



**Bevis Green Works (Tetrosyl)
Mill Road, Bury BL9 6RE**

**Development for Residential Use
(Planning Ref. 63533)**

**PHASE 2 AREA (excluding Phase 2A & 2B
and Former Mill Lodge Reservoir)**

DETAILED REMEDIATION STRATEGY

For: Barratt Homes Manchester

October 2025

R2174-R11-v7

DOCUMENT CONTROL SHEET

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Signed For Smith Grant LLP

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1. Introduction

- 1.1. The Bevis Green Works on Mill Road, Walmersley, Bury, previously operated by Tetrosyl Ltd., has been granted planning consent by Bury Council (BC) for residential redevelopment with associated infrastructure and open space, subject to planning conditions including matters related to contamination. The lead developer for the site is Barratt Homes who have instructed Smith Grant LLP (SGP) to assist in preparing a Contamination Remediation Strategy for the Site. SGP and Groundtech Limited have subsequently produced several reports pertaining to investigations, monitoring, risk assessments, remediation strategies and completion reporting that are listed and summarised in Appendix B to this report.
- 1.2. The Site comprises the Phase 2 area of site development which includes the southern part of the former Tetrosyl works. The area covered by this report and herein referred to as the 'Phase 2 area' or the 'Site' relates to the area as shown within Drawing D01 (pink hatched area). Phase 1A and 1B have been remediated and are undergoing construction and are not considered further within this report. Phase 2A, Phase 2B and the Mill Lodge Reservoir will be subject to further separate assessment and reporting and hence these areas are split off for the purposes of this Remediation Strategy document.
- 1.3. The works complex includes nineteenth century cotton mill and textile print works buildings together with more recent plant, warehouses and office buildings. The works was latterly used by Tetrosyl Ltd. for the manufacturing, packaging, storage and distribution of car-care products including a wide range of items such as antifreeze, cleaning-materials, waxes and paints. Tetrosyl also operated a solvent recovery process under an Industrial Pollution Control (IPC) authorisation.

1.4. Site details are:

Address	Bevis Green Works, Mill Road, Bury BL9 6RE
National Grid Reference	380950, 413950
Local Authority	Bury Metropolitan Borough Council
Site Area (phase 2 excluding 2A, 2b & Reservoir)	3.1 ha total
Current Use	Vacant site, former buildings and plant demolished above ground level, culverted watercourse (Pigs Lee Brook) flowing from north to south.
Site Access	Entrances off Walmersley Old Road and Mill Road
Planning Reference	63533
Proposed Use	residential with access roads and watercourse in east

Figure 1.1: Location of Full Redevelopment (including Phase 1, 2, 2a, 2b, and Mill Lodge)



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- 1.5. Planning Consent 63533 includes Condition No. 4 which relates to the requirement for site investigation, risk assessment and remediation proposals to be submitted to and approved by BC. Condition 4 is worded as follows:

4. No development, other than site clearance, demolition, or works relating to site investigation remediation or ground works, shall commence unless and until: -

A contaminated land Preliminary Risk Assessment report to assess the actual/potential contamination and/or ground gas/landfill gas risks at the site shall be submitted to, and approved in writing by, the Local Planning Authority.

Where actual/potential contamination and/or ground gas/landfill gas risks have been identified, detailed site investigation and suitable risk assessment shall be submitted to and approved in writing by the Local Planning Authority.

Where remediation/protection measures is/are required, a detailed Remediation Strategy shall be submitted to, and approved in writing by, the Local Planning Authority.

- 1.6. SGP undertook a review of pre-existing site investigation information and produced an updated Preliminary Risk Assessment and Outline Remediation Strategy (Ref: R2174-R01-v2, dated 02.05.2019) following the framework described in the EA / DEFRA Contaminated Land Report 11: 'Model Procedures for the Management of Land Contamination' 2004 (CLR11).
- 1.7. This document was submitted together with proposals for additional site investigation works to BC and their consultee, the Environment Agency (EA), for comment. The BC response (Ref: CL584.240719.1 date 24.07.19) and EA response (07.02.2020) acknowledged the general

approach of enabling / demolition works, further investigation, and development of supplementary measures to the Outline Remediation Strategy, as required.

- 1.8. Both regulators reiterated the requirement for further investigation and better characterisation of the risks associated with the site before the Outline Remediation Strategy (ORS) could be approved, or alternatively required the production of Detailed Remediation Strategies for issues relating to the management of risks to human health from ground gas, VOC vapours and the protection of Controlled Waters.
- 1.9. The boundaries of the Phase 2 Area of the site area with respect to the other site phases are indicated on Drawing 01.
- 1.10. The Phase 1 remediation and preparatory earthworks were carried out under the provisions of the ORS between June 2020 and September 2020 and are detailed in SGP's Remediation Earthworks Completion Report – Phase 1 (R2174C-R04-v2; November 2020). This report was submitted to BC and the EA for comment; they concluded that the works were sufficient to allow construction to commence in Phase 1 in accordance with a Construction-Stage Remediation Strategy summarising the recommendations for development made in the previous Phase 1 reporting. This document is referenced R2174-R07-v3, March 2021. Phase 1a has been subject to validation testing and completion reporting in accordance with the approved ORS.
- 1.11. The Phase 2 Area includes bulk above / below ground storage tanks (ASTs & USTs) for bulk fuels and chemicals, former mill buildings and other fuel storage areas. Demolition and clearance works have now largely been completed in the Phase 2 area which has allowed the required additional site investigation works to commence in this part of the site.
- 1.12. This report includes summaries of the further investigations and assessments undertaken to date to assess the identified potential source zones in the Phase 2 area. These are listed below and in Appendix A:

- R2174C-R03-v1, October 2020 *Phase 1 Supplementary Groundwater Investigation (included due to relevance of information regarding hydrogeology and chemistry adjacent to Phase 2 boundary)
- R2174c-R05-v1, December 2020 "Phase 2 Supplementary Groundwater Investigation No.1"
- R2174c-R06-v1, April 2021 "Phase 2 Supplementary Site Investigation"
- R2174c-R09-v1, June 2021 "Phase 2 Supplementary Groundwater Investigation No. 2"
- GRO-21459-3627, July 2022 "Groundwater Investigation Factual Report"

- GRO-21459-3928-1.3, December 2022 “Supplementary Geo-Environmental Appraisal – Phase 2”
- GRO-21459-4595, 14th July 2023 “Containing Proposed Soil RTVs”

- 1.13. Accordingly, this Phase 2 Remediation Strategy focusses upon the results of the further investigations and risk assessments and addresses the proposed methods for dealing with identified contamination hot spots that exceed relevant environmental target values. The report details the Tetrosyl Bevis Green Phase 2 Remedial Strategy to be implemented by specialist demolition, remediation and earthworks engineering contractors (Remediation Phase) and by the housebuilder and their sub-contractors (Construction Phase).
- 1.14. The assessment methodology follows the guidance in EA Land Contamination Risk Management (LCRM): Stage 3 Remediation and Verification, updated 19th April 2021, and includes an options appraisal to evaluate and identify feasible remediation options, specification of appropriate techniques, and an implementation programme and verification plan. The principal differences between the ORS and Phase 2 Remedial Strategy relate to remediation proposals, and therefore the LCRM guideline procedures for options review are referred to with specific respect to these matters. The general approach to preparatory earthworks and development-phase containment measures are essentially unchanged from the ORS agreed under the previous CLR11 guidance.
- 1.15. This Detailed Remedial Strategy is based upon information gained from numerous site investigations and monitoring that has extended over several years up to the present and reflects our current knowledge of the site and experience from remediation works carried out to date. The Detailed Remediation Strategy sets out the specific proposals for ground treatment, target values and verification methods to ensure that all significant risks to human health, property and environmental resources can be appropriately managed, to facilitate regulatory and planning approvals, and to enable redevelopment of the Phase 2 area.
- 1.16. The Remedial Target Values (RTVs) derived by Groundtech and applicable to groundwater protection area provided within letter report, reference: GRO-21459-4595 dated 14th July 2023 as contained within Appendix B supersede those produced by SGP within (R2174-R10-v2) and have been adopted within this Phase 2 area Detailed Remediation Strategy. Regulatory approval of the most recent Groundtech reporting including the derived RTVs has been obtained and associated correspondence is provided in Appendix D.

2. Information Review

2.1. Historical Site Investigations

2.1.1. The principal historical sources of information consulted in the preparation of the original ORS and the detailed Phase 2 Strategy include:

Table 2.1: Information Sources

date and reference	author and title	purpose and information content
report no. 10468-1(01) January 2003	ENSR International Ltd. "Phase I and Phase II Environmental Site Assessment Tetrosyl, Bevis Green Works"; for Tetrosyl Ltd.	environmental desk study, site inspection and intrusive site investigations including identification of 32 areas of potential concern regarding contamination, with targeted investigations (11 trial pits, 45 window sampler boreholes, 11 cable percussion boreholes; 17 gas/groundwater monitoring installations, analysis of soil and water samples) report includes summary details of 3 previous geotechnical site investigations in specific locations in 1976, 1981 and 1996 prior to developments by Tetrosyl at, or adjacent to, the current solvents tank farm and the office building
ref: 16565-R1(00) February 2011	RSK STATS Geoconsult Ltd. "Revised Environmental Site Assessment Tetrosyl, Bevis Green Works"; for Tetrosyl Ltd.	review of ENSR 2003 desk study and intrusive investigation, with updated comparison of analytical data against relevant environmental standards, with further walkover site inspection
report 10-110-r1, May 2014	e3p "Phase i and Phase II Geo-environmental Site Investigation Bevis Green Works (Tetrosyl)"; for Tetrosyl Group Ltd.	environmental desk study, site inspection and intrusive site investigation at targeted locations (14 window sampler boreholes with gas/groundwater monitoring installations, analysis of soil and water samples)
report 11-500-R1; February 2017	e3p "Remediation and Enabling Works Strategy Bevis Green Works"; for Countryside Properties	factual information concerns supplementary targeted ground investigation works (4 rotary boreholes, 23 window sampler boreholes, 13 trial pits in car park, with gas/groundwater monitoring installations, analysis of soil and water samples); report includes reference to 5 rotary boreholes drilled in 2014 - logs not provided, with groundwater analyses from RB103 and RB104

date and reference	author and title	purpose and information content
15/BHM/006/MJF/GS/L R1, October 2015	Betts Associates 'Mill Road, Walmersley, Bury Mining Report'; for Barratt Homes	desk study review of Coal Authority and geological information concerning mining and underground quarrying risks and requirements for investigation

2.1.2. The desk studies within the above reports together with a recent culvert survey provided a basis of information concerning the development and uses of the site, in particular concerning the locations of Tetrosyl liquid storage facilities and production plant, tanks, pipes and drains most likely to serve as contamination sources, and pathways for any migration of dissolved and liquid phase pollutants.

2.1.3. The above site investigations provided a reasonable assessment of shallow contamination in the made ground across the site, although some areas of the site including Tetrosyl operational areas inside former buildings remained to be investigated, and some potential or known areas of hydrocarbon contamination required further assessment. Whilst the investigations were mainly targeted at particular areas of interest, the total of 112 borehole and trial pit entries over 10.4 ha is roughly equivalent to an average 30m spacing across the entire site, with closer spacing in specific parts of the site where contamination has been found or suspected.

2.1.4. The investigations were carried out for the specific purpose of assessing contamination liabilities and geotechnical constraints to redevelopment for residential housing, but to varying standards. The ENSR investigations were limited in terms of the number of samples and suitability of the analytical suite adopted for soil samples, however the more recent e3p site assessments appear to have been carried out generally in accordance with the guidance principals of BS10175:2001, BS5930:1997 and CLR11, although again some potential contaminants were omitted from the test suites.

2.1.5. On the basis of the historical land use information, site observations and intrusive investigations and monitoring a series of 15 discrete actual or potential contamination hotspots (HS1 to HS15) were recognised across the full development site with nine located on the Phase 2 area. Some of these were associated with individual bulk storage tanks, groups of tanks, particular industrial activities, or physical features. The potential hot spots located within phase 2 area are listed below:

Table 2.2 Potential or Known Contamination "Hot-spots" within Phase 2 Site Area Only

Hotspot ref:	Feature
HS1	Former reservoir; underground storage tanks (USTs for white spirit, antifreeze (MEG) and methanol; above ground storage tanks (ASTs) including heating oil; antifreeze mixing area
HS2	Drum compound
HS3	Fuel oil AST
HS4	Diesel AST

Hotspot ref:	Feature
HS5	Kerosene AST
HS6	ASTs for dichloromethane (DCM), white spirit, kerosene, sodium silicate and heating oil - located between former mill buildings
HS7	Electrical transformer and diesel AST on side of mill building
HS8	Disused AST (contents unknown) on lodge dam

2.1.6. Further critical review of the historical site investigations can be found within the ORS and is not repeated below. Because further investigations were recommended by E3P, the limitations of the historical investigations and requirements for additional works to inform the remediation strategy were discussed in the ORS Section 3.5 with proposals for additional investigations discussed in ORS Section 4.5.

2.1.7. The investigations covered a period of time extending between 2003 and 2017; Tetrosyl operations continued over this time to reducing degrees, with some raw materials and product storage continuing up to closure and decommissioning. The site investigation findings are therefore expected to reflect worst case conditions assuming that site closure and removal of most stored liquids was carried out without significant accidental or deliberate releases of fluid tank and drum contents, and that any polluting substances present in the soils, bedrock or groundwater will have been subject to varying degrees of dispersion and degradation over the subsequent period of time. These assumptions appear valid on the evidence available from more recent investigations and monitoring as described below.

2.2. Supplementary Site Investigations

2.2.1. Further investigations and monitoring carried out by SGP in 2018, 2020 and 2021, and by Groundtech in 2022 and 2023 either within or adjacent to the Phase 2 boundary, are summarised below. This information has been used to confirm the contaminants of concern, to inform quantitative risk assessment with respect to contamination in soils and groundwater within phase 2 and to determine the remediation objectives and target concentrations as described in section 3.

SGP Walkover Inspection and Preliminary VOC Monitoring and Groundwater sampling Within Phase 2 Site area and Phase 2b (located to the north)

2.2.2. On 12th September 2018 SGP carried out a walkover inspection of the site and conducted preliminary monitoring of VOC vapours within accessible boreholes and some drains, and sampled groundwater from boreholes RB201 on the phase 2 site area and RB203 located off site to the north within southern area of Phase 2B. In addition, the culverted stream at the reservoir overflow and culvert outlet downstream of the site was also sampled. Water analyses were carried out for a comprehensive range of VOCs, semi-volatile organic compounds (SVOCs), glycols and surfactants (detergents) together with tentatively identified organic

compounds (TICs). The purpose of this exercise was to include water monitoring at the key controlled waters receptors for the site (the surface water outfall from the culvert and the downgradient shallow aquifer) to determine if pollution was occurring.

2.2.3. Low levels of benzene, vinyl chloride and MTBE were detected in RB203 (2.0, 0.4 and 2.4 µg/l respectively), with 192 µg/l of C5-C6 aliphatic hydrocarbons (e.g., pentane/hexane). A significant level of dichlorodifluoromethane ('Freon-12') was detected in RB203, at 3,488 µg/l, and 128 µg/l of ethyl ether was tentatively identified (90% certainty).

2.2.4. Propylene glycol was recorded in RB201, RB203 and the upstream culvert at concentrations of 11, 12 and 13 µg/l respectively, but was not detected downstream of the culvert.

2.2.5. Anionic surfactants were detected in all samples: RB201 0.7 mg/l; RB203 1.4 mg/l; upstream culvert 1.3 mg/l; downstream culvert 1.2 mg/l. Moderate foaming was noted at the culvert exit downstream.

2.2.6. No VOC/SVOC contamination was detected in groundwater in RB201 and culvert water samples.

2.2.7. Apart from records of a sheen on groundwater and in some saturated soils, no floating product layers have been observed in any investigation within the site. The aromatic solvents recorded within groundwater at the site (in particular toluene, ethylbenzene and xylenes) are light non-aqueous phase liquids (LNAPLs) in their free states, however none of the concentrations recorded in groundwater exceed their respective solubility limits. Relatively low levels of chlorinated hydrocarbon solvents and their breakdown products have been detected at some locations.

2.2.8. A comprehensive sweep of drains, containers and structures was not carried out during the SGP inspection; however, some readily accessible sub-surface voids were checked, again at the downgradient and of the site to establish if off-site emissions were occurring. Elevated PID readings were detected in a number of manhole covers, including some off-site locations near residential housing.

2.2.9. On the basis of the above information, the proven or likely contamination sources that will need to be considered when redeveloping the site are as follows:

- the general made ground, including ash and clinker, with localised inclusions of heavy hydrocarbons or organic materials (timber fragments), and possible cyanides (at a single location);
- soils, shallow rock and groundwater below and around former storage facilities for solvents and solvent processing operations (white spirit / toluene, ethylbenzene and xylene)

- other storage and handling/dispensing areas for liquids including white spirit, fuel oils, antifreeze, detergents and other chemicals, in particular, the area of USTs in south of site (BH10 area) which relates to HS1;
- all drains, channels and ducts crossing the site where historical or contemporary leaks and spills may have collected, migrated and discharged;
- wet and dry waste materials storage;
- asbestos building materials and demolition materials / laggings in fills (if found);
- potentially methanogenic organic matter in fills within the former sandstone quarry,
- Japanese Knotweed infestation outside southern site boundary in 2020, alongside Mill Lane; limited potential for spread into site below boundary wall.

2.2.10. The numerical values of soil concentrations for the above contaminants can be compared against accepted limits that cause no significant harm to human health or controlled waters. The use of these standards normally requires a statistical approach to be taken based upon averaging areas. However, there has been insufficient sampling and analysis in order to adopt this approach and both confirmed and anticipated, highly localised impacts, and preferential migration pathways emanating from sources which cannot be fully assessed due to exiting constraints, necessitate the assumption that at least some of the soils will present unacceptable risks to future residential use of the site without mitigation.

SGP Phase 2 Supplementary Groundwater Investigation (R2174C-R05-v1, December 2020)

2.2.11. Five monitoring wells (RBH301 - 305) were installed in July 2020 into bedrock at the southern, down-gradient edge of the site to either side of the culverted Pig Lee Brook watercourse. The western boreholes RBH301 - 302 did not encounter the Rough Rock and response zones were located within the Rossendale Formation mudstones. A summary of borehole response zones is provided in section 2.3.

2.2.12. Apart from RBH301, the wells are down gradient of potential contamination hot-spots HS1 to HS4. Groundwater gradients were from north/northeast down to the south/southwest and converge upon the culvert which appears to be the principal drainage route for groundwater flows and surface water runoff within the site. The culvert invert level is around 1-2m below the groundwater level measured in the closest boreholes. The water table lies within ashy fill adjacent to the culvert which runs along the base of the infilled valley and varied in depth below ground level from 5.2m in the east, to 9.7m nearest to the culvert.

2.2.13. The wells were sampled on two occasions together with sampling of the culvert outfall 200m down-stream of the site. No visible signs of contamination or odour were detected on either sampling round. Contamination levels in excess of WHO or USEPA (for glycols) drinking water guidelines were recorded for RBH304 (glycols), and RBH305 (ethylbenzene, xylenes, C9-C16

aliphatic hydrocarbons, EC8-EC16 aromatic hydrocarbons and phenols). No chlorofluorocarbons (CFCs) were detected. Traces of glycols and hydrocarbons were detected at the culvert outfall but did not approach or exceed quality standards.

2.2.14. RBH304 and 305 were located adjacent to and down-gradient of a group of bulk storage tanks (HS1) used for white spirit, antifreeze (glycol) and methanol, and former antifreeze and CFC work areas. The above results confirm the presence of localised contamination associated with HS1 but do not indicate any significant contamination of Pig Lee Brook from either this area or potential sources further to the north (up-gradient) within the site.

SGP Phase 2 Supplementary Site Investigation (R2174C-R06-v1, April 2021)

2.2.15. The purpose of this investigation was to a) characterise any fluid contents of remaining USTs at HS1, and b) obtain soil samples for analysis from the locations of other hotspots as listed in Table 2.2. Works were subject to access and were carried out in stages between June and December 2020.

2.2.16. All above ground storage tanks and associated pipework and free-standing storage containers had been removed on behalf of Tetrosyl prior to Barratt Homes obtaining vacant possession of the site. The only known locations of remaining storage tanks are 15 USTs grouped in the HS1 area. Their contents were sampled and determined to be as follows:

- 4 tanks contain kerosene, diesel, antifreeze (ethylene glycol) and white spirit
- 6 tanks contain rainwater variously contaminated by petroleum hydrocarbons
- 5 tanks - dry

2.2.17. Trial pit investigations, soil sampling and vapour monitoring were carried out for other accessible Phase 2 hotspots as summarised below; test results were compared against generic assessment criteria for human health assuming a residential land use over the shallow soils to determine their potential significance for redevelopment:

Table 2.3 Summary of Hot-spot Soils Investigations

Location	Soil thickness over bedrock (m)	Key contamination findings	Earlier Investigation Findings
HS2	~1.6-1.9	aromatic HCs, glycol, CM, TCE, PCE	lead
HS4	>2.9	traces of polychlorinated naphthalenes	arsenic
HS5	0.6 - 2.0	traces of glycols	none
HS6	0.3 - 1.6	various petroleum HCs, PAHs, CM, glycols, phthalates	HCs
HS7	0.2 - >1.0	PCB trace (0.04 mg/kg)	none
HS8 down-slope	0.2	none	aromatic HCs

abbreviations: HCs= petroleum hydrocarbons, CM - chloromethane, TCE - trichloroethene, PCE - tetrachloroethene. PAHs - polyaromatic hydrocarbons, PCB - polychlorinated biphenyl, VOC - volatile organic compound

Groundtech Groundwater Investigation Factual Report (GRO021459-3627)

2.2.18. Following submission of R2174C-R06-v1 and R2174C-R09-v1 to the Environment Agency, a detailed response (SO/2020/120065/04-L01) was received acknowledging that whilst specific areas of the site could not be investigated due to existing access constraints (buildings etc.) a large part of the site including several of the identified hotspot areas (Table 2.3) had not been investigated and that further investigation was required. It was also recognised by the EA that removal of existing tanks etc. would be required to facilitate the further investigation and that these should be undertaken to reduce the likelihood of any further contaminants migrating into the underlying soils / groundwater.

2.2.19. Groundtech carried out supplementary investigation works including the drilling 18 rotary boreholes to depths of between 9 and 20m bgl (BH501 to BH518) which covered an area to the immediate south of the reservoir down to the southern boundary of Phase 2. This also targeted the following hotspot areas:

- HS1 (BH518)
- HS2 (BH517 downgradient of RBH202)
- HS3 (BH512)
- HS4 (BH511)
- HS6 (BH503 & BH504)
- HS7 (BH509)
- HS8 (BH501)

2.2.20. Entries BH502 and BH506-BH508 were located within the footprint of a former warehouse and downgradient from located on the Phase 2b area to the north, and BH510 & BH513-BH516 downgradient of hotspots HS5-7.

2.2.21. Three further boreholes (BH519-BH521) were drilled to 20m bgl in the southwest of Phase 2 up and downgradient of the culvert.

2.2.22. Soil sampling was undertaken with a total of eighteen samples submitted for 'environmental testing' which included TPHCWG (18), VOC & SVOCs (18), glycols (18) and PCBs (2). It is understood that the soil samples related to 18 collected from the newly installed boreholes and the remainder associated with validation following removal of impacted soils / tanks / infrastructure etc and that these will be reported as part of the overall Phase 2 verification reporting. Samples collected following the removal of Groundwater analysis was completed in two stages, the first was carried in February 2022 and consisted of the monitoring of the 22 previously installed wells located across the full site (RBH301-RBH305 & RBH314-RBH330)

with the second round completed in May / June 2022 with monitoring of the newly installed wells (BH501-BH521) as well as 3 groundwater treatment wells installed by Urban Regen.

- 2.2.23. Groundwater samples were submitted for a similar range of 'contaminants of concern' including hydrocarbons (fractionated or GRO), MTBE + BTEX, phenol and glycol. VOC/SVOC analysis was scheduled for the newly installed boreholes only.
- 2.2.24. Elevated concentrations of MTBE, BTEX and hydrocarbon compounds were again widely reported when compared to the adopted EQS values used by Groundtech within and around the hotspots in Phases 2a & 2b located to the northeast of the Phase 2 area. Which confirms the initial findings by SGP. A single elevated concentration of m/p-xylene was reported within RBH305 located in the south in hotspot HS1 within Phase 2 area.
- 2.2.25. The highest contaminant concentrations were again recorded within the light volatile hydrocarbons (C4-C12) although its not possible to differentiate between aliphatic/aromatic fractions with samples submitted for GRO analysis. Xylene and ethylbenzene were also significantly elevated with maximum concentrations approximately 50% lower than those of the other hydrocarbons. Benzene continued to form a minor constituent of the contaminant mixture.
- 2.2.26. No exceedances were reported within the new monitoring wells installed by Groundtech which were installed within the central and southern parts of the site. This demonstrates that the upgradient hotspot areas (HS10, HS11 and HS13) where MTBE, BTEX and hydrocarbon exceedances have been reported are not extended downgradient and hence onto the Phase 2 area of the site. This further suggests that the impacted groundwater plume in Phase 2B is stationary.
- 2.2.27. VOC / SVOC analysis was undertaken on the newly installed wells only in the southern part of the site, concentrations did not generally exceed analytical detection limits. Monitoring in the north had previously detected the presence of the CFC compound dichlorodifluoromethane, however its incidence was limited to only one of the newly installed wells (BH505) with a concentration of 10µg/l, substantially below the >1,000 µg/l previously reported around the main hydrocarbon plume in the north.
- 2.2.28. A single exceedance of phenol was reported within BH506, located to the south of the culvert. No identifiable contamination sources were attributed to this location and phenol concentrations, but it is noted that the response zone of this borehole straddled across the made ground.
- 2.2.29. Concentrations of phthalates within the groundwater did not exceed detection limits within boreholes BH503-BH504 located within HS6 (where previous high phthalates were reported) or within the downgradient wells (BH513-BH514).

2.2.30. Reference to observations of visual / olfactory contamination indicators was limited to a mild hydrocarbon odour in BH502 and a moderate hydrocarbon odour with black staining in BH517 at 3.1-3.6m bgl. No observations are made with regard to the presence of free product, and it is noted that previous monitoring undertaken by SGP that no measurable layer of floating product (LNAPL) was encountered.

Groundtech Supplementary Geo-Environmental Appraisal (GRO-21459-3928)

2.2.31. An additional round of groundwater sampling was undertaken across the site between 13th and 18th October 2022 and included the sampling of the following wells on the phase 2 area of the site: BH501 to BH518, RBH301, RBH304, RBH305, RBH314 and RBH315.

2.2.32. In total 31 groundwater samples were submitted for TPHCWG, VOC, SVOC and glycols as identified as the main contaminants through previous investigation and assessments.

2.2.33. Ten of the monitoring wells could not be sampled due to either no groundwater present (BH501, BH510, BH512 BH514, BH520) or destruction as part of site works (BH516, RBH314, RBH318, RBH327 and RBH328). The absence of groundwater in previously monitored wells has been associated with low groundwater levels after a particularly dry summer.

2.2.34. Exceedances of the adopted EQS were generally similar to the first round of groundwater sampling reported by Groundtech.

2.2.35. No exceedances of BTEX, MTBE, glycols or phthalates were reported within the boreholes in the Phase 2 site area with a single exceedance of aliphatic C8-C10 hydrocarbons reported within BH502 to the south of the reservoir. A new potential hotspot, BH506, was identified during the most recent round of groundwater monitoring with elevated phenol recorded. Reference is made to the possible presence of LNAPL being observed during the second round of groundwater sampling of BH506, however no such observations were reported during the first round of sampling (ref. GRO-21459-3627), none was encountered within downgradient entry BH507, and the relatively low contaminant concentrations within the two groundwater samples collected from BH506 are not indicative of the presence of product.

2.3. Summary of Phase 2 Site Investigations and Groundwater Monitoring

2.3.1. The monitoring well installation recorded within the Phase 2 Area are summarised below:

Table 2.4 Groundwater Monitoring Response Zones

Monitoring Installation	Response Zone Depth Range (m bgl)	Groundwater Sample Depth (m bgl)	Response Zone Strata Type(s)
SGP Boreholes			

Monitoring Installation	Response Zone Depth Range (m bgl)	Groundwater Sample Depth (m bgl)	Response Zone Strata Type(s)
RBH301	6.00-15.00	8.00	Rossendale Formation (Mudstone)
RBH302	13.00-15.00	14.00	Rossendale Formation (Mudstone)
RBH303	10.00-15.00	12.00	Glacial Till
			No recovery- assumed weathered Rough Rock
RBH304	1.00-10.00	8.00	Glacial Till
			Rough Rock (Sandstone)
RBH305	5.00-15.00	9.00	Rough Rock (Sandstone)
RBH314	2.00-15.00	6.00	Rough Rock (Sandstone)
RBH315	3.50-15.00	5.00	Rough Rock (Sandstone)
Groundtech Boreholes			
BH501	7.50-10.00	NGW	Rough Rock (Sandstone)
BH502	5.00-7.00	5.23	Rough Rock (Sandstone)
BH503	3.00-7.00	3.48	Rough Rock (Sandstone)
BH504	2.50-9.50	3.46	Rough Rock (Sandstone)
BH505	6.80-10.00	6.14	Rossendale Formation (Mudstone)
BH506	6.00-10.00	9.19	Made Ground & Rough Rock (Sandstone)
BH507	7.00-15.00	7.27	Made Ground & Rough Rock (Sandstone) / Rossendale Formation (Mudstone)
BH508	3.00-8.00	6.07	Rough Rock (Sandstone)
BH509	2.00-6.00	4.23	Rough Rock (Sandstone)
BH510	1.50-4.50	NGW	Made Ground & Glacial Till
BH511	2.00-5.00	NGW	Made Ground & Glacial Till
	12.00-15.00	8.58	Rossendale Formation (Mudstone)
BH512	6.00-12.00	Blocked	Rossendale Formation (Mudstone)
BH513	1.00-3.00	2.47	Rough Rock (Sandstone)
BH514	3.55-8.00	6.81	Rough Rock (Sandstone) / Rossendale Formation (Mudstone)
BH515	6.00-12.00	8.41	Rough Rock (Sandstone) / Rossendale Formation (Mudstone)
BH516	3.00-6.00	3.02	Rough Rock (Sandstone)
BH517	4.00-11.00	5.60	Rough Rock (Sandstone)
BH518	6.00-18.00	7.20	Rough Rock (Sandstone)
BH519	5.00-11.50	13.04	Made Ground
BH520	15.00-20.00	16.82	Rossendale Formation (Mudstone)
BH521	3.00-14.00	10.53	Made Ground

2.3.2. The general conditions are sufficiently well-characterised to enable development of the remediation strategy. The recent site investigations and monitoring have confirmed the

disposition and nature of contamination within Phase 2 area. The following key conclusions can be drawn:

- Elevated concentrations of volatile petroleum hydrocarbons are present within shallow soils, bedrock and groundwater associated with the northern hotspot HS9, HS10 and HS11. It can be concluded that a plume of groundwater pollution is localised and stable or receding within this area as higher concentrations of volatiles are located within hotspots HS10 and HS11.
- no significant layers of LNAPL or DNAPL have been found within the Rough Rock aquifer, although solubility limits for some petroleum hydrocarbon fractions are approached in the above hot spots. The potential presence of LNAPL was also described in the groundwater of BH506 however this appears to be anomalous given the lack of consistency between observations during the two monitoring rounds and the low contaminant concentrations detected in both groundwater samples collected from this entry.
- the southern group of USTs (HS1) include some tanks that contain various hydrocarbons or antifreeze products or contaminated rainwater; these represent potential primary sources of pollution; however, groundwater monitoring has not indicated significant pollution; soils adjacent to the USTs may be contaminated and will be sampled as part of the verification process during the removal of relict infrastructure and impacted soils;
- no significant impacts from site contaminants have been detected within the watercourse downstream of the site.

