0003		0.0003				0.07	0.00	
TP226D	1.6			0.00537				0.067		0.0032			0.014529			8.1		0.0016		0.0016		0.0016				0.07	0.01	
TP226E	1.3	Yes		0.00612				0.417	0.004169	0.0611			0.172290			9.3		0.0305		0.0305		0.0305				0.42	0.03	
TP23	0.1		0.01757	0.00117	0.000	0.000					0.000	0.006			0.00007	10.8	0.012		0.009		0.009						0.02	
TP23	0.5		0.04900	0.00367	0.001	0.000					0.001	0.007			0.00007	8.5	0.028		0.027		0.027						0.05	
TP23	1.0		0.05245	0.00377	0.001	0.000					0.001	0.008			0.00007	8.0	0.030		0.029		0.029						0.05	
TP24	0.5		0.05870	0.01437	0.001	0.000					0.001	0.009			0.00007	8.1	0.042		0.032		0.032						0.05	
TP24	2.0		0.07162	0.01367	0.001	0.000					0.001	0.014			0.00007	11.4	0.022		0.041		0.041						0.07	
TP267A	0.1	Yes		0.00002				0.105	0.001054	0.0026			0.005368			10.7		0.0009		0.0009		0.0009				0.11	0.00	
TP267B	0.1			0.00004				0.045		0.0022			0.004617			10.6		0.0008		0.0008		0.0008				0.05	0.00	
TP267B	0.8-1.0			0.00064				0.825	0.008245	0.0030			0.009163			8.2		0.0014		0.0014		0.0014				0.82	0.00	
TP269A	0.5			0.00004				0.117	0.001169	0.0011			0.002404			11.0		0.0004		0.0004		0.0004				0.12	0.00	
TP269B	0.5	Yes		0.00004				0.113	0.001132	0.0012			0.002709			11.1		0.0005		0.0005		0.0005				0.11	0.00	
TP20	4.0		0.00541	0.00017	0.002	0.000					0.002	0.022			0.00007	8.5	0.008		0.001		0.001						0.02	
BH201	1.8		0.20502																									
BH203	4.5		1.10502																									
TP40	4.1		0.00300	0.00027	0.000	0.000					0.000	0.005			0.00007	8.3	0.007		0.001		0.001						0.01	
BH201	9.0		0.18522																									
BH201	23.0		0.22014																									
BH 2020 CD5	3.5-4.0		0.01754	0.00179	0.001	0.001				0.0016	0.001	0.009	0.004835		0.00007	7.9	0.010	0.0009	0.009	0.0009	0.009	0.0009		0.0002			0.02	
BH201	0.5		0.11743	0.02469	0.003	0.000				0.0027	0.003	0.019	0.010762		0.00026	8.1	0.132	0.0023	0.058	0.0023	0.058	0.0023					0.15	
BH202	0.5		0.02037	0.00474	0.000	0.000				0.0007	0.000	0.010	0.002542		0.00007	10.7	0.013	0.0005	0.010	0.0005	0.010	0.0005					0.02	
BH204	0.5		0.12079	0.01880	0.002	0.000				0.0008	0.002	0.013	0.002185		0.00013	8.2	0.091	0.0003	0.068	0.0003	0.068	0.0003					0.11	0.87
BH204	0.5	Yes	0.23575	0.02823	0.003	0.000				0.0022	0.003	0.018	0.005845		0.00018	8.1	0.106	0.0007	0.136	0.0007	0.136	0.0007					0.23	1.39
TP 203 CD1	0.5	Yes	0.03223	0.00719	0.001	0.000				0.0000	0.001	0.009	0.000083		0.00025	7.6	0.293	0.0000	0.013	0.0000	0.013	0.0000					0.34	
TP 266 A CD3	2.0															8.6												
TP 266 A K4	2.0		0.06836	0.00978	0.002	0.000		0.034		0.0008	0.002	0.005	0.001469		0.00007		0.119	0.0002	0.039	0.0002	0.039	0.0002				0.03	0.14	
TP 266 D CD3	2.0															8.5												
TP 266 D K4	2.0	Yes	0.27944	0.02754	0.003	0.000		0.027		0.0013	0.003	0.010	0.002314		0.00012		0.106	0.0003	0.163	0.0003	0.163	0.0003				0.03	0.27	
TP132	0.5		0.21092	0.01887	0.004	0.000					0.003	0.008			0.00007	8.4	0.085		0.123		0.123			0.0005			0.21	
