

Ground Gas Addendum Report

Site: Tupa, Penley
Reference: 17-510-R3
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This report has been prepared for the sole benefit, use, and information of the client. The liability of Environmental Engineering Partnership Limited T/A E3P with respect to the information contained in the report will not extend to any third party. This report has been prepared by the qualified persons as listed below.

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Table of Contents

1. INTRODUCTION	2
1.1. Background	2
1.2. Proposed Development.....	2
1.3. Objectives	2
1.4. Limitations	3
1.5. Confidentiality	3
2. RATIONALE	4
2.1. Sources and Pathways of Ground Gas.....	4
2.1.1. Monitoring Frequency.....	5
3. GROUND GAS RISK ASSESSMENT	6
3.1. Ground Gas Risk Assessment Methodology	6
3.2. Monitoring Methodology.....	7
3.3. Summary of Monitoring Results	10
3.3.1. Groundwater	10
3.3.2. Barometric pressure	10
3.3.3. Gas Flow.....	10
3.3.4. Gas Concentrations	10
3.4. Radon Risk	11
3.5. Conclusion	11
APPENDIX I LIMITATIONS.....	12
APPENDIX II GLOSSARY	18
APPENDIX III DRAWINGS	21
APPENDIX IV EXPLORATORY HOLE	23
LOGS.....	23

Drawing List

17-510-R1-001 - Site Location Plan
17-510-R1-002 - Proposed Development Plan
17-510-R1-003 - Historical Features Plan
17-510-R1-004 - Site Features Plan
17-510-R1-006 - Exploratory Hole Location Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has previously completed a ground investigation on land off Penley Hall Drive, Tupa. The findings of the ground investigation are presented within the E3P report entitled Phase II Geoenvironmental Site Assessment, report reference 17-510-R2-2, dated June 2024.

During the investigation E3P installed six ground gas monitoring wells, which were to be monitored over a period of three months after installation. The data collected from the gas monitoring wells are summarised in this report and this comprises the completed ground gas assessment.

1.2. PROPOSED DEVELOPMENT

E3P understands that the landowner intends to construct a 9 unit low-rise residential development with associated gardens, estate roads and infrastructure. Drawing 17-510-002 (APPENDIX III) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.

Figure 1 **Snapshot of Proposed Development**



1.3. OBJECTIVES

The objectives of the ground gas addendum report are to provide a detailed assessment of ground gas risk based on all available data from the E3P ground investigation works.



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. RATIONALE

Hazardous ground gas qualitative risk assessment is based on a conceptual site model (CSM) similar to that used for soil and groundwater contamination sources (i.e., source pathway receptor pollutant linkages).

The risk can be assessed based on knowledge of the ground conditions and CSM and a measure of hazardous gas concentrations and gas flow at the site within monitoring standpipes.

2.1. SOURCES AND PATHWAYS OF GROUND GAS

Table 1 summarises the potential sources and pathways of ground gas within the context of the recorded site setting and proposed development.

Table 1 Identified Potential Sources of Ground Gas

SOURCE

Made Ground

Made Ground deposits were encountered within the south (TP105) and the south-east (WS101 and TP101) to depths of between 0.30 m and 0.50 m bgl although, in general, Made Ground was not encountered within any of the other exploratory hole locations.

Deposits within TP105 are believed to be in the position of the former pond feature and comprise reworked silty, sandy clay topsoil above brown sandy gravels of sandstone and brick with cobbles of whole brick identified within the matrix. Between 0.40–0.50 m bgl an organic odour has been noted within the Made Ground deposits.

WS101 and TP101 were advanced in the position of the former tennis courts in the south east and with a thin layer of tarmacadam (up to 0.05 m in thickness) overlying reworked sandy gravels of mudstone, sandstone and fragments of brick. Within TP101 between 0.05–0.20 m bgl black sandy gravel of ash and clinker has been identified.

Drift Strata

No PEAT deposits or organic material were encountered during the intrusive investigation. The site was proven to be underlain by cohesive CLAY deposits locally interbedded with granular deposits.

Solid Strata

No solid strata were encountered during the intrusive investigation.

The site is not located within a Coal Mining Reporting Area. There are no mine entries, coal outcrops, past or probable shallow coal mine workings beneath or close to the site. The risk from underground coal workings is therefore considered to be very low and no further works are deemed to be required in relation to coal mining.

Landfill Sites

No landfill sites (current or historic) are located within 250 m of the site.

In the southern sector, there is an infilled pond, and in this area, there is the potential for Made Ground infill as well as organic-rich alluvium deposits to be present. During the site investigation, this area was waterlogged, as such the investigation was limited.

Other Gases

Radon Class 1 - less than 1% of homes are estimated to be at or above the Action Level. No radon protection measures required.

Additionally, no volatile contamination has been identified as part of the soil analysis onsite.



2.1.1. MONITORING FREQUENCY

The CIRIA C665 guidance on gas risk assessment includes recommendations for periods and frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source.

The proposed development comprises private residential properties, which would be classified as a Type A development (high sensitivity) in accordance with BS8485:2015+A1:2019. However, it is considered that the likely generation potential of the identified gas sources (taking into account the likelihood of future increases in gas generation) would be best classified as low.

Therefore within the context of the proposed residential end-use and ground gas generation potential, the gas assessment requires six visits over three months, with at least two sets of readings at low or falling atmospheric pressure.



3. GROUND GAS RISK ASSESSMENT

3.1. GROUND GAS RISK ASSESSMENT METHODOLOGY

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)*
- ✿ BS8485:2015+A1:2019 – *Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation (CS) and the proposed development based on building type.