3. Updated Site Characterisation

3.1. Historical Development and Use

- 3.1.1. The site occupies the valley of a tributary to Pig Lee Brook which was dammed to form a mill lodge discharging to two further lodges and a culvert below the southeast part of the site. Bentley and Lumn Cotton Mills were the original development within the site. Part of the site extends south of Mill Road and is referred to as 'The Croft'. An abandonment survey for Lumn Mills Mine dated 1877 shows 2 adit entrances (one as an incline) located in the southeast corner of the site connecting with workings in the Sand Rock coal seam off-site to the east.
- 3.1.2. The mills were redeveloped or expanded before the date of the 1877 mine abandonment plan, and the main mill lodge extended northwards, presumably by raising the height of the dam. The 1890 Ordnance Survey 25"/mile scale map shows the current masonry-constructed mill buildings were largely in place, annotated 'Lumn Mills (Cotton and Logwood Dyes)', with two small lodges still present in the south, and a new earth-retained reservoir in the southwest; the central lodge enclosed by buildings was reduced in size compared to the 1844 plan. An air shaft is shown on the northwest side of the main lodge, and a well in the southwest corner of the site; it is now believed that the "air shaft" was associated with a feed water culvert to the mill. Two round structures (marked as chimneys on the 1908 revision) were shown alongside the mill buildings.
- 3.1.3. The 1910 map marks the Lumn Mills as 'disused', and the 1928 map describes the mills as 'Bevis Green Print Works; the central reservoir is built over by this date and the air shaft is no longer shown. A rock quarry measuring ~33m east-west by ~60m north-south is recorded about 50m west of the main lodge, with a spoil heap between the quarry and former air shaft. The two chimneys previously shown are absent whilst a new building and chimney signifying a boiler house are shown on the eastern side of the southwestern reservoir.
- 3.1.4. The 1960 map records the quarry as disused with a pond present in the base, and the 1971 maps shows the quarry as part-infilled, and a refuse tip is indicated in the southern part.
- 3.1.5. Tetrosyl acquired and developed the site in the mid-1960s, and the 1971 map annotates the site as 'Car Accessories Factory'. The boiler house chimney was no longer shown, presumed demolished, and some storage tanks were indicated. The timings of site investigations referenced by ENSR indicate that the solvent tank farm was constructed after 1981, and the current office and reception building was constructed after 1996. The small lodge in the southeast corner of the site is shown as infilled on the 1984 map, and two large portal frame warehouses are shown in the northwest of the site. According to ENSR, Tetrosyl personnel advised that the warehouses were constructed in the 1970s and that the excavation required to construct the northern warehouse generated rock and soil that was used to infill the large

reservoir in the southwest and to form the present car park. The 1984 map does not show the quarry which is presumed to have been fully infilled by this date. Two areas of fill on the southern and western sides of the main lodge are shown on the 1999 map.

3.1.6. A variety of wells and pumps are depicted on the various maps in several locations and at different dates indicating probably shallow and small structures drawing water from the shallow sandstone bedrock below the site.

3.1.7. Asbestos containing materials (ACMs) were used within the site, including structural asbestos cement boarding and insulation; asbestos survey reports are available for the site buildings.

3.1.8. Above ground storage tanks, drums and pipework were removed from the site before Barratt Homes took possession of the site, and SGP has no information concerning the decommissioning of these potential contamination sources. However, no evidence of recent spills, leaks or deliberate discharges of polluting liquids or solid wastes has been seen by SGP before BHM gained vacant possession of the site.

3.2. Geology

3.2.1. The site is mapped by BGS as being covered by superficial deposits of glacial till (boulder clay), with bedrock exposed just outside the northern boundary. Site investigation information shows that the glacial till is generally thin sandy gravelly clay, usually less than 2m thick, and absent over significant parts of the site.

3.2.2. The presence of widespread made ground can be anticipated given the industrial development and use of the site, featuring the damming of the valley, coal mining and spoil disposal in the southeast, quarrying, use of coal-fired boiler houses with ash disposal. Significant thicknesses were deposited to infill the valley in the south of the site. Progressive development and replacement of buildings must also have generated significant volumes of demolition rubble, and relatively recently the construction of the warehouses generating rock and soil fill. This is confirmed by the intrusive site investigations that have recorded variable depths of made ground throughout the developed parts of the site. It follows that the generally undeveloped northern third of the site appears to contain only natural soils other than a veneer of hardcore in the northwest. The deepest area of fill is recorded as lying to the south of Mill Lane ('The Croft') where historical mapping shows a fill embankment over the culverted stream; BH9 in this area recorded 11m of predominantly ash fill.

3.2.3. The site investigations record a local area of silt below part of the solvent recovery area to the west of the lodge; this may be natural or might represent made ground resulting from the removal of alluvium from the stream valley during construction or maintenance of the lodge and dam.

3.2.4. Bedrock is mapped as the Rough Rock, a sandstone of the Millstone Grit series (Namurian age). Close to the western boundary this gives way to the underlying Upper Haslingden Flags, sequences of sandstones and mudstones.

3.2.5. The Rough Rock is typically around 20m thick and contains the Sand Rock coal seam which is occasionally observed to be accompanied by a band of seatearth which is described as clay. The coal seam is typically around 0.6m thick at about 12m above the base of the Rough Rock; the seam may be underlain by mudstones. The Sand Rock coal seam is shown outcropping adjacent to the southeast site boundary and dipping away from the site to the southeast; this is consistent with the Lumn Mills Colliery mine abandonment plan. A coal seam and associated fireclay stratum within the Rough Rock was recorded in boreholes to the north of the Phase 2 site (around HS11 – within Phase 2B).

3.2.6. A fault crosses the centre of the site southeast-northwest, displacing the strata down to the southwest. There are no records of the dip of strata within the site, however the outcrop pattern suggests that the centre of the site has relatively shallow dip to the south and east, with this increasing towards the eastern boundary. Rotary drilled boreholes within the site indicate a more complex pattern than suggested by the geological mapping, with thick mudstones present in places (either mudstones possibly associated with the Sand Rock coal, or Rossendale Formation mudstones between the Rough Rock and Upper Haslingden Flags); this suggests the existence of further unrecorded faulting. None of the rotary-drilled borehole logs (RB201 – RB204) recorded substantial coal seams, although a small void (50mm) was reported in RB203 within sandstone bedrock at 3.7m below rockhead, and thin coals have been recorded in several boreholes within the Rough Rock.

3.2.7. The typical stratigraphy derived from information in the ENSR, e3p, SGP and Groundtech site investigation logs is summarised below:

Table 3.1 Summary of Site Stratigraphy

stratum	typical thickness (m)
made ground	0.5 – 1.0m generally below main mill buildings (likely to deepen adjacent to culverted former stream) 1-2m below solvents tank farm area 4-6m car park area maximum 5.5m in backfilled quarry 14.5m in “The Croft”
glacial till (boulder clay)	0 – 4m (deepest on western side of site, thinnest in centre/north of site)
Rough Rock	~15m generally, but thinning to absence in south and west of site

3.3. Hydrology and Hydrogeology

3.3.1. The hydrogeology is likely to largely reflect the original surface topography, which falls from around 154maod to 135m aod across the development area.

- 3.3.2. The Pig Lee Brook tributary is the principal surface water feature traversing the site from north to south. It passed via the Mill Lodge Reservoir to the north before entering a culvert to the south of the key contamination hot-spots HS10 and HS11 located in Phase 2B. The culvert has now been diverted to a shallow cut temporary channel along the western alignment of the mill lodge reservoir. The stream runs adjacent to bedrock strata of the Rough Rock sandstone, which forms the shallow aquifer. The Rough Rock is likely to exhibit significant secondary permeability via bedding planes and joints and faults and is classified by the Environment Agency as a Secondary A aquifer. The presence of historical wells and pumps in the area indicate sufficient transmissivity for local abstraction for industrial use. There are no current licensed abstractions within 500m.
- 3.3.3. The bedrock is overlain by variable thicknesses of glacial drift and industrial fills which are likely to be largely permeable to rainfall infiltration and historical industrial leaks and spills.
- 3.3.4. The Rough Rock strata dip to the east and are underlain by lower permeability mudstones of the Rossendale Formation, proven to >14m in BH305. The mudstones sub-crop below the southwestern part of the site. Haslingden Flags are mapped below these but were not encountered within any site boreholes. The Rough Rock is described as a weathered fractured sandstone with occasional thin coal and fireclay partings between the sandstone beds. These features indicate a degree of anisotropy (relatively high sub-horizontal permeability via fractures and reduced vertical permeability between beds) and potential for adsorption of pollutants to the clay minerals and organic matter.
- 3.3.5. Groundwater levels are at around rockhead in the north of the Phase 2 area, rapidly deepening to the south with the fall in the topography and with a direction of flow that appears to converge upon the southern part of the culvert. The culvert to the south of the Mill Lodge has been recorded to receive seepage discharges at many points, as surveyed in a 2012 CCTV inspection carried out for the Environment Agency (described as "gushing", "running" and "dripping" infiltrations at various points). Groundwater levels fall by around 20m between HS10/HS11 (~147m AOD) and the southern site boundary (~127m AOD) over a distance of 200m (gradient ~0.1). This evidence indicates rapid groundwater flows through the permeable sandstone beds, which is likely to exhibit a predominantly southerly direction given the combination of topography, easterly dip of the aquifer, and sub-crop of low permeability beds to the west.
- 3.3.6. The culverted stream (tributary of Pig Lee Brook) is likely to be the principal point of discharge and receptor for groundwater flows from the site; it is assumed that the culvert generally follows the original base of the valley. The culvert appears to be generally of masonry construction often with a flagstone roof below the mill, becoming a brick arch or tube downstream. The

remediation and development plans require the abandonment of the existing culvert, which will be grubbed out at shallow depth, or grouted up where it runs at depth in the southern end of the site. The surface water outflow from the mill lodge reservoir will be diverted into a new open channel along the eastern boundary before entering a new high-level culvert across Mill Lane and returning to the existing culvert at the southern boundary of the satellite site south of Mill Lane.

- 3.3.7. No evidence of mine drainage from the old mine adits has been found during recent works to expose and grout up the collapsed former entrances. It may be assumed that the mines are drained by adits or natural springs downhill of the site.
- 3.3.8. Mudstone strata are likely to limit the depth of groundwater movements within the site, and groundwater flows are expected to be predominantly sub-horizontal and shallow in depth (say up to 15m), potentially reducing in the south of the site where rotary drilling has recorded lower permeability mudstones replacing the sandstones. A spring is recorded to the southeast of the site which may represent the boundary exposure of sandstones and underlying mudstones.
- 3.3.9. Groundwater monitoring works undertaken by Groundtech have confirmed a south / south-westerly groundwater flow which largely reflects the original surface topography as shown within their Groundwater Contour Plan. Groundwater to the north of the Phase 2 site area, around the solvent filling room (HS10) and solvent tank farm (HS11) is mapped to the southwest with a shallow gradient of 0.044 reported. Along the southern part of the site, it has been reported that there is a split in groundwater flow direction with groundwater following the line of the culvert to the southwest and secondly to the south toward Pigg Lee Brook exiting the site in the area of HS1.
- 3.3.10. Moderate to strong solvent / hydrocarbon odours have been reported within the soils and groundwater within Phase 2a and 2b to the north but have not been encountered within the site. Most recent monitoring to the north of Phase 2 has not recorded the presence of detectable layers of non-aqueous phase liquids. Delineation works by Groundtech have mapped the extent of the impacted groundwater plume in Phase 2B with regards to BTEX and hydrocarbons (C4-C12) which demonstrates that the plume is static or receding in Phase 2B and have demonstrated that it does not extend to the Phase 2 site which is covered within this report.
- 3.3.11. The absence of LNAPL is unexpected, however the historical drainage system and outfall in the north of Phase 2 are considered to provide a migration pathway at the most significant source of contamination (recorded within HS11). Given that the majority of the contaminants of concern have been recorded in greater concentrations than their respective solubility limits then Groundtech consider it likely that any LNAPL released during spill or leaks during site operation has now migrated off-site via the historic drainage. The exception to this is in BH506 where the most recent groundwater monitoring reported the possible presence of LNAPL, despite low

overall groundwater concentrations recorded. Monitoring of upgradient wells between BH506 and the HS10/HS11 plume area has not reported any LNAPL present and is considered unlikely a result of plume migration. The primary source of contaminant (from tanks and other infrastructure within Phase 2B) have now all been removed.

3.3.12. Perched groundwater has been recorded at shallow depth within the made ground in various locations; however the clayey fills and drift deposits are likely to hold limited quantities of groundwater. The ashy fills in the south of the site appear to be relatively free-draining, and groundwater was recorded at or below the base of the fill in the southernmost part of the site.

3.4. Present Land Condition

Table 3.2: Land Condition Summary

Site Description	Access to the Phase 2 area is off Mill Road. All former buildings have been demolished although some boundary walls and retaining walls remain in place; all ASTs, bulk containers and above ground pipework have been removed; and many buried service pipes and drains remain in situ within phase 2 area. Specific substances previously stored in bulk tanks on the Phase 2 area of the site have included: • white spirit (paint thinner - light petroleum distillate) - USTs • monoethylene glycol (antifreeze) - USTs • methanol - USTs • fuel oil (diesel and heating oils) - ASTs • kerosene (paraffin) - AST • methylene chloride (dichloromethane / DCM) - AST • sodium silicate solution - AST • aromatic solvents (toluene/ethylbenzene/xylenes) - ASTs • bitumen AST Numerous (estimated at several hundred) IBCs, 45-gallon drums and other containers on site were observed during the SGP walkover inspection in 2018; a full inventory was not possible, however legible labels including the following:
Site Description continued	• isopropyl alcohol (propan-2-ol) - solvent • C10 aromatic naphtha solvent (aromatic hydrocarbons predominantly in C8-C12 range, with <1% naphthalene) • 'Semtol' paraffinic white oil • alcohol-based fragrances • 'waste' or unlabelled containers Heavy staining was noted on surfaces in several locations, as were sheens on standing water.
Boundaries of Phase 2	north: former Mill Lodge Reservoir, base of Phase 2B and Phase 2A area. east: masonry walls and steel palisade fencing south: brick/concrete walls and steel palisade fences; the Croft is unfenced onto Mill Road west: steel palisade fences and walls, with temporary site fencing onto Phase 1

Services / Wayleaves	surface water culvert runs via lodge overflow channel to south side of dam, then south below mill buildings (invert level 2.22m depth in manhole in south of site), then below Mill Lane and The Croft (invert level at 13.36m depth in manhole near southern boundary), flowing to outlet in valley 145m to southwest. A combined sewer runs west below Mill Road from the southern end of the site, at 2.75m depth at the site boundary. 6.6kV electricity mains run through the site between Walmersley Old Road and Mill Road, with low voltage distribution from a substation in the centre of the site. There is no record of gas mains entering the site; water mains and telephone lines enter the site but there are no details regarding internal networks. There is no information concerning other pipelines or fibre optics systems and a full utilities and services survey is outside the scope of this assessment. Other than Mill Road between the Croft and the remainder of the site there are no Rights of way crossing the site.
Structures	A variety of buildings previously occupied the site, ranging from original single, one and two-storey masonry mill buildings to modern 2-storey offices and steel portal frame warehouses. There were various bulk liquid storage tanks distributed around the site, including underground and above ground tanks (USTs and ASTs) on the Phase 2 area - these are described further below.
Surfaces / Vegetation	The site was sparsely vegetated in the southern part, with some peripheral trees and scrub; around the car park and offices was managed grass and tree landscaping. Japanese Knotweed was surveyed by Knotweed Eradication in February 2020 - no infestation was recorded within the Phase 2 site however a colony was recorded alongside Mill Lane outside the southern boundary of the site. The majority of vegetation in development areas of the site has now been stripped.
Surface Waste / Contaminat ion	A 2017 walkover inspection by SGP noted numerous tank locations and storage of IBCs (intermediate bulk containers) with a range of contents; no evidence of significant leaks or spills of chemicals or of waste disposal within the site was recorded, although much of the material in drums and IBCs was deemed to be waste material, given the condition of the containers and the storage arrangements. All ASTs and bulk containers and their contents were removed from Phase 2 prior to Barratt Homes taking possession of the site. A preliminary survey of manholes in parts of the site and in Mill Road recorded elevated concentrations of volatile organic compounds (VOCs) measured by PID inferring a degree of discharge or emission from the site was taking place at this time (2017).

3.5. Contamination

3.5.1. Nine potential or known hydrocarbon contamination source areas in Phase 2 have been identified in Table 3.3 below, at the approximate positions shown on drawing D02; this information is cross-referenced with the areas of potential concern (APCs) listed by ENSR (2003). In addition to these, a further potential hotspot area (BH506) has been identified through recent groundwater monitoring where elevated phenol has been reported and the possible presence of LNAPL (although the lack of consistency in this observation between the two

monitoring rounds and the groundwater analytical results from this entry suggest that the presence of free product is very unlikely).

Table 3.3: Potential or Known Phase 2 Contamination "Hot-spots" in Phase 2 Site Area only

ref.	feature	investigation	reported contamination
HS1 (APC-1, APC-2, APC-13)	southern corner of site including former reservoir, USTs for white spirit, antifreeze (MEG), methanol, and ASTs including heating oil, antifreeze mixing area	ENSR (2003) BH10, BH11, PH12, PH13, PH42	high TPH/BTEX reported in PH42 soils and groundwater; groundwater in BH10 (down-gradient) contained traces of ethylbenzene and xylenes
		e3p (2014) WS107 (RB102 - no log or monitoring data)	no significant contamination in ashy fill
		SGP (2021) - UST tank contents	tanks empty or part filled with contaminated rainwater, variously with diesel, kerosene, white spirit and glycol
		Groundtech (2022) – BH518	No elevated concentrations in groundwater
HS2 (APC-4)	drum compound	ENSR (2003) PH40, PH41	elevated lead in PH41 soil (492mg/kg at 0.8m)
		e3p (2017) RB202	trace of aromatic hydrocarbons (C10-C12) in groundwater 48 µg/l
		SGP (2021) HS2-TP1, HS2-TP2, HS1-TP3	elevated glycol, with minor soil contamination by chlorinated hydrocarbons and aromatic hydrocarbons
		Groundtech (2022) – BH517	Black staining and moderate hydrocarbon odour in BH517 at 3.1—3.6m bgl (top of bedrock). No elevated concentrations in groundwater
HS3 (APC-6)	fuel oil AST in yard	ENSR (2003) PH9, PH44	elevated sulphate in PH9 soil
		Groundtech (2022) – BH512	no soil or groundwater (BH512 blocked) samples
HS4 (APC-7)	diesel AST in yard	ENSR (2003) PH10	possible TPH contamination (but could be coal) and slightly elevated arsenic (43mg/kg at 1.1m)
		e3p (2014) WS114	no significant contamination in ashy fill
		e3p (2017) RB201	sampling by SGP 2018 - no significant contamination in groundwater
		SGP (2021) HS4-TP1, HS4-TP2	low level of polychlorinated naphthalenes but no other significant organic contamination in soil
		Groundtech (2022) – BH511	No elevated concentrations in groundwater
HS5 (APC-8)	kerosene AST	ENSR (2003) BH8	no analysis (visually uncontaminated sandstone gravel over concrete)
		e3p (2017) WS201, RB103	no significant contamination
		SGP (2021) HS5-TP1, HS5-TP2	no significant organic contamination in soil

ref.	feature	investigation	reported contamination
HS6 (APC-9, APC-10)	ASTs for DCM, white spirit, kerosene, sodium silicate, heating oil located between mill buildings	ENSR (2003) PH3, PH4, PH15	elevated TPH in PH15 at 0.2m depth; no other samples analysed due to absence of apparent contamination
		e3p (2014) WS111, WS132	WS113 - moderate TPH (C16+) contamination in soil above 0.5m depth; WS132 - no analysis
		e3p (2017) WS205, WS207	no significant soil contamination
		Groundtech (2022) – BH503-BH504	No elevated concentrations in groundwater
		SGP (2021) HS6-TP1 to HS6-TP6	locally high concentrations of phthalates with glycols, TPH and some chlorinated hydrocarbons in soil
HS7 (APC-11, APC-12)	electrical transformer, diesel AST on side of mill building	ENSR (2003) PH5	no PCBs detected in sample from PH5 adjacent to transformer; no other samples analysed due to absence of apparent contamination
		SGP (2021) HS7-TP1	minor PCB contamination in soil
		Groundtech (2022) – BH509	No elevated concentrations in groundwater
HS8 (APC-15)	disused AST (contents unknown) on lodge dam	ENSR (2003) PH17	traces of TEX/TPH in sample at 2.4-2.6m
		e3p (2014) WS109 (RB101- no log or monitoring data)	no significant soil contamination
		SGP (2021) HS8-TP1 - located nearby below dam	no contamination indicators in soil
		Groundtech (2022) – BH501 – located on dam	No elevated concentrations in groundwater
BH506	Former building footprint	Groundtech (2022)	Elevated phenol in groundwater and NAPL reported in recent (Sept 22) groundwater monitoring

MEG - monoethylene glycol, DCM - dichloromethane (methylene chloride), TPH - total petroleum hydrocarbons, BTEX - benzene, toluene, ethylbenzene, xylenes, TCE - trichloroethene

3.5.2. Several other operational areas of the site could be associated with contamination resulting from leaks or spills of pollutants. These include:

- Tetrosyl vehicle maintenance shed in south of site (APC-5) - WS209 encountered asbestos, and elevated metals (copper 100, lead 500 and zinc 890 mg/kg) at 0.5m depth;
- Tetrosyl maintenance shop and former printing works mechanics workshop (APC-3) - not investigated;
- former Tetrosyl spraying room (APC-14) - PH39 no samples analysed due to absence of apparent contamination;

- Tetrosyl resin room and former reservoir (APC-17) - PH1 (0.15-0.25m depth) recorded elevated total chromium (977 mg/kg) but hexavalent chromium was <0.1 mg/kg; boron was elevated in PH6 (1.6-1.7m depth) at 181 mg/kg;
- former boiler house site, later part-covered by office building - not investigated.

3.5.3. The history of textiles industry development and use is likely to have been associated with characteristic forms of contamination resulting from construction, maintenance, demolition and waste disposal activities; the typical contaminants will include metals (e.g. lead, zinc, copper, nickel), metalloids (e.g. arsenic), sulphates, asbestos, polyaromatic hydrocarbons (PAHs) and other persistent hydrocarbons associated with oils and greases. Three soil samples collected from made ground (sandstone gravel or ash) from beneath the old mill floors recorded elevated concentrations of contaminants as follows:

- ENSR (2003) PH11 (0.8m) arsenic 70 mg/kg
- ENSR (2003) PH14(0.3m) total cyanide 437 mg/kg
- ENSR (2003) PH21 (0.5m) arsenic 84, chromium 269, copper 336, lead 1528 mg/kg

3.5.4. Asbestos testing of soils has been limited and based in part upon observations of suspect contamination. The following positive identifications of asbestos in soils have previously been made:

Table 3.4: Asbestos in Soils

Date and Source	Entry ref.	Description
ENSR, 2003	PH14 (0.15-0.50m)	amosite board fragments - 15-20% w/w in fill above concrete
	PH16 (0.26 - 0.45m)	chrysotile fabric - 15-20% w/w in ash and gravel fill
	PH29 (depth unknown)	amosite and chrysotile fibre fragments (0.16-0.3% w/w) in quarry backfill
e3p, 2014	WS106 (0.5m)	chrysotile fibres
e3p, 2017	TP102 (0.4m)	chrysotile fibres (<0.001% w/w) car park reservoir fill
	TP104 (0.7m)	chrysotile and amosite fibres, amosite lagging (0.001% w/w car park reservoir fill
	WS209 (0.5m)	anthophyllite fibres, chrysotile and crocidolite lagging (0.093% w/w) in subbase to car maintenance shed

3.5.5. Asbestos testing of UR crushed aggregate within Phase 1 gave results that were all below 0.001% w/w. All soil samples collected to date within Phase 2 for laboratory analysis have been screened for asbestos. No visible asbestos has been identified in Phase 2 however the testing of crushed aggregate recovered for re-use will proceed as for Phase 1.

3.5.6. Areas of deep fill historically created for engineering purposes and/or associated with waste disposal are listed as follows:

Table 3.5: Principal Areas of Deep Fills

ref.	feature	investigation	description of fill
#A (APC-29)	The Croft area south of Mill Road	ENSR (2003) BH9, TP7, TP8, Groundtech (2022) BH519-BH520)	principally ashy sandy clay fill >100 years old, up to 14.5m depth proven, overlies culvert
#C (APC-16, APC-31)	earthworks dam, including bitumen AST, and fill area on south side of lodge, used as turning area,	ENSR (2003) BH5, PH18, TP6 e3p (2017) WS211, WS213	turning area fill is mixed construction and demolition waste with hydrocarbon contamination locally, probably around 30 years old; general dam construction features masonry gravity retaining walls and mixed soil and rock fill over 120 years old; bitumen layers noted adjacent to bitumen AST, maximum depths likely to reflect height drop of around 11m, reducing up valley sides to east and west

3.5.7. Visual and olfactory observations of contamination derived from site investigation logs are summarised below together with records of VOC measurements (limited to probehole samples in ENSR entries):

Table 3.6: Contamination Observations from Site Investigations

Date and Source	Entry Ref	Description
ENSR, 2003	TP6	adjacent to lodge - hydrocarbon odour and sheen on wet fill 0.9-1.4m
	PH10	next to diesel tank - slight hydrocarbon odour 0.25-0.5m depth, PID 41ppm at 0.6-0.7m depth
	PH14	near paint spraying room - suspect asbestos fragment, PID 39ppm at 0.3m depth
	PH15	near fuel AST - hydrocarbon odour at 0.2-0.3m depth, PID up to 50ppm
	PH16	main building - fragment of suspect asbestos at 0.26-0.45m depth
	PH17	near AST by lodge - hydrocarbon from 1.6m to base of hole at 4.0m, PID up to 970ppm and elevated throughout entry
	PH42	near USTs - hydrocarbon odour at 1.7m to base of entry at 3.7m; sheen on wet gravelly clay below 2.0m depth; PID elevated at all depths to maximum 7889ppm at 1.7m depth
	BH4	near to former boiler house, slight odour and possible staining in made ground at 0.5-1.0m depth; strong solvent odour in bedrock at 2.3->3.2m associated with water table
	BH10	adjacent to USTs - hydrocarbon odour at 0.15 - 0.7m depth
	WS109	in lodge dam - 'unusual odour' in made ground 2.7-3.1m depth
e3p, 2017	WS206	in backfilled quarry - hydrocarbon 0.15-0.35m depth
	WS210	between solvent tank farm and quarry - hydrocarbon odour 0.15-0.25m depth
SGP, 2020	HS2-TP2	Drum compound – PID 10.8 ppm at 0.3-0.9m bgl

Date and Source	Entry Ref	Description
	HS6-TP1	ASTs – PID 3.9-24.7 ppm at 0.25-0.6m bgl
	HS6-TP3	ASTs – PID 17.1 – 50 ppm at 0.15 tp 0.7m bgl with strong sweet odour at 0.15-0.3m depth
	HS6-TP4	ASTs – PID 8.1-178.8 ppm from 0.2-0.9m bgl with strong hydrocarbon odour at 0.2-0.5m bgl
	HS6-TP5	ASTs – Slight hydrocarbon odour with 6.6-7.8 ppm at 0.15-0.7m bgl
	HS6-TP6	ASTs – PID max 74.3 ppm at 0.4-1.6m bgl with moderate hydrocarbon odour
Groundtech, 2022	BH517	Former Underground Storage Tanks (USTs) – Mild hydrocarbon odour and black staining from 3.1 to 3.6m bgl

3.6. Conceptual Site Model

3.6.1. The conceptual site model is summarised below and presented in diagram form in drawing D03.

Table 3.7: Summary of Pollutant Linkages under development and residential use

receptors	Pathways	contaminant sources
human health (future residents) (transient risks to construction workers addressed under HSWA 1974 / COSSH)	consumption of contaminated vegetables	asbestos, metals/metalloids and PAHs in made ground, asbestos residues, VOCs in made ground and natural soils / bedrock: <i>probably widespread throughout site, although regrading may locally remove sources from specific areas</i>
	soil and dust ingestion	
	inhalation of dust / vapours	
	dermal uptake	
	migration and accumulation of ground gas in buildings	methane and carbon dioxide, locally VOC vapours emanating from made ground and natural soils / bedrock (or possibly shallow groundwater) VOCs <i>have been confirmed by high PID readings and represent a significant risk of intrusion into future dwellings with long-term inhalation by occupants - it is noted that VOC sources will naturally decline over time due to volatilisation and dispersion to the atmosphere and by degradation and, dispersion in soils and groundwater</i>
	infiltration of water supply pipes	VOCs, PAHs and sulphates in made ground and groundwater
buildings	migration and accumulation of explosive gas in buildings	Methane emanating from made ground and hydrocarbon impacted natural soils / bedrock, possible mine-gas <i>subject to various assessment with varying degrees of confidence, precautionary mitigation measures will be required in a significant proportion of the site</i>
	contact with aggressive soil or groundwater	sulphate in made ground -assessed
plants	root uptake of phytotoxic metals	boron, copper, nickel, zinc in made ground, <i>although concentrations not indicative of severe risks</i>
groundwater and Pig Lee Brook tributary	migration of dissolved substances	metals, hydrocarbons, detergents, alcohols (antifreeze), Freon.
	surface water run-off / drain discharges	suspended solids (silt), hydrocarbons, detergents and antifreeze mobilised from drain sediment or loose deposits on site surface.

3.6.2. Where exceedances of generic assessment criteria have been identified then remedial actions will be required. These may take the form of further investigation and detailed quantitative risk assessment, or a direct assumption that remedial treatment will be necessary. In the above instances, it has been concluded that contamination is of sufficient significance to warrant physical remediation and has therefore been subject to a review of remedial options as described in section 4 below.

4. Risk Assessment and Remediation Objectives

4.1. Risk Assessment

4.1.1. The conceptual site model for Phase 2 has identified potentially significant risks to human health from residual soil and groundwater contamination, and environmental receptors (the Rough Rock aquifer and Pig Lee Brook tributary).

4.1.2. The Groundtech detailed quantitative risk assessment (DQRA) (ref: GRO-21459-4595, dated 14th July 2023) produced a set of remedial target values (RTVs). The locations where exceedances for one or more of the Tier 3 RTVs which indicate that remediation may be necessary are summarised below and are shown within Drawing D04. Moreover, There are areas where further investigation and sampling is required owing to the presence of various site constraints. These dedicated areas for inspection are shown in Drawing D05 and within the table below.

Table 4.1 Summary of potential or known contamination hot spots within the Phase 2 area

Hotspot ref:	Feature	Exceedances of Soil RTVs	Notes
HS1	Former reservoir; underground storage tanks (USTs) for white spirit, antifreeze (MEG) and methanol; above ground storage tanks (ASTs) including heating oil; antifreeze mixing area	Not sampled – UST residual contents includes Diesel/Kerosene, White Spirit & Glycols	USTs require draining and removal prior to further soil sampling* and assessment of local remediation needs
HS2	Drum compound	2 Samples with moderate exceedance of RTV for Aromatic C10-C12 and 1 moderate exceedance of xylene	Sampling in well within bunded area E3P RBH202 20/12217 did not indicate any impacts. Remediation of impacted soils / further sampling of soil is required
HS3	Fuel oil AST	Not sampled - below URL compound	Further soil sampling is required after re-location of site compound*
HS4	Diesel AST	Only one sample obtained, minor exceedance or aromatic C10-C12	Remediation of impacted soils / further sampling of soil is required
HS5	Kerosene AST	Only two samples obtained – one minor exceedance or aromatic C10-C12	Further soil sampling is required*

Hotspot ref:	Feature	Exceedances of Soil RTVs	Notes
HS6	ASTs for dichloromethane, white spirit, kerosene, sodium silicate (non-polluting) and heating oil	moderate exceedance of RTVs for Aromatic C10-C12, m/p and ortho-xylenes and high exceedance of ethylbenzene	Very high phthalates reported in soil in one location, but no phthalates reported within groundwater. Further soil sampling is required, with probable localised soil remediation*
HS7	Electrical transformer and diesel AST	one sample obtained, no exceedances of RTVs	Further soil sampling is required, with probable localised soil remediation (PCBs)
HS8	Disused AST (contents unknown) on lodge dam	Not sampled directly, soil sample from ground to south was uncontaminated	Further soil sampling is required*
BH502	Former building footprint	None	Slight exceedance in groundwater. Further inspections warranted during remediation works to confirm presence / absence of LNAPL impacted soils. If confirmed, remediate by removal.
BH506	South of former reservoir and directly north of Piggs Lee Tributary.	None	Slight exceedance in groundwater. Further inspections warranted during remediation works to confirm presence/ absence of phenol impact soils. If confirmed, remediate by removal.

**it is noted that further soil sampling are necessarily combined with earthworks to remove USTs or other obstructions and will be carried out contemporaneously with stripping of any significant contamination and verification testing and comparison to agreed soil remediation criteria*

4.1.3. No exceedances for soil RTVs were reported within BH502. The possible presence of LNAPL in BH506 has been assessed during recent groundwater monitoring whereby no LNAPL has been observed and hence remediation is not considered warranted.

4.1.4. The locations of maximum soil concentrations exceeding the RTVs are shown in Drawing D04 all of which, are located within HS6. However remedial works in each of the identified hotspot areas and verification sampling will be required to confirm that residual exceedances do not remain. Drawing D05 shows where detailed inspections will be required.

