



87 Woolverstone Close
Ipswich
IP2 9RX

Structural Inspection Report

DOCUMENT CONTROL

Report prepared by:



Justin Harvey - ACIOB MPTS

On behalf of J P Chick & Partners Limited

Report reviewed by:



Paul Davis - BSc (Hons) CEng MICE FStructE

On behalf of J P Chick & Partners Limited

JPC ISSUING OFFICE

7 Museum Street, Ipswich, IP1 1HQ

ISSUE AND REVISIONS RECORD

Document No:	Issue Date:	Issued to:			Format Issued			
					Email	Disk	Digital upload	Post
IG22/340	01/08/2023	Orwell Housing			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document Revision No:	Issue Date:	Document Revision Comments	Revised by (INT):	Reviewed by (INT):				
Job no/report/RevA	Click or tap to enter a date.				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Click or tap to enter a date.				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Click or tap to enter a date.				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Table of Contents

DOCUMENT CONTROL	1
1.0 BRIEF	3
2.0 SITE INVESTIGATION	3
3.0 FINDINGS	4
4.0 RESULTS	5
5.0 LIMITATIONS	6
6.0 CONCLUSIONS AND RECOMMENDATIONS	7
7.0 APPENDICES	11
Appendix A – J P Chick Report dated 15 November 2022	12
Appendix B – Soil Investigation Eastern Limited Report dated 05 June 2023	13



1.0 BRIEF

- 1.1 J P Chick & Partners Limited were appointed by Orwell Housing to undertake a structural inspection to report on crack damage. Our initial report IG22/340 dated 15 November 2022 refers. This is contained within Appendix A for completeness.
- 1.2 Within our report we made recommendations with regard to further investigations to be undertaken in order to understand and identify the mechanism of movement and likely cause. We were subsequently appointed by Orwell Housing to undertake these investigations.
- 1.3 Intrusive site Investigations were undertaken Soil Investigation Eastern Limited on 05 June 2023 following an initial aborted attempt on 04 May 2023 where access could not be permitted. The factual Report for the investigations is contained within Appendix B to the rear of this Report.

2.0 SITE INVESTIGATION

- 2.1 Site investigations were undertaken to establish the foundation depth and profile to the rear of the structure, which is considered to be the main element which has suffered movement. A trial pit was undertaken immediately adjacent the fence line between 87 and 89, on the side of number 89. This is due to difficulty with gaining full access to 87 with the site investigation equipment used at the time. Accepting that the two structures have been built as a single unit their foundations are considered to be identical. A second trial pit was undertaken at the junction between number 87 and 85, the latter of which is set back slightly from number 87 as well as being slightly elevated following the natural contouring of the site.
- 2.2 We are aware that number 85 Woolverstone Close had also been suffering some limited damage in this location. We had reported on this separately on behalf of Orwell Housing under our reference IG22/299. Information obtained will prove useful in this respect also.
- 2.3 The locations of these trial pits, numbered 1 and 2 respectively are recorded within the site location plan of Soil Investigation Eastern Limited Report, which is contained within Appendix B.



- 2.4 Trial pit 1 was extended with the use of an Auger, where a depth of 6m was achieved, in situ testing was also undertaken to obtain strength parameters and soil samples were recovered from the borehole for the purpose of laboratory testing. These samples were collected in order to establish soil classification or Atterberg Limits of the soil and moisture profiles.
- 2.5 Trial pit 2 was not extended with the use of an Auger, accepting that there is little distance between the two points and there was unlikely to be significant variation in soil characteristics. The primary purpose of this location was to establish the foundation provision to both no's 85 and 87 at their junction.
- 2.6 Root samples were also encountered down to 3m and recovered from the excavations in order to undertake identification of potential vegetation which may be contributing to the damage. In this instance all significant vegetation exists within third party ownership to the rear of the property. This is anticipated as being land under the ownership of Ipswich Borough Council.

3.0 FINDINGS

- 3.1 In trial Pit 1, the foundation is a concrete strip footing 300mm thick with a toe projection of 350mm, situated 900mm below existing ground level in a stiff sandy silty Clay. Roots of up to 7mm diameter were noted to the underside of the foundation. This clayey material remained unchanged but became stiffer continuing to 2.8m depth. From 2.8m through to termination at 6m the material was essentially very stiff silty Clay with silt and sand partings and roots continuing into the very stiff material at 3.6m depth. Shear vane readings obtained were consistently high, at or above 150kPa.
- 3.2 Trial Pit 2 was undertaken at the junction of number 87 and the rearward right hand flank projection of number 85. Findings are recorded within the Soil Investigation Eastern Limited Report within Appendix B, with details listed as trial pit 2a, showing the foundation of number 87 and trial pit 2b showing the foundation of number 85.
- 3.3 In this location the foundation for number 87 was recorded as concrete foundation situated at an overall depth of 700mm below ground level with a thickness of 300mm and a 280mm toe projection. Foundations recorded for number 85 indicate a concrete foundation and overall depth



of 400mm below ground level with a toe projection of 340mm. The toe projection was noted to be at or very close to existing ground level.

3.4 The foundation for number 87 is situated on a stiff sandy silty clay, similar to that seen within trial pit 1. The foundation for number 85 would be situated within the material recorded above this as medium dense, silty sand with lenses of clay and roots.

3.5 Soil samples were recovered from trial pit 1 to be tested for moisture contents and their Atterberg Limits. In conjunction with this root samples were taken for identification purposes having been found beneath the foundation of the rear elevation.

4.0 RESULTS

4.1 All results provided by laboratory testing for both soil samples and root identification samples are contained within Soil Investigation Eastern Limited's Report which can be seen within Appendix B.

4.2 Root samples were issued to Richardsons Botanical Identifications. Three roots recovered, one of which is 7mm in diameter, were identified as belonging to the Quercus (Oak) family. These are also confirmed at least notionally as being "alive".

4.3 Trial Pit/Borehole 1

4.3.1 Laboratory testing of soils was undertaken by Flawless Soil Testing Limited. Samples taken from directly to the underside of the foundation through to approximately 2.8m depth are considered to provide relative homogeneity. These have been classified as soils being clay with a high plasticity, increasing to very high at the bottom of this layer. The main difference being that the more coarse soil fraction retained on the 425-micron sieve recorded as 19% the underside of the foundation reduces through the layer to 8%, this does have limited impact on the plasticity index which is reduced as a consequence of the coarse fraction. The soil classification with regard to BS 5930 2018 Figure 8, remains as a clay of high plasticity and very high plasticity to the sample from 2.5m.

