



Phase 2 (ground investigation) assessment report

Land between 10 and 12 Risegate Road, Gosberton

Produced for JC Architectural Consultant

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Ground investigation report

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EXECUTIVE SUMMARY

<u>DESK STUDY INFORMATION</u>	
<i>Proposed works</i>	Demolition of a redundant commercial building and the erection of two residential two-storey properties with associated gardens, driveways and separate garages
<i>Site description</i>	<i>Location:</i> Land between 10 and 12 Risegate Road, Gosberton, PE11 4EY, around grid reference 521100,329790 <i>Size:</i> About 70m by 30m in plan area
<i>Site topography</i>	The site is relatively flat and located at a low elevation. Ground levels are estimated to be about 3m above Ordnance datum (AOD)
<i>Site history</i>	○ The existing barn was probably originally built in the 1960s and was extended in the 1990s and has been used as a workshop ○ Possible former farmyard (on-site) – prior to 1950s ○ Former possible bungalow (on-site) – late 1950s until 1990s ○ Possible haulage yard (for sewage removal wagons) – 1990s until around 2010 ○ Vacant site with occasional use for storage of building materials – around 2010 to present ○ Existing garage (0m west) – from early 1970s, with fuel tank (about 15m west) ○ Existing Elm Tree Farm (40m west) – from early 1970s
<i>Published geology</i>	• <i>Artificial made ground / worked ground:</i> none • <i>Superficial drift deposits:</i> Tidal Flat Deposits • <i>Bedrock:</i> Oxford Clay Formation
<i>Hydrology / hydrogeology</i>	○ The anticipated mudstone bedrock is classed as Unproductive Strata ○ The anticipated TFD clay drift is classed as Unproductive Strata ○ No nearby groundwater abstractions or groundwater Source Protection Zones (SPZs) ○ Nearest identified surface water feature: Risegate Eau - drain/ditch (18m north) ○ There are significant flooding issues at or adjacent to the site, but most of the site is in a reported low flood risk area (Flood Zone 1)
<i>Landfills</i>	• No nearby historical landfills (within 1km)
<i>Radon</i>	The site is not in an area affected by radon (less than 1%)
<i>UXOs / UXBs</i>	The site is not in an area anticipated to be affected by UXOs (from WWII)
<u>RECENT SITE INVESTIGATION WORKS</u>	
<i>22 Oct 2024</i>	Five boreholes (WS1 to WS5) and two hand dug pits (HP1 and HP2) with geochemical testing for contaminants of potential concern within recovered soil samples
<i>Recently revealed ground conditions</i>	<u>Concrete slab (below existing barn building)</u> • 0.2m-thick, revealed in HP2 <u>Made ground</u> • Revealed across the site to a depth of between 0.30m and 0.80m

<i>(in descending order)</i>	- Mainly comprised of granular stone and/or rubble with some soily material <u>Silty Subsoil</u> - Revealed across the site to a depth ranging between 0.8m and 1.3m - Slightly organic dark-coloured slightly sandy SILT (with occasional rootlets) <u>Tidal Flat Deposits (TFD) – silt</u> - Revealed across the site to the maximum depth of exploration (of 2.00m) - Mainly comprised of orangish brown slightly sandy SILT - Locally (in WS5), slightly organic, brownish grey with black mottling slightly sandy SILT with degraded rootlets
<i>Groundwater</i>	No groundwater observations were recorded in on-site boreholes (WSs 1 to 5) and trial pits (HP1 and HP2). The holes appear to have remained dry
<i>Hole stability</i>	No instability noted in recent boreholes
<u>CONTAMINATION ISSUES</u>	
<i>Soil contamination screening</i>	The screened contamination test results, as summarised later (in Tables 8 and 9), indicate the following: - Elevated levels of metals (most notably lead) within shallow made ground could pose a substantial hazard to human health (through ingestion, dermal absorption and dust inhalation) - Elevated levels of metals (most notably copper) within shallow made ground could pose a substantial hazard to ecological (plant) health through absorption - Elevated level of low volatility, genotoxic PAHs (such as benzo(a)pyrene) within shallow made ground could pose a hazard to human health (through ingestion, dermal absorption and dust inhalation) - Some notable (but relatively harmless) levels of (heavier) petroleum hydrocarbons have been detected in HP2, which suggests there could be some nearby localised hotspots of low volatility (possibly odorous) TPH contamination (near to or below the existing barn building) - Two samples of shallow made ground were found to contain PAHs and heavier TPH at levels that might potentially pose a hazard to standard plastic water supply pipework - Detected levels of TPH, volatile PAHs (such as naphthalene), BTEX and MTBE, VOCs and SVOCs within near surface ground samples were found to be too low to pose a substantial hazard to human health - No asbestos has been detected within made ground samples
<i>Revised contamination assessment</i>	A revised contamination risk assessment identified five revised potential contamination linkages (RPCL1 to RPCL5): - RPCL1: inhalation/ingestion/absorption of soil contamination by future site users in or via soft landscaped (garden) areas - RPCL2: inhalation/ingestion/absorption of soil contamination by groundworkers during building works - RPCL3: indoor inhalation of potential malodorous vapours by site users

	• RPCL4: absorption of phytotoxic contaminants by plant ecology • RPCL5: permeation of water supply pipework by hydrocarbons There are no identified significant risks to controlled waters. However, further action is needed for the above (RPCL1 to RPCL5)
<i>Anticipated remediation requirements</i>	• Suitable demolition and removal of the existing building fabric (including possible asbestos sheets) by competent workers • Chasing out (and off-site removal) of any unidentified localised malodorous fuel/oil impacted ground material below or adjacent to the existing barn building after its removal • Clean soil cover systems within proposed soft landscaped (garden) areas • Barrier pipe and fittings for below ground water supply Additionally, it is anticipated that groundwork contractors will employ safe working practices for working with made ground on a brownfield site
<i>Reuse of site won material</i>	Any excavated (potentially contaminated) made ground will only be suitable for reuse on the site if covered by an appropriate permit, exemption or protocol (such as a U1 or T5 exemption, the WRAP Protocol or the CL:AIRE Code of Practice: Definition of Waste). It would be sensible to make budgetary allowance for the off-site removal of any made ground excavated during building works All relevant paperwork (including waste transfer notes) will need to be retained to provide documentary evidence of suitable waste disposal
<i>Ground gas protection</i>	A ground gas risk assessment has not identified any viable source of hazardous ground gas. Revealed ground material is of low organic content. No requirement for ground gas protection measures is anticipated
<i>Unforeseen contamination</i>	Any unforeseen contamination encountered during the development of the site must be immediately reported to the local authority and adjacent works halted

1 Introduction

The client, JC Architectural Consultant, engaged Humberside Materials Laboratory Limited (HML) to undertake a Phase 2 (ground investigation) assessment report in advance of a proposed residential development at land between 10 and 12 Risegate Road, Gosberton, South Holland, Lincolnshire. The land will be hereinafter referred to as the site.

1.1 Aims

The aim of the ground investigation is to investigate the site's geo-environmental ground conditions and to carry out assessments to determine the nature and extent of contamination-related risks and possible required remediation measures. This report is intended to provide a Stage 1 Tier 2: generic quantitative risk assessment (GQRA), as defined in the Environment Agency Land Contamination Risk Management (LCRM) guidance.

1.2 Scope

The scope of the investigation includes:

- A review of desk study information
- Intrusive investigation works (boreholes)
- Geochemical laboratory testing
- Analysis and screening of ground contamination levels within the site
- Revised conceptual site model of potential contamination linkages
- Revised assessment of contamination risks
- Recommendations for contamination remediation, where appropriate
- Recommendations for further investigation works, where appropriate

1.3 Conditions and Limitations

This report is produced solely for the client and should only be copied in full. When transmitted electronically, the definitive copy of the report is held by Humberside Materials Laboratory Ltd.

This report is prepared on the assumption that all relevant facts have been disclosed.

The comments given in this report and the opinions expressed assume that conditions do not vary beyond the range revealed by this study and the information provided in the production of this report is complete and reliable.

2 Review of desk study information

This report section provides a summary of the desk study information presented in a recent HML Phase 1 (desk study) report (HML reference: 1488/6457/P/P1, Revision 0.0, dated September 2024).

2.1 Proposed development

The proposed building works comprise the construction of two new dwellings that will be two storeys tall and will include a separate garage for each property. The site will include some areas of soft landscaping on the northern side of both proposed properties as well as a small area on the western side of Plot 2. There will also be large areas of hardstanding that include driveways for both properties and a longer driveway/track for access to Plot 1 that is situated in the south of the site. There is some expected new shrub and tree planting around the southern and eastern boundary. The properties are to be accessed from Risegate Road that is north of the site.

Enabling works will include the removal of existing commercial buildings including a barn-style workshop/storage building.

2.2 Site description

The site is land between 10 and 12 Risegate Road, Gosberton, PE11 4EZ, around grid reference 521100, 329790. It is about 70m by 30m in plan area.

The site features based on recent and previous site inspections, as shown in site features plans (in Appendix A), are as follows:

- The site includes an existing barn-style building, a small, dilapidated former cow shelter, a large yard area and two small stockpiles of stone and soil. The large steel barn occupies the majority of the southern part of the site (25m by 27m) with the rest of the site being surfaced with compacted stone
- The barn building is L-shaped with a concrete floor slab (with the floor level very slightly lower than some adjacent outdoor ground levels). Some asbestos containing materials (ACMs) are suspected within corrugated cement panels in part of the roof (the older northern part of the barn building). The barn building is steel framed with a steel truss roof and is clad in metal panels
- The barn building has previously been used as a workshop and storage building but has clearly been disused for some time
- The whole barn building is disused, but there are some materials and equipment awaiting removal. The equipment includes some small appliances for carpentry as well as some small machinery used for road works

- Within the southeast corner of the barn building there is a red diesel above ground tank that has a connected external hose
- The small farm building in the east part of the site was previously used for cattle shelter but looks to be in poor condition. The roof is of suspected ACM corrugated cement panels
- There are two small stockpiles onsite that look to consist of stone and soil, with some rubble in the northern pile. Both of the small heaps are within the main front yard area
- The rest of the site is covered in stone which is grassy and vegetated near the eastern boundary. Towards the south of the site there is a large area of overgrown plants (such as nettles and brambles)

The site is relatively flat and located at a low local elevation. Ground levels are estimated to be about 3m above Ordnance datum (AOD).

2.3 Site History

Summary of historical information:

- The existing barn was probably originally built in the 1960s and was extended in the 1990s and has possibly been used as a workshop
- Possible former farmyard (on-site) – prior to 1950s
- Former possible bungalow (on-site) – late 1950s until 1990s
- Possible haulage yard for sewage removal wagons – 1990s until around 2010
- Vacant site with occasional use for storage of building materials – around 2010 to present
- Existing garage (0m west) – from early 1970s, with fuel tank (about 15m west)
- Existing Elm Tree Farm (40m west) – from early 1970s

2.4 Geology, Hydrogeology and Hydrology

2.4.1 *Published geology*

Anticipated ground conditions based on published geological information are as shown below (in Table 1).

Table 1: Anticipated ground conditions inferred from geology records		
<i>Strata</i>	<i>Description</i>	<i>Depth to base (m BEGL)</i>
Made ground	Possible small thickness of made ground below building and hardstanding.	<1
Tidal Flat Deposits – CLAY / SILT	Unconsolidated sediment, mainly mud and/or sand	8 – 9
Oxford Clay Formation - MUDSTONE	Silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules	58 – 79
All anticipated ground conditions are subject to confirmation with site works		

2.4.2 Hydrogeological information:

- The anticipated mudstone bedrock is classed as an Unproductive Aquifer
- The anticipated TFD clay/silt drift is classed as an Unproductive Aquifer
- No nearby groundwater abstractions or groundwater Source Protection Zone (SPZ)

2.4.3 Hydrological information:

- Nearest identified surface water feature: Risegate Eau - drain/ditch (18m north)
- There are significant flooding issues at or adjacent to the site, but most of the site is in a low flood risk area (Flood Zone 1)
- There are no nearby reported historical landfills (none within 1km)

2.5 Other environmental information

- There are no nearby reported historical landfills (within 1km)
- The site is not affected by radon. No protection measures required
- The site is in an area with a low historical bombing density
- Nitrate Vulnerable Zone (on-site) – for surface water in Risegate Eau Nvz

2.6 Previous initial contamination assessment

2.6.1 Initial conceptual site model (sources, pathways and receptors)

The following potential sources of contamination were identified for the site.

- Made ground
- Existing building fabric
- Current land use: occasional building materials storage
- Previous land use: Farm yard
- Previous land use: haulage yard
- Previous land use: workshops
- Existing red diesel above ground storage tank (AST) in southwest part of the barn
- Historical WWII bombing
- Highly organic subsoils

- J. Existing garage (0m west) including UST (15m west)
- K. Farm c. 40m west

However, based on further analysis, two of the above sources (H and K) are not considered credible. Metals, PAHs, Asbestos, Petroleum hydrocarbons, VOCs and SVOCs were identified as contaminants of concern

Considered contamination possible pathways include inhalation, ingestion, absorption and migration while receptors affected by contaminants might include humans, ecology, controlled waters and building materials.

2.6.2 Preliminary risk assessment (PRA)

A preliminary risk assessment previously identified seven potential contamination linkages (PCL1 to PCL7) with unacceptable risks, as summarised below (in Table 2). These linkages merit further consideration.

Table 2: Potential contamination linkages (PCLs)					
Ref.	Source	Pathway	Receptor	Risk rating	Possible solution
PCL1	1. Made ground 2. Existing building fabric 3. Current land use: occasional building materials storage 4. Previous land use: Farmyard 5. Previous land use: haulage yard 6. Previous land use: workshops 7. Existing red diesel above ground storage tank (AST) in southwest part of the barn 8. Existing garage (0m west) including UST (15m west) Metals, PAHs, Asbestos, Petroleum hydrocarbons, VOCs and SVOCs	Inhalation, ingestion, absorption	Future site users	Low / moderate	Soil cover systems in soft garden and landscaped areas and off-site removal of two existing spoil heaps
PCL2			Ground workers	Low / moderate	Safe working practices
PCL3			Demolition workers	Low / moderate	Survey and removal of any asbestos containing materials (ACMs) within the building fabric, as needed
PCL4		Inhalation of vapours	Future site users	Low / Moderate	Excavation and disposal of impacted soils (and vapour resistant membrane)
PCL5		Absorption	Flora and fauna (ecology)	Low / moderate	Soil cover systems in soft garden and landscaped areas
PCL6		Aggressive attack (by absorption)	Water supply pipe	Low / moderate	Barrier pipe for water supply
PCL7	9. Highly organic subsoils	Migration and inhalation/combustion	Future site users	Low / moderate	Gas resistant membrane in floors and subfloor ventilation

3 Site Investigation Works

The procedures adopted for the recent site investigation were based on BS 5930 (2015 + A1, 2020) – Code of Practice for Site Investigations and BS 10175 (2011 + A2, 2017). The soils and rocks encountered have been described based on BS5930 (2015 + A1, 2020), BS EN ISO 14688-1 (2018), BS EN ISO 14688-2 (2018) and BS EN ISO 14689-1 (2018).

3.1 Fieldwork

Fieldwork took place on the following date.

- 22 October 2024:
 - Five number (windowless) dynamic sampler boreholes (WS1 to WS5)
 - Two hand dug pits (HP1 to HP2)

The purpose of the site works was to investigate the ground conditions for several reasons, as detailed below (in Table 3). The objectives were to determine (1) the general shallow ground conditions and (2) the presence, extent and nature of any ground contamination (3).

Table 3: Rationale for site works		
Location	Type	Rationale
WS1, WS2, WS3, WS4, WS5	Windowless (dynamic) sampler	Reveal shallow ground conditions Provide ground material samples for testing
HP1, HP2	Hand dug inspection pits	Reveal shallow ground conditions – to a depth of 1.00m Provide ground material samples for testing

Approximate locations of the site works are shown in the exploratory hole location plan which is presented later (in Appendix A).

The positions of the exploratory holes were established relative to existing site features and using GPS locating equipment. The depths to sub-strata and groundwater were measured from existing ground level. Ground levels at exploratory holes were only roughly estimated from available topographical plans and site observations.

Logs for the exploratory holes are presented later (in Appendix B).

3.1.1 Windowless sampler boreholes (WS1 to WS5)

Five windowless sampler (i.e. dynamic sampler) boreholes (WSs 1 to 5) were drilled below the site by HML using a Dando Terrier (dynamic sampler) tracked drilling rig. This

extracted 1m-long tubes of ground material which were between about 60mm and 110mm in diameter. No casing was used. The tubes of ground material were promptly logged and sub-sampled by an HML engineer.

The five boreholes (WS1 to WS5) were drilled around the proposed locations of the proposed new dwellings within proposed garden areas and beneath building footprints. The boreholes reached a maximum sampling depth of between 1.00m and 2.00m and all were terminated due to revealing a substantial thickness of clean, natural silty soil.

A dip meter was used to check for the presence of groundwater during and after drilling.

Standard Penetration Tests (SPTs) were carried out at 1m intervals within some of the boreholes (WS1, WS3 and WS5) using an automatic drop hammer. Based on depths, borehole diameter and expected hammer efficiency (c. 80%), corrected N_{60} values should be similar to recorded SPT N values.

3.1.2 Hand dug pits (HP1 to HP2)

Two hand dug pits (HP1 and HP2) were excavated by hand. The pits were dug by an HML engineer to a depth of 1.0m below existing ground level (BEGl). The engineer logged the pits and took suitable samples.

3.2 Laboratory testing

Geochemical testing was undertaken by Chemtech Environmental (Chemtech), a UKAS and MCERTS accredited laboratory. The scope of geochemical testing comprised:

- Eight tests for a suite of metals and metalloids
- Eight tests for a suite of polycyclic aromatic hydrocarbons (PAHs)
- Eight tests for the presence of asbestos fibres Three tests for benzene, toluene, ethylbenzene and xylenes (BTEX) and methyl-tert-butyl-ether (MTBE)
- Five tests for total petroleum hydrocarbons (TPH) within aliphatic and aromatic carbon chain fractions similar to the Criteria Working Group (CWG) method
- Two tests for volatile organic compounds (VOCs) including tentatively identified compounds (TICs)
- Two tests for semi-volatile organic compounds (SVOCs) including tentatively identified compounds (TICs)
- Ten tests for total organic content (TOC)

A schedule of testing is shown below (in Table 4). Results for all the laboratory testing undertaken are included later in this report (in Appendix C).

Table 4: Recent laboratory test schedule

Sample hole	Sample location	HML Sample ref. (S/_)	Chemtech sample ref.	Depth (m BGL)	Geochemical							
					Metals	PAHs	Asbestos	TPH by CWG	BTEX & MTBE	VOCs incl TICs	SVOCs incl TICs	TOC
WS1	WS1-1	73066	19549	0.10-0.30	✓	✓	✓					
	WS1-2	73067	19550	0.30-0.60	✓	✓	✓					✓
	WS1-3	73068	19551	1.00-2.00								✓
WS2	WS2-2	73069	19552	0.30-0.60	✓	✓	✓	✓		✓	✓	✓
	WS2-3	73070	19553	0.60-2.00								✓
WS3	WS3-2	73071	19554	0.30-0.50	✓	✓	✓					✓
	WS3-4	73072	19555	0.80-2.00								✓
WS4	WS4-1	73073	19556	0.10-0.50				✓	✓			
WS5	WS5-1	73074	19557	0.00-0.30	✓	✓	✓					✓
	WS5-2	73075	19558	0.30-0.50	✓	✓	✓					✓
	WS5-3	73076	19559	0.50-0.80				✓	✓			✓
HP1	HP1-1	73077	19560	0.00-0.50	✓	✓	✓					✓
HP2	HP2-1	73078	19561	0.00-0.30	✓	✓	✓	✓	✓	✓	✓	
	HP2-2	73079	19562	0.50-0.80				✓	✓			

4 Revealed Ground and Groundwater Conditions

4.1 Sequence of sub-strata

The sub-strata as recently revealed at the site are summarised below (in Table 5) and within geological cross-sections, presented later (in Appendix A). Copies of the exploratory hole logs are also presented later (in Appendix B).

