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**PROPOSED RESIDENTIAL DEVELOPMENT
NORTHCOTE ROAD
LANGHO, BLACKBURN
FOR
OAK TREE DEVELOPMENTS**

JUNE 2023

PHASE II GEO-ENVIRONMENTAL INVESTIGATION REPORT

22009/GEIR/005

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DOCUMENT STATUS

Site Reference	Northcote Road, Langho
Title	Phase II Geo-Environmental Investigation Report
Client	Oak Tree Developments
Project No.	22009
Report Version	Final Issue
Date Issued	27 th April 2022
Issue Notes	Issued for comment and approval
Report Version	002
Date Issued	13 th May 2022
Issue Notes	Updated drawings.
Report Version	003
Date Issued	27 th May 2022
Issue Notes	Updated Foundation Zoning Plan
Report Version	004
Date Issued	24 th May 2023
Issue Notes	Updated drawings.
Report Version	005
Date Issued	21 st June 2023
Issue Notes	Revised following UK Radon Risk Map update, December 2022.

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EXECUTIVE SUMMARY

Site	The site is irregular in shape and located east of Northcote Road, Langho, Blackburn. The site is located within a residential / semi rural area and extends to an area of approximately 0.41 hectares.
NGR	SD 70750, 34575
Site History	A review of the historical maps show the site has remained a parcel of greenfield land since the earliest date of mapping (1844 – 1848). Recent aerial photography shows the presence of a carpark within the southern third of the site in 2013 but appears to have been removed by 2018.
Investigations	The investigations have extended to:- <ul style="list-style-type: none"> • Intrusive investigations by trial pits • Chemical analysis of soil samples • Assessment of results
Ground Conditions	Made ground deposits have been identified only within TP07 at a depth of 0.15m – 0.20m bgl, coinciding with the location of the historical car park. Topsoil was recorded across the site to a maximum proven depth of 0.25m, composing a soft brown slightly gravelly, sandy clay with abundant rootlets. A soft becoming stiff with increasing depth clay has been recorded to a maximum proven depth of 2.00m bgl. Bedrock has not been identified during this investigation.
Environmental	Chemical analyses has confirmed that the topsoil present within the site is suitable for reuse within the proposed residential development.
Trees	The site contains numerous mature trees and hedges located primarily towards the north but also sporadically around the site boundary. All trees within and lying adjacent to the site area within influencing distance should be subject to an arboriculturist report. The clay soils within this site have a LOW volume change potential as defined by the NHBC.
Foundations	The natural clay strata offers a safe bearing capacity of at least 100kN/m ² at a minimum depth of 0.9m below finished ground level. Shallow strip foundations will be suitable for the majority of the site. In those areas where tree root effects are of concern deep trench fill foundations may be required to depths up to 2.5m below ground level. Foundation depths should be designed in accordance with NHBC Handbook Chapter 4.2.
Slabs	It is recommended that all properties within this site should be provided with a suspended ground floor construction. The floors may be of a precast concrete beam and block arrangement or of a cast insitu reinforced concrete. In those areas where tree effects are important it may be preferable to adopted pc floors to allow sufficient air void below the floor in accordance with NHBC recommendations.
SUDS	Assessment of the ground conditions present within the site in terms of sustainable urban drainage confirms effectively impermeable cohesive glacial till across the majority of the site area. It is in our option based upon the results of these investigations that the superficial deposits indicate that surface water disposal by soakaways would not be feasible. It will be necessary for surface water to be disposed of utilising a traditional sewer system.

This brief summary should not be assumed to represent a complete account of all the potential geo-environmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.

PHASE II GEO-ENVIRONMENTAL INVESTIGATION WORKS

NORTHCOTE ROAD, LANGHO

1.0 INTRODUCTION

1.1 Instructions

1.1.1 We are instructed by Oak Tree Developments, Office Suite 2, No. 1 Derby Street, Leigh, Lancashire, WN7 4PF to undertake a programme of intrusive geo-environmental investigations at a parcel of land located on the eastern side of Northcote Road, Langho. The site has been the subject of a previous Phase I Desk Study prepared by REFA (report reference 22009/GEDS) dated March 2022. Reference should be made to this previous desk study report when considering this report.

1.2 Object

1.2.1 The object of these investigations were as follows:

- To enable sufficient information regarding ground conditions to be obtained from which risks to end users and the environment may be assessed;
- To utilise the information obtained from the investigations to provide recommendations for remediation measures where required;
- To determine the engineering properties of the soils present within the site to form a basis upon which foundation and general infrastructure recommendations and design may be based.

1.3 Scope

1.3.1 The investigations considered within this report have comprised of the following elements and are based upon the principles and recommendations presented in BS10175:2011 "The Investigation of Potentially Contaminated Sites".

- Review of the previous reports;
- Undertake intrusive ground investigation works utilising trial pits;
- Determine the presence, nature and extent of any soil and groundwater contamination at the site;
- Determination of the engineering properties of the soils present within the site to form a basis upon which recommendations for foundations and infrastructure construction may be based;
- Identify the potential requirements for any remedial actions where required

1.4 Development Proposals

1.4.1 We have been provided with a sketch layout for the proposed residential development of the site, comprising of eight (8 No.) residential properties with associated road access, parking and private garden areas.

1.4.2 It is acknowledged within this report that the redevelopment proposals will be subject to planning approval and it is possible that the proposals shown upon the preliminary site layout may be amended as a result of local planning and commercial requirements.

1.5 Services

- 1.5.1 Service information has been provided by our client and the plans do not show any services entering the site. Overhead BT lines run parallel along Northcote Road but terminate at existing properties. Historical plans show a water culvert entering the north east of the site and travelling northwards. However, no evidence of the culvert was uncovered during the investigation works.
- 1.5.2 It is essential that all services within and adjacent to the site are positively identified and located prior to any development works being undertaken. Where services have been disconnected, confirmation is required from the relevant authority.

2.0 REVIEW OF PREVIOUS STUDIES

2.1 Site Location

- 2.1.1 The site is irregular in shape and extends to an area of approximately 0.41 hectares. The site is located immediately to the east of Northcote Road, approximately 7.20km to the north east of Blackburn town centre. The centre of the site is situated at National Grid Reference SD 70750, 34574 within a generally residential/semi-rural type area. The location of the site is shown in figure 1 below.

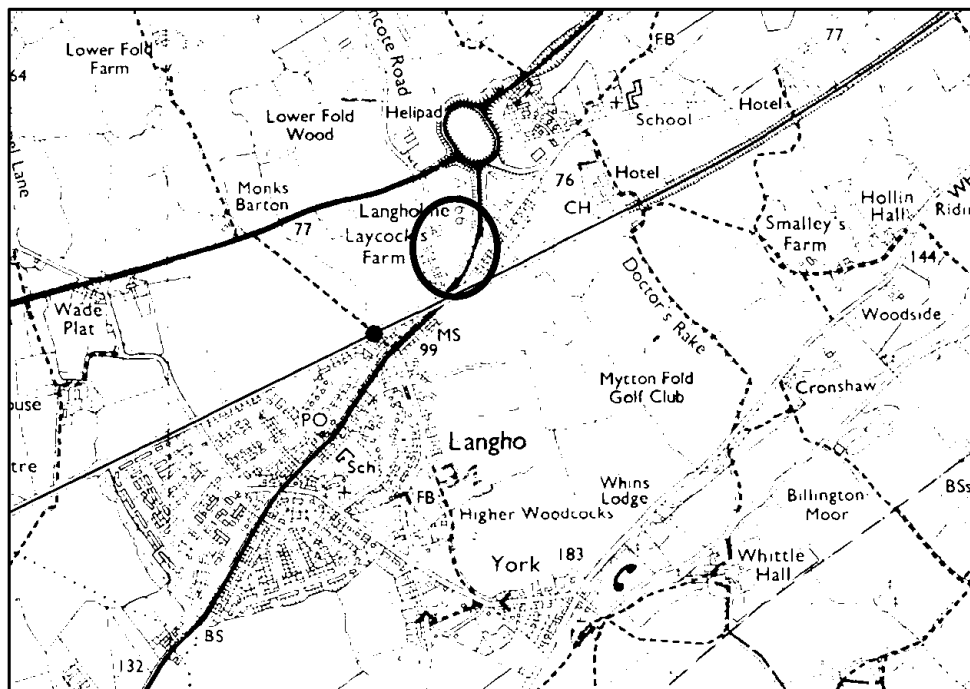


Figure 1: Site Location

2.2 Previous Phase I Summary

- 2.2.1 This site has been the subject of a previous Phase I Desk Study Report prepared by REFA dated March 2022. This study provided an environmental appraisal of the site and included the review of the environmental setting, review of propriety environmental database, review of historical plans and geological report.

The report should be read in full however the main findings are presented below:

- The site walkover confirmed that the site is largely undeveloped and comprises of a grassed field, with sheds, a tractor and trailer and fire pit towards the north. Access and use of the land is by the residential property towards the north west.
- No significant visible evidence of contamination was observed, although the remains of a fire pit were noted centrally within the site.
- A review of the historical maps show that the site has remained a parcel of greenfield land since the earliest date of mapping, 1844 – 1848. Recent aerial photography shows the presence of a carpark within the southern third of the site on the 2013 maps, however, it appears to have been removed from 2018 onwards;

2.2.2 REFA recommended that intrusive investigations were required on a precautionary basis and recommended that the scope of works for the ground investigation should comprise the following elements:-

- Programme of ground investigations to identify the strata sequence and assess engineering properties.
- Sampling of the existing strata for chemical and civil engineering laboratory test purposes.
- Programme of chemical analysis upon representative samples of the strata to determine the suitability for reuse and within residential environment.
- Preparation of factual and interpretative report.

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

3.1 Risk Assessment Methodology

3.1.1 A review of the previous information has allowed a preliminary conceptual site model to be provided below. The conceptual site model is now shown in Table 2 below. This report adopts the methodology for risk evaluation presented in CIRIA report C552 'Contaminated Land Risk Assessment – A Guide to Good Practice', 2001. The method is qualitative and involves the classification of the following:

- The magnitude of the potential severity or consequence of the risk occurring;
- The magnitude of the likelihood or probability of the risk occurring.

3.1.2 Once the likelihood of an event occurring and its severity have been classified, a risk category can be assigned using Table 1 overleaf.

		Table 1: Comparison of Consequence against Probability			
		Consequence / Risk			
		Severe	Medium	Mild	Minor
Probability	High Likelihood		High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	
	Unlikely	Moderate/Low	Low		

3.1.3 In the context of regulatory definition of 'Contaminated Land' (as defined by the EPA 1990), 'very high' and 'high' risks would fall under the classification of 'Contaminated Land'. 'Moderate' risk could also potentially be classified as 'Contaminated Land' but any lower risk rating would not. Thus the following potential exposure pathways between potential and known contaminant sources based on information provided to date and receptors are tentatively identified in Table 2 below.