4.3.2 The clay layer from 2.8m through to 6m appears to provides relative homogeneity. Moisture contents within this layer commence at 50% from 3m before reducing to 39% and 46% at 5m. Roots

(albeit fine) are still present to 3m depth, and it then can then be expected that moisture contents may increase where the presence of roots reduce.

4.3.3 When considering the results in conjunction with empirical formulae the high plastic layer down to 2.8m shows moisture contents which reduce through the layer and increasingly have the potential to suffer from negative volumetric change. It is anticipated that volumetric change will occur where the natural moisture content of the soil falls within the envelope of 0.5-0.4 of the liquid limit. In this case soils from 0.9m and 1.5m are both within this envelope with soils recovered from 2m possibly falling below the 0.4 of the liquid limit. This then indicates that volumetric change is very likely. Within the layer below and again considering results with empirical formulae, moisture contents typically exist within the envelope of between 0.4 and 0.5 of the liquid limit, giving the potential that some negative movement may have occurred. This is with the likely exception of that recovered from 3m and at the bottom of the layer at 5m where moisture contents tend to increase.

4.3.4 Another measure of the potential for desiccation is the liquidity index. Where the liquidity index is recorded between 0 and 1 then it is considered that the soil remains in a plastic state. The closer the value is to zero the drier the soil is and the closer it becomes to going below its plastic state and becoming more of a solid, where it is characteristically hard and brittle. These results therefore tend to indicate that through the 1.5m-2.0m depth desiccation is likely to exist with the liquidity index reducing very close to zero.

4.3.5 Soil recovered from the higher-level foundation of 85 is comparable in terms of its Atterberg limits to that below the foundation of 87. Roots were again present.

5.0 LIMITATIONS

5.1 This report shall be for the private and confidential use of the client for whom it was undertaken and it should not be reproduced in whole or in part or relied upon by third parties for any use without the express written authority of J P Chick and Partners Limited.

5.2 Unless stated otherwise in the report, we have not disturbed any fixtures and therefore no fitted carpets, floorboards or linings have been removed. Coupled with this, we have not exposed the



foundations or tested the drains to the property. We are therefore unable to report that such part of the property is free from defect.

5.3 We have not inspected woodwork or other parts of the structure, which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

5.4 The condition of the finishes, waterproofing, damp penetration and structural timbers, unless specifically referred to, are not the subject of this report. We would recommend the services of a specialist to cover these areas.

5.5 It should be noted that the possibility that different conditions exist other than at the trial pit locations, or at greater depth, should not be ruled out. In particular, ground water records apply only to the time and place of investigation, since wide variations may occur through seasonal or other causes.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Based upon the site investigation information we consider that the site is underlain by relatively homogenous clay soils which are represented by two slightly varying stratifications. The upper horizon which includes the layer within which the foundations are situated down to 2.8m is a clay of high plasticity which has a diminishing coarse fraction with depth. This also is considered to have an increasing likelihood of negative volumetric change with depth, down to the base of the layer at 2.8m.

6.2 The deeper stratification which becomes fine grained, grey Clay of very high plasticity would appear to have less of an impact in terms of negative volumetric change. The presence of the roots extends no further than 3.6m and as their influence reduces moisture contents will increase.

6.3 When considering soil moisture contents, it should be acknowledged that the time of sampling should see soil moisture deficits at a relatively low point being that this is in the Springtime. The trend for soil moisture deficits tends to increase from late Spring to Summer, i.e., June through to August where there is greater potential for desiccation to occur. Based upon the timing of these

samplings there is therefore the potential for insitu moistures to become lower in value which may well lead to increased movement.

- 6.4 The variation in foundation depths is likely to represent physical steps within the foundation lines. When considering number 85 the structure is higher than number 87 by approximately 400-500mm following the natural contouring of the wider site. The difference in foundation depth between number 85 and 87 is then commensurate with the difference in finished floor levels. It does however then bring into question the adequacy in terms of depth of the foundation for number 85 being less than 400mm below ground level.
- 6.5 The likely occurrence of desiccation and subsequent volumetric change of the founding subsoils to the rear of the structure has resulted in the horizontal distortion seen across the rear of number 87, resulting in gaps within bed joints and cracks which have occurred around openings. The mechanism of this movement has impacted on the internal aspect of the structure to the rear causing cracking to internal walls.
- 6.6 Mature vegetation exists to the rear of the property in the form of Oak Trees. The closest approximately 15m remote and in the region of 16m in height. We consider that these Oak trees are directly responsible for the desiccation (negative volumetric change) within the founding clay soils which has lead to the movement of foundations and structural damage.
- 6.7 We are of the opinion that the damage has the potential to be ongoing and this is most likely to be in the form of cyclical movement. Whilst it is unlikely to cause issues with structural instability there will be repetitive issues with serviceability. This may involve difficulty operating doors and windows etc. which if left unchecked could lead to safety issues for the occupant in relation to escape in the event of fire.
- 6.8 These Oak trees are growing in land considered to be under ownership of Ipswich Borough Council. With reference to NHBC Chapter 4.2 Foundation Depth Tables an indicative foundation depth taking into account the existing trees is in the region of 2m depth. Obviously, these standards post-date the time of the construction of Woolverstone Close, and although the trees are likely to have been present at this time, clearly, they would have been significantly smaller. Bearing in mind this suggested depth from NHBC tables, it should be recognised that roots have been encountered down to approximately 3.6m, which is an indication to the extent to which vegetation has impacted

on the site. Typically, when installed, foundations are usually taken at least 300mm below root activity.

