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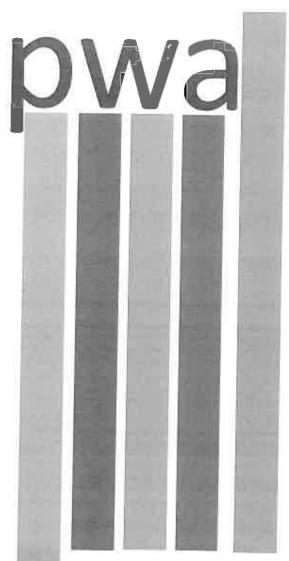
Geo-Environmental Ltd

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Project Ref: 17140/GR/02 Victoria Mill,

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Dr Lindsay Palmer November 2017

Project Details: Victoria Mills, Sabden

Date: November 2017



Client

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Documents Revision Status

REVISION	DATE	COMMENTS
V1	November, 2017	

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Date: November 2017



Executive Summary

Background

Skipton Properties Ltd., are proposing the redevelopment of a site, located at Victoria Mill in Sabden, Lancashire. The site currently comprises the former Victoria Mill complex and a small historic reservoir, with Sabden Brook culverted beneath the Mill building through the centre of the site.

The development proposal comprises the construction of approx. 35 No. Residential properties with associated gardens, parking spaces and access roads, along with the conversion of part of the existing Mill building within the north-eastern area of the site into 3 No. Residential dwellings.

PWA Geo-Environmental Brief and Objective

A Geo-environmental Assessment for the site was initially undertaken by RSK in 2010. A Phase 1 preliminary risk assessment was undertaken by PWA Geoenvironmental Ltd., in July 2017 . PWAG were subsequently commissioned by Skipton Properties, to undertake a Phase II Geo-environmental Assessment for the site. The overall objective of the review was to determine the presence and likely extent of any potential environmental liabilities associated with the current and past uses of the site, with respect to the proposed residential development and provide a preliminary geotechnical assessment of the site, as well as to satisfy the local planning authority and provide information on substructure design.

Site History

Historical maps dating from 1848 indicate that at this time the northern area of the site was developed with a commercial Mill building and a reservoir/Mill Pond located in the north-western area of the site; with the southern area of the site undeveloped. By 1893 the majority of the site was shown to be occupied by Victoria Mills, with a Mill Pond in the northern area and a small reservoir located within the southwestern corner of the site and by 1911 a chimney is also recorded on-site (associated with Victoria Mills). Historic maps dating from 1970 show the Mill Pond within the north is no longer recorded and an electric substation is denoted adjacent to the eastern boundary of the site. The site has recently been utilised by Marbill Developments Ltd with the yard area to the south utilised by Castle Sheet Metal Works.

A summary of the Phase II Assessment is provided in the following table; this brief summary should not be assumed to represent a complete account of all the potential geo-environmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.

Subject	Remarks		
Current use	The northern and central areas of site are currently unused and occupied by a vacant Mill building. The southern yard area is currently used for storage by Castle Sheet Metal Works.		
Adjacent land uses	North–Whalley Road with residential properties beyond. East–Watt Street with commercial/residential premises beyond. South –Castle Sheet Metal Works with residential premises beyond. West –Small reservoir with open fields beyond.		
Mining	The Envirocheck Report states that the site is within an area that may be affected by Coal Mining activities, however, the Coal Authority Interactive Map Viewer shows that there are no mine entries, coal seams or historical workings within 2.5km of the site. The risk from shallow coal mining is therefore assessed as very low.		
Site Works	Site investigation works were undertaken on the 14 th September 2017 and initially comprised seven trial pits, to depths of up to 2.4m bgl, A second phase of site investigation was undertaken		

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on the 23rd October and comprised five window sample boreholes to a depth of 4.0m bgl, with ground gas/groundwater monitoring wells installed in four window sample borehole locations to allow ground gas and groundwater monitoring. Additional monitoring and chemical testing of surface and groundwater was also undertaken following the identification of NAPL within historic boreholes onsite. The ground conditions were generally found to comprise Made Ground over superficial drift deposits, comprising alluvium over glacial till and weathered bedrock. In the northern/north-western area of the site, Made Ground was encountered from ground level to depths of between 1.5 and 2.1m bgl, and typically comprised a slightly clayey sandy GRAVEL. Gravel was of brick, sandstone, and tiles (including asbestos cement tiles) with very occasional fragments of metal wire and glass. In the central area of the site (within the footprint of the Mill building) Made Ground was generally encountered to depths of 0.4 m bgl, (although the historic investigation undertaken by RSK recorded Made Ground up to depths of 2.20m bgl within the central area this was not confirmed by the PWAG investigation). The Made Ground generally comprised dark grey ashy sandy gravel or slightly sandy gravel, with gravel of clinker, limestone and brick fragments and a hydrocarbon odour noted in WS02. In the south of the site Made Ground was encountered from ground level to depths of between 0.3 and 1.20m bgl and typically comprised a dark grey gravel of limestone, brick fragments and clinker underlain by either a creamy brown slightly clayey sand or a dark grey to greyish brown sandy gravel of clinker, brick, sandstone and fine coal. In the northern/north-western areas of the site, soft to very soft alluvium (Mill pond sediments) Ground was encountered beneath the Made Ground at depths of between 1.5 and 2.1m bgl and proven Conditions up to a depth of 3.20m bgl in WS01. The Alluvium generally comprised a grey soft to very soft Encountered organic silty clay and an associated hydrocarbon odour was noted in TP02 and WS01. In the central area of the site (within the footprint of the historic Mill building) Alluvium was encountered beneath the Made Ground at depths of 0.4m and proven up to a depth of 2.40m bgl in WS02 and generally comprised a brown slightly gravelly to gravelly sandy CLAY or wet slightly gravelly to gravelly SAND or very sandy GRAVEL. Alluvium was not encountered within the southern area of the site. In the southern area of the site only Glacial Till was encountered directly beneath the Made Ground at depths of between 0.3 and 1.20m bgl and proven to depths of 2.70m bgl. The Glacial Till typically comprised a soft to firm brown slightly sandy gravelly CLAY, underlain by a firm to stiff orangish brown and greyish brown sandy slightly gravelly clay. Weathered bedrock (Sabden Shales) was generally encountered beneath the Glacial Till at depths of between 2.10 and 3.20m bgl and proven to a depth of 4.0m in WS01. The weathered bedrock generally comprised a firm to stiff or stiff greyish brown sandy gravelly CLAY with gravel and cobbles of mudstone and sandstone. Three samples (between depths of 0.2m and 1.9m bgl) returned elevated concentrations of Lead. Two samples were collected from the north-western area of the site, one of which relates to Mill Pond sediments (TP01 at 1.9m bgl), with the other exceedance relating to material sampled from WS03 – in the vicinity of the former suspected gasometer area. One sample of Alluvium (Mill Pond sediments) taken from TP01 at 1.9m bgl also returned elevated concentrations of C16 - C21, and C21 -C35 Aromatic Petroleum Hydrocarbon species and an elevated concentration of zinc compared to the zinc GAC for plant life. Two samples of Alluvium (Mill pond sediments) returned elevated concentrations of PAH including Benzo(a)pyrene, Benz(a)anthracene, Benzo(b)fluoranthene, Chysene, Dibenz(a,h) Contamination anthracene and Indeno(1,2,3,cd)pyrene. Elevated concentrations of PAH were also identified in (Human Health) shallow Made Ground within the north-western area of the site (TP03 at 0.2m bgl) and alluvium underlying the Mill building (WS03 at 0.7m bgl). Two samples taken from Made Ground in the north-western area of the site (TP01 at 0.6m and TP03 at 0.2 – 0.2m bgl) returned a positive asbestos identification (identified as Fibres/Clumps of Chrysotile) with concentrations of 0.005% and 0.002% respectively. In addition, a sample of

suspected ACM (tiles) obtained from trial pit TP03 at 1.4m bgl was also sent for Asbestos testing

and was subsequently confirmed as Chrysotile cement/insulation.

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In addition to the above Non Aqueous Phase Liquids (NAPL-comprising Oil/creoscontamination) was encountered during groundwater monitoring of historic borehold and WS04) within the former Mill building. Additional groundwater monitoring was subsundertaken to assess the potential risk to controlled waters. Contamination (Plant Life) One sample (Mill Pond sediment) returned a slightly elevated concentration of Zinc (39 compared to the GAC for plant life of 300mg/kg. Following the installation of a clean cover the risk to plant life is likely to be negligible. Minor groundwater seepages were noted within the Made Ground and shallow soils on subsequent groundwater monitoring recorded shallow groundwater between 0.89 and associated with the Alluvium sands and gravels. Although chemical testing of groundwater was not initially scheduled as part of the investigation, NAPL (comprising Oil/creosote type contamination) was recorded groundwater monitoring of historic boreholes within the former Mill building and accompositional chemical testing of groundwater was undertaken to assess the potential controlled waters. The results of the groundwater analysis indicate that there are locally concentrations of organic hydrocarbon contaminant species within shallow groundwaters waters within shallow groundwaters analysing the site, although the majority of determinands analysed were below the discontinuation.	es (WS05 equently Omg/kg) r system site, and 1.9m bgl Phase 2 during cordingly I risk to elevated dwaters
(Plant Life) compared to the GAC for plant life of 300mg/kg. Following the installation of a clean cover the risk to plant life is likely to be negligible. Minor groundwater seepages were noted within the Made Ground and shallow soils on subsequent groundwater monitoring recorded shallow groundwater between 0.89 and associated with the Alluvium sands and gravels. Although chemical testing of groundwater was not initially scheduled as part of the investigation, NAPL (comprising Oil/creosote type contamination) was recorded groundwater monitoring of historic boreholes within the former Mill building and accompanies additional chemical testing of groundwater was undertaken to assess the potential controlled waters. The results of the groundwater analysis indicate that there are locally concentrations of organic hydrocarbon contaminant species within shallow groundwaters.	r system site, and 1.9m bgl Phase 2 during ordingly I risk to elevated dwaters
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limit of the laboratory.	atection
The Secondary A Aquifer underlying the site is classified as having Good Chemical status, a permeability Glacial Till overlying the aquifer limiting vertical migration of potential contar Accordingly, the site is not considered to present a significant risk to groundwater. The Brook watercourse is currently culverted within the central area of the site. Additional water monitoring was also undertaken to assess the risk to Sabden Brook and sho significant difference in water quality between upstream and downstream samples indicate the subject site is not having a detrimental impact on the water quality of the curvatercourse (Sabden Brook).	ninants. Sabden surface wed no
It was considered from the evidence available that the gas generation potential at the site below to moderate. This was based on the site being underlain by deep areas of Made (up to 2.1m thick), underlain by Alluvium and Glacial Till deposits and the historical prese Mill Pond. Given the residential end-use of the site, the sensitivity of the development considered to be high.	Ground, nce of a ent was
Accordingly, the gas monitoring programme in accordance with CIRIA C665 was sched comprise nine return visits over a six month period once the site works were completed. will be provided in a ground gas addendum following completion of the monitoring programme.	Results
Apart from the undulating ground within the northwest of the site (associated with the mill pond) site levels are currently relatively level within the central and southern areas site, although the southern area of the site sits at a higher elevation (from 140m within the area to 143.0m in the south of the site). It is anticipated that finished floor levels will be be approximately 141.8m and 143.3m AoD; and therefore upfilling works are likely to be required the central and northern areas. Accordingly, it is recommended that an Earthworks Strategies developed for the site prior to any works starting. Minor groundwater seepages were encountered during the site works and more undertaken to date, has recorded groundwater levels between 0.89 and 1.9m bgl. As su envisaged that at shallow depths (<2m bgl) any groundwater seepages will be minor, and controlled by sump pumping methods. However, below 2m more significant groundwater	historic s of the central etween uired in ategy is hitoring ach it is
may be encountered and a dewatering specialist contractor may be required. A number of trial pit excavations were noted to be slightly unstable and shallow	buried
obstructions were encountered in localised areas, including a historic culvert encountered northern area of site and a sandstone wall (possible relic foundation) within the eastern is recommended that the historic culvert is surveyed and either diverted/culverted (if it is grubbed out and filled with suitably compacted granular fill (if it is no longer in use or required it is envisaged that the excavation of shallow soils may present some difficulty for smalle and equipment, and the provision of a breaker is likely to be required. It is recommended to	area. It live) or uired). r plant

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	site personnel enter any trenches unless there is adequate support and this has been assessed by a competent person.
Floor Slab	We understand that an Insulslab Floor slab solution is the clients preferred floor slab solution. An 'Insulslab' solution could be constructed on vibro-treated Made Ground, engineered granular fill, or re-engineered soils to achieve Insulslab specifications.
	Skipton Properties preferred foundation solution is a Insulsiab Raft.
	In the north-western area of the site very soft to soft compressible alluvium soils have been recorded to a maximum depth of 2.70m bgl, and it is recommended that a piled foundations solution is adopted to transfer loads down to more competent strata, as the excavation and replacement of the weak, compressible soils with granular fill is unlikely to be economical.
	In the central area of the site (within the Mill building footprint) where Made Ground has generally been recorded to depths of 0.4mbgl. Given the relative density of the Made Ground and underlying alluvium and the requirement for significant upfilling works it is anticipated that an Insulslab raft solution can be adopted subject to the works being undertaken to achieve a suitable end specification, to be agreed with the Insulslab foundation designer.
Foundation Solutions	In the southern area of the site, where the top of the Glacial Till and/or weathered bedrock is currently between 0.3m and 0.8m below the current ground level, insulslab raft foundation can be adopted within the firm to stiff orangish brown to greyish brown slightly sandy to sandy slightly gravelly to gravelly CLAY where an allowable bearing capacity of 100kN/m2, can be adopted for foundation design which should limit total settlement to less than 25mm. A minimum foundation depth of 0.9m is required and the Glacial Till should be excavated and replaced with granular fill.
	Further deepening of foundations may be required locally where foundations are within the zone of influence of existing trees in accordance with Chapter 4.2 of NHBC Standards. The clays present on-site range from low to medium volume change potential, and where present within the zone of influence of foundations, a minimum foundation depth of 1.25m below existing site levels is recommended for residential properties. In addition, the influence of proposed shrub planting on foundation depths should be considered, in accordance with NHBC Standards.
Roads and Paved Areas	It is considered likely a CBR of 5% will be achievable over the majority of the site, (with the exception of the northwest and southwest areas of the site where a CBR of less than 2.5% is likely) and can be used for preliminary design, subject to in-situ testing during construction. Where the CBR is found to be less than 2.5%, the sub-grade may be unsuitable for both the trafficking of site plant and as support for a permanent foundation, without improvement works being undertaken. Improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5.
	The results of sulphate concentrations and pH values presented in Section 7.3 suggest a Design Sulphate Class of DS-1 and ACEC Class of AC-1 for the Made Ground and Glacial Till shallow soils.
Sulphate Class	For the Alluvium recorded within the north/north-western area of the site (encountered between 1.5 and 2.40m bgl) the sulphate and pH results suggest a Design Sulphate Class of DS-2 and ACEC Class of AC-2.

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APPENDICES

Appendix A – General Notes

01	Standard definitions, procedures, guidance.	

Appendix B - Drawings

Drawing No.	Title	
17140-G-150	Site Location	
17140-G-151	Schematic Conceptual Site Model	
17140-G-152	Site Investigation Plan	
DGL Associates drawing		
Development Layout (27 th July 2017)	Proposed Development Plan	

Appendix C – Exploratory Hole Logs and Trial Pit Photographs

Appendix D – Chemical Laboratory Results and GAC Summary

Appendix E – Geotechnical Laboratory Results

Appendix F – Gas Monitoring Results

Appendix G – Statistical Summary (GAC)

Appendix H - Asbestos Assessments JIWG - DST

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FOREWORD (Geo-environmental Investigation Report)

This report has been prepared for the sole use and reliance of Skipton Properties Limited (the Client) named above and cannot be relied upon by any other parties without the express written authorisation of PWA Geo-Environmental Ltd. Any unauthorized third party relies on this report at their own risk and the authors owe them no duty of care.

The report presents observations and factual data obtained during our site walkover, along with information reviewed during the desk study, and provides an assessment of geo-environmental issues with respect to information provided by the Client regarding the site. Further advice should be sought from PWA Geo-Environmental Ltd should the site be redeveloped.

The report should be read in its entirety, including all associated drawings and appendices. PWA Geo-Environmental Ltd cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third party reports) are based on information obtained from the sources listed, which PWA Geo-Environmental Ltd understands are reliable. All reasonable skill, care and diligence has been applied in examining the information obtained. However, PWA Geo-Environmental Ltd accepts no responsibility for inaccuracies in the data supplied or for opinions based on any such inaccurate data.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

PWA Geo-Environmental Ltd reserves the right to amend their conclusions and recommendations in the light of further information that may become available.

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1. INTRODUCTION

PWA Geo-Environmental Ltd (PWAG), have been commissioned by Skipton Properties Ltd. to carry out a Phase II Geo-Environmental assessment of the former Victoria Mill Complex located to the south of Whalley Road, and to the west of Watt Street in Sabden, Lancashire. The site has recently been utilised by Marbill Developments Ltd with the yard area to the south utilised by Castle Sheet Metal Works. It is understood that the proposed development comprises approx. 35 No. residential properties with associated, gardens, access roads and parking areas along with the conversion of the existing Mill building within the north-eastern area of the site into 3 No. Residential dwellings.

A Phase 1 desk based preliminary risk assessment has been previously undertaken by PWA Geoenvironmental Ltd. (Ref: 17140/GR/01, July 2017) and it is recommended that report is read in conjunction with this report. Although, a summary of the Phase 1 report is provided in the subsequent sections of this report.

The objectives of this Phase II investigation are to assess the ground conditions at the site, to provide a preliminary assessment for potential contamination and provide geotechnical recommendations and geotechnical design parameters for the proposed development.

The Phase II assessment includes:

- Intrusive investigation to assess the ground conditions.
- Chemical Laboratory Testing.
- Geotechnical Laboratory Testing.
- Geo-environmental Risk Assessment.
- Geotechnical Assessment.
- Ground gas and groundwater monitoring

General notes and limitations relevant to all PWA Geo-Environmental Ltd preliminary investigations are described in the Foreword. These should be read in conjunction with this report. The text of the report draws specific attention to any modification to these procedures and to any other special techniques employed.

Standard definitions, procedures and guidance are contained within Appendix A, which includes background, generic information on assessment of the site's environmental setting.

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2 SITE PROFILE

2.1 Site Location

The site location is shown on Drawings No. 17140-G-150, and is presented in Appendix B to this report. Site details are summarised in Table 1 below.

Table 1. Site Details

Detail	Remarks
Location	Watt Street, Sabden BB7 9ED
NGR	NGR 377586, 437259
Area	Approx.11,700m² (~1.7 Ha)
Known services	Communications, electric. The positions of other services are currently unknown. It is recommended that a full utilities survey is undertaken prior to the commencement of any site works.

2.2 Site Reconnaissance

A site reconnaissance was undertaken on 11^{th} July 2017; observations are summarised in Table 2 and below. In addition, site photographs are provided in Appendix C.

Access to the north-eastern area of the site is provided from a gated entrance located off Watt Street which leads onto a small yard area, and the main entrance to the Victoria Mill building. A smaller stone Mill building (understood to be housing an electric sub-station) is located immediately adjacent to the south of the access gate onto Watt Street. The majority of the ground surface within this area is covered by stone setts/cobbles, with a partly demolished. chimney located within the central area of the site.

The entrance door to Victoria Mill leads through an office area into a large warehouse building with asbestos cement corrugated sheet roofing. Areas of the warehouse building roof were noted to be in a general state of disrepair. A second entrance/door leads from the northern perimeter of the Victoria Mill warehouse to another small yard located to the north /northwest of the Victoria Mill complex. A number of trees, weeds and shrubs were noted within the western area of the yard, alongside Sabden Brook which is culverted under the Victoria Mill building before flowing to the west. The ground within the north-western area was noted to be soft underfoot and anecdotal evidence suggests that mechanical excavators had difficulties traversing this area of the yard — due to soft areas of ground (possible historic reservoir area).

A large yard area also occupies land to the south of the Victoria Mill complex, and to the north of Castle Sheet metal works. This yard area can be accessed via a second entrance further to the south on Watt Street. The yard is also enclosed by high stone walling and is currently covered by either concrete hardstanding or gravel hardcore, with scrub/vegetation within the far western area of the yard — adjacent to the western perimeter wall. A small historic reservoir is understood to be located further (to the west), beyond the western perimeter of the yard, however access to this area was not available due to the high stone walling and dense vegetation currently within this area.

No significant evidence of contamination was noted onsite.

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Table 2. Site Reconnaissance Findings

Feature	Remarks	
Current Access	Vehicle and pedestrian access via gate, accessed off Watt Street.	
Topography	The site sits at an elevation of between 140m and 143m AOD, with the elevation decreasing towards Sabden Brook in the central/ northern area of the site.	
Surrounding land uses	North-Whalley Road with residential properties beyond.	
	East-Watt Street with commercial premises beyond.	
	South - Caste Sheet Metal with residential premises beyond.	
	West –Small reservoir with open fields beyond.	

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2.3 Historical Reports

2.3.1 RSK Group Geo-environmental Assessment (Ref: 350059-R01(00) 2010)

A Geo-Environmental Site Assessment was previously undertaken by the RSK group in 2010 and a summary of the findings is provided below.