Therefore, in accordance with BS8485, based on the measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) shall be derived for each monitoring point, from which the site characteristic hazardous gas flow rate (Q_{hgs}), and then the Characteristic Situation (CS) can be determined.

The following equation should be utilised:

$$Q_{hg} = q \left(\frac{C_{hg}}{100} \right)$$

Where:

q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe
 C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

The subsequent derived gas screening value (GSV) should be the maximum Q_{hg} (flow rate x concentration as a percentage volume) for all the monitoring events.

A 'worst case check' may be carried out using the maximum recorded flow in any hole with the maximum concentration in any hole to present the plausible worst case conditions. Adoption of the worst case Q_{hg} requires thorough justification and reference to the CSM.

The final derived GSV can then be used to characterise the site as summarised in Table 2.



Table 2 Site Characterisation by GSV (BS8485:2015+A1:2019)

CS	HAZARD POTENTIAL	GSV (L/HR) FOR METHANE AND CARBON DIOXIDE	ADDITIONAL FACTORS
CS1	Very Low	< 0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	< 0.70	Typical measured flow rate <70 l/h (otherwise consider an increase to CS3)
CS3	Moderate	< 3.5	N/A
CS4	Moderate to High	< 15	N/A
CS5	High	< 70	N/A
CS6	Very High	> 70	N/A

Notes:

The CS is equivalent to the characteristic GSV in CIRIA C665.

The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter should be considered.

Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, multiplied by the concentration in the air stream of the particular gas being considered.

The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

3.2. MONITORING METHODOLOGY

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

Gas measurements were recorded for a minimum of 300 seconds (5 minutes) at each location, increasing to 600 seconds if elevated concentrations identified, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded.

The results of the ground gas monitoring are presented in Table 3.

In addition to the raw data, the results for each individual standpipe have been assessed with reference to guidance provided in the most recent BS8485. Based on the initial peak measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) have been derived for each monitoring point, from which an individual Characteristic Situation (CS) can ultimately be determined.



Table 3 Summary of Ground Gas Monitoring Results

WELL	STRATA	DATE	CH ₄ PEAK (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ Q _{hg} (l/hr)	CO ₂ PEAK (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ Q _{hg} (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	Natural CLAY Drift	03/04/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.4	985	Steady	0.1	0.1	1.00–4.00	3.80	0.15
		18/04/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1010	Falling	0.1	0.1		3.91	0.32
		01/05/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1001	Steady	0.1	0.1		3.81	0.57
		22/05/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	996	Falling	0.1	0.1		3.81	0.22
		06/06/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1007	Steady	0.1	0.1		3.81	0.65
WS102	Natural CLAY Drift	02/07/2024	0.1	0.1	0.0001	0.2	0.1	0.0001	20.5	1011	Steady	0.1	0.1	1.00–4.00	3.81	0.83
		03/04/2024	0.1	0.1	0.0001	0.7	0.3	0.0007	20.2	988	Steady	0.1	0.1		3.69	0.15
		18/04/2024	0.1	0.1	0.0001	0.2	0.1	0.0002	20.6	1012	Falling	0.1	0.1		3.76	0.26
		01/05/2024	0.1	0.1	0.0001	0.4	0.3	0.0004	20.5	1001	Steady	0.1	0.1		3.70	0.57
		22/05/2024	0.1	0.1	0.0001	0.3	0.3	0.0003	20.1	997	Falling	0.1	0.1		3.70	0.00
WS103	Natural CLAY Drift	06/06/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1007	Steady	0.1	0.1	1.00–3.00	3.68	0.72
		02/07/2024	0.1	0.1	0.0001	7.4	7.4	0.0074	14.2	1011	Steady	0.1	0.1		3.68	0.98
		03/04/2024	0.1	0.1	0.0001	0.8	0.8	0.0008	19.9	985	Steady	0.1	0.1		2.80	0.05
		18/04/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1010	Falling	0.1	0.1		2.79	0.88
		01/05/2024	0.1	0.1	0.0001	2.9	2.9	0.0029	15.4	1001	Steady	0.1	0.1		2.76	1.60
WS104	Natural CLAY Drift	22/05/2024	0.1	0.1	0.0016	4.9	0.2	0.0784	20.2	996	Falling	1.6	0.1	1.00–3.00	2.76	1.42
		06/06/2024	0.1	0.1	0.0001	0.5	0.2	0.0005	20.4	1007	Steady	0.1	0.1		2.74	0.98
		02/07/2024	0.1	0.1	0.0001	5.5	5.3	0.0005	7.9	1011	Steady	0.1	0.1		2.74	1.90
		03/04/2024	0.1	0.1	0.0001	0.2	0.2	0.0002	20.4	985	Steady	0.1	0.1		2.90	0.10
		18/04/2024	0.1	0.1	0.0001	2.2	0.9	0.0022	18.9	1011	Falling	0.1	0.1		2.88	1.15
WS105	Natural CLAY Drift	01/05/2024	0.1	0.1	0.0001	4.7	4.7	0.0047	10.4	1001	Steady	0.1	0.1	1.00–3.00	2.87	1.05
		22/05/2024	0.5	0.1	0.0105	3.6	3.6	0.0756	13.8	996	Falling	2.1	0.1		2.87	1.20
		06/06/2024	0.1	0.1	0.0001	0.3	0.3	0.0003	20.3	1007	Steady	0.1	0.1		2.87	0.97
		02/07/2024	0.1	0.1	0.0001	7.3	7.0	0.0073	5.2	1011	Steady	0.1	0.1		2.87	2.10
		03/04/2024		Area in the position of the well flooded.											1.00–3.00	N/A
18/04/2024													2.72	0.36		
01/05/2024	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1001	Steady	0.1	0.1	2.72	2.02			
22/05/2024	0.1	0.1	0.0004	1.6	0.1	0.0064	20.5	997	Falling	0.4	0.1	2.72	1.91			
06/06/2024	0.1	0.1	0.0001	0.5	0.1	0.0005	20.4	1007	Steady	0.1	0.1	2.72	1.91			
WS106	Natural CLAY Drift	02/07/2024	0.1	0.1	0.0001	0.4	0.2	0.0004	20.3	1011	Steady	0.1	0.1	1.00–3.00	2.73	1.88
		03/04/2024	0.1	0.1	0.0001	1.0	0.1	0.0010	20.4	985	Steady	0.1	0.1		2.60	0.20
		18/04/2024	0.1	0.1	0.0001	3.2	3.1	0.0032	19.9	1011	Falling	0.1	0.1		2.55	0.15
		01/05/2024	0.1	0.1	0.0001	3.2	0.6	0.0032	20.4	1001	Steady	0.1	0.1		2.48	0.53
		22/05/2024	0.1	0.1	0.0045	4.5	2.8	0.2025	19.8	996	Falling	4.5	4.5		2.48	0.43
WS106	Natural CLAY Drift	06/06/2024	0.1	0.1	0.0009	3.7	0.6	0.0333	20.5	1007	Steady	0.9	0.1	1.00–3.00	2.50	0.70
		02/07/2024	0.1	0.1	0.0001	0.5	0.4	0.0005	20.2	1011	Steady	0.1	0.1		2.50	0.95



