PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Site:	Buzz Bingo
References:	18-376-R2-2
Date:	27 March 2026
Client:	Kellen Homes Ltd



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QUALITY ASSURANCE

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01	First Issue	February 2026
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EXECUTIVE SUMMARY

SITE DESCRIPTION AND HISTORY

Site Address	Buzz Bingo, Kirkmanshulme Lane, Manchester, M18 7BA.
Grid Reference	E 387762, N 396230.
Site Area	2.09 Ha.
Proposed Development	Kellen Homes Ltd intends to construct a low-rise residential development comprising a combination of low-rise dwellings and apartment blocks, with associated gardens, estate roads and infrastructure.
Current Site Use	The subject site is an irregular-shaped parcel of land located east of Belle Vue, Manchester, and is currently occupied by a disused bingo hall, two hardstanding car parks, and localised landscaping. The bingo hall is located in the northwestern corner of the site. The car parks occupy the northeastern and southwestern corners of the site. The southwest car park (MCC Land) is bordered by a 1.5—2.0 m high metal fence, separating it from the rest of the site (land proposed for redevelopment by Kellen Homes). The south of the site is occupied by an access road from Kirkmanshulme Lane. A row of storage containers is located along the western site boundary. An area of landscaping comprising grasses, low shrubs and semi-mature to mature trees is present along the northern boundary. Additionally, a grassed embankment is present between the northern boundary and the hardstand area, sloping downhill to the south. Sporadic semi-mature and mature trees are present along the eastern, western, and southern boundaries, with a more densely vegetated area along the southwest boundary toward the MCC parcel. Sapling trees and scrub vegetation are noted to be growing through former surface drainage grids and cracks/areas of poorly conditioned hardstanding across the central and eastern areas.
Site History	Historical mapping suggests the site was formerly agricultural land, c. 1848, comprising three fields, split by tree-lined field boundaries, and two ponds. By 1893, the site had been excavated and recorded as a boating lake within the Belle Vue Zoological Gardens. A clock tower was recorded within the boating lake in c. 1923 and c. 1961 a miniature railway was noted through the south and southwest of the site. By c. 1978, the boating lake was infilled with a bowling alley constructed in the northwest. The site layout has remained largely unchanged since circa 1978, with only minor changes occurring with the extent of the car park in the northeast.

ENVIRONMENTAL SETTING

Geology	**Superficial Geology**	Glacial Till – Diamicton (CLAY, SAND, SILT, GRAVEL).
	Solid Geology	Chester Formation – SANDSTONE.
	Faults	There are no faults identified within a 250 m radius of the site.

Geomorphology	Based on the historical development recorded on-site, the site in its current condition is not representative of natural geomorphology. It is likely that extensive Made Ground fill deposits were used to infill the boating lake and create a site-level plateau before the development of the bowling alley and car parks. Made Ground fill may have also been used when there were minor changes to the softstanding landscaped areas on-site between c. 1978 and c. 2003.
Hydrogeology	The site is underlain by a secondary undifferentiated superficial aquifer and a principal bedrock aquifer in the bedrock. The site is not located within Groundwater Source Protection Zone or a Drinking Water Safeguard Zone. In addition, there are no active groundwater, surface water, or potable abstraction points within a 2 km radius of the site.
Hydrology	There are no watercourses within 50 m of the subject site. The site is situated in Flood Risk Zone 1, and, as such, is considered to have a very low risk of fluvial flooding each year. There are localised areas subject to a low (0.1 – 1%) to high (>3.3%) risk of surface water flooding each year. The Groundsure report states there is a moderate-high risk of groundwater flooding at the site.
Utility Locations	A formal utilities survey has not been provided to E3P for review; however, multiple service indicators have been noted during the desk study. These include lampposts/CCTV cameras, cable boxes, manhole covers, surface water drains, and ground scarring within the site boundary. Directly outside the northern site boundary, a marker peg, an electrical pylon, and overhead cables have been noted.
Landfill Sites and Waste Sites	There are no active landfills within a 2 km radius of the site boundary, there is, however, one historical landfill recorded by the EA within 250 m of the site. There are no active licensed waste sites within a 2 km radius, and no historic waste sites within a 250 m radius of the site. No Waste Exemptions or Environmental Permits have been identified in the environmental database for the site.
Radon	The BGS report records indicate the site is situated in an area where less than 1% of homes are above the “Action Level”. Therefore, full radon protective measures are not necessary for the construction of new dwellings or extensions, and as such, no further assessment is required.
Unexploded Ordnance	The site is situated within a Moderate Risk UXO area, with munition storage and military use recorded on the adjacent site. A detailed UXO risk assessment should be undertaken to confirm the hazard level on site.
PFAS	No potential current or historical sources of PFAS have been identified on site. No further risk assessment required.
Hazardous Installations	No hazardous installations precluding the redevelopment of the site have been identified.

E3P GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: • 12 x Mechanically excavated trial pits, • 6 x Window sample boreholes with the construction of environmental monitoring installations, • 2 x Cable percussive boreholes, • 3 x BRE 365 Soakaway Tests.
Ground Conditions	**Made Ground** Made Ground deposits were encountered within all of the exploratory locations, to a maximum proven depth of 2.00 m bgl (CP101). A Depth of Made Ground Plan is presented as Drawing 18-376-007 in APPENDIX IV. **Topsoil (0.00 m – 0.40)** Natural, undisturbed topsoil was not encountered during the investigation. **Superficial** Superficial deposits were encountered at depths ranging between 0.40 m and in excess of 7.57 m bgl (limit of the investigation). Superficial deposits were encountered as sandy gravelly CLAY with gravel constituents of mudstone and sandstone across the site. The soils were generally encountered to be in firm and stiff conditions with isolated occurrences of very stiff soils encountered. Soft sandy CLAY was encountered in two locations (TP109 and CP101), at depths between 1.60 m to 3.00 m bgl. **Solid** The solid bedrock of the Chester Sandstone Formation was not encountered during the intrusive investigation, undertaken to a maximum depth of 7.57 m bgl. British Geological Society borehole data of the wider area record the top of bedrock at circa 30.00 m bgl. **Groundwater** Groundwater was encountered as seepages in three trial pit locations from 0.50–1.80 m bgl. During preliminary return monitoring, groundwater depths varied sporadically across the site between 0.22 m and 6.00 m bgl. Groundwater is is perched and discontinuous, **Visual/Olfactory Evidence of Contamination** An organic odour was noted in four exploratory hole locations (TP101, TP107, TP108 and TP109) within Made Ground soils at depths between 0.30 m and 1.80 m bgl.

CONTAMINATED LAND ASSESSMENT

Potential Contamination Sources	The site was agricultural before the development of the boating lake in circa 1893, which was subsequently infilled with Made Ground. Made Ground may be a potential source of heavy metals, TPHs, PAHs, and ACMs. There is an additional minor potential source of heavy metals, TPHs, and PAHs from the miniature railway. Off-site sources of potential contamination include the tramway, unspecified tanks, electrical substations/pylons, and a speedway stadium all within 100m of the site. These uses are a potential source of TPH, PAH, heavy metals, PCB and SVOCs. However, given the distance to the site and low permeability underlying soil, are not considered credible contamination sources.
Human Health Risk Assessment	Following a Tier 2 assessment for residential end-use, elevated concentrations of arsenic, lead, nickel, benzo(a)anthracene, benzo(b) fluoranthene, benzo(a) pyrene dibenzo(a,h)anthracene and TPH C21-C35 have been identified in multiple locations across the site at varying depths throughout the Made Ground soil matrix. Given the nature of the material, a point source of elevated heavy metals and non-volatile PAH + TPH compounds can be attributed to a single source and must therefore be considered site-wide. All of the identified elevated concentrations have primary exposure pathways related to soil ingestion and consumption of homegrown vegetables (PL1) dermal contact and ingestion of soils (PL2). The risk to chronic human health associated with the elevated concentrations on inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils. Where roads, plots and hardstands are proposed, this will serve to cut the contamination pathway, removing the risk to future end users. The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy.
Controlled Waters Risk Assessment	Low Risk to controlled waters.
Ground Gas Risk Assessment	Ground gas monitoring and the Conceptual Site Model (CSM) confirm the site as Characteristic Situation 1 (CS1) – Very Low Gas Risk, with no credible gas source identified. Made Ground, including former boating lake infill, will be excavated and remediated as part of the geotechnical works. Any localised organic material will be identified and removed, eliminating potential gas sources. Following remediation, the residual risk is negligible and no gas protection measures are required. Agreement with the Local Authority is recommended prior to implementation.
Potable Water Infrastructure	Based on the assessment of current site conditions, it is likely that barrier pipe will be required for the proposed development. However, this will need to be confirmed with a UKWIR risk assessment post-remediation. Post-remediation and enabling works ground conditions may be different from those identified during this intrusive ground investigation.

GEOTECHNICAL ASSESSMENT

Underground Obstructions & Subterranean Hazards	No subterranean obstructions that prevented the continuation of boreholes were encountered on site. However, within TP103 a brick fill layer was encountered between 0.30 m and 0.40 m bgl. Obstructions are anticipated beneath the current structure in the northwest.
Allowable Bearing Capacity	The ABC data derived from SPT results demonstrates that the following suitable materials for founding have been identified on-site: - Natural firm to very stiff sandy gravelly CLAY from 1.00 m to >3.00 m bgl, with an ABC range of 82 to 4475 kN/m^2.
Foundation Options	The site comprises a variable thickness of ground over stiff natural clay. The made ground is unsuitable for direct foundation bearing in its existing condition. Anticipated foundation solutions include: - Strip and trench fill foundations founded in competent natural clay where made ground thickness is limited and tree influence is manageable. - Ground improvement (vibro stone columns) in areas of moderate made ground thickness to improve ground performance and limit total and differential settlement. - Localised piled foundations in areas of poor ground, significant made ground thickness, or where extreme tree influence would otherwise require excessive shallow foundation depths. Tree influence will be assessed on a plot-by-plot basis, with foundation depths and any heave precautions designed in accordance with current NHBC guidance for shrinkable clays. A Geotechnical Foundation Type Plan will be prepared to define and coordinate the appropriate foundation solution across the site.
Foundation Near Trees	Foundation depths within the proposed trees' influence zone will need to be deepened to ensure that structural loading is within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuations in moisture content.
Heave Precautions Near Trees	Required in the conjectured zone of trees.
Building Floor Slabs	It is considered that all substructures will require a suspended floor slab.
Soakaway Drainage	BRE 365 testing has indicated that the underlying drift deposits have low permeability, making them unsuitable for soakaway drainage.
Sulphate Assessment	Concrete classification will be DS-2, AC-1s.
CBR Design %	Granular soils can be re-engineered to ensure 5% within the subgrade during favourable climatic conditions. Natural clay soils will provide a CBR in the order of 3-5% during drier climatic periods. However, if water is allowed to shed onto the formation, the CBR will reduce to <2%, which will require specialist engineering of the subgrade.
Enabling Earthworks	Development levels are unknown at this time; however, it is unlikely that significant cut-and-fill works will be required as the majority of the site has already

	been upfilled to create a level developable platform (with the exception of the north of the site which is slightly raised). Variable thickness made ground, placed during the mid-20th century, is present across the site and is considered to be largely inert. However, due to its variability, the material is unsuitable for direct support of the proposed infrastructure in its existing condition. All former structural foundations, slabs, and relic infrastructure will be fully removed. The made ground will then be excavated, processed to remove oversized and deleterious materials, and re-engineered through controlled placement and compaction in accordance with the earthworks specification to form a near-surface development platform above the underlying natural clay. This approach will provide a uniform and predictable platform, enabling safe and economical construction while limiting long-term total and differential settlement and preventing adverse effects on adjacent land and infrastructure. As part of the earthworks design, materials should be assessed and characterised prior to re-use in the construction of upfill to a geotechnical design. All future earthworks should be completed in accordance with a Geotechnical Design Report (GDR) that will consider the ground model within the context of the potential for settlement induced by surcharge from earthworks, dynamic and permanent loading of the development and all known hazards.
Civil Engineering Excavations	The intrusive investigation has not encountered anything that may impede the installation of drainage or affect other civil engineering works. However, localised soft spots have been encountered that will require excavation and re-engineering or a reinforced pipe bedding design.
Waste Characterisation	Any material that is to be disposed of off-site should undergo assessment using Technical Guidance. WM3: *Waste Classification – Guidance on the classification and assessment of waste*. This can be done upon request and in line with the Environment Agency sampling frequencies.

RECOMMENDATION

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- Ground gas addendum.
- Plot specific foundation schedule (upon receipt of the final development levels).
- Geotechnical Design Report (GDR).
- Remediation and enabling works strategy.

CONTENTS

1. INTRODUCTION 10
1.1. Background 10
1.2. Proposed Development 10
1.3. Objectives 11
1.4. Scope of Works 11
1.5. Limitations 11
1.6. Risk Classification 12
1.7. Confidentiality 12

2. E3P GROUND INVESTIGATION 13
2.1. General Overview 13
2.2. Scope of Investigation 13
2.3. Insitu Standard Penetration Test (SPT) 14
2.4. Permeability Tests 14
2.5. Laboratory Analysis 14
2.6. Storage, Preservation and Transport of Samples 15

3. GROUND AND GROUNDWATER CONDITIONS 17
3.1. Summary of Ground Conditions 17
3.2. Made Ground 17
3.3. Topsoil 18
3.4. Superficial Geology 18
3.5. Solid Geology 18
3.6. Groundwater 18
3.7. Visual and Olfactory Evidence of Contamination 19
3.8. Obstructions 19

4. TIER 2 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT 20
4.1. Deviating Samples 20
4.2. Sample Analysis Population 20
4.3. Human Health Risk Assessment 20
4.4. Controlled Waters Sensitivity 25
4.5. Controlled Waters Risk Assessment 26
4.6. Ground Gas Risk Assessment 32
4.7. Potable Water Supply 43
4.8. Developed Conceptual Site Model 44

5. GEOTECHNICAL ASSESSMENT 50
5.1. Soil Consistency 50
5.2. Side Stability and Ease of Excavation 53
5.3. Consolidation 53
5.4. Particle Size Distribution 53
5.5. Soil Density/Moisture Content Relationship 54
5.6. Soil Infiltration 54
5.7. Soil Plasticity 55
5.8. pH and Sulphate 55
5.9. Groundwater 56
5.10. Site Preparation 56
5.11. Foundation Conditions and Assessment of Potential Bearing Capacities 56
5.12. Foundation Options Appraisal 57
5.13. Ground Floor Slabs 59
5.14. Heave Precautions 59
5.15. Drainage 60
5.16. exteRNAL INFRASTRUcture 60
5.17. Excavations 60
5.18. Enabling Earthworks 61
5.19. Slope Stability 61
5.20. Construction Activity and Inspection 61
5.21. Developed Geotechnical Risk Register 62
5.22. Further Work 64

DRAWING LIST

18-701-001 - Site Location Plan

18-701-002 - Proposed Development Plan

18-701-003 - Historical Features Plan

18-701-004 - Site Features Plan

18-701-006 - Exploratory Hole Location Plan

18-701-007 - Depth of Made Ground Plan

1. INTRODUCTION

1.1. BACKGROUND

Kellen Homes Ltd (the client) commissioned E3P to undertake a Phase II Geoenvironmental Site Assessment at Buzz Bingo, Kirkmanshulme Lane, Manchester, M18 7BA, herein referred to as the site.

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as a part of the proposed development for a low-rise residential development.

1.2. PROPOSED DEVELOPMENT

Kellen Homes Ltd intends to construct a low-rise residential development comprising a combination of low-rise dwellings and apartment blocks, with associated gardens, estate roads and infrastructure. Drawing 18-376-002 (APPENDIX IV) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

The adjacent parcel to the immediate southwest of the site boundary (referred to as the Manchester City Council [MMC] parcel) has been included in the desk top searches and the site summary; however, it was not included within the intrusive site investigation as it is understood that the proposed development only pertains to the redline boundary shown in Figure 1.1 at this stage. It is understood that the adjacent MCC parcel may be part of a future land and redevelopment purchase.

Figure 1.1 Proposed Development Layout



1.3. OBJECTIVES

The objectives of the geoenvironmental investigation are as follows:

- Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority available to complete a desk study in line with the Environment Agency (EA) document Land Contamination: Risk Management (LCRM) (updated June 2023).
- Undertake a phase of sampling and analysis to provide an overview of the environmental issues identified.
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site concerning the site's future use and off-site receptors.
- Assess the geotechnical information and provide recommendations concerning foundations, pavement construction and floor slabs; and,
- Provide recommendations regarding future works as required.

1.4. SCOPE OF WORKS

The scope of works includes the elements included in Table 1.1

Table 1.1 Scope of Works

Ground Investigation	• Design of suitable ground investigation. • Window sample probeholes with the construction of environmental monitoring installations. • Mechanically excavated trial pits. • Soakaway pits. • Cable percussive boreholes with the construction of deep environmental monitoring installations. • Soil and groundwater sampling.
Testing and Monitoring	• In-situ geotechnical testing. • Chemical and geotechnical analysis. • Groundwater monitoring. • Ground gas monitoring.
Assessment and Reporting	• Factual and interpretative reporting. • Contamination risk assessment and conceptual site model. • Geotechnical assessment and interpretation.

1.5. LIMITATIONS

The limitations of this report are presented in APPENDIX I.

1.6. RISK CLASSIFICATION

The description of risk classification and the likely action required as set out in CIRIA C552 are included in APPENDIX III.

1.7. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed or with whom an assignment has been agreed. Should any third party wish to use or rely upon the report's contents, written approval must be sought from E3P; a charge may be levied against such consent.

2. E3P GROUND INVESTIGATION

2.1. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between the 8th and 10th December 2025. The works are summarised in Table 2.1.

2.2. SCOPE OF INVESTIGATION

A summary of the fieldwork completed is included in Table 2.1.

Table 2.1 Summary of Fieldwork

POTENTIAL SOURCE / RAIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General Ground Conditions, Including the Presence/Nature of Obstructions	TP102	Machine Excavated Trial Pits	2.00	N/A
	TP103		1.90	N/A
	TP104		2.10	N/A
	TP105		2.00	N/A
	TP107		2.00	N/A
	TP108		2.30	N/A
	TP110		2.00	N/A
	TP111		1.00	N/A
	TP112		2.10	N/A
	WS101	Window Sample Probeholes	3.44	0.50–1.00
	WS102		3.43	1.00–3.00
	WS103		2.44	0.50–1.00
	WS104		3.44	1.00–3.00
	WS105		3.44	0.50–1.00
	WS106		3.44	2.00–3.00
Soakaway Pits	TP/SA101	Machine Excavated Trial Pits with Soakaway Testing	2.90	N/A
	TP/SA106		2.40	N/A
	TP/SA109		2.60	N/A
Investigation of Deeper Ground Conditions	CP101	Cable Percussive Boreholes	7.57	4.00–7.00
	CP102		6.26	2.00–6.00

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples, spatially distributed to offer the maximum site coverage, whilst also being advanced to target specific contaminant sources.

Mechanically excavated trial pits were also advanced to undertake BRE365 soakaway testing to determine the soakage potential of the underlying soils.

Window sample probeholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

Cable percussive boreholes were advanced to investigate deeper ground conditions and obtain samples are greater depths.

The sampling locations are illustrated in Drawing 18-376-006 (APPENDIX IV). The ground conditions encountered are indicated on the logs, which are provided in APPENDIX VI.

The locations were surveyed by GPS to Ordnance Datum with an accuracy of <10mm.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater recovered for chemical analysis.

2.3. INSITU STANDARD PENETRATION TEST (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60-degree cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in APPENDIX VI, presented in Table 5.2 and discussed in Section 5.0.

2.4. PERMEABILITY TESTS

Four soakaway permeability tests were undertaken in order to assess the likely permeability of the underlying strata to determine the potential suitability for soakaway drainage within the proposed development. The results are presented in Table 5.7, and the test certificates are included in APPENDIX X.

2.5. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical geotechnical analysis, summarised in Table 2.2.

Table 2.2 Summary of Laboratory Analysis

CHEMICAL ANALYSIS
Metals
pH, total sulphate, water-soluble sulphate (2:1 extract)
Sulphide
Cyanide
Phenols
Total and speciated polycyclic aromatic hydrocarbons (PAHs)
Asbestos identification and quantification
Speciated and banded total petroleum hydrocarbons (TPHs)

- Total Organic Carbon (TOC)
- Leachate analysis
- Coal tar analysis

GEOTECHNICAL ANALYSIS

- Atterberg limits determinations
- Moisture content
- Dry Density/Optimum Moisture Content 4.5kg rammer
- Particle Size Distribution (PSD)
- Single Stage Triaxial
- Consolidation (Oedometer)

2.6. STORAGE, PRESERVATION AND TRANSPORT OF SAMPLES

Measures taken to ensure the quality and integrity of the collected samples, from collection to receipt of the samples by the laboratory, are summarised in Table 2.3.

Table 2.3 Sample Integrity Information

SUBJECT	CHEMICAL SAMPLING	
Storage	Soil Glass jars supplied by the laboratory were used for the collection of soil samples to be analysed for VOCs. Plastic tubs were used to collect soil samples for metals analysis, PFAS testing and asbestos screening. Glass vials supplied by the laboratory were used for the collection of samples to be analysed for VOCs. Samples to be analysed for lower volatility compounds were stored in laboratory-prepared glass jars. Samples to be tested for PFAS compounds were stored in laboratory-supplied HDPE bottles.	Groundwater Glass vials supplied by the laboratory were used for the collection of samples to be analysed for VOCs. Samples to be analysed for lower volatility compounds were stored in laboratory-prepared glass jars. Samples to be tested for PFAS compounds were stored in laboratory-supplied HDPE bottles.
Preservation	Soil and groundwater sample containers were filled to minimise headspace prior to sealing and stored at a low temperature within cool boxes with cooling aids to minimise the loss of volatile contaminants and reduce microbial activity during the collection of samples. Cooling aids that may contain PFAS compounds (such as blue ice) were not utilised to prevent cross-contamination with samples.	
Sample Integrity	Dedicated disposable nitrile gloves were worn and changed between sample collections to prevent cross-contamination. Hand tools were decontaminated with PFAS free detergent and rinsed with	Groundwater samples were collected using dedicated plastic tubing, which was changed between monitoring well locations to prevent cross-contamination. Interface probes were decontaminated with PFAS free

SUBJECT	CHEMICAL SAMPLING	
	PFAS free water between sampling events. PFAS free stationary was used to label all samples.	detergent and rinsed with PFAS free water between monitoring wells. PFAS free stationary was used to label all samples.
Transport	Samples were stored and shipped in dedicated sample boxes provided by the laboratory. Sample details were recorded on the laboratory chain of custody form enclosed with the samples prior to dispatch. Scheduling information for the samples was confirmed with the laboratory via email.	

Chemical analysis has been undertaken by an accredited laboratory with the testing results summarised and discussed in Section 4 and the testing certificates included in APPENDIX VII.

Geotechnical samples were collected as required per location immediately after excavation, labelled and sealed to minimise moisture loss. The geotechnical samples were collected and couriered by a dedicated courier to an accredited geotechnical testing laboratory. The testing results are summarised and discussed in section 5 and the testing certificates are included in APPENDIX VIII.

3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 3.1.

Table 3.1 Summary of Strata

HOLE	DEPTH TO STRATUM (m bgl)		
	MADE GROUND	SOFT CLAY	FIRM TO VERY STIFF CLAY
TP/SA101	0.00–1.50		1.50–2.90
TP102	0.00–0.80	2.00–2.00	0.80–2.00
TP103	0.00–1.00		1.00–1.90
TP104	0.00–1.20		1.20–2.10
TP105	0.00–0.40		0.40–2.00
TP/SA106	0.00–1.20		1.20–2.40
TP107	0.00–1.00		1.00–2.00
TP108	0.00–1.80		1.80–2.30
TP/SA109	0.00–1.60	1.60–2.60	
TP110	0.00–1.50		1.50–2.00
TP111	0.00–1.00		
TP112	0.00–1.20		1.20–2.10
WS101	0.00–1.50		1.50–3.44
WS102	0.00–0.60		0.60–3.43
WS103	0.00–1.40		1.40–2.44
WS104	0.00–1.00		1.00–3.44
WS105	0.00–1.00		1.00–3.44
WS106	0.00–1.60		1.60–3.44
CP101	0.00–2.00	2.00–3.00	3.00–7.57
CP102	0.00–1.00		1.00–6.26

3.2. MADE GROUND

Made Ground deposits were encountered within all of the exploratory locations, to a maximum proven depth of 2.00 m bgl (CP101).

Reworked Topsoil was encountered in one location (TP105), at a depth ranging from ground level to 0.40 m bgl. The stratum consisted of slightly gravelly sandy clay, with gravel constituents of mudstone, sandstone, brick and wood.

Where hardstand surface is present (eighteen locations), Made Ground comprised an asphalt cover underlain by a TYPE 1 MOT sub-base of light grey sandy gravel, with gravel constituents comprised of

subangular to subrounded concrete and limestone. The sub-base was recorded to vary in thickness between 0.10 m to 0.40 m.

Generally, Made Ground underlying the sub-base/reworked topsoil consisted of slightly sandy slightly gravelly clay, with gravel constituents of mudstone, sandstone, brick and ceramic. Cobbles were occasionally encountered consisting of brick. The depths of this stratum ranged from 0.20 to 1.80 m bgl.

Locally, Made Ground comprised clayey sandy gravel with gravel constituents of mudstone, sandstone, brick, asphalt, concrete and plastic were encountered. The strata were recorded from depths ranging from 0.30 to 2.00 m bgl. Cobbles were encountered sporadically and generally consisted of bricks and concrete fragments.

Olfactory evidence of organic contamination was noted in four locations (TP101, TP107, TP108 and TP109), with an organic odour noted at depths between from 0.30 to 1.80 m bgl, generally encountered in the peripheral sections of the site, within the southeast and the southwest.

Additionally, localised brick fill was encountered in TP103 from 0.30 to 0.40 m bgl. The fill was recovered as reddish brown gravel, with gravel consisting of brick.

A Depth of Made Ground Plan is presented as Drawing 18-376-007 in APPENDIX IV.

3.3. TOPSOIL

Natural, undisturbed topsoil was not encountered during the investigation.

3.4. SUPERFICIAL GEOLOGY

Superficial deposits were encountered within all exploratory hole locations, with the exception of TP111 undertaken within the current embankment in the north of the site. Where encountered, superficial deposits were encountered at depths ranging between 0.40 m and in excess of 7.57 m bgl (limit of the investigation).

Superficial deposits were encountered as sandy gravelly CLAY with gravel constituents of mudstone and sandstone across the site. The soils were generally encountered to be in firm and stiff conditions with isolated occurrences of very stiff soils encountered.

Soft sandy CLAY was encountered in two locations (TP109 and CP101), at depths between 1.60 m to 3.00 m bgl.

3.5. SOLID GEOLOGY

The solid bedrock of the Chester Sandstone Formation was not encountered during the intrusive investigation, undertaken to a maximum depth of 7.57 m bgl. British Geological Society borehole data of the wider area record the top of bedrock at circa 30.00 m bgl.

3.6. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages is shown on the exploratory hole records in APPENDIX VI and are summarised in Table 3.2.

Table 3.2 Summary of Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)	OBSERVATIONS
TP102	1.80	Seepage within slightly sandy slightly gravelly CLAY
TP112	0.50	Seepage within MADE GROUND
WS106	0.50	Seepage within MADE GROUND

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free-phase hydrocarbon product, if present. These results are summarised in Table 4.8.

3.7. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Olfactory evidence of contamination was noted in four locations, summarised in Table 3.3.

Table 3.3 Summary of Visual and Olfactory Evidence of Contamination

LOCATION	DEPTH (m)	OBSERVATIONS
TP101	0.40 – 1.50	Organic Odour
TP107	0.90 – 1.00	Organic Odour
TP108	0.30 – 1.80	Organic Odour
TP109	0.30 – 1.60	Organic Odour

3.8. OBSTRUCTIONS

No sub-terranean obstructions that prevented the continuation of boreholes was encountered on site. However, within TP103 a brick fill layer was encountered between 0.30 m and 0.40 m bgl.

