Crossfield CONSULTING
GEOTECHNICAL ENVIRONMENTAL

CHURCHILL RETIREMENT LIVING

LAND AT ROUNDSTONE CARAVAN PARK, WORTHING ROAD SOUTHWATER, RH13 9JF

SUPPLEMENTARY GROUND INVESTIGATION REPORT
(REVISION 1)

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Revision History		
Version Number	**Date of Issue**	**Revision Notes**
Original Issue	3 May 2024	n/a
Revision 1 (R1 appended to report number)	25 June 2024	Updated ground conditions and Appendix I. Updated Tables 2 and 3 to include additional laboratory test data obtained during subsequent ground investigation and reviewed assessment of potential contamination section based on the additional data, with no amendments required.

1. INTRODUCTION

A residential development is proposed at Land at Roundstone Caravan Park, Worthing Road, Southwater. The site is bisected by an access road, the area north of which was formerly occupied by a sales office, adjoining workshop and external sales display area, which have all since been demolished/removed and the area is now disused. The area south of the access road was previously occupied by motor homes and static caravans and is currently occupied by a car parking area. The proposed development comprises a two-storey block of apartments and one-and-a-half-storey cottages, together with car parking, managed landscaping areas and private garden areas. The residents will be of retirement age.

Crossfield Consulting Limited has previously undertaken a Desk Study Appraisal in July 2021 and a Ground Investigation in August 2021, and the findings of the investigation were provided in reports, as referenced.

The Ground Investigation Report recommended that supplementary ground investigation be undertaken at the site once suitable access is available trial pitting was recommended to inspect the area of the current workshop and also to assess excavation stability and provide additional information on groundwater depth and the rate of water entry to excavations so that implications for foundation excavations and dewatering techniques could be further assessed.

Crossfield Consulting Limited has been commissioned by Churchill Retirement Living to undertake the supplementary ground investigation and provide recommendations for remediation works, recommendations regarding ground stability/support, and recommendations for foundations and general construction advice in the context of the above development proposals.

This report presents the information obtained from a supplementary ground investigation. The Ground Investigation Report and Sections 2 to 5 of this report, together with the associated Figures and Appendices, provides a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007. This report should be read in conjunction with the Desk Study Appraisal and Ground Investigation Report.

A risk-based assessment of potential contamination is included in Section 7 of the report. This assessment makes reference to the desk study, all of the ground investigation information and a Conceptual Site Model. It is considered that the report complies with National Planning Policy Framework and is in general accordance with guidance published by the Environment Agency and NHBC. The ground investigation to inform the risk assessment of potential contamination is a supplementary investigation, as defined in Environment Agency Land Contamination Risk Management (LCRM) (2023) and BS 10175:2011+A2:2017.

The report also includes a geotechnical assessment and the salient information, assessments and recommendations are presented in Sections 9 to 12 of the report, together with the associated Figures and Appendices.

The report has been prepared under the direction and supervision of a Chartered Geologist and Registered Specialist in Land Condition (SiLC). It is considered that the report is suitable for submission in support of a planning application and the report is appropriate to assist in an appraisal of development solutions and costs, together with the preparation of engineering designs for the development. The report also complies with the published guidance relating to the requirements of a Building Control authority.

2. THE SITE

2.1 Location

The site is located to the east of Worthing Road, approximately 1 km to the north of the village of Southwater, West Sussex as shown on Figure 1. The National Grid Reference for the site is TQ 1571 2708. The site is bounded to the north, east and south by residential development as shown on Figure 2. Farmland is present to the west, beyond Worthing Road.

2.2 Site Description

This site description is based on observations made during the initial phase of supplementary ground investigation undertaken in April 2024. A site plan and topographical survey (prior to demolition of former structures) is presented as Figure 2.

The site is an irregularly shaped parcel of land with an approximate area of 0.56 ha. The site is bisected by an access road running east to west and secured by fencing along the western boundary and each side of the road to minimise public access. The area north of the access road is disused and unsurfaced, with two container units present in the west. A stockpile, understood to be of asbestos-containing materials, is present in the northeast of the site and is covered with plastic sheeting. A telegraph pole is also present in the northeast of the site with two overhead wires connected and running off site to the south and southeast.

The area of the site south of the access road comprises a tarmac surfaced area, currently in use as a car park, with rough vegetation along the southern boundary and grass surfacing around the northern, eastern, and western perimeter. Two temporary cabins are present in the southeast of the site and a third is present in the southwest. A telegraph pole is present in the southeast corner of the site with a connected overhead wire running east to west along the southern boundary.

The site is generally flat and level with a slight overall fall to the south. However, the majority of the area north of the access road, excluding the northeast corner, is approximately 1 m lower than the access road and southern area of the site.

A mature oak tree is located at the current site entrance on Worthing Road. Trees are also present along the northern boundary and within the southeast corner.

2.3 Site History

A detailed history of the site, including historical map extracts and other pertinent information, is provided in the Desk Study Appraisal by Crossfield Consulting Limited. A summary of pertinent historical development at the site and in the surrounding area is provided below.

The site remained undeveloped until the construction of the caravan park in the 1970s when workshop buildings and a hardstanding or gravel surfaced area is shown at the site. The workshop buildings on the site were demolished and replaced by a larger building by 2003 and the caravan park to the east had changed from a touring caravan park to a static caravan park. No further changes had occurred at the site until the commencement of the recent demolition and clearance works and the surrounding area is occupied by residential development. The caravan retailer that recently vacated the property is understood to have operated from the site since 1937 and operations on site included a caravan repair and maintenance workshop.

3. PUBLISHED GEOLOGY

Geological map data, published by the British Geological Survey (BGS), online and in print, on the 1:50,000 scale Sheet No. 302 (Horsham), indicate that superficial deposits are absent from beneath the site and the solid strata are shown to be the Cretaceous Horsham Stone (upper bed) within the Weald Clay Formation. The general dip direction of the strata is towards the southwest.

4. DESK STUDY ENQUIRIES

Detailed desk study information is presented in the Desk Study Appraisal by Crossfield Consulting Limited. A summary of relevant information is provided below.

There are no active or historical landfills recorded within 250 m of the site.

There are no facilities with a licensed pollutant release permit within 250 m of the site. Neither the site nor land in close proximity has been classified as contaminated under Part 2A of the Environmental Protection Act (1990).

Hydrogeological information confirms the absence of superficial deposits beneath the site and the bedrock strata are classified as a 'Secondary A' aquifer. There are no active groundwater abstractions recorded within 500 m of the site. The site is not located within a groundwater Source Protection Zone.

Hydrological information indicates that there is a surface water feature, an underground stream, located beneath the western margins of the site. The site is not located within a Zone 2 or Zone 3 floodplain.

With reference to BRE BR211 (2023) and the associated radon affected area maps (based on UK Health Security Agency and British Geological Survey data, updated December 2022), the site is indicated not to be within an area where radon precautions are required in new buildings.

5. GROUND CONDITIONS AND GEOLOGICAL MODEL

5.1 Ground Investigation

Details of the rationale and scope of the supplementary ground investigation and laboratory testing, together with exploratory hole logs, monitoring, in situ and laboratory test results, are given in Appendix I. Based on all phases of ground investigation completed to date, the following ground conditions have been identified below the site.

5.2 Buried Foundations and Services

Buried services and foundations were not encountered during the ground investigation. Buried services and foundations should be anticipated beneath the site associated with the former buildings and live services are also likely to cross the site to supply the adjacent caravan park to the east.

5.3 Strata Encountered

Made Ground
Asphalt surfacing is present to a depth of 0.07 m within the area south of the access road. The remainder of the site is unsurfaced. Locally within the eastern area of the site, beneath the asphalt surfacing, a concrete base

was encountered between a depth of between 0.05 m and 0.25 m. Below the concrete base, a horizon of sandstone cobbles was encountered at a depth of between 0.6 m and 0.8 m.

Made Ground is present across the site and generally comprises brown clayey sandy gravel or soft consistency gravelly sandy silty clay with ceramic, clinker, concrete, brick, and ashy fragments to depths of between 0.1 m and 0.8 m, and most commonly approximately 0.3 m thick.

Within the area south of the access road and in the southwest of the area north of it, dark greenish grey gravelly sandy clay, generally of firm consistency, with brick, concrete, and ashy fragments is present from the base of the brown gravels/clays (between 0.1 m and 0.3 m in these areas) to between 0.2 m and 0.6 m depths, with a typical thickness of approximately 0.2 m. Locally within the eastern area of the site, a slight organic odour was present.

Beneath the brown gravels/clays and dark greenish grey clays, reworked natural strata are present to depths of between 0.2 m and 1.8 m, but typically 1 m, and generally comprise firm to stiff consistency yellowish brown/light brown mottled light grey gravelly sandy silty clay with man-made inclusions such as brick, polystyrene, and ashy fragments, mudstone fragments, and occasional sandy pockets.

Horsham Stone Member
Beneath the Made Ground at the site, predominantly firm to stiff consistency, brown and grey, sandy clay with lithorelicts was encountered to 2.45 m depth, the maximum depth investigated at the site. However, locally softened materials have been identified at sub-crop. At depths of 2.0 m, dynamic sample boreholes could not be extended further due to the high strength/density of the strata and it is likely that weak sandstone strata are present at that depth.

In situ hand vane tests undertaken in the top of the natural clay strata indicate undrained shear strengths of between 30 and 105, and generally between 50 and 85.

Standard penetration tests undertaken within these strata recorded 'N' values of between 2 and 10 at 1 m depth and in excess of 50 at 2 m depth.

5.4 Groundwater

Groundwater has been recorded across the site at between 0.6 m and 2.45 m depths during the intrusive investigations in eleven of the twenty-two exploratory holes progressed at the site. Typically, the shallowest groundwater inflows have been noted in the area to the south of the main access road.

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

6. PROPOSED DEVELOPMENT

The proposed development comprises a two-storey block of apartments and one-and-a-half-storey cottages, together with car parking, managed landscaping areas (apartments) and private garden areas (cottages). A proposed development plan is presented as Figure 3. The residents will be of retirement age.

7. ASSESSMENT OF POTENTIAL CONTAMINATION AND GROUND GASES

7.1 Assessment Criteria

Assessment of potential contamination and ground gases has been undertaken using a risk assessment-based approach, as recommended within the Environmental Protection Act (1990) (and subsequent amendments), Environment Agency LCRM (2023), CLEA Model (2004-2009), BS 10175:2011+A2:2017, CIRIA C552 (2001) and NHBC R&D Report 66 (2008). This approach considers the likely source of contamination, given the history and location of the site, and the possible migration pathways by which these potentially hazardous substances may reach likely receptors, such as end users of the site, controlled waters or the wider environment, in the context of the proposed development.

Part IIA of the Environmental Protection Act (1990) states that

'Contaminated Land is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or
(b) significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused;'

All risk assessments carried out as part of this investigation have been carried out with respect to the definition of 'contaminated land' within Part IIA of the Environmental Protection Act (1990) and have considered the site both before and on completion of the development. The basis of the risk assessment is the Conceptual Site Model, which is derived from the desk study and initial information and identifies potential contaminant linkages that could affect receptors relevant to the site and the wider environment. The Conceptual Site Model is presented in Table 1.

Based on the model, a ground investigation and subsequent supplementary ground investigation were designed to obtain relevant information to assess further the identified contaminant linkages. Where relevant, this included the recovery of representative samples and subsequent analytical laboratory testing. The rationale for the supplementary ground investigation sampling and testing is set out in Appendix I. The results of the analytical testing are presented in Appendix I and summarised together with data in the Ground Investigation Report in Tables 2 and 3. On the basis of the conceptual site model and the results of the analytical laboratory testing (together with any quantitative risk assessment, if applicable, as presented in Appendix II), an assessment of the identified contaminant linkages is presented in Table 4.

7.2 Potential Sources of Contamination

Based on the site history, the site has only been developed with small buildings associated with the adjacent caravan park and the former caravan retailer on site selling new and used caravans and static mobile homes which had a caravan repair and servicing workshop. It is considered that the existing land use is not associated with a significant source of potential contaminants. The caravan workshop may have been associated with small-scale storage of some lubricating oils and chemicals, but the concrete floor of the workshop would have prevented such contaminants from entering the ground. The majority of the site area is covered by hard surfacing which would also prevent any minor spillages of such materials entering the ground across the site.

Former buildings on site may have been associated with asbestos containing construction materials. During demolition of the former structures, it is possible that such asbestos containing materials could have entered the ground. It is understood that fragments of buried cement-bound asbestos have been discovered in an isolated area during recent demolition/enabling works and at the time of the supplementary ground

investigation works had been placed in a small, tarpaulin-covered stockpile on a hardstanding area. It is understood that the cement-bound asbestos has now been taken to a suitably permitted facility and additional details will be provided in the subsequent Remediation Verification Report. Similarly, coarse-grained materials may have been imported to create the relatively flat platforms associated with the caravan display areas. This could have included demolition-derived materials, which may also be associated with asbestos containing materials or ashy materials, which could be associated with toxic and phytotoxic metals and polyaromatic hydrocarbons (PAHs).

With respect to potential sources of off-site contamination, the surrounding land comprises residential properties with some areas historically farmland and is not associated with uses that would include the storage of mobile contaminants.

Based on the available information, representative soil samples were recovered from the Made Ground materials encountered beneath the site and tested for the potential contaminants identified above. The test results are summarised in Table 2 (private garden end use) and Table 3 (managed landscaping end use) and are presented against generic assessment criteria (GAC) and Category 4 Screening Levels (C4SL), relevant to the protection of human health in a residential development. As can be seen from Tables 2 and 3, the majority of the potential contaminant concentrations are recorded below the GAC (negligible risk to human health) and C4SL (low but acceptable risk to human health) and, therefore, do not represent an unacceptable risk to end users. However, arsenic and certain PAH concentrations have been recorded above the assessment criteria. Asbestos fibres and ACM have not been detected at the site. Additional comments relevant to human health risk assessment are provided in Section 7.3.1.

Based on appropriate laboratory test data, risks to construction materials are assessed in Section 7.3.2.

No significant concentrations of potentially phytotoxic chemicals have been recorded. However, as the site is currently devoid of topsoil, a suitable thickness of topsoil is likely to be required to provide a growing medium in proposed garden and soft landscaping areas. Further comment is provided in Section 7.3.3.

As indicated in the Conceptual Site Model, no valid contaminant linkage has been identified in respect of controlled waters. On the basis of the ground conditions encountered and the analytical laboratory test data, which indicates no significant concentrations of potentially mobile contaminants, it is considered that the Conceptual Site Model is valid and that there are no unacceptable risks to controlled waters indicated at the site. On this basis, it is considered that no further risk assessment is required in respect of controlled waters receptors.

No putrescible material has been identified at the site and no significant thicknesses of Made Ground have been recorded. There are no recorded landfills within influencing distance and the site is not within an area where precautions against the ingress of radon gas are required in new buildings. Therefore, it is considered that there are no sources of hazardous ground gases at the site and ground gas protection is not required for the proposed development.

7.3 Contaminant Linkages – Solids and Liquids

Based on the Conceptual Site Model, consideration is given below to identified contaminant linkages and a risk evaluation is undertaken of each possible source-pathway-receptor linkage that may occur at the site. The risk evaluation considers the potential consequences and probability of occurrence in accordance with CIRIA C552 (2001). Where risks are identified as ‘negligible’, then by implication such risks are within normally accepted levels for the proposed development, and the further reduction of such risks by remediation works is considered unnecessary. Where risks are identified that are ‘low’ as defined in CIRIA C552 (2001), or worse, then

consideration is given to the management of the identified risks, with appropriate recommended actions that may include engineering solutions/remediation works as described in the following sections.

7.3.1 Human Health

As can be seen from Tables 2 and 3, the majority of the potential contaminants associated with the site history have generally been identified at concentrations below relevant GAC and C4SL values during the investigations but locally, elevated concentrations of arsenic and certain polyaromatic hydrocarbons have been recorded at concentrations above the GAC and/or C4SL values. On this basis, a possible contaminant linkage to site end users has been identified and relates to dermal contact and the ingestion and inhalation of materials impacted by the above listed contaminants. Whilst no asbestos fibres have been identified within the soils, buried fragments of cement bound asbestos have been identified at one location. However, these materials have now been removed from site to a suitably permitted facility.