Table 5: Summary of recently revealed ground conditions								
Strata		Exploratory hole						
		WS1	WS2	WS3	WS4	WS5	HP1	HP2
		Depth to base of strata in m BGL						
MADE GROUND	(Grass turf over) Soily Stony Fill (with occasional rootlets)		0.30	0.50	0.50	0.30		
	(Grass turf over) Soily Rubbly Fill (with occasional rootlets)	0.30				0.50	0.50	0.30
	Grey CONCRETE							0.50
	Reworked Silt			0.80				
Subsoil	(Soft to firm) friable slightly organic dark sandy (clayey) SILT with occasional rootlets	1.00	0.60		0.80	1.30	1.00+	1.00+
Tidal Flat Deposits, TFD	Brown to orangish brown slightly sandy SILT	2.00+	2.00+	2.00+	1.00+			
	Possibly slightly organic , brownish grey with occasional black mottling slightly sandy SILT with occasional degraded rootlets					2.00+		

The revealed ground conditions were generally as expected based on geological and historical desktop information. There was a modestly thick layer of made ground present across most of the site underlain by natural subsoils and superficial drift deposits of probable tidal flat deposits, mainly present as silt.

The ground conditions across the site seemed relatively consistent. Nevertheless, there were some slight variations in the nature of the made ground and underlying natural soils.

4.2 Made ground (MGR)

4.2.1 Extent and thickness of the made ground (MGR)

A thin to moderate thickness of made ground was found across the site. It was recorded to range between 0.30m (in WS1) and 0.80m (in WS3 and WS4) in thickness (and was about 0.5m in average thickness).

4.2.2 Nature of the made ground (MGR)

The revealed made ground was found to mainly comprise granular fill (of stone or rubble) which contained much loamy (topsoil-like) soil. The recorded made ground consisted of:

- **Soily Stony Fill:** silty fine SAND and GRAVEL of fine to medium flint and chert – revealed across most of the site
- **Soily Rubbly Fill:** very silty sandy GRAVEL of stone, brick and concrete fragments with some loamy silt/sand and occasional rootlets – revealed in the far north and the south of the site
- **Concrete Slab:** 0.2m-thick concrete which forms the floor slab for the existing main barn building
- **Reworked Silt:** slightly sandy SILT with rare fine brick red gravel – revealed in the centre of the site below Soily Stony Fill (in WS3)

The stone and rubble could have been imported onto the site historically. The reworked silt could be mainly natural sub-soils.

The revealed made ground is probably of very low organic content. Testing on sampled made ground material has yielded estimated organic contents of between 1.6% and 12.1%, as shown later (in Appendix C) and summarised below (in Table 6), which means the made ground could potentially be described as 'Inorganic' to 'Organic.' However, the higher organic contents are probably the result of sampling bias, since only fine material was tested for organic content. The finer content was relatively soily and, therefore, probably much more organic than the predominant coarser, granular stone and rubble material. The actual overall organic content of the revealed made ground is probably rarely higher than about 2%, and could, therefore, probably be classed as inorganic.

Table 6: Results of TOC testing and estimated organic content

Hole	Material	Sample depth (m BEGL)	HML sample ref.	Chemtech sample ref.	Total organic carbon, TOC (%)	Estimated soil organic matter, SOM (%)	Description of organic content as per BS5930
WS1	Subsoil	0.30 – 0.60	73067	19549	2.06	3.5	SLIGHTLY ORGANIC
WS1	TFD silt	1.00 – 2.00	73068	19550	0.73	1.3	(INORGANIC)
WS2	Subsoil	0.30 – 0.60	73069	19552	2.40	4.1	SLIGHTLY ORGANIC
WS2	TFD silt	0.60 – 2.00	73070	19553	0.59	1.0	(INORGANIC)
WS3	Soily Stony Fill	0.30 – 0.50	73071	19554	4.92	8.5	ORGANIC
WS3	TFD silt	0.80 – 2.00	73072	19555	0.64	1.1	(INORGANIC)
WS5	Soily Stony Fill	0.00 – 0.30	73074	19557	0.92	1.6	(INORGANIC)
WS5	Soily Rubbly Fill	0.30 – 0.50	73075	19558	1.13	1.9	(INORGANIC)
WS5	Subsoil	0.50 – 0.80	73076	19559	3.28	5.6	SLIGHTLY ORGANIC
HP1	Soily Rubbly Fill	0.00 – 0.50	73077	19560	7.04	12.1	ORGANIC

4.2.3 Visual or olfactory indicators of potential contamination in the made ground (MGR)

No clear evidence of contamination was noted within the revealed made ground. No asbestos containing materials (ACMs) or unusual odours or oily staining were recorded in the made ground. No sign of any petroleum impacted ground material was identified.

On the other hand, there were still signs of potential contamination in the made ground:

- The brick and concrete rubble within the made ground could be a source of **asbestos, metals and PAHs**

4.3 Subsoil

4.3.1 Extent and thickness of the Subsoil

A thin layer of darker-coloured, usually slightly organic, silty subsoil was logged across the site. This was logged to a depth ranging between 0.6m and 1.3m.

4.3.2 Nature of the Subsoil

The recorded Subsoil could be the naturally slightly organic, loamy material left behind following a topsoil strip of the site during historical development works. The silty nature of the Subsoil is typical of the local TFD silts. The TFD silts could have been impacted by overlying topsoil, vegetation and other near surface activity (such as animal burrowing) to become Subsoil.

The Subsoil was found to be slightly organic. Its colour was slightly darker compared to much of the deeper (orangish brown) TFD sandy silt. Occasional rootlets were noted within the Subsoil. Detected TOC ranged between 2.06% and 3.28%, as shown above (in Table 6).

4.3 Tidal Flat Deposits (TFD)

4.3.1 Extent and thickness of the Tidal Flat Deposits (TFD)

The Tidal Flat Deposits (TFD) were proven to the maximum depth of exploration (of 1.00m or 2.00m BEGL) in all five boreholes (WS1 to WS5) and both hand dug pits (HP1 to HP2).

The base of the Tidal Flat Deposits is anticipated to be about 9m based on inference from local published geological information. However, this depth is subject to confirmation.

4.3.2 Nature of the Tidal Flat Deposits (TFD)

The recorded Possible Tidal Flat Deposits comprised:

- **(Inorganic) orangish brown sandy SILT** – revealed across most of the site (in WSs 1, 2, 3 and 4)
- **Possibly slightly organic slightly sandy SILT with occasional degraded rootlets** – revealed in the southernmost part of the site (in WS5)

4.4 Groundwater observations

No groundwater observations were recorded within the recent exploratory holes (WS1 to WS5), as detailed below (in Table 7). No groundwater was noted and boreholes remained dry during site investigation works.

Table 7: Groundwater observations from recent site works										
Hole	Approx ground level (m AOD)	Max. total depth (m)	Approx. elevation of base (m AOD)	Groundwater observations in chronological order (left to right)						Date (dd/mm/yyyy)
				Observation 1		Observation 2		Observation 3		
				Depth (m BGL)	Details	Depth (m BGL)	Details	Depth (m BGL)	Details	
WS1	3	2.00	1	No groundwater observations (borehole was dry on completion of drilling)						22 Oct 2024
WS2	3	2.00	1	No groundwater observations (borehole was dry on completion of drilling)						
WS3	3	2.00	1	No groundwater observations (borehole was dry on completion of drilling)						
WS4	3	1.00	2	No groundwater observations (borehole was dry on completion of drilling)						
WS5	3	2.00	1	No groundwater observations (borehole was dry on completion of drilling)						
HP1	3	1.00	2	No groundwater observations (pit was dry on completion of digging)						
HP2	3	1.00	2	No groundwater observations (pit was dry on completion of digging)						
GW – groundwater; GWL – groundwater level.										

4.5 Observations of exploratory hole stability

No reported significant instability was identified during the drilling of recent boreholes. Boreholes appeared to have remained stable to the full depths (of up to 2.0m depth).

5 Soil contamination screening

Detected soil contaminant concentrations (in made ground and natural ground) need to be compared against suitable assessment criteria to determine whether the contamination poses a potential hazard to the health of various receptors. The receptors include humans, ecology, building materials and controlled waters.

Generic assessment criteria (GAC) are taken from current best practice publications. The sources of the generic assessment criteria are detailed below (in Section 5.2) while subsequent sections within this chapter (Sections 5.3 to 5.4) compare these GAC against detected concentrations and provide detailed analysis of the general findings.

5.1 Scope of soil contamination testing

As detailed earlier (in Table 4), tests for the presence of contaminants of potential concern have been carried out on samples of ground material. This includes near surface made ground and natural soil material. Contaminants tested for include:

- Metals
- PAHs
- Asbestos
- TPH by CWG
- VOCs
- SVOCs including TICs
- Total organic content (TOC)

The complete test results are presented later (in Appendix C).

5.2 Assessment criteria

Generic assessment criteria (GAC) for soil and made ground within the proposed site development are presented later (in Appendix D). A rationale explaining the basis for these GAC is presented below (in Sections 5.2.1 to 5.2.4).

Where detected concentrations are consistently below the GAC then the hazard from the contaminant is usually considered to be acceptable. If a pollutant is recorded at concentrations higher than the GAC then an unacceptable hazard is not necessarily present, but it does indicate that further consideration is merited.

5.2.1 Human health

Several sources have been used to determine suitable generic acceptance criteria (GAC) for human health, including the following, shown in general order of selected preference.

- Category 4 Screening Levels (C4SLs) as produced by CL:AIRE, SAGTA and SOBRA which covers the original six (Phase 1) contaminants (benzo(a)pyrene, lead, benzene, cadmium, chromium VI and arsenic) and recently published batches of Phase 2 technical reports for contaminants (including vinyl chloride, naphthalene and PFAS) while other reports for contaminants including beryllium are currently awaiting completion
- *Land Quality Management Ltd/Chartered Institute of Environmental Health suitable for use levels* (LQM/CIEH S4ULs) report (Nathanial *et al.*, 2015). This reference provides several GAC for a wide range of contaminants (89 in total) and development scenarios based on the CLEA model and a negligible health risk
- Human health Soil GAC from EIC/AGS/CL:AIRE (2010)
- Atkins ATRISK™ Soil Screening Values
- US EPA Regional Screening Levels for Chemical Contaminants

The GAC are based on the context of a residential scenario with the potential for the consumption of homegrown produce.

Where detected concentrations are consistently below the GAC then the hazard from the contaminant is usually considered to be acceptable. If a pollutant is recorded at concentrations higher than the GAC then an unacceptable hazard is not necessarily present, but it does indicate that further consideration is merited.

5.2.2 Ecology

Some GAC have been adopted for zinc, copper and nickel relating to their effect on ecological health (of plants, trees and so on). The GAC are based on trigger values published in BS 16729: 2013: 'Soil quality – Determination of nitric acid soluble fractions of elements,' and applied within BS 8332:2015: 'Specification for Topsoil.'

5.2.3 Water supply pipework

Detected concentrations of contaminants have also been compared against trigger values to assess whether plastic water supply pipework might be suitable. Trigger values have been taken from the following (in order of preference):

1. Water UK (2014) Contaminated Land Assessment Guidance: Protocols published by agreement between Water UK and the Home Builders Federation. Published by Water UK, January 2014
2. UKWIR (2011) UK Water Industry Research: "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites"

However, it should be noted that some water authorities (e.g. Anglian Water) may not recognise the alternative bandings and trigger values for petroleum hydrocarbon fractions offered by Water UK (2014).

5.2.4 *Buried concrete*

BRE Special Digest 1 (2005) is used to evaluate the aggressivity of ground material to buried concrete especially with respect to sulphate attack.

5.3 Test results compared with ecology / human health GAC

A full comparison of detected contamination test results against adopted human health (and ecological health) GAC is presented below (in Table 8). The only identified results of potential concern related to:

- **Elevated levels of metals (in samples of near surface ground material)**
- **One elevated level of Benzo(a)pyrene (in a sample of made ground)**

On the other hand, no human health (or ecological health) GAC exceedances of TPH, BTEX and MTBE, VOCs or SVOCs have been identified.

5.3.1 *Metals – human health and ecology*

Several metal or metalloid GAC exceedances have been detected within near surface made ground material:

- **Beryllium** (*above human health GAC*) – in WS1, WS5 and HP2 (in samples of Soily Rubbly Fill)
- **Copper** (*above ecological health GAC*) – in WS3 (in a sample of Soily Stony Fill)
- **Lead** (*above human health GAC*) – in WS3, HP1 and HP2 (in samples of Soily Rubbly Fill and Soily Stony Fill)
- **Mercury** (*at or above human health health GAC*) – in WS1 and WS2 (in samples of Soily Rubbly Fill and Silt Subsoil)
- **Zinc** (*above ecological health GAC*) – in HP1 and HP2 (in samples of Soily Rubbly Fill)

There might be good justification to suggest that the detected levels of beryllium, copper and mercury are of limited, insignificant concern. This is explained as follows.

- The (S4UL) GAC for **beryllium** of 1.7mg/kg is exceptionally conservative, for example, compared to residential screening values from other countries which are generally well above the maximum detected beryllium concentration (of 5.3mg/kg) and beryllium is a naturally occurring element that is typically detected at concentrations of between 2mg/kg and 5mg/kg within the Earth's crust

Table 8: Soil contamination results screened against human health/ecology GAC															
Location:		WS1	WS1	WS1	WS2	WS2	WS3	WS3	WS4	WS5	WS5	WS5	HP1	HP2	HP2
Depth (m BGL):		0.10-0.30	0.30-0.60	1.00-2.00	0.30-0.60	0.60-2.00	0.30-0.50	0.80-2.00	0.10-0.50	0.00-0.30	0.30-0.50	0.50-0.80	0.00-0.50	0.00-0.30	0.50-0.80
Date sampled:		22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024
Soil type:		Soily Rubbly Fill MGR	Silt Subsoil	TFD silt	Silt Subsoil	TFD silt	Soily Stony Fill MGR	TFD silt	Soily Stony Fill MGR	Soily Rubbly Fill MGR	Soily Rubbly Fill MGR	Silt Subsoil	Soily Rubbly Fill MGR	Soily Rubbly Fill MGR	Silt Subsoil
HML sample ref.:		S/73066	S/73067	S/73068	S/73069	73070	S/73071	S/73072	S/73073	S/73074	S/73075	S/73076	S/73077	S/73078	S/73079
Chemtech sample ref.:		19549	19550	19551	19552	19553	19554	19555	19556	19557	19558	19559	19560	19561	19562
Element	GAC* (mg/kg)	Concentration detected (mg/kg)													
Metals and metalloids															
Arsenic	37	11.2	11.9	-	11.0	-	16.6	-	-	7.9	14.2	-	18.4	16.3	-
Beryllium	1.7	3.2	0.8	-	0.6	-	1.3	-	-	1.0	2.1	-	1.0	5.3	-
Cadmium	14	<1.6	<1.6	-	<1.6	-	<1.6	-	-	<1.6	<1.6	-	1.7	<1.6	-
Chromium VI	21	<0.040	<0.040	-	<0.040	-	<0.040	-	-	<0.040	0.080	-	<0.040	<0.040	-
Copper	100/135/200 #	15.6	20.4	-	34.6	-	125	-	-	20.8	16.8	-	62.2	51.1	-
Lead	200	35.7	43.8	-	60.8	-	205	-	-	34.8	34.8	-	362	212	-
Mercury	1.2	1.4	0.7	-	1.2	-	0.9	-	-	<0.7	1.0	-	0.8	0.9	-
Nickel	60/75/110 #	14.8	15.6	-	13.4	-	17.0	-	-	12.9	18.9	-	24.4	30.8	-
Zinc	200/300 #	67.6	61.7	-	66.0	-	124	-	-	59.2	70.8	-	452	434	-
Other metals	-	NGED	NGED	-	NGED	-	NGED	-	-	NGED	NGED	-	NGED	NGED	-
PAHs															
Naphthalene	2.3	<0.016	<0.016	-	<0.016	-	0.076	-	-	<0.016	<0.016	-	0.040	0.030	-
Benzo(a)pyrene	5	0.125	0.026	-	0.150	-	5.75	-	-	0.072	0.152	-	0.199	0.373	-
Total PAHs	-	1.27	<0.280	-	1.45	-	77.3	-	-	0.637	2.36	-	2.43	5.12	-
Asbestos															
Asbestos	-	NAD	NAD	-	NAD	-	NAD	-	-	NAD	NAD	-	NAD	NAD	-
Total petroleum hydrocarbons (TPH)															
>EC6-EC7 (aro.)	70	-	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
>EC7-EC8 (aro.)	130	-	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
>EC8-10 (aro.)	34	-	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
>EC10-12 (aro.)	74	-	-	-	<0.6	-	-	-	<0.6	-	-	1.0	-	2.1	3.9
>EC12-16 (aro.)	140	-	-	-	<1.0	-	-	-	3.0	-	-	1.1	-	6.2	11.3
>EC16-21 (aro.)	260	-	-	-	<2.0	-	-	-	<2.0	-	-	<2.0	-	7.4	14.3
>EC21-35 (aro.)	1100	-	-	-	<4.5	-	-	-	15.0	-	-	7.3	-	58.7	410
>EC35-44 (aro.)	1100	-	-	-	<2.0	-	-	-	3.3	-	-	<2.0	-	12.9	132
>C5-C6 (ali.)	42	-	-	-	<0.10	-	-	-	<0.10	-	-	<0.10	-	<0.10	<0.010
>C6-C8 (ali.)	100	-	-	-	<0.10	-	-	-	<0.10	-	-	<0.10	-	<0.10	<0.010
>C8-C10 (ali.)	27	-	-	-	<0.10	-	-	-	<0.10	-	-	<0.10	-	<0.10	<0.010
>C10-C12 (ali.)	130 (48 ^a)	-	-	-	<1.0	-	-	-	<1.0	-	-	<1.0	-	2.0	3.9
>C12-C16 (ali.)	1100 (24 ^a)	-	-	-	<0.5	-	-	-	<0.5	-	-	0.8	-	1.9	11.3
>C16-C35 (ali.)	65000 (8.5 ^a)	-	-	-	<3.0	-	-	-	6.3	-	-	20.9	-	184	184
>C35-C44 (ali.)	65000 (8.5 ^a)	-	-	-	<0.5	-	-	-	0.8	-	-	1.5	-	22.0	132
Sum of TPH	-	-	-	-	<4.5	-	-	-	21.3	-	-	98.3	-	297.2	902.7
Sum of TPH/GAC	1.0 [^]	-	-	-	<0.01	-	-	-	0.03	-	-	0.03	-	0.19	0.73
BTEX & MTBE															
Benzene	0.087	-	-	-	-	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
Toluene	130	-	-	-	-	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
Ethylbenzene	47	-	-	-	-	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
m- & p-xylene	56	-	-	-	-	-	-	-	<0.020	-	-	<0.020	-	<0.020	<0.020
o-xylene	60	-	-	-	-	-	-	-	<0.010	-	-	<0.010	-	<0.010	<0.010
MTBE	43	-	-	-	-	-	-	-	<0.020	-	-	<0.020	-	<0.020	<0.020
VOCS															
Individual VOCs	-	-	-	-	<0.010	-	-	-	-	-	-	-	-	<0.010	-
VOC TICs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOCs															
Individual SVOCs	-	-	-	-	<0.10	-	-	-	-	-	-	-	-	<0.10	-
SVOC TICs	-	-	-	-	N/D	-	-	-	-	-	-	-	-	N/D	-
* based on GAC for residential with potential for consumption of home grown produce (see Appendix D)															
# - ecological GAC															
[^] - no units. Sum of detected TPH fractions divided by relevant GAC should be less than 1.0															
Abbreviations: k = 1000. MGR – made ground; Poss. - possible; NGED – no GAC exceedances detected, ND – none detected, NAD – no asbestos detected. Note: potential GAC exceedances or results of concern shown in red.															

- The maximum detected **copper** concentration (of 125mg/kg) only exceeds the GAC (of 100mg/kg) for a soil pH of less than 6, but the anticipated pH is much higher than 6 based on local experience of similar geology
- The maximum detected **mercury** concentration of 1.4mg/kg only just exceeds the 1.2mg/kg GAC for elemental mercury, but no elemental mercury is suspected, so a much more appropriate GAC could be 11mg/kg (for methyl mercury)

On the other hand, the detected levels of **lead** and **zinc** within near surface made ground material (Soily Rubbly Fill and Soily Stony Fill) are of significant concern to human health and ecological health respectively. The presence of these metals within near surface ground material merits further consideration.