TP132	2.0		0.41695	0.02269	0.002	0.000				0.0043	0.002	0.005	0.009208		0.00007	7.9	0.144	0.0017	0.040	0.0017	0.040	0.0017					0.17	
TP202	0.5		0.13560	0.00939	0.001	0.000				0.0017	0.001	0.008	0.003474		0.00007	9.9	0.026	0.0006	0.079	0.0006	0.079	0.0006					0.13	
TP202	1.0		1.05991	0.00832	0.002	0.000				0.0002	0.001	0.020	0.000444		0.00007	7.9	0.013	0.0001	0.021	0.0001	0.021	0.0001		0.0005			0.04	
TP202	1.1	Yes	0.01786	0.00275	0.001	0.000				0.0000	0.000	0.009	0.000499		0.00007	12.0	0.004	0.0002	0.006	0.0002	0.006	0.0002		0.0002			0.01	
TP202	2.0		0.70637	0.00018	0.002	0.000				0.0000	0.002	0.009	0.000154		0.00007	7.1	0.010	0.0000	0.004	0.0000	0.004	0.0000		0.0005			0.01	
TP202	3.0		0.00388	0.00017	0.001	0.000					0.001	0.008			0.00007	8.1	0.007		0.001		0.001						0.01	
TP203	0.1		0.01692	0.00127	0.000	0.000					0.000	0.006			0.00007	10.9	0.010		0.009		0.009						0.01	
TP203	3.0		0.00537	0.00037	0.001	0.000					0.001	0.004			0.00007	8.7	0.008		0.002		0.002						0.01	
TP265B	2.0															8.0												
TP273 CD1	SOIL H.				0.000											8.2								0.0002			0.00	
TP273 K2	SOIL H.		0.07843	0.00493	0.002	0.000				0.0019	0.002	0.013	0.004284		0.00008		0.044	0.0007	0.045	0.0007	0.045	0.0007					0.08	
TP274 CD1	SOIL H.				0.000											8.1								0.0002			0.00	
TP274 K2	SOIL H.		0.05545	0.00863	0.001	0.000				0.0013	0.001	0.006	0.002900		0.00018		0.051	0.0004	0.032	0.0004	0.032	0.0004					0.06	
TP275 CD1	SOIL H.				0.000											9.2								0.0002			0.00	
TP275 K2	SOIL H.		0.03875	0.00739	0.001	0.000				0.0005	0.001	0.007	0.000897		0.00007		0.092	0.0001	0.022	0.0001	0.022	0.0001					0.11	
TP276 CD1	SOIL H.				0.000											8.8								0.0002			0.00	
TP276 K2	SOIL H.		0.03564	0.00376	0.001	0.000				0.0014	0.001	0.007	0.003832		0.00007		0.028	0.0007	0.019	0.0007	0.019	0.0007					0.03	
TP277 CD1	SOIL H.				0.000											8.5								0.0002			0.00	
TP277 K2	SOIL H.		0.09261	0.00602	0.001	0.000				0.0008	0.001	0.010	0.001616		0.00007		0.093	0.0002	0.054	0.0002	0.054	0.0002					0.11	
TP40	0.0		0.04566	0.00818	0.000	0.000					0.000	0.008			0.00008	8.1	0.045		0.025		0.025						0.05	
TP40	0.5		0.28695	0.00695	0.002	0.000				0.0004	0.001	0.015	0.000738		0.00014	8.2	0.061	0.0001	0.020	0.0001	0.020	0.0001		0.0005			0.07	
TP40	1.0		0.01771	0.00407	0.001	0.000					0.000	0.006			0.00007	8.1	0.018		0.008		0.008			0.0005			0.02	
TP41	0.5	Yes	0.30687	0.07937	0.005	0.000					0.005	0.009			0.00007	8.9	0.129		0.179		0.179						0.30	
TP42	1.0		0.03702	0.00247	0.001	0.000					0.001	0.006			0.00007	7.4	0.018		0.020		0.020						0.03	
TP42	3.0		0.02250	0.00097	0.001	0.000				0.0000	0.000	0.009	0.000019		0.00007	7.5	0.016	0.0000	0.005	0.0000	0.005	0.0000		0.0005			0.02	
TP44	0.0		0.07088	0.02627	0.003	0.000					0.003	0.015			0.00007	8.1	0.115		0.038		0.038			0.0005			0.13	
TP44	2.0		0.04680	0.01237	0.002	0.000					0.002	0.006			0.00007	8.2	0.028		0.025		0.025						0.04	