Obstructions are anticipated beneath the current structure in the northwest.

4. TIER 2 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 2 qualitative land risk assessment with respect to human health, controlled waters and ground gas to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. DEVIATING SAMPLES

Best practice sampling procedures including the use of appropriate sampling containers and adhering to the laboratory holding times for each contaminant analysis, were undertaken in order to avoid samples being deviating.

4.2. SAMPLE ANALYSIS POPULATION

Table 4.1 summarises the chemical analysis testing scheduled.

Table 4.1 Summary of Testing Schedule

TYPE OF SAMPLE	NUMBER OF SAMPLES	DETERMINANDS
Made Ground	5	Speciated PAH, pH, Total Metals, TOC, Speciated TPH
	5	Asbestos ID & Quantification
	1	Leachate
	1	Coal Tar
Natural CLAY	3	Speciated PAH, pH, Total Metals, TOC, Speciated TPH

4.3. HUMAN HEALTH RISK ASSESSMENT

At Tier 2 stage, the long-term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

Where Tier 2 screening values are not provided by LQM, other screening values have been used as referenced.

The Tier 2 screening values for residential with plant uptake have been utilised for this assessment due to the proposed development being a residential end-use. To remain conservative at an early stage, the screening values based on a 1% SOM have been utilised for this assessment.

The results of the comparison have been summarised in Table 4.2.

Table 4.2 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use (with plant uptake)

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PL	ASSESSMENT
Arsenic	mg/kg	37	8	37.00	TP/SA109 1.00	1	Further Action Required
Cadmium	mg/kg	11	8	1.00	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.0	8	<1.80	N/A	1	No Further Action
Lead	mg/kg	200	8	370.00 370.00 250.00	TP105 0.20 WS104 0.90 TP/SA109 1.00	1	Further Action Required
Mercury	mg/kg	1.2	8	0.70	N/A	4	No Further Action
Nickel	mg/kg	130	8	33.00	N/A	1	No Further Action
Selenium	mg/kg	250	8	1.70	N/A	1	No Further Action
Copper	mg/kg	2400	8	130.00	N/A	1	No Further Action
Zinc	mg/kg	3700	8	360.00	N/A	1	No Further Action
Cyanide – Total	mg/kg	791	8	1.00	N/A	1	No Further Action
Phenols – Total	mg/kg	120	8	<1.00	N/A	1	No Further Action
Asbestos	mg/kg	NFD	5	NFD	NFD	3	No Further Action
Naphthalene	mg/kg	2.3	8	0.88	N/A	4	No Further Action
Acenaphthylene	mg/kg	170	8	0.80	N/A	2	No Further Action
Acenaphthene	mg/kg	210	8	2.70	N/A	1	No Further Action
Fluorene	mg/kg	170	8	3.20	N/A	1	No Further Action
Phenanthrene	mg/kg	95	8	22.00	N/A	2	No Further Action
Anthracene	mg/kg	2400	8	5.50	N/A	2	No Further Action
Fluoranthene	mg/kg	280	8	28.00	N/A	2	No Further Action
Pyrene	mg/kg	620	8	28.00	N/A	2	No Further Action

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PL	ASSESSMENT
Benzo(a) Anthracene	mg/kg	7.2	8	12.00 7.50	WS104 0.90 TP105 0.20	2	Further Action Required
Chrysene	mg/kg	15	8	12.00	N/A	2	No Further Action
Benzo(b) Fluoranthene	mg/kg	2.6	8	16.00 7.90 6.90	WS104 0.90 TP105 0.20 TP/SA109 1.00	2	Further Action Required
Benzo(k) Fluoranthene	mg/kg	77	8	4.80	N/A	2	No Further Action
Benzo(a) Pyrene	mg/kg	2.2	8	12.00 6.50 5.50	WS104 0.90 TP105 0.20 TP/SA109 1.00	2	Further Action Required
Indeno (123-cd) Pyrene	mg/kg	27	8	6.00	N/A	2	No Further Action
Dibenzo (a,h) Anthracene	mg/kg	0.24	8	1.30 0.59 0.57	WS104 0.90 TP/SA109 1.00 TP105 0.20	2	Further Action Required
Benzo(ghi) Perylene	mg/kg	320	8	7.30	N/A	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	8	<0.1	N/A	4	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	8	<0.01	N/A	4	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	8	<0.02	N/A	4	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	8	9.30	N/A	4	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	8	27.00	N/A	4	No Further Action
TPH C16-21 (aromatic)*	mg/kg	260	8	68.00	N/A	1	No Further Action
TPH C21-35 (aromatic)*	mg/kg	1100	8	1700.00	TP107 0.20	1	Further Action Required
Coal Tar	Presence		1	Not Identified	N/A	N/A	No Further Action

Notes
PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas inhalation
Abbreviations: GAC = general assessment criteria, N = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; PL = Contaminant pathway of that contaminant.
**The Tier 2 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 2 values for aliphatic compounds for the volatile and semi-volatile fractions (C5-C12) and the Tier 2 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.*
***The Tier 2 GAC for lead has been taken from CL:AIRE C4SL.*
****USEPA Risk Management Levels*

Referring to Table 4.2, the result of this direct comparison indicates no exceedances of any contaminants of concern against the screening criteria for a residential end use with plant uptake and 1% SOM.

Inorganics

- Arsenic;
- Lead;

Organics

- Benzo(a)anthracene;
- Benzo(b)fluoranthene;
- Benzo(a)pyrene
- Dibenzo(a,h)anthracene
- TPH C21-C35 (Aromatic)

4.3.1. EXPOSURE PATHWAYS

The main exposure pathways based on the Tier 2 exceedances are:

- Soil ingestion and consumption of homegrown vegetables (PL1);
- Dermal contact and ingestion (PL2);

4.3.2. HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

Heavy Metals and Non-Volatile PAHs

Elevated concentrations of arsenic, lead, nickel, benzo(a)anthracene, benzo(b) fluoranthene, benzo(a) pyrene and dibenzo(a,h)anthracene have been identified in multiple locations across the site at varying depths throughout the Made Ground soil matrix.

Given the nature of the material, a point source of the elevated heavy metals and non-volatile PAH compounds can be attributed to a singular source and must therefore be considered site wide.

All of the identified elevated concentrations have primary exposure pathways related to soil ingestion and consumption of homegrown vegetables (PL1) dermal contact and ingestion of soils (PL2).

The risk to chronic human health associated with the elevated concentrations on inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils. Where roads, plots and hardstand is proposed, this will serve to cut the contamination pathway removing the risk to future end users.

The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy.

Non-Volatile TPH

With regards to elevated long chain TPHs (C21 – C35) a singular shallow exceedance of the GAC screening values was recorded within TP107 at 0.20 m bgl. Long chain hydrocarbons have primary exposure pathways related to soil ingestion and consumption of homegrown vegetables (PL1) and dermal contact and ingestion of soils (PL2).

The risk to chronic human health associated with the elevated concentrations on inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils.

The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy.

Asbestos

No asbestos has been identified in samples obtained to date.

Due to the age of the fills asbestos cannot be ruled out. If identified during the enabling works, asbestos impacted soils should be managed in accordance with the Asbestos Risk Conceptual Site Model (Figure 4.1).

Figure 4.1 Asbestos Risk Mitigation Conceptual Site Model



Notes

ND None Direct

0.001% Soils may contain <0.001% asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be a short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression) 0.1% Soils at a depth of > 1.00m bgl may contain <0.1% asbestos using composite testing where they will not be likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with Asbestos JIWG risk assessment tools.

Undefined – this will be dependent upon soils encountered during earthworks, which may be placed at these depths to ensure no potential risk to human health.

Topsoil and Subsoil

There are no suitable sources of topsoil available on-site.

Chemical analysis of the natural superficial deposits have not identified exceedances of the relevant GACs, as such, preliminary sampling indicates that these materials are suitable for re use as subsoil within proposed gardens and soft landscaping areas.

Imported topsoil and site won/imported subsoil for use in proposed gardens and soft landscaping areas will require chemical validation sampling during the enabling works phase in order to meet regulatory sampling frequencies.

4.4. CONTROLLED WATERS SENSITIVITY

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 4.3.

Table 4.3 Controlled Waters Conceptual Model and Sensitivity Profile

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground Made Ground has been identified site wide to a maximum proven depth of 2.00 m bgl, predominantly composed of reworked clay with areas of gravels. Chemical analysis of Made Ground soils has recorded minor elevated heavy metals, PAH and long chain hydrocarbons. Additional, organic odours have been noted in Made Ground soils across the south of the site, indicating potential organic impact. No significantly elevated compounds, volatile or mobile contamination has been identified within sampling to date.		Moderate
Pathway		
Vertical Migration The entirety of the site is underlain by homogenous cohesive Glacial Till. The cohesive drift will inhibit vertical migration to do the low permeability nature of the soils, offering protection to the underlying aquifer.		Low
Lateral Migration Isolated, discontinuous pockets of granular Made Ground have been recorded between cohesive Made Ground soils. As such, lateral migration of contaminants is considered limited due to the presence of cohesive Made Ground and superficial and deposits across the site, that will inhibit lateral flow.		Low
Receptors		
Aquifer Classification in Superficial Drift Deposits	Glacial Till – Secondary Undifferentiated Aquifer	Low
Aquifer Classification in Bedrock	Chester Sandstone Formation – Principal Aquifer	High
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected	Low
Distance to the closest Groundwater Abstraction Point	None identified within a 500 m radius.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	No	Low

DISCUSSION	SENSITIVITY RATING
The ICSM developed within the context of the site setting has identified the primary receptor for the site as the principal aquifer within the underlying bedrock. However, no significant and permanent sources of contaminants have been identified at the site. No viable sources for mobile contaminants or hydrocarbons, such as tanks, have been recorded within the data searches or encountered during the site investigation. This was supported by no exceedances of contamination identified during chemical analysis of soil samples taken from the site. Furthermore, there isn't a viable pollutant pathway due to the presence of cohesive material across the site offering protection from the downward migration of contaminants to the primary receptor. Lastly, given the absence of any nearby abstractions within the aquifer, the risk to controlled waters is significantly reduced.	

4.5. CONTROLLED WATERS RISK ASSESSMENT

The Tier 2 assessment, in line with LCRM (2023), has included a comparison of leachate analysis from samples of the Made Ground and groundwater samples to drinking water standards (DWS) and environmental quality standards (EQS).

DWS will be viewed as a priority given the pollutant linkage is with the underlying principal aquifer within the bedrock; however, where there are no regulatory guidance values for DWS, the EQS will be utilised in their absence.

Water samples were obtained utilising a bailer.

These are presented in Table 4.4.

Table 4.4 Comparison of Groundwater and Leachate Analysis with Tier 2 Screening Levels

DETERMINAND	UNIT	EQS AA 1,2	DWS 3,4	NO OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	NO OF LEACHATE SAMPLES	MAX CONC IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
Arsenic	µg/l	50	10	3	4.07	N/A	1	1.6	N/A	No Further Action
Cadmium	µg/l	0.08-0.25	5	3	0.05	N/A	1	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	–	3	<5.0	N/A	1	<5.0	N/A	No Further Action
Chromium (III)	µg/l	4.7	50	3	6.3	EQS – WS104	1	<0.4	N/A	Further Assessment
Copper	µg/l	1	2000	3	3	EQS – WS104	1	8.1	EQS – WS106 0.30m	Further Assessment
Total Cyanide	µg/l	1	50	3	<1.0	N/A	1	<1.0	N/A	No Further Action
Lead	µg/l	1.2	10	3	0.3	N/A	1	<1.0	N/A	No Further Action
Mercury	µg/l	–	1.0	3	0.12	N/A	1	<0.5	N/A	No Further Action
Nickel	µg/l	4	20	3	4.3	EQS – CP101	1	1.4	N/A	Further Assessment
Selenium	µg/l	–	10	3	18	DWS – WS104	1	<4.0	N/A	Further Assessment
Zinc	µg/l	10.9	–	3	6.2	N/A	1	11	EQS – WS106 0.30m	No Further Action
pH		6–9		3	7.5	N/A	1	7.7	N/A	No Further Action
Polycyclic Aromatic Hydrocarbons										
Naphthalene	µg/l	2	10*	3	0.82	N/A	1	<0.01	N/A	No Further Action
Anthracene	µg/l	0.1		3	0.7 0.27	EQS – CP101 EQS – WS106	1	<0.01	N/A	Further Assessment
Benzo (b) Fluoranthene	µg/l	0.00017*		3	1.4 1	EQS – WS106 EQS – CP101	1	<0.01	N/A	Further Assessment
Benzo (k) Fluoranthene	µg/l	0.00017*		3	0.62 0.54	EQS – WS106 EQS – CP101	1	<0.01	N/A	Further Assessment

DETERMINAND	UNIT	EQS AA 1,2	DWS 3,4	NO OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	NO OF LEACHATE SAMPLES	MAX CONC IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
Benzo (a) Pyrene	µg/l	0.00017*		3	0.97 1.3	EQS – WS106 EQS – CP101	1	<0.01	N/A	Further Assessment
Indeno(123-cd)pyrene	µg/l	0.00017*		3	0.42 0.52	EQS – WS106 EQS – CP101	1	<0.01	N/A	Further Assessment
Fluoranthene	µg/l	0.0063		3	0.48 0.52	EQS – WS106 EQS – CP101	1	<0.01	N/A	Further Assessment
Benzo(ghi) Perylene	µg/l	1.7–4		3	0.52	N/A	1	<0.01	N/A	No Further Action
Aromatic Hydrocarbon										
TPH C5-C7 (Benzene)	µg/l	10	1	3	<1.0	N/A	1	<1.0	N/A	No Further Action
TPH C7-C8 (Toluene)	µg/l	74	700	3	<1.0	N/A	1	<1.0	N/A	No Further Action
TPH C8-C10 (Xylene)	µg/l	30	300	3	6.5	N/A	1	<1.0	N/A	No Further Action
TPH C10-C12 (Naphthalene)	µg/l	2	90	3	10	EQS – WS106	1	<10	N/A	No Further Action
TPH C12-C16	µg/l	-	90	3	13	N/A	1	<10	N/A	No Further Action
TPH C16-C35	µg/l	-	90	3	40	N/A	1	<10	N/A	No Further Action
Aliphatic Hydrocarbon										
TPH C5-C6	µg/l	–	10005	3	<1.0	N/A	1	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	–	10005	3	<1.0	N/A	1	<1.0	N/A	No Further Action
TPH C8-C10	µg/l	–	300	3	<1.0	N/A	1	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	–	300	3	<10	N/A	1	<10	N/A	No Further Action
TPH C12-C16	µg/l	–	300	3	49	N/A	1	<10	N/A	No Further Action

DETERMINAND	UNIT	EQS AA 1,2	DWS 3,4	NO OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	NO OF LEACHATE SAMPLES	MAX CONC IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
TPH C16-C21	µg/l	–	300**	3	85	N/A	1	<10	N/A	No Further Action
TPH C21-C35	µg/l	–	300**	3	360	DWS – WS106	1	<10	N/A	Further Assessment

#Solubility <0.01µg/l

AA – Annual Average

**Polyaromatic hydrocarbons (PAH) – Benzo(a)pyrene (BaP), Benzon(b)fluoranthene,*

Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water.

***There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.*

1. *The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (legislation.gov.uk)*
2. *The Water Supply (Water Quality) Regulation 2018 (legislation.gov.uk)*
3. *Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum (who.int)*
4. *CL:AIRE publishes Petroleum Hydrocarbons in Groundwater guidance (claire.co.uk)*
5. *A total TPH criteria of 1000 mg/kg will act as a surrogate criterion for remaining aliphatic and aromatic TPH fractions.*

This comparison indicates that the data exceed the EQS and DWS values for the following inorganic compounds:

TABLE 4.5 SUMMARY OF CONTROLLED WATERS RISK ASSESSMENT EXCEEDANCE OF EQS	EXCEEDANCE OF DWS
Groundwater • Chromium (III) – 6.3 µg/l – WS104 • Copper – 3.0 µg/l – WS104 • Nickel – 4.3 µg/l – CP101 • Anthracene – 0.7 µg/l – CP101 – 0.27 µg/l – WS106 • Benzo(b)Fluoranthene – 1.40 µg/l – WS106 – 1.00 µg/l – CP101 • Benzo(k)Fluoranthene – 0.62 µg/l – WS106 – 0.54 µg/l – CP101 • Benzo(a)Pyrene – 0.97 µg/l – WS106 – 1.30 µg/l – CP101 • Indeno(123-cd)pyrene – 0.42 µg/l – WS106 – 0.52 µg/l – CP101 • Fluoranthene – 0.48 µg/l – WS106 – 0.52 µg/l – CP101 **Leachate** • Copper – 8.10 µg/l – WS106 0.30 m • Zinc – 11 µg/l – WS106 0.30 m	**Groundwater** • Selenium – 18 µg/l – WS104 • TPH C21-35 - 360 µg/l – WS106 **Leachate** • N/A

It should be noted that leaching tests were undertaken alongside groundwater testing. The leachate test is aggressive (de-ionised water) and is not in aqueous equilibrium (steady state) within the solid sample. This may cause rapid dissolution and overestimation of the aqueous phase concentrations compared to groundwater in contact with contaminated soils.

4.5.1. DISCUSSION OF CONTROLLED WATERS RISK ASSESSMENT

Heavy Metals
Marginal exceedance of chromium (III), copper and nickel have been identified in shallow groundwater samples when compared to the EQS values.

Marginally elevated concentrations of copper have been identified in both groundwater and leachate samples when screened against the conservative EQS value of 1 µg/l.

Marginally elevated concentrations of selenium have been identified in one shallow groundwater sample (WS106) when screened against the DWS value of 10 µg/l.

Polycyclic Aromatic Hydrocarbons
Five PAHs have been noted as marginally exceeding the EQS values due to low thresholds of between 0.00017–0.0063 µg/l.

The maximum concentration of these five PAHs is benzo(b)fluoranthene within WS106, with a concentration of 1.40 µg/l, which is still well below the DWS value for all PAHs at 10.0 µg/l.

Total Petroleum Hydrocarbons
Marginally elevated concentrations of TPH C21-35 have been identified in one shallow groundwater sample (WS106) when screened against the DWS value of 300 µg/l.

Discussion
Shallow perched groundwater has recorded low level impact of PAH, heavy metals and long chain hydrocarbons. It is noted that the impacted groundwater records similar elevations to Made Ground soil data, and as such, low level leaching of contaminants from within the site wide Made Ground is the likely contamination source of perched groundwater. However, only minor copper and zinc exceedances were recorded within leachate samples, indicating that the leaching of contaminants has been historic with most of the mobile contamination now depleted.

It should be noted that while there have been several exceedances, they have been marginal. PAHs, copper, chromium (III), nickel and zinc have only exceeded EQS values, when the DWS values have been viewed as a priority given the primary pollutant receptor has been identified as the principal aquifer within the underlying bedrock. Given the absence of surface water features on, or within influencing distance of the site, low level impact of the aforementioned contaminants within the perched, discontinuous groundwater are not considered to pose a risk to controlled water receptors.

Minor exceedance of DWS have been recorded within shallow perched groundwater for selenium and long chain hydrocarbons (non-volatile). The site is not located within Groundwater Source Protection Zone or a Drinking Water Safeguard Zone. In addition, there are no active groundwater, surface water, or potable abstraction points within a 2 km radius of the site. Permeability testing has shown that the overlying drift deposits have low rates of permeability, limiting vertical migration to the underlying principal bedrock aquifer.

Taking the above into account, it is considered that the risk to sensitive controlled water receptors or future end users is low.

4.6. GROUND GAS RISK ASSESSMENT

4.6.1. RATIONALE

Hazardous ground gas qualitative risk assessment is based on a conceptual site model (CSM) similar to that used for soil and groundwater contamination sources (i.e., source pathway receptor pollutant linkages).

The risk can be assessed based on knowledge of the ground conditions and CSM and a measure of hazardous gas concentrations and gas flow at the site within monitoring standpipes.

4.6.1. SOURCES AND PATHWAYS OF GROUND GAS

Table 4.6 summarises the potential sources and pathways of ground gas within the context of the recorded site setting and proposed development.

Table 4.6 Identified Potential Sources of Ground Gas

SOURCE
Made Ground Made Ground has been identified across the site from ground level to depths between approximately 0.40 m and 2.00 m below ground level (bgl), predominantly comprising sandy gravel underlying areas of asphalt hardstanding. Putrescible material within the Made Ground was limited, with only minor fragments of wood recorded within TP105 between 0.00 m and 0.40 m bgl. Notwithstanding this, a localised organic odour was noted within Made Ground soils across the southern part of the site. This is considered indicative of low concentrations of degraded organic matter rather than significant accumulations of actively decomposing material. No evidence of volatile contamination has been identified during the course of the investigation, and no elevated ground gas concentrations have been recorded. Given the relatively shallow thickness of the Made Ground and the limited presence of putrescible material, the strata is not considered capable of generating significant quantities of ground gas. In particular, the absence of widespread biodegradable organic matter limits the potential for sustained microbial activity required for the generation of methane and carbon dioxide. The site is understood to have historically comprised a shallow boating lake that was infilled approximately 50 years ago. Such features are not typically associated with significant ground gas risk for several reasons: Shallow lakes generally accumulate only limited volumes of organic sediment compared to deeper water bodies, restricting the availability of biodegradable material. Any organic matter present at the time of infilling would have undergone decomposition relatively rapidly following burial. Given the elapsed time period (circa five decades), any biodegradable fraction would now be largely depleted. Methane generation from organic material follows a declining trend over time, with peak generation typically occurring within the first few years to decades after burial. After 50 years, gas production potential is expected to be negligible. The observed Made Ground composition (predominantly sandy gravel) is relatively granular and free-draining, which is not conducive to the preservation of anaerobic conditions required for ongoing methanogenic activity.

Accordingly, the former lake infill is not considered to represent a credible or ongoing source of ground gas.

Should any localised pockets of organic or putrescible material associated with the former lake bed be encountered during construction, these could present a short-term, localised source of ground gas. However, such materials would be readily identifiable during earthworks and can be removed through targeted excavation and appropriate disposal.

Following the removal of any such materials, the residual risk associated with ground gas generation would be negligible, and no further gas protection measures would be required beyond standard good construction practice.

Superficial Strata

Superficial deposits were encountered within the majority of exploratory hole locations between 0.40 and in excess of 7.57 m bgl.

Superficial deposits were encountered as sandy gravelly CLAY with gravel constituents of mudstone and sandstone across the site. No organic soils that would provide a gas source have been encountered.

Additionally, due to the low permeability nature of the superficial soils, gas migration will be restricted.

Bedrock Strata

The Chester Sandstone Formation is not considered a ground gas source.

Landfill Sites

There are no active landfills within a 2 km radius of the site boundary, there is, however, one historical landfill recorded by the EA within 250 m of the site that accepted household waste.

There are no active licensed waste sites within a 2 km radius, and no historic waste sites within a 250 m radius of the site.

Landfill gas migration beneath the site is unlikely, given the low permeability nature of the underlying superficial deposits and distance to the source (246 m).

Other Gases

The BGS report records indicates the site is situated in an area where less than 1% of homes are above the “Action Level”. Therefore, full radon protective measures are not necessary for the construction of new dwellings or extensions, and as such, no further assessment is required.

No vapour source or impact has been recorded on site.

4.6.2. MONITORING FREQUENCY

The CIRIA C665 guidance on gas risk assessment includes recommendations for frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source.

The proposed development comprises private residential properties, which would be classified as a Type A development (high sensitivity) in accordance with BS8485:2015+A1:2019. However, it is considered that the likely generation potential of the identified gas sources (taking into account the likelihood of future increases in gas generation) would be best classified as low.

Therefore, within the context of the proposed residential end-use and ground gas generation potential, the gas assessment requires six visits over three months, with at least two sets of readings at low or falling atmospheric pressure.

4.6.3. GROUND GAS RISK ASSESSMENT METHODOLOGY

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in:

- CIRIA Report 665 – Assessing risks posed by hazardous ground gases to buildings (2007).
- BS8485:2015+A1:2019 – Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
- CL:AIRE Publication "Good Practice for Risk Assessment for Coal Mine Gas Emissions" (October 2021).

BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation (CS) and the proposed development based on building type.

Therefore, in accordance with BS8485, based on the measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) shall be derived for each monitoring point, from which the site characteristic hazardous gas flow rate (Q_{hgs}), and then the Characteristic Situation (CS) can be determined.

The following equation should be utilised:

$$Q_{hg} = q\left(\frac{C_{hg}}{100}\right)$$

Where:

q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe.

Chg is the measured hazardous gas concentration (in percentage volume/volume).

The subsequent derived gas screening value (GSV) should be the maximum Q_{hg} (flow rate x concentration as a percentage volume) for all the monitoring events.

A 'worst case check' may be carried out using the maximum recorded flow in any hole with the maximum concentration in any hole with the maximum concentration in any hole to present the plausible worst case conditions. Adoption of the worst-case Qhg requires thorough justification and reference to the CSM.

The final derived GSV can then be used to characterise the site as summarised in Table 4.7

Table 4.7 Site Characterisation by GSV (BS8485:2015+A1:2019)

CS	HAZARD POTENTIAL	GSV (L/HR) FOR METHANE AND CARBON DIOXIDE	ADDITIONAL FACTORS
CS1	Very Low	< 0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	< 0.70	Typical measured flow rate <70 l/h (otherwise consider an increase to CS3)
CS3	Moderate	< 3.5	N/A

CS4	Moderate to High	< 15	N/A
CS5	High	< 70	N/A
CS6	Very High	> 70	N/A

Notes

1) The CS is equivalent to the characteristic GSC in CIRIA C665.
2) The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter should be considered.
3) Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, multiplied by the concentration in the air stream of the particular gas being considered.
4) The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

It should be noted that in the first instance, this assessment has been carried out in accordance with BS8485:2015+A1(2019) and the thresholds given therein.

4.6.4. MONITORING FREQUENCY

Concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) were measured using a calibrated infrared gas analyser (GFM435) with gas flow rates measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 300 seconds (5 minutes) at each location, increasing to 600 seconds if elevated concentrations identified, at which points the maximum concentration of CH_4 and CO_2, together with the lowest concentration of O_2 were recorded.

The results of the ground gas monitoring are presented in Table 4.8.

In addition to the raw data, results for each individual standpipe have been assessed with reference to guidance provided in BS8485:2015+A1:2019. Based on the initial peak measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) have been derived for each monitoring point, from which an individual Characteristic Situation (CS) can be determined.

4.6.5. SUMMARY OF MONITORING RESULTS

Table 4.8 presents the ground gas and groundwater monitoring results.

