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Our ref: 25459-02R (00)

1st May 2013

Cambridge City Council – Environmental Services
Mandela House
4 Regent Street
Cambridge
CB2 1BY

For the attention of: Themis Kantara

Dear Themis

Supplementary Investigation NIAB 1 Fields, Phase 1 Development
Your reference wk/201258067

Background

A geo-environmental ground investigation was conducted at the above site by RSK to supplement a previous phase of investigation performed by Millard Consulting Engineers. The reports were submitted on behalf of our Client, Barratt Homes, in support of the planning application references 07/0003/OUT and S/07/0001/F.

The planning application spans the boundary between the districts administered by South Cambridgeshire District Council (SCDC) and Cambridge City Council (CCC), therefore both local authorities were consulted in respect to the information submitted and a joint response was issued on 12th December 2012.

Specifically, the response confirmed the northern portion of the site, located within the SCDC district to have been adequately investigated in respect its proposed future use. The following scope of further investigation, was however, prescribed for the remaining area of the site:

- Three additional rounds of ground gas monitoring to confidently characterise the ground gas regime beneath the site;
- Further non-targeted chemical testing for herbicides and pesticides to provide greater confidence in the initial suite of analyses; and
- Further targeted investigation of a former waste disposal area, two former above ground storage tanks and a former shed.

A scope of supplementary, targeted investigation and chemical analyses was subsequently proposed by RSK in January 2013, which comprised the following:

- Three additional rounds of ground gas monitoring;
- Additional investigation targeted to the location of an above ground fuel storage tank, formerly located adjacent to the farm yard, comprising the excavation of two shallow trial pits (HP1 and HP2) and testing a minimum of two soil samples for a suite of analyses including polycyclic aromatic hydrocarbons (PAH) (EPA16) and petroleum hydrocarbons (TPH-CWG);
- Additional investigation targeted to the location of a former waste storage area, comprising the excavation of five shallow trial pits (HP3 to HP7) and testing a minimum of five soil samples for a suite of analyses including PAH (EPA16), nine commonly occurring metals, a screen for asbestos containing materials (ACMs), Triazine herbicides, Phenoxy acid herbicides and petroleum hydrocarbons (TPH-total);
- Additional investigation targeted to the location of a former storage shed, comprising the excavation of three shallow trial pits (HP8 to HP10) and testing a minimum of three soil samples for a suite of analyses including PAH (EPA16), nine commonly occurring metals, a screen for asbestos containing materials (ACMs), Triazine herbicides, Phenoxy acid herbicides and petroleum hydrocarbons (TPH-total); and
- Additional investigation targeted to the location of an above ground fuel storage tank, formerly located adjacent to the sports pavilion, comprising the excavation of two shallow trial pits (HP12 and HP13) and testing a minimum of two soil samples for a suite of analyses including polycyclic aromatic hydrocarbons (PAH) (EPA16) and petroleum hydrocarbons (TPH-CWG).

The scope of testing for pesticides and herbicides was proposed following discussions between RSK and the National Institute of Agricultural Botany regarding the use of the plant protection products at the site. It was confirmed that plant protection products, approved for use by the Chemical Regulations Directorate, had been applied to the site in strict accordance with the Code of practice for using plant protection products. The products were stored off-site within the farmyard and mixed within a bunded chemical mixing unit with spill catchment facility. Based on this information, the risk posed by the former use of plant protection products was considered to be low.

The proposed scope of work was verbally agreed between RSK and yourself prior to its commencement.

Supplementary fieldwork

Thirteen trial pits, designated HP1 to HP13, were excavated by hand at the locations agreed for further investigation on 1st March 2013. The investigation and the soil descriptions were carried out in general accordance with 'BS 5930:1999. Code of Practice for Site Investigations' (BSI, 1999) and 'BS10175:2011 Investigation of Potentially Contaminated Sites – Code of Practice' (BSI, 2011).

The investigation points were located by rigorous surveying techniques as shown in Figure 1, the exploratory hole logs are also appended for reference.

The soils samples were collected in containers appropriate to the anticipated testing suite required. The containers were filled to capacity and placed in a cool box to minimise volatilisation. Samples were transported directly to RSK's testing laboratory (Envirolab) under chain of custody documentation. The samples were tested for the agreed suite of organic and inorganic compounds.

In addition to the above, three additional rounds of ground gas monitoring were conducted to record ground gas concentrations from the installations constructed during the previous main phase of investigation.

The results of the supplementary ground gas monitoring events and laboratory analyses are appended to this letter.

Ground conditions

The supplementary, targeted investigation confirmed the shallow ground conditions at the specified locations to comprise a generally uniform veneer of made ground overlying the Gault Formation. The made ground soils typically comprised a silty sandy locally gravelly clay with rare pockets of ash and brick. No obvious signs of any significant contamination were observed during the course of the investigation. No groundwater was encountered during the course of the shallow investigation.

Copies of the exploratory hole records are appended to this letter for reference.

Chemical test results and assessment

The chemical test results were directly compared against the RSK Generic Assessment Criteria (GAC) values derived using CLEA version 1.06 for the protection of human health in residential sites with pathways for plant uptake. The GAC values and details of their derivation are appended to this letter for reference.

No elevated concentrations of any determinants were identified during the comparison. Whilst no GACs have been derived for the assessment of herbicides, pesticides or ACM's, no concentrations of any of these contaminants were recorded above the relevant laboratory limits of detection.

Ground Gas Regime

The results of the three recent monitoring events have been combined with the previous three rounds and are appended to this letter. The minimum and maximum results are summarised in the table below.

Table 1: Summary of ground gas monitoring results

Borehole	Response zone/strata	Probable source(s) of ground gas	Number of monitoring visits	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Flow rate (l/hr)	Water level (m b TOC)	Atmospheric pressure (mbar)
BH1	GC	Shallow topsoil / made ground	6	<0.1 to 0.1	0.1 to 1.8	18.5 to 21.4	0.0	Dry to 1.70	1005 to 1022
BH2	RTD / GC	Shallow topsoil / made ground	6	<0.1	0.5 to 1.6	18.5 to 21.0	-0.4 to 0.4	0.85 to 1.86	1004 to 1022
BH3	RTD / GC	Shallow topsoil / made ground	6	-0.2 to <0.1	0.5 to 1.5	17.7 to 21.2	0.0	1.38 to 1.44	1005 to 1022
BHG	MG.TS / RTD / GC	Shallow topsoil / made ground	6	<0.1	0.0 to 1.8	19.3 to 21.5	-0.1 to 0.2	0.95 to 2.19	1005 to 1022
BHK	RTD / GF	Shallow topsoil / made ground	6	-0.1 to 0.1	0.0 to 3.5	18.0 to 21.0	-0.1 to 0.2	1.35 to 2.09	1006 to 1022
WS3	MG.TS / GF	Shallow topsoil / made ground	6	<0.1 to 0.1	0.3 to 2.2	19.3 to 21.0	0.0 to 0.9	1.55 to 2.92	1006 to 1022
WS17	MG.TS / GF	Shallow topsoil / made ground	5	<0.1	0.0 to 2.9	18.6 to 21.4	0.0 to 0.2	1.57 to 1.88	1005 to 1022
WSH	MG.TS	Shallow topsoil / made ground	6	<0.1 to 0.1	0.1 to 4.2	18.0 to 20.8	0.0 to 0.2	Dry	1005 to 1022
Note: MG.TS – Made Ground / Topsoil, RTDC – River Terrace Deposits, GC – Gault Clay									

The results of the combined data set have been assessed in accordance with the guidance provided in *CIRIA Report C665: Assessing risks posed by hazardous ground gases to buildings* (Wilson et al., 2007). In the assessment of risks posed by hazardous ground gases and selection of appropriate mitigation measures, CIRIA C665 identifies two types of development, termed Situation A (modified Wilson and Card method), appropriate to all development excluding traditional low-rise construction, and Situation B (National House-Building Council, NHBC) only appropriate to traditional low-rise construction with ventilated sub-floor voids. The site is to be redeveloped with both low-rise residential houses and commercial properties and therefore falls under Situation A and B.

The gas monitoring data has identified a maximum methane concentration of 0.1% and a maximum concentration of carbon dioxide of 4.2%. A maximum gas flow rate of 0.9l/hr has been recorded. The calculated GSV for methane is 0.0009l/hr and the GSV for carbon dioxide is 0.0378l/hr. Based on the GSVs the site has been characterised as CS1 for the area of the development defined by Situation A and as Green for the remainder of the development defined by Situation B.

The proposed mixed-use development, which fulfils the requirements of both Situation A and Situation B, has been characterised as Characteristic Situation 1 and Green, respectively. This indicates that a negligible gas regime has been identified and that gas protection measures are not considered necessary.

Conclusions

The results of the agreed scope of supplementary investigation have not identified any significant ground contamination. The supplementary investigation has therefore provided a greater level of confidence that the soils across the site are suitable for use within all areas of the proposed mixed-use development.

In addition, the supplementary rounds of ground gas monitoring, which has increased the data set for the site to the minimum prescribed by CIRIA C665, has confirmed a negligible gas regime, for which gas protection measures are not considered necessary.

In conclusion, the supplementary phase of investigation has confirmed, with an appropriate level of confidence, that the site is suitable for its proposed use. No further investigation or remediation is therefore recommended at this stage. However, should any unexpected ground conditions be revealed during redevelopment, immediate advice should be sought from the local authority and the environmental consultant.

We trust the information supplied is sufficient to recommended discharge of the contaminated land conditions pertaining to the site, should however, you have any queries or require any further information please do not hesitate to give me a call.

Yours sincerely
For RSK Environment Ltd

Duncan Sharp
Associate Director
RSK Environment - Geosciences

Encl.

Figure 1 Exploratory hole location plan
Exploratory hole records
Chemical test results
Ground gas monitoring records
RSK GAC values for residential sites with pathways for plant uptake

Cc. Claire Sproats - SCDC

FIGURES

RSK	Exploratory hole location plan	Client:	BDW Trading	Figure No:	Figure 1
		Site:	NIAB Phase 1	Job No:	25459-02(00)
		Scale:	NTS	Source:	Woods Hardwick

EXPLORATORY HOLE LOGS

INSPECTION PIT LOG

Contract: NIAB - Phase 1	Client: BDW Trading Limited	Trial Pit: HP1

Contract Ref: 25459	Date: 01.03.13	Ground Level (m AOD): ---	National Grid Co-ordinate: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES	T+J+VL			MADE GROUND: Firm dark brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional rootlets (1-2mm diameter) and occasional to rare ash pockets. Sand is fine to medium. (MADE GROUND)	(0.30) 0.30	
0.30	2	ES	T+J+VL			MADE GROUND: Firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments. (MADE GROUND)	(0.36) 0.66	
0.60	3	ES	T+J+VL					
						Inspection pit terminated at 0.66m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used: Inspection pit + Hand dug	Plant Used: Hand tools	Logged By: CJBall	Checked By:

INSPECTION PIT LOG

Contract: NIAB - Phase 1	Client: BDW Trading Limited	Trial Pit: HP2

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional rootlets (1-2mm diameter) and occasional to rare ash pockets. Sand is fine to medium. (MADE GROUND)	(0.40) 0.40	
0.50	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments. (MADE GROUND)	(0.20) 0.60	
						Firm yellow brown with grey mottling slightly silty CLAY with occasional sub-angular fine to coarse flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.61	

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used: Hand dug	Plant Used: Hand tools	Logged By: VMacfarlane	Checked By:

RSK Environment Ltd, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT. Tel: 01442 437500, Fax: 01442 437550, Web: www.rsk.co.uk.

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP3

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES	T+J+VL			MADE GROUND- soft brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional rootlets (1-2mm diameter).	(0.40) 0.40	
0.50	2	ES	T+J+VL			Firm yellow brown mottled grey slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels. Sand is fine to medium. (GAULT FORMATION).	(0.20) 0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	VMacfarlane	

AGS

INSPECTION PIT LOG

Contract: NIAB - Phase 1	Client: BDW Trading Limited	Trial Pit: HP4

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown slightly silty sandy CLAY with occasional sub-angular fine to medium flint gravels and with occasional rootlets (1-2mm diameter) and occasional to rare ash pockets. Sand is fine to medium.	(0.30) 0.30	
0.40	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to medium flint gravels and with occasional to rare ash.	(0.25) 0.55	
						Firm light brown mottled grey slightly silty CLAY with occasional sub-angular fine to coarse flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres

Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	CJBall	

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP5

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
0.20	1	ES	T+J+VL			MADE GROUND-soft dark brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional brick fragments. Sand is fine to medium.	(0.30) 0.30	
0.40	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments.	(0.25) 0.55	
						Firm light brown slightly silty CLAY (GAULT FORMATION).	0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	VMacfarlane	

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP6

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
0.20	1	ES	T+J+VL			MADE GROUND- firm brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with rare brick fragments. Sand is fine to medium.	(0.30) 0.30	
0.40	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments.	(0.20) 0.50	
						Firm light brown mottled grey slightly silty sandy CLAY with occasional sub-roundeded to sub-angular fine to coarse flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	VMacfarlane	

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP7

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES	T+J+VL			MADE GROUND-brown slightly silty CLAY with occasional sub-angular fine to coarse flint gravels and with occasional roots (5mm diameter) rootlets (1-2mm diameter) and occasional to rare ash pockets and brick fragments.	(0.50) 0.50	
0.50	2	ES	T+J+VL			MADE GROUND- firm light brown slightly silty CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments.	0.60	
						Firm yellow brown mottled grey slightly silty CLAY with occasional sub-angular fine to coarse flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.65	
						Inspection pit terminated at 0.65m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	CJBall	