The assessment previously undertaken by RSK involved a preliminary risk assessment based on a site walkover and a review of published data including historic maps, along with intrusive site investigation works.

The preliminary risk assessment identified a number of potential pollutant linkages including ground gas migration from a number of potential sources, the potential for Made Ground across the site and potentially contaminated soils associated with potential onsite and off-site sources identified by the RSK review.

The site investigation works were undertaken in June 2010 and comprised of four No. cable percussive boreholes, eleven window sample boreholes, and eight trial pits, along with in-situ testing and sample collection for geotechnical and chemical laboratory testing. Monitoring wells were also installed to allow for ground gas and groundwater monitoring. The RSK geoenvironmental site assessment report provides a detailed description of the ground conditions encountered which are summarised below:

Ground conditions

Made Ground was encountered in all exploratory hole locations to a maximum depth of 3.70m bgl in BH01.

Boulder clay was encountered in BH01, BH02 and BH03 and in all window sample locations except WS02 and all trial pits except TP06. In addition to this WS04, TP07 and TP08 encountered a sand or sand and gravel between 1.10 and 3.00m representing the alluvium deposits associated with Sabden Brook. Bedrock was not encountered in any of the exploratory holes.

Geotechnical Assessment

Geotechnical Laboratory testing show that the clays are classified as having a Low Shrinkability and that foundations should be placed at a minimum depth of 0.75m below existing or final ground level (whichever is lower). The foundation depths in the vicinity of trees shrubs may need to be deepened to comply with requirements of NHBC Standards Chapter 4.2, building near trees. The RSK report recommends that foundations are taken down through any Made Ground to the underlying clay and designed to a net allowable bearing pressure of 125kN/m².

The results of Sulphate and pH testing undertaken as part of the RSK geo-environmental assessment suggests Design Sulphate Class of DS-1 and ACEC Class of AC-1.

Chemical Contamination Assessment

Some evidence of contamination was encountered in a number of exploratory holes undertaken as part of the RSK assessment. In TP01 a seepage and associated hydrocarbon odour and oily sheen was encountered at 1.20m bgl on the southern face of the trial pit, a slight hydrocarbon odour was noted in TP04 between 0.7 and 1.40m bgl, WS05 encountered an orange brown oily/ creosote like substance between 1.10 and 2.20m bgl, which was also

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encountered in WS08, and in groundwater samples collected from WS05. The main findings of the contamination assessment are detailed below:

- An assessment of chemical results against the GAC for a residential with plant uptake end use show all metal contaminant concentrations are below the respective GAC apart from Arsenic in TP06 at 0.70m bgl.
- Chemical assessment shows that (apart from Anthracene and Acenaphthene) the PAH US₉₅ confidence level concentrations of the soils tested are generally above the GAC for a residential end-use. Results highlight two potential hotspots associated with WS05 and TP06.
- An assessment of the TPH chemical results show that all US95 confidence level concentrations of the soils are below the GAC for a residential end-use -except for aliphatic hydrocarbons C8 to C16, aromatic hydrocarbons C9 to C35, and Benzene in WS05. Results indicate four potential hotspots around WS05, TP04, TP06 and TP07.
- Five groundwater samples were collected and sent for chemical testing as part of the RSK investigation. Results showed a slight exceedance for zinc and copper when compared to the EQS for freshwaters, however the EQS target values are dependent on hardness which was not assessed as part of the RSK investigation. Accordingly RSK recommend that the hardness of Sabden Brook is tested as part of any future works to enable the correct assessment/interpretation of chemical results.

Groundwater

Groundwater monitoring recorded groundwater levels between 138.76m AOD and 139.89m bgl.

Ground Gas Assessment

The initial two rounds of ground gas monitoring undertaken by RSK recorded a maximum methane concentration of 0.1 % v/v, a maximum carbon dioxide concentration of 2.5% v/v and a minimum oxygen concentration of 2.6 % v/v, with a maximum flow rate of 2.4 l/hr. Based on the highest monitoring results a GSV for CO_2 of 4.56 was calculated by RSK (it should be noted that PWAG considers there to be a numerical error in the RSK calculation and the actual GSV should be 0.0456 for CO_2), and the site was subsequently classified as Green and/or Characteristic Situation CS1. However only two rounds of the RSK ground gas monitoring data were provided and no RSK ground gas addendum has been made available.

Conclusions and Recommendations

The RSK geo-environmental assessment report concluded by recommending that the four potential hotspots and associated impacted soils should be removed as part of the development works, along with validation works undertaken to confirm that the contaminated soils have been removed.

A number of contaminant concentrations within shallow soils/Made Ground were found to be above the GAC for water supply pipes and RSK considered it likely that Protectaline water supply pipes would be required for any redevelopment on-site. In addition, RSK recommended that soil samples were tested for leachable metals, PAH and TPH to assess any potential impact on controlled waters.

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3 ENVIRONMENTAL SETTING

3.1 Geology

The BGS 1:50,000 scale geological map indicates that the central/southern area of the site is directly underlain by Glacial Till, which generally comprise firm to stiff clay and sandy clays, with Alluvium comprising clay, silt, sand and gravel indicated in the central and northern areas of the site (in the vicinity of Sabden Brook). These superficial deposits are underlain by the Sabden Shales which comprise interbedded Mudstone and Siltstone.

There are no Historical borehole logs held by the British Geological Survey in the vicinity of the site. The RSK investigation generally confirmed the published geology.

3.2 Hydrogeology

According to Environment Agency data the solid strata beneath the site have been designated as a Secondary A Aquifer, which are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers. The Superficial deposits are designated as Secondary Undifferentiated Aquifer. In most cases this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to variations in the rock type.

The site is not shown to lie within a Groundwater Source Protection Zone (SPZ).

Given the topography of the surrounding area and the location of surface water features it is assumed that the local groundwater flow will be towards the west, in the general direction of Sabden Brook and the River Calder.

Reference to the Environment Agency web site shows the Groundwater Body/Bodies beneath the site are classified as having Good Quantitative Quality and Good Chemical quality.

3.3 Hydrology

The nearest surface water feature is Sabden Brook which flows from east to west and is culverted beneath the Victoria Mill building complex, along with an unnamed watercourse which flows from the north and is culverted beneath Whalley Road prior to converging with Sabden Brook. The combined watercourse then flows towards the west/southwest and in the general direction of the River Calder which is located approx. 4km to the southwest of the site.

Reference to the Environment Agency web site shows the surface waters within the vicinity of the site (Sabden Brook) are classified as having Good Ecological quality and Good Chemical Quality.

The northern area of the site is designated by the Environment Agency database as being located in a Flood Zone 3 (which indicates that the site has a 1 in 100 annual probability of flooding), with the southern area of the site designated as being located within a Flood Zone 1 (less than 1 in 1000 annual probability of flooding). It is understood that a Flood and Geomorphology Risk Assessment (Ref: RLTFP07-08) has been undertaken by the River Ribble Trust, although there is no date on the report.

No further consideration of flood risk is undertaken in this report. It is recommended that specialist flood risk advice is sort with regards to surface waters, drainage and flooding.

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3.4 Preliminary Ground Gas Assessment

The risks associated with the ground gases methane (CH₄) and carbon dioxide (CO₂) are assessed using BS 8485:2015 (Ref. 1) guidelines from CIRIA 665 (Ref. 2) and the NHBC (Ref. 3).

Current UK best practice guidance suggests that the ground gas assessment and characterisation for a site is dealt with separately for different types of development. In the above guidance:

- 'Situation A' covers all forms of development (residential and industrial/commercial developments), other than low rise residential development; and
- 'Situation B' is defined as the specific development of low-rise (one to three storeys in height) housing with beam and block floors, vented sub-floor void and gardens.

The development proposals require consideration of Situation A.

From the available evidence, it is considered that the gas generation potential at the site will be low to moderate. This is based on the site being potentially underlain by deeper areas of Made Ground and Alluvium soils (associated with historic reservoir onsite), with Glacial Till deposits anticipated directly beneath this ground, a watercourse passing through the site and historic commercial/industrial activities previously undertaken onsite. Given the residential end-use of the site, the sensitivity of the development is considered to be high.

3.5 Radon

The Envirocheck report records that the site is in a lower probability Radon area where the maximum Radon Potential is between 1 - 3% of homes above the action level. The corresponding BRE guidance document (Ref. 4) indicates that no radon protection measures are required for developments or the construction of new dwellings undertaken in this area.

3.6 Unexploded Ordnance

In general accordance with CIRIA report C681 (Ref. 5) a non-UXO specialist screening exercise has been carried out for the site. The Zetica Unexploded Bomb Risk Map (Lancashire) indicates the site to be in an area of 'Low' Risk. In such cases Zetica advise that further action to mitigate the risk is considered prudent, although not essential.

3.7 Ecology

The site is located in a designated 'Area of Outstanding Natural Beauty', with an area of Ancient Woodland located approx. 690m to the Southwest of the site. There are no recorded ecological sensitive sites which have been identified within 1 km of the site.

3.8 Japanese Knotweed

Japanese Knotweed is an invasive non-native plant species. Guidance on the management of Japanese Knotweed on development sites is given in the Environment Agency's code of practice (2001; Ref. 6). The presence or absence of Japanese Knotweed requires assessment by a specialist survey and is beyond the scope of this report, although no evidence of its presence was noted during the site walkover.

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3.9 Summary of Site Sensitivity

The sensitivity of each of the identified receptors in the vicinity of the site to potential contamination sources are summarised in Table 7.

Table 7. Sensitivity of Environmental Receptors in the Vicinity of the Site

Receptor Type	Receptor(s)	Sensitivity	Reasoning
Groundwater Surface Water	Secondary Aquifer (at depth)	Low- Moderate	The Secondary A Aquifer underlying the site is classified as having Good Chemical status. However, the site is not located in a source protection zone and low permeability Glacial Ti and/or Mudstones are anticipated to overlie th aquifer.
	Secondary Undifferentiated Aquifer (Superficial deposits)	Low	Designated as both minor and non-aquifer in different locations due to variations in the rock type. Hydraulic continuity likely to be limited.
	Sabden Brook	Moderate	Sabden Brook located onsite, locally culverted and classified as good potential with respect to ecological status.

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4 GROUND INVESTIGATION STRATEGY

In consideration of the preliminary conceptual site model, plausible potential pollutant linkages were identified and formed the basis and justification for the intrusive site investigation works subsequently undertaken. The rationale is summarised below.

4.1 Sampling Strategy

The principal objectives of the study were to examine the ground conditions, provide a preliminary assessment of the environmental liabilities and to determine whether the site is suitable for the proposed development. The site investigation layout was designed to investigate the whole site, and to target specific features identified from a review of the sites history.

The exploratory hole locations are shown on Drawing 17140-G-152.

4.2 Chemical Testing

Nine soil samples from the Made Ground and underlying superficial deposits (Alluvium and Glacial Till) were collected and sent to Chemtest for chemical analysis. Each sample was analysed for a suite of determinands including heavy metals and organic compounds, including phenols, speciated PAH and Asbestos screening, with selected samples scheduled for TPH-CWG and asbestos quantification undertaken on any samples returning a positive asbestos identification. One additional sample of Made Ground (suspected asbestos tile) was also sent for Asbestos identification.

4.3 Geotechnical Testing

In total, ten samples were collected from the Made Ground and underlying natural Deposits and sent to Professional Soil Laboratories (PSL) in Doncaster for Atterberg tests and to DETS for 2:1 Water Soluble Sulphate and pH Testing.

4.4 Ground Gas monitoring

It is judged from the available evidence that the gas generation potential at the site is low to moderate, due to the potential for Made Ground, organic contaminants, Alluvium and organic soils associated with the infilled mill ponds and watercourse (Sabden Brook) passing through the site. The sensitivity of the development is considered to be high, on account of the development comprising residential properties, in line with C665.

The idealised monitoring frequency is 9-12 No. visits over 6 months (after Wilson et al 2005), Therefore, an initial monitoring period of 9 No. visits over 6 months, will be conducted. Depending on the concentrations recorded, additional monitoring may be required upon the completion of this programme.

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5 GROUND INVESTIGATION

5.1 Anticipated Ground Conditions

The BGS 1:50,000 scale geological map indicates that the majority of the site is directly underlain by superficial deposits denoted as Glacial Till (which generally comprises clay and sandy clays) and alluvium (comprising clay, silt, sand and gravel) indicated in the northern and central areas of the site -in the vicinity of Sabden Brook. These superficial deposits are underlain by the Sabden Shales which comprise interbedded Mudstone and Siltstone.

5.2 Site Works

The initial site investigation works were undertaken on the 14th September 2017 and comprised seven trial pits, excavated to a depth of 2.4m bgl. A second phase of site investigation was undertaken on the 23rd October and comprised five window sample boreholes to a depth of 4.0m bgl with ground gas/groundwater monitoring wells installed in four window sample borehole locations to allow ground gas and groundwater monitoring of the Made Ground and underlying Alluvium and Mill pond sediments.

Additional monitoring and chemical testing of surface and groundwater was also undertaken following the identification of NAPL within historic boreholes onsite.

The trial pits and window sample boreholes were logged by an engineering geologist in general accordance with BS 5930:2015 (Ref. 7) and Eurocode 7 (Ref. 8) requirements, with representative samples being taken for chemical analysis and geotechnical testing. Samples were taken stored and transported in general accordance with BS 10175:2011 (Ref. 9).

The trial pit logs are provided in Appendix C, chemical analysis results are provided in Appendix D and the geotechnical laboratory results are provided in Appendix E.

5.3 Ground Gas Monitoring

To date one out of nine monitoring visits have been undertaken to monitor ground gas concentrations and groundwater levels within the installed monitoring wells. The ground gas monitoring undertaken to date has recorded a maximum concentration of carbon dioxide of 0.6% v/v, a maximum concentration of methane of 0.0 % v/v and a minimum concentration of oxygen of 19.6%. No positive flow measurements have been recorded. A further eight visits will be undertaken, and results provided separately in a ground gas addendum report following completion of the ground gas monitoring programme.

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6 GROUND INVESTIGATION DATA

6.1 Ground Conditions

Ground conditions encountered across the site generally reflect the published geology and those previously recorded by RSK in 2010.

6.1.1 Made Ground

Made Ground was generally encountered across the site from existing ground level and/or beneath hardstanding. In the northern/north-western area of the site, Made Ground was encountered from ground level to depths of between 1.5 and 2.1m bgl, and typically comprised a slightly clayey sandy GRAVEL. Gravel was of brick, sandstone, tiles (including a number of asbestos cement tiles in TP03) with occasional fragments of metal wire and glass.

In the central area of the site (within the footprint of the Mill building) Made Ground was generally encountered from ground level to depths of 0.4m bgl (although the historic investigation undertaken by RSK recorded Made Ground up to depths of 2.20m bgl within the central area, this was not confirmed by the PWAG investigation). The Made Ground generally comprised dark grey ashy sandy gravel or slightly sandy gravel, with gravel of clinker, limestone and brick fragments with a hydrocarbon odour noted in WSO2.

In the southern area of the site, the Made Ground was encountered from ground level to depths of between 0.3 and 1.20m bgl and typically comprised a dark grey gravel of limestone, brick fragments and clinker underlain by either a creamy brown slightly clayey sand or a dark grey to greyish brown sandy gravel of clinker, brick, sandstone and fine coal with rare fragments of tile, plastic and metal pipe.

Shallow buried obstructions were encountered within the Made Ground in the northern area of the site, including a historic sandstone culvert (not flowing) encountered in TPO4 between 0.9m and 2.0m bgl.

SPT 'N' values between 3 and 12 were recorded within the Made Ground deposits.

6.1.2 Alluvium

In the northern/north-western areas of the site, Alluvium was encountered beneath the Made Ground in trial pits TP01, TP02, TP03 and WS01 at depths of between 1.5 and 2.1m bgl and proven up to a depth of 3.20m bgl in WS01. The Alluvium generally comprised a grey to dark grey soft to very soft organic slightly silty to silty clay with an associated hydrocarbon odour noted in TP02 and WS01. The Alluvium in this area is considered likely to relate to the former location of a Mill Pond historically located within the north-western area of the site.

In the central area of the site (within the footprint of the historic Mill building) Alluvium was encountered beneath the Made Ground in WS02 and WS03 at depths of 0.4m and proven up to a depth of 2.40m bgl in WS02. The Alluvium within this area generally comprised a brown slightly gravelly to gravelly sandy CLAY or wet slightly gravelly to gravelly SAND or very sandy GRAVEL.

Alluvium was not encountered within the southern area of the site.

The Laboratory tests show that the soft to very soft Alluvium has a Moisture Content of between 40 and 111%, a Liquid Limit of between 51 and 92%, and a Plasticity Index of between

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24 and 53%. This corresponds to soils with a high to extremely high plasticity. Modified Plasticity Index values between 20.1% and 50.3% were calculated, corresponding to soils with a medium to high volume change potential.

SPT 'N' values between 1 and 20 were recorded within the Alluvium showing the variable and low strength of these soils.

Indicative undrained shear strengths can be derived by applying a correlation factor to SPT 'N' values according to the material's plasticity, after Stroud (1975; Ref. 10). Based on typical plasticity index of between 24-53 % for the alluvium clays, a correction factor of between 4.2 and 5.0 is derived. Using the above correlation factor an indicative shear strength of between 4kPa and 100kPa is calculated, indicative of the high variation in strength of the alluvium soils, and confirming their unsuitability as founding strata.

6.1.3 Glacial Till

Glacial Till was encountered in the southern area of the site only, where it was encountered directly beneath the Made Ground in trial pits (TP05, TP06, TP07 and WS04, WS05) at depths of between 0.3 and 1.20m bgl and proven to depths of 2.70m bgl.

The Glacial Till typically comprised a soft to firm brown slightly sandy gravelly CLAY, underlain by a firm to stiff orangish brown to greyish brown slightly sandy to sandy slightly gravelly clay. Gravel is fine to coarse sub-rounded to sub-angular of sandstone and various lithologies.

The Laboratory tests show that the firm to stiff Glacial Till has a Moisture Content of between 22 and 27%, a Liquid Limit of between 38 and 59%, and a Plasticity Index of between 18 and 33%. This corresponds to soils with an intermediate to high plasticity. Modified Plasticity Index values between 16.5% and 31.0% were calculated, corresponding to soils with a low to medium volume change potential.

SPT 'N' values between 21 and 24 were recorded within the firm to stiff Glacial Till.

Indicative undrained shear strengths can be derived by applying a correlation factor to SPT 'N' values according to the material's plasticity, after Stroud (1975; Ref. 10). Based on typical plasticity index of between 18 - 33% for the Glacial Till clays, a correction factor of between 5.5 and 4.3 is derived. Using the above correlation factor an indicative shear strength of between 90 kPa and 132kPa is calculated, indicative of medium strength soils.

6.1.4 Weathered Sabden Shales

Weathered bedrock (Sabden Shales) was encountered beneath the Glacial Till in window sample WS01, WS02, WS03 and WS05 at depths of between 2.10 and 3.20m bgl and proven to a depth of 4.0m in WS01. The weathered bedrock generally comprised a firm to stiff greyish brown sandy gravelly CLAY with gravel and cobbles of mudstone and sandstone.

SPT 'N' values of > 50 were recorded within the weathered Sabden Shales.

Indicative undrained shear strengths can be derived by applying a correlation factor to SPT 'N' values according to the material's plasticity, after Stroud (1975; Ref. 10). Based on typical plasticity index of 18 - 23% for the clay, a correction factor of between 5.5 and 5.0 is derived. Using the above correlation factor an indicative shear strength of between 250kPa and 275kPa is calculated, indicative of a extremely weak Mudstone.

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6.2 Visual and Olfactory Evidence of Contamination

Suspected Asbestos Containing Materials (Chysotile cement roofing/tiles) were noted on the ground surface within the north-western area of the site and Asbestos Containing Materials (comprising asbestos cement tiles) were encountered within TP03 between 0.2 and 1.4m bgl.

A hydrocarbon odour and associated sheen were noted within TP02 and a hydrocarbon odour was noted within in WS01 and WS02 – associated with the former Mill Pond within the northwestern area of the site.

A hydrocarbon or creosote odour was also noted during the excavation of WS02 (underlying the Mill building). In addition Non Aqueous Phase Liquids (NAPL) comprising 'creosote/oil' type of contamination were also encountered during the groundwater monitoring of historic boreholes (primarily in WS05 and to a lesser extent in WS04) within the central area of the Mill building.

No visual or olfactory evidence of contamination was encountered in any of the other trial pits or window sample excavations.

6.3 Sulphate Content

Sulphate concentrations within the Made Ground, Glacial TIII and Weathered Bedrock range from 16mg/l to 63mg/l with pH ranging from 7.4 to 8.4.

Sulphate concentrations with the Alluvium (encountered between 1.5 and 2.4m bgl within the northern/north-western area of the site) were recorded as 900mg/l with a pH of 7.8.

6.4 Groundwater

Minor groundwater seepages were recorded within the Made Ground encountered in trial pits TP01 at 1.6m bgl, TP02 at 1.8m bgl and TP06 at 1.2m bgl, with groundwater seepages also encountered within the Mill Pond sediments in WS01 at 2.5m bgl, and the alluvium in WS02 and WS03 at 1.4m bgl. Groundwater was also encountered during the site investigation works in TP04 at 1.9m bgl associated with a historic culvert/drainage run encountered between 0.9 and 2.0m bgl.

