



Overarching Geo-Environmental Site Summary

Parcel C, Prescott Miller
13-158-R1
October 2020



OVERARCHING GEO-ENVIRONMENTAL SITE SUMMARY

Parcel C
Carr Lane
Prescot
L34 1JZ

Prepared for:
Miller Homes



Report Ref: 13-158-R1
Date Issued: October 2020

E3P

5 Taylor Road
Trafford Park
Stretford
Manchester
M41 7SW

+ 44 (0) 161 707 9612
<https://e3p.co.uk/>

Registered in England
CRN: 807255262

QUALITY ASSURANCE

PROJECT NUMBER	13-158		
VERSION	Version 1		
REMARKS	Final		
DATE	October 2020		
PREPARED BY	J Oliver		
QUALIFICATIONS	BSc (Hons)		
SIGNATURE			
CHECKED BY	A. Garrity		
QUALIFICATIONS	BSc, MSc, FGS		
SIGNATURE			
AUTHORISED BY	M. Dyer		
QUALIFICATIONS	BSc, FGS, AIEMA, MIEnvSc, CEnv		
SIGNATURE			



EXECUTIVE SUMMARY

Site Address	Parcel C - Land off Carr Lane, Prescott, L34 1JZ	
Grid Reference	E346218, N391982	
Site Area	3.03 Ha.	
Stated Objective	The primary purpose of this report is to summarise the works undertaken on Parcel C within the wider Prescott Park development site.	
Current Site Situation	Parcel C is located within the central sector of the wider development site to the southwest of Parcel A. An adopted highway (spine road) forms the southern and south western boundaries and provides access to the development parcel. The site has since undergone enabling works, with additional upfill works being undertaken ahead of the proposed residential development.	
Proposed Development	The development forms part of the wider mixed commercial and residential Carr Lane development. The proposed development of the site is for 63 No. low-rise residential properties with associated highways and associated infrastructure for adoption.	
Environmental Setting	Drift Geology	Glacial Till – Clay sand and gravels
	Bedrock Geology	Westphalian A Coal Measures
	Hydrogeology	Secondary (undifferentiated) Aquifer – drift Secondary A Aquifer – bedrock geology The nearest licensed groundwater abstraction to the site boundary is approximately 1780m east, which is operated by St Helens and Knowsley Hospitals. The groundwater abstracted is used for drinking, cooking and sanitary processes.
	Hydrology	The closest surface water feature is Prescott Brook which is located 75m northwest from the western boundary. One surface water abstraction is located within a 1km radius of the subject site (approximately 625m northwest). This abstraction is used for irrigation processes and is unlikely to be affected or affect the subject site.
Site History	Parcel C remained largely undeveloped throughout the 20th century with only access tracks and re-enforced concrete and earth retaining walls constructed. All such features have since been removed as part of the large scale remediation and enabling works documented herein. The earth embankment was used to infill the far western portion of Parcel C to create a level plateau, the land was infilled with ash type materials in the late 1940's and early 1950's prior to the construction of the Prysmian Cable Facility that was predominantly located in Parcel A&B. By 1972 the site had been developed and formed part of the larger cable works to the northeast.	



Site History	Prior to the instigation of remediation and enabling works, Parcel C was a spilt level plateau with a re-enforced concrete retaining wall transecting north south through the centre with a large earth retaining embankment supporting the a portion of the large BICC (later) Prysmian Cables main manufacturing building that extended east and north across Parcels A&B. The overarching aim of the remediation and enabling works was to 'civilise' the landform removing the large difference in elevation (and thus the retaining walls) to create a parcel suitable for residential development, this started in the early 2000's as part of the wider site area.
Landfill Sites and Ground Gases	Ground gas monitoring to date suggests that the site will fall into the bracket for Characteristic Situation 2 / Amber 1. Based on the monitoring results to date (6 No. Surveys) the site would be classified as CS2 which will require specialist mitigation measures to be constructed in accordance with BS8485. This ground gas risk assessment has been approved by Knowsley Metropolitan Borough Council. BS8485 requires that for Characteristic Situation 2 the proposed low rise development constructed using a cast in-situ (suspended) floor slab will require the correct ground gas mitigation measures to be installed and validated. There is one active registered Landfill within 250m of the site boundary and three historical landfills are present within 250m of the site boundary, one of which straddles the western boundary of the site on the historical maps. These landfill sites have the potential for the migration of ground gas on to the site, particularly the historical landfill on the western boundary and as such will require the correct protective measures, as specified from the gas monitoring findings.
Radon	According to the Landmark Report, the site is located within an area where less than 1% of homes are affected by elevated levels of radon gas BRE Radon Atlas confirm that specific radon gas protective measures are not required for new structures (including residential, commercial or industrial) at the site.
Coal Mining/Land Stability	Known historical coal workings beneath Parcel C in the south west sector posed a potential stability risk. These workings were proven at a shallow depth with insufficient rick cover and so were pressure grouted to ensure stability as outlined within the geotechnical assessment.

INTRUSIVE GROUND INVESTIGATION

Site Investigation Works	The following phases of environmental work have previously been carried out at the site:  WSP – Phase 1 Geo-Environmental Site Investigation Ref 12121590/002, dated January 2008;  WSP – Phase 2 Geo-Environmental Site Investigation, Ref 12121590/002 dated June 2008.
---------------------------------	---



Site Investigation Works	 E3P – Remediation and Enabling Works Strategy, Land at Carr Lane, Prescott, Ref: 10-021-R4-RevA, dated June 2014.  E3P– Supplementary Site Investigation Works & Contaminants Assessment Ref: 10-021-9C Dated March 2015. Prepared for Knowsley Metropolitan Borough Council .
Ground Conditions	MADE GROUND A reworked topsoil comprising a dark grey to black sandy clay with a gravel of brick, ash and clinker was encountered in the WSP investigation from ground level to a maximum depth of 1.10m bgl This material is underlain by a reworked soft to firm dark brown to black sandy clay with a gravel of brick sandstone, ash, clinker and coal with some wood, glass and metal content. This material was encountered by WSP from 0.10m bgl to a maximum depth of 3.70m bgl. Coal was recorded in rb8 at 23.5m bgl to 23.5m bgl Within the E3P investigation A reworked topsoil was encountered from ground level to a maximum depth of 0.60m bgl. Underlying the topsoil, a reworked firm to stiff clay with a gravel of brick, concrete, glass, coal and metal was encountered at depths of 0.45m bgl to 3.60m bgl. A brown to red clayey gravel of brick, sandstone and mudstone was also encountered at depth ranging from 0.20m bgl to 2.20m bgl. A black ashy gravel of ash, brick, coal concrete and sandstone was also encountered between 0.30m bgl and 2.90m bgl The ground conditions following the completed enabling works are different to those encountered during the ground investigations. Current depths of Made Ground are between 8.0m bgl in the east and 3.0m bgl in the west Drift Glacial Till present as a firm to stiff CLAY with a gravel of mudstone was encountered in the WSP ground investigation at depths ranging from 1.20 m bgl to 3.80 m bgl. The depth of Made Ground was not fully proven in TP11 In the E3P investigation glacial till in the form of firm to stiff brown mottled CLAY with a gravel of sandstone and mudstone was encountered at depths between 0.90m bgl 4.10m bgl In TP101 a light brown SAND was present 2.80m bgl to 3.30m bgl. Bedrock - The solid geology was not encountered during the E3P Trial Pitting exercise IN the WSP site investigation the solid geology was encountered as MUDSTONE and SANDSTONE in RB8 at 2.60m bgl proven to 30.0m bl Weak MUDSTONE was also encountered in TP10 at 3.50m bgl to 3.70m bgl.



CONTAMINATED LAND ASSESSMENT

Human Health	The Tier I Risk Assessment for the protection of human health and controlled waters confirmed the site would pose no unacceptable level of risk to future site occupants or the wider environ subject to the construction of the necessary protective measures. Asbestos fibres were identified within the anthropogenic soils and as such all earthworks needed to be managed in strict accordance with the methodologies presented within the E3P Remediation Strategy. The necessary legislative bodies have approved the remediation works and a Validation Report has been submitted to KMBC in pursuance of satisfaction of the relevant planning condition.
Controlled Waters	E3P have completed supplementary groundwater and soil leachate sampling within trial pits across the site. No sources of contamination have been identified. And no exceedances have been recorded in samples submitted for analysis. Therefore, it has been determined that this site poses no risk to controlled waters and the wider environ and as such no further action is required. The controlled waters risk assessment has previously been approved by the EA.
Ground Gas	Ground gas monitoring to date suggests that the site will fall into the bracket for Characteristic Situation 2 / Amber 1. Based on the monitoring results to date (6 No. Surveys) the site would be classified as CS2 which will require specialist mitigation measures to be constructed in accordance with BS8485. BS8485 requires that for Characteristic Situation 2 the proposed low rise development constructed using a cast in-situ (suspended) floor slab will require the correct ground gas mitigation measures to be installed and validated.
Landfills	There is one active registered Landfill within 250m of the site boundary (approximately 248m to the northwest). No information about the type of waste accepted or the lifespan of the landfill have been provided with the Landmark Report. Three historical landfills are present within 250m of the site boundary, one of which straddles the western boundary of the site on the historical maps. No information about the type of waste. These landfill sites have the potential for the migration of ground gas on to the site, particularly the historical landfill on the western boundary and as such will require the correct protective measures as specified from the gas monitoring findings.
Portable water infrastructure	Following the cut and fill earthworks, Polyethylene pipeline will be suitable for the potable water infrastructure in the near surface soils between 0.75 and 0.9m bgl.



GEOTECHNICAL ASSESSMENT

Underground Obstructions	All below ground obstructions and hard materials were removed and crushed to a 6F2 grade material along with the demolition rubble to be utilised within the earthworks at the site. There is a surface water pipe that transects across the north eastern section of the site.
Synopsis of Enabling Earthworks	All relic structures and obstructions were removed, compressible alluvial material was excavated. Made ground material was screened and approved for fill use. Major earthworks to cut /fill the site and achieve suitable development elevations in accordance with the agreed levels. With the post-remediation gas monitoring to confirm the ground gas regime for the site.
Foundation Options	A preliminary assessment of foundation and floor slab construction has been undertaken based on the mixed residential end use. The site has been engineered to be facilitate the use of Vibro Stone Columns.
Coal Mining	Drilling and Grouting works have been completed within areas of known workings beneath Parcel C (south west sector) A previously unidentified mine entry was encountered and subsequently treated as part of the stabilisation works. All mine workings and entries have been grouted and capped with Coal Authority approval.



TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
1. INTRODUCTION	9
1.1. Background	9
1.2. Objectives	9
1.3. Limitations	10
1.4. Confidentiality	10
1.5. Summary Of Parties Involved	10
1.6. Previous reports	10
2. SITE SETTING	12
2.1. Site Details	12
2.2. Proposed development	12
2.3. Site Summary	13
3. PHASE I DESK STUDY	15
4. GROUND INVESTIGATION	16
4.1. Summary of Reported Ground Conditions	16
4.2. Contaminated Land	18
4.2.1. Contaminated land risk assesment	18
5. COAL MINING AND SHALLOW WORKINGS	19
5.1.1. Coal Mining Risk Assessment	19
5.1.2. Coal mining stabilisation works	20
6. REMEDIATION & ENABLING WORKS	21
6.1. Contaminated land	21
6.2. Geotechnical enabling works	22
7. BUILD PHASE MITIGATION WORKS	25
7.1.1. Gas Mitigation Measures	25
7.1.2. Chemical Analysis of Clean Cover System	29
7.1.3. Placement of Chemically Suitable Cover System	30
8. CONCLUSIONS AND RECOMMENDATIONS	
APPENDIX I LIMITATIONS	
APPENDIX II GLOSSARY	
APPENDIX III DRAWINGS	



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Miller homes to prepare an overarching assessment of Geo-Environmental issues, instigated land remediation / enabling earthworks and viable geotechnical engineering solutions for the residential development of Parcel C.

