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Proposed basement development
14a Hampstead Hill Gardens
London

Basement Impact Assessment Report

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Proposed basement redevelopment
14a Hampstead Hill Gardens
Camden
London
NW3 2PL

Basement Impact Assessment Report

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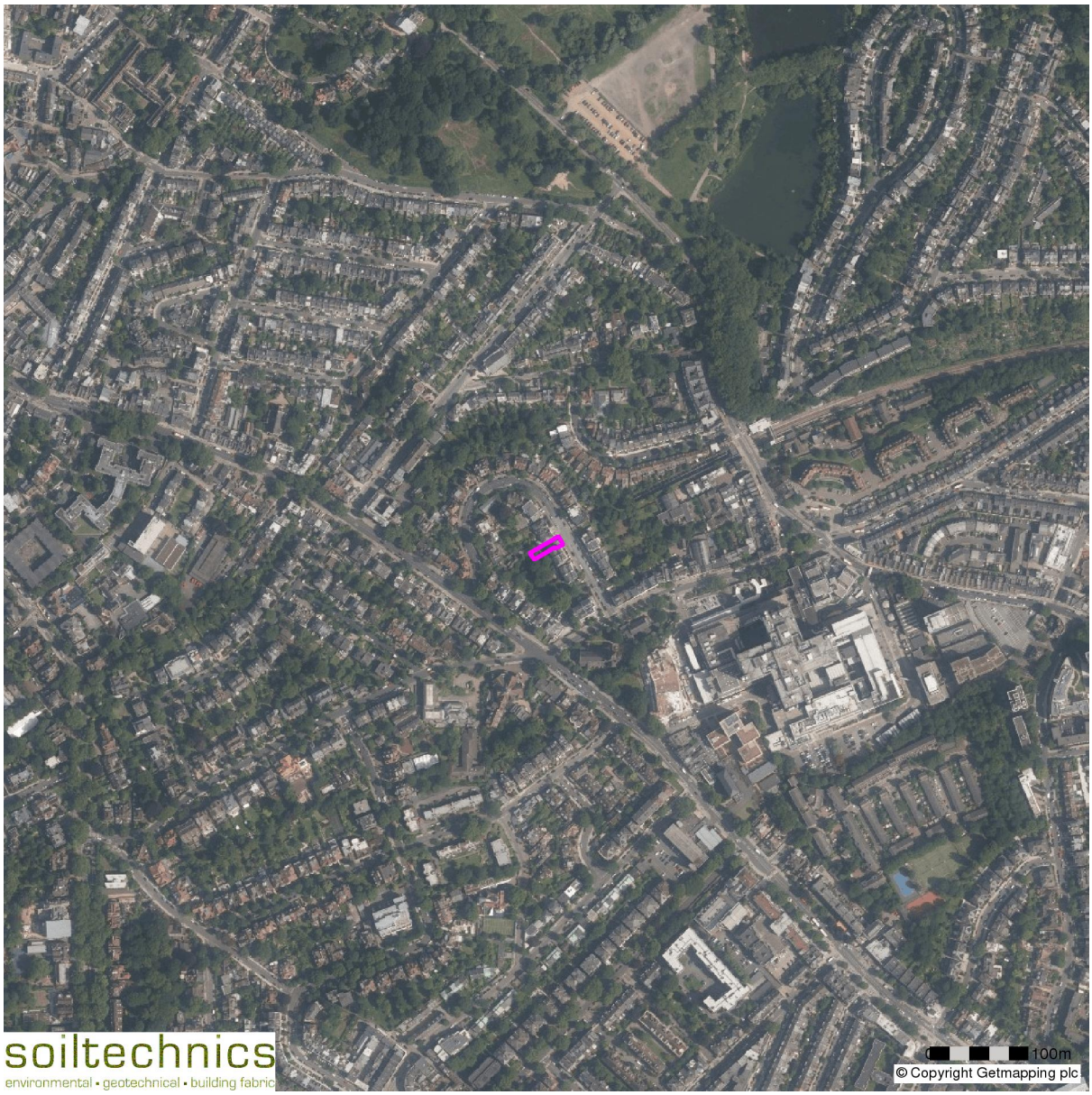
Aerial photograph of site



Report status and format

Report Section	Principal Coverage
1	Introduction
2	Existing and Proposed Development
3	Desk Study
4	Screening
5	Scoping
6	Ground Investigations
7	Engineering
8	Basement Impact Assessment

List of drawings

Drawing	Principal coverage	Revision	Comments
01	Site location plan		
02	Existing site features		

List of appendices

Appendix	Content
A	Author's CV
B	Letter of approval from Chartered Geologist
C	Project proposals
D	Copies of responses from statutory undertakers
E	Ground Movement Analyses

Non – Technical Summary

The site is located at the garage site at 14a Hampstead Hill Gardens, London, NW3 2PL.

The site is generally flat and is currently occupied by two single garages. Hampstead Hill Tunnel, which carries the North London Line, passes directly under the site. The crown of the tunnel is approximately 14m below ground level at the site.

The proposed development comprises demolition of the existing garages followed by construction of a two storey building with accommodation in the roof plus single storey basement.

The site was occupied by a field prior to construction of the present-day properties along Hampstead Hill Gardens at some point between 1871 and 1895. The site and immediate vicinity remains largely unchanged from 1915 until the present day

A ground investigation was undertaken in October 2020. Ground conditions comprise Made Ground sequentially overlying Head and London Clay. Groundwater was encountered during the site investigation within the Head deposits. Post fieldwork monitoring recorded groundwater at a depth of around 3m below ground level.

Ground movement analyses have been undertaken to assess the impact on the adjoining properties from the proposed works. Those analyses demonstrate that with appropriate controls, the potential damage to adjoining properties can be limited to Burland Category 1, in accordance with planning guidance.

1 Introduction

1.1. Objectives

1.1.1 This report presents a Basement Impact Assessment (BIA) for a proposed basement at the garage site at 14a Hampstead Hill Gardens, London, NW3 2PL. This report considers the effect of the proposed basement on the local hydrology, geology, hydrogeology and potential impacts to neighbours and the wider environment. A site location plan is presented as Drawing 01.

1.1.2 The principal objective of the assessment is to present evidence to support a planning application for the project as required by policy A5 Basements in the Camden Local Plan (2017) and Camden Planning Guidance – Basements (2021). It also provides evidence as required by policy BA1 of the Hampstead Neighbourhood Plan (October, 2018)

1.2. Client instructions and confidentiality

1.2.1 This report has been produced following instructions received from Price and Myers on behalf of our mutual client, Mr Alon Mekel.

1.2.2 This report has been prepared for the sole benefit of our above-named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report.

1.3. Author qualifications

1.3.1 The report has been prepared by a Chartered Civil Engineer with over 10 years relevant experience in geotechnical engineering. A copy of the CV is presented in Appendix A.

1.3.2 This report has also been reviewed by a Chartered Geologist to satisfy Camden planning guidance with respect to groundwater flow; a letter of approval is presented as Appendix B.

1.4. Sources of information

1.4.1 Specific documents are referenced at appropriate places within this report. Reference has also been made to the following documents:

- Camden Planning Guidance – Basements (London Borough of Camden, 2021)
- Camden geological, hydrogeological and hydrological study – Guidance for subterranean development (Arup, 2010)
- Camden Local Plan (London Borough of Camden, 2017)

1.4.2 A construction method statement has been prepared by a Structural Engineer which is presented separately.

1.5. Soiltechnics Liability

1.5.1 Soiltechnics disclaims any responsibility to our Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence in accordance with the terms of our contract, taking account of the resources, investigations and testing devoted to it by agreement with our Client. This report is confidential to our Client and Soiltechnics accepts no responsibility of

whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

1.6. Revision B

1.6.1 The scheme proposals have changed since original issue of this report. The changes are limited to alteration of the roof line and architectural details. The structural engineer has confirmed that the loadings will not differ significantly from those previously modelled. On this basis the original modelling is considered to remain valid. This report has been updated to include the latest design proposals and correct typographical errors.

1.7. Revision C

1.7.1 The report has been further updated to update references to current planning guidance.

1.8. Revision D

1.8.1 A meeting was held with Campbell Reith (on behalf of Camden Borough Council) on 04 September 2024. The following requests were raised by Campbell Reith:

- Review the c_u v depth profile plot.
- Provide commentary on the choice of factor used in above plot.
- Review ground movement curves adopted.
- The bearing capacities derived should be reviewed in view of the variable ground conditions.

1.9. Revision E

1.9.1 This report has been updated following further email correspondence with Campbell Reith (on behalf of Camden Borough Council). Changes are limited to updates to the Screening and Scoping sections of the report. Specifically this includes:

- Stating the increase in impermeable area at the site due to the proposed works.
- Referring to the Flood Risk Assessment produced by others.

2 Existing and Proposed Development

2.1. Description of the existing site

2.1.1 The existing features at the site are presented as Drawing 02.

2.1.2 The site comprises two garages located between a four storey and three storey residential property. The garages are in a satisfactory state of repair.

2.1.3 The site is located on the side of a hill with the ground sloping down towards the east at a gradient of approximately 1V:15H. The level of the site is approximately 72m above Ordnance Datum (AOD)

2.1.4 The locale is dominated by residential properties of masonry construction, many of which have a basement or lower ground floor.

2.1.5 There is a gap in the houses along both sides of Hampstead Hill Gardens. This gap coincides with the alignment of a railway line, owned and operated by London Overground, which passes through a tunnel beneath the site.

2.2. Project proposals

2.2.1 The proposed development comprises demolition of the existing garages followed by the construction of a two storey building with accommodation in the roof plus single storey basement.

2.2.2 The project proposals are shown on the drawings presented as Appendix C.

3 Desk Study

3.1. Site history

3.1.1 A review of Ordnance survey and London town maps dating back to 1850 has been undertaken.

3.1.2 The site was occupied by open fields in 1850. Significant residential development in the wider area is recorded on the 1871 maps; this includes construction of the railway tunnel beneath the site carrying the North London Line. The railway tunnel, which connects Hampstead Heath Station in the East to Finchley Road and Frognal Station in the west, is understood to have been opened in 1860 (https://www.theundergroundmap.com/article.html?id=3364)

3.1.3 Development of the area continued throughout the 1800s and includes the construction of Hampstead Hill Gardens and several of the present day properties at some point between 1871 and 1895. The remaining properties along Hampstead Hill Gardens were constructed prior to 1915.

3.1.4 The site and immediate vicinity remains largely unchanged from 1915 until the present day.

3.2. Geology

3.2.1 Reference has been made to the 1:50 000 scale geological map published by the British Geological Survey (BGS) – Sheet 256 North London (2006). Reference has also been made to historical exploratory hole logs available from the BGS GeoIndex.

3.2.2 The site is indicated to be underlain by London Clay, which is anticipated to extend for tens of metres beneath the site.

3.2.3 No superficial deposits have been mapped at or in close proximity to the site. However, head propensity is mapped at the site indicating a possible chance of encountering head deposits.

3.3. Hydrogeology

3.3.1 The site is underlain by London Clay which is designated as an unproductive stratum.

3.3.2 The site is not located within a Source Protection Zone.

3.4. Hydrology, drainage and flood risk

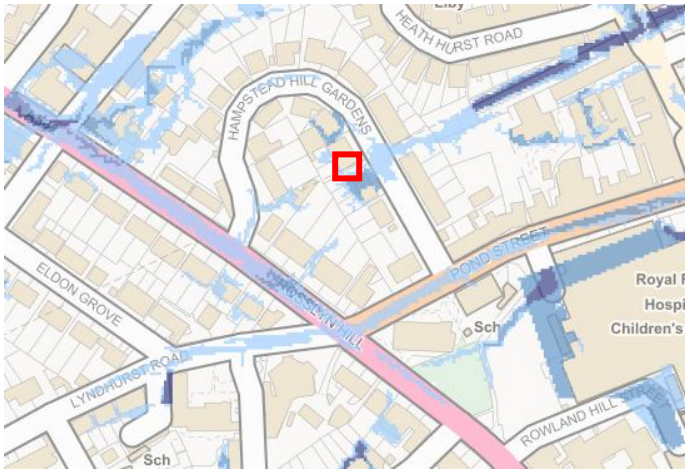
3.4.1 The site is not located within close proximity (250m) of any surface water features.

3.4.2 Reference has been made to Figure 11 from the Camden Geological, Hydrogeological and Hydrological Study (Arup, 2010). The site is not located within close proximity to any historical watercourses. An extract of Figure 11 is presented below with the approximate position of the site represented by the red box.

3.4.3 The site lies outside of the catchment of the Hampstead Heath Ponds.

3.4.4 The front of the site is surfaced hard surfaced to facilitate access to the garage. The rear of the site is soft landscaped. It is understood that there is an existing drainage pipe situated between the garages and discharging to the main sewer on the street.

3.4.5 Reference has been made to GOV.UK website to assess the risk of flooding due to a variety of sources. The site is indicated to be at low to medium risk of flooding from surface water, sometimes referred to as flash flooding.



3.4.6 Reference has been made to Figure 15 of the Camden Geological, Hydrogeological and Hydrological Study (Arup, 2010). That Figure shows the property to be remote from areas of historical flooding.

3.4.7 Reference has been made to the London Borough of Camden, Strategic Flood Risk Assessment (URS, 2014). Figure 6 of that document indicates that the site is not situated within a Critical Drainage Area. A Critical Drainage Area (CDA) is defined as *"a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure"*.

3.5. Quarrying and mining

3.5.1 The site is not within an area affected by mining.

3.5.2 Inspection of historical Ordnance Survey maps dating back to 1850 does not reveal any quarrying activities within 250m of the property.

3.6. Unexploded Ordnance (UXO)

3.6.1 Reference has been made to The London County Council Bomb Damage Maps, 1939 – 1945 (Ward, 2015). Those maps show that the site and immediate vicinity did not suffer bomb damage during World War 2.

3.6.2 Additionally, a UXO preliminary risk review was commissioned by Soiltechnics and undertaken by MACC International Ltd who are a UXO specialist. They concluded that "the UXO risk is considered to be LOW within the site boundary".

3.7. Below ground services and infrastructure

3.7.1 We have contacted the following Statutory Undertakers (SUs) to obtain copies of their records for the purposes of our ground investigation activities. Copies of statutory undertaker's responses are presented in Appendix D.

- BT Openreach Ltd;
- Cadent Gas Ltd;
- Thames Water;
- UK Power Networks; and
- London Underground Ltd.

3.7.2 There is an existing railway tunnel situate beneath the site. The crown of the tunnel is estimated to be ~14m below current site ground level.

3.7.3 There is a sewer and a water main indicated to be located within the centre of the highway. BT cables are indicated to be present beneath the pavement closest to the site. A gas pipe is indicated to be present in the footpath furthest from the site.

4 Screening

4.1. Introduction

4.1.1 A screening process has been undertaken to satisfy Stage 1 of Camden Planning Guidance – Basements; this section of the report provides direct responses to the questions posed in Figures 12 to 14.

4.2. Subterranean (groundwater) flow

Question	Response	Details
1a. Is the site located directly above an aquifer?	No	The site is underlain by London Clay.
1b. Will the proposed basement extend beneath the water table surface?	No	The London Clay Formation comprises reasonably homogenous relatively impermeable clays which are not able to transmit groundwater under normal hydraulic gradients
2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	No	The site is remote (in excess of 100m) of any known watercourse. The geology of the area is not conducive to spring lines or wells for extraction of water.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is outside the catchment area.
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	Yes	The proposed development will increase the impermeable area on site from 125m^2 to 150m^2 as garden space to the rear of the site is removed to construct the two-storey dwelling.
5. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	The size of the rear garden will be reduced and therefore the volume of water discharged to the ground will also be reduced. However, SUDS will be utilised to attenuate surface water, before discharging into the combined water sewer at the site.
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No	There are no ponds or spring lines within 100m of the site.

Table 4.2

4.3. Slope stability

Question	Response	Details
1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	No	The site is generally flat.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No	N/A
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	No	The site is located on the side of a hill with the ground sloping down towards the east at a gradient of approximately 1V:15H

4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately1 in 8)?	No	The wider site setting comprises a hill sloping down to the east at a gradient of circa 1V:15H.
5. Is the London Clay the shallowest strata at the site?	Yes	A nominal, inconsequential, thickness of Made Ground associated with the existing building is anticipated.
6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained?	No	No trees to be removed
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	Yes	London Clay is susceptible to shrink swell subsidence. However, the proposed basement foundations will be below the depth of susceptibility.
8. Is the site within 100m of a watercourse or a potential spring line?	No	The site is remote from any current watercourses. The geology of the area is not conducive to spring lines or wells for extraction of water.
9. Is the site within an area of previously worked ground?	No	There is no evidence to suggest quarrying has taken place at the site.
10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	The property is underlain by London Clay, which is relatively impermeable.
11. Is the site within 50m of the Hampstead Heath Ponds?	No	The site is circa 350m away from the Hampstead No. 1 Pond.
12. Is the site within 5m of a highway or pedestrian right of way?	Yes	The site will be within 5m of the Hampstead Hill Gardens highway and pavement.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	The neighbouring properties both have existing basements and therefore foundation levels are likely to be similar.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	Yes	The site directly overlies an existing railway tunnel.

Table 4.3

4.4. Surface flow and flooding

Question	Response	Details
1. Is the site within the catchment of the ponds chains on Hampstead Heath?	No	The site is outside the catchment of the ponds.
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	Whilst there is an increase in impermeable area the increased volume of flow over such a small area is considered minimal..
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	The proposed development will increase the impermeable area on site from 125m^2 to 150m^2 as garden space to the rear of the site is removed to construct the two-storey dwelling.
4. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	There will be negligible change to the drainage pattern on site.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	There will be negligible change to the drainage pattern on site.

Question	Response	Details
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature.	No	The site is indicated to be at low to medium flood risk from surface water flooding. However, there have been no floods recorded at the site historically. Furthermore, the strategic flood risk assessment does not record the site as being at risk from flooding.

Table 4.4

4.5. Non-technical summary of screening process

4.5.1 The screening process has identified the following issues to be carried forward to scoping for further assessment:

- Potential damage to neighbouring properties
- Potential impact on the railway tunnel that passes beneath the site
- Increase in impermeable area

5 Scoping

5.1. Introduction

5.1.1 A scoping assessment has been undertaken to satisfy Stage 2 of Camden Planning Guidance – Basements; this section of the report provides an assessment and discussion of each of the issues that have arisen from the screening process.

5.2. Potential damage to neighbouring properties

5.2.1 Construction of the proposed basement will cause ground movements that have the potential to cause damage to existing neighbouring structures.

5.2.2 It is considered that the scheme can be suitably designed and constructed to maintain stability therefore minimise damage. A detailed ground movement analysis is presented in Section 7.3

5.3. Potential impact on railway tunnel beneath the site

5.3.1 The proposed building has the potential to result in an increased stress on the existing Network Rail tunnel. The tunnel crown is situated circa 11m below the underside of the basement. Accordingly, it is considered that the impact to the tunnel from the scheme will be negligible. Nevertheless, Network Rail will be consulted, and approval sought, as the project progresses.

5.4. Increase in Impermeable Area

5.4.1 The proposed development will increase the impermeable area on site from 125m^2 to 150m^2 as garden space to the rear of the site is removed to construct the two-storey dwelling. This has the potential to increase the amount of surface water run-off and therefore the risk of flooding.

5.4.2 A Flood Risk Assessment has been undertaken by Price and Myers and reference should be made to that Report (Rev 2, September 2024) for further details and proposed mitigation measures.

6 Ground Investigations

6.1. Scope

6.1.1 A ground investigation was undertaken in October 2020 and comprised:

- 3 no. boreholes undertaken using dynamic windowless sampling techniques to a maximum depth of 6m to confirm underlying ground conditions
- 1 no. hand excavated trial pit to expose the existing foundations of the garages

6.1.2 It should be noted that Network Rail would not permit a borehole extending beyond 6m unless the existing tunnel was surveyed. Given the anticipated ground conditions coupled with the cost and programme constraints of the project, the boreholes terminated at 6m.

6.2. Ground conditions encountered

6.2.1 Ground conditions in the vicinity of the proposed basement comprised Made Ground sequentially overlying Head and the London Clay Formation.

6.2.2 The Made Ground was notably thicker in exploratory hole WS01 (2.80m) in comparison to WS02 (0.50m) and WS03 (0.88m). Anecdotal evidence suggests that there is an existing drainage pipe from the middle of the two garages discharging to the sewer in the road. Accordingly, it is conjectured that WS01 was undertaken down the side of this existing drainage run.

6.2.3 Head was encountered in all of the exploratory holes to a depth of circa 4.20m. It was described as a soft to stiff brown occasionally mottled grey Clay with occasional gravels of flint and shells.

6.2.4 From 4.20m BGL, no flint was observed in the samples recovered from the borehole. Secondly, there was a notable increase in shear strength. Accordingly, it is interpreted that London Clay was encountered at circa 4.20m BGL to the base of the boreholes. It was typically described as a firm to stiff brown mottled grey silty Clay.

6.2.5 Groundwater was encountered at 3m BGL in WS01 but not encountered in WS02 or WS03. Subsequent monitoring recorded groundwater at 2.34m BGL and 3.20m BGL in WS01 and WS03 respectively. It is interpreted that flow rates will be relatively minor given the predominantly clayey nature of the soil.

6.3. Ground model

6.3.1 The following table summarises the ground model proposed for the site:

Stratum	Depth to top (m BGL)	Depth to base (m BGL)
Made Ground	0	1.00
Head	1.00	4.20
London Clay	4.20	>>6

Table 6.3

6.4. Existing foundations

6.4.1 The main dwellings at Nos. 12 and 14 Hampstead Hill Gardens have lower ground floors. It is estimated that the foundations for those buildings are at approximately 2.5m below ground level.

7 Engineering

7.1. Outline geotechnical design parameters

7.1.1 Relevant geotechnical parameters for London Clay have been derived from laboratory testing, technical standards, industry publications and wider literature. The following table summarises those parameters:

Parameter / property	Value	Derivation
Characteristic unit weight, γ (kN/m³)	19	BS8004
Characteristic constant volume angle of shearing resistance, ϕ (°)	21	Literature
Characteristic undrained shear strength, c_u (kN/m²)	40 + 8Z where z = depth below 4.2	In situ testing
Undrained modulus, E_u (MN/m²)	17 + 3.4Z where z = depth below 4.2	Correlation with c_u ($E_u = 425c_u$)

Table 7.1a

7.1.2 The above strength profile (40 + 8z) is based on a pocket penetrometer data and correlation with SPT N value. It is acknowledged that a correlation factor of 6 has been applied to the N value, which whilst it is higher than many situations, it is not an unreasonable factor. It is also noted that the significant majority of the data points (PPs and SPTs) lie to the right of the line indicating the line is moderately conservative. Furthermore, the line typically adopted in London Clay is 50 + 8z. Accordingly the line strength profile adopted (40 + 8z) is considered reasonable.