With respect to end users, the significant area of the site that will be covered by buildings and road pavements will ensure that there are effective barriers between end users and the existing ground across much of the site following development. Therefore, risks to end users are mitigated in those areas following completion of the development. Additional consideration is given below in relation to areas of the development that will comprise managed soft landscaping areas. As end users will not have rights to dig into or cultivate managed landscaping areas around the apartment development, end user exposure would largely be associated with dust exposure pathways.

It is noted that the GAC used for the preliminary assessment of human health risk are based on end users up to the age of 6 years old. The proposed development is for residents of retirement age and the GAC are considered to be conservative for the proposed development. Therefore, site specific assessment criteria (SSAC) have been generated for the identified elevated contaminants in relation to the nature of the proposed development. The CLEA Model v1.07 software has been used to generate the SSAC and two models have been developed to reflect the different exposure pathways that may exist in managed soft landscaping and private garden end uses. The outputs from the model are presented in Appendix II.

On the basis of the details provided in Appendix II, it is noted that the maximum recorded concentration of benzo(a)pyrene and dibenzo(ah)anthracene recorded at the site remain above the SSAC for managed soft landscaping. The maximum concentration of benzo(b)fluoranthene is also elevated above the SSAC in relation to the private garden end use.

In order to mitigate the above contaminant linkage within the shallow soils in managed soft landscaping and private garden, it is recommended that an allowance be made to provide a topsoil/subsoil barrier/capping layer.

With reference to the guidance provided within BRE BR465 (2004) and *A Regulator's Guide to Cover Systems and their Verification* produced by the National Contaminated Land Officers Group (NCLOG (2024), it is considered that allowance should be made for topsoil/soil-forming materials of a minimum thickness of 600 mm in private garden areas. It is also recommended that allowance be made for a geotextile separator beneath the capping layer in private garden areas.

For managed soft landscaping areas, allowance should be made for a topsoil/soil-forming materials of a minimum thickness of 450 mm in proposed planted landscaping areas and a minimum thickness of 300 mm in proposed lawn landscaping areas.

Landscaping contractors employed to manage the landscaping areas should only be involved in works to maintain the decorative landscaping and some replanting works involving limited digging into topsoil materials.

Therefore, it is considered that there should be no unacceptable risks to this site user group following completion of this development.

Groundworkers involved in the constructions of the new development are unlikely to be exposed to short term (acute risks). However, in line with good practice, it is recommended that appropriate personal protective equipment (PPE) be worn, and high levels of personal hygiene be maintained by groundworkers. To minimise soils at the site becoming airborne and moving beyond the site boundaries during earth moving operations, it is recommended that appropriate soil dampening equipment be maintained on site during dry periods to minimise dust generation.

7.3.2 Durability of Buried Structures and Services

In view of the low soluble sulphate content and near-neutral soil conditions, there are no special precautions required for the protection of good quality buried foundation concrete. Based on guidance within *BRE Special Digest 1* (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1.

The workshop at the site may have included limited fuel/chemical storage and, therefore, the site may be considered to be 'brownfield' under the definition provided by UKWIR (2010) with respect to the assessment of ground for water supply pipes (although the potential for such contaminants to enter the ground is limited, as previously noted). It would be prudent to make allowance for the use of multi-layer barrier pipes. If the use of conventional (polyethylene) plastic materials is preferred, additional soil sampling and analytical laboratory testing can be undertaken within the specific materials likely to be in contact with buried services once the potable pipe layout (and any other services) has been finalised. Alternatively, the decision can be made to provide barrier pipe materials for water supply pipes without undertaking additional testing.

It should be noted that individual water companies may have in-house requirements for the assessment of ground conditions for potable water supply pipes and these requirements may be in addition to, or may contradict, the guidance provided by UKWIR. Therefore, it is recommended that the relevant water supply company be consulted prior to finalising the potable water supply design.

7.3.3 Landscape and Garden Areas

It is anticipated that the topsoil/subsoil barrier/capping layer recommended in Section 7.3.1, should be appropriate as a growing medium. However, specific reference should also be made to the planting schedule and requirements of the landscape designer.

For any topsoil imported to site, it should be of appropriate quality and should not provide a source of contamination. Topsoil sourced from a brownfield site or from a topsoil recycling facility should be the subject of appropriate analytical testing to confirm that the imported soils do not themselves represent a risk to end users of the development or to the wider environment. In compliance with NHBC published procedures, details of topsoil to be imported should be received and confirmed as compatible with use on a residential development prior to soil import; such materials should also be confirmed/documented as not waste materials.

7.4 Recommended Remedial Works

As outlined in Sections 7.1 to 7.3, remediation or mitigation works are required during construction, as detailed below.

- An allowance should be made for a minimum 600 mm thick topsoil/subsoil capping layer to be placed in proposed private garden areas. To provide an increased level of confidence against digging through

the capping layer and into the underlying, existing ground, a geotextile separator should be placed between the capping layer and the existing Made Ground in private garden areas to act as a marker layer and separator.

- An allowance should be made to provide a topsoil/subsoil capping layer in areas of new soft landscaping around the apartment block. A minimum thickness of 450 mm should be placed in planted landscaping areas and a minimum thickness of 300 mm in lawn areas.
- If topsoil/subsoil is imported then the supplier should provide documentation to confirm that the materials are suitable for use, that they would not represent an unacceptable risk to human health or the wider environment and that the materials would not be considered to be a waste.
- Allowance should be made for the installations of proprietary multi-layer barrier pipes for the potable water supply (although the need for such a precaution would be dependent on water supply company requirements).

As usual for brownfield land, it is recommended that a Discovery Strategy be implemented during the period of groundworks at the site. This provides a straightforward procedure for the site team to report unexpected materials that might be associated with a potential source of contamination, such that those materials are then inspected/investigated and any necessary risk assessment or further works undertaken, with all necessary documentation issued to the local planning authority and, if applicable NHBC, in compliance with published requirements.

In compliance with the published requirements of the local planning authority and, if applicable NHBC, it will be necessary to provide a Remediation Strategy document, which details the specific controls and inspections etc associated with the above works. The Remediation Strategy should also include, as applicable, criteria for reuse of materials on site and acceptance criteria for materials to be imported to site.

On completion of the development, and in compliance with the methodology as set out in the Remediation Strategy, a Verification Report should be provided to document satisfactory completion of the remedial works in compliance with the stated methodology and including the supporting factual records.

7.5 Construction Management/Best Practice

In compliance with normal construction good practice, consideration should be given to the following:

- Soils should be kept damp during groundworks undertaken in dry weather to minimise the potential of aerial migration of dust to neighbouring properties and public areas.

7.6 Potential Liabilities

Based on the available data and risk assessment, it is considered that there should be no significant environmental liabilities associated with the ground conditions and site ownership. Provided the work outlined in Section 7.4 is undertaken, there should be no such liabilities following completion of the development.

8. ASSESSMENT OF MINING, QUARRYING AND OVERALL GROUND STABILITY

The site is not within an area of recorded underground mining or other such mineral extraction, nor are there any quarries recorded at, or in close proximity to, the site. Therefore, it is unlikely that the proposed development would be constrained by ground stability issues associated with mining or quarrying.

9. GEOTECHNICAL ASSESSMENT

9.1 Assessment of Foundation Solutions

Ground conditions at the site comprise a variable thickness of Made Ground, with a maximum depth of 1.8 m identified, underlain by typically firm to stiff consistency, clays with lithorelicts of the Horsham Stone Member. In the southern part of the site, the upper natural clays are locally soft consistency. Dynamic sampling exploratory holes undertaken during the previous ground investigation terminated at 2 m depth with standard penetration test 'N' values of greater than 50, indicating the potential presence of weak sandstone or mudstone strata. The weathered strata, comprising clays, between 1 m and 2 m depth are generally assessed as high strength but some variation (i.e. low and medium strength) may initially be present at subcrop.

Groundwater was identified within the previous boreholes from 1.8 m depth. During the supplementary ground investigation, water inflows were noted from 0.6 m depth within trial pits in the southern area of the site. This is likely to be associated with perched surface water trapped in coarse grained bands within the Made Ground Within the northern area of the site, groundwater was encountered from 1.9 m depth.

Based on the recorded ground conditions, strip/trench fill footings placed within the weathered horizon of high strength clay strata or underlying sandstone strata of the Horsham Stone Member are considered to be suitable to support the proposed apartment block. Foundations will need to extend through Made Ground and locally lower strength clays that may initially be present within the Horsham Stone Member strata and some founding depths in the order of 1.5 m may be necessary. Deepened foundations will also be required in the vicinity of existing and former trees. The recent trial pits have identified some localised perched groundwater above the likely base of the strip/trench fill footings and this may give rise to instability in foundation excavations. Allowance should be made for excavating and concreting foundation trenches in short sections. Provision for a blinding layer and excavation shuttering with sump-pump dewatering is also recommended.

In view of the rapid perched water inflows noted within the area of the proposed cottages and the softened nature of the upper natural clays, it is considered that a pier and beam type foundation, with piers being formed from pre-cast concrete rings and founded on the weak sandstone or mudstone at approximately 2.0 m to 2.5 m depth is likely to offer the most appropriate and cost-effective solution for these units.

9.2 Recommended Foundation Design Parameters

9.2.1 Strip/Trench Fill Foundations – Apartment Block

On the basis of the foregoing assessment, it is considered that strip/trench fill footings provide a foundation solution that should be compatible with the proposed apartment block structure. On the basis of the ground conditions and structures described in the report, the recommended parameters for the foundation design are as follows:

Foundation Strata:	High strength clays with lithorelicts (Horsham Stone Member)
Foundation Depth:	Minimum 0.75 m, deepened through Made Ground and through lower strength materials and within influencing distance of trees, as required.
Foundation Width/Size:	Up to 2 m
Nett Allowable Bearing Pressure:	150 kN/m^2

It is considered that total settlement of foundations designed on the above basis should be less than the normal serviceability limit state for this development (i.e. total settlements of 25 mm).

Laboratory testing results indicate the clayey horizons at the site comprise 'low' volume change potential soils, as defined in NHBC Standards (2024). Within the influence zones of existing or proposed trees, suitable foundation precautions should be adopted, as outlined in NHBC Standards (2024). However, it should be noted that foundations would not need to be deepened below groundwater (as strata below groundwater would be moisture stable) and would not need to be deepened through weathered rock strata (i.e. strata that are no longer clays) as such strata should not have volume change potential.

9.2.1 Pier and Beam Foundations – Cottages

On the basis of the foregoing assessment, it is considered that a pier and beam type foundation with piers being formed from pre-cast concrete rings and founded on the weak sandstone or mudstone at approximately 2.0 m to 2.5 m depth is likely to offer the most appropriate and cost-effective solution for these units. It is estimated that 9 No. piers will be required (end and mid-point of each load-bearing wall) with the load-bearing walls supported on a reinforced ground beam designed to span between the piers for each of the pair of semi-detached cottages. On the basis of the ground conditions and structures described in the report, the recommended parameters for the foundation design are as follows:

Foundation Strata:	Very high strength Clay/Weak Mudstone/Sandstone (Horsham Stone Member)
Foundation Depth:	Approximately 2.5 m, deepened 0.2 m into foundation strata
Foundation Width/Size:	Up to 3 m
Nett Allowable Bearing Pressure:	250 kN/m^2

It is considered that total settlement of foundations designed on the above basis should be less than the normal serviceability limit state for this development (i.e. total settlements of 25 mm).

9.3 Buried Concrete

Based on guidance published within BRE Special Digest 1 (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1.

9.4 Floor Slab Recommendations

Due to the thickness of Made Ground identified beneath the site, the potential for ground disturbance during demolition of the former structures and the presence of clays at shallow depth, it is recommended that an allowance be made for suspended ground floor slabs for the proposed new buildings. Underfloor voids may be necessary within influencing distance of trees, in accordance with NHBC Standards (2024).

9.5 General Construction Advice

All formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Care should be taken to ensure that any existing services encountered are carefully and satisfactorily blocked to prevent water seeping through the drains and into any excavations.

The locations of any trial pits undertaken as part of this investigation should be accurately surveyed in order that their precise locations are known and that appropriate precautions can be taken when building over or near to these locations.

10. TEMPORARY WORKS

Conventional plant is considered appropriate for shallow excavation works at the site. However, the use of hydraulic breakers may be required to break up floor slabs, concrete surfacing, foundations and any buried concrete structures.

Shallow excavations may remain stable in the short term where excavations do not encounter groundwater. However, instability may occur in excavations left open for extended periods of time. Support should be provided, or the sides battered back, in any excavations requiring man entry in compliance with the relevant risk assessment.

Groundwater has been encountered between 0.6 m and 1.9 m depth below current site levels during ground investigation and it is recommended that excavations be kept above groundwater, where possible. Based on recent observations it is consider that sump pumping should be appropriate to control perched water entries.

Faster groundwater seepages have been noted in the area of the proposed cottages in the southern part of the site, it would be prudent to undertake a dewatering pumping trial in this area to confirm that sump pumping techniques will be appropriate to allow construction of the proposed pier and beam type foundations.

13. ASSESSMENT OF MATERIALS FOR WASTE DISPOSAL

There is no requirement to remove soils from site and, therefore, development levels should be set such that soils can be retained and reused on site where possible. Providing development levels are set to accommodate soil arisings (for example, from foundation excavations), such materials would not be classified as waste if retained and re-used on site. However, if materials are excess to requirements, they should be taken to an appropriately permitted waste facility.

If material is identified for removal to a waste facility, it will be necessary to provide a description of the material and laboratory test data to the receiving facility. This information is included in Appendix I. It should be noted that additional testing, either for classification purposes or for waste acceptance criteria (WAC) testing to confirm acceptability of the waste may be required (as noted below).

The available analytical laboratory test data has been used to provide preliminary waste disposal advice. It should be noted that these test results may not specifically relate to materials that are, or will be, scheduled for removal from site. However, the results are appropriate for preliminary guidance and costing purposes.

A preliminary assessment of potential waste classification for materials on site has been undertaken in accordance with the Environment Agency's document Guidance on the Classification and Assessment of Waste WM3 (2021). The assessment indicates that the following preliminary waste classification advice would be appropriate.

- Tarmac surfacing should be taken to a recycling facility. Such materials are unlikely to meet WAC for disposal at landfill.
- Any visible fragments of asbestos containing materials should be contained/covered prior to disposal as 'hazardous'
- Analytical testing completed to date has not identified chemical concentrations within the Made Ground or natural soils that are indicative of materials that may be classified as 'hazardous' waste. Some of the available testing relating to petroleum hydrocarbons and PAHs is marginal in respect of 'inert' WAC limiting values. Therefore, it would be prudent to consider the Made Ground materials as likely to be classified as 'non-hazardous' waste for disposal at landfill. It remains possible that some Made Ground materials may be classified as 'inert' waste. However, it may not be feasible to identify Made Ground materials that may be classified as 'inert' or 'non-hazardous' waste by visual observations alone. Therefore, it may be necessary to stockpile materials that will require off-site disposal and undertake WAC testing (and possibly additional classification testing if materials are identified that differ to those assessed to date) to ensure correct disposal routes for materials being removed from site.
- Natural strata, providing they have not been impacted by potential contaminants associated with the site usages, would be classified as 'inert' waste without any requirement for laboratory testing.

Waste requires pre-treatment prior to disposal at landfill and this may take the form of physical or chemical treatment to reduce hazards and/or waste volumes. The segregation and screening of waste soils into separate, and appropriately classified, waste streams would satisfy the pre-treatment criteria by ensuring that volumes of each waste category are minimised. Segregation of waste streams is also important to prevent materials being classified within a worse-case category and, therefore, incurring higher disposal costs. Mixing of different waste streams to dilute hazardous properties is not permitted.

It should be noted that the above assessment is provided in accordance with current waste disposal and environmental permitting legislation and guidance documents. However, individual landfills and other waste disposal facilities may have variances in their permit that differs from standard guidance. Waste facilities may also make decisions with respect to accepting waste on a commercial basis. Therefore, landfills or other waste facilities should be approached to confirm that they will accept waste materials prior to finalising waste disposal proposals.

