PHASE I AND PHASE II GEO-ENVIRONMENTAL SITE ASSESSMENT

Kilbuck Lane
Haydock
St. Helens

Prepared for:

damson CONSULTANCY

Report Ref: 12-639-r02
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e3p | Environmental | Energy | Engineering

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EXECUTIVE SUMMARY		
Site Address	Land north of Kilbuck Lane, Haydock, St. Helens, WA11 9SZ	
Grid Reference	E356690, N397800	
Site Area	1.88 Ha	
Current Site Use	The site is currently occupied by Fishwicks Industrial Estate comprises a large warehouse building in the centre of the site that is sub-divided in to a number of different tenants. Two further buildings are also present in the west of the site, of which the larger of the two is currently vacant. All structures are used for commercial or industrial uses including a plastic bin distributor, generator distributors, waste recyclers, landscape gardeners and a bus depot. Buildings present in the west of the site, and the front section of the large warehouse building comprise single storey brick structures. Whilst the eastern portion of the large warehouse building comprises a steel portal frame building, with concrete hardstanding floors. External areas comprise concrete and asphalt hardstanding with small areas of soft standing. A tall brick structure (former chimney) is present in the south-west of the main warehouse building which currently houses a phone mast. An electricity substation is present in the south-east of the site and a gas governor is present in the south-western corner of the site.	
Proposed Development	E3P understands that the client is involved with respect to the proposed development of the site for commercial end use; which will involve demolition of the existing industrial units and construction of four new commercials units with associated access roads, service yards, car parking and adopted utility infrastructure.	
Environmental Setting	*Drift Geology*	Till – Diamicton, consisting of clay, sand and gravel.
	Bedrock Geology	Pemberton Rock– Sandstone.
	Hydrogeology	Undifferentiated aquifer strata overlying a Secondary A Aquifer (Bedrock Geology).
	Hydrology	A drainage ditch has been identified 56m east of the site, however this is not considered to be a sensitive receptor.
	Flood Risk	Unaffected by flooding from rivers (Flood Zone 1)
	Ecology	No sensitive ecological or aquatic ecosystems identified.
	Subsidence Hazards	No hazards identified in data searches.
Site History	Historical mapping suggest that the site was undeveloped agricultural land, with the presence of a pond in the east of the site, until circa 1960, where it received large scale industrial development which included the construction of multiple buildings, with one large central building, listed under the title 'Works'. In the 1970s the site was recorded as an 'Engineering Works'. 'Tanks' were located within the north of the site from pre-1971 to pre-1985. Following the development, the central building, like the area surrounding the site, received varied amounts of additional development, including the extension of the northern and eastern areas of the building, where the eastern extension was later demolished circa 1992. From this time the site has remained in this configuration.	

EXECUTIVE SUMMARY	
Utility Locations	A formal drainage survey has not been completed, however a review of online records has indicated the presence of utilities within Kilbuck Lane, with an electricity feed into the Electricity Substation located along the south-eastern boundary, and a gas feed into the gas governor located in the west of the site. These services are then distributed throughout the site.
Landfill Sites & Ground Gases	There are no recorded landfills within influencing distance of the site. A clinical waste transfer station is however present approximately 137m to the South West of the site. A historically infilled pond has been identified within the eastern sector of the site and this may contain organic material that could potentially generate ground gas.
Radon	Unaffected – No special precautions required.
Coal Mining / Land Stability	A Coal Authority Report obtained for the site (Ref: 51001853592001) states: ▪ *The property is an area of probable unrecorded shallow workings;* ▪ *There is no spine roadway recorded at shallow depth;* ▪ *No mine entries are recorded within 100m of the site's boundary;* ▪ *The property is not within an area where a notice to withdraw support has been given, nor is it in an area where a relevant notice has been published under the Coal Industry Act 1994;* ▪ *The site is in an area which has historically been subjected to coal mining activity;* ▪ *The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining; and* ▪ *The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.* The Coal Authority Interactive Map indicates the site is located within a development high risk area. Probable shallow coal mine workings and coal outcrops are identified within the site boundary. The closest mine entry is located circa. 170m east of the site. A high risk associated with past shallow coal mining is identified; an intrusive site investigation is required.
Preliminary Geotechnical Risk Assessment	
Based on the desk study information, the following geotechnical assessment has been made: Given the predominantly developed nature of the site, it is likely there will be Made Ground fill deposits and obstructions. Existing buildings will require demolition with all relict foundations grubbed out, prior to the construction of the proposed development; A historically infilled pond is present within the site boundary which are potential sources of alluvial deposits, silts and possible organic peat deposits in addition to potential depths of Made Ground. Investigation will be required in order to assess these and undertake in-situ geotechnical testing to determine the likely foundation solution for plots in these areas; and,	

Initial Conceptual Site Model

Human Health

Asbestos containing materials (ACM), heavy metals, total petroleum hydrocarbon (TPHs), polycyclic aromatic hydrocarbon (PAHs), non-volatile and volatile hydrocarbon products may be present within Made Ground deposits on site as a result of the sites historic industrial uses, and the demolition of buildings in the east of the site. If present these substances can cause harm to construction workers and commercial end users during the initial earth work phases of the development and the following third-party end uses via either, dust and fibre inhalation, dermal contact and ingestion of impacted material.

Controlled Waters

Former above ground storage tanks (ASTs) associated with historical use of the site as an engineering works are potential sources of non-volatile and volatile hydrocarbons which are mobile.

Significant on-site sources of potentially mobile contaminants are not anticipated at the subject site. The site is underlain by low permeability Glacial Till which will limit the vertical migration of any mobile contaminants, however given the presence of a Secondary A Aquifer in the solid geology, it is considered that there is a moderate risk to controlled waters and a detailed controlled waters risk assessment will be required to satisfy the Environment Agency.

Ground Gas

Former ponds and field boundaries are present across the site which may be potential sources of alluvial / organic deposits which may be a source of carbon dioxide and methane. Carbon dioxide and methane have associated asphyxiation and explosive risks respectively and if present the risks can be appropriately mitigated through the careful design of building structures. Furthermore, a vapour risk may be present from volatile hydrocarbon products associated with the former use of the site as an engineering works and the identified ASTs on site.

E3P Intrusive Ground Investigation

Ground Investigation Works	E3P has completed an intrusive Ground Investigation comprising, 6No. window sample boreholes, 3No. cable percussive boreholes with rotary follow on and environmental monitoring installations. Full access to the site was restricted due to the active nature of the site.
Ground Conditions	**Made Ground** Made Ground deposits were encountered within all exploratory hole locations to a proven depth of between 0.15m and 2.30m bgl, although in general Made Ground was encountered to a depth of less than 1.00m bgl. Made Ground deposits predominantly comprise a hardstanding cover of concrete/asphalt, although a reworked topsoil of dark brown/black slightly clayey gravelly sand with brick and mudstone was encountered in WS102. Underlying this was a black brown slightly clayey gravel of sandstone, coal, mudstone, brick, clinker, glass, plastic and concrete in the majority of exploratory locations. In the south east of the site within WS105 and S106, a reddish brown sandy gravel with ash, clinker, slag and brick was encountered. **Drift Deposits** Drift deposits were encountered within all exploratory locations. The drift deposits comprise a firm to stiff brown silty sandy gravelly CLAY with a discontinuous band of reddish brown SAND and occasional GRAVEL in several locations. A thin layer of PEAT was encountered in WS103 at 3.70-3.80m bgl. Gravels encountered within the clay and sand layers comprised mudstone, sandstone and occasional coal. **Solid Geology** The solid bedrock geology was encountered at depths of between 9.50m and 13.90m bgl, becoming deeper in the north of the site. The solid

Ground Conditions	geology comprised interbedded grey sandstone, light grey mudstone and siltstone with intact bands of coal. Three intact coal seams were identified during the intrusive ground investigation with a maximum thickness of 1.10m. **Groundwater** Groundwater strikes were encountered as strikes and seepages at depths of between 2.45m and 10.69mbgl.
Contaminated Land Assessment	
Human Health	Loose chrysotile fibres were identified within the Made Ground deposits in WS104 and WS105, however it should be assumed that asbestos fibres are present throughout the Made Ground across the site. Loose fibres could be released during earthworks and subsequently inhaled by construction workers and possibly third-party property. Although no asbestos containing materials were present within the soil (physical fragments / pieces of ACM), should any visual ACM be identified during the enabling works, all ACM should be collected, double bagged and placed into skip; before safely being disposed offsite, to a suitable licensed facility in a compliant manner. A suitably detailed remediation strategy will be required to document the safe handling, management and placement of all Made Ground so as to ensure that no unacceptable degree of risk is presented to construction workers as part of the build-phase. Placement of soils will require careful management and regulatory authority approved phase of enabling works, under strict construction phase health and safety controls. Upon placement of asbestos impacted soils at depth beneath hardstanding or plots in line with the E3P Asbestos Conceptual Site Model, they will present no unacceptable risk to the future site users.
Controlled Waters	Moderate risk to controlled waters from identified organic contaminants in the area of WS103. Tanks were historically present in this vicinity which may have contained TCE as part of the engineering works. Furthermore, an Oil Distribution Terminal was present along the northern boundary of the site. At this time, it is not possible to isolate the impact to the area surrounding WS103 and it is recommended further window sample probeholes are completed in this area with further groundwater monitoring to delineate the area. The risk to controlled waters is reduced given the presence of low permeability cohesive drift deposits beneath the site and the absence of a groundwater abstraction point within 1km of the site. The brook identified adjacent to the site is assumed to be a small drainage ditch.
Ground Gas	Characteristic Situation 2.
Potable Water Infrastructure	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.
Geotechnical Assessment	
Underground Obstructions	Significant concrete and brick foundations and floor slabs are anticipated underlying the existing onsite structures. During a phase of cut fill enabling works to create a development 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	The underlying natural clay drift deposits have been assessed as being firm to very stiff high strength with a net ABP in the order of between 46-70 kN/m^2 at 1.20m-4.00m increasing to 93-405 kN/m^2 with depth.
Foundation Options	At this time, it is not possible to accurately define the foundation types due to the absence of a finalised Proposed Development scheme or finished floor levels (FFLs), however upon completion of enabling works, it is likely that the most cost effective option for the majority of the site will be to re-engineer the Made Ground and loose sands using Vibro Stone Columns (VSC) or Pile foundations to transfer structural loadings to deep competent stratum. Consideration must also be given to the varying soil matrices and differing settlement characteristics and where a foundation spans two varying matrices the sub-structure should be designed accordingly. It may also be necessary to locally deepen foundations within influence of existing of proposed trees.
Building Floor Slabs	A ground bearing slab will be viable but it will need to be constructed on a granular sub base with the thickness designed by a structural engineer to ensure that settlement tolerances are taken into consideration and that sufficient surface clays have been removed from tree influence areas if present to mitigate any seasonal volume changes in the clay influence zones.
Heave Precautions	The underlying clay is of low volume change potential and heave precautions will not be required to the internal face of a foundation. However, heave precautions will be required to the underside of floor slabs (where there is no 200mm void) or ground beams within the modelled influencing distance of trees.
Soakaway Drainage	Falling head permeability testing has shown the underlying drift deposits to have a poor soakage potential. Furthermore, the entire site is predominantly underlain by circa. 1-2m of likely low permeability gravelly CLAY. Therefore, the use of soak-away drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured it is not recommended that soakaways utilised for disposal of surface water runoff. If soak-away drainage is to be considered, full BRE365 Testing must be completed to inform the detailed design.
Sulphate Assessment	Concrete classification will be DS1 AC1.
CBR Design %	Granular soils can likely be re-engineered to ensure 5% within the sub-grade during favourable climatic conditions. Natural clay soils will provide a CBR in the order of 3-5% during drier climatic periods, however If water is allowed to shed onto the formation, the CBR will reduce to <2% which will require specialist engineering of the sub-grade.
Cut / Fill	Development levels unknown at this time, however significant cut fill works are unlikely to be required to prepare the development platform.
Waste Characterisation	Further WM3 assessment will be required for waste classification. Any material that is to be disposed off-site should undergo assessment using *Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste.*
Coal Mining	E3P has reviewed BGS Geological Mapping and CA information, in addition to completing 3 No. 35.00m rotary boreholes to investigate shallow mine workings; a summary of which is detailed below: • The intrusive ground investigation comprising three deep rotary boreholes identified coal seams within all boreholes; • All coal seams encountered were intact;

Coal Mining	▪ Coal seams within RB101 and RB102 have been inferred as The Higher Florida Coal seam from depths at 13.00m or 13.70mbgl. Coal from 14.15mbgl. within RB103 have been inferred as the Lower Florida Coal Seam; While no evidence of workings has been identified at the E3P borehole positions, the seams are present and of a workable thickness. The Coal Authority has evidence of shallow mining in the Higher & Lower Florida immediately east and west of the site, therefore it is more than probable that coal has been mined within the area of the proposed development in the 17th and 18th centuries before accurate records were made. Given that the seam is outcropping and dipping at a shallow gradient, there is <10x Seam Cover of competent bedrock, therefore the risk of consolidation within unrecorded mine workings and the potential to induce subsidence at the surface is significant. It will therefore be necessary to undertake a programme of proof drilling and where necessary stabilisation of workings by pressure grouting in accordance with a detailed design and Coal Authority Permit.
Recommendations	Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course: ▪ Additional site investigation within the footprints of the existing buildings and electricity substation; ▪ Delineation of the former ponds and identified Peat deposits; ▪ Delineation of the chlorinated hydrocarbon impact at WS103; ▪ Arboricultural Survey; ▪ Materials Management Plan; ▪ Geotechnical Earthworks Strategy (Infrastructure); ▪ Remediation & Enabling Works strategy; ▪ Additional rotary borehole drilling and where mine workings identified a process of pressure grouting to consolidate workings; ▪ Full three-dimensional earthworks Cut / Fill Model; and, ▪ Asbestos survey of existing on-site structures prior to demolition.

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APPENDICES

1. INTRODUCTION

1.1 Background

E3P has been commissioned by Damson Consulting to undertake a detailed Phase I and II Geo-Environmental Site Investigation for a parcel of land to the north of Kilbuck Lane, Haydock, St. Helens.

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 commercial development.

The scope of work the following elements:

- *Detailed review of historic information;*
- *Detailed desk study;*
- *Design of suitable intrusive ground investigation;*
- *6No. Window sample probeholes with and construction of environmental monitoring installations;*
- *3No. cable percussive boreholes with deep rotary follow-on boreholes;*
- *In-situ geotechnical testing;*
- *Chemical & geotechnical laboratory analysis;*
- *Groundwater monitoring and sampling;*
- *Ground gas monitoring;*
- *Contamination risk assessment & conceptual site model;*
- *Geotechnical assessment & interpretation; and,*
- *Factual and interpretive reporting.*

1.2 Proposed Development

E3P understands that the client is involved with respect to the proposed development of the site for commercial end use; which will involve demolition of the existing industrial units and construction of three new commercials units with associated access roads, car parking and adopted utility infrastructure. The site is part of a larger development area.

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 Geo-Environmental Investigation are to:

- Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));
- 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 in relation to off-site receptors;
- Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs; and,
- 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 north of Kilbuck Lane, Haydock, St. Helens, WA11 9SZ
National Grid Reference	E356704, N397808
Site Area	1.88 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 12-639-001.

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	The site is currently occupied by Fishwicks Industrial Estate comprising a number of different occupiers. The building located in the south-east of the site is currently vacant. Other units comprise a plastic bin distributor, generator distributors, waste recyclers, landscape gardeners and a bus depot.	
Structures	The site currently comprises a large warehouse building in the centre of the site split up for a number of different tenants, with a two further buildings in the west of the site, of which the larger of the two is currently vacant. All structures are used for commercial or industrial uses. Buildings present in the west of the site, and the front section of the large warehouse building comprise single storey brick structures. Whilst the eastern portion of the large warehouse building comprises a steel portal frame building, with concrete hardstanding floors. External areas comprise concrete and asphalt hardstanding with small areas of soft standing. A tall brick structure is present in the south-west of the main warehouse building which houses a phone mast on top. An electricity substation is present in the south-east of the site along the southern boundary. A gas governor is present in the south-western corner of the site.	
Access	Vehicular and pedestrian access to the site is via secured gateways along Kilbuck Lane in the south east and south west of the site.	
Slope	The site is generally level in topography. The north of the site is at a greater elevation than the south of the site. A shallow ramp is present in the north of the site.	
Retaining structures	A retaining structure comprising a small wall is present in the north of the site.	
Surface Cover (%)	Buildings:	68%
	Hardstand:	30%
	Soft cover:	2%
Vegetation/Ecology	The majority of the site is covered in hardstanding; however, a small area of grass is present in the south western corner of the site. Furthermore, the site borders onto a large un-development area of rough scrub land along its eastern boundary. A Habitat Survey will be required to support the planning application.	

Hazardous Material Storage	A large storage tank is present in the south-east of the site; however, this is assumed to contain water for a sprinkler system. A metal self bunded Above Ground Storage Tank (AST) has been identified within Unit 5, and contains diesel for the use within gardening and landscaping equipment. During the site walkover the tank appeared to be in a good condition, where no spillages were identified and is approximately 1000 litres in size. Entry into the bus depot unit was not available during the site walkover, therefore the storage of hazardous materials such as fuel oils cannot be discounted.
Asbestos Containing Material (ACM)	No evidence of ACM was noted across the majority of the site during the site walkover. However due to the age of the existing buildings it is likely that ACM will be contained within the building fabric. A pre-demolition asbestos survey will likely be required within all existing buildings within the site boundary.
Polychlorinated Biphenyls (PCBs)	An electricity substation is present along the southern boundary of the site in the south-east of the site, which may contain PCBs.
Waste Storage	Waste storage was generally observed to be stored appropriately and no significant areas of potential environmental concern were noted. However, access to the bus depot was not permitted during the site walkover, therefore substantial waste storage will require confirmation.
Utilities	A formal drainage survey has not been completed, however a review of online records has indicated the presence of utilities within Kilbuck Lane, with an electricity feed into the Electricity Substation located along the south-eastern boundary, and a gas feed into the gas governor located in the west of the site. These services are then distributed throughout the site.

2.3 Surrounding Area

The surrounding area land uses are summarised in Table 2.2.

Table 2.2 Surrounding Land Uses

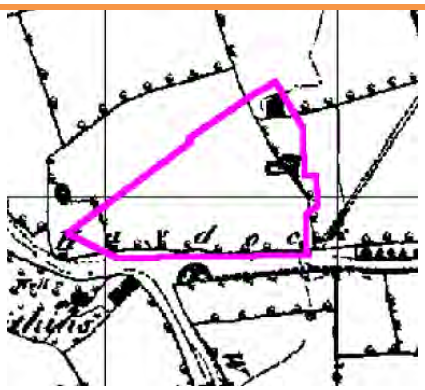
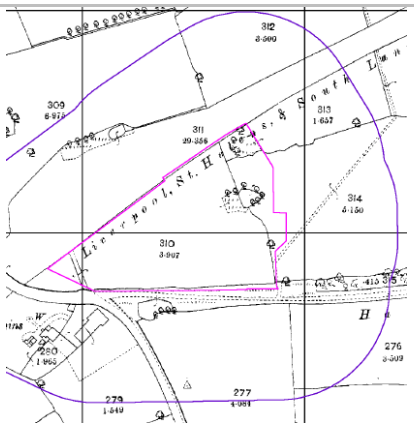
DIRECTION	LAND USE
North	Sainsbury's Distribution Centre (Commercial)
East	Rough ground, Law Distribution Depot (Commercial)
South	Kilbuck Lane and Manheim Haydock Auctions (Commercial)
West	Haydock Lane Industrial Estate (Commercial / Industrial)

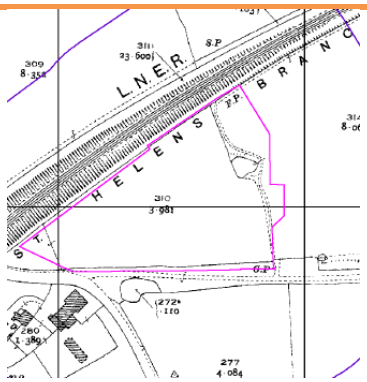
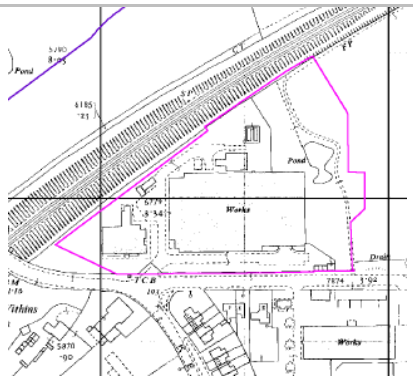
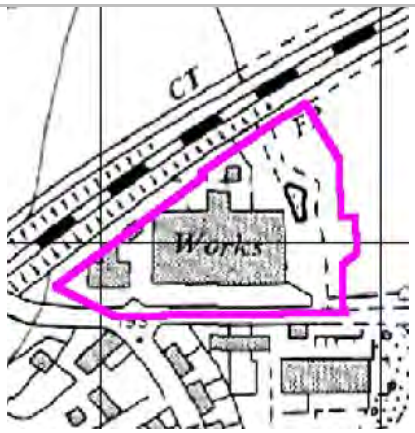
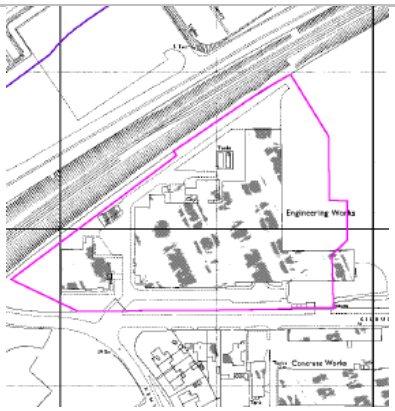
3. SITE HISTORY

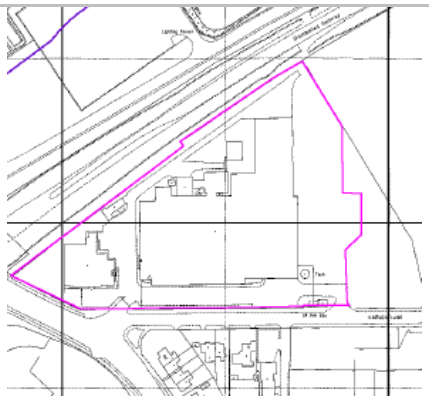
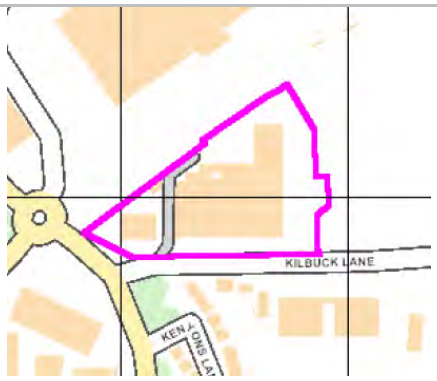
3.1 On-Site Historical Development

A review of historical mapping pertinent to the site is summarised in Table 3.1 below. In addition, historical site features are presented on Drawing No 12-639-003 in Appendix III.

Table 3.1 Historical Development

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1849 1:10,560	The site is agricultural land, with hedge rows intersecting the north east and south corners. Three ponds are present in the north east of the site. A road lines the southern boundary of the site.	
1893 1:2,500	Two of the three aforementioned ponds are now recorded as marshland. A railway is present along the northern boundary of the site.	
1907 1:2,500	Hedge rows present in the south west and north east corners of the site have been removed. Railway sidings within an embankment are present along the northern boundary of the site.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1928 1:2,500	A field boundary or small stream is present in the south western corner of the site.	
1960 – 1961 1:2,500	Seven buildings of varying size are now present on site, covering the majority of the central and western areas. The buildings are recorded as 'Works'.	
1965 1:10,000	No significant changes.	
1971 – 1972 1:1,250	The large central building has been extended into the northern and eastern areas of the site, and comprises a number of the previously standalone buildings. A chimney is present to the north-west of the main works building. Tanks are present in the north of the site. The pond in the north eastern area of the site has now been infilled.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1977 – 1985 1:1,250	The tanks are no longer marked.	
1992 1:1,250	The eastern portion of the extension to central building has been demolished. A tank and electrical substation are present in the south-eastern corner of the site.	
1995 1:10,000	No significant changes.	
2018 1:10,000	No significant changes.	

3.2 Off-Site Historical Development

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

Table 3.2 Surrounding Historical Development

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Railway Line *…Then Dismantled Railway* *…Then no longer marked*	0m	Pre 1893 – Pre 1992 Pre 1992 – Pre 1999 Pre 1999 - Present	North
Ponds (x8) *…then no longer marked*	20-225m	Pre 1894 - Pre 1908 / Pre 1938 / Pre 1951 / Pre 1975 - Present	North / South / East / West
Works *…Then Concrete Works with 3No. Tanks* *…Then Works* *…Then unnamed*	50m	Pre 1960-Pre 1971 Pre 1971-Pre 1985 Pre 1985 – Pre 1992 Pre 1992 - Present	South East
Depot (x3) *…Then Haydock Lane Industrial Estate (inc. 2No. tanks)*	100m	Pre 1971 – Pre 1992 Pre 1992 - Present	South West
Depot	100m	Pre 1999 - Present	North
Depot	100m	Pre 1985 – Present	South-East
Tank *…Then no longer marked*	125m	Pre 1971 – Pre 1999 Pre 1999 - Present	North
Oil Distribution Terminal *…Then no longer marked*	125-250m	Pre 1971- Pre 1995 Pre 1995 - Present	North
Works	125m	Pre 1994 - Present	South-East
Depot *…Then unnamed*	225m	Pre 1960 – Pre 1992 Pre 1992 - Present	West
Depot	225-250m	Pre 1999 - Present	North

3.3 Planning History

E3P has undertaken a detailed search of on-line planning records held by St. Helens Council which has identified that a planning application for the construction of a distribution warehouse, associated service yard and external works including a cut and fill operation was made to the site in November 2015. A decision was reached on the application in June 2016, unfortunately the outcome regarding the planning offices verdict has not been made available.

4. ENVIRONMENTAL SETTING

4.1 Geology and Hydrogeology

The British Geological Survey (BGS) map for the site, (1:50,000, Solid & Drift edition) and online records indicates 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	Till - Diamicton	Sands, Clay and Gravels	Secondary Undifferentiated
Solid	Pemberton Rock	Sandstone	Secondary A Aquifer

Table 4.2 Summary of BGS Borehole Records

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
52m East	11.61m	N/A	N/A	Marl <5.69m Rocks <8.64m Broken Rocks (shows having fallen by working coal or other mine, probably Higher Florida) <11.61m
52-146m East	17.59m	N/A	N/A	Marl <6.86m Metal <7.29m Healey Rock <9.73m Light Metal <11.20m Travstone <11.35m Coal <11.53m Bass Warrant <11.73m Light metal <16.53m Dark Metal and Bass < 17.11m Coal <17.49m Warrant <17.59m
	15.85m	N/A	N/A	Marl <8.86m Metal <9.17m Coal <9.86m Rock <14.33m Metal <14.89m Top Roger Coal <15.40m Dark Warrant <15.65m Light Warrant <15.85m

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
98 North-East	57 Feet 9 inches	N/A	N/A	Marl<22ft 6 inches Metal <23ft 11 inches Marly Rock <31ft 11 inches Light Metal <36ft 9 inches Ironstone <37ft 3 inches Coal <37ft 10 inches Basso Warrant <38 ft 6 inches Light Metal <54 ft 3 inches Dark Metal <56 ft 2 inches Coal <57ft 5 inches Warrant <57ft 9 inches

The Envirocheck Report indicates that the site is not located within a Groundwater Source Protection Zone. Furthermore, there are no groundwater / potable abstractions within 1km of the site.

Based on the local topography and the location of surface watercourses it is considered likely that shallow groundwater, if present, will flow in a southerly direction, following topographic gradient towards Sankey Brook, the St Helens Canal and River Mersey.

4.2 Geotechnical Data

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

Table 4.3 Summary of Geotechnical Data

HAZARD	DESIGNATION
Shrink-Swell Clay	Very Low Risk
Landslides	Very Low Risk
Ground Dissolution	No Hazard
Compressible Ground	No Hazard
Collapsible Deposits	Very Low Risk
Running Sand	Very Low Risk

4.3 Coal Mining

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

A Coal Authority Mining Report was obtained (Ref: 51001853592001) dated 30th May 2018.

The Coal Authority operates a risk-based approach to the assessment of potential instability issues associated with future development of land located within the pre-defined Coal Authority Consultation Areas. This risk-based approach sub-divides the potential risk into 'Low & 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 Coal Authority categorically state:
"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 are 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).*

4.3.1 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 Coal Authority has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth which 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 a consideration of a wide range of information and E3P has completed a review of relevant information in relation to potential coal mining activities. Table 4.4 (overleaf) provides a summary of pertinent coal mining information.

Table 4.4 Coal Mining Information

SOURCES OF INFORMATION	SUMMARY
Coal Authority Mining Report	The Coal Authority Mining Report (Ref: 51001853592001) dated 30th May 2018 has been obtained for the subject site by E3P. This report confirmed: ▪ *The property is an area of probable unrecorded shallow workings;* ▪ *There is no spine roadway recorded at shallow depth;* ▪ *No mine entries are recorded within 100m of the sites boundary;* ▪ *The property is not within an area where a notice to withdraw support has been given, nor is it in an area where a relevant notice has been published under the Coal Industry Act 1994;* ▪ *The site is in an area which has historically been subjected to coal mining activity;* ▪ *The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining; and* ▪ *The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.*
Coal Authority Interactive Map	The Coal Authority Interactive Map indicates the presence of three mine entries within influencing distance of the property, the closest approximately 170m east of the site. The site is within a development high risk area, with two coal outcrops beneath the site. 
British Geological Survey Mapping	The 1:10,000 geological mapping for the area notes the Higher Florida (or Pemberton Five Foot Mine) coal seam is preeent across the centre area of the site, traversing from north west to south East; with the Lower Florida (or Bickershaw Seven Foot Mine) coal seam present just north east of the site boundary, running parallel to the Pemberton Five Foot coal seam. The coal seams are shown to be dipping in a southerly direction beneath the site. There are two unspecified boreholes located adjacent to the south-eastern corner of the site and circa. 136m east of the site. Furthermore, a mine shaft is located circa. 166m south-east of the site.
Review of Coal Authority Archive	A review of the Coal Authority archives and mine abandonment plans has not been undertaken for the purpose of this report.

SOURCES OF INFORMATION	SUMMARY
Historical Ordnance Survey Mapping	A review of the 1:10,000 Ordnance Survey mapping which has records of mine workings which pre-dated the Mining & Regulation Act of 1872 identified the following features which indicate historical mine workings in proximity to the application site: ▪ Old Boston Pits – 500 south east ▪ New Boston Pits – 600 south west ▪ Old Shaft – 500m west
Historical Site Investigations	E3P has not been provided with any historic site investigation reports.
Conclusions	In consideration of the historical mining features in proximity to the site and potential for coal close to the surface it is considered possible that coal extraction has occurred underlying the site at relatively shallow depths although further investigation would be required to determine the extent and depth of any worked seams.

4.3.2 Coal Mining Risk Assessment

This Risk Assessment comprises a desk-based review of all available information on the coal mining issues which 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 4.5.

Table 4.5 Summary of Coal Mining Risk Assessment

COAL MINING RISK ASSESSMENT	YES / NO	RISK ASSESSMENT
Recorded Underground Coal Mining at Shallow Depth (<30m)	**Yes**	**Moderate**
Recorded Underground Coal Mining at Shallow Depth (>30m)	**Yes**	**Moderate**
Unrecorded Underground Coal Mining at Shallow Depth (<30m)	**Yes**	**High**
Mine Entries (Shaft / Adits)	**Yes**	**High**
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 high risk of unrecorded coal mining at shallow depth has been identified. The Coal Authority as a statutory consultee will require a series of rotary open holes across the site to determine the presence of any coal on site and understand the nature of any coal workings.

4.4 Hydrology

Surface water features within 250m of the subject site are summarised in Table 4.6.

Table 4.6 Surface Water Features

SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Drainage Ditch	-	56m	East

The site is 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 across the majority of the site. The north of the site has potential for groundwater flooding of property situated below ground level.

4.5 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.

4.6 Industrial Land Uses

The Envirocheck report lists 25 entries within the trade directory for industrial land uses that are within influencing distance of the site, 9 of which are currently active. The closest, approximately 78m south west of the site, is listed for filter manufacturers and suppliers and is operated by Filter Design. The remaining active entries include garage services, packaging manufacturers, waste disposal services, printers, clothing manufacturers, distribution services and commercial vehicle repairs.

4.7 Sensitive Land Uses

The closest residential properties are located circa. 26m south of the site. The site is located within a Nitrate Vulnerable Zone.

No other environmentally sensitive land uses have been identified within close proximity to the site.

4.8 Site Sensitivity Assessment

The site is assessed to be located within a **Moderate** sensitivity setting as discussed within Table 4.7.

Table 4.7 Site Sensitivity Assessment

SESITIVITY PROFILE	DISCUSSION	RATING
Sensitive land uses within close proximity (e.g. residential, school, nursery, local nature reserves etc.)	Residential homes are present circa. 26m to the southern boundary. The site is located within a Nitrate Vulnerable Zone.	MODERATE
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The Envirocheck Report indicates that the site is not located within a Groundwater Source Protection Zone.	LOW
Distance to the closest groundwater abstraction point.	There are no groundwater abstractions within 1km of the site.	LOW

SESITIVITY PROFILE	DISCUSSION	RATING
Aquifer Classification in Superficial Drift Deposits.	A Secondary Undifferentiated Aquifer is present within the drift deposits.	**LOW**
Aquifer classification in Bedrock.	A Secondary A Aquifer is present within the bedrock geology.	**MODERATE**
Is the site underlain by low permeability Drift to depths in excess of 10.0m?	E3P have previously completed a number of boreholes on the adjacent site, which has identified low permeability drift deposits to underlie the site to between 9.30m and 10.00mbgl.	**LOW**
Is the site located within 50m of a surface watercourse?	Sankey Brook has been identified adjacent to the southern boundary of the site.	**HIGH**
Overall Site Environmental Sensitivity		**MODERATE**

4.9 Preliminary Geotechnical Assessment

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

- Given the predominantly developed nature of the site, it is likely there will be 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; and,
- A number of historically infilled ponds are present within the site boundary which are potential sources of alluvial deposits, silts and possible organic peat deposits in addition to potential depths of Made Ground. Investigation will be required in order to assess these and undertake in-situ geotechnical testing to determine the likely foundation solution for plots in these areas.

4.10 Unexploded Ordnance

The regional unexploded bomb risk map from Zetica indicates that the site is in an area at moderate risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. (Zetica, 2014).

5. CONSULTATIONS

5.1 Contaminated Land Officer

E3P have contacted the Environmental Health Department at St Helens Council. The response is as follows:

- The site has not been determined as Contaminated Land under Part 2A of the Environmental Protection Act 1990;

- St. Helens Council has undertaken a prioritisation of all potentially contaminated land throughout the borough via an assessment of historical land uses and proximity to sensitive human health and environmental receptors. Sites have been classified as a high, medium or low priority for inspection under Part 2A. The site in question has been classified as a high priority for inspection owing to the previous use of the site as a works with associated tanks and the proximity of a surface water course. Despite the high priority classification there are a significant number of sites throughout the borough that are of a higher priority for inspection. A sub group of 40 sites have been assessed as being of the very highest priority (former chemical works with sensitive receptors either on or within influencing distance of the site) and it is these sites that the Council is focussing its efforts on under Part 2A. Whilst it is possible that the site will be subject to inspection at some point in the future there are no current plans to initiate inspection. It is very difficult to comment on the likelihood of any future inspection resulting in a determination as contaminated land. The Council holds no investigation reports for the site therefore there is no knowledge of the actual presence of contamination; and,

- This department is not aware of any environmental issues that would warrant additional /specific assessment as part of any future redevelopment. There are numerous potential contamination sources, both on and off site, that would need to be investigated and assessed as part of any future planning application for redevelopment. Perhaps of most note is a former oil distribution terminal that was present immediately north of the site throughout the 1970's – 1980's.

5.2 Landfill Sites and Waste Treatment Sites

There are no recorded landfills within influencing distance of the site. A clinical waste transfer station is however present approximately 137m to the South West of the site.

5.3 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 250m of the subject site and not otherwise detailed in the report.

Table 5.1 Summary of Environmental Data

RECORD	ENTRIES WITHIN 250m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified (N/A).
Authorised industrial processes (IPC/IPPC/LAPPC).	1	LAPPC for Siegwerk Ink Uk Ltd, located 211m south-west of the site for coating manufacturing.
Fuel Stations Entries	0	N/A
Licensed radioactive substances	0	N/A
Enforcements, prohibitions or prosecutions	0	N/A
Discharge Consents	0	N/A
Pollution Incidents	1	The Envirocheck report records a Category 3 – minor incident having occurred on site in the Sankey Brook catchment area of unknown oils.
Consents issued under the Planning (Hazardous Substances) Act 1990	0	N/A
Control of Major Accident Hazard (COMAH) sites	1	A lower tier COMAH site is located 242m north-west of the site associated with Shell UK Oil. The record ceased to be supplied under COMAH regulations.

6. INITIAL CONCEPTUAL SITE MODEL

6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P Ltd has developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

Table 6.1 Initial Conceptual Site Model

SOURCE	PATHWAY	RECEPTOR
Human Health		
Heavy metals / PAH associated within Made Ground and historical site use as an Engineering Works	Dermal Contact and Ingestion	Construction Workers Commercial End Users
Discussion: Historical development and demolition, the use of the site as an Engineering Works, along with infilling of a pond are potential sources of heavy metals and PAHs from Made Ground which may contain ash deposits. Heavy metals and non-volatile PAHs may pose a short-term risk to construction workers who may be exposed to impacted soils during earthworks. Construction works must be undertaken using the appropriate Personal Protective Equipment (PPE) to remove this potential risk. Future commercial end users may be exposed to impacted soils within landscaped areas. An intrusive ground investigation is required to identify and assess for the presence of heavy metals and PAHs, to facilitate further risk assessment, and to determine appropriate remediation and / or mitigation measures. If impacted soils are identified then localised remediation or an appropriate cover system, designed in accordance with BRE465 (Cover Systems for Land Regeneration), will mitigate the risk.		
Volatile hydrocarbon compounds associated with Made Ground and off-site industrial land uses.	Volatilisation / Accumulation, Vapour Inhalation	Construction Workers, Commercial End Users
Discussion: Made Ground across the site, and the storage of diesel and petrol fuel oils currently and potentially historically during the use of the site as an Engineering Works, are potential sources of fuel oils, volatile hydrocarbons and potential chlorinated hydrocarbons. Hydrocarbon compounds and chlorinated hydrocarbons may pose a risk to construction workers if they come into contact with impacted soils during further earthworks, however appropriate PPE/ Respiratory Protective Equipment (RPE) will ensure they are at no unacceptable risk. Future commercial end users may come into contact with impacted soils in landscaped areas, though the main pathway of volatile compounds is considered to be vapour inhalation indoors. If identified it is likely that additional remediation of impacted soils and/or perched groundwater will be required to mitigate the risk to future commercial end users.		
Asbestos Containing Materials (ACM) within Made Ground	Fibre / Dust Inhalation	Construction Workers Commercial End Users Third Party Property
Discussion: ACM may be present within any localised Made Ground deposits. A pre-demolition survey will be required with all asbestos materials removed from the building prior to demolition.		

SOURCE	PATHWAY	RECEPTOR
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. However, with the appropriate construction phase health and safety controls, asbestos containing material is likely to represent a low risk. Furthermore, if identified, landscaped areas are likely to require a cover system.		
Hazardous Ground Gases		
Methane and Carbon Dioxide associated with possible on-site fill material	Inhalation Accumulation	Construction Works Commercial End Users
Discussion: The presence of any localised Made Ground and infilled ponds on site may represent a potential source of alluvial/organic deposits and/ or Made Ground which may be a source of carbon dioxide or methane. Carbon dioxide and methane have associated asphyxiation and explosive risks respectively. Should a ground gas risk be identified to end users, the risks can be mitigated through the adoption of suitable control measures within the building construction using guidance presented within CIRIA 665 (Assessing Risk Posed by Hazardous Ground Gases to Buildings) and BS8485 (Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments).		
Controlled Waters		
Hydrocarbon compounds associated with Made Ground / former fuel storage.	Vertical / Lateral Migration	Secondary A Aquifer
Discussion: As discussed above the Made Ground beneath the site may contain residual hydrocarbon compounds associated with fuel storage. If cohesive drift deposits are present beneath the site these will reduce the potential for migration of contaminants, if present, however, considering the underlying Secondary A Aquifer within the bedrock deposits, a moderate risk to controlled waters is identified. Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.		
Buildings and Infrastructure		
pH & Sulphate	pH & Sulphate	pH & Sulphate
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.		
Ecology		
None Identified	Lateral Migration	None Identified
Discussion: No significant ecological receptors identified.		