Current groundwater monitoring recorded a shallow groundwater body within the newly installed and historic boreholes with response zones terminating in the Made Ground and underlying Alluvium/Glacial Till at depths of between 0.9m and 1.9m bgl. (138.4 AOD to 142.9m AOD) which indicates shallow groundwater flow is towards the north/northwest in the general direction of Sabden Brook.

Table 11: Groundwater Levels

Borehole	Depth to Groundwater (m bgl)	Ground Level (mOD)	Groundwater Elevation (Reduced Level) (mOD)
WS01	1.52	141.5	139.98
WS03	0.89	140.2 139.3	
WS04	DRY	142.9	142.9
WS05	1.89	143.0	141.11

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Borehole	Depth to Groundwater (m bgl)	Ground Level (mOD)	Groundwater Elevation (Reduced Level) (mOD)
WS01H	1.80	140.7	138.9
WS03H	1.90	140.3	138.4
WS04H	1.12	140.2	139.08
WS05H	1.15	140.2	139.05
WS10H	1.20	140.2	139.0

Following the identification of NAPL during groundwater monitoring of historic boreholes within the Mill building, groundwater samples were recovered from boreholes WS01, and historic boreholes WS03H, WS04H, WS105H and BH10H on one occasion following the purging of three well volumes (where recharge allowed), along with the collection of surface waters from Sabden Brook (upstream and downstream) to assess any potential risk to controlled waters.

The samples were subsequently sent under chain of custody to Chemtest Laboratories for chemical analysis.

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7 CONTAMINATION ANALYSIS

7.1 Analytical Strategy

The suite of determinants was initially selected with consideration given to the site history and surrounding area and the potential contamination sources identified in the Phase 1 Report. The analysis therefore comprised heavy metals species including chromium, and organic species including phenols, and speciated PAH, with TPH-CWG, Asbestos screening and quantification of positive Asbestos identification results undertaken in selected trial pit locations. Following identification of NAPL associated with historic boreholes onsite, additional analysis was undertaken on selected groundwater/surface water samples for gasworks suite contaminants, banded TPH, VOC's and BTEX species.

7.2 Results of Chemical Analysis ~ Soils

Five samples of Made Ground material, one sample of Mill Pond sediments and three samples of the underlying natural ground were analysed at Chemtest Laboratories for the suite of potential contaminant species. One additional sample (suspected asbestos fragment) was submitted for asbestos identification.

This is a Tier 2 assessment using soil screening values and involves generic human health risk assessment for the following standard CLEA land use scenario:

Residential with plant uptake (using a SOM of 6.0%).

The chemical laboratory data relating to the shallow soils (human health) has been assessed as one averaging area. The soil chemical analysis results have been screened against guideline soil concentrations to provide an assessment of potential risks associated with contamination at the site. In the cases where all the samples tested for a given substance were below the GAC, no further consideration is necessary for that substance. However, for completeness all data has been statistically assessed and included within Appendix D. The following observations are made concerning the spatial distribution of chemicals of potential concern across the site:

- Three soil samples (between depths of 0.2m and 1.9m bgl) taken from across the site returned elevated concentrations of Lead which were above the C4SL screening level for a residential with plant uptake end-use.
- Four soil samples (two of which were Mill Pond sediments) returned elevated concentrations of PAH including Benzo(a)pyrene, Benz(a)anthracene, Benzo(b)fluoranthene, Chysene, Dibenz(a,h) anthracene and Indeno(1,2,3,cd)pyrene.
- One sample of Alluvium (Mill pond sediments) taken from TP01 at 1.9m bgl also returned elevated concentrations of C₁₆ C₂₁, and C₂₁ -C₃₅ Aromatic Petroleum Hydrocarbon species along with an elevated concentration of Zinc which may be phytotoxic to plants.
- Two samples taken from the north-western area of the site (TP01 at 0.6m and TP03 at 0.2 0.2m bgl) returned a positive Asbestos identification (identified as Fibres/Clumps of Chrysotile) with concentrations of 0.005% and 0.002% respectively. In addition, a sample of suspected ACM (tiles) obtained from trial pit TP03 at 1.4m bgl was also sent for Asbestos testing and was subsequently confirmed as Chrysotile cement/insulation.

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7.3 Human Health

7.3.1 Metals and Inorganics

The data set for each chemical determinand has been assessed for the presence of potential outliers (based on the conceptual model) and to determine if the data are normally or non-normally distributed. No outliers have been removed.

Three samples (between depths of 0.2m and 1.9m bgl) returned elevated concentrations of Lead above the C4SL screening level for a residential with plant uptake end-use. One sample of shallow Made Ground taken from the north-western area(TP03 at 0.2m bgl), one sample of alluvium (Mill Pond sediments from TP01 at 1.9m) and one sample of Alluvium (WS03 at 0.7m) returned elevated concentrations of Lead (between 230 and 400mg/kg) vs the C4SL for lead of 200mg/kg). The US95 for Lead (450 mg/kg) also exceeded the C4SL screening levels for Lead. All other samples were below the most conservative GAC threshold criteria for a 'Residential' end-use, for all inorganic contaminant species assessed. Where there is no exceedance of a GAC, the risks are deemed to be insignificant and the site is considered suitable for use.

A summary of the statistical assessment is included in include in Appendix D.

7.3.2 PAH

The data set for the PAH determinands has been assessed for the presence of potential outliers (based on the conceptual model) and to see if the data are normally or non-normally distributed. No outliers have been removed.

Four samples, three of which were taken from the north-western area of the site (TP01 at 1.9m, TP02 at 1.9m, TP03 at 0.2m and WS03 at 0.7m bgl) returned elevated concentrations of PAH including Benzo(a)pyrene (between 8.3 and 26 mg/kg vs the C4SL of 5 mg/kg), Benz(a)anthracene (between 7.2 and 33 mg/kg vs the GAC of 4.7mg/kg), Benzo(b)fluoranthene (10 and 30 mg/kg vs the GAC of 6.5 mg/kg), Chysene (10 and 25 mg/kg vs the GAC of 8mg/kg), Dibenz(a,h) anthracene (1.5 and 3.3 mg/kg vs the GAC of 0.86 mg/kg) and Indeno(1,2,3,cd)pyrene (4.5 and 15 mg/kg vs the GAC of 3.9 mg/kg). One sample of Made Ground taken from TP03 at 0.2m bgl also returned slightly elevated concentrations of Benzo(k) fluoranthene (13 mg/kg vs GAC of 10 mg/kg). The US95 for Benzo(a)pyrene (19.3mg/kg), and other elevated PAH species also exceeded the GAC and C4SL target levels. All other samples tested for PAH returned concentrations below the GAC assessment criteria.

A summary of the statistical assessment is included Appendix D.

7.3.3 TPH

The nature of petroleum hydrocarbon contamination (localised spillages) does not allow the application of statistical analysis. Therefore, the Petroleum Hydrocarbon (TPH-CWG) laboratory results have been assessed directly against the GAC values.

One sample of Alluvium taken from TP01 at 1.9m bgl returned elevated concentrations of C_{16} – C_{21} , (1300mg/kg) and C_{21} - C_{35} (4100mg/kg) **Aromatic Petroleum Hydrocarbon** species which were both above their respective GAC generic screening value of 770mg/kg for C_{16} – C_{21} , and 1200mg/kg for C_{21} - C_{35} hydrocarbon species. All other samples tested for TPH returned concentrations below the GAC assessment criteria.

A summary of the statistical assessment is included in Appendix D.

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7.3.4 Asbestos

Asbestos screening was undertaken on eight soil samples and one sample of suspected ACM, with additional asbestos quantification undertaken on all samples returning a positive asbestos identification. Two samples of Made Ground taken from the north-western area (TP1 at 0.6m and TP3 at 0.2 – 0.2m bgl) returned a positive asbestos identification (identified as Fibres/Clumps of Chrysotile) with concentrations of 0.005% and 0.002% respectively. In addition, a sample of suspected ACM (tiles) obtained from trial pit TP03 at 1.4m bgl was also sent for Asbestos testing and was subsequently confirmed as Chrysotile cement/insulation.

7.4 Groundwater

In the absence of relevant published assessment criteria specifically for groundwater and the potential risks to Controlled Waters from groundwater onsite, chemical results from the initial round of groundwater analysis were screened against EQS values and DWS standards (where EQS values are not available), to assess the potential environmental impact on controlled waters in the vicinity of the site. Note that in some instances the reporting limit (or detection limit) quoted by the laboratory may be greater than the water quality target that it is being assessed against. Where this is the case it is not thought that these determinands are a significant risk to controlled waters.

A summary of the groundwater results are included within Appendix D and exceedances are summarised in Table 13.

- One groundwater sample returned significantly elevated concentrations of total petroleum hydrocarbon species (C₆ C₄₀). This relates to groundwater sampled from WS01 (former Mill Pond in the north-western area) which returned an elevated TPH concentration of 140 mg/l. Slightly elevated concentrations of TPH were also recorded in shallow groundwater associated with historic boreholes WS05H (2.1 mg/l), and WS10H (1.4mg/l), compared to the Water Supply Regulations 1989 and the Private Water Supply Regulations 1991 which both contain a prescribed concentration of 10 μg/l for "dissolved or emulsified hydrocarbons (after extraction with petroleum ether); mineral oils".
- Groundwater sampled from WS05H also returned elevated concentrations of Xylene species (300 μg/l) which exceeds the relevant EQS for inland waters of 30 μg/l.
- Groundwater sampled from historic borehole WS03H returned an elevated concentration of Benzene (19 μg/l) compared to the EQS of 10 μg/l, an elevated concentration of Xylene (183 μg/l) compared to the EQS of 30 μg/l. In addition, groundwater from WS03H also returned elevated concentrations of 1,2,4-Trimethylbenzene (150 μg/l) 1,3,5-Trimethylbenzene (49 μg/l) and slightly elevated concentrations of N-Propylbenzene (4.8 μg/l) and Isopropylbenzene (14 μg/l). Groundwater in WS03H is considered to represent shallow groundwater associated with the underlying Made Ground and superficial deposits within the Mill building adjacent to the northern side of the culverted Sabden Brook.

The results of the groundwater analysis indicate that there are locally elevated concentrations of organic hydrocarbon contaminant species within shallow groundwaters underlying the site, although the majority of determinands analysed were below the detection limit of the laboratory.

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To summarise, the highest concentrations of total TPH, were recorded in WS01 and are considered to be associated with historic Mill Pond sediments in this area of the site. Elevated concentrations of BTEX organic species were also recorded locally within historic boreholes (WS05H and WS03H) underlying the Mill Building and are likely to be associated with the creosote/oil type of contamination (possible gasometer) encountered during the intrusive site investigation works undertaken by both PWAG and previously by RSK.

7.5 Surface Water - Historic Culverted Watercourse/Sabden Brook

Surface water sampling of Sabden Brook was also undertaken to assess the risk to controlled waters in the vicinity of the site. Two surface water samples were collected from Sabden Brook (upstream and downstream locations in the vicinity of the site) and were sent under chain of custody to Chemtest Laboratories for chemical analysis where they were analysed for a suite of potential contaminants including gas works suite determinands, BTEX and banded TPH.

Chemical results from the initial round of surface water analysis were screened against EQS values and DWS standards, where available, to assess the potential environmental impact of the site on controlled waters in the vicinity of the site. Note that in some instances the reporting limit (or detection limit) quoted by the laboratory may be greater than the water quality target that it is being assessed against. Where this is the case it is not thought that these determinands are a significant risk to controlled waters.

The results of the surface water analysis indicate that there are no chemicals of potential concern detected in the culverted surface watercourse (Sabden Brook) flowing beneath the site, and the majority of determinands analysed were below both the respective EQS and DWS and also below the respective laboratory detection limit.

Generally, there appears to be no significant difference in water quality between upstream and downstream samples indicating that the subject site is not having a detrimental impact on the quality of surface waters (Sabden Brook) culverted through the central area of the site.

7.6 Plant Life

The data set for each chemical determinand has been assessed for the presence of potential outliers (based on the conceptual model) and to determine if the data are normally or non-normally distributed. No outliers have been removed.

One sample of Mill Pond sediments taken from TP01 at 1.9m bgl, returned a zinc concentration of 390mg/kg compared to the GAC of 300mg/kg. The calculated U_{95} for zinc (310mg/kg) is also slightly above the zinc GAC for plant life.

However, given that only one isolated exceedance of Zinc was recorded in Mill pond sediments (at a depth of 1.9m bgl) this is not considered to present a significant risk to plant life. In addition, given the limited quantities of topsoil on-site, it is anticipated that topsoil will require to be imported onto site for garden and landscaped areas. It is suggested that further advice from a landscape architect should be sought with regards to risks to plant life and any requirement to import a clean growing medium for proposed garden/landscaped areas.

All other samples were below the most conservative GAC threshold criteria for 'Plant life', for all inorganic and organic contaminant species assessed. A summary of the statistical assessment is included in Appendix D.

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7.7 Ground Gas

The risks associated with the ground gases methane (CH₄) and carbon dioxide (CO₂) are assessed using BS 8485:2015 (Ref. 1) and guidelines from CIRIA 665 (Ref. 2) and the NHBC (Ref. 3).

Current UK best practice guidance suggests that the ground gas assessment and characterisation for a site is dealt with separately for different types of development. In the above guidance:

- 'Situation A' covers all forms of development (residential and industrial / commercial developments), other than low rise residential development; and
- 'Situation B' is defined as the specific development of low-rise (one to three storeys in height) housing with beam and block floors, vented sub-floor void and gardens.

The development proposals require consideration of Situation A.

From the available evidence, it is considered that the gas generation potential at the site will be low to moderate. This is based on the site being underlain by relatively deep (up to 2.1m) deposits of Made Ground, with Alluvium and Glacial Till deposits directly beneath this ground, the potential for organic contaminants and two historic Mill ponds located onsite. Given the residential end-use of the site, the sensitivity of the development is considered to be high.

The ground gas monitoring undertaken to date (one of nine visits), has recorded a maximum concentration of 0.6% v/v CO_2 , 0.0% v/v CH_4 and a minimum of 19.6% O_2 , with no positive flows recorded. From this, a GSV of 0.0006 l/hr. has been calculated for CO_2 . The worst case scenario GSV to date indicates the site will be classified as CS1 in accordance with CIRIA C665. However, a Ground Gas Addendum report will be issued following completion of the ground gas monitoring confirming the ground gas classification for the site.

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8 RISK ASSSSMENT AND REVISED CONCEPTUAL SITE MODEL

8.1 Introduction

Environmental Risk has been addressed by adopting a site-specific qualitative approach to identify the risk of environmental harm in accordance with the Department of Environment, Transport and Regions (DETR) guidance on Contaminated Land (Ref. 11) and the Construction Industry Research and Information Association (Ref. 12). The guiding principle of this approach is an attempt to establish connecting links between a hazardous source, via an exposure pathway to a potential receptor. A pollutant linkage is the term used by the DETR in their standard procedure on risk assessment. If there is no pollutant linkage, then there is no risk. Our risk assessment is based on the redevelopment of the site with a 'Residential with plant uptake' end use.

Contaminated land risk assessment is based on development of a conceptual model for the site (Drawing No. 17140/G/151). This is representation of the relationship between contaminant sources, pathways and receptors developed on the basis of hazard identification. Chemical laboratory results have been compared to GAC criteria to assess the potential risk to Human Health, Controlled waters and the wider environment. Where there is no exceedance of a GAC, the risks are deemed to be insignificant and the site is considered suitable for use, therefore no further consideration is necessary. However, it is recommended that this be agreed with the regulatory authorities.

8.2 Identified Sources

- Made Ground Two samples of Made Ground taken from the north-western area of the site (TP01 at 0.6m and TP03 at 0.2 0.2m bgl) returned a positive asbestos identification (identified as Fibres/Clumps of Chrysotile) with concentrations of 0.005% and 0.002% respectively. In addition, a sample of suspected ACM (tiles) obtained from trial pit TP03 at 1.4m bgl was also sent for Asbestos testing and was subsequently confirmed as Chrysotile cement/insulation. Elevated concentrations of PAH and Lead were also identified in shallow Made Ground within the north-western area of the site (TP03 at 0.2m bgl)
- Mill Pond sediments (North-western area) One sample of Alluvium (Mill Pond sediments) from TP01 at 1.9m bgl also returned elevated concentrations of C16 C21, and C21 -C35 Aromatic Petroleum Hydrocarbon species, an elevated concentration of Lead, and an elevated concentration of zinc compared to the GAC for plant life for zinc. Two samples of Alluvium (Mill pond sediments) also returned elevated concentrations of PAH including Benzo(a)pyrene, Benz(a)anthracene, Benzo(b)fluoranthene, Chysene, Dibenz(a,h) anthracene and Indeno(1,2,3,cd)pyrene. Groundwater associated with WS01 also returned elevated concentrations of TPH species.
- Elevated concentrations of PAH and Lead were also identified in alluvium underlying the Mill building (WS03 at 0.7m bgl).
- Elevated concentrations of TPH, BTEX and associated organic species including 1,3,5-Trimethylbenzene and 1,2,4-Trimethylbenzene were also identified in groundwater sampled from historic boreholes underlying the Mill building (WS05H, WS03H and WS10H).

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In summary, elevated concentrations of Lead, PAH and TPH were identified both within the shallow Made Ground, Mill pond sediments and Alluvium soils underlying. Asbestos and/or Asbestos containing materials (ACM's) were identified in three samples of shallow Made Ground between 0.2 and 0.7m bgl, located within the north/north-western area of the site. In addition NAPL comprising creosote/oil type of contamination was encountered (primarily in WS05) during groundwater monitoring of historic boreholes— within the partly demolished mill building and subsequent groundwater monitoring identified locally elevated concentrations of TPH, BTEX and organic species associated with historic boreholes underlying the Mill building.

8.3 Qualitative Risk Assessment and Conceptual Site Model

A qualitative risk assessment has been undertaken for these potential source-pathway-receptor linkages. This is based on consideration of both:

- The likelihood of an event (probability takes into account both the presence of the hazard and receptor and the integrity of the pathway);
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

The risk assessment detailed in Table 9 has been based on redevelopment of the site with a proposed 'Residential with plant uptake End-Use'.



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Table 9. Preliminary Environmental Risk Assessment – Proposed Residential with plant uptake End-Use

Pollutant /	ant /	Receptors	Pathways to Receptor	Associated Hazard [Potential severity]	Likelihood of Occurrence	Potential Risk
		Construction workers Future Site Occupiers	Ingestion, inhalation	Effect on human health [Low-Severc]	Any risks can be mitigated by appropriate site management during construction stage. Shallow Made Ground within garden/landscaped areas to be removed or isolated beneath a clean cover system with associated 'hard to dig layer' to be installed which will minimise the risk to end users.	Гом
Lead Arsenic PAH	ad th	Controlled Waters Groundwater	Leaching via ground water	Pollution of controlled waters [Slight]	Majority of site currently covered by hardstanding. Clean cover to be installed post development. Low permeability clays and mudstone underlying the site likely to limit vertical migration of potential contaminants.	Low
		Controlled Waters (surface water)	Surface flows and shallow ground water discharging to surface	Pollution of controlled waters [Slight]	Chemical testing of surface waters (Sabden Brook) show no significant difference between upstream and downstream samples, indicating that the subject site is not having a detrimental impact on the water quality of Sabden Brook.	Low
Asbestos	sstos	Construction workers Future Site Occupiers	Contact, ingestion, inhalation	Effect on human health [Low to Severe]	Asbestos identified within the north/north-western area of the site. Any risks can be mitigated by appropriate site management during construction stage. Asbestos awareness training and suitable PPE to be provided for construction staff. Made Ground to be removed or isolated beneath clean cover system thus minimising risk to future site users.	Low to Moderate
HAL	TPH. Lead.	Future Site Occupiers	Ingestion, inhalation Direct Contact	Effect on human health [Low-Severe]	Elevated concentrations of contaminants within Mill Pond sediments are at a depth of 1.9m bg/ and are not considered a significant risk to human health. Any risks can be mitigated by appropriate site management during construction stage.	ГОМ
7d	РАН	Controlled Waters Groundwater	Leaching via ground water	Pollution of controlled waters [Slight]	Locally elevated concentrations of TPH identified in shallow groundwater associated with Mill Pond sediments in northwest of site. Low permeability clays and Mudstones underlying the site likely to limit vertical migration of potential contaminants to underlying Secondary A aquifer.	Low



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Source	Pollutant /	Receptors	Pathways to Receptor	Associated Hazard [Potential severity]	Likelihood of Occurrence	Potential Risk
		Controlled Waters (surface water)	Surface flows and shallow ground water discharging to surface	Pollution of controlled waters [Slight]	Chemical testing of surface waters (Sabden Brook) show no significant difference between upstream and downstream samples, indicating that the subject site is not having a detrimental impact on the water quality of Sabden Brook.	Low
	Zìnc	Flora and Fauna	Direct contact, plant uptake	Effect on plant life [Low]	Unlikely - one isolated slight exceedance in Mill Pond sediments at depth. Made Ground/contaminated soils in proposed garden/landscaped areas to be removed or isolated beneath clean cover system and hard to dig layer as part of proposed development.	Very Low
		Construction workers Future Site Occupiers	Contact, ingestion, inhalation	Effect on human health [Low to Severe]	Any risks can be mitigated by appropriate site management during construction stage. Further investigation and chemical testing of shallow soils within vicinity of former gasometer to be undertaken following demolition of Mill building with possible remedial works required. Clean cover system and 'hard to dig layer' to be installed within proposed garden/landscaped areas which will minimise the risk to end users.	Low
On-site Spillages, leaks of contaminants associated with historic activities and possible	Unidentified NAPL, (TPH, BTEX PAH Heavy metals, Organic	Controlled Waters Groundwater	Leaching via ground water	Pollution of controlled waters [Slight]	Non Aqueous Phase Liquids (NAPL) and elevated concentrations of BTEX and organic species identified in shallow groundwater sampled from historic boreholes underlying Mill building. Low permeability clays and mudstones underlying the site likely to limit vertical migration of potential contaminants to Secondary A Aquifer. Further investigation and chemical testing of shallow soils within vicinity of former gasometer to be undertaken following demolition of Mill building with possible remedial works required.	Low to Moderate
	(capped)	Controlled Waters (surface water)	Surface flows and shallow ground water discharging to surface	Pollution of controlled waters [Slight]	Sabden Brook currently culverted through the site. Chemical analysis of surface waters shows no significant difference between upstream and downstream water samples indicating that the subject site is not having a detrimental impact on the water quality associated with Sabden Brook. Hard surfacing currently present across Mill building - limiting infiltration and lateral migration of surface waters.	Low to Moderate
		New in ground services and construction materials.	Direct contact	Degradation [Slight]	Elevated concentrations of TPH and PAH identified onsite. The adoption of suitably designed water supply pipes will limit any potential risk.	Low



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Source	Pollutant /	Receptors	Pathways to	Associated Hazard	Likelihood of Occurrence	Potential Risk
	Hazard		Neceptor	I ordinal serendi		
		Future Site Occupiers	Migration	Asphyxiation or explosion(Severe)	Gas monitoring undertaken to date indicates that the site is likely to be	
On-site Ground gas	сн4, со2,	Buildings	through soils or groundwater to indoor air.	Explosion (Severe)	classification will be confirmed following completion of the ground gas monitoring programme and reported separately in a ground gas	Low to Moderate
		Neighbour Properties	Inhalation.	Asphyxiation or explosion (Severe)	addendum.	