INSPECTION PIT LOG

Contract: NIAB - Phase 1	Client: BDW Trading Limited	Trial Pit: HP8

Contract Ref: 25459	Date: 01.03.13	Ground Level (m AOD): ---	National Grid Co-ordinate: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10	1	ES	T+J+VL			MADE GROUND- firm greyish brown slightly silty CLAY with sub-angular fine to medium flint gravels and with occasional rootlets (1-2mm diameter) and occasional to rare ash pockets and brick fragments.	(0.30) 0.30	
0.30	2	ES	T+J+VL			MADE GROUND- firm light brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels. Sand is fine to medium.	0.40	
						Firm yellow brown mottled grey slightly silty sandy CLAY with occasional sub-angular fine to medium flint gravels. Sand is fine to medium. (GAULT FORMATION).	(0.25) 0.65	
						Inspection pit terminated at 0.65m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used: Hand dug	Plant Used: Hand tools	Logged By: VMacfarlane	Checked By:

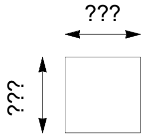
INSPECTION PIT LOG

Contract: NIAB - Phase 1	Client: BDW Trading Limited	Trial Pit: HP9

Contract Ref: 25459	Date: 01.03.13	Ground Level (m AOD): ---	National Grid Co-ordinate: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments. Sand is fine to medium.	(0.30) 0.30	
0.40	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments.	(0.20) 0.50	
						Firm light brown mottled grey and orange slightly silty sandy CLAY with occasional sub-angular fine to medium flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)



General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used: Hand dug	Plant Used: Hand tools	Logged By: CJBall	Checked By:

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP10

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional rootlets (1-5mm diameter) and occasional to rare ash pockets and metal fragments. Sand is fine to medium.	(0.40) 0.40	
0.50	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments.	0.50	
						Firm light brown mottled grey and orange slightly silty sandy CLAY with occasional sub-rounded fine to medium flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	CJBall	

AGS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP11

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown slightly silty sandy CLAY with occasional sub-rounded to sub-angular fine to medium flint gravels and with occasional rootlets (1-2mm diameter) and occasional to rare ash pockets. Sand is fine to medium.	(0.30) 0.30
0.50	2	ES	T+J+VL			MADE GROUND- soft to firm brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional to rare ash pockets and brick fragments.	(0.30) 0.60
						Firm yellow brown mottled grey slightly silty CLAY with occasional sub-angular fine to coarse flint gravels. Sand is fine to medium. (GAULT FORMATION).	0.70
						Inspection pit terminated at 0.70m depth.	

Plan (Not to Scale)

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General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	VMacfarlane	

AGS

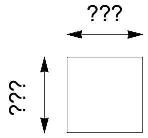
INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP12

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels and with occasional rootlets (1-2mm diameter) and crop stubble.	(0.40) 0.40	
0.50	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty CLAY with occasional sub-angular fine to medium flint gravels and with occasional to rare roots and rootlets (1-2mm)	0.50	
						Soft to firm light yellow brown silty CLAY with occasional sub-angular fine to medium flint gravels. (GAULT FORMATION).	0.66	
						Inspection pit terminated at 0.66m depth		

Plan (Not to Scale)



General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres | Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	Hand tools	VMacfarlane	

AGS

INSPECTION PIT LOG

Contract:	Client:	Trial Pit:
NIAB - Phase 1	BDW Trading Limited	HP13

Contract Ref:	Date:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
25459	01.03.13	---	---	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
						MADE GROUND- re-worked topsoil and grass cover.	0.10	
0.20	1	ES	T+J+VL			MADE GROUND- firm dark brown very silty sandy CLAY with occasional sub-rounded fine to medium flint gravels and with occasional rootlets (1-2mm diameter) and occasional to rare ash pockets. Sand is fine to medium.	(0.30) 0.40	
0.50	2	ES	T+J+VL			MADE GROUND- firm yellow brown slightly silty sandy CLAY with occasional sub-angular fine to coarse flint gravels. occasional to rare roots and rootlets (1-2mm diameter) with ash pockets and brick fragments.	(0.20) 0.60	
						Inspection pit terminated at 0.60m depth		

Plan (Not to Scale)

???

???

General Remarks

1. No ground water encountered
2. Backfilled with arising
3. Inspection pit remained stable
4. Weather conditions: cool, overcast

All dimensions in metres

Scale: 1:13

Method Used:	Plant Used:	Logged By:	Checked By:
Inspection pit + Hand dug	Hand tools	VMacfarlane	

CHEMICAL TEST RESULTS

Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number:	13/01097	
Issue Number:	1	**Date:** 18 March, 2013

Client: RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

Project Manager:	Nigel Austin / Chris Ball / Verity Macfarlane
Project Name:	BDW Trading / NIAB 1, Cambridge
Project Ref:	25459
Order No:	Not specified
Date Samples Received:	06/03/13
Date Instructions Received:	06/03/13
Date Analysis Completed:	18/03/13

Prepared by:	**Approved by:**
M Marshall	G Scott
Melanie Marshall	Gill Scott
Laboratory Coordinator	Laboratory Manager

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on the dried sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS.
For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations. If results are in italic font they are associated with such quality control failures and may be unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected. Superscript # indicates method accredited to ISO 17025. Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
Please contact us if you need any further information.

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 13/01097

Client Project Name: BDW Trading / NIAB 1, Cambridge

Client Project Ref: 25459

Lab Sample ID	13/01097/1	13/01097/2	13/01097/3	13/01097/4	13/01097/5	13/01097/6	13/01097/7	13/01097/8	Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8		
Depth to Top	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10		
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5AE	5E	6AE	6AE	6AE	6AE	6AE	6E		
Asbestos in soil$_{D}^{\#}$	-	-	NAD	NAD	NAD	NAD	NAD	NAD		A-T-045
Asbestos Matrix$_{D}$	-	-	-	-	-	-	-	-		A-T-045
Arsenic$_{D}^{M\#}$	-	-	6	5	7	6	5	5	mg/kg	A-T-024
Cadmium$_{D}^{M\#}$	-	-	0.9	0.8	0.8	0.8	0.9	1.0	mg/kg	A-T-024
Copper$_{D}^{M\#}$	-	-	24	20	16	20	21	25	mg/kg	A-T-024
Chromium$_{D}^{M\#}$	-	-	41	36	26	39	40	47	mg/kg	A-T-024
Lead$_{D}^{M\#}$	-	-	50	41	32	42	46	52	mg/kg	A-T-024
Mercury$_{D}$	-	-	0.40	0.34	0.18	0.26	0.39	0.27	mg/kg	A-T-024
Nickel$_{D}^{M\#}$	-	-	32	30	23	32	32	38	mg/kg	A-T-024
Selenium$_{D}^{M\#}$	-	-	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_{D}^{M\#}$	-	-	70	59	54	63	69	78	mg/kg	A-T-024
TPH total (C6-C40)$_{A}$	-	-	<10	<10	25	<10	<10	21	mg/kg	A-T-007s

Lab Sample ID	13/01097/1	13/01097/2	13/01097/3	13/01097/4	13/01097/5	13/01097/6	13/01097/7	13/01097/8	Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8		
Depth to Top	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10		
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5AE	5E	6AE	6AE	6AE	6AE	6AE	6E		
Acid Herbs										
2,3,6-TBA	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
2,4-D	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
2,4-DB	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
2,4,5-T	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
2,4,5-TP; (Fenoprop); (Silvex)	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
4-CPA	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Benazolin	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Bentazone	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Bromacil	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Bromoxynil	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Clopyralid	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Dicamba	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
2,4-DP; (Dichlorprop)	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Diclofop	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Flamprop	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Flamprop-isopropyl	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Fluroxypyr	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Ioxynil	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
MCPA	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
MCPB	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
MCPP; (Mecoprop)	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
PCP; (Pentachlorophenol)	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Picloram	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon
Triclopyr	-	-	-	<0.1	-	<0.1	-	<0.1	mg/kg	Subcon

Lab Sample ID	13/01097/1	13/01097/2	13/01097/3	13/01097/4	13/01097/5	13/01097/6	13/01097/7	13/01097/8	Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8		
Depth to Top	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10		
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5AE	5E	6AE	6AE	6AE	6AE	6AE	6E		
PAH 16										
$Acenaphthene_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
$Acenaphthylene_A^{M\#}$	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
$Anthracene_A^{M\#}$	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	A-T-019s
$Benzo(a)anthracene_A^{M\#}$	0.14	0.10	<0.04	0.11	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
$Benzo(a)pyrene_A^{M\#}$	0.22	0.18	<0.04	0.96	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
$Benzo(b)fluoranthene_A^{M\#}$	0.28	0.21	<0.05	0.60	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
$Benzo(ghi)perylene_A^{M\#}$	0.19	0.13	<0.05	4.69	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
$Benzo(k)fluoranthene_A^{M\#}$	0.15	0.12	<0.07	0.59	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
$Chrysene_A^{M\#}$	0.20	0.13	<0.06	0.13	<0.06	<0.06	<0.06	<0.06	mg/kg	A-T-019s
$Dibenzo(ah)anthracene_A^{M\#}$	<0.04	<0.04	<0.04	3.89	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
$Fluoranthene_A^{M\#}$	0.28	0.13	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	A-T-019s
$Fluorene_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
$Indeno(123\text{-}cd)pyrene_A^{M\#}$	0.15	0.12	<0.03	4.37	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
$Naphthalene_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
$Phenanthrene_A^{M\#}$	0.07	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
$Pyrene_A^{M\#}$	0.28	0.15	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
$Total\ PAH_A^{M\#}$	1.96	1.29	<0.08	15.4	<0.08	<0.08	<0.08	<0.08	mg/kg	A-T-019s

Envirolab Job Number: 13/01097 **Client Project Name: BDW Trading / NIAB 1, Cambridge**

Client Project Ref: 25459

Lab Sample ID	13/01097/1	13/01097/2	13/01097/3	13/01097/4	13/01097/5	13/01097/6	13/01097/7	13/01097/8	Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8		
Depth to Top	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10		
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5AE	5E	6AE	6AE	6AE	6AE	6AE	6E		
Triazines (x11)										
Ametryne	-	-	<0.2	-	<0.2	<0.2	<0.2	-	mg/kg	Subcon
Atraton	-	-	<0.1	-	<0.1	<0.1	<0.1	-	mg/kg	Subcon
Atrazine	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon
Cyanazine	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon
Prometon	-	-	<0.1	-	<0.1	<0.1	<0.1	-	mg/kg	Subcon
Prometryn	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon
Propazine	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon
Simazine	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon
Simetryn	-	-	<0.1	-	<0.1	<0.1	<0.1	-	mg/kg	Subcon
Terbuthylazine	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon
Terbutryn	-	-	<0.02	-	<0.02	<0.02	<0.02	-	mg/kg	Subcon

Envirolab Job Number: 13/01097

Client Project Name: BDW Trading / NIAB 1, Cambridge

Client Project Ref: 25459

Lab Sample ID	13/01097/1	13/01097/2	13/01097/3	13/01097/4	13/01097/5	13/01097/6	13/01097/7	13/01097/8	Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8		
Depth to Top	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10		
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5AE	5E	6AE	6AE	6AE	6AE	6AE	6E		
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Total Aliphatics$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-022+23s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-023s
Total Aromatics$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A^{\#}$	<0.1	<0.1	-	-	-	-	-	-	mg/kg	A-T-022+23s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	-	-	-	-	-	-	mg/kg	A-T-022s

Envirolab Job Number: 13/01097

Client Project Name: BDW Trading / NIAB 1, Cambridge

Client Project Ref: 25459

Lab Sample ID	13/01097/9	13/01097/10	13/01097/11	13/01097/12	13/01097/13				Units	Method ref
Client Sample No										
Client Sample ID	HP9	HP10	HP11	HP12	HP13					
Depth to Top	0.20	0.20	0.20	0.20	0.20					
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6E	5AE	6AE					
Asbestos in soil$_D^{\#}$	NAD	NAD	-	-	-					A-T-045
Arsenic$_D^{M\#}$	6	7	-	-	-				mg/kg	A-T-024
Cadmium$_D^{M\#}$	0.9	0.9	-	-	-				mg/kg	A-T-024
Copper$_D^{M\#}$	22	25	-	-	-				mg/kg	A-T-024
Chromium$_D^{M\#}$	37	31	-	-	-				mg/kg	A-T-024
Lead$_D^{M\#}$	51	85	-	-	-				mg/kg	A-T-024
Mercury$_D$	0.24	0.26	-	-	-				mg/kg	A-T-024
Nickel$_D^{M\#}$	32	28	-	-	-				mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	2	-	-	-				mg/kg	A-T-024
Zinc$_D^{M\#}$	97	107	-	-	-				mg/kg	A-T-024
TPH total (C6-C40)$_A$	<10	45	-	-	-				mg/kg	A-T-007s

