

the remediation report based on the site investigation will comprise a cut on the whole site, then a 450mm layer of subsoil

topped with 150mm topsoil.

CONDITION 11

All good practice principles as stated in Table 21 will be adhered to

Trusting this meets with your approval

Yours faithfully

--

Regards, Janine

Janine Renshaw-Livesey
Planning Officer
Development Management North
Planning Building Control and Licensing - Growth and Neighbourhoods
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12 February 2020
Our Ref: 11392-L02 (00)

Mr David Garrity
Splash Developments Limited
222 Oldham Road
Failsworth
Manchester
M35 0HH

[Issued by e-mail only]

For the attention of David Garrity

Dear David,

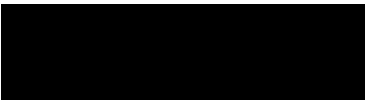
**RE: REMEDIATION STRATEGY LETTER REPORT
FOR THE DEVELOPMENT SITE AT DAISY BANK MILL, TERENCE STREET, NEWTON HEATH**

Please find attached a remediation strategy for the Splash Developments Ltd development site at the former Daisy Bank Mill site, Terence Street, Newton Heath, Manchester. The document seeks to provide the information required as part of the final part of Condition 10(a) of the extant planning permission for the site (Ref: 112059/FO/2016).

If you have any queries, please do not hesitate to contact us.

Yours sincerely

On behalf of RSK


Katie Foster SiLC
Principal Geo-environmental Consultant
(Author)


Karl Hall
Senior Geo-environmental Consultant
(Technical Reviewer)

Enc.

Appendix A - RSK Service Constraints
Appendix B - Figures
Appendix C - Generic Assessment Criteria for Human Health



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**REMEDIATION STRATEGY,
DAISY BANK MILL, TERENCE STREET, NEWTON HEATH**

1. INTRODUCTION

RSK Environment Limited (RSK) was commissioned by Splash Developments Limited (referred to herein as the Client) to prepare a remediation strategy (RS) document for the proposed development at the former Daisy Bank Mill site, Terence Street, Newton Heath, Manchester.

This report is subject to the RSK service constraints given in Appendix A and limitations that may be described through this document.

The site is subject to conditioned planning approval (Ref: 112059/FO/2016). The RS (this document) must be submitted to, and approved in writing by, the local planning authority, which is Manchester City Council (MCC).

1.1 Limitations

This remediation strategy is limited to consideration of the Human Health risks and does not consider the risks to Controlled Waters, the report may therefore require a revision if/when the position of the Environment Agency is confirmed.

The management of potential asbestos risks during construction is outside the scope of this remediation strategy and should be managed under the provisions of an asbestos management plan (if required).

2. BACKGROUND

The site is situated directly to the south of Terence Street in Newton Heath, M40 1QS, grid reference 388662, 400146. A site location plan is attached as Figure 1 in Appendix B. The site covers an area of approximately 0.3 hectares and is currently a disused parcel of land covered in shrubs and demolition material.

The site is being considered for redevelopment with residential end use. The redevelopment will comprise construction of eighteen (18No.) new houses (five semi-detached and two blocks of four houses) with associated car parking areas with some soft landscaping off the new road and private garden areas to the rear of the houses. The planned layout of the site is attached as Figure 2 in Appendix B, which has been reproduced from a client supplied drawing (ref 'Proposed New Houses on Daisy Bank Mill Site, Terence Street'), dated April '16, produced by Les Foey Building Design Consultants.

Condition 10 of the extant planning permission for the site requires the following to be completed and approved by Manchester City Council prior to the development commencing.

- (a) Before the development hereby approved commences, a report (the Preliminary Risk Assessment) to identify and evaluate all potential sources and impacts of any ground contamination, groundwater contamination and/or ground gas relevant to the site shall be submitted to and approved in writing by the City Council as local planning authority.



- In the event of the Preliminary Risk Assessment identifying risks which in the written opinion of the Local Planning Authority require further investigation, the development shall not commence until a scheme for the investigation of the site and the identification of remediation measures (the Site Investigation Proposal) has been submitted to and approved in writing by the City Council as local planning authority.
- The measures for investigating the site identified in the Site Investigation Proposal shall be carried out, before the development commences and a report prepared outlining what measures, if any, are required to remediate the land (the Site Investigation Report and/or Remediation Strategy) which shall be submitted to and approved in writing by the City Council as local planning authority.

When the development commences:

- (b) the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority.

Worms Eye Limited Preliminary risk assessment report (report reference Terence Street/M40 1QD/2018, dated 23 November 2018)

A preliminary risk assessment (PRA) was completed for the site by was completed by Worms Eye Limited (dated 23rd November 2018). The PRA identified several potentially complete contaminant linkages requiring further investigation and assessment. This report forms the basis of the information required as part of the first part of Condition 10(a).

RSK Site investigation interpretive letter report (reference 11392-L01 (00), dated 11 July 2019)

RSK was appointed by the client to undertake an initial phase of intrusive investigation and assessment at the site in July 2019. The main purpose of this investigation was to collect information on the ground conditions and chemical quality of the soils underlying the site so a generic quantitative risk assessment (GQRA) specific to human health risks could be undertaken thus identifying if further assessment and/ or potential remediation as required.

As part of this investigation four drive-in sampler boreholes (designated WS01 to WS04) were advanced to a maximum depth of 5m bgl at locations determined by the Client. RSK's remit for the investigation was to attend the location of each borehole on completion of the drilling to record soil descriptions in general accordance with BS5930 (2015) and collect samples for subsequent chemical testing scheduled by RSK. The findings of the investigation are summarised below.

- The investigation identified made ground to depths of between 1.00 m and 3.50 m. The made ground generally comprised gravel including brick, concrete, coal, slag and sandstone to depths of up to 2.15 m. A reworked clay was encountered in WS02 between 1.65 m to 3.50 m bgl. Underlying the made ground was Till comprising varying proportions of clay, silt, sand and gravel to the maximum depth of investigation of 5.00 m.
- Generally, all contaminants were found to be below the respective RSK Human Health GAC for a residential with home grown produce end-use with the exception except of lead in a sample of made



ground collected from WS02 (0.5-0.6m) located in the Northern part of the site. In this sample a lead concentration of 263mg/kg in excess of the GAC threshold of 200mg/kg was recorded.

- asbestos in soil in the form of loose chrysotile fibres was detected in the Made Ground sample from WS03 at 0.7-0.8m bgl. Subsequent asbestos quantification recorded the asbestos percentage composition in the sample <0.001%, below the laboratory's detection limit. Laboratory testing did not identify ACM or asbestos fibres in three other samples of made ground collected and tested from across the remainder of the site.
- The results indicate that a potentially complete contaminant linkage may exist associated with phytotoxic effects due to a copper concentration of 306mg/kg in the sample WS02 at 0.50-0.60m exceeding the assessment criterion of 200mg/kg.
- Assessment of soil chemical data against UKWIR thresholds indicated that polyethylene pipe materials may not be suitable for use at the site if installed within made ground. Therefore, alternative water supply pipe materials should be considered (e.g. PVC pipes) unless an appropriate level of remedial mitigation is implemented to reduce potential risks to acceptable levels.
- Ground gas monitoring and associated quantitative risk assessment was not undertaken as a review of the potential off-site ground gas sources were not considered significant and the made ground found on site had no evidence of organic materials or potentially degradable material, which is likely to present a higher risk of ground gas generation. Therefore, it is considered that the made ground present on site is likely to pose a low risk for ground gas generation potential and the Client has confirmed that properties constructed at the site will, as a minimum, include gas protection measures for an Amber 1 ground gas regime in accordance with the NHBC Traffic Light System.
- The report concluded that further investigation and/ or remediation is/ are required to further assess and/ or mitigate risks associated with identified potentially complete contaminant linkages in order to protect receptors

In respect of the RSK report conclusions, the following sections in this RS have been prepared to provide the information required to support discharge of the final part of Condition 10(a) of the planning permission. The objective of this RS document is to clearly set out the present site condition and state the objectives of the remediation work to be carried out, to remove potentially complete contaminant linkages that remain on site.

3. SUMMARY OF CONCEPTUAL MODEL AND RISK ASSESSMENT

This section summarises the conceptual site model (CSM) as developed and refined during the preceding stages of investigation undertaken by Worms Eye and RSK. The CSM is a key tool to enable linkages between contaminant sources, pathways, and receptors to be assessed in accordance with the CLR11 procedures. Where exploratory hole locations from the preceding phases of work undertaken by RSK are referenced, their locations on site are presented on Figure 3 provided in Appendix B.

3.1 Geology

Surface construction



The site is generally unsurfaced and covered with rough gravel and demolition rubble. There are some areas of grass and vegetation around the perimeter areas of the site.

