



e3p

PHASE I AND PHASE II GEO-ENVIRONMENTAL SITE INVESTIGATION

**Bevis Green Works (Tetrosyl)
Mill Road
Walmersley
Bury
Lancashire
UK
BL9 6RE**

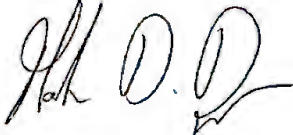
**E3P Report: 10-110-r1
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Prepared for



Tetrosyl
Group Limited

QUALITY ASSURANCE

Remarks	Final
Date	May 2014
Prepared by	M. Dyer
Qualifications	BSc, FGS, AIEMA, MIEEnvSc, CEnv
Signature	
Checked by	A. Edgar
Qualifications	BSc, AIEMA, MIEEnvSc, CEnv
Signature	
Authorised by	M. Dyer
Qualifications	BSc, FGS, AIEMA, MIEEnvSc, CEnv
Signature	
Project number	10-110

Environment – Energy – Engineering

***E3P
Heliport Business Park,
Liverpool Road
Eccles,
Manchester,
M30 7SA
UK***

www.e3p.co.uk

EXECUTIVE SUMMARY

Site Address	Tetrosyl Ltd, Bevis Green Works, Mill Road, Walmersley, Bury
Grid Reference	380950, 413950
Site Area	10.46 hectares or 25.85 acres
Current Site Use	The site is an operational formulation plant for Tetrosyl's car care products, with mixing, blending, packaging, storage and distribution activities being undertaken within various buildings across the site. A large reservoir is located within the central eastern sector of the landholding with the dam / high wall at the southerly end. The majority of the proposed development footprint is occupied by large industrial buildings that comprise 19th century mills and more modern portal frame warehousing. The site can be split between the upper and lower sectors with large 19th century mill buildings and reservoir dams forming retaining features. The developable area falls from circa 154m AOD at the northern tank farm to circa 139m AOD at the entrance from Mill Lane at the south west boundary.
Topography	The eastern boundary is formed by Cross Hall Lane, which is at a similar elevation to the north eastern boundary, however the current site levels drop significantly at the southern end of the reservoir which results in a level change from the top of the embankment at 149.38 to 138.90 at the lower level building floor slab. This 11.0m level difference appears to have been a result of the forming of the reservoir dam in the 19th century. Two further in-filled reservoirs are present within the central and southwest sectors which have also resulted in notable level changes as the site appears to have been redeveloped from a level plateau formed by the in-filling works. The site is underlain by a Secondary Aquifer.
Environmental Setting	Five groundwater abstractions have been identified within a 1km radius of the site. The site is not within an area that is at risk from flooding.
Site History	Historical maps indicate that the site has been used to house Cotton Mills, a Dye Works and later a Print Works. A second reservoir was formerly situated in the south western sector of the site and a quarry was present in the northern sector.
Utility Locations	A review of online data held by United Utilities shows no sewer or drainage services on site, however facilities are available in the immediate surrounding area.
Landfill Sites & Ground Gases	Made Ground associated with the in-filled reservoirs and quarries has been identified as a potential source of ground gas and chemical vapours.
Radon	Unaffected – no special precautions required.
Coal Mining / Land Stability	Three recorded Coal Authority assets are present within the curtilage of the proposed development site, these are:  Adit – South eastern boundary;  Shaft – Far Southeast boundary; and,



Air Shaft Central northern sector.

A review of the detailed Coal Authority Mine Abandonment Plans in consultation with Coal Authority surveyors suggests that the south eastern sector of the subject site may be underlain by shallow mine workings which could pose a theoretical risk of subsidence at the surface due to successive cavitation's of any workings.

Further detailed intrusive Ground Investigation and risk assessments are required in accordance with the Coal Authority Permissions Process to confirm the following:



Location of the historic Adit & its current condition;



Presence / absence of shallow mine workings;



Location of historic mine shaft at southeast boundary;



Location, size and depth of historic air shaft in the central north;



Confirm the absence of shallow coal workings within the area of the historic air shaft; and,



Preparation of a suitable programme of stabilisation works in accordance with the Coal Authority Permissions Process.

Intrusive Ground Investigation

Made Ground

Extensive depths of Made Ground are present across the majority of the proposed development site, extending to depths of circa 4.0m in the western sectors within the area of in-filled reservoirs, generally 2.0 to 3.0m in the central and southern sectors.

No Made Ground was identified within the sampling location toward the northern margins of the wider landholding, albeit this is outside the area of proposed development.

The backfilled materials are highly variable, and the extent of exploratory investigations is limited by the operational nature of the subject site. Inter-bedded granular and cohesive matrices are present throughout the site.

Drift

Stiff / high strength glacial clay soils have been identified underlying the Made Ground towards the northern sector of the site, overlying very dense sand and gravel stratum (possible weathered Millstone Grit bedrock).

Ground Water

No discernable aquifer has been identified (partially due to the limitation of the exploratory investigative technique). Perched groundwater has been identified within the monitoring wells.

The underlying weathered bedrock may provide some degree of effective porosity.

In general the current buildings have been 'cut' into the natural landform, with former reservoirs and lower elevations in-filled to create level plateaus across the site.

Ground Conditions

Tier 1 Contaminated Land Risk Assessment

Elevated concentrations of non-volatile inorganic heavy metals, PAH and trace asbestos fibres have been identified within the underlying Made Ground across the subject site. Further post decommissioning investigation will be required to quantify the exact level of risk, however this pollutant linkage can be mitigated through the adoption of the following mitigation processes;



Careful management of soils during the remediation & enabling works and placement of problematic materials within area of low / non sensitivity; and,



Construction of a suitable cover system (nominally 600mm) within all areas of private garden, soft landscaping and Public Open Space.

Human Health

Elevated volatile (aliphatic and aromatic) petroleum range (BTEX) compounds have been identified within the shallow soil and groundwater adjacent to the AST's used for the storage / recovery of bulk solvents and UST's used to store petrol, diesel and white spirit.

The elevated contaminants of concern would pose an unacceptable level of risk to chronic human health. Therefore; upon safe decommissioning of all AST's and UST's, further detailed intrusive investigations will be required to inform the production of a Tier 2 Detailed Quantitative Risk Assessment, (DQRA) that will derive the Site Specific Remediation Targets (SSRT's) and ultimately define the extent of remediation works.

It is considered that the potential pollutant linkage associated with volatile hydrocarbon compounds can be mitigated through the bioremediation of impacted soil and on-site treatment of groundwater to ensure the most cost effective, legislatively compliant and sustainable development solutions.

On completion of site decommissioning and demolition works, further intrusive Ground Investigation works will be required.

Elevated concentrations of volatile, soluble phase C5-C12 (aliphatic & Aromatic) hydrocarbon impact has been identified within the immediate vicinity of the Above-ground Storage Tanks (AST's) in the northern sector of the site.

The reported concentrations would pose an unacceptable level of risk to the critical on-site controlled waters receptors (reservoir & culvert) and underlying aquifer.

Controlled Waters

Further intrusive sampling will be required as and when the site has been fully decommissioned, to inform the production of a robust Tier 2 DQRA that will define the Site Specific Remediation Targets, to ensure the site is developed in a manner that will pose no unacceptable level of risk to controlled waters and the wider environ.

Eco-toxic

No significantly elevated concentrations of eco-toxic contaminants have been identified within the intrusive ground investigation works completed to date.

The initial assessment has identified significantly elevated concentrations of methane and carbon dioxide, attributed to the decomposition of organic materials within the deep Made Ground (reservoirs) and possibly the anaerobic degradation of hydrocarbon (solvent) impact to the near surface soil and groundwater.

Ground Gas

Extensive land remediation and enabling works will be required to facilitate the construction of a suitable development platform, which will accommodate the proposed low rise residential structures. As part of the enabling works process, a significant amount of material will be excavated and treated, to

either remove the hydrocarbon contamination or degradable organic matter, and thus treat the identified sources of hazardous ground gasses.

Ground Gas Monitoring including (VOC analysis) is currently on-going, the results of which will be reported as an addendum to this document in July 2014.

It is likely that hydrocarbon resistant potable water supply infrastructure will be required for this development site.

Potable Water Infrastructure

On completion of the land remediation and enabling works, a UKWIR assessment should be completed, to inform the detailed design of potable water supply infrastructure.

Geotechnical Assessment

Underground Obstructions

The site is underlain by notable historic features in the form of backfilled reservoirs, quarries that contain notable quantities of large buried obstructions and high walls.

Historical mapping confirms the presence of features such as large chimneys, culverts, machine beds and reservoir high walls. In light of the site history, it is considered that the entire site will be underlain by large relict obstructions, which will need to be removed to facilitate the proposed development.

Allowable Bearing Capacity

The site is underlain by stiff high strength clay soils, with a calculated Allowable Bearing Pressure in excess of 125kN/m², overlying very dense sand and gravels at circa 3.0-5.0m bgl with an ABP in excess of 300kN/m².

Foundation Options

It is considered that a well-designed remediation and enabling works programme is to be completed in conjunction with a site wide cut / fill works, to ensure the placement of granular materials beneath the proposed plot footprints to facilitate re-engineering through the construction of vibro replacement stone columns.

Plots within the in-filled reservoir, adjacent to sensitive retaining structures and deep cohesive fills will require a piled foundation.

Soak-away Drainage

The underlying weathered bedrock will provide some degree of infiltration potential, therefore soak-away drainage may be viable within the central, northwest and southwest sectors of the site.

The presence of soluble hydrocarbon impacted soil and groundwater may result in limitations in the use of Soak-away drainage.

Sulphate Assessment

Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).

CBR Design %

It is considered that site remediation and enabling works will re-engineer the Made Ground to ensure a CBR of 5% and thus ensure standard highway construction.

The site has significant topographical variances, which are formed by retaining features, incorporated into the existing 19th century mill buildings.

Cut / Fill

It is considered that a large scale cut / fill exercise will be required to achieve a development platform, suitable to accommodate the proposed low rise residential units and critically the adopted infrastructure.

Waste Classification

Stable Non-Reactive (Non Hazardous & Inert)

Surface Water

The existing culvert will need to be addressed as part of the detailed surface water management plan and external works design.

An initial appraisal of the subject site in relation to the proposed development, would suggest that a large scale earthworks exercise is required to construct a suitable development platform, which will accommodate the appropriate highway and pavement grade.

Earthworks

The current reservoir and adjacent highway levels will constrain the proposed development at the central and eastern boundary, with existing properties in the south-western also a factor.

It is likely that large scale up-filling, combined with some retaining structure will provide the optimum development platform.

Development Considerations

To facilitate the cost effective, legislatively compliant and sustainable regeneration of the Bevis Green Works for a low rise residential end use, the following key development constraints must be addressed within the site Remediation & Enabling Works:

-  Safe decommissioning of all above ground and below ground solvent, petroleum and diesel storage tanks and all associated infrastructure;
-  Further detailed contamination investigation within the immediate vicinity of each and every identified tank / piece of infrastructure to accurately define the extent of vertical and lateral migration of soluble / volatile hydrocarbon impact within the underlying soils;
-  Further investigation within the areas of identified deep Made Ground to characterise the nature across the site;
-  Confirmation with respect to the absence of any soluble phase hydrocarbon impact to the underlying aquifer within the superficial drift deposits and solid rock formations;
-  Development of Site Specific Remediation Targets to inform the pragmatic remediation of impacted soil and groundwater;
-  Development of a suitable on-site (in-situ / ex-situ) remediation solution to treat impacted soils to ensure they comply with the SSRT's;
-  Completion of further detailed intrusive investigations within the areas of the known mine workings at the central northern sector (air shaft) and south east (Adit, shaft & possible shallow workings) to inform an appropriate risk assessment in accordance with the standards and guidance set out within CIRIA32;
-  Identify the precise location of all mine entries and if present shallow coal workings, undertake stabilisation works in accordance with the Coal Authority Permissions Process and in general accordance with CIRIA 665;
-  Define the extent of the in-filled quarry within the central northern sector, demarcation of all high walls and assess the need for ground work in this sector to facilitate development of residential dwellings, highways and infrastructure;
-  Removal of all Asbestos Containing Material from within the building fabric, in strict accordance with the UK Control of Asbestos Regulations (CAR 1212);
-  Identify the location of the large surface water culvert emanating from the reservoir in the central eastern sector and exiting at the southwest boundary;
-  Demolition of all buildings, slabs, foundations, drainage infrastructure and anthropogenic obstructions across the entirety of the site in a controlled manner;
-  Treatment of all invasive plant species;
-  Treatment of all in-filled reservoirs to remove any deleterious content and render the ground suitable for re-engineering to facilitate the development of residential housing and ancillary

infrastructure;



Survey / investigation of the reservoir embankment to confirm integrity and stability to inform the design of in-filling works at the western periphery of this feature in maximise the development area;



Structural engineer survey all existing retaining features prior to the commencement of any demolition works;



A large scale cut / fill operation will be required to achieve a suitable development gradient and minimise the requirement for large retaining walls at the south-eastern boundary where the existing buildings form retaining features to the off-site highway and higher site elevations.

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APPENDICES

Appendix I	Limitations
Appendix II	Glossary
Appendix III	Drawings

Drawing No 10-110-001	Site Location Plan
Drawing No 10-110-002	Current Site Condition Plan
Drawing No 10-110-003	Proposed Development Plan (Planning Masterplan)
Drawing No. 10-110-004	Historical Features Plan
Drawing No. 10-110-005	Topographical Variance
Drawing No. 10-110-006	Mining Issues
Drawing No. 10-110-007	Development Over Current / Historic Features.
Drawing No. 10-110-008	E3P Exploratory Hole Location Plan.

Appendix IV	Historical Maps
Appendix V	Photographs
Appendix VI	E3P Exploratory Hole Logs
Appendix VII	Ground Gas Results
Appendix VIII	Chemical Testing Results
Appendix IX	Origin of Tier I Generic Assessment Criteria
Appendix X	Coal Authority Report

1.0 INTRODUCTION

1.1 Background

E3P Ltd have been commissioned by Tetrosyl Group Ltd to undertake a detailed Geo-Environmental Assessment for a large parcel of land currently known as the Bevis Green Works, located to the east of Walmersley Old Road in Bury, Greater Manchester.

1.2 Proposed Development

Tetrosyl have been granted outline Planning Permission (ref: 53762) dated 30/03/2011 for the construction of 275 dwellings with associated private gardens and driveways, estate roads and adopted infrastructure. At this time the final development layout has not been defined, however the indicative 'master plan' has been presented within Drawing 10-110-003 and indicated in Figure 1.1 (below)

Figure 1.1 – Indicative Development Layout



1.3 Objectives

The objectives of the Geo-Environmental Site Assessment 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;

-  Provide an assessment of the soakage of the underlying soils to assist in the design of infiltration based SuDS;
-  Undertake a detailed desk based review of potential historical mining issues and assess the requirement for future investigation works to ascertain the requirement for stabilisation in accordance with the Coal Authority Permissions Process; 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.

2.0 SITE SETTING

2.1 Site Details

Site Address	Tetrosyl Ltd, Bevis Green Works, Mill Road, Walmersley, Bury, BL9 6RE
National Grid Reference	380950E, 413950N
Site Area	10.46 hectares or 25.85 acres

The site is on the outskirts of Walmersley, with the M66 motorway located beyond the north eastern boundary. The site occupies an irregular shape with the longest axis north to south, with the land falling from north to south and west to east.

The current site layout and synopsis of land uses is detailed within E3P Drawing 10-110-002 included within Appendix III of this report and indicated in Figure 2.1 below.

Figure 2.1 Current Site Location & Layout



2.2 Current Site Use

Site Description

Occupancy/use	The total site area occupies approximately 25.85 acres, of which approximately 4.4 acres is designated as green belt land in the north of the site. A large reservoir is present within the eastern quadrant of the landholding with mature and semi mature trees to the embankments. A small brook (tributary of Pigs Lee Brook) flows westerly from the eastern boundary and into the reservoir before discharging via an overflow / spillway (southern end of reservoir) to a lower pond / sump before entering a culvert that runs through the site and emerges to the south of the site. The site is an operational formulation plant for Tetrosyl's car care products, with mixing, blending, packaging, storage and distribution activities being undertaken within various buildings across the site.
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	In brief the site comprises a number of mill buildings that date back to the mid to late 19th Century, that are currently utilised for the storage and blending of bulk product, the manufacture of solvent based paints and bulk storage of product prior to distribution. Two large portal framed buildings are sited within the central / north western sector. These buildings are reportedly used for the storage of motor vehicle cleaning products for wholesale distribution. Historically the site was used to house a large scale solvent recovery plant within the north eastern quadrant, where bulk solvents were imported for recovery and subsequent re-use in the manufacture of paint products. The tanks and infrastructure associated with this operation remain to the present day, albeit completely unused.	
Access	Site access is gained from Walmersley Old Road which forms the Western site boundary, where the current driveway ramps up towards the existing gatehouse, driveways and car-parking. A secondary access is available at the southwest boundary off Mill Road where the 'lower' sector of the site is accessible to HGV's.	
Slope / Topography	The site has significant topographical variances that will be a major consideration of any future redevelopment for a residential end use. In brief the site can be split between the upper and lower sectors, with large 19th century mill buildings and reservoir dams forming retaining features. The developable area falls from circa 154m AOD at the northern tank farm to circa 139m AOD at the entrance from Mill Lane at the south west boundary. E3P has prepared a drawing detailing indicative areas of the site which are notably different in elevation from that of the other site areas. The eastern Boundary is formed by Cross Hall Lane which is at a similar elevation to the north eastern boundary, however the current site levels drops significantly at the southern end of the reservoir which results in a level change from the top of the embankment at 149.38 to 138.90 at the lower level building floor slab. This 11.0m level difference appears to have been a result of the forming of the reservoir dam in the 19th century. Two further in-filled reservoirs are present within the central and southwest sectors which have also resulted in notable level changes as the site appears to have been redeveloped from a level plateaux formed by the in-filling works.	
Retaining structures	The buildings that form the south-eastern boundary also retain the landform to the east and adjacent highway and as such formation levels will be dictated by these constraints in the future. The dam in the central sector of the site retains the reservoir and land to the east of the site. A specialist survey will be required to inspect the current integrity of this feature and inform any future redevelopment works. A number of 'split level' buildings are present across the subject site, varying degrees of access and retaining elements which form the split between the top and bottom level plateaux.	
Surface Cover (%)	Buildings:	50
	Hardstand:	20
	Soft cover:	30

Trees

Semi-mature trees around the northern boundary of the site and to the north of the reservoir.

**Hazardous
Material Storage**

A large solvent tank farm is located within the north eastern sector of the site. This tank farm currently houses 16 No. large storage tanks (circa 10,000 litre) that have been utilised for the storage of bulk industrial solvents used in the manufacture of paints. The tank farm is understood to be sited here to allow gravity flow of bulk solvent across the site for use in paint manufacture.

It is understood that the majority of the tanks were used to store an industrial solvent known as White Spirit or paint thinners nominally described as a mixture of aliphatic aromatic C7 to C12 hydrocarbons with a maximum content of 25% of C7 (xylene) to C12 aromatic hydrocarbons.

No evidence of any halogenated / chlorinated hydrocarbon compounds such as TCE have been identified during a review of the current tank labelling.

Within the central sector of the site, within a passageway between the two main 19th century mill buildings, 6 circa 10,000litre tanks were identified within a brick bund. Three of these tanks were listed for the storage of White Spirit, with the fourth tank being used for the storage of sodium silicate, believed to be used in the production of a preservative for motor vehicle parts.

Two further Above Ground Storage Tanks are located on the reservoir embankment in the central eastern sector.

An underground Tank Farm was observed within the far southern corener of the site (at the lower elevation) with evidence of filler points, air ventilation pipework and general manhole covers representing UST's. The site manager had no detailed records of the number, type and current condition of the UST's.

The locations of all identified Above and Below Ground Storage Tanks are detailed within the Current Site Configuration drawing (ref: 10-110-002) included within Appendix III of this report.

**Asbestos
Containing
Material (ACM)**

The current works buildings on site are known to contain asbestos since they were built before the year 2000.

Prior to any demolition a full Pre-Demolition & Asbestos Survey will be required to ascertain the costs of licensed removal and legislatively compliant disposal.

PCBs

Historic Transformers have been identified on-site which are a potential source of PCB Impact.

Drainage

An extensive and ageing drainage network is present across the majority of the site which is understood to be a combined foul and surface water system discharging into Walmersley Road to the west.

2.3 Surrounding Area

The surrounding land uses are summarised below:

Direction	Land Use
North	M66 Motorway and undeveloped land beyond the motorway.
East	Pigs Lee Brook, undeveloped land and M66 Motorway
South	Residential land use.
West	Residential land use.

2.4 Previous Reports by Others

E3P has been provided with a previous phase of investigation undertaken by RSK in February 2011, the findings of which are documented within their report (ref 16565-R1) dated February 2011; the salient features of which are presented below:

RSK STATS Geoconsult Limited (RSK) were commissioned by Tetrosyl Limited (Tetrosyl) to conduct a review and reassessment of a site investigation at Tetrosyl's Bevis Green site in Walmersley, Bury that was conducted by a predecessor company (ENSR International Ltd) in 2002. The site is currently an operational car products formulation plant and has a long industrial history as a former cotton mill, dye house and print works.

It is intended to relocate the operational part of the site, and to redevelop the site for a mix of residential housing and open space. In order to provide information to support such a planning application, the information from the site investigation reported in 2003 has been reviewed and the chemical information has been assessed against current guidance values.

There are several areas of the site which have been infilled over time, including a former reservoir at the south of the site, two other small reservoirs, an old quarry in the centre of the site and parts of the edges of the existing on-site reservoir. Map based evidence of an air shaft and adits connected with shallow coal mining to the east of the site were also noted in the 2003 report.

The current reservoir retaining wall is of unknown construction and integrity. All these aspects would require engineering assessment prior to redevelopment of the site. Analysis of chemical contaminants on site showed the presence of some arsenic, lead and cyanide in surface soils or made ground at concentrations which would exceed Generic Acceptance Criteria (GAC) for a residential with gardens end-use. The areas affected were predominantly in the central and southern part of the site and were generally associated with the presence of made ground. These conditions are unlikely to have changed since the site investigation was undertaken in 2002. Copper and zinc concentrations in three groundwater samples were also found at concentrations which exceed controlled water targets for freshwater

The source is likely to be the made ground and some remedial works may be required during any redevelopment.

Areas of soil and made ground were detected with concentrations of total petroleum hydrocarbons (TPH) above levels suitable for residential housing. These oil impacted areas were generally associated with historic or current site operations such as fuel storage tanks. Remedial works would be required to remove or treat hydrocarbon

impacted soils prior to redevelopment of the site. BTEX compounds and TPH were also found in some groundwater samples at concentrations which exceeded surface water target concentrations. It is likely that removal of hydrocarbon impacted soil and made ground would be sufficient to remove the source of hydrocarbons to groundwater. No chlorinated solvents or free phase product were found on site.

A site walkover by RSK personnel (April 2010) confirmed that site conditions had not changed significantly since the 2002 site investigation was conducted. The ground conditions were assessed with a total of 11 trial pits, 45 probe holes and eleven boreholes across the site, targeted in areas of potential concern due to historic or current activities.

Solvents and VOCs were not detected in soils or ground waters of the site. PCBs were not detected in soil at the site.

Methane and carbon dioxide were detected in considerably elevated concentrations in several of the in-filled areas of the site, with the highest concentration at the southernmost part of the site at BH10. The risk posed to on-site construction workers, future site residents and off-site residents from ground gases should be further investigated by gas monitoring under current guidance and to provide more recent data on ground gas conditions.

Asbestos was detected in three out of five soil samples analysed. An asbestos survey and removal programme will be required prior to redevelopment of the site.

In summary, the findings of the 2003 report were reviewed and found to reflect current conditions at the site. Any future analysis of TPH would benefit from being for speciated TPH which would allow more accurate assessment of the risks from the hydrocarbons present on-site to be assessed. Analysis for PAH was not conducted, but these compounds are likely to be present in made ground on-site. The reassessment has confirmed that the site is suitable for residential redevelopment if appropriate remedial works are undertaken. Ground stability should also be considered when planning redevelopment. Remediation would include localised removal of contaminated made ground or provision of clean cover. Hydrocarbon impacted soils may be suitable for in-situ or ex-situ bioremediation.

The risks from methane and CO₂ in infilled areas, hydrocarbon impact to soil and waters, asbestos, and some metal and cyanide impact in made ground are the main contaminant issues on site, with dissolved phase hydrocarbons and some minor metal impact to ground waters also noted.

The contaminant status of reservoir sediments is not known. The north-western part of the site is less affected by contaminants and made ground, and would require less remediation prior to development compared with the central and southern parts of the site where greater impact from the site's history is evident.

An extract of the RSK Historical Synopsis is included as Figure 2.1 (overleaf).

Figure 2.1 – Extract of RSK Intrusive Investigations & Historic Land Use



3.0 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 10-110-002 (Appendix II).