4.1.5. Further validation soil sampling is to run concurrently with the preparatory works including the removal of relict infrastructure and/or removal of impacted soils as necessary.

4.1.6. The areas of high soil and bedrock VOC vapour measurements are coincident with the elevated concentrations in groundwater and the vapours are likely to arise primarily from LNAPL within the bedrock of adjacent soils concentrated around a "smear" zone generated by natural water table fluctuations and capillary action. Evaporation from the dissolved phase in groundwater is likely to be a relatively minor source. The volatility of the hydrocarbons means that unroofing by removal of slabs and cohesive soils during the preparatory earthworks will inevitably result in accelerated dispersion and attenuation of the vapours and depletion of the LNAPL sources. The requirements for groundwater and soil source removal to protect groundwaters would also

expedite a reduction in soil VOCs posing a risk to human health, and no specific additional measures for source reduction are considered likely to be necessary for remediation to protect human health. This assessment can be reviewed following post-remediation validation monitoring for soil VOCs using shallow gas probes, however the installation of VOC-resistant membranes in all buildings in affected hot-spot areas will break this potential pollution linkage with respect to human health via indoor inhalation.

- 4.1.7. It is acknowledged that further risk assessment and refinement of criteria and objectives is required for the groundwater within areas Phase 2A, 2b and the reservoir area to assess the groundwater contaminant mass and distribution which shall be used to derive a robust remedial options appraisal.
- 4.1.8. The principal of applying protective soil criteria to the Phase 2 site area (excluding Phase 2a,2b and the mill lodge reservoir) has been agreed by the EA (as preventing further hazardous substances from entering groundwater in line with WFD) and that the residual groundwater concentrations in these areas do not need direct remedial action.

4.2. Remediation Objectives

4.2.1. The key remediation objectives are to:

- break significant or potentially significant future pollutant linkages resulting from the change of land use;
- remove / remediate significant soil sources to achieve approved RTVs within the Phase 2 area that pose a risk to humans and / or the environment; with respect to groundwater protection the sources will be defined by exceedance of the EA approved soil RTVs (provided within the Groundtech Consulting letter report dated 14th July 2023 ref: GRO21459-4595);
- recover materials with the potential for re-use within the development (specifically soils which may be used in gardens, engineering fill materials required to achieve the planned development levels, and aggregates for use in construction;
- minimise the generation of wastes requiring disposal off-site by maximising the re-use of soils and demolition materials;
- respond appropriately to contingencies in particular any discovery of currently uncharacterised contamination;
- manage all emissions to air and water to protect local residents (including current and future occupants of Phase 1), surface waters and groundwater, and the atmosphere during the remediation works;
- provide appropriate secondary protection measures to be implemented during construction, including building gas barriers, water mains protection, and garden / open space cover soils of specified quality and thickness.

4.2.2. The potential risks identified will be managed to break any potential pollution linkages and allow development of the site for its intended residential use without harm to human health, property, and the environment. Each of the potential contaminant linkages identified in the site conceptual model and risk assessment will be addressed for the Remediation Strategy to be considered appropriate for the site and to allow construction to commence.

4.2.3. Risks to human health associated with the identified contamination by asbestos, metals, PAHs and non-volatile hydrocarbons can be managed by isolation of affected soils from future residents and, to lesser extent, maintenance workers (whose exposure is likely to be limited). It is assumed that these substances may be widespread in the made ground across the site. Re-graded fills will be covered in part by permanent hard standing or buildings to provide physical isolation of any residual contamination. Specific measures to isolate humans from direct exposure to such contamination are only required in areas where gardens or soft landscaping is proposed or where future disturbance can be readily anticipated, such as utility corridors.

- 4.2.4. The other exposure pathway with the potential to affect human health is the volatilisation, migration and indoor inhalation of volatile petroleum hydrocarbons associated with fuel, white spirit or other solvent spills or leaks. Other than the CFC Freon, the majority of substances previously detected are readily degradable and are likely to have dispersed and have been attenuated to varying degrees. Chlorinated hydrocarbons have been generally recorded in lower concentrations in groundwater, and the occasional detections of breakdown intermediates including cis 1,2 dichloroethane and chloroethene (vinyl chloride) are evidence of anaerobic microbial degradation of the original solvents. Freon poses low risks to human health but is a greenhouse gas and causes ozone depletion. The ORS specified that post-remediation vapour monitoring will be undertaken to confirm whether VOC protection measures are required within dwellings overlying the remediated hotspot areas.
- 4.2.5. Remediation of elevated hydrocarbon contamination will combine methods for source reduction together with construction barriers, the latter comprising the use of VOC-resistant barrier membranes within dwellings. Following the earthworks remediation, it is intended to carry out completion monitoring of the shallow soils across VOC hot-spot areas to confirm any requirement for VOC protection to buildings and to provide reassurance that there are no further potentially significant exposure pathways for future residents (i.e. via outdoor inhalation). Notwithstanding the results of completion monitoring, it is expected that all new buildings on hydrocarbon-impacted parts of the site will utilise passive gas protection measures including methane/VOC-resistant membranes and ventilated sub-floors.
- 4.2.6. The monitoring and risk assessment carried out to date does not indicate any significant impact upon the Pig Lee Brook tributary, however there is legacy contamination by dissolved hydrocarbons and halocarbons within zones of shallow groundwater within the Rough Rock aquifer within Phase 2B located to the north of Phase 2 area which is to undergo further assessment. The known primary contamination sources have been removed from this area together with the USTs within HS1 to the southeast of the wider phase 2 area. Secondary sources in the soils and bedrock have been and continue to be subject to attrition through natural attenuation (biodegradation, volatilisation, dilution and dispersion) and soil RTVs have been developed to achieve these objectives and are tabulated in section 4.3.
- 4.2.7. Specialist remediation proposed method statements are attached as Appendix C to this Detailed Remediation Strategy but necessarily include elements of contingency planning. These will be the subject to agreement and any necessary permits with the Regulatory Authorities.
- 4.2.8. The potential for exposure of concrete to aggressive ground conditions and damaging substances is considered as generally low but may be subject to further assessment during or following the remediation works. Pipelines in hydrocarbon impacted areas will require use of protected pipe materials and clean beddings in accordance with the requirements of the service

provider.

4.2.9. During the remediation works it is possible that currently uncharacterised contaminated materials may be exposed and precautionary mitigation to prevent exposure of site workers, local-residents, and site visitors to harmful or nuisance substances including dust and odour is a requirement of the remediation strategy. Similarly, the works must not cause pollution of water by discharge of silt or other materials to surface waters or the release of fluids from underground tanks or pipes. As a priority the general remediation works proposed must not cause the release of any polluting substances to controlled waters, either via sub-surface or overland flows.

4.2.10. Further enabling works will be required to physically prepare the site for the proposed development. These will entail removing wastes, obstructions, relict sub-surface structures and pipework, and otherwise deleterious materials (possibly including organic soils if encountered), modifying ground levels, partial infilling of the Mill Lodge, and provision of supporting structures and suitable founding surfaces for infrastructure. The culvert re-location will require the formation of a new lined surface water channel and reservoir outfall, and new discharge to the retained culvert at the southern end of the site. The old culvert will at this point be grubbed out or grouted up. The realignment and isolation of the watercourse from groundwater within the site will considerably lengthen the potential pathway for groundwater to enter the watercourse to beyond the southern site boundary, further reducing any residual risks to the watercourse.

4.3. Remediation Criteria

4.3.1. Soils remediation Criteria are site specific objectives that have been determined through quantitative or qualitative risk assessment. It is key to note that the selected remedial approach for the Phase 2 area is not dependent on groundwater remediation as there are only minor exceedences recorded. The RTVs derived through Detailed Quantitative Risk Assessment have been completed by Groundtech (ref: letter report of 14th July 2023 ref: Groundtech GRO-214594595) derives standards for residual hydrocarbon (aliphatic C10-C12, aromatic C10-C12 and BTEX), phenol, dichloromethane, PCE, TCE, and 1,2-dichloroethene concentrations in soils. Compliance with the proposed target values will also serve to reduce potential risks to controlled waters and from VOC migration into the development soil cover and house foundations.

Table 4.2 Groundwater Remediation Target Values

Substance	Soil (mg/kg)
benzene	0.19
toluene	4.23
ethylbenzene	4.64
xylene (total)	3.84

Substance	Soil (mg/kg)
aliphatic (C5-C6)	331
aliphatic (C6-C8)	1,680
aliphatic (C8-C10)	300
aliphatic (C10-C12)	60,800,000 (> saturation)
aromatic (EC10-EC12)	62.9
phenol	0.18
dichloromethane	0.0682
PCE (tetrachlorethene)	0.754
TCE (trichloroethene)	0.396
1,2-cis-dichloroethene	
vinyl chloride	

>Saturation equates to where free phase product is encountered

Water Discharges

4.3.2. Criteria for discharges of treated groundwater to sewer are set out within the UR method statement (Appendix C).

4.3.3. The Tier 1 (generic) Environmental Quality Standards for Pig Lee Brook are set out below and will be maximum limit concentrations applied to all surface water discharges into the watercourse from the site; these are taken from either Water Framework Directive standards or, for glycols, phthalates and suspended solids, from other available guidelines for controlled waters.

Table 4.3. Surface Water Discharge Target Values (µg/l)

general hydrocarbons	no visible sheen (i.e. solubility limit - typically ~100		
benzene	10	1, 2 cis dichloroethene	50
toluene	74	trichloroethene (TCE)	10
ethylbenzene	300	tetrachloroethene (PCE)	10
xylenes	30	chlorobenzene	300
vinyl chloride (VC)	0.5	1, 2 dichlorobenzene	20
dichloromethane (DCM)	20	phenols	7.7
chloroform (trichloromethane)	2.5	di-n butyl phthalate	8
1, 1 dichloroethane	30	glycols	14,000
1,1,1 trichloroethane	100	total suspended solids	100,000

Soils

4.3.4. The shallow garden soils criteria selected are protective of human health when applied to shallow soils in a model residential garden, with sensitive (child) receptors and high exposure frequencies and durations assumed for a conservative approach. These criteria were previously set out in the approved ORS. While exceedances of the GACs may indicate a significant risk, it is also acceptable to undertake further testing, statistical analysis of the results and / or more detailed risk assessment in this eventuality.

4.3.5. The human health criteria will be applied to shallow soils, defined as those which will be in the upper 600mm of garden surfaces following completion of the development, with a shallower depth of 300mm suitable for the managed POS areas and other landscaping where penetration below the surface layers is less likely and can be controlled.

4.3.6. No published criterion exists for asbestos, and one cannot be readily derived, however industry practice is to apply the limit of detection that can be achieved through quantification of the asbestos in the soil by commercially available laboratory techniques, typically 0.001% by mass. If higher concentrations are encountered then a further assessment would be required to determine likely risks, however concentrations above what are widely recognised as “trace” are not normally tolerated in residential soils and so this will be adopted for the residential areas of the development. Higher concentration in other areas /or at greater depths may be acceptable, depending on whether future exposure during construction or maintenance can be reasonably anticipated and avoided.

4.3.7. The cover soils remediation criteria for the site are given in Table 4.4 below and in section 7 "Verification Plan". These are derived to be protective of human health and are sufficiently conservative to afford protection for other receptors.

Table 4.4: Cover soil screening criteria (residential use)

Contaminant	Screening criteria for Residential Use (mg/kg unless stated)
Asbestos fibre	<0.001% by mass (limit of detection)
Arsenic	37 (S4UL)
Cadmium	11 (S4UL)
Chromium III	910 (S4UL)
Chromium VI	6 (S4UL)
Copper	2,400 (S4UL)
Lead	200 (C4SL)
Mercury	1.2 (S4UL)
Nickel	130 (S4UL)
Zinc	3,700 (S4UL)
Naphthalene	2.3 (S4UL)
Acenaphthene	210 (S4UL)
Acenaphthylene	170 (S4UL)
Fluorene	170 (S4UL)
Phenanthrene	95 (S4UL)
Anthracene	2,400 (S4UL)
Fluoranthene	280 (S4UL)
Pyrene	620 (S4UL)
Benzo(a) anthracene	7.2 (S4UL)
Chrysene	15 (S4UL)
Benzo(b) fluoranthene	2.6 (S4UL)
Benzo(k) fluoranthene	77 (S4UL)
Benzo(a) pyrene	2.2 (S4UL)

Contaminant	Screening criteria for Residential Use (mg/kg unless stated)
Indeno(123cd) pyrene	27 (S4UL)
Dibenzo(ah) anthracene	0.24 (S4UL)
Benzo(ghi) perylene	320 (S4UL)
Aliphatic C5-C6	42 (S4UL)
Aliphatic C6-C8	100 (S4UL)
Aliphatic C8-C10	27 (S4UL)
Aliphatic C10-C12	130 (S4UL)
Aliphatic C12-C16	1,100 (S4UL)
Aliphatic C16-C21	65,000 (S4UL)
Aliphatic C21-C35	65,000 (S4UL)
Aromatic C6-C7	70 (S4UL)
Aromatic C7-C8	130 (S4UL)
Aromatic C8-C10	34 (S4UL)
Aromatic C10-C12	74 (S4UL)
Aromatic C12-C16	140 (S4UL)
Aromatic C16-C21	260 (S4UL)
Aromatic C21-C35	1,100 (S4UL)

NAD: No asbestos detected

S4UL: LQM/CIEH Suitable for Use Levels (S4ULs), residential with homegrown produce land use, (at 1% SOM, 6% SOM for metals). Copyright Land Quality Management Ltd. Reproduced with permission publication number S4UL 3102. All rights reserved.

C4SL: Category 4 Screening Levels published by CL:AIRE (C4SLs); 'residential with homegrown produce land use' (at 1% SOM)

4.3.8. The above human health remediation criteria do not apply to deeper soils, which, based on the available evidence and risk assessments do not generally require further screening or assessment, the exception being where hydrocarbon hot spots have been identified. These areas or volumes of soil and bedrock will be subject to the soils remediation criteria in Table 4.2 and VOC vapour monitoring to determine acceptability for retention and whether there is a requirement for additional VOC -resistant vapour barriers in building foundations.

PCBs (HS07)

4.3.9. Low-level PCBs have been reported within the soils around HS07 and further inspection during preparatory works and if necessary, remediation of impacted soils is required. The Environment Agency Soil Guideline Values for dioxins, furnace and dioxin-like PCBs in soil (Science Report SC050021 / Dioxins SGV) based on a residential land use will be adopted as generic screening criteria:

Table 4.5. PCB Generic Assessment Criteria

Substance	Soil Guideline Value ($\mu\text{g kg}^{-1}\cdot\text{bw}\cdot\text{day}^{-1}$)
Sum of PCDDs, PCDFs and dioxin-like PCBs	8

Phthalates (HS06)

4.3.10. Elevated phthalates have been reported within the soils around HS06 with a maximum dimethyl phthalate concentration of 13,132 mg/kg in HS6-TP3-S1 although their presence has not been recorded within the groundwater. Further inspection during preparatory works within this area is required to delineate and remediate the extent of phthalate impacted soils. In the absence of any published health criteria for dimethyl phthalate, it is proposed to adopt the most stringent phthalate GAC produced by CL:AIRE which is for Di-n-butyl phthalate.

Table 4.6. Dimethyl Phthalate Generic Assessment Criteria

Substance	Screening criteria (mg/kg)
dimethyl phthalate	13*

*Adopted from CL:AIRE GAC for Di-n-butyl phthalate based on 1% SOM in a residential scenario with consumption of homegrown produce.

Soil VOC Vapours

4.3.11. A screening criterion of 50ppm for VOCs measured in spike samples by photo-ionisation detector (PID) will be used for rapid field determinations of the acceptability of soils for retention below the cover system.

4.3.12. Post-remediation VOC monitoring across hot-spot areas will initially be assessed against Tier 1 screening criteria based upon safe concentrations for long-term human inhalation. The methodology for deriving assessment screening criteria for health impacts from VOCs at the receptor is set out in Appendix 9 of the VOC handbook¹. Tolerable Daily Soil Intake values or Index Doses (for non-carcinogens and carcinogens respectively) are multiplied by the body weight (13.3 kg) and divided by the inhalation rate (8.8 m³/day) of a child receptor as defined in the most recent published UK guidance (DEFRA C4SL). Most of the substances under consideration have toxicological inhalation data published in the "LQM/CIEH S4ULs for Human Health Risk Assessment" (S4UL) - *Copyright Land Quality Management Limited reproduced with Permission* or CL:AIRE "Soil Generic Assessment Criteria for Human Health Risk Assessment". The exception is benzene for which an air quality standard is available (5 $\mu\text{g}/\text{m}^3$).

4.3.13. The assessment criteria are highly conservative, as they assume long-term, constant exposure of residents over 24 hr periods, 365 days a year and a continuous source which does not diminish over time, with no attenuation by construction barriers, dispersion, dilution or biodegradation.

4.3.14. The Tier 1 screening criteria are presented in Table 4.7 below. Exceedance of the criteria in soil vapours will trigger either further investigation and / or risk assessment or the implementation of additional remediation measures as appropriate. It is likely that all confirmed VOC hot-spot areas will in any case be specified to deploy VOC-resistant barriers into new housing as a precautionary measure.

Table 4.7. Tier 1 Assessment Criteria for Soil-Vapour Concentrations

Substance	Inhalation Health Critical Value ($\mu\text{g kg}^{-1} \cdot \text{bw} \cdot \text{day}^{-1}$)	Assessment Criteria ($\mu\text{g m}^{-3}$)
Benzene	1.4 (S4UL)	5
Toluene	1400 (S4UL)	2,116
Ethylbenzene	74.3 (S4UL)	112
m/p-xylene	60 (S4UL)	91
o-xylene	60 (S4UL)	91
Aliphatic Hydrocarbons (C4-C6)	5000 (S4UL)	7,557
Aliphatic Hydrocarbons (C6-C8)	5000 (S4UL)	7,557
Aliphatic Hydrocarbons (C8-C10)	290 (S4UL)	438
Aliphatic Hydrocarbons (C10-C12)	290 (S4UL)	438
Aromatic Hydrocarbons (C5-C7)	1400 (S4UL)	2,116
Aromatic Hydrocarbons (C7-C8)	1400 (S4UL)	2,116
Aromatic Hydrocarbons (C8-C10)	60 (S4UL)	91
Aromatic Hydrocarbons (C10-C12)	60 (S4UL)	91
Chloromethane	5.14 (CL:AIRE GAC)	7.77
1, 1-Dichloroethane	200 (CL:AIRE GAC)	132.33
Chloroform	40 (S4UL)	26.47
Trichloroethene (TCE)	0.57 (S4UL)	0.86

¹ CIRIA C682: The VOCs Handbook: Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination 2009

5. Remediation Options and Selection

5.1. Options Appraisal

5.1.1. Options for the remediation of the identified and potential contamination sources with respect to breaking links to the key receptors of resident's health and groundwater are summarised below:

Table 5.1: Remedial Options Outline

Method	Advantages	Disadvantages	Feasibility
Do nothing	No cost, no resource use	Potential long-term human health risk remains from exposure to impacted soils in garden areas, and VOC vapours from shallow depth contamination. Future constraint against potential resource use of parts of the Rough Rock aquifer (note no significant impacts to Pig Lee Brook under current conditions)	Not acceptable given the future residential use of the site, and regulatory position regarding groundwater quality
Physical Barriers	Established technology and practice.	Requirement to source, place and maintain cover layers, and accommodate cover thickness within development levels; covers to hydrocarbon vapour sources may require high-specification gas protection. Groundwater barriers within bedrock are impractical	Practical option for garden and landscaped areas where direct exposure is a possibility and for breaking the indoor migration pathway in parts of the site where required. However, some localised source concentrations are too high or too mobile for sole reliance to be placed on barriers; not a feasible option for groundwater remediation
In-situ treatment (thermal/chemical/bio logical)	Treat contamination at source, reducing disposal cost and waste generation; may be suitable for VOCs or halocarbons in bedrock aquifer via enhanced degradation methods	Destructive techniques only suitable for relatively degradable organic residues, and methods for these may inhibit natural degradation of halocarbons. Timescales for the treatment of more recalcitrant substances adsorbed to aquifer matrix are typically long-term and unlikely to fit development programme	Biological/chemical treatment is a preferred option where significant soil / groundwater contamination by light petroleum hydrocarbons is confirmed, and is not accessible for more reliable ex-situ methods (i.e. within the sandstone bedrock/aquifer)
In-situ treatment (stabilisation)	Stabilisation is an effective means of isolating inorganic or low volatility/low solubility organic substances which are not amenable to treatment using destructive techniques	Likely to be a feasible option for inorganic or low-volatility hydrocarbon impacted soils to be reused below development areas	Most contaminants requiring treatment on the site are organic; if stabilisation of localised asbestos containing soils is proposed a high intensity (solidification) solution may be suitable; it is more practical that these are isolated at depth when such treatment would not be required

Method	Advantages	Disadvantages	Feasibility
Excavation / extraction followed by ex situ treatment or disposal	Industry standard methods to chase out contamination for controlled treatment; methods can reduce source volumes and contaminant levels and can be validated on short timescale for soils (longer for groundwater). Soil contamination on site should be amenable to treatment using soil farming techniques (oxygenation, moisture and nutrient enhancement to promote biological activity).	VOC contamination appears to have migrated into sandstone bedrock below and down-gradient of sources areas; not feasible to excavate bedrock and groundwater treatment by extraction can be lengthy depending upon extent and accessibility of solvent plume(s). Off-site disposal of contaminated soils and liquids would be costly and resource intensive.	Practical option for defined hot-spot shallow soils and groundwater containing volatile / semi-volatile petroleum hydrocarbon contaminants, disposal is the only likely option for inorganic or highly recalcitrant contaminants which are not suitable for treatment or retention below a cover system risk modelling suggests groundwater volumes needing treatment are limited

Detailed Evaluation of Remedial Options

5.1.2. The ground on the site locally contains concentrations of contaminants that, in the absence of mitigation, could pose an unacceptable risk to the health of future site users if present in garden soils and where residents may be exposed by inhalation of harmful vapours. The "do nothing" option, containing no specific measure to remediate ground contamination or deal with further mobile substances, is therefore not acceptable.

5.1.3. Whilst groundwater contamination below parts of the Phase 2b area is significant, this is historical in origin, and there is currently no significant impact from this area upon the surface watercourse or aquifer down-gradient of the site within Phase 2 area. This means that there is no requirement for groundwater remediation in the Phase 2 Area. The culvert removal and realignment of the surface watercourse will further reduce potential risks to the Pig Lee Brook tributary.

5.1.4. A strategy involving removal of all site fills for off-site treatment or disposal has the benefit of removing all potential contamination sources. However much of the material present on the site does not pose an unacceptable risk to human health or controlled waters. This option would require the use of significant resources in the form of replacement fill materials and landfill space, and large additional lorry movement numbers, and is therefore regarded as unsustainable both economically and environmentally. The regrading requirements to develop the site require a balance or net import of fills and therefore any unnecessary removal of material from the site should be minimised.

5.1.5. Risks to future site users from direct exposure to any residual low-mobility contamination can be managed by the use of barrier systems. Use of a suitable thickness of clean cover material over the site surface in areas where low-mobility residual contaminants will remain and where

human exposure could occur following remediation would provide physical isolation and break the relevant pollutant linkages. Gas protection measures can afford a high degree of protection from some mobile sources, although the degree of reliance that can be placed on these is dependent on the quality of the materials and the installation. Minor risks to site users from tainting of water supplies can be managed by the use of high specification resistant materials for pipelines, and/or locating water mains within clean trench fills or clean uncontaminated strata.

5.1.6. The presence of significant hydrocarbon contamination in the areas where potential sources of these substances were present is confirmed. Whilst some further inspections are required for the central and southern hot spots these are expected to disclose similar types of contamination to that already known, but at a reduced scale. It is envisaged that low concentrations can be mitigated through the use of barrier systems as described, although this should be combined with source reduction or removal where exceedances of RTVs indicate a secondary soil source with the potential to continue to leach to groundwater. There is no recorded significant impact upon Pig Lee Brook tributary from contaminated groundwater within the site (and realignment works will further reduce such risks), however the quantitative risk assessments have demonstrated that groundwater protection will require localised remediation of the shallow aquifer and/or overlying soils to reduce source concentrations.

Preferred Final Remediation Option

5.1.7. The preferred option for the wider Phase 2 area (excluding Phase 2a, 2b and the Mill Lodge reservoir) involves elements of all of the previously described techniques. This will entail:

- removal of effectively un-treatable contaminated / deleterious materials (organic wastes, bulk asbestos, free product or otherwise untreatable hydrocarbon contamination) for off-site treatment / disposal;
- screening all other contaminated materials identified during the works and selection of those which present unacceptable risks to human health or are potentially significant long-term diffuse pollution source; removal of these segregated materials for either on-site treatment or off-site treatment / disposal; on-site treatment of readily-degradable VOC contaminated soils is the preferred sustainable option, by means of enhanced biodegradation techniques (aeration, moisture control and nutrient admixes);
- in areas of the site where low-level residual contamination such as the metal and arsenic affected fill materials are already characterised, provision of clean cover system for gardens and landscape areas;
- the provision of gas/vapour barriers to built development will be reviewed following the further investigations and monitoring, but passive building gas protection (e.g., CIRIA CS2) measures are likely to be required for deep fill areas (>2m depth), with CIRIA CS3 / hydrocarbon vapour barriers in areas over residual solvent contamination.

- Only minor exceedances of groundwater have been recorded within the Phase 2 area and hence primary and secondary source removal will be undertaken in Phase 2 area and validation of the remediated areas will be completed to achieve the soil RTVs as approved.

5.1.8. The remediation strategy involves provision for the removal of selected asbestos wastes and contaminated soils and liquids (where encountered), remediation of petroleum hydrocarbons/solvents in soils, rock and groundwater where appropriate, and the isolation of residual low-level contamination by barrier systems to each potential migration pathway identified.

5.1.9. Screening and testing of any site-won, treated materials, including recovered aggregates, will be required where it is proposed to reuse such materials; the screening of samples of recovered aggregate for asbestos fibres will be undertaken. Appropriate permits will be obtained for groundwater abstraction, treatment and discharge, and soils treatment in advance, and validation testing of the resultant products will be undertaken to enable comparison with the specified target levels for the protection of human health and controlled waters.

5.1.10. At present it is assumed that all parts of the Phase 2 development area will require clean cover, and that there is negligible recoverable topsoil present, necessitating the import of clean topsoil. It may be possible to generate some clean subsoil from the shallow natural soils where accessible. All site-won or imported soils to be used as part of the garden or landscaping cover layer will require validation.

5.1.11. The preferred remedial options are considered to provide a long-term robust, technically-sound means of breaking the identified pollution linkages, can be executed in a programme that is compatible with and supports the overall development plan, and are environmentally sustainable in terms of minimising resource and energy use. The methods and quality targets for residual soils and groundwater are verifiable by means of soil and water sampling and analysis. There are no long-term monitoring or maintenance requirements associated with the engineering remediation scheme as the principal pollutants are all expected to further diminish through natural attenuation over time following completion of the remediation works.

6. Implementation Plan

6.1. General Approach - Remediation Engineering (Stage 1)

6.1.1. The general approach to the Phase 2 site preparatory / remediation works (Stage 1) is described below. To assist the residential housebuilder, the implementation and verification requirements applicable to the construction stage of the development are separately described in section 8 of this Strategy:

Table 6.1: Remedial Works Plan

Site security and supervision	The site will be securely fenced throughout the works; the remediation contractor will provide a full-time Engineer on site.
Access	Access will be formed through an existing entrance off Mill Road
Tree protection	none present
Ecological clearance	Ecological clearance works (fish removal from Mill Lodge) will progress in accordance with a method statement provided by Barratt Homes and in accordance with an Environment Agency permit. Phase 2 is not directly subject to measures with respect to protected species or invasive weeds however a Japanese Knotweed colony was reported outside the southern site boundary in 2020 and the potential for migration into the site will be considered. It is proposed to excavate impacted soils and roots (rhizomes) from this area and bury them within a lined cell constructed under POS in the northwest (Phase 1) area of the site
Asbestos clearance / decommissioning demolition	not relevant - all building sources removed; appropriate measures will be taken in event of disclosure of underground sources
Vegetation strip	already completed
Dedicated Inspections	Dedicated inspections with further soil sampling during the preparatory works to verify the absence of any residual contamination or carry out remedial verification works if contamination encountered at: HS3, HS5, HS8, HS9 and HS1 following UST removal and breaking out of obstructions during preparatory works. Supervision of the remediation and removal of impacted soils and collection of verification samples at: HS2, HS4, HS6, HS7, and BH502.
Breaking out paved surfaces, foundations and sub-structures	Existing concrete slabs, tarmac roads, relict foundations, manholes and other sub-structures will be grubbed out by hydraulic excavator. Where underground storage tanks, pipes, etc are encountered these will be removed in accordance with established Environment Agency pollution prevention practices - emptying and cleaning/purging as necessary by specialist contractors before physical removal. The presence of a large retaining wall to be retained along part of the eastern boundary will constrain earthworks in this vicinity to prevent destabilising the structure, however any hot spots will be dealt with locally.

Ground Engineering	As far as practicable made ground/fills will be excavated to their full depth to allow complete removal of obstructions, oversized and deleterious materials, and identify uncharacterised contamination sources. For any areas where this cannot be achieved for any reason, an assessment of the area of constraint must be fully recorded, and an assessment made of the implications for achieving the remediation objectives and geotechnical specifications for the preparatory earthworks. Any such areas / constraints are to be fully detailed in the verification reporting for the site.
Lodge Treatment, Stream / Culvert Diversion	The engineering development of the site requires the emptying and partial filling of the lodge, and diversion of the stream course / culvert into an open channel running from north to south around the eastern side of the site, before returning to the existing culvert in the south of the site; this will be carried out prior to removal or grouting up (subject to depth) of the existing culvert. Soft and organic sediments within the lodge will be excavated and stockpiled for drying, testing and re-use subject to suitability in landscaping works; cement stabilisation may be necessary to stabilise the material but is not a remediation requirement.
Materials recovery / Waste Treatment	All suitable hard materials will be crushed and stockpiled for re-use by the developer; crushing and screening plant will be operated under a valid permit with appropriate controls over noise and dust and will be located at least 100m from existing housing; hard materials feedstock stockpiles will be inspected for potential asbestos-containing materials before crushing, with any suspect materials being removed for disposal. All materials processing will be carried out in accordance with an approved Dust Management Plan. The treatment of hydrocarbon contaminated soils will be carried out under a Mobile Treatment permit, and a separate method statement detailing environmental controls, monitoring methods and target criteria is provided as Appendix B. A central soil treatment facility will be established on existing concrete slabs supplemented by plastic-liners and bunds to prevent surface water runoff. Any accumulated standing water within the bund will be removed for treatment. The existing MMP will be updated to reflect the proposed soil treatment arrangements and will record the source, storage and destination areas for treated soils.

Drainage Controls	There are risks from accidental spillages or leaks to the aquifer and culvert from materials and activities associated with the Phase 2 engineering works. These are addressed by the Principal Contractor in his method statements, with particular reference to the bunding and containment of fuels and lubricants etc., and provision of spill kits. A key risk arises from the entry of surface runoff during storms or dewatering activities to the culvert carrying silt and mobile hydrocarbons; the measures deployed during Phase 1 works entailing the use of silt traps, filter and settling ponds will continue to apply within Phase 2. Any temporary dewatering required within the site for engineering purposes (e.g., removal of old drains) will be removed by pumping or bowser to the water treatment facility for testing and processing as appropriate (see below).
Handling / treatment of hazardous materials / liquid wastes	Secure skips will be retained on site for the receipt of any small volume hazardous materials such as liquid waste / asbestos / chemical wastes encountered on site; contaminated waters will be pumped to vacuum tanker for removal to a specialist treatment facility; petroleum hydrocarbon contaminated soils or sludges will be temporarily stored in polymer-lined lagoons designed to prevent leaching or runoff pending treatment or disposal; any underground storage tanks or fuel / oil / solvent pipelines encountered will be carefully examined in situ, emptied and purged as appropriate prior to removal
Earthworks completion	On completion of the remediation and enabling works, the site will be re-graded to design plot levels less 600mm in areas of residual made ground, to allow for the placing of 600mm of soil cover in future gardens. A suitable geotextile should be placed at formation level where residually contaminated made ground is present prior to the application of garden soils to further reduce mixing and the likelihood of penetration of the cover system by future residents.

6.2. Contaminated Soil Remediation

6.2.1. Any contamination “hotspots” such as asbestos, oil, fuel or other free product, and deleterious materials such as scrap metal and timber will require removal if present. Asbestos containing materials where forming discrete sub-surface deposits exposed during earthworks, will be removed wherever they are observed.