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9 ENVIRONMENTAL ASSESSMENT AND RECOMMENDATIONS

9.1 Human Health

The risk assessment undertaken in Section 9 has identified that there are elevated concentrations of Lead, PAH and total TPH in shallow Made Ground, Mill Pond sediments and Alluvium soils underlying the site which are likely to require remedial action. In addition, Asbestos (considered to be associated with the construction/demolition of historic buildings onsite) has been identified within the north/north-western area of the site, with sample concentrations ranging between 0.002% and 0.005% total asbestos.

Creosote/oil type of hydrocarbon contamination was also encountered during groundwater monitoring of historic boreholes located within the central area of the site and subsequent chemical analysis of groundwaters within the historic boreholes identified a number of organic hydrocarbon type of contaminant species including 1,2,4,-Trimethylbenzene (150ug/l) and BTEX species. Reference to the SOBRA methodology (Ref: 19) for assessing long term risks to human health from inhalation of vapours arising from groundwater suggests a GAC of 24ug/l is appropriate for 1,2,4,-Trimethylbenzene in groundwater to ensure no risk to human health associated with vapour inhalation. As the concentrations within shallow groundwater exceed this GAC it is recommended that a hydrocarbon resistant vapour is installed in overlying properties to remove any risk to human health associated with vapour inhalation.

The elevated levels of TPH were encountered within the soft – very soft alluvium sediments associated with the former Mill Pond in the north-western area of the site (underlying proposed plot numbers Plot 35 and Plot 34). Given that this TPH contamination is located at a depth exceeding 1.7m bgl this is unlikely to present a significant risk to Human Health, however it is recommended that a hydrocarbon resistant vapour is installed in overlying properties to remove any risk to human health associated with vapour inhalation. The potential risk to controlled waters is discussed in section 9.2.

It is recommended that the buried asbestos tiles (ACM's associated with TPO3) and any ACM's fragments on the ground surface are removed for off-site disposal at a suitably licenced facility. Any works undertaken which are likely to disturb or remove the asbestos within the Made Ground onsite should be undertaken in accordance with the CAR 2012 regulations (Ref:13) and associated CL:AIRE 2016 Industry Guidance on managing and working with Asbestos in soil, construction and demolition materials (Ref.14). Utilisation of the JIWG Decision Support Tool for Asbestos is Soil and Construction and Demolition materials indicates that the work to remove the buried Chrysotile asbestos tiles is likely to be classified Nonlicensed work, although PPE will be required. A copy of the JIWG -DST is provided in Appendix H.

In terms of the elevated Lead, PAH and asbestos in shallow Made Ground, the source-pathway-receptor linkage for the risk to human health can be broken by the installation of a clean cover system in garden areas and areas of public open space, comprising a 'no dig' layer overlain by 600mm of clean topsoil / subsoil. Elsewhere, the presence of hardstanding in the roadways and parking areas will break the source-pathway-receptor linkage. While these areas will be covered in hardstanding or clean cover systems post-development (breaking any source-pathway-receptor linkage for end-users), there is a potential risk to construction workers involved in the re-development works. Utilisation of the JIWG Decision Support Tool

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for Asbestos is Soil and Construction and Demolition materials indicates that the work to remove the Made Ground containing (0.002 – 0.005%) fibres/clumps of chrysotile is likely to be classified Non-licensed work, although PPE will be required. A copy of the JIWG -DST is provided in Appendix H.

Where possible, the ground works on-site should be designed and planned to minimise the exposure of workers to contaminated soil. This should be taken into account in the Health and Safety plan under the CDM regulations. Where risks cannot be removed entirely at the planning stage, mitigation measures should include the use of personal protective clothing (PPE) including gloves. Dust suppression measures should also be incorporated into the works to reduce ingestion and inhalation of contaminated dust.

9.2 Controlled Waters

A number of minor groundwater seepages were noted within the Made Ground and shallow soils onsite, and subsequent groundwater monitoring recorded shallow groundwater between 0.9m and 1.9m bgl associated with the Alluvium sands and gravels. Although chemical testing of groundwater was not initially scheduled as part of the Phase 2 investigation, Non Aqueous Phase Liquids (NAPL) comprising creosote/oil type of contamination were encountered during groundwater monitoring of the historic boreholes located within the former Mill building and a programme of groundwater and surface water sampling and analysis was subsequently undertaken to assess the risk to controlled waters.

The results of the groundwater analysis indicate that there are locally elevated concentrations of organic hydrocarbon contaminant species (including BTEX and TPH) within shallow groundwaters underlying the site. However, the site is underlain by low permeability clays associated with the Glacial Till, weathered bedrock, and Mudstones associated with the Sabden Shales, which is likely to limit the vertical migration of potential contaminants down to the Secondary A aquifer (at depth beneath the site). Accordingly the contamination of the shallow groundwaters are not considered to present a significant risk to the underlying aquifer.

The results of the surface water analysis indicate that there are no chemicals of potential concern in the culverted surface watercourse (Sabden Brook) flowing beneath the site, and the majority of determinands analysed were below both the respective EQS and DWS and also below the respective laboratory detection limit. In addition there was no significant difference between upstream and downstream water quality. Accordingly, the contamination of the shallow groundwaters are not considered to present a significant risk to adjacent surface waters (Sabden Brook).

9.3 Plant Life

The risk assessment undertaken in Section 9 indicates that one isolated elevated concentration of Zinc (which may be harmful to plant life) was identified within the alluvium (Mill Pond sediments) underlying the north-western area of the site at a depth of 1.9m bgl. However, it is considered that this isolated exceedance at a depth of 1.9m does not present a significant risk to plant life. In addition, the installation of a clean cover system will provide a clean growing medium for the proposed planting however, further advice from a landscape architect with regards to the required depth of growing medium and risks to plant life should be sought.

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9.4 Precautions Against Ground Gas

9.4.1 Radon

The Radon interactive map indicates that the site is in an area where between 1-3% of homes are above the action level. The corresponding BRE guidance document indicates that radon protection measures are not required for developments or the construction of new dwellings undertaken in this area. This should be confirmed with local building control.

9.4.2 Ground Gas

The ground gas monitoring undertaken to date indicates that the site is likely to be classified as CS1 in accordance with CIRIA C665, with no ground gas protection measures required. However, the ground gas classification will be confirmed in a ground gas addendum report to be issued following completion of the ground gas monitoring program.

9.5 Waste Management

The handling, re-use or disposal of waste is regulated by the Environment Agency. Any material excavated on-site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. One of the ways this can be achieved is set out in the Development Industry Code of Practice (CoP; Ref. 15). This builds on the Environment Agency guidance document Definition of waste: developing greenfield and brownfield sites (2006). The Agency will take into account the use of the CoP in deciding whether to regulate materials as waste. If materials are dealt with in accordance with the CoP, the Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development.

Good practice has three basic elements:

- Ensuring that an adequate Materials Management Plan (MMP) is in place, covering the
 use of materials on a specific site.
- Ensuring that the MMP is based on an appropriate risk assessment, concluding that the
 objectives of preventing harm to human health and pollution of the environment will be
 met if materials are used in the proposed manner.
- Ensuring that the requirements of the MMP are met.

All material proposed for off-site disposal (e.g. during future construction works) should be given a proper description and waste classification as required by the Environmental Protection Duty of Care Regulations (Ref. 16), and in accordance with WM3 and the Environment Agency Technical Guidance on the assessment and classification of Hazardous Waste. Advice on the classification of wastes containing asbestos is provided in Chapter 3 of Environment Agencies document 'Guidance on the classification and assessment of waste Technical Guidance WM3' (Ref 17.).

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10 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

10.1 Geotechnical Categorization of the Proposed Development

Eurocode 7, Section 2 advocates the use of geotechnical categorization of the proposed structure(s) to establish the design requirements. Initial categorisation can be made before site investigation and can be used to define the scope and extent of geotechnical investigation required. For the purposes of this investigation, the proposed structures have been classed as follows:

• Geotechnical Category 1.

10.2 Flooding

The northern area of the site is designated by the Environment Agency database as being located in a Flood Zone 3 (which indicates that the site has a 1 in 100 annual probability of flooding), with the southern area of the site designated as being located within a Flood Zone 1 (less than 1 in 1000 annual probability of flooding). It is understood that a Flood and Geomorphology Risk Assessment (Ref: RLTFP07-08) has been undertaken by the River Ribble Trust, although there is no date on the report.

No further consideration of flood risk is undertaken in this report. However, specialist flood risk advice may also be required with regards to surface waters, drainage and flooding.

10.3 Site Preparation, Earthworks, Groundworks and Landscaping

Apart from the undulating area within the northwest (associated with the historic mill pond) site levels are relatively level within the central area of the site. The southern area of the site sits at a higher elevation compared to the central and northern areas of the site (from 140m within the central area to 143.0m in the south of the site). It is anticipated that finished floor levels will be between approximately 141.8m and 143.3m AoD; and therefore, it is likely that earth works will be required across the site to achieve development levels. Accordingly, it is recommended that an Earthworks Strategy is developed for the site prior to any works starting.

No significant groundwater was encountered during the site investigation works and Groundwater monitoring undertaken to date, has recorded groundwater levels within the Made Ground and superficial alluvium deposits between 0.89 and 1.9m bgl. As such it is envisaged that at shallow depths (<2m) any groundwater seepages will be minor, and may be controlled by sump pumping methods. However, below 2m significant groundwater ingress may be encountered and a specialist dewatering contractor may be required. It should be noted that groundwater levels may vary from those at the time of the investigation, for example in response to seasonal fluctuations.

Shallow buried obstructions were encountered in localised areas of the site, including a historic culvert encountered in TP04 at 0.9m bgl, and a sandstone wall encountered in TP07 at 1.60m bgl. The historic culvert (located in the vicinity of TP04) will need to be surveyed and either diverted (if it is live), or, grubbed out and backfilled with a suitably compacted granular fill if it is no longer in use. In addition, there are likely to be obstructions associated with the former Mill building foundations and below ground structures. It is envisaged that the excavation of shallow soils may present some difficulty for smaller plant and equipment, and

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the provision of a breaker is anticipated to be required. A number of trial pit excavations were noted to be slightly unstable and it is recommended that no site personnel enter any trenches unless there is adequate support and this has been assessed by a competent person.

10.4 Foundations

It is understood that the development will comprise approx. 35 No. residential properties with the preferred foundation solution being an 'Insulslab' raft solution. Anticipated foundation loadings are therefore likely to be in the region of $50kN/m^2$. While the finished floor levels are still to be confirmed, it is anticipated that they will be approximately 141.8-143.3m AoD. The preliminary foundation designs in this section are based on the parameters given in Section 6.

The Made Ground is not considered a suitable founding material in its current state, as it is variable in composition and has unpredictable load-bearing and settlement characteristics. Made Ground has been recorded across the site to depths of between 0.3 and 2.1m bgl, with the deepest Made Ground recorded in the north-western area of the site, where an infilled mill pond feature is understood to have been located.

In addition to the above, soft to very soft alluvium soil has been recorded in the north-western area of the site (associated with the historic Mill Pond) from 1.70m to a maximum depth of 2.70m in WS01, underlain by a soft to firm slightly sandy alluvium CLAY to a depth of 3.20m bgl over a firm to stiff clay associated with the weathered bedrock proven to 4.0m bgl. Given the above and the recorded ground conditions detailed in Section 6, the site can be split into three zones for foundation solutions, based on the indicative depths to Alluvium soils, Glacial Till and weathered bedrock.

10.4.1. North-western area – former Mill Pond

Within the north-western area of the site where soft to very soft alluvium soils have been recorded to a maximum depth of 2.70m bgl, it is recommended that foundations loadings are taken down through these deposits to the underlying Alluvium (slightly sandy clay) or Weathered Bedrock.

Given the depths of the weak and compressible ground in the north-west area, a piled foundations solution is likely to be the most economical solution to transfer loads down into the deeper alluvium deposits, and weathered bedrock in this area. Either bored and cast in situ continuous flight auger (CFA) piles or driven, preformed piling techniques are considered likely to be suitable for the ground conditions at the site. Care should be taken for bored, cast in situ piles to be taken though the soft alluvium, where collapse of the pile shaft could lead to 'necking' of the pile. A specialist piling contractor should be consulted for selection of appropriate piling method. An assessment should be made if driven piles are considered, as these may be subject to excessive noise or vibration which may be unacceptable to neighbouring properties. Alternatively, it may be more economical to excavate the soft to very soft silty clays (which are also impacted with TPH contamination) and subsequently up fill with granular fill placed and fully compacted in layers and in accordance with the foundation designers specification. However, discussions with Insulslab suggest that where proposed development is within the zone of influence of trees, the maximum allowable depth of engineered up fill for utilisation of Insulslab is 1.25m, which given the presence of trees and the medium to high volume change potential alluvium soils within the north-western area may preclude the use of Insulslab within this area.

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10.4.2. Central area - former Mill Building

In the central area of the site (within the Mill building footprint) Made Ground has been recorded to depths of 0.4m (although the historic investigation undertaken by RSK recorded Made Ground up to depths of 2.20m bgl within the central area, this was not confirmed by the PWAG investigation). Soft to firm alluvium (sandy gravelly clays) were generally encountered below the Made Ground to depths of between 1.2 and 1.4m bgl with Alluvium sands and gravels generally encountered at depths of between 1.20 and 1.4m below the current ground level.

Given the clients preferred foundation solution (Insulslab) and given that this area is likely to require significant up fill to achieve finished floor levels it recommended that the Made Ground is re-engineered and the fill works are undertaken using a suitable granular fill placed to a suitable end specification, which is capable of supporting loads of up to 50 to 75kN/m², to be agreed with the Insulslab foundation designer.

Alternatively it may be possible to utilise Vibro Stone Columns on completion of the up fill works however, it is recommended that a specialist contractor is contacted regarding the detail design and in particular the upfill specification required by the ground improvement contractor.

10.4.3. Southern area - Castle Sheet Metal Works yard

In the southern area of the site, where the top of the Glacial Till and/or weathered bedrock is currently between 0.3m and 1.5m below the current ground level, a Insulsiab Raft solution can be adopted within the firm to stiff orangish brown to greyish brown slightly sandy to sandy slightly gravelly to gravelly CLAY where an allowable bearing capacity of 100kN/m², can be assumed for foundation design, which should limit total settlement to less than 25mm. Due to the volume change potential a minimum foundation depth of 0.9m is required, which will require the excavation of shrinkable soils and replacement with a suitable granular fill material.

Further deepening of foundations may be required locally where foundations are within the zone of influence of existing trees. These zones depend on the soil shrinkage potential, and the ratio of the tree mature height (H) and distance from the tree to the foundation (D), in accordance with Chapter 4.2 of NHBC Standards. The clays present within the southern area of the site range from low to medium volume change potential, and where present within the zone of influence of foundations, a minimum foundation depth of 1.25m below existing site levels is recommended for residential properties. In addition, the influence of proposed shrub planting on foundation depths should be considered, in accordance with NHBC Standards.

All planting schedules (tree and shrub) should be provided by a qualified landscape architect or by a suitably qualified person and agreed with the planning authority before work commences on site. The agreed planting schedule should also be provided to the foundation designer to consider the effects of proposed shrubs and trees on foundation depths.

The depth of foundations should be designed and formations inspected by a competent structural/geotechnical engineer. Any sub-formation materials deemed as unsuitable such as soft or loose zones should be excavated and replaced with well compacted suitable granular fill or lean mix concrete. It should be noted that where foundations straddle different materials re-enforcement should be placed in the top and bottom of the footing. Foundation

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excavations should be protected from water and inclement weather including frost and any water should be removed by pumping from a sump in the base of the excavation.

10.5 Floor Slabs

We understand that an insulsiab raft foundation solution is the clients preferred floor slab solution.

10.6 Roads and Pavements

It is considered likely a CBR of 5% will be achievable over the majority of the site (apart from the areas within the northwest and southwest associated with the historic mill ponds) and can be used for preliminary design, subject to in-situ testing during construction.

Proof rolling of the formation level will be required and any loose or soft spots to be removed and replaced with an engineered fill, in accordance with a suitable Specification. The formation level will also need to be protected during inclement weather from deterioration. Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable Specification to ensure the ground conditions are as expected. All testing should be carried out in accordance with DMRB IAN 73/06 and confirm that the ground conditions at time of construction are consistent with the previous design parameters.

The CBR is likely to be significantly lower within the areas to the north-west and potentially also within the south-west of the site (associated with the historic Mill Ponds). Where the CBR is found to be less than 2.5%, the sub-grade may be unsuitable for both the trafficking of site plant and as support for a permanent foundation, without improvement works being undertaken. Improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5. In summary, consideration may be given to the following potential remedial techniques:

- excavation and re-engineering (possibly a cement or lime binder) or replacement of weaker soils;
- the inclusion of geosynthetic reinforcement within the unbound layers of the capping and sub-grade.

10.7 Buried Concrete

Buried concrete classification is based on guidelines provided in BRE Special Digest 1 (Ref. 18.)

The site has been assessed as brownfield, with a mobile groundwater at foundation level.

The results of sulphate concentrations and pH values presented in Section 7.3 suggest a Design Sulphate Class of DS-1 and ACEC Class of AC-1 for the Made Ground, Glacial Till shallow soils and weathered bedrock. For the Alluvium recorded within the north/north-western area of the site (encountered between 1.5 and 2.40m bgl) the sulphate and pH results suggest a Design Sulphate Class of DS-2 and ACEC Class of AC-2.

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10.8 Water Supply Pipes

Permeation and accelerated deterioration of pipe material can occur due to chemical reactions between the pipe and contaminants in the ground in which it is laid. This can lead to premature failures resulting in leakage and loss of water quality.

Water supply pipes should be specified and laid in accordance with the regional water supply company's specifications. Given the presence of hydrocarbon contaminants within the Made Ground and alluvium soils, barrier type water supply pipes are likely to be required for the proposed development.

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11 RECOMMENDATIONS

- Following the demolition of the Mill building and associated structures it is recommended that additional investigation should be undertaken in the vicinity of WS02 (the suspected historic gasometer location) and historic boreholes WS05H and WS03H to investigate and delineate the previously reported 'creosote' type contamination initially recorded within the RSK Geo-environmental Assessment (2010), and shallow groundwater contaminants including NAPL (creosote/oil type contamination) identified during the current programme of groundwater monitoring within historic boreholes underlying the Mill building.
- Following the drain down of the historic Mill Pond within the south-western area of the site (currently inaccessible), it is recommended that 2 – 3 trial pits are undertaken to assess the depth of soft alluvium soils and underlying ground conditions, with additional chemical testing of soils/sediments to check for potential contaminants.
- It is recommended that the historic culvert (located in the vicinity of TP04) is surveyed and either diverted/re-culverted if it is live, or grubbed out and backfilled with a suitably compacted granular fill if it is redundant.
- It is recommended that the buried asbestos tiles (associated with TP03) and any ACM's
 present on the ground surface are removed for off-site disposal at a suitably licenced
 facility. Any works likely to disturb the asbestos should be undertaken in accordance
 with the CAR 2012 regulations (Ref:15) and associated CL:AIRE 2016 Industry Guidance
 (Ref:14).
- It is recommended that a clean cover system, comprising a 'no dig' layer and 600mm
 of clean topsoil/subsoil is installed in all garden area and landscaped areas, to break
 the source-pathway-receptor linkage from contaminants within the Made Ground and
 underlying superficial soils.
- It is recommended that a Remedial Plan is produced, which details the proposed remedial works, cover system requirements, waters supply pipes, and any ground gas protection measures required for the site, the contents of which should be approved by the regulators.
- It is recommended that this report is submitted to the regulators to gain approval of the findings and recommendations.