Table 4.8 Summary of Ground Gas Monitoring Results

WELL	STRATA	DATE	CH_4 PEAK (%V/V)	CH_4 STEADY (%V/V)	CH_4 Q_{hg} (l/hr)	CO_2 PEAK (%V/V)	CO_2 STEADY (%V/V)	CO_2 Q_{hg} (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
CP101	Sandy Gravelly CLAY	15/12/2025	0.1	0.1	0.0001	0.3	0.1	0.0003	18.6	1004	Rising	0.1	0.1	4.00–7.00	6.97	4.23
		13/01/2026	0.1	0.1	0.0001	3.7	3.3	0.0037	14.2	1006	Rising	0.1	0.1		6.97	4.22
		03/02/2026	0.1	0.1	0.0001	2.9	2.8	0.0029	16.4	996	Falling	0.1	0.1		6.95	4.22
		03/03/2026	0.1	0.1	0.0001	2.3	2.3	0.0023	17.4	994	Rising	0.1	0.1		6.95	4.21
		10/03/2026	0.1	0.1	0.0001	3.4	3.4	0.0034	16.8	999	Falling	0.1	0.1		6.95	4.21
		16/03/2026	0.1	0.1	0.0001	2.8	2.8	0.0028	17.7	1003	Steady	0.1	0.1		6.95	4.22
CP102	Sandy Gravelly CLAY	15/12/2025	0.1	0.1	0.0001	5.4	5.3	0.0054	12.0	1002	Rising	0.1	0.1	2.00–6.00	6.10	Dry
		13/01/2026	0.1	0.1	0.0001	4.8	4.8	0.0048	13.2	1004	Rising	0.1	0.1		6.08	6.00
		03/02/2026	0.1	0.1	0.0001	3.4	3.4	0.0034	15.4	992	Falling	0.1	0.1		6.08	6.00
		03/03/2026	0.1	0.1	0.0001	2.2	2.2	0.0022	16.3	994	Rising	0.1	0.1		6.08	6.00
		10/03/2026	0.1	0.1	0.0001	3.0	3.0	0.0003	15.9	999	Falling	0.1	0.1		6.08	6.00
		16/03/2026	0.1	0.1	0.0001	2.3	2.3	0.0023	18.3	1003	Steady	0.1	0.1		6.08	6.00
WS101	MADE GROUND	15/12/2025	0.1	0.1	0.0001	0.1	0.1	0.0001	19.7	1002	Rising	0.1	0.1	0.50–1.00	1.03	**0.52**
		13/01/2026	0.1	0.1	0.0001	0.6	0.6	0.0006	20.0	1006	Rising	0.1	0.1		1.03	**0.52**
		03/02/2026	0.1	0.1	0.0001	1.2	1.1	0.0012	19.5	997	Falling	0.1	0.1		1.00	**0.52**
		03/03/2026	0.1	0.1	0.0001	0.6	0.6	0.0006	19.9	995	Rising	0.1	0.1		1.00	**0.51**
		10/03/2026	0.1	0.1	0.0001	0.1	0.1	0.0001	18.5	1000	Falling	0.1	0.1		1.00	**0.51**

WELL	STRATA	DATE	CH_4 PEAK (%V/V)	CH_4 STEADY (%V/V)	CH_4 Q_{hg} (l/hr)	CO_2 PEAK (%V/V)	CO_2 STEADY (%V/V)	CO_2 Q_{hg} (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	MADE GROUND	16/03/2026	0.1	0.1	0.0001	1.3	1.3	0.0013	19.9	1003	Steady	0.1	0.1	0.50–1.00	1.00	**0.50**
WS102	Sandy Gravelly CLAY	15/12/2025	0.1	0.1	0.0001	2.2	2.2	0.0022	16.3	1002	Rising	0.1	0.1	1.00–3.00	2.93	2.70
		13/01/2026	0.1	0.1	0.0001	1.7	1.7	0.0017	18.3	1006	Rising	0.1	0.1		2.93	2.68
		03/02/2026	0.1	0.1	0.0001	0.8	0.8	0.0008	20.2	997	Falling	0.1	0.1		2.95	2.67
		03/03/2026	0.1	0.1	0.0001	1.3	1.3	0.0013	19.4	995	Rising	0.1	0.1		2.95	2.66
		10/03/2026	0.1	0.1	0.0001	2.0	2.0	0.0020	18.1	1000	Falling	0.1	0.1		2.95	2.65
		16/03/2026	0.1	0.1	0.0001	1.4	1.4	0.0014	19.8	1003	Steady	0.1	0.1		2.95	2.65
WS103	MADE GROUND	15/12/2025	0.1	0.1	0.0001	0.1	0.1	0.0001	20.4	1004	Rising	0.1	0.1	0.50–1.00	0.85	**0.45**
		13/01/2026	0.1	0.1	0.0001	2.6	2.5	0.0026	18.9	1007	Rising	0.1	0.1		0.85	**0.45**
		03/02/2026	0.1	0.1	0.0001	1.4	1.4	0.0014	19.1	998	Falling	0.1	0.1		0.85	**0.45**
		03/03/2026	0.1	0.1	0.0001	1.0	1.0	0.0010	19.6	995	Rising	0.1	0.1		0.85	**0.45**
		10/03/2026	0.1	0.1	0.0001	1.5	1.5	0.0015	19.0	1001	Falling	0.1	0.1		0.85	**0.45**
		16/03/2026	0.1	0.1	0.0001	1.0	1.0	0.0001	20.1	1003	Steady	0.1	0.1		0.85	**0.45**
WS104	Sandy CLAY	15/12/2025	0.1	0.1	0.0001	0.6	0.6	0.0006	15.1	1003	Rising	0.1	0.1	1.00–3.00	2.96	**1.00**
		13/01/2026	0.1	0.1	0.0001	1.0	1.0	0.0010	17.0	1007	Rising	0.1	0.1		2.96	**1.06**
		03/02/2026	0.1	0.1	0.0001	0.7	0.7	0.0007	19.7	996	Falling	0.1	0.1		2.96	**1.05**
		03/03/2026	0.1	0.1	0.0001	1.6	1.6	0.0016	19.2	994	Rising	0.1	0.1		2.95	**1.05**

WELL	STRATA	DATE	CH_4 PEAK (%V/V)	CH_4 STEADY (%V/V)	CH_4 Q_{hg} (l/hr)	CO_2 PEAK (%V/V)	CO_2 STEADY (%V/V)	CO_2 Q_{hg} (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS104	Sandy CLAY	10/03/2026	0.1	0.1	0.0001	2.0	2.0	0.0020	18.8	999	Falling	0.1	0.1	1.00–3.00	2.95	1.05
		16/03/2026	0.1	0.1	0.0001	1.7	1.7	0.0017	19.6	1003	Steady	0.1	0.1		2.95	1.05
WS105	MADE GROUND	15/12/2025	0.1	0.1	0.0001	0.3	0.2	0.0003	20.0	1003	Rising	0.1	0.1	0.50–1.00	0.93	0.60
		13/01/2026	0.1	0.1	0.0001	0.6	0.5	0.0006	19.7	1007	Rising	0.1	0.1		0.95	0.62
		03/02/2026	0.1	0.1	0.0001	1.5	1.5	0.0015	19.0	997	Falling	0.1	0.1		0.94	0.62
		03/03/2026	0.1	0.1	0.0001	0.5	0.5	0.0005	20.3	996	Rising	0.1	0.1		0.94	0.62
		10/03/2026	0.1	0.1	0.0001	0.9	0.9	0.0009	19.8	1001	Falling	0.1	0.1		0.94	0.62
		16/03/2026	0.1	0.1	0.0001	0.4	0.4	0.0004	20.4	1003	Steady	0.1	0.1		0.95	0.63
WS106	Sandy Gravelly CLAY	15/12/2025	1.6	1.6	0.0016	1.7	1.7	0.0017	15.9	1004	Rising	0.1	0.1	2.00–3.00	2.80	0.22
		13/01/2026	7.0	5.0	0.0070	1.2	0.8	0.0012	15.1	1005	Rising	0.1	0.1		2.80	0.42
		03/02/2026	13.3	12.0	0.0133	1.5	1.3	0.0015	16.3	994	Falling	0.1	0.1		2.8	0.40
		03/03/2026	20.3	19.0	0.0203	0.8	0.7	0.0008	20.1	996	Rising	0.1	0.1		2.80	0.40
		10/03/2026	24.1	23.0	0.0241	1.3	1.2	0.0013	19.5	1001	Falling	0.1	0.1		2.80	0.40
		16/03/2026	18.3	17.0	0.0183	0.9	0.8	0.0009	19.6	1003	Steady	0.1	0.1		2.80	0.38

Notes

CIRIA Characteristic Situation		Q_{hg}		
	CS1	*<0.07*	*Typical Max CO2 <5 % Typical Max CH4 <1 %*	*Values in BOLD exceed CS1 Thresholds*
	CS2	*<0.7*	*Flow rate not to exceed 70 l/hr otherwise consider increase to CS3*	*Values in BLUE denote water above level of response zone (flooded)*
	CS3	*<3.5*		
	CS4	*<15*	*Quantitative Risk Assessment required to evaluate scope of protective measures*	

4.6.6. GROUNDWATER

During the monitoring period, groundwater was encountered at variable depths ranging from 0.22 m to 6.00 m bgl. Levels fluctuated across the Site without a clear spatial pattern, providing further evidence of a discontinuous perched groundwater regime within the granular Made Ground. Overall, groundwater levels remained relatively stable throughout the monitoring period, with no significant temporal variation observed.

Four of the monitoring wells have recorded water above the response zone and being classed as flooded (WS101, WS103, WS104 and WS106). Data from flooded well locations is not reliable and will be excluded from the final assessment.

Due to the predominantly low permeability cohesive drift stratum, it is likely that water levels are representative of perched groundwater collecting within the standpipes and may not a true representation of groundwater.

4.6.7. BAROMETRIC PRESSURE

Visit 1 and 2 and 4 have been undertaken during a period of rising pressure, with atmospheric pressures recorded between 1002 m bar and 1004 m bar during visit one, 1004 m bar to 1007 m bar during visit 2 and 994 m bar to 996 m bar during visit four.

Visit 3 and 5 have been undertaken during a period of falling pressure, with atmospheric pressures recorded between 994 m bar and 998 mbar during visit three and 999 m bar and 1000 m bar during visit five.

Visit 6 was undertaken during a period of steady pressure, with atmospheric pressure of 1003 m bar recorded during the visit.

Across the monitoring period, a representative range of atmospheric pressure conditions was recorded. Atmospheric pressure varied from a high of 1007 mbar (Visit 2) to a low of 994 mbar (Visit 3). On this basis, the monitoring is considered to have captured an appropriate range of pressure regimes, and no further monitoring visits are considered necessary.

4.6.8. GAS FLOW

Throughout the monitoring period, flow rates were recorded to be 0.1 l/hr (limit detection of the analyser).

4.6.9. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.1% v/v (limit of detection of the analyser) for most locations, with the exception of WS106, which recorded elevated methane on all occasions. Methane values within WS106 were recorded between 1.6 % v/v and 24.1 % v/v, generally increasing over time. However, this location was significantly flooded during the monitoring period, with groundwater levels recorded approximately 1.60–1.78 m above the response zone. Under these conditions, the well is considered to be hydraulically compromised, preventing representative ground gas ingress and resulting in unreliable measurements.

Furthermore, there are no identifiable plausible sources of ground gas in the vicinity of this monitoring location to support the elevated concentrations recorded. On this basis, the data from this monitoring location is considered invalid and has been excluded from the quantitative ground gas assessment.

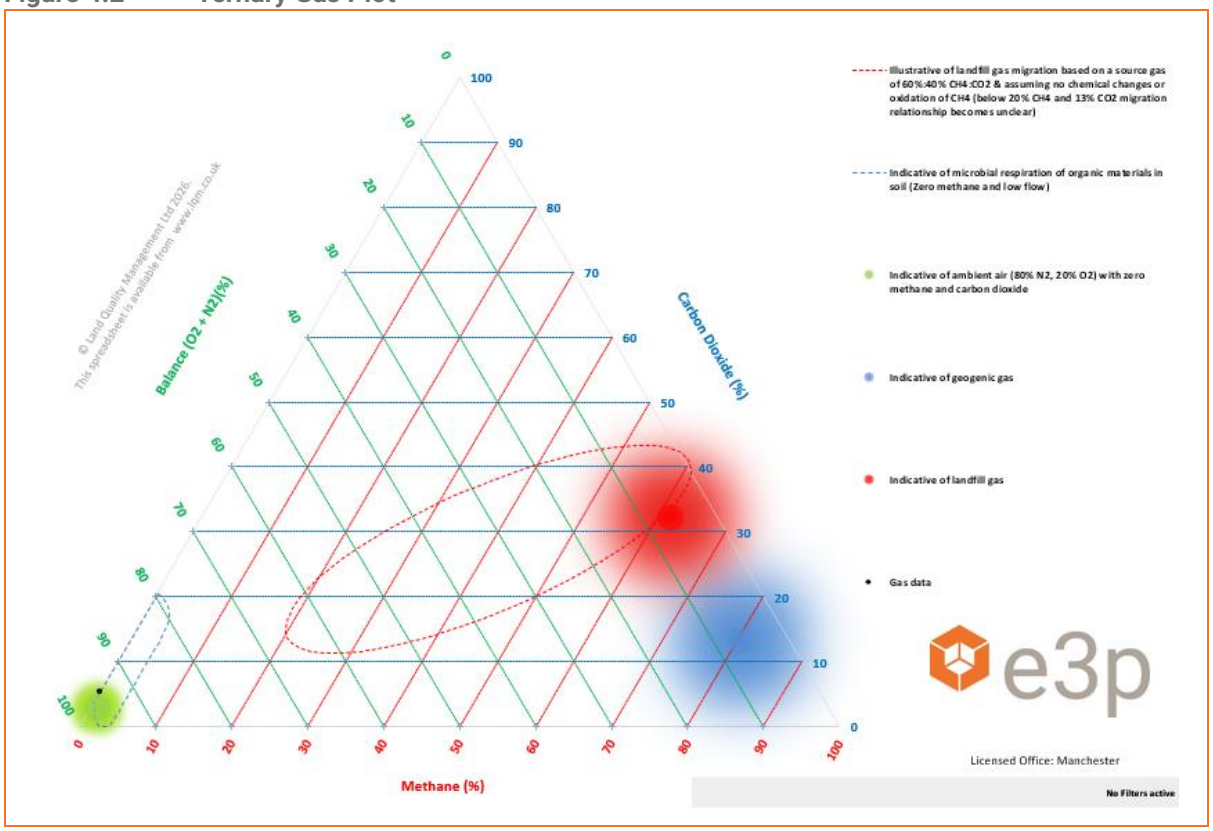
Carbon dioxide concentrations were recorded at concentrations ranging from 0.1% v/v (limit of detection of the analyser) to 5.40 % v/v (CP102).

4.6.10. TERNARY PLOT FOR GROUND GAS

A ternary gas plot is a triangular plot of three variables which equal 100%. They allow the composition of gas to be identified and can help identify the potential source of gas. As carbon dioxide is present in natural soils (such as Glacial Till), this can lead to uncertainty about whether it is necessary to increase the gas regime. On this basis, a ternary plot has been used as an assessment tool for the gas monitoring data to identify if there is a true risk in locations where carbon dioxide has been recorded above the CS1 threshold of 5% (CP102, Visit 1).

Figure 4.2 shows the ternary gas plot for the gas monitoring data.

Figure 4.2 Ternary Gas Plot



Carbon dioxide concentrations marginally elevated within CP102 during Visit 1 fall within the range typically associated with ambient air mixing and are consistent with levels generated by microbial degradation of minor organic material, as evidenced by the absence of methane and low gas flow rates. This aligns with the conceptual site model (CSM), which does not identify a significant gas source, with only occasional, limited putrescible material (e.g. wood fragments) encountered.

Furthermore, the shallow and limited extent of the Made Ground reduces its potential to act as a significant gas source. Following targeted remediation and removal of any organic material, the residual risk is considered negligible.

No evidence of a geogenic or landfill gas source has been identified.

4.6.11. RADON RISK

The site is situated in an area where less than 1% of homes are above the “Action Level” and that the BGS reports that full radon protective measures are not necessary for the construction of new dwellings or extensions.

4.6.12. CONCLUSION

The determined Characteristic Situation for each standpipe for each visit is summarised in Table 4.9 utilising a "worst-case scenario" for each location.

Table 4.9 Gas Profile and Location

WELL	MAX FLOW (l/hr)	MAX CH4 (%V/V)	MAX CH4 QHG (l/hr)	MAX CO2 (%V/V)	MAX CO2 QHG ((l/hr))	CHARACTERISTIC SITUATION
CP101	0.1	0.1	0.0001	3.7	0.0037	CS1
CP102	0.1	0.1	0.0001	**5.4**	0.0054	**CS2**
WS101	Well Flooded					N/A
WS102	0.1	0.1	0.0001	2.2	0.0022	CS1
WS103	Well Flooded					N/A
WS104	Well Flooded					N/A
WS105	0.1	0.1	0.0001	1.7	0.0017	CS1
WS106	Well Flooded					N/A

E3P have assessed the previous variables and come to the following conclusions:

- Made Ground deposits were identified within each exploratory hole location advanced on the site to a maximum proven depth of 2.00 m bgl.
- Unflooded monitoring wells generally classify as Characteristic Situation (CS)1 – Very Low Gas Risk. With all GSVs across the site remaining within CS1 classification.
- Marginal exceedance of CS1 carbon dioxide threshold (5%) recorded on one occasion within CP102 (5.4 % v/v – Visit 1). The ternary plot indicates this falls within the range typically associated with ambient air mixing and are consistent with levels generated by microbial degradation of minor organic material, as evidenced by the absence of methane and low gas flow rates. This aligns with the conceptual site model (CSM), which does not identify a significant gas source, with only occasional, limited putrescible material (e.g. wood fragments) encountered.
- Following targeted remediation and removal of any organic material, the residual risk is considered negligible.
- No evidence of a geogenic or landfill gas source has been identified.
- No radon risk has been identified on site.
- The Site Conceptual Site Model (CSM) has not identified a risk associated with volatile vapours.
- In the absence of a significant gas source, GSVs falling within CS1 classification and following remediation and enabling works removing any residual organic materials, it is considered that no future risk of hazardous ground gas is present on site and the site falls within CS1 – no gas protection measures required.

Based on the findings of the ground gas monitoring and the updated Conceptual Site Model (CSM), the site is characterised by very low gas generation potential. Measured Gas Screening Values (GSVs) are consistently within Characteristic Situation 1 (CS1), with only a marginal and isolated exceedance of carbon dioxide recorded, which is considered to be attributable to minor microbial degradation of limited organic matter rather than an active or significant gas source.

The identified Made Ground, including material associated with the infilled former shallow boating lake, will be subject to excavation and remediation as part of the proposed geotechnical earthworks. This

process will involve the controlled stripping, reworking, and/or removal of unsuitable or deleterious materials to achieve the required engineering specification. Through these works, any localised pockets of organic or putrescible material will be identified during excavation and removed or appropriately treated.

Given the age of the former lake infill (circa 50 years), the limited thickness of Made Ground, the predominantly granular composition, and the absence of a viable long-term gas generation mechanism, the infill does not represent a credible ongoing source of ground gas. Furthermore, the proposed remediation strategy will effectively eliminate any residual, localised sources that could give rise to short-term gas generation.

Accordingly, upon completion of the remediation and earthworks, the site will not present a risk from hazardous ground gases. The development is therefore appropriately classified as Characteristic Situation 1 (CS1), and no specific gas protection measures are required in accordance with current guidance. Standard good construction practice should be adopted throughout.

It is recommended that the findings of this assessment and the proposed remediation approach are agreed with the Local Authority to support discharge of planning conditions and formal acceptance of the ground gas risk classification.

4.7. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication “Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites.”

Table 4.10 Pipeline Selection Assessment

CONTAMINANT GROUP	PE THRESHOLD (mg/kg)	CONCENTRATIONS AT CURRENT PIPELINE DEPTH (mg/kg)
Total VOC	0.5	N/A
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	9.9 - 27
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	82 - 220
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	N/A
Ethers*	0.5	N/A
Nitrobenzene*	0.5	N/A
Ketones*	0.5	N/A
Aldehydes*	0.5	N/A
Amines	Fail	N/A
Other Considerations		

Are there any exceedances of the PE threshold outside of the pipeline depth?	Yes: TPH C12-C16: 24 mg/kg, 0.20 m bgl (TP105) TPH C21-C35: 1700 mg/kg, 0.20 m bgl (TP107) TPH C35-C40: 1300 mg/kg, 0.20 m bgl (TP107)
Is free product present in soil and groundwater?	Long chain hydrocarbons TPH C21-35 have exceeded DWS standards within WS106 (360 µg/l0. However, no free product was identified.
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	No
Will soils impacted with above determinands likely be utilised elsewhere on site?	No
Will soils be imported to site as part of any future earthworks?	To be confirmed.

Notes – pipe line depth normally between 0.75m – 1.35 m

Based on the assessment of current site conditions, it is likely that barrier pipe will be required for the proposed development. However, this will need to be confirmed with a UKWIR risk assessment post-remediation. Post-remediation and enabling works ground conditions may be different from those identified during this intrusive ground investigation.

4.8. DEVELOPED CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 4.11 has been prepared for the site.

Table 4.11 Developed Conceptual Site Model

CONTAMINANT SOURCE	MIGRATION PATHWAY	RECEPTOR
HUMAN HEALTH		
Heavy Metals, PAHs, long chain TPHs	Accidental ingestion and/or dermal contact with contaminated soil and/or leachate. **PL1/PL2** Inhalation of contaminated dust **PL3**	Human Health – construction workers Human Health – end users
Discussion Elevated concentrations of arsenic, lead, nickel, benzo(a)anthracene, benzo(b) fluoranthene, benzo(a) pyrene and dibenzo(a,h)anthracene have been identified in multiple locations across the site at varying depths throughout the Made Ground soil matrix. Given the nature of the material, a point source of the elevated heavy metals and non-volatile PAH compounds can be attributed to a singular source and must therefore be considered site wide. **Recommendation** The risk to chronic human health associated with the elevated concentrations on inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils. Where roads, plots and hardstand is proposed, this will serve to cut the contamination pathway removing the risk to future end users.		
Likelihood: Likely	**Severity: Minor**	**Level of Risk: Low**
VOCs, hydrocarbons, volatile PAHs (naphthalene)	Inhalation of vapours **PL4** Migration through permeable strata and preferential pathways **PL5**	Human Health – end users Human Health – Off-site receptors
Discussion No GAC exceeding concentrations have been identified throughout the site within the laboratory testing data. Additionally, no current or historic volatile sources have been identified. **Recommendation** No further action required.		
Likelihood: Unlikely	**Severity: Minor**	**Level of Risk: Very Low**

CONTAMINANT SOURCE	MIGRATION PATHWAY	RECEPTOR
Asbestos Containing Materials (ACM)	Inhalation (of fibres) and construction works disturbing bound material and releasing fibres **PL3**	Construction workers, end users, and adjacent sites

Discussion
No ACMs were identified on-site or trace fibres within the laboratory testing data. However, due to the age of the fills, asbestos cannot be ruled out.

Recommendation
If identified during the enabling works, asbestos impacted soils should be managed in accordance with the Asbestos Risk Conceptual Site Model.

Likelihood: Low Likelihood	**Severity: Minor**	**Level of Risk: Very Low**

CONTROLLED WATERS

Mobile Contaminants	Contact with contaminated groundwater **PL2** Migration to the principal aquifer **PL5** Migration to drainage ditch and off-site ponds **PL5**	Human Health – site personnel Human Health – Consumer Aquatic ecosystems

Discussion
Marginally elevated concentrations of heavy metals and PAHs have been recorded in shallow perched groundwater compared against the conservative EQS values. Given the absence of surface water features on, or within influencing distance of the site, low level impact of the aforementioned contaminants within the perched, discontinuous groundwater are not considered to pose a risk to controlled water receptors.

Minor exceedances of selenium and long chain hydrocarbons (TPH C21-35) were identified in shallow perched groundwater when compared to the DWS values, which is what is viewed as the priority given the primary receptor for the site is the principal aquifer within the under bedrock.

The site is not located within Groundwater Source Protection Zone or a Drinking Water Safeguard Zone. In addition, there are no active groundwater, surface water, or potable abstraction points within a 2 km radius of the site. Permeability testing has shown that the overlying drift deposits have low rates of permeability, limiting vertical migration to the underlying principal bedrock aquifer.

Taking the above into account, it is considered that the risk to sensitive controlled water receptors or future end users is low.

Recommendation
No further action required.

Likelihood: Likely	**Severity: Minor**	**Level of Risk: Low**

CONTAMINANT SOURCE	MIGRATION PATHWAY	RECEPTOR
GROUND GAS		
Ground Gases	Inhalation of ground gas **PL4** Accumulation of ground gas in confined spaces (asphyxiation or explosion) **PL4**	Human Health – site personnel Human Health – end users Infrastructure and services

Discussion
Based on the monitoring visits completed to date, the peak flow rates classify as Characteristic Situation (CS)1 – Very Low Gas Risk, with areas of the site falling within CS2.

It should be noted that no hazardous thresholds have been recorded above CS1 limits. Additionally elevated methane was only recorded in a flooded well the gas data from WS106 are considered unreliable and are interpreted as being influenced by flooded standpipe conditions, leading to gas accumulation in a reduced headspace. The elevated methane concentration is therefore not considered representative of in-situ ground gas generation from the underlying Till or a discrete subsurface source.

Recommendation
Completion of monitoring program and production of ground gas addendum. Agreement of gas mitigation measures (if required) with the local authority prior to their adoption on site.

Likelihood: Low Likelihood	Severity: Mild	Level of Risk: Low
Radon	Inhalation of ground gas **PL4** Accumulation of ground gas in confined spaces (carcinogenic)	Human Health – site personnel Human Health – end users

Discussion
The site is situated in an area where less than 1% of homes are above the “Action Level” and that the BGS reports that full radon protective measures are not necessary for the construction of new dwellings or extensions.

Likelihood: Unlikely	Severity: Minor	Level of Risk: Very Low

CONTAMINANT SOURCE	MIGRATION PATHWAY	RECEPTOR
INFRASTRUCTURE AND DEVELOPMENT		
Made Ground **Sulphate from potential ash within the Made Ground**	Sulphate attack on concrete **PL6**	Building concrete

Discussion
the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005), with isolated instances of DS-2, AC-1s due to elevated concentrations of sulphate in TP/SA109 and WS104 between 0.90–1.00 m bgl.

Recommendation
Concrete design in accordance with DS-2, AC-1s

Likelihood: Likely	Severity: Minor	Level of Risk: Low
Made Ground **Phytotoxic contaminants**	Direct contact (plant uptake) **PL8**	Flora

Discussion
Made Ground encountered site wide has low level PAH, heavy metal and long chain hydrocarbon impact.

Recommendation
Cover systems to be installed in areas of proposed soft standing to provide suitable growing medium.

Likelihood: Likely	Severity: Minor	Level of Risk: Low
Made Ground **Organic contaminants such as hydrocarbons, solvents**	Ingestion of tainted water supply. **PL7**	Human Health – End users Water pipeline

Discussion
Based on the assessment of current site conditions, it is likely that barrier pipe will be required for the proposed development.

Recommendation
UKWIR risk assessment post-remediation. Post-remediation and enabling works ground conditions may be different from those identified during this intrusive ground investigation.

Likelihood: Likely	Severity: Mild	Level of Risk: Low/Moderate

Main Exposure Pathways
PL1 = Soil Ingestion, PL2 = Dermal Contact and Ingestion, PL3 = Dust Inhalation, PL4 = Vapour/Gas Inhalation, PL5 = Vertical/Lateral Migration, PL6 = Corrosion of Concrete, PL7 = Tainting of Water Supply, PL8 = Uptake by Plants

FROM CIRA 552 (2001)

		RISK ASSESSMENT MATRIX			
		Consequence			
		SEVERE	MEDIUM	MILD	MINOR
Probability	HIGH LIKELIHOOD	Very High	High	Moderate	Moderate / Low
	LIKELY	High	Moderate	Moderate / Low	Low
	LOW LIKELIHOOD	Moderate	Moderate/ Low	Low	Very Low
	UNLIKELY	Moderate / Low	Low	Very Low	Very Low

5. GEOTECHNICAL ASSESSMENT

5.1. SOIL CONSISTENCY

Undrained shear strength values were measured using both field hand shear vane tests and laboratory undrained triaxial tests. Results of the tests are presented in Table 5.1 and Table 5.2, which indicate the clay soils to be between firm and very stiff. Strength test data is generally consistent with the field descriptions of the soils.

It should be noted that due to the friable nature of cohesive soils, hand shear vane data could not be undertaken across a number of exploratory hole locations.

Table 5.1 Summary of Hand Shear Vane Tests

LOCATION	DEPTH (m bgl)	SHEAR STRENGTH (kPA)	CALCULATED ALLOWABLE BEARING CAPACITY (kN/m²)
TP/SA101	2.00	46	108.1
TP102	1.00	137	322.0
TP102	2.00	73	171.6
TP/SA109	2.00	30	70.5

Notes: ABC Calculated using Stroud and Butler et al 1974.
**granular content within soil tests may underestimate true shear strength.*

Table 5.2 Summary of Undrained Shear Strength in Triaxial Compression – Laboratory

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m²)	CONSISTENCY
WS102	1.50–2.00	Grey brown silty slightly gravelly CLAY	216	Very Stiff

Results of the standard penetration tests, including undrained shear strengths derived from SPTs are included in Table 5.3.