Disclaimer: This spreadsheet does not take risk phrases into account that are applicable where an individual substance or the sum of substances exceed 25% (250g/kg or 250000mg/kg) of the total sample material.

Table A7: Waste classification based on soil values

		Worst case substances	Xylene Dimercury Dichloride Calcium Sulphide Copper Sulphate	Benzene Phenol Naphthalene Cadmium Oxide	Arsenic Trioxide Calcium Cyanide	Nickel-carbonate	PRO (C6-C10)	DRO (C10-C25 or >C10 in absence of specific information)	Threshold value for carcinogenic PAH in whole oil	Sum of carcinogenic PAHs (percentage of whole oil)	Arsenic Trioxide	Calcium Chromate	Sum of PAH	Aromatic hydrocarbons (BTEX)	Cadmium Oxide	pH	Phenol Zinc Chloride Arsenic Trioxide	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Phenol	Calcium Cyanide	PCBs "To maintain consistency with international and UK legislation and guidance, the agencies consider that the level of 50mg/kg (0.005%) should be the defining threshold concentration for wastes containing PCBs and PCTs; above that concentration such waste should be considered as hazardous waste."	TPH (full range - C5-C40 etc.)	Max of R50-53's (Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs)	Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs
	Hazard		H4 - 'Irritant'	H6(H5) - 'Toxic'		H7 - 'Carcinogenic'										H8(H4) - 'Corrosive'		H10 - 'Toxic for reproduction'				H11 - 'Mutagenic'		H12 - Substances & preparations which release toxic gases in cont. with water air and acid		H14 - 'Ecotoxic'		
	Risk Phrase		R38	R23-25, R48	R26-28	R40		R45							R49		R34	R60	R61		R63	R46	R68	R32		R52/53	R50-53	R50-53/0.25 + R51-53/2.5 + R52-53/25
	Threshold value in %		20	3	0.1	1	0.1	0.1							0.1	<2 >11.5	5	0.5	0.5		5	0.1	1.0	0.2	0.005	2.5	0.25	1
	Maximum value		66.762	0.10	0.462	0.01	0.0	3.8			0.02	0.04	0.30682	0.000	0.0182	12.9	0.86	0.0752	2.271	0.0752	2.3	0.0752	0.0000	0.2365	0.0000	3.8340	3.8023	1.7
Sample identity	Sample depth (m)	Hazardous Waste																										
TP44	3.5		0.25635	0.00458	0.003	0.000				0.0009	0.002	0.006	0.001651		0.00007	7.7	0.019	0.0004	0.022	0.0004	0.022	0.0004		0.0005			0.04	
TP45	0.5		0.01150	0.08407	0.001	0.000					0.000	0.014			0.00007	8.3	0.007		0.004		0.004			0.0005			0.08	
TP45	1.0		0.61335	0.01697	0.003	0.000					0.002	0.006			0.00007	8.3	0.050		0.126		0.126			0.0005			0.21	
TP46	1.0		0.07064	0.01364	0.008	0.000				0.0001	0.008	0.022	0.000752		0.00023	7.7	0.072	0.0001	0.037	0.0001	0.037	0.0001		0.0005			0.08	
TP46	2.0		0.03815	0.00560	0.004	0.000					0.004	0.022			0.00010	7.7	0.036		0.019		0.019						0.04	
TP47	0.7		0.48887	0.02438	0.009	0.000		0.025		0.0001	0.009	0.021	0.000250		0.00027	7.9	0.183	0.0000	0.072	0.0000	0.072	0.0000		0.0005		0.02	0.21	1.31
TP47	1.5		0.10251	0.00127	0.003	0.000		0.007		0.0001	0.002	0.003	0.000154		0.00007	8.5	0.025	0.0000	0.009	0.0000	0.009	0.0000		0.0005		0.01	0.03	
TP48	0.0		0.06777	0.01327	0.001	0.000		0.000			0.001	0.014			0.00007	8.3	0.110		0.038		0.038					0.00	0.13	
TP61	0.5		0.23239	0.00853	0.001	0.000				0.0024	0.000	0.006	0.005529		0.00007	7.9	0.034	0.0009	0.019	0.0009	0.019	0.0009		0.0005			0.04	
TP62	0.5		0.36082	0.01151	0.003	0.000				0.0015	0.002	0.013	0.003317		0.00007	8.0	0.098	0.0006	0.041	0.0006	0.041	0.0006		0.0005			0.11	
TP63	0.0		0.52753	0.00229	0.002	0.000				0.0007	0.001	0.007	0.001558		0.00007	7.6	0.026	0.0003	0.019	0.0003	0.019	0.0003		0.0005			0.03	
TP63	1.0		0.44979	0.00177	0.002	0.000				0.0005	0.001	0.005	0.001007		0.00007	7.9	0.021	0.0002	0.012	0.0002	0.012	0.0002		0.0005			0.02	
BH202	5.0		0.00426	0.00018	0.001	0.000				0.0000	0.001	0.005	0.000146		0.00007	8.4	0.007	0.0000	0.001	0.0000	0.001	0.0000					0.01	
BH202	5.5		0.09288																									
TP45	3.6		0.07830	0.00217	0.001	0.000					0.001	0.015			0.00007	8.4	0.032		0.045		0.045						0.08	
Site C -TP1	0.3		0.01265	0.00347	0.001			0.024			0.001	0.012			0.00007	9.7	0.015		0.006		0.006					0.02	0.02	
Site C -TP1	0.6		0.04225	0.00612	0.003			0.003			0.003	0.020			0.00012	8.0	0.078		0.024		0.024					0.00	0.09	