Notes

CIRIA Characteristic Situation	Q_{hg}		
CS1	<0.07	Typical Max CO2 <5 % Typical Max CH4 <1 %	Values in BOLD exceed CS1 Thresholds
CS2	<0.7	Flow rate not to exceed 70 l/hr otherwise consider increase to CS3	Values in BLUE denote water above level of response zone (flooded)
CS3	<3.5		
CS4	<15	Quantitative Risk Assessment required to evaluate scope of protective measures	



3.3. SUMMARY OF MONITORING RESULTS

3.3.1. GROUNDWATER

The water level within several of the monitoring wells was recorded to be above the top of the response zone (flooded) on a number of occasions, as summarised in Table 4, thus rendering some of the monitoring data unreliable. Therefore, each time a flooded well was encountered, the well was bailed and left to re-equilibrate. Wells were re-monitored after a period of 20–30 minutes.

Table 4 Flooded Monitoring Well Data

WELL	VISIT 1 03/04/2024	VISIT 2 18/04/2024	VISIT 3 01/05/2024	VISIT 4 22/05/2024	VISIT 5 06/06/2024	VISIT 6 02.07.2024
WS101	Y	Y	Y	Y	Y	Y
WS102	Y	Y	Y	Y	Y	Y
WS103	Y	Y	-	-	Y	-
WS104	Y	-	-	-	Y	-
WS105	-	-	Y	-	-	-
WS106	Y	Y	Y	Y	Y	Y

Within remaining monitoring wells, groundwater levels were observed to rise over the monitoring period, however, due to the predominantly low permeability cohesive drift stratum, it is likely that water levels are representative of surface water collecting within the standpipes and not a true representation of groundwater.

3.3.2. BAROMETRIC PRESSURE

Visit 1 was undertaken during a period of relatively low/rising pressure with pressure recorded at 985 mbar.

Visit 2 was undertaken during relatively high/falling pressure with pressure recorded at 1010 mbar.

Visits 3 and 6 were undertaken during a period of moderate/steady pressure with pressure recorded to be 1001 mbar and 1011 mbar respectively.

Visit 4 was undertaken during low/falling pressure and visit 5 was undertaken during rising pressure.

It is therefore considered that the visits have been undertaken over a wide range of conditions.

3.3.3. GAS FLOW

Throughout the monitoring period, flow rates were recorded to be 0.1 l/hr to 4.5 l/hr (WS106 round 4).

3.3.4. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.1% v/v (limit of detection of the analyser).

Carbon dioxide concentrations were recorded at concentrations ranging from 0.1% v/v to 7.4% v/v (WS102).



3.4. RADON RISK

All sites registered from 1st December 2022 onwards will have been assessed against the updated radon maps by NHBC.

The site is in an area where less than 1% of homes are above the Radon Action Level, therefore radon protection measures will not be required in any proposed new dwellings.

3.5. CONCLUSION

The determined Characteristic Situation for each standpipe for each visit is presented in Table 5. This indicates that based on the peak flow rates the majority of the monitoring visits classify as Characteristic Situation (CS)1 – Very Low Gas Risk.

Table 5 Gas Risk Profile and Location

WELL	MAX FLOW (l/hr)	MAX CH ₄ (%V/V)	MAX CH ₄ Q _{hg} (l/hr)	MAX CO ₂ (%V/V)	MAX CO ₂ Q _{hg} (l/hr)	CHARACTERISTIC SITUATION
WS101	0.1	0.1	0.0001	0.2	0.0001	CS1
WS102	0.1	0.1	0.0001	7.4	0.0074	CS1
WS103	1.6	0.1	0.0016	5.5	0.0784	CS1
WS104	2.1	0.1	0.0105	7.3	0.0756	CS1
WS105	0.4	0.1	0.0004	1.6	0.0064	CS1
WS106	4.5	0.1	0.0045	4.5	0.2025	CS1

E3P have assessed the previous variables and come to the following conclusions:

- ✳ In the vicinity of WS102, WS103, WS104, carbon dioxide has been identified above the 5% v/v threshold, however the GSV is noted to be within a CS1 classification.
- ✳ Made Ground has been encountered in localised areas between depths of 0.30 – 0.50 m bgl.
- ✳ The site is underlain by cohesive CLAY deposits locally interbedded with granular deposits.
- ✳ Monitoring wells within WS101, WS102 and WS106 were flooded throughout the monitoring period and therefore monitoring data is unreliable.
- ✳ With due consideration to the Conceptual Site Model and the absence of any persistent gas source and gas generation potential, it is considered by E3P that the site can be classified as CS1, and therefore no gas protection measures are required.