7.1.3 Head was encountered at the site and will be retained by the basement walls. The following parameters will be adopted:

Parameter / property	Value	Derivation
Characteristic unit weight, γ (kN/m³)	18	BS8004
Characteristic constant volume angle of shearing resistance, ϕ (°)	20	Correlation with plasticity index

Table 7.1b

7.1.4 Made Ground associated with the general development of the site is anticipated to be encountered at shallow depth and would therefore be retained by the basement walls. It was typically encountered as Clay material and is conjectured to be derived from the Head and London Clay. Therefore the following parameters will be adopted for design of the retaining wall:

Parameter / property	Value	Derivation
Characteristic unit weight, γ (kN/m³)	18	BS8004
Characteristic constant volume angle of shearing resistance, ϕ (°)	20	Assumed from to be derived from the Head / London Clay.

Table 7.1c

7.2. Outline temporary and permanent works proposals

7.2.1 The proposed development comprises demolition of the existing garages followed by the construction of a two storey building including single storey basement.

7.2.2 The proposed construction will adopt an underpinning technique to construct reinforced concrete L shaped retaining walls around the perimeter of the basement. A reinforced suspended concrete slab will then be constructed between the toes of the L shaped retaining wall sections.

7.2.3 The L shaped retaining walls will be founded on London Clay. Ultimate limit state analyses (bearing capacity) have been undertaken using traditional methods with a Factor of Safety of 3 to derive an allowable bearing pressure of 95 kN/m^2, which has been adopted by the structural engineer.

7.2.4 Excavation of the basement will cause an unloading of stress on the soil and consequently heave is likely to occur towards the centre of the basement and diminishing towards the perimeter walls. Ignoring boundary effects and therefore adopting a worst case scenario it is estimated that total heave will be less than 30mm, which comprises immediate heave of circa 10mm and long-term heave of 20mm. Accordingly, the structural design of the slab will account for this heave.

7.3. Ground movement and damage impact assessment

7.3.1 Camden Planning Guidance – Basements, require that basement construction does not cause structural damage to neighbouring buildings. The risk of structural damage should be assessed using the Burland Scale and the classification must be no higher than Category 1 – very slight.

7.3.2 Ground movement analyses have been undertaken with the aid of computer software package XDisp Version 20.1 developed by OASYS. The software estimates the ground movements induced by basement excavation using the movement profile curves presented within CIRIA Report C760 or user specified movement profiles. The building damage is then assessed within the software against the damage criteria presented by Burland.

7.3.3 Construction of the basement will induce ground movements within the soil that have the potential to cause damage to neighbouring properties. Ground movement will occur due to the following activities:

- Construction of the underpins
- Excavation of the basement leading to inward yield
- Long term settlement of the soil due to the loads acting on the underpins

7.3.4 There is very limited published information on ground movements due to construction of underpins. However, assuming good construction practice and workmanship it is estimated that ground movement will be limited to 5mm of vertical movement and 5mm of horizontal movement per lift. It is further assumed that this will affect a zone extending 45° from the base of the underpin layer.

7.3.5 It is acknowledged that the excavation for the underpins will be undertaken through Head deposits, which are less competent than London Clay. The structural method statement has indicated that the excavation will be shored and propped throughout the excavation. accordingly, the movement curve indicated above is considered a reasonable upper bound of movement.

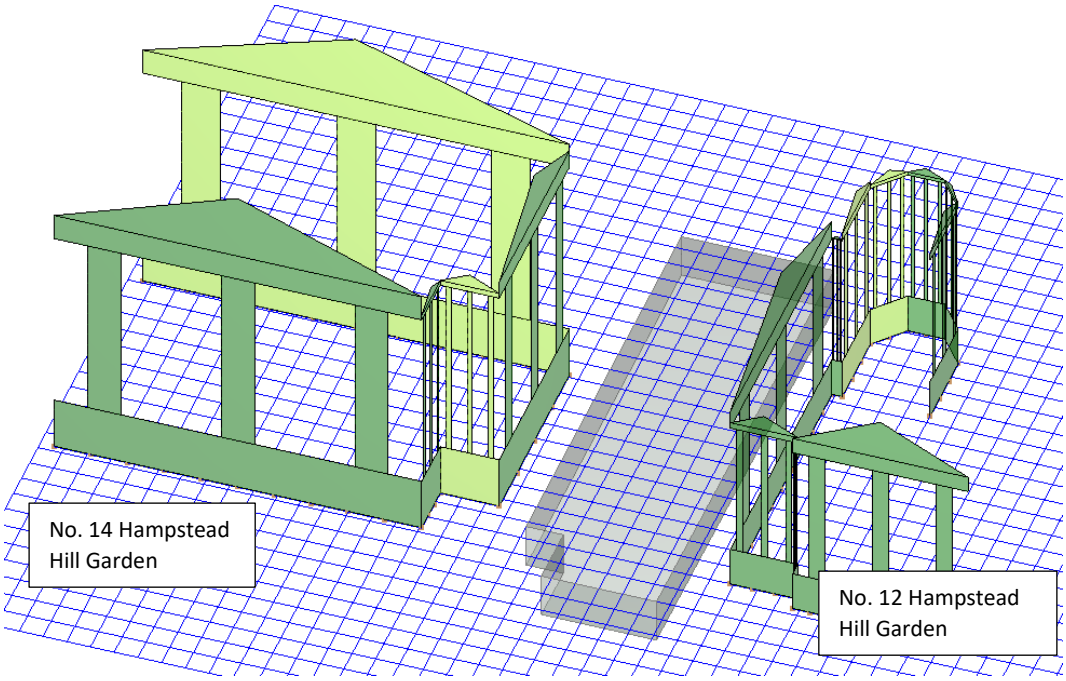
7.3.6 It is assumed that the underpins will be founded on the London Clay at a depth of circa 4.50m BGL. It is assumed that the existing lower ground floors for Nos. 12 and 14 Hampstead Hill Gardens are at 2.50m BGL. On this basis the ‘effective’ depth of the excavation that has the potential to induce ground movement is 2.00m.

7.3.7 Benefits due to corner stiffening effects have been ignored in the analyses; accordingly, full plane strain conditions have been assumed at the corners as well.

7.3.8 Following discussion with Campbell Reith on previous projects ground movement due to excavation of the basement has been estimated with the aid of computer software package PDisp Version 20.0 developed by OASYS. Pre-defined ground movement curves within XDisp have not been used as this would then result in double counting the effects of the excavation.

7.3.9 Long term settlement of the soil due to the loads on the underpins has also been estimated with the aid of PDisp. Settlement beneath the neighbouring properties (Nos. 12 and 14 Hampstead Hill Gardens) has been assessed. These calculated displacements have been imported into XDisp and combined with the estimated ground movements due to underpin construction to determine a worst-case assessment.

7.3.10 The results are illustrated below and presented in detail in Appendix E alongside the input data:



Extract from XDisp modelling with Burland Categories shown: Dark green (Category 0) and light green (Category 1)

7.3.11 The analysis indicates that damage will be limited to Burland Category 1. Nevertheless the excavation will be propped during excavation and the neighbouring properties monitored with appropriate trigger levels and control measures agreed prior to commencement of works.

7.4. Construction works controls

7.4.1 A detailed construction methodology, including appropriate control measures, has been developed by the structural engineer and is presented separately.

8 Basement Impact Assessment

8.1. Ground Stability

8.1.1 The basement will be founded on London Clay.

8.1.2 Ground movement analyses have been undertaken in accordance with CIRIA Report C760 with the aid of computer software package XDisp. Damage to surrounding structures has been assessed using the Burland scale and concluded that, with appropriate controls, the damage will be limited to Burland Category 1.

8.1.3 The site is generally flat. Ground levels fall to the east and therefore away from the proposed basement. Accordingly, the proposed works will not impact upon the current stability of the slope.

8.2. Hydrogeology and groundwater flooding

8.2.1 The proposed development will have negligible impact to the wider hydrogeological environment.

8.2.2 Groundwater monitoring indicates that perched groundwater is present within the depth of the basement at about 2.8m below ground level. It is anticipated that groundwater flow rates will be relatively minimal given the clayey nature of materials encountered. Accordingly, groundwater flows encountered during construction, if any, will be collected via a sump and suitably discharged.

8.3. Hydrology, surface water flooding and sewer flooding

8.3.1 The proposed development will have negligible impact to the wider hydrological environment.

8.3.2 The proposed development will not increase the likelihood of surface water or sewer flooding.

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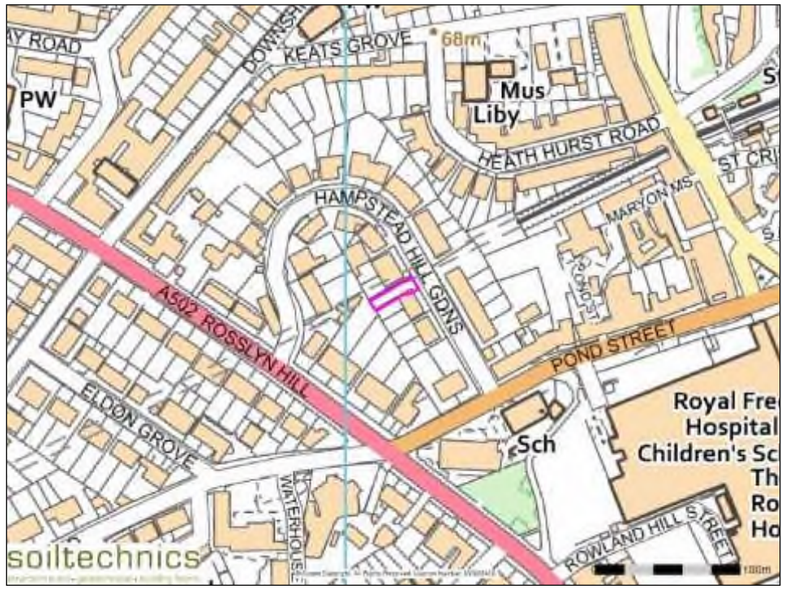
Neighbourhood extract from Ordnance Survey map

Town extract from Ordnance Survey map



Detail extract from Ordnance Survey map

Title	Scale	Drawing number
Site location plan	Not to scale	01

Revision: A

Created: December 2020

Key

WS	Approximate location of proposed borehole formed by Dynamic Sampling techniques
HP	Approximate location of hand pit excavation
P	Approximate location and orientation of photographic record
	Approximate site boundary

Notes

Base drawing from topographical survey undertaken by Warner Surveys

REV	DESCRIPTION	PRODUCED BY	CHECKED BY	REVIEWED BY	DATE
A	First issue	AM	SC	ID	14.12.2020

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PROJECT
14a Hampstead Hill Gardens, London

TITLE
Plan showing existing site features and approximate location of exploratory points

PROJECT NO.	SCALE AT A3	DRAWING NO.
STS5065	1:125	02

Curriculam Vitae
Angus Wilson CEng MICE
UK RoGEP – Professional

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Qualifications

- Chartered Civil Engineer – Member of the Institution of Civil Engineers (2014)
- UK Registered Ground Engineering Professional (2014)
- National Grid G17 Civil Systems Approver – Geotechnics (2015)

Career History

Soiltechnics
(2018 – Present)

Position of Associate Technical Director with the following primary responsibilities:

- Provide technical direction to engineers throughout the life cycle of a project.
- Oversee engineers in the design and execution of ground investigations including scheduling of laboratory testing and subsequent derivation of ground model with geotechnical parameters.
- Supervise engineers undertaking calculations for a range of geotechnical problems including earth retaining structures, ground movement analyses and foundation assessments.
- Design and prepare specifications for earthworks control.
- Providing the role of Designer's Geotechnical Advisor in accordance with CD 622 Managing Geotechnical Risk.
- Preparing tenders for a range of Clients.
- Write and review Basement Impact Assessments, for submission as part of planning applications.

Jacobs
(2009 – 2018)

Position of graduate geotechnical engineer through to Principal Geotechnical Engineer held at Jacobs, Birmingham (UK). Attained competence and experience in the following areas:

- Deriving complex ground models combining topographical mapping, geological mapping and ground investigation data.
- Undertaking concept engineering through to detailed design for a number of geotechnical problems including slope stability, earthworks, foundation design, earth retaining structures and seepage related analyses.
- Designing and supervising ground investigations, scheduling laboratory testing and deriving geotechnical design parameters.
- Writing desk study reports, geotechnical interpretative and geotechnical design reports in accordance with Eurocode 7 and HD22/08 – Managing Geotechnical Risk.
- Contract management including tender submissions, producing fee estimates, programme of works, managing budgets and raising early warnings and compensation events.
- Acting as Client's representative to validate earthworks and other construction elements.
- Producing and maintaining geotechnical risk registers.
- Making presentations to technical and non-technical audiences.
- Management of incidents on site; including liaison with statutory bodies and the public.
- Discharging the duties of a Designer in accordance with CDM (2015) Regulations.

Curriculam Vitae
Angus Wilson CEng MICE
UK RoGEP – Professional

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environmental ▪ geotechnical ▪ building fabric

Project Experience (Key Roles)	
A47 Highway Improvements	This project comprised the dualling of the A47 highway immediately west of Norwich and the realignment of a roundabout south west of Wisbech. As the GI Contractor's project manager Angus was responsible for the delivery of the ground investigation. Drawing upon his experiences as a designer Angus was able to advise the Client and designer the best ways of obtaining the GI data required for the design balancing cost, safety and geotechnical risk.
A46 Trenchless Crossing	The project comprises the installation of a new drainage pipe beneath the dual carriageway. Angus is the Designer's Geotechnical Advisor responsible for managing the geotechnical risks throughout the project and liaising with the Overseeing Organisation's Geotechnical Advisor and wider project team.
HS2 Gas Pipeline Diversions	Angus was the geotechnical project manager and, leading a team of engineers across three offices, he was responsible for the delivery of geotechnical design elements for each of the 23 diversions. The project faced a variety of ground conditions, environmental constraints and engineering challenges including trenchless crossing beneath watercourses, railways and highways. Angus provided technical consistency across the project incorporating lessons learned from other diversions where possible. Angus led the project from Desk Study phase through to ground investigation, interpretation and preparation of geotechnical design reports in accordance with National Grid Specification CE/2. He advised the Client throughout the commission with respect to geotechnical issues and frequently offered cost effective ways of optimising the design to improve buildability and safety.
Jackfield Stabilisation	Angus was the lead Geotechnical Engineer for the stabilisation of a 1 million m^3 shallow translational landslide within a UNESCO World Heritage Site. He was responsible for reviewing geotechnical data, determining the failure mechanism, optioneering at outline design and supervising a team of graduate engineers during detailed design. Furthermore, he provided site supervision and validation of the design throughout the construction stage and reviewing Contractor's remediation proposals to address defects. Angus led a collaborative work effort with the Contractor's temporary works designer to ensure sufficient knowledge transfer between geotechnical specialists and ensuring safe working methods were proposed within an active landslide environment.
Netherton Tunnel Remediation	This scheme involved the remediation of a 3km masonry lined canal tunnel. He was the Project Engineer responsible for reviewing of 150 years' worth of data before forensically engineering the tunnel to determine the failure mechanism. He led a survey team to establish construction joints within the tunnel and undertook outline design of remediation measures.
Publications	
	Wilson, A. K. & Ashton, J., 2012. An engineering geological model of the Conwy Valley, east of Dolgarrog, In, Nichol, D. & Bassett, M.G. (Eds), Urban Geology in Wales: 4. National Museum of Wales Geological Series No. 27, Cardiff, 2015

Chord Environmental Ltd

Angus Wilson
Soiltechnics Ltd
Cedar Barn
White Lodge
Walgrave
Northampton
NN6 9PY

Your Ref: 14A Hampstead Hill Gardens
Our Ref: 1127/LJE151220

For the attention of: Angus Wilson

15th December 2020

Proposed Basement at 14A Hampstead Hill Gardens, London, NW3 2PL: BIA Review

Dear Angus,

Further to your instruction to proceed on behalf your client (Price and Myers on behalf of Mr Alon Mekel) I have undertaken a review of the Basement Impact Assessment (BIA) prepared by Soiltechnics Ltd for the proposed basement development at 14A Hampstead Hill Gardens, London NW3 2PL.

I have reviewed the design of the proposed basement development, together with the information presented within the above documents, against the requirements of the Camden BIA guidance set out within Policy A5 (Basements) of the Camden Local Plan (2017), Camden Planning Guidance on basements (adopted March 2018) and the Camden geological, hydrogeological and hydrological study report 'Guidance for subterranean development ', produced by Arup (2011) on behalf of the London Borough of Camden.

Chord Environmental Ltd specialise in the provision of hydrogeological services with extensive experience in the UK supporting both private and public sector clients. I am a geologist and hydrogeologist and have a BSc. in geology from the University of Bristol, a MSc. in hydrogeology from the University of East Anglia and am also a Chartered Geologist and fellow of the Geological Society. I am Managing Director at Chord Environmental and was previously a Technical Director with Paulex Environmental Consulting and managed Hyder Consulting (UK) Ltd's groundwater team.

I have been a hydrogeologist for over 20 years. During that time I have advised on over 150 basement developments. Much of my career has been spent assessing the impact of development on the quality and quantity of groundwater resources. I have worked for both promoters and regulators of schemes and have acted as an expert witness for the Highways Agency and on BIA schemes.

Development proposal

The site is currently occupied by two single garages located between a four storey and three storey residential property. The site is located on the side of a hill at an elevation of 72 m above Ordnance Datum (OD) with the ground falling away to the east at a gradient of 1:15.

The surrounding area is dominated by residential properties of masonry construction, many of which have a basement or lower ground floor. Hampstead Hill Tunnel which carries the North London Line runs directly beneath the site at a depth of 14m.

The proposed project comprises the demolition of the existing garages followed by construction of a three storey property with a single level basement.

Environmental Site Setting

The BIA screening assessment has identified 14A Hampstead Hill Gardens to be underlain by the Eocene London Clay as shown on the British Geological Survey 1:50,000 scale map (Sheet 256 – North London) to a depth of c.80m. The London Clay is classified as Unproductive Strata by the Environment Agency, strata with low permeability that have negligible significance for water supply or base flow to rivers. The very low permeability of the London Clay results in very low rates of rainfall infiltration and correspondingly, very high rates of rainfall runoff. The London Clay, together with the clays of the Eocene Lambeth Group, acts as an effectively impermeable confining layer over the Chalk which lies at a depth of over 100m beneath the site.

The closest surface water feature, based on the Ordnance Survey 1:25,000 scale map, is the southern-most Hampstead Pond which lies approximately 350m to the north east of the site. Figure 11 of the "Camden Geological, Hydrogeological and Hydrological Study", shows 14A Hampstead Hill Gardens to lie between the former headwaters of the rivers Fleet and Tyburn which ran over 300m to the north east and 450m south west of the proposed development respectively. The Tyburn and Fleet are now culverted and discharge to the Thames.

The proposed 14A Hampstead Hill Gardens development does not lie within an area of fluvial or tidal flood risk as designated by the Environment Agency and was not identified as being on one of the roads affected by the surface water flooding events of the area which occurred during 1975 and 2002 (Figure 15 of the Arup report 2010).

Screening assessments have been undertaken to satisfy Stage 1 of Camden Planning Guidance – Basements

Subterranean (Groundwater) Flow Screening Assessment

I have commented on the answer to each question below.

- **Question 1a: Is the site located directly above an aquifer?**

  As the Site is mapped as being underlain by a significant thickness of London Clay, designated as Unproductive Strata by the Environment Agency, I agree it is not located above an aquifer and the hydrogeology of the area is well understood.

- **Question 1b: Will the proposed basement extend beneath the water table surface?**

  No. The hydraulic properties of the very low permeability and cohesive London Clay do not allow it to support a water table and transmit groundwater in any significant quantities under normal hydraulic gradients.

- **Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?**

  No mapped surface water features are present within 100m of the site and the London Clay is not capable of providing groundwater baseflow to watercourses. The proposed basement would therefore not act to prevent groundwater flow to any watercourses, wells or spring lines.

- **Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?**

  The Site is located more than 300m south west, and down topographic gradient, of the Hampstead Heath ponds and therefore lies outside their hydrological catchment area (refer to Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study).

- **Question 4: Will the proposed development result in a change in the proportion of hard surfaced / paved area?**

  No. The basement would lie beneath the existing garage footprints and existing paved areas.

- **Question 5: As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to ground (e.g. via soakaways and/or SUDS)?**

  No. There will be negligible change to the existing drainage arrangement.

- **Question 6: Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?**

  No - there are no mapped local groundwater dependent ponds or spring lines present within 100m of the Site. This is consistent with the geology and hydrogeology of the area.

Slope Stability Assessment

The BIA screening, scoping and risk assessments have followed the Camden Planning Guidance - Basements criteria and screening questions. The potential ground movement issues raised by the screening and scoping exercises have been appropriately addressed by Angus Wilson (C.Eng) of Soiltechnics Ltd within the BIA report and no areas of concern relating to the proposed development were identified.

Surface Flow and Flooding Assessment

The BIA screening, scoping and risk assessments have followed the Camden Planning Guidance - Basements criteria and screening questions. No potential surface flow or flooding issues were raised by the screening and scoping exercise and no areas of concern relating to the proposed development were identified.

Conclusions

The BIA report has appropriately characterised 14A Hampstead Hill Gardens with respect to its geological and groundwater site setting. As the site is underlain by low permeability London Clay, the geological and hydrogeological setting of 14A Hampstead Hill Gardens is not sensitive with respect to groundwater resources or flow. Isolated pockets of groundwater may be encountered during excavation and some form of groundwater control may be required (e.g. sump pumping) however significant inflows of groundwater are not anticipated.

The purpose of the Basement Impact subterranean or groundwater flow assessment is to identify the potential for the proposed basement development to cause groundwater impacts and subsequently identify areas which require further investigation. The proposed development would be constructed within a significant thickness of London Clay and no potential adverse groundwater impacts have been established by these assessments.

