Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Tel: 0208 594 8134
Fax: 0208 594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons). MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref: **16/25536-2**
December 2016

28 CANFIELD GARDENS

LONDON, NW6 3LA

BASEMENT IMPACT ASSESSMENT

Revised report – December 2019

Prepared for

Martin Redston Associates

Acting on behalf of

Kolyma Investments Limited

CONTENTS

1.0 NON-TECHNICAL SUMMARY

1.1 Project Objectives

At the request of Martin Redston Associates, working on behalf of Kolyma Investments Limited, a Basement Impact Assessment has been carried out at 28 Canfield Gardens, London, NW6 2LA in support of a planning application for a proposed development which includes the construction of a single storey basement beneath the current property. It is understood that the proposed basement is at a level of approximately 2.880 mOD.

1.2 Desk Study Findings

From historical map evidence it would appear that the site was first built on between 1871 and 1896, with minor changes taking place to the property since its construction. The surrounding area was initially used for agricultural and recreational uses, however this predominately changed to residential, although some industrial sites including a coal depot, warehouses and a food factory have been present within the area.

1.3 Ground Conditions

The boreholes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 2.40m in thickness resting on deposits of the London Clay formation. The Made Ground extended down to depths of between 0.60m and 2.40m (43.40mOD to 41.60mOD). The material generally comprised a surface layer of either concrete or slate chippings over a brown, black clayey gravelly sand with brick and concrete fragments underlying a brown, black silty sandy clay containing brick and concrete fragments. The London Clay formation was encountered below the Made Ground and consisted of stiff clay with occasional pockets and partings of silty fine sand and scattered gypsum crystals. These deposits extended down to the full depths of investigation of 15.00m below ground level in Borehole 1 and 10.00m below ground level in Borehole 2 (29.00 to 34.00 mOD). Following drilling operations, groundwater monitoring piezometers were installed in Boreholes 1 and 2 to approximately 8.00m and 8.50m depth.

Groundwater was encountered at respective depths of 5.78m and 0.53m within the standpipes in Boreholes 1 and 2 after a period of approximately four months.

1.4 Recommendations

A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans. Trigger levels on movements will need to be defined. Precise levelling or reflective survey targets should be installed at the garden walls and neighbouring buildings. It would be prudent to continue to monitor the standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations. The chosen contractor should also have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure.

The qualifications required by L. B. Camden are fulfilled as documented in Table A below. All assessors meet the qualification requirements of the council guidance.

Subject	Qualifications Required by CPG4	Relevant persons and qualifications/experience	
		Name/Qualifications	Experience
Surface flow and flooding	A hydrologist or a Civil Engineer specialising in flood risk management and surface water drainage, with either: • The 'CEng' (Chartered Engineer) qualification from the Engineering Council; or a Member of the Institution of Civil Engineers ('MICE') • The CWEM (Chartered Water and Environmental Manager) qualification from the Chartered Institution of Water and Environmental Management	Mr Neil Smith Eur Ing, BSc (Eng), MSc, CEng, FICE, FGS	40+ years' experience in geotechnics and hydrogeology, British Geotechnical Association Member, International Society for Soil Mechanics and Geotechnical Engineering
		Mr Thomas Murray BSc(hons) MSc FGS	5.5+ years of hydrogeological experience
		Mr Andrew Garnham BSc(Hons) MSc FGS	10+ years of hydrogeological experience
Subterranean (ground water flow)	A hydrogeologist with the 'CGeol' (Chartered Geologist) qualification from the Geological Society of London	Mike Brice BSc MSc DIC CGeol	30+ years of hydrological/geotechnical experience and Member British Geotechnical Association)
Land Stability	A Civil Engineer with the 'CEng (Chartered Engineer) qualification from the Engineering Council or specialising in ground engineering; or A Member of the Institution of Civil Engineers ('MICE') and a Geotechnical Specialist as defined by the Site Investigation Steering Group	Mike Brice BSc MSc DIC CGeol	30+ years of hydrological/geotechnical experience and Member British Geotechnical Association)

Table A – Qualifications

2.0 INTRODUCTION

2.1 Project Objectives

At the request of Martin Redston Associates, working on behalf of Kolyma Investments Limited, a Basement Impact Assessment has been carried out at the above site in support of a planning application.

The purpose of this assessment is to consider the effects of a proposed basement construction on the local slope stability, surface water and groundwater regime at the existing residential property.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the Client and other parties, including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

2.2 Planning Policy Context

The information contained within this BIA has been produced to meet the requirements set out by Camden Planning Guidance – Basements and Lightwells (CPG4) including Camden Development Policies DP27 – Basements and Lightwells (Ref. 1) in order to assist London Borough of Camden with their decision making process.

As recommended by the Guidance for Subterranean Development (Ref. 1) the BIA comprises the following steps

1. **Initial screening** to identify where there are matters of concern

2. **Scoping** to further define the matters of concern

3. **Site Investigation and study** to establish baseline conditions

4. **Impact Assessment** to determine the impact of the basement on baseline conditions

5. **Review and Decision Making** (to be undertaken by LBC)

3.0 SITE DETAILS

(National Grid Reference: TQ261845)

3.1 Site Location

28 Canfield Gardens is a residential property, located on the northern side of Canfield Gardens, South Hampstead at approximate postcode NW6 3LA. The residential dwelling has three levels of accommodation; ground, first and second floor with rooms in the roof space and a lower ground floor. The residential property also comprises a front and rear garden. The site covers an approximate area of 0.03 Hectares with the general area being under the authority of the London Borough of Camden.

The site is located on the northern side of Canfield Gardens with residential properties to the north-east and south-west, with private gardens to the north-west and a roadway to the south-east.

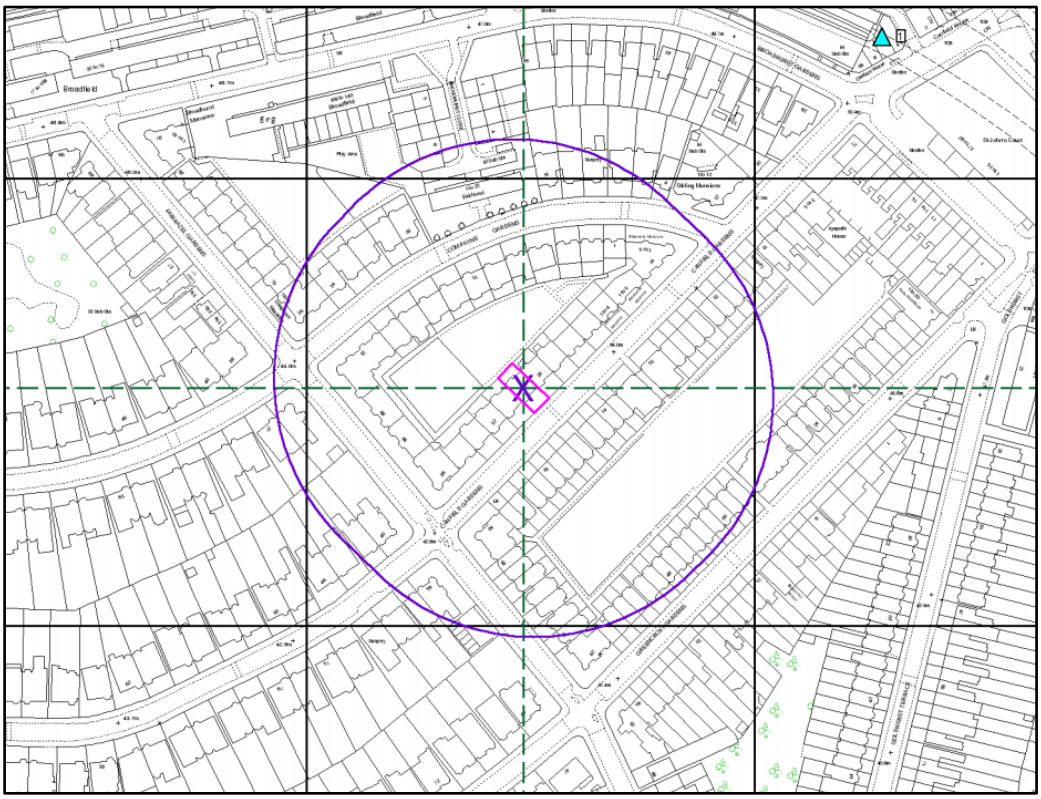


Figure 1. Site Location Plan

3.2 Site Layout and History

The site is accessed from Canfield Gardens located to the south and comprises of a three storey residential property, with front and rear garden areas.

The property is bound by Canfield Road to the south, with residential properties with residential properties to the north-east and south-west.

The property contains a brick paved pathway, with two medium trees on either side, leading up to the front door of the property.

With reference to available spot height data from Ordnance Survey (OS) mapping, an assumed ground level of approximately 43m AOD is anticipated at the site. Based on this level, it is understood that ground level at the site steps down from approximately 43mAOD at the front of the property to approximately 42.15mAOD at lowered rear garden level.

The site slopes very gently to the south-west. The slope angle is less than 7 degrees. Also with reference to the Camden Geological, Hydrogeological and Hydrological Study, (Figure 2 below), the neighbouring properties also have slopes less than 7 degrees.

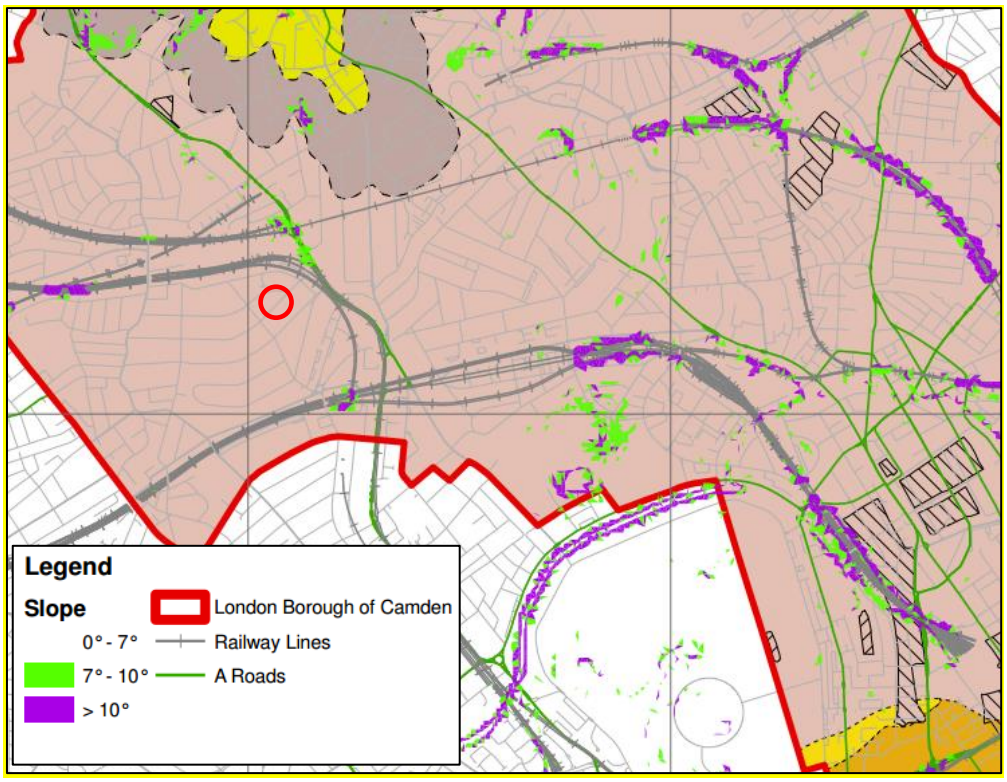


Figure 2. Exact from Figure 16 of the Camden CPG4 showing slope angles within the borough

From historical map evidence it would appear that the site was first built on between 1871 and 1896, with minor changes taking place to the property since its construction. The surrounding area was initially used for agricultural and recreational uses, however this predominately changed to residential, although some industrial sites, including a coal depot, warehouses and a food factory have been present within the area.

3.3 Previous Reports

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 16/25536-1) and Phase 2 Site Investigation (SAS Report Ref: 16/25536) was undertaken across the site by Site Analytical Services Limited in August 2016 and the results are discussed in this BIA.

3.4 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain the London Clay Formation at depth.

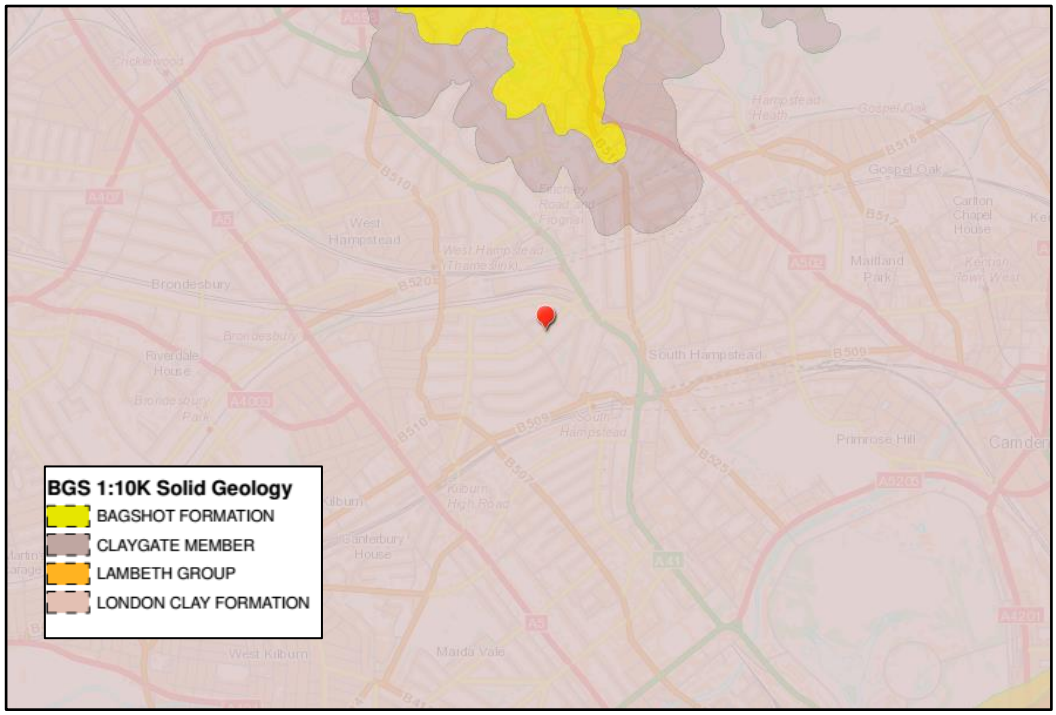


Figure 4. Geology of the Site (Ref. BGS Geoindex)

The British Geological Survey maintains an archive of historical exploratory borehole logs throughout the UK. SAS has searched the database and have found that there are 4 boreholes located within 150m of the site. These reveal Made Ground to a depth of 0.90m underlain the London Clay Formation to the full depth of excavation at 7m.

3.5 Hydrology and drainage

3.5.1 Surface Water

According to Mayes (1997) rainfall in the local area averages around 610mm and significantly less than the national average of around 900mm.

Evapotranspiration is typically 450mm/year resulting in about 160mm/year as 'hydrologically effective' rainfall which is available to infiltrate into the ground or run-off as surface water flow.

With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within 5m of the site (Figure 5).

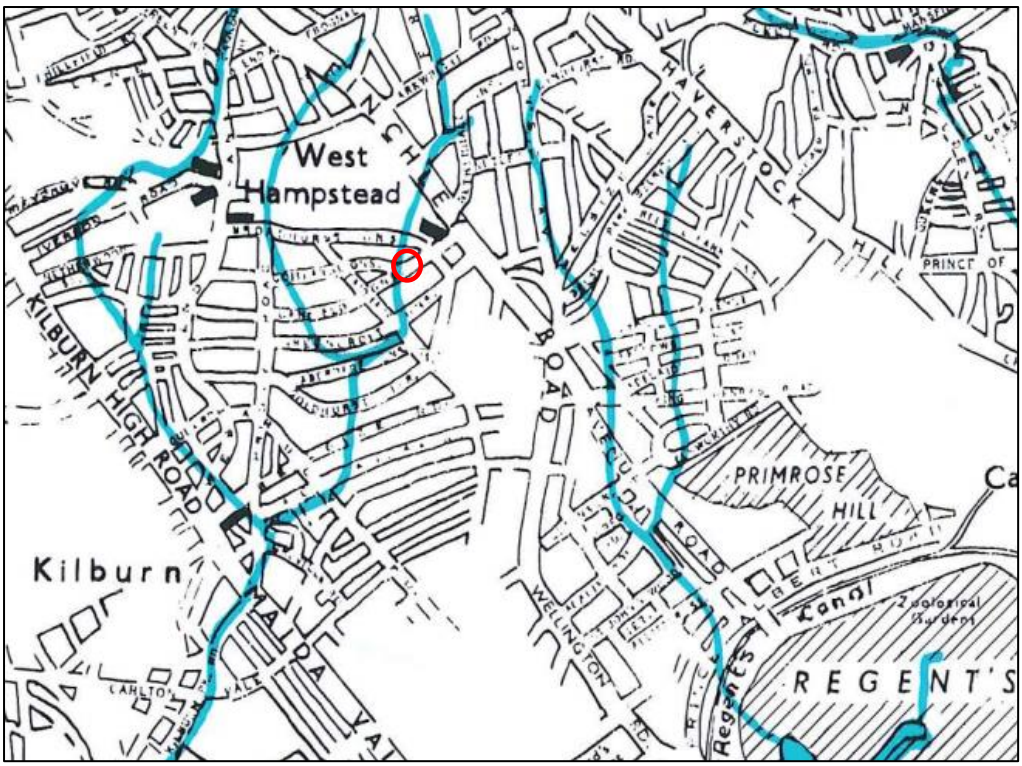


Figure 5. Location of site (circled) relative to the 'Lost Rivers' of London (Source: Barton, 1992)

The River Westbourne flowed in a southerly direction from West Hampstead. From the tributaries it flowed southwards towards Kilburn, across Bayswater Road and into Hyde Park, where it entered the Serpentine. From the Serpentine it flowed southwards under Knightsbridge before issuing into the River Thames within the grounds of Chelsea Hospital.

The watercourses have since been largely lost through a culverting system as the urban extent of the borough has grown over time.

Envirocheck indicates that the closest surface water feature is a drain located 691m east of the site.

The area located immediately around the site is highly developed with more than 80% of the surface covered with hardstanding. Most of the rainfall in the area will run-off hard surface areas and be collected by the local sewer network.

Surface drainage from the site is assumed to be directed to drains flowing downhill to the south-west along Canfield Road.

Further investigation into the 'lost river' using Ordnance survey maps taken from the Desk Top Study (Figure 6) indicate a small drainage ditch running between two field boundaries (1871) which is the only indication of a water source for the River Westbourne. By 1896 this ditch/stream has either been culverted and running beneath the roads, or has been removed as it is no longer needed.

Due to the small size of the ditch, any possible flooding that may have occurred is unlikely to have caused anything but very thin layers of Alluvium, but is unlikely to extend as far as No. 28 as such there is no influence on site.

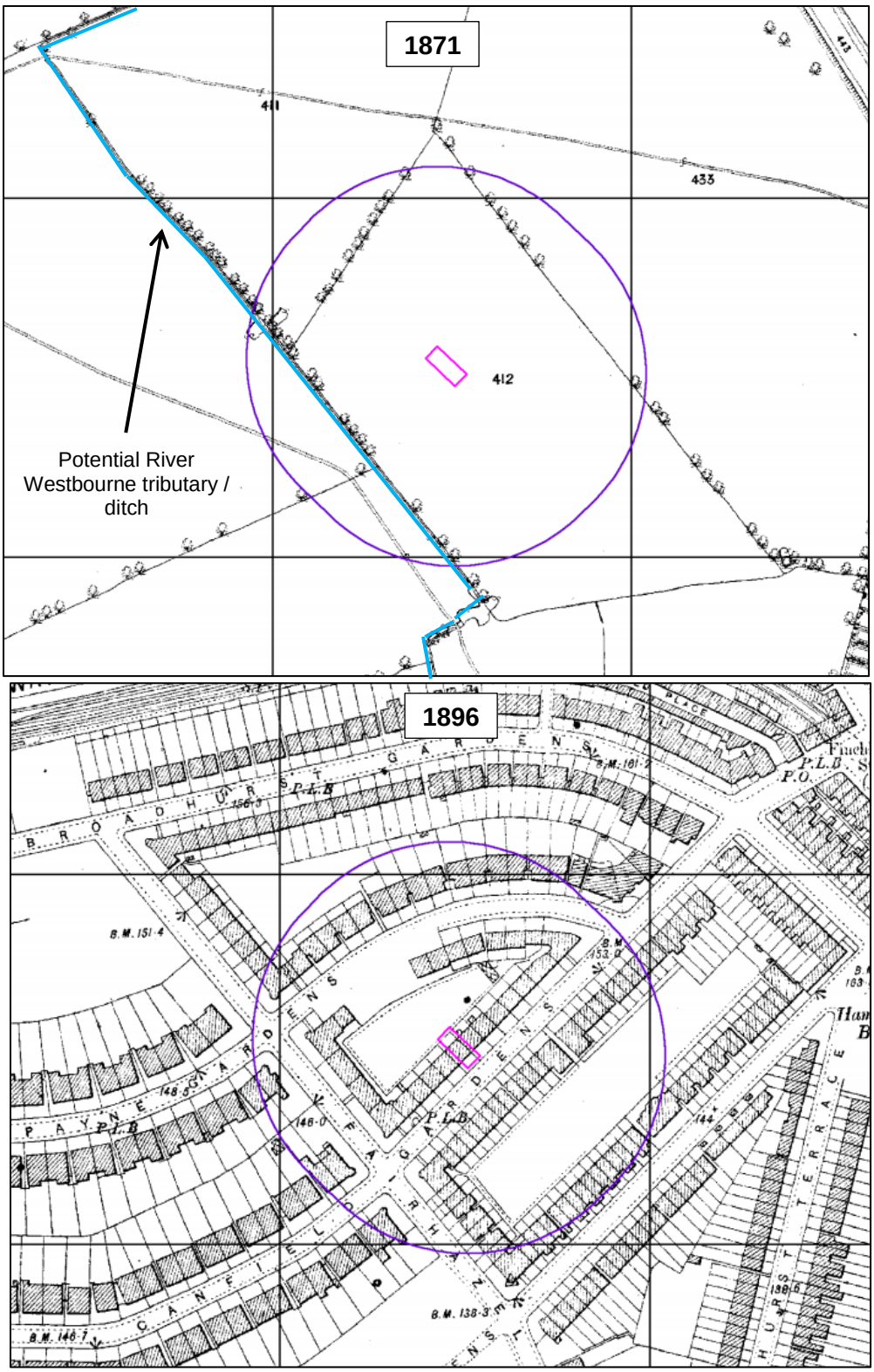


Figure 6. Location of site from Ordnance Survey Maps

3.5.2 Flood Risk

3.5.2.1 River or Tidal flooding

According to Environment Agency Flood maps there are no flood risk zones within 1 kilometre of the site. The EA's website also shows that this area does not fall within an area at risk of flooding from reservoirs. Based on this information a flood risk assessment will not be required.