Site C -TP1	1.0		0.07248	0.00877	0.002			0.001			0.002	0.004			0.00007	7.8	0.022		0.042		0.042					0.00	0.07	
Site C -TP1	1.5		0.05028	0.00197	0.001			0.001			0.001	0.005			0.00007	8.1	0.009		0.029		0.029					0.00	0.05	
Site C -TP1	2.3		0.00329	0.00077	0.002			0.003			0.002	0.008			0.00007	8.1	0.007		0.001		0.001					0.00	0.01	
Site C -TP1	3.5		0.00494	0.00177	0.002			0.001			0.002	0.005			0.00007	8.5	0.010		0.002		0.002					0.00	0.01	
Site C - TP2	0.6		0.01376	0.00417	0.002			0.024			0.002	0.010			0.00007	10.1	0.019		0.007		0.007					0.02	0.02	
Site C - TP2	1.5		0.05439	0.00687	0.003			0.006			0.003	0.005			0.00007	10.0	0.038		0.032		0.032					0.01	0.05	
Site C - TP2b	0.6	Yes	0.01847	0.00548	0.002			0.177	0.001770	0.0028	0.002	0.008	0.003870		0.00007	11.6	0.016	0.0010	0.010	0.0010	0.010	0.0010				0.18	0.02	
Site C - TP2b	1.0		0.06544	0.00537	0.002			0.002			0.002	0.005			0.00007	8.0	0.016		0.038		0.038					0.00	0.06	
Site C - TP2b	2.2		0.00379	0.00067	0.002			0.001			0.002	0.009			0.00007	9.1	0.007		0.001		0.001					0.00	0.01	
Site C - TP2b	3.2		0.00304	0.00067	0.002			0.001			0.002	0.009			0.00007	8.5	0.006		0.001		0.001					0.00	0.01	
Site C - TP3	0.6	Yes	0.04725	0.00338	0.002			0.142	0.001418	0.0017	0.002	0.005	0.002530		0.00007	11.3	0.025	0.0004	0.027	0.0004	0.027	0.0004				0.14	0.05	
Site C - TP3	0.7		0.00729	0.00137	0.002			0.001			0.002	0.007			0.00007	8.3	0.008		0.003		0.003					0.00	0.01	
Site C - TP3	1.2		0.07398	0.00717	0.002			0.004			0.002	0.004			0.00007	7.7	0.021		0.043		0.043					0.00	0.07	
Site C - TP3	1.6		0.00357	0.00107	0.001			0.002			0.001	0.010			0.00007	7.8	0.008		0.002		0.002					0.00	0.01	
Site C - TP4	0.2		0.03170	0.00009	0.002	0.003		0.209	0.002085	0.0015	0.002	0.005	0.003980		0.00007	9.7	0.049	0.0008	0.025	0.0008	0.025	0.0008				0.21	0.05	
Site C - TP4	0.4		0.03321	0.00011	0.005	0.006		0.189	0.001892	0.0006	0.005	0.007	0.004330		0.00007	8.0	0.123	0.0014	0.014	0.0014	0.014	0.0014				0.19	0.14	
Site C - TP4	0.6	Yes	0.09290	0.00304	0.001	0.001		0.177	0.001768	0.0819	0.001	0.004	0.306820		0.00007	12.9	0.082	0.0752	0.122	0.0752	0.122	0.0752	0.0000	0.0002		0.18	0.12	
Site C - TP4	1.0	Yes	1.45942	0.00101	0.011	0.013		0.072		0.0021	0.011	0.010	0.004660		0.00057	8.1	0.859	0.0006	0.722	0.0006	0.722	0.0006	0.0000	0.0002		0.07	1.46	
Site C - TP4B	0.6	Yes	0.03418	0.00022	0.003	0.006		0.129	0.001291	0.0020	0.003	0.007	0.004540		0.00007	7.4	0.053	0.0005	0.033	0.0005	0.033	0.0005	0.0000	0.0002		0.13	0.06	
Site C - TP4B	1.1		0.01373	0.00008	0.003	0.003		0.002		0.0001	0.003	0.022	0.000170		0.00007	7.9	0.013	0.0000	0.019	0.0000	0.019	0.0000	0.0000	0.0002		0.00	0.02	
Site C - TP4B	2.0		0.02082	0.00008	0.002	0.003		0.003		0.0001	0.002	0.007	0.000280		0.00007	7.9	0.021	0.0001	0.040	0.0001	0.040	0.0001	0.0000	0.0002		0.00	0.04	
Site C - TP4B	2.8		0.00476	0.00008	0.002	0.002		0.003		0.0001	0.001	0.019	0.000160		0.00007	7.8	0.009	0.0000	0.005	0.0000	0.005	0.0000	0.0000	0.0002		0.00	0.02	
Site C - TP4B	3.5		0.00200	0.00008	0.002	0.002		0.002		0.0001	0.002	0.004	0.000160		0.00007	8.0	0.006	0.0000	0.001	0.0000	0.001	0.0000	0.0000	0.0002		0.00	0.01	
Site C - TP4B	4.1		0.00136	0.00007	0.001	0.002		0.001			0.001	0.010			0.00007	8.4	0.005		0.001		0.001					0.00	0.01	
Site C - TP5	0.4	Yes	0.27703	0.00013	0.006	0.007		0.071		0.0011	0.006	0.010	0.007090		0.00007	10.9	0.338	0.0021	0.290	0.0021	0.290	0.0021	0.0000	0.0002		0.07	0.39	
Site C - TP5	0.8		0.02126	0.00023	0.003	0.003		0.021		0.0218	0.002	0.005	0.046890		0.00007	8.1	0.039	0.0094	0.065	0.0094	0.065	0.0094	0.0000	0.0002		0.02	0.07	
Site C - TP5	1.2		0.00390	0.00007	0.002	0.002		0.002			0.002	0.008			0.00007	7.9	0.008		0.003		0.003					0.00	0.01	
Site C - TP5	2.2		0.02568	0.00007	0.002	0.003		0.004			0.002	0.012			0.00007	8.0	0.045		0.038		0.038					0.00	0.05	
Site C - TP5	2.9		0.00408	0.00007	0.002	0.003		0.002			0.002	0.019			0.00007	7.9	0.009		0.003		0.003					0.00	0.02	
Site C - TP5	4.2		0.00357	0.00007	0.002	0.003		0.003			0.002	0.015			0.00007	8.2	0.008		0.003		0.003					0.00	0.02	