Table 3.1 Summary of Potentially Contaminative Historical Land Uses

Map Edition	Historical Land Use
1850-1851 1:10000	A large reservoir is located within the central eastern portion of the site with a second smaller reservoir present in the central sector. Blintley Mill is located in the southeast quadrant which is believed to be fed by a mill race leading from the reservoir at a higher elevation. A chimney is also shown to the north of the mill indicating steam generation and coal burning. No evidence of the historic mine workings has been denoted on this drawing.
1894 1:10000	A third large reservoir is now present in the south western sector, this is a large square feature with embankments constructed on the south and western elevations to form a large reservoir to capture water by maximising the natural landform. A fourth smaller reservoir is also shown at the far southern tip of the site. Lumn Mill is now shown on the southern sector of the site with buildings adjacent to the eastern boundary and in the central sector below the reservoirs in a similar configuration to that of the present day. Lumn Mills are listed as Cotton and Logwood Dyes. The water is shown to leave the upper reservoir in the central western sector before flowing in an open mill race to the reservoirs in the central sector and ultimately the far south before exiting the site and flowing towards the southwest. An Air Shaft is shown within the central northern sector for the first time. A tramway type structure is shown leading from the northerly most mill buildings towards the air shaft.
1911-1912 1:10000	Further small buildings are noted in the southern and central sectors which appear to have been part of the expansion of the Lumn Mill Complex (now disused). The reservoir in the central sector has now been filled, with the mill buildings in the central sector having been consolidated into one large building, which is thought to remain to the present day. A quarry is present in the central northern sector with two rectangular buildings adjacent to the easterly reservoir, again these features are thought to remain to the present day.
1930 1:2500	An oval shaped depression is noted within the general vicinity of the former air shaft toward the northern boundary. A large chimney can be seen in the central sector of the site. The reservoir at the southern extremity is in-filled with small open tanks denoted in its place. The site is now listed at the Bevis Green Print Works

Map Edition	Historical Land Use
1937 1:2500	There are no significant changes to the site.
1963-1964 1:2500	Bevis Green Print Works are now marked as Works. The quarry is marked as disused and noted as a pond.
1971 1:2500	The works are recorded as Car Accessories Factory. It is understood that the site was acquired and converted for the manufacture of car accessory parts including spray paints, cleaning agents and protective coatings.
1982-1987 1:10000	The large reservoir in the western sector of the site is now shown to be in-filled, albeit the embankments to the south and west remain to form a level plateaux. Two large portal framed buildings are noted in the central northern sector, these are thought to remain to the present day. The large tank farms in the north eastern sector are believed to have been constructed in the 1980's, with the solvent recovery works also having been constructed.
2013 1:10000	There are no significant changes to the site, however a site walkover and anecdotal study suggest that the majority of the buildings in the south eastern sector have remained unused since the mid to late 1990's.

An extract of aerial photography from English heritage 1927 archive is presented as **Figure 3.1 below:**



Figure 3.1 gives an overview of the site with two large reservoirs to the north and west and main mil complex to the central and southeast. The landform has been dammed to allow the collection of water with mill buildings having been built into the hillside to create a split level site.

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 Summary of Potentially Contaminative Off-Site Historical Land Uses

Surrounding Feature	Distance	Dates	Direction
Tramway ...Then no longer recorded	50m	Pre 1894-Pre 1982 Pre 1982-Present	South East
Cross Hall Farm	50m	Pre 1893-Present	South
Quarry ...Then no longer marked ...Then no longer recorded	250m	Pre 1893- Pre 1930 Pre 1930- Pre 1975 Pre 1975-Present	North
Dye Works ...Then marked as Walmersley Bleach and Dye Works ...Then marked as Works	250m	Pre 1894-Pre 1911 Pre 1911- Pre 1967 Pre 1967- Present	South
Sewage Tanks ...Then marked as disused ...Then no longer recorded	Adjacent	Pre 1930- Pre 1938 Pre 1938- Pre 1967 Pre 1967- Present	South

3.3 Planning History

E3P has undertaken a review of recent on-line planning records held by Bury Council and no environmentally pertinent information has been obtained.

4.0 ENVIRONMENTAL SETTING

4.1 Geology & Hydrogeology

The British Geological Survey (BGS) map for the site indicates that the site is underlain by the following geological sequence:

Geological Unit	Classification	Description	Aquifer Classification	Sensitivity
Drift	Glacial	Till	Unproductive Strata	Low
Solid	Haslingden Flags Sandstone (Millstone Grit Series)	Sandstone	Secondary A	Low

The Envirocheck Report identifies five groundwater abstractions within a 1km radius of the subject site.

Based on the local topography and location of surface watercourses it is considered likely that shallow groundwater, if present, will flow in a south easterly direction towards the Pigs Lee Brook.

4.2 Geotechnical Data

Geotechnical Data presented within the Envirocheck report identifies the following ground conditions:

Hazard	Designation
Collapsible Ground	Very Low Hazard
Compressible Ground	No Hazard
Ground Dissolution	No Hazard
Landslide	Very Low Hazard
Running Sand	No Hazard to Very Low Hazard
Shrinking Swelling Clay	No Hazard to Very Low Hazard
Radon Hazard	<1% effected – No Hazard to Very Low Hazard

4.3 Coal Mining

A coal authority report was obtained which identified the following key considerations:

The site is within the likely zone of influence on the surface from workings in 1 seam of coal at shallow depth, the last date of working was 1877.

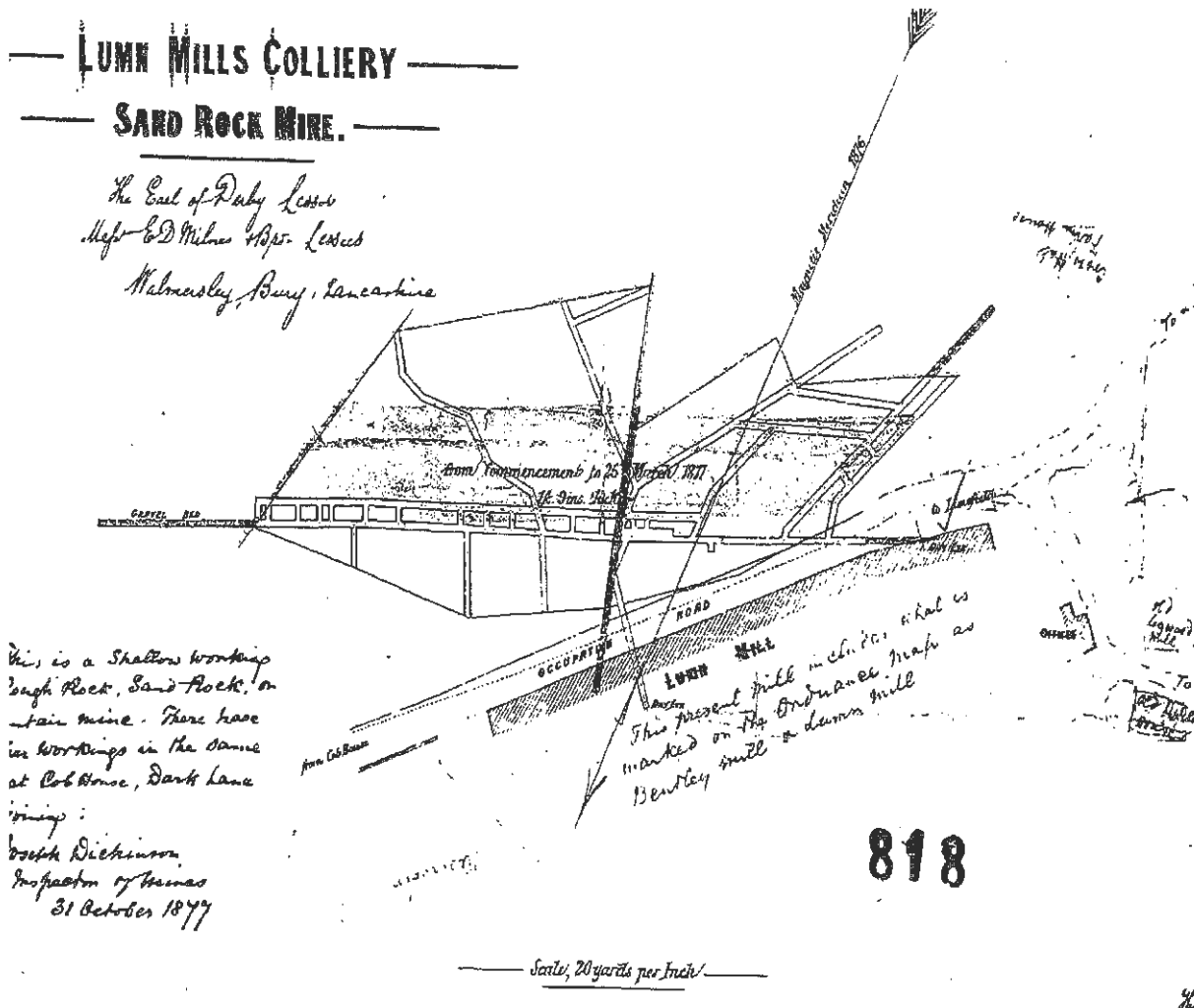
Three recorded Coal Authority assets are present within the curtilage of the proposed development site, these are:

Adit – South eastern boundary;
Shaft – Far Southeast boundary; and,
Air Shaft Central northern sector.

A review of the detailed Coal Authority Mine Abandonment Plans in consultation with Coal Authority surveyors suggests that the south eastern sector of the subject site may be underlain by shallow mine workings which could pose a theoretical risk of subsidence at the surface due to successive cavitation's of any workings.

An extract of the Coal Authority Mine abandonment plans is included as Figure 4.1 (below):

Figure 4.1 – Coal Authority Mine Abandonment Plans



The extract of this mapping clearly shows the presence of a shallow Adit and potential shallow coal workings within the south eastern extremity of the site beneath Lumn Mill.

Further detailed intrusive Ground Investigation and risk assessments are required in accordance with the Coal Authority Permissions Process to confirm the following:

- Location of the historic Adit & its current condition;
- Presence / absence of shallow mine workings;
- Location of historic mine shaft at southeast boundary;
- Location, size and depth of historic sir shaft in the central north;
- Confirm the absence of shallow coal workings within the area of the historic air shaft; and,
- Preparation of a suitable programme of stabilisation works in accordance with the Coal Authority Permissions Process.

4.4 Hydrology

Surface water features in the vicinity of the subject site are as follows:

Surface Water Feature	Quality*	Distance (m)	Direction
Pigs Lee Brook	D-Poor	70	East

*Chemical water quality as classified under the EA's General Quality Assessment (GQA) Scheme

The site is not located within a currently defined flood risk zone.

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 site is situated within an industrial area. The Trade Directory identifies 3 industrial land uses within a 250m radius of the site. Two of these are located at the Bevis Green Works and are inactive, including a car accessories manufacturers and a car washing and polishing equipment and supplies industry.

4.7 Sensitive Land Uses

A reservoir is present in the east sector of the site and there are mature and semi mature trees surrounding the northern perimeter of the reservoir which may host protected wildlife. Residential properties are located adjacent to the west and south east of the site. There are areas of undeveloped land to the north and east.

4.8 Site Sensitivity Assessment

The site is considered to be located within a low to moderate sensitivity setting due to the following reasons:

-  Residential properties are located within close proximity;
-  The underlying solid geology is classified as a Secondary A Aquifer.
-  There are five groundwater abstractions within a 1km radius;
-  There is a reservoir located on site.
-  The Pigs Lee Brook is within influencing distance of the site.

5.0 CONSULTATIONS

5.1 Local Authority Contaminated Land Officer

An information request was placed with Bury Council upon receipt of the response the information will be provided within an addendum.

5.2 Local Authority Building Control Officer

An information request has been placed with Bury Council and a response is awaited.

5.3 Landfill Sites and Waste Treatment Sites

There are two historical landfill sites within a 500m radius of the site. The nearest is 200m to the south west, known as the Mill Road Landfill Site.

5.4 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table only includes records not otherwise detailed in the report.

Table 5.1 Summary of Data

Entry	Number within 250m	Details
Contaminated Land Register Entries and Notices	0	Not Applicable (N/A).
Authorised industrial processes (IPC/IPPC/LAPPC).	3	On site this includes Tetrosyl Ltd which is no longer active and RGS Engineering which is an active engineering company towards the west of the site.
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	0	N/A
Consents issued under the Planning (Hazardous Substances) Act 1990	0	N/A
Control of Major Accident Hazard (COMAH) sites	0	N/A

6.0 INITIAL CONCEPTUAL SITE MODEL (CSM)

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 have developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area.

Source	Exposure Pathways	Potential Receptors
Human Health		
Volatile & Semi Volatile Aliphatic & Aromatic Hydrocarbons	Dermal Contact Ingestion Vapour Inhalation	Construction Workers Future Residents

Discussion

The site is currently utilised for the manufacture of solvent based paint products with large scale storage of White Spirit which is generally a mixture of C7-C12 paint thinners, which include a significant xylene content. There are two distinct areas of large scale solvent storage in the far northern sector of the production facility and within the central sector between the two large historic mill buildings.

A series of Underground Storage Tanks (UST's) have been identified at the far southern boundary, used for the storage of petrol, diesel and White Spirit. Given the age, condition and historic use of these UST's, it is considered that general decay of filler pipes and tank infrastructure, will have resulted in impact to underlying soil from this infrastructure.

Given the size and scale of works currently / historically present on-site, it is considered that further currently unidentifiable AST's or UST's will have been present on-site, resulting in localised volatile hydrocarbon impact.

Historical, tank leakage, spillage and seepages will have occurred from these storage tanks on site and there is considered to be short term risk to construction workers who may come into contact with any. It is also considered that there is a risk to future residential site occupants through the migration of vapours to indoor air, direct contact and consumption of home-grown vegetables.

Inorganic Heavy Metals and Asbestos	Dermal Contact Ingestion Dust Inhalation	Construction Workers Future Residents
-------------------------------------	--	--

Discussion

The historic site use as a cotton mill, dye works and to a lesser degree car paint manufacturing facility, will have resulted in low level impact to the underlying soil (across the majority of the site) with inorganic (non-volatile) heavy metals and asbestos fibres.

The former coal fired boilers, tramways, dye additives, machine workshops and other industrial process have been identified as sources of inorganic heavy metal impact.

Heavy metals may pose a short term risk to construction workers who may come into contact with impacted soils during any future earthworks. Residential end users may come into contact with impacted soils within garden areas and through the consumption of home grown vegetables etc.

Dust associated with any Made Ground may potentially contain ACMs which could be released during earthworks and then subsequently inhaled by construction workers and possibly third party property.

Poly
Hydrocarbons

Cyclic

Aromatic

Ingestion
Vapour Inhalation

Construction Workers
Future Residents

Discussion

The former site use as a cotton mill and dye works will have resulted in the wide spread use of naphthalene as a dyeing agent and as such it is anticipated that the underlying soils will be impacted by this semi-volatile compound.

It is considered that the use of coal as a fuel will have resulted in significant quantities of ash Made Ground across the site resulting in low level non-volatile PAH impact to the soil.

Controlled Water

Hydrocarbon Compounds and
VOC's

Vertical Migration
Lateral Migration

Secondary A Aquifer

Discussion

The primary risk to controlled waters, including the on-site reservoir & Lee Brook (culvert) will form the primary controlled water risk assessment. However; the underlying Secondary A Aquifer is also identified as a critical receptor.

The site has been utilised for the storage of bulk hydrocarbon solvents (aliphatic & aromatic) C7-12, which while predominantly Light Non Aqueous Phase Liquid (LNAPL) will migrate as both a separate and dissolved phase plume toward the on-site surface water features and underlying aquifer.

Buildings and Infrastructure

Sulphate / pH

Leachate and Corrosion

Buried Concrete

Discussion

Made Ground associated with the former quarry, and reservoir can be a source of sulphate and other corrosive compounds which can pose a risk to underground structures.

Ecological

Hydrocarbon Compounds,
PAH's and Solvent Compounds

Consumption
Ingestion
Vapour Inhalation

Protected Species

Discussion

Any protected species on site may be affected by any contamination to surface water which they consume, or by any dust associated with made ground, or contact with hydrocarbon compounds.

7.0 GROUND INVESTIGATION

7.1 General

A ground investigation has been designed based on the findings in consideration of the historic reports and findings of the desk study review completed with exploratory holes advanced to target specific potential contaminant sources summarised in Table 7.1.

It must be noted that the current operational nature of the site restricted the extent of the ground investigation works and as such exploratory holes were limited in to specific locations adjacent to point sources of contamination as identified within the E3P site walkover survey.

Table 7.1 Summary of Fieldwork

Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Monitoring Wells Response Zone
In-filled reservoir	WS101	Window Sample	3.00	N/A
Undeveloped land to north	WS102	Window Sample	1.60	N/A
Northern extremity of Solvent Tank Farm	WS103	Window Sample	2.00	N/A
Eastern edge of solvent recovery plant	WS104	Window Sample	4.45	N/A
Southern UST's	WS105	Window Sample	3.37	N/A
Down gradient of Solvent AST	WS106	Window Sample	3.00	N/A
Southern UST's	WS107	Window Sample	2.70	N/A
Infilled reservoir	WS108	Window Sample	4.00	N/A
Reservoir dam / tank	WS109	Window Sample	4.00	N/A
Solvent storage	WS110	Window Sample	1.00	N/A
Central Solvent Tanks	WS111	Window Sample	1.00	N/A
Central solvent tanks	WS112	Window Sample	1.55	N/A
In-filled reservoir	WS113	Window Sample	4.45	N/A
Diesel AST	WS114	Window Sample	5.45	N/A

Notes

m bgl – metres below ground level.

The window sample probeholes were designed to provide geotechnical information and confirm the findings of the Initial Conceptual Site Model (ICSM).

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. Ground gas monitoring is ongoing with the results to be provided within an addendum to this report.

Selected soil samples were submitted for a range of chemical analysis comprising, metals, pH, total sulphate, water soluble sulphate (2:1 extract), sulphide, cyanide, phenols, total and speciated polycyclic aromatic hydrocarbons (PAHs), asbestos, organic carbon and total and speciated petroleum hydrocarbon (TPH).

The analytical work was completed at an appropriately certified analytical laboratory with testing to UKAS accreditation standards where applicable.

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 testing was conducted using the Cone Penetration Test (CPT). The results are shown in the probehole logs in Appendix VI.

7.3 In-Situ California Bearing Ration (CBR)

No in-situ CBR testing has been completed as part of this phase of intrusive investigation works due to the operational nature of the site.

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), asbestos, organic carbon and total and speciated petroleum hydrocarbon (TPH).

Exova Laboratories undertook the analytical work and the testing results are included in Appendix VIII.

8.0 GROUND AND GROUNDWATER CONDITIONS

8.1 Ground Conditions

8.1.1 Summary of Ground Conditions

The ground investigation generally confirms the published geology, historic ground investigations and identifies the strata set out in Table 8.1 below:

Table 8.1 Summary of Strata

Strata:	General Description:	Typical Depth (mbgl):			
		Top:		Base:	
		Min:	Max:	Min:	Max:
Made Ground ¹	Dark brown, black clayey gravelly fine to coarse sand. Gravel is fine to medium sub-angular brick sandstone.	0.00	3.00	0.10	4.50
Made Ground ²	Firm to stiff brown gravelly sandy clay. Gravel is occasional brick gritstone sandstone shale.	0.10	3.30	0.40	4.00
Made Ground ³	Soft grey brown slightly medium coarse sandy gravelly clay. Gravel is medium to coarse sub-angular to sub-rounded brick gritstone.	0.00	2.70	0.10	3.37
Made Ground ⁴	Yellow medium coarse sandy gravel. Gravel is fine to medium sub-angular gritstone.	0.00	0.36	0.18	1.25
Made Ground-Boulders	Grey yellow clayey boulders. Boulders are sub-angular gritstone.	1.00	1.00	1.70	1.70
CLAY	Brown very stiff slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded gritstone sandstone shale.	0.00	0.45	1.50	3.80
GRAVEL	Light brown medium coarse sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded gritstone.	0.35	3.80	1.00	4.45
SAND	Yellow brown gravelly SAND. Gravel is fine to medium sub-angular gritstone.	4.50	4.50	5.45	5.45

8.1.2 Made Ground

Made Ground

Extensive depths of Made Ground are present across the majority of the proposed development site, extending to depths of circa 4.0m in the western sectors within the area of in-filled reservoirs, generally 2.0 to 3.0m in the central and southern sectors.

No Made Ground was identified within the sampling location toward the northern margins of the wider landholding, albeit this is outside the area of proposed development.

The backfilled materials are highly variable, and the extent of exploratory investigations is limited by the operational nature of the subject site. Inter-bedded granular and cohesive matrices are present throughout the site.

Drift

Stiff / high strength glacial clay soils have been identified underlying the Made Ground towards the northern sector of the site, overlying very dense sand and gravel stratum (possible weathered Millstone Grit bedrock).

Ground Water

No discernable aquifer has been identified (partially due to the limitation of the exploratory investigative technique). Perched groundwater has been identified within the monitoring wells.

The underlying weathered bedrock may provide some degree of effective porosity.

In general the current buildings have been 'cut' into the natural landform, with former reservoirs and lower elevations in-filled to create level plateaus across the site.

Table 8.2 Standard/Cone Penetration Test Results

Boreholes	Depth (m bgl) (i)	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	MG Gravelly Clay	11	11.09	N/A	Medium strength	Stiff	55.45
WS101	2	MG Gravelly Clay	23	21.01	N/A	High strength	Very Stiff	105.06
WS101	2.5	MG Gravelly Clay	16	14.21	N/A	Medium strength	Stiff	71.05
WS101	3	MG Gravelly Clay	32	27.83	N/A	High strength	Very Stiff	139.14
WS102	1	Sandy Gravelly Clay	43	43.35	N/A	Very high strength	Very Stiff	216.75
WS102	1.5	Sandy Gravelly Clay	50	47.51	N/A	Very high strength	Very Stiff	237.54
WS103	1	Gravelly Clay	15	15.12	N/A	High strength	Very Stiff	75.61
WS103	2	Gravelly Clay	50	45.68	N/A	Very high strength	Very Stiff	228.38
WS104	1	MG Gravelly Sand	1	1.01	Very Loose	N/A	N/A	N/A
WS104	2	Sandy gravelly clay	9	8.22	N/A	Medium strength	Stiff	41.11
WS104	3	Sandy Gravelly Clay	9	7.83	N/A	Low strength	Firm	39.13
WS104	4	Very Sandy GRAVEL	50	42.24	Dense	N/A	N/A	N/A
WS105	1	MG Clayey Boulders	8	8.07	Loose	N/A	N/A	N/A
WS105	2	MG Sandy Gravelly Clay	0	0.00	N/A	FALSE	FALSE	0.00
WS105	3	MG Sandy Gravelly Clay	40	34.79	N/A	Very high strength	Very Stiff	173.93
WS106	1	MG Sandy Gravelly Clay	6	6.05	N/A	Low strength	Firm	30.24
WS106	2	MG Gravelly Clay	8	7.31	N/A	Low strength	Firm	36.54
WS106	3	MG Gravelly Clay	33	28.70	N/A	High strength	Very Stiff	143.49
WS107	1	MG Gravelly Sandy Clay	0	0.00	N/A	FALSE	FALSE	0.00
WS107	2	MG Sandy Clay	0	0.00	N/A	FALSE	FALSE	0.00

Boreholes	Depth (m bgl) (i)	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)
WS107	2.7	Sandy GRAVEL	35	30.80	Dense	N/A	N/A	N/A
WS108	1	MG Gravelly Sand	15	15.12	Medium Dense	N/A	N/A	N/A
WS108	2	MG Gravelly Clay	4	3.65	N/A	Very low strength	Soft	18.27
WS108	3	MG Sand	5	4.35	Loose	N/A	N/A	N/A
WS108	4	MG Gravelly Clay	5	4.22	N/A	Low strength	Firm	21.12
WS109	1	MG Sandy Gravel	13	13.11	Medium Dense	N/A	N/A	N/A
WS109	2	MG Gravelly Clay	6	5.48	N/A	Low strength	Firm	27.41
WS109	3	MG Gravelly Clay	9	7.83	N/A	Low strength	Firm	39.13
WS109	4	MG Gravelly Clay	15	12.67	N/A	Medium strength	Stiff	63.36
WS109	5	MG Gravelly Clay	50	41.48	N/A	Very high strength	Very Stiff	207.41
WS110	1	MG Gravelly Clay	50	50.41	N/A	Very high strength	Very Stiff	252.04
WS111	1	Sandy Gravel	50	50.41	Very Dense	N/A	N/A	N/A
WS112	1	MG Sandy Gravel	8	8.07	Loose	N/A	N/A	N/A
WS112	2	MG Gravelly clay	50	45.68	N/A	Very high strength	Very Stiff	228.38
WS113	1	MG Sandy Gravel	5	5.04	Loose	N/A	N/A	N/A
WS113	2	MG Sandy Gravel	1	0.91	Very Loose	N/A	N/A	N/A
WS113	3	MG Sandy Gravel	2	1.74	Very Loose	N/A	N/A	N/A
WS113	4	MG Sandy Gravel	10	8.45	Loose	N/A	N/A	N/A
WS114	1	MG Gravelly Sand	4	4.03	Loose	N/A	N/A	N/A
WS114	2	MG Clay	2	1.83	N/A	Low strength	Very Soft	9.14
WS114	3	MG Gravelly Sand	1	0.87	Very Loose	N/A	N/A	N/A
WS114	4	MG Gravelly Sand	2	1.69	Very Loose	N/A	N/A	N/A
WS114	5	Gravelly Sand	10	8.30	Loose	N/A	N/A	N/A

Notes

Undrained shear strength values have been taken from correlations with SPT values based on Stroud and Butler and take account of the soil plasticity summarised in Table 2.5.

Stroud and Butler use un-corrected SPT values for the correlations which are based on empirical data.

Certificate of Calibration for the Er Value should be available.

Corrections for overburden and length of rods.

Design SPT values should be corrected below groundwater.

8.1.3 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix VIII (summarised below in Table 8.3), 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 8.3 Summary of pH and Sulphate Data

Location	Depth (m)	SO ₄ in 2:1 water / soil (g/l)	pH Value
WS101	0.5	0.02	7.54
WS102	0.6	0.02	7.26
WS104	0.3	0.01	7.20
WS104	2.5	N/A	N/A
WS105	2.3	N/A	N/A
WS106	0.5	<0.01	7.46
WS107	0.7	0.02	7.69
WS108	1.8	0.02	7.27

8.2 Groundwater Conditions

Groundwater strikes were encountered as seepages at WS104, WS105, WS106, WS107, WS108, WS110 and WS113. The depth of the seepages and the depth to which groundwater rose are shown on the exploratory hole records and summarised in Table 8.2 below:

Table 8.4 Summary Groundwater Strikes

Location	Depth to strike (m)	Depth to standing water (m)	Notes
WS104	3.5	N/A	Seepage
WS105	1.0	N/A	Seepage
WS106	1.5	N/A	Seepage
WS107	1.10	N/A	Seepage
WS108	2.20	N/A	Seepage
WS110	0.75	N/A	Seepage
WS113	1.0	N/A	Seepage

8.3 Ground Gas

Concentrations of methane (CH₄), carbon dioxide (CO₂) and Oxygen (O₂) were measured using an infra-red gas analyser (GA2000) calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an attached flow pod.