Yours sincerely,

THE GEOLOGICAL SOCIETY
CGeol
CHARTERED GEOLOGIST
Fellow No. 1012979

John Evans BSc MSc CGeol.
Director

PRICE & MYERS

14A Hampstead Hill Gardens London

Construction Method Statement

Prepared by: **Peter Dash BEng CEng MIStructE**
Job Number: **28806**

Date	Revision	Notes/Amendments/Issue Purpose
March 2021	3	For Planning
June 2023	4	For Planning
June 2024	5	For Planning
September 2024	6	For Planning

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Contents

1 Introduction

This report has been prepared in support of the Planning application for a new house at 14A Hampstead Hill Gardens. This report should be read in conjunction with the full ground investigation (ref STS5065 – G01) and Basement Impact Assessment (ref STS5065 – BIA) produced by Soiltechnics. The proposals involve the demolition of two small free-standing garages and the construction of a new three storey house with a basement level. The new house will be modest in scale and is also freestanding.

Figure 1: Site photo

Figure 2: Proposed front elevation

2 The Site

The Basement Impact Assessment by Soiltecnics contains a full desktop study and description of the site and its history but, in brief, the site is currently occupied by two prefabricated garage structures which will be dismantled and removed as part of the proposals. Historic maps indicate the existing house at 14 Hampstead Hill Gardens was built around the late 1800s, with the garages added around 1940.

Figure 3: OS Six Inch, 1888-1913

Figure 4: OS 25 Inch, 1892-1914

The British Geological Survey maps show that the site is expected to be underlain by the London Clay Formation, close to the border with the Claygate Beds in an area of 'Head propensity', suggesting the potential presence of unmapped superficial deposits.

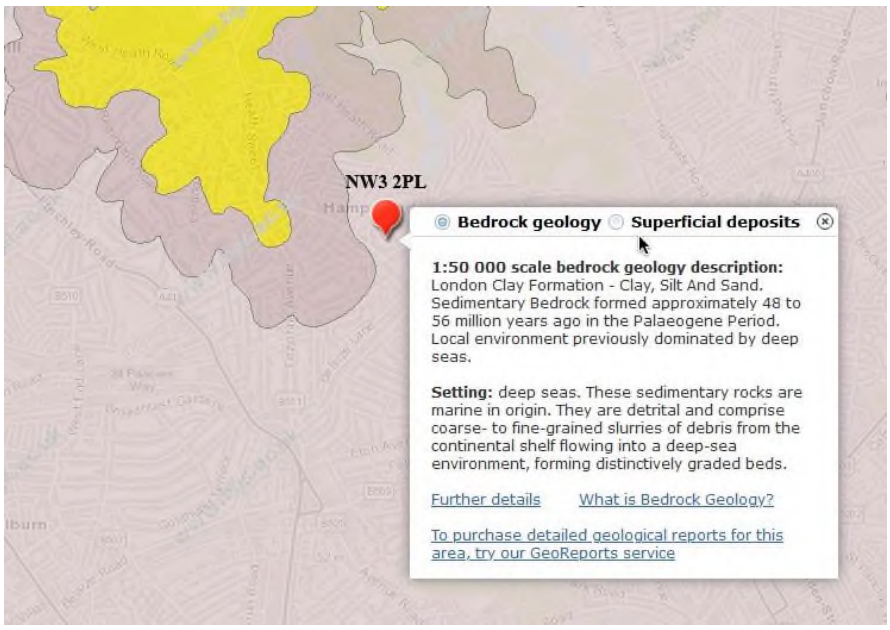

Figure 5: Extract from 1: 50,000 British Geological Survey map

In brief the ground conditions discovered on site were:

- Made ground to 0.5-0.88m depth, over
- Head deposits of variable strength and typically comprising low strength clays to around 4.2m depth, over
- London Clay formation

The Head deposits discovered are inherently variable in nature and so the site investigation recommends that foundations are founded in the London clay formation which is what the sequence drawings indicate.

Groundwater

Groundwater was encountered at 3m below ground level in one borehole but not encountered in the other two. Subsequent monitoring recorded groundwater at 2.34m and 3.20m below ground level in two of the boreholes. It is interpreted that this is perched groundwater and that flow rates will be relatively minor given the predominantly clayey nature of the soil.

3 Railway Tunnel

The site sits around 14m above the Hampstead heath tunnel, which was built in 1859 and is one of the oldest tunnels within the Anglia region.

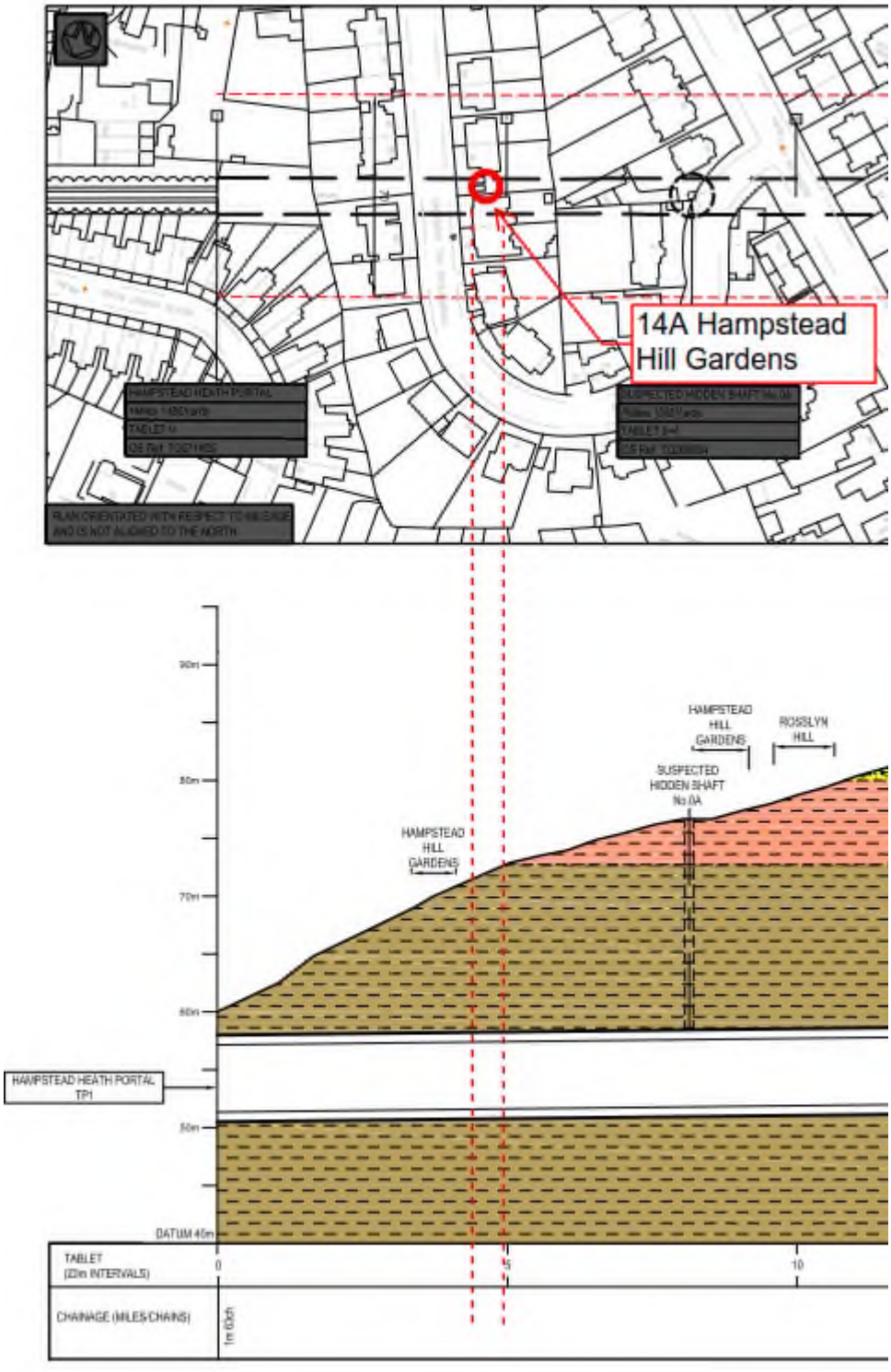

Figure 6: Extract from Network Rail drawing J1343/Hampstead Heath/01

We have been in contact with Network Rail and a Basic Asset Protection Agreement has been signed to allow the site investigation to be undertaken safely. We have held a number of meetings with the various stakeholders at Network Rail and they are aware of the nature and extent of the proposals.

Detailed geotechnical analysis of the scheme to determine the strains on the tunnel structure during the construction process, and in the final permanent state, as well as surveying and monitoring before and during the works will be required. Network Rail have agreed that this work should be carried out during the next, detailed design, phases of the project if planning approval is granted.

4 Proposed Construction Methodology

See Appendix A for sketches showing the proposed construction sequence for the new basement. Care has been taken to ensure that the new retaining walls are fully propped at all times in both the temporary and permanent cases to ensure that any potential movements are minimised.

Substructure

The basement structures will be formed in an underpinning construction method with reinforced concrete basement and ground floor slab to form a stiff concrete box. The retaining wall underpins will be over-dug so that they bear within the London clay formation and the basement designed to span between the new foundations. This method has been chosen to avoid any piling due to the relatively shallow depth of the Network Rail tunnel.

Figure 7: New basement in relation to neighbouring foundation levels

In the permanent case two forms of waterproofing will be used. These will be a drained cavity and crystalline slurry coating such as MacLennan Crystalcoat, which together will form a Grade 3 waterproofing system.

The sketches in Appendix A show the proposed sequence, however in brief the proposed methodology is:

1. Form retaining wall in an underpinning sequence, ensuring that pins are kept fully shored at all times to minimise any ground movements.
2. Prop top of retaining wall.
3. Excavate and prop wall above basement slab level.
4. Pour basement slab.
5. Pour ground floor slab.

This sequence ensures the basement walls are propped at all stages and minimises any risk of ground movements that might affect neighbouring structures.

Underpinning and ground movements

The underpinning will be carried out in such a way as to minimise any ground movements. All underpins will be fully propped internally using trench sheets for shoring which are propped with scaffold and screw jacks ensuring safe and stable excavation conditions. If any groundwater or poor earth conditions are encountered, then closed board shoring will be used.

Groundwater

The site investigation has shown that any groundwater flows will be localised and minor and can be easily pumped out if encountered with a submersible pump. Given the nature of the soil and minimal flows of groundwater this will not have any adverse effects on neighbouring structures.

Superstructure

The superstructure design will be simple traditional construction of loadbearing masonry with timber joists and isolated steel beams where required.

Damage Classification

Ground movement analyses have been undertaken by Soiltechnics to assess the impact on the adjoining properties from the proposed works. Those analyses demonstrate that with appropriate controls (which will be enforced), the potential damage to adjoining properties can be limited to Burland Category 1, very slight, in accordance with planning guidance.

5 Design Criteria

Codes and Standards

The works will be designed in accordance with the relevant British Standards and Eurocodes with appropriate National Annexes.

Design Life

Category 4 to BS EN 1990 – Building structures and other common structures: 50 years.

Loadings

Area	Imposed Load (kN/m²)
Floors	2.5
Roofs	0.75
Retaining - surcharge	10

Disproportionate Collapse

Class 1 to Building Regulations Part A3 - no special measures required.

Calculations

Conservative geotechnical parameters for soil density, cohesion and an accidental scenario of retained water level will be adopted for the design. Heave of the clays will also be considered.

Appendix A
Construction Sequence Sketches

PRICE & MYERS

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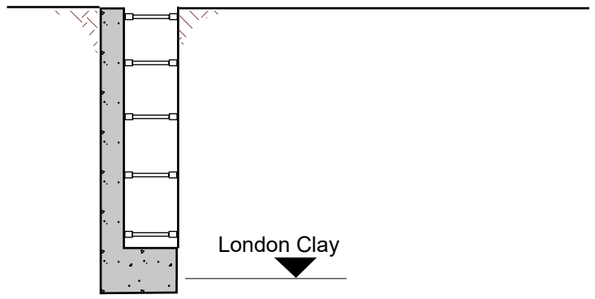
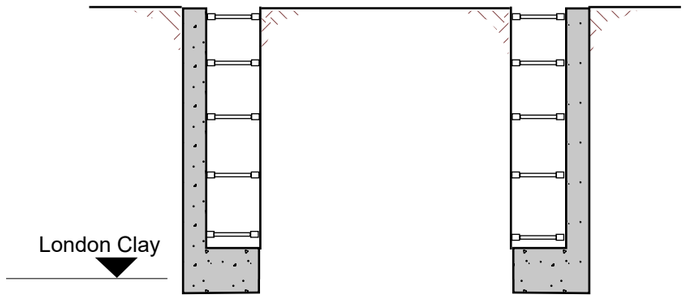
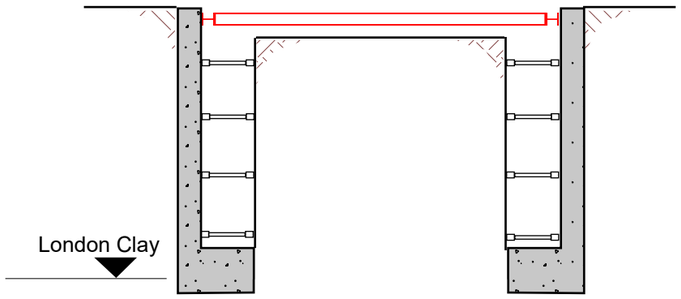


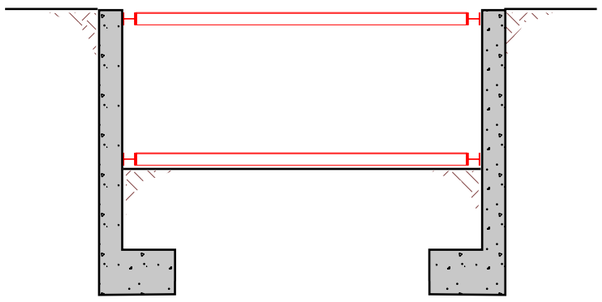
1
Form retaining wall in underpinning sequence.
Ensure excavations are fully shored at all times.



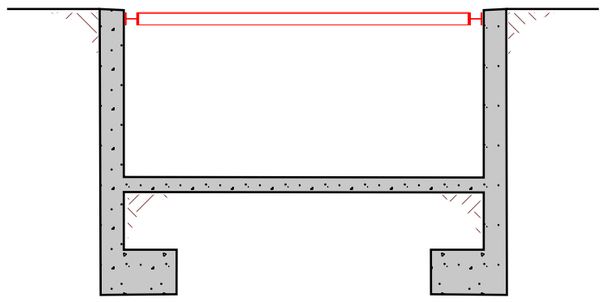
2
Complete retaining wall in underpinning sequence. Ensure excavations are fully shored at all times.



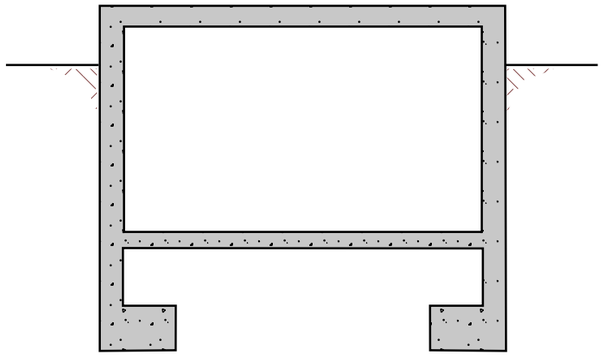
3
Prop top of walls all around



4
Excavate to above basement slab level and prop walls



5
Pour basement slab and remove base prop once slab has reached required strength



6
Pour ground floor slab and remove top prop once slab has reached required strength

Indicative Basement Construction Sequence

(~ 1:100 @ A3)

Indicative only, not for construction.
Construction sequence must ensure that wall is continuously propped at top and base by either temporary or permanent works.

Appendix B
Structural Sketches

PRICE & MYERS

Job No	28806	Page	SK001	Rev	2
Date	Sep 2024	Eng	PD	Chd	
Job	14 Hampstead Hill Gardens				

General Notes

GENERAL

Price & Myers' drawings are to be read in conjunction with all relevant Architect's, Engineer's and Specialists' drawings and specifications.

Do not scale from any Price & Myers' drawing. All dimensions are in millimetres and levels in metres.

All waterproofing, DPC and DPMs are to Architect's details. Any damp proof membranes shown on our drawings are indicative of their position within the construction only.

The extent of demolition work, fire protection to steelwork, floor separation details and acoustic isolation are to Architect's details.

SUBMISSION AND CHECKING

The Structural Engineer requires either an electronic copy or two paper copies of all drawings and calculations for temporary work, steel fabrication and sub-contractor design elements. These are to be issued allowing ten working days after receipt of drawings for preparation of comments by the Structural Engineer.

TEMPORARY WORKS

Temporary works design should comply with the requirements of BS 5975. Confirm details of the Designated Individual at Tender; and the project Temporary Works Co-ordinator at least fifteen working days before starting any temporary works on site.

The Contractor is responsible for the design, installation and maintenance of all necessary temporary works to ensure the strength and stability of the building throughout the course of the works. The Contractor is to produce a Temporary Works Register and issue this, updated as required, with Method Statements, the proposed sequence of works and temporary works details for comment by the Structural Engineer before starting any section of temporary works.

When installing beams into an opening wider than 3m in an existing structure, allow for the use of folding wedges, or other means to pre-deflect the beam to give a mid- span deflection of span/400 before transferring load from temporary works into the beam.

FOUNDATIONS

Foundation sizes and depths are based on an allowable safe ground bearing pressure of 95 kN/m² in accordance with Soiltechnics report ref: STS5065. All foundation details are subject to approval by the Building Inspector. The Structural Engineer and Building Inspector shall be given the opportunity of examining all excavations, filling and hardcore before they are concreted or covered up.

CONCRETE

Strip footings and trench fill, blinding	GEN1	CIIIA or CIIB-V
Mass concrete for superstructure	GEN3	
Reinforced concrete - above ground	RC28/35	
Foundation concrete - reinforced	FND2	CIIIB or CIIB-V

Ground bearing floor slabs to be 100 thick RC28/35 with 1 layer of A142 mesh in the top with 25 cover.

Concrete finishes to BS EN 13670 Table F.4:

- All formed surfaces are to be ordinary finish

Tops of ground beams and floor slabs are to be uniformly levelled and tamped to give a basic unformed finish.

STEEL

All general steel sections and plate are to be grade S275. Hollow sections are to be grade S355.

The Contractor is to produce dimensioned fabrication drawings.

All bolted connections are to use grade 8.8 bolts with a minimum of two M16 bolts per member unless specifically indicated otherwise on details.

All welds are to be minimum 6mm leg length continuous fillet welds unless specifically noted otherwise.

All internal steelwork is to be blast cleaned to Sa 2.5 and painted with zinc phosphate primer - Sherwin-Williams' Macropoxy 400 or equal approved.

- For steelwork in dry internal spaces: 75 microns dry film thickness (dft)
- For steelwork in cavities: 250 microns dft.

All external steelwork is to be galvanised and painted to specification.

All steel work below ground, including bolts and baseplates is to be encased in concrete with minimum 50 cover.

MASONRY

Minimum characteristic strength is to be:

- 20N/mm² for all load bearing brickwork.
- 7N/mm² for all load bearing blockwork.

All lintels to have minimum 150 bearing at supports.

Sulfate-resisting cement is to be used below DPC level.

Pockets in party walls for padstones etc. are to be formed by carefully removing stretchers and snapping off headers where required.

MORTAR

Mortar Class / Traditional Mortar Mix Designation	Mortar Mix by Volume Cement: Lime: Sand			Min Compressive Strengths N/mm²	
				7 days	28 days
M 12 Type (i)	1	0 - ¼	3	7.25	11
M 4 Type (iii)	1	1	5 - 6	1.85	2.75

TIMBER

All timber members are to be grade C16 unless noted otherwise. All timbers except upper floor joists are to be pressure-impregnated with preservative and cut ends brush treated.

Joists marked DJ are to be doubled joists bolted together using M10 black bolts at 600 centres.

All bolts into timber are to have 50 square x 3 thick mild steel washers below nut.

Solid blocking or herringbone strutting is to be provided between all timber joists or rafters as follows:

- 2.5m to 4.5m span: midspan and at each end support

Spans longer than 4.5m: two rows equally spaced in span and at end supports. Outer joists or rafters to be blocked solidly to perimeter walls.

Wall plates for roofs are to be tied down using 1200 long 30 x 2.5 galvanized mild steel straps at 1200 centres with a 100 bob end. Straps are to be nailed to the top plate and plugged and screwed to the internal face of the wall. Refer to typical details.

Lateral restraint straps for floors are to be minimum 900 long 30 x 5 galvanized mild steel straps at 1200 centres with 150 a bob end. Straps perpendicular to joists are to be nailed to tops of three joists + solid blocking infill using 5, 75 long, 3.8Ø nails. Straps parallel to joists are to be let-in to the top of the joists and nailed in place using 6, 50 long, 3.4Ø nails. Refer to typical details.

All new timber partitions are to be built off double joists or solid timber blocking between floor joists.

Structural timber members may only be drilled or cut for services as follows unless specified otherwise on the Engineer's drawings:

- Single notches, either top or bottom; maximum 0.125 x joist depth and no longer than twice the joist width, located between 0.125 and 0.25 x the span from the supports.
- Holes; maximum diameter 0.25 x joist depth, located between 0.25 and 0.4x the span from the supports. Hole spacing is to be a minimum of 3 hole diameters.

BELOW GROUND DRAINAGE

MANHOLES & INSPECTION CHAMBERS

Concrete manholes / inspection chambers by Milton Precast, or similar approved.
Polypropylene inspection chambers by Wavin, or similar approved.

PIPES

Pipes to be vitrified clay. 100 diameter unless noted otherwise. Maximum rocker pipe length 600.

Initial below ground nominal 100 diameter foul and surface water lateral/branch pipes shall be laid no flatter than 1:40 and 1:60 respectively unless noted otherwise. Where necessary, to avoid clashes, lateral connections may be laid to nominal falls and ramp at 45 degrees to manhole invert or pipe junction.

All pipes with cover more than 600 are to be laid in class 'S' surround in external areas; for cover less than 600 pipes are to be laid in class 'Z' surround. If pipework is below a reinforced concrete slab use Class Y or W surround.
All pipes under foundations are to be laid Class Z surround.

Selected fill for backfilling shall consist of uniform readily compactible as-dug material, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve.

Where branch pipes are to connect directly onto a main run provide above ground rodding access at head of branch run and:

- When connecting 100 or 150 diameter branches to a main run of 300 diameter or larger use a preformed saddle fitting.
- Otherwise connections shall be made with a preformed oblique junction swept in the direction of flow.

All bends in pipework shall be long radius.
All gullies are to be trapped and roddable.

DISUSED PIPES

Confirm pipework is no longer in use before abandoning / demolishing. All pipework within building envelope to be:

- Demolished; should be removed and replaced with well compacted clean fill material.
- Abandoned; should be grouted up with concrete at both ends.