3.5.2.2 Surface water flooding

Figure 7 shows that Canfield Gardens flooded during the 2002 event, but not in the 1975 flood event.

Figure 7. Exact from Figure 15 of the Camden CPG4 showing roads which flooded in 1975 (light blue), in 2002 (dark blue) and 'areas with potential to be at risk from surface water flooding' (wide light blue bands)

Further modelling of surface water flooding has been undertaken by the Environment Agency and was published on its website in January 2014; an extract from their model is presented in Figure 7. Whilst this map identifies four levels of risk (high, medium, low and very low) it is understood that it is based at least in part on depths of flooding. This modelling shows a 'Very Low' risk of flooding (the lowest category for the national background level of risk) for No.9 and the surrounding area.

A Flood Risk Assessment has been completed by Sandersons Associates which concludes that the site can be developed without increasing flood risk to the site itself and other sites in the vicinity with the implementation of suitable mitigation measures.

3.5.2.3 Sewer flooding

The London Regional Flood Risk Appraisal (2009) advises that foul sewer flooding is most likely to occur where properties are connected to the sewer system at a level below the hydraulic level of the sewage flow, which in general are often basement flats or premises in low lying areas. There is no record of sewer flooding having occurred at 28 Canfield Gardens and therefore the risk of sewer flooding is considered low.

3.6 Hydrogeological setting

The Environment Agency Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) and also their role in supporting surface water flows and wetland ecosystems.

The Bedrock geology underlying the site (London Clay) has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Other hydrogeological data obtained from the Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 16/25536) for the site include:

- The underlying soil classification of the site is of high leaching potential.
- The site is located 516m to the east of a Zone II (Outer Protection Zone) Source Protection Zone.
- There are 4 groundwater abstraction licences listed within one kilometre of the site. The closest is located 686m east of the site and relates to spray irrigation.

3.7 Proposed Development

It is proposed to extend the existing basement beneath the majority of the existing property to a depth of 2.70m below the existing ground level.

Within this report, the deepest level of excavation (47.52mSD) will be reference in relation to possible water levels encountered during site work.

Sections showing the proposed developments are detailed in Figure 8 below.

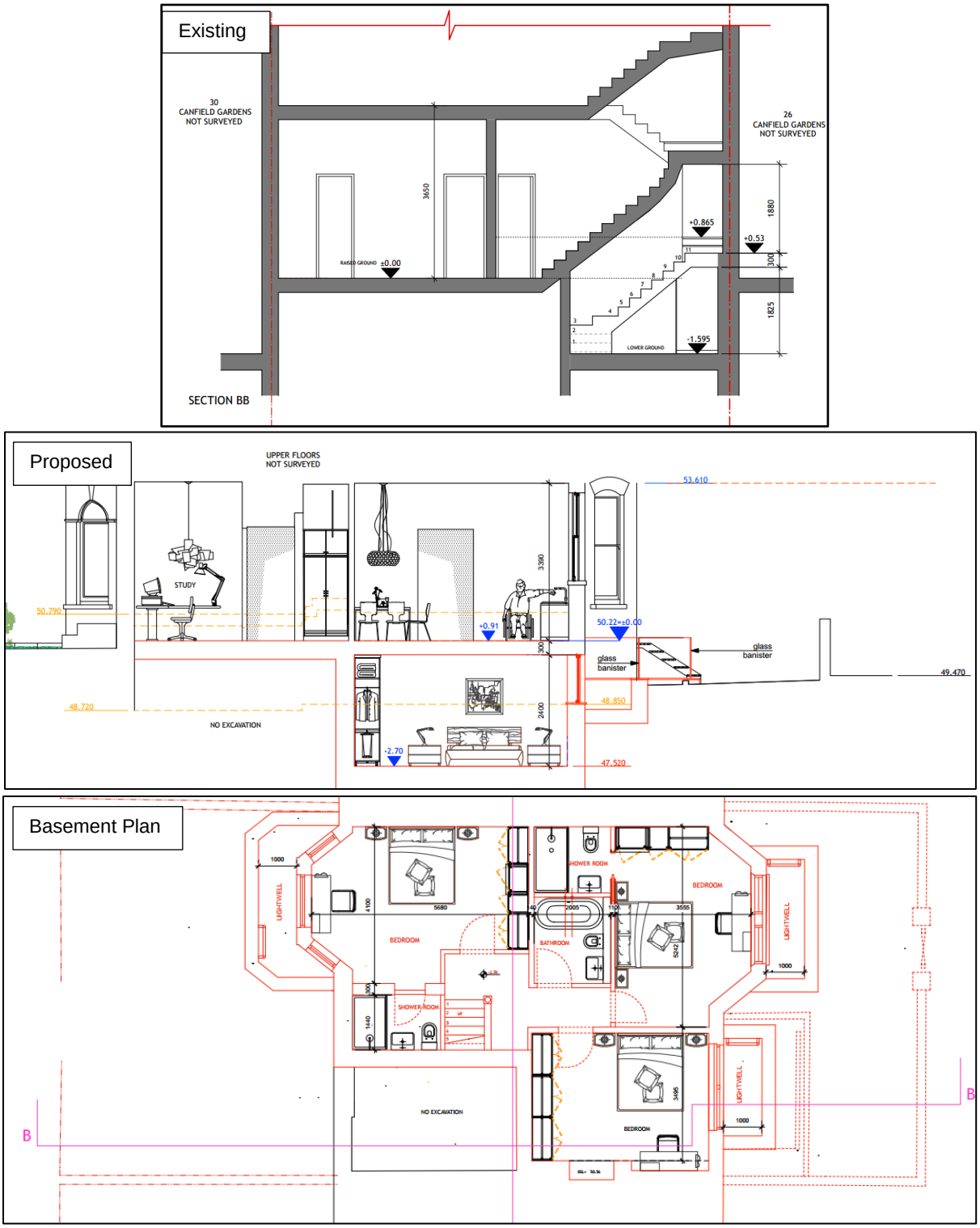


Figure 8. Sections of the existing and proposed elevations as well as the basement plan of the property.

3.8 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site and the results are summarised in Table 1 below:

Table 1: Summary of screening results

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	No	The site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	1b. Will the proposed basement extend beneath the water table surface?	Unknown – to be confirmed by Ground Investigation	Given the presence of a non-aquifer below the site it is unlikely that groundwater will be encountered during any excavations for the proposed basement, however this will be confirmed by the ground investigation.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	Yes	Envirocheck indicates that the closest surface water feature is a drain located 691m east of the site. With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within 5m of the site (Figure 5). From the British Geological Society 'Geoindex' the nearest water well is located approximately 2.37 km south of the site.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	Yes	The amount of hardstanding on-site will be substantially reduced.
	4. 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	Existing drainage paths are to be utilised where possible. Whether soakaways/SUDS are used on the proposed development is to be confirmed (beyond the scope of this report). An appropriately qualified engineer should be engaged to ensure mandatory requirements are met.
	5. 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 or spring line.	Yes	Envirocheck indicates that the closest surface water feature is a drain located 691m east of the site. With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within 5m of the site (Figure 5). From the British Geological Society 'Geoindex' the nearest water well is located approximately 2.37 km south of the site.

Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8).	No	There is a slight slope from north to south across the site, but is below 7 degrees.
	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	Re-profiling of landscaping at the site is not proposed.
	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 surrounding area drops to the south-east, but from survey information and with reference to Figure 16 from Camden CPG 4, this is at angles of less than 7 degrees.
	4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8).	No	There is a general slope in the area towards the south down to the south-east, but this is at an angle of less than 7 degrees.
	5. Is the London Clay the shallowest strata at the site.	Yes	With reference to available BGS records, the London Clay formation is expected to be encountered from ground level.
	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 are to be felled as part of the development. An arboricultural impact report (Ref: jc/aiams1/28cg) has been prepared which confirms that no basement development will intrude upon root protection areas.
	7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	Yes	The site lies above the London Clay formation well known as having a high tendency to shrink and swell.
	8. Is the site within 100m of a watercourse or a potential spring line.	Yes	Envirocheck indicates that the closest surface water feature is a drain located 691m east of the site. With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within 5m of the site (Figure 5).
	9. Is the site within an area of previously worked ground.	No	According to records from the BGS the site is not in the vicinity of any recorded areas of worked ground.

	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 site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	11. Is the site within 50m of the Hampstead Heath Ponds	No	With reference to the Camden Geological, Hydrogeological and Hydrological Study, the site is not within the catchment of the pond chains on Hampstead, nor the Golder's Hill Chain.
	12. Is the site within 5m of a highway or pedestrian right of way.	Yes	The site lies within 5m of Canfield Gardens.
	13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	No	The development will increase the depths of foundation at the site, although this will not extend significantly below foundation depths of adjacent properties, indicated in the historic planning records.
	14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	No	A full statutory service search has been completed as part of this investigation and it is confirmed that no utilities will be affected by the proposed development.
Surface Water and Flooding	1. Is the site within the catchment of the ponds chains on Hampstead Heath	No	With reference to the Camden Geological, Hydrogeological and Hydrological Study, the site is not within the catchment of the pond chains on Hampstead, nor the Golder's Hill Chain.
	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	No – any additional surface water generated from an increased hardstanding area will be attenuated to ensure they are not increased or altered. The basement will be beneath the footprint of the new dwelling therefore the 1m distance between the roof of the basement and ground surface as recommended by Chapter 5 of the Arup report, does not apply across these areas.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	Yes	The proportion of hard-surface / paved areas will be reduced.

	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	All surface water for the site will be contained within the site boundaries and collected as described above; hence there will be no change from the development on the quantity or quality of surface water being received by adjoining sites. The basement will be beneath the footprint of the dwelling therefore the 1m distance between the roof of the basement and ground surface as recommended by Chapter 5 of the Arup report does not apply across these areas.
	5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses.	No	The surface water quality will not be affected by the development, as in the permanent condition collected surface water will be generally be from roofs, domestic hard landscaping or collected from beneath the landscaping layer over the basement.
	6. Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature	Yes	Canfield Gardens flooded during the 2002 flood event. According to modelling by the Environment Agency, there is a 'Very Low' risk of surface water flooding (the lowest category for the national background level of risk) for No.28 and the surrounding area.

3.9 Non-Technical Summary of Chapter 3.0

28 Canfield Gardens is a residential property, located on the northern side of Canfield Gardens, South Hampstead at approximate postcode NW6 3LA. The residential dwelling has three levels of accommodation; ground, first and second floor. The residential property also comprises a front and rear garden.

The property is constructed on very slightly sloping ground from north-east to south-west.

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain by the London Clay formation. The London Clay formation is classed as unproductive strata or a non-aquifer.

Envirocheck indicates that the closest surface water feature is a drain located 691m east of the site.

According to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011) and Stanford (1868) the site is located approximately 5m north-west of the site respectively (Figure 4).

According to Environment Agency Flood maps there are no flood risk zones within 1 kilometre of the site. The EA's website also shows that this area does not fall within an area at risk of flooding from reservoirs.

Based on this information a flood risk assessment will be required. Canfield Gardens flooded during the 2002 flood event. Modelling of surface water flooding by the Environment Agency shows a 'Very Low' risk of flooding (the lowest category for the national background level of risk) for No.28 and the surrounding area.

The Screening Exercise has identified the following potential issues which will be carried forward to the Scoping Phase

Subterranean Groundwater Flow

- Will the proposed basement extend beneath the water table surface?
- Is the site within 100m of a watercourse, well (used / disused) or potential spring line.
- 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 or spring line.

Slope Stability

- Is the London Clay the shallowest strata at the site?
- Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?
- Is the site within 100m of a watercourse or a potential spring line?
- Is the site within 5m of a highway or pedestrian right of way?

Surface Water and Flooding

- Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?

4.0 SCOPING PHASE

4.1 Introduction

This purpose of the scoping phase is to assess in more detail the factors to be investigated in the impact assessment. Potential impacts are assessed for each of the identified impact factors and recommendations are stated.

A conceptual ground model is usually complied at the scoping stage however, because the ground investigation has already been undertaken for this project, the conceptual ground model including the findings of the ground investigation is described under Chapter 4.

Subterranean (Groundwater Flow)

Potential Issue (Screening Question)		**Potential impacts and actions**
1	Will the proposed basement extend beneath the water table surface?	**Potential impact:** Local restriction of groundwater flows (perched groundwater or below groundwater table). **Action:** Ground investigation required, the review.
2	Is the site within 100m of a watercourse, well (used / disused) or potential spring line	**Potential impact:** The flow from a spring, well or watercourse may increase or decrease if the groundwater flow regime is affected by the proposed basement **Action:** Review hydrogeology of the site and undertake a ground investigation.

Slope Stability

3	Is the London Clay the shallowest strata at the site?	**Potential impact:** The London Clay is prone to seasonal shrink-swell (subsidence and heave). **Action:** Ground investigation required, the review.
4	Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	**Potential Impact:** Ground movements will occur during and after the basement construction. **Action:** Ground investigation required, then review.
5	Is the site within 5m of a highway or a pedestrian right of way?	**Potential impact:** Excavation of basement causes loss of support to footway/highway and damage to the services beneath them. **Action:** Ensure adequate temporary and permanent support by use of best practice working methods.

6	Will the proposed basement substantially increase the differential depth of foundations relative to neighbouring properties?	**Potential impact:** Loss of support to the ground beneath the new foundations to neighbouring properties if basement excavations are inadequately supported. **Action:** Ensure adequate temporary and permanent support by use of best practice methods.

Surface Water and Flooding

Potential Issue (Screening Question)		**Potential impacts and actions**
8	Is the site in an area known to be at risk from surface water flooding?	**Potential impact**: Flooding occurs during the excavation of the basement **Action**: A flood risk assessment should be carried out to assess whether a groundwater exception test should be carried out prior to any construction works.

These potential impacts have been further assessed through the ground investigation, as detailed in Section 4 below.

4.2 Non-Technical Summary of Chapter 4.0

The scoping exercise has reviewed the potential impacts for each of the items carried forward from Stage 1 screening, and has identified the following actions to be undertaken:

- A ground investigation is required (which has already been undertaken).
- Review of site's hydrogeology and groundwater control requirements.

All these actions are covered in Stage 4 or Stage 3 for the ground investigation.

5.0 SITE INVESTIGATION DATA

5.1 Records of site investigation

A site-specific ground investigation was undertaken by Site Analytical Services Limited (SAS) in July to December 2016 and included two continuous flight auger boreholes (Boreholes 1 and 2).

The factual findings from the investigation are presented in Appendix B, including a site plan, exploratory hole logs, groundwater monitoring and laboratory test results.

5.2 Ground conditions

The boreholes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 2.40m in thickness resting on deposits of the London Clay formation.

5.2.1 Made Ground

The Made Ground extended down to depths of between 0.60m and 2.40m in the boreholes 1 and 2 (40.60mOD to 41.55mOD). The material generally comprised a surface layer of either concrete or slate chippings over a brown, black clayey gravelly sand with brick and concrete fragments underlying a brown, black silty sandy clay containing brick and concrete fragments.

5.2.2 London Clay Formation

The London Clay formation was encountered below the Made ground and consisted of stiff clay with occasional pockets and partings of silty fine sand and scattered gypsum crystals. These deposits extended down to the full depths of investigation of 15.00m below ground level in Borehole 1 and 10.00m below ground level in Borehole 2 (28.00 to 32.15 mOD).

5.3 Groundwater

Groundwater was not encountered within the boreholes and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Following drilling operations groundwater monitoring piezometers were installed in Boreholes 1 and 2 to approximately 8.00m and 8.50m depth respectively.

Groundwater encountered at a depth of 1.02mbgl (41.13mOD0 within Borehole 2 and was not encountered within Borehole 1 during September 2016. In November 2016 groundwater was encountered at respective depths of 5.78mbgl (37.22mOD) and 0.53mbgl (41.62mOD).

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (July to December 2016) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

5.4 In-Situ and Laboratory Testing

The results of the laboratory and in-situ tests are presented in the factual report contained in Appendix A.

5.4.1 Hand Vane Tests

In the essentially cohesive natural soils encountered at the site, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930:2015.

5.4.2 *Mackintosh Probe Tests*

Mackintosh Probe tests were made at regular depth increments in order to assess the relative density of the soils encountered in the boreholes. The results can be interpreted using the generally accepted correlation for Mackintosh Probe Tests which is as follows:

Mackintosh N75 X 0.38 = SPT 'N' Value

or

Mackintosh N300 X 0.1 = SPT 'N' Value

5.4.3 Classification Tests

Atterberg Limit tests have been conducted on three selected samples taken from Boreholes 1 and 2, and showed the samples tested to fall into Class CH according to the British Soil Classification System.

These are fine grained silty clay soils of high plasticity and as such generally have a low permeability and a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 41% and 43%, with all of the samples being above the higher 40% boundary between soils assessed as being of medium swelling and shrinkage potential and those assessed as being of high swelling and shrinkage potential.

5.4.4 Sulphate and pH Analyses

The results of the sulphate and pH analyses show the natural soil samples to have water soluble sulphate contents of up to 2.56g/litre associated with near neutral pH values.

5.5 Non-Technical Summary of Chapter 5.0

A site-specific ground investigation was undertaken by Site Analytical Services Limited (SAS) in July 2016 and included two continuous flight auger boreholes (Boreholes 1 and 2) drilled to 15m and 10m below ground level.

The boreholes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 2.40m in thickness resting on deposits of the London Clay Formation.

Following drilling operations groundwater monitoring piezometers were installed in Boreholes 1 and 2 to approximately 8.00m and 8.50m depth.

Groundwater encountered at a depth of 1.02mbgl (41.13mOD0 within Borehole 2 and was not encountered within Borehole 1 during September 2016. In November 2016 groundwater was encountered at respective depths of 5.78mbgl (37.22mOD) and 0.53mbgl (41.62mOD).

6.0 FOUNDATION DESIGN

6.1 Introduction

It is proposed to extend the existing basement beneath the majority of the existing property to a depth of 2.70m below the existing ground level.

It is understood that the proposed basement is at a level of approximately 47.52 mSD (2.70m below ground level).

6.2 Site Preparation Works

The main contractor should be informed of the site conditions and risk assessments should be undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man-made services are undertaken over the site prior to final design works.

6.3 Ground Model

On the basis of the fieldwork, the ground conditions at the site can be characterised as follows:

- Made Ground extends to depths of between 0.60m to 2.40m depth below ground level (40.60mOD to 41.55mOD).

- The London Clay formation comprising stiff silty sandy clay with gypsum crystals to the full depths of investigation of 10.00m and 15.00m below ground level (28.00 to 32.15 mOD).

- Groundwater encountered at a depth of 1.02mbgl (41.13mOD0 within Borehole 2 and was not encountered within Borehole 1 during September 2016. In November 2016 groundwater was encountered at respective depths of 5.78mbgl (37.22mOD) and 0.53mbgl (41.62mOD).

6.4 Basement Excavation

Groundwater is not expected to be encountered in the basement excavation, but it would be prudent for the chosen contractor to have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure. Trial excavations to the proposed basement depth could be carried by the main contractor to confirm the stability of the soil and to further investigate the presence of any groundwater inflows.

6.5 Conventional Spread Foundations

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Based on the ground and groundwater conditions encountered in the boreholes, it should be possible to support the proposed new development on conventional strip or basement raft foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff sandy silty clay deposits which occur at depths of between approximately 0.60m and 2.40m below ground level over the site. Foundations should be placed in the natural deposits at a minimum depth of 1.00m below final ground level in order to avoid the zone affected by seasonal moisture content changes.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 175kN/m^2 at 2.00m depth increasing to 250kN/m^2 at 4.00m depth in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from “Foundation Design and Construction”, Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, “Building near Trees" and it is considered that this document is relevant in this situation.

6.6 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

6.7 Retaining Walls

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure’s construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table 2 below to assist the design of these structures.

Stratum	Depth to top (mOD)	Bulk Density (Mg/m3) (γ)	Effective Angle of Internal Friction (Φ)
Made Ground	43.40 to 41.60	2.00	28
London Clay Formation	34.00 to 29.00	2.00	23

Table 2. Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients ka and kp. The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

6.8 Chemical Attack on Buried Concrete

The results of the chemical analyses show the natural soil samples tested to have water soluble sulphate contents of up to 2.56g/litre associated with near neutral pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-3 conditions.

In addition, segregations of gypsum were noted within the London Clay and also are well known to occur within London Clay deposits. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such concrete in accordance with full Class DS-3 conditions.

6.9 Non-Technical Summary of Chapter 6.0

On the basis of the fieldwork, the ground conditions at the site can be characterised as follows: Made Ground extends to depths of between 0.60m to 2.40m depth below ground level (43.40 to 41.60 mOD), The London Clay formation extends to the full depth of investigation of 10.00m and 15.00m below ground level (34.00 to 29.00 mOD). Groundwater was encountered at respective depths of 5.78m and 0.53m within the standpipes in Boreholes 1 and 2 after a period of approximately four months.

Groundwater is not expected to be encountered in the basement excavation, but it would be prudent for the chosen contractor to have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure.

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

Based on the water soluble sulphate tests carried out as part of these works, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-3 conditions.

In addition, segregations of gypsum were noted within the London Clay and also are well known to occur within London Clay deposits. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such concrete in accordance with full Class DS-3 conditions.

7.0 BASEMENT IMPACT ASSESSMENT / CONCEPTUAL SITE MODEL

7.1 Summary

The screening identified a number of potential impacts. The table below summarises the previously identified potential impacts and the additional information that is now available from the site investigation in consideration of each impact.