7. E3P INTRUSIVE 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 between the 10th July 2018 and the 27th July 2018. The works are summarised in Table 7.1 below.

Table 7.1 Summary of Fieldwork

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (mbgl)	MONITORING WELLS RESPONSE ZONE (mbgl)
General Ground Conditions including the presence / nature of obstructions and depth of Made Ground.	WS101	Window Sample Probehole	5.45	1.00-4.00
	WS102		5.45	1.00-4.00
	WS103		4.45	1.00-4.00
	WS104		5.45	1.00-5.00
	WS106		5.45	1.00-4.00
Evidence of former onsite pond	WS105	Window Sample Probehole	5.45	1.00-4.00
Investigation of shallow mine workings across the site.	RB101-RB103	Rotary Open Holes	35.00	N/A

Investigation of the electricity substation on site was not feasible during this investigation as the site is currently active and operational.

The rotary boreholes were advanced to investigate the potential presence of shallow mine workings. These boreholes were drilled in accordance with the CA Permissions process and industry best practice.

The sampling locations are illustrated in Drawing 12-639-005 (Appendix III). The ground conditions encountered are indicated on the logs which are provided in Appendix VI.

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.

7.2 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 VI and presented in Table 8.5 and discussed in Section 10.0.

7.3 Permeability Tests

Three variable head permeability tests were undertaken within environmental monitoring wells WS101, WS104, WS106) in order to assess the likely permeability of the underlying strata to determine the potential suitability for soakaway drainage within the proposed development. The results are presented in Table 8.6.

7.4 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 poly-aromatic hydrocarbons (PAHs), SVOCs, VOCs, asbestos and total and speciated petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VII and discussed in Section 11.0.

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

- Atterberg Limits Determinations;
- Multi Stage Triaxial Tests; and,
- Odometer Tests.

Laboratory analysis sheets are included in Appendix IX and are summarised in Section 9.0:

8. GROUND AND GROUNDWATER CONDITIONS

8.1 Ground and Groundwater Conditions

8.1.1 Summary of Ground Conditions

The Ground Investigation generally confirms the published geology and identifies the strata set out in Table 8.1 below:

Table 8.1 Summary of Strata

HOLE	DEPTH TO STRATUM (mbgl)						
	MADE GROUND	CLAY	SAND	PEAT	GRAVEL	BEDROCK	COAL
BH101	0.00-0.15	0.30-10.90	0.15-0.30	-	-	10.90-35.00	13.00-13.50 20.50-21.50 28.00-28.40
BH102	0.00-1.30	1.30-9.50	-	-	-	9.50-35.00	13.70-14.80 21.20-21.50
BH103	0.00-2.30	2.30-13.90	-	-	-	13.90-35.00	14.15-15.00 21.00-21.50 23.00-23.60
WS101	0.00-0.45	0.45-1.10 1.50-4.00	1.10-1.50 4.00-5.45	-	-	-	-
WS102	0.00-0.40	0.40-1.90 2.20-2.95 3.30-5.45	1.90-2.20 2.95-3.30	-	-	-	-
WS103	0.00-0.25	0.25-2.45 4.70-5.45	2.45-3.85	-	3.85-4.70	-	-
WS104	0.00-0.90	0.90-3.70 3.80-5.45	-	3.70-3.80	-	-	-
WS105	0.00-1.35	1.35-5.45	-	-	-	-	-
WS106	0.00-0.45	0.45-0.95 1.30-5.45	0.95-1.30	-	-	-	-

8.1.2 Made Ground

Made Ground deposits were encountered within all exploratory hole locations to proven depths of between 0.15m and 2.30m bgl, although in general Made Ground was encountered to a depth of less than 1.00m bgl.

Made Ground deposits predominantly comprise a hardstanding cover of concrete/asphalt, although a reworked topsoil of dark brown/black slightly clayey gravelly sand with brick and mudstone was encountered in WS102. Underlying this was a black brown slightly clayey gravel of sandstone, coal, mudstone, brick, clinker, glass, plastic and concrete in the majority of exploratory locations. In the south east of the site within WS105 and WS106, a reddish brown sandy gravel with ash, clinker, slag and brick was encountered.

8.1.3 Drift Deposits

Drift deposits were encountered within all exploratory locations. The drift deposits comprise a firm to stiff brown silty sandy gravelly CLAY with a discontinuous band of reddish brown SAND and occasional GRAVEL in several locations. A thin layer of PEAT was encountered in WS103 at 3.70-3.80m bgl.

Gravels encountered within the clay and sand layers comprised mudstone, sandstone and occasional coal.

8.1.4 Solid Geology

The solid bedrock geology was encountered at depths of between 9.50m and 13.90m bgl, becoming deeper in the north of the site. The solid geology comprised interbedded grey sandstone, light grey mudstone and siltstone with intact bands of coal.

3No. intact coal seams were identified during the intrusive ground investigation with a maximum thickness of 1.10m.

8.1.5 Groundwater

Groundwater was encountered within exploratory hole locations WS101, WS102, WS103, WS106, BH101 and BH102. The depth of the strikes and seepages are shown on the exploratory hole records and summarised in Table 8.2:

Table 8.2 Summary Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)
WS101	4.05
WS102	3.35
WS103	2.50
WS106	2.45
BH101	10.90
BH102	9.60

8.1.6 Visual and Olfactory Evidence of Contamination

Visual and olfactory evidence of potential contamination has been identified during the site investigation and these are summarised in Table 8.3.

Table 8.3 Summary Visual and Olfactory Evidence of Contamination

LOCATION	DEPTH (m)	STRATUM	NOTES
WS103	0.70	Made Ground	Hydrocarbon odour
WS103	1.40	Made Ground	Hydrocarbon odour

8.1.7 Soil Consistency

Undrained shear strength values were measured using laboratory undrained triaxial tests. Results of the tests are presented in Table 8.4 below which indicate the clay soils to vary between firm and very stiff. Strength test data is generally consistent with the field descriptions of the soils given above.

Table 8.4 Summary of Undrained Shear Strength Test Results

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m^2)	CONSISTENCY
WS102	2.50-3.00	Very stiff brown slightly gravelly very sandy CLAY.	163	Very Stiff
WS105	3.50-4.00	Very stiff brown slightly gravelly very sandy CLAY.	248	Very Stiff
BH103	6.50-6.95	Firm brown slightly gravelly very sandy CLAY.	53	Firm

Results of the Standard Penetration Tests, including undrained shear strengths derived from SPTs are included on Table 8.5.

8.1.8 Side Stability and Ease of Excavation

Although no exploratory trial pits were advanced during the Ground investigation to determine stability of ground conditions, exploratory probeholes appeared to be stable within both Made Ground and drift deposits and were excavated with relative ease.

Table 8.5 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 (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS101	1.00	Clayey SAND	7	7.06	Loose	N/A	N/A	N/A
WS101	2.00	CLAY	12	10.96	N/A	Medium strength	Stiff	54.81
WS101	3.00	CLAY	15	13.04	N/A	Medium strength	Stiff	65.22
WS101	4.00	SAND	15	12.67	Medium Dense	N/A	N/A	N/A
WS101	5.00	SAND	14	11.61	Medium Dense	N/A	N/A	N/A
WS102	1.00	Silty CLAY	11	11.09	N/A	Medium strength	Stiff	55.45
WS102	2.00	Gravelly CLAY	14	12.79	N/A	Medium strength	Stiff	63.95
WS102	3.00	SAND	11	9.57	Loose	N/A	N/A	N/A
WS102	4.00	CLAY	20	16.90	N/A	High strength	Very Stiff	84.49
WS102	5.00	CLAY	20	16.59	N/A	High strength	Very Stiff	82.96
WS103	1.00	Gravelly CLAY	11	11.09	N/A	Medium strength	Stiff	55.45
WS103	2.00	CLAY	12	10.96	N/A	Medium strength	Stiff	54.81
WS103	3.00	SAND	14	12.18	Medium Dense	N/A	N/A	N/A
WS103	4.00	GRAVEL	7	5.91	Loose	N/A	N/A	N/A
WS103	5.00	CLAY	11	9.13	N/A	Medium strength	Stiff	45.63
WS104	1.00	Gravelly CLAY	10	10.08	N/A	Medium strength	Stiff	50.41
WS104	2.00	CLAY	5	4.57	N/A	Low strength	Firm	22.84
WS104	3.00	CLAY	6	5.22	N/A	Low strength	Firm	26.09
WS104	4.00	CLAY	8	6.76	N/A	Low strength	Firm	33.79
WS104	5.00	CLAY	14	11.61	N/A	Medium strength	Stiff	58.07
WS105	1.00	MG: Gravel	10	10.08	Medium Dense	N/A	N/A	N/A
WS105	2.00	CLAY	12	10.96	N/A	Medium strength	Stiff	54.81
WS105	3.00	CLAY	17	14.78	N/A	Low strength	Firm	73.92
WS105	4.00	CLAY	19	16.05	N/A	High strength	Very Stiff	80.26
WS105	5.00	CLAY	17	14.10	N/A	Medium strength	Stiff	70.52
WS106	1.00	Clayey SAND	6	6.05	Loose	N/A	N/A	N/A
WS106	2.00	CLAY	14	12.79	N/A	Medium strength	Stiff	63.95
WS106	3.00	CLAY	15	13.04	N/A	Medium strength	Stiff	65.22

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 (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS106	4.00	CLAY	13	10.98	N/A	Medium strength	Stiff	54.92
WS106	5.00	CLAY	17	14.10	N/A	Medium strength	Stiff	70.52
BH101	1.2	CLAY	7	6.87	N/A	Low strength	Firm	34.34
BH101	2.2	CLAY	16	14.44	N/A	Medium strength	Stiff	72.19
BH101	3.2	CLAY	17	14.68	N/A	Medium strength	Stiff	73.41
BH101	4.2	CLAY	14	11.78	N/A	Medium strength	Stiff	58.89
BH101	5.3	CLAY	20	16.52	N/A	High strength	Very Stiff	82.62
BH101	8.1	CLAY	16	12.95	N/A	Medium strength	Stiff	64.73
BH101	10.9	SANDSTONE	50	38.82	Dense	N/A	N/A	N/A
BH102	1.2	MG: Sandy gravel	11	10.79	Medium Dense	N/A	N/A	N/A
BH102	2.3	CLAY	11	9.87	N/A	Medium strength	Stiff	49.35
BH102	3.2	CLAY	11	9.50	N/A	Medium strength	Stiff	47.50
BH102	4.2	CLAY	13	10.94	N/A	Medium strength	Stiff	54.68
BH102	5.1	CLAY	18	14.91	N/A	Medium strength	Stiff	74.56
BH102	6.5	CLAY	18	14.70	N/A	Medium strength	Stiff	73.48
BH102	9.6	SANDSTONE	50	40.29	Dense	N/A	N/A	N/A
BH103	1.2	MG: CLAY	12	11.77	N/A	Medium strength	Stiff	58.87
BH103	2.2	SANDY CLAY	16	14.44	N/A	Medium strength	Stiff	72.19
BH103	3.2	SANDY CLAY	14	12.09	N/A	Medium strength	Stiff	60.45
BH103	4.3	SANDY CLAY	18	15.11	N/A	High strength	Very Stiff	75.56
BH103	5.3	SANDY CLAY	17	14.05	N/A	Medium strength	Stiff	70.23
BH103	8.3	SANDY CLAY	29	23.45	N/A	High strength	Very Stiff	117.24
BH103	10.5	SANDY CLAY	50	39.45	N/A	Very high strength	Very Stiff	197.23
BH103	12.3	SANDY CLAY	26	19.14	N/A	High strength	Very Stiff	95.68
BH103	13	CLAY	50	35.87	N/A	Very high strength	Very Stiff	179.37

8.1.9 Soil Infiltration

In-situ variable (falling) head permeability tests were undertaken within monitoring well installations located in three probeholes (WS101, WS104 and WS106). Tests were undertaken within monitoring wells with response zones located in the natural drift stratum.

The results are presented in Table 8.6 below and the test certificates are included within Appendix IX.

Table 8.6 Soil Infiltration Results

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
WS101	1.00-4.00	Slightly silty clayey SAND / Silty sandy gravelly CLAY	Test No.1	2.6E-07
WS104	1.00-5.00	Silty sandy gravelly CLAY / PEAT	Test No.1	9.5E-08
WS106	1.00-4.00	Slightly silty clayey SAND / Silty sandy gravelly CLAY	Test No.1	2.24E-07

Soil infiltration was taken over the wetted area from between 75% and 25% of the effective depth. All tests showed both granular and cohesive drift deposits to have poor soakage potential.

Therefore, considering the significant volumes of low permeability clay on the site, it is considered that soakaway drainage may not be suitable for the proposed development. However, the application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365 – *Soakaway Design*.

8.1.10 Soil Plasticity

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth.

E3P typically only consider a soil to be shrinkable if the proportion finer than 63µm is >35%.

PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised January 2014), which advocates the use of modified Plasticity Index (I’p), defined as:

I’p = Ip * (%< 425µm/100)

ie if PI is 30%, but the soil contains 80% < 425µm, then: I’p = 30 * 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs.

E3P apply engineering judgment where PI results are spread over a range of classifications. Consideration is given to the average values for each particular soil type (ie differentiate between residual soil and alluvium), the number of results in each class and the actual values.

The Atterberg Limits determinations, summarised in Table 8.7.

Table 8.7 Summary of Plasticity Index Test Results

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS103	2.00	13	14	27	13	97	12.61	LOW
WS104	1.00	12	13	28	15	97	14.55	LOW
WS106	3.00	15	13	29	16	100	16.00	LOW
BH101	2.20	12	15	30	15	96	14.40	LOW
BH102	2.30	14	14	28	14	97	13.58	LOW

The results of the Atterberg Limits testing confirmed that the soils would be deemed to be Low Volume Change Potential in accordance with the classification system utilised by the LABC / NHBC industry guidance.

8.1.11 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix VII (summarised below in Table 8.8), 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 8.8 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER / SOIL (g/l)	pH VALUE	CLASSIFICATION
WS101	0.35	0.12	7.9	DS-1, AC-1s
WS101	0.80	0.12	7.6	DS-1, AC-1s
WS102	0.35	0.040	7.4	DS-1, AC-1s
WS102	1.30	0.022	7.8	DS-1, AC-1s
WS103	0.20	0.034	8.3	DS-1, AC-1s
WS103	0.70	0.077	8.1	DS-1, AC-1s
WS104	0.60	0.10	7.7	DS-1, AC-1s
WS104	1.50	0.030	8.5	DS-1, AC-1s
WS104	3.80	0.44	7.1	DS-1, AC-1s
WS105	0.95	0.29	7.0	DS-1, AC-1s
WS105	1.55	0.048	7.9	DS-1, AC-1s
WS106	0.30	0.085	8.1	DS-1, AC-1s
WS106	0.75	0.015	7.4	DS-1, AC-1s

8.2 Ground Gas

A ground gas assessment has been completed in accordance with guidance provided within CIRIA 665 *Assessing risk posed by hazardous ground gases to buildings*.

8.2.1 Investigation Rationale

The ICSM has identified that the underlying potential onsite Made Ground, the backfilled pond and historical hedgerows may represent a potential source of ground gas generation, whilst the identification of organic deposits in WS103 during the ground investigation may also be a potential ground gas generation source. Based the identification of these sources within the

ground investigation, E3P has determined that the site represents a low ground gas source generation potential.

Within the context of the proposed commercial end use and ground gas generation potential, the gas assessment requires 4No. visits are required over 1 month 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.

Table 8.9 Ground Gas Monitoring Location Rationale

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Deeper natural ground / groundwater well	1.00 to 4.00
WS102	Deeper natural ground / groundwater well	1.00 to 4.00
WS103	Deeper natural ground / groundwater well	1.00 to 4.00
WS104	Deeper natural ground / groundwater well / peat deposits	1.00 to 5.00
WS105	Made Ground / Infilled Pond / Deeper natural ground / groundwater well	1.00 to 4.00
WS106	Deeper natural ground / groundwater well	1.00 to 4.00

8.2.2 Monitoring Methodology

Concentrations of methane (CH_4), carbon dioxide (CO_2) and Oxygen (O_2) were measured using an infra-red gas analyser (GFM435) calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of sixty seconds at each location, at which point the maximum concentration of CH_4 and CO_2 together with the lowest concentration of O_2 were recorded. The results of the ground gas monitoring are presented in Table 8.10 (overleaf).

Table 8.10 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 / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS101	11/09/18	0.1	0.1	-0.0106	0.5	0.5	-0.0532	18.9	1011	Rising	-10.64	1.00-4.00	4.07	0.36
	18/09/18	0.1	0.1	0.0042	0.5	0.5	0.0212	16.4	997	Rising	4.24		4.07	0.37
	21/09/18	0.1	0.1	0.0051	0.4	0.4	0.0204	17.2	1016	Rising	5.10		4.07	0.40
	25/09/18	0.1	0.1	0.0039	0.3	0.3	0.0117	17.9	1029	Falling	3.90		4.08	0.39
WS102	11/09/18	0.1	0.1	-0.0035	0.7	0.4	-0.0243	19.5	1011	Rising	-3.47	1.00-4.00	4.02	0.94
	18/09/18	0.1	0.1	0.0039	2.4	2.4	0.0931	16.4	997	Rising	3.88		4.04	0.96
	21/09/18	0.1	0.1	0.0025	2.1	2.1	0.0519	17.1	1016	Rising	2.47		4.03	0.99
	25/09/18	0.1	0.1	0.0019	2.5	2.5	0.0475	16.2	1029	Falling	1.90		4.04	0.98
WS103	11/09/18	Unable to access – obstruction										1.00-4.00		
	18/09/18	0.1	0.1	-0.0048	1.0	1.0	-0.0483	18.9	997	Rising	-4.83		4.17	1.17
	21/09/18	0.1	0.1	-0.0025	1.1	1.1	-0.0275	18.7	1016	Rising	-2.50		4.18	1.20
	25/09/18	0.1	0.1	-0.0013	0.9	0.9	-0.0117	19.1	1029	Falling	-1.30		4.18	1.19
WS104	11/09/18	0.9	0.9	0.0163	3.1	3.1	0.0561	13.9	1011	Rising	1.81	1.00-5.00	4.40	0.95
	18/09/18	0.1	0.1	0.0012	5.1	5.1	0.0592	12.2	997	Rising	1.16		4.41	1.52
	21/09/18	0.1	0.1	0.0009	5.3	5.3	0.0477	11.9	1016	Rising	0.90		4.40	1.49
	25/09/18	0.1	0.1	0.0012	4.9	4.9	0.0588	12.8	1029	Falling	1.20		4.40	1.53
WS105	11/09/18	0.1	0.1	-0.0095	2.8	1.6	-0.2668	17.1	1011	Rising	-9.53	1.00-4.00	4.05	1.05
	18/09/18	0.1	0.1	0.0076	2.5	2.5	0.1905	16.0	997	Rising	7.62		4.07	1.15
	21/09/18	0.1	0.1	0.0054	2.9	2.9	0.1566	16.8	1016	Rising	5.40		4.06	1.19
	25/09/18	0.1	0.1	0.0065	2.6	2.6	0.169	16.4	1029	Falling	6.50		4.05	1.20
WS106	11/09/18	0.1	0.1	-0.0058	0.3	0.1	-0.0174	19.9	1011	Rising	-5.81	1.00-4.00	4.11	0.70
	18/09/18	0.1	0.1	-0.0031	0.2	0.2	-0.0062	20.0	997	Rising	-3.10		4.10	0.75
	21/09/18	0.1	0.1	-0.0012	0.3	0.2	-0.0036	19.8	1016	Rising	-1.20		4.10	0.80
	25/09/18	0.1	0.1	-0.0027	0.3	0.2	-0.0081	19.7	1029	Falling	-2.70		4.10	0.82

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 a 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).

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

Table 9.1 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Commercial End Use

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	640	13	74	N/A	1	No Further Action
Cadmium	mg/kg	190	13	2.4	N/A	1	No Further Action
Chromium (VI)	mg/kg	33	13	<4.0	N/A	1	No Further Action
Lead	mg/kg	1100	13	150	N/A	1	No Further Action
Mercury	mg/kg	58	13	<0.30	N/A	2	No Further Action
Nickel	mg/kg	980	13	79	N/A	1	No Further Action
Selenium	mg/kg	12000	13	<1.0	N/A	1	No Further Action
Copper	mg/kg	68000	13	1600	N/A	1	No Further Action
Zinc	mg/kg	730000	13	5700	N/A	1	No Further Action
Phenols - Total.	mg/kg	760	13	<1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	7	Fibres	WS104 0.60m 0.013% WS105 0.95m <0.001%	4	Further Action
Naphthalene	mg/kg	190	13	<0.05	N/A	2	No Further Action
Acenaphthylene	mg/kg	83000	13	<0.05	N/A	3	No Further Action
Acenaphthene	mg/kg	84000	13	<0.05	N/A	1	No Further Action
Fluorene	mg/kg	63000	13	<0.05	N/A	1	No Further Action
Phenanthrene	mg/kg	22000	13	0.34	N/A	3	No Further Action
Anthracene	mg/kg	520000	13	<0.05	N/A	3	No Further Action
Fluoranthene	mg/kg	23000	13	0.33	N/A	3	No Further Action
Pyrene	mg/kg	54000	13	0.27	N/A	3	No Further Action
Benzo(a)Anthracene	mg/kg	170	13	0.15	N/A	3	No Further Action
Chrysene	mg/kg	350	13	0.19	N/A	3	No Further Action
Benzo(b)Fluoranthene	mg/kg	44	13	<0.05	N/A	3	No Further Action
Benzo(k)Fluoranthene	mg/kg	1200	13	<0.05	N/A	3	No Further Action
Benzo(a)Pyrene**	mg/kg	35	13	<0.05	N/A	3	No Further Action
Indeno(123-cd)Pyrene	mg/kg	500	13	<0.05	N/A	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	3.5	13	<0.05	N/A	3	No Further Action
Benzo(ghi)Perylene	mg/kg	3900	13	<0.05	N/A	3	No Further Action
TPH C5-C6 (aliphatic)	mg/kg	3200	1	< 0.001	N/A	2	No Further Action
TPH C6-C8 (aliphatic)	mg/kg	7800	1	< 0.001	N/A	2	No Further Action
TPH C8-C10 (aliphatic)	mg/kg	2000	1	< 0.001	N/A	2	No Further Action
TPH C10-C12 (aliphatic)	mg/kg	9700	1	< 1.0	N/A	2	No Further Action
TPH C12-C16 (aliphatic)	mg/kg	59000	1	11	N/A	1	No Further Action
TPH C16-C35 (aliphatic)	mg/kg	1600000	1	75	N/A	1	No Further Action
TPH C5-C7 (aromatic)	mg/kg	26000	1	< 0.001	N/A	1	No Further Action
TPH C7-C8 (aromatic)	mg/kg	56000	1	< 0.001	N/A	2	No Further Action
TPH C8-C10 (aromatic)	mg/kg	3500	1	< 0.001	N/A	2	No Further Action
TPH C10-C12 (aromatic)	mg/kg	16000	1	< 1.0	N/A	2	No Further Action
TPH C12-C16 (aromatic)	mg/kg	36000	1	8.6	N/A	2	No Further Action
TPH C16-C21 (aromatic)	mg/kg	28000	1	38	N/A	1	No Further Action
TPH C21-C35 (aromatic)	mg/kg	28000	1	16	N/A	1	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	3200	12	<1.0	N/A	2	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	7800	12	<0.1	N/A	2	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	2000	12	<0.1	N/A	2	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	16000	12	<2.0	N/A	2	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	36000	12	52	N/A	2	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	28000	12	150	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	28000	12	70	N/A	1	No Further Action

Notes
Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 4 = Dust Inhalation.
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 (C_5-C_{12}) and the Tier 1 values for aromatic compound for the non-volatile fractions (C_{12}-C_{35}). 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.

Referring to Table 9.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a commercial end use for the following contaminants:

- Asbestos

Asbestos in the form of loose chrysotile fibres and loose chrysotile-bitumen fibres have been identified within shallow Made Ground deposits in WS104 and in WS105.

No other contaminants of concern were identified within the chemical analysis.

The laboratory analysis confirms the assessment within the initial conceptual site model that the main constituents of concern were likely to be Asbestos. Meanwhile, no elevated levels of PAHs, SVOCs, VOCs, hydrocarbon compounds and heavy metal compounds have been identified within the analysis undertaken to date.

In relation to the identified exceedances, the following can be determined:

- The main exposure pathways based on the Tier I exceedances are:
    1. Fibre / Dust Inhalation
- The exceedances for all determinands are associated with shallow granular Made Ground deposits (0.95m).

Risk Assessment and Mitigation

Asbestos in the form of chrysotile has been identified within two localised areas of shallow Made Ground deposits (<1.00m bgl.); however, it should be assumed that asbestos fibres are present throughout the Made Ground across the site.

Asbestos quantification of has been undertaken which shows soils to have between <0.001% and 0.013%.

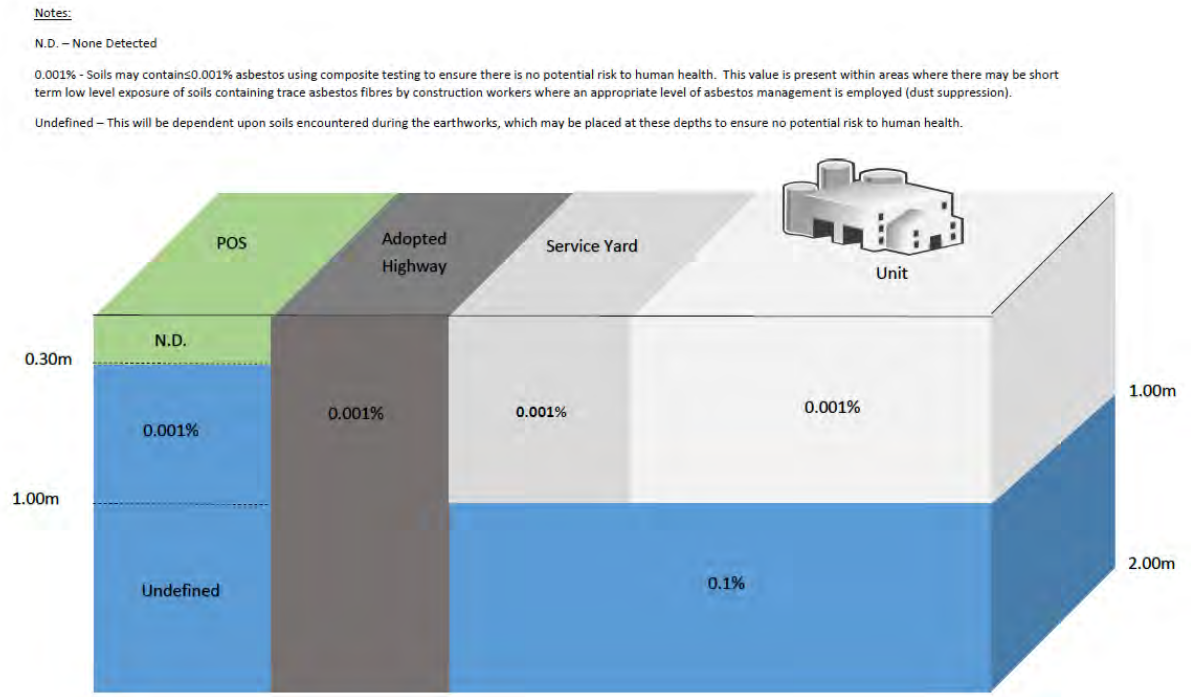
The exposure pathway is via dust inhalation and when considered within the context of the proposed commercial development, the presence of buildings and hardstanding will prevent future site users from direct contact with the impacted Made Ground.

Although no asbestos containing materials were present within the soil (physical fragments / pieces of ACM), should any visual ACM be identified during the enabling works, all ACM should be collected, double bagged and placed into skip; before safely being disposed offsite, to a suitable licensed facility in a compliant manner.

A suitably detailed remediation strategy will be required to document the safe handling, management and placement of all Made Ground so as to ensure that no unacceptable degree of risk is presented to construction workers as part of the build-phase.

E3P has produced an asbestos specific CSM which identifies the locations that asbestos impacted soils may be placed in a commercial setting to ensure there is no unacceptable level of risk to the future site users, included as Figure 9.1:

Figure 9.1 Asbestos Conceptual Site Model



Chemical analysis of the natural sand and clay drift deposits have identified these soils to be acceptable for use as subsoil however further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.

9.2 Controlled Waters Risk Assessment

The site sensitivity with respect to controlled waters is summarised within Table 9.2 (below).

Table 9.2 Controlled Waters Sensitivity Profile

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The Envirocheck Report indicates that the site is not located within a Groundwater Source Protection Zone.	**LOW**
Distance to the closest groundwater abstraction point.	There are no groundwater abstractions within 1km of the site.	**LOW**
Aquifer Classification in Superficial Drift Deposits.	A Secondary Undifferentiated Aquifer is present within the drift deposits.	**LOW**
Aquifer classification in Bedrock.	A Secondary A Aquifer is present within the bedrock geology.	**HIGH**
Viability for Anthropogenic soil in direct contact with aquifer (drift or bedrock).	Made Ground soils were encountered immediately overlying the drift deposits; however cohesive drift deposits are unproductive.	**LOW**
Is the site located within 50m of a surface watercourse?	A drainage ditch has been located 56m of the site, however this is not considered significant as there has not been a source or confluence identified. It is assumed to be culverted and part of a wider sewer network.	**LOW**
Summary The ICSM developed within the context of the site setting has identified viable pollutant risks involving the downward migration of potentially mobile phase soluble contaminants towards the underlying Secondary A Aquifer and nearby brook. However, the overall sensitivity of this receptor is reduced given the absence of any groundwater abstraction and thus the potential for the creation of a complete pollutant linkage.		

To further refine the ICSM, E3P has undertaken an initial qualitative assessment of the soil data analysis to assess the potential for a source of separate phase or dissolved phase contamination originating from either a defined on-site source or from impacted soils. This assessment is summarised in Table 9.3.

Table 9.3 Qualitative Risk to Controlled Waters from Soil Analytical Results

BTEX - >1mg/kg **Total VOC - > 1mg/kg**	All concentrations are below the laboratory LOD.
Total SVOC - > 1 mg/kg	All concentrations are below the laboratory LOD.
C5-C10 - > 5mg/kg	All concentrations are below the laboratory LOD.
C10-C12 - > 10mg/kg	All concentrations are below the laboratory LOD.
C12-C16 - > 50mg/kg	All concentrations are below the laboratory LOD excluding WS103 (0.70m) with a value of 11mg/kg; WS102 (0.35m) with a value of 52mg/kg; and, WS103 (0.20m) with a value of 24 mg/kg;
Phenols - > 2mg/kg	All concentrations are below the laboratory LOD.
Naphthalene - > 2mg/kg	All concentrations are below the laboratory LOD.
Total PAH - > 10mg/kg	Total concentrations of low solubility PAH compounds greater than 10mg/kg have not been detected in the soil analysis.
Heavy metals - > 500mg/kg	Concentrations of copper and zinc have been identified above 500mg/kg within WS105 at 0.95m.; Zinc has been recorded at 860mg/kg within WS104 at 0.60mbgl.

In due consideration of the ICSM which has identified a potential pollutant linkage associated with the migration towards the underlying aquifers and nearby brook, E3P has undertaken a Tier I controlled waters risk assessment. The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground and groundwater samples to Drinking Water Standards and Environmental Quality Standards (EQS).

These are presented in Table 9.4.

Table 9.4 Comparison of Groundwater Analysis with Tier 1 Screening Levels

DETERMINAND	UNITS	EQS SCREENING VALUE [1, 2, 3]		DWS [3,4,5]	N (L-Leachate, GW – Groundwater)	MC	LOC OF EX	ASSESSMENT
		AA	MAC					
Arsenic	µg/l	50	-	10	2 L and 6 GW	7.8	N/A	No Further Action
Cadmium	µg/l	0.08	0.45	5	2 L and 6 GW	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	-	-	2 L and 6 GW	<5.0	N/A	No Further Action
Chromium (III)	µg/l	4.7	-	50	2 L and 6 GW	1.3	N/A	No Further Action
Copper (hardness)	µg/l	1-28		2000	2 L and 6 GW	7.8	N/A	No Further Action
Total Cyanide	µg/l	1	-	50	2 L and 6 GW	<1.0	N/A	No Further Action
Lead	µg/l	1.2	14	10	2 L and 6 GW	1.5	N/A	No Further Action
Mercury	µg/l	-	0.07	1.0	2 L and 6 GW	<0.5	N/A	No Further Action
Nickel	µg/l	4	34	20	2 L and 6 GW	15	N/A	No Further Action
Selenium	µg/l		-	10	2 L and 6 GW	5.6	N/A	No Further Action
Zinc(hardness)	µg/l	8-125	-	-	2 L and 6 GW	7.3	N/A	No Further Action
pH	6-9				2 L and 6 GW	7.0-8.1	N/A	No Further Action
PAH								
Naphthalene	µg/l	2	130	10*	2 L	0.65	N/A	No Further Action
Anthracene	µg/l	0.1	0.1		2 L	<0.01	N/A	No Further Action
Benzo[b]fluoranthene	µg/l	1.7^{-4}	0.017		2 L	<0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	1.7^{-4}	0.017		2 L	<0.01	N/A	No Further Action
Benzo(a)pyrene	µg/l	1.7^{-4}	0.27		2 L	<0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063	0.12		2 L	<0.01	N/A	No Further Action
Benzo(ghi)perylene	µg/l	1.7^{-4}	8.2^{-3}		2 L	<0.01	N/A	No Further Action
TPH-Aromatic								
TPH C5-C6 (benzene)	µg/l	10	50	1	2 L and 6 GW	27	WS103 (GW) – EQS AA	Further Action
TPH C6-C8 (toluene)	µg/l	50	-	700	2 L and 6 GW	9.1	N/A	No Further Action
TPH C8-C10 (ethyl Benzene)	µg/l	20	-	300	2 L and 6 GW	25 20	WS103 (L/GW) - EQS AA	No Further Action
TPH C10-C12 (xylene)	µg/l	30	-	500	2 L and 6 GW	34 89	WS103 (L/GW) – EQS AA	Further Action
TPH C12-C16	µg/l	2	130	90[5]	2 L and 6 GW	35 180	WS103 (L/GW) – EQS/DWS	Further Action
TPH C16-C35	µg/l	50#	50#	90[5]	2 L and 6 GW	300	WS103 (GW) – EQS/DWS	Further Action
TPH Aliphatic [5]								
TPH C5-C6	µg/l	-	-	15000	2 L and 6 GW	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	-	-	15000	2 L and 6 GW	<1.0	N/A	No Further Action
TPH C8-C10	µg/l	-	-	300	2 L and 6 GW	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	-	-	300	2 L and 6 GW	<10	N/A	No Further Action
TPH C12-C16	µg/l	-	-	300	2 L and 6 GW	200	N/A	No Further Action

DETERMINAND	UNITS	EQS SCREENING VALUE [1, 2, 3]		DWS [3,4,5]	N (L-Leachate, GW – Groundwater)	MC	LOC OF EX	ASSESSMENT
		AA	MAC					
TPH C16 – C21	µg/l	-	-	300**	2 L and 6 GW	420	WS103 (GW)	Further Action
TPH C21-C35	µg/l	-	-	300**	2 L and 6 GW	160	N/A	No Further Action
VOC								
Trichlorobenzene	µg/l	0.4	-	-	6 GW	<1.0	N/A	No Further Action
Trichloromethane	µg/l	2.5	-	-	6 GW	<1.0	N/A	No Further Action
Vinyl Chloride	µg/l	-	-	0.3	6 GW	256	WS103 (GW)	Further Action

Notes
Solubility <0.01µg/l
AA – Annual Average
MAC- Maximum Admissible Concentration
* Sum of The specified compounds are benzo[b]fluoranthene (CAS 205-99-2), benzo[k]fluoranthene (CAS 207-08-9), benzo[g,h,i]perylene (CAS 191-24-2) and indeno[1,2,3-c,d]pyrene (CAS 193-39-5)

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)

For the purposes of the Tier 1 assessment E3P has compared the laboratory test data directly to the EQS values, which are for the protection of surface water quality and DWS values for drinking water.

This comparison indicates that the data exceeds for the following organic compounds:

- Aromatic TPH C5-C6
- Aromatic TPH C10-C12
- Aromatic TPH C12-C16
- Aromatic TPH C16-C35
- Aliphatic TPH C16 – C21
- Vinyl Chloride

It should be noted that the Tier I assessment criteria provides a conservative view, which may over-state the risk. All of the exceedances identified are associated with leachate and groundwater samples from WS103 where hydrocarbon impact was identified.

Historical mapping has identified a former railway and oil distribution terminal along the northern boundary of the site and tanks within the vicinity of WS103, where TCE may have been stored as it was historically used as a degreaser in engineering works. Therefore, the elevated concentrations may be attributed to these.

Analysis of VOC results has identified the presence of Cis-1,2-dichloroethene (DCE) and vinyl chloride (VC), which suggests a possible Trichloroethylene (TCE) source material as DCE and VC and break-down products of TCE. TCE was not recorded in WS106 and indicates that the source area may not have been located during this phase of investigation.

As it is considered that groundwater will flow in a southerly direction it is possible that the impact is associated within an off-site source but further delineation of the area and beneath the existing buildings is recommended.; groundwater samples from WS106 within the south of the site has not identified any elevated levels of determinants.

Soil analysis from this borehole has not identified any elevated levels of determinants. However, the presence of Vinyl Chloride presents a vapour risk to human health.

It is recommended to complete further boreholes within this area and undertake further groundwater sampling to delineate the impact.

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.

CIRIA C665, 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:

$$GSV = \frac{concentration\ (by\ vol)}{100} \times flowrate\ (1/hr)$$

The GSVs within CIRA C665 are based upon all buildings other than standard residential houses. The thresholds for GSVs based upon CIRIA guidance are provided within Table 9.5 (below)

Table 9.5 Thresholds for Gas Screening Values (GSV) in accordance with CIRIA C665 Commercial End Use.

CIRIA – NO SUB-FLOOR VOID	
CLASSIFICATION	**GSV (METHANE AND CARBON DIOXIDE)**
CS1	<0.07
CS2	<0.70
CS3	<3.5
CS4	<15
CS5	<70
CS6	>70

9.4 Sources of Ground Gas

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

- Made Ground deposits
- Organic deposits
- Coal seams
- In-filled pond area

9.4.1 Groundwater

Groundwater levels were observed to fluctuate slightly over the monitoring period with levels generally decreasing over the monitoring period. The greatest groundwater change occurred within WS104 where levels decreased by 0.58m over the monitoring period. WS104 was set within a low permeability clay stratum and groundwater may be a result of surface water collecting in the well rather than a measure of true groundwater.

9.4.2 Gas Flow

During the monitoring a positive flow was noted in WS101, WS102, WS104, and WS105. 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 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. Negative flows were recorded in within all monitoring wells apart from WS104.

9.4.3 Gas Concentrations

Methane has been recorded within all monitoring wells at concentrations between 0.1% v/v, the limit of detection, and 0.9% v/v in WS104.

Carbon dioxide concentrations were recorded within all the monitoring wells at concentrations ranging from 0.1%, the limit of detection, to 5.3% v/v (WS104). The maximum carbon dioxide were also associated within low oxygen concentrations and appear to be associated with a thin layer of peat identified within WS104.

9.4.4 Gas Assessment

In accordance with the methodology outlined within 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 9.6.