Disclaimer: This spreadsheet does not take risk phrases into account that are applicable where an individual substance or the sum of substances exceed 25% (250g/kg or 250000mg/kg) of the total sample material.



DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING.

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

Rev	Description	Date	Drn	Chkd
01	SITE BOUNDARY UPDATED	11.06.09	NG	TS

INFORMATION

Status of drawing

Camden Mill
Lower Bristol Road
Bath BA2 3DQ
UK
Tel: +44 (0)1225 320600
Fax: +44 (0)870 787 4148
Email: 023000@burohappold.com
Web: www.burohappold.com

Buro Happold
Consulting Engineers

Architect RAFAEL VIÑOLY

Project **Battersea Masterplan 2008**

Dwg Title SUSPECTED HAZARDOUS WASTE LOCATIONS

Scales@A1 1:1000
Drawn by NG
Checked by JB
Date DCC 2008

Job No. 023000
Drawing No. FIGURE 19
Rev 01

Table A7: Waste classification based on soil values

Worst case substances			Xylene Dimercury Dichloride Calcium Sulphide Copper Sulphate	Benzene Phenol Naphthalene Cadmium Oxide	Arsenic Trioxide Calcium Cyanide	Nickel-carbonate	PRO (C6-C10)	DRO (C10-C25 or >C10 in absence of specific information)	Threshold value for carcinogenic PAH in whole oil	Sum of carcinogenic PAHs (percentage of whole oil)	Arsenic Trioxide	Calcium Chromate	Sum of PAH	Aromatic hydrocarbons (BTEX)	Cadmium Oxide	pH	Phenol Zinc Chloride Arsenic Trioxide	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Lead sulphate	Max PAH (excl. Naphthalene)	Phenol	Calcium Cyanide	PCBs "To maintain consistency with international and UK legislation and guidance, the agencies consider that the level of 50mg/kg (0.005%) should be the defining threshold concentration for wastes containing PCBs and PCTs; above that concentration such waste should be considered as hazardous waste."	TPH (full range - C5-C40 etc.)	**Max of R50-53's** Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs)	Zinc Sulphate Cadmium Oxide Diarsenic Trioxide Selenium Calcium Chromate Lead sulphate Dimercury Dichloride Nickel Carbonate Calcium Cyanide Copper Sulphate PAHs, PCBs
	Hazard		H4 - 'Irritant'	H6(H5) - 'Toxic'		H7 - 'Carcinogenic'										H8(H4) - 'Corrosive'		H10 - 'Toxic for reproduction'				H11 - 'Mutagenic'			H12 - Substances & preparations which release toxic gases in cont. with water air and acid		H14 - 'Ecotoxic'		
	Risk Phrase		R38	R23-25, R48	R26-28	R40		R45							R49		R34	R60	R61		R63	R46	R68	R32		R52/53	R50-53	R50-53;0.25 + R51-53/2.5 + R52-53/25
	Threshold value in %		20	3	0.1	1	0.1				0.1				0.1	<2 >11.5	5	0.5	0.5		5	0.1	1.0	0.2	0.005	2.5	0.25	1
	Maximum value		66.762	0.10	0.462	0.01	0.0	3.8		0.02	0.04	0.30682	0.000	0.0182	12.9	0.86	0.0752	2.271	0.0752	2.3	0.0752	0.0000	0.2365	0.0000	3.8340	3.8023	1.7
Sample identity	Sample depth (m)	Hazardous Waste																										
BH1002	9.0		0.95526																									
BH1002	10.0	Yes	1.14696	0.02762	0.009	0.000					0.009	0.040			0.00112	8.0	0.216		0.073		0.073						0.24	1.46
BH2017	3.9		0.24516													7.9												
BH801	5.5		4.74120																									
TP10	4.0		0.01920	0.00177	0.001	0.000					0.001	0.007			0.00007	7.5	0.021		0.009		0.009						0.02	
BH801	17.5		0.74288																									
BH801	39.5		0.75474																									
BH902A	2.0	Yes	0.25819	0.00867	0.002	0.000					0.002	0.009			0.00007	9.6	0.049		0.152		0.152						0.25	
TP 263 CD1	0.7		0.00564	0.00125	0.003	0.000				0.0143	0.003	0.009	0.025277		0.00007		0.005	0.0041	0.003	0.0041	0.003	0.0041					0.01	
