Abbeydale
Building Environment Consultants

10 Cambridge Chase
Gomersal
Bradford
West Yorkshire
BD14 4PW

For the attention of: J. Valente

Your Ref:

Our Ref: 131018-DQRA

Planning Ref:

Date: 18 December 2023

Environmental assessment of existing topsoil at 77 Latham Lane, Gomersal, West Yorkshire.

1. INTRODUCTION

On the instruction of John Valente, Abbeydale Building Environment Consultants Ltd (Abbeydale BEC) were requested to carry out a detailed quantitative risk assessment at the site of 77 Latham Lane, which is being redeveloped by a detached residential house. The site is situated on the north side of Gomersal, centred on National Grid Reference 420350, 426810, with an overall site area of 0.2 hectares. See Figure 1.

This letter-report was produced for our client, J. Valente and their advisors and financiers; it should not be relied upon or transferred to any other parties without the express written authorisation of Abbeydale BEC and our client. If any unauthorised third party comes into possession of this report they rely on it at their own risk and the authors owe them no duty of care or skill.

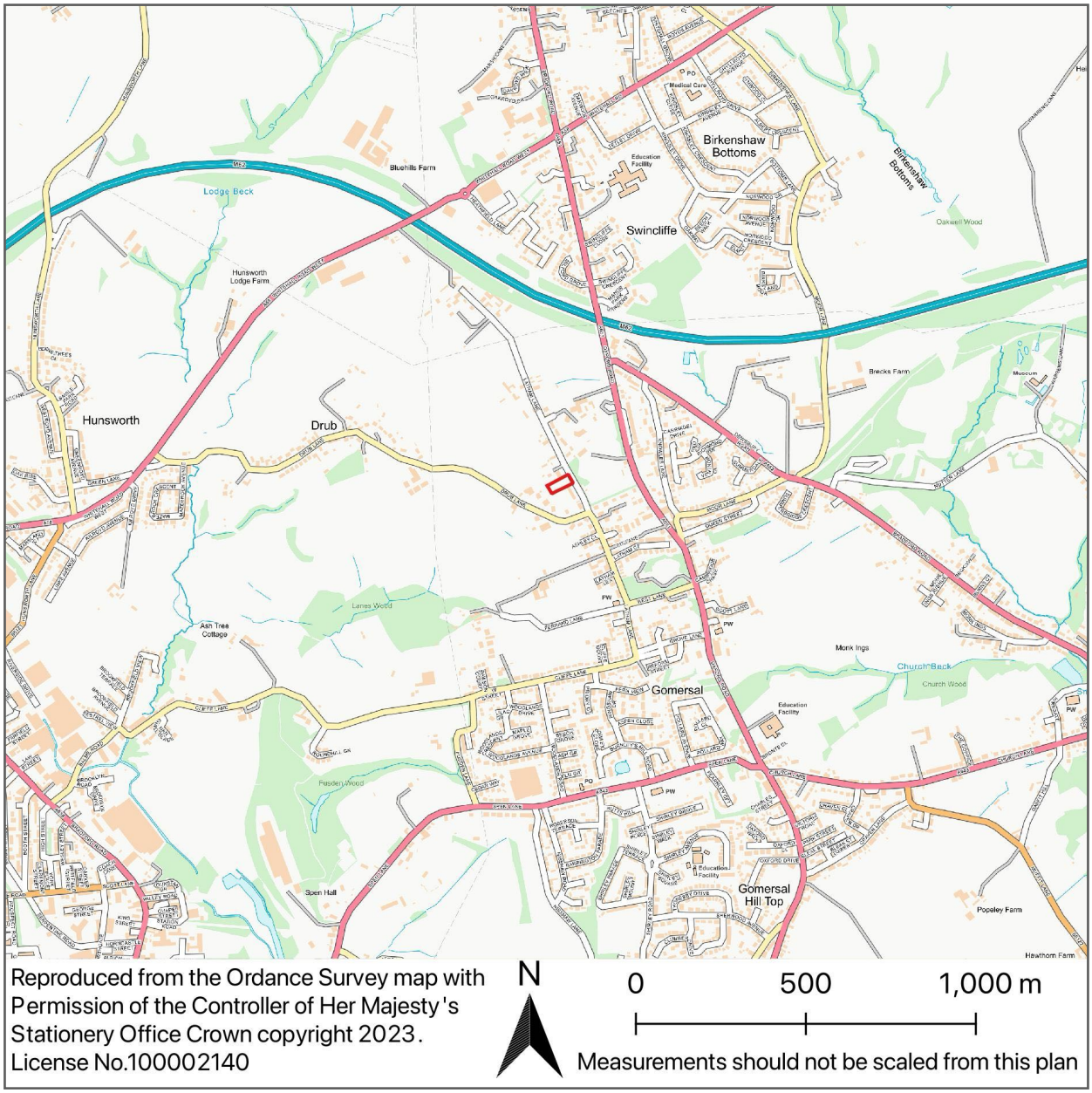


FIGURE 1 - PROPOSED LAYOUT PLAN

The purpose of this letter-report is to confirm the potential risks from the existing topsoil that is proposed to be retained in proposed garden areas as part of the redevelopment of the site.

A series of previously prepared reports and letter-report were provided by the client to provide relevant background information regarding the site and initial ground investigation works, namely:

- Phase 1 Qualitative Desk Study Report & Phase 2 Intrusive Site Investigation Quantitative Contamination Report by GA Site Investigation Ltd (ref: GA.1573.23. Combined-rev01), dated 29th August 2023.
- Letter dated 8th September 2023 by GA Site Investigation Ltd, titled "Additional Soil Analysis: 77 Latham Lane, Gomersal.
- Letter dated 9th October 2023 by GA Site Investigation Ltd, titled "Site Investigation: 77 Latham Lane, Gomersal, BD19 4AD".