14. RECOMMENDED SUPERVISION AND MONITORING

In compliance with the requirements in BS EN 1997-1:2004 and BE EN 1997-2:2007, construction and workmanship of the engineering solutions recommended in this report shall be supervised. In particular, issues listed in Section 9.5 General Construction Advice shall be considered in the implementation of the works and design of any necessary temporary works set out in Section 10.

In relation to the foundation solution(s) and ground floor slab recommendations in Section 9, the following supervision and monitoring is recommended.

- Inspections of formation strata in excavations for strip/trench-fill or pad/pier footings
- Groundwater observations (eg. to check groundwater is below proposed formation levels, immediately prior to commencing excavations)

15. SUMMARY

A residential development is proposed at Land at Roundstone Caravan Park, Worthing Road, Southwater. The site is bisected by an access road, the area north of which was formerly occupied by a sales office, adjoining workshop and external sales display area, which have all since been demolished/removed and the area is now disused. The area south of the access road was previously occupied by motor homes and static caravans and is currently occupied by a car parking area. The proposed development comprises a two-storey block of apartments and one-and-a-half-storey cottages, together with car parking, managed landscaping areas and private garden areas. The residents will be of retirement age.

Ground conditions at the site comprise a variable thickness of Made Ground, with a maximum depth of 1.8 m identified, underlain by typically firm to stiff consistency, clays with lithorelicts of the Horsham Stone Member. In the southern part of the site, the upper natural clays are locally soft consistency. Weak muds/sandstone has been recorded at depths of between 2.0 m and 2.3 m. Groundwater was identified within the previous boreholes from 1.8 m depth. During the supplementary ground investigation, water inflows were noted from 0.6 m depth within trial pits in the southern area of the site. This is likely to be associated with perched surface water trapped in coarse grained bands within the Made Ground. Within the northern area of the site, groundwater was encountered from 1.9 m depth.

The results of the ground investigation have confirmed there are some linkages relating to sources of potential contamination associated with past site usages. The proposed buildings and hardstanding largely eliminate the majority of potential exposure pathways with end users. However, there is a possibility of exposure pathways in the areas of proposed private gardens and managed soft landscaping areas and allowance should be made for a capping layer of topsoil/subsoil in these areas. A geotextile marker layer is recommended at the base of the capping layer in proposed private garden areas. It is recommended that allowance be made for the use of multi-layer barrier pipes for the potable water supply.

It is evident that the ground conditions at the site are not associated with a valid contaminant linkage in relation to controlled waters and the proposed development should not be constrained by issues relating to ground gases.

Strip/trench fill footings placed within the weathered horizon of high strength clay strata or underlying sandstone or mudstone strata of the Horsham Stone Member are considered to be suitable to support the proposed apartment block. The recent trial pits have identified some localised perched groundwater above the likely base of the strip/trench fill footings and this may give rise to instability in foundation excavations. Allowance should be made for excavating and concreting foundation trenches in short sections. Provision for a blinding layer and excavation shuttering with sump-pump dewatering is also recommended.

In view of the rapid perched water inflows noted within the area of the proposed cottages and the softened nature of the upper natural clays, it is considered that a pier and beam type foundation, with piers being formed from pre-cast concrete rings and founded on the weak sandstone or mudstone at approximately 2.0 m to 2.5 m depth is likely to offer the most appropriate and cost-effective solution for these units.

REFERENCES

Site Specific References

Crossfield Consulting Limited (July 2021) *Land at Roundstone Caravan Park, Worthing Road, Southwater, RH13 9JF, Desk Study Appraisal* Report No. CCL03455.CN89

Crossfield Consulting Limited (August 2021) *Land at Roundstone Caravan Park, Worthing Road, Southwater, RH13 9JF, Ground Investigation Report* Report No. CCL03455.CO03

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BRE (2023) *BR211 – Radon: Guidance on protective measures for new buildings (sixth edition with minor revisions)* BRE Press

BSI (2004) *BS EN1997-1:2004 Eurocode 7: Geotechnical Design – Part 1: General Rules* British Standards Institution

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CL:AIRE (2010) *Soil Generic Assessment Criteria for Human Health Risk Assessment* Contaminated Land: Applications in Real Environments

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Environment Agency (2010) *Guiding Principles for Land Contamination – GPLC1 to 3* EA

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National Contaminated Land Officers Group (2024) *A Regulator's Guide to Cover Systems and their Verification* NCLOG

NHBC (2024) *Standards* National House Building Council

UKWIR (2010) *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites Report Ref. No. 10/WM/03/21* UK Water Industry Research

GENERAL NOTES

1. The report is limited to the site boundaries and is specific to the development proposals as identified by the Client (or Client's advisor) and confirmed within this report. The report should not be used in a different context. Where the report is identified as a site appraisal, further geoenvironmental assessment, and detailed investigations, will be required prior to finalisation of ground related assessment and designs. Other reports may recommend additional investigation or other works that would be considered essential prior to the preparation of final assessments and associated designs.

2. This report has been prepared by Crossfield Consulting Limited with all reasonable skill, care and diligence within the terms of the Appointment/Proposal Terms and Conditions (as applicable) and with the resources agreed with the Client. Responsibility for any matters outside the agreed scope is not accepted.

3. Where any data supplied by the Client or by other external sources, including previous site investigation data, has been used it has been assumed that the information is correct unless otherwise stated. No responsibility can be accepted by Crossfield Consulting Limited for inaccuracies within the data supplied by others.

4. Any borehole data from the British Geological Survey sources are included on the following basis: "The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation".

5. Any assessments made in this report are based on the ground conditions indicated by the factual records included and/or referenced in the report, namely, trial pits and/or boreholes, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant site data/desk study information which may have been obtained for the site. Variations in ground conditions may occur between exploratory hole locations and there may be special conditions appertaining to the site that have not been revealed by the investigation and that have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.

6. Exploratory hole locations provided in the report are generally established by tape measurement (or similar measurement) from existing features or boundaries. Ground levels stated in the report are based on site survey plans as provided. Hole locations are not accurately surveyed and ground levels at these locations are not obtained unless specifically included in the agreed scope of services.

7. Unless stated otherwise, no consultations with regulatory authorities, funders or other third parties have been carried out; hence, definitive assurance that such third parties will accept the findings of this report cannot be provided.

8. This report is only valid when used in its entirety. Any information or advice should not be relied upon if removed from the report or not considered in the context of the whole document. Crossfield Consulting Limited cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared.

9. The report is provided for the sole use by the Client or its assignees and is confidential to the Client's professional advisers. No responsibility whatsoever for the contents of this report will be accepted to any person other than the Client or its assignees.

10. The Client cannot place reliance on the report until full payment has been made for the report and all associated works.

11. New information, improved methods, changes in published guidance, codes of practice, policies and legislation can occur at any time and may necessitate an alteration to the report in whole, or in part, after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Crossfield Consulting Limited for re-assessment and, if necessary, re-appraisal.

TABLES

CONCEPTUAL SITE MODEL

	Potential Contaminant Source	Potential Contaminants	Potential Pathway	Receptors and Assessed Contaminant Linkage
On-Site Solid	Small scale storage of lubricating oils and chemicals may be present within the former caravan workshop area of the site but no large-scale storage of such materials. Workshop floor and hard surfacing across site would prevent potential contaminants entering the ground. Demolition of historical buildings Imported coarse-grained materials to create level platforms may have included demolition-derived or ashy materials	Petroleum Hydrocarbons Polyaromatic Hydrocarbons (PAHs) Asbestos fibres/ACM Asbestos fibres/ACM Toxic and phytotoxic metals Polyaromatic Hydrocarbons (PAHs)	Dermal and oral exposure pathways (including air-borne migration) are present during construction phase but will generally not be present following development due to building and hardstanding effective barriers. Limited garden and landscaping areas after development represent possible dermal, oral and dust exposure pathways. ***Release into Liquid Phase*** n/a – no source ***Release into Vapour Phase*** n/a – no source	**Human Health** *End Users:* Possible contaminant linkage *Groundworkers:* Possible contaminant linkage *Neighbouring Properties/General Public:* Possible contaminant linkage ***Buried Structures & Services*** *Buried concrete:* No contaminant linkage *Potable water pipes:* Possible contaminant linkage *Other buried structures:* No contaminant linkage **Landscape and Garden Areas** Possible contaminant linkage
Off-Site Solid	No evidence of potential source	n/a		
On-Site Liquid	No evidence of potential source	n/a	n/a – no source ***Release into Vapour Phase*** n/a – no source	
Off-Site Liquid	No evidence of potential source	n/a		
On Site Liquid	No evidence of potential source	n/a	n/a – no source	**Controlled Waters** *Groundwater:* Secondary A aquifer strata, no groundwater source protection zone: No contaminant linkage *Surface Water*: Drain along western site boundary: No contaminant linkage
Ground Gases	No historical/active landfills Site not located in a radon affected area	n/a n/a	n/a – no source	**Human Health** *End Users:* No contaminant linkage

NOTES

1. The above conceptual model is based on CIRIA C552 (2001) and BS 10175:2011+A2:2017, BS EN ISO 21365:2020 and Environment Agency Land Contamination Risk Management (LCRM) (2020).
2. The Conceptual Site Model is prepared from available desk study information. Where a site walkover or ground investigation identifies information that was not known at the desk study stage, such information is used to modify the Model.
3. Where a contaminant linkage is identified, any subsequent ground investigation is designed to obtain relevant information to assess the contaminant linkage. See Table 4 for a summary of contaminant linkage assessments.

SUMMARY OF ANALYTICAL TEST DATA: SOILS
RISKS TO HUMAN HEALTH – (PRIVATE GARDENS)

Determinand	Units	No of Tests[6]	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Residential With Plant Uptake		Category 4 Screening Level (mg/kg) Residential With Plant Uptake	
			Min	Max	Value	No>GAC	Value	No>C4SL
Arsenic	mg/kg	19	12	230	37[1]	1	37[3]	1
Cadmium	mg/kg	19	<0.2	0.5	11[1]	0	26[3]	0
Chromium (Total) [4]	mg/kg	19	20	34	910[1]	0	-	-
Chromium (VI)	mg/kg	19	<1.8	<4.0	6[1]	0	21[3]	0
Lead	mg/kg	19	16	200	-	-	200[3]	0
Inorganic Mercury	mg/kg	19	<0.3	<0.3	40[1]	0	-	-
Nickel	mg/kg	19	14	30	130[1]	0	-	-
Selenium	mg/kg	19	<1.0	1.4	250[1]	0	-	-
Copper	mg/kg	19	12	31	2400[1]	0	-	-
Zinc	mg/kg	19	56	110	3700[1]	0	-	-
Boron	mg/kg	19	0.2	4.1	290[1]	0		
Phenols	mg/kg	19	<1.0	<1.0	120[1]	0	-	-
pH	-	19	7.2	10.1	-	-	-	-
Total Organic Carbon	%	19	0.1	2.4	-	-	-	-
Petroleum Hydrocarbons								
Aliphatics $C_5 – C_6$	mg/kg	19	<0.001	<0.02	42[1]	0	-	-
Aliphatics $C_6 – C_8$	mg/kg	19	<0.001	<0.02	100[1]	0	-	-
Aliphatics $C_8 – C_{10}$	mg/kg	19	<0.001	<0.05	27[1]	0	-	-
Aliphatics $C_{10} – C_{12}$	mg/kg	19	<1.0	3.8	130[1]	0		
Aliphatics $C_{12} – C_{16}$	mg/kg	19	<2.0	18	1100[1]	0	-	-
Aliphatics $C_{16} – C_{35}$	mg/kg	19	<16.0	280	65,000[1]	0	-	-
							-	-
Aromatics $C_6 – C_7$	mg/kg	19	<0.001	<0.01	70[1]	0	-	-
Aromatics $C_7 – C_8$	mg/kg	19	<0.001	<0.01	130[1]	0	-	-
Aromatics $C_8 – C_{10}$	mg/kg	19	<0.001	<0.05	34[1]	0	-	-
Aromatics $C_{10} – C_{12}$	mg/kg	19	<1.0	1.1	74[1]	0		
Aromatics $C_{12} – C_{16}$	mg/kg	19	<2.0	18	140[1]	0	-	-
Aromatics $C_{16} – C_{21}$	mg/kg	19	<10	160	260[1]	0	-	-
Aromatics $C_{21} – C_{35}$	mg/kg	19	<10	380	1100[1]	0	-	-
VOCs								
Benzene	mg/kg	19	<0.001	<0.005	0.087[1]	0	0.2[3]	0
Toluene	mg/kg	19	<0.001	<0.005	130[1]	0	-	-
Ethylbenzene	mg/kg	19	<0.001	<0.005	47[1]	0	-	-
Xylene	mg/kg	19	<0.001	<0.005	56[1]	0	-	-
MTBE	mg/kg	19	<0.001	<0.005	49[2]	0	-	-

Determinand	Units	No of Tests[6]	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Residential With Plant Uptake		Category 4 Screening Level (mg/kg) Residential With Plant Uptake	
			Min	Max	Value	No>GAC	Value	No>C4SL
PAHs								
Naphthalene	mg/kg	19	<0.05	0.34	2.3[1]	0	-	-
Acenaphthylene	mg/kg	19	<0.05	1.3	170[1]	0	-	-
Acenaphthene	mg/kg	19	<0.05	1.1	210[1]	0	-	-
Fluorene	mg/kg	19	<0.05	1.3	170[1]	0	-	-
Phenanthrene	mg/kg	19	<0.05	16	95[1]	0	-	-
Anthracene	mg/kg	19	<0.05	6.3	2400[1]	0	-	-
Fluoranthene	mg/kg	19	<0.05	39	280[1]	0	-	-
Pyrene	mg/kg	19	<0.05	39	620[1]	0	-	-
Benz(a)anthracene	mg/kg	19	<0.05	23	7.2[1]	2	-	-
Chrysene	mg/kg	19	<0.05	22	15[1]	1	-	-
Benzo(b)fluoranthene	mg/kg	19	<0.05	29	2.6[1]	3	-	-
Benzo(k)fluoranthene	mg/kg	19	<0.05	12	99[1]	0	-	-
Benzo(a)pyrene	mg/kg	19	<0.05	26	2.2[1]	3	5[3]	3
Indeno(123cd)pyrene	mg/kg	19	<0.05	13	27[1]	0	-	-
Dibenz(ah)anthracene	mg/kg	19	<0.05	4.9	0.24[1]	3	-	-
Benzo(ghi)perylene	mg/kg	19	<0.05	14	320[1]	0	-	-

NOTES

1. Suitable for Use Level (S4UL) published by LQM/CIEH, 2015 – Residential With Plant Uptake landuse. S4UL assumptions comprise 1% soil organic matter, soil pH of 7 and sandy loam soil type. S4ULs are copyright © Land Quality Management Limited reproduced with permission; Publication Number S4UL3133.
2. Soil GAC for Human Health Risk Assessment produced by CL:AIRE (2010) – Residential With Plant Uptake. Assumption of 1% soil organic matter.
3. Category 4 Screening Level (C4SL), Department for Environment Food and Rural Affairs (March 2014) – calculated for 1% SOM using the CLEA Model v1.071
4. In the absence of desk study or historical map evidence indicating a potential source of chromium (VI) usage at or in the near vicinity of the site (and confirmed by laboratory testing), total chromium concentrations have been compared to the GAC for chromium (III).
5. For determinands that exceed the GAC and C4SL, site specific assessment criteria are derived in Appendix II.
6. Includes relevant data from the Ground Investigation Report

SUMMARY OF ANALYTICAL TEST DATA: SOILS
RISKS TO HUMAN HEALTH (MANAGED LANDSCAPING)