Table 9.6 Gas Risk Profile & Location

LOCATION	MAX CO2	GSV	MAX CH4	GSV	CLASSIFICATION
WS101	0.5	-0.0532	0.1	-0.01064	CS1
WS102	2.5	0.09312	0.1	0.00388	CS2
WS103	1.1	-0.0483	0.1	-0.00483	CS1
WS104	5.3	0.05916	0.9	0.01629	CS2
WS105	2.9	-0.26684	0.1	-0.00953	CS2
WS106	0.3	-0.01743	0.1	-0.00581	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.

Elevated GSVs have been identified within WS102 and WS105, where monitoring well response zones was located within natural drift deposits, and flow rates were high. CL:AIRE Research Bulletin RB17 (dated November 2012) suggests that:

"Differential pressure recorded in a well with a response zone spanning different strata may be different to pressure recorded in discrete locations. This could create an artificial flow regime. It is a particular problem where deep wells are installed for groundwater sampling and are then used for ground gas monitoring where no credible gas source is present. It also occurs where more permeable strata are confined by impermeable material such as clay over sand layers or clay over peat."

Within WS102 and WS105 the monitoring well response zone was located within different strata, therefore the above may be the driving force behind the elevated GSVs at these locations.

Ground gas monitoring suggests that the site is classified as both CS1 and CS2; worst case scenario should be utilised in this instance and therefore it is considered that gas protection measures will be required and buildings will require specialist protection measures as detailed below. Further ground gas monitoring is recommended following the demolition of the current buildings on site to further refine the gas regime on site.

9.5 Commercial Building Gas Risk Mitigation

British Standard BS8485 (2015) provides different types of commercial property that require assessment. These building types are:

- **Type C building:** commercial building with central building management control of any alterations to the building or its uses and central building management control of the maintenance of the building, including the gas protection measures. Single occupancy of ground floor and basement areas. Small to large size rooms with active ventilation or good passive ventilation of all rooms and other internal spaces throughout ground floor and basement areas. Probably civil engineering construction. Examples include offices, some retail premises, and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).

- **Type D building:** industrial style building having large volume internal space(s) that are well ventilated. Corporate ownership with building management controls on alterations to the ground floor and basement areas of the building and on maintenance of ground gas protective measures. Probably civil engineering construction. Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).

Based on the ground gas risk assessment and the proposed Type D Building, it is envisaged that a point score of 1.5 will be required for affected properties as summarised in Table 9.7.

Table 9.7 BS8485 (2015) Points Required for Type A and B Building

CHARACTERISTIC SITUATION	NHBC TRAFFIC LIGHT SYSTEM	MINIMUM GAS PROTECTION SCORE (POINTS)			
		High Sensitivity		Low Sensitivity	
		Type A building	Type B building	Type C building	Type D building
1	Green	0	0	0	0
2	Amber 1	3.5	3.5	2.5	1.5
3	Amber 2	4.5	4	3	2.5
4	Red	6.5	5.5	4.5	3.5
5	N/A	—	6.5	5.5	4.5
6	N/A	—	—	7.5	6.5

1.5 points must be achieved by installation of a suitable combination of measures detailed Table 9.8.

Table 9.8 Summary of Ground Gas Mitigation Measures - BS8485 (2015)

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	SCORE[A]
a) Floor and substructure design	
Precast suspended segmental subfloor (i.e. beam and block).	0
Cast in situ ground bearing floor slab (with only nominal mesh reinforcement.	0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations.	1 or 1.5[B]
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing..[C]	2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing. [C]	2.5

A) The scores are conditional on breaches of floor slabs, etc., being effectively sealed.
B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2).
C) The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).

PROTECTION ELEMENT SYSTEM		SCORE	COMMENTS
Gas protection scores for ventilation protection measures			
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)		0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and / or is not terminated in a venting trench (or similar), then the score is zero.
(b) Passive sub floor dispersal layer: Media used to provide the dispersal layer are: • *Clear void* • *Polystyrene void former blanket* • *Geocomposite void former blanket* • *No-fines gravel layer with gas drains* • *No-fines gravel layer*	Very good performance	2.5	The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B of BS8485:2015. Passive ventilation should be designed to meet at least "good performance".
	Good performance	1.5	
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a sub floor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.		1.5 to 2.5	This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance".

PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to *Buildings Regulations 2000, Approved Document F [9].*
Gas protection score for the gas resistant membrane		
Gas resistant membrane meeting all of the following criteria: • *Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m^2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method_;* • *Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;* • *Sufficiently strong to withstand in-service stresses (eg settlement if placed below a floor slab);* • *Sufficiently strong to withstand the installation process and following trades until covered (eg penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc);* • *Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and,* • *Verified in accordance with CIRIA C735.*	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.40mm thickness (equivalent to 370g/m^2 for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite then the score is zero.
This table should be read in conjunction with the notes presented in BS8485 (2015)		

9.6 Revised Conceptual Site Model

Following the completion of the intrusive site investigation, chemical analysis and risk assessment the conceptual model shown in Table 9.9 has been prepared for the site.

Table 9.9 Revised Conceptual Model

POLLUTANT LINKAGE	PATHWAY	RECEPTOR	CONTAMINANT (SOURCE)	PROBABILITY	RISK	ASSESSMENT AND RECOMMENDATIONS
PL1	Inhalation of soil, fibres and dust. Ingestion of soils, dust, vegetables, soil attached to vegetables. Windblown dust.	Future site users. Offsite receptors.	ACM identified in Made Ground deposits and potentially within existing buildings.	Likely	Moderate	Likely probability due to identification within Made Ground deposits and age of buildings on site. **Recommendations**: Although no asbestos containing materials were present within the soil (physical fragments / pieces of ACM), should any visual ACM be identified during the enabling works, all ACM should be collected, double bagged and placed into skip; before safely being disposed offsite, to a suitable licensed facility in a compliant manner. A suitably detailed remediation strategy will be required to document the safe handling, management and placement of all Made Ground so as to ensure that no unacceptable degree of risk is presented to construction workers as part of the build-phase Management of soils should be completed in line with the E3P Asbestos Conceptual Site Model. Pre-demolition asbestos survey of existing structures.
PL2	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Offsite land users.	Methane, carbon dioxide. (Peat, coal measures and potentially infilled features on and within 250m of the site).	Likely	Moderate	Likely probability due to the presence of Made Ground and peat. Glacial Till will likely restrict migration of any coal measures gas into shallow foundations. Recommendation: CS2 gas protection measures required.

POLLUTANT LINKAGE	PATHWAY	RECEPTOR	CONTAMINANT (SOURCE)	PROBABILITY	RISK	ASSESSMENT AND RECOMMENDATIONS
PL3	Migration through permeable strata and preferential pathways Perched waters migration.	Drift and Bedrock aquifers. Surface water (Unnamed stream	Mobile contaminants such as hydrocarbons and volatile compounds.	Likely	Moderate	Likely probability as significant exceedances of organic contaminants and Vinyl Chloride have been identified within the location of WS103. Given the site is underlain by low probability cohesive drift deposits which will afford protection to the underlying aquifer and the absence of a groundwater abstraction point within 1km of the site, there is considered a moderate risk to controlled waters. **Recommendation**: Delineation/treatment of impacted soils/groundwater.
PL4	Sulphate attack on concrete.	Building structure.	Sulphate (potential ash, clinker and slag within made ground).	Low-Likelihood	Moderate / Low	Low-likelihood although as is anticipated within the Made Ground across the site which may be in contact with concrete used in future buildings. Concrete has been classified thus far as DS-1, AC-1s. **Recommendation**: Concrete of DS-1, AC-1 should be used for all structures in contact with Made Ground deposits.
PL5	Ingestion of tainted water supply.	Future site users. Water pipes.	Organic Contaminants such as hydrocarbons, solvents	Likely	Moderate	Likely probability as significant contamination anticipated at pipeline depth across the west of the site (0.75-1.35m). Recommendation: Intrusive investigation required.
PL6	Direct Contact (plant uptake).	Flora.	Phytotoxic Contaminants (made ground).	Unlikely	Low	Unlikely probability due to limited areas of landscaping on site and commercial end use.

10. GEOTECHNICAL ASSESSMENT

10.1 Proposed Development

E3P understands that the client is involved with respect to the proposed development of the site for commercial end use; which will involve demolition of the existing industrial units and construction of 4 No new commercials units with associated access roads, car parking and adopted utility infrastructure. Drawing 12-639-002 (Appendix III) identifies the proposed development layout.

10.2 Summary of Ground Conditions

Made Ground

Made Ground deposits were encountered within all exploratory hole locations to proven depths of between 0.15m and 2.30m bgl, although in general Made Ground was encountered to a depth of less than 1.00m bgl.

Made Ground deposits predominantly comprise a hardstanding cover of concrete/asphalt, although a reworked topsoil of dark brown/black slightly clayey gravelly sand with brick and mudstone was encountered in WS102. Underlying this was a black brown slightly clayey gravel of sandstone, coal, mudstone, brick, clinker, glass, plastic and concrete in the majority of exploratory locations. In the south east of the site within WS105 and WS106, a reddish brown sandy gravel with ash, clinker, slag and brick was encountered.

Drift Deposits

Drift deposits were encountered within all exploratory locations. The drift deposits comprise a firm to stiff brown silty sandy gravelly CLAY with a discontinuous band of reddish brown SAND and occasional GRAVEL in several locations. A thin layer of PEAT was encountered in WS103 at 3.70-3.80m bgl.

Gravels encountered within the clay and sand layers comprised mudstone, sandstone and occasional coal.

Solid Geology

The solid bedrock geology was encountered between 9.50m and 13.90m bgl, becoming deeper in the north of the site. The solid geology comprises grey sandstone, light grey mudstone and siltstone and intact bands of coal.

3no intact coal seams were identified in the upper 35.00m with maximum thickness of 1.10m.

Groundwater

Groundwater strikes were encountered as strikes and seepages at depths of between 2.45m and 10.690mbgl.

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 Specification for Highway Works. This should include:

- 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; and,

- Buried structures and old foundations will be present on site. These should be excavated from below the proposed development foot print with the resulting void backfilled.

10.4 Foundation Conditions & 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 ABPs

GRANULAR SOILS			
Description	**Depth (range bgl)**	**Relative Density**	**Allowable Bearing Pressure (kN/m²)**
Slightly silty clayey SAND/GRAVEL	1.00-4.00	Loose	59-95
Slightly silty clayey gravelly SAND	3.00-5.00	Medium Dense	116-126
SANDSTONE	9.60-10.90	Dense	388-402
COHESIVE SOILS			
Description	**Depth (range m bgl)**	**Undrained Shear Strength (Cu) kN/m²**	**Allowable Bearing Pressure (kN/m²)**
Firm silty sandy gravelly CLAY	1.20-4.00	22-34	46-70
Stiff slightly sandy gravelly CLAY	1.00-8.10	45-74	93-153
Very stiff sandy CLAY	4.00-13.00	75-197	155-405

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 underlying stiff to very stiff Glacial clays and localised areas of medium dense to dense sands. The geotechnical assessment will be based on the assumed allowable bearing pressure of the proposed development to be >125kN/m^2.

It is unlikely that significant cut/fill operations will be required to create a level developable platform although significant buried obstructions may be encountered under the footprint of the existing building which will require excavation and grubbing out prior to the detailed design of a suitable foundations solution.

It is anticipated that on completion of any enabling works, the ground will comprise circa. 1.00-2.00m of variable Made Ground. The Made Ground is not considered suitable founding stratum (in its current condition) due to its inherent variability and unquantifiable potential for long term total and differential settlement.

The geotechnical assessment confirmed that the natural stratum will provide the required safe ABP (assumed to be >125 kN/m^2 based on the proposed site structures) is generally at a depth in excess of 2.50m and as such the use of a traditional spread footing (strip or trench fill) is likely to be unviable for the construction of the proposed commercial unit.

It may be feasible to remediate the Made Ground to facilitate re-engineering using a vibro replacement stone column (VRSC) to remove the variability within the Made Ground and facilitate the construction of doubly reinforced strip foundations at a shallow depth.

The lifting and processing of the existing concrete slab is likely to generate a large volume of material that can be processed into aggregate for re-use as part of the development platform. Should there be a shortfall, it may be necessary to import suitable engineered fill.

The vibro granular columns could provide a bearing capacity of around 125kN/m² but will also remove variability within the Made Ground. Specialist advice should be sought from a suitably experience contractor with regard to allowable bearing capacity and settlements.

Consideration must also be given to the varying soil matrices and differing settlement characteristics and where a foundation spans two varying matrices the sub-structure should be designed accordingly.

The final foundation solution will be dependent on the structural loadings and elevation and should be designed by a suitably qualified structural engineer.

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

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

At this time, it is not possible to accurately define the foundation types required due to the absence of ground investigation within the footprints of existing buildings. It is recommended further ground investigation is completed within the vicinity of the existing buildings to further refine the foundation types.

A Depth to Rock Head Plan is included as Drawing 12-639-008 in Appendix III.

10.5 Ground Floor Slabs

Due to the presence of thickness' of Made Ground exceeding 600mm in several locations across the site is considered that ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement.

Where suspended floor slabs are employed ventilation of the under floor void will be required to address condensation issues. This would also assist in the mitigation of potential gas ingress issues.
A ground bearing slab will be viable for the commercial structures; however, it will need to be constructed utilising a sub-base with the thickness designed by a structural engineer to ensure that settlement tolerances are taken into consideration.

Where a ground bearing floor slab is to be constructed within the conjectured zone of tree influence, the clay will need to be removed to ensure that any desiccated soil cannot swell and induce heave to the structure. Alternatively, it may be possible to design the structure to resist the influence of clay heave using exaggerated sub-base and additional re-enforcement within the slab to be designed by the Structural Engineer.

Where it is necessary to undertake cut / fill works utilising site derived cohesive soils, careful consideration must be given to seasonal climatic conditions which will have a significant impact of Moisture Conditions and the ability to compact clay soils in the wetter winter months.

It may be necessary to undertake an element of stabilisation works through the addition of lime to ensure the soils can be engineered to the required performance standards.

It would be possible to utilise soil stabilisation techniques that incorporate the addition of lime and OPC to construct a stiffened soil horizon with a CBR >15% to constitute a sub-base replacement layer that could then be capped with Type 1 MOT. The use of soil stabilisation could be extended within the conjectured zone of tree influence to modify the structure of clay soils and negate the potential for volumetric instability.

10.6 Heave Precautions

The site has been proven to be underlain by clay soils which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC / LABC conjectured zones of influence.

As the clay is deemed to be low plasticity heave precautions are not required to the internal face of the external load bearing walls (outside or within tree influence).

If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams.

If the ground floor slab is to be constructed with a beam and block floor, a minimum sub-floor void of 200mm is required within any structures located in the zone of conjectured tree influence.

If the ground floor slab is constructed with a cast in-situ suspended floor slab heave precautions that can tolerate 50mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.

A summary of Heave Precautions is presented in Table 10.3.

Table 10.3 Summary of Heave Precautions

		MINIMUM VOID DIMENSION FOR FOUNDATIONS, GROUND BEAMS AND SUSPENDED IN-SITU CONCRETE GROUND FLOORS		MINIMUM VOID DIMENSIONS UNDER PRE-CAST CONCRETE AND SUSPENDED TIMBER FLOORS
Plasticity Index of Soil	**Required Foundation Depth (m)**	**Thickness of Void Former Against Side of Foundation or Ground Beam (mm)**	**Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm)**	**Void Dimension (mm)**
High Plasticity (>40)	>2.50	Engineer Design		Engineer Design
	2.00-2.50	35	150	300
	1.50-2.00	25	75	
Moderate Plasticity (20-40)	>2.50	Engineer Design		Engineer Design
	2.00-2.50	25	100	250
	1.50-2.00	25	50	
Low Plasticity (<20)	2.00-2.50	-	50	200
	>2.00	No Special Precautions		

10.7 Pavement Construction

A programme of enabling works will be required to develop the proposed road sub-grade in accordance with the requirements of the highways design manual (series 600) for a Method Compaction.

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

10.8 Drainage

The presence of substantial depths of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Falling head permeability testing has shown the underlying drift deposits to have a poor soakage potential. Furthermore, the entire site is predominantly underlain by circa. 1-2m of likely low permeability gravelly CLAY. Therefore, the use of soak-away drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured it is not recommended that soakaways utilised for disposal of surface water runoff.

If soak-away drainage is to be considered, full BRE365 Testing must be completed to inform the detailed design.

10.9 Concrete Durability

Based upon the results of the chemical analyses summarised in 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-1 in accordance with the recommendations provided in BRE Special Digest 1 (2005).

10.10 Excavations

Although no exploratory trial pits were advanced during the Ground investigation to determine stability of ground conditions, exploratory probeholes appeared to be stable within both Made Ground and drift deposits and were excavated with relative ease.

Site observations indicated that excavations should be feasible in the near surface with normal plant, however obstructions were identified in the near surface including former foundations and former floor slabs. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works.

However, due to the depth and variability of the Made Ground and possibility 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. Consideration should be given for the potential for dewatering gravels in the surrounding areas to the subject site that may cause structural damage to buildings sub-structures in close proximity to the site.

Table 10.4 Civil Engineering Excavation Risk Matrix

RISK ITEM	PRESENT	COMMENT
Running Sands	No	NA
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	No	Shallow Bedrock has not been encountered onsite.

10.11 Coal Mining Risk Assessment & Recommendations

A detailed coal mining risk assessment has been undertaken due to the identified presence of shallow coal seam outcropping beneath the site and potential for shallow coal mining on-site and in the immediate surrounding area.

A review of the mining geology confirmed the presence of the Higher Florida Coal Seam outcropping within the site boundary and the Lower Florida Coal Seam outcropping to the north of the site, both dipping in a south/south westerly direction. The recorded details are summarised in Table 10.5 below.

Table 10.5 Coal Mining Geology

COAL SEAM	THICKNESS	OUTCROP	DEPTH
The Lower Florida (Bickershaw Seven Foot Mine)	7 Foot	**17.4m North of Site**	**51 feet (based on nearby borehole)**
The Higher Florida (Pemberton Five Foot Mine)	5 Foot	**On site**	**32 feet (based on nearby borehole)**

Recorded Coal Authority Workings

No mine entries have been identified within 100m of the site boundary, the closest is located circa. 170m east of the site. However, The Coal Authority have considered there to be probable unrecorded shallow workings at the site; past underground mining has been identified beneath the site at depths of between 82m and 331mbgl. where they were last mined between 1879 and 1922.

10.11.1 Scope of intrusive Ground Investigation

In due consideration of the potential presence the Higher Florida Coal Seam outcropping on site and the Lower Florida Coal Seam outcropping north of the site a series of rotary boreholes have been advanced in accordance with Coal Authority Permission ref: 16204 to assess the potential presence of shallow workings within these seams and the potential for ground instability to induce a future subsidence event within the proposed development.

10.11.2 Summary of Ground Investigation Works

Three No. rotary boreholes have been advanced at the locations detailed within the E3P exploratory borehole location plan at positions to interject the potential coal seams and assess the potential for any workings. The findings of the boreholes are summarised in Table 10.6

Table 10.6 Summary of Coal Mining Investigation Findings

ROTARY BOREHOLE	DEPTH TO ROCKHEAD	DEPTH TO TOP / (THICKNESS) OF COAL	EVIDENCE OF MINING ACTIVITY / SEAM	REMARKS
RB101	10.90m	13.00m (0.50m) 20.50m (1.00m) 28.00m (0.40m)	N/A	Coal intact The Higher Florida (or Pemberton Five Foot Mine)
RB102	9.50m	13.70m (1.10m) 21.20m (0.30m)	N/A	Coal intact The Lower Florida (or Bickershaw Seven Foot Mine)

ROTARY BOREHOLE	DEPTH TO ROCKHEAD	DEPTH TO TOP / (THICKNESS) OF COAL	EVIDENCE OF MINING ACTIVITY / SEAM	REMARKS
RB103	13.90m	14.15m (0.85m) 21.00m (0.50m) 23.00m (0.60m)	N/A	Coal intact The Lower Florida (or Bickershaw Seven Foot Mine)

10.11.3 Summary of Coal Mining Issues

E3P has reviewed BGS Geological Mapping and CA information, in addition to completing 3 No. 35.00m rotary boreholes to investigate shallow mine workings; a summary of which is detailed below:

- The intrusive ground investigation comprising three deep rotary boreholes identified coal seams within all boreholes;
- All coal seams encountered were intact;
- Coal seams within RB101 and RB102 have been inferred as The Higher Florida Coal seam from depths at 13.00m or 13.70mbgl. Coal from 14.15mbgl. within RB103 have been inferred as the Lower Florida Coal Seam;

While no evidence of workings has been identified at the E3P borehole positions, the seams are present and of a workable thickness. The Coal Authority has evidence of shallow mining in the Higher & Lower Florida immediately east and west of the site, therefore it is more than probable that coal has been mined within the area of the proposed development in the 17th and 18th centuries before accurate records were made.

Given that the seam is outcropping and dipping at a shallow gradient, there is <10x Seam Cover of competent bedrock, therefore the risk of consolidation within unrecorded mine workings and the potential to induce subsidence at the surface is significant.

It will therefore be necessary to undertake a programme of proof drilling and where necessary stabilisation of workings by pressure grouting in accordance with a detailed design and Coal Authority Permit.

10.12 Further Works

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

- Additional site investigation within the footprints of the existing buildings and electricity substation;
- Delineation of the former ponds and identified Peat deposits;
- Delineation of the chlorinated hydrocarbon impact at WS103;
- Arboricultural Survey;
- Materials Management Plan;
- Geotechnical Earthworks Strategy (Infrastructure);
- Remediation & Enabling Works strategy;
- Full three-dimensional earthworks Cut / Fill Model; and,
- Asbestos survey of existing on-site structures prior to demolition.

10.13 Construction Activity and Inspection

The following activities and inspections should be incorporated in to 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 formation and sub formations 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 utilised;
- It is considered that de-watering 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 provision of space for settling tanks or an attenuation pond;
- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results; and,
- The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

11. CONCLUSIONS AND RECOMMENDATIONS

Contaminated Land Assessment	
Human Health	Loose chrysotile fibres were identified within the Made Ground deposits in WS104 and WS105, however it should be assumed that asbestos fibres are present throughout the Made Ground across the site. Loose fibres could be released during earthworks and subsequently inhaled by construction workers and possibly third-party property. Although no asbestos containing materials were present within the soil (physical fragments / pieces of ACM), should any visual ACM be identified during the enabling works, all ACM should be collected, double bagged and placed into skip; before safely being disposed offsite, to a suitable licensed facility in a compliant manner. A suitably detailed remediation strategy will be required to document the safe handling, management and placement of all Made Ground so as to ensure that no unacceptable degree of risk is presented to construction workers as part of the build-phase. Placement of soils will require careful management and regulatory authority approved phase of enabling works, under strict construction phase health and safety controls. Upon placement of asbestos impacted soils at depth beneath hardstanding or plots in line with the E3P Asbestos Conceptual Site Model, they will present no unacceptable risk to the future site users.
Controlled Waters	Moderate risk to controlled waters from identified organic contaminants in the area of WS103. Tanks were historically present in this vicinity which may have contained TCE as part of the engineering works. Furthermore, an Oil Distribution Terminal was present along the northern boundary of the site. At this time, it is not possible to isolate the impact to the area surrounding WS103 and it is recommended further window sample probeholes are completed in this area with further groundwater monitoring to delineate the area. The risk to controlled waters is reduced given the presence of low permeability cohesive drift deposits beneath the site and the absence of a groundwater abstraction point within 1km of the site. The brook identified adjacent to the site is assumed to be a small drainage ditch.
Ground Gas	Characteristic Situation 2.
Potable Water	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.
Geotechnical Assessment	
Significant concrete and brick obstructions are anticipated underlying the existing onsite structures presently onsite. During a phase of cut 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. Further investigation is recommended within the footprint of the existing buildings to confirm ground conditions in these areas. Delineation of the former ponds should also be undertaken, along with delineation of the identified Peat deposits. Peat deposits will require removal during the enabling works. The underlying natural clay drift deposits have been assessed as being firm to very stiff high strength with a net ABP in the order of between 46-70 kN/m2 at 1.20-4.00m increasing to 93-405 kN/m^2 with depth.	

At this time, it is not possible to accurately define the foundation types due to the absence of a finalised Proposed Development scheme or finished floor levels (FFLs), however upon completion of these enabling works, it is likely that the most cost effective option for the majority of the site will be to re-engineer the Made Ground and loose sands using Vibro Stone Columns (VSC) or Pile foundations to transfer structural loadings to deep competent stratum.

Consideration must also be given to the varying soil matrices and differing settlement characteristics and where a foundation spans two varying matrices the sub-structure should be designed accordingly. It may also be necessary to locally deepen foundations within influence of existing of proposed trees.

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 1.2.

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 be 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.

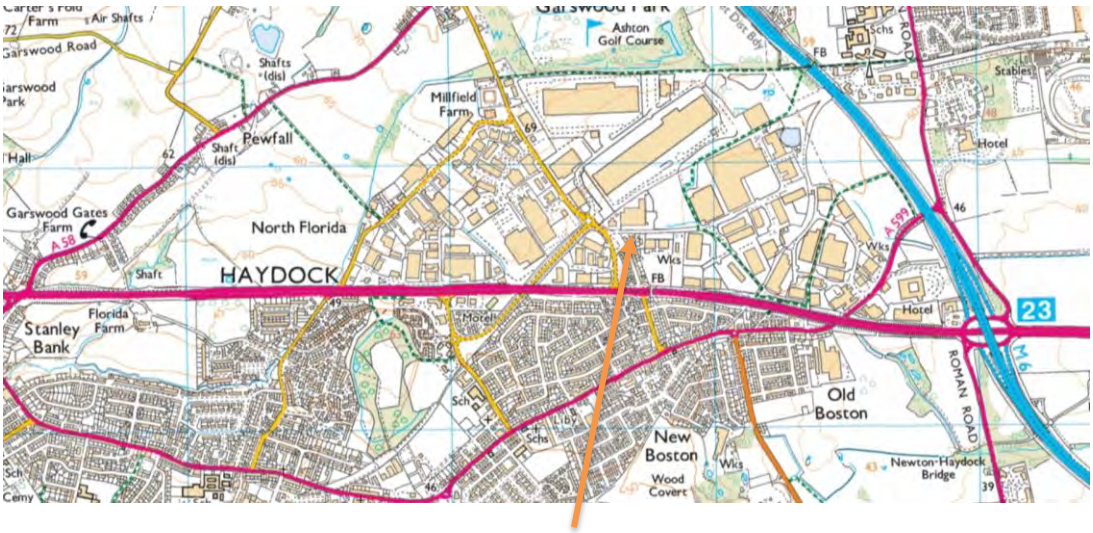
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

TERMS

AST	Above Ground Storage Tank	**SGV**	Soil Guideline Value
BGS	British Geological Survey	**SPH**	Separate Phase Hydrocarbon
BSI	British Standards Institute	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	**SPT**	Standard Penetration Test
CIEH	Chartered Institute of Environmental Health	**SVOC**	Semi Volatile Organic Compound
CIRIA	Construction Industry Research Association	**UST**	Underground Storage Tank
CLEA	Contaminated Land Exposure Assessment	**VCCs**	Vibro Concrete Columns
CSM	Conceptual Site Model	**VOC**	Volatile Organic Compound
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)	**WTE**	Water Table Elevation
DWS	Drinking Water Standard	**m**	Metres
EA	Environment Agency	**km**	Kilometres
EQS	Environmental Quality Standard	**%**	Percent
GAC	General Assessment Criteria	**%v/v**	Percent volume in air
GL	Ground Level	**mb**	Milli Bars (atmospheric pressure)
GSV	Gas Screening Value	**l/hr**	Litres per hour
HCV	Health Criteria Value	**µg/l**	Micrograms per Litre (parts per billion)
ICSM	Initial Conceptual Site Model	**ppb**	Parts Per Billion
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)	**mg/kg**	Milligrams per kilogram (parts per million)
ND	Not Detected	**ppm**	Parts Per Million
LMRL	Lower Method Reporting Limit	**mg/m^3**	Milligram per metre cubed
NR	Not Recorded	**m bgl**	Metres Below Ground Level
PAH	Polycyclic Aromatic Hydrocarbon	**m bcl**	Metre Below Cover Level
PCB	Poly-Chlorinated Biphenyl	**mAOD**	Metres Above Ordnance Datum (sea level)
PID	Photo Ionisation Detector	**kN/m^2**	Kilo Newtons per metre squared
QA	Quality Assurance	**µm**	Micro metre
SGV	Soil Guideline Value		

APPENDIX III
DRAWINGS



SITE

Drawing 12-639-001

Site Location Plan

KILBUCK LANE
HAYDOCK

DEVELOPMENT OPTION

27 04 2018

1:500 at A1

Damson Consultancy Ltd
Chartered Architects

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W E
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Key:

Notes:

P1	-	11.06.2018	DRAFT	HM	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Damson Consultancy

Job No: 12-639

Date: 11.06.2018

Drawing No: 002

Scale: NTS

Job Title: Kilbuck Lane, Haydock

Drawing Title: Proposed Development Plan

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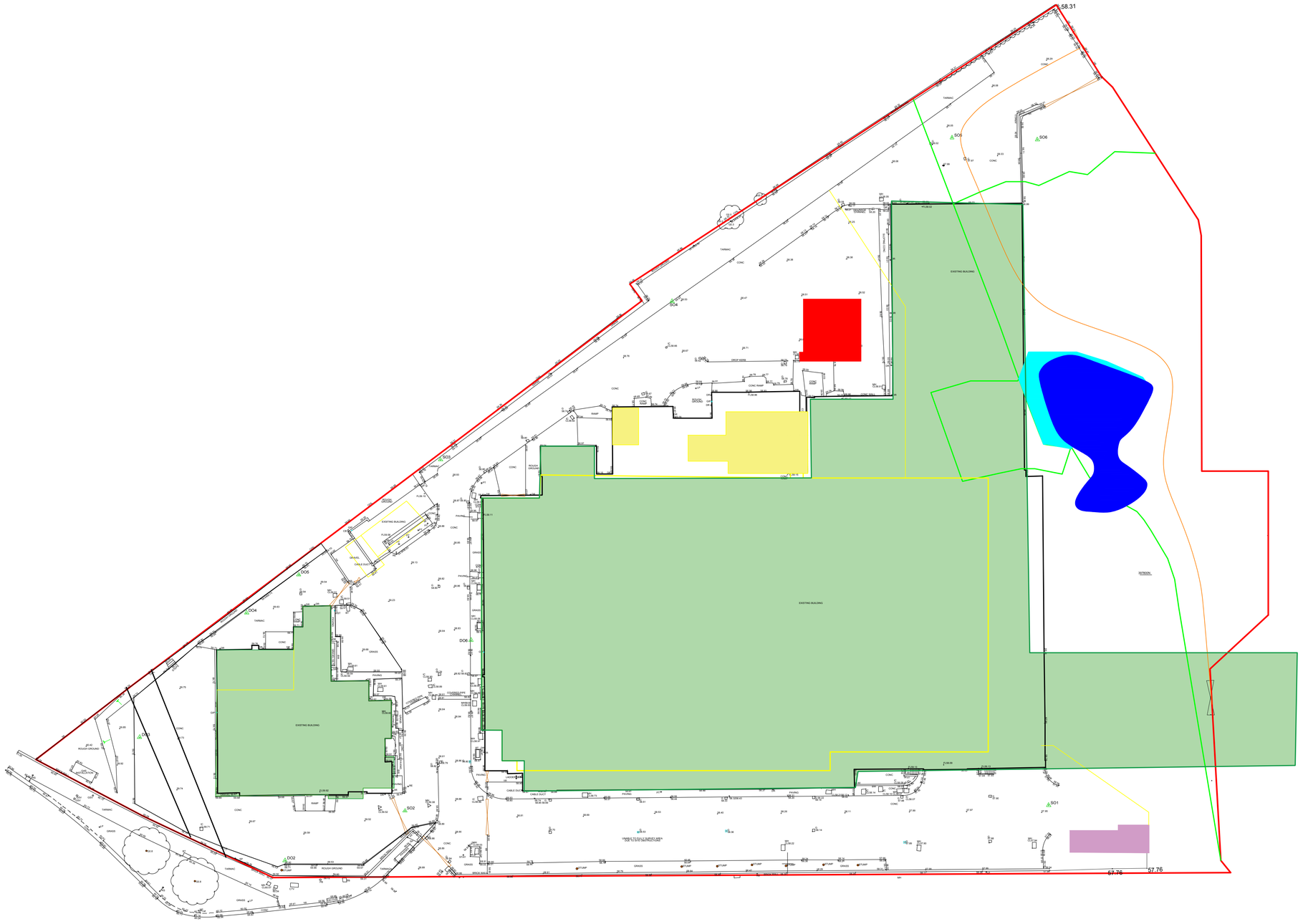

Key:

Historical Features

- Former Field Boundary (Pre 1893 - Pre 1971)
- Former Pond (Pre 1893 - Pre 1928)
- Former Pond (Pre 1928 - Pre 1961)
- Former Road (Pre 1893)
- Former Pathway (Pre 1907 - Pre 1971)
- Former Buildings (Pre 1971 - Present)
- ASTs (Pre 1971 - Present)
- Sub-Station (Pre 1971 - Present)
- Former Buildings (Pre 1972 - Pre 1985)

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	11.06.2018	DRAFT	HM	MD

Client: Damson Consultancy

Job No: 12-639

Date: 11.06.2018

Drawing No: 003

Scale: NTS

Job Title: Kilbuck Lane, Haydock

Drawing Title: Historical Features Plan

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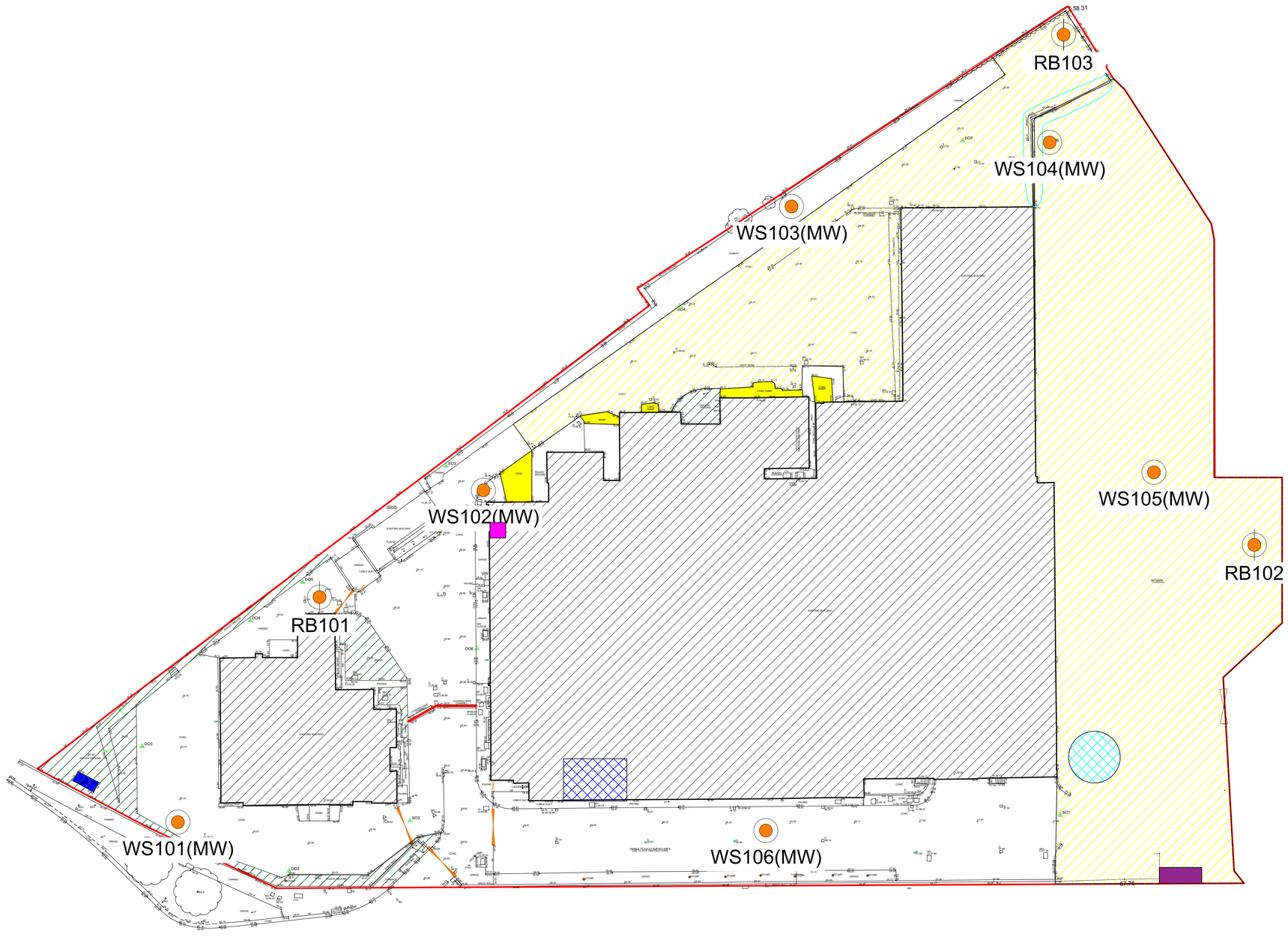

Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- RB101 — Approximate Rotary Borehole Location

Development Constraints

- Concrete.
- Current Buildings
- Vegetation / Grass / Rough Ground
- Water-tank for sprinkler system - Not in use
- Brick Tower With Mobile / Radio Mast
- AST - Red Diesel
- Covered Electric Cable
- Gateway / Fencing
- Retaining Wall
- Electricity Substation
- Concrete

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	11.06.2018	DRAFT	HM	MD

Client: Damson Consultancy

Job No: 12-639

Date: 11.06.2018

Drawing No: 004

Scale: NTS

Job Title: Kilbuck Lane, Haydock

Drawing Title: Development Constraints Plan

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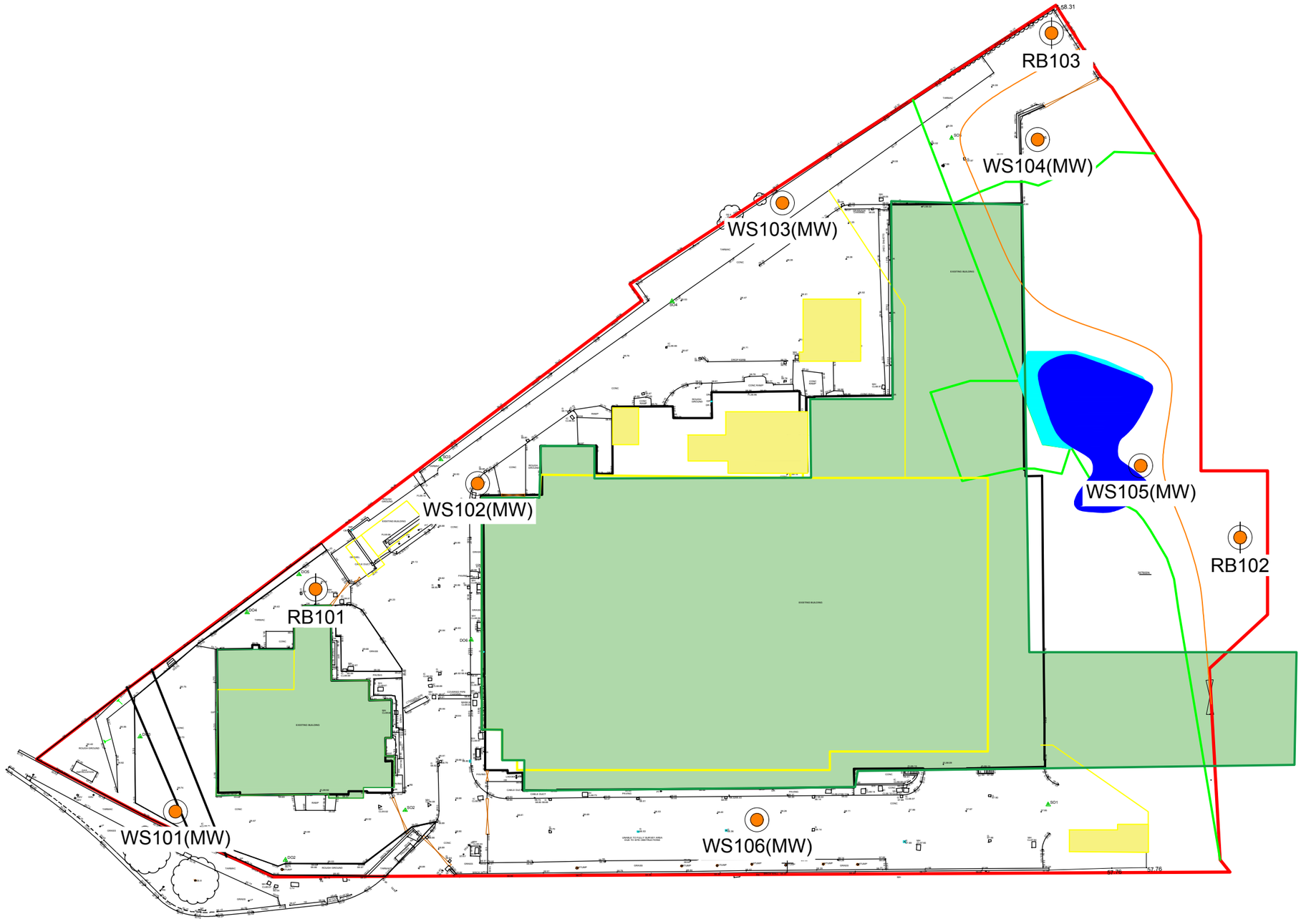

Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

WS101(MW) — Approximate Window Sample Probehole Location with Install

RBH101 — Approximate Rotary Borehole Location

Historical Features

- Former Field Boundary (Pre 1893 - Pre 1971)
- Former Pond (Pre 1893 - Pre 1928)
- Former Pond (Pre 1928 - Pre 1961)
- Former Road (Pre 1893)
- Former Pathway (Pre 1907 - Pre 1971)
- Former Buildings (Pre 1971 - Present)
- Former Buildings (Pre 1972 - Pre 1985)

Notes:

P1	R2	12.07.2018	REVISION	CB	MD
P1	R1	04.07.2018	REVISION	HM	MD
P1	-	05.06.2018	DRAFT	HM	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Damson Consultancy

Job No: 12-639

Date: 12.07.2018

Drawing No: 005

Scale: NTS

Job Title: Kilbuck Lane, Haydock

Drawing Title: Exploratory Hole Location Plan

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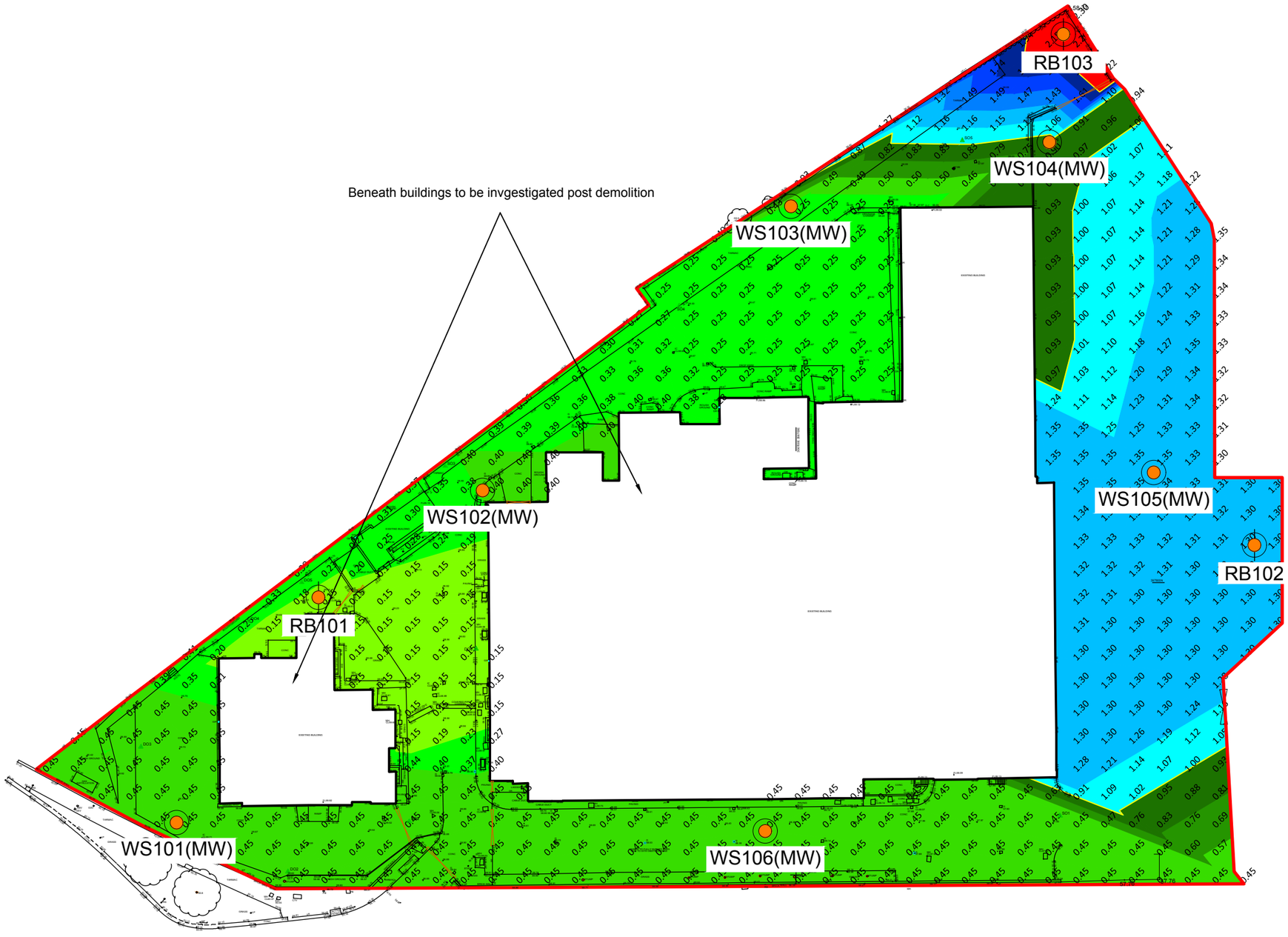

Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- RBH101 — Approximate Rotary Borehole Location

Made Ground Depth (m)

- Made Ground in Excess of 2.00m
- Depth of Made Ground Between 1.80 - 1.99m
- Depth of Made Ground Between 1.60 - 1.79m
- Depth of Made Ground Between 1.40 - 1.59m
- Depth of Made Ground Between 1.20 - 1.39m
- Depth of Made Ground Between 1.00 - 1.19m
- Depth of Made Ground Between 0.80 - 0.99m
- Depth of Made Ground Between 0.60 - 0.79m
- Depth of Made Ground Between 0.40 - 0.59m
- Depth of Made Ground Between 0.20 - 0.39m
- Depth of Made Ground Between 0.00 - 0.19m

Notes:

The conjectured depth mapping has been completed using 3D modelling software to produce indicative assessments that at this time are the most accurate interpretation of the Ground Investigation data. However, the conjectured nature of the model, limitations and areas of uncertainty between two proven points and the intermediary area result in uncertainties that should be considered by the reader of a drawing and incorporated in any subsequent assessment.

P1	-	03-10-2018	DRAFT	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Damson Consultancy

Job No: 12-639

Date: 03-10-2018

Drawing No: 006

Scale: NTS @ A3

Job Title: Kilbuck Lane, Haydock

Drawing Title: Depth of Made Ground Plan

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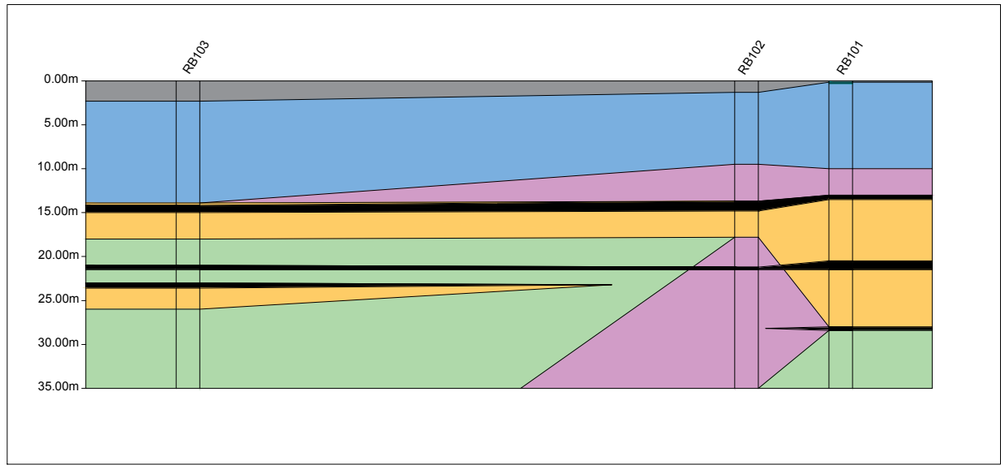

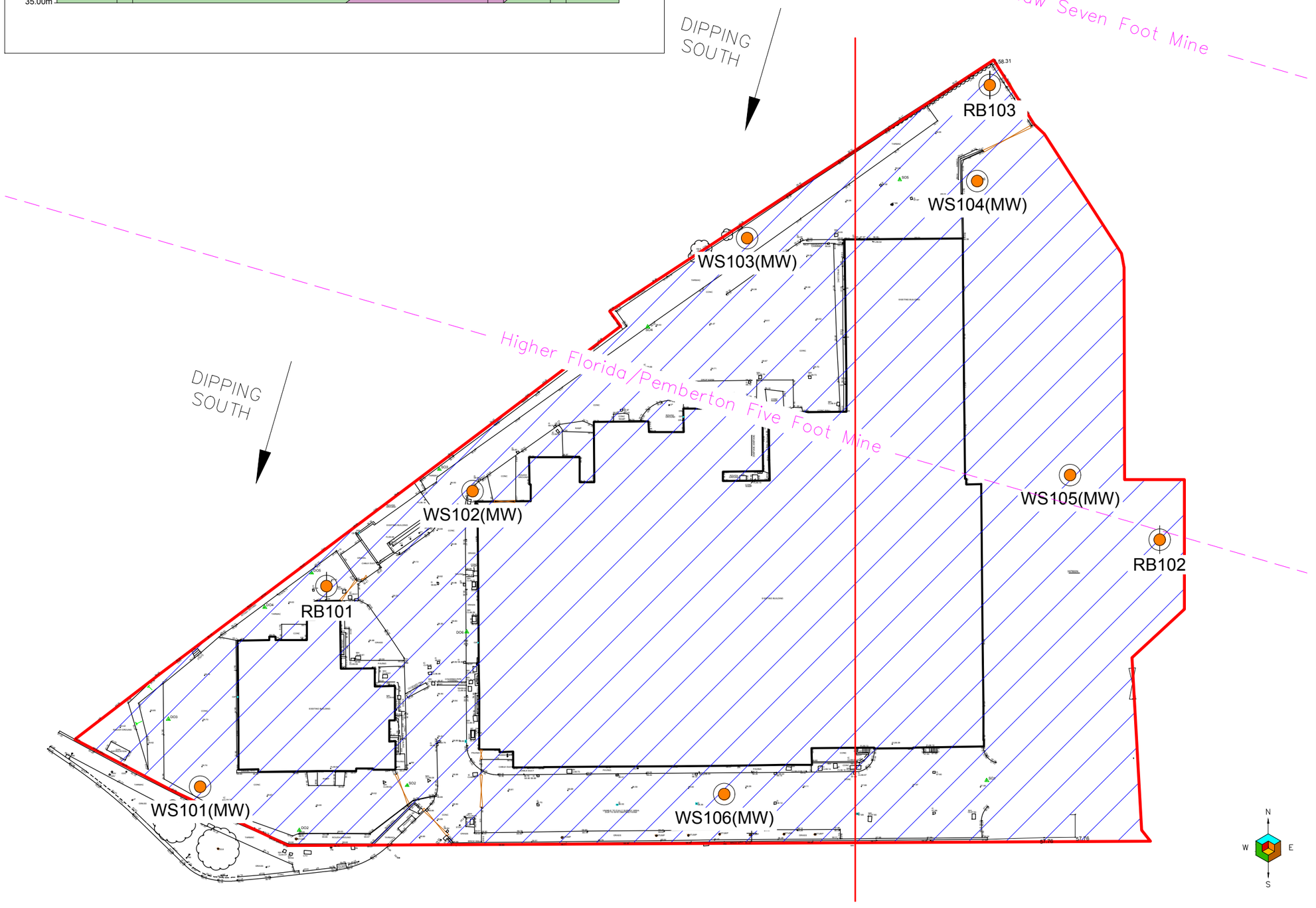

Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- RBH101 — Approximate Rotary Borehole Location

Coal Mining Issues

- Development High Risk Area
- Coal Seam
- Line of Cross Section

Coal Cross Section

- Made Ground
- Clay
- Coal
- Mudstone
- Sandstone
- Siltstone
- Sand

Notes:

P1 P1	R1 -	03.10.2018 27.06.2018	REVISION DRAFT	CB HM	MD MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Damson Consultancy

Job No: 12-639

Date: 03.10.2018

Drawing No: 007

Scale: NTS

Job Title: Kilbuck Lane, Haydock

Drawing Title: Coal Mining Assessment Plan

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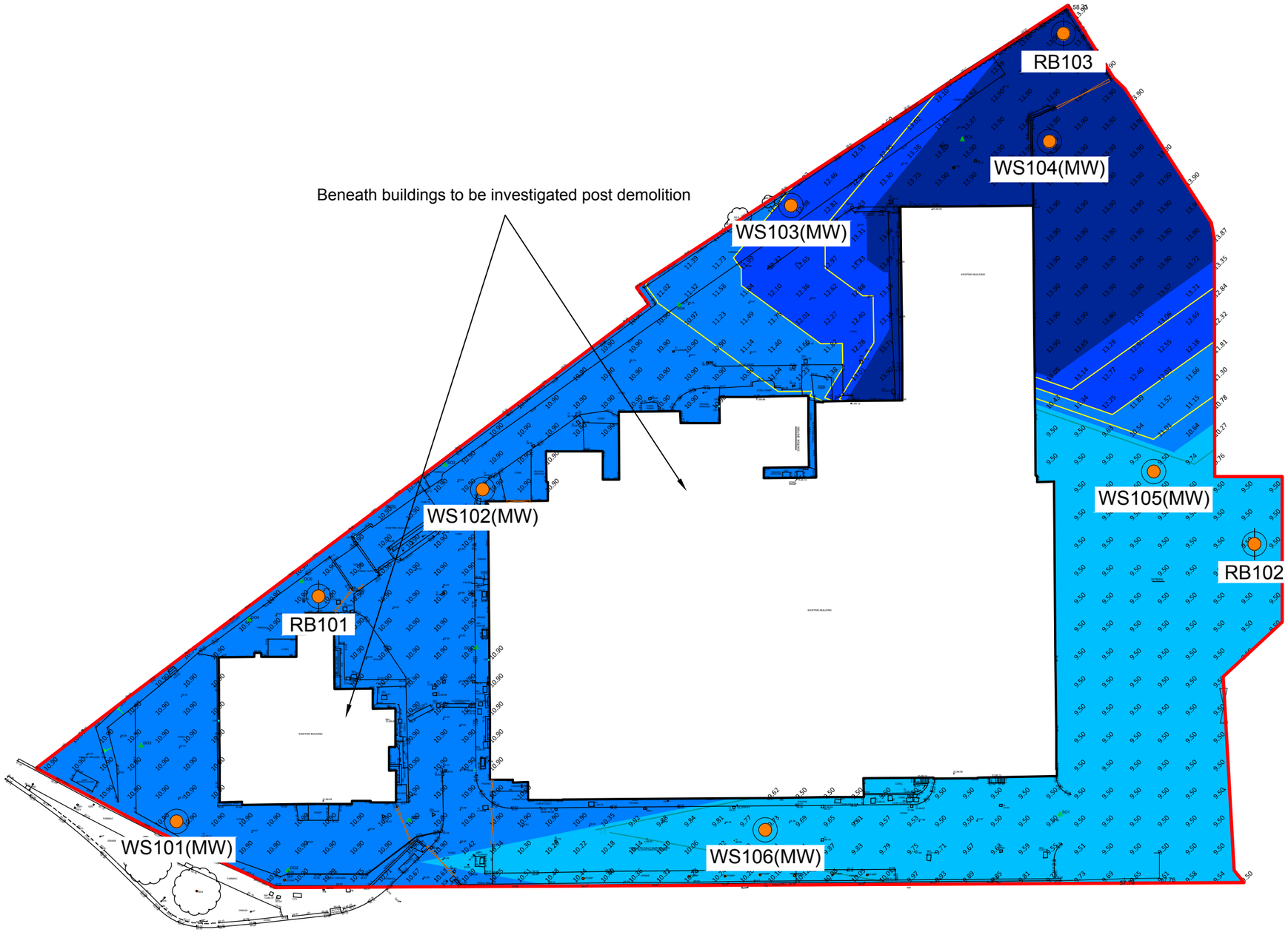


Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- RBH101 — Approximate Rotary Borehole Location

Bedrock Depth (m)

- Bedrock in Excess of 15.00m
- Depth to Bedrock Between 13.50 - 14.99m
- Depth to Bedrock Between 12.00 - 13.49m
- Depth to Bedrock Between 10.50 - 11.99m
- Depth to Bedrock Between 9.00 - 10.49m
- Depth to Bedrock Between 7.50 - 8.99m
- Depth to Bedrock Between 6.00 - 7.49m
- Depth to Bedrock Between 4.50 - 5.99m
- Depth to Bedrock Between 3.00 - 4.49m
- Depth to Bedrock Between 1.50 - 2.99m
- Depth to Bedrock Between 0.00 - 1.49m

Notes:

The conjectured depth mapping has been completed using 3D modelling software to produce indicative assessments that at this time are the most accurate interpretation of the Ground Investigation data. However, the conjectured nature of the model, limitations and areas of uncertainty between two proven points and the intermediary area result in uncertainties that should be considered by the reader of a drawing and incorporated in any subsequent assessment.

P1	-	05-10-2018	DRAFT	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Damson Consultancy

Job No: 12-639

Date: 05-10-2018

Drawing No: 008

Scale: NTS @ A3

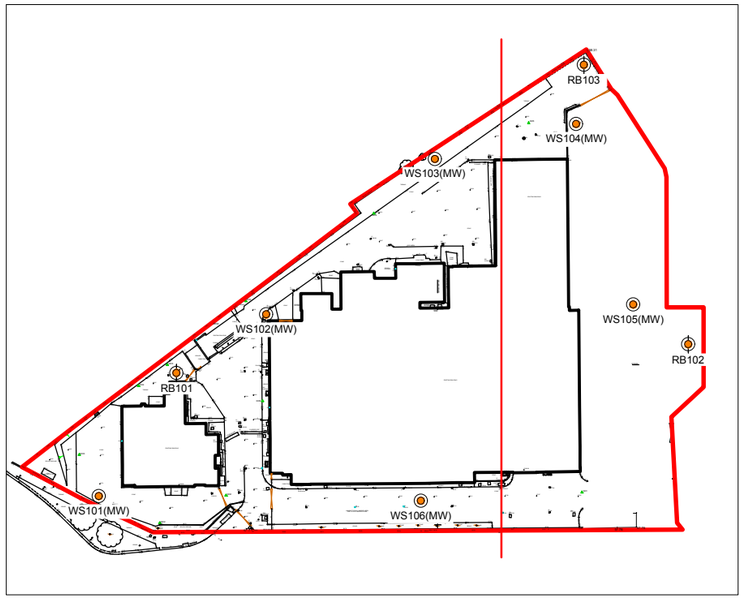
Job Title: Kilbuck Lane, Haydock

Drawing Title: Depth to Bedrock Plan

N W E S

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

POLLUTANT LINKAGE	PATHWAY	RECEPTOR	SOURCE
PL1	Inhalation of soil, fibres and dust. Ingestion of soils, dust, vegetables, soil attached to vegetables. Windblown dust.	Future site users. Offsite receptors.	ACM identified in Made Ground deposits and potentially within existing buildings.
PL2	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Offsite land users.	Methane, carbon dioxide. (Peat, coal measures and potentially infilled features on and within 250m of the site)
PL3	Surface run-off. Migration through permeable strata and preferential pathways. Perched waters migration.	Drift and bedrock aquifers. Surface water (Unnamed stream)	Mobile contaminants such as hydrocarbons and volatile compounds.
PL4	Sulphate attack on concrete.	Building structure.	Sulphate (Potential ash, clinker and slag within Made Ground)
PL5	Ingestion of tainted water supply.	Future site users. Water pipes.	Organic contaminants such as hydrocarbons, solvents.
PL6	Direct contact (Plant uptake)	Flora	Phytotoxic contaminants (Made Ground)



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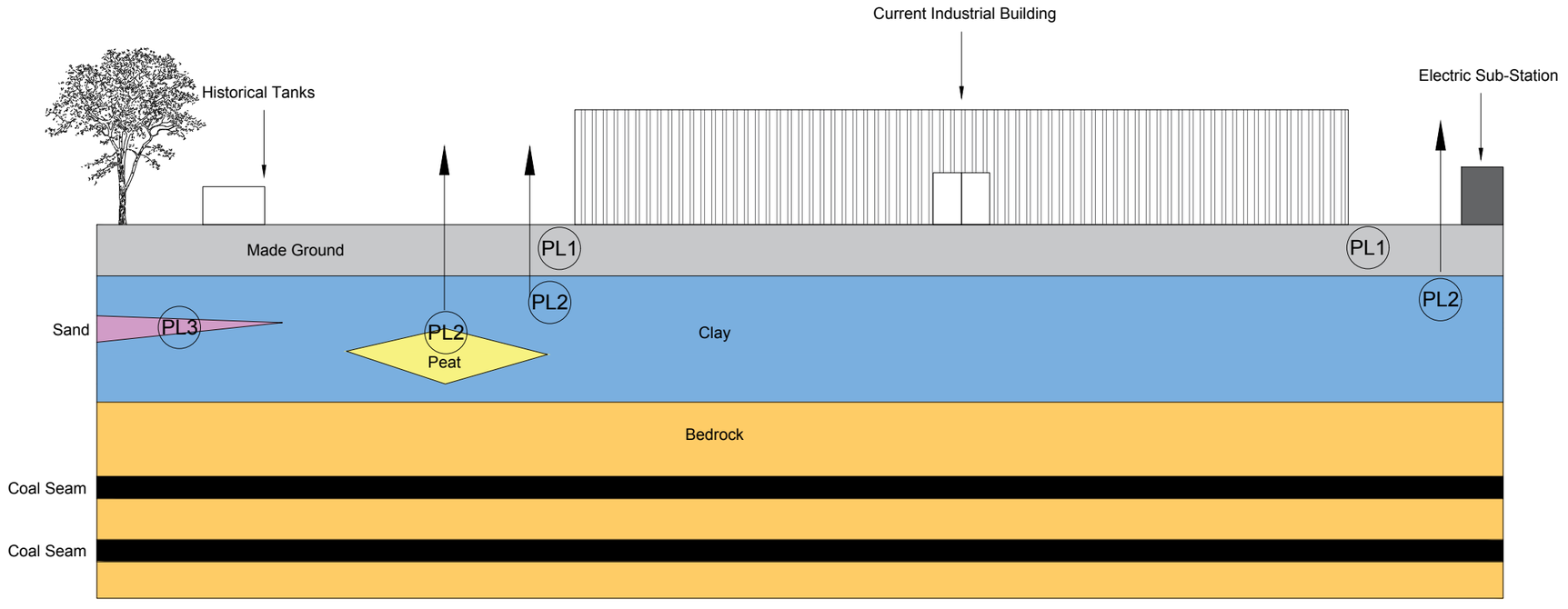

Key:

Notes:

P1 P1	R1 -	09-10-2018 03-10-2018	REVISION DRAFT	CB CB	MD MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Damson Consultancy

Job No: 12-639

Date: 09-10-2018

Drawing No: 009

Scale: NTS @ A3

Job Title: Kilbuck Lane, Haydock

Drawing Title: Conceptual Site Model

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APPENDIX IV
PHOTOGRAPHS

PLATE 1: GASOMETER IN THE WEST OF THE SITE

PLATE 2: DIESEL STORAGE TANK

PLATE 3: ELECTRICITY SUBSTAION IN SOUTH-EAST OF SITE

PLATE 4: VIEW OF WEST OF SITE ALONG SOUTHERN BOUNDARY

PLATE 5: WAREHOUSE BUILDING

PLATE 6: SITE ENTRANCE IN WEST OF SITE

PLATE 7: VIEW OF SMALL UNIT IN WEST OF SITE

PLATE 8: STRUCTURE IN WEST OF SITE WITH TELEPHONE MAST

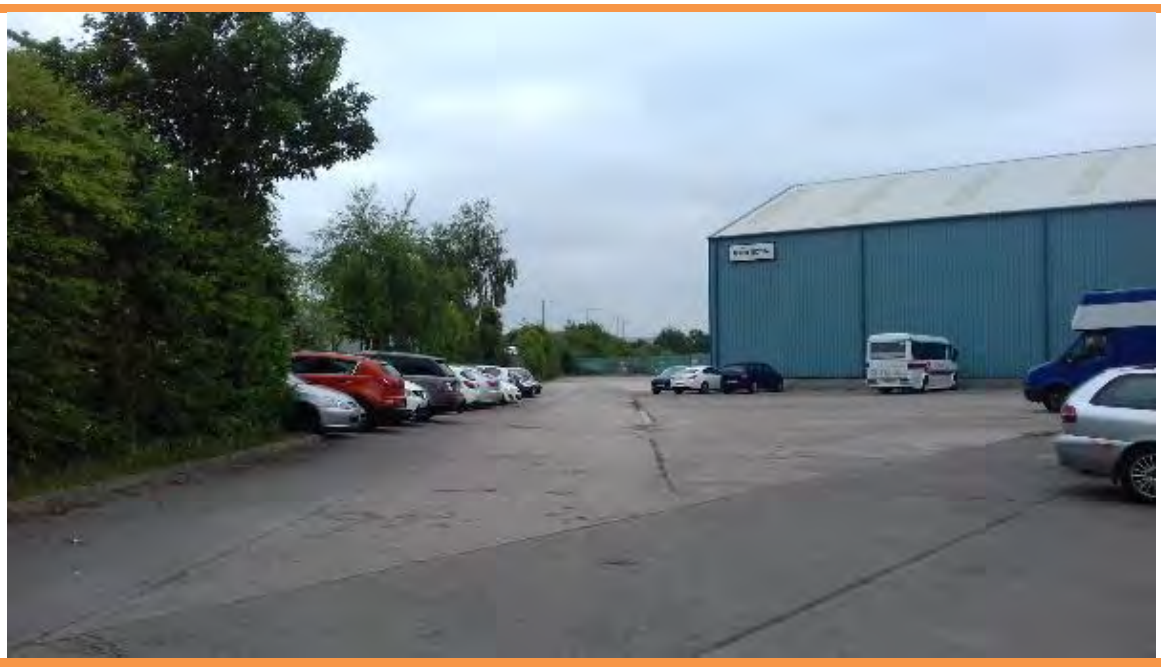


PLATE 9: VIEW OF NORTH OF SITE LOOKING EAST

PLATE 10: BUS DEPOT

PLATE 11: VIEW OF NORTH OF THE SITE

PLATE 12: WAREHOUSE BUILDING IN EAST OF THE SITE

PLATE 13: WATER STORAGE TANK

PLATE 14: BIN STORAGE IN EAST OF SITE

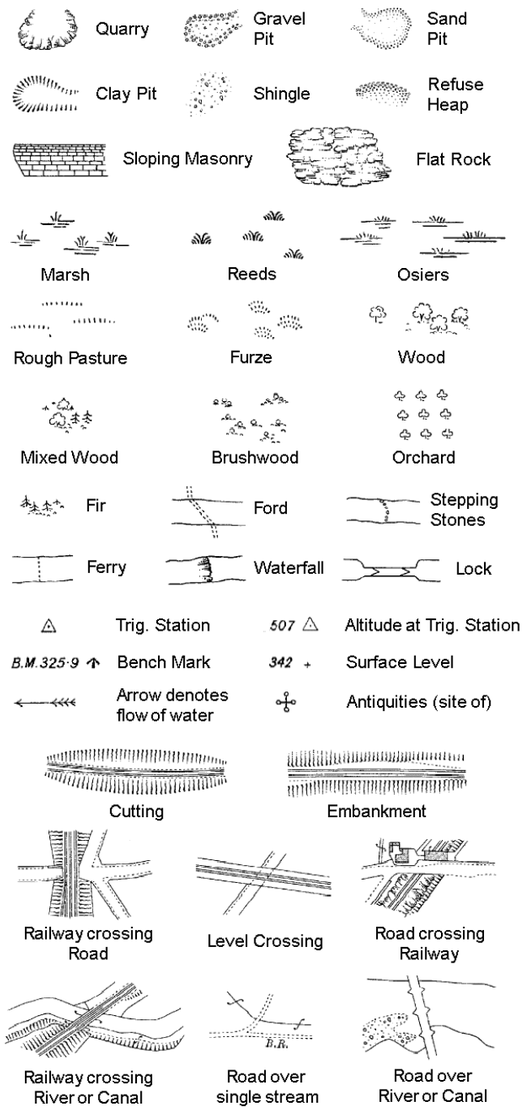
PLATE 15: WS103

PLATE 16: WS106

APPENDIX V
HISTORICAL MAPS

Historical Mapping Legends

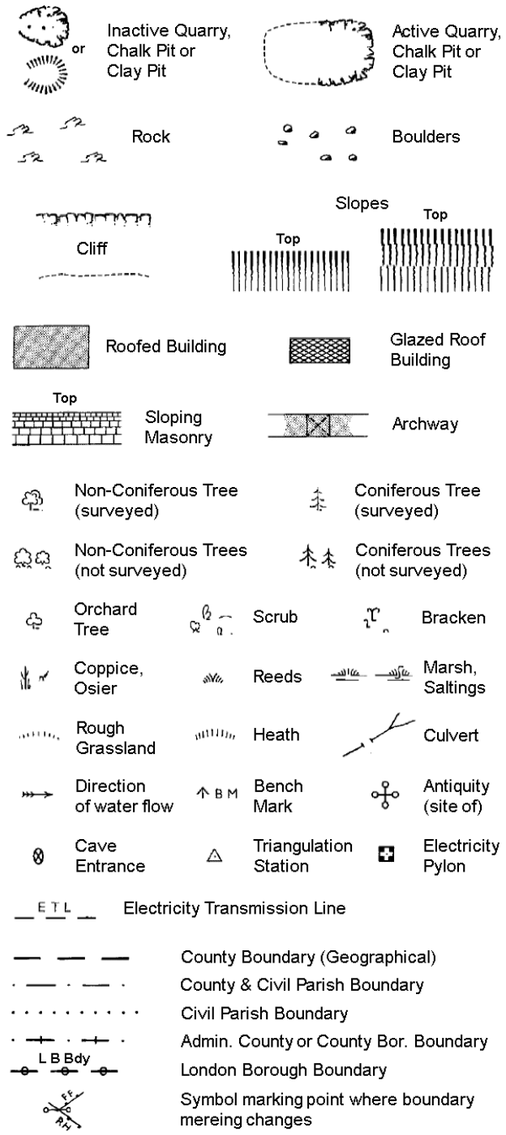
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

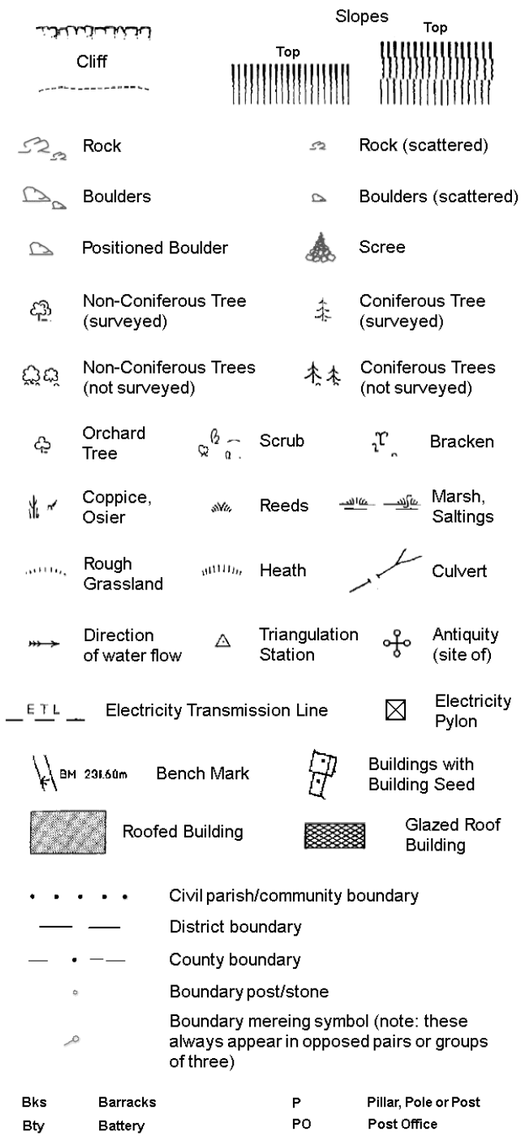
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

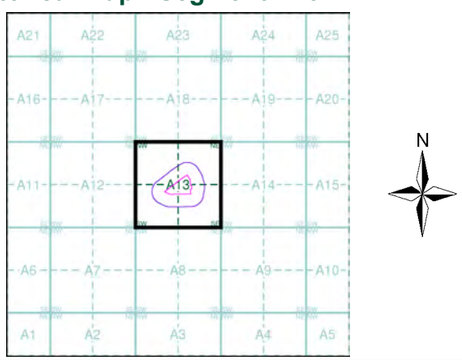
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

e3p

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1907	3
Lancashire And Furness	1:2,500	1928	4
Ordnance Survey Plan	1:2,500	1960 - 1961	5
Ordnance Survey Plan	1:1,250	1971 - 1972	6
Ordnance Survey Plan	1:2,500	1972	7
Additional SIMs	1:1,250	1977 - 1985	8
Additional SIMs	1:1,250	1981 - 1990	9
Ordnance Survey Plan	1:1,250	1983 - 1989	10
Large-Scale National Grid Data	1:1,250	1992	11
Large-Scale National Grid Data	1:1,250	1992 - 1994	12
Large-Scale National Grid Data	1:1,250	1993 - 1994	13

Historical Map - Segment A13



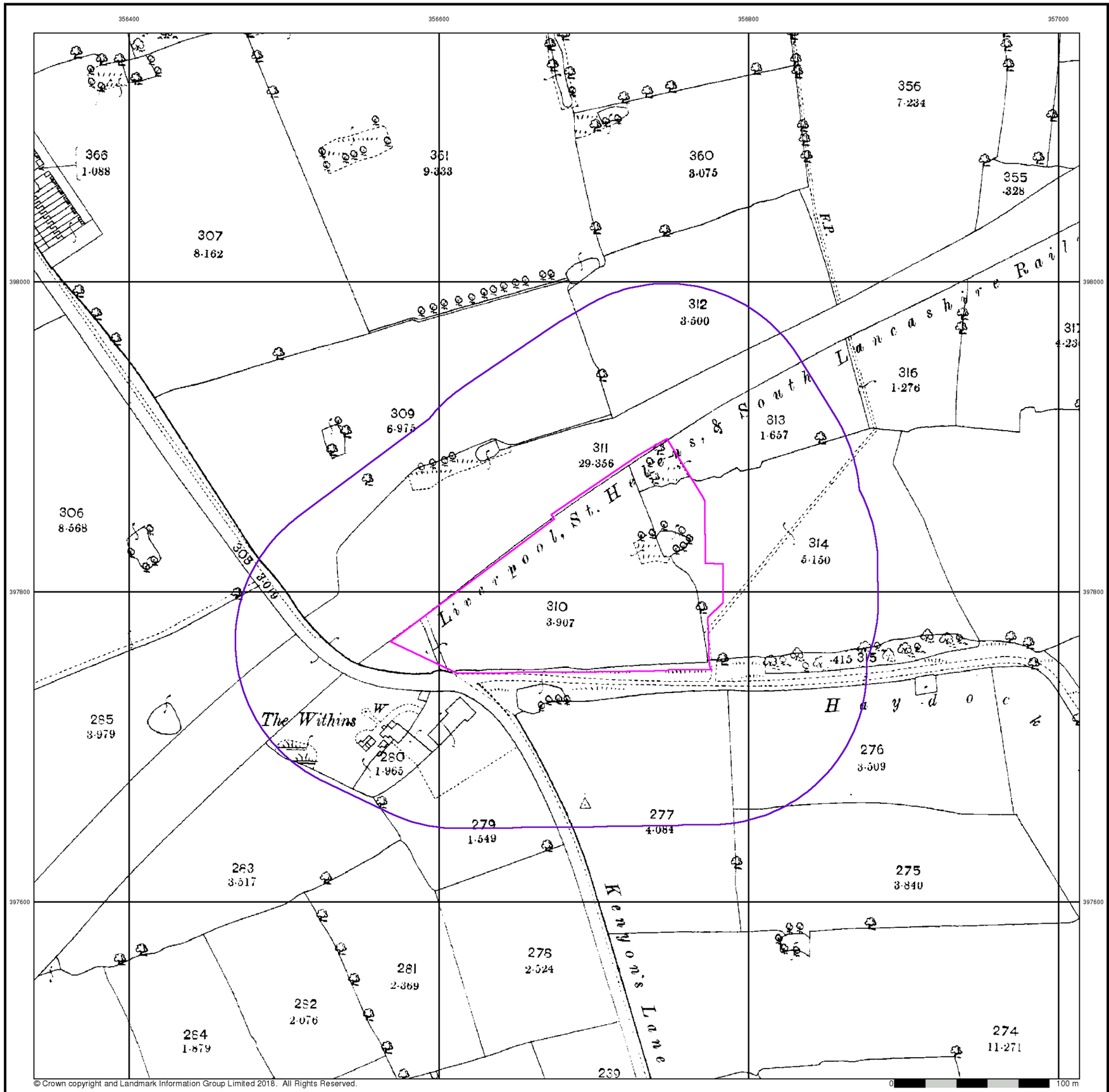
Order Details

Order Number: 169182665_1_1
Customer Ref: 12-639
National Grid Reference: 356690, 397800
Slice: A
Site Area (Ha): 1.88
Search Buffer (m): 100

Site Details

Kilbuck Lane, ST. HELENS, WA11 9SZ

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



e3p

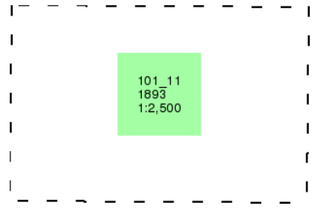
Lancashire And Furness

Published 1893

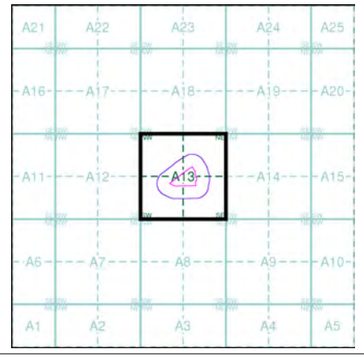
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