The source of the detected metals concentrations could be twofold:

1. Construction waste within the identified **rubbly made ground**
2. **Historical land use** within the site which, for example, has been used as a haulage yard and for workshops

5.3.3 PAHs – human health

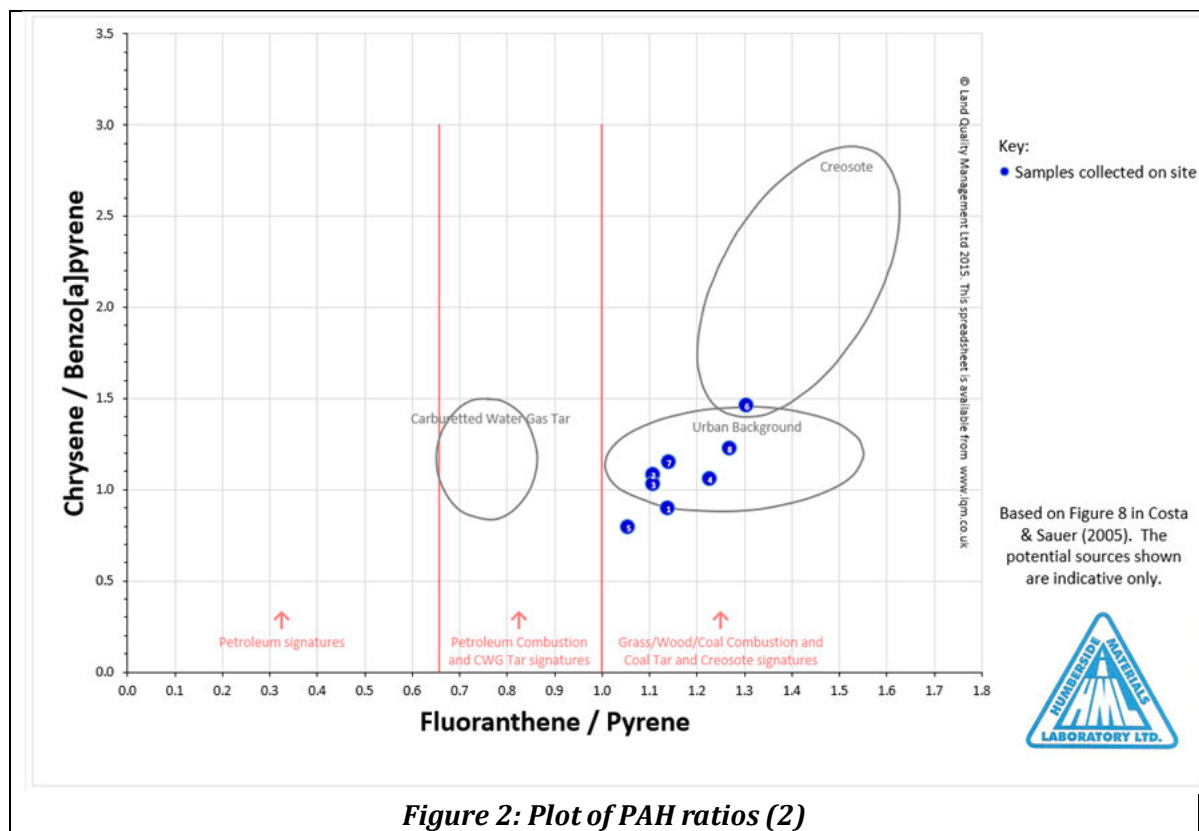
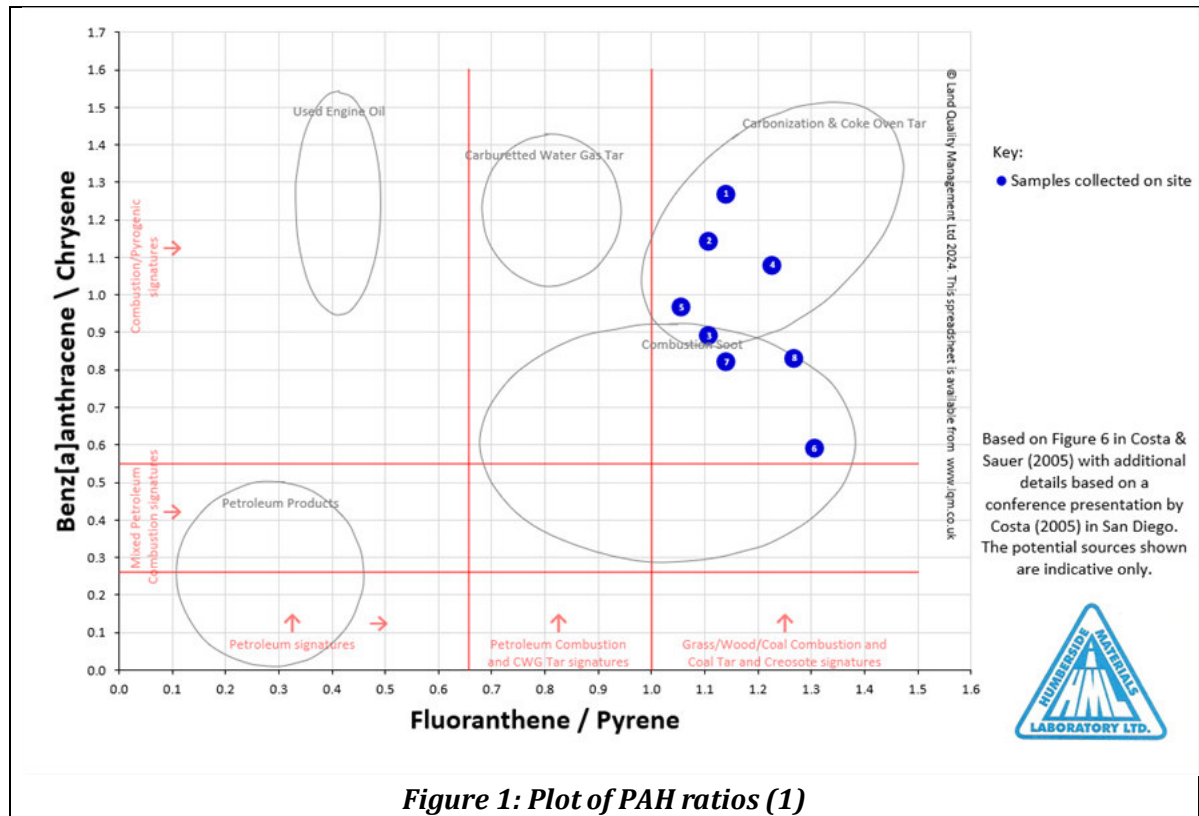
One human health GAC exceedance of **benzo(a)pyrene** has been detected at 5.75mg/kg, which is above the pC4SL GAC (of 5mg/kg). Benzo(a)pyrene is a surrogate marker for other similar genotoxic PAHs, so the GAC exceedance is an indicator of elevated levels of seven other PAHs:

- benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenz(ah)anthracene & indeno(123-cd)pyrene

No elevated levels of naphthalene (a relatively volatile PAH) were detected.

PAH profiling plots, for example, as shown below (in Figures 1 and 2) confirm the source of the detected, mostly relatively low levels of PAH contamination to be pyrogenic rather than petrogenic and the likely source of the detected PAHs is expected to be ash or clinker (in burnt grass/wood/coal) or traces of coal tar (from asphalt) within the revealed made ground. No petroleum signatures have been identified.

Accordingly, there is a localised potential hazard to human health from low volatility genotoxic PAHs (such as benzopyrene) within shallow soily rubbly/stony made ground. However, there is no identified hazard from volatile PAHs (such as naphthalene) and no indication of petroleum contamination has been identified.



5.3.4 Total petroleum hydrocarbons (TPH) – human health

As detailed above (in Table 8), there have been no human health GAC exceedances of any aliphatic or aromatic fractions of TPH. Accordingly, *detected* TPH is not expected to pose a substantial hazard to human health.

Nevertheless, some concentrations of heavier aromatic TPH were detected in samples of made ground. Even though no visual or olfactory signs of possible petroleum contamination were logged in exploratory holes, the results suggest there could be some local patches (slight hotspots) of low-level fuel or oil contamination. However, neither test results nor on-site logs have indicated the likely presence of any significant TPH hotspots.

Notwithstanding the above, the concentrations of relatively heavy TPH fractions in HP2 are such that there could be some localised hotspots of relatively heavy TPH fractions in or adjacent to the existing barn building. Any such hotspots could (1) pose a potential hazard through ingestion and (2) pose a potential nuisance through inhalation of **localised unpleasant odours**.

5.3.2 Asbestos – human health

There appears to be a potentially negligible hazard from asbestos within near surface ground material at the site. The test results show that no asbestos fibres were detected in any of the five tested made ground samples. No fragments of potential ACMs were noted within the exploratory hole logs.

Nevertheless, there is always potential for pockets of asbestos containing materials (ACMs), asbestos fibre bundles or loose asbestos fibres to be present with made ground. Even small amounts can be harmful. While the hazard to human health from asbestos within *in situ* ground material appears generally low, it might still potentially be significant if unforeseen asbestos contamination is present.

The **existing building fabric** has been identified to potentially include much asbestos within the existing corrugated cement wall and roof panels. The removal of these panels, if carried out carelessly, could introduce asbestos into the ground and pose a significant hazard to human health.

5.3.5 SVOCs – human health

No identified human health GAC exceedance of SVOCs has been identified, as summarised above (in Table 8). In fact, concentrations of individual SVOCs were consistently below the limit of test detection (of 0.1mg/kg) and no tentatively identified compounds (TICs) were indicated. Accordingly, SVOCs which include many pesticides,

within made ground test samples are not expected to pose a substantial hazard to human health.

5.3.5 VOCs – human health

No identified human health GAC exceedance of VOCs has been identified, as summarised above (in Table 8). In fact, concentrations of individual VOCs were consistently below the limit of test detection (of 0.01mg/kg). Accordingly, VOCs, which include some pesticides, within made ground test samples are not expected to pose a substantial hazard to human health.

5.4 Hazard to plastic water pipe screening values

The results of chemical tests show that some of the near surface ground material is not suitable for standard polyethylene (PE) water supply pipework due to the presence of slightly elevated contamination, as detailed below (in Table 9). The presence of benzo(a)pyrene, which is classed as a VOC by water industry guidance, is locally above acceptable levels within some Soily Stony Fill made ground from WS3. Also, detected TPH fractions (from EC10 to EC40) are elevated above threshold values for plastic water pipe in some shallow silty Subsoil from HP2.

Table 9: Soil contamination results screened against water supply pipework GAC															
Location:		WS1	WS1	WS1	WS2	WS2	WS3	WS3	WS4	WS5	WS5	WS5	HP1	HP2	HP2
Depth (m BGL):		0.10-0.30	0.30-0.60	1.00-2.00	0.30-0.60	0.60-2.00	0.30-0.50	0.80-2.00	0.10-0.50	0.00-0.30	0.30-0.50	0.50-0.80	0.00-0.50	0.00-0.30	0.50-0.80
Date sampled:		22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024
Soil type:		Soily Rubbly Fill MGR	Silt Subsoil	TFD silt	Silt Subsoil	TFD silt	Soily Stony Fill MGR	TFD silt	Soily Stony Fill MGR	Soily Stony Fill MGR	Soily Rubbly Fill MGR	Silt Subsoil	Soily Rubbly Fill MGR	Soily Rubbly Fill MGR	Silt Subsoil
HML sample ref.:		S/73066	S/73067	S/73068	S/73069	73070	S/73071	S/73072	S/73073	S/73074	S/73075	S/73076	S/73077	S/73078	S/73079
Chemtech sample ref.:		19549	19550	19551	19552	19553	19554	19555	19556	19557	19558	19559	19560	19561	19562
Element	GAC [^] (mg/kg)	Concentration detected (mg/kg)													
VOCs															
Naphthalene	-	<0.016	<0.016	-	<0.016	-	0.076	-	-	<0.016	<0.016	-	0.040	0.030	-
Benzo(a)pyrene	-	0.125	0.026	-	0.150	-	5.75	-	-	0.072	0.152	-	0.199	0.373	-
Other VOCs	-	-	-	-	<0.61	-	-	-	-	-	-	-	-	<0.61	-
Total VOCs	0.5 [^]	0.125	-	-	0.150	-	5.83	-	-	0.072	0.152	-	0.239	0.403	-
Total petroleum hydrocarbons (TPH)															
EC5-EC10	2 [^]	-	-	-	<0.33	-	-	-	<0.33	-	-	<0.33	-	<0.33	<0.33
EC>10-EC16	10 [^]	-	-	-	<1.6	-	-	-	3.0	-	-	2.1	-	8.3	15.2
EC>16-EC40	500 [^]	-	-	-	<8.5	-	-	-	18.3	-	-	7.3	-	79	556.3
BTEX & MTBE															
BTEX + MTBE	0.1 [^]	-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	<0.1	<0.1
SVOCs															
Total SVOCs	2 [^]	-	-	-	<4.8	-	-	-	-	-	-	-	-	<4.8	-
[^] - threshold/trigger values (or GAC) for polyethylene water supply pipework as per Water UK (2014) and/or UKWIR (2011) Guidance, detailed later (in Appendix D). Abbreviations: MGR – made ground; ND – not detected															

[^] - threshold/trigger values (or GAC) for polyethylene water supply pipework as per Water UK (2014) and/or UKWIR (2011) Guidance, detailed later (in Appendix D). Abbreviations: MGR – made ground; ND – not detected

5.5 Summary of contamination test results

The screened contamination test results indicate the following:

- Elevated levels of metals (most notably lead) within shallow made ground could pose a substantial hazard to human health (through ingestion, dermal absorption and dust inhalation)
- Elevated levels of metals (most notably copper) within shallow made ground could pose a substantial hazard to ecological (plant) health through absorption
- Elevated level of low volatility, genotoxic PAHs (such as benzo(a)pyrene) within shallow made ground could pose a hazard to human health (through ingestion, dermal absorption and dust inhalation)
- Some notable (but relatively harmless) levels of (heavier) petroleum hydrocarbons have been detected in HP2, which suggests there could be some nearby localised hotspots of low volatility (odorous) TPH contamination (near to or below the existing barn building)
- Two samples of shallow made ground were found to contain PAHs and heavier TPH at levels that might potentially pose a hazard to standard plastic water supply pipework
- Detected levels of TPH, volatile PAHs (such as naphthalene), BTEX and MTBE, VOCs and SVOCs within near surface ground samples were found to be too low to pose a substantial hazard to human health
- No asbestos has been detected within made ground samples

6 Revised Contamination Assessment

6.1 Revised conceptual site model (CSM)

The sources, pathways and receptors of contamination at the site have been revised in light of the findings of recent site works and laboratory testing. Generally, the same sources, pathways and receptors are still considered to be potentially relevant, as detailed previously (in the HML desk study report), although the additional information helps to determine the credibility of associated potential contamination linkages.

6.2 Revised risk assessment

The results of the desk study review, site works, lab testing and screening have been used to carry out a revised risk assessment, as shown below (in Table 10). Risks greater than very low or low are considered significant and require further consideration.

There are no identified significant risks to controlled waters but there are five identified revised potential contamination linkages (RPCLs): two that might affect the human health of future site users, one that might affect the health of groundworkers, one that might affect (plant) ecological health and one that might affect water supply pipework.

6.2.1 Risks to human health (of future site users)

There are two identified unacceptable risks to future site users that require mitigation:

- Ingestion, dermal absorption or dust inhalation of contaminants (including detected elevated levels of lead and genotoxic PAHs and potential future asbestos contamination) in made ground that could occur in or via soft landscaped zones such as **soft garden areas** by direct exposure or through the ingestion of homegrown produce
- **Indoor** inhalation of unpleasant odours from leaks or spills of low volatility fractions of total petroleum hydrocarbons (TPHs), such as degraded diesel or lubricating oil

6.2.2 Risks to human health (construction workers)

There is one identified unacceptable risk to construction workers that requires mitigation:

- Ingestion, dermal absorption or dust inhalation of contaminants (including detected elevated levels of lead and genotoxic PAHs and potential future asbestos contamination) in made ground that could occur **during groundworks** by direct exposure to *in situ* made ground

Table 10: Revised conceptual site model and risk assessment

Revised conceptual site model			Revised risk assessment			
Potential source	Potential pathway	Potential receptor	Probability	Severity	Risk rating	Comments / Rationale
1. Made ground 2. Existing building fabric 3. Current land use: occasional building materials storage 4. Previous land use: Farmyard 5. Previous land use: haulage yard 6. Previous land use: workshops 7. Existing red diesel above ground storage tank (AST) in southwest part of the barn 8. Existing garage (0m west) including UST (15m west) Metals, PAHs, Asbestos, Petroleum hydrocarbons, VOCs and SVOCs	Inhalation, ingestion, absorption	Future site users	Low likelihood	Medium	Low / Moderate	Shallow made ground, typically about 0.5m-thick, contains elevated levels of metals (notably lead) and genotoxic PAHs (such as benzo(a)pyrene)
		Ground workers	Low likelihood	Medium	Low / Moderate	Asbestos within the existing barn building could contaminate the ground if not removed carefully
	UXO explosion	Ground workers	Negligible	Severe	Low	UXOs are not considered a credible hazard
	Inhalation of vapours	Future site users	Low likelihood	Medium	Low / Moderate	No substantial fuel or oil contamination has been detected. However, there might be potential for some unpleasant odours if localised TPH hotspots (for example, of degraded diesel or lubricating oil) are present below (or near to) the existing barn building
		Ground workers	Unlikely	Mild	Very low	
	Migration	Aquifer waters (none nearby)	Unlikely	Mild	Very low	Detected contamination, especially mobile contamination, appears to be very limited. The revealed ground conditions are of low permeability. No groundwater was revealed within the exposed top 2m below ground level
	Migration	Surface waters (such as nearby Risegate Eau, 15m north)	Unlikely	Mild	Very low	
	Absorption	Local flora and fauna	Low likelihood	Medium	Low / Moderate	Elevated levels of phytotoxic contamination (notably zinc) have been detected in shallow made ground that might pose a substantial hazard to vegetation growth
	Aggressive attack (by absorption)	Water supply pipework	Low likelihood	Medium	Low / Moderate	Detected levels of PAHs and TPH are generally low but could potentially permeate plastic water supply pipework
		Buried concrete	Unlikely	Medium	Low	It is assumed that sulphate protection will be provided as required based on BRE Special Digest 1 guidance and building regulations
9. Highly organic subsoils Hazardous ground gas	Migration and inhalation / combustion	Future site users	Unlikely	Medium	Low	Revealed shallow ground material is only slightly organic. Generation rates of ground gas will be negligible

6.2.3 *Risks to ecological health*

There is one identified unacceptable risk to ecological health that requires mitigation:

- Absorption of phytotoxic contaminants (including detected elevated levels of zinc) in made ground that could occur in or via soft landscaped zones such as **soft garden areas**

6.2.4 *Risks to water supply pipework*

There is one identified unacceptable risk to water supply pipework that requires mitigation:

- Water supply pipework could be permeated by hydrocarbons (PAHs and TPH) within made ground

6.2.5 *Risks to controlled waters*

Based on a hydrogeological risk assessment, there is no identified significant risk to groundwaters. This is explained as follows.

- Some ground contamination has been detected (such as metals and low volatility organic compounds) but this has been found to be of limited amount or mobility. Most metals are of limited solubility and other contaminants have only been found in small amounts
- No groundwater was observed during recent borehole exploration (to 2m depth)
- The revealed Tidal Flat Deposits are not a recognised aquifer (they are classed as Unproductive Strata) and neither is the anticipated deep mudstone
- The revealed natural ground material consists of low permeability silts and clays and even the shallow granular made ground was largely 'Soily' which should limit the transmissivity of any contamination
- There are no reported nearby groundwater abstractions or groundwater Source Protection Zones (SPZs)

Based on a hydrological risk assessment, there is no identified significant risk to surface waters. This is explained as follows.

- The nearest identified surface water feature is about 18m north of the site (Risegate Eau - drain/ditch)
- No groundwater was observed during recent borehole exploration
- The revealed low permeability ground conditions (of silt) should restrict the off-site migration of ground contamination
- The site is mostly in a lower risk (Flood Zone 1) area
- Only very limited levels of mobile contamination have been detected or are suspected within the site

6.2.5 Risks from hazardous ground gas

Based on a ground gas risk assessment, there is no identified significant risk to future site users. This is explained as follows.

- The only identified source is organic material within natural soils; the revealed made ground is too thin (less than 1m thick) to offer a credible source of ground gas
- The revealed natural ground conditions of TFD (clayey) silt are of relatively low permeability that should inhibit the flow of ground gas
- The revealed natural ground is not a credible source of hazardous ground gas; as explained by NHBC report NF94 (NHBC, 2023, page 19): *“Natural alluvium or mud flat deposits, including geological peat, are very unlikely to be credible sources of ground gas on most sites. The organic material is locked in a low permeability matrix. The gas generation rates are incredibly low.”*
- TOC testing has shown that the near surface TFD silts are inorganic or only slightly organic, as shown earlier (in Table 6)

6.3 Provisional proposed remediation

Based on the revised risk assessment above (in Table 10), five possible revised potential contamination linkages (RPCL1 to RPCL5) have been identified, as summarised below (in Table 11). These are the only remaining plausible potential contamination linkages unless unforeseen contamination is encountered. These linkages represent unacceptable levels of risk and merit further action.

