



Phase I and II Geoenvironmental Site Assessment
The Three Lions, Mansfield

Reference:14-437-R1-4
Date: July 2023



PHASE I & II GEOENVIRONMENTAL SITE ASSESSMENT

The Three Lions
11-15 Netherland Lane
Meden Vale
Mansfield
NG20 9PA

Prepared for:



Report Ref: 14-437-R1-4
Date Issued: July 2023

The Three Lions

Phase I & II Geoenvironmental Site Assessment
July 2023

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ISO 9001 (2015)
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Cert No 18890


EXECUTIVE SUMMARY

Site Address	Land off Netherland Lane, Meden Vale, Mansfield NG20 9PA	
Grid Reference	E 458030, N 369520.	
Site Area	0.86 Ha.	
Proposed Development	E3P understands that Shape Land & Property are intending the proposed acquisition and future redevelopment of the Three Lions public house for residential apartments and residential dwellings with associated gardens, car parking, estate road and utility infrastructure.	
Current Site Use	The subject site is a rectangular shaped parcel of land located to the southeast of Netherfield Lane, Meden Vale, Mansfield. The site can be split into two distinct areas, firstly the north eastern sector which is predominantly hardstanding and currently occupied by The Three Lions public house with associated parking facilities with an outside drinking and children's play area. Secondly, the south western sector of the site is currently occupied by rough grassland with no apparent designated use although through discussions with the property owners the field has been subject to fly-tipping in the past and trespassing in the form of antisocial behaviour.	
Site History	A review of the pertinent Ordnance Survey mapping dating from circa 1850 to the present day confirmed the following land use: The site remained open grassland until the mid-1970s when the Three Lions Public House was constructed in the north eastern sector of the site. The south western sector of the site has always been an area of open grassland.	
Environmental Setting	Drift Geology	Alluvium CLAY, SILT, SAND AND GRAVEL
	Bedrock Geology	Lenton Sandstone Formation SANDSTONE
	Faults	None recorded
	Hydrogeology	Bedrock Principal Aquifer
	Hydrology	Meden River is 64m east of the site.
	Flood Risk	Unaffected by flooding from rivers.
Natural Landform and Geomorphology	A river flows in a south-westerly direction to the southeast of the subject site at a lower elevation, however, it can be determined that due to the gentle slope towards the river from the subject site it would appear that the current site level will have formed through natural processes. However, some historical upfilling of material may have occurred prior to the construction of the Three Lions Public House.	
Previous Reports	E3P has not been provided with any previous reports for this site.	
Utility Locations	A formal drainage survey has not yet been completed, however, a review of online records held by Severn Trent indicates the presence of a public combined gravity/lateral drain running across the south western field area in a northeast to southwest trajectory. Drainage also enters the site in the northern corner of the site, coming in from Netherland Lane, bordering the northern edge of the Three Lions building perimeter and running in a northwest to southeast trajectory. Localised drainage was also observed around the existing building perimeter	
Landfill Sites and Ground Gases	There are no registered landfill or waste treatment facilities located within 250m of the subject site	
Radon	Unaffected – no special precautions required.	



<p>Coal Mining/Land Stability</p>	<p>A coal seam has been determined to be underneath the site at depths of >500m. E3P has completed a detailed coal mining risk assessment as part of this Geoenvironmental Site Assessment.</p>
<p>Hazardous Installations</p>	<p>No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.</p>
<p>Initial Conceptual Site Model</p>	<p>Current and historical land uses on-site are a potential source of heavy metals, PAHs and TPH. Made Ground associated with historical developments on-site (historic pub buildings) may contain heavy metals, PAHs and TPHs. If the land has been used previously for farming, there is a potential for heavy metal contamination from the use of fertilisers and pesticides.</p> <p>One electrical transformer box has been observed on-site located in the northwest corner of the area of rough grassland to the south of the site. However, through visual inspection during the site walkover, this transformer box was identified as being installed post-1985 and therefore the presence of PCBs is unlikely.</p> <p>Historic mapping indicates that the pub was constructed pre-1977. Due to the age of the building, the presence of ACM cannot be discounted.</p>

GROUND INVESTIGATION

<p>Ground Investigation Works</p>	<p>E3P has completed an intrusive ground investigation comprising:  6 x window sample boreholes</p>
<p>Ground Conditions</p>	<p>MADE GROUND – 0.0mbgl to 0.5mbgl Made Ground deposits were encountered in two exploratory hole locations (WS101 and WS106) to depths of between 0.46 m and 0.50 m bgl respectively. Made Ground deposits encountered comprised a layer of asphalt, overlying a yellowish brown, very sandy gravel interpreted as a subbase layer of the asphalt. This overlays a blackish brown very gravelly medium sand with sandstone in both locations. This layer was interpreted as a layer of reworked natural ground, originating from the development of the site in the early 1970s for the construction of the Three Lions Public House.</p> <p>TOPSOIL – 0.0mbgl to 0.28mbgl In the remaining exploratory holes predominantly in the southern area of site, Topsoil was generally encountered between 0.00 mbgl and 0.28 mbgl. Topsoil material was described on-site as brown sandy gravelly clay of sandstone and frequent rootlets.</p> <p>DRIFT – 0.21mbgl to 2.36mbgl Drift deposits were encountered within all of the exploratory locations between 0.20 m bgl and 2.36 m bgl. The drift deposits are varied but generally comprised a medium dense to dense brown, very sandy, very gravelly SAND with gravel of sandstone interbedded with a dense reddish brown, very sandy, slightly silty GRAVEL. These deposits originated from the fluvial action of the nearby watercourse and have been interpreted as alluvial deposits. In the southern area of site, natural Topsoil was underlain by soft low strength brown slightly sandy gravelly CLAY of sandstone.</p> <p>SOLID – 1.73mbgl to 3.45mbgl</p>



	<p>A medium dense to dense reddish brown, medium SAND was encountered at depths of between (1.73-2.36 mbgl) and (3.45 mbgl) which was determined through lack of granular constituents as being the weathered horizon of the underlying bedrock.</p>
	<p>GROUNDWATER – Groundwater was encountered between 2 mbgl and 2.5 mbgl during the site investigation. Within the four installed monitoring wells on site, the groundwater levels were observed at depths of between 1.41mbgl to 2.30 mbgl.</p>

CONTAMINATED LAND ASSESSMENT

<p>Human Health</p>	<p>The Tier 1 human health risk assessment identified no site-wide concentrations of non-volatile, insoluble heavy metals and hydrocarbon compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. The test results were compared to the screening values for residential end-use and none exceeded the threshold values. The site will be suitable for redevelopment with only the incorporation of a 300mm growing medium in landscaped areas.</p> <p>ACM’s are likely contained within the existing building fabric, with a pre-demolition survey recommended in regards to this matter.</p>
<p>Controlled Waters</p>	<p>Leachate analysis was undertaken in soils at WS101, WS103 and WS106, and identified marginally elevated levels of heavy metals across all samples. Where leachate analysis has been undertaken, this can overestimate the risk and is not wholly representative of the site characterisation.</p> <p>No significant visual or olfactory evidence of contamination was observed within the site investigation alongside limited deposits of Made Ground encountered. No potential sources of heavy metals have been identified within the laboratory analysis of the soils, with no heavy metals identified above 500 mg/kg, and therefore there is not considered to be a significant source on site.</p> <p>There are 14 groundwater abstractions identified within 250 m of the site, all of which identified 241 m east used for General farming and Domestic purposes, and therefore may be used for potable water. The River Meden is identified 64 m east of the site, and therefore is just outside the 50 m zone of influence for leaching potential.</p> <p>The northern half of the site is predominantly covered by hardstanding which will reduce infiltration and leaching potential, however, as the site is currently open in the western field area, with little hard standing surface cover, rainfall is not being intercepted and subsequently infiltrates freely into the underlying affected natural stratum, potentially mobilising the identified contaminants. Despite this, the proposed end-use will include significant portions of the site covered by both hardstanding and buildings and therefore this will also reduce the risk.</p> <p>Based on the above assessment, there is considered to be low risk to controlled waters.</p>
<p>Ground Gas</p>	<p>Preliminary ground gas monitoring suggests that the site can be predominantly classified as CS1, and in these areas, it is considered that gas protection measures will not be required.</p>



Potable Water Infrastructure	Based on the assessment of current site conditions it is likely that barrier pipe will not be required at the proposed development. This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.
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COAL MINING RISK ASSESSMENT

Coal Mining	<p>In accordance with industry best practice as detailed within CIRIA 32, E3P has concluded that shallow mine workings are present in the north-western sector of the site. The assessment has also concluded that there is sufficient rock cover to provide the required degree of stability in the event of successive collapses (cavitations) within the known workings, which could ultimately result in a “crown hole” subsidence event at the surface.</p> <p>E3P has reviewed the historical BWB Desk Study Coal Workings Risk Assessment, BGS geological mapping and CA information.</p> <p>Historic coal mining in the area primarily originates from the Welbeck colliery which historically was a deep mining operation >500 mbgl.</p> <p>The seams located below the subject site do not pose a risk to the proposed development due to the thickness of the overburden and hence unlikely to cause any development issues for the site</p>
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GEOTECHNICAL ASSESSMENT

Underground Obstructions	The area inside the existing building footprint and in the vicinity of the existing building will likely have obstructions present. During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.
Allowable Bearing Pressure	<p>The underlying sand and gravel drift deposits have been assessed as being medium dense to dense with a net ABP in the order of 240-500 kN/m² at circa 1 mbgl decreasing to 140-300 kN/m² at circa 2 mbgl.</p> <p>Proposed plots across the site will likely be constructed using strip or trench fill foundations bearing on the medium dense to dense sands and gravels</p>
Foundation Options	<p>Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the areas of medium-dense sands.</p> <p>Therefore upon completion of enabling works, it is likely that the most cost-effective option for the site would be shallow strip foundations, or mass trench fill in areas of variable ground.</p> <ul style="list-style-type: none"> ✿ Shallow strip foundations bearing on firm to gravelly medium SAND at circa 0.75 mbgl ✿ Trench fill to support reinforced strip foundations in areas of variable ground and/or potential tree influence along the western boundary.



	Due to the lack of investigation within the area of the existing building, alongside shallow bedrock across the site and an assumption of deeper Made Ground, there may be a requirement for engineered foundation solutions within the vicinity of the public house. Further post demolition site investigation will be required to confirm the ground conditions and ultimate foundation solution.
Building Floor Slabs	Ground-bearing floor slabs are unlikely to be viable given the anticipated depths.
Heave Precautions	No heave precautions required.
Soakaway Drainage	<p>The site is predominantly underlain by circa 1-3m of likely high probability gravelly SAND and sandy GRAVEL. Therefore the use of soakaway drainage is considered applicable to the site.</p> <p>If soakaway drainage is to be considered, full BRE 365 testing must be completed to inform the detailed design.</p>
Sulphate Assessment	Concrete classification will be DS1 AC1s.
CBR Design %	Granular soils can be re-engineered to ensure 5% within the subgrade during favourable climatic conditions.
Cut/Fill	Development levels unknown at this time; however, significant cut-and-fill works will be required to prepare the development platform.
Civil Engineering Excavations	The E3P Intrusive Ground Investigation has identified the presence of weathered/competent bedrock at a shallow depth, the presence of which will impede the excavation materials to form sewerage and drainage infrastructure and foundations.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste.</i>

RECOMMENDATIONS

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




-  Further post demolition site investigation will be required to confirm the ground conditions and ultimate foundation solution.
-  Plot-specific foundation schedule (upon receipt of the final development levels).
-  Geotechnical earthworks strategy (infrastructure).



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DRAWING LIST

- 14-437-R1-001 - Site Location Plan
- 14-437-R1-002 - Proposed Development Plan
- 14-437-R1-004 - Site Features Plan
- 14-437-R1-003 - Historical Features Plan
- 14-437-R1-005 - Exploratory Hole Location Plan
- 14-437-R1-006 - Depth of Made Ground Plan
- 14-437-R1-007 - Depth to Topsoil Plan
- 14-437-R1-008 - Depth to Founding Strata Plan
- 14-437-R1- 010- Conceptual Site Model



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Shape Land & Property to undertake a detailed Phase I and II Geoenvironmental Site Assessment for the Three Lions public house located southwest of Netherland Lane, Meden Vale, Mansfield.

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

The scope of work includes the following elements:

- ✦ Detailed review of historic information;
- ✦ Detailed desk study;
- ✦ Design of suitable intrusive ground investigation;
- ✦ 6 no. window sample probeholes with, and construction of, environmental monitoring installations;
- ✦ In-situ geotechnical testing;
- ✦ Chemical and geotechnical laboratory analysis;
- ✦ Groundwater monitoring and sampling;
- ✦ Ground gas monitoring;
- ✦ Contamination risk assessment and conceptual site model;
- ✦ Geotechnical assessment and interpretation; and,
- ✦ Factual and interpretive reporting.

1.2. PROPOSED DEVELOPMENT

E3P understands that Shape Land & Property are intending the proposed acquisition and future redevelopment of the Three Lions public house for residential apartments and residential dwellings with associated gardens, car parking, estate road and utility infrastructure.

Drawing 14-437-002 (Appendix III) identifies the proposed development layout.

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



FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:

- ✦ Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified.
- ✦ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and relation to off-site receptors.
- ✦ Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- ✦ Provide recommendations regarding future works required.

1.4. LIMITATIONS

The limitations of this report are presented in Appendix I.



1.5. CONFIDENTIALITY

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



2. SITE SETTING

2.1. SITE DETAILS

Site Address	Land off Netherland Lane, Meden Vale, Mansfield NG20 9PA
National Grid Reference	E 458030, N 369520.
Site Area	0.86 Ha.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 14-437-001.

2.2. CURRENT SITE USE

E3P has undertaken a site walkover of the entire site and a description of the key findings is summarised in Table 2.1.

TABLE 2.1 SITE DESCRIPTION

Occupancy/Use	<p>The subject site is a rectangular shaped parcel of land located to the southeast of Netherfield Lane, Meden Vale, Mansfield. The site can be split into two distinct areas.</p> <p>Firstly the north eastern sector which is predominantly hardstanding and currently occupied by The Three Lions public house with associated parking facilities with an outside drinking and children’s play area.</p> <p>Secondly, the south western sector of the site is currently occupied by a field with no apparent designated use although through discussions with the property owners the field has been subject to fly-tipping in the past and trespassing in the form of antisocial behaviour.</p>	
Surface Cover (%)	Buildings	25%
	Hardstand	25%
	Soft Cover	50%
Structures	<p>A large two-storey building is present in the north eastern sector of the site currently occupied by The Three Lions public house. Several fences are present and a low-lying brick wall surrounding the beer garden. There is no cellar at the site confirmed on-site by the current resident.</p> <p>There are no significant structures in the southwest sector of the site. A small electrical transfer box is located in the northern corner of the field, however, this appears to be very new in age.</p>	
Access	<p>Access to the site can be gained from a designated entrance off Netherland Lane, with access to the adjoining land gained from a gate located within the grounds of the Three Lions public house.</p>	
Slope	<p>The site is largely level topographically, however, a gentle slope was observed in a south eastern direction, with the land naturally sloping towards the River Meden which is located very closely on the south-eastern boundary of the site.</p>	
Retaining Structures	<p>No retaining structures were observed.</p>	



Vegetation/Ecology	<p>Mature trees are present along the north western boundary of the field area of the site, bordering Netherland Lane. Mature trees are located on the south-eastern boundary of the site, to the south of The Three Lions public house.</p> <p>A habitat survey will be required to support the planning application.</p>
Hazardous Material Storage	<p>No above-ground storage tanks (ASTs) or underground storage tanks (USTs) were observed at the site during the preliminary site walkover. Due to the previously undeveloped nature of the site, it is unlikely that hazardous materials storage will have occurred on the site.</p>
Asbestos-Containing Material (ACM)	<p>No evidence of ACM was noted across the site during the site walkover. However, access was not possible into the Three Lions public house and due to the age of the building, ACMs will likely be contained within the building fabric. Due to the lack of further structures on the site, it is unlikely there will be any further asbestos present within the Made Ground Deposits.</p>
Polychlorinated Biphenyls (PCBs)	<p>There is no equipment identified that may contain PCBs within the site boundary; however, there is an electric transformer box located in the northern corner of the field in the south western sector of the site.</p>
Waste Storage	<p>Potentially hazardous waste streams are unlikely to be generated at the site and none were observed during the preliminary site inspection.</p>
Drainage	<p>A formal drainage survey has not yet been completed, however, a review of online records held by Severn Trent indicates the presence of a public combined gravity/lateral drain running across the south western field area in a northeast to southwest trajectory. Drainage also enters the site in the northern corner of the site, coming in from Netherland Lane, bordering the northern edge of the Three Lions building perimeter and running in a northwest to southeast trajectory.</p> <p>Localised drainage was also observed around the existing building perimeter.</p>

2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

DIRECTION	LAND USE
North	School with associated playing fields
East	Woodland
South	Woodland
West	Residential units

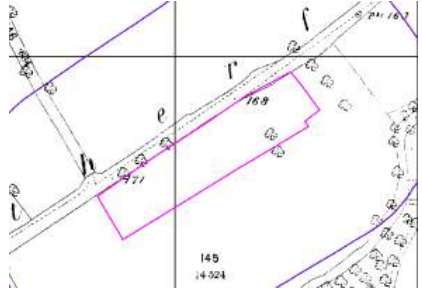

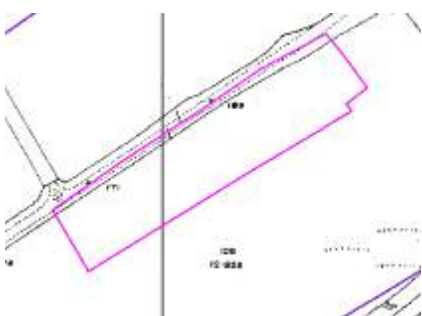
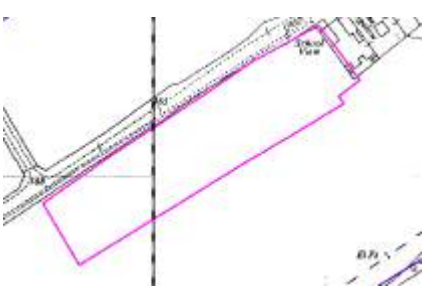


3. SITE HISTORY






3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented on Drawing No 14-437-003 in Appendix III.

TABLE 3.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1885 1:2,500	The site is open grassland with a few scattered trees present.	
1898 1:2,500	The trees now appear to have been removed. No other significant changes observed.	
1919 1:2,500	No other significant changes observed.	
1960-1961 1:2,500	No other significant changes observed.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
<p>1977-1982 1:1,2500</p>	<p>The site is now occupied by the Three Lions public house in the north eastern sector of the site.</p> <p>No other significant changes observed.</p>	
<p>1984-1992 1:2,500</p>	<p>The Three Lions public house appears to have been extended in the north eastern corner of the building.</p> <p>No other significant changes observed.</p>	
<p>1993 1:2,500</p>	<p>No other significant changes observed.</p>	
<p>1999 Aerial Photograph</p>	<p>No other significant changes observed.</p>	
<p>2021 Google Earth Image</p>	<p>No other significant changes observed.</p>	



3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 250 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Sewage Works (Filter bed) Then: no longer marked	200 m	Pre 1920–Pre 1966 Pre 1991–Present	South West
Sewage Works (Pumping Station) Then: no longer recorded	250 m	Pre 1920–Pre 1955 Pre 1955–Present	South West
Wilbeck Colliery Railway Then: marked as Mineral Railway	250 m	Pre 1920–Pre 1955 Pre 1970–Present	South East

3.3. PLANNING HISTORY

E3P has undertaken a review of online planning records held by Mansfield District Council and no environmentally pertinent information has been obtained for the site.