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

9.0 TIER 1 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 Assessment of Historic Data

A detailed review of the historic RSK Report is included within Section 2.4 of this report. E3P has extracted the pertinent data from the historic RSK Reports for inclusion within the updated Tier 1 Contaminated Land Risk Assessment as detailed below.

The RSK report identified notable volatile phase C5-C12 hydrocarbon impact within the underlying soil and groundwater within BH6 drilled adjacent to the former solvent recovery facility. While only limited speciation of Total Petroleum Range Hydrocarbons was undertaken during the historic ground investigations it is clear that the notable impact within the northern tank farm / solvent recovery area is associated with BTEX impact. It is concluded that the identified impact would pose an unacceptable level of risk to human health of future residential site occupants through volatilisation of hazardous vapours to indoor and migration of separate / soluble phase impact to the controlled waters receptors.

No chlorinated solvent impact was recorded within any of the historical sampling locations.

Asbestos was identified within 75% of the samples analysed, however no quantified analysis has been undertaken to inform the assessment of risk and type asbestos fibre identified.

Elevated inorganic heavy metals were identified across the site.

9.2 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 by the EA (Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGV)) and where absent, Generic Assessment Criteria (GACs) published by LQM/CIEH (2nd edition).

In this instance the Tier 1 Assessment is limited due to the targeted nature of the dataset available, and operational constraints of the site which severely restrict the potential to undertake extensive sampling across the site.

The results of this comparison have been summarised within Table 9.2 (overleaf).

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

Determinand	Units	GAC	n	MC	Loc. of Ex	Pathway	Assessment
Arsenic	mg/kg	32	8	16.7	N/A	1	No Further Action
Cadmium	mg/kg	10	8	<1.0	N/A	1	No Further Action
Chromium (VI)	mg/kg	4.3	8	<1.0	N/A	1	No Further Action
Lead ⁽ⁱⁱ⁾	mg/kg	225	8	68.8	N/A	1	No Further Action
Mercury	mg/kg	11	8	<1.0	N/A	2	No Further Action
Nickel	mg/kg	130	8	30.1	N/A	1	No Further Action
Selenium	mg/kg	350	8	<1.0	N/A	1	No Further Action
Copper ⁽ⁱⁱ⁾	mg/kg	2330	8	71.7	N/A	1	No Further Action
Zinc ⁽ⁱⁱ⁾	mg/kg	3750	8	81.5	N/A	1	No Further Action
Cyanide - Total	mg/kg	791	8	<1.0	N/A	1	No Further Action
Phenols - Total.	mg/kg	210	8	<1.0	N/A	1	No Further Action
Naphthalene	mg/kg	1.5	12	<0.1	N/A	2	No Further Action
Acenaphthylene	mg/kg	170	12	0.1	N/A	3	No Further Action
Acenaphthene	mg/kg	210	12	0.1	N/A	1	No Further Action
Fluorene	mg/kg	160	12	<0.1	N/A	1	No Further Action
Phenanthrene	mg/kg	92	12	0.5	N/A	3	No Further Action
Anthracene	mg/kg	2300	12	0.1	N/A	3	No Further Action
Fluoranthene	mg/kg	260	12	0.5	N/A	3	No Further Action
Pyrene	mg/kg	560	12	0.5	N/A	3	No Further Action
Benzo(a)Anthracene	mg/kg	3.1	12	0.2	N/A	3	No Further Action
Chrysene	mg/kg	6	12	0.2	N/A	3	No Further Action
Benzo(b/k)Fluoranthene ⁽ⁱ⁾	mg/kg	5.6	12	0.2	N/A	3	No Further Action
Benzo(a)Pyrene	mg/kg	0.83	12	0.1	N/A	3	No Further Action
Indeno(123-cd)Pyrene	mg/kg	3.2	12	<0.1	N/A	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.76	12	<0.1	N/A	3	No Further Action
Benzo(ghi)Perylene	mg/kg	44	12	<0.1	N/A	3	No Further Action
TPH C ₅ -C ₆ (aliphatic)*	mg/kg	30	19	<1.0	N/A	2	No Further Action
TPH C ₆ -C ₈ (aliphatic)*	mg/kg	73	19	<1.0	N/A	2	No Further Action
TPH C ₈ -C ₁₀ (aliphatic)*	mg/kg	19	19	5.5	N/A	2	No Further Action
TPH C ₁₀ -C ₁₂ (aromatic)*	mg/kg	69	19	1.4	N/A	2	No Further Action
TPH C ₁₂ -C ₁₆ (aromatic)*	mg/kg	140	19	36.3	N/A	1	No Further Action
TPH C ₁₆ -C ₂₁ (aromatic)*	mg/kg	250	19	172.0	N/A	1	No Further Action
TPH C ₂₁ -C ₃₅ (aromatic)*	mg/kg	890	19	142.2	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.

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

Referring to Table 9.2, the results of this direct comparison indicates that the data does not exceed any of the screening criteria for a residential end use. However it is important to note that this dataset has been obtained from limited sampling data obtained from an initial phase of intrusive investigation given the operational nature of the subject site.

No detectable concentrations of chlorinated solvent compounds have been identified within any of the soil or groundwater samples analysed during this (and previous) phase of intrusive investigation.

Results of groundwater samples collected from WS104 & WS106 installed adjacent to the main solvent tank farm / former solvent recovery plant within the northern sector of the site confirmed the presence of elevated volatile phase C5-C12 hydrocarbon compounds which would pose an unacceptable level of risk through volatilisation to indoor air from impacted groundwater.

The presence of significantly elevated concentrations of hydrocarbon (solvent contamination) within the perched groundwater is indicative of a wider plume as would be expected given the high risk associated with the historic storage of bulk solvents. It must therefore be inferred that the soils within the immediate vicinity of the solvent recovery works and tank farm are impacted by volatile phase hydrocarbon compounds that would pose an unacceptable level of risk to the identified receptors and thus trigger further assessment works and land remediation.

The identified volatile hydrocarbon contamination within the northern tank-farm and solvent recovery area confirms the findings of previous phases of intrusive investigation.

No detectable concentrations of chlorinated solvents have been identified which generally confirms the reported historical site use associated with aromatic and aliphatic petroleum range solvents (BTEX).

E3P would suggest that once the site has been decommissioned with all above and below ground storage tanks and associated infrastructure having been safely removed, the localised hydrocarbon impact identified as part of this phase of investigation should be delineated vertically and laterally. The results of this delineation exercise should be used to inform the production of a detailed Tier 2 Quantitative Risk Assessment (DQRA) that will determine the Site Specific Remediation Targets (SSRT) and define the extent of future remediation works to treat the impacted soil and groundwater once the source (tanks) have been removed.

The above mentioned works will include the following key elements:

-  ***Safe decommissioning of all above ground and below ground solvent, petroleum and diesel storage tanks and associated infrastructure;***
-  ***Further detailed contamination investigation within the immediate vicinity of each and every identified tank / piece of infrastructure to accurately define the extent of vertical and lateral migration of soluble / volatile hydrocarbon impact within the underlying soils;***
-  ***Conformation with respect to the absence of any soluble phase hydrocarbon impact to the underlying aquifer within the superficial drift deposits and solid rock formations;***
-  ***Development of Site Specific Remediation Targets to inform the pragmatic remediation of impacted soil and groundwater;***

 Development of a suitable on-site (in-situ / ex-situ) remediation solution to treat impacted soils to ensure they comply with the SSRT's;

The entire site is underlain with a layer of Made Ground which will contain unacceptable levels of heavy metals, non-volatile PAH and trace asbestos fibres which could pose a theoretical risk to human health of future site occupants. This risk associated with the aforementioned contaminants of concern can be mitigated through the incorporation of the following mitigation measures within the proposed development:

 Suitable cover system (nominally 600mm) to be confirmed on completion of site decommissioning and supplementary investigation & sampling works.

9.3 Controlled Waters

Significantly elevated concentrations of volatile, soluble phase C5-C12 (aliphatic & Aromatic) hydrocarbon impact has been identified within the immediate vicinity of the Above-ground Storage Tanks (AST's) in the northern sector of the site.

The reported concentrations would pose an unacceptable level of risk to the critical on-site controlled waters receptors (reservoir & culvert) and underlying aquifer.

The identified soluble phase impact is representative of plume that has migrated a short distance from the known source. It will therefore be necessary to remove the source (AST's) and undertake further delineation sampling in the vicinity of these tanks to inform the production of a Tier 2 DQRA & SSRT defining the extent of land remediation works required to ensure the residual soil and groundwater poses no unacceptable level of risk to controlled waters.

It is considered that a similar exercise (albeit to a lesser degree) will be required within the central sector of the site, where further solvent storage tanks are present and at the tank farm in the far southern portion of the landholding.

It is considered that once the tanks have been decommissioned and all residually impacted soil and ground water has been treated, the site will be rendered suitable for redevelopment for a low rise residential end use and the risk to controlled waters and the wider environment will be negated.

The identified dissolved phase (volatile) hydrocarbon impact is primarily associated with C5-C12 hydrocarbon compounds which are volatile in composition, therefore on removal of the primary source (AST's) the risk to controlled waters will be dramatically reduced. If the underlying soil and perched groundwater is deemed to pose a risk as a secondary source, it is likely that in-situ soil vapour extraction and bio-remediation (soil) will provide viable remediation technologies. However the selection of suitable technologies to achieve the SSRT will ultimately be the responsibility of the preferred remediation contractor.

Further groundwater sampling will be required within the areas of deep Made Ground (backfilled reservoirs & Quarry) to confirm the absence of any impacted perched groundwater within the base of the Made Ground.

In summary, further intrusive sampling will be required as and when the site has been fully decommissioned to inform the production of a robust Tier 2 DQRA that will define the Site Specific Remediation Targets to ensure the site is developed in a manner that will pose no unacceptable level of risk to controlled waters and the wider environment.

9.4 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.

The desk based analysis and subsequent ground investigation has identified the following potential sources of ground gas:

-  In-filled reservoirs;
-  In-filled quarries;
-  Shallow coal mine;
-  Air Ventilation shaft;
-  Degradation of hydrocarbon compounds (currently stored on-site); and,
-  General Made Ground and fill across the site.

The initial assessment has identified significantly elevated concentrations of methane and carbon dioxide, attributed to the decomposition of organic materials within the deep Made Ground (reservoirs) and possibly the anaerobic degradation of hydrocarbon (solvent) impact to the near surface soil and groundwater.

Extensive land remediation and enabling works will be required to facilitate the construction of a suitable development platform, which will accommodate the proposed low rise residential structures. As part of the enabling works process, a significant amount of material will be excavated and treated, to either remove the identified hydrocarbon impact or degradable organic matter and thus treat the identified sources of hazardous ground gasses.

Ground Gas Monitoring including (VOC analysis) is currently on-going, the results of which will be reported as an addendum to this document in July 2014.

9.5 Developed Conceptual Model

Following the completion of the latest phase of intrusive site investigation, chemical analysis and risk assessment the conceptual model shown in Table 9.5 has been prepared for the site.

Table 9.5 Conceptual Model

Source	Exposure Pathways	Potential Receptors
Human Health		
Hydrocarbon Compounds and VOCs	Dermal Contact Ingestion Vapour Inhalation	Construction Workers Residential End Users

Discussion

Elevated concentrations of C5-C12 hydrocarbon (BTEX) compounds have been identified with a number of recent and historic sampling locations (within the soil and groundwater). It is considered that these contaminants of concern will pose an unacceptable level of risk to human health of future residential site occupants and as such remediation works will be required to treat the impacted soil and groundwater.

Heavy Metals, Non-Volatile PAH and Asbestos	Dermal Contact Ingestion Dust Inhalation	Construction Workers Residential End Users Third Party Property
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Discussion

The significant industrial land uses within the subject site and large-scale infilling of historical reservoirs have resulted in the wide presence of non-volatile, low solubility inorganic heavy metals, asbestos and polycyclic aromatic hydrocarbon compounds across the entire development site.

It is considered that the risk associated with the identified pollutant linkage can be mitigated through the construction of a suitable cover system within all areas of private garden, soft landscaping and areas of Public Open Space (POS). Nominally the cover system could comprise as a minimum 600mm of clean soil.

If any potential contaminants that would be deemed to pose a risk at a shallow depth are identified on completion of the site demolition then it is considered that a well-designed Materials Management Plan (MMP) would ensure any such problematic material could be encapsulated within areas of lower sensitivity (i.e. at depth or below public open space).

Controlled Water		
Hydrocarbon compounds (C5-12) including BTEX	Separate & dissolved phase migration	On-site reservoir and colvert / underlying aquifer.

Discussion

C5-C12 hydrocarbon impact has been identified within / adjacent to the solvent storage & recovery area at concentrations that would pose a risk to controlled waters and the wider environ.

On completion of the site decommissioning works further intrusive investigations will be required to determine the extent of vertical and lateral migration of the hydrocarbon plume and inform the development of a Tier 2 DQRA. The DQRA will generate Site Specific Remediation Targets (SSRT) that will inform the extent of land remediation works that are required to remove the identified potential pollutant linkage prior to any future redevelopment of this site.

Source	Exposure Pathways	Potential Receptors
Buildings and Infrastructure		
Elevated CH ₄ & CO ₂	Ingress into proposed dwellings	Explosion / asphyxiation

Discussion:

Initial observations and historic monitoring of methane and carbon dioxide within the areas of deep in-fill and hydrocarbon impacted soils have identified elevated concentrations and methane and carbon dioxide.

Monitoring is currently ongoing which will inform the production of a full and detailed ground gas risk assessment and specification for mitigation measures to ensure adequate protection to the proposed dwellings. This assessment will be reported as an addendum to this document.

10.0 GEOTECHNICAL ASSESSMENT

10.1 Proposed Development

It is understood that the proposed development will comprise circa 275 low rise residential dwellings. Details of the proposed loadings are not yet known and therefore a line loading of 75kN/m has been assumed for preliminary assessment purposes only.

It is likely that the proposed development will be completed over a number of phases given its size and scale.

Given the nature of the proposed development it is considered that the structure meets the criteria of Geotechnical Category 1 of Euro Code 7.

Given the nature of the development it is considered that acceptable risk from settlement is a total settlement value of 25mm for a masonry structure.

Current site elevations must be considered in the appraisal of the proposed residential development and it must be noted that the current 19th Century Structures form a large ten meter retaining structure at the eastern boundary and also form the split levels across the development site.

The proposed development layout also includes for the in-filling of the westerly portion of the existing reservoir, therefore specialist advice must be sought with regards to the stability of the current dam and reservoir infrastructure.

Give the absence of any indicative development levels or infrastructure concept it is not possible to determine the foundation types that can be utilised within the proposed development, however E3P has reviewed all pertinent information in an attempt to make interpretive comments with respect to potential foundation types / solutions.

10.2 Summary of Ground Conditions

Ground conditions identified at the site are summarised in Table 10.1 overleaf.

Table 10.1 Summary of Ground Conditions

Strata:	General Description:	Typical Depth (mbgl):			
		Top:		Base:	
		Min:	Max:	Min:	Max:
Made Ground ¹	Dark brown, black clayey gravelly fine to coarse sand. Gravel is fine to medium sub-angular brick sandstone.	0.00	3.00	0.10	4.50
Made Ground ²	Firm to stiff brown gravelly sandy clay. Gravel is occasional brick gritstone sandstone shale.	0.10	3.30	0.40	4.00
Made Ground ³	Soft grey brown slightly medium coarse sandy gravelly clay. Gravel is medium to coarse sub-angular to sub-rounded brick gritstone.	0.00	2.70	0.10	3.37
Made Ground ⁴	Yellow medium coarse sandy gravel. Gravel is fine to medium sub-angular gritstone.	0.00	0.36	0.18	1.25
Made Ground-Boulders	Grey yellow clayey boulders. Boulders are sub-angular gritstone.	1.00	1.00	1.70	1.70
CLAY	Brown very stiff slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded gritstone sandstone shale.	0.00	0.45	1.50	3.80
GRAVEL	Light brown medium coarse sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded gritstone.	0.35	3.80	1.00	4.45
SAND	Yellow brown gravelly SAND. Gravel is fine to medium sub-angular gritstone.	4.50	4.50	5.45	5.45

10.3 Site Preparation

The site will be the subject of extensive site demolition works prior to the completion of an extensive enabling works platform that will be required to construct a suitable development platform to accommodate the proposed development.

Land remediation works will be required within the areas of identified hydrocarbon contamination, which will in all likelihood necessitate the excavation of a significant amount of soil for ex-situ treatment. In light of this, any environmental remediation works should be considered within the context of the proposed development solution to ensure a holistic approach to the overall development and ensure the most cost effective foundation solution.

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;
-  Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,
-  Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development foot print with the resulting void backfilled.

Given the known presence of trace asbestos fibres within the underlying Made Ground and inorganic heavy metals, PAH and hydrocarbon impact the enabling works should be designed in such a manner so as to minimise any removal of soil materials from site given that the underlying soil could be classified as either hazardous or stable reactive no hazardous .

10.4 Foundation Conditions and Bearing Capacity

General

Given the size and complexity of the proposed development, it will not be possible to accurately define the plot specific foundation solution until the proposed development levels have been formulated in detail and the land remediation and enabling works element has been designed in full. However for general guide purposes, E3P would suggest that the proposed development would be constructed using the following foundation types:

-  Strip Foundations;
-  Conventional strip footings on vibro granular columns;
-  Deeper pile foundations; and,

These options are discussed below:

Strip Foundations

Traditional shallow strip foundations could potential be constructed at least 150mm in to the underlying stiff clay within the north-western periphery of the site which was not previously developed. However in reality, it is likely that once development levels have been accurately defined and all relict foundation and buried obstructions have been removed, it is unlikely

that there will be any areas where foundations could be constructed bearing on the underlying shallow soils.

Ground Improvement

It is considered that the optimum foundation solution for this development site would be to undertake a large scale programme of land remediation and enabling works to manage materials in such a way so as to render as much of the site as possible suitable for re-engineering through the construction of Vibro Replacement Stone Columns.

Extensive obstructions are present throughout the deep filled reservoirs and quarries that would currently prohibit the use of a Vibro Replacement Stone Column, however subject to the completion of the afore mentioned works, it is likely that a significant proportion of the site can be treated in this manner.

Stiff / high strength glacial clays or dense sand and gravel are anticipated at a depths of circa 4-6m bgl and as such a standard vibro stone column is considered viable.

The use of ground improvement techniques such as Vibro granular columns will allow shallow re-enforced concrete foundations to be utilised with the Made Ground at a minimum of 600mm below treated level. The vibro granular columns should provide a bearing capacity of around 150kN/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.

Piled Foundations

Piled foundations will undoubtedly be required within certain sectors of this site given the complexities associated with the land, current / proposed levels and reservoirs etc. A preliminary assessment by E3P would suggest that as a minimum driven Piled Foundations would be required within the areas of the site subject to the following constraints:

-  In-filled reservoir;
-  Areas of deep fill where >20 of the soil matrix is cohesive in structure;
-  Areas potentially effected by high-walls;
-  Development adjacent to sensitive structures such as the reservoir dam and retaining walls; and,
-  Plots within influencing distance of trees where clay soils are present.

Recommendation

At this time it is not possible to determine the foundation types, however consideration should be given to the design of a suitable enabling works solution to facilitate the construction of plots using a Vibro stone column to support a shallow strip foundation where possible or a deep driven piled foundation.

10.5 Ground Floor Slabs

Due to the presence of substantial thickness' of Made Ground 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.

10.6 Pavement Construction

The Made Ground can be re-engineered in accordance with the Highways Design Manual Series 600 to ensure a CBR design value of 5%.

10.7 Drainage

The presence of substantial depths of Made Ground across 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.

10.8 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-1s in accordance with the recommendations provided in BRE Special Digest 1 (2005).

10.9 Excavations

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 extensive site remediation and enabling works.

Due to the variability of the Made Ground it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA RR97. It is anticipated that the undercroft will be formed either with an open excavation, in which case the side slopes should be suitably battered, or the excavation will be supported with sheet pile or secant bored pile wall. Groundwater seepages were noted in several trial pits, however, these were minor and it considered that conventional sump pumping should be adequate.

10.10 Minerals

Three recorded Coal Authority assets are present within the curtilage of the proposed development site, these are:

-  **Adit** – South eastern boundary;
-  **Shaft** – Far Southeast boundary; and,
-  **Air Shaft** - Central northern sector.

A review of the detailed Coal Authority Mine Abandonment Plans in consultation with Coal Authority surveyors suggests that the south eastern sector of the subject site may be underlain by shallow mine workings which could pose a theoretical risk of subsidence at the surface due to successive cavitation's of any workings.

Further detailed intrusive Ground Investigation and risk assessments are required in accordance with the Coal Authority Permissions Process to confirm the following:

-  Location of the historic Adit & its current condition;
-  Presence / absence of shallow mine workings;
-  Location of historic mine shaft at southeast boundary;
-  Location, size and depth of historic sir shaft in the central north;
-  Confirm the absence of shallow coal workings within the area of the historic air shaft; and,
-  Preparation of a suitable programme of stabilisation works in accordance with the Coal Authority Permissions Process.

11.0 CONCLUSIONS & RECOMMENDATIONS

Geotechnical Assessment

The site in its current form would provide significant barriers to a low rise residential development given the topographical variances, reservoirs and dams, deep infill, historical retaining structures and extensive buried obstructions. As such it is considered that a programme of site remediation and enabling works will be required to construct a development platform that is suitable to accommodate the proposed dwellings, and associated infrastructure.

It is considered that a well design site remediation and enabling works solution would render circa 50-70% of the proposed land suitable for re-engineering through the construction of vibro stone columns to support a reinforced strip foundation.

Plots within the in-filled reservoir, adjacent to sensitive retaining structures and deep cohesive fills will require a piled foundation.

Roads and areas of adopted infrastructure can be re-engineered in accordance with the highways design manual series 600 to ensure a minimum CBR% of 5.

Contaminated Land Assessment

The site has been found to be impacted by inorganic heavy metals, asbestos fibres and non-volatile PAH and as such appropriate mitigation measures in the form of a suitable cover system within the proposed residential gardens and careful management of materials during site enabling works will be sufficient to mitigate the identified risk.

Elevated volatile (aliphatic and aromatic) petroleum range (BTEX) compounds have been identified within the shallow soil and groundwater adjacent to the AST's used for the storage / recovery of bulk solvents and UST's used to store petrol, diesel and white spirit. On completion of the decommissioning demolition works further detailed Tier 2 Quantitative Risk Assessments will be required to inform the production of Site Specific Remediation Targets (SSRT) to inform the completion of appropriate remediation works to treat the impact soil and groundwater.

Further post demolition site investigations will be required to further characterise the nature of the deep fill within the historic reservoirs and in filled ground to further refine the conceptual site model and confirm the findings of this report.

Initial monitoring has identified the presence of marginally elevated methane and CO₂ within the areas of deep Made Ground & hydrocarbon impact. Monitoring is on-going and will be reported as an addendum in July 2014.