It is recommended that the full ground gas assessment and recommended protection measures (if applicable) 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.

END OF REPORT

APPENDIX I

LIMITATIONS





GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P "Terms of Business" or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.
3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.
4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.
6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.
7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.
8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.



9. 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 does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental And Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.
12. The investigation has been undertaken to provide information concerning either:
- I. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - II. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.



18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.
20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.
21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.
22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.
23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.
25. The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.
26. If costs have been included in relation to additional site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.



EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.
30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.
32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.



MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.
35. The data is presented and will be compared with assessment criteria.

APPENDIX II

GLOSSARY





TERMS

ACM	Asbestos containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Aboveground 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 nonaqueous 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	Vibrionaceae column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibroreplacement stone columns
LMRL	Lower method reporting limit	VSC	Vibrostone columns
LNAPL	Light nonaqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation



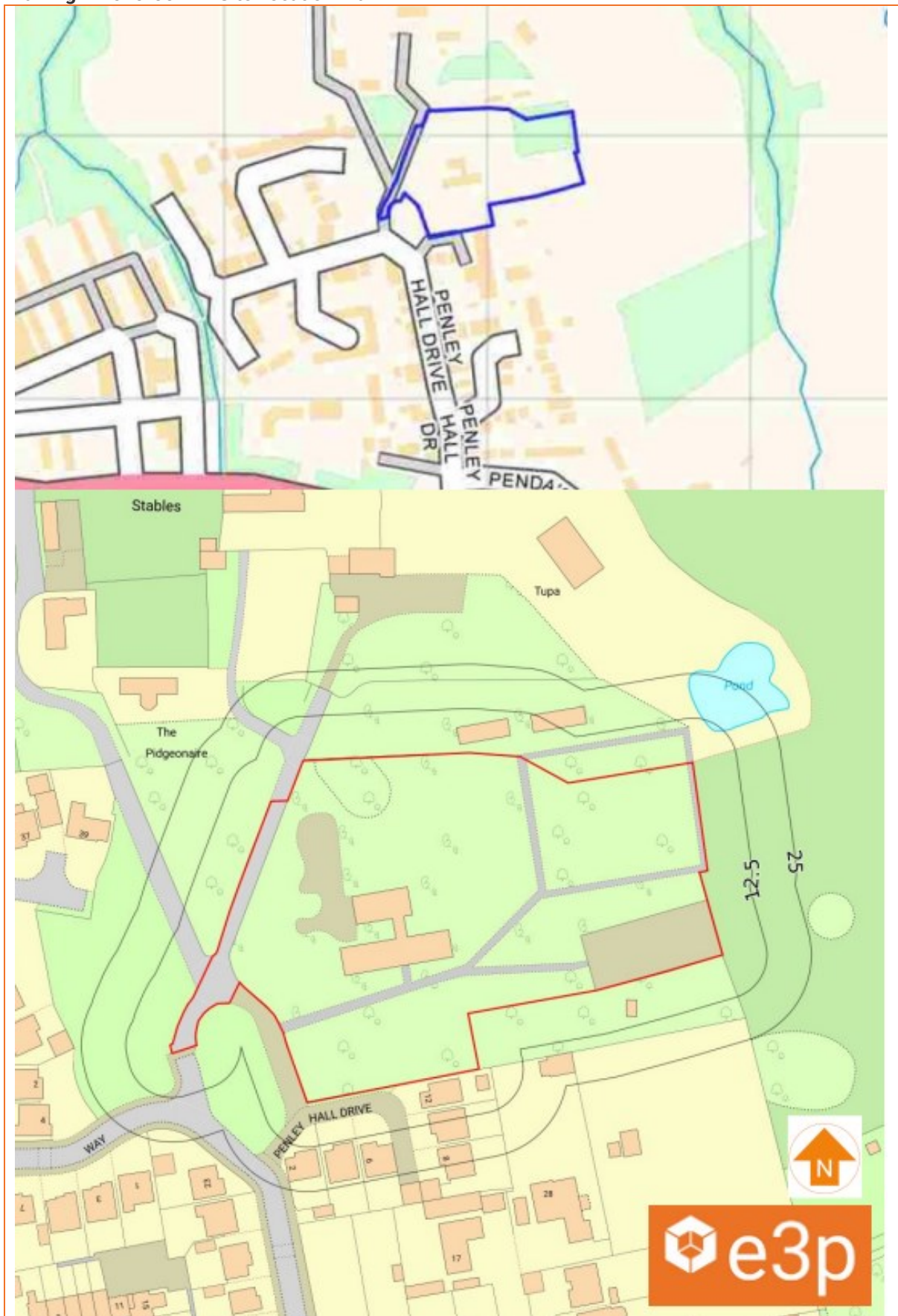
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	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



Drawing 17-510-001 Site Location Plan





Notes:					
P1	REVA	07.03.2024	OW	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:	Fisher German LLP
	Tupa, Pensley

Job No:	17-510
Drawing No:	002

Date:	07.03.2024
Scale:	1:1000 @ A3



Environmental Engineering
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Historical Features