The following remediation measures are proposed to deal with the identified relevant contamination linkages. These measures are subject to further review and local planning authority approval.

6.3.1 RPCL1

RPCL1 concerns the risk to residential site users from the general contaminants within the made ground that may harm future site users through a pathway of inhalation (of dust), ingestion, and absorption. This pathway could occur outdoors in soft landscaped areas and gardens. The main contaminants of concern are metals (such as lead), genotoxic PAHs (such as benzo(a)pyrene) and asbestos.

A two-stage approach could be required to mitigate RPCL1:

1. Suitable, careful removal off-site of any asbestos containing materials (ACMs) within the existing building fabric
2. Clean soil cover system in soft landscaped areas

Table 11: Revised potential contamination linkages (RPCLs)

<i>Ref.</i>	<i>Source</i>	<i>Pathway</i>	<i>Receptor</i>	<i>Risk rating</i>	<i>Possible solution</i>
RPCL1	1. Made ground 2. Existing building fabric 3. Current land use: occasional building materials storage 4. Previous land use: Farmyard	Ingestion, dust inhalation, absorption	Future site users	Low / Moderate	(a) Clean soil cover systems within soft landscaped (garden) areas AND (b) suitable removal of existing <i>in situ</i> asbestos materials
RPCL2	5. Previous land use: haulage yard		Ground workers	Low / Moderate	Safe working practices
RPCL3	6. Previous land use: workshops 7. Existing red diesel above ground storage tank (AST) in southwest part of the barn	Inhalation of vapours	Future site users	Low / Moderate	Chasing out of any (malodorous) TPH impacted soils near proposed dwellings
RPCL4	8. Existing garage (0m west) including UST (15m west) Metals, PAHs, Asbestos, Petroleum hydrocarbons, VOCs and SVOCs	Absorption	(plant) Ecology	Low / Moderate	Clean soil cover systems within soft landscaped (garden) areas
RPCL5		Aggressive attack (by absorption)	Below-ground water pipework	Low / moderate	Barrier pipe and wrapped fittings for any below ground water supply

The existing building will need to be dismantled and removed off-site by suitably competent professionals. The existing wall and roof panels are likely to include asbestos containing materials (ACMs) which will require additional care to remove and dispose. Records will need to be maintained for inspection to demonstrate the appropriate demolition and disposal of the existing building fabric by suitably authorised contractors.

The most robust option to protect future site users could be to provide a suitable soil barrier system (or cover system) within soft garden areas and soft landscaped areas where made ground is present (across the site). This would sever any pathway between soil contaminants of concern in the near surface made ground and future site users. The barrier system would need to be at least 0.6m in thickness within soft gardens (based on current best practice and a consideration of site-specific constraints and risks), consist of proven clean soils and be underlain by a geotextile separation layer. Further details about the requirements of a barrier system are presented in the YALPAG Guidance: *Verification requirements for cover systems*, the most up-to-date version of which should be available to download from local planning authority websites.

Barrier systems would need to be in place for all soft garden areas and soft landscaped areas. Areas of permanent hard surfacing (for roads, parking bays, and so on) should not require any barrier system since the proposed hard surfacing should automatically provide protection to site users from contaminants within the *in situ* ground material.

6.3.2 RPCL2

RPCL2 concerns the risk to groundworkers during site works from exposure to detected metals and PAH contamination within *in situ* made ground (and potential future asbestos contamination if the existing building fabric is not carefully removed off-site). This risk should be managed by standard groundworks safe working practices.

Nevertheless, it will be necessary to engage a suitably competent groundworks contractor and provide them with contamination information (such as a copy of this report) to allow them to carry out risk assessments and develop site-specific safe working procedures.

It is expected that safe working procedures will include a suitable strategy for identifying and dealing with any suspected buried unexploded ordnance (UXOs) during groundworks.

6.3.3 RPCL3

RPCL3 concerns the risk to future site users from the nuisance inhalation of unpleasant petroleum hydrocarbon odours within indoor areas – considered to be a hazard around the location of the existing barn building. The most appropriate means of mitigating this risk could be the removal of any malodorous or fuel/oil impacted ground material from the site, especially below proposed dwellings.

Fuel/oil impacted ground material would need to be chased out by an environmental engineer, possibly with the assistance of a photo-ionisation detector (PID) probe. Impacted material would require off-site removal (or on-site treatment) by suitably authorised waste contractors.

Chasing out works should only be carried out after the removal of the existing building and floor slab. It would be impracticable to carry out such works prior to the building's removal.

6.3.4 RPCL4

RPCL4 pertains to the risk to plant ecology from the absorption of phytotoxic contaminants (most notably copper) that have been detected in samples of made ground. The installation of a clean soil cover system (as discussed above, in Section 6.3.1) in soft landscaped areas could mitigate this risk.

6.3.5 RPCL5

RPCL5 concerns the risk of permeation of water supply pipes by hydrocarbons. It is recommended that barrier pipe (polyethylene pipe with an internal core of aluminium),

such as Protect-aline™, be employed along with suitable fittings and joints (wrapped in aluminium tape/foil).

Remediation measures (such as the provision of barrier pipe) will need to be agreed with and approved by the relevant regulatory body (Anglian Water Services or other local water authority). The installation of barrier pipe will need to be verified with appropriate site works photographs, delivery tickets, receipts and so on.

6.4 Waste management and reuse of site won material

6.4.1 Potential for the re-use of site won material

The revealed *in situ* deeper natural Tidal Flat Deposits silty soils could be generally suitable for reuse around the site – provided the ground material is found to be clean and uncontaminated. Any excavated clean silts and clays (or other clean natural soil) should be stockpiled (separately) and checked for suitability before being reused around the site.

Where waste is created during construction works, such as soil arisings from trench excavations, then waste regulations require the reuse is covered by an environmental permit or a suitable waste exemption (e.g. a T5 Exemption) or protocol (such as the WRAP Protocol or the CL:AIRE Definition of Waste: Code of Practice). However, the revised Waste Framework Directive (2008/98/EC) explains that the following does not need to be classed as waste and can be reused on site: *“uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated”*.

Accordingly, any excavated (potentially contaminated) made ground will only be suitable for reuse on the site if covered by an appropriate permit, exemption or protocol (such as a U1 or T5 exemption, the WRAP Protocol or the CL:AIRE Code of Practice: Definition of Waste).

Further guidance about waste exemptions and protocols is available online from:

- <https://www.gov.uk/guidance/register-your-waste-exemptions-environmental-permits>
- <https://www.ceca.co.uk/wp-content/uploads/legacy-media/300067/ceca-waste-classification-and-permitting-in-construction-february-2018.pdf>

At this stage, it would be sensible to make budgetary allowance for the off-site removal of any made ground excavated during building works.

6.4.2 Removal of waste off-site

Some substantial amount of made ground and some surplus natural ground material might need off-site removal. This will need to be taken away and received by suitably authorised waste contractors.

Early consultation with local licensed waste handlers and landfills or soil treatment facilities is recommended to predict likely costs for removal and waste disposal.

All relevant paperwork (including waste transfer notes) will need to be retained for inspection to provide documentary evidence of suitable waste disposal (for example, of made ground). Similarly, paperwork will need to be retained detailing any material movements if made ground is reused around the site based on a suitable exemption or protocol, such as using a suitably administered MMP.

6.5 Unforeseen contamination

Any unforeseen contamination (for example, petroleum odours or staining or asbestos containing materials) encountered during the development of the site must be monitored and immediately reported to the local authority. Work shall be halted in the area of any revealed potential contamination and the contamination investigated and assessed to the satisfaction of the local planning authority and any other relevant regulatory bodies who may require some revised contamination remediation measures to be implemented.

6.6 Further investigation works / next steps

The extent of the investigation carried out to date could be adequate to robustly characterise the nature and extent of land contamination risks at the site, so no further investigative works might be required. However, this is subject to review by the local planning authority's environmental team and other potentially relevant regulatory bodies (such as the Environment Agency).

It is anticipated that a (Phase 3) detailed remediation strategy and verification procedure (RSVP) – also referred to as a remediation method statement (RMS) – will need to be produced to detail the remediation options and confirm the chosen solutions. The RSVP will need to be approved by the local planning authority prior to the start of building works.

Subsequently, at the completion of remediation works, a (Phase 4) verification or closure report would be needed to confirm or otherwise that remediation works comply with the proposed remediation strategy, and to allow the local planning authority to fully discharge any contamination related planning conditions.

7 SUMMARY & CONCLUSIONS

7.1 Desk study information

7.1.1 *Proposed development*

The proposed building works comprise the construction of two new detached two-storey dwellings following the removal of an existing barn workshop/storage building.

7.1.2 *Site description*

The site is land between 10 and 12 Risegate Road, Gosberton, PE11 4EY, around grid reference 521100,329790. It is about 70m by 30m in plan area.

The site comprises an existing barn building (partly roofed in possible asbestos sheets), a small, dilapidated former cow shelter and two stockpiles. The large steel barn occupies the majority of the southern part of the site (25m by 27m) with the rest of the site being covered by compacted stone.

The site is relatively flat and located at a low local elevation. Ground levels are estimated to be about 3m above Ordnance datum (AOD).

7.1.3 *Site History*

Summary of historical information:

- The existing barn was probably originally built in the 1960s and was extended in the 1990s and has possibly been used as a workshop
- Possible former farmyard with (on-site) – prior to 1950s
- Former possible bungalow (on-site) – late 1950s until 1990s
- Possible haulage yard for sewage removal wagons – 1990s until around 2010
- Vacant site with occasional use for storage of building materials – around 2010 to present
- Existing garage (10m west) – from early 1970s
- Existing Elm Tree Farm (40m west) – from early 1970s

7.1.4 *Geology, hydrogeology and hydrology*

Prior to site investigation works, anticipated ground conditions based on published local geological information were as shown below (in Table 12).

Table 12: Previously anticipated ground conditions inferred from local geology records

<i>Strata</i>	<i>Depth to base (m BEGL)</i>
Made ground	<1
Tidal Flat Deposits	8 – 9
Oxford Clay Formation	58 – 79

Hydrogeological information:

- The anticipated mudstone bedrock is classed as an Unproductive Aquifer
- The anticipated TFD clay drift is classed as an Unproductive Aquifer
- No nearby groundwater abstractions or groundwater Source Protection Zone (SPZ)

Hydrological information:

- Nearest identified surface water feature: Risegate Eau - drain/ditch (18m north)
- There are significant flooding issues at or adjacent to the site, but most of the site is in a low flood risk area

7.1.5 Other environmental information

- There are no nearby historical Landfill Sites (within 1km)
- The site is not affected by radon. No protection measures required
- The site is in an area with a low historical bombing density

7.2 Recently revealed ground conditions

7.2.1 Scope of recent HML site investigation works

The scope of recent HML site investigation works includes five shallow boreholes (WS1 to WS5) drilled to depths of 2.0m below existing ground level (BEGL) and two hand dug pits (HP1 and HP2) dug to depths of 1.0m with geochemical testing for contaminants of potential concern on recovered soil samples.

7.2.2 Recently revealed ground conditions

The findings of the recent HML investigation indicate the following sub-strata at the site (in descending order).

- **Concrete slab (below existing barn building)**
 - 0.2m-thick, revealed in HP2
- **Made ground**
 - Revealed across the site to a depth of between 0.30m and 0.80m
 - Mainly comprised of granular stone and/or rubble with some soily material
- **Silty Subsoil**
 - Revealed across the site to a depth ranging between 0.8m and 1.3m

- Slightly organic dark-coloured slightly sandy SILT (with occasional rootlets)
- **Tidal Flat Deposits (TFD) – silt**
- Revealed across the site to the maximum depth of exploration (of 2.00m)
- Mainly comprised of orangish brown slightly sandy SILT
- Locally (in WS5), slightly organic, brownish grey with black mottling slightly sandy SILT with degraded rootlets

No groundwater observations were recorded during recent site works. All the exploratory holes appear to have remained dry.

7.3 Contamination investigation

7.3.1 Summary of geochemical contamination testing

The screened contamination test results, as summarised earlier (in Tables 8 and 9), indicate the following:

- Elevated levels of metals (most notably lead) within shallow made ground could pose a substantial hazard to human health (through ingestion, dermal absorption and dust inhalation)
- Elevated levels of metals (most notably copper) within shallow made ground could pose a substantial hazard to ecological (plant) health through absorption
- Elevated level of low volatility, genotoxic PAHs (such as benzo(a)pyrene) within shallow made ground could pose a hazard to human health (through ingestion, dermal absorption and dust inhalation)
- Nevertheless, some notable levels of (heavier) petroleum hydrocarbons have been detected in HP2, and there could be some nearby localised hotspots of low volatility (odorous) TPH contamination (near to or below the existing barn building)
- Two samples of shallow made ground were found to contain PAHs and heavier TPH at levels that might potentially pose a hazard to standard plastic water supply pipework
- Detected levels of TPH, volatile PAHs (such as naphthalene), BTEX and MTBE, VOCs and SVOCs within near surface ground samples were found to be too low to pose a substantial hazard to human health
- No asbestos has been detected within made ground samples

7.3.2 Revised contamination risk assessment

Based on the revised risk assessment above (in Table 10), five possible revised potential contamination linkages (RPCL1 to RPCL5) have been identified, as summarised below (in Table 13). These linkages represent unacceptable levels of risk and merit further action, potentially as suggested below (in Table 13).

Table 13 (also Table 11): Revised potential contamination linkages (RPCLs)					
Ref.	Source	Pathway	Receptor	Risk rating	Possible solution
RPCL1	1. Made ground 2. Existing building fabric 3. Current land use: occasional building materials storage 4. Previous land use: Farmyard	Ingestion, dust inhalation, absorption	Future site users	Low / Moderate	(a) Clean soil cover systems within soft landscaped (garden) areas AND (b) suitable removal of existing <i>in situ</i> asbestos materials
RPCL2	5. Previous land use: haulage yard		Ground workers	Low / Moderate	Safe working practices
RPCL3	6. Previous land use: workshops 7. Existing red diesel above ground storage tank (AST) in southwest part of the barn	Inhalation of vapours	Future site users	Low / Moderate	Chasing out of any (malodorous) TPH impacted soils near proposed dwellings
RPCL4	8. Existing garage (0m west) including UST (15m west) Metals, PAHs, Asbestos, Petroleum hydrocarbons, VOCs and SVOCs	Absorption	(plant) Ecology	Low / Moderate	Clean soil cover systems within soft landscaped (garden) areas
RPCL5		Aggressive attack (by absorption)	Below-ground water pipework	Low / moderate	Barrier pipe and wrapped fittings for any below ground water supply

Details of proposed remediation solutions will need to be agreed and approved by the local planning authority prior to building works. A verification report will subsequently need to confirm completion of remediation measures.

7.3.3 Waste management and reuse of site won material

Any excavated (potentially contaminated) made ground will only be suitable for reuse on the site if covered by an appropriate permit, exemption or protocol (such as a U1 or T5 exemption, the WRAP Protocol or the CL:AIRE Code of Practice: Definition of Waste). It would be sensible to make budgetary allowance for the off-site removal of any made ground excavated during building works.

All relevant paperwork (including waste transfer notes) will need to be retained to provide documentary evidence of suitable waste disposal.

7.3.4 Unforeseen contamination

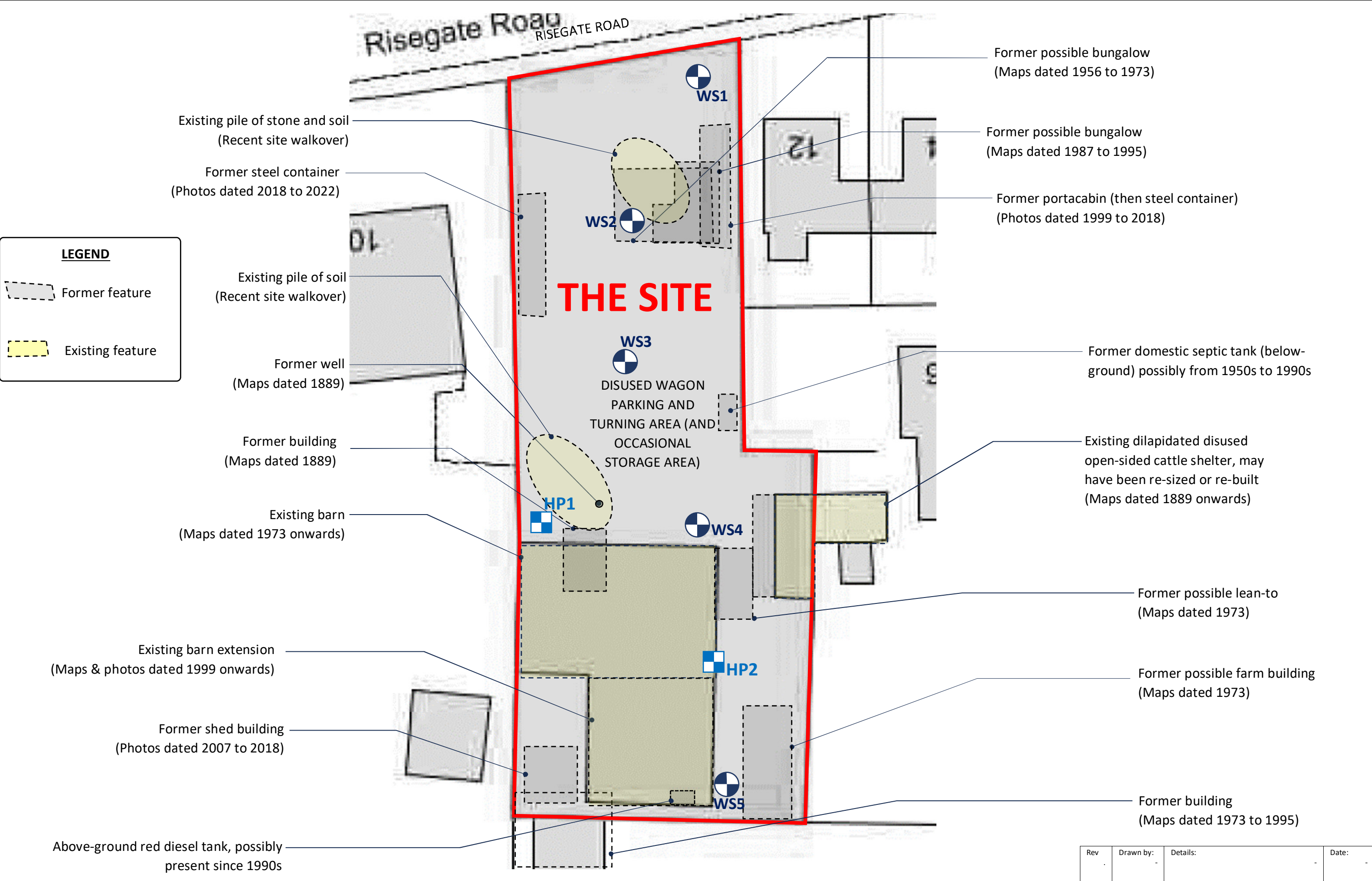
Work shall be halted around any revealed unforeseen potential contamination (such as asbestos containing materials, unusual odours or oily staining). The local planning authority shall be informed immediately.