Envirolab Job Number: 13/01097

Client Project Name: BDW Trading / NIAB 1, Cambridge

Client Project Ref: 25459

Lab Sample ID	13/01097/9	13/01097/10	13/01097/11	13/01097/12	13/01097/13				Units	Method ref
Client Sample No										
Client Sample ID	HP9	HP10	HP11	HP12	HP13					
Depth to Top	0.20	0.20	0.20	0.20	0.20					
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6E	5AE	6AE					
Acid Herbs										
2,3,6-TBA	-	<0.1	-	-	-				mg/kg	Subcon
2,4-D	-	<0.1	-	-	-				mg/kg	Subcon
2,4-DB	-	<0.1	-	-	-				mg/kg	Subcon
2,4,5-T	-	<0.1	-	-	-				mg/kg	Subcon
2,4,5-TP; (Fenoprop); (Silvex)	-	<0.1	-	-	-				mg/kg	Subcon
4-CPA	-	<0.1	-	-	-				mg/kg	Subcon
Benazolin	-	<0.1	-	-	-				mg/kg	Subcon
Bentazone	-	<0.1	-	-	-				mg/kg	Subcon
Bromacil	-	<0.1	-	-	-				mg/kg	Subcon
Bromoxynil	-	<0.1	-	-	-				mg/kg	Subcon
Clopyralid	-	<0.1	-	-	-				mg/kg	Subcon
Dicamba	-	<0.1	-	-	-				mg/kg	Subcon
2,4-DP; (Dichlorprop)	-	<0.1	-	-	-				mg/kg	Subcon
Diclofop	-	<0.1	-	-	-				mg/kg	Subcon
Flamprop	-	<0.1	-	-	-				mg/kg	Subcon
Flamprop-isopropyl	-	<0.1	-	-	-				mg/kg	Subcon
Fluroxypyr	-	<0.1	-	-	-				mg/kg	Subcon
Ioxynil	-	<0.1	-	-	-				mg/kg	Subcon
MCPA	-	<0.1	-	-	-				mg/kg	Subcon
MCPB	-	<0.1	-	-	-				mg/kg	Subcon
MCPP; (Mecoprop)	-	<0.1	-	-	-				mg/kg	Subcon
PCP; (Pentachlorophenol)	-	<0.1	-	-	-				mg/kg	Subcon
Picloram	-	<0.1	-	-	-				mg/kg	Subcon
Triclopyr	-	<0.1	-	-	-				mg/kg	Subcon

Lab Sample ID	13/01097/9	13/01097/10	13/01097/11	13/01097/12	13/01097/13				Units	Method ref
Client Sample No										
Client Sample ID	HP9	HP10	HP11	HP12	HP13					
Depth to Top	0.20	0.20	0.20	0.20	0.20					
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6E	5AE	6AE					
PAH 16										
Acenaphthene$_A$$^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01				mg/kg	A-T-019s
Acenaphthylene$_A$$^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01				mg/kg	A-T-019s
Anthracene$_A$$^{M\#}$	<0.02	<0.02	<0.02	<0.02	0.04				mg/kg	A-T-019s
Benzo(a)anthracene$_A$$^{M\#}$	<0.04	<0.04	<0.04	<0.04	0.16				mg/kg	A-T-019s
Benzo(a)pyrene$_A$$^{M\#}$	<0.04	<0.04	<0.04	0.05	0.24				mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$$^{M\#}$	<0.05	<0.05	<0.05	0.07	0.29				mg/kg	A-T-019s
Benzo(ghi)perylene$_A$$^{M\#}$	<0.05	<0.05	<0.05	<0.05	0.17				mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$$^{M\#}$	<0.07	<0.07	<0.07	<0.07	0.14				mg/kg	A-T-019s
Chrysene$_A$$^{M\#}$	<0.06	<0.06	<0.06	0.09	0.26				mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$$^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04				mg/kg	A-T-019s
Fluoranthene$_A$$^{M\#}$	<0.08	<0.08	<0.08	0.15	0.38				mg/kg	A-T-019s
Fluorene$_A$$^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01				mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A$$^{M\#}$	<0.03	<0.03	<0.03	<0.03	0.13				mg/kg	A-T-019s
Naphthalene$_A$$^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03				mg/kg	A-T-019s
Phenanthrene$_A$$^{M\#}$	<0.03	<0.03	<0.03	0.05	0.19				mg/kg	A-T-019s
Pyrene$_A$$^{M\#}$	<0.07	<0.07	<0.07	0.13	0.37				mg/kg	A-T-019s
Total PAH$_A$$^{M\#}$	<0.08	<0.08	<0.08	0.55	2.38				mg/kg	A-T-019s

Envirolab Job Number: 13/01097

Client Project Name: BDW Trading / NIAB 1, Cambridge

Client Project Ref: 25459

Lab Sample ID	13/01097/9	13/01097/10	13/01097/11	13/01097/12	13/01097/13				Units	Method ref
Client Sample No										
Client Sample ID	HP9	HP10	HP11	HP12	HP13					
Depth to Top	0.20	0.20	0.20	0.20	0.20					
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6E	5AE	6AE					
Triazines (x11)										
Ametryne	<0.2	-	-	-	-				mg/kg	Subcon
Atraton	<0.1	-	-	-	-				mg/kg	Subcon
Atrazine	<0.02	-	-	-	-				mg/kg	Subcon
Cyanazine	<0.02	-	-	-	-				mg/kg	Subcon
Prometon	<0.1	-	-	-	-				mg/kg	Subcon
Prometryn	<0.02	-	-	-	-				mg/kg	Subcon
Propazine	<0.02	-	-	-	-				mg/kg	Subcon
Simazine	<0.02	-	-	-	-				mg/kg	Subcon
Simetryn	<0.1	-	-	-	-				mg/kg	Subcon
Terbuthylazine	<0.02	-	-	-	-				mg/kg	Subcon
Terbutryn	<0.02	-	-	-	-				mg/kg	Subcon

Envirolab Job Number: 13/01097 **Client Project Name: BDW Trading / NIAB 1, Cambridge**

Client Project Ref: 25459

Lab Sample ID	13/01097/9	13/01097/10	13/01097/11	13/01097/12	13/01097/13				Units	Method ref
Client Sample No										
Client Sample ID	HP9	HP10	HP11	HP12	HP13					
Depth to Top	0.20	0.20	0.20	0.20	0.20					
Depth To Bottom										
Date Sampled	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13	01-Mar-13					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6E	5AE	6AE					
TPH CWG										
Ali >C5-C6$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Total Aliphatics$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-022+23s
Aro >C5-C7$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-023s
Total Aromatics$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A^{\#}$	-	-	<0.1	<0.1	<0.1				mg/kg	A-T-022+23s
BTEX - Benzene$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s
MTBE$_A^{\#}$	-	-	<0.01	<0.01	<0.01				mg/kg	A-T-022s

SUPPLEMENTARY GROUND GAS MONITORING RECORDS

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks
Round 1	Constant	Constant	1018	1020	Dipmeter + GA2000 + Weather: Clear & Sunny + Ground: Dry + Wind: Strong + Air Temp: 16DegC
Round 2	Rising	Rising	1008	1009	Dipmeter + GA2000 + Weather: Overcast + Ground: Damp + Wind: Medium + Air Temp: 7DegC
Round 3	Falling	Falling	1005	1005	Dipmeter + GFM-40 + Weather: Overcast & Sunny + Ground: Dry + Wind: Medium

Exploratory Position ID	Monitoring Round	Measured Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	1	4.18	19/09/2012	1018	1018	$0.0_{(SS)}$	DRY	0.6	0.1	19.8	-	0.2	0.0	0.0
BH1	1	---	15 secs	-	-	$0.0_{(SS)}$	-	0.8	0.1	19.1	-	0.2	0.0	0.0
BH1	1	---	30 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.1	-	0.2	0.0	0.0
BH1	1	---	60 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.1	-	0.0	0.0	0.0
BH1	1	---	90 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	1	---	120 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	1	---	180 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	1	---	240 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	1	---	300 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	1	---	360 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	1	---	420 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0
BH1	2 (2)	4.22	05/10/2012	1004	1008	$0.0_{(SS)}$	DRY	0.0	0.0	20.4	-	0.0	0.0	0.0
BH1	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH1	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0
BH1	3 (3)	4.25	11/10/2012	1004	1000	$0.0_{(SS)}$	DRY	0.0	0.0	20.9	0.0	-	-	-
BH1	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.9	0.0	-	-	-
BH1	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.2	0.0	-	-	-
BH1	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.1	0.0	-	-	-
BH1	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.0	0.0	-	-	-
BH1	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.0	0.0	-	-	-
BH1	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.1	0.0	-	-	-
BH2	1	---	19/09/2012	1018	1018	$0.3_{(SS)}$	-	0.8	$0.0_{(I)}$	20.1	$0.0_{(I)}$	0.3	0.0	0.0
BH2	1	---	15 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.2	0.0	0.0
BH2	1	---	30 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	60 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	90 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	120 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	180 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	240 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	300 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	360 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	1	---	420 secs	1018	1018	$0.3_{(SS)}$	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0
BH2	2	---	05/10/2012	1008	1008	$0.4_{(I)}$	-	0.0	0.0	20.8	0.0	0.0	0.0	0.0
BH2	2	---	15 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BH2	2	---	30 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	60 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	90 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.8	0.0	-	-	-	
BH2	2	---	120 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	180 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	240 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	300 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	360 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	420 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	3	---	11/10/2012	1005	1005	$0.0_{(I)}$	-	0.3	0.0	20.9	0.0	-	-	-	
BH2	3	---	15 secs	1005	1005	$0.0_{(SS)}$	-	$1.7_{(SS)}$	$0.0_{(SS)}$	$20.9_{(SS)}$	$0.0_{(SS)}$	-	-	-	
BH2	3	---	30 secs	1005	1005	$0.0_{(SS)}$	-	1.8	0.0	20.0	0.0	-	-	-	
BH2	3	---	60 secs	1005	1005	$0.0_{(SS)}$	-	1.8	0.0	19.5	0.0	-	-	-	
BH2	3	---	90 secs	1005	1005	$0.0_{(SS)}$	-	1.8	-	19.4	-	-	-	-	
BH2	3	---	120 secs	1005	1005	$0.0_{(SS)}$	-	1.8	-	19.3	-	-	-	-	
BH2	3	---	180 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.3	-	-	-	-	
BH2	3	---	240 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH2	3	---	300 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH2	3	---	360 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH2	3	---	420 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH3	2 (2)	3.23	05/10/2012	-	1009	$0.0_{(SS)}$	1.44	0.0	0.0	20.6	0.0	0.0	0.0	0.0	
BH3	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT	Compiled By	Date	Checked By	Date	Contract Ref: 25459
		24/10/12			
	Contract: **NIAB - Phase 1**				Page: 3 of 11

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BH3	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	3 (3)	3.50	11/10/2012	-	1008	$0.0_{(SS)}$	1.58	0.0	-	20.7	-	-	0.0	-	
BH3	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.4	-	19.4	-	-	-	-	
BH3	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.5	-	18.2	-	-	-	-	
BH3	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BH3	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BH3	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BH3	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BHG	1	4.32	19/09/2012	1018	1018	$-0.1_{(SS)}$	2.12	0.2	0.0	20.2	0.0	0.3	0.0	0.0	
BHG	1	---	15 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	1	---	30 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	1	---	60 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	90 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	120 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	180 secs	-	-	$-0.1_{(SS)}$	-	0.1	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	240 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	300 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	1	---	360 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date	Checked By	Date	Contract Ref: 25459
	24/10/12			