6.2.2. All below ground containers including drums, pipework, tanks and bunds will be checked for liquid product and tar residues or sludge; an intrinsically safe PID will be used to assess the potential for flammable or toxic VOC vapours. Residual product will be identified by laboratory testing to confirm the appropriate waste classification and disposal route; note that sampling and analysis of the contents of all known USTs within the site has been completed previously.

6.2.3. Tanks will be purged and de-gassed, flushed with water as necessary and emptied to tanker before the structure is removed and disposed of or recycled off-site, after which any secondary containment or supporting structures will be broken out using appropriate plant. Any leaks or

spills of liquid product will be dealt with under the provisions set out in the general environmental management for the site.

6.2.4. Where contamination of brick or concrete is suspected such materials will be segregated by placing in temporary stockpiles for testing prior to processing for aggregate. Where solid residues (tars) are encountered these will be removed using excavators during breaking out of the containing structure. In all cases inspection of the underlying and surrounding soils will take place in accordance with the provisions set out for hydrocarbon hotspot treatment below.

6.2.5. The hydrocarbon soil contamination hotspots identified to date, and any further hydrocarbon contamination identified in the additional investigations, will require specific measures to reduce or remove sources. These will entail the initial identification of impacted soils primarily using a PID and visual inspection. Impacted soils will be removed to a Soil Treatment Facility located in the central part of the site, placed in a bunded area on an impermeable membrane liner. The volume of material to be treated will be minimised by segregation of contaminated and non-contaminated materials where possible. The side walls and bases of excavations where contaminated materials are removed will be sampled to verify that contamination has been reduced to acceptable levels (see Section 7).

6.2.6. The soil treatment process will entail processes designed to maximise natural biodegradation of hydrocarbons using the indigenous microflora. This will entail maintaining and promoting aerobic conditions via regular soil turnover and mixing, with control of soil moisture levels to an optimum of around 40%. Fertilizer (NPK) amendments are also proposed in order to remove nutrient constraints to biological activity. Successful recovery of soils for reuse as engineering fills within the site and in accordance with the MMP will be determined through systematic testing and the meeting of verification criteria as set out in section 7.

6.2.7. The natural superficial deposits are unlikely to be contaminated outside potential hydrocarbon / solvent hot-spots, and in areas where the natural strata are exposed at the formation surface following levelling works, and then the surfaces will be inspected for evidence of contamination. The Developer will be responsible for validating the natural soils and providing any additional topsoil needed as a growing medium for plants in gardens and landscaping, as described in Section 7 below.

6.3. Materials Management Plan

6.3.1. A Materials Management Plan (MMP) has been produced and registered for the remediation phase of the redevelopment; this addresses all soils treatment and recovery operations, the crushing and reuse of hard materials (concrete, brick and masonry), general cut and fill operations, and the import of cover soils. The MMP has been produced in accordance with the CL:AIRE Definition of Waste: Development Industry Code of Practice and will be progressively

updated where any changes to types and volumes of materials are envisaged. All waste transfer records will be retained for reference. The MMP will be taken forward by the housebuilder to address construction arisings generated during development works and recovery of clean soils for use in the cover system.

6.3.2. Materials management will be carried out to ensure that contaminated materials/runoff or discharge do not affect clean areas of the site or surroundings (in particular soils and materials from any hydrocarbon remediation excavations will be segregated and placed inside lined bunds in the Central Treatment Facility.

6.3.3. In the interests of maximising the sustainable use of resources, suitable recovered aggregates (crushed demolition rubble) or recovered soils will be used within the site wherever possible, and within the scope of the planning consent and where significant harm to man or pollution of the environment is avoided.

6.4. Unexpected Contamination

6.4.1. If previously uncharacterised materials or contamination sources (i.e., buried wastes / tanks etc.) are identified during the works, a decision must be made as to whether these can be dealt with using the techniques selected to manage the contamination characterised to date. Materials must be inspected by an appropriately qualified and experienced Environmental Consultant and, if appropriate, samples collected and analysed. The Local Authority will be immediately informed in writing following any such discovery.

6.4.2. It is anticipated that immobile (low volatility/solubility) contaminants similar to the types described in the site characterisation would be retained below the proposed barrier system in garden areas and that other contaminants including asbestos, volatile or liquid hydrocarbons, drums, tanks or pipes will be excavated for waste treatment or disposal using the techniques set out within Section 4.4. If any substantive alterations to this strategy are required, then these will be agreed with the regulators at the earliest opportunity and before completion of the remediation earthworks.

6.5. Dedicated Inspections and Monitoring

6.5.1. Dedicated site inspections during preparatory works are required at the following locations:

- Dedicated independent inspection of all hotspots during excavation, screening for contaminant and verification sampling;
- remediation and validation where exceedance of soil RTVs are reported within Phase 2 area, currently confirmed at HS6, Remediation and validation of HS6 is to also extend to remove soils impacted by phthalates.
- monitoring of VOC vapours in the shallow ground if any hydrocarbon hotspots discovered

as works progress;

- post remediation earthworks the areas of deep fills will be subject to re-assessment of the gassing regime by means of ground gas monitoring;

6.5.2. No exceedances for soil RTVs were reported within BH502. The possible presence of LNAPL in BH502 and BH506 has been explored during recent groundwater monitoring events whereby no LNAPL has been observed and hence remediation is not considered warranted.

6.5.3. The locations of maximum soil concentrations exceeding the RTVs are shown in Drawing D04 all of which, are located within HS6. However remedial works in each of the identified hotspot areas and verification sampling will be required to confirm that residual exceedances do not remain. Drawing D05 shows where detailed inspections will be required.

6.5.4. The further assessments of hot spots will use the same techniques as implemented to date, as specified in the ORS and in section 7 below.

6.5.5. VOC monitoring methods are specified within the Section 7 Verification Plan. Exceedances of target criteria in vapour samples will trigger a tiered response depending upon the concentrations, including:

- level 1 - no action required (basic gas protection for buildings / protected water supply pipelines)
- level 2 - VOC resistant gas protection to be deployed in houses, with integrity testing and inspection
- level 3 - no development pending further monitoring, risks assessment and remediation, if necessary, until concentrations drop to level 2 or below.

6.5.6. The specification for ground gas monitoring of deep fills to re-assess the gassing regime and revision to the requirements for building protection is set out in section 7.

6.6. Programme and Phasing

6.6.1. It is anticipated that the proposed remediation programme for the wider Phase 2 area will be 12-18 months, but this is subject to access constraints.

6.6.2. In order to expedite the early release of specific sub-phases for construction, interim remediation earthworks phase verification reporting may be prepared and submitted to the Local Authority to facilitate approval for the start of development activities.

6.6.3. Any such completions of sub-phases will have due regard to the potential for trans-boundary

migration of pollutants from incomplete areas of the site, particularly via groundwater, sub-surface VOC vapour or gas migration, or dust and odour.

7. Verification Plan

7.1.1. It is considered that further soil sampling will be undertaken at the identified hotspot areas concurrently with the preparatory remedial works as part of the verification process during the removal of relict infrastructure (USTs, pipework etc.) and impacted soils where present.

7.2. Targeted Inspections, Verification & Monitoring

7.2.1. Dedicated inspections will be required as preparatory works commence in the following areas:

- HS3, HS5, HS8, and HS1 to allow further inspections of ground conditions and these locations and collection of representative soil samples to demonstrate the absence of impacted soils, or if encountered collection of verification samples following remedial works.
- Dedicated inspection during the remediation works in the vicinity of BH502 and BH506 where recent groundwater monitoring recorded the potential presence of LNAPL. Remediation of any relict sources and impacted soils and removal of free product (if present).
- Supervision following the removal of impacted soils at hotspot locations, currently confirmed at HS2, HS4, HS6, HS7 and BH502.
- Further surface water monitoring of the Piggs Lee Brook at an agreed compliance point downstream of the site on a fortnightly basis during both groundworks and remedial works.
- In the event that the Soils RTVs cannot be achieved for any reason, further assessment of the residual concentrations will be carried out to establish their significance with respect to controlled water risks. This may include further risk assessment and/or groundwater monitoring to confirm post-remediation conditions.
- On completion of the necessary groundwater monitoring, all wells will be decommissioned by filling with bentonite pellets.

7.2.2. Site inspection will be supervised by an appropriately experienced and qualified specialist Contaminated Land Consultant. It is likely that a series of short reports will be produced detailing the investigations in each area, describing any requirement for modifications to the remedial strategy.

7.3. General Inspections

7.3.1. In order to provide support to the Remediation Contractor and undertake verification inspections and testing, a specialist Contaminated Land Consultant will be required to attend the site. While full-time attendance for the full programme of works is not considered necessary, regular attendance will be required within parts of the works involving the established hot spots to implement the verification plan and identify currently uncharacterised contamination.

7.3.2. It is envisaged that full-time attendance will be required on the Phase 2 area during the breaking out of relict pipework, drains and other structures where still present. Outside these activities and scheduled inspections and testing, a minimum weekly visit will be required.

7.3.3. A record of descriptions, supplemented by photographic records, of the exposed strata in all areas where contamination remediation excavations are carried out will be maintained by the Environmental Consultant, together with detailed logs of PID readings, sample locations, drawings and other relevant information for inclusion in final verification reporting.

7.4. Information Gaps and Further Requirements During Remediation Works

7.4.1. Additional soils testing will be undertaken associated with Hot-spots HS3, 5, 6 and 8 during preparatory works to remove surface slabs, relict infrastructure etc.

7.4.2. The USTs in HS1 have been emptied and removed, however further soils sampling / verification testing is warranted within the surrounding soils.

7.4.3. Dedicated inspection of the remediation works in the vicinity of BH506 where the potential presence of LNAPL was described in the groundwater (although not backed up by the groundwater analytical results). If confirmed to be present this will require removal from the site.

7.4.4. Soil VOC and ground gas monitoring in all areas and any other VOC hot spots encountered.

7.4.5. Groundwater monitoring for selected aquifer monitoring wells and surface watercourse during and following remediation works.

7.5. Verification Criteria - Residual, Re-engineered and Treated Soils

7.5.1. Stripped surfaces within any hydrocarbon hotspot areas following removal of unacceptable contamination will be validated by visual inspection and PID screening to provide assessment of the efficiency of the works; additionally, soil samples will be collected for laboratory analysis. A minimum of 5 entries/samples will be taken where validation is required following any stripping of contaminated soils, with spacing across larger areas on a nominal rate of 1 sample per 25m². The soil vapour screening concentration of 50 ppm as determined by PID will apply.

7.5.2. The soil RTVs to protect groundwater below the site (Table 7.1) will apply to residual soils across hydrocarbon hotspot areas HS1, HS6 and BH506 and any other as yet undiscovered locations. These criteria will also determine the acceptability of recovered soils from the Soil Treatment Facility for reuse as engineering fills. In addition, a maximum limit of 5% w/w degradable organic matter will apply to treated soils for re-use (to minimise the potential for ground gas generation), and the soil screening vapour VOC concentration of 50 ppm, as determined by PID, will apply.

Table 7.1: Hydrocarbon screening criteria for remediated soils used as general fill

Substance	Soil (mg/kg)
benzene	0.19
toluene	4.23
ethylbenzene	4.64
xylene (total)	3.84
aliphatic (C5-C6)	331
aliphatic (C6-C8)	1,680
aliphatic (C8-C10)	300
aliphatic (C10-C12)	60,800,000
aromatic (EC10-EC12)	62.9
phenol	0.18
dichloromethane	0.0682
PCE (tetrachloroethene)	0.754
TCE (trichloroethene)	0.396
1-2 Dichloroethene	0.503

7.5.3. Verification sampling rates for recovered treated soils will be one spike test for VOCs by PID every 50m³ of soil and one composite sample (5 representative sub-samples) for laboratory hydrocarbons screening per 100m³ of soil.

7.5.4. It is intended that the crushed demolition and foundation arisings may be used for various purposes including protection of the site surface on haul routes, as a sub-base for hard standing, and in the construction of roads. If sufficient volumes are available this material may be placed at formation in gardens as well, however it is not currently proposed that this material is used to form part of the cover system in garden areas; therefore, testing of the material will be restricted to screening for asbestos fibres at a frequency of 1 sample per 500m³ or 1kg bulk sample per 500m³. Aggregate recovery should be undertaken in accordance with the WRAP protocol and particle size analysis is also required to demonstrate compliance with the required specification.

7.6. Verification Criteria – Cover Soils

7.6.1. Subsoils recovered during the works will be tested for an appropriate contamination suite (to include all contaminants of concern identified in the relevant source areas, i.e., metals, PAHs and asbestos as a minimum) at an initial screening frequency of one sample per 500m³. Analysis and acceptability criteria will be as set out below (using LQM/CIEH S4ULs and DEFRA C4SL). Samples will be submitted to a laboratory with MCERTS accreditation as available.

Table 7.3: Cover soil screening criteria (residential use)

Contaminant	Screening criteria for Residential Use (mg/kg unless stated)
Asbestos fibre	<0.001% by mass (limit of detection)
Arsenic	37 (S4UL)
Cadmium	11 (S4UL)
Chromium III	910 (S4UL)
Chromium VI	6 (S4UL)
Copper	2,400 (S4UL)
Lead	200 (C4SL)
Mercury	1.2 (S4UL)
Nickel	130 (S4UL)
Zinc	3,700 (S4UL)
Naphthalene	2.3 (S4UL)
Acenaphthene	210 (S4UL)
Acenaphthylene	170 (S4UL)
Fluorene	170 (S4UL)
Phenanthrene	95 (S4UL)
Anthracene	2,400 (S4UL)
Fluoranthene	280 (S4UL)
Pyrene	620 (S4UL)
Benzo(a) anthracene	7.2 (S4UL)
Chrysene	15 (S4UL)
Benzo(b) fluoranthene	2.6 (S4UL)
Benzo(k) fluoranthene	77 (S4UL)
Benzo(a) pyrene	2.2 (S4UL)
Indeno(123cd) pyrene	27 (S4UL)
Dibenzo(ah) anthracene	0.24 (S4UL)
Benzo(ghi) perylene	320 (S4UL)
Aliphatic C5-C6	42 (S4UL)
Aliphatic C6-C8	100 (S4UL)
Aliphatic C8-C10	27 (S4UL)
Aliphatic C10-C12	130 (S4UL)
Aliphatic C12-C16	1,100 (S4UL)
Aliphatic C16-C21	65,000 (S4UL)
Aliphatic C21-C35	65,000 (S4UL)
Aromatic C6-C7	70 (S4UL)
Aromatic C7-C8	130 (S4UL)
Aromatic C8-C10	34 (S4UL)

Contaminant	Screening criteria for Residential Use (mg/kg unless stated)
Aromatic C10-C12	74 (S4UL)
Aromatic C12-C16	140 (S4UL)
Aromatic C16-C21	260 (S4UL)
Aromatic C21-C35	1,100 (S4UL)

NAD: No asbestos detected
S4UL: LQM/CIEH Suitable for Use Levels (S4ULs), residential with homegrown produce land use, (at 1% SOM, 6% SOM for metals). Copyright Land Quality Management Ltd. Reproduced with permission publication number S4UL 3102. All rights reserved.
C4SL: Category 4 Screening Levels published by CL:AIRE (C4SLs); 'residential with homegrown produce land use' (at 1% SOM)

7.7. Ground Gas and VOC Monitoring

7.7.1. Following completion of the remediation earthworks in the Phase 2 area (or any sub-phase), general ground gas monitoring will be carried out to assess the gassing regime within all areas of deep fills >3m, including existing, reworked and new fill areas. Drilled boreholes will be equipped with minimum 50mm diameter gas wells with response zones 1-4m depth (where possible over bedrock), placed on a grid spacing of 1 entry per 2,500m² (~50m grid). Testing will be for pressure and flow, methane, carbon dioxide, oxygen and VOC (by PID) concentrations. Monitoring will occur on 6 occasions over a 3-month period following completion of earthworks, with possible extension of the programme should any results indicate a change from the default assumption for building protection measures of CIRIA CS2 conditions, as set out in Section 9 below.

7.7.2. VOC vapour monitoring will take place across all areas where built development is proposed over VOC hotspots (identified hotspot area HS6, and any other suspect areas; the latter will include locations where existing or further site investigations identify elevated VOCs by PID testing that exceed 50 ppm).

7.7.3. The VOC monitoring will utilise shallow soil probes with response zone extending from 1m to the water table or 2m below ground level; this may require drilling to competent rock. Monitoring locations will be spaced at 1 per 25m² over the VOC hotspot area within the wider Phase 2 area (HS6) and at a wider spacing of 1 per 50m² over the remaining Phase 2 site area. VOC monitoring will take place on 3 occasions, with monitoring by PID, with one sample per probe to be collected in Silocan or equivalent container for GC-MS laboratory analysis.

7.7.4. The results of laboratory VOC analysis will be compared against manufacturers' specifications for VOC-resistant membranes and outdoor inhalation health criteria to provide reassurance concerning residual VOC levels. Detailed quantitative risk assessment will be carried out to determine the significance of any exceedances of the above screening levels and need for any change to the assumed house protection measures (as set out in section 9 below).

7.7.5. All gas monitoring wells will be decommissioned upon completion of monitoring by filling with hydrated bentonite pellets.

Inspection & Remediation / Preparatory Earthworks Completion Reporting

- 7.7.6. It is envisaged that a series of reports will be prepared following the completion of additional inspections and assessment of the identified specific areas of the site where these are required, as identified in Drawing D06.
- 7.7.7. Phase reports detailing the works carried out and the results of the validation / verification testing will be prepared by the Environmental Consultant and submitted to the local authority for approval upon completion of the remediation / preparatory phase of works by the Remediation Contractor. Reports will include a full description of the works carried out, findings of all investigations and monitoring, photographic record, details of wastes removed, and any fills imported, and recommendations concerning the development requirements (see below).

8. Health, Safety and Environmental Management

8.1. Health and Safety Roles / Responsibilities

8.1.1. The Remediation Contractor will be Principal Contractor under the Construction Design and Management Regulations and is responsible for managing health and safety during the remediation/ preparation works and for producing a risk assessment and method statement for the Stage 1 Remediation Works. Following handover of the site to the Developers, Barratt Homes will take on the role of Principal Contractor.

8.1.2. Protection of site workers, local residents and visitors during the remediation works will be achieved by the adoption of appropriate health and safety practices, environmental management and site security. All site workers will be given a comprehensive health and safety induction including notification of hazards associated with contamination and required to use appropriate personal protective equipment.

8.1.3. Asbestos clearance on the site will be carried out in accordance with the Control of Asbestos Regulations and Approved Code of Practice. The initial phase of clearance will be carried out by a specialist sub-contractor using suitably trained personnel in accordance with the remediation plan and may include licenced and notifiable works. The provision of monitoring and control measures for dealing with asbestos will be set out in separate working plans to be provided by the contractors involved.

8.2. Environmental Management Issues

8.2.1. Given the potential for disruption and odours (particularly associated with remediation and treatment of volatile hydrocarbon contamination), a communications plan will be developed to keep residents informed of the potential for odours or nuisance.

8.2.2. The scope of remediation works is unlikely to have a significant impact upon the surrounding housing and environment provided that due care is taken to control dust, odour, noise and vibration, and to prevent surface runoff onto land to the west or south of the site (Mill Road, Lumn Street, Bevis Green and Walmersley Old Road and into the drainage system leading to Pig Lee Brook.

8.2.3. Noise emissions will be managed through the observation of approved working hours, use of silenced plant, and appropriate location of crushing plant.

8.2.4. It is anticipated that works to excavate and/or treat organic contamination at the site could result in intermittent odorous vapour emissions. While these are expected to be transient, occurring mainly during physical disturbance and will dissipate rapidly through dilution and dispersion, monitoring of odours at the site boundary and modification of working methods to prevent

nuisance will be implemented. The Central Soils Treatment Facility is bunded and located at least 100m from local housing including the new Phase 1 development, towards the eastern side of the site; the local prevailing winds are from the west/southwest and blow away from the local housing. Odours are most likely during periods of stable atmospheric conditions characterised by light winds with minimum dispersion. These are typically associated with cool nights, early mornings and evenings. Particular care will be required to minimise odour emissions during periods of light easterly and south-easterly winds and associated overcast skies.

- 8.2.5. The Site Engineer will be responsible for odour monitoring and management during the Phase 2 remediation works and will carry out twice daily inspections along the site boundaries to check for odours. In the event of odours being detected at the site boundary, or odour complaints being received, the Site Engineer will immediately investigate the sources and will instruct measures to reduce or eliminate the sources as appropriate. These may include ceasing earthworks excavations or soil turnover, covering exposed areas of contamination, or re-locating activities further away from sensitive boundaries to mitigate emissions.
- 8.2.6. Monitoring for VOC vapour concentrations will be required during most of the hydrocarbon contamination remediation activities and a hand-held photo-ionisation detector with a lamp appropriate for the range of substances present will be available. Short-term concentrations will be compared to workplace exposure limits; for mixtures of VOC contaminants, limits for the most toxic member (benzene) will be adopted (5ppm short-term exposure limit) with provision for appropriate Respiratory Protective Equipment available where exposure limits are exceeded.
- 8.2.7. Dust management will be a key requirement, and a separate Dust Management Plan will be produced for the site. Dust will be routinely monitored, and if unacceptable emissions of any substance beyond the site boundary are noted then the element of the works contributing to this will be halted until appropriate mitigation (damping down, road sweeper, etc) can be deployed. A tractor and bowser with rain gun will be maintained ready for use if required to damp down dusty surfaces during the earthworks.
- 8.2.8. The generation of contaminated perched water or free product is unlikely to occur outside of excavations, however early measures will be taken to ensure that old drains crossing site boundaries are traced and cut off at an early stage in the works. All discharges of dewatering or surface runoff to surface waters will pass through settlement ponds of sufficient capacity. Dewatering from hydrocarbon impacted hot spots will be passed via the water treatment facility before discharge to foul sewer, in agreement with the utility provider.
- 8.2.9. Construction of the stream open channel will route drainage largely away from key hot-spot areas but will pass through or close to the area of former USTs within HS1. This area requires

prior remediation and further investigation to determine any requirement for remediation before the construction of a fully lined channel in this section can commence. The proposed watercourse also passes close to the presumed locations of the two mine adits; these have been investigated, were found to be collapsed and have been subject to remedial grouting in accordance with Coal Authority requirements.

8.2.10. Contractor's plant fuel and lubricant storage will take place using suitable containers, bunds and secured filling points. An oil spill kit and adsorbent materials will be provided to manage any accidental release of liquid pollutants from these sources, and also from any accidental discharge of liquid product occurring from decommissioning of relict tanks and pipe work. Where discharges soak into the ground the impacted soils will be excavated immediately, under the provisions for removal of historical hydrocarbon contamination set out in Section 4.

8.2.11. Suitable sealed skips and containers will be used for the temporary storage of small quantities of asbestos or other hazardous solid wastes, and appropriate tanks or drums will be used to temporarily hold liquid product prior to removal from the site.

8.2.12. Further details of the remediation contractors proposed methods of environmental control are provided in the method statements for soils and groundwater treatment in Appendix C.

9. Stage 2 Development Phase Remediation

9.1. Developer requirements for remediation associated with the development/construction phase of work will be as follows, based on current information and assumptions. However, it must be noted that post-remediation gas and VOC vapour monitoring is required and final recommendations with respect to gas protection will be reported separately following the completion of monitoring and any further risk assessment necessary.

9.2. Building Gas Protection

9.2.1. On present information, the Phase 2 area of the site should be classed as CS2 under CIRIA C665 guidance, meaning that basic precautions against ground gases are required.

9.2.2. Areas of residual solvent / fuel contamination after remediation are likely to require a higher specification of membrane and independent verification and integrity testing as a precautionary measure against the potential for VOC vapours. The extent of these areas will be confirmed following the additional investigations and assessment of verification testing results.

9.2.3. Building gas protection and verification proposals will be submitted by the Developer to the Local Authority for approval prior to the commencement of housebuilding in the relevant area of the site.

9.3. Garden and Landscaping Soils

9.3.1. The Developer will be responsible for managing soils stockpiles and completed areas of soil cover so as to avoid cross-contamination of clean materials.

9.3.2. The general requirements will be as follows:

- placement of a suitable warning/barrier geotextile at the compacted interface of the formation/base of cover layer in all garden areas overlying residually contaminated made ground;
- provision of 600mm of clean soil cover over made ground materials within garden areas, typically comprising 450mm of subsoil, and 150mm of imported topsoil, with a reduced thickness of 450mm in landscape areas;
- materials to be used as the garden/landscape soils must be suitable for use and validated;
- potential cross-contamination of cover soils due to secondary excavations for foundations construction or trenching must be avoided, with appropriate replacement or disposal of arisings and effective materials management to prevent cross-contamination and minimise disposal.

9.3.3. Verification testing for soil quality will be dependent on the provenance of the soil and will be

completed as follows:

- site won subsoil (if natural soils recovered from wider development): 1 sample per 50m³;
- imported topsoil / subsoil (well-characterised Greenfield source): 1 sample per 250m³;
- imported topsoil / subsoil (unknown / well-characterised Brownfield source with evidence that extraction of suitable soils for transfer is feasible): 1 sample per 100m³;
- minimum of 3 samples to be collected from each source;

9.3.4. Quality criteria for the garden cover soils will be as set down in the table in 7.3 above. Criteria for public open space areas may be relaxed by agreement with the local authority to reflect the reduced potential for exposure pathways under managed permanent grassland. Soils will be tested at an MCERTS or UKAS accredited environmental laboratory. Sampling and quality and depth validation will be undertaken by independent specialist contaminated land consultants.

9.3.5. Depth validation will be carried out at a frequency of 1 test pit per 3 plots following placing of the final soil cover, or test pits on a 25m grid across public open space areas.

9.4. Water Mains

9.4.1. It is considered likely that protected water mains will be required across substantial parts of the site unless post-remediation testing and risk assessment can demonstrate that protection is not required; United Utilities guidelines require detailed assessments and will be completed prior to development.

9.5. Concrete Protection

9.5.1. Requirements are as specified within the ground investigation reports, although these could be re-assessed following remediation works.

9.6. Validation Reporting

9.6.1. Verification information of the construction phase mitigation measures will be required for each individual plot.

10. Conclusions and Recommendations

10.1. Conclusions

10.1.1. SGP considers that the Phase 2 area has been adequately investigated for the purposes of updating and detailing the existing outline remediation strategy to prepare the site for residential development and that the likely key development constraints and requirements for remediation are understood. Remedial options for the treatment of hydrocarbon impacted soils and groundwater have been reviewed and the preferred option selected based upon considerations of technical feasibility, flexibility, robustness, sustainability and economic cost. The proposed groundwater abstraction and treatment will require evaluation and a treatability / efficacy review as the work progresses.

10.1.2. Dedicated inspections will be carried out as described in specific parts of the site and any modifications to the Phase 2 Detailed Remediation Strategy will require agreement with Bury Council and the Environment Agency. It is considered that this work will meet the requirements of Planning Conditions and specific requirements of the Council.

10.1.3. The proposed management and programme for site inspections & assessment, remediation and verification / validation testing regime will demonstrate that the proposed remedial works have been carried out and the site made suitable for the proposed development, subject to the execution of the additional requirements on the developer set out above.

10.1.4. The dedicated inspections and verification measures to be adopted are summarised as follows:

Table 10.1: Remediation Summary

Remediation Stage 1 (preparatory earthworks)	
1. Dedicated inspections	Dedicated inspections (see Drawing D05) during preparatory works are required in the following areas to further confirm the presence / absence of impacted soils and if necessary remedial works: - HS1, HS2, HS3, HS4, HS5 , HS6, HS7 and HS8, - Any area where USTs and other pits, sumps, wells, tanks, drains etc. containing residual fluids, sludges or vapours not previously encountered - BH502 and BH506 where possible NAPL has been reported (however this is not supported by the groundwater analysis).
2. stockpile testing	recovered aggregate or imported recycled aggregate – testing for asbestos at 1/500m ³ recovered subsoil – screening tests for soil contaminants at 1/500m ³
3. regular inspections and site attendance	weekly site visits during principal earthworks and where foundations, relict drainage and other sub-surface structures are being broken out and removed / remediation with full time attendance during dedicated inspections / hotspot remediation as per 1. Dedicated Inspections.

4. response to unexpected conditions / occurrences	Environmental Consultant to be available to attend site and investigate any occurrences at short notice (1 day); the Local Authority will be advised as soon as possible in event of the discovery of new contamination which has not been characterised as part of the existing conceptual site model and risk assessment and addressed by the provisions of the Remediation Strategy.
5. gas and vapour monitoring	Ground gas monitoring is required across areas of deep fills in accordance with the Ground Gas Handbook requirements (50m grid / 3-month programme), to confirm building gas protection requirements. The locations where gas monitoring is required is shown in Drawing D09. VOC vapour monitoring is required across site to assess whether upgraded VOC protection measures are required. Post-remediation monitoring is proposed on a 25m grid over the existing VOC hotspot areas and reduced 50m grid spacing across the remainder of the Phase 2 development areas as shown in Drawing D10.
6. reporting	The Environmental Consultant will produce a series of supplementary assessment reports for the high-risk areas identified, any additional areas and a final earthworks remediation completion report (or reports if the works are completed using a phased approach)

Remediation Stage 2 (development phase)	
7. cover soil verification	Contamination testing will be carried out for placed subsoil and topsoil at respective rates of 1 sample per 50m ³ (site won), 1 per 100m ³ (import from unknown/characterised brownfield source) or 1 per 250m ³ (well characterised greenfield source). Cover soil depths will be verified using test pits at 1 per 3 plots, or a 25m grid over POS; inspection and testing certification will be provided on plots as they are completed, copied to NHBC and the Local Authority
8. building gas protection installation and inspection	Gas protection measures appropriate to CS2 / BS 8485 are required across the site although re-classification following post-remediation monitoring within areas of deep fills may result in re-classification within specific locations; VOC hot-spots likely to require additional hydrocarbon-resistant membranes and independent CQA / certification; inspection certificates to be provided as plots are completed, copied to NHBC and the Local Authority; final recommendations are subject to review depending on the findings of post-remediation gas and vapour assessments
8. water mains risk assessment	A standard water supply pipe risk assessment for the utility provider is required, it is envisaged that protective materials will be required for new water supply pipes

10.1.5. With the adoption of the above normal practices for brownfield development, and on the information available to it, SGP considers that the site can be safely and economically redeveloped, and the existing environmental liabilities managed. It is concluded that submission and approval of this Remediation Strategy will satisfy the requirements of Planning Conditions.

10.1.6. The implementation of the remediation scheme and the scope and content of verification reporting are described above. This remediation strategy also describes how unexpected contamination will be reported, investigated and assessed. Any departure from the approved remediation strategy necessary will be agreed in advance with the local authority. It is considered that there is unlikely to be a requirement for monitoring following completion of the site remediation and development given the low risks associated with any residual contamination. Maintenance duties will be limited to management of public open space areas under normal maintenance procedures.

10.1.7. SGP reserves the right to alter any of the foregoing information in the event of new information being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.