TP 263 CD3	0.9															10.2												
TP 263 K4	0.9																											
TP 264 C CD5	1.0															8.2												
TP 264 C K6	1.0		0.01202	0.00679	0.000	0.000		0.037		0.0000	0.000	0.016	0.000073		0.00007		0.023	0.0000	0.000	0.0000	0.000	0.0000		0.0000		0.04	0.03	
TP10	1.0		0.13439	0.00512	0.012	0.000					0.012	0.035			0.00012	8.4	0.064		0.076		0.076						0.13	
TP130	0.5		0.02012	0.00067	0.001	0.000					0.001	0.010			0.00007	8.6	0.014		0.010		0.010						0.02	
TP130	2.0	Yes	0.33755	0.00527	0.003	0.000					0.003	0.008			0.00007	7.5	0.026		0.198		0.198						0.53	
TP264E	1.0		0.10255	0.00971	0.002	0.000		0.029		0.0009	0.002	0.010	0.001697		0.00008	10.5	0.044	0.0003	0.059	0.0003	0.059	0.0003				0.03	0.10	
TP264E	2.0	Yes	0.57576	0.04466	0.002	0.000		0.012		0.0091	0.002	0.011	0.019421		0.00009	10.0	0.065	0.0033	0.342	0.0033	0.342	0.0033				0.01	0.57	
TP279 CD1	SOIL H.				0.000											8.2								0.0002			0.00	
TP279 K2	SOIL H.		0.08017	0.01249	0.001	0.000				0.0052	0.001	0.010	0.011119		0.00007		0.100	0.0019	0.046	0.0019	0.046	0.0019					0.12	
TP30	0.0		0.06229	0.00353	0.001	0.000		0.000		0.0016	0.001	0.011	0.003522		0.00010	8.5	0.043	0.0007	0.031	0.0007	0.031	0.0007				0.00	0.05	
TP30	0.5	Yes	0.07424	0.03713	0.007	0.000		0.034		0.0001	0.007	0.008	0.000661		0.00010	8.3	0.418	0.0001	0.039	0.0001	0.039	0.0001				0.03	0.49	
TP30	1.0		0.01496	0.00347	0.000	0.000					0.000	0.008			0.00007	8.1	0.025		0.006		0.006						0.03	
TP4	0.6	Yes	66.76233	0.00652	0.001	0.000				0.0001	0.000	0.004	0.000416		0.00007	7.9	0.022	0.0001	0.096	0.0001	0.096	0.0001	0.0005				0.16	
TP4	1.0		0.09622	0.00947	0.002	0.000					0.002	0.007			0.00007	8.4	0.054		0.056		0.056						0.09	
TP50	0.5		0.04344	0.00187	0.004	0.000					0.004	0.012			0.00007	7.7	0.030		0.021		0.021						0.04	
TP50	1.1	Yes	0.66709	0.01469	0.016	0.000					0.016	0.008			0.00039	8.0	0.146		0.395		0.395						0.66	
TP54	0.1		0.03641	0.00307	0.002	0.000					0.002	0.008			0.00007	8.1	0.024		0.020		0.020						0.03	
TP54	1.0	Yes	0.02311	0.00807	0.006	0.001		0.192	0.001920		0.006	0.010			0.00007	8.0	0.028		0.011		0.011					0.19	0.03	
TP54	1.5	Yes	0.01650	0.01207	0.003	0.000		0.720	0.007199		0.003	0.016			0.00007	6.6	0.013		0.008		0.008					0.72	0.02	
TP54	1.7		6.06749	0.00221	0.001	0.000				0.0003	0.000	0.004	0.000719		0.00007	8.1	0.014	0.0001	0.007	0.0001	0.007	0.0001	0.0005				0.02	
TP54A	0.5		0.12066	0.01677	0.002	0.000					0.002	0.015			0.00007	8.6	0.094		0.070		0.070						0.12	0.90
TP54A	1.7		0.32608	0.00559	0.003	0.000				0.0003	0.002	0.007	0.000494		0.00007	8.4	0.029	0.0001	0.042	0.0001	0.042	0.0001	0.0005				0.07	
TP54A	1.7																											
TP54A	3.3		0.25279	0.00917	0.006	0.000					0.006	0.008			0.00007	8.4	0.039		0.147		0.147						0.25	
TP55	1.0	Yes	0.01356	0.00098	0.000	0.000					0.000	0.041			0.00008	12.4	0.008		0.006		0.006						0.04	
TP57	0.0		0.08462	0.00587	0.002	0.000					0.002	0.008			0.00007	8.2	0.046		0.048		0.048						0.08	
TP57	2.0		0.04949	0.00547	0.001	0.000					0.001	0.008			0.00007	8.0	0.044		0.027		0.027						0.05	
TP59	0.0		0.52857	0.00562	0.002	0.000				0.0021	0.001	0.010	0.004883		0.00007	8.0	0.047	0.0010	0.029	0.0010	0.029	0.0010	0.0005				0.05	
TP60	0.0		0.65863	0.00789	0.003	0.000				0.0015	0.002	0.008	0.003265		0.00007	7.9	0.084	0.0006	0.046	0.0006	0.046	0.0006	0.0005				0.10	