Table 5.3 Standard/Cone Penetration Test Results

LOCATION	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N1)60	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m²)	ALLOWABLE BEARING CAPACITY (kN/m²)*
WS101	1	MADE GROUND	5	5.04	Loose	N/A	N/A	N/A	50.41
	2	Sandy CLAY	20	18.27	N/A	High strength	Very Stiff	91.35	187.82
	3	Sandy CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS102	1	Sandy Gravelly CLAY	11	11.09	N/A	Medium strength	Stiff	55.45	114.00
	2	Sandy Gravelly CLAY	33	30.15	N/A	Very high strength	Very Stiff	150.73	309.91
	3	Sandy Gravelly CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS103	1	MADE GROUND	13	13.11	Medium Dense	N/A	N/A	N/A	131.06
	2	Sandy CLAY	50	45.68	N/A	Very high strength	Very Stiff	228.38	469.56
WS104	1	Sandy CLAY	13	13.11	N/A	Medium strength	Stiff	65.53	134.73
	2	Sandy CLAY	28	25.58	N/A	High strength	Very Stiff	127.90	262.95
	3	Sandy CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS105	1	Sandy CLAY	8	8.07	N/A	Medium strength	Stiff	40.33	82.91
	2	Sandy CLAY	20	18.27	N/A	High strength	Very Stiff	91.35	187.82
	3	Sandy CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS106	1	MADE GROUND	2	2.02	N/A	Very low strength	Soft	10.08	20.73
	2	Sandy Gravelly CLAY	26	23.75	N/A	High strength	Very Stiff	118.76	244.17
	3	Sandy CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00

LOCATION	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N1)60	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m²)	ALLOWABLE BEARING CAPACITY (kN/m²)*
CP101	1.2	MADE GROUND	4	3.92	Very Loose	N/A	N/A	N/A	39.25
	2	Sandy Gravelly CLAY	4	3.65	N/A	Very low strength	Soft	18.27	37.56
	3	Sandy Gravelly CLAY	37	32.18	N/A	Very high strength	Very Stiff	160.89	330.78
	4	Sandy Gravelly CLAY	34	28.72	N/A	High strength	Very Stiff	143.62	295.29
	5	Sandy Gravelly CLAY	50	41.48	N/A	Very high strength	Very Stiff	207.41	426.43
	6	Sandy Gravelly CLAY	50	40.99	N/A	Very high strength	Very Stiff	204.97	421.42
	7.5	Sandy Gravelly CLAY	50	40.56	N/A	Very high strength	Very Stiff	202.82	417.00
CP102	1.2	Sandy Gravelly CLAY	18	17.66	N/A	High strength	Very Stiff	88.31	181.57
	2	Sandy Gravelly CLAY	27	24.67	N/A	High strength	Very Stiff	123.33	253.56
	4	Sandy Gravelly CLAY	45	38.02	N/A	Very high strength	Very Stiff	190.09	390.83
	5	Sandy Gravelly CLAY	50	41.48	N/A	Very high strength	Very Stiff	207.41	426.43
	6	Sandy Gravelly CLAY	50	40.99	N/A	Very high strength	Very Stiff	204.97	421.42

5.2. SIDE STABILITY AND EASE OF EXCAVATION

The sides of the exploratory trial pit excavations appeared to be generally stable during excavation, with no collapse noted.

5.3. CONSOLIDATION

One undisturbed sample of Glacial Till was submitted for oedometer analysis. The results are provided in Table 5.4.

Table 5.4 Oedometer Consolidation Results

LOCATION	DEPTH (m)	SAMPLE TYPE	MOISTURE CONTENT (%)	OEDOMETER CONSOLIDATION		
				PRESSURE RANGE (kPa)	Mv (m²/year)	Cv (m²/year)
CP102	3.00 – 3.45	U100	15.3	0–65	0.37	35.68
				65–130	0.15	16.79
				130–260	0.11	16.66
				260–520	0.07	16.31
				520–65	0.03	–

When considered at over-burdened pressure with an additional load of 520 kPa the coefficient of volume compressibility (Mv) ranged from 0.07 m^2/MN up to 0.37 m^2/MN. The material is considered to be low to medium compressibility.

The rate at which settlement is likely to occur is determined by the coefficient (Cv). As shown in Table 5.4, the coefficient ranges from 16.31 m^2/yr to 35.68m^2/yr.

5.4. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular material via wet sieve to obtain information on the soil fractions. The results are included in Table 5.5. The full results can be found in APPENDIX VIII.

Table 5.5 Summary of Particle Size Distribution Test Results

LOCATION	DEPTH (m)	SOIL FRACTION (%)				MCW 600 CLASS
		COBBLES	GRAVEL	SAND	SILT/CLAY	
TP105	0.20 (Made Ground)	0	46	23	31	2C
TP106	0.60 (Made Ground)	0	32	17	51	2C
CP101	3.00 (Sandy, Gravelly CLAY)	0	24	6	70	2C

5.5. SOIL DENSITY/MOISTURE CONTENT RELATIONSHIP

Dry density/moisture content relationship analysis has been conducted on soils utilising compaction tests utilising a 4.5 kg rammer. The results of the tests has been summarised in Table 5.6. The full test results can be found in APPENDIX VIII.

Table 5.6 Summary of Dry Density and Moisture Content

LOCATION	LABORATORY DESCRIPTION	TOP DEPTH (m)	METHOD OF COMPACTION	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MATERIAL RETAINED ON 37.5mm SIEVE (%)	MAX DRY DENSITY (mg/m^3)	MATERIAL RETAINED ON 20.0mm TEST SIEVE (%)
TP105	Made Ground	0.20	4.5kg	26.1	18	4	1.59	19
TP106	Made Ground	0.60	4.5kg	28.2	17	10	1.70	23

The compaction tests have indicated that the Made Ground is slightly wet of the optimum. It should be noted that if this material is excavated for use in a cut/fill operation, careful consideration should be taken in the stabilisation of this material.

Engineering of this type of material will need to be completed during dry weather periods only.

5.6. SOIL INFILTRATION

In-situ BRE 365 Soakaway tests were undertaken over a 24-hour period within trial pits complete as TP/SA101, TP/SA106, and TP/SA109.

The results are presented in Table 5.7, and the test certificates are included within APPENDIX XI.

Table 5.7 Soil Infiltration Results

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
TP/SA101	1.70 – 2.65	Firm medium strength yellowish brown slightly sandy slightly gravelly CLAY	1	FAIL
TP/SA106	0.45 – 1.06	Stiff brown mottled light grey slightly gravelly CLAY	1	FAIL
TP/SA109	0.40 – 1.10	Soft greyish brown slightly sandy CLAY	1	FAIL

Soil infiltration was taken over the wetted area from between 75% and 25% of the effective depth. In all locations the BRE 365 soakaway tests failed to achieve a 25% storage depth, with the head of water remaining constant over monitoring period with minor fluctuations.

The data presented above, derived from in-situ testing using the BRE 365 test method, forms only part of the overall ground model assessment and the design process for the infiltration drainage system. Due to the presence of low permeability clay soils extending to depths greater than 7.0m, it is considered unsuitable as a stratum for infiltration drainage systems due to its distinct geological characteristics and soil mechanics properties.

The soils have commonly exhibited a high fines content, particularly clay and silt fractions, which further restrict permeability. The fine-grained particles have a strong capillary effect, allowing moisture to be retained within the soil matrix and impeding the downward migration of water. This characteristic not only limits infiltration rates but also increases the risk of water accumulating within the upper soil profile, thereby reducing the system's overall drainage efficiency.

In light of the above and the results of the soakaway testing, soakaways are not considered suitable for use at this site.

5.7. SOIL PLASTICITY

The Atterberg limits determinations, summarised in Table 5.8, show the clay to be of low to marginally moderate plasticity.

Table 5.8 Summary of Plasticity Index Test Results

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS102	2.00	13.5	14	33	19	84	15.96	Low
WS105	2.00	15.3	12	32	20	83	16.60	Low

The results of the Atterberg limits testing confirmed that the soils would be deemed to be “Low Change Potential” in accordance with the classification system utilised by the NHBC industry guidance.

5.8. PH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in APPENDIX VII (summarised in Table 5.9, shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005), with isolated instances of DS-2, AC-1s due to elevated concentrations of sulphate in TP/SA109 and WS104 between 0.90–1.00 m bgl.

Table 5.9 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP/SA101	1.70	0.068	6.9	DS-1, AC-1s
TP103	1.80	0.065	8.0	DS-1, AC-1s
TP105	0.20	0.055	7.5	DS-1, AC-1s
TP107	0.20	0.047	8.2	DS-1, AC-1s
TP/SA109	1.00	0.710	7.6	**DS-2, AC-1s**
WS104	0.90	0.810	7.9	**DS-2, AC-1s**
WS105	2.10	0.054	8.2	DS-1, AC-1s
WS106	0.30	0.100	8.3	DS-1, AC-1s

5.8.1. HIGHWAYS AND CONCRETE

MCHW Series 600 provides a criteria of 1500 mg/l for water-soluble sulphate within 500 mm of any concrete surface, this threshold has not been exceeded within samples obtained to date.

A second criteria of 300 mg/l is given with respect to soils within 500 mm of steel structures, soils sampled within TP/SA109 and WS104 exceed this threshold.

5.9. GROUNDWATER

Table 5.10 Summary of Groundwater Strikes

LOCATION	DEPTH (m bgl)	DESCRIPTION OF STRIKE	STRATA	EVIDENCE OF CONTAMINATION
Site Investigation Water Strike Information				
TP102	1.80	Seepage	Slightly Sandy Slightly Gravelly CLAY	None
TP112	0.50	Seepage	MADE GROUND	None
WS106	0.50	Seepage	MADE GROUND	None

Table 5.11 Summary of Groundwater Monitoring Levels

LOCATION	DEPTH (m bgl)	DATE OF MONITORING (MARCH—APRIL)	WEATHER CONDITIONS DURING MONITORING	COMMENTS
Groundwater Monitoring Summary from Installations				
CP101	4.22	December 2025 – February 2026	Wetter Months	N/A
CP102	6.00			N/A
WS101	0.52			N/A
WS102	2.67 – 2.70			N/A
WS103	0.45			N/A
WS104	1.00 – 1.06			N/A
WS105	0.60 – 0.62			N/A
WS106	0.22 – 0.42			N/A

5.10. SITE PREPARATION

Our assessment has been based on the fact that the site will be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Document for Highway Works (MCHW)*. This should include the following:

- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- Obstructions and relic foundations should be grubbed out.
- Current hardstand to be broken out and processed.
- Made Ground to be turned over and engineered in accordance with an agreed geotechnical performance specification.

5.11. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the safe allowable bearing capacity (ABC) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 5.12.

Table 5.12 Summary of ABC

COHESIVE SOILS			
DESCRIPTION	**DEPTH (RANGE m bgl)**	**UNDRAINED SHEAR STRENGTH (CU) (kN/m²)**	**ALLOWABLE BEARING CAPACITY (kN/m²)**
Soft CLAY	1.60 – 3.00 (TP109 and CP101)	18 – 30	37 - 70
Firm to Very Stiff CLAY	1.00 – 1.99	40 - 137	82 - 322
	2.00 – 2.99	46 - 228	108 - 469
	>3	143 - 217	295 - 447

The above ABC data demonstrates that the following suitable materials for founding have been identified on-site:

- Natural firm to very stiff sandy gravelly CLAY from 1.00 m to >3.00 m bgl, with an ABC range of 82 to 4475 kN/m^2.

5.12. FOUNDATION OPTIONS APPRAISAL

Ground conditions comprise variable thickness made ground over stiff cohesive strata (natural clay). The made ground is not considered suitable for foundation bearing in its existing condition and should be either removed and replaced with engineered fill to form a competent development platform, or bypassed by appropriate foundation solutions where removal is not practicable.

A mixed foundation strategy is anticipated, subject to plot-specific ground investigation and foundation depth confirmation:

- **Shallow foundations (strip/trench fill):**Suitable for low-rise housing where competent natural clay is encountered at reasonable depth and tree influence is manageable. Foundations should be taken through made ground to bear in undisturbed natural clay and designed in accordance with NHBC Standards, with allowance for local variability. Trench fill foundations are likely to be appropriate where made ground thickness is variable and to limit excavation open time in cohesive soils.
- **Ground improvement (Vibro Stone Columns, VSC):** Where the ground is of moderate thickness and the natural clay provides adequate confinement, VSC may be adopted to improve ground performance and reduce total and differential settlement, facilitating the use of shallow foundations and/or improved platform performance. Suitability, layout, and performance criteria should be confirmed by specialist design.
-
- **Localised deep foundations (piles):**Piled foundations may be required in localised areas of poor ground, significant made ground thickness, where obstructions limit ground improvement, or where **extreme tree influence** would otherwise necessitate excessive shallow foundation depths. Pile type and founding stratum should be confirmed by site investigation and specialist design, with consideration of negative skin friction where made ground is retained.

Tree influence should be assessed on a plot-by-plot basis, with foundation depths and any heave precautions designed in accordance with current NHBC guidance for shrinkable clays.

A **Geotechnical Foundation Type Plan** should be prepared to define the appropriate foundation solution across the site, taking account of ground conditions, made ground thickness, tree influence, and

proposed earthworks. The plan should be used to inform plot-specific foundation design and coordinated with the structural engineer and groundworks contractor.

To determine if VSC is viable at the subject site, E3P has completed a Ground Improvement Design Risk Matrix that is summarised in Table 5.13.

Table 5.13 Ground Improvement Design Risk Matrix

RISK ITEM	COMMENT	PASS/FAIL
Soft clay with an undrained shear strength less than 30 kN/m²	Soft sandy CLAY was encountered in three locations (TP102, TP109 and CP101), at depths between 1.60 m to 3.00 m bgl. Where encountered soft clays will require excavation and re-engineering to an agreed specification.	PASS – Following Engineering Works
Ground with peat layers close to foundation level or the base of the stone column, or where intermediate layers of peat are thicker than 200mm, either as a single layer or the sum of the thickness of individual layers throughout the length of the stone column	None identified	PASS
Voided filled ground, e.g. old water tanks, pottery, glass bottles, concrete rubble or brick fill of unsuitable grading	None identified	PASS
Loose or non-engineered fill not previously subject to rising fluctuating water levels saturation	None identified.	PASS
Filled ground still settling or expected to settle under its own weight or due to the effects of surcharging/upfilling where there is a high organic content or where decay is continuing	Made Ground was infilled >50 years ago. Settlement of this material is considered to have occurred.	PASS
Fill, containing degradable material where organic material forms more than 15% of fill by volume	None identified.	PASS
Clays with a plasticity index greater than 40%	None identified.	PASS
Highly sensitive soils liable to collapse or remoulding	None identified.	PASS
Cohesive soils with trees in influencing distance	None identified.	PASS
Overall Risk Rating and Suitability For Vibratory Ground Improvement		**PASS**

It is advisable to consult with geotechnical engineers and foundation specialists who can assess the specific ground conditions and design an appropriate Vibro Stone Column system to meet the project's requirements. They will consider factors such as soil composition, depth, and spacing of the stone columns to ensure effective ground improvement and proper load distribution for the strip foundation.

At present, details of any cut/fill to be undertaken at the site have not been provided and therefore, finished floor levels are not known. It is recommended that the foundation recommendations are revisited following confirmation of FFLs.

Foundation depths should take account of the presence of proposed trees, with foundations deepened locally to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirement of NHBC standards.

It is recommended that at working drawing stage a foundation schedule is prepared for the development, taking account of the physical change of natural clay soils and proposed locations of trees.

5.13. GROUND FLOOR SLABS

Current building control regulations that where infilled ground is present to depths in excess of 600mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of proposed trees, a suspended floor slab is required.

In this instance, the underlying stratum would have in excess of 600 mm of Made Ground infill and, as such, a suspended floor slab will be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave precautions) will be required in the construction of the substructure.

In clay soils allowance should be made in the design for heave. This must be incorporate either a clear void of a specified minimum depth under the suspended floor, or a proprietary compressible material/void former below the underside of the floor construction.

5.14. HEAVE PRECAUTIONS

In areas affected by existing or proposed trees, foundations will be designed to account for clay shrinkage and swelling behaviour. Where foundations are taken to depth within the zone of tree influence, heave precautions may be required following tree removal or reduction to prevent upward movement of foundations and floor slabs.

Heave protection measures may include increased foundation depth, compressible void formers to the sides of foundations, and compressible layers beneath ground-bearing slabs, designed in accordance with current NHBC/LABC guidance for shrinkable clays.

The requirement and extent of heave precautions will be assessed on a plot-by-plot basis, taking account of tree species, size, distance, and proposed landscaping.

In addition to the requirements of the ‘Drainage’ sections, drainage near trees should incorporate additional provisions. Where there is a volume change potential within the ground, the provisions include:

- Increased falls to cater for any ground movement.
- Deeper and wider backfill of granular material.
- A drainage system that is capable of movement should heave and shrinkage occur.
- Drainage pipes should not be encased in concrete.
- Additional clearance is required where drains pass through the structure of a building to allow for additional movement.

5.15. DRAINAGE

Where loose or soft materials have been identified at drainage levels, there will need to be consideration for the use of reinforced pipe bedding.

Shrinkage and heave of clay soils can affect pipelines. To protect against the effects of heave, drainage should be designed:

- To take account of potential ground movement as shown in Table 5.16, including where pipes and services pass through substructure walls or foundations.
- With gradients which may need to be steeper.
- To use alternative means of catering for the movement when sufficient falls cannot be provided, for example, by deepening the excavation and laying pipework on a granular bedding of suitable thickness to reduce the extent of potential movement.

Table 9

VOLUME CHANGE POTENTIAL	HIGH	MEDIUM	LOW
Potential Ground Movement	150 mm	100 mm	50 mm

5.16. EXTERNAL INFRASTRUCTURE

Construction of external infrastructure, including estate roads, footways, service corridors, and drainage, will require appropriate preparation and earthworks to ensure adequate long-term performance. All areas of proposed external infrastructure will be subject to on-site material and ground stripping, with the removal of unsuitable materials, former foundations, slabs, and relict infrastructure.

Subgrade formation will be inspected by a suitably qualified geotechnical engineer and proof-rolled where appropriate. Any soft spots or areas of poor ground exposed at formation will be remediated by local over-excavation and replacement with engineered fill, or by localised ground improvement, to achieve a uniform and competent platform.

Engineered fill will be placed and compacted in controlled layers in accordance with the earthworks specification, with validation testing undertaken to confirm compliance.

These preparation works will ensure that external infrastructure is founded on a stable and predictable platform, minimising the risk of long-term settlement, pavement distress, or service damage.

5.17. EXCAVATIONS

Trial pits were generally stable. Site observations indicated that excavations should be feasible in the near surface with normal plant. It is anticipated that any obstructions will be grubbed out during the reduced-level dig for the substructure works.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations, then consideration should be given to the potential for dewatering gravels in the surrounding areas that may cause structural damage to building substructures near the site.

Table 5.17 Civil Engineering Excavation Risk Matrix

RISK ITEM	PRESENT	COMMENT
Running Sand	No	N/A
Water Ingress to Excavation	Yes	Groundwater was encountered as seepages in three trial pit locations from 0.50–1.80 m bgl. The seepages were generally noted as perched discontinuous groundwater.

RISK ITEM	PRESENT	COMMENT
		Groundwater was encountered within three monitoring wells during the first subsequent visit.
Shallow Bedrock	No	Bedrock was not encountered during the intrusive investigation; BGS boreholes report top of bedrock at circa 30.00 m bgl.

5.18. ENABLING EARTHWORKS

Earthworks will be required to facilitate the proposed development and provide a safe, stable, and uniform platform for construction.

Works will include site clearance, removal of all former structural foundations, slabs, hardstanding's, and relic infrastructure, together with stripping of topsoil and unsuitable near-surface materials.

Variable thickness made ground will be excavated as required, processed to remove oversized and deleterious materials, and either disposed of or re-engineered for reuse in accordance with the earthworks specification. Re-engineered fill will be placed and compacted in controlled layers to form development platforms and formation levels above the underlying natural clay.

Exposed formation levels will be inspected by a suitably qualified geotechnical engineer. Any soft spots or areas of unsuitable ground will be remediated through local over-excavation and replacement with engineered fill, or by localised ground improvement where appropriate. Validation testing will be undertaken during placement to confirm compliance with the specified performance criteria.

The enabling earthworks will reduce ground variability, limit the risk of total and differential settlement, and provide suitable platforms for foundations, external infrastructure, and subsequent construction activities.

5.19. SLOPE STABILITY

The north is topographically raised in comparison to the central and southern areas of the site. Currently, an embankment is present running approximately east to west in the north of the site. Additionally, a brick retaining wall runs along the northern boundary.

Finalised levels are currently unknown. Depending on final levels, a slope stability model may be required.

5.20. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated into the site works:

- Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and subformations to foundations and pavement construction.
- Excavations where access is required should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of a support system in accordance with CIRIA R97 should be utilised.
- It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required, and consideration should be given to the provision of space for settling tanks or an attenuation pond.

- Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- The presence of potential contamination and mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risk, reduce their impact and finally, to include the use of personnel protective equipment (PPE).

5.21. DEVELOPED GEOTECHNICAL RISK REGISTER

POTENTIAL CONSTRAINT	LOCATION ON-SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils	Site Wide	100	Shallow Made Ground is encountered across the site to depths of up to 2.00 m bgl.
Shallow Bedrock	N/A	N/A	Bedrock was not encountered during the intrusive investigation. Surrounding BGS boreholes record the top of the Chester Sandstone Formation at 30.00 m bgl.
Cohesive Stratum overlying shallow Bedrock (<3.00m)	N/A	N/A	Shallow bedrock is not present, with cohesive stratum present >7 m bgl.
Obstructions	Current Structures	30%	No obstructions encountered during the investigation. However, obstructions are anticipated below the current structure in the north west.
Artificially levelled and filled platforms	Site Wide	100%	A former boating lake has been infilled across the site. Made Ground fills have been encountered up to 2.00 m bgl.
Trench collapse	Granular Made Ground	20%	Trial pit excavations were noted as stable, however, where granular Made Ground is encountered, these soils are typically unstable and likely to lead to trench collapse.
Drainage Invert levels	TP109 and CP101	10	The majority of natural CLAY soils are firm to very stiff, therefore reinforced pipe bedding is unlikely to be required. However, localised soft spots have been encountered that will require excavation and re-engineering or a reinforced pipe bedding design.
Mature Trees	Periphery	20	Mature trees are present along the northwest and southwest boundary. Consideration will need to be taken for foundation depths, ground floor slabs, and heave precautions within tree influence.

POTENTIAL CONSTRAINT	LOCATION ON-SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Volume Change Potential Clay	Site Wide	100%	Atterberg results indicate the soils to be of low volume change potential in accordance with the classification system utilised by the NHBC industry guidance. When considering tree influence and foundations, low volume change potential clay should be assumed site-wide.
Concrete Design	All	100%	Concrete classification is DS-2, AC-1s to be appropriately conservative.
Low-Permeability Ground	All	100%	Soakaways are unlikely to be effective in areas given the presence of low-permeability cohesive deposits.
Services/Sensitive Structures	Site Wide	15%	A formal utilities survey has not been provided to E3P for review; however, multiple service indicators have been noted during the desk study. These include lampposts/CCTV cameras, cable boxes, manhole covers, surface water drains, ground scarring, an electrical pylon, and overhead cables have been noted within the site boundary
Abnormal Foundation Solutions	TBC	40%	Abnormal foundations may be required in the vicinity of deep Made Ground (reworked clay) or in the vicinity of any proposed trees.
Slope	North	25	The north is topographically raised in comparison to the central and southern areas of the site. Currently an embankment is present running approximately east to west in the north of the site. Additionally, a brick retaining wall runs along the northern boundary. Dependant on finalised levels a slope stability report may be required.
Consolidation & Settlement	N/A	N/A	Current ground conditions indicate a low overall risk from settlement, should site levels change significantly (> +2m) further assessment may be required.
Enabling Earthworks	All	100%	All proposed earthworks will need to be designed by a suitably qualified geotechnical engineer in accordance with NHBC Chapter 4.6. The earthworks design will incorporate a Geotechnical Specification for Earthworks that will define protocols to ensure no unacceptable future risk.

5.22. FURTHER WORK

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- Ground gas addendum.
- Plot specific foundation schedule (upon receipt of the final development levels).
- Geotechnical Design Report (GDR).
- Remediation and enabling works strategy.

END OF REPORT

Appendix I: Limitations



GENERAL

This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P “Terms of Business” or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

Project-specific appointment documents may be agreed upon at our discretion, and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.

The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects’ responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental And Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.

The investigation has been undertaken to provide information concerning either:

- The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report

The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.

The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.

Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work

The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of

any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.

Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.

The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.

If costs have been included in relation to additional site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales

associated with the Regulatoy Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.

The data is presented and will be compared with assessment criteria.

Appendix II: Glossary



ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
MRA	Mining Remediation Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation

MCV	Moisture condition value	**WRAP**	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	**WTE**	Water table elevation
m	Metres	**ppm**	Parts per million
km	Kilometres	**mg/m^3**	Milligram per metre cubed
% v/v	Percent volume in air	**m bgl**	Metres below ground level
mb	Millibars (atmospheric pressure)	**m bcl**	Metre below cover level
l/hr	Litres per hour	**mAOD**	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	**kN/m^2**	Kilonewtons per metre squared
ppb	Parts per billion	**µm**	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	**SSRT**	Site Specific Remediation Target
PSD	Particle Size Distribution	**DD**	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	**Mc**	Moisture Content
ρ	Bulk Density	**GPR**	Ground Penetrating Radar
NDP	Nuclear Density Probe	**FFL**	Finished Floor Level
LEL	Lower Explosive Limit	**UKWIR**	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	**LOD**	Limit of Detection
PFAS	Per- and Poly-Fluorinated Substances	**PFOA**	Perfluorooctanoic Acid

Appendix III: CIRIA 552 Risk Classification



CIRIA C552;2001 – Classification of Consequence

CLASSIFICATION	CATEGORY	DEFINITION
SEVERE	Humans	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part 2a
	Controlled Water	Short-term risk of pollution of sensitive water resource
	Property	Catastrophic damage to buildings/property
	Ecology	Short-term risk to a particular ecosystem or organism forming part of such ecosystem
MEDIUM	Humans	Chronic damage to human health ("significant harm" as defined in DEFRA, 2006)
	Controlled Waters	Pollution of sensitive water resources
	Ecological Systems	Significant change in a particular ecosystem or organism forming part of such ecosystem
	Humans	Chronic damage to human health ("significant harm" as defined in DEFRA, 2006)
MILD	Controlled Waters	Pollution of non-sensitive water resources
	Property	Significant damage to buildings, structures, crops and services ("significant harm" as defined in DEFRA, 2006) and damage to sensitive buildings/structures and services
	Ecological Systems	Damage to the environment
MINOR	Humans	Non-permanent health effects to human health that are easily prevented by the use of PPE
	Property	Easily repairable effects of damage to buildings, structures and services
	Financial / Project	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve

CIRIA 552:2001 Classification of Probability

RISK	DEFINITION
LOW	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
LOW MODERATE	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the Site.
MODERATE	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or

	undertake further environmental improvements. Redevelopment of the Site will likely require further site investigation.
MODERATE HIGH	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
HIGH	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.

