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REMEDIATION STRATEGY

For

PHASES 5, 6 & SCHOOL LAND

at

EDGEHILL PARK, WHITEHAVEN

Prepared for

STORY HOMES LIMITED

Report No. 4046-G-R022 Rev A

Date: May 2025

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Revision History

From	Date	Comments
4046-G-R022	July 2021	Original Report
4046-G-R022 Rev A	May 2025	Phase 3 renamed Phases 5 & 6 Findings & recommendations of supplementary investigation between 2021-2025

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1 INTRODUCTION

1.1 The Commission and Brief

1.1.1 ID Geoenvironmental Limited (IDG), were commissioned by Story Homes (the Client) to prepare a Remediation Strategy for Phases 5, 6 & School Land at Edgehill Park, Whitehaven hereafter referred to as the site. The site location and Phase boundaries are depicted on Drawing No.4046-G-D050 Rev D in Appendix A.

1.1.2 The following reports have been prepared in respect of the site:

1.1.3 IDG have been provided with copies of the following reports prepared by Integra on behalf of Story Homes:

- Post Remediation Validation Report for the Site at the Former TDG Tanker Depot, High Road, Whitehaven, Cumbria for Story Land, reference 2074 dated June 2010.
- Geotechnical Ground Investigation at Land at High Road, Rhodia, Whitehaven, Cumbria for Story Homes Limited (Draft), reference 2546 dated September 2011.
- Phase 2 Environmental Ground Investigation at Land at High Road, Rhodia, Whitehaven, Cumbria for Story Homes Limited (Draft), reference 2725 Rev A dated February 2014.

1.1.4 IDG have prepared the following reports on behalf of Story Homes:

- Shallow Mining Report for land at Magellan Park/Edgehill Park Phase 2, Whitehaven, Cumbria, reference 4046-G-R002 dated February 2017
- Supplementary Geoenvironmental Appraisal of land at Phase 3, Edgehill Park, Whitehaven, Cumbria. Report Reference No. 4046-G-R019 Rev A dated December 2020
- Remediation Strategy Report for land at Phase 3B, Edgehill Park, Whitehaven, reference 4046-G-R022 dated July 2022.
- Phase 3B Bolt-on Edgehill Park & Former Phosphate Storage Area - Supplementary Trial Pit Investigation, letter Report reference No. 4046-G-L028 Rev C, dated March 2023
- Phase 3B Bolt-on Edgehill Park & Former Phosphate Storage Area – Verification of Delineation & Excavation of Slag/Concrete Sub-base & Metal Contaminated Granular Made Ground, Report Reference No. 4046-G-L031 Rev A dated 3rd May 2023
- Edgehill Park Phase 3 & 5 – Chemical & Geotechnical Assessment of Stockpiles to inform MMP, Letter Report Reference No. 4046-G-LR033 Rev A dated 3rd August 2023
- Edgehill Park Materials Management Plan reference 4046-G-MMP Rev A dated October 2023
- Supplementary Geoenvironmental Appraisal of land at Phases 5, 6 & School Land, Edgehill Park, Report reference No. 4046-G-R038 dated November 2024
- Edgehill Park, Whitehaven Phase 6 Site Compound & Anhydrite Stockpile – Supplementary Investigation letter report reference no. 4046-G-LR041 dated May 20th 2025.

1.1.5 The findings of Reports 4046-G-R002 & 4046-G-R019 Rev A informed Remediation Strategy reference 4046-G-R022. The findings of reports 4046-G-L028 Rev C (2023), 4046-G-L031, (2023) 4046-G-LR033 Rev A (2023), 4046-G-R038 (2024) and 4046-G-LR041 (2025) have been used to inform and will be submitted in support of this updated Remediation Strategy.

1.1.6 This document outlines the remediation objectives necessary to protect environmental receptors and render the site suitable for the proposed development. Revision to this document may be required upon receipt of any further Regulatory comments.

1.1.7 A Method Statement should be prepared by the Contractor undertaking the works, in order to detail how the objectives will be achieved.

1.1.8 It may be the case that the remediation works are to be undertaken by more than one contractor, for example where initial works are undertaken by a demolition and remediation contractor, with placement of soil cover by the groundworker later in the project. In this situation, the Client should ensure that each Contractor has confirmed that they understand their responsibilities.

1.1.9 The Contractor's Method Statement should be submitted to, and approved by, the Client.

1.2 Regulatory Correspondence

1.2.1 Report No's 4046-G-R019 Rev A, 4046-G-L028 Rev C & 4046-G-LR033 Rev A were submitted to the Local Authority and the Environment Agency for comment:

1.2.2 The above reports and associated regulatory correspondence form the basis of MMP Rev 1 and the corresponding CL:AIRE Disposal of Waste Code of Practice (DoWCoP) declaration dated October 2023. A copy of the CL:AIRE MMP Declaration is presented in Appendix B. A copy of the MMP can be provided by IDG if necessary.

2 SITE DESCRIPTION & DEVELOPMENT PROPOSALS

2.1.1 Site details are summarised in Table 2.1 and discussed further in Section 2.1.2.

Table 2.1: Summary of Site Details

Current Access	Off Wilson Pit Road
Topography	Site occupies a shallow hollow with slopes up to western northern and eastern boundaries.
Approximate Areas	20,050m^2 concrete/tarmac hardstand incl. 8,200m^2 Anhydrite/slag stockpile 50,600m^2 grass 11,000m^2 Topsoil stockpiles 13,000m^2 Subsoil stockpiles

2.1.2 The site location is shown on Drawing No 4046-G-D050 in Appendix A.

2.1.3 The southwest of the site is occupied by Story Homes construction compound and an approximately 3m high stockpile comprising approximately 20,000m3 of made ground. The Story Homes compound is surfaced with concrete and includes several steel containers and office cabins, stockpiles of brick and block and cement silos.

2.1.4 The stockpile in the southwest corner principally comprises sand, gravel and cobbles of anhydrite with ash, gravel and cobbles of brick, concrete and slag and boulders of slag.

2.1.5 The southeast of the site is currently vacant following removal of former soil stockpiles and reduced level dig. Further details are provided in IDG letter report reference 4046-G-L028 Rev C, summarised in Section 3 below.

2.1.6 The northeast of the site is occupied by a number of soil stockpiles. The stockpiles comprise topsoil, natural subsoil and concrete, brick and demolition rubble accumulated during recent phases of development. Further discussion of the stockpile materials is provided in IDG report reference 4046-G-LR033 Rev A summarised in Section 3 below. The northwestern third of the site comprises vacant fields which slope up towards the western and northern boundaries. A grass covered embankment which crosses this area from northeast to southwest is considered to be a disused mineral railway.

2.2 The Proposed Development

2.2.1 It is understood that consideration is being given to redevelopment of the site with two storey domestic dwellings, associated gardens, Public Open Space (POS) areas and adoptable roads and sewers. The proposed layout is shown on Story Homes Drawing No. 20094.90.9.SL Rev P1 presented in Appendix A.

2.2.2 The Local Planning Authority have previously agreed planning permission for redevelopment of this site (ref 4/20/2474/0R1).

3 BACKGROUND

3.1 Site History

3.1.1 Historical plans indicate that the southwest of the site currently occupied by Story Homes compound and the anhydrite stockpile, was formerly a TDG Depot (tanker refuelling and washing facility incorporating a below ground oil/water separator), associated with the Marchon Chemical Works, formerly located on High Road and immediately east of the site.

3.1.2 A Phosphorite Storage Area associated with the former Marchon Chemical Works formerly occupied the southeast of the site.

3.1.3 A "reservoir", which was infilled during the late 20th Century was present in the northeast of the site. A building titled "Gameriggs" adjacent to the reservoir is considered to have been a winding house associated with the former Gameriggs Mine shaft (Coal Authority reference 297515-001 immediately adjacent. Recent research indicates the shaft dates from circa 1700, was recommissioned to pump mine water in the 19th Century. It is assumed the mine water was pumped into the adjacent reservoir.

3.1.4 The former Fox Pit also dating from circa 1700 is located in the northwest of the site. An embankment crossing from west to northeast is considered to be a former mineral railway associated with the pit. Both the Fox Pit and Gameriggs Pits are presumed infilled although untreated.

3.2 Integra 2725 (2010 - 2014) Investigation Findings

3.2.1 Integra ground investigation findings are summarised within IDG report 4046-G-R019. It should be noted that Integra stated that with the exception of the infilled former reservoir and TDG Depot no significant elevated metals semi metals or organics were recorded across the site above respective LQM Generic Assessment Criteria (GAC) 2009 (now superseded). However, IDG's comparison of Integra's Chemical Test Results with S4UL 2014 & C4SL screening criteria identified the following:

- Arsenic, chromium, nickel, vanadium, PAH & TPH contamination within Made Ground in the infilled reservoir.
- Arsenic, chromium, nickel, PAH & TPH within Made Ground beneath the TDG Depot, (including 98mg/kg benzo(a)pyrene, 1500mg/kg of EC21-EC35 TPH at 0.5m depth in TP37).
- Localised marginally elevated concentrations of arsenic within topsoil in the undeveloped field (TP73).

3.2.2 Integra 2010, carried out remedial works during 2010 to remove transformer fluids from beneath the TDG Depot which had migrated into the upper 0.2m of Made Ground. Integra's validation report demonstrates al of the spilled PCBs were removed. In the absence of any further PCB sources, no further investigation is considered necessary.

3.2.3 Integra exploratory hole locations are depicted on IDG Drawing No. 4046-G-D085 Rev D in Appendix A.

3.3 IDG Ground Investigations 2020- 2025

3.3.1 IDG carried out an intrusive ground investigation during July and September 2020 comprising a total of 28 trial pits, soil sampling and laboratory testing, a coal mining investigation comprising 6 rotary probeholes and a ground gas investigation comprising installation of ground gas monitoring wells and a gas monitoring programme. IDG exploratory hole locations are depicted on Drawing No. 4046-G-D085 Rev D in Appendix A.

3.3.2 The findings of the above investigations informed Remediation Strategy reference 4046-G-R022. A summary of the pertinent findings presented in Report reference 4046-G-R019 Rev A is provided below:

- Trial Pits TP720-TP723 & TP729 excavated within the former reservoir/settlement lagoon encountered between 0.8m and 2.7m thickness of Made Ground comprising Reworked Glacial Till, Reworked Bedrock (mudstone and siltstone) including brick, pottery, glass, metal wire, organic plant material, Granular Made Ground comprising timber, metal sheets, rubber and pockets of ash and clinker and tarmacadam.
- Possible reservoir sediment deposits comprising greenish-grey silty fine sand with clay gravel and layers of partially composted grass/turf was proven between depths of 1.4m and 2.7m bgl within TP720, TP722 and TP723.
- Thin deposits of Topsoil and Granular Made Ground were also proven outside of the infilled reservoir at TP735 and TP736 during the search for Fox Pit.
- Relatively thin superficial deposits comprising generally firm to stiff light brown gravelly clay interpreted to be Glacial Till (Boulder Clay), were proven to depths of between 0.5m (TP715) and in excess of 3.2m bgl (TP739).
- Bedrock comprising siltstone and mudstone with coal seams was proven from depths of between 0.2m and in excess of 3.2m.
- Rotary probeholes proved up to five shallow coal seams of between 0.2m and 1.0m thickness between depths of 1.5m 29.8m bgl which dip WSW at approximately 7^{o}. These seams are interpreted to include the Brassey Coal and Black Metal Coal. At the time of reporting, it was concluded that on the basis of their thickness that these seams were unlikely to have been worked.
- Geotechnical Atterberg clay classification tests for 4 samples indicated intermediate to high plasticity clay (Glacial Till).
- Chemical laboratory testing and contamination analysis identified elevated concentrations of arsenic, lead, nickel and beryllium, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(ah)anthracene PAH's and a fragment of chrysotile ACM in Made Ground within the infilled reservoir (TP720).
- Topsoil was stripped over an area of approximately 400m^2 around the Coal Authority's indicated position of Fox Pit - while brick and colliery spoil were encountered, the shaft location was not identified. The location of Gameriggs pit was partially flooded and it was not possible to search. However, historical investigation by Story did not identify any evidence of the shaft at the Coal Authority indicated position.

3.3.3 Post 2021, the following activities took place which changed the site's topography and influence of former contamination sources (i.e. infilled reservoir and former Phosphorite Storage Area):

- The northeast of the site was stripped of topsoil and several stockpiles of topsoil and predominantly natural clay subsoil generated during development of adjacent Phases 2, 3 were placed upon this area.
- Phase 3B Bolt-on (Reports reference 4046-G-L028 Rev C & 4046-G-L031 Rev A) in the southeast of the site was cleared of former stockpiles and regraded to anticipated development levels.

3.3.4 As a consequence, further investigation took place in accordance with the requirements of Remediation Strategy Report 4046-G-R022 including the following:

- Supplementary investigation of the former Phosphate Storage Area

- Location and treatment of known mine shafts and any previously undetected mine entries (i.e. Coal Authority mine shafts 296515-003 Fox Pit & 297515-001 Gameriggs Pit).

3.3.5 In addition, supplementary investigation took place to assess current ground conditions and risks from shallow mining, to assess risks to groundwater beneath the compound/former TDG Depot.

3.3.6 The locations of the former TDG Depot and Infilled Reservoir are shown on Drawing No. 4046-G-D051 in Appendix A.

3.3.7 IDG findings to date are summarized below:

- Further investigation of the Phosphorite Storage Area (4046-G-LR028 Rev C) detected elevated concentrations of arsenic & beryllium and a hotspot of localised asbestos fibre contamination. Verification of the excavation and remediation of contaminant sources is presented in IDG 4046-G-L031 Rev A dated May 2023. No further remediation is required in this area.
- Investigation to assess the properties of the topsoil and subsoil stockpiles placed upon the northeast of the site (4046-G-L033 Rev A) demonstrated that the topsoil and predominantly natural subsoil stockpiles were free of contamination and suitable for re-use in accordance with the approved MMP Rev 1. This included confirmation that a locally elevated lead concentration at TP733 was not significant.
- Supplementary Investigation during 2024 (Report reference 4046-G-R038) which excluded the Compound/ TDG Deport, identified the following:
    - Topsoil Made Ground present in NW of Phase 5 and north of Phase 6.
    - Up to 6m of Made Ground (including 3m thickness of subsoil stockpile & 3m thickness of reservoir fill) surfacing the proposed School Land.
    - Up to 1.7m of Cohesive/Granular Made Ground beneath northwest of Phase 6, including large concrete obstructions in proximity to a former mineral railway embankment.
    - Glacial Till comprising silty sandy gravely clay with varying frequency of cobbles and boulders proven up to 2.0m in thickness beneath Phases 5 & 6 and to circa 6.0m depth beneath School Land.
    - Bedrock: Middle Coal Measures comprising mudstone, sandstone with coal seams was proven between 0.2m - 6.0m.
    - Perched water is present at the interface between Made Ground and superficial deposits/mudstone bedrock.
    - Rotary drilling enabled formulation of a detailed geological model and concluded that the risk of shallow mining was very low. However, potential evidence of opencast workings was encountered in the
    - Fox Pit (Coal Authority ref: 296515-003) dimensions 2.3m x 1.8m, was located within Phase 6 close to the site's western boundary. The position of the shaft was recorded by topographic survey by RHI Ltd.
    - No significant risk from hazardous ground gas identified: However, it is recommended that properties constructed within 50m of the deep Fox Pit and Gameriggs shafts should be constructed with CS2 ground gas protection measures
    - No radon protection measures required.
    - School Land: Elevated concentrations of metal & PAH contamination detected in the Reservoir Made Ground & slightly elevated concentrations of leachable metals.
    - Previously detected ACM and chrysotile asbestos fibres in the area of TP720 were located beneath a large stockpile *and remain to be delineated*.
    - *Phase 6: Locally elevated concentrations of arsenic at TP1219 within Relict Topsoil & in nearby TP735 during previous GI. Delineation & excavation of contamination & either disposal or placement beneath 600mm soil cover recommended.*
- Report 4046-G-R038 recommended the following further works:
    - Investigation to establish position of Gameriggs Pit
    - Delineation & investigation of ACM/asbestos fibres at TP720

- Delineation excavation of relict Topsoil at TP1219
- Delineation excavation of Granular Made Ground at TP735
- Concrete obstruction encountered in TP1224 and potential for obstructions beneath the former mineral railway embankment will require breaking out.
- Further post demolition investigation within compound/former TDG Depot.

- Supplementary investigation (IDG Report 4046- G-L041 Rev A), within the compound/former TDG including review of IDG & Integra data to assess risks to groundwater during April 2025, identified the following:
  - Reinforced concrete (0.15-0.5m) or tarmac (0.05m) underlain by up to 2.0m of Made Ground variously comprising Hardcore. Slag/Anhydrite, Cohesive & Granular components
  - Flooded relict wastewater receptor tank remains in-situ beneath concrete hardstanding
  - Natural Glacial Till proven between depths of 0.35m and 5.0m
  - Coal Measures bedrock (mudstone & siltstone) proven between depths of 2.0 - 5.0m bgl.
  - Marginally elevated concentrations of up to 43mg/kg of arsenic within Granular Made Ground (Integra TP37 & TP38) and up to 9.4mg/kg of beryllium within Slag Made Ground (Integra TP36, TP37, TP38 & TP39)
  - Elevated concentrations of 249mg/kg aliphatic C_8-C_{12} & 140mg/kg aromatic C_{12}-C_{16} within Granular Made Ground (IDG TP741), which exceed residential with homegrown produce soil screening criteria
  - Elevated concentrations of PAH and TPH detected in perched water (WS102) and evidence within perched water in WS107.
- Report 4046-G-L041 Rev A recommended the following:
  - break out and remove the concrete hardstanding and underground waste-water receptor tank
  - Pumping and disposal of perched groundwater and water from within the flooded interceptor tank to remove a significant proportion of the TPH contamination
  - A watching brief during slab removal to further assess the significance of any wider or more significant TPH impact to Made Ground
  - Any anhydrite encountered beneath the demolished slab to be retained within the Anhydrite Stockpile that will form the proposed landscaped area
  - Concrete hardstanding outside of the footprint of the proposed residential development may remain beneath the proposed landscaping as it will isolate the anhydrite from the underlying made ground and mitigate against downward migration of any leachable PAH contamination within the Anhydrite Stockpile which is to be re-engineered and landscaped

3.3.8 Following removal of topsoil stockpiles, IDG carried out trenching between 21st & 22nd May to establish the location of Gamesrigg shaft (ref: 297515-001). The shaft, dimensions approximately 4m x 3m, was identified beneath approximately 4m of Made Ground. The position and shaft dimensions were recorded by survey by RHI Ltd.

3.4 Conceptual Site Model

3.4.1 In terms of the proposed redevelopment, plausible pollutant linkages and feasible remediation options for Phase 6 and the School Land are summarised in Table 3.1 overleaf. It should be noted that remediation of Phase 6 is subject to Residential with homegrown produce soil screening criteria whereas the School Land is subject to less conservative Residential POS Screening Criteria (i.e. without plant uptake).

3.4.2 There is are no outstanding remediation requirements for the Phase 5 area.

Table 3.1: Conceptual Site Model

Sources	Receptors	Plausible Pathways	Potential Remediation Options	Post-Remediation Pollutant Linkage
Phase 6				
Locally elevated concentration of arsenic at TP1219 within Relict Topsoil	Human Health (future site users – residential with consumption of homegrown produce)	Direct contact, inhalation of dust	Delineation, excavation & disposal or Isolation beneath 600mm of clean soil cover.	Pollutant linkage broken or source removed
Arsenic contaminated Granular Made Ground at TP735		Direct contact, inhalation of dust	Delineation, excavation & disposal or Isolation beneath 600mm of clean soil cover.	Pollutant linkage broken or source removed
Arseni & beryllium and PAH contamination within Made Ground beneath TDG Depot (TP36 - TP40)	Human Health (future site users – residential with consumption of homegrown produce)	Direct contact, inhalation of dust	Delineation, excavation & disposal or Isolation beneath 600mm of clean soil cover. Isolation beneath 300mm of clean soil cover in proposed POS	Pollutant linkage broken
	Groundwater within Secondary A Aquifer	Downwards migration of leachable metal oxide/sulphate contamination	Positive surface water drainage to minimise surface water infiltration: Further investigation following slab removal	Mitigation of impact
PAHs within Anhydrite Made Ground Stockpile	Human Health (future site users – residential with consumption of homegrown produce)	Direct contact, inhalation of dust	Retained on site within landscaped anhydrite stockpile beneath 300mm clean soil cover.	Contaminant source removed
	Groundwater within Secondary A Aquifer	Downwards migration of leachable PAH contamination	Positive surface water drainage, minimise surface water infiltration; Further investigation following slab demolition	Mitigation of impact
Aliphatic C8-C16 & aromatic C12-C16 TPH & C21-C35 beneath former TDG Depot (proposed residential properties) TP37, TP741 & WS102	Human Health (future site users – residential with consumption of homegrown produce)	Direct contact and inhalation of vapours	Impacted soils to be retained on site, subject to results of QRA *OR* impacted soils to be delineated and excavated prior to treatment or off -site disposal	Contaminant Source Removed
	Groundwater within Secondary A Aquifer	leaching and migrations of dissolved phase hydrocarbons	Pumping and offsite disposal	Contaminant Source Removed

Hazardous Gas (carbon dioxide & methane) potentially emitted from former Gameriggs & Fox Pit Shafts	Human Health	Migration of Carbon Dioxide through granular strata and ingress into confined spaces leading to potential asphyxiating mixtures of gas	Gas protection measures within proposed properties within 50m radius	Pollutant linkage broken
	Proposed Buildings	Migration of Methane through granular strata and ingress into confined spaces leading to potential explosive mixtures of gas		
School Land				
Nickel and PAH contamination in Made Ground within Infilled Reservoir	Human Health (future site users – residential with consumption of homegrown produce)	Direct contact, inhalation of dust	Isolation beneath 300mm of clean soil cover in proposed POS	Pollutant linkage broken
	Groundwater within Secondary A Aquifer	Downwards migration of leachable metal oxide/sulphate contamination	Positive surface water drainage to minimise surface water infiltration: Further investigation following slab demolition	Mitigation of impact
Asbestos cement fragments in Made Ground at TP720	Human Health (future site users – residential with consumption of homegrown produce)	Inhalation of dust containing asbestos fibres	Controlled delineation, excavation and off-site disposal	Contaminant source removed

◊ Transient risks to construction workers will be addressed by the adoption of appropriate health and safety measures in accordance with the Health and Safety at Work Act 1974, and regulations made under the Act including for example the COSHH Regulations.

3.4.3 Following correspondence with the Environment Agency it has been determined that the Anhydrite Made Ground Stockpile may be retained on site beneath landscaped mounds to be constructed in the southwest of the site. Minor non-volatile PAH contamination associated with the Anhydrite Stockpile subsequently placed in residential POS may therefore be mitigated by placement of 300mm of clean soil cover.

3.4.4 As stated in IDG letter report 4046-G-LR041, concrete hardstanding outside of the footprint of proposed residential development in Phase 6 may remain beneath the proposed landscaping as it will isolate the anhydrite from the underlying strata and mitigate against downward migration of any leachable PAH contamination within the Anhydrite Stockpile.

4 RISK ASSESSMENT & TARGET CONCENTRATIONS

4.1 General

4.1.1 Critical concentrations for the protection of Human Health for contaminants of concern for materials to remain on site are summarised in Table 4.1 and Table 4.2. Copies of the CLEA 1.071 Model Settings employed to derive the critical concentrations & CLEA Model Results are presented in Appendix C.

4.1.2 The target concentrations presented in Table 4.1 are applicable to Made Ground which will remain beneath proposed new dwellings, hardstand and 600mm of clean soil cover in gardens within Phase 6 (i.e. within the footprint of the former TDG Depot or vicinity of made ground identified in TP1219 or TP735).

4.1.3 The determinand concentrations presented in Table 4.2 are for Made Ground to remain beneath proposed landscaped areas (i.e. Infilled Reservoir or Anhydrite Made Ground to be placed beneath Landscaped Mounds) and assume placement of 300mm of clean soil cover. The determinand concentrations presented in Table 4.2 were calculated using the CLEA 1.071 Model using LQM S4UL screening criteria and there is no evidence to indicate that significant concentrations are present anywhere beneath the site; soil chemical analysis to date has detected maximum aliphatic C_8-C_{12} & aromatic C_{12}-C_{16} C_{21}-C_{435} TPH concentrations of 249mg/kg, 140mg/kg and 1500mg/kg respectively and has not detected any significant BTEX concentrations. The CLEA 1.071 results are presented to demonstrate that placement of any soils which do contain volatile hydrocarbon concentrations will not represent a risk to end users of POS.

4.1.4 It is not possible to devise an assessment concentration for asbestos in soil. However, asbestos screening tests will be used to identify whether site materials contain asbestos. Where asbestos is identified in screening tests, samples will be subjected to quantification tests as required.

4.1.5 Asbestos fibre target concentrations of <0.001% are required for granular soils retained beneath adopted highways. Asbestos fibre concentrations of 0.1% may be retained beneath 1.0m of clean soil cover within residential gardens and POS.

Table 4.1: Human Health Remediation Target Concentrations for Soils to Remain Beneath Proposed Dwellings & 600mm Clean Soil Cover in Gardens within the Footprint of the former TDG Depot.

Determinant	Target Concentrations for Made Ground Fill to remain on site below plots, hardstand or 600mm clean cover (mg/kg)
Naphthalene	2.3
Benzene	0.38
Toluene	908*
Ethylbenzene	83.4
Xylenes (p-Xylene)	79
Aliphatic C_5-C_6	42
Aliphatic C_6-C_8	104
Aliphatic C_8-C_{10}	27
Aliphatic C_{10}-C_{12}	133*
Aliphatic C_{12}-C_{16}	1,110^
Aliphatic C_{16}-C_{35}	131,000^ F
Aliphatic C_{35}-C_{44}	131,000^ F
Aromatic C_5-C_7	379
Aromatic C_7-C_8	891*
Aromatic C_8-C_{10}	7
Aromatic C_{10}-C_{12}	258
Aromatic C_{12}-C_{16}	2850^
Aromatic C_{16}-C_{21}	NR*
Aromatic C_{21}-C_{35}	NR^
Asbestos Quantification Test (if asbestos detected in screen test)	<0.001%

NR: Exceeds soil saturation limits. * : Exceeds vapour saturation limit. ^ : Exceeds solubility saturation limits. F : Oral, dermal & inhalation exposure compared with oral HCV

Table 4.2: Human Health Remediation Target Concentrations for Soils to Remain Beneath 300mm Clean soil Cover in POS

Determinant	Target Concentrations for Made Ground Fill to remain in POS below 300mm clean cover (mg/kg)
Naphthalene	44,900^
Benzene	7,960^
Toluene	12,400,000*
Ethylbenzene	872,000*
Xylenes (p-Xylene)	728,000^
Aliphatic C_5-C_6	3,490,000^
Aliphatic C_6-C_8	5,450,000^
Aliphatic C_8-C_{10}	668,000*
Aliphatic C_{10}-C_{12}	1,490,000*
Aliphatic C_{12}-C_{16}	4,300,000^
Aliphatic C_{16}-C_{21}	123,000,000^F
Aliphatic C_{21}-C_{35}	123,000,000^F
Aromatic C_5-C_7	7,890,000^
Aromatic C_7-C_8	12,200,000*
Aromatic C_8-C_{10}	404,000*
Aromatic C_{10}-C_{12}	942,000^
Aromatic C_{12}-C_{16}	3,120,000^
Aromatic C_{16}-C_{21}	NR*
Aromatic C_{21}-C_{35}	NR^
Asbestos Quantification Test (if asbestos detected in screen test)	<0.001%

NR: Exceeds residual soil saturation limits. * : Exceeds vapour saturation limit. ^ : Exceeds solubility saturation limits. F : Oral, dermal & inhalation exposure compared with oral HCV

4.1.6 The above table indicates that hydrocarbon contamination within materials placed in POS presents no risk to human health. However, should significant hydrocarbon impacted soils be encountered during remediation works, further consultation with the EA and further assessment of the risk to controlled waters may be necessary.

4.1.7 Some contaminants (NR) reach residual saturation before a vapour risk is predicted to occur by the QRA model. However, IDG recognise that it is unacceptable to leave free product in the ground where redevelopment of a site is proposed. Consequently, this Remediation Strategy advocates the removal\treatment of soils that contain significant free product.

4.1.8 In this context, significant free product is readily identifiable by the naked eye, and pervasive throughout the soil mass, probably with noticeable seepages. Traces of free product in fissures or localised, cobble-sized pockets would not normally be considered significant.

5 REMEDIATION OPTIONS APPRAISAL

5.1 Objectives

5.1.1 The objective of the remediation options appraisal is to determine the most appropriate means of meeting the remediation objectives and remediation criteria whilst taking into account site and project specific factors including:

- Physical site constraints
- Costs
- Programme
- Sustainability
- Environmental impact
- Health and safety requirements
- Geotechnical requirements and development design
- Regulatory controls – permitting and waste

5.1.2 Several methods have the ability to meet the remediation objectives and criteria. However, their impact, requirements and effectiveness will vary. Therefore, the objective of the options appraisal is to assess the advantages and disadvantages of the various methods to determine the most appropriate method or combination of methods.

5.1.3 Site clearance and earthworks (if required) will be undertaken in accordance with an earthwork specification and are not considered further in this Remediation Strategy.

5.2 Remediation Options

5.2.1 Viable pollutant source, sensitive receptor and pollutant pathways have been identified at the development. It is considered that there are three main ways to mitigate or control the pollutant linkage, these are:

- Remove or treat the source of the pollutant(s)
- Remove or modify the pathway(s)
- Remove or modify the behaviour of the receptor(s)

5.2.2 Modification of the receptor's behaviour is not considered plausible for a residential development; therefore the preferred approach is to protect future residents from exposure to the impacted materials.

5.2.3 It is therefore considered that managing the pollutant sources and/or exposure pathways are the most appropriate methods of mitigating the risk to future residents.

5.2.4 A preliminary appraisal of techniques that can be used to mitigate the contamination identified at the site is presented in Table 5.1.

Table 5.1: Preliminary Remediation Methods Options Appraisal

Option	Methodology	Contaminant Type				Media
		Metals	PAH	TPH	VOC	
Excavation and placement below hardstand/ plot footprints	Civil Engineering	✓	✓	✓	×	Soil
Excavation & disposal	Civil Engineering	✓	✓	✓	✓	Soil, free product, water
Containment – cover system	Civil Engineering	✓	✓	✓	×	Soil
Solidification/stabilisation with binders	Stabilisation	✓	✓	✓	✓	Soil
Biopiles	Biological	×	✓	✓	✓	Soil
Chemical oxidation	Chemical	×	✓	✓	✓	Soil, water

5.2.5 The above demonstrates that there are several options that can be adopted for the contaminants

present onsite, however, several of the techniques outlined in Table 5.1 are deemed unnecessary for the site on the basis of need and/or scale of operation.

5.2.6 Therefore, IDG consider the following techniques to be appropriate to mitigate the pollutant linkages at the site:

- Excavation and offsite disposal
- Isolation beneath hardstanding or 0.6m thick cover layer in soft end use areas

5.2.7 A feasibility assessment of the appropriate remediation methods noted above is presented in Table 5.2.

Table 5.2: Appropriate Remediation Methods Options Appraisal

Method	Advantages	Disadvantages	Feasible
Excavation & offsite disposal	Rapid and effective Can be undertaken simultaneously with preparatory works (i.e. removal of relict structures)	Excessive cost if large volumes of material require disposal Vehicle movements, Potential release of dust to adjacent environment	Yes
Isolation beneath hardstanding or 0.6m thick cover layer (0.3m for POS)	Avoids generation of waste Generally reduces earthworks requirements Minimises import of materials and associated vehicle movements	Cover soils may need to be sourced Additional earthworks may be necessary in localised areas of the site to accommodate impacted material within the development	Yes

5.2.8 Based on the anticipated earthworks to be undertaken at the site, the remediation methods which involve the isolation of impacted material beneath hardstanding or 0.6m thick cover layer (0.3m for POS) or the excavation and offsite disposal of the impacted material are considered the most appropriate.

6 DEVELOPMENT LEVELS, EARTHWORKS MODELLING & ANTICIPATED FOUNDATIONS

6.1 Development Layout and Ground Levels

6.1.1 The proposed Phase 5 site layout is provided on Story Homes Site Layout Drawing No. 20016.90.9.GA Rev C1 General Arrangement, presented in Appendix A.

6.1.2 The proposed Phase 6 site layout is provided on Story Homes Site Layout Drawing No. 20094.90.9.SL Rev P1 Site Layout presented in Appendix A.

6.1.3 A cut fill drawing (Earthworks model) is awaited. However, it is anticipated that site levels within the centre of the site will be raised by circa 2.0m.

6.2 Earthworks Modelling

6.2.1 An earthworks modelling exercise should be undertaken with a view to enabling a “materials balance” (i.e. volume of cut to broadly equal’s the volume of fill).

6.2.2 The earthworks modelling exercise should consider:

- Volume reduction caused by turnover (compaction of loose Made Ground; removal of obstructions\tanks etc.);
- Whether or not processed arisings\treated soils are retained on site;
- The thickness of the soil cover required in garden areas;
- Implications for foundations.

6.3 Foundations

6.3.1 No final development layout is currently available. However, it is anticipated that the proposed plots will be constructed upon either reinforced strip or trenchfill foundations, although vibratory improvement may be adopted in areas of fill, subject to provision of an appropriate engineering specification.

6.4 Materials Management Plan

6.4.1 Edgehill Park is the subject of Materials Management Plan reference 4046-G-MMP Rev 01, dated October 2023 & CL:AIRE DoWCoP Declaration dated October 2023. Modification of the MMP may be required upon receipt of the Earthworks Model drawings.

6.4.2 A Verification Report is required to validate the volumes of soil it is proposed to re-use during the development of the site.

6.4.3 Made Ground excavated from the footprint of the TDG Depot or Infillled Reservoir may only be moved in accordance with the MMP and revision to this Remediation Strategy.

7 REMEDIATION STRATEGY (GENERAL)

7.1 Aims

7.1.1 The principal aim of the Remediation works is to resolve contamination issues in order to protect environmental receptors, and render the site suitable for the proposed development.

7.1.2 In addition, a stockpile comprising anhydrite aggregate is present in the southwest of Phase 6 which is geotechnical unsuitable for re-use beneath hardstanding or in proximity to below ground concrete structures. This material is suitable for placement within landscaping which is proposed upon the site's south-western boundary. However, it should be placed above groundwater and in order to minimise weathering processes or leaching of sulphate, the potential for surface water infiltration should be minimised.

7.2 Overview of Preparatory Works

7.2.1 The following site preparatory works are required:

- Demolition/excavation of concrete slabs and tarmac hardstand and grubbing up of below ground structures beneath current site compound former TDG Depot and stockpiling for re-use or removal from site.
- Crushing of all suitable artificial hard material (i.e. concrete/brick etc).
- General site clearance of surface materials and vegetation.
- Topsoil strip.

7.3 Overview of Remediation Works

7.3.1 The following remediation works are required which will require supervision by an appropriately qualified Geoenvironmental Engineer:

Phase 6

- Provision of shaft investigation and treatment specification and treatment of Fox Pit.
- Excavation and re-engineering of the Anhydrite Stockpile (i.e. removal from proposed residential plots and gardens footprints)
- Post slab demolition trial pit investigation in the footprint of the former TDG Depot, within footprints of proposed residential development.(To further investigate TPH at TP37, TP741 & WS102)
- Delineation and excavation of arsenic contaminated topsoil Made Ground from TP1219
- Delineation and excavation of contaminated Granular Made Ground from TP735
- Contingency for previously unidentified contamination (hotspot protocol).
- Placement of 600mm clean soil cover in garden and landscaped areas within the footprint of the former TDG Depot (subject to post slab demolition investigation) .
- Provision of CS2 Ground gas protection measures within 50m radius of the treated mineshaft.
- Provision of a minimum 150mm clean soil growing medium for plots within the undeveloped open field areas (subject to delineation of TP735 & TP1219).

School Land

- Controlled delineation, excavation and off-site disposal of any asbestos containing material within 5m^2 grid centred on TP730
- Provision of shaft investigation and treatment specification and treatment of Gameriggs Pit
- Contingency for previously unidentified contamination (hotspot protocol).
- Placement of 300mm of clean soil cover within footprint of the Infilled Former Reservoir.
- Provision of CS2 Ground gas protection measures within 50m radius of the treated mineshaft.

7.3.2 Any major deviation from the works required in this Remediation Strategy must be agreed with the Local Planning Authority (LPA). In addition, any unexpected contamination encountered during the remediation works should be brought to the attention of the LPA.

7.3.3 Excavation and re-use of the Anhydrite Stockpile beneath proposed landscaping in the southwest of Phase 6 shall be detailed in an updated Materials Management Plan (MMP Rev 1). A detailed volumetric modelling exercise will need to be undertaken prior to MMP Rev 1 being updated.

7.3.4 It is also anticipated that significant regrading of the site (i.e. cut/fill) will also take place to achieve the desired development platform. It is important to note that the Contractor shall be required to ensure that any imported materials are tested to verify that they are free from contamination. This revised Remediation Strategy will form part of the updated MMP Rev 1.

7.4 Site Set-up, Organisation and Safety

7.4.1 The Client shall ensure that the Contractor is provided with copies of all reports produced by IDG, in order that they can carry out their own risk assessments for the works. IDG will provide information on request relating to specific hazards associated with contamination issues respectively.

7.4.2 A detailed Method Statement will be prepared by the Contractor undertaking the remediation and preparatory works. This should demonstrate how the Contractor intends to carry out the works in order to achieve the remediation objectives. In particular, details of the way in which different material types are to be kept separate should be clearly stated. The Contractor's Method Statement should be forwarded to IDG to enable comments to be made prior to works commencing and a pre-start meeting is advised.

7.4.3 The Contractor's Method Statement should include details of how the site will be organised in order to minimise the risks to workers and the public, associated with handling contaminated materials. The following measures may need to be considered:

- Designated 'clean' and 'dirty' areas
- Wheel washing facilities for vehicles
- Protective clothing, footwear and gloves
- Boot-washing facilities
- Refuelling of mobile plant in a designated area to prevent contamination of soils on site.

7.4.4 Although carbon dioxide concentrations in the ground are likely to be relatively low, access into excavations must be controlled and only undertaken in accordance with the Confined Spaces Regulations 1997. The atmosphere in shored trenches in excess of 1.2m should be monitored for oxygen and hazardous gas (methane & carbon dioxide), prior to personnel entering such excavations. Monitoring should continue whilst personnel are working in deep excavations.

7.4.5 The remediation works summarised above shall be supervised by a suitably qualified Geoenvironmental Engineer, and the Contractor will need to provide notice of works being carried out that require supervision.

7.5 Contractor's Responsibilities

7.5.1 Prior to the commencement of any works the Contractor, in agreement with the Client, will:

- Fulfil any requirements of the Client's contract documentation.
- Establish the boundaries of the site and the working areas.
- Undertake a dilapidation survey of site boundaries, adjacent properties and highways, via dated photographs or video footage.
- Liaise with the Local Authority regarding working hours, noise\dust\odour control, and protected trees.
- Liaise with the Local Water Company regarding any proposed discharge to sewer.
- Complete a full services search and liaise with all relevant utility companies regarding work

in close proximity to their apparatus.
- Prepare a detailed Method Statement outlining how the objectives of this Remedial Strategy will be achieved (and obtain approvals).
- Inform the Engineer of any risk, identified and assessed, which could impact upon the Engineer's activities.
- Prepare the necessary COSHH statements and Health & Safety Plan in accordance with CDM regulations.

7.5.2 The Contractor shall satisfy the Health & Safety Executive with regard to all matters concerning the health, safety and welfare of persons on the site.

7.5.3 The Contractor shall ensure that:

- Personnel, plant, materials and other equipment related to the contract are confined within the boundaries of the site.
- Any live services lying within the site boundary are marked and protected, or appropriate arrangements made to truncate them.
- Good practices relating to personal hygiene are adopted.
- Suitable precautions are implemented at all times to prevent off-site migration of pollutants via airborne dust.
- Suitable precautions are taken to prevent the spread of mud and debris on public highways.
- Refuelling of mobile plant is undertaken in a designated area. Above ground oil storage tanks shall comply with the requirements of Pollution Prevention Guideline PPG2. A spill kit shall be kept on site, adjacent to the designated refuelling area.

8 PHASE 6 SPECIFIC REMEDIATION REQUIREMENTS SUBJECT TO VALIDATION

8.1 Treatment of Fox Pit Mine Shaft

8.1.1 The location of Fox Pit has been established by IDG and its location has been recorded by survey by RHI Ltd.

8.1.2 A Shaft Treatment Specification for the approval of the Coal Authority will be prepared by the engineer.

Validation

8.1.3 The Shaft Treatment Specification will specify testing and validation measures required within the Shaft Treatment Verification Report.

8.2 Excavation of Anhydrite Stockpile and Placement within Landscaping Mounds

8.2.1 The Anhydrite Stockpile within the southwest of the site principally comprises quarried anhydrite aggregate which is geotechnically unstable and contains high concentrations of sulphate with the potential to leach and to attack buried concrete. This material is not suitable for retention beneath highways, buildings or development infrastructure and also contains metal and PAH contamination in excess of residential with gardens screening criteria. The anhydrite material will be placed beneath landscaping mounds which form an integral aspect of an area of POS proposed within the southwest of the development.

8.2.2 The slopes and crowns of the landscaped mounds will be retained by placement of terram (or similar) geo-membrane to retain the aggregate. The surface of the mounds shall be capped with a 300mm thick layer of impermeable clay to minimise surface water infiltration and potential for weathering and leaching and a further 150mm thickness of topsoil (growing medium). The landscaping design should ensure that there are no potential hollows or low points upon or adjacent to the landscaped mounds with the potential for water to pool. The design should incorporate surface drainage designed to move surface water away from the mounds and into the proposed surface water drainage system.

8.2.3 Evidence of anhydrite has been encountered within Made Ground beneath the TDG Depot hardstanding. Any anhydrite identified during supplementary investigation or site regrade will be segregated and placed with the Anhydrite beneath the Landscaping mounds.

8.2.4 Landscape designs should be provided to the Engineer for comment and for inclusion into the MMP prior to commencement of any excavation works. Details of the volumes and movement of the anhydrite stockpile and the source, volume and movement of proposed clay capping material will be provided in updated MMP Rev 1 which references this Remediation Strategy.

Contractor Requirements

8.2.5 The Contractor will ensure that the proposed location of the anhydrite within the landscaping mounds is surveyed and demarcated prior to deposition. The Contractor will provide a topographic survey to the Engineer on completion of the anhydrite deposition and again on completion of the clay capping works.

Validation

8.2.6 The Engineer will supervise movement of the anhydrite and will maintain records and photographs recording the movement and deposition works and placement of the clay capping.

8.2.7 Full details of the movement of the anhydrite and construction of the landscaping mounds, with any additional chemical test results and the fate of any excess arisings (see Section 7.7), together with regulatory correspondence will be provided in the Verification Report.

8.3 Supplementary Trial pit Investigation in the Footprint of the Former TDG Depot

8.3.1 Exploratory investigations within the footprint of the former TDG Depot have been constrained by site cabins, building material stores, site operations and a buried gas main. Window sample investigation during April 2025 indicates perched water and Made Ground beneath the concrete (i.e. WS102, TP741) are contaminated with diesel associated with former site operations (tanker refuelling and washing) which represent a risk to end users and the environment.

8.3.2 The Engineer will be present immediately following demolition/grubbing up of the concrete slabs and removal of the gas main to investigate any visual or olfactory evidence of contamination. The Engineer will be equipped with a PID to monitor returns for volatile hydrocarbon vapours.

8.3.3 Any unanticipated grossly contaminated soils will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and bunded.

8.3.4 The Engineer will liaise with the Local Authority EHO to obtain approvalfor any new remediation actions arising..

Validation

8.3.5 Analysis of at least 3 samples from each stockpile of suspected TPH-impacted soils, for an appropriate range of determinands will be undertaken. On receipt of the results, the Engineer will liaise with the Contractor regarding the most appropriate remediation option.

8.3.6 Full details of the location and nature of the contaminant source together with chemical test results and the fate of any arisings, together with regulatory correspondence will be provided in the Verification report.

8.4 Delineation and Excavation of Arsenic-Impacted Topsoil Made Ground from TP1219

8.4.1 Topsoil Made Ground locally proven between 1.2-1.7mbgl in TP1219 contained an elevated concentration of arsenic.

8.4.2 The arsenic impacted Topsoil Made Ground in the vicinity of TP1219 shall be delineated, excavated and stockpiled during the remediation works.

8.4.3 On completion of soil removal, the extent of the excavation shall be recorded by survey and the Contractor shall await the Engineer's instruction to backfill the excavation.

Characterisation of Excavated Material

8.4.4 Samples of the stockpiled material will be taken at a frequency of 1 per 100m^3 (with a minimum of three samples) and dispatched to a UKAS accredited laboratory where they will be analysed for a suite

8.4.5 The results of the characterisation analysis will be compared against the relevant LQM/CIEH S4UL screening concentrations.

8.4.6 Should the results of the characterisation of the excavated material record concentrations less than the relevant screening concentrations, the material will be considered suitable for retention on site beneath the proposed 600mm clean cover layer.

Validation

8.4.7 Following excavation of the arsenic impacted material; the Engineer will inspect and sample the resultant excavation.

8.4.8 A minimum of 5 verification samples will be taken from the excavation sidewalls and base. These samples shall be dispatched to a UKAS accredited laboratory and analysed for arsenic

8.4.9 In larger excavations, additional verification samples will be taken from the exposed excavation surfaces on a 10m grid.

8.4.10 The Engineer will instruct continued removal of soil\fill should verification samples yield concentrations in excess the relevant LQM/CIEH S4UL screening concentrations.

8.5 Delineation and excavation of Arsenic-impacted Granular Made Ground from TP735

8.5.1 Slightly elevated concentration of arsenic were detected in Granular Made Ground between 0.3 – 0.55m bgl at TP735.

8.5.2 The arsenic impacted Granular Made Ground in the vicinity of TP735 shall be delineated, excavated and stockpiled during the remediation works.

8.5.3 On completion of soil removal, the extent of the excavation shall be recorded by survey and the Contractor shall await the Engineer's instruction to backfill the excavation.

Characterisation of Excavated Material

8.5.4 Samples of the stockpiled material will be taken at a frequency of 1 per 100m^3 (with a minimum of three samples) and dispatched to a UKAS accredited laboratory where they will be analysed for a suite

8.5.5 The results of the characterisation analysis will be compared against the relevant LQM/CIEH S4UL screening concentrations.

8.5.6 Should the results of the characterisation of the excavated material record concentrations less than the relevant screening concentrations, the material will be considered suitable for retention on site beneath the proposed 600mm clean cover layer.

Validation

8.5.7 Following excavation of the arsenic impacted material; the Engineer will inspect and sample the resultant excavation.

8.5.8 A minimum of 5 verification samples will be taken from the excavation sidewalls and base. These samples shall be dispatched to a UKAS accredited laboratory and analysed for arsenic.

8.5.9 In larger excavations, additional verification samples will be taken from the exposed excavation surfaces on a 10m grid.

8.5.10 The Engineer will instruct continued removal of soil\fill should verification samples yield concentrations in excess the relevant LQM/CIEH S4UL screening concentrations.

9 SCHOOL LAND SPECIFIC REMEDIATION REQUIREMENTS SUBJECT TO VALIDATION

9.1 Delineation & Excavation of Asbestos Containing Material at TP720

9.1.1 Chrysotile ACM Fragments were encountered within Granular Made Ground between 0.9m and 1.4m in TP720 which also contained demolition type material including cement, timber, rubber strips, bricks and glass.

9.1.2 Further investigation/ delineation centred on TP720 will be undertaken to establish whether the detected ACM fragments represent a significant source of ACM material. The excavation will be taken down to the base of the Granular Made Ground. The excavation will be expanded until the Engineer is satisfied that any significant source of ACM material (i.e. cement bonded panels etc. is not present or has been removed.

9.1.3 The location of TP720 is shown on Drawing No. 4046-G-D085 Rev D presented in Appendix A.

Contractor Requirements

9.1.4 Made Ground will be excavated under the full-time supervision of the Engineer.

9.1.5 Impacted soils will be excavated and placed in temporary bunded stockpiles on hardstand or visqueen and be suitably covered.

Validation Requirements

9.1.6 A minimum of 5 verification samples of Made Ground will be obtained from the base and sidewalls of the delineation excavation which will be dispatched to a UKAS accredited laboratory where they will be scheduled for the presence of asbestos screens.

9.1.7 On receipt of the chemical analysis results, the Engineer will liaise with the Contractor regarding the most appropriate remediation option.

9.1.8 The Engineer will instruct continued removal of soil\fill if verification samples yield concentrations in excess of the clean-up criteria stated in Section 4.

9.1.9 Photographic records of the excavation will be retained by the Engineer for the Verification Report.

9.2 Treatment of Gameriggs Mine Shaft

9.2.1 The location of Gameriggs Pit has been established by IDG and its location has been recorded by survey by RHI Ltd. The position of the shaft is depicted on Drawing No. 4046-G-D093 in Appendix A.

9.2.2 A Shaft Treatment Specification for the approval of the Coal Authority will be prepared by the engineer.

Validation

9.2.3 The Shaft Treatment Specification will specify testing and validation measures required within the Shaft Treatment Verification Report.

10 GENERAL REMEDIATION REQUIREMENTS

10.1 Unrecorded Mine Entries

10.1.1 In the event that unrecorded mine entries are identified during site preparatory works, the contractor shall inform the Engineer. The Engineer will prepare a specification for investigation and treatment in accordance with guidance presented in CIRIA Abandoned Mineworkings Manual (C758) for approval by the Coal Authority.

Contractor Requirements

10.1.2 The position of any suspected shafts will be surveyed by the Contractor and the positions immediately protected by heras fencing with appropriate warning signs which will remain until the approved treatment works take place.

Validation

10.1.3 The Shaft Treatment Specification will specify testing and validation measures required within the Shaft Treatment Verification Report.

10.2 Contingency for Previously Unidentified Contamination (Hotspot Protocol).

10.2.1 Even after an appropriate preliminary investigation and ground investigation a geoenvironmental appraisal is typically based on inspection of the ground underlying less than 0.5% of the total site area. Consequently, there is always a possibility that unanticipated ground conditions will be encountered during the remediation works. Should this occur during remediation or site development works, the Contractor shall immediately seek further advice from the Engineer.

10.2.2 Any unanticipated grossly contaminated soils will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and bunded.

10.2.3 The Engineer will liaise with the Local Authority EHO to obtain approval for the modification or amendment of the Remediation Strategy for the site.

Validation

10.2.4 Samples of the impacted material will be taken at a frequency of 1 per 100m3 (maximum 3 samples per hotspot) and dispatched to a UKAS accredited laboratory where they will be scheduled for an appropriate range of determinants to characterise the contamination.

10.2.5 It should be noted that significant volumes of impacted material are not anticipated to be encountered during the remediation works. Impacted material demonstrated to be unsuitable for retention onsite beneath either hardstanding or the 0.6m cover layer will be disposed offsite to an appropriately licensed facility.

10.2.6 On receipt of the results, the Engineer will liaise with the Contractor regarding the most appropriate remediation option.

10.2.7 Full details of the location and nature of the contaminant source together with chemical test results and the fate of any arisings, together with regulatory correspondence will be provided in the Verification report.

10.3 Export to Landfill

10.3.1 It is anticipated that the majority of materials excavated from the site will comprise inert natural arisings. Excavation arisings that are unsuitable for retention and re-use on site will be placed in temporary stockpiles prior to removal from the site.

Contractor Requirements

10.3.2 Any material exported from site to an alternative site or to landfill should be hauled by a registered waste carrier in accordance with the requirements of the current regulations.

10.3.3 A transfer note will be completed, signed and retained by the parties involved. The transfer note should include the volume of waste, the nature of the material and a statement of its chemical composition, details of the source and destination sites, and details of the haulier.

10.3.4 In order to protect the general public from dust and vapour emissions, vehicles that are to be used for the haulage of the contaminated material from the site must be sheeted. In addition, the Contractor must ensure that no fluids seep from the wagons.

Validation

10.3.5 In order to provide the landfill facility with information regarding the chemical composition of the waste, the Contractor should request the Engineer to undertake analysis of material that requires removal from site.

11 ENGINEERING SUPERVISION AND VERIFICATION

11.1.1 Provided that the Contractor's advises their intended programme of works in a timely fashion, the Geoenvironmental Engineer will ensure that the requirements of this Remediation Strategy are complied with.

11.1.2 The responsibilities of the Geoenvironmental Engineer shall include the following:

- Supervision of the remediation works outlined above.
- Advice on the correct handling of materials encountered.
- Retrieval of soil samples and the subsequent scheduling of appropriate laboratory analysis to enable verification of various aspects of the works, as required.
- Liaison with statutory authorities as required.

11.1.3 On satisfactory completion of all the works the Geoenvironmental Engineer will prepare a Verification Report. Copies of the Verification Report will be issued to the Client and the Local Authority. The Verification Report will stand as certification that the remediation and ground preparatory works have been carried out in accordance with this Remediation Strategy.

11.1.4 The Verification Report will include:

- A summary of the remediation works undertaken, including any works associated with unforeseen ground conditions
- Verification test results associated with "hot-spot" treatment, including plans showing sample locations & levels, and the extent of any "hot-spot" excavations.
- Details of the fate of any arisings excavated from contamination "hot-spots".
- Verification test results associated with site won and imported fill materials.
- Verification test results associated with the placement of any fill material to an engineering specification.
- Verification test results associated with proposed source materials for clean cover.
- Copies of any correspondence with Regulators relating to specific aspects of the remediation works.
- A summary of any constraints, such as easements associated with live services or culverts that may have led to the remedial tasks not being completed in specific areas of the site.
- A summary of the remedial works still to be undertaken upon completion of the main remediation and preparatory works by the Contractor, (e.g. placement of 600mm thick cover system in garden areas).

12 DEVELOPMENT PHASE REMEDIATION REQUIREMENTS SUBJECT TO VALIDATION

12.1 Provision of Ground Gas Protection Measures

12.1.1 Ground gas protection measures in accordance with Characteristic Situation 2 are required for plots within a 50m radius of the Fox Pit and Gameriggs Pit shafts. The affected plots are depicted on Drawing reference 4046-G-D093 in Appendix A.

12.1.2 A separate Ground Gas Measures Verification Plan will be prepared by the Engineer for the Approval of the regulators. Details of the measures required to enable verification of the ground gas measures will be presented in the Verification Plan.

12.2 Placement of Soil Cover

12.2.1 Clean inert fill (600mm thick) is required to be placed over the Made Ground in proposed garden and landscaped areas within the footprint of the former TDG Depot on completion of the Construction Phase. This cover layer is to comprise 450mm of “clean” subsoil plus 150mm of topsoil.

12.2.2 Further investigation (i.e. Trial Pits TP735 & TP1219) may result in further requirement for provision of clean soil cover.

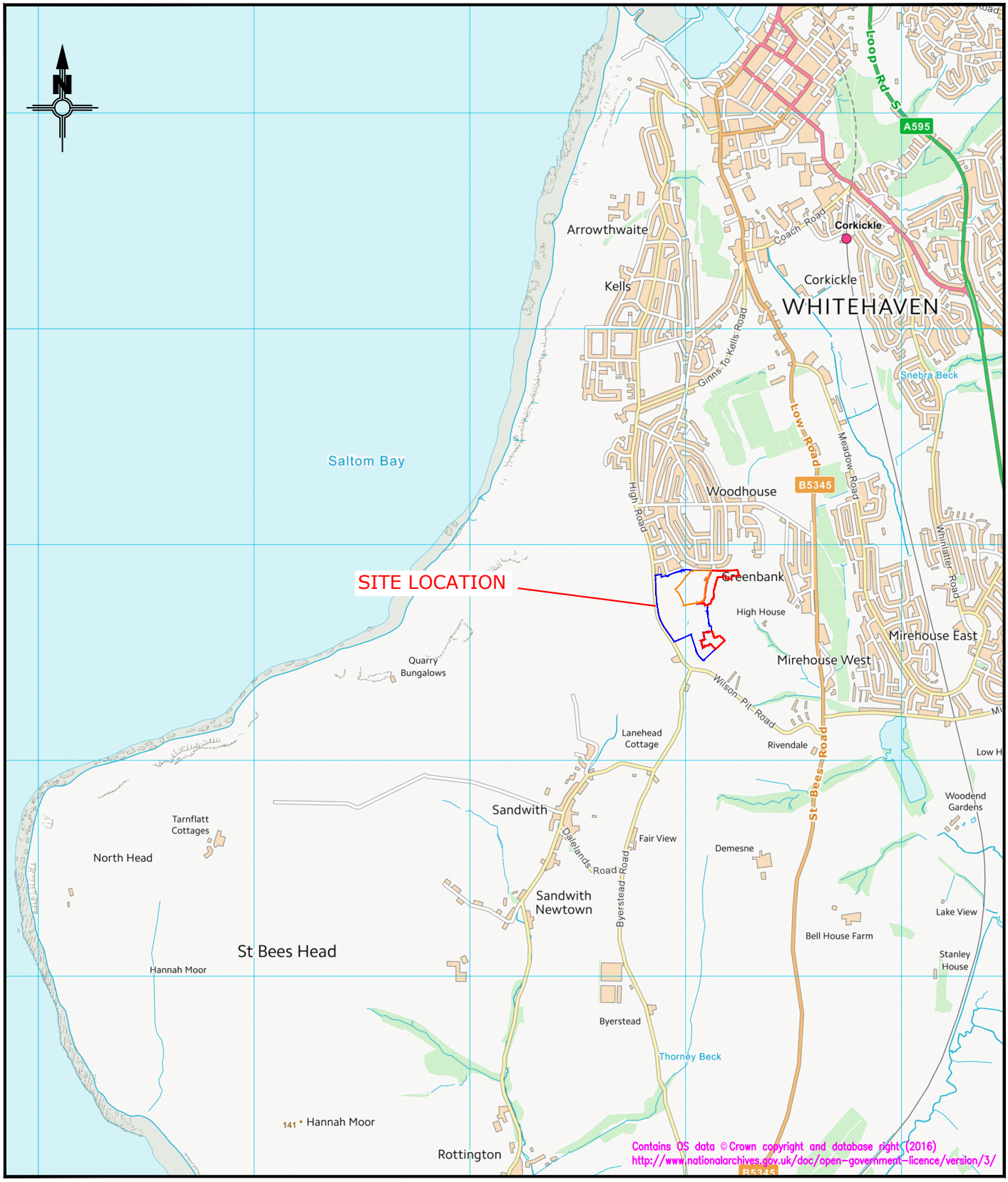
12.2.3 Clean inert fill (300mm thick) is required to be placed over the Made Ground in proposed POS and landscaped areas within the footprint of the Infilled Reservoir and landscaped Anhydrite Stockpile on completion of the Construction Phase. This cover layer is to comprise 150mm of “clean” subsoil plus 150mm of topsoil.

12.2.4 On completion of the Construction Phase and where required, a plot validation report will be provided for each plot, group of plots or landscaped area, in accordance with the requirements confirmed in the Verification Report.

12.2.5 Any site won or imported material for use as cover should be validated in accordance with the protocol presented in Appendix D. The Protocol includes assessment criteria which should not be exceeded.

12.2.6 The Developer will be responsible for arranging for a suitably qualified Geoenvironmental Engineer to visit site in order to carry out verification that the cover soils placed in the garden and landscaped areas is suitable for use and is present in sufficient thickness (i.e. 600mm thick). These visits are normally undertaken following the issue of the Verification Report for the site, and it is normal practice for the Engineer to produce an additional letter report for each plot or group of plots examined.

APPENDIX A



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CLIENT	Story Homes
JOB TITLE	Phase 5, 6 & School Land, Edgehill Park
DRAWING TITLE	Site Location Plan

DRAWN BY	SIGNATURE	DATE	STATUS
NW		22-06-21	FINAL

APPROVED	SIGNATURE	DATE	SCALE	DRG No.
BRB		23-06-21	1:25,000@A4	4046-G-D050 Rev D

A4 border: 186 x 218

KEY

- P5 Site Boundary
- P6 Site Boundary
- School Land Boundary
- WS — IDG Window Sample 2025
- PH — IDG Rotary Probehole 2024
- BH — IDG CP borehole 2024
- TP1200 — IDG Trial Pit 2024
- IDG Shaft Trench 2024
- TP900 — IDG Trial Pit 2021
- PH600 — IDG Probehole 2020
- TP700 — IDG Trial Pit (2019)
- PH300 — IDG Probehole 2016
- PH5 — Integra Probehole (2009-11)
- TP — Integra Trial Pit (2009-11)
- 296515-001 — CA Recorded Mine Shaft
- BGS Geological Fault
- Medium Pressure Gas Main
- Builders Compound
- Anhydrite Stockpile
- Reworked Glacial Till Stockpile
- Topsoil Stockpiles

Revision	Description	Date
D	Gameriggs Shaft Position Confirmed	29-5-25
C	Window sample locations within compound	25-3-25
B	Final rotary probehole positions	23-9-24
A	Final Trial Pit & CP borehole positions	23-8-24

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CLIENT: Story Homes

JOB TITLE: Phase 5, 6 & School Land, Edgehill Park

DRAWING TITLE: Exploratory Hole Location Plan

KEY

STATUS: FINAL

DRAWN BY	SIGNATURE	DATE
NW		12-08-24
APPROVED	SIGNATURE	DATE
BRB		10-10-24

SCALE: 1:750

DRG No.: 4046-G-D085

A1 Border: 575 X 769

KEY

- P5 Site Boundary
- P6 Site Boundary
- School Land Site Boundary
- CS2 Gas Protection Measures Required
- Builders Compound
- Anhydrite Stockpile
- TP WS — Contamination Location
- Infilled Reservoir
- Gameriggs (1867)

100 metres

Revision	Description	Date

iD GeoEnvironmental Limited

Head Office:
Dane Mill Business Park
Broadhurst Lane
Congleton
CW12 1LA

Tel: 01565 755557
Fax: 01565 740263

CLIENT: Story Homes

JOB TITLE: Phases 5, 6 & School Land, Edgehill Park

DRAWING TITLE: Phase Boundaries

KEY:

STATUS: FINAL

DRAWN BY	SIGNATURE	DATE
NW		12-08-24

APPROVED	SIGNATURE	DATE
LM		10-10-24

SCALE: 1:750

DRG No.: 4046-G-D093

A1 Border: 575 X 799

A0
1:500

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W E
S

WINDERMERE ROAD

Posts

El Sub Sta

Issues

HOUSETYPE ACCOMMODATION SCHEDULE (A20)

SITE NAME	EDGEHILL PARK 5				REF.	20106

REF.	HOUSETYPE	HOUSE TYPE AND BEDROOM	PARKING	SQ. FT.	RSL NO.	DMV NO.	OM NO.	TOT. SQ. FT
2 BEDROOM RANGE								
OXY	OXLEY	2 Bed Semi	Front Parking	682			8	5456
3 BEDROOM RANGE								
HPR	Harper	3 Bed Semi	Front Parking	849			8	6792
SPR	Spencer	3 Bed Detached/Semi	Front Parking	953			4	3812
CPR	Cooper	3 Bed Detached	Front Parking	1039			2	2078
4 BEDROOM RANGE								
PRN	Pearson	4 Bed Detached	Detached Single Garage	1147			9	10323
GYN	Grayson	4 Bed Semi	Front Parking	1196			2	2392
DWN	Dawson	4 Bed Semi/Terrace	Front Parking	1413			3	4239
SAN	Sanderson	4 Bed Detached	Integ Single Garage	1433			6	8598
HWN	Hewson	4 Bed Detached	Integ Single Garage	1556			2	3112
TOTAL AFFORDABLE AND OPEN MARKET UNITS						0	44	
TOTAL UNITS AND SQ. FT.						44		46802

Gross Site Area in Meters	14376.7
Gross Site Area in Acres	3.55
Strategic POS in Meters	1762.3
Strategic POS in Acres	0.44
Net Site Area in Meters	12614.4
Net Site Area in Acres	3.12
Net Site Area in Hectacres	1.26
Density (Sq.Ft per Acre)	15015.2
Density (Units per Acre)	14.1
Density (Units per Hectacre)	34.88

Site Boundaries:

SH Red Line Boundary

Housetype Pack Information:

A 01 — House Type Version
Construction Pack Ref.
1/1 01 — Elevation Pack Ref.
Elevation Code

To find out which revision a chosen Plot is at, please refer to the 'BMW Badge' found within each Plot on either the GA or EFBT Plans.

Other Information:

VP — Visitor Parking Space (Total 4 No.)

S — External Step to Plot Path/Patio

LA — Level Access

Garden Batter

Underfloor Vents

Street Lighting Column

Highway Bollard

Story HOMES

DEVELOPMENT
EDGEHILL PARK

DRAWING
GENERAL ARRANGEMENTS

DRAWN BY	MQ	DATE	22/05/2024
CHECKED BY	-	SCALE	1:500 @A0
DWG PACK	DRAWING NUMBER		REVISION
CON.	20106.90.9.GA		C1

Revisions	Notes	Date
REV.	COMMENTS	XX/XX/XXXX
C1	Initial Issue.	07/04/2025

Story House, Lords Way, Kingmoor Business Park, Carlisle, CA6 4SL

A0
1:500

N
W E
S

Ref	House Name	House Type	Sq.Ft	Garage / Parking	RSL No.	Dis No.	Open No.	Total Sq.Ft
OXY	OXLEY	2 Bed Semi	691	Parking			14	**9674**
OXY	OXLEY	2 Bed Terrace	691	Parking			3	**2073**
HPR	HARPER	3 Bed Semi	855	Parking			8	**6840**
HPR	HARPER	3 Bed Terraced	855	Parking			15	**12825**
SPR	SPENCER	3 Bed Semi	960	Parking			14	**13440**
CTR	CARTER	3 Bed Detached	958	Single Integ			7	**6706**
CPR	COOPER	3 Bed Detached	1031	Single Det			8	**8248**
AXR	ALEXANDER	3 Bed Semi	1114	Parking			8	**8912**
AXR	ALEXANDER	3 Bed Terraced	1114	Parking			6	**6684**
LRN	LARSON	4 Bed Detached	1109	Single Integ			8	**8872**
JSN	JAMESON	4 Bed Detached	1207	Single Integ			10	**12070**
EMN	EMMERSON	4 bed Semi	1292	Parking			10	**12920**
EMN	EMMERSON	4 Bed Terraced	1292	Parking			6	**7752**
SAN	SANDERSON	4 Bed Detached	1412	Single Integ			12	**16944**
WLN	WILSON	4 Bed Detached	1425	Single Det			3	**4275**
HWN	HEWSON	4 Bed Detached	1561	Single Integ			7	**10927**
MTN	MASTERTON	5 Bed Detached	1803	Integ			6	**10818**
				Total			**145**	**159980**

Gross Site Area in Meters	81405.2907
Gross Site Area in Acres	20.11
Strategic POS in Meters	44744.7607
Strategic POS in Acres	11.06
Net Site Area in Meters	36660.53
Net Site Area in Acres	9.06
Net Site Area in Hectacres	3.67
Density (Sq.Ft per Acre)	17660.4
Density (Units per Acre)	16.0
Density (Units per Hectacre)	39.55

Story HOMES

DEVELOPMENT
EDGEHILL PARK

DRAWING
SITE LAYOUT

DRAWN BY	MO	DATE	22/05/2024
CHECKED BY	-	SCALE	1:500 @A0
DWG PACK	DRAWING NUMBER		REVISION
PLN.	20094.90.9.SL		P1

Revisions	Notes	Date
REV.	COMMENTS	XX/XX/XXXX
P1	Initial Issue.	22/05/2024

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Story House, Lords Way, Kingmoor Business Park, Carlisle, CA6 4SL

APPENDIX B

CL:AIRE Definition of Waste Code of Practice - Declaration Form

* Required

Qualified Person Declaration

Qualified Person Name *

John Coggins

Qualified Person Number *

QP013

1. This Declaration relates to - *

NB new Declaration required on any new Site of Origin or 2 site Cluster arrangement

Site of Origin - Route A: Land affected by contamination or suspected of being affected by contamination. ✓

Site of Origin - Route B: Land not suspected of being affected by contamination

Direct Transfer - Route A: Direct use of clean naturally occurring soils with elevated levels of naturally occurring substances on another development site

Direct Transfer - Route B: Direct use of clean naturally occurring soils on another development site

Cluster Project (including use of a fixed Soil Treatment Facility as a Hub site)

2. Proposed Volumes *

Volume of material intended to be reused (m3). Please only provide one number relating to this specific application of the DoW CoP e.g. do not repeat total project volumes if make additional Declarations.

41,142m^3 of materials chargeable under the CoP, comprising 3,912m^3 of site sourced topsoil (in temporary stockpiles), 17,230m^3 (of naturally occurring gravelly sandy clay subsoil with rare inclusions of clean quarried stone, brick & concrete (in temporary stockpiles) and 20,000m^3 of anhydrite (in temporary stockpile), to be re-used within Phases 3B & 4, on the Site of Origin as detailed in the MMP.

Site of Origin

3a. Site of origin - name of site owner, address & contact details

Story Homes,
Story House,
Lords Way,
Kingmoor Business Park,
Carlisle,
CA6 4SL

Tel: 01228 404550

Contact: Mr Matt Davis - Technical Manager
Email: Matt.Davis@storyhomes.co.uk

3b. Site of origin - site name & address

Phases 3B & 4 Edgehill Park,
Wilson Pit Road,
Whitehaven,
Cumbria,
CA28 9LT

NGR. E297360 N513640

3c. Site of origin - developer name, address & contact details

Story Homes,
Story House,
Lords Way,
Kingmoor Business Park,
Carlisle,
CA6 4SL
Tel: 01228 404550

Contact: Mr Matt Davis - Technical Manager
Email: Matt.Davis@storyhomes.co.uk

Direct Transfer

If including multiple Donor or Receiver sites, please number or reference clearly (e.g. Site 1 = Details, Site 2 = Details...) and use the same number / reference when answering Q12 to identify which documents exist for each site.

4a. Donor Site - developer name, address & contact details

N/A

4b. Donor Site - site name & address

N/A

4c. Receiver Site - developer name, address & contact details

N/A

4d. Receiver Site - site name & address

N/A

Soil Treatment Facility / Cluster

If including multiple Donor or Receiver sites, please number of reference clearly (e.g. Site 1 = Details, Site 2 = Details...) and use the same number / reference when answering Q12 to clearly show which documents exist for each site.

5a. Soil Treatment Facility / Hub site owner / operator - name, address & contact details

N/A

5b. EA / NRW Permit number for Mobile Treatment Plant or Fixed Soil Treatment site

If applicable

N/A

5c. Donor site - developer name, address & contact details

N/A

5d. Donor site - name & address

N/A

5e. Receiver site - developer name, address & contact details

NB - New Declaration required for each Receiver site in a Cluster arrangement i.e. a Declaration for any 2 site arrangement

N/A

5f. Receiver site name and address

N/A

All Projects

6a. Local Authority name, address *

Specific to the location of the receiver site

Cumberland Council (formerly Copeland Borough Council, prior to 1 April 2023)

Public Health & Protection,
Whitehaven Commercial Park,
Moresby Parks,
Whitehaven,
Cumbria,
CA28 8YD

and

Development Management,
Thriving Place & Development,
Market Hall,
Market Place,
Whitehaven,
CA28 7JG

6b. Local Authority - name and contact details: *

Contact: Kevan Buck – Environmental Health Officer (Public Health & Protection)
Tel: 0300 3733730
Email: kevan.buck@cumberland.gov.uk

&

Contact: Chris Harrison – Principal Planning & Case Officer (Development Management)
Tel: 01946 598412
Email: christopher.harrison@cumberland.gov.uk

6c. Environment Agency / Natural Resources Wales local office address & contact details *

This must show details of the area office for the receiver site, with a generic e-mail address for the waste team if possible.

Environment Agency
Lutra House,
Dodd Way,
Walton Summit,
Bamber Bridge,
Preston,
PR5 8BX

Contact: Liz Locke – Sustainable Places Officer
Tel: 020 3025 1356
Email: clplanning@environment-agency.gov.uk

&

Environment Agency
Ghyll Mount,
(Gillan Way),
Penrith 40 Business Park,
Penrith,
Cumbria,
CA11 9BP

Contact: Hui Zhang – Planning Advisor (Sustainable Places)
Tel: 03708 506506 (Customer Services)
Email: clplanning@environment-agency.gov.uk

&

Environment Agency
Waste Regulation/Regulated Industry
Lutra House,
Dodd Way,
Walton Summit,
Preston,
PR5 8BX

Contact: Gabriela Boca – Senior Environment Officer, Cumbria & Lancashire Area
Tel: 020 3025 1277 (Direct Dial)
Email: gabriela.boca@environment-agency.gov,uk

General email contact for Waste Team:
NWNorth_Permitting@environment-agency.gov.uk

Declaration Fee

Administration fees are £165 + VAT for all projects. Projects involving reuse volumes greater than 5,000m3 accrue a Declaration fee calculated by rounding the expected reuse volume up to the nearest 1,000m3 and multiplying by £0.01

7. How will payment be made *

BACS✓
Credit card by phone - please call 01844 296 112 between 10:00 & 13:30

8. Who will pay the Declaration fee? *

Name, contact details of person / organisation, please include company name and individual contact.

Nick Ward
ID Geoenvironmental Ltd
Dane Mill Business Centre
Broadhurst Lane
Congleton
Cheshire
CW12 1LA
Tel: 01565 755557

9. Email address of person identified in Q8 *

Email: nick.ward@id-geo.co.uk

10. Terms & Conditions *

Has the Terms & Conditions box on page 1 of the MMP been ticked? Please note, the fee payer must agree to the Terms & Conditions; failure to pay could result in the restriction of future DoW CoP use.

Person identified in Q8 has read and agreed to the Terms & Conditions.✓

11. Please provide a purchase order number *

Purchase Order number. Not Required (IDG job no. 4046)

Declaration

12a. I confirm that - *

I satisfy the Qualified Person requirements set out in Appendix 6 of the Definition of Waste: Development Industry Code of Practice to complete this Declaration. I have reviewed the Materials Management Plan for the above project. I have reviewed the risk assessment. I have reviewed the Remediation Strategy/Design Statement covering the above site. I have requested correspondence / documentation relating to the development and how that relates to the use of materials.✓

12b.Please provide a reference for the Materials Management Plan *

MMP Form (Site Ref. 4046-G-MMP Rev 1) dated October 2023, prepared by Nick Ward of ID Geoenvironmental Ltd (IDG) on behalf of Story Homes.

12c.Please provide a reference for the Risk Assessment *

Sections 6, 12.3, 12.5 & 12.6 of Supplementary Geoenvironmental Investigation of land for Phase 3 Edgehill Park, Whitehaven, (Report ref. 4046-G-R019 Rev B) dated January 2021 by IDG.

Sections 3.1.2, 8.3, 8.4,8.5 & 9.3 of Geoenvironmental Appraisal of land for Phase 4 Edgehill Park, Whitehaven, (Report ref. 4046-G-R024), dated December 2021 by IDG.

Sections 3.11 & 4 and Appendix C of Remediation Strategy for Phase 3B of land at Edgehill Park, Whitehaven, (Report ref. 4046-G-R022) dated July 2021 by IDG.

Sections 4 & 5 of Remediation Strategy for land at Phase 4 of Edgehill Park, (Report ref. 4046-G-R030) dated November 2022 by IDG.

12d.Please provide a reference for the Remediation Strategy or Design Statement documents. *

Please note these should be standalone documents. Route A projects must reference a Remediation Strategy, Route B projects must reference a Design Statement

Remediation Strategy for Phase 3B of land at Edgehill Park, Whitehaven, (Report ref. 4046-G-R022) dated July 2021 by IDG.

Remediation Strategy for land at Phase 4 of Edgehill Park, (Report ref. 4046-G-R030) dated November 2022 by IDG.

12e. Please provide a reference for the Verification Plan

Sections 6.1.6-6.1.9, 6.3.5-6.3.7, 6.4.5, 6.4.6, 6.6, 7, 8 and Appendix D of Remediation Strategy for Phase 3B of land at Edgehill Park, Whitehaven, (Report ref. 4046-G-R022) dated July 2021 by IDG.

Sections 9 & 10.1 and Appendix C of Remediation Strategy for land at Phase 4 of Edgehill Park, (Report ref. 4046-G-R030) dated November 2022 by IDG.

Also refer to answer to Question 26 on the MMP Form.

12f. Identify the individual / organisation (and contact details) with responsibility for producing the Verification Report *

Responsibility for Production of the Verification Report(s) will be by:
Story Homes,
Story House,
Lords Way,
Kingmoor Business Park,
Carlisle,
CA6 4SL
Tel: 01228 404550

Contact: Mr Matt Davis - Technical Manager
Email: Matt.Davis@storyhomes.co.uk

12g.Please provide an estimated production date for the Verification Report. *

Production dates for Verification Report(s) for re-use of excavated materials on site, estimated date as entered in answer to Qu 26 of MMP Form. i.e. 30 April 2025

12h.Please reference other supporting documents as required in the MMP. *

e.g. location plans, schematics, Desk Top Study, mass balance calculations, contingency arrangements, tracking systems, verification plan.

Site of Origin

Site Location Plan, (All Phases) Edgehill Park – Drawing ref. 4046-G-D048 Rev A by IDG.
Site Location Plan, (Phase 4) Edgehill Park – Drawing ref. 4046-G-D038 by IDG.
Development Phases Plan depicting Phase 3 and relationship to approved Planning Phases 1-6 and Planning Phases subsequently granted Full Planning Permission by Reserved Matters - Drawing ref. 4046-G-D082 Rev A by IDG.

Chronology Document 4046-G-C001 rev 1 produced by IDG dated October 2023, providing full details of several phases of ground investigation and planning permissions for the Edgehill Park development dating back to 2011.

Supplementary Geoenvironmental Investigation of land for Phase 3 Edgehill Park, Whitehaven, (Report ref. 4046-G-R019 Rev B) dated January 2021 by IDG. (Section 3.2 summarises contents of Phase 1 Geotechnical Ground Investigation (Desk Study) for land at High Road, Whitehaven, (Report ref. 2546) dated September 2011 by Integra).

Geoenvironmental Appraisal of land for Phase 4 Edgehill Park, Whitehaven, (Report ref. 4046-G-R024), dated December 2021 by IDG. (Section 3 contains summary of IDG Preliminary Geo Environmental (Desk Study) & Coal Mining Risk Assessment for Phase 4, (Report ref. 4046-G-R015 Rev A, dated November 2021).

MMP Schematics, ref. 4046-G-MMP003 Rev A, detailing movements MM1-MM9 for excavated material types in Phases 3B & 4 of Edgehill Park development, by IDG.

Stockpile Locations Plan (depicts the stockpile locations, survey volumes and other sources of site sourced materials) – Drawing ref. 4046-G-D083 Rev A dated 3 August 2023 by IDG.
Stockpile Assessment containing detailed chemical & geotechnical test results (Phase 3 &5) Letter Report ref. 4046-G-L033 Rev A dated 3 August 2023 by IDG.

Detailed Site Development Layout (depicts the layout up to completion of Phase 3B including proposed screening landscape) – Drawing ref. 54D-STO Rev J, dated October 2020 by Story Homes.
Soft Landscape Plan (with landscaped bund) -Drawing ref. UG_1415_LAN_SL_DRW_11 Rev P03 by Urban Green.

Initial Cut & Fill Plan (depicts Phase 3B (proposed Phase 5) areas of cut and fill) - Drawing ref. SC0021 by Story Homes.

Proposed screening landscape and relative volumes of cover soils required to Phase 3B - Drawing ref. 7503-ABM-02 by Coopers Consulting.

Detailed Development Layouts (107 plots) for Phase 4 – Drawings refs. VER-100 rev R & VER-101 Rev D by Story Homes.
Proposed Earthworks (depicts the proposed earthworks and cut/fill volumes to achieve development levels in Phase 4) - Drawing ref. 7843-SK05 Rev H by Coopers Consulting.

Contingency arrangements as stated in answers to questions 21a-d on completed MMP Form.
Tracking system(s) as per answers to questions 22a, b, c, d & e on completed MMP Form.
Materials Tracking Form.

13a. I confirm that I have reviewed the following correspondence / documentation relating to the development and how that relates to the use of materials from: *

a) The Local Authority ✓
b) Environment Agency ✓ / NRW
c) Other relevant environmental regulatory bodies associated with the development, e.g. Defra, Natural England

13b. Please reference the correspondence with the Local Authority. *

Provide references e.g email from - to, title, date

a) The Local Authority

Environmental Health email dated 12 September 2023 to IDG confirming acceptance of the recommendation of the IDG Remediation Strategy Reports for Phase 3A (4046-G-R021) & 3B (4046-G-R022) for Planning to discharge condition 27 (remediation strategy) of Planning Permission 4/13/2235/0O1.

Environmental Health email dated 12 September 2023 to IDG confirming that Cumberland Council have no objection to re-use of stockpiles of materials refs.1,2,4,5,7,9,10,11,12 & 13 on the site of origin in accordance with DoWCoP.

Letter dated 10 February 2023 to Story Homes confirming that Cumberland Council (formerly Copeland BC) approve the recommendations of the IDG Remediation Strategy Report for Phase 4 (ref. 4046-G-R030).

Planning Case Officer's Report to Planning Committee held on 5 July 2023 for Reserved Matters Planning Application ref. 4/22/2332/0F1.

13c.Please reference the correspondence with the EA / NRW. *

If Route B and relying on the presence of a Desk Top Study to satisfy the requirements of Table 2 (in the DoW CoP), please ensure it is referenced 'above' and flag again here.

b) Environment Agency

Email correspondence dated 10 February 2021 to IDG confirming that the Local Waste Team of the Environment Agency (EA) have no objection to on-site re-use of the Anhydrite made ground stockpile in accordance with DoWCoP.

Environment Agency Waste email dated 18 September 2023 confirms that the subsoil & topsoil stockpiles within Phase 3A & 3B (the subject of IDG correspondence 4046-G-L033 may be re-used on site of origin in accordance with DoWCoP.

Environment Agency Waste email dated 25 September 2023 to IDG states "we have no objections to the re-use of material excavated within Phase 1, Phase 2A & 2B and Phase 3 A of the development at Edgehill Park Whitehaven, on the site from which it has been excavated, for the purpose of land development, as defined by the CL:AIRE DOWCOP".

Environment Agency Waste email correspondence dated 3 October 2023 states "we agree with your definition of Phases 1-6 and 4 of this large Edghill Park development project as one "Site of Origin".

13d. Please reference the correspondence with other relevant regulatory bodies

N/A

14a. I have reviewed the planning consent including planning conditions *

Confirm by stating the Reference or state Not Applicable.

Planning Permission to Application ref. 4/13/2235/0O1 granted (dated 13 March 2014) by Copeland Borough Council in OUTLINE for

431(approx.) dwellings, land reserved for Primary School & associated ancillary space on Phases 1-6 & Approval in FULL for 139 dwellings to the south of the site (Phases 1A, 1B & Phase 2) with access, pedestrian bridge, suds features & associated space & infrastructure.

Planning Permission to Application ref. 4/17/2103/0R1 (pursuant to 4/13/2235/0O1) granted by Copeland Borough Council (dated for "Reserved Matters Application for the Erection of 96 Dwellings and Associated Infrastructure (Phases 3 & 4) Land at Edgehill Park, Whitehaven.
Planning Permission to Application ref. 4/19/2124/0F1 (Revision of previously approved Permission 4/17/2103/0R1) granted (dated 7 August 2019) by Copeland Borough Council to decrease the number of dwellings from 105 to 83) land at Edgehill, Whitehaven (Phase 2).

Reserved Matters Planning Permission Reference 4/20/2474/0R1 granted by Copeland Borough Council (dated 27 April 2021) for Erection of 335 Dwellings including associated infrastructure pursuant to Outline Planning Approval 4/13/2235/0O1 Phase 3 Edgehill Park.

Full Planning Permission to Application ref. 4/22/2217/0F1 granted by Copeland Borough Council (dated 24 November 2022) for importation & deposit of earth material to reprofile existing ground levels/contours ; installation of surface water drainage infrastructure including installation of foul water drainage infrastructure on land to west of Valley View Road, Whitehaven.

Approval letter dated 10 February 2023 to Application ref. 4/22/2470/DOC to discharge condition 4 (provision of remediation strategy) of approval 4/22/2217/9F1 by Copeland BC.

Application ref. 4/22/2332/0F1 for 107 dwelling houses and associated infrastructure within Phase 4 of the Edgehill Park development was heard by the Planning Committee of Cumberland Council on 5 July 2023 and it was resolved that Full Planning Permission be granted subject to a 106 Agreement. A copy of the decision notice is not yet available, but copies of the Planning Case Officer Report and Minutes of the meeting have been provided.

14b. I have reviewed correspondence concerning the planning consent regarding the development from *
a) The Local Authority ✓

b) Environment Agency ✓/ NRW
c) Other relevant environmental regulatory bodies
d) Planning consent not required

14c. Please list correspondence reviewed in 14b*

Provide references e.g email from - to, title, date

a) Local Authority

Environmental Health email dated 12 September 2023 to IDG confirming acceptance of the recommendation of the IDG Remediation Strategy Reports for Phase 3A (4046-G-R021) & 3B (4046-G-R022) for Planning to discharge condition 27 (remediation strategy) of Planning Permission 4/13/2235/0O1.

Environmental Health email dated 12 September 2023 to IDG confirming that Cumberland Council have no objection to re-use of stockpiles of materials refs.1,2,4,5,7,9,10,11,12 & 13 on the site of origin in accordance with DoWCoP.

Letter dated 10 February 2023 to Story Homes confirming that Cumberland Council (formerly Copeland BC) approve the recommendations of the IDG Remediation Strategy Report for Phase 4 (ref. 4046-G-R030).

Planning Case Officer's Report to Planning Committee held on 5 July 2023 for Reserved Matters Planning Application ref. 4/22/2332/0F1.

b) Environment Agency

Letter dated 22 December 2020 (ref. NO/2020/113153/01-L01) from EA to Planning, providing comments in response to Supplementary Geoenvironmental Investigation of land for Phase 3 Edgehill Park, Whitehaven, (Report ref. 4046-G-R019) dated November 2020 by IDG submitted for Planning Application ref. 4/20/2474/0R1.

Letters dated 9 June & 25 July 2023 (refs. NO/2022/114475/01-L01 & NO/2022/114475/02-L01 from EA to Planning, providing comments in response to Planning Approval ref. 4/22/2217/0F1.

Letter dated 20 January 2023 (ref. NO/2023/115007/01-L01) from EA to Planning, in response to Planning Application ref. 4/22/2470/DOC agreeing to discharge of condition 4 (remediation strategy) of Planning Approval ref. 4/22/2217/0F1.

15. If planning consent is not required please explain why

N/A

16. I confirm that the MMP contains the information required:- *

Where a project has been refused a recovery permit and/or the recipient of the soil is being paid to accept it then clients should be asked to seek further advice from the EA / NRW. The proposal may still proceed and a declaration be issued providing there is evidence the EA / NRW has no objections (i.e. it does not regard the material to be waste and the operation to be waste disposal). Please see FAQs at www.claire.co.uk/cop for more info.

The risk assessment assesses human health and environmental risks in relation to the proposed uses of all the materials in the MMP. The risk assessment concludes that the objectives of preventing harm to human health and pollution of the environment will be met if materials are used in the proposed manner. ✓

The Local Authority, the Environment Agency / Natural Resources Wales and other relevant environmental regulatory bodies have not objected to the proposed development / land remediation on the basis that the use of any material is likely to cause harm to human health or pollution of the environment. [This confirmation should be given regardless of whether planning consent is required for the activity. Also see paragraph 3.37 of the CoP.]. ✓

The EA/NRW have not objected to the reuse of materials on the grounds that it a.) constitutes a waste management operation or b.) has had a previous application for an environmental permit for waste recovery refused (on the grounds that the project represents waste disposal).✓

The project has not yet commenced; this is not a retrospective application of the DoW CoP.✓

The project does not involve land-spreading/agricultural re-profiling. ✓

There is no need to print this form. A copy of the Declaration, for your records, will be provided with the Declaration receipt.

BACK

SUBMIT

APPENDIX C

CLEA Software Version 1.071

Report generated	05-Jul-21
Report title	Remediation target Concentrations for soils to remain below 300mm clear
Created by	Nick Ward at IDG

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Benzene (S4UL)	NR	7.96E+03	7.96E+03	0.00	1.00	1.00	1.22E+03 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
2	Toluene (S4UL)	NR	1.24E+07	1.24E+07	0.00	1.00	1.00	8.69E+02 (vap)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
3	Ethylbenzene (S4UL)	NR	8.72E+05	8.72E+05	0.00	1.00	1.00	5.18E+02 (vap)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
4	Xylene p- (S4UL)	NR	7.28E+05	7.28E+05	0.00	1.00	1.00	5.76E+02 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
5	Naphthalene	NR	4.49E+04	4.49E+04	0.00	1.00	1.00	7.64E+01 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
6	ALIPHATIC C5-C6	NR	3.49E+06	3.49E+06	0.00	1.00	1.00	3.04E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
7	ALIPHATIC C6-C8	NR	5.45E+06	5.45E+06	0.00	1.00	1.00	1.44E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
8	ALIPHATIC C8-C10	NR	6.68E+05	6.68E+05	0.00	1.00	1.00	7.77E+01 (vap)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
9	ALIPHATIC C10-C12	NR	1.49E+06	1.49E+06	0.00	1.00	1.00	4.75E+01 (vap)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
10	ALIPHATIC C12-C16	NR	4.30E+06	4.30E+06	0.00	1.00	1.00	2.37E+01 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
11	ALIPHATIC C16-C21	1.23E+08	NR	NR	1.00	NR	NR	8.48E+00 (sol)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
12	ALIPHATIC C21-C35	1.23E+08	NR	NR	1.00	NR	NR	8.48E+00 (sol)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
13	AROMATIC C5-C7	NR	7.89E+06	7.89E+06	0.00	1.00	1.00	1.22E+03 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
14	AROMATIC C7-C8	NR	1.22E+07	1.22E+07	0.00	1.00	1.00	8.69E+02 (vap)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
15	AROMATIC C8-C10	NR	4.04E+05	4.04E+05	0.00	1.00	1.00	6.13E+02 (vap)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
16	AROMATIC C10-C12	NR	9.42E+05	9.42E+05	0.00	1.00	1.00	3.64E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
17	AROMATIC C12-C16	NR	3.12E+06	3.12E+06	0.00	1.00	1.00	1.69E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
18	AROMATIC C16-C21	NR	NR	NR	0.00	NR	NR	5.37E+01 (vap)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
19	AROMATIC C21-C35	NR	NR	NR	0.00	NR	NR	4.83E+00 (sol)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
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Environment Agency

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

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Benzene (S4UL)	57.3	39.9	2.8	100.0	7.96E+03	1.35E+06	NA	NA	NA	NA	4.73E-02	0.00E+00	NA	NA	NA	NA	NA	NA
2	Toluene (S4UL)	80.2	18.5	1.3	100.0	1.24E+07	9.68E+08	NA	NA	NA	NA	4.71E+01	0.00E+00	NA	NA	NA	NA	NA	NA
3	Ethylbenzene (S4UL)	89.8	9.4	0.8	100.0	8.72E+05	4.20E+07	NA	NA	NA	NA	2.47E+00	0.00E+00	NA	NA	NA	NA	NA	NA
4	Xylene p- (S4UL)	89.9	9.5	0.6	100.0	7.28E+05	2.70E+07	NA	NA	NA	NA	1.81E+00	0.00E+00	NA	NA	NA	NA	NA	NA
5	Naphthalene	93.2	6.8	0.0	100.0	4.49E+04	7.39E+04	NA	NA	NA	NA	2.33E-02	0.00E+00	NA	NA	NA	NA	NA	NA
6	ALIPHATIC C5-C6	55.7	3.2	41.0	100.0	3.49E+06	8.65E+09	NA	NA	NA	NA	8.45E+01	0.00E+00	NA	NA	NA	NA	NA	NA
7	ALIPHATIC C6-C8	82.2	1.0	16.8	100.0	5.45E+06	5.54E+09	NA	NA	NA	NA	8.45E+01	0.00E+00	NA	NA	NA	NA	NA	NA
8	ALIPHATIC C8-C10	96.1	0.1	3.8	100.0	6.68E+05	1.52E+08	NA	NA	NA	NA	4.90E+00	0.00E+00	NA	NA	NA	NA	NA	NA
9	ALIPHATIC C10-C12	99.2	0.0	0.8	100.0	1.49E+06	6.83E+07	NA	NA	NA	NA	4.90E+00	0.00E+00	NA	NA	NA	NA	NA	NA
10	ALIPHATIC C12-C16	99.9	0.0	0.1	100.0	4.30E+06	2.36E+07	NA	NA	NA	NA	4.90E+00	0.00E+00	NA	NA	NA	NA	NA	NA
11	ALIPHATIC C16-C21	100.0	0.0	0.0	100.0	1.23E+08	3.93E+07	NA	NA	NA	NA	3.38E+01	0.00E+00	NA	NA	NA	NA	NA	NA
12	ALIPHATIC C21-C35	100.0	0.0	0.0	100.0	1.23E+08	3.93E+07	NA	NA	NA	NA	3.38E+01	0.00E+00	NA	NA	NA	NA	NA	NA
13	AROMATIC C5-C7	57.3	39.9	2.8	100.0	7.89E+06	1.34E+09	NA	NA	NA	NA	4.69E+01	0.00E+00	NA	NA	NA	NA	NA	NA
14	AROMATIC C7-C8	80.2	18.5	1.3	100.0	1.22E+07	9.50E+08	NA	NA	NA	NA	4.63E+01	0.00E+00	NA	NA	NA	NA	NA	NA
15	AROMATIC C8-C10	96.7	2.9	0.4	100.0	4.04E+05	1.07E+07	NA	NA	NA	NA	1.01E+00	0.00E+00	NA	NA	NA	NA	NA	NA
16	AROMATIC C10-C12	98.1	1.8	0.1	100.0	9.42E+05	4.58E+06	NA	NA	NA	NA	1.01E+00	0.00E+00	NA	NA	NA	NA	NA	NA
17	AROMATIC C12-C16	99.1	0.9	0.0	100.0	3.12E+06	1.34E+06	NA	NA	NA	NA	1.01E+00	0.00E+00	NA	NA	NA	NA	NA	NA
18	AROMATIC C16-C21	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00	NA	NA	NA	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
19	AROMATIC C21-C35	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00	NA	NA	NA	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
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Environment Agency

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

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Benzene (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-03	0.00E+00	0.00E+00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00
2	Toluene (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E+00	5.63E-04	5.58E-03	0.00	0.00	0.00	0.00	0.00	99.60	0.00	0.40
3	Ethylbenzene (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-02	2.81E-04	1.13E-03	0.00	0.00	0.00	0.00	0.00	98.48	0.00	1.52
4	Xylene p- (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.37E-02	6.19E-04	6.30E-03	0.00	0.00	0.00	0.00	0.00	89.49	0.00	10.51
5	Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.90E-04	3.94E-04	1.70E-04	0.00	0.00	0.00	0.00	0.00	80.26	0.00	19.74
6	ALIPHATIC C5-C6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
7	ALIPHATIC C6-C8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
8	ALIPHATIC C8-C10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-01	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
9	ALIPHATIC C10-C12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-01	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
10	ALIPHATIC C12-C16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-01	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
11	ALIPHATIC C16-C21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	0.00	50.00	50.00	0.00
12	ALIPHATIC C21-C35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	0.00	50.00	50.00	0.00
13	AROMATIC C5-C7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E+00	1.69E-04	1.21E-02	0.00	0.00	0.00	0.00	0.00	99.13	0.00	0.87
14	AROMATIC C7-C8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+00	5.63E-04	3.15E-02	0.00	0.00	0.00	0.00	0.00	97.75	0.00	2.25
15	AROMATIC C8-C10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-02	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
16	AROMATIC C10-C12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-02	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
17	AROMATIC C12-C16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-02	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
18	AROMATIC C16-C21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	AROMATIC C21-C35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	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 (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Benzene (S4UL)	ID	0.29	ID	1.4	NR	NR	1.16E-01	8.77E-06	6.64E-10	1.83	2.13	0.1	0.5	10	1	1
2	Toluene (S4UL)	TDI	223	TDI	1400	10	92	1.15E-01	7.78E-06	5.88E-10	2.31	2.73	0.1	0.5	10	1	1
3	Ethylbenzene (S4UL)	TDI	100	TDI	74.3	5	18.6	1.39E-01	7.04E-06	5.31E-10	2.65	3.15	0.1	0.5	10	1	1
4	Xylene p- (S4UL)	TDI	180	TDI	60	11	104	1.07E-01	7.04E-06	5.31E-10	2.65	3.15	0.1	0.5	10	1	1
5	Naphthalene	TDI	20	TDI	0.86	7	2.8	6.62E-03	6.52E-06	5.16E-10	2.81	3.34	0.13	0.5	1	1	1
6	ALIPHATIC C5-C6	TDI	5000	TDI	5000	9.99E+99	9.99E+99	2.10E+01	1.00E-05	1.00E-09	2.91	3.31	0.1	0.5	10	1	1
7	ALIPHATIC C6-C8	TDI	5000	TDI	5000	9.99E+99	9.99E+99	2.73E+01	1.00E-05	1.00E-09	3.58	4.13	0.1	0.5	10	1	1
8	ALIPHATIC C8-C10	TDI	100	TDI	290	9.99E+99	9.99E+99	4.15E+01	1.00E-05	1.00E-09	4.48	5.22	0.1	0.5	10	1	1
9	ALIPHATIC C10-C12	TDI	100	TDI	290	9.99E+99	9.99E+99	6.44E+01	1.00E-05	1.00E-09	5.38	6.3	0.1	0.5	10	1	1
10	ALIPHATIC C12-C16	TDI	100	TDI	290	9.99E+99	9.99E+99	1.71E+02	1.00E-05	1.00E-09	6.73	7.94	0.1	0.5	10	1	1
11	ALIPHATIC C16-C21	TDI	2000	NR	NR	9.99E+99	NR	1.07E+03	1.00E-05	1.00E-09	8.76	10.39	0.1	0.5	10	1	1
12	ALIPHATIC C21-C35	TDI	2000	NR	NR	9.99E+99	NR	1.07E+03	1.00E-05	1.00E-09	8.76	10.39	0.1	0.5	10	1	1
13	AROMATIC C5-C7	TDI	223	TDI	1400	3	200	1.16E-01	8.77E-06	6.64E-10	1.83	2.13	0.1	0.5	10	1	1
14	AROMATIC C7-C8	TDI	223	TDI	1400	10	520	1.15E-01	7.78E-06	5.88E-10	2.31	2.73	0.1	0.5	10	1	1
15	AROMATIC C8-C10	TDI	40	TDI	60	9.99E+99	9.99E+99	2.53E-01	1.00E-05	1.00E-09	3.2	3.69	0.1	0.5	10	1	1
16	AROMATIC C10-C12	TDI	40	TDI	60	9.99E+99	9.99E+99	7.22E-02	1.00E-05	1.00E-09	3.4	3.93	0.1	0.5	10	1	1
17	AROMATIC C12-C16	TDI	40	TDI	60	9.99E+99	9.99E+99	1.26E-02	1.00E-05	1.00E-09	3.7	4.29	0.1	0.5	10	1	1
18	AROMATIC C16-C21	TDI	30	NR	NR	9.99E+99	NR	6.95E-04	1.00E-05	1.00E-09	4.15	4.82	0.1	0.5	10	1	1
19	AROMATIC C21-C35	TDI	30	NR	NR	9.99E+99	NR	2.48E-05	1.00E-05	1.00E-09	5.1	5.95	0.1	0.5	10	1	1
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	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	Benzene (S4UL)	3.92E-01	6.24E+03	1.78E+03	model	model	model	model	model	model
2	Toluene (S4UL)	1.18E+00	1.73E+03	5.90E+02	model	model	model	model	model	model
3	Ethylbenzene (S4UL)	2.59E+00	5.53E+02	1.80E+02	model	model	model	model	model	model
4	Xylene p- (S4UL)	2.59E+00	4.75E+02	2.00E+02	model	model	model	model	model	model
5	Naphthalene	3.74E+00	2.31E+00	1.90E+01	model	model	model	model	model	model
6	ALIPHATIC C5-C6	4.71E+00	2.19E+04	3.59E+01	model	model	model	model	model	model
7	ALIPHATIC C6-C8	2.21E+01	3.45E+03	5.37E+00	model	model	model	model	model	model
8	ALIPHATIC C8-C10	1.75E+02	3.20E+02	4.27E-01	model	model	model	model	model	model
9	ALIPHATIC C10-C12	1.39E+03	3.21E+01	3.39E-02	model	model	model	model	model	model
10	ALIPHATIC C12-C16	3.11E+04	1.53E+00	7.59E-04	model	model	model	model	model	model
11	ALIPHATIC C16-C21	3.34E+06	2.38E-02	2.54E-06	model	model	model	model	model	model
12	ALIPHATIC C21-C35	3.34E+06	2.38E-02	2.54E-06	model	model	model	model	model	model
13	AROMATIC C5-C7	3.92E-01	6.24E+03	1.78E+03	model	model	model	model	model	model
14	AROMATIC C7-C8	1.18E+00	1.73E+03	5.90E+02	model	model	model	model	model	model
15	AROMATIC C8-C10	9.19E+00	3.20E+02	6.46E+01	model	model	model	model	model	model
16	AROMATIC C10-C12	1.46E+01	3.21E+01	2.45E+01	model	model	model	model	model	model
17	AROMATIC C12-C16	2.91E+01	1.14E+00	5.75E+00	model	model	model	model	model	model
18	AROMATIC C16-C21	8.19E+01	5.62E-03	6.53E-01	model	model	model	model	model	model
19	AROMATIC C21-C35	7.30E+02	1.61E-06	6.61E-03	model	model	model	model	model	model
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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)
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CLEA Software Version 1.071

Report generated 05/07/2021

Report title Remediation target Concentrations for soils to remain below 300mm clean cover cover in residential POS

Created by Nick Ward at IDG

BASIC SETTINGS

Land Use Residential with produce (C4SL)

Building No building
Receptor Female (res C4SL) 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 (C4SL) **Receptor** Female (res C4SL)

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	170	365	365	23.0	1.0	0.06	0.10	0.10	5.60	0.7	5.4	0.32	0.26	3.43E-01
2	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	9.80	0.8	8.0	0.33	0.26	4.84E-01
3	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	12.70	0.9	8.9	0.32	0.25	5.82E-01
4	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	15.10	0.9	10.1	0.35	0.28	6.36E-01
5	365	365	365	170	365	365	19.0	1.0	0.06	0.10	0.10	16.90	1.0	10.1	0.35	0.28	7.04E-01
6	365	365	365	170	365	365	19.0	1.0	0.06	0.10	0.10	19.70	1.1	10.1	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	12.0	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	12.0	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	12.0	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	12.0	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	12.0	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	15.2	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	15.2	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	15.2	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	15.2	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	15.2	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	15.7	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	13.6	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 No building

Soil Sandy loam

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

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 (%)	1.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	5.80E-03
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)	**30**
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($cm^3\ s^{-1}$)	0.00E+00
Building ventilation rate ($cm^3\ s^{-1}$)	0.00E+00
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

CLEA Software Version 1.071

Report generated	05-Jul-21
Report title	Remediation target Concentrations for soils to remail below plots, hardstar
Created by	Nick Ward at IDG

Environment Agency

RESULTS

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		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Benzene (S4UL)	NR	3.82E-01	3.82E-01	0.00	1.00	1.00	1.22E+03 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
2	Toluene (S4UL)	NR	9.08E+02	9.08E+02	0.00	1.00	1.00	8.69E+02 (vap)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
3	Ethylbenzene (S4UL)	NR	8.34E+01	8.34E+01	0.00	1.00	1.00	5.18E+02 (vap)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
4	Xylene p- (S4UL)	NR	7.93E+01	7.93E+01	0.00	1.00	1.00	5.76E+02 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
5	Naphthalene	NR	2.33E+00	2.33E+00	0.00	1.00	1.00	7.64E+01 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
6	ALIPHATIC C5-C6	NR	4.24E+01	4.24E+01	0.00	1.00	1.00	3.04E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
7	ALIPHATIC C6-C8	NR	1.04E+02	1.04E+02	0.00	1.00	1.00	1.44E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
8	ALIPHATIC C8-C10	NR	2.68E+01	2.68E+01	0.00	1.00	1.00	7.77E+01 (vap)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
9	ALIPHATIC C10-C12	NR	1.33E+02	1.33E+02	0.00	1.00	1.00	4.75E+01 (vap)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
10	ALIPHATIC C12-C16	NR	1.11E+03	1.11E+03	0.00	1.00	1.00	2.37E+01 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
11	ALIPHATIC C16-C21	1.31E+05	NR	NR	1.00	NR	NR	8.48E+00 (sol)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
12	ALIPHATIC C21-C35	1.31E+05	NR	NR	1.00	NR	NR	8.48E+00 (sol)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
13	AROMATIC C5-C7	NR	3.79E+02	3.79E+02	0.00	1.00	1.00	1.22E+03 (sol)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
14	AROMATIC C7-C8	NR	8.91E+02	8.91E+02	0.00	1.00	1.00	8.69E+02 (vap)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
15	AROMATIC C8-C10	NR	4.74E+01	4.74E+01	0.00	1.00	1.00	6.13E+02 (vap)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
16	AROMATIC C10-C12	NR	2.58E+02	2.58E+02	0.00	1.00	1.00	3.64E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
17	AROMATIC C12-C16	NR	2.85E+03	2.85E+03	0.00	1.00	1.00	1.69E+02 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
18	AROMATIC C16-C21	NR	NR	NR	0.00	NR	NR	5.37E+01 (vap)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
19	AROMATIC C21-C35	NR	NR	NR	0.00	NR	NR	4.83E+00 (sol)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group						
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
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Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Benzene (S4UL)	57.3	39.9	2.8	100.0	3.82E-01	6.48E+01	NA	NA	NA	2.15E-03	2.27E-06	0.00E+00	NA	NA	NA	NA	NA	NA
2	Toluene (S4UL)	80.2	18.5	1.3	100.0	9.08E+02	7.07E+04	NA	NA	NA	2.15E+00	3.45E-03	0.00E+00	NA	NA	NA	NA	NA	NA
3	Ethylbenzene (S4UL)	89.8	9.4	0.8	100.0	8.34E+01	4.02E+03	NA	NA	NA	1.13E-01	2.37E-04	0.00E+00	NA	NA	NA	NA	NA	NA
4	Xylene p- (S4UL)	89.9	9.5	0.6	100.0	7.93E+01	2.95E+03	NA	NA	NA	8.26E-02	1.98E-04	0.00E+00	NA	NA	NA	NA	NA	NA
5	Naphthalene	93.2	6.8	0.0	100.0	2.33E+00	3.84E+00	NA	NA	NA	1.06E-03	1.21E-06	0.00E+00	NA	NA	NA	NA	NA	NA
6	ALIPHATIC C5-C6	55.7	3.2	41.0	100.0	4.24E+01	1.05E+05	NA	NA	NA	3.85E+00	1.03E-03	0.00E+00	NA	NA	NA	NA	NA	NA
7	ALIPHATIC C6-C8	82.2	1.0	16.8	100.0	1.04E+02	1.05E+05	NA	NA	NA	3.85E+00	1.61E-03	0.00E+00	NA	NA	NA	NA	NA	NA
8	ALIPHATIC C8-C10	96.1	0.1	3.8	100.0	2.68E+01	6.11E+03	NA	NA	NA	2.23E-01	1.97E-04	0.00E+00	NA	NA	NA	NA	NA	NA
9	ALIPHATIC C10-C12	99.2	0.0	0.8	100.0	1.33E+02	6.11E+03	NA	NA	NA	2.23E-01	4.39E-04	0.00E+00	NA	NA	NA	NA	NA	NA
10	ALIPHATIC C12-C16	99.9	0.0	0.1	100.0	1.11E+03	6.11E+03	NA	NA	NA	2.23E-01	1.27E-03	0.00E+00	NA	NA	NA	NA	NA	NA
11	ALIPHATIC C16-C21	100.0	0.0	0.0	100.0	1.31E+05	4.21E+04	NA	NA	NA	1.54E+00	3.62E-02	0.00E+00	NA	NA	NA	NA	NA	NA
12	ALIPHATIC C21-C35	100.0	0.0	0.0	100.0	1.31E+05	4.21E+04	NA	NA	NA	1.54E+00	3.62E-02	0.00E+00	NA	NA	NA	NA	NA	NA
13	AROMATIC C5-C7	57.3	39.9	2.8	100.0	3.79E+02	6.43E+04	NA	NA	NA	2.14E+00	2.25E-03	0.00E+00	NA	NA	NA	NA	NA	NA
14	AROMATIC C7-C8	80.2	18.5	1.3	100.0	8.91E+02	6.94E+04	NA	NA	NA	2.11E+00	3.38E-03	0.00E+00	NA	NA	NA	NA	NA	NA
15	AROMATIC C8-C10	96.7	2.9	0.4	100.0	4.74E+01	1.26E+03	NA	NA	NA	4.62E-02	1.19E-04	0.00E+00	NA	NA	NA	NA	NA	NA
16	AROMATIC C10-C12	98.1	1.8	0.1	100.0	2.58E+02	1.26E+03	NA	NA	NA	4.61E-02	2.78E-04	0.00E+00	NA	NA	NA	NA	NA	NA
17	AROMATIC C12-C16	99.1	0.9	0.0	100.0	2.85E+03	1.23E+03	NA	NA	NA	4.61E-02	9.29E-04	0.00E+00	NA	NA	NA	NA	NA	NA
18	AROMATIC C16-C21	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
19	AROMATIC C21-C35	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Benzene (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-03	0.00E+00	0.00E+00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
2	Toluene (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E+00	5.63E-04	5.58E-03	0.00	0.00	0.00	0.00	99.59	0.01	0.00	0.40
3	Ethylbenzene (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-02	2.81E-04	1.13E-03	0.00	0.00	0.00	0.00	98.47	0.01	0.00	1.52
4	Xylene p- (S4UL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.37E-02	6.19E-04	6.30E-03	0.00	0.00	0.00	0.00	89.48	0.01	0.00	10.51
5	Naphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.90E-04	3.94E-04	1.70E-04	0.00	0.00	0.00	0.00	80.26	0.00	0.00	19.74
6	ALIPHATIC C5-C6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	50.00	0.00	0.00	50.00
7	ALIPHATIC C6-C8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	50.00	0.00	0.00	50.00
8	ALIPHATIC C8-C10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-01	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	50.00	0.00	0.00	50.00
9	ALIPHATIC C10-C12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-01	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	50.00	0.00	0.00	50.00
10	ALIPHATIC C12-C16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-01	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	49.99	0.01	0.00	50.00
11	ALIPHATIC C16-C21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	49.95	0.05	50.00	0.00
12	ALIPHATIC C21-C35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	49.95	0.05	50.00	0.00
13	AROMATIC C5-C7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E+00	1.69E-04	1.21E-02	0.00	0.00	0.00	0.00	99.13	0.00	0.00	0.87
14	AROMATIC C7-C8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+00	5.63E-04	3.15E-02	0.00	0.00	0.00	0.00	97.74	0.01	0.00	2.25
15	AROMATIC C8-C10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-02	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	49.99	0.01	0.00	50.00
16	AROMATIC C10-C12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-02	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	49.99	0.01	0.00	50.00
17	AROMATIC C12-C16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-02	5.62E+95	6.06E+95	0.00	0.00	0.00	0.00	49.95	0.05	0.00	50.00
18	AROMATIC C16-C21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	AROMATIC C21-C35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.62E+95	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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Environment Agency

		Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		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	Benzene (S4UL)	ID	0.29	ID	1.4	NR	NR	1.16E-01	8.77E-06	6.64E-10	1.83	2.13	0.1	0.5	10	1	1
2	Toluene (S4UL)	TDI	223	TDI	1400	10	92	1.15E-01	7.78E-06	5.88E-10	2.31	2.73	0.1	0.5	10	1	1
3	Ethylbenzene (S4UL)	TDI	100	TDI	74.3	5	18.6	1.39E-01	7.04E-06	5.31E-10	2.65	3.15	0.1	0.5	10	1	1
4	Xylene p- (S4UL)	TDI	180	TDI	60	11	104	1.07E-01	7.04E-06	5.31E-10	2.65	3.15	0.1	0.5	10	1	1
5	Naphthalene	TDI	20	TDI	0.86	7	2.8	6.62E-03	6.52E-06	5.16E-10	2.81	3.34	0.13	0.5	1	1	1
6	ALIPHATIC C5-C6	TDI	5000	TDI	5000	9.99E+99	9.99E+99	2.10E+01	1.00E-05	1.00E-09	2.91	3.31	0.1	0.5	10	1	1
7	ALIPHATIC C6-C8	TDI	5000	TDI	5000	9.99E+99	9.99E+99	2.73E+01	1.00E-05	1.00E-09	3.58	4.13	0.1	0.5	10	1	1
8	ALIPHATIC C8-C10	TDI	100	TDI	290	9.99E+99	9.99E+99	4.15E+01	1.00E-05	1.00E-09	4.48	5.22	0.1	0.5	10	1	1
9	ALIPHATIC C10-C12	TDI	100	TDI	290	9.99E+99	9.99E+99	6.44E+01	1.00E-05	1.00E-09	5.38	6.3	0.1	0.5	10	1	1
10	ALIPHATIC C12-C16	TDI	100	TDI	290	9.99E+99	9.99E+99	1.71E+02	1.00E-05	1.00E-09	6.73	7.94	0.1	0.5	10	1	1
11	ALIPHATIC C16-C21	TDI	2000	NR	NR	9.99E+99	NR	1.07E+03	1.00E-05	1.00E-09	8.76	10.39	0.1	0.5	10	1	1
12	ALIPHATIC C21-C35	TDI	2000	NR	NR	9.99E+99	NR	1.07E+03	1.00E-05	1.00E-09	8.76	10.39	0.1	0.5	10	1	1
13	AROMATIC C5-C7	TDI	223	TDI	1400	3	200	1.16E-01	8.77E-06	6.64E-10	1.83	2.13	0.1	0.5	10	1	1
14	AROMATIC C7-C8	TDI	223	TDI	1400	10	520	1.15E-01	7.78E-06	5.88E-10	2.31	2.73	0.1	0.5	10	1	1
15	AROMATIC C8-C10	TDI	40	TDI	60	9.99E+99	9.99E+99	2.53E-01	1.00E-05	1.00E-09	3.2	3.69	0.1	0.5	10	1	1
16	AROMATIC C10-C12	TDI	40	TDI	60	9.99E+99	9.99E+99	7.22E-02	1.00E-05	1.00E-09	3.4	3.93	0.1	0.5	10	1	1
17	AROMATIC C12-C16	TDI	40	TDI	60	9.99E+99	9.99E+99	1.26E-02	1.00E-05	1.00E-09	3.7	4.29	0.1	0.5	10	1	1
18	AROMATIC C16-C21	TDI	30	NR	NR	9.99E+99	NR	6.95E-04	1.00E-05	1.00E-09	4.15	4.82	0.1	0.5	10	1	1
19	AROMATIC C21-C35	TDI	30	NR	NR	9.99E+99	NR	2.48E-05	1.00E-05	1.00E-09	5.1	5.95	0.1	0.5	10	1	1
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	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})	Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})	Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
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Environment Agency

		Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Benzene (S4UL)	3.92E-01	6.24E+03	1.78E+03	model	model	model	model	model	model
2	Toluene (S4UL)	1.18E+00	1.73E+03	5.90E+02	model	model	model	model	model	model
3	Ethylbenzene (S4UL)	2.59E+00	5.53E+02	1.80E+02	model	model	model	model	model	model
4	Xylene p- (S4UL)	2.59E+00	4.75E+02	2.00E+02	model	model	model	model	model	model
5	Naphthalene	3.74E+00	2.31E+00	1.90E+01	model	model	model	model	model	model
6	ALIPHATIC C5-C6	4.71E+00	2.19E+04	3.59E+01	model	model	model	model	model	model
7	ALIPHATIC C6-C8	2.21E+01	3.45E+03	5.37E+00	model	model	model	model	model	model
8	ALIPHATIC C8-C10	1.75E+02	3.20E+02	4.27E-01	model	model	model	model	model	model
9	ALIPHATIC C10-C12	1.39E+03	3.21E+01	3.39E-02	model	model	model	model	model	model
10	ALIPHATIC C12-C16	3.11E+04	1.53E+00	7.59E-04	model	model	model	model	model	model
11	ALIPHATIC C16-C21	3.34E+06	2.38E-02	2.54E-06	model	model	model	model	model	model
12	ALIPHATIC C21-C35	3.34E+06	2.38E-02	2.54E-06	model	model	model	model	model	model
13	AROMATIC C5-C7	3.92E-01	6.24E+03	1.78E+03	model	model	model	model	model	model
14	AROMATIC C7-C8	1.18E+00	1.73E+03	5.90E+02	model	model	model	model	model	model
15	AROMATIC C8-C10	9.19E+00	3.20E+02	6.46E+01	model	model	model	model	model	model
16	AROMATIC C10-C12	1.46E+01	3.21E+01	2.45E+01	model	model	model	model	model	model
17	AROMATIC C12-C16	2.91E+01	1.14E+00	5.75E+00	model	model	model	model	model	model
18	AROMATIC C16-C21	8.19E+01	5.62E-03	6.53E-01	model	model	model	model	model	model
19	AROMATIC C21-C35	7.30E+02	1.61E-06	6.61E-03	model	model	model	model	model	model
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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)
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CLEA Software Version 1.071

Report generated	05/07/2021
Report title	Remediation target Concentrations for soils to remail below plots, hardstand & 600mm clean cover
Created by	Nick Ward at IDG

BASIC SETTINGS

Land Use	Residential with produce (C4SL)					
Building	Small terraced house					
Receptor	Female (res C4SL)	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 (C4SL) **Receptor** Female (res C4SL)

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	170	365	365	23.0	1.0	0.06	0.10	0.10	5.60	0.7	5.4	0.32	0.26	3.43E-01
2	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	9.80	0.8	8.0	0.33	0.26	4.84E-01
3	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	12.70	0.9	8.9	0.32	0.25	5.82E-01
4	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	15.10	0.9	10.1	0.35	0.28	6.36E-01
5	365	365	365	170	365	365	19.0	1.0	0.06	0.10	0.10	16.90	1.0	10.1	0.35	0.28	7.04E-01
6	365	365	365	170	365	365	19.0	1.0	0.06	0.10	0.10	19.70	1.1	10.1	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	12.0	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	12.0	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	12.0	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	12.0	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	12.0	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	15.2	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	15.2	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	15.2	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	15.2	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	15.2	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	15.7	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	13.6	0.33	0.27	1.80E+00

Consumption Rates

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

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

Top 2 applied? No

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

Building Small terraced house

Soil Sandy loam

Building footprint (m^2)	2.80E+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)	4.23E+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 (%)	1.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	5.80E-03
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)	**60**
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 ($cm^3\ s^{-1}$)	1.87E+04
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

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

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

Soil - Plant Model

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

Gardener type Average

APPENDIX D

IDG Protocol for Soil Cover Validation
Residential with Consumption of Homegrown Produce

Introduction

Isolation of Made Ground material beneath a cover of "clean" subsoil and topsoil in residential gardens is often recommended where Made Ground is to be left in-situ; most notably when it contains some inorganic and organic contaminants at concentrations above guidance threshold values.

A cover is only required in residential gardens underlain by Made Ground. The soil cover breaks direct contact pollutant linkages between the contaminants in the Made Ground and future residents.

The Local Authority's Environmental Health Department and the NHBC (or other warranty providers) generally require as a condition of planning a validation report be submitted to confirm the thickness and chemical suitability of the cover soils placed in residential garden areas. Validation reports are normally prepared by independent geoenvironmental consultants such as ID Geoenvironmental Limited.

Soil cover validation requires independent assessment of;

- Confirmation of the chemical/physical suitability of the cover soil (i.e. topsoil and subsoil).
- Verification of the thickness of the placed cover soils.

Sources of Cover Soils

Site Won Materials

It is often possible to "win" suitable subsoil and/or topsoil materials from a development site. However, in order to ensure that materials are suitable for use, and remain suitable for use during the development process, careful assessment, segregation and handling of the soil will be required.

Natural clay or sand excavated during site remediation works or during development (such as during the excavation of service trenches or foundations) can often be suitable for use as a subsoil. Topsoil can sometimes be won from landscaped areas of the site during the remediation and preparatory works stages of the development.

Site won materials should be subject to the same validation requirements as for imported materials.

Imported Cover Soils

Imported cover soils can be derived from three different sources;

- Greenfield
- Brownfield
- Recycling Centre

IDG advocates the sampling of cover soils after importation to site. Where soil is sampled at source, additional confirmatory testing may be required following import to site.

Inspection and Sampling of cover soil following import to site by IDG

In most cases, soil is delivered to site prior to sampling and chemical testing. Such soils should be stockpiled in a secure location on site and IDG should be contacted to arrange for visual inspection, sampling and chemical testing. Once the stockpile has been sampled no further material should be added to the stockpile. It is strongly recommended that soils should not be placed in gardens, prior to confirmation of the suitability of the soil by IDG. This normally takes two weeks from initial notification.

Soil Suitability

Physical Suitability

Suitable soil material should:

- Principally comprise natural materials.
- Be clean and free of foreign debris, building waste materials or contaminants.
- Not have a stone content of greater than 20% by visual estimation.
- Have a maximum stone size of 150mm in any one direction.
- Not have been sourced from an area within 7m laterally, or 3m vertically, of Japanese Knotweed plants, and not contain any Japanese Knotweed fragments (rhizomes, leaves, stems etc).

Chemical Suitability

A summary of recommended sampling frequencies and chemical analysis suites for varying sources of cover soils is presented in Table 1 overleaf. In addition further analysis may be required depending on the historical land uses of the sites the cover soils are derived from.

IDG will inspect soil chemical test results provided by the soil supplier or in certain circumstances visit and sample the source location. On receipt of written confirmation from IDG, the Client should instruct his Contractor to commence importation. It is recommended that each imported batch of soil be placed in separate stockpiles whilst chemical test results are awaited.

On importation to site, IDG should inspect the stockpiled material and the Contractor should provide the Client with appropriate haulage notes detailing the source and volume of material imported.

The number of samples to be tested and the chemical analysis suite undertaken will be dependent on the nature of the source and the quantity of material to be imported. Both the testing ratios and chemical analysis suites presented in Table 1 should be agreed with the Local Authority (EHO) before testing is undertaken.

A less frequent sampling rate may be appropriate where large volumes (say >2,000m^3) of soil are imported from a single, relatively homogenous greenfield source.

The Client\Contractor will be notified of the soil's suitability (or otherwise) immediately following receipt of the results (typically taking 7 working days). Chemical assessment criteria for cover soils are presented in Tables 2 and 3 below.

Chemical testing to determine the relative concentrations of determinands present should be supplemented by total organic carbon analysis (TOC). It is widely accepted that soil organic matter contains 58% carbon. Therefore the soil organic matter (SOM) content may be derived by means of the following equation:

$$SOM = TOC / 0.58$$

The appropriate screening criteria presented in Tables 2 and 3 should be relative to the average SOM of the proposed cover soils.

	Table 1 – Sampling Frequency and Chemical Analysis Suites Summary Table				
	Nature of Source Material	**Sampled**	**Sampling Frequency**	**Minimum Testing Suite**	**Sampling Requirements**
Site Won Material	Greenfield	On site	1:100m³ - Topsoil	pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen	Minimum of 3 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.
			1:250m³ - Subsoil		
	Brownfield		1:50m³ - Topsoil	pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site	Minimum of 6 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.
			1:100m³ - Subsoil		
Imported Cover Soils	Greenfield	At source	1:100m³ - Topsoil	pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen	Two sampling methodolgies can be used; • Sampling from stockpile. Minimum of 3 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled. • In-situ sampling of cover soils on a grid pattern across a designated area of the site. An adequate number of samples should be taken to satisfy the sampling frequency.
			1:250m³ - Subsoil		
		Following delivery to site	1:100m³ - Topsoil	pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen	Minimum of 3 samples to be tested from each imported batch of stockpiled material. No further material to be added to the stockpile once it has been sampled.
			1:250m³ - Subsoil		
	Brownfield	At source	1:50m³ - Topsoil	pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site	Minimum of 6 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.
			1:100m³ - Subsoil		
		Following delivery to site	1:50m³ - Topsoil	pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site	Minimum of 6 samples to be tested from each imported batch of stockpiled material. No further material to be added to the stockpile once it has been sampled.
			1:100m³ - Subsoil		
	Recycling Centre	At recycling centre	1:50m³ – Topsoil & Subsoil	pH, metals, speciated PAH, TPHCWG, BTEX, cyanide, phenols, Total Organic Carbon & Asbestos Screen	Minimum of 6 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.
		Following delivery to site	1:50m³ – Topsoil & Subsoil	pH, metals, speciated PAH, TPHCWG, BTEX, cyanide, phenols, Total Organic Carbon & Asbestos Screen	Minimum of 6 samples to be tested from each imported batch of stockpiled material. No further material to be added to the stockpile once it has been sampled.

Hard to Excavate Layers

Cover layers can often include a "difficult to dig" or capillary break layer of coarse natural or recycled aggregate. Where this aggregate is sourced from recycled materials (such as crushed demolition arisings) asbestos screening tests should also be undertaken.

Table 2 - Common Inorganic Determinands

Contaminant	Assessment Concentration (mg/kg)			Source
	% Soil Organic Matter			
	1%	2.5%	6%	
pH	>6 to <8			Initial assessment only
Arsenic	37			S4UL LQM/CIEH 2015
Cadmium	11			S4UL LQM/CIEH 2015
Chromium	910			S4UL LQM/CIEH 2015 value for Chromium III
	6			S4UL LQM/CIEH 2015 value for Chromium VI
Copper	2,400			S4UL LQM/CIEH 2015
Lead	200			SP1010: Development of C4SLs for Assessment of Land Affected by Contamination-Policy Companion Document, December 2014.
Mercury	40			S4UL LQM/CIEH 2015
Nickel	130			S4UL LQM/CIEH Revised Aug 2015
Selenium	250			S4UL LQM/CIEH 2015
Zinc	3,700			S4UL LQM/CIEH 2015
Asbestos	Not Detected			UKAS accredited asbestos screen

Table 3 - Common Organic Determinands

Contaminant	Assessment Concentration (mg/kg)			Source
	% Soil Organic Matter			
	1%	2.5%	6%	
Benzene	0.11	0.23	0.49	IDG Assessment criteria based on S4UL parameters and C4SL exposures for residential with homegrown produce **without indoor inhalation pathway**
Toluene	148	337	768	
Ethyl Benzene	106	253	581	
Xylenes (p-xylene)	191	454	1040	
**Benzo(a)pyrene (as surrogate marker)	1.6	1.95	2.14	
Acenaphthene	222	528	1,150	
Acenaphthylene	180	431	954	
Anthracene	2,390	5,440	10,900	
Benz(a)anthracene	9.15	12.3	14.3	
Benzo(a)pyrene	2.25	2.74	3.00	
Benzo(b)fluoranthene	2.63	3.33	3.71	
Benzo(g,h,i)perylene	318	340	349	
Benzo(k)fluoranthene	78	93	101	

Contaminant	Assessment Concentration (mg/kg)			Source
	% Soil Organic Matter			
	1%	2.5%	6%	
Chrysene	15.3	22.3	27.1	IDG Assessment criteria based on S4UL parameters and C4SL exposures for residential with homegrown produce **without indoor inhalation pathway**
Dibenzo(a,h)anthracene	0.25	0.29	0.31	
Fluoranthene	286	561	898	
Fluorene	173	409	880	
Indeno(1,2,3-cd)pyrene	27.7	36.4	41.4	
Naphthalene	27	64.4	147	
Phenanthrene	97	221	442	
Pyrene	622	1,250	2,040	
Aliphatic C5-C6	4820	11000	24200	
Aliphatic >C6-C8	14600	36600	69700	
Aliphatic >C8-C10	1630	2930	4280	
Aliphatic >C10-C12	4650	5550	6100	
Aliphatic >C12-C16	6280	6340	6360	
Aliphatic >C16-C21	127000	127000	127000	
Aliphatic >C21-C35	127000	127000	127000	
Aromatic EC5-EC7 (Benzene)	87	176	378	
Aromatic >EC7-EC8 (Toluene)	148	337	768	
Aromatic >EC8-EC10	56	134	299	
Aromatic >EC10-EC12	81	192	415	
Aromatic >EC12-EC16	144	331	671	
Aromatic >EC16-EC21	264	546	937	
Aromatic >EC21-EC35	1120	1490	1710	
GRO C_5-C_6	87*	176*	378*	IDG Assessment criteria based on S4UL parameters and C4SL exposures for residential with homegrown produce **without indoor inhalation pathway**
GRO C_6-C_8	148*	337*	769*	
GRO C_8-C_{10}	56	134	299	
DRO C_{10}-C_{12}	81	192	415	
DRO C_{12}-C_{16}	144	331	671	
DRO C_{16}-C_{21}	264	546	937	
LRO C_{21}-C_{35}	1,120	1490	1,710	
Phenol	152	278	535	

* BTEX compounds must also be assessed with Aromatic C5-C7, Aromatic C7-C8, GRO C5-C6 and TPH C6-C8 bandings

**Benzo(a)pyrene assessed as surrogate marker for genotoxic PAH. Oral HCV based on minimal risk value (CLAIRE 2014, Appendix E Table 2.2) ID_{Oral} of 0.021 ug/kgBW/day compared to oral, dermal and inhalation exposures and ID_{Inhal} og 0.0003 ug/kgBW/day compared to inhalation exposure.

Placed Thickness Validation

Thickness can only be checked after placement, but should be done before turfing, fencing etc. Thickness will be checked via the excavation of an appropriate number of inspection trial pits. Typically one trial pit for every two gardens will be required.

The thickness of cover is dependent on the nature and degree of contamination (and often the Local Authority whose area the site lies within), but typically between 600mm and 1,000mm is required. Where underlying materials do not contain contaminants above critical concentrations but contains materials generally considered undesirable as a near-surface material in garden areas (i.e. construction rubble) then a 300mm thick cover, in accordance with NHBC Standards, Chapter 9.2, should be adequate.

Soil cover is usually placed many weeks after completion of the preparatory\remedial works, and issue of the associated Verification Report. Consequently, site visits, to generate supplementary letter reports, are typically required after soil cover has been placed in the gardens of each plot, or set of plots.

Issue of Soil Cover Validation Reports

Validation reports will be issued by IDG following the confirmation of the placed thickness within each plot, or set of plots. Each report will contain the following information;

- Details of the provenance of the subsoil and topsoil.
- Chemical test data.
- An interpretation of the chemical data indicating whether the soils are suitable for use in a clean cover layer.
- Photographs of the excavated trial pits confirming the thickness of placed soils.
- A data table indicating the thickness of cover soils within each trial pit excavated.

Soil Cover Validation Reports will be issued to the Client, Local Authority and to the NHBC by email.