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 Ltd 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 been made known or accessible.
 5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
 6. In addition to the above E3P Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.
 7. 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.
 8. 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.
 9. 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.
 10. This report presents an interpretation of the geotechnical information established by excavation, observation and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently there may be conditions present not revealed by this investigation.
 11. E3P can not 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.
 12. Rather, this investigation has been undertaken to provide a preliminary characterisation of the existing sub-surface geotechnical characteristics and make up and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
 13. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
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APPENDIX II

GLOSSARY

TERMS

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCs	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

UNITS

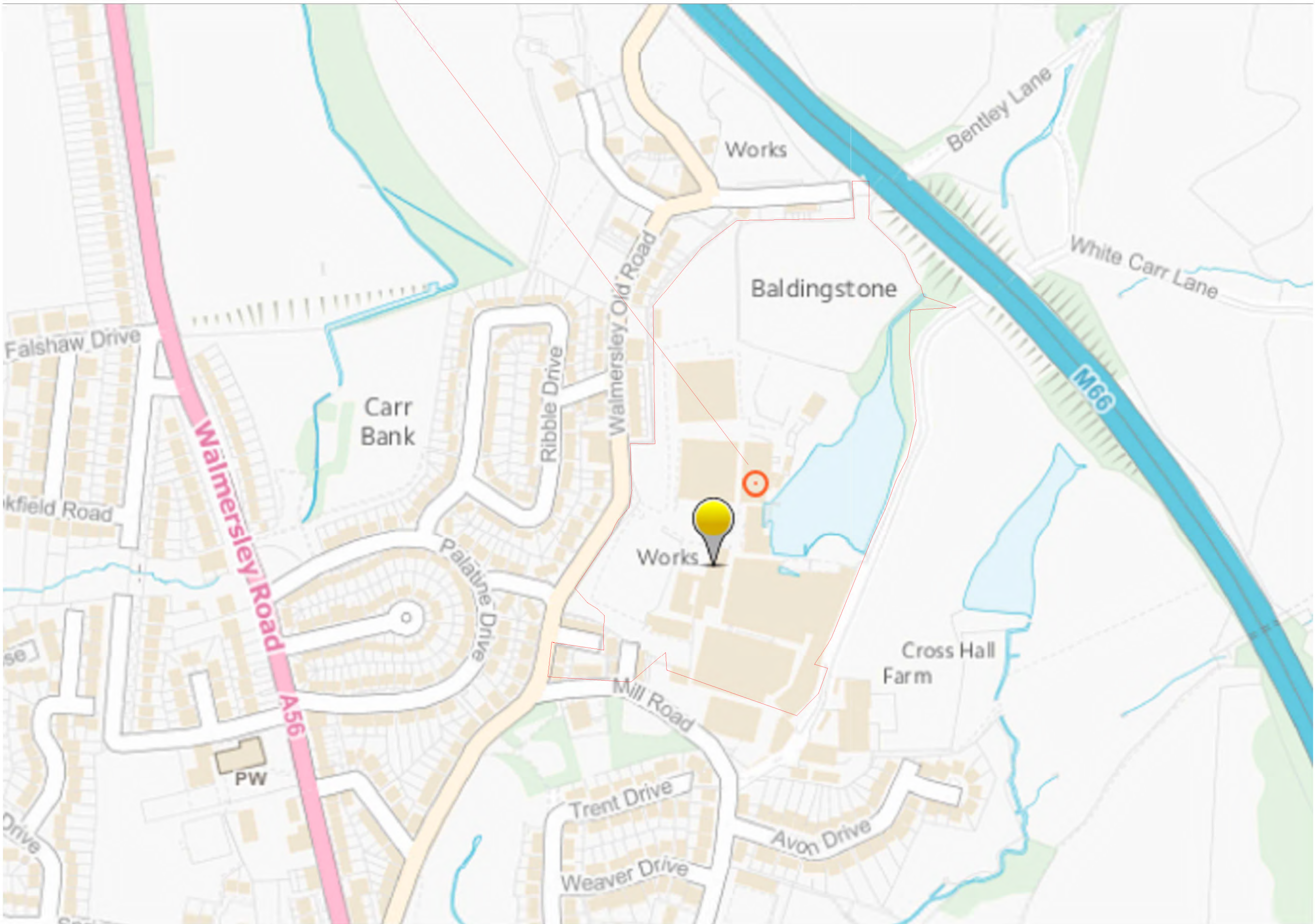
m	Metres
km	Kilometres
%	Percent
%v/v	Percent volume in air
mb	Milli Bars (atmospheric pressure)
l/hr	Litres per hour
µg/l	Micrograms per Litre (parts per billion)
ppb	Parts Per Billion
mg/kg	Milligrams per kilogram (parts per million)
ppm	Parts Per Million
mg/m ³	Milligram per metre cubed
m bgl	Metres Below Ground Level

m bcl	Metre Below Cover Level
mAOD	Metres Above Ordnance Datum (sea level)
kN/m ²	Kilo Newtons per metre squared
µm	Micro metre

APPENDIX III DRAWINGS



Site Location:
Bevis Green Works
Mill Road
Walmersley
Bury
BL9 6RE
E,380985
N,413894



R0	06/05/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Site Location Plan		10-110	06/05/2014	
Drawing No:		Scale:		
		001	NTS	
Job Title:		Client:		
Tetrosyl		Tetrosyl LTD		



Helipoint Business Centre,
Eccles,
Manchester,
M30 7RU
Tel: 0161 883 2087
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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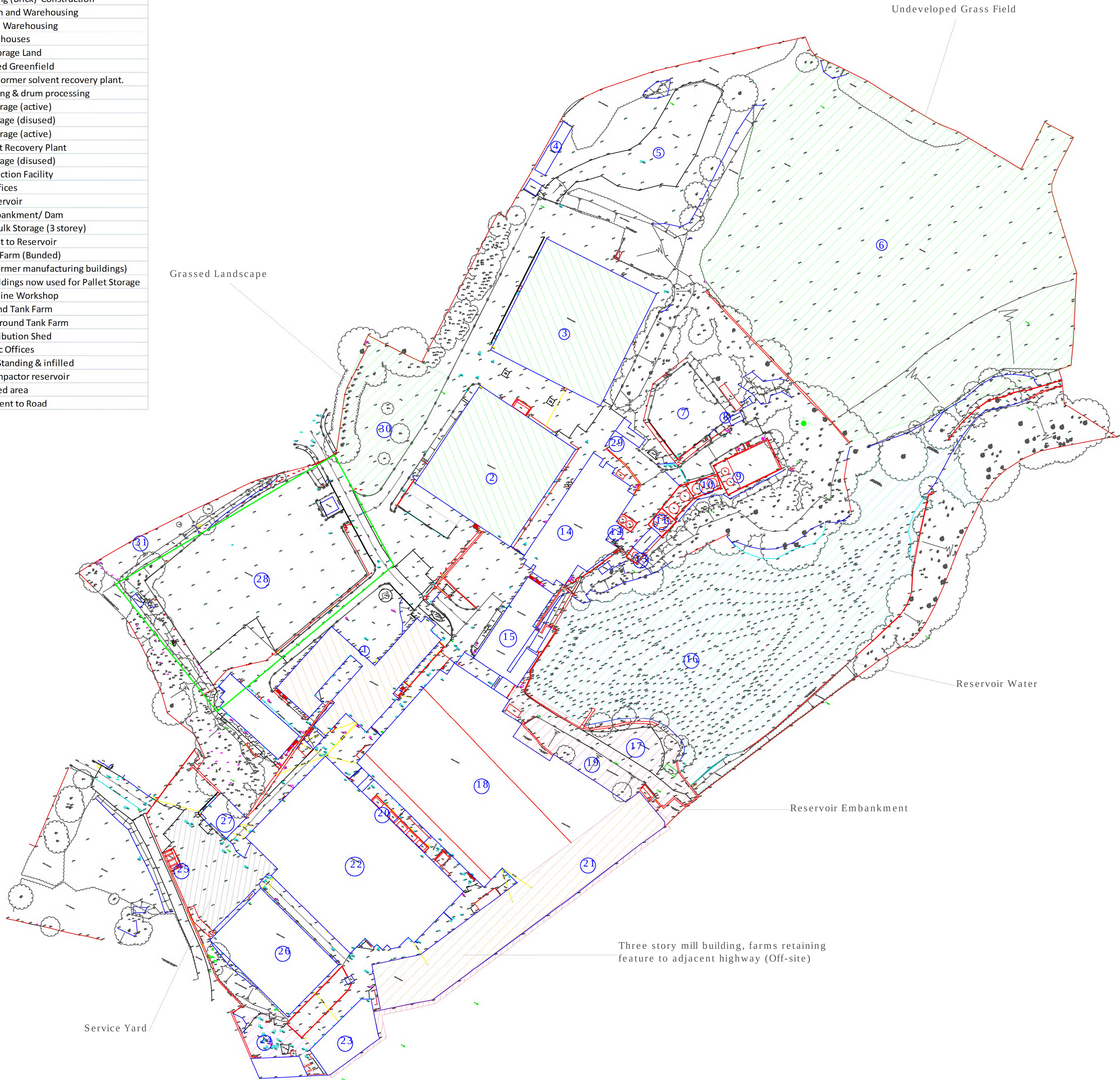
R0	07/03/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:			Job No:	Date:
Current Site Layout			10-110	07/03/2014
			Drawing No:	Scale:
			002	NTS
Job Title:			Client:	
Tetrosyl			Tetrosyl LTD	



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Eccles,
Manchester,
M30 7RU
Tel: 0161 883 2087
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Area	Current Land Use
1	Tetrosyl Office Building (Brick) Construction
2	Portal Distribution and Warehousing
3	Portal Frame Warehousing
4	Greenhouses
5	Open Storage Land
6	Undeveloped Greenfield
7	Bulk Raw Product Storage & Former solvent recovery plant.
8	Former Product Mixing & drum processing
9	Solvent Storage (active)
10	Solvent Storage (disused)
11	Solvent Storage (active)
12	Former Solvent Recovery Plant
13	Solvent Storage (disused)
14	Paint Production Facility
15	Offices
16	Reservoir
17	Reservoir Embankment/ Dam
18	Stone Mixing and Bulk Storage (3 storey)
19	Embankment to Reservoir
20	Solvent Tank Farm (Bunded)
21	Disused Buildings (3 storey former manufacturing buildings)
22	4 storey stone Historical Mill Buildings now used for Pallet Storage
23	Former Machine Workshop
24	Underground Tank Farm
25	Diesel Above Ground Tank Farm
26	Pallet Distribution Shed
27	Historic Offices
28	Aggregate Hard Standing & infilled
29	Waste point compactor reservoir
30	Grassed area
31	Embankment to Road



20 - Current Site Features

R0	07/03/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Current Land uses		10-110	07/03/2014	
		Drawing No:	Scale:	
		002	NTS	
Job Title:		Client:		
Tetrosyl		WHR Property Consultants LLP		



R0	06/05/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Proposed Development Plan		10-110	06/05/2014	
		Drawing No:	Scale:	
		003	NTS	
Job Title:		Client:		
Tetrosyl		Tetrosyl LTD		

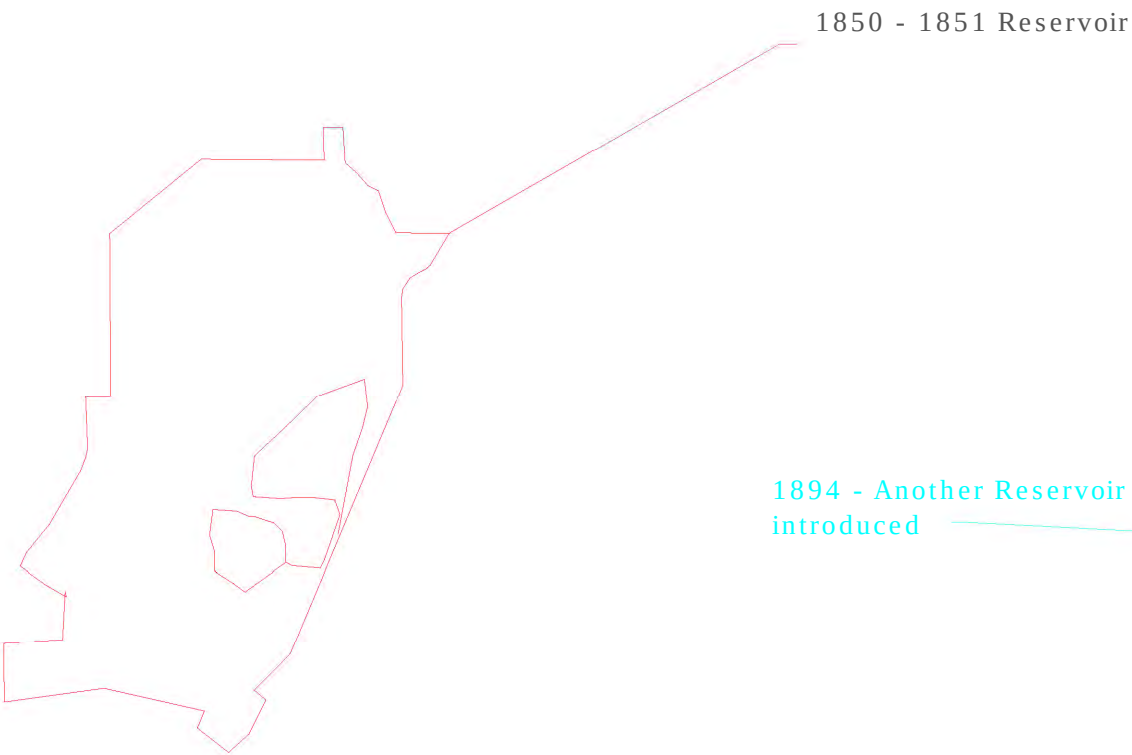


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Eccles,
Manchester,
M30 7RU
Tel: 0161 883 2087
E-mail: info@e3p.co.uk
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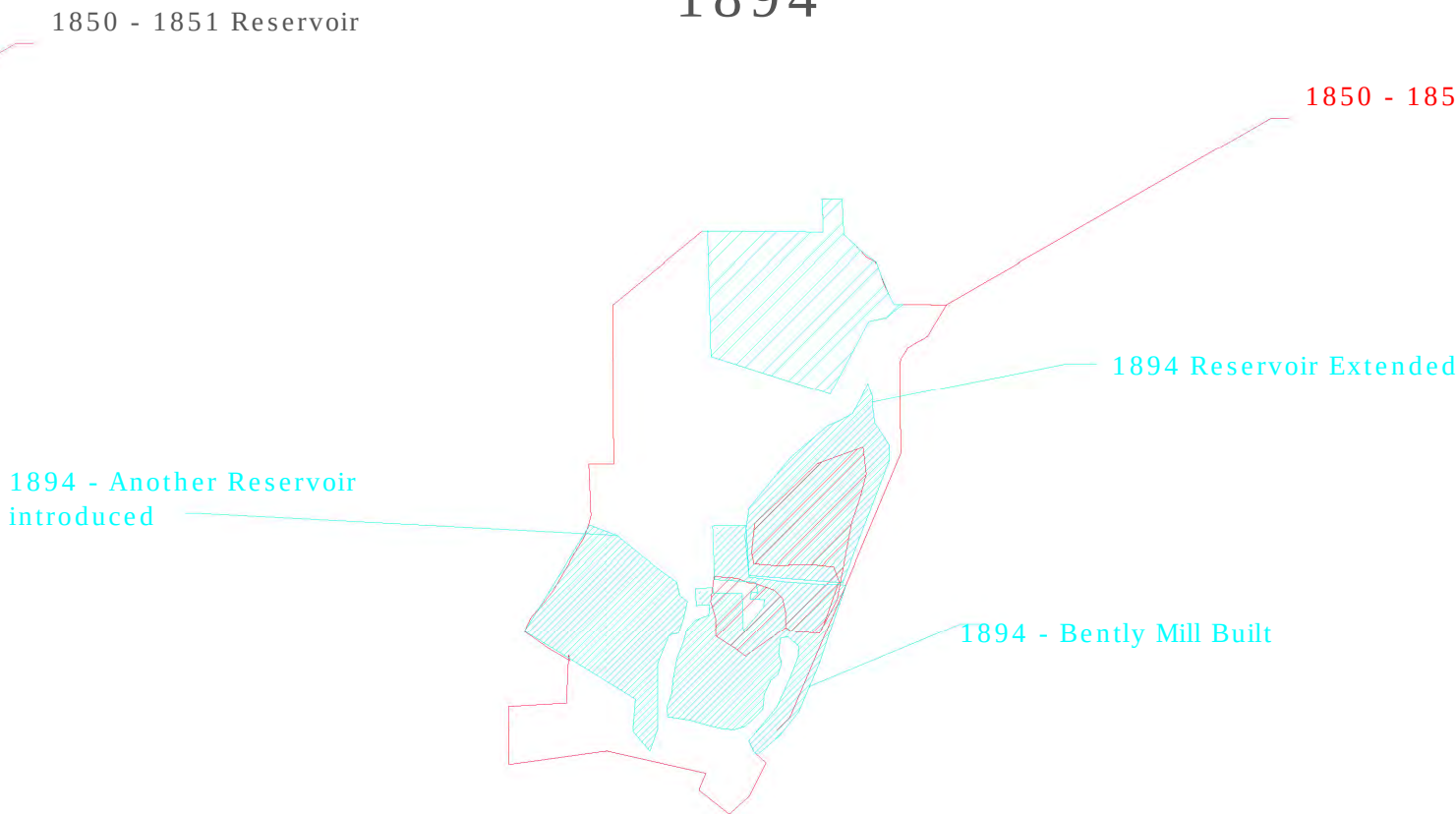
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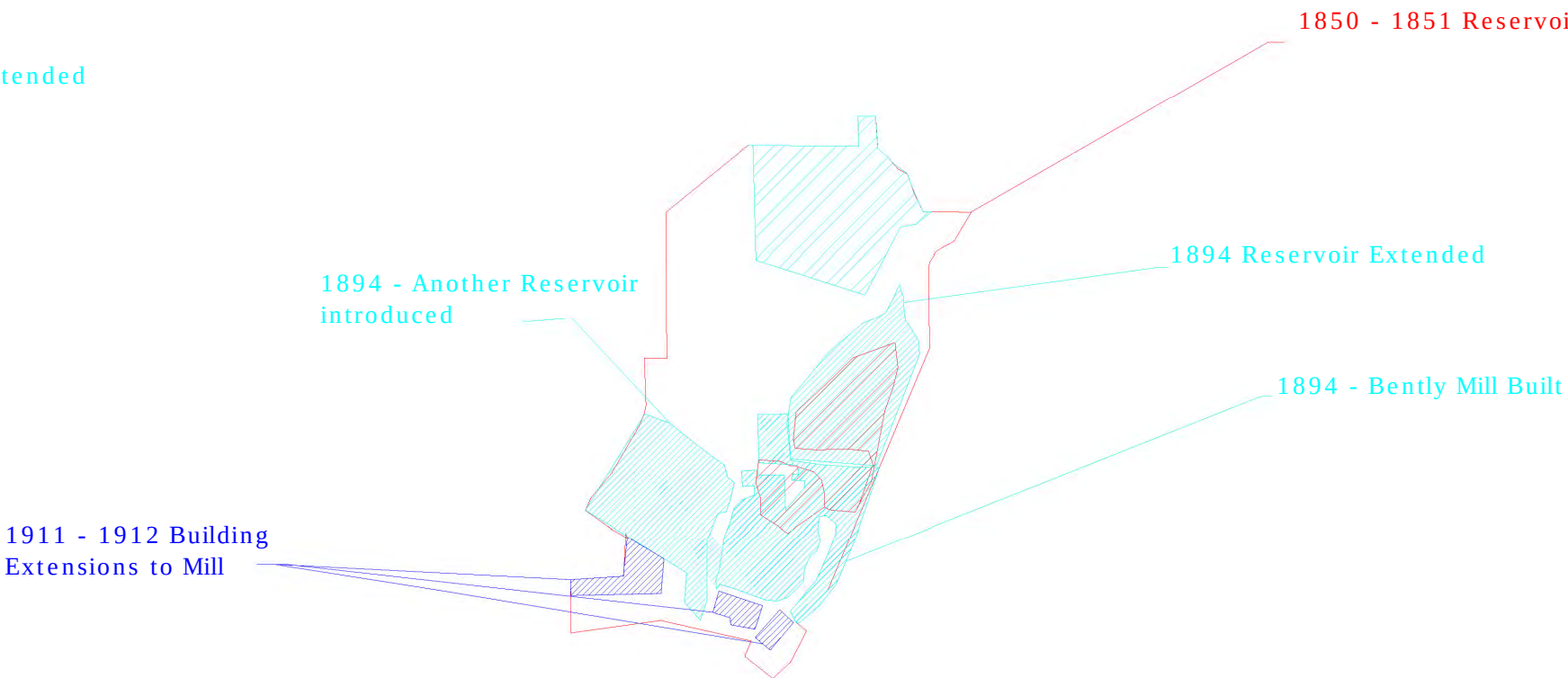
1850 - 1851



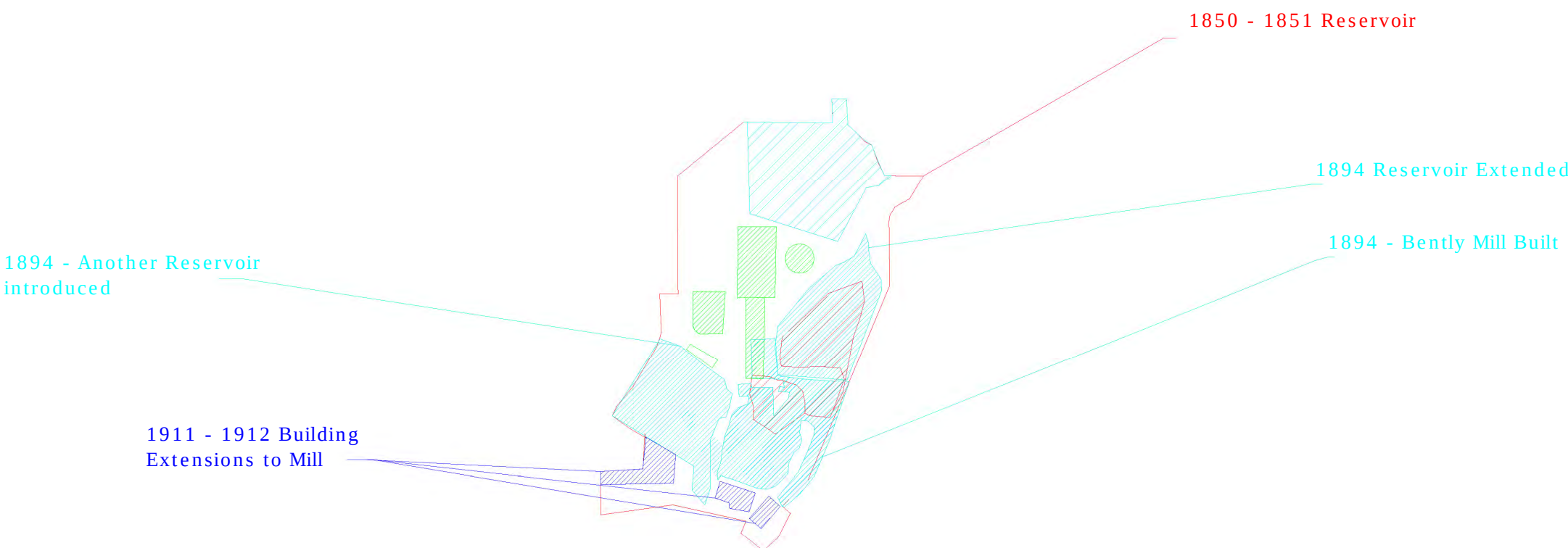
1894



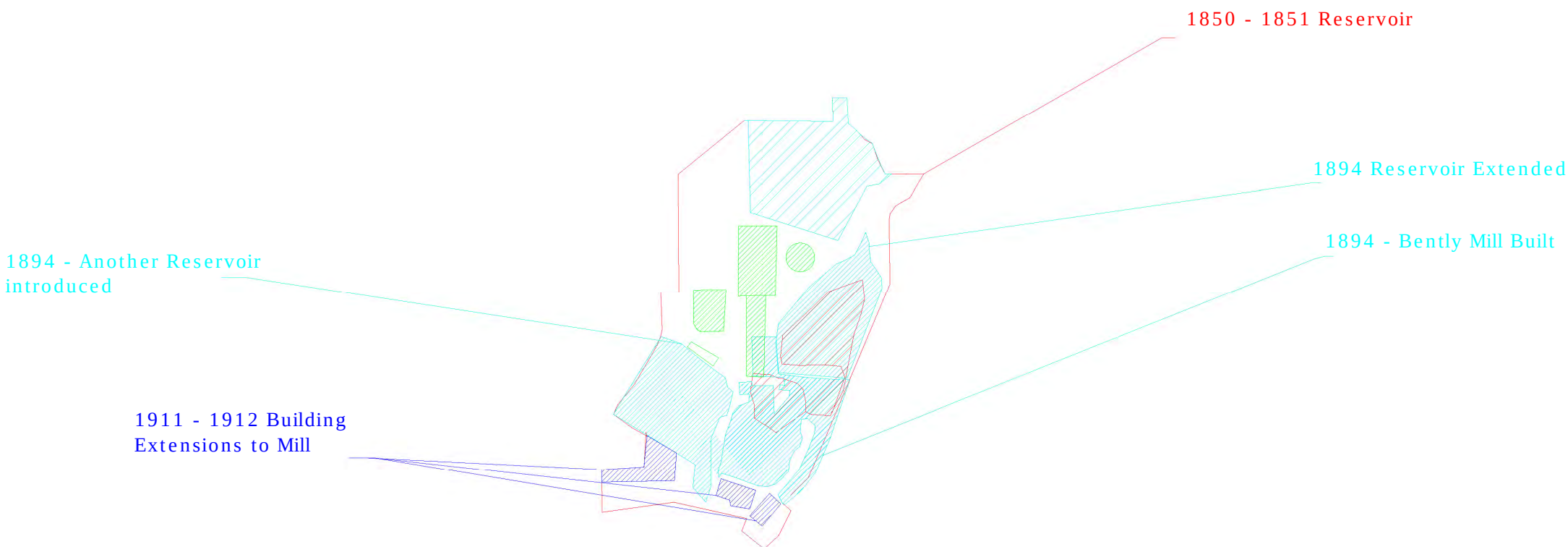
1911 - 1912



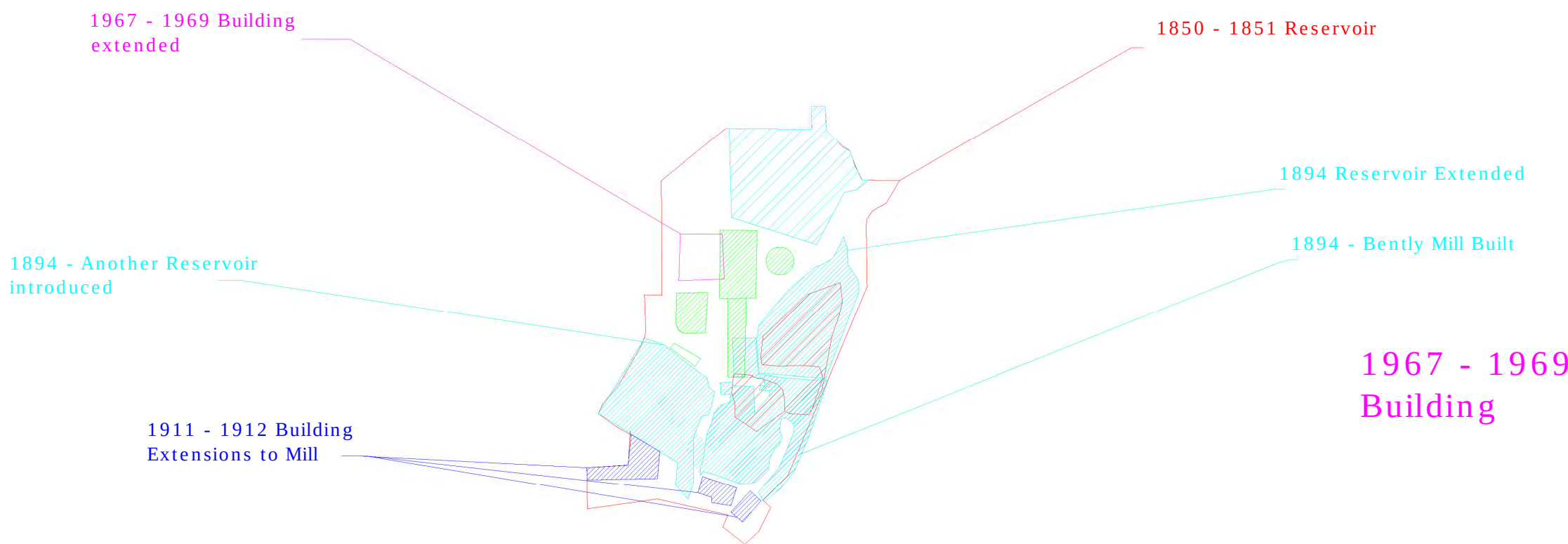
1930 - 1931



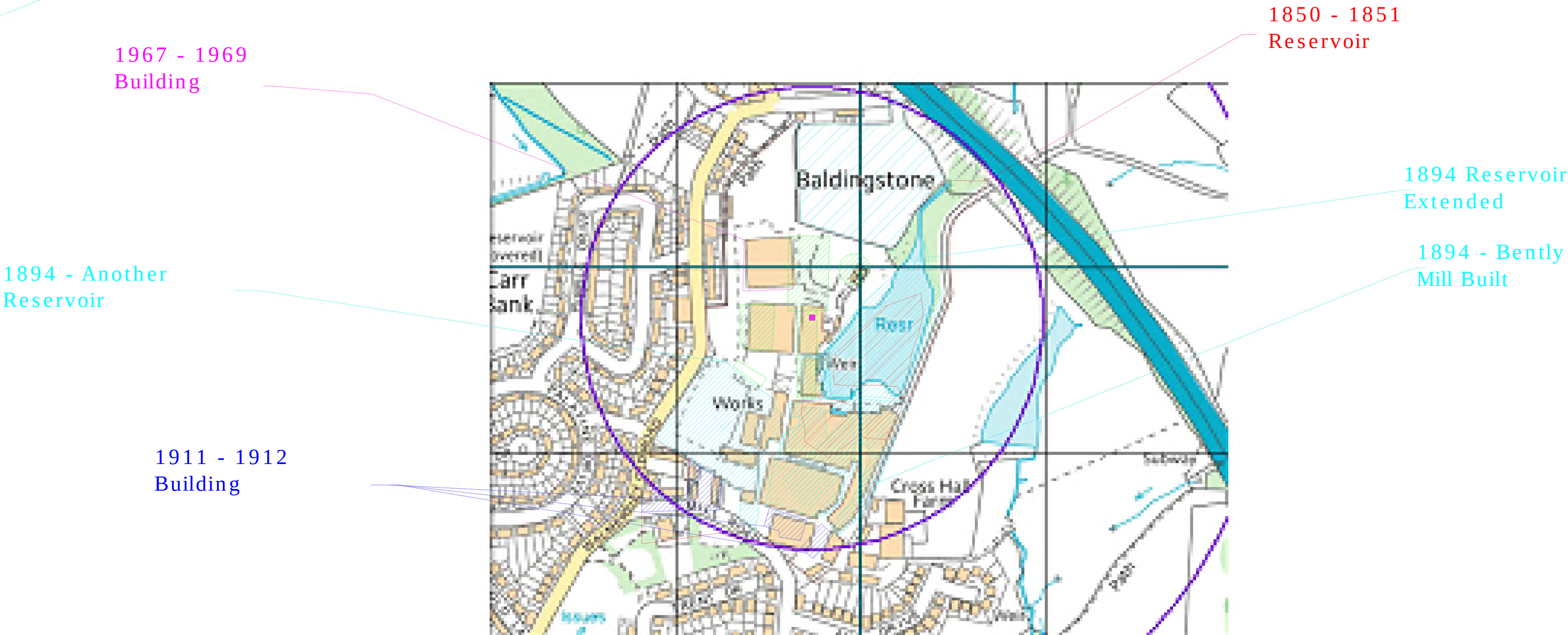
1938 - 1939



1967 - 1969



2013



R0	07/X03/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Existing Site Layout Plan		10-110	07/03/2014	
		Drawing No:	Scale:	
		004	NTS	
Job Title:		Client:		
Tetrosyl		Tetrosyl LTD		