4. ENVIRONMENTAL SETTING

4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map (Sheet 113) for the site, (1:50,000, Solid and Drift editions) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift (south of site in association with the River Meden)	Alluvium	CLAY, SILT, SAND AND GRAVEL	Secondary A
Solid	Lenton Sandstone Formation	SANDSTONE	Principal Aquifer

TABLE 4.2 SUMMARY OF BGS BOREHOLE RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
200m E	141 m	None recorded	0.00 – 6.50 mbgl SAND and GRAVEL	6.50 – 141 mbgl SANDSTONE, LIMESTONE and MARL.

The British Geological Survey (BGS) map indicates that there are no recorded geological faults within 250m of the site.

The Envirocheck report indicates that the site is not located within a groundwater source protection zone.

There are 14 groundwater abstractions identified within the Envirocheck report within 250 m of the site, all of which identified 241 m east under the operator A E Bowring & Sons Ltd and used for General farming and Domestic purposes.

4.2. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological assessment of the landform and its possible mechanism for formation.

The subject site is underlain by alluvial deposits consisting of interbedded sands and gravels. These are formed through material suspended within the water column from adjacent water systems. This material falls out of suspension when energy levels fall and become deposited as sands and gravels. The underlying rock formations are associated with the Lenton Sandstone Formation which consists of Sandstone.

A river flows in a south-westerly direction to the southeast of the subject site at a lower elevation, however, it can be determined that due to the gentle slope towards the river from the subject site it would appear that the current site level will have formed through natural processes. However some historical upfilling of the material may have occurred prior to the construction of the Three Lions Public House.



4.3. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 4.3.

TABLE 4.3 SUMMARY OF GEOTECHNICAL DATA

HAZARD	DESIGNATION
Shrink-Swell Clay	No Hazard
Landslides	Very low risk
Ground Dissolution	No hazard
Compressible Ground	No hazard
Collapsible Deposits	Very low risk
Running Sand	No Hazard

4.4. COAL MINING

The Envirocheck report states the site is in an area that may be affected by coal mining.

A CA mining report was obtained (Ref:51002344576003) dated 21st December 2020.

The CA operates a risk-based approach to the assessment of potential instability issues associated with future development of land located within the predefined CA consultation areas. This risk-based approach subdivides the potential risk into “low” and “high” risk categories.

The risk categories can be defined as:

Low-Risk Sites – Deemed to be land where coal mining has taken place, however it was at such depth not to pose a risk to new development and it therefore contains no known recorded risks and as such no further assessment is required.

For low-risk sites, the CA categorically states:

If your proposed development is within the Development Low Risk Area there is no need for you to submit any coal mining information with your planning application and The Coal Authority will not be consulted by the LPA. The LPA will include our Standing Advice as an informative note within the decision notice.

High-Risk Sites – Deemed to be landholdings located within an area known to contain legacy risks that include:

- ✿ Mine entries (shaft or adit);
- ✿ Shallow coal workings (recorded and probable);
- ✿ Workable coal seam outcrops;
- ✿ Mine gas sites and areas;
- ✿ Recorded coal-mining-related hazards;
- ✿ Geological features (fissures and break lines); and
- ✿ Former surface mining sites (sometimes using historic opencast extraction methods).

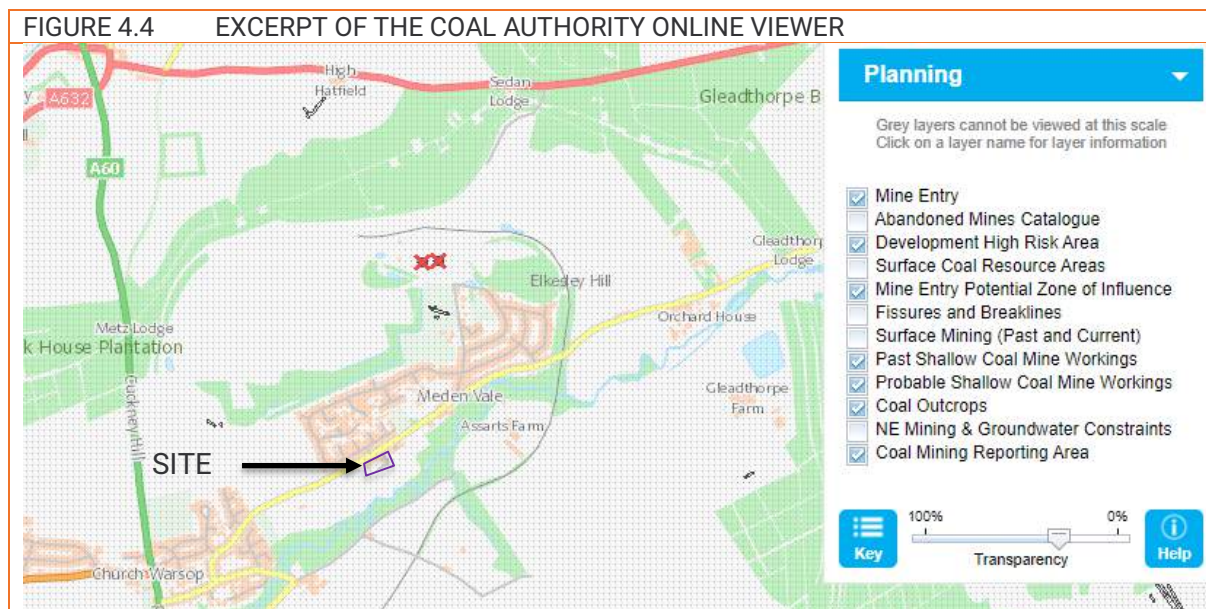


4.5. COAL MINING INFORMATION

Prior to the enactment of the Coal Mines Regulation Act (1872), which came into force on the 1st January 1883, there was no statutory requirement to record the extent of abandoned mine workings and as such the CA has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth that could result in a subsidence event in the future (through successive cavitation) associated with failure of support mechanism.

To determine if a site may have unrecorded or recorded coal mine workings requires the consideration of a wide range of information and E3P has completed a review of relevant information in relation to potential coal mining activities.

In the first instance, E3P has reviewed the Coal Authority Online Viewer and an excerpt of this is presented in Figure 4.4. The map shows that the site does not lie within a development high risk area with no mine entries within 250m of the subject site.



As the site is within an area affected by Coal Mining E3P has consulted with the Coal Authority who have provided a Consultant Coal Mining Report for the site (ref: 51002344576003).

Table 4.5 provides a summary of pertinent coal mining information with this report.



TABLE 4.5 COAL MINING INFORMATION

SOURCES OF INFORMATION	SUMMARY				
	Seam	Dip	Extraction thickness (cm)	Depth (m)	Year
Known Past Underground Mining	TOP HARD	1.4	211	607	1916
	TOP HARD	2.3	140	628	1916
	TOP HARD	2.2	211	640	1928
	TOP HARD	2.8	140	640	1928
	TOP HARD	2.7	213	644	1938
	TOP HARD	2.7	215	653	1939
	DEEP SOFT	2.7	250	829	1991
Probable Unrecorded workings	No				
Spine Roadways at Shallow Depth	No spine roadway recorded at shallow depth.				
Mine Entries within 100m of the site	None recorded within 100 metres of the enquiry boundary.				
Mine Abandonment plans	Yes				
Known outcrops	No outcrops recorded.				
Faults / Fissures	No faults, fissures or breaklines recorded.				
Opencast mines	None recorded within 500 metres of the enquiry boundary.				
Coal Authority Managed Tips	None recorded within 500 metres of the enquiry boundary.				
Remediated Sites	None recorded within 50 metres of the enquiry boundary.				
Coal Mining Subsidence	There is 1 claim(s) within 50 metres of the property boundary that do not match the property address. These are shown on the enquiry boundary plot.				
	There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.				
Mine Gas	None recorded within 500 metres of the enquiry boundary.				
Mine Water	None recorded within 500 metres of the enquiry boundary.				
Future Underground Mining	None recorded.				
Coal Authority Development Advice	The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.				
British Geological Survey Mapping	The 1:10,000 geological mapping for the area notes no coal seams within the area.				



SOURCES OF INFORMATION	SUMMARY
Review of Coal Authority Archive	No CA archives/mine abandonment plans are made available.
Historical Ordnance Survey Mapping	<p>A review of the 1:10,000 Ordnance Survey mapping from circa 1850, which has records of mine workings that predate the Mining & Regulation Act of 1872, identified the following features indicative of historical mine workings in proximity to the application site:</p> <ul style="list-style-type: none"> ☛ Welbeck Colliery 600m NE <p>Historical evidence from online sources in relation to the Welbeck Colliery identified deep shafts at >500mbgl hence it is highly unlikely than any shallow mining occurred in the vicinity or on-site.</p>
Historical Site Investigations	E3P has not been provided with any historic site investigation reports.

4.6. COAL MINING RISK ASSESSMENT

This risk assessment comprises a desk-based review of all available information on coal mining issues that are relevant to the application site deemed to be located within a high-risk area. This includes:

- ☛ Interpretation of information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- ☛ Setting out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- ☛ Demonstrating to the local planning authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

The coal mining risk assessment is summarised in Table 4.6.

TABLE 4.6 SUMMARY OF COAL MINING RISK ASSESSMENT

COAL MINING RISK ASSESSMENT	YES/NO	RISK ASSESSMENT
Recorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Low
Recorded Underground Coal Mining at Shallow Depth (> 30 m)	No	Low
Evidence of Unrecorded Surface Extraction of Coal Outcrop	No	Low
Unrecorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Low
Mine Entries (Shaft/Adits)	No	Low
Coal Mining Geology – Fractures/Fissures	No	Low
Recorded Gas Emissions	No	Low
Recorded Mining Surface Hazard	No	Low
Surface Mining (Opencast)	No	Very Low/Low

Based on the above, a low risk of unrecorded coal mining at shallow depth has been identified for the subject site.



4.7. RADON RISK POTENTIAL

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

4.8. PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the desk-study information, the following geotechnical assessment has been made:

- ✿ Given the predominantly undeveloped nature of the site, it is likely there will be limited Made Ground fill deposits and obstructions. Existing buildings will require demolition with all relict foundations grubbing out, prior to the construction of the proposed development.
- ✿ The site is relatively flat topographically as such limited earthworks will be required to create a level developable platform. No cellar was identified and confirmed verbally on-site by the current resident.

4.9. HYDROLOGY

Surface water features within 250 m of the subject site are summarised in Table 4.7.

TABLE 4.7 SURFACE WATER FEATURES

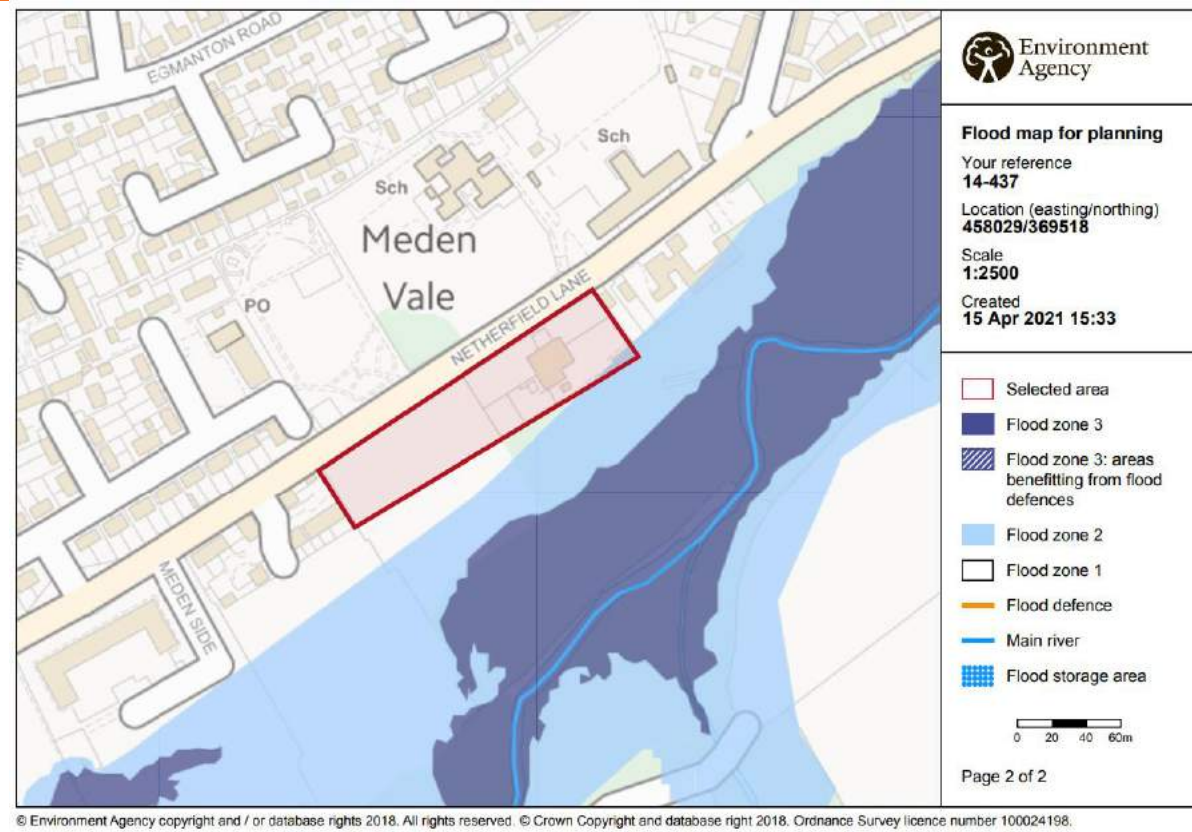
SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Meden River	Fairly Good	64 m	East

The site is predominantly located within a currently defined “Flood Risk Zone 1”; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (< 0.1%), and as such is considered to be unaffected by river flooding. In addition, the Envirocheck report states there is a limited potential for groundwater flooding to occur at the site. The Environment Agency (EA) Flood Risk Map for the site is presented in Figure 4.1.

Based on the local topography, it is considered likely that shallow groundwater, if present, will flow in an easterly direction, following the topographical gradient towards Meden River to the southeast.



FIGURE 4.1 EA FLOOD RISK MAP



Source - <https://flood-map-for-planning.service.gov.uk/>

4.10. INDUSTRIAL LAND USES

Eight entries for industrial land use are located within 250m of the subject site with two of these active, the closest situated 49 m northeast of the site and identified as the Welbeck service station and the other 194 m southwest classified as a joinery manufacturer.

4.11. SENSITIVE LAND USES.

The closest residential properties are located adjacent to the north western and south eastern boundaries of the site. A school with associated playing fields is also located on the north western boundary.

Other sensitive land uses identified by the Envirocheck report include;

- 📍 1 No nature reserve located directly southeast of the site, and;
- 📍 3 No Nitrate Vulnerable Zones located directly northwest of the site.

4.12. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a “Moderate” sensitivity setting as discussed within Table 4.8.



TABLE 4.8 SITE SENSITIVITY ASSESSMENT

SENSITIVITY PROFILE	DISCUSSION	RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	Not located within a Groundwater Source Protection Zone or Drinking water Safeguard Zone.	Low
Distance to the Closest Groundwater Abstraction Point	187m east of the site, used for agricultural supply	Low
Aquifer Classification in Superficial Drift Deposits	Secondary A aquifer in the south of site associated with the Meden River.	Moderate
Aquifer Classification in Bedrock	Principal Aquifer	High
Is the Site Underlain by Low-Permeability Drift to Depths in excess of 10 m?	The underlying superficial deposits are likely to comprise sands and gravels with high permeability characteristics thus potential contaminants may move freely towards the bedrock aquifer or adjacent watercourse.	High
Is the Site Located Within 50 m of a Surface Watercourse?	The risk of surface water is moderate due to the proximity of a viable receptor within influencing distance of the site.	Moderate
Sensitive Land Uses	The site is surrounded by residential dwellings, there is a nature preserve located directly southeast of the site, and a school to the north.	High
OVERALL SITE ENVIRONMENTAL SENSITIVITY		Moderate/High



5. CONSULTATIONS

5.1. LANDFILL SITES AND WASTE TREATMENT SITES

There are no registered landfill or waste treatment facilities located within 250m of the subject site.

5.2. REGULATORY DATABASE

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and not otherwise detailed in the report.

TABLE 5.1 SUMMARY OF ENVIRONMENTAL DATA

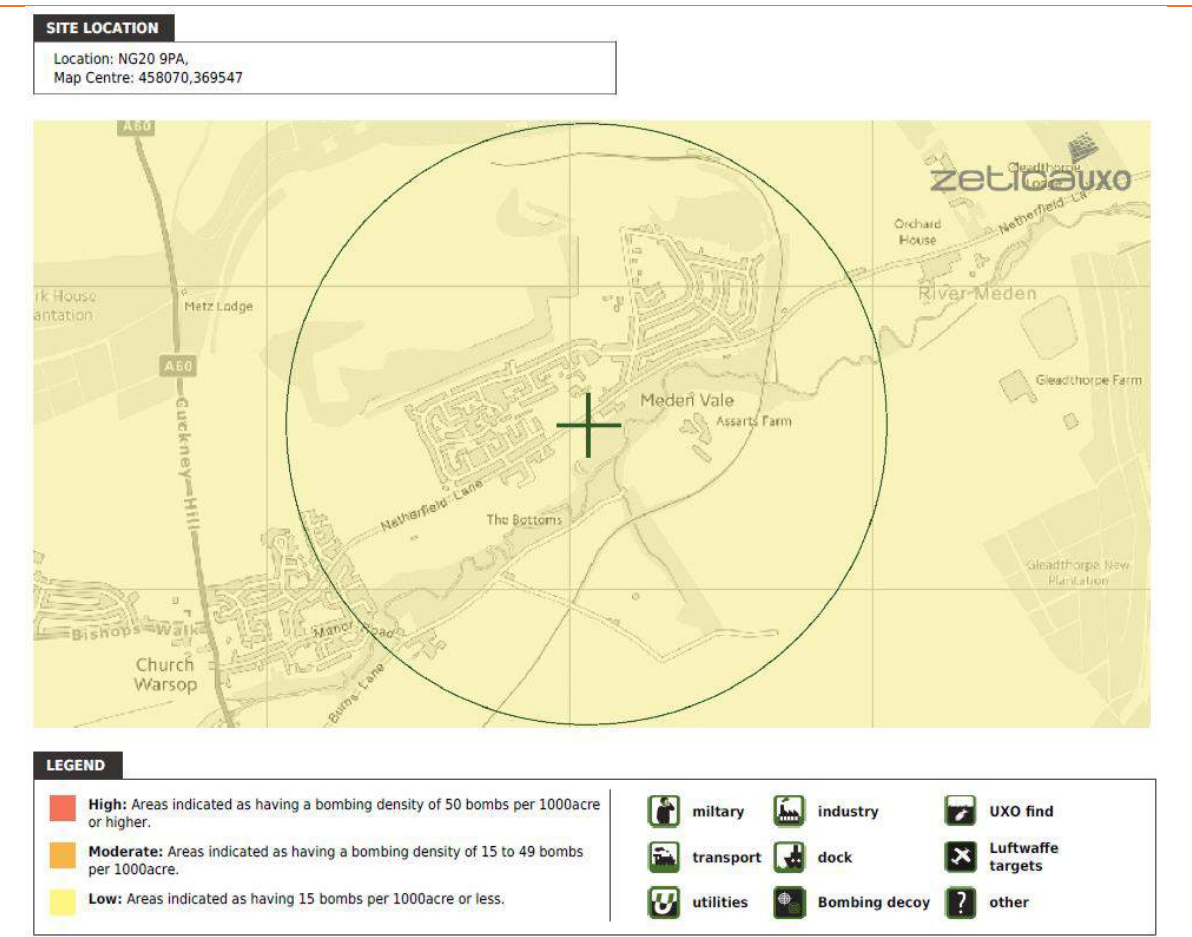
RECORD	ENTRIES WITHIN 250 m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified
Authorised Industrial Processes (IPC/IPPC/LAPPC)	0	None Identified
Fuel Stations Entries	1	Welbeck Service Station 49m north east of the site
Licensed Radioactive Substances	0	None Identified
Enforcements, Prohibitions or Prosecutions	0	None Identified
Discharge Consents	4	2 No discharge consents related to sewage discharge from W&J Eastwood Ltd 2 No discharge consents related to sewage discharge from Severn Trent Water
Pollution Incidents	1	Category 3- minor incident 164m SW of the site, 16 th August 1996
Consents Issued Under the Planning (Hazardous Substances) Act 1990	0	None Identified
Control of Major Accident Hazard (COMAH) Sites	0	None Identified

5.3. UNEXPLODED ORDNANCE

The regional unexploded bomb risk map from Zetica (2014) indicates that the site is in an area at low risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetica UXO Risk Map is presented as Figure 5.1.