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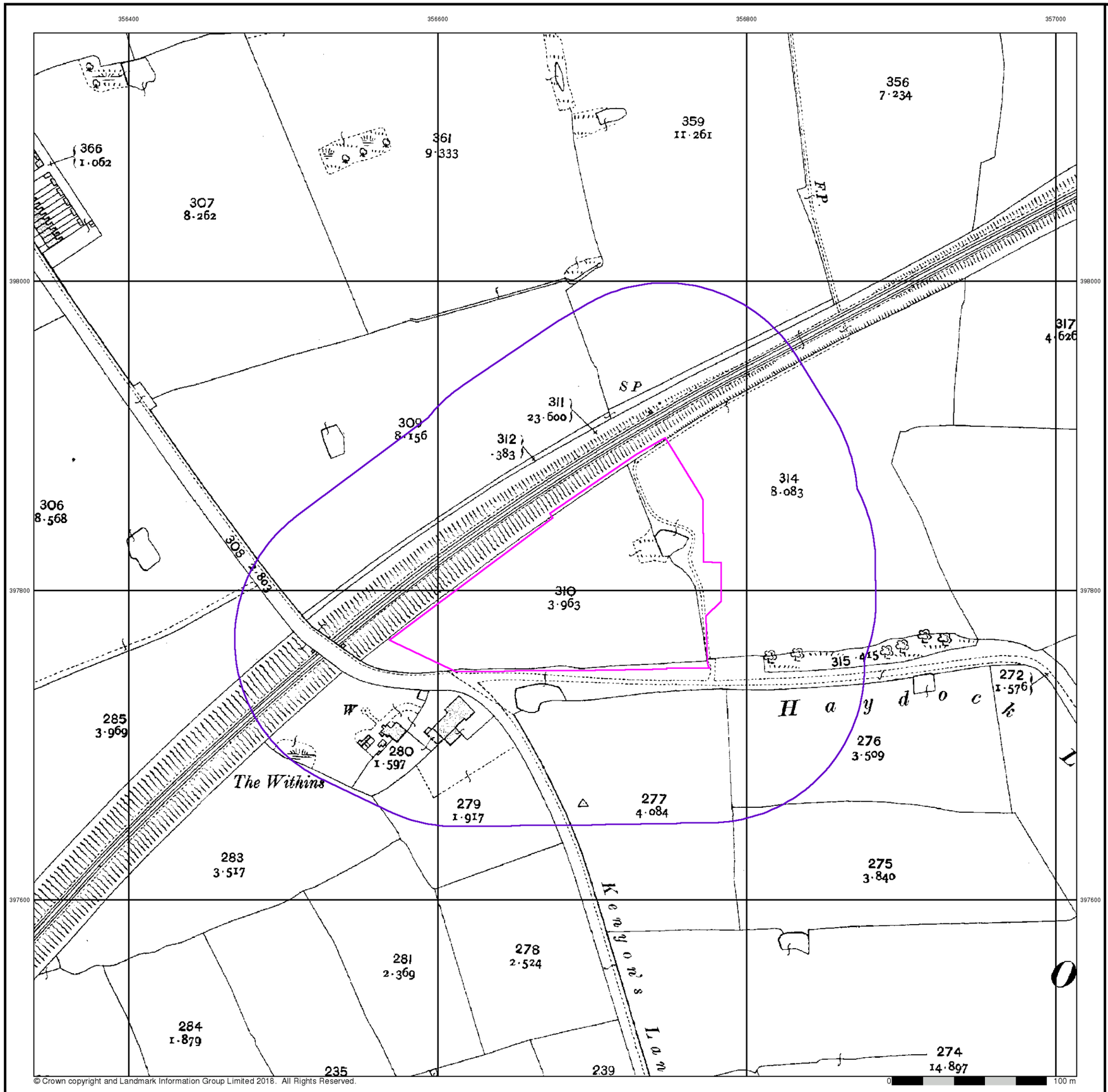

e3p

Lancashire And Furness

Published 1907

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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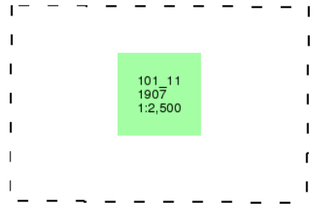
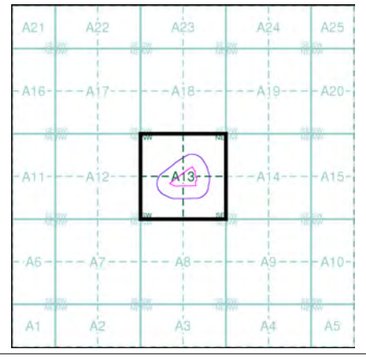


Historical Map - Segment A13



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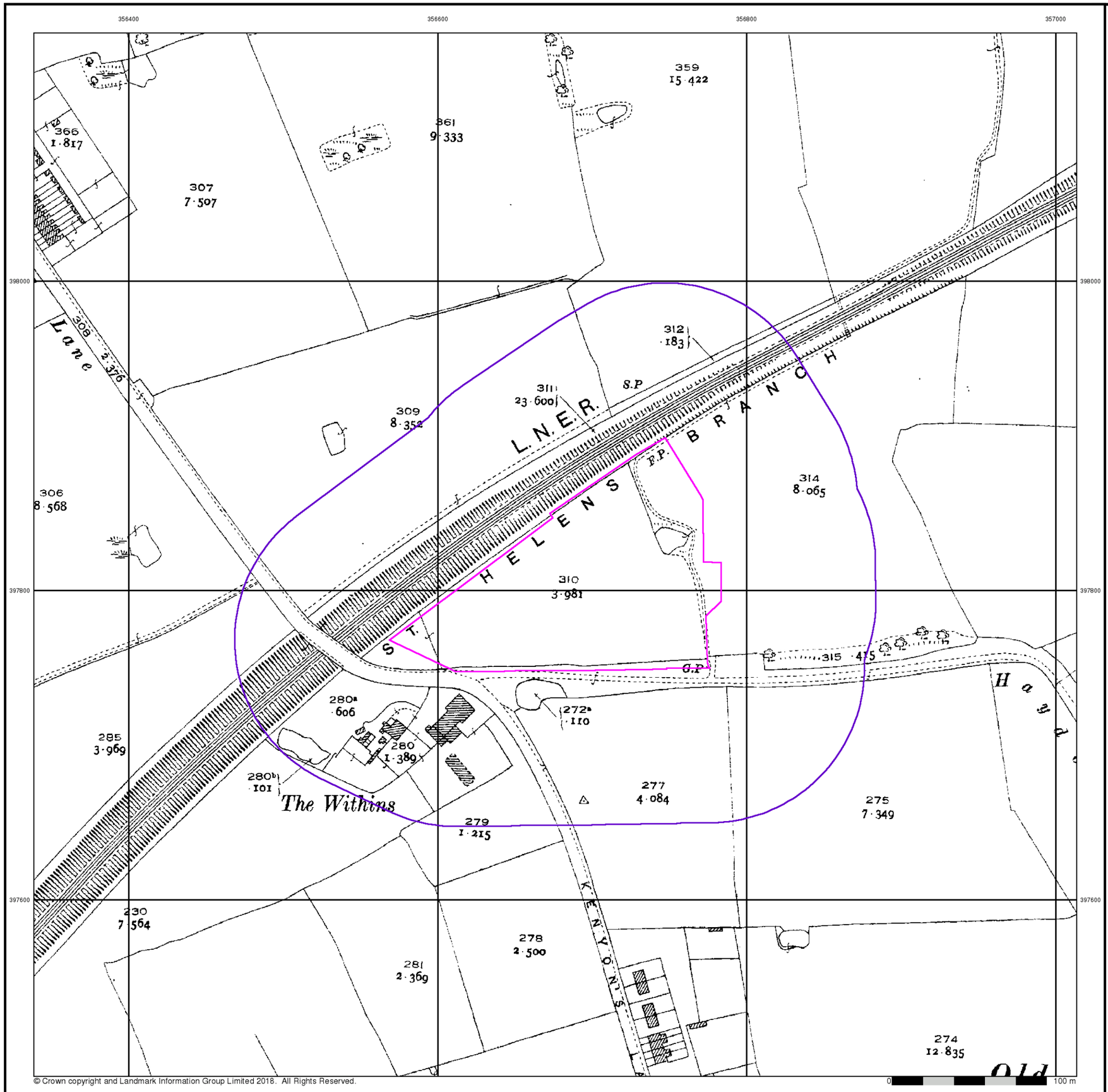

e3p

Lancashire And Furness

Published 1928

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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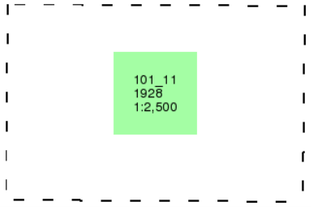
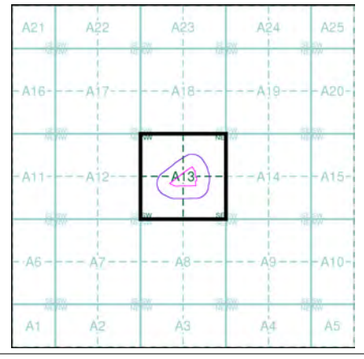


Historical Map - Segment A13



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Slice:	A
Site Area (Ha):	1.88
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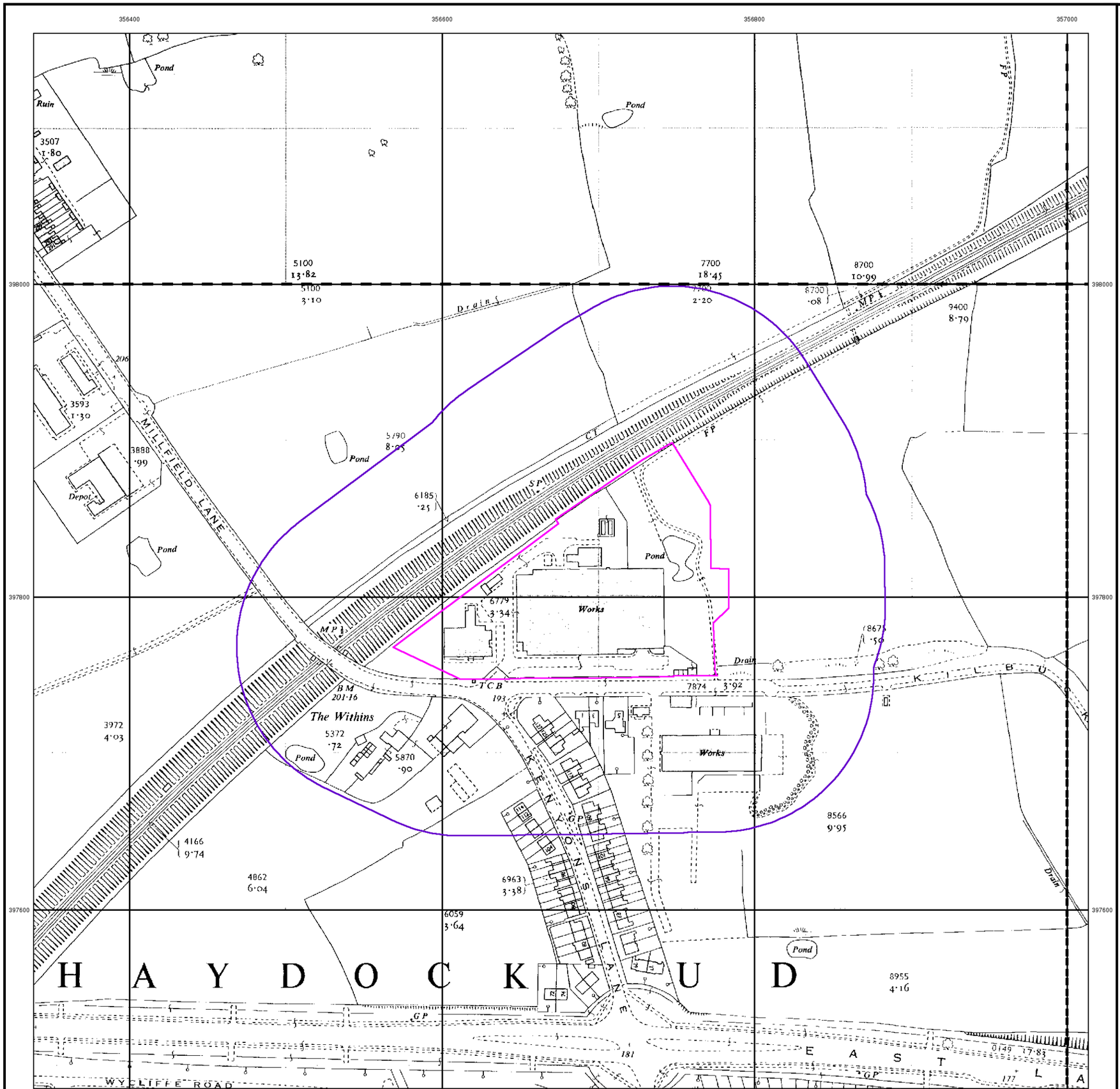


Ordnance Survey Plan

Published 1960 - 1961

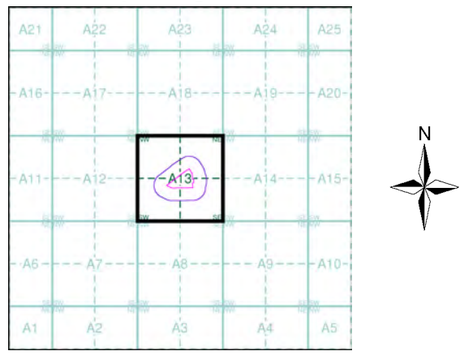
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ5698 1961 1:2,500	SJ5798 1961 1:2,500
SJ5697 1960 1:2,500	SJ5797 1960 1:2,500

Historical Map - Segment A13



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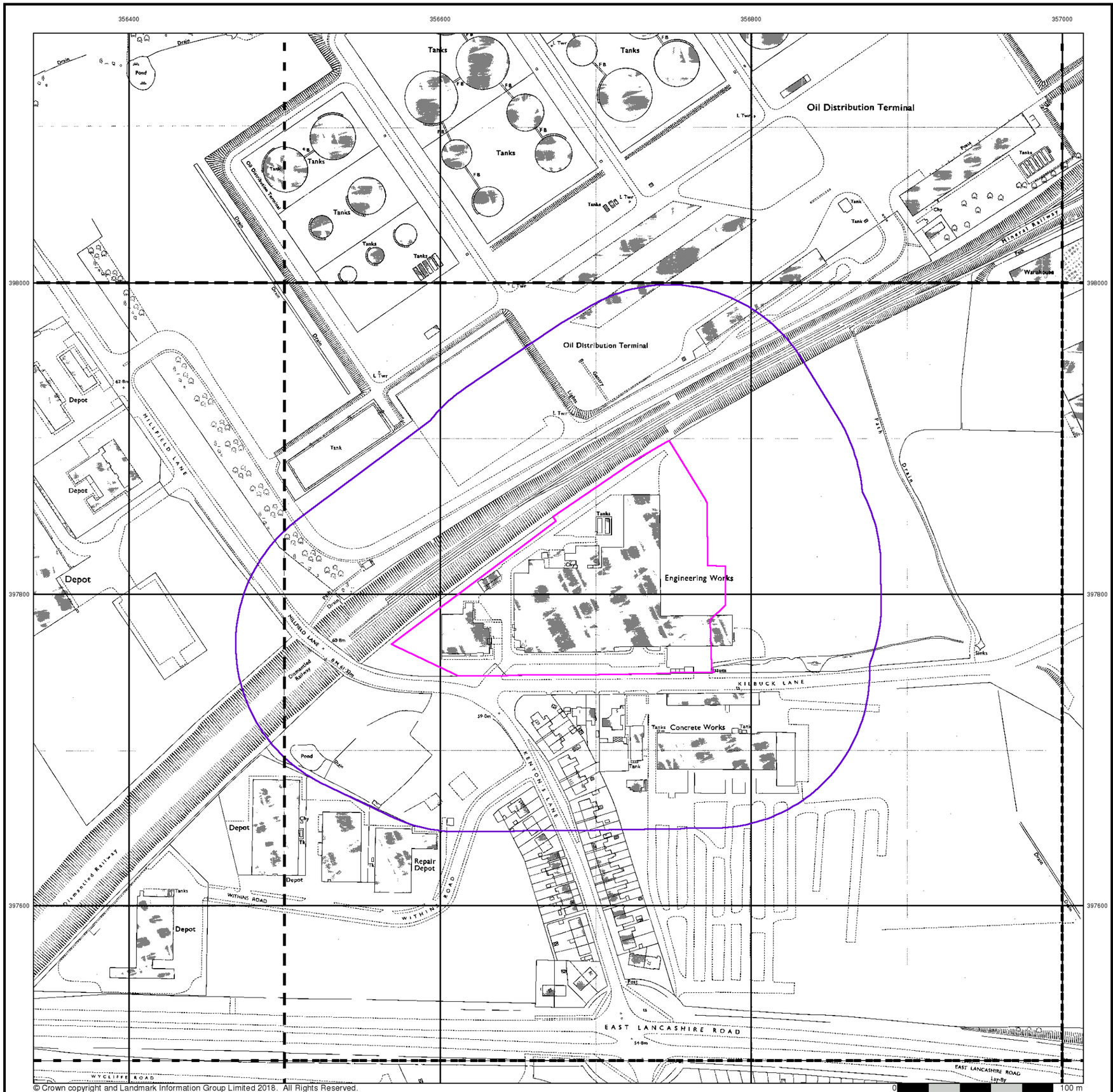


e3p

Ordnance Survey Plan

Published 1971 - 1972

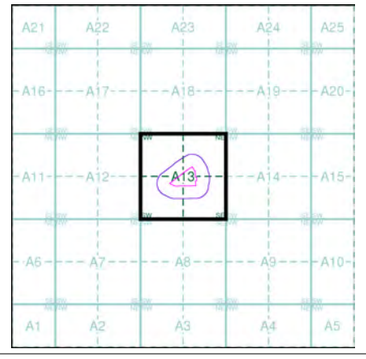
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ5698SW 1972 1:1,250	SJ5698SE 1972 1:1,250	SJ5798SW 1972 1:1,250
SJ5697NW 1971 1:1,250	SJ5697NE 1971 1:1,250	SJ5797NW 1971 1:1,250
SJ5697SW 1971 1:1,250	SJ5697SE 1971 1:1,250	SJ5797SW 1971 1:1,250

Historical Map - Segment A13



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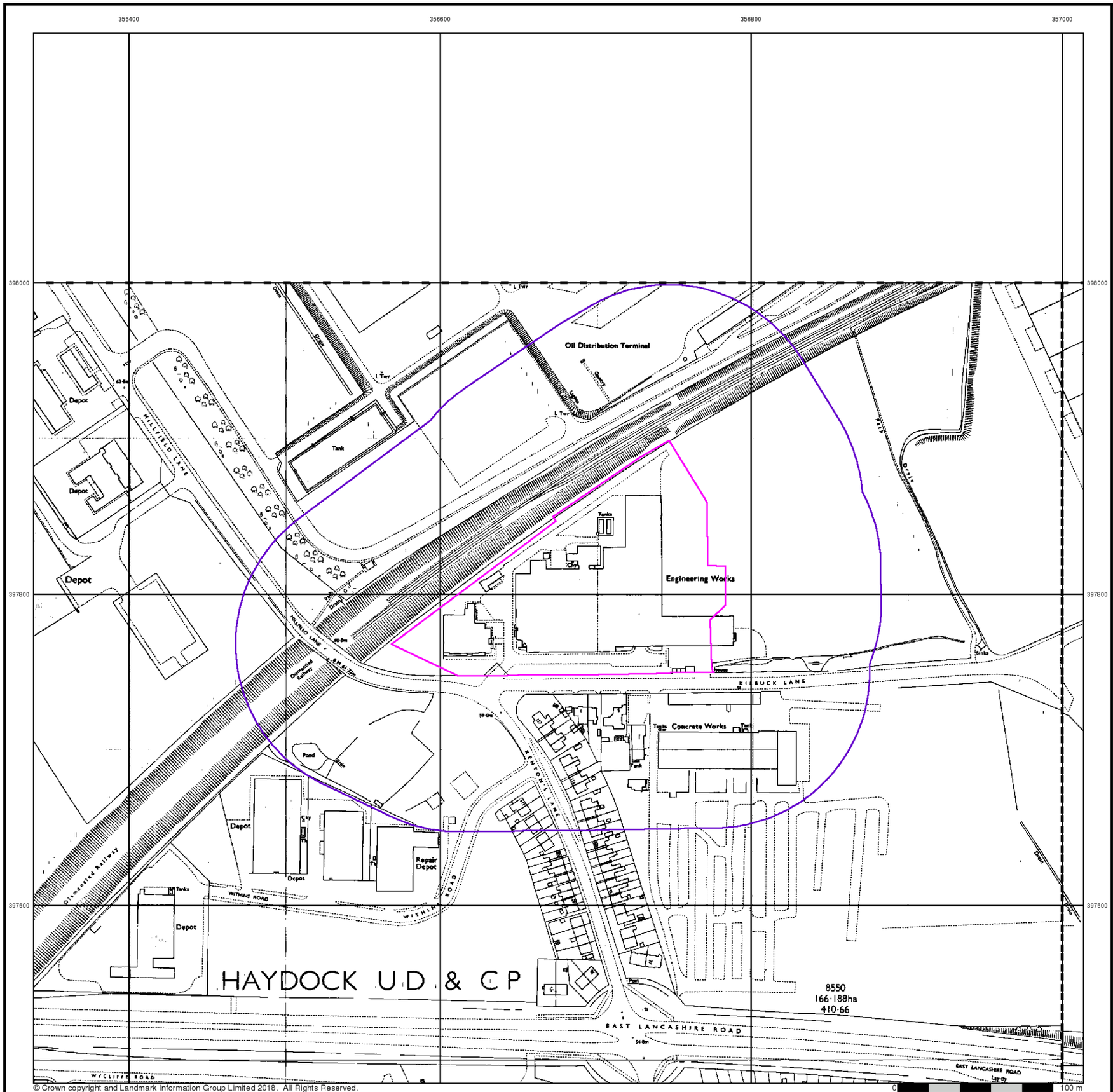

Ordnance Survey Plan

Published 1972

Source map scale - 1:2,500

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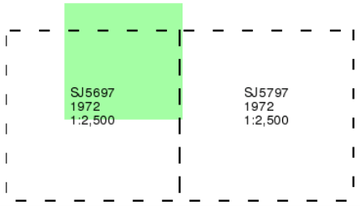
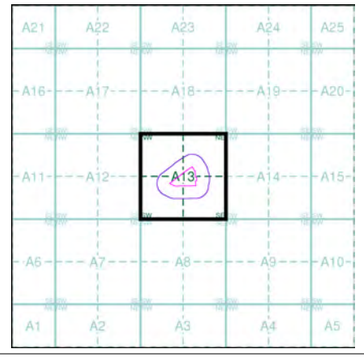


Historical Map - Segment A13



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Web: www.envirocheck.co.uk

e3p

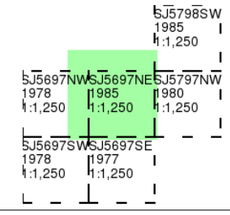
Additional SIMs

Published 1977 - 1985

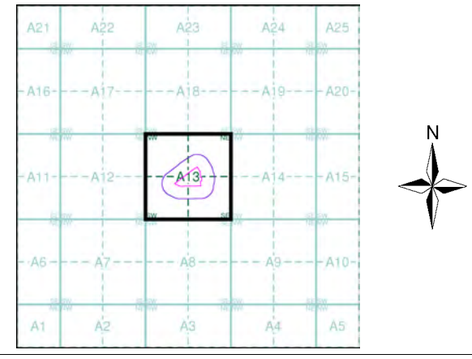
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	100

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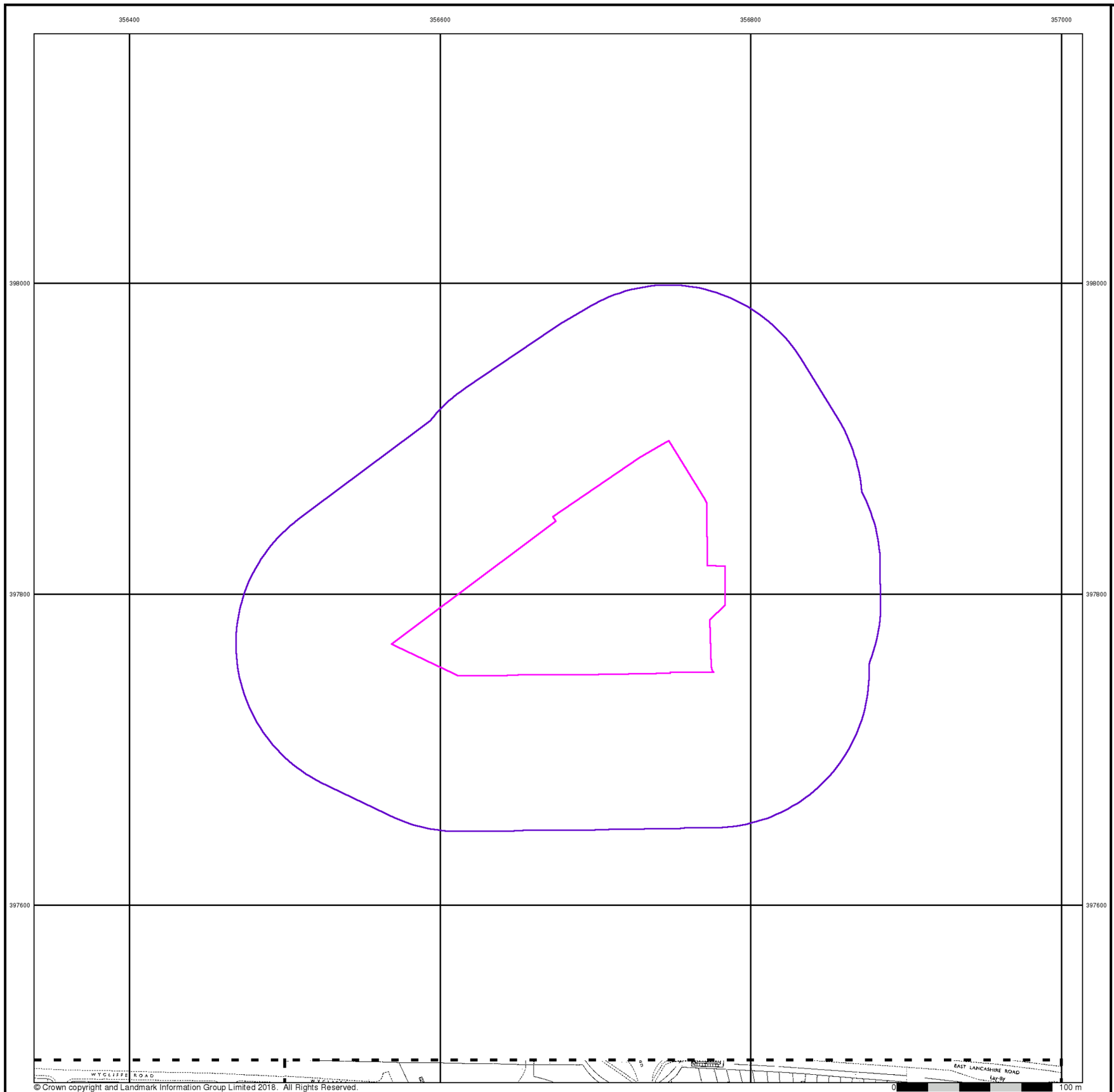


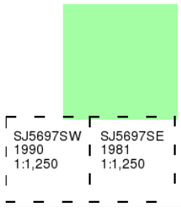
Additional SIMs

Published 1981 - 1990

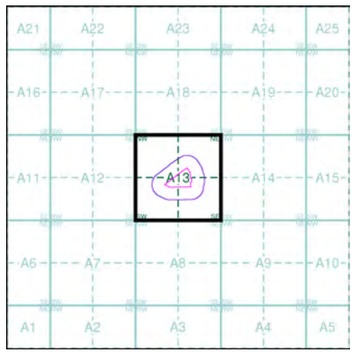
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	100

Site Details

Kilbuck Lane, ST. HELENS, WA11 9SZ

Landmark INFORMATION GROUP
Tel: 0844 844 9952
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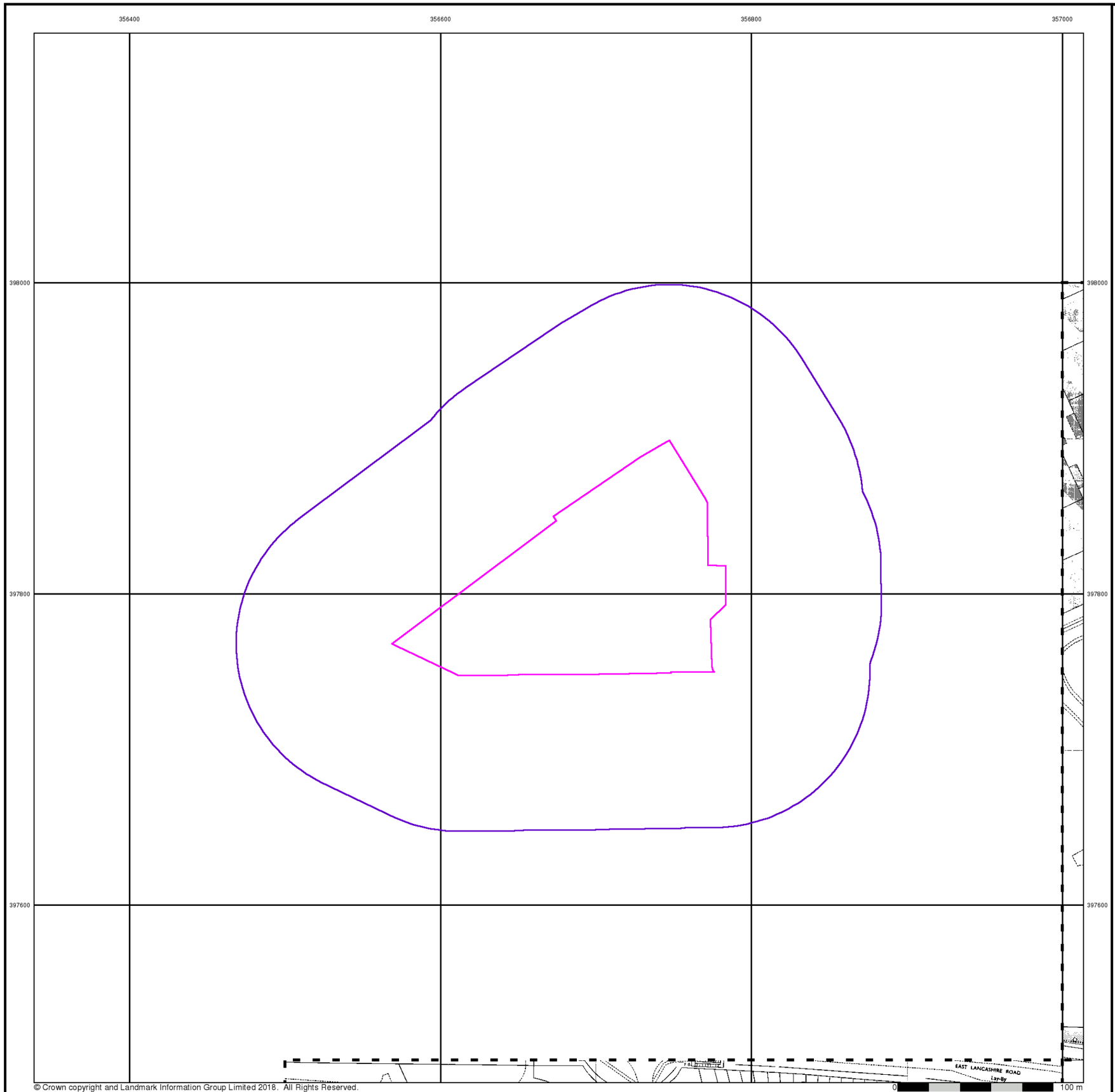
Web: www.envirocheck.co.uk



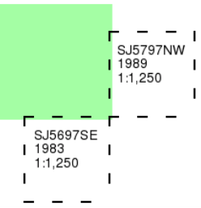
Ordnance Survey Plan

Published 1983 - 1989

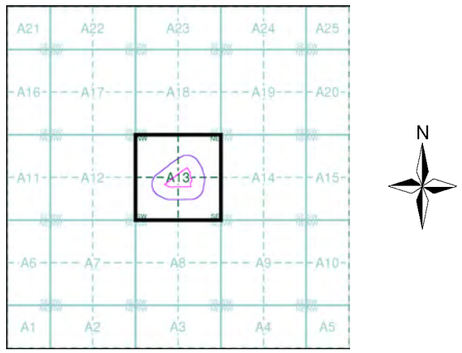
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



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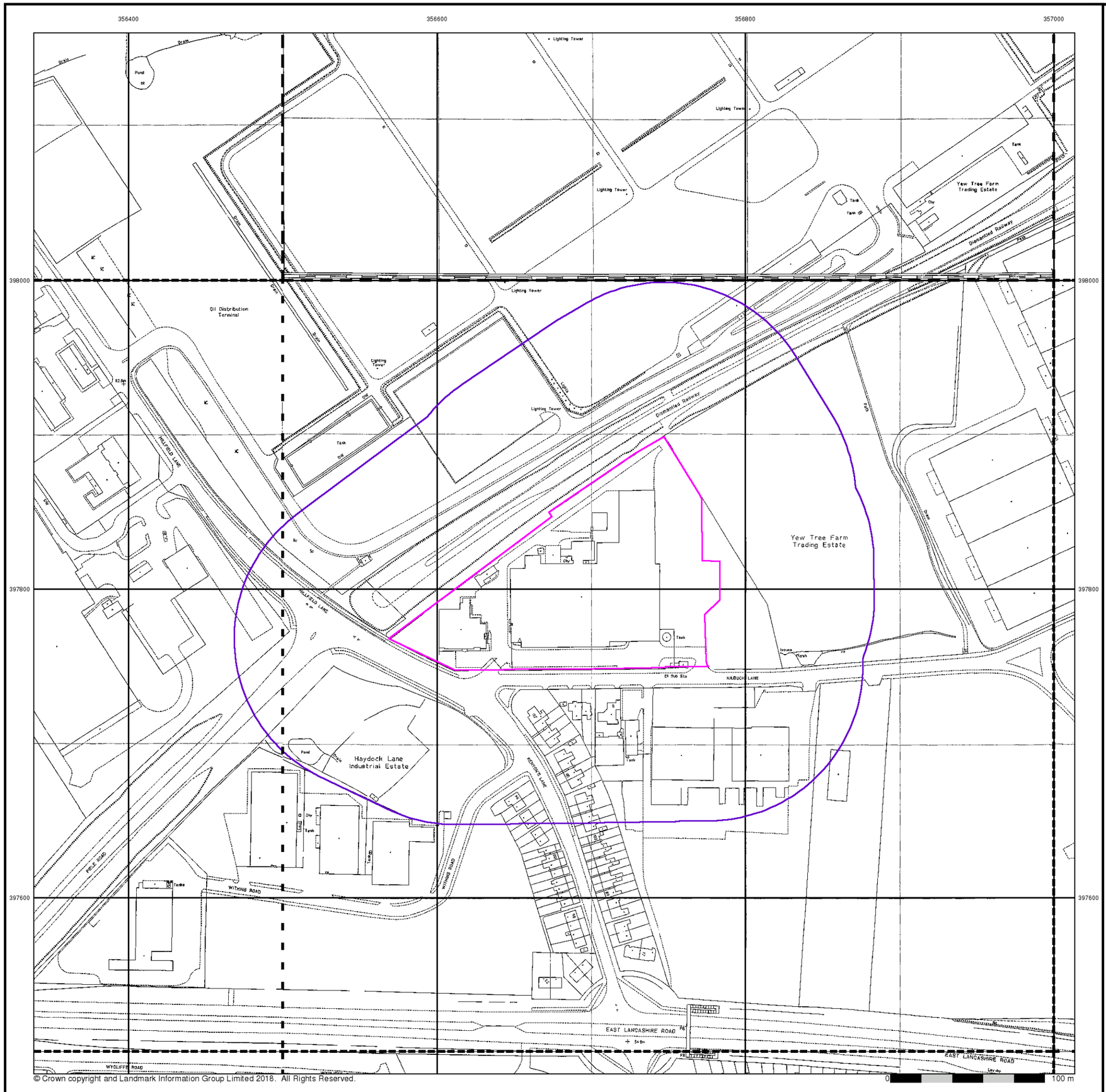


e3p

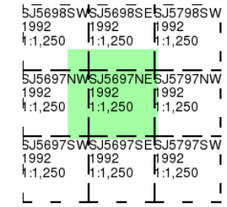
Large-Scale National Grid Data

Published 1992

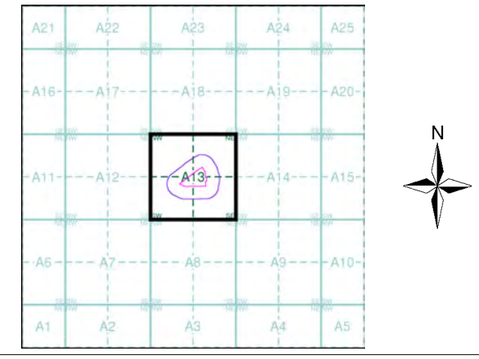
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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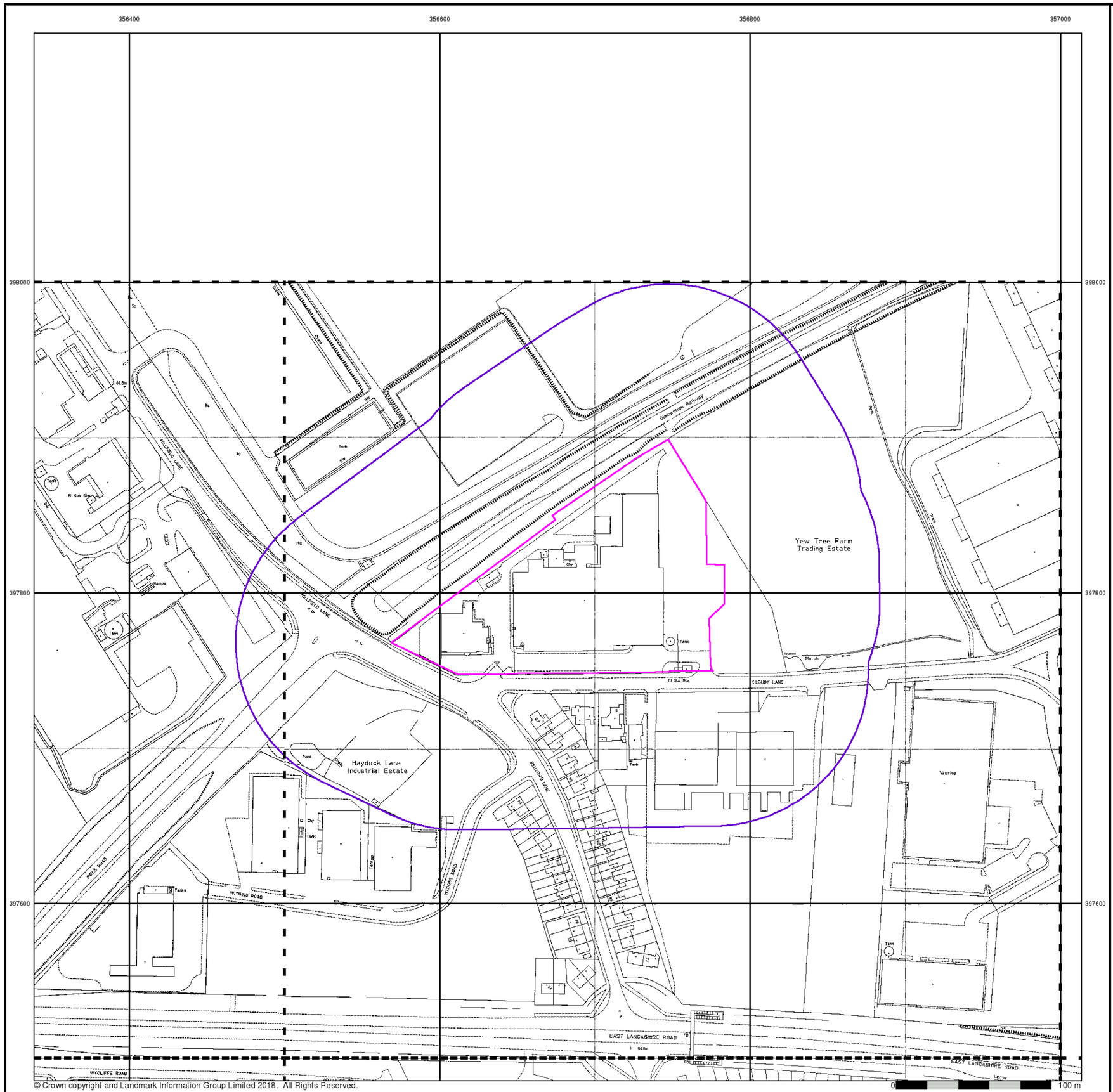