This report provides an overview of historical site investigations, contamination risk characterisation, details of ground conditions reported by others and a synopsis of the remediation and enabling earthworks operations implemented by Prescott Park under the supervision of E3P to facilitate the preparation of the development of Parcel C.

E3P were previously appointed by Prescott Park as independent Geo-Environmental Consultant for the supervision site remediation, preparation / enabling and validation works and the subsequent production of a suitably detailed report to ensure the satisfaction of the relevant planning conditions and geotechnical engineering requirements for Building Control, warranty providers and the future adoption of infrastructure by the Highways Authority and statutory service providers.

For the avoidance of doubt, E3P can confirm that the parcel of land refers to the red-line boundary as indicated in Figure 1.1 below:

FIGURE 1.1 SITE PARCEL PLAN



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

1.2. OBJECTIVES

The primary purpose of this report is to summarise the works undertaken on Parcel C within the wider Prescott Park development site.

Information pertinent to Parcel C will be summarised to detail the following:

- ✦ Phase I Desk Studies
- ✦ Phase II Geoenvironmental Site Assessment
- ✦ Remediation and Enabling Works Strategy and Validation (including demolition)



- ✦ Coal Mining Stabilisation Specification and Validation
- ✦ Foundation Solutions

1.3. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.4. 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.

1.5. SUMMARY OF PARTIES INVOLVED

NAME OF PARTY	FUNCTION / INTEREST
Landowner	Prescot Park
Developer	Miller Homes
Geo-Environmental Consultant	E3P
Main Contractor	McAuliffe
Remediation Contractor	McAuliffe
Human Health Regulator / Local Planning Authority	Knowsley MBC
Controlled Waters Regulator	Environment Agency

1.6. PREVIOUS REPORTS

The following environmental reports, strategies and specifications have been prepared for the site:

- ✦ **WSP** – *Phase 1 Environmental Assessment for land at Carr Lane, Prescott* -Ref:121215/90/002 Revision 1, January 2008. Prepared for Prysmian Cables & Systems Ltd
- ✦ **WSP**– 8684 (2) – *Phase 2 Geo-environmental Assessment, Prysmian Cables, Prescott*. Ref: 8684 (2) Revision 1, Dated June 2008. Prepared for Prysmian Cables & Systems Ltd
- ✦ **REC** - *Geo-Environmental Investigation, Land at Carr Lane*. Ref: 43875p2r0, Dated May 2011
- ✦ **E3P** – *Remediation and Enabling Works Specification*. Ref: 10-021-R1 Dated January 2014, Prepared for Prysmian Cable Works
- ✦ **E3P** – *Specification for Consolidation of Abandoned Mine Workings*. Ref: 10-021-R2 Dated March 2014, Prepared for Prescott Park



Parcel C, Prescott

Geo-Environmental Site Summary
October 2020

- ✦ **E3P**– *Remediation and Enabling Works Strategy Parcel C*. Ref: 10-021-R4-RevA Dated June 2014. Prepared for Prescott Business Park - June 2014
- ✦ **E3P**– *Supplementary Site Investigation Works & Contaminants Assessment* Ref: 10-021-9C Dated March 2015. Prepared for Knowsley Metropolitan Borough Council
- ✦ **GROUNDSHIRE** – *Mineworkings Remediation Report, Land off Carr Lane, Prescott*. Ref: MSJ/LME 180515 Dated January 2016. Prepared for Prescott Business Park
- ✦ **E3P**– *Construction Environmental Management Plan* Ref: 10-021-R5-RevA Dated August 2014 Prepared for- Prysmian Cables
- ✦ **E3P** – *Remediation and Enabling Works Performance Specification* – Ref: 10-021-R6 Dated September 2014. Prepared for Prescott Business Park
- ✦ **E3P** – *Remediation and Enabling Works Validation Report. Parcel C*. Ref: 10-021-R12-Rev1 Dated April 2017. Prepared for Prescott Business Park.
- ✦ **E3P** – *Addendum Specification – Parcel C*. Ref: 10-021-L1 Dated August 2019. Prepared for Prescott Business park
- ✦ **E3P** – *Parcel C Enabling Earthworks Addendum Report*. Ref: 10-021-R17 Dated April 2020 Prepared for Prescott Business Park

The above reports have been reviewed with the information pertinent to Parcel C summarised within this report.



2. SITE SETTING

2.1. SITE DETAILS

Site Address	Parcel C - Land off Carr Lane, Prescott, L34 1JZ
National Grid Reference	E346218, N391982
Site Area	3.03 Ha.

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

FIGURE 2.1 SITE PARCEL PLAN



A site location map is presented in Appendix III as Drawing 13-158-001.

2.2. PROPOSED DEVELOPMENT

The development forms part of the wider mixed commercial and residential site development.

It is understood that Miller Homes proposes to develop the site for 85 No. low-rise residential properties with associated highways and associated infrastructure for adoption.

A snapshot of the proposed development is shown in Figure 2.2.



FIGURE 2.2 PROPOSED SITE DEVELOPMENT PLAN



2.3. SITE SUMMARY

SITE DESCRIPTION & SETTING

Occupancy/use	Parcel C is located within the central sector of the wider development site to the southwest of Parcel A.	
	The site is currently unoccupied and has undergone a programme of enabling works, mine stabilisation and further geotechnical upfilling in order to prepare the site for future residential development.	
Environmental Setting	A newly constructed adopted highway (spine road) forms the south and south western boundaries and provides access to the development parcel.	
	Drift Geology	Glacial Till – Clay, sand and gravel
	Bedrock Geology	Pennine Lower Coal Formation- Mudstone, siltstone and sandstone
Hydrogeology	Secondary (Undifferentiated) Aquifer (Drift) overlaying a Secondary A Aquifer (Bedrock).	
	The nearest licensed groundwater abstraction to the site boundary is approximately 1780m east, which is operated by St Helens and Knowlsley Hospitals. The groundwater abstracted is used for drinking, cooking and sanitary processes.	



Parcel C, Prescott

Geo-Environmental Site Summary

October 2020

Environmental Setting	Surface Water	The closest surface water feature is Prescott Brook which is located 75m northwest from the western boundary. One surface water abstraction is located within a 1km radius of the subject site (approximately 625m northwest). This abstraction is used for irrigation processes and is unlikely to be affected or affect the subject site.
	Source Protection Zone	The site is not located within an EA designated Groundwater Source Protection Zone
	Groundwater Sensitivity	Moderate
	Surface Water Safeguarding Zone	The site is not located within or located near a designated Surface Water Safeguarding Zone.
	Groundwater Safeguarding Zone	The site is not located within or located near a designated Ground Water Safeguarding Zone.
Site History	Historical mapping as documented in the REC and WSP reports and reviewed by E3P details the following site history Pre 1850 – 1951 The site comprised agricultural Land with a small pond (previously an old sand pit within the centre of the site). Pre 1951 – The pond is no longer recorded as present on-site, assumed infilled, The sewage disposal works constructed to the west of the site encroached on the western boundary of the site. Pre1966 - Access tracks are shown running across the site relating to the surrounding works and sewage works. A large earth embankment has been constructed to the west of the site. Pre1978 – A works has been constructed encroaching on the south of the site, with further access tracks constructed. And the site remained in this configuration until remediation works started.	
Landfill Sites & Ground Gases	There is one active registered Landfill within 250m of the site boundary (248m northwest). No information about the type of waste accepted or the lifespan of the landfill have been provided with the Landmark Report. Three historic landfills are present within 250m of the site boundary, one of which straddles the western boundary of the site on the historical maps. No information about the type of waste accepted or the lifespan of the landfill have been provided. One active licensed waste management facility is located adjacent to the northern boundary and is operated by Allena Ltd, within the Allena Building. Post-enabling works ground gas monitoring suggests that the site will fall into the bracket for Characteristic Situation 2 / Amber 1 which will require specialist mitigation measures to be constructed in accordance with BS8485.	



3. PHASE I DESK STUDY

WSP completed a Phase I Desk Study (Ref: Ref:121215/90/002 Rev 1 Dated January 2008), the phase 1 report was written with a future commercial development rather than residential end use. The information pertinent to Parcel C has been summarised below:

Human Health	Heavy metal, predominantly copper impacted soils are anticipated across the wider site due to its industrial use. The concentrations were not considered by WSP to present a risk to commercial land use but leachates and groundwater seepages may need management.
Controlled Waters	WSP recommend surface water sampling of Prescott Brook- no further consideration to controlled waters was discussed in the Phase I report.
Ground Gas	WSP did not consider ground gas sources in their Conceptual Site Model. The presence of coal seams and Made Ground deposits are the potential ground gas sources for Parcel C.
Coal Mining	The Coal Authority (CA) were contacted regarding historical mine working within the vicinity of the site. The CA hold records of mine working that were constructed post 1860; therefore, there is the possibility that workings before this date will not be highlighted. The Tenlands mine has been recorded as being mined by open cast methods, although this does not fall within the Parcel C site boundary. The CA Report states that five coal seams have been worked below the wider site between 100m and 340m bgl. These were last worked in 1895 and any ground subsidence from these workings will now have ceased. No recorded mine entries are located within Parcel C. The Bastian Seam outcrops beneath the southern sector and has been drilled and grouted. A shaft in the southern sector (proposed POS) has also been grouted and capped.
Geotechnical Assessment	No evidence of slope instability was noted across the site and the integrity of retaining walls had not been investigated by WSP. It was considered that the slopes were unlikely to move having remained stable for over 40 years. Standoff zones at the crest and toe of slopes was anticipated should structures been planned near the slopes. Due to the anticipated depths of Made Ground WSP considered the use of piles or ground treatment (assumed to be VSC) would be required.



4. GROUND INVESTIGATION

The following phases of environmental work have previously been carried out within the wider development site. The ground investigation pertinent to Parcel C is further detailed:

🔧 **WSP**– 8684 (2) – Phase 2 Geo-environmental Assessment, Prysmian Cables, Prescott. Ref: 8684 (2) Revision 1, Dated June 2008. Prepared for Prysmian Cables & Systems Ltd

- Five mechanically excavated trial pits (TP8 – TP12)
- Two cable percussive boreholes (BH4, BH5)
- One rotary borehole (BH8)
- Chemical analysis of soils
- Geotechnical laboratory testing

🔧 **E3P**– *Supplementary Site Investigation Works & Contaminants Assessment* Ref: 10-021-9C Dated March 2015. Prepared for Knowsley Metropolitan Borough Council

- 15 mechanically excavated trial pits
- Chemical analysis of soils

4.1. SUMMARY OF REPORTED GROUND CONDITIONS

Ground Conditions	Made Ground A reworked topsoil comprising a dark grey to black sandy clay with a gravel of brick, ash and clinker was encountered in the WSP investigation from ground level to a maximum depth of 1.10m bgl This material is underlain by a reworked soft to firm dark brown to black sandy clay with a gravel of brick sandstone, ash, clinker and coal with some wood, glass and metal content. This material was encountered by WSP from 0.10m bgl to a maximum depth of 3.70m bgl. Coal was recorded in RB8 at 23.5m bgl to 23.5m bgl Within the E3P investigation A reworked topsoil was encountered from ground level to a maximum depth of 0.60m bgl. Underlying the topsoil, a reworked firm to stiff clay with a gravel of brick, concrete, glass, coal and metal was encountered at depths of 0.45m bgl to 3.60m bgl. A brown to red clayey gravel of brick, sandstone and mudstone was also encountered at depth ranging from 0.20m bgl to 2.20m bgl. A black ashy gravel of ash, brick, coal concrete and sandstone was also encountered between 0.30m bgl and 2.90m bgl
--------------------------	--



Ground Conditions	Drift Glacial Till present as a firm to stiff CLAY with a gravel of mudstone was encountered in the WSP ground investigation at depths ranging from 1.20 m bgl to 3.80 m bgl. The depth of Made Ground was not fully proven in TP11 In the E3P investigation glacial till in the form of firm to stiff brown mottled CLAY with a gravel of sandstone and mudstone was encountered at depths between 0.90m bgl 4.10m bgl In TP101 a light brown SAND was present 2.80m bgl to 3.30m bgl. Solid Geology The solid geology was not encountered during the E3P Trial Pitting exercise IN the WSP site investigation the solid geology was encountered as MUDSTONE and SANDSTONE in RB8 at 2.60m bgl proven to 30.0m bl Weak MUDSTONE was also encountered in TP10 at 3.50m bgl to 3.70m bgl.
Groundwater	Groundwater was recorded in WSP ground investigation at 1.20m within the Made Ground deposits, present as perched water. During the E3P investigation groundwater was encountered predominantly as perched water with the Made Ground deposits at depths of 1.10m bgl to 1.80m bgl
Radon	According to the Landmark Report, the site is located within an area where less than 1% of homes are affected by elevated levels of radon gas BRE Radon Atlas confirm that specific radon gas protective measures are not required for new structures (including residential, commercial or industrial) at the site.
Ground Gas	WSP undertook ground gas monitoring throughout the wider development area but no boreholes within Parcel C were monitored for ground gas. Within monitoring locations across the wider site elevated methane concentrations have been recorded in BH3(18.6%v/v) and WS24 (19.8%v/v). The source of methane is considered likely to be either from degradation of putrescible materials within the Made Ground or the underlying Coal Measures (and associated workings) or a combination of the two. It will be possible to determine the source by undertaking gas sampling and characterisation. Given the limited gas monitoring undertaken to date and the methane concentrations noted above, it is recommended that an allowance be made for gas protection measures within any future development.