- 6.9 With reference to BRE Digest 251 Assessment of Damage in Low Rise Buildings, the damage should be categorised as 3 on a scale of 0-5. At this level of damage there will be a requirement to undertake mitigation works to avoid cyclical damage and reoccurrence of movement as well as remedial repairs. Based upon the findings of the site investigation, as well as our own observations, we consider that it is highly likely that movement will continue on a cyclical basis which will to some extent be dependent on seasonal change and variation. Movements are therefore likely to continue following typical patterns of soil moisture deficit. It is anticipated that they will increase in magnitude toward the latter part of the summer, closing through the winter only to repeat this cycle.
- 6.10 On the basis of site investigation results and our observations we would recommend an Arboriculturist be appointed in order to consider all existing trees and the potential for the removal of individuals among those which exist. Our findings and site investigations will assist with any considerations and proposals they may have. They may also be able to assist with an application to have the tree(s) removed. Root samples have already been recovered to prove the trees are the most likely cause which will support the argument for vegetation control to be undertaken should this be the course of action decided upon.
- 6.11 We consider that there are options to address the issue of movement.
1. The first is to underpin the rear of the structure to a moisture stable depth, although based on site investigation findings the desiccation and the presence of roots continue to a depth where traditional underpinning may not be achievable. Underpinning in order to stabilise the structure to the rear would therefore require a piled solution. This will create a hard spot between number 87 and any adjoining structures which are not similarly stabilised or piled, which could lead to further structural damage occurring on a seasonal basis.
 2. The alternative to sub structure works is to undertake vegetation control, which is likely to result in recovery of the soils. In this instance, the tree directly to the rear and closest to 87 would, in our opinion, be that to be removed. Subsequently, number 87 as well as neighbouring structures may potentially experience some heave movement over and above recovery,



although based upon the extent of desiccation and other trees on site the recovery movement is likely to be limited.

In this scenario consideration should be given to the installation of a deep datum and level monitoring in order that any recovery can be charted.

3. Consideration may also be given to the installation of a root barrier. This could be installed across the rear boundary of the properties on Woolverstone Close, (suggested no's 85 – 89) sufficiently distant from the trees to avoid damage to them or their roots. Similarly as with the removal of trees it may be necessary to install monitoring as the barrier will enable rehydration of the soils protected by its installation which could in turn lead to heave recovery.

6.11 Heave would occur where soils would be able to regain some moisture in the absence of the tree, or in the absence of their root growth (in the case of a root barrier) which is seasonally extracting water, and then would swell, or increase in volume, as the moisture content regains becoming closer to equilibrium.

6.12 In the event that options 2 or 3 above were adopted we would recommend that remedial works be held in abeyance for as long as possible to allow recovery to occur. It could be years before the extent of any recovery is recognised. In the meantime, external flexible sealants could be used to fill cracks and gaps maintaining weather tightness. Internal structural repairs are likely to consist of resin repairs, potentially utilising helical steel bars, and the use of expanding metal lath applied before plastering to reduce the potential for cracking to recur. Doors and windows should be accepted as having a requirement for easing and adjusting seasonally to account for the recovery.



7.0 APPENDICES



Appendix A – J P Chick Report dated 15 November 2022



15 November 2022
IG22/340/JH

Orwell Housing
Crane Hill Lodge
325 London Road
Ipswich
IP2 0BE

For the attention of Kirsty Hughes

Dear Kirsty

87 WOOLVERSTONE CLOSE, IPSWICH, IP2 9RX – STRUCTURAL INSPECTION

Brief

J P Chick & Partners Limited were appointed by Orwell Housing to undertake a structural inspection of the above titled property following reports of cracking and issues with the operation of the rear personnel door reported by the tenant. We received our order on Friday 30th September 2022. We contacted the tenant and agreed to attend site on Monday 3rd October 2022. The weather remained dry and mild throughout the period of our inspection.

Description

The property is in a modern terrace arrangement with adjoining properties both sides. It is two storey in height and considered to be of traditional cavity masonry construction with a duo pitched roof over. Floors are ground bearing slabs at ground floor and suspended timber at first floor. Internal walls at ground floor are masonry considered to be built off floor slabs. This report should be considered in conjunction with our previous report on the adjoining structure, 85 Woolverstone Close, ref: IG22/299.



Member of the Association of Consulting Engineers

Directors: J P Chick - MSc DIC C.Eng C.Env FAE FICE FStructE MCIHT MCIARB FConsE, P J Davis - BSc C.Eng FStructE MICE MCIHT IMaPS FConsE

G Brundell - B.Eng C.Eng MStructE, D Cantrill - B.Eng C.Eng MICE MStructE, D Arend - B.Eng, C.Eng MStructE, R Findlay - M.Eng C.Eng MStructE, R Crowther - AMICE PIEMA AMEI
Registered Office: 7 Museum Street Ipswich Suffolk IP1 1HQ T 01473 280699 E ipswich@chick.co.uk Registered No: 4806356

Observations & Damage

Cracking is present within both ground floor reception rooms to the rear, most notably within the dining room to the left-hand side. Cracking has manifest full depth of this room up to the cross wall with the kitchen. The most significant crack emanates from the window to the left-hand party line. Horizontal in nature this is approximately 2.5mm in width and continues at a lesser magnitude on the party line as a horizontal crack. Further cracking above the back door is present in the form of a vertical crack as well as diagonal cracks above the through door from the kitchen to the main living room. The dining room window has a drop toward the right-hand side by approximately 10mm when measured with a 1.8m level. The floor has a 15mm drop from its front to the rear as well as a 5mm drop from left to right with the low point at the rear right-hand corner of the dining room. The living room exhibits predominantly vertical cracks above and beneath window openings as well as a horizontal crack extending toward the right-hand party wall at mid height.

Externally there are a number of horizontal cracks which have opened, notably at or close to DPC level and then at lintel height emanating from the rear opening door. Further stepped cracking is present both above and below the sitting room window as well as above the dining room window stepping up into the centre of the property. It can be noted that there is a mature Oak tree approximately 16m in height to the rear of the property which is approximately 15m remote.

Limitations

This limited structural survey was commissioned to visually inspect the crack damage affecting the property and to comment on its cause. Other parts of the building have not been inspected. We have not dug trial holes to expose foundations, lifted floor coverings or removed decorations. We are therefore not aware of any hidden defects or unusual construction details.

The extent of the survey is such that we cannot detect problems that are latent or concealed. We would always recommend, regardless of the structural condition that buildings cover is maintained for all insurable perils.

Our advice is concerned solely with the current structural condition. We do not report on the condition of finishes, water proofing, damp penetration, timbers or asbestos, except where specifically noted.

This report is for our client's personal use and is confidential, non-assignable and carries no admission of liability to any third party.

Conclusions & Recommendations

We consider that as a result of the long dry summer of 2022 there has been a higher than normal loss of moisture from the cohesive subsoils at foundation depth leading to negative volumetric change. This in turn has been sufficient to have caused foundation movement across the rear of the structure. All crack patterns and distortions recorded are consistent with slight foundation movement. With reference to BRE Digest 251 'Assessment of damage in low rise buildings', damage should be categorised as 2 – 3 on a scale of 0 – 5 with 5 being the most severe.