Made ground

Made Ground was encountered in every hole to depths of between 1.0m and 3.5m. Made ground composition was variable, generally comprising gravelly sand or sandy gravel with gravel of brick, concrete, coal, slag and sandstone with cobbles of sandstone and brick in places. Some sandy gravelly clayey portions were also present in WS01 and WS02.

Soils interpreted to be reworked natural clay were encountered in WS02 and WS04. This generally comprised firm or stiff, reddish brown or orange mottled light grey gravelly clay, sometimes with gravel of coal and sandstone.

Natural geology - Till

Till was underlying the Made Ground in every hole, the top of which was between 1.0m and 3.5m bgl and the full depth of which was not proven in any hole. The Till consisted of lenses of varying proportions of clay, silt, sand and gravel. WS01 was predominantly gravelly sand, WS02 was gravelly sand and gravelly sandy clay, in WS03 there was a layer of organic silty soil with an organic odour overlying gravelly clay. WS04 was alternating horizons of gravelly clays and sands.

Solid Geology

Bedrock was not encountered during the investigation works.

3.2 Groundwater

Groundwater seepages were in WS01 at 2.0m and 3.0m bgl and groundwater was struck in WS04 at 3.0m bgl. No groundwater was within WS02 or WS03 in the eastern side of the site. Groundwater occurrences were all within the granular portions of the Till. And are considered to be perched water volumes, not representative of the natural groundwater table.

3.3 Contamination observations

Visual evidence of potential contamination was observed in WS01 in the north west of the site as asphalt gravel within the Made Ground between ground level and 0.6m bgl. Ash and gravel of coke and slag were present in WS02 at 0.40m to 1.00m bgl and slag only between 1.10m and 1.65m bgl. This made ground in the north east of the site is thought to be associated with the former chimney.

Organic, soft to firm, grey, predominantly silty and clayey soils with an organic odour were encountered in the Till in WS03 in the south east of the site between 1.0m and 1.6m bgl.

Gravel of coke was present within the made ground in WS04 in the south west of the site from ground level to 1.0m bgl.



No other visual or olfactory evidence of contamination was noted during the fieldwork though asbestos fibres were detected during laboratory analysis of the sample from WS03 at 0.7-0.8m bgl.

Following the laboratory testing all contaminants were found to be below their respective generic assessment criteria (GAC), except for lead in WS02, with a concentration of 263mg/kg, exceeding the threshold of 200mg/kg, which may be associated with the presence of the ash and gravel of coke and slag which were noted in this area.

3.4 Relevant contaminant linkages

Following completion of the generic quantitative risk assessment and further assessment detailed in the previous Worms Eye and RSK reports, the following relevant contaminant linkages were identified by RSK as being potentially complete and requiring further assessment and/ or remedial action:

- Linkage 1: risk to human health from direct contact (including fibre inhalation) with contaminated made ground (including lead and asbestos)
- Linkage 2: phytotoxic risk to proposed vegetation growing within contaminated made ground
- Linkage 3: risk of impact from organic contaminants on potable water supply pipes
- Linkage 4: Possible risk to future site users from ground gas accumulation



4. REMEDIAL AND DEVELOPMENT OBJECTIVES

4.1 Remedial objectives

The objective of the remedial works is to address the relevant contaminant linkages identified in Section 3.4, to render the site suitable for the proposed end use. The following remedial objectives are taken into account in formulating this strategy:

- compliance with regulatory environmental protection requirements;
- reduce to acceptable levels the potential risks that are associated with contaminants by either removing the source from the site or breaking the pathway that links the source to the receptor; and
- limit the removal of soil from site (for disposal) only to that necessary to achieve required development levels – Government policy is to encourage sustainable methods of remediation

4.2 Development objectives

The following development objectives have been taken into account in formulating this strategy:

- economy of development by maximising use of development form (e.g. hard surfacing, building construction) in arriving at a remedial solution;
- minimise delay to development programme; and
- minimise long-term maintenance requirements.

5. REMEDIATION STRATEGY

The general principles underpinning the proposed remediation are presented in the following section according to the contaminant linkage which is to be addressed. It is important to note that owing to the limited data set that is available, certain of the remedial actions assume any made ground present at the site is unsuitable to remain within 0.60m of soft cover finish level in garden areas. This is considered a conservative approach to mitigating potential risks posed to the identified receptors post-development. It is recognised that the requirement for remedial action may be reduced (or even removed) in specific areas of the site subject to further investigation and assessment being carried out and this robustly demonstrating risks to be at acceptable levels. Any amendment to the remedial actions proposed below will require prior agreement with the local planning authority and may possibly necessitate a revision to this remediation strategy.

5.1 Contaminant linkage 1 – risk to human health from direct contact (including fibre inhalation) with contaminated soils (including lead and asbestos)

It is recommended that any made ground that is present within 600mm of soft cover finish level in areas of the site where private garden areas will be post-development is removed to allow 'clean' cover soil to be placed. Where natural soils are present within 600mm of garden finish level, this material may remain in situ subject to verification of the material's suitability via chemical testing and assessment.

Contaminated materials, if being stockpiled on site, should be contained to prevent cross contamination of previously 'clean' soils. This should involve placement of plastic sheeting beneath the stockpile or stockpiling the material over an area of hardstanding.

An environmental specialist should be present during the work to provide verification of the remedial action for inclusion in the remedial verification report.

5.2 Contaminant linkage 2 - phytotoxic

The remedial strategy described for linkage 1 above would be considered an appropriate measure to also address the potential linkage for the phytotoxic effect on plants within garden areas. This would be done through the importation of a clean and suitable growing medium as the topsoil.

5.3 Contaminant linkage 3 – water supply pipes

It is noted the presence of hydrocarbon concentrations in shallow made ground underlying the site may require selection of specialist pipe materials to protect the potable water supply connected to future buildings. Therefore, a United Utilities risk assessment for water supply pipes requires completion to assist selection of suitably protective pipe materials for the potable water supply for the development.

5.4 Contaminant linkage 4 – gas

Whilst the gas regime for the site hasn't been completed quantitatively, given the general absence of potential sources of ground gas and the absence of any putrescible material within the made ground, there is likely to be a very low potential of ground gas. However, in the absence of quantitative evidence (ground



gas monitoring), to qualify this, as a 'worse-case' approach, a ground gas regime of 'Amber 1' should be assumed for the site, which provides low level gas protection for the properties.

It is understood that it is already the developer's proposals to install ground gas protective measures which would be suitable for an 'Amber 1' scenario in all properties. This requires the incorporation of a membrane and ventilated sub-floor void to create a permeability contrast to prevent ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. Ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours.

Alternatively, it may be possible to 'de-categorise' the assumed ground gas regime, with some ground gas monitoring and further quantitative site assessment. However, as the developer is proposing to install gas protection measures to 'Amber 1' levels for the development, a ground gas risk assessment was not considered to be required at this stage. However, it will be prudent to ensure the installation of the gas protection measures has been carried out to an appropriate standard and verified, as per the details in section 6.2 below.

5.5 Non-remedial general excavation/soft strip

There are several excavation activities that may be necessary on site due to design reasons, rather than for remediation purposes. During these works, should any suspected contamination be encountered, the contractors should contact the environmental specialist in the first instance. Such activities may include:

- excavations to allow removal of, or to reduce the level of, old foundations and other hard sub-surface structures such that they do not interfere with foundations to the proposed development
- excavations for foundations
- excavations to remove shallow drainage, and redundant services, if required.

These additional excavations may also provide an opportunity to observe ground conditions and, if necessary, obtain samples for chemical analyses if there is any cause for concern. These excavation works are not a required part of the remedial strategy as they are related to construction activities. However, they are noted here since they may potentially reveal ground that has previously not been observed.

5.6 Re-use of materials

The development is likely to produce an excess of soil during earthworks associated reduced level digs, excavations for foundations and utilities, etc. If re-use of site-won materials is proposed, then such operations shall be subject to the provisions of a materials management plan (MMP) and/ or within the limits and conditions of an appropriate waste exemption for a low-risk waste operation that is exempt from needing an environmental permit.

5.7 Waste disposal

Disposal of materials to off-site waste receiving/treatment facilities may also be covered under the site waste management plan. Excess soils or soils unsuitable to remain on site are likely to be generated during



the development. Where this occurs, chemical test data will be used to inform waste classification of the material. Additional soil samples may be required to determine the nature of the soil in relation to waste disposal. Additional analysis may include the determination of waste acceptance criteria (WAC) results. Appropriate disposal facilities will be contacted to confirm the adequacy of data already available and additional data will be collected where this is necessary. It is possible that disposal may be granted based on the information that is already available.

Waste soils will be taken to an appropriately licensed treatment or disposal facility and transported by an appropriately licensed carrier. Duty of Care information to demonstrate this will be collected and maintained on site for inspection.

Disposal of general waste may be managed under a site waste management plan the development of which is outside the scope of this report.