4.2. CONTAMINATED LAND

4.2.1. CONTAMINATED LAND RISK ASSESMENT

Human Health	The WSP ground investigation noted a hydrocarbon sheen and odour within the reworked clay made ground in TP11 at 3.0m bgl to 3.70m bgl. No samples submitted for analysis exceedance thresholds from future industrial use. Comparison against existing residential threshold levels suggest WSP recorded elevated concentrations of heavy metals and PAHs. In the E3P supplementary site investigation, a localised area of elevated concentrations of non-volatile hydrocarbons were identified in TP108 at 1.0m with the reworked topsoil. ACM was identified in a single location by e3p within TP103 between 0.10m and 0.80m bgl. .Asbestos fibres were also noted in soils across the wider development. All of the above exceedances have exposure pathways via dermal contact, soil ingestion and inhalation of fibres. The risk to human health can be mitigated through the use of a cover system to all soft standing areas (gardens, landscaping and POS).
Controlled Waters	The WSP and REC site investigation report for the wider site did not identify any mobile phase contaminants that may pose a risk to controlled water or surface water. Prior to the enabling works the EA requested further groundwater analysis and risk assessment to confirm the findings of the WSP and REC reports. Additional assessment was undertaken in June 2016 and submitted to the EA under a paid consultation. It should be noted that Parcel C has not the subject of any historic significant contaminated land uses and thus the controlled waters risk assessment is more pertinent to the wider development site.
Potable Water Supply	It was considered that Polyethylene pipeline will be suitable for the proposed potable water infrastructure in the near surface soils between 0.75 and 0.9m bgl. This should be confirmed with Untied Utilities with a post enabling works UKWIR risk assessment submitted ahead on pipeline installation.
Ground Gas	It was recommended by E3P to undertake post-enabling works ground gas monitoring due to the elevated levels of methane recorded in the wider site during the WSP site investigation. .

Overall Parcel C was not considered to pose a significant risk to human health or controlled waters, with localised impacted soils deemed suitable to remain on site with the appropriate placement of soil and the use of a cover system (600mm).



5. COAL MINING AND SHALLOW WORKINGS

5.1.1. COAL MINING RISK ASSESSMENT

The Coal Authority records and BGS mapping indicates the presence of The Tenlands Mine seam sub-cropping to the south of Parcel C, dipping at a 9° in a south westerly direction. This was also documented in the WSP Phase I report.

Investigation by WSP (2008) and REC (2011) further suggested the presence of an additional sub-crop (unknown) which was possibly an additional seam to the Bastian Mine below Parcel C, however E3P considers this a mis-interpretation.

The WSP coal mining risk assessment concluded that the worked seams beneath the wider site were last worked in 1895 and any ground subsidence would have ceased. No mine entries were recorded within Parcel C.

There is no record of seams beneath Parcel C having been worked but this does not mean they haven't been historically worked prior to the creation of mining records.

E3P further assessed the seams in Parcel C to be the Tenlands Mine, comprising two seams (Bastard seam, Tenlands Tops and Tenlands Bottom). Review of the WSP and REC coal mining investigations suggested that the Tenlands Tops and Bottoms seams have not been worked.

This was based on the following:

- ✿ 13 No Rotary Percussive Boreholes have been drilled across the western 'Lower' portion of the site, none of which encountered any potential voids, losses in flush or evidence of shallow workings;
- ✿ The 3 or 4 shafts recorded by the Coal Authority in the North Western sector of the site were formed to access workings in the deeper Bastian and St. Johns seams, both of which are located at depths well beyond any influence at the surface;
- ✿ The rotary borehole logs confirm poor quality coal at or very close to the surface Mine within the central portion and immediately to the west of the outcrop. It is considered that it would have been unviable to extract coal through pillar and stall and especially Bell Pit mining techniques given the insufficient competent rock cover to allow any working in these seams at a shallow depth;
- ✿ The seam dips steeply towards the south west and as such workings from shafts recorded to the west and potentially north west of this site are thought to be present at a depth where there will be in excess of 10 x seam thickness of rock cover;
- ✿ The Tenlands Bottom Seam appears to be generally at a depth in excess of 10m below competent rock head;
- ✿ The Tenlands Tops and Bottoms were extensively mined through open cast techniques within the south-western sector (discussed in detail within the REC Report). Mine abandonment plans from these workings confirm poor quality coal and it is supposed that if it was deemed viable to extract the coal by open cast techniques the mine could have been progressed north and eastwards

It was conclude that the extent of the shallow mine workings was limited beneath the southern sector of the wider site however it was to be confirmed during the mine stabilisation and consolidation works.



Following the reviewed all previous coal mining investigations and desk studies, E3P prepared the Coal Mining Stabilisation Specification (Ref: 10-021-R1 Dated Feb 2014) which detailed the methodology for the stabilising and consolidation of shallow workings and mine entries.

5.1.2. COAL MINING STABILISATION WORKS

Groundshire were instructed to undertake the coal mining stabilisation works between May and August 2015. Their works had the following objectives pertinent to Parcel C:

- ✿ Additional exploratory drilling across the site to determine the otherwise shallow mineworking in the Tenlands coal seam.
- ✿ Reduce the risk of ground subsidence resulting from the presence of shallow coal workings through land stabilisation works (drill and grout)

Rotary open hole drilling was undertaken on a grid system to identify the presence of the seam and any shallow workings. Coal was identified in the south west and south west of Parcel C with broken ground in the southern sector of the parcel.

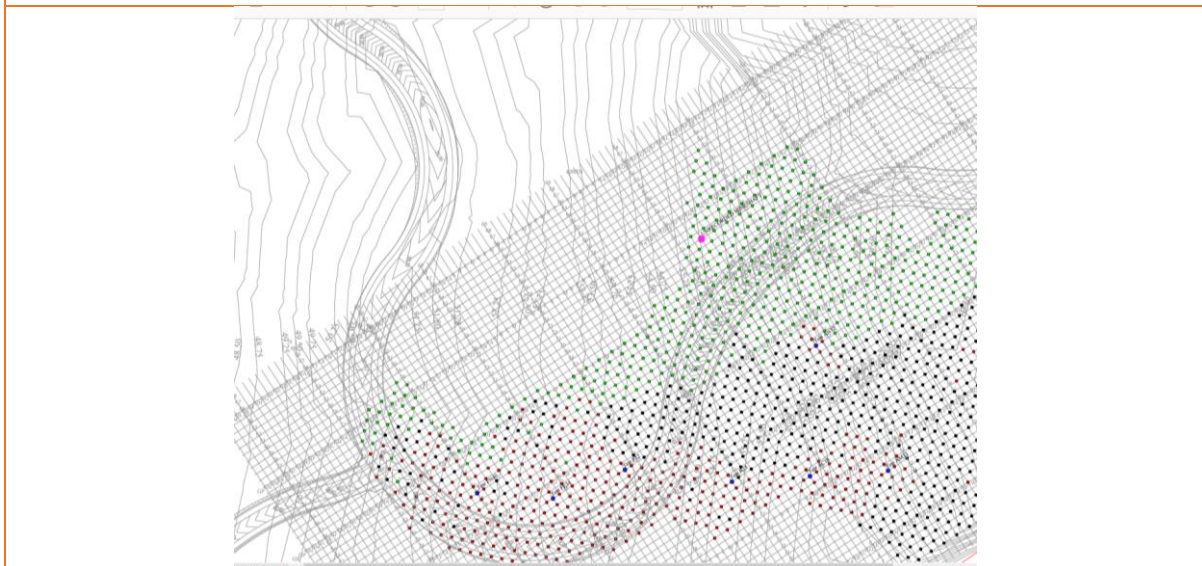
Subsequent treatment in resulted in the use of 25.8 tonnes of ground within the southern sector of Parcel C.

During the additional exploratory drilling exercise a previously unidentified mine entry was identified at a central-eastern location (Ref location: AH52, E346406, N331932)). Rockhead was identified at 8.0m bgl, the base of the shaft was identified at 87.8m bgl with the hole terminating in solid geology at 93.0m bgl. The shaft was treated using 17tonnes of grout as per the specification.

Additional test holes were drilled (BH2) and treated with 88tonnes of grout and a further test hole (BH3) was also drilled and treated with one tonne of grout, resulting in completion of the stabilisation off the mien entry.

The Groundshire, Mineworks Remediation Report (Ref:MSJ/LME 180515 Dated Jan 2016) details the full shallow mine workings and mine entry treatment for the wider development. It is considered that the stabilisation works within Parcel C have been completed satisfactorily with no risk to future development remaining.

FIGURE 5.1 AREA OF DRILL & GROUT PERTINENT TO PARCEL C



6. REMEDIATION & ENABLING WORKS

E3P produced a Remediation and Enabling Works Strategy (Ref:10-021-R1 dated June 2014) and provided the part time supervision of the enabling works, with chemical and geotechnical sampling in accordance with the remediation strategy.

6.1. CONTAMINATED LAND

No significant contamination was identified within Parcel C in comparison to the wider site, however localised ACM materials were recorded by E3P. All chemical validation and mitigation of contaminated land is summarised below.

Overview of Works

Due to the fill required, the re-engineered Made Ground soils were sorted through and deposited with in Parcel C the Parcel slopes from east to west. Made Ground present in the finger of the site was cut and placed within the fill areas in the eastern and central sector of the site. Furthermore, an element of fill was required in the southern perimeter of the site boundary to raise the formation levels to create the required development platform and remediation elevation.

All soils were inspected during the turnover by E3P in order to assess the potential for any previously unidentified contamination hotspots of areas of potential concern. For the avoidance of doubt, no evidence of potentially impacted soils was identified

OVERSIZE MATERIALS

All below ground obstructions and hard materials were crushed to a 6F2 grade material along with the demolition rubble to be utilised within the earthworks at the site.

E3P attended site to obtain samples of the crushed hard materials for chemical validation in accordance with the E3P remediation strategy. As shown above, ten samples of 6F2 were collected in total for chemical analysis.

Chemical analysis identified the crush materials to be chemically suitable for re-use within the earthworks. Although not specifically within the proposed parcel c development site the adjacent spine road leading from Manchester Road in the north along the western boundary of the site was capped with 300mm of the site generated 6F2 crush.

ASBESTOS CONTAINING MATERIALS (ACM)

Asbestos containing materials were identified within the general made ground materials across the entire Prysmian Cables site. Whilst not specifically identified within the proposed parcel c sector, all soils were inspected and confirmed the absence of any visible acm during the cut and fill enabling works.

The remediation contractor, McAuliffe environmental opted to remove materials with notable visible ACM as oppose to a strategy of placement beneath buildings or hardstand. This option was necessary (in the main) due to the fact that no detailed development plan was available at the site of the remediation and enabling works. To this end, where possible all notable ACM has been removed to site in a highly controlled manner.