-  Former Buildings and Structures
-  Former Pond
-  Former Hospital Building
-  Tennis Court

Notes:

Notes:

P1	REVA	07.03.2024	OW	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:

Fisher German LLP

Job Title:

Tupa, Pensley

Job No:

17-510

Drawing No:

003

Date:

07.03.2024

Scale:

1:1000 @ A3



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Site Features

- | | | | |
|--|--------------------------------|--|--------------|
| | Dense Vegetation | | Gates |
| | Boggy | | Tennis Court |
| | Former Hospital Building | | Manhole |
| | Heavily Vegetated Areas | | |
| | Heavily Vegetated and Boggy | | |
| | Footpath | | |
| | Heavily Vegetated Hardstanding | | |
| | Gates | | |
| | Mature Tree | | |

Notes:

P1	REVB	12.03.2024	EB	JW	MJ
P1	REVA	07.03.2024	OW	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:

Fisher German LLP

Job Title:
Tupa, Pensley

Job No:

17-510
Drawing No:
004

Drawing Title:
Site Features Plan

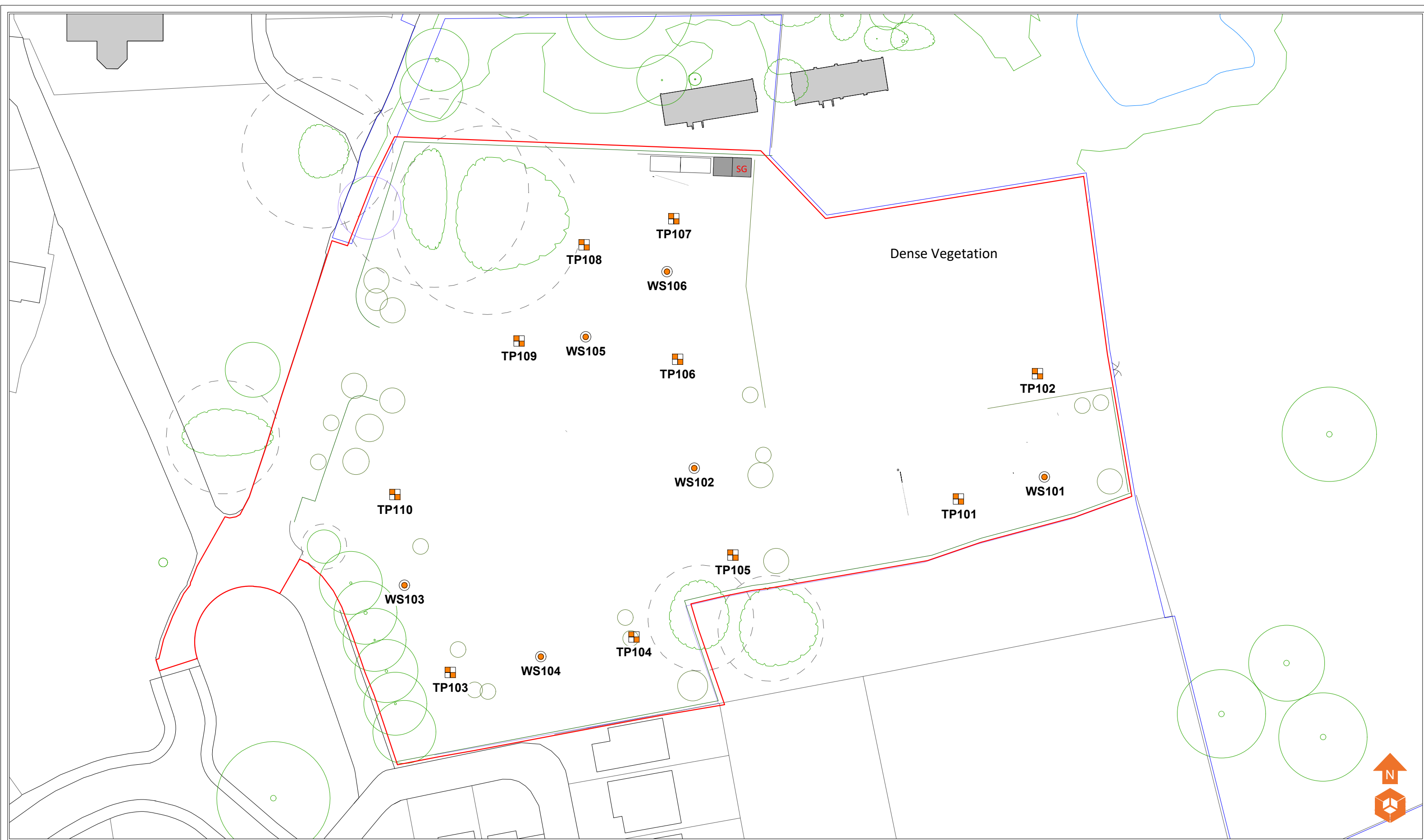
Date:

12.03.2024
Scale:
NTS@ A3



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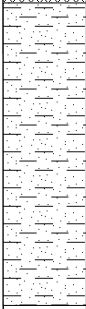


Location Symbols WS101 Approximate Window Sample Probehole Location (E3P March 2024) TP101 Approximate Trial Pit Location (E3P March 2024)						Notes:						Client: Fisher German LLP		Job No: 17-510	Date: 02.04.2024	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk					
<table><tr><td>P1</td><td>REVA</td><td>02.04.2024</td><td>EB</td><td>JW</td><td>MJ</td></tr><tr><td>Phase</td><td>Issue</td><td>Date</td><td>Drawn</td><td>Checked</td><td>PM</td></tr></table>						P1	REVA	02.04.2024	EB	JW	MJ	Phase	Issue	Date	Drawn		Checked	PM	Job Title: Tupa, Pensley		Drawing No: 005
P1	REVA	02.04.2024	EB	JW	MJ																
Phase	Issue	Date	Drawn	Checked	PM																
								Drawing Title: Exploratory Hole Location Plan		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.											