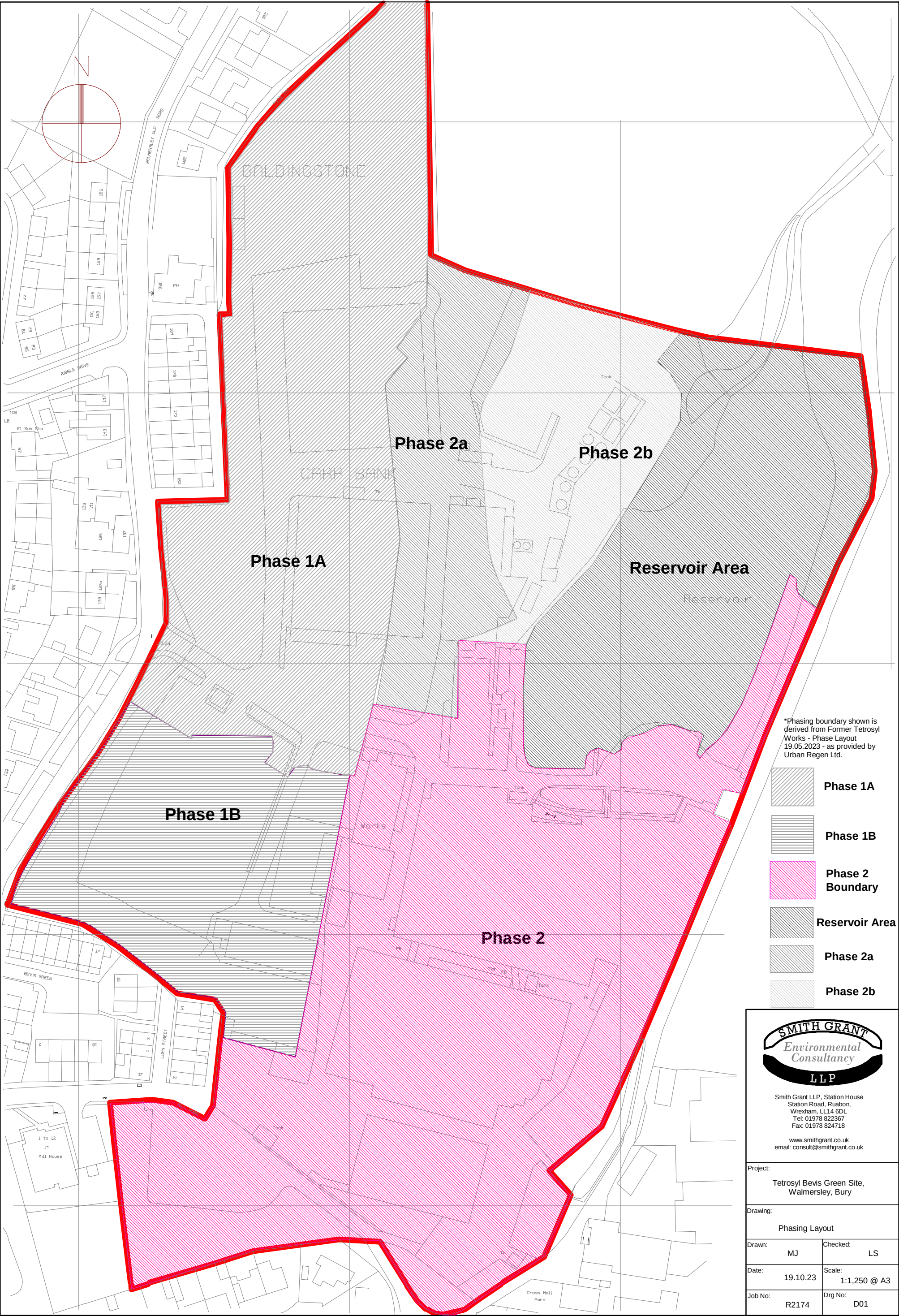
10.2. Limitations

10.2.1. This report has been prepared by SGP for the sole and exclusive use of Barratt Homes Manchester, Anwyl Homes and Urban Regen Ltd. Reasonable skill, care and diligence has been exercised within the budget available, and in accordance with the technical requirements of the brief. This assessment makes use of the factual information provided by previous site investigators and is taken in good faith; where errors or conflicting information have been noted this has been identified, however SGP does not accept liability for missing or erroneous information provided by others.

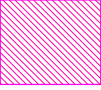
10.2.2. Notwithstanding the efforts made by the professional team in undertaking the assessment and preparing this report, it is possible that other ground conditions and contamination as yet undetected may exist. Reliance on the findings of this report must therefore be limited accordingly. Such reliance must be based on the whole report and not on extracts which may lead to incomplete or incorrect conclusions when taken out of context.

10.2.3. SGP reserves the right to alter any of the foregoing information in the event of new information being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.

DRAWINGS



*Phasing boundary shown is derived from Former Tetrosyl Works - Phase Layout 19.05.2023 - as provided by Urban Regen Ltd.

-  **Phase 1A**
-  **Phase 1B**
-  **Phase 2 Boundary**
-  **Reservoir Area**
-  **Phase 2a**
-  **Phase 2b**



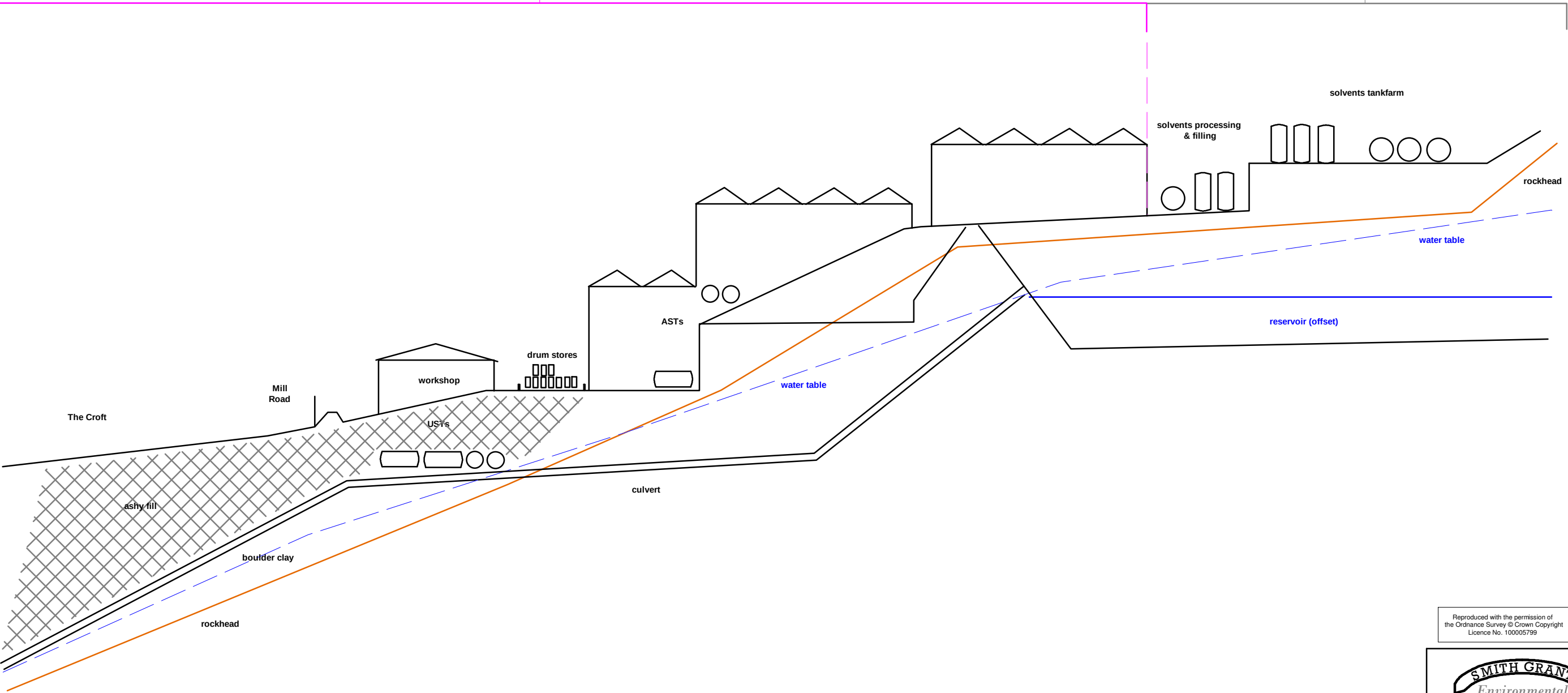
Smith Grant LLP, Station House
Station Road, Ruabon,
Wrexham, LL14 6DL
Tel: 01978 822367
Fax: 01978 824718

www.smithgrant.co.uk
email: consult@smithgrant.co.uk

Project: Tetrosyl Bevis Green Site, Walmersley, Bury	
Drawing: Phasing Layout	
Drawn: MJ	Checked: LS
Date: 19.10.23	Scale: 1:1,250 @ A3
Job No: R2174	Drg No: D01

Phase 2

Phase 2a / 2b



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email: consult@smithgrant.co.uk

Project:

Tetrosyl Bevis Green Site

Drawing:

Conceptual Site Model

Drawn:

MJ

Checked:

LS

Date:

16.10.23

Scale:

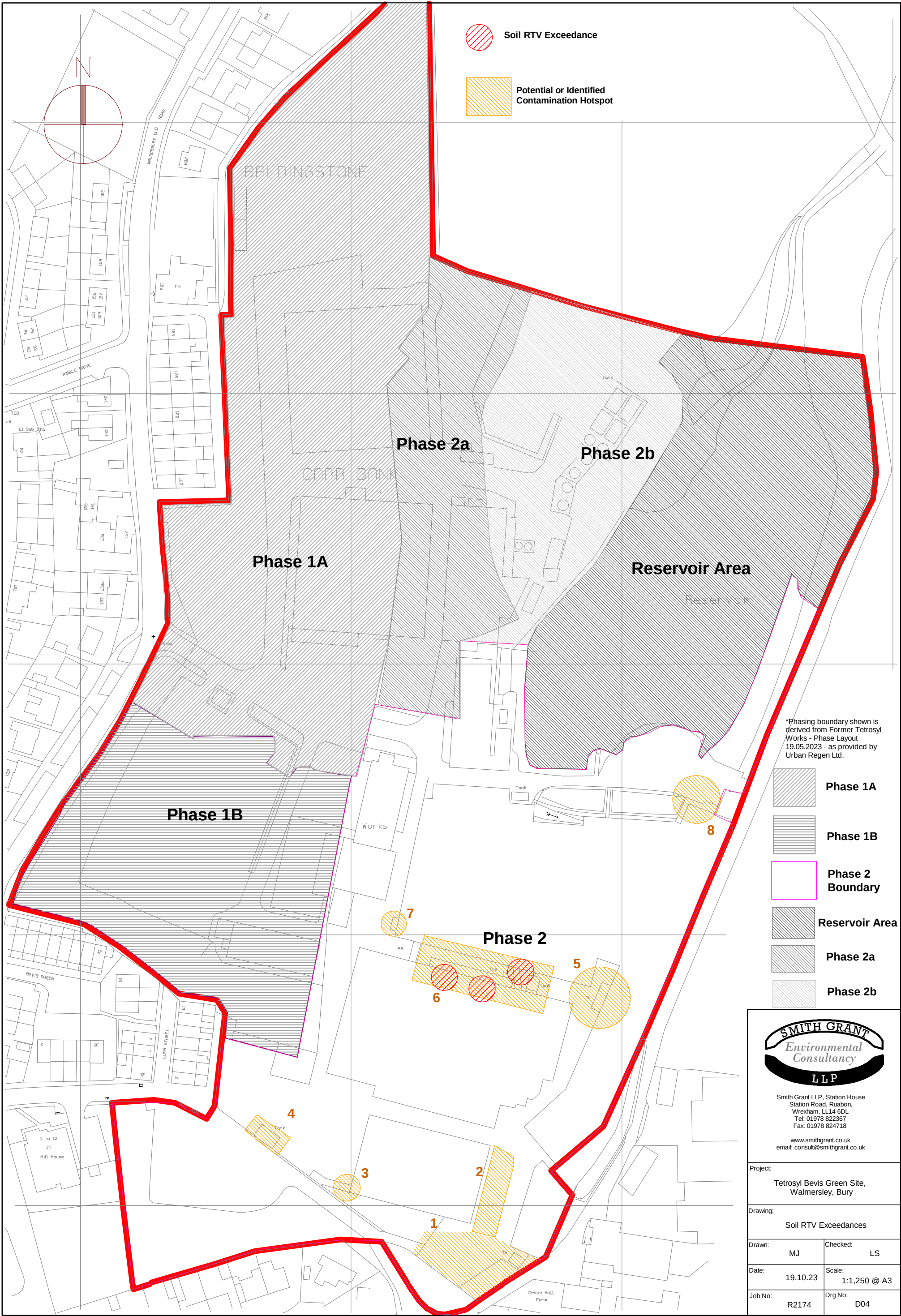
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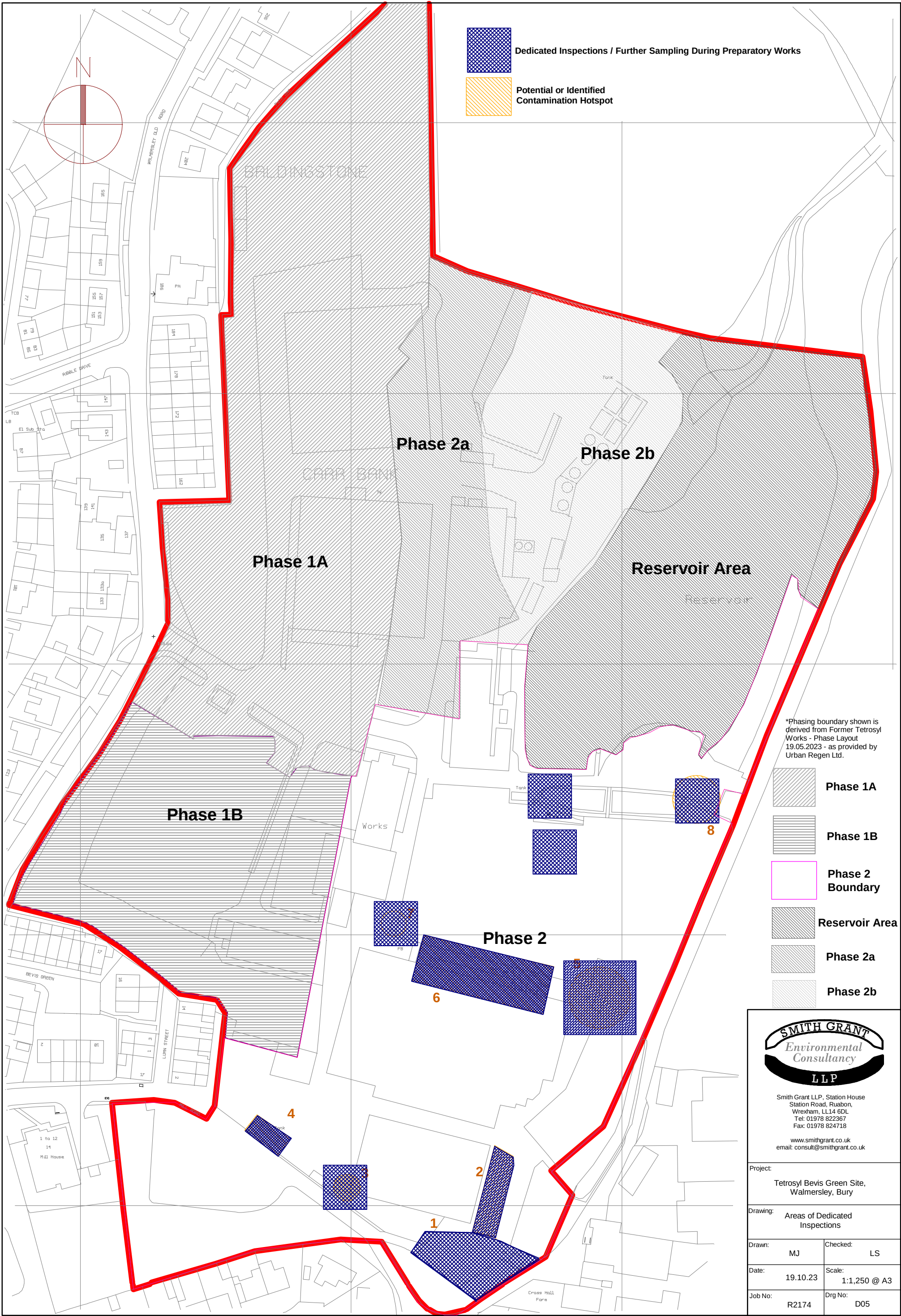
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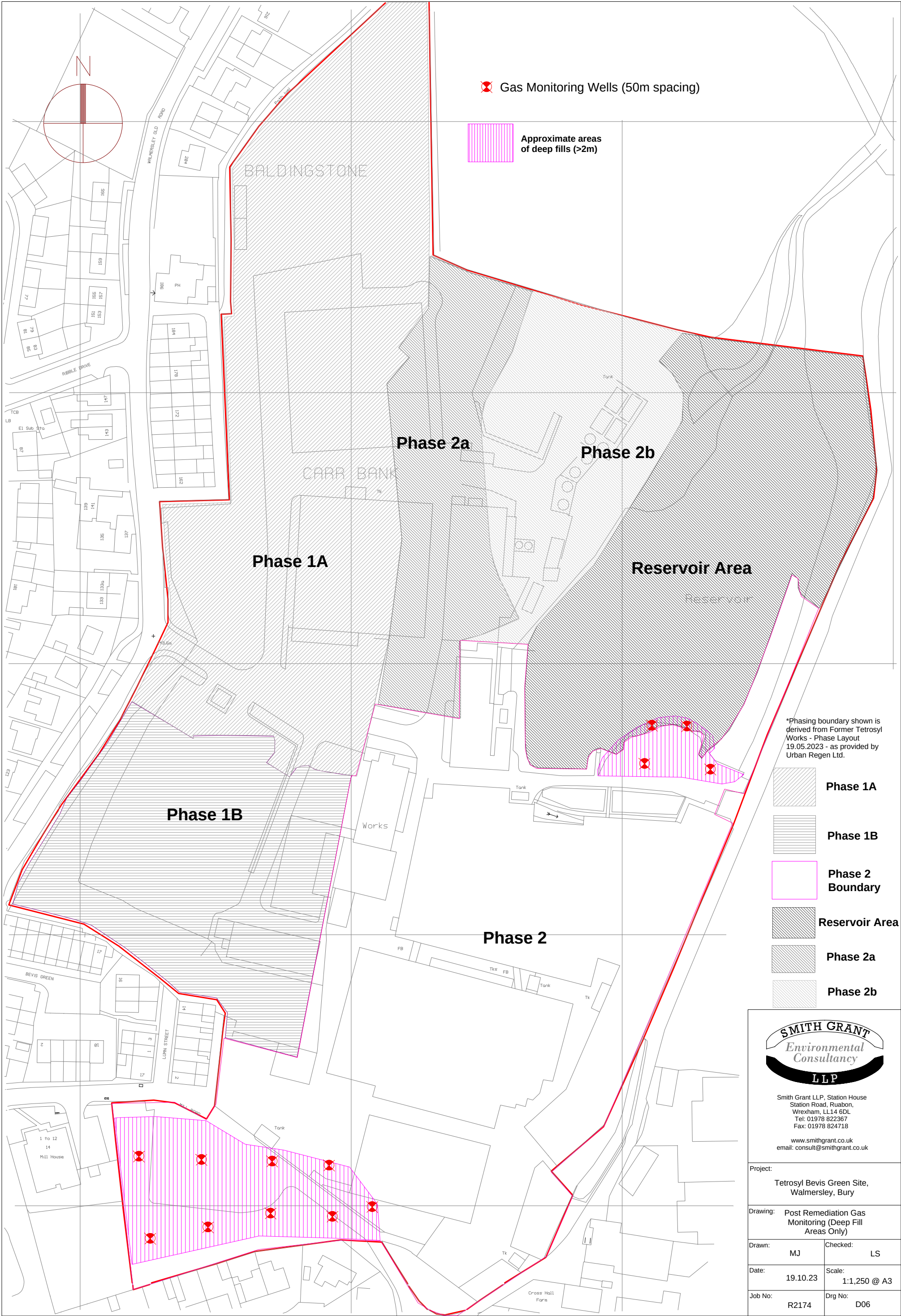
R2174

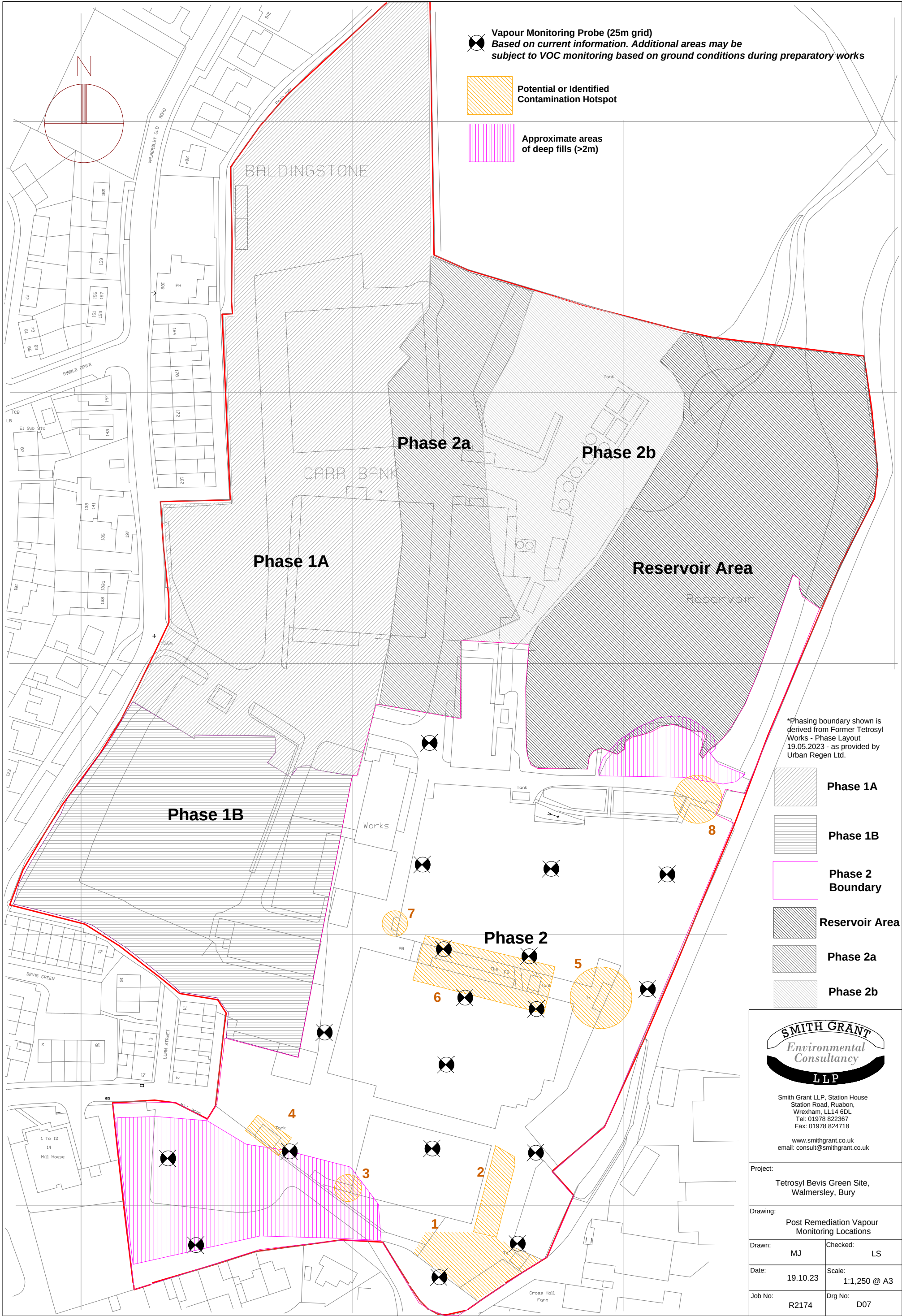
Drg No:

D03









APPENDIX A

SGP Summary of Reporting

Reference	Date	Title	Summary
R2174-R01-v2	May 2019	Outline Remediation Strategy	review and remediation strategy for entire site, including recommended further investigation
R2174C-R02-v1	June 2020	Phase 1 Supplementary Site Investigation	Investigation and assessment to assess risks from ground gas and vapors (human health) through installation of monitoring wells & sampling around former AST locations. The report concluded that provisions of the outline strategy (R2174-R01) remain applicable but that elevated methane in WS306 & WS316 required further investigation/assessment and remediation. Recommendations made for gas/vapour barriers to be installed in plots subject to completion of Ph1 preparatory earthworks.
R2174C-R03-v1	October 2020	Phase 1 Supplementary Groundwater Investigation	Investigation and assessment of groundwater concentrations around potential on-site source zones (HS12 and HS15) and/or migration from sources outside Phase 1 but within the wider site area. Installation of GW monitoring wells and a program of GW monitoring. The report concluded local impacted GW around H12 and HS15 although significant lateral migration has not occurred, similarly no impact from source areas outside Phase 1. Recommendations for the remediation of impacted soil sources around HS12 and HS15 as per outline strategy, no requirement for groundwater treatment or further assessment within Phase 1.
R2174-R04-v2	November 2020	Phase 1 Remediation Earthworks Completion Report	Site attendance during preparatory earthworks in Phase 1 including the remediation of HS12 and HS15. Recommendations made for the installation of VOC protection measures within plots in the east of the phase and basic (Amber-1) gas measures within all remaining plots; application of 600mm soil cover system within all plots.
R2174C-R05-v1	December 2020	Phase 2 Supplementary Groundwater Investigation No. 1	Borehole monitoring on southern part of site including the installation of dedicated GW monitoring wells. Localized impacted GW is present around HS1 and HS2, however no evidence of contamination plumes at downgradient locations along the site's southern boundary. Recommendation for the removal of primary (USTs) and secondary (impacted soils). Further assessment within the north of Phase 2 is still required.
R2174-R06-v1	April 2021	Phase 2	Further investigation to characterize primary (tanks)

		Supplementary Site Investigation	and secondary (soil) contaminant sources within source zones to support and develop a detailed remediation strategy for Phase 2. Fourteen hotspot locations investigated through trial-pitting and the collection of soil samples. The report concluded that significant pollution sources were identified (HS 1, 6, 10, 11 & 13) and that further assessment to assess the impact to GW is proposed. Recommendations made for GW assessment, remediation of impacted soils, investigation of the former quarry and following the completion of preparatory works a ground gas and vapor assessment to inform developer stage mitigation measures.
R2174-R07-v3	March 2021	Phase 1 Developer Stage Remediation Strategy	Recommendations on the requirement for VOC protection measures (Plots 39-57 & 143-146) and their verification. All remaining Phase 1 plots to be installed with gas protection measures and their validation in accordance with CIRIA CS2 / Amber-1 conditions. Soil cover system (600mm) to be installed in all gardens and validated as per outline strategy.
R2174-R08-v1	May 2021	Remediation Earthworks Interim Completion Report – Phase 2 North (HS10, HS11 & HS13)	Remediation of HS10, HS11 and HS13 hotspots and verification sampling. The report concluded that whilst removal of impacted soils has taken place, further assessment of the risks from ground gas and vapors and leaching to groundwater is still required with groundwater monitoring to determine site-specific remedial target values currently underway.
R2174-R09-v1	June 2021	Phase 2: Supplementary Groundwater Investigation No. 2	Installation of GW monitoring wells within the area of HS10, HS11, HS13 and HS14 and GW sampling. The report concluded that impacted GW is present around HS10 and HS11 with significant exceedances of Tier 1 criteria although downgradient monitoring does not suggest migration of the impacted GW/plume. Recommendations were made for the production of site-specific remedial target values (RTVs) for both groundwater and soils to assess the adequacy of source removal during remediation works.
R2174-R10-v2	August 2021	Controlled Waters Risk Assessment	Determination of site-specific RTVs for soil and groundwater to inform remedial target values for a detailed Phase 2 Remediation Strategy.
GRO-21459-3627	July 2022	Groundwater Investigation Report	Installation of 18 GW monitoring wells (BH501-BH518) to between 9-20m bgl and 3 additional wells (BH519-BH5210) to 20m bgl. GW monitoring within 22 existing GW wells (RBH301-RBH305 & RBH314-RBH330) and

			additional wells installed by Groundtech (BH501-BH521) for aliphatic/hydrocarbon and BTEX analysis and phenol and glycol testing in specific wells. Concentrations compared to Tier 1 (EQS) with generic risk assessment confirming multiple BTEX, MTBE and hydrocarbon exceedances in the northern area of Ph2 with only limited exceedances in the south. A single exceedance of phenol was reported in the center of the site (BH506) whilst no glycol exceedances were reported.
GRO-21459-3710-1.2	November 2022	Hydrogeological Detailed Quantitative Risk Assessment (DQRA)	Determination of site-specific RTVs for soil and groundwater based on current groundwater monitoring data across the entire area of Phase 2. Derived RTVs supersede those reported within R2174-R10-v2 for use within detailed Phase 2 Remediation Strategy.
GRO-21459-3928	December 2022	Supplementary Geo-Environmental Appraisal – Phase 2	Further determination and clarification of the distribution of groundwater plumes, additional groundwater monitoring, revised CSM and classification of hazardous groundwater contaminants. Report produced following initial EA correspondence on Groundwater Investigation Factual Report and Hydrogeological Detailed Quantitative Risk Assessment
GRO-21459-4595	July 2023	Letter report including updated RTVs	Detailed Quantitative Risk Assessment (DQRA) with updated Soil remedial target values (RTVs) for protection of groundwater receptors

APPENDIX B

GroundTech Letter Report: GRO-21459-4595, dated 14th July 2023

14 July 2023

Environment Agency Groundwater
Hydrology & Contaminated Land team
Warrington

For the attention of Lee Beveridge

Re: Tetrosyl Bevis Green Works, Bury Project (Ref: ENVPAC/1/GMC/00429)

Dear Lee,

Thank you for your recent letter (Ref: *SO/2022/122094/03-L01*, dated 27 April 2023) with regards to the DQRA undertaken by Groundtech Consulting (Ref: *GRO-21459-3710_1.2*, dated 22 November 2022).

The letter highlights the requirement of defining validation and verification criteria for the far southern area of site. Based on the requirements, we have developed site specific Level 3 (L3) Remedial Target Values (RTVs) for soils in the southern section of site. The RTVs are based on no degradation and 0m compliance point.

The following parameters were selected for all compounds:

Parameter	Value	Source of data
Porosity (Water Filled)	0.097 θ_w	Site won data (Laboratory testing conversion)
FoC (L1 Soil)	0.08561 (Fraction)	TOC database (HS1 Validation Exercise)
FoC (L3 Soil)	0.002 (Fraction)	TOC database (Rough Rock Database)
Length of source in direction of groundwater flow	20m	Conservatively estimated Hotspot width
Width of source perpendicular to groundwater flow	20m	Conservatively estimated Hotspot length

The following CoC specific parameters were used to calculate the L3 Soil RTVs for the southern section of site:

Compound	L3 RTV (mg/kg)	Henry's Law Constant (Dimensionless)	Source	KoC (l/kg)	Source
Benzene	0.19	0.228	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	67.6	SC050021/SR7
Toluene	4.23	0.272	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	204	SC050021/SR7
Ethylbenzene	4.64	0.323	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	447	SC050021/SR7
Xylene	3.84	0.276	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	457	SC050021/SR7

			Impact to Ground Water Soil Remediation Standards		
Aliphatic (C5-C6)	331	0.14	Online directory based on hexane	790	CL:AIRE: Petroleum Hydrocarbons in Groundwater
Aliphatic (C6-C8)	1680	0.272	No value for Aliphatic C6-C8 (Heptane) so Toluene value used as similarly ranged Toluene taken from: Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	4,000	CL:AIRE: Petroleum Hydrocarbons in Groundwater
Aliphatic (C8-C10)	300	0.276	No value for Aliphatic C8-C10 (Octane/Nonane) so Xylene value used as similarly ranged Xylene taken from: Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	32,000	CL:AIRE: Petroleum Hydrocarbons in Groundwater
Aliphatic (C10-C12)	60,800,000	0.0198	No value for Aliphatic C10-C12 so Naphthalene value used as similarly ranged Naphthalene taken from: Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards		CL:AIRE: Petroleum Hydrocarbons in Groundwater
Aromatic (C10-C12)	62.9	0.14	-	2,500	CL:AIRE: Petroleum Hydrocarbons in Groundwater
PCE	0.754	0.754	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	269	SC050021/SR7
TCE	0.396	0.422	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	141	SC050021/SR7
Dichloromethane	0.0682	0.098	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards	11.7	Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards
1-2 Dichloroethene	0.503	0.167	Chemical Properties for Calculation of	35.5	Chemical Properties for Calculation of

			<i>Impact to Ground Water Soil Remediation Standards</i>		<i>Impact to Ground Water Soil Remediation Standards</i>
<i>Phenol</i>	<i>0.18</i>	<i>0.065</i>	<i>Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards</i>	<i>83.2</i>	<i>SC050021/SR7</i>

The Remedial Target Worksheets will be attached to the email to allow them to be reviewed, if you have any queries please do not hesitate to contact the undersigned.

Yours Sincerely
For Groundtech Consulting Limited



Luke Harrison
Senior Consulting Engineer
lh@groundtechconsulting.com



APPENDIX C

URL Proposed Soil Treatment Method Statement

Tetrosyl Soils Treatment Method Statement

Method statement for the Ex-Situ Bioremediation of contaminated Soils from secondary source remediation excavations

**Waldmers Wood Development (Former Tetrosyl Bevis Green Works)
Waldmersley Old Road,
Bury
BL9 6SB**

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1.0 Introduction

Urban Regen Ltd. is undertaking a phased programme of demolition, remediation, and road/drainage installation at the former Tetrosyl - Bevis Green Works to achieve a residential end land use. Accessed off Walmersley Old Road and Mill Road, the site is located north of Bury (see Appendix A).

