Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT
Environmental Consultancy
LLP

Partnership No: OC 300776

New Settlement Area, Heyford Park, Oxfordshire

Dorchester Phase 5C - Post Remediation Vapour Risk Assessment

For: Dorchester Heyford Park Group Ltd

March 2020

R1742d-R01-v1 Final

DOCUMENT CONTROL SHEET

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Signed for Smith Grant LLP

	Name	Position	Signature	Date
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NEW SETTLEMENT AREA, HEYFORD PARK, OXFORDSHIRE

DORCHESTER PHASE 5C - POST REMEDIATION VAPOUR RISK ASSESSMENT

For: Dorchester Heyford Park Group Ltd

March 2020

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DRAWINGS

APPENDICES

1. Introduction

1.1 Remediation earthworks to prepare the Dorchester Phase 5 area of the Heyford Park development off Camp Road, Upper Heyford, for a residential land use have been undertaken by Urban Regen Ltd. (URL) on behalf of Dorchester Homes (DH). Smith Grant LLP (SGP) were appointed to validate the remedial works carried out on the site.

1.2 The Remediation Strategy (R1742-R01) for the site (under the planning boundary for the New Settlement Area) was prepared and submitted to Cherwell District Council (CDC) and was approved on 01.10.14.

1.3 The Strategy identified that the main contamination sources requiring remediation within the New Settlement Area were underground storage tanks which were used to store fuels associated with a former fuel filling station and several boiler houses. No other locations or sources of contamination had been identified through the previous assessments.

1.4 Preparatory earthworks have been completed within the Dorchester Phase 5 area and have been reported in several phases due to the size of the site; these are as follows:

- R1742b-R10-v2 (February 2016)
- R1742b-L03 (December 2017)
- R1742b-L06 (May 2018)

1.5 During construction works in the north of Dorchester Phase 5 (herein referred to as Phase 5C), an area of previously uncharacterised contamination was identified consisting of bitumen and diesel impacted soils beneath a cover of replaced weathered bedrock. Following identification of the contamination, the Local Authority was notified by letter (R1742-190618) and remediation of the contaminated area was carried out by URL under the approved Strategy. These works were carried out over 3 phases and Remediation Works Verification Reports were prepared (refs. R1742b-R16-v2 and R1742-R18-v1) and submitted to Cherwell District Council & South Northamptonshire Council (CDC/SNC) for comment on 08.08.18 and 08.01.20, respectively.

1.6 The Remediation Works Verification Reports confirmed that all feasible extents of contamination had been removed but that residual contamination may remain within either impacted bedrock (the Strategy does not require the remediation of bedrock) or within potentially impacted soils beneath retained roads to the north (Camp Road) and south of the excavation area.

1.7 SGP recommended (R1742-R18-v1) that either further risk assessment should be undertaken using vapour monitoring wells or that a precautionary approach through the installation of a ventilated void and installation of gas membranes specific for hydrocarbon resistance should be installed within Plots 869-891. The proposed development layout for Phase 5C is attached to this report (Drawing ref. 0521-PH5C-102).

1.8 Dorchester Homes' preferred option was to undertake vapour monitoring and assessment to establish where the installation of VOC protection measures is necessary. SGP produced and submitted a propose scope of works for the VOC assessment (ref. R1742d-L20200108) to CDC/SNC on 09.01.20, a formal response approving the methodology was received on 10.01.20.

1.9 This report details the findings of the above assessment, provides a further quantitative risk assessment on the results and makes recommendations on further monitoring / precautionary mitigation measures as necessary.

2. Methodology

2.1 Monitoring Locations and Installations

2.1.1 Installations for the monitoring of VOCs were constructed on 22.01.20 in accordance with British Standard BS8576:2013[1] (Section 10.2.3) and were located on an approximate 50m spacing in the footprints of the proposed buildings as indicated on Drawing D01. This involved the drilling of 8 boreholes extending to 1m below ground level and placement of 1.5m steel monitoring probes with holes drilled in the bottom 0.5m to provide a response zone into the window sampler boreholes. Approximately 0.5m of the probe was left above ground level allow their identification and minimise potential disturbance or destruction. The lower 0.5m was surrounded by permeable fill (10mm single-sized stone gravel) and an annulus of hydrated bentonite pellets was compacted at the surface to provide a sufficient seal.

2.1.2 Following installation of the probes, passive diffusion tubes (provided by Gradko International Ltd.) with appropriate adsorption media for volatile aliphatic and aromatic hydrocarbons (<C16 and BTEX) were secured to the probe caps and sealed with PFTE tape. The diffusion tubes were then left in-situ for a period specified by the laboratory (3 weeks) to allow sufficient adsorption of determinants and achieve a suitable limit of detection (LOD) for comparison with assessment criteria.

Figure 1. Vapour Probe Construction

Steel vapour probe (1.5m) installed within window sampler hole to 1m bgl. Gravel packing between 0.5-1.0m bgl and bentonite seal from 0.0-0.5m bgl. Diffusion tube as supplied by Gradko International Ltd. secured to screw top and sealed with PTFE tape.

2.1.3 A travel blank (to check for cross-contamination which remained sealed) and an external tube to provide background concentrations located in the northeast corner of the site were also used during the monitoring period.

2.1.4 Diffusion tubes were left in-situ for a period of 3 weeks before collection on 13.02.20, tubes were then couriered to Gradko International Ltd. analysis (lab ref. O01578R).

[1] BS 8576:2016 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)

2.2 Derivation of Inhalation Assessment Criteria

2.2.1 To determine whether concentrations of the contaminants of concern were present at a level which may pose a risk to human health, derivation of assessment criteria was carried out.

2.2.2 The methodology for deriving assessment screening criteria for health impacts from VOCs at the receptor is set out in Appendix 9 of the VOC handbook[2]. Tolerable Daily Soil Intake values or Index Doses (for non-carcinogens and carcinogens respectively) are multiplied by the body weight (13.3 kg) and divided by the inhalation rate (8.8 m^3/day) of a child receptor as defined in the most recent published UK guidance (DEFRA C4SL). Most of the substances under consideration have toxicological inhalation data published in the "LQM/CIEH S4ULs for Human Health Risk Assessment" (S4UL) - *Copyright Land Quality Management Limited reproduced with Permission* or CL:AIRE "Soil Generic Assessment Criteria for Human Health Risk Assessment".

2.2.3 TDI's and / or ID's used in the determination of inhalation assessment criteria and are summarised in the table below:

Table 1. Derived Inhalation Assessment Criteria

Contaminant	Index Dose/Tolerable Daily Intake ($\mu g/kg.bw.day^{-1}$)	Assessment Criteria ($\mu g.m^3$)
Benzene	1.4 (S4UL)	2.12
Toluene	1400 (S4UL)	2,115.91
Ethylbenzene	74.3 (S4UL)	112.29
m/p-xylene	60 (S4UL)	90.68
o-xylene	60 (S4UL)	90.68
Aliphatic Hydrocarbons (C6-C8)	5000 (S4UL)	7,556.82
Aliphatic Hydrocarbons (C8-C10)	290 (S4UL)	438.3
Aliphatic Hydrocarbons (C10-C12)	290 (S4UL)	438.3
Aliphatic Hydrocarbons (C12-C16)	290 (S4UL)	438.3
Aromatic Hydrocarbons (C5-C7)	1400 (S4UL)	2,115.91
Aromatic Hydrocarbons (C7-C8)	1400 (S4UL)	2,115.91
Aromatic Hydrocarbons (C8-C10)	60 (S4UL)	90.68
Aromatic Hydrocarbons (C10-C12)	60 (S4UL)	90.68
Aromatic Hydrocarbons (C12-C16)	60 (S4UL)	90.68

2.2.4 The assessment criteria are inherently conservative, as they assume long-term, constant exposure of residents over 24 hr periods, 365 days a year and a continuous source which does not diminish over time. However, for the most vulnerable receptors, infants and small children, significant amounts of time spent within dwellings may be anticipated.

[2] CIRIA C682: The VOCs Handbook: Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination 2009

3. Vapour Risk Assessment

3.1. Comparison of soil-vapour concentrations determined through diffusion tube monitoring are compared to the derived inhalation assessment criteria in the table below with laboratory results provided in Appendix A.