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BHG	1	---	420 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0
BHG	2 (2)	4.31	05/10/2012	1008	1008	$0.0_{(SS)}$	2.15	0.0	0.0	20.8	0.0	0.0	0.0	0.0
BHG	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	19.6	0.0	0.0	0.0	0.0
BHG	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	19.9	0.0	0.0	0.0	0.0
BHG	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	20.0	0.0	0.0	0.0	0.0
BHG	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	20.0	0.0	0.0	0.0	0.0
BHG	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	0.2	0.0	20.0	0.0	0.0	0.0	0.0
BHG	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	0.2	0.0	20.1	0.0	0.0	0.0	0.0
BHG	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	0.2	0.0	20.1	0.0	0.0	0.0	0.0
BHG	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	0.1	0.0	20.1	0.0	0.0	0.0	0.0
BHG	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	0.1	0.0	20.1	0.0	0.0	0.0	0.0
BHG	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	0.1	0.0	20.2	0.0	0.0	0.0	0.0
BHG	3 (3)	4.58	11/10/2012	1003	1003	$0.0_{(SS)}$	2.40	0.3	0.0	20.9	0.0	-	-	-
BHG	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	20.0	0.0	-	-	-
BHG	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.5	0.0	-	-	-
BHG	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.4	0.0	-	-	-
BHG	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.3	0.0	-	-	-
BHG	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.3	0.0	-	-	-
BHG	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-
BHG	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-
BHG	3 (3)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-
BHG	3 (3)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-
BHG	3 (3)	---	420 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-
BHK	1	4.05	19/09/2012	1018	1018	$0.0_{(SS)}$	1.97	1.3	0.1	19.8	1.0	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BHK	1	---	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.1	19.5	1.0	0.0	0.0	0.0
BHK	1	---	30 secs	-	-	$0.0_{(SS)}$	-	1.4	0.1	19.5	1.0	0.0	0.0	0.0
BHK	1	---	60 secs	-	-	$0.0_{(SS)}$	-	1.3	0.1	19.5	1.0	0.0	0.0	0.0
BHK	1	---	90 secs	-	-	$0.0_{(SS)}$	-	1.3	0.1	19.5	1.0	0.0	0.0	0.0
BHK	1	---	120 secs	-	-	$0.0_{(SS)}$	-	1.4	0.1	19.5	1.0	0.0	0.0	0.0
BHK	1	---	180 secs	-	-	$0.0_{(SS)}$	-	1.5	0.1	19.5	1.0	0.0	0.0	0.0
BHK	1	---	240 secs	-	-	$0.0_{(SS)}$	-	1.7	0.1	19.4	1.0	0.0	0.0	0.0
BHK	1	---	300 secs	-	-	$0.0_{(SS)}$	-	1.8	0.1	19.3	1.0	0.0	0.0	0.0
BHK	1	---	360 secs	-	-	$0.0_{(SS)}$	-	1.8	0.1	19.3	1.0	0.0	0.0	0.0
BHK	1	---	420 secs	-	-	$0.0_{(SS)}$	-	1.8	0.1	19.3	1.0	0.0	0.0	0.0
BHK	2 (2)	4.04	05/10/2012	1009	1008	$0.2_{(SS)}$	2.06	0.2	0.0	20.8	-	0.0	0.0	0.0
BHK	2 (2)	---	15 secs	-	-	$0.2_{(SS)}$	-	0.7	0.0	19.8	-	0.0	0.0	0.0
BHK	2 (2)	---	30 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	60 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	90 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	120 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	180 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	240 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	300 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	360 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0
BHK	2 (2)	---	420 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0
BHK	3 (3)	4.30	11/10/2012	-	1006	$-0.1_{(SS)}$	2.38	0.1	0.0	20.7	0.0	-	-	-
BHK	3 (3)	---	15 secs	-	-	$-0.1_{(SS)}$	-	3.2	0.0	19.2	0.0	-	-	-
BHK	3 (3)	---	30 secs	-	-	$-0.1_{(SS)}$	-	3.3	0.0	18.4	0.0	-	-	-
BHK	3 (3)	---	60 secs	-	-	$-0.1_{(SS)}$	-	3.3	0.0	18.2	0.0	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT	Compiled By	Date	Checked By	Date	Contract Ref: 25459
	[signature]	24/10/12			
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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BHK	3 (3)	---	90 secs	-	-	$-0.1_{(SS)}$	-	3.4	0.0	18.1	0.0	-	-	-	
BHK	3 (3)	---	120 secs	-	-	$-0.1_{(SS)}$	-	3.4	0.0	18.1	0.0	-	-	-	
BHK	3 (3)	---	180 secs	-	-	$-0.1_{(SS)}$	-	3.5	0.0	18.0	0.0	-	-	-	
BHK	3 (3)	---	240 secs	-	-	$-0.1_{(SS)}$	-	3.5	0.0	18.0	0.0	-	-	-	
BHK	3 (3)	---	300 secs	-	-	$-0.1_{(SS)}$	-	3.5	0.0	18.0	0.0	-	-	-	
WS3	1	3.21	19/09/2012	1018	1018	$0.2_{(SS)}$	DRY	0.0	0.1	20.3	0.0	0.0	0.0	0.0	
WS3	1	---	15 secs	-	-	$0.2_{(SS)}$	-	0.6	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	30 secs	-	-	$0.2_{(SS)}$	-	0.7	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	60 secs	-	-	$0.2_{(SS)}$	-	0.8	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	90 secs	-	-	$0.2_{(SS)}$	-	0.7	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	120 secs	-	-	$0.2_{(SS)}$	-	0.7	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	180 secs	-	-	$0.2_{(SS)}$	-	0.6	0.1	20.3	1.0	0.0	0.0	0.0	
WS3	1	---	240 secs	-	-	$0.2_{(SS)}$	-	0.6	0.1	20.3	1.0	0.0	0.0	0.0	
WS3	1	---	300 secs	-	-	$0.2_{(SS)}$	-	0.5	0.1	20.4	1.0	0.0	0.0	0.0	
WS3	1	---	360 secs	-	-	$0.2_{(SS)}$	-	0.4	0.1	20.5	1.0	0.0	0.0	0.0	
WS3	1	---	420 secs	-	-	$0.2_{(SS)}$	-	0.4	0.1	20.5	1.0	0.0	0.0	0.0	
WS3	2 (2)	3.18	05/10/2012	1004	1008	$0.3_{(SS)}$	2.92	1.1	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	15 secs	-	-	$0.3_{(SS)}$	-	1.1	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	30 secs	-	-	$0.3_{(SS)}$	-	1.1	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	60 secs	-	-	$0.3_{(SS)}$	-	1.2	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	90 secs	-	-	$0.3_{(SS)}$	-	1.2	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	120 secs	-	-	$0.3_{(SS)}$	-	1.1	0.0	19.4	-	-	-	-	
WS3	2 (2)	---	180 secs	-	-	$0.3_{(SS)}$	-	1.0	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	240 secs	-	-	$0.3_{(SS)}$	-	0.9	0.0	19.5	-	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date	Checked By	Date	Contract Ref: 25459
	24/10/12			

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WS3	2 (2)	---	300 secs	-	-	$0.3_{(SS)}$	-	0.9	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	360 secs	-	-	$0.3_{(SS)}$	-	0.8	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	420 secs	-	-	$0.3_{(SS)}$	-	0.8	0.0	19.6	-	-	-	-	
WS3	3 (3)	5.44	11/10/2012	-	1006	$0.0_{(SS)}$	2.87	0.3	0.0	20.7	0.0	-	-	-	
WS3	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	2.1	0.0	19.9	0.0	-	-	-	
WS3	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	300 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	360 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	420 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS17	1	2.95	19/09/2012	1020	1020	$0.1_{(SS)}$	DRY	1.7	0.0	19.5	0.0	-	-	-	
WS17	1	---	15 secs	-	-	$0.1_{(SS)}$	-	1.7	0.0	19.5	0.0	-	-	-	
WS17	1	---	30 secs	-	-	$0.1_{(SS)}$	-	1.8	0.0	19.2	0.0	-	-	-	
WS17	1	---	60 secs	-	-	$0.1_{(SS)}$	-	2.0	0.0	19.1	0.0	-	-	-	
WS17	1	---	90 secs	-	-	$0.1_{(SS)}$	-	2.1	0.1	19.0	1.0	-	-	-	
WS17	1	---	120 secs	-	-	$0.1_{(SS)}$	-	2.4	0.1	18.8	2.0	-	-	-	
WS17	1	---	180 secs	-	-	$0.1_{(SS)}$	-	2.7	0.1	18.7	2.0	-	-	-	
WS17	1	---	240 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	
WS17	1	---	300 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	
WS17	1	---	360 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WS17	1	---	420 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	
WS17	2 (2)	2.95	05/10/2012	1383	1009	$0.0_{(SS)}$	1.88	0.1	0.0	20.2	0.0	0.0	0.0	0.0	
WS17	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	20.2	0.0	-	0.0	0.0	
WS17	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.4	0.0	20.2	0.0	-	0.0	0.0	
WS17	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.8	0.0	19.7	0.0	-	0.0	0.0	
WS17	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.9	0.0	19.6	0.0	-	0.0	0.0	
WS17	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	19.2	0.0	-	0.0	0.0	
WS17	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.4	0.0	18.9	0.0	-	0.0	0.0	
WS17	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.5	0.0	18.8	0.0	-	0.0	0.0	
WS17	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.5	0.0	18.8	0.0	-	0.0	0.0	
WS17	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.4	0.0	18.9	0.0	-	0.0	0.0	
WS17	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	18.9	0.0	-	0.0	0.0	
WS17	3 (3)	2.90	11/10/2012	-	1005	$0.0_{(SS)}$	1.85	0.2	-	21.3	-	-	-	-	
WS17	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.6	-	20.6	-	-	-	-	
WS17	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.6	-	20.5	-	-	-	-	
WS17	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.7	-	20.4	-	-	-	-	
WS17	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.9	-	20.2	-	-	-	-	
WS17	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.1	-	20.0	-	-	-	-	
WS17	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.4	-	19.6	-	-	-	-	
WS17	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.6	-	19.6	-	-	-	-	
WS17	3 (3)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.7	-	19.3	-	-	-	-	
WS17	3 (3)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.7	-	19.3	-	-	-	-	
WSH	1	2.33	19/09/2012	1018	1018	$0.0_{(SS)}$	DRY	2.7	0.1	19.1	1.0	0.7	0.0	0.0	
WSH	1	---	15 secs	-	-	$0.0_{(SS)}$	-	2.8	0.1	19.0	1.0	0.0	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd 18 Frogmore Road Hemel Hempstead Hertfordshire HP3 9RT	Compiled By	Date	Checked By	Date	Contract Ref: 25459
	[signature]	24/10/12			
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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WSH	1	---	30 secs	-	-	$0.0_{(SS)}$	-	3.1	0.1	18.8	1.0	0.0	0.0	0.0
WSH	1	---	60 secs	-	-	$0.0_{(SS)}$	-	3.4	0.1	18.8	1.0	0.0	0.0	0.0
WSH	1	---	90 secs	-	-	$0.0_{(SS)}$	-	3.5	0.1	18.8	1.0	0.0	0.0	0.0
WSH	1	---	120 secs	-	-	$0.0_{(SS)}$	-	3.6	0.1	18.7	1.0	0.0	0.0	0.0
WSH	1	---	180 secs	-	-	$0.0_{(SS)}$	-	3.6	0.1	18.8	1.0	0.0	0.0	0.0
WSH	1	---	240 secs	-	-	$0.0_{(SS)}$	-	3.5	0.1	18.9	1.0	0.0	0.0	0.0
WSH	1	---	300 secs	-	-	$0.0_{(SS)}$	-	3.3	0.1	18.9	1.0	0.0	0.0	0.0
WSH	1	---	360 secs	-	-	$0.0_{(SS)}$	-	3.3	0.1	19.0	1.0	0.0	0.0	0.0
WSH	1	---	420 secs	-	-	$0.0_{(SS)}$	-	3.2	0.1	19.0	1.0	0.0	0.0	0.0
WSH	2 (2)	2.39	05/10/2012	-	1008	$0.0_{(SS)}$	DRY	0.0	0.0	19.9	-	0.0	0.0	0.0
WSH	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	19.1	-	-	0.0	0.0
WSH	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	2.9	0.0	18.7	-	-	0.0	0.0
WSH	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0
WSH	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0
WSH	3 (3)	2.70	11/10/2012	1004	1005	$0.0_{(SS)}$	DRY	0.1	0.0	20.8	0.0	-	-	-
WSH	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	3.5	0.0	19.2	0.0	-	-	-
WSH	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	3.5	0.0	18.6	0.0	-	-	-
WSH	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	3.7	0.0	18.4	0.0	-	-	-
WSH	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	4.0	0.0	18.2	0.0	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WSH	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	4.1	0.0	18.1	0.0	-	-	-	
WSH	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	4.2	0.0	18.0	0.0	-	-	-	
WSH	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	4.2	0.0	18.0	0.0	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT	Compiled By	Date	Checked By	Date	Contract Ref: 25459
	[signature]	24/10/12			
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APPENDIX - Results of Gas Monitoring (date 16/01/2013)

Atmospheric Pressure (mb): 1009

AP Conditions (BBC Website): Rising

Equipment Used GA2000+

Temperature: 1C

Weather Conditions: Clear, recent snow fall

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH1	0.80	4.27		0	0.0	0.0	0.1	21.4	0	0	0			
				15	0.0	0.0	0.7	21.1	0	0	0			
				30	0.0	0.0	0.7	21.0	0	0	0			
				60	0.0	0.0	0.7	21.0	0	0	0			
				90	0.0	0.0	0.7	21.0	0	0	0			
				120	0.0	0.0	0.7	21.0	0	0	0			
				180	0.0	0.0	0.7	21.0	0	0	0			
				240	0.0	0.0	0.7	21.0	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH2		4.34		0	0.0	0.0	0.1	20.7	0	0	0			
				15	0.0	0.0	0.9	19.5	0	0	0			
				30	0.0	0.0	0.9	18.0	0	0	0			
				60	0.0	0.0	0.9	18.0	0	0	0			
				90	0.0	0.0	0.9	18.2	0	0	0			
				120	0.0	0.0	0.9	18.2	0	0	0			
				180	0.0	0.0	0.9	18.2	0	0	0			
				240	0.0	0.0	0.9	18.2	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH3		3.22		0	0.0	0.0	0.1	21.2	0	0	0			
				15	0.0	0.0	1.1	20.2	0	0	0			
				30	0.0	0.0	1.1	18.9	0	0	0			
				60	0.0	0.0	1.1	17.7	0	0	0			
				90	0.0	0.0	1.1	17.7	0	0	0			
				120	0.0	0.0	1.1	17.7	0	0	0			
				180	0.0	0.0	1.1	17.7	0	0	0			
				240	0.0	0.0	1.1	17.7	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BHG	0.95	4.30		0	0.0	0.0	0.1	21.4	0	0	0			
				15	0.0	0.1	0.9	21.3	0	0	0			
				30	0.0	0.1	0.9	20.8	0	0	0			
				60	0.0	0.1	0.9	20.8	0	0	0			
				90	0.0	0.1	0.4	20.8	0	0	0			
				120	0.0	0.1	0.4	20.8	0	0	0			
				180	0.0	0.1	0.4	20.8	0	0	0			
				240	0.0	0.1	0.4	20.7	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BHK	1.96	4.3		0	0	0.0	0.1	20.7	0	0	0			
				15	-0.1	0.0	0.6	20.6	0	0	0			
				30	-0.1	0.0	0.6	17.5	0	0	0			
				60	-0.1	0.0	0.6	17.5	0	0	0			
				90	-0.1	0.0	0.6	17.5	0	0	0			
				120	-0.1	0.0	0.5	17.5	0	0	0			
				180	-0.1	0.0	0.5	17.5	0	0	0			
				240	-0.1	0.0	0.6	17.5	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WS3		3.20		0	0.0	0.0	0.1	21.0	0	0	0			
				15	0.0	0.0	2.2	20.5	0	0	0			
				30	0.0	0.0	2.2	19.4	0	0	0			
				60	0.0	0.0	2.1	18.8	0	0	0			
				90	0.0	0.0	2.1	18.8	0	0	0			
				120	0.0	0.0	2.1	18.8	0	0	0			
				180	0.0	0.0	2.1	18.8	0	0	0			
				240	0.0	0.0	2.1	18.8	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WS17	0.83	2.90		0	0.0	0.0	0.1	21.2	0	0	0			
				15	0.1	0.0	0.1	21.1	0	0	0			
				30	0.1	0.0	0.1	21.3	0	0	0			
				60	0.1	0.0	0.1	21.3	0	0	0			
				90	0.1	0.0	0.1	21.3	0	0	0			
				120	0.1	0.0	0.1	21.3	0	0	0			
				180	0.1	0.0	0.1	21.3	0	0	0			
				240	0.1	0.0	0.1	21.3	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WSH	1.30	2.32		0	0.0	0.0	0.1	21.3	0	0	0			
				15	0.0	0.0	1.2	20.5	0	0	0			
				30	0.0	0.0	1.2	20.1	0	0	0			
				60	0.0	0.0	1.2	20.0	0	0	0			
				90	0.0	0.0	1.2	20.0	0	0	0			
				120	0.0	0.0	1.2	20.0	0	0	0			
				180	0.0	0.0	1.2	20.0	0	0	0			
				240	0.0	0.0	1.2	20.0	0	0	0			