Potential Impact	Site Investigation conclusions	Impact sufficiently addressed without further justification?
The proposed basement extends beneath the water table surface.	Groundwater encountered at a depth of 1.02mbgl (41.13mOD0 within Borehole 2 and was not encountered within Borehole 1 during September 2016. In November 2016 groundwater was encountered at respective depths of 5.78mbgl (37.22mOD) and 0.53mbgl (41.62mOD). It is likely that the water encountered within the standpipes is not representative of the true groundwater level and is likely caused by perched water from the Made Ground or surface water infiltration	Yes
The site is within 100m of a watercourse, well (used / disused) or potential spring line	According to the Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within 5m Ordnance survey maps indicate a small drainage ditch running between two field boundaries (1871) which is the only indication of a water source for the River Westbourne. By 1896 this ditch/stream has either been culverted and running beneath the roads, or has been removed as it is no longer needed. Due to the small size of the ditch, any possible flooding that may have occurred is unlikely to have caused anything but very thin layers of Alluvium, but is unlikely to extend as far as No. 28 as such there is no influence on site.	No – see below for further details.
The lowest point of the proposed excavation is close to, or lower than, the mean water level in any local pond or spring line		
There a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	The London Clay was proven below the site and was recorded as having a high susceptibility to shrinkage and shrinkage. However, the base of proposed basement will extend well below the potential depth of root action.	Yes
The site is within 5m of a highway or pedestrian right of way.	The proposed basement is not to be extended below Canfield Gardens and therefore it is suggested that the impact on these access roads is likely to be minimal. There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.	Yes.

The site is in an area known to be at risk from surface water flooding.	There is a potential risk of surface water following the construction. However a Flood Risk Assessment has been completed by Sandersons Associates which concludes that the site can be developed without increasing flood risk to the site itself and other sites in the vicinity with the implementation of suitable mitigation measures.	Yes

7.2 Outstanding risks and issues

The site is within 100m of a watercourse, well (used / disused) or potential spring line & the lowest point of the proposed excavation is close to, or lower than, the mean water level in any local pond or spring line

As noted, there are no watercourses in the vicinity of the site.

Ordnance survey maps taken from the Desk Top Study (Figure 6) indicate a small drainage ditch running between two field boundaries (1871) which is the only indication of a water source for the River Westbourne. By 1896 this ditch/stream has either been culverted and running beneath the roads, or has been removed as it is no longer needed.

Due to the small size of the ditch, any possible flooding that may have occurred is unlikely to have caused anything but very thin layers of Alluvium, but is unlikely to extend as far as No. 28 as such there is no influence on site.

The site is within a densely developed urban area, with a number of barriers to overland flow created by the existing residential development (i.e. the building footprint and the walls around the perimeter of the site).

Current information suggests that 28 Canfield Road marks the route of the River Westbourne, a former watercourse that has become lost through culverting and urban development of the catchment.

Assuming the watercourse exists in the area within a culverted section, this would flow southwards towards Kilburn, across Bayswater Road and into Hyde Park, where it entered the Serpentine. From the Serpentine it flowed southwards under Knightsbridge before issuing into the River Thames within the grounds of Chelsea Hospital. In an extreme flood event, the highway provides an open - and largely unobstructed - flow route.

The Utilities survey carried out by Groundwise note the presence of a storm release sewer in the vicinity of the site, which may possibly carry the culverted River Westbourne and / or its tributaries.

The proposed basement development is located under existing property and would be outside the extent of any such flow route. As such, no overland pathways to or from this feature exist across the site.

The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties.

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground if not properly managed. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures during the works. This will require close collaboration with the appointed contractor's temporary works coordinator.

The Party Wall Act (1996) will apply to this development because neighbouring houses lie within a defined space around the proposed building works. The party wall process should be followed and adhered to during this development.

The historic plans of the adjacent properties supplied indicate that the neighbouring properties have basement layouts similar to the existing basement at No. 28.

A ground movement assessment was carried out at the site by Fairhurst under the instruction of Site Analytical Services Limited (Report Reference 117401/R1). The report is provided as Appendix B to this report and concludes that providing that good workmanship and construction sequences are used along with appropriate support during excavations, and groundwater management, the proposed basement construction is unlikely to cause significant damage to the surrounding structures. Based on the predicted ground movements, the adjacent structures are not expected to suffer any damage greater than CIRIA C580 Damage Category 1 (Very Slight).

A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans. Trigger levels on movements will need to be defined. Precise levelling or reflective survey targets should be installed at the garden walls and neighbouring buildings. Monitoring should take place in advance of the proposed works as a base-line survey, during the works and for a period following the completion of the works, to understand the long term effects.

The site is in an area known to be at risk from surface water flooding.

Canfield Gardens flooded during either the 2002 flood event. According to modelling by the Environment Agency, there is a 'Very Low' risk of surface water flooding (the lowest category for the national background level of risk) for No.28 and the surrounding area.

A Flood Risk Assessment has been completed by Sandersons Associates which concludes that the site can be developed without increasing flood risk to the site itself and other sites in the vicinity with the implementation of suitable mitigation measures.

The proposed development will not increase flood risk at the site or the surrounding area. Also since the development is on already developed land, it will not adversely impact the Council's sustainability objectives.

7.3 Advice on Further Work and Monitoring

A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans. Trigger levels on movements will need to be defined. Precise levelling or reflective survey targets should be installed at the garden walls and neighbouring buildings. Monitoring should take place in advance of the proposed works as a base-line survey, during the works and for a period following the completion of the works, to understand the long term effects.

An indicative temporary works scheme is required for the lightwell and sequencing and propping to be outlined. Contingencies for encountering softer Alluvium (which is very unlikely as proven in the site investigation) should be considered.

It would be prudent to continue to monitor the standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations. The chosen contractor should also have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure.

7.4 Non-Technical Summary of Chapter 7.0

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground if not properly managed. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures during the works. It is not considered that the proposed basement would result in a significant change to the groundwater flow regime in the vicinity of the proposal. Also, given limited scope of the scheme and limited increase in impermeable areas, the scheme is also considered compliant with the surface water management and flood risk elements of NPPF and Camden policy.

Given good workmanship, the basement to No. 28 Canfield Gardens can be constructed without imposing more than negligible damage on the adjoining properties. The development is not likely to significantly affect the existing local groundwater regime.

It would be prudent to continue to monitor the standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations.

8.0 REFERENCES

1. CIRIA Special Publication 69, 1989. The engineering implications of rising groundwater levels in the deep aquifer beneath London

2. Environment Agency, 2006. Groundwater levels in the Chalk-Basal Sands Aquifer in the London Basin

3. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

4. British Standards Institution, 2015. Code of Practice for Site Investigations, BS5930, BSI, London

5. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

6. British Standards Institution, 2009. Code of Practice for Protection of Below Ground Structures Against Water from the Ground. BS 8102, BSI, London

7. CIRIA, 2000. Sustainable Urban Drainage Systems: Design Manual for England and Wales. CIRIA C522, Construction Industry Research and Information Association, London

8. Environment Agency Status Report 2010. Management of the London Basin Chalk Aquifer. Environment Agency

9. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

Appendix A. Ground Investigation Factual Report

Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Tel: 0208 594 8134
Fax: 0208 594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons), MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref: **Ref: 16/25536-1**
December 2016

28 CANFIELD GARDENS,

LONDON, NW6 3LA

FACTUAL REPORT ON A GROUND INVESTIGATION

Prepared for

Martin Redston Associates

Acting on behalf of

Kolyma Investments Limited

CONTENTS

1.0 INTRODUCTION

1.1 Outline and Limitations of Report

At the request of Martin Redston Associates, working on behalf of Kolyma Investments Limited, a ground investigation was carried out in connection with a proposed residential basement development at the above site. A Phase 1 Preliminary Risk Assessment (Desk Study) is presented under separate cover in Site Analytical Services Limited Report Reference 16/25536.

The information was required for the design and construction of foundations and infrastructure for the proposed development at the existing site.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 SITE DETAILS

(National Grid Reference: TQ261845)

2.1 Site Location

28 Canfield Gardens is a residential property, located on the northern side of Canfield Gardens, South Hampstead at approximate postcode NW6 3LA. The residential dwelling has three levels of accommodation; ground, first and second floor with rooms in the roof space and a lower ground floor. The residential property also comprises a front and rear garden. The site covers an approximate area of 0.03 Hectares with the general area being under the authority of the London Borough of Camden.

The site is located on the northern side of Canfield Gardens with residential properties to the north-east and south-west, with private gardens to the north-west and a roadway to the south-east.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, ‘North London’, Solid and Drift Edition) indicates the site to be underlain by the London Clay formation.

The British Geological Survey maintains an archive of historical exploratory borehole logs throughout the UK. SAS Limited has searched the database and have found that there are 4 boreholes located within 150m of the site. These reveal Made Ground to a depth of 0.90m underlain the London Clay formation to the full depth of excavation at 7m.

2.3 Previous Investigations

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 16/25536, dated December 2016) has been undertaken across the site by Site Analytical Services Limited.

3.0 SCOPE OF WORK

3.1 Site Works

The exploratory investigation included for an inspection of the site and near surface soils in order to: -

- Determine the presence, extent and significance of potential contaminants in the sub-surface strata associated with current and former activities at the site and surrounds identified during the Phase 1 PRA.
- Assess the significance of potential impacts on sensitive receptors at or adjacent to the site.
- Assess the potential environmental liabilities and consequences associated with the site.
- Identify requirements for further works, including the design of any additional investigative/monitoring works and remedial measures if deemed necessary.

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of two continuous flight auger boreholes to depths of 10.00m and 15.00m below ground level (Boreholes 1 and 2).
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the boreholes.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.
- Factual reporting on the results of the investigation.

3.2 Ground Conditions

The locations of the exploratory holes are shown on the site sketch plan, Figure 1.

The boreholes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 2.30m in thickness resting on deposits of the London Clay formation.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the boreholes, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Level to top of strata (mOD)	Depth to base of strata (mbgl)	Level to base of strata (mOD)	Description
Made Ground	0.00	43.00 to 42.15	0.60 to 2.40	41.55 to 40.60	Concrete or slate chippings over a brown, black clayey gravelly sand with brick and concrete fragments underlying a brown, black silty sandy clay containing brick and concrete fragments.
London Clay Formation	0.60 to 2.40	41.55 to 40.60	10.00/15.00 (base of BH's 1 & 2)	32.15 to 28.00	Stiff clay with occasional pockets and partings of silty fine sand and scattered gypsum crystals.

Table A: Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered within Boreholes 1 and 2 and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Groundwater was encountered at a depth of 1.02mbgl (41.13mOD0 within borehole 2 and was not encountered within Borehole 1 during September 2016. In November 2016 groundwater was encountered at respective depths of 5.78mbgl (37.22mOD) and 0.53mbgl (41.62mOD).

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (July to December 2016) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.0 IN-SITU TESTING AND LABORATORY TESTS

4.1 Hand Vane Tests

In the essentially cohesive natural soils encountered at the site, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930:2015.

4.2 Mackintosh Probe Tests

Mackintosh Probe tests were made within the Made ground in order to assess the relative density of the soils encountered in Borehole 1. The results can be interpreted using the generally accepted correlation for Mackintosh Probe Tests which is as follows:

Mackintosh N75 X 0.38 = SPT 'N' Value

or

Mackintosh N300 X 0.1 = SPT 'N' Value

4.3 Classification Tests

Atterberg Limit tests were conducted on three samples taken at depth in Boreholes 1 and 2 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

The test results are given in Table 1, contained in Appendix B.

4.4 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on five samples are presented on Table 2, contained in Appendix B.

4.5 Waste Acceptance Criteria Analysis

A sample of soil from 1.00m depth in BH1 was analysed using the 'Catwastesoil' assessment tool, which concluded that the sample from the site was not hazardous in nature.

The sample was analysed for Waste Acceptance Criteria Testing in order to classify soils for disposal purposes.

For the purpose of waste disposal, the soil samples would be classified as follows:

Borehole 1 @ 1.00m *Inert Waste*

p.p. SITE ANALYTICAL SERVICES LIMITED

T P Murray MSc BSc (Hons) FGS
Geotechnical Engineer

5.0 REFERENCES

1. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

2. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London

3. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London

4. British Standards Institution, 20. Code of Practice for Site Investigations, BS5930: 2015, BSI, London

5. British Standards Institution, 2004. Geotechnical Design, BS EN 1997-1 BSI, London

6. Building Research Establishment Special Digest 1, 2005, "Concrete in Aggressive Ground – Third Edition."

7. Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107

8. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London

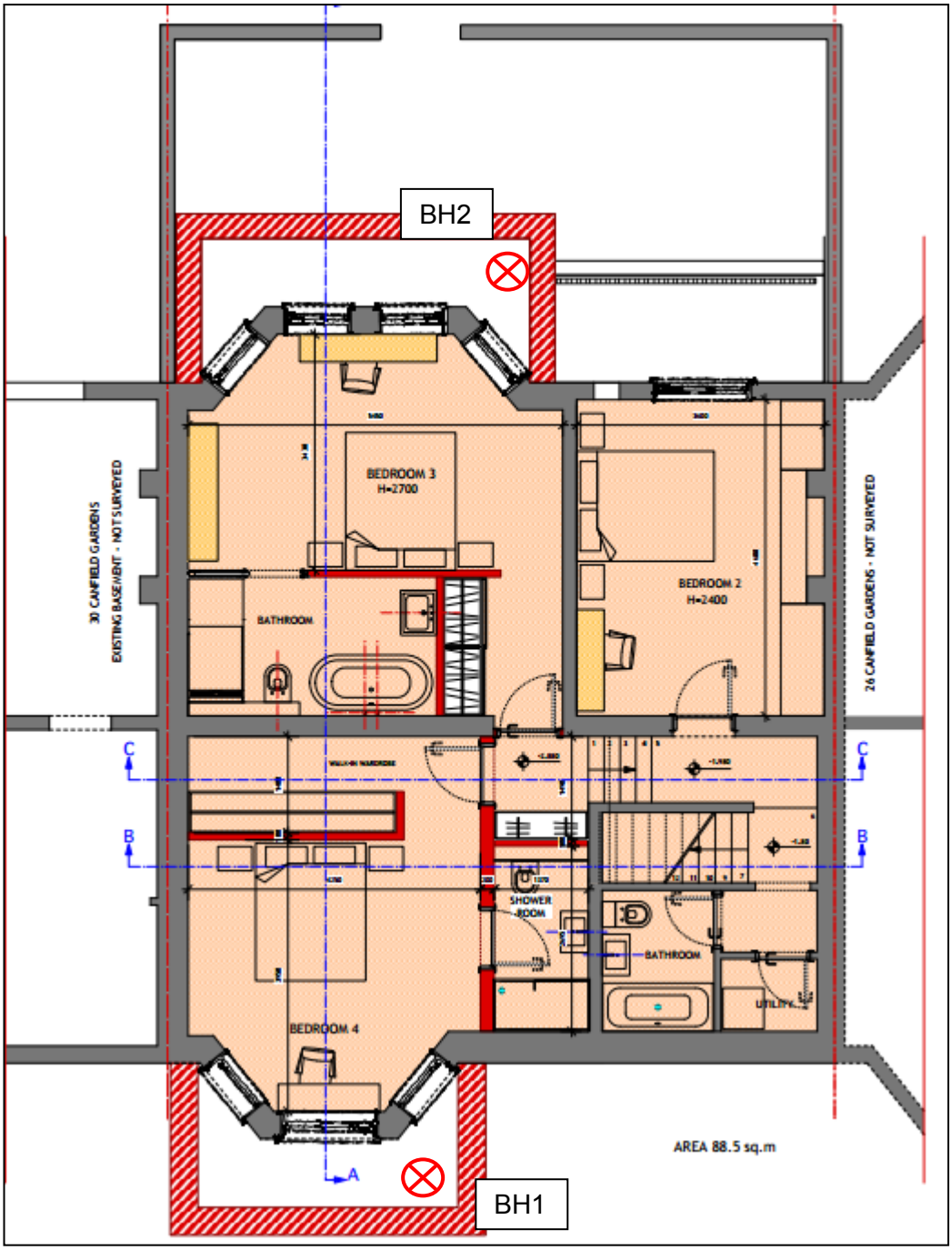
9. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

11. Stroud M.A. and Butler F.G. (1975) Symposium on the Engineering Behaviour of Glacial Materials; the Midland Soil Mechanics and Foundation Engineering Society; pgs 124 et seq.

12. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

Site Analytical Services Ltd.				REF: 16/25536
LOCATION:	28 Canfield Gardens, London, NW6 3LA			FIG: 1
TITLE:	Site Sketch Plan	DATE:	Dec 2016	SCALE: NTS



A P P E N D I X `A'

Borehole Logs

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m	43.00	KOLYMA INVESTMENTS LIMITED	1625536
	Location TQ260845	**Dates** 21/07/2016	**Engineer** MARTIN REDSTON ASSOCIATES	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.25	D1					(0.70)	MADE GROUND: Slate chippings over dark brown black slightly gravelly clayey sand with fragments of brick and concrete rubble. Gravel is fine to coarse of sub-angular to sub-rounded flint.		
0.50	D2				42.30	0.70			
0.75	D3					(0.50)	MADE GROUND: Soft, brown silty sandy clay with fragments of brick and concrete rubble.		
1.00 1.00-1.30	D4 M1 94/300				41.80	1.20			
1.50 1.50	D5 V1 95					(1.20)	MADE GROUND: Stiff, light brown silty sandy clay with fragments of brick and concrete rubble.		
2.00 2.00	D6 V2 117				40.60	2.40			
2.50 2.50	D7 V3 130+						Stiff, brown sandy silty CLAY.		
3.00 3.00	D8 V4 130+								
3.50 3.50	D9 V5 130+								
4.00 4.00	D10 V6 130+								
4.50 4.50	D11 V7 130+					(4.80)			
5.00 5.00	D12 V8 130+								
6.00 6.00	D13 V9 130+								
7.00 7.00	D14 V10 130+				35.80	7.20	Stiff, brown blue sandy silty CLAY.		
8.00 8.00	D15 V11 130+								
9.00 9.00	D16 V12 130+					(2.80)			

Remarks
D= Disturbed Sample
M= Makintosh Probe - Blows/Penetration (mm)
V= Vane Test - Result in kPa
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 1625536.BH!

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m	43.00	KOLYMA INVESTMENTS LIMITED	1625536
	Location	**Dates**	**Engineer**	**Sheet**
	TQ260845	21/07/2016	MARTIN REDSTON ASSOCIATES	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00 10.00	D17 V13 130+				33.00	10.00	Stiff, brown blue sandy silty CLAY.		
11.00 11.00	D18 V14 130+								
12.00 12.00	D19 V15 130+					(5.00)			
13.00 13.00	D20 V16 130+								
14.00 14.00	D21 V17 130+								
15.00 15.00	D22 V18 130+				28.00	15.00	Complete at 15.00m		

Remarks
D= Disturbed Sample
M= Makintosh Probe - Blows/Penetration (mm)
V= Vane Test - Result in kPa
Groundwater was not encountered during boring/excavation

Scale (approx)	Logged By
1:50	EW

Figure No. 1625536.BH!

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH1

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
KOLYMA INVESTMENTS LIMITED

Job Number
1625536

Location
TQ260845

Ground Level (mOD)
43.00

Engineer
MARTIN REDSTON ASSOCIATES

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			42.00	1.00	Bentonite Seal
			35.00	8.00	Slotted Standpipe
			34.00	9.00	Bentonite Seal
			28.00	15.00	General Backfill

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

Remarks
Lockable cover set in cement

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m	42.15	KOLYMA INVESTMENTS LIMITED	1625536
	Location	**Dates**	**Engineer**	**Sheet**
	TQ260845	21/07/2016	MARTIN REDSTON ASSOCIATES	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					42.10	0.05	MADE GROUND: Concrete slab		
					42.08	0.07			
0.25	D1					(0.43)	MADE GROUND: Thin layer of concrete		
0.50	D2				41.65	0.50	MADE GROUND: Black silty sandy clay with fragments of brick and concrete rubble.		
0.75	D3				41.55	0.60	MADE GROUND: Brown silty sandy clay with fragments of brick and concrete rubble.		
1.00	D4						Firm becoming stiff, brown sandy silty CLAY		
1.00	V1 70								
1.50	D5								
1.50	V2 81								
2.00	D6								
2.00	V3 87								
2.50	D7								
2.50	V4 93								
3.00	D8								
3.00	V5 101								
3.50	D9					(5.90)			
3.50	V6 113								
4.00	D10								
4.00	V7 122								
4.50	D11								
4.50	V8 127								
5.00	D12								
5.00	V9 130+								
6.00	D13								
6.00	V10 130+								
					35.65	6.50	Stiff, dark blue grey sandy silty CLAY with occasional gypsum crystals.		
7.00	D14								
7.00	V11 130+								
8.00	D15								
8.00	V12 130+					(3.50)			
9.00	D16								
9.00	V13 130+								
10.00	D17								
10.00	V14 130+				32.15	10.00			

Remarks
D= Disturbed Sample
M= Makintosh Probe - Blows/Penetration (mm)
V= Vane Test - Result in kPa
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 1625536.BH2

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH2

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
KOLYMA INVESTMENTS LIMITED

Job Number
1625536

Location
TQ260845

Ground Level (mOD)
42.15

Engineer
MARTIN REDSTON ASSOCIATES

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			41.15	1.00	Bentonite Seal
			33.65	8.50	Slotted Standpipe
			32.65	9.50	Bentonite Seal
			32.15	10.00	General Backfill

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks
Lockable cover set in cement

A P P E N D I X `B'

Laboratory Test Data

Site Analytical Services Ltd.

Ref: 16/25536-1

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 28 Canfield Gardens, London, NW6 3LA

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 μm %	Class
BH1	3.50	30	65	24	41	100	CH
	4.00	31	64	22	42	100	CH
BH2	4.00	32	69	26	43	100	CH

Table 1

Site Analytical Services Ltd.