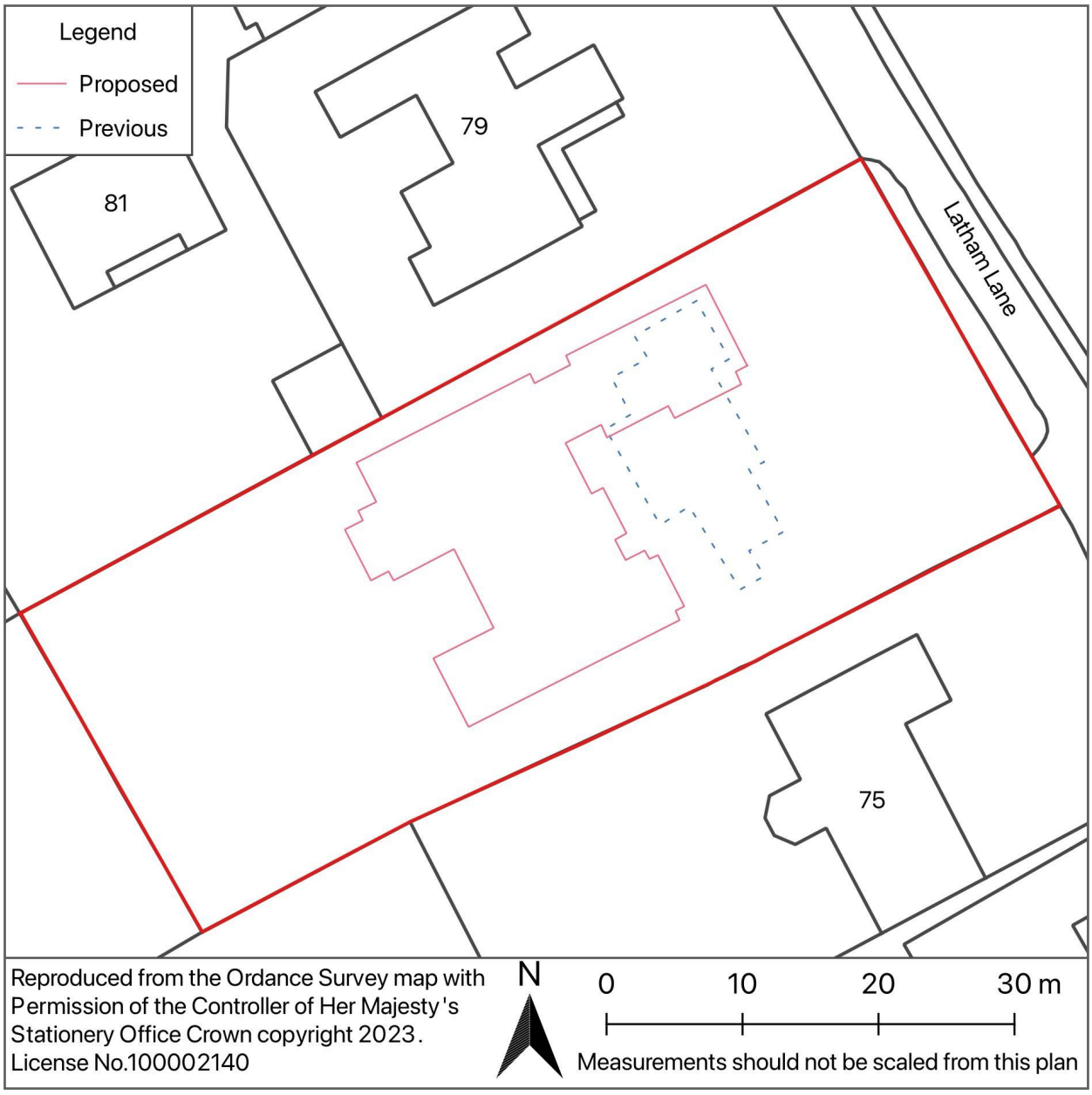


FIGURE 2 - PROPOSED SITE PLAN

- Letter dated 7th November 2023 by GA Site Investigation Ltd, titled “Site Investigation: 77 Latham Lane, Gomersal, BD19 4AD”.

2. THE SITE

The site is a rectangular parcel of land on the west side of Latham Lane, bound by neighbouring residential properties to the north and south, also fronting Latham Lane, and also further to the west. Previously the site was occupied by a residential dwelling, which had been demolished prior to undertaking the supplementary environmental assessment works.

The proposal is to construct a new detached residential dwelling with an access driveway off Latham Lane and garden areas to the north-east and west of the site, as shown on Figure 2. A proposed layout plan is also included as Appendix A.

3. PRELIMINARY ENVIRONMENTAL ASSESSMENT

Previous ground investigation and associated environmental assessment was undertaken in two phases by GA Site Investigation Ltd; firstly with three window sample holes that were undertaken on 5th May 2023 (BH1 to BH3), followed by three supplementary trial pits on 2nd October 2023, designated as TPA to TPC, to collect samples of the existing topsoil to confirm the suitability of the soils for retention in proposed garden areas. The approximate locations of the exploratory holes undertaken by GA Site Investigation Ltd are depicted on Figure 3.

In total five samples of the exiting topsoil were were sent for chemical analysis from all of the exploratory holes undertaken by GA Site Investigation Ltd, for comparison against current Suitable 4 Use Levels (S4ULs) or Category 4 Screening Levels (C4SLs) where no S4UL is available. The chemical testing highlighted two elevated arsenic concentrations in the topsoil from TPA/0.25m-0.35m and TPC/0.10m-0.20m, however no other elevated chemical concentrations were noted when comparing the measured soil concentrations against current S4ULs or C4SLs for a residential end use with potential for homegrown produce, representative of the proposed development and potential exposure pathways.