6. REQUIREMENTS FOR REMEDIATION VERIFICATION

6.1 Cover soils

6.1.1 Site records

A record of all soil imports and exports to site for the purpose of installing a suitable cover will be maintained and this will include:

- invoices and vehicle tickets - the origin of the soil can be traced to the specific donor site
- chemical test data – all data obtained from the donor site or from site initiated chemical testing
- storage – the location of temporary storage or quarantine areas will be identified, and plans / photographs will be kept showing where the stockpiles were; and
- verification reports – reports that are generated following visits for the purpose of verification will be retained on site.

Site records will be maintained so that sufficient data are available for the purpose of compiling a robust verification report. In addition, where further testing and assessment of asbestos in soil for in situ soils / site-derived soils is undertaken, details of this will be retained (along with any mitigation measures implemented) for inclusion in the site health and safety file.

Chemical test data and visual confirmation of suitability will be recorded prior to confirming the imported soils as being suitable. Verification records relating to cover soils will be collated in a verification report on completion of all site works.

6.1.2 Chemical testing frequency

The type and frequency of confirmatory soil laboratory analysis will be in accordance with that in Table 1. Where appropriate chemical test data is not available, additional sampling will be undertaken once the material is received at site.

Imported soil material will either be quarantined in a temporary storage area where its use will await confirmation of chemical test data or it will be placed directly into the final place of use. Soils may need to be removed from site if the chemical test data shows it is not suitable. Any imported soils will be clearly labelled as awaiting clearance until suitable data confirms its acceptance.

Material arriving at the site will be visually assessed for suitability before it is either placed in quarantine or directly in the final location.



Table 1: Sampling and Testing Requirements

Number of samples		Testing schedule
Site derived soils		
Natural soil	If material is to remain in situ within 600mm of soft cover finish level, then 1 sample per 4 gardens	As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn, PAH (16 USEPA speciation)
Imported cover soil		
Greenfield soils	Minimum 3 samples, or 1 per 250m ³ (whichever is the greater)	As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn, PAH (16 USEPA speciation),
Brownfield / screened soils	Minimum 3 samples or 1 per 100m ³ (whichever is the greater)	As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn, PAH (16 USEPA speciation), TPH (CWG banded), asbestos in soil and any additional analysis depending on the history of the donor site

6.1.3 Chemical validation criteria

Imported and/or site-derived soils destined for use as part of a simple soil cover system will be scheduled for chemical testing in accordance with the determinants listed in Table 1, and their suitability assessed by comparison of the chemical data with RSK's generic assessment criteria (GAC) for human health (residential with home grown produce). A copy of the GAC are presented as Appendix C.

6.1.4 Physical validation of cover soil thickness

In addition to assessing the chemical suitability of the imported material, measurements of the placed subsoil and topsoil thickness will also be confirmed by a third-party. In the areas of soft landscaping and gardens which overly made ground a simple soil cover is to be built up with growth supporting imported subsoil (or suitable excavated material) and topsoil materials as indicated below:

- Garden areas shall comprise at least 600mm total thickness of chemically certified 'clean' cover soil including a minimum of 150mm topsoil. The physical thickness of cover soils will be assessed at a frequency of 1 per plot
- Landscape area shall comprise at least 300mm total thickness of chemically certified 'clean' cover soil including a minimum of 150mm topsoil. The physical thickness of cover soils will be assessed at a frequency of 1 per area.

Soil descriptions for subsoil and topsoil, relevant measurements recorded; photographic evidence will be obtained. A drawing showing the layout of the buildings' footprints, the hard-surfaced areas and the soft landscaping areas, together with the locations where the soils in the landscaped areas have been removed and replaced by imported material will be documented in the verification report.



6.2 Gas protection measures

The detailed design of the gas protection measures should be included within the gas verification process. In accordance with BS8485, the verification report should include:

- a description of any measures installed – this could be presented in textual form, as photographic records or by as-built construction drawings (any variations to the pre-construction design should be fully detailed, and justification(s) presented);
- details of who installed the measures;
- details of who inspected or verified the installation/s and a description of how this took place, together with any constraints (i.e. areas that could not be inspected or tested) or other issues of uncertainty;
- verification test results, outcome of inspections and compliance data should be provided, either within the main text or as an Annex to the report; and
- any defects identified, together with corrective actions and subsequent verification checks.

Where appropriate, the report content should also include:

- copies of regulatory correspondence/sign off;
- manufacturers' specifications, warranties and/or guarantees;
- personnel details (such as relevant qualifications); and
- maintenance requirements and/or limitations of the system.

In all circumstances, the report should provide a concluding comment about the suitability (or otherwise) of installed gas measures and include the name of the author, company details and date of issue.

7. CONSTRAINTS AND CONTINGENCY FOR ADDITIONAL ASSESSMENT

7.1 Potential constraints

The availability of suitable storage areas on site to quarantine soils that are awaiting confirmation testing may be insufficient or unavailable, depending on the nature of the work being undertaken. If storage is unavailable, it may be necessary to place the cover system soils directly into place as they are received and schedule chemical testing from samples taken in-situ. In the event that the chemical test data shows an exceedance of the assessment criteria, there is a risk this soil would need to be excavated and removed from site or used in another location where it will be suitable.



7.2 Unanticipated contamination

As is the case with the redevelopment of any Brownfield site, it is possible that contamination that has not already been identified by site investigation could be encountered during development works. A watching brief will be maintained by site staff, looking for any visual and olfactory evidence of contamination during the development works, to ensure that any unexpected areas of contamination are identified and assessed.

In the event that unexpected horizons of contaminated soils are identified during excavation works, the contractor will inform the site manager and/or contact the environmental consultant immediately. Work will be postponed in the area of discovery with the work area cordoned off. The soils will be inspected, sampled and or analysed to assess the potential risks. The environmental consultant will document any findings.

7.3 Waste disposal

Disposal of general waste will be managed under a site waste management plan the development of which is outside the scope of this report.

The off-site disposal of soils (including made ground) to an off-site facility will also be covered under the waste management plan, which will require sufficient chemical and physical testing to be undertaken to allow correct waste classification / characterisation to be completed.



APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Splash Developments Limited (the "Client") in accordance with the terms of a contract [RSK Environment Standard Terms and Conditions] between RSK and the Client, via email dated 29 January 2020. The Services were performed by RSK with the reasonable skill and care ordinarily exercised by an environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the Client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
 - a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.



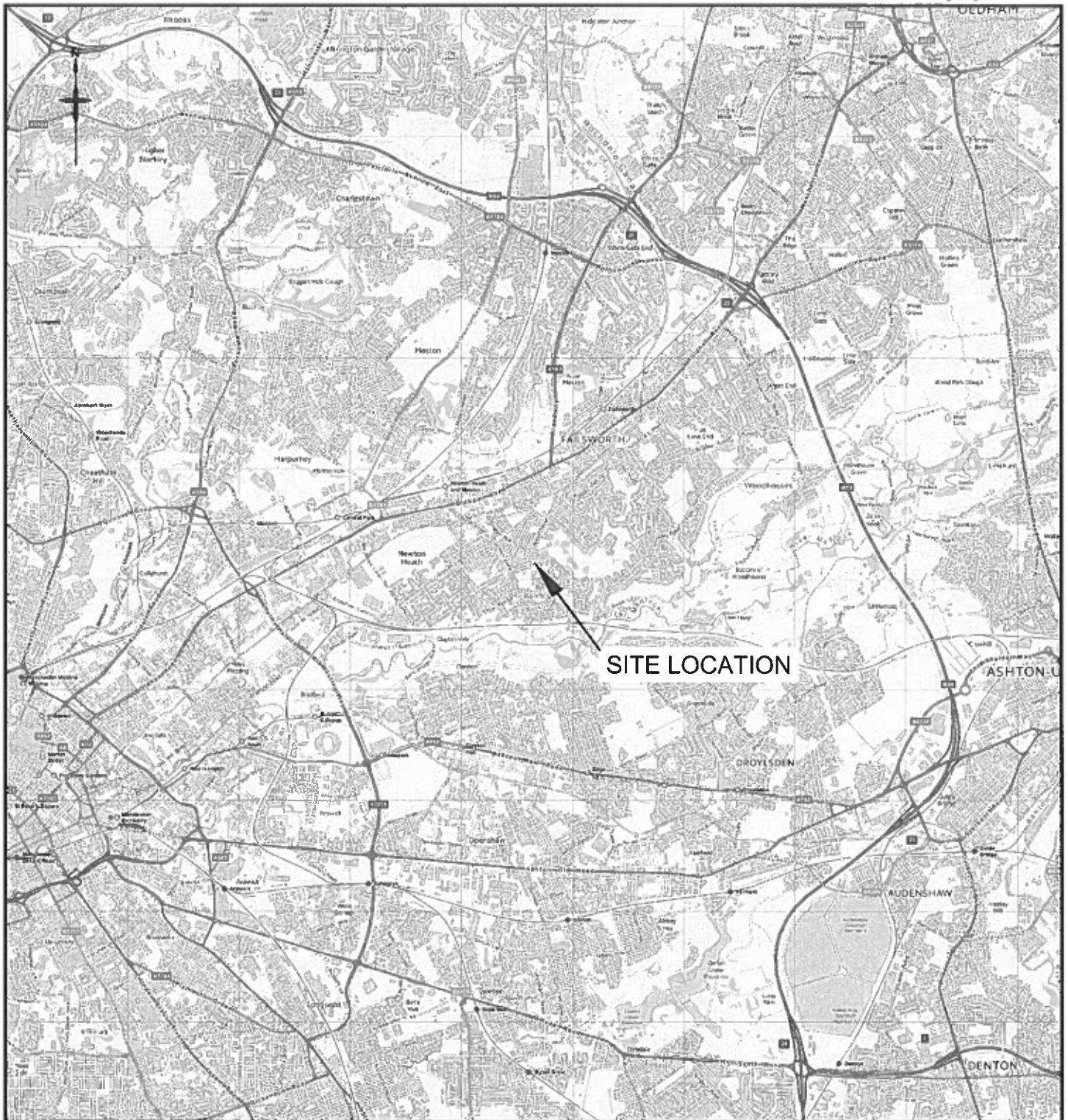
- b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.
- c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