Determinand	Units	No of Tests[6]	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Residential Without Plant Uptake		Category 4 Screening Level (mg/kg) Residential Without Plant Uptake	
			Min	Max	Value	No>GAC	Value	No>C4SL
Arsenic	mg/kg	19	12	230	40[1]	1	40[3]	1
Cadmium	mg/kg	19	<0.2	0.5	85[1]	0	149[3]	0
Chromium (Total) [4]	mg/kg	19	20	34	910[1]	0	-	-
Chromium (VI)	mg/kg	19	<1.8	<4.0	6[1]	0	21[3]	0
Lead	mg/kg	19	16	200	-	-	310[3]	0
Inorganic Mercury	mg/kg	19	<0.3	<0.3	56[1]	0	-	-
Nickel	mg/kg	19	14	30	180[1]	0	-	-
Selenium	mg/kg	19	<1.0	1.4	430[1]	0	-	-
Copper	mg/kg	19	12	31	7100[1]	0	-	-
Zinc	mg/kg	19	56	110	40,000[1]	0	-	-
Boron	mg/kg	19	0.2	4.1	11,000[1]	0		
Phenols	mg/kg	19	<1.0	<1.0	440[1]	0	-	-
pH	-	19	7.2	10.1	-	-	-	-
Total Organic Carbon	%	19	0.1	2.4	-	-	-	-
Petroleum Hydrocarbons								
Aliphatics $C_5 – C_6$	mg/kg	19	<0.001	<0.02	42[1]	0	-	-
Aliphatics $C_6 – C_8$	mg/kg	19	<0.001	<0.02	100[1]	0	-	-
Aliphatics $C_8 – C_{10}$	mg/kg	19	<0.001	<0.05	27[1]	0	-	-
Aliphatics $C_{10} – C_{12}$	mg/kg	19	<1.0	3.8	130[1]	0		
Aliphatics $C_{12} – C_{16}$	mg/kg	19	<2.0	18	1100[1]	0	-	-
Aliphatics $C_{16} – C_{35}$	mg/kg	19	<16.0	280	65,000[1]	0	-	-
							-	-
Aromatics $C_6 – C_7$	mg/kg	19	<0.001	<0.01	370[1]	0	-	-
Aromatics $C_7 – C_8$	mg/kg	19	<0.001	<0.01	860[1]	0	-	-
Aromatics $C_8 – C_{10}$	mg/kg	19	<0.001	<0.05	47[1]	0	-	-
Aromatics $C_{10} – C_{12}$	mg/kg	19	<1.0	1.1	250[1]	0		
Aromatics $C_{12} – C_{16}$	mg/kg	19	<2.0	18	1800[1]	0	-	-
Aromatics $C_{16} – C_{21}$	mg/kg	19	<10	160	1900[1]	0	-	-
Aromatics $C_{21} – C_{35}$	mg/kg	19	<10	380	1900[1]	0	-	-
VOCs								
Benzene	mg/kg	19	<0.001	<0.005	0.38[1]	0	0.89[3]	0
Toluene	mg/kg	19	<0.001	<0.005	880[1]	0	-	-
Ethylbenzene	mg/kg	19	<0.001	<0.005	83[1]	0	-	-
Xylene	mg/kg	19	<0.001	<0.005	79[1]	0	-	-
MTBE	mg/kg	19	<0.001	<0.005	73[2]	0	-	-

Determinand	Units	No of Tests[6]	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Residential Without Plant Uptake		Category 4 Screening Level (mg/kg) Residential Without Plant Uptake	
			Min	Max	Value	No>GAC	Value	No>C4SL
PAHs								
Naphthalene	mg/kg	19	<0.05	0.34	2.3[1]	0	-	-
Acenaphthylene	mg/kg	19	<0.05	1.3	2900[1]	0	-	-
Acenaphthene	mg/kg	19	<0.05	1.1	3000[1]	0	-	-
Fluorene	mg/kg	19	<0.05	1.3	2800[1]	0	-	-
Phenanthrene	mg/kg	19	<0.05	16	1300[1]	0	-	-
Anthracene	mg/kg	19	<0.05	6.3	31,000[1]	0	-	-
Fluoranthene	mg/kg	19	<0.05	39	1500[1]	0	-	-
Pyrene	mg/kg	19	<0.05	39	3700[1]	0	-	-
Benz(a)anthracene	mg/kg	19	<0.05	23	11[1]	2	-	-
Chrysene	mg/kg	19	<0.05	22	30[1]	1	-	-
Benzo(b)fluoranthene	mg/kg	19	<0.05	29	3.9[1]	3	-	-
Benzo(k)fluoranthene	mg/kg	19	<0.05	12	110[1]	0	-	-
Benzo(a)pyrene	mg/kg	19	<0.05	26	3.2[1]	3	5.3[3]	3
Indeno(123cd)pyrene	mg/kg	19	<0.05	13	45[1]	0	-	-
Dibenzo(ah)anthracene	mg/kg	19	<0.05	4.9	0.31[1]	3	-	-
Benzo(ghi)perylene	mg/kg	19	<0.05	14	360[1]	0	-	-

NOTES

1. Suitable for Use Level (S4UL) published by LQM/CIEH, 2015 – Residential Without Plant Uptake landuse. S4UL assumptions comprise 1% soil organic matter, soil pH of 7 and sandy loam soil type. Where S4UL presented by LQM is greater than 100%, the S4UL for this assessment has been capped at 1,000,000 mg/kg. S4ULs are copyright © Land Quality Management Limited reproduced with permission; Publication Number S4UL3133.
2. Soil GAC for Human Health Risk Assessment produced by CL:AIRE (2010) – Residential Without Plant Uptake. Assumption of 1% soil organic matter.
3. Category 4 Screening Level (C4SL), Department for Environment Food and Rural Affairs (March 2014) – calculated for 1% SOM using the CLEA Model v1.071
4. In the absence of desk study or historical map evidence indicating a potential source of chromium (VI) usage at or in the near vicinity of the site (and confirmed by laboratory testing), total chromium concentrations have been compared to the GAC for chromium (III).
5. For determinands that exceed the GAC and C4SL, site specific assessment criteria are derived in Appendix II.
6. Includes relevant data from the Ground Investigation Report

ASSESSMENT OF CONTAMINANT LINKAGES

NOTES:
1. Contaminant linkage validity assessed following qualitative or semi-quantitative risk assessment.
2. Contaminant linkage assessed following detailed quantitative risk assessment or assuming the recommended remediation or mitigation measures are in place.

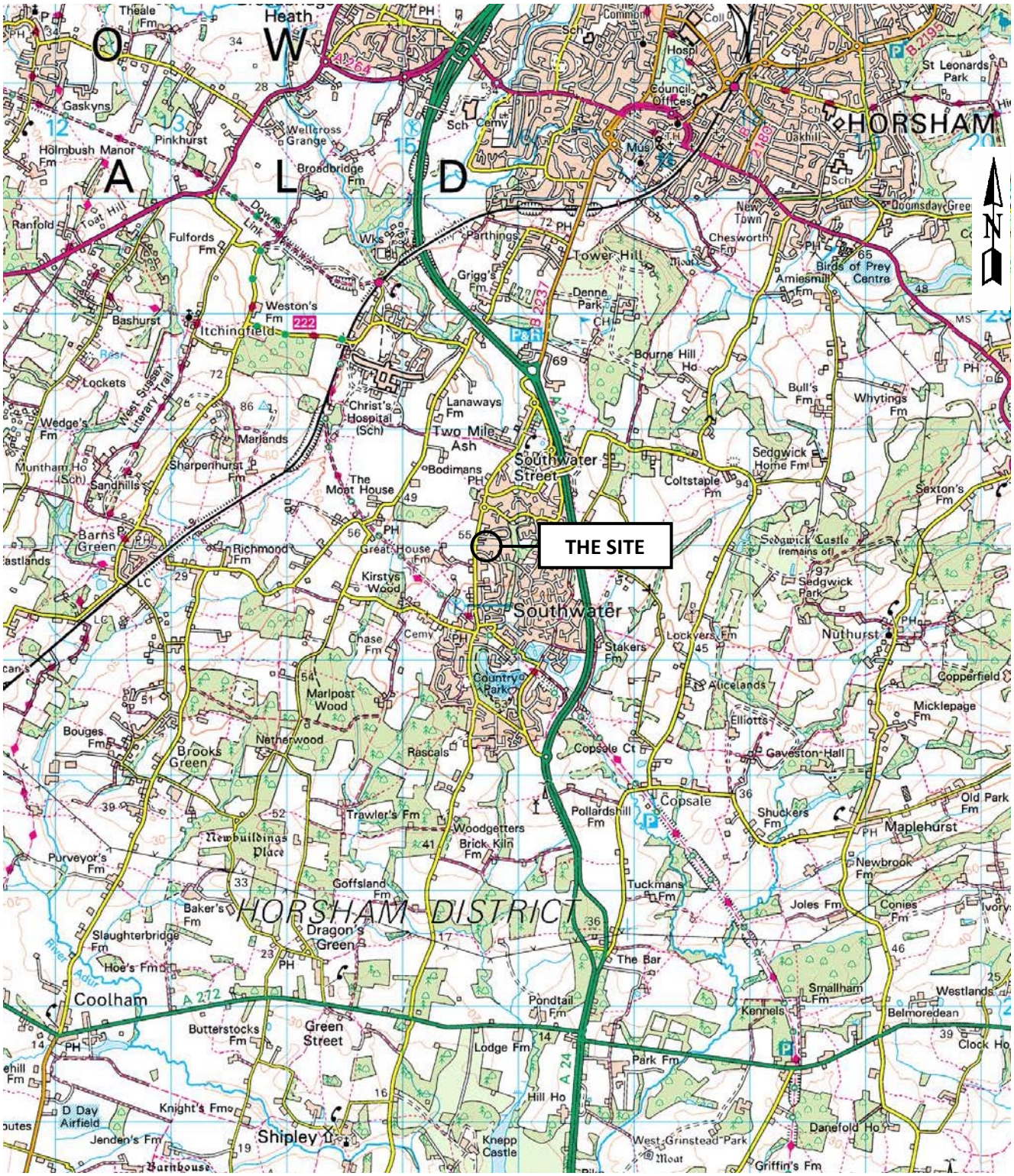
		Consequence (C)			
		Severe	Medium	Mild	Minor
Probability (P)	High likelihood (HL)	Very High Risk	High Risk	Moderate Risk	Moderate/ Low Risk
	Likely (L)	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low likelihood (LL)	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely (UL)	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

All terminology in accordance with the definitions provided in CIRIA C552 (2001)

Contaminant Linkage			Assessment of Contaminant Linkage following Ground Investigation	Contaminant Linkage Valid? [1]	Risk Rating			Quantitative Risk Assessment	Recommended Remediation/Mitigation (See Section 7 for further details)	Recommended Work Verified?	Contaminant Linkage Valid? [2]
Source	**Pathway**	**Receptor**			**C**	**P**	**Risk**				
Toxic metals Petroleum Hydrocarbons PAHs Asbestos	Dermal contact Ingestion Inhalation (N.B. inhalation only in areas of managed landscaping)	End users	Arsenic and certain PAHs identified above the GAC and C4SL No asbestos detected	Yes No	Med n/a	LL n/a	Med/Low n/a	Yes, site specific assessment criteria using CLEA Model V1.07 which confirms benzo(a)pyrene and dibenzo(ah)anthracene concentrations to be above the SSAC values for the proposed development.	Provide a topsoil/subsoil capping layer in private garden and managed soft landscaped areas.	To be confirmed during construction	No
Toxic metals PAHs Asbestos	Dermal contact, Ingestion, Inhalation	Construction workers	All tests below concentrations considered to be a short-term (acute) risk. No further assessment required. No asbestos detected	No No	n/a n/a	n/a n/a	n/a n/a	Not applicable	Not required but standard personal protective equipment is recommended as good practice. Conventional dust control and soil dampening to be used during construction.	Not applicable	No
Toxic metals PAHs Asbestos	Dermal contact, Ingestion, Inhalation (Dust)	Neighbours/general public	Arsenic and certain PAHs identified above the GAC and C4SL No asbestos detected	Yes No	Med n/a	UL n/a	Low n/a	Not applicable	Conventional dust control and soil dampening to be used during construction.	To be confirmed during construction phase.	No
Phytotoxic metals	Plant uptake	Landscape/garden plantings	No phytotoxic metals indicated at concentrations considered a risk to healthy plant growth based on BS 3882.2015	No	n/a	n/a	n/a	Not applicable	The site is currently devoid of topsoil, such that, a thickness of imported topsoil will be required to act as a growing medium for the proposed plants within garden and landscaping areas.	Not applicable	No
Organic compounds	Direct contact	Potable water supply	No significant organic compounds detected. However, land considered to be brownfield based on historical land use	Yes	Med	UL	Low	Not applicable	Allowance to be made for multi-layer barrier pipe or other protective pipe material to be used for potable water supply.	To be confirmed during construction phase	No

FIGURES

FIGURE 1

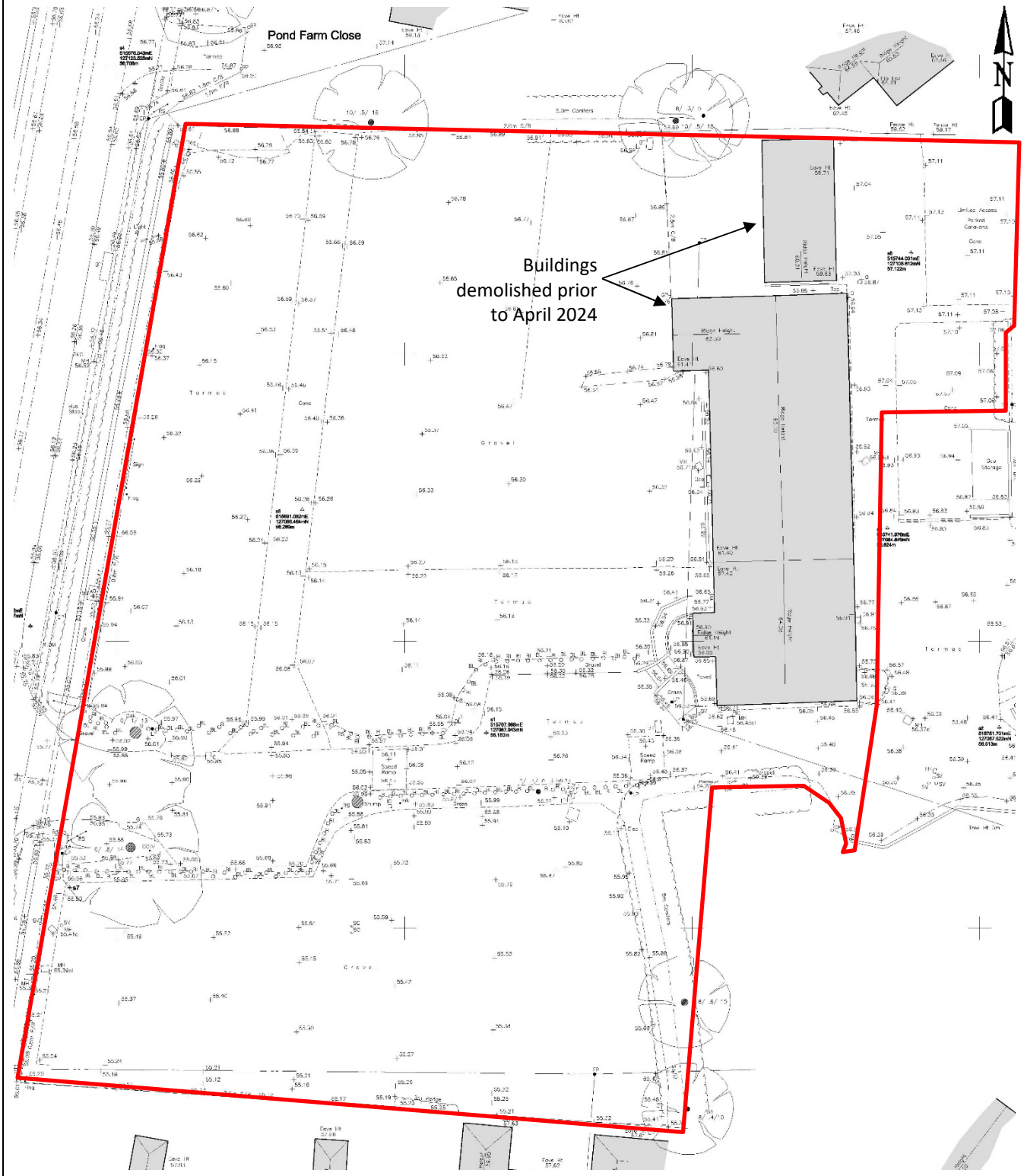


SITE LOCATION PLAN

Scale 1: 50,000

Reproduced from the 2013 1:50,000 Ordnance Survey map with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. Licence No.100014660

FIGURE 2



SITE PLAN AND TOPOGRAPHICAL SURVEY

Scale 1: 500

Reproduced from the topographical survey – D&H Surveys, July 2021

FIGURE 3



PROPOSED DEVELOPMENT PLAN

Scale 1: 500

Reproduced from Dwg No. 20083SW_PL_002 Rev. P3 by Planning Issues

APPENDIX I

APPENDIX I – SUPPLEMENTARY GROUND INVESTIGATION

Introduction

This Appendix, together with Sections 2 to 5 of the report (and the equivalent information in the Desk Study Appraisal (dated July 2021) and the Ground Investigation report (dated August 2021) by Crossfield Consulting Limited, as referenced), forms the Ground Investigation Report for the development described in the report, in compliance with the requirements of BS 5930:2015+A1:2020, BS EN1997-1:2004(2007) and BS EN1997-2:2007(2007).