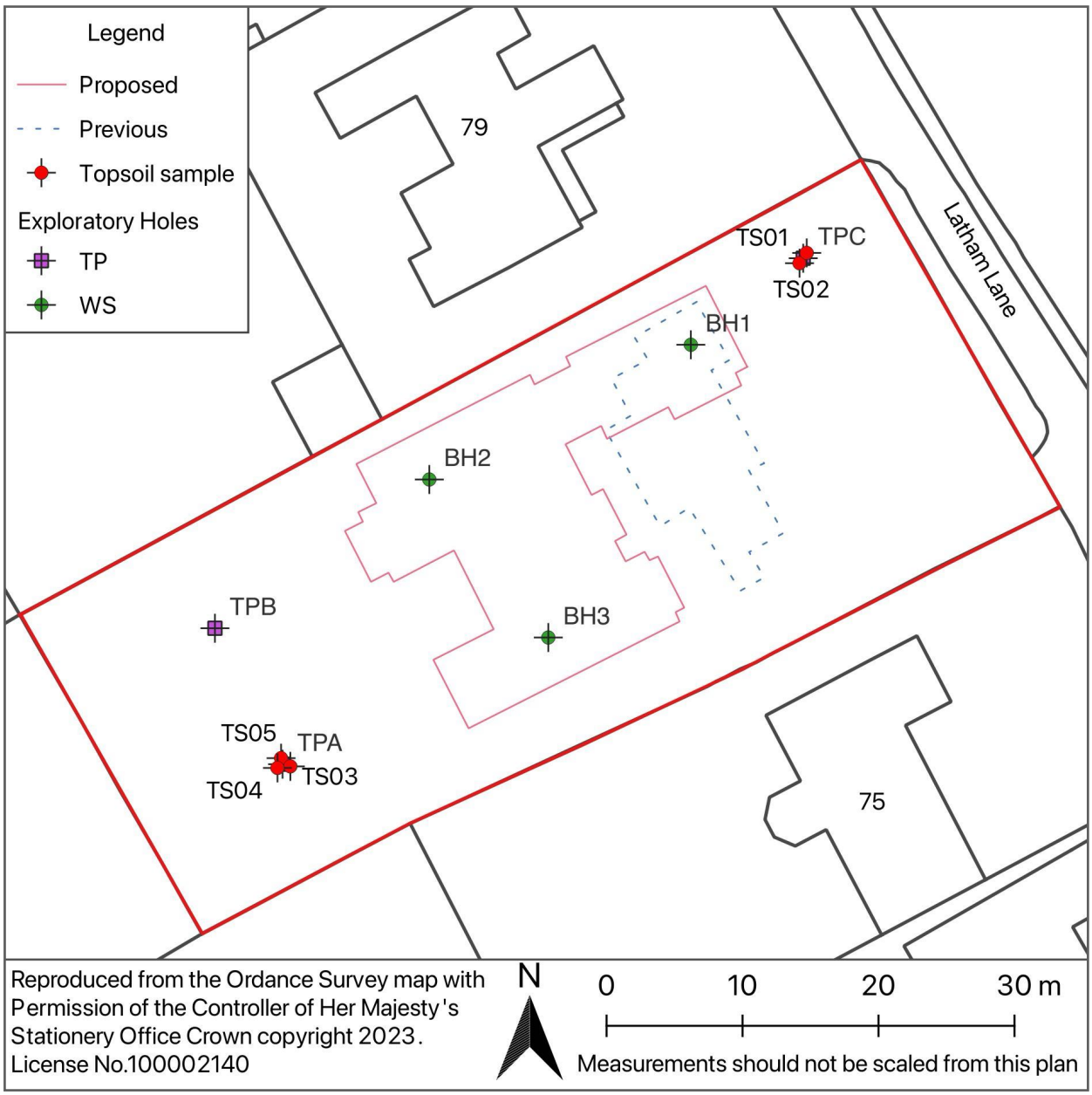


FIGURE 3 - EXPLORATORY HOLE PLAN

4. SUPPLEMENTARY TOPSOIL SAMPLING

To allow a detailed assessment of the potential risk from the elevated arsenic values recorded in the topsoil in TPA and TPC, a further five hand-excavated trial pits were excavated on 1 December 2023 to obtain samples of the topsoil, designated as TS01 to TS05. Two of the samples (TS01 and TS02) were taken around the location of TPC, and three of the additional topsoil samples (TS03 to TS05) were taken from the vicinity of TPA; the approximate locations are shown on Figure 3.

Any Abbyedale BEC Geoscience Engineer excavated the hand pits at locations chosen by the engineer, in the vicinity of the previously identified hotspots. Exploratory hole logs for the supplementary hand-excavated trial pits are included as Appendix B.