Ref: 16/25536-1

SULPHATE & pH DETERMINATIONS

LOCATION 28 Canfield Gardens, London, NW6 3LA

BH/TP No.	DEPTH BELOW GL m	SOIL SULPHATES AS SO_4 TOTAL %	SOIL SULPHATES AS SO_4 WATER SOL g/l	WATER SULPHATES AS SO_4 g/l	pH	CLASS	SOIL - 2mm %
BH1	8.00		2.25		6.2	DS-3	100
	13.00		2.23		6.3	DS-3	100
BH2	5.00		2.56		6.2	DS-3	100
	7.00		1.09		6.6	DS-2	100
	9.00		0.81		6.7	DS-2	100

Classification – Tables C1 and C2 : BRE Special Digest 1 : 2005

Table 2

Aubrey Davidson
Site Analytical Services Ltd
Units 14 & 15
River Road Business Park
33 River Road
Barking
Essex
IG11 0EA

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 16-47575

Site Reference:	28 Canfield Gardens London, NW6 3LA
Project / Job Ref:	16\25536
Order No:	22973
Sample Receipt Date:	03/08/2016
Sample Scheduled Date:	04/08/2016
Report Issue Number:	1
Reporting Date:	10/08/2016

Authorised by:

Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
QTS Environmental Report No: 16-47575	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 28 Canfield Gardens London, NW6 3LA	**TP / BH No**	BH1				
Project / Job Ref: 16\25536	**Additional Refs**	D4				
Order No: 22973	**Depth (m)**	1.00				
Reporting Date: 10/08/2016	**QTSE Sample No**	220895				

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected				
pH	pH Units	N/a	MCERTS	8.1				
Total Cyanide	mg/kg	< 2	NONE	< 2				
Complex Cyanide	mg/kg	< 2	NONE	< 2				
Free Cyanide	mg/kg	< 2	NONE	< 2				
Total Sulphate as SO_4	mg/kg	< 200	NONE	669				
Total Sulphate as SO_4	%	< 0.02	NONE	0.07				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	256				
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.26				
Sulphide	mg/kg	< 5	NONE	< 5				
Organic Matter	%	< 0.1	MCERTS	1.7				
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	1				
Arsenic (As)	mg/kg	< 2	MCERTS	15				
W/S Boron	mg/kg	< 1	NONE	< 1				
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2				
Chromium (Cr)	mg/kg	< 2	MCERTS	49				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	MCERTS	26				
Lead (Pb)	mg/kg	< 3	MCERTS	108				
Mercury (Hg)	mg/kg	< 1	NONE	< 1				
Nickel (Ni)	mg/kg	< 3	MCERTS	18				
Selenium (Se)	mg/kg	< 3	NONE	< 3				
Zinc (Zn)	mg/kg	< 3	MCERTS	77				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Javeed Malik

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 16-47575	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 28 Canfield Gardens London, NW6 3LA	**TP / BH No**	BH1				
Project / Job Ref: 16\25536	**Additional Refs**	D4				
Order No: 22973	**Depth (m)**	1.00				
Reporting Date: 10/08/2016	**QTSE Sample No**	220895				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1				
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1				
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluoranthene	mg/kg	< 0.1	MCERTS	0.32				
Pyrene	mg/kg	< 0.1	MCERTS	0.27				
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.17				
Chrysene	mg/kg	< 0.1	MCERTS	0.15				
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.15				
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1				
Coronene	mg/kg	< 0.1	NONE	< 0.1				
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1				
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1				
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6				
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{o}C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 16-47575	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 28 Canfield Gardens London, NW6 3LA	**TP / BH No**	BH1				
Project / Job Ref: 16\25536	**Additional Refs**	D4				
Order No: 22973	**Depth (m)**	1.00				
Reporting Date: 10/08/2016	**QTSE Sample No**	220895				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21			
Total >C5 - C35	mg/kg	< 42	NONE	< 42			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 16-47575	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 28 Canfield Gardens London, NW6 3LA	**TP / BH No**	BH1				
Project / Job Ref: 16\25536	**Additional Refs**	D4				
Order No: 22973	**Depth (m)**	1.00				
Reporting Date: 10/08/2016	**QTSE Sample No**	220895				

Determinand	**Unit**	**RL**	**Accreditation**					
Benzene	ug/kg	< 2	**MCERTS**	< 2				
Toluene	ug/kg	< 5	**MCERTS**	< 5				
Ethylbenzene	ug/kg	< 2	**MCERTS**	< 2				
p & m-xylene	ug/kg	< 2	**MCERTS**	< 2				
o-xylene	ug/kg	< 2	**MCERTS**	< 2				
MTBE	ug/kg	< 5	**MCERTS**	< 5				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3

					Landfill Waste Acceptance Criteria Limits		
QTS Environmental Report No: 16-47575	**Date Sampled**	None Supplied			**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Site Analytical Services Ltd	**Time Sampled**	None Supplied					
Site Reference: 28 Canfield Gardens London, NW6 3LA	**TP / BH No**	BH1					
Project / Job Ref: 16\25536	**Additional Refs**	D4					
Order No: 22973	**Depth (m)**	1.00					
Reporting Date: 10/08/2016	**QTSE Sample No**	220895					
Determinand	**Unit**	**MDL**					
TOC[MU]	%	< 0.1	1		3%	5%	6%
Loss on Ignition	%	< 0.01	6.40		--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05		6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1		1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10		500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7		100	--	--
pH[MU]	pH Units	N/a	8.1		--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1		--	To be evaluated	To be evaluated

Eluate Analysis	**2:1 mg/l**	**8:1 mg/l**		**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01	< 0.01		< 0.2	0.5	2	25
Barium[U]	0.04	< 0.02		0.2	20	100	300
Cadmium[U]	< 0.0005	< 0.0005		< 0.02	0.04	1	5
Chromium[U]	< 0.005	< 0.005		< 0.20	0.5	10	70
Copper[U]	< 0.01	< 0.01		< 0.5	2	50	100
Mercury[U]	< 0.005	< 0.005		< 0.01	0.01	0.2	2
Molybdenum[U]	0.009	0.008		< 0.1	0.5	10	30
Nickel[U]	< 0.007	< 0.007		< 0.2	0.4	10	40
Lead[U]	< 0.005	< 0.005		< 0.2	0.5	10	50
Antimony[U]	0.008	0.006		< 0.06	0.06	0.7	5
Selenium[U]	< 0.005	< 0.005		< 0.1	0.1	0.5	7
Zinc[U]	< 0.005	< 0.005		< 0.2	4	50	200
Chloride[U]	4	1		12	800	15000	25000
Fluoride[U]	1.1	1		9.7	10	150	500
Sulphate[U]	16	3		31	1000	20000	50000
TDS	121	66		679	4000	60000	100000
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-
DOC	11.6	6.6		67.9	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.21						
Dry Matter (%)	84.6						
Moisture (%)	18.2						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.06						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Sample Descriptions
QTS Environmental Report No: 16-47575
Site Analytical Services Ltd
Site Reference: 28 Canfield Gardens London, NW6 3LA
Project / Job Ref: 16\25536
Order No: 22973
Reporting Date: 10/08/2016

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 220895	BH1	D4	1.00	15.4	Light brown clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S
^ no sampling date provided; unable to confirm if samples are within acceptable holding times

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 16-47575
Site Analytical Services Ltd
Site Reference: 28 Canfield Gardens London, NW6 3LA
Project / Job Ref: 16\25536
Order No: 22973
Reporting Date: 10/08/2016

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Appendix B. Ground Movement Assessment

28 Canfield Gardens, London NW6 3LA

Ground Movement Assessment

January 2020

FAIRHURST

FAIRHURST

CONTROL SHEET

CLIENT:	**SITE ANALYTICAL SERVICES LIMITED**
PROJECT TITLE:	**28 CANFIELD GARDENS, LONDON NW6 3 LA**
REPORT TITLE:	**GROUND MOVEMENT ASSESSMENT**
PROJECT REFERENCE:	**117401**
DOCUMENT NUMBER:	**117401/R1**
STATUS:	**FINAL**

Issue & Approval Schedule		Name	Signature	Date
	Prepared by	Olivier Colas		30.11.16
	Checked by	Andrew Smith		01.12.16
	Approved by	Heather Bourne		05.12.16

Revision Record	Rev.	Date	Status	Description	Signature	
	1	January 2020	FINAL	Updated GMA in accordance with recent proposed development plans	By	
					Check	
					Approve	
					By	
					Check	
					Approve	

This document has been prepared in accordance with procedure OP/P02 of the *Fairhurst Quality and Environmental Management System*

This document has been prepared in accordance with the instructions of the client, Site Analytical Services Ltd, for the client's sole and specific use. Any other persons who use any information contained herein do so at their own risk.

CONTENTS

FIGURES

APPENDIX

1.0 INTRODUCTION

1.1 Background

Fairhurst has been commissioned by Site Analytical Services Limited (SASL) to complete a Ground Movement Assessment (GMA) in connection with a proposed residential development at 28 Canfield Gardens, London, NW6 3LA. The purpose of this assessment is to determine what effects the proposed basement construction at the site may have upon nearby structures.

A site specific Phase II Ground Investigation has previously been carried out by SASL in July 2016. The ground investigation was designed by SASL and the results have been used in the derivation of parameters utilised in this assessment. Fairhurst cannot be held responsible for any inaccuracy in the factual data provided.

It is understood that this report will be included as part of a planning application to be submitted to the London Borough of Camden (LBC) by the client.

1.2 Proposed Development

With reference to the proposed development plans provided by the client and presented as Appendix A, it is understood that the property owner is intending to excavate a basement under the footprint of the majority of the building including the excavation of three new proposed lightwells at the front and back of the property.

The proposed basement extension is split into three different areas with various depths of excavation:

1. An area below the north eastern section of the existing building adjacent to No. 26 Canfield Gardens which will be extended to 3.00m below ground level or 1.175m below existing basement level (circa 47.22m AOD).
2. An area below the south western section of the existing building adjacent to No. 30 Canfield Gardens which will extend to 3.00m below ground level (circa 47.22m AOD).
3. Lightwells at the front and rear of the site which are proposed to extend to depths of 1.50m bgl (48.72m AOD).

1.3 Limitations

The conclusions and recommendations made in this report are made on the basis of the site specific ground investigations undertaken by SASL undertaken in July 2016. The ground investigation was designed by SASL and the results of the work should be viewed in the context of the range of data sources consulted and the information provided, the number of locations where the ground was sampled and the number of samples tested. No liability can be accepted for inaccuracies in the factual data, information in other data sources or conditions not revealed by the sampling or testing.

In addition to this SASL have recommended the use of third party data where appropriate, it is assumed that reliance on that data used in this report has been agreed by SASL.

2.0 BASELINE CONDITIONS

2.1 Site Description

The site is located at 28 Canfield Gardens, London, NW6 3LA located in the London Borough of Camden at approximate grid reference 526099, 184507. A site location plan is presented as Figure 1. The site currently comprises a four storey terraced residential house with an existing basement level along with front and rear garden areas.

Information provided by the Architect (Drawing ref. 28CanfieldBasement@Camden16052016) and assuming a 0.30m thick lower ground floor slab, it is assumed that the existing basement extends to a depth of 1.825mbgl (48.395mAOD).

With reference to the proposed section plan provided by Architecture Ltd. (ref. 10 – PROPOSED SECTIONS A-A Rev 00) the ground level of the site is approximated to be 50.22mAOD. Based on this level, it is understood that ground level at the site steps down from approximately 50.22mAOD at the front of the property to approximately 49.37mAOD at lowered rear garden level.

The ground in the surrounding area generally slopes slightly to the south along Broadhurst Gardens, approximately 150m north of the site, to the intersection between Greencroft and Fairhazel Gardens 150m south of the site.

The surrounding area is generally residential. Details of the buildings located adjacent to the site are described below in Table 1 and highlighted on Figure 2.

Table 1. Summary of Structures Surrounding the Site

Structure Name	Description	Estimated Height (m)	Distance from the site
No. 30 Canfield Gardens	4 storey terraced residential dwelling with basement	14	Connected by party wall, directly south west of the property.
No. 26 Canfield Gardens	4 storey terraced residential dwelling with basement	14	Connected by party wall, directly north east of the property.

2.2 Geology

The British Geological Survey (BGS) map of the area (North London, Sheet 256) indicates that the site is underlain by the London Clay Formation with no superficial deposits directly mapped at the site. However Head Deposits (Prodensity) are indicated to be present approximately 30m north-west of the site. These deposits have not been formally mapped by the BGS and have been interpreted from slope analyses and borehole data only.

Superficial Head Deposits generally comprise clays, silts, sands and gravels and were formed up to 3 million years ago in the Quaternary Period in a local environment previously dominated by subaerial slopes.

The London Clay Formation is detailed by the BGS to comprise blue clay which becomes brown when weathered with occasional bands of fine silty sand and nodular lumps of pyrite and selenite. These soils were formed approximately 34 to 56 million years ago in the Palaeogene Period in a local environment previously dominated by deep seas.

There are 7 No. historical BGS Boreholes close to the site (BGS references: TQ28SE514 to TQ28SE521) related to the construction of residential properties on Broadhurst Gardens approximately 100m to 200m north of the site in the 1950s. The boreholes indicate up to 4m thickness of Made Ground overlying deposits typical of the London Clay Formation. Groundwater seepages are generally recorded within Made Ground at depths of between 3 and 4mbgl.

2.3 Adjacent Ground Investigations

Review of the LBC planning portal indicates that several recent planning applications have been made for basement extensions at various properties within 150m of the site. Ground investigation works were carried out as part of the associated planning applications which are summarised in Table 2 below.

Table 2. Summary of Adjacent Basement Construction and Ground investigation

Site address (distance from site)	Planning application reference	Planning application status	Ground investigation details	Scope of works
No. 44 Canfield Gardens (110m south west from site)	2010/3616/P	Granted 23-11-2010	Herts and Essex Investigation Ltd (Report Ref: MRS/9764A dated 18th October 2010)	• 2 No. cable percussive boreholes to 6m maximum depth; • 7 No. hand excavated trial pits to 1.4m maximum depth to expose buildings foundations.
No. 50 Canfield Gardens (150m south west from site)	2012/2812/P	Granted 04-03-2013	Land Science Ltd (Report Ref: LS048 dated from 2nd of May 2012)	• 2 No window sampler boreholes to 8m maximum depth; • 4 No. hand excavated trial pits to 1.5m maximum depth to expose buildings foundations.
No. 29 Compayne Gardens (140m west from site)	2016/0320/P	Granted 17-06-2016	Chelmer Site Investigation Ltd (Report Ref: FACT/6028 dated from 3rd of November 2015)	• 2 No. continuous flight auger boreholes to 8m maximum depth; • 4 No. hand excavated trial pits to 2.17m maximum depth to expose buildings foundations.

The section below provides a brief summary of the findings of the above ground investigations although reference should be made to the original reports for full details of the findings. Approximate ground level elevations for the investigation works have been taken from spot heights on available OS maps.

2.3.1 Ground Conditions

The exploratory holes recorded ground conditions that were generally consistent with the geological records and known history of the area with between 0.40m to 1m of Made Ground overlying deposits typical of the London Clay Formation. A summary of the ground conditions encountered is presented in Table 3 below:

Table 3. Summary of Adjacent Ground Investigation

Strata	Depth (mbgl)		Maximum Thickness (m)	Description
	Top	Bottom		
Fill/Made Ground	GL	0.4 to 1.0	1	Generally described as a dark brown, slightly sandy, silty CLAY, with occasional gravel, brick and clinker fragments
London Clay Formation	0.4 to 1.0	6 to 8	8.5*	Generally described as grey and then blue firm becoming stiff, slightly sandy, silty CLAY, with partings of brown and orange silt and fine sand and occasional selenite crystals

*Maximum thickness of London Clay Formation not proven in any of the ground investigations

Groundwater was not generally encountered as part of the Ground Investigation works and the boreholes and trial pits remained essentially dry throughout. However a slight seepage was recorded within a trial pit at 50 Canfield Road at depth of 0.75 to 1.10mbgl.

The results of groundwater monitoring carried out following drilling is summarised below:

- No post field work groundwater monitoring data is provided within the Herts and Essex Report at No. 44 Canfield Gardens;
- At 50 Canfield Gardens, a monitoring standpipe was installed by Land Science to a depth of 5.00m and subsequently monitored on 19th April 2012 recording a water depth of 0.70mbgl within the London Clay Formation;
- At 29 Compayne Gardens monitoring standpipes were installed by Chelmer to 8.0m bgl in both of the boreholes drilled at the site, and water level readings were taken on 10th and 20th November 2015. During this period of monitoring, the water level in BH1 rose from 2.60m to 1.26m bgl, whereas the water level in BH2 fell from 6.25m to 7.96m bgl.

2.3.2 In Situ and Laboratory Testing

In-situ and laboratory testing was carried out as part of the ground investigation works described above and the full results are contained in the relevant factual reports.

In summary, 28 No. samples of the London Clay formation were tested for Atterberg limits tests as part of the adjacent ground investigations. The results indicate Plasticity Index (PI) varying between 27 and 56%. The results are indicative of Class CI and CV according to the British Soil Classification System which are representative of fine grained clays of intermediate to very high plasticity and as such generally have a medium to high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2.

Furthermore, 46 No. in-situ Hand Shear Vane (HSV) tests were undertaken within the London Clay Formation with recorded undrained shear strengths varying between 44 and 168kN/m^2 (generally increasing with depth), with an average of 107kN/m^2. The results are indicative of a medium to very high strength material at depth and are within the expected range for the London Clay Formation.

3.0 GROUND INVESTIGATION AND MONITORING

3.1 Records of Site Investigations

A site specific ground investigation was undertaken by Site Analytical Services Limited (SASL) in July 2016. The site works undertaken at the site comprised the following:

- 2 No. boreholes using hollow stem auger methods, one to 15m bgl at the front of the property (BH1) and one to 10m bgl at the rear garden of the property (BH2) with in-situ hand shear vane tests completed at regular intervals in both holes;
- Collection of disturbed soil samples for geotechnical laboratory testing;
- Installation of 2 No. 50mm internal diameter groundwater monitoring wells in BH1 and BH2 to depths of 8.00m to 8.50m bgl respectively;
- Two rounds of groundwater level monitoring following the site works on 2nd September and the 22nd of November 2016.

The factual information describing the results of the investigation dated July 2016 is presented in Appendix B.

3.2 Ground Conditions

The boreholes recorded ground conditions that were generally consistent with the geological records, known history of the area and the findings from the nearby historical ground investigations with up to 2.40m thickness of Made Ground encountered overlying the London Clay Formation to the full depths of drilling of 12.0m bgl. A summary of the ground conditions encountered is presented in Table 4 below:

Table 4. Summary of the Site Specific Ground Investigation (2016)

Strata	Depth mbgl (mAOD)		Maximum Thickness (m)	Description
	Top	Bottom		
Made Ground	GL (50.22)	0.5 to 2.4 (49.72 to 47.82)	2.4	Slate chippings over dark brown black slightly gravelly clayey SAND with fragments of brick and concrete rubble. Gravel is fine to coarse of sub-angular to sub-rounded flint. Soft to stiff brown silty sandy clay with fragments of brick and concrete rubble.
London Clay Formation	0.5 to 2.4 (49.72 to 47.82)	10 to 15 (40.22 to 35.22)	12.6*	Stiff brown sandy silty CLAY overlying stiff brown blue sandy silty CLAY.

*Maximum thickness of London Clay Formation not proven

3.3 Groundwater

Groundwater was not encountered as part of the Ground Investigation works and the boreholes remained dry. Monitoring standpipes were installed in BH1 and BH2 to 8.00 and 8.50mbgl respectively, and water level readings were taken on the 2nd of September 2016, as summarised in Table 5 overleaf.

Table 5. Monitoring Summary

Date	Borehole ID	Ground Level	Response Zone			Groundwater Level	
		m AOD	m bgl	m AOD	(Strata)	m bgl	m AOD
02/09/2016	BH1	50.22	1.00 to 8.00	49.22 – 42.22	MG/LC	DRY	DRY
	BH2	50.22	1.00m to 8.50	49.22 - 41.72	LC	1.00	49.22
22/11/2016	BH1	50.22	1.00 to 8.00	49.22 - 42.22	MG/LC	5.78	44.44
	BH2	50.22	1.00m to 8.50	49.22 – 41.72	LC	0.53	49.69

The results of the ground water monitoring carried out at the site indicate that groundwater levels are above the maximum proposed excavation depth of 3.00mbgl (47.22m AOD) in BH2 at a maximum level of 49.69mAOD.

It should be noted that the above comments on groundwater conditions are based on two monitoring visits at the site undertaken in the September 2016 and relate to observations made at that time. Changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions. It is considered prudent to continue ground water monitoring for as long as possible prior to construction.

3.4 In-Situ and Laboratory Testing

The results of the laboratory and in-situ tests are presented within the SASL factual information dated from July 2016 and presented in Appendix B.

3.4.1 Atterberg Limit Tests

Atterberg Limit tests have been conducted on 3No. selected samples of the London Clay Formation. The results indicate moisture contents varying between 30% and 32% and Plasticity Index values (PI) of between 41% and 43% indicating materials of Class CH according to the British Soil Classification System. These are representative of fine grained CLAY of high plasticity and as such generally have a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2 (2015).

The Atterberg limit tests results have been plotted on a Casagrande plot, and are presented on Figure 3 of the report along with the results of the historical investigations.

3.4.2 Shear Vane Testing

In the London Clay Formation, in-situ shear vane tests were undertaken at regular depth intervals to assess the undrained shear strength profile of the materials. The testing has recorded undrained shear varying from 70kPa up to 130kPa which is the limiting value of the shear vane apparatus. This correlates to cohesive materials of medium to (at least) high strength which is in keeping with the historical laboratory testing results at the adjacent sites. The results of the shear vane tests are presented on Figure 4 along with the results of the historical investigations.

4.0 PREDICTION OF GROUND MOVEMENTS

4.1 Introduction

In connection with the planning requirements of the proposed basement construction from LBC a ground movement and damage assessment has been undertaken at the site. The purpose of this assessment is to determine the effects of the proposed basement construction upon the neighbouring structures.

The calculations provided in this ground movement and damage assessment are specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

4.2 Adjacent Properties

The properties or structures more likely to be affected by ground movements associated with the proposed basement construction are detailed on Figure 2 and summarised below:

- No. 30 Canfield Gardens located to the south west;
- No. 26 Canfield Gardens located to the north east;

4.3 Ground Model

The stratigraphic sequence utilised in this assessment is based on the site specific ground investigation undertaken by SASL at the site. This comprises Made Ground to a depth of 2.40m bgl overlying the London Clay Formation.

To increase accuracy of the analyses, the in-situ and laboratory results from the nearby historical boreholes described in section 2.3 have been used in combination with the site specific investigation. It should be noted that no liability can be accepted for inaccuracies in the factual data of the nearby historical investigation and it is understood that reliance on this data has been sought by SASL.

4.3.1 Model parameters

The method of Ground Movement Analyses undertaken requires soils stiffness parameters to be used. In accordance with BS8004:2015 section 4.3.1.6 'Soil Stiffness' it is acknowledged that both the drained and undrained stiffness moduli of soils (E', E_u) are highly strain dependent. The change in axial strain will directly influence the resultant stiffness of the soil, and in turn the stiffness of the soil will influence the strain exhibited.

Therefore in order to define a stiffness modulus applicable to the engineering problem considered, it is necessary to assess the magnitude of axial strain which the soil will be subjected to. In accordance with the recommendations made in BS8004:2015 the strain generally applicable to foundations design is in the range of 0.075 to 0.2%. The material stiffness values used for the analysis of the ground movements have been interpreted as follows.

Made Ground

The Made Ground was described in the borehole logs as clayey gravelly sand/soft to stiff brown silty sandy clay. For the purposes of this assessment, a conservative approach has been taken and the Made Ground will be treated as a soft clay. The Elastic modulus values for a soft clay typically range from 2 to 7MPa (short term, Eu) and 1 to 5MPa (long term, E') based on Table 11.7, Handbook of Geotechnical Investigation and Design Tables, Look (2007).