FIGURE 5.1 ZETICA UXO RISK MAP



Source - <https://zeticauxo.com/downloads-and-resources/risk-maps/>



6. INITIAL CONCEPTUAL SITE MODEL

In accordance with EA LCRM (2019) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P has developed an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

6.1. ON-SITE SOURCES OF CONTAMINATION

The following potential on-site sources of contamination have been identified:

- ✳ Historic buildings/foundations/infilled ground (Made Ground)
 - Heavy metals, PAH's, ACM and ground gases.
- ✳ Electrical transformer box located in the northern corner of the field in the south western sector of the site.
 - Polychlorinated Biphenyls (PCB's)

6.2. OFF-SITE SOURCES OF CONTAMINATION

The following potential off-site source of contamination have been identified:

- ✳ Wilbeck Service Station 49m north east of the site;
 - BTEX, Chemicals, PAH's and TPH.
- ✳ Sewage Works (Filter bed) 200m southwest of the site;
 - Heavy metals, PAH's, ACM and ground gases.
- ✳ Sewage Works (Pumping Station) 250m southwest of the site;
 - Heavy metals, PAH's, ACM and ground gases.
- ✳ Wilbeck Colliery Railway 250m southeast of the site.
 - Heavy metals, PAH's, ACM and ground gases.



TABLE 6.1 INITIAL CONCEPTUAL SITE MODEL

SOURCE	PATHWAY	RECEPTOR
Human Health		
Heavy Metals, PAHs Associated Within Made Ground	Dermal Contact and Ingestion Consumption of Homegrown Produce	Construction Workers Residential End Users
<p>Discussion: Current and historical land uses on-site are a potential source of heavy metals, PAHs and TPH. Made Ground associated with historical developments on-site (historic pub buildings) may contain heavy metals, PAHs and TPHs. If the land has been used previously for farming, there is a potential for heavy metal contamination from the use of fertilisers and pesticides.</p> <p>If present heavy metals, non-volatile PAH and TPH may pose a short-term risk to construction workers who may come into contact with impacted soils during earthworks. However, this risk can be mitigated through the use of appropriate Personal Protective Equipment (PPE) and the provision of adequate welfare facilities.</p> <p>Future end users may come into contact with impacted soils within any garden and landscaped areas. If impacted soils are identified then localised remediation or an appropriate cover system, designed in accordance with an agreed remediation strategy will mitigate the risk.</p>		
Polychlorinated Biphenyl (PCB) associated with on-site sub stations	Dermal Contact Inhalation Accumulation	Construction Workers Residential End Users Third-Party Property
<p>Discussion: One electrical transformer box has been observed on-site located in the northwest corner of the area of rough grassland to the south of the site. However, through visual inspection during the site walkover, this transformer box was identified as being installed post-1985 and therefore the presence of PCBs is unlikely.</p>		
Asbestos-Containing Materials (ACMs) within Made Ground	Fibre/Dust Inhalation	Construction Workers Residential End Users Third-Party Property
<p>Discussion: Historic mapping indicates that the pub was constructed pre-1977. Due to the age of the building, the presence of ACM cannot be discounted.</p> <p>Dust associated with any Made Ground underlying the site may potentially contain ACMs which could be released during future earthworks and then subsequently inhaled by construction workers, third party property and end-users within proposed landscaping areas.</p>		
Hazardous Ground Gases		
Methane and Carbon Dioxide Associated with underlying alluvial deposits.	Inhalation Accumulation	Construction Workers Residential End Users
<p>Discussion: Limited Made Ground is anticipated on site however if any Made Ground deposits identified on-site contain putrescible materials, the production of hazardous ground gases may occur. Possible underlying coal seams (albeit at significant depth) may also be a source of harmful gas emissions.</p> <p>If present, ground gas could accumulate within excavations, which could cause harm to construction workers via inhalation, or within the proposed extension buildings, which could cause harm via ignition or inhalation to the end-users. If present, the risks can be appropriately mitigated through the careful design of building structures.</p>		



SOURCE	PATHWAY	RECEPTOR
Buildings and Infrastructure		
pH and Sulphate exceedances within Made Ground	Corrosion of Concrete	Foundations/Concrete
Discussion: Presence of pH and sulphate within Made Ground deposits may result in corrosion of buried concrete within the proposed development. Intrusive investigation with chemical analysis of soil samples is recommended to confirm the levels of pH and sulphate within Made Ground deposits and thus determine the concrete classification.		



7. GROUND INVESTIGATION

7.1. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources summarised in Table 7.1. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed on 7th January 2021. The works are summarised in Table 7.1.

7.2. LIMITATIONS OF THE INVESTIGATION

The following limitations were encountered during the site investigation:

- ✿ The area in the north eastern sector within the vicinity of the Three Lions Public House had a significant presence of underlying services leading to a lack of investigation in this area.

7.3. SCOPE OF INVESTIGATION

TABLE 7.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General Ground Conditions Including the Presence/Nature of Obstructions – Monitoring well targeting identified alluvium	WS101	Window Sample Probehole	3.45	0.50–2.00
	WS102	Window Sample Probehole	2.95	0.50–2.00
General Ground Conditions Including the Presence/Nature of Obstructions.	WS103	Window Sample Probehole	2.05	N/A
	WS104	Window Sample Probehole	3.45	N/A
General Ground Conditions Including the Presence/Nature of Obstructions – Monitoring well targeting identified alluvium	WS105	Window Sample Probehole	3.45	0.50–2.50
	WS106	Window Sample Probehole	3.45	0.50–2.00

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

The sampling locations are illustrated in Drawing 14-437-005 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix V.

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



7.4. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix V and presented in Table 8.3 and discussed in Section 10.

7.5. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis comprising:

- ✦ Metals.
- ✦ pH, total sulphate, water-soluble sulphate (2:1 extract).
- ✦ Sulphide.
- ✦ Cyanide.
- ✦ Phenols.
- ✦ Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- ✦ Semi Volatile Organic Compounds (SVOC).
- ✦ Volatile Organic Compounds (VOC).
- ✦ Asbestos identification and quantification.
- ✦ Speciated and banded total petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 9.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

- ✦ Atterberg limits determinations; and
- ✦ Single-stage triaxial tests.

Laboratory analysis sheets are included in Appendix VIII and are summarised in Section 10.



8. GROUND AND GROUNDWATER CONDITIONS

8.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 8.1.

TABLE 8.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (M BGL)					
	MADE GROUND	TOPSOIL	CLAY	SAND	GRAVEL	Weathered BEDROCK
WS101	0.00-0.50	-	-	0.50-1.70	1.70-1.95	1.95-3.45 >3.45
WS102	-	0.00-0.20	-	0.20 -1.48	1.48-1.73	1.73-2.95 >2.95
WS103	-	0.00-0.21	0.21-1.14	1.14-2.05	-	-
WS104	-	0.00-0.28	0.28-0.93	0.93-1.82	-	1.82-3.45 >3.45
WS105	-	0.00-0.28	0.28-0.64	0.64-2.36	-	2.36-3.45 >3.45
WS106	0.00-0.46	-	-	0.46-1.32	1.32-1.84	1.84-3.45 >3.45

8.2. MADE GROUND

Made Ground deposits were encountered in two exploratory hole locations (WS101 and WS106) to depths of between 0.46 m and 0.50 m bgl respectively.

Made Ground deposits encountered comprised a layer of asphalt, overlying a yellowish brown, very sandy gravel interpreted as a subbase layer of the asphalt. This overlays a blackish brown very gravelly medium sand with sandstone in both locations. This layer was interpreted as a layer of reworked natural ground, originating from the development of the site in the early 1970s for the construction of the Three Lions Public House.

A Depth of Made Ground Plan is presented as Drawing 14-437-R1-006 in Appendix III.

8.3. TOPSOIL

In the remaining exploratory holes predominantly in the southern area of site, Topsoil was generally encountered between 0.00 mbgl and 0.28 mbgl. Topsoil material was described on-site as brown sandy gravelly clay of sandstone and frequent rootlets.

8.4. DRIFT DEPOSITS

Drift deposits were encountered within all of the exploratory locations between 0.20 m bgl and 2.36 m bgl. The drift deposits are varied but generally comprised a medium dense to dense brown, very sandy, very gravelly SAND with gravel of sandstone interbedded with a dense reddish brown, very sandy, slightly silty GRAVEL. These deposits originated from the fluvial action of the nearby watercourse and have been interpreted as alluvial deposits. In the southern area of site, natural Topsoil was underlain by soft low strength brown slightly sandy gravelly CLAY of sandstone.



8.5. SOLID GEOLOGY

A medium dense to dense reddish brown, medium SAND was encountered at depths of between (1.73-2.36 m bgl) and (3.45 m bgl) which was determined through lack of granular constituents as being the weathered horizon of the underlying bedrock.

8.6. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in Appendix IV and are summarised in Table 8.2.

TABLE 8.2 SUMMARY GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m bgl)	NOTES
WS101	2.30	Gradual ingress, water perched within weathered horizon stratum
WS102	2.00	Gradual ingress, water perched within weathered horizon stratum
WS104	2.30	Gradual ingress, water perched within weathered horizon stratum
WS105	2.50	Gradual ingress, water perched within weathered horizon stratum
WS106	2.20	Gradual ingress, water perched within weathered horizon stratum

8.7. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has not been identified during the site investigation.



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TABLE 8.3 STANDARD/CONE PENETRATION TEST RESULTS

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS101	1	Slightly silty very gravelly SAND	24	24.20	Medium Dense	N/A	N/A	N/A	241.96
WS101	2	SAND (Weathered horizon of bedrock)	33	30.15	Dense	N/A	N/A	N/A	301.47
WS101	3	SAND (Weathered horizon of bedrock)	50	43.48	Dense	N/A	N/A	N/A	434.83
WS102	1	Clayey gravelly SAND	24	24.20	Medium Dense	N/A	N/A	N/A	241.96
WS102	2	SAND (Weathered horizon of bedrock)	41	37.46	Dense	N/A	N/A	N/A	374.55
WS102	2.5	SAND (Weathered horizon of bedrock)	50	44.41	Dense	N/A	N/A	N/A	444.09
WS103	1	Sandy gravelly CLAY to slightly clayey gravelly SAND	31	31.25	Dense	N/A	N/A	N/A	312.53



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BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS103	1.6	Clayey gravelly SAND	50	47.08	Dense	N/A	N/A	N/A	470.80
WS104	1	Slightly silty very gravelly SAND	23	23.19	Medium Dense	N/A	N/A	N/A	231.87
WS104	2	SAND (Weathered horizon of bedrock)	16	14.62	Medium Dense	N/A	N/A	N/A	146.17
WS104	3	SAND (Weathered horizon of bedrock)	50	43.48	Dense	N/A	N/A	N/A	434.83
WS105	1	Gravelly SAND	24	24.20	Medium Dense	N/A	N/A	N/A	241.96
WS105	2	Gravelly SAND	20	18.27	Medium Dense	N/A	N/A	N/A	182.71
WS105	3	SAND (Weathered horizon of bedrock)	50	43.48	Dense	N/A	N/A	N/A	434.83
WS106	1	Silty gravelly SAND	49	49.40	Dense	N/A	N/A	N/A	493.99



Three Lions

Phase I & II Geoenvironmental Site Assessment
July 2023

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS106	2	SAND (Weathered horizon of bedrock)	19	17.36	Medium Dense	N/A	N/A	N/A	173.57
WS106	3	SAND (Weathered horizon of bedrock)	50	43.48	Dense	N/A	N/A	N/A	434.83

NOTES

* The Allowable Bearing Pressure (ABP) should be considered indicative.

The interpretation of in situ mass undrained shear strength (cu) data from SPT Blow Count (N) results and the influence of the Plasticity Index (PI) was reported in Standard Penetration Test in Insensitive Clays and Soft Rocks. Stroud (1974). The standard penetration test and the engineering properties of glacial materials subsequently. Stroud and Butler (1975) and (1989).

Allowable bearing pressure on sands. Soil Mechanics in Engineering Practice Terzaghi, K. & Peck, R.B. 1996.



8.8. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular material via wet sieve to obtain information on the soil fractions. The results are included in Table 8.4. The full results can be found in Appendix VIII.

TABLE 8.4 SUMMARY OF PARTICLE SIZE DISTRIBUTION TEST RESULTS

LOCATION	DEPTH (m)	SOIL FRACTION (%)			
		COBBLES	GRAVEL	SAND	SILT/CLAY
WS102	0.30 (Natural)	0	26	46	28
WS104	1.40 (Natural)	0	50	41	9
Ws106	0.70 (Natural)	0	53	39	8

8.9. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised in Table 8.5), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

TABLE 8.5 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
WS101	0.30	0.0082	8.4	DS-1, AC-1s
WS103	0.15	0.011	7	DS-1, AC-1s
WS103	1.50	0.0087	7.3	DS-1, AC-1s
WS104	0.80	0.007	7.2	DS-1, AC-1s
WS106	0.40	0.018	7.3	DS-1, AC-1s
WS106	0.60	0.046	6.7	DS-1, AC-1s



9. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

9.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

Where Tier 1 screening values are not provided by LQM, other screening values have been used and these are referenced in Table 9.1.

The results of this comparison have been summarised within Table 9.1.



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TABLE 9.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE WITH PLANT UPTAKE

DETERMINAND	UNITS	GAC	N	MC	LOC. OF EX	PATHWAY	ASSESSMENT
Arsenic	mg/kg	37	11	14	NA	1	No Further Action
Cadmium	mg/kg	11	11	<0.2	NA	1	No Further Action
Chromium (VI)	mg/kg	6.1	11	<4.0	NA	1	No Further Action
Lead	mg/kg	200	11	35	NA	1	No Further Action
Mercury	mg/kg	1.2	11	<0.3	NA	2	No Further Action
Nickel	mg/kg	180	11	21	NA	1	No Further Action
Selenium	mg/kg	250	11	<1.0	NA	1	No Further Action
Copper	mg/kg	2400	11	22	NA	1	No Further Action
Zinc	mg/kg	3700	11	88	NA	1	No Further Action
Cyanide - Total	mg/kg	791	11	<1	NA	1	No Further Action
Phenols - Total.	mg/kg	210	6	<1.0	NA	1	No Further Action
Asbestos	Fibres	NFD	5	ND	NA	4	No Further Action
Naphthalene	mg/kg	2.3	11	<0.05	NA	3	No Further Action
Acenaphthylene	mg/kg	170	11	<0.05	NA	2	No Further Action
Acenaphthene	mg/kg	210	11	<0.05	NA	1	No Further Action
Fluorene	mg/kg	170	11	<0.05	NA	1	No Further Action
Phenanthrene	mg/kg	95	11	<0.05	NA	2	No Further Action
Anthracene	mg/kg	2400	11	<0.05	NA	2	No Further Action
Fluoranthene	mg/kg	280	11	0.36	NA	2	No Further Action
Pyrene	mg/kg	620	11	0.44	NA	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	11	<0.05	NA	2	No Further Action
Chrysene	mg/kg	15	11	<0.05	NA	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	11	<0.05	NA	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	77	11	<0.05	NA	2	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	11	<0.05	NA	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27	11	<0.05	NA	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	11	<0.05	NA	2	No Further Action
Benzo(ghi)Perylene	mg/kg	320	11	<0.05	NA	2	No Further Action
TPH C5-C6 (aliphatic)	mg/kg	42	11	<1.0	NA	3	No Further Action
TPH C6-C8 (aliphatic)	mg/kg	100	11	<0.1	NA	3	No Further Action
TPH C8-C10 (aliphatic)	mg/kg	27	11	<0.1	NA	3	No Further Action
TPH C10-C12 (aromatic)	mg/kg	74	11	<2.0	NA	3	No Further Action
TPH C12-C16 (aromatic)	mg/kg	140	11	5.4	NA	3	No Further Action
TPH C16-C21 (aromatic)	mg/kg	260	11	13	NA	1	No Further Action
TPH C21-C35 (aromatic)	mg/kg	1100	11	32	NA	1	No Further Action



Notes

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 1 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

** Atkins ATRISK

*** USEPA Risk Management Levels

Referring to Table 9.1, the result of this direct comparison indicates that the data does not exceed the screening criteria for a residential end-use with plant uptake.

HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

All of the chemical samples for the subject site showed no elevated concentrations hence no risk to human health has been identified within the encountered deposits on site.

No asbestos was identified within the Made Ground deposits on-site; however, ACM's will likely be present within the existing building fabric of the Three Lions Public House, therefore a pre-demolition survey will be required and appropriate mitigation must be taken during demolition.

The chemical analysis has concluded the site is suitable for redevelopment for residential end use without the requirement for mitigation measures and only the installation of 150mm topsoil overlying natural strata (or a 300mm growing medium).

9.2. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 9.2.



TABLE 9.2 CONTROLLED WATERS CONCEPTUAL MODEL AND SENSITIVITY PROFILE

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground Heavy metal and PAH contamination was not identified on the site investigation within the Made Ground deposits on site.		Low
Pathway		
Vertical Migration Due to the majority of the site being underlain by granular alluvium deposits, vertical migration of contaminants is likely to occur as a result of the high permeability of the drift deposits.		High
Lateral migration Lateral migration of contaminants is considered possible due to the presence of granular alluvium deposits across the site.		Medium
Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary A in the south of site	Medium
Aquifer Classification in Bedrock	Principal aquifer	High
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected	Low
Distance to the Closest Groundwater Abstraction Point	None identified within a 1 km radius.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	No – however, the Meden River is located 64m east of the site	Moderate
The ICSM developed within the context of the site setting has viable pollutant pathway, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying principal aquifer and the lateral migration towards the Meden River, which lies below site level.		

To ensure a robust appraisal of the identified risk to controlled waters, E3P has identified the sources of potential contamination that represent a risk to controlled waters from the initial CSM, we have then assessed the availability of ground investigation data in the form of analysis of the solid phase (soil) and dissolved phase within the perched groundwater or aquifer. The results of this assessment are presented in Table 9.3.