Table 2. Derivation of Assessment Criteria and Comparison to Soil-Vapour Concentrations

Contaminant	Assessment Criteria (µg/m^3)	Soil-Vapour Range of concentrations (µg/m^3)	Exceedances
Benzene	2.12	0.7-4.6	**V1, V7**
Toluene	2,115.91	0.7-5.9	None
Ethylbenzene	112.29	<0.5-0.8	None
m/p-xylene	90.68	<0.5-1.8	None
o-xylene	90.68	<0.5-0.7	None
Aliphatic Hydrocarbons (EC6-8)	7,556.82	<1.6-145	None
Aliphatic Hydrocarbons (EC8-10)	438.3	Not detected – 7,513	**V1, V2, V3**
Aliphatic Hydrocarbons (EC10-12)	438.3	Not detected – 1,195	**V1**
Aliphatic Hydrocarbons (EC12-16)	438.3	Not detected – 3.9	None
Aromatic Hydrocarbons (EC5-7)	2,115.91	0.7-4.6	None
Aromatic Hydrocarbons (EC7-8)	2,115.91	0.7-5.9	None
Aromatic Hydrocarbons (EC8-10)	90.68	Not detected – 1.6	None
Aromatic Hydrocarbons (EC10-12)	90.68	Not detected – 5.5	None
Aromatic Hydrocarbons (EC12-16)	90.68	Not detected	None

3.2. Exceedances of the derived assessment criteria for the aliphatic hydrocarbon range EC8-EC10 were reported within vapour probes ‘V1’ (7513 µg/m^3), ‘V2’ (665 µg/m^3) and ‘V3’ (453 µg/m^3), as well as the aliphatic hydrocarbon range EC10-E12 within probe ‘V1’ at 1,195 µg/m^3. Exceedances for benzene were also reported within vapour probes ‘V1’ and ‘V7’ at 4.3 µg/m^3 and 4.6 µg/m^3, respectively.

3.3. Concentrations of TEX, Aliphatic EC6-8/EC12-16 and Aromatic EC5-12 hydrocarbon compounds were also reported above detection limits, but not at concentrations exceeding the assessment criteria.

3.4. Whilst exceedances within the soil-vapour phase have been reported for benzene and the aliphatic hydrocarbon ranges EC8-EC10 and EC10-E12, this does not necessarily represent concentrations within future dwellings and so further assessment is required to determine the likelihood whether indoor air concentrations would exceed the assessment criteria.

3.5. Quantitative Vapour Risk Assessment

The CLEA model predicts indoor vapour concentrations based on the Johnson and Ettinger (1991) equations utilising predicted soil-gas concentrations as derived through CLEA. Site specific soil-gas concentrations as determined through monitoring (as described above), and the maximum recorded concentrations for benzene and the aliphatic hydrocarbon ranges EC8-EC10 and EC10-E12 have been input into the CLEA v1.071 model to derive site-specific indoor vapour concentrations for comparison to health-critical indoor air targets.

3.6. To produce an assessment of predicted indoor vapour concentrations, site-specific criteria have been adopted where possible supplemented by literature-based or default values. A summary of the CLEA parameters of contaminant, building, soil and receptor are provided below whilst values and their justification / source are referenced in Appendix B.

Contaminant

3.7. Physio-chemical and toxicological values for benzene and the aliphatic hydrocarbon ranges EC8-EC10 and EC10-E12 were adopted from the LQM/CIEH Suitable For Use Levels for Human Health Risk Assessment[3].

3.8. Default CLEA values as reported within CLEA SR3[4] and used within the production of S4ULs were adopted as sub-surface soil to indoor air correction factors as contaminant specific values are not available.

Building

3.9. A number of building parameters including air exchange rates, pressure difference, floor crack area, dust loading factor and soil gas ingress rate were used based on the CLEA SR3 default building parameters for residential properties. In the absence of default parameters for apartments and where site-specific data is not available, the worst-case values for the differing types of residential properties have been utilised where applicable to allow for a conservative assessment (i.e. floor crack area – bungalow).

3.10. To allow a conservative yet representative assessment, the size of the smallest apartment (as detailed in plans provided by DL) has been utilised. This corresponds to Plot 875 which has a footprint of approximately 57m^2 and a living space height of 2.4m. The minimum specified thickness of C30 concrete topping overlying the block and beam foundation construction (75mm) has also been utilised for the 'foundation thickness' value.

Soil

3.11. The Phase 5C Remediation Works Verification Reports describe that the soils replaced following excavation and removal of grossly contaminated soils comprised a small volume of weathered

[3] Nathaniel, C.P., McCaffrey, C., Gillet, A.G., Ogden, R.C. and Nathanial, J.F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. Copyright LQM/CIEH – All rights reserved

[4] Environment Agency. 2009. Updated Technical Background to the CLEA Model. Science Report: SC050021/SR3

limestone bedrock fill and more substantial quantities of clay. To allow for a highly conservative assessment, the worst-case granular constituent (sand) soil has been adopted as the dominant soil type.

3.12. Soil Organic Matter (SOM) and pH values of 1.5% and 8.6 respectively have been generated through averaging of soil data from formation sampling across the wider Phase 5 area.

Receptor

3.13. A future site resident has been identified as the critical receptor with the model utilising the CLEA default values as reported within the SR3 document for a female aged between 0 and 6 years.

3.14. CLEA Predicted Indoor Air Concentrations

The CLEA model was run utilising the updated published values and site-specific criteria for all of the contaminants which exceeded the derived inhalation criteria with an inhalation exposure pathway only. The output values are summarised in the table below with CLEA output worksheets provided in Appendix C and are compared to derived inhalation assessment criteria as reproduced in Table 3.

Table 3 Comparison of assessment criteria and CLEA predicted indoor air concentrations

Compound	CLEA predicted indoor air concentration (µg.m^3)	Assessment Criteria (µg.m^3)	Exceedances
Benzene	0.000432	2.12	None
Aliphatic Hydrocarbons (EC8-10)	0.731	438.3	None
Aliphatic Hydrocarbons (EC10-12)	0.116	438.3	None

3.15. The predicted indoor air concentrations of benzene (0.000432 µg.m^3), aliphatic hydrocarbons EC8-10 (0.731 µg.m^3) and EC10-12 (0.116 µg.m3) are all substantially below the derived inhalation assessment criteria of 2.12 µg.m^3, 438.3 µg.m^3 and 438.3 µg.m^3, respectively. This assessment is considered to be highly conservative based on the assumptions made, including duration of indoor occupation, sand as being the predominant soil type and the smallest dwelling type. It is also recognised that the model does not take into account the dilution and dispersion that takes place within the sub-floor void which is to be constructed under current foundation designs.

4. Conclusions and Recommendations

4.1. Previous investigation and validation data from soils analysis had indicated that volatile hydrocarbons were the main contaminants of concern in the remediated hotspot area. In-situ vapour monitoring was completed on an approximate 50m spacing with vapour probes located in the footprints of proposed buildings to intercept the potential pathway of any residual contaminants migrating from the remediated hotspot into future dwellings. Concentrations of BTEX and volatile hydrocarbons (<C16) within the soil-gas phase were compared to derived inhalation criteria with concentrations of benzene and aliphatic hydrocarbon ranges EC8-10 and EC10-12 exceeding the criteria within a total of four locations ('V1', 'V2', 'V3' and 'V7').

4.2. To assess the significance of the exceedances within the soil-vapour phase further, the CLEA model was used to predict indoor air concentrations. The model used authoritative physio-chemical and toxicological data for the determinants and provided a conservative assessment based on duration of occupation, soil type and building type. Site specific parameters for the building type were used to provide a representative assessment of the dwelling with the smallest living space taken from plans provided by Dorchester Living: Plot 875 (apartment).

4.3. Predicted indoor air concentrations were significantly below the derived inhalation assessment criteria and it is further acknowledged that the model does not take into account the protection provided by a sub-floor void where further dilution and dispersion of vapour is likely to occur. It is also acknowledged that further contamination source removal is scheduled to take place to the direct north of the hotspot remediation area which could further reduce any residual concentrations along the northern boundary.

4.4. The soil-vapour monitoring programme and subsequent assessment demonstrates that predicted indoor air concentrations of hydrocarbons in proposed future dwellings emanating from the remediated hotspot are substantially below derived inhalation criteria. It is also recognised that this is a highly conservative assessment. It is considered that further monitoring or assessment is not required and that there is no requirement for the installation of VOC resistant gas protection measures within plots in Phase 5C of the development.