Poisson's ratio for soft clays are typically 0.50 (short term) and 0.40 (long term) based on Industrial Floors and Pavement Guidelines (1999).

In the absence of laboratory test results, a bulk unit weight of 16kN/m^2 has been adopted for design.

London Clay

Based on the maximum (i.e. most conservative) axial strain of 0.2% prescribed in BS8004:2015, the following correlation has been used to determine the Young's Modulus (Eu) of the London Clay. The relation has been taken from ICE manual of geotechnical engineering (2012), Volume II, chapter 53.7

and matches ratio of Eu/Cu at 0.2% axial strain recommended in Tomlinson (7th, 2001) based on works by Jardine et al. (1986):

$$Eu = 330Cu\ (kN/m^2)$$

The ratio of end of construction (Undrained) settlement to total settlement (fully drained) was taken as taken as 60% as specified in ICE manual of geotechnical engineering (2012), Volume II, chapter 53.6.

Therefore:

$$Eu = 200Cu\ (kN/m^2)$$

Utilising a plasticity index of 43% a drained (υ') and undrained (υ) poisson's ratio of 0.40 and 0.45 respectively were utilised based on Industrial Floors and Pavement Guidelines (1999). A plot of Young's modulus versus depth is presented as Figure 5 to this report.

A summary of the stiffness values utilised in this analysis is presented in Table 6 below based on the trendline presented on Figure 5:

Table 6. Soil Stratigraphy and Stiffness Parameters Adopted

Strata	Level at top (mbgl)	Bulk Unit Weight ϒ (kN/m³)	Short-term (undrained)			Long-term (drained)		
			Top	Bottom	Poisson's Ratio (υ)	Top	Bottom	Poisson's Ratio (υ')
			E_u kPa	E_u kPa		E' kPa	E' kPa	
Made Ground	GL	16	5000	5000	0.50	2500	2500	0.40
London Clay Formation	2.4	20	23000	43000	0.45	13000	26000	0.40

4.4 Basement Foundation and Load Case

With reference to development plans provided (Appendix A) and Martin Redston Associates Ltd load drawings (Appendix C), it is understood that the walls to No. 30 and No. 26 Canfield Gardens will be underpinned. The proposed lightwells to the front and back of the property will be constructed with a reinforced concrete retaining wall excavated and cast in 1m sections with a traditional hit and miss sequence.

It is understood that the retaining wall will be cast with an eccentric base section. The base will be placed against the un-excavated soil to prevent sliding and the top of the wall will be propped to resist overturning.

In the permanent condition, the loads of the structure above the newly constructed basement will be transferred to the underlying soils via a ground bearing raft foundation with an average unfactored gross Uniformly Distributed Load (UDL) of 95kN/m^2 being applied at the base of the foundation.

The assessment presented in Section 4.5 is specific to the construction sequence and load case described above and should be updated in accordance with any changes made to the proposed developments at the site.

4.5 Ground Movements inside the Area of the New Basement.

Following excavation of the basement area the soil at this level and along the boundary of the excavation will tend to heave upwards due to vertical stress relief. The magnitude and distribution of ground movements inside the excavated area are a function of the excavation size and shape along with the stiffness of the underlying soils.

The stress conditions and resultant settlement/heave have been assessed using the Boussinesq's method and geotechnical software PDISP. The software calculates vertical strains on the basis of the calculated stress changes and then integrated to obtain vertical movements.

Three stages of the redevelopment have been modelled as follows:

1. A first stage simulating excavation across the site with unloading due to the removal of soil. Assuming that no delays occur during the construction process, this stage has been simulated using short term soil parameters only (i.e. undrained conditions).

   The proposed excavation levels are as follows (assuming existing ground level to be at 50.01 m AOD, or front garden level):

   - 3.00m bgl (relative to existing external ground levels) within the main proposed basement footprint. The undrained removal of the overburden will therefore cause an unloading pressure of approximately -50.4kN/m^2 in this area;
   - 1.50m below the formation level of existing lower ground floor (equal to 3.00mbgl relative to existing external ground levels) within the southern portion of the property. Unloading pressure is calculated as -26.4kN/m^2 in this area;
   - 1.50mbgl within proposed lightwells. An unloading pressure is calculated as -24kN/m^2 for proposed lightwell footprints.

   The PDISP analysis outputs for the basement (including main basement and southern basement) and lightwells are presented in Appendix D.

2. A second stage simulating the conditions at the end of the construction phase when the site is to be re-loaded with the pressures from the proposed structures has also been analysed.

   The new loads are to be transferred via a ground bearing raft with a gross UDL of 95kN/m^2. A nominal load of 5kN/m^2 has been applied to the lightwells as these will not comprise load bearing structures. The PDISP analysis outputs at main basement and lightwells for this stage are presented in Appendix E.

3. A final third stage simulates a long term condition after construction, when the stress conditions within the soil have been allowed to equilibrate under the new pressures (i.e fully drained conditions). The PDISP analysis outputs at basement and lightwells for this stage are presented in Appendix F.

The elastic parameters for the soil have been chosen as appropriate for the short and long term conditions. Undrained parameters have been used for the short term analyses whilst fully drained parameters have been used for the long term assessments. The vertical boundary of the model has been fixed at 15 mbgl where the effective vertical stress due to foundation unloading decreases to approximately 20% of the effective overburden as required in EC7.

The results of the PDISP analysis indicate movement beyond the site boundaries as shown on the output models. The modelling is based on an unrestrained excavation and is therefore unable to take account of the mitigating effect of the retaining wall supporting the excavation sides, which in reality will combine to restrict these movements within the basement excavation. The movements predicted at or just beyond the site boundaries are unlikely to be fully realised and should not therefore have a detrimental impact upon any nearby structures as long as temporary works measures and design are robust in nature.

PDISP Results

The PDISP results were presented in Table 7 with the results detailed in Appendix C to Appendix J. Simplified construction stages have therefore been considered taking into account the net ground displacements at formation level.

Table 7: PDISP results

Load case	Settlement/Heave (mm)*	
	Basement	Lightwells
Excavation (Undrained)	-7	-5
Re-loading (Drained)	22	12
Net Movement (Drained)	15	7

*Heave is denoted by -vet sign convention

The load cases in Table 7 have been modelled in isolation without consideration to the combined and/or net effects from both heave and settlement (i.e. interaction between load cases).

Conclusions and recommendations

The results show that initially upon excavation and before construction the ground is expected to heave upwards by a maximum of 7mm in the basement and 5mm in the lightwells. In the long term, a maximum settlement of 15mm is expected in the basement, whilst the ground underlying the lightwells is expected to settle by 7mm.

PDISP uses individual layer properties to calculate the displacements resulting from applied stresses. The heave values are considered to be overestimated and therefore conservative. It should be noted, Bowles in his text (Foundation Analysis and Design-Fifth Edition, 1995, page 542) states that "In general, where heave is involved, considerable experience and engineering judgement are necessary in estimating probable soil response, for currently there are no reliable theories for the problem".

Final designs for the basement retaining walls, basement slabs and internal load-bearing basement walls and columns should be designed to support ground movements. These movements should be taken into account particularly at party walls where additional loadings are proposed. Any proposed drainage system or pipe works within the vicinity should be designed to accommodate the predicted movements.

4.6 Ground Movements Outside the Area of the New Basement.

4.6.1 Approach and assumptions

Ground movements due to basement excavations are typically estimated based on guidance given in the CIRIA publication C580 (now updated as CIRIA C760). This is based on the behaviour of deep excavations supported by embedded walls at numerous sites in the London area.

As detailed in section 4.4 the main basement box is to be constructed using an underpin type sequence towards No. 30 and No. 26 Canfield Gardens. The proposed lightwells at the front and back of the property will be constructed with a reinforced concrete retaining wall excavated and cast in 1m sections with a traditional hit and miss sequence.

For conservatism the excavation (including the existing lower ground floor) and lightwells have been modelled together as excavations from ground level to the maximum proposed excavation depth (3.0m) below the property. The CIRIA C760 ground movement curves for “excavation in front of a high stiffness wall in stiff clay” along with “installation of contiguous bored pile wall In stiff clay” (to an assumed pile toe depth of 3 m bgl) have been used together in order to replicate the excavation and underpinning.

It is understood that the walls will be propped before significant excavation is undertaken, ensuring that the wall behaviour in response to excavation is stiff. Good quality workmanship and attention to the detailed design during the excavation sequence is assumed in the predictions given in this report.

4.6.2 Results

Ground movements have been analysed using XDISP and a building damage assessment has been undertaken based on the results of the predicted ground movements. Contours of vertical and horizontal ground movement and full tabular output of the analysis are presented in Appendix G. Summary tables are provided in Section 4.7 below.

4.7 Building Damage Assessment

4.7.1 General

The building damage assessment was carried out on the relevant adjacent structures, as detailed in Figure 6 and summarised below in Table 8.

Table 8: Summary of Structures

Structure	Structure ID (As specified on Figure 6)	Assumed structural Height (m)
No. 30 Canfield Gardens	Wall 1	14
	Wall 2	14
	Wall 3	14
	Wall 4	14
	Wall 5	14
No. 26 Canfield Gardens	Wall 6	14
	Wall 7	14
	Wall 8	14

4.7.2 Results

Table 9 presents the damage assessments for the structures listed above. The table also presents the CIRIA C580 approximate crack widths corresponding to the damage categories. The full tabular output for the basement and sub-basement is presented as Appendix G.

Table 9: Ground Movement Summary

Structure ID (Figure 6)	Maximum settlement (mm)	Maximum Tensile Strain (%)	Minimum Radius of Curvature (m)	Damage Category[1]	Approximate Crack Width (mm) (CIRIA C580)
Wall 1	1.75	0.045	4384	Negligible	<0.1mm
Wall 2	2.27	0.026	82676	Negligible	<0.1mm
Wall 3	3.13	0.064	1620	Very Slight	<1mm
Wall 4	2.39	0.000	92517	Negligible	<0.1mm
Wall 5	3.14	0.063	1812	Very Slight	<1mm
Wall 6	2.51	0.037	3219	Negligible	<0.1mm
Wall 7	4.10	0.025	1048	Negligible	<0.1mm
Wall 8	3.03	0.060	475	Very Slight	<1mm

[1] After Burland et al, 1977, Boscardin and Cording, 1989; and Burland, 2001

Based on these predicted ground movements, the properties surrounding the site are not expected to suffer any damage greater than CIRIA C580 Damage Category 1 (Very Slight).

4.8 Summary of Ground Movement Assessment and Advice on Further Monitoring

Providing that good workmanship and construction sequences are used along with appropriate support during excavations, and groundwater management, the proposed basement construction is unlikely to

cause significant damage to the surrounding structures. Based on the predicted ground movements, the adjacent structures are not expected to suffer any damage greater than CIRIA C580 Damage Category 1 (Very Slight).

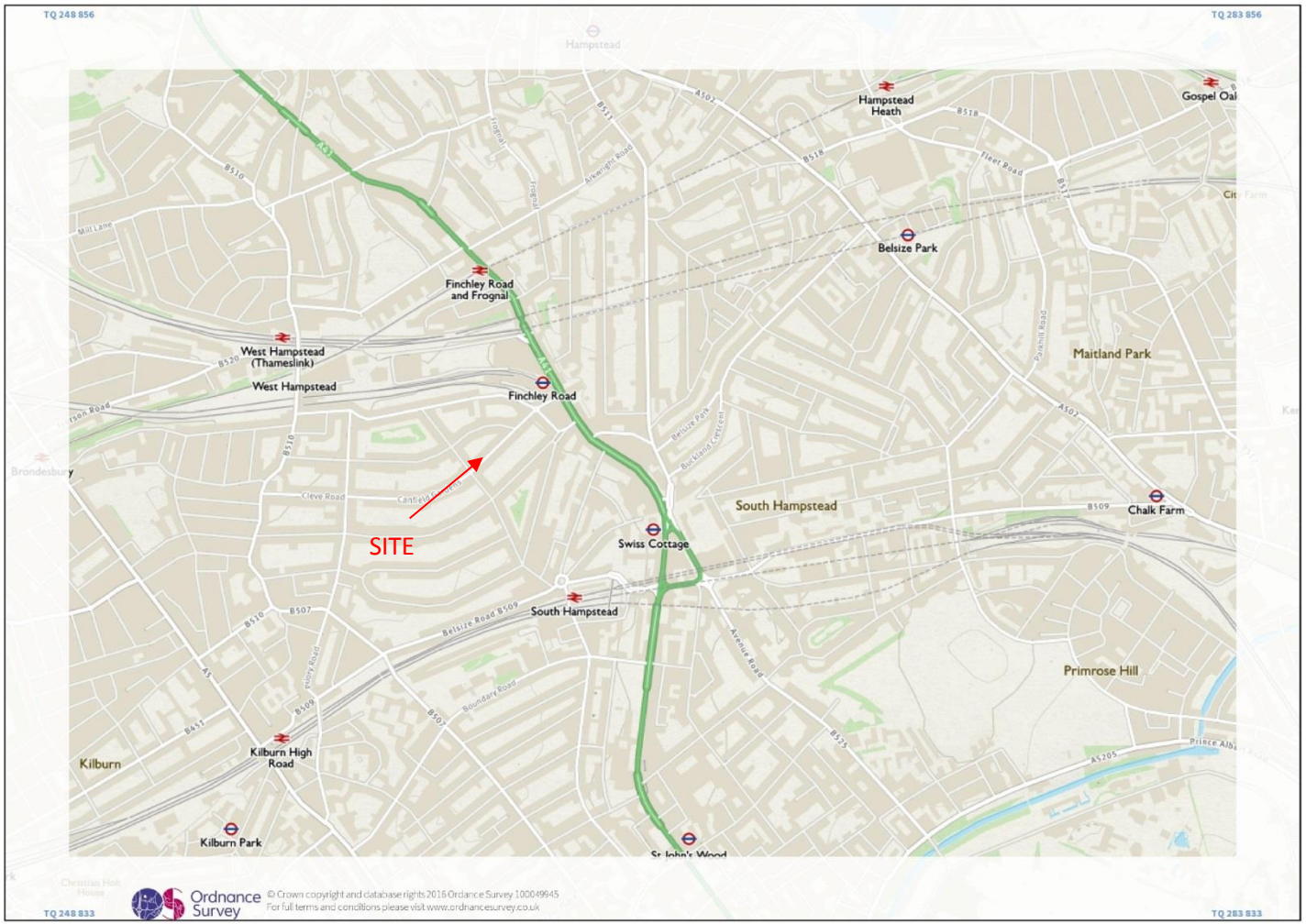
Despite the predicted low level of damage, it is recommended that movement monitoring of the walls to the neighbouring buildings is carried out and a ground movement sensitivity monitoring plan is set out at design stage which should include a movement monitoring strategy, instrumentation and action plans. More specifically trigger levels on movements will need to be defined and this should be done by way of precise levelling or reflective survey targets being installed at the neighbouring buildings. The temporary and permanent works will need to be designed to limit eventual movement.

Open excavations and underpinning, even in cohesive materials, can result in significant ground movements when not properly retained/managed. The magnitude of movement is almost entirely a function of the standard of the workmanship which is assumed to be of sufficient quality in this analysis.

Additionally, observations made during post ground investigation ground water monitoring, indicate that the groundwater levels at the site is likely to be at c. 0.53mbgl (41.62mAOD), perched within the Made Ground overlying the London Clay Formation which will be above the depths of excavation. The chosen contractor should have a comprehensive plan in place to deal with groundwater when encountered to ensure stability of the excavations.

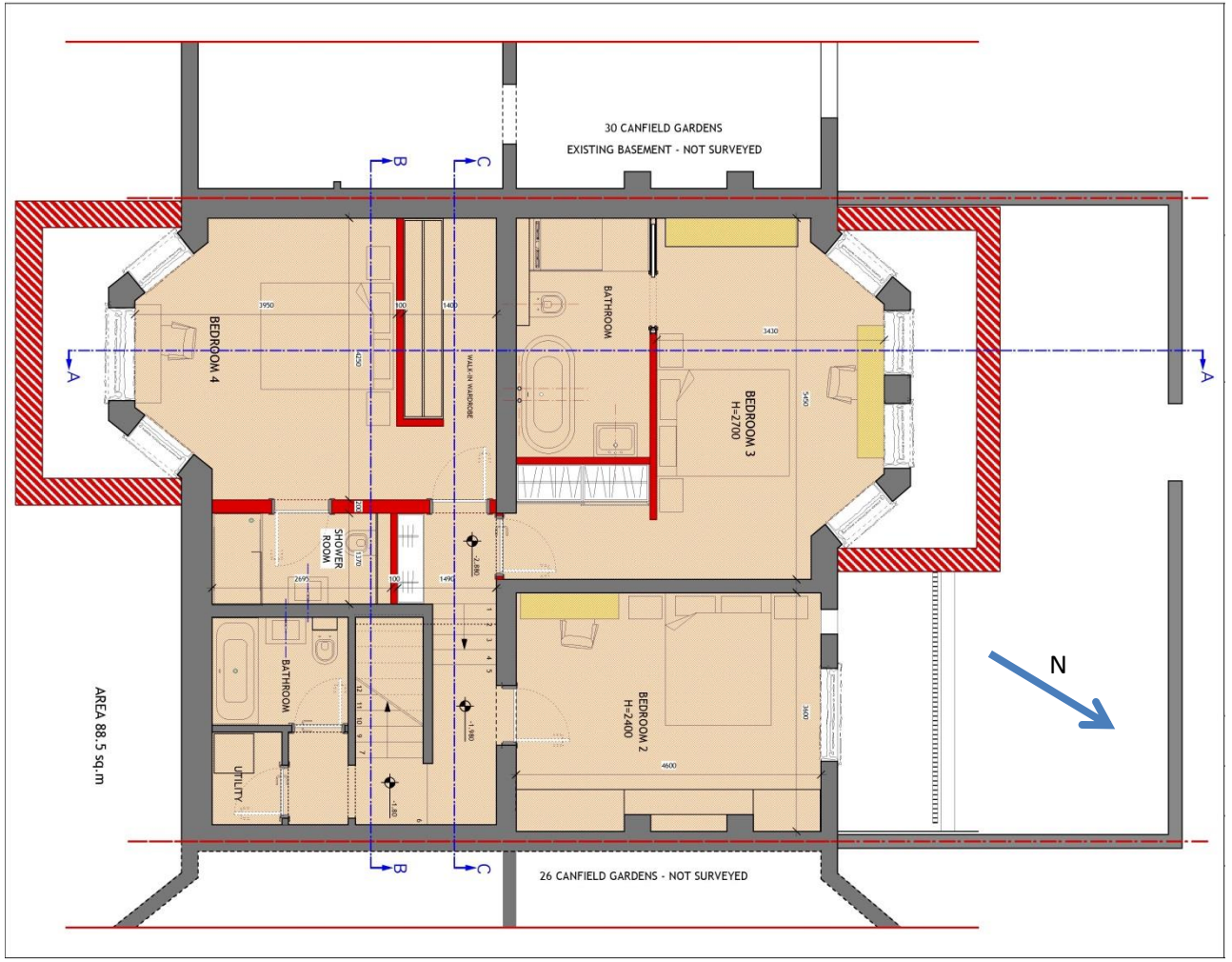
It is recommended to continue monitoring the ground water levels prior to construction works, to provide a better understanding of the ground water conditions at the site.