Table 2: Preliminary Conceptual Site Model						
Potential Source	Potential Receptor	Possible Pathway	Probability	Consequence	Risk	Mitigation / Investigation
Contaminated Soils	Site personnel during construction	Direct contact of soils	Lw	Mi	Low	Soil sampling during intrusive investigations. Laboratory analysis of samples
		Inhalation or ingestion of soil / dust				
	Future site users	Direct contact of soils	Lw	Mi	Low	
		Inhalation or ingestion of soil / dust				
	Surface water in the vicinity of the site	Leaching of contaminants through drainage system	Lw	Md	Low	
	Ground water in aquifer	Leaching of contaminants to ground water	Ul	Md	Low	
	Future site users	Vapour migration from soils	Mi	Mr	Low	
Proposed buildings and services	Direct contact with contaminated soils	Lw	Mi	Low		
Plants in gardens and soft landscaping	Direct contact	Lw	Mi	Low		
Contaminated ground water	Site personnel during construction	Water entering excavations	Lw	Mi	Low	Sampling of ground water (where encountered)
	Future site Users	Retained surface water	Lw	Mi	Low	

Potential Source	Potential Receptor	Possible Pathway	Probability	Consequence	Risk	Mitigation / Investigation
Toxic and explosive gasses	Proposed buildings and occupiers	Ground gas migration into buildings	UI	Md	Low	No gas monitoring required.
Radon Gases	Proposed buildings and occupiers	Ground gas migration into buildings	UI	Md	Moderate	Site is located in an area where 5 – 10% of properties are affected by radon gas. Consequently BASIC Radon Gas protection measures should be adopted on site

Key: Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor Hi = High, Li = Likely, Lw = Low Likelihood, UI = Unlikely

4.0 **SITE WORKS**

4.1 **Walkover Survey**

- 4.1.1 Prior to commencing any further intrusive ground investigations a walkover survey of the site was undertaken to ensure that the site conditions were similar to those reported in the REFA report.
- 4.1.2 The site remains a parcel of grassed land, used by the neighbouring residential property. Numerous sheds, a chicken coup and children’s toy were noted across the area but predominantly within the northern section. No evidence of contamination was noted during the visit. The area towards the north and east contained dense, mature vegetation and trees, which will provide difficult to enter with a tracked machine.

4.2 **Intrusive Works**

- 4.2.1 The ground conditions at this site have been investigated by the excavation of a total of seven (7 No.) trial pits supervised by a REFA engineer utilising a backhoe style excavator. Trial pits were excavated to a maximum depth of 2.00m bgl.
- 4.2.2 During the excavation works representative samples of the soils encountered have been obtained for laboratory analysis and testing. Visual appraisal of the strata present has been undertaken during these investigations.

4.3 **Locations**

- 4.3.1 The locations of each of the trial pits are indicated upon the exploratory hole location plan 22009/03. These locations are shown in relation to site features present at the time of the investigation.
- 4.3.2 During the site investigation the north and north eastern portion of the site contained numerous children’s toys including outdoor play equipment, dense vegetation with low hanging branches were situated towards the north east, thus limiting the areas available for investigation.

4.4 Records

4.4.1 During the investigation’s details of the strata types, water entries, ground conditions and levels have been maintained by the supervising engineer. This information has been collated into a series of trial pit journals which are appended to this report for reference. During these investigations representative samples of the strata encountered have been retained for laboratory testing as required.

4.5 Targeting

4.5.1 The trial pits were undertaken to identify the strata present over the whole area of the proposed development. It should be acknowledged that ground conditions may vary between individual trial pit locations and vigilance should be maintained during subsequent development works. Where significant variation in ground conditions is identified, then further reference should be made to REFA for guidance.

4.5.2 The investigation locations have been spread over the whole area of the site in accordance with the recommendations laid down in BS10175: 2011 “Investigation of Potentially Contaminated Sites”. The initial ground investigation strategy is detailed within table 3.

Table 3: Initial Ground Investigation Strategy		
Exploratory Hole No.	Target	Purpose
TP 01 – TP07	Generally over the site area.	To determine the general nature of underlying soils and geology including: <ol style="list-style-type: none"> 1. Nature, distribution and thickness of made ground 2. Nature, degree and extent of potential contamination 3. Content of unacceptable material e.g. peat and biodegradable matter etc. 4. Suitability of the ground for the founding of structures 5. Engineering properties of the ground.

5.0 GROUND CONDITIONS

5.1 Made Ground

5.1.1 These investigation works have identified minimal made ground material present only within TP07 between 0.15m and 0.20m bgl. The made ground was seen to comprise a grey sandy gravel of limestone and sandstone. No visual or olfactory evidence of contamination was noted within the made ground material.

5.2 Natural Strata

5.2.1 Topsoil was recorded across the site area to a maximum proven depth of 0.25m bgl (TP05) and comprised soft brown slightly gravelly slightly sandy clay with abundant rootlets. Gravel was seen to be of mixed lithologies including mudstone, sandstone and siltstone.

- 5.2.2 Underlying the topsoil stratum a soft becoming firm, dark brown occasionally mottled orangish brown, slightly sandy gravelly clay with a low cobble content has been identified and proven to a maximum depth of 1.80m bgl.

This strata was recorded as overlying a firm becoming stiff greyish brown slightly sandy slightly gravelly clay with a medium cobble content and abundant pockets of brown sand. Visual appraisal of the natural clay stratum indicate that the natural clay strata is capable of offering a safe bearing capacity in excess of 100kN/m² at a minimum depth of 0.9m bgl. Increased bearing capacities may be available within localised areas and generally at greater depths

- 5.2.3 Bedrock was not identified within any trial pit locations within this ground investigation.

5.3 Groundwater

- 5.3.1 These intrusive investigations have identified groundwater ingress within positions TP01, TP04 and TP06 depths of 1.00m bgl.

This groundwater is considered to be perched upon the underlying cohesive deposits and does not represent the natural groundwater level within this area.

- 5.3.2 The site is underlain by impermeable clay deposits and it is likely that during periods of inclement weather, excavations may accumulate with perched water. However, it is considered that simple sump pumping techniques would remediate this issue.

5.4 Excavations

- 5.4.1 It is essential that personnel should not be allowed to approach or enter any excavation made upon this site unless appropriate precautions have been adopted. This is particularly important in respect of the necessary site preparation works, drainage and foundation works where personnel may be specifically required to enter excavations. Reference should be made to H.S.E. Publication HSG 150 for further guidance.

5.5 Contamination

- 5.5.1 The intrusive investigations have not identified any significant visual or olfactory evidence of contamination and the underlying natural strata is not known to be affected by any naturally occurring environmental hazards.

5.6 Sampling

- 5.6.1 Based upon the initial site appraisal in conjunction with the findings of the intrusive investigations a series of representative samples of the strata encountered have been retained for laboratory analyses. These analyses have been intended to determine the potential presence of any contamination which may represent a hazard to site operatives or end users of the site. This part of the work is considered in more detail in sections 6 & 7 of this report.

5.7 SUDS

- 5.7.1 Assessment of the ground conditions present within this site in terms of sustainable urban drainage, confirms the presence of shallow groundwater within the site and effectively impermeable cohesive natural strata. It is our opinion, based upon the results of these investigations, that the site conditions are considered to be impermeable and not suitable for the use of a soakaway system of surface water disposal. It will be necessary for surface water to be disposed of utilising a traditional gravity drainage system.

6.0 CONTAMINATION ANALYSIS & ASSESSMENT CRITERIA

6.1 Sampling

6.1.1 A total of six (6 No.) samples of made ground and topsoil encountered during these investigations have been retained for chemical analyses. Generally, these samples relate to the shallow ground conditions located within the site. These samples are considered to be representative of the ground conditions within the site and form a basis for assessment of their potential for reuse within a residential environment.

6.1.2 All samples obtained from this site were considered to be subject to a programme of PAH and analyses. Accordingly, all samples have been placed into a 500ml wide necked brown glass jar. All soil samples have been stored in cool boxes at temperatures of approximately 4° (+ or - 2°C) until delivery to the selected laboratory. All sample containers were marked with the site address, trial pit or borehole number, depth and date of sampling. All samples have been tested within the specified handling period to accord with the sampling protocol presented by Element.

6.2 Range

6.2.1 Topsoil deposits have been identified across the whole site area with a minimal amount of made ground within TP07 between 0.15m and 0.20m. Therefore, the topsoil samples have been obtained to determine its suitability for retention within the proposed residential development.

6.2.2 The desk study information has not indicated any potentially naturally occurring elevated concentrations of contaminants within the underlying natural strata and therefore the natural strata is considered suitable for retention within the proposed development.

6.3 Laboratory

6.3.1 All samples selected for chemical analyses have been returned to Element Laboratories who are an MCERTS and UKAS accredited laboratory facility. Each sample has been subject to a range of chemical analyses to determine the concentrations of a wide range of common contaminants applicable to the former use of this site and the materials present. Details of the analysis program are shown in table 4 below. Confirmation of the UKAS and MCERTS accreditations for each test is indicated within the results which are appended to this report.

6.4 Development Proposals

6.4.1 We understand that the site is to be developed in a residential manner with associated rear garden areas, areas of hard standing and access roads. It is essential to ensure that the materials present within the sensitive site areas are suitable for retention within a residential environment.

6.5 Analysis Range

6.5.1 The preliminary conceptual model identifies that there is the potential for a pollutant pathway linkage to be present at the site and that further assessment is required. Table 4 below confirms the range of analyses undertaken upon the samples of topsoil and made ground obtained from this site.

Table 4: Chemical Testing Schedule

Analysis	Determinands	No. of Samples
Metals	Arsenic, Cadmium, Chromium total, Copper, Lead, Mercury, Nickel, Selenium, Zinc	6
Organics 1	PAH – USEPA 16 suite, Phenol	6
Inorganics	Cyanide, Soluble Sulphates, Sulphide, pH, TOC	6

6.6 Results

6.6.1 Full details of the chemical analyses results are appended to this report for reference and should be read in conjunction with the comments and recommendations regarding risk assessments. Summaries of the test results are presented in conjunction with the current assessment criteria in Section 8 of this report.

6.7 Approach

6.7.1 The current UK approach to the consideration of contaminated land is based upon the principles of risk assessment. This in turn is founded upon the use of a source-pathway-target principle in order to establish the presence of a potential pollutant linkage. Our approach to the risk assessment is consistent with UK guidance and best practice. As advocated in the EA Policy Statement: Guidelines for Environmental Risk Assessment and Management a tiered approach has been adopted. This tiered approach is central to Part IIA of the Environmental Protection Act 1990 and the Town and Country Planning Act 1990.

6.8 Site Classification

6.8.1 The current development proposals for this site confirm that the site will be developed on a private residential basis with associated private garden areas. Accordingly, the site usage has been considered on the basis of an end land use of residential as defined by EA Science Report SC050021/SR3 2009 in relation to the most recent soil guideline values.

6.9 Criteria

6.9.1 The concentrations of contaminants within the ground have been compared to a range of generic soil guideline values that have been prepared by DEFRA and the Environment Agency. Where published, soil guideline values (SGV) have been utilised as intervention values for the purpose of an initial tier 1 assessment.