Overview of Works

Give the former site use and nature of filled materials, it is self-evident that impact to all anthropogenic materials across the entire site, however given the quantities of material involved and the absence of any visible notifiable asbestos containing materials the overarching risk profile is reduced.

The implementation of the development in a manner that will ensure no future exposure pathway as set out within the CSM is sufficient to ensure the site is entirely suitable for the intended use.

Supplementary Validation Testing has been completed at the remediated surface at 13 No. locations across the site with quantification testing where a positive asbestos fibre result is detected.

6.2. GEOTECHNICAL ENABLING WORKS

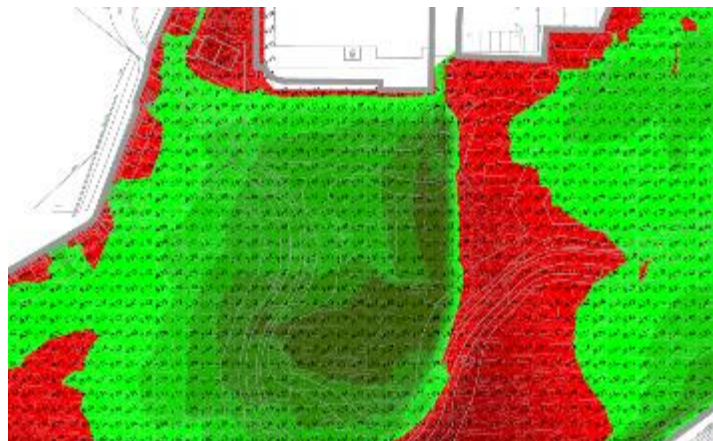
Parcel C required a significant programme of cut and fill works to provide a development platform for residential use.

A Materials Management Plan (MMP) was developed by MacAuliffe in accordance with the industry Code of Practice (Version 2) to document the proposed materials management operations and corresponding management objectives to demonstrate the safe, sustainable and legislatively compliant management and re-use of soils on-site.

The MMP was subject to review by an Qualified Person (QP) in accordance with the requirements of the CoP prior to the signed declaration being made to the CL:AIRE.

With reference to Figure 2.1, the eastern sector (area shaded red) of Parcel C was generally subject large earthwork exercise that required the removal of between 2-3 meters of historically placed fill that formally comprised a large earth embankment that sub-divided the upper and lower plateau. Subsequent to the cut operation, a turn-over of 3.0m was instigated with subsequent replacement of re-engineered material. In the western sector the landform was upfilled by circa 3.0 - 4.0 at the south west boundary to facilitate the construction of the appropriate road grade (area shaded green).

FIGURE 6.1 EXTRACT OF CUT/FILL DRAWING



An overview of the geotechnical enabling works is provided overleaf:



Parcel C, Prescott

Geo-Environmental Site Summary

October 2020

Demolition of Existing Buildings	The large variable height retaining wall / ramped access that transected north south through the central portion of the site supporting graded embankment leading to the lower level plateau that was broken down in a controlled manner in April 2014. The resulting historically filled stratum to the rear of the retaining wall was benched back to a safe 45% angle of repose, prior to the instigation of the main earthworks. For the avoidance of any doubt, no high walls or notable changes in natural stratum are present beneath parcel c. The remains of the concrete pads were excavated and removed from beneath the former structure footprint in May 2014 with the resulting materials stockpiled within the central / southern sector of parcel a/b for subsequent processing as a recycled aggregate in accordance with the wrap protocol. No further structures were present within Parcel C and no previously unidentified structures were encountered throughout the duration of the works to Parcel C
Compaction of Materials	Within the northern / eastern sector of the Parcel C, the depth of Made Ground post remediation enabling works is >3.0m bgl and such all anthropogenic materials have been lifted to a depth of 3.0m prior to the replacement in accordance with the compaction requirements for the material Type. The use of a Method Compaction specification required the pre-classification of materials generally (6N) prior to their placement in circa 250mm layers and compaction with >5.5T smooth wheeled vibrating roller with >8 passes on each and every layer. Within the southern / western sector of the site Made Ground generally extends to circa 3.0 to 6.0m below remediated ground level. In this instance the upper 3.0m below remediated platform was lifted, sorted and subsequently replaced in a controlled manner to ensure compliance with a Method Compaction specification.
In Situ Plate Load Geotechnical Testing	In-situ Plate Load Tests have been completed on a uniform grid across Parcel C. The Plate Load test was completed at the remediated surface level to assess the relative instant settlement potential and inform the calculation of an equivalent CBR Value. The results of the Plate Load Testing confirmed CBR Values >5% increasing to >20%. Total recorded settlement under an applied load of 250kN/m² was less than 7mm in all instances confirm no settlement under loads that would significantly exceed the working load for a proposed structure. In many instances the relative in-situ CBR was found to be in excess of 20% at circa 0.50m below remediated level indicating a very low modulus of sub-grade reaction and Youngs modulus confirming the potential for any long term differential settlement was non-existent.



In Situ Zone Load - Geotechnical Testing	The Zone Load Tests were positioned in accordance with BS1377: Part 9, Section 4.2 as per the E3P Zone Load Test Design and Method Statement, enclosed within this letter (Ref: Drawing 10-009-009). The base plate of each test was surveyed at each corner prior to loading and subsequent monitoring was completed at each 10kN/m² increment to the total loading of 70kN/m² was achieved. Each location was surveyed using a precise laser level to the accuracy of 0.01mm and calibrated on each visit using two fixed control points. Initial monitoring completed in the wider site area confirmed that the materials beneath the site are generally uniform when taking the averages into consideration. The maximum deformation identified from tests across the wider site has been calculated at 13mm under an applied loading of 70kN/m². The initial and overall settlement is within acceptable tolerances for residential development.
Foundation Solution	The site has been prepared in a manner that will facilitate the use of VSC to support a doubly reinforced strip footing. Due to the presence of mine workings the use of drive piles is negated, even following stabilisation and the potential pressure of bulb may impact on the grout.
Post Enabling Works Ground Gas Monitoring	The E3P Remediation Strategy required the installation of validation six ground gas monitoring wells across Parcel C to assess the post remediation ground gas regime. The site characterisation report and subsequent land remediation and enabling works identified the following potential sources of ground gas: ✿ Made Ground Deposits ✿ Coal Seams During the monitoring visits completed to date, no significantly elevated concentrations of methane or carbon dioxide were recorded within any of the Probeholes.
Post Enabling Works Ground Gas Monitoring	The monitoring of hazardous ground gasses has been completed at periods of falling and low barometric pressure which is the critical determining factor in the assessment of risk associated with potentially hazardous ground gasses to ensure the establishment of worst case scenario. It is noted that while pressures did not fall below 1000mb, the nature of a changing and falling weather condition is the overriding factor in ensuring monitoring of the worst-case scenario.



**Post Enabling Works
Ground Gas
Monitoring**

Site derived Made Ground was predominantly inert in composition comprising construction aggregates, combusted ash and rocks derived from the discard of copper ore. No notable putrescible material was recorded within the large earthworks operation. The material would therefore not be considered to represent a significant ground gas generation potential.

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.02 l/hr (WS219) and for carbon dioxide was 0.0041 l/hr (WS216).

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

Ground gas monitoring suggests that the site will fall into the bracket for Characteristic Situation 2 / Amber 1 and will require mitigation measures according to BS8485.

This risk assessment has been accepted by Knowsley Metropolitan Borough Council.

7. BUILD PHASE MITIGATION WORKS

A second post demolition phase of works will be required to ensure the proposed development is constructed in a manner that incorporates the required mitigation measures to ensure the development is compliant with UK Building Regulations and the Local Authority Planning requirements.

Once the ground has been stabilised and rendered suitable for development, the builder will be required to undertake a second phase of remediation works to mitigate the identified theoretical risk to human health.

-  Construction of all dwellings with Amber 1/ CS2 ground gas mitigation measures;
-  Post enabling works UKWIR Risk Assessment to inform potable water supply pipeline choice;
-  Provide and place a 600mm soft cover system to all garden and landscaped areas of the development (150mm imported topsoil, 450mm site won subsoil).

7.1.1. GAS MITIGATION MEASURES

The E3P Remediation Strategy required the installation of validation six ground gas monitoring wells across Parcel C to assess the post remediation ground gas regime.

Based on the monitoring results the site would be classified as CS2 which will require specialist mitigation measures to be constructed in accordance with BS8485 as summarised overleaf



Parcel C, Prescott

Geo-Environmental Site Summary

October 2020

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER		SCORE
a) Floor and substructure design		
Precast suspended segmental subfloor (i.e. beam and block).		0
Cast in situ ground bearing floor slab (with only nominal mesh reinforcement.		0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations.		1 or 1.5
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing.		2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing.		2.5
PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS
Gas protection scores for ventilation protection measures		
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)	0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and / or is not terminated in a venting trench (or similar), then the score is zero.
(b) Passive sub floor dispersal layer: Media used to provide the dispersal layer are:  Clear void  Polystyrene void former blanket  Geocomposite void former blanket  No-fines gravel layer with gas drains  No-fines gravel layer	Very good performance 2.5 Good performance 1.5	The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B of BS8485:2015. Passive ventilation should be designed to meet at least “good performance”.
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a sub floor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.	1.5 to 2.5	
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient “coverage” of the building footprint and the redundancy of the system. Active ventilation should



Parcel C, Prescott

Geo-Environmental Site Summary

October 2020

		always be designed to meet at least "good performance".
PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to <i>Buildings Regulations 2000, Approved Document F [9]</i> .
Gas protection score for the gas resistant membrane		
Gas resistant membrane meeting all of the following criteria: ✳ Sufficiently impervious to the gases with a methane gas transmission rate $<40.0 \text{ ml/day/m}^2/\text{atm}$ (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method_; ✳ Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; ✳ Sufficiently strong to withstand in-service stresses (eg settlement if placed below a floor slab); ✳ Sufficiently strong to withstand the installation process and following trades until covered (eg penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc); ✳ Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and, ✳ Verified in accordance with CIRIA C735.	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.40mm thickness (equivalent to 370g/m^2 for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite then the score is zero.



Parcel C, Prescott

Geo-Environmental Site Summary

October 2020

The validation inspection is to include verification of the items below:

INSPECTION	METHOD
Product Verification	Confirmation that suitable products have been installed to consist of photographs of product types, labels on packaging and delivery tickets.
Wall Cavity Inspection	Confirmation that gas membrane spans the external wall cavity above the periscopic vents.
General Condition	The membrane is to be inspected to ensure there are no tears, punctures or rips.
Jointing	The engineer is to check the overlaps between membranes are correctly sealed with sufficient overlaps.
Service Entry Points	Verification of the presence of preformed tophats sealed to the pipe and membrane as per the construction detail.
Passive Venting Systems	The engineer should verify the presence of vents at 2m centres on at least 3 of the external walls. Verification of the stone venting layer and presence of pipes to be supplied by photographic records from site.

Examples of gas membrane verification (photographs include different membrane types for demonstrative purposes only – gas membranes are site specific):



Photographs 1 and 2: Check general condition of membrane for punctures / tears etc



Photograph 3: Confirm membrane product type and check joints between rolls of membrane to ensure 150mm overlap and presence of double sided butyl tape (by touch – may not be visible) and girth jointing tape.





Photograph 4: Check top hat is sealed to membrane and pipework. If the formed top hat is not tight to the pipework then also confirm presence of jubilee clip beneath butyl tape.

7.1.2. CHEMICAL ANALYSIS OF CLEAN COVER SYSTEM

The Remediation Strategy for the site, with respect to human health of the future site users includes the provision of a chemically suitable clean material to be installed in all garden and landscaped areas; the construction of the 600mm clean cover / placement of clean material shall consist of:

- ✿ 450mm subsoil; and,
- ✿ 150mm topsoil.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be imported or re-used on site to confirm the proposed development will pose no unacceptable risk to human health or the wider environ.