The five supplementary topsoil samples were sent to Chemtech Environmental Ltd, a UKAS accredited laboratory, and all five topsoil samples were analysed for total arsenic concentrations, with the samples from TS01 and TS05 also tested for bioaccessible arsenic, to quantify the percentage of the total arsenic that is available for adsorption into the human body via the ingestion pathway from the existing topsoil. Laboratory testing results certificates from the supplementary chemical testing are included as Appendix C.

5. DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

The additional topsoil sampling was undertaken to facilitate a Detailed Quantitative Risk Assessment (DQRA) and confirm whether the previously identified elevated arsenic values constituted a potential risk to future residents who could come into contact with the existing topsoil in proposed garden areas and potentially ingest the soils.

All of the total arsenic concentrations in the supplementary topsoil samples were below the generic S4UL of 37 mg/kg for arsenic, with the bioaccessible arsenic fractions recorded as 17.4% in TS01 and 17.7% in TS05 respectively.

Based on the measured bioaccessible arsenic values from the site topsoil, the model assumptions for the relative bioavailability for arsenic used in CLEA model was adjusted to 18% (0.18) based on the highest measured bioaccessible arsenic percentage from the laboratory testing undertaken. No other settings or model assumptions were changed when using the CLEA model to calculate a Site Specific Assessment Criteria (SSAC) to be used to screen the total arsenic concentrations, making allowance for the reduced bioavailability of arsenic in the site soils compared with the generic assumptions.

Output reports from the CLEA model are included as Appendix D, confirming the calculated SSAC for arsenic of 96.5 mg/kg using the site bioaccessibility testing results for the existing topsoil.

Using the SSAC for arsenic, all of the measured concentrations are below the calculated SSAC and therefore not considered to pose a potential risk to future receptors who could come into contact with the soils in the proposed garden areas.

6. CONCLUSIONS

Based on the findings of the DQRA, all of the concentrations of arsenic in the existing topsoil are below the calculated SSAC value, and all other chemical concentrations are below the generic S4UL or C4SL values. The existing topsoil is therefore considered to be chemically suitable for retention in proposed garden areas as part of the proposed redevelopment of the site, and no remediation measures are considered necessary in the proposed garden areas.

We trust that the above is all in order but please don't hesitate to contact our office on 01924 376622 if you'd like to discuss anything with us at any point.

Yours Sincerely

Richard Saville
BSc CGeol FGS.

APPENDIX A - PROPOSED LAYOUT PLAN

2 PROPOSED STREET SCENE ELEVATION
SCALE 1:200

3 SITE LOCATION PLAN
SCALE 1:1250

1 PROPOSED SITE BLOCK PLAN
SCALE 1:200

GENERAL SPECIFICATION FOR INITIAL ESTABLISHMENT AND MAINTENANCE OF PLANTED AREAS.

Preparation:
Prior to planting, shrub beds shall be forked, dug, hoed and stone picked to create a smooth, even surface free from weeds, stones greater than 50mm in any dimension or other deleterious material. Any perennial weed shall be removed including the roots. If necessary an approved herbicide shall be applied to manufacturer's instructions.

1st Season Maintenance:
Following planting all areas of new shrub planting shall be mulched with coarse grade bark to a minimum settled depth of 75mm during moist ground conditions. Shrub beds shall be kept clear of all weeds by either mechanical or chemical control during the first growing season after planting. Edges of shrub beds that abut grassed areas shall be kept tidy by regular edging at the time of grass cutting.

Long term Maintenance
Bark mulch shall be topped up as necessary at the start of each growing season to maintain a minimum settled depth of 75mm. Such mulching shall only be done once the beds are weed-free. Weeding shall be carried out as necessary during the growing season to keep beds in a tidy condition. Edges of shrub beds shall be kept clipped as above.
Pruning of shrubs shall be carried out as appropriate to maintain shape, flower and vigour.

Turfing
Soil to be prepared with all stones removed. Surface to be lightly scarified and graded to slope evenly where gradients necessary. Supply, lay and bed imported turf to be sourced from an Approved landscape turf supplier (Turf should be in accordance with the specifications given in BS 3969, and laid in accordance with BS 4428:1989, Section 6).