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- YALPAG (2021) Verification Requirements for Cover Systems: Technical Guidance for Developers, Landowners and Consultants (Version 4.1, June 2021) Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG). Available online
- YALPAG (2019) Development on Land Affected by Contamination: Technical Guidance for Developers, Landowners and Consultants (Version 10.3, April 2019), Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG). Available online

Appendix A
Plans & Photographs



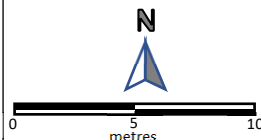
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Brigg
North Lincolnshire
DN20 8AR
Telephone: 01652 652753
www.humbersidematerialslab.co.uk



Notes:

1. Do not scale
2. All locations are approximate only
3. JC Architectural Consultant drawing number 0412/23/03D, dated 14 Sept 2024
4. Historical sources include anecdotal information from site owner as well as maps, aerial photos, streetviews and recent site walkover



Drawing Title: Exploratory hole location plan

Site: Land between 10 and 12 Risegate Road,
Client: Gosberton

Project No.: JC Architectural Consultant

Rev	Drawn by:	Details:	Date:
-	-	-	-

Drawn by: ED / RL

Checked by: DD

Scale: As shown

Size: A3

Date: 28 Nov 2024

Drawing number:

1488-6457-P2-01

Revision: -

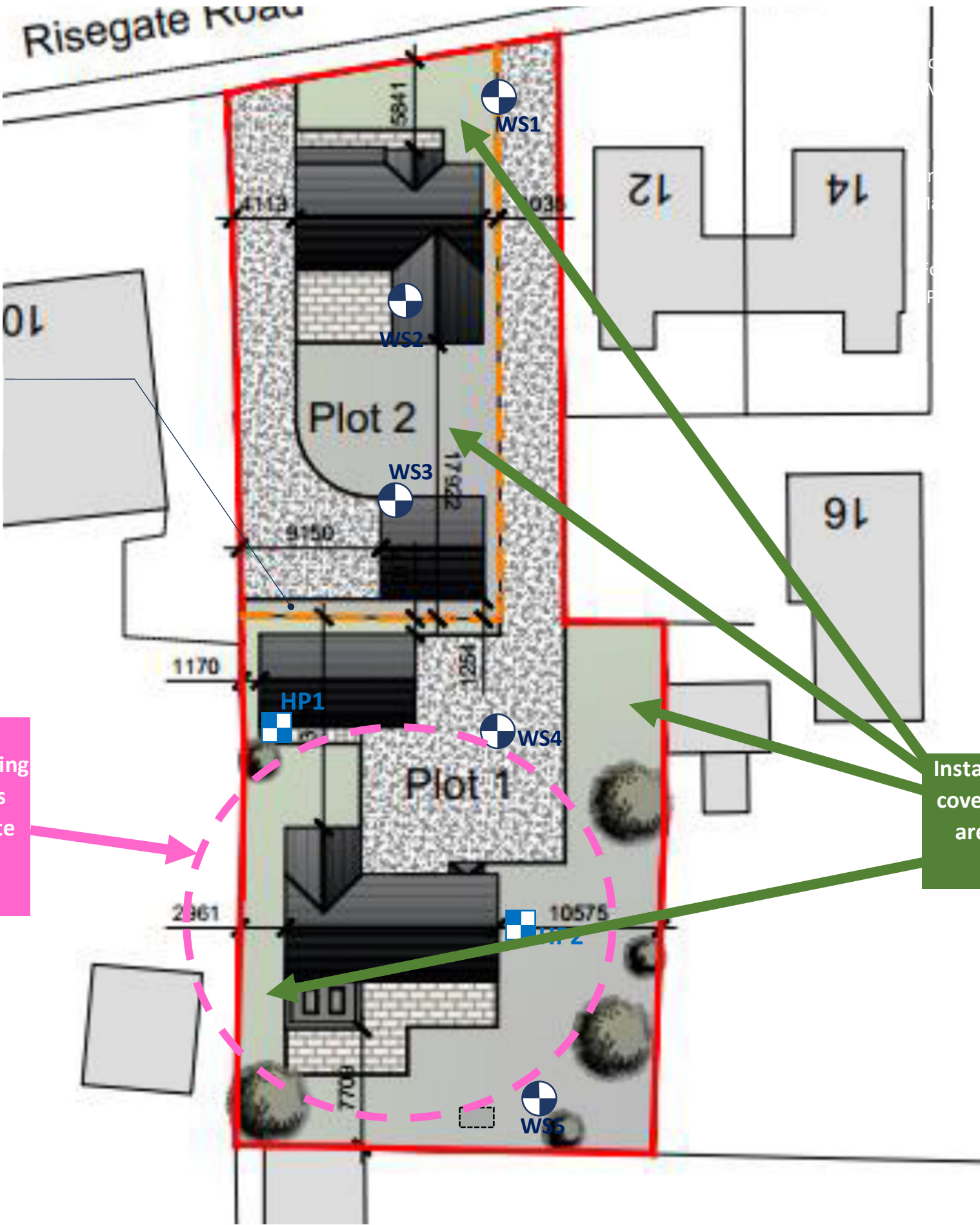
ALL PROPOSED REMEDIATION MEASURES
REQUIRE PRIOR LOCAL PLANNING
AUTHORITY APPROVAL

Barrier pipework
probably needed for
water supply (subject to
Anglian Water
requirements)

Inspection of ground material by an
environmental engineer after removal of existing
buildings and chasing out of any malodorous
fuel/oil impacted soils and subsequent off-site
removal by suitably authorised waste
contractors

Suitable dismantling and
off-site removal of existing
building fabric, especially
possible asbestos sheeting,
by competent workers

Installation of 0.6m-deep engineered clean soil
cover system within proposed soft landscaped
areas comprising clean imported soils and,
potentially, some clean site won soils



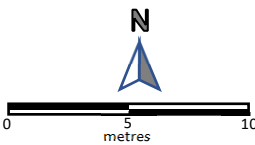
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Notes:

1. Do not scale
2. All locations are approximate only
3. JC Architectural Consultant drawing number 0412/23/03D, dated 14 Sept 2024
4. Historical sources include anecdotal information from site owner as well as maps, aerial photos, streetviews and recent site walkover



Drawing Title: Remediation plan

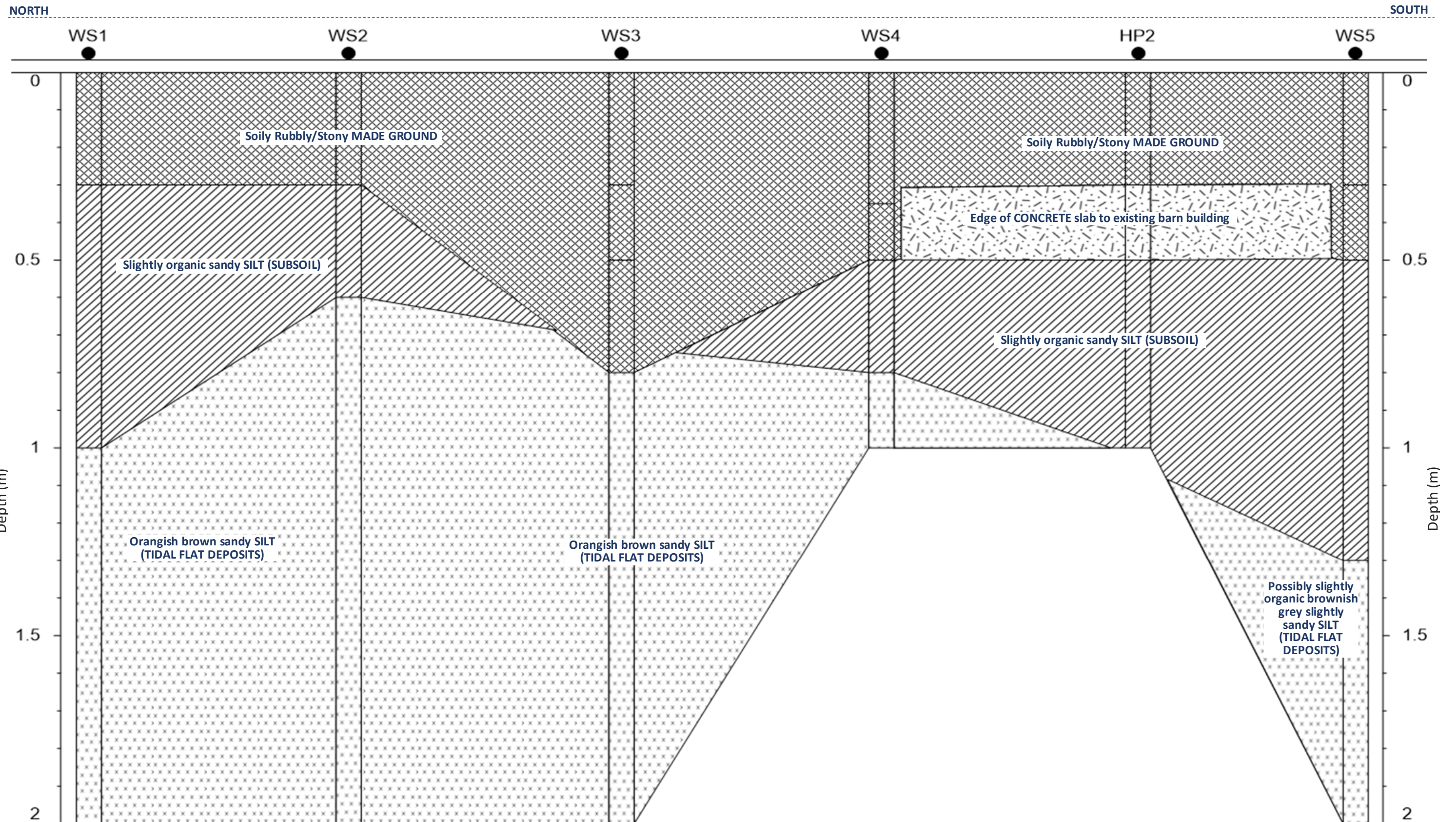
Site: Land between 10 and 12 Risegate Road,
Client: Gosberton

Project No.: JC Architectural Consultant

Rev	Drawn by:	Details:	Date:
-	-	-	-

Drawn by: ED / RL
Checked by: DD
Scale: As shown
Size: A3
Date: 02 Dec 2024

Drawing number:
1488-6457-P2-02
Revision: -



Rev	Drawn by:	Details:	Date:

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Notes:

1. Do not scale
2. All locations are approximate only
3. Strata boundaries and groundwater levels are inferred or imagined only, highly speculative and subject to confirmation
4. Strata descriptions are typical and could vary



Drawing Title: Geological cross sectional sketch

Site: Land between 10 and 12 Risegate Road, Gosberton

Client: JC Architectural Consultant

Project No.: Market Rasen

Drawn by: **RL**

Checked by: **MD**

Scale: **As shown**

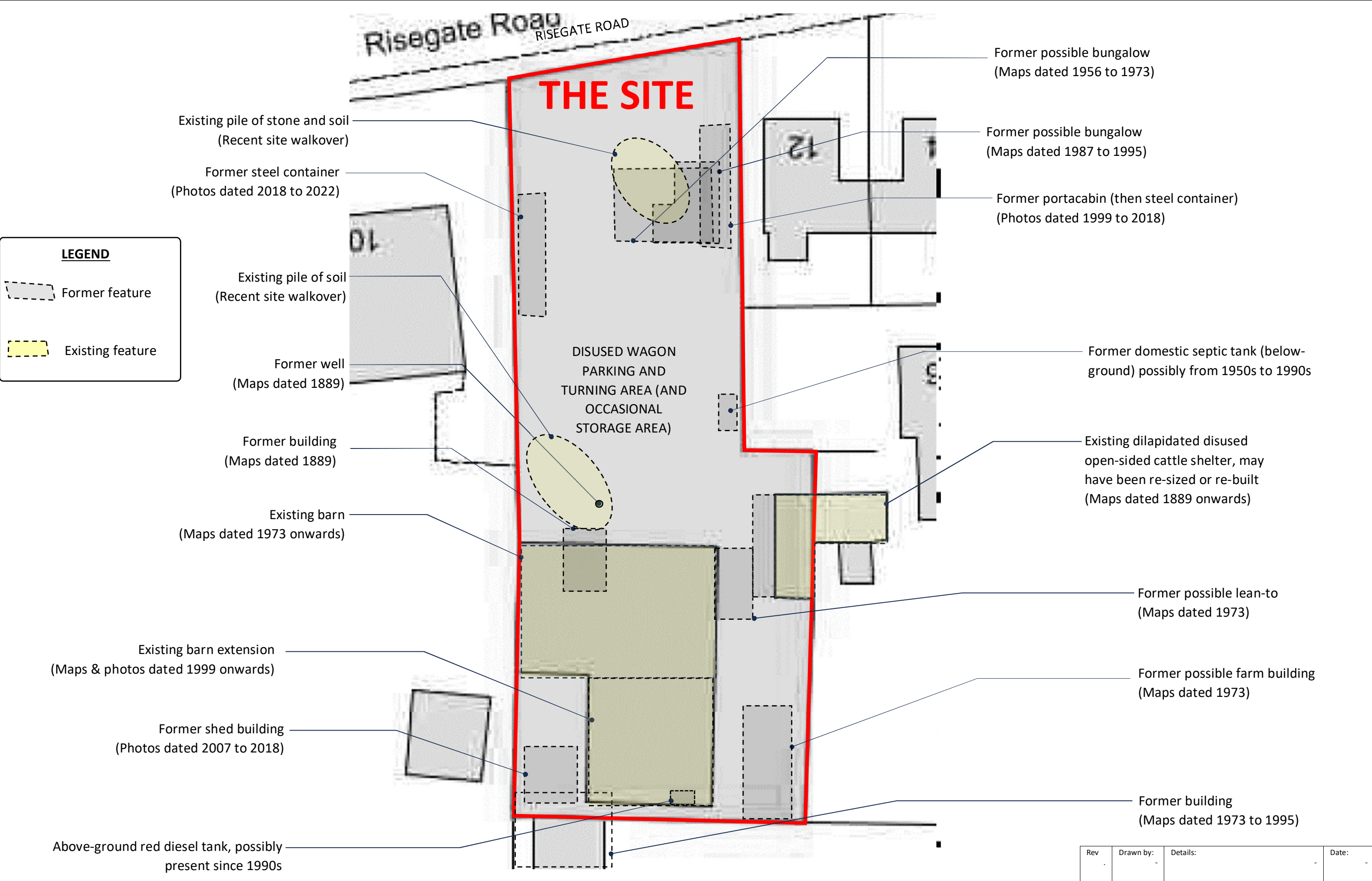
Size: **A3**

Date: **02 Dec 2024**

Drawing number:

1488-6457-P2-03

Revision: -



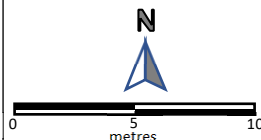
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Notes:

1. Do not scale
2. All locations are approximate only
3. JC Architectural Consultant drawing number 0412/23/03D, dated 14 Sept 2024
4. Historical sources include anecdotal information from site owner as well as maps, aerial photos, streetviews and recent site walkover



Drawing Title: Existing & historical features plan

Site: Land between 10 and 12 Risegate Road, Gosberton
Client: JC Architectural Consultant

Project No.: 1488/6457/P/P1

Rev	Drawn by:	Details:	Date:
-	-	-	-

Drawn by: ED / RL

Checked by: DD

Scale: As shown

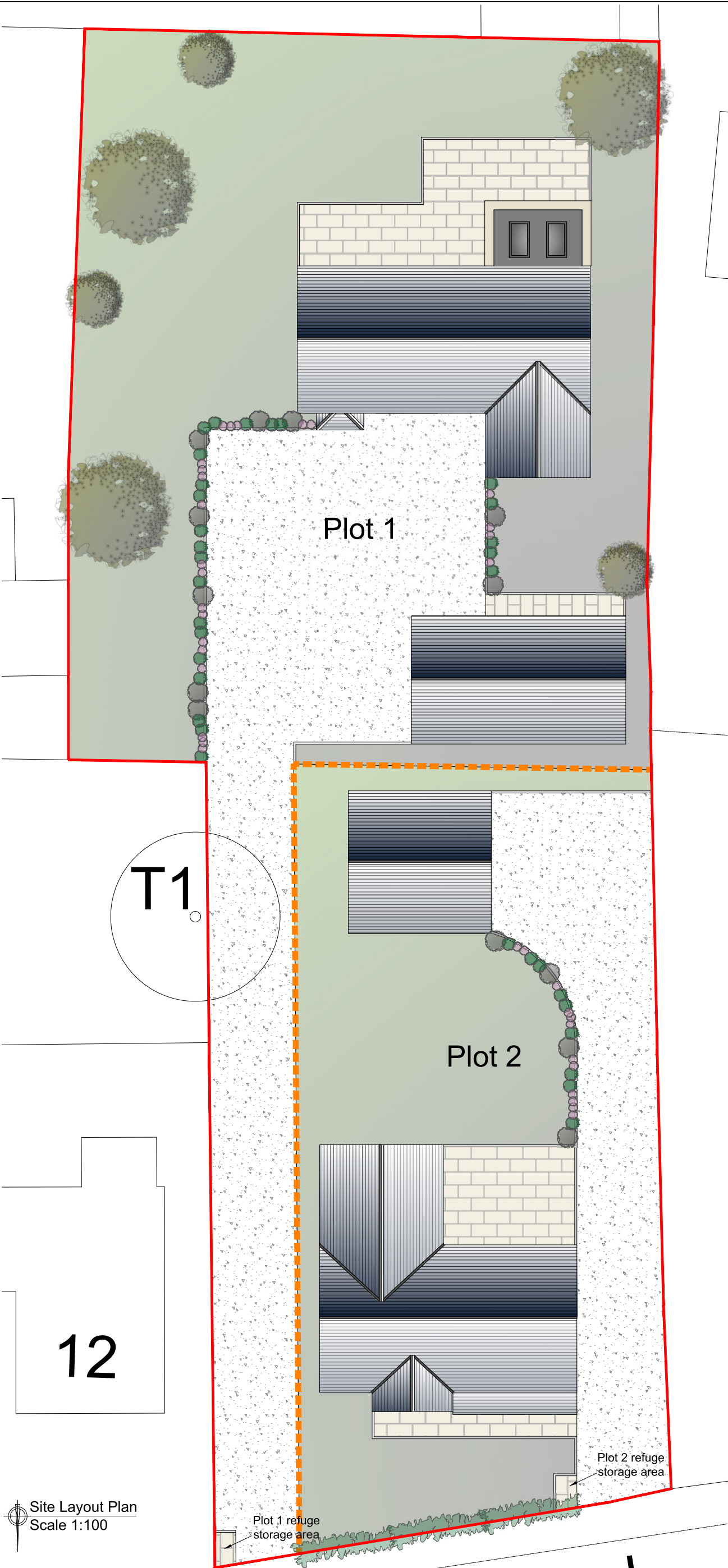
Size: A3

Date: 12 Aug 2024

Drawing number:

1488-6457-P1-01

Revision: -



CONSTRUCTION MANAGEMENT PLAN

SITE SET-UP

THE NORTH BOUNDARY OF THE SITE WILL BE SECTIONED OFF FROM THE PUBLIC FOOTPATH AND HIGHWAY BY A HERAS FENCE WITH FEET AND REAR BRACING SUPPORTS ON TO THE SITE. THE FENCING WILL HAVE A SINGLE ACCESS POINT WHICH CAN BE OPENED AND CLOSED AS NECESSARY. THE REMAINDER OF THE FENCING WILL HAVE A FORM OF HOARDING TO OBLSCURE THE VIEW OF THE SITE FROM PASSING MEMBERS OF PUBLIC.

THE PROTECTED TREE, LABELLED T1 ON THE ADJACENT SITE LAYOUT PLAN, WILL BE SURROUNDED BY HERAS FENCING TO AT LEAST THE FURTHEST POINT OF THE CANOPY FROM THE TRUNK. THIS WILL BE INSTALLED PRIOR TO ANY SITE CLEARANCE AND DEMOLITION WORKS AND WILL BE MAINTAINED IN POSITION FOR THE ENTIRETY OF THE WORKS TO ENSURE THE TREE IS NOT DAMAGED IN ANY WAY.

ACCESS

ACCESS TO THE SITE WILL BE VIA THE SINGLE ACCESS POINT IN THE HERAS FENCING AS MENTIONED ABOVE. THE ACCESS GATE WILL BE CLOSED WHEN NOT IN USE TO ENSURE NO UNAUTHORISED ACCESS IS PERMITTED TO THE SITE. ALL VEHICLES GOING TO AND FROM THE SITE WILL USE THIS ACCESS TO ENSURE THAT THE SINGLE POINT OF ACCESS TO AND FROM THE HIGHWAY IS MAINTAINED THROUGHOUT THE DURATION OF THE WORKS.

TRAFFIC MANAGEMENT

AS ABOVE, THE ACCESS TO THE SITE WILL REMAIN CLOSED AT ALL TIMES, THE EXCEPTION TO THIS BEING WHEN VEHICLES ARE ACCESSING THE SITE. WHEN TRADES ARE ACCESSING THE SITE THEY WILL PULL UP ON THE HIGHWAY ADJACENT TO THE SITE TO OPEN THE GATE, THEN PARK THEIR VEHICLE WITHIN THE SITE FOR THE DURATION OF THE DAY AND CLOSE THE GATE.

IF DELIVERIES ARE BEING BROUGHT TO THE SITE, THIS WILL BE PRIOR ARRANGED SO THE GATE CAN BE OPENED WHEN A DELIVERY TIME IS AGREED TO ENSURE LARGE VEHICLES ARE NOT LEFT TO POTENTIALLY BLOCK THE HIGHWAY. ALL UNLOADING CAN THEN TAKE PLACE WITHIN THE SITE AND THE DELIVERY VEHICLE CAN LEAVE THE SITE FACING FORWARD RATHER THAN HAVING TO REVERSE ON TO THE HIGHWAY. ALL MOVEMENTS OF LARGER VEHICLES TO AND FROM THE SITE WILL HAVE SOMEBODY PRESENT TO WATCH THE DRIVER ON TO THE HIGHWAY, ONCE THE VEHICLE HAS LEFT THE GATE WILL THEN BE CLOSED.