Subsoil and topsoil shall be free of any deleterious materials, such as buildings materials, timber, plastics etc and conform to the requirements of BS 3882:2007.

The agreed sampling frequency for these materials is presented in Table 7.1 below.

TABLE 7.1 - SPECIFICATION OF MATERIALS VALIDATION LABORATORY ANALYSIS

Material Use	Testing Frequency	Suite of Analysis
Site generated Sub-Soil (450mm garden cover)	1 Sample Per 100m ³	A / B / C / D
Imported Topsoil (150mm garden cover)	1 sample per 50m ³	A / B / C / D

Notes – Table 5.4.1

Suites of Analysis

- A) Speciated PAH
- B) Banded TPH (C5-C35)
- C) Asbestos (ID)
- D) CLEA Inorganic



All analysis prescribed above to be completed by UKAS accredited laboratory.

Source testing certificates and validation testing of the imported materials shall be provided and is required to comply with the criteria set out in Table 5.2 below.

7.1.3. PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Proposed garden and landscaped areas within the residential development require a 600mm chemically suitable cover system in order to break the exposure pathway between the end user and the contaminants.

Procedure for Placement:

-  If proposed utilities are to be placed within the cover system, the clean cover should be placed prior to installation of these utilities;
-  If natural drift deposits are encountered, excavation can cease here;
-  Garden and landscaped areas need to be constructed with a suitable 600mm clean cover system that will comprise 450mm chemically validated subsoil, with 150mm topsoil overlaying this. Topsoil & Subsoil is required to be confirmed as chemically suitable prior to placement.

Garden Validation Procedure

The placement of 600mm of clean material will be undertaken during the build phase works of the project.

The placement of subsoil and corresponding validation will be documented within the Garden Validation Letters (to be issued on completion of the contractor's works).

Photographic evidence of the placement of 150mm of certified topsoil and 450mm of subsoil will be undertaken on completion of construction works which will constitute the completion of the 600mm clean cover.

This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.



PROCEDURE	METHOD
Chemical Validation	Imported sub-soils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the garden systems. If acceptable the materials can be installed to the required depth at which time the plot will be deemed complete following a validation procedure.
Trial Holes	Trial holes are deemed necessary for the all plots given that the 600mm cover system will need to be placed on each plot during the build phase.
Validation	Photographic evidence will be taken of the subsoil / topsoil placement demonstrating the depth of installed cover system and practical completion of works are required for each and every plot.
Validation Certificate	As and when certified sub-soil and topsoil has been placed, inspected and photographed for each plot, a validation completion certificate will be prepared to include plot specific photographs and laboratory test certification.
Completion Report	Upon completion of all garden and landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.



Photographs 1 and 2: Examples of validation photographs demonstrating clean cover.



8. CONCLUSIONS AND RECOMMENDATIONS

Based on the review of all previous ground investigation reports, supplementary reports, remediation strategies and coal mining stabilisation reports, it is considered that the site has been prepared in an appropriate manner to ensure a geotechnically suitable development platform that poses no risk to human health or controlled waters.

A number of build phase item will need to be implemented to ensure that all potential exposure pathways are broken and there is no future risk to residential end users.

The site has been prepared in a manner suitable for VSC to support a doubly reinforced shallow strip foundation.

It is considered that the shallow mine workings and previously unidentified mine entry have been stabilised in accordance with best industry practice.

It is recommended to ensure all previous validation reports have been submitted and accepted with the Local Authority in order to fully discharge all relevant planning conditions. A post enabling UKWIR assessment should be submitted and signed off by Untiled Utilities prior to installing the potable water supply.

END OF REPORT



APPENDIX I

LIMITATIONS

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



APPENDIX II

GLOSSARY

TERMS

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



Parcel C, Prescott

Geo-Environmental Site Summary

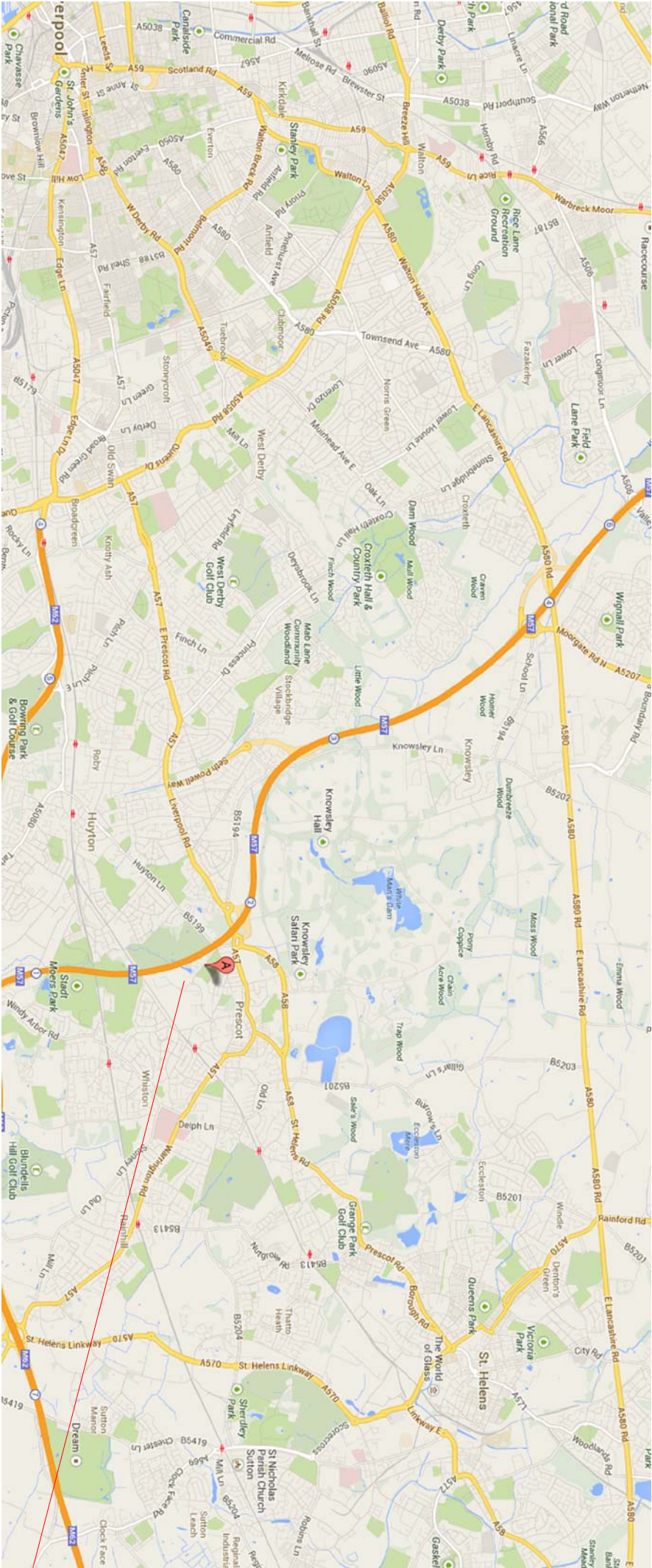
October 2020

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

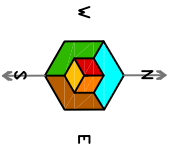
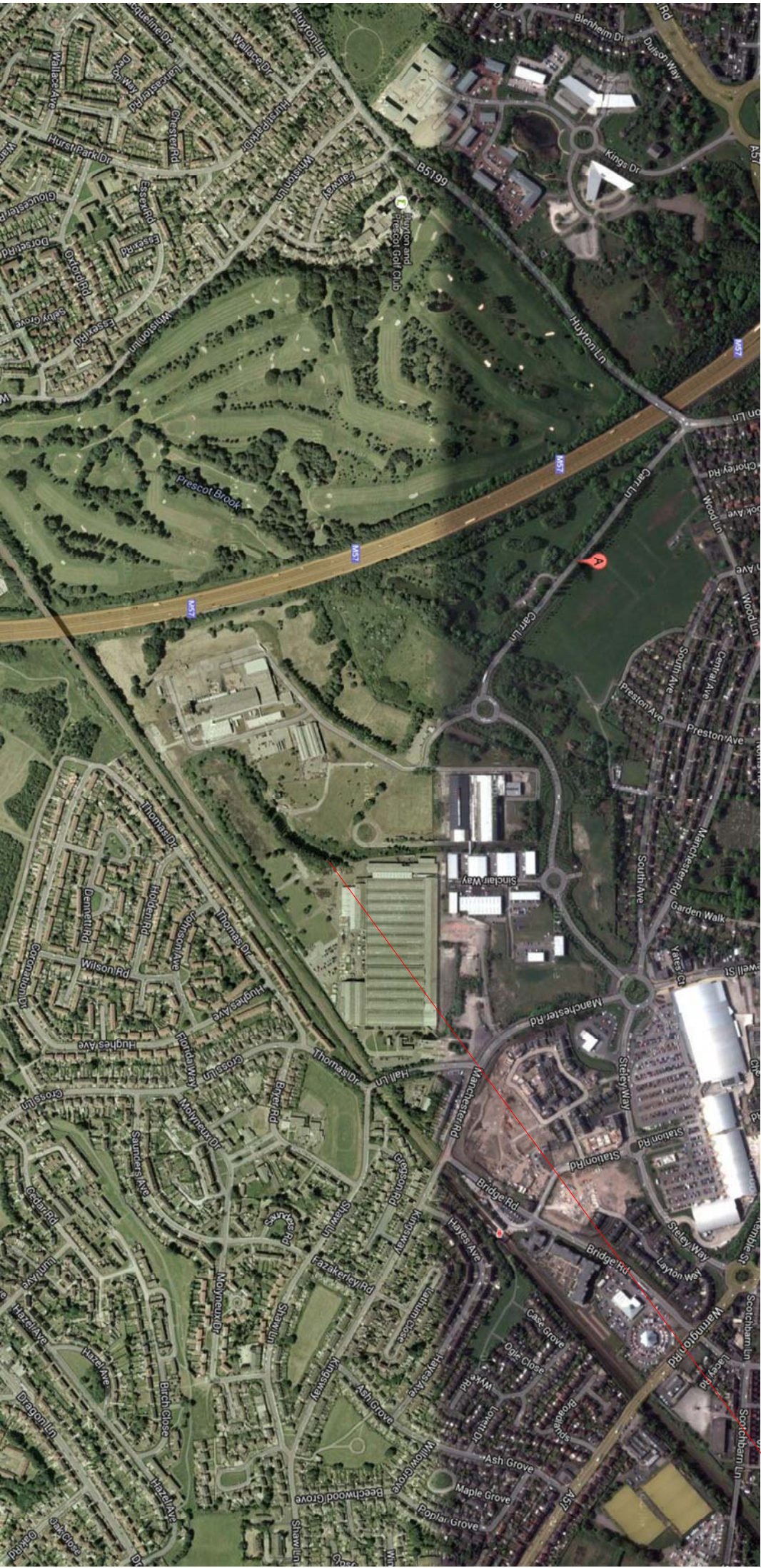