Project Details: Victoria Mills, Sabden

Date: November 2017



12 REFERENCES

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- 15. CL:AIRE Development Industry Code of Practice, Version 2 2011.
- 16. Environmental Protection (Duty of care Regulations 2009).
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- 18. Concrete in Aggressive Ground, BRE Special Digest 1, 2005.
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Project Details: Victoria Mills, Sabden

Date: November 2017



APPENDIX A

Legal Framework

Project Details: Victoria Mills, Sabden

Date: November 2017



Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source – pathway - target relationship in accordance with the approach set out in the 1995 Environment Act, The Contaminated Land (England) Regulations 2000 and the DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land. Contaminated land is defined within the legislative framework as land which is in such condition by reason of substance in, on or under the land that:

- a) significant harm is being caused or there is a significant possibility of such harm being caused:
- b) significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- Source: Substances that are potential contaminants or pollutants that may cause harm:
- Pathway: A potential route by which contaminants can move from the source to the receptor; and
- Receptor or target: A receptor that may be harmed, for example the waters environment, humans, water, flora and fauna.

Where a source, pathways and target are all present a pollutant linkage exists and there is potential for harm to be caused. Therefore, the presence of measurable concentrations of contaminants within the ground and subsurface environment does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm.

The nature and importance of both pathways and receptors, which are relevant to a particular site, will vary according to the intended use of the site, its characteristics and its surroundings.

The key principle which underpins this approach is the "suitable for use" criterion. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and appropriate and cost effective remediation techniques exist, taking into account the actual or intended use of the site.

Project Details: Victoria Mills, Sabden

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Guidance

PWA Geo-Environmental Ltd (PWAG) is part of a registered Engineering Practice which is a member of the Association of Consulting Engineers (ACE).

This report has been prepared in accordance with:

- CLR11 Model Procedures
- Contamination and Environmental Matters Their implications for Property Professionals (2nd Edition RICS Nov 2003)
- Brownfields Managing the development of previously developed land A client's guide, CIRIA 2002
- DEFRA and Environment Agency (EA) publications CLR7 10, (subsequently withdrawn) supported by the TOX guides and SGV guides, dated March 2002
- DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002

And any other protocols advised by DEFRA and the EA and guidance's prepared by BSI, CERTA, BURA, and other industry advisory bodies including BS5930 and BS10175.

Judicial Precedents and Legislation

The following non-exhaustive list of the legislative framework documents has been considered in the compliance of this document.

- The Environment Act (1995)
- The Environment Protection Act (1990)
- The Water Resources Act (1991)
- The Radioactive Substances Act (1993)
- The Pollution Prevention and Control (England and Wales) Regulations (2007)
- The Contaminated Land (England) Regulations (2006)
- The Environment Act 1995 (Commencement No.16 and Saving Provision) (England)
 Order (2000)
- The Contaminated Land (England) Regulations (2006)
- The Landfill Regulations (England and Wales) Regulations (2002)
- The Landfill (England and Wales) (Amendment) Regulations (2004)
- Rylands v Fletcher Private Nuisance, Escape
- Health and Safety at Work Act 1974
- The Building Regulations 2011, Part C of Schedule 1
- The Controlled Waste Regulations 1992
- Special Waste Regulations 1996

Neither the list of guidance nor the list of judicial precedents and legislation should be considered exclusive or comprehensive. There are approximately 85 individual items of

Project Details: Victoria Mills, Sabden

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legislation regulating contaminated land work. PWAG makes every effort to ensure that all are adhered to in the preparation and presentation of this report.

Technical Competence

PWAG is a leading specialist multi-disciplinary engineering practice working in the contaminated land market. Most of the workload undertaken by PWAG is within the property development market dealing with brownfield re-development and associated environmental and geotechnical issues.

Established in 2009 PWAG is at the forefront of environmental asset management providing expertise in environmental risk assessments, environmental site investigations, geotechnical site investigations and remediation strategies.

PWAG's staff come from a wide variety of backgrounds within the geotechnical and environmental sectors and are all degree qualified. Specialists include geotechnical engineers, geologists, chartered environmentalists and chartered engineers.

PWAG's technical protocols are described in our reports and are strictly adhered to by quality control checks in the field and in the laboratory. PWAG only uses UKAS and MCERTS accredited laboratories for all methods used to derive determinant concentrations.

PWAG is working towards a quality assurance process under ISO9001:2000 which facilitates rigorous in-house administrative and technical protocols. PWAG also initiates a robust health and safety program for each site and ensures the regular training of staff in new guidance's and techniques.

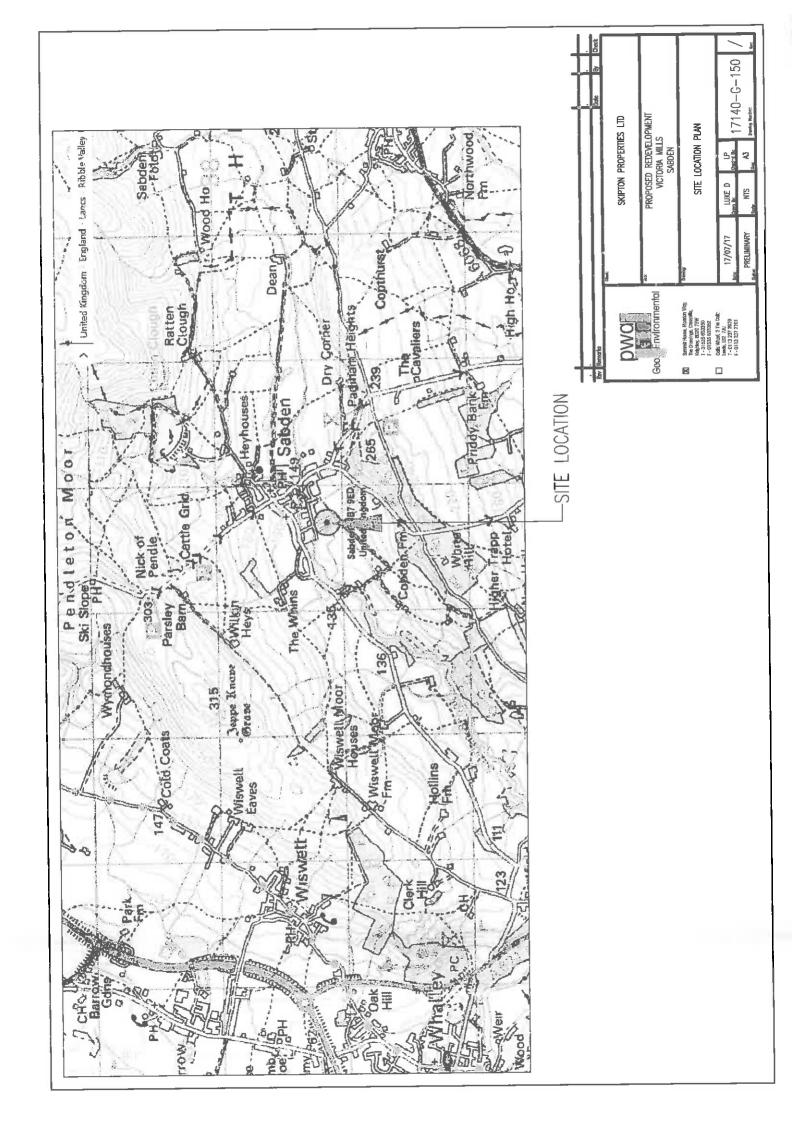
Project Details: Victoria Mills, Sabden

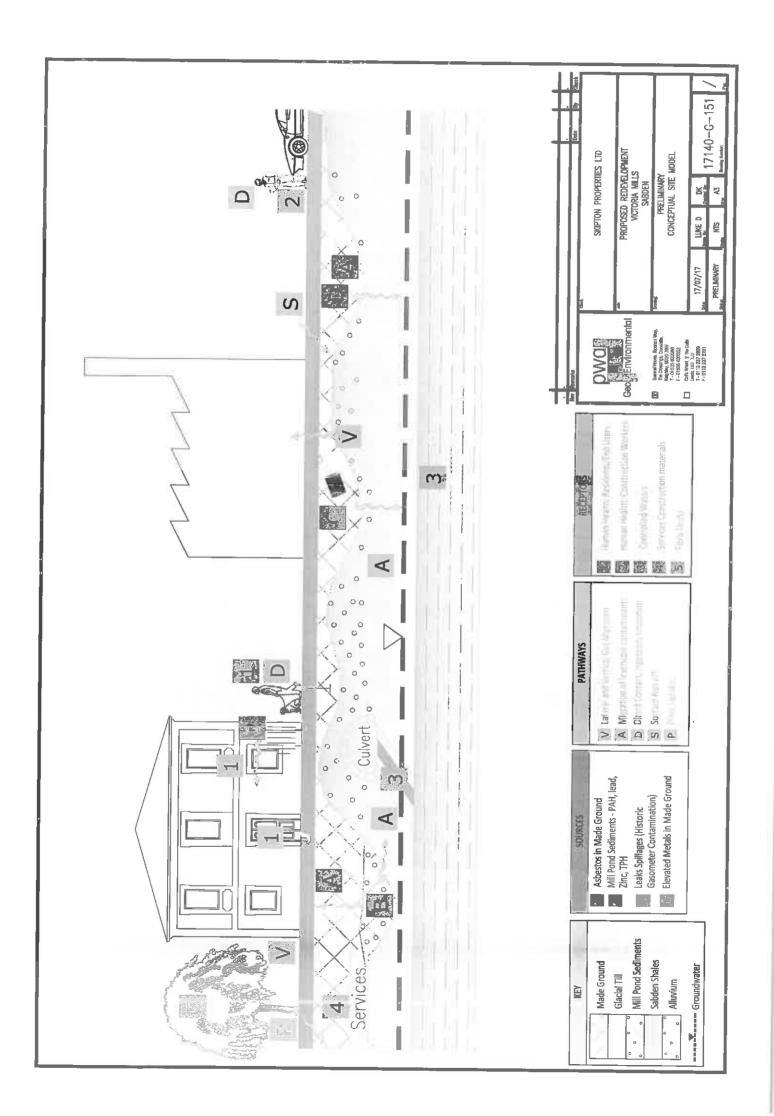
Date: November 2017

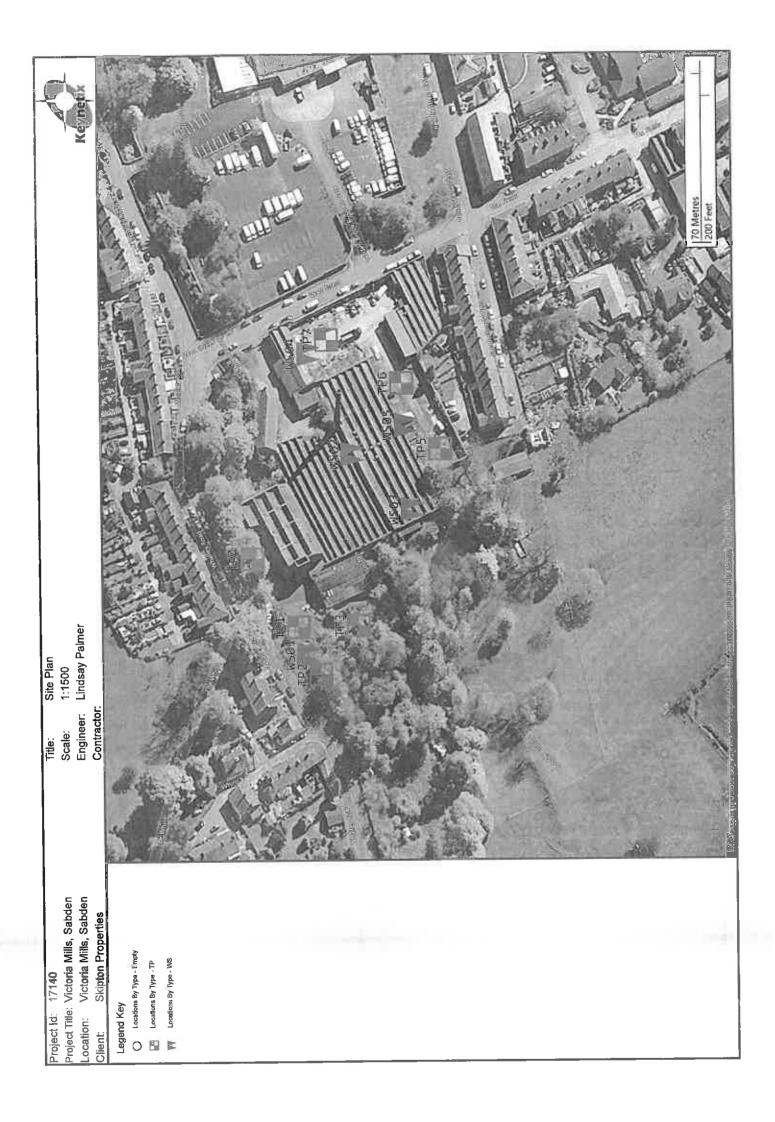


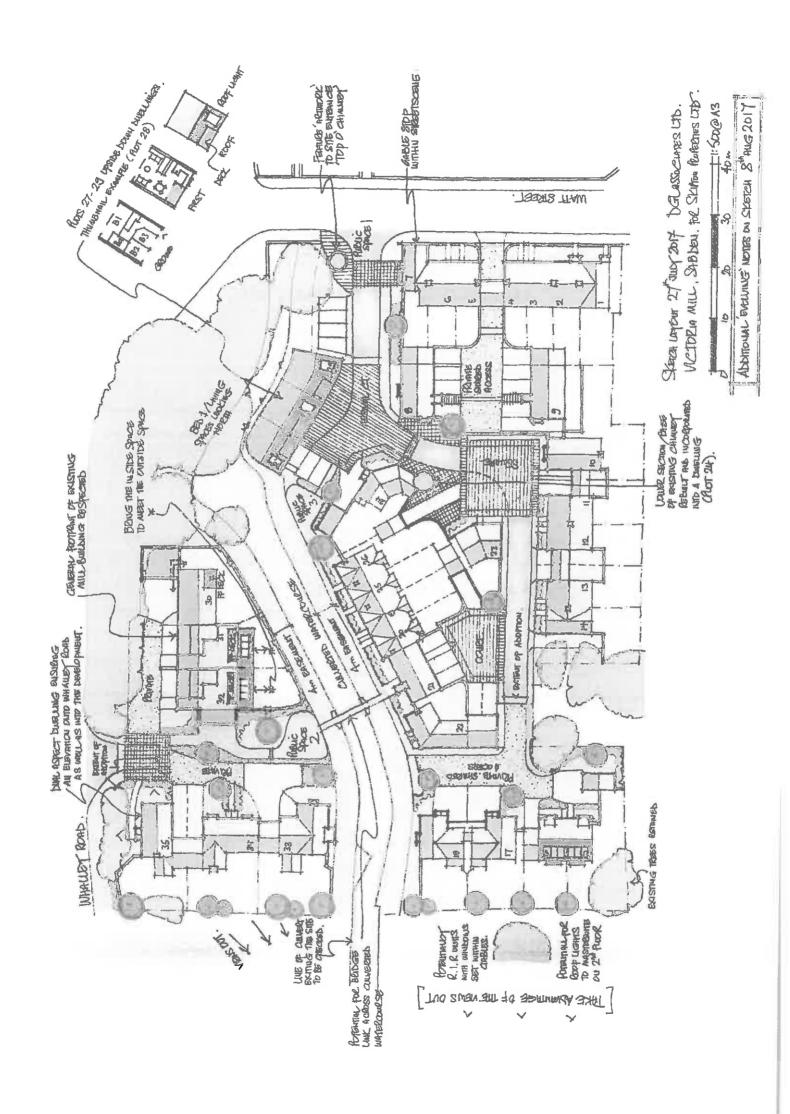
APPENDIX B

Drawings









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APPENDIX C

Exploratory Hole Logs and Photographs

D\	WO √≧e	PWA Geo-envi Summit H Ripairan	оцѕе,		Т	RIA	L PIT		G		Boreho TP	
Proj	nvironmental ect						Project		Date	٠.	Sheet	
Nan		Vi	ctoria Milís,	Sabden			1714	00			Dep 2.2	.0
Locat	ion:	Vi	ctoria Mills,	Sabden			E5	Coordinate 43240, N596			Wid	th:
Clie	nt:		Skipton Prop	perties	_		Elevation:	Logged B	-	ale: 25	Leng	th:
Water Strike	Sa Depth (m)	Type		ults	Depth (m)	Legend		Stratum	Description			Scale
	0.6 0.6	D ES			0.7 0		Reddish brown is fine to coars and sandstone tiles. [MADE GROUID Creamy brown GRAVEL. Grav subangular of tiles, bricks, an wire. [MADE GROUID CROUID	se angular to e with cobble ND] n and dark go el is fine to el sandstone, nd rare fragn	es of brick, rey slightly coarse angu brick with o	ar of brid sandston clayey sa lar to cobbles o	ck, tile ne and andy	1-
	1.8 1.9 - 2.0	D ES			2.20		Soft to very so sandy silty CLA [ALLUVIUM /N	Y.			organic	2
												3
												4
tability:	olfactory ev	vas terminated vidence of cont	in natural g amination.	ground . 2. G	round	dwater see	epage at 1.60m l	bgl. 3. No vis	ual or	D - [ES - En	Key: - Bulk samp Disturbed sai vironmental Hand shear	mple sample

Stability:

90) ETN	O . Gran	PWA Gec-enviror Summit Hou Ripairan Wa BD20 7BW	se, Iy,	TRI	AL PIT LOG	Borehole ID: TP2 Sheet 1 of 1				
Project	- 1	Victo	oria Milis, Sabden		Project ID: Date:	Depth: 2.40				
Locatio		Victo	oria Mills, Sabden		Coordinates: E543221, N5964951	Width:				
Client	: 1	Ski	pton Properties		Elevation: Logged By: Scale: Len					
Vater		mples and In Sit		Depth Lege	nd Stratum Description	Scale				
Strike	Depth (m)	Туре	Results	0.30	Dark brown clayey sandy GRAVEL with frag brick, metal wood and sandstone cobbles, metal bowl. [MADE GROUND] Brown slightly sandy gravelly CLAY Gravel is coarse sub-angular with tile, brick and sand fragments, and rare glass bottles. [MADE GROUND] Yellowish brown and greyish brown slightly	s fine to dstone				
	1.9 - 2.0	ES		2.10	CLAY. Gravel is fine to coarse, sub-angular rounded of sandstone, rare brick and vario lithologies. [MADE GROUND/REWORKED CLAY] Soft dark greyish black wet silty clay with bodour. [ALLUVIUM/MILL POND SEDIMENTS]	2 -				
						3				
						4				

HSV - Hand shear vane

Stability: Trial pit slightly unstable

D\ CeoleE	VO se a nvironmento.	PWA Geo-env Summit I Ripairan BD20 7	House, Way,		Ţ	RIA	L PIT	LOG	ì	Borehole ID: TP3 Sheet 1 of 1 Depth:	
Proje		V	ictoria Mills	, Sabden			Project		Date:		
Nam Locat			ictoria M ills				1714 E5	0 Coordinates: 43241, N59649	35	2.3 Widt	
Clier	nt:		Skipton Pro	perties			Elevation:	Logged By:	Scale: 1:25	Leng	th:
Water		mples and In			Depth	Legend		Stratum Des			Scale
Strike	0.2 - 0.4	ES	Re	sults	(m)		CLAY. Gravel is of brick sandst [MADE GROUI Reddish black	s over brown a fine to coarse a cone, glass, woo ND] slightly clayey s of brick, tiles, we boulders.	nd dark grey gra angular to sub-r od, plastic and c andy gravel. Gr rire, with low co	ounded oncrete.	1 -
	1.4	ES D			1.50			ular to rounde	CLAY. Gravel is f d of sandstone a		2 -
					2.30						4
-											

Remarks: 1. Trial pit was terminated in natural ground 2. No Groundwater encountered. 3. Possible Asbestos containing materials visible near surface.