Appendix IV: Drawings



DRAWING 18-376-001 – Site Location Plan





P1	REVA	23.03.2026	TG	MD	MD	
Phase	Issue	Date	Drawn	Checked	PM	

Notes:

Client: Kellen Homes

Job No: 18-376

Date: 23.03.2026

Drawing No: 002

Scale: NTS

Job Title: Buzz Bingo

Drawing Title: Proposed Development Plan

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Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
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Historical Features

- Boating Lake
- Clock Tower
- Bowling Alley / Bingo Hall / Disused Bingo Hall
- Footpath
- Field Boundary

Notes:

P1	REVA	27.10.2025	TG	EP	MD
Phase	Issue	Date	Drawn	Checked	PM

Client: Kellen Homes

Job No: 18-376

Date: 27.10.2025

Drawing No: 003

Scale: NTS

Job Title: Buzz Bingo

Drawing Title: Historical Features Plan

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Site Features

- Area Of Vegetation
- Footpath
- Access Road
- Hardstanding Car Park
- Cable Box
- Storage Container
- Diused Bingo Hall
- Air Conditioning Unit
- Skip / Bin
- Manhole
- Surface Water Drain
- Stairs
- Electrical Pylon
- Trees
- Lamppost
- Sign Post
- MCC Land Boundary
- Vehicle Access Gate

Notes:

P1	REVA	27.10.2025	TG	EP	MD
Phase	Issue	Date	Drawn	Checked	PM

Client: Kellen Homes

Job No: 18-376

Date: 27.10.2025

Drawing No: 004

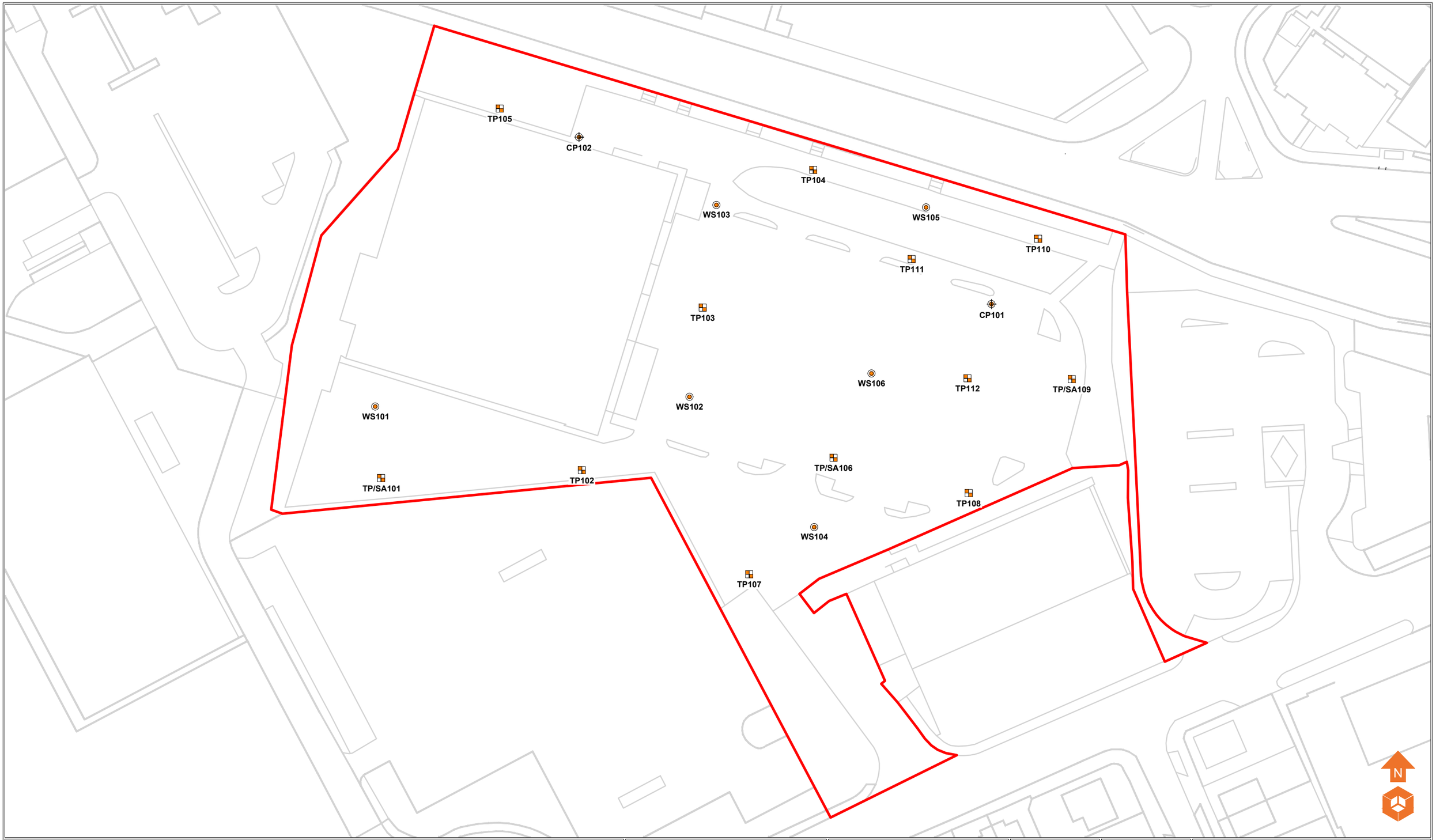
Scale: NTS

Job Title: Buzz Bingo

Drawing Title: Site Features Plan

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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location
- Approximate Trial Pit / Soakaway Location

Notes:

P1	REVA	15.12.2025	TG	CA	GC
Phase	Issue	Date	Drawn	Checked	PM

Client: Kellen Homes

Job No: 18-376

Date: 15.12.2025

Drawing No: 006

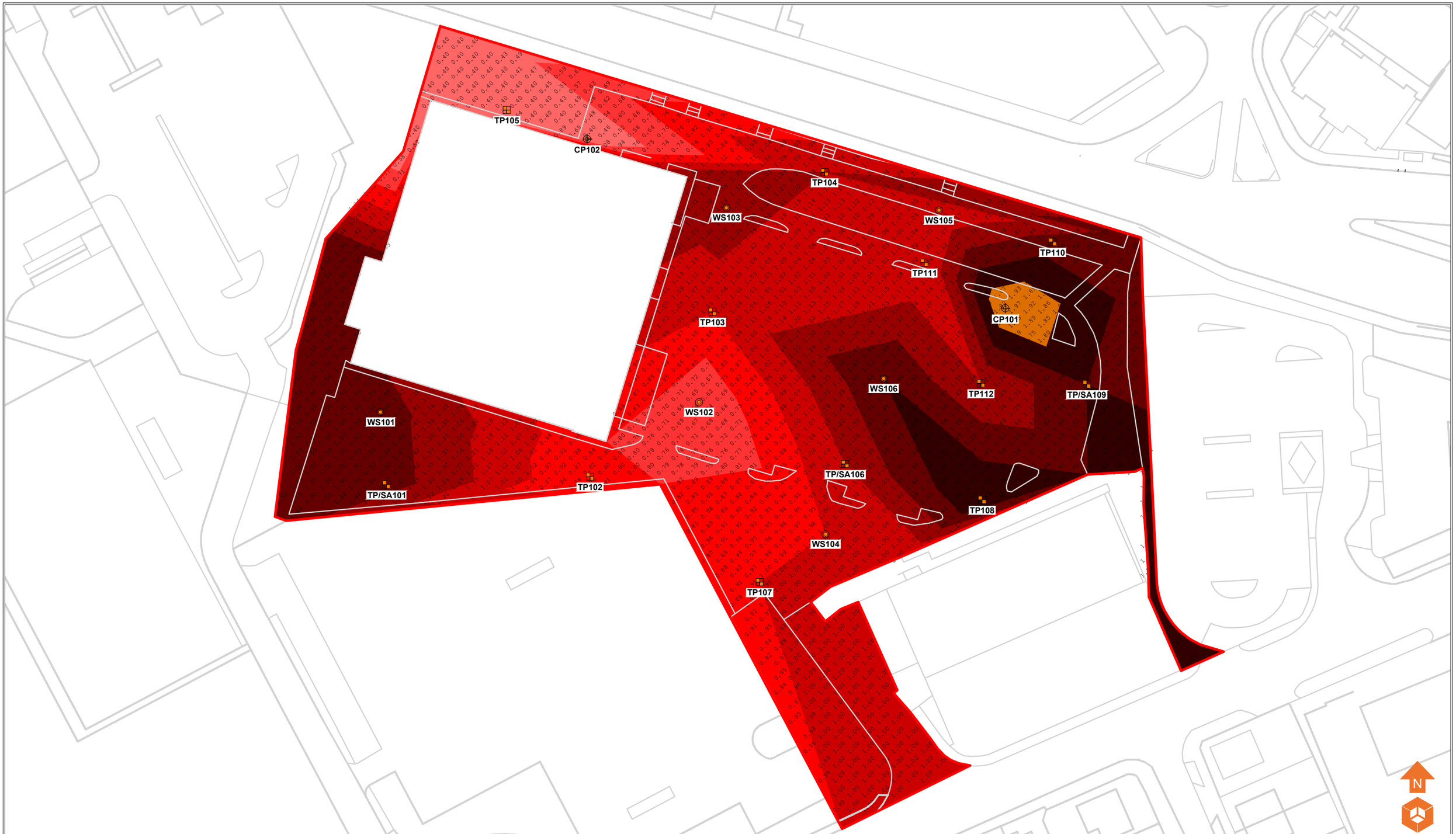
Scale: NTS

Job Title: Buzz Bingo

Drawing Title: Exploratory Hole Location Plan

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Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- TP101 — Approximate Trial Pit Location
- CP101 — Approximate Cable Percussive Borehole Location
- TP/SA101 — Approximate Trial Pit / Soakaway Location

Made Ground Depth (m)

- Depth of Made Ground 0.40 - 0.59m
- Depth of Made Ground 0.60 - 0.79m
- Depth of Made Ground 0.80 - 0.99m
- Depth of Made Ground 1.00 - 1.19m
- Depth of Made Ground 1.20 - 1.39m
- Depth of Made Ground 1.40 - 1.59m
- Depth of Made Ground 1.60 - 1.79m
- Depth of Made Ground >1.80m

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	06.02.2026	TG	MD	MD

Client: Kellen Homes

Job No: 18-376

Date: 06.02.2026

Drawing No: 007

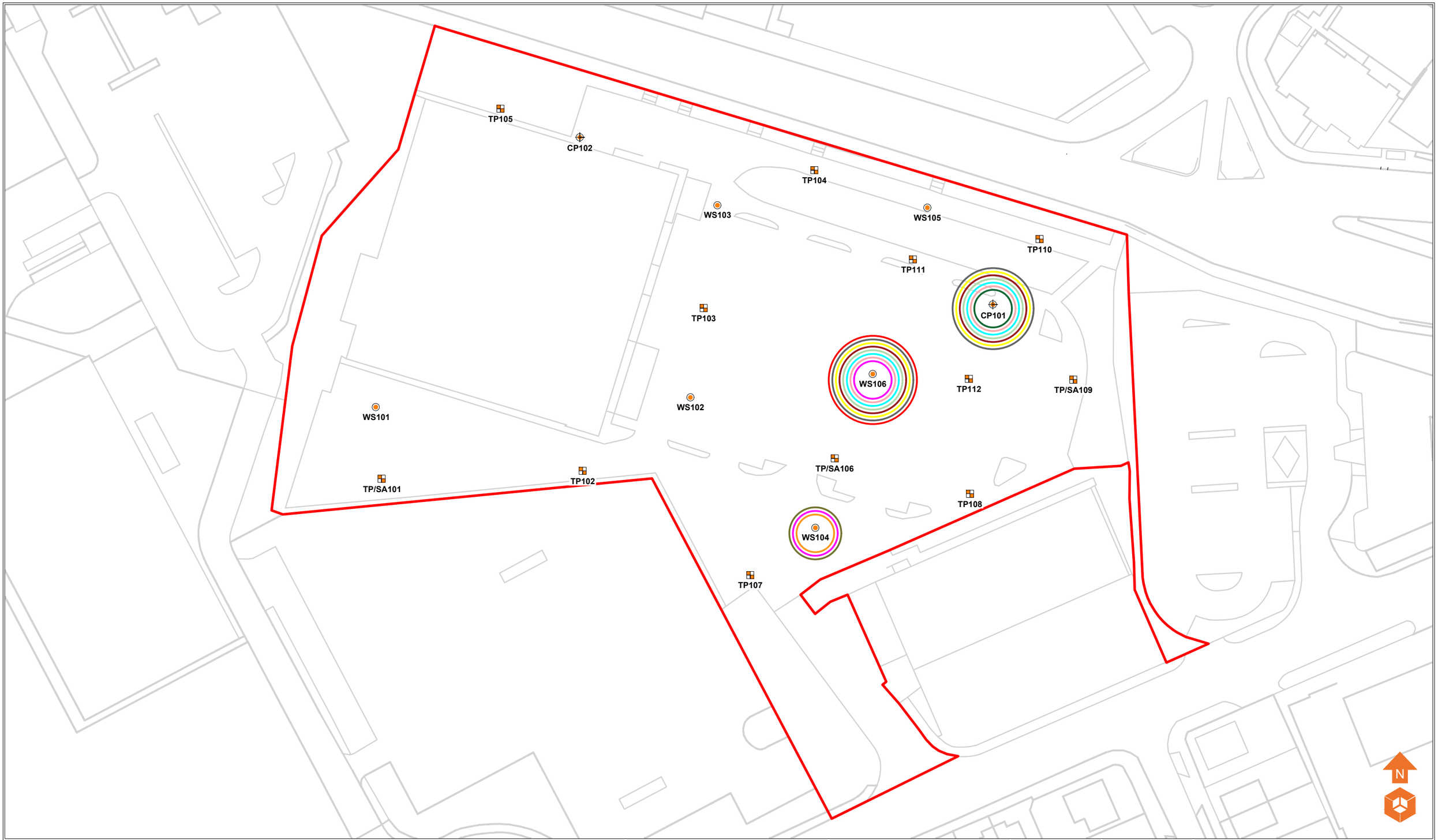
Scale: NTS

Job Title: Buzz Bingo

Drawing Title: Depth Of Made Ground Plan

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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location
- Approximate Trial Pit / Soakaway Location

Contamination Exceedances

- Chromium III
- Copper
- Nickel
- Selenium
- TPH C21–C35
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo (a) Pyrene
- Indeno(123-cd)pyrene
- Fluoranthene
- Anthracene

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	23.03.2026	TG	TM	MD

Client: Kellen Homes

Job No: 18-376

Date: 23.03.2026

Drawing No: 014

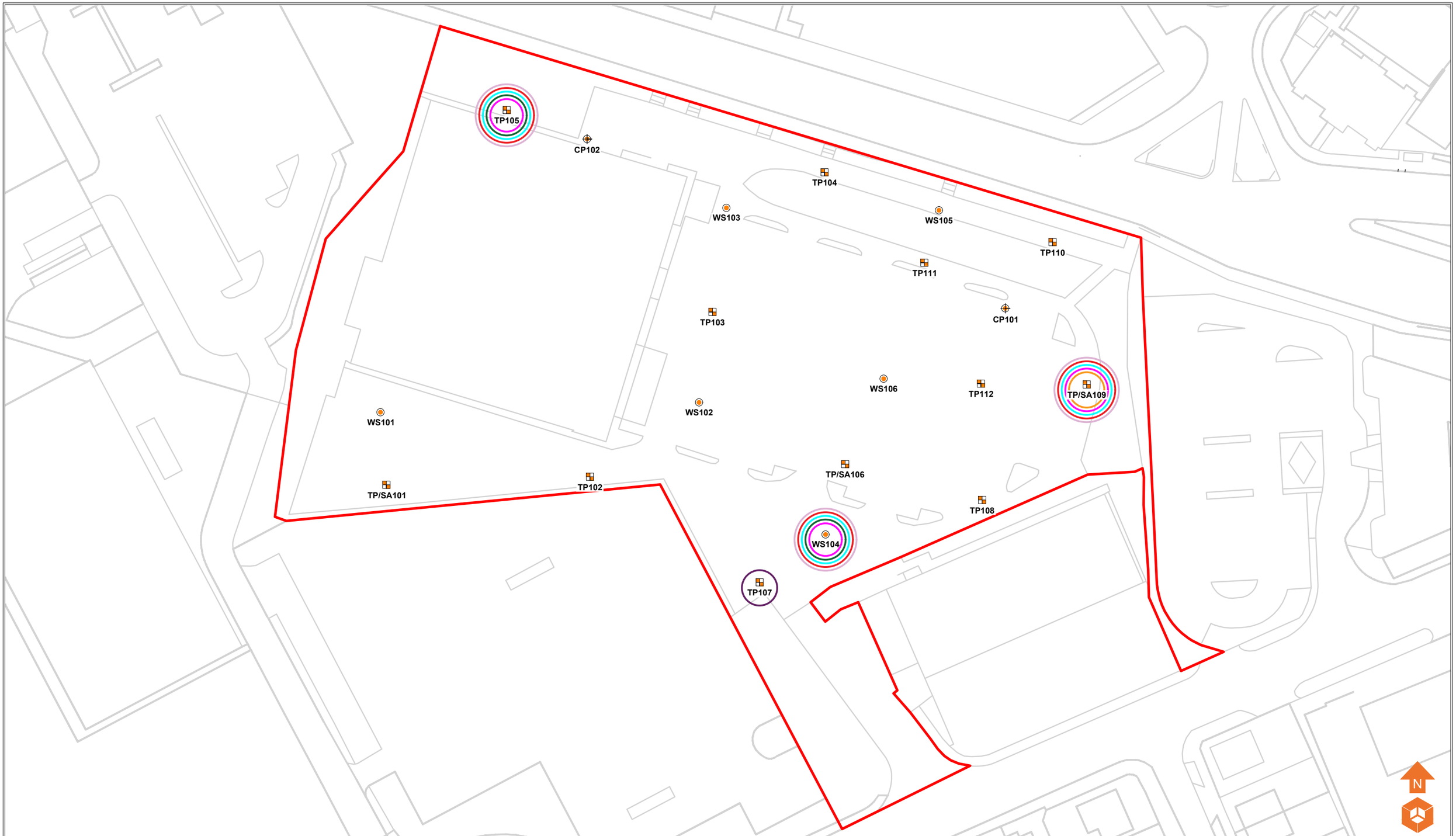
Scale: NTS

Job Title: Buzz Bingo

Drawing Title: Contamination Exceedances Plan - Groundwater

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location
- Approximate Trial Pit / Soakaway Location

Contamination Exceedances

- Arsenic
- Lead
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(a)pyrene
- Dibenzo(a,h)anthracene
- TPH C21–C35 (Aromatic)

Notes:

Client: Kellen Homes

Job No: 18-376

Date: 23.03.2026

Drawing No: 014

Scale: NTS

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	23.03.2026	TG	TM	MD

Job Title: Buzz Bingo

Drawing Title: Contamination Exceedances Plan - Soils

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Appendix V: Photographs



PLATE 1 WS101 ARISINGS



PLATE 2 WS102 ARISING



PLATE 3 WS103 ARISING



PLATE 4 WS104 ARISING



PLATE 5 WS105 ARISING



PLATE 6 WS106 ARISING



Appendix VI: Exploratory Hole Logs



Trial Pit

TPSA101

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387705.67	396226.46	62.40	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.10	B 1		62.30	(0.10) 0.10		Asphalt.
						(0.30)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					62.00	0.40		MADE GROUND: Dark greyish brown clayey sandy gravel with frequent cobbles. Gravel is fine to coarse, angular to subrounded of mudstone, sandstone, brick, asphalt, concrete and plastic. Subangular cobbles of brick and concrete. *Organic Odour (0.40 - 1.50m)*
						(1.10)		
					60.90	1.50		Firm medium strength yellowish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone.
		1.70	ES 1					
		2.00	HV	46 (kPa)				
						(1.40)		
					59.50	2.90		*End of Trial Pit at 2.90m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.40 m and 1.50 m bgl. 4. No water strike encountered.

Method, Plant, Stability, Dimensions
0.00 - 2.90m TP JCB
Stable
L = 3.00m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Trial Pit

TPSA101

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387705.67	396226.46	62.40	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.40 m and 1.50 m bgl. 4. No water strike encountered.

Method, Plant, Stability, Dimensions
0.00 - 2.90m TP JCB
Stable
L = 3.00m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP102

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387744.11	396226.47	61.60	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					61.50	(0.10) 0.10		Asphalt.
						(0.30)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
		0.50	B 1		61.20	0.40		MADE GROUND: Yellowish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone, ceramic.
		0.60	ES 1			(0.40)		
		1.00	HV	137 (kPa)	60.80	0.80		Stiff high strength yellowish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone.
						(1.20)		
		2.00	HV	73 (kPa)	59.60	2.00		*End of Trial Pit at 2.00m*

Remarks
1. Complete. 2. Location derived from GPS. 3. Water strike encountered at 1.80 m bgl, described as seepage.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Trial Pit

TP102

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387744.11	396226.47	61.60	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. Water strike encountered at 1.80 m bgl, described as seepage.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP103

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387775.81	396259.47	61.53	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					61.43	(0.10) 0.10		Asphalt.
						(0.20)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					61.23	0.30		
					61.13	(0.10) 0.40		MADE GROUND: Reddish brown gravel, with frequent cobbles. Gravel is course, angular to subangular brick. Cobbles are angular to subangular of brick. (Brick Fill).
						(0.60)		MADE GROUND: Brown sandy gravel, with frequent cobbles. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone, brick, concrete and asphalt. Cobbles of subangular brick and concrete.
		1.80	ES 1		60.53	1.00		Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone.
						(0.90)		
					59.63	1.90		*End of Trial Pit at 1.90m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 1.90m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP103

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387775.81	396259.47	61.53	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 1.90m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP104

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387798.00	396289.00	62.73	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					62.63	(0.10) 0.10		Asphalt.
						(0.20)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					62.43	0.30		MADE GROUND: Dark brown slightly sandy gravelly clay with occasional cobbles. Gravel is fine to coarse, subangular to subrounded of brick, sandstone and mudstone. Cobbles of angular brick.
						(0.90)		
		1.30	ES 1		61.53	1.20		Stiff brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to medium, subangular to rounded of mudstone and sandstone.
		1.40	B 1			(0.90)		
					60.63	2.10		*End of Trial Pit at 2.10m*

Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to gravels within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.10m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP104

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387798.00	396289.00	62.73	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to gravels within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.10m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP105

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387729.96	396301.73	61.94	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.20 0.20	ES 1 B 1			(0.40)		MADE GROUND: Brown slightly gravelly sandy clay with frequent rootlets. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, brick and wood. (Reworked topsoil).
					61.54	0.40		
						(0.60)		Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone and sandstone.
					60.94	1.00		
						(1.00)		Firm brown sandy CLAY.
					59.94	2.00		*End of Trial Pit at 2.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to sands within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP105

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387729.96	396301.73	61.94	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to sands within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TPSA106

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387797.88	396227.44	61.95	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					61.85	(0.10) 0.10		Asphalt.
						(0.30)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					61.55	0.40		MADE GROUND: Greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of brick, mudstone, sandstone and asphalt.
		0.60	B 1					
		0.90	ES 1			(0.80)		
		1.20	B 1		60.75	1.20		Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone and sandstone.
						(1.20)		
					59.55	2.40		*End of Trial Pit at 2.40m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 2.40m TP JCB
Stable
L = 3.00m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TPSA106

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387797.88	396227.44	61.95	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
Buzz Bingo		18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 2.40m TP JCB
Stable
L = 3.00m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP107

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387776.00	396204.31	61.37	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					61.27	(0.10) 0.10		Asphalt.
		0.20	ES 1			(0.20)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					61.07	0.30		MADE GROUND: Brown sandy gravel. Gravel is fine to coarse, subangular to subrounded of asphalt, brick, concrete, mudstone and sandstone with cobble sized fragments of brick.
						(0.70)		*Organic Odour (0.90 - 1.00m)*
					60.37	1.00		Firm brown mottled grey slightly sandy CLAY.
		1.30	B 1			(1.00)		
					59.37	2.00		*End of Trial Pit at 2.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.90 m and 1.00 m bgl. 4. No water strike encountered. 5. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP107

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387776.00	396204.31	61.37	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.90 m and 1.00 m bgl. 4. No water strike encountered. 5. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP108

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387822.57	396222.47	62.58	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					62.48	(0.10) 0.10		Asphalt.
						(0.20)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					62.28	0.30		MADE GROUND: Blackish brown slightly sandy slightly gravelly clay. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and brick. *Organic Odour (0.30 - 1.80m)*
						(1.50)		
					60.78	1.80		Stiff brown sandy CLAY.
		2.20	ES 1			(0.50)		
					60.28	2.30		*End of Trial Pit at 2.30m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.30 m and 1.80 m bgl. 4. No water strike encountered. 5. Unable to obtain hand shear vane due to gravels within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP108

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387822.57	396222.47	62.58	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
Buzz Bingo		18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.30 m and 1.80 m bgl. 4. No water strike encountered. 5. Unable to obtain hand shear vane due to gravels within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TPSA109

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387841.00	396236.00	62.95	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client Kellen Homes Ltd

Consultant E3P

Contractor Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					62.85	(0.10) 0.10		Asphalt.
					62.65	(0.20) 0.30		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
		0.70	B 1			(1.30)		MADE GROUND: Dark brown sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, brick, concrete, ceramic, glass, timber and rubber. *Organic Odour (0.30 - 1.60m)*
		2.00	HV	30 (kPa)	61.35	1.60		Soft low strength greyish brown slightly sandy CLAY.
					60.35	(1.00) 2.60		*End of Trial Pit at 2.60m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks

1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.30 m and 1.60 m bgl. 4. No water strike encountered.

Method, Plant, Stability, Dimensions

0.00 - 2.60m TP JCB
Stable
L = 3.00m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TPSA109

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387841.00	396236.00	62.95	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
Buzz Bingo		18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. Organic odour noted in Made Ground deposits between 0.30 m and 1.60 m bgl. 4. No water strike encountered.

Method, Plant, Stability, Dimensions
0.00 - 2.60m TP JCB
Stable
L = 3.00m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP110

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387837.88	396274.44	62.99	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					62.89	(0.10) 0.10		Asphalt.
					62.79	(0.10) 0.20		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
		0.30 0.30	ES 1 B 1			(0.40)		MADE GROUND: Light brown sandy gravelly clay with frequent rootlets and cobbles. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, brick, concrete and asphalt. Cobbles of angular brick.
					62.39	0.60		MADE GROUND: Dark brown sandy gravelly clay with frequent cobbles. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and brick. Cobbles of angular brick.
						(0.90)		
					61.49	1.50		Firm yellowish brown slightly sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of mudstone and sandstone.
						(0.50)		
					60.99	2.00		*End of Trial Pit at 2.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to gravels within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP110

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387837.88	396274.44	62.99	1:25
Project Name		**Project No.**	**Start Date**	**End Date**
Buzz Bingo		18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered. 4. Unable to obtain hand shear vane due to gravels within clay.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP111

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387818.08	396271.37	63.02	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					62.82	(0.20) 0.20		MADE GROUND: Brown slightly sandy gravelly clay with frequent rootlets. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, concrete, brick, slate and plastic with cobble sized fragments of brick and mudstone. (Reworked Topsoil).
		0.50 0.50	ES 1 B 1			(0.80)		MADE GROUND: Brown slightly sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, concrete, brick, slate and plastic.
					62.02	1.00		*End of Trial Pit at 1.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered.

Method, Plant, Stability, Dimensions
0.00 - 1.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP111

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387818.08	396271.37	63.02	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. No water strike encountered.

Method, Plant, Stability, Dimensions
0.00 - 1.00m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Trial Pit

TP112

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387819.97	396245.02	62.46	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
					62.36	(0.10) 0.10		Asphalt.
						(0.40)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
	▽				61.96	0.50		
		0.60	ES 1					MADE GROUND: Brown slightly gravelly sandy clay. Gravel is fine to coarse, subangular to subrounded of brick, mudstone, sandstone, concrete and asphalt.
						(0.70)		
		1.00	B 1					
					61.26	1.20		Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone and sandstone.
						(0.90)		
					60.36	2.10		*End of Trial Pit at 2.10m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
1. Complete. 2. Location derived from GPS. 3. Water strike encountered at 0.50 m bgl, described as seepage.
4. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 2.10m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Trial Pit

TP112

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	387819.97	396245.02	62.46	1:25

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling





Remarks
1. Complete. 2. Location derived from GPS. 3. Water strike encountered at 0.50 m bgl, described as seepage. 4. Unable to obtain hand shear vane due to friable clay.