4.5. It is recommended that all plots within the Phase 5C are constructed with a sub-floor void to allow sufficient dilution and dispersion of any residual vapours.

General

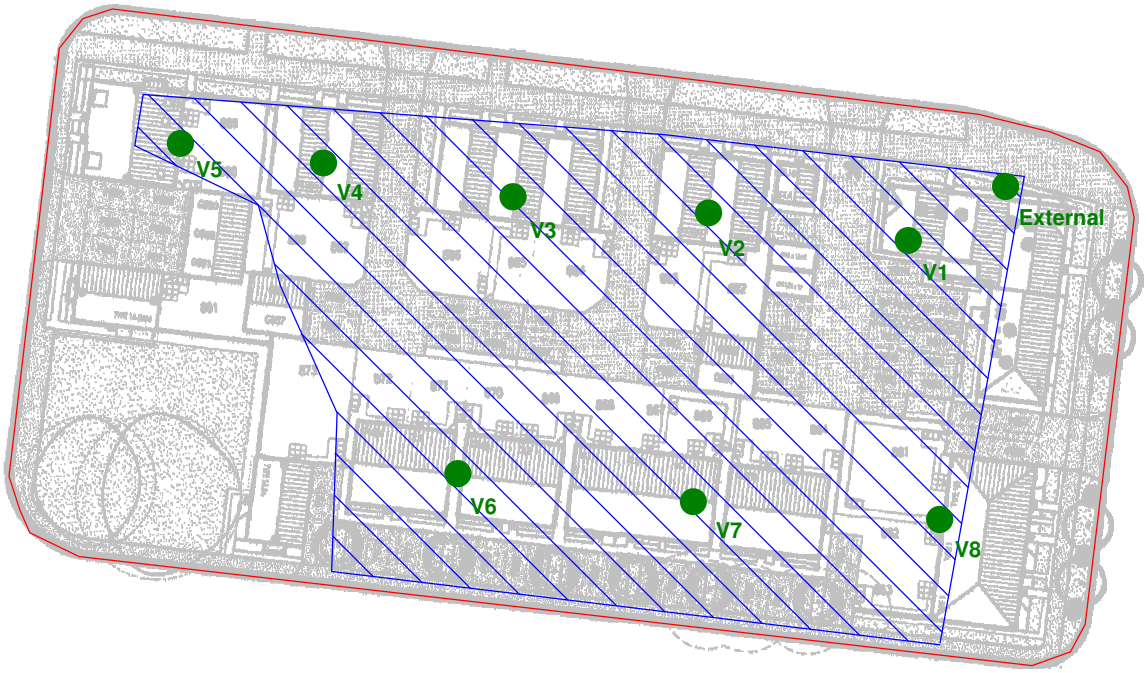
4.6. This report has been prepared by SGP for the sole and exclusive use of Dorchester Heyford Park Group Ltd. Reasonable skill, care and diligence has been exercised within the budget available, and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in undertaking the assessment and preparing this report, it is possible that other ground conditions and contamination as yet undetected may exist. Reliance on the findings of this report must therefore be limited accordingly. Such reliance must be based on the

whole report and not on extracts which may lead to incomplete or incorrect conclusions when taken out of context.

4.7. Any comments made on soil-air vapour conditions are based on observations or tests made at the time that the work was carried out. It should be noted that concentrations of substances may vary according to seasonal or weather-related effects, sometimes in an unpredictable fashion.

4.8. SGP reserves the right to alter any of the foregoing information in the event of new information being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.

DRAWING



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Project: Heyford Park, Dorchester Phase 5C	
Drawing: Diffusion Tube Locations	
Drawn: SM	Checked: DW
Date: 12.02.20	Scale: 1:750 @ A4
Job No: R1742d	Drg No: R1742d-R01-D01

PHASE 5C, HEYFORD PARK, UPPER HEYFORD, BICESTER

LEGEND

SITE BOUNDARIES			
	APPLICATION BOUNDARY		
EXISTING VEGETATION			
	EXISTING TREE TO BE RETAINED		EXISTING RPA
	EXISTING VEGETATION TO BE REMOVED		
EXTERNAL BOUNDARY TREATMENTS			
	1800mm HIGH SCREEN WALL (REFER TO MATERIALS LAYOUT 0521-PHS-SD-S(R)-108 FOR MATERIALS)		1800mm HIGH CLOSE BOARD TIMBER FENCE
	1800mm HIGH PLOT DIVISION PANEL FENCE		1800mm HIGH TIMBER MATCHBOARD ACCESS GATE
NUMBERING			
12	PLOT NUMBERS	G12	GARAGE NUMBERS
V	VISITOR PARKING	(h)	PLOT HANDING
P12	PARKING NUMBERS	BM	BIN MUSTER AREA
SSP	SUBSTATION PARKING		
MISCELLANEOUS			
	CHIMNEY		PERSONNEL ACCESS
	AFFORDABLE HOUSING - RENTED		GARAGE ACCESS
	BIN HARDSTANDING WITH 1.5m TURNING CIRCLE		EXISTING BUILDING
	LOCATION OF WHEELCHAIR UNIT'S PARKING SPACE		WHEELCHAIR UNIT
	ROTARY DRYER		COMPOST BIN
	BIN HARDSTANDING		WATER BUTT
GROUND SURFACING			
	MARSHALLS KEYBLOK BLOCK PAVING COLOUR: BRINDLE		RAMP / RUMBLE STRIP TO ENGINEERS DESIGN
	MARSHALLS PRIORA CONCRETE BLOCK PERMEABLE PAVING COLOUR: BRINDLE		PAVING SLABS
	TARMAC		450mm x 450mm MARSHALLS SAXON BUFF PATIO SLABS
LANDSCAPING			
	PROPOSED NEW TREE REFER TO SEPARATE LANDSCAPING DRAWINGS FOR EXACT DETAILS		PROPOSED HEDGEROW (REFER TO SEPARATE LANDSCAPING DRAWINGS FOR EXACT DETAILS)
	PROPOSED GRASS PLANTING REFER TO SEPARATE LANDSCAPING DRAWINGS FOR EXACT DETAILS		PROPOSED PLANTING BEDS (REFER TO SEPARATE LANDSCAPING DRAWINGS FOR EXACT DETAILS)

ACCOMMODATION SCHEDULE

OPEN MARKET

Name		Stories	Bedrooms	Gross sqft	No. Of Units
DL2		2 Storey	3 Bed house	888ft²	3
DL6		2 Storey	3 Bed house	858ft²	6
Type 1		2 Storey	3 Bed house	1023ft²	3
TYPE 1A-SA	(side access)	2 Storey	3 Bed house	1038ft²	2
SP7C		2.5 Storey	4 Bed house	1400ft²	1
SP7B		2.5 Storey	4 Bed house	1400ft²	1
SP2-V3		3 Storey	4 Bed house	1523ft²	7
TOTAL					23

AFFORDABLE HOUSING UNITS - RENTED

Name		Stories	Bedrooms	sqft	
SPF9	1BF3	3 Storey	1 Bed flat	490ft²	1
SPF9	1BF2	3 Storey	1 Bed flat	506ft²	2
SPF9	1BF1	3 Storey	1 Bed flat	597ft²	1
SPF9	2BM2	3 Storey	2 Bed maisonette	813ft²	1
SPF9	2BM (DIS)	3 Storey	2 Bed maisonette	829ft²	1
SPF9	2BF1	3 Storey	2 Bed flat	829ft²	1
SPF9	2BM3	3 Storey	2 Bed maisonette	831ft²	1
TOTAL					8
TOTAL AFFORABLE UNITS					8
GRAND TOTAL					31

DORCHESTER LIVING

REVISION/S:

A. 2019-06-27. Plot 26 adjusted to ensure AD.M4(3) compliancy. DJE
B. 2019-10-03. Red line, plot numbers and schedule updated. MED