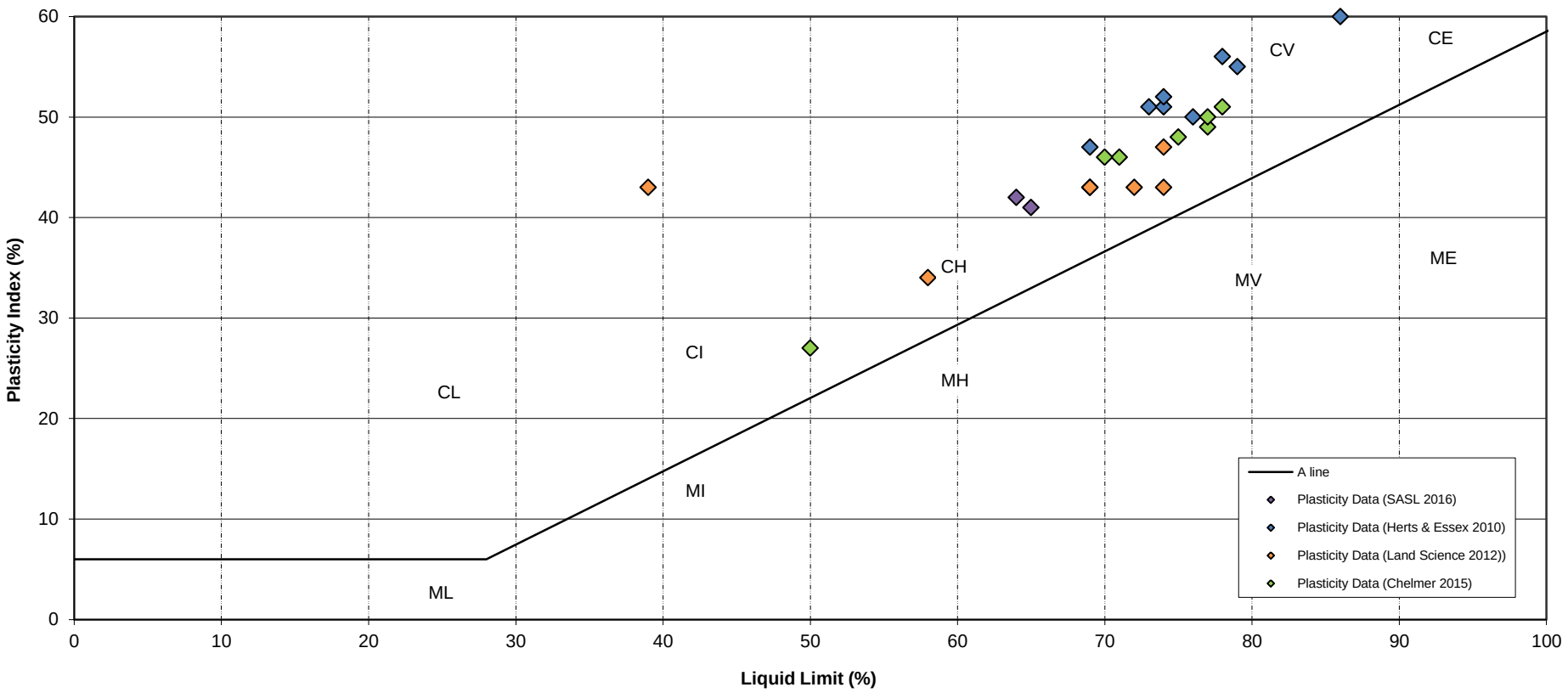
Figure 1 – Site Location Plan



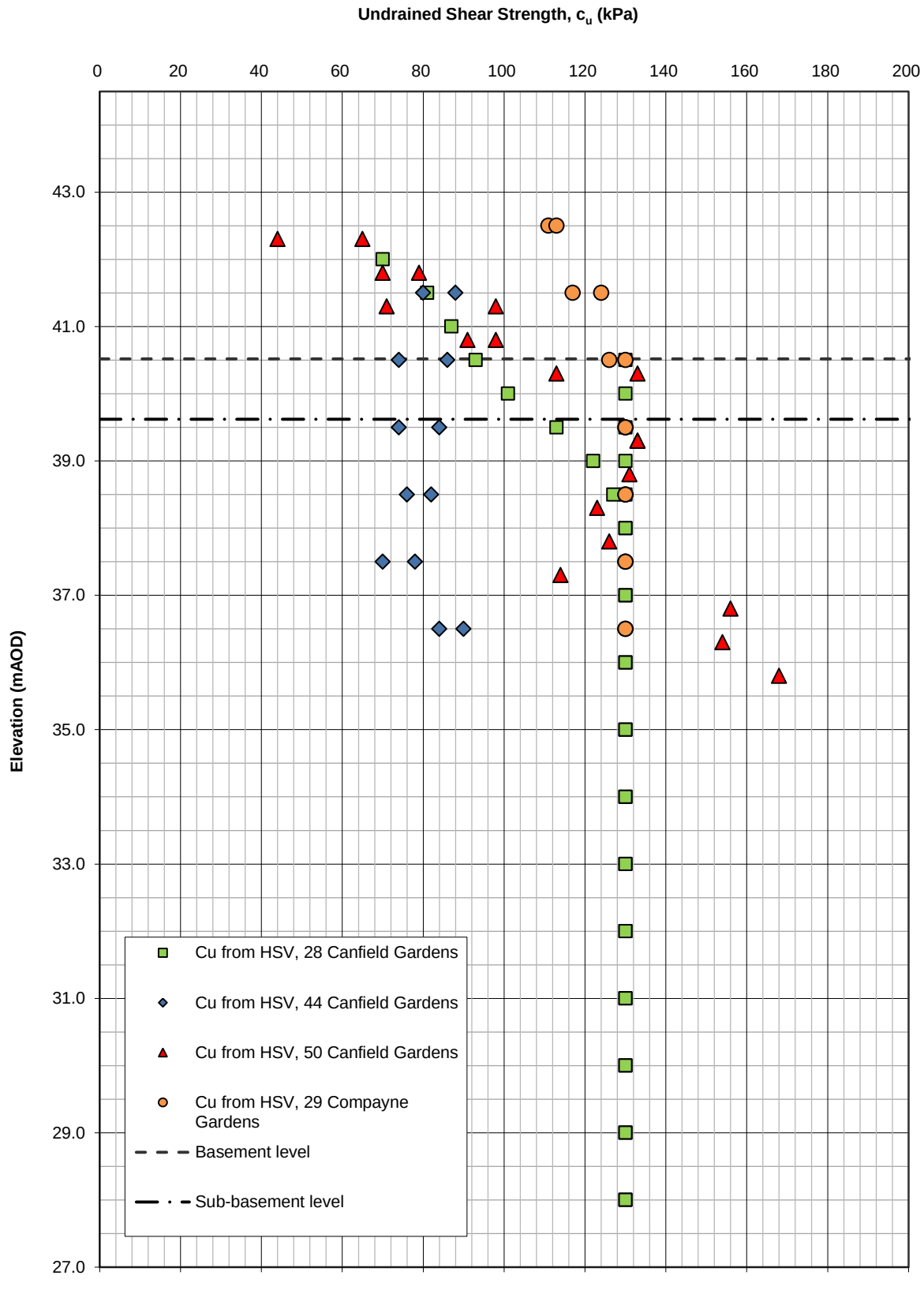
Copyright. Ordnance Survey 2016

Figure 2 – Site Plan Showing Neighbouring Properties to the Site

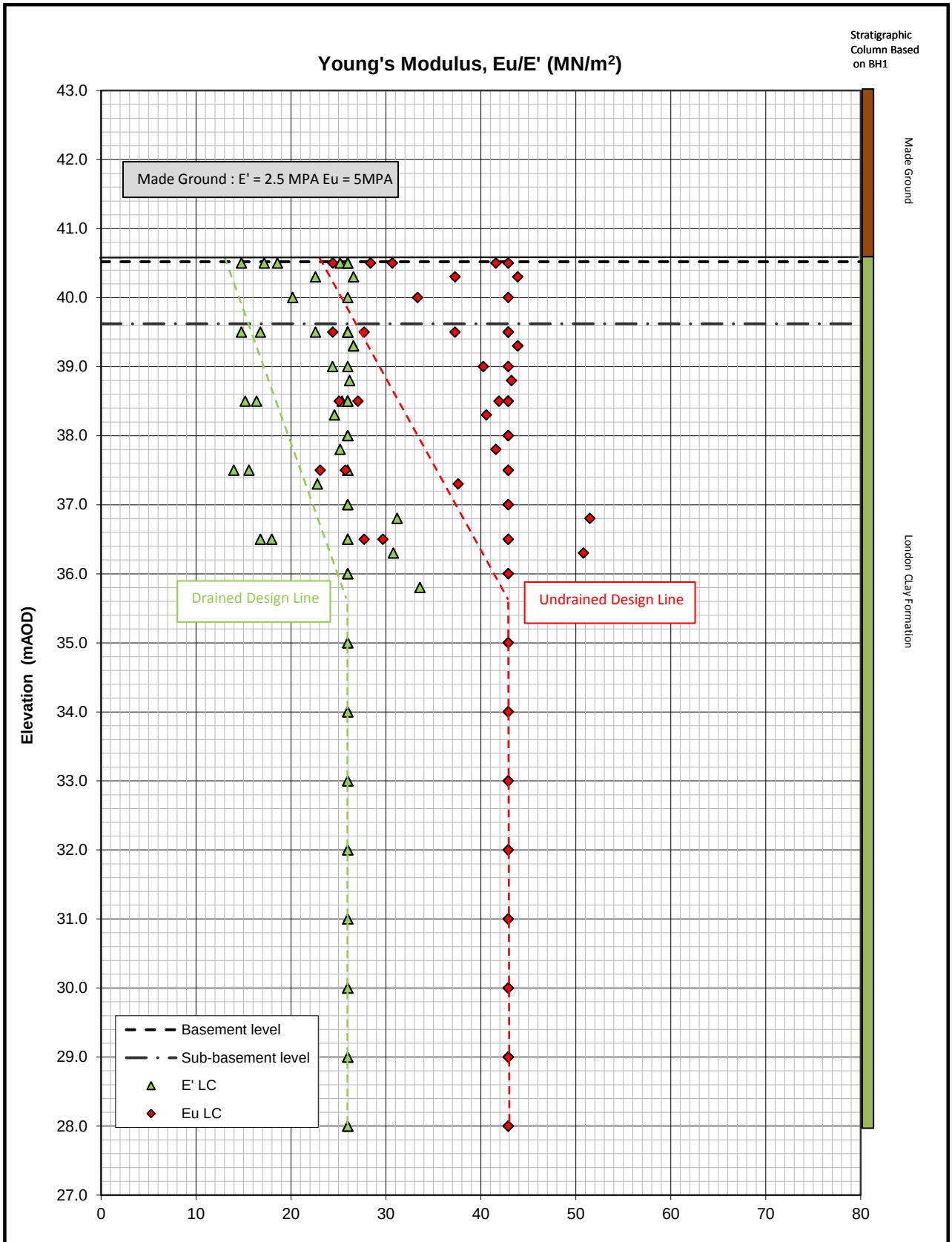




PROJECT TITLE:- **28 Canfield Gardens**	ORIGINATOR:- FAIRHURST
FIG TITLE:- **Ground Movement Assessment** Casagrande Plasticity Chart	FIG No.:- **Figure 3**
REPORT No.:- **117401**	DATE:- **January 2020**

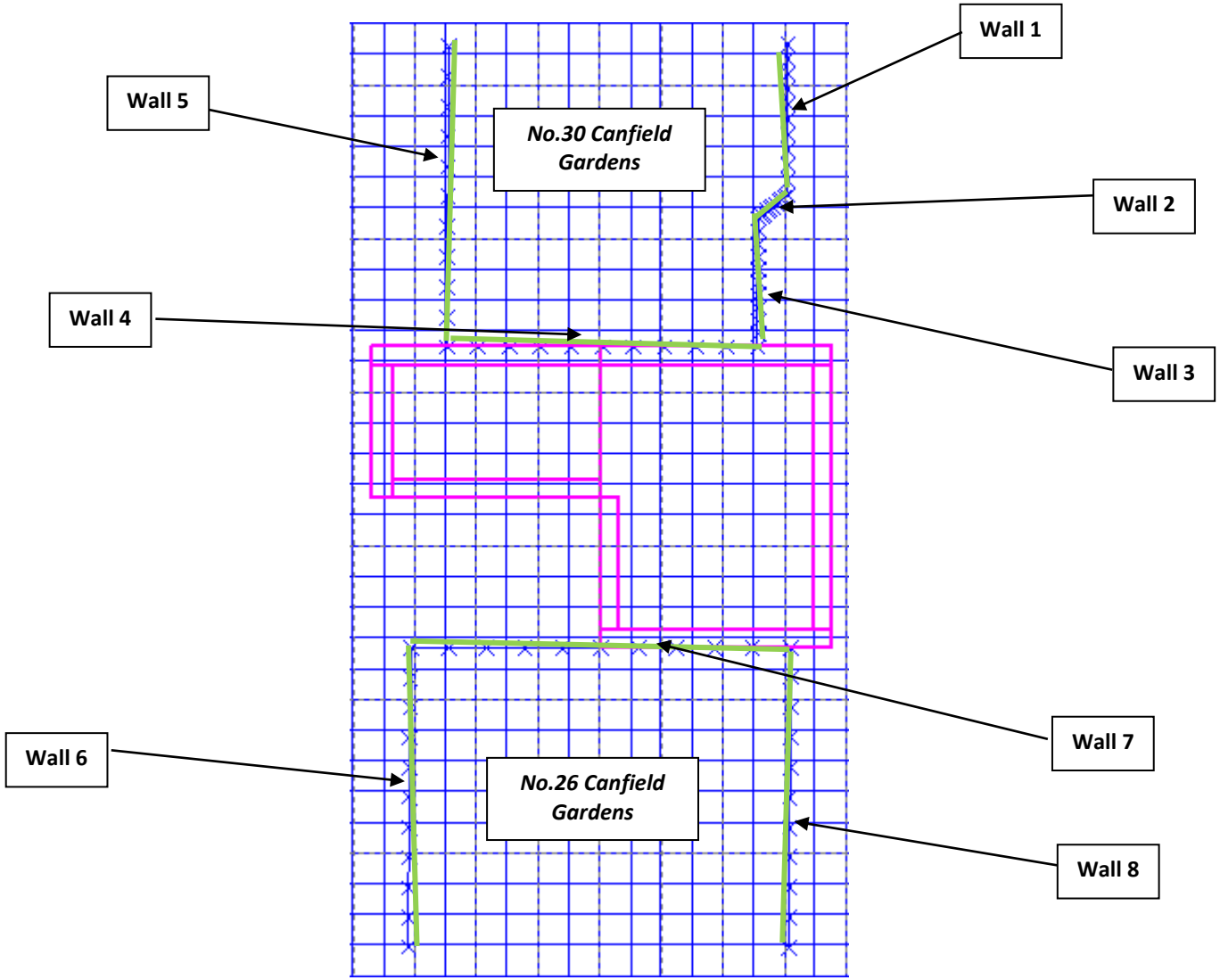


PROJECT TITLE:- **28 Canfield Gardens**	ORIGINATOR:- FAIRHURST
FIG TITLE:- **Ground Movement Assessment** Undrained Shear Strength versus Depth	FIG No.:- **Figure 4**
	REPORT No.:- **117401**
	DATE:- January 2020



PROJECT TITLE:- **28 Canfield Gardens**	ORIGINATOR:- FAIRHURST
FIG TITLE:- **Ground Movement Assessment** Young's Modulus vs Depth	FIG No.:- **Figure 5**
	REPORT No.:- **117401**
	DATE:- January 2020

Figure 6 – Wall Plan used for XDISP Analysis



Appendix A – Architects Existing and Proposed Drawings

THE TREATMENT
ARCHITECTURE LTD.
11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

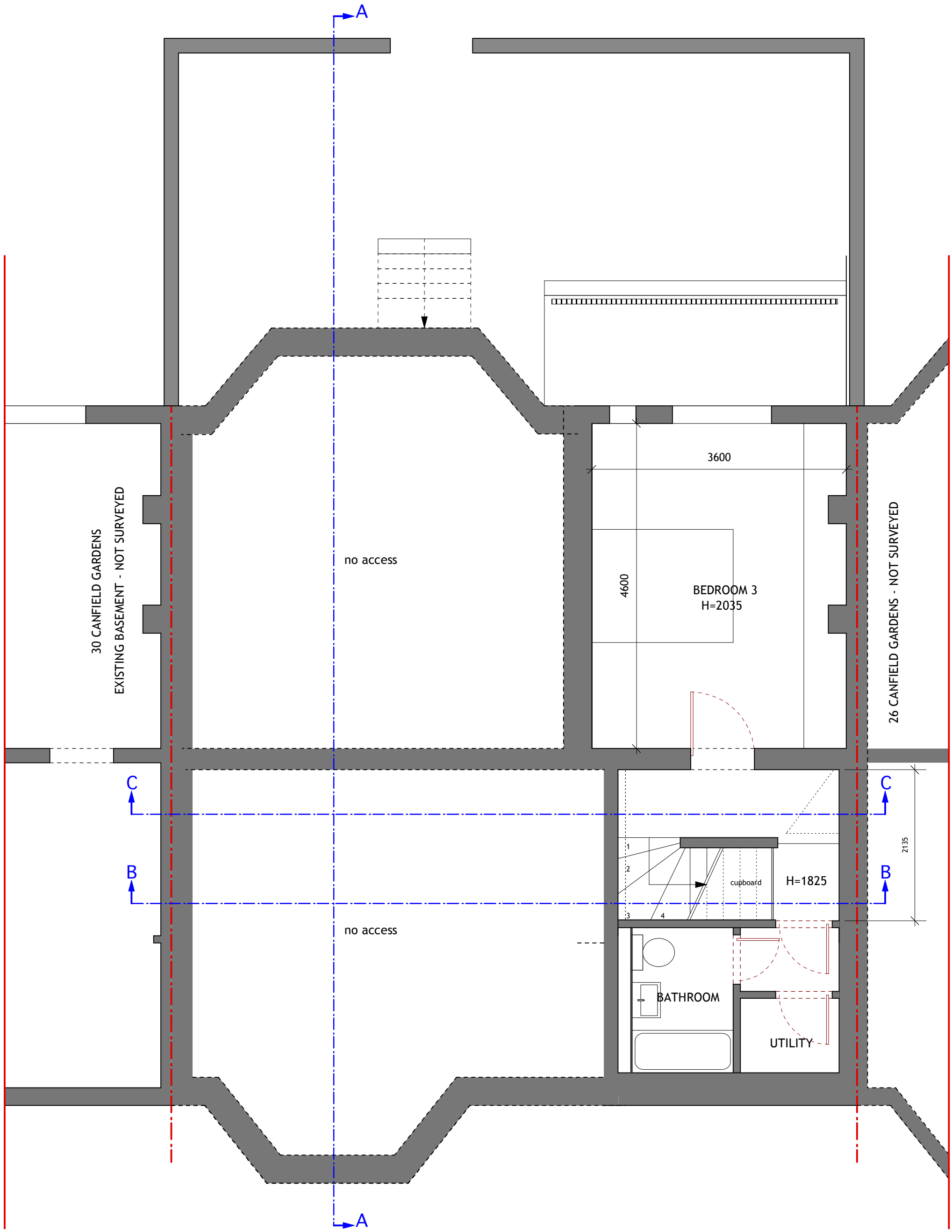
PROJECT
28 CANFIELD GARDENS
LONDON NW6 3LA

DRAWING NAME
01 - EXISTING BASEMENT FLOOR PLAN

DRAWING Ref.
28CanfieldBasement@Camden16052016

DRAWEN : *RCB*

SCALE :	PROJ No.	REV. No.	SHEET :	DATED :
1/50	*NW63LA*	*00*	*A3*	*01/06/2016*



THE TREAT MENT
ARCHITECTURE LTD.
11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

28 CANFIELD GARDENS
LONDON NW6 3LA
PROJECT

04 - EXISTING SECTION AA

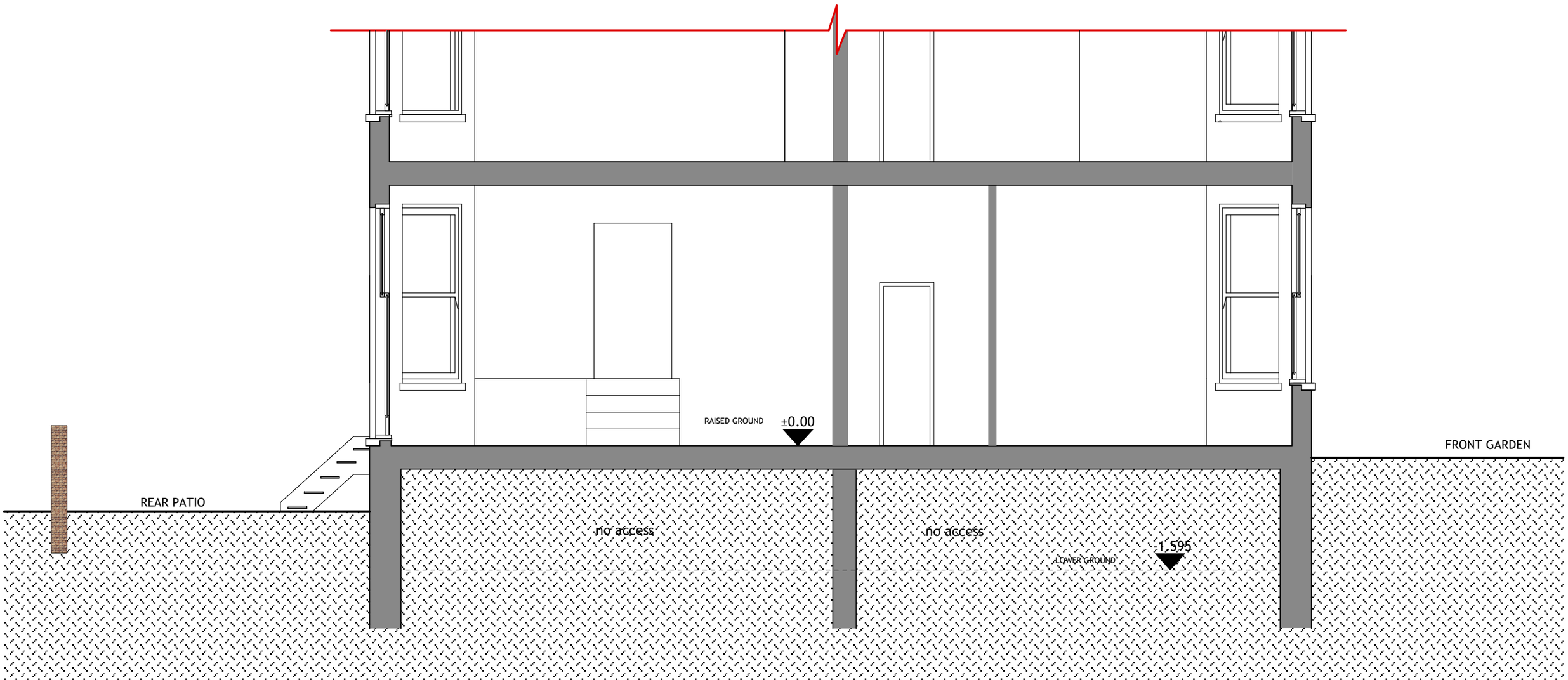
DRAWING NAME

DRAWING Ref.
28CanfieldBasement@Camden16052016

SCALE :	PROJ No.	REV. No.
1/50	*NW63LA*	*00*

RCB DRAWEN :
A3 SHEET :
01/06/2016 DATED :

LEGENDE:



THE TREATMENT
ARCHITECTURE LTD.
11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

05 - EXISTING SECTIONS BB & CC

DRAWING Ref. 28CanfieldBasement@Camden16052016

DRAWEN : RCB

SCALE :	PROJ No.	REV. No.	SHEET :	DATED :
1/50	NW63LA	00	A3	01/06/2016

PROJECT: 28 CANFIELD GARDENS LONDON NW6 3LA

DRAWING NAME

30 CANFIELD GARDENS NOT SURVEYED

26 CANFIELD GARDENS NOT SURVEYED

3650

+0.865

+0.53

±0.00

RAISED GROUND

1880

300

1825

-1.525

SECTION CC

30 CANFIELD GARDENS NOT SURVEYED

26 CANFIELD GARDENS NOT SURVEYED

3650

+0.865

+0.53

RAISED GROUND ±0.00

1880

300

1825

11
10
9
8
7
6
5
4
3
2
1

LOWER GROUND

-1.595

SECTION BB

THE TREATMENT
ARCHITECTURE LTD.
11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

28 CANFIELD GARDENS
LONDON NW6 3LA
PROJECT

06 - EXISTING FRONT ELEVATION

DRAWING NAME

DRAWING Ref. *28CanfieldBasement@Camden16052016*

DRAWEN : *RCB*

SCALE :	PROJ No.	REV. No.	SHEET :	DATED :
1/50	*NW63LA*	*00*	*A3*	*01/06/2016*

THE TREATMENT
ARCHITECTURE LTD.
11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

PROJECT
28 CANFIELD GARDENS
LONDON NW6 3LA

DRAWING NAME
07 - EXISTING REAR ELEVATION

DRAWING Ref.
28CanfieldBasement@Camden16052016

DRAWEN : *RCB*

SCALE :	PROJ No.	REV. No.	SHEET :	DATED :
1/50	*NW63LA*	*00*	*A3*	*01/06/2016*

THE TREATMENT ARCHITECTURE LTD.
43 WILTON ROAD , LONDON N10 1LX , UK
Email: thetreatment@mac.com
Landline: 020 88832503 Mobile: 07887 646505