- 8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.
- 9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
- 10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.
- 11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.
- 12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.



APPENDIX B FIGURES



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Client

SPLASH DEVELOPMENTS LTD

Project Title

TERENCE STREET, NEWTON HEATH

Drawing Title

SITE LOCATION PLAN

Drawn	Date	Checked	Date	Approved	Date	Project No.	Drawing File
HD	06.02.20	KF	06.02.20	KF	06.02.20	11392	11392-L02(00)D001A
Scale	1:50000	Orig Size	A4	Dimensions	—	Drawing No.	Rev.
						FIGURE 1	A

Proposed private garden areas

Proposed landscaped areas

A	06.02.20	FIRST ISSUE	HD	KF	KF
REV	DATE	DESCRIPTION	BY	CHKD./APR.	
Dimensions		Position	Scale	Orig. Size	
m			NTS	A3	

香

[illegible]

SPLASH DEVELOPMENTS LTD

TERENCE STREET, NEWTON HEATH

PROPOSED DEVELOPMENT PLAN

JOB No.:	DRAWING FILE:	
11392	11392-L02(00)D002A	
BY:	DATE	CONTRACT NO.
HD	06.02.20	
FIGURE 2		REV:
		A

[illegible]

LEGEND:

- Proposed private garden areas
- Proposed landscaped areas
- Site boundary
- Window sample borehole



SURFACE WATERS AND DRAINAGE
ALL GARDENS TO BE TURFED AND ALL DRIVES AND PATHS
TO BE PERMEABLE.

LANDSCAPING TREATMENT
2ND TREES TO BE RETAINED AT THE REAR OF THE SITE
T10&T7 SEE ATTACHED TREE SURVEY PLAN.
TURFED FRONT AND REAR GARDENS.
DETAIL OF BOUNDARY AND GARDEN TREATMENT
DRAWING ATTACHED.

PRIOR TO THE DEMOLITION OF THE BUILDING AN
ECOLOGY REPORT AND BAT SURVEY DETAILS WILL BE
SUBMITTED.

refuse vehicle turning within the site.

2.1 MTS HIGH FENCE

2.1 MTS HIGH FENCE

NO WORK TO COMMENCE BEFORE PLANNING PERMISSIONS HAVE BEEN GRANTED
AND WORK TO COMPLY WITH BUILDING REGULATIONS APPROVAL HAS BEEN OBTAINED
ALL WORK TO BE COMPLETED WITHIN THE TIME FRAME SPECIFIED IN THE CONTRACT
ALL SIZES AND SPACES TO THIS PLAN TO BE REPORTED TO LES FOR REVIEW AND APPROVAL
IF THE WORK FALLS WITHIN THE PROVISIONS OF THE PARTY WALL ACT 1993 THE CLIENT
SERVES NOTICE IN WRITING OF ANY PROPOSED WORK TO THE OTHER PARTY TO THE PARTY WALL ACT 1993
WHICH IS NECESSARY TO BE ADVISED TO

REV	DATE	DESCRIPTION	BY	CHKD	APPD
A	06.02.20	FRST ISSUE	HD	KF	KF
DIMENSIONS			SCALE	DATE	SIZE
m			NTS		A3



Project No: 11392
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Tel: 0161 275 1234
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Web: www.psk.co.uk

CLIENT	SPLASH DEVELOPMENTS LTD
PROJECT	TERENCE STREET, NEWTON HEATH
TITLE	PROPOSED DEVELOPMENT WITH EXPLORATORY HOLE PLAN
JOB NO.	DRAWING FILE
11392	11392-L02(00)D003A
BY: DATE	CONTRACT NO.
HD 06.02.20	FIGURE 3
	A



APPENDIX C GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH



Generic assessment criteria for human health: residential scenario with home-grown produce

Background

RSK's generic assessment criteria (GAC) were initially prepared following the publication by the Environment Agency (EA) of soil guideline value (SGV) and toxicological (TOX) reports, and associated publications in 2009⁽¹⁾. RSK GAC were updated following the publication of GAC by LQM/CIEH in 2009⁽²⁾. RSK GAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

Updates to the RSK GAC

In 2014, the publication of Category 4 Screening Levels (C4SL)^(3,4), as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3)⁽⁵⁾ used in the generation of SGVs.

C4SL were published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010⁽³⁾). Where a C4SL has been published, the RSK GAC duplicates the C4SL published values using all input parameters within the SP1010 final project report⁽³⁾ and associated appendices⁽⁶⁾, and adopts them as GAC for these six substances.

For all other substances the C4SL exposure modifications, with the exception of the "top two" produce type approach taken in the C4SL, have been applied to the current RSK GAC. These include alterations to daily inhalation rates for residential and commercial scenarios, reducing soil adherence factors in children (age classes 1 to 12 only) for residential land use, reducing exposure frequency for dermal contact outdoors for residential land use, and updated produce type consumption rates (90th percentile) based on recent data from the National Diet and Nutrition Survey.

The RSK GAC have also been revised with updated toxicology published by LQM/CIEH in 2015⁽⁷⁾ or by the USEPA⁽¹⁴⁾, where a C4SL has not been published.

RSK GAC derivation for metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated using the Contaminated Land Exposure Assessment (CLEA) tool v1.071, supporting EA guidance^(5,8,9) and revised exposure scenarios published for the C4SL⁽³⁾. The SAC are also termed GAC.

Conceptual model

In accordance with SR3⁽⁵⁾, the residential with home-grown produce scenario considers risks to a female child between the ages of 0 and 6 years old as the highest risk scenario. In accordance with Box 3.1 of SR3⁽⁵⁾, the pathways considered for production of the SAC in the residential with home-grown produce scenario are

- direct soil and dust ingestion



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

Figure 1 is a conceptual model illustrating these linkages.

In line with guidance in the EA SGV report for cadmium⁽¹⁾, the RSK GAC for cadmium has been derived based on estimates representative of lifetime exposure. Although young children are generally more likely to have higher exposures to soil contaminants, the renal toxicity of cadmium, and the derivation of the TDI_{oral} and TDI_{inh} , are based on considerations of the kidney burden accumulated over 50 years or so. It is therefore reasonable to consider exposure not just in childhood but averaged over a longer period.

With respect to volatilisation, the CLEA model assumes a simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase⁽⁹⁾. The upper boundaries of this partitioning are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA model estimates saturated soil concentrations where these limits are reached⁽⁹⁾. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous- or vapour-based soil saturation limits. Model output cells are flagged red where the saturated soil concentration has been exceeded and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10%. In this case, further consideration of the following is required⁽⁹⁾:

- Free phase contamination may be present.
- Exposure from the vapour pathways will be over-predicted by the model, as in reality the vapour phase concentration will not increase at concentrations above saturation limits
- Where the vapour pathway contribution is greater than 90%, it is unlikely the relevant health criteria value (HCV) will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV.

Where the vapour pathway is the predominant pathway (contributes greater than 90% of exposure) or the only exposure route considered and the cell is highlighted red (SAC exceeds saturation limit), the risk based on the assumed conceptual model is likely to be negligible as the vapour risk is assumed to be tolerable at maximum possible soil concentrations. In such circumstances, the vapour pathway exposure should be considered based on the presence of free phase or non-aqueous phase liquid sources and the measured concentrations of volatile organic compounds (VOC) in the vapour phase. Screening could be considered based on setting the SAC as the modelled soil saturation limits. However, as stated within the CLEA handbook⁽⁹⁾, this is likely to not be practical in many cases because of the very low saturation limits and, in any case, is highly conservative.

It should also be noted that for mixtures of compounds, free phase may be present where soil (or groundwater) concentrations are well below saturation limits for individual compounds.

Where the vapour pathway is only one of the exposure pathways considered, an additional approach can then be utilised as detailed within Section 4.12 of the CLEA model handbook⁽⁹⁾, which explains how to calculate an effective assessment criterion manually.

SR3⁽⁵⁾ states that, as a general rule of thumb, it is recognised that estimating vapour phase concentrations from dissolved and sorbed phase contamination by petroleum hydrocarbons are



at least a factor of ten higher than those likely to be measured on-site. RSK has therefore applied an empirical subsurface to indoor air correction factor of 10 into the CLEA model chemical database for all petroleum hydrocarbon fractions (including BTEX, trimethylbenzenes and the polycyclic aromatic hydrocarbons (PAH) naphthalene, acenaphthene and acenaphthylene) to reduce this conservatism.

Input selection

The most up-to-date published chemical and toxicological data was obtained from EA Report SC050021/SR7⁽¹⁰⁾, the EA TOX⁽¹¹⁾ reports, the C4SL SP1010 project report and associated appendices^(3,6), the 2015 LQM/CIEH report⁽⁷⁾ or the USEPA IRIS database⁽¹⁴⁾. Where a C4SL has been published, the RSK GAC have duplicated the C4SL published values using all input parameters within the SP1010 final project report⁽³⁾ and associated appendices⁽⁶⁾, and has adopted them as GAC for these six substances. Toxicological and specific chemical parameters for 1,2,4-trimethylbenzene, barium and methyl tertiary-butyl ether (MTBE) were obtained from the CL:AIRE Soil Generic Assessment Criteria report⁽¹¹⁾.

For TPH, aromatic hydrocarbons C₅–C₈ were not modelled, as this range comprises benzene (>EC5-EC7) and toluene (>EC7-EC8), which are modelled separately.

Physical parameters

For the residential with home-grown produce scenario, the CLEA default building is a small, two-storey terrace house with a concrete ground-bearing slab. The house is assumed to have a 100m² private garden consisting of lawn and flowerbeds, incorporating a 20m² plot for growing fruit and vegetables consumed by the residents. SR3⁽⁵⁾ notes this residential building type to be the most conservative in terms of potential for vapour intrusion. The building parameters used in the production of the RSK GACs are the default CLEA v1.06 inputs presented in Table 3.3 of SR3⁽³⁾, with a dust loading factor detailed in Section 9.3 of SR3⁽⁵⁾. The parameters for a sandy loam soil type were used in line with Table 4.4 of SR3⁽⁵⁾. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for SOM, RSK has produced an additional set of GAC for SOM of 1% and 2.5% for all substances using the CLEA tool.

Summary of modifications to the default CLEA SR3⁽⁵⁾ input parameters for residential with home-grown produce land-use scenario

In summary, the RSK GAC were produced using the default input parameters for soil properties, the air dispersion model, building properties and the vapour model detailed in SR3⁽⁵⁾. Modifications to the default SR3⁽⁵⁾ exposure scenarios based on the C4SL exposure scenarios⁽³⁾ are presented in Tables 2 and 3 below.

The final selected GAC are presented by pathway in Table 4 and the combined GAC in Table 5.

Figure 1: Conceptual model for residential scenario with home-grown produce

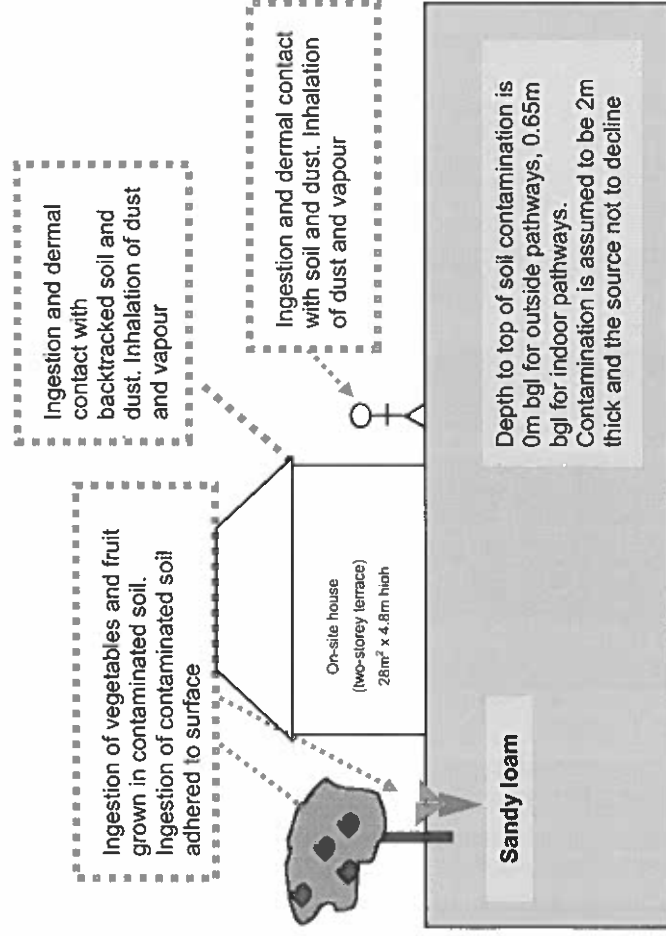


Table 1: Exposure assessment parameters for residential scenario with home-grown produce – inputs for CLEA model

Parameter	Value	Justification
Land use	Residential with homegrown produce	Chosen land use
Receptor	Female child age 1 to 6	Key generic assumption given in Box 3.1, SR3 ⁽⁵⁾
Building	Small terraced house	Key generic assumption given in Box 3.1, SR3. Small, two-storey terraced house chosen, as it is the most conservative residential building type in terms of protection from vapor intrusion (Section 3.4.6, SR3) ⁽⁵⁾
Soil type	Sandy Loam	Most common UK soil type (Section 4.3.1, from Table 3.1, SR3) ⁽⁵⁾
Start AC (age class)	1	Range of age classes corresponding to key generic assumption that the critical receptor is a young female child aged 0–6. From Box 3.1, SR3 ⁽⁵⁾
End AC (age class)	6	
SOM (%)	6	Representative of sandy loamy soil according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents' ⁽¹³⁾
	1	To provide SAC for sites where SOM <6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Residential with home-grown produce – modified home-grown produce data

Name	Consumption rate 90 th percentile (g FW kg ⁻¹ BW day ⁻¹) by age class						Dry weight conversion factor (g DW g ⁻¹ FW)	Home-grown fraction (average)	Home-grown fraction (high end)	Soil loading factor (g g ⁻¹ DW)	Preparation correction factor
	1	2	3	4	5	6					
Green vegetables	7.12	5.87	5.87	5.87	4.53	4.53	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	10.7	2.83	2.83	2.83	2.14	2.14	0.103	0.06	0.4	1.00E-03	1.00E+00
Tuber vegetables	16	6.6	6.6	6.6	4.95	4.95	0.21	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	1.83	3.39	3.39	3.39	2.24	2.24	0.058	0.06	0.4	1.00E-03	6.00E-01
Shrub fruit	2.23	0.46	0.46	0.46	0.19	0.19	0.166	0.09	0.6	1.00E-03	6.00E-01
Tree fruit	3.82	10.3	10.3	10.3	5.16	5.16	0.157	0.04	0.27	1.00E-03	6.00E-01
Justification	Table 3.4, SP1010 ⁽³⁾						Table 6.3, SR3 ⁽⁵⁾	Table 4.19, SR3 ⁽⁵⁾		Table 6.3, SR3 ⁽⁵⁾	

Table 3: Residential with home-grown produce – modified and use and receptor data

Parameter	Unit	Age class					
		1	2	3	4	5	6
EF (soil and dust ingestion)	day yr ⁻¹	180	365	365	365	365	365
EF (consumption of home-grown produce)	day yr ⁻¹	180	365	365	365	365	365
EF (skin contact, indoor)	day yr ⁻¹	180	365	365	365	365	365
EF (skin contact, outdoor)	day yr ⁻¹	170	170	170	170	170	170
EF (inhalation of dust and vapour, indoor)	day yr ⁻¹	365	365	365	365	365	365
EF (inhalation of dust and vapour, outdoor)	day yr ⁻¹	365	365	365	365	365	365
Justification		Table 3.5, SP1010 ⁽³⁾ ; Table 3.1, SR3 ⁽⁵⁾					
Soil to skin adherence factor (outdoor)	mg cm ⁻² day ⁻¹	0.1	0.1	0.1	0.1	0.1	0.1
Justification		Table 3.5, SP1010 ⁽³⁾					
Inhalation rate	m ³ day ⁻¹	5.4	8.0	8.9/f	10.1	10.1	10.1
Justification		Mean value USEPA, 2011 ⁽¹²⁾ ; Table 3.2, SP1010 ⁽³⁾					
Notes: For cadmium , the exposure assessment for a residential land use is based on estimates representative of lifetime exposure AC1-18. This is because the TDI _{oral} and TDI _{inh} are based on considerations of the kidney burden accumulated over 50 years. It is therefore reasonable to consider exposure not just in childhood but averaged over a longer period. See the Environment Agency Science Report SC05002/ TOX 3 ⁽¹⁾ , Science Report SC050021/Cadmium SGV ⁽¹⁾ and the project report SP1010 ⁽³⁾ for more information.							

References

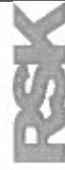
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GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 4
Human Health Generic Assessment Criteria by Pathway for Residential With Home-Grown Produce Scenario

Compound	SAC Appropriate to Pathway SOM 1% (mg/kg)			SAC Appropriate to Pathway SOM 2.5% (mg/kg)			SAC Appropriate to Pathway SOM 5% (mg/kg)			Soil Saturation Limit (mg/kg)		
	Oral	Inhalation	Combined	Oral	Inhalation	Combined	Oral	Inhalation	Combined	Oral	Inhalation	Combined
Metals												
Arsenic	3.71E+01	5.28E+02	NR	NR	NR	NR	NR	NR	NR	3.71E+01	5.28E+02	NR
Barium	1.34E+03	NR	NR	NR	NR	NR	NR	NR	NR	1.34E+03	NR	NR
Beryllium	1.13E+02	1.72E+00	NR	NR	NR	NR	NR	NR	NR	1.13E+02	1.72E+00	NR
Boron	3.00E+02	5.20E+06	NR	NR	NR	NR	NR	NR	NR	3.00E+02	5.20E+06	NR
Cadmium	2.30E+01	4.88E+02	2.21E+01	NR	NR	NR	NR	NR	NR	2.30E+01	4.88E+02	2.21E+01
Chromium (III) - Invalent	1.84E+04	9.07E+02	NR	NR	NR	NR	NR	NR	NR	1.84E+04	9.07E+02	NR
Chromium (VI) - hexavalent	5.85E+01	2.06E+01	NR	NR	NR	NR	NR	NR	NR	5.85E+01	2.06E+01	NR
Copper	2.72E+03	1.41E+04	2.47E+03	NR	NR	NR	NR	NR	NR	2.72E+03	1.41E+04	NR
Lead	2.01E+02	NR	NR	NR	NR	NR	NR	NR	NR	2.01E+02	NR	NR
Elemental Mercury (Hg ⁰)	NR	2.35E+01	NR	4.31E+00	NR	NR	NR	NR	NR	NR	2.35E+01	NR
Inorganic Mercury (Hg ²⁺)	3.95E+01	3.63E+03	3.91E+01	NR	NR	NR	NR	NR	NR	3.95E+01	3.63E+03	NR
Methyl Mercury (Hg ⁺)	1.29E+01	1.87E+01	7.52E+00	7.33E+01	3.62E+01	8.34E+00	1.29E+01	1.29E+01	7.68E+01	1.29E+01	7.68E+01	3.04E+02
Nickel	1.27E+02	1.81E+02	NR	NR	NR	NR	NR	NR	NR	1.27E+02	1.81E+02	NR
Selenium	2.59E+02	NR	NR	NR	NR	NR	NR	NR	NR	2.59E+02	NR	NR
Vanadium	4.13E+02	1.46E+03	NR	NR	NR	NR	NR	NR	NR	4.13E+02	1.46E+03	NR
Zinc	3.89E+03	3.63E+07	NR	NR	NR	NR	NR	NR	NR	3.89E+03	3.63E+07	NR
Cyanide (free)	1.37E+00	1.37E+04	1.37E+00	NR	NR	NR	NR	NR	NR	1.37E+00	1.37E+04	NR
Volatile Organic Compounds												
Benzene	2.63E+01	9.01E+01	2.03E+01	1.22E+03	5.39E+01	1.68E+00	2.29E+03	1.19E+00	8.72E+01	2.29E+03	1.19E+00	4.71E+03
Toluene	1.53E+02	9.08E+02	1.31E+02	8.69E+02	3.49E+02	2.00E+03	2.97E+02	1.92E+03	4.55E+03	2.97E+02	1.92E+03	4.55E+03
Ethylbenzene	1.10E+02	8.34E+01	4.74E+01	5.18E+02	2.61E+02	1.96E+02	1.12E+02	6.00E+02	4.59E+02	6.00E+02	4.59E+02	2.60E+03
Xylene - m	2.10E+02	8.25E+01	5.92E+01	6.25E+02	5.01E+02	1.95E+02	1.40E+02	1.47E+03	4.65E+02	1.15E+03	4.65E+02	3.46E+03
Xylene - o	1.92E+02	8.87E+01	6.07E+01	4.78E+02	4.58E+02	2.08E+02	1.43E+02	1.12E+03	4.65E+02	1.05E+03	4.65E+02	2.82E+03
Xylene - p	1.98E+02	7.93E+01	5.66E+01	5.76E+02	4.70E+02	1.86E+02	1.33E+02	1.35E+03	4.96E+02	1.08E+03	4.96E+02	3.17E+03
Total xylene	1.92E+02	7.93E+01	5.66E+01	6.25E+02	4.58E+02	1.96E+02	1.47E+03	1.47E+03	4.36E+02	1.05E+03	4.36E+02	3.46E+03
Methyl tertiary-Butyl ether (MTBE)	1.54E+02	1.04E+02	6.22E+01	2.04E+04	2.97E+02	1.69E+02	1.08E+02	3.31E+04	6.03E+02	3.21E+02	6.03E+02	6.27E+04
1,1,1,2-Tetrachloroethane	5.39E+00	1.54E+00	1.20E+00	2.60E+03	1.27E+01	3.55E+00	6.00E+03	2.92E+01	8.28E+00	6.00E+03	2.92E+01	1.40E+04
1,1,2,2-Tetrachloroethane	2.81E+00	3.92E+00	1.64E+00	2.67E+03	6.10E+00	8.04E+00	3.47E+03	1.36E+01	7.67E+00	1.76E+01	7.67E+00	1.20E+04
1,1,1-Trichloroethane	3.33E+02	9.01E+00	8.77E+00	1.43E+03	7.26E+02	1.84E+01	1.80E+01	2.89E+03	1.62E+03	4.04E+01	3.94E+01	6.39E+03
1,1,2 Trichloroethane	1.82E+00	1.25E+00	7.62E+01	4.03E+03	4.21E+00	2.55E+00	1.59E+00	8.21E+03	9.39E+00	5.59E+00	3.50E+00	1.80E+04
1,1-Dichloroethane	1.99E+01	3.29E+01	3.23E+01	2.23E+03	3.89E+01	5.82E+01	5.74E+01	3.94E+03	8.15E+01	1.17E+00	1.18E+00	7.94E+03
1,2-Dichloroethane	3.17E+02	9.20E+03	7.13E+01	3.41E+03	5.73E+02	1.33E+02	1.08E+02	1.09E+03	2.28E+02	1.09E+03	2.28E+02	8.43E+03
1,2,4-Trimethylbenzene	NR	1.78E+00	NR	4.74E+02	NR	4.28E+00	NR	NR	9.72E+00	NR	NR	2.76E+00
1,3,5-Trimethylbenzene	NR	NR	NR	2.20E+02	NR	NR	NR	NR	5.52E+02	NR	NR	1.30E+03
1,2-Dichloropropane	4.29E+00	3.40E+02	3.37E+02	1.19E+03	8.44E+00	6.00E+02	5.96E+02	2.11E+03	1.77E+01	1.21E+01	1.20E+01	4.24E+03
Carbon Tetrachloride (tetrachloromethane)	3.10E+00	2.59E+02	2.57E+02	1.52E+03	7.11E+00	5.65E+02	5.69E+02	3.39E+03	1.62E+01	1.62E+01	1.62E+01	7.54E+03
Chloroethane	NR	1.17E+01	NR	NR	NR	1.59E+01	NR	NR	3.54E+03	NR	2.57E+01	NR
Chloromethane	NR	1.17E+02	NR	1.91E+03	NR	1.38E+02	NR	NR	2.24E+03	NR	1.95E+02	NR
Cis 1,2 Dichloroethane	1.59E+01	NR	NR	3.94E+03	2.68E+01	NR	NR	6.61E+03	5.19E+01	NR	NR	1.29E+04
Dichloromethane	7.04E+01	3.05E+00	6.24E+01	7.27E+03	1.27E+00	4.08E+00	1.08E+00	6.66E+03	2.33E+00	6.42E+00	1.92E+00	1.55E+04
Tetrachloroethane	4.48E+00	1.79E+01	1.04E+01	4.24E+02	1.04E+01	4.02E+01	3.94E+01	9.51E+02	9.21E+01	9.21E+01	9.04E+01	2.18E+03
Trans 1,2 Dichloroethane	6.45E+00	2.76E+01	NR	3.42E+03	1.29E+01	4.96E+01	NR	6.17E+03	2.74E+01	1.02E+00	NR	1.26E+04
Trichloroethene	2.89E+01	1.72E+02	1.62E+02	1.54E+03	6.29E+01	3.95E+02	3.40E+02	3.22E+03	1.41E+00	7.98E+02	7.95E+02	7.14E+03
Vinyl Chloride (chloroethene)	3.82E+03	7.73E+04	6.43E+04	1.36E+03	6.87E+03	1.00E+03	8.73E+04	1.76E+03	1.25E+03	1.53E+03	1.35E+03	2.69E+03
Semi-Volatile Organic Compounds												
2-Chloronaphthalene	2.76E+02	5.39E+00	5.28E+00	1.14E+02	6.59E+02	1.33E+01	1.50E+01	2.80E+02	1.45E+03	3.17E+01	1.45E+03	6.69E+02
Acenaphthene	2.27E+02	4.98E+04	2.25E+02	5.70E+01	5.41E+02	1.18E+05	5.38E+02	1.18E+03	2.68E+05	1.18E+03	2.68E+05	3.38E+02
Acenaphthylene	1.85E+02	4.69E+04	1.94E+02	8.61E+01	4.42E+02	1.11E+05	4.40E+02	2.12E+02	8.79E+02	2.53E+05	8.74E+02	5.06E+02
Anthracene	2.43E+03	1.53E+05	2.39E+03	1.17E+00	5.55E+03	3.77E+05	5.45E+03	2.91E+00	1.10E+04	8.78E+05	1.09E+04	6.96E+00



GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 4
Human Health Generic Assessment Criteria by Pathway for Residential With Home-Grown Produce Scenario

Compound	Notes	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)			SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)			SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)		
		Oral	Inhalation	Combined	Oral	Inhalation	Combined	Oral	Inhalation	Combined	Oral	Inhalation	Combined	Oral	Inhalation	Combined	Oral	Inhalation	Combined
Benz(a)anthracene		1.01E+01	2.47E+01	7.18E+00	1.71E+00	4.37E+01	1.07E+01	1.42E+01	4.37E+01	1.07E+01	4.28E+00	6.26E+01	1.35E+01	1.69E+01	6.26E+01	1.35E+01	1.03E+01	6.26E+01	1.35E+01
Benz(a)pyrene	(a)	4.98E+00	3.51E+01	NR	9.11E+01	4.98E+00	NR	4.98E+00	3.77E+01	NR	2.28E+00	3.89E+01	NR	4.98E+00	3.89E+01	NR	5.46E+00	3.89E+01	NR
Benz(b)fluoranthene		2.98E+00	1.93E+01	2.65E+00	1.22E+00	2.13E+01	3.29E+01	3.89E+00	2.13E+01	3.29E+01	3.04E+00	4.43E+00	3.69E+00	4.43E+00	2.22E+01	3.69E+00	7.29E+00	4.43E+00	2.22E+01
Benz(g,h,i)perylene		3.77E+02	1.87E+03	3.14E+02	1.54E+02	4.09E+02	3.38E+02	4.09E+02	1.94E+03	3.38E+02	3.85E+02	1.97E+03	3.48E+02	4.23E+02	1.97E+03	3.48E+02	9.25E+02	1.97E+03	3.48E+02
Benz(k)fluoranthene		8.82E+01	5.41E+02	7.68E+01	6.87E+01	5.76E+02	9.22E+01	1.10E+02	5.76E+02	9.22E+01	1.78E+02	5.91E+02	1.00E+02	1.21E+02	5.91E+02	1.00E+02	4.12E+00	5.91E+02	1.00E+02
Chrysene		1.68E+01	1.19E+02	1.46E+01	4.40E+01	2.54E+01	2.17E+01	2.54E+01	1.49E+02	2.17E+01	1.10E+00	1.66E+02	2.07E+01	3.19E+01	1.66E+02	2.07E+01	2.64E+00	1.66E+02	2.07E+01
Dibenz(a,h)anthracene		2.94E+01	1.45E+02	2.41E+01	3.93E+03	3.43E+01	2.84E+01	3.43E+01	1.64E+00	2.84E+01	9.82E+03	3.69E+01	3.04E+01	3.69E+01	1.74E+00	3.04E+01	2.36E+02	3.69E+01	1.74E+00
Fluoranthene		2.87E+02	3.83E+04	2.85E+02	1.89E+01	5.63E+02	5.60E+02	5.63E+02	8.97E+04	5.60E+02	4.73E+01	8.00E+02	8.95E+02	8.00E+02	1.83E+05	8.95E+02	1.13E+02	8.00E+02	1.83E+05
Fluorene		1.77E+02	6.20E+03	1.72E+02	3.09E+01	4.19E+02	4.07E+02	4.19E+02	1.53E+04	4.07E+02	7.65E+01	8.98E+02	3.62E+04	8.98E+02	3.62E+04	8.77E+02	1.83E+02	8.98E+02	3.62E+04
Hexachlorobenzene		2.88E+01	NR	NR	8.17E+00	6.57E+01	NR	6.57E+01	NR	NR	2.01E+01	1.55E+00	NR	1.55E+00	NR	NR	4.81E+01	1.55E+00	NR
Indeno(1,2,3-cd)pyrene		3.09E+01	2.12E+02	2.70E+01	6.13E+02	4.22E+01	3.69E+01	4.22E+01	2.38E+02	3.69E+01	1.53E+01	4.92E+01	4.11E+01	4.92E+01	2.50E+02	4.11E+01	3.68E+01	4.92E+01	2.50E+02
Naphthalene		2.78E+01	2.33E+01	1.03E+02	7.64E+01	6.86E+01	3.04E+01	6.86E+01	5.98E+01	3.04E+01	1.83E+02	1.31E+02	7.06E+01	1.31E+02	7.06E+01	4.32E+02	1.83E+02	7.06E+01	4.32E+02
Phenanthrene		9.85E+01	7.17E+03	9.72E+01	3.60E+01	2.24E+02	2.22E+02	2.24E+02	1.75E+04	2.22E+02	8.96E+01	4.49E+02	4.07E+04	4.49E+02	4.07E+04	4.43E+02	2.14E+02	4.49E+02	4.07E+04
Pyrene		6.26E+02	8.79E+04	6.20E+02	2.20E+00	1.26E+03	1.24E+03	1.26E+03	2.04E+05	1.24E+03	5.49E+00	2.09E+03	4.23E+05	2.09E+03	4.23E+05	2.04E+03	1.32E+01	2.09E+03	4.23E+05
Phenol		1.60E+02	4.58E+02	1.20E+02	2.42E+04	2.96E+02	2.09E+02	2.96E+02	6.95E+02	2.09E+02	3.81E+04	5.88E+02	1.19E+03	5.88E+02	1.19E+03	3.93E+02	7.03E+04	5.88E+02	1.19E+03
Total Petroleum Hydrocarbons																			
Aliphatic hydrocarbons >EC ₅ -EC ₆		4.99E+03	4.24E+01	4.23E+01	3.04E+02	1.13E+04	7.78E+01	1.13E+04	7.78E+01	7.78E+01	5.58E+02	2.50E+04	1.61E+02	2.50E+04	1.61E+02	1.60E+02	1.15E+03	2.50E+04	1.61E+02
Aliphatic hydrocarbons >EC ₇ -EC ₈		1.48E+04	1.04E+02	1.03E+02	1.44E+02	3.43E+04	2.31E+02	3.43E+04	2.31E+02	2.31E+02	3.22E+02	7.11E+04	5.28E+02	7.11E+04	5.28E+02	5.28E+02	7.38E+02	7.11E+04	5.28E+02
Aliphatic hydrocarbons >EC ₉ -EC ₁₀		1.81E+03	2.08E+01	2.67E+01	7.77E+01	2.81E+03	6.51E+01	2.81E+03	6.51E+01	6.51E+01	1.90E+02	4.20E+03	1.54E+02	4.20E+03	1.54E+02	1.54E+02	4.51E+02	4.20E+03	1.54E+02
Aliphatic hydrocarbons >EC ₁₁ -EC ₁₂		4.57E+03	1.33E+02	1.32E+02	4.75E+01	5.51E+03	3.31E+02	5.51E+03	3.31E+02	3.31E+02	1.18E+02	5.98E+03	7.83E+02	5.98E+03	7.83E+02	7.83E+02	2.83E+02	5.98E+03	7.83E+02
Aliphatic hydrocarbons >EC ₁₃ -EC ₁₄		6.27E+03	1.11E+03	1.06E+03	2.37E+01	6.34E+03	2.78E+02	6.34E+03	2.78E+02	2.41E+03	5.91E+01	6.38E+03	6.57E+03	6.38E+03	6.57E+03	4.34E+03	1.42E+02	6.38E+03	6.57E+03
Aliphatic hydrocarbons >EC ₁₅ -EC ₁₆	(d)	6.48E+04	NR	NR	8.48E+00	9.17E+04	NR	9.17E+04	NR	NR	2.12E+01	1.10E+05	NR	1.10E+05	NR	NR	5.09E+01	1.10E+05	NR
Aliphatic hydrocarbons >EC ₁₇ -EC ₁₈	(b)	6.48E+04	NR	NR	8.48E+00	9.17E+04	NR	9.17E+04	NR	NR	2.12E+01	1.10E+05	NR	1.10E+05	NR	NR	5.09E+01	1.10E+05	NR
Aromatic hydrocarbons >EC ₁₉ -EC ₂₀		5.78E+01	4.74E+01	3.45E+01	6.13E+02	1.38E+02	1.18E+02	1.38E+02	1.18E+02	8.88E+01	1.50E+03	3.07E+02	2.77E+02	3.07E+02	2.77E+02	1.94E+02	3.58E+02	3.07E+02	2.77E+02
Aromatic hydrocarbons >EC ₂₁ -EC ₂₂		8.29E+01	2.58E+02	7.52E+01	3.64E+02	1.86E+02	6.39E+02	1.86E+02	6.39E+02	1.78E+02	8.99E+02	4.25E+02	1.52E+03	4.25E+02	1.52E+03	3.91E+02	2.15E+03	4.25E+02	1.52E+03
Aromatic hydrocarbons >EC ₂₃ -EC ₂₄		1.47E+02	2.85E+03	1.45E+02	1.68E+02	3.38E+02	7.07E+03	3.38E+02	7.07E+03	3.32E+02	4.19E+02	6.81E+02	1.68E+04	6.81E+02	1.68E+04	6.74E+02	1.00E+03	6.81E+02	1.68E+04
Aromatic hydrocarbons >EC ₂₅ -EC ₂₆	(b)	2.88E+02	NR	NR	5.37E+01	5.45E+02	NR	5.45E+02	NR	NR	1.34E+02	9.34E+02	NR	9.34E+02	NR	NR	3.21E+02	9.34E+02	NR
Aromatic hydrocarbons >EC ₂₇ -EC ₂₈	(b)	1.09E+03	NR	NR	4.83E+00	1.47E+03	NR	1.47E+03	NR	NR	1.21E+01	1.70E+03	NR	1.70E+03	NR	NR	2.90E+01	1.70E+03	NR
Aromatic hydrocarbons >EC ₂₉ -EC ₃₀	(b)	1.09E+03	NR	NR	4.83E+00	1.47E+03	NR	1.47E+03	NR	NR	1.21E+01	1.70E+03	NR	1.70E+03	NR	NR	2.90E+01	1.70E+03	NR

Notes:

EC - equivalent carbon. SAC - soil assessment criteria.

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

Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%.

Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

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

SAC for TPH fractions. PAHs naphthalene, acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway (Section 10.1.1, SR3)

(a) SAC for arsenic, benzo(a)pyrene, cadmium, chromium VI and lead are derived using the CxSL toxicology data.

(b) SAC for boron and selenium should not include the inhalation pathway as no expert group HCV has been derived; aliphatic and aromatic hydrocarbons >EC16 should not include inhalation pathway due to their non-volatile nature and inhalation exposure being minimal (oral, dermal and inhalation exposure is compared to the oral HCV); arsenic should only be based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The Oral SAC should be adopted for zinc and benzo(a)pyrene.

(c) SAC for CrIII should be based on the lower of the oral and inhalation SAC (see LOM/CIH/2015 Section 6.8)

(d) SAC for elemental mercury, chromium VI and nickel should be based on the inhalation pathway only.

(e) SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data. SAC for 1,2,4-trimethylbenzene may be used.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE



Table 5
Human Health Generic Assessment Criteria for Residential with home-grown produce

Compound	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals			
Arsenic	37	37	37
Barium	1,300	1,300	1,300
Beryllium	1.7	1.7	1.7
Boron	300	300	300
Cadmium	22	22	22
Chromium (III) - trivalent	910	910	910
Chromium (VI) - hexavalent	21	21	21
Copper	2,500	2,500	2,500
Lead	200	200	200
Elemental Mercury (Hg ⁰)	0.2	0.6	1.2
Inorganic Mercury (Hg ²⁺)	39	39	39
Methyl Mercury (Hg ^{CH3})	10	10	10
Nickel	130	130	130
Selenium	258	258	258
Vanadium	410	410	410
Zinc	3,900	3,900	3,900
Cyanide (free)	1.4	1.4	1.4
Volatile Organic Compounds			
Benzene	0.20	0.41	0.87
Toluene	130	300	680
Ethylbenzene	50	110	260
Xylene - m	59	140	327
Xylene - o	61	143	332
Xylene - p	57	133	310
Total xylene	57	133	310
Methyl tertiary-Butyl ether (MTBE)	60	110	210
1,1,1,2-Tetrachloroethane	1.20	2.78	6.46
1,1,2,2-Tetrachloroethane	1.6	3.5	7.7
1,1,1-Trichloroethane	9	18	39
1,1,2-Trichloroethane	0.8	1.6	3.5
1,1-Dichloroethane	0.32	0.57	1.16
1,2-Dichloroethane	0.007	0.011	0.019
1,2,4-Trimethylbenzene	1.8	4.3	9.7
1,3,5-Trimethylbenzene	NR	NR	NR
1,2-Dichloropropane	0.034	0.060	0.120
Carbon Tetrachloride (tetrachloromethane)	0.026	0.056	0.127
Chloroethane	11.7	15.9	25.7
Chloromethane	0.012	0.014	0.019
Cis 1,2 Dichloroethene	0.16	0.27	0.52
Dichloromethane	0.62	1.08	1.92
Tetrachloroethene	0.2	0.4	0.9
Trans 1,2 Dichloroethene	0.28	0.50	1.02
Trichloroethene	0.02	0.03	0.08
Vinyl Chloride (chloroethene)	0.0006	0.0009	0.0014
Semi-Volatile Organic Compounds			
2-Chloronaphthalene	5	13	31
Acenaphthene	230	540	1,170
Acenaphthylene	180	440	970
Anthracene	2,400	5,500	10,900
Benzo(a)anthracene	7	11	13
Benzo(a)pyrene	5	5	5
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(g,h,i)perylene	310	340	350
Benzo(k)fluoranthene	77	92	100
Chrysene	15	22	27
Dibenzo(a,h)anthracene	0.24	0.28	0.30
Fluoranthene	290	560	900
Fluorene	170	410	880
Hexachloroethane	0.27	0.66	1.55
Indeno(1,2,3-cd)pyrene	27	36	41
Naphthalene	13	30	71
Phenanthrene	100	220	440
Pyrene	620	1,240	2,040
Phenol	120	210	390
Total Petroleum Hydrocarbons			
Aliphatic hydrocarbons EC ₅ -EC ₉	42	78	160
Aliphatic hydrocarbons >EC ₉ -EC ₈	100	230	530
Aliphatic hydrocarbons >EC ₈ -EC ₁₀	27	65	154
Aliphatic hydrocarbons >EC ₁₀ -EC ₁₂	130 (48)	330 (118)	760 (283)
Aliphatic hydrocarbons >EC ₁₂ -EC ₁₆	1,100 (24)	2,400 (59)	4,300 (142)
Aliphatic hydrocarbons >EC ₁₆ -EC ₃₅	65,000 (8)	92,000 (21)	110,000
Aliphatic hydrocarbons >EC ₃₅ -EC ₄₄	65,000 (8)	92,000 (21)	110,000
Aromatic hydrocarbons >EC ₃ -EC ₁₀	30	80	190
Aromatic hydrocarbons >EC ₁₀ -EC ₁₂	80	180	390
Aromatic hydrocarbons >EC ₁₂ -EC ₁₆	140	330	670
Aromatic hydrocarbons >EC ₁₆ -EC ₂₁	260	540	930
Aromatic hydrocarbons >EC ₂₁ -EC ₃₅	1,100	1,500	1,700
Aromatic hydrocarbons >EC ₃₅ -EC ₄₄	1,100	1,500	1,700
Minerals			
Asbestos	Stage 1 test – No asbestos detected with ID; Stage 2 test - <0.001% dry weight (exceedance of either equates to an exceedance of the GAC) ¹		
Notes: - Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data. NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data. SAC for 1,2,4-trimethylbenzene may be used EC - equivalent carbon. SAC - soil assessment criteria. ¹ LOD for weight of asbestos per unit weight of soil calculated on a dry weight basis using PLU, handpicking and gravimetry. The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994. SAC for TPH fractions, PAHs naphthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1 SR3. (VALUE IN BRACKETS) RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.			