N

PLANNING LAYOUT

SCALE: 1:500 @ A 3
0 5 10 [m]
DATE: DECEMBER 2018
DRAWN: DGK
DRAWING TITLE: PLANNING LAYOUT
DRAWING NO: 0521-PH5C-102

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APPENDIX A

Analytical Results

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2187

LABORATORY ANALYSIS REPORT

Report Number	**O01578R**
Customer	**Smith Grant LLP** **Station House** **Station Road** **Ruabon, Wrexham** **LL14 6DL**
Booking In Reference	**S0256**
Despatch Note Number	**76384**
Date Samples Received	**17/02/2020**
Diffusion Tube Type	**Tenax**
Job Reference	**R1742d**

Quantitative Analysis of BTEX
Identification and estimation of ng on tube in accordance with ISO16000-6

Tube Number	**004561**
Gradko Lab Reference	**08O0212**
Exposure Time (mins)*	**31539**
Sample ID	**V1**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	30.7	1.4	4.3
Toluene	52.2	1.6	5.9
Ethylbenzene	6.8	0.1	0.6
m/p-Xylene	17.3	0.4	1.6
o-Xylene	7.8	0.2	0.7

EC6-EC8 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Octane	94	693	11.0	50.1
Cyclohexane, 1,3-dimethyl-, cis-	91	374	5.9	26.6
Cyclohexane, 1,4-dimethyl-, trans-	94	321	5.1	22.8
Cyclohexane, 1,3-dimethyl-, trans-	94	121	1.9	8.6
Heptane, 3-methyl-	95	119	1.9	8.6
Cyclohexane, methyl-	94	102	1.6	6.3
Cyclopentane, 1-ethyl-3-methyl-, trans-	94	93	1.5	6.6
Cyclopentane, 1-ethyl-2-methyl-, cis-	93	46	0.7	3.3
Heptane	91	37	0.6	2.3
Cyclopentane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.alpha.)-	95	23	0.4	1.7
Hexane	87	19	0.3	1.0
Cyclopentane, 1,2,3-trimethyl-, (1.alpha.,2.alpha.,3.beta.)-	94	15	0.2	1.1
Cyclopentane, ethyl-	95	14	0.2	0.8
Hexane, 3-methyl-	90	13	0.2	0.8
Cyclopentane, 1,2-dimethyl-, trans-	91	12	0.2	0.7

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....[redacted].....
L. Gates, Laboratory Manager

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ilac-MRA UKAS TESTING 2187

LABORATORY ANALYSIS REPORT

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Cyclopentane, methyl-	94	11	0.2	0.6
Hexane, 2,4-dimethyl-	94	10	0.2	0.7
Cyclopentane, 1,3-dimethyl-, trans-	76	10	0.2	0.6
Hexane, 2,5-dimethyl-	95	8	0.1	0.6
Cyclopentane, 1,3-dimethyl-, cis-	90	6	0.1	0.4
Pentane, 2,3-dimethyl-	59	<5	<0.1	<0.3
Total**		**2053**	**32.6**	**145**

EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	95	12884	204	1160
Nonane	95	8765	139	711
Nonane, 4-methyl-	94	8606	136	775
Nonane, 2-methyl-	87	7446	118	671
Cyclohexane, butyl-	62	6811	108	605
Cyclohexane, 1,2,4-trimethyl- (sum of isomers)		6676	106	533
Nonane, 3-methyl-	91	5902	94	531
cis-1-Ethyl-3-methyl-cyclohexane	91	5507	87	440
Cyclohexane, 1-ethyl-2-methyl-	91	4897	78	391
Octane, 2-methyl-	91	3844	61	312
Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	91	3226	51	258
Octane, 3-methyl-	91	3179	50	258
Cyclohexane, 1-ethyl-4-methyl-, trans-	91	3038	48	243
Heptane, 2,4,6-trimethyl-	94	1999	32	180
Cyclohexane, 1-ethyl-4-methyl-, cis-	93	1841	29	147
Cyclohexane, 1,3,5-trimethyl-	95	1812	29	145
Cyclohexane, ethyl-	94	1071	17	76
Heptane, 2,6-dimethyl-	91	414	6.6	34
Cyclohexane, 1,1,3-trimethyl-	92	285	4.5	23
Heptane, 2,4-dimethyl-	83	149	2.4	12
Hexane, 3-ethyl-2-methyl-	83	69	1.1	5.6
Heptane, 2,2-dimethyl-	38	31	0.5	2.5
Total**		**88453**	**1402**	**7513**

EC>10-EC12 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Undecane	95	4326	69	428
Decane, 4-methyl-	93	3535	56	350
Decane, 2-methyl-	95	3030	48	300
Cyclohexane, pentyl-	87	1203	19	118
Total**		**12094**	**192**	**1195**

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>12-EC16 Aliphatic Hydrocarbons**				
Tridecane	95	33	0.5	3.9
EC5-EC7 Aromatic Hydrocarbons**		(Benzenze)		
EC>7-EC8 Aromatic Hydrocarbons**		(Toluene)		
	NIST Library Quality Match	Estimated ng on tube	ppb in air*	
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1	
	NIST Library Quality Match	Estimated ng on tube	ppb in air*	
EC>10-EC12 Aromatic Hydrocarbons**		<5	<0.1	
	NIST Library Quality Match	Estimated ng on tube	ppb in air*	
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1	

Tube Number	**004467**
Gradko Lab Reference	**08O0213**
Exposure Time (mins)*	**31539**
Sample ID	**V2**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	12.3	0.6	1.7
Toluene	12.6	0.4	1.4
Ethylbenzene	2.6	0.1	0.2
m/p-Xylene	6.4	0.1	0.6
o-Xylene	<5	<0.1	<0.5

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC6-EC8 Aliphatic Hydrocarbons**				
Cyclohexane, 1,3-dimethyl- (sum of isomers)		275	4.4	20
Cyclohexane, 1-ethyl-4-methyl-, trans-	91	153	2.4	12
Cyclohexane	60	39	0.6	2.1
Cyclohexane, methyl-	94	28	0.4	1.7
Hexane	86	16	0.3	0.9
Heptane	91	15	0.2	0.9
Cyclopentane, methyl-	94	10	0.2	0.5

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Cyclopentane, 1-ethyl-2-methyl-, cis-	50	9	0.1	0.7
Cyclohexane, 1,4-dimethyl-, cis-	91	8	0.1	0.6
Hexane, 3-methyl-	58	8	0.1	0.5
Heptane, 3-methyl-	83	<5	<0.1	<0.4
Total**		**566**	**9.0**	**40**

EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	95	2247	36	202
Nonane, 2-methyl-	87	978	16	88
Nonane	95	830	13	67
Nonane, 3-methyl-	94	629	10	57
Nonane, 4-methyl-	91	563	8.9	51
Cyclohexane, propyl-	68	468	7.4	42
Octane, 2,6-dimethyl-	86	425	6.7	38
Cyclohexane, 1-ethyl-2-methyl-	91	356	5.6	28
cis-1-Ethyl-3-methyl-cyclohexane	91	295	4.7	24
Octane, 2-methyl-	87	153	2.4	12
Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	94	140	2.2	11
Octane, 3-methyl-	91	138	2.2	11
Heptane, 2,4,6-trimethyl-	94	121	1.9	11
Cyclohexane, 1-ethyl-4-methyl-, cis-	94	104	1.6	8.3
Cyclohexane, 1,3,5-trimethyl-	94	70	1.1	5.6
Cyclohexane, 1,1,3-trimethyl-	92	35	0.6	2.8
Cyclohexane, ethyl-	94	35	0.6	2.5
Cyclohexane, 1,2,4-trimethyl- (sum of isomers)		25	0.4	2.0
Heptane, 2,6-dimethyl-	91	14	0.2	1.2
Total**		**7628**	**121**	**665**

EC>10-EC12 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Undecane	95	1276	20	126
Decane, 4-methyl-	93	633	10	63
Decane, 2-methyl-	94	598	9.5	59
Cyclohexane, pentyl-	83	382	6.1	37
Dodecane	78	217	3.4	23
Total**		**3106**	**49.2**	**309**

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>12-EC16 Aliphatic Hydrocarbons**				
Tridecane	95	5	0.1	0.6
Hexadecane	74	<5	<0.1	<0.7
Total**		**10**	**0.2**	**1.3**

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>10-EC12 Aromatic Hydrocarbons**		<5	<0.1