APPENDIX - Results of Gas Monitoring (date 18/04/2013)

Atmospheric Pressure (mb): 1006

AP Conditions (BBC Website): Rising

Equipment Used GA2000+

Temperature: 11C

Weather Conditions: Overcast, dry

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH1	0.89	4.27		0	0.0	0.0	0.1	21.4	0	0	0			
				15	0.0	0.0	0.2	21.2	0	0	0			
				30	0.0	0.0	0.2	21.2	0	0	0			
				60	0.0	0.0	0.2	21.2	0	0	0			
				90	0.0	0.0	0.2	21.2	0	0	0			
				120	0.0	0.0	0.2	21.2	0	0	0			
				180	0.0	0.0	0.2	21.2	0	0	0			
				240	0.0	0.0	0.2	21.2	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH2		4.34		0	0.0	0.0	0.1	20.7	0	0	0			
				15	0.0	0.0	0.7	19.5	0	0	0			
				30	0.0	0.0	0.7	19.5	0	0	0			
				60	0.0	0.0	0.7	19.5	0	0	0			
				90	0.0	0.0	0.7	19.5	0	0	0			
				120	0.0	0.0	0.7	19.5	0	0	0			
				180	0.0	0.0	0.7	19.5	0	0	0			
				240	0.0	0.0	0.7	19.5	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH3		3.22		0	0.0	0.0	0.1	21.2	0	0	0			
				15	0.0	0.0	0.5	20.1	0	0	0			
				30	0.0	0.0	0.5	19.8	0	0	0			
				60	0.0	0.0	0.5	19.8	0	0	0			
				90	0.0	0.0	0.5	19.8	0	0	0			
				120	0.0	0.0	0.5	19.8	0	0	0			
				180	0.0	0.0	0.5	19.8	0	0	0			
				240	0.0	0.0	0.5	19.8	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BHG	1.01	4.30		0	0.1	0.0	0.0	21.5	0	0	0			
				15	0.1	0.0	0.0	21.5	0	0	0			
				30	0.1	0.0	0.0	21.4	0	0	0			
				60	0.1	0.0	0.0	21.5	0	0	0			
				90	0.1	0.0	0.0	21.5	0	0	0			
				120	0.1	0.0	0.0	21.5	0	0	0			
				180	0.1	0.0	0.0	21.5	0	0	0			
				240	0.1	0.0	0.0	21.5	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BHK	1.75	4.3		0	0	0.0	0.0	20.0	0	0	0			
				15	-0.1	0.0	0.0	20.0	0	0	0			
				30	-0.1	0.0	0.0	20.9	0	0	0			
				60	-0.1	0.0	0.0	21.0	0	0	0			
				90	-0.1	0.0	0.0	21.0	0	0	0			
				120	-0.1	0.0	0.0	21.0	0	0	0			
				180	-0.1	0.0	0.0	21.0	0	0	0			
				240	-0.1	0.0	0.0	21.0	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WS3		3.20		0	0.0	0.0	0.1	21.0	0	0	0			
				15	0.0	0.0	1.2	20.5	0	0	0			
				30	0.0	0.0	1.2	19.5	0	0	0			
				60	0.0	0.0	1.2	19.5	0	0	0			
				90	0.0	0.0	1.2	19.5	0	0	0			
				120	0.0	0.0	1.2	19.5	0	0	0			
				180	0.0	0.0	1.2	19.5	0	0	0			
				240	0.0	0.0	1.2	19.5	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WS17	0.83	2.90		0	0	0.0	0.1	21.2	0	0	0			
				15	0.1	0.0	0.1	21.1	0	0	0			
				30	0.1	0.0	0.1	21.3	0	0	0			
				60	0.1	0.0	0.1	21.3	0	0	0			
				90	0.1	0.0	0.1	21.3	0	0	0			
				120	0.1	0.0	0.1	21.3	0	0	0			
				180	0.1	0.0	0.1	21.3	0	0	0			
				240	0.1	0.0	0.1	21.3	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WSH	1.57	2.32		0	0.1	0.0	0.1	18.9	0	0	0			
				15	0.1	0.0	0.0	21.4	0	0	0			
				30	0.1	0.0	0.0	21.4	0	0	0			
				60	0.1	0.0	0.0	21.4	0	0	0			
				90	0.1	0.0	0.0	21.4	0	0	0			
				120	0.1	0.0	0.0	21.4	0	0	0			
				180	0.1	0.0	0.0	21.4	0	0	0			
				240	0.1	0.0	0.0	21.4	0	0	0			

APPENDIX - Results of Gas Monitoring (date 30/04/2013)

Atmospheric Pressure (mb): 1022

AP Conditions (BBC Website): Rising

Equipment Used: GA 2000 +3

Temperature: 15C

Weather Conditions: Sunny spells, dry

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH1	1.70	4.27		0	0.0	0.0	0.1	20.8	0	0	0			
				15	0.0	0.0	0.5	20.4	0	0	0			
				30	0.0	0.0	0.5	20.3	0	0	0			
				60	0.0	0.0	0.5	20.2	0	0	0			
				90	0.0	0.0	0.5	20.1	0	0	0			
				120	0.0	0.0	0.5	20.1	0	0	0			
				180	0.0	0.0	0.5	20.1	0	0	0			
				240	0.0	0.0	0.5	20.1	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH2	1.86	4.34		0	-0.1	0.0	0.0	20.4	0	0	0			
				15	-0.1	0.0	0.5	19.9	0	0	0			
				30	-0.1	0.0	0.5	19.9	0	0	0			
				60	-0.1	0.0	0.5	19.9	0	0	0			
				90	-0.1	0.0	0.5	19.9	0	0	0			
				120	-0.1	0.0	0.5	20.0	0	0	0			
				180	-0.1	0.0	0.5	20.0	0	0	0			
				240	-0.1	0.0	0.5	20.0	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BH3	1.78	3.22		0	0.0	0.0	0.0	20.8	0	0	0			
				15	-0.1	0.0	0.2	20.7	0	0	0			
				30	-0.2	0.0	0.2	20.7	0	0	0			
				60	-0.2	0.0	0.2	20.7	0	0	0			
				90	-0.2	0.0	0.2	20.8	0	0	0			
				120	-0.2	0.0	0.2	20.8	0	0	0			
				180	-0.2	0.0	0.2	20.8	0	0	0			
				240	-0.2	0.0	0.2	20.8	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BHG	1.14	4.30		0	0.0	0.0	0.5	20.7	0	0	0			
				15	0.0	0.0	1.4	19.4	0	0	0			
				30	0.0	0.0	1.4	19.4	0	0	0			
				60	0.0	0.0	1.4	19.4	0	0	0			
				90	0.0	0.0	1.4	19.4	0	0	0			
				120	0.0	0.0	1.4	19.4	0	0	0			
				180	0.0	0.0	1.4	19.4	0	0	0			
				240	0.0	0.0	1.4	19.4	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
BHK	1.35	4.3		0	0.01	0.0	0.0	20.9	0	0	0			
				15	0.0	0.0	0.9	20.0	0	0	0			
				30	0.0	0.0	0.9	20.0	0	0	0			
				60	0.0	0.0	0.9	20.0	0	0	0			
				90	0.0	0.0	1.0	19.9	0	0	0			
				120	0.0	0.0	1.0	19.9	0	0	0			
				180	0.0	0.0	1.0	19.9	0	0	0			
				240	0.0	0.0	1.0	19.9	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WS3	1.55	3.20		0	0.0	0.0	0.4	20.9	0	0	0			
				15	0.0	0.0	1.4	19.8	0	0	0			
				30	0.0	0.0	1.4	19.8	0	0	0			
				60	0.0	0.0	1.4	19.9	0	0	0			
				90	0.0	0.0	1.3	20.0	0	0	0			
				120	0.0	0.0	1.3	20.1	0	0	0			
				180	0.0	0.0	1.2	20.2	0	0	0			
				240	0.0	0.0	1.1	20.3	0	0	0			

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WS17														**Could not locate position**

Location	Depth to water (m bgl)	Depth to base of well (m bgl)	Differential Pressure (mb)	Time (secs.)	Flow (l/hr)	Methane (%/vol)	Carbon Dioxide (%/vol)	Oxygen (%/vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Product	Observation
WSH	1.6	2.32		0	0.0	0.0	2.0	19.5	0	0	0			
				15	0.0	0.0	2.1	19.2	0	0	0			
				30	0.0	0.0	2.1	19.2	0	0	0			
				60	0.0	0.0	2.2	19.1	0	0	0			
				90	0.0	0.0	2.3	19.1	0	0	0			
				120	0.0	0.0	2.3	19.1	0	0	0			
				180	0.0	0.0	2.2	19.1	0	0	0			
				240	0.0	0.0	2.2	19.2	0	0	0			

RSK GAC FOR RESIDENTIAL LAND USE WITH PATHWAYS FOR PLANT UPTAKE

Generic assessment criteria for human health: residential scenario – private gardens

The human health generic assessment criteria (GAC) have been developed during a period of regulatory review and updating of the Contaminated Land Exposure Assessment (CLEA) project. Therefore, the Environment Agency (EA) is in the process of publishing updated reports relating to the CLEA project and the GAC presented in this document may change to reflect these updates. This issue was prepared following the publication of soil guideline value (SGV) reports and associated publications[(1)] for mercury, selenium, benzene, toluene, ethylbenzene and xylene in March 2009, arsenic and nickel in May 2009, cadmium and phenol in June 2009, dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs) in September 2009. It was also produced following publication of GAC by LQM[(6)]. Where available, the published soil guideline values (SGV)[(1)] were used as the GAC. The GAC for lead is discussed separately below owing to it not being derived using the same approach as other compounds.

Lead GAC derivation

The Environment Agency SGV and Tox reports for lead were withdrawn in 2009. In addition, the provisional tolerable weekly intake data published in the Netherlands were withdrawn in 2010 owing to concerns that they were not suitably protective of human health. The withdrawn SGVs were based on a target blood lead concentration of 10µg/dl. In the absence of current guidelines many consultants continue to use the withdrawn SGV. However, as this is not considered sufficiently protective of human health, after attendance at the SOBRA summer workshop June 2011, RSK has revised its GAC and is currently undertaking a review of recent toxicological developments that will be used to refine this GAC further in the coming months. In the meantime, RSK has undertaken sensitivity analysis using the Society of Environmental Geochemistry and Health (SEGH) equation and the CLEA model to produce an interim GAC value. The results are summarised below:

- Using CLEA with the former provisional tolerable weekly intake (PTWI) (25 µg/kg bw), assuming 100% lead is bioavailable, produces a GAC of 212 mg/kg
- Using CLEA with the former PTWI, assuming 50% lead is bioavailable, produces a GAC of 478 mg/kg
- Using the SEGH equation amended for a blood target concentration of 5.6 µg/dl (equal to the LOAEL for IQ defects) gives a negative GAC number unless other factors such as child background blood concentration or delta are amended. Without undertaking further research into these numbers, RSK can present sensitivity analysis to demonstrate the sensitivity of these input parameters but cannot justify one parameter over another. The results are:
    - GAC between 39mg/kg and 99mg/kg if the value of delta (the slope or response of blood Pb versus soil and dust Pb relationship) only is amended from 5 to 2µg/dl/1000µg/g. The value of 2 was chosen as it is within the reasonable range quoted in the former SGV report
    - GAC between 244mg/kg and 610mg/kg if the geometric mean of blood lead concentration in young children is reduced from 3.4µg/dl to 2µg/dl. This decrease has been simulated on the basis that blood concentrations are likely to decrease over time across the UK owing to a ban on lead in petrol, lead within paint used internally and water pipe replacement. This decrease is considered reasonable as the site is a new development

so lead-based paints will not be used internally and lead water supply pipelines will be absent.

Therefore, given the results above RSK proposes to use a GAC of **300mg/kg** for a residential end use. This value is broadly in the middle of the range of sensitivity modelling results quoted above when background mean blood lead concentrations in children are reduced to reflect a new development. The value is also broadly in the middle of the range of sensitivity modelling results for a range of bioavailability of lead between 50% and 100%. This number is considered reasonably protective of human health while being practical for use.

GAC derivation for other metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated using CLEA v1.06 and the supporting UK guidance[1–6]. Groundwater assessment criteria (GrAC) protective of human health via the inhalation pathway were derived using the RBCA 1.3b model. RSK has updated the inputs within RBCA to reflect the UK guidance[1–5]. The SAC and GrAC collectively are termed GAC.

Conceptual model

In accordance with EA Science Report SC050221/SR3[3], the residential with private garden scenario considers risks to a female child between the ages of 0 and 6 years old. In accordance with Box 3.1, SR3[3], the pathways considered for production of the SAC in the residential with gardens scenario are:

- direct soil and dust ingestion;
- consumption of home-grown produce;
- consumption of soil attached to home-grown produce;
- dermal contact with soil and indoor dust, and
- inhalation of indoor and outdoor dust and vapours.

Figure 1 is a conceptual model illustrating these linkages.