EXISTING BORDERS AND NEW GROUNDCOVER

Existing Borders:
To provide maturity to the garden where possible existing mature shrubs will be retained and any areas requiring infill will be supplemented with the addition of Pachysandra, Hebe, Vinca, Euonymous, Genista etc.

New Ground Cover Plants:
To soften the base of the new house at the edge of the drive and pathway use Pachysandra, Hebe, Vinca, Euonymous, Genista etc.

EXISTING HEDGES AND THEIR PROTECTION DURING THE CONSTRUCTION PHASE

Existing Hedging:
In the interests of providing effective screening and to attract wildlife the existing boundary hedges of beech,hawthorn,holly, privet and hazel will be retained. For new more formal hedging if required use Carpinus or Fagus species or a mixture of the two.

Construction Phase Protection
During the construction phase theexisting hedges and existing trees are to be protected by means of barriers that offer full protection to the trees and hedges and their root systems (contractors responsibility)

Rev A -07/03/23- Street scene elevations added

Revisions

NORTHLIGHT ARCHITECTURE LTD
The Media Centre
7 Northumberland Street
Huddersfield
HD1 1RL
t : 07815 290485
t : 07815 290486
e : info@northlightarchitecture.com
w : www.northlightarchitecture.com

Client
John & Sharon Valente

Project
77 Latham Lane,
Gomersal
CLECKHEATON, BD19 4RX

Drawing title
Site Block & Location Plans
As Proposed

PLANNING APPLICATION

Scale @ A1	Drawn by
1:200/ 1:1250	CG
Date	App'd
February '23	-
Drawing no	Rev
22-1185/(AL)01	A

APPENDIX B - EXPLORATORY HOLE LOGS

4 Neville Street
WAKEFIELD
WF1 5EF
Tel: 01924 376622
www.abbeydalebec.com

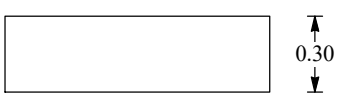
TRIAL PIT LOG

Abbeydale
Building Environment Consultants

Project				TRIAL PIT No
77 Latham Lane, Gomersal, West Yorkshire				TS01
Job No	Date	Ground level (m)	Co-Ordinates ()	
131018	01-12-23		E 420,368.0 N 426,835.0	
Method/Plant Used Hand excavated.				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20	J					(0.25)	MADE GROUND. Soft dark brown sandy gravelly CLAY. Gravel is fine to medium subangular of sandstone and brick. Much rootlets.		
						0.25	Bottom of hand excavated trial pit at 0.25m bgl.		

Shoring/Support: None.
Stability: Stable.



GENERAL REMARKS

Hand excavated trial pit to obtain topsoil sample in vicinity of former TPC. Backfilled with arisings on completion.
Stable.

All dimensions in metres Scale 1:5	Client J. Valente	Contractor ABEC	Logged By RS

ABEC TRIAL PIT 131018.GPJ ABEC TEMPLATE.GDT 18/12/23

4 Neville Street
WAKEFIELD
WF1 5EF
Tel: 01924 376622
www.abbeydalebec.com

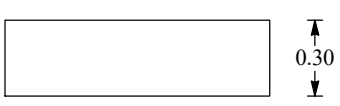
TRIAL PIT LOG

Abbeydale
Building Environment Consultants

Project				TRIAL PIT No
77 Latham Lane, Gomersal, West Yorkshire				TS02
Job No	Date	Ground level (m)	Co-Ordinates ()	
131018	01-12-23		E 420,368.0 N 426,834.0	
Method/Plant Used Hand excavated.				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.15	J					(0.25)	MADE GROUND. Soft dark brown sandy gravelly CLAY. Gravel is fine to medium subangular of sandstone and brick. Much rootlets.		
						0.25	Bottom of hand excavated trial pit at 0.25m bgl.		

Shoring/Support: None.
Stability: Stable.



GENERAL REMARKS

Hand excavated trial pit to obtain topsoil sample in vicinity of former TPC. Backfilled with arisings on completion.
Stable.