Red area denotes sectors of the site where significant topographic variations have been observed



R0	06/05/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:			Job No:	Date:
Current Level issues			10-110	06/05/2014
			Drawing No:	Scale:
			005	NTS
Job Title:			Client:	
Tetrosyl			Tetrosyl LTD	

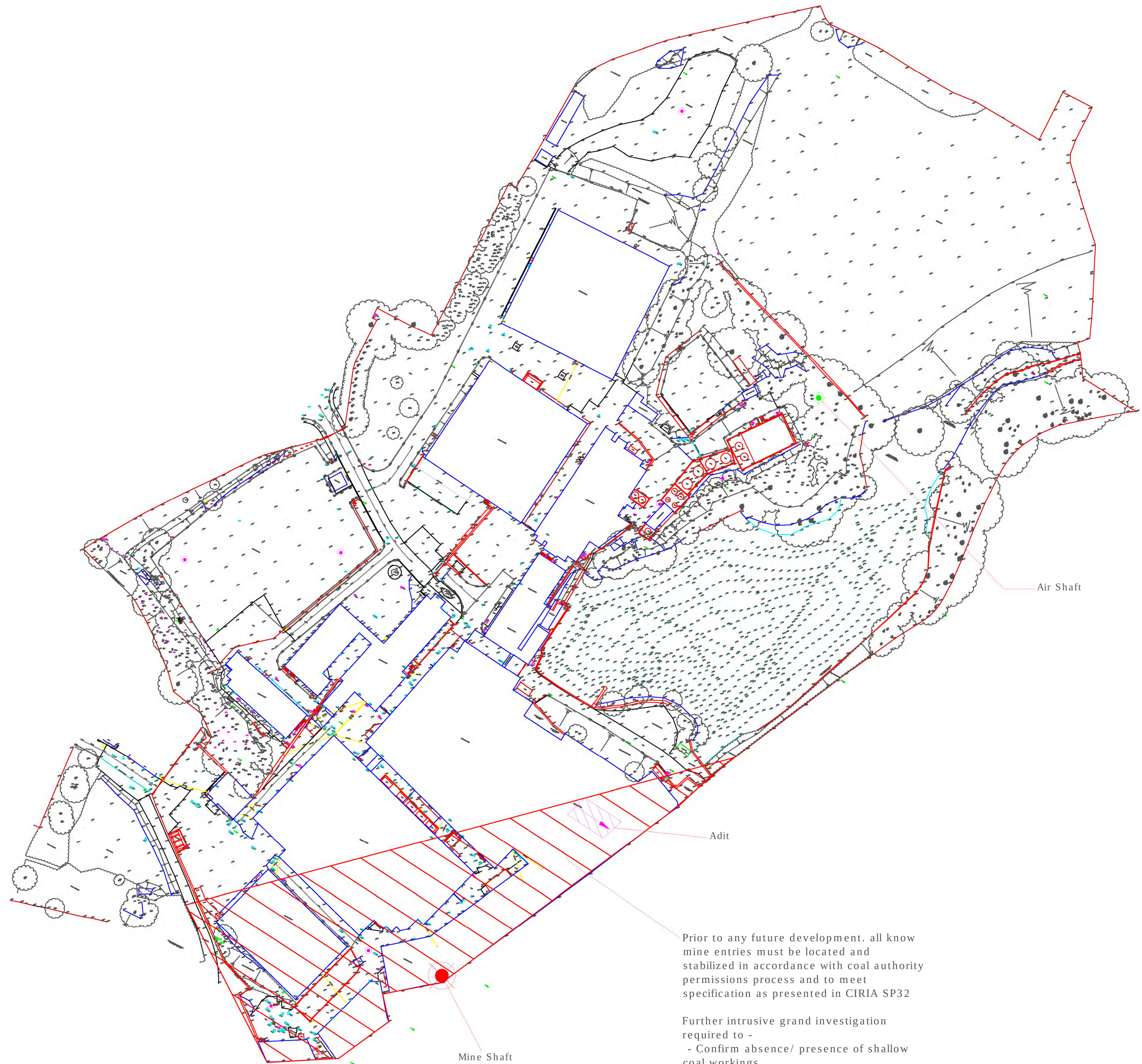


 Believed to be an air ventilation shaft for deeper workings.

 Denotes extent of site potentially undertaken by shallow historic coal workings.

 Denotes anticipated location of historic mine entry. This is a horizontal entry tunnel into a shallow drift mine to the east of the subject site.

 Historical mine shaft 380413 - 001. Believed to be vertical shaft leading to workings in rough rock, coal and sand rock ³/₄ maintain mine. Reported 1ft 9 inches coal mined early to mid 19th century.



R0	06/05/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Mining Issues		10-110	06/05/2014	
		Drawing No:	Scale:	
		006	NTS	
Job Title:		Client:		
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 Heliport Business Centre,
Eccles,
Manchester,
M30 7RU
Tel: 0161 883 2087
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Denotes Historic current onsite features

R0	06/05/14	Original	JN	MD
Note	Date	Revision	Initial	Check
Drawing Title:			Job No:	Date:
Proposed Development and historic features			10-110	06/05/2014
			Drawing No:	Scale:
			007	NTS
Job Title:			Client:	
Tetrosyl			Tetrosyl LTD	



Heliport Business Centre,
Eccles,
Manchester,
M30 7RU
Tel: 0161 983 2067
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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WS101

Approximate Window Sample
Probehole Location



R0	07/03/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Exploratory Hole Location Plan		10-110	07/03/2014	
		Drawing No:	Scale:	
		008	NTS	
Job Title:		Client:		
Tetrosyl		WHR Property Consultants LLP		



Heliport Business Centre,
Eccles,
Manchester,
M30 7RU
Tel: 0161 883 2087
E-mail: info@e3p.co.uk
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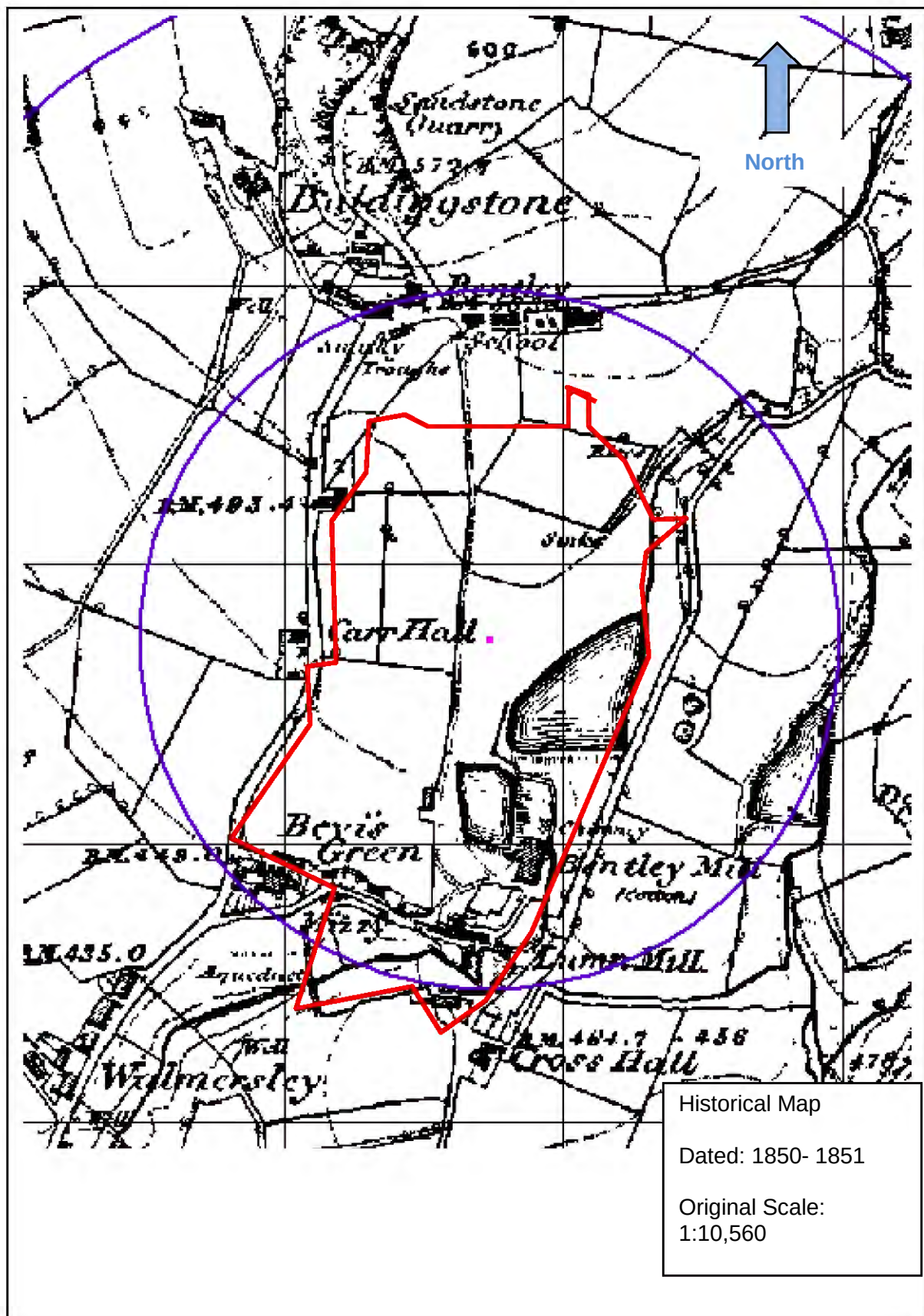
WS101

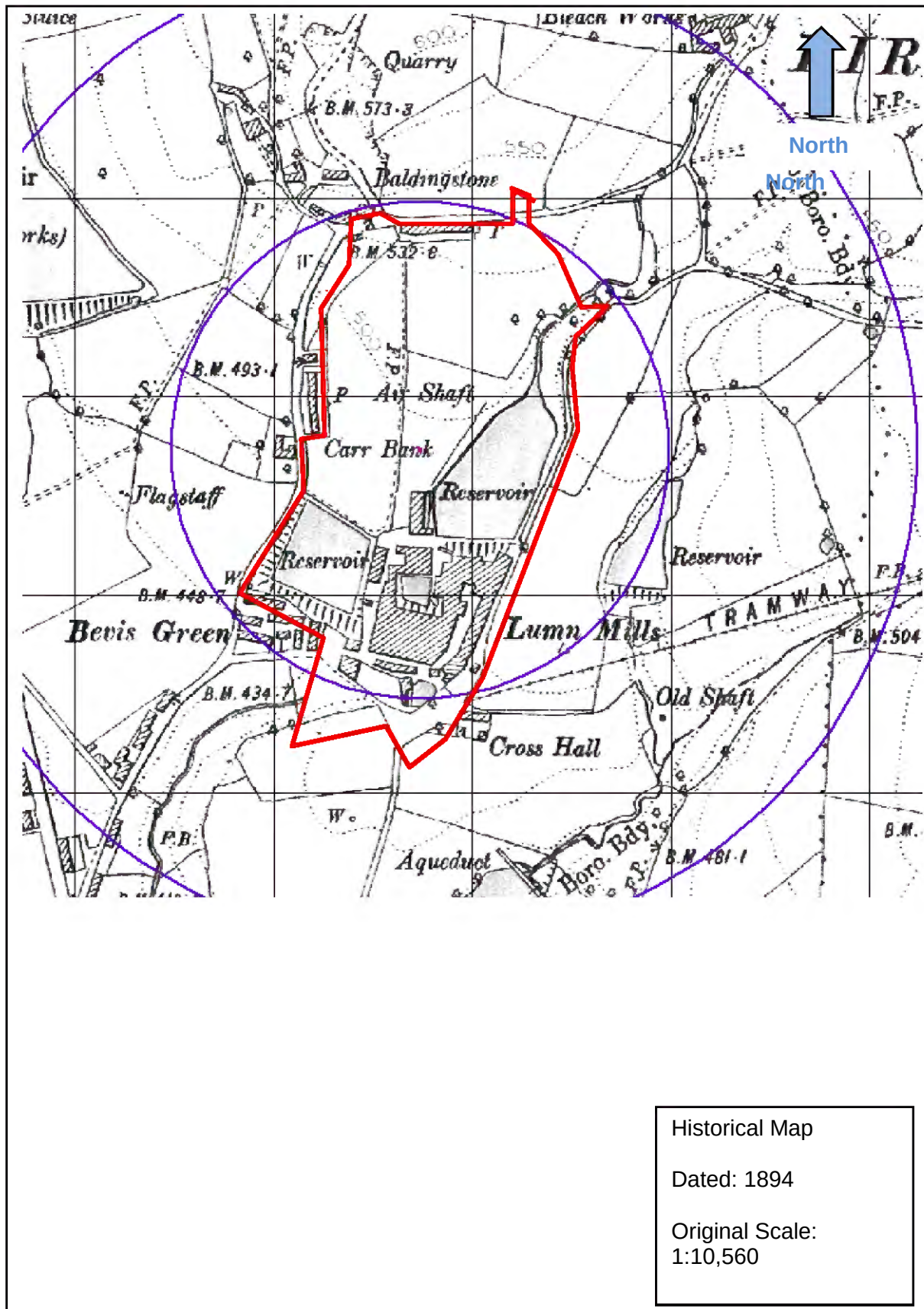
Approximate Window Sample
Probehole Location

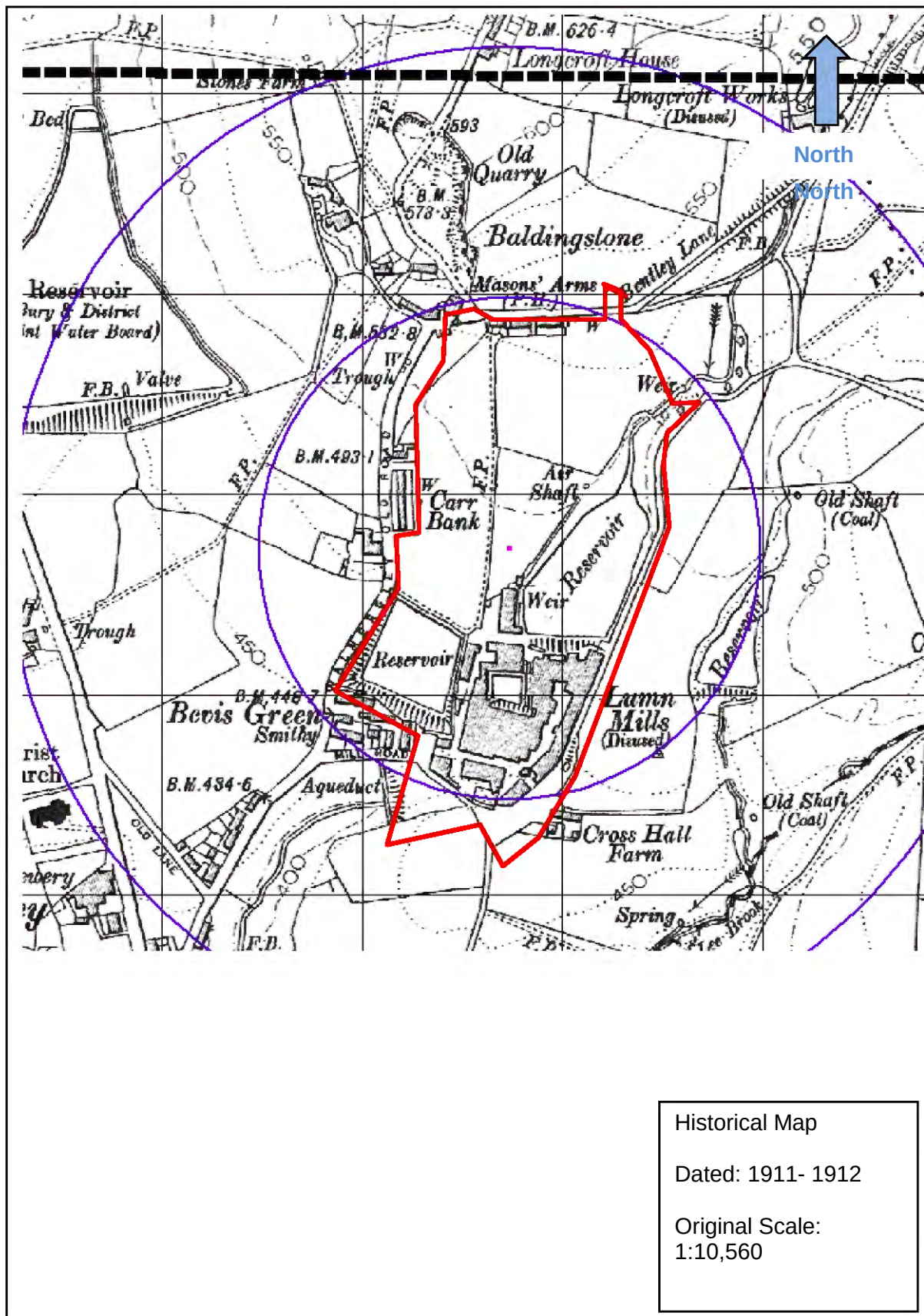


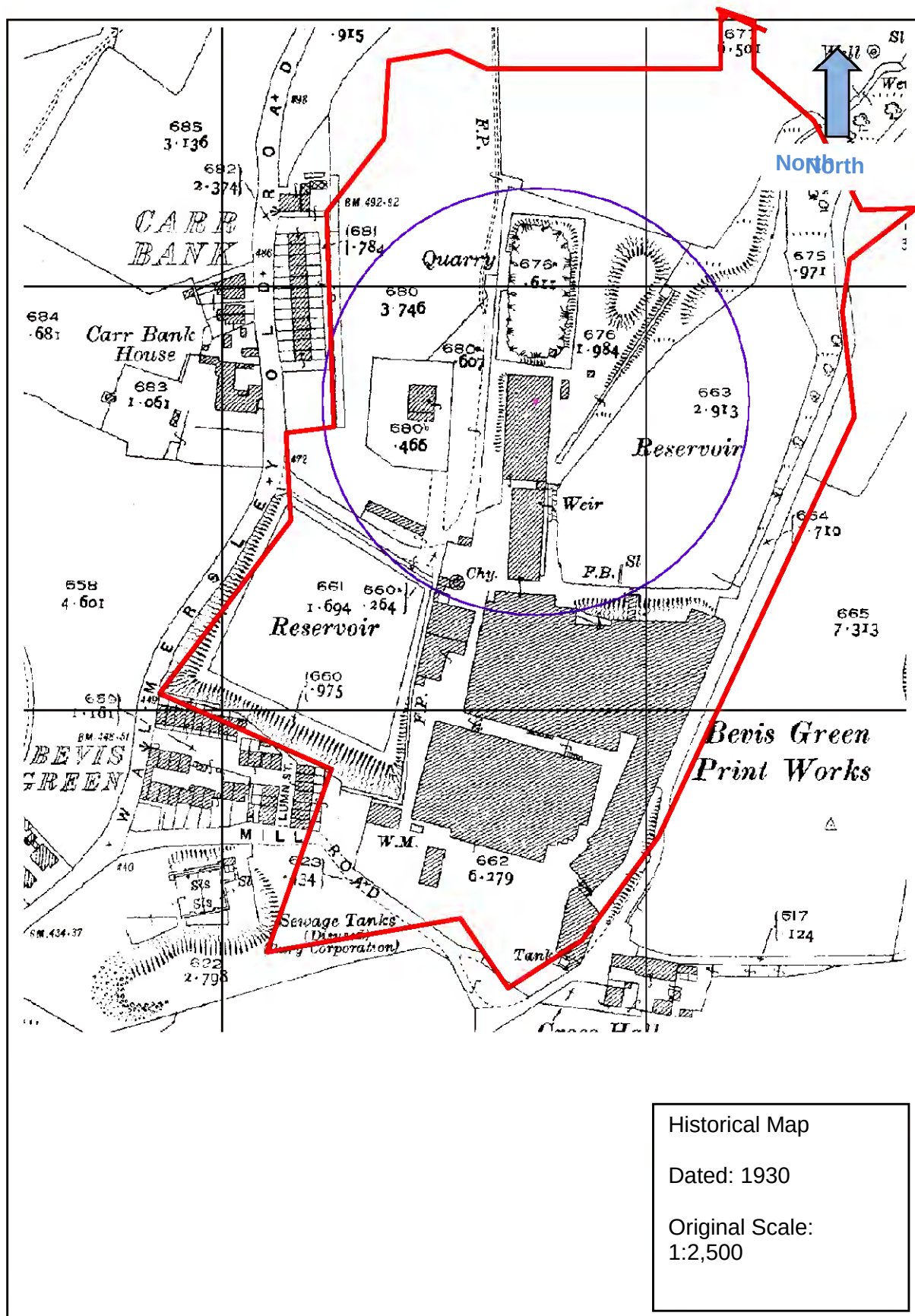
R0	07/03/14	Original	JN	MD
Note	Date	Revision	Initial	Checked
Drawing Title:		Job No:	Date:	
Exploratory Hole Location Plan		10-110	07/03/2014	
		Drawing No:	Scale:	
		008	NTS	
Job Title:		Client:		
Tetrosyl		WHR Property Consultants LLP		