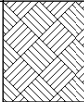
APPENDIX IV

EXPLORATORY HOLE LOGS



				Trial Pit Log				TrialPit No TP101 Sheet 1 of 1		
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341844.00 - 340167.00 Level:		Date 20/03/2024		
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30		
Client: Fisher German						Depth 1.50		Logged J. WAUGH		
Water Strike  0.30	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.10	ES+L		0.20			MADE GROUND: Asphalt. MADE GROUND: Black sandy gravel. Gravel is fine to coarse angular to subrounded of sandstone and clinker with inclusions of ash. MADE GROUND: Light orangish brown to grey silty sandy gravel. Gravel is fine to coarse angular to subrounded of mudstone and sandstone with fragments of brick. Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to medium angular to subrounded of mudstone. Becoming very stiff			
	0.50	ES		0.30						
	0.50	HVP	84	0.50						
	1.00	B								
1.00	HVP	197								
	1.50	HVP	197	1.50			End of Pit at 1.50m			
Trial Pit Photographs										
 TP101 - Excavation					 TP101 - Arisings					
Remarks: 1. Complete. 2. Water strike noted as moderate ingress at 0.30 m bgl. 3. W3W: bonnet.severe.ensemble										
Stability: STABLE										

				Trial Pit Log			TrialPit No TP102 Sheet 1 of 1			
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341855.00 - 340186.00 Level:		Date 20/03/2024		
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30		
Client: Fisher German						Depth 2.10		Logged J. WAUGH		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
 0.70	0.10	ES		0.30			Dark brown silty clayey gravelly fine to medium SAND with rootlets. Gravel is fine to medium subrounded of sandstone. (Topsoil).			
	0.50	ES					Greyish brown silty gravelly fine to medium SAND. Gravel is fine to coarse subangular to rounded of sandstone.			
	1.00	HVP	96				Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.			
	1.50	HVP	197	2.10			Becoming very stiff			
	2.00	HVP	197				End of Pit at 2.10m			
									4	
Trial Pit Photographs										
TP102 - Excavation					TP102 - Arisings					
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.70 m bgl. 3. W3W: marmalade.continues.unwound										
Stability: STABLE										

				Trial Pit Log				TrialPit No TP103 Sheet 1 of 1	
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341766.00 - 340144.00 Level:		Date 20/03/2024	
Location: Wrexham						Dimensions (m): 3.00 0.60		Scale 1:30	
Client: Fisher German						Depth 2.30		Logged J. WAUGH	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
 0.40	0.20	ES		0.40			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).		
	0.50	HVP	87				Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.		
	1.00	HVP	155				Becoming very stiff		
	1.50 1.50	B HVP	197						
	1.90	HVP	197						
				2.30			End of Pit at 2.30m		
Trial Pit Photographs									
 20/03/2024 274° W Tupa, Penley 17-510 TP103					 20/03/2024 311° NW Tupa, Penley 17-510 TP103				
TP103 - Excavation					TP103 - Arisings				
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.40 m bgl. 3. W3W: left.shorts.correctly									
Stability: STABLE									
									

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341809.00 - 340149.00
Level:

Date
20/03/2024

Location: Wrexham

Dimensions (m): 3.00

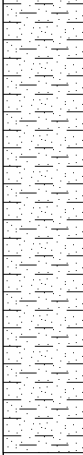
Scale
1:30

Client: Fisher German

Depth 2.10

0.60

Logged
J. WAUGH

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
 0.30				0.30			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
	0.50	HVP	96				Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	1
	1.00 1.00	ES HVP	152				<i>Becoming very stiff</i>	
	1.50	HVP	197					
	2.00	HVP	197	2.10				
							End of Pit at 2.10m	

Trial Pit Photographs



TP104 - Excavation

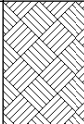
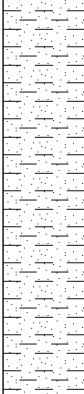


TP104 - Arisings

Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.30 m bgl. 3. W3W: onto.claps.manicured

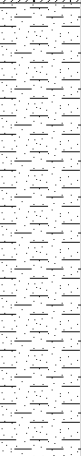
Stability: STABLE

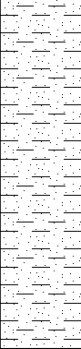
				Trial Pit Log				TrialPit No TP105 Sheet 1 of 1		
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341822.00 - 340156.00 Level:		Date 20/03/2024		
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30		
Client: Fisher German						Depth 1.90		Logged J. WAUGH		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
 1.00	0.20	ES+L		0.10			MADE GROUND: Dark brown silty sandy clay with frequent rootlets. (Reworked topsoil). MADE GROUND: Orangish brown sandy gravel. Gravel is fine to coarse angular to subrounded of sandstone and brick with frequent subangular cobbles of brick. MADE GROUND: Black slightly clayey slightly gravelly silty sand with a slight organic odour. Gravel is fine to medium angular to subrounded of sandstone with fragments of brick. Grey silty fine to medium SAND. Light orangish brown silty clayey fine to medium SAND. Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone. Becoming very stiff			
	0.40	ES+L		0.40						
	0.50	ES		0.50						
	0.80	B		0.80						
	1.00	HVP	80	1.00						
	1.50	HVP	197							
	1.90	HVP	197	1.90						
							End of Pit at 1.90m			
Trial Pit Photographs										
 TP105 - Excavation						 TP105 - Arisings				
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 1.00 m bgl. 3. Slight organic odour between 0.40 m bgl and 0.80 m bgl. 4. W3W: tadpole.tilt.waxing										
Stability: STABLE										