6.9.2 At the time of the preparation of this report soil guideline values were available only for a limited number of contaminants and the development of both the CLEA model and additional soil guideline values is on-going. Where published soil guideline values are available, they have been utilised as intervention values for the purposes of an initial tier 1 assessment. A number of SGV's have recently been updated to reflect a modern approach to the protection of human health.

6.9.3 In March 2014 the Department for Environment Food & Rural Affairs published SP1010 : Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination Policy Companion Document. This document provides a series of Category 4 screening levels based upon differing land uses. Reference has been made to the values presented within this report in relation to the appropriate land usage.

- 6.9.4 Where soil guideline values were not published at the time of preparing this report, generic assessment criteria (GAC) published by Land Quality Management Ltd., in conjunction with the Chartered Institute of Environmental Health have been adopted. The values published in the LQM/CIEH S4UL for "Human Health Risk Assessment" Registration Number S4UL 3265.
- 6.9.5 Reference has also been made to published soil screening values presented by Atkins Ltd., under their Atrisk Subscription Service. The SSVs have been adopted where SGVs or GACs are not available. The remaining contaminants have been considered based upon information that was the best available at the time of the study.

7.0 RESULTS OF ANALYSIS & QUALITATIVE RISK ASSESSMENT

7.1. Model

- 7.1.1 As discussed above, assessment of contaminated land is based upon a simple assessment of pollutant linkages referred to as the source-pathway-target model. This assessment considers the current or proposed usage of the site in terms of suitability for use. This implies the use of risk assessment in principle in order to evaluate the potential effects and concerns of contamination on a site-specific basis.
- 7.1.2 Initial assessment of the chemical analyses results has been undertaken to assess the concentrations of determinands in relation to tier 1 assessment criteria. The summary of these test results is detailed below.

7.2 Results Summary

- 7.2.1 The samples were obtained from the topsoil deposits from across the site and a made ground sample from TP07 only. Tables 5 - 6 have been prepared as a summary of the laboratory analyses depending upon the class of analyses undertaken. The test results have been compared to the adopted assessment criteria, relating to a proposed residential with home grown land produce.

7.3 Metals & Inorganics

- 7.3.1 Table 5 below indicates the range of contaminants that were analysed and their respective assessment criteria. A review of the results has not identified any concentrations above the adopted assessment criteria.

	No. of Samples	Range of Values (mg/kg)	Assessment Criteria (mg/kg)	No. of Samples Failing	Locations
Arsenic	6	3.6 – 17.5	37 ³	0	-
Cadmium	6	0.3 – 2.1	11.0 ³	0	-
Chromium (total)	6	20.0 – 62.5	910 ³	0	-
Copper	6	11.0 – 27.0	2400 ³	0	-
Lead	6	11.0 – 139.0	200 ¹	0	-
Mercury	6	<0.1 – 0.1	40 ³	0	-
Nickel	6	8.8 – 35.6	180 ³	0	-
Selenium	6	1.0 – 3.0	250 ³	0	-
Zinc	6	23.0 – 130.0	3700 ³	0	-
Total Cyanide	6	<0.5	30 ²	0	-
Phenol	6	<0.15	120 ³	0	-
pH	6	5.37 – 8.30	-	0	-
SOM	6	1.47 – 5.26	-	0	-
SO ₄ (2:1)	6	0.0059 – 0.0140	0.5 ⁵	0	-

¹ DEFRA : SP1010 : Category 4 Screening Levels
² Atkins Atrisk SSV residential with home grown produce (1% SOM)
³ LQM and CIEH S4UL's for Human Health Risk Assessment (Registration No. S4UL 3265) residential with home grown produce (1% SOM)
⁴ BRE Special Digest 1:2005 DS-1. N.D. – None detected.

7.4 Speciated PAH

- 7.4.1 The soil samples retained from the site investigation have been subject to a programme of analyses which have assessed the concentrations of the individual constituents of the polycyclic aromatic hydrocarbon series. A summary of these results is shown in table 6. The assessment criteria utilised are based upon the presence of 1% soil organic matter within the samples generally. Reference to the tests results does however show more variable soil organic matter content.
- 7.4.2 Assessment of table 6 has indicated that all concentrations are below the adopted assessment criteria.

	No. of Samples	Range of Values (mg/kg)	Assessment Criteria ¹ (mg/kg)	No. of Samples Failing	Locations
Acenaphthene	6	<0.05 – 0.06	210	0	-
Acenaphthylene	6	<0.03 – 0.05	170	0	-
Anthracene	6	<0.04 – 0.16	2400	0	-
Benzo{a}anthracene	6	<0.06 – 0.72	7.2	0	-
Benzo{a}pyrene	6	<0.04 – 0.76	5.0 ²	0	-
Benzo{b}fluoranthene	6	<0.05 – 1.08	2.6	0	-
Benzo{ghi}perylene	6	<0.04 – 0.55	320	0	-
Benzo{k}fluoranthene	6	<0.02 – 0.42	77.0	0	-
Chrysene	6	0.04 -0.78	15.0	0	-
Dibenz{ah}anthracene	6	<0.04 – 0.12	0.24	0	-
Fluoranthene	6	0.05 – 1.29	280	0	-
Fluorene	6	<0.04	170	0	-
Indeno{123-cd}pyrene	6	<0.04 – 0.59	27.0	0	-
Naphthalene	6	<0.04 – 0.05	2.3	0	-
Phenanthrene	6	<0.03 – 0.62	95.0	0	-
Pyrene	6	0.05 – 1.16	620	0	-

¹ LQM & CIEH S4UL's for human health risk assessment (Registration No. S4UL 3265) – Residential with home grown produce (1% SOM)
² DEFRA : SP1010 : Category 4 Screening Levels

7.5 Sulphates

7.5.1 Within the programme of laboratory testing each sample has also been analysed to determine the concentration of water-soluble sulphates within the ground. Reference to the laboratory results presented by Element confirms that soluble sulphates are present at concentrations between 0.0059 and 0.0140g/l. Reference to BRE Special Publication 1: 2005 "Concrete in Aggressive Ground" confirms that at <0.5g/l, the ACEC class for this site is assessed to be AC-1s on the basis that static water is present with a pH >2.5. Reference to table D1 of BRE publication confirms that the ground contact concrete and mortar should be designed to DC-1 class.

7.6 Index Properties

7.6.1 A total of six (6 No.) samples of natural clay strata encountered during these investigations have been returned to a civil engineering laboratory to determine their index properties. Copies of the laboratory tests are appended to this report for reference. Analysis have recorded plasticity indices in the range of 17 – 23%. We have calculated the modified plasticity index (MPI) in accordance with the NHBC Handbook Chapter 4.2 and generated values ranging between 4.32 and 8.36%. Based on these results, the site should be considered as having a low volume change potential.

8.0 DISCUSSIONS

8.1 General

8.1.1 The desk study undertaken by REFA in March 2022 identified the site has remained greenfield land throughout its history with no indications of development. A temporary carpark was noted on the 2013 aerial photographs but had been removed by 2018.

8.1.2 The results of the chemical analyses undertaken upon representative samples of strata obtained from the site have been assessed in Section 7 above and subject to further discussion below.

8.2 Contamination

8.2.1 A programme of chemical analyses has not identified any elevated concentrations above the adopted assessment criteria. Based upon this information, it is considered that the topsoil within the site is suitable for reuse within the proposed residential development.

8.3 Revised Conceptual Site Model

8.3.1 As a result of these intrusive ground investigations and subsequent programme of chemical analyses, it has been possible to revise the preliminary conceptual site model presented in Section 3, with the revised conceptual site model shown in table 9. This report adopts the methodology for risk evaluation presented in CIRIA report C552 'Contaminated Land Risk Assessment – A Guide to Good Practice', 2001. The method is qualitative and involves the classification of the following:

8.3.2 In the context of regulatory definition of 'Contaminated Land' (as defined by the EPA 1990), 'very high' and 'high' risks would fall under the classification of 'Contaminated Land'. 'Moderate' risk could also potentially be classified as 'Contaminated Land' but any lower risk rating would not. Thus, the following potential exposure pathways between potential and known contaminant sources based on information provided to date and receptors are tentatively identified in table 7.

Table 2: Preliminary Conceptual Site Model						
Potential Source	Potential Receptor	Possible Pathway	Probability	Consequence	Risk	Mitigation / Investigation
Contaminated Soils	Site personnel during construction	Direct contact of soils	Lw	Mi	High	Topsoil suitable for retention
		Inhalation or ingestion of soil / dust				
	Future site users	Direct contact of soils	Lw	Mi		
		Inhalation or ingestion of soil / dust				
	Surface water in the vicinity of the site	Leaching of contaminants through drainage system	Lw	Md		
	Ground water in aquifer	Leaching of contaminants to ground water	UI	Md		
	Future site users	Vapour migration from soils	Mi	Mr		
	Proposed buildings and services	Direct contact with contaminated soils	Lw	Mi		
Plants in gardens and soft landscaping	Direct contact	Lw	Mi			
Contaminated ground water	Site personnel during construction	Water entering excavations	Lw	Mi	Low	No visual or olfactory evidence of groundwater contamination present
	Future site Users	Retained surface water	Lw	Mi	Low	
Toxic and explosive gasses	Proposed buildings and occupiers	Ground gas migration into buildings	UI	Md	Low	No ground gas issues
Radon gas	Proposed buildings and occupiers	Ground gas migration into buildings	UI	Sv	Moderate	Site is located in an area where 5 – 10% of properties are affected by radon gas. Consequently, BASIC Radon Gas protection measures should be adopted on site
Key: Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor Hi = High, Li = Likely, Lw = Low Likelihood, UI = Unlikely						

8.4 Preliminary Remediation Proposals

- 8.4.1 The site has not identified any elevated concentrations of contaminants above the adopted assessment criteria and therefore no remediation is required as part of the development process. The topsoil within the site is considered suitable for reuse within the development.
- 8.4.2 Where any visual or olfactory evidence of suspicious ground conditions are encountered during the development process it is important that works within this area are terminated and the appropriate authorities notified. Appropriate inspection, sampling and testing should then be undertaken to determine whether these materials represent a potential hazard to site operatives or end users of the site prior to works recommencing. Vigilance is also important in terms of potential asbestos fibres within the made ground deposits.

8.5 Foundations

- 8.5.1 The ground investigation has identified firm to stiff clays over the whole site area which are considered capable of offering a safe bearing capacity of at least 100kN/m² at a minimum depth of 0.90m bgl.
Greater bearing capacity may be achieved with depth. Based upon this information, it is anticipated that the majority of the site will adopt traditional strip type foundations constructed at depths carrying between 0.90 – 1.50m bgl.
- 8.5.2 Where areas of tree influences are present, it may be necessary to consider foundations extending to increased depths within the clay strata in accordance with the requirements of the NHBC Handbook Chapter 4.2. Laboratory testing has demonstrated that the clay strata within this site has a low volume change potential as defined by the NHBC and this information should be utilised in conjunction with the tree types and geometry of the site layout to determine likely foundation depths.
- 8.5.3 If bedrock is encountered within the formation of the foundation, then all remaining foundations should extend to bedrock to avoid differential settlement.