We consider that the Oak tree immediately to the rear which is the most likely cause of moisture demand has caused volumetric change within the founding subsoils. It is likely that this tree pre-dates the properties. By how long is unknown. On this basis we consider that the tree should not be removed without further investigation in order to understand the potential for any residual heave. To this end we recommend that it is necessary to undertake subsoil investigations to establish foundation depth and subsoil profile to include laboratory and insitu testing. This would ideally be using a traditional percussion rig in order to extract undisturbed samples for suction testing although we are mindful that access to the rear may be limited.

Depending on results of investigations and testing and where heave may cause greater levels of damage than currently exist we recommend that consideration should be given to some limited underpinning of the back wall of the structure which could all be attained externally. With initial reference to NHBC Chapter 4.2 "Building near trees" taking account of the Oak trees assuming medium shrinkage soil foundation depths should be in the region of 1.75m depth. It would be necessary to introduce transition bays to the adjoining structures of 89 and 85 Woolverstone Close the latter of which was subject to a previous report undertaken by J P Chick & Partners Limited, reference IG22/299.

In the short term we would recommend that damage be visually monitored as this is likely to recover through the winter months whereby cracks may close, and levels may recover slightly. During this period, it will be necessary to maintain the property in order that it remains safe and adequate for the tenant in terms of doors remaining functional. We do not consider that the structure will become unsafe or compromised at any point in the foreseeable future without any works being undertaken.



J Harvey ACIOB
On behalf of J P Chick & Partners Limited

justin.harvey@chick.co.uk



Countersigned.....



Appendix B – Soil Investigation Eastern Limited Report dated 05 June 2023



FACTUAL REPORT OF INVESTIGATION

AT: - 87 Woolverstone Close, Ipswich IP2 9RX

ON: - 5th June 2023

FOR: - J P Chick & Partners Ltd

REF: -

JOB No: - JP4221

SOIL INVESTIGATION (EASTERN) LTD
Unit 8, Hill Farm, Church Lane, Ford End, Chelmsford, Essex, CM3 1LH.
TEL. 01245 237555

Site Location Plan

Sheet: 1 of 1

Job No: JP4221

Scale: Not to scale

Date: 05/06/2023

Client: JP Chick and Partners Ltd



Tel/Fax 01245 237555 Mobile 07810 820620

Site: 87 Woolverstone Close, Ipswich. IP2 9RX



Remarks: ON SITE TREE IDENTIFICATION FOR GUIDANCE ONLY.
NOT AUTHENTICATED

Key:		Trial Pit		Borehole
		Man Hole		Gully
		Soil Vent Pipe		Tree / Bush
		Rain Water Pipe		(approx. ht. in m)

Job No. JP4221 - 87 Woolverstone Close, Ipswich IP2 9RX

Photos taken by our team 5th June 2023







Trial Pit 1

Sheet: 1 of 1
 Job No: JP4221
 Date: 05/06/2023

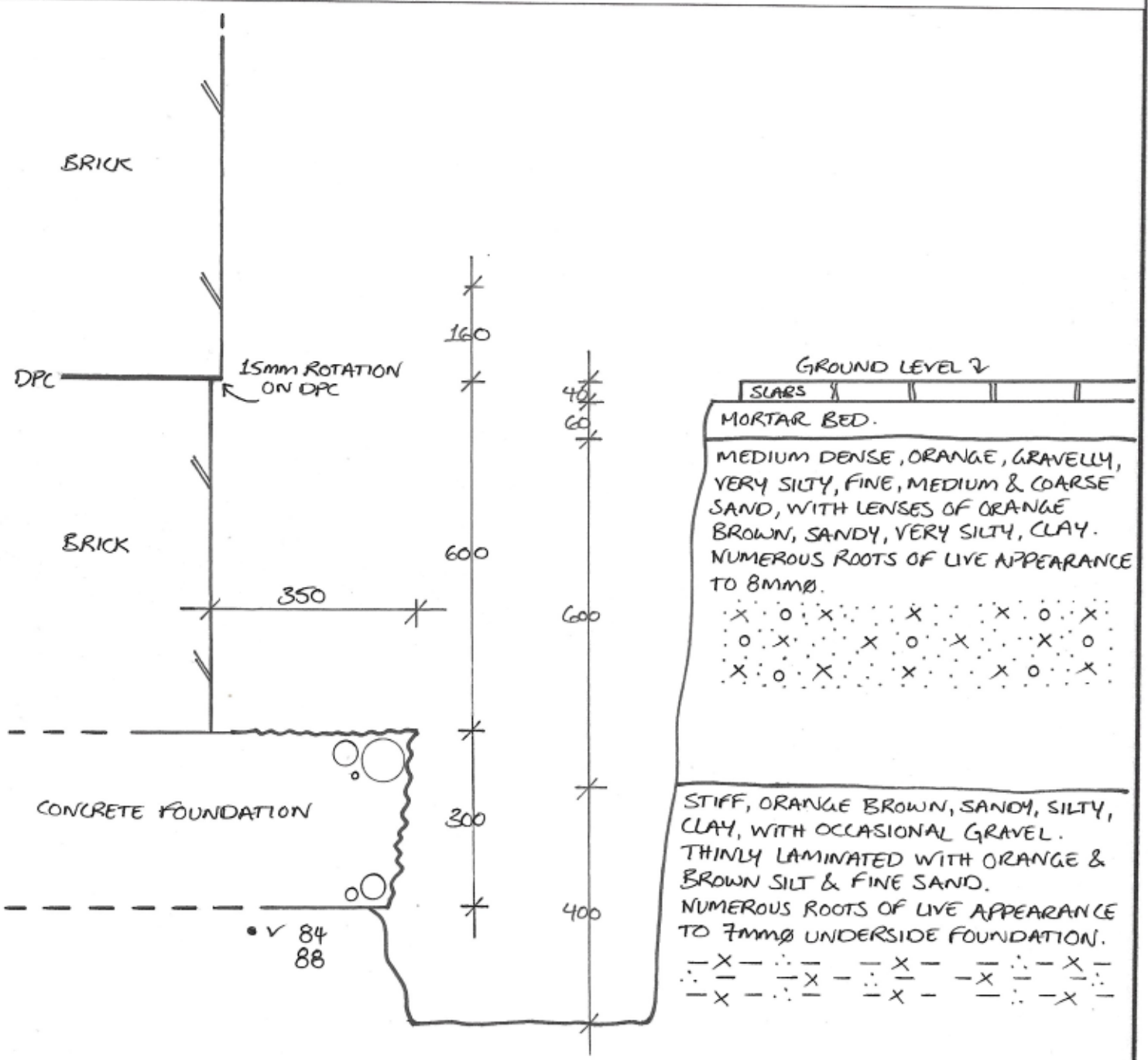
Excavation Method: Hand Tools

Client: JP Chick & Partners Ltd.