CONSTRUCTION

The Contractor is to make the Section 106 application to the Water Authority for a new connection to a public sewer and is to receive consent before making the connection.

The Contractor shall allow for the temporary and permanent support and diversion works as necessary to all existing services to the satisfaction of the Public Utilities. The Contractor shall establish the location, size and depth of all existing drains/sewers and services before the start of works on site.

All connections to existing drainage are to be confirmed on receipt of condition survey.

SETTING OUT

All levels and dimensions shall be checked on site before the start of any works.

All cover levels, FWP / RWP and gully locations are shown as indicative only. The Architect is to confirm all locations, cover levels and termination positions of vent pipes.

Landscape layout and finished levels to be confirmed by Architects. The Contractor is to co-ordinate manhole positions and levels with landscape drawing requirements in hard landscaped areas to tie-in with the finishes proposed, i.e. block paviours & paving. Manhole covers shall be set to same level and fall as adjacent ground.

Setting out dimensions given for the centre of cover opening are "guide" positions. Positions of inspection chambers may require manual adjustment on site due to confinement and congestion of pipe runs.

The Contractor is to position cover slabs / manhole openings to allow access over benching from the bottom of ladder or steps.

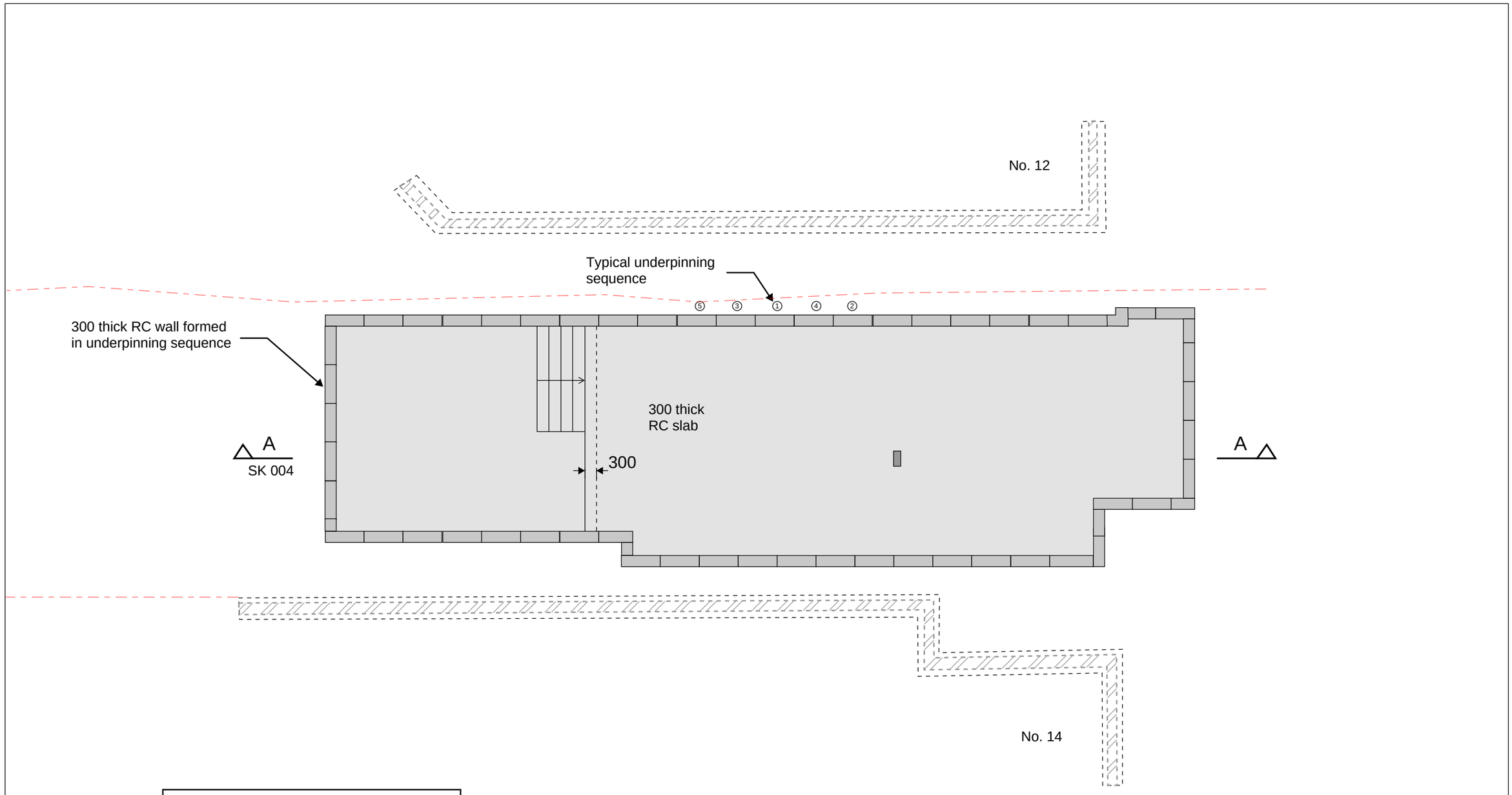
Manhole to manhole runs should be kept straight and not be extended in length without approval of the Engineer.

COMPLETION

The Contractor should carry out a drainage CCTV survey after completion of private pipework to demonstrate that the constructed drainage is in accordance with the design.

PRICE & MYERS

Job No.	28806	Page	SK 002	Rev	1
Date	June 2024	Eng	PD	Chd	
Job	14 Hampstead Hill Gardens				



Retaining walls to be fully propped at all times until permanent basement structure is complete

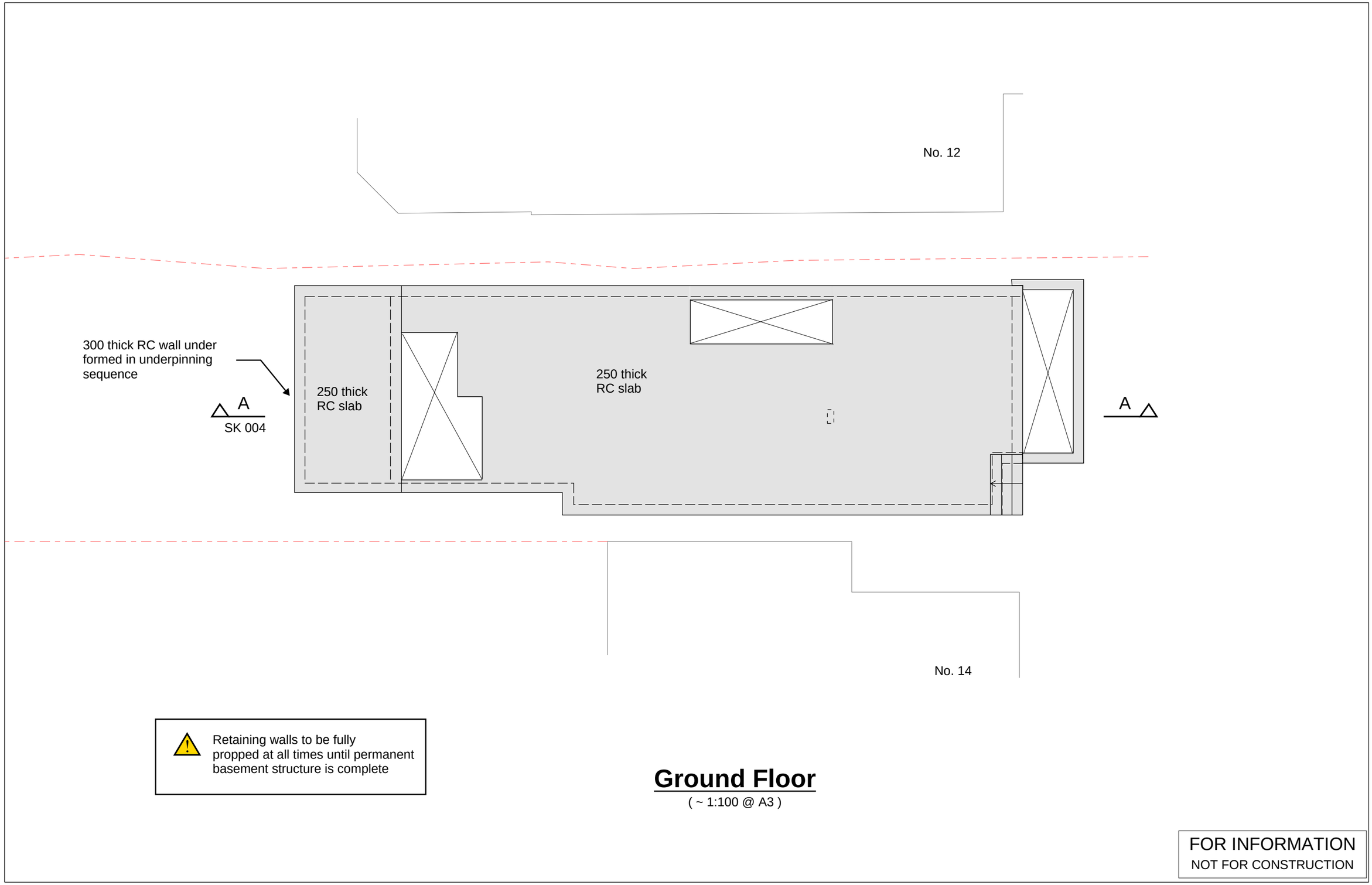
Basement

(~ 1:100 @ A3)

FOR INFORMATION
NOT FOR CONSTRUCTION

PRICE & MYERS

Job No.	28806	Page	SK 003	Rev	1
Date	June 2024	Eng	PD	Chd	
Job	14 Hampstead Hill Gardens				



Retaining walls to be fully propped at all times until permanent basement structure is complete

Ground Floor

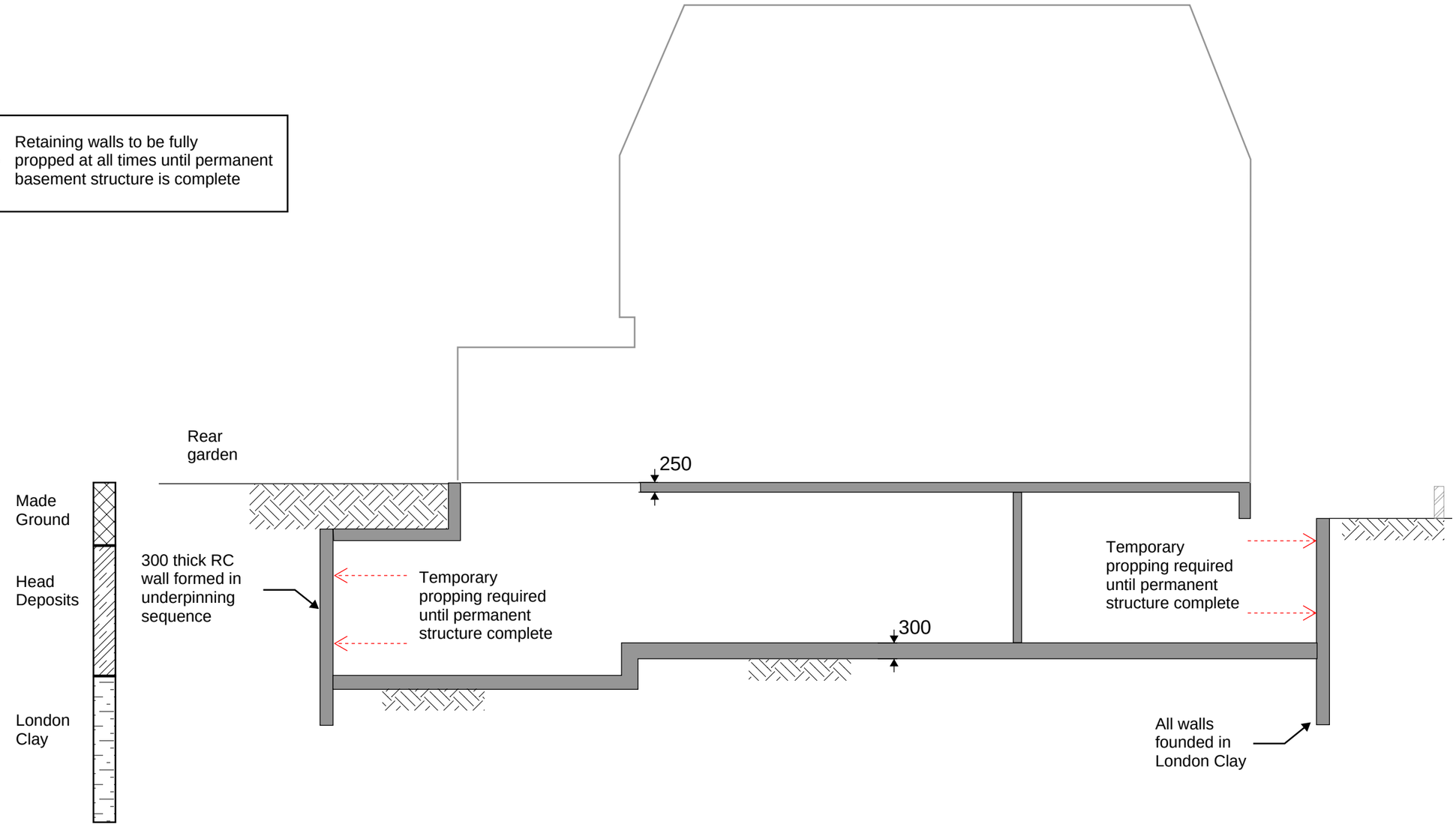
(~ 1:100 @ A3)

FOR INFORMATION
NOT FOR CONSTRUCTION

PRICE & MYERS

Job No.	28806	Page	SK 004	Rev	1
Date	June 2024	Eng	PD	Chd	
Job	14 Hampstead Hill Gardens				

⚠ Retaining walls to be fully propped at all times until permanent basement structure is complete



SECTION A-A

SCALE: ~1:100

FOR INFORMATION
NOT FOR CONSTRUCTION

Asset location search

Property Searches

Soiltechnics Limited
Cedar Barn
White Lodge
WALGRAVE
NN6 9PY

Search address supplied NW3 2PL

Your reference STS5065

Our reference ALS/ALS Standard/2020_4185339

Search date 29 April 2020

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Asset location search

Property Searches

Search address supplied: NW3 2PL

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

Asset location search

Property Searches

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

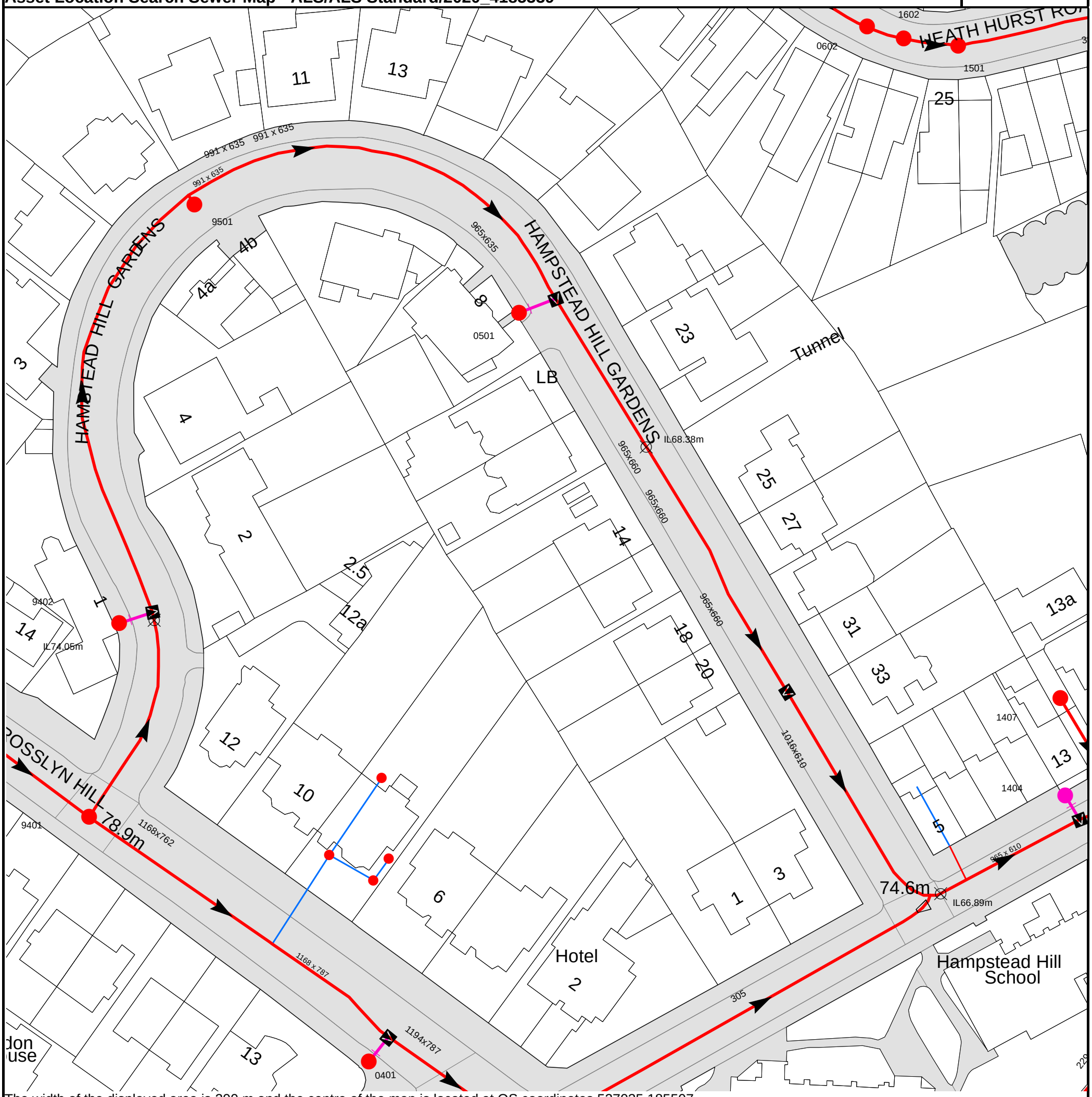
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4185339



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 527035,185507

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1404	n/a	n/a
1407	70.52	68.66
1501	68.17	64.89
0501	n/a	n/a
9501	75.45	n/a
1602	68.74	65.26
0602	69.01	65.28
0401	n/a	n/a
041C	n/a	n/a
041B	n/a	n/a
941A	n/a	n/a
9401	78.9	74.93
041A	n/a	n/a
9402	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

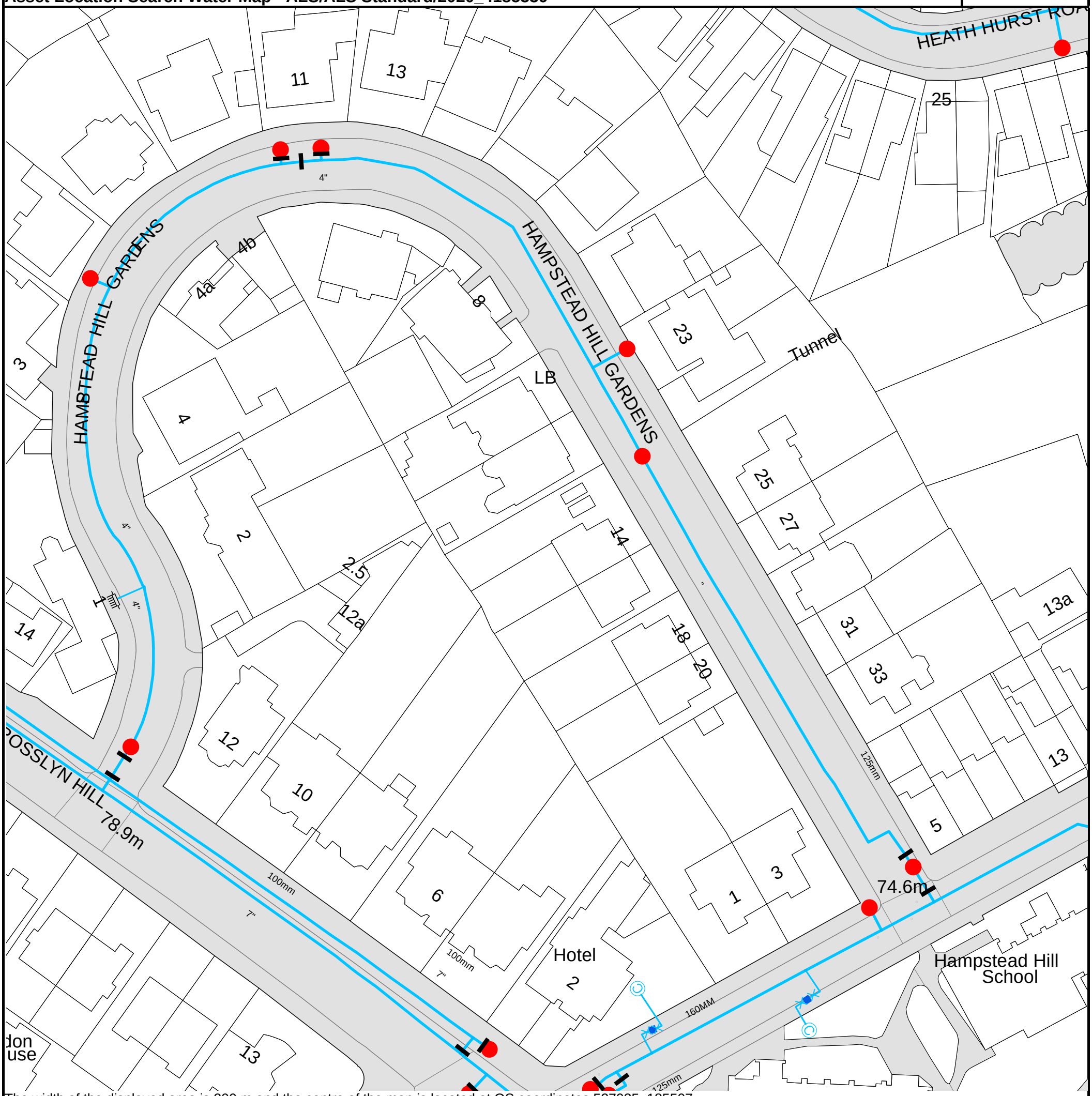
Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2020_4185339



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 527035, 185507.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Enquiry Confirmation

LSBUD Ref: 18271576

Date of enquiry: 29/04/2020
Time of enquiry: 13:19

Enquirer

Name	Miss Alexa Band	Phone	01604 781877
Company	Soiltechnics	Mobile	Not Supplied
Address	Cedar Barn White Lodge Walgrave Northamptonshire NN6 9PY		
Email	Alexa.Band@soiltechnics.net		

Enquiry Details

Scheme/Reference	STS5065		
Enquiry type	Initial Enquiry	Work category	Development Projects
Start date	30/04/2020	Work type	Commercial/industrial
End date	30/04/2020	Site size	50 metres diameter
Searched location	XY= 527040, 185515	Work type buffer*	25 metres
Confirmed location	527040 185515		
Site Contact Name	Not Supplied	Site Phone No	Not Supplied
Description of Works	Not Supplied		

* The WORK TYPE BUFFER is a distance added to your search area based on the Work type you have chosen.