8.6 Ground Floor Construction

- 8.6.1 It is recommended that all properties within this site should be provided with a suspended ground floor construction. This may be of a specialist manufactured precast concrete beam and block type or of a designed cast insitu construction. It is recommended within the areas of tree root influences that a beam and block floor utilising an appropriate air void be adopted in accordance with the recommendations made by the NHBC. In all other areas it will be possible to utilise a cast insitu ground floor construction if required.

8.7 SUDS

- 8.7.1 The superficial deposits present within the site have been confirmed to comprise of impermeable clay deposits and therefore it is considered that the site will not be suitable for the adoption of surface water disposal by soakaways. It is anticipated that the drainage will need to adopt a traditional sewer system.

9.0 CONCLUSIONS & RECOMMENDATIONS

9.1 Foundations

- 9.1.1 The ground investigation has identified firm to stiff clays over the whole site area which are considered capable of offering a safe bearing capacity of at least 100kN/m² at a minimum depth of 0.90m bgl. Greater bearing capacity may be achieved with depth. Based upon this information, it is anticipated that the majority of the site will adopt traditional strip type foundations constructed at depths carrying between 0.90 – 1.50m bgl.
- 9.1.2 Where areas of tree influences are present, it may be necessary to consider foundations extending to increased depths within the clay strata in accordance with the requirements of the NHBC Handbook Chapter 4.2. Laboratory testing has demonstrated that the clay strata within this site has a low volume change potential as defined by the NHBC and this information should be utilised in conjunction with the tree types and geometry of the site layout to determine likely foundation depths.
- 9.1.3 If bedrock is encountered within the formation of the foundation, then all remaining foundations should extend to bedrock to avoid differential settlement.

9.2 Ground Floor Construction

- 9.2.1 It is recommended that all properties within this site should be provided with a suspended ground floor construction. This may be of a specialist manufactured precast concrete beam and block type or of a designed cast in-situ construction. It is recommended within the areas of tree root influences that a beam and block floor utilising an appropriate air void be adopted in accordance with the recommendations made by the NHBC. In all other areas it will be possible to utilise a cast in-situ ground floor construction if required.

9.3 SUDS

- 9.3.1 The superficial deposits present within the site have been confirmed to comprise of impermeable clay deposits and therefore it is considered that the site will not be suitable for the adoption of surface water disposal by soakaways. It is anticipated that the drainage will need to adopt a traditional sewer system.

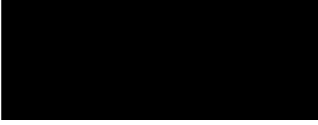
9.4 Further Works

- 9.4.1 If any unusual or suspicious strata or ground conditions are encountered during the subsequent site stripping and preparation works, it may be necessary for these areas to be brought to the attention of the appropriate authorities so that all necessary inspection, sampling and testing may be undertaken to determine whether these materials represent a hazard to human health. It is incumbent upon this site, contractors to advise a responsible authority of any unusual findings within the site which may then be further investigated.
- 9.4.2 The site walkover has identified mature trees located within the site itself and the site boundary and therefore there is a requirement for a full arboriculturist report to determine the extent of tree root effects on foundation designs.

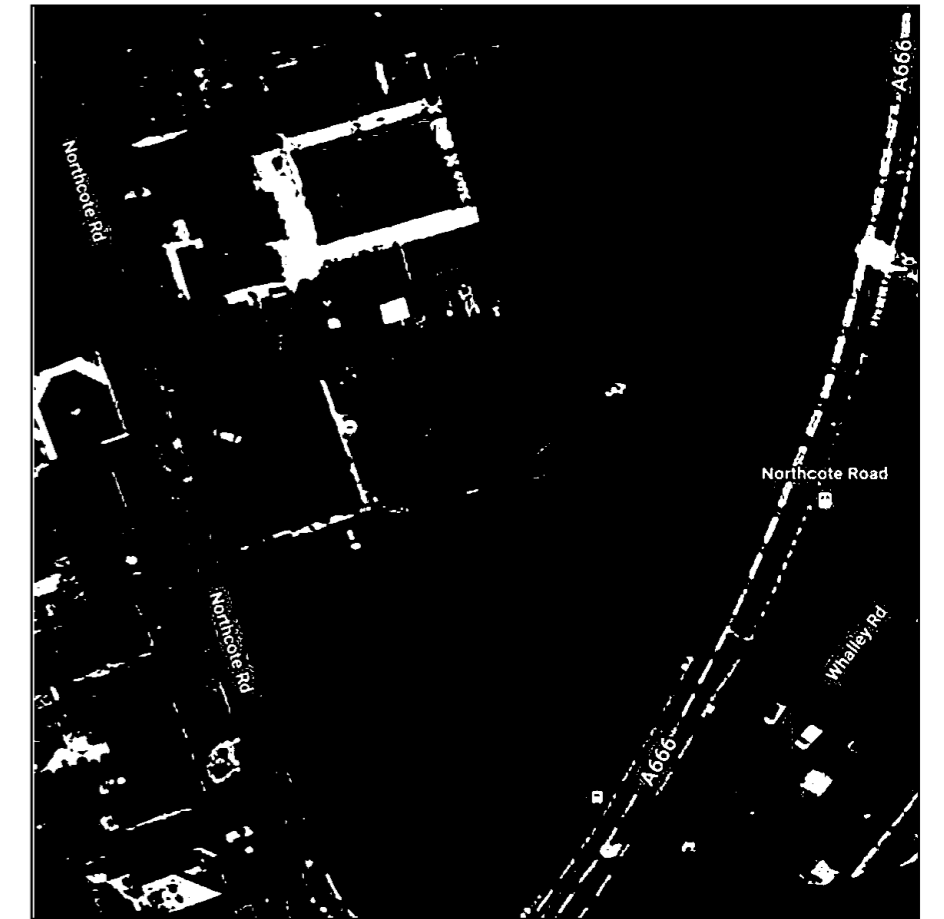
10.0 NOTES

- 10.1** All reports are for advisory purposes only and all design decisions are the ultimate responsibility of others.
- 10.2** Unless stated otherwise the investigation has been undertaken in general accordance with the recommendations given in BS 5930: 1999 "A Code of Practice for site Investigations" and the laboratory testing has been carried out in accordance with BS 1377: 1990 "Methods of Test for Civil Engineering Purposes".
- 10.3** Soil and rock descriptions are generally based on the scales of strength and relative density within BS 5930 although it should be noted that in certain circumstances descriptions are based on site records or a qualitative assessment without the benefit of in-situ or laboratory test results.
- 10.4** The assessment of ground conditions given in this report is based on the results of the fieldwork and laboratory testing carried out and there may be other conditions at the site not encountered by these works, which have not been taken into account.
- 10.5** The scope of the investigation and information provided may not necessarily reflect all the geotechnical and environmental aspects related to the site, and the omission of certain items does not mean that the site is unaffected by such problems.
- 10.6** It should be noted that groundwater levels can vary and may at times be significantly different to those recorded during the investigation and attention is drawn to BS 5930 which indicates that measurements may be necessary over an extended period of time to investigate changes in groundwater pressures due to seasonal, tidal and other causes.
- 10.7** Any recommendations on construction methods within this report are for initial guidance only and all design proposals remain the responsibility of the appropriate contractor/consultant.
- 10.8** Further assessment, investigation, construction activities or time may reveal conditions that were not found during the period of investigation and, therefore, could not have been taken into account in the preparation of the report and where such information might impact upon the stated opinion R. E. Fry & Associates Ltd request the opportunity to review such information and modify the report if necessary.
- 10.9** Where information has been obtained from sources other than the direct findings of the investigation, R. E. Fry & Associates Ltd cannot and does not guarantee the authenticity or reliability of this information.
- 10.10** Where opinions expressed in this report are based on current available guidelines and legislation, no liability can be accepted by R. E. Fry & Associates Ltd for the effects of any future changes to such guidelines and legislation.
- 10.11** This report has been prepared on the instructions and to the requirements of the named client and any unauthorised party using this information for any purpose does so at his own risk and any duty of care to that party is excluded.

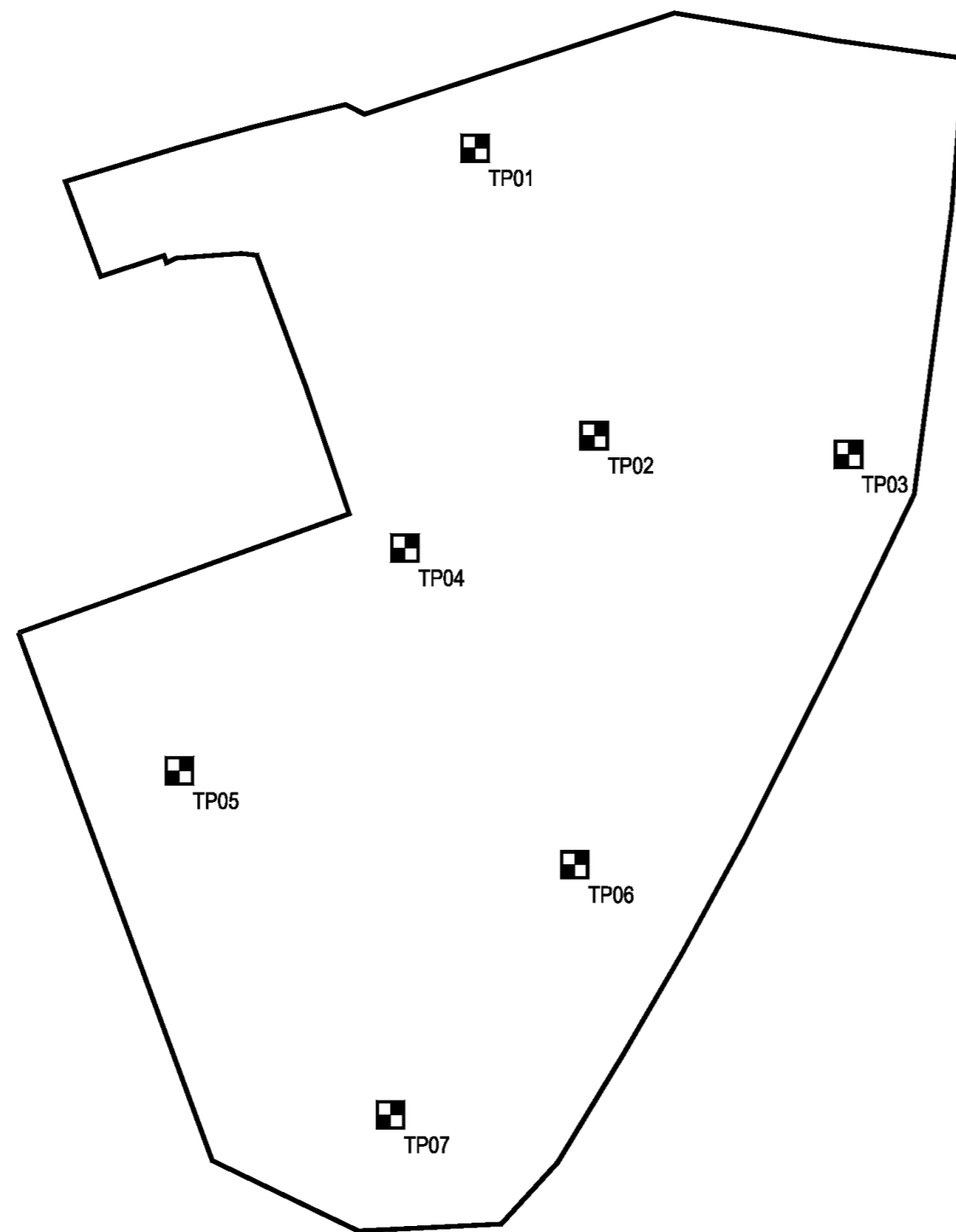
Signed for and on behalf of
R E FRY & ASSOCIATES LIMITED