Large-Scale National Grid Data

Published 1992 - 1994

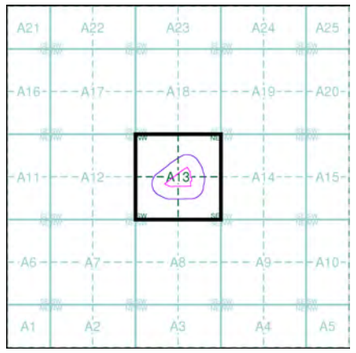
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

	SJ5697NE 1994 1:1,250	
SJ5697SW 1992 1:1,250	SJ5697SE 1994 1:1,250	SJ5797SW 1993 1:1,250

Historical Map - Segment A13



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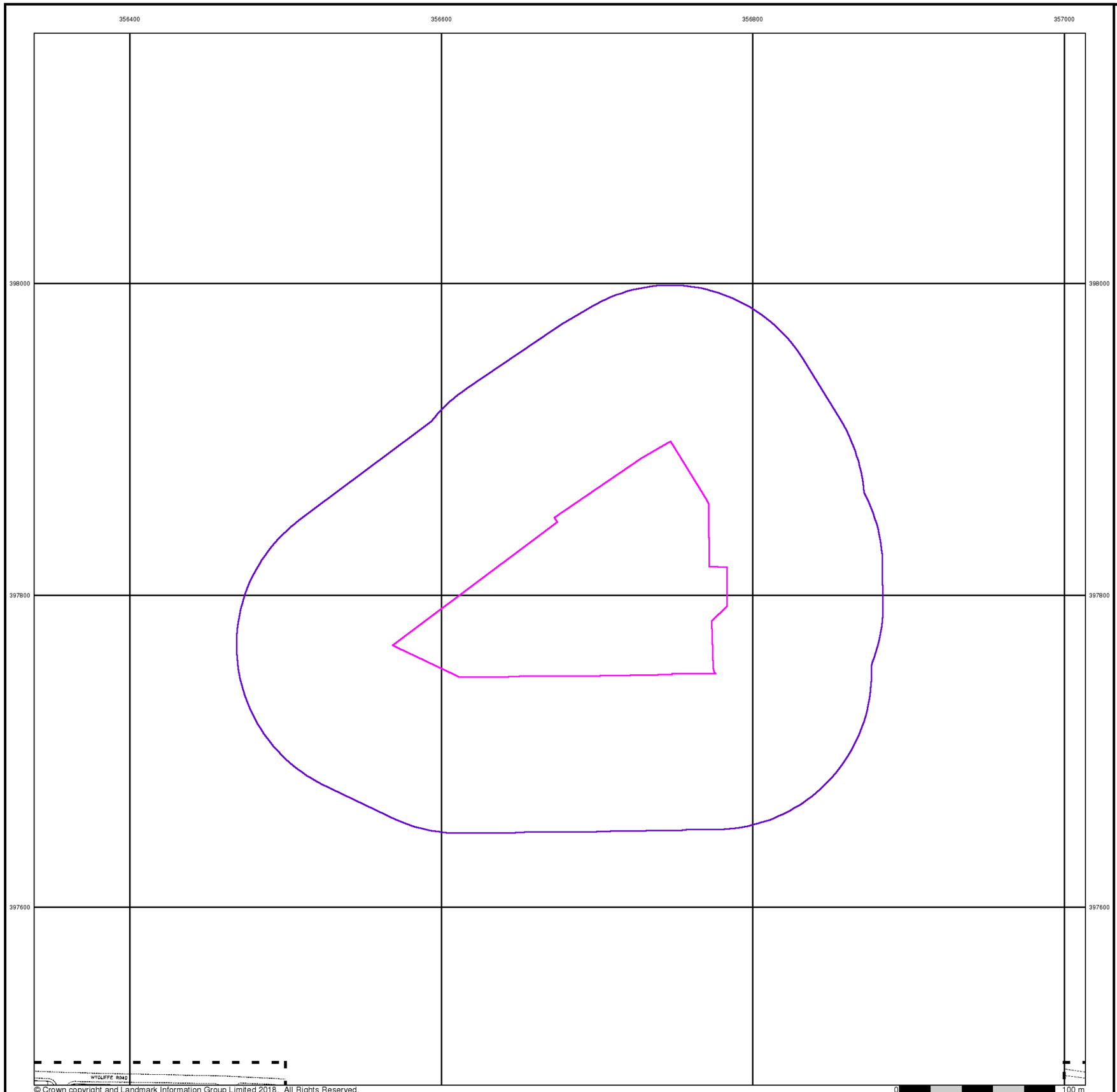

Large-Scale National Grid Data

Published 1993 - 1994

Source map scale - 1:1,250

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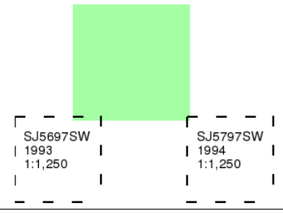
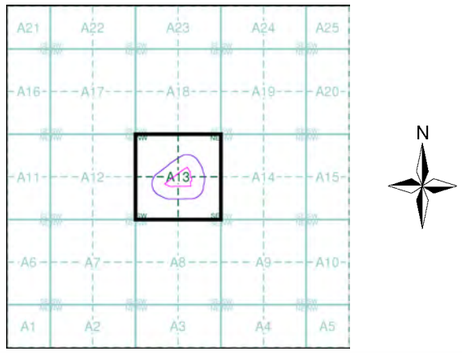


Historical Map - Segment A13



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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

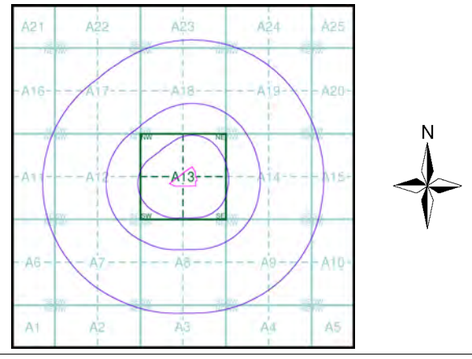
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Mud
Sand
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

e3p

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:10,560	1849	2
Lancashire And Furness	1:10,560	1894 - 1895	3
Lancashire And Furness	1:10,560	1908 - 1909	4
Lancashire And Furness	1:10,560	1929	5
Lancashire And Furness	1:10,560	1929	6
Lancashire And Furness	1:10,560	1938 - 1939	7
Lancashire And Furness	1:10,560	1938 - 1951	8
Lancashire And Furness	1:10,560	1951	9
Ordnance Survey Plan	1:10,000	1956	10
Ordnance Survey Plan	1:10,000	1965	11
Ordnance Survey Plan	1:10,000	1975	12
Ordnance Survey Plan	1:10,000	1983	13
Ordnance Survey Plan	1:10,000	1995	14
10K Raster Mapping	1:10,000	1999	15
Street View	Variable		16

Historical Map - Slice A



Order Details

Order Number: 169182665_1_1
Customer Ref: 12-639
National Grid Reference: 356690, 397800
Slice: A
Site Area (Ha): 1.88
Search Buffer (m): 1000

Site Details

Kilbuck Lane, ST. HELENS, WA11 9SZ

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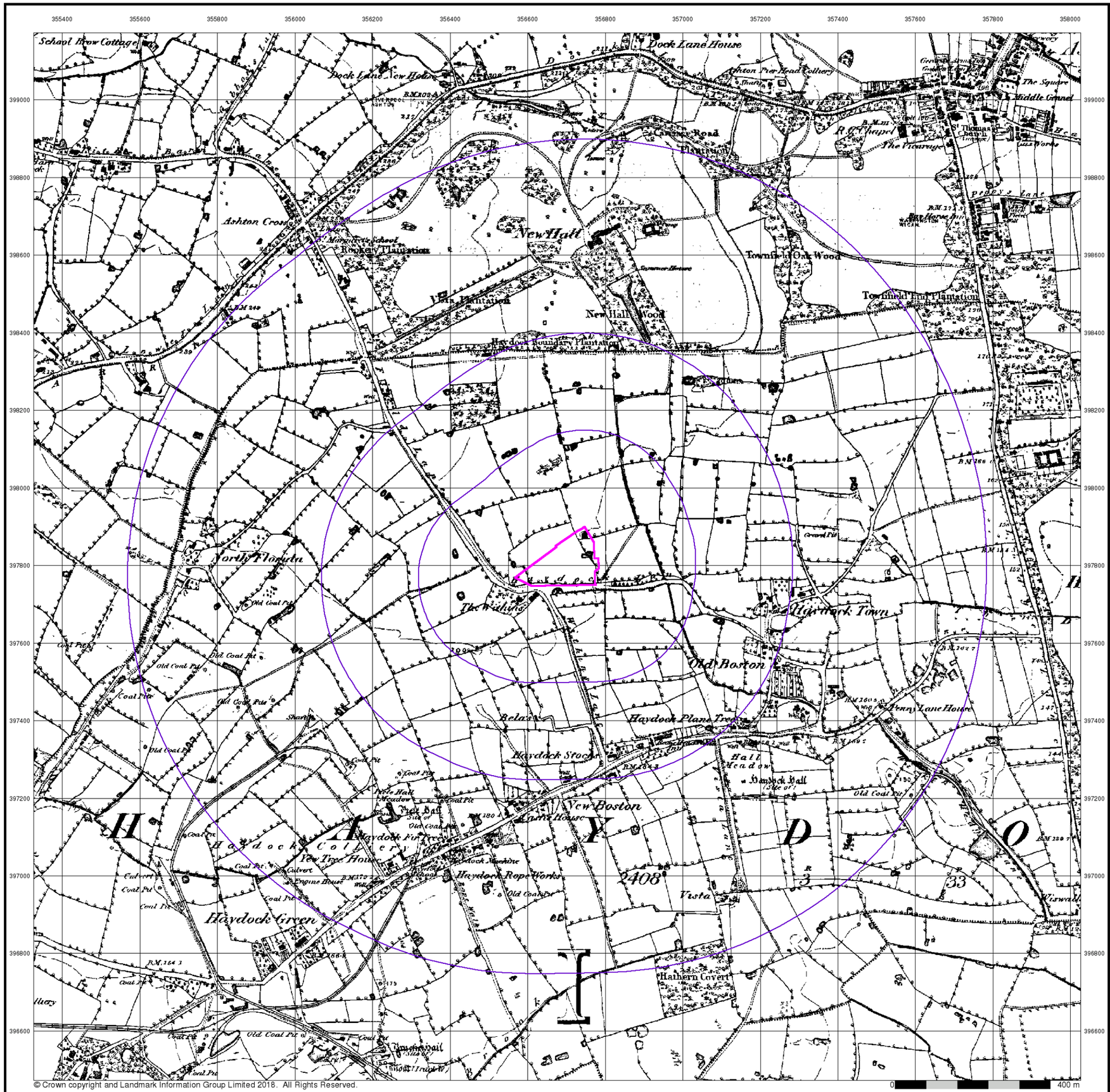


e3p

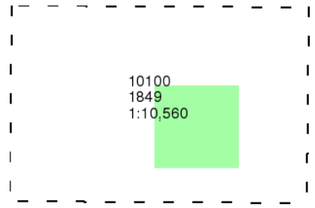
Lancashire And Furness

Published 1849

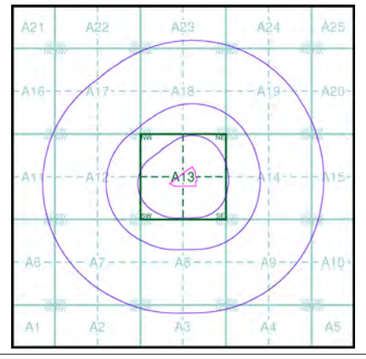
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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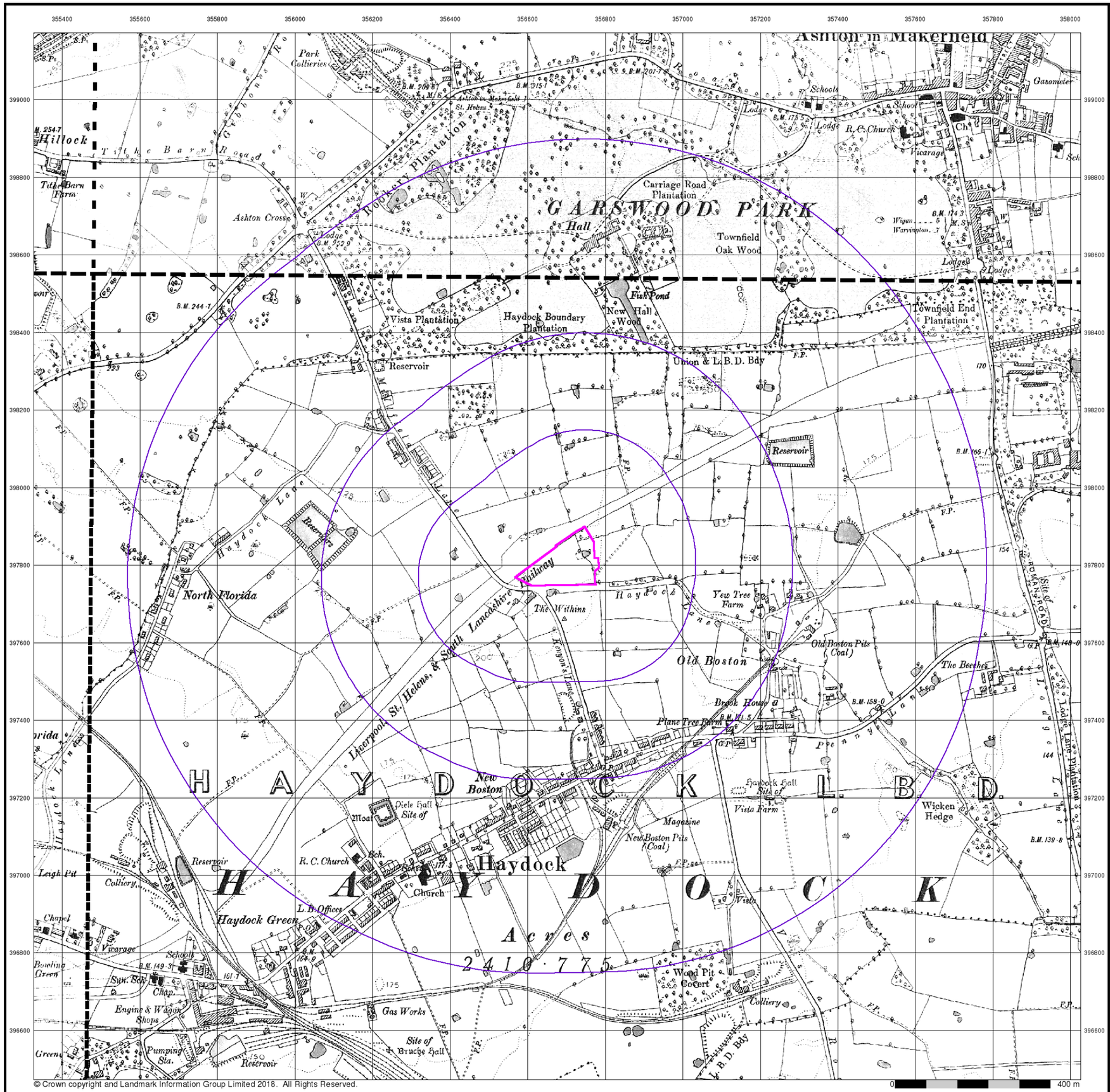

e3p

Lancashire And Furness

Published 1894 - 1895

Source map scale - 1:10,560

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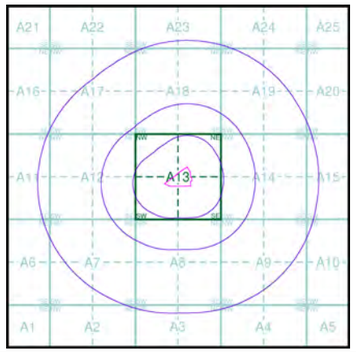
Map Name(s) and Date(s)

101NW 1894 1:10,560	101NE 1894 1:10,560
101SW 1895 1:10,560	101SE 1894 1:10,560

Historical Map - Slice A



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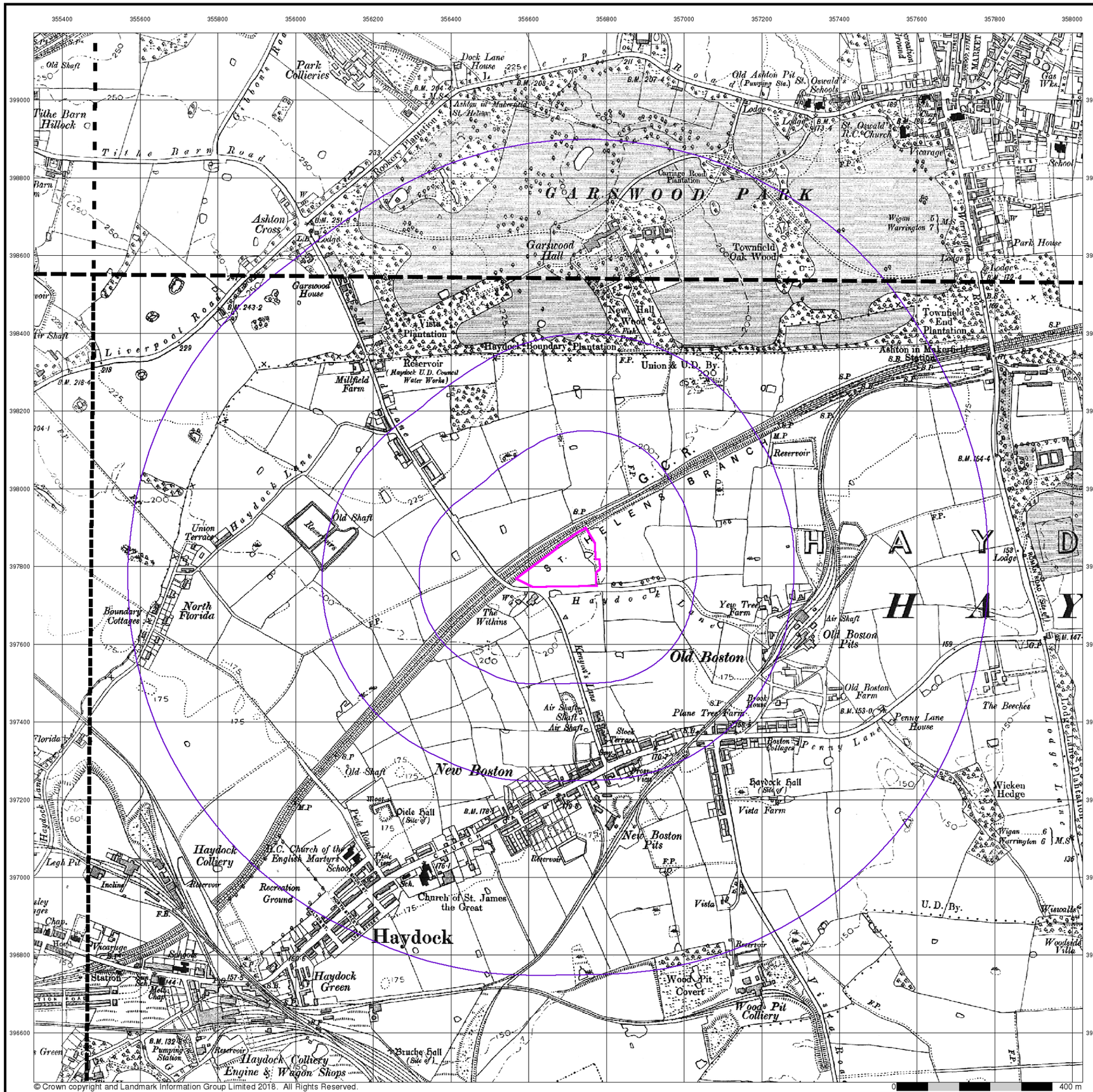

Lancashire And Furness

Published 1908 - 1909

Source map scale - 1:10,560

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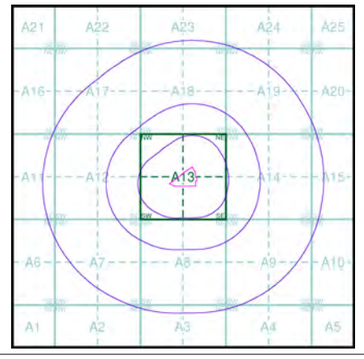
Map Name(s) and Date(s)

101NW 1909 1:10,560	101NE 1909 1:10,560
101SW 1909 1:10,560	101SE 1908 1:10,560

Historical Map - Slice A



N

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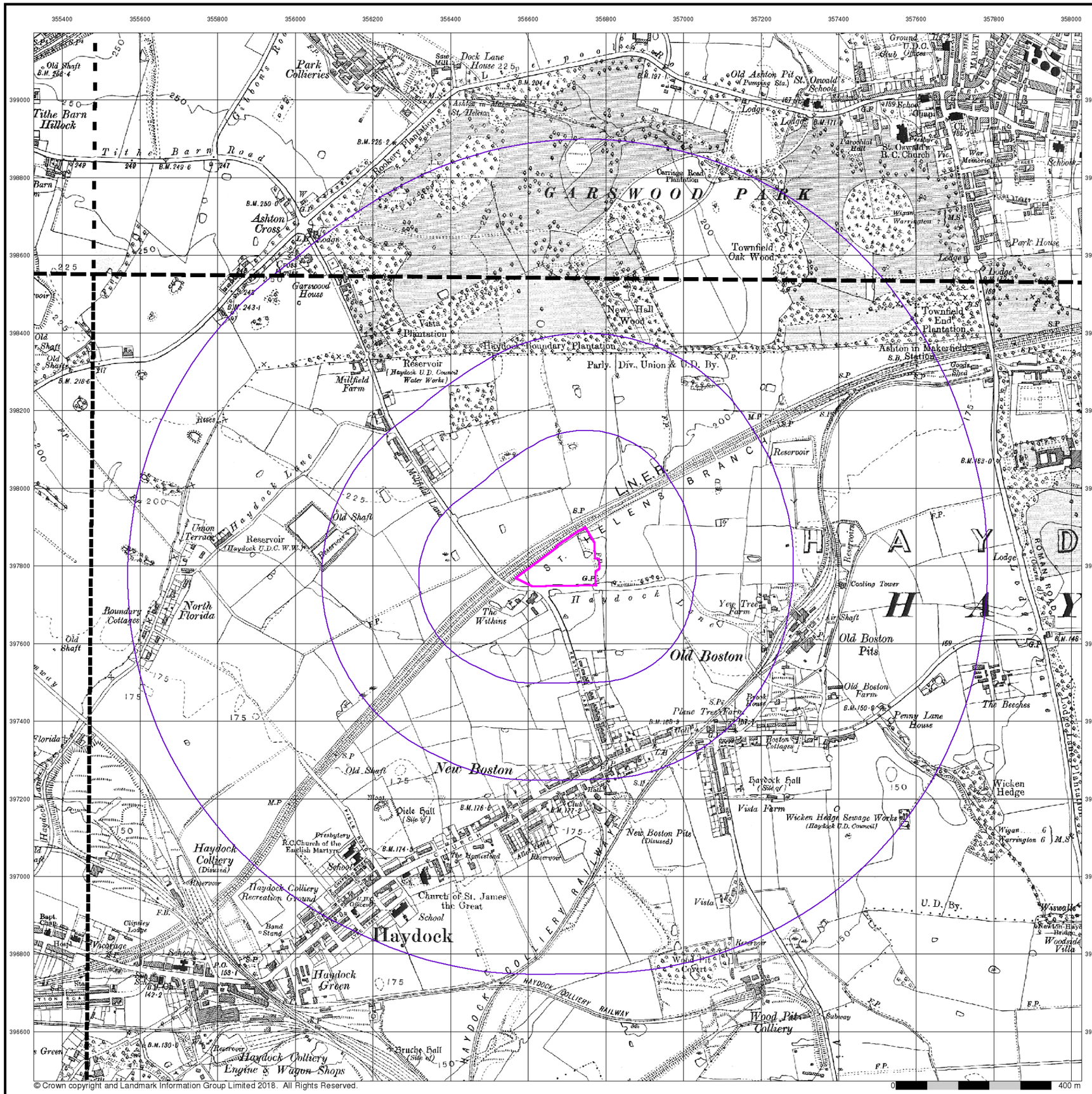

e3p

Lancashire And Furness

Published 1929

Source map scale - 1:10,560

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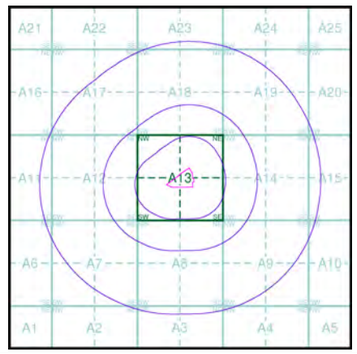
Map Name(s) and Date(s)

101NW 1929 1:10,560	101NE 1929 1:10,560
101SW 1929 1:10,560	101SE 1929 1:10,560

Historical Map - Slice A



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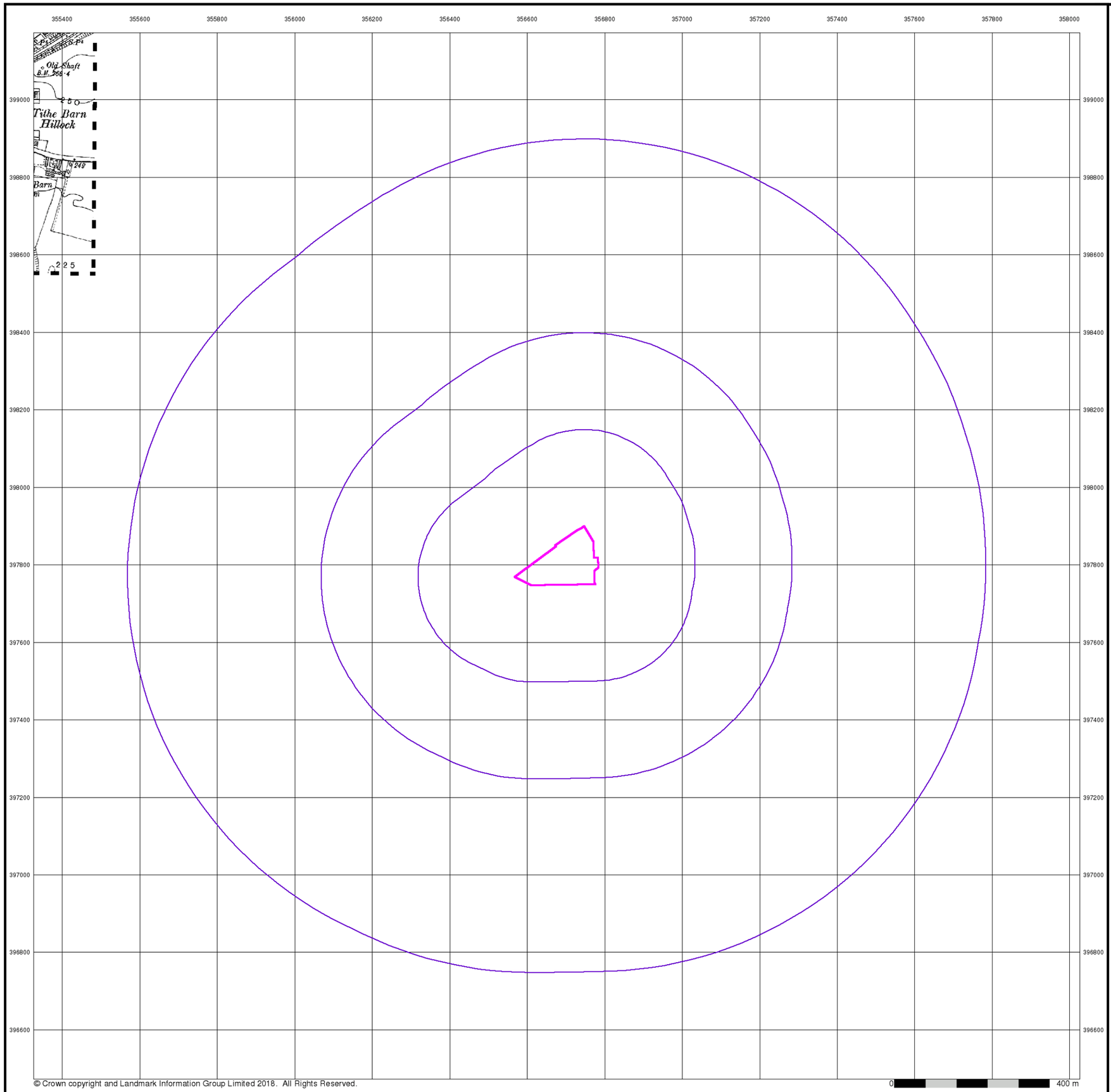

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Lancashire And Furness

Published 1929

Source map scale - 1:10,560

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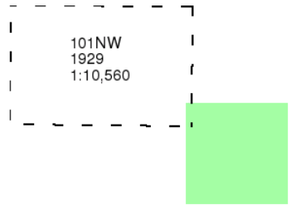
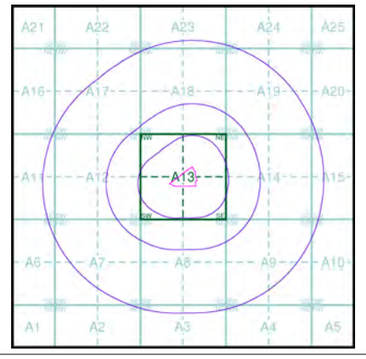


Historical Map - Slice A



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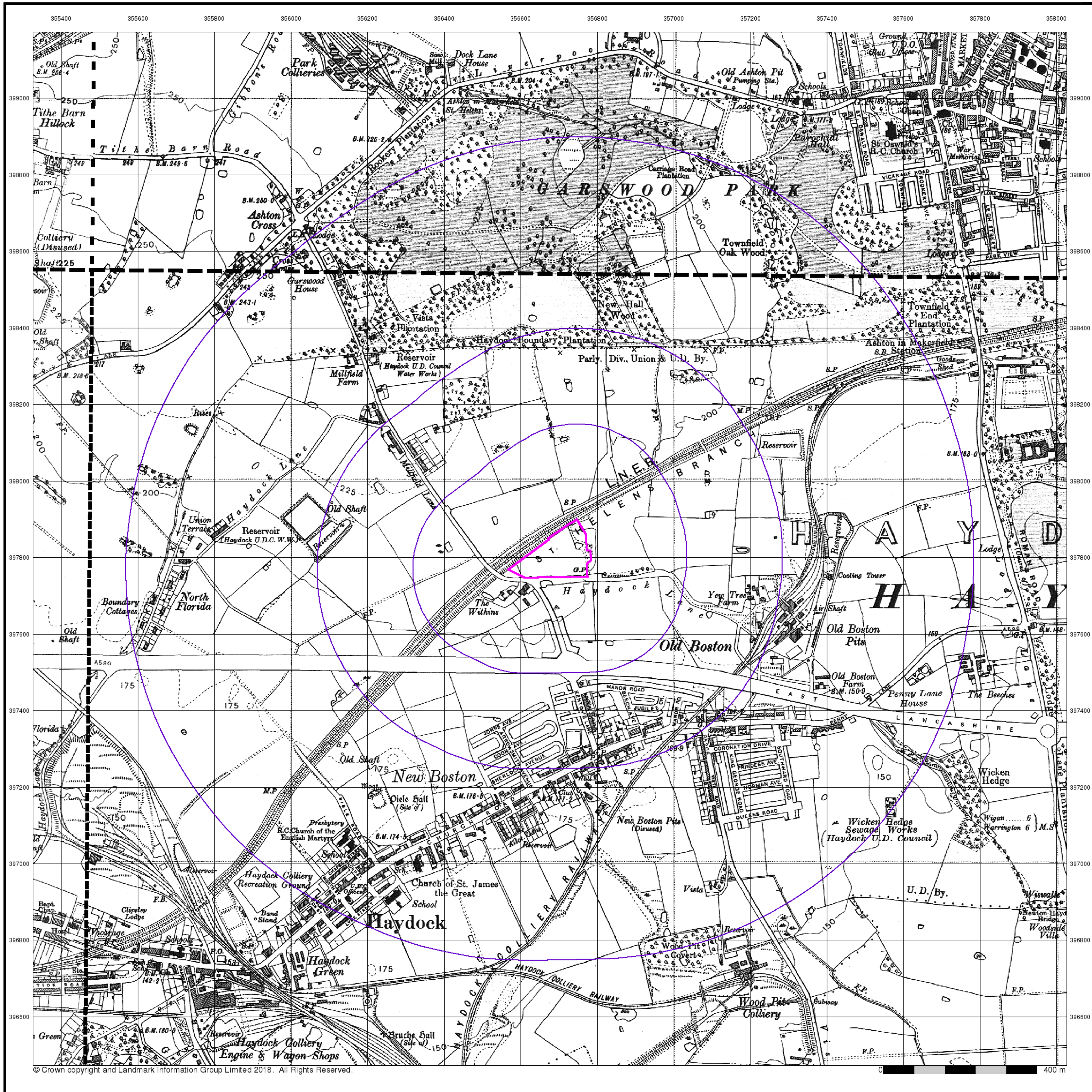
Web: www.envirocheck.co.uk



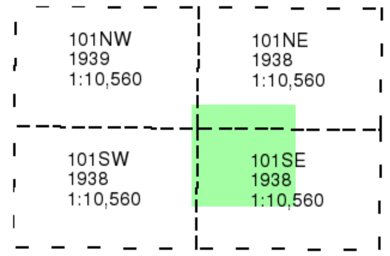
Lancashire And Furness

Published 1938 - 1939

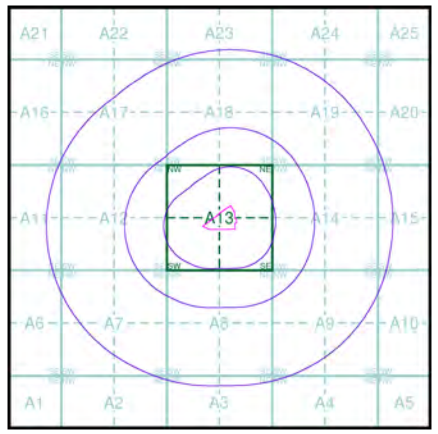
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



N

Order Details

Order Number: 169182665_1_1
Customer Ref: 12-639
National Grid Reference: 356690, 397800
Slice: A
Site Area (Ha): 1.88
Search Buffer (m): 1000

Site Details

Kilbuck Lane, ST. HELENS, WA11 9SZ

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

e3p

Lancashire And Furness

Published 1938 - 1951

Source map scale - 1:10,560

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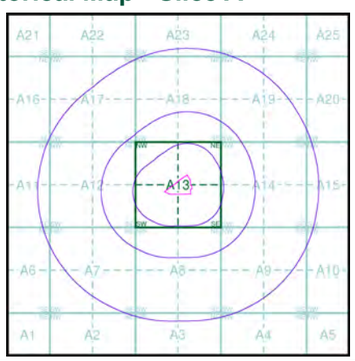
Map Name(s) and Date(s)

101NW 1951 1:10,560	101NE 1951 1:10,560
101SW 1938 1:10,560	101SE 1951 1:10,560

Historical Map - Slice A



N

Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

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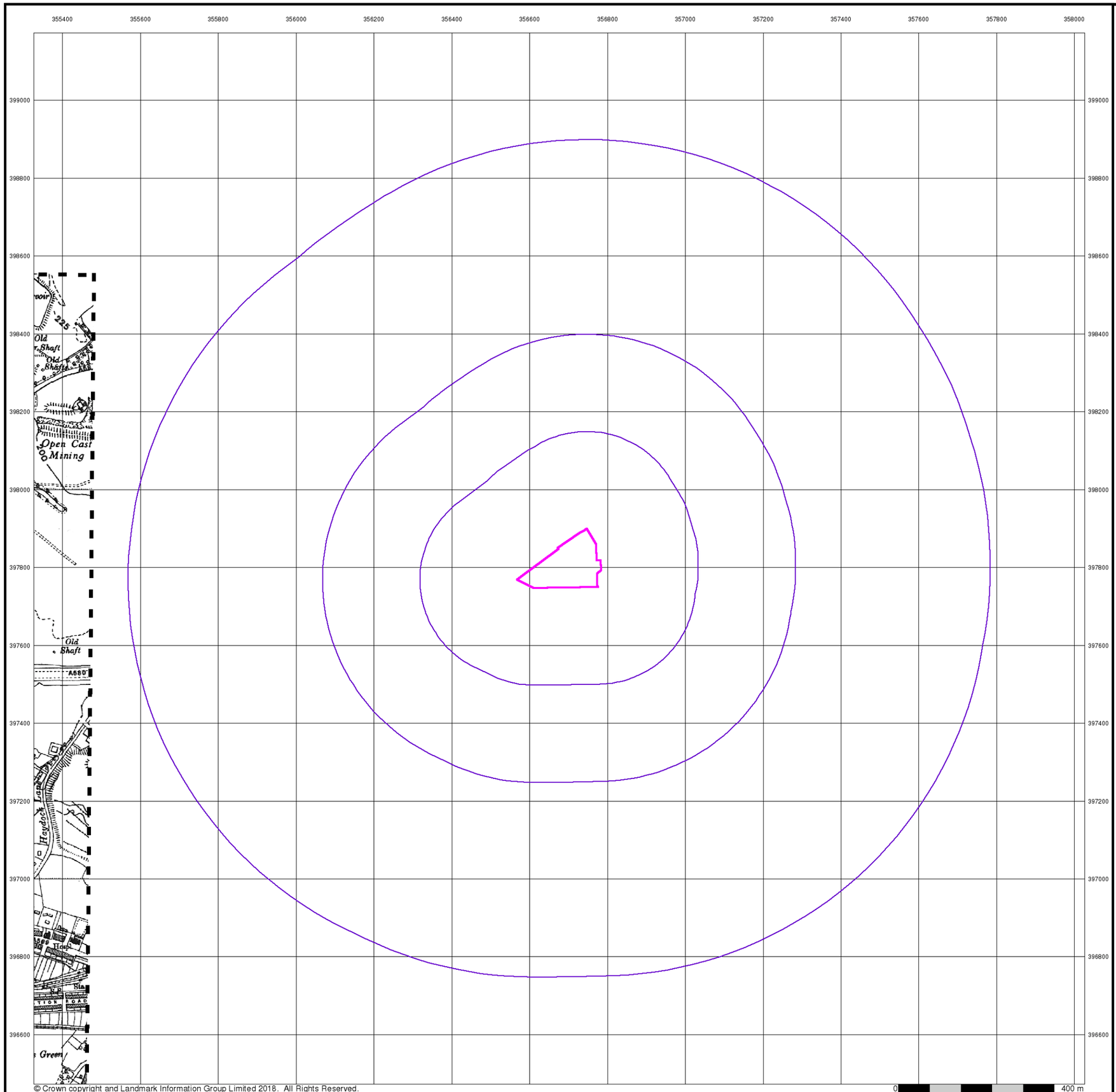


e3p

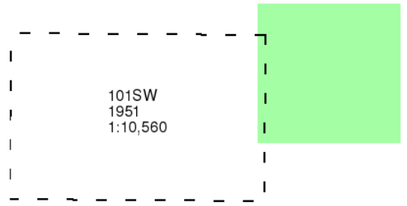
Lancashire And Furness

Published 1951

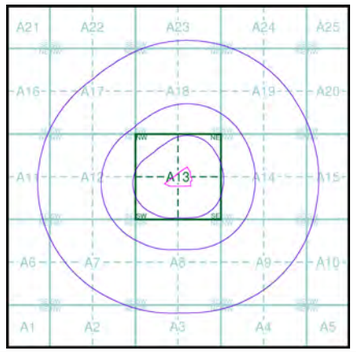
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

Site Details

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e3p

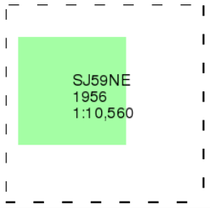
Ordnance Survey Plan

Published 1956

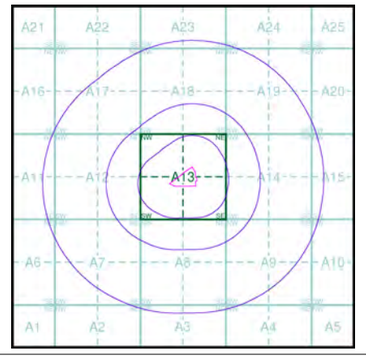
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