Site Map

Enquiry Confirmation

LSBUD Ref: 18271576

Date of enquiry: 29/04/2020
Time of enquiry: 13:19

Asset Owners

Terms and Conditions. Please note that this enquiry is subject always to our standard terms and conditions available at www.linesearchbeforeudig.co.uk ("Terms of Use") and the disclaimer at the end of this document. Please note that in the event of any conflict or ambiguity between the terms of this Enquiry Confirmation and the Terms of Use, the Terms of Use shall take precedence.

Notes. Please ensure your contact details are correct and up to date on the system in case the LSBUD Members need to contact you.

Validity and search criteria. The results of this enquiry are based on the confirmed information you entered and are valid only as at the date of the enquiry. It is your responsibility to ensure that the Enquiry Details are correct, and LinesearchbeforeUdig accepts no responsibility for any errors or omissions in the Enquiry Details or any consequences thereof. LSBUD Members update their asset information on a regular basis so you are advised to consider this when undertaking any works. It is your responsibility to choose the period of time after which you need to resubmit any enquiry but the maximum time (after which your enquiry will no longer be dealt with by the LSBUD Helpdesk and LSBUD Members) is 28 days. If any details of the enquiry change, particularly including, but not limited to, the location of the work, then a further enquiry must be made.

Asset Owners & Responses. Please note the enquiry results include the following:

1. "LSBUD Members" who are asset owners who have registered their assets on the LSBUD service.
2. "Non LSBUD Members" are asset owners who have not registered their assets on the LSBUD service but LSBUD is aware of their existence. Please note that there could be other asset owners within your search area.

Below are three lists of asset owners:

1. LSBUD Members who have assets registered within your search area. ("Affected")
   a. These LSBUD Members will either:
      i. Ask for further information ("Email Additional Info" noted in status). The additional information includes: Site contact name and number, Location plan, Detailed plan (minimum scale 1:2500), Cross sectional drawings (if available), Work Specification.

      ii. Respond directly to you ("Await Response"). In this response they may either send plans directly to you or ask for further information before being able to do so, particularly if any payments or authorisations are required.

2. LSBUD Members who do not have assets registered within your search area. ("Not Affected")

3. Non LSBUD Members who may have assets within your search area. Please note that this list is not exhaustive and all details are provided as a guide only. It is your responsibility to identify and consult with all asset owners before proceeding.

National Grid. Please note that the LSBUD service only contains information on National Grid's Gas above 7 bar asset, all National Grid Electricity Transmission assets and National Grid's Gas Distribution Limited above 2 bar asset.

For National Grid Gas Distribution Ltd below 2 bar asset information please go to www.beforeyoudig.nationalgrid.com

Enquiry Confirmation

LSBUD Ref: 18271576

Date of enquiry: 29/04/2020
Time of enquiry: 13:19

LSBUD Members who have assets registered on the LSBUD service within the vicinity of your search area.

List of affected LSBUD members			
Asset Owner	**Phone/Email**	**Emergency Only**	**Status**
UK Power Networks	08000565866	08000565866	Await response

LSBUD Members who do not have assets registered on the LSBUD service within the vicinity of your search area. Please be aware that LSBUD Members make regular changes to their assets and this list may vary for new enquiries in the same area.

List of not affected LSBUD members		
AWE Pipeline	Balfour Beatty Investments Limited	BOC Limited (A Member of the Linde Group)
BP Exploration Operating Company Limited	BPA	Carrington Gas Pipeline
CATS Pipeline c/o Wood Group PSN	Cemex	Centrica Storage Ltd
Chrysaor Production (UK) Limited	CLH Pipeline System Ltd	CNG Services Ltd
Concept Solutions People Ltd	ConocoPhillips (UK) Teesside Operator Ltd	Diamond Transmission Corporation
DIO (MOD Abandoned Pipelines)	Drax Group	E.ON UK CHP Limited
EirGrid	Electricity North West Limited	ENI & Himor c/o Penspen Ltd
EnQuest NNS Limited	EP Langage Limited	ESP Utilities Group
ESSAR	Esso Petroleum Company Limited	Fulcrum Pipelines Limited
Gamma	Gateshead Energy Company	Gigaclear Ltd
Gtt	Heathrow Airport LTD	Humbly Grove Energy
IGas Energy	INEOS FPS Pipelines	INEOS Manufacturing (Scotland and TSEP)
INOVYN Enterprises Limited	Intergen (Coryton Energy or Spalding Energy)	Mainline Pipelines Limited
Manchester Jetline Limited	Manx Cable Company	Marchwood Power Ltd (Gas Pipeline)
Melbourn Solar Limited	Murphy Utility Assets	National Grid Gas (Above 7 bar), National Grid Gas Distribution Limited (Above 2 bar) and National Grid Electricity Transmission
Northumbrian Water Group	NPower CHP Pipelines	Oikos Storage Limited
Ørsted	Perenco UK Limited (Purbeck Southampton Pipeline)	Perenco UK Limited (Purbeck Southampton Pipeline)
Petroineos	Phillips 66	Portsmouth Water
Premier Transmission Ltd (SNIP)	Redundant Pipelines - LPDA	RWE - Great Yarmouth Pipeline (Bacton to Great Yarmouth Power Station)
RWEnpower (Little Barford and South Haven)	SABIC UK Petrochemicals	Scottish and Southern Electricity Networks
Scottish Power Generation	Seabank Power Ltd	SES Water
SGN	Shell	Shell NOP
SSE (Peterhead Power Station)	SSE Enterprise Telecoms	SSE Utility Solutions Limited
Tata Communications (c/o JSM Construction Ltd)	Total (Colnbrook & Colwick Pipelines)	Total Finaline Pipelines
Transmission Capital	Uniper UK Ltd	Vattenfall
Veolia ES SELCHP Limited	Veolia ES Sheffield Ltd	Wales and West Utilities
West of Duddon Sands Transmission Ltd	Western Power Distribution	Westminster City Council

Zayo Group UK Ltd c/o JSM Group Ltd

Enquiry Confirmation

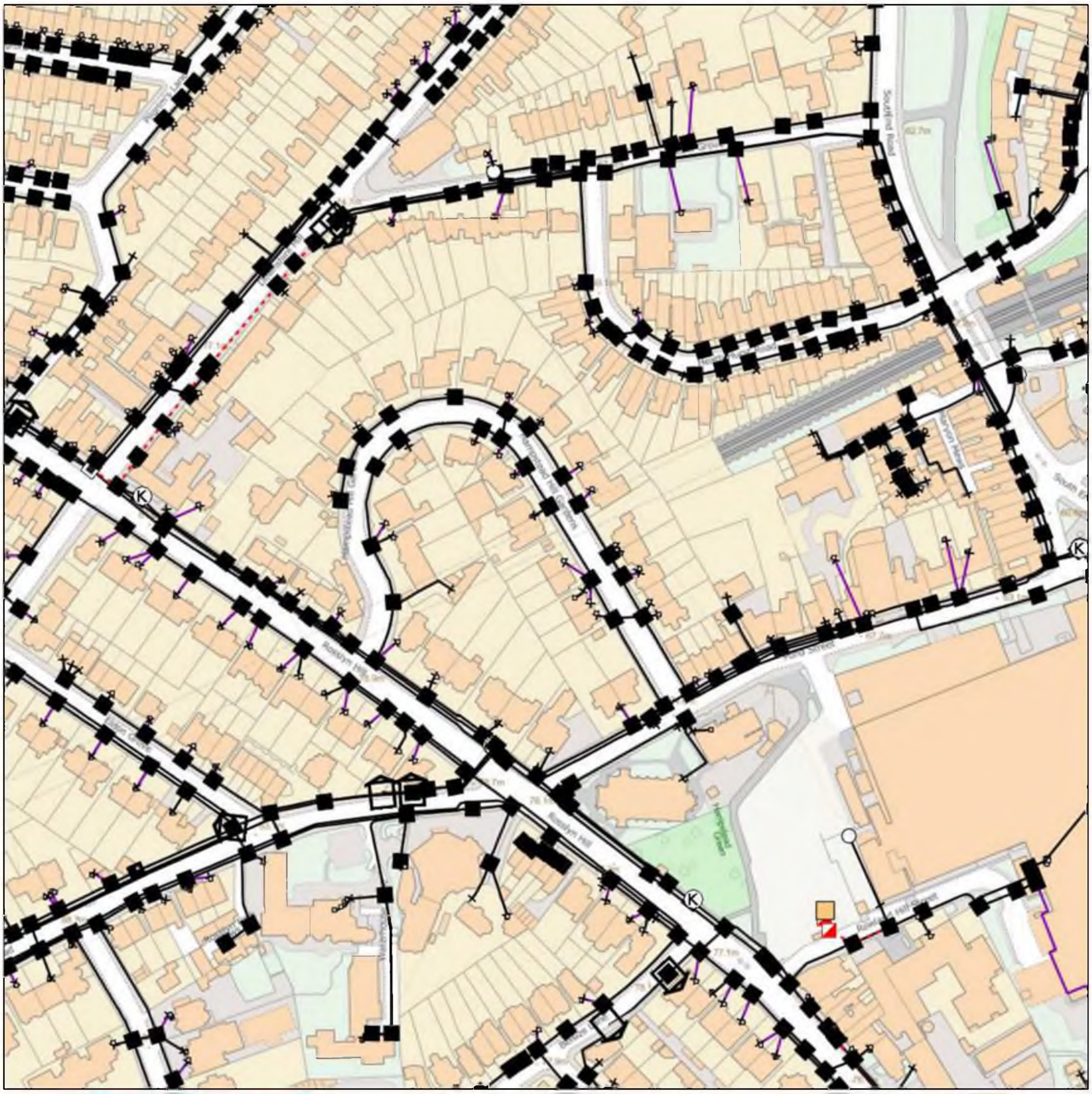
LSBUD Ref: 18271576

Date of enquiry: 29/04/2020
Time of enquiry: 13:19

The following Non-LSBUD Members may have assets in your search area. It is YOUR RESPONSIBILITY to contact them before proceeding. Please be aware this list is not exhaustive and it is your responsibility to identify and contact all asset owners within your search area.

Non-LSBUD members (Asset owners not registered on LSBUD)			
Asset Owner	**Preferred contact method**	**Phone**	**Status**
BT	https://www.swns.bt.com/pls/mbe/welcome.home	08009173993	Not Notified
Cadent Gas	plantprotection@cadentgas.com	0800688588	Not Notified
CenturyLink Communications UK Limited	plantenquiries@instalcom.co.uk	02087314613	Not Notified
CityFibre	asset.team@cityfibre.com	033 3150 7282	Not Notified
Colt	plantenquiries@catelecomuk.com	01227768427	Not Notified
Energetics Electricity	plantenquiries@lastmile-uk.com	01698404646	Not Notified
ENGIE	nrswa@cofely-gdfsuez.com	01293 549944	Not Notified
GTC	https://pe.gtc-uk.co.uk/PlantEnqMembership	01359240363	Not Notified
KPN (c/-Instalcom)	kpn.plantenquiries@instalcom.co.uk	n/a	Not Notified
Mobile Broadband Network Limited	mbnlplantenquiries@turntown.com	01212 621 100	Not Notified
Sky UK Limited	nrswa@sky.uk	02070323234	Not Notified
Sota	SOTA.plantenquiries@instalcom.co.uk		Not Notified
Teliasonera	telenttelia.plantenquiries@telent.com	0800526015	Not Notified
Thames Water	http://www.digdat.co.uk	08450709145	Not Notified
Utility assets Ltd	assetrecords@utilityassets.co.uk		Not Notified
Verizon Business	osp-team@uk.verizonbusiness.com	01293611736	Not Notified
Virgin Media	http://www.digdat.co.uk	08708883116	Not Notified
Vodafone	osm.enquiries@atkinsglobal.com	01454662881	Not Notified

Maps by email Plant Information Reply



openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08 00 to 17 00)
www.openreach.co.uk/cbyd

Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

KEY TO BT SYMBOLS

	Planned	Live
PCP		
Pole		
Box		
Manhole		
Cabinet		

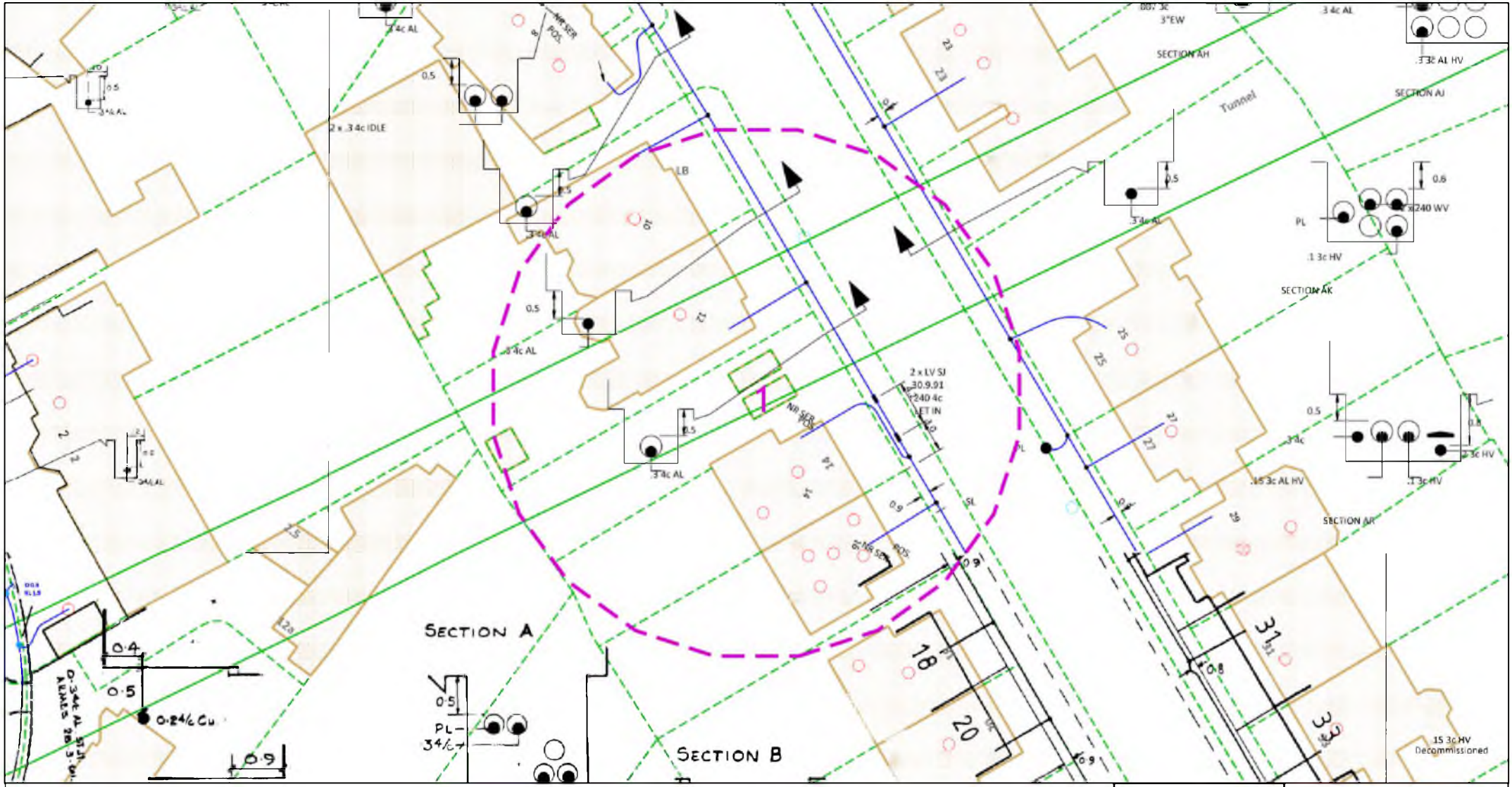
Change Of State		Hatchings	
Split Coupling		Built	
Duct Tee		Planned	
Building		Inferred	
Kiosk		Duct	

Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded
Existing BT Plant may not be recorded
Information valid at time of preparation Maps are only valid for 90 days after the date of publication

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : OEJ01231W
Map Reference : (centre) TQ2704085515
Easting/Northing : (centre) 527040,185515
Issued : 29/04/2020 13:23:45

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk



0 12.5 25
metres

Dig Sites Area: Line:

The quality and accuracy of any print will depend on your printer, your computer and its print settings. Measurements scaled from this plan may not match measurements between the same points on the ground.

This plan must be used with the attached 'Symbols' document.

Date Requested: 29/04/2020
Job Reference: 18271576
Site Location: 526991 185478
Requested by: Miss Alexa Band

Your Scheme/Reference:
STS5065
Scale: 1:500 (When plotted at A4)

1. The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed.
2. The exact position of the apparatus should be verified - use approved cable avoidance tools prior to excavation using suitable hand tools.
3. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all the cables have been determined.
4. It must be assumed that there is a service cable into each property, lamp column and street sign, etc.
5. All cables must be treated as being live unless proved otherwise by UK Power Networks.
6. The information proved must be given to all people working near UK Power Networks plant and equipment. Do not use plans more than 3 months after the issue date for excavation purposes.
7. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.
8. Please be aware the Low Voltage Overhead power lines are not currently displayed for the Eastern Region via this service, if you require records on the location of these please contact our Plan Provision team directly via plans@ukpowernetworks.co.uk.

1. UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk.
2. UK Power Networks does not exclude or limit its liability if it causes the death of any persons or causes personal injury to a person.
3. Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise for any loss, damage, cost, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.
4. This plan has been provided to you on the basis of the terms of use set out in the covering letter that accompanies this plan. If you do not accept and/or do not understand the terms of use set out in the covering letter you must not use the plan and must return it to the sender of the letter.
5. You are responsible for the security of the information provided to you. It must not be given, sold or made available upon payment of a fee to a third party.
6. Please Note: The Overview map does not display UK Power Networks electricity network and should not be used for the location of UK Power Networks assets. For detail of the electricity network please view the relevant page as highlighted in the Overview map.

N W E S

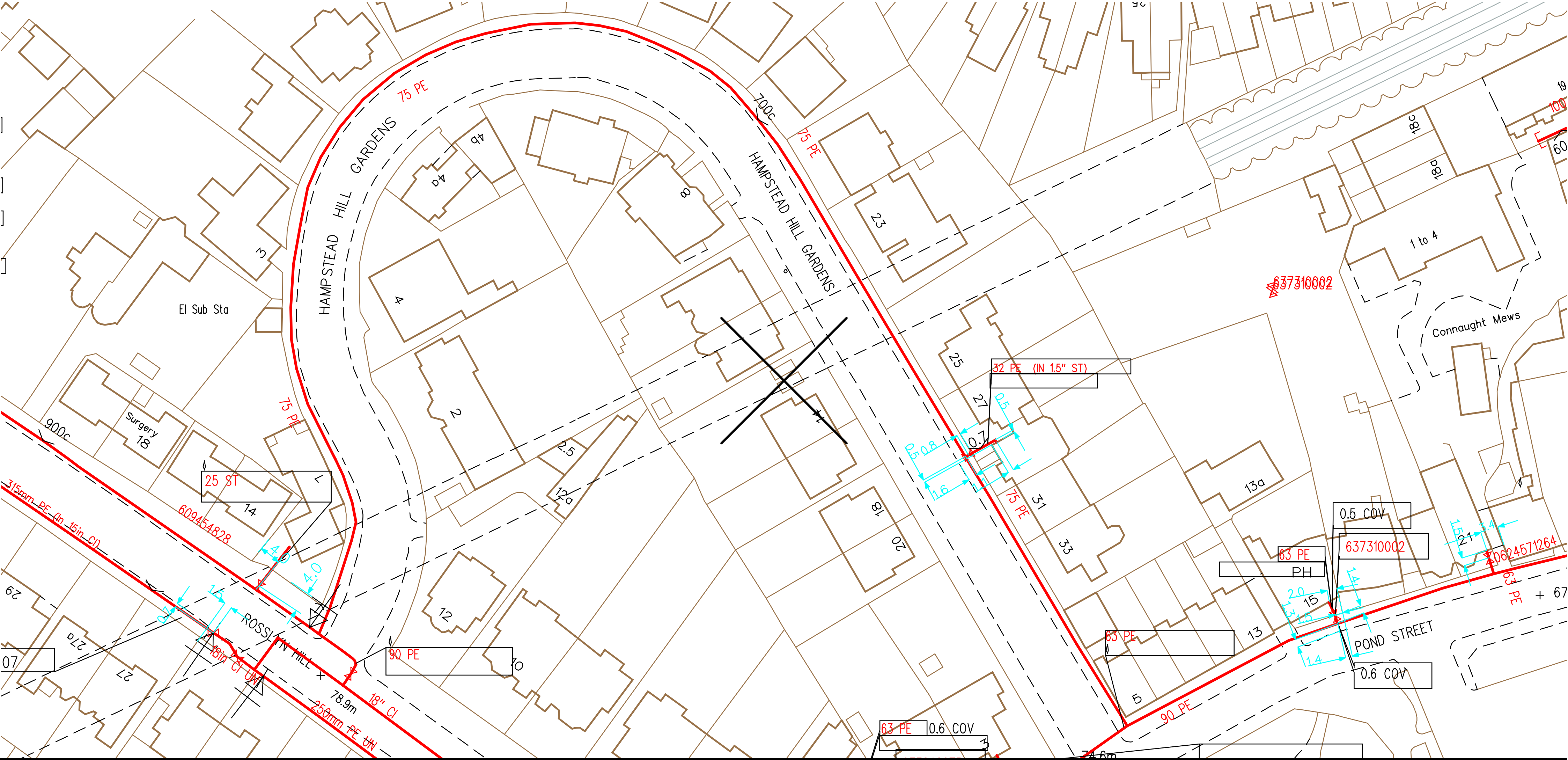
UK Power Networks

IF IN DOUBT - ASK! PHONE
0800 056 5866
EMERGENCY - If you damage a cable or line
Phone 0800 783 8838 (24hrs)
URGENTLY

LOOK OUT LOOK UP

ALWAYS LOOK UP BEFORE YOU START WORK
Refer to HSE Guidance note GS6

Maps produced at 1:2500 scale are Geo-Schematics which show LV mains cables and overhead lines (in some cases all voltages). Prior to carrying out excavations you must refer to the 1:500 records to determine the location of all known underground plant and equipment.