Tel/Fax 01245 237555 Mobile 07810 820620

Site: 87 Woolverstone Close, Ipswich



FOR STRATA BELOW 1100mm.
 SEE BOREHOLE 1 LOG.

Remarks

- Key:**
- Small disturbed sample
 - B Bulk disturbed sample
 - W Water sample
 - J Jar sample
 - V Pilcon Vane (kPa)
 - I Mackintosh Probe

Trial Pit 2A

Sheet: 1 of 2

Job No: JP4221

Excavation Method: Hand Tools

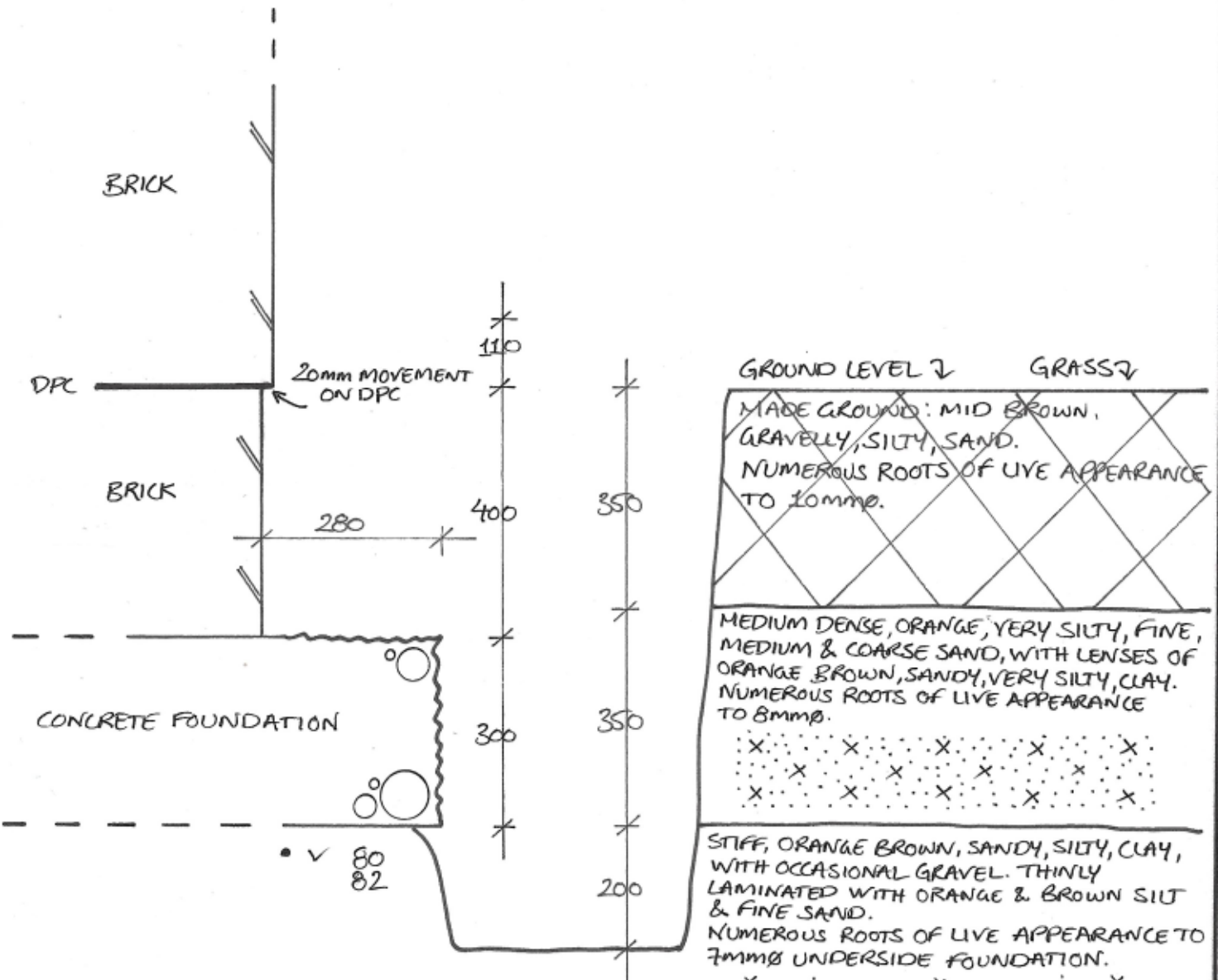
Date: 05/06/2023

Client: JP Chick & Partners Ltd.



Tel/Fax 01245 237555 Mobile 07810 820620

Site: 87 Woolverstone Close, Ipswich



GROUND LEVEL ↴ GRASS ↴

MADE GROUND: MID BROWN, GRAVELLY, SILTY, SAND. NUMEROUS ROOTS OF LIVE APPEARANCE TO 10mm.

MEDIUM DENSE, ORANGE, VERY SILTY, FINE, MEDIUM & COARSE SAND, WITH LENSES OF ORANGE BROWN, SANDY, VERY SILTY, CLAY. NUMEROUS ROOTS OF LIVE APPEARANCE TO 8mm.

STIFF, ORANGE BROWN, SANDY, SILTY, CLAY, WITH OCCASIONAL GRAVEL. THINLY LAMINATED WITH ORANGE & BROWN SILT & FINE SAND. NUMEROUS ROOTS OF LIVE APPEARANCE TO 7mm @ UNDERSIDE FOUNDATION.

TRIAL PIT ENDS AT 900mm.

Remarks DRY & OPEN ON COMPLETION.