				Trial Pit Log				TrialPit No TP106 Sheet 1 of 1		
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341799.00 - 340183.00 Level:		Date 20/03/2024		
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30		
Client: Fisher German						Depth 2.30		Logged J. WAUGH		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.20	ES		0.50 0.60			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).			1
							Orangish brown silty clayey fine to medium SAND.			
							Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.			
	0.90 1.00	ES HVP	93							2
	1.50	HVP	197				Becoming very stiff			
2.00	HVP	197	2.30			End of Pit at 2.30m			3	
										4
Trial Pit Photographs										
										
TP106 - Excavation						TP106 - Arisings				
Remarks: 1. Complete. 2. W3W: peach.products.contact										
Stability: STABLE										
										

				Trial Pit Log			TrialPit No TP107 Sheet 1 of 1	
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341797.00 - 340216.00 Level:		Date 20/03/2024
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30
Client: Fisher German						Depth 2.50		Logged J. WAUGH
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
 0.60				0.40			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
				0.60			Orangish brown silty clayey fine to medium SAND.	
	0.80	ES					Stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	
	1.00	HVP	104				Becoming very stiff	
	1.50	HVP	197					
	1.80	HVP	197					
				2.50			End of Pit at 2.50m	
Trial Pit Photographs								
TP107 - Excavation				TP107 - Arisings				
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.60 m bgl. 3. W3W: collected.traders.slides								
Stability: STABLE								

				Trial Pit Log				TrialPit No TP108 Sheet 1 of 1	
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341780.00 - 340214.00 Level:		Date 20/03/2024	
Location: Wrexham						Dimensions (m): 3.00 0.60		Scale 1:30	
Client: Fisher German						Depth 2.20		Logged J. WAUGH	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
 0.60	0.10	ES		0.30			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).		
							Orangish brown silty clayey fine to medium SAND.		
	0.50	ES		0.60			Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.		
	1.00	HVP	99						
	1.50	HVP	197				Becoming very stiff		
	2.00	HVP	197	2.20			End of Pit at 2.20m		
Trial Pit Photographs									
 20/03/2024 59° NE Tupa, Penley 17-510 TP108					 20/03/2024 16° N Tupa, Penley 17-510 TP108				
TP108 - Excavation					TP108 - Arisings				
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.60 m bgl. 3. W3W: constrain.represent.saves									
Stability: STABLE									
									

				Trial Pit Log				TrialPit No TP109 Sheet 1 of 1	
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341775.00 - 340195.00 Level:		Date 20/03/2024	
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30	
Client: Fisher German						Depth 2.10		Logged J. WAUGH	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
 0.30				0.30			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).		
	0.50	HVP	58				 <i>Becoming very stiff</i>		
	1.00	HVP	158						
	1.10	ES							
	1.50	HVP	197						
	1.90	HVP	197	2.10			End of Pit at 2.10m		
Trial Pit Photographs									
									
TP109 - Excavation					TP109 - Arisings				
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.30 m bgl. 3. W3W: mysteries.rising.beaks									
Stability: STABLE									

				Trial Pit Log				TrialPit No TP110 Sheet 1 of 1	
Project Name: Tupa, Penley				Project No. 17510		Co-ords: 341754.00 - 340171.00 Level:		Date 20/03/2024	
Location: Wrexham						Dimensions (m): 3.00		Scale 1:30	
Client: Fisher German						Depth 2.00		Logged J. WAUGH	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
 0.40	0.10	ES		0.30 0.40			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).		1 2 3 4
	0.50	HVP	101				Orangish brown silty clayey fine to medium SAND. Stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.		
	1.00	HVP	197			Becoming very stiff			
	1.20	ES+L							
	1.50	HVP	197						
	2.00	HVP	197	2.00		End of Pit at 2.00m			
Trial Pit Photographs									
 TP110 - Excavation					 TP110 - Arisings				
Remarks: 1. Complete. 2. Water strike noted as slow ingress at 0.40 m bgl. 3. W3W: redefined.dividers.digital									
Stability: STABLE									

Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341861.00 - 340172.00

Hole Type
WS

Location: Wrexham

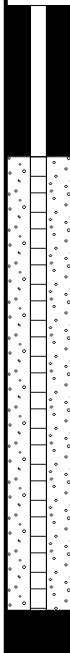
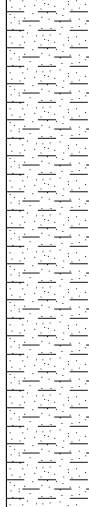
Level:

Scale
1:50

Client: Fisher German

Dates: 20/03/2024 -

Logged By
J. WAUGH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.05			0.05			MADE GROUND: Asphalt.	
		0.30			0.30			MADE GROUND: Greyish brown sandy gravel. Gravel is fine to coarse angular to subrounded of sandstone with fragments of brick.	
		0.60			0.60			Greyish brown silty fine to medium SAND.	
		1.00	D		1.00			Brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	1
		1.00	U	N=15 (1,2/3,3,4,5)	1.00				
		2.00	D		2.00				2
		2.00		N=36 (4,5/6,8,10,12)	2.00				
		3.00	D		3.00				3
		3.00		N=29 (5,6/6,7,8,8)	3.00				
		4.00	D		4.00				4
		4.00		50 (7,10/50 for 160mm)	4.00				
					4.31			End of borehole at 4.31 m	