The site operations were carried out on 11th April and 14th June 2024 under the supervision of a geotechnical/geoenvironmental engineer from Crossfield Consulting Limited. The scope and rationale for the design of the investigation is presented in Table I-1.

The ground investigation was designed and supervised by qualified and experienced geotechnical/geoenvironmental specialists from Crossfield Consulting Limited. Where appropriate, and as outlined below, specialist drilling/sampling equipment was procured together with trained and experienced operators. Unless otherwise indicated, sampling and logging remained the responsibility of trained staff from Crossfield Consulting Limited and field records were prepared on site, during or immediately following drilling/sampling or in situ measurements/tests. The results of in situ tests are presented on the relevant record sheets in this Appendix.

An exploratory hole location plan is presented as Figure I-1.

Trial Pits

Eight trial pits, denoted as TP1 to TP8, were excavated by a JCB 3CX excavator, on 11th April. An additional eight trial pits, denoted as TP101 to TP108, were excavated on 14th June 2024, also by a JCB 3CX excavator. The trial pit records from the investigation are presented in this Appendix and these records include the descriptions and depths of the strata encountered, together with sample depths, groundwater observations and other pertinent comments.

In situ hand vane tests were carried out on fine-grained soils, where appropriate, to provide undrained shear strength data representative of the tested horizon. The tests were carried out using Pilcon-Edeco hand vane tester, with extension rods in accordance with the site health and safety method statement. With reference to the guidance published in Serota & Jangle (1972), it is noted that this instrument is calibrated and scaled to provide a direct reading of undrained shear strength, such that application of additional correction factors on the recorded measurements is not necessary. Published correlations with undrained shear strength, as measured by immediate undrained triaxial tests, indicate this hand vane tester provides measurements with a significantly lower scatter in comparison to triaxial tests, with fewer anomalous results. Specific test measurements are listed on the exploratory hole records and a summary of the test data and instrument details are presented in this Appendix.

Soil Samples

All samples for analytical testing were collected in appropriate containers, stored in cool boxes (where appropriate) and sent to the testing laboratory overnight. The sample containers, storage and handling procedures were all compatible with the relevant recommendations of the UKAS accredited testing laboratory for the specific testing proposed.

Samples designated for geotechnical testing were collected, stored and transported in accordance with the published requirements for the specific tests scheduled, such that moisture content and soil structure integrity was maintained, as necessary for the test requirements.

Analytical Laboratory Testing
The rationale for the analytical testing is set out in Table I-2.

Selected samples of the soils encountered were submitted for screening analysis of the following determinands:

- Arsenic (Total)
- Chromium (Total and Hexavalent)
- Lead (Total)
- Nickel (Total)
- Selenium (Total)
- Cyanide (Total)
- Sulphate (Water soluble)
- pH
- Asbestos (Fibre & ACM Screen)
- Cadmium (Total)
- Copper (Total)
- Mercury (Total)
- Zinc (Total)
- Boron (Water soluble)
- Sulphide (Total)
- Phenols (Total-monohydric)
- Total Organic Carbon

Note: Total determinands are based on an aqua-regia extract.

Selected samples of the soils encountered were submitted for analysis of the following determinands:

- Total Petroleum Hydrocarbons – aromatic/aliphatic split and carbon number banding, using GC-FID techniques
- BTEX and MTBE – using GC-MS techniques
- Polyaromatic Hydrocarbons – using GC-MS techniques

The analyses were carried out by i2 Analytical, a UKAS accredited laboratory, and the results are presented in this Appendix. Soil testing was undertaken in accordance with the Environment Agency's Monitoring Certification Scheme (MCERTS).

TABLE I-1

RATIONALE FOR THE DESIGN OF THE SUPPLEMENTARY GROUND INVESTIGATION

The scope of the supplementary ground investigation was designed with reference to the published geology and ground conditions indicated in the desk study and the August 2021 ground investigation information.

In compliance with the guidance published in BS EN 1997-2:2007, the ground investigation was designed to verify the preliminary ground model, established from the desk study information and to characterise the ground conditions within influencing distance of the proposed structures. In this regard, the exploratory holes were targeted within relevant areas of the site to provide information on the strata profile down to competent materials. With reference to the desk study information and the support requirements of the proposed development, it is evident that adequate support is provided by the strata that continue below the depths of the exploratory holes.

In compliance with the guidance published in BS 10175:2011+A2:2017, BS 5930:2015+A1:2020 and Environment Agency LCRM (2020), the layout of the exploratory holes and sampling regime also considers the Conceptual Site Model and potential contaminant linkages, such that the spatial arrangement of the investigation provides the necessary information to support a risk assessment of the identified potential contaminant linkages.

Exploratory Hole and Technique	**Rationale for Hole Location**	**Depth (m)**	**Sampling/In Situ Testing and Monitoring**
TP 1-8	All exploratory hole locations were chosen to provide data on the nature of Made Ground across the site. Three exploratory holes were located to provide further information on the founding strata, excavation stability.	TP1,3,4,6,8: 1.0 m - 1.4 m TP 2, 5, 7 1.9 m – 2.4 m	Representative samples of Made Ground and natural strata recovered for analytical laboratory testing. In situ hand vane tests were carried out within natural materials within all holes to provide information on soil properties.
TP101 TP102 TP103 TP104 TP105 TP106 TP107 TP108	Exploratory holes were located to provide further information on the deeper Made Ground, the founding strata, and excavation stability across the site	1.9 m 1.9 m 1.7 m 0.65 m 2.0 m 1.8 m 2.45 m 1.3 m	Representative samples of Made Ground and natural strata recovered for analytical laboratory testing. In situ hand vane tests were carried out within natural materials within all holes to provide information on soil properties.

Key

TP *X* Machine dug trial pit

TABLE I-2

RATIONALE FOR THE ANALYTICAL TESTING SUITE

Exploratory Hole and Samples	Selection Criteria	Analytical Tests
TP1 – 0.4 m TP2 – 0.25 m TP4 – 0.15 m TP5 – 0.15 m TP7 – 0.3 m TP8 – 0.4 m TP101 - 0.8 m TP102 – 0.6 m TP103 – 0.8 m TP104 – 0.6 m TP105 – 0.6 m TP106 – 0.7 m TP107 – 0.6 m TP108 – 0.5 m	Representative Made Ground and natural strata samples recovered and tested to assess the presence and concentration of potential contaminants identified as relevant to the site risk assessment based on the Conceptual Site Model.	Metals and metalloids, cyanide (total), pH, phenol, sulphate (water and acid soluble), sulphide, sulphur (total) and TOC Petroleum Hydrocarbons (aliphatic and aromatic split with CWG carbon number banding including BTEX and MTBE) Polyaromatic Hydrocarbons Asbestos (identification and, if applicable, quantification)
TP2 – 0.25 m TP7 – 0.3 m	Waste acceptance	Waste Acceptance Criteria Tests (WAC) to BS EN 12457-3

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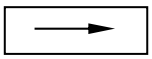
Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP101**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	West	**Shoring**	None used
Ground Level	49.94 m OD		
Plant	U50-5	**Stability**	Sidewalls A and C collapse from 0.90 m to base of trial pit
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	 B / C	**Checked by**	
Water	Slight groundwater seepage at 0.95 m		Logged on site during excavation

Depth	Face A	Face B	Face C	Depth
0.07		(1)		0.07
0.15		(2)		0.15
0.20		(3)		0.20
		(4)		
1.70				1.70
1.90		(5)		1.90
		End of Hole		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
			1	0.00 - 0.07	Asphalt surfacing MADE GROUND
			2	0.07 - 0.15	Multicoloured fine to coarse sand and subangular to subrounded fine to medium gravel of flint, granite and quartzite with medium cobble content. Cobbles are subangular of concrete MADE GROUND
			3	0.15 - 0.20	Soft consistency greenish grey slightly sandy silty clay MADE GROUND
0.40 0.80	c_{fv} JGg	55,58,62	4	0.20 - 1.70	Soft becoming firm consistency light brown mottled light grey slightly sandy slightly gravelly silty clay with low cobble content. Gravel is subangular fine to medium of ash. And sandstone. Cobbles are subangular of sandstone MADE GROUND
			5	1.70 - 1.90	Stiff consistency light brown mottled light grey sandy CLAY with many subangular sandstone lithorelics WEATHERED HORSHAM STONE MEMBER

Remarks

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

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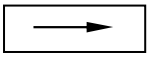
GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP102**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	East	**Shoring**	None used
Ground Level	49.62 m OD		
Plant	U50-5	**Stability**	Sidewalls A and C collapse from 1.00 m to base of trial pit
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	 B	**Checked by**	Logged on site during excavation
	C	**Water**	Moderate groundwater seepage at 1.20 m

Depth	Face A	Face B	Face C	Depth
0.05		(1)		0.05
0.20		(2)		0.20
0.40		(3)		0.40
1.50		(4)		1.50
1.90		(5)		1.90
		End of Hole		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
			1	0.00 - 0.05	Asphalt surfacing MADE GROUND
			2	0.05 - 0.20	Cream clayey fine to coarse sand and angular to subrounded fine to coarse gravel of brick, concrete and quartzite with medium cobble content. Cobbles are subangular of brick MADE GROUND
			3	0.20 - 0.40	Soft consistency dark grey slightly gravelly silty clay. Gravel is subangular fine to medium of ash and concrete MADE GROUND
0.60 0.60	c_{fv} JGg	55,74,79	4	0.40 - 1.50	Soft becoming stiff consistency light brown mottled light grey slightly gravelly sandy silty clay. Gravel is subangular fine to medium of ash and sandstone MADE GROUND
			5	1.50 - 1.90	Stiff consistency light brown mottled light grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium of sandstone WEATHERED HORSHAM STONE MEMBER

Remarks

Sandstone encountered at the base of the trial pit

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

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GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP103**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	North	**Shoring**	None used
Ground Level	49.69 m OD		
Plant	U50-5	**Stability**	Stable Throughout Excavation
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	B	**Checked by**	Logged on site during excavation
	C	**Water**	Slight groundwater seepage at 1.30 m

Depth	Face A	Face B	Face C	Depth
0.07		(1)		0.07
0.25		(2)		0.25
0.50		(3)		0.50
1.50		(4)		1.50
1.70		(5)		1.70
		End of Hole		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
			1	0.00 - 0.07	Asphalt surfacing MADE GROUND
			2	0.07 - 0.25	Multicoloured fine to coarse sand and subangular fine to medium gravel of concrete, flint, granite and quartzite with medium cobble and rare boulder content. Cobbles are subangular of brick. Boulder is subrounded of concrete (former fence post foundation) MADE GROUND
			3	0.25 - 0.50	Firm consistency greenish grey slightly sandy slightly gravelly clay. Gravel is subangular fine to medium of flint and sandstone MADE GROUND
0.80 0.90	JGg c_{fv}	45,48,55	4	0.50 - 1.50	Soft becoming firm consistency light brown mottled light grey slightly sandy slightly gravelly clay with rare pockets of dark grey silty clay. Gravel is subangular fine to coarse of concrete and sandstone MADE GROUND
			5	1.50 - 1.70	Stiff light brown mottled light grey slightly gravelly sandy CLAY. Gravel is subangular fine to coarse of sandstone WEATHERED HORSHAM STONE MEMBER

Remarks

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

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GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP104**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	South	**Shoring**	None used
Ground Level	m OD		
Plant	U50-5	**Stability**	Stable Throughout Excavation
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	→ B	**Water**	No groundwater encountered
	C	**Checked by**	Logged on site during excavation

Depth	Face A	Face B	Face C	Depth
0.08		(1)		0.08
0.25		(2)		0.25
0.65		(3)		0.65
		End of Hole		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
			1	0.00 - 0.08	Grey and brown clayey sandy subangular to subrounded fine to medium gravel of ash, flint, granite and quartzite MADE GROUND
			2	0.08 - 0.25	Firm consistency dark grey slightly gravelly silty clay. Gravel is subangular to subrounded fine to medium of ash, flint, quartzite and sandstone MADE GROUND
0.40 0.60	c_{fv} JGg	55,68,72	3	0.25 - 0.65	Firm becoming stiff consistency brown slightly sandy slightly gravelly clay with occasional rootlets. Gravel is subangular to subrounded fine to medium of quartzite and sandstone POSSIBLE MADE GROUND - REWORKED NATURAL STRATA

Remarks

Sandstone encountered at the base of the trial pit

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

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GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP105**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	East	**Shoring**	None used
Ground Level	51.05 m OD		
Plant	U50-5	**Stability**	Stable throughout excavation
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	B	**Checked by**	Logged on site during excavation
	C	**Water**	Slight groundwater seepage at 1.90 m

Depth	Face A	Face B	Face C	Depth
		(1)		
1.00				1.00
		(2)		
2.00				2.00
		End of Hole		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
0.60	JGg		1	0.00 - 1.00	Stiff consistency light brown mottled light grey slightly sandy gravelly silty CLAY with occasional rootlets. Gravel is subangular to subrounded fine to medium of sandstone
0.80	c_{fv}	84,84,86			POSSIBLE MADE GROUND - REWORKED NATURAL STRATA
			2	1.00 - 2.00	Stiff consistency light brown mottled light grey slightly sandy gravelly silty CLAY. Gravel is subangular to subrounded fine to medium of sandstone
					WEATHERED HORSHAM STONE MEMBER
					...Becomes light grey mottled light brown with no rootlets present below 1.30 m
					...Medium boulder content. Boulders are subangular of sandstone below 1.50 m