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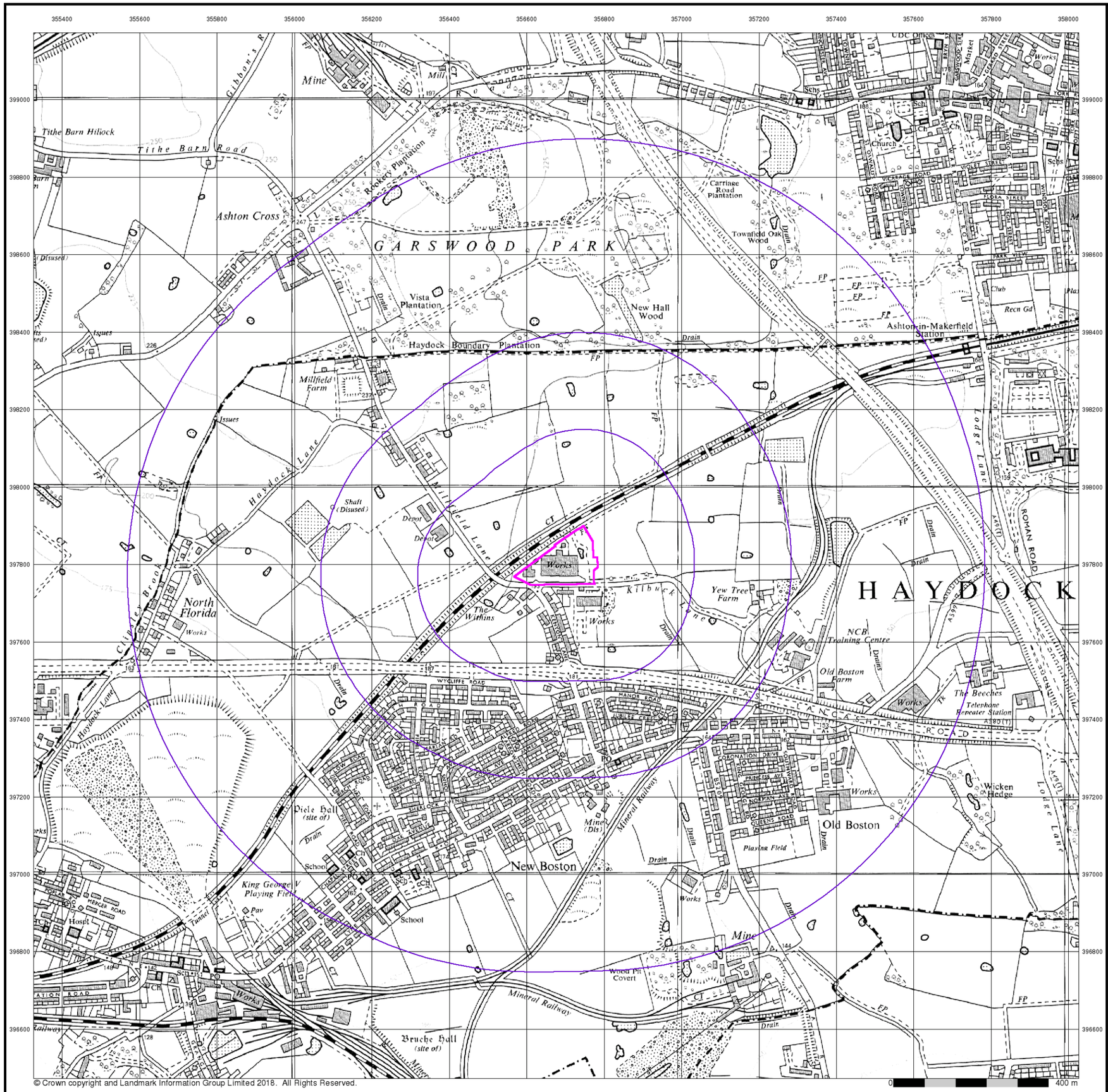


0 400 m

e3p

Ordnance Survey Plan

Published 1965

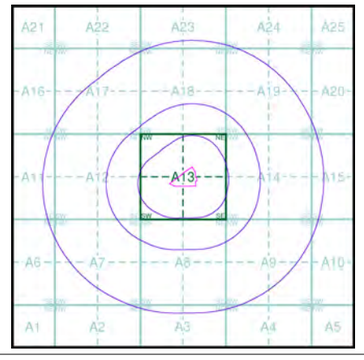
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SJ59NE
1965
1:10,560

Historical Map - Slice A



N

Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

Site Details

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Ordnance Survey Plan

Published 1975

Source map scale - 1:10,000

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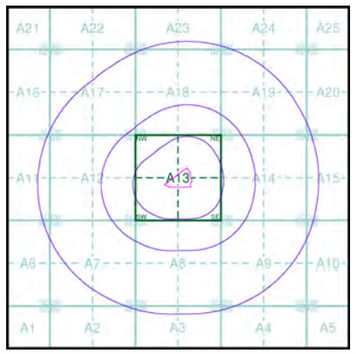
Map Name(s) and Date(s)

SJ59NE
1975
1:10,000

Historical Map - Slice A



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

Site Details

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Ordnance Survey Plan

Published 1983

Source map scale - 1:10,000

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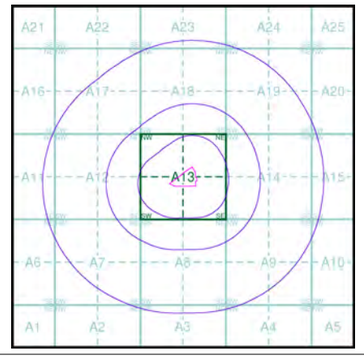
Map Name(s) and Date(s)

SJ59NE
1983
1:10,000

Historical Map - Slice A



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
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Site Details

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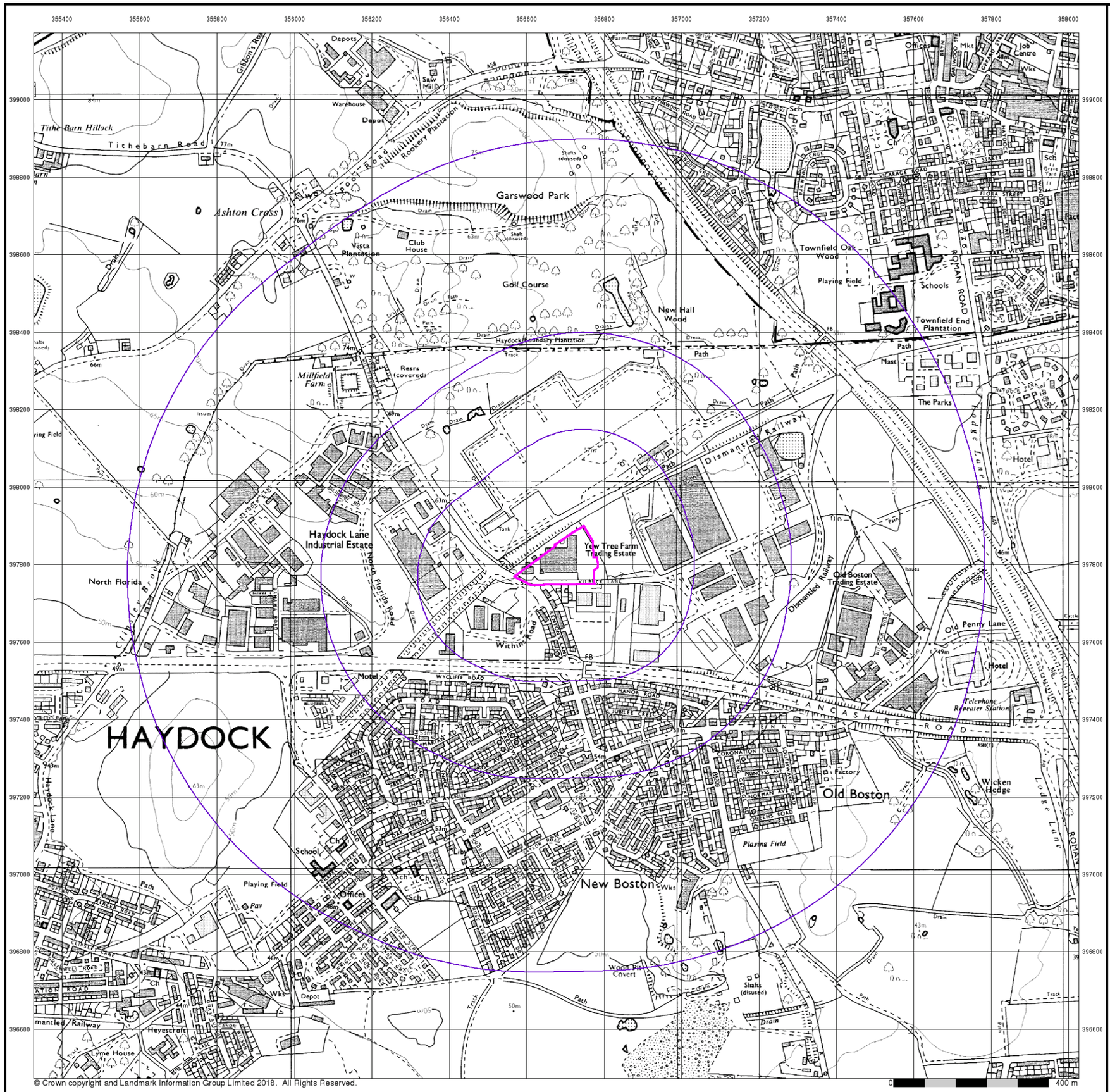


e3p

Ordnance Survey Plan

Published 1995

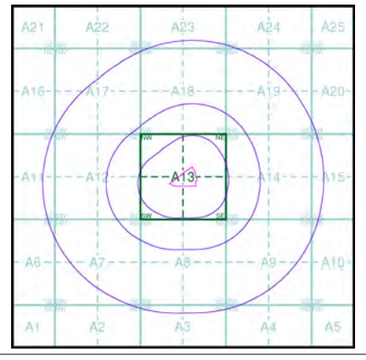
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SJ59NE
1995
1:10,000

Historical Map - Slice A



N

Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

Site Details

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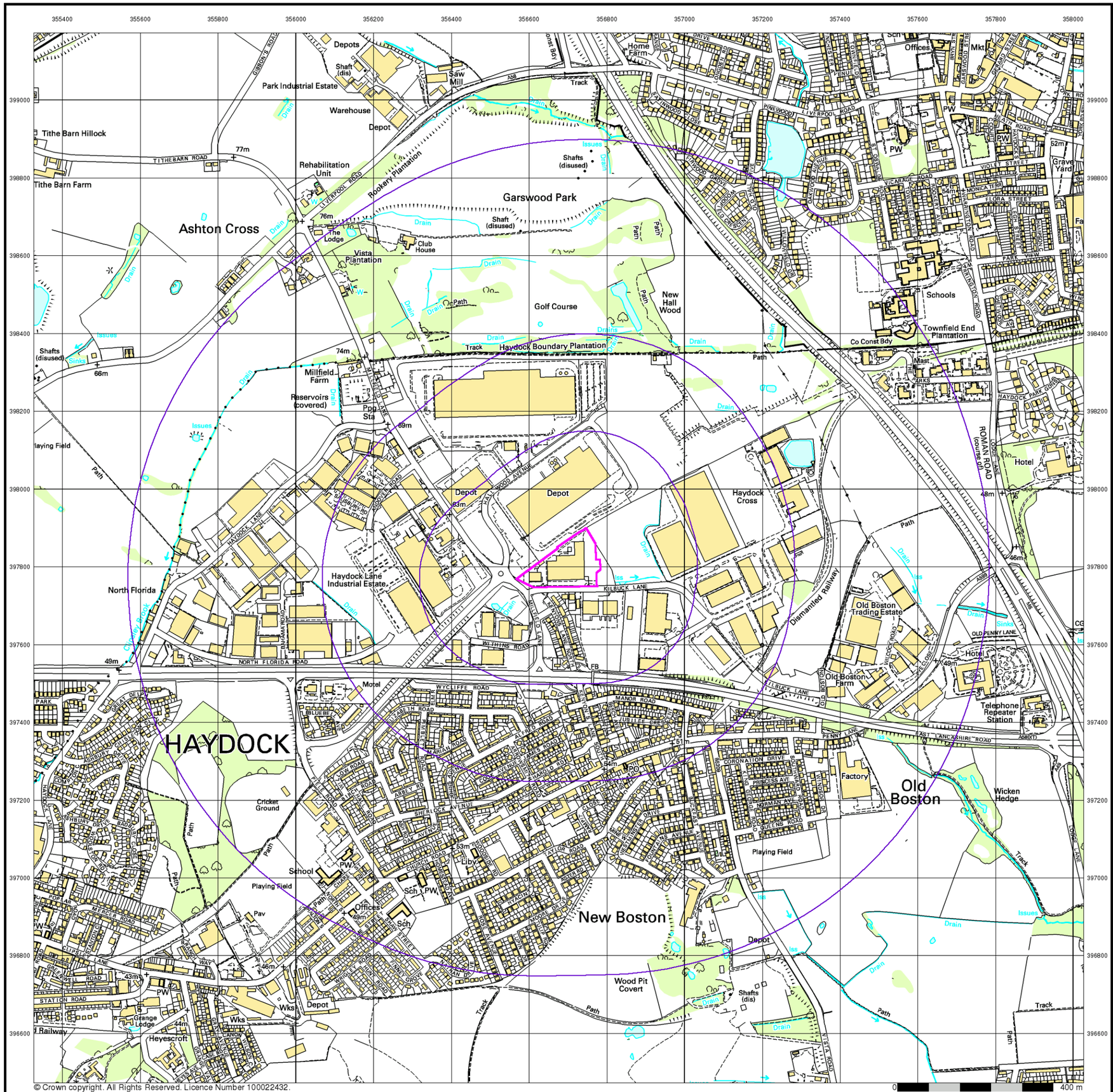


e3p

10k Raster Mapping

Published 1999

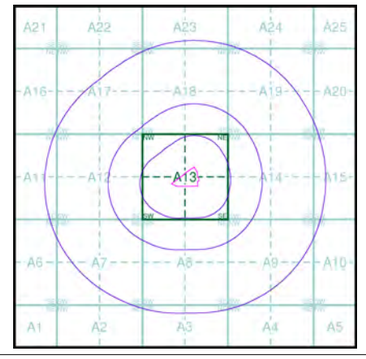
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

SJ59NE
1999
1:10,000

Historical Map - Slice A



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

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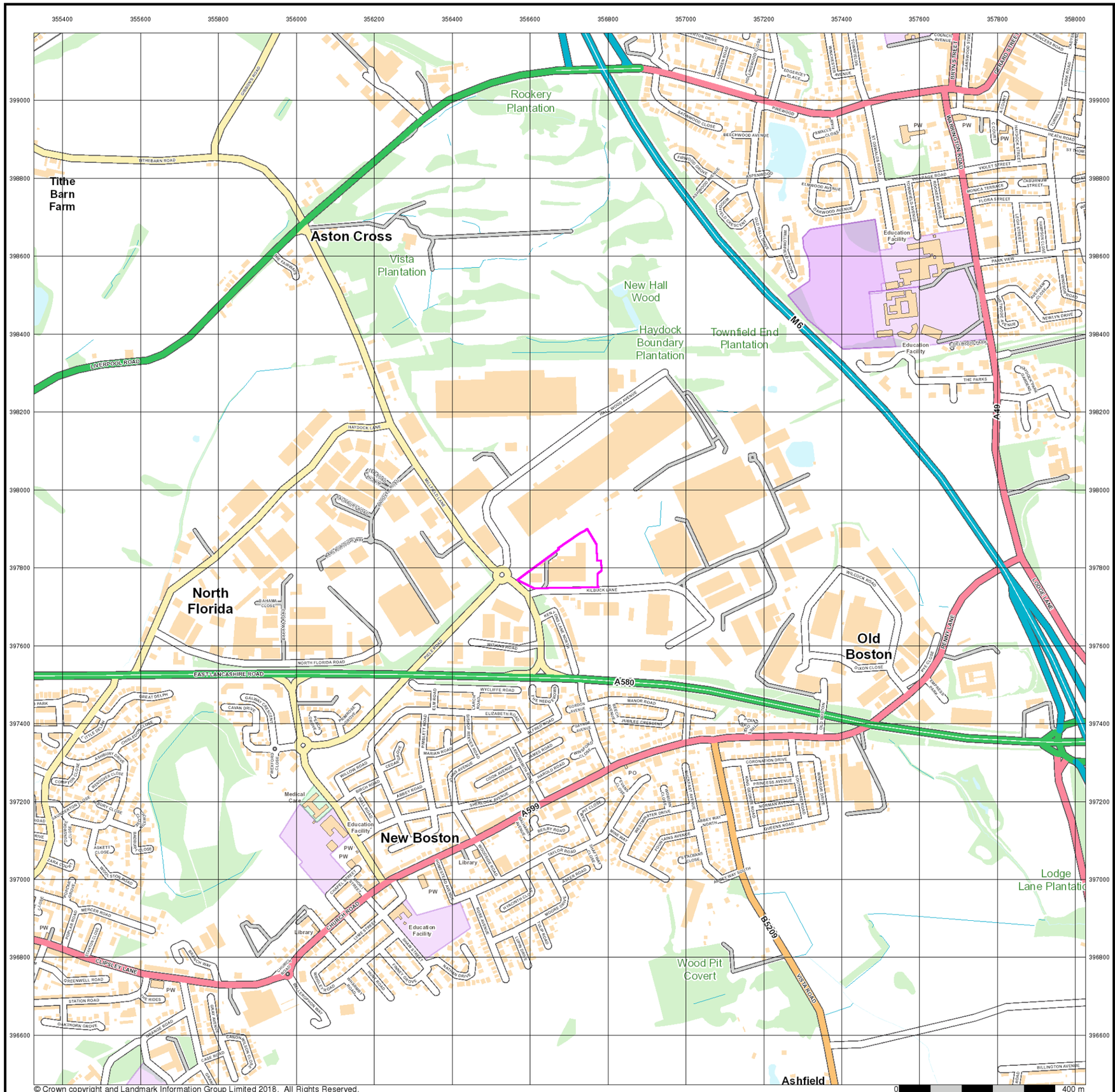


e3p

Street View

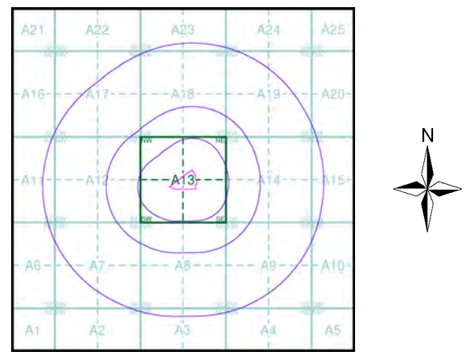
Published 2018

Source map scale - 1:10,000

Street View is a street-level map for the whole of Great Britain produced by the Ordnance Survey. These maps are provided at a nominal scale of 1:10,000

Map Name(s) and Date(s)

Street View Map - Slice A



Order Details

Order Number:	169182665_1_1
Customer Ref:	12-639
National Grid Reference:	356690, 397800
Slice:	A
Site Area (Ha):	1.88
Search Buffer (m):	1000

Site Details

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APPENDIX VI
E3P EXPLORATORY HOLE LOGS

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Killbuck Lane	Project No.: 12639	Co-ords: -	Hole Type: WS
Location: Haydock		Level:	Scale: 1:50
Client: Damson Consultancy Ltd		Dates: 10-07-2018 -	Logged By: M. Whittaker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.25			MADE GROUND: Concrere slab.
		0.35	ES		0.45			MADE GROUND: Brown black slightly clayey gravel. Gravel is fine to coarse angular to sub-angular to sub-rounded of brick, concrete, ash and clinker.
		0.50	PP	186				
		0.80	ES					
		0.90	PP	29 N=7 (1,1/1,2,2,2)	1.10			Firm low strength brown mottled grey silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
		1.50	U		1.50			Loose red brown slightly silty clayey medium SAND.
				N=12 (2,2/3,3,3,3)				Stiff medium strength brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular of mudstone and sandstone with occasional sand lenses at 2.70m bgl and 4.20m bgl.
		2.60	PP	44				
				N=15 (3,3/3,4,4,4)				
	▼			N=15 (3,3/3,4,4,4)	4.00			Medium dense red brown slightly silty clayey medium SAND.
				N=14 (1,2/3,3,4,4)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed. 3. Water strike encountered at 4.20m bgl.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Killbuck Lane	Project No.: 12639	Co-ords: -	Hole Type: WS
Location: Haydock		Level:	Scale: 1:50
Client: Damson Consultancy Ltd		Dates: 10-07-2018 -	Logged By: M. Whittaker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.35 0.45	ES PP	74	0.30 0.40			MADE GROUND: Black slightly clayey gravelly medium sand (Topsoil) with rootlets. Gravel is fine to coarse angular to sub-angular of brick and mudstone.
		0.80	PP	88				MADE GROUND: Black brown slightly silty gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, clinker, glass, metal and mudstone.
		1.10 1.30	PP ES	N=11 (2,2/2,3,3,3) 123				Stiff medium strength brown slightly gravelly silty CLAY. Gravel is fine to coarse angular to sub-angular of mudstone, sandstone and rare coal.
				N=14 (2,2/3,3,4,4)	1.90			Red slightly silty clayey medium SAND.
		2.40 2.50	PP U	103	2.20			Medium strength stiff brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
				N=11 (2,2/2,3,3,3)	2.95			Loose red slightly silty clayey medium SAND.
	▼				3.30			Very stiff high strength red brown slightly slity gravelly CLAY with sand lenses. Sand lenses encountered at 3.50m bgl, 3.90m bgl and 4.50m bgl.
				N=20 (3,4/4,5,6,5)				
				N=20 (4,4/4,4,6,6)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed. 3. Water strike encountered at 3.50m bgl.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Killbuck Lane	Project No.: 12639	Co-ords: -	Hole Type: WS
Location: Haydock		Level:	Scale: 1:50
Client: Damson Consultancy Ltd		Dates: 10-07-2018 -	Logged By: M. Whittaker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20	ES		0.12			MADE GROUND: Asphalt.
					0.25			MADE GROUND: Grey gravel. Gravel is fine to coarse angular to sub-angular of limestone.
		0.50	PP	113				Stiff medium strength brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-rounded of mudstone, sandstone and occasional coal. (Hydrocarbon odour at 0.70m bgl and 1.40m bgl).
		0.70	ES					
		0.90	PP	103				
				N=11 (1,3/2,3,3,3)				
		1.30	PP	64				
		1.40	ES					
		1.50	U					
				N=12 (2,2/2,3,3,4)				
					2.45			Red clayey fine to medium SAND.
					2.55			Medium dense brown slightly silty gravelly clayey medium SAND. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
				N=14 (2,2/2,4,4,4)				
					3.85			Loose brown red slightly silty clayey GRAVEL. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
				N=7 (1,1/2,1,2,2)				
					4.70			Firm to stiff brown slightly silty gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
				N=11 (3,2/2,3,3,3)	5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Water strike encountered at 2.50m bgl. 3. Monitoring well installed. 4.Hydrocarbon odour at 0.70m bgl and 1.40m bgl.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Killbuck Lane	Project No.: 12639	Co-ords: -	Hole Type: WS
Location: Haydock		Level:	Scale: 1:50
Client: Damson Consultancy Ltd		Dates: 10-07-2018 -	Logged By: M. Whittaker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.19			MADE GROUND: Concrete with rebar
					0.35			MADE GROUND: Grey brown slightly sandy gravel. Gravel is fine to coarse angular to sub-angular to sub-rounded of limestone.
		0.60	ES					
				N=10 (2,3/2,2,3,3)	0.90			MADE GROUND: Black brown slightly clayey gravel. Gravel is fine to coarse angular to sub-angular to sub-rounded of brick, mudstone, sandstone, concrete and plastic.
		1.40	PP	167				
		1.40	ES					
		1.50	D					
		2.10	PP	N=5 (1,0/1,1,1,2) 83				Stiff medium strength becoming firm low strength circa 2.00m brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
					2.30			Firm low strength brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular of mudstone and sandstone.
				N=6 (2,1/1,1,2,2)				
					3.70			Black fibrous PEAT.
		3.80	D		3.80			Firm brown silty gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
				N=8 (1,0/2,2,2,2)	4.10			
					4.50			Firm low strength dark brown silty sandy CLAY with frequent organic clayey sandy peat.
				N=14 (3,3/3,3,4,4)				Stiff medium strength brown silty gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Killbuck Lane	Project No.: 12639	Co-ords: -	Hole Type: WS
Location: Haydock		Level:	Scale: 1:50
Client: Damson Consultancy Ltd		Dates: 10-07-2018 -	Logged By: M. Whittaker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.19			MADE GROUND: Black asphalt.
					0.45			MADE GROUND: Grey brown slightly sandy gravel. Gravel is fine to coarse angular to sub-angular of limestone and concrete.
		0.95	ES	N=10 (2,3/2,2,3,3)	0.80			MADE GROUND: Red sightly sandy gravel. Gravel is fine to coarse angular to sub-angular of brick.
					1.35			MADE GROUND: Medium dense brown red slightly clayey gravel. Gravel is fine to coarse angular to sub-angular of brick, ash, clinker, coal and slag.
		1.50	PP	74	1.50			Firm to stiff light brown mottled grey slightly silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
		1.55	ES					Stiff medium strength dark brown mottled grey slightly sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone. Circa 4.00m bgl becomes very stiff high strength. Circa 5.00m bgl becomes stiff medium strength.
		1.80	D					
		1.90	PP	83 N=12 (2,2/2,2,4,4)				
		2.50	PP	98				
				N=17 (3,3/3,4,5,5)				
		3.50	U					
				N=19 (4,4/4,5,5,5)				
				N=17 (3,3/3,4,5,5)				
					5.45			End of borehole at 5.45 m

1 2 3 4 5 6 7 8 9 10

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Killbuck Lane	Project No.: 12639	Co-ords: -	Hole Type: WS
Location: Haydock		Level:	Scale: 1:50
Client: Damson Consultancy Ltd		Dates: 10-07-2018 -	Logged By: M. Whittaker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.23			MADE GROUND: Concrete with rebar.
					0.45			MADE GROUND: Red brown slightly clayey gravel. Gravel is fine to coarse angular to sub-angular of brick and ash.
		0.75	ES	172				Firm to stiff brown red mottled grey slightly gravelly silty slightly sandy CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
		0.80	PP	N=6 (2,2/2,2,1,1)	0.95			
					1.30			Loose red brown slightly silty clayey medium SAND.
		1.50	D					Stiff medium strength light brown mottled grey slightly silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
				N=14 (2,3/3,3,4,4)				
	▼				2.45			Stiff medium strength red brown slightly gravelly silty sandy CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone with occasional sand lenses.
		2.60	PP	128				
				N=15 (3,2/3,3,4,5)				
				N=13 (2,2/3,4,3,3)				
				N=17 (3,4/3,4,5,5)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Water seepage encountered at 2.45m bgl. 3. Monitoring well installed. 4. Sandstone at 2.50m bgl, 2,70m bgl, 3.00m bgl, 3.60m bgl.

Borehole Log

Borehole No. **RBH101**

Sheet 1 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			MADE GROUND: Asphalt.
					0.30			Brown medium SAND.
		0.50	D					Firm low strength brown mottled grey silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
		1.20		N=7 (1,0/1,2,2,2)				
		1.50	B					
		2.20		N=16 (3,3/4,4,4,4)	2.20			Stiff medium strength brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular of mudstone and sandstone. (Circa 3.50m bgl becomes very stiff high strength) (Circa 8.10m bgl becomes stiff medium strength).
		2.50	B					
		3.20		N=17 (2,2/3,4,5,5)				
		4.00	D					
		4.20		N=14 (2,3/3,4,4,3)				
		5.00	D					
		5.30		N=20 (3,3/5,5,5,5)				
		6.00	D					
		6.50	U					
		7.00	D					
		8.10		N=16 (3,4/4,4,4,4)				
		8.30	D					
		9.50	U		9.50			Stiff medium strength brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular of mudstone and sandstone.
		10.00	B					
								Continued on next sheet

Remarks
1. Complete. 2. Water strike encountered at 10.90m bgl.

Borehole Log

Borehole No. **RBH101**
Sheet 2 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00	D					
	▼	10.90		50 (3,12/50 for 30mm)	10.90			Dense grey SANDSTONE.
					11.25			Light grey SANDSTONE.
					13.00			COAL.
					13.50			Light grey MUDSTONE with sandstone bands.
								Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
1. Complete. 2. Water strike encountered at 10.90m bgl.

Borehole Log

Borehole No. **RBH101**

Sheet 3 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					20.50			COAL.
					21.50			Light grey MUDSTONE.
					28.00			COAL.
					28.40			Light grey SILTSTONE.
								Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

1. Complete. 2. Water strike encountered at 10.90m bgl.

Borehole Log

Borehole No.
RBH101
Sheet 4 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					35.00			End of borehole at 35.00 m

31
32
33
34
35
36
37
38
39
40

Remarks
1. Complete. 2. Water strike encountered at 10.90m bgl.

Borehole Log

Borehole No. **RBH102**

Sheet 1 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Concrete.
					0.30			MADE GROUND: Grey brown slightly sandy gravel. Gravel is fine to coarse angular to sub-angular of limestone and concrete.
		0.60	D		0.40			MADE GROUND: Concrete.
		1.20		N=11 (1,1/2,3,3,3)	1.30			MADE GROUND: Medium dense brown red slightly clayey gravel. Gravel is fine to coarse angular to sub-angular of brick, ash, clinker, coal and slag.
		1.50	B					Stiff medium strength dark brown mottled grey slightly sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
		2.30		N=11 (1,1/2,3,3,3)				
		2.50	D					
		3.20		N=11 (2,2/2,3,3,3)				
					3.40			Stiff medium strength dark brown mottled grey slightly sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone.
		4.20		N=13 (2,2/3,3,3,4)				
		5.00	D					
		5.10		N=18 (2,2/3,5,5,5)				
		5.70	B					
		6.50		N=18 (3,4/4,4,5,5)				
		7.00	D					
		8.00	U					
		8.50	D					
	▼	9.60		50 (12,13/50 for 30mm)	9.50			Dense grey SANDSTONE.
					9.85			

Continued on next sheet

Remarks

1. Complete. 2. Water strike encountered at 9.60m bgl.

Borehole Log

Borehole No. **RBH102**

Sheet 2 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Light grey SANDSTONE.
					13.70			COAL.
					14.80			Light grey MUDSTONE.
					17.80			Light grey SANDSTONE.
								Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
1. Complete. 2. Water strike encountered at 9.60m bgl.

Borehole Log

Borehole No. **RBH102**

Sheet 3 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					21.20			COAL.
					21.50			Light grey SANDSTONE.
								Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks
1. Complete. 2. Water strike encountered at 9.60m bgl.

Borehole Log

Borehole No.
RBH102
Sheet 4 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					35.00			End of borehole at 35.00 m

31
32
33
34
35
36
37
38
39
40

Remarks
1. Complete. 2. Water strike encountered at 9.60m bgl.

Borehole Log

Borehole No. **RBH103**

Sheet 1 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.25			MADE GROUND: Concrete with rebar.
		0.50	D		0.30			MADE GROUND: Grey brown slightly sandy gravel. Gravel is fine to coarse angular to sub-angular of limestone and concrete.
		1.20		N=12 (2,2/3,3,3,3)				MADE GROUND: Stiff medium strength brown gravelly clay. Gravel is fine to coarse angular to sub-angular to sub-rounded of brick, mudstone, sandstone, concrete and plastic.
		1.70	B					
		2.30		N=16 (1,2/4,4,4,4)	2.30			Stiff medium strength brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone. (Circa 4.30m bgl becomes very stiff high strength). (Circa 5.30m bgl becomes stiff medium strength).
		3.20		N=14 (2,2/3,4,3,4)				
		3.50	D					
		4.30		N=18 (3,4/4,4,5,5)				
		5.00	D					
		5.30		N=17 (2,2/3,4,5,5)				
		6.50	U		6.50			Firm to stiff sandy CLAY.
		7.00	D					
		8.00	B					
		8.30		N=29 (4,4/5,6,8,10)				
					8.50			Very stiff high strength brown silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular to sub-rounded of mudstone and sandstone. (Circa 10.50m bgl becomes very tiff high strength).
		9.50	U					
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RBH103**

Sheet 2 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50		50 (25 for 70mm/50 for 70mm)	10.80			Stiff brown CLAY with cobbles.
		12.30		N=26 (4,5/5,6,7,8)	11.50			Very stiff high strength grey CLAY.
		13.00		50 (25 for 30mm/50 for 40mm)	13.00			Very stiff very high strength brown CLAY.
					13.50			Stiff grey CLAY with boulders.
		13.90	D		13.90			Brown MUDSTONE.
					14.15			COAL.
					15.00			Light grey MUDSTONE.
					18.00			Light grey SILTSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RBH103**

Sheet 3 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					21.00			COAL.
					21.50			Light grey SILTSTONE.
					23.00			COAL.
					23.60			Light grey MUDSTONE.
					26.00			Light grey SILTSTONE.
								Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks
Complete.

Borehole Log

Borehole No.
RBH103
Sheet 4 of 4

Project Name: Killbuck Lane	Project No. 12639	Co-ords: -	Hole Type BH
Location: Haydock		Level:	Scale 1:50
Client: Damson Consultancy Ltd		Dates: -	Logged By R. Hodnett

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					35.00			End of borehole at 35.00 m

Remarks
Complete.

APPENDIX VII
CHEMICAL TESTING RESULTS

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Analytical Report Number : 18-92362

Replaces Analytical Report Number : 18-92362, issue no. 1

Project / Site name:	Kilbuck Lane	**Samples received on:**	11/07/2018
Your job number:	12-639	**Samples instructed on:**	13/07/2018
Your order number:	12639-9234-BH	**Analysis completed by:**	21/09/2018
Report Issue Number:	2	**Report issued on:**	21/09/2018
Samples Analysed:	2 leachate samples - 13 soil samples		

Reporting Manager
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999957	999958	999959	999960	999961
Sample Reference				WS101	WS101	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35	0.80	0.35	1.30	0.20
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
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	%	N/A	NONE	9.3	11	10	11	8.7
Total mass of sample received	kg	0.001	NONE	0.47	0.51	0.43	0.58	0.54
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.9	7.6	7.4	7.8	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	700	350	410	230	300
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	250	240	80	43	68
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.12	0.12	0.040	0.022	0.034
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	125	118	39.8	21.7	33.8
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	7.8
Total Sulphur	mg/kg	50	MCERTS	940	150	220	120	390
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 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
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10	6.7	8.5	4.8	5.0
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	31	40	75	38	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	25	20	42	20	16
Lead (aqua regia extractable)	mg/kg	1	MCERTS	12	5.9	13	5.6	9.1
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	28	42	43	41	26
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	26	36	76	37	69

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999957	999958	999959	999960	999961
Sample Reference				WS101	WS101	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35	0.80	0.35	1.30	0.20
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
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	< 4.0	< 4.0	52	< 4.0	24
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	150	< 1.0	56
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	70	< 1.0	36
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	270	< 10	120

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999957	999958	999959	999960	999961
Sample Reference				WS101	WS101	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35	0.80	0.35	1.30	0.20
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

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Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999957	999958	999959	999960	999961
Sample Reference				WS101	WS101	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35	0.80	0.35	1.30	0.20
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999962	999963	999964	999965	999966
Sample Reference				WS103	WS104	WS104	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.60	1.50	3.80	0.95
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
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	%	N/A	NONE	13	16	9.5	25	11
Total mass of sample received	kg	0.001	NONE	0.57	0.48	0.49	0.42	0.47
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	-	-	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.013	-	-	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.013	-	-	< 0.001
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.1	7.7	8.5	7.1	7.0
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	290	800	350	1200	6300
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	150	200	61	890	570
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.077	0.10	0.030	0.44	0.29
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	77.4	99.9	30.3	445	287
Sulphide	mg/kg	1	MCERTS	20	20	< 1.0	7.4	< 1.0
Total Sulphur	mg/kg	50	MCERTS	260	1300	160	1300	2100
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	0.17
Anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	0.33
Pyrene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	0.27
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	0.15
Chrysene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	0.19
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	< 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
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	< 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	1.11
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.2	18	5.0	12	74
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.8	< 0.2	< 0.2	2.4
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	43	95	31	35	330
Copper (aqua regia extractable)	mg/kg	1	MCERTS	24	270	21	54	1600
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.7	77	5.3	47	150
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	45	79	40	69	< 1.0
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	860	42	92	5700

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999962	999963	999964	999965	999966
Sample Reference				WS103	WS104	WS104	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.60	1.50	3.80	0.95
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	< 1.0	-	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
o-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	11	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	43	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	32	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	86	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	8.6	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	38	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	16	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	63	-	-	-	-

TPH (C5 - C6)	mg/kg	1	NONE	-	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	-	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	-	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	-	2.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	-	63	< 1.0	10	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	-	63	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	-	130	< 10	12	< 10

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999962	999963	999964	999965	999966
Sample Reference				WS103	WS104	WS104	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.60	1.50	3.80	0.95
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Chloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Styrene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999962	999963	999964	999965	999966
Sample Reference				WS103	WS104	WS104	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.60	1.50	3.80	0.95
Date Sampled				10/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-	-	-	-
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	-	-	-	-

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Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999967	999968	999969		
Sample Reference				WS105	WS106	WS106		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.55	0.30	0.75		
Date Sampled				10/07/2018	10/07/2018	10/07/2018		
Time Taken				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	26		
Moisture Content	%	N/A	NONE	14	10	8.3		
Total mass of sample received	kg	0.001	NONE	0.52	0.42	0.54		
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-		
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-		
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-		
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.9	8.1	7.4		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Total Sulphate as SO_4	mg/kg	50	MCERTS	280	5100	150		
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	96	170	30		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.048	0.085	0.015		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	47.9	85.2	14.9		
Sulphide	mg/kg	1	MCERTS	< 1.0	2.2	< 1.0		
Total Sulphur	mg/kg	50	MCERTS	130	1800	91		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.34	< 0.05		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.26	< 0.05		
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.25	< 0.05		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	0.85	< 0.80		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.4	18	9.9		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	45	23	37		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	23	18		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	13	26	11		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	35	29	30		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	62	62	28		

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Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999967	999968	999969		
Sample Reference				WS105	WS106	WS106		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.55	0.30	0.75		
Date Sampled				10/07/2018	10/07/2018	10/07/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	-	-		
Toluene	µg/kg	1	MCERTS	-	-	-		
Ethylbenzene	µg/kg	1	MCERTS	-	-	-		
p & m-xylene	µg/kg	1	MCERTS	-	-	-		
o-xylene	µg/kg	1	MCERTS	-	-	-		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH (C21 - C35)	mg/kg	1	MCERTS	19	< 1.0	< 1.0		
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH Total C5 - C40	mg/kg	10	MCERTS	21	< 10	< 10		

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999967	999968	999969		
Sample Reference				WS105	WS106	WS106		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.55	0.30	0.75		
Date Sampled				10/07/2018	10/07/2018	10/07/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-		
Chloroethane	µg/kg	1	NONE	-	-	-		
Bromomethane	µg/kg	1	ISO 17025	-	-	-		
Vinyl Chloride	µg/kg	1	NONE	-	-	-		
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-		
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-		
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-		
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-		
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-		
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-		
Trichloromethane	µg/kg	1	MCERTS	-	-	-		
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-		
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-		
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-		
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-		
Benzene	µg/kg	1	MCERTS	-	-	-		
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-		
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-		
Trichloroethene	µg/kg	1	MCERTS	-	-	-		
Dibromomethane	µg/kg	1	MCERTS	-	-	-		
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-		
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-		
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-		
Toluene	µg/kg	1	MCERTS	-	-	-		
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-		
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-		
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-		
Tetrachloroethene	µg/kg	1	NONE	-	-	-		
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-		
Chlorobenzene	µg/kg	1	MCERTS	-	-	-		
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-		
Ethylbenzene	µg/kg	1	MCERTS	-	-	-		
p & m-Xylene	µg/kg	1	MCERTS	-	-	-		
Styrene	µg/kg	1	MCERTS	-	-	-		
Tribromomethane	µg/kg	1	NONE	-	-	-		
o-Xylene	µg/kg	1	MCERTS	-	-	-		
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-		
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-		
Bromobenzene	µg/kg	1	MCERTS	-	-	-		
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-		
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-		
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-		
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-		
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-		
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-		
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-		
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-		
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-		
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-		
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-		
Butylbenzene	µg/kg	1	MCERTS	-	-	-		
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-		
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-		
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-		
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-		

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Lab Sample Number				999967	999968	999969		
Sample Reference				WS105	WS106	WS106		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.55	0.30	0.75		
Date Sampled				10/07/2018	10/07/2018	10/07/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	-	-		
Phenol	mg/kg	0.2	ISO 17025	-	-	-		
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-		
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-		
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-		
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-		
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-		
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-		
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-		
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-		
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-		
4-Methylphenol	mg/kg	0.2	NONE	-	-	-		
Isophorone	mg/kg	0.2	MCERTS	-	-	-		
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-		
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-		
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-		
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-		
Naphthalene	mg/kg	0.05	MCERTS	-	-	-		
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-		
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-		
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-		
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-		
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-		
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-		
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-		
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-		
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-		
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-		
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-		
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-		
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-		
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-		
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-		
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-		
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-		
Fluorene	mg/kg	0.05	MCERTS	-	-	-		
Azobenzene	mg/kg	0.3	MCERTS	-	-	-		
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-		
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-		
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-		
Anthracene	mg/kg	0.05	MCERTS	-	-	-		
Carbazole	mg/kg	0.3	MCERTS	-	-	-		
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-		
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-		
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-		
Pyrene	mg/kg	0.05	MCERTS	-	-	-		
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-		
Chrysene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-		

Analytical Report Number: 18-92362
Project / Site name: Kilbuck Lane
Your Order No: 12639-9234-BH

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
999963	WS104	0.60	69	Loose Fibres & Bitumen	**Chrysotile**	0.013	**0.013**
999966	WS105	0.95	62	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

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

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane

Your Order No: 12639-9234-BH

Lab Sample Number				999970	999971			
Sample Reference				WS103	WS106			
Sample Number				None Supplied	None Supplied			
Depth (m)				1.40	0.30			
Date Sampled				10/07/2018	10/07/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	8.1	7.7			
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0			
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	11	1.7			
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	0.32	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	0.26	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	0.61	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	0.38	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01			
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	1.6	< 0.2			
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1	7.8			
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08			
Chromium (hexavalent)	µg/l	5	NONE	< 5.0	< 5.0			
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.5	0.7			
Copper (dissolved)	µg/l	0.7	ISO 17025	4.7	7.8			
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	1.5			
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Nickel (dissolved)	µg/l	0.3	ISO 17025	< 0.3	0.7			
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0			
Zinc (dissolved)	µg/l	0.4	ISO 17025	2.2	7.3			

Analytical Report Number: 18-92362

Project / Site name: Kilbuck Lane

Your Order No: 12639-9234-BH

Lab Sample Number				999970	999971			
Sample Reference				WS103	WS106			
Sample Number				None Supplied	None Supplied			
Depth (m)				1.40	0.30			
Date Sampled				10/07/2018	10/07/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	25	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10			
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	99	< 10			
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	25	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	34	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	35	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	30	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	120	< 10			

Analytical Report Number : 18-92362

Project / Site name: Kilbuck Lane

* 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 *
999957	WS101	None Supplied	0.35	Brown clay with gravel.
999958	WS101	None Supplied	0.80	Brown clay.
999959	WS102	None Supplied	0.35	Brown clay.
999960	WS102	None Supplied	1.30	Brown clay.
999961	WS103	None Supplied	0.20	Light brown clay and sand with gravel.
999962	WS103	None Supplied	0.70	Brown clay.
999963	WS104	None Supplied	0.60	Brown clay and sand with gravel.
999964	WS104	None Supplied	1.50	Brown clay.
999965	WS104	None Supplied	3.80	Brown clay and sand.
999966	WS105	None Supplied	0.95	Brown sandy clay with brick and gravel
999967	WS105	None Supplied	1.55	Brown clay.
999968	WS106	None Supplied	0.30	Brown gravel with brick.
999969	WS106	None Supplied	0.75	Brown clay and sand with stones.