DATE: 06/09/2019

REV NUMBER: 00

PROJECT: **28 CANFIELD GARDENS, LONDON NW6 3EE**

DRAWING NAME: **08 - PROPOSED BASEMENT FLOOR PLAN**

SCALE: 1/50

0.0 1.0 2.0 3.0 4.0 5.0

LEGEND: NEW

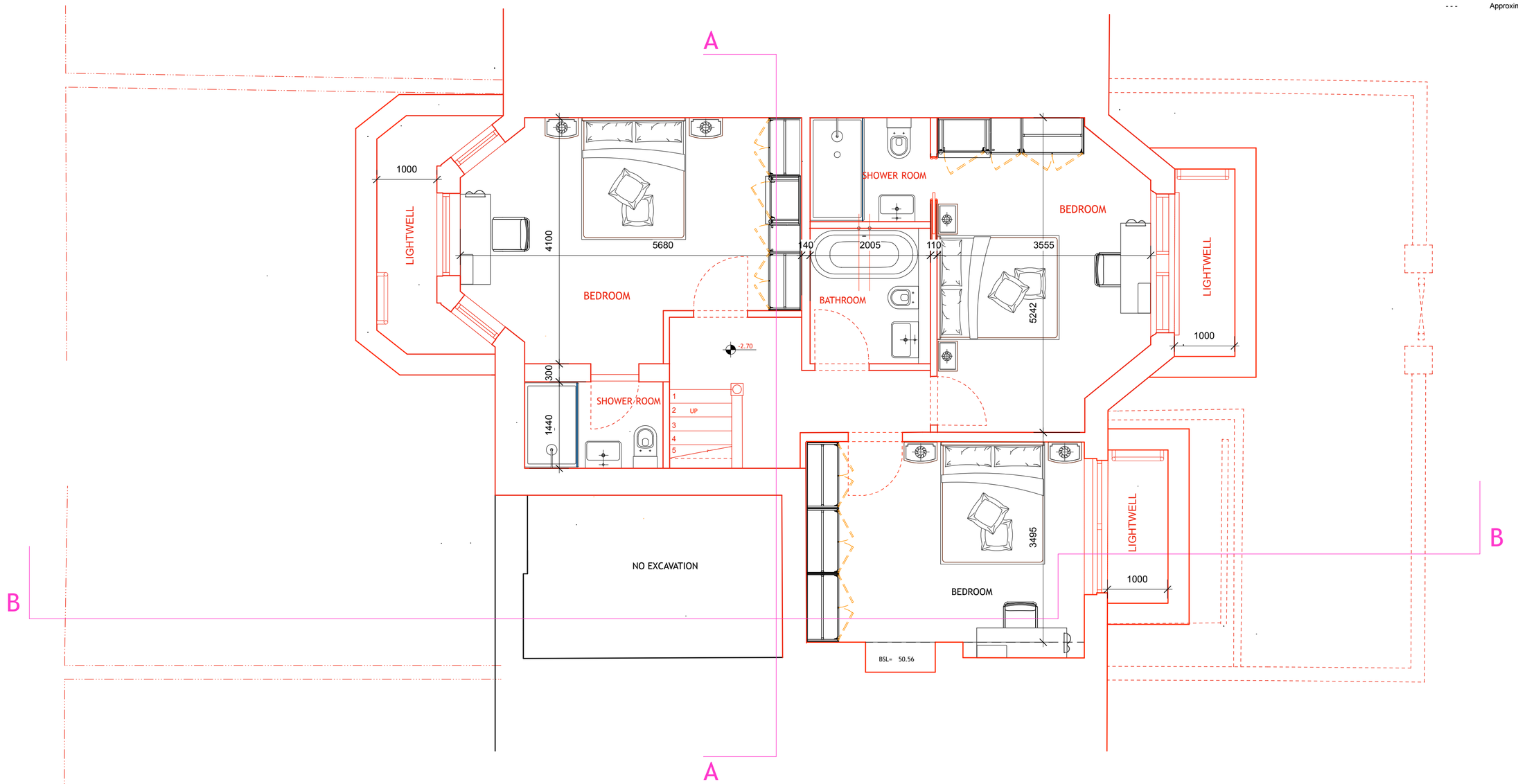
F Foul Water Pipe
S Surface Water Pipe

Building Abbreviations

BL	Basement Level	HD	Heating Duct
BH	Beam Soffit Height	H	Height
BSL	Beam Soffit Level	RWP	Rain Water Pipe
C	Cill Height from FFL	SL	Soffit Level
DP	Down Pipe	SVP	Soil and Vent Pipe
DPC	Damp Proof Course	VP	Vent Pipe
DH	Door Height	W	Window Height from cill
DHL	Door Head level		Direction of Floor Joist Span
FFL	Finished Floor Level	C Level	Cill Level
2100	Floor to Ceiling Height or Ceiling Level	H Level	Window Head Level Detail Approx.
25.56		CSU	Ceiling slopes up
CH	Ceiling Height	F-H	Floor - Window head Ht

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker	EJB	Electricity Junction Box	SPR	Spread
BH	Borehole	MT	Mercury Telecom Cover	EC	Electricity Cover	STA	Traverse Station
BOL	Bollard	OHC	Overhead Cable	EP	Electricity Pole	SV	Stop Valve
BT	British Telecom Cover	OHP	Overhead Pipe	ER	Earthing Rod	SVP	Soil Vent Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark	FH	Fire Hydrant	SW	Storm Water
BWK	Brickwork	PB	Post Box	FIG	Feed Into Ground	TB	Telephone Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker	FW	Foul Water	TBM	Temporary Bench Mark
CB	Close Boarded Fence	PR	Post & Rail Fence	GU	Gully	TFR	Taken From Records
CCTV	Closed Circuit TV	PW	Post & Wire Fence	GV	Gas Valve	TJB	Telephone Junction Box
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence	H	Height	TPT	Trial Pit
CHPL	Chestnut Paling Fence	RE	Rodding Eye	IC	Inspection Cover	TL	Traffic Light
CL	Cover Level	RG	Road Gully	IL	Invert Level	TP	Telephone Pole
CM	Cable Marker	RN	Road Name	IR	Iron Railing Fence	UTL	Unable To Lift
CP	Catch Pit	RS	Road Sign	KO	Kerb Outlet	UTT	Unable To Trace
CPL	Catch Pit Base Level	RW	Retaining Wall	LB	Litter Bin	VP	Vent Pipe
DIA	Diameter	RWP	Rain Water Pipe	LC	Lamp Column	WKH	Water Key Hole
DK	Drop Kerb	SAP	Sapling	LP	Lamp Post	WM	Water Meter
DP	Down Pipe	SC	Stop Cock	MH	Manhole	WV	Water Valve
						- - -	Approximate



THE TREATMENT ARCHITECTURE LTD.
43 WILTON ROAD , LONDON N10 1LX , UK
Email: thetreatment@mac.com
Landline: 020 88832503 Mobile: 07887 646505

DATE: 06/09/2019

REV NUMBER: 00

PROJECT: 28 CANFIELD GARDENS, LONDON NW6 3EE

DRAWING NAME: 09 - PROPOSED GROUND FLOOR PLAN

SCALE: 1/50

0.0 1.0 2.0 3.0 4.0 5.0

LEGEND: NEW

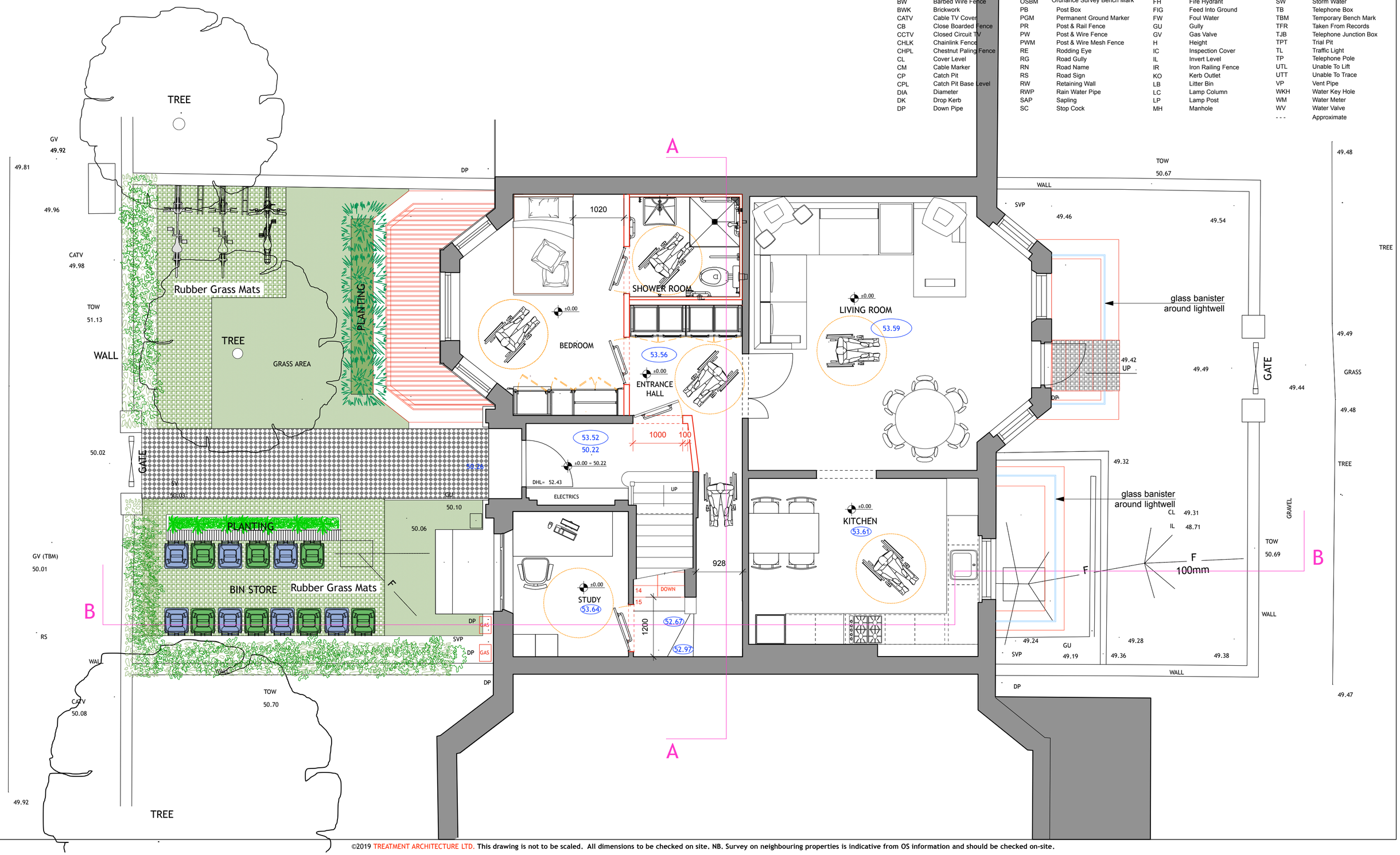
Building Abbreviations

BL	Basement Level	HD	Heating Duct
BH	Beam Soffit Height	H	Height
BSL	Beam Soffit Level	RWP	Rain Water Pipe
C	Cill Height from FFL	SL	Soffit Level
DP	Down Pipe	SVP	Soil and Vent Pipe
DPC	Damp Proof Course	VP	Vent Pipe
DH	Door Height	W	Window Height from cill
DHL	Door Head level		Direction of Floor Joist Span
FFL	Finished Floor Level	C Level	Cill Level
2100	Floor to Ceiling Height or Ceiling Level	H Level	Window Head Level Detail Approx.
25.56		CSU	Ceiling slopes up
CH	Ceiling Height	F-H	Floor - Window head Ht

F Foul Water Pipe
S Surface Water Pipe

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker	EJB	Electricity Junction Box	SPR	Spread
BH	Borehole	MT	Mercury Telecom Cover	EC	Electricity Cover	STA	Traverse Station
BOL	Bollard	OHC	Overhead Cable	EP	Electricity Pole	SV	Stop Valve
BT	British Telecom Cover	OHP	Overhead Pipe	ER	Earthing Rod	SVP	Soil Vent Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark	FH	Fire Hydrant	SW	Storm Water
BWK	Brickwork	PB	Post Box	FIG	Feed Into Ground	TB	Telephone Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker	FW	Foul Water	TBM	Temporary Bench Mark
CB	Close Boarded Fence	PR	Post & Rail Fence	GU	Gully	TFR	Taken From Records
CCTV	Closed Circuit TV	PW	Post & Wire Fence	GV	Gas Valve	TJB	Telephone Junction Box
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence	H	Height	TPT	Trial Pit
CHPL	Chestnut Paling Fence	RE	Rodding Eye	IC	Inspection Cover	TL	Traffic Light
CL	Cover Level	RG	Road Gully	IL	Invert Level	TP	Telephone Pole
CM	Cable Marker	RN	Road Name	IR	Iron Railing Fence	UTL	Unable To Lift
CP	Catch Pit	RS	Road Sign	KO	Kerb Outlet	UTT	Unable To Trace
CPL	Catch Pit Base Level	RW	Retaining Wall	LB	Litter Bin	VP	Vent Pipe
DIA	Diameter	RWP	Rain Water Pipe	LC	Lamp Column	WKH	Water Key Hole
DK	Drop Kerb	SAP	Sapling	LP	Lamp Post	WM	Water Meter
DP	Down Pipe	SC	Stop Cock	MH	Manhole	WV	Water Valve
						- - -	Approximate



THE TREATMENT ARCHITECTURE LTD.
43 WILTON ROAD , LONDON N10 1LX , UK
Email: thetreatment@mac.com
Landline: 020 88832503 Mobile: 07887 646505

DATE: 06/09/2019

REV NUMBER: 00

PROJECT: **28 CANFIELD GARDENS, LONDON NW6 3EE**

DRAWING NAME: **10 - PROPOSED SECTIONS A-A**

SCALE: 1/50

0.0 1.0 2.0 3.0 4.0 5.0

LEGEND: NEW

Building Abbreviations

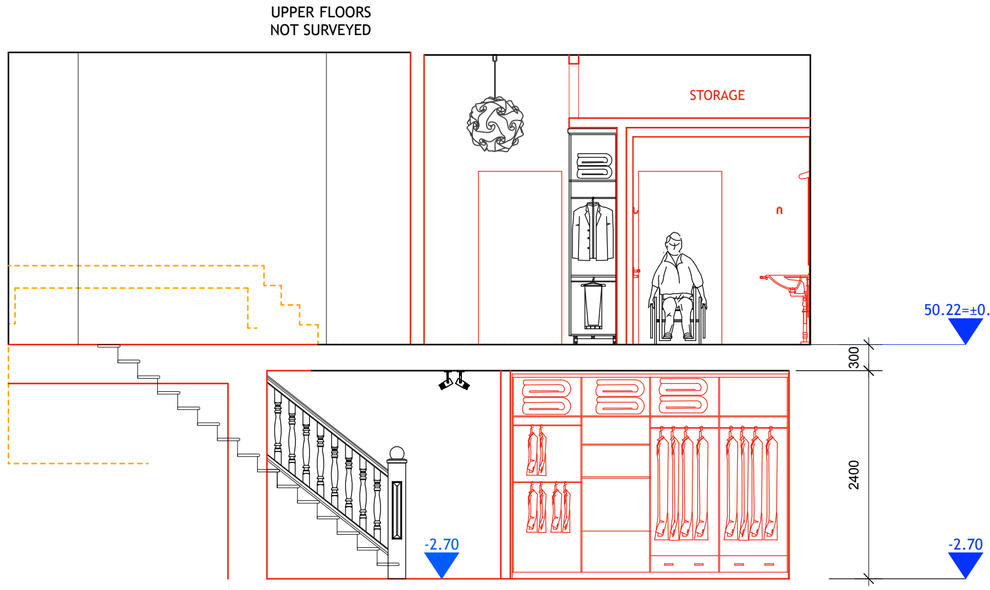
BL	Basement Level	HD	Heating Duct
BH	Beam Soffit Height	H	Height
BSL	Beam Soffit Level	RWP	Rain Water Pipe
C	Cill Height from FFL	SL	Soffit Level
DP	Down Pipe	SVP	Soil and Vent Pipe
DPC	Damp Proof Course	VP	Vent Pipe
DH	Door Height	W	Window Height from cill
DHL	Door Head level		Direction of Floor Joist Span
FFL	Finished Floor Level	C Level	Cill Level
2100	Floor to Ceiling Height or Ceiling Level	H Level	Window Head Level
25.56			Detail Approx.
CH	Ceiling Height	CSU	Ceiling slopes up
		F-H	Floor - Window head Ht

F Foul Water Pipe

S Surface Water Pipe

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker	EJB	Electricity Junction Box	SPR	Spread
BH	Borehole	MT	Mercury Telecom Cover	EC	Electricity Cover	STA	Traverse Station
BOL	Bollard	OHC	Overhead Cable	EP	Electricity Pole	SV	Stop Valve
BT	British Telecom Cover	OHP	Overhead Pipe	ER	Earthing Rod	SVP	Soil Vent Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark	FH	Fire Hydrant	SW	Storm Water
BWK	Brickwork	PB	Post Box	FIG	Feed Into Ground	TB	Telephone Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker	FW	Foul Water	TBM	Temporary Bench Mark
CB	Close Boarded Fence	PR	Post & Rail Fence	GU	Gully	TFR	Taken From Records
CCTV	Closed Circuit TV	PW	Post & Wire Fence	GV	Gas Valve	TJB	Telephone Junction Box
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence	H	Height	TPT	Trial Pit
CHPL	Chestnut Paling Fence	RE	Rodding Eye	IC	Inspection Cover	TL	Traffic Light
CL	Cover Level	RG	Road Gully	IL	Invert Level	TP	Telephone Pole
CM	Cable Marker	RN	Road Name	IR	Iron Railing Fence	UTL	Unable To Lift
CP	Catch Pit	RS	Road Sign	KO	Kerb Outlet	UTT	Unable To Trace
CPL	Catch Pit Base Level	RW	Retaining Wall	LB	Litter Bin	VP	Vent Pipe
DIA	Diameter	RWP	Rain Water Pipe	LC	Lamp Column	WKH	Water Key Hole
DK	Drop Kerb	SAP	Sapling	LP	Lamp Post	WM	Water Meter
DP	Down Pipe	SC	Stop Cock	MH	Manhole	WV	Water Valve
						- - -	Approximate



DATUM 46.00m

THE TREATMENT ARCHITECTURE LTD.
43 WILTON ROAD , LONDON N10 1LX , UK
Email: thetreatment@mac.com
Landline: 020 88832503 Mobile: 07887 646505

DATE: 06/09/2019

REV NUMBER: 00

PROJECT: 28 CANFIELD GARDENS, LONDON NW6 3EE

DRAWING NAME: 11 - PROPOSED SECTION B-B

SCALE: 1/50

0.0 1.0 2.0 3.0 4.0 5.0

LEGEND: NEW

Building Abbreviations

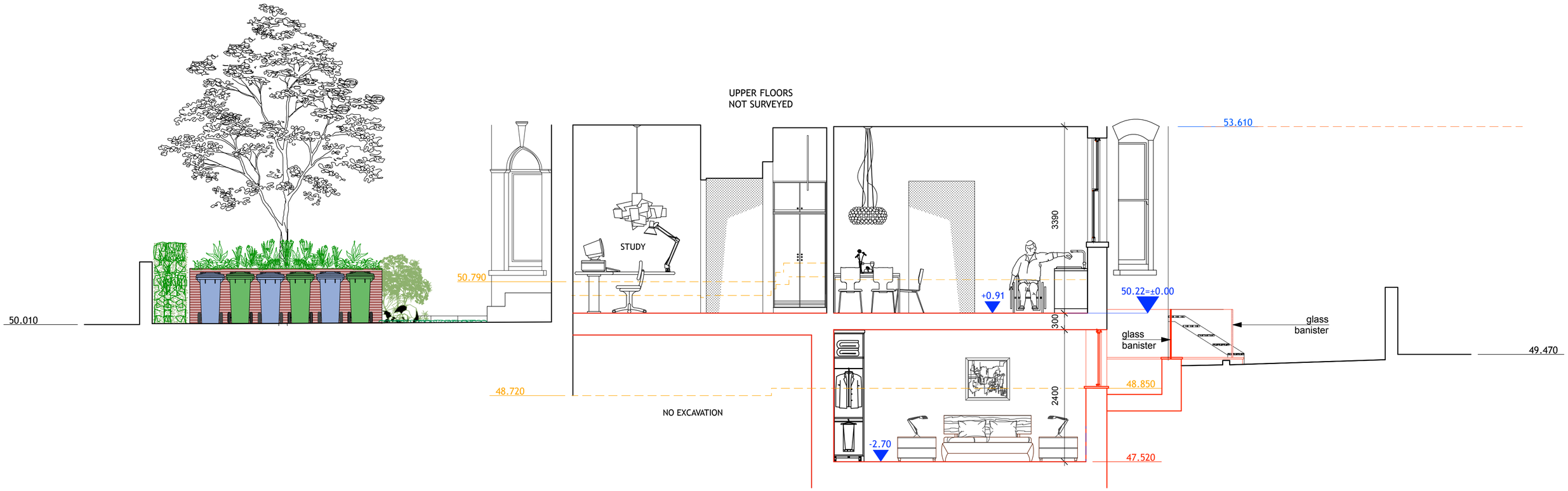
BL	Basement Level	HD	Heating Duct
BH	Beam Soffit Height	H	Height
BSL	Beam Soffit Level	RWP	Rain Water Pipe
C	Cill Height from FFL	SL	Soffit Level
DP	Down Pipe	SVP	Soil and Vent Pipe
DPC	Damp Proof Course	VP	Vent Pipe
DH	Door Height	W	Window Height from cill
DHL	Door Head level		Direction of Floor Joist Span
FFL	~~Finished Floor Level~~	C Level	Cill Level
2100	Floor to Ceiling Height or Ceiling Level	H Level	Window Head Level
25.56			Detail Approx.
CH	Ceiling Height	CSU	Ceiling slopes up
		F-H	Floor - Window head Ht