- Key:
- Small disturbed sample
 - J Jar sample
 - B Bulk disturbed sample
 - V Pilcon Vane (kPa)
 - W Water sample
 - I Mackintosh Probe

Trial Pit 2B

Sheet: 2 of 2

Job No: JP4221

Excavation Method: Hand Tools

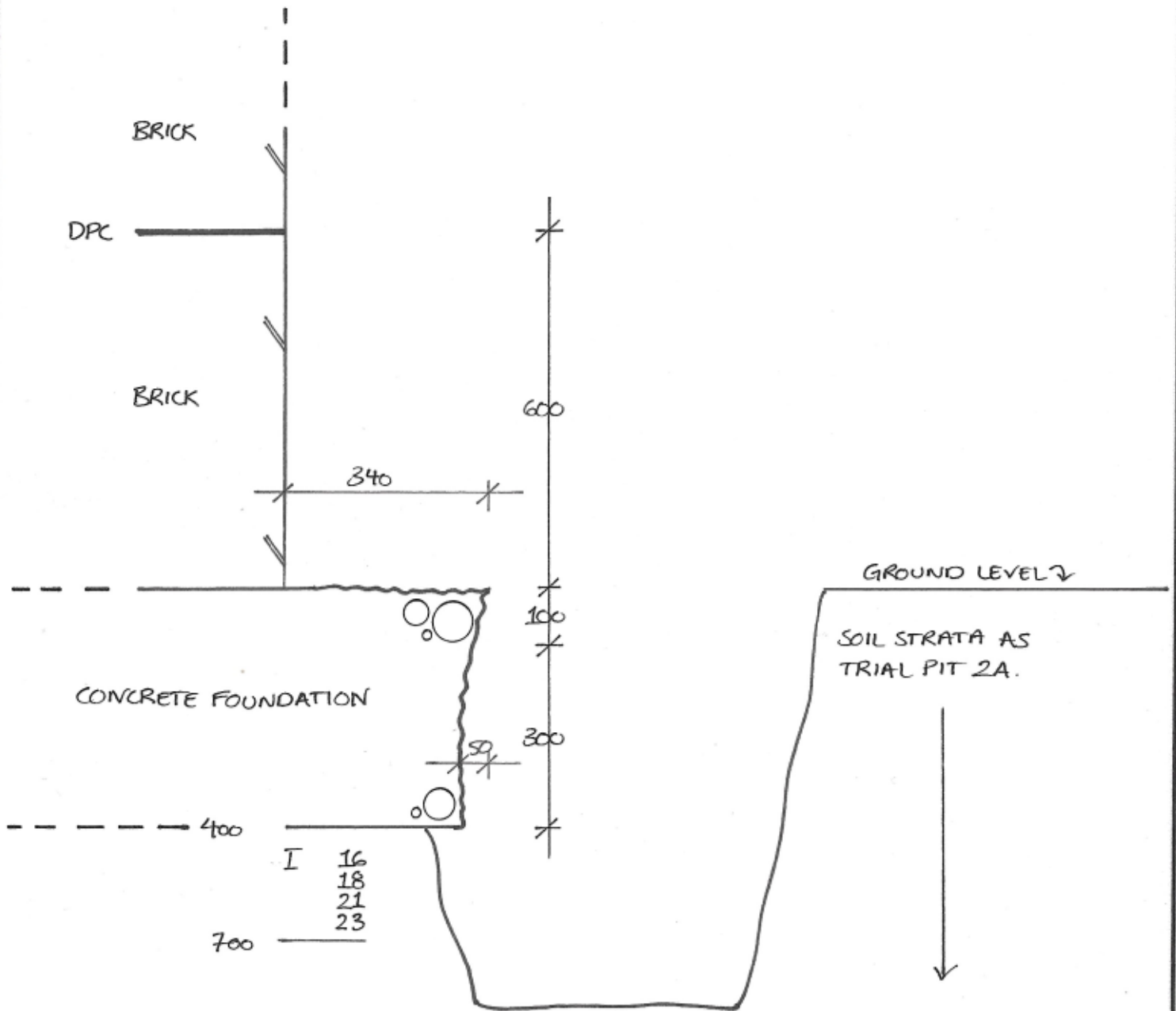
Date: 05/06/2023

Client: JP Chick & Partners Ltd.



Tel/Fax 01245 237555 Mobile 07810 820620

Site: 87 Woolverstone Close, Ipswich



Remarks

Key: ● Small disturbed sample J Jar sample
B Bulk disturbed sample V Pilcon Vane (kPa)
W Water sample I Mackintosh Probe

Borehole No: 1

Sheet: 1 of 1

Job No: JP4221

Boring Method: 100mmø CFA

Date: 05/06/2023



Tel/Fax 01245 237555 Mobile 07810 820620

Client: JP Chick & Partners Ltd.

Site: 87 Woolverstone Close, Ipswich

Depth (mm/m)	Description of Strata	Thick- Ness (mm/m)	Legend	Sample	Test Type	Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	As trial pit 1.	1.1						100 Numerous roots of live & dead appearance to 1mm to	
1.1	Stiff, orange brown, grey veined, slightly sandy, very silty, CLAY, with partings of orange & brown silt & fine sand.	500	$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$						
1.6	Very stiff, as above.		$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•			1.5		
		1.2	$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•	V	140+ 140+	2.0		
			$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•			2.5	2.6. Numerous hair & fibrous roots to 3.6m.	
2.8	Stiff, light brown, grey veined, very silty, CLAY, with partings of orange & brown silt & fine sand.	600	$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•	V	132 130	3.0		
3.4	Very stiff, as above.		$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•	V	140+ 140+	4.0	No roots observed below 3.6m. Slight water seepage at	2.8
4.6	Very stiff, mid grey, very silty, CLAY, with partings of grey silt & fine sand.	1.4	$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•	V	140+ 140+	5.0		
6.0	Borehole ends at 6.0m		$\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$ $\frac{x}{x} \frac{x}{x}$	•	V	140+ 140+	6.0		

Remarks: Borehole moist & open on completion.

Key:

- Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample(U100)
- W Water sample
- J Jar sample
- V Pilcon Vane (kPa)
- I Mackintosh Probe
- S Standard penetration test
- N SPT blow count



Richardson's Botanical Identifications

Root identification
Vegetation surveys
Tree/Bulking investigations
Plant taxonomy

Soil Investigation (Eastern) Ltd.
Unit 8
Hill Farm
FORD END
Chelmsford CM3 1LH

28/06/2023

Dr Ian B K Richardson
BSc, MSc, PhD, MRSB, FLS

James Richardson
BSc (Hons. Biology)

Enterprise House
49-51 Whiteknights Road
Reading
RG6 7BB

Tel: (0118) 986 9552 *(Direct line)*

E-mail: richardsons@botanical.net

Web: www.botanical.net

Your ref: **JP4221**

Our ref: **87/0206**

Dear Sandra

87 Woolverstone Close, Ipswich IP2 9RX

The samples you sent in relation to the above on 13/06/2023 have been examined. Their structures were referable as follows:

TP2, u/s foundation		
3 no.	Examined root: QUERCUS (Oak).	Alive, recently*.
1 no.	A piece of BARK only, insufficient material for identification.	