Analytical Report Number : 18-92362

Project / Site name: Kilbuck Lane

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
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
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
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	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	NONE
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
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
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
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	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
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	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

Analytical Report Number : 18-92362

Project / Site name: Kilbuck Lane

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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
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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
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 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
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
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
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 based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	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.

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS104		S	18-92362	999965	b	Monohydric phenols in soil	L080-PL	b
WS104		S	18-92362	999965	b	Speciated EPA-16 PAHs in soil	L064-PL	b
WS104		S	18-92362	999965	b	TPH in (Soil)	L076-PL	b

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

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Analytical Report Number : 18-93593

Project / Site name:	Kilbuck Lane	**Samples received on:**	23/07/2018
Your job number:	12-639	**Samples instructed on:**	23/07/2018
Your order number:	12639-9327-BH	**Analysis completed by:**	27/07/2018
Report Issue Number:	1	**Report issued on:**	27/07/2018
Samples Analysed:	6 water samples		

[redacted]
Reporting Manager
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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Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007061	1007062	1007063	1007064	1007065
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				23/07/2018	23/07/2018	23/07/2018	23/07/2018	23/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.6	7.3	7.2	7.0	7.4
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	2.9	2.5	3.4	1.2	4.0
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	5.03	4.66	7.23	3.07	5.74
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	0.05	< 0.02
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.8	0.5	0.4	0.5	0.5
Copper (dissolved)	µg/l	0.5	ISO 17025	1.9	< 0.5	3.8	3.8	1.1
Lead (dissolved)	µg/l	0.2	ISO 17025	0.2	< 0.2	< 0.2	0.3	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.9	2.6	2.3	3.7	15
Selenium (dissolved)	µg/l	0.6	ISO 17025	2.1	1.2	4.5	5.6	2.1
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.4	1.2	3.8	6.4	2.6

Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007061	1007062	1007063	1007064	1007065
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				23/07/2018	23/07/2018	23/07/2018	23/07/2018	23/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	26.6	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	9.1	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	15.6	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	2.7	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	2.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	1300	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	200	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	420	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	160	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	770	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	27	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	9.1	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	20	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	89	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	180	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	300	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	630	< 10	< 10

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Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007061	1007062	1007063	1007064	1007065
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				23/07/2018	23/07/2018	23/07/2018	23/07/2018	23/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	256	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	2.9	8.1	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	7.1	488	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	7.1	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	26.6	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	18.5	16.2	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	9.1	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	1.1	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	15.6	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	2.7	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	2.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007061	1007062	1007063	1007064	1007065
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				23/07/2018	23/07/2018	23/07/2018	23/07/2018	23/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	0.42
Phenol	µg/l	0.05	NONE	< 0.05	0.36	< 0.05	< 0.05	0.41
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	1.3	< 0.05	< 0.05	3.4
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.65	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	0.21
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	1.2	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.32	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	0.35	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.82	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.29	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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

Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007066				
Sample Reference				WS106				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				23/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	8.1				
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0				
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	1.5				
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.01				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.3				
Copper (dissolved)	µg/l	0.5	ISO 17025	2.5				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Nickel (dissolved)	µg/l	0.5	ISO 17025	0.6				
Selenium (dissolved)	µg/l	0.6	ISO 17025	4.6				
Zinc (dissolved)	µg/l	0.5	ISO 17025	< 0.5				

Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007066				
Sample Reference				WS106				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				23/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10				

Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007066				
Sample Reference				WS106				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				23/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

Analytical Report Number: 18-93593

Project / Site name: Kilbuck Lane

Your Order No: 12639-9327-BH

Lab Sample Number				1007066				
Sample Reference				WS106				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				23/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05				
Phenol	µg/l	0.05	NONE	< 0.05				
2-Chlorophenol	µg/l	0.05	NONE	< 0.05				
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05				
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05				
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05				
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05				
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05				
2-Methylphenol	µg/l	0.05	NONE	< 0.05				
Hexachloroethane	µg/l	0.05	NONE	< 0.05				
Nitrobenzene	µg/l	0.05	NONE	< 0.05				
4-Methylphenol	µg/l	0.05	NONE	< 0.05				
Isophorone	µg/l	0.05	NONE	< 0.05				
2-Nitrophenol	µg/l	0.05	NONE	< 0.05				
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05				
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05				
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05				
Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05				
4-Chloroaniline	µg/l	0.05	NONE	< 0.05				
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05				
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05				
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05				
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05				
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05				
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05				
Dimethylphthalate	µg/l	0.05	NONE	< 0.05				
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05				
Dibenzofuran	µg/l	0.05	NONE	< 0.05				
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05				
Diethyl phthalate	µg/l	0.05	NONE	< 0.05				
4-Nitroaniline	µg/l	0.05	NONE	< 0.05				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Azobenzene	µg/l	0.05	NONE	< 0.05				
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05				
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Carbazole	µg/l	0.05	NONE	< 0.05				
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05				
Anthraquinone	µg/l	0.05	NONE	< 0.05				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

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

Analytical Report Number : 18-93593

Project / Site name: Kilbuck Lane

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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 VIII
ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

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 C_5-C_6 (aliphatic)	
TPH C_6-C_8 (aliphatic)	
TPH C_8-C_{10} (aliphatic)	
TPH C_{10}-C_{12} (aliphatic)	
TPH C_{12}-C_{16} (aromatic)	
TPH C_{16}-C_{21} (aromatic)	
TPH C_{21}-C_{35} (aromatic)	

APPENDIX IX
GEOTECHNICAL TESTING RESULTS

LABORATORY REPORT

4043

Contract Number: PSL18/4276

Report Date: 21 September 2018

Client's Reference: 12639/9181/MW

Client Name: E3P
Heliport Business Park
Liverpool Road
Eccles
Manchester
M30 7RU

For the attention of: Mike Whittaker/R.Hodnett

Contract Title: Kilbuck Lane

Date Received: 24/8/2018
Date Commenced: 24/8/2018
Date Completed: 18/9/2018

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:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)
[redacted]
L Knight (Senior Technician)
L Pavey (Senior/Quality Technician)
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS102		Liner	2.50	3.00	Very stiff brown slightly gravelly very sandy CLAY.
WS103		Tub	2.00		Brown slightly gravelly very sandy CLAY.
WS103		Liner	1.50	2.00	Brown slightly gravelly very sandy CLAY.
WS104		Tub	1.00		Brown slightly gravelly very sandy CLAY.
WS105		Liner	3.50	4.00	Very stiff brown slightly gravelly very sandy CLAY.
WS106		Tub	3.00		Brown very sandy CLAY.
BH101		Tub	2.20	2.65	Brown slightly gravelly very sandy CLAY.
BH102		Tub	2.30	2.75	Brown slightly gravelly very sandy CLAY.
BH103	U11	Liner	6.50	6.95	Firm brown slightly gravelly very sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS103		Tub	2.00		13			27	14	13	97	Low plasticity CL.
WS104		Tub	1.00		12			28	13	15	97	Low plasticity CL.
WS106		Tub	3.00		15			29	13	16	100	Low plasticity CL.
BH101		Tub	2.20		12			30	15	15	96	Low plasticity CL.
BH102		Tub	2.30		14			28	14	14	97	Low plasticity CL.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Kilbuck Lane

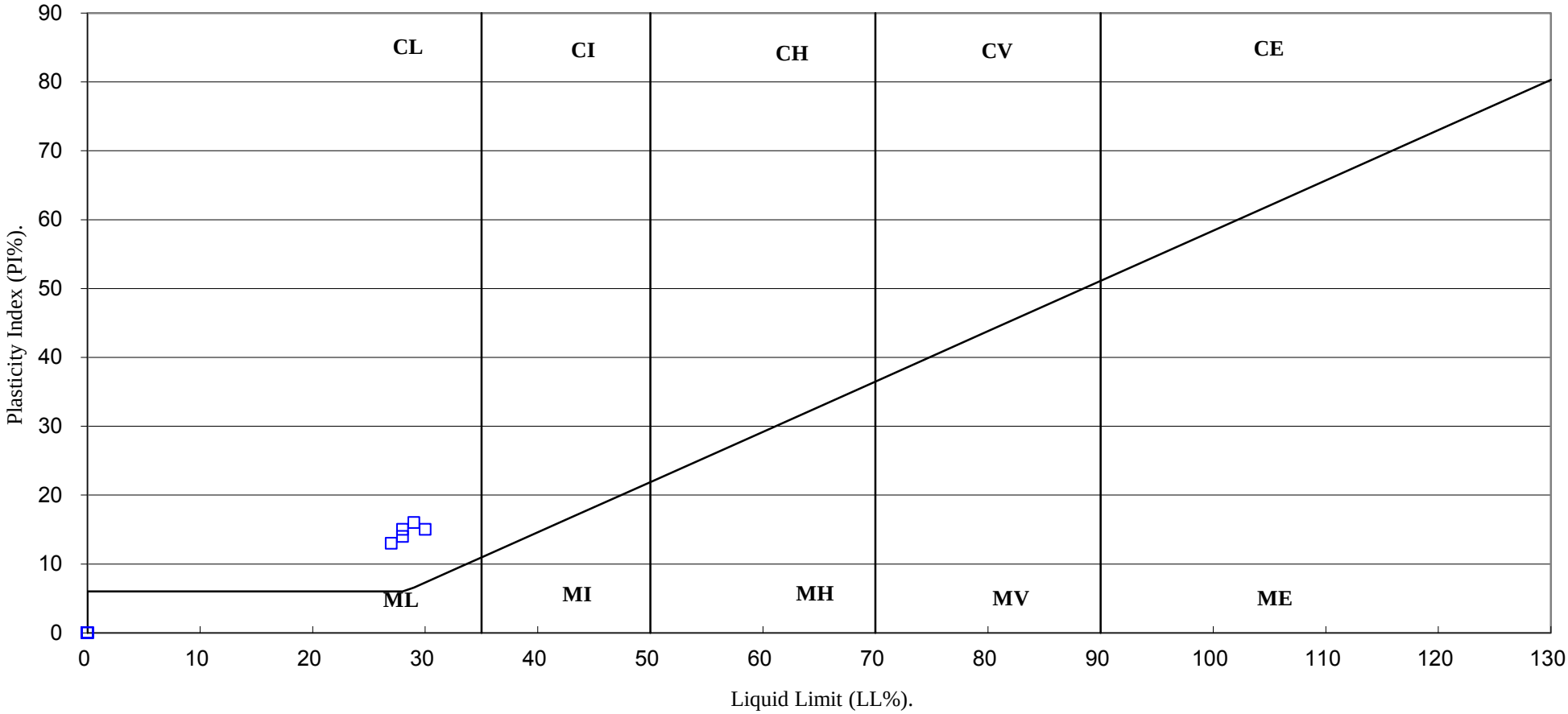
Contract No:

PSL18/4276

Client Ref:

12639

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



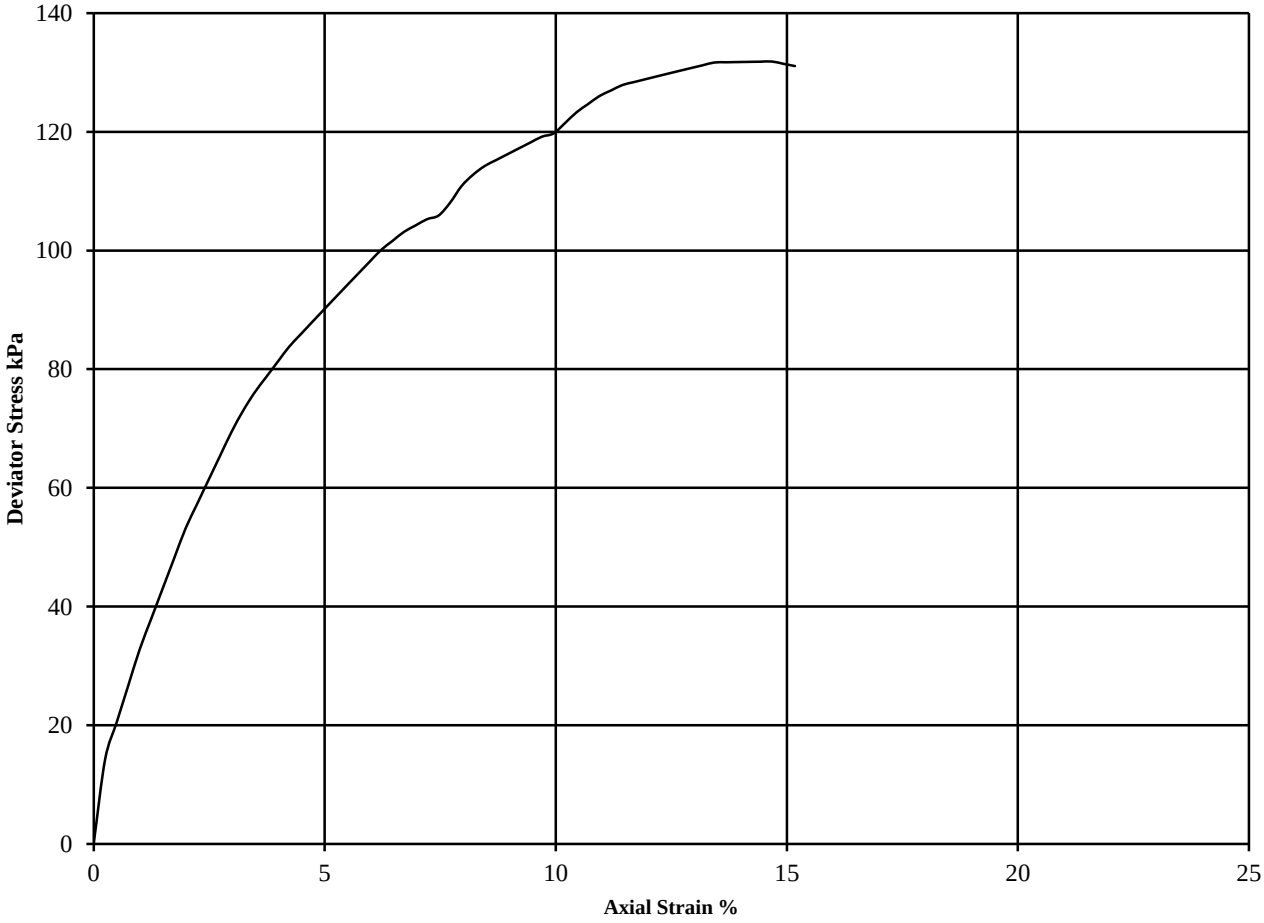
UKAS TESTING 4043	PSL Professional Soils Laboratory	**Kilbuck Lane**	**Contract No:** PSL18/4276 **Client Ref:** 12639

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 9

Hole Number:	**BH103**	**Top Depth (m):**	**6.50**
Sample Number:	**U11**	**Base Depth (m):**	**6.95**
Sample Type	**Liner**		



Diameter (mm):		103	Height (mm):		207	Test:	UU Multistage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick Membrane Correction applied (kPa)
1	16	2.20	1.90	33.75	106	53	7.5		0.35 0.35 0.34
				67.5	120	60	10.0		See summary of soil descriptions
				135	132	66	14.7	Plastic	

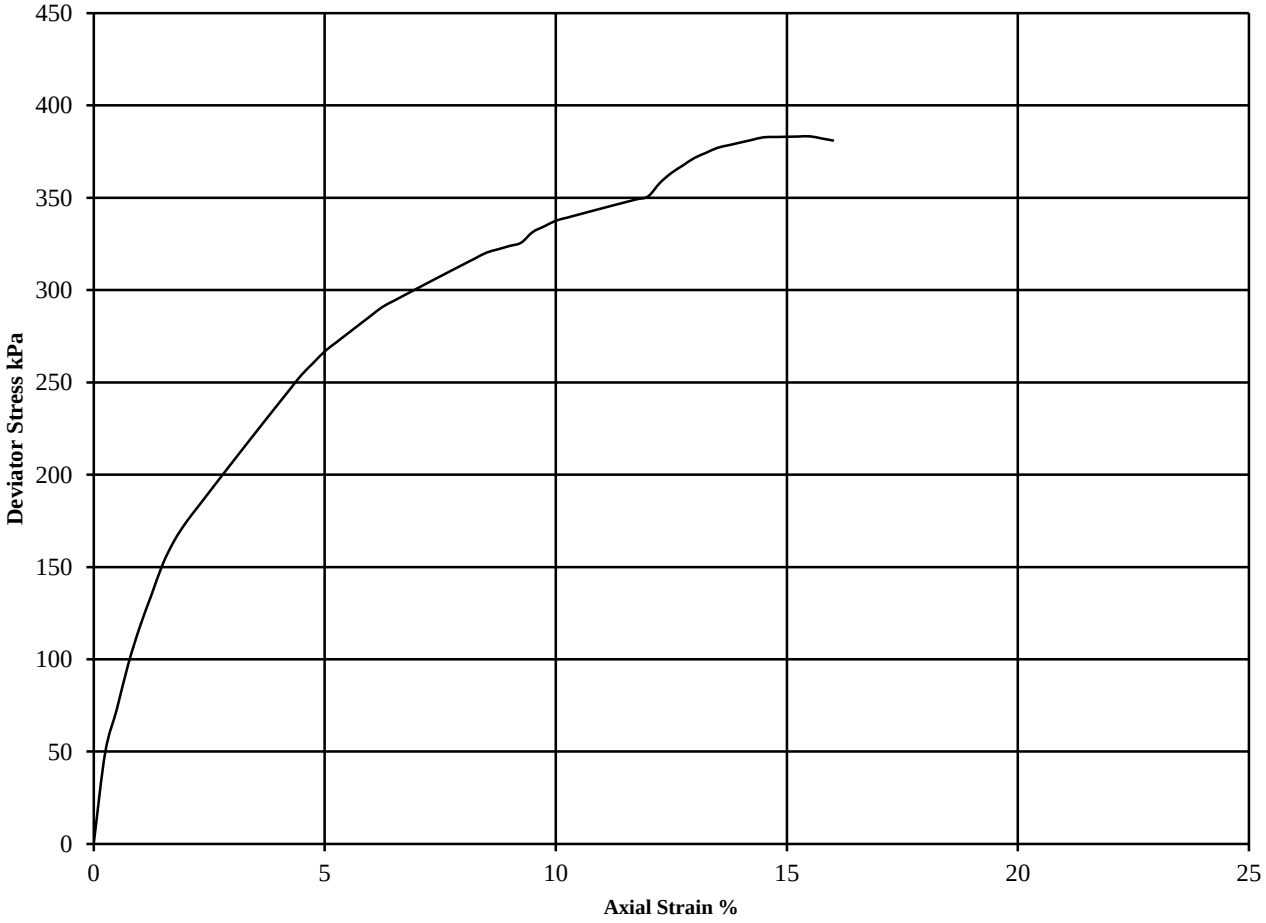
UKAS TESTING 4043	PSL Professional Soils Laboratory	**Kilbuck Lane**	**Contract No:** PSL18/4276 **Client Ref:** 12639

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 9

Hole Number:	**WS102**	**Top Depth (m):**	**2.50**
Sample Number:		**Base Depth (m):**	**3.00**
Sample Type	**Liner**		



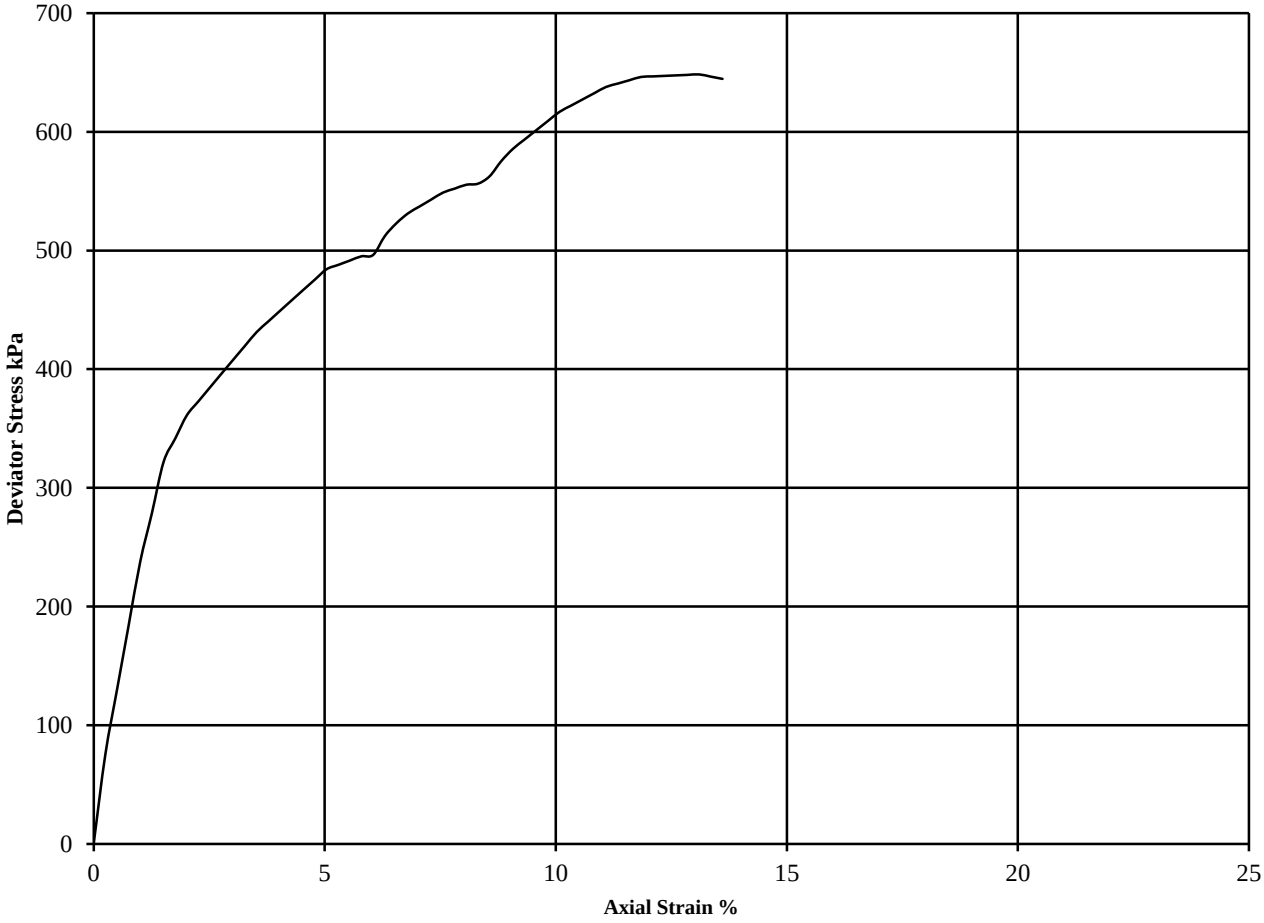
Diameter (mm):		84	Height (mm):		168	Test:	UU Multistage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick Membrane Correction applied (kPa)
1	12	2.24	2.01	55	326	163	9.3		0.43 0.42 0.42
				110	351	175	12.0		See summary of soil descriptions
				220	383	192	15.5	Plastic	

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 9

Hole Number:	**WS105**	**Top Depth (m):**	**3.50**
Sample Number:		**Base Depth (m):**	**4.00**
Sample Type	**Liner**		



Diameter (mm):		63	Height (mm):		125	Test:	UU Multistage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick Membrane Correction applied (kPa)
1	12	2.27	2.02	75	496	248	6.0		0.58 0.58 0.56
				150	556	278	8.3		See summary of soil descriptions
				300	648	324	13.1	Plastic	

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Kilbuck Lane**	**Contract No:** PSL18/4276 **Client Ref:** 12639

ONE DIMENSIONAL CONSOLIDATION TEST

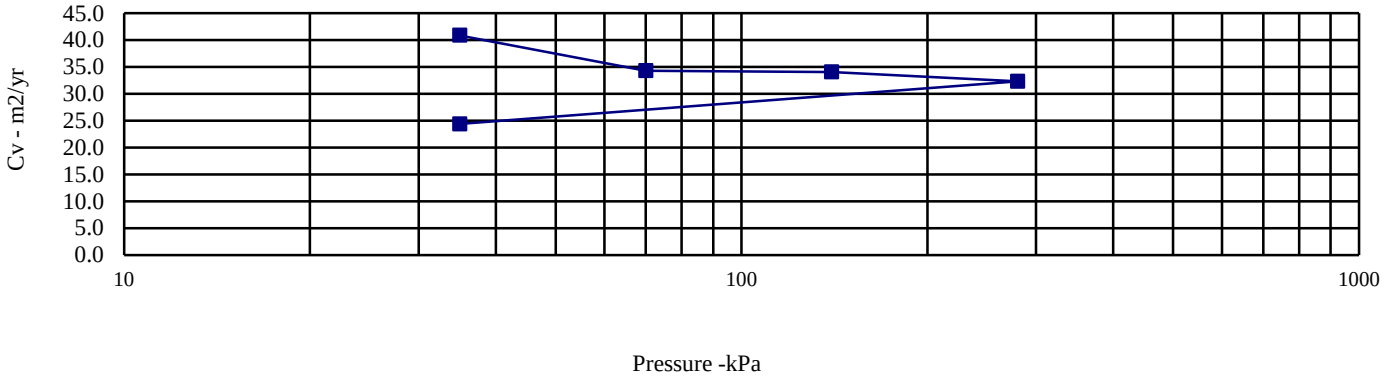
BS 1377: Part 5: 1990: Clause 3

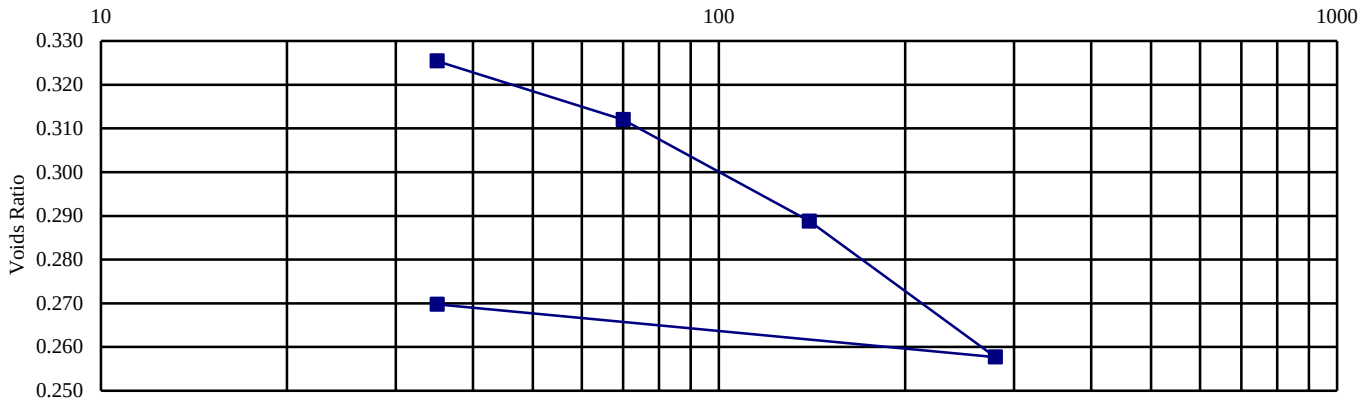
Hole Number: **WS103** **Top Depth (m):** **1.50**

Sample Number: **Base Depth (m) :** **2.00**

Sample Type: **Liner**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	12						
Bulk Density (Mg/m3):	2.22	0	35	0.169	40.849	Method used to	
Dry Density (Mg/m3):	1.99	35	70	0.289	34.288	determine CV:	T90
Voids Ratio:	0.333	70	140	0.253	34.042	Nominal temperature	
Degree of saturation:	91.6	140	280	0.172	32.296	during test ' C:	20
Height (mm):	19.986	280	35	0.039	24.378	Remarks:	
Diameter (mm)	50.03					See summary of soil descriptions	
Particle Density (Mg/m3): Assumed	2.65						





UKAS TESTING 4043	PSL Professional Soils Laboratory	**Kilbuck Lane**	**Contract No:** **PSL18/4276** **Client Ref:** **12639**

APPENDIX X
COAL AUTHORITY REPORT

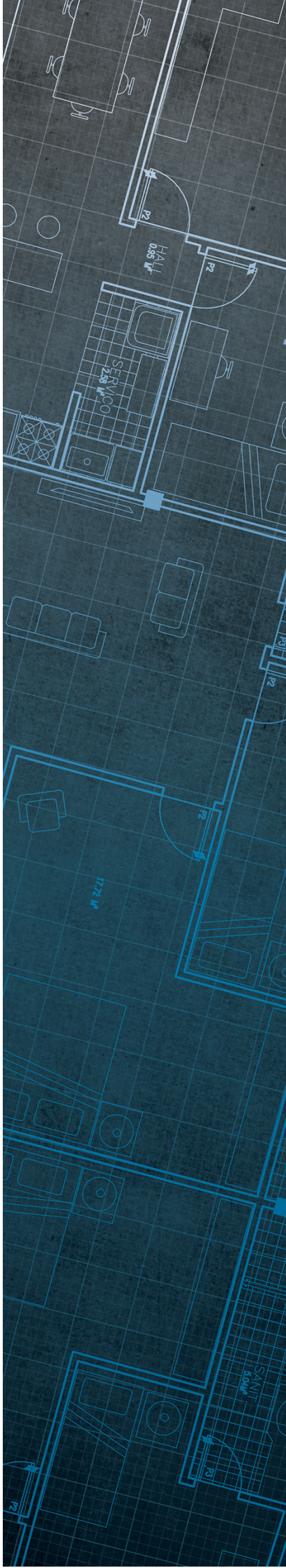
The Coal Authority

Consultants

Coal Mining Report

Land Off
Kilbuck Lane
Haydock
St Helens Council
WA11 9SZ

Date of enquiry:	**30 May 2018**
Date enquiry received:	**30 May 2018**
Issue date:	**30 May 2018**
Our reference:	**51001853592001**
Your reference:	**12639/8868/bh**



Consultants
Coal Mining Report

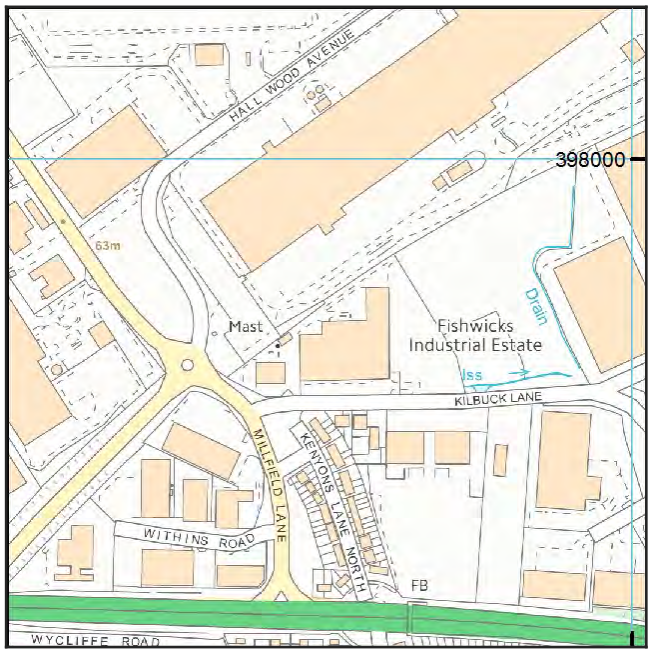
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

E3P

Enquiry address

Land Off
Kilbuck Lane
Haydock
St Helens Council
WA11 9SZ



Approximate position of property

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

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
unnamed	WIGAN FIVE FEET	Coal	34CD	82	Beneath Property	2.6	South-East	110	1883
unnamed	WIGAN FOUR FEET	Coal	34DS	115	Beneath Property	2.6	South-East	180	1879
unnamed	TRENCHERB ONE	Coal	34G3	135	Beneath Property	2.6	South-East	170	1896
unnamed	ARLEY	Coal	34KX	331	Beneath Property	11.0	East	90	1922

Probable unrecorded shallow workings

Yes.

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:

NW60	NW887	NW886
NW62	NW888	16820
NW61	NW401	10693

Our records show we have more plans than those shown above which could affect the enquiry boundary.

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

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
HIGHER FLORIDA	Coal	Yes	Within	N/A	108
LOWER FLORIDA	Coal	Yes	17.4	North	289

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
The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31st October 1994.

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 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 not in an area where a notice to withdraw support has been given.

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.

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.

The Coal Authority

Summary of findings

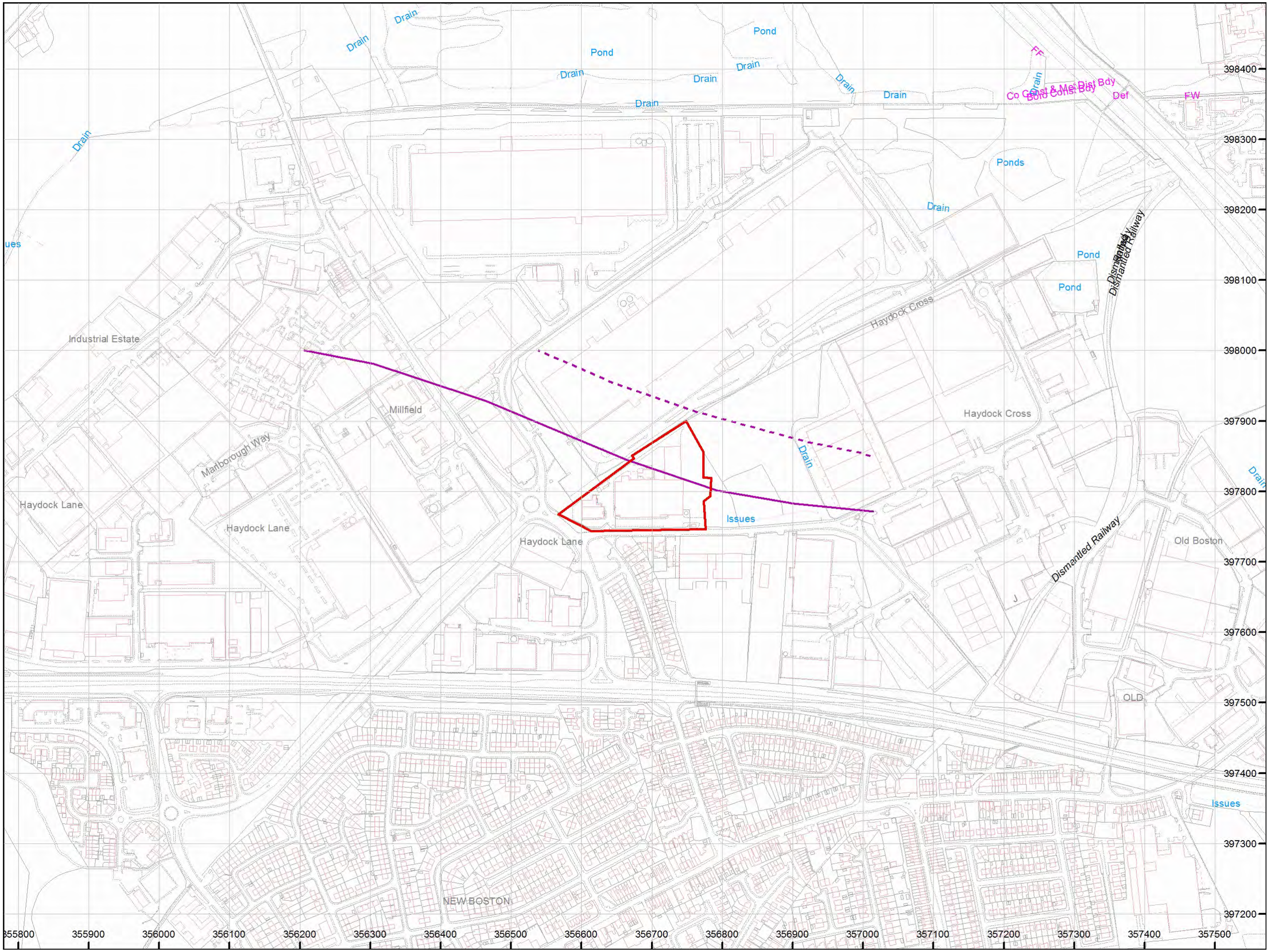
The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

Approximate position of the enquiry boundary shown

Outcrop (Proven)

Outcrop (Conjectured)



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