APPENDIX III

DRAWINGS



SITE LOCATION

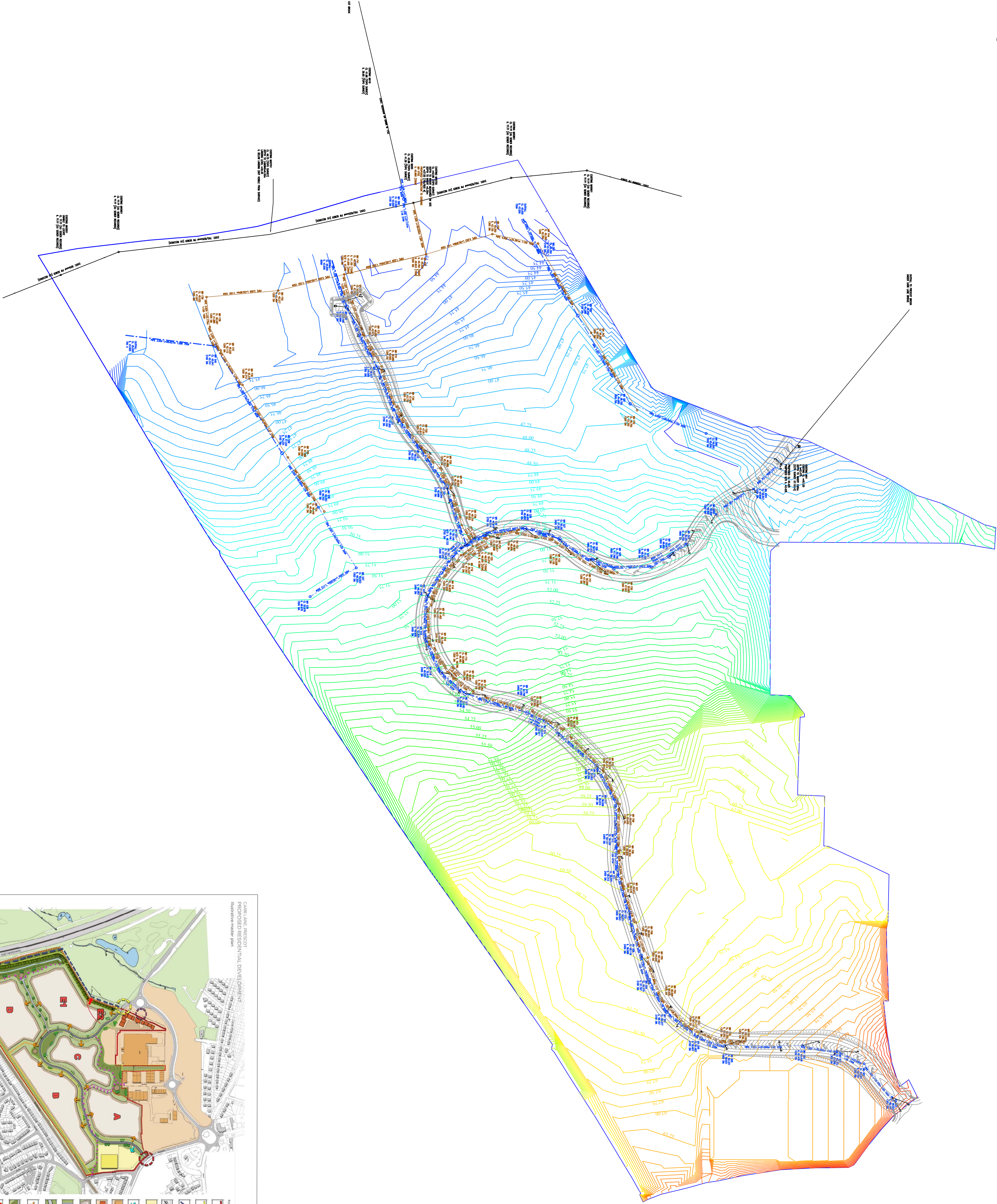
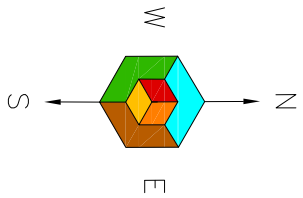


Note	20/01/2014 Draft	ST	MD
Date	Revision		
Drawing Title:	Site Location Plan	Job No:	10021
		Drawing No:	001
Job Title:	Former Prysman Cables, Prescott	Client:	Prescot Business Park



City Hallport Business Park, Eccles
Manchester, M30 7RU
Tel: 0161 883 2087
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P without permission in writing from E3P. Any unauthorised amendments to drawings or designs are the responsibility of the client. E3P shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:

- XX.XX Indicative Regrade Level (500mm Construction Allowed for in Volumetrics)
- Designed Gradient/Assumed Gradient Direction
- Fill from OGL to Formation Level
- XX.XX Cut from OGL to Formation Level

Volumetrics Between OGL and Design Formation To Masterplan 15.06.14					
Volumetric			Details		Average Density
Group	Details	Cut (M3/m3)	Fill (M3/m3)	Balance	Net
Final Area Total	15.000	21719.000	21900.000	4681.000	15.000

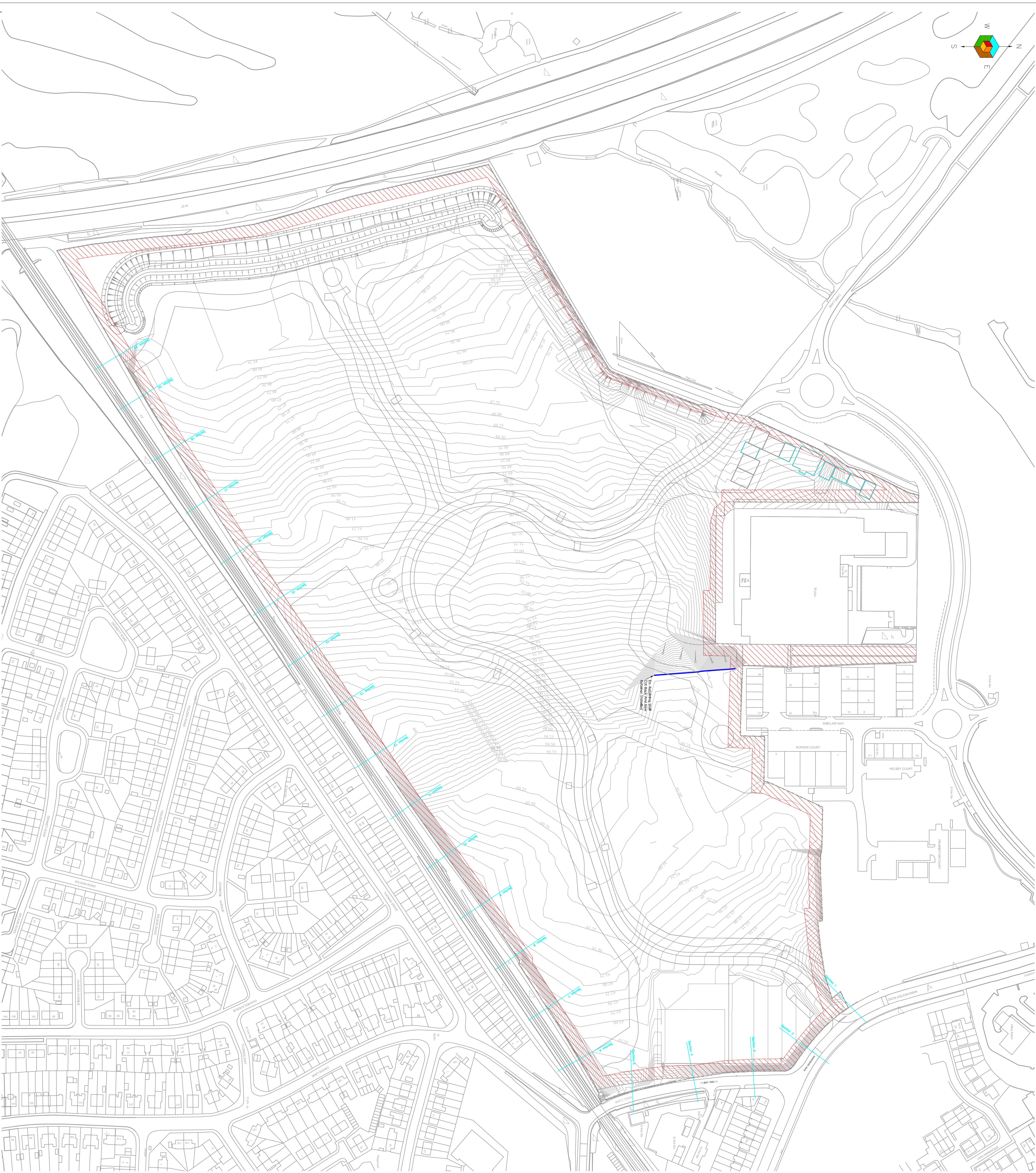
Notes:

P1	RA	15-01-2015	Revision	RW	MD
P1	-	18-12-2014	Draft	RW	MD
Phase	Revision	Date	Issue	Drawn	Authorised
Client:		Job No:		Date:	
		10-021		15-01-2015	
		Drawing No:		Scale:	
		015		1:1500 @ A1	

Job Title:	Prescot Business Park	Drawing Title:	Remediation Master Plan
------------	-----------------------	----------------	-------------------------



The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in obtained in advance of the amendments being made. E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:



Hatched area denotes boundary offset where handstanding needs to be removed but the 3.00m turnover is not required. Boundary offsets are as follows:

- Boundaries against the existing railway and retaining structures require a 10.00m offset
- Boundaries where retaining structures are not present require a 6.00m offset



Location of Cross Section (See Section Drawing)

Notes:

P1	-	20-01-2015	Draft	RW	MD
Phase	Revision	Date	Issue	Drawn	Authorised
Client:	-		Job No:	Date:	
			Drawing No:	Scale:	
			022	1:1500 @ A1	
			10-021	20-01-2015	

Job Title:

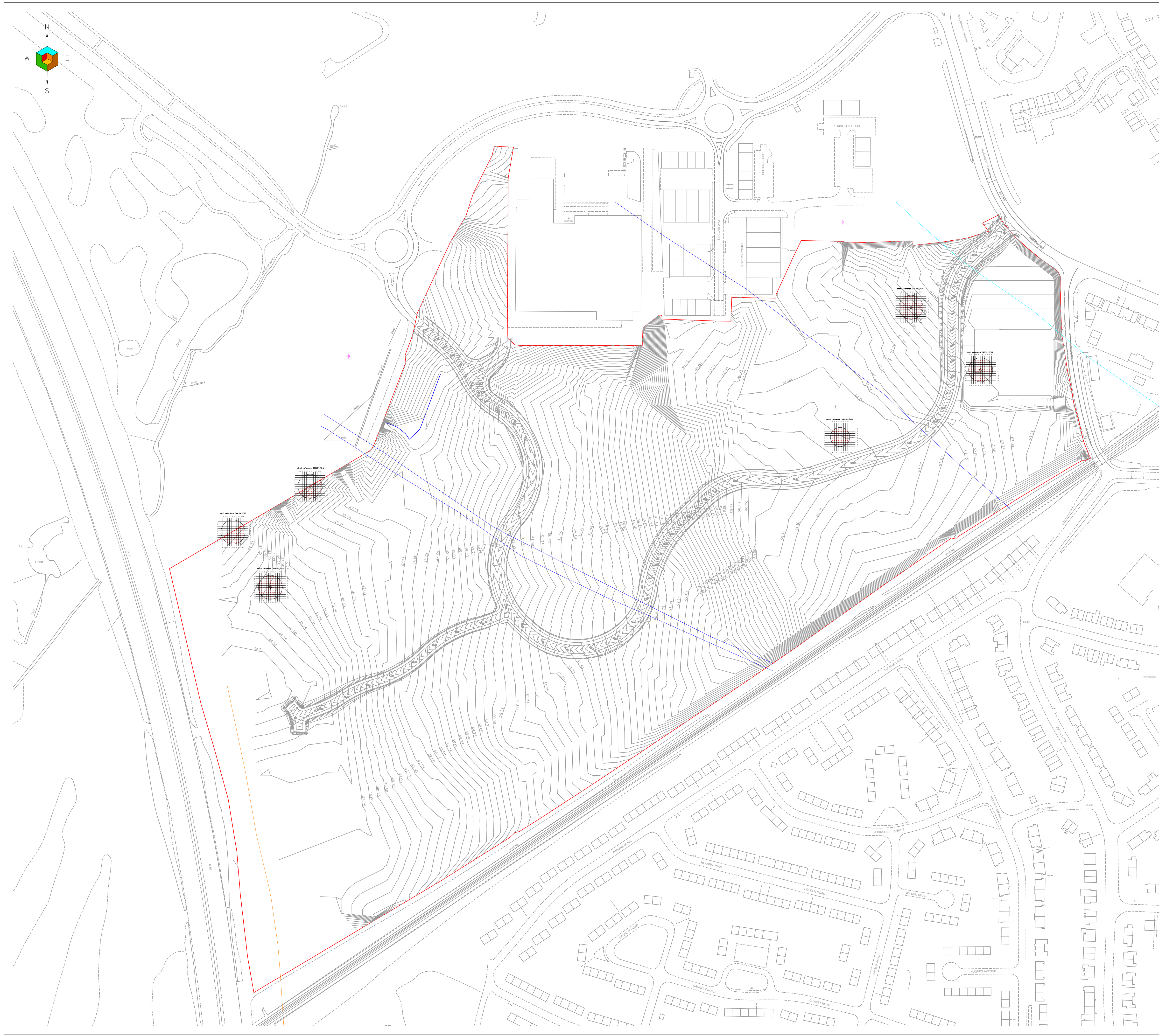
Drawing Title:

Prescot Business Park
Boundary Treatment Plan



Environmental Energy Engineering Partnerships Ltd
City Helport & Business Park
Eccles, Manchester, M20 7RN
Tel: 0161 787 8612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in obtained in advance of the amendments being made. E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



- Key:
- Approximate Location of Disused Mine Shaft
 - Approximate Location of Coal Seam
 - Approximate Location of Fault at Surface
 - Approximate Location of Fault Underground

Notes:

P2 P1	A -	22-05-2015 29-01-2015	A Draft	RW RW	ST ST
Phase	Revision	Date	Issue	Drawn	Authorised
Client:			Job No:	Date:	
Prescot Business Park			10-021	22-05-2015	
			Drawing No:	Scale:	
Job Title:			031	1:1500 @ A1	
			Drawing Title:	Coal Mining Location Plan	
Prysmian Cables, Prescot					



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

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



- Approximate Plate Load Test Location
- Approximate Dynamic Cone Penetrometer Test Location
- Approximate Hand Pit Location
- Approximate Plate Load Test Location (Unable to Investigate)
- Approximate Dynamic Cone Penetrometer Test Location (Unable to Investigate)

P1	R3	29-02-2016	Revision	CB	MD
P1	R2	22-12-2015	Revision	CB	MD
P1	R1	17-11-2015	Revision	CB	MD
P1	-	29-04-2015	Draft	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client:	Job No:	Date:
Prescot Business Park	10-021	29-02-2016
Drawing No:	Scale:	
034	1:1500 @ A1	

Job Title:	Drawing Title:
Pyrsnian Cables, Prescot	Geo-Technical Testing Location Plan



e3p

Environmental Energy Engineering Partnerships Ltd

City Helipoint & Business Centre

Eccles, Manchester, M30 7RU

Tel: 0161 707 9612

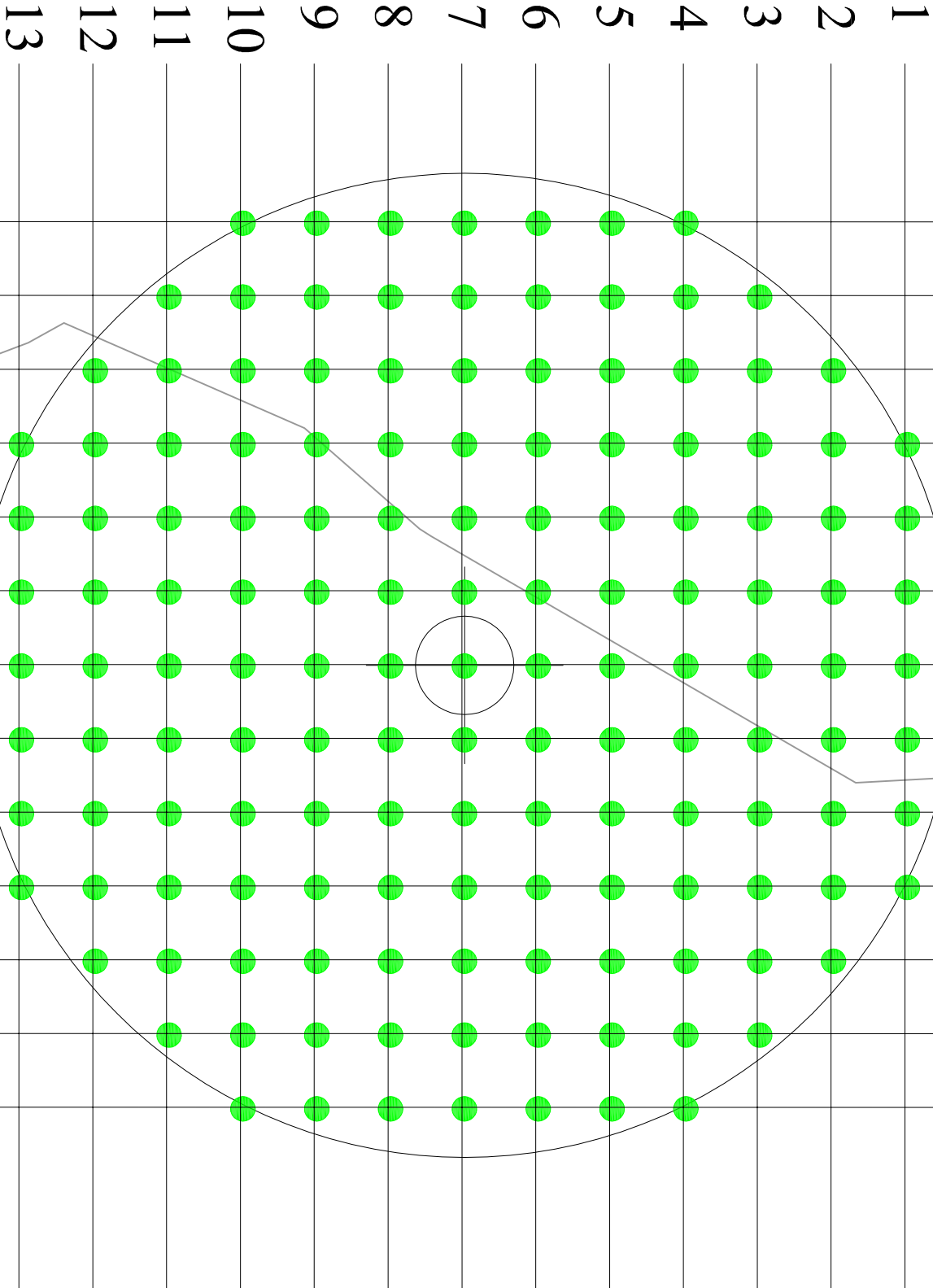
E-mail: info@e3p.co.uk

Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.

Shaft Reference 346391/019

A B C D E F G H J K L M N



1 2 3 4 5 6 7 8 9 10 11 12 13

A B C D E F G H J K L M N



AMENDMENT		REV	BY	DATE			
Client		Prescot Business Park					
Project							
Land off Carr Lane							
Prescot							
Merseyside							
Drawing Title							
Mineshaft Probe Plan							
346391-019							
Version 1							
Drawn	WRD	Date Jan 16					
Checked	TH	Date Jan 16					
Scale	Do Not Scale (1:125)						
Groundshire Limited							
THE MINeworkings							
REMEDICATION SPECIALISTS							
Lithburn House, Lithburn Industrial Estate							
Langley Moor, DURHAM, DH7 8HJ							
T 0191 378 4005							
E enquiries@groundshire.com							
Dwg. No.		12267-006		Rev. A			

Projected Depths of Made Ground

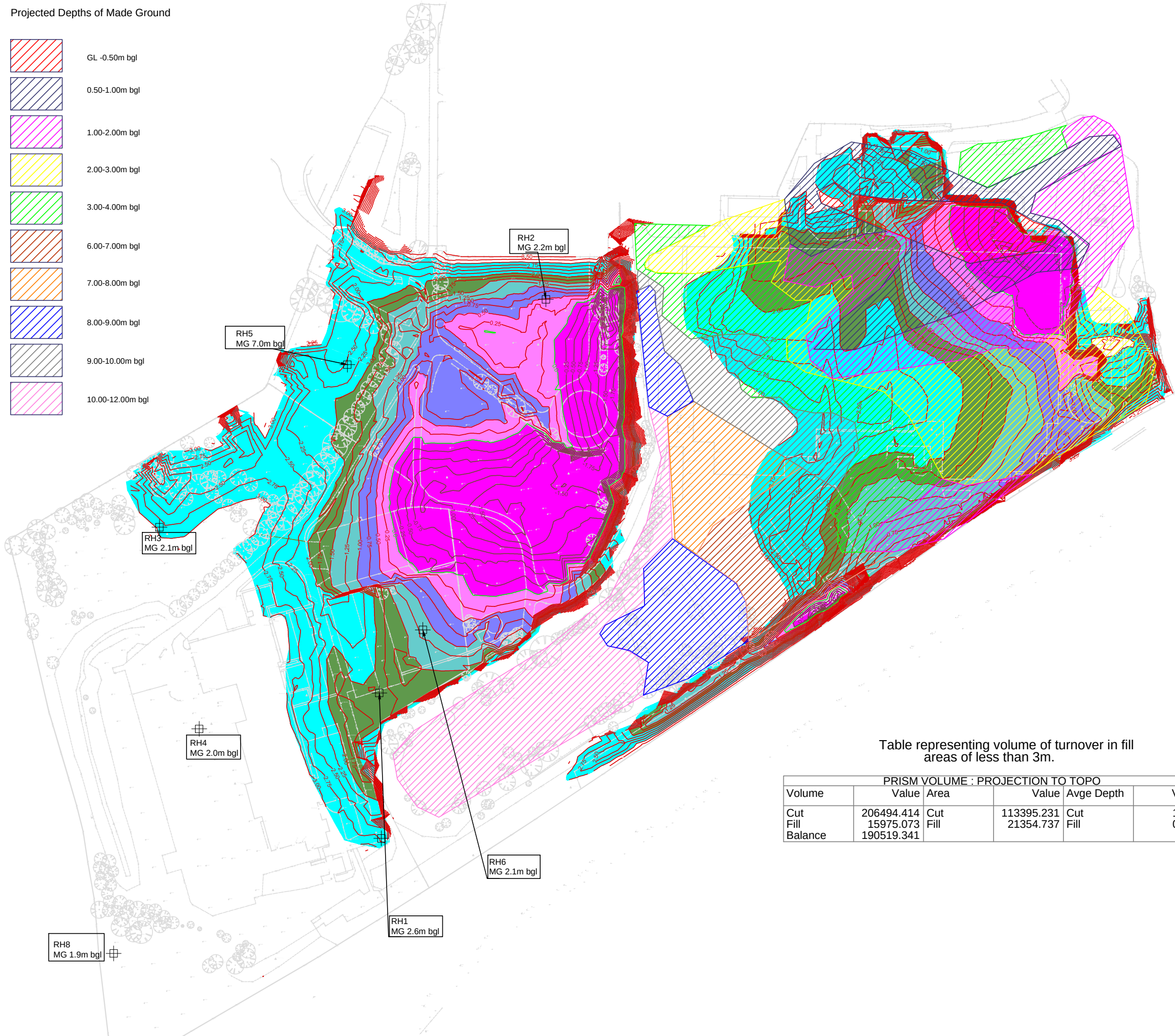
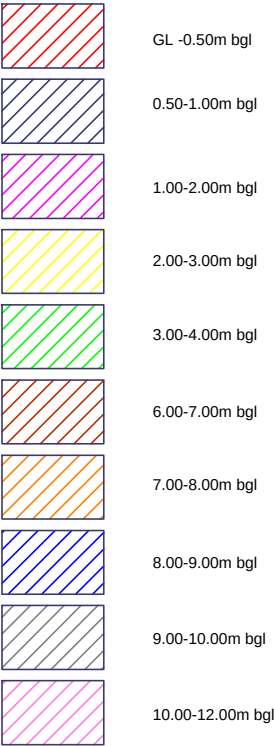


Table representing volume of turnover in fill areas of less than 3m.