Method, Plant, Stability, Dimensions
0.00 - 2.10m TP JCB
Stable
L = 2.50m
W = 1.00m

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS101

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387704.13	396236.52	62.04	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					61.94	(0.10) 0.10		Asphalt.
						(0.30)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					61.64	0.40		
						(0.60)		MADE GROUND: Dark brown slightly sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and brick.
		1.00	SPT	N=5 (3,2/1,2,1,1)	61.04	1.00		MADE GROUND: Dark brown sandy gravel. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, asphalt and brick.
		1.40	ES 1			(0.50)		
					60.54	1.50		Very stiff very high strength yellowish brown sandy CLAY.
		2.00	SPT	N=20 (2,3/4,4,5,7)				
						(1.94)		
		3.00	SPT	N=50 for 290mm (6,9/12,13,13,12 for 65mm)				
					58.60	3.44		*End of Borehole at 3.44m*

Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 0.50 - 1.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Window Sampler

WS101

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387704.13	396236.52	62.04	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling



Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 0.50 - 1.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS102

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387771.09	396243.08	61.55	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Legend	Description
					61.45	(0.10)		Asphalt.
					61.35	0.10		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
						(0.10)		
						0.20		MADE GROUND: Brown sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone, brick and asphalt with cobble sized fragments of brick.
						(0.40)		
					60.95	0.60		Stiff medium strength brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone. (Becoming very stiff very high strength from 2.00 m bgl).
		0.90 1.00	ES 1 SPT	N=11 (2,2/3,2,3,3)				
		1.50-2.00	L 1					
		2.00	SPT	N=33 (5,5/7,7,8,11)		(2.83)		
		3.00	SPT	N=50 for 275mm (8,10/13,13,13,11 for 50mm)				
					58.12	3.43		*End of Borehole at 3.43m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

Remarks
1. Refused at 3.43 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 1.00 - 3.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.43m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS102

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387771.09	396243.08	61.55	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling



Remarks
1. Refused at 3.43 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 1.00 - 3.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.43m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS103

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387778.00	396280.14	61.71	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.20	ES 1		61.61	(0.10) 0.10		Asphalt.
					61.41	(0.20) 0.30		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
		1.00	SPT	N=13 (2,2/3,2,3,5)		(1.10)		MADE GROUND: Greyish brown sandy gravel. Gravel is fine to coarse, subangular to subrounded of mudstone and sandstone.
		1.50-2.00	L 1		60.31	1.40		Very stiff very high strength brown slightly sandy CLAY.
		2.00	SPT	N=50 for 290mm (5,7/11,13,14,3 for 65mm)		(1.04)		
					59.27	2.44		*End of Borehole at 2.44m*

Remarks
1. Refused at 2.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 0.50 - 1.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 2.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Window Sampler

WS103

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387778.00	396280.14	61.71	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling



Remarks
1. Refused at 2.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 0.50 - 1.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 2.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS104

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387790.43	396217.88	61.69	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					61.59	(0.10) 0.10		Asphalt.
						(0.30)		MADE GROUND: Grey slightly sandy gravel. Gravel is fine to coarse, subangular to rounded of brick asphalt, mudstone, sandstone and limestone.
					61.29	0.40		
						(0.60)		MADE GROUND: Brown slightly sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of brick and sandstone.
		0.90 1.00	ES 1 SPT	N=13 (2,3/3,3,3,4)	60.69	1.00		Stiff medium strength brown mottled grey slightly sandy CLAY. (Becoming very stiff high strength from 2.00 m bgl, then becoming very stiff very high strength from 3.00 m bgl).
		2.00	SPT	N=28 (4,5/5,7,7,9)		(2.44)		
		2.50-3.00	L 1					
		3.00	SPT	N=50 for 290mm (6,9/11,13,14,12 for 65mm)				
					58.25	3.44		*End of Borehole at 3.44m*

Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 1.00 - 3.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Window Sampler

WS104

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387790.43	396217.88	61.69	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling



Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 1.00 - 3.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS105

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387815.11	396281.05	62.73	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					62.63	(0.10) 0.10		Asphalt.
					62.43	(0.20) 0.30		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
						(0.70)		MADE GROUND: Brown slightly sandy slightly gravelly clay. Gravel is fine to coarse, subangular to subrounded of brick and mudstone.
		1.00	SPT	N=8 (1,1/2,2,2,2)	61.73	1.00		Stiff medium strength yellowish brown slightly sandy CLAY.
						(0.60)		
					61.13	1.60		Very stiff high strength brown slightly sandy CLAY. (Becoming very high stiff very high strength from 3.00 m bgl).
		2.00 2.10	SPT ES 1	N=20 (3,4/4,4,5,7)				
		2.50-3.00	L 1			(1.84)		
		3.00	SPT	N=50 for 285mm (7,9/12,13,13,12 for 60mm)				
					59.29	3.44		*End of Borehole at 3.44m*

Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 0.50 - 1.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Window Sampler

WS105

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387815.11	396281.05	62.73	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling



Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 0.50 - 1.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Window Sampler

WS106

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387807.66	396246.11	62.21	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					62.11	(0.10) 0.10		Asphalt.
		0.30	ES 1			(0.30)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
	▽				61.81	0.40		
						(0.30)		MADE GROUND: Reddish brown sandy gravel. Gravel is fine to coarse, subangular to subrounded of ceramic, brick, sandstone and mudstone.
					61.51	0.70		
		1.00	SPT	N=2 (1,0/1,0,1,0)		(0.30)		MADE GROUND: Brown slightly sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of asphalt, brick, mudstone and sandstone.
					61.21	1.00		
						(0.60)		MADE GROUND: Reddish brown sandy gravel. Gravel is fine to coarse, subangular to subrounded of ceramic, brick, sandstone and mudstone.
					60.61	1.60		
		2.00	SPT	N=26 (3,3/5,6,7,8)				Very stiff high strength dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone.
		2.00	ES 1			(1.20)		
					59.41	2.80		Very stiff very high strength brown slightly sandy CLAY.
		3.00	SPT	N=50 for 290mm (7,9/10,13,13,14 for 65mm)		(0.64)		
					58.77	3.44		*End of Borehole at 3.44m*

Remarks
1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. Water strike encountered at 0.50 m bgl. 4. Monitoring well installed with response zone from 2.00 - 3.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 3.44m WS

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Window Sampler

WS106

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	387807.66	396246.11	62.21	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client	Consultant	Contractor
Kellen Homes Ltd	E3P	Paddy Malone Sampling



Remarks

1. Refused at 3.44 m bgl due to stiff clay. 2. Location derived from GPS. 3. Water strike encountered at 0.50 m bgl. 4. Monitoring well installed with response zone from 2.00 - 3.00 m bgl.

Method, Plant, Stability, Dimensions		Logger
0.00 - 3.44m	WS	C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Cable Percussion Log

CP101
Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
CP	387824.80	396259.67	62.55	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-08	2025-12-08

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					62.45	(0.10) 0.10		Asphalt.
					62.25	(0.20) 0.30		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
		1.20 1.20 1.20	SPT D 1 B 1	N=4 (1,1/1,1,1,1)		(1.70)		MADE GROUND: Brown sandy gravel. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone, brick, concrete and asphalt.
		2.00 2.00 2.00	SPT D 1 B 1	N=4 (1,1/1,1,1,1)	60.55	2.00		Soft very low strength brown slightly sandy gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone. (Becoming Very stiff very high strength from 3.00 m bgl, then becoming very stiff high strength from 4.00 m bgl, then becoming very stiff very high strength from 5.00 m bgl).
						(0.50)		
					60.05	2.50		Very stiff very high strength brown slightly sandy gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone.
		3.00 3.00 3.00	SPT D 1 B 1	N=37 (3,5/7,9,9,12)				
		4.00 4.00 4.00	SPT D 1 B 1	N=34 (4,4/6,8,10,10)				
		5.00	SPT	N=50 for 265mm (4,6/9,16,16,9 for 40mm)		(5.07)		
		5.00 5.00	D 1 B 1					
		6.00	SPT	N=50 for 260mm (3,7/10,14,20,6 for 35mm)				
		6.00 6.00	D 1 B 1					
		7.50	SPT	N=50 for 25mm (25 for 45mm/50 for 25mm)	54.98	7.57		*End of Borehole at 7.57m*

Remarks
1. Refused at 7.57 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 4.00 - 7.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 7.57m CP

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Cable Percussion Log

CP102
Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
CP	387746.98	396298.84	61.91	1:50

Project Name	Project No.	Start Date	End Date
Buzz Bingo	18-376	2025-12-09	2025-12-09

Client
Kellen Homes Ltd

Consultant
E3P

Contractor
Paddy Malone Sampling

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
					61.81	(0.10)		Asphalt.
						0.10 (0.30)		MADE GROUND: Light greyish brown slightly sandy gravel. Gravel is fine to coarse, subangular to subrounded of concrete and limestone. (TYPE 1 MOT).
					61.51	0.40		MADE GROUND: Brown sandy gravel. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone, brick, concrete and asphalt with cobble sized fragments of brick and concrete.
						(0.60)		
					60.91	1.00		Very stiff very high strength brown slightly sandy gravelly CLAY. Gravel is fine to medium, subangular to subrounded of mudstone and sandstone.
		1.20	SPT	N=18 (4,4/4,4,5,5)				
		1.20	D 1					
		1.20	B 1					
		2.00	SPT	N=27 (5,5/6,7,7,7)				
		2.00	D 1					
		2.00	B 1					
		3.00-3.45	L 1					
						(5.26)		
		4.00	SPT	N=50 for 215mm (5,15/20,25,0 for 65mm)				
		4.00	D 1					
		4.00	B 1					
		5.00	SPT	N=50 for 175mm (3,12/18,22,10 for 25mm)				
		5.00	D 1					
		6.00	SPT	N=50 for 130mm (6,19/30,20 for 55mm)				
					55.65	6.26		*End of Borehole at 6.26m*

Remarks
1. Refused at 6.26 m bgl due to stiff clay. 2. Location derived from GPS. 3. No water strike encountered. 4. Monitoring well installed with response zone from 2.00 - 6.00 m bgl.

Method, Plant, Stability, Dimensions
0.00 - 6.26m CP

Logger
C. Allen

Checked By: M. Dee **Approved By:** M. Dee

Created using Pebble Geo

Appendix VII: Chemical Testing Results



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Analytical Report Number : 25-066965

Project / Site name:	Buzz Bingo	**Samples received on:**	11/12/2025
Your job number:	18-376	**Samples instructed on/ Analysis started on:**	11/12/2025
Your order number:	12961	**Analysis completed by:**	22/12/2025
Report Issue Number:	1	**Report issued on:**	22/12/2025
Samples Analysed:	7 soil samples - 1 leachate sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

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

Analytical Report Number: 25-066965
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number				778759	778760	778761	778762	778763
Sample Reference				TP/SA101	TP103	TP105	TP107	TP/SA109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.70	1.80	0.20	0.20	1.00
Date Sampled				08/12/2025	08/12/2025	08/12/2025	08/12/2025	08/12/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	38.3	80.5	< 0.1
Moisture Content	%	0.01	NONE	22	13	18	6.4	28
Total mass of sample received	kg	0.1	NONE	1.1	1.1	0.7	0.8	1.7
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	-	-	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	-	-	CZJ	CZJ	CZJ
Analysis completed	N/A	N/A	N/A	-	-	19/12/2025	19/12/2025	19/12/2025
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	6.9	8	7.5	8.2	7.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	68	65	55	47	710
Water Soluble SO_4 16hr extraction (2:1)	mg/l	1.25	MCERTS	34.2	32.5	27.5	23.4	354
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.7	0.8	2.1	4.5	1.8
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.06	< 0.05	0.41	0.13	0.48
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.26	0.11	0.11
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.7	0.09	0.92
Fluorene	mg/kg	0.05	MCERTS	0.05	< 0.05	1.6	0.08	0.64
Phenanthrene	mg/kg	0.05	MCERTS	0.24	< 0.05	16	0.59	3.2
Anthracene	mg/kg	0.05	MCERTS	0.05	< 0.05	2.8	0.17	1.1
Fluoranthene	mg/kg	0.05	MCERTS	0.13	< 0.05	17	0.82	8.9
Pyrene	mg/kg	0.05	MCERTS	0.09	< 0.05	17	0.95	8.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	7.5	< 0.05	4.7
Chrysene	mg/kg	0.05	MCERTS	0.05	< 0.05	7.4	0.58	5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	7.9	0.84	6.9
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	2.8	0.3	2.5
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	6.5	0.79	5.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.6	0.59	2.7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.57	< 0.05	0.59
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.5	1.1	3.2
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	96.5	7.13	55

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Analytical Report Number: 25-066965
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number				778759	778760	778761	778762	778763
Sample Reference				TP/SA101	TP103	TP105	TP107	TP/SA109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				1.70	1.80	0.20	0.20	1.00
Date Sampled				08/12/2025	08/12/2025	08/12/2025	08/12/2025	08/12/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.7	9	20	9.5	37
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	1	0.7	0.8
Chromium (hexavalent)	mg/kg	1.8	MCERTS	U/S *U/S g	< 1.8	U/S *U/S g	< 1.8	< 1.8
Chromium (hexavalent) by IC	mg/kg	1.8	NONE	< 1.80	-	< 1.80	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	25	25	17	34
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	25	72	40	130
Lead (aqua regia extractable)	mg/kg	1	MCERTS	15	12	370	72	250
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	28	25	25	29
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	28	56	190	91	360
Petroleum Hydrocarbons								
TPH (>EC5 - EC10) $_{HS_1D_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (>EC5 - EC6) $_{HS_1D_TOTAL}$	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (>EC6 - EC8) $_{HS_1D_TOTAL}$	mg/kg	0.01	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
TPH (>EC8 - EC10) $_{HS_1D_TOTAL}$	mg/kg	0.02	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
TPH (>EC10 - EC12) $_{EH_CU_1D_TOTAL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	4.2	3.4	9.3
TPH (>EC12 - EC16) $_{EH_CU_1D_TOTAL}$	mg/kg	4	MCERTS	< 4.0	< 4.0	24	14	27
TPH (>EC16 - EC21) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	63	59	68
TPH (>EC21 - EC35) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	60	1700	220
TPH (>EC35 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	< 10	1300	65
TPH Total >EC5 - EC40 $_{EH_CU+HS_1D_TOTAL}$	mg/kg	10	NONE	< 10	< 10	160	3100	390
TPH (EC10 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	160	3100	390

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

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Analytical Report Number: 25-066965
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number				778764	778765
Sample Reference				WS105	WS106
Sample Number				None Supplied	None Supplied
Water Matrix				N/A	N/A
Depth (m)				2.10	0.30
Date Sampled				08/12/2025	08/12/2025
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	47.7
Moisture Content	%	0.01	NONE	13	11
Total mass of sample received	kg	0.1	NONE	0.8	1.5

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	-	CZJ
Analysis completed	N/A	N/A	N/A	-	19/12/2025

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.2	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	54	100
Water Soluble SO_4 16hr extraction (2:1)	mg/l	1.25	MCERTS	27	51
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.8	0.3

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.05	0.1
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.25
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.26
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.05	0.19
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.16
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.24
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.09
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.18
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.12
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.15

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	1.74

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Analytical Report Number: 25-066965
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number				778764	778765
Sample Reference				WS105	WS106
Sample Number				None Supplied	None Supplied
Water Matrix				N/A	N/A
Depth (m)				2.10	0.30
Date Sampled				08/12/2025	08/12/2025
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.7	6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8
Chromium (hexavalent) by IC	mg/kg	1.8	NONE	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	11
Copper (aqua regia extractable)	mg/kg	1	MCERTS	24	22
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	63
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.7	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	55	59
Petroleum Hydrocarbons					
TPH (>EC5 - EC10) $_{HS_1D_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0
TPH (>EC5 - EC6) $_{HS_1D_TOTAL}$	mg/kg	0.1	NONE	< 0.1	< 0.1
TPH (>EC6 - EC8) $_{HS_1D_TOTAL}$	mg/kg	0.01	MCERTS	< 0.01	< 0.01
TPH (>EC8 - EC10) $_{HS_1D_TOTAL}$	mg/kg	0.02	MCERTS	< 0.02	< 0.02
TPH (>EC10 - EC12) $_{EH_CU_1D_TOTAL}$	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH (>EC12 - EC16) $_{EH_CU_1D_TOTAL}$	mg/kg	4	MCERTS	< 4.0	< 4.0
TPH (>EC16 - EC21) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10
TPH (>EC21 - EC35) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10
TPH (>EC35 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10
TPH Total >EC5 - EC40 $_{EH_CU+HS_1D_TOTAL}$	mg/kg	10	NONE	< 10	< 10
TPH (EC10 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10

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

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Analytical Report Number: 25-066965
Project / Site name: Buzz Bingo

Your Order No: 12961

Lab Sample Number				778765
Sample Reference				WS106
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.30
Date Sampled				08/12/2025
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
General Inorganics				
pH (automated)	pH Units	N/A	ISO 17025	7.7
Total Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0
Total Phenols				
Total Phenols (monohydric) low level	µg/l	1	NONE	1.6
Speciated PAHs				
Naphthalene	µg/l	0.01	NONE	< 0.01
Acenaphthylene	µg/l	0.01	NONE	< 0.01
Acenaphthene	µg/l	0.01	NONE	< 0.01
Fluorene	µg/l	0.01	NONE	< 0.01
Phenanthrene	µg/l	0.01	NONE	< 0.01
Anthracene	µg/l	0.01	NONE	< 0.01
Fluoranthene	µg/l	0.01	NONE	< 0.01
Pyrene	µg/l	0.01	NONE	< 0.01
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01
Chrysene	µg/l	0.01	NONE	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01
Total PAH				
Total EPA-16 PAHs	µg/l	0.16	NONE	< 0.16
Heavy Metals / Metalloids				
Arsenic (dissolved)	µg/l	1	ISO 17025	1.6
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4
Copper (dissolved)	µg/l	0.7	ISO 17025	8.1
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.4
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	11
Petroleum Hydrocarbons				
TPH - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	µg/l	1	NONE	< 1.0
TPH - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	µg/l	1	NONE	< 1.0
TPH - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	µg/l	1	NONE	< 1.0
TPH - Aliphatic >EC10 - EC12 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >EC12 - EC16 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >EC16 - EC21 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >EC21 - EC35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >EC5 - EC35 $_{HS+EH_1D_AL_MS}$	µg/l	10	NONE	< 10

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Analytical Report Number: 25-066965
Project / Site name: Buzz Bingo

Your Order No: 12961

Lab Sample Number				778765
Sample Reference				WS106
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.30
Date Sampled				08/12/2025
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
TPH - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	µg/l	1	NONE	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	µg/l	1	NONE	< 1.0
TPH - Aromatic >EC8 - EC10 $_{EH_1D_AR_MS}$	µg/l	1	NONE	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC12 - EC16 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC16 - EC21 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC21 - EC35 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC6 - EC35 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH (EC10 - EC40) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0
Benzene	µg/l	1	NONE	< 1.0
Toluene	µg/l	1	NONE	< 1.0
Ethylbenzene	µg/l	1	NONE	< 1.0
p & m-xylene	µg/l	1	NONE	< 1.0
o-xylene	µg/l	1	NONE	< 1.0

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

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

Analytical Report Number : 25-066965
Project / Site name: Buzz Bingo

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
778759	TP/SA101	None Supplied	1.7	Brown clay and sand
778760	TP103	None Supplied	1.8	Brown clay and sand
778761	TP105	None Supplied	0.2	Brown loam and clay with vegetation and stones
778762	TP107	None Supplied	0.2	Brown loam and sand with gravel and stones
778763	TP/SA109	None Supplied	1	Brown loam and clay with gravel
778764	WS105	None Supplied	2.1	Brown clay and sand with gravel and vegetation
778765	WS106	None Supplied	0.3	Brown clay and sand with brick and stones

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

Analytical Report Number : 25-066965
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Hexavalent chromium in soil by Ion Chromatography	Determination of hexavalent chromium in alkaline soil extract by use of ion chromatography with spectrophotometric detection	In-house method	L130B	W	NONE
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Total petroleum hydrocarbons by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total petroleum hydrocarbons by HS-GC-MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS	In-house method	L088-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099-PL	D	MCERTS
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025

Analytical Report Number : 25-066965
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total petroleum hydrocarbons with carbon banding by GC-MS in leachate	Determination of total petroleum hydrocarbons in leachate by GC-MS with carbon banding aliphatic and aromatic	In-house method	L070B	W	NONE
Total petroleum hydrocarbons with carbon banding by GC-MS/GC-MS HS in leachate (Summed Bands)	Determination of total petroleum hydrocarbons in leachate by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic (Summed Bands).	Calculation	L070B/L088-PL	W	NONE
Total petroleum hydrocarbons by GC-MS in leachate	Determination of total petroleum hydrocarbons in leachate by GC-MS	In-house method	L070B	W	NONE
BTEX and/or Volatile organic compounds in leachate	Determination of volatile organic compounds in leachate by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	NONE
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	ISO 17025
Monohydric phenols (low level) in leachate	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	NONE
Total cyanide (low level) in leachate	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	NONE
Total petroleum hydrocarbons with carbon banding by HS-GC/MS in leachate	Determination of total petroleum hydrocarbons in leachate by HS-GC/MS with carbon banding aliphatic and aromatic	In-house method	L088-PL	W	NONE
pH at 20°C in leachate (automated)	Determination of pH in leachate by electrometric measurement	In-house method	L099-PL	W	ISO 17025
Speciated PAHs and/or Semi-volatile organic compounds in leachate	SVOCs and PAHs in leachate	In-house method	L102B		NONE

Analytical Report Number : 25-066965
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
NRA Leachate 10:1		In-house method based on interim NRA guidance (1994)	L020B	W	NONE

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

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

*U/S g- Unsuitable for analysis due to high colour intensity.

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Analytical Report Number : 25-067375

Project / Site name:	Buzz Bingo	**Samples received on:**	11/12/2025
Your job number:	18 376	**Samples instructed on/ Analysis started on:**	15/12/2025
Your order number:	12961	**Analysis completed by:**	30/12/2025
Report Issue Number:	1	**Report issued on:**	30/12/2025
Samples Analysed:	1 soil sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

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

Analytical Report Number: 25-067375
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number	781438
Sample Reference	WS104
Sample Number	None Supplied
Water Matrix	N/A
Depth (m)	0.90
Date Sampled	08/12/2025
Time Taken	None Supplied

Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	20
Total mass of sample received	kg	0.1	NONE	0.8

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MJN
Analysis completed	N/A	N/A	N/A	23/12/2025

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	810
Water Soluble SO_4 16hr extraction (2:1)	mg/l	1.25	MCERTS	403
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.88
Acenaphthylene	mg/kg	0.05	MCERTS	0.8
Acenaphthene	mg/kg	0.05	MCERTS	2.2
Fluorene	mg/kg	0.05	MCERTS	3.2
Phenanthrene	mg/kg	0.05	MCERTS	22
Anthracene	mg/kg	0.05	MCERTS	5.5
Fluoranthene	mg/kg	0.05	MCERTS	28
Pyrene	mg/kg	0.05	MCERTS	28
Benzo(a)anthracene	mg/kg	0.05	MCERTS	12
Chrysene	mg/kg	0.05	MCERTS	12
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	16
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	4.8
Benzo(a)pyrene	mg/kg	0.05	MCERTS	12
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.3
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	7.3

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	161

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Analytical Report Number: 25-067375
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number	781438
Sample Reference	WS104
Sample Number	None Supplied
Water Matrix	N/A
Depth (m)	0.90
Date Sampled	08/12/2025
Time Taken	None Supplied

Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	25
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120
Lead (aqua regia extractable)	mg/kg	1	MCERTS	370
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	33
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	200
Petroleum Hydrocarbons				
TPH (>EC5 - EC10) $_{HS_1D_TOTAL}$	mg/kg	1	NONE	< 1.0
TPH (>EC5 - EC6) $_{HS_1D_TOTAL}$	mg/kg	0.1	NONE	< 0.1
TPH (>EC6 - EC8) $_{HS_1D_TOTAL}$	mg/kg	0.01	MCERTS	< 0.01
TPH (>EC8 - EC10) $_{HS_1D_TOTAL}$	mg/kg	0.02	MCERTS	< 0.02
TPH (>EC10 - EC12) $_{EH_CU_1D_TOTAL}$	mg/kg	2	MCERTS	2.4
TPH (>EC12 - EC16) $_{EH_CU_1D_TOTAL}$	mg/kg	4	MCERTS	9.9
TPH (>EC16 - EC21) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	44
TPH (>EC21 - EC35) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	82
TPH (>EC35 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	27
TPH Total >EC5 - EC40 $_{EH_CU+HS_1D_TOTAL}$	mg/kg	10	NONE	170
TPH (EC10 - EC40) $_{EH_CU_1D_TOTAL}$	mg/kg	10	MCERTS	170

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

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Analytical Report Number : 25-067375
Project / Site name: Buzz Bingo

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
781438	WS104	None Supplied	0.9	Brown clay and sand with gravel

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Analytical Report Number : 25-067375
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Total petroleum hydrocarbons by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total petroleum hydrocarbons by HS-GC-MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS	In-house method	L088-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099-PL	D	MCERTS

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Analytical Report Number : 25-067375
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

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

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

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

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Analytical Report Number : 25-068153

Project / Site name:	Buzz Bingo	**Samples received on:**	17/12/2025
Your job number:	18-376	**Samples instructed on/ Analysis started on:**	17/12/2025
Your order number:	13007	**Analysis completed by:**	07/01/2026
Report Issue Number:	1	**Report issued on:**	07/01/2026
Samples Analysed:	3 water samples		

Signed:

Trevor Hill
Customer Service
For & on behalf of i2 Analytical Ltd.