Stability: Trial pit slightly unstable

Key: B - Bulk sample D - Disturbed sample ES - Environmental sample HSV - Hand shear vane

PV	/O 	WA Geo-environ Summit Hous Ripairan Way BD20 7BW	e,		RIA	L PIT LOG	Borehol TP4 Sheet 1	ļ
Projec	1	Victo	ria Mills, Sabden		î	Project ID: Date: 17140	Depti 2.00	
Name		Victo	ria Mills, Sabden			Coordinates: E543269, N5964979	Widt	
Client	: (Skir	oton Properties			Elevation: Logged By: Scale: 1:25	Lengt	h:
Vater	Sam	ples and in Situ	a Testing	Depth	Legend	Stratum Description	-	Scale
Strike	Depth (m)	Туре	Results	(m)		Tarmac and concrete hardstanding.		
	0.8 - 0.9	D		0.15 0.80 0.90 1.00		Tarmac and concrete hardstanding. [MADE GOUND] Dark brown sandy GRAVEL. Gravel is fine sub-angular of clinker brick, tiles, with low sandstone cobbles and fine coal fragment [MADE GROUND] Greyish brown gravelly clay with low to m boulder content. Gravel is fine to coarse sto sub-angular of sandstone with large sational boulders. [MADE GROUND/REWORKED FILL] Large cemented sandstone boulders with beneath. Void with water (Historic CULVERT)	oderate sub-rounded	2 -
		1-1						
	ks: 1. Trial pit v at 1.90m b :y: Trial Pit slig	gl. 3. No visible	i on culvert obstru e evidence of cont	ction bet aminatio	tween 1 - n 4. Trial	2m ogl. 2. Groundwater present in culvert oit was slightly unstable.	Key: B - Bulk sal D - Disturbed ES - Environmen HSV - Hand sh	sampie tai samp

Ratio	VO nvironmemo:	PWA Geo-envi Summit H Ripairan BD20 7	louse, Way,		T	RIA	L PIT				Boreho TP Sheet 1	5 . of 1
Proje Nam		Vi	ctoria Mills,	Sabden			Project 1714		Date	:	Dept 2,2	
Locat	·	Vi	ctoria Mills,	Sabden				Coordinate 43315, N596			Widt	
Clier	nt:		Skipton Prop	erties			Elevation:	Logged By	r: Sca	ale: 25	Leng	th:
Water Strike		mples and In :			Depth (m)	Legend		Stratum [Description			Scale
Strike	0.4 - 0.5 0.5	D ES	Resu		(m) 0.30		Grass over da sub-angular o and tile. [MADE GROU Firm to stiff gravel is fine to sandstone and [GLACIAL TILL]	rk grey GRAV f limestone, l ND] reyish brown to coarse rou d various lithe	EL. Gravel i brick fragm slightly gra nded to sul	ents, san	dstone .Y.	2
												-

Remarks: 1. Trial pit was terminated in natural ground 2. No groundwater encountered, 3. No visible or olfactory

evidence of contamination noted.

Stability: Trial pit stable

Key:
B - Bulk sample
D - Disturbed sample
ES - Environmental sample
HSV - Hand shear vane

PV Goo, En	VO Vironmenio	PWA Geo-environme Summit House, Ripairan Way, BD20 78W	entai	() () ()	RIA	ALPITLOG TP Sheet				
Project Name		Victoria	Mills, Sapden			Project 1714		Date:	Dept 2.40	j
Locatio		Victoria	Mills, Sabaen		ģ	E5.	Coordinates: 43342, N59649	17	Widt	n:
Clien	t:	Skipte	on Properties		194 174	Elevation:	Lengt	rs:		
Water Strike		amples and In Situ		Depth (m)	Legend		Stratum De	scription		Scale
Strike	(Depth (m)	Туре	Results	1 (11)		Gravel over sa	indstone flor sl	ab.	((
	0.4 0.5	D ES		0.20		Cream brown slightly clayey SAND. [MADE GROUND]				
	1.5	D			2.40	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse rounded to subrounded of various lithologies. [GLACIAL TILL]				
		it was terminated i		1.2 Slimin	taroundw	ator soonage at	1.70m pgl 3.1	No visible or	key:	4

olfactory evidence of contamination noted.

Stability: Trial pit stable.

Key: B - Bulk sample D - Disturbed sample

ES - Environmental sample

HSV - Hand shear vane

D\	VO invironmental	PWA Geo-envi Summit H Ripairan	ouse, Way,	T	RIA	L PIT	LO	G	Boreho	7
Proje		BD20 7				Project	ID:	Date:	Sheet 1	
Nam			ctoria Mills, Sab			17140 2. Coordinates: Wid				
Locat	ion:	Vie	ctoria Mills, Sab	den —————		E543361, N5964949				
Cile	nt:	5	kipton Properti	es		Elevation:	Logged By	Scale:	Leng	th:
Water Strike	Sa Depth (m)	mples and In S	Situ Testing Results	Depth (m)	Legend		Stratum D	escription		Scale
Remarks	1.7	D vas terminated	d in natural grou	0.25 0.80	undwater	GRAVEL of clir [MADE GROUI Greyish brown angular to sub fragments of p [MADE GROUI Reddish brown fine sub-rounce	nker. ND] In sandy grave In angular of bolastic and me ND] In sandy slight Ided to sub-an Il encountere	ly gravelly CLAY. ogular of Sandstoid along south fac	o coarse with rare Gravel is	2
	evidence of	f contaminatio	n noted.					D	B - Bulk samp - Disturbed sa	

Stability: Trial pit stable.

ES - Environmental sample HSV - Hand shear vane

Borehole ID: PWA Geo-environmental WINDOW SAMPLE LOG Summit House. WS01 Riparian Way Sheet 1 of 1 Geo: Environmental BD20 7BW Hole Type: Project Number: Elevation: Project Victoria Mills, Sabden 17140 WS Name: Coordinates: Scale: Project Victoria Milis, Sabden E543229, N5964956 1:25 Location: Logged By: Dates: Skipton Properties Client Name: 23/10/2017 Depth Water Samples and In Situ Tests Scale Stratum Description Legend instell Strike (m) Results Depth (m) Туре Dark brown topsoil. 0.10 [TOPSOIL] Red brick fill. [MADE GROUND] 0.40 Greyish brown slightly sandy gravelly clay. Gravel is fine to coarse of clinker coal, brick and sandstone fragments. [MADE GROUND] 1.00 SPT(S) N=12 (1,3/5,3,2,2) 1.20 Soft greyish brown gravelly clay. Gravel is fine to coarse angular to sub-angular of sandstone, concrete with rare fragments of glass and brick. [MADE GROUND] 1.70 Soft to very soft dark grey slightly gravelly silty CLAY with hydrocarbon odour. Gravel is fine to coarse angular to sub-rounded of SPT(S) N=2 (1,0/0,1,0,1) 2.00 sandstone and rare brick. [MILL POND SEDIMENTS] 2.70 Soft to firm greyish brown slightly sandy 2.80 ES CLAY. [ALLUVIUM] SPT(S) 3 3.00 N=16 (3,4/4,4,4,4) 3.20 Firm to stiff greyish brown gravelly sandy CLAY. Gravel to cobble size fragments of sandstone and Mudstone. [WEATHERED BEDROCK] 50 (4,10/50 for 4.00 4.00 SPT() 290mm)

Remarks: 1. Window sample was terminated in natural ground . 2. Groundwater encountered at 2.5m bgl. 3. Hydrocarbon odour below 1.8m bgi.

Key: ES - Environmental sample B - Bulk sample

D - Disturbed sample SPT - Std. Penetration Test

[[]	VVQ Egg Environr	nentol	Sum Rip	environmer mit House, arian Way 220 7BW		NDO	W S	AMPLE	LOG	Boreho WS Sheet	02
1	oject me:			Victoria	Mills, Sabden		Pr	oject Number: 17140	Elevation:	Hole 1	
	oject ation:			Victoria	Mills, Sabden			Coordinate E543313, N596		Sca 1:2	le:
	Name:			Skiptor	n Properties			Dates:		Logged By:	
instail.	Water			nples and Ir	ı Situ Tests	Depth	Legend				Capla
Instail.	Water Strike	2	Sar pth (m)	ES ES SPT(S)	Situ Tests Results 50 (4,6/50 for 250mm)	Depth (m) 0.20 0.40 1.20 1.60 3.45	Legend	Concrete ground [MADE GROUND] Dark grey/black a hydrocarbon odo sub-angular of cli lithologies. [MADE GROUND] Soft to firm brown CLAY. Gravel is fir sub-angular of sa various lithologies [ALLUVIUM]	floor slab. Ishy sandy gravel vur. Gravel is fine to nker, brick and var in slightly gravelly she to coarse sub-rondstone, mudstons. In Standy CLAY with poor ND. Gravel is fine b-rounded of sand in sandy CLAY. Gravel is profivarious lithold in sandy CLAY. Gravel is gravel i	co coarse ious andy punded to e and kets of to coarse stone, fine to ogies.	2
											5
Remark	<s: 1.="" \="" bgl.<="" td=""><td>Vindov 3. Slig</td><td>w sample ht hydroca</td><td>was termina arbon odou</td><td>ated in natural groun r 0.3m bgl.</td><td>d . 2. Grou</td><td>ndwater</td><td>encountered below</td><td>ES - Envi B - D - Di</td><td>Key: ironmental sa Bulk sample sturbed samp d. Penetration</td><td>le</td></s:>	Vindov 3. Slig	w sample ht hydroca	was termina arbon odou	ated in natural groun r 0.3m bgl.	d . 2. Grou	ndwater	encountered below	ES - Envi B - D - Di	Key: ironmental sa Bulk sample sturbed samp d. Penetration	le

Borehole ID: PWA Geo-environmental WINDOW SAMPLE LOG WS03 Summit House, Riparian Way Sheet 1 of 1 Cook Environmento BD20 78W Hole Type: Project Number: Elevation: Project Victoria Milis, Sabden WS 17140 Name: Coordinates: Scale: Project Victoria Mills, Sabden E543290, N5964913 1:25 Location: Logged By: Dates: Client Name: Skipton Properties 23/10/2017 Depth Samples and in Situ Tests Water Legend Scale Stratum Description nstall (m)Strike Depth (m) Type Results Concrete floor slab. [MADE GROUND] 0.20 Dark grey slightly sandy GRAVEL. Gravel is fine to coarse angular to sub-angular of 0.40 clinker limestone and various lithologies. [MADE GROUND] Soft to firm greyish brown slightly gravelly ES 0.70 slightly sandy CLAY. Gravel is fine to coarse D 0.80 sub-angular of sandstone and various lithologies. SPT(S) N=1 (1,0/0,0,0,1) 1.00 [ALLUVIUM] 1.40 Grevish brown wet clayey slightly gravelly SAND. [ALLUVIUM] 1.80 1.80 D Greyish brown very sandy GRAVEL. Gravel is mostly fine sub-angular to sub-rounded of 2.00 SPT(S) N=20 (3,4/5,5,5,5) sandstone and various lithologies. 2.10 [ALLUVIUM] Firm to stiff dark grey slightly gravelly CLAY. Gravel is mostly coarse sub-angular to subrounded of mudstone. [WEATHERED BEDROCK] 50 (11,13/50 for 2.60 2.60 SPT(S) 295mm)

Remarks: 1. Window sample was terminated in natural ground . 2. Damp below1.4m bgl. 3. No visual or

olfactory evidence of contamination.

Key: ES - Environmental sample

B - Bulk sample D - Disturbed sample SPT - Std. Penetration Test

O Geo	NO Page Invironm	nentol	Sum. Ripa	-environmer mit House, arian Way 020 7BW		DO	W S	SAMPLE	LOG	Borehole ID: WS04 Sheet 1 of 1	
	ject me:			Victoria	Mills, Sabden		P	roject Number: 17140	Elevation:	Hole T	
Pro	ject tion:			Victoria	Mills, Sabden			Coordinates: E543355, N5964		Scali 1:2	e:
Client	Name:			Skiptor	n Properties			Dates: 23/10/2017		Logged	Ву:
Install.	Water Strike	Do	San oth (m)	nples and Ir Type	Situ Tests Results	Depth (m)	Legend		m Description	<u></u>	Scale
		1	1.00 1.30	SPT(S) ES	N=3 (1,1/0,1,1,1) N=21 (7,5/5,6,5,5)	0.20 0.50 1.20 2.40 2.70		Limestone GRAVEL. [MADE GROUND] Dark grey GRAVEL. [MADE GROUND] Dark grey clayey Gitimber and brick. Gangular of Limeston [MADE GROUND] Soft to firm orangis CLAY. [GLACIAL TILL] Greyish brown oranging to coarse sub-angular to coarse sub-angular cobble size fragmer [GLACIAL TILL]	RAVEL with fragm iravel is mainly cone. h brown slightly sold gravel ar of sandstone were an arms of sandstone were ar of sandstone were arrows are sandsto	sandy	3

Remarks: 1. Window sample was terminated in natural ground . 2. No groundwater encountered. 3. No

visual or olfactory evidence of contamination.

Key:

ES - Environmental sample
B - Bulk sample
D - Disturbed sample
SPT - Std. Penetration Test

Borehole iD: PWA Geo-environmental WINDOW SAMPLE LOG Summit House, WS05 Riparian Way Sheet 1 of 1 **Environmenial** 6.00 BD20 7BW Hole Type: Project Number: Elevation: Project Victoria Mills, Sabden 17140 WS Name: Coordinates: Scale: Project Victoria Mills, Sabden E543325, N5964916 1:25 Location: Logged By: Dates: Skipton Properties Client Name: 23/09/2017 Depth Samples and In Situ Tests Water Scale Stratum Description Legend install (m)Strike Depth (m) Туре Results Limestone GRAVEL. 0.10 [MADE GROUND] Dark greyish brown gravelly CLAY. Gravel is fine to coarse angular to sub-angular of sandstone with fragments of brick. 0.50 [MADE GROUND] Soft to firm brown very slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to sub-rounded of sandstone and various lithologies. 1.00 SPT(S) N=1 (1,0/0,0,1,0) [GLACIAL TILL] 1.50 Firm to stiff brownish grey slightly gravelly CLAY. Gravel is coarse sub-angular of sandstone and mudstone. [GLACIAL TILL] 2.00 2.00 SPT(S) N=20 (4,5/5,5,5,5) No recovery due to cobble blocking window sampler. SPT(S) N=24 (6,6/6,5,6,7) 3.00 3.00 Stiff to very stiff dark greyish brown slightly gravelly CLAY. Gravel is fine to coarse (mostly coarse) sub-angular of mudstone sandstone and various lithologies. [WEATHERED BEDROCK] 4.00

Remarks: 1. Window sample was terminated in natural ground - 2. No groundwater encountered. 3. No visual or olfactory evidence of contamination.

Key:

ES - Environmental sample B - Bulk sample

D - Disturbed sample SPT - Std. Penetration Test

Report No: 17140/GR/02 Project Details: Victoria Mill, Sabden

Date: November, 2017





Plate 1: Trial Pit TP01 – Showing Made Ground



Plate 2: TP01



Plate 3: TP02 showing soft -very soft (TPH impacted) alluvial deposits

Project Details: Victoria Mill, Sabden Date: November, 2017





Plate 4: TP03 – Showing asbestos tiles within Made Ground and on ground surface



Plate 5: TP03

Project Details: Victoria Mill, Sabden Date: November, 2017





Plate 6: TP04 – Historic Culvert encountered

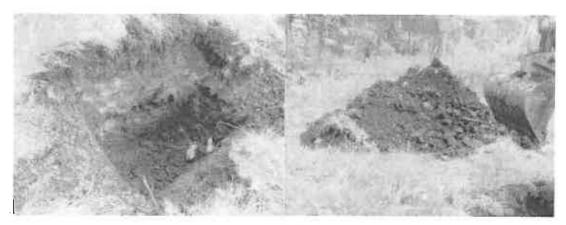


Plate 7: TP05

Report No: 17140/GR/02 Project Details: Victoria Mill, Sabden

Date: November, 2017





Plate 8: TP06



Plate 9: TP07



Plate 10: NAPL (Oil Creosote) type contamination on dipper associated with monitoring of historic WS05

Project Details: Victoria Mills, Sabden

Date: November 2017



APPENDIX D

Chemical Laboratory Results





Chemtest Ltd. Depot Road Newmarket CB8 0AL Tel: 01638 606070

Email: info@chemtest.co.uk

Final Report

Report No.:

17-24883-1

Initial Date of Issue:

28-Sep-2017

Client

Paul Waite Associates Geoenvironmental

Client Address:

Summit House

Riparian Way

The Crossings, Cross Hills

Keighley BD20 7BW

Contact(s):

Lindsay Palmer

Project

17140 Victoria Mills, Sabden

Quotation No.:

Date Received:

21-Sep-2017

Order No.:

Date Instructed:

21-Sep-2017

No. of Samples:

7

Turnaround (Wkdays):

Results Due:

27-Sep-2017

Date Approved:

28-Sep-2017

Approved By:

Details:

Glynn Harvey, Laboratory Manager



Bulk Identification Certificate

Paul Waite

Client: Associates

Geoenvironmental

Site Address:

Date Sampled: 18-Sep-2017

Date Received: 21-Sep-2017

Your Ref.:

Project:

17140 Victoria Mills,

Job Number: Sabden 17-24883

No Samples:

Date Reported:

28-Sep-2017

Sample No.	Sample Ref.	Description	SOP	Accred.	Laboratory	Material	Result
514124		TP3	2185	U	COVENTRY	Cement and insulation	Chrysotile

The in-house procedure SOP2185 is in accordance with the requirements of Appendix 2 of the Analyst Guide (HSG 248).

The results relate only to items tested as supplied by the client.

Comments and interpretations are beyond the scope of UKAS accreditation.

Samples associated with asbestos in building surveys are retained for six months (HSG 264 refers)

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Project: 17140 Victoria Mills, Sabden	ia.									
Client: Paul Waite Associates		Che	Chemtast Job No.:	op No.:	17-24883	17-24883	17-24883	17-24883	17-24883	17-24883
Onotation No:		Chemte	Chemtest Sample ID.	ple ID.:	514118	514119	514120	514121	514122	514123
Order No.:		Clie	Client Sample Ref.	le Ref.:	TP1	TP1	TP2	TP3	TP5	TP6
			Samp	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top De	Top Depth (m):	9.0	1.9	1.9	0.2	0.5	0.5
		æ	Bottom Depth (m):	pth (m):		2.0	2.0	0.4		
			Date S	Date Sampled:	18-Sep-2017	18-Sep-2017	18-Sep-2017	18-Sep-2017	18-Sep-2017	18-Sep-2017
			Asbesi	Asbestos Lab:	COVENTRY			COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	COD						
Arsenic	n		mg/kg	1.0	26	21	19	25	9.0	4.4
Beryllium	n	2450	mg/kg	1.0	1.4	1.7	1.1	1.6	1.0	× 1.0
Boron (Hot Water Soluble)	n	2120	mg/kg	0.40	< 0.40	1.4	< 0.40	1.4	< 0.40	× 0.40
Cadmium	ם	2450	mg/kg	0.10	0.61	2.0	1.0	0.90	0.1	01.0
Chromium (Trivalent)	z	2490	mg/kg	5.0	23	2.7	26	39	22	
Chromium (Hexavalent)	z	_	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.50 v
Chromium	⊃		mg/kg	1.0	23	27	26	39	22	= ;
Copper]]	_	mg/kg	0.50	83	98	50	77	26	6.7
Lead	-		mg/kg	0.50	190	310	140	400	39	23
Merciny	>	-	mg/kg	0.10	0.27	0.53	0.17	0.35	< 0.10	× 0.10
Nickel)		mg/kg	0.50	42	46	37	52	35	=
Salapium	, -	-	ma/ka	0.20	< 0.20	0.94	0.81	< 0.20	0.21	< 0.20
Vanadium	=	_	ma/ka	5.0	46	30	29	26	22	15
Zing		2450		0.50	140	390	180	250	80	24
Cincido (Gree)	=	2300		0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (riee))=	2020		0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Acceptable of the control of the con) - -		ma/ka	0 10	0.24	0.22	0.22	0.55	< 0.10	< 0.10
Accorditions	=		ma/ka	0.10	0.98	1.9	2.8	4.0	< 0.10	< 0.10
Action	=	2700	ma/ka	0.10	1.6	1.9	5.7	15	< 0.10	< 0.10
Benzelelanthracena) =	2700	ma/ka	0.10	4.1	7.2	7.2	33	0.37	0.21
Benzolalavrana		2700	ma/ka	0.10	3.6	13	8.3	26	< 0.10	< 0.10
Benzo[h][horanthane	=		ma/ka	0.10	3.9	10	6.0	30	0.23	< 0.10
Benzold h ilperviene				0.10	0.48	5.5	5.1	13	96.0	< 0.10
Benzolkifluoranthene	-			0.10	1.9	4.4	2.4	13	0.46	< 0.10
Chysene	ם	2700	mg/kg	0.10	3.6	5.0	4.4	25	0.34	0.22
Dibenz(a.h)Anthracene]	2700		0.10	0.54	1.5	1.5	3.3	< 0.10	< 0.10
Fluoranthene	∍	2700	-	0.10	8.2	11	2.0	20	0.94	0.43
Fluorene	ח	2700	-	0.10	0.43	0.62	1.4	3.8	< 0.10	× 0.19
Indeno(1,2,3-c,d)Pyrene	٦	2700		0.10	1.9	6.9	3.9	15	0.21	× 0.19
Naphthalenc	⊃	2700		0.10	0.13	0.33	0.60	0.46	< 0.10	< 0.10
Phenanthrene	ם	2700		0.10	4.6	5.3	4.9	55	< 0.10	× 0.10
Pyrene	ר	2700	mg/kg	0.10	6.9	9.2	15	62	0.32	< 0.10
Fraction of Organic Carbon	ם -	2625	_	0.0010	0.053	960.0	0.053	0.045	0.013	0.0067
Hd	n	2010		N/A	9.6	7.2	7.0	8.6	8.2	8.3
ACM Type	n	2192		N/A	Fibres/Clumps			Fibres/Clumps	+	•
Aspestos Identification)	2192	%	0.001	Chrysotile			Chrysotile	No Asbestos	No Asbestos
	_							-	ייייייייייייייייייייייייייייייייייייייי	ביינייייייייייייייייייייייייייייייייייי

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Client: Paul Waite Associates		ວົ	emtest	Chemtest Job No.:	17-24883	17-24883	17-24883	17.24883	17.24883	17 24002
Geoenvironmental						2001 -	2000	COOL - 1	C0047-71	20047-71
Quotation No.:		Chem	test Sar	Chemtest Sample ID.:	514118	514119	514120	514121	514122	514123
Order No.:		Ö	ent San	Client Sample Ref.:	TP1	TP1	TP2	TP3	TP5	TP6
			Sam	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top D.	op Depth (m):	9.0	1.9	1.9	0.2	0.5	0.5
		ā	ottom D	Bottom Depth (m):		2.0	2.0	0.4		
			Date (Date Sampled:	18-Sep-2017	18-Sep-2017	18-Sep-2017	18-Sep-2017	18-Sep-2017	18-Sep-2017
			Asbe	Asbestos Lab:	COVENTRY			COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	COD						
Asbestos by Gravimetry	n	2192	%	0.001	0.005			0.002		
Total Asbestos	z	2192	%	0.001	0.005			0.002		
Moisture	z	2030	%	0.020	14	48	37	24	14	16
Aliphatic TPH >C5-C6	z	2680	mg/kg	1.0		< 1.0	< 1.0			
Aliphatic TPH >C6-C8	Z	2680	mg/kg	1.0		< 1.0	< 1.0			
Aliphatic TPH >C8-C10	n	2680	mg/kg	1.0		< 1.0	< 1.0			
Aliphatic TPH >C10-C12	n	2680	mg/kg	1.0		< 1.0	7.0			
Aliphatic TPH >C12-C16	n	2680	mg/kg	1.0		< 1.0	40			
Aliphatic TPH >C16-C21	ח	2680	mg/kg	1.0		3.2	64			
Allphatic TPH >C21-C35	n	2680	mg/kg	1.0		8.8	29			
Aliphatic TPH >C35-C44	z	2680	mg/kg	1.0		33	< 1.0			
Total Aliphatic Hydrocarbons	z	2680	mg/kg	5.0		45	180			
Aromatic TPH >C5-C7	z	2680	mg/kg	1.0		< 1.0	< 1.0			
Aromatic TPH >C7-C8	z	2680	mg/kg	1.0		< 1.0	× 1.0			
Aromatic TPH >C8-C10	ñ	2680	mg/kg	1.0		× 1.0	× 1.0			
Aromatic TPH >C10-C12	n	2680	mg/kg	1.0		< 1.0	< 1.0			
Aromatic TPH >C12-C16	n	2680	mg/kg	1.0		06	4.1			
Aromatic TPH >C16-C21	D	2680	mg/kg	1.0		1300	1.6			
Aromatic TPH >C21-C35	ס	2680	mg/kg	1.0		4100	51			
Aromatic TPH >C35-C44	z		mg/kg	1.0		290	< 1.0			
Total Aromatic Hydrocarbons	z		mg/kg	5.0		2800	25			
Total Petroleum Hydrocarbons	z	2680	mg/kg	10.0		2800	240			
Total Of 16 PAH's	∍	2700	2700 mg/kg	2.0	43	84	76	370	3.8	< 2.0



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	рН	pH Meter
	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2185	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600 Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5-C6, >C6-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44Aromatics: >C5-C7, >C7-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene: Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol. Methylphenols, Dimethylphenols, 1- Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.



Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
 - < "less than"
 - > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: customerservices@chemtest.co.uk



Chemtest The right chemistry to deliver results

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Email: info@chemtest.co.uk

Final Report

Report No.:

17-28084-1

Initial Date of Issue:

31-Oct-2017

Client

Paul Waite Associates Geoenvironmental

Client Address:

Summit House

Riparian Way

The Crossings, Cross Hills

Keighley BD20 7BW

Contact(s):

Lindsay Palmer

Project

17140 - Victoria Mills Sabden

Quotation No.:

Date Received:

25-Oct-2017

Order No.:

17140

Date Instructed:

25-Oct-2017

No. of Samples:

1

Turnaround (Wkdays):

Results Due:

31-Oct-2017

Date Approved:

31-Oct-2017

Approved By:

Details:

Glynn Harvey, Laboratory Manager

lemtest	a right chemistry to deliver results 140 - Victoria Mills Sabden
K K	Th Project: 1

Quotation No.:		Chem	test Sar	Chemtest Sample ID.:	529662	529663	529664	529665
Order No.: 17140		Ö	ent Sam	Client Sample Ref.:	WS 1	WS 2	WS 3	WS 4
			Sam	Sample Type:	SOIL	SOIL	SOIL	SOIL
			Top D	Top Depth (m):	2.80	1.60	0.70	1.30
		۱۳	ottom D	Bottom Depth (m):		1.80		
			Date	Date Sampled:	23-Oct-2017	23-Oct-2017	23-Oct-2017	23-Oct-2017
			Aspei	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	ĽΟD				
Arsenic	o l	2450	mg/kg			11	17	6.3
Beryllium	n	2450	mg/kg			< 1.0	< 1.0	< 1.0
Boron (Hot Water Soluble)	⊃	2120	mg/kg			< 0.40	< 0.40	< 0.40
Cadmlum	D	2450	mg/kg	0.10		0.91	0.54	0.23
Chromium (Trivalent)	z	2490	mg/kg	5.0		9.3	17	12
Chromium (Hexavalent)	z	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Chromium	ס	2450	mg/kg	1.0		9.3	17	12
Copper	ב	2450	mg/kg	0.50		14	51	15
Lead	ס	2450	mg/kg	0.50		22	230	29
Mercury	n	2450	mg/kg	0.10		< 0.10	0.15	< 0.10
Nickel	D	2450	mg/kg			23	27	16
Selenium	D	2450	mg/kg	0.20		< 0.20	< 0.20	< 0.20
Vanadium	n	2450	mg/kg	5.0		6.6	24	15
Zinc	n	2450	mg/kg	0.50		59	62	48
Cyanide (Free)	_ n	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Total Phenols	n	2920		0.30		< 0.30	< 0.30	< 0.30
Acenaphthene	⊃	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Acenaphthylene	⊃	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Anthracene	⊃	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	5	2700	mg/kg	0.10		< 0.10	9.2	< 0.10
Benzo[a]pyrene	⊃	2700	mg/kg	0.10		< 0.10	9.3	< 0.10
Benzo[b]fluoranthene	⊃	2700	mg/kg	0.10		< 0.10	12	< 0.10
Benzo[g,h,i]perylene	٦	2700	mg/kg	0.10		< 0.10	5.9	< 0.10
Benzo[k]tluoranthene	5	2700	mg/kg	0.10		< 0.10	5.6	< 0.10
Chrysene	⊃ [:	2700	mg/kg	0.10		< 0.10	10	< 0.10
Dibenz(a,h)Anthracene	ا ا	2700	mg/kg	0.10		< 0.10	2.8	< 0.10
Fluoranthene) 		mg/kg	0.10		< 0.10	9.2	0.24
Fluorene	5		mg/kg	0:10		< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene)	_	mg/kg	0.10		< 0.10	4.5	< 0.10
Naphthalene	0		mg/kg	0.10		< 0.10	< 0.10	< 0.10
Phenanthrene	5		mg/kg	0.10		< 0.10	< 0.10	< 0.10
Fyrene	> 	_	mg/kg	0.10		< 0.10	12	0.36
Fraction of Organic Carbon	٥	2625		0.0010		0.0043	0.027	0.0077
Hd	n	2010		N/A		8.2	8.2	7.9
ACM Type	ם	2192		N/A		_		1
Asbestos Identification	>	2192	%	0.001		No Asbestos	No Asbestos	No Asbestos
	, _	1	ę	- 20.5		Detected	Detected	Detected

Froject: 17140 - Victoria Mills Sabden	St r results en		
Client: Paul Waite Associates Geomylconmental	Chemtest Job No.: 17-28084	17-28084	1
Quotation No.:	Chemtest Sample ID.:	529662	"
Order No.: 17140	Client Sample Ref.:	WS 1	
	Sample Type:	SOIL	
	Top Depth (m):	2.80	
	Rottom Denth (m):		

Results - Soil

Client: Paul Waite Associates		Che	mtest J	ob No.:	Chemtest Job No.: 17-28084	17-28084	17-28084	17-28084
Ouotation No .		Chemt	est Sam	Chemtest Sample ID.:	529662	529663	529664	529665
Order No - 17140		ਰੱ	ent Samp	Client Sample Ref .:	WS 1	WS 2	WS 3	WS 4
			Samp	Sample Type:	SOIL	SOIL	SOIL	SOIL
			Top De	Top Depth (m):	2.80	1.60	0.70	1.30
		ğ	Bottom Depth (m):	pth (m):		1.80		
			Date S	ampled:	Date Sampled: 23-Oct-2017	23-Oct-2017 23-Oct-2017	23-Oct-2017	23-Oct-2017
		I	Asbes	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	COD				
Moistare	z	2030	%	0.020	16	15	22	21
Total TPH >C6-C40)	2670	mg/kg	10	< 10	39	390	× 10
Total Of 16 PAH's	>	2700	2700 mg/kg	2.0		< 2.0	81	< 2.0



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barlum; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromlum in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3- band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dirnethylphenols, 1- Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.



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 - < "less than"
 - > "greater than"

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The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: customerservices@chemtest.co.uk



Chentest The right chemistry to deliver results

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:

17-30022-1

Initial Date of Issue:

17-Nov-2017

Client

Paul Waite Associates Geoenvironmental

Client Address:

Summit House

Riparian Way

The Crossings, Cross Hills

Keighley BD20 7BW

Contact(s):

Lindsay Palmer

Project

17140 - Vic Mills, Sabden

Quotation No.:

Q17-11151

Date Received:

13-Nov-2017

Order No.:

Date Instructed:

13-Nov-2017

No. of Samples:

3

Turnaround (Wkdays):

Results Due:

17-Nov-2017

Date Approved:

17-Nov-2017

Approved By:

Details:

Martin Dyer, Laboratory Manager

Project: 17140 - Vic Mills, Sabden							
Client: Paul Waite Associates		ວັ	emtest	Chemtest Job No.:	17-30022	17-30022	17-30022
Quotation No.: Q17-11151		Chem	rtest Sa	Chemtest Sample ID.:	538230	538231	538232
Order No.:		Ö	ient Sar	Client Sample Ref.:	Sabden	Sabden	WS01
			Slient Sa	Client Sample ID.:	ns	DS	WS01
			Sam	Sample Type:	WATER	WATER	WAIER
			Date	Date Sampled:	09-Nov-2017	09-Nov-2017	/L02-von-60
Determinand	Accred.	SOP	Units	2			
Cadmium (Dissolved)	٥	1450	hg/l	0.080	< 0.080	< 0.080	
Cyanide (Total)	٥	1300	mg/l	0.050	< 0.050	< 0.050	
Hd	ے اد	_	į	¥,	8.2	7.8	
Electrical Conductivity	- -	_	ms/cm	0.0	001	009	
Suspended Solids At 105C	=	1220) (A	5 5	12.5	11	
Chlonde	> =	1220) ()	0 010	0.073	0.039	
Sulphoto	, =	1220	ma/i	1.0	20	13	
Cyanide (Free)		1300	mg/l	0.050	< 0.050	< 0.050	
Thiocyanate		1300	mg/l	0.50	< 0.50	< 0.50	
Cyapide (Complex)	=	1300	ma/l	0.050	< 0.050	< 0.050	
Sulphide		1325	mg/l	0.050	[B] < 0.050	[B] < 0.050	
Arsenic (Dissolved)		1450	mg/l	0.0010	< 0.0010	< 0.0010	
Chromium (Dissolved)		1450	mg/l	0.0010	< 0.0010	< 0.0010	
Copper (Dissolved)	5	1450	l/gm	0.0010	0.0011	0.0014	
Mercury (Dissolved)	n	1450	l/bu	0.00050	< 0.00050	< 0.00050	
Vickel (Dissolved)	ח	1450	l/gm	0.0010	0.0014	0.0011	
ead (Dissolved)	⊃	1450	l/gm	0.0010	< 0.0010	< 0.0010	
Selenium (Dissolved)	n	1450	l/gm	0.0010	< 0.0010	< 0.0010	
Zinc (Dissolved)	_	1450	l/gm	0.0010	< 0.0010	< 0.0010	
ron (Dissolved)	z	1450	mg/	0.020	0.31	0.26	
Total Organic Carbon	∍	1610	/gm	2.0	15	15	140
TPH >C6-C10	z	1670	rg/	0.10	01.0 >	0.10	310
TPH >C10-C21	z -	1670	μg/	0.10	0.10	0.10	34000
TPH >C21-C40	z :	16/0	/gl	01.70	× 0.10	7,000	140000
Fotal TPH >C6-C40	⇒ :	16/0	ı/Brl		2 2	200	200
Total TPH >C6-C44	z I	16/0	Ď.	0.010	0.010	0.000	
Naphthalene	∍ :	1/00	mg/	0.00010	< 0.00010	< 0.00010	
Acenaphthylene	> :	1700	mg/l	0.00010	< 0.00010	× 0.00010	
Acenaphthene	> :	1/00	mg/l	0.00010	< 0.00010	0.00010	
Fluorene	5	1700	ğ	0.00010	0.00010	0.00010	
Phenanthrene	> : - -	1700	mg/	0.00010	< 0.00010	< 0.00010	
Anthracene	ə : -	00/L	BE I	0.00010	0.00010	0.00010	
Fluoranthene	- : -	1/00	lg l	0.000	0.000	0.00010	
Pyrene	=	32	70	0.000	0.00010	< 0.00010	
Denzolajantiriacene	=	1700	, DE	0.00010	< 0.00010	< 0.00010	
III yadılığ	,	2	, n				
D Ch. 10	-	1700	/200	0.00010	< 0.00010	< 0.00010	

St	Cinco
te	den
	Mills, S.
	7140 - Vic
	Project: 1

09-Nov-2017 WS01 WS01 WATER 17-30022 538232 09-Nov-2017 [C] < 0.0010[C] < 0.0010 [C] < 0.0010[C] < 0.0010[C] < 0.0010< 0.00010 < 0.00010 < 0.00010 < 0.00010 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.030 17-30022 < 0.0020 WATER < 0.0050 < 0.0050 < 0.0050 Sabden 538231 DS 09-Nov-2017 [C] < 0.0010[C] < 0.0010[C] < 0.0010[C] < 0.0010[C] < 0.0010< 0.00010 < 0.00010 < 0.00010 < 0.0050 < 0.0050 < 0.00010 < 0.0050 17-30022 Sabden < 0.0050 < 0.030 WATER < 0.0020 < 0.0050 < 0.0050 < 0.0050 538230 0.0010 Chemtest Job No.: Date Sampled: 1700 mg/l 0.00010 0.00010 Sample Type: 0.00010 0.00010 Client Sample Ref.: Client Sample ID.: 0.0010 0.0010 Chemtest Sample ID. 0.0020 0.0010 0.0050 0.0050 0.0050 0.0050 0.0050 0.030 0.0050 0.0050 200 Units mg/ mg/l mg/l 1760 mg/l mg/l шâ⁄I mg/l ₩g/l ₩ J ľ8́E ₩g/l ∥g/l mg/l ∥gш l/gm SOP 1700 1700 1700 1760 1760 1760 1920 1920 1920 1920 1920 1920 1760 1920 Accred. z Z Client: Paul Waite Associates Quotation No.: Q17-11151 ndeno(1,2,3-c,d)Pyrene (ylenols & Ethylphenols Dibenz(a,h)Anthracene Benzo[g,h,i]perylene Geoenvironmental Total Of 16 PAH's rimethylphenols 3enzo[a]pyrene Ethylbenzene Determinand n & p-Xylene Total Phenols Resorcinol -Naphthol Order No.: Catechols -Xylene Benzene oluene Cresols Pheno



Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample ID:	Sample Ref:	Sample ID:	Sampled Date:	Deviation Code(s):	Containers Received:
538230	Sabden	US	09-Nov-2017	ВС	Coloured Winchester 1000mi
538230	Sabden	US	09-Nov-2017	BC	Plastic Bottle 1000ml
538231	Sabden	DS	09-Nov-2017	ВС	Coloured Winchester 1000ml
538231	Sabden	DS	09-Nov-2017	BC	Plastic Bottle 1000ml



Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	рН	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1030	Total Suspended Solids	Total suspended solids	Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C.
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N-dimethyl-pphenylenediamine.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmlum; Chromlum; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6-C40); optional carbon banding, e.g. 3- band - GRO, DRO & LRO	Pentane extraction / GC FID detection
	Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghf]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GC FID detection
	(VOCs) in Waters by		Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
1920	Phenois in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.



Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
 - < "less than"
 - > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenois

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: <u>customerservices@chemtest.co.uk</u>



Chentest The right chemistry to deliver results

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:

17-30026-1

Initial Date of Issue:

17-Nov-2017

Client

Paul Waite Associates Geoenvironmental

Client Address:

Summit House

Riparian Way

The Crossings, Cross Hills

Keighley BD20 7BW

Contact(s):

Lindsay Palmer

Project

17140 - Vic Mills, Sabden

Quotation No.:

Q17-11151

Date Received:

13-Nov-2017

Order No.:

Date Instructed:

13-Nov-2017

No. of Samples:

4

Turnaround (Wkdays):

Results Due:

17-Nov-2017

Date Approved:

17-Nov-2017

Approved By:

Details:

Glynn Harvey, Laboratory Manager

Pocults - Water

538242 WS10H WATER 09-Nov-2017

17-30026

The right chemistry to deliver results	St results					Results	ts - Wate
Project: 17140 - Vic Mills, Sabden Client: Paul Waite Associates		5	nemtest	Chemtest Job No.:	17-30026	17-30026	17-30026
Geoenvironmental		Chen	ntest Sa	Chemtest Sample ID.:	538239	538240	538241
Order No		o	lient San	Client Sample Ref .:	WS05H	WSZH	WS04H
			Sam	Sample Type:	WATER	WATER	WATER
			Date	Date Sampled:	09-Nov-2017	09-Nov-2017	09-Nov-2017
Determinand	Accred.	SOP	Units	LOD			
Cadmium (Dissolved)	n	1450	l/gri	0.080	< 0.080		< 0.080
Cvanide (Total)	ח	1300	l/gm	0.050	< 0.050		< 0.050
ha	ח	1010		N/A	7.2		6.9
Electrical Conductivity	n	1020	us/cm	1.0	520		570
Suspended Solids At 105C	n	1030	l/6ш	5.0	300		1400
Chloride	o :	1220	l/gm	1.0	13		13
Ammonium	> =	1220	mg/l	0.010	0.023 58	İ	70
Sulphate	=	1300	l/bm	0.050	< 0.050		< 0.050
Cyanide (riee) Thiocyanate		1300	ma/l	0.50	< 0.50		< 0.50
Cvanide (Complex)		1300	mg/l	0.050	< 0.050		< 0.050
Sulphide	-	1325	l/gm	0.050	[B] < 0.050		[B] < 0.050
Arsenic (Dissolved)	n	1450	l/gm	0.0010	0.0014		< 0.0010
Chromium (Dissolved)	n	1450	l/gm	0.0010	< 0.0010		< 0.0010
Copper (Dissolved)	O	1450	mg/l	0.0010	< 0.0010		< 0.0010
Mercury (Dissolved)	ח	1450	∥⁄gш	0.00050	< 0.00050		< 0.00050
Nickel (Dissolved)	Э	1450	mg/l	0.0010	< 0.0010		0.0010
Lead (Dissolved)		1450	l/gm	0.0010	< 0.0010		0.0000
Selenium (Dissolved)	= =	4 5 5 5 6 7	light Ingri	0.00	0.0023		< 0.0010
Zinc (Dissolved)	> z	1450	70	0.00	0.15		0.16
Total Organic Carbon	=	1610	4-	2.0	15		12
Total TPH >C6-C44	z	1670	┺	0.010	2.1		< 0.010
Naphthalene		1700	┺	0.00010	< 0.00010		< 0.00010
Acenaphthylene)	1700	L-	0.00010	< 0.00010		< 0.00010
Acenaphthene	n	1700	mg/l	0.00010	< 0.00010		< 0.00010
Fluorene	ח	1700	l/6m	0.00010	< 0.00010		< 0.00010
Phenanthrene	n	1700	l/gm	0.00010	< 0.00010		< 0.00010
Anthracene	n	1700	mg/l	0.00010	< 0.00010		< 0.00010
Fluoranthene	_	1700	4	0.00010	< 0.00010		< 0.00010
Pyrene	5	1700	4	0.00010	< 0.00010		< 0.00010
Benzo[a]anthracene	⊃	1700	_	0.00010	< 0.00010		0.00010
Chrysene	D	1700	-	0.00010	< 0.00010		× 0.00010
Benzo[b]fluoranthene	→	1700	4	0.00010	< 0.00010		0.00010
Benzo[k]fluoranthene	∍ :	1700	_	0.00010	< 0.00010		< 0.00010
Benzo[a]pyrene	∍	9	4	0.00010	< 0.00010		0.00010
Indeno(1,2,3-c,d)Pyrene	> : -	120	_	0.00010	< 0.00010 > 0.00010		× 0.00010
Dibenz(a,h)Anthracene	<u> </u>	2 5	-	0.00010	\ 0.00010	i	× 0.00010
Benzo[g,h,i]perylene	> =	178) (1)	0.0020	< 0.0020 < 0.0020		< 0.0020
lotal Of 16 PAH'S	>	3	4	2,201	, , ,		