ENVIRONMENTAL CONTROL

DURING THE SITE CLEARANCE AND DEMOLITION WORKS SCREENING WILL BE INSTALLED IF REQUIRED TO ENSURE DUST AND DEBRIS DOES NOT SPREAD BEYOND THE CONFINED AREA OF THE SITE. THE MATERIAL WILL ALSO BE SPRAYED WITH WATER TO ENSURE THE DUST IS KEPT TO A MINIMUM. IF ANY ANIMALS ARE FOUND DURING THIS PHASE, BATS, OWLS, NEWTS ETC, THEY WILL BE PROTECTED/MOVED AS NECESSARY. WHERE SPECIALISTS ARE REQUIRED FOR THIS ALL WORK WILL BE STOPPED IMMEDIATELY AND THE NECESSARY SURVEYS/INSPECTIONS WILL BE CARRIED OUT.

IF ANY CONTAMINATED LAND IS FOUND OR IF ANY LAND IS TO BECOME CONTAMINATED DURING THE COURSE OF THE SITE CLEARANCE AND DEMOLITION WORKS IT IS TO BE CLEANED ACCORDINGLY/REMOVED FROM SITE AND DISPOSED OF IN AN APPROPRIATE MANNER.

ANY PLANT AND MACHINERY ON SITE WILL BE MAINTAINED AND KEPT IN A GOOD CONDITION TO ENSURE THERE ARE NO IMPACTS ON THE SITE AND THE SURROUNDING AREAS OF HARDSTANDING, INCLUDING THE ADJACENT FOOTPATH AND THE HIGHWAY.

THERE WILL BE NO BURNING OF ANY MATERIALS OR WASTE ON SITE DUE TO THE CLOSE PROXIMITY OF THE ADJACENT AND SURROUNDING PROPERTIES. THIS ALSO ENSURES THAT THERE WILL BE NO RISK OF CONTAMINATING THE SITE DURING THE BUILD WORKS AND ALSO NO POSSIBLE DAMAGE CAUSED TO THE PROTECTED TREE, BOUNDARY HEDGES ETC.

WASTE MANAGEMENT

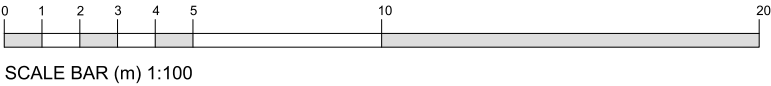
ALL WASTE FROM THE SITE WILL BE STORED WITHIN THE SITE BOUNDARIES AND REMOVED FROM SITE CORRECTLY WHEN CONVENIENT TO DO SO. DURING SITE CLEARANCE THE WASTE MATERIAL WILL BE SORTED IN TO ITS DIFFERENT MATERIAL GROUPS AND EITHER RECYCLED OR DISPOSED OF AS NECESSARY. ANY CONTAMINATING MATERIALS, ASBESTOS ETC, WILL BE STORED IN AN APPROPRIATE MANNER, EITHER WRAPPED IN POLYTHENE OR PLACED IN BAGS AND SEALED, UNTIL THEY ARE PROFESSIONALLY DISPOSED OF.

DURING THE CONSTRUCTION WORKS ANY MATERIAL OR PACKAGING WASTE WILL BE DISPOSED OF VIA AN ON SITE SKIP WHICH WILL BE REPLACED WHEN FULL. EVERY CARE WILL BE TAKEN TO RECYCLE ALL MATERIAL AND WASTE WHERE POSSIBLE VIA THE CORRECT MEANS. ALL MATERIALS WILL BE CORRECTLY STORED TO ENSURE THERE IS NOT UNNECESSARY DAMAGE THAT WOULD RESULT IN MORE DISPOSAL OF WASTE THAN IS STRICTLY REQUIRED, INCLUDING MAINTENANCE MATERIALS ETC FOR PLANT AND MACHINERY.

LANDSCAPING KEY

N.B. Site levels are to remain as existing and FFL is to be approx. 300mm above

- DENOTES AREAS OF NEW GOLDEN GRAVEL DRIVEWAY
GOLDEN GRAVEL (20mm MINIMUM) LAID AT A MAX. DEPTH OF 50mm OVER 150mm WELL COMPACTED CLASS 1 HARDCORE OVER A SUITABLE GEOTEXTILE MEMBRANE
- DENOTES AREAS OF NEW PORCELAIN PAVING (EXACT PRODUCT TBC BY CLIENT)
INSTALLED USING A SUITABLE EXTERNAL GRADE FLEXIBLE ADHESIVE AND COLOURED EXTERNAL GRADE GROUT. INSTALLED OVER A 50mm IN SITU CONCRETE SLAB (FORMED SO FINISHED LEVEL TO BE LEVEL WITH DOOR THRESHOLDS) OVER 100mm WELL COMPACTED CLASS 1 HARDCORE
- DENOTES AREAS OF NEW LAWN TO BE:
GOOD QUALITY LAWN SEED SPREAD OVER A LAYER OF HIGH QUALITY TOPSOIL (GRADED TO NEW LEVELS) WITH A MINIMUM DEPTH OF 150mm TOPSOIL INSTALLED
- DENOTES AREAS OF NEW MARSHALLS GRANITE COBBLES 100 x 100mm CUBED FORMAT
INSTALLED INTO A 50mm 3:1 SAND CEMENT BED OVER 150mm LAYER OF WELL COMPACTED CLASS 1 HARDCORE. INSTALLED TO LEVELS AS DETAILED AND TO INCORPORATE NOMINAL FALLS SHOWN, JOINTS FILLED WITH A SAND CEMENT MORTAR
- DENOTES NEW TIMBER CLOSE BOARD FENCING - TO BOUNDARIES AS SHOWN.
TO BE 1.8m HEIGHT TO EAST AND WEST BOUNDARIES AND TO BOUNDARY BETWEEN PLOT 1 AND PLOT 2. SOUTH BOUNDARY TO BE 1.2m
- DENOTES NEW NATIVE HEDGING - TO NORTH BOUNDARY OF PLOT 2 AS SHOWN.
TO BE INSTALLED AT APPROX. 1.8m IN HEIGHT AND MAINTAINED AT THAT HEIGHT THEREAFTER. SPECIES TO INCLUDE COMMON HAWTHORN, HAZEL, BLACKTHORN, FIELD MAPLE AND OTHER COMMON NATIVE SPECIES.
- DENOTES NEW HIGH AND LOW LEVEL PLANTING - TO BE SPORADIC ACROSS THE SITE.
LOW LEVEL PLANTING TO BE A MIXTURE OF SHRUBS, SMALL BUSHES ETC. TO GENERALLY FORM EDGES AND BE MAINTAINED AS SUCH. HIGH LEVEL PLANTING TO CONSIST OF SCATTERED NATIVE TREE SPECIES INCLUDING SILVER BIRCH, WHITEBARK ETC.



Site Layout Plan
Scale 1:100

Risegate Road

DESCRIPTION
ERECTION OF 2nd NEW TWO STOREY DWELLINGS AT LAND OFF RISEGATE ROAD, GOSBERTON RELEGATE, SPALDING, LINCOLNSHIRE, PE11 4EE
DATE: 05/09/2024 APPROVED: SN

Do Not Scale From This Drawing

Architectural Consultant
JC
Do Not Scale From This Drawing

PROJECT:
2nd NEW DWELLINGS

DRAWING:
SITE LAYOUT PLAN
CONSTRUCTION MANAGEMENT PLAN

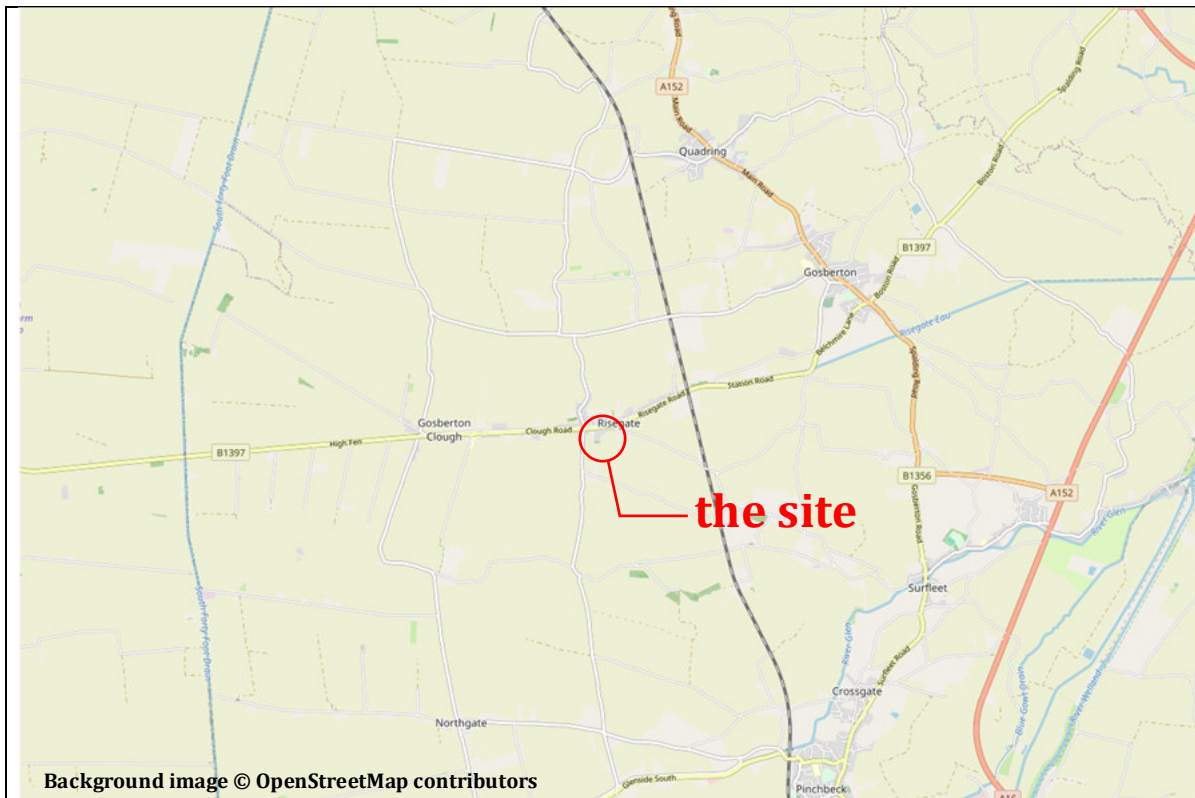
SIZE:
A1

CLIENT:
Mr & Mrs T. Waltham

DATE:
04/12/24/CC01

NOTES: THIS DRAWING IS THE PROPERTY OF JC ARCHITECTURAL CONSULTANT. NO UNAUTHORISED COPYING OR REPRODUCTION IN ANY FORM IS PERMITTED WITHOUT OBTAINING PRIOR WRITTEN PERMISSION FROM JC ARCHITECTURAL CONSULTANT. JC ARCHITECTURAL CONSULTANT RESERVES THE RIGHT TO WITHDRAW THIS INFORMATION AT ANY TIME. ALL DIMENSIONS ARE TO BE CONFIRMED BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO JC ARCHITECTURAL CONSULTANT IMMEDIATELY.

THE DESIGN HAS BEEN UNDERTAKEN AS FAR AS POSSIBLE TO AVOID RISKS TO HEALTH AND SAFETY OR TO REDUCE AND CONTROL THE EFFECTS OF ANY UNDESIRABLE RISKS. ANY RELEVANT INFORMATION REGARDING RISKS WHICH ARE NOT ABLE TO BE ELIMINATED WILL BE INCLUDED WITHIN THE PROJECT HEALTH AND SAFETY FILE.



Site location plan 1

Date copied: 06 Aug 2024

Source: openstreetmap.org



Site location plan 2

Date copied: 06 Aug 2024

Source: openstreetmap.org

Background image © Maxar Technologies
Image date: 22 Sept 2021



Aerial photograph: 1 Date copied: 06 Aug 2024 Source: Google Earth Pro®



Site works photo: 1 Date: 05 Aug 2024
Photo direction: North
Description: View of existing grassed yard, scrub vegetation and stockpiles

Camera position:





Site walkover photo: 2 *Date: 05 Aug 2024*
Photo direction: West
Description: View of side of barn, vehicle on site, trailer and grassy yard

Camera position:



Site walkover photo: 3 *Date: 05 Aug 2024*
Photo direction: South
Description: View of dilapidated farm building (cattle shelter) and overgrown vegetation

Camera position:





Site walkover photo: 4 *Date: 05 Aug 2024*
Photo direction: South
Description: View of side of barn, disused cattle shelter and surrounding overgrown vegetation

Camera position:



Site walkover photo: 5 *Date: 05 Aug 2024*
Photo direction: Southwest
Description: View inside of barn with miscellaneous items such as sofas and bins

Camera position:





Site walkover photo: 6 *Date: 05 Aug 2024*
Photo direction: South
Description: View of red diesel tank in southwestern corner of barn with external pump

Camera position:



Site walkover photo: 7 *Date: 05 Aug 2024*
Photo direction: North
Description: View of existing barn with localised possible asbestos containing roof panels

Camera position:





Site walkover photo: 8 *Date: 05 Aug 2024*
Photo direction: West
Description: View inside of barn and stored wares including furniture and carpentry tools

Camera position:



Site walkover photo: 9 *Date: 05 Aug 2024*
Photo direction: South
Description: View of inside of barn with assorted wares, red diesel tank and possible asbestos roof

Camera position:





Site walkover photo: 10 *Date: 05 Aug 2024*
Photo direction: North
Description: View of inside barn including assorted wares (furniture and carpentry tools)

Camera position:



Site walkover photo: 11 *Date: 05 Aug 2024*
Photo direction: Southwest
Description: View inside of barn with log supply, carpentry tools and area of overgrown garden

Camera position:





Site walkover photo: 12 *Date: 05 Aug 2024*
Photo direction: Southeast
Description: View of overgrown garden area behind barn

Camera position:



Site walkover photo: 13 *Date: 05 Aug 2024*
Photo direction: West
Description: View of parked vehicle, front of barn and overgrown vegetation in yard area

Camera position:





Site walkover photo: 14 *Date: 05 Aug 2024*
Photo direction: North
Description: View of grassed yard, stockpiles (materials from barn extension) and road signs

Camera position:



Site walkover photo: 15 *Date: 05 Aug 2024*
Photo direction: West
Description: View of vehicle, trailer and pile of ground material with some scrub vegetation

Camera position:





Site walkover photo: 16 *Date: 05 Aug 2024*
Photo direction: West
Description: View of disused carpentry area in barn with some small appliances

Camera
position:



Appendix B
HML exploratory hole logs



HUMBERSIDE MATERIALS LABORATORY Ltd.

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email info@humbermaterialslab.co.uk

BOREHOLE LOG

Borehole
No
WS1

Client :- JC Architectural Consultancy
Site :- Land between 10 and 12 Risegate Rd, Gosberton
Project No :- 6457

Location :- see site plan
Date :- 22 Oct 2024

Coordinates E: N:
Elevation :-
Excavated by :- Dando Terrier
Drilled by :- HML

Depth (m)	Lithology / Description / Depth (m)	Elevation	Thickness (m)	Samples	Water level & well	SPT 0 25 50 75 100	SH DCP 0 10 20 30 40	Notes
0.0	Grass turf over multicoloured, mainly brown very silty sandy medium to coarse GRAVEL of brick and concrete fragments with occasional rootlets. (MADE GROUND)	0.30	0.30	1	D			
0.5	Soft to firm friable slightly organic dark greyish brown with occasional black carbonaceous or organic mottling sandy clayey SILT with occasional rootlets. Sand is fine. (Possible Buried Subsoil)	0.70	0.70	2	D			
1.0	Thinly laminated brown to orangish brown slightly sandy SILT. Sand is fine. (TIDAL FLAT DEPOSITS)	1.00				13		SPT at 1.00m: 5,5,3,3,3,4
1.5			1.00	3	D			
2.0		2.00				11		SPT at 2.00m: 2,2,2,3,3,3
2.5								
3.0								
3.5								
4.0								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
U undisturbed
DCP SHDCP
HV Hand Vane

Notes :-

Depth drilled :-2
Casing depth :-

File Ref :- 1488/ 6457
Logged by :- M Driver (of HML)



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BOREHOLE LOG

Borehole
No
WS2

Client :- JC Architectural Consultancy

Site :- Land between 10 and 12 Risegate Rd, Gosberton

Project No :- 6457

Location :- see site plan

Date :- 22 Oct 2024

Coordinates E: N:

Elevation :-

Excavated by :- Dando Terrier

Drilled by :- HML

Depth (m)	Lithology / Description / Depth (m)	Elevation	Thickness (m)	Samples	Water level & well	SPT	SH DCP	Notes
0.0	Brown very clayey sandy silty GRAVEL of flint and chert with occasional rootlets. (MADE GROUND)		0.30	1	D			
0.30								
0.5	Friable slightly organic dark greyish brown with rare black carbonaceous mottling slightly sandy SILT. Sand is fine. (Possible Buried Subsoil)		0.30	2	D			
0.60								
1.0	Orangish brown slightly sandy SILT. Sand is fine. (TIDAL FLAT DEPOSITS)		1.40	3	D			
1.5								
2.0		2.00						
2.5								
3.0								
3.5								
4.0								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
U undisturbed
DCP SHDCP
HV Hand Vane

Notes :-

Depth drilled :-2

Casing depth :-

File Ref :- 1488/ 6457
Logged by :- M Driver (of HML)



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BOREHOLE LOG

Borehole
No
WS3

Client :- JC Architectural Consultancy

Site :- Land between 10 and 12 Risegate Rd, Gosberton

Project No :- 6457

Location :- see site plan

Date :- 22 Oct 2024

Coordinates E: N:

Elevation :-

Excavated by :- Dando Terrier

Drilled by :- HML

Depth (m)	Lithology / Description / Depth (m)	Elevation	Thickness (m)	Samples	Water level & well	SPT 0 25 50 75 100	SH DCP 0 10 20 30 40	Notes
0.0	Grass turf over brown slightly silty sandy fine to coarse GRAVEL of flint and chert. (MADE GROUND)		0.30	1	D			
0.30	(Possibly slightly organic) dark greyish brown very silty fine SAND and GRAVEL of fine to medium flint and chert. (MADE GROUND)		0.20	2	D			
0.50	Dark greyish brown with occasional black carbonaceous mottling slightly sandy SILT with rare fine brick red gravel. Sand is fine. (Possible Made Ground)		0.30	3	D			
0.80	Orangish brown slightly sandy SILT. (TIDAL FLAT DEPOSITS)							
1.0						7		SPT at 1.00m: 2,3,2,1,2,2
1.20				4	D			
1.5								
2.0						12		SPT at 2.00m: 2,2,3,3,3,3
2.5								
3.0								
3.5								
4.0								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
U undisturbed
DCP SHDCP
HV Hand Vane

Notes :-

Depth drilled :-2

Casing depth :-

File Ref :- 1488/ 6457
Logged by :- M Driver (of HML)



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BOREHOLE LOG

Borehole
No
WS4

Client :- JC Architectural Consultancy
Site :- Land between 10 and 12 Risegate Rd, Gosberton
Project No :- 6457

Location :- see site plan
Date :- 22 Oct 2024

Coordinates E: N:
Elevation :-
Excavated by :- Dando Terrier
Drilled by :- HML

Depth (m)	Lithology / Description / Depth (m)	Elevation	Thickness (m)	Samples	Water level & well	SPT	SH DCP	Notes
0.0	Buff angular coarse GRAVEL of flint and chert with some dark brown loamy sandy silt. (MADE GROUND)		0.35	1	D			
0.35	Dark greyish brown gravelly, silty, silty fine SAND. Gravel is medium flint and chert. (MADE GROUND)		0.15					
0.50	Dark greyish brown with occasional black carbonaceous mottling slightly sandy SILT. Sand is fine. (Possible Buried Subsoil)		0.30					
0.80	Orangish brown slightly sandy SILT. (TIDAL FLAT DEPOSITS)		0.20					
1.00								
1.5								
2.0								
2.5								
3.0								
3.5								
4.0								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
U undisturbed
DCP SHDCP
HV Hand Vane

Notes :-

Depth drilled :-2
Casing depth :-

File Ref :- 1488/ 6457
Logged by :- M Driver (of HML)



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North Lincs DN20 8AR
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email info@humbersidematerialslab.co.uk

BOREHOLE LOG

Borehole
No
WS5

Client :- JC Architectural Consultancy
Site :- Land between 10 and 12 Risegate Rd, Gosberton
Project No :- 6457

Location :- see site plan
Date :- 22 Oct 2024

Coordinates E: N:
Elevation :-
Excavated by :- Dando Terrier
Drilled by :- HML

Depth (m)	Lithology / Description / Depth (m)	Elevation	Thickness (m)	Samples	Water level & well	SPT 0 25 50 75 100	SH DCP 0 10 20 30 40	Notes
0.0	Grass turf over brown loamy sandy very silty medium GRAVEL of flint and chert with rare rootlets. (MADE GROUND)		0.30	1	D			
0.30								
0.5	Multicoloured (grey, brick red and brown) medium to coarse GRAVEL of brick and concrete fragments with some silty sand. (MADE GROUND)		0.20	2	D			
0.50								
0.5	Slightly organic dark greyish brown slightly sandy SILT. Sand is fine. (Possible Buried Subsoil)			3	D			
1.0			0.80					
1.30								SPT at 1.00m: 1,1,2,2,3,3
1.5	(Possibly slightly organic) Brownish grey with occasional black organic mottling slightly sandy SILT. Sand is fine. Organic material is amorphous peat of completely degraded roots. (TIDAL FLAT DEPOSITS)		0.70	4	D			
2.0								
2.0								SPT at 2.00m: 2,2,2,2,3
2.5								
3.0								
3.5								
4.0								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
U undisturbed
DCP SHDCP
HV Hand Vane

Notes :-

Depth drilled :-2
Casing depth :-

File Ref :- 1488/ 6457
Logged by :- M Driver (of HML)



HUMBERSIDE MATERIALS LABORATORY Ltd.