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

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

Analytical Report Number: 25-068153
Project / Site name: Buzz Bingo

Your Order No: 13007

Lab Sample Number				785623	785624	785625
Sample Reference				WS104	WS106	CP101
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				Other water	Other water	Other water
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				16/12/2025	16/12/2025	16/12/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Test Limit of detection	Test Accreditation Status			
General Inorganics						
pH (L099)	pH Units	N/A	NONE	7.5	7.3	7.5
Total Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	9.14	7.78	3.21
Total Phenols						
Total Phenols (Monohydric) Low Level	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	µg/l	0.01	NONE	< 0.01	< 0.01	0.82
Acenaphthylene	µg/l	0.01	NONE	< 0.01	0.1	0.13
Acenaphthene	µg/l	0.01	NONE	< 0.01	0.19	0.52
Fluorene	µg/l	0.01	NONE	< 0.01	0.13	0.48
Phenanthrene	µg/l	0.01	NONE	< 0.01	0.75	2.2
Anthracene	µg/l	0.01	NONE	< 0.01	0.27	0.7
Fluoranthene	µg/l	0.01	NONE	< 0.01	1.9	3.2
Pyrene	µg/l	0.01	NONE	< 0.01	1.8	3.1
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01	1	1.4
Chrysene	µg/l	0.01	NONE	< 0.01	1.1	1.5
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01	1.1	1.4
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01	0.54	0.62
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01	0.97	1.3
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	0.42	0.52
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	0.48	0.52

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

Analytical Report Number: 25-068153
Project / Site name: Buzz Bingo

Your Order No: 13007

Lab Sample Number				785623	785624	785625
Sample Reference				WS104	WS106	CP101
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				Other water	Other water	Other water
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				16/12/2025	16/12/2025	16/12/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Test Limit of detection	Test Accreditation Status			
Heavy Metals / Metalloids						
Arsenic (dissolved)	µg/l	0.15	NONE	1.06	4.07	1.24
Cadmium (dissolved)	µg/l	0.02	NONE	0.05	< 0.02	0.02
Chromium (dissolved)	µg/l	0.2	NONE	6.3	0.3	0.2
Copper (dissolved)	µg/l	0.5	NONE	3	< 0.5	0.6
Lead (dissolved)	µg/l	0.2	NONE	< 0.2	0.3	0.3
Manganese (dissolved)	µg/l	0.05	NONE	740	2900	840
Mercury (dissolved)	µg/l	0.05	NONE	0.12	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	NONE	2.7	2.9	4.3
Selenium (dissolved)	µg/l	0.6	NONE	18	1.7	1.8
Zinc (dissolved)	µg/l	0.5	NONE	6.2	2.3	6.2
Calcium (dissolved)	mg/l	0.012	NONE	130	110	77
Chromium (hexavalent)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0
Petroleum Hydrocarbons						
TPH - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC10 - EC12 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aliphatic >EC12 - EC16 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10	49	16
TPH - Aliphatic >EC16 - EC21 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10	85	17
TPH - Aliphatic >EC21 - EC35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10	360	86
TPH - Aliphatic >EC5 - EC35 $_{HS+EH_1D_AL_MS}$	µg/l	10	NONE	< 10	490	120
TPH - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	µg/l	1	NONE	< 1.0	6.5	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10	10	< 10
TPH - Aromatic >EC12 - EC16 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10	10	13
TPH - Aromatic >EC16 - EC21 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10	12	22
TPH - Aromatic >EC21 - EC35 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10	16	18
TPH - Aromatic >EC5 - EC35 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10	55	53
TPH (EC10 - EC40) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10	540	170
VOCs						
Chloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 25-068153
Project / Site name: Buzz Bingo

Your Order No: 13007

Lab Sample Number				785623	785624	785625
Sample Reference				WS104	WS106	CP101
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				Other water	Other water	Other water
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				16/12/2025	16/12/2025	16/12/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Test Limit of detection	Test Accreditation Status			
Chloroform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Benzene	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Carbontetrachloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Toluene	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Styrene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Naphthalene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	1	NONE	< 1.0	1.5	< 1.0
Isopropylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	NONE	< 3.0	5.4	< 3.0
tert-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	NONE	< 3.0	24.9	< 3.0
sec-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 25-068153
Project / Site name: Buzz Bingo

Your Order No: 13007

Lab Sample Number				785623	785624	785625
Sample Reference				WS104	WS106	CP101
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				Other water	Other water	Other water
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				16/12/2025	16/12/2025	16/12/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Test Limit of detection	Test Accreditation Status			
SVOCs						
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	0.22	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	0.13	0.38
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	0.27	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	0.09	0.38
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	0.12	0.07	0.09
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	0.28
Dibutyl phthalate	µg/l	0.05	NONE	0.08	0.13	0.2
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	0.14
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05

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

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Analytical Report Number : 25-068153
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited matrices: SW, PW, GW, except B - SW,GW, Hg - SW,PW, Al - SW,PW	In-house method based on USEPA Method 6020 & 200.8 for the determination of trace elements in water by ICP-MS	L012B	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR Analyser. Accredited matrices: SW, PW, GW, FSE, LL	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE
Total Petroleum Hydrocarbons with carbon banding in water by GC-MS	Determination of total petroleum hydrocarbons in water by GC-MS with carbon banding aliphatic and aromatic	In-house method	L070B	W	NONE
Total Petroleum Hydrocarbons with carbon banding in water by GC-MS/HS-GC-MS	Determination of total petroleum hydrocarbons in water by GC-MS/HS-GC-MS with carbon banding aliphatic and aromatic (Summed Bands)	Calculation	L070B/L088-PL	W	NONE
Total Petroleum Hydrocarbons in water by GC-MS	Determination of total petroleum hydrocarbons in water by GC-MS. Accredited matrices (TPH C12-C35): SW, PW, GW	In-house method	L070B	W	NONE
BTEX and/or Volatile Organic Compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW, PW, GW	In-house method based on USEPA 8260	L073B	W	NONE
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5-diphenylcarbazide, followed by colorimetry. Accredited matrices: SW, PW, GW, FSE, LL	In-house method by continuous flow analyser	L080-PL	W	NONE
Monohydric phenols (low level) in water	Determination of phenols in water by continuous flow analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	NONE
Total cyanide (low level) in water	Determination of total cyanide in water by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	NONE
Total Petroleum Hydrocarbons in water by HS-GC/MS	Determination of total petroleum hydrocarbons in water by headspace HS-GC/MS . Accredited matrices: SW, PW, GW	In-house method	L088-PL	W	NONE
pH of water at 20°C (automated)	Determination of pH of water by electrochemical measurement. Accredited matrices: SW, PW, GW, FSE, LL	In-house method	L099-PL	W	NONE
Speciated PAHs and/or Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds (including PAHs) in water by extraction in dichloromethane followed by GC-MS. Accredited matrices (PAHs): SW, PW, GW	In-house method based on USEPA 8270	L102B	W	NONE

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Analytical Report Number : 25-068153
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited matrices: SW, PW, GW, FSE, LL; PrW, DI PrW (Al, Cu, Fe,Zn)	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	NONE

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

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

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Analytical Report Number : 25-068912

Project / Site name:	Buzz Bingo	**Samples received on:**	16/12/2025
Your job number:		**Samples instructed on/ Analysis started on:**	22/12/2025
Your order number:	12961	**Analysis completed by:**	12/01/2026
Report Issue Number:	1	**Report issued on:**	12/01/2026
Samples Analysed:	1 soil sample		

Signed:

Rafał Szczepańczyk
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

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Analytical Report Number: 25-068912
Project / Site name: Buzz Bingo
Your Order No: 12961

Lab Sample Number	790285
Sample Reference	TPSA101
Sample Number	None Supplied
Water Matrix	N/A
Depth (m)	0.10
Date Sampled	16/12/2025
Time Taken	None Supplied

Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	0.94
Total mass of sample received	kg	0.1	NONE	0.8

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	0.12
Acenaphthene	mg/kg	0.05	NONE	0.08
Fluorene	mg/kg	0.05	NONE	0.15
Phenanthrene	mg/kg	0.05	NONE	0.38
Anthracene	mg/kg	0.05	NONE	0.25
Fluoranthene	mg/kg	0.05	NONE	0.35
Pyrene	mg/kg	0.05	NONE	0.41
Benzo(a)anthracene	mg/kg	0.05	NONE	< 0.05
Chrysene	mg/kg	0.05	NONE	0.93
Benzo(b)fluoranthene	mg/kg	0.05	NONE	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	NONE	< 0.05
Benzo(a)pyrene	mg/kg	0.05	NONE	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.98
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.34
Benzo(ghi)perylene	mg/kg	0.05	NONE	2.3

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	6.29

Miscellaneous Organics

Coal Tar		N/A	NONE	Not Identified
Total Residue	mg/kg	10	NONE	9500

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

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Analytical Report Number : 25-068912
Project / Site name: Buzz Bingo

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
790285	TPSA101	None Supplied	0.1	Black tar *g

Analytical Report Number : 25-068912
Project / Site name: Buzz Bingo

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content (Wet Weight)	Moisture content (% wet weight), determined gravimetrically (up to 30°C)	In-house-procedure based on BS EN 12880:2000	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	NONE
Coal Tar in soil	In-house method by GC-MS, by calculation of discrete polyaromatic content	In-house method by calculation	L064B	D	NONE
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

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

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

*g - Unaccredited sample matrix.

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

Appendix VIII: Geotechnical Testing Results



MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client e3p

Address Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

Contract 18-376 -
Buzz Bingo

Job Number MRN 26002/16
Date of Issue 13 January 2026

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

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

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

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M U R R A Y R I X
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

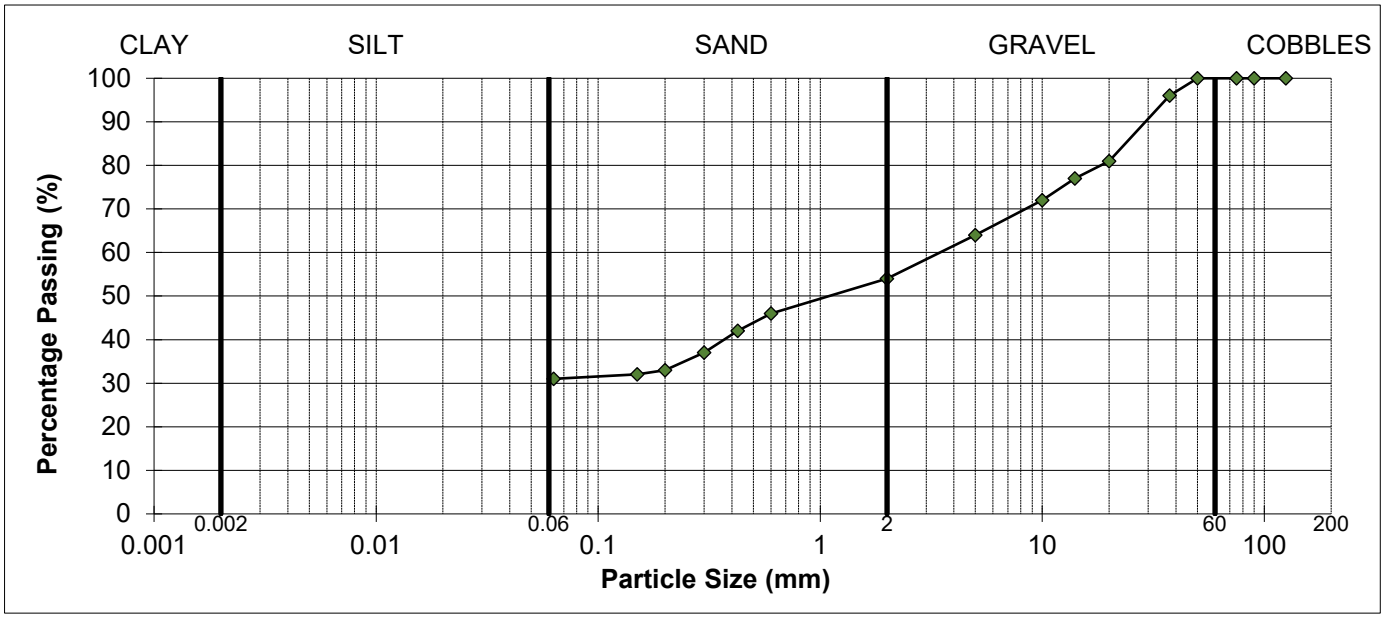
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	TP105 0.2m B	DATE SAMPLED	Not advised
LAB SAMPLE No	5249401	DATE RECEIVED	18-Dec-25
DATE TESTED	19-Dec-25	SAMPLED BY	Client

MATERIAL	MADE GROUND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100	100	5	64	
90	100		2	54	15-80
75	100		0.6	46	
50	100		0.425	42	
37.5	96		0.3	37	
20	81		0.2	33	
14	77		0.15	32	
10	72		0.063	31	15-80



SOIL FRACTIONS			
COBBLES	0%	SAND	23%
GRAVEL	46%	SILT / CLAY	31%

As received water content	26.1%

REMARKS
Sample complies with the advised grading specification for a 2C material (SHW Series 600, Table 6/2 Feb. 2017)

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 13-Jan-26

M U R R A Y R I X

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

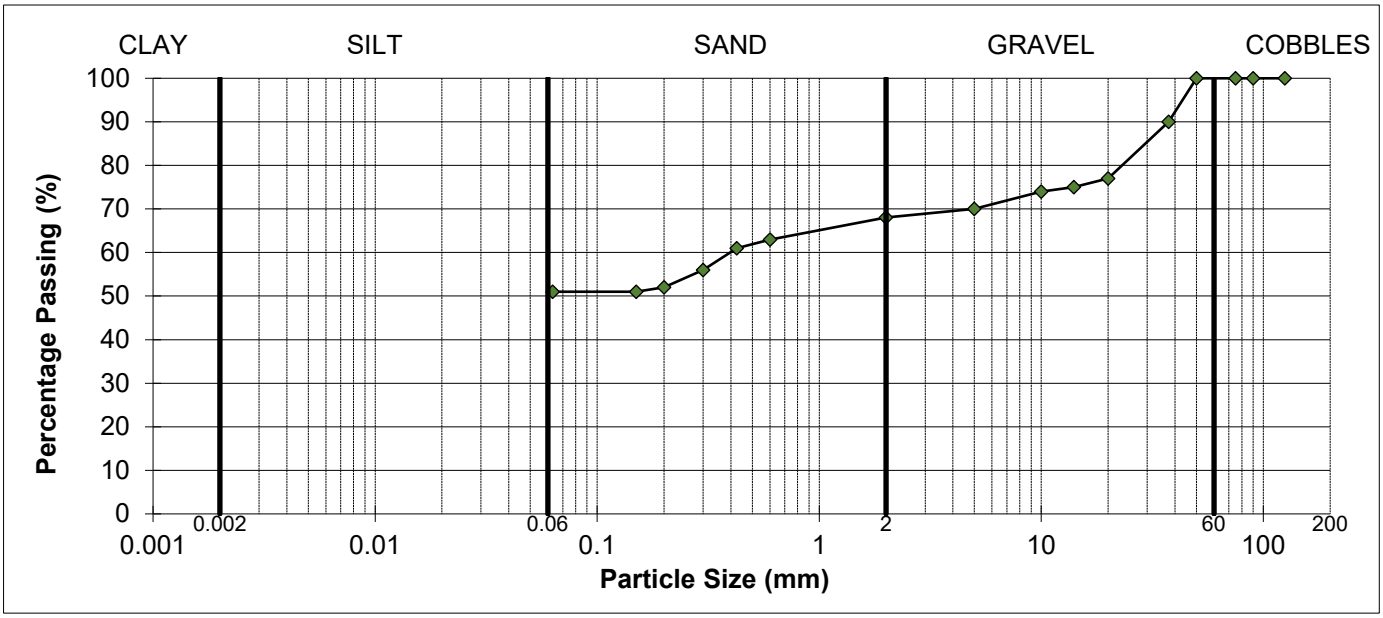
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	TP/SA106 0.6m B	DATE SAMPLED	Not advised
LAB SAMPLE No	5249402	DATE RECEIVED	18-Dec-25
DATE TESTED	19-Dec-25	SAMPLED BY	Client

MATERIAL	MADE GROUND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100	100	5	70	
90	100		2	68	15-80
75	100		0.6	63	
50	100		0.425	61	
37.5	90		0.3	56	
20	77		0.2	52	
14	75		0.15	51	
10	74		0.063	51	15-80



SOIL FRACTIONS			
COBBLES	0%	SAND	17%
GRAVEL	32%	SILT / CLAY	51%

As received water content	28.2%

REMARKS

Sample complies with the advised grading specification for a 2C material (SHW Series 600, Table 6/2 Feb. 2017)

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NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 13-Jan-26

M U R R A Y R I X

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

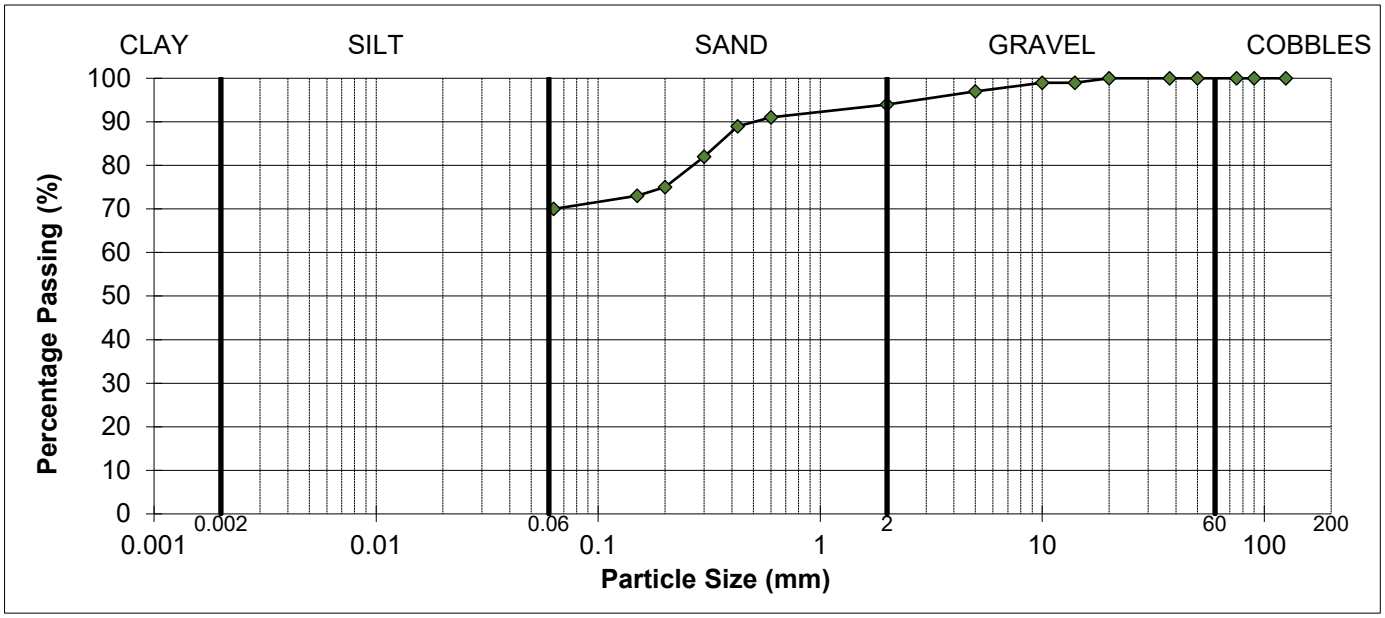
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	CP101 3.0m B	DATE SAMPLED	Not advised
LAB SAMPLE No	5249407	DATE RECEIVED	18-Dec-25
DATE TESTED	19-Dec-25	SAMPLED BY	Client

MATERIAL	Dark brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100	100	5	97	
90	100		2	94	80-100
75	100		0.6	91	
50	100		0.425	89	
37.5	100		0.3	82	
20	100		0.2	75	
14	99		0.15	73	
10	99		0.063	70	15-100



SOIL FRACTIONS			
COBBLES	0%	SAND	24%
GRAVEL	6%	SILT / CLAY	70%

As received water content	14.3%

REMARKS

Sample complies with the advised grading specification for a 2A/2B material (SHW Series 600, Table 6/2 Feb. 2017)

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 13-Jan-26

MURRAY RIX

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TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 4.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

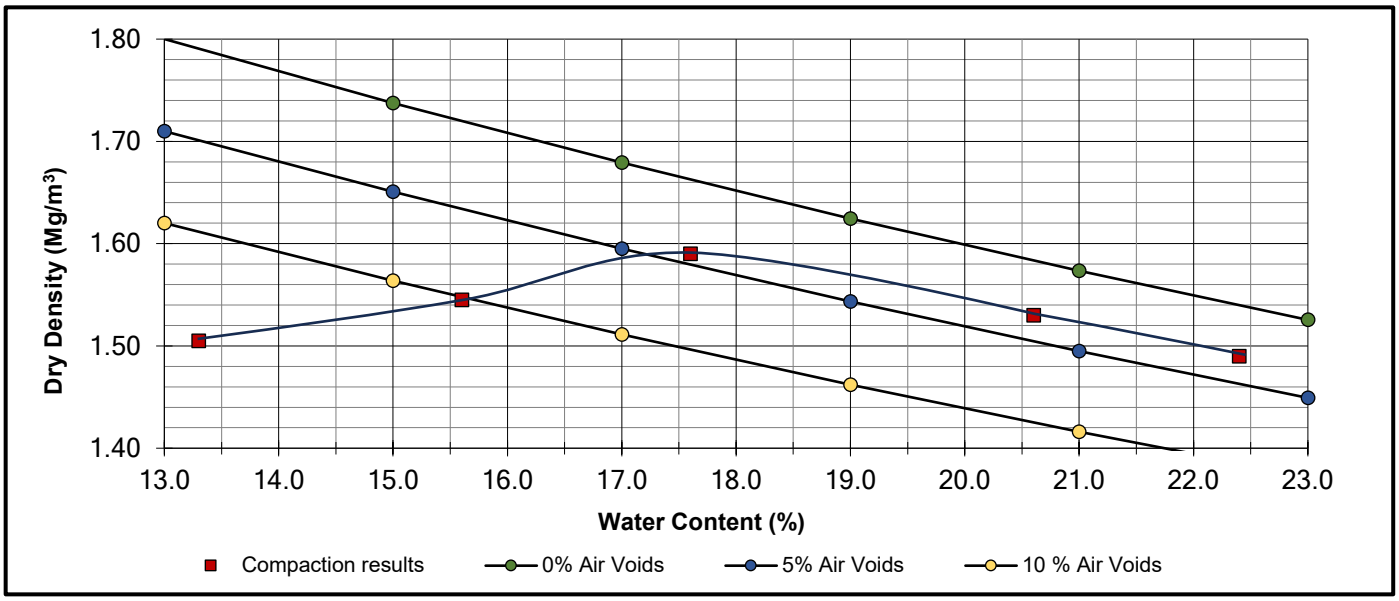
CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	TP105 0.2m B	DATE SAMPLED	Not advised
SAMPLE NUMBER	5249401	DATE RECEIVED	18-Dec-25
DATE TESTED	06-Jan-26	SAMPLED BY	Client

MATERIAL	MADE GROUND
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	4 %	GRADING ZONE	Zone 4
RETAINED 20mm	19 %	PARTICLE DENSITY	2.35 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	13.3	1.505
2	15.6	1.545
3	17.6	1.590
4	20.6	1.530
5	22.4	1.490



OPTIMUM WATER CONTENT	**18**	(%)
MAXIMUM DRY DENSITY	**1.59**	(Mg/m^3)

REMARKS

NAME O.P. Davies BA (Hons) SIGNED DATE 13-Jan-26
(Director / Head of Laboratory)

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 4.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

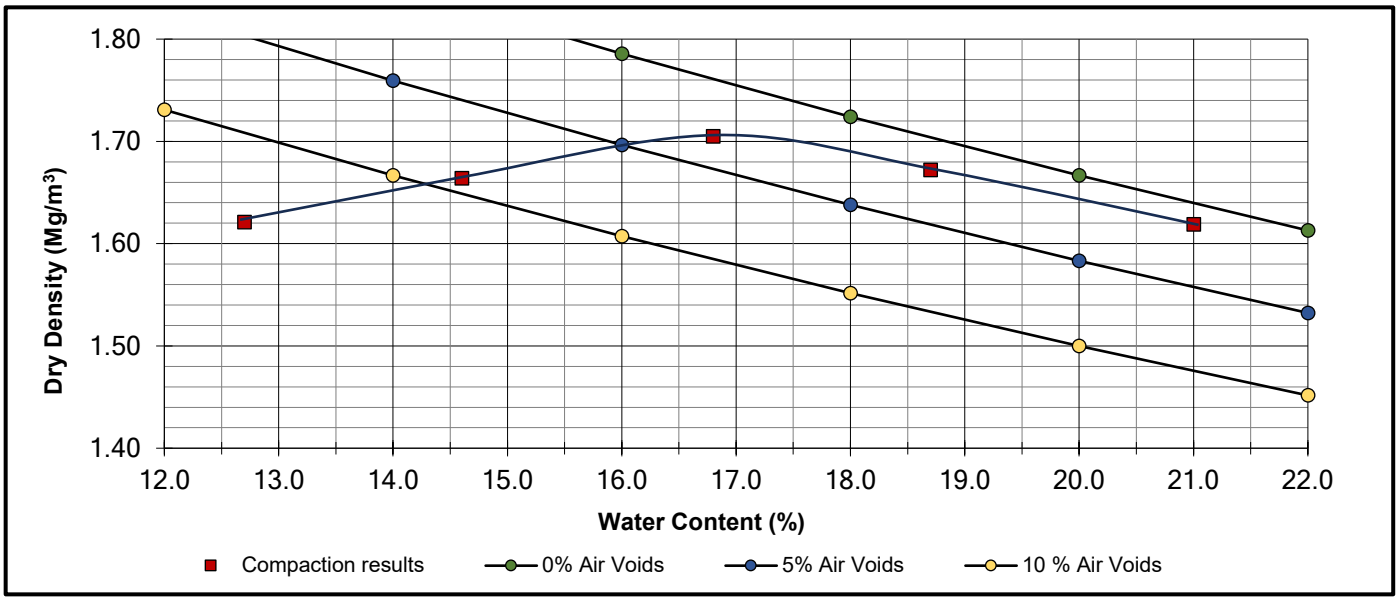
CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	TP/SA106 0.6m B	DATE SAMPLED	Not advised
SAMPLE NUMBER	5249402	DATE RECEIVED	18-Dec-25
DATE TESTED	06-Jan-26	SAMPLED BY	Client

MATERIAL	MADE GROUND
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	10 %	GRADING ZONE	Zone 5
RETAINED 20mm	23 %	PARTICLE DENSITY	2.50 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	12.7	1.621
2	14.6	1.664
3	16.8	1.705
4	18.7	1.672
5	21.0	1.619



OPTIMUM WATER CONTENT	**17**	(%)
MAXIMUM DRY DENSITY	**1.70**	(Mg/m^3)

REMARKS

NAME O.P. Davies BA (Hons) SIGNED DATE 13-Jan-26
(Director / Head of Laboratory)

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

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TEST CERTIFICATE

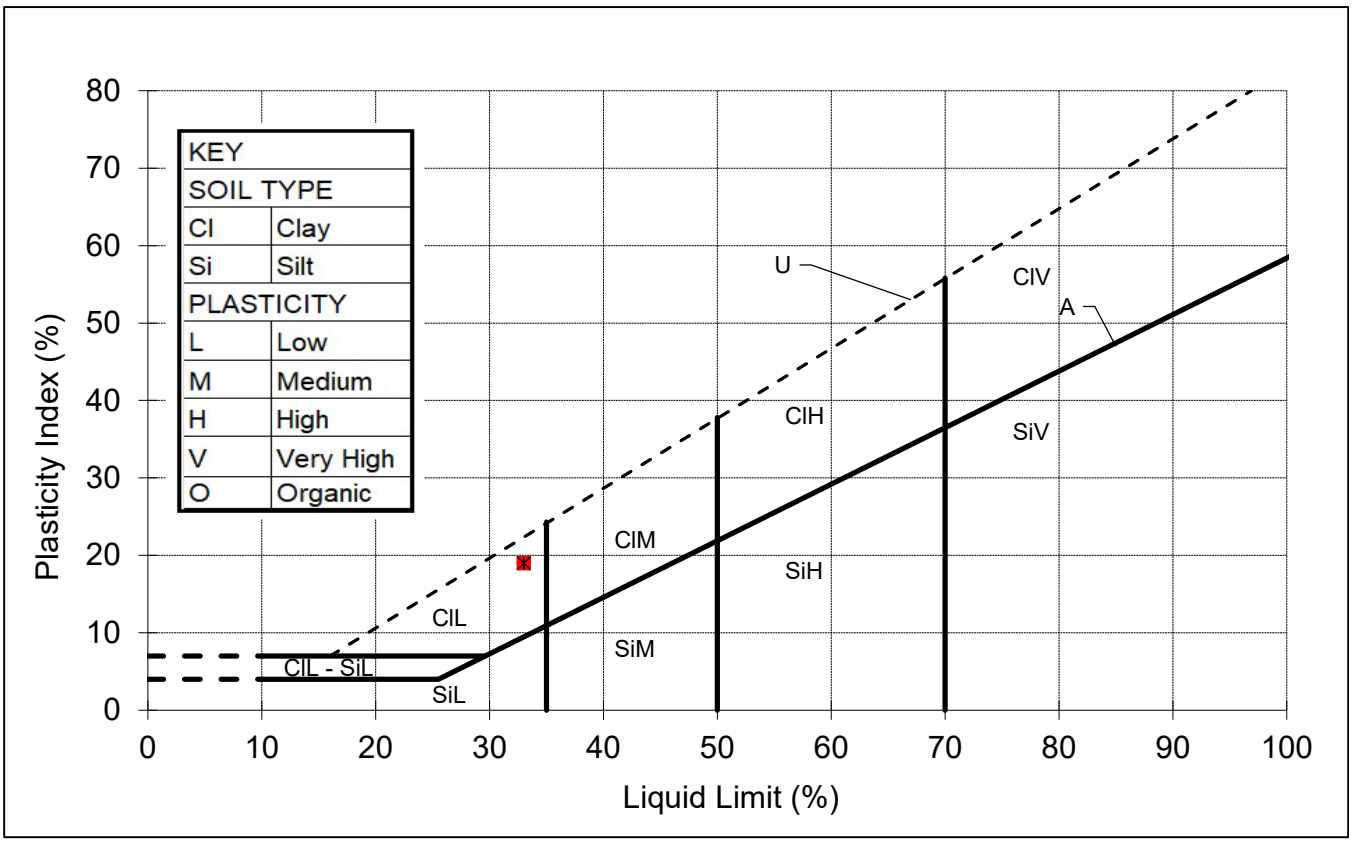
LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 4 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	WS102 2.0m D	DATE SAMPLED	Not advised
SAMPLE No.	5249403	DATE RECEIVED	18-Dec-25
DATE TESTED	09-Jan-26	SAMPLED BY	Client