 BSc (Hons), MSc, FGS
Senior Geo-Environmental Manager



Location Image



Plan On Investigation Locations

LEGEND:

— Approximate Site Boundary

□ TP01 Trial Pit Location

DRG REFERENCES:

- Survey Eng Ltd Topographical Survey OD.TS.08 Rev A

revision suffix	Revision Details	Date

worksafe consultant SS P
www.smasltd.com

Drawing Stage	Drawing Status	
Draft	Comments	Tender
Issued	Information	Construction
Preliminary	Approval	As Built

This drawing is not authorised unless signed as checked & approved

Client
Oak Tree Developments

Job title
Northcote Road Langho

Drawing title
Exploratory Hole Location Plan

REFA 45 Bridgeman Terrace
Wigan, Lancs
WN1 1TT
Tel: -(01942) 826020
Fax: -(01942) 230816

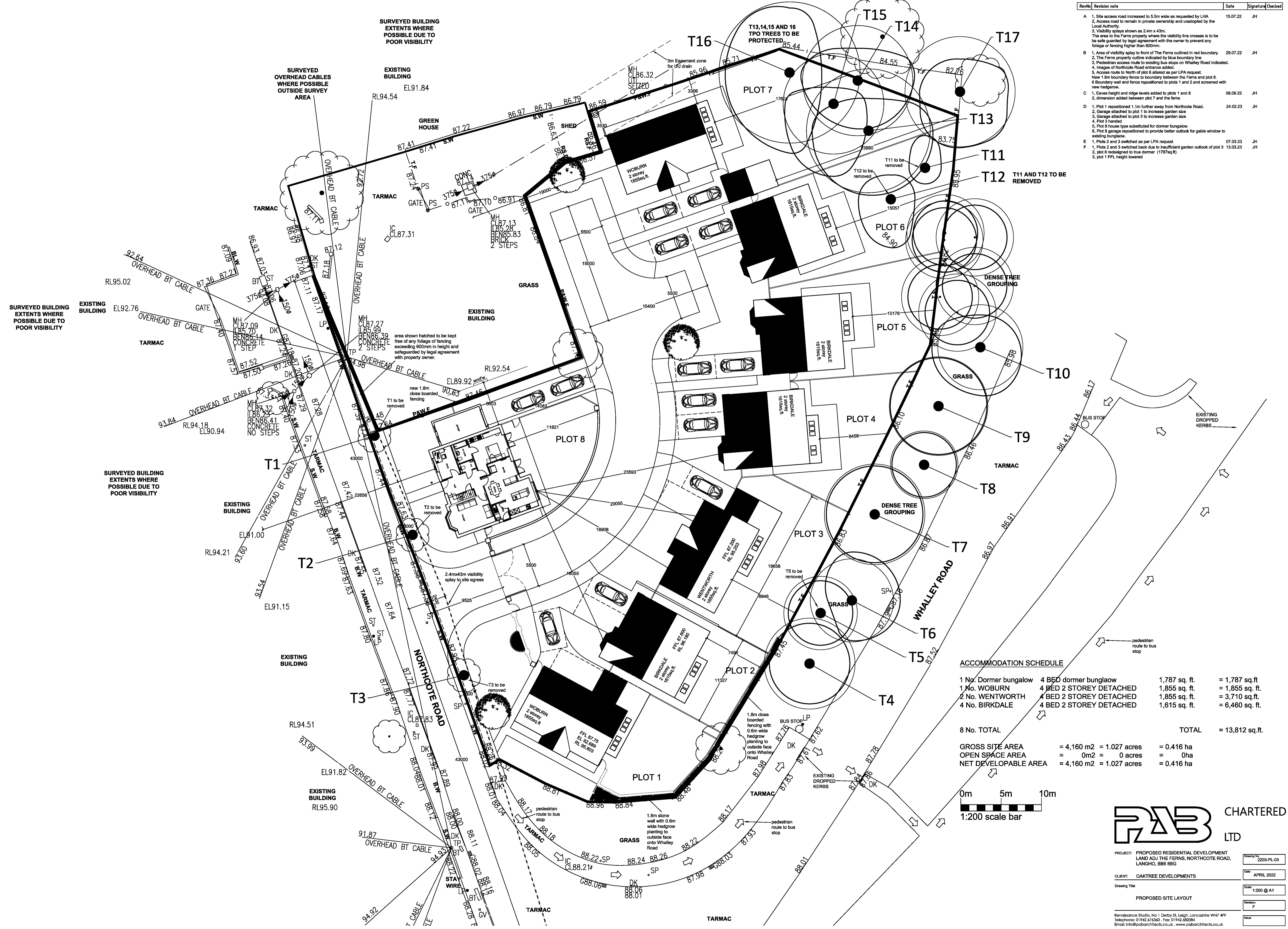
CONSULTING ENGINEERS
CIVIL • STRUCTURAL
GEOTECHNICAL • ENVIRONMENTAL

Chkd	Appvd	date	scale	drawn
		07.04.22	1:500 @ A2	PT

DRAWING No		rev
	22009/03	

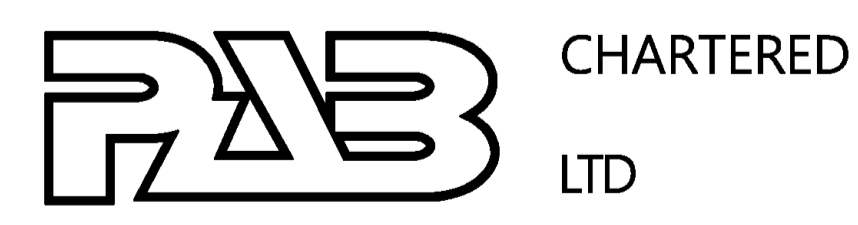
© This drawing is the property of REFA and should not be copied, used or its contents divulged without prior written consent
Any discrepancies to this drawing discovered on site should be reported to REFA immediately. IF IN DOUBT ASK!

- | | | | | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----|--|
| A | 1. Site access road increased to 5.5m wide as requested by LHA
2. Access road to remain in private ownership and unadopted by the Local Authority.
3. Visibility splays shown as 2.4m x 43m.
The area to the Ferns property where the visibility line crosses is to be safe guarded by legal agreement with the owner to prevent any foliage or fencing higher than 600mm. | 15.07.22 | JH | |
| B | 1. Area of Visibility splay to front of The Ferns outlined in red boundary.
2. The Ferns property outline indicated by blue boundary line.
3. Pedestrian access route to existing bus stops on Whalley Road indicated.
4. Images of Northcote Road entrance added.
5. Access route to North of plot 8 altered as per LPA request.
New 1.8m boundary fence to boundary between the Ferns and plot 8.
6. Boundary wall and fence repositioned to plots 1 and 2 and screened with new hedge row. | 29.07.22 | JH | |
| C | 1. Eaves height and ridge levels added to plots 1 and 8
2. dimension added between plot 7 and the ferns | 08.09.22 | JH | |
| D | 1. Plot 1 repositioned 1.1m further away from Northcote Road.
2. Garage attached to plot 1 to increase garden size
3. Garage attached to plot 3 to increase garden size
4. Plot 3 handed
5. Plot 8 house type substituted for dormer bungalow.
6. Plot 8 garage repositioned to provide better outlook for gable window to existing bungalow. | 24.02.23 | JH | |
| E | 1. Plots 2 and 3 switched as per LPA request | 07.03.23 | JH | |
| F | 1. Plots 2 and 3 switched back due to insufficient garden outlook of plot 3
2. plot 8 redesign to true dormer (1797sq ft)
3. plot 1 FFL height lowered | 13.03.23 | JH | |



ACCOMMODATION SCHEDULE

1 No. Dormer bungalow	4 BED dormer bungalow	1,787 sq. ft.	= 1,787 sq.ft
1 No. WOBURN	4 BED 2 STOREY DETACHED	1,855 sq. ft.	= 1,855 sq. ft.
2 No. WENTWORTH	4 BED 2 STOREY DETACHED	1,855 sq. ft.	= 3,710 sq.ft.
4 No. BIRKDALE	4 BED 2 STOREY DETACHED	1,615 sq. ft.	= 6,460 sq. ft.
8 No. TOTAL			TOTAL = 13,812 sq.ft.
GROSS SITE AREA	= 4,160 m ² = 1.027 acres	= 0.416 ha	
OPEN SPACE AREA	= 0m ² = 0 acres	= 0ha	
NET DEVELOPABLE AREA	= 4,160 m ² = 1.027 acres	= 0.416 ha	



PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT LAND ADJ THE FERNS, NORTHCOTE ROAD, LANGHO, BB5 8BG
 CLIENT: OAKTREE DEVELOPMENTS
 Drawing Title: PROPOSED SITE LAYOUT
 Drawing No: 2203-PL-03
 Date: APRIL 2022
 Scale: 1:200 @ A1
 Revision: F
 Issue:



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Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
Location: Northcote Road, Langho		Dimensions (m): <input type="text"/>	Scale 1:25
Client: Oak Tree Developments		Depth 1.60	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.10	ES		0.15			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone. Occasional boulders of subrounded mudstone (topsoil).
	1.50	D		1.60			Soft becoming firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY with a high cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone.
							End of Pit at 1.60m

Remarks: Groundwater ingress from 1.00m bgl. Trial pit backfilled with arisings.



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Trial Pit Log

TrialPit No
TP02
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
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Location: Northcote Road, Langho	Dimensions (m): <input type="text"/>	Scale 1:25
Client: Oak Tree Developments	Depth 1.80	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.20			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone. Occasional boulders of subrounded mudstone (topsoil).
	1.80	D		1.80			Soft becoming firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY with a medium cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone. Occasional pockets of orangish brown sand. <i>Becoming stiff with a decrease in mottling.</i>
							End of Pit at 1.80m

Remarks: Trial pit backfilled with arisings.



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Trial Pit Log

TrialPit No
TP03
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
--------------------------------------	-------------------	----------------------	--------------------

Location: Northcote Road, Langho	Dimensions (m): <input type="text"/>	Scale 1:25
Client: Oak Tree Developments	Depth 2.00	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.20			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone. Occasional boulders of subrounded mudstone (topsoil).
	2.00	D		1.80			Soft becoming firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY with a low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone and sandstone. <i>Low boulder content of mudstone and sandstone.</i>
							End of Pit at 2.00m

Remarks: Trial pit backfilled with arisings.