Atherton Way, Brigg
North Lincs DN20 8AR
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TRIAL PIT LOG

Trial pit
No
HP1

Client :- JC Architectural Consultancy
Site :- Land between 10 and 12 Risegate Rd, Gosberton
Project No :- 6457

Location :- see site plan
Date :- 22 Oct 2024

Coordinates E: N:
Elevation :-
Excavated by :- Hand tools

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe	Notes
0	Multicoloured (brown, brick red, grey and buff) medium to coarse GRAVEL of brick fragments and stone with some organic loamy sandy silt. (MADE GROUND)	0			0 25 50 75 100	
0.5	(Possibly slightly organic) Dark greyish brown slightly sandy SILT. Sand is fine. (Possible Buried Subsoil)	0.5	1 D			
1		1	2 D			
1.5		1.5				
2		2				
2.5		2.5				
3		3				

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1488 / 6457

Logged by :- M Driver (of HML)



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TRIAL PIT LOG

Trial pit
No
HP2

Client :- JC Architectural Consultancy
Site :- Land between 10 and 12 RiseGate Rd, Gosberton
Project No :- 6457

Location :- see site plan
Date :- 22 Oct 2024

Coordinates E: N:
Elevation :-
Excavated by :- Hand tools

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe	Notes
0	Multicoloured (brown, brick red, grey and buff) medium to coarse GRAVEL of brick fragments and stone with some loamy sandy silt. (MADE GROUND)	(0.30)	1	D		
0.30	Grey CONCRETE.	(0.20)				
0.50	Dark greyish brown slightly sandy SILT. Sand is fine. (Possible Buried Subsoil)	(0.50)	2	D		
1.00						
1.5						
2						
2.5						
3						

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1488 / 6457

Logged by :- M Driver (of HML)

Appendix C
Laboratory test results



ANALYTICAL TEST REPORT

Report Number 24-03346, issue number 1

Contract name: 10/12 Risegate Road,

Client reference: 10/12 Risegate Road, gosberton - 1488/6457/P

Clients name: Humberside Materials Laboratory

Clients address: Humberside Materials Laboratory
Atherton Way
Brigg

North Lincolnshire DN20 8AR

Samples received: 25/10/2024

Analysis started: 25/10/2024

Analysis completed: 14/11/2024

Report issued: 15/11/2024

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
U/S	Sample not suitable for testing
NAD	No Asbestos Detected

Approved by: Abbie Neasham-Bourn
Senior Reporting Administrator

SAMPLE INFORMATION

MCERTS (Soils):
Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample ID	Depth (m)	Sample description	Material removed	% Removed	% Moisture
19549	S/73066 - WS1-1	0.10 - 0.30	Brown Clay sandy loam with Gravel and Vegetation.	-	-	10.9
19550	S/73067 - WS1-2	0.30 - 0.60	Brown Clay sandy loam with Gravel and Vegetation.	-	-	21.7
19551	S/73068 - WS1-3	1.00 - 2.00	-	-	-	-
19552	S/73069 - WS2-2	0.30 - 0.60	Brown Clay sandy loam with Gravel and Vegetation.	-	-	15.5
19553	S/73070 - WS2-3	0.60 - 2.00	-	-	-	-
19554	S/73071 - WS3-2	0.30 - 0.50	Brown Clay sandy loam with Gravel and Vegetation.	-	-	12.4
19555	S/73072 - WS3-4	0.80 - 2.00	-	-	-	-
19556	S/73073 - WS4-1	0.10 - 0.50	Brown Clay sandy loam with Gravel and Vegetation.	-	-	12.6
19557	S/73074 - WS5-1	0.00 - 0.30	Brown Clay sandy loam with Gravel and Vegetation.	-	-	5.5
19558	S/73075 - WS5-2	0.30 - 0.50	Brown Clay sandy loam with Gravel and Vegetation.	-	-	11.2
19559	S/73076 - WS5-3	0.50 - 0.80	Brown Clay sandy loam with Gravel and Vegetation.	-	-	22.8
19560	S/73077 - HP1-1	0.00 - 0.50	Brown Clay sandy loam with Gravel and Vegetation.	-	-	17.3
19561	S/73078 - HP2-1	0.00 - 0.30	Brown Clay sandy loam with Gravel and Vegetation.	-	-	18.4
19562	S/73079 - HP2-2	0.50 - 0.80	Brown Clay sandy loam with Gravel and Vegetation.	-	-	24.9

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

- a Sampling date not provided
- b Sampling time not provided (waters only)
- c Sample not received in appropriate containers
- d Storage Temperature
- e Headspace present in sample container
- f Sample exceeded sampling to receipt
- g Sample exceeded holding time(s)

Lab ref	Sample ID	Depth (m)	Deviating	Tests (Reason for deviation)
19549	S/73066 - WS1-1	0.10 - 0.30	N	
19550	S/73067 - WS1-2	0.30 - 0.60	N	
19552	S/73069 - WS2-2	0.30 - 0.60	N	
19554	S/73071 - WS3-2	0.30 - 0.50	N	
19556	S/73073 - WS4-1	0.10 - 0.50	N	
19557	S/73074 - WS5-1	0.00 - 0.30	N	
19558	S/73075 - WS5-2	0.30 - 0.50	N	
19559	S/73076 - WS5-3	0.50 - 0.80	N	
19560	S/73077 - HP1-1	0.00 - 0.50	N	
19561	S/73078 - HP2-1	0.00 - 0.30	N	
19562	S/73079 - HP2-2	0.50 - 0.80	N	



SOILS

Lab Number					19549	19550	19551	19552	19553
Sample ID					S/73066 - WS1-1	S/73067 - WS1-2	S/73068 - WS1-3	S/73069 - WS2-2	S/73070 - WS2-3
Depth (m)					0.10 - 0.30	0.30 - 0.60	1.00 - 2.00	0.30 - 0.60	0.60 - 2.00
Sampling Date					22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024
Test	Method	Accred	LoD	Units					
Asbestos									
Asbestos Identification	SUBCON	SU	0	-	NAD	NAD	n/t	NAD	n/t
Metals									
Water Soluble Boron	CE063	N	0.5	mg/kg	1.42	1.43	n/t	1.97	n/t
Arsenic	CE264	U	1.8	mg/kg	11.2	11.9	n/t	11.0	n/t
Beryllium	CE264	M	0.2	mg/kg	3.2	0.8	n/t	0.6	n/t
Cadmium	CE264	M	1.6	mg/kg	< 1.6	< 1.6	n/t	< 1.6	n/t
Copper	CE264	M	1.6	mg/kg	15.6	20.4	n/t	34.6	n/t
Lead	CE264	U	2.3	mg/kg	35.7	43.8	n/t	60.8	n/t
Mercury	CE264	U	0.7	mg/kg	1.4	0.7	n/t	1.2	n/t
Nickel	CE264	M	2.1	mg/kg	14.8	15.6	n/t	13.4	n/t
Selenium	CE264	U	3	mg/kg	< 3.0	< 3.0	n/t	< 3.0	n/t
Vanadium	CE264	U	1.8	mg/kg	115	54.1	n/t	40.1	n/t
Zinc	CE264	M	4	mg/kg	67.6	61.7	n/t	66.0	n/t
Volatile Petroleum Hydrocarbons									
>C5-C6 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	n/t	n/t	n/t	< 0.10	n/t
>C6-C8 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	n/t	n/t	n/t	< 0.10	n/t
>C8-C10 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	n/t	n/t	n/t	< 0.10	n/t
>C8-C10 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	n/t	n/t	n/t	< 0.010	n/t
>C6-C7 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	n/t	n/t	n/t	< 0.010	n/t
>C7-C8 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	n/t	n/t	n/t	< 0.010	n/t
Colourimetric									
Water Soluble Chromium VI	CE263	N	0.04	mg/kg	< 0.040	< 0.040	n/t	< 0.040	n/t
Chromium III	CE208	N	2	mg/kg	74.9	49.6	n/t	36.7	n/t
Combustion									
Moisture Content	CE001	N	0.1	%	10.9	21.7	n/t	15.5	n/t
Total Organic Carbon	CE197	N	0.1	%	n/t	2.06	0.73	2.40	0.59
TPH Ali/Aro									
>C12-C16 Aliphatic (EH_2D_AL)	CE250	N	0.5	mg/kg	n/t	n/t	n/t	< 0.5	n/t
>C12-C16 Aromatic (EH_2D_AR)	CE250	N	1	mg/kg	n/t	n/t	n/t	< 1.0	n/t
>C16-C21 Aromatic (EH_2D_AR)	CE250	N	2	mg/kg	n/t	n/t	n/t	< 2.0	n/t

SOILS

>C16-C35 Aliphatic (EH_2D_AL)	CE250	N	3	mg/kg	n/t	n/t	n/t	< 3.0	n/t
>C21-C35 Aromatic (EH_2D_AR)	CE250	N	4.5	mg/kg	n/t	n/t	n/t	< 4.5	n/t
>C35-C44 Aliphatic (EH_2D_AL)	CE250	N	0.5	mg/kg	n/t	n/t	n/t	< 0.5	n/t
>C35-C44 Aromatic (EH_2D_AR)	CE250	N	2	mg/kg	n/t	n/t	n/t	< 2.0	n/t
>C10-C12 Aliphatic (EH_2D_AL)	CE250	N	1	mg/kg	n/t	n/t	n/t	< 1.0	n/t
>C10-C12 Aromatic (EH_2D_AR)	CE250	N	0.6	mg/kg	n/t	n/t	n/t	< 0.6	n/t
Polyaromatic hydrocarbons									
Naphthalene	CE087	M	0.016	mg/kg	< 0.016	< 0.016	n/t	< 0.016	n/t
Acenaphthylene	CE087	M	0.015	mg/kg	< 0.015	< 0.015	n/t	< 0.015	n/t
Acenaphthene	CE087	M	0.013	mg/kg	< 0.013	< 0.013	n/t	< 0.013	n/t
Fluorene	CE087	U	0.013	mg/kg	< 0.013	< 0.013	n/t	< 0.013	n/t
Phenanthrene	CE087	M	0.014	mg/kg	0.046	< 0.014	n/t	0.068	n/t
Anthracene	CE087	U	0.017	mg/kg	0.026	< 0.017	n/t	0.022	n/t
Fluoranthene	CE087	M	0.017	mg/kg	0.228	0.041	n/t	0.215	n/t
Pyrene	CE087	M	0.016	mg/kg	0.200	0.037	n/t	0.194	n/t
Benzo(a)anthracene	CE087	U	0.012	mg/kg	0.142	0.032	n/t	0.137	n/t
Chrysene	CE087	M	0.028	mg/kg	0.112	< 0.028	n/t	0.154	n/t
Benzo(b)fluoranthene	CE087	M	0.02	mg/kg	0.153	0.038	n/t	0.189	n/t
Benzo(k)fluoranthene	CE087	M	0.025	mg/kg	0.077	< 0.025	n/t	0.082	n/t
Benzo(a)pyrene	CE087	U	0.019	mg/kg	0.125	0.026	n/t	0.150	n/t
Indeno(1,2,3-cd)pyrene	CE087	M	0.019	mg/kg	0.102	< 0.019	n/t	0.122	n/t
Dibenzo(a,h)anthracene	CE087	M	0.017	mg/kg	< 0.017	< 0.017	n/t	0.023	n/t
Benzo(g,h,i)perylene	CE087	M	0.019	mg/kg	0.055	< 0.019	n/t	0.095	n/t
Total PAH(16)	CE087	N	0.28	mg/kg	1.27	< 0.280	n/t	1.45	n/t
BTEX									
Benzene	CE267	U	0.0005	mg/kg	n/t	n/t	n/t	n/t	n/t
Toluene	CE267	U	0.001	mg/kg	n/t	n/t	n/t	n/t	n/t
Ethylbenzene	CE267	U	0.001	mg/kg	n/t	n/t	n/t	n/t	n/t
MTBE	CE267	N	0.002	mg/kg	n/t	n/t	n/t	n/t	n/t
Total BTEX	CE267	N	0.006	mg/kg	n/t	n/t	n/t	n/t	n/t
m,p-Xylene	CE267	U	0.002	mg/kg	n/t	n/t	n/t	n/t	n/t
oXylenes	CE267	U	0.002	mg/kg	n/t	n/t	n/t	n/t	n/t



SOILS

Lab Number					19554	19555	19556	19557	19558
Sample ID					S/73071 - WS3-2	S/73072 - WS3-4	S/73073 - WS4-1	S/73074 - WS5-1	S/73075 - WS5-2
Depth (m)					0.30 - 0.50	0.80 - 2.00	0.10 - 0.50	0.00 - 0.30	0.30 - 0.50
Sampling Date					22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024
Test	Method	Accred	LoD	Units					
Asbestos									
Asbestos Identification	SUBCON	SU	0	-	NAD	n/t	n/t	NAD	NAD
Metals									
Water Soluble Boron	CE063	N	0.5	mg/kg	2.52	n/t	n/t	0.77	0.71
Arsenic	CE264	U	1.8	mg/kg	16.6	n/t	n/t	7.9	14.2
Beryllium	CE264	M	0.2	mg/kg	1.3	n/t	n/t	1.0	2.1
Cadmium	CE264	M	1.6	mg/kg	< 1.6	n/t	n/t	< 1.6	< 1.6
Copper	CE264	M	1.6	mg/kg	125	n/t	n/t	20.8	16.8
Lead	CE264	U	2.3	mg/kg	205	n/t	n/t	34.8	34.8
Mercury	CE264	U	0.7	mg/kg	0.9	n/t	n/t	< 0.7	1.0
Nickel	CE264	M	2.1	mg/kg	17.0	n/t	n/t	12.9	18.9
Selenium	CE264	U	3	mg/kg	< 3.0	n/t	n/t	< 3.0	< 3.0
Vanadium	CE264	U	1.8	mg/kg	50.9	n/t	n/t	34.3	73.3
Zinc	CE264	M	4	mg/kg	124	n/t	n/t	59.2	70.8
Volatile Petroleum Hydrocarbons									
>C5-C6 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	n/t	n/t	< 0.10	n/t	n/t
>C6-C8 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	n/t	n/t	< 0.10	n/t	n/t
>C8-C10 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	n/t	n/t	< 0.10	n/t	n/t
>C8-C10 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	n/t	n/t	< 0.010	n/t	n/t
>C6-C7 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	n/t	n/t	< 0.010	n/t	n/t
>C7-C8 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	n/t	n/t	< 0.010	n/t	n/t
Colourimetric									
Water Soluble Chromium VI	CE263	N	0.04	mg/kg	< 0.040	n/t	n/t	< 0.040	0.080
Chromium III	CE208	N	2	mg/kg	44.3	n/t	n/t	82.1	76.8
Combustion									
Moisture Content	CE001	N	0.1	%	12.4	n/t	12.6	5.5	11.2
Total Organic Carbon	CE197	N	0.1	%	4.92	0.64	n/t	0.92	1.13
TPH Ali/Aro									
>C12-C16 Aliphatic (EH_2D_AL)	CE250	N	0.5	mg/kg	n/t	n/t	< 0.5	n/t	n/t
>C12-C16 Aromatic (EH_2D_AR)	CE250	N	1	mg/kg	n/t	n/t	3.0	n/t	n/t
>C16-C21 Aromatic (EH_2D_AR)	CE250	N	2	mg/kg	n/t	n/t	< 2.0	n/t	n/t

SOILS

>C16-C35 Aliphatic (EH_2D_AL)	CE250	N	3	mg/kg	n/t	n/t	6.3	n/t	n/t
>C21-C35 Aromatic (EH_2D_AR)	CE250	N	4.5	mg/kg	n/t	n/t	15.0	n/t	n/t
>C35-C44 Aliphatic (EH_2D_AL)	CE250	N	0.5	mg/kg	n/t	n/t	0.8	n/t	n/t
>C35-C44 Aromatic (EH_2D_AR)	CE250	N	2	mg/kg	n/t	n/t	3.3	n/t	n/t
>C10-C12 Aliphatic (EH_2D_AL)	CE250	N	1	mg/kg	n/t	n/t	< 1.0	n/t	n/t
>C10-C12 Aromatic (EH_2D_AR)	CE250	N	0.6	mg/kg	n/t	n/t	1.0	n/t	n/t
Polyaromatic hydrocarbons									
Naphthalene	CE087	M	0.016	mg/kg	0.076	n/t	n/t	< 0.016	< 0.016
Acenaphthylene	CE087	M	0.015	mg/kg	0.049	n/t	n/t	< 0.015	< 0.015
Acenaphthene	CE087	M	0.013	mg/kg	0.476	n/t	n/t	< 0.013	< 0.013
Fluorene	CE087	U	0.013	mg/kg	0.547	n/t	n/t	< 0.013	< 0.013
Phenanthrene	CE087	M	0.014	mg/kg	8.78	n/t	n/t	0.025	0.397
Anthracene	CE087	U	0.017	mg/kg	2.82	n/t	n/t	< 0.017	0.020
Fluoranthene	CE087	M	0.017	mg/kg	16.2	n/t	n/t	0.075	0.483
Pyrene	CE087	M	0.016	mg/kg	13.2	n/t	n/t	0.071	0.370
Benzo(a)anthracene	CE087	U	0.012	mg/kg	6.55	n/t	n/t	0.055	0.131
Chrysene	CE087	M	0.028	mg/kg	6.07	n/t	n/t	0.057	0.222
Benzo(b)fluoranthene	CE087	M	0.02	mg/kg	6.57	n/t	n/t	0.083	0.234
Benzo(k)fluoranthene	CE087	M	0.025	mg/kg	2.94	n/t	n/t	0.040	0.093
Benzo(a)pyrene	CE087	U	0.019	mg/kg	5.75	n/t	n/t	0.072	0.152
Indeno(1,2,3-cd)pyrene	CE087	M	0.019	mg/kg	3.87	n/t	n/t	0.082	0.141
Dibenzo(a,h)anthracene	CE087	M	0.017	mg/kg	0.608	n/t	n/t	< 0.017	0.024
Benzo(g,h,i)perylene	CE087	M	0.019	mg/kg	2.77	n/t	n/t	0.078	0.093
Total PAH(16)	CE087	N	0.28	mg/kg	77.3	n/t	n/t	0.637	2.36
BTEX									
Benzene	CE267	U	0.0005	mg/kg	n/t	n/t	< 0.010	n/t	n/t
Toluene	CE267	U	0.001	mg/kg	n/t	n/t	< 0.010	n/t	n/t
Ethylbenzene	CE267	U	0.001	mg/kg	n/t	n/t	< 0.010	n/t	n/t
MTBE	CE267	N	0.002	mg/kg	n/t	n/t	< 0.020	n/t	n/t
Total BTEX	CE267	N	0.006	mg/kg	n/t	n/t	< 0.060	n/t	n/t
m,p-Xylene	CE267	U	0.002	mg/kg	n/t	n/t	< 0.020	n/t	n/t
oXylenes	CE267	U	0.002	mg/kg	n/t	n/t	< 0.010	n/t	n/t