F Foul Water Pipe

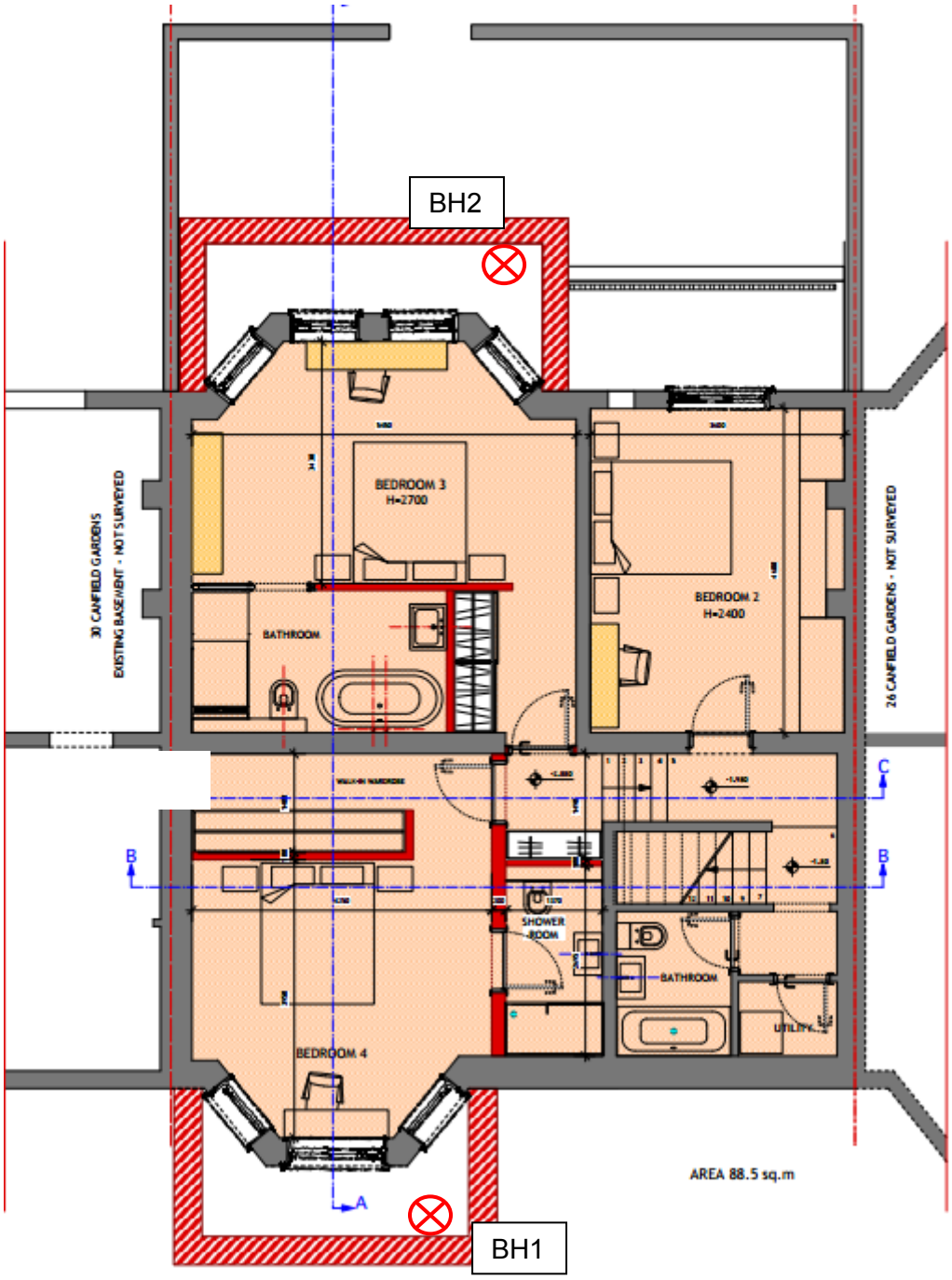
S Surface Water Pipe

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker	EJB	Electricity Junction Box	SPR	Spread
BH	Borehole	MT	Mercury Telecom Cover	EC	Electricity Cover	STA	Traverse Station
BOL	Bollard	OHC	Overhead Cable	EP	Electricity Pole	SV	Stop Valve
BT	British Telecom Cover	OHP	Overhead Pipe	ER	Earthing Rod	SVP	Soil Vent Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark	FH	Fire Hydrant	SW	Storm Water
BWK	Brickwork	PB	Post Box	FIG	Feed Into Ground	TB	Telephone Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker	FW	Foul Water	TBM	Temporary Bench Mark
CB	Close Boarded Fence	PR	Post & Rail Fence	GU	Gully	TFR	Taken From Records
CCTV	Closed Circuit TV	PW	Post & Wire Fence	GV	Gas Valve	TJB	Telephone Junction Box
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence	H	Height	TPT	Trial Pit
CHPL	Chestnut Paling Fence	RE	Rodding Eye	IC	Inspection Cover	TL	Traffic Light
CL	Cover Level	RG	Road Gully	IL	Invert Level	TP	Telephone Pole
CM	Cable Marker	RN	Road Name	IR	Iron Railing Fence	UTL	Unable To Lift
CP	Catch Pit	RS	Road Sign	KO	Kerb Outlet	UTT	Unable To Trace
CPL	Catch Pit Base Level	RW	Retaining Wall	LB	Litter Bin	VP	Vent Pipe
DIA	Diameter	RWP	Rain Water Pipe	LC	Lamp Column	WKH	Water Key Hole
DK	Drop Kerb	SAP	Sapling	LP	Lamp Post	WM	Water Meter
DP	Down Pipe	SC	Stop Cock	MH	Manhole	WV	Water Valve
						- - -	Approximate



Appendix B – Site Analytical Service Limited Site Investigation Data


BH2
BEDROOM 3
H=2700
BATHROOM
BEDROOM 2
H=2400
30 CANFIELD GARDENS
EXISTING BASEMENT - NOT SURVEYED
26 CANFIELD GARDENS - NOT SURVEYED
C
B
B
SHOWER ROOM
BATHROOM
UTILITY
BEDROOM 4
A
AREA 88.5 sq.m
BH1

THE TREAT MENT

11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

ARCHITECTURE LTD.

01 - EXISTING BASEMENT FLOOR PLAN

DRAWING NAME

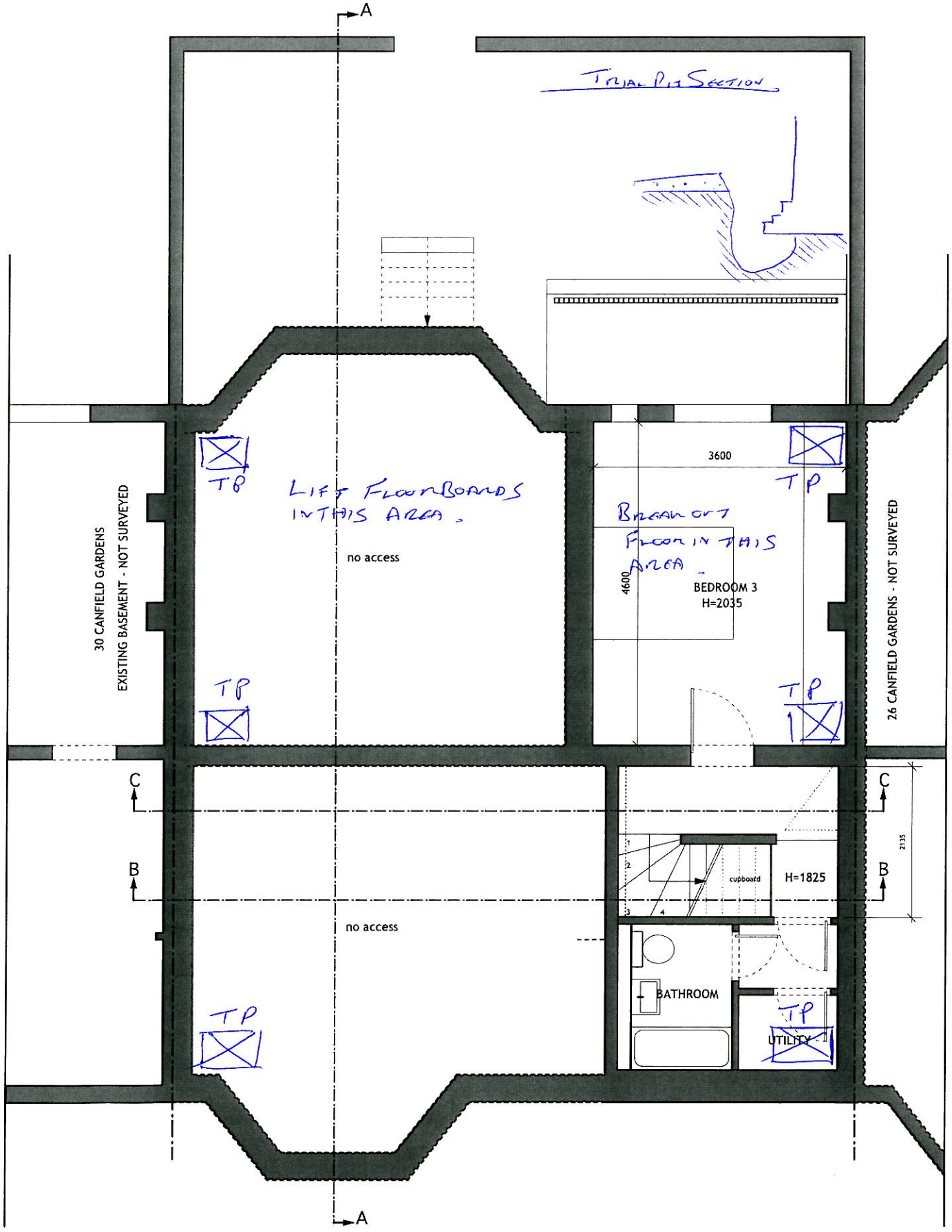
DRAWING Ref: 28CanfieldBasement@Camden16052016

DRAWN: RCB

SCALE	PROJ No.	REV. No.	SHEET	DATED
1/50	NW63LA	00	A3	01/06/2016

PROJECT

28 CANFIELD GARDENS
LONDON NW6 3LA



Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MARTIN REDSTON	1625536
	Location TQ260845	**Dates** 21/07/2016	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.25	D1					(0.70)	MADE GROUND: Slate chippings over dark brown black slightly gravelly clayey sand with fragments of brick and concrete rubble. Gravel is fine to coarse of sub-angular to sub-rounded flint.		
0.50	D2								
0.75	D3					0.70			
1.00	D4					(0.50)	MADE GROUND: Soft, brown silty sandy clay with fragments of brick and concrete rubble.		
1.00-1.30	M1 94/300					1.20			
1.50	D5						MADE GROUND: Stiff, light brown silty sandy clay with fragments of brick and concrete rubble.		
1.50	V1 95					(1.20)			
2.00	D6								
2.00	V2 117					2.40			
2.50	D7						Stiff, brown sandy silty CLAY.		
2.50	V3 130+								
3.00	D8								
3.00	V4 130+								
3.50	D9								
3.50	V5 130+								
4.00	D10								
4.00	V6 130+								
4.50	D11								
4.50	V7 130+					(4.80)			
5.00	D12								
5.00	V8 130+								
6.00	D13								
6.00	V9 130+								
7.00	D14								
7.00	V10 130+					7.20	Stiff, brown blue sandy silty CLAY.		
8.00	D15								
8.00	V11 130+								
9.00	D16					(2.80)			
9.00	V12 130+								

Remarks
D= Disturbed Sample
M= Makintosh Probe - Blows/Penetration (mm)
V= Vane Test - Result in kPa
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 1625536.BH!

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MARTIN REDSTON	1625536
	Location TQ260845	**Dates** 21/07/2016	**Engineer**	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00 10.00	D17 V13 130+					10.00	Stiff, brown blue sandy silty CLAY.		
11.00 11.00	D18 V14 130+								
12.00 12.00	D19 V15 130+					(5.00)			
13.00 13.00	D20 V16 130+								
14.00 14.00	D21 V17 130+								
15.00 15.00	D22 V18 130+					15.00	Complete at 15.00m		

Remarks
D= Disturbed Sample
M= Makintosh Probe - Blows/Penetration (mm)
V= Vane Test - Result in kPa
Groundwater was not encountered during boring/excavation

Scale (approx)	Logged By
1:50	EW

Figure No. 1625536.BH!

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MARTIN REDSTON	1625536
	Location TQ260845	**Dates** 21/07/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.05	MADE GROUND: Concrete slab		
						0.07 (0.43)	MADE GROUND: Thin layer of concrete		
0.25	D1					0.50	MADE GROUND: Black silty sandy clay with fragments of brick and concrete rubble.		
0.50	D2					0.60	MADE GROUND: Brown silty sandy clay with fragments of brick and concrete rubble.		
0.75	D3						Firm becoming stiff, brown sandy silty CLAY		
1.00	D4								
1.00	V1 70								
1.50	D5								
1.50	V2 81								
2.00	D6								
2.00	V3 87								
2.50	D7								
2.50	V4 93								
3.00	D8								
3.00	V5 101								
3.50	D9					(5.90)			
3.50	V6 113								
4.00	D10								
4.00	V7 122								
4.50	D11								
4.50	V8 127								
5.00	D12								
5.00	V9 130+								
6.00	D13								
6.00	V10 130+								
						6.50	Stiff, dark blue grey sandy silty CLAY with occasional gypsum crystals.		
7.00	D14								
7.00	V11 130+								
8.00	D15								
8.00	V12 130+					(3.50)			
9.00	D16								
9.00	V13 130+								
10.00	D17								
10.00	V14 130+					10.00			

Remarks
D= Disturbed Sample
M= Makintosh Probe - Blows/Penetration (mm)
V= Vane Test - Result in kPa
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 1625536.BH2

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH1

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
MARTIN REDSTON

Job Number
1625536

Location
TQ260845

Ground Level (mOD)

Engineer

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Bentonite Seal
				1.00	
					Slotted Standpipe
				8.00	
					Bentonite Seal
				9.00	
					General Backfill
				15.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks
Lockable cover set in cement

Site Analytical Services Ltd.

Site	Borehole Number
28 CANFIELD GARDENS,LONDON,NW6 3LA	BH2

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
MARTIN REDSTON

Job Number
1625536

Location
TQ260845

Ground Level (mOD)

Engineer

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Bentonite Seal
				1.00	
					Slotted Standpipe
				8.50	
					Bentonite Seal
				9.50	
					General Backfill
				10.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks
Lockable cover set in cement

Site Analytical Services Ltd.

Ref: 16/25536

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 28 Canfield Gardens, London, NW6 3LA

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 μm %	Class
BH1	3.50	30	65	24	41	100	CH
	4.00	31	64	22	42	100	CH
BH2	4.00	32	69	26	43	100	CH

Table 2

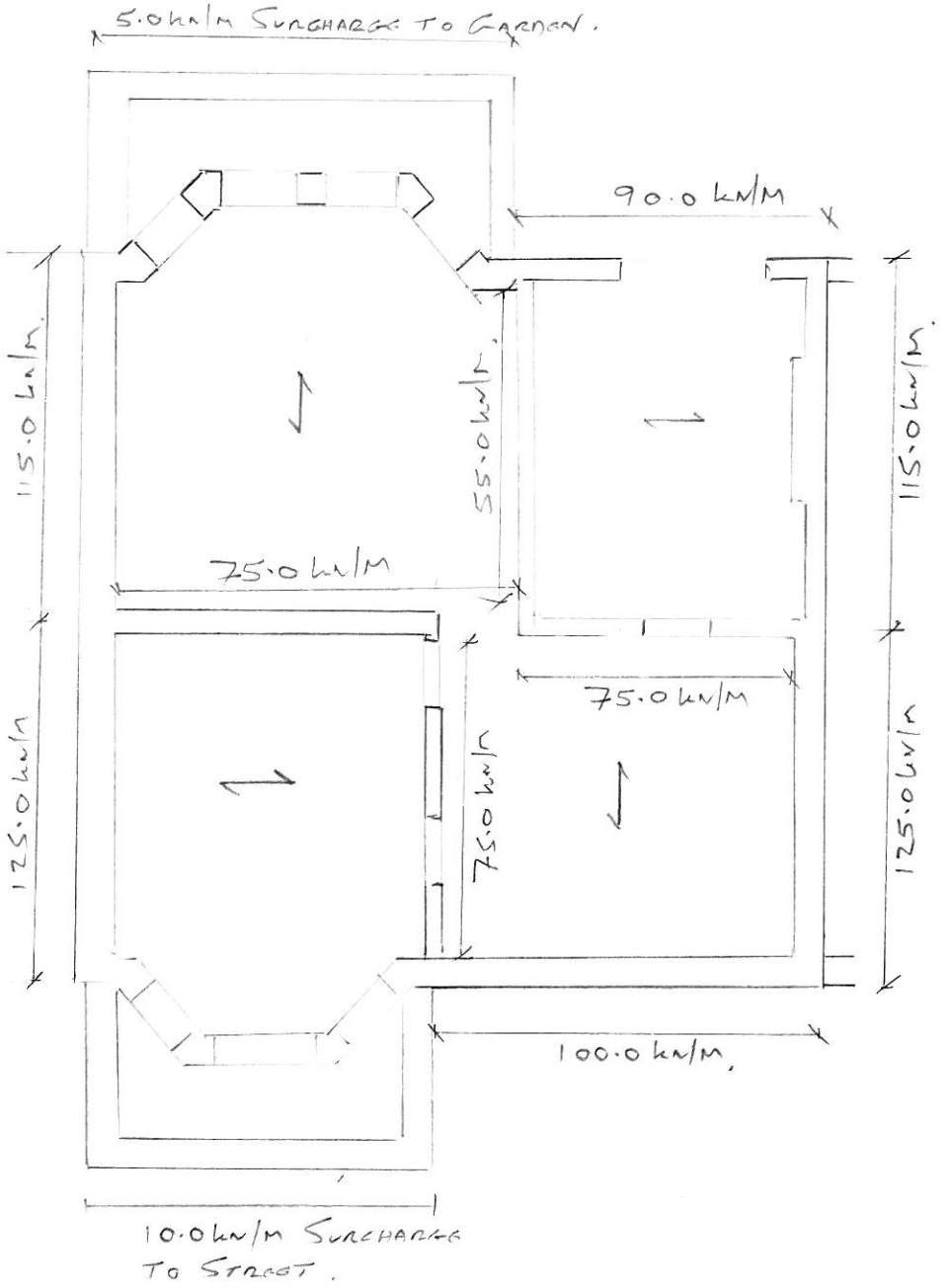
Appendix C – Martin Redston Associate Engineers Load Drawing

Martin Redston Associates
Consulting Civil & Structural Engineers
3 Edward Square, London N1 0SP
Tel: 020 7837 5377 Fax: 020 7837 3211
6 Hale Lane, London NW7 3NX
Tel: 020 8959 1666 Fax: 020 8906 8503
Email: martin@redston.org

Date 17/10/16.	Sheet No. TL-01
Eng. PS	
Job No. 16.440	

28 Canfield Gardens NW6.

Temporary Condition Line Loads



(Front, Canfield Gdns)

Permanent Condition

Wall Loads Spread into Base Slab to Give an Average Load of Approximately 95.0 kN/m². (Unfactored)

THE TREAT MENT

11 WOODBERRY CRESCENT, LONDON N10 1PJ, UK
Email: thetreatment@mac.com
Landline: 020 8883 2503 Mobile: 07887 646505

ARCHITECTURE LTD.

01 - EXISTING BASEMENT FLOOR PLAN

DRAWING NAME

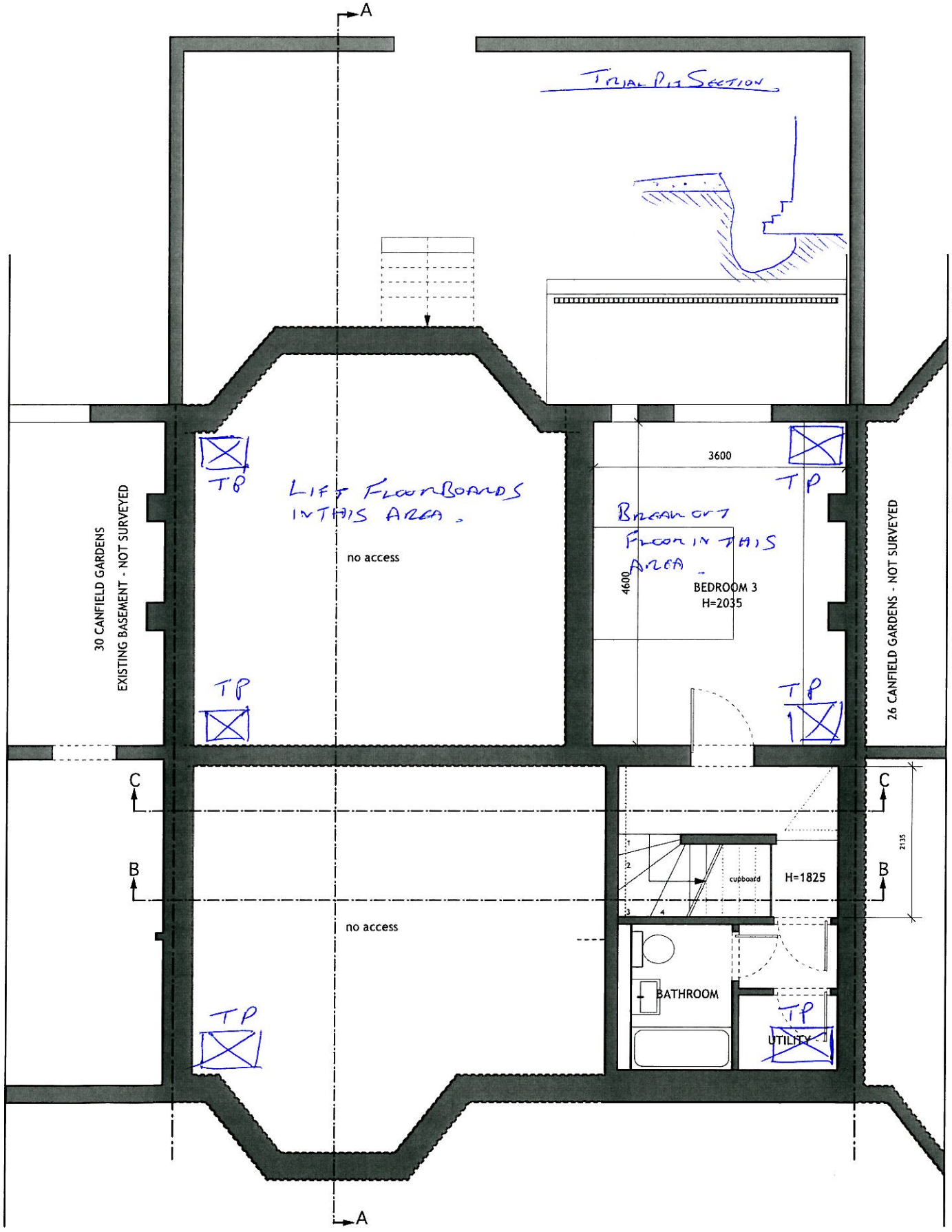
DRAWING Ref: 28CanfieldBasement@Camden16052016

DRAWN: RCB

SCALE	PROJ No.	REV. No.	SHEET	DATED
1/50	NW63LA	00	A3	01/06/2016

PROJECT

28 CANFIELD GARDENS
LONDON NW6 3LA