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

Tube Number	**004481**
Gradko Lab Reference	**08O0214**
Exposure Time (mins)*	**31538**
Sample ID	**V3**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	6.8	0.3	1.0
Toluene	7.0	0.2	0.8
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC6-EC8 Aliphatic Hydrocarbons**				
Cyclohexane, methyl-	94	11	0.2	0.7
Cyclohexane, 1,3-dimethyl-, cis-	64	<5	<0.1	<0.4
Cyclopentane, methyl-	90	<5	<0.1	<0.3
Cyclohexane, 1,4-dimethyl-, trans-	91	<5	<0.1	<0.4
Total**		**<26**	**<0.4**	**<1.6**

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EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	95	1127	18	101
Octane, 2,6-dimethyl-	90	617	9.8	56
Cyclohexane, butyl-	64	609	9.6	54
Nonane, 2-methyl-	81	605	9.6	55
Nonane, 3-methyl-	94	399	6.3	36
Nonane	95	397	6.3	32
Nonane, 4-methyl-	91	362	5.7	33
Cyclohexane, 1-ethyl-2-methyl-	94	226	3.6	18
Cyclohexane, 1,2,4-trimethyl- (sum of isomers)		182	2.9	15
Heptane, 2,4,6-trimethyl-	94	109	1.7	9.9
Octane, 2-methyl-	90	106	1.7	8.6
Octane, 3-methyl-	91	98	1.6	8.0
Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	91	94	1.5	7.5
Cyclohexane, 1-ethyl-4-methyl-, trans-	91	87	1.4	6.9
Cyclohexane, 1-ethyl-4-methyl-, cis-	91	59	0.9	4.7
Cyclohexane, 1,3,5-trimethyl-	91	45	0.7	3.6
Cyclohexane, 1,1,3-trimethyl-	97	19	0.3	1.5
Cyclohexane, ethyl-	90	15	0.2	1.1
Heptane, 4-ethyl-	35	15	0.2	1.2
Heptane, 2,6-dimethyl-	83	12	0.2	0.9
Total**		**5182**	**82.2**	**453**

EC>10-EC12 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Undecane	95	902	14	89
Decane, 4-methyl-	87	432	6.9	43
Decane, 2-methyl-	94	386	6.1	38
Cyclohexane, pentyl-	81	327	5.2	32
Dodecane	68	293	4.6	32
*Total***		**2339**	**37.1**	**234**

EC>12-EC16 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Tridecane	83	9	0.1	1.0

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1
	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>10-EC12 Aromatic Hydrocarbons**		<5	<0.1
	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

Tube Number	**004470**
Gradko Lab Reference	**08O0215**
Exposure Time (mins)*	**31538**
Sample ID	**V4**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	6.5	0.3	0.9
Toluene	6.0	0.2	0.7
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

EC6-EC8 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Hexane	72	6	0.1	0.3
Heptane	87	<5	<0.1	<0.3
Total**		**11**	**0.2**	**0.7**

EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	95	45	0.7	4.1
Octane, 2,6-dimethyl-	93	32	0.5	2.8
Cyclohexane, 1-ethyl-2-methyl-	93	17	0.3	1.4
Nonane, 3-methyl-	91	17	0.3	1.5
Nonane, 4-methyl-	90	14	0.2	1.3
Cyclohexane, 1,2,4-trimethyl- (sum of isomers)		11	0.2	0.9
1-Ethyl-3-methylcyclohexane (c,t)	95	11	0.2	0.8
Octane, 3-methyl-	70	9	0.2	0.8
Cyclohexane, 1-ethyl-4-methyl-, cis-	94	6	0.1	0.5
Heptane, 2,4,6-trimethyl-	87	5	0.1	0.5
Cyclohexane, 1,1,3-trimethyl-	78	<5	<0.1	<0.4
Cyclohexane, 1-ethyl-4-methyl-, trans-	87	<5	<0.1	<0.4
Total**		**177**	**2.8**	**15.3**

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>10-EC12 Aliphatic Hydrocarbons**				
Decane, 4-methyl-	87	20	0.3	1.9
Undecane	60	18	0.3	1.8
Dodecane	92	<5	<0.1	<0.5
Total**		**42**	**0.7**	**4.2**

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>12-EC16 Aliphatic Hydrocarbons**				
Hexadecane	93	<5	<0.1	<0.7

EC5-EC7 Aromatic Hydrocarbons**	(Benzenze)

EC>7-EC8 Aromatic Hydrocarbons**	(Toluene)

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>10-EC12 Aromatic Hydrocarbons**				
Naphthalene	43	7	0.1	0.5

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

Tube Number	**004506**
Gradko Lab Reference	**08O0216**
Exposure Time (mins)*	**31537**
Sample ID	**V5**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	6.4	0.3	0.9
Toluene	6.2	0.2	0.7
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

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EC6-EC8 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Hexane	64	11	0.2	0.6
Cyclohexane, methyl-	97	7	0.1	0.5
Heptane	87	6	0.1	0.4
Cyclopentane, methyl-	81	<5	<0.1	<0.3
Cyclohexane, 1,3-dimethyl-, cis-	72	<5	<0.1	<0.4
Total**		**34**	**0.54**	**2.04**

EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	95	82	1.3	7.4
Nonane, 2-methyl-	43	55	0.9	5.0
Nonane	94	23	0.4	1.9
Nonane, 3-methyl-	91	19	0.3	1.7
Nonane, 4-methyl-	90	17	0.3	1.5
Octane, 2,6-dimethyl-	87	16	0.3	1.4
Cyclohexane, 1-ethyl-2-methyl-	87	16	0.2	1.3
Cyclohexane, 1-ethyl-3-methyl- (c,t)	95	12	0.2	1.0
Cyclohexane, 1,1,3-trimethyl-	90	9	0.1	0.8
Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	94	9	0.1	0.8
Cyclohexane, 1-ethyl-4-methyl-, trans-	91	6	0.1	0.5
Cyclohexane, 1-ethyl-4-methyl-, cis-	81	<5	<0.1	<0.4
Total**		**270**	**4.3**	**23.5**

EC>10-EC12 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Undecane	91	36	0.6	3.5
Decane, 4-methyl-	90	23	0.4	2.3
Decane, 2-methyl-	91	18	0.3	1.8
Total**		**77**	**1.2**	**7.6**

EC>12-EC16 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*
		<5	<0.1

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*	
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1	

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>10-EC12 Aromatic Hydrocarbons**				
Naphthalene	76	5	0.1	0.4

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1	

Tube Number	**004599**
Gradko Lab Reference	**08O0217**
Exposure Time (mins)*	**31537**
Sample ID	**V6**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	5.2	0.2	0.7
Toluene	22.6	0.7	2.6
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC6-EC8 Aliphatic Hydrocarbons**				
Hexane, 2,2,5-trimethyl-	59	122	1.9	9.9
Cyclopentane, methyl-	94	8	0.1	0.4
Heptane	90	6	0.1	0.4
Cyclohexane, methyl-	87	5	0.1	0.3
Total**		**141**	**2.2**	**11.0**

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>8-EC10 Aliphatic Hydrocarbons**				
Decane	94	33	0.5	2.9
Octane, 2,6-dimethyl-	91	32	0.5	2.9
Cyclohexane, 1-ethyl-2-methyl-	76	15	0.2	1.2
Cyclohexane, 1,1,3-trimethyl-	90	14	0.2	1.1
Nonane, 3-methyl-	91	13	0.2	1.2
Nonane, 4-methyl-	94	12	0.2	1.1
Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	93	10	0.2	0.8
Cyclohexane, 1-ethyl-3-methyl- (c,t)	94	10	0.2	0.8
Octane, 3-methyl-	43	7	0.1	0.6
Cyclohexane, 1-ethyl-4-methyl-, trans-	87	6	0.1	0.5
Heptane, 2,4,6-trimethyl-	76	6	0.1	0.5
Total**		**157**	**2.5**	**13.5**

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>10-EC12 Aliphatic Hydrocarbons**		<5	<0.1
EC>12-EC16 Aliphatic Hydrocarbons**		<5	<0.1
EC5-EC7 Aromatic Hydrocarbons**		(Benzenze)	
EC>7-EC8 Aromatic Hydrocarbons**		(Toluene)	
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1
EC>10-EC12 Aromatic Hydrocarbons**		<5	<0.1
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