TP60	2.0		0.57661	0.00821	0.003	0.000				0.0013	0.002	0.011	0.002730		0.00007	7.9	0.064	0.0005	0.045	0.0005	0.045	0.0005	0.0005				0.08	
TP7	2.0		3.16436	0.00521	0.003	0.000				0.0005	0.002	0.009	0.000949		0.00007	9.5	0.065	0.0001	0.029	0.0001	0.029	0.0001	0.0005				0.08	
TP90	3.0		0.00423	0.00017	0.001	0.000					0.001	0.005			0.00007	8.6	0.006		0.001		0.001						0.01	
BH1100	4.5	Yes	0.37105	0.04297	0.002	0.000					0.002	0.009			0.00007	7.5	0.026		0.219		0.219						0.37	
BH2006	4.9		0.76734													7.0												
BH901	6.0		0.02468	0.00287	0.001	0.000					0.001	0.024			0.00007	10.7	0.025		0.012		0.012						0.03	
TP201	1.6		0.26946													8.1												
TP201	2.0		0.00822	0.00107	0.001	0.001					0.001	0.007			0.00007	8.4	0.011		0.003		0.003						0.01	
TP201	4.0		0.00421	0.00017	0.002	0.000					0.002	0.008			0.00007	7.5	0.007		0.001		0.001						0.01	
BH1100	9.5		0.26100																									
BH1100	1.0		0.18179	0.00817	0.001	0.000					0.001	0.009			0.00007	8.7	0.044		0.107		0.107						0.18	
BH2006	4.3		0.46584													7.3												
TP 201 CD1	0.5		0.04164	0.00338	0.001	0.000				0.0001	0.001	0.016	0.000292		0.00007	7.6	0.025	0.0000	0.022	0.0000	0.022	0.0000					0.04	
TP 2039 A CD	1.0	Yes	0.13510	0.00411	0.002	0.000				0.0047	0.001	0.008	0.012427		0.00007	7.7	0.133	0.0025	0.080	0.0025	0.080	0.0025	0.0002				0.16	1.15
TP 2039 A CD	1.6	Yes	0.12856	0.00491	0.002	0.000				0.0063	0.002	0.008	0.017679		0.00018	7.5	0.189	0.0041	0.075	0.0041	0.075	0.0041	0.0002				0.22	1.39
TP 208 CD3	0.5		0.19322	0.01363	0.002	0.000				0.0021	0.002	0.012	0.003902		0.00009	9.4	0.055	0.0005	0.112	0.0005	0.112	0.0005	0.0002				0.19	
TP 209 CD1	0.2	Yes	0.13560	0.01819	0.004	0.000				0.0013	0.004	0.025	0.002230		0.00016	NDP	0.084	0.0003	0.078	0.0003	0.078	0.0003					0.13	
TP 209 CD3	1.0	Yes	0.00355	0.00129	0.001	0.000				0.0009	0.001	0.018	0.001546		0.00007	NDP	0.006	0.0003	0.001	0.0003	0.001	0.0003					0.02	
TP2	1.5		0.03829	0.00437	0.001	0.000					0.001	0.011			0.00007	11.1	0.031		0.021		0.021						0.04	
TP201	0.4	Yes	0.19462	0.00304	0.462	0.000				0.0003	0.002	0.007	0.000671		0.00007	7.7	0.019	0.0001	0.012	0.0001	0.012	0.0001	0.2365				0.24	
TP201	0.4		0.04032	0.00427	0.003	0.000					0.003	0.008			0.00007	8.2	0.024		0.021		0.021						0.03	
TP278 CD1	SOIL H.				0.000											8.1								0.0002			0.00	
TP278 K2	SOIL H.		0.09965	0.00679	0.002	0.000				0.0014	0.002	0.008	0.003392		0.00007		0.064	0.0005	0.058	0.0005	0.058	0.0005					0.10	
TP58	2.0		0.06682	0.00857	0.001	0.000					0.001	0.008			0.00007	9.1	0.036		0.038		0.038						0.06	
TP6	1.0		0.04829	0.00557	0.003	0.000					0.003	0.011			0.00007	10.0	0.038		0.026		0.026						0.04	
TP6	2.0		0.03531	0.00287	0.001	0.000					0.001	0.007			0.00007	10.2	0.023		0.019		0.019						0.03	
TP236	3.2		0.19584													7.5												
TP238	1.2		0.25308													7.6												
TP34	3.8		0.02079	0.00137	0.001	0.000					0.001	0.014			0.00007	7.2	0.015		0.010		0.010						0.02	
TP37	4.0		0.00808	0.00097	0.000	0.000					0.000	0.013			0.00007	6.9	0.012		0.003		0.003						0.01	
BH402	14.0		0.46710																									
BH402	26.5		0.33480																									
BH401	0.5		0.03506	0.00345	0.001	0.000				0.0040	0.001	0.007	0.010724		0.00007	8.2	0.019	0.0019	0.019	0.0019	0.019	0.0019					0.03	
BH401	0.5		0.05476	0.00477	0.002	0.000					0.002	0.011			0.00007	8.1	0.025		0.031		0.031						0.05	
BH402	0.5		0.02068	0.00197	0.001	0.000					0.001	0.011			0.00007	9.1	0.016		0.010		0.010						0.02	