Remarks

1. Refused on very stiff CLAY. 2. Water strike at 0.70 m bgl. 3. Monitoring well installed. 4. Response zone 1.00 - 4.00 m bgl. 5. W3W: tacky.outermost.munched

Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341803.00 - 340169.00

Hole Type
WS

Location: Wrexham

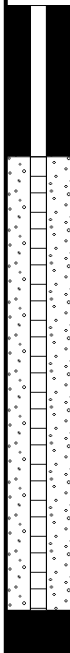
Level:

Scale
1:50

Client: Fisher German

Dates: 20/03/2024 -

Logged By
J. WAUGH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
					0.60			Grey slightly gravelly clayey fine to medium SAND. Gravel is fine to medium subangular to subrounded of sandstone.	
		0.90	ES					Light orangish brown clayey fine to medium SAND.	1
		1.00	D	N=16 (1,2/3,4,4,5)	1.10			Brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	
		1.00						Very stiff, high to very high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	
		2.00	D						2
		2.00	U	N=35 (2,5/5,7,10,13)					
		2.00							
		3.00	D						3
		3.00		N=32 (4,6/6,8,9,9)					
		4.00	D		4.00				4
		4.00		50 (8,12/50 for 240mm)	4.39				
								End of borehole at 4.39 m	5
									6
									7
									8
									9
									10

Remarks

1. Refused on very stiff CLAY. 2. Monitoring well installed. 3. Response zone 1.00 - 4.00 m bgl. 4. W3W: gossiping.cultivation.ignore



Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341760.00 - 340152.00

Hole Type
WS

Location: Wrexham

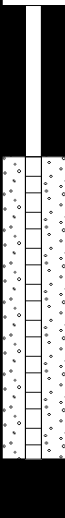
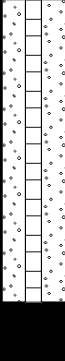
Level:

Scale
1:50

Client: Fisher German

Dates: 20/03/2024 -

Logged By
J. WAUGH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
		0.40			0.40			Greyish brown clayey fine to medium SAND.	
		0.80	ES						1
		1.00		N=13 (1,2/2,3,4,4)				Stiff to very stiff, medium to very high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	
		2.00	D						2
		2.00	U						
		2.00		N=34 (3,4/5,8,9,12)					
		3.00	D						3
		3.00		50 (7,11/50 for 240mm)	3.39				
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Refused on very stiff CLAY. 2. Monitoring well installed. 3. Response zone 1.00 - 3.00 m bgl. 4. W3W: cloak.cupcake.incorrect



Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341785.00 - 340147.00

Hole Type
WS

Location: Wrexham

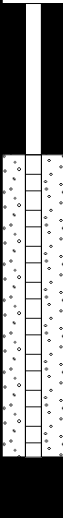
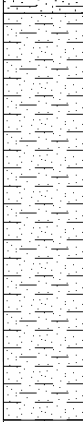
Level:

Scale
1:50

Client: Fisher German

Dates: 20/03/2024 -

Logged By
J. WAUGH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
		0.60	ES		0.70			Light orangish brown clayey fine to medium SAND.	
		1.00	D					Brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone. Very stiff, high to very high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	1
		1.00	U	N=15 (3,3/4,4,4,3)					
		1.00							
		2.00	D						2
		2.00		N=41 (3,5/6,9,12,14)					
		3.00	D		3.00				3
		3.00		50 (6,6/50 for 280mm)	3.39				
							End of borehole at 3.43 m	4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Refused on very stiff CLAY. 2. Monitoring well installed. 3. Response zone 1.00 - 3.00 m bgl. 4. W3W: wealth.outpost.yell



Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341783.00 - 340203.00

Hole Type
WS

Location: Wrexham

Level:

Scale
1:50

Client: Fisher German

Dates: 20/03/2024 -

Logged By
J. WAUGH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00	U		0.20			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
		1.00	D	N=14 (1,2/2,3,4,5)				Brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	1
		1.00							
		1.20	ES						
		2.00	D	N=33 (3,4/6,7,9,11)					2
		2.00							
		3.00	D	50 (6,9/50 for 280mm)	3.00				3
		3.00			3.43				
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Refused on very stiff CLAY. 2. Monitoring well installed. 3. Response zone 1.00 - 3.00 m bgl. 4. W3W: handlebar.stance.soda





Borehole Log

Borehole No.

WS106

Sheet 1 of 1

Project Name: Tupa, Penley

Project No.
17510

Co-ords: 341798.00 - 340209.00

Hole Type
WS

Location: Wrexham

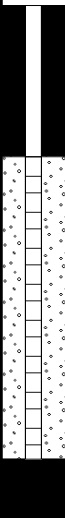
Level:

Scale
1:50

Client: Fisher German

Dates: 20/03/2024 -

Logged By
J. WAUGH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Dark brown silty sandy CLAY with frequent rootlets. (Topsoil).	
					0.50			Greyish brown silty clayey fine to medium SAND.	
								Light brown sandy CLAY.	
		0.90	ES						1
		1.00	D						
		1.00		N=16 (1,2/3,3,5,5)	1.20				
								Brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	
		2.00	D					Very stiff, high to very high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded to rounded of sandstone.	2
		2.00	U						
		2.00		N=39 (4,5/6,8,12,13)					
									
		3.00	D		3.00				3
		3.00		50 (7,8/50 for 270mm)	3.42				
								End of borehole at 3.42 m	4
									5
									6
									7
									8
									9
									10

Remarks

1. Refused on very stiff CLAY. 2. Monitoring well installed. 3. Response zone 1.00 - 3.00 m bgl. 4. W3W: denoting.frown.dreading