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Trial Pit Log

TrialPit No
TP04
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
Location: Northcote Road, Langho		Dimensions (m): <input type="text"/>	Scale 1:25
Client: Oak Tree Developments		Depth 2.00	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	1.50	D		0.20			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone (topsoil).
				1.50			Soft becoming firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY with a medium cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone.
				2.00			Firm becoming stiff dark brown gravelly clay with a high cobble content. Cobbles are subangular to subrounded of mudstone.
							End of Pit at 2.00m

Remarks: Groundwater ingress from 1.00m bgl. Trial pit backfilled with arisings.

Stability:





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Trial Pit Log

TrialPit No
TP05
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
--------------------------------------	-------------------	----------------------	--------------------

Location: Northcote Road, Langho	Dimensions (m): <input type="text"/>	Scale 1:25
Client: Oak Tree Developments	Depth 2.00	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.25			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone (topsoil).
				0.70			Soft becoming firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone.
	1.70	D		2.00			Firm becoming stiff greyish brown slightly sandy slightly gravelly CLAY with a medium cobble content. Gravel is subangular to subrounded fine to medium of mudstone, sandstone and siltstone. Cobbles are subrounded of mudstone. Occasional pockets of brown sand.
							End of Pit at 2.00m

Remarks: Trial pit backfilled with arisings.



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Trial Pit Log

TrialPit No
TP06
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
Location: Northcote Road, Langho		Dimensions (m): <input type="text"/>	Scale 1:25
Client: Oak Tree Developments		Depth 1.90	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.20			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone (topsoil).
				0.80			Firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY . Gravel is subangular to subrounded fine to coarse of mudstone.
				1.90			Firm becoming stiff greyish brown slightly sandy slightly gravelly CLAY . Gravel is subangular to subrounded fine to medium of mudstone, sandstone and siltstone. Occasional pockets of brown sand.
							End of Pit at 1.90m

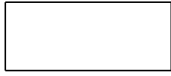
Remarks: Groundwater ingress from 1.00m bgl. Trial pit backfilled with arisings.



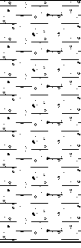


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Trial Pit Log

TrialPit No
TP07
Sheet 1 of 1

Project Name: Northcote Road, Langho	Project No. 22009	Co-ords: - Level:	Date 06/04/2022
Location: Northcote Road, Langho		Dimensions (m): 	Scale 1:25
Client: Oak Tree Developments		Depth 2.00	Logged


Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15			Grass over soft brown slightly gravelly slightly sandy clay with abundant roots and rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, mudstone and siltstone (topsoil). MADE GROUND: Grey sandy gravel. Gravel is angular to subrounded fine to medium of limestone. Soft becoming firm dark brown occasionally mottled orangish brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.
	0.20	ES		0.20			
				1.20			Firm becoming stiff dark grey slightly sandy slightly gravelly CLAY with a medium cobble content. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and siltstone. Cobbles are subrounded of mudstone. Abundant pockets of brown fine to mediums sand.
	2.00	D		2.00			End of Pit at 2.00m

Remarks: Trial pit backfilled with arisings.



Robert E Fry & Associates Ltd
45 Bridgeman Terrace
Wigan
WN1 1TT



Attention : 

Date : 19th April, 2022

Your reference : 22009

Our reference : Test Report 22/5866 Batch 1

Location : Northcote Road, Langho

Date samples received : 9th April, 2022

Status : Final Report

Issue : 1

Six samples were received for analysis on 9th April, 2022 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Robert E Fry & Associates Ltd
Reference: 22009
Location: Northcote Road, Langho
Contact: Hollie Marengo
EMT Job No: 22/5866

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-2	3-4	5-6	7-8	9	10					Please see attached notes for all abbreviations and acronyms			
Sample ID	TP01	TP02	TP03	TP05	TP07	TP07								
Depth	0.1	0.2	0.1	0.1	0.1	0.25								
COC No / misc														
Containers	J T	J T	J T	J T	J	J								
Sample Date	06/04/2022	06/04/2022	06/04/2022	06/04/2022	06/04/2022	06/04/2022								
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1	1								
Date of Receipt	09/04/2022	09/04/2022	09/04/2022	09/04/2022	09/04/2022	09/04/2022								
											LOD/LOR	Units	Method No.	
pH #	7.21	5.37	6.57	6.76	7.90	8.30					<0.01	pH units	TM73/PM11	

Element Materials Technology

Notification of Deviating Samples

Client Name: Robert E Fry & Associates Ltd
Reference: 22009
Location: Northcote Road, Langho
Contact: Hollie Marengo

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5866						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5866

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

Element Materials Technology

Method Code Appendix

EMT Job No: 22/5866

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEPA 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013i	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes

TD Construction Testing Ltd

**Gerard Hall
40 Lord Street
St Helens
Merseyside
WA10 2SD**



8011

TEST REPORT



T: 01744 734769

E: enquiries@tdconstructiontesting.co.uk

Determination of Liquid and Plastic Limits

Client: Robert E.Fry Associates
Client Address: 45 Bridgeman Terrace, Wigan, WN1 1TT

Site: 22009 - Northcote Road, Langho
Supplier/Source*: Client/Site Won
Test Method: 1 Point

Report No: TD22-R-03-C-01
Date Reported: 20/04/2022
Sampled By: Client
Date Sampled*: 06/04/2022
Date Received: 08/04/2022
Date Tested: 14/04/2022

Site Reference*	Lab Reference	Sample Location*	Sample Description	Sample Type	Sample Prep.	% Ret. 425µm sieve	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
TP01@1.50m	Lab 22/852	TP01@1.50m	Dark Brown sandy Clay with gravel	D	A	42	13	37	19	18

Sample Type: D = Disturbed, B = Bulk, U = Undisturbed *Sample Prep:* N = tested in natural condition, A = air dried before test, W = subject to wet sieving before test *Result:* NP = Non-plastic

Testing was carried out in accordance with BS 1377-2:1990 Methods 3.0, 4.4 and 5.3

Where sampling was not carried out by TD Construction Testing Ltd, the results relate to the sample as received.

This report shall not be reproduced except in full without approval of the laboratory.

Results relate only to the sample tested.

* Information supplied by client.

Comments/Deviations:

Signed:	[Redacted]	(Technical Manager/Director)
	[Redacted]	(Laboratory Manager/Director)
	[Redacted]	(Laboratory Section Manager)

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Determination of Liquid and Plastic Limits

Client: Robert E.Fry Associates
Client Address: 45 Bridgeman Terrace, Wigan, WN1 1TT

Site: 22009 - Northcote Road, Langho
Supplier/Source*: Client/Site Won
Test Method: 1 Point

Report No: TD22-R-03-C-02
Date Reported: 20/04/2022
Sampled By: Client
Date Sampled*: 06/04/2022
Date Received: 08/04/2022
Date Tested: 14/04/2022

Site Reference*	Lab Reference	Sample Location*	Sample Description	Sample Type	Sample Prep.	% Ret. 425µm sieve	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
TP02@1.80m	Lab 22/853	TP02@1.80m	Dark Brown sandy Clay with gravel	D	A	31	9.9	32	15	17

Sample Type: D = Disturbed, B = Bulk, U = Undisturbed *Sample Prep:* N = tested in natural condition, A = air dried before test, W = subject to wet sieving before test *Result:* NP = Non-plastic

Testing was carried out in accordance with BS 1377-2:1990 Methods 3.0, 4.4 and 5.3

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Comments/Deviations:

Signed:	[Redacted]	(Technical Manager/Director)
	[Redacted]	(Laboratory Manager/Director)
	[Redacted]	(Laboratory Section Manager)

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Determination of Liquid and Plastic Limits

Client: Robert E.Fry Associates
Client Address: 45 Bridgeman Terrace, Wigan, WN1 1TT

Site: 22009 - Northcote Road, Langho
Supplier/Source*: Client/Site Won
Test Method: 1 Point

Report No: TD22-R-03-C-03
Date Reported: 20/04/2022
Sampled By: Client
Date Sampled*: 06/04/2022
Date Received: 08/04/2022
Date Tested: 14/04/2022

Site Reference*	Lab Reference	Sample Location*	Sample Description	Sample Type	Sample Prep.	% Ret. 425µm sieve	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
TP03@2.00m	Lab 22/854	TP03@2.00m	Dark Brown sandy Clay with gravel	D	A	44	13	37	18	19

Sample Type: D = Disturbed, B = Bulk, U = Undisturbed *Sample Prep:* N = tested in natural condition, A = air dried before test, W = subject to wet sieving before test *Result:* NP = Non-plastic

Testing was carried out in accordance with BS 1377-2:1990 Methods 3.0, 4.4 and 5.3

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* Information supplied by client.

Comments/Deviations:

Signed:	[Redacted]	[Redacted] (Technical Manager/Director)
	[Redacted]	[Redacted] (Laboratory Manager/Director)
	[Redacted]	[Redacted] (Laboratory Section Manager)

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Determination of Liquid and Plastic Limits

Client: Robert E.Fry Associates
Client Address: 45 Bridgeman Terrace, Wigan, WN1 1TT

Site: 22009 - Northcote Road, Langho
Supplier/Source*: Client/Site Won
Test Method: 1 Point

Report No: TD22-R-03-C-04
Date Reported: 21/04/2022
Sampled By: Client
Date Sampled*: 06/04/2022
Date Received: 08/04/2022
Date Tested: 13/04/2022

Site Reference*	Lab Reference	Sample Location*	Sample Description	Sample Type	Sample Prep.	% Ret. 425µm sieve	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
TP04@1.50m	Lab 22/855	TP04@1.50m	Dark Brown sandy Clay with gravel	D	A	24	25	41	18	23

Sample Type: D = Disturbed, B = Bulk, U = Undisturbed **Sample Prep:** N = tested in natural condition, A = air dried before test, W = subject to wet sieving before test **Result:** NP = Non-plastic

Testing was carried out in accordance with BS 1377-2:1990 Methods 3.0, 4.4 and 5.3

Where sampling was not carried out by TD Construction Testing Ltd, the results relate to the sample as received.

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Results relate only to the sample tested.

* Information supplied by client.

Comments/Deviations:

Signed: 	 (Technical Manager/Director)
	 (Laboratory Manager/Director)
	 (Laboratory Section Manager)

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Determination of Liquid and Plastic Limits

Client: Robert E.Fry Associates
Client Address: 45 Bridgeman Terrace, Wigan, WN1 1TT

Site: 22009 - Northcote Road, Langho
Supplier/Source*: Client/Site Won
Test Method: 1 Point

Report No: TD22-R-03-C-05
Date Reported: 21/04/2022
Sampled By: Client
Date Sampled*: 06/04/2022
Date Received: 08/04/2022
Date Tested: 13/04/2022

Site Reference*	Lab Reference	Sample Location*	Sample Description	Sample Type	Sample Prep.	% Ret. 425µm sieve	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
TP05@1.70m	Lab 22/856	TP05@1.70m	Dark Brown silty sandy Clay with gravel	D	A	24	14	33	15	18

Sample Type: D = Disturbed, B = Bulk, U = Undisturbed **Sample Prep:** N = tested in natural condition, A = air dried before test, W = subject to wet sieving before test **Result:** NP = Non-plastic

Testing was carried out in accordance with BS 1377-2:1990 Methods 3.0, 4.4 and 5.3

Where sampling was not carried out by TD Construction Testing Ltd, the results relate to the sample as received.