Click here for more information: [QUERCUS](#)

I trust this is of help. Please call us if you have any queries; our Invoice is enclosed.

Yours sincerely

Dr Ian B K Richardson

* Based mainly on the Iodine test for starch. Starch is present in some cells of a living woody root, but is more or less rapidly broken down by soil micro-organisms on death of the root, sometimes before decay is evident. This result need not reflect the state of the parent tree.

** Try out our web site on www.botanical.net **



SITE INVESTIGATION LABORATORY TEST REPORT

REPORT NUMBER:

SIE053

CLIENT :

Soil Investigation (Eastern)Ltd

SITE ADDRESS:


87 Woolverstone Close
Ipswich
IP2 9RX

DATE OF SITE VISIT:

05/06/2023

DATE RECEIVED BY LABORATORY:

09/06/2023

Compiled by :

J.Garrett

Approved by :

J.Garrett

DATE REPORTED: 16-Jun-2023

Laboratory Summary Results

Our Ref : SIE053
 Location : 87 Woolverstone Close, Ipswich, IP2 9RX
 Client : Soil Investigations (Eastern)Ltd
 Address : Unit 8, Hill Farm, Church Lane, Ford End, Chelmsford, Essex, CM3 1LN

Date Sampled: 05/06/2023
 Date Received : 09/06/2023
 Date Tested : 12/06/2023
 Date of Report : 16/06/2023

Sample Ref		Type	Moisture Content (%) [1]	Soil Fraction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index [5]	Modified Plasticity Index (%) [6]	Soil Class [7]	Filter Paper Contact Time (d)	Soil Sample Suction (kPa) [8]	Roots Present or Below [9]	In situ Shear Vane Strength (kPa) [10]	Organic Content L.O.I (%) [11]	pH Value [12]	Sulphate Content (g/l)		Class [15]
TP/BH No	Depth (m)																SO ₃ [13]	SO ₄ [14]	
1	U/S 0.90	D	33	19	68	25	43	0.19	35	CH			Roots Present	86					
	1.5	D	28	9	66	26	40	0.04	37	CH			Roots Present						
	2.0	D	25	8									Roots Present	>140					
	2.5	D	34	<5	72	25	47	0.19	47	CV			Roots Present						
	3.0	D	50	<5									Roots Present	>140					
	4.0	D	39	<5									Below Roots						
	5.0	D	46	<5									Below Roots	>140					

Test Methods / Notes

[1] BS 1377 : Part 2 : 1990, Test No 3.2
 [2] Estimated if <5%, otherwise measured
 [3] BS 1377 : Part 2 : 1990, Test No 4.4
 [4] BS 1377 : Part 2 : 1990, Test No 5.3
 [5] BS 1377 : Part 2 : 1990, Test No 5.4
 [6] BRE Digest 240 : 1993
 [7] BS 5930 : 2018 : Figure 8 - Plasticity Chart for the classification of fine soils

Test results reported relate only to the items tested.

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

[8] S9a adapted from BRE IP 4/93

[9] Roots present at depth, below roots found. Taken from logs provided

[10] Values of shear strength were determined in situ by client using

a Picon hand vane or Geonor vane (GV).

[11] BS 1377 : Part 3 : 1990, Test No 4

[12] BS 1377 : Part 2 : 1990, Test No 9

[13] BS 1377 : Part 3 : 1990, Test No 5.6

[14] SO₄ = 1.2 x SO₃

[15] BRE Special Digest One (Concrete in Aggressive Ground) August 2005

Note that if the SO₄ content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4M or DS-5M class respectively unless water soluble magnesium testing is undertaken to prove otherwise.

Full reports can be provided upon request.

Key

D Disturbed sample (small)
 B Disturbed sample (bulk)
 U Undisturbed sample
 W Groundwater sample
 ENP Essentially Non-Plastic by inspection
 US Underside of Foundation

Laboratory Testing Results

Our Ref : SIE053
 Location : 87 Woolverstone Close, Ipswich, IP2 9RX
 Client : Soil Investigations (Eastern)Ltd
 Address : Unit 8, Hill Farm, Church Lane, Ford End, Chelmsford, Essex, CM3 1LN

Date Sampled : 05/06/2023
 Date Received : 09/06/2023
 Date Tested : 12/06/2023
 Date of Report : 16/06/2023

Sample Ref.		Type	Moisture Content (%) [1]	Soil Fraction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity * Index [5]	Modified * Plasticity Index (%) [6]	Soil * Class [7]	Filter Paper Contact Time (d)	Soil Sample Suction (kPa) [8]	Roots Present or Below [9]	In situ Shear Vane Strength (kPa) [10]	Organic Content L.O.I (%) [11]	pH Value [12]	Sulphate Content (g/l)		Class [15]
TP/BH No.	Depth (m)																SO ₃ [13]	SO ₄ [14]	
TP2A	U/S 0.70																D	28	

Test Methods / Notes

[1] BS 1377 : Part 2 : 1990, Test No 3.2
 [2] Estimated if <5%, otherwise measured
 [3] BS 1377 : Part 2 : 1990, Test No 4.4
 [4] BS 1377 : Part 2 : 1990, Test No 5.3
 [5] BS 1377 : Part 2 : 1990, Test No 5.4
 [6] BRE Digest 240 : 1993
 [7] BS 5930 : 2018 : Figure 8 - Plasticity Chart for the classification of fine soils

Test results reported relate only to the items tested.
 This report shall not be reproduced except in full without approval of the laboratory.

[8] S_{9a} adapted from BRE IP 4/93

[9] Roots present at depth, below roots found. Taken from logs provided
 [10] Values of shear strength were determined in situ by client using a Pilon hand vane or Geonor vane (GV).
 [11] BS 1377 : Part 3 : 1990, Test No 4
 [12] BS 1377 : Part 2 : 1990, Test No 9
 [13] BS 1377 : Part 3 : 1990, Test No 5.6
 [14] SO₄ = 1.2 x SO₃

[15] BRE Special Digest One (Concrete in Aggressive Ground) August 2005

Note that if the SO₄ content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4M or DS-5M class respectively unless water soluble magnesium testing is undertaken to prove otherwise.

Full reports can be provided upon request.