Disclaimer: This spreadsheet does not take risk phrases into account that are applicable where an individual substance or the sum of substances exceed 25% (250g/kg or 250000mg/kg) of the total sample material.

Table A6: GROUND GAS ASSESSMENT	Job name:Battersea	Job number:023000	

NOTES:
Assessment based on guidance published in CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings.'

Information from Table 8.5 of CIRIA C665	Key for shading
Characteristic Situation 1 conditions	CO_2 > 5% in air
Gas screening value (CH4 or CO2) < 0.07 l/h	CH4 > 1 % in air
Typically methane < 1 % by volume	GSV > or = 0.07 l/h
Typically carbon dioxide < 5% by volume	GSV> or = 0.7 l/h
Characteristic Situation 2 conditions	
Gas screening value (CH4 or CO2) < 0.7 l/h	
Borehole air flow rate < 70 l/h	
Characteristic Situation 3 conditions	
Gas screening value (CH4 or CO2) < 3.5 l/h	

Approach:
Maximum concentration and flow values are used in the assessment below (minimum values for oxygen).
Where no detectable flow is recorded the instrument limit of detection is used
Where concentrations are recorded below LoD, the instrument LoD is used in the assessment (0.5%)

SITE MONITORING DATA

Investigation & Year of installation	Exploratory Hole	Response zone stratum	Date Monitored/ Sampled	Flow Rate (l/hr)	Atmos Pres (mb)	Min O2 (%) air	Max CO2 (% air)	Max CH4 (% air)	CO2 as fraction	Gas screening value CO_2 (l/hr)	CH_4 as fraction	Gas screening value CH_4 (l/hr)	Characteristic Situation
Fugro 2004	BH2033	RTG	24/09/2004	0	1018	20.9	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			07/10/2004	0.5	1015	20.8	0.1	0.1	0.001	0.0005	0.001	0.0005	1
Fugro 2004	BH2039B	RTG	28/08/2004	0.9	1009	20.9	0.1	0.1	0.001	0.0009	0.001	0.0009	1
			13/09/2004	1.7	999	20.9	0.1	0.1	0.001	0.0017	0.001	0.0017	1
			11/10/2004	2.3	1014	20.9	0.1	0.1	0.001	0.0023	0.001	0.0023	1
Fugro 2004	GW08	RTG	24/09/2004	0.4	1019	20.9	0.1	0.1	0.001	0.0004	0.001	0.0004	1
			11/10/2004	2.4	1015	19.8	0.7	0.1	0.007	0.0168	0.001	0.0024	1
Geotechnics Limited 2002	BH103	RTG/LC	17-Jul-02	-	1021	16.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			22-Jul-02	-	1012	19.1	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			25-Jul-02	-	1015	17.2	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			30-Jul-02	-	1012	16.6	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			05-Aug-02	-	1015	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			12-Aug-02	-	1011	19.7	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			27-Aug-02	-	1015	19.8	0.1	0.1	0.001	0.0001	0.001	0.0001	1
Geotechnics Limited 2002	BH602A	RTG / LC	25-Jun-02	-	1027	20.5	0.1	0.1	0.001	0.0001	0.001	0.0001	1
			01-Jul-02	-	1002	8.5	5.7	0.1	0.057	0.0057	0.001	0.0001	**2**
			08-Jul-02	-	1009	9.2	6.1	0.1	0.061	0.0061	0.001	0.0001	**2**
			12-Jul-02	-	1020	7.8	5.2	0.1	0.052	0.0052	0.001	0.0001	**2**
			17-Jul-02	-	1021	8.5	5.6	0.1	0.056	0.0056	0.001	0.0001	**2**
			22-Jul-02	-	1012	7.7	5.6	0.1	0.056	0.0056	0.001	0.0001	**2**
			25-Jul-02	-	1015	6.6	5.4	0.1	0.054	0.0054	0.001	0.0001	**2**
			30-Jul-02	-	1012	6	6	0.1	0.060	0.0060	0.001	0.0001	**2**
			05-Aug-02	-	1017	6.2	5.9	0.1	0.059	0.0059	0.001	0.0001	**2**
			12-Aug-02	-	1011	5.8	4.7	0.2	0.047	0.0047	0.002	0.0002	1
			27-Aug-02	-	1015	4.4	5.2	0.1	0.052	0.0052	0.001	0.0001	**2**
					(Max)		(Max)	(Max)					
		WORSE CASE CALCULATION ALL DATA		**4.20**			**11.60**	**3.90**	**0.116**	**0.487**	**0.039**	**0.164**	**2**

Buro Happold

Appendix B: Previous Investigations (CD)

Dr Gary Graveling
Buro Happold Limited
Camden Mill
Lower Bristol Road
Bath
BA2 3DQ
UK

Telephone: +44 (0)1225 320600
Facsimile: +44 (0)870 787 4148

Email: gary.graveling@burohappold.com

ardent

BIRCHAM DYSON BELL

Buro Happold

CORDEROY

Halcrow

JOHN McASLAN + PARTNERS

Quod

steer davies gleave

studiodareARCHITECTS

URS

Volterra