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* Information supplied by client.

Comments/Deviations:

Signed: 	 (Technical Manager/Director)
	 (Laboratory Manager/Director)
	 (Laboratory Section Manager)

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Client: Robert E.Fry Associates
Client Address: 45 Bridgeman Terrace, Wigan, WN1 1TT

Site: 22009 - Northcote Road, Langho
Supplier/Source*: Client/Site Won
Test Method: 1 Point

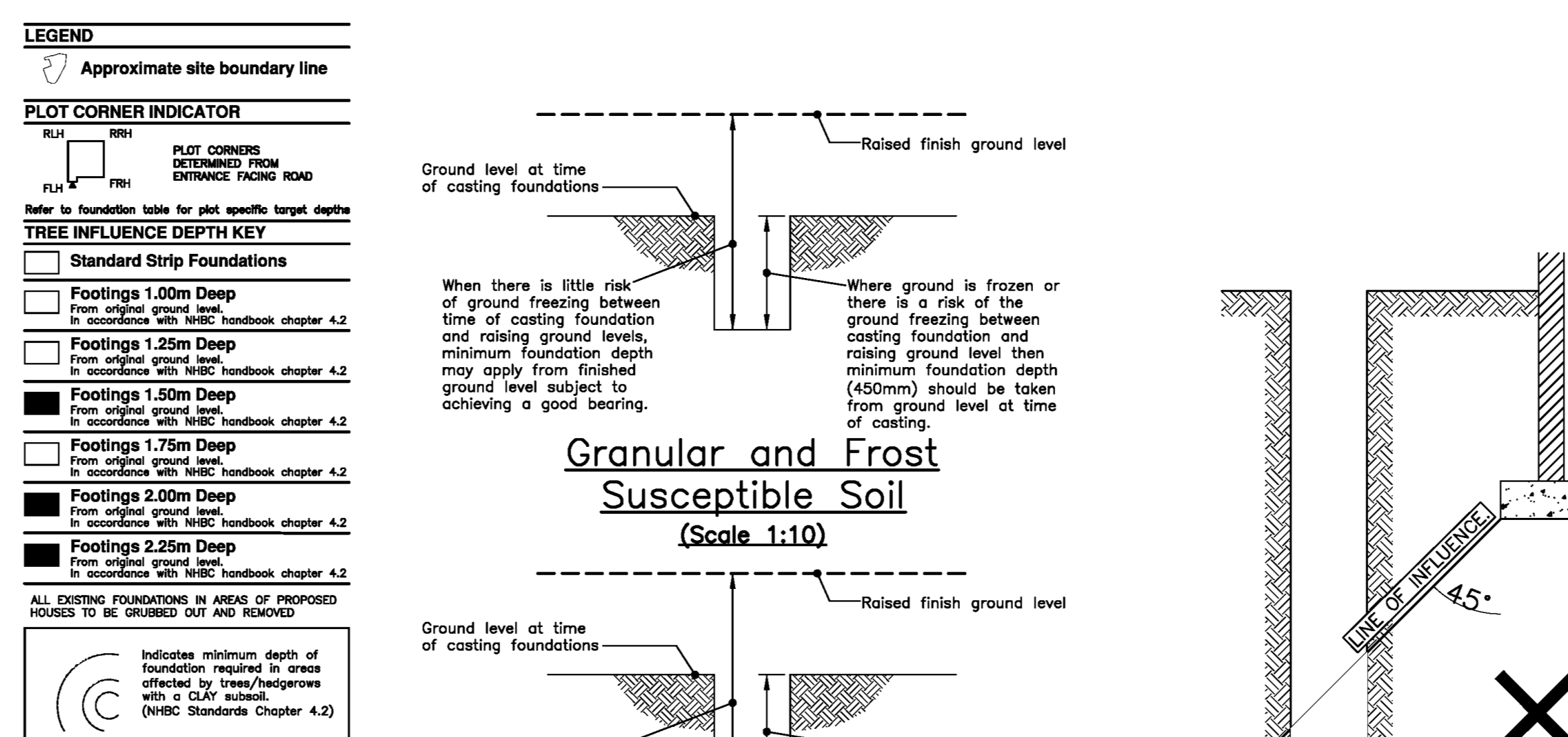
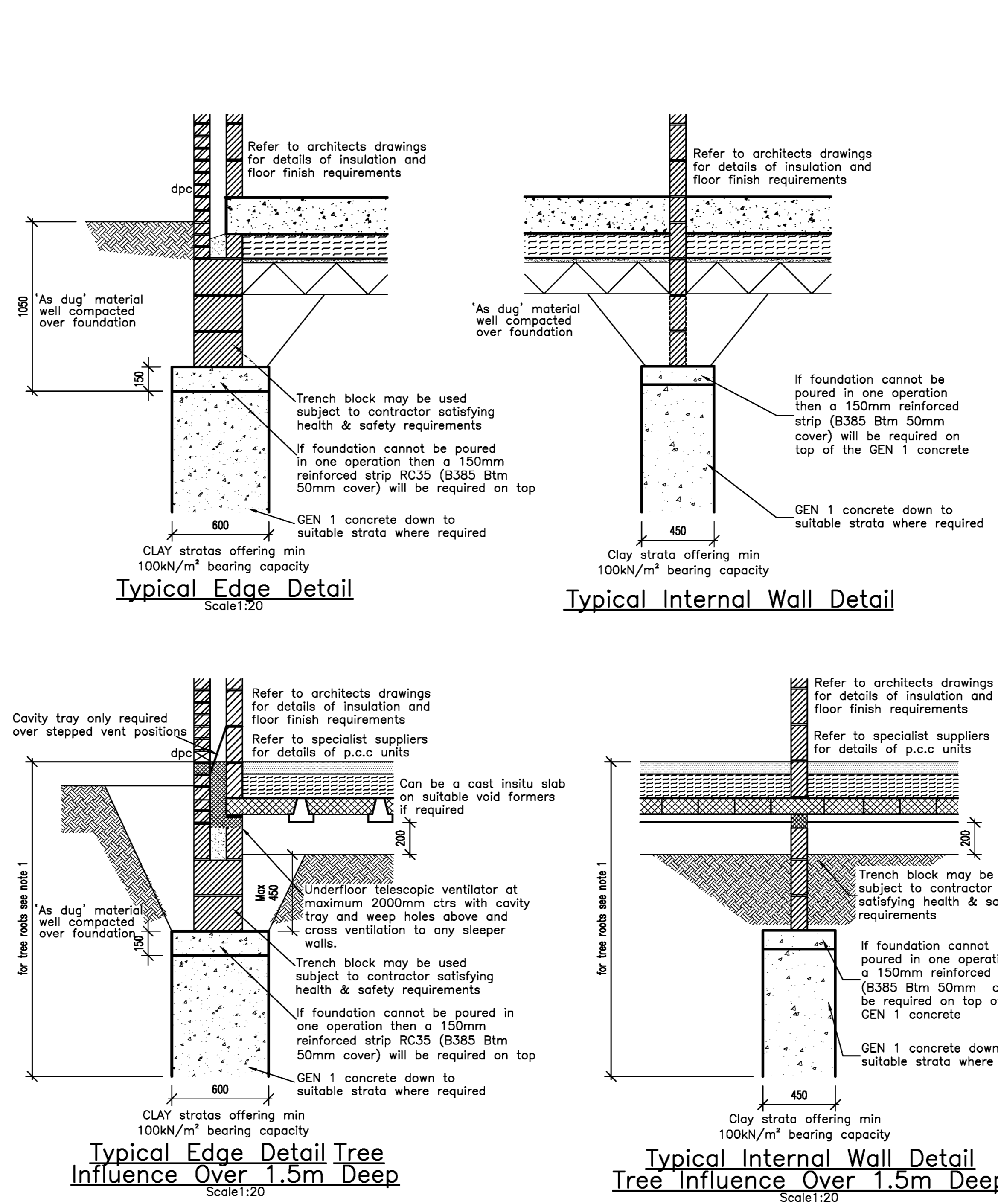
Report No: TD22-R-03-C-06
Date Reported: 21/04/2022
Sampled By: Client
Date Sampled*: 06/04/2022
Date Received: 08/04/2022
Date Tested: 13/04/2022

Site Reference*	Lab Reference	Sample Location*	Sample Description	Sample Type	Sample Prep.	% Ret. 425µm sieve	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
TP07@2.00m	Lab 22/857	TP07@2.00m	Dark Brown sandy Clay with gravel	D	A	40	14	32	15	17

Sample Type: D = Disturbed, B = Bulk, U = Undisturbed **Sample Prep:** N = tested in natural condition, A = air dried before test, W = subject to wet sieving before test **Result:** NP = Non-plastic

Testing was carried out in accordance with BS 1377-2:1990 Methods 3.0, 4.4 and 5.3
Where sampling was not carried out by TD Construction Testing Ltd, the results relate to the sample as received.
This report shall not be reproduced except in full without approval of the laboratory.
Results relate only to the sample tested.
* Information supplied by client.
Comments/Deviations:

Signed:	[Redacted]	(Technical Manager/Director)
	[Redacted]	(Laboratory Manager/Director)
	[Redacted]	(Laboratory Section Manager)



SITE SUMMARY BASED ON REFA 'PHASE II GEO-ENVIRONMENTAL INVESTIGATION REPORT 22009/GEIR/003' APRIL 2022

Summary of ground conditions.	Ground conditions encountered some made ground over soft-firm clays
Bearing capacity.	Clay 100kN/m ² @0.9m-1.5m BOGL
Foundation solutions.	Standard strip foundations.
Rock strata.	If any foundation excavations encounter rock then whole plots needs to bear onto rock.
Reinforcement in footings.	N/A
Further investigations required.	None
Strata plasticity.	Cohesive Strata LOW plasticity.
Ground Gas/Radon protection measures.	N/A
Design sulphate class.	DS-1.
ACEC class.	AC-1s.
Groundwater and excavation instability.	GW noted across site, levels vary. Perched water. Localised ground water management maybe required
Contamination.	N/A
Obstructions.	N/A
Mining.	N/A
Environmental constraints.	Existing Trees

C.D.M. Regulations 2015

In line with the requirements placed upon designers by the above regulations we are required to consider during the design process, the health and safety of those who are going to construct, repair, maintain and use a structure, and even how it may be demolished. All designs are therefore undertaken to avoid or minimize foreseeable risks wherever possible. Residual risks that cannot be fully eliminated from the design are highlighted as requiring special consideration by the client and contractors.