SOILS

Lab Number					19559	19560	19561	19562
Sample ID					S/73076 - WS5-3	S/73077 - HP1-1	S/73078 - HP2-1	S/73079 - HP2-2
Depth (m)					0.50 - 0.80	0.00 - 0.50	0.00 - 0.30	0.50 - 0.80
Sampling Date					22/10/2024	22/10/2024	22/10/2024	22/10/2024
Test	Method	Accred	LoD	Units				
Asbestos								
Asbestos Identification	SUBCON	SU	0	-	n/t	NAD	NAD	n/t
Metals								
Water Soluble Boron	CE063	N	0.5	mg/kg	n/t	1.44	0.72	n/t
Arsenic	CE264	U	1.8	mg/kg	n/t	18.4	16.3	n/t
Beryllium	CE264	M	0.2	mg/kg	n/t	1.0	5.3	n/t
Cadmium	CE264	M	1.6	mg/kg	n/t	1.7	< 1.6	n/t
Copper	CE264	M	1.6	mg/kg	n/t	62.2	51.1	n/t
Lead	CE264	U	2.3	mg/kg	n/t	362	212	n/t
Mercury	CE264	U	0.7	mg/kg	n/t	0.8	0.9	n/t
Nickel	CE264	M	2.1	mg/kg	n/t	24.4	30.8	n/t
Selenium	CE264	U	3	mg/kg	n/t	< 3.0	< 3.0	n/t
Vanadium	CE264	U	1.8	mg/kg	n/t	52.7	80.9	n/t
Zinc	CE264	M	4	mg/kg	n/t	452	434	n/t
Volatile Petroleum Hydrocarbons								
>C5-C6 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	< 0.10	n/t	< 0.10	< 0.10
>C6-C8 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	< 0.10	n/t	< 0.10	< 0.10
>C8-C10 Aliphatic (HS_1D_AL)	CE267	N	0.1	mg/kg	< 0.10	n/t	< 0.10	< 0.10
>C8-C10 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	< 0.010	n/t	< 0.010	< 0.010
>C6-C7 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	< 0.010	n/t	< 0.010	< 0.010
>C7-C8 Aromatic (HS_1D_AR)	CE267	N	0.01	mg/kg	< 0.010	n/t	< 0.010	< 0.010
Colourimetric								
Water Soluble Chromium VI	CE263	N	0.04	mg/kg	n/t	< 0.040	< 0.040	n/t
Chromium III	CE208	N	2	mg/kg	n/t	53.4	54.6	n/t
Combustion								
Moisture Content	CE001	N	0.1	%	22.8	17.3	18.4	24.9
Total Organic Carbon	CE197	N	0.1	%	3.28	7.04	n/t	n/t
TPH Ali/Aro								
>C12-C16 Aliphatic (EH_2D_AL)	CE250	N	0.5	mg/kg	< 0.5	n/t	0.8	1.9
>C12-C16 Aromatic (EH_2D_AR)	CE250	N	1	mg/kg	1.1	n/t	6.2	11.3
>C16-C21 Aromatic (EH_2D_AR)	CE250	N	2	mg/kg	< 2.0	n/t	7.4	14.3

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>C16-C35 Aliphatic (EH_2D_AL)	CE250	N	3	mg/kg	< 3.0	n/t	20.9	184
>C21-C35 Aromatic (EH_2D_AR)	CE250	N	4.5	mg/kg	7.3	n/t	58.7	410
>C35-C44 Aliphatic (EH_2D_AL)	CE250	N	0.5	mg/kg	< 0.5	n/t	1.5	22.0
>C35-C44 Aromatic (EH_2D_AR)	CE250	N	2	mg/kg	< 2.0	n/t	12.9	132
>C10-C12 Aliphatic (EH_2D_AL)	CE250	N	1	mg/kg	< 1.0	n/t	< 1.0	2.0
>C10-C12 Aromatic (EH_2D_AR)	CE250	N	0.6	mg/kg	< 0.6	n/t	2.1	3.9
Polyaromatic hydrocarbons								
Naphthalene	CE087	M	0.016	mg/kg	n/t	0.040	0.030	n/t
Acenaphthylene	CE087	M	0.015	mg/kg	n/t	< 0.015	0.029	n/t
Acenaphthene	CE087	M	0.013	mg/kg	n/t	< 0.013	< 0.013	n/t
Fluorene	CE087	U	0.013	mg/kg	n/t	< 0.013	0.014	n/t
Phenanthrene	CE087	M	0.014	mg/kg	n/t	0.167	0.553	n/t
Anthracene	CE087	U	0.017	mg/kg	n/t	0.033	0.115	n/t
Fluoranthene	CE087	M	0.017	mg/kg	n/t	0.372	0.996	n/t
Pyrene	CE087	M	0.016	mg/kg	n/t	0.326	0.785	n/t
Benzo(a)anthracene	CE087	U	0.012	mg/kg	n/t	0.187	0.379	n/t
Chrysene	CE087	M	0.028	mg/kg	n/t	0.228	0.456	n/t
Benzo(b)fluoranthene	CE087	M	0.02	mg/kg	n/t	0.275	0.526	n/t
Benzo(k)fluoranthene	CE087	M	0.025	mg/kg	n/t	0.117	0.197	n/t
Benzo(a)pyrene	CE087	U	0.019	mg/kg	n/t	0.199	0.373	n/t
Indeno(1,2,3-cd)pyrene	CE087	M	0.019	mg/kg	n/t	0.236	0.373	n/t
Dibenzo(a,h)anthracene	CE087	M	0.017	mg/kg	n/t	0.041	0.052	n/t
Benzo(g,h,i)perylene	CE087	M	0.019	mg/kg	n/t	0.209	0.245	n/t
Total PAH(16)	CE087	N	0.28	mg/kg	n/t	2.43	5.12	n/t
BTEX								
Benzene	CE267	U	0.0005	mg/kg	< 0.010	n/t	< 0.010	< 0.010
Toluene	CE267	U	0.001	mg/kg	< 0.010	n/t	< 0.010	< 0.010
Ethylbenzene	CE267	U	0.001	mg/kg	< 0.010	n/t	< 0.010	< 0.010
MTBE	CE267	N	0.002	mg/kg	< 0.020	n/t	< 0.020	< 0.020
Total BTEX	CE267	N	0.006	mg/kg	< 0.060	n/t	< 0.060	< 0.060
m,p-Xylene	CE267	U	0.002	mg/kg	< 0.020	n/t	< 0.020	< 0.020
oXylenes	CE267	U	0.002	mg/kg	< 0.010	n/t	< 0.010	< 0.010

SOIL VOCS

Lab Number					19552	19561
Sample ID					S/73069 - WS2-2	S/73078 - HP2-1
Depth (m)					0.30 - 0.60	0.00 - 0.30
Sampling Date					22/10/2024	22/10/2024
Test	Method	Accred	LoD	Units		
VOC						
Benzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Toluene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Ethylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
m,p-Xylene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
o-xylene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1-Dichloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Chloroform	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Tetrachloromethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1,1-Trichloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Trichloroethylene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Tetrachloroethylene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Chlorobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Bromobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Bromodichloromethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1-Dichloro-1-propene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Trans - 1-2 -dichloroethylene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
2,2-Dichloropropane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Bromochloromethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2-Dichloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Dibromomethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2-Dichloropropane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1,2-Trichloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Dibromochloromethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,3-Dichloropropane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2-dibromoethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Styrene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Propylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
2-Chlorotoluene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2,4-Trimethylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
4-Chlorotoluene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010

SOIL VOCS

t-butylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,3,5-Trimethylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,3-Dichlorobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Butylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Hexachlorobutadiene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1-2-3 - Trichlorobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Naphthalene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1-2-4 - Trichlorobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,4-Dichlorobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2-Dichlorobenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Bromoform	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2-Dibromo-3-Chloropropane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
4-Isopropyltoluene_(p-Cymene)	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1,1,2-Tetrachloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Bromomethane	CE174	N	0.03	mg/kg	g < 0.030	g < 0.030
Chloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Chloromethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Cis-1,2-Dichloroethene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
cis-1,3-Dichloro-1-Propene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1,2,2-Tetrachloroethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Dichlorodifluoromethane_(CFC-12)	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Dichloromethane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Isopropylbenzene_(Cumene)	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
MTBE	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
sec-Butylbenzene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
trans-1,3-Dichloro-1-Propene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Trichlorofluoromethane_(CFC-11)	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
Vinyl chloride	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,1-Dichloroethene	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010
1,2,3-Trichloropropane	CE174	N	0.01	mg/kg	g < 0.010	g < 0.010



SOIL SVOCS

Lab Number					19552	19561
Sample ID					S/73069 - WS2-2	S/73078 - HP2-1
Depth (m)					0.30 - 0.60	0.00 - 0.30
Sampling Date					22/10/2024	22/10/2024
Test	Method	Accred	LoD	Units		
SVOC						
Phenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Bis(2-chloroethyl)ether	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-Chlorophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
1-3-Dichlorobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
1-4-Dichlorobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
1-2-Dichlorobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-Methylphenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	CE189	N	0.1	mg/kg	< 0.10	< 0.10
3 and 4-methylphenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Hexachloroethane	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Nitrobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Isophorone	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2- Nitrophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-4-Dimethylphenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Bis(2-chloroethoxy)methane	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-4-Dichlorophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
4-Chloroaniline	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Hexachloro- 1-3-butadiene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
4-Chloro-3-methylphenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-Methylnaphthalene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
1-Methylnaphthalene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Hexachlorocyclopentadiene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2.4.6-Trichlorophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2.4.5-Trichlorophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-Nitroaniline	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Dimethyl phthalate	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-6-dinitrotoluene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
3-Nitroaniline	CE189	N	0.1	mg/kg	< 0.10	< 0.10
4-nitrophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10

SOIL SVOCS

Dibenzofuran	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Diethyl phthalate	CE189	N	0.1	mg/kg	< 0.10	< 0.10
4-Nitroaniline	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2-Methyl-4,6-dinitrophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Azobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Hexachlorobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Pentachlorophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Carbazole	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Di-n-butyl phthalate	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Butyl benzyl phthalate	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Di-n-octyl phthalate	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Bis(2-ethylhexyl)phthalate	CE189	N	0.1	mg/kg	< 0.10	< 0.10
4-Bromophenylphenylether	CE189	N	0.1	mg/kg	< 0.10	< 0.10
4-Chlorophenylphenylether	CE189	N	0.1	mg/kg	< 0.10	< 0.10
1,2,4-Trichlorobenzene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
Naphthalene, 2-chloro-	CE189	N	0.1	mg/kg	< 0.10	< 0.10
N-Nitrosodimethylamine	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2,4-Dinitrophenol	CE189	N	0.1	mg/kg	< 0.10	< 0.10
2,4-Dinitrotoluene	CE189	N	0.1	mg/kg	< 0.10	< 0.10
SVOC TIC Soil/Solid	CE189	N	0		N/D	N/D

METHOD DETAILS

METHOD	TESTNAME	METHOD SUMMARY	ANALYSIS BASIS
CE267	VPH in Soil	HS-GCFID	As submitted sample
SUBCON	Asbestos Solid	HSG248	Air Dried Sample
CE174	VOC in solids	HS-GCMS	As submitted sample
CE063	Water soluble boron	ICPOES	Air dried sample
CE189	SVOC in solids	DCM Extraction and GCMS	As submitted sample
CE264	Metals by ICP in Soil	ICPOES	Air dried sample
CE267	BTEX in solids	Analysis by HSGCFID	As submitted sample
CE263	ChromiumVI by Discrete Analyser in Solid	Gallery	Air dried sample
CE250	GCXGC in Solids	DCM Extraction and GCxGC-FID	As submitted sample
CE087	PAH in Soil	DCM Extraction and GCMS	As submitted sample
CE208	Chromium Hexavalent in Soil	Colorimetry	Air dried sample
CE197	Primacs in Solids	Primacs	Air dried sample

REPORT INFORMATION

Report No.:24-03346, issue number 1

Key

U	ISO17025 Accredited Result
M	ISO17025 and MCERTS Accredited Result
N	Do not currently hold accreditation
^	MCERTS accreditation not applicable for sample matrix
*	ISO17025 accreditation not applicable for sample matrix
S	Subcontracted
I/S	Insufficient Sample
U/S	Unsuitable sample
N/T	Not tested
<	Means "less than"
>	Means "greater than"

LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

This report shall not be reproduced except in full, without prior written approval.

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

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

The results relate only to the sample received.

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Moisture Content Calculated on a Wet Weight basis

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

Sampling was undertaken by Chemtech Environmental Limited and is outside the UKAS accreditation scope.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying

For soils and solids, analytical results are inclusive of stones, where applicable.

Sample Retention and Disposal

All soil samples will be retained for a period of 4 weeks from the point of receipt

All water samples will be retained for a period of 2 weeks from the point of Reporting

Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_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
MS	Mass Spectrometry

Appendix D
GAC for soil contamination

Appendix D – generic assessment criteria (GAC) for soils

D.1 Human health and ecology GAC

D1.1 Metals and metalloids

Table D1 (below) gives the adopted GAC for metal (and metalloid) contaminants considered for the site. These pertain to human health – except for copper, nickel and zinc (which pertain to ecological health).

Table D1: Generic assessment criteria for metals - Residential with plant uptake			
pH:	<6.0	6.0 – 7.0	>7.0
Element	(mg/kg)		
Arsenic*	37		
Antimony^	550		
Barium^	1300		
Beryllium	1.7		
Boron	290		
Cadmium*	14		
Chromium III	910		
Chromium VI*	21		
Copper+	100	135	200
Cyanide	34 [£]		
Lead*	200		
Mercury element	1.2		
Mercury inorganic	40		
Mercury methyl	11		
Molybdenum^	670		
Nickel+	60	75	110
Selenium	250		
Vanadium	410		
Zinc+	200	200	300
GAC From LQM/CIEH (2015) Copyright Land Quality Management Limited Reproduced with permission; Publication number S4UL3575. All rights reserved. Except for: * from SOBRA/CL:AIRE/SAGTA (CL:AIRE, 2014) C4SLs; + From BS 8332:2015 based on ecological health ^ from EIC/AGS/CL:AIRE (2010) based on no consumption of homegrown produce £ from Atkins Atrisksoil guidance			

D1.2 Polycyclic aromatic hydrocarbons (PAHs)

Table D2 (below) gives the adopted human health GAC (from LQM/CIEH, 2015, except where indicated) for PAH contaminants. These vary with soil organic matter (SOM) content. At this stage, the most onerous SOM of 1% is assumed, where available, which should be reasonably conservative.

Table D2: Soil GACs for PAH - Residential with plant uptake			
Element	SOM of 1%	SOM of 2.5%	SOM of 6%
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Anthracene	2400	5400	11000
Fluoranthene	280	560	890
Fluorene	170	400	860
Naphthalene [^]	15	36	85
Phenanthrene	95	220	440
Pyrene	620	1200	2000
Above values are: Copyright Land Quality Management Limited Reproduced with permission; Publication number S4UL3575. All rights reserved.			
Benzo(a)pyrene as a surrogate marker*	-	-	5.0
* pC4SL from Defra (2014) – applies to eight genotoxic PAHs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenz(ah)anthracene & indeno(123-cd)pyrene. ^ pC4SLs from CL:AIRE / SAGTA / SOBRA (2024)			

D1.3 Total petroleum hydrocarbons (TPH)

Table D3 (below) gives the adopted human health GAC (from LQM/CIEH, 2015) for speciated TPH fractions. These vary with soil organic matter (SOM) content. At this stage, the most onerous SOM of 1% is assumed, which should be reasonably conservative.

Table D3 - Total Petroleum (TPHs) GAC – residential with plant uptake				
Compound		GAC (mg/kg)		
		1% SOM	2.5% SOM	6% SOM
TPH Aliphatic	EC5- EC6	42	78	160
	EC>6- EC8	100	230	530
	EC>8- EC10	27	65	150
	EC>10- EC12	130 (48 ^v)	330 (118)	760 (283)
	EC>12- EC16	1100 (24 ^s)	2400 (59)	4300 (142)
	EC>16- EC35	65000 (8.5 ^s)	92000 (21)	110000
	EC>35- EC44	65000 (8.5 ^s)	92000 (21)	110000
TPH Aromatic	EC5- EC7	70	140	300
	EC>7- EC8	130	290	660
	EC>8- EC10	34	83	190
	EC>10- EC12	74	180	380
	EC>12- EC16	140	330	660
	EC>16- EC21	260	540	930
	EC>21- EC35	1100	1500	1700
Note: values in parentheses indicate vapour saturation limit (v) or limit of solubility (s) Copyright Land Quality Management Limited. Reproduced with permission; Publication number S4UL3575. All rights reserved				

D1.4 BTEX and MTBE

Table D4 (below) gives the adopted human health GAC (from LQM/CIEH, 2015) for BTEX and MTBE. These vary with soil organic matter (SOM) content. At this stage, the most onerous SOM of 1% is assumed, which should be reasonably conservative.

Table D4 - BTEX human health GAC – residential with plant uptake/consumption			
Compound	1% SOM	2.5% SOM	6% SOM
Benzene	0.087	0.17	0.37
Toluene	130	290	660
Ethylbenzene	47	110	260
o-xylene	60	140	330
m-xylene	59	140	320
p-xylene	56	130	310
Methyl tert-butyl ether (MTBE)	43	84	160
Note: values in parentheses indicate vapour saturation limit (v) or limit of solubility (s) Copyright Land Quality Management Limited. Reproduced with permission; Publication number S4UL3575. All rights reserved			

D1.5 Asbestos

According to ICRCL Guidance Note 64/85 2nd edition 1990: “Laboratory studies ... have shown that concentrations of respirable fibres of asbestos in soil as low as 0.001% by weight may, in loose dry soils, give rise to measurable levels of airborne fibres if disturbed.” Accordingly, 0.001% might potentially be used as a provisional generic assessment criteria (GAC) for loose asbestos fibres in soil protective of human health.

D1.6 SVOCs

Adopted human health GACs for SVOCs include LQM/CIEH C4SLs, SOBRA/CL:AIRE/SAGTA S4ULs and EIC/AGS/CL:AIRE Soil GACs. These can be referenced on-line or via relevant publications.

The following GAC are based on US EPA Regional Screening Levels for Chemical Contaminants for Resident Soil (mg/kg).

- 2-Methylnaphthalene: 2.40e+02
- 1-Methylnaphthalene: 1.80e+01

D2 Water supply pipework GAC

The following (in Tables D6 to D8) are water supply GAC for PAHs, TPH, BTEX and MTBE within near surface soils through which water supply pipework might be laid in or pass through.

Table D6: Possible PAH soil trigger values for plastic water supply pipes	
PAH	Soil trigger value (mg/kg)
Benzo(a)pyrene	0.5*
Naphthalene	
Based on A) UKWIR (2011) UK Water Industry Research: "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" and B) Water UK (2014) Contaminated Land Assessment Guidance: Protocols published by agreement between Water UK and the Home Builders Federation. Published by Water UK, January 2014 *Based on the polyethylene trigger value of 0.5mg/kg for Extended VOC suite which includes benzo(a)pyrene and naphthalene (as well as many other less ubiquitous VOCs). The PVC trigger value is only 0.125mg/kg. Accordingly, other (higher) trigger value exceedances may be recorded if full VOC suites were carried out	

Table D7: TPH trigger values for plastic water supply pipes	
Aromatic and aliphatic petroleum	Trigger value (mg/kg)
¹ EC5-EC10	2
¹ EC>10-EC16	10
¹ EC>16-EC40	500
² Mineral oil C11-C20	10
² Mineral oil C21-C40	500
1. Based on Water UK (2014) guidance 2. Based on UKWIR (2011) UK Water Industry Research: "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites"	

Table D8: BTEX & MTBE GAC for plastic water supply pipes	
Aromatic and aliphatic petroleum	Threshold value (mg/kg)
Total BTEX & MTBE	0.03 (PVC)
	0.1 (PE)
Based on UKWIR (2011) UK Water Industry Research: "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" and Water UK (2014) Contaminated Land Assessment Guidance: Protocols published by agreement between Water UK and the Home Builders Federation. Published by Water UK, January 2014	

D3 Buried concrete GAC

D3.1 Sulphate, sulphur, pH and other soluble salts

Guidance provided within BRE Special Digest 1 (2005) is used to assess the required sulphate protection for concrete buried in contact within soils and groundwater.