SCALE: Not to scale	
USER ID: LaurenW	
DATE: 29/04/2020	
EXTRACT DATE: 03/03/2020	
MAP REF: TQ2785	
CENTRE: 527040, 185515	

LP MAINS
MP MAINS
IP MAINS
LHP MAINS

Some examples of Plant Items:
Valve
Depth of Cover
Syphon
Diameter Change
Material Change
Out of Standard Service

This plan shows those pipes owned by Cadent Gas Ltd in their role as a
Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or
omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue. Further information on all DR4s can be determined by calling the DR4 hotline on 01455 892426 (9am-5pm)
A DR4 is where a potential error has been identified within the asset record and a process is currently underway to investigate and resolve the error as appropriate.

MAPS Viewer Version 5.8.0.1

Local Machine

Titles

Job No.: STS5065
Job Title: 14A Hampstead Hill Gardens
Sub-title:
Calculation Heading:
Initials: AKW
Checker:
Date Saved:
Date Checked:
Notes:
File Name: Underpin and excavation.pdd
File Path: \\st-dc01\Soiltechnics\ST PROJECTS\Schemes 2020 (S)\STS5065 - 14 Hampstead Hill Gardens, London\Geotechnical

History

Date	Time	By	Notes
15-Dec-2020	07:05	AngusW	New
15-Dec-2020	10:41	AngusW	
15-Dec-2020	14:38	AngusW	
15-Dec-2020	15:41	AngusW	
16-Dec-2020	07:44	AngusW	
16-Dec-2020	11:50	AngusW	

Analysis Options

General
Global Poisson's ratio: 0.20
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: 88.50 [m OD]
Displacements at load centroids: Yes
GSA piled raft data : No

Elastic
Elastic : Yes
Analysis: Boussinesq
Stiffness for horizontal displacement calculations: Weighted average
Using legacy heave correction factor: Yes

Consolidation
Consolidation : Yes
Time Period : 50.000000 years.
Time Step : 0.200000 years.
Cv or k : Cv
Rigid Boundary : Impermeable

Water
Level : 99.500000 [m].
Unit Weight : 10.000000 [kN/m³].

Soil ProfilesSoil Profile 1

Layer ref.	Name	Level at top [mOD]	Number of intermediate displacement levels	Youngs Modulus : Top [kN/m²]	Youngs Modulus : Btm. [kN/m²]	Poissons ratio	Cons. : Method	Cons. : m_v [m²/kN]	Cons. : e_0	Cons. : C_c	Cons. : C_r	Cons. : Over Cons.	Cons. : Pre Cons. Press. [kN/m²]	Cons. : OCR	Cons. : OCM	C_v [m²/year]	Bulk unit weight [kN/m³]	C_a	C_{ae}	Non-linear ref. curve
1	Head	100.00	5	10000.	10000.	0.20000	mv	300.00E-6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20.000	18.000	N/A	10.000E-6	None
2	London Clay	98.300	15	17000.	50320.	0.20000	mv	90.000E-6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.000	19.000	N/A	10.000E-6	None

Soil Zones

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile
1	Soil Zone 1	-30.000	30.000	-20.000	40.000	Soil Profile 1

Rectangular Load Data

Load ref.	Name	Orientation of Plane	Centre (Global) : x [m]	Centre (Global) : y [m]	Centre (Global) : z [m]	Position : Angle of local x from [Degrees]	Position : Width x or Radius [m]	Position : Length y [m]	Value : Normal (local z) [kN/m²]	Value : Tangential (local x) [kN/m²]	Value : Tangential (local y) [kN/m²]
1	Rect Load 1	Horizontal	0.50000	12.21000	98.30000	0.0	1.0000	17.000	111.25	0.0	0.0
2	Rect Load 2	Horizontal	3.21500	21.21000	98.30000	0.0	6.4300	1.0000	111.25	0.0	0.0
3	Rect Load 3	Horizontal	5.93000	10.85500	98.30000	0.0	1.0000	19.710	111.25	0.0	0.0
4	Rect Load 4	Horizontal	4.00000	0.50000	98.30000	0.0	4.8600	1.0000	111.25	0.0	0.0
5	Rect Load 5	Horizontal	2.07000	1.85500	98.30000	0.0	1.0000	1.7100	111.25	0.0	0.0
6	Rect Load 6	Horizontal	1.28500	3.21000	98.30000	0.0	2.5700	1.0000	111.25	0.0	0.0

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Basement excavation	98.30000	(1.57,0) (6.43,0) (6.43,21.7) (0,21.7) (0,2.71) (1.57,2.71) (1.57,0)	10.000	2	-63.000

Polygonal Loads' Rectangles

No.	Centre : x [m]	Centre : y [m]	Angle of local x from global X [Degrees]	Width x [m]	Depth y [m]
Load 1 : Basement excavation					
(Edge 1 optimal)					
1	4.00000	10.85500	0.0	4.8600	21.710
2	0.78500	12.21000	0.0	1.5700	19.000

Displacement Lines

Name	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals [No.]	Calculate	Detailed Results
No. 14 Hampstead Hill Gardens 1	-19.42000	1.29000	100.00000	-3.92000	1.29000	100.00000	10	Yes	Yes
No. 14 Hampstead Hill Gardens 2	-3.92000	1.29000	100.00000	-3.92000	3.57000	100.00000	3	Yes	Yes
No. 14 Hampstead Hill Gardens 3	-3.92000	3.57000	100.00000	-1.43000	3.57000	100.00000	1	Yes	Yes
No. 14 Hampstead Hill Gardens 4	-1.43000	3.57000	100.00000	-1.43000	12.14000	100.00000	4	Yes	Yes
No. 14 Hampstead Hill Gardens 5	-1.43000	12.14000	100.00000	-19.42000	12.14000	100.00000	10	Yes	Yes
No. 12 Hampstead Hill Gardens 1	19.10000	1.37000	100.00000	11.70000	1.37000	100.00000	10	Yes	Yes
No. 12 Hampstead Hill Gardens 2	11.70000	1.37000	100.00000	11.70000	2.00000	100.00000	1	Yes	Yes
No. 12 Hampstead Hill Gardens 3	11.70000	2.00000	100.00000	8.86000	2.00000	100.00000	3	Yes	Yes
No. 12 Hampstead Hill Gardens 4	8.86000	2.00000	100.00000	8.86000	14.43000	100.00000	10	Yes	Yes
No. 12 Hampstead Hill Gardens 5	8.86000	14.43000	100.00000	9.29000	14.43000	100.00000	1	Yes	Yes
No. 12 Hampstead Hill Gardens 6	9.29000	14.43000	100.00000	9.29000	17.86000	100.00000	3	Yes	Yes
No. 12 Hampstead Hill Gardens 7	9.29000	17.86000	100.00000	10.43000	19.14000	100.00000	2	Yes	Yes
No. 12 Hampstead Hill Gardens 8	10.43000	19.14000	100.00000	12.00000	19.14000	100.00000	2	Yes	Yes
No. 12 Hampstead Hill Gardens 9	12.00000	19.14000	100.00000	13.00000	17.86000	100.00000	2	Yes	Yes
No. 12 Hampstead Hill Gardens 10	13.00000	17.86000	100.00000	13.00000	14.43000	100.00000	3	Yes	Yes

Name	X1	Y1	Z1	X2	Y2	Z2	Intervals Calculate	Detailed Results
	[m]	[m]	[m]	[m]	[m]	[m]	[No.]	

Warnings

(1)Soil Profile 1 : Stratum 1 : The time step should preferbaly be in the range 0.00134 to 0.00803 (see Pore Pressures section of the help file) to avoid large discretisation errors and numerical disturbances. Please adjust the timestep and/or no.of intermediate displacement levels for this layer.

(2)Soil Profile 1 : Stratum 2 : The time step should preferbaly be in the range 0.00834 to 0.05 (see Pore Pressures section of the help file) to avoid large discretisation errors and numerical disturbances. Please adjust the timestep and/or no.of intermediate displacement levels for this layer.

Results : Total : Displacement Data : Lines

Ref.	Name	TimeStep No	TimeStep : Value	x	y	z	Sett. : Immediate	Sett. : Primary	Sett. : Secondary	Sett. : Total
			[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]	
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-19.42000	1.29000	100.00000	0.00868	0.00000	0.00000	0.00868
		200	40.00000	-19.42000	1.29000	100.00000	0.00868	-0.02088	0.07233	0.06014
		250	50.00000	-19.42000	1.29000	100.00000	0.00868	-0.02088	0.08299	0.07080
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-17.87000	1.29000	100.00000	0.00940	0.00000	0.00000	0.00940
		200	40.00000	-17.87000	1.29000	100.00000	0.00940	-0.02713	0.07233	0.05461
		250	50.00000	-17.87000	1.29000	100.00000	0.00940	-0.02713	0.08299	0.06527
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-16.32000	1.29000	100.00000	0.01004	0.00000	0.00000	0.01004
		200	40.00000	-16.32000	1.29000	100.00000	0.01004	-0.03560	0.07233	0.04677
		250	50.00000	-16.32000	1.29000	100.00000	0.01004	-0.03560	0.08299	0.05743
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-14.77000	1.29000	100.00000	0.01047	0.00000	0.00000	0.01047
		200	40.00000	-14.77000	1.29000	100.00000	0.01047	-0.04721	0.07233	0.03559
		250	50.00000	-14.77000	1.29000	100.00000	0.01047	-0.04721	0.08299	0.04625
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-13.22000	1.29000	100.00000	0.01050	0.00000	0.00000	0.01050
		200	40.00000	-13.22000	1.29000	100.00000	0.01050	-0.06325	0.07233	0.01959
		250	50.00000	-13.22000	1.29000	100.00000	0.01050	-0.06325	0.08299	0.03025
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-11.67000	1.29000	100.00000	0.00984	0.00000	0.00000	0.00984
		200	40.00000	-11.67000	1.29000	100.00000	0.00984	-0.08559	0.07233	-0.00342
		250	50.00000	-11.67000	1.29000	100.00000	0.00984	-0.08559	0.08299	0.00724
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-10.12000	1.29000	100.00000	0.00801	0.00000	0.00000	0.00801
		200	40.00000	-10.12000	1.29000	100.00000	0.00801	-0.11689	0.07233	-0.03654
		250	50.00000	-10.12000	1.29000	100.00000	0.00801	-0.11689	0.08299	-0.02588
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-8.57000	1.29000	100.00000	0.00434	0.00000	0.00000	0.00434
		200	40.00000	-8.57000	1.29000	100.00000	0.00434	-0.16077	0.07233	-0.08410
		250	50.00000	-8.57000	1.29000	100.00000	0.00434	-0.16077	0.08299	-0.07344
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-7.02000	1.29000	100.00000	-0.00201	0.00000	0.00000	-0.00201
		200	40.00000	-7.02000	1.29000	100.00000	-0.00201	-0.22189	0.07233	-0.15157
		250	50.00000	-7.02000	1.29000	100.00000	-0.00201	-0.22189	0.08299	-0.14091
1	No. 14 Hampstead Hill Gardens 1	0	0.00000	-5.47000	1.29000	100.00000	-0.01169	0.00000	0.00000	-0.01169
		200	40.00000	-5.47000	1.29000	100.00000	-0.01169	-0.30505	0.07233	-0.24441
		250	50.00000	-5.47000	1.29000	100.00000	-0.01169	-0.30505	0.08299	-0.23375
2	No. 14 Hampstead Hill Gardens 2	0	0.00000	-3.92000	1.29000	100.00000	-0.02343	0.00000	0.00000	-0.02343
		200	40.00000	-3.92000	1.29000	100.00000	-0.02343	-0.41129	0.07233	-0.36238
		250	50.00000	-3.92000	1.29000	100.00000	-0.02343	-0.41129	0.08299	-0.35172
2	No. 14 Hampstead Hill Gardens 2	0	0.00000	-3.92000	2.05000	100.00000	-0.03736	0.00000	0.00000	-0.03736
		200	40.00000	-3.92000	2.05000	100.00000	-0.03736	-0.49464	0.07233	-0.45966
		250	50.00000	-3.92000	2.05000	100.00000	-0.03736	-0.49464	0.08299	-0.44900
2	No. 14 Hampstead Hill Gardens 2	0	0.00000	-3.92000	2.81000	100.00000	-0.05474	0.00000	0.00000	-0.05474
		200	40.00000	-3.92000	2.81000	100.00000	-0.05474	-0.59088	0.07233	-0.57329
		250	50.00000	-3.92000	2.81000	100.00000	-0.05474	-0.59088	0.08299	-0.56263
3	No. 14 Hampstead Hill Gardens 3	0	0.00000	-3.92000	3.57000	100.00000	-0.07560	0.00000	0.00000	-0.07560
		200	40.00000	-3.92000	3.57000	100.00000	-0.07560	-0.69901	0.07233	-0.70228
		250	50.00000	-3.92000	3.57000	100.00000	-0.07560	-0.69901	0.08299	-0.69162
4	No. 14 Hampstead Hill Gardens 4	0	0.00000	-1.43000	3.57000	100.00000	-0.09885	0.00000	0.00000	-0.09885
		200	40.00000	-1.43000	3.57000	100.00000	-0.09885	-1.15763	0.07021	-1.18627
		250	50.00000	-1.43000	3.57000	100.00000	-0.09885	-1.15763	0.08087	-1.17561
4	No. 14 Hampstead Hill Gardens 4	0	0.00000	-1.43000	5.71250	100.00000	-0.37293	0.00000	0.00000	-0.37293
		200	40.00000	-1.43000	5.71250	100.00000	-0.37293	-2.21230	0.07233	-2.51290
		250	50.00000	-1.43000	5.71250	100.00000	-0.37293	-2.21230	0.08299	-2.50224
4	No. 14 Hampstead Hill Gardens 4	0	0.00000	-1.43000	7.85500	100.00000	-0.56874	0.00000	0.00000	-0.56874
		200	40.00000	-1.43000	7.85500	100.00000	-0.56874	-2.97785	0.07343	-3.47315
		250	50.00000	-1.43000	7.85500	100.00000	-0.56874	-2.97785	0.08409	-3.46249
4	No. 14 Hampstead Hill Gardens 4	0	0.00000	-1.43000	9.99750	100.00000	-0.65181	0.00000	0.00000	-0.65181
		200	40.00000	-1.43000	9.99750	100.00000	-0.65181	-3.33122	0.07343	-3.90960
		250	50.00000	-1.43000	9.99750	100.00000	-0.65181	-3.33122	0.08409	-3.89894
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-1.43000	12.14000	100.00000	-0.66886	0.00000	0.00000	-0.66886
		200	40.00000	-1.43000	12.14000	100.00000	-0.66886	-3.40531	0.07343	-4.00073
		250	50.00000	-1.43000	12.14000	100.00000	-0.66886	-3.40531	0.08409	-3.99007
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-3.22900	12.14000	100.00000	-0.33007	0.00000	0.00000	-0.33007
		200	40.00000	-3.22900	12.14000	100.00000	-0.33007	-1.89254	0.07343	-2.14917
		250	50.00000	-3.22900	12.14000	100.00000	-0.33007	-1.89254	0.08409	-2.13852
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-5.02800	12.14000	100.00000	-0.14959	0.00000	0.00000	-0.14959
		200	40.00000	-5.02800	12.14000	100.00000	-0.14959	-1.05807	0.07343	-1.13422
		250	50.00000	-5.02800	12.14000	100.00000	-0.14959	-1.05807	0.08409	-1.12356
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-6.82700	12.14000	100.00000	-0.06259	0.00000	0.00000	-0.06259
		200	40.00000	-6.82700	12.14000	100.00000	-0.06259	-0.60900	0.07343	-0.59816
		250	50.00000	-6.82700	12.14000	100.00000	-0.06259	-0.60900	0.08409	-0.58750
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-8.62600	12.14000	100.00000	-0.02136	0.00000	0.00000	-0.02136
		200	40.00000	-8.62600	12.14000	100.00000	-0.02136	-0.36246	0.07343	-0.31038
		250	50.00000	-8.62600	12.14000	100.00000	-0.02136	-0.36246	0.08409	-0.29972
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-10.42500	12.14000	100.00000	-0.00216	0.00000	0.00000	-0.00216
		200	40.00000	-10.42500	12.14000	100.00000	-0.00216	-0.22305	0.07233	-0.15287
		250	50.00000	-10.42500	12.14000	100.00000	-0.00216	-0.22305	0.08299	-0.14221
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-12.22400	12.14000	100.00000	0.00640	0.00000	0.00000	0.00640
		200	40.00000	-12.22400	12.14000	100.00000	0.00640	-0.14167	0.07233	-0.06294
		250	50.00000	-12.22400	12.14000	100.00000	0.00640	-0.14167	0.08299	-0.05228
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-14.02300	12.14000	100.00000	0.00981	0.00000	0.00000	0.00981
		200	40.00000	-14.02300	12.14000	100.00000	0.00981	-0.09267	0.07233	-0.01053
		250	50.00000	-14.02300	12.14000	100.00000	0.00981	-0.09267	0.08299	0.00013
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-15.82200	12.14000	100.00000	0.01074	0.00000	0.00000	0.01074
		200	40.00000	-15.82200	12.14000	100.00000	0.01074	-0.06226	0.07233	0.02081
		250	50.00000	-15.82200	12.14000	100.00000	0.01074	-0.06226	0.08299	0.03147
5	No. 14 Hampstead Hill Gardens 5	0	0.00000	-17.62100	12.14000	100.00000	0.01051	0.00000	0.00000	0.01051
		200	40.00000	-17.62100	12.14000	100.00000	0.01051	-0.04287	0.07233	0.03997
		250	50.00000	-17.62100	12.14000	100.00000	0.01051	-0.04287	0.08299	0.05063
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	19.10000	1.37000	100.00000	0.01004	0.00000	0.00000	0.01004
		200	40.00000	19.10000	1.37000	100.00000	0.01004	-0.07511	0.07233	0.00726
		250	50.00000	19.10000	1.37000	100.00000	0.01004	-0.07511	0.08299	0.01792
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	18.36000	1.37000	100.00000	0.00954	0.00000	0.00000	0.00954
		200	40.00000	18.36000	1.37000	100.00000	0.00954	-0.08717	0.07233	-0.00530
		250	50.00000	18.36000	1.37000	100.00000	0.00954	-0.08717	0.08299	0.00536
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	17.62000	1.37000	100.00000	0.00873	0.00000	0.00000	0.00873
		200	40.00000	17.62000	1.37000	100.00000	0.00873	-0.10143	0.07233	-0.02036
		250	50.00000	17.62000	1.37000	100.00000	0.00873	-0.10143	0.08299	-0.00970
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	16.88000	1.37000	100.00000	0.00755	0.00000	0.00000	0.00755
		200	40.00000	16.88000	1.37000	100.00000	0.00755	-0.11830	0.07233	-0.03842
		250	50.00000	16.88000	1.37000	100.00000	0.00755	-0.11830	0.08299	-0.02776
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	16.14000	1.37000	100.00000	0.00589	0.00000	0.00000	0.00589
		200	40.00000	16.14000	1.37000	100.00000	0.00589	-0.13830	0.07233	-0.06007
		250	50.00000	16.14000	1.37000	100.00000	0.00589	-0.13830	0.08299	-0.04941
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	15.40000	1.37000	100.00000	0.00365	0.00000	0.00000	0.00365
		200	40.00000	15.40000	1.37000	100.00000	0.00365	-0.16202	0.07233	-0.08604
		250	50.00000	15.40000	1.37000	100.00000	0.00365	-0.16202	0.08299	-0.07538
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	14.66000	1.37000	100.00000	0.00068	0.00000	0.00000	0.00068
		200	40.00000	14.66000	1.37000	100.00000	0.00068	-0.19014	0.07233	-0.11713
		250	50.00000	14.66000	1.37000	100.00000	0.00068	-0.19014	0.08299	-0.10647
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	13.92000	1.37000	100.00000	-0.00316	0.00000	0.00000	-0.00316
		200	40.00000	13.92000	1.37000	100.00000	-0.00316	-0.22343	0.07233	-0.15426
		250	50.00000	13.92000	1.37000	100.00000	-0.00316	-0.22343	0.08299	-0.14360
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	13.18000	1.37000	100.00000	-0.00800	0.00000	0.00000	-0.00800
		200	40.00000	13.18000	1.37000	100.00000	-0.00800	-0.26270	0.07233	-0.19837
		250	50.00000	13.18000	1.37000	100.00000	-0.00800	-0.26270	0.08299	-0.18771
6	No. 12 Hampstead Hill Gardens 1	0	0.00000	12.44000	1.37000	100.00000	-0.01393	0.00000	0.00000	-0.01393
		200	40.00000	12.44000	1.37000	100.00000	-0.01393	-0.30872	0.07233	-0.25031
		250	50.00000	12.44000	1.37000	100.00000	-0.01393	-0.30872	0.08299	-0.23965
7	No. 12 Hampstead Hill Gardens 2	0	0.00000	11.70000	1.37000	100.00000	-0.02087	0.00000	0.00000	-0.02087
		200	40.00000	11.70000	1.37000	100.00000	-0.02087	-0.36197	0.07233	-0.31051
		250	50.00000	11.70000	1.37000	100.00000	-0.02087	-0.36197	0.08299	-0.29985
8	No. 12 Hampstead Hill Gardens 3	0	0.00000	11.70000	2.00000	100.00000	-0.03064	0.00000	0.00000	-0.03064
		200	40.00000	11.70000	2.00000	100.00000	-0.03064	-0.41746	0.07233	-0.37577
		250	50.00000	11.70000	2.00000	100.00000	-0.03064	-0.41746	0.08299	-0.36511
8	No. 12 Hampstead Hill Gardens 3	0	0.00000	10.75333	2.00000	100.00000	-0.04584	0.00000	0.00000	-0.04584
		200	40.00000	10.75333	2.00000	100.00000	-0.04584	-0.52001	0.07233	-0.49352
		250	50.00000	10.75333	2.00000	100.00000	-0.04584	-0.52001	0.08299	-0.48286
8	No. 12 Hampstead Hill Gardens 3	0	0.00000	9.80667	2.00000	100.00000	-0.06214	0.00000	0.00000	-0.06214
		200	40.00000	9.80667	2.00000	100.00000	-0.06214	-0.64151	0.07233	-0.63132
		250	50.00000	9.80667	2.00000	100.00000	-0.06214	-0.64151	0.08299	-0.62066
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	2.00000	100.00000	-0.07118	0.00000	0.00000	-0.07118
		200	40.00000	8.86000	2.00000	100.00000	-0.07118	-0.76977	0.07126	-0.76969
		250	50.00000	8.86000	2.00000	100.00000	-0.07118	-0.76977	0.08192	-0.75903
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	3.24300	100.00000	-0.16716	0.00000	0.00000	-0.16716
		200	40.00000	8.86000	3.24300	100.00000	-0.16716	-1.17014	0.07233	-1.26496
		250	50.00000	8.86000	3.24300	100.00000	-0.16716	-1.17014	0.08299	-1.25430
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	4.48600	100.00000	-0.25950	0.00000	0.00000	-0.25950
		200	40.00000	8.86000	4.48600	100.00000	-0.25950	-1.55762	0.07343	-1.74369