Remarks

Sandstone encountered at the base of the trial pit

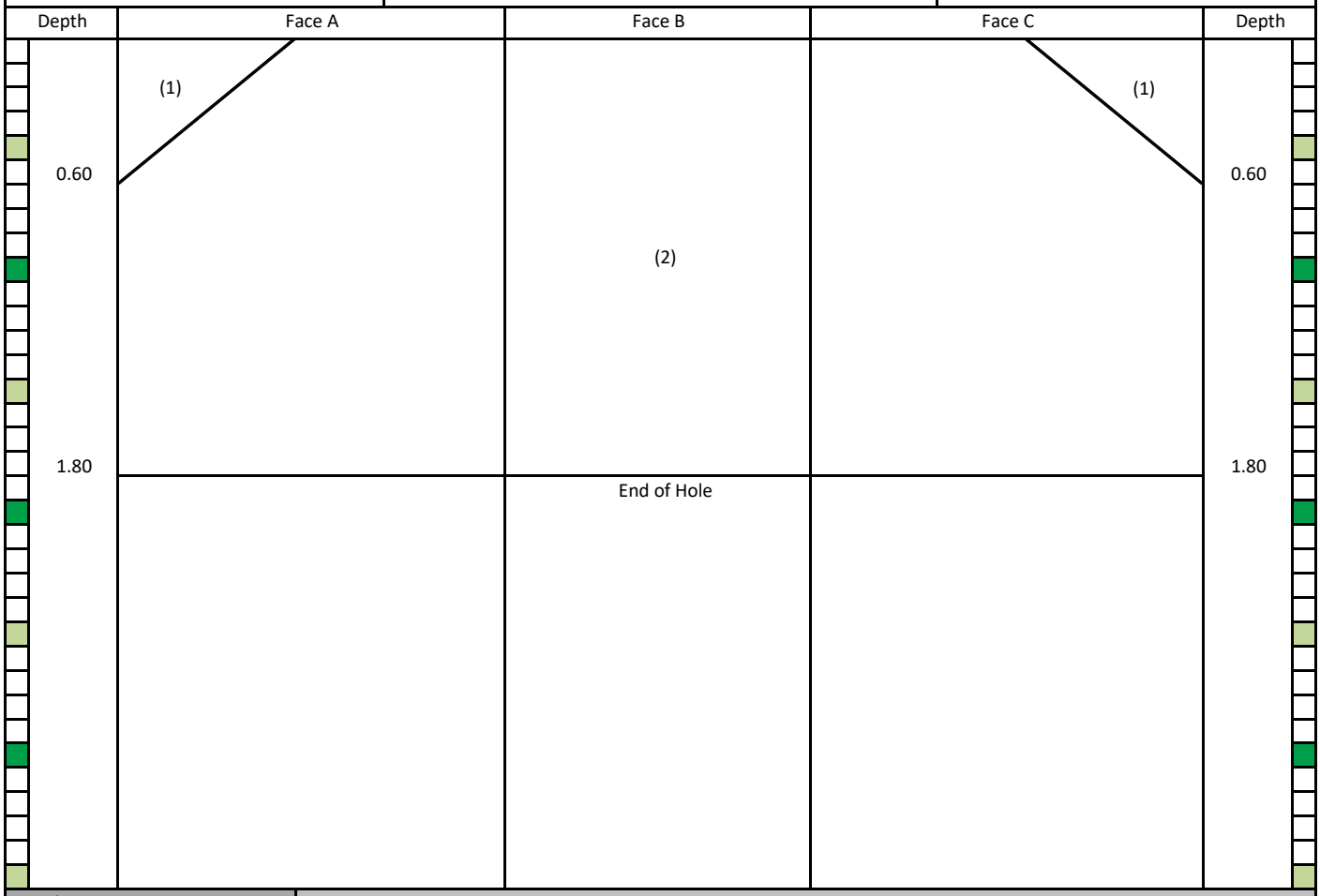
Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

Crossfield CONSULTING
GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP106**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	East	**Shoring**	None used
Ground Level	51.32 m OD		
Plant	U50-5	**Stability**	Stable Throughout Excavation
Co-ordinates			
Trial Pit	A	**Logged by**	MW Logged on site during excavation
Plan	B	**Checked by**	
	C	**Water**	No groundwater encountered



Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
0.40	JGg		1	0.00-0.60	Dark grey and black slightly gravelly fine to coarse ashy sand and subangular to subrounded fine to coarse gravel of ash, brick, concrete, ceramic and flint with occasional pockets of stiff consistency light brown mottled light grey clay and medium cobble content. Cobbles are subangular of brick MADE GROUND
0.50 0.70	c_{fv} JGg	74,86,105	2	0.00/0.60 - 1.80	Stiff consistency light brown mottled light grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of flint and sandstone WEATHERED HORSHAM STONE MEMBER

Remarks

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

Crossfield CONSULTING
GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP107**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	North	**Shoring**	None used
Ground Level	51.36 m OD		
Plant	U50-5	**Stability**	Stable Throughout Excavation
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	→ B	**Water**	Slight groundwater seepage at 2.45 m
	C	**Checked by**	

Logged on site during excavation

Depth	Face A	Face B	Face C	Depth
0.10		(1)		0.10
0.35		(2)		0.35
1.80		(3)		1.80
2.45		(4)		2.45
		End of Hole		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
			1	0.00 - 0.10	Cream slightly clayey gravelly fine to coarse sand. Gravel is subangular to subrounded fine to medium of flint MADE GROUND
0.25	c_{fv}	65,78,85	2	0.10 - 0.35	Stiff consistency dark grey slightly gravelly silty clay with occasional black specs. Gravel is subrounded fine to medium of sandstone MADE GROUND
0.60 0.70	JGg c_{fv}	50,60,72	3	0.35 - 1.80	Firm consistency light brown mottled light grey slightly sandy slightly gravelly silty clay. Gravel is subangular to subrounded fine to medium of ash, flint and sandstone MADE GROUND
			4	1.80 - 2.45	Stiff consistency light brown mottled light grey and orangish brown slightly sandy gravelly silty CLAY with medium cobble content. Gravel is subangular to subrounded fine to medium of sandstone. Cobbles are subangular of sandstone WEATHERED HORSHAM STONE MEMBER

Remarks

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

Crossfield CONSULTING
GEOTECHNICAL ENVIRONMENTAL

Trial Pit Record Sheet

Project	Roundstone Caravan Park, Southwater	**Hole Ref.**	**TP108**
Date	14/06/2024	**Sheet**	1 of 1
		Job No.	CCL03455
Bearing:	North	**Shoring**	None used
Ground Level	51.12 m OD		
Plant	U50-5	**Stability**	Stable Throughout Excavation
Co-ordinates			
Trial Pit	A	**Logged by**	MW
Plan	B	**Checked by**	
	C	**Water**	No groundwater encountered

Logged on site during excavation

Depth	Face A	Face B	Face C	Depth
0.05		1		0.05
0.25		2		0.25
0.40		3		0.40
0.60		4		0.60
0.80				0.80
1.00		5		1.00
1.30		End of Hole		1.30

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m^2)	Ref. No.	Strata Depth	Description
			1	0.00 - 0.05	Asphalt surfacing MADE GROUND
			2	0.05 - 0.25	Concrete slab MADE GROUND
0.30	JGg		3	0.25 - 0.40	Black sandy subangular fine to medium gravel of ash and clinker with medium cobble content. Cobbles are subangular of brick MADE GROUND
0.50	c_{fv}	30,35,38	4	0.40 - 0.60	Soft consistency dark grey slightly sandy silty clay with occasional black specs and slight organic odour
0.50	JGg				MADE GROUND
			5	0.60 - 0.80	Brown subangular cobbles of sandstone MADE GROUND
0.90	c_{fv}	40,55,64	6	0.80 - 1.30	Stiff consistency light brown mottled light grey sandy CLAY
0.90	JGg				WEATHERED HORSHAM STONE MEMBER
					...Occasional subangular sandstone lithorelics below 1.00 m

Remarks

Sandstone encountered at the base of the trial pit

Notes

1. All logging and sampling in accordance with BS 5930:2015+A1:2020
2. Symbols and abbreviations are explained on the accompanying key
3. All linear dimensions are in metres unless otherwise stated

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Analytical Report Number : 24-014245

Project / Site name:	Worthing Road, Southwater	**Samples received on:**	15/04/2024
Your job number:	CL03455	**Samples instructed on/ Analysis started on:**	15/04/2024
Your order number:	PO13374	**Analysis completed by:**	23/04/2024
Report Issue Number:	1	**Report issued on:**	23/04/2024
Samples Analysed:	6 soil samples		

Signed: JSzwagrak

Joanna Szwagrzak
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-014245
Project / Site name: Worthing Road, Southwater
Your Order No: PO13374

Lab Sample Number				171224	171225	171226	171227	171228
Sample Reference				TP1	TP2	TP4	TP5	TP7
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.25	0.15	0.15	0.30
Date Sampled				11/04/2024	11/04/2024	11/04/2024	11/04/2024	11/04/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	15	18	16	21
Total mass of sample received	kg	0.1	NONE	0.9	1	0.9	1	1.1
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO	PDO	PDO
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	10.1	7.8	7.2	8	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	2800	410	380	430	570
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	590	110	34	110	56
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.294	0.0553	0.017	0.057	0.028
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	294	55.3	17	57	28
Sulphide	mg/kg	1	MCERTS	14	< 1.0	< 1.0	2.2	2.4
Total Sulphur	mg/kg	50	MCERTS	1200	200	240	240	290
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.8	0.3	1.2	0.7	1.6
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.34	< 0.05	0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	1.3	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.1	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	1.3	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	16	< 0.05	0.29	0.07	0.05
Anthracene	mg/kg	0.05	MCERTS	6.3	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	39	< 0.05	0.95	0.16	0.13
Pyrene	mg/kg	0.05	MCERTS	39	< 0.05	0.84	0.21	0.11
Benzo(a)anthracene	mg/kg	0.05	MCERTS	23	< 0.05	0.35	0.08	0.05
Chrysene	mg/kg	0.05	MCERTS	22	< 0.05	0.46	0.09	0.07
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	29	< 0.05	0.55	0.1	0.08
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	12	< 0.05	0.27	0.06	0.07
Benzo(a)pyrene	mg/kg	0.05	MCERTS	26	< 0.05	0.46	0.09	0.07
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	13	< 0.05	0.29	0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	4.9	< 0.05	0.08	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	14	< 0.05	0.28	0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	249	< 0.80	4.88	0.96	< 0.80

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 24-014245
Project / Site name: Worthing Road, Southwater
Your Order No: PO13374

Lab Sample Number				171224	171225	171226	171227	171228
Sample Reference				TP1	TP2	TP4	TP5	TP7
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.25	0.15	0.15	0.30
Date Sampled				11/04/2024	11/04/2024	11/04/2024	11/04/2024	11/04/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	230	23	17	21	15
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	0.9	0.4	0.6	2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	27	24	24	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	31	22	12	21	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	18	26	23	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	29	17	25	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	79	68	61	67	58
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	3.8	2.4	1.3	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	19	15	9.9	5.5	5.3
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	49	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	140	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	210	19	12	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	1.1	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	18	4.3	3.3	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	160	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	380	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	560	< 10	< 10	< 10	< 10
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 24-014245
Project / Site name: Worthing Road, Southwater
Your Order No: PO13374

Lab Sample Number				171229
Sample Reference				TP8
Sample Number				None Supplied
Depth (m)				0.40
Date Sampled				11/04/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	19
Total mass of sample received	kg	0.1	NONE	1
Asbestos				
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO
General Inorganics				
pH (L099)	pH Units	N/A	MCERTS	8
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	430
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	34
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0168
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	16.8
Sulphide	mg/kg	1	MCERTS	1.1
Total Sulphur	mg/kg	50	MCERTS	210
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1
Total Phenols				
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05
Total PAH				
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80

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Analytical Report Number: 24-014245
Project / Site name: Worthing Road, Southwater
Your Order No: PO13374

Lab Sample Number				171229
Sample Reference				TP8
Sample Number				None Supplied
Depth (m)				0.40
Date Sampled				11/04/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15
Boron (water soluble)	mg/kg	0.2	MCERTS	1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	18
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	56
Petroleum Hydrocarbons				
TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	1.5
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	6
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10
VOCs				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 24-014245
Project / Site name: Worthing Road, Southwater

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
171224	TP1	None Supplied	0.4	Brown clay and sand with gravel
171225	TP2	None Supplied	0.25	Brown clay and sand with gravel
171226	TP4	None Supplied	0.15	Brown sandy clay with gravel
171227	TP5	None Supplied	0.15	Brown sandy clay with gravel
171228	TP7	None Supplied	0.3	Brown sandy clay with gravel
171229	TP8	None Supplied	0.4	Brown sandy clay with gravel

Analytical Report Number : 24-014245
Project / Site name: Worthing Road, Southwater

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	In-house method	L010	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS

Analytical Report Number : 24-014245
Project / Site name: Worthing Road, Southwater

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 24-015774

Project / Site name:	Worthing Road, Southwater	**Samples received on:**	15/04/2024
Your job number:	CL03455	**Samples instructed on/ Analysis started on:**	24/04/2024
Your order number:	PO13386	**Analysis completed by:**	01/05/2024
Report Issue Number:	1	**Report issued on:**	01/05/2024
Samples Analysed:	2 soil samples - 2 2stage samples		

Signed:

Joanna Wawrzeczko
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Waste Acceptance Criteria Analytical Results

Report No:	**24-015774**						
					Client:	**CROSSFCLTD**	
Location	**Worthing Road, Southwater**						
Lab Reference (Sample Number)	178820				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	11/04/2024				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP2						
Depth (m)	0.25						
Solid Waste Analysis							
TOC (%)**	0.2				3%	5%	6%
Loss on Ignition (%) **	1.4				--	--	10%
BTEX (µg/kg)**	< 5.0				6000	--	--
Sum of PCBs (mg/kg)**	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	7.9				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	17				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	0.0024	< 0.0020		< 0.020	0.5	2	25
Barium *	0.019	0.0064		0.076	20	100	300
Cadmium *	< 0.00010	< 0.00010		< 0.0010	0.04	1	5
Chromium *	< 0.00060	0.00092		0.0087	0.5	10	70
Copper *	0.010	0.0033		0.039	2	50	100
Mercury *	< 0.00070	< 0.0007		< 0.0070	0.01	0.2	2
Molybdenum *	0.0015	0.0030		0.029	0.5	10	30
Nickel *	< 0.00090	< 0.00090		< 0.0090	0.4	10	40
Lead *	0.0023	< 0.0017		< 0.017	0.5	10	50
Antimony *	< 0.0020	< 0.0020		< 0.020	0.06	0.7	5
Selenium *	< 0.0050	< 0.0050		< 0.050	0.1	0.5	7
Zinc *	0.0052	0.0013		0.017	4	50	200
Chloride *	< 4.0	< 4.0		35	800	15000	25000
Fluoride*	0.62	1.6		15	10	150	500
Sulphate *	15	3.4		46	1000	20000	50000
TDS*	110	65		690	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.16	< 0.13		< 0.50	1	-	-
DOC	8.84	8.8		88.1	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.8						
Dry Matter (%)	85						
Moisture (%)	15						
Stage 1							
Volume Eluate L2 (litres)	0.320						
Filtered Eluate VE1 (litres)	0.17						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation ** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**24-015774**						
					Client:	**CROSSFCLTD**	
Location	**Worthing Road, Southwater**						
Lab Reference (Sample Number)	178821				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	11/04/2024				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP7						
Depth (m)	0.30						
Solid Waste Analysis							
TOC (%)**	1.4				3%	5%	6%
Loss on Ignition (%) **	3.3				--	--	10%
BTEX (µg/kg)**	< 5.0				6000	--	--
Sum of PCBs (mg/kg)**	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	7.5				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	1.1				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	0.0022	0.0021		0.021	0.5	2	25
Barium *	0.057	0.033		0.36	20	100	300
Cadmium *	< 0.00010	< 0.00010		< 0.0010	0.04	1	5
Chromium *	< 0.00060	0.0017		0.015	0.5	10	70
Copper *	0.032	0.015		0.17	2	50	100
Mercury *	< 0.00070	< 0.0007		< 0.0070	0.01	0.2	2
Molybdenum *	0.0069	0.0036		0.039	0.5	10	30
Nickel *	0.0027	0.0015		0.017	0.4	10	40
Lead *	< 0.0017	0.0042		0.039	0.5	10	50
Antimony *	< 0.0020	< 0.0020		< 0.020	0.06	0.7	5
Selenium *	< 0.0050	< 0.0050		< 0.050	0.1	0.5	7
Zinc *	0.0085	0.0057		0.060	4	50	200
Chloride *	< 4.0	< 4.0		25	800	15000	25000
Fluoride*	0.36	0.50		4.8	10	150	500
Sulphate *	41	13		160	1000	20000	50000
TDS*	170	110		1100	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.16	< 0.13		< 0.50	1	-	-
DOC	30.2	13		152	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.8						
Dry Matter (%)	79						
Moisture (%)	21						
Stage 1							
Volume Eluate L2 (litres)	0.304						
Filtered Eluate VE1 (litres)	0.20						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

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Analytical Report Number : 24-015774
Project / Site name: Worthing Road, Southwater

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
178820	TP2	None Supplied	0.25	Brown clay and sand with gravel
178821	TP7	None Supplied	0.3	Brown sandy clay with gravel

Analytical Report Number : 24-015774
Project / Site name: Worthing Road, Southwater

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in soil	Determination of pH in soil by addition of water followed by electrometric measurement	In-house method	L005B	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L023B	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L027B	D	MCERTS
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L031B	W	ISO 17025
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033B	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037B	W	NONE
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed	L039B	W	ISO 17025
Sulphate in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed	L039B	W	ISO 17025
Preparation WAC leachate		In-house method	L043B	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046B	W	NONE
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047	D	MCERTS
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS	In-house method	L076B/L088	D/W	NONE

Analytical Report Number : 24-015774
Project / Site name: Worthing Road, Southwater

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser	In-house based on MEWAM Method ISBN 0117516260	L082B	W	ISO 17025

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 24-025165

Replaces Analytical Report Number: 24-025165, issue no. 1
Client sampling date amended.
Sampling dates amended on all samples as per client's request.