Historically, in the 19th and the first part of the 20th century, the site housed cotton mills and textile printing works. Subsequent to this, it was used for the formulation and packaging of vehicle maintenance products by Tetrosyl; the operational area occupying approximately 7 hectares, consisting of industrial buildings (of varying age and construction), and numerous bulk/intermediate bulk/drum stores, of solvents and other hazardous/polluting substances.

Site investigation has demonstrated that the made ground, natural superficial deposits and the Solid Geology underlying the site, is locally impacted by amounts of historical contamination. Most of this pollution (defined as concentration above Criteria set for the protection of human health or controlled waters), is from '*Volatile Organic Compounds*' (VOCs), the vast majority of the contaminant mass comprising light hydrocarbon fractions (from discharges of white spirit, toluene and xylenes).

The site is being remediated under the provisions of an '*Outline Remediation Strategy*' which has already been implemented in the lower risk parts of the site (*Phase 1*), but which requires updating to a '*Detailed Remediation Strategy*' in response to ground conditions encountered in the higher risk areas (*Phase 2*). To further inform the '*Detailed Remediation Strategy*', Barratt Homes have commissioned a phase of supplementary site investigation (and subsequent risk assessments), to be progressed post demolition/site clearance in this area.

As part of the remediation works, to manage risks from land contamination, and prevent pollution, it is required that soils within identified contamination source zones, where the concentration exceeds site '*Remediation Criteria*', are treated to reduce secondary source concentrations, and manage on-going/future harm & pollution risks.

The treatment of soils to reduce contamination to acceptable concentrations is to be carried out under a '*Permit*' to deploy mobile plant (see Appendix B).

This '*Method Statement*' describes the activities to be carried out to enable the main soils treatment programme to be completed.

All operations involving soils treatment are to be carried out by Urban Soil Solutions Ltd., or an alternative specialist groundwater treatment provider acting as a sub-contractor, working in accordance with '*Urban Soil Solutions Management Procedures (Rev 1) September 2021*'.

Urban Regen Ltd. as Principal Contractor will review all method statements and advise on any additional or supplementary procedures/measures necessary to comply with the site Health, Safety, Environment and Quality requirements.

2.0 Planning permission

To allow development works to be carried out, Barratt Homes have obtained the following planning permission from Bury Council:

Application reference number: **63533** (granted 04th March 2019)

Full planning application for: Residential development comprising 268no. dwellings (Class C) with associated access, car parking, landscaping and open space. Planning Condition No 4 requires that:

4 - No development, other than site clearance, demolition, or works relating to site investigation, remediation, or ground works, shall commence unless and until: -

- A contaminated land Preliminary Risk Assessment report to assess the actual/potential contamination and/or ground gas/landfill gas risks at the site shall be submitted to, and approved in writing by, the Local Planning Authority.*
- Where actual/potential contamination and/or ground gas/landfill gas risks have been identified, detailed site investigation and suitable risk assessment shall be submitted to and approved in writing by the Local Planning Authority.*
- Where remediation/protection measures is/are required, a detailed Remediation Strategy shall be submitted to, and approved in writing by, the Local Planning Authority.*

(For the full decision notice see Appendix C)

In order to fulfil the requirements of Condition 4., a ‘*Detailed Remediation Strategy*’, prepared in accordance with the requirements of the guidance provided in ‘*Land Contamination Risk Management*’ (LCRM) is required.

In the context of pollution risks, this entails achieving specific '*Remediation Criteria*' where possible, or otherwise achieving significant betterment to a level agreed in consultation with the Regulators (where it is accepted that the site will not pose an ongoing risk of pollution). It is intended that this '*Method Statement*' accompany the '*Detailed Remediation Strategy*' to allow the Planning Authority and its consultee, the Environment Agency, confidence that the selected methods (selected from an '*Options Appraisal*' - to select the most appropriate means of achieving the '*Remediation Objectives*' at the site), can meet the stated objectives, without causing harm or pollution.

The '*Method Statement*' is also required to support the deployment notice needed for the '*Mobile Plant Permit*', under which '*Soil Treatment*' is to be carried out.

3.0 Notifications

PRIOR to works commencing the following notifications **MUST** be made to the following:

3.1 Local Planning Authority

The '*Outline Remediation Strategy*' prepared for the site includes '*Remediation Criteria*' but not the risk-based site-specific '*Remediation Targets*' needed to assess the adequacy of soils treatment. The updated '*Detailed Remediation Strategy*' demonstrating completion of the '*Options Appraisal*', and including '*Implementation*' and '*Verification Plans*', must be submitted to, and approved by, Bury Council, prior to the commencement of formal '*Soils treatment*' in Phase 2.

3.1 Environment Agency

As a consultee of the Local Authority, and for compliance with the '*Definition of Waste: Development Industry Code of Practice*' (see 3.2), approval of the '*Detailed Remediation Strategy*' is required by the Environment Agency.

The planned soils treatment programme will require full adherence to the relevant mobile plant '*Permit Conditions*', and an application to deploy the relevant mobile plant under deployment form MPP2. The activities cannot commence until written approval of the application from the Environment Agency has been received, and an additional 7 days' notice of work starting on the site have been provided.

3.2 CLAIRE

Soils recovered as part of the enabling/preparatory works which require treatment to enable re-use on-site, will need to be demonstrably non-waste materials. Under '*The Definition of Waste: Development Industry Code of Practice*', a Material Management Plan (MMP) must be developed which contains the lines of evidence to demonstrate with certainty that the treated material is

required to enable the permitted development, and that the materials will be suitable for their intended use. The MMP must be reviewed by an independent Qualified Person (their declaration confirming that it is compliant with the '*Code of Practice*'), and registered with the administrators of the scheme (CLAIRE).

4.0 Resources

4.1 Plant

Plant likely to be employed for the works include:

- 2 no. 25T-50T tracked excavators c/w attachments.
- 1 no 10-15T capacity dump truck.
- Mobile fuel bowser.
- Tractor/bowser.
- Lifting chains.
- Articulated lorries (for materials deliveries)
- Tipper trucks (for removal of soils for disposal - if required)

All plant will be accompanied with the relevant certification in accordance with '*PUWER Regulations 1998*' and provided to the Principal Contractor for entry into the relevant register of the '*Construction Phase Plan*'.

All machines must allow the operator to have a minimum of 1m visibility around the full perimeter of the machine at all times.

All self-propelled mobile plant operated on site must have an amber warning beacon to alert pedestrians and other plant users of operational equipment in the immediate vicinity.

All plant (inc' attachments) must be inspected and maintained daily in accordance with the manufacturer's recommendations prior to use (or post re-configuration); a written report made weekly and provided to the Principal Contractor for entry into the relevant register of the '*Construction Phase Plan*'.

4.2 Materials

Anticipated materials for the works include:

- Nitrogen, phosphorus and magnesium fertiliser
- Gas oil
- Engine oil
- Hydraulic oil
- Suitable spill kits

4.3 Personnel

Personnel likely to be employed for the works include:

- Project Manager (Ben Thomas - Urban Regen).
- WAMITAB technically competent manager (Pete Wilson - Urban Regen).
- Site Manager (Tony Smith - Urban Regen)
- Equipment Supplier and Set up (Gareth Wood - Remedex)
- Independent Consultant (Brad Massey - Groundtech).

All personnel are to be in possession of a valid and suitable CPCS/CCDO/CSCS/NPORS card or similar. Copies of all certification are to be provided to the Principal Contractor for entry into the relevant register of the '*Construction Phase Plan*'. Random certification checks are to be carried out, as necessary.

All personnel are to sign in and out of site daily using the relevant register of the '*Construction Phase Plan*'.

All site personnel are to receive a site specific '*Safety Induction*' by the Principal Contractor, and works associated '*Method Statement Briefing*' prior to commencing any works on site. These are to be signed for and entered into the relevant register of the '*Construction Phase Plan*'.

NOTE: All works associated with the treatment of soils for the purposes of remediation are to be directly managed by the WAMITAB technically competent manager.

5.0 Enabling works

Prior to any works being carried out the following operations must be completed:

5.1 Site security

High standards of site security are to be maintained at all times.

The wider site is secured by palisade/temporary hoarding fencing. The treatment areas are exclusively within Phase 2 of the site, and are separated from the active Phase 1 construction areas by HERAS type temporary fencing. Gates accessing through this fence are to be kept locked at all times, except for access, during site working hours.

Formal fencing inspections are to be carried out weekly by the Principal Contractor; being recorded on the '*Fencing Inspection Form*', and held on-site in the relevant register of the '*Construction Phase Plan*'. Temporary repairs to any damaged fencing are to be carried out immediately upon discovery to prevent third party access, with permanent repairs carried out as soon as is practicable.

Outside of working hours the following actions are also to be taken (if necessary):

- Treatment Area is to be secure.
- Immobilise vehicles and plant.

5.2 Site compound

The Principal Contractors site compound is to be established inside the main entrance off Walmersley Old Road, and is to contain the welfare facilities. On-site car parking is to be adjacent to the site compound.

The welfare facilities are to provide suitable sanitary conveniences, washing facilities, drinking water, and facilities to prepare and eat food. A detailed list of welfare provisions is detailed in the '*Construction Phase Plan*'.

No smoking is allowed within the welfare facilities or on operational site. Smoking is only permitted in an area specifically designated by the Principal Contractor.

5.3 Traffic management

A suitable traffic management system is to be established by the Principal Contractor to detail access arrangements, and control vehicle/plant/pedestrian movements around site, to minimise interfaces/potential conflicts. This is to be prepared in conjunction with Barratt Homes who are responsible for the **fenced** Phase 1 area.

5.4 Ecological mitigation

Prior to the works commencing, all necessary ecological mitigation works are to be implemented as detailed in the associated '*Construction Environmental Management Plan*'

5.5 Existing services

Details of all known services in and around the immediate work area are to be provided to the Principal Contractor by the Client prior to any works commencing (to be included in the PCI). This information is to be held on-site at all times within the relevant register of the '*Construction Phase Plan*'.

All relevant services are to be terminated by the Client prior to works commencing with the associated disconnection certification provided, and entered into the relevant register of the '*Construction Phase Plan*'.

Any services which are to remain live within or around the immediate work area, or may be impacted by the works i.e., subject to the movement of heavy plant, ground transmitted vibration from the operation of plant, or from falling debris, are to be protected at all times. Any protective measures implemented should be as specified by the service providers.

6.0 Soils Treatment

6.1 Soils treatment area

The site has one confirmed area where soil treatment is required to reduce secondary soil source concentrations to below '*Remediation Criteria*'. There are also several other locations where this may be required, dependent upon the outcomes of further investigations and risk assessments.

It is intended that all excavated soils from the impacted areas are collected in a central soil's treatment facility. This is to be located, as far as is practicable, away from the site boundary, and on a retained, intact, concrete slab, in order that the area can be readily contained to prevent harmful, nuisance, or polluting emissions (see Appendix A).

The treatment facility must be sufficiently large to enable all of the material to be placed in temporary stockpiles and then spread and formed into windrows/bio-piles – dependent upon volumes and rates of generation, to facilitate quarantine, and assessment, prior to the commencement of any treatment.

Prior to the placement of any contaminated materials, the concrete slab is to be supplemented with an impermeable membrane, being lapped up onto a perimeter containment bund to prevent surface water run-off to the surrounding ground. Internally, the area may be sub divided further with additional bunds and membrane to segregate different classes of materials which may require differing treatments.

Temporary HERAS type fencing is to be erected around the treatment areas, separating/securing them from other site operations/activities/hazards.

6.2 Storage

All materials delivered to site are to be stored within the confines of site only.

When not in use, site plant associated with the operations are to be stored securely, off hardstanding, in the plant storage area located adjacent to the compound.

6.3 Works access/egress/deliveries

Access/egress arrangements are to be maintained throughout the works. Deliveries of plant/materials are to access site via the main entrance off Walmersley Old Road, using the new development roads to access the treatment area. In the event that a new haul route is required to maintain access, it is to be provided by the Principal Contractor.

Plant and materials will be delivered to the treatment areas by HIAB/telehandler where possible; if not, a tracked excavator using suitable lifting accessories in accordance with the '*Lift Plan*' will be used.

All deliveries are to be co-ordinated by the Principal Contractor, with full and detailed records kept in the relevant register of the '*Construction Phase Plan*'.

Contractors delivering to the site are to be provided with '*Traffic Management Rules*' detailing all access requirements prior to attending site.

Deliveries are to be confined to normal working hours only (although movement of particularly large plant may need to take place at other times).

No construction vehicles are to block roads at any time.

Road vehicles delivering plant and materials to the site are to remain on hard standings at all times. Prior to leaving site, these vehicles are to use the wheel wash facility (to minimise off-site dust/trafficking), and be inspected to ensure that they are sufficiently clean, a record of which is to be maintained and entered into the relevant register of the '*Construction Phase Plan*'.

Vehicles leaving the site are to be controlled to minimise/prevent congestion on Walmersley Old Road.

Pedestrian access to the treatment area will be by defined route, and as detailed on the site *'Traffic Management Plan'*.

6.4 Soils Excavation and Transfer

The ex-situ treatment of soils necessitates that the contaminated materials be excavated from the identified source zones. The impacted materials are to be selected using a combination of visual assessment, PID screening, and comparison of laboratory analysis to *'Remediation Targets'*, in accordance with the provisions of the *'Detailed Remediation Strategy'*.

It is anticipated that the materials will comprise a mixture of made ground, superficial natural cohesive soils (glacial till), and weathered sandstone. These materials will be assessed with regards to the *'Remediation Targets'*, prior to being relocated directly to the treatment area.

As it is not intended for soils remediation excavations to extend beyond the water table (which is located within the Rough Rock sandstone aquifer), the source materials should not be excessively wet, allowing stockpiling of materials.

Individual stockpiles will be formed for each source area to prevent cross contamination, and keep different classes of contaminant separate to facilitate the associated treatment regime. In the event that it is possible to determine differing contaminant zones within individual source areas, these may also be stockpiled separately.

6.5 Soils Treatment

Given the duration that substances have been present in the ground, it is considered that indigenous populations of organisms capable of metabolising the contaminants will already exist. Although contaminant concentrations present in the ground are locally very high (approaching saturation limits - although there no evidence of very substantial amounts of free product), the concentration and types of substances present are not considered likely to require pre-treatment.

To enhance existing processes, the following should be considered:

- Oxygen limiting conditions are the most likely factor restricting the breakdown rates of the in-ground contaminants. By introducing oxygen into the soils, the rate of degradation can be realistically expected to increase by several orders of magnitude ^{1, 2}.
- Following the availability of oxygen (and making the reasonable assumption that the soils contain sufficient available calcium, iron and other micronutrients to maintain a healthy biota of microorganisms), the amount of nitrogen and phosphorous would be considered the most likely limiting factor. Slow release NPK granules should be used at 1-10g per kg, or 100kg -1,000 kg per 500m³, at the start of the treatment phase during the initial aeration.
- Moisture content should be controlled. It is not considered likely that the materials will dry out completely, however a minimum moisture content should be maintained (above 50% the capacity of the soils). Equally, the soils should not be allowed to become saturated, as this will promote the establishment of anoxic conditions.
- Temperatures of less than 10°C are likely to decrease metabolic rates significantly. The efficiency of the treatment will therefore be significantly higher during the months of May to October (and the treatment activity should be scheduled within these months).

The regular mixing of the soils with air during the warmer months, and the addition of basic nutrients, provide a simple and cost-effective means of encouraging natural organisms to metabolise the contaminants present. This can be accomplished through a variety of techniques, however, given the available area and timescales, either windrows or bio piles should be considered.

¹ EA Draft Technical Report P5-079/TR1 Review of Fate & Transport of Selected Contaminants in the Soil Environment

² USGS Open File Report 2006-1338 Description, Properties & Degradation of Selected Volatile Organic Compounds in Groundwater – A Review of Selected Literature.

Of these techniques, windrows are more preferable as a higher rate of degradation can be achieved. However, windrows take up considerable space, and it is likely that only part of the total volume of the contaminated soils could be treated at any one time. To maximise this process intensive mechanical intervention will be required.

In actuality, the soils from each individual treatment stream (contaminated area or defined sub zone within contaminated area), will be located to a temporary stockpile, a portion of which will be subject to bulk mixing with the specified nutrients, and formed in to a windrow (maximum 2-3m high, and 3-5m wide).

The windrow will be turned on a weekly basis, and process monitoring undertaken until steady PID readings are obtained, and analysis indicates that the material is likely to pass verification testing. At this point, the windrow will be placed in a separate quarantined stockpile until the verification testing can be arranged. If the stockpile passes the verification testing it will be relocated into the general earthworks, with a record kept of the location and depth at which it was placed.

The treatment area must be kept free from standing water to prevent anoxia. Also, any runoff from the treatment area is potentially highly polluting.

The treatment process must not result in VOC emissions above specified ambient air concentration limits. If these limits are exceeded, the aeration rates, and exposed surface areas, must be reduced until the emissions are acceptable.

The procedures for managing run-off, and for detecting whether unacceptable VOC emissions are occurring, or are likely to occur, are set out in the Section 7.0 - Health and Safety, and Section 8.0 - Environmental Controls, below.

6.6 System Management and Optimisation

When sufficient volumes of contaminated soils have been stockpiled to justify mobilisation of treatment equipment, an assessment is to be made to determine the baseline parameters for treatment (the results of which will inform the process monitoring).

Stockpiled materials may be subject to pre-testing before commencement of formal treatment to determine whether the process of excavation has facilitated sufficient volatilisation, or enhanced biological activity by aeration, to reduce contamination to acceptable limits. If the results indicate sufficiently low concentrations of contaminants, full verification testing can be carried out, and the materials returned directly as earthwork fills (if acceptable).

During treatment, the effectiveness of the process in reducing contaminant concentrations will be monitored. As this is not part of the '*Verification Procedure*' to demonstrate the adequacy of the completed works, direct comparison to site '*Remediation Criteria*' is not required.

In order to determine the impact of the system on removing contaminant mass during remediation treatment, the pollutant concentrations of the feedstock soils must be assessed at various stages during the treatment process. This information will be used to assess whether the system needs to be altered and, in conjunction with '*Verification Testing*' of the soils, establish end-points for the soil treatment.

For each soil stream being treated, testing during the interim stages of treatment will be carried out. For most of the contaminant classes that can be anticipated on the site, measurements using a PID will be used (using the highest frequency), to assess VOC concentration trends.

The system will require active management to run efficiently, and it is envisaged that during initial commissioning, daily visiting and sampling will be carried out to establish the parameters for optimum contaminant removal.

A spike survey of the upper 1m of the soils (in stockpile, or during treatment), is to be carried out with VOC concentrations in the voids recorded using a photo ionisation detector (PID). Tests are to be carried out at a minimum of 10no. locations per 500m³ materials. A 1.5m bar is to be driven into the stockpile to a depth of 1m, retracted, and the inlet of the PID introduced into the resultant hole. A reading of the headspace VOC concentrations is then to be taken. This information is to be used to assess how the near-surface contaminant concentrations are reducing over time.

This mobile screening will be supplemented as necessary by laboratory analysis for GRO/BTEX, or for other classes of VOCs or SVOCs should these be detected in sufficient concentrations (and require soils treatment). Soil samples are also to be collected for analysis (on a less frequent basis), to determine whether the treatment has been successful, and trigger '*Verification Sampling*' (See 6.7). Trial holes, the full depth of the bio-piles/windrows, are to be excavated using a tracked excavator, and representative samples collected.

Samples will be transferred to appropriate containers (supplied by the laboratory), kept cool in accordance with storage requirements, and transferred to UKAS accredited laboratory '*Element Materials Technology, Deeside*' within 24 hours, and analysed for the following determinants:

- Gasoline Range Hydrocarbons C4-C8 & C8-C12 (GRO) -*Limit of detection 0.01 mg/l*
- Benzene, Ethylbenzene, Toluene & Xylenes (BTEX) -*Limit of detection 0.005 mg/l*
- Any additional determinants to the appropriate limit of detection for other contamination accepted into the treatment process.

Additional analysis will also be carried out on each sample to confirm the moisture content, and the total organic content (TOC).

Topographic surveying of the material stockpiles is to be carried out to confirm volumes.

6.7 Verification

Verification of the process effectiveness at reducing determinant concentrations, will be carried out through the systematic sampling of treated soils, post process monitoring.

This will be undertaken by independent, competent consultants, at frequencies, specified by, and in accordance with methodologies set out in the '*Verification Plan*' provided in the '*Detailed Remediation Strategy*'.

6.8 Treatment Residues and Waste Disposal

The residues from the treatment process will be limited to:

- Soils which have achieved the specified '*Remediation Criteria*' and can be returned to the earthworks.
- Soils which cannot be remediated using the selected methods and are unsuitable for retention.
- Water run-off from stockpiles collected from the soils treatment area.

Soils which have achieved the '*Remediation Criteria*' will be assessed under the '*Site Verification Plan*', and in accordance with the MMP, provided they are suitable for use, that there is certainty for their use, that they will not be wastes, and that they can be retained within the development, subject to the provisions of the '*Detailed Remediation Strategy*'.

Soils which do not achieve the '*Remediation Criteria*' will remain wastes. It is possible that these could be treated further, through a more intensive process under a different mobile plant deployment, however, the default position is that soils which do not meet the site '*Remediation Criteria*' must be classified, and disposed of, as waste.

Liquid inside the soils treatment area must be considered to be contaminated and is not suitable for discharge to surface waters, or the ground. Some water from within the treatment area may be recirculated to maintain optimum moisture levels within the stockpiled soils to promote the

bio-remediation treatment process. Any excess waters within this area must either be discharged to sewer under the '*Trade Effluent Discharge Consent*' – see Appendix C (which may require pre-treatment using the site groundwater treatment plant), or removed off-site by tanker (as waste).

It is possible that some treatment residues may be classed as hazardous waste. These wastes are generally '*Mirror Entries*' of '*Wastes from Soil and Groundwater Remediation*' with the EWC code prefixed 19 13. The wastes must be accurately classified, consignment notes completed, and checks made to ensure carriers and accepting sites have the appropriate licenses/permits.

6.9 Decommissioning of the Soils Treatment Area

When soils treatment has been completed, all validated soils achieving the '*Remediation Criteria*' will be relocated, being re-used within the earthworks as described. Any soils which do not meet the '*Remediation Criteria*' are to be disposed off-site as waste.

When the soils treatment area has been cleared, the impermeable sheeting is to be removed and disposed of off-site, as necessary. The perimeter bund can then be recovered for use in the earthworks, prior to the concrete slab being broken out. Underlying made ground can then be excavated/replaced in accordance with the provisions of the '*Outline*' and '*Detailed Remediation Strategies*'. This process will include the dedicated inspection and testing of all materials recovered from within the treatment areas to check for cross contamination caused by the treatment process, with dedicated verification inspections and testing carried out by the independent consultant for reporting as part of the verification process.

7.0 Health and safety

All works to be carried out on site are to be risk assessed, with suitable method statements prepared and approved by the Principal Contractor, prior to any associated works commencing.

7.1 Risk assessments

Risk assessments associated with the works are to be included within the relevant section of the '*Construction Phase Plan*'. These include:

- Earthworks
- Operated construction plant
- HGV Driving
- General operations (Health/Fire/Skin/Disease/trips/Electric/Injury)
- Manual Handling
- Working at height
- Cut/trapped limbs/fingers or hands
- Refuelling
- Management of underground services
- Environmental risk assessment
- Fire risk assessment

7.2 COSHH

COSHH data sheets providing recommended precautions and PPE requirements for substances likely to be encountered on site are to be included within the '*Construction Phase Plan*' e.g., fuels, oils, contaminated materials, fertiliser etc.

7.3 Personal protective equipment

PPE is to be supplied to protect against those risks associated with the works that cannot be avoided. Appropriate training is to be provided to all site personnel in the safe use of PPE. Spare PPE is to be available at all times.

Minimum requirement for PPE is as follows:

- Hard hat
- Hi-visibility vest/coat
- Safety footwear

Additional task specific PPE as required:

- Eye protection
- Dust mask
- Ear protection
- Gloves
- Disposable suits
- Respiratory Protective Equipment (RPE)

If any other PPE is required to carry out works on site, it is to be provided by the Principal Contractor.

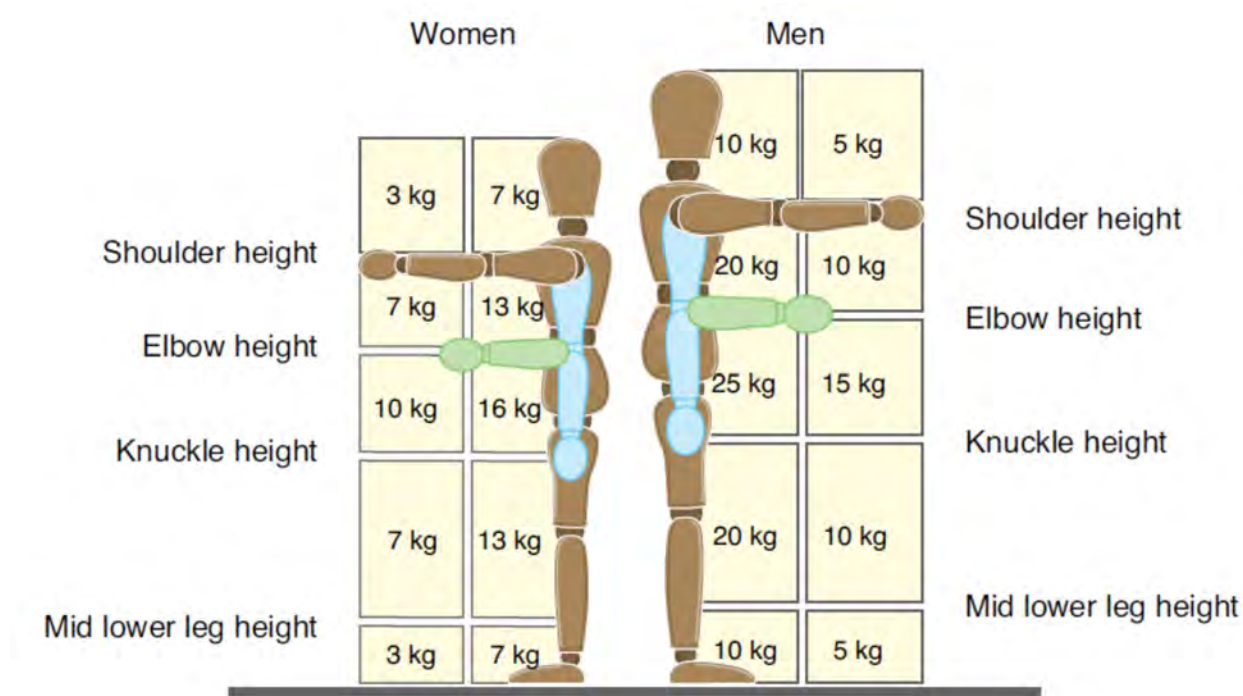
7.2 Workplace Exposure Limits (WELs)

While the concentrations of contaminants present in the soils are not likely to pose any acute or chronic health risk to workers, it is recognised that the release of VOC vapours could occur during the treatment process.

Monitoring of ambient air will be carried out at the commissioning of the treatment system, as soils are transferred into the treatment area, when each new batch of soil is moved, and during treatment. These results are to be assessed in relation to the relevant short and long-term '*Workplace Exposure Limits*' (see 10.2).

8.0 Manual Handling

Manual handling is to be minimised during the works, with equipment/materials lifted mechanically as detailed in the associated lift plan/risk assessment '**363 URCDLP001**', wherever possible. In the event that manual handling is required, a *Manual Handling Assessment* is to be carried out using the *Lifting and lowering risk filter* extracted from the *Manual Handling Operations Regulations 1992* to determine weights which can be lifted (see below).



Plan 6 – *Lifting and lowering risk filter*

8.1 Manual Handling Procedure

Plan



Consider where the load is to be placed, the distances involved, and any potential obstructions/raised areas. Assess whether assistance is required, or lifting aids/other equipment is necessary.

Load



Keep the heaviest side of the load to the body, with the load close to the waist for as long as possible whilst lifting, to reduce the amount of pressure on the spine and back muscles. In the event that your body cannot be positioned close to the load, slide the load towards your body (if possible) before attempting to lift.

Position



Adopt a stable position. Feet should be shoulder width apart with one leg slightly forwards (alongside the load if it is on the ground) to maintain the stability. Ensure that appropriate clothing and footwear is worn.

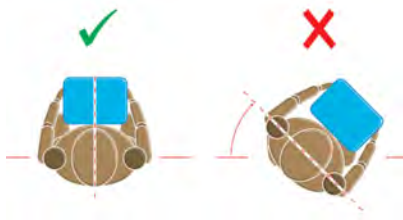
Hold

Wherever possible, hug the load close to the body rather than gripping the load tightly with your hands. This should allow a stronger more solid lift.

Lift



A slight bending of the back, hips and knees at the start of the lift is preferable, rather than stooping and/or squatting. Do not flex your back any further. To ensure this, lift the load before straightening your legs.



Avoid twisting the back or leaning sideways, especially when the back is bent. Keep shoulders level and facing the same direction as the hips, turning by moving feet as opposed to twisting the body to turn.

Look/Move

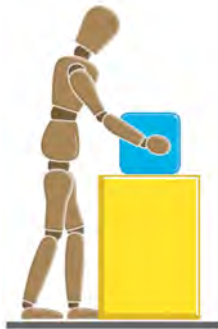


Keep your head up whilst handling the load, looking ahead, not down. Move slowly, do not jerk, twist, or snatch the load as this can make it harder to control and increases the risk of injury.

Limits

Do not lift or handle more than you can easily manage. There is a difference between what someone can lift, and what they can safely lift. If in doubt, seek advice.

Lower



Put the load down carefully. If you need to position the load precisely, put it down first and slide it into the desired position (if possible).

Team Handling

Handling/lifting a load using more than one person may make an operation possible which is beyond the capability of a single person. It can also reduce the risk of injury. All parties must have a clear path prior to commencing the lift in order to avoid any risks which are heightened due to additional handlers.

9.0 Occupational Health

9.1 Noise

In construction there are various action levels to control exposure to noise. These are:

LEAV - Lower Exposure Action Value 80dB(A) – provide information.

UEAV - Upper Exposure Action Value 85dB(A) – provide hearing protection.

ELV - Exposure Limit Value 87dB(A) – maximum level personnel can be exposed to.

It is not anticipated that any substantial noise will be generated during the groundwater treatment process. In the event that a noise level is suspected to be approaching the LEAV an assessment of the noise must be carried out to determine safe working durations and PPE to be worn.

9.2 Vibration

In construction there are various action levels to control exposure to vibration. These are:

Daily exposure	the extent of mechanical vibration a worker is exposed to during the working day which takes into account both the magnitude and duration of vibration.
Exposure Action Value (EAV)	the level of daily exposure that, if exceeded, requires specific action to be taken to reduce risk.
Exposure Limit Value (ELV)	the level of daily exposure for any worker that must not be exceeded.

Dependent upon the type of exposure to vibration being monitored there are different values.

<u>Hand-arm vibration</u>	Daily Exposure Action Value	2.5m/s ² A(8)
	Daily Exposure Limit Value	5.0m/s ² A(8)

<u>Whole-body vibration</u>	Daily Exposure Action Value	0.5m/s ² A(8)
	Daily Exposure Limit Value	1.15m/s ² A(8)

(where A(8) represents a working day of 8 hours).

It is not anticipated that any substantial vibration will be generated during the groundwater treatment process. In the event that vibration levels are suspected to be approaching the EAV an assessment of the vibration must be carried out to determine safe working durations and PPE to be worn.

9.3 Dust

Dust is produced when solid materials are broken down into finer particles. The longer that the dust stays in the air the easier it is to breathe in. Airborne dust is usually respirable dust.

Excess levels of construction dust can cause health problems, with harmful effects ranging from minor skin irritation to severe respiratory illnesses. Such problems are not likely to arise if occupational exposure limits and regulations are observed, and safe systems of work maintained.

Exposure to any unlisted substance or general nuisance dust should be limited by reducing the dust levels to the minimum reasonably practicable. These levels should not exceed 10mg/m³ of air when measured over an 8-hour period. Within this figure, only 4mg/m³ should be respirable dust. If this level is exceeded the substance becomes hazardous under COSHH.

Generally speaking, if dust can be seen in the air, it is highly possible that the 10mg limit is being approached (or exceeded).

9.3.1 Silica dust

With regards to the works detailed in this '*Method Statement*', site personnel are likely to be exposed to silica dust.

Silica is a natural substance found in most rocks, sand, and clay products such as bricks and concrete. In the workplace these materials create dust when they are cut, sanded, carved etc.

Some of this dust is sufficiently fine that it can be drawn into the lungs during breathing and cause harm to your health (including Silicosis, Chronic Obstructive Pulmonary Disease (COPD), and lung cancer). This fine dust is called '*Respirable Crystalline Silica*' (RCS) and is not visible to the naked eye.