Tube Number	**004555**
Gradko Lab Reference	**08O0218**
Exposure Time (mins)*	**31536**
Sample ID	**V7**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	32.8	1.5	4.6
Toluene	50.5	1.6	5.7
Ethylbenzene	8.9	0.2	0.8
m/p-Xylene	19.4	0.4	1.8
o-Xylene	7.7	0.2	0.7

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EC6-EC8 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Hexane	91	122	1.9	6.6
Octane	70	100	1.6	7.2
Cyclohexane	46	88	1.4	4.7
Heptane	91	76	1.2	4.8
Cyclohexane, methyl-	94	70	1.1	4.4
Hexane, 3-methyl-	91	54	0.9	3.4
Heptane, 3-methyl-	94	31	0.5	2.3
Cyclopentane, methyl-	94	25	0.4	1.3
Pentane, 2,3-dimethyl-	91	17	0.3	1.1
Cyclopentane, 1,2-dimethyl-, trans-	95	13	0.2	0.8
Cyclopentane, 1-ethyl-2-methyl-, cis-	83	11	0.2	0.8
Cyclohexane, 1,3-dimethyl-, cis-	87	9	0.1	0.6
Cyclopentane, 1,2-dimethyl-, cis-	81	7	0.1	0.4
Hexane, 2,4-dimethyl-	53	7	0.1	0.5
Cyclopentane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.alpha.)-	84	7	0.1	0.5
Cyclopentane, ethyl-	76	7	0.1	0.4
Cyclopentane, 1,2,3-trimethyl-, (1.alpha.,2.alpha.,3.beta.)-	83	6	0.1	0.4
Pentane, 2,4-dimethyl-	81	5	0.1	0.3
Cyclohexane, 1,3-dimethyl-, trans-	90	<5	<0.1	<0.4
Total**		**660**	**10.5**	**41.0**

EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	93	62	1.0	5.6
Nonane	93	50	0.8	4.1
Octane, 2,6-dimethyl-	92	12	0.2	1.0
Nonane, 3-methyl-	91	11	0.2	1.0
Nonane, 4-methyl-	81	10	0.2	0.9
Heptane, 2,6-dimethyl-	78	9	0.1	0.8
Cyclohexane, 1-ethyl-3-methyl- (c,t)	87	9	0.1	0.7
Cyclohexane, 1-ethyl-2-methyl-	81	9	0.1	0.7
Cyclohexane, 1,1,3-trimethyl-	91	9	0.1	0.7
Cyclohexane, ethyl-	94	8	0.1	0.6
Cyclohexane, 1-ethyl-4-methyl-, cis-	64	7	0.1	0.6
Heptane, 2,3-dimethyl-	87	5	0.1	0.4
Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	93	5	0.1	0.4
Heptane, 2,5-dimethyl-	74	<5	<0.1	<0.4
Total**		**213**	**3.4**	**18.0**

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L. Gates, Laboratory Manager

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LABORATORY ANALYSIS REPORT

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>10-EC12 Aliphatic Hydrocarbons**				
Undecane	83	29	0.5	2.9
Decane, 2-methyl-	58	13	0.2	1.3
Decane, 4-methyl-	68	12	0.2	1.2
Dodecane	96	6	0.1	0.7
Total**		**61**	**1.0**	**6.1**

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>12-EC16 Aliphatic Hydrocarbons**		<5	<0.1

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>8-EC10 Aromatic Hydrocarbons**				
Benzene, 1-ethyl-2-methyl-	42	10	0.2	0.8
Benzene, 1,3,5-trimethyl-	94	6	0.1	0.4
Benzene, (1-methylethyl)-	43	<5	<0.1	<0.4
		21	**0.3**	**1.6**

	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
EC>10-EC12 Aromatic Hydrocarbons**				
Naphthalene	95	35	0.6	2.8
Indane	94	18	0.3	1.3
Benzene, 1,2,3-trimethyl-	81	10	0.2	0.8
Benzene, 1-ethyl-2,3-dimethyl-	53	6	0.1	0.5
Total**		**69**	**1.1**	**5.5**

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

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LABORATORY ANALYSIS REPORT

Tube Number	**004507**
Gradko Lab Reference	**08O0219**
Exposure Time (mins)*	**31536**
Sample ID	**V8**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	6.3	0.3	0.9
Toluene	8.5	0.3	1.0
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

EC6-EC8 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Cyclohexane, methyl-	93	6	0.1	0.4
Cyclopentane, methyl-	68	6	0.1	0.3
Pentane, 2,3,3-trimethyl-	47	6	0.1	0.4
Total**		**18**	**0.3**	**1.1**

EC>8-EC10 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Decane	93	19	0.3	1.7
Cyclohexane, 1-ethyl-2-methyl-	83	6	0.1	0.4
Cyclohexane, 1,1,3-trimethyl-	78	<5	<0.1	<0.4
Total**		**29**	**0.5**	**2.5**

EC>10-EC12 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*	µgm^{-3}*
Undecane	92	21	0.3	2.1

EC>12-EC16 Aliphatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*
		<5	<0.1

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

EC>8-EC10 Aromatic Hydrocarbons**	NIST Library Quality Match	Estimated ng on tube	ppb in air*
		<5	<0.1

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LABORATORY ANALYSIS REPORT

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>10-EC12 Aromatic Hydrocarbons**		<5	<0.1
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

Tube Number	**004516**
Gradko Lab Reference	**08O0220**
Exposure Time (mins)*	**31513**
Sample ID	**External**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	7.1	0.3	1.0
Toluene	7.9	0.2	0.9
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC6-EC8 Aliphatic Hydrocarbons**		<5	<0.1
EC>8-EC10 Aliphatic Hydrocarbons**		<5	<0.1
EC>10-EC12 Aliphatic Hydrocarbons**		<5	<0.1
EC>12-EC16 Aliphatic Hydrocarbons**		<5	<0.1

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

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	NIST Library Quality Match	Estimated ng on tube	ppb in air*
EC>8-EC10 Aromatic Hydrocarbons**		<5	<0.1
EC>10-EC12 Aromatic Hydrocarbons**		<5	<0.1
EC>12-EC16 Aromatic Hydrocarbons**		<5	<0.1

Tube Number	**004549**
Gradko Lab Reference	**08O0221**
Sample ID	**Blank**

BTEX	ng on tube
Benzene	<5
Toluene	5.5
Ethylbenzene	<5
m/p-Xylene	<5
o-Xylene	<5

	NIST Library Quality Match	Estimated ng on tube
EC6-EC8 Aliphatic Hydrocarbons**		
Hexane		<5
EC>8-EC10 Aliphatic Hydrocarbons**		<5
EC>10-EC12 Aliphatic Hydrocarbons**		<5
EC>12-EC16 Aliphatic Hydrocarbons**		<5

EC5-EC7 Aromatic Hydrocarbons** (Benzenze)

EC>7-EC8 Aromatic Hydrocarbons** (Toluene)

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	NIST Library Quality Match	Estimated ng on tube
EC>8-EC10 Aromatic Hydrocarbons**		<5
EC>10-EC12 Aromatic Hydrocarbons**		<5
EC>12-EC16 Aromatic Hydrocarbons**		<5

Uptake Rates:

Benzene 0.70 ng.ppm^{-1}.min^{-1}.
Toluene 1.03 ng.ppm^{-1}.min^{-1}.
Ethylbenzene 1.46 ng.ppm^{-1}.min^{-1}.
m/p Xylene 1.46 ng.ppm^{-1}.min^{-1}.
o-Xylene 1.46 ng.ppm^{-1}.min^{-1}.
All other compounds: 2.00 ng.ppm^{-1}.min^{-1}.

Results are not Blank corrected.

Results greater than 1000ng are outside of our UKAS accredited calibration range.

Reporting Limit 5ng on tube
Results reported as <5ng on tube are below the reporting limit.
Estimated results reported as <5ng on tube are below the reporting limit for the non-specific standard toluene.

Measurement Uncertainty BTEX compounds ±16.3%

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Estimated results as ng on tube are calculated by reference to toluene in accordance with ISO 16000-6

Compounds reported may not be the most abundant detected in these samples.
**The classification and grouping of TPH compounds to CWG guidelines is not covered by our UKAS accreditation.

Identification of compounds is carried out by comparison of the mass spectra to the NIST 17 mass spectral library. Compounds with a quality match below 85% are noted as a tentative identity and shown in italics. These compounds are outside of the scope of our UKAS accreditation.