Project / Site name:	Land At Roundstone Caravan Park, Worthing Road, Southwater	**Samples received on:**	14/06/2024
Your job number:	CCL03455	**Samples instructed on/ Analysis started on:**	14/06/2024
Your order number:	PO13430	**Analysis completed by:**	21/06/2024
Report Issue Number:	2	**Report issued on:**	25/06/2024
Samples Analysed:	8 soil samples		

Izabela Wójcik
Signed:

Izabela Wójcik
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwater
Your Order No: PO13430

Lab Sample Number				228002	228003	228004	228005	228006
Sample Reference				TP101	TP102	TP103	TP104	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.60	0.80	0.60	0.60
Date Sampled				14/06/2024	14/06/2024	14/06/2024	14/06/2024	14/06/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	14	15	21	13	13
Total mass of sample received	kg	0.1	NONE	0.8	0.8	0.8	0.8	0.8
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM	WEM
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	8.2	8.3	7.7	7.5	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	190	120	460	94	280
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	28	22	110	24	90
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0141	0.0109	0.0545	0.0119	0.0449
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	14.1	10.9	54.5	11.9	44.9
Sulphide	mg/kg	1	MCERTS	< 1.0	4.5	4.8	< 1.0	6.5
Total Sulphur	mg/kg	50	MCERTS	91	95	320	100	100
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.2	0.4	1.5	0.6	0.2
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.17	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.48	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.43	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.21	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.33	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.34	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.15	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.29	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.18	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.2	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	2.8	< 0.80	< 0.80

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwater
Your Order No: PO13430

Lab Sample Number				228002	228003	228004	228005	228006
Sample Reference				TP101	TP102	TP103	TP104	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.60	0.80	0.60	0.60
Date Sampled				14/06/2024	14/06/2024	14/06/2024	14/06/2024	14/06/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	25	27	16	24	22
Boron (water soluble)	mg/kg	0.2	MCERTS	0.2	0.3	1	0.3	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	29	24	34	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	27	18	16	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	17	16	28	20	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	29	21	27	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.1	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	66	87	74	70	65
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC5 - EC35 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	< 10	< 10	13	< 10	< 10
TPHCWG - Aromatic >EC5 - EC35 $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	< 10	< 10	13	< 10	< 10
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwat
Your Order No: PO13430

Lab Sample Number				228007	228008	228009
Sample Reference				TP106	TP107	TP108
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.60	0.50
Date Sampled				14/06/2024	14/06/2024	14/06/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	12	19
Total mass of sample received	kg	0.1	NONE	0.8	0.8	0.8
Asbestos						
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM	MJN	MJN
General Inorganics						
pH (L099)	pH Units	N/A	MCERTS	8.6	8.7	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	240	240	430
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	25	29	460
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0124	0.0147	0.231
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	12.4	14.7	231
Sulphide	mg/kg	1	MCERTS	2	< 1.0	15
Total Sulphur	mg/kg	50	MCERTS	110	90	590
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.2	0.1	1.5
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.14
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.32
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.29
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.14
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.25
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.29
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.22
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.13
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.17
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	2.06

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Analytical Report Number: 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwat
Your Order No: PO13430

Lab Sample Number				228007	228008	228009
Sample Reference				TP106	TP107	TP108
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.60	0.50
Date Sampled				14/06/2024	14/06/2024	14/06/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	20	12
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.5	1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.5
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	24	25
Copper (aqua regia extractable)	mg/kg	1	MCERTS	25	20	19
Lead (aqua regia extractable)	mg/kg	1	MCERTS	20	18	51
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30	26	19
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.4	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	75	66	110
Petroleum Hydrocarbons						
TPHCWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC5 - EC35 $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	< 10	< 10	14
TPHCWG - Aromatic >EC5 - EC35 $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	< 10	< 10	14
VOCs						
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwater

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
228002	TP101	None Supplied	0.8	Brown clay and sand with gravel
228003	TP102	None Supplied	0.6	Brown clay and sand with gravel
228004	TP103	None Supplied	0.8	Brown clay and sand with gravel and vegetation
228005	TP104	None Supplied	0.6	Brown clay and sand with gravel and vegetation
228006	TP105	None Supplied	0.6	Brown clay and sand with gravel and vegetation
228007	TP106	None Supplied	0.7	Brown clay and sand
228008	TP107	None Supplied	0.6	Brown clay and sand
228009	TP108	None Supplied	0.5	Brown clay and sand

Analytical Report Number : 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwater

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	In-house method	L010	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS

Analytical Report Number : 24-025165
Project / Site name: Land At Roundstone Caravan Park, Worthing Road, Southwater

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS
Asbestos Quant if Screen/ID positive	In-house method	In-house method		D	NONE
Asbestos types if id possitive	In-house method	In-house method		D	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

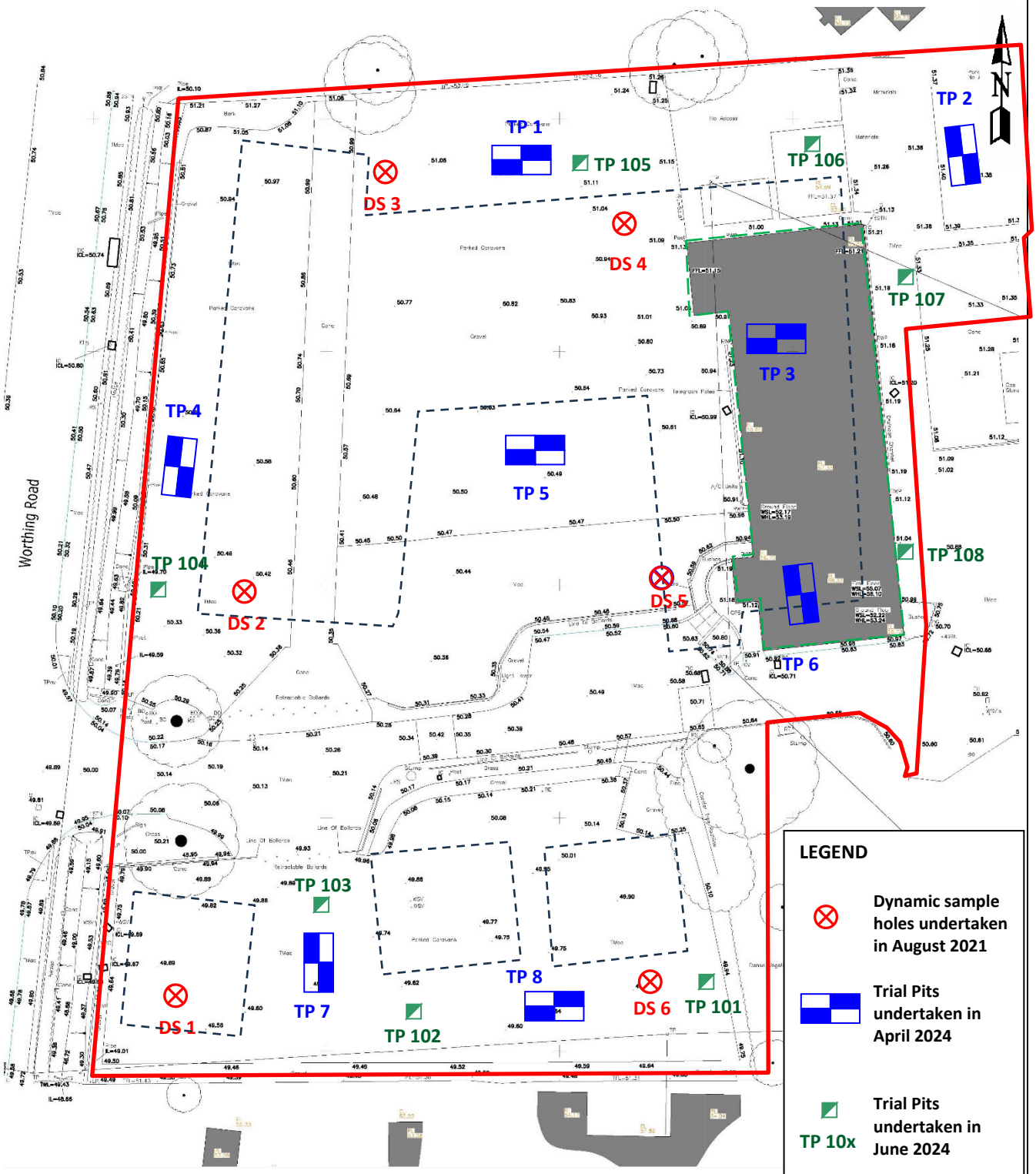
Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

FIGURE I-1



PROPOSED EXPLORATORY HOLE LOCATION PLAN

Scale 1: 500

Reproduced from the topographical survey – Folkes Architects Dwg No. 20097-1.01

APPENDIX II

APPENDIX II – QUANTITATIVE RISK ASSESSMENT: HUMAN HEALTH

Contaminated Land Exposure Assessment Model v1.071

A site-specific risk assessment, with respect to human health considerations, has been undertaken due to the concentrations of arsenic, benz(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(ah)anthracene recorded at levels above the generic assessment criteria (GAC).

Two models have been set up to reflect the two types of proposed development (apartments with managed landscaping and cottages with private gardens) for residents of retirement age.

With respect to the apartments, the development will have managed landscaping such that there will be no private gardens and residents will not be permitted to cultivate the ground. The contaminant linkages considered are compatible with the published criteria for a residential development without plant uptake. It is noted that the risk assessment model presumes that the soil associated with the substance will be exposed at the surface following completion of the development. However, as the soft landscaped areas will comprise entirely grassed and mulched ornamental planting areas, which will be tended by landscaping contractors as part of a maintenance agreement, it is considered that there will be no exposure route relating to home grown produce or long-term direct dermal soil contact. The CLEA model has been set up for an age class of 18, which is appropriate for end users of retirement age as the critical risk receptor. The soil organic matter and pH parameters have been determined from average site data for samples with contaminants above GAC/C4SL.

With respect to the cottages, and in addition to the above, the model includes exposure pathways relating to direct dermal soil contact and consumption of homegrown vegetables as end users of the cottages will be free to cultivate the private gardens.

The model parameters, exposure route analysis and the summary of results for the relevant compounds are presented in this Appendix. The output data are summarised as follows:

TABLE II-1 Residential with Plant Uptake

Substance	Maximum Concentration (mg/kg)	Concentration Range (mg/kg)	Site Specific Assessment Criteria (SSAC) (mg/kg)	Maximum Concentration Exceeds SSAC? [1]	No. of Samples that Exceed SSAC
Arsenic	230	14 to 230	266	No	0
Benz(a)anthracene	23	<0.05 to 23	49	No	0
Benzo(b)fluoranthene	29	<0.05 to 29	15	Yes	1
Benzo(a)pyrene	26	<0.05 to 26	13	Yes	1
Chrysene	22	<0.05 to 22	92	No	0
Dibenzo(ah)anthracene	4.9	<0.05 to 4.9	1.5	Yes	1

Notes

1. SSAC are presented as two significant figures from the calculated values
2. Where the maximum concentration does not exceed the SSAC, risks to end users are considered to be negligible and, therefore, no further assessment is required.

TABLE II-2 Residential without Plant Uptake

Substance	Maximum Concentration (mg/kg)	Concentration Range (mg/kg)	Site Specific Assessment Criteria (SSAC) (mg/kg)	Maximum Concentration Exceeds SSAC? [1]	No. of Samples that Exceed SSAC
Arsenic	230	14 to 230	410	No	0
Benz(a)anthracene	23	<0.05 to 23	98	No	0
Benzo(b)fluoranthene	29	<0.05 to 29	30	No	0
Benzo(a)pyrene	26	<0.05 to 26	24	Yes	1
Chrysene	22	<0.05 to 22	230	No	0
Dibenzo(ah)anthracene	4.9	<0.05 to 4.9	2.4	Yes	1

Notes

1. SSAC are presented as two significant figures from the calculated values
2. Where the maximum concentration does not exceed the SSAC, risks to end users are considered to be negligible and, therefore, no further assessment is required.

CLEA Software Version 1.071

Report generated	29-Apr-24
Report title	Roundstone Caravan Park, Southwater - Res with plant
Created by	CP at Crossfield Consulting Limited