The quantity of silica contained within different materials varies - see Table 1 below.

Table 1 **Approximate crystalline silica content of different materials**

Material	Silica content %
Sandstone	70-90%
Concrete, mortar	25-70%
Tile	30-45%
Granite	20-45%, typically 30%
Slate	20-40%
Brick	Up to 30%
Limestone	2%
Marble	2%

9.3.2 Managing the risk

The generation of any dust is to be kept to a minimum at all times.

Wherever necessary dust suppression techniques are to be implemented to prevent dust from becoming airborne/respirable.

It is not anticipated that any substantial dust will be generated during the groundwater treatment process.

10.0 Environmental considerations

Currently, residential development is being carried out in the western part of the site (Phase 1). Enabling works are being carried out to the Phase 2 area (east and south).

When soils treatment is being carried out (within the Phase 2 area), occupations will have commenced in the Phase 1 area.

Sensitive receptors with the potential to be impacted by harmful, nuisance or pollution from the treatment areas include:

- Residents of dwellings along Walmersley Old Road, and Mill Road.
- Occupants of new dwellings within the Phase 1 area.
- Construction workers within the Phase 1 and Phase 2 areas.
- The reservoir/lodge.
- The culverted tributary of Pig Lee Brook.
- Surface Water drains and gullies within the developed Phase 1 area, and the surrounding road network
- Groundwater within the underlying Rough Rock aquifer.

10.1 Contamination/pollution

Excavated soils may be contaminated to varying degrees, however by definition, soils designated for treatment will all have the potential to cause pollution and/or harm under certain circumstances. The most contaminated soils currently identified contain concentrations of hydrocarbon solvents approaching solubility limits, and small amounts of free product. White spirit type solvents are also anticipated within the source areas, along with much lower concentrations of more persistent and harmful VOC substances.

These primary and secondary constituents of soil contamination are well characterised, however, if during the works any suspected additional and uncharacterised contamination/pollution is

encountered, all associated works are to cease and the Urban Regen Ltd. Project Manager informed immediately.

10.2 VOC vapours

As significant volumes of free product are not anticipated, VOC emissions should be limited. However, during the aeration/mixing process there is potential for more significant emissions. It is presumed that any emissions will disperse rapidly and not result in elevated concentrations of vapours within the treatment area or further afield, however, it is proposed to carry out reassurance monitoring to demonstrate this.

During the initial transfer of soils and at the commencement of treatment of each batch collected from individual areas, monitoring will be carried out using portable monitoring equipment, specifically a photo-ionisations detector (PID).

Results from monitoring in and around the treatment area, and within the unoccupied parts of the development, will be compared to the '*Workplace Exposure Limits*' (WELs).

The VOCs identified on-site at significant concentrations are unsubstituted hydrocarbons comprising mixtures of aliphatic and aromatic substances, dominated by C6-C10 range. Benzene does not appear to form a significant proportion of the mixtures, so the WELs for the most abundant target list VOC xylenes (50ppm 8hr / 100ppm 15 min), would appear a reasonable surrogate for the mixtures, as this has the lowest TDSIs of the other light aromatics and is also more toxic than the mixtures assessed under the TPHCWG framework. Using a 10.6 PID lamp with a response factor of 0.3 for xylene, PID monitoring limits of 15ppm (8hr exposure), or 30ppm (15-minute exposure) for ambient air in working areas, will trigger the requirement for control measures (the use of RPE within the treatment area, or the adjustment of treatment rates, volumes and exposed surface area if detected in the wider site area).

While it is considered that low to moderate, and generally transitory emissions, are unlikely to result in adverse health impacts to nearby receptors; in order to provide confidence that

emissions do not have any potential to cause wider impacts, ambient VOC concentrations will be recorded. Measurements will be made at the site boundary nearest to occupied properties, or if new dwellings within the development become occupied before works are complete, at the Phase 1/Phase 2 boundary, nearest the closest occupied residence.

'Environmental Exposure Limits' for ambient air have been determined in the *'Ground Gas and VOC Vapour Risk Assessment'* completed for the development (R31744-R02) – See Table 2.

Table 2 VOC *'Environmental Exposure Limits'*

Contaminant	Inhalation Health Critical Value ($\mu\text{g}/\text{kg.bw.day}^{-1}$)	Assessment Criteria ($\mu\text{g}/\text{m}^3$)
Benzene	1.4 (S4UL)	5
Toluene	1400 (S4UL)	2,116
Ethylbenzene	74.3 (S4UL)	112
xylene	60 (S4UL)	91

Other hydrocarbons, and trace VOCs, are either of similar, or lower toxicity, or are present at much lower concentrations, allowing the adoption of BTEX as an indicator of whether emissions have the potential to impact on health.

Measurements will be taken using a PID during that soils treatment process to provide confidence that high concentrations of VOCs are not being released, however, compliance will be assessed through the deployment of adsorption tubes within the treatment area, and at site boundaries, nearest the closest occupied dwellings (See Appendix A).

10.3 Odour

Whilst the generation of VOC vapour concentrations in excess of *'Occupation Health Limits'* (in areas where workers are present), or *'Indoor Air Criteria'*, is not considered likely given the source concentrations and dilution that will occur. Odour thresholds for many of the other substances under consideration are significantly lower than the *'Environmental'* and *'Occupational Exposure Limits'*.

It is possible that odour impacts will be detected at receptors that are not associated with health risks, but could cause concern or nuisance. The monitoring of ambient odours will be carried out at commissioning of the treatment system, and when each new abstraction point is brought on line.

During the works, if any nuisance odour cannot be controlled with existing methods, all works associated with the odour are to cease, and the Urban Regen Ltd. Project Manager informed immediately. If necessary, formal odour monitoring is to be carried out. All monitoring is to be recorded and copies held on site within the relevant register of the '*Construction Phase Plan*'.

10.4 Noise

Noise generation is to be kept to a minimum at all times, however, given the distance to the nearest occupied properties (see Appendix A), and in consideration of the large-scale demolition/earthworks activities that have already taken place (much closer than the anticipated groundwater abstraction and treatment locations), impacts are not considered likely. To ensure this, the following points are to be considered:

- The condition of machinery being used (e.g., efficient engines, silencers, covers and compliance with manufacturers' maintenance requirements).
- The citing of machinery (e.g., the use of available shielding such as walls or buildings, the placing of material stores and distance from noise sensitive receptors).
- The method of operation (e.g., the use of operation time restraints to avoid disturbance).
- Substitution of machinery (e.g., electric power in place of internal combustion power).
- Substitution of methodology (e.g., pressure bursting instead of percussive methods).
- Reduction of boundary noise levels by appropriate positioning of preformed shielding.
- Be aware of the planning conditions with reference to permitted working hours.

During the works, if any nuisance noise cannot be controlled with existing methods, all works associated with the noise are to cease, and the Urban Regen Ltd. Project Manager informed immediately. If necessary, formal noise monitoring is to be carried out. All monitoring is to be recorded, and copies held on site within the relevant register of the '*Construction Phase Plan*'.

10.5 Vibration

Vibration is to be kept to a minimum at all times, however, given the distance to the nearest occupied properties (see Appendix A), and in consideration of the large-scale demolition/earthworks activities that have already taken place (much closer than the anticipated groundwater abstraction and treatment locations), impacts are not considered likely. To ensure this, the following points are to be considered:

- Attention must be given to the movement of heavy plant and the import of bulk materials at all times.
- Sensitive locations are to be avoided if possible.

During the works, if any nuisance vibration cannot be controlled with existing methods, all works associated with the vibration are to cease, and the Urban Regen Ltd. Project Manager informed immediately. If necessary, formal vibration monitoring is to be carried out. All monitoring is to be recorded, and copies held on site within the relevant register of the '*Construction Phase Plan*'.

10.6 Dust

The generation of any dust is to be kept to a minimum. Attention must be given to wind direction during the works, and best practice employed to ensure that this is achieved. Mitigation methods are to be employed, if necessary, to achieve this e.g., tractor and bowser.

During the works, if any nuisance dust cannot be controlled with existing methods, all works associated with the dust are to cease, and the Urban Regen Ltd. Project Manager informed

immediately. If necessary, formal dust monitoring is to be carried out. All monitoring is to be recorded, and copies held on site within the relevant register of the '*Construction Phase Plan*'.

10. 7 Surface water

The soils treatment area is located close to, and upgradient of, the culverted tributary of Pigs Lee Brook, and the on-site reservoir/lodge (see Appendix A). Connections to the local surface water drainage network also remain live.

No run-off from the soils treatment process is permitted to be discharged to surface waters.

During site works, surface water run-off is to be managed at all times to ensure that it does not impact on the works, or lead to contamination of adjacent watercourses. Open sections of watercourse should be protected by the use of temporary bunds.

Excess standing water within the treatment area is to be removed to prevent the accumulation of potentially polluting effluent. This liquid is either to be diverted into the on-site groundwater treatment facility prior to '*Permitted*' discharge to sewer, or removed off-site by tanker.

10. 8 Groundwater

The site overlies a Secondary A Aquifer where groundwater is of medium to low vulnerability.

Excess standing water within the treatment area is to be removed to prevent the accumulation of potentially polluting effluent. This liquid is either to be diverted into the on-site groundwater treatment facility prior to '*Permitted*' discharge to sewer, or removed off-site by tanker.

10. 9 Sewer

All discharges to foul sewer are to be in accordance with the '*Trade Effluent Discharge Consent*' provided by the sewerage undertaker (see Appendix D).

11.0 Emergency procedure

All persons on site are to be instructed in the '*Emergency Procedure*' at the '*Site Induction*'. The '*Emergency Procedure*' is also to be displayed on the site '*Notice Board*' at all times.

In the event of an emergency situation arising, i.e., physical injury, mechanical damage, fire, etc. all work is to stop, and site management informed immediately.

Project Manager	Anthony Smith	07867 490746
Geo-environmental Manager	Ben Thomas	07376 611818
Contract Manager	Gary Owen	07824 325322
Managing Director	Andy Walker	07971 973891

The Project Manager is the designated First Aider for the works.

The first aid box is located in the Principal Contractors site office.

Should an emergency incident occur, all works are to stop, the Urban Regen Ltd. Project Manager is to be informed immediately, and the '*Emergency Plan*' is to be implemented.

The '*Emergency Plan*' is to be prepared as part of the '*Construction Phase Plan*', and should provide information/detail the procedures to be followed, in the event of physical injuries, mechanical damage, or environmental impact etc.

As a minimum the '*Emergency Plan*' should identify the following:

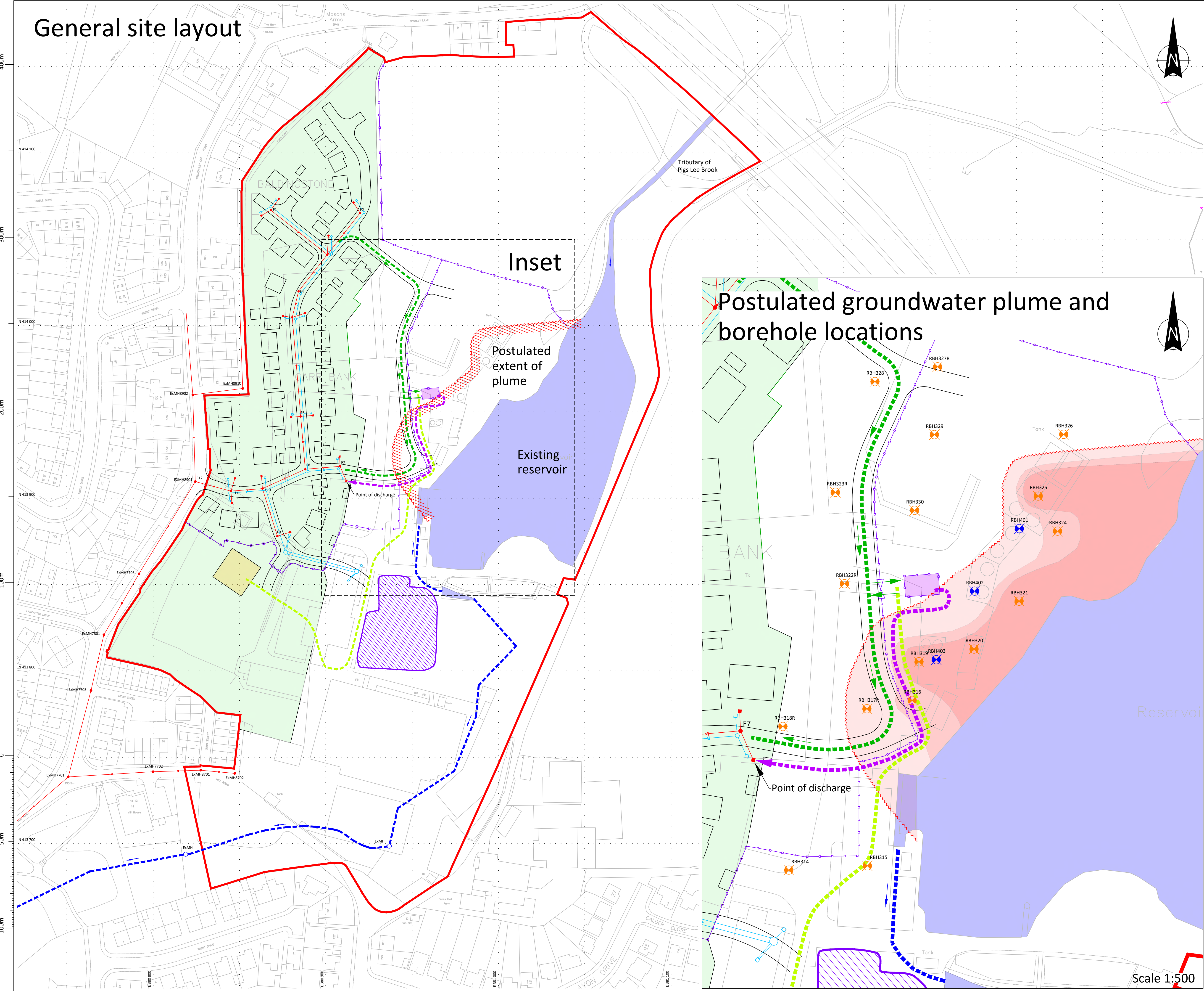
- Emergency contacts (e.g., emergency services/Environment Agency/Waste Management and Spill Management contractors/water companies etc.).
- Site contact details.
- Site specific restrictions (e.g., working hours/noise restrictions/protected and restricted areas etc.).

- Site layout plan detailing the main site features, foul and surface water drainage, waste locations (skips/stockpiles), sensitive receptors (inc' residents), protected or restricted areas, spill response equipment, firefighting equipment, first aid equipment etc.
- Record of fuels/oils/chemicals on site detailing location, quantity/volume, hazard and means of use.
- A flow diagram detailing the procedure to follow in the event of an incident.

A record of any incidents, and associated correspondences, are to be retained on site; being held within the relevant register of the '*Construction Phase Plan*'.

Appendix A Groundwater treatment site layout

General site layout



Location Plan Scale 1:10,000

Legend:	
Site boundary	
Development area (Phase 1)	
Construction fencing	
Culverted watercourse	
Drainage - surface water	
Drainage - foul water	
Principal contractor welfare facilities	
Soils treatment area	
Treatment plant	
Treatment plant - one way vehicle access	
Treatment plant - pedestrian access	
Treatment plant - discharge route to sewer (see Note 1)	
Postulated extent of groundwater plume	
Postulated extent of groundwater plume 1-10x EQS value	
Postulated extent of groundwater plume 10-100x EQS value	
Postulated extent of groundwater plume >100x EQS value	
Boreholes - major abstraction	
Boreholes - minor abstraction/monitoring	

- Notes**
- Discharges from the treatment plant are to be in accordance with the criteria detailed in the United Utilities 'Trade Effluent Discharge Consent'.
 - The treatment plant is to discharge to the southern foul drag of manhole F7 only.

Survey Information:	
Co-ord System:	Co-ord Type:
OSGB36(15)	Grid
Primary Survey Control:	Secondary Survey Control:
Leica SmartNet	Site

Rev	Date	Amendment	Drawn	Checked



ESTABLISHED 2001

Client:

Barratt Homes (Manchester)

Project:

Tetrosyl, Bury

Title:

Groundwater treatment site layout

Scale:	1:1000 @ A1	First Issue:	12th Jul 2022	Drawn:	D.J.Woodrow	Checked:	B.Thomas	
Drawing No:	333-20-006						Revision:	

Appendix B Environmental permit

Notice of variation with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Urban Soil Solutions Ltd
C/O Urban Regen Ltd
Langley Road
Pendlebury
Salford
M6 6FG

Variation application number

EPR/EB3704LN/V002

Permit number

EPR/EB3704LN

Mobile Plant

Permit number EPR/EB3704LN

Introductory note

This introductory note does not form a part of the notice.

The following notice gives notice of the variation of an environmental permit.

The permit has been varied at the request of the operator to reflect a change in registered office address from 23 Spring Vale, Edgworth, Bolton, BL7 0FS to C/O Urban Regen Ltd, Langley Road, Pendlebury, Salford, M6 6FG.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	Date	Comments
SR2008 no.27 permit EPR/EB3704LN issued	14/12/16	
Notified of change of registered office address.	15/11/21	Registered office address changed to C/O Urban Regen Ltd Langley Road, Pendlebury, Salford, M6 6FG
Variation issued EPR/EB3704LN/V002	16/11/21	Varied permit issued to Urban Soil Solutions Limited.

End of introductory note

Notice of variation

The Environmental Permitting (England and Wales) Regulations 2016

The Environment Agency in exercise of its powers under regulation 20 of the Environmental Permitting (England and Wales) Regulations 2016 varies

Permit number

EPR/EB3704LN

Issued to

Urban Soil Solutions Ltd (“the operator”)

whose registered office is

C/O Urban Regen Ltd

Langley Road

Pendlebury

Salford

M6 6FG

company registration number 09966805

as follows

on the permit page the registered office address of the operator is changed from 23 Spring Vale, Edgworth, Bolton, BL7 0FS to C/O Urban Regen Ltd, Langley Road, Pendlebury, Salford, M6 6FG.

This notice shall take effect from 16/11/2021.

Name	Date
Ieuan Thomas	16/11/2021

Authorised on behalf of the Environment Agency

Appendix C

Planning permission

NOTICE OF PLANNING PERMISSION

Town and Country Planning Act 1990 Town and Country Planning (Development Management Procedure) (England) Order 2015

To:

Ms Fielden
Avison Young
Norfolk House
7 Norfolk Street
Manchester
M2 1DW

On Behalf Of:

BDW Trading Ltd trading as Barratt Homes
C/O agent

PART 1 - Particulars of Application

Application Number: 63533

Date of Registration: 04/03/2019

Proposal:

Residential development comprising 268 no. dwellings (Class C3) with associated access, car parking, landscaping and open space

Location:

Bevis Green Works, Mill Road, Bury, BL9 6RE

PART 2 - Particulars of Decision

Bury Metropolitan Borough Council hereby give notice in pursuance of the provisions of the Town and Country Planning Act 1990 that permission has been **GRANTED** for the carrying out of the development referred to in Part 1 hereof in accordance with the application and plans submitted subject to the following conditions:-

- 1 The development must be begun not later than three years beginning with the date of this permission.
Reason. Required to be imposed by Section 91 Town & Country Planning Act 1990.
- 2 This decision relates to drawings numbered 456/P/LP/02, 456/P/PL/02 F, 456/P/ML/02 E, 456/P/HLL/02 E, 456/P/SHL/02 E, 456/P/RSL/02 E, 456/P/BTL/02 E, c-1339-02 Rev A, c-1339-03 Rev A, 456/P/SS/02, 456/P/DP/01, BALD 00CD 01, BALD 56SD 01, TBC 01, 2016/FAL/01, 2016/FAL/02, BHLN 00CD 01, BHLN 56SD 01, BKEY 00CD 01, BKIS 00CE 01, BKIS 00CI 01, BKIS 56SE 01, BKIS 56SI 01, BKNL 00CE 01, BKNL 00CI 01, BKNL 56SE 01, BLUT 00CD 01, BLUT 56SD 01, BMAI 00CE 01, BMAI 56SE 01, BMMS 00CD 01, BMMS 00CE 01, BMMS 56SE 01, BMMS 56SD 01, BTHO 00CD 01, BWIE 00CD 01, BWIE 56SD 01, 2010/DET/C/135, 2010/DET/C/1362010/DET/CS/01, NGF - TYPE 65 A, BS04 and the development shall not be carried out except in accordance with the drawings hereby approved.
Reason. For the avoidance of doubt and to ensure a satisfactory standard of design pursuant to the policies of the Bury Unitary Development Plan listed.
- 3 Prior to the commencement of development (excluding site clearance, demolition, or works relating to site investigation, remediation or ground works) details/samples of

the (materials/bricks) to be used in the external elevations, together with details of their manufacturer, type/colour and size, shall be submitted to and approved in writing by the Local Planning Authority. Only the approved materials/bricks shall be used for the construction of the development.

Reason. No material samples have been submitted and are required in the interests of visual amenity and to ensure a satisfactory development pursuant to UDP Policy EN1/1 Visual Amenity.

- 4 No development, other than site clearance, demolition, or works relating to site investigation remediation or ground works, shall commence unless and until:-
- A contaminated land Preliminary Risk Assessment report to assess the actual/potential contamination and/or ground gas/landfill gas risks at the site shall be submitted to, and approved in writing by, the Local Planning Authority;
 - Where actual/potential contamination and/or ground gas/landfill gas risks have been identified, detailed site investigation and suitable risk assessment shall be submitted to, and approved in writing by the Local Planning Authority;
 - Where remediation/protection measures is/are required, a detailed Remediation Strategy shall be submitted to, and approved in writing by, the Local Planning Authority.

Reason. The scheme does not provide full details of the actual contamination and subsequent remediation, which is required to secure the satisfactory development of the site in terms of human health, controlled waters, ground gas and the wider environment and pursuant to National Planning Policy Framework Section 15 - Conserving and enhancing the natural environment.

- 5 Following the provisions of Condition 4 of this planning permission, where remediation is required, the approved Remediation Strategy must be carried out to the satisfaction of the Local Planning Authority within agreed timescales; and A Site Verification Report detailing the actions taken and conclusions at each stage of the remediation works, including substantiating evidence, shall be submitted to and approved in writing by the Local Planning Authority prior to the development being brought into use.

Reason. To secure the satisfactory development of the site in terms of human health, controlled waters and the wider environment and pursuant to National Planning Policy Framework Section 15 - Conserving and enhancing the natural environment.

- 6 Prior to the commencement of the development hereby approved (excluding site clearance, demolition, or works relating to site investigation, remediation or ground works), a scheme for the provision of electric vehicle charging points shall be submitted to and approved in writing by the Local Planning Authority. The approved scheme shall be implemented prior to occupation of the building hereby approved.
- Reason. In accordance with paragraph 35 and 124 of the NPPF, to encourage the uptake of ultra-low emission vehicles and ensure the development is sustainable. To safeguard residential amenity, public health and quality of life.

- 7 No development shall commence (excluding site clearance, demolition, or works relating to site investigation, remediation or ground works) unless and until surface water drainage proposals have been submitted to and approved in writing by the Local Planning Authority. The scheme should be in accordance with the submitted Surface Water Sustainable Drainage Assessment and must be based on the hierarchy of drainage options in the National Planning Practice Guidance and be designed in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015). This must include assessment of potential SuDS options for surface water drainage with appropriate calculations and test results to support the chosen solution. Details of proposed maintenance arrangements should

also be provided. The approved scheme only shall be implemented prior to first occupation and thereafter maintained.

Reason. The current application contains insufficient information regarding the proposed drainage scheme to fully assess the impact. To promote sustainable development and reduce flood risk pursuant to Unitary Development Plan Policies EN5/1- New Development and Flood Risk , EN7/3 - Water Pollution and EN7/5 - Waste Water Management and chapter 14 - Meeting the challenge of climate change, flooding and coastal change of the NPPF.

- 8 Foul and surface water shall be drained on separate systems.
Reason. To promote sustainable development and reduce flood risk pursuant to Unitary Development Plan Policies EN5/1- New Development and Flood Risk , EN7/3 - Water Pollution and EN7/5 - Waste Water Management and chapter 14 - Meeting the challenge of climate change, flooding and coastal change of the NPPF.

- 9 Demolition, stripping out, and development ground works shall take place in accordance with a programme of archaeological works set out in a Written Scheme of Investigation (WSI) submitted to and approved in writing by the local planning authority. The WSI shall cover the following:

1. A phased programme of archaeological fieldwork to include:
 - i) A targeted watching brief during stripping out and demolition
 - ii) Targeted open area excavation
2. A programme for post investigation assessment to include,
 - i) analysis of the watching brief and excavation records and finds
 - ii) production of a final report
3. Provision for publication and dissemination of the findings.
4. Provision for archive deposition of the report, finds and records of the site investigation.
5. Nomination of a competent person or persons/organisation to undertake the programme set-out within the approved WSI.

Reason: In accordance with NPPF paragraph 199, to record and advance the understanding of the significance of the historic asset remains for and to make this evidence of our past publicly accessible.

- 10 The development hereby approved shall be carried out in accordance with the recommendations of the Noise Impact Assessment, dated November 2018.
Reason. To protect the amenity of the occupiers of the dwellings pursuant to Policy EN7/2 - Noise Pollution of the Bury Unitary Development Plan.
- 11 The landscaping scheme hereby approved shall be implemented to the written satisfaction of the Local Planning Authority not later than 12 months from the date the building(s) is first occupied. Any trees or shrubs removed, dying or becoming severely damaged or becoming seriously diseased within 5 years of planting shall be replaced by trees or shrubs of a similar size and species to those originally required to be planted to the written satisfaction of the Local Planning Authority.
Reason. To secure the satisfactory development of the site and in the interests of visual amenity pursuant to Policy EN8/2 – Woodland and Tree Planting of the Bury Unitary Development Plan..
- 12 Prior to any demolition works, bat emergence surveys for all low, medium and high risk buildings for bat roosts, shall be carried out and submitted to and approved in writing by the Local Planning Authority. The scheme shall be carried out in accordance with the approved details.

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 – Conservation of the Natural Environment and EN6/3 – Features of Ecological Value of the Bury Unitary Development Plan and Section 11 of the National Planning Policy Framework.

- 13 No demolition of the mill buildings shall commence unless or until the Local Planning Authority has been provided with either:
- a license issued by Natural England pursuant to Regulation 55, of the Conservation of Habitats and Species Regulations 2017 authorising the specified activity/development go ahead: or
 - a statement in writing from the relevant licensing body or LPA to the effect that it does not consider that the specified development will require a license

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 – Conservation of the Natural Environment and EN6/3 – Features of Ecological Value of the Bury Unitary Development Plan and Section 11 of the National Planning Policy Framework.

- 14 No works to trees or shrubs shall occur between the 1st March and 31st August in any year unless a detailed bird nest survey by a suitably experienced ecologist has been carried out immediately prior to clearance.

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 - Conservation of the Natural Environment and EN6/3 - Features of Ecological Value of the Bury Unitary Development Plan and National Planning Policy Framework Section 15 - Conserving and enhancing the natural environment.

- 15 No development (excluding demolition) shall commence until full details of a scheme for the eradication and/or control of Japanese Knotweed (*Fallonia Japonica*, *Rouse Decraene*, *Polygonum Cuspidatum*), Himalayan Balsam (*Impatiens Glandulifera*), rhododendron and monbretia is submitted to and approved in writing by the Local Planning Authority. The approved management plan shall include a timetable for implementation. Should a delay of more than one year occur between the date of approval of the management scheme and either the date of implementation of the management scheme or the date of development commencing, a further site survey must be undertaken and submitted to the Local Planning Authority.

Reason. The scheme does not provide full details of the actual extent of invasive species in the interest of UDP Policy EN9 - Landscape and pursuant to National Planning Policy Framework Section 11 - Conserving and enhancing the natural environment.

- 16 No draw down of water or fish removal shall occur unless or until a permit has been obtained from the Environment Agency or a statement in writing from the Environment Agency or the Local Planning Authority that it does not consider that permit is required. A copy of which is supplied to and approved in writing by the Local Planning Authority.

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 – Conservation of the Natural Environment and EN6/3 – Features of Ecological Value of the Bury Unitary Development Plan and Section 11 of the National Planning Policy Framework.

- 17 Prior to the commencement of any earthworks, draw down and infilling of the mill lodge, a reasonable avoidance method statement for amphibians, written by a suitably experienced ecologist shall be submitted to and approved in writing by the Local Planning Authority. The method statement will include full details of:

- The consultant name and contact details and experience;
- Detail of how contractors will be briefed;
- Procedures on how to deal with common toad if found on site;

- Timing of draw down and site clearance;
- Procedures for checking the site prior to work commencing and;
- Procedures for management of the site during construction

Only the approved method statement shall be adhered to and implemented in full prior to works commencing.

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 – Conservation of the Natural Environment and EN6/3 – Features of Ecological Value of the Bury Unitary Development Plan and Section 11 of the National Planning Policy Framework.

- 18 The development shall be carried out in accordance with the details contained in the Report by ERAP, reference 2018-202d Sections 6.1 to 6.5.

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 – Conservation of the Natural Environment and EN6/3 – Features of Ecological Value of the Bury Unitary Development Plan and Section 11 of the National Planning Policy Framework.

- 19 Prior to development commencing (excluding site clearance, demolition, or works relating to site investigation, remediation or ground works) a lighting plan for the street lighting shall be submitted to and approved in writing by the Local Planning Authority. The strategy shall:

- Identify areas/features on site that are potentially sensitive to lighting for bats;
- show how and where street lighting will be installed and through appropriate lighting contour plans demonstrated clearly that any impacts on bats is negligible;

All external lighting shall be installed in accordance with the approved details and specifications and locations set out in the strategy.

Reason. In order to ensure that no harm is caused to a Protected Species pursuant to policies EN6 – Conservation of the Natural Environment and EN6/3 – Features of Ecological Value of the Bury Unitary Development Plan and Section 11 of the National Planning Policy Framework.

- 20 In relation to the use hereby approved, the measures set out in the Travel Plan to promote more sustainable travel to and from the site by residents of the dwellings and reduce the reliance on private vehicle use, shall be implemented in full and thereafter maintained.

Reason. In order to encourage sustainable travel pursuant to NPPF (Section 9) and UDP Policy HT4 New Development.

- 21 The car parking indicated on the approved plans shall be surfaced, demarcated and made available for use prior to the dwelling hereby approved commencing and thereafter maintained at all times.

Reason. To ensure adequate off street car parking provision in the interests of road safety pursuant to Policy HT2/4 - Car Parking and New Development of the Bury Unitary Development Plan.

- 22 The development shall not be commenced (excluding site clearance, demolition, or works relating to site investigation, remediation or ground works) unless and until an approved programme of traffic monitoring has been carried out on Ribble Drive, Lancaster Drive, Palatine Drive and Old Lane by the developer. Within six months of the occupation of 200 of the properties comprising the development, an equivalent programme of traffic monitoring shall be carried out by the developer, who shall then submit a scheme of traffic calming measures to the Local Planning Authority for the above mentioned roads for Local Planning Authority approval. The approved details within that scheme shall then be carried out by the developer unless otherwise

approved in writing by the Local Planning Authority.

Reason: To ensure good highway design in the interests of road safety and to reduce the impact of vehicular and pedestrian conflict pursuant to Unitary Development Plan Policies H2/1 - The Form of New Residential Development, H2/2 - The Layout of New Residential Development and HT6/2 - Pedestrian and Vehicular Conflict.

- 23 No development shall commence unless and until a 'Construction Traffic Management Plan' (CTMP), has been submitted to and approved by the Local Planning Authority and shall confirm/provide the following:

- Access route for vehicles from the highway network;
- Access points to the site for each phase of the development, including any temporary works required to facilitate vehicular access;
- Hours of operation and number of vehicle movements;
- Proposed site hoarding/gate positions clear of appropriate visibility splays onto the adjacent adopted highways/Public Rights of Way;
- A scheme of appropriate warning/speed limit signage in the vicinity of the construction site accesses;
- Arrangements for the turning and manoeuvring of vehicles within the curtilage of the site;
- Parking on site of operatives' and demolition/construction vehicles together with storage on site of demolition/construction materials;
- Measures to ensure that all mud and other loose materials are not carried on the wheels and chassis of any vehicles leaving the site and measures to minimise dust nuisance caused by the operations

The approved plan shall be adhered to throughout the demolition/construction period and the measures shall be retained and facilities used for the intended purpose for the duration of the demolition and construction periods. The areas identified shall not be used for any other purposes other than the turning/parking of vehicles and storage of demolition/construction materials.