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LABORATORY ANALYSIS REPORT

Where a result is shown as less than the reporting limit the reporting limit concentration is included in the total TPH result.

If the sum of results below the reporting limit is greater than the sum of results above the reporting limit total TPH will be reported as less than the value reported.

Analysts Name	Katya Paldamova	**Date of Analysis**	27/02/2020
Report Checked By	Mariella Angelova	**Date of Report**	06/03/2020

Analysis has been carried out in accordance with in-house method GLM 13

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APPENDIX B

CLEA Input Values

Building		
Building Footprint (m^2)	57	Building footprint of the smallest apartment assessed (Plot 875) - information provided by Dorchester Living
Living space air exchange rate (hr)	0.5	CLEA SR3 Default Building Parameters (residential)
Living space height above ground (m)	2.4	Living space height of Phase 5c ground floor apartments - information provided by Dorchester Living
Living space height below ground (m)	0	No cellars/underground rooms
Pressure difference (Pa)	3.1	CLEA SR3 Default Building Parameters (all residential other than bungalow; used in absence of data for apartments)
Foundation thickness (m)	0.075	Minimum specified thickness of C30 concrete topping overlying block and beam foundation construction - information provided by Dorchester Living
Floor Crack Area (cm^2)	706.5	CLEA SR3 Default Building Parameters for bungalow (largest floor crack area of all default residential scenarios; used in absence of data for apartments)
Dust loading factor (ug m^3)	60	CLEA SR3
Default soil gas ingress rate (cm^3 s)	25	CLEA SR3
Soil		
Soil type	Sand	Assumption of sand as a worst case granular constituent
SOM Content	1.5	Site derived value (average of formation soils dataset from wider Phase 5 area)
pH	8.6	Site derived value (average of formation soils dataset from wider Phase 5 area)
Receptor (Future Site Resident)		
Critical Receptor (yrs)	0-6	CLEA SR3 Default Residential Land Use (Age Cass 1-6)
Body Mass (kg)	13.3	CLEA SR3 Default Residential Land Use (Age Cass 1-6 averaged)
Exposure Duration (yrs)	6	CLEA SR3 Default Residential Land Use Exposure Duration
Exposure Frequency (days)	2190	CLEA SR3 Default Residential Land Use Exposure Frequency
Inhalation Rate Indoors (m^3/d)	11.85	CLEA SR3 Default Residential Land Use (Age Cass 1-6 averaged)
Time indoors (hrs)	21.6	CLEA SR3 Default Site Occupancy for age class of one to six averaged
Inhalation Rate Outdoors (m^3/d)	1.3	CLEA SR3 assumes high intensive activity over age class 1-6 averarged, assuming 1 hour outdoors per day
Time Outdoors (hrs)	1	CLEA SR3 Default Residential Land Use (Age Cass 1-6 averaged)

Benzene

Parameters: Benzene		
Parameter	**Input Value**	**Notes/Source**
Oral HCV (ug kg BW day)	0.29	LQM/CIEH S4UL (2015)
Inhal HCV (ug kg BW day)	1.4	LQM/CIEH S4UL (2015)
Oral MDI (ug day)	NA	LQM/CIEH S4UL (2015)
Inhalation MDI (ug day)	NA	LQM/CIEH S4UL (2015)
Air-Water Partition Coefficient (K_{aw})	1.16E-01	LQM/CIEH S4UL (2015)
Diffusion Coefficient in Air (m^2s)	8.77E-06	LQM/CIEH S4UL (2015)
Diffusion Coefficient in Water (m^2s)	6.64E-10	LQM/CIEH S4UL (2015)
Relative Molecular Mass (g mol)	78.11	LQM/CIEH S4UL (2015)
Vapour Pressure (Pa)	6.24E+03	LQM/CIEH S4UL (2015)
Water Solubility (mg/l)	1.78E+03	LQM/CIEH S4UL (2015)
Log Organic Carbon - Water Partition Coefficient (K_{oc})	1.83	LQM/CIEH S4UL (2015)
Log Octanol-Water Partition Coefficient (K_{ow})	2.13	LQM/CIEH S4UL (2015)
Dermal Absorption Fraction	0.1	LQM/CIEH S4UL (2015)
Soil to dust transport factor (g g dry weight)	0.5	LQM/CIEH S4UL (2015)
sub-surface soil to indoor air correction factor	10	LQM/CIEH S4UL (2015)

Aliphatic Hydrocarbons EC8-10

Parameters: Aliphatic Hydrocarbons EC8-10		
Parameter	**Input Value**	**Notes/Source**
Oral HCV (ug kg BW day) - TDI	100	LQM/CIEH S4UL (2015) - TDI
Inhal HCV (ug kg BW day) - TDI	290	LQM/CIEH S4UL (2015) - TDI
Oral MDI (ug day)	9.99E+99	LQM/CIEH S4UL (2015)
Inhalation MDI (ug day)	9.99E+99	LQM/CIEH S4UL (2015)
Air-Water Partition Coefficient (K_{aw})	4.15E+01	LQM/CIEH S4UL (2015)
Diffusion Coefficient in Air (m^2s)	1.00E-05	LQM/CIEH S4UL (2015)
Diffusion Coefficient in Water (m^2s)	1.00E-09	LQM/CIEH S4UL (2015)
Relative Molecular Mass (g mol)	130	LQM/CIEH S4UL (2015)
Vapour Pressure (Pa)	3.20E+02	LQM/CIEH S4UL (2015)
Water Solubility (mg/l)	4.27E-01	LQM/CIEH S4UL (2015)
Log Organic Carbon - Water Partition Coefficient (K_{oc})	4.48	LQM/CIEH S4UL (2015)
Log Octanol-Water Partition Coefficient (K_{ow})	5.22	LQM/CIEH S4UL (2015)
Dermal Absorption Fraction	0.1	LQM/CIEH S4UL (2015)
Soil to dust transport factor (g g dry weight)	0.5	LQM/CIEH S4UL (2015)
sub-surface soil to indoor air correction factor	10	LQM/CIEH S4UL (2015)

Aliphatic Hydrocarbons EC10-12

Parameters: Aliphatic Hydrocarbons EC10-12		
Parameter	**Input Value**	**Notes/Source**
Oral HCV (ug kg BW day) - TDI	100	LQM/CIEH S4UL (2015) - TDI
Inhal HCV (ug kg BW day) - TDI	290	LQM/CIEH S4UL (2015) - TDI
Oral MDI (ug day)	9.99E+99	LQM/CIEH S4UL (2015)
Inhalation MDI (ug day)	9.99E+99	LQM/CIEH S4UL (2015)
Air-Water Partition Coefficient (K_{aw})	6.44E+01	LQM/CIEH S4UL (2015)
Diffusion Coefficient in Air (m^2s)	1.00E-05	LQM/CIEH S4UL (2015)
Diffusion Coefficient in Water (m^2s)	1.00E-09	LQM/CIEH S4UL (2015)
Relative Molecular Mass (g mol)	160	LQM/CIEH S4UL (2015)
Vapour Pressure (Pa)	3.21E+01	LQM/CIEH S4UL (2015)
Water Solubility (mg/l)	3.39E-02	LQM/CIEH S4UL (2015)
Log Organic Carbon - Water Partition Coefficient (K_{oc})	5.38	LQM/CIEH S4UL (2015)
Log Octanol-Water Partition Coefficient (K_{ow})	6.3	LQM/CIEH S4UL (2015)
Dermal Absorption Fraction	0.1	LQM/CIEH S4UL (2015)
Soil to dust transport factor (g g dry weight)	0.5	LQM/CIEH S4UL (2015)
sub-surface soil to indoor air correction factor	10	LQM/CIEH S4UL (2015)

CLEA Software Version 1.071

Report generated	13/02/2015
Report title	R1742d-R01-v1
Created by	Scott Miller at Smith Grant LLP

Environment Agency

BASIC SETTINGS

Land Use	Residential with produce						
Building	DL Ph5c Apartment 875						
Receptor	Female (res)	Start age class	1	End age class	6	Exposure Duration	6 years
Soil	Sand						