TABLE 9.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

CONTAMINANT	ASSESSMENT RATING
BTEX > 1 mg/kg	The soil data analysis has not identified any detectable concentrations of VOCs above 1mg/kg or TPH C5 to C6 that might otherwise be indicative of VOC impact.
Total VOC > 1 mg/kg	
Total SVOC > 1 mg/kg	SVOC analysis recorded concentrations below the laboratory LOD, and PAH analysis recorded concentrations below the laboratory LOD
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.
C10-C12 > 10 mg/kg	All concentrations are below the laboratory LOD.
C12-C16 > 50 mg/kg	All concentrations are below the laboratory LOD.
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.
Naphthalene > 2 mg/kg	All concentrations are below the laboratory LOD.
Total PAH > 10 mg/kg	All concentrations are below the laboratory LOD.
PCB > 1 mg/kg	No potential sources of PCB have been identified
Heavy metals > 500 mg/kg	No potential sources of heavy metals have been identified

The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground and natural drift to environmental quality standards (EQS) and drinking water standards. No groundwater samples have been completed to date.

These are presented in Table 9.4.



TABLE 9.4 COMPARISON OF GROUNDWATER AND LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Arsenic	µg/l	50	10	3	< 1.0	NA	No Further Action
Cadmium	µg/l	0.08-0.25	5	3	0.3 0.15	WS103 1.50 mbgl WS106 0.40 mbgl	Further Action
Chromium (VI)	µg/l	3.4	–	3	< 5.0	NA	No Further Action
Chromium (III)	µg/l	4.7	50	3	0.7	NA	No Further Action
Copper	µg/l	1	2000	3	74 63 73	WS101 0.40 mbgl WS103 1.50 mbgl WS106 0.40 mbgl	Further Action
Total Cyanide	µg/l	1	50	3	< 1.0	NA	No Further Action
Lead	µg/l	1.2	10	3	7.9 5.6 5.6	WS101 0.40 mbgl WS103 1.50 mbgl WS106 0.40 mbgl	Further Action
Mercury	µg/l	–	1.0	3	< 0.5	NA	No Further Action
Nickel	µg/l	4	20	3	3.6	NA	No Further Action
Selenium	µg/l	–	10	3	< 4.0	NA	No Further Action
Zinc	µg/l	10.9	–	3	16 35 27	WS101 0.40 mbgl WS103 1.50 mbgl WS106 0.40 mbgl	Further Action
pH	6–9			3	7.4	NA	No Further Action
Naphthalene	µg/l	2	10*	3	< 0.01	NA	No Further Action
Anthracene	µg/l	0.1	10*	3	< 0.01	NA	No Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10*	3	< 0.01	NA	No Further Action
Benzo[k]fluoranthene	µg/l	0.00017*	10*	3	< 0.01	NA	No Further Action



DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Benzo(a)pyrene	µg/l	0.00017*	10*	3	< 0.01	NA	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	3	< 0.01	NA	No Further Action
Fluoranthene	µg/l	0.0063	10*	3	< 0.01	NA	No Further Action
Benzo(ghi)perylene	µg/l	1.7–4	10*	3	< 0.01	NA	No Further Action
TPH C5-C6 (benzene)	µg/l	10	1	3	< 1.0	NA	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	3	< 1.0	NA	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20	300	3	< 1.0	NA	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	3	< 1.0	NA	No Further Action
TPH C12-C16	µg/l	2	90 ⁵	3	< 10	NA	No Further Action
TPH C16-C35	µg/l	50	90 ⁵	3	< 10	NA	No Further Action
TPH C5-C6	µg/l	–	15000	3	< 1.0	NA	No Further Action
TPH C6-C8	µg/l	–	15000	3	< 1.0	NA	No Further Action
TPH C8-C10	µg/l	–	300	3	< 1.0	NA	No Further Action
TPH C10-C12	µg/l	–	300	3	< 10	NA	No Further Action
TPH C12-C16	µg/l	–	300	3	< 10	NA	No Further Action
TPH C16-C21	µg/l	–	300**	3	< 10	NA	No Further Action
TPH C21-C35	µg/l	–	300**	3	< 10	NA	No Further Action
Tetrachloroethylene	µg/l	0.4	10	3	NA	NA	No Further Action
Trichloroethylene	µg/l	10	10	3	NA	NA	No Further Action
Trichlorobenzene	µg/l	0.4	–	3	NA	NA	No Further Action



DETERMINAND	UNIT	EQS ^{1,2,3}	DWS ^{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Trichloromethane	µg/l	2.5	–	3	NA	NA	No Further Action
Dichloromethane	µg/l	20	200	3	NA	NA	No Further Action
Carbon Tetrachloride	µg/l	12	3	3	NA	NA	No Further Action
Vinyl Chloride	µg/l	–	0.3	3	NA	NA	No Further Action

Notes

Solubility <0.01µg/l
AA – Annual Average
MAC- Maximum Admissible Concentration
* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water
** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



9.2.1. CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

Three leachate samples were taken of the underlying soil during the ground investigation and analysed for possible contaminants at i2 analytical laboratories. The test results were compared to environmental quality standards (EQS) due to the close proximity to the River Meden as well as drinking water standards (DWS) due to the presence of the underlying principal aquifer within the bedrock.

This comparison indicates that the data exceeds the EQS values for the following inorganic compounds:

- ✦ Cadmium
- ✦ Copper
- ✦ Lead
- ✦ Zinc

None of the above elevated heavy metals exceeded the drinking water standards, and therefore the risk towards the principal aquifer is considered negligible.

In relation to the elevated heavy metals against the EQS as listed above, these can be considered isolated occurrences from the leachate analysis undertaken in Made Ground soils at WS101 and WS106, with elevated concentrations also detected within the natural stratum in WS103. Where leachate analysis has been undertaken, this can overestimate the risk and is not wholly representative of the site characterisation.

No significant visual or olfactory evidence of contamination was observed within the site investigation alongside limited deposits of Made Ground encountered. No potential sources of heavy metals have been identified within the laboratory analysis of the soils, with no heavy metals identified above 500 mg/kg, and therefore there is not considered to be a significant source on site.

There are 14 groundwater abstractions identified within 250 m of the site, all of which identified 241 m east used for General farming and Domestic purposes, and therefore may be used for potable water. The River Meden is identified 64 m east of the site, and therefore is just outside the 50 m zone of influence for leaching potential.

The northern half of the site is predominantly covered by hardstanding which will reduce infiltration and leaching potential, however, as the site is currently open in the western field area, with little hard standing surface cover, rainfall is not being intercepted and subsequently infiltrates freely into the underlying affected natural stratum, potentially mobilising the identified contaminants. Despite this, the proposed end-use will include significant portions of the site covered by both hardstanding and buildings and therefore this will also reduce the risk.

Based on the above assessment, there is considered to be low risk to controlled waters.



9.3. GROUND GAS

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 – *Assessing risks posed by hazardous ground gases to buildings* (2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

9.3.1. INVESTIGATION RATIONALE

The ICSM has identified that the underlying Made Ground, may represent a potential source of ground gas generation. Based on the identification of these sources, E3P has determined that the site represents a low ground gas source generation potential.

Within the context of the proposed residential end use and ground gas generation potential, the gas assessment requires that 6 visits are required over 3 months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for low gas hazard sites (Made Ground with limited degradable material, organic clay of limited thickness) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

TABLE 9.5 GROUND GAS MONITORING LOCATION RATIONALE

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Alluvium	0.50-2.00
WS102	Alluvium	0.50-2.00
WS105	Alluvium	0.50-2.50
WS106	Alluvium	0.50-2.00

9.3.2. MONITORING METHODOLOGY

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using a calibrated infra-red gas analyser (GFM435) with gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 60 seconds at each location, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded. The results of the ground gas monitoring are presented in Table 8.9.

CIRIA C665 and NHBC Report No 10627-R01 provide assessments for carbon dioxide and methane based upon gas screening values (GSVs) utilising flow rates and concentrations. The site-based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{\text{concentration (by vol)}}{100} \times \text{flowrate (l / hr)}$$

The GSVs within CIRIA C665 are based upon all buildings other than standard residential houses. The NHBC GSVs are based upon standard residential houses with precast concrete floors (block and beam). The CIRIA 665 report author (Steve Wilson) since provided further clarification regarding which guidance should be adopted for residential houses that have suspended cast in-situ concrete floor slab: for the avoidance of doubt, it was confirmed that the GSVs within the CIRIA 665 guidance should be adopted.



The thresholds for GSVs based upon NHBC and CIRIA guidance are provided within Table 9.6.

TABLE 9.6 RESIDENTIAL THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH CIRIA C665 AND NHBS REPORT NO 10627-R01 – RESIDENTIAL END USE

CIRIA – NO SUBFLOOR VOID		NHBC – SUBFLOOR VOID		
CLASSIFICATION	GSV (METHANE AND CARBON DIOXIDE)	CLASSIFICATION	GSV (METHANE)	GSV (CARBON DIOXIDE)
CS1	< 0.07	Green	< 0.13	< 0.76
CS2	< 0.70	Amber 1	< 0.63	< 1.60
CS3	< 3.5	Amber 2	< 1.60	< 3.10
CS4	< 15	Red	> 1.60	> 3.10
CS5	< 70	N/A	N/A	N/A
CS6	> 70	N/A	N/A	N/A

9.3.3. SUMMARY OF MONITORING RESULTS

Table 9.7 presents of the ground gas and groundwater monitoring results to date.



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TABLE 9.7 SUMMARY OF GROUND GAS MONITORING RESULTS

WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	21/01/21	0.1	0.1	0.0001	4.2	4.2	0.0042	12.8	970	Falling	0.1	0.50 - 2.00m bgl	2.10	1.53
	12/02/21	0.1	0.1	0.0001	0.8	0.8	0.0008	18.8	1028	Falling	0.1		2.10	1.51
	22/02/21	0.1	0.1	0.0001	1.3	1.3	0.0013	18.0	1006	Steady	0.1		2.10	1.44
	08/03/21	0.1	0.1	0.0001	1.6	1.6	0.0016	18.4	1012	Rising	0.1		2.10	1.50
	18/03/21	0.1	0.1	0.0001	1.7	1.7	0.0017	17.5	1023	Rising	0.1		2.10	1.70
	21/04/21	0.1	0.1	0.0001	1.7	1.7	0.0017	18.5	1018	Rising	0.1		2.10	1.70
WS102	21/01/21	0.1	0.1	0.0001	1.0	1.0	0.001	19.5	970	Falling	0.1	0.50 - 2.00m bgl	1.95	1.75
	12/02/21	0.1	0.1	0.0001	0.8	0.8	0.0008	19.9	1028	Falling	0.1		1.95	1.95
	22/02/21	0.1	0.1	0.0001	0.9	0.9	0.0009	20.1	1005	Steady	0.1		1.95	1.93
	08/03/21	0.1	0.1	0.0001	0.7	0.7	0.0007	19.8	1012	Rising	0.1		1.95	1.95
	18/03/21	0.1	0.1	0.0001	0.8	0.8	0.0008	19.9	1025	Rising	0.1		1.95	1.95
	24/04/21	0.1	0.1	0.0001	0.9	0.9	0.0009	19.6	1016	Rising	0.1		1.95	1.95
WS105	21/01/21	0.1	0.1	0.0001	1.4	1.4	0.0014	18.6	969	Falling	0.1	0.50 - 2.50m bgl	2.50	2.21
	12/02/21	0.1	0.1	0.0001	1.2	1.2	0.0012	19.2	1028	Falling	0.1		2.50	2.23
	22/02/21	0.1	0.1	0.0001	1.2	1.2	0.0012	19.6	1006	Steady	0.1		2.50	2.24
	08/03/21	0.1	0.1	0.0001	1.5	1.5	0.0015	19.4	1012	Rising	0.1		2.50	2.30
	18/03/21	0.1	0.1	0.0001	0.1	0.1	0.0001	20.7	1024	Rising	0.1		2.50	2.25
	24/04/21	0.1	0.1	0.0001	0.9	0.9	0.0009	19.7	1016	Rising	0.1		2.50	2.30






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WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS106	21/01/21	0.1	0.1	0.0001	0.4	0.4	0.0004	14.5	971	Falling	0.1	0.50 - 2.00m bgl	1.95	1.41
	12/02/21	0.1	0.1	0.0001	2.6	2.6	0.0026	13.8	1024	Falling	0.1		1.95	1.54
	22/02/21	0.1	0.1	0.0001	2.1	2.1	0.0021	14.0	1006	Steady	0.1		1.92	1.51
	08/03/21	0.1	0.1	0.0001	1.4	1.4	0.0014	14.6	1012	Rising	0.1		1.95	1.55
	18/03/21	0.1	0.1	0.0001	2.2	2.2	0.0022	15.7	1023	Rising	0.1		1.95	1.55
	21/04/21	0.1	0.1	0.0001	4.7	4.7	0.0047	13.7	1017	Rising	0.1		1.95	1.60

NOTES

NHBC Traffic Light System		Typical Max CH ₄ Concentration	GSV CH ₄	Typical Max CO ₂ Concentration	GSV CO ₂
	Amber 1	1	0.16-0.63	5	0.78-1.56
	Amber 2	5	0.63-1.56	10	1.56-3.13
	Red	20	1.56+	30	3.13+

Values in **BOLD** exceed Amber 1 Thresholds
 Values in **BLUE** denote water above monitoring well



9.3.4. SOURCES OF GROUND GAS

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

- ❖ Limited Made Ground is anticipated on site however if any Made Ground deposits identified on site contain putrescible materials, the production of hazardous ground gases may occur.
- ❖ Possible underlying coal seams may also be a source of harmful gas emissions.

9.3.5. GROUNDWATER

Within the monitoring wells the groundwater levels were observed to be at depths of between 1.41-2.30 m bgl.

9.3.6. GAS FLOW

During the monitoring, a positive flow was noted in all monitoring wells. The measure of positive flow is considered to be the result of groundwater fluctuations and flooding of the well causing compression – as opposed to gas generation – as the highest flows are recorded during periods of high groundwater levels.

Negative flows are indicative of back pressure from wind being greater than the active flow from the wells.

9.3.7. GAS CONCENTRATIONS

Methane has been recorded within all monitoring wells at maximum concentrations of 0.1% v/v, respectively.

Carbon dioxide concentrations were recorded within all the monitoring wells at concentrations ranging from 0.1% v/v to 4.7% v/v (WS106).

9.3.8. GAS ASSESSMENT

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV). The GSVs for the monitoring positions are summarised in Table 9.8.

TABLE 9.8 GAS RISK PROFILE AND LOCATION

LOCATION	MAX CH ₄ (% v/v)	GSV (l/hr)	MAX CO ₂ (% v/v)	GSV (l/hr)	CLASSIFICATION
WS101	0.1	0.0001	4.2	0.0042	Green/CS1
WS102	0.1	0.0001	1.0	0.001	Green/CS1
WS105	0.1	0.0001	1.5	0.0015	Green/CS1
WS106	0.1	0.0001	4.7	0.0047	Green/CS1



The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Ground gas monitoring suggests that the site can be classified as Green/CS1, and therefore it is considered that gas protection measures will not be required.



9.4. POTABLE WATER SUPPLY

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

TABLE 9.9 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold (mg/kg)	Concentrations at Current pipeline depth (mg/kg)
Total VOC	0.5	N/A
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	5.4
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	32
Phenols (From SVOC Analysis)*	2	<1.0
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	NA
Ethers*	0.5	NA
Nitrobenzene*	0.5	NA
Ketones*	0.5	NA
Aldehydes*	0.5	NA
Amines	Fail	NA
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	None	
Is free product present in soil and groundwater?	None	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	No – heavy end hydrocarbon impact and low solubility PAH has been identified within Made Ground and the natural stratum..	
Will soils impacted with above determinands likely be utilised elsewhere on site?	No	
Will soils be imported to site as part of any future earth works	Currently unknown, however it is unlikely soils will be required to be imported to site.	

Notes - Pipe line depth normally between 0.75m–1.35m
Based on the assessment of current site conditions it is likely that barrier pipe will not be required at the proposed development.



9.5. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 9.10 has been prepared for the site.

TABLE 9.10 CONCEPTUAL MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Heavy Metals, non-volatile PAH (Made Ground)	Dermal contact. Dermal contact and ingestion.	Future site users. Off-site receptors.	Low Likelihood	Low	LOW
<p>Discussion: The Tier 1 human health risk assessment identified no site-wide concentrations of non-volatile, insoluble heavy metals and hydrocarbon compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. The test results were compared to the screening values for residential end-use and none exceeded the threshold values.</p> <p>Recommendation: The site will be suitable for redevelopment with only the incorporation of a 300mm growing medium in landscaped areas or 150mm topsoil directly overlying the natural deposits.</p>						
PL3	ACM in Made Ground	Inhalation of dust.	Future site users. Buildings. Off-site land users.	Low Likelihood	Low	LOW
<p>Assessment: Asbestos fibres have not been encountered within any of the soil samples submitted for chemical analysis.</p> <p>Recommendation: No action needed.</p>						



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POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL4	Volatile Contaminants such as hydrocarbons, solvents.	Inhalation of vapours. Migration through permeable strata and preferential pathways.	Future site users. Off-site receptors.	Low Likelihood	Low	LOW
<p>Assessment: Concentrations of volatile contaminants have not been encountered within the soils exceeding the relevant assessment criteria for the proposed development.</p> <p>Recommendation: No action needed.</p>						
PL4	Methane, carbon dioxide (peat, coal measures and potentially infilled features on and within 250 m of the site)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users.	Low likelihood	Low	LOW
<p>Assessment: Gas monitoring shows a GREEN/CS1 classification for the site, and therefore gas protection measures will not be required at the site.</p> <p>Recommendation: No action needed.</p>						
PL5	Mobile contaminants such as metals, PAHs, hydrocarbons, volatile compounds	Migration through permeable strata and preferential pathways. Perched waters migration.	Groundwater (secondary A aquifer). Surface water (Weden River).	Low likelihood	Moderate	To be determined



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POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
<p>Assessment: Leachate analysis was undertaken in soils at WS101, WS103 and WS106, and identified marginally elevated levels of heavy metals across all samples. Where leachate analysis has been undertaken, this can overestimate the risk and is not wholly representative of the site characterisation.</p> <p>No significant visual or olfactory evidence of contamination was observed within the site investigation alongside limited deposits of Made Ground encountered. No potential sources of heavy metals have been identified within the laboratory analysis of the soils, with no heavy metals identified above 500 mg/kg, and therefore there is not considered to be a significant source on site.</p> <p>There are 14 groundwater abstractions identified within 250 m of the site, all of which identified 241 m east used for General farming and Domestic purposes, and therefore may be used for potable water. The River Meden is identified 64 m east of the site, and therefore is just outside the 50 m zone of influence for leaching potential.</p> <p>The northern half of the site is predominantly covered by hardstanding which will reduce infiltration and leaching potential, however, as the site is currently open in the western field area, with little hard standing surface cover, rainfall is not being intercepted and subsequently infiltrates freely into the underlying affected natural stratum, potentially mobilising the identified contaminants. Despite this, the proposed end-use will include significant portions of the site covered by both hardstanding and buildings and therefore this will also reduce the risk.</p> <p>Based on the above assessment, there is considered to be low risk to controlled waters.</p> <p>Recommendation: No action required.</p>						
PL6	Sulphate (potential ash within Made Ground)	Sulphate attack on concrete.	Building structure.	Low likelihood	Low	LOW
<p>Assessment: Chemical analyses for pH and soluble sulphate content contained in Appendix V (summarised in Table 7.13), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).</p> <p>Recommendation: No action needed.</p>						



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POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL7	Organic contaminants such as hydrocarbons, solvents	Ingestion of tainted water supply.	Future site users. Water pipes.	Low likelihood	Low	LOW
<p>Assessment: No elevated levels of organic contaminants were detected for the subject site.</p> <p>Recommendation: No action needed.</p>						
PL8	Phytotoxic contaminants (Made Ground)	Direct Contact (plant uptake).	Flora.	Low likelihood	Low	LOW
<p>Assessment: No elevated phytotoxic contaminants were detected within the Made Ground deposits.</p> <p>Recommendation: No action needed.</p>						

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants;



10. GEOTECHNICAL ASSESSMENT

10.1. PROPOSED DEVELOPMENT

E3P understands that Shape Land & Property are intending the proposed acquisition and future redevelopment of the Three Lions public house for residential apartments and residential dwellings with associated gardens, car parking, estate road and utility infrastructure.