Ref.	Name	TimeStep No	TimeStep Value [m]	x [m]	y [m]	z [mm]	Sett. Immediate [mm]	Sett. Primary [mm]	Sett. Secondary [mm]	Sett. Total
		250	50.00000	8.86000	4.48600	100.00000	-0.25950	-1.55762	0.08409	-1.73303
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	5.72900	100.00000	-0.33485	0.00000	0.00000	-0.33485
		200	40.00000	8.86000	5.72900	100.00000	-0.33485	-1.88401	0.07343	-2.14543
		250	50.00000	8.86000	5.72900	100.00000	-0.33485	-1.88401	0.08409	-2.13477
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	6.97200	100.00000	-0.39069	0.00000	0.00000	-0.39069
		200	40.00000	8.86000	6.97200	100.00000	-0.39069	-2.13539	0.07343	-2.45265
		250	50.00000	8.86000	6.97200	100.00000	-0.39069	-2.13539	0.08409	-2.44199
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	8.21500	100.00000	-0.42895	0.00000	0.00000	-0.42895
		200	40.00000	8.86000	8.21500	100.00000	-0.42895	-2.31427	0.07343	-2.66979
		250	50.00000	8.86000	8.21500	100.00000	-0.42895	-2.31428	0.08409	-2.65913
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	9.45800	100.00000	-0.45260	0.00000	0.00000	-0.45260
		200	40.00000	8.86000	9.45800	100.00000	-0.45260	-2.42865	0.07343	-2.80782
		250	50.00000	8.86000	9.45800	100.00000	-0.45260	-2.42865	0.08409	-2.79716
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	10.70100	100.00000	-0.46416	0.00000	0.00000	-0.46416
		200	40.00000	8.86000	10.70100	100.00000	-0.46416	-2.48606	0.07343	-2.87679
		250	50.00000	8.86000	10.70100	100.00000	-0.46416	-2.48606	0.08409	-2.86613
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	11.94400	100.00000	-0.46495	0.00000	0.00000	-0.46495
		200	40.00000	8.86000	11.94400	100.00000	-0.46495	-2.49064	0.07343	-2.88215
		250	50.00000	8.86000	11.94400	100.00000	-0.46495	-2.49064	0.08409	-2.87149
9	No. 12 Hampstead Hill Gardens 4	0	0.00000	8.86000	13.18700	100.00000	-0.45478	0.00000	0.00000	-0.45478
		200	40.00000	8.86000	13.18700	100.00000	-0.45478	-2.44164	0.07343	-2.82298
		250	50.00000	8.86000	13.18700	100.00000	-0.45478	-2.44164	0.08409	-2.81232
10	No. 12 Hampstead Hill Gardens 5	0	0.00000	8.86000	14.43000	100.00000	-0.43182	0.00000	0.00000	-0.43182
		200	40.00000	8.86000	14.43000	100.00000	-0.43182	-2.33303	0.07343	-2.69142
		250	50.00000	8.86000	14.43000	100.00000	-0.43182	-2.33303	0.08409	-2.68076
11	No. 12 Hampstead Hill Gardens 6	0	0.00000	9.29000	14.43000	100.00000	-0.36159	0.00000	0.00000	-0.36159
		200	40.00000	9.29000	14.43000	100.00000	-0.36159	-2.02357	0.07343	-2.31173
		250	50.00000	9.29000	14.43000	100.00000	-0.36159	-2.02357	0.08409	-2.30107
11	No. 12 Hampstead Hill Gardens 6	0	0.00000	9.29000	15.57333	100.00000	-0.33148	0.00000	0.00000	-0.33148
		200	40.00000	9.29000	15.57333	100.00000	-0.33148	-1.88267	0.07343	-2.14072
		250	50.00000	9.29000	15.57333	100.00000	-0.33148	-1.88267	0.08409	-2.13006
11	No. 12 Hampstead Hill Gardens 6	0	0.00000	9.29000	16.71667	100.00000	-0.28795	0.00000	0.00000	-0.28795
		200	40.00000	9.29000	16.71667	100.00000	-0.28795	-1.68579	0.07343	-1.90031
		250	50.00000	9.29000	16.71667	100.00000	-0.28795	-1.68579	0.08409	-1.88965
12	No. 12 Hampstead Hill Gardens 7	0	0.00000	9.29000	17.86000	100.00000	-0.23036	0.00000	0.00000	-0.23036
		200	40.00000	9.29000	17.86000	100.00000	-0.23036	-1.43338	0.07343	-1.59031
		250	50.00000	9.29000	17.86000	100.00000	-0.23036	-1.43338	0.08409	-1.57965
12	No. 12 Hampstead Hill Gardens 7	0	0.00000	9.86000	18.50000	100.00000	-0.15385	0.00000	0.00000	-0.15385
		200	40.00000	9.86000	18.50000	100.00000	-0.15385	-1.07420	0.07343	-1.15463
		250	50.00000	9.86000	18.50000	100.00000	-0.15385	-1.07420	0.08409	-1.14397
13	No. 12 Hampstead Hill Gardens 8	0	0.00000	10.43000	19.14000	100.00000	-0.09992	0.00000	0.00000	-0.09992
		200	40.00000	10.43000	19.14000	100.00000	-0.09992	-0.80686	0.07343	-0.83335
		250	50.00000	10.43000	19.14000	100.00000	-0.09992	-0.80687	0.08409	-0.82269
13	No. 12 Hampstead Hill Gardens 8	0	0.00000	11.21500	19.14000	100.00000	-0.07141	0.00000	0.00000	-0.07141
		200	40.00000	11.21500	19.14000	100.00000	-0.07141	-0.65041	0.07343	-0.64839
		250	50.00000	11.21500	19.14000	100.00000	-0.07141	-0.65041	0.08409	-0.63773
14	No. 12 Hampstead Hill Gardens 9	0	0.00000	12.00000	19.14000	100.00000	-0.04947	0.00000	0.00000	-0.04947
		200	40.00000	12.00000	19.14000	100.00000	-0.04947	-0.52596	0.07343	-0.50200
		250	50.00000	12.00000	19.14000	100.00000	-0.04947	-0.52596	0.08409	-0.49134
14	No. 12 Hampstead Hill Gardens 9	0	0.00000	12.50000	18.50000	100.00000	-0.04600	0.00000	0.00000	-0.04600
		200	40.00000	12.50000	18.50000	100.00000	-0.04600	-0.50459	0.07343	-0.47716
		250	50.00000	12.50000	18.50000	100.00000	-0.04600	-0.50459	0.08409	-0.46650
15	No. 12 Hampstead Hill Gardens 10	0	0.00000	13.00000	17.86000	100.00000	-0.04108	0.00000	0.00000	-0.04108
		200	40.00000	13.00000	17.86000	100.00000	-0.04108	-0.47624	0.07343	-0.44389
		250	50.00000	13.00000	17.86000	100.00000	-0.04108	-0.47624	0.08409	-0.43323
15	No. 12 Hampstead Hill Gardens 10	0	0.00000	13.00000	16.71667	100.00000	-0.05109	0.00000	0.00000	-0.05109
		200	40.00000	13.00000	16.71667	100.00000	-0.05109	-0.53600	0.07343	-0.51366
		250	50.00000	13.00000	16.71667	100.00000	-0.05109	-0.53600	0.08409	-0.50300
15	No. 12 Hampstead Hill Gardens 10	0	0.00000	13.00000	15.57333	100.00000	-0.05963	0.00000	0.00000	-0.05963
		200	40.00000	13.00000	15.57333	100.00000	-0.05963	-0.58710	0.07343	-0.57330
		250	50.00000	13.00000	15.57333	100.00000	-0.05963	-0.58710	0.08409	-0.56264

Titles

Job No.: STS5065
Job Title: 14A Hampstead Hill Gardens
Sub-title:
Calculation Heading:
Initials: AKW
Checker:
Date Saved: 16-Dec-2020
Date Checked:
Notes:
File Name: Ground movement.xdd
File Path: \\st-dc01\Soiltechnics\ST PROJECTS\Schemes 2020 (S)\STS5065 - 14 Hampstead Hill Gardens, London\Geotechnical

History

Date	Time	By	Notes
15-Dec-2020	10:43	AngusW	New
15-Dec-2020	13:44	AngusW	
15-Dec-2020	15:48	AngusW	
16-Dec-2020	09:21	AngusW	
16-Dec-2020	12:00	AngusW	

Displacement Lines

Ref.	Name	x1 [m]	y1 [m]	z1 [m]	x2 [m]	y2 [m]	z2 [m]	Intervals [No.]	Surface type for tunnels	Interpolate imported displacements	Calculate
1	No. 14 Hampstead Hill Gardens 1	-19.42000	1.29000	100.00000	-3.92000	1.29000	100.00000	10	Surface	No	Yes
2	No. 14 Hampstead Hill Gardens 2	-3.92000	1.29000	100.00000	-3.92000	3.57000	100.00000	3	Surface	No	Yes
3	No. 14 Hampstead Hill Gardens 3	-3.92000	3.57000	100.00000	-1.43000	3.57000	100.00000	1	Surface	No	Yes
4	No. 14 Hampstead Hill Gardens 4	-1.43000	3.57000	100.00000	-1.43000	12.14000	100.00000	4	Surface	No	Yes
5	No. 14 Hampstead Hill Gardens 5	-1.43000	12.14000	100.00000	-19.42000	12.14000	100.00000	10	Surface	No	Yes
6	No. 12 Hampstead Hill Gardens 1	19.10000	1.37000	100.00000	11.70000	1.37000	100.00000	10	Surface	No	Yes
7	No. 12 Hampstead Hill Gardens 2	11.70000	1.37000	100.00000	11.70000	2.00000	100.00000	1	Surface	No	Yes
8	No. 12 Hampstead Hill Gardens 3	11.70000	2.00000	100.00000	8.86000	2.00000	100.00000	3	Surface	No	Yes
9	No. 12 Hampstead Hill Gardens 4	8.86000	2.00000	100.00000	8.86000	14.43000	100.00000	10	Surface	No	Yes
10	No. 12 Hampstead Hill Gardens 5	8.86000	14.43000	100.00000	9.29000	14.43000	100.00000	1	Surface	No	Yes
11	No. 12 Hampstead Hill Gardens 6	9.29000	14.43000	100.00000	9.29000	17.86000	100.00000	3	Surface	No	Yes
12	No. 12 Hampstead Hill Gardens 7	9.29000	17.86000	100.00000	10.43000	19.14000	100.00000	2	Surface	No	Yes
13	No. 12 Hampstead Hill Gardens 8	10.43000	19.14000	100.00000	12.00000	19.14000	100.00000	2	Surface	No	Yes
14	No. 12 Hampstead Hill Gardens 9	12.00000	19.14000	100.00000	13.00000	17.86000	100.00000	2	Surface	No	Yes
15	No. 12 Hampstead Hill Gardens 10	13.00000	17.86000	100.00000	13.00000	14.43000	100.00000	3	Surface	No	Yes

Displacement Grids

Ref.	Name	Extrusion: Direction	Base line start: X [m]	Base line start: Y [m]	Base line start: Z(level) [m]	Base line end: x [m]	Base line end: Y [m]	Base line end: Z(level) [m]	Base line: Intervals [No.]	Extrusion: Distance [m]	Extrusion: Intervals [No.]	Surface type for tunnels	Calculate
1	Displacement Grid 1	Global X	-20.00000	-10.00000	100.00000	-	30.00000	100.00000	40	50.00000	50	Surface	Yes

Imported Displacements

Set: Ref.	Set: Name	Result: Ref.	Coordinates: x [m]	Coordinates: y [m]	Coordinates: z [m]	Displacements: x [mm]	Displacements: y [mm]	Displacements: z [mm]	
1	Underpin and excavation - Consolidation	1	-19.42000	1.29000	100.00000	0.00000	0.00000	0.07080	1,2,6
		2	-17.87000	1.29000	100.00000	0.00000	0.00000	0.06527	1,2,6
		3	-16.32000	1.29000	100.00000	0.00000	0.00000	0.05743	1,2,6
		4	-14.77000	1.29000	100.00000	0.00000	0.00000	0.04625	1,2,6
		5	-13.22000	1.29000	100.00000	0.00000	0.00000	0.03025	1,2,6
		6	-11.67000	1.29000	100.00000	0.00000	0.00000	0.00724	1,2,6
		7	-10.12000	1.29000	100.00000	0.00000	0.00000	-0.02588	1,2,6
		8	-8.57000	1.29000	100.00000	0.00000	0.00000	-0.07344	1,2,6
		9	-7.02000	1.29000	100.00000	0.00000	0.00000	-0.14091	1,2,6
		10	-5.47000	1.29000	100.00000	0.00000	0.00000	-0.23375	1,2,6
		11	-3.92000	1.29000	100.00000	0.00000	0.00000	-0.35172	1,2,6
		12	-3.92000	1.29000	100.00000	0.00000	0.00000	-0.35172	1,2,6
		13	-3.92000	2.05000	100.00000	0.00000	0.00000	-0.44900	1,2,6
		14	-3.92000	2.81000	100.00000	0.00000	0.00000	-0.56263	1,2,6
		15	-3.92000	3.57000	100.00000	0.00000	0.00000	-0.69162	1,2,6
		16	-3.92000	3.57000	100.00000	0.00000	0.00000	-0.69162	1,2,6
		17	-1.43000	3.57000	100.00000	0.00000	0.00000	-1.17561	1,2,6
		18	-1.43000	3.57000	100.00000	0.00000	0.00000	-1.17561	1,2,6
		19	-1.43000	5.71250	100.00000	0.00000	0.00000	-2.50224	1,2,6
		20	-1.43000	7.85500	100.00000	0.00000	0.00000	-3.46249	1,2,6
		21	-1.43000	9.99750	100.00000	0.00000	0.00000	-3.89894	1,2,6
		22	-1.43000	12.14000	100.00000	0.00000	0.00000	-3.99007	1,2,6
		23	-1.43000	12.14000	100.00000	0.00000	0.00000	-3.99007	1,2,6
		24	-3.22900	12.14000	100.00000	0.00000	0.00000	-2.13852	1,2,6
		25	-5.02800	12.14000	100.00000	0.00000	0.00000	-1.12356	1,2,6
		26	-6.82700	12.14000	100.00000	0.00000	0.00000	-0.58750	1,2,6
		27	-8.62600	12.14000	100.00000	0.00000	0.00000	-0.29972	1,2,6
		28	-10.42500	12.14000	100.00000	0.00000	0.00000	-0.14221	1,2,6
		29	-12.22400	12.14000	100.00000	0.00000	0.00000	-0.05228	1,2,6
		30	-14.02300	12.14000	100.00000	0.00000	0.00000	0.00013	1,2,6
		31	-15.82200	12.14000	100.00000	0.00000	0.00000	0.03147	1,2,6
		32	-17.62100	12.14000	100.00000	0.00000	0.00000	0.05063	1,2,6
		33	-19.42000	12.14000	100.00000	0.00000	0.00000	0.06259	1,2,6
		34	19.10000	1.37000	100.00000	0.00000	0.00000	0.01792	1,2,6
		35	18.36000	1.37000	100.00000	0.00000	0.00000	0.00536	1,2,6
		36	17.62000	1.37000	100.00000	0.00000	0.00000	-0.00970	1,2,6
		37	16.88000	1.37000	100.00000	0.00000	0.00000	-0.02776	1,2,6
		38	16.14000	1.37000	100.00000	0.00000	0.00000	-0.04941	1,2,6
		39	15.40000	1.37000	100.00000	0.00000	0.00000	-0.07538	1,2,6
		40	14.66000	1.37000	100.00000	0.00000	0.00000	-0.10647	1,2,6
		41	13.92000	1.37000	100.00000	0.00000	0.00000	-0.14360	1,2,6
		42	13.18000	1.37000	100.00000	0.00000	0.00000	-0.18771	1,2,6
		43	12.44000	1.37000	100.00000	0.00000	0.00000	-0.23965	1,2,6
		44	11.70000	1.37000	100.00000	0.00000	0.00000	-0.29985	1,2,6
		45	11.70000	1.37000	100.00000	0.00000	0.00000	-0.29985	1,2,6
		46	11.70000	2.00000	100.00000	0.00000	0.00000	-0.36511	1,2,6
		47	11.70000	2.00000	100.00000	0.00000	0.00000	-0.36511	1,2,6
		48	10.75333	2.00000	100.00000	0.00000	0.00000	-0.48286	1,2,6
		49	9.80667	2.00000	100.00000	0.00000	0.00000	-0.62066	1,2,6
		50	8.86000	2.00000	100.00000	0.00000	0.00000	-0.75903	1,2,6
		51	8.86000	2.00000	100.00000	0.00000	0.00000	-0.75903	1,2,6
		52	8.86000	3.24300	100.00000	0.00000	0.00000	-1.25430	1,2,6
		53	8.86000	4.48600	100.00000	0.00000	0.00000	-1.73303	1,2,6
		54	8.86000	5.72900	100.00000	0.00000	0.00000	-2.13477	1,2,6
		55	8.86000	6.97200	100.00000	0.00000	0.00000	-2.44199	1,2,6
		56	8.86000	8.21500	100.00000	0.00000	0.00000	-2.65913	1,2,6
		57	8.86000	9.45800	100.00000	0.00000	0.00000	-2.79716	1,2,6
		58	8.86000	10.70100	100.00000	0.00000	0.00000	-2.86613	1,2,6
		59	8.86000	11.94400	100.00000	0.00000	0.00000	-2.87149	1,2,6
		60	8.86000	13.18700	100.00000	0.00000	0.00000	-2.81232	1,2,6
		61	8.86000	14.43000	100.00000	0.00000	0.00000	-2.68076	1,2,6
		62	8.86000	14.43000	100.00000	0.00000	0.00000	-2.68076	1,2,6
		63	9.29000	14.43000	100.00000	0.00000	0.00000	-2.30107	1,2,6
		64	9.29000	14.43000	100.00000	0.00000	0.00000	-2.30107	1,2,6

Set: Ref.	Set: Name	Result: Coordinates: Coordinates: Coordinates: Displacements: Displacements: Displacements: Ref.	x [m]	y [m]	z [m]	x [mm]	y [mm]	z [mm]	
		65	9.29000	15.57333	100.00000	0.00000	0.00000	-2.13006	1,2,6
		66	9.29000	16.71667	100.00000	0.00000	0.00000	-1.88965	1,2,6
		67	9.29000	17.86000	100.00000	0.00000	0.00000	-1.57965	1,2,6
		68	9.29000	17.86000	100.00000	0.00000	0.00000	-1.57965	1,2,6
		69	9.86000	18.50000	100.00000	0.00000	0.00000	-1.14397	1,2,6
		70	10.43000	19.14000	100.00000	0.00000	0.00000	-0.82269	1,2,6
		71	10.43000	19.14000	100.00000	0.00000	0.00000	-0.82269	1,2,6
		72	11.21500	19.14000	100.00000	0.00000	0.00000	-0.63773	1,2,6
		73	12.00000	19.14000	100.00000	0.00000	0.00000	-0.49134	1,2,6
		74	12.00000	19.14000	100.00000	0.00000	0.00000	-0.49134	1,2,6
		75	12.50000	18.50000	100.00000	0.00000	0.00000	-0.46650	1,2,6
		76	13.00000	17.86000	100.00000	0.00000	0.00000	-0.43323	1,2,6
		77	13.00000	17.86000	100.00000	0.00000	0.00000	-0.43323	1,2,6
		78	13.00000	16.71667	100.00000	0.00000	0.00000	-0.50300	1,2,6
		79	13.00000	15.57333	100.00000	0.00000	0.00000	-0.56264	1,2,6
		80	13.00000	14.43000	100.00000	0.00000	0.00000	-0.60930	1,2,6

1 - Data point coincident with displacement location. Its displacement has been added to those calculated by Xdisp.
2 - Data point coincident with horizontal movement calculation point for a specific building. Its displacement has been added before performing building damage calculations.
6 - Data point coincident with vertical movement calculation point for a specific building. Its displacement has been added before performing building damage calculations.