PRISM VOLUME : PROJECTION TO TOPO					
Volume	Value	Area	Value	Avg Depth	Value
Cut	206494.414	Cut	113395.231	Cut	1.821
Fill	15975.073	Fill	21354.737	Fill	0.748
Balance	190519.341				



Approx North



Surveying & Engineering Department
Contact :doug@mcauliffegroup.co.uk
Mobile : 07818000533

Legend

Fill Depths to construct re-grade

Fill depth	Turnover depth
0 to 1m	approx. 2.5m
1 to 1.5m	approx. 2m
1.5 to 2m	approx. 1.5m
2 to 2.5m	approx. 1m
2.5 to 3m	approx. 0.5m
3m plus	0m

Turnover Isopachyte

Cut & Fill based on re-grade contours -3m

Cut	[Red line]
Fill	[Brown line]

JOB
PRYSMIAN_CABLES
PRESCOT

DRAWING
TURNOVER_VOLUMETRIC_APPRAISAL
INC_DEPTH_TO_MADE_GROUND

DATE: 4/11/2014 | DRAWN: DL | SCALE: 1:12500A1

www.mcauliffegroup.co.uk



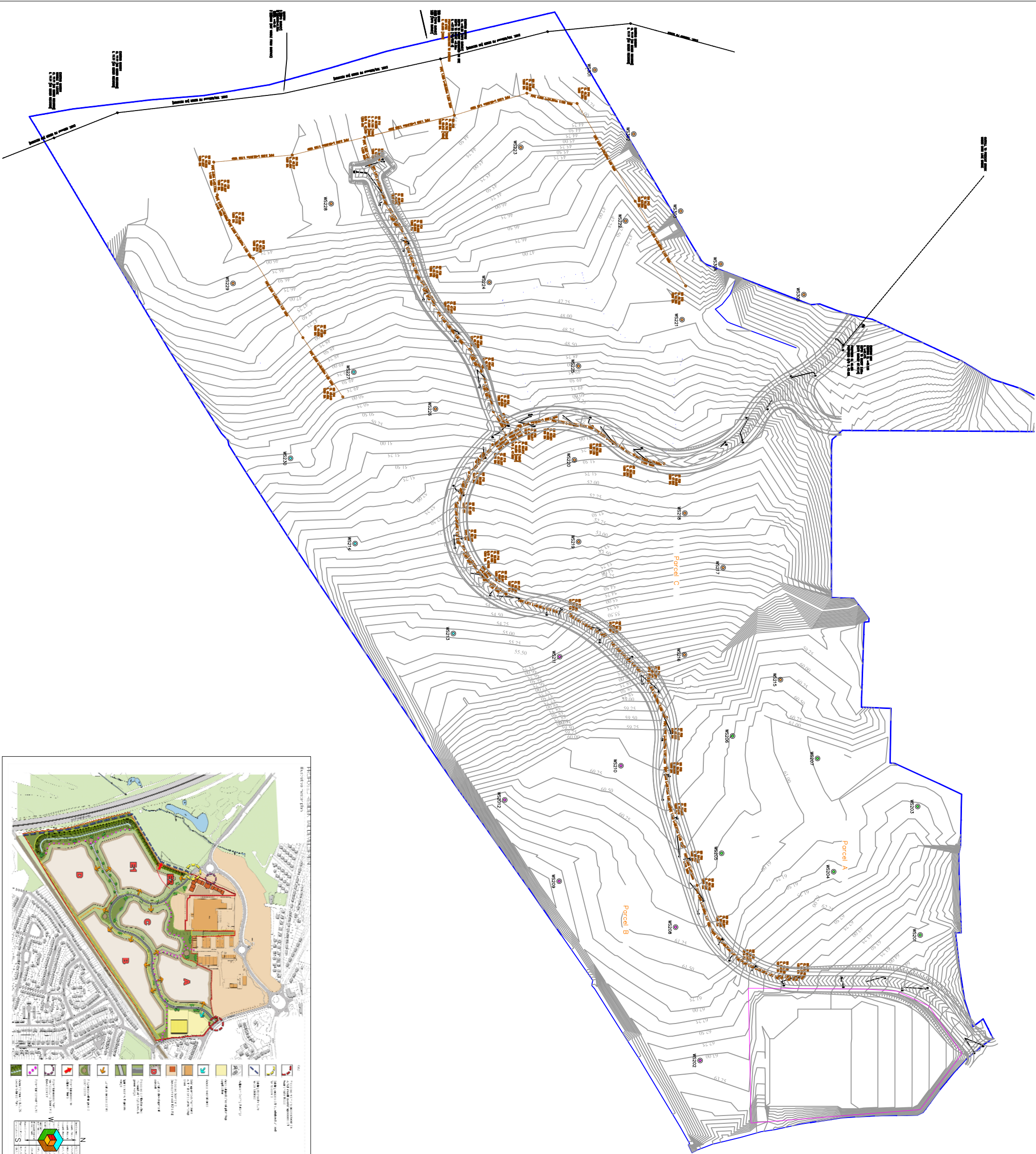
McAULIFFE ENVIRONMENTAL LTD
Mcauliffe House
Northcott Road
Wolverhampton
West Midlands
W V14 OTP
Tel: 01902 354400
12 Bath Street
Hale
Cheshire
WA14 2HG
Tel: 0161 928 7740

DRAWING No: E3P-1256_MADEGR

Key:

Location Symbols

- WS201 Approximate Window Sample Probehole Location
- WS301 Approximate Window Sample Probehole Location (UU Land)
- WS201 Approximate Window Sample Probehole Location (25-01-2016)
- WS201 Approximate Window Sample Probehole Location (26-01-2016)
- WS201 Approximate Window Sample Probehole Location (27-01-2016)



Volumetrics Between OGL And Design Foundation To Masterplan 1606.14					
Design		Volume		Drawing	
Depth	Code	Car Material	Fill (Void)	Car Material	Fill (Void)
0.0000	271710.0000	271000.0000	400.0000	10000.0000	10000.0000

Notes:

P1	R1	12-02-2016	REVISION	CB	MD
P1	-	21-01-2016	DRAFT	JN	MD
Phase	Revision	Date	Issue	Drawn	Authorised

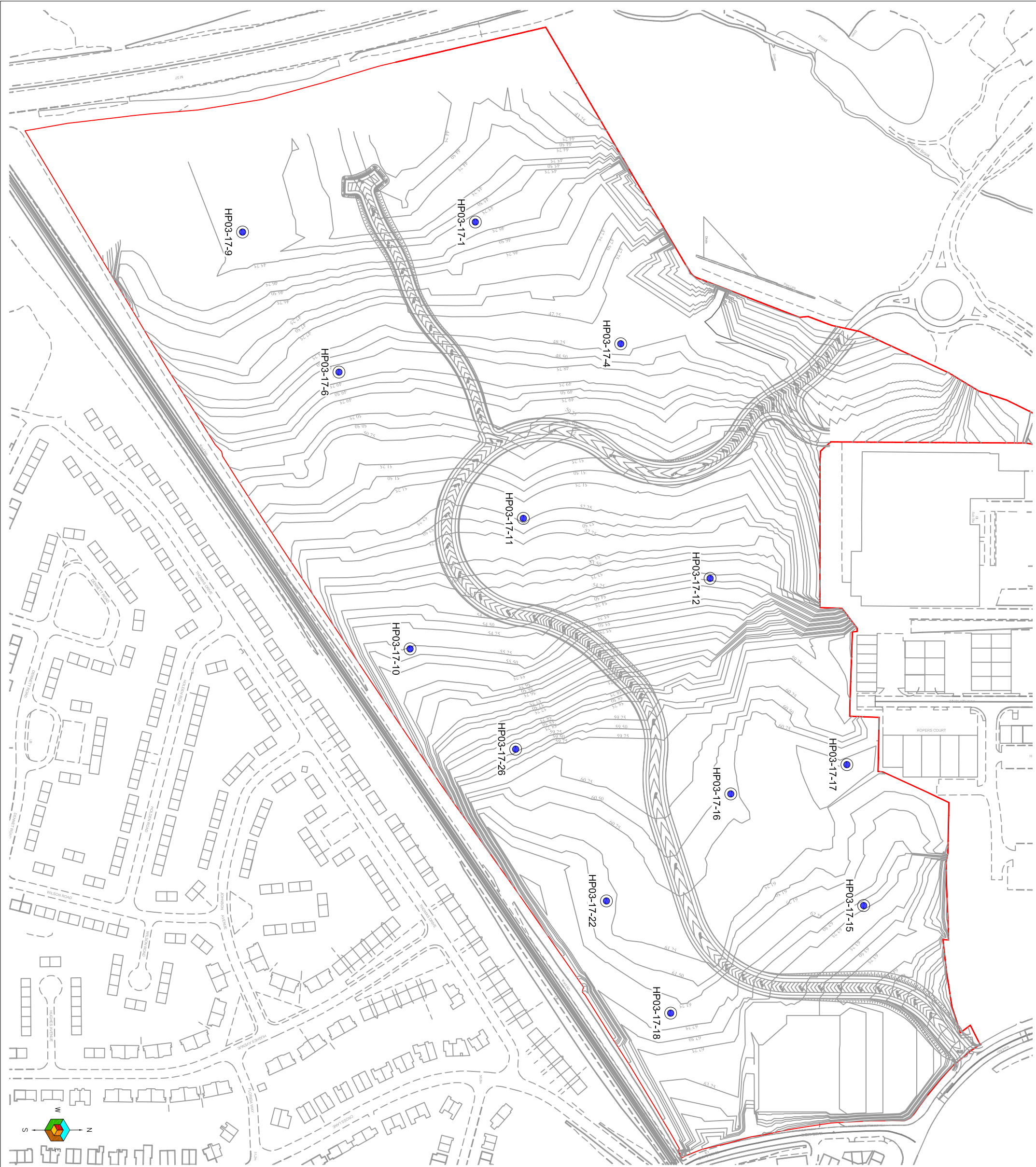
Client:	Prescot Business Park	Job No:	10021	Date:	12-02-2016
		Drawing No:	040	Scale:	1:2500 @ A3

Job Title:	Pyramid Cables, Prescot	Drawing Title:	Supplementary Intrusive Investigation Plan
------------	-------------------------	----------------	--



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

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Location Symbols

Hand Pit to 0.00 - 0.40m to Sample Made Ground and Collect Sample
for ASB Analysis

Notes

--	--	--	--

P1	R0	13-04-2017	Draft	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised
Client			Job No.	Date	
Prescot Business Park			10-021	13-04-2017	
			Drawing No.	Scale	
			044	1:2500 @ A3	

Job Title:	Drawing Title:
Pyrmian Cables, Prescot	Asbestos Validation Sample Location Plan



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

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. E3P Ltd shall not be liable for any damage and/or losses obtained in advance of the amendments being made. E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.

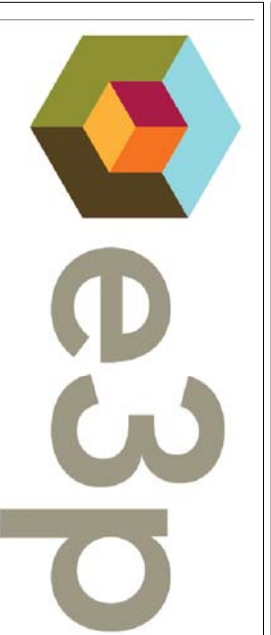


- Approximate Plate Load Test Location
- Approximate Dynamic Cone Penetrometer Test Location
- Approximate Hand Pit Location
- Approximate Plate Load Test Location (Unable to Investigate)
- Approximate Dynamic Cone Penetrometer Test Location (Unable to Investigate)

P1	R3	29-02-2016	Revision	CB	MD
P1	R2	22-12-2015	Revision	CB	MD
P1	R1	17-11-2015	Revision	CB	MD
P1	-	29-04-2015	Draft	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client:	Job No:	Date:
Prescot Business Park	10-021	29-02-2016
Drawing No:	Scale:	
034	1:1500 @ A1	

Job Title:	Drawing Title:
Pyrsnian Cables, Prescot	Geo-Technical Testing Location Plan



e3p

Environmental Energy Engineering Partnerships Ltd

City Helipoint & Business Centre

Eccles, Manchester, M30 7RU

Tel: 0161 707 9612

E-mail: info@e3p.co.uk

Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.