10.2. SUMMARY OF GROUND CONDITIONS

- ✿ **Made Ground** - Made Ground deposits were encountered in two exploratory hole locations (WS101 and WS106) to depths of between 0.46 m and 0.50 m bgl respectively.

Made Ground deposits encountered comprised a layer of asphalt, overlying a yellowish brown, very sandy gravel interpreted as a subbase layer of the asphalt. This overlays a blackish brown very gravelly medium sand with sandstone in both locations. This layer was interpreted as a layer of reworked natural ground, originating from the development of the site in the early 1970s for the construction of the Three Lions Public House.

- ✿ **Topsoil** - In the remaining exploratory holes predominantly in the southern area of site, Topsoil was generally encountered between 0.00 mbgl and 0.28 mbgl. Topsoil material was described on-site as brown sandy gravelly clay of sandstone and frequent rootlets.

- ✿ **Drift Deposits** - Drift deposits were encountered within all of the exploratory locations between 0.20 m bgl and 2.36 m bgl. The drift deposits are varied but generally comprised a medium dense to dense brown, very sandy, very gravelly SAND with gravel of sandstone interbedded with a dense reddish brown, very sandy, slightly silty GRAVEL. These deposits originated from the fluvial action of the nearby watercourse and have been interpreted as alluvial deposits. In the southern area of site, natural Topsoil was underlain by soft low strength brown slightly sandy gravelly CLAY of sandstone.

- ✿ **Solid Geology** - A medium dense to dense reddish brown, medium SAND was encountered at depths of between (1.73-2.36 mbgl) and (3.45 mbgl) which was determined through lack of granular constituents as being the weathered horizon of the underlying bedrock.

- ✿ **Groundwater** - Groundwater was encountered between 2 mbgl and 2.5 mbgl during the site investigation. Within the four installed monitoring wells on site, the groundwater levels were observed at depths of between 1.41mbgl to 2.30 mbgl.

10.3. SITE PREPARATION

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:



- ✦ Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- ✦ Demolition of all existing buildings and removal of all concrete hardstanding.
- ✦ Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ✦ Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development footprint with the resulting void backfilled.

10.4. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 10.1.

TABLE 10.1 SUMMARY OF ABP

GRANULAR SOILS			
Description	Depth (Range mbgl)	Relative Density	Allowable Bearing Pressure (kN/m ²)
Gravelly SAND	1.00	Medium dense to dense	240-500
Medium SAND	2.00	Medium dense to dense	140-300
Medium SAND – Weathered horizon of bedrock	3.00	Dense	400-430

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the areas of medium-dense sands.

Therefore upon completion of enabling works, it is likely that the most cost-effective option for the site would be shallow strip foundations, or mass trench fill in areas of variable ground:

- ✦ Shallow strip foundations bearing on medium dense to dense gravelly SAND at circa 0.75 mbgl
- ✦ Trench fill to support reinforced strip foundations in areas of variable ground and/or potential tree influence along the western boundary.

A summary of anticipated foundations is presented in Table 10.2.



TABLE 10.2 ANTICIPATED FOUNDATIONS

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (mbgl)	GROUND WATER (mbgl)	TARGET STRATUM	TREES	COAL	FOUNDATION TYPE	TYPE OF CONCRETE
WS101	0.75	2.30	Medium dense, medium SAND	N	N	Shallow Strip	DS-1 AC-1s
WS102	1.75	2.00	Dense medium SAND	N	N	Shallow Strip	DS-1 AC-1s
WS103	1.15	N/A	Dense medium SAND	N	N	Shallow Strip	DS-1 AC-1s
WS104	0.95	2.30	Medium dense medium SAND	N	N	Shallow Strip	DS-1 AC-1s
WS105	0.75	2.50	Medium dense medium SAND	N	N	Shallow Strip	DS-1 AC-1s
WS106	0.75	2.20	Dense medium SAND	N	N	Shallow Strip	DS-1 AC-1s

10.5. HIGHWAYS CONSTRUCTION

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

10.6. DRAINAGE

The site is predominantly underlain by circa 1-3m of likely high probability gravelly SAND and sandy GRAVEL. Therefore the use of soakaway drainage will be applicable to the site.

If soakaway drainage is to be considered, full BRE 365 testing must be completed to inform the detailed design.

10.7. CONCRETE DURABILITY

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).

10.8. EXCAVATIONS

Site observations indicated that excavations should be feasible in the near surface with normal plant. It is anticipated that any obstructions will be grubbed out during the reduced-level dig for the substructure works, this is primarily focused on the area around the Three Lions Public House post-demolition.



However due to the variability of the natural ground and likelihood of trench collapse, it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

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

TABLE 10.3 CIVIL ENGINEERING EXCAVATION RISK MATRIX

RISK ITEM	PRESENT	COMMENT
Running Sands	No	No running sand has been identified.
Minor Water Ingress	Yes	Minor water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	Yes	Shallow bedrock has been identified throughout the site at depths less than 3 m below current ground levels. The presence of shallow bedrock may impede excavation for drainage infrastructure using traditional excavation plant and equipment.

10.9. CONSTRUCTION ACTIVITY AND INSPECTION

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

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



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10.10. GEOTECHNICAL RISK REGISTER

POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON-SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils		N/A	N/A	Contaminated soils have not been identified within the subject site.
Bedrock		All	100	Shallow bedrock is identified, this represents a significant risk in terms of the viability for excavations to install infrastructure using standard construction equipment at circa >3.45m.
Obstructions		Area surrounding Three Lions Public House	30	The area inside the existing building footprint and in the vicinity of the existing building will likely have obstructions present.
Artificially levelled and filled platforms		N/A	N/A	The site appears to be in its natural state in terms of levels.
Retaining walls		N/A	N/A	No retaining walls were identified on-site.
Trench collapse		All	100	Made Ground present beneath the site is likely to be loosely compacted and possibly prone to collapse.
Mature trees		N/A	N/A	No cohesive material has been identified on-site, hence tree influence in terms of geotechnical considerations are not applicable.
Volume change potential clay		Southern area	<10	Limited deposits of cohesive material were identified on site, and therefore heave precautions are not considered to be required.
Peat		Not on-site	N/A	No peat has been identified on-site.
Running sands		N/A	N/A	Data searches indicate low risk.



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POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON-SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Ground dissolution		N/A	N/A	Data searches indicate no hazard.
Concrete design		On site	100	Chemical results indicate the concrete design being DS-1/AC-1s.
Low-permeability ground		N/A	N/A	No low permeability ground was encountered for the subject site.
Services/sensitive structures		-Yes	20	A review of online services combined with onsite observations has identified a number of services within the site boundary, primarily focused on the area surrounding the Three Lions Public House.
Abnormal foundation solutions		N/A	20	Due to the lack of investigation within the area of the existing building, alongside shallow bedrock across the site and an assumption of deeper Made Ground, there may be a requirement for engineered foundation solutions within the vicinity of the public house. Further post demolition site investigation will be required to confirm the ground conditions and ultimate foundation solution.
Areas not investigated		N/A	20	All proposed areas of investigation were conducted during the site investigation, however the existing pub building alongside the area within the vicinity of the existing building had a significant presence of underlying services leading to a lack of investigation.
Surface water features		N/A	N/A	No surface water features were present on site.
Current ponds to be filled		N/A	N/A	No ponds were present on site.
Mining		Yes	0	The coal seams located beneath the property are overlain by a significant depth of overburden, hence will not pose a threat to the proposed development.
Slope		N/A	N/A	No significant slopes were identified on-site.



10.11. FURTHER WORKS

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

- ✦ Further post demolition site investigation will be required to confirm the ground conditions and ultimate foundation solution.
- ✦ Plot-specific foundation schedule (upon receipt of the final development levels).
- ✦ Geotechnical earthworks strategy (infrastructure).



11. CONCLUSIONS AND RECOMMENDATIONS

11.1. CONTAMINATED LAND ASSESSMENT

<p>Human Health</p>	<p>The Tier 1 human health risk assessment identified no site-wide concentrations of non-volatile, insoluble heavy metals and hydrocarbon compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. The test results were compared to the screening values for residential end-use and none exceeded the threshold values. The site will be suitable for redevelopment with only the incorporation of a 300mm growing medium in landscaped areas.</p> <p>ACM's are likely contained within the existing building fabric, with a pre-demolition survey recommended in regards to this matter.</p>
<p>Controlled Waters</p>	<p>Leachate analysis was undertaken in soils at WS101, WS103 and WS106, and identified marginally elevated levels of heavy metals across all samples. Where leachate analysis has been undertaken, this can overestimate the risk and is not wholly representative of the site characterisation.</p> <p>No significant visual or olfactory evidence of contamination was observed within the site investigation alongside limited deposits of Made Ground encountered. No potential sources of heavy metals have been identified within the laboratory analysis of the soils, with no heavy metals identified above 500 mg/kg, and therefore there is not considered to be a significant source on site.</p> <p>There are 14 groundwater abstractions identified within 250 m of the site, all of which identified 241 m east used for General farming and Domestic purposes, and therefore may be used for potable water. The River Meden is identified 64 m east of the site, and therefore is just outside the 50 m zone of influence for leaching potential.</p> <p>The northern half of the site is predominantly covered by hardstanding which will reduce infiltration and leaching potential, however, as the site is currently open in the western field area, with little hard standing surface cover, rainfall is not being intercepted and subsequently infiltrates freely into the underlying affected natural stratum, potentially mobilising the identified contaminants. Despite this, the proposed end-use will include significant portions of the site covered by both hardstanding and buildings and therefore this will also reduce the risk.</p> <p>Based on the above assessment, there is considered to be low risk to controlled waters.</p>
<p>Ground Gas</p>	<p>Preliminary ground gas monitoring suggests that the site can be predominantly classified as CS1, and in these areas, it is considered that gas protection measures will not be required.</p>
<p>Potable Water</p>	<p>This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.</p>



11.2. GEOTECHNICAL ASSESSMENT

The area inside the existing building footprint and in the vicinity of the existing building will likely have obstructions present. During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.

The underlying sand and gravel drift deposits have been assessed as being medium dense to dense with a net ABP in the order of 240-500 kN/m² at circa 1 mbgl decreasing to 140-300 kN/m² at circa 2 mbgl.

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the areas of medium-dense sands.

Therefore upon completion of enabling works, it is likely that the most cost-effective option for the site would be shallow strip foundations bearing on firm to gravelly medium SAND at circa 0.75 mbgl, or mass trench fill in areas of variable ground.

Due to the lack of investigation within the area of the existing building, alongside shallow bedrock across the site and an assumption of deeper Made Ground, there may be a requirement for a mass trench foundation solution within the vicinity of the public house. Further post demolition site investigation will be required to confirm the ground conditions and ultimate foundation solution.

Ground-bearing floor slabs are unlikely to be viable given the anticipated depths and no heave precautions are considered to be required.

The site is predominantly underlain by circa 1-3m of likely high probability gravelly SAND and sandy GRAVEL. Therefore the use of soakaway drainage is considered applicable to the site. If soakaway drainage is to be considered, full BRE 365 testing must be completed to inform the detailed design.

Concrete classification will be DS1 AC1s.

Granular soils can be re-engineered to ensure 5% within the subgrade during favourable climatic conditions. Development levels unknown at this time; however, significant cut-and-fill works will likely be required to prepare the development platform.

The E3P Intrusive Ground Investigation has identified the presence of weathered/competent bedrock at a shallow depth, the presence of which will impede the excavation materials to form sewerage and drainage infrastructure and foundations.

END OF REPORT



APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

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



Three LionsPhase II Geoenvironmental Site Assessment
July 2023

MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection



APPENDIX III DRAWINGS

DRAWING 14-437-001 – SITE LOCATION PLAN





Proposed Site Layout
1:500

Notes: This drawing is the copyright Paddock Johnson Partnership Limited and may not be used without their prior written consent. Written dimensions to be taken in preference to scaled dimensions. Due to the inaccuracies of scanning, scanned images should not be scaled.

REV:	DATE:	DESCRIPTION:	BY:
A	May 2022	Annotation Amendments	SH
B	29.09.22	Re-design of layout arrangement following LA's feedback	RD
C	27.10.22	Amended proposed site layout following planning officer's comments (21.10.22)	RD
D	22.11.22	Amended proposed site layout following client's comments	RD
E	14.12.22	Annotations amended.	RD
F	27.01.23	Site Layout updated following planning officer's comments	RD
G	07.03.23	Site Layout Annotation updated following Planning Officer's comments	RD
H	13.03.23	Site Layout Re-Arrangement	RD
I	17.03.23	Site Layout Amendments	RD
J	28.03.23	Boundary Line Amendmend following Official Title Plan	RD
K	05.04.23	Annotation Amendments	RD
L	25.04.23	Site Layout updated following planning officer's comments	RD

Units Mix:

28 no. 1B2P Walk Up Apartments

1 no. 2B3P Bungalow

7 no. 2B4P Houses

5 no. 3B5P Houses

Total: 41 units

Parking Arrangement:

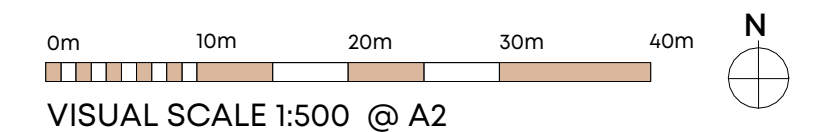
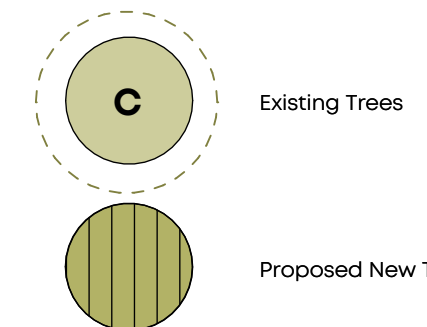
Typical Car Parking Space - 2.5m x 5.0m

Parallel Car Parking Space - 2.5m x 6.0m

Total: 56 (2 of which for visitors)

V Visitor Spaces

***** EV Charing Points
4 no. to allocated points
10 no. (20%) unallocated points



CLIENT:

Shape Land & Property

PROJECT:

New Housing
11-15 Netherfield Lane, Mansfield
NG20 9PA

DRAWING NUMBER:

22042-PJA-00-ZZ-DR-A-1002-L

DRAWING TITLE:

Proposed Site Plan

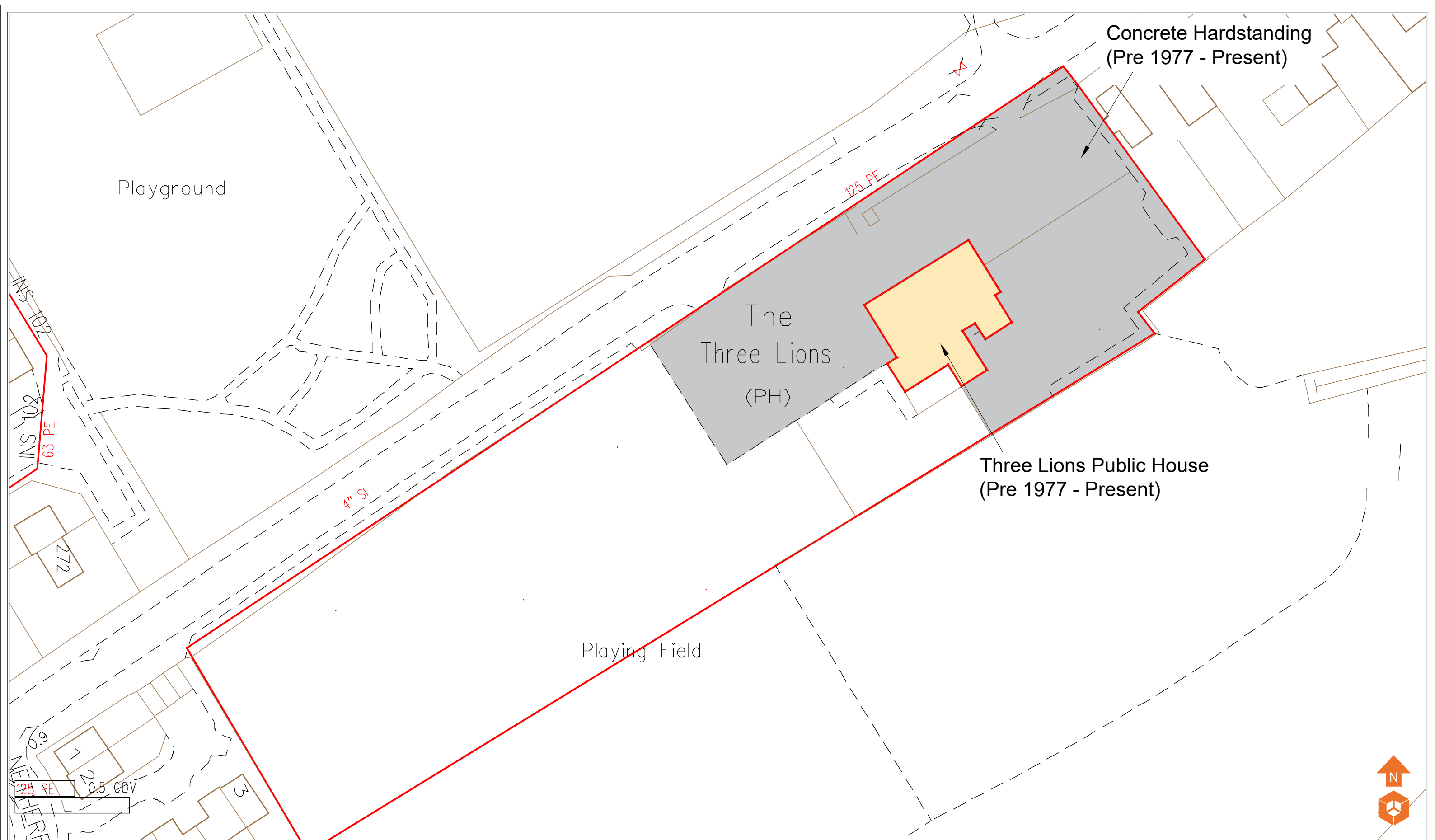
STATUS:

PLANNING

SCALE: As indicated@A2 DATE: May 2022 BY: RD CHECKED: SH

**PADDOCK
JOHNSON**

Studio 2, The Lyceum,
Bath Street, Port Sunlight,
Merseyside, CH62 4UU
0151 643 1234
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Paddock Johnson Partnership
Limited. Registered in England
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Historical Features

	Concrete Hard Standing (Pre 1977 - Present)
	Three Lions Public House (Pre 1977 - Present)

Notes:

Client:

Shape
Propertyys

Job No:

14-437

Drawing No:

003

Date:

26.04.2021

Scale:

NTS



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

Phase	Issue	Date	Drawn	Checked
P1	REVB	26.04.2021	HM	PW
P1	REVA	15.02.2021	EB	BH

Job Title:

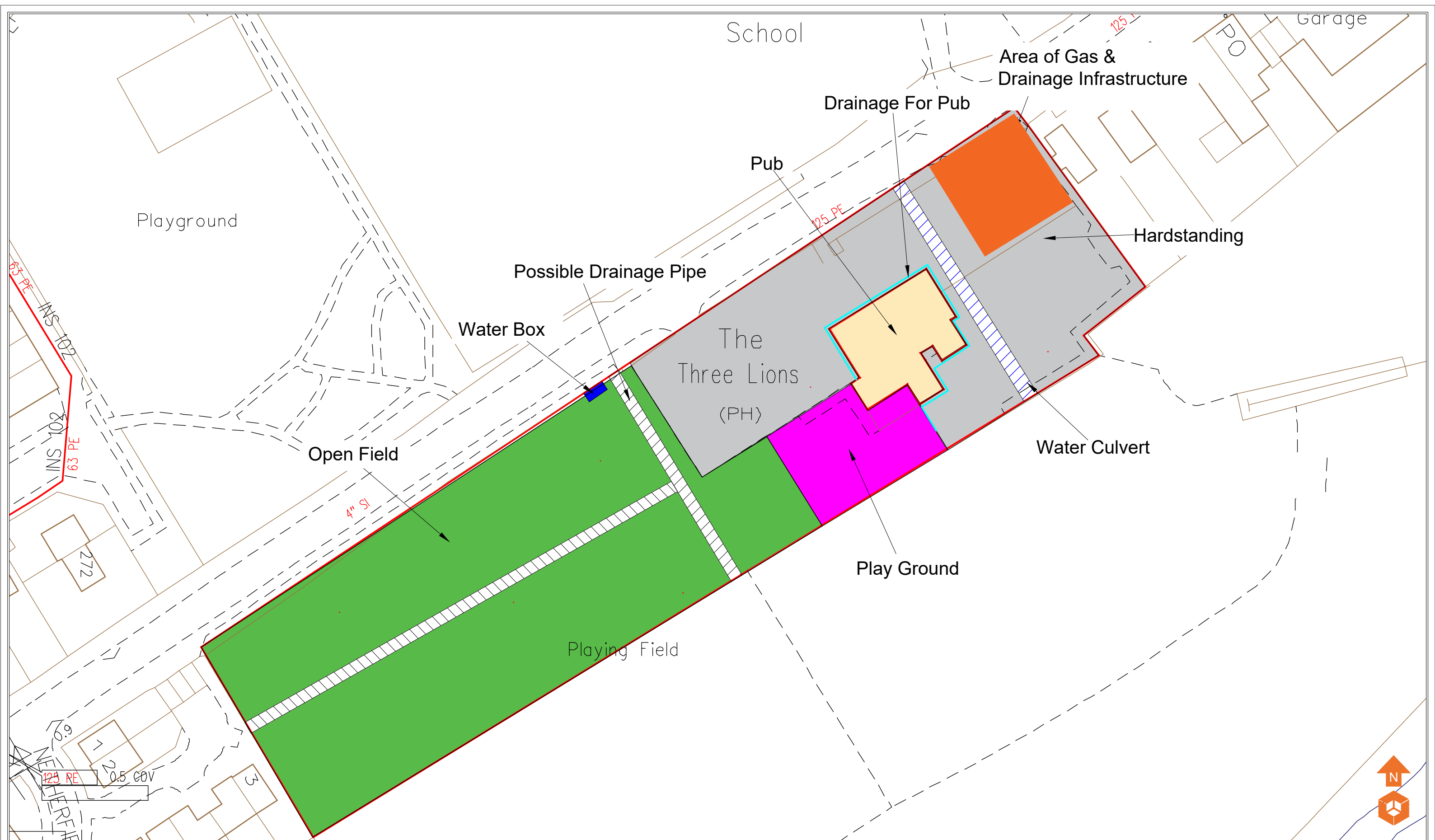
Three Lions,
Netherfield Lane

Drawing Title:

Historical Features
Plan

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Site Features

- Hardstanding
- Open Field
- Play Ground
- Three Lions Pub
- Water Box
- Possible Drainage Pipe
- Water Culvert
- Drainage for Pub
- Area of Gas & Drainage Infrastructure

Notes:

Phase	Issue	Date	Drawn	Checked
P1	REVC	29.03.2021	HM	JC
P1	REVB	24.03.2021	EB	BH
P1	REVA	19.03.2021	EB	BH

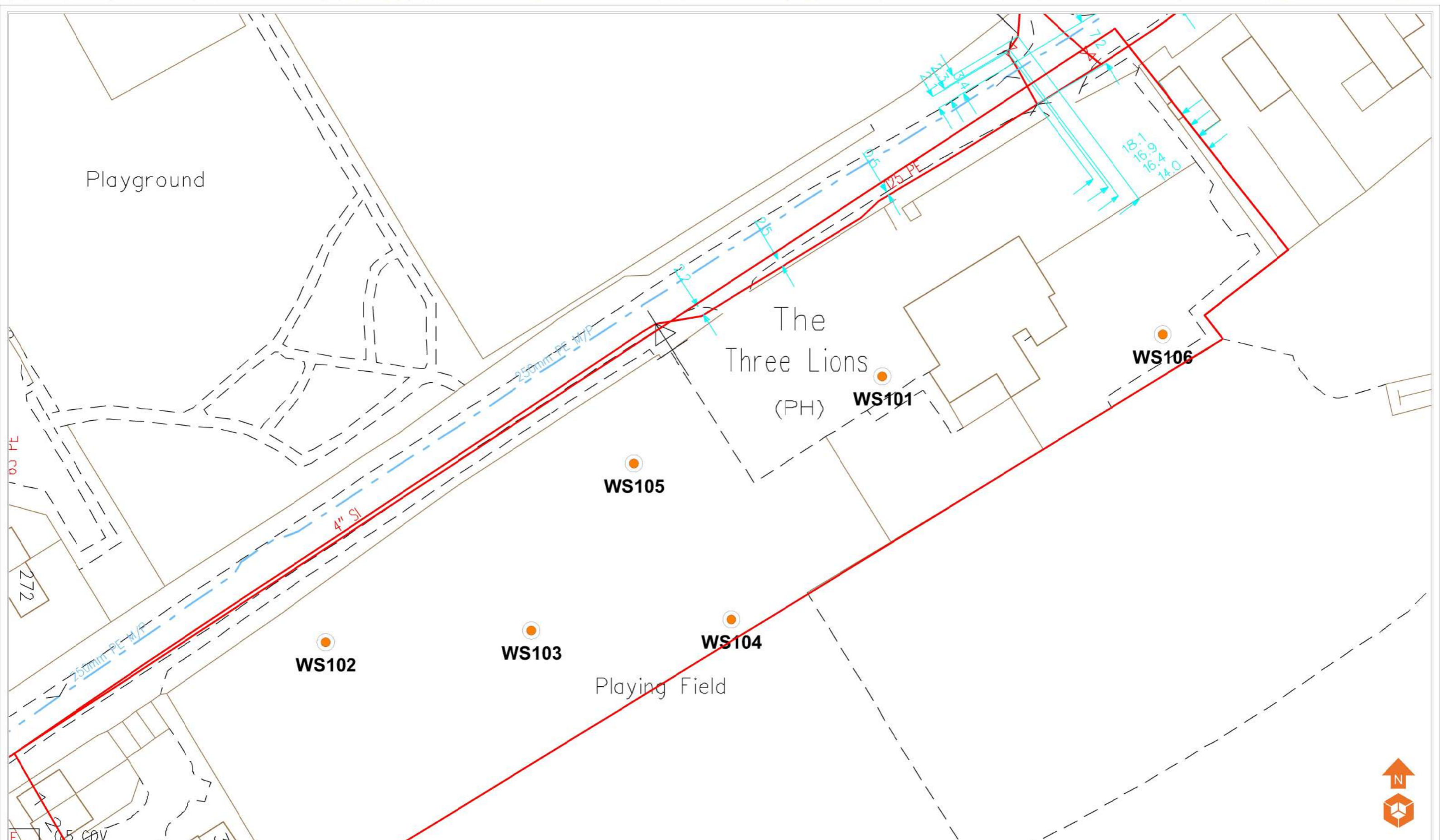
Client: Shape Propertyys

Job Title: Three Lions, Netherfield Lane

Job No: 14-437	Date: 29.03.2021
Drawing No: 004	Scale: NTS
Drawing Title: Site Features Plan	

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Location Symbols
 * Approximate Window Sample Probehole Location

Notes:				
P1	REVA	15.02.2021	EB	BH
Phase	Issue	Date	Drawn	Checked

Client:
Shape Properties

Job Title:
Three Lions, Netherfield Lane

Job No:
14-437

Drawing No:
005

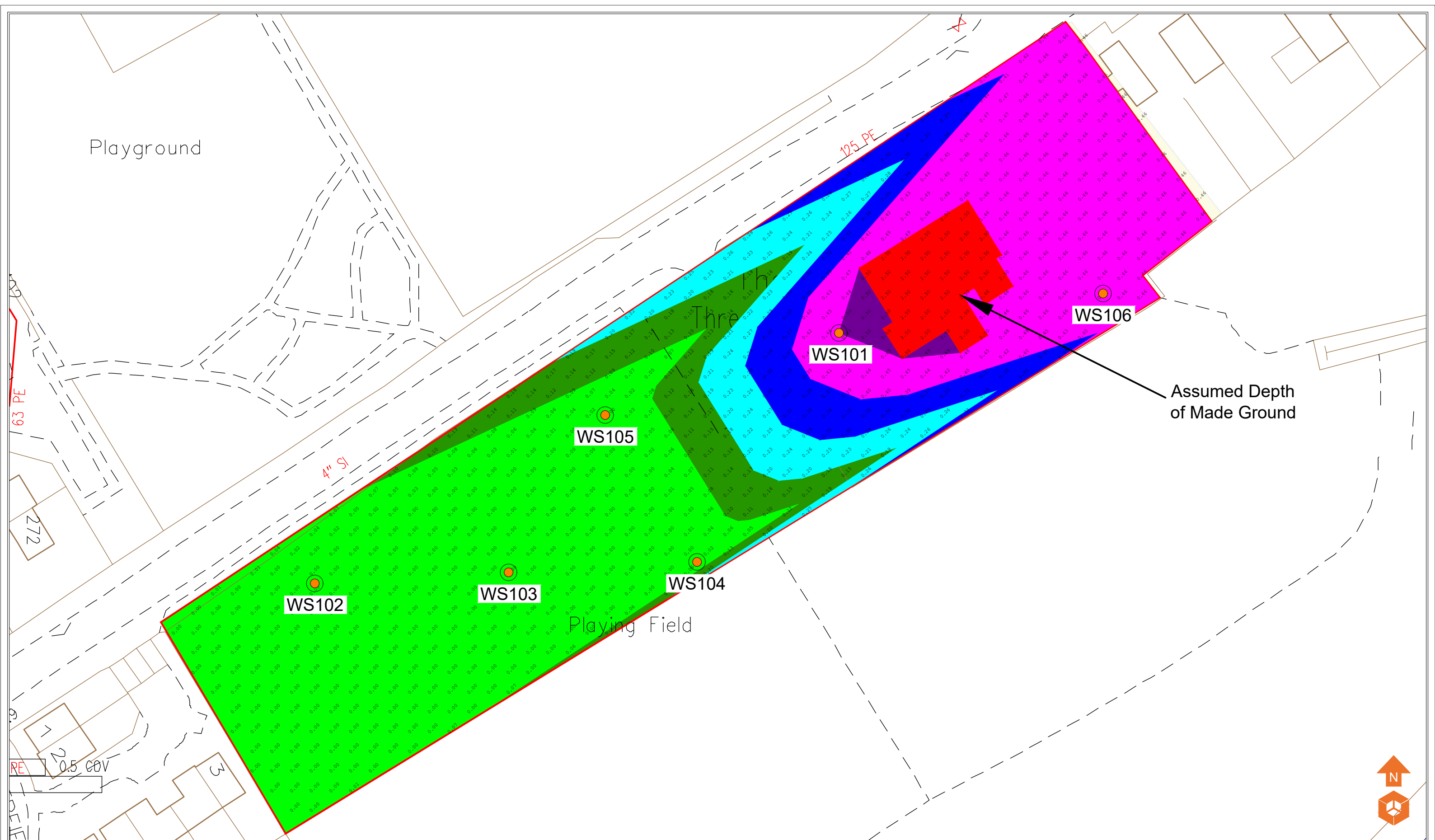
Date:
15.02.2021

Scale:
NTS



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Location Symbols
 ● Approximate Window Sample Probehole Location

Made Ground Depth (m)

Light Green	Depth of Made Ground 0.00 - 0.09m
Dark Green	Depth of Made Ground 0.10 - 0.19m
Cyan	Depth of Made Ground 0.20 - 0.29m
Blue	Depth of Made Ground 0.30 - 0.39m
Magenta	Depth of Made Ground 0.40 - 0.49m
Purple	Depth of Made Ground 0.50 - 0.59m
Yellow	Depth of Made Ground 0.60 - 0.69m
Orange	Depth of Made Ground 0.70 - 0.79m
Red	Depth of Made Ground >0.80m

Notes:

Client:

Job No:

Date:

Shape Propertyts				
------------------	--	--	--	--

14-437

29.04.2021

P1	REVB	29.04.2021	HM	JC
P1	REVA	22.02.2021	EB	BH
Phase	Issue	Date	Drawn	Checked

Drawing No:

Scale:

006

NTS

Job Title:

Drawing Title:

Three Lions,
Netherfield Lane

Depth Of Made
Ground Plan



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Location Symbols

• Approximate Window Sample Probohole Location

Topsoil Depth (m)

- Depth of Topsoil 0.00 - 0.19m
- Depth of Topsoil 0.20 - 0.29m
- Depth of Topsoil 0.30 - 0.49m
- Depth of Topsoil 0.50 - 0.59m
- Depth of Topsoil 0.60 - 0.69m
- Depth of Topsoil 0.70 - 0.79m
- Depth of Topsoil 0.80 - 0.89m
- Depth of Topsoil 0.90 - .99m
- Depth of Topsoil >1.00m

Notes:

Client: Shape Propertyys

Phase	Issue	Date	Drawn	Checked
P1	REVB	29.04.2021	HM	JC
P1	REVA	25.02.2021	HM	BH

Job No: 14-437

Date: 29.04.2021

Job Title: Three Lions, Netherfield Lane

Drawing No: 007

Scale: NTS

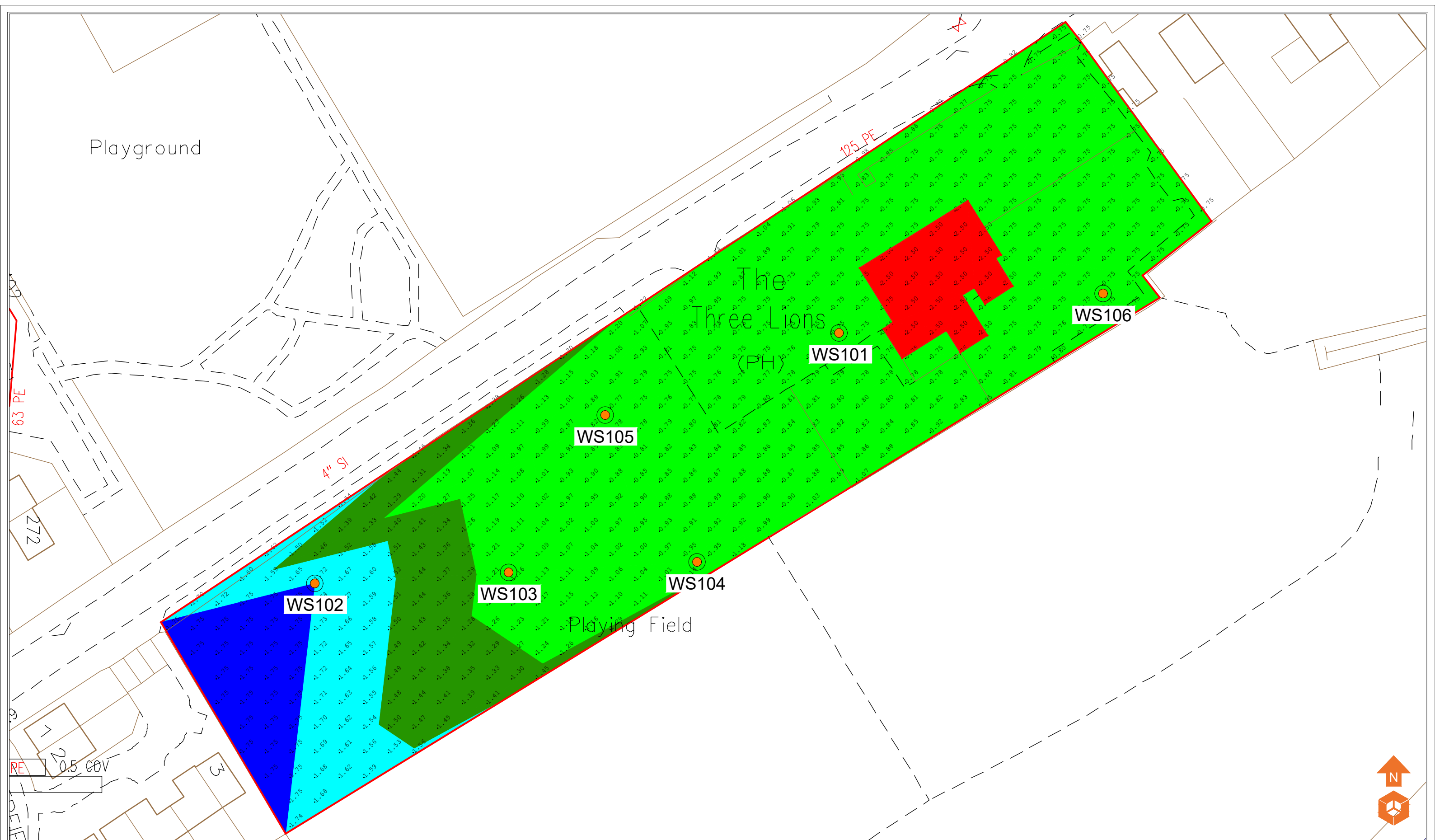
Drawing Title: Depth Of Topsoil Plan



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Location Symbols
 ● Approximate Window Sample Probehole Location

- Shallow Spread Footings**
- Depth to Founding Strata 0.00 - 1.24m
 - Depth to Founding Strata 1.25 - 1.49m
- Mass Trench Fill Footings**
- Depth to Founding Strata 1.50 - 1.74m
 - Depth to Founding Strata 1.75 - 1.99m
 - Depth to Founding Strata 2.00 - 2.24m
- Engineered Footings**
- Depth to Founding Strata 2.25 - 2.49m
 - Depth to Founding Strata >2.50m

Notes:

Phase	Issue	Date	Drawn	Checked
P1	REVB	26.04.2021	HM	PW
P1	REVA	03.03.2021	LM	BH

Client:

Shape
Properties

Job Title:

Three Lions,
Netherfield Lane

Job No:

14-437

Drawing No:

008

Date:

26.04.2021

Scale:

NTS

Drawing Title:

Depth to Founding
Strata Plan

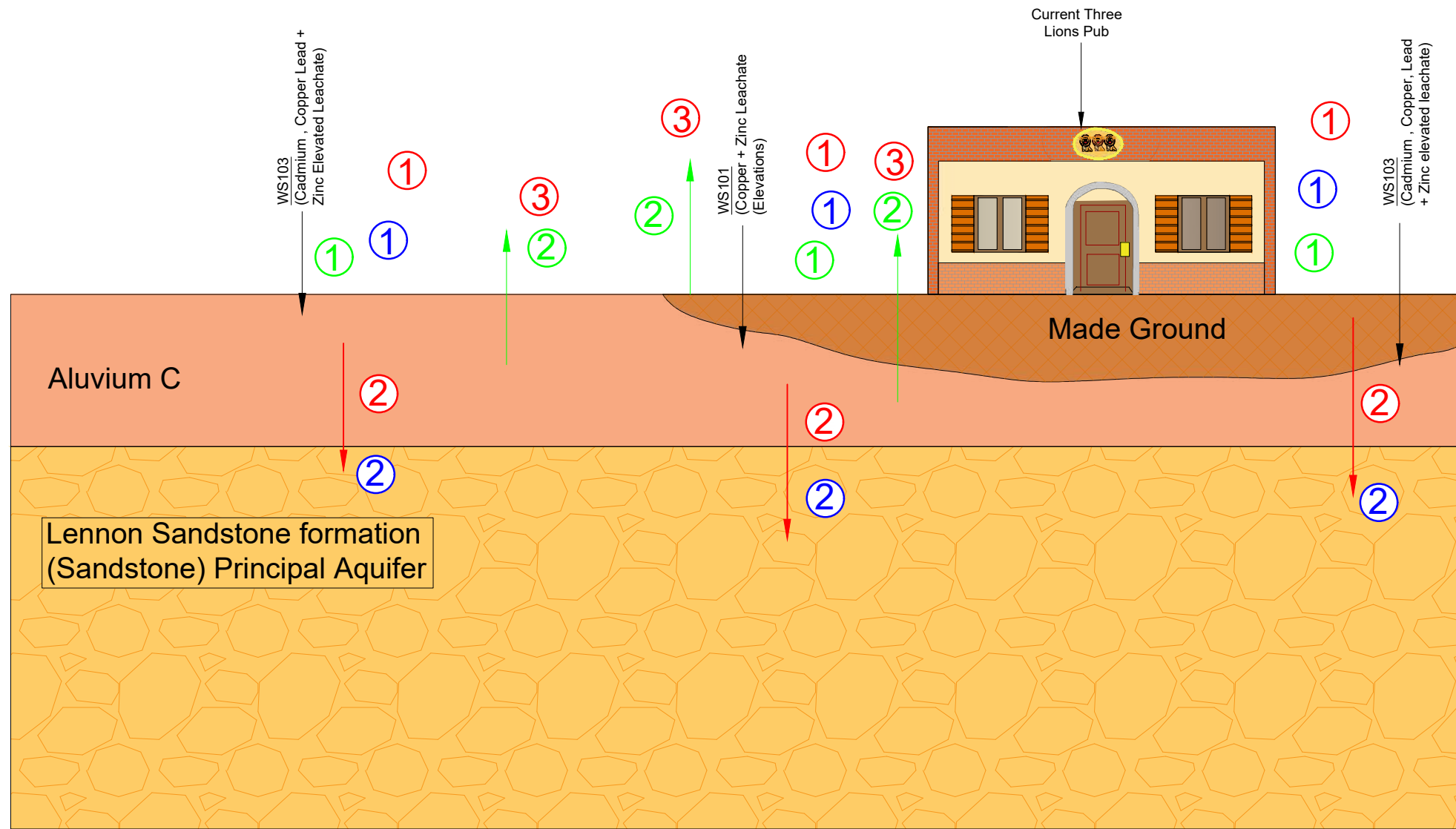
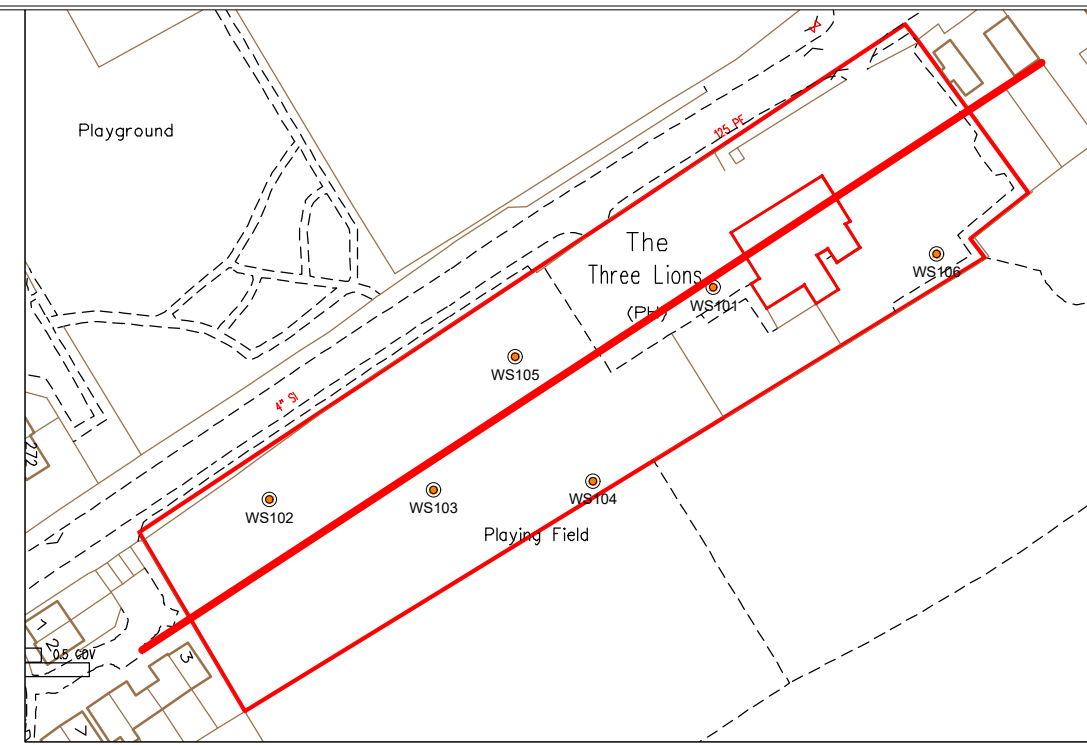


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SW

NE



Geology Key

	Made Ground
	Aluvium C
	Lennon Sandstone

Sources

	Elevated Metals
	Hazardous Ground Gas (Sources)

Receptors

	Future Residents / Construction Workers
	Bedrock Groundwater

Pathways

	Dermal Contact
	Vertical Migration
	Vapours

Notes:

P1	REVA	03.03.2021	LM	JC
Phase	Issue	Date	Drawn	Checked

Client:

Shape
Properties

Job Title:

Three Lions,
Netherfield Lane

Job No:

14-437

Drawing No:

010

Date:

03.03.2021

Scale:

NTS

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Drawing Title:

Conceptual Site
Model

APPENDIX IV PHOTOGRAPHS

Three Lions

Phase II Geoenvironmental Site Assessment

July 2023

PLATE 1 VIEW OF FRONT OF THE THREE LIONS PUBLIC HOUSE IN THE NORTH OF SITE



PLATE 2 VIEW OF SOUTHERN AREA OF SITE



Three Lions

Phase II Geoenvironmental Site Assessment
July 2023

PLATE 3 VIEW OF NORTHERN AREA OF SITE FACING SOUTH



PLATE 4 VIEW OF CAR PARK TO THE NORTH OF THE EXISTING PUB BUILDING SHOWING MATURE TREES ALONG THE EASTERN BOUNDARY.



APPENDIX V
E3P EXPLORATORY HOLE
LOGS

Project Name: Three Lions

 Project No.
14437

Co-ords: 458057E - 369540N

 Hole Type
WS

Location: Meden Vale, Mansfield

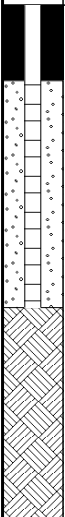
Level:

 Scale
1:50

Client: Shape Land and Property

Dates: 07/01/2021

 Logged By
J Craig

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20			0.20		MADE GROUND: Asphalt.	
		0.30	ES		0.34		MADE GROUND: Yellowish brown very sandy gravel. Gravel is angular to subangular, fine to coarse of sandstone.	
		0.40	ES		0.50		MADE GROUND: Blackish brown very gravelly medium sand. Gravel is angular to rounded, fine to coarse of sandstone.	
		0.60	ES				Medium dense brown, slightly silty, very gravelly, medium SAND. Gravel is rounded, fine to coarse of sandstone.	
		1.00	SPT	N=24 (3,5/6,6,6,6)		1.70		Medium dense reddish brown very sandy, slightly silty GRAVEL. Gravel is rounded, fine to coarse of sandstone.
	2.00	SPT	N=33 (2,3/4,7,10,12)		1.95		Weak reddish brown SANDSTONE. Recovered as: Dense reddish brown medium SAND.	
	3.00	SPT	50 (11,13/50 for 150mm)		3.45		End of Borehole at 3.45m	

Remarks

1. Refusal at 3.45m bgl on sandstone bedrock 2. Water strike at 2.30m bgl 3. Monitoring well installed with response zone 0.5 -2.0 m bgl.

Project Name: Three Lions

 Project No.
14437

Co-ords: 457970E - 369501N

 Hole Type
WS

Location: Meden Vale, Mansfield

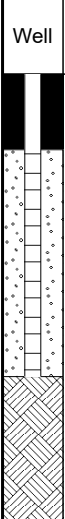

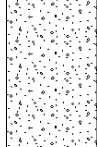
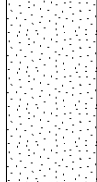
Level:

 Scale
1:50

Client: Shape Land and Property

Dates: 07/01/2021

 Logged By
J Craig

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15	ES		0.20		TOPSOIL: Soft low strength brown clay. Frequent rootlets.	1	
		0.30	B						
		0.40	ES						
		1.00	SPT	N=24 (2,3/4,5,7,8)	1.24		Medium dense brown clayey gravelly SAND. Gravel is rounded to subangular, fine to coarse of sandstone.		
		1.48			Medium dense brown slightly clayey, gravelly, medium SAND. Gravel is rounded, fine to coarse of sandstone.				
		1.73			Medium dense brown silty, sandy GRAVEL. Gravel is rounded, fine to coarse of sandstone.				
2.00	SPT	N=41 (4,7/8,9,12,12)	2.95		Weak reddish brown SANDSTONE. Recovered as: Dense reddish brown medium SAND.	2			
2.50	SPT	50 (8,10/50 for 285mm)							
							End of Borehole at 2.95m	3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Refusal at 2.95m bgl on sandstone bedrock 2. Water strike at 2.00m bgl 3. Monitoring well installed with response zone 0.5 -2.0 m bgl.



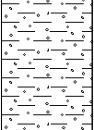
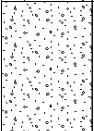
Borehole Log


Borehole No.

WS103

Sheet 1 of 1

Project Name: Three Lions	Project No. 14437	Co-ords: 457990E - 369493N	Hole Type WS
Location: Meden Vale, Mansfield		Level:	Scale 1:50
Client: Shape Land and Property		Dates: 07/01/2021	Logged By J Craig

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15	ES		0.21		 TOPSOIL: Soft low strength brown clay. Frequent rootlets.		
		1.00	SPT	N=31 (3,4/6,7,7,11)	1.14		 Soft low strength brown slightly sandy gravelly CLAY. Gravel is rounded to subangular, fine to coarse of sandstone.	1	
		1.50 1.60	ES SPT	50 (8,12/50 for 285mm)	2.05		 Dense brown slightly clayey, gravelly, medium SAND. Gravel is rounded, fine to coarse of sandstone.	2	
							End of Borehole at 2.05m	3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks	
1. Refusal in natural ground at 2.05m bgl, possible cobble/boulder.	



Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Three Lions

Project No.
14437

Co-ords: 458031E - 369502N

Hole Type
WS

Location: Meden Vale, Mansfield








Level:

Scale
1:50

Client: Shape Land and Property

Dates: 07/01/2021

Logged By
J Craig

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 2.30	0.20	ES		0.28		TOPSOIL: Soft low strength brown clay. Frequent rootlets.		
		0.80	ES				Soft low strength brown slightly sandy gravelly CLAY. Gravel is rounded to subangular, fine to coarse of sandstone.		
		1.00	SPT	N=23 (2,3/5,6,6,6)	0.93		Medium dense brown, slightly silty, very gravelly, medium SAND. Gravel is rounded, fine to coarse of sandstone.	1	
		1.40	B						
		2.00	SPT	N=16 (4,5/3,3,4,6)	1.82		Weak reddish brown SANDSTONE. Recovered as: Medium-dense reddish brown medium SAND.	2	
		3.00	SPT	50 (10,14/50 for 150mm)	3.45			3	
							End of Borehole at 3.45m	4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Refusal at 3.45m bgl on sandstone bedrock 2. Water strike at 2.30m bgl





Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Three Lions	Project No. 14437	Co-ords: 458014E - 369528N	Hole Type WS
Location: Meden Vale, Mansfield		Level:	Scale 1:50
Client: Shape Land and Property		Dates: 07/01/2021	Logged By J Craig

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.28		TOPSOIL: Soft low strength brown clay. Frequent rootlets.		
		0.50	ES		0.64		Soft low strength brown slightly sandy gravelly CLAY. Gravel is rounded to subangular, fine to coarse of sandstone.		
		0.70	ES						
		1.00	SPT	N=24 (4,3/4,6,6,8)			Medium dense brown gravelly, medium SAND. Gravel is rounded to subangular, fine to coarse of sandstone.	1	
		2.00	SPT	N=20 (5,6/6,4,5,5)				2	
	2.36								
	2.50						Weak reddish brown SANDSTONE. Recovered as: Medium-dense reddish brown medium SAND.	3	
	3.00	SPT	50 (8,11/50 for 160mm)						
					3.45		End of Borehole at 3.45m	4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks
 1. Refusal at 3.45m bgl on sandstone bedrock 2. Water strike at 2.50m bgl 3. Monitoring well installed with response zone 0.5 -2.5 m bgl.



Project Name: Three Lions

 Project No.
14437

Co-ords: 458101E - 369552N

 Hole Type
WS

Location: Meden Vale, Mansfield

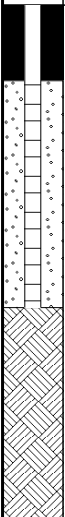
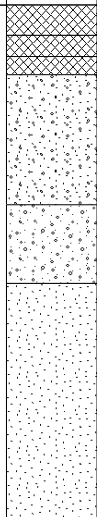
Level:

 Scale
1:50

Client: Shape Land and Property

Dates: 07/01/2021

 Logged By
J Craig

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.20		MADE GROUND: Asphalt.	
		0.40	ES		0.34		MADE GROUND: Yellowish brown very sandy gravel. Gravel is angular to subangular, fine to coarse of sandstone.	
		0.60	ES		0.46		MADE GROUND: Blackish brown very gravelly medium sand. Gravel is angular to rounded, fine to coarse of sandstone.	
		0.70	B				Dense brown, slightly silty, very gravelly, medium SAND. Gravel is rounded, fine to coarse of sandstone.	
		1.00	SPT	N=49 (3,3/7,13,17,12)	1.32		Dense reddish brown very sandy, slightly silty GRAVEL. Gravel is rounded, fine to coarse of sandstone.	
		2.00	SPT	N=19 (1,2/3,5,5,6)	1.84		Weak reddish brown SANDSTONE. Recovered as: Medium-dense reddish brown medium SAND.	
		3.00	SPT	50 (7,8/50 for 180mm)	1.84			
					3.45		End of Borehole at 3.45m	

Remarks

1. Refusal at 3.45m bgl on sandstone bedrock 2. Water strike at 2.20m bgl 3. Monitoring well installed with response zone 0.5 -2.0 m bgl.

APPENDIX VI CHEMICAL TESTING RESULTS



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Analytical Report Number : 21-50175

Project / Site name:	Three Lions	Samples received on:	08/01/2021
Your job number:	14-437	Samples instructed on/ Analysis started on:	08/01/2021
Your order number:	JC-14437-B	Analysis completed by:	15/01/2021
Report Issue Number:	1	Report issued on:	15/01/2021
Samples Analysed:	3 leachate samples - 11 soil samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number	1733176	1733177	1733178	1733179	1733180			
Sample Reference	WS101	WS101	WS102	WS102	WS103			
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Depth (m)	0.30	0.60	0.15	0.40	0.15			
Date Sampled	07/01/2021	07/01/2021	07/01/2021	07/01/2021	07/01/2021			
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	7.3	6.1	14	7.2	8.7
Total mass of sample received	kg	0.001	NONE	0.5	1.2	0.5	0.5	0.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.4	-	-	-	7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO4	mg/kg	50	MCERTS	430	-	-	-	580
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.0082	-	-	-	0.011
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	16	-	-	-	21
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	8.2	-	-	-	10.7
Sulphide	mg/kg	1	MCERTS	< 1.0	-	-	-	1.7
Total Sulphur	mg/kg	50	MCERTS	120	-	-	-	310

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.36	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.44	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	0.8	< 0.80	< 0.80
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Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number	1733176	1733177	1733178	1733179	1733180
Sample Reference	WS101	WS101	WS102	WS102	WS103
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	0.60	0.15	0.40	0.15
Date Sampled	07/01/2021	07/01/2021	07/01/2021	07/01/2021	07/01/2021
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Element	Unit	Limit of detection	Accreditation Status	1733176	1733177	1733178	1733179	1733180
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	2.4	11	7.4	4.9	6.4
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	58	70	56	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	0.97	0.46	0.4	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	< 0.2	0.6	< 0.2	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	3.8	-	-	-	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	20	17	17	8.7
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	16	34	15	26
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	4.7	14	8.6	21	16
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	22	19	18	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	30	65	62	44	53

Petroleum Hydrocarbons

Parameter	Unit	Limit of detection	Accreditation Status	1733176	1733177	1733178	1733179	1733180
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	4.7	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	13	< 1.0	11	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	29	< 1.0	30	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	49	< 10	42	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number				1733181	1733182	1733183	1733184	1733185
Sample Reference				WS103	WS104	WS104	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.50	0.20	0.80	0.70	0.40
Date Sampled				07/01/2021	07/01/2021	07/01/2021	07/01/2021	07/01/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	5.6	7.9	8.5	6.6	16
Total mass of sample received	kg	0.001	NONE	1.5	0.4	0.5	1.5	1.0

Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-	-	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.3	-	7.2	-	7.3
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO4	mg/kg	50	MCERTS	210	-	260	-	560
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.0087	-	0.007	-	0.018
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	17	-	14	-	36
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	8.7	-	7.0	-	17.8
Sulphide	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	15
Total Sulphur	mg/kg	50	MCERTS	66	-	130	-	490

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80	< 0.80
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Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number				1733181	1733182	1733183	1733184	1733185
Sample Reference				WS103	WS104	WS104	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.50	0.20	0.80	0.70	0.40
Date Sampled				07/01/2021	07/01/2021	07/01/2021	07/01/2021	07/01/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.9	8.1	5.1	5.0	8.5
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	67	-	25	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	0.51	-	0.36	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.4	-	0.3	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11	-	9.3	-	14
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.3	9.2	4.7	13	17
Lead (aqua regia extractable)	mg/kg	1	MCERTS	10	35	12	8.2	33
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	11	8.9	16	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	21	-	14	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	45	64	34	34	76

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	5.4	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	13	6.3	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	32	21	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	52	30	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number				1733186
Sample Reference				WS106
Sample Number				None Supplied
Depth (m)				0.60
Date Sampled				07/01/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	9.7
Total mass of sample received	kg	0.001	NONE	0.5

Asbestos in Soil	Type	N/A	ISO 17025	-
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.7
Total Cyanide	mg/kg	1	MCERTS	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	330
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.046
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	93
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	46.4
Sulphide	mg/kg	1	MCERTS	4.2
Total Sulphur	mg/kg	50	MCERTS	110

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80
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Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number				1733186
Sample Reference				WS106
Sample Number				None Supplied
Depth (m)				0.60
Date Sampled				07/01/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	22
Lead (aqua regia extractable)	mg/kg	1	MCERTS	21
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	88

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	5.0
TPH (C16 - C21)	mg/kg	1	MCERTS	12
TPH (C21 - C35)	mg/kg	1	MCERTS	31
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	50

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 21-50175

Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number				1733187	1733188	1733189
Sample Reference				WS101	WS103	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.40
Date Sampled				07/01/2021	07/01/2021	07/01/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status			

General Inorganics

pH	pH Units	N/A	ISO 17025	7.4	6.9	7.3
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	4.0	4.1	4.4
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	0.3	0.15
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.7	0.6	0.4
Copper (dissolved)	µg/l	0.7	ISO 17025	74	63	73
Lead (dissolved)	µg/l	1	ISO 17025	7.9	5.6	5.6
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.6	3.5	3.6
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	16	35	27

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10



Analytical Report Number: 21-50175
 Project / Site name: Three Lions

Your Order No: JC-14437-B

Lab Sample Number				1733187	1733188	1733189
Sample Reference				WS101	WS103	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.40
Date Sampled				07/01/2021	07/01/2021	07/01/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status			

Petroleum Hydrocarbons

TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10
------------------	------	----	------	------	------	------

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-50175
Project / Site name: Three Lions

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1733176	WS101	None Supplied	0.3	Light brown loam and sand with gravel.
1733177	WS101	None Supplied	0.6	Brown sand with gravel.
1733178	WS102	None Supplied	0.15	Brown loam and clay with gravel and vegetation.
1733179	WS102	None Supplied	0.4	Brown loam and clay with gravel.
1733180	WS103	None Supplied	0.15	Brown loam with gravel and vegetation.
1733181	WS103	None Supplied	1.5	Brown loam and sand with gravel.
1733182	WS104	None Supplied	0.2	Brown loam with gravel and vegetation.
1733183	WS104	None Supplied	0.8	Brown loam with gravel and vegetation.
1733184	WS105	None Supplied	0.7	Brown loam and sand with gravel.
1733185	WS106	None Supplied	0.4	Brown clay and loam with gravel.
1733186	WS106	None Supplied	0.6	Brown loam and sand with gravel.