The pathway considered in production of the GrAC is the volatilisation of compounds from groundwater and subsequent vapour inhalation by residents while indoors. Figure 2 illustrates this linkage. Although the outdoor air inhalation pathway is also valid, this contributes little to the overall risks owing to the dilution in outdoor air. Within RBCA, the solubility limit of the determinant restricts the extent of volatilisation, which in turn drives the indoor air inhalation pathway. While the same restriction is not built into the CLEA model, the CLEA model output cells are flagged red where the soil saturation limit has been exceeded.

An assumption used in the CLEA model is that of simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[4]. The upper boundaries of this partitioning are represented by the aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous-based or the vapour based saturation limits. Where model output cells are flagged red the soil or vapour saturation limit has been exceeded and further consideration of the SAC to be used within the assessment is required. One approach that could be adopted is to use the 'modelled' solubility saturation limit or vapour saturation limit of the compound as the SAC. However, as stated within the CLEA handbook[4] this is likely to not be practical in many cases because of the very low limits and, in any case, is highly conservative. Unless free-phase product is present, concentrations of the chemical are unlikely to be present at sufficient concentration to result in an exceedance of the health criteria value (HCV).

RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH[6] whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limit given in brackets. Therefore, when using the SAC to screen laboratory analysis the assessor should take note if a given SAC has a corresponding solubility or vapour saturation limit (in brackets), and subsequently incorporate this piece of information within the screening analytical discussion. If further assessment is required following this process then an additional approach can be utilised as detailed within Section 4.12 of the CLEA model handbook[4], which explains how to calculate an effective assessment criterion manually.

Input selection

Chemical data was obtained from EA Report SC050021/SR7[5] and the health criteria values (HCV) from the UK TOX[1] reports where available. For SAC for total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH), toxicological and chemical specific parameters were obtained from the LQM/CIEH report[6]. Similarly, toxicological and specific chemical parameters for the volatile organic compound 1,2,4-trimethylbenzene were obtained from EIC/AGS/CL:AIRE[7].

For total petroleum hydrocarbons (TPH), aromatic hydrocarbons C_5-C_8 were not modelled since benzene and toluene are being modelled separately. The aromatic C_8-C_9 hydrocarbon fraction comprises ethylbenzene, xylene and styrene. Since ethylbenzene and xylene are being modelled separately, the physical, chemical and toxicological data for this band has been taken from styrene.

Owing to the lack of UK-specific data, default information in the RBCA model was used to evaluate methyl tertiary butyl ether (MTBE). No published UK data was available for 1,3,5-trimethylbenzene, so information was obtained from the US EPA as in the RBCA model. RBCA uses toxicity data for the inhalation pathway in different units to the CLEA model and cannot consider separately the mean daily intake (MDI), occupancy periods or breathing rates. Therefore, the HCV in RBCA was amended to take account of:

- amendments to the MDI using Table 3.4 of SR2[2]
- a child weighing 13.3kg (average of 0–6 year old female in accordance with Table 4.6 of SR3[3]) and breathing 11.85m^3 (average daily inhalation rate for a 0–6-year old female in accordance with Table 4.14 of SR3[3]

1. The 50% rule (for petroleum hydrocarbons, trimethylbenzenes and MTBE)[2] where MDI data is not available but background exposure is considered important in the overall exposure.

Physical parameters

For the residential with private gardens scenario, the CLEA default building is a small two-storey terrace house with concrete ground-bearing slab. The house is assumed to have a $100m^2$ private garden consisting of lawn, flowerbeds and incorporating a $20m^2$ plot for growing fruit and vegetables consumed by the residents. SR3[3] notes this residential building type to be the most conservative in terms of protection from vapour intrusion. The building parameters are outlined in Table 5.

The parameters for a sandy loam soil type were used in line with SR3[3]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this parameter, RSK has produced an additional set of SAC for an SOM of 1% and 2.5%. For the GrAC, the depth to groundwater was taken as 2.5m based on RSK's experience of assessing the volatilisation pathway from groundwater.

GAC

The SAC were produced using the input parameters in Tables 1 to 5 and the GrAC using input parameters in Table 6. The final selected GAC are presented by pathway in Table 7 and the combined GAC in Table 8.

Figure 1: Conceptual model for CLEA residential scenario – private gardens

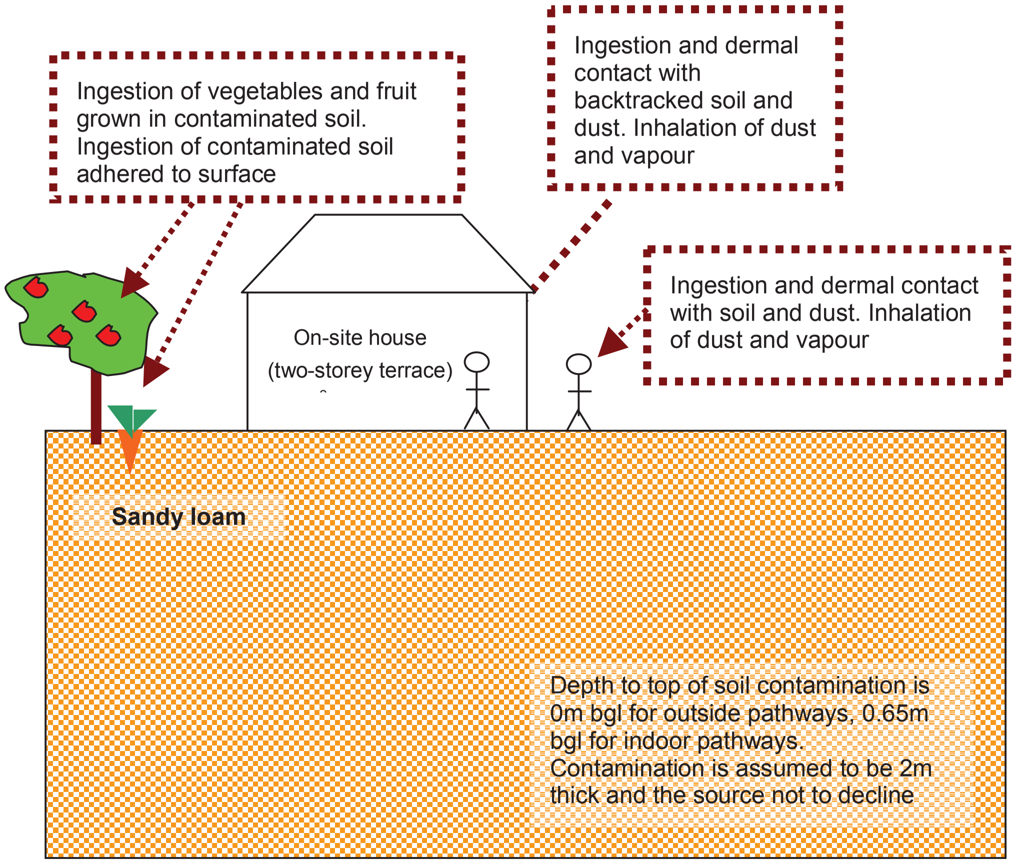

Table 1: Exposure assessment parameters for residential scenario - private gardens – inputs for CLEA model

Parameter	Value	Justification
Land use	Residential with homegrown produce	Chosen land use
Receptor	Female child age 1 to 6	Key generic assumption given in Box 3.1, report SC050021/SR3[(3)]
Building	Small terraced house	Key generic assumption given in Box 3.1, report SC050021/SR3. Two storey small terraced house chosen as it is the most conservative residential building type in terms of protection from vapor intrusion (Section 3.4.6, report SC050021/SR3)[(3)]
Soil type	Sandy Loam	Most common UK soil type (Section 4.3.1, From Table 3.1, report SC050021/SR3)[(3)]
Start AC (age class)	1	Range of age classes corresponding to key generic assumption that the critical receptor is a young female child aged zero to six. From Box 3.1, report SC050021/SR3[(3)]
End AC (age class)	6	
SOM (%)	6	Representative of sandy loamy soil according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[(8)]
	1	To provide SAC for sites where SOM <6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Residential with private gardens –home-grown produce data for CLEA model

	Consumption rate (g FW kg^{-1} BW day^{-1}) by age class						Dry weight conversion factor	Home-grown fraction (average)	Home-grown fraction (high end)	Soil loading factor	Preparation correction factor
Name	1	2	3	4	5	6	g DW g^{-1} FW	-	-	g g^{-1} DW	-
Green vegetables	7.12	6.85	6.85	6.85	3.74	3.74	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	10.69	3.30	3.30	3.30	1.77	1.77	0.103	0.06	0.4	1.00E-03	1.00E+00
Tuber vegetables	16.03	5.46	5.46	5.46	3.38	3.38	0.21	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	1.83	3.96	3.96	3.96	1.85	1.85	0.058	0.06	0.4	1.00E-03	6.00E-01
Shrub fruit	2.23	0.54	0.54	0.54	0.16	0.16	0.166	0.09	0.6	1.00E-03	6.00E-01
Tree fruit	3.82	11.96	11.96	11.96	4.26	4.26	0.157	0.04	0.27	1.00E-03	6.00E-01
Justification	Table 4.17, SR3(3)						Table 6.3, SR3(3)	Table 4.19, SR3(3)		Table 6.3, SR3(3)	

Table 3: Residential with private gardens – land use data for CLEA model

Parameter	Unit	Age class					
		1	2	3	4	5	6
EF (soil and dust ingestion)	day yr^{-1}	180	365	365	365	365	365
EF (consumption of home-grown produce)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, indoor)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, outdoor)	day yr^{-1}	180	365	365	365	365	365
EF (inhalation of dust and vapour, indoor)	day yr^{-1}	365	365	365	365	365	365
EF (inhalation of dust and vapour, outdoor)	day yr^{-1}	365	365	365	365	365	365
Justification		Table 3.1, SR3[(3)]					
Occupancy period (indoor)	hr day^{-1}	23	23	23	23	19	19
Occupancy period (outdoor)	hr day^{-1}	1	1	1	1	1	1
Justification		Table 3.2, SR3[(3)]					
Soil to skin adherence factor (indoor)	mg cm^{-2} day^{-1}	6.00E-02	6.00E-02	6.00E-02	6.00E-02	6.00E-02	6.00E-02
Soil to skin adherence factor (outdoor)	mg cm^{-2} day^{-1}	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Justification		Table 8.1, SR3[(3)]					
Soil and dust ingestion rate	g day^{-1}	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Justification		Table 6.2, SR3[(3)]					

Of note, for **cadmium**, the exposure assessment for a residential land use is based on estimates representative of lifetime exposure AC1-18. This is because the TDI_{oral} and TDI_{inh} – are based on considerations of the kidney burden accumulated over 50 years. It is therefore reasonable to consider exposure not only in childhood but averaged over a longer time period. See the Environment Agency Science report: SC05002 / TOX 3 [(1)] and Science Report SC050021/Cadmium SGV [(1)] for more information.

Table 4: Residential with private gardens – receptor data for CLEA model

Parameter	Unit	Age Class						Justification
		1	2	3	4	5	6	
Body weight	kg	5.6	9.8	12.7	15.1	16.9	19.7	Table 4.6, SR3(3)
Body height	m	0.7	0.8	0.9	0.9	1	1.1	
Inhalation rate	m^3 day^{-1}	8.5	13.3	12.7	12.2	12.2	12.2	Table 4.14, SR3(3)
Max exposed skin fraction (indoor)	m^2 m^{-2}	0.32	0.33	0.32	0.35	0.35	0.33	Table 4.8, SR3(3)
Max exposed skin fraction (outdoor)	m^2 m^{-2}	0.26	0.26	0.25	0.28	0.28	0.26	

See cadmium note as per Table 3 above.

Table 5: Residential with private gardens – soil and building inputs for CLEA model

Parameter	Unit	Value	Justification
Soil properties for sandy loam			
Porosity, total	cm^3 cm^{-3}	0.53	Default soil type is sandy loam, Section 4.3.1, SR3(3) Parameters for sandy loam from Table 4.4, SR3(3)
Porosity, air filled	cm^3 cm^{-3}	0.20	
Porosity, water filled	cm^3 cm^{-3}	0.33	
Residual soil water content	cm^3 cm^{-3}	0.12	
Saturated hydraulic conductivity	cm s^{-1}	3.56E-03	
van Genuchten shape parameter (*m*)	-	3.20E-01	
Bulk density	g cm^{-3}	1.21	
Threshold value of wind speed at 10m	m s^{-1}	7.20	Default value taken from Section 9.2.2, SR3(3)
Empirical function (F_x) for dust model	-	1.22	Value taken from Section 9.2.2, SR3(3)
Ambient soil temperature	K	283	Annual average soil temperature representative of UK surface soils. Section 4.3.1, SR3(3)
Air dispersion model			
Mean annual wind speed (10m)	m s^{-1}	5.00	Default value taken from Section 9.2.2, SR3(3)
Air dispersion factor at height of 0.8m	g m^{-2} s^{-1} per kg m^{-3}	2400	Values for a 0.01 ha site, appropriate to a residential land use in Newcastle (most representative city for UK). (from Table 9.1, SR3)(3) Assumed child of 6 is not tall enough to reach 1.6m
Air dispersion factor at height of 1.6m	g m^{-2} s^{-1} per kg m^{-3}	0	
Fraction of site with hard or vegetative cover	m^2 m^{-2}	0.75	Section 3.2.6, SR3 (3) based on residential land use