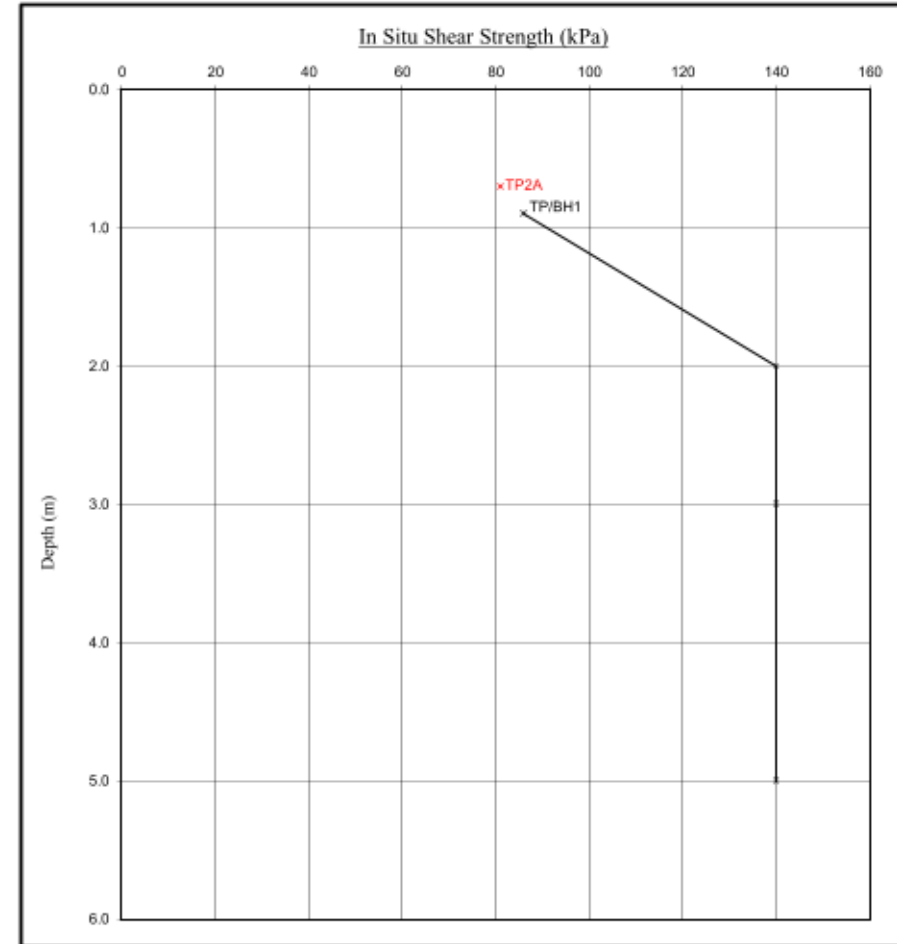
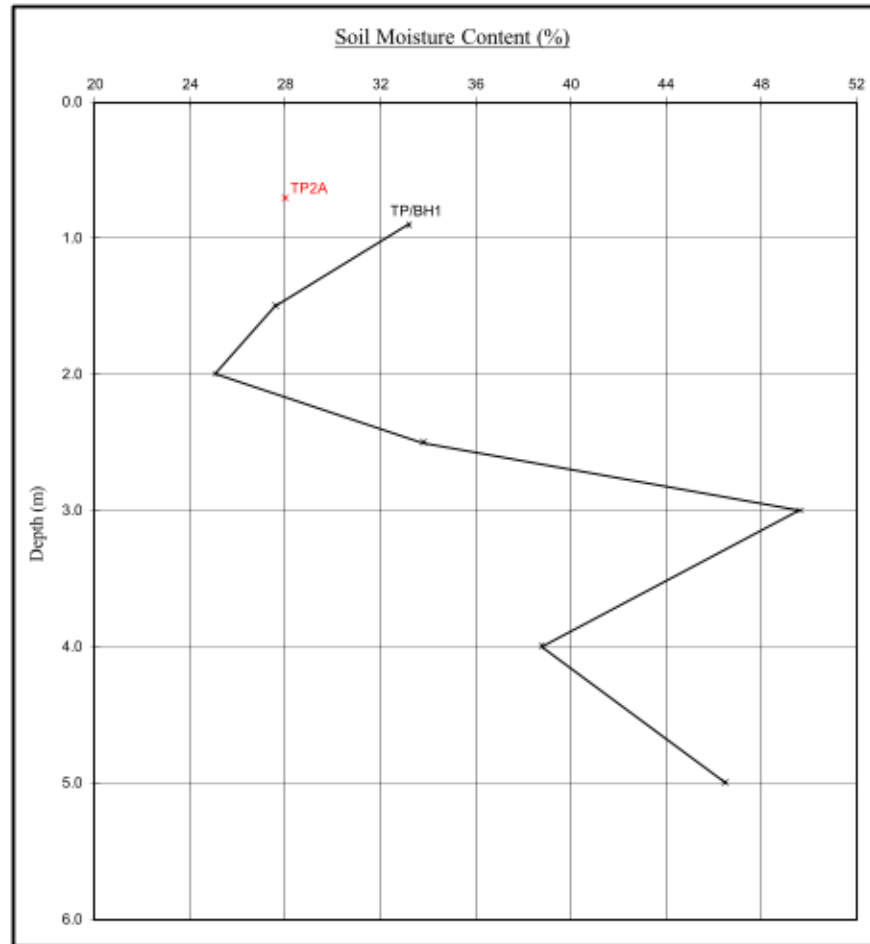
Key

D Disturbed sample (small)
 B Disturbed sample (bulk)
 U Undisturbed sample
 W Groundwater sample
 ENP Essentially Non-Plastic by inspection
 U/S Underside of Foundation

Moisture Content Profiles

Our Ref: SIE053
Location: 87 Woolverstone Close, Ipswich, IP2 9RX
Work carried out for: Soil Investigations (Eastern)Ltd

Date Sampled: 05/06/2023
Date Received: 09/06/2023
Date Tested: 12/06/2023
Date of Report: 16/06/2023



Notes

1. If plotted, $0.4 LL$ and $PL+2$ (after Driscoll, 1983) should only be applied to London Clay (and similarly overconsolidated clay) at shallow depths.

Note

1. Unless otherwise stated, values of Shear Strength were determined in situ by the client using a Picon Hand Vane the calibration of which is limited to a maximum reading of 140 kPa.

Plasticity Chart

Our Ref : SIE053
Location : 87 Woolverstone Close, Ipswich, IP2 9RX
Work carried out for: Soil Investigations (Eastern)Ltd
Unit 8, Hill Farm, Church Lane, Ford End, Chelmsford, Essex, CM3 1LN

Date Sampled : 05/06/2023
Date Received : 09/06/2023
Date Tested : 12/06/2023
Date of Report : 16/06/2023