Exposure Pathways

Direct soil and dust ingestion	✘	Dermal contact with indoor dust	✘	Inhalation of indoor dust	✘
Consumption of homegrown produce	✘	Dermal contact with soil	✘	Inhalation of soil dust	✘
Soil attached to homegrown produce	✘			Inhalation of indoor vapour	✓
				Inhalation of outdoor vapour	✓

Environment Agency

Land Use Residential with produce **Receptor** Female (res)

Age Class	Exposure Frequencies (days yr^{-1})						Occupation Periods (hr day^{-1})		Soil to skin adherence factors (mg cm^{2})		Direct soil ingestion rate (g day^{-1})	Body weight (kg)	Body height (m)	Inhalation rate (m^{3} day^{-1})	Max exposed skin factor		Total skin area (m^{2})
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Indoors	Outdoors	Indoor	Outdoor					Indoor (m^{2} m^{-2})	Outdoor (m^{2} m^{-2})	
1	180	180	180	180	365	365	23.0	1.0	0.06	1.00	0.10	5.60	0.7	8.5	0.32	0.26	3.43E-01
2	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	9.80	0.8	13.3	0.33	0.26	4.84E-01
3	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	12.70	0.9	12.7	0.32	0.25	5.82E-01
4	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	15.10	0.9	12.2	0.35	0.28	6.36E-01
5	365	365	365	365	365	365	19.0	1.0	0.06	1.00	0.10	16.90	1.0	12.2	0.35	0.28	7.04E-01
6	365	365	365	365	365	365	19.0	1.0	0.06	1.00	0.10	19.70	1.1	12.2	0.33	0.26	7.94E-01
7	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	22.10	1.2	12.4	0.22	0.15	8.73E-01
8	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	25.30	1.2	12.4	0.22	0.15	9.36E-01
9	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	27.50	1.3	12.4	0.22	0.15	1.01E+00
10	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	31.40	1.3	12.4	0.22	0.15	1.08E+00
11	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	35.70	1.4	12.4	0.22	0.14	1.19E+00
12	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	41.30	1.4	13.4	0.22	0.14	1.29E+00
13	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	47.20	1.5	13.4	0.22	0.14	1.42E+00
14	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	51.20	1.6	13.4	0.22	0.14	1.52E+00
15	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	56.70	1.6	13.4	0.21	0.14	1.60E+00
16	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	59.00	1.6	13.4	0.21	0.14	1.63E+00
17	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.00	1.6	14.8	0.33	0.27	1.78E+00
18	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.90	1.6	12.0	0.33	0.27	1.80E+00

Consumption Rates

Consumption rates (g FW kg^{-1} bodyweight day^{-1}) by Produce Group

Age Class	MEAN RATES						90TH PERCENTILE RATES					
	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit
1							7.12E+00	1.07E+01	1.60E+01	1.83E+00	2.23E+00	3.82E+00
2							6.85E+00	3.30E+00	5.46E+00	3.96E+00	5.40E-01	1.20E+01
3							6.85E+00	3.30E+00	5.46E+00	3.96E+00	5.40E-01	1.20E+01
4							6.85E+00	3.30E+00	5.46E+00	3.96E+00	5.40E-01	1.20E+01
5							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
6							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
7							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
8							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
9							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
10							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
11							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
12							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
13							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
14							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
15							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
16							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
17							2.94E+00	1.40E+00	1.79E+00	1.61E+00	2.20E-01	2.97E+00
18							2.94E+00	1.40E+00	1.79E+00	1.61E+00	2.20E-01	2.97E+00

Top 2 applied? No

Where top 2 method is applied, two produce categories use 90th percentile rates, while the remainder use the mean. Produce categories vary on a chemical-by-chemical basis. Where top 2 method is not used, all produce categories for all chemicals assume 90th percentile rates.

Building DL Ph5c Apartment 875

Soil Sand

Building footprint (m^2)	5.70E+01
Living space air exchange rate (hr^{-1})	5.00E-01
Living space height (above ground, m)	2.40E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	3.10E+00
Foundation thickness (m)	7.50E-02
Floor crack area (cm^2)	7.07E+02
Dust loading factor (µg m^{-3})	6.00E+01

Porosity, Total (cm^3 cm^{-3})	5.40E-01
Porosity, Air-Filled (cm^3 cm^{-3})	3.00E-01
Porosity, Water-Filled (cm^3 cm^{-3})	2.40E-01
Residual soil water content (cm^3 cm^{-3})	7.00E-02
Saturated hydraulic conductivity (cm s^{-1})	7.36E-03
van Genuchten shape parameter *m* (dimensionless)	3.51E-01
Bulk density (g cm^{-3})	1.18E+00
Threshold value of wind speed at 10m (m s^{-1})	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02
Soil pH	8.60E+00
Soil Organic Matter content (%)	1.50E+00
Fraction of organic carbon (g g^{-1})	8.70E-03
Effective total fluid saturation (unitless)	3.62E-01
Intrinsic soil permeability (cm^2)	9.83E-08
Relative soil air permeability (unitless)	7.68E-01
Effective air permeability (cm^2)	7.54E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	57.5
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($cm^3\ s^{-1}$)	2.50E+01
Building ventilation rate ($cm^3\ s^{-1}$)	1.90E+04
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m ($m\ s^{-1}$)	5.00
Air dispersion factor at height of 0.8m *	2400.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover ($m^2\ m^{-2}$)	0.75

* Air dispersion factor in $g\ m^{-2}\ s^{-1}$ per $kg\ m^{-3}$

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction		Soil loading factor	Preparation correction factor
		Average	High		
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type Average

APPENDIX C

CLEA Derived Indoor Vapour Concentrations

CLEA Software Version 1.071

Report generated	13-Feb-15
Report title	R1742d-R01-v1
Created by	Scott Miller at Smith Grant LLP

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group						
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Benzene	0.00E+00	0.00E+00	0.00E+00	0.00	#VALUE!	#VALUE!	1.46E+03 (sol)	No	No	No	No	No	No	No	No	No
2	Ali C8-C10	0.00E+00	0.00E+00	0.00E+00	0.00	#VALUE!	#VALUE!	1.17E+02 (vap)	Yes	Yes	No	0	0	0	0	0	0
3	Ali C10-C12	0.00E+00	0.00E+00	0.00E+00	0.00	#VALUE!	#VALUE!	7.13E+01 (vap)	Yes	Yes	No	0	0	0	0	0	0
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Environment Agency

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group						
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
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Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Benzene	0.0	0.0	0.0	0.0	0.00E+00	**4.60E-03**	NA	NA	NA	4.32E-07	Error	0.00E+00	NA	NA	NA	NA	NA	NA
2	Ali C8-C10	0.0	0.0	0.0	0.0	0.00E+00	**7.51E+00**	NA	NA	NA	7.31E-04	Error	0.00E+00	NA	NA	NA	NA	NA	NA
3	Ali C10-C12	0.0	0.0	0.0	0.0	0.00E+00	**1.20E+00**	NA	NA	NA	1.16E-04	Error	0.00E+00	NA	NA	NA	NA	NA	NA
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Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Benzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#VALUE!	0.00E+00	0.00E+00	#######	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2	Ali C8-C10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#VALUE!	5.62E+95	6.06E+95	#######	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
3	Ali C10-C12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#VALUE!	5.62E+95	6.06E+95	#######	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
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Environment Agency

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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Environment Agency

		Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{OC} (cm^3 g^{-1})	log K_{OW} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Benzene	ID	0.29	ID	1.4	NR	NR	1.16E-01	8.77E-06	6.64E-10	1.83	2.13	0.1	0.5	10	1	1
2	Ali C8-C10	TDI	100	TDI	290	9.99E+99	9.99E+99	4.15E+01	1.00E-05	1.00E-09	4.48	5.22	0.1	0.5	10	1	1
3	Ali C10-C12	TDI	100	TDI	290	9.99E+99	9.99E+99	6.44E+01	1.00E-05	1.00E-09	5.38	6.3	0.1	0.5	10	1	1
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Environment Agency

	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
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Environment Agency

		Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Benzene	5.88E-01	6.24E+03	1.78E+03	model	model	model	0.00E+00	0.00E+00	model
2	Ali C8-C10	2.63E+02	3.20E+02	4.27E-01	model	model	model	model	model	model
3	Ali C10-C12	2.09E+03	3.21E+01	3.39E-02	model	model	model	model	model	model
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Environment Agency

	Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg\ L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
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