Parameter	Unit	Value	Justification
Building properties for small terrace house with ground-bearing floor slab			
Building footprint	m^2	28	From Table 3.3 and 4.21, SR3[(3)]
Living space air exchange rate	hr^{-1}	0.50	
Living space height (above ground)	m	4.8	
Living space height (below ground)	m	0.0	Assumed no basement
Pressure difference (soil to enclosed space)	Pa	3.1	From Table 3.3, SR3[(3)]
Foundation thickness	m	0.15	
Floor crack area	cm^2	423	
Dust loading factor	$\mu g\ m^{-3}$	50	Default value for a residential site taken from Section 9.3, SR3[(3)]
Vapour model			
Default soil gas ingress rate	$cm^3\ s^{-1}$	25	Generic flow rate, Section 10.3, SR3[(3)]
Depth to top of source (beneath building)	cm	50	Section 3.2.6, SR3 [(3)] states source is 50cm below building or 65cm below ground surface
Depth to top of source (no building)	cm	0	Section 10.2, SR3 [(3)] assumes impact from 0m to 1m for outdoor inhalation pathway
Thickness of contaminant layer	cm	200	Model default for indoor air, Section 4.9, SR4[(4)]
Time average period for surface emissions	years	6	Time period of a 0 to 6 year old, Box 3.5, SR3[(3)]
User-defined effective air permeability	cm^2	3.05E-08	Calculated for sandy loam using equations in Appendix 1, SR3[(3)]

Figure 2: GrAC conceptual model for RBCA residential with private gardens scenario

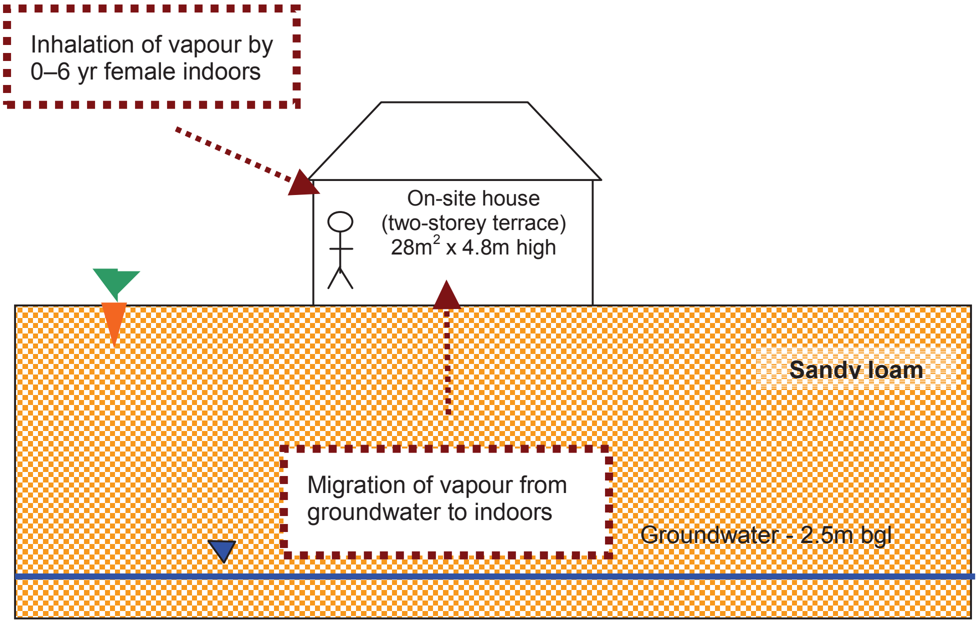

Table 6: Residential with private gardens – RBCA inputs

Parameter	Unit	Value	Justification
Receptor			
Averaging time	Years	6	From Box 3.1, SR3(3)
Receptor weight	kg	13.3	Average of CLEA 0–6 year old female data, Table 4.6, SR3(3)
Exposure duration	Years	6	From Box 3.1, report, SR3(3)
Exposure frequency	Days/yr	350	Weighted using occupancy period of 23 hours per day for 365 days of the year
Soil type – sandy loam			
Total porosity	-	0.53	CLEA value for sandy loam. Parameters for sandy loam from Table 4.4, SR3(3)
Volumetric water content	-	0.33	
Volumetric air content	-	0.20	
Dry bulk density	g cm^{-3}	1.21	
Vertical hydraulic conductivity	cm s^{-1}	3.56E-3	CLEA value for saturated conductivity of sandy loam, Table 4.4, SR3(3)
Vapour permeability	m^2	3.05E-12	Calculated for sandy loam using equations in Appendix 1, SR3(3)
Capillary zone thickness	m	0.1	Professional judgement

Parameter	Unit	Value	Justification
Fraction organic carbon	%	(i) 0.0348	Representative of sandy loam according to EA guidance note dated January 2009 entitled ‘Changes We Have Made to the CLEA Framework Documents’[8]
		(ii) 0.0058	To provide SAC for sites where SOM < 6% as often observed by RSK
Building			
Building volume/area ratio	m	4.8	Table 3.3, SR3[3]
Foundation area	m^2	28	
Foundation perimeter	m	22	Calculated assuming building measures 7m x 4m to give $28m^2$ foundation area
Building air exchange rate	d^{-1}	12	Table 3.3, SR3[3]
Depth to bottom of foundation slab	m	0.15	
Foundation thickness	m	0.15	
Foundation crack fraction	-	0.0151	Calculated from floor crack area of 423 cm^2 and building footprint of $28m^2$ in Table 4.21, SR3[3]
Volumetric water content of cracks	-	0.33	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric air content of cracks	-	0.2	
Indoor/outdoor differential pressure	Pa	3.1	From Table 3.3, SR3[3]

References

1. Environment Agency (2009), 'Science Report SC050021/benzene SGV, toluene SGV, ethylbenzene SGV, xylene SGV, mercury SGV, selenium SGV, nickel SGV, arsenic SGV, cadmium SGV, phenol SGV, dioxins, furans and dioxin like PCBs SGVs', 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', March 2009, May 2009 and September 2009.

2. Environment Agency (2009), *Human health toxicological assessment of contaminants in soil. Science Report – Final SC050021/SR2*, January (Bristol: Environment Agency).

3. Environment Agency (2009), *Science Report – SC050021/SR3. Updated technical background to the CLEA model* (Bristol: Environment Agency).

4. Environment Agency (2009), Contaminated Land Exposure Assessment (CLEA) software, version 1.06.

5. Environment Agency (2008), *Science Report SC050021/SR7. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values* (Bristol: Environment Agency).

6. Chartered Institute for Environmental Health and Land Quality Management (2009), 'The LQM/CIEH Generic Assessment Criteria for Human Health', second edition.

7. CL:AIRE (2009), *Soil Generic Assessment Criteria for Human Health Risk Assessment* (London: CL:AIRE).

8. Changes made to the CLEA framework documents after the three-month evaluation period in 2008, released January 2009 by the Environment Agency.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH PRIVATE GARDENS

Table 7

Human Health Generic Assessment Criteria by Pathway for Residential Scenario - Private Gardens

Compound	Notes	GrAC (mg/l)	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals														
Arsenic	(b)(c)	-	3.24E+01	8.50E+01	-	NR	3.24E+01	8.50E+01	-	NR	3.24E+01	8.50E+01	-	NR
Cadmium	(b)	-	1.12E+01	1.85E+02	1.10E+01	NR	1.12E+01	1.85E+02	1.10E+01	NR	1.12E+01	1.85E+02	1.10E+01	NR
Chromium (III) - oxide		-	1.84E+04	3.55E+03	2.98E+03	NR	1.84E+04	3.55E+03	2.98E+03	NR	1.84E+04	3.55E+03	2.98E+03	NR
Chromium (VI) - hexavalent		-	1.02E+01	4.25E+00	3.21E+00	NR	1.02E+01	4.25E+00	3.21E+00	NR	1.02E+01	4.25E+00	3.21E+00	NR
Copper		-	2.66E+03	1.04E+04	2.33E+03	NR	2.66E+03	1.04E+04	2.33E+03	NR	2.66E+03	1.04E+04	2.33E+03	NR
Lead	(a)	-	3.00E+02	-	-	NR	3.00E+02	-	-	NR	3.00E+02	-	-	NR
Elemental Mercury (Hg^0)	(b)(d)	9.40E-03	-	1.70E-01	-	4.31E+00	-	4.24E-01	-	1.07E+01	-	1.02E+00	-	2.58E+01
Inorganic Mercury (Hg^{2+})	(b)	-	1.81E+02	2.55E+03	1.69E+02	NR	1.81E+02	2.55E+03	1.69E+02	NR	1.81E+02	2.55E+03	1.69E+02	NR
Methyl Mercury (Hg^{4+})	(b)	2.00E+01	1.39E+01	1.59E+01	7.40E+00	7.33E+01	1.39E+01	3.08E+01	9.55E+00	1.42E+02	1.39E+01	6.53E+01	1.14E+01	3.04E+02
Nickel	(b)(d)	-	5.31E+02	1.27E+02	-	NR	5.31E+02	1.27E+02	-	NR	5.31E+02	1.27E+02	-	NR
Selenium	(b)(c)	-	3.50E+02	-	-	NR	3.50E+02	NR	-	NR	3.50E+02	-	-	NR
Zinc	(c)	-	3.75E+03	2.55E+07	-	NR	3.75E+03	2.55E+07	-	NR	3.75E+03	2.55E+07	-	NR
Cyanide		-	2.66E+01	3.97E+00	3.68E+00	NR	2.66E+01	3.97E+00	3.68E+00	NR	2.66E+01	3.97E+00	3.68E+00	NR
Volatile Organic Compounds														
Benzene	(b)	7.20E+00	1.12E-01	2.69E-01	7.92E-02	1.22E+03	2.28E-01	4.99E-01	1.57E-01	2.26E+03	4.89E-01	1.04E+00	3.32E-01	4.71E+03
Toluene	(b)	1.90E+03	1.47E+02	6.26E+02	1.19E+02	8.69E+02	3.35E+02	1.38E+03	2.70E+02	1.92E+03	7.59E+02	3.14E+03	6.11E+02	4.36E+03
Ethylbenzene	(b)	2.60E+02	1.06E+02	1.70E+02	6.52E+01	5.18E+02	2.51E+02	3.98E+02	1.54E+02	1.22E+03	5.70E+02	9.32E+02	3.54E+02	2.84E+03
Xylene - m		8.40E+01	2.02E+02	5.56E+01	4.36E+01	6.25E+02	4.80E+02	1.31E+02	1.03E+02	1.47E+03	1.09E+03	3.07E+02	2.40E+02	3.46E+03
Xylene - o	(b)	1.00E+02	1.85E+02	5.98E+01	4.52E+01	4.78E+02	4.38E+02	1.40E+02	1.06E+02	1.12E+03	9.96E+02	3.27E+02	2.46E+02	2.62E+03
Xylene - p		8.70E+01	1.91E+02	5.34E+01	4.17E+01	5.76E+02	4.51E+02	1.26E+02	9.82E+01	1.35E+03	1.02E+03	2.94E+02	2.28E+02	3.17E+03
Total xylene		8.40E+01	2.02E+02	5.56E+01	4.36E+01	6.25E+02	4.80E+02	1.31E+02	1.03E+02	1.47E+03	1.09E+03	3.07E+02	2.40E+02	3.46E+03
Methyl t-Butyl ether		2.20E+03	1.75E+00	1.84E+02	1.75E+00	1.66E+04	3.68E+00	2.40E+02	3.67E+00	2.16E+04	7.41E+00	3.70E+02	7.37E+00	3.34E+04
Trichloroethene		1.80E+00	2.83E+00	1.10E-01	1.06E-01	1.54E+03	6.25E+00	2.30E-01	2.22E-01	3.22E+03	1.40E+01	5.11E-01	4.93E-01	7.14E+03
Tetrachloroethene		3.60E+00	1.06E+01	1.03E+00	9.36E-01	4.24E+02	2.44E+01	2.30E+00	2.10E+00	9.51E+02	5.55E+01	5.28E+00	4.82E+00	2.18E+03
1,1,1-Trichloroethane		2.60E+01	3.20E+02	6.33E+00	6.21E+00	1.43E+03	6.97E+02	1.29E+01	1.27E+01	2.92E+03	1.55E+03	2.84E+01	2.79E+01	6.39E+03
1,1,1,2 Tetrachloroethane		1.40E+01	5.19E+00	1.08E+00	8.93E-01	2.60E+03	1.22E+01	2.50E+00	2.08E+00	6.02E+03	2.78E+01	5.83E+00	4.82E+00	1.40E+04
1,1,2,2-Tetrachloroethane		1.40E+01	2.70E+00	2.76E+00	1.37E+00	2.67E+03	5.85E+00	5.65E+00	2.87E+00	5.46E+03	1.30E+01	1.24E+01	6.34E+00	1.20E+04
Carbon Tetrachloride		5.50E-02	1.05E+00	1.81E-02	1.79E-02	1.52E+03	2.41E+00	3.97E-02	3.93E-02	3.32E+03	5.44E+00	8.99E-02	8.92E-02	7.54E+03
1,2-Dichloroethane		3.00E-01	3.06E-02	6.46E-03	5.34E-03	3.41E+03	5.53E-02	9.32E-03	7.98E-03	4.91E+03	1.05E-01	1.60E-02	1.39E-02	8.43E+03
Vinyl Chloride		1.90E-02	3.69E-03	5.43E-04	4.73E-04	1.36E+03	6.64E-03	7.02E-04	6.35E-04	1.76E+03	1.21E-02	1.07E-03	9.86E-04	2.69E+03
1,2,4-Trimethylbenzene		7.50E-02	-	3.51E-01	-	5.57E+02	-	8.55E-01	-	1.36E+03	-	2.10E+00	-	3.25E+03
1,3,5-Trimethylbenzene		4.70E-02	1.45E+01	4.60E-01	4.56E-01	9.47E+01	3.47E+01	1.10E+00	1.09E+00	2.26E+02	7.94E+01	2.59E+00	2.56E+00	5.33E+02
Semi-Volatile Organic Compounds														
Acenaphthene		3.20E+00	2.18E+02	3.46E+03	2.05E+02	5.70E+01	5.08E+02	8.54E+03	4.79E+02	1.41E+02	1.06E+03	2.03E+04	1.01E+03	3.36E+02
Acenaphthylene		4.20E+00	1.78E+02	3.27E+03	1.68E+02	8.61E+01	4.17E+02	8.03E+03	3.97E+02	2.12E+02	8.90E+02	1.91E+04	8.51E+02	5.06E+02
Anthracene		2.10E-02	2.31E+03	1.08E+05	2.26E+03	1.17E+00	5.03E+03	2.65E+05	4.93E+03	2.91E+00	9.33E+03	6.15E+05	9.19E+03	6.96E+00
Benzo(a)anthracene		3.80E-03	7.00E+00	5.55E+00	3.10E+00	1.71E+00	8.98E+00	9.83E+00	4.69E+00	4.28E+00	1.01E+01	1.41E+01	5.88E+00	1.03E+01
Benzo(b)fluoranthene		2.00E-03	8.06E+00	1.79E+01	5.56E+00	1.22E+00	9.78E+00	1.97E+01	6.53E+00	3.04E+00	1.07E+01	2.05E+01	7.02E+00	7.29E+00
Benzo(g,h,i)perylene		2.60E-04	6.68E+01	1.27E+02	4.38E+01	1.54E-02	7.04E+01	1.32E+02	4.59E+01	3.85E-02	7.19E+01	1.34E+02	4.68E+01	9.23E-02
Benzo(k)fluoranthene		8.00E-04	1.25E+01	2.66E+01	8.51E+00	6.87E-01	1.44E+01	2.83E+01	9.56E+00	1.72E+00	1.53E+01	2.91E+01	1.00E+01	4.12E+00
Chrysene		2.00E-03	8.76E+00	1.95E+01	6.00E+00	4.40E-01	1.20E+01	2.45E+01	8.04E+00	1.10E+00	1.41E+01	2.72E+01	9.27E+00	2.64E+00
Dibenzo(a,h)anthracene		6.00E-04	1.19E+00	2.13E+00	7.62E-01	3.93E-03	1.33E+00	2.42E+00	8.58E-01	9.82E-03	1.39E+00	2.56E+00	9.03E-01	2.36E-02
Fluoranthene		2.30E-01	2.59E+02	2.69E+04	2.57E+02	1.89E+01	4.67E+02	6.23E+04	4.63E+02	4.73E+01	6.78E+02	1.28E+05	6.74E+02	1.13E+02
Fluorene		1.90E+00	1.70E+02	4.35E+03	1.63E+02	3.09E+01	3.91E+02	1.07E+04	3.77E+02	7.65E+01	8.00E+02	2.54E+04	7.76E+02	1.83E+02
Indeno(1,2,3-cd)pyrene		2.00E-04	4.58E+00	1.04E+01	3.18E+00	6.13E-02	5.74E+00	1.17E+01	3.85E+00	1.53E-01	6.37E+00	1.22E+01	4.19E+00	3.68E-01
Phenanthrene		5.30E-01	9.35E+01	5.04E+03	9.18E+01	3.60E+01	2.04E+02	1.23E+04	2.01E+02	8.96E+01	3.81E+02	2.86E+04	3.76E+02	2.14E+02
Pyrene		1.30E-01	5.69E+02	6.18E+04	5.63E+02	2.20E+00	1.05E+03	1.44E+05	1.04E+03	5.49E+00	1.56E+03	2.97E+05	1.56E+03	1.32E+01
Benzo(a)pyrene		3.80E-03	1.21E+00	2.62E+00	8.26E-01	9.11E-01	1.42E+00	2.81E+00	9.43E-01	2.28E+00	1.52E+00	2.90E+00	9.98E-01	5.46E+00
Naphthalene		1.90E+01	2.68E+01	1.64E+00	1.54E+00	7.64E+01	6.36E+01	3.93E+00	3.70E+00	1.83E+02	1.43E+02	9.27E+00	8.71E+00	4.32E+02
Phenol	(b)	-	4.51E+02	3.11E+02	1.84E+02	4.16E+04	9.38E+02	4.20E+02	2.90E+02	8.15E+04	2.04E+03	5.21E+02	4.15E+02	1.74E+05