\$\begin{align*}
\$<0.080 & 0.050 & 0.050 & 0.050 & 0.050 & 0.050 & 0.90 & 0.90 & 0.90 & 0.90 & 0.0050 & 0.0050 & 0.0050 & 0.0050 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0016 & 0.0010 & 0.0010 & 0.0010 & 0.0010 & 0.0010 & 0.0010 & 0.00

ater

538242 WS10H WATER 09-Nov-2017

17-30026

The right chemistry to deliver results Project: 17140 - Vic Mills, Sabden	er results						
Client: Paul Waite Associates Geoenvironmental		O	hermtes	Chemtest Job No.:	17-30026	17-30026	17-30026
Quotation No.: Q17-11151		Cher	ntest Sa	Chemtest Sample ID.:	L	538240	538241
Order No.:			lient Sa	Client Sample Ref.:	Ш	WSZH	WS04H
			San	Sample Type:	\perp	WATER	WATER
Dodozen		900	Date	Date Sampled:	09-Nov-2017	09-Nov-2017	09-Nov-2017
Dichlorodifluoromethane	Accred.	1787	STILIS IN	2,5		01/10	
Chloromethane	, -	1760	200	5 6		2 V	
Vinyl Chloride	z	1760	 	1.0		<u>C</u> < 1.0	
Bromomethane	ח	1760	l/grl	5.0		[C] < 5.0	
Chloroethane	n	1760	лgл	2.0		[C] < 2.0	
Trichlorofluoromethane	⊃	1760	l/gu	1.0		[C] < 1.0	
1,1-Dichloroethene	∍	1760	/br	1.0		[C] < 1.0	
Trans 1,2-Dichloroethene	∍	1760	l/grl	1.0		[C] < 1.0	
1,1-Dichloroethane	٦	1760	l/gu	0.		[C] < 1.0	
cis 1,2-Dichloroethene	> :	1760	l/grl	1.0		[C] < 1.0	
Bromochloromethane	5	1760	ľg⊓	5.0		[C] < 5.0	
1 nchloromethane	>	1760	/Bri	1.0		<u>C</u> < 1.0	
Totachlamoreum	= =	09/1	ng/	0,1		CJ < 1.0	
1 1-Dichloromopene	=	1760	/6rl	0.0		<u>C</u> < 1.0	
Benzene)=	1760	Light Light	0.000	101 0 0000	0.1 ^ [2]	07000
Benzene		1760	/on	1.0	[5] 0.0023	IC: 10	0100.00 > [2]
1,2-Dichloroethane	>	1760	/bn	2.0		ICI < 2.0	
Trichloroethene	Z	1760	hg/l	1.0		[C] < 1.0	
1,2-Dichloropropane	Ω	1760	l/grl	1.0		[C] < 1.0	
Dibromomethane	Э	1760	l/grl	10		[C] < 10	
Bromodichloromethane	∍	1760	l/grl	5.0		[C] < 5.0	
cls-1,3-Dichloropropene	Z	1760	l/Br	10		[C] < 10	
Toluene	5	1760	mg/l	0.0010	[C] 0.012		[C] < 0.0010
Toluene	-	1760	l/grl	1.0		[C] 5.7	
I rans-1,3-Dichloropropene	2	1760	l/grl	10		[C] < 10	
Tetrachlomethene	> =	1760	/g/	10		CI < 10	
1,3-Dichloropropane		1760		200	,	0 V V	
Dibromochloromethane	٦	1760	/bri	9		[C] < 10	
1,2-Dibromoethane	D.	1760	l/Brl	5.0		[C] < 5.0	
Chlorobenzene	z	1760	l/gri	1.0		[C] < 1.0	
1,1,1,2-Tetrachloroethane	n	1760	l/gri	2.0		[C] < 2.0	
Ethylbenzene	⊃	1760	mg/l	0.0010	[C] < 0.0010		[C] < 0.0010
Ethylbenzene	э:	1760	l/gr	1.0		[C] 22	
m & p-Xylene	> :	1760	l/gm	0.0010	[C] 0.17		[C] < 0.0010
m & p-Xylene		9	/gr	1.0		[C] 95	
o-Aylene o-Xylene	> =	1/60	l/gm	0.0010	[C] 0.13		[C] < 0.0010
O-Aylelle Styrene	=		Sr i	0.0	1	88	
Syland	3	00/1	Mg/	2		[C] < 1.0	

[C] 0.0081

Page 3 of 7

[C] 0.0088

[C] 0.0054

[C] 0.0018

[C] 0.010



Client: Paul Waite Associates Geoenvironmental		Ċ	emtest	Chemtest Job No.:	17-30026	17-30026	17-30026	17-30026
	=	5						
Ountation No.: 017-11151		Chem	itest Sa	Chemtest Sample ID.:	538239	538240	538241	538242
Order No.		<u> </u>	ient San	Client Sample Ref .:	WS05H	MSZH	WS04H	WS10H
			Sam	Sample Type:	WATER	WATER	WATER	WATER
			Date	Date Sampled:	09-Nov-2017	09-Nov-2017	09-Nov-2017	09-Nov-2017
Determinand	Accred.	SOP	Units	100				
Tribromomethane		1760	l/grl	1.0		[C] < 1.0		
Isopropylbenzene	 -	1760	l/grl	1.0		[C] 14		
Bromobenzene) -	1760	l/gri	1.0		[C] < 1.0		
1,2,3-Trichloropropane	z	1760	l/gri	50		[C] < 50		
N-Propylbenzene	⊃	1760	l/Brl	1.0		[C] 4.8		
2-Chlorotoluene	<u> </u>	1760	l/gri	1.0		[C] < 1.0		
1,3,5-Trimethylbenzene	n	1760	l/Brl	1.0		[C] 49	į	
4-Chlorotoluene	n	1760	l/gri	1.0		[C] < 1.0		
Tert-Butylbenzene	Þ	1760	l/Bri	1.0		[C] < 1.0		
1,2,4-Trimethylbenzene	ח	1760	l/6rl	1.0		[C] 150	11	
Sec-Butylbenzene	ח	1760	l/Bri	1.0		[C] < 1.0		
1,3-Dichlorobenzene	z	1760	l/βπ	1.0		[C] < 1.0		
4-Isopropyltoluene	n	1760	μg/	1.0		[C] < 1.0		
1,4-Dichlorobenzene	n	1760	пg/í	1.0		[C] < 1.0		
N-Butylbenzene	n	1760	l/grl	1.0		[C] < 1.0		
1,2-Dichlorobenzene	n	1760	μg/l	1.0		[C] < 1.0		
1,2-Dibromo-3-Chloropropane	n	1760	µg/l	50		[C] < 50		
1,2,4-Trichlorobenzene	n	1760	l/Brl	1.0		[C] < 1.0		
Hexachlorobutadiene	n	1760	l/grl	1.0		[C] < 1.0		
1,2,3-Trichlorobenzene	n	1760	l/gr	2.0		[C] < 5.0		
Methyl Tert-Butyl Ether	Z	1760	l/gr	1.0		[C] < 1.0		0.00
Resorcinol	ס	1920	l/6m	0.0050	< 0.0050		< 0.0050	000.0 >
Phenol	n	1920	l/6m	0.0050	< 0.0050		< 0.0050	< 0.0050
Cresols)	1920	l/gm	0.0050	< 0.0050		< 0.0050	< 0.0050
1-Naphthol	z	1920	l/gm	0.0050	< 0.0050		< 0.0050	< 0.0050
Trimethylphenols	<u></u>	1920	l/gm	0.0050	< 0.0050		< 0.0050	< 0.0050
Catechols	z	1920	l/gm	0.0050	< 0.0050		< 0.0050	< 0.0050
Xvlenols & Ethylphenols	ے ا	1920	∥gm	0.0050	< 0.0050		< 0.0050	< 0.0050
Total Phenois		1920	l/bu	0.030	< 0.030		< 0.030	< 0.030



Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample ID:	Sample Ref:	Sample ID:	Sampled Date:	Deviation Code(s):	Containers Received:
538239	WS05H		09-Nov-2017	ВС	Coloured Winchester 1000ml
538239	WS05H		09-Nov-2017	BC	Plastic Bottle 1000ml
538240	WSZH		09-Nov-2017	С	Coloured Winchester 1000ml
538241	WS04H		09-Nov-2017	вс	Coloured Winchester 1000ml
538241	WS04H		09-Nov-201 7	ВС	Plastic Bottle 1000ml
538242	WS10H		09-Nov-2017	ВС	Coloured Winchester 1000ml



Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1030	Total Suspended Solids	Total suspended solids	Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C.
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N-dimethyl-pphenylenediamine.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene: Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GC FID detection
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.



Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: <u>customerservices@chemtest.co.uk</u> Project No: 17140/GR/02

Project Details: Victoria Mills, Sabden

Date: November 2017



APPENDIX E

Geotechnical Laboratory Results

Tharide Content

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Pressures

(CD) benisted betsbile

Lateral Pressure (kPa)

(GD) beging posterious?

Normal (F13)

CHEMICAL

SHEAR BOX TESTS

TRIAXIAL TESTS

Date Received by lab: Results Required By:

Date Issued:

Project Engineer:

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Spe

Schedule Number:

Sample Storage Period:

Date: 01.07.
Approved By: Anthony Watkins

LOCATION: VICTORIA MILLS

All tests are certed out to BSL377:1990 unless otherwise states

PROJECT ENGINEER: L. PALMET

Issue No. 1

CONTRACT NUMBER: 17(40

issue No. 1

PSLF01

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Project No: 17140/GR/02

Project Details: Victoria Mills, Sabden

Date: November 2017



APPENDIX F

Gas and Groundwater Monitoring Data

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Geo/ Environment		PID (VOC) ppm	CH, % v/v 0.0	00, % W. 0.0	V 20.7	02 %	Ambient Readings O ₂ % v/v 20.7
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Project No: 17140/GR/02

Project Details: Victoria Milis, Sabden

Date: November 2017



APPENDIX G

Statistical Summary of Laboratory Results

Chemical of Potential Concern	Generic Criterion (mg/kg) Basis for Generic Criterion	Basis for Generic Criterion	No. Samples	Min. (mg/kg)	Max. (mg/kg)	No. Samples Equal to, or Greater Than, Generic	US95 (mg/kg)
Aliphatics > EC6-EC8	370	LOM/CIEH + CLEA 1.06	2		-	Criterion	
Aliphatics >EC8-EC10	110	LOWCIEH + CLEA 1.06	2		_	5 6	1.00
Allphatics >EC10-EC12	280	LOM/CIEH + CLEA 1 06	200	- -	- r	0	1.00
Aliphatics >EC12-EC16	140	OM/CIEH + CI EA 1 OR	100		_	0	17.08
Aliphatics >EC16-EC35	76000	LOM/CIEH + CLEA 1.06	2	- 5	457	D	105.52
Aliphatics >EC35-EC44	76000	LOM/CIEH + CLEA 1.06	2	-	101		332.60
Aromatics EC5-EC7	280	LOM/CIEH + CLEA 1.06		-	8 -		86.76
Aromatics >EC7-EC8	610	LOM/CIEH + CLEA 1.06				0	1.00
Aromatics > EC8-EC10	150	LOM/CIEH + CLEA 1.06	2	-	- -		1.00
Aromatics >EC10-EC12	350	LOWCIEH + CLEA 1.06	6		- 4		1.00
Aromatics >EC12-EC16	590	LOM/CIEH + CLEA 1.06	-	41	- 8		1.00
Aromatics >EC16-EC21	770	LOM/CIEH + CLEA 1.06	2	- w	4500	0 7	234.31
Aromatics >EC21-EC35	1200	LOM/CIEH + CLEA 1.06	2	2.5	1300		3481.31
Aromatics >EC35-EC44	1200	LOM/CIEH + CLEA 1.06	2	5	300	- 0	10902.32
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Ali >EC16-EC35	42000	64000	000/	45000	00000	Conno	00000	T	000026	100000	100000	1000001	81000	81000	81000 LQM/CIEH + CLEA 1.06
Ali >EC35-EC44	45000	64000	17000	45000	94000	ODDQ)	Vaccional	<u>اک</u>	20000	1300	2300	4700	180000	180000	180000 LQM/CIEH + CLEA 1.06
Aro ECS-EC7	260	480	980	92	130.00	087	2 8	17	420	07.0	1000	4400	180000	180000	180000 LQM/CIEH + CLEA 1.06
Aro >EC7-EC8	610	1300	2200	120	270	610.0	77	Į Į	3 :	000	200	20000	18000	16000	18000 DM/CIFH + CI FA 1 06
AM SECRETOIN	33	81	190.0	27	92	150	8.6	5	5	0	900	2000	2000	20000	ACAS LOTA MICIEM + OF EA 4 OR
1040 1040	180	420	870	69	160	350	13	31	74	360	006	ZZUD	OOOGL	0000	TOOOD LANGELL + OLLY 1.00
Aro >ECIU-ECIZ	200	1000	12002	170	340.0	590 0	2	57	130	36000	37000	38000	16000	16000	16000 LQM/CIEH + CLEA 1.06
Aro >EC12-EC16		na	3	OF C	200	1000	av.	ļ	260	28000	28000	28000	12000	12000	12000 LOM/CIEH + CLEA 1.06
Aro >EC16-EC21	1300	1300	1300	25	490	2	044	i	2000	28000	28000	28000	12000	12000	12000 LOM/CIEH + CLEA 1.06
Aro >EC21-EC35	1300	1300	1300	890	1100	1200	3/0	i	000	20000	20000	00000	12000	12000	12000 LOM/CIFH + CLEA 1.06
Am >FC36-FC44	1300	1300	1300	890	1100	1200	370	i	009	20002	20000	2000	2000	1000	OAN COV PROPERTY OF THE
2001.00	0.97	0.49	-	0.08	0.16	0.33	0.017		0.075	28	200	S	240	0.57	Appropriate Appropriate 4 October 198
Delizerie	100	000	0020	130	270	810	22		120	870	1900	4400	180000	180000	180000 Sev report + CLEM 1.00
oiuene	2	200	300	2	277	0 20	46	İ	6	620	1200	2800	81000	81000	81000 SGV report + CLEA 1.06
thylbenzene	170	380	2	S	no.	000	0 0	000	100	UBY	1100	2600	150000	150000	150000 SGV report + CLEA 1.06
Xvlene o-	9	140	320	3	110	DQZ	97	i	3	2	200	9010	450000	160000	150000 SCV report + CLEA 1 06
Vidence on	17.5	130	300	44	100	240	3	7.4	180	250	T I	S C	ODDOC	00000	20 CO CO CO CO CO CO CO CO CO CO CO CO CO
yichie, III-	1	130	000	42	86	230	29	02	160	280	1400	3200	150000	nonct	190000 Sev report + CLEA 1.00
Aylene, p-	3 5	36	02%	40	84	160	23	4	8	7900	13000	24000	240000	240000	240000 EIC/AGS/CLAIRE + CLEA
N N	2	וקח	027	0	10	2									

Human Health	Residential with pl	Recipential with plant indules (1% COM)					
		an cheard (second)					
Concern	on (mg/kg	Basis for Generic Criterion	No. Samples	Min. (mg/kg)	Max. (mg/kg)	No. Samples Equal to, or Greater Than, Generic	US95 (mg/kg)
Arsenic	35	SGV report + CLEA 1.06	co	4.4	26	Curenon	97 08
Beryllum		LOM/CIEH + CLEA 1.06	6	<u></u>	1.7	» c	162
Baron	_	LOM/CIEH + CLEA 1.06	6	0.4	14		1 26
Cadmium		SGV report + CLEA 1.06	6	0.1	2	0	162
Chromium (III)		LOM/CIEH + CLEA 1.06	6	9.3	39		34.57
Chromitum (VI)	ĺ	LOM/CIEH + CLEA 1.06	6	0.5	0.5	0	0.50
Copper		LOM/CIEH + CLEA 1.06	6	6.7	98		94.07
		Superseded SGV 10	6	22	400	0	356.32
Mercury, morganic		SGV report + CLEA 1.06	6	0.1	0.53	0	0.43
Nickel	l	SGV report + CLEA 1.06	6	11	52	0	52.23
Selenium		SGV report + CLEA 1.06	6	0.2	0.94	0	0.79
vanadium		LOM/CIEH + CLEA 1.06	6	6.6	46	0	39.63
Cumple (feed)	3700	LOM/CIEH + CLEA 1.06	6	24	390	0	310.84
Cyanide (ride)		PWAG + CLEA 1.06	6	0.5	0.5	0	0.50
menol (total)		SGV report + CLEA 1.06	6	0.3	0.3	0	0.30
Acenaphilippe	0001	LUMCIEH + CLEA 1.06	6	0.1	0.55	0	0.41
Anthraceno		CUMPOIER + CLEA 1.06	60 (0.1	4	0	3.25
Renz/alanthracene		CAMPIELL - OFF 4 25	55 (0.1	15	0	9.94
Banzofalmrana		LUMICIER + CLEA 1.08	מ	0.1	æ	4	22.02
Benzofhillioranthene	- -	LCIWCIET + CLEA 1.06	5	0.1	26	S	19.38
anzolohilnervlene		CAMPOIEN + CLEA 1.00	50 (0.1	30	3	21.12
Benzofkilluoranthene		DAWCIEH + CLEA + OR	3 5 C	1.0	13	0	9.82
Chrysene		I OM/CIEH + CI EA 1 06	n a	5	13	~ ·	9.24
Dibenz(a.h)anthracene		I OMICIEH + CLEA 106	2	-	શુ	2	17.12
Fluoranthene		LOWCEH + C/ FA 1 06	» a		3.3	4	2.92
Fluorene		LOWICIEH + CLEA 1.06	o a		0,0	0 (44.19
Indeno(1,2,3,cd)pyrene	ŀ	LOWCIEH + CLEA 1.06	o	, 0	5.0	0	2.53
Naphthalene	8.7	LOM/CIEH + CLEA 1.08	6	100	2 80	200	10.7
Phenanthrene		LOW/CIEH + CLEA 1.06	6	0.1	35		23.75
Ругеле	1600	LOM/CIEH + CLEA 1.06	6	0.1	62	0	40.37
Plant Life							
Chemical of Potential	Generic Criterion (mg/kg) Basis for Generic	Basis for Generic	No. Samples	Mln. (mg/kg)	Max. (mg/kg)	No. Samples Equal to, or	US95 (mg/kg)
	4	Criterion				Greater Than, Generic Criterion	
Arsenic		MAFF 1998	6	4.4	26	0	27.08
Christian (III)		New Zealand timber 1997	6	0.4	1.4	0	1.26
Chromatin (III)		MALE 1998 (Cr(T))	6	9.3	39	O	34.52
Constitution (VI)	25	ICRCL 70/90 1990	8	0.5	0.5	0	0.50
Nickel		BS3862 2007	6	6.7	86	0	91.07
Zina	000	BS3862 2007	a	11	52	0	52.23
III TO		BS3882 2007	6	24	390		240.04

Project No: 17140/GR/02

Project Details: Victoria Mills, Sabden

Date: November 2017



APPENDIX H

JIWG - DST Asbestos Assessment

Joint Industry Working Group Assestos in Soil and Construction & Demolition Materials

Victoria Mills Subden	Properties	Lindsay Palmer	23 Novemebr 2017	ile asbestos tiles in Made Ground

Decision Support Tool for CAR2012 Work Categories

		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Bonded ACMs: cement, viryl, composites, textured decorative coatings, bitumen products	-
Extent of degradation of ACMs at outset of work	Weathered (Slight degradation in ACM; material still retains its basic integrity)	1 2
Friedricy and degree of bonding by matrix (ACM matrix, not ground materials)	Non-friable ACM or ACM with fibres firmly linked in a matrix	
Distribution of Visible Asbestos Across Affected Area	Moderate/frequent occurrences of visible contamination by ACMs	o o
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Large quantities - >0.1 %wrt/wr	4
Sub-totel		(湖) S
	Note the asbestas Baznsing regime is unaffected by the type of asbestas fibre present in ACMs	
Hazard ranking		

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Probable Licensing Status	Non-Licensed Work
	EN149 type. FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
ene/Decontamination***	Localised and basic personal decontamination facilities

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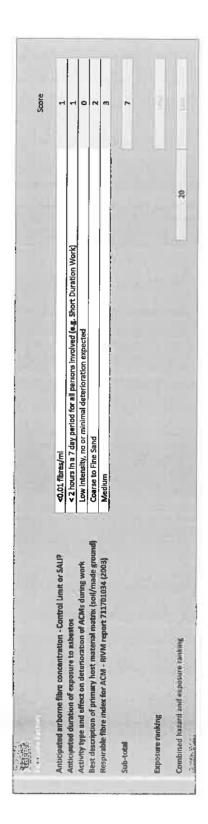
Project Reference Site Name	Client Run by	Date	Scenario details

Decision Support Tool for CAR2012 Work Categories

Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibras/fibre bundles) 3 Priable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles) 4 Occasional/random occurrences of visible contamination by ACMs 1 Very Low quantities 40.001 to 0.01 %wr/wt Note the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs 13
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No warranty, expressed or Implied, or reliance, Is provided in relation to the use of this tool. It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

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Probable Licenting Status Probable Licenting Status Probable Licenting Status Probable Licenting Status Probable Licenting Status RPE Wanual/localised dust supression User Suppression* Localised and basic personal decontamination facilities Localised and basic personal decontamination facilities Localised and basic personal decontamination facilities Localised and basic personal decontamination facilities Localised and basic personal decontamination facilities Localised and basic personal paragraphic and basic personal decontamination and personal hygiene measures may be reviewed on a site/confamination-specific basis