Reason. Information not submitted at application stage. To mitigate the impact of the construction traffic generated by the proposed development on the adjacent residential streets, and ensure adequate off street car parking provision and materials storage arrangements for the duration of the construction period and that the adopted highways are kept free of deposited material from the ground works operations, in the interests of highway safety pursuant to Bury Unitary Development Plan Policies EN1/2 - Townscape and Built Design and HT6/2 - Pedestrian/Vehicular Conflict.

- 24 Notwithstanding the details indicated on approved plan reference 456/P/PL/02 Revision E, no development shall commence unless and until full details of the following have been submitted on a topographical based survey of the site and adjacent adopted highways (where appropriate) to, and approved in writing by the Local Planning Authority:

- A review of existing pedestrian facilities at the Walmersley Road/ Walmersley Old Road/Springside Road signalised junction to explore the potential for providing a subsequent scheme of improvements to improve facilities for users across all arms of the junction, to a scope and specification to be agreed;
- In connection with the above, a review of existing signal timings to explore the potential for providing a full pedestrian stage to improve crossing conditions for pedestrians;
- Alteration of the existing site access onto, and works abutting, Walmersley Old

Road, incorporating the widening and reconstruction/provision of footways minimum of 2.0m in width including all accommodation works required at tying in points, level/1 in 40 plateau at the junction onto the adopted highway, reinstatement of all redundant accesses, demarcation of the limits of the adopted highway and all associated highway and highway drainage remedial works required as a result of the construction of, and statutory undertakers connections to, the proposed development;

- Formation of the secondary emergency access onto Mill Road/Byway Open to All Traffic (BOAT) No. 20, Bury, to serve the residential development, to a specification and length to be agreed, incorporating removable and fixed bollards (number and positions to be agreed) at all interfaces with the proposed estate road and the Public Right of Way and all associated highway and highway drainage remedial works;
- Reconstruction of and modifications to the existing alignment of the unadopted section of Mill Road/Byway Open to All Traffic (BOAT) No. 20, Bury to scope, specification and in materials to be agreed, in order to upgrade the route as indicated, incorporating the widening and reconstruction/provision of 2.0m minimum wide footways where indicated, level/1 in 40 plateau at the junction onto the adopted highway, reinstatement of all redundant accesses, works to form a junction with Lumn Street, demarcation of the limits of the adopted highway and all associated highway and highway drainage remedial works required as a result of the construction of, and statutory undertakers connections to, the proposed development;
- Proposed scheme of works of a scope and specification to be agreed at the interface with the retained section of Byway Open to All Traffic (BOAT) No. 20, Bury leading to Mather Road, to the east of the driveway serving Plot 267;
- Proposed scheme of works to improve the surface and line of Public Footpath No. 13, Bury, that crosses the site and provide a route not less than 4.0m in width in accordance with the previously approved diversion order;
- Formation of all pedestrian connections indicated onto the existing adopted highway and Public Rights of Way abutting the site;
- Proposals for the introduction of waiting restrictions to scope to be agreed at the at the junctions of the proposed site access and Mill Road with Walmersley Old Road, including all necessary road markings and signage;
- Provision of a street lighting assessment for (and, where necessary, a scheme of improvements) the proposed residential development and sections of Walmersley Old Road and of Mill Road/Byway Open to All Traffic (BOAT) No. 20, Bury, abutting the site;
- Foundation details for all boundary walls/fences abutting the existing/future adopted highway;
- White lining scheme for the proposed junctions onto the existing adopted highway;
- An Approval In Principle for the any retaining structures located adjacent to the adopted highway, incorporating full structural, construction and drainage details, calculations and a detailed construction method statement.

The details subsequently approved shall be implemented to an agreed programme.

Reason. To secure the satisfactory development of the site in terms of highway safety, ensure good highway design and maintain the integrity of the adopted highway, all in the interests of highway safety pursuant to the following Policies of the Bury Unitary Development Plan:

Policy EN1/2 - Townscape and Built Design

Policy H2/1 - The Form of New Residential Development

Policy H2/2 - The Layout of New Residential Development

Revision E, in the event that it is intended for the proposed estate roads and/or improved section of Mill Road to be put forward for adoption, no development shall commence unless and until full details of the following have been submitted on a topographical based survey of the site and adjacent adopted highways (where appropriate) to, and approved in writing by the Local Planning Authority:

- Proposed internal road layout to a specification and materials to be agreed and to current adoption standards, incorporating 2.0m minimum width footways throughout the development and a 6.5m minimum carriageway width on the section of estate road between Walmersley Old Road and Plot 90 and at the bends adjacent to Plots 90/91 and 95;
- Revised turning head position relative to the easterly limits of adoption on Mill Road;
- In the event that retaining structures are required adjacent to the future adopted highway, an 'Approval In Principle' for the proposed structure(s), incorporating full structural, construction and drainage details, calculations, pedestrian protection measures and a detailed construction method statement;
- A scheme of 20mph traffic calming measures on the proposed internal roads and white lining scheme to a scope and specification to be agreed including details of proposed materials, road markings and signage as required;
- Undertaking of a review of/safety audit for the need to provide vehicle containment measures to the east of the estate road abutting the proposed open watercourse.

The details subsequently approved shall be implemented to an agreed programme.

Reason. To secure the satisfactory development of the site in terms of highway safety, ensure good highway design and maintain the integrity of the adopted highway, all in the interests of highway safety pursuant to the following Policies of the Bury Unitary Development Plan:

Policy EN1/2 - Townscape and Built Design

Policy H2/1 - The Form of New Residential Development

Policy H2/2 - The Layout of New Residential Development

- 26 The visibility splays, pedestrian visibility splays at the back edge of the footway and forward visibility envelopes on approved plan reference 456/P/PL/02 Revision E shall be implemented before the development is brought into use and subsequently maintained free of obstruction above the height of 0.6m.

Reason. To ensure the intervisibility of the users of the site and the adjacent highways in the interests of road safety pursuant to Policies H2/1 - The Form of New Residential Development and Policy H2/2 - The Layout of New Residential Development of the Bury Unitary Development Plan.

- 27 A minimum hardstanding of 5.5m measured between the highway boundary and any proposed garage doors shall be provided and thereafter maintained.

Reason. To enable a vehicle to stand clear of the highway whilst the garage doors are opened and to allow adequate space to maintain a vehicle clear of the highway in the interests of road safety pursuant to Policies H2/1 - The Form of New Residential Development and Policy H2/2 - The Layout of New Residential Development of the Bury Unitary Development Plan.

- 28 Where dwellings are constructed without a garage a minimum hardstanding length of 5.0m in order to accommodate a vehicle clear of the adopted highway shall be provided within the curtilage of each dwelling and thereafter maintained.

Reason. To ensure adequate off street car parking provision in the interests of road safety pursuant to Policies H2/1 - The Form of New Residential Development and Policy H2/2 - The Layout of New Residential Development of the Bury Unitary

Development Plan.

- 29 In the event that the estate roads are not adopted, details of the proposed arrangements for future management and maintenance of the proposed estate roads within the development shall be submitted to and approved by the Local Planning Authority prior to first occupation. The estate roads shall thereafter be maintained in accordance with the approved management and maintenance details until such time as a private management and maintenance company has been established.
Reason. To ensure that the unadopted estate road serving the development is maintained to an acceptable standard in the interest of residential/highway safety; to ensure a satisfactory appearance to the highways infrastructure serving the development; and to safeguard the visual amenities of the locality and users of the highway pursuant to Policies H2/1 - The Form of New Residential Development and Policy H2/2 - The Layout of New Residential Development of the Bury Unitary Development Plan.
- 30 Notwithstanding the details indicated on approved plan reference 456/P/PL/02 Revision E, no development shall commence unless and until full details of a dilapidation survey of the footways and carriageways leading to and abutting the site in the event that subsequent remedial works are required following construction of the development have been submitted to and approved in writing by the Local Planning Authority. The footways and carriageways shall be repaired to the condition in the approved dilapidation survey following the completion of the development.
Reason. To secure the satisfactory development of the site in terms of highway safety, ensure good highway design and maintain the integrity of the adopted highway, all in the interests of highway safety pursuant to the following Policies of the Bury Unitary Development Plan:
Policy EN1/2 - Townscape and Built Design
Policy H2/1 - The Form of New Residential Development
Policy H2/2 - The Layout of New Residential Development.
- 31 No development, other than site clearance, demolition, or works relating to site investigation, shall commence unless or until a scheme of mitigation measures to ensure that phase 1 of the development does not increase the risk of flooding on-site or elsewhere has been submitted to, and approved in writing by, the Local Planning Authority. The scheme shall:
- Include an updated model and assessment of fluvial flood risk, demonstrating that flood risk can suitably managed on site
 - Demonstrate consideration of the impacts of climate change
 - Ensure that there are no detrimental impacts to flood storage or flood flow routes
 - Ensure any mitigation measures proposed are sufficient and do not increase the risk of flooding
 - Prevent flooding by ensuring the satisfactory storage of/disposal of surface water from the site
- The scheme shall be fully implemented and subsequently maintained, in accordance with the scheme's timing/phasing arrangements.
Reason. To reduce the risk of flooding elsewhere pursuant to Policy EN5/1 - New Development and Flood Risk of the Bury Unitary Development Plan and Section 14 of the National Planning Policy Framework.
- 32 No development in phase 2, other than site clearance, demolition, or works relating to site investigation, remediation or ground works, shall commence unless or until details of the new channel for Pigs Lee Brook has been submitted to and approved in writing by the Local Planning Authority. The details shall include structures and

long/cross sections showing compliance with the approved FRA by CEC (ref: 6155/issue5 dated Jan 2020).

The scheme shall be fully implemented and subsequently maintained, in accordance with a scheme for timing and phasing arrangements which shall be agreed in writing with the Local Planning Authority.

Reason. To reduce the risk of flooding on site and elsewhere pursuant to Policy EN5/1 - New Development and Flood Risk of the Bury Unitary Development Plan and Section 14 of the National Planning Policy Framework.

- 33 No development in phase 2, other than site clearance, demolition, or works relating to site investigation, remediation or ground works, shall commence unless or until a scheme of remedial works associated with the retained downstream section of Pigs Lee Brook culvert has been submitted to, and approved in writing by, the Local Planning Authority. The scheme shall identify remedial works and the phasing of repairs to occur before any ground raising or development above the culvert.

The scheme shall be fully implemented and subsequently maintained, in accordance with a scheme for timing and phasing arrangements which shall be agreed in writing with the Local Planning Authority.

Reason. To ensure the structural integrity of the existing culverted watercourse that is to be retained within the site thereby reducing the risk of flooding pursuant to Policy EN5/1 - New Development and Flood Risk of the Bury Unitary Development Plan and Section 14 of the National Planning Policy Framework.

- 34 No development in phase 2, other than site clearance, demolition, or works relating to site investigation, remediation or ground works, shall commence unless or until a scheme for the provision and management of a high quality ecological network along Pigs Lee Brook has been submitted to, and approved in writing by, the Local Planning Authority. Thereafter, the development shall be carried out in accordance with the approved scheme.

The Pigs Lee Brook corridor shall be free from built development including access roads, lighting, domestic gardens and formal landscaping.

The scheme shall include

- detailed plans, including updated long and cross-sections, based on existing and proposed site development levels, and FRA recommendations for residential scheme, showing the extent undeveloped riparian buffer zone
- details of new diverted Pigs Lee Brook channel informed by fluvial and geomorphological assessment.
- details of proposed land remodelling proposed adjoining new riparian corridor.
- details of proposed revetment options proposed along the new riparian corridor.
- details of proposed soft landscaping scheme including planting schedule; predominantly based of native species, including groundflora and aquatics.
- details demonstrating how new river corridor will be sensitively managed over the longer term including adequate financial provision and named body responsible for management plus production of detailed management plan
- details of any proposed new flow control structures, surface water outfalls, footpaths, fencing, lighting, etc.

The scheme shall be fully implemented and subsequently maintained, in accordance with a scheme for timing and phasing arrangements which shall be agreed in writing with the Local Planning Authority.

Reason. The above approach is supported by paragraphs 170 and 175 of the National Planning Policy Framework (NPPF) which recognise that the planning

system should conserve and enhance the environment by minimising impacts on and providing net gains for biodiversity. If significant harm resulting from a development cannot be avoided, adequately mitigated, or as a last resort compensated for, planning permission should be refused.

From a geomorphological perspective, the plans to de-culvert and divert this section of the Pigs Lee Brook into new, open channel are welcomed. However, it is not possible to fully assess the application submitted, due to a lack of information surrounding the new channel design. The current plans do not include any detailed information on the bed and bank characteristics of the new diverted channel, whilst greater clarification is required on channel cross sections shown in the WFD assessment (CEC July 2019).

The new channel should be designed to account for any elevation changes across the site to prevent the section of river becoming canalised and featureless, whilst integrating any Flood Risk Assessment requirements for new residential development, and site remediation needs.

- 35 No development in phase 2 shall take place until a working method statement to cover all Pigs Lee Brook de-culverting and diversion works shall be submitted to and approved in writing by the Local Planning Authority. Thereafter the development shall be carried out in accordance with the approved scheme. The submitted method statement should include cover the following:

- timing of works
- methods used for all channel, bankside water margin works
- machinery (location and storage of plant, materials and fuel, access routes, access to banks etc)
- protection of areas of ecological sensitivity and importance
- site supervision

The working method statement shall be fully implemented, in accordance with a scheme for timing and phasing arrangements which shall be agreed in writing with the Local Planning Authority.

Reason. The construction phase of any proposed development affecting the bank or channel of a watercourse poses significant risks of:

- damage to water dependent species and habitats. At this site a known risk is that construction may damage downstream fishery.
- diffuse pollution of the water environment arising from ground works.

pursuant to Policy EN5/1 - New Development and Flood Risk of the Bury Unitary Development Plan and Section 14 of the National Planning Policy Framework.

Statement in accordance with Article 35(2) Town and Country Planning (Development Management Procedure) (England) (Amendment) Order 2015

The Local Planning Authority worked positively and proactively with the applicant to identify various solutions during the application process to ensure that the proposal comprised sustainable development and would improve the economic, social and environmental conditions of the area and would accord with the development plan. These were incorporated into the scheme and/or have been secured by planning condition. The Local Planning Authority has therefore implemented the requirement in Paragraph 38 of the National Planning Policy Framework.

The following policies of the Bury Unitary Development Plan, National and Regional Government were considered relevant:

EC2/1 EC2/1 - Employment Generating Areas

EN1/2	EN1/2 - Townscape and Built Design
H1/2	H1/2 - Further Housing Development
H2/1	H2/1 - The Form of New Residential Development
H2/2	H2/2 - The Layout of New Residential Development
H4/1	H4/1 - Affordable Housing
EN1/1	EN1/1 - Visual Amenity
EN1/2	EN1/2 - Townscape and Built Design
EN1/3	EN1/3 - Landscaping Provision
EN1/5	EN1/5 - Crime Prevention
EN2	EN2 - Conservation and Listed Buildings
EN5/1	EN5/1 - New Development and Flood Risk
EN6/3	EN6/3 - Features of Ecological Value
EN6/4	EN6/4 - Wildlife Links and Corridors
EN7/1	EN7/1 - Atmospheric Pollution
EN8	EN8 - Woodland and Trees
OL1/5	OL1/5 - Mineral Extraction and Other Development in the Green Belt
RT2/2	RT2/2 - Recreation Provision in New Housing Development
RT3/3	RT3/3 - Access to the Countryside
HT2/4	HT2/4 - Car Parking and New Development
HT2/10	HT2/10 - Development Affecting Trunk Roads
HT5/1	HT5/1 - Access For Those with Special Needs
HT6/1	HT6/1 - Pedestrian and Cyclist Movement
HT6/2	HT6/2 - Pedestrian/Vehicular Conflict
HT6/3	HT6/3 - Cycle Routes
SPD5	Development Control Policy Guidance Note 5: Affordable Housing Provision in New Residential Developments
SPD1	Supplementary Planning Document 1 - Open Space, Sport and Recreation Provision in New Housing Development
SPD2	Development Control Policy Guidance Note 2: Wildlife Links & Corridors
SPD3	Development Control Policy Guidance Note 3: Planning Out Crime in New Development
SPD11	Development Control Policy Guidance Note 11 - Parking Standards in Bury
SPD12	Development Control Policy Guidance Note 12 - Travel Plans in Bury
SPD14	Development Control Policy Guidance Note 14 - Employment Land and Premises
SPD16	Development Control Policy Guidance Note 16 - Design and Layout of New Development in Bury
NPPF	National Planning Policy Framework (2018)

This decision relates only to the Town and Country Planning Acts and does not include any consent or approval under any other enactment or under the Building Regulations. Any other consent or approval which is necessary must be obtained from the appropriate authority.

Applicant Plan Numbers:

456/P/LP/02
456/P/PL/02 F
456/P/ML/02 D
456/P/HLL/02 D
456/P/SHL/02 D
456/P/RSL/02 D
456/P/BTL/02 D
c-1339-02 Rev A
c-1339-03 Rev A
456/P/SS/02
456/P/DP/01

BALD 00CD 01
BALD 56SD 01
TBC 01
2016/FAL/01
2016/FAL/02
BHLN 00CD 01
BHLN 56SD 01
BKEY 00CD 01
BKIS 00CE 01
BKIS 00CI 01
BKIS 56SE 01
BKIS 56SI 01
BKNL 00CE 01
BKNL 00CI 01
BKNL 56SE 01
BLUT 00CD 01
BLUT 56SD 01
BMAI 00CE 01
BMAI 56SE 01
BMMS 00CD 01
BMMS 00CE 01
BMMS 56SE 01
BMMS 56SD 01
BTHO 00CD 01
BTHO 00CD 01
BWIE 00CD 01
BWIE 56SD 01
2010/DET/C/135
2010/DET/C/1362010/DET/CS/01
NGF - TYPE 65 A
BS04

NOTES TO APPLICANT

1. The applicant's attention is drawn to the need to consult the Department of Operations regarding the specification for and implementation of the required highway works and implementation of any required traffic regulation orders. The cost of the works will be the responsibility of the developer.
2. The applicant's attention is drawn to the need to complete a Section 38 Agreement under the Highways Act 1980, and a Section 104 Agreement under the Water Industry Act 1991, regarding the future adoption of the proposed roads and sewers. The submission shall include the provision of long sections and cross sections at positions to be agreed through the proposed estate roads and turning heads to ensure adoptable gradients can be achieved along the proposed adopted highways and a swept path analysis of the proposed estate roads to ensure an 11.85m long refuse collection vehicle can pass a private car and manoeuvre at all turning heads.
- 3.. The applicant's attention is drawn to the existence of the Public Rights of Way that cross/abut part of the site. No development should take place which affect the Rights of Way in the absence of appropriate closure or diversion orders.
4. The applicant's attention is drawn to Section 167 of the Highways Act 1980 which requires Highway Authority approval of all structural details and calculations of retaining structures adjacent to the highway, prior to works commencing.

5. The applicant's attention is drawn to Section 80 of the Building Act 1984 and the need to give six weeks prior written notice to the Department for Operations detailing any proposed demolition works in connection with the proposed development.
6. It would be advantageous for the land affected by the highway proposals to be in the control of the Highway Authority. An appropriate course of action would be the free dedication of the land to the Highway Authority by the freeholder.
7. For the avoidance of doubt, the conditions listed above can be satisfied in phases.

Signed:

A handwritten signature in black ink, appearing to be 'R. M. J.', written over a horizontal line.

14 of 14

.....
On behalf of the Council

Date of Decision: 06/02/2020

Appendix D Trade effluent discharge consent

Temporary Agreement

Reference TWAUrbanRegen1

WwTW BURY



TEMPORARY WASTEWATER AGREEMENT BETWEEN

UNITED UTILITIES WATER LIMITED

And

URBAN REGEN LIMITED

This temporary Agreement is for 6 months duration or less

Start date **01 February 2022**

Expiry date **01 September 2022**

Any discharge must only commence from the start date and must terminate on or before the expiry date, as stated above. Any discharges undertaken outside the specified dates will be considered illegal. Any subsequent discharge will require a new application.

Temporary Agreement

Reference TWAUrbanRegen1

WwTW BURY

TEMPORARY AGREEMENT BETWEEN:

UNITED UTILITIES WATER LIMITED a company incorporated under the laws of England & Wales (company number 2366678) whose registered office is at Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington WA5 3LP (**"the Company"**)

AND

URBAN REGEN LIMITED a company incorporated under the laws of England & Wales (company number 40946) whose registered office is at **Langley Road, Pendlebury, Salford, Manchester, M6 6FG** (**"the Applicant"**)

(each a **"Party"** and together **"the Parties"**)

WHEREAS:

The Company is the sewerage undertaker for the North West region of the United Kingdom appointed under the Water Industry Act 1991.

The Applicant is involved with the **development and preparation of construction sites** whose premise address is **Barratt Manchester Walmders Wood Development, Former Tetrosyl Bevis Green Works, Walmersley Old Road, Bury, BL9 6SB**

The Applicant has applied to the Company for an agreement to discharge wastewater from the said premises into the sewers through details completed in an application form which was duly made on **19 November 2021**.

The discharge of wastewater shall be in accordance with the said application form and would not be lawful without the permission of the Company.

The Parties are entering into this Agreement to set out the terms and conditions on which the Company agrees to the discharge of wastewater by the Applicant from the said premises into its sewer.

Temporary Agreement

Reference TWAUrbanRegen1

WwTW BURY

NOW IT IS HEREBY AGREED as follows:

The Company HEREBY agrees to the discharge of wastewater detailed in the application form dated **03 September 2021** from the said premises into their sewers. This agreement shall be as if the discharge was trade effluent as defined in the Water Industry Act 1991 and shall be SUBJECT TO THE FOLLOWING CONDITIONS:

- | | |
|--|---|
| Nature of discharge | 1. Subject to the provisions of conditions below the nature or composition of the wastewater to be discharged under this agreement shall be solely as specified in the said application form and shall consist solely of wastewater derived from site Preparation, Remediation Works and Construction of Residential Development |
| Sewer affected | 2. The sewer into which the wastewater may be discharged and the point of discharge is the public foul sewer situated at Walmersley Old Road -MH8901 |
| Connections | 3. No connections shall be made to the said sewer without the prior approval of the Company and all such connections shall be constructed and maintained to the satisfaction of the Company at the expense of the Applicant. |
| Maximum volume of discharge | 4. The maximum amount of the wastewater discharged in any one day of twenty four hours shall not exceed 15 m³ without prior written consent of the Company. |
| Maximum rate of discharge | 5. The highest rate at which the wastewater may be discharged shall not exceed 10 litre/sec , in dry weather only. |
| Matters to be eliminated prior to discharge to sewers | 6. The following matters shall be eliminated from the wastewater before it is discharged into the sewers of the Company:

a) petroleum spirit;

b) calcium carbide;

c) carbon disulphide;

d) except as provided in paragraph 7 hereof, the prescribed substances listed in Schedule 1 to The Trade Effluents (Prescribed Processes and Substances) Regulations 1989, as amended from time to time, insofar as |

Temporary Agreement

Reference TWAUrbanRegen1

WwTW BURY

they are in concentration greater than the background concentration (as defined in the said Regulations);

- e) where the wastewater derives from a prescribed process mentioned in Schedule 2 to the said Regulations, and except as provided in paragraph 7 hereof, asbestos (as defined in the said Regulations) and chloroform in a concentration greater than the background concentration (as defined in the said Regulations);
- f) organo-halogen compounds including pesticide residues and degreasing agents;
- g) any substances which either alone or in combination with each other or with any other matter lawfully present in the said sewers would be likely to;
 - i) cause a nuisance or produce flammable, harmful or toxic vapours either in the sewers or at the sewage works of the Company;
 - ii) injure the sewers or interfere with the free flow of their contents or affect prejudicially the treatment and disposal of their contents or have injurious effects on the sewage treatment works to which it is conveyed or upon any treatment plant there;
 - iii) be dangerous to or cause injury to any person working in the sewers or at the sewage treatment works;
 - iv) affect prejudicially any watercourse, estuary or coastal water into which the treated wastewater will eventually be discharged.

Matters to be limited prior to discharge to the sewer

- 7. The wastewater shall not contain
 - a) sulphides, hydrosulphides, polysulphides and substances producing hydrogen sulphide on acidification in excess of **1 mg/l**
 - b) cyanides and cyanogen compounds which produce hydrogen cyanide on acidification in excess of **1 mg/l**
 - c) sulphates as SO₄ in excess of **1,000 mg/l**

Temporary Agreement

Reference TWAUrbanRegen1

WwTW BURY

- d) Total suspended solids at pH 7.0 and dried at 110°C in excess of **400 mg/l**
- e) Settled chemical oxygen demand in excess of **1,000 mg/l**
- f) Toxic metals in excess of **10,000 ug/l** either individually or in total i.e. Antimony, Beryllium, Chromium, Copper, Lead, Nickel, Selenium, Silver, Tin, Vanadium, Zinc;
- g) Separable grease and oil in excess of **100 mg/l**
- h) Chloroform and its compounds in excess of **100 ug/l**
- i) 1,1,1 Trichloroethane and its compounds in excess of **100 ug/l**
- j) Benzene and its compounds in excess of **100 ug/l**
- k) Dichloromethane and its compounds in excess of **100 ug/l**
- l) Phenol and its compounds in excess of **100 ug/l**
- m) Toluene and its compounds in excess of **100 ug/l**
- n) Xylene (Ortho, Meta, Para) and its compounds in excess of **100 ug/l**

Sampling and flow measurement

- 8. a) A flow metering device is to be installed at the discharge point and is to be maintained by the Applicant to the satisfaction of the Company, or another means of assessing the volume of wastewater discharged is to be agreed in writing.
- b) (i) A sampling point is to be provided so as to enable an authorised member of the Company's staff safely to obtain a sample of effluent passing to sewer. Such authorised members of staff shall be given free and ready access to the sampling point at all times.

(ii) Representative samples of the wastewater may be obtained from **380840 413906 (Blue Circle) Last foul manhole (F1) in new connection for development (houses not occupied) as identified on the plan.**
- c) The Trade Effluent department should be notified of all various discharges during the commissioning phase in order that adequate samples can be taken to monitor the discharge.

pH value

- 9. No wastewater shall be discharged having a pH of less than 6 or greater than 10.

Temporary Agreement

Reference TWAUrbanRegen1

WwTW BURY

- Temperature** 10. No wastewater shall be discharged which has a temperature higher than 43.3°C (110°F).
- Cessation of Discharge** 11. In order to protect the sewer network and treatment processes it is essential that, should it be deemed necessary, the discharge to sewer will be terminated immediately on verbal instruction to the Applicant's staff from the Trade Effluent department.
- Breach of Agreement** 12. If any wastewater is discharged to the sewer in excess or in breach of the conditions of this agreement:
- a) The Applicant shall notify the Company on becoming aware of such a breach and shall immediately cease the discharge.
 - b) If the Company detects such a breach they shall notify the Applicant and if required by the Company the Applicant shall immediately cease the discharge.
- Disputes** 13.
 - a) The Parties shall attempt to resolve all disputes and differences between themselves but if any dispute remains unresolved for more than 30 calendar days after it first arose it shall be referred to the Parties' senior management for resolution.
 - b) If the Parties are unable to reach a resolution between them or through senior management then any dispute arising out of or in connection with this agreement shall be determined by a single arbitrator to be agreed between the Parties.

Signed  Date 18/01/2022

Print Name Ben Thomas

For and on behalf of Urban Regen Limited

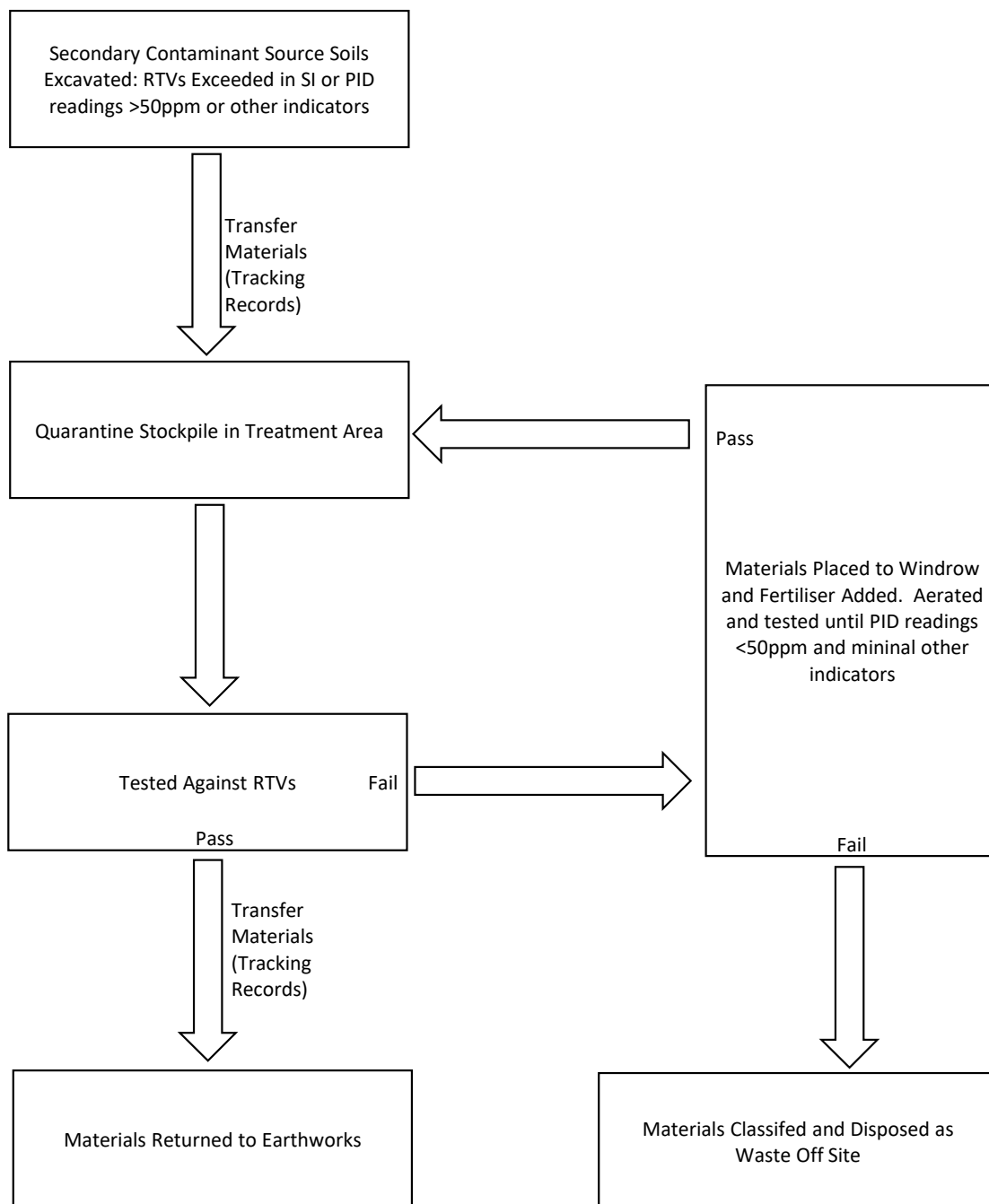
Signed Helen Wilson Date 14/1/22

Print Name

For and on behalf of United Utilities Water Limited

Appendix E Soils treatment schematic

Soils Treatment Schematic



APPENDIX D

Correspondence from Environment Agency

From: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Sent: Tuesday, October 10, 2023 8:26 AM
To: James Doyle <jd@groundtechconsulting.com>
Subject: RE: Tetrosyl

Hello James

Thank you for the submission of the RTM P20 worksheets along with the short technical note dating July 2023.

Having looked through both, I am happy to accept them as is and for them to be used to support the wider remediation of the Phase 2 works at the former Tetrosyl site. I note that for some of the hydrocarbons the remedial target concentration is at or above the solubility limit for a marker compound. With a mind on a pragmatic approach, I think it is important to identify that where or if non-aqueous phase liquid is encountered or suspected by observation then this is removed as a default.

I am mindful of the fact that the RTM Methodology identifies NAPL to be a long-term risk which should be removed where encountered as and where necessary. I appreciate that this is likely to be subject to work done by others, but I wanted to ensure that there is a commonality running throughout this matter and site.

Thank you for patience and I look forward to the next submission for this site.

Kind Regards

Lee.

L. Beveridge
BSc (Hons), MSc
Technical Specialist
Environment Agency
Groundwater, Hydrology & Contaminated Land team
Warrington

Tel. 0203 025 0768
Mob. 07771 625922

Pronouns: he/him ([*why is this here?*](#))

From: James Doyle <jd@groundtechconsulting.com>
Sent: 18 July 2023 20:15
To: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Subject: Tetrosyl

Evening Lee,

Please find attached the revised letter to include some additional RTVs that were missed, let me know if you have any queries.

Best Regards,

James Doyle

Director

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