Polygonal Excavations

Ref. 1
Excavation Name: Underpins
Surface level [m]: 100.00
Contribution: Positive

Corner	x [m]	y [m]	Base Level [m]	Arc Enabled	Stiffened	Prev. Side: d [m]	Prev. Side: p1 [%]	Prev. Side: p2* [%]	Next Side: d [m]	Next Side: p1 [%]	Next Side: p2* [%]
1	1.5700	0.0	98.000	Yes	No	-	-	-	-	-	-
2	6.4300	0.0	98.000	Yes	No	-	-	-	-	-	-
3	6.4300	21.710	98.000	Yes	No	-	-	-	-	-	-
4	0.0	21.710	98.000	Yes	No	-	-	-	-	-	-
5	0.0	2.7100	98.000	Yes	No	-	-	-	-	-	-
6	1.5700	2.7100	98.000	Yes	No	-	-	-	-	-	-

Side	x1 [m]	y1 [m]	x2 [m]	y2 [m]	G.M. Curve: Vertical	G.M. Curve: Horizontal
1	1.5700	0.0	6.4300	0.0	Underpin - ver	Underpin - hor
2	6.4300	0.0	6.4300	21.710	Underpin - ver	Underpin - hor
3	6.4300	21.710	0.0	21.710	Underpin - ver	Underpin - hor
4	0.0	21.710	0.0	2.7100	Underpin - ver	Underpin - hor
5	0.0	2.7100	1.5700	2.7100	Underpin - ver	Underpin - hor
6	1.5700	2.7100	1.5700	0.0	Underpin - ver	Underpin - hor

Circular Excavations

Vertical Ground Movement Curves

Curve Name: Underpin - ver
Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Settlement / wall depth or max. excavation depth (z)(%)]

[0.000,0.000,0.250][1.000,0.000,0.000]

Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = -2.50000E-1x + 2.50000E-1
Coeff. of Determination: 1.00000

Horizontal Ground Movement Curves

Curve Name: Underpin - hor
Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Horizontal movement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.250][1.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = -2.50000E-1x + 2.50000E-1
Coeff. of Determination: 1.00000

Damage Category Strains

Ref.	Name	0 (Negligible) to 1 (Very Slight)	1 (Very Slight) to 2 (Slight)	2 (Slight) to 3 (Moderate)	3 (Moderate) to 4 (Severe)
1	Burland Strain Limits	0.0	500.00E-6	750.00E-6	0.0015000

Specific Buildings - Geometry

Ref.	Building Name	Sub-Building Name	Displacement Line	Distance Along Line: Start [m]	Distance Along Line: End [m]	Vertical Offsets from Line for Vertical Movement Calculations [m]	Vertical Displacement Limit Sensitivity [mm]	Damage Category Strains	Poisson's Ratio	E/G
1	14 Hampstead Hill	Sub 1	No. 14 Hampstead Hill Gardens 1	0.00000	15.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
2	14 Hampstead Hill	Sub 2	No. 14 Hampstead Hill Gardens 2	0.00000	2.28000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
3	14 Hampstead Hill	Sub 3	No. 14 Hampstead Hill Gardens 3	0.00000	2.49000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
4	14 Hampstead Hill	Sub 4	No. 14 Hampstead Hill Gardens 4	0.00000	8.57000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
5	14 Hampstead Hill	Sub 5	No. 14 Hampstead Hill Gardens 5	0.00000	17.99000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
6	12 Hampstead Hill	Sub 6	No. 12 Hampstead Hill Gardens 1	0.00000	7.40000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
7	12 Hampstead Hill	Sub 7	No. 12 Hampstead Hill Gardens 2	0.00000	0.62900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
8	12 Hampstead Hill	Sub 8	No. 12 Hampstead Hill Gardens 3	0.00000	2.84000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
9	12 Hampstead Hill	Sub 9	No. 12 Hampstead Hill Gardens 4	0.00000	12.43000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
10	12 Hampstead Hill	Sub 10	No. 12 Hampstead Hill Gardens 5	0.00000	0.42900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
11	12 Hampstead Hill	Sub 11	No. 12 Hampstead Hill Gardens 6	0.00000	3.42900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
12	12 Hampstead Hill	Sub 12	No. 12 Hampstead Hill Gardens 7	0.00000	1.71400	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
13	12 Hampstead Hill	Sub 13	No. 12 Hampstead Hill Gardens 8	0.00000	1.57000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
14	12 Hampstead Hill	Sub 14	No. 12 Hampstead Hill Gardens 9	0.00000	1.62400	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
15	12 Hampstead Hill	Sub 15	No. 12 Hampstead Hill Gardens 10	0.00000	3.42900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000

Specific Buildings - Bending Parameters

Ref.	Building Name	Sub-Building Name	Height [m]	Default	Hogging: 2nd Mom. of Area (per unit width) [m³]	Hogging: Dist. of Bending Strain from N.A. [m]	Hogging: Dist. of N.A. from Edge of Beam in Tension [m]	Sagging: 2nd Mom. of Area (per unit width) [m³]	Sagging: Dist. of Bending Strain from N.A. [m]	Sagging: Dist. of N.A. from Edge of Beam in Tension [m]
1	14 Hampstead Hill	Sub 1	12.000	Yes	576.00	12.000	12.000	144.00	6.0000	6.0000
2	14 Hampstead Hill	Sub 2	12.000	Yes	576.00	12.000	12.000	144.00	6.0000	6.0000
3	14 Hampstead Hill	Sub 3	12.000	Yes	576.00	12.000	12.000	144.00	6.0000	6.0000
4	14 Hampstead Hill	Sub 4	12.000	Yes	576.00	12.000	12.000	144.00	6.0000	6.0000
5	14 Hampstead Hill	Sub 5	12.000	Yes	576.00	12.000	12.000	144.00	6.0000	6.0000
6	12 Hampstead Hill	Sub 6	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000

Ref.	Building Name	Sub-Building Name	Height	Default	Hogging: 2nd Mom. of Area	Hogging: Dist. of Bending	Hogging: Dist. of N.A. from	Sagging: 2nd Mom. of Area	Sagging: Dist. of Bending	Sagging: Dist. of N.A. from
7	12 Hampstead Hill	Sub 7	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
8	12 Hampstead Hill	Sub 8	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
9	12 Hampstead Hill	Sub 9	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
10	12 Hampstead Hill	Sub 10	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
11	12 Hampstead Hill	Sub 11	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
12	12 Hampstead Hill	Sub 12	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
13	12 Hampstead Hill	Sub 13	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
14	12 Hampstead Hill	Sub 14	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
15	12 Hampstead Hill	Sub 15	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000

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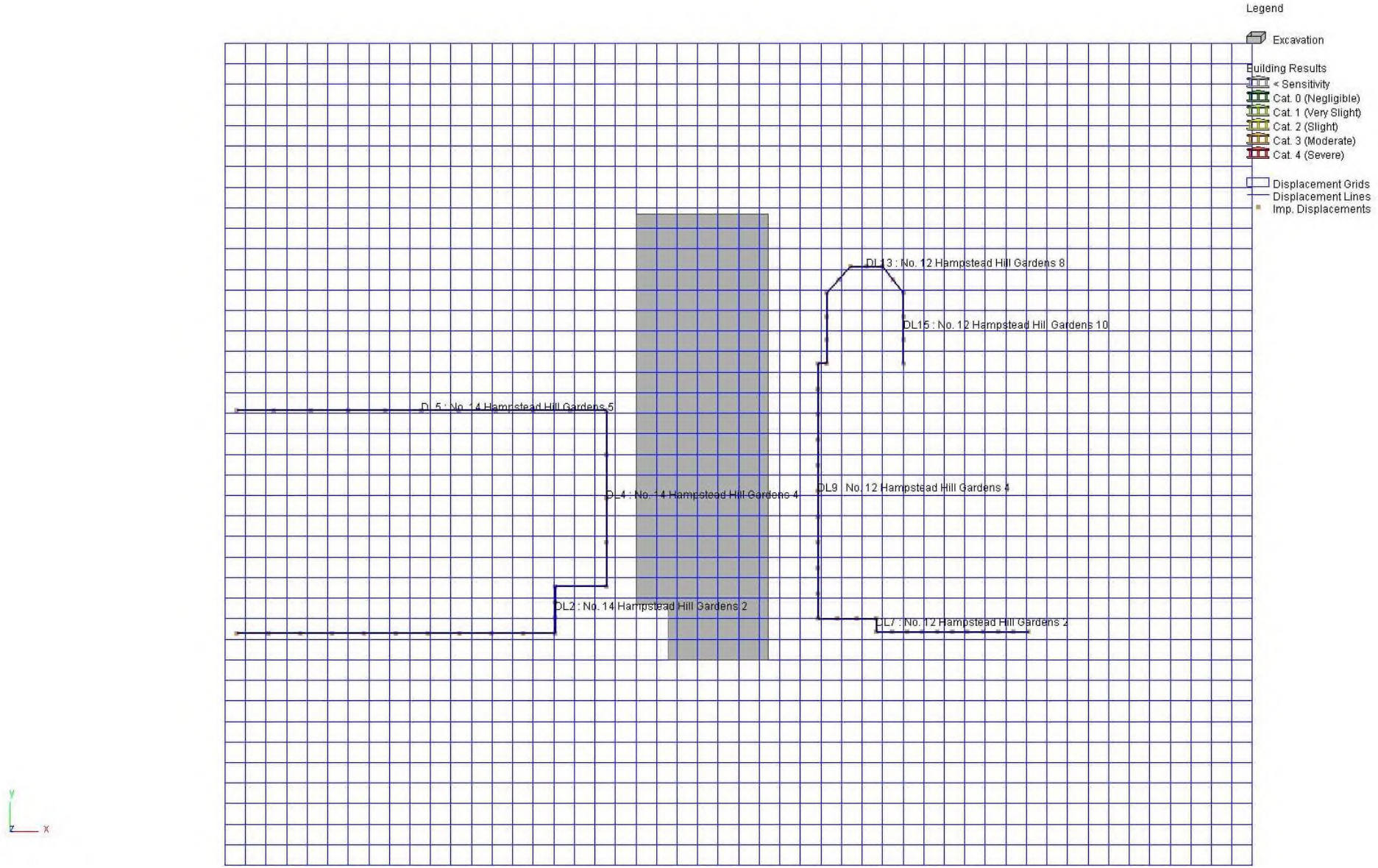

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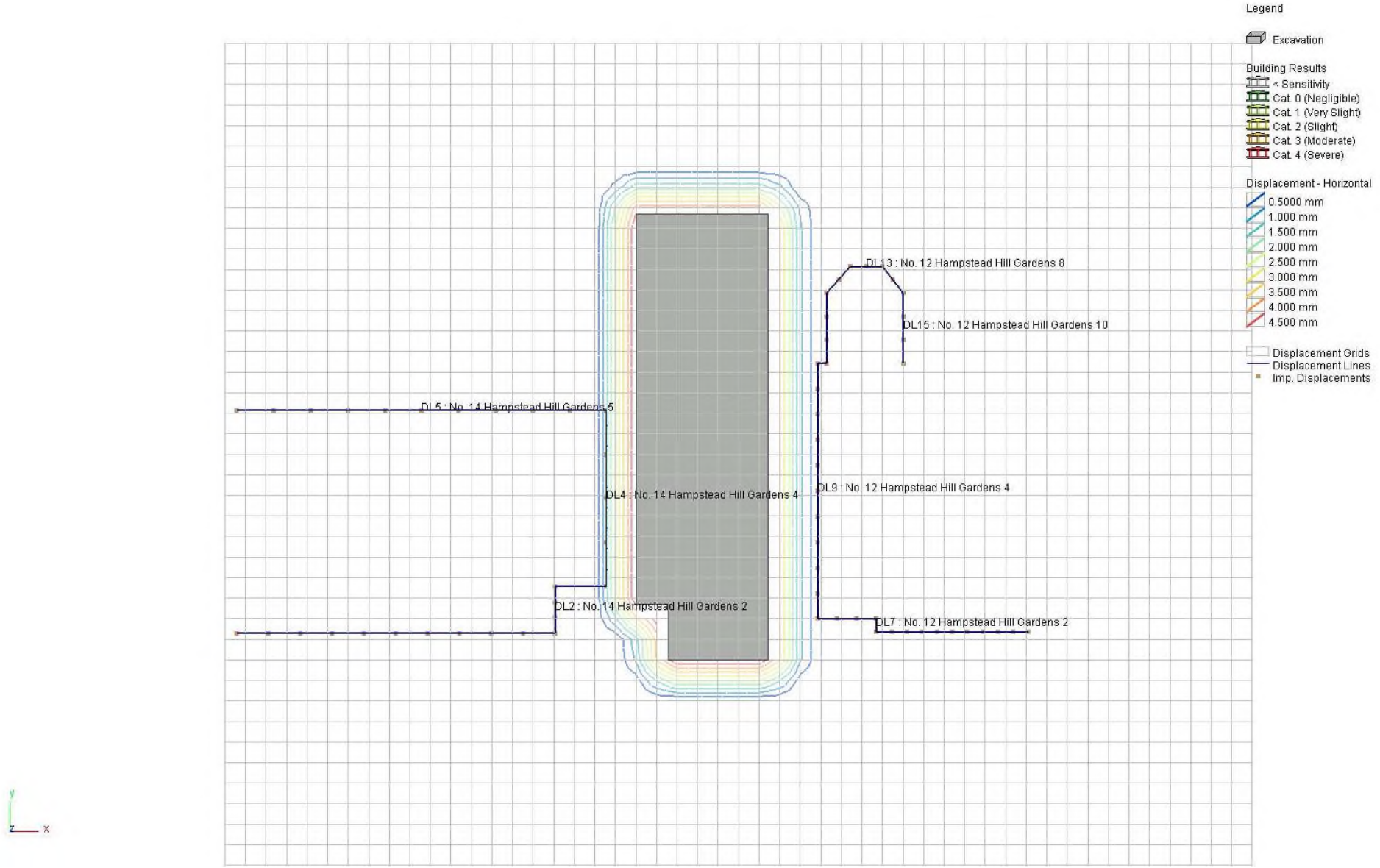

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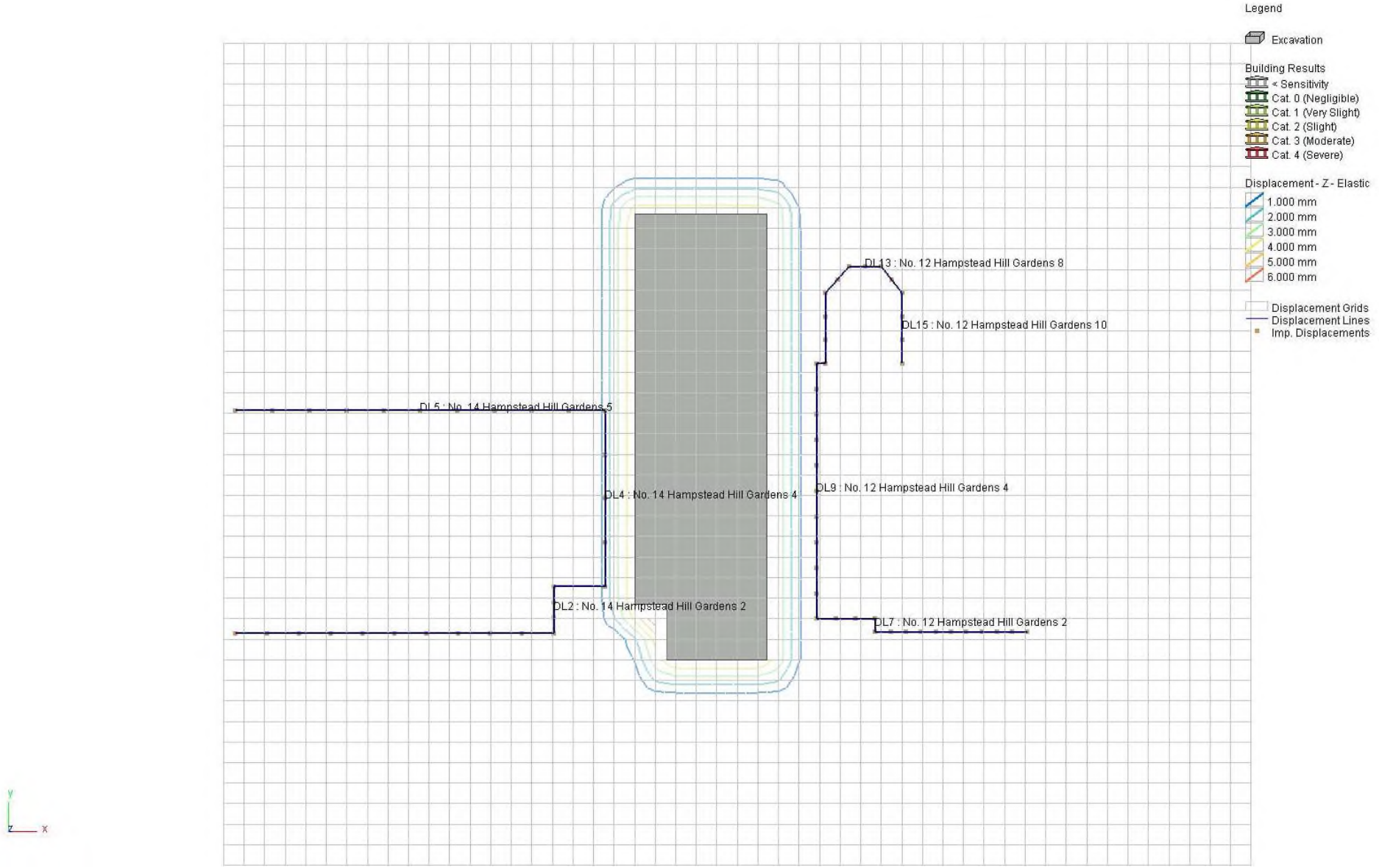

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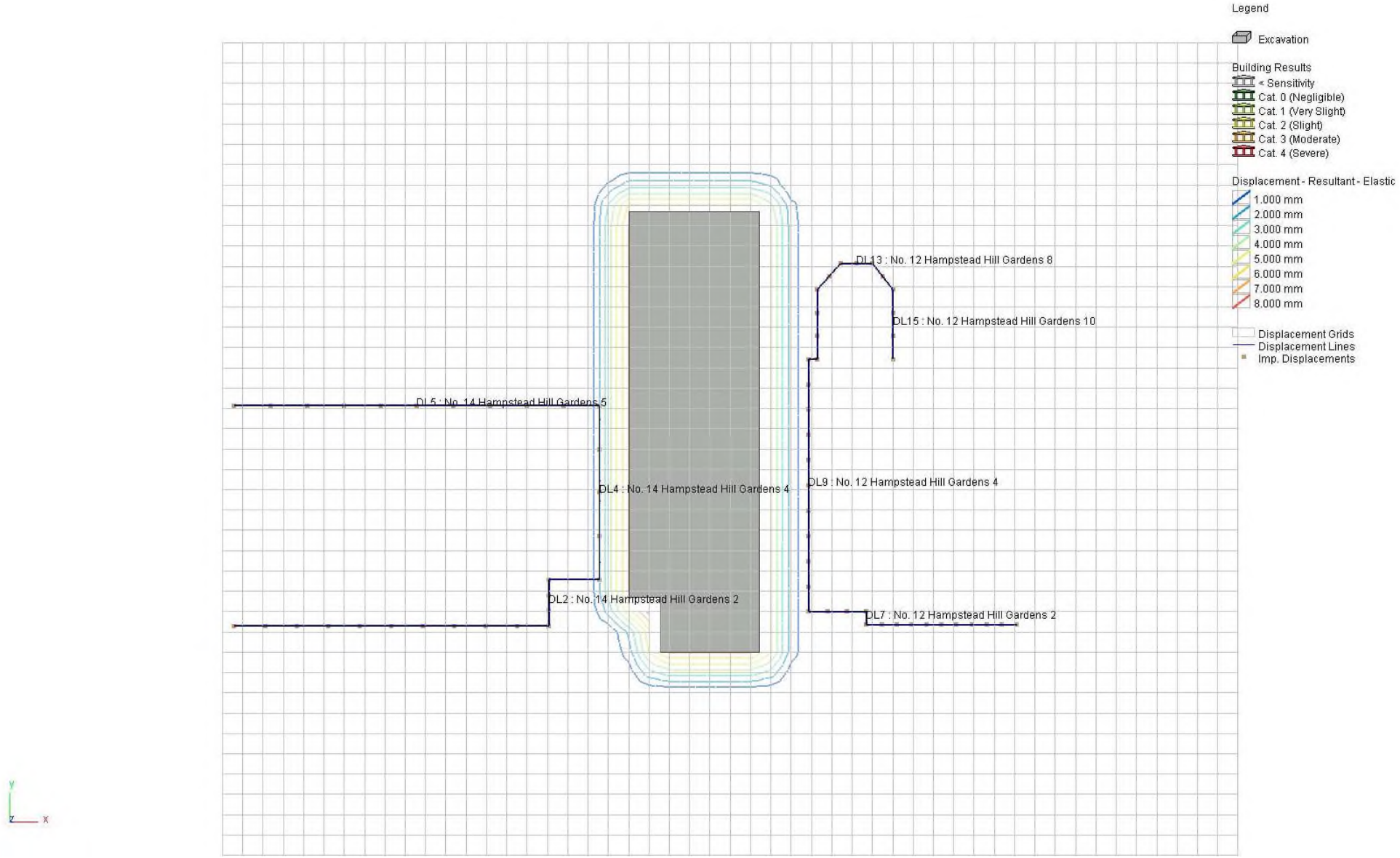

Specific Building Damage Results - Critical Values for All Segments within Each Sub-Building

Stage: Ref.	Stage: Name	Specific Building: Ref.	Specific Building: Name	Sub-building Name	Vertical Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging) [m]	Min Radius of Curvature (Sagging) [m]	Damage Category
0	Base Model	1	14 Hampstead Hill	Sub 1	0.0	0.0060168	0.0	303.03E-6	0.0	0.0059156	0.0	303.03E-6	-	-	0 (Negligible)
		2	14 Hampstead Hill	Sub 2	0.0	0.026053	0.0	0.0010797	0.0	0.025814	0.0	0.0010797	-	-	0 (Negligible)
		3	14 Hampstead Hill	Sub 3	0.0	0.0	0.057229	-183.44E-6	0.0	0.057229	-571.96E-6	-183.44E-6	-	-	1 (Very Slight)
		4	14 Hampstead Hill	Sub 4	0.0	0.031087	0.0	0.0019049	0.0	0.030206	0.0	0.0019049	-	979.39	0 (Negligible)
		5	14 Hampstead Hill	Sub 5	0.0	0.034799	0.015842	-0.0024531	0.0	0.050919	-791.48E-6	-0.0024531	-	784.27	1 (Very Slight)
		6	12 Hampstead Hill	Sub 6	0.0	0.0079735	0.0	486.54E-6	0.0	0.0077583	0.0	486.54E-6	-	-	0 (Negligible)
		7	12 Hampstead Hill	Sub 7	0.0	0.0	0.0	207.18E-6	0.0	35.763E-9	0.0	207.18E-6	-	-	0 (Negligible)
		8	12 Hampstead Hill	Sub 8	0.0	0.022352	0.0	947.96E-6	0.0	0.021795	0.0	947.96E-6	-	-	0 (Negligible)
		9	12 Hampstead Hill	Sub 9	0.0	0.046684	0.0	0.0020508	0.0	0.044837	0.0	0.0020508	-	471.54	0 (Negligible)
		10	12 Hampstead Hill	Sub 10	0.0	0.0	0.0	-0.0017660	0.0	35.763E-9	0.0	-0.0017660	-	-	0 (Negligible)
		11	12 Hampstead Hill	Sub 11	0.0	0.058036	0.0	-0.0021622	0.0	0.055953	0.0	-0.0021622	-	541.98	1 (Very Slight)
		12	12 Hampstead Hill	Sub 12	0.0	0.072676	0.0	-0.0023515	0.0	0.072007	0.0	-0.0023515	-	291.83	1 (Very Slight)
		13	12 Hampstead Hill	Sub 13	0.0	0.042642	0.0	-0.0012836	0.0	0.042312	0.0	-0.0012836	-	-	0 (Negligible)
		14	12 Hampstead Hill	Sub 14	0.0	0.027921	0.0	-635.57E-6	0.0	0.027690	0.0	-635.57E-6	-	-	0 (Negligible)
		15	12 Hampstead Hill	Sub 15	0.0	0.0088007	0.0	-317.90E-6	0.0	0.0085890	0.0	-317.90E-6	-	-	0 (Negligible)

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