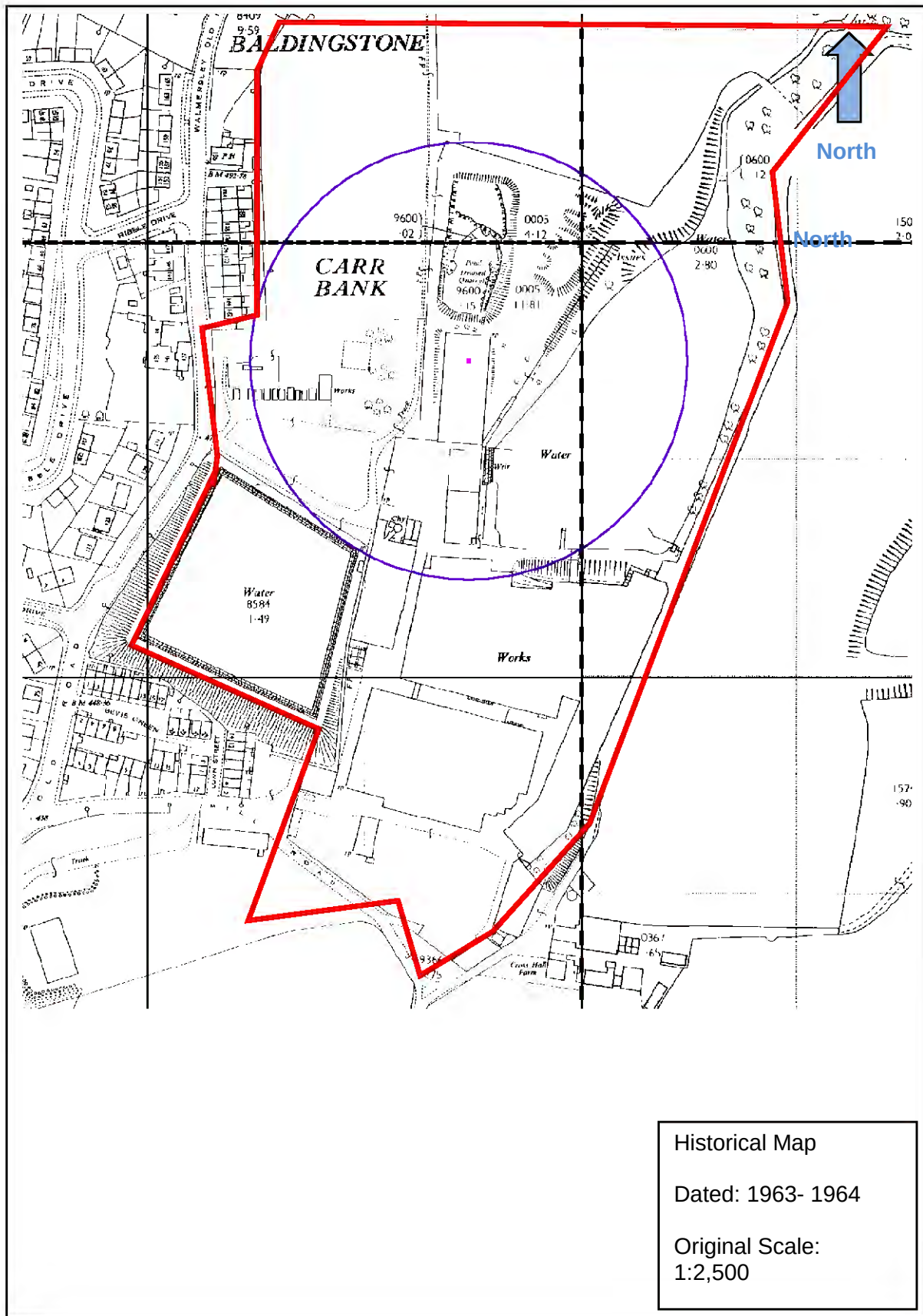
APPENDIX IV HISTORICAL MAPS

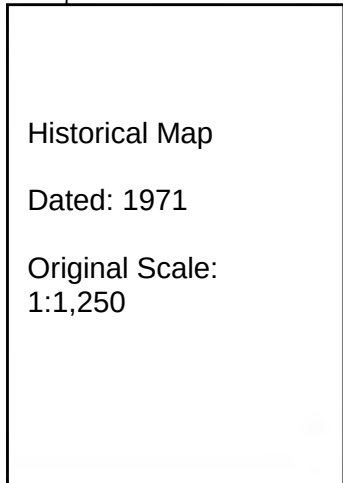


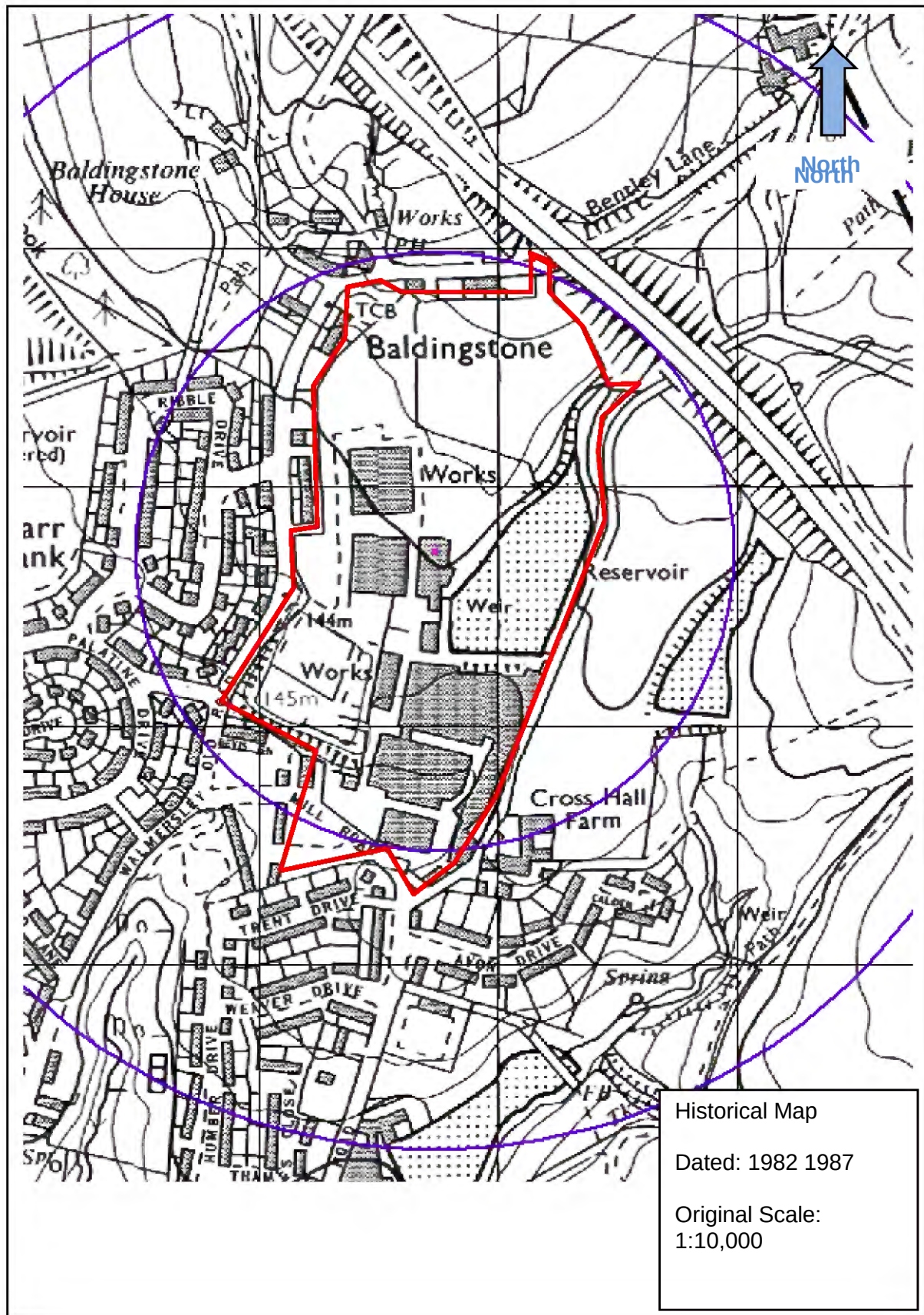


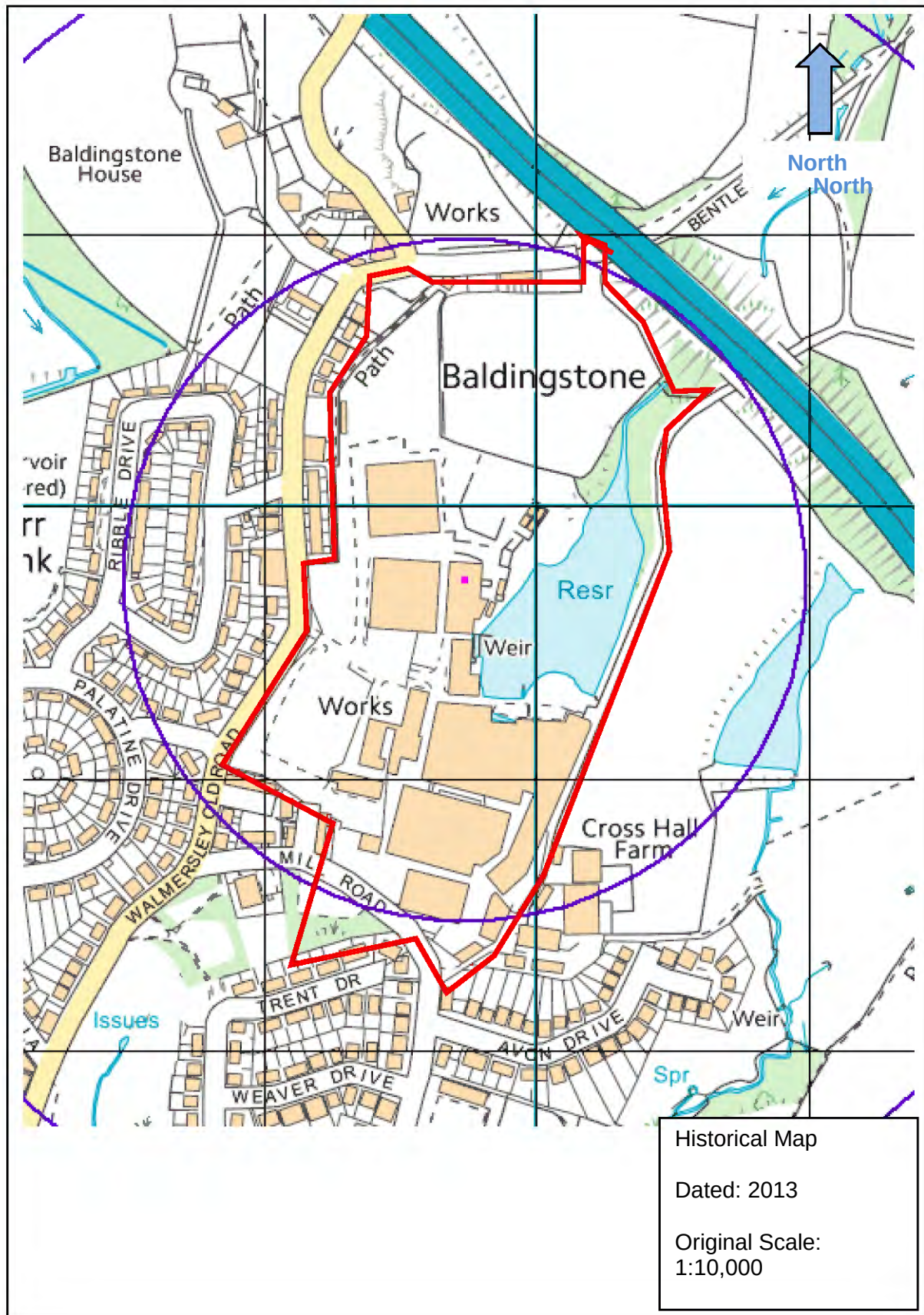












APPENDIX V

CHEMICAL TEST RESULTS



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Project Ref 10110 - Soil samples

Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14

Date Reported: 19 March, 2014

Date Received: 12 March, 2014

Sample Type: Solid

Certificate No: 14/1031/RG/S/C1

File No: 14/1031/RG/S

Client Ref: No order supplied

		Lab sample ref: C174722		C174723		C174725		C174726	
		Client sample ref: WS101 0.5m		WS102 0.6m		WS104 0.3m		WS104 2.5m	
		Date sampled: 10/03/14		10/03/14		10/03/14		10/03/14	
Sample matrix (see notes page):		S		S		S		S	
Determinand	Method	Units	ISO17025	MCERTS	LOD				
Deviation Assessment									
Deviation(s)	C. Review	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E3P001 - Soil									
pH	AN5a	Units	Y	Y	0.1	7.54	7.26	7.20	N/A
Sulphate (total)	AN49	% w/w	Y	Y	0.02	0.04	0.03	<0.02	N/A
Sulphate (water soluble)	AN50e-ICP	g/l	N	N	0.01	0.02	0.02	0.01	N/A
Sulphide _M	AN45b	mg/kg	N	N	2	<2	<2	<2	N/A
Sulphur (total)	an8i	mg/kg	N	N	10	157	82.8	138	N/A
Cyanide (total) _M	AN45f	mg/kg	Y	Y	1	<1	<1	<1	N/A
Phenols (screen) _M	AN45d	mg/kg	Y	N	1	<1	<1	<1	N/A
Arsenic	AN8b	mg/kg	Y	Y	2	14.7	6.1	10.3	N/A
Cadmium	AN8a	mg/kg	Y	Y	1	<1.0	<1.0	<1.0	N/A
Chromium (total)	AN8b	mg/kg	Y	Y	2	15.1	18.1	19.5	N/A
Chromium (VI)	AN7	mg/kg	Y	Y	1	<1.0	<1.0	<1.0	N/A
Copper	AN8b	mg/kg	Y	Y	2	38.6	18.0	55.7	N/A
Lead	AN8b	mg/kg	Y	Y	2	68.8	<2.0	31.6	N/A
Mercury	AN8a	mg/kg	Y	Y	1	<1.0	<1.0	<1.0	N/A
Nickel	AN8b	mg/kg	Y	Y	2	15.2	14.8	18.0	N/A
Selenium	AN8a	mg/kg	Y	Y	1	<1.0	<1.0	<1.0	N/A
Zinc	AN8b	mg/kg	Y	Y	2	63.4	42.3	71.3	N/A
Sample Prep(C)									
EMR	EMR	%	N	N/A	0.1	<0.1	<0.1	<0.1	N/A
% Stones	Stones	%	N	N/A	0.1	16.3	20.1	19.9	N/A
Moisture Content @ <30°C	AN1	%	Y	N/A	0.1	16.5	14.6	18.8	N/A
Sample Description	MCERTS ver4.		N	N/A		2AD	2A	6A	N/A
Misc									
Asbestos	ASB001	%	Y	N/A	0.001	NAD	N/A	N/A	N/A
PAH (USEPA16)									
PAH (USEPA16) Total _M	GCM501	mg/kg	Y	Y	1	2.4	<1	N/A	N/A
Naphthalene (PAH) _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
Acenaphthylene _M	GCM501a	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
Acenaphthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
Fluorene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
Phenanthrene _M	GCM501	mg/kg	Y	Y	0.1	0.4	<0.1	N/A	N/A
Anthracene _M	GCM501	mg/kg	Y	Y	0.1	0.1	<0.1	N/A	N/A
Fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	0.5	<0.1	N/A	N/A
Pyrene _M	GCM501	mg/kg	Y	Y	0.1	0.5	<0.1	N/A	N/A
Benz(a)anthracene _M	GCM501	mg/kg	Y	Y	0.1	0.2	<0.1	N/A	N/A
Chrysene _M	GCM501	mg/kg	Y	Y	0.1	0.2	<0.1	N/A	N/A
Benzo(b)fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	0.2	<0.1	N/A	N/A
Benzo(k)fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	0.2	<0.1	N/A	N/A
Benzo(a)pyrene _M	GCM501	mg/kg	Y	Y	0.1	0.1	<0.1	N/A	N/A
Indeno(1,2,3-cd)pyrene _M	GCM501a	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
Dibenz(a,h)anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
Benzo(ghi)perylene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	N/A	N/A
TPH Banded(Al/Aro)									
C5-C7 Aliphatic _M	AN15-1	µg/kg	N	N	1000	N/A	N/A	N/A	<1000
>C7-C8 Aliphatic _M	AN15-1	µg/kg	N	N	1000	N/A	N/A	N/A	<1000
>C8-C10 Aliphatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C10-C12 Aliphatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C12-C16 Aliphatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C16-C35 Aliphatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C35-C44 Aliphatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
Total Aliphatics _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
C5-C7 Aromatic _M	AN15-1	µg/kg	N	N	1000	N/A	N/A	N/A	<1000
>C7-C8 Aromatic _M	AN15-1	µg/kg	N	N	1000	N/A	N/A	N/A	<1000
>C8-C10 Aromatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C10-C12 Aromatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C12-C16 Aromatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C16-C21 Aromatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C21-C35 Aromatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
>C35-C44 Aromatic _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
Total Aromatics _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000
MTBE _M	AN15a	µg/kg	N	N	10	N/A	N/A	N/A	<10
Benzene _M	AN15a	µg/kg	Y	N	10	N/A	N/A	N/A	<10
Toluene _M	AN15a	µg/kg	Y	N	10	N/A	N/A	N/A	<10
Ethylbenzene _M	AN15a	µg/kg	Y	N	10	N/A	N/A	N/A	<10
m,p-xylene _M	AN15a	µg/kg	Y	N	10	N/A	N/A	N/A	<10
o-Xylene _M	AN15a	µg/kg	Y	N	10	N/A	N/A	N/A	<10
Total VPH _M	AN15	µg/kg	N	N	1000	N/A	N/A	N/A	<1000
Total TPH _M	SOP05	µg/kg	Y	N	1000	N/A	N/A	N/A	<1000



Test Certificate

Client: E3P
Office 4, Heliport, Liverpool Road, Eccles
Site: Tetrosyl - Project Ref 10110 - Soil samples
Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14
Date Reported: 19 March, 2014
Date Received: 12 March, 2014
Sample Type: Solid

Certificate No: 14/1031/RG/S/C1
File No: 14/1031/RG/S
Client Ref: No order supplied

		Lab sample ref:		C174724	C174725	C174727	C174730
		Client sample ref:		WS103 0.3m	WS104 0.3m	WS105 1.2m	WS106 1.9m
		Date sampled:		10/03/14	10/03/14	10/03/14	10/03/14
		Sample matrix (see notes page):		S	S	S	S
Determinand	Method	Units	ISO17025	MCERTS	LOD		
SVOC							
Phenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
bis-(2-chloroethyl) ether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
1,3 - dichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2-chlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
1,4 - dichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
1,2 - dichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
bis(2-chloroisopropyl) ether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2-methylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
N-nitroso-di-n-propylamine	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
hexachloroethane	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
4-methylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Nitrobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Isophorone	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2-nitrophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,4-dimethylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
bis(2-chloroethoxy)-methane	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,4-dichlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
1,2,4 - trichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Naphthalene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Hexa chlorobutadiene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
4-chloro-3-methylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2-methylnaphthalene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,4,6-trichlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,4,5-trichlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2-chloronaphthalene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Acenaphthylene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Dimethyl phthalate	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,6-dinitrotoluene	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5
Acenaphthene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,4-dinitrophenol	SOP04	mg/kg	Y	N	1	<1	<1
Dibenzofuran	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2,4-dinitrotoluene	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5
4-nitrophenol	SOP04	mg/kg	Y	N	1	<1	<1
Fluorene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Diethylphthalate	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
4-chlorophenyl-phenylether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
2-methyl-4,6-dinitrophenol	SOP04	mg/kg	Y	N	1	<1	<1
N-nitrosodiphenylamine	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
4-bromophenyl phenyl ether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Hexachlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Pentachlorophenol	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5
Phenanthrene	SOP04	mg/kg	Y	N	0.1	0.2	<0.1
Anthracene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Carbazole	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Dibutyl phthalate	SOP04	mg/kg	Y	N	0.1	0.1	<0.1
Fluoranthene	SOP04	mg/kg	Y	N	0.1	0.3	<0.1
Pyrene	SOP04	mg/kg	Y	N	0.1	0.3	<0.1
Benzyl butyl phthalate	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5
Benzo(a)anthracene	SOP04	mg/kg	Y	N	0.1	0.2	<0.1
Chrysene	SOP04	mg/kg	Y	N	0.1	0.2	<0.1
Bis(2-ethylhexyl) phthalate	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5
Di-n-octyl phthalate	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5
Benzo(b)fluoranthene	SOP04	mg/kg	Y	N	0.1	0.1	<0.1
Benzo(k)fluoranthene	SOP04	mg/kg	Y	N	0.1	0.1	<0.1
Benzo(a)pyrene	SOP04	mg/kg	Y	N	0.1	0.1	<0.1
Indeno(1,2,3-cd)pyrene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1
Benzo(ghi)perylene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Project Ref 10110 - Soil samples

Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14

Date Reported: 19 March, 2014

Date Received: 12 March, 2014

Sample Type: Solid

Certificate No: 14/1031/RG/S/C1

File No: 14/1031/RG/S

Client Ref: No order supplied

Lab sample ref: C174724						C174725	C174727	C174730
Client sample ref: WS103 0.3m						WS104 0.3m	WS105 1.2m	WS106 1.9m
Date sampled: 10/03/14						10/03/14	10/03/14	10/03/14
Sample matrix (see notes page): S						S	S	S
Determinand	Method	Units	ISO17025	MCERTS	LOD			
VOC								
Vinyl chloride _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Bromomethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Trichlorofluoromethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,1-Dichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
2,2-Dichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Bromochloromethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Chloroform _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,1,1-Trichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Carbon tetrachloride _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,1-Dichloropropene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Benzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2-Dichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Trichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2-Dichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Dibromomethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Bromodichloromethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
cis-1,3-Dichloropropene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Toluene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
trans-1,3-Dichloropropene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,1,2-Trichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Tetrachloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,3-Dichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2-Dibromoethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Chlorobenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Ethylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
m,p-xylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
o-Xylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Styrene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Bromoform _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
iso-Propylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Bromobenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2,3-Trichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
n-Propylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
2-Chlorotoluene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,3,5-Trimethylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
4-Chlorotoluene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
tert-Butylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2,4-Trimethylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
sec-Butylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,3-Dichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,4-Dichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
n-Butylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2-Dichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2-Dibromo-3-chloro-propane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2,4-Trichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Hexachlorobutadiene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,2,3-Trichlorobenzene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,1,2,2 - Tetrachloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
1,1-Dichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
4-isopropyltoluene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Chlorodibromomethane _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Cis - 1,2 -dichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
Naphthalene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10	<10
trans-1,2-Dichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10	<10



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Project Ref 10110 - Soil samples

Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14

Date Reported: 19 March, 2014

Date Received: 12 March, 2014

Sample Type: Solid

Certificate No: 14/1031/RG/S/C1

File No: 14/1031/RG/S

Client Ref: No order supplied

		Lab sample ref: C174728		C174729		C174731	
		Client sample ref: WS105 2.3m		WS106 0.5m		WS107 0.7m	
		Date sampled: 10/03/14		10/03/14		10/03/14	
		S		S		S	
Sample matrix (see notes page):							
Determinand	Method	Units	ISO17025	MCERTS	LOD		
Deviation Assessment	C. Review	N/A	N/A	N/A	N/A	N/A	N/A
Deviation(s)							
E3P001 - Soil							
pH	AN5a	Units	Y	Y	0.1	N/A	7.69
Sulphate (total)	AN49	% w/w	Y	Y	0.02	N/A	0.03
Sulphate (water soluble)	AN50e-ICP	g/l	N	N	0.01	N/A	0.02
Sulphide _M	AN45b	mg/kg	N	N	2	N/A	<2
Sulphur (total)	an8i	mg/kg	N	N	10	N/A	106
Cyanide (total) _M	AN45f	mg/kg	Y	Y	1	N/A	<1
Phenols (screen) _M	AN45d	mg/kg	Y	N	1	N/A	<1
Arsenic	AN8b	mg/kg	Y	Y	2	N/A	10.3
Cadmium	AN8a	mg/kg	Y	Y	1	N/A	<1.0
Chromium (total)	AN8b	mg/kg	Y	Y	2	N/A	23.3
Chromium (VI)	AN7	mg/kg	Y	Y	1	N/A	<1.0
Copper	AN8b	mg/kg	Y	Y	2	N/A	30.8
Lead	AN8b	mg/kg	Y	Y	2	N/A	25.2
Mercury	AN8a	mg/kg	Y	Y	1	N/A	<1.0
Nickel	AN8b	mg/kg	Y	Y	2	N/A	20.4
Selenium	AN8a	mg/kg	Y	Y	1	N/A	<1.0
Zinc	AN8b	mg/kg	Y	Y	2	N/A	78.9
Sample Prep(C)							
EMR	EMR	%	N	N/A	0.1	N/A	<0.1
% Stones	Stones	%	N	N/A	0.1	N/A	19.2
Moisture Content @ <30°C	AN1	%	Y	N/A	0.1	N/A	14.0
Sample Description	MCERTS ver4.		N	N/A		N/A	6A
Misc							
Asbestos	ASB001	%	Y	N/A	0.001	N/A	Chrysotile (Loose fibres) NAD
TPH Banded(Al/Aro)							
C5-C7 Aliphatic M	AN15-1	µg/kg	N	N	1000	<1000	N/A
>C7-C8 Aliphatic M	AN15-1	µg/kg	N	N	1000	<1000	N/A
>C8-C10 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C10-C12 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C12-C16 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C16-C35 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C35-C44 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
Total Aliphatics M	SOP05	µg/kg	Y	N	1000	<1000	N/A
C5-C7 Aromatic M	AN15-1	µg/kg	N	N	1000	<1000	N/A
>C7-C8 Aromatic M	AN15-1	µg/kg	N	N	1000	<1000	N/A
>C8-C10 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C10-C12 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C12-C16 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C16-C21 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C21-C35 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
>C35-C44 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000	N/A
Total Aromatics M	SOP05	µg/kg	Y	N	1000	<1000	N/A
MTBE M	AN15a	µg/kg	N	N	10	<10	N/A
Benzene M	AN15a	µg/kg	Y	N	10	<10	N/A
Toluene M	AN15a	µg/kg	Y	N	10	<10	N/A
Ethylbenzene M	AN15a	µg/kg	Y	N	10	<10	N/A
m,p-xylene M	AN15a	µg/kg	Y	N	10	<10	N/A
o-Xylene M	AN15a	µg/kg	Y	N	10	<10	N/A
Total VPH M	AN15	µg/kg	N	N	1000	<1000	N/A
Total TPH M	SOP05	µg/kg	Y	N	1000	<1000	N/A



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Project Ref 10110 - Soil samples

Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14

Date Reported: 19 March, 2014

Date Received: 12 March, 2014

Sample Type: Solid

Certificate No: 14/1031/RG/S/C1

File No: 14/1031/RG/S

Client Ref: No order supplied

Lab sample ref: C174733
Client sample ref: WS108 1.8ms

Date sampled: 10/03/14
Sample matrix (see notes page): S

Determinand	Method	Units	ISO17025	MCERTS	LOD	
Deviation Assessment						
Deviation(s)	C. Review	N/A	N/A	N/A	N/A	N/A
E3P001 - Soil						
pH	AN5a	Units	Y	Y	0.1	7.27
Sulphate (total)	AN49	% w/w	Y	Y	0.02	0.03
Sulphate (water soluble)	AN50e-ICP	g/l	N	N	0.01	0.02
Sulphide _M	AN45b	mg/kg	N	N	2	<2
Sulphur (total)	an8l	mg/kg	N	N	10	242
Cyanide (total) _M	AN45f	mg/kg	Y	Y	1	<1
Phenols (screen) _M	AN45d	mg/kg	Y	N	1	<1
Arsenic	AN8b	mg/kg	Y	Y	2	5.3
Cadmium	AN8a	mg/kg	Y	Y	1	<1.0
Chromium (total)	AN8b	mg/kg	Y	Y	2	17.8
Chromium (VI)	AN7	mg/kg	Y	Y	1	<1.0
Copper	AN8b	mg/kg	Y	Y	2	22.4
Lead	AN8b	mg/kg	Y	Y	2	<2.0
Mercury	AN8a	mg/kg	Y	Y	1	<1.0
Nickel	AN8b	mg/kg	Y	Y	2	25.9
Selenium	AN8a	mg/kg	Y	Y	1	<1.0
Zinc	AN8b	mg/kg	Y	Y	2	55.7
Sample Prep(C)						
EMR	EMR	%	N	N/A	0.1	<0.1
% Stones	Stones	%	N	N/A	0.1	14.4
Moisture Content @ <30°C	AN1	%	Y	N/A	0.1	14.4
Sample Description	MCERTS ver4.		N	N/A		3A
Misc						
Asbestos	ASB001	%	Y	N/A	0.001	NAD
TPH Banded(Al/Aro)						
C5-C7 Aliphatic M	AN15-1	µg/kg	N	N	1000	<1000
>C7-C8 Aliphatic M	AN15-1	µg/kg	N	N	1000	<1000
>C8-C10 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000
>C10-C12 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000
>C12-C16 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000
>C16-C35 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000
>C35-C44 Aliphatic M	SOP05	µg/kg	Y	N	1000	<1000
Total Aliphatics M	SOP05	µg/kg	Y	N	1000	<1000
C5-C7 Aromatic M	AN15-1	µg/kg	N	N	1000	<1000
>C7-C8 Aromatic M	AN15-1	µg/kg	N	N	1000	<1000
>C8-C10 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000
>C10-C12 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000
>C12-C16 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000
>C16-C21 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000
>C21-C35 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000
>C35-C44 Aromatic M	SOP05	µg/kg	Y	N	1000	<1000
Total Aromatics M	SOP05	µg/kg	Y	N	1000	<1000
MTBE M	AN15a	µg/kg	N	N	10	<10
Benzene M	AN15a	µg/kg	Y	N	10	<10
Toluene M	AN15a	µg/kg	Y	N	10	<10
Ethylbenzene M	AN15a	µg/kg	Y	N	10	<10
m,p-xylene M	AN15a	µg/kg	Y	N	10	<10
o-Xylene M	AN15a	µg/kg	Y	N	10	<10
Total VPH M	AN15	µg/kg	N	N	1000	<1000
Total TPH M	SOP05	µg/kg	Y	N	1000	<1000



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Project Ref 10110 - Soil samples

Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14

Date Reported: 19 March, 2014

Date Received: 12 March, 2014

Sample Type: Solid

Certificate No: 14/1031/RG/S/C1

File No: 14/1031/RG/S

Client Ref: No order supplied

		Lab sample ref: C174732		C174733		C174734		C174735	
		Client sample ref: WS107 1.5m		WS108 1.8ms		WS109 2.9m		WS109 3.9m	
		Date sampled: 10/03/14		10/03/14		10/03/14		10/03/14	
		Sample matrix (see notes page): S		S		S		S	
Determinand	Method	Units	ISO17025	MCERTS	LOD				
SVOC									
Phenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
bis-(2-chloroethyl) ether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
1,3 - dichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2-chlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
1,4 - dichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
1,2 - dichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
bis(2-chloroisopropyl) ether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2-methylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
N-nitroso-di-n-propylamine	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
hexachloroethane	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
4-methylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Nitrobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Isophorone	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2-nitrophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,4-dimethylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
bis(2-chloroethoxy)-methane	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,4-dichlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
1,2,4 - trichlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Hexa chlorobutadiene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
4-chloro-3-methylphenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,4,6-trichlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-trichlorophenol	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2-chloronaphthalene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Dimethyl phthalate	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,6-dinitrotoluene	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,4-dinitrophenol	SOP04	mg/kg	Y	N	1	<1	<1	<1	<1
Dibenzofuran	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2,4-dinitrotoluene	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5	<0.5	<0.5
4-nitrophenol	SOP04	mg/kg	Y	N	1	<1	<1	<1	<1
Fluorene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Diethylphthalate	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
4-chlorophenyl-phenylether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
2-methyl-4,6-dinitrophenol	SOP04	mg/kg	Y	N	1	<1	<1	<1	<1
N-nitrosodiphenylamine	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
4-bromophenyl phenyl ether	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Pentachlorophenol	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Carbazole	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Dibutyl phthalate	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Benzyl butyl phthalate	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Bis(2-ethylhexyl) phthalate	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5	<0.5	<0.5
Di-n-octyl phthalate	SOP04	mg/kg	Y	N	0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	SOP04	mg/kg	Y	N	0.1	<0.1	<0.1	<0.1	<0.1



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Project Ref 10110 - Soil samples

Date Tested: 13/03/14, 14/03/14, 17/03/14, 19/03/14

Date Reported: 19 March, 2014

Date Received: 12 March, 2014

Sample Type: Solid

Certificate No: 14/1031/RG/S/C1

File No: 14/1031/RG/S

Client Ref: No order supplied

					Lab sample ref: C174732	C174734	C174735
					Client sample ref: WS107 1.5m	WS109 2.9m	WS109 3.9m
					Date sampled: 10/03/14	10/03/14	10/03/14
					Sample matrix (see notes page):	S	S
Determinand	Method	Units	ISO17025	MCERTS	LOD		
VOC							
Vinyl chloride _M	AN15a	µg/kg	Y	N	10	<10	<10
Bromomethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Trichlorofluoromethane _M	AN15a	µg/kg	Y	N	10	<10	<10
1,1-Dichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10
2,2-Dichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10
Bromochloromethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Chloroform _M	AN15a	µg/kg	Y	N	10	<10	<10
1,1,1-Trichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Carbon tetrachloride _M	AN15a	µg/kg	Y	N	10	<10	<10
1,1-Dichloropropene _M	AN15a	µg/kg	Y	N	10	<10	<10
Benzene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2-Dichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Trichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2-Dichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10
Dibromomethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Bromodichloromethane _M	AN15a	µg/kg	Y	N	10	<10	<10
cis-1,3-Dichloropropene _M	AN15a	µg/kg	Y	N	10	<10	<10
Toluene _M	AN15a	µg/kg	Y	N	10	<10	<10
trans-1,3-Dichloropropene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,1,2-Trichloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Tetrachloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,3-Dichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2-Dibromoethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Chlorobenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
Ethylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
m,p-xylene _M	AN15a	µg/kg	Y	N	10	<10	<10
o-Xylene _M	AN15a	µg/kg	Y	N	10	<10	<10
Styrene _M	AN15a	µg/kg	Y	N	10	<10	<10
Bromoform _M	AN15a	µg/kg	Y	N	10	<10	<10
iso-Propylbenzene _M	AN15a	µg/kg	Y	N	10	<10	11
Bromobenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2,3-Trichloropropane _M	AN15a	µg/kg	Y	N	10	<10	<10
n-Propylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
2-Chlorotoluene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,3,5-Trimethylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
4-Chlorotoluene _M	AN15a	µg/kg	Y	N	10	<10	<10
tert-Butylbenzene _M	AN15a	µg/kg	Y	N	10	<10	16
1,2,4-Trimethylbenzene _M	AN15a	µg/kg	Y	N	10	<10	63
sec-Butylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,3-Dichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10
1,4-Dichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10
n-Butylbenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2-Dichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2-Dibromo-3-chloro-propane _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2,4-Trichlorobenzene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10
Hexachlorobutadiene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,2,3-Trichlorobenzene _M	AN15a	µg/kg	Y	N	10	<10	<10
1,1,2,2-Tetrachloroethane _M	AN15a	µg/kg	Y	N	10	<10	<10
1,1-Dichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10
4-isopropyltoluene _M	AN15a	µg/kg	Y	N	10	<10	<10
Chlorodibromomethane _M	AN15a	µg/kg	Y	N	10	<10	<10
Cis - 1,2 - dichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10
Naphthalene (VOC) _M	AN15a	µg/kg	Y	N	10	<10	<10
trans-1,2-Dichloroethylene _M	AN15a	µg/kg	Y	N	10	<10	<10

Notes

- All analyses performed on the sample dried at <30°C, except analyses suffixed with 'M'.
- Analyses suffixed 'M' were performed on the sample as received and corrected for % moisture at <30°C where applicable.
- All results are expressed as dry weight.
- MCERTS accreditation applicable to Sample Matrix 'S' only.
- Natural stones (pebbles, gravels etc.) which do not pass a 2mm sieve are excluded from dried analyses.
- Tests marked * indicate subcontracted analyses.
- NAD denotes 'No Asbestos Detected'.
- The laboratory has tested the material/items supplied by the client as sampled in accordance with the client's own requirements.
- *Sample Description key: 1. - Sand, 2. Loam, 3. Clay, 4. Sand/loam mix, 5. Sand/clay mix, 6. Clay/loam mix, 7. Other.
suffixed with: A - Stones, B - Construction rubble, C - Visible Hydrocarbons, D - Vegetation, E - Glass/metal, F - Strong odour, G - Other.
- Leachate preparation is not included in our UKAS accreditation.
- Dates of testing for all parameters are available upon request.

Signed for, and on behalf of Exova (UK) Ltd.

Prepared by:

F Barr

F Barr
Administrator

Approved by:

Julie McElery

J McElery
Laboratory Manager





Test Certificate

Client: E3P
Office 4, Heliport, Liverpool Road, Eccles
Site: Tetrosyl - Project Ref 10110 - Soil samples
Date Tested: 04/01/14, 04/02/14
Date Reported: 2 April, 2014
Date Received: 26 March, 2014
Sample Type: Liquid

Certificate No: 14/1272/RG/W/C1
File No: 14/1272/RG/W
Client Ref: 10-110

Determinand	Method	Units	ISO17025	LOD	Lab sample ref:	C175856	C175857	C175858	C175859	C175860	C175861
					Client sample ref:	WS104	WS106	WS107	WS108	WS109	WS113
					Date sampled:	24/03/14	24/03/14	24/03/14	24/03/14	24/03/14	24/03/14
					Sample matrix:	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid
Deviation Assessment											
Deviation(s)	C. Review	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MTBE (w)	AN15	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5
BTEX (w)											
Benzene (w)	AN15	µg/l	Y	5	86	123	<5	<5	<5	<5	<5
Toluene (w)	AN15	µg/l	Y	5	21008	24297	<5	<5	<5	<5	<5
Ethylbenzene (w)	AN15	µg/l	Y	5	513	943	<5	<5	<5	<5	<5
m,p-Xylene (w)	AN15	µg/l	Y	5	1337	3541	<5	<5	<5	<5	<5
o-Xylene (w)	AN15	µg/l	Y	5	422	1008	<5	<5	<5	<5	<5
TPH Banded(Alk/Aro) (w)											
>C6-C8 Aliphatic (w)	AN15-1	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C7-C8 Aromatic (w)	AN15-1	mg/l	N	0.01	2.27	5.49	<0.01	<0.01	<0.01	<0.01	<0.01
C5-C6 Aliphatic (w)	AN15-1	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
C5-C7 Aromatic (w)	AN15-1	mg/l	N	0.01	21.09	24.42	<0.01	<0.01	<0.01	<0.01	<0.01
>C8-C10 Aliphatic (w)	AN34	mg/l	N	0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01
>C8-C10 Aromatic (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C10-C12 Aliphatic (w)	AN34	mg/l	N	0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
>C10-C12 Aromatic (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C12-C16 Aliphatic (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C12-C16 Aromatic (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C16-C35 Aliphatic (w)	AN34	mg/l	N	0.01	0.04	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C16-C21 Aromatic (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C21-C36 Aromatic (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C35-C44 Aliphatics(w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C35-C44 Aromatics(w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Aliphatics (w)	AN34	mg/l	N	0.01	0.04	0.07	0.02	<0.01	<0.01	<0.01	<0.01
Total Aromatics (w)	AN34	mg/l	N	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01



Test Certificate

Client: E3P
Office 4, Heliport, Liverpool Road, Eccles
Site: Tetrosyl - Project Ref 10110 - Soil samples
Date Tested: 04/01/14, 04/02/14
Date Reported: 2 April, 2014
Date Received: 26 March, 2014
Sample Type: Liquid

Certificate No: 14/1272/RG/W/C1
File No: 14/1272/RG/W
Client Ref: 10-110

		Lab sample ref: C175856		C175857		C175858		C175859		C175860		C175861	
		Client sample ref: WS104		WS106		WS107		WS108		WS109		WS113	
		Date sampled: 24/03/14		24/03/14		24/03/14		24/03/14		24/03/14		24/03/14	
		Sample matrix: Liquid		Liquid		Liquid		Liquid		Liquid		Liquid	
Determinand	Method	Units	ISO17025	LOD									
SVOC (w)													
phenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bis(2-chloroethyl)ether	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-dichlorobenzene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-chlorophenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-dichlorobenzene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-dichlorobenzene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bis(2-chloroisopropyl)ether	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-methylphenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-nitroso-di-n-propylamine	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hexachloroethane	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-methylphenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
nitrobenzene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
isophorone	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-nitrophenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-dimethylphenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bis(2-chloroethoxy)methane	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-dichlorophenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
naphthalene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hexachlorobutadiene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-chloro-3-methylphenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-methylnaphthalene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,6-trichlorophenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,5-trichlorophenol	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-chloronaphthalene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
acenaphthylene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
dimethylphthalate	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,6-dinitrotoluene	SOP04a	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
acenaphthene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-dinitrophenol	SOP04a	µg/l	Y	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
dibenzofuran	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-dinitrotoluene	SOP04a	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4-nitrophenol	SOP04a	µg/l	Y	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
fluorene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
diethylphthalate	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-chlorophenyl-phenyl ether	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4,6-dinitro-2-methylphenylphenol	SOP04a	µg/l	Y	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-nitrosodiphenylamine	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-bromophenyl-phenyl ether	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hexachlorobenzene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pentachlorophenol	SOP04a	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
phenanthrene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	2.1
anthracene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
carbazole	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
di-n-butyl phthalate	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
fluoranthene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pyrene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
butyl benzyl phthalate	SOP04a	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
benzo(a)anthracene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
chrysene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bis 2-ethylhexyl phthalate.	SOP04a	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
d-n-octyl phthalate	SOP04a	µg/l	Y	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
benzo(b)fluoranthene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
benzo(k)fluoranthene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
benzo(a)pyrene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
indeno(123-cd)pyrene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
dibenzo(ah)anthracene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
benzo(ghi)perylene	SOP04a	µg/l	Y	1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes

1. Tests marked * indicate subcontracted analyses.
2. The laboratory has tested the material/items supplied by the client as sampled in accordance with the client's own requirements.
3. Results reported for metals are 'dissolved' unless otherwise stated.
4. Dates of testing for all parameters are available upon request.

Signed for, and on behalf of Exova (UK) Ltd.

Prepared by:

Claire McLaughlin

C McLaughlin
Administrator

Approved by:

Julie McElroy

J McElroy
Laboratory Manager



0568

The contents of this document are governed by the terms and conditions overleaf.
Registered Office: Exova (UK) Ltd, Lochard Industrial Estate, Newbridge, Midlothian, EH26 8PL, United Kingdom. Reg No. SC 70429



Test Certificate

Client: E3P
Office 4, Heliport, Liverpool Road, Eccles
Site: Tetrosyl - Soil samples
Date Tested: 04/03/14, 04/07/14
Date Reported: 7 April, 2014
Date Received: 1 April, 2014
Sample Type: Solid

Certificate No: 14/1333/G/S/C1
File No: 14/1333/G/S
Client Ref: 10110-231-md

Lab sample ref:	C176240	C176241	C176242	C176243	C176244
Client sample ref:	WS110 0.2m	WS110 0.5m	WS110 1.0m	WS111 0.2m	WS111 0.5m
Date sampled:	14/03/14	14/03/14	14/03/14	14/03/14	14/03/14
Sample matrix (see notes page):	S	S	S	S	S

Determinand	Method	Units	ISO17025	LOD					
TPH Banded(Alil/Aro) 1									
EC>5-6 Aliphatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>6-8 Aliphatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>8-10 Aliphatic	SOP05a	µg/kg	Y	1000	5500	<1000	<1000	<1000	<1000
EC>10-12 Aliphatic	SOP05a	µg/kg	Y	1000	20700	<1000	<1000	<1000	<1000
EC>12-16 Aliphatic	SOP05a	µg/kg	Y	1000	26900	1300	3000	1200	<1000
EC>16-35 Aliphatic	SOP05a	µg/kg	Y	1000	22600	10900	23400	37900	8100
EC>35-44 Aliphatic	SOP05a	µg/kg	Y	1000	3200	<1000	8100	21500	2900
Total Aliphatics (1)	SOP05a	µg/kg	Y	1000	78900	12200	34500	60600	11000
EC>5-7 Aromatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>7-8 Aromatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>8-10 Aromatic	SOP05a	µg/kg	Y	1000	1700	<1000	<1000	<1000	<1000
EC>10-12 Aromatic	SOP05a	µg/kg	Y	1000	1400	<1000	<1000	<1000	<1000
EC>12-16 Aromatic	SOP05a	µg/kg	Y	1000	3200	<1000	9000	2900	<1000
EC>16-21 Aromatic	SOP05a	µg/kg	Y	1000	3700	5300	16600	11100	<1000
EC>21-35 Aromatic	SOP05a	µg/kg	Y	1000	12200	12700	18200	142200	6200
EC>35-44 Aromatic	SOP05a	µg/kg	Y	1000	1700	2500	15300	100700	5600
Total Aromatics (1)	SOP05a	µg/kg	Y	1000	23900	20500	59100	256900	11800
Methyl t-butyl ether	SOP05	µg/kg	N	10	<10	<10	<10	<10	<10
Benzene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
Toluene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
Ethylbenzene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
m&p-Xylene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
o-Xylene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
Total VPH	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
TPH	SOP05a	µg/kg	Y	1000	102800	32700	93600	317500	22800



Test Certificate

Client: E3P

Office 4, Heliport, Liverpool Road, Eccles

Site: Tetrosyl - Soil samples

Date Tested: 04/03/14, 04/07/14

Date Reported: 7 April, 2014

Date Received: 1 April, 2014

Sample Type: Solid

Certificate No: 14/1333/G/S/C1

File No: 14/1333/G/S

Client Ref: 10110-231-md

Lab sample ref:	C176245	C176246	C176247	C176248	C176249
Client sample ref:	WS112 0.3m	WS112 1.3m	WS113 0.4m	WS113 2.2m	WS114 0.6m
Date sampled:	14/03/14	14/03/14	14/03/14	14/03/14	14/03/14
Sample matrix (see notes page):	S	S	S	S	S

Determinand	Method	Units	ISO17025	LOD					
TPH Banded(Alil/Aro) 1									
EC>5-6 Aliphatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>6-8 Aliphatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>8-10 Aliphatic	SOP05a	µg/kg	Y	1000	<1000	<1000	<1000	<1000	<1000
EC>10-12 Aliphatic	SOP05a	µg/kg	Y	1000	<1000	<1000	1900	<1000	<1000
EC>12-16 Aliphatic	SOP05a	µg/kg	Y	1000	1100	<1000	158300	<1000	5500
EC>16-35 Aliphatic	SOP05a	µg/kg	Y	1000	13100	6200	609500	12000	36300
EC>35-44 Aliphatic	SOP05a	µg/kg	Y	1000	1400	<1000	23100	4300	<1000
Total Aliphatics (1)	SOP05a	µg/kg	Y	1000	15600	6200	792800	16300	41800
EC>5-7 Aromatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>7-8 Aromatic	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
EC>8-10 Aromatic	SOP05a	µg/kg	Y	1000	<1000	<1000	<1000	<1000	<1000
EC>10-12 Aromatic	SOP05a	µg/kg	Y	1000	<1000	<1000	<1000	<1000	<1000
EC>12-16 Aromatic	SOP05a	µg/kg	Y	1000	<1000	<1000	36300	1200	1000
EC>16-21 Aromatic	SOP05a	µg/kg	Y	1000	<1000	<1000	172000	3400	8500
EC>21-35 Aromatic	SOP05a	µg/kg	Y	1000	2100	<1000	129500	10500	8700
EC>35-44 Aromatic	SOP05a	µg/kg	Y	1000	<1000	<1000	22200	7400	<1000
Total Aromatics (1)	SOP05a	µg/kg	Y	1000	2100	<1000	360000	22500	18200
Methyl t-butyl ether	SOP05	µg/kg	N	10	<10	<10	<10	<10	<10
Benzene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
Toluene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
Ethylbenzene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
m&p-Xylene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
o-Xylene (VPH)	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
Total VPH	SOP05	µg/kg	Y	10	<10	<10	<10	<10	<10
TPH	SOP05a	µg/kg	Y	1000	17700	6200	1152800	38800	60000



Test Certificate

Client: E3P
Office 4, Heliport, Liverpool Road, Eccles
Site: Tetrosyl - Soil samples
Date Tested: 04/03/14, 04/07/14
Date Reported: 7 April, 2014
Date Received: 1 April, 2014
Sample Type: Solid

Certificate No: 14/1333/G/S/C1
File No: 14/1333/G/S
Client Ref: 10110-231-md

Lab sample ref: C176250
Client sample ref: WS114 1.5m
Date sampled: 14/03/14
Sample matrix (see notes page): S

Determinand	Method	Units	ISO17025	LOD	
TPH Banded(Al/Aro) 1					
EC>5-6 Aliphatic	SOP05	µg/kg	Y	10	<10
EC>6-8 Aliphatic	SOP05	µg/kg	Y	10	<10
EC>8-10 Aliphatic	SOP05a	µg/kg	Y	1000	<1000
EC>10-12 Aliphatic	SOP05a	µg/kg	Y	1000	<1000
EC>12-16 Aliphatic	SOP05a	µg/kg	Y	1000	<1000
EC>16-35 Aliphatic	SOP05a	µg/kg	Y	1000	1500
EC>35-44 Aliphatic	SOP05a	µg/kg	Y	1000	<1000
Total Aliphatics (1)	SOP05a	µg/kg	Y	1000	1500
EC>5-7 Aromatic	SOP05	µg/kg	Y	10	<10
EC>7-8 Aromatic	SOP05	µg/kg	Y	10	<10
EC>8-10 Aromatic	SOP05a	µg/kg	Y	1000	<1000
EC>10-12 Aromatic	SOP05a	µg/kg	Y	1000	<1000
EC>12-16 Aromatic	SOP05a	µg/kg	Y	1000	<1000
EC>16-21 Aromatic	SOP05a	µg/kg	Y	1000	<1000
EC>21-35 Aromatic	SOP05a	µg/kg	Y	1000	1400
EC>35-44 Aromatic	SOP05a	µg/kg	Y	1000	<1000
Total Aromatics (1)	SOP05a	µg/kg	Y	1000	1400
Methyl t-butyl ether	SOP05	µg/kg	N	10	<10
Benzene (VPH)	SOP05	µg/kg	Y	10	<10
Toluene (VPH)	SOP05	µg/kg	Y	10	<10
Ethylbenzene (VPH)	SOP05	µg/kg	Y	10	<10
m&p-Xylene (VPH)	SOP05	µg/kg	Y	10	<10
o-Xylene (VPH)	SOP05	µg/kg	Y	10	<10
Total VPH	SOP05	µg/kg	Y	10	<10
TPH	SOP05a	µg/kg	Y	1000	2900

Notes

- All analyses performed on the sample dried at <30°C, except analyses suffixed with 'M'.
- Analyses suffixed 'M' were performed on the sample as received and corrected for % moisture at <30°C where applicable.
- All results are expressed as dry weight.
- MCERTS accreditation applicable to Sample Matrix 'S' only.
- Natural stones (pebbles, gravels etc.) which do not pass a 2mm sieve are excluded from dried analyses.
- Tests marked * indicate subcontracted analyses.
- The laboratory has tested the material/items supplied by the client as sampled in accordance with the client's own requirements.
- *Sample Description key: 1. - Sand, 2. Loam, 3. Clay, 4. Sand/loam mix, 5. Sand/clay mix, 6. Clay/loam mix, 7. Other.
suffixed with: A - Stones, B - Construction rubble, C - Visible Hydrocarbons, D - Vegetation, E - Glass/metal, F - Strong odour, G - Other.
- Leachate preparation is not included in our UKAS accreditation.
- Dates of testing for all parameters are available upon request.

Signed for, and on behalf of Exova (UK) Ltd.

Prepared by:

F Barr
Administrator

Approved by:

C McGinty
Inorganics Head of Section



0568

APPENDIX VI

E3P EXPLORATORY LOGS



Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

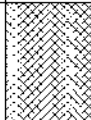
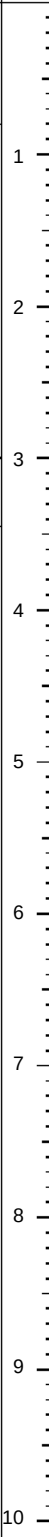
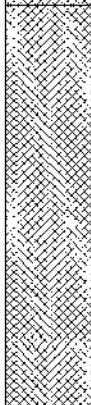
Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES		0.80			MADE GROUND: Dark brown clayey gravelly fine to coarse sand. Gravel is fine to medium sub-angular brick sandstone.	
		1.00 1.00 - 1.45	D	N=11 (1,2/2,3,3,3)				MADE GROUND: Stiff brown gravelly clay. Gravel is occasional brick gritstone sandstone shale.	
		2.00 2.00 - 2.45	D	N=23 (3,4/5,5,6,7)	3.00				
		2.50		N=16 (21 for 0mm/16 for 0mm)					
		3.00 3.00 - 3.45	D	N=32 (5,6/7,7,8,10)				MADE GROUND: Stiff brown gravelly clay. Gravel is occasional brick gritstone sandstone shale.	
					3.45			End of borehole at 3.45 m	

Remarks

Refusal - No water strikes.





Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.60	ES					Brown very stiff slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded gritstone sandstone shale.	1
		1.00							
		1.00 - 1.45	D	N=43 (3,3/8,12,15,8)					
		1.50			1.50				
		1.50 - 1.60	D	N=50 (6,12/50 for 236mm)	1.70			Light brown medium coarse sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded gritstone.	2
								End of borehole at 1.70 m	
									3
									4
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.10 0.18 0.45			MADE GROUND: Soft to firm brown clay with rootlets.	
		1.00		N=15 (2,3/3,4,4,4)				MADE GROUND: Yellow medium coarse sandy gravel. Gravel is fine to medium sub-angular gritstone.	1
		2.00		N=50 (4,4/8,13,15,14)				MADE GROUND: Firm black brown slightly gravelly clay. Gravel is fine to medium sub-angular shale.	2
					2.45			Stiff to very stiff gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded sandstone gritstone shale.	
								End of borehole at 2.45 m	3
									4
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES					MADE GROUND: Firm to stiff brown slightly sandy gravelly clay. Sand is fine to medium. Gravel is fine to medium angular to sub-angular brick ash and clinker.	
		1.00		N=1 (1,0/0,0,0,1)	1.00			MADE GROUND: Dark brown slightly clayey gravelly fine to coarse sand. Gravel is fine to medium angular to sub-angular ash sandstone shale.	1
		1.50	ES						
		2.00		N=9 (2,2/2,3,2,2)	1.90			Firm to stiff brown slightly sandy gravelly clay. Gravel is fine to medium shale sandstone and gritstone.	2
		2.50	ES						
		3.00		N=9 (3,3/3,2,2,2)					3
		4.00		N=50 (4,6/50 for 285mm)	3.80			Yellow grey very sandy GRAVEL. Sand is coarse. Gravel is fine to coarse sub-angular to sub-rounded gritstone.	4
					4.45			End of borehole at 4.45 m	
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

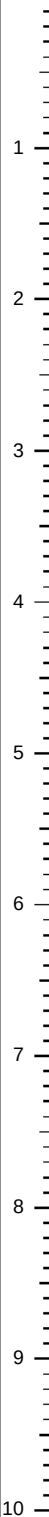
Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES		0.30			MADE GROUND: Black medium coarse sandy gravel. Gravel is fine to coarse sub-angular occasional ash gritstone brick.	
					0.70			MADE GROUND: Black gravelly clay. Gravel is fine to coarse sub-angular occasional ash gritstone brick.	
		1.00		N=8 (2,2/2,2,2,2)	1.00			MADE GROUND: Black medium coarse sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded occasional ash brick gritstone.	
		1.00 - 1.45	D					MADE GROUND: Grey yellow clayey boulders. Boulders are sub-angular gritstone.	
		1.20	ES		1.70			MADE GROUND: Clayey medium coarse sandy gravel. Gravel is sub-angular ash.	
		2.00		N=0 (1,0/0,0,0,0)	2.00			MADE GROUND: Very soft black grey gravelly sandy clay. Gravel is fine to medium sub-angular to sub-rounded occasional ash brick gritstone.	
		2.00 - 2.45	D						
		2.30	ES		2.70			MADE GROUND: Soft grey brown slightly medium coarse sandy gravelly clay. Gravel is medium to coarse sub-angular to sub-rounded brick gritstone.	
		3.00		N=40 (5,8/40 for 255mm)	3.17			MADE GROUND: Soft grey brown slightly medium coarse sandy gravelly clay. Gravel is medium to coarse sub-angular to sub-rounded brick gritstone.	
		3.00 - 3.37	D		3.37			End of borehole at 3.17 m	

Remarks
Refusal



Borehole Log

Borehole No.

WS106

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES					MADE GROUND: Stiff brown sandy gravelly clay. Gravel is fine to coarse brick shale gritstone.	1
		1.00		N=6 (1,1/1,2,1,2)					
		1.00 - 1.45	D		1.50				
		1.90	ES	N=8 (2,2/2,2,2,2)				MADE GROUND: Soft grey brown gravelly clay. Gravel is fine to medium sub-angular brick gritstone. Moderate odour.	2
		2.00	D		2.20				
		2.00 - 2.45						MADE GROUND: Firm to stiff slightly gravelly gravelly clay. Gravel is fine sub-angular brick grit stone.	3
		3.00		N=33 (6,6/8,9,8,8)	3.00			MADE GROUND: Firm to stiff slightly gravelly gravelly clay. Gravel is fine sub-angular brick gritstone.	3
		3.20	ES						
		3.50		0 (50 for 95mm/0 for 0mm)	3.59			End of borehole at 3.59 m	4
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS107

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20			MADE GROUND: Grey white medium coarse sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded gritstone.	
		0.70	ES					MADE GROUND: Black fine to medium sandy gravel. Gravel is fine to medium sub-angular to sub-rounded ash coal brick gritstone.	1
		1.00		N=0 (1,0/0,0,0,0)	1.20				
		1.50	ES					MADE GROUND: Very soft grey gravelly sandy clay. Gravel is fine to medium sub-angular to sub-rounded ash brick gritstone.	2
		2.00		N=0 (1,0/0,0,0,0)	2.50				
		2.70		35 (25,15/35 for 180mm)	2.70			Yellow grey very sandy GRAVEL. Sand is coarse. Gravel is fine to coarse sub-angular to sub-rounded gritstone.	3
								End of borehole at 2.88 m	
									4
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS108

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES	N=15 (2,7/6,5,2,2) N=4 (2,1/1,1,1,1) N=5 (1,1/2,1,1,1) N=5 (1,1/1,2,1,1) N=23 (3,4/4,6,6,7)	0.10			MADE GROUND: Asphalt. MADE GROUND: Firm to stiff grey gravelly clay. Gravel is medium sub-angular to sub-rounded gritstone brick.	1
		1.00			1.15			MADE GROUND: Grey gravelly medium coarse sand. Gravel is fine to medium sub-angular to sub-rounded gritstone.	
		1.80			1.55			MADE GROUND: Firm grey gravelly clay. Gravel is fine to medium sub-angular to sub-rounded brick gritstone sandstone shale.	2
		2.00							
		3.00			3.00			MADE GROUND: Orange brown sand.	3
					3.30				
		4.00			4.00			MADE GROUND: Firm grey gravelly clay. Gravel is fine to medium sub-angular to sub-rounded brick gritstone sandstone shale.	4
								MADE GROUND: Firm grey gravelly clay. Gravel is fine to medium sub-angular to sub-rounded brick gritstone sandstone shale.	
		5.00							5
					5.45			End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS109

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Black gravelly medium coarse sand. Gravel is fine to medium brick sandstone.	
								MADE GROUND: Grey white medium coarse sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded occasional brick gritstone sandstone.	1
		1.00		N=13 (11,8/3,4,4,2)	1.20				
		2.00						MADE GROUND: Very stiff grey brown gravelly clay. Gravel is sub-angular fine to medium sandstone brick gritstone.	2
		2.00 - 2.45	D	N=6 (2,2/2,1,2,1)					
		2.90			2.70			MADE GROUND: Soft to firm brown mottled grey CLAY. Unusual odour.	3
		3.00	ES	N=9 (2,2/2,3,2,2)	3.10				
		3.00 - 3.45	D					MADE GROUND: Very stiff grey brown gravelly clay. Gravel is sub-angular fine to medium sandstone brick gritstone.	4
		3.90	ES	N=15 (2,3/3,4,4,4)	4.00			MADE GROUND: Very stiff grey brown gravelly clay. Gravel is sub-angular fine to medium sandstone brick gritstone.	4
		4.00	D						
		4.00 - 4.45							
		5.00		N=50 (8,9/13,13,14,10)	5.45				5
								End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS110

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES	50 (3,3/50 for 160mm)	0.20			MADE GROUND: Concrete.	
		0.50	ES		0.24			MADE GROUND: Soft to firm blue grey clay.	
					0.30			MADE GROUND: Grey clayey fine to medium sandy gravel. Gravel is coarse sub-angular siltstone.	
		1.00			0.75			MADE GROUND: Stiff gravelly clay. Gravel is fine to medium sub-angular to sub-rounded siltstone brick.	
		1.00	ES		0.85			MADE GROUND: Black very clayey gravel. Gravel is fine to medium sub-angular ashphalt.	
		1.00 - 1.45	D		1.00			MADE GROUND: Black brown gravelly clay. Gravel is fine to medium sub-angular ashphalt.	
					1.21			MADE GROUND: Black brown gravelly clay. Gravel is fine to medium sub-angular ashphalt.	
								End of borehole at 1.21 m	

Remarks
Refusal



Borehole Log

Borehole No.

WS111

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES	50 (3,4/50 for 145mm)	0.20			MADE GROUND: Concrete.	
		0.50	ES		0.35			MADE GROUND: Black clayey gravelly fine to medium sand. Gravel is fine sub-angular to sub-rounded brick sandstone ash.	
		1.00						Yellow medium coarse sandy GRAVEL. Gravel is fine to coarse sub-angular fine to coarse sub-angular to sub-rounded gritstone.	1
		1.00 - 1.45	D		1.19			End of borehole at 1.19 m	
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS112

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.21 0.40			MADE GROUND: Concrete.	
								MADE GROUND: Firm to stiff brown fine to medium sandy clay.	
		1.00		N=8 (2,2/2,2,2,2)				MADE GROUND: Yellow brown fine to medium sandy gravel. Gravel is fine to coarse sub-angular sandstone.	1
		1.30	ES		1.25 1.55			MADE GROUND: Soft to firm brown gravelly clay.gravel is fine to medium sub-angular to sub-rounded very fissile sheeted muscovite mica and carbonaceous material.	
		2.00		N=50 (11,11/10,9,19,12)				MADE GROUND: Soft to firm brown gravelly clay.gravel is fine to medium sub-angular to sub-rounded very fissile sheeted muscovite mica and carbonaceous material.	2
					2.45			End of borehole at 2.45 m	
									3
									4
									5
									6
									7
									8
									9
									10

Remarks
Refusal



Borehole Log

Borehole No.

WS113

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES		0.04 0.36			MADE GROUND: Asphalt.	
		1.00			0.90			MADE GROUND: Red grey fine to coarse sandy gravel. Gravel is fine to medium sub-angular brick concrete.	
		1.00 - 1.45	D	N=5 (2,2/2,2,1,0)				MADE GROUND: Very stiff brown gravelly clay. Gravel is fine to medium sub-angular to sub-rounded ash brick sandstone.	1
		2.00							2
		2.20	ES	N=1 (1,0/0,0,0,1)					
		3.00		N=2 (1,0/1,0,1,0)					3
		4.00		N=10 (1,1/2,2,3,3)					4
					4.45			End of borehole at 4.45 m	5
									6
									7
									8
									9
									10

Remarks

Hole collapsing





Borehole Log

Borehole No.

WS114

Sheet 1 of 1

Project Name: Tetrosyl

Project No.
10110

Co-ords: -

Hole Type
WS

Location: Bury

Level:

Scale
1:50

Client: WHR Property Consultants LLP

Dates: 10/03/2014 -

Logged By
J.O'K

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05			MADE GROUND: Asphalt.	
					0.35			MADE GROUND: Yellow brown gravelly fine to medium sand. Gravel is fine to coarse sub-angular to sub-rounded sandstone.	
		0.60	ES					MADE GROUND: Firm to stiff black and brown clayey gravelly sand. Gravel is fine to medium sub-angular to sub-rounded brick clinker ash.	1
		1.00		N=4 (3,2/1,1,1,1)					
		1.00 - 1.45	D		1.20				
		1.50	ES					MADE GROUND: Black and grey gravelly fine to medium sand. Gravel is fine to medium sub-angular sandstone ash.	
		2.00		N=2 (1,0/0,0,1,1)	1.90			MADE GROUND: Firm to stiff light brown CLAY.	2
		3.00		N=1 (3,2/1,0,0,0)	3.00			MADE GROUND: Black clayey gravelly fine to medium sand. Gravel is fine sub-angular to sub-rounded ash clinker fissile micaceous material and carbonaceous material.	3
		4.00		N=2 (2,2/0,0,1,1)					
					4.50			Yellow brown gravelly SAND. Gravel is fine to medium sub-angular gritstone.	4
		5.00		N=10 (2,2/2,2,3,3)					
		5.00 - 5.45	D		5.45			End of borehole at 5.45 m	5
									6
									7
									8
									9
									10

Remarks
Complete

APPENDIX VII

GROUND GAS ASSESSMENT

APPENDIX VIII

PHOTOGRAPHS



Plate 1 – Mill Buildings through central sector of the site



Plate 2 – Western Sector Gatehouse



Plate 3 – Portal Frame Distribution Shed in North West Sector



Plate 4 – Bitumen Tank on Reservoir Dam



Plate 5 – Reservoir Dam Looking East



Plate 6 – Reservoir Looking North



Plate 7 – Dam Looking Southeast Showing Split Level Site



Plate 8 – Solvent Storage Tanks in Farm Northern Sector



Plate 9 - Large Solvent Storage Tanks in Northern Tank Farm



Plate 10 - Solvent Storage Tanks in Central Sector



Plate 11 - View from central sector to east showing split level building



Plate 12 - Far Southern sector showing Underground Tank Farm and Ventilation Pipes



Plate 13 - Building at Eastern Boundary

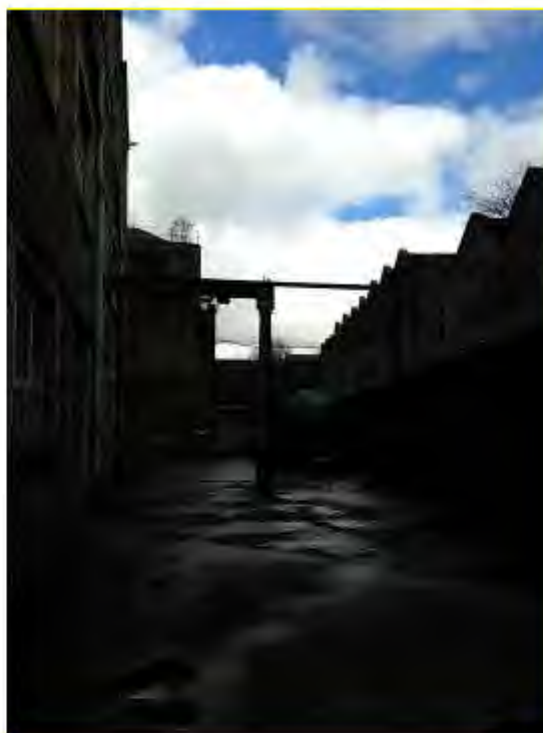


Plate 14 - Building at Eastern Boundary & Solvent Tank



Plate 15 – Wider View of Tank farm to North

APPENDIX IX

TIER 1 CONTAMINATION ASSESSMENT CRITERIA

ORIGIN OF E3P TIER I VALUES

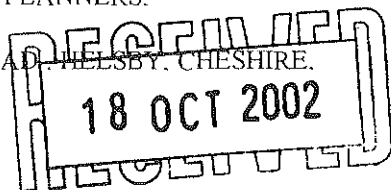
Constituent	Origin of Risk Assessment Value
Arsenic	2009 SGV
Cadmium	LQM CIEH 2 nd Edition 2009
Chromium	LQM CIEH 2 nd Edition 2009
Lead	Residential Half 2003 EA SGV based on planned target blood lead level reduction to 5µg/l. Commercial Calculated using commercial exposure equation within lead SGV 2003 with revised input data from HPA and taking proposed blood lead levels into account.
Mercury	2009 SGV
Nickel	2009 SGV
Selenium	Soil guideline value, DEFRA/Environment Agency
Copper	LQM CIEH 2 nd Edition 2009
Zinc	LQM CIEH 2 nd Edition 2009
Cyanide - Total	CLEA 1.06 Derived Value
Phenols - Total.	LQM CIEH 2 nd Edition 2009 – 1% SOM
Naphthalene	General Assessment Criteria (GAC) developed by CIEH / LQM the using CLEA 1-06 with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene ⁽ⁱ⁾	
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 X

COAL AUTHORITY REPORT



RSK ENVIROMENT LIMITED,
ENGINEERS AND PLANNERS,
SPRING LODGE,
172, CHESTER ROAD, HELSBY, CHESHIRE,
WA6 0AR



This matter is being dealt with by Louise Tipper

Our Ref: **431866-02**

Your Ref: 10468

Electronic Ref:

Date: 17 October 2002

Dear Sir,

Coal Mining Report

**TETROSYL LTD, BEVIS GREEN WORKS, MILL ROAD, WALMERSLEY, BURY,
LANCASHIRE, BL9 6RE**

I refer to the enquiry dated 10th October 2002, received 14th October 2002, in connection with the above.

This report is based on and limited to the records in the possession of The Coal Authority at the time the search is answered.

- Ordnance Survey (O.S.) is undertaking a Positional Accuracy Improvement Programme of its mapping data. The Coal Authority (CA) has no control over the timing of issue of Positionally Improved mapping data by O.S. or over users of that data. In some instances the relative position between surface features and coal mining features may alter as a consequence of this programme. The CA will ensure that the integrity of its database is maintained by replotting some mining information to sustain the relationship between that mining information and the improved O.S. surface positions, some of which are now being released. However, mining reports are currently being produced against pre improved O.S. mapping whilst the Authority updates its database in line with the O.S. changes.

Past Underground Mining

The property is within the likely zone of influence on the surface from workings in 1 seam of coal at shallow depth, the last date of working being 1877.

Present Underground Mining

The property is not within the zone of likely physical influence on the surface from any present underground coal workings.

Future Underground Mining

The property is not within a geographical area for which a licence to extract coal by underground methods is awaiting determination by the Coal Authority.

The property is not within a geographical area for which a licence to extract coal by underground methods has been granted.

—
—
—

Working Facilities Orders

The property is not within a geographical area that is the subject of an Order made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to Owners of Former Copyhold Land

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

Additional Remarks

In view of the mining circumstances a prudent developer would seek appropriate technical advice before works are undertaken on site. All proposals should have regard to good engineering practice in mining areas as identified in authoritative publications on mining stability problems. In any event, no activities should be undertaken that intersect, disturb, or interfere with any coal or mines of coal without permission of the Coal Authority.

These replies are prepared in accordance with the Law Society's Guidance Notes 1998.

We acknowledge the receipt of your remittance in payment of our fee.

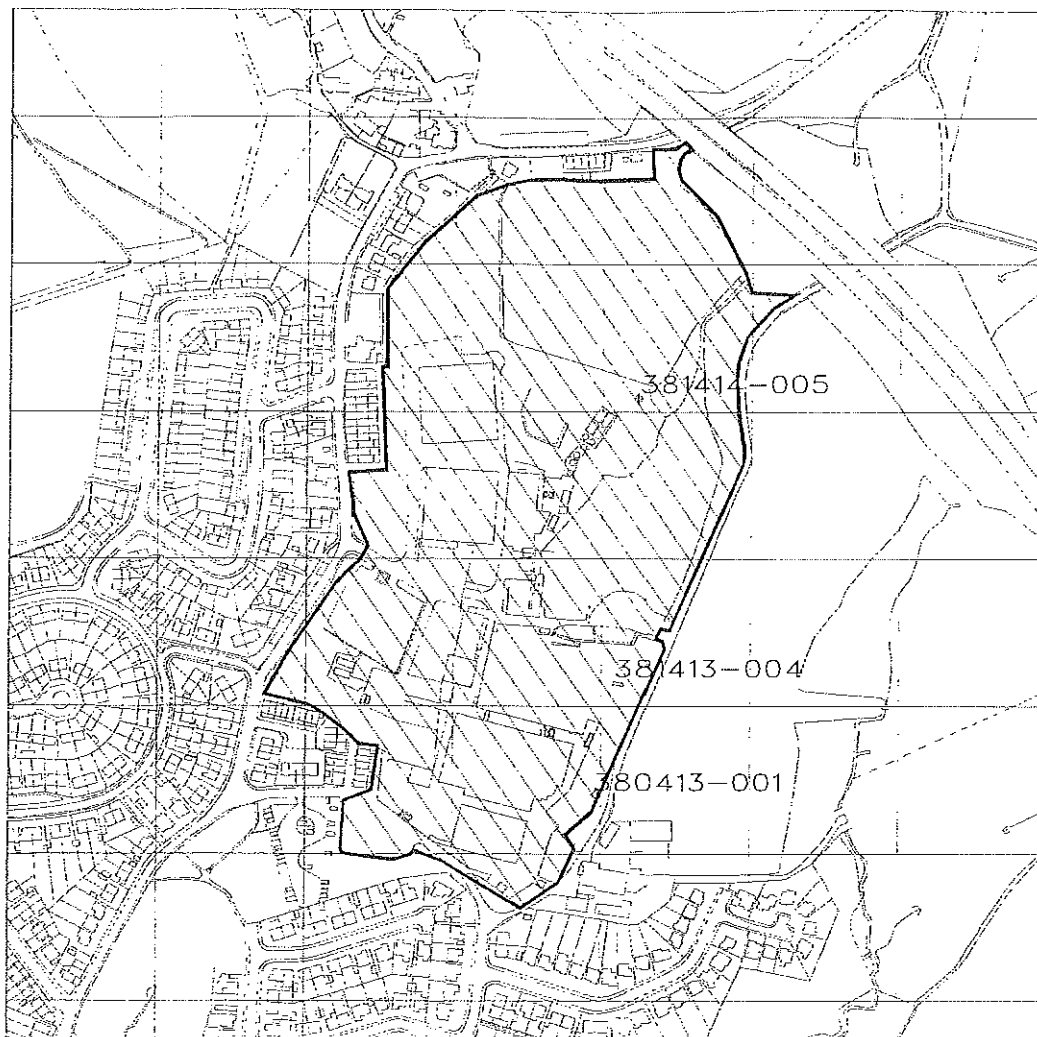
Yours faithfully

A handwritten signature in black ink, appearing to read 'A Schofield', written in a cursive style.

Albert Schofield

Director of Mining Records and Services

—
—



Crown Copyright. Quoted scale is approximate.

SCALE: 1:5000

This map is reproduced from the Ordnance Survey material by The Coal Authority [or division thereof] with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: AL51060A001.

This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN



APPROXIMATE POSITION OF DISUSED MINE SHAFTS SHOWN



APPROXIMATE POSITION OF DISUSED MINE ADITS SHOWN



This plan shows the approximate location of the disused mine entry/entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A DTI leaflet setting out the rights and the obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by telephoning 0845 762 6848.

If you wish to discuss the relevance of any of the information contained in the attached report you should seek the advice of a qualified mining engineer or surveyor. If you or your adviser wish to examine the source plans from which the information has been taken these are available at our Mansfield office, free of charge, by prior appointment, telephone 01623 638233. Should you or your advisor wish to carry out any physical investigations that may enter, disturb or interfere with any disused mine entry the prior permission of the owner must be sought. For coal mine entries the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries). Our emergency telephone number at all times is 01623 646333.

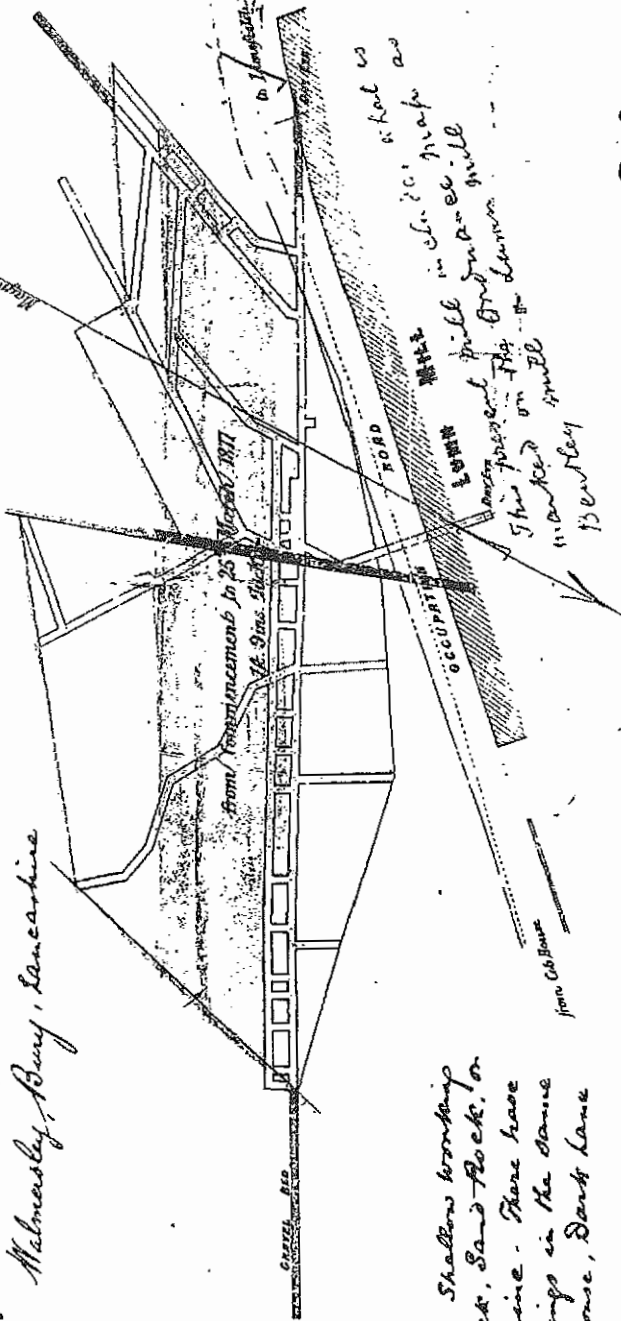


22

SAND ROCK MINES.

48 The Earl of Derby Letters
Mepm-Ed Milnes Apr. - Leeds

Walmersley, Bury, Lancashire



Mem. This is a shallow working in the Rough Rock, Sand Rock, or $3\frac{1}{4}$ Mountain mine. There have been other workings in the same stream at Cold House, Dark Lane &c. adjoining:

Worth Dickinson.
Inspector of Customs
31 October 1897

Scale, 20 yards per Inch -

The diagrams show a cell in three stages of mitosis. The top diagram shows metaphase, with chromosomes aligned at the center. The middle diagram shows anaphase, with sister chromatids separating and moving to opposite poles. The bottom diagram shows telophase, with two new nuclei forming at opposite poles.

W. A. L. L.
D. A. L. L.
B. A. L. L.