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH PRIVATE GARDENS

Table 7

Human Health Generic Assessment Criteria by Pathway for Residential Scenario - Private Gardens

Compound	Notes	GrAC (mg/l)	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Total Petroleum Hydrocarbons														
Aliphatic hydrocarbons EC_5-EC_6		1.00E+01	4.79E+03	2.98E+01	2.97E+01	3.04E+02	1.08E+04	5.47E+01	5.46E+01	5.58E+02	2.35E+04	1.13E+02	1.13E+02	1.15E+03
Aliphatic hydrocarbons >EC_6-EC_8		5.40E+00	1.43E+04	7.27E+01	7.26E+01	1.44E+02	3.21E+04	1.62E+02	1.62E+02	3.22E+02	6.36E+04	3.72E+02	3.71E+02	7.36E+02
Aliphatic hydrocarbons >EC_8-EC_{10}		2.30E-01	1.46E+03	1.89E+01	1.88E+01	7.77E+01	2.44E+03	4.60E+01	4.58E+01	1.90E+02	3.30E+03	1.09E+02	1.08E+02	4.51E+02
Aliphatic hydrocarbons >EC_{10}-EC_{12}		3.40E-02	3.52E+03	9.34E+01	9.28E+01	4.75E+01	4.01E+03	2.32E+02	2.29E+02	1.18E+02	4.24E+03	5.57E+02	5.37E+02	2.83E+02
Aliphatic hydrocarbons >EC_{12}-EC_{16}		7.60E-04	4.37E+03	7.82E+02	7.44E+02	2.37E+01	4.40E+03	1.95E+03	1.69E+03	5.91E+01	4.41E+03	4.68E+03	3.03E+03	1.42E+00
Aliphatic hydrocarbons >EC_{16}-EC_{35}	(c)	-	4.51E+04	-	-	8.48E+00	6.38E+04	-	-	2.12E+01	7.61E+04	-	-	5.09E+01
Aliphatic hydrocarbons >EC_{35}-EC_{44}	(c)	-	4.51E+04	-	-	8.48E+00	6.38E+04	-	-	2.12E+01	7.61E+04	-	-	5.09E+01
Aromatic hydrocarbons >EC_8-EC_9 (styrene)		7.40E+00	1.66E+02	2.65E+02	1.33E+02	6.20E+02	3.92E+02	6.47E+02	3.16E+02	1.52E+03	8.50E+02	1.54E+03	7.02E+02	3.61E+03
Aromatic hydrocarbons >EC_9-EC_{10}		7.40E+00	5.55E+01	3.33E+01	2.69E+01	6.13E+02	1.31E+02	8.16E+01	6.54E+01	1.50E+03	2.84E+02	1.94E+02	1.51E+02	3.58E+02
Aromatic hydrocarbons >EC_{10}-EC_{12}		2.50E+01	7.97E+01	1.82E+02	6.91E+01	3.64E+02	1.86E+02	4.48E+02	1.62E+02	8.99E+02	3.87E+02	1.07E+03	3.46E+02	2.15E+03
Aromatic hydrocarbons >EC_{12}-EC_{16}		5.80E+00	1.40E+02	2.00E+03	1.38E+02	1.69E+02	3.13E+02	4.96E+03	3.08E+02	4.19E+02	6.01E+02	1.18E+04	5.93E+02	1.00E+03
Aromatic hydrocarbons >EC_{16}-EC_{21}	(c)	-	2.47E+02	-	-	5.37E+01	4.82E+02	-	-	1.34E+02	7.66E+02	-	-	3.21E+02
Aromatic hydrocarbons >EC_{21}-EC_{35}	(c)	-	8.88E+02	-	-	4.83E+00	1.11E+03	-	-	1.21E+01	1.22E+03	-	-	2.90E+01
Aromatic hydrocarbons >EC_{35}-EC_{44}	(c)	-	8.88E+02	-	-	4.83E+00	1.11E+03	-	-	1.21E+01	1.22E+03	-	-	2.90E+01

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.
NR - the compound is not volatile and therefore a soil saturation limit not calculated within CLEA
EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly effect the interpretation of any exceedances since the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. This shading has also been used for the RBCA output where the theoretical solubility limit has been exceeded. The SAC has been set as the model calculated SAC with the saturation limits shown in brackets.
Calculated SAC exceeds soil saturation limit but will not effect the SSV significantly since the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.
Calculated SAC does not exceed the soil saturation limit.

For consistency where the theoretical solubility limit within RBCA has been exceeded in production of the GrAC, these cellls have also been hatched red.

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.
SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3

(a) Sensitivity analysis undertaken on SEGH equation and CLEA model, considered reasonable in absence of UK specific data
(b) GAC taken from the Environment Agency SGV reports published 2009.
(c) SAC for selenium, aliphatic and aromatic hydrocarbons >EC16 does not include inhalation pathway owing to absence of toxicity data. SAC for arsenic is only based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The same approach has been adopted for zinc.
(d) SAC for elemental mercury, chromium VI and nickel is based on the inhalation pathway only owing to an absence of toxicity for elemental mercury, in accordance with the SGV report for nickel and LQM report for chromium VI.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH PRIVATE GARDENS

Table 8
Human Health Generic Assessment Criteria for Residential Scenario - Private Gardens

Compound	GrAC for Groundwater (mg/l)	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals				
Arsenic	-	32	32	32
Cadmium	-	10	10	10
Chormium (III) - oxide	-	3,000	3,000	3,000
Chromium (VI) - hexavalent	-	4.3	4.3	4.3
Copper	-	2,300	2,300	2,300
Lead	-	300	300	300
Elemental Mercury (Hg^0)	0.009	0.17	0.42	1.0
Inorganic Mercury (Hg^{2+})	-	170	170	170
Methyl Mercury (Hg^{4+})	20	7.4	9.6	11
Nickel	-	130	130	130
Selenium	-	350	350	350
Zinc	-	3,800	3,800	3,800
Cyanide	-	3.7	3.7	3.7
Volatile Organic Compounds				
Benzene	7	0.079	0.157	0.33
Toluene	1,900	120	270	610
Ethylbenzene	260	65	154	350
Xylene - m	100	44	103	240
Xylene - o	87	45	106	250
Xylene - p	84	42	98	230
Total xylene	84	44	103	240
Methyl tertiary butyl ether (MTBE)	2,200	1.8	3.7	7.4
Trichloroethene	1.8	0.11	0.2	0.49
Tetrachloroethene	3.6	0.94	2.1	4.8
1,1,1-Trichloroethane	26	6.2	12.7	28
1,1,1,2Tetrachloroethane	14	0.89	2.1	4.8
1,1,2,2-Tetrachloroethane	14	1.4	2.87	6.3
Carbon Tetrachloride	0.055	0.018	0.039	0.089
1,2-Dichloroethane	0.30	0.0053	0.0080	0.014
Vinyl Chloride	0.019	0.00047	0.0006	0.001
1,2,4-Trimethylbenzene	0.075	0.35	0.85	2.1
1,3,5-Trimethylbenzene	0.047	0.46	1.1	2.6
Semi-Volatile Organic Compounds				
Acenaphthene	3.2	210	480	1,000
Acenaphthylene	4.2	170	400	850
Anthracene	0.021	2,300	4,900	9,200
Benzo(a)anthracene	0.0038	3.1	4.7	5.9
Benzo(b)fluoranthene	0.0020	5.6	6.5	7.0
Benzo(g,h,i)perylene	0.00026	44	46	47
Benzo(k)fluoranthene	0.00080	8.5	9.6	10
Chrysene	0.0020	6.0	8.0	9.3
Dibenzo(a,h)anthracene	0.00060	0.76	0.86	0.90
Fluoranthene	0.23	260	460	670
Fluorene	1.9	160	380	780
Indeno(1,2,3-cd)pyrene	0.0002	3.2	3.8	4.2
Phenanthrene	0.53	92	200	380
Pyrene	0.13	560	1,000	1,600
Benzo(a)pyrene	0.0038	0.83	0.94	1.0
Naphthalene	19	1.5	3.7	8.7
Phenol	-	180	290	420
Total Petroleum Hydrocarbons				
Aliphatic hydrocarbons EC_5-EC_6	10	30	55	110
Aliphatic hydrocarbons >EC_6-EC_8	5.4	73	160	370
Aliphatic hydrocarbons >EC_8-EC_{10}	0.23	19	46	110
Aliphatic hydrocarbons >EC_{10}-EC_{12}	0.034	93 (48)	230 (118)	540 (283)
Aliphatic hydrocarbons >EC_{12}-EC_{16}	0.00076	744 (24)	1,700 (59)	3,000 (142)
Aliphatic hydrocarbons >EC_{16}-EC_{35}	-	45,100 (8.48)	64,000 (21)	76,000
Aliphatic hydrocarbons >EC_{35}-EC_{44}	-	45,100 (8.48)	64,000 (21)	76,000
Aromatic hydrocarbons >EC_8-EC_9 (styrene)	7.4	130	316	700
Aromatic hydrocarbons >EC_9-EC_{10}	7.4	27	65	150
Aromatic hydrocarbons >EC_{10}-EC_{12}	25	69	160	346
Aromatic hydrocarbons >EC_{12}-EC_{16}	5.8	140	310	593
Aromatic hydrocarbons >EC_{16}-EC_{21}	-	250	480	770
Aromatic hydrocarbons >EC_{21}-EC_{35}	-	890	1,100	1,230
Aromatic hydrocarbons >EC_{35}-EC_{44}	-	890	1,100	1,230

Notes:
'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58.
1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

The SAC has been set as the model calculated SAC with the saturation limit shown in brackets.
For consistency where the GrAC exceeds the solubility limit, GrAC has been set at the solubility limit. The GrAC conservative since concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free-phase product is absent.