MATERIAL	Dark brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
13.5	33	14	19	84



REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 13-Jan-26

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UKAS TESTING 1580

TEST CERTIFICATE

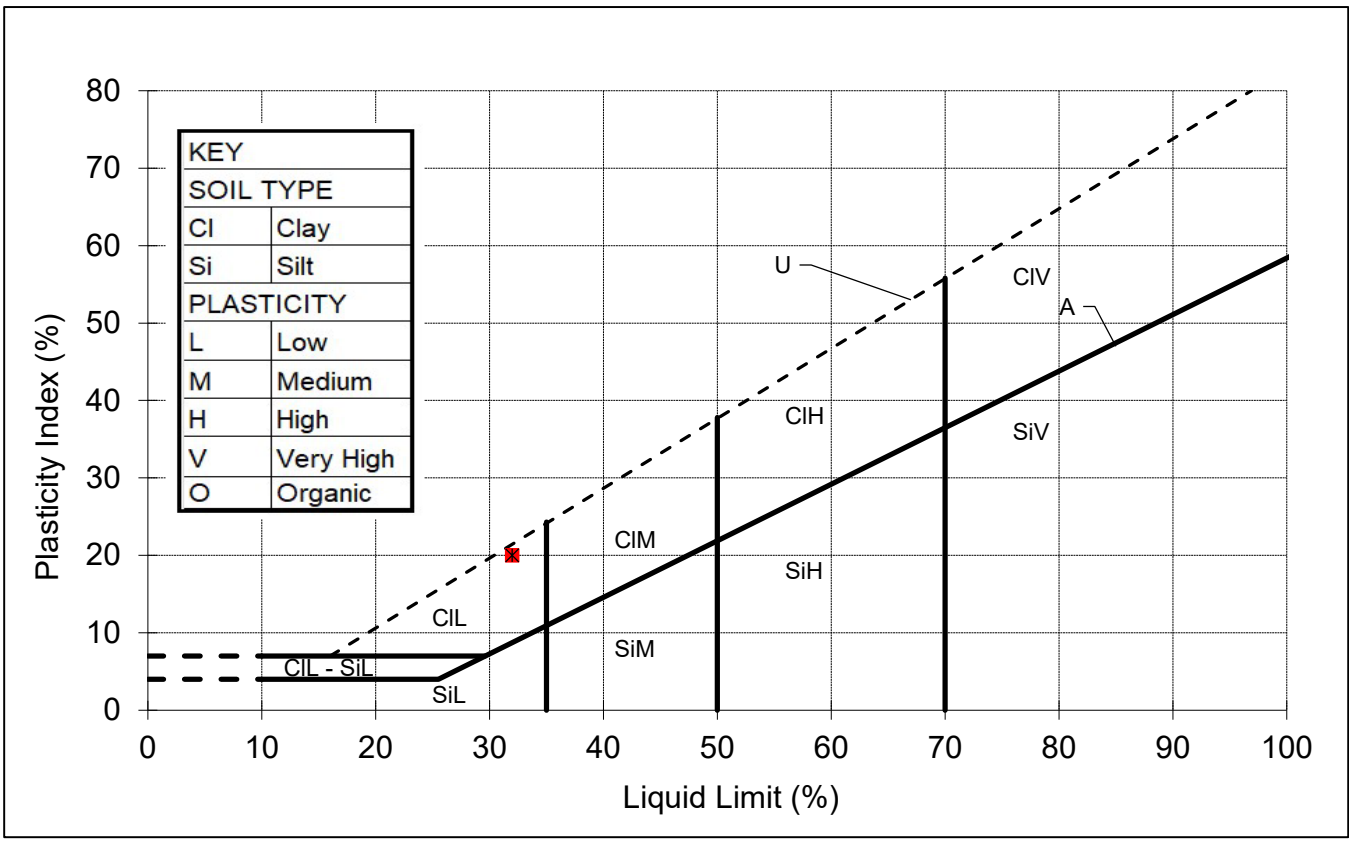
LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 4 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	WS105 2.0m D	DATE SAMPLED	Not advised
SAMPLE No.	5249406	DATE RECEIVED	18-Dec-25
DATE TESTED	09-Jan-26	SAMPLED BY	Client

MATERIAL	Dark brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15.3	32	12	20	83



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 13-Jan-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS EN ISO 17892-8:2018

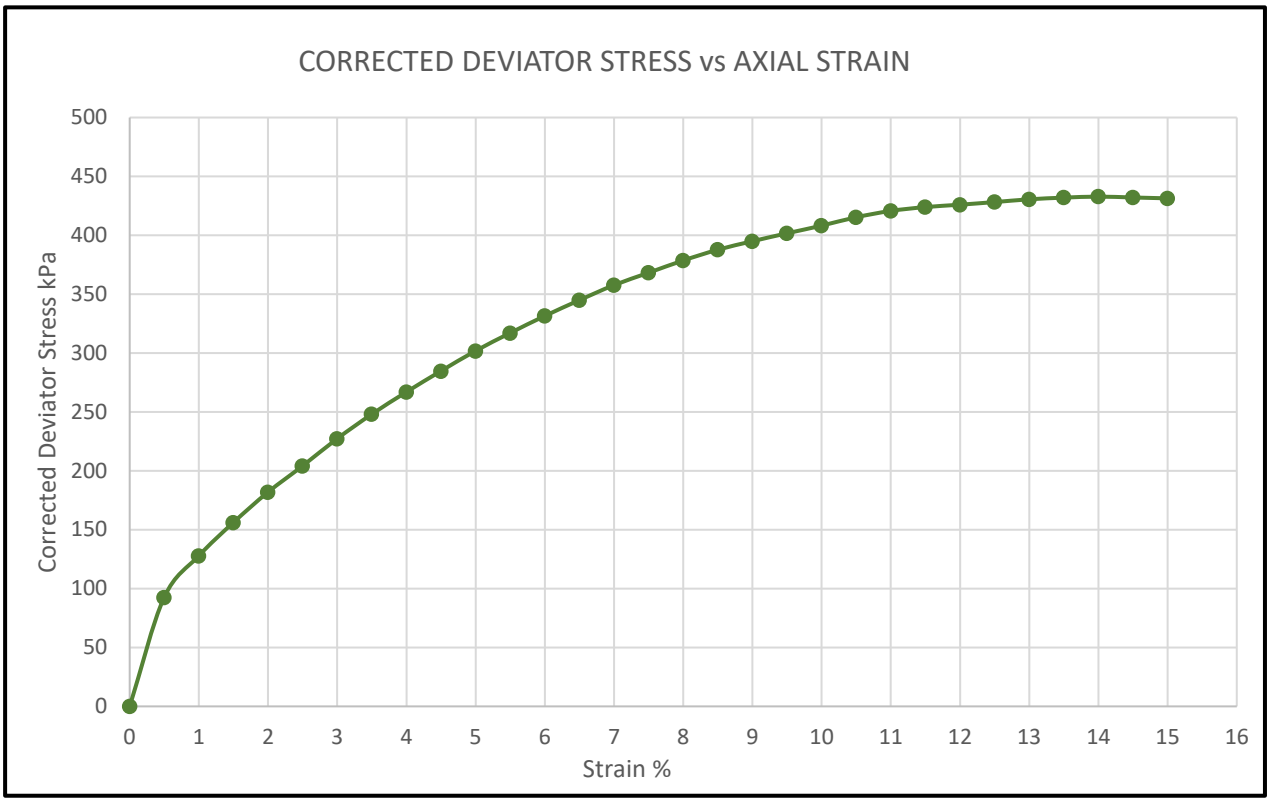
CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	WS102 1.5-2.0m U	**DATE SAMPLED**	Not advised
LAB SAMPLE No.	5249405	**DATE RECEIVED**	18-Dec-25
DATE TESTED	09-Jan-26	**SAMPLED BY**	Client
MATERIAL	Grey brown silty slightly slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

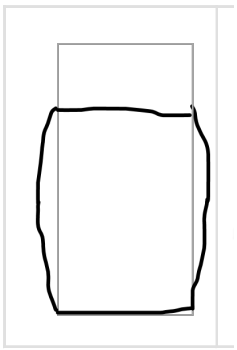
Specimen Location 

Sample Length (mm)	370	Specimen depth from top of Sample (mm)	20
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	149	Specimen Water Content (%)	16.7
Specimen Diameter (mm)	73	Specimen Bulk Density (Mg/m3)	2.14
Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	1.83
Membrane Correction	3.39		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
35	14.0	2.0	433	216

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed 

Date 13 January 2026

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

INCREMENTAL LOADING OEDOMETER TEST
BS EN ISO 17892-5:2017

CLIENT	e3p
SITE	18-376 - Buzz Bingo
JOB NUMBER	MRN 26002/16

SAMPLE LABEL	CP102 3.0-3.45m U	**DATE SAMPLED**	Not advised
LAB SAMPLE No.	5249408	**DATE RECEIVED**	18-Dec-25
DATE TESTED	06-Jan-26	**SAMPLED BY**	Client
MATERIAL	Grey brown silty slightly slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

Specimen Location

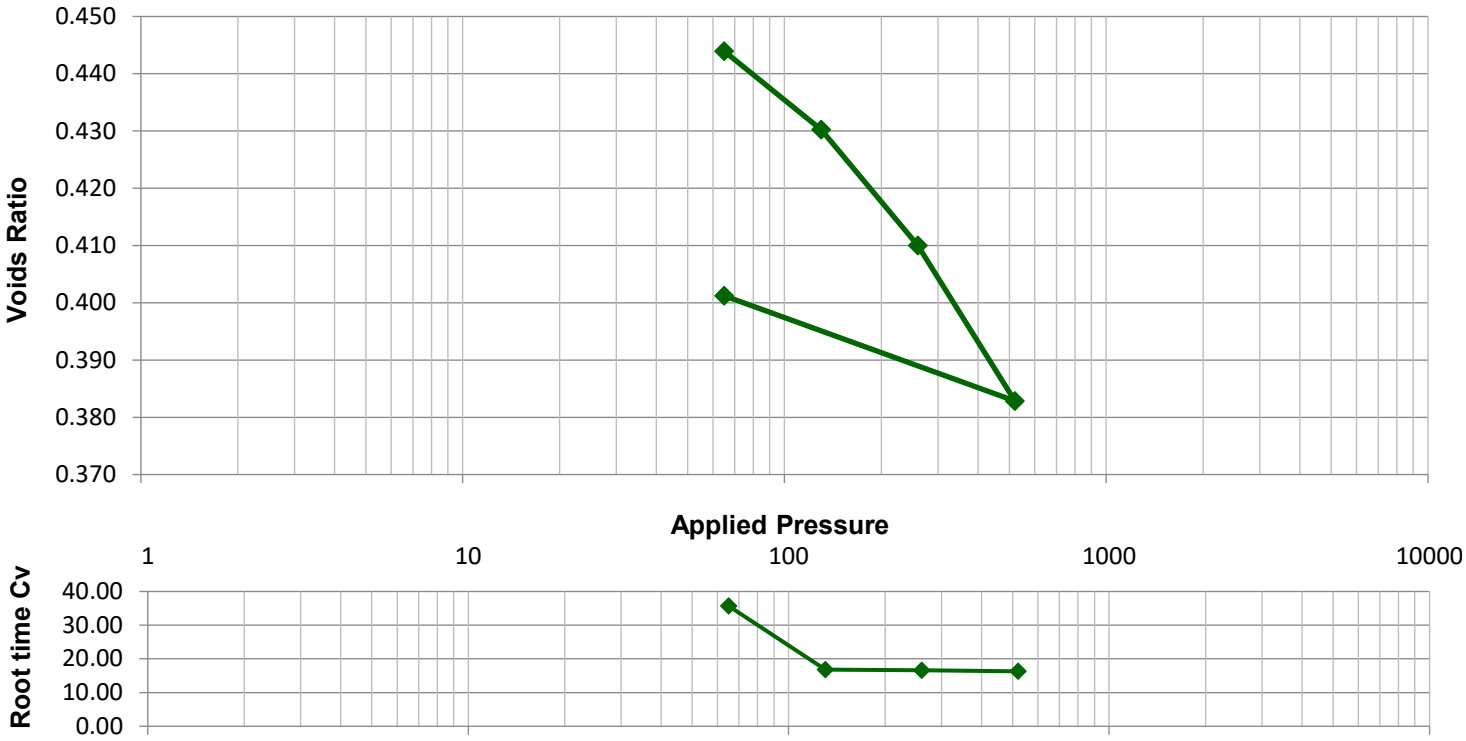
Sample Length (mm)	420	Specimen depth from top of Sample (mm)	40
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.1	mm	Particle density	2.65	Ass
Diameter	70.1	mm	Initial void ratio	0.48	
Weight wet	160.2	g	Deg. of sat.	85	%
Water cont.*	15.3	%	Swell. press.	0	kN/m^2
Bulk Density	2.07	Mg/m^3	Dry density	1.79	Mg/m^3

*determined from specimen trimmings

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m^2/MN	Temp °C	Cv t90 root m^2/yr	Cv t50 log m^2/yr
1	65	19.62	0.444	0.37	20	35.68	37.77
2	130	19.43	0.430	0.15	20	16.79	16.62
3	260	19.16	0.410	0.11	20	16.66	16.08
4	520	18.79	0.383	0.07	20	16.31	15.43
5	65	19.04	0.401	0.03	20		
6							
7							



REMARKS

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

SIGNED

DATE 13-Jan-26

Appendix IX: Origin of Chemical Assessment Criteria



CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	PROVISIONAL C4SL
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Benzo(b/k)Fluoranthene (iii)	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C5-C6 (aliphatic)	
TPH C6-C8 (aliphatic)	
TPH C8-C10 (aliphatic)	
TPH C10-C12 (aliphatic)	
TPH C21-C35 (aromatic)	

Appendix X: BRE 365 Soakaway Infiltration Tests



Site:	Buzz Bingo	**Trial Pit Number:**	TP101
Job Number:	18-376	**Length:**	3.00 m
Date of Test:	08/12/2025	**Width:**	1.00 m
		Depth:	2.90 m
		Groundwater Level:	m
		Proportion of Pit Volume Occupied by Gravel Solids (Pg)	0.00

Drafted	Rev	Auth

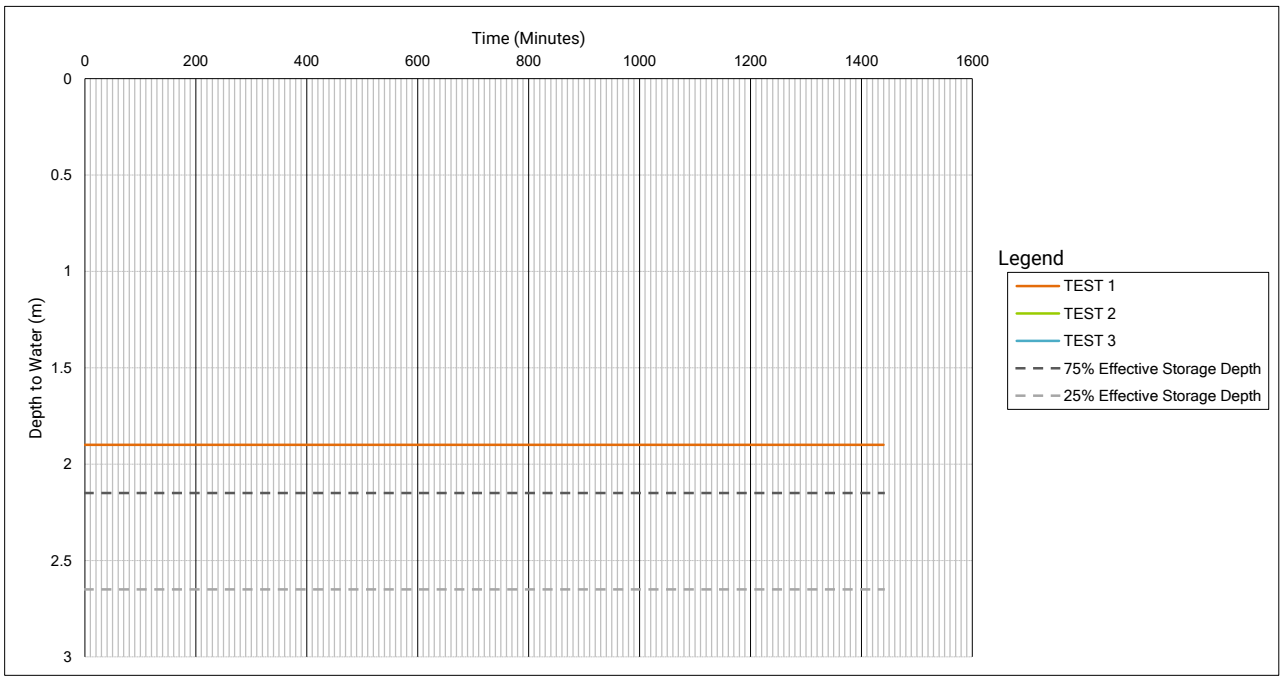
Remarks

Effective Depth - For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

Gravel Filled Pits - Typically, the proportion of volume occupied by gravel is 0.70 (i.e. 70%), leaving 30% free storage volume. If the pit is left open (gravel is not used) then Pg = 0

		TEST 1		TEST 2		TEST 3	
		Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0	1.90				
		1	1.90				
		2	1.90				
		3	1.90				
		4	1.90				
		5	1.90				
		10	1.90				
		20	1.90				
		30	1.90				
		60	1.90				
		120	1.90				
		180	1.90				
		240	1.90				
		300	1.90				
		360	1.90				
		1440	1.90				
Effective Storage Depth	m		1.00		N/A		N/A
75% Effective Storage Depth	m		0.75		N/A		N/A
(i.e. depth below GL)	m		2.15		N/A		N/A
25% Effective Storage Depth	m		0.25		N/A		N/A
(i.e. depth below GL)	m		2.65		N/A		N/A
Effective Storage Depth 75%-25%	m		0.50		N/A		N/A
Time to fall to 75% effective depth	mins		N/A		N/A		N/A
Time to fall to 25% effective depth	mins		N/A		N/A		N/A
Effective Volume of Pit - V(75%-25%) x (1-Pg)	m3		1.50		N/A		N/A
Area of Pit - ap50 (50%)	m2		7.00		N/A		N/A
t (75%-25%)	mins		N/A		N/A		N/A
SOIL INFILTRATION RATE	m/s		**N/A**		**N/A**		**N/A**

DESIGN SOIL INFILTRATION RATE, f	**N/A - Failed to soakawy to 25% effective storage depth**



Site:	Buzz Bingo	**Trial Pit Number:**	TP106
Job Number:	18-376	**Length:**	3.00 m
Date of Test:	08/12/2025	**Width:**	1.00 m
		Depth:	2.40 m
		Groundwater Level:	m
		Proportion of Pit Volume Occupied by Gravel Solids (Pg)	0.00

Drafted	Rev	Auth

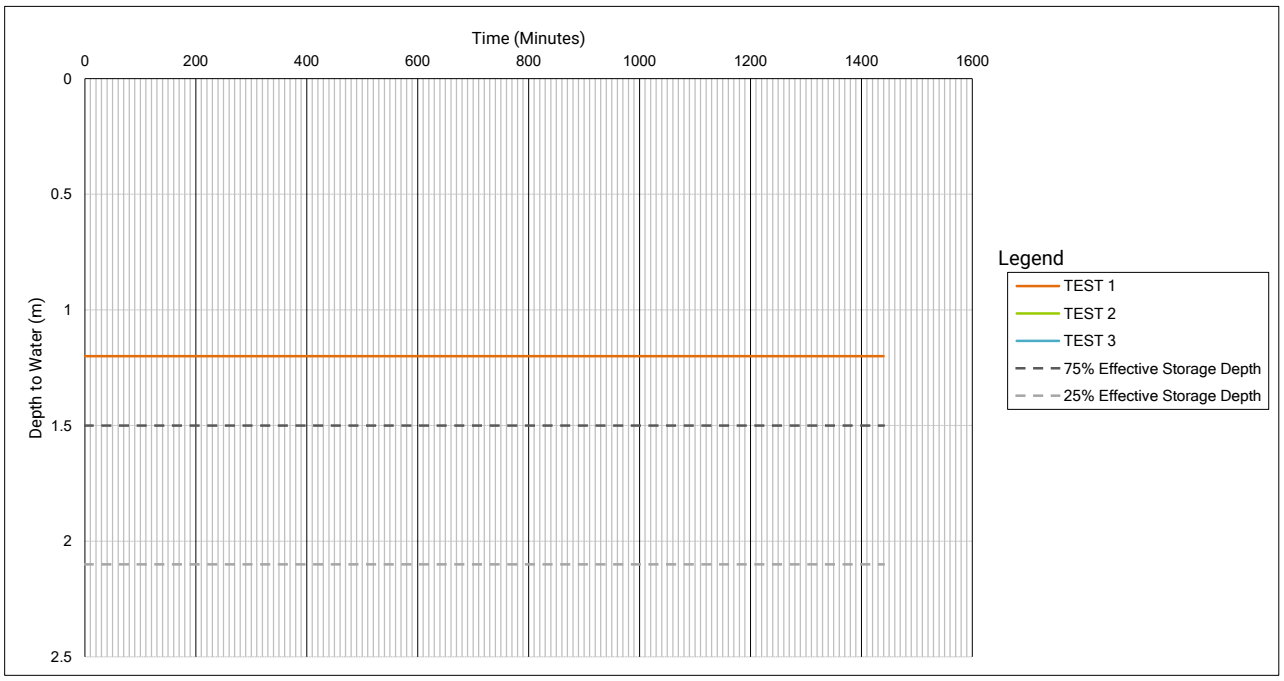
Remarks

Effective Depth - For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

Gravel Filled Pits - Typically, the proportion of volume occupied by gravel is 0.70 (i.e. 70%), leaving 30% free storage volume. If the pit is left open (gravel is not used) then Pg = 0

		TEST 1		TEST 2		TEST 3	
		Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0	1.20				
		1	1.20				
		2	1.20				
		3	1.20				
		4	1.20				
		5	1.20				
		10	1.20				
		20	1.20				
		30	1.20				
		60	1.20				
		120	1.20				
		180	1.20				
		240	1.20				
		300	1.20				
		360	1.20				
		1440	1.20				
Effective Storage Depth	m		1.20		N/A		N/A
75% Effective Storage Depth	m		0.90		N/A		N/A
(i.e. depth below GL)	m		1.50		N/A		N/A
25% Effective Storage Depth	m		0.30		N/A		N/A
(i.e. depth below GL)	m		2.10		N/A		N/A
Effective Storage Depth 75%-25%	m		0.60		N/A		N/A
Time to fall to 75% effective depth	mins		N/A		N/A		N/A
Time to fall to 25% effective depth	mins		N/A		N/A		N/A
Effective Volume of Pit - V(75%-25%) x (1-Pg)	m3		1.80		N/A		N/A
Area of Pit - ap50 (50%)	m2		7.80		N/A		N/A
t (75%-25%)	mins		N/A		N/A		N/A
SOIL INFILTRATION RATE	m/s		**N/A**		**N/A**		**N/A**

DESIGN SOIL INFILTRATION RATE, f	**N/A - Failed to soakawy to 25% effective storage depth**



Site:	Buzz Bingo	**Trial Pit Number:**	TP109
Job Number:	18-376	**Length:**	3.00 m
Date of Test:	08/12/2025	**Width:**	1.00 m
		Depth:	2.60 m
		Groundwater Level:	m
		Proportion of Pit Volume Occupied by Gravel Solids (Pg)	0.00

Drafted	Rev	Auth

Remarks

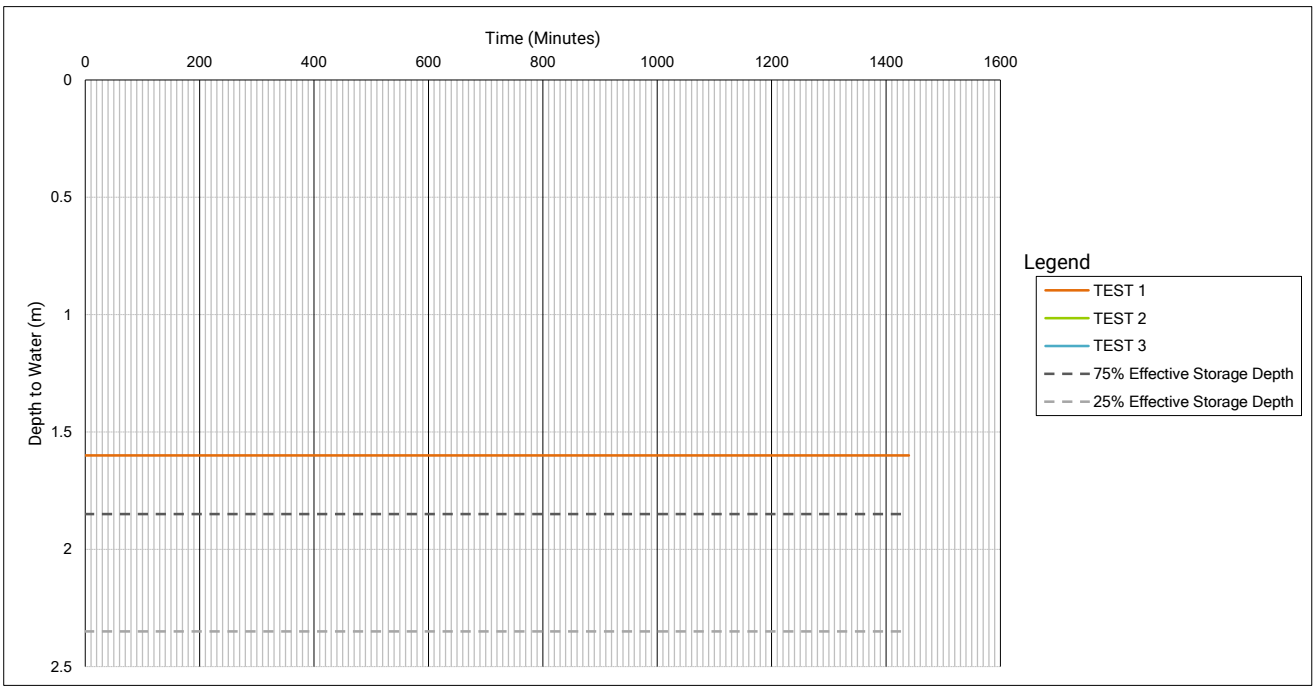
Effective Depth - For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

Gravel Filled Pits - Typically, the proportion of volume occupied by gravel is 0.70 (i.e. 70%), leaving 30% free storage volume. If the pit is left open (gravel is not used) then Pg = 0

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0	1.60				
1	1.60				
2	1.60				
3	1.60				
4	1.60				
5	1.60				
10	1.60				
20	1.60				
30	1.60				
60	1.60				
120	1.60				
180	1.60				
240	1.60				
300	1.60				
360	1.60				
1440	1.60				

		TEST 1	TEST 2	TEST 3
Effective Storage Depth	m	1.00	N/A	N/A
75% Effective Storage Depth	m	0.75	N/A	N/A
(i.e. depth below GL)	m	1.85	N/A	N/A
25% Effective Storage Depth	m	0.25	N/A	N/A
(i.e. depth below GL)	m	2.35	N/A	N/A
Effective Storage Depth 75%-25%	m	0.50	N/A	N/A
Time to fall to 75% effective depth	mins	N/A	N/A	N/A
Time to fall to 25% effective depth	mins	N/A	N/A	N/A
Effective Volume of Pit - V(75%-25%) x (1-Pg)	m3	1.50	N/A	N/A
Area of Pit - ap50 (50%)	m2	7.00	N/A	N/A
t (75%-25%)	mins	N/A	N/A	N/A
SOIL INFILTRATION RATE	m/s	**N/A**	**N/A**	**N/A**

DESIGN SOIL INFILTRATION RATE, f	N/A - Failed to soakawy to 25% effective storage depth



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