All design works are carried out in conjunction with the relevant Local Authority Specifications, Building Regulations, Sewers for Adoption 6th Edition, British Standards and Codes of Practice.

For this project our design works have been limited to :-
 a) R/C foundation designs and details
 In the design process we have assumed that :-
 b) All contractors will be competent
 c) Only competent contractors will be employed
 d) Contractors will have addressed, to the satisfaction of the client/CDM Coordinator, the manner in which they will manage health and safety on site, including residual risks highlighted by the designers.
 e) Only contractors with a valid health and safety policy and good health and safety record will be employed.

Having reviewed the designs undertaken, we consider there to be no residual risks involved in the construction and maintenance of the elements of design undertaken by ourselves on this project that a competent civil engineering contractor should not be aware of and be capable of dealing with in a manner which does not prejudice Health & Safety.

It is assumed that the generic risks associated with this type of work and as detailed below will be managed in accordance with accepted procedures and HSE Guidelines :-
 1. Adequate support / treatment to ALL excavations
 2. Guarding of ALL excavations both during and outside normal working hours.
 3. Undermining of existing structures / highways
 4. Confined space operations
 5. Dealing with and protection of existing mains / services
 6. Traffic management
 7. Safe handling / lifting of heavy materials
 8. Working where contaminated ground is notified by client

This information should be forwarded to prospective contractors at tender stage to enable them to take account of the risks involved in this project

NOTES

This drawing is to be read in conjunction with the following:-
 a) REFA 'PHASE II GEO-ENVIRONMENTAL INVESTIGATION REPORT 22009/GEIR/003' APRIL 2022
 b) The latest architects planning layout '2203 PL-03/G'.

The foundation types indicated are based upon the facts established from observations and field tests during the trial pit and borehole investigations. It should be recognized that natural strata may vary considerably from point to point and the ground water regime may be influenced by seasonal or other factors. The foundation types indicated are therefore for 'GUIDANCE PURPOSES ONLY' and should be reviewed in the light of the actual conditions on site during the construction work.

Where necessary foundations should be stepped in accordance with current NHBC recommendations.

Where slab levels differ between adjacent plots by 600mm or greater the provision of retaining walls between the plots is anticipated. To avoid imposing unnecessary loading on the wall, the foundation for the dwelling on the retained side may have to be deepened. This drawing does NOT take into consideration the potential influence on the foundation level of the anticipated retaining walls. Once retaining wall positions have been finalized the information may have to be reviewed and foundation depths amended to ensure that no footings are not subject to any additional loadings.

Internal foundations to extend to levels similar to adjacent external foundations Depths indicated are to be considered to be minimum and where ground conditions require foundations may need to extend to a deeper formation level.

All foundations to be formed upon uniform strata offering a bearing capacity of at least 150kN/m² to the approval of the Building Inspector and Engineer.

Formation depth of all foundations to be minimum 0.50m below finished ground level upon approved strata. All foundation excavations must be inspected and approved by the Building Inspector prior to the placing of concrete.

Concrete grade GEN1 to be used for standard strip foundations, in accordance with BS5000 as appropriate with GEN1 mass/french fill concrete required to suitable approved bearing strata.

Foundation blockwork in 2 storey properties to be min 3.5N/mm in class M4(ii) mortar foundation blockwork in 3 storey properties to be min 7.3N/mm in class M4(ii) mortar.

All service excavations deeper than 600mm to be located in positions such that they do not interfere with the 45° load spread of the foundation.

All concrete is to be well compacted using a vibrating poker to ensure optimum density.

Concrete to be suitably covered and cured for at least 48hrs before commencing building of masonry. Concrete should not be placed in temperatures less than 5° on a falling thermometer and antifreeze agents must not be used without the agreement of the Engineer.

Refer to private drainage design for confirmation of sewer invert levels as foundations must extend beyond invert levels of any adjacent sewers.

Depth of excavation and bearing levels shown indicative only, actual depths to formation level are to be determined on site and to be inspected and agreed with REFA.

Site personnel must NOT enter any excavation made upon this site deeper than 1.0m unless suitably designed side supports have been provided of the sides of the excavation are suitably battered.

Subject to confirmation of road and sewer designs & fill's

PLEASE NOTE
 This drawing is preliminary and subject to confirmation of planning layout, external works and private drainage designs.

PLEASE NOTE
 Multiple units subject to specific analysis to confirm foundation widths

Concrete Design Class DS-1
 ACEC Class AC-1s
 Design Chemical Class DC-1s

Foundation excavations SHOULD NOT BE DEEPENED unless essential due to the conditions exposed. Where ground water is encountered it is strongly recommended that foundation excavations SHOULD NOT BE over excavated and work should cease until further advice can be obtained from a suitably experienced Engineer.

Depth of excavation and bearing levels shown indicative only. Actual depths to formation level are to be determined on site, and to be inspected and agreed with REFA.

Excavations should be to a depth that gives sufficient bearing and protection from frost damage.
 To avoid damage caused by frost, the depth of the foundation(s) in frost susceptible ground should be at a minimum 450mm below ground level.
 If the finished ground level will be above the existing ground level then, in cold conditions when freezing is expected, the foundation depth should be calculated from the existing, not finished ground level.
 Ground levels need raising as soon as possible once foundations have been concreted, to prevent weathering.

HEAVE PRECAUTIONS required to all foundations where tree influence depths are greater than 1.5m.
 Strip Footings - 200mm min. void beneath ground floor.

Existing site services and utilities may influence foundation depths T.B.C.

This drawing is based on planning layout provided by client drawing number-
 Revision:-
 Client to ensure the above layout is current before using this drawing for construction purposes

PLEASE NOTE
 If footings are formed on one continuous strata then reinforcement is not required and GEN1 concrete can be used. If not then RC35 concrete is required with one layer B385 reinforcement in bottom 50mm cover

If ROCK is encountered during foundation excavations then whole of foundation to bear onto rock strata

Strip & Trench Fill Foundations Where Ground Levels Are To Be Raised (NHBC Technical Guidance 4.3/03 Jan 2016)

Refer to External Works layout for confirmation FFL's & underbuild requirements

PLEASE NOTE
 Prior to any excavations on site the contractor must liaise with the client regarding existing services locations

NOTE 1: Where site levels are to remain the same or raised then foundations depths for tree roots to be taken from ORIGINAL ground level. Where site levels are being reduced then tree root depths to be taken from REDUCED ground level.

Contractors to confirm all drainage points & RWP's locations with latest architects & drainage drawings prior to the commencement of works.

All relevant dimensions to be confirmed on site prior to the commencement of any works.

The shrinkability of the cohesive soil on this site has been determined as LOW in accordance with NHBC Standards Chapter 4.2.

Existing site services and utilities may influence foundation depths T.B.C.

Print this drawing in COLOUR only

TARGET FOUNDATION SCHEDULE (Best case estimates only. No allowance for contingencies)

1) Depth of excavation bearing levels are shown indicative only. Actual depths to formation level are to be determined on site and to be inspected by & agreed with REFA
 2) FFL's shown should be consistent with external works drawings and any anomalies are to be queried with REFA. FFL's are also subject to revisions on site

Plot	Existing Ground Level At Time Of Investigation				Proposed FFL vs FFL of plot +/-	Anticipated Formation Level				Depth Of Foundation Below Existing G.L.				Depth Of Foundation Below FFL				Type of suitable founding strata	Approx depth of suitable strata from original G.L.0.45m min.	Floor Type	Foundation Type	Retaining Measures	Tree Influence	Tree Reference	Heave Prec.	Underbuild	Deep For Drainage	Remarks/Hazards	
	FLH	RLH	RRH	FRH		FLH	RLH	RRH	FRH	FLH	RLH	RRH	FRH	FLH	RLH	RRH	FRH												
1	88.500	88.300	88.300	88.750	87.750	-0.713	86.500	86.700	86.550	86.700	2.000	1.600	1.750	2.050	1.250	1.050	1.200	1.050	CLAY	1.200	SUSPENDED FLOOR	DEEP STRIP	N/A	YES	MAPLE/HAWTHORN	NO	YES	NO	
2	87.750	87.750	88.300	88.250	87.600	-0.413	86.550	86.550	86.100	86.550	1.200	1.200	2.200	1.700	1.050	1.050	1.500	1.050	CLAY	1.000	SUSPENDED FLOOR	DEEP STRIP	N/A	YES	HAWTHORN	NO	NO	NO	
3	87.100	86.800	87.600	87.600	87.200	-0.075	86.150	85.800	86.150	86.150	0.950	1.000	1.450	1.450	1.050	1.400	1.050	1.050	CLAY	0.900	SUSPENDED FLOOR	STANDARD STRIP	N/A	YES	HAWTHORN	NO	NO	NO	
4	86.500	86.250	86.450	86.800	86.500	0.000	85.450	85.000	85.450	85.380	1.050	1.250	1.000	1.420	1.050	1.500	1.050	1.120	CLAY	0.900	SUSPENDED FLOOR	DEEP STRIP	N/A	YES	ELM	NO	NO	YES	
5	85.900	85.600	86.000	86.250	86.300	0.362	84.700	83.850	84.250	85.050	1.200	1.750	1.750	1.200	1.600	2.450	1.050	1.250	CLAY	1.200	BLOCK & BEAM	TRENCH FILL	N/A	YES	ELM	YES	NO	NO	
6	85.900	85.450	85.350	85.900	86.300	0.650	83.700	83.700	83.600	84.700	1.250	1.750	1.750	1.200	1.650	2.600	2.000	1.600	CLAY	1.200	BLOCK & BEAM	TRENCH FILL	YES	YES	ELM	YES	NO	NO	
7	86.400	86.500	85.900	85.950	86.300	0.112	85.200	85.250	84.150	84.450	1.200	1.250	1.750	1.500	1.100	1.050	2.150	1.850	CLAY	1.200	BLOCK & BEAM	TRENCH FILL	N/A	YES	ELM	YES	NO	NO	
75G	85.900	85.600	85.550	85.900	86.150	0.412	84.650	83.850	84.050	84.650	1.250	1.750	1.500	1.250	1.500	2.300	2.100	1.500	CLAY	1.200	BLOCK & BEAM	TRENCH FILL	N/A	YES	WILLOW	YES	YES	NO	
8	87.550	87.400	87.550	87.750	87.750	0.188	86.300	86.400	86.650	86.500	1.250	1.000	0.900	1.250	1.450	1.350	1.100	1.250	CLAY	0.900	SUSPENDED FLOOR	DEEP STRIP	N/A	YES	OAK	NO	YES	NO	

Revision details table with columns for revision number, description, and date.

Client: **OAK TREE DEVELOPMENTS**

Job title: **NORTHCOTE ROAD LANGHO**

Drawing title: **PRELIMINARY FOUNDATION KEY PLAN**

REFA CONSULTING ENGINEERS
 CIVIL & STRUCTURAL
 GEOTECHNICAL & ENVIRONMENTAL

Drawn: [Name] Date: 17.08.22
 Checked: [Name] Date: 17.08.22
 Approved: [Name] Date: 17.08.22

DRAWING No: **22009/202** Scale: **1:200**

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