Analytical Report Number : 21-50175
Project / Site name: Three Lions

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In house method.	L005-PL	W	ISO 17025
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 21-50175
Project / Site name: Three Lions

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX VII
ORIGIN OF TIER I GENERIC
ASSESSMENT CRITERIA

Three Lions

Phase II Geoenvironmental Site Assessment

July 2023

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene ⁽ⁱⁱⁱ⁾	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C₅-C₆ (aliphatic)	
TPH C₆-C₈ (aliphatic)	
TPH C₈-C₁₀ (aliphatic)	
TPH C₁₀-C₁₂ (aliphatic)	
TPH C₁₂-C₁₆ (aromatic)	
TPH C₁₆-C₂₁ (aromatic)	
TPH C₂₁-C₃₅ (aromatic)	



**APPENDIX VIII
GEOTECHNICAL
LABORATORY RESULTS**



LABORATORY REPORT



4043

Contract Number: PSL21/0355

Report Date: 04 February 2021

Client's Reference: 14-437

Client Name: E3P
Taylor Road
Urmston
Manchester
M41 7JQ

For the attention of: Jamie Craig

Contract Title: Three Lions Pub

Date Received: 12/1/2021

Date Commenced: 12/1/2021

Date Completed: 4/2/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Senior Technician)

S Eyre
(Senior Technician)


H Daniels
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
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e-mail: awatkins@prosoils.co.uk
rberriman@prosoils.co.uk

Page 1 of

PARTICLE SIZE DISTRIBUTION TEST

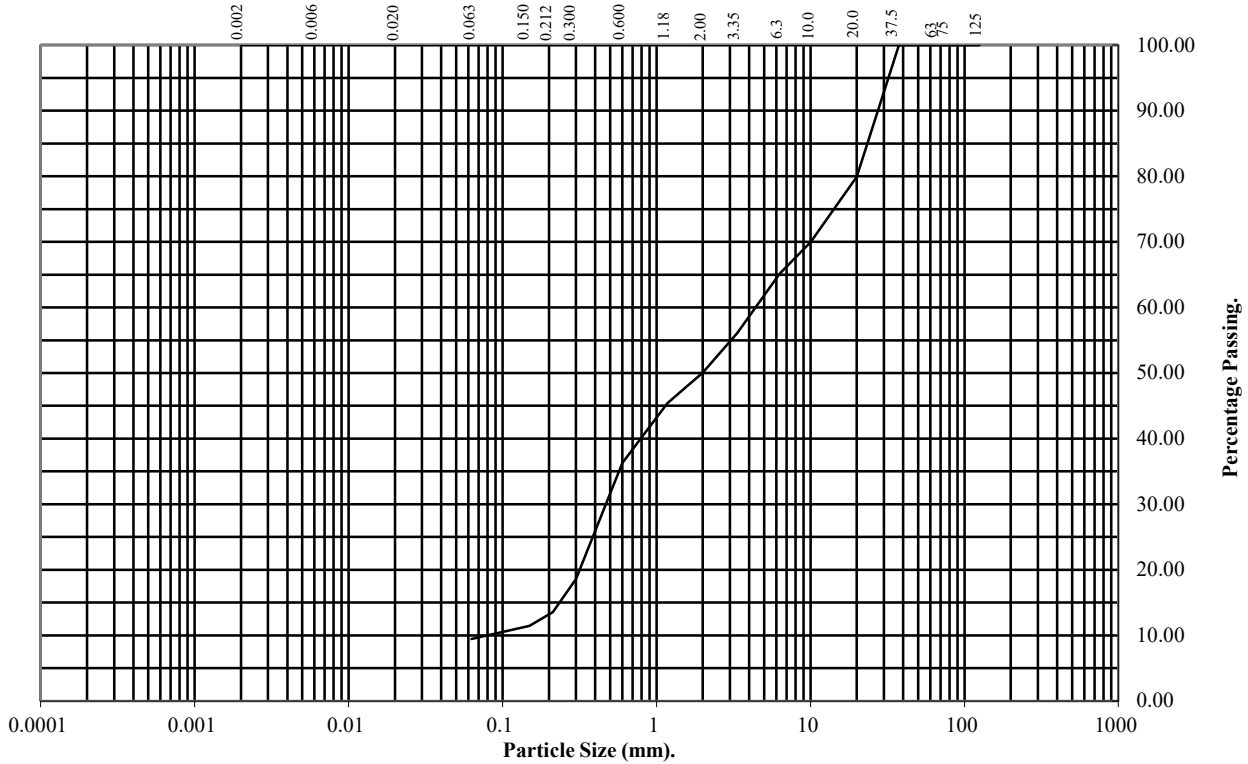
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS104** **Top Depth (m):** **1.40**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	80
10	70
6.3	65
3.35	56
2	50
1.18	45
0.6	36
0.3	19
0.212	14
0.15	11
0.063	9

Soil Fraction	Total Percentage
Cobbles	0
Gravel	50
Sand	41
Silt/Clay	9

Remarks:
See Summary of Soil Descriptions



Three Lions Pub

Contract No:
PSL21/0355
Client Ref:
14-437

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

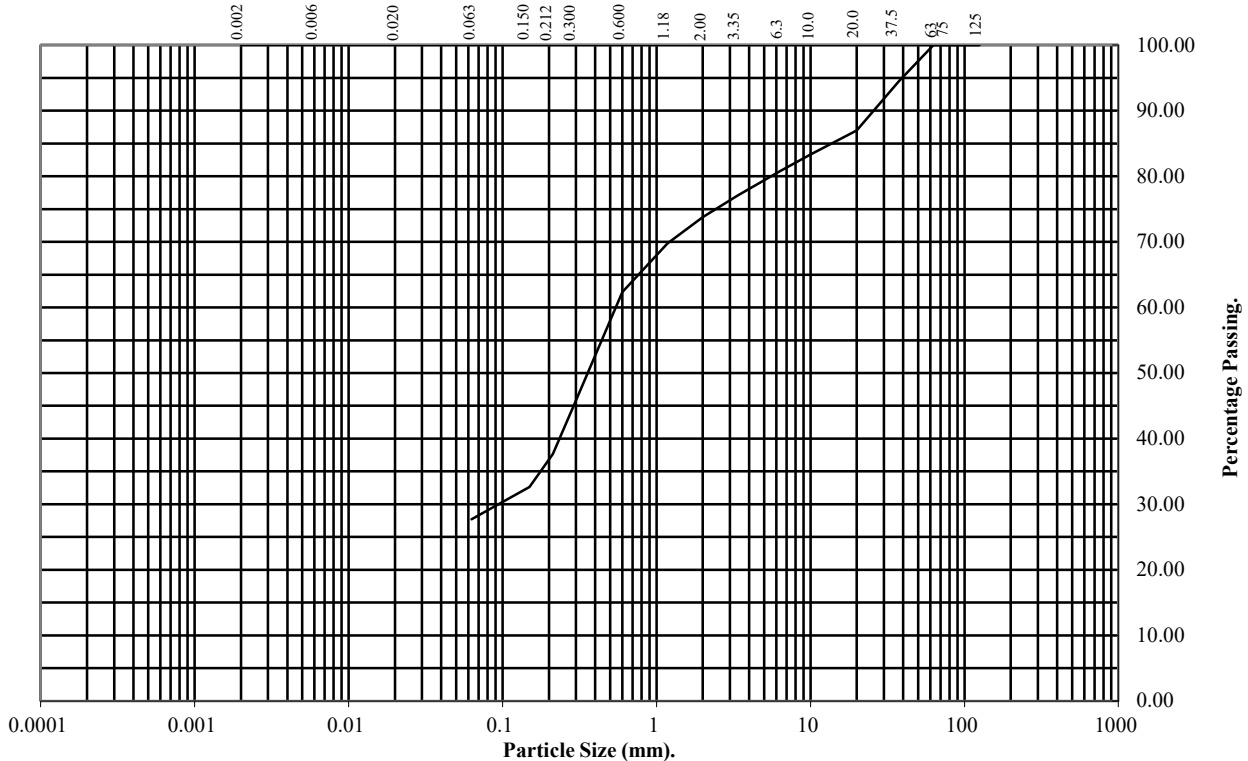
Hole Number: **WS102**

Top Depth (m): **0.30**

Sample Number:

Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	87
10	83
6.3	81
3.35	77
2	74
1.18	70
0.6	62
0.3	46
0.212	38
0.15	33
0.063	28

Soil Fraction	Total Percentage
Cobbles	0
Gravel	26
Sand	46
Silt/Clay	28

Remarks:
See Summary of Soil Descriptions



Three Lions Pub

Contract No:
PSL21/0355
Client Ref:
14-437

PARTICLE SIZE DISTRIBUTION TEST

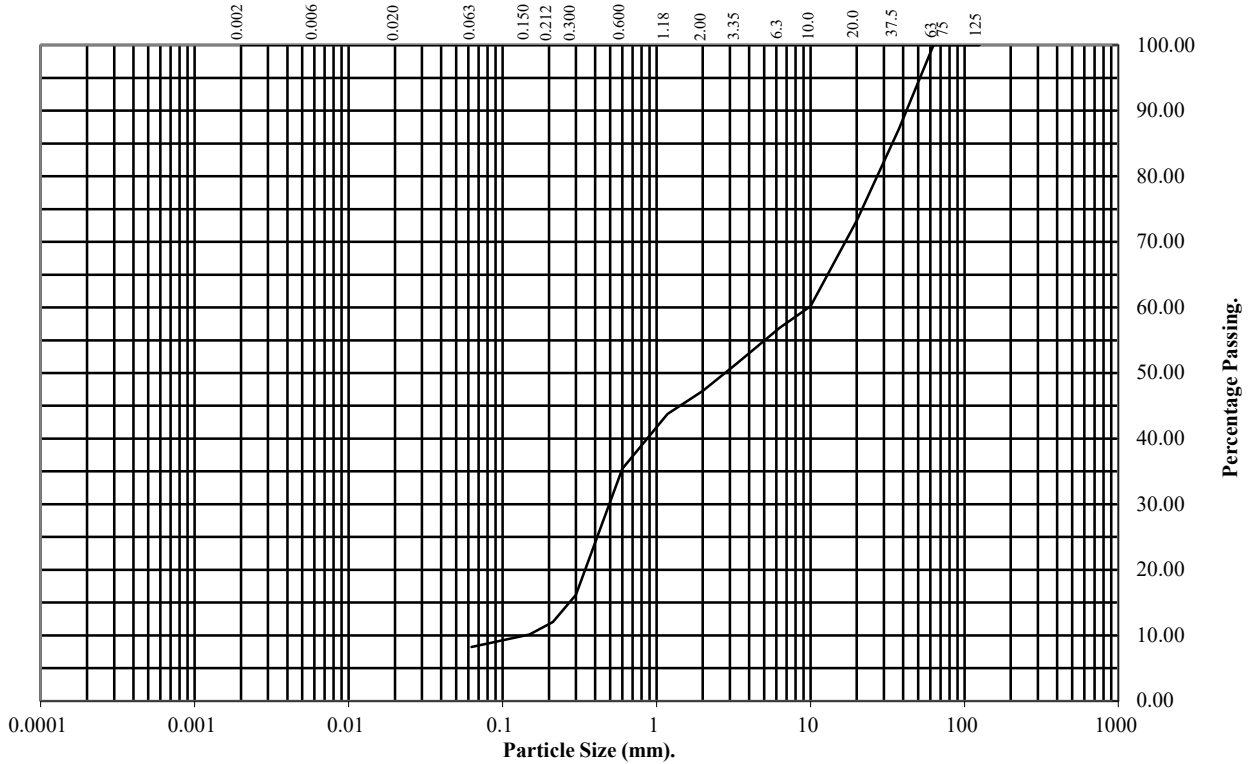
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS106** **Top Depth (m):** **0.70**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	87
20	73
10	60
6.3	57
3.35	51
2	47
1.18	44
0.6	35
0.3	16
0.212	12
0.15	10
0.063	8

Soil Fraction	Total Percentage
Cobbles	0
Gravel	53
Sand	39
Silt/Clay	8

Remarks:
See Summary of Soil Descriptions



Three Lions Pub

Contract No:
PSL21/0355
Client Ref:
14-437

APPENDIX IX COAL AUTHORITY REPORT



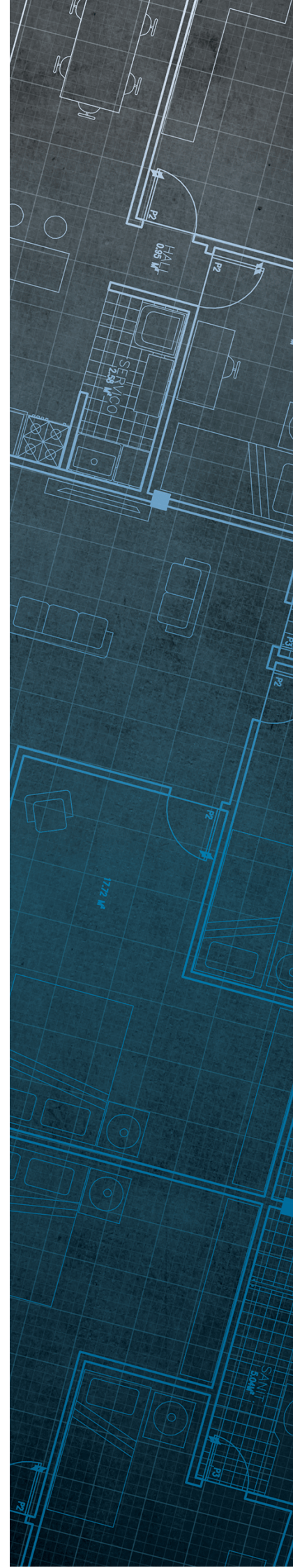
The Coal
Authority

Consultants Coal Mining Report

Three Lions, Netherfield Lane
Meden Vale
Mansfield
Nottinghamshire
NG20 9PA

Date of enquiry: 21 December 2020
Date enquiry received: 21 December 2020
Issue date: 21 December 2020

Our reference: 51002344576003
Your reference: 270801379_2



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

NLIS Hub

Enquiry address

Three Lions, Netherfield Lane
Meden Vale
Mansfield
Nottinghamshire
NG20 9PA

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

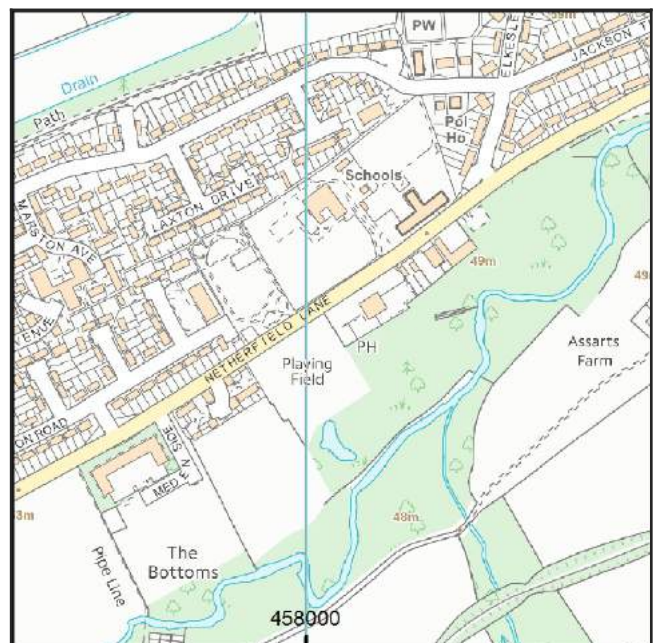
www.groundstability.com

 @coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /thecoalauthority



Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
WELBECK	TOP HARD	Coal	4Y3E	607	North	1.4	South-East	211	1916
WELBECK	TOP HARD	Coal	5QAA	628	North	2.3	South-East	140	1916
WELBECK	TOP HARD	Coal	4Y3G	640	Beneath Property	2.2	South	211	1928
WELBECK	TOP HARD	Coal	5QA7	640	Beneath Property	2.8	South-East	140	1928
WARSOP	TOP HARD	Coal	5QA6	644	South-West	2.7	East	213	1938
WARSOP	TOP HARD	Coal	62GX	653	South	2.7	East	215	1939
WELBECK	DEEP SOFT	Coal	204R	829	South	2.2	North-East	250	1991

Probable unrecorded shallow workings

None.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

16081	18175	
-------	-------	--

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

No outcrops recorded.

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

There are 1 claim(s) within 50 metres of the property boundary that do not match the property address. These are shown on the enquiry boundary plot.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

If further subsidence damage claims information is required, please visit www.groundstability.com.

See Section 4 for further information.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is in an area where a notice to withdraw support was given in 1982.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

Coal mining subsidence

The site is within an area of previous interest. It is close to where the Coal Authority or licensed mine operator has investigated and where necessary remediated issues relating to coal mining subsidence.

The site requires further investigation and may influence your risk assessment. We recommend that you order the appropriate **Coal Authority Subsidence Claims Report**, which will include more information about the hazard.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.