All dimensions in metres Scale 1:5	Client J. Valente	Contractor ABEC	Logged By RS

ABEC TRIAL PIT 131018.GPJ ABEC TEMPLATE.GDT 18/12/23

4 Neville Street
WAKEFIELD
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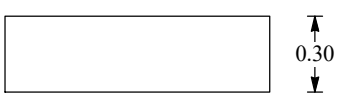
TRIAL PIT LOG

Abbeydale
Building Environment Consultants

Project				TRIAL PIT No
77 Latham Lane, Gomersal, West Yorkshire				TS03
Job No	Date	Ground level (m)	Co-Ordinates ()	
131018	01-12-23		E 420,330.0 N 426,798.0	
Method/Plant Used Hand excavated.				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.15	J					(0.30)	MADE GROUND. Soft dark brown sandy gravelly CLAY. Gravel is fine to medium subangular of sandstone and brick. Much rootlets.		
						0.30	Bottom of hand excavated trial pit at 0.30m bgl.		

Shoring/Support: None.
Stability: Stable.



GENERAL REMARKS

Hand excavated trial pit to obtain topsoil sample in vicinity of former TPA. Backfilled with arisings on completion.
Stable.

All dimensions in metres Scale 1:5	Client J. Valente	Contractor ABEC	Logged By RS

ABEC TRIAL PIT 131018.GPJ ABEC TEMPLATE.GDT 18/12/23

4 Neville Street
WAKEFIELD
WF1 5EF
Tel: 01924 376622
www.abbeydalebec.com

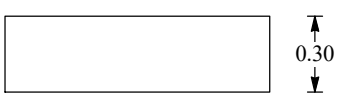
TRIAL PIT LOG

Abbeydale
Building Environment Consultants

Project				TRIAL PIT No
77 Latham Lane, Gomersal, West Yorkshire				**TS04**
Job No	Date	Ground level (m)	Co-Ordinates ()	
131018	01-12-23		E 420,329.0 N 426,798.0	
Method/Plant Used Hand excavated.				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.15	J					(0.30)	MADE GROUND. Soft dark brown sandy gravelly CLAY. Gravel is fine to medium subangular of sandstone and brick. Much rootlets.		
						0.30	Bottom of hand excavated trial pit at 0.30m bgl.		

Shoring/Support: None.
Stability: Stable.



GENERAL REMARKS

Hand excavated trial pit to obtain topsoil sample in vicinity of former TPA. Backfilled with arisings on completion.
Stable.

All dimensions in metres Scale 1:5	Client J. Valente	Contractor ABEC	Logged By RS

ABEC TRIAL PIT 131018.GPJ ABEC TEMPLATE.GDT 18/12/23

4 Neville Street
WAKEFIELD
WF1 5EF
Tel: 01924 376622
www.abbeydalebec.com

TRIAL PIT LOG

Abbeydale
Building Environment Consultants

Project				TRIAL PIT No
77 Latham Lane, Gomersal, West Yorkshire				TS05
Job No	Date	Ground level (m)	Co-Ordinates ()	
131018	01-12-23		E 420,330.0 N 426,798.0	
Method/Plant Used Hand excavated.				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.15	J					(0.30)	MADE GROUND. Soft dark brown sandy gravelly CLAY. Gravel is fine to medium subangular of sandstone and brick. Much rootlets.		
						0.30	Bottom of hand excavated trial pit at 0.30m bgl.		

Shoring/Support: None.
Stability: Stable.

GENERAL REMARKS

Hand excavated trial pit to obtain topsoil sample in vicinity of former TPA. Backfilled with arisings on completion.
Stable.

All dimensions in metres Scale 1:5	Client J. Valente	Contractor ABEC	Logged By RS

ABEC TRIAL PIT 131018.GPJ ABEC TEMPLATE.GDT 18/12/23

APPENDIX C - LABORATORY TEST RESULTS CERTIFICATES

ANALYTICAL TEST REPORT

Contract no: 128905

Contract name: 77 Latham Lane, Gomersal

Client reference: 131018

Clients name: Abbeydale BEC

Clients address: 4 Neville Street
Wakefield
WF1 5EF

Samples received: 04 December 2023

Analysis started: 04 December 2023

Analysis completed: 13 December 2023

Report issued: 13 December 2023

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing

Approved by:

Samantha Rogerson
Reporting Manager

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
128905-1	TS01	0.20	Loamy Clay with Roots	-	-	20.2
128905-2	TS02	0.15	Loamy Clay with Roots	-	-	17.2
128905-3	TS03	0.15	Loamy Clay with Roots	-	-	27.2
128905-4	TS04	0.15	Loamy Clay with Roots	-	-	17.2
128905-5	TS05	0.15	Loamy Clay with Roots	-	-	18.8

Chemtech Environmental Limited

SOILS

Lab number			128905-1	128905-2	128905-3	128905-4	128905-5
Sample id			TS01	TS02	TS03	TS04	TS05
Depth (m)			0.20	0.15	0.15	0.15	0.15
Date sampled			01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Test	**Method**	**Units**					
Arsenic (total)	CE264^{M}	mg/kg As	30.6	26.4	4.2	25.9	33.5
Subcontracted analysis							
Arsenic (bioaccessible)	$	% w/w	17.4	-	-	-	17.7

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE264	Arsenic (total)	Aqua Regia Extraction, ICPOES	Dry	M	3	mg/kg As
$	Arsenic (bioaccessible)	Details on request	Dry		0.1	% w/w

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
128905-1	TS01	0.20	N	
128905-2	TS02	0.15	N	
128905-3	TS03	0.15	N	
128905-4	TS04	0.15	N	
128905-5	TS05	0.15	N	

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Soil/Solid samples will be disposed of 4 weeks from initial receipt unless otherwise agreed.

Waters and leachate samples will be disposed of 2 weeks from report issue unless otherwise agreed.

DEFRA Licence for the introduction and movement within England of prohibited soil for chemical and physical analysis Licence No: 132693/469907-0

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones, where applicable.

Moisture Content Calculated on a Wet Weight basis

APPENDIX D - CLEA MODEL RESULTS AND SETTINGS

CLEA Software Version 1.071

Report generated	14-Dec-23
Report title	77 Latham Lane, Gomersal, West Yorkshire
Created by	Richard Saville at Abbeydale Building Environment Consultants

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	Arsenic	9.65E+01	8.50E+01	NR	0.88	1.00	NR	NR	No	No	No	No	No	No	No	No	No
2																	
3																	
4																	
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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
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

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	Arsenic	99.9	0.1	0.0	100.0	8.50E+01	NR	4.25E+01	3.62E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.65E-02	3.40E-02	1.95E-02	2.80E-02	1.70E-02	9.35E-02
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3																			
4																			
5																			
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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
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

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	Arsenic	1.13E-04	5.35E-05	9.71E-05	2.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
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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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		Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)	Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	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	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.18**	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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		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	Arsenic	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
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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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CLEA Software Version 1.071

Report generated 14/12/2023

Report title 77 Latham Lane, Gomersal, West Yorkshire

Created by Richard Saville at Abbeydale Building Environment Consultants

BASIC SETTINGS

Land Use Residential with produce

Building Detached house
Receptor Female (res) Start age class 1 End age class 6 Exposure Duration 6 years
Soil Sandy loam

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	✓

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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

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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 Detached house

Soil Sandy loam

Building footprint (m^2)	6.80E+01
Living space air exchange rate (hr^{-1})	5.00E-01
Living space height (above ground, m)	4.80E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	3.10E+00
Foundation thickness (m)	1.50E-01
Floor crack area (cm^2)	6.60E+02
Dust loading factor ($\mu g\ m^{-3}$)	5.00E+01

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	2.00E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.30E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.20E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	3.56E-03
van Genuchten shape parameter *m* (dimensionless)	3.20E-01
Bulk density ($g\ cm^{-3}$)	1.21E+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	7.00E+00
Soil Organic Matter content (%)	6.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	3.48E-02
Effective total fluid saturation (unitless)	5.12E-01
Intrinsic soil permeability (cm^2)	4.75E-08
Relative soil air permeability (unitless)	6.42E-01
Effective air permeability (cm^2)	3.05E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($cm^3\ s^{-1}$)	2.50E+01
Building ventilation rate ($cm^3\ s^{-1}$)	4.53E+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