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (S4UL)	2.66E+02	4.81E+02	NR	1.00	0.55	NR	NR	No	No	No	0	0	0	0	0	0
2	Benz(a)anthracene (S4UL)	6.59E+01	2.00E+02	4.95E+01	0.75	0.25	1.00	5.13E+00 (sol)	No	No	No	0	0	0	0	0	0
3	Benzo(b)fluoranthene (S4UL)	1.92E+01	8.73E+01	1.57E+01	0.82	0.18	1.00	6.04E-01 (vap)	No	No	No	0	0	0	0	0	0
4	Benzo(a)pyrene (S4UL)	1.66E+01	6.97E+01	1.34E+01	0.81	0.19	1.00	2.73E+00 (vap)	No	No	No	0	0	0	0	0	0
5	Dibenzo(ah)anthracene (S4UL)	1.87E+00	6.79E+00	1.46E+00	0.78	0.22	1.00	1.18E-02 (vap)	No	No	No	0	0	0	0	0	0
6	Chrysene (S4UL)	1.08E+02	6.39E+02	9.22E+01	0.86	0.14	1.00	1.32E+00 (vap)	No	No	No	0	0	0	0	0	0
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (S4UL)	99.9	0.1	0.0	100.0	2.66E+02	NR	1.33E+02	1.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-01	1.07E-01	1.29E-02	8.79E-02	5.33E-02	2.93E-01
2	Benz(a)anthracene (S4UL)	100.0	0.0	0.0	100.0	4.95E+01	1.16E-03	2.48E+01	2.11E-08	0.00E+00	1.01E-06	2.78E-07	0.00E+00	9.76E-02	3.63E-01	2.52E-01	0.00E+00	0.00E+00	9.25E-04
3	Benzo(b)fluoranthene (S4UL)	100.0	0.0	0.0	100.0	1.57E+01	1.77E-05	7.87E+00	6.70E-09	0.00E+00	1.88E-08	7.34E-08	0.00E+00	1.85E-02	8.58E-02	5.91E-02	0.00E+00	0.00E+00	1.35E-04
4	Benzo(a)pyrene (S4UL)	100.0	0.0	0.0	100.0	1.34E+01	1.05E-05	6.69E+00	5.69E-09	0.00E+00	1.17E-08	5.66E-08	0.00E+00	1.12E-02	5.94E-02	4.21E-02	0.00E+00	0.00E+00	6.98E-05
5	Dibenzo(ah)anthracene (S4UL)	100.0	0.0	0.0	100.0	1.46E+00	2.44E-06	7.32E-01	6.23E-10	0.00E+00	2.31E-09	4.96E-09	0.00E+00	6.26E-04	4.50E-03	3.06E-03	0.00E+00	0.00E+00	2.87E-06
6	Chrysene (S4UL)	100.0	0.0	0.0	100.0	9.22E+01	3.06E-04	4.61E+01	3.92E-08	0.00E+00	3.01E-07	6.05E-07	0.00E+00	3.14E-01	9.52E-01	6.23E-01	0.00E+00	0.00E+00	3.91E-03
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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 and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (S4UL)	1.88E-04	8.00E-05	3.21E-05	1.11E-06	0.00E+00	0.00E+00	0.00E+00	62.60	26.68	10.71	0.00	0.00	0.00	0.00	0.00
2	Benz(a)anthracene (S4UL)	3.49E-05	5.57E-05	2.59E-05	2.06E-07	1.66E-07	0.00E+00	0.00E+00	29.87	47.66	22.15	0.18	0.14	0.00	0.00	0.00
3	Benzo(b)fluoranthene (S4UL)	1.11E-05	1.26E-05	8.23E-06	6.55E-08	3.07E-09	0.00E+00	0.00E+00	34.66	39.42	25.71	0.20	0.01	0.00	0.00	0.00
4	Benzo(a)pyrene (S4UL)	9.44E-06	8.62E-06	7.00E-06	5.57E-08	1.91E-09	0.00E+00	0.00E+00	37.58	34.32	27.87	0.22	0.01	0.00	0.00	0.00
5	Dibenzo(ah)anthracene (S4UL)	1.03E-06	6.32E-07	7.66E-07	6.09E-09	3.77E-10	0.00E+00	0.00E+00	42.38	25.93	31.43	0.25	0.02	0.00	0.00	0.00
6	Chrysene (S4UL)	6.50E-05	1.52E-04	4.82E-05	3.83E-07	4.93E-08	0.00E+00	0.00E+00	24.46	57.24	18.14	0.14	0.02	0.00	0.00	0.00
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		Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{OC} ($cm^3\ g^{-1}$)	log K_{OW} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (S4UL)	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	1	1
2	Benz(a)anthracene (S4UL)	ID	0.155	ID	0.0015	NR	NR	3.16E-05	4.60E-06	3.80E-10	4.89	5.91	0.13	0.5	1	1	1
3	Benzo(b)fluoranthene (S4UL)	ID	0.039	ID	0.00038	NR	NR	2.05E-06	4.36E-06	3.62E-10	5.02	6.08	0.13	0.5	1	1	1
4	Benzo(a)pyrene (S4UL)	ID	0.031	ID	0.0003	NR	NR	1.76E-06	4.38E-06	3.67E-10	5.11	6.18	0.13	0.5	1	1	1
5	Dibenzo(ah)anthracene (S4UL)	ID	0.0031	ID	0.00003	NR	NR	5.40E-06	4.08E-07	3.40E-10	5.27	6.38	0.13	0.5	1	1	1
6	Chrysene (S4UL)	ID	0.31	ID	0.003	NR	NR	3.18E-06	4.57E-06	3.77E-10	4.74	5.73	0.13	0.5	1	1	1
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		Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (S4UL)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 dw	0.00033 fw	0.0002 fw	0.0011 fw
2	Benz(a)anthracene (S4UL)	1.35E+03	1.24E-06	3.80E-03	model	model	model	model	model	model
3	Benzo(b)fluoranthene (S4UL)	1.82E+03	6.34E-09	2.00E-03	model	model	model	model	model	model
4	Benzo(a)pyrene (S4UL)	2.24E+03	2.00E-08	3.80E-03	model	model	model	model	model	model
5	Dibenzo(ah)anthracene (S4UL)	3.24E+03	1.66E-10	6.00E-04	model	model	model	model	model	model
6	Chrysene (S4UL)	9.56E+02	4.52E-08	2.00E-03	model	model	model	model	model	model
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CLEA Software Version 1.071

Report generated 29/04/2024

Report title Roundstone Caravan Park, Southwater - Res with plant

Created by CP at Crossfield Consulting Limited

BASIC SETTINGS

Land Use Residential with produce

Building Bungalow
Receptor Female (res) Start age class 18 End age class 18 Exposure Duration 10 years
Soil Sandy clay loam

Exposure Pathways

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

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

Age Class	Exposure Frequencies (days yr^{-1})						Occupation Periods (hr day^{-1})		Soil to skin adherence factors (mg cm^{2})		Direct soil ingestion rate (g day^{-1})	Body weight (kg)	Body height (m)	Inhalation rate (m^{3} day^{-1})	Max exposed skin factor		Total skin area (m^{2})
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Indoors	Outdoors	Indoor	Outdoor					Indoor (m^{2} m^{-2})	Outdoor (m^{2} m^{-2})	
1	180	180	180	180	365	365	23.0	1.0	0.06	1.00	0.10	5.60	0.7	8.5	0.32	0.26	3.43E-01
2	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	9.80	0.8	13.3	0.33	0.26	4.84E-01
3	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	12.70	0.9	12.7	0.32	0.25	5.82E-01
4	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	15.10	0.9	12.2	0.35	0.28	6.36E-01
5	365	365	365	365	365	365	19.0	1.0	0.06	1.00	0.10	16.90	1.0	12.2	0.35	0.28	7.04E-01
6	365	365	365	365	365	365	19.0	1.0	0.06	1.00	0.10	19.70	1.1	12.2	0.33	0.26	7.94E-01
7	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	22.10	1.2	12.4	0.22	0.15	8.73E-01
8	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	25.30	1.2	12.4	0.22	0.15	9.36E-01
9	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	27.50	1.3	12.4	0.22	0.15	1.01E+00
10	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	31.40	1.3	12.4	0.22	0.15	1.08E+00
11	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	35.70	1.4	12.4	0.22	0.14	1.19E+00
12	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	41.30	1.4	13.4	0.22	0.14	1.29E+00
13	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	47.20	1.5	13.4	0.22	0.14	1.42E+00
14	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	51.20	1.6	13.4	0.22	0.14	1.52E+00
15	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	56.70	1.6	13.4	0.21	0.14	1.60E+00
16	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	59.00	1.6	13.4	0.21	0.14	1.63E+00
17	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.00	1.6	14.8	0.33	0.27	1.78E+00
18	**365**	**365**	**365**	**170**	**365**	**365**	**16.0**	**1.0**	**0.06**	**0.30**	**0.05**	70.90	1.6	**17.4**	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

	MEAN RATES						90TH PERCENTILE RATES					
Age Class	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 Bungalow

Soil Sandy clay loam

Building footprint (m^2)	7.80E+01
Living space air exchange rate (hr^{-1})	5.00E-01
Living space height (above ground, m)	2.40E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	2.60E+00
Foundation thickness (m)	1.50E-01
Floor crack area (cm^2)	7.07E+02
Dust loading factor ($\mu g\ m^{-3}$)	5.00E+01

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	1.60E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.70E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.50E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density ($g\ cm^{-3}$)	1.20E+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	9.40E+00
Soil Organic Matter content (%)	3.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	1.74E-02
Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($cm^3\ s^{-1}$)	2.50E+01
Building ventilation rate ($cm^3\ s^{-1}$)	2.60E+04
Averaging time surface emissions (yr)	10
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	29-Apr-24
Report title	Roundstone Caravan Park, Southwater - Res without plant
Created by	CP at Crossfield Consulting Limited

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (S4UL)	4.11E+02	4.81E+02	NR	1.00	0.85	NR	NR	No	No	No	0	0	0	0	0	0
2	Benz(a)anthracene (S4UL)	1.90E+02	2.06E+02	9.88E+01	0.52	0.48	1.00	5.13E+00 (sol)	No	No	No	0	0	0	0	0	0
3	Benzo(b)fluoranthene (S4UL)	4.79E+01	8.43E+01	3.06E+01	0.64	0.36	1.00	6.04E-01 (vap)	No	No	No	0	0	0	0	0	0
4	Benzo(a)pyrene (S4UL)	3.81E+01	6.77E+01	2.44E+01	0.64	0.36	1.00	2.73E+00 (vap)	No	No	No	0	0	0	0	0	0
5	Dibenzo(ah)anthracene (S4UL)	3.81E+00	6.74E+00	2.43E+00	0.64	0.36	1.00	1.18E-02 (vap)	No	No	No	0	0	0	0	0	0
6	Chrysene (S4UL)	3.81E+02	6.07E+02	2.34E+02	0.61	0.39	1.00	1.32E+00 (vap)	No	No	No	0	0	0	0	0	0
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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	Arsenic (S4UL)	99.9	0.1	0.0	100.0	4.11E+02	NR	2.05E+02	1.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Benz(a)anthracene (S4UL)	100.0	0.0	0.0	100.0	9.88E+01	2.31E-03	4.94E+01	4.21E-08	0.00E+00	1.90E-06	5.54E-07	0.00E+00	NA	NA	NA	NA	NA	NA
3	Benzo(b)fluoranthene (S4UL)	100.0	0.0	0.0	100.0	3.06E+01	3.44E-05	1.53E+01	1.30E-08	0.00E+00	6.46E-08	1.42E-07	0.00E+00	NA	NA	NA	NA	NA	NA
4	Benzo(a)pyrene (S4UL)	100.0	0.0	0.0	100.0	2.44E+01	1.91E-05	1.22E+01	1.04E-08	0.00E+00	4.06E-08	1.03E-07	0.00E+00	NA	NA	NA	NA	NA	NA
5	Dibenzo(ah)anthracene (S4UL)	100.0	0.0	0.0	100.0	2.43E+00	4.06E-06	1.22E+00	1.04E-09	0.00E+00	4.28E-09	8.24E-09	0.00E+00	NA	NA	NA	NA	NA	NA
6	Chrysene (S4UL)	100.0	0.0	0.0	100.0	2.34E+02	7.78E-04	1.17E+02	9.96E-08	0.00E+00	1.12E-06	1.54E-06	0.00E+00	NA	NA	NA	NA	NA	NA
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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 and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (S4UL)	2.90E-04	0.00E+00	1.03E-05	1.71E-06	0.00E+00	0.00E+00	0.00E+00	96.56	0.00	3.44	0.00	0.00	0.00	0.00	0.00
2	Benz(a)anthracene (S4UL)	6.97E-05	0.00E+00	1.07E-05	4.11E-07	3.10E-07	0.00E+00	0.00E+00	85.87	0.00	13.24	0.51	0.38	0.00	0.00	0.00
3	Benzo(b)fluoranthene (S4UL)	2.15E-05	0.00E+00	3.32E-06	1.27E-07	1.06E-08	0.00E+00	0.00E+00	86.17	0.00	13.28	0.51	0.04	0.00	0.00	0.00
4	Benzo(a)pyrene (S4UL)	1.72E-05	0.00E+00	2.65E-06	1.01E-07	6.65E-09	0.00E+00	0.00E+00	86.17	0.00	13.28	0.51	0.03	0.00	0.00	0.00
5	Dibenzo(ah)anthracene (S4UL)	1.72E-06	0.00E+00	2.65E-07	1.01E-08	7.01E-10	0.00E+00	0.00E+00	86.17	0.00	13.28	0.51	0.04	0.00	0.00	0.00
6	Chrysene (S4UL)	1.65E-04	0.00E+00	2.54E-05	9.73E-07	1.84E-07	0.00E+00	0.00E+00	86.12	0.00	13.28	0.51	0.10	0.00	0.00	0.00
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			Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)	Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{OC} ($cm^3\ g^{-1}$)	log K_{OW} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}\ DW$)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (S4UL)	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	1	1
2	Benz(a)anthracene (S4UL)	ID	0.155	ID	0.0015	NR	NR	3.16E-05	4.60E-06	3.80E-10	4.89	5.91	0.13	0.5	1	1	1
3	Benzo(b)fluoranthene (S4UL)	ID	0.039	ID	0.00038	NR	NR	2.05E-06	4.36E-06	3.62E-10	5.02	6.08	0.13	0.5	1	1	1
4	Benzo(a)pyrene (S4UL)	ID	0.031	ID	0.0003	NR	NR	1.76E-06	4.38E-06	3.67E-10	5.11	6.18	0.13	0.5	1	1	1
5	Dibenzo(ah)anthracene (S4UL)	ID	0.0031	ID	0.00003	NR	NR	5.40E-06	4.08E-07	3.40E-10	5.27	6.38	0.13	0.5	1	1	1
6	Chrysene (S4UL)	ID	0.31	ID	0.003	NR	NR	3.18E-06	4.57E-06	3.77E-10	4.74	5.73	0.13	0.5	1	1	1
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		Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (S4UL)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 dw	0.00033 fw	0.0002 fw	0.0011 fw
2	Benz(a)anthracene (S4UL)	1.35E+03	1.24E-06	3.80E-03	model	model	model	model	model	model
3	Benzo(b)fluoranthene (S4UL)	1.82E+03	6.34E-09	2.00E-03	model	model	model	model	model	model
4	Benzo(a)pyrene (S4UL)	2.24E+03	2.00E-08	3.80E-03	model	model	model	model	model	model
5	Dibenzo(ah)anthracene (S4UL)	3.24E+03	1.66E-10	6.00E-04	model	model	model	model	model	model
6	Chrysene (S4UL)	9.56E+02	4.52E-08	2.00E-03	model	model	model	model	model	model
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CLEA Software Version 1.071

Report generated	29/04/2024
Report title	Roundstone Caravan Park, Southwater - Res without plant
Created by	CP at Crossfield Consulting Limited

BASIC SETTINGS

Land Use	Residential without produce						
Building	Apartment - Large						
Receptor	Female (res)	Start age class	18	End age class	18	Exposure Duration	10 years
Soil	Sandy clay 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 without produce **Receptor** Female (res)

Age Class	Exposure Frequencies (days yr^{-1})						Occupation Periods (hr day^{-1})		Soil to skin adherence factors (mg cm^{-2})		Direct soil ingestion rate (g day^{-1})	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor		Total skin area (m^2)
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Indoors	Outdoors	Indoor	Outdoor					Indoor (m^2 m^{-2})	Outdoor (m^2 m^{-2})	
1	180	0	180	180	365	365	23.0	1.0	0.06	1.00	0.10	5.60	0.7	8.5	0.32	0.26	3.43E-01
2	365	0	365	365	365	365	23.0	1.0	0.06	1.00	0.10	9.80	0.8	13.3	0.33	0.26	4.84E-01
3	365	0	365	365	365	365	23.0	1.0	0.06	1.00	0.10	12.70	0.9	12.7	0.32	0.25	5.82E-01
4	365	0	365	365	365	365	23.0	1.0	0.06	1.00	0.10	15.10	0.9	12.2	0.35	0.28	6.36E-01
5	365	0	365	365	365	365	19.0	1.0	0.06	1.00	0.10	16.90	1.0	12.2	0.35	0.28	7.04E-01
6	365	0	365	365	365	365	19.0	1.0	0.06	1.00	0.10	19.70	1.1	12.2	0.33	0.26	7.94E-01
7	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	22.10	1.2	12.4	0.22	0.15	8.73E-01
8	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	25.30	1.2	12.4	0.22	0.15	9.36E-01
9	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	27.50	1.3	12.4	0.22	0.15	1.01E+00
10	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	31.40	1.3	12.4	0.22	0.15	1.08E+00
11	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	35.70	1.4	12.4	0.22	0.14	1.19E+00
12	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	41.30	1.4	13.4	0.22	0.14	1.29E+00
13	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	47.20	1.5	13.4	0.22	0.14	1.42E+00
14	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	51.20	1.6	13.4	0.22	0.14	1.52E+00
15	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	56.70	1.6	13.4	0.21	0.14	1.60E+00
16	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	59.00	1.6	13.4	0.21	0.14	1.63E+00
17	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.00	1.6	14.8	0.33	0.27	1.78E+00
18	**365**	**365**	**365**	**170**	**365**	**365**	**16.0**	**1.0**	**0.06**	**0.30**	**0.05**	70.90	1.6	**17.4**	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 Apartment - Large

Soil Sandy clay loam

Building footprint (m^2)	8.00E+01
Living space air exchange rate (hr^{-1})	5.00E-01
Living space height (above ground, m)	2.50E+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)	2.56E+03
Dust loading factor ($\mu g\ m^{-3}$)	5.00E+01

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	1.60E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.70E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.50E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density ($g\ cm^{-3}$)	1.20E+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	9.40E+00
Soil Organic Matter content (%)	3.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	1.74E-02
Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($cm^3\ s^{-1}$)	2.50E+01
Building ventilation rate ($cm^3\ s^{-1}$)	2.78E+04
Averaging time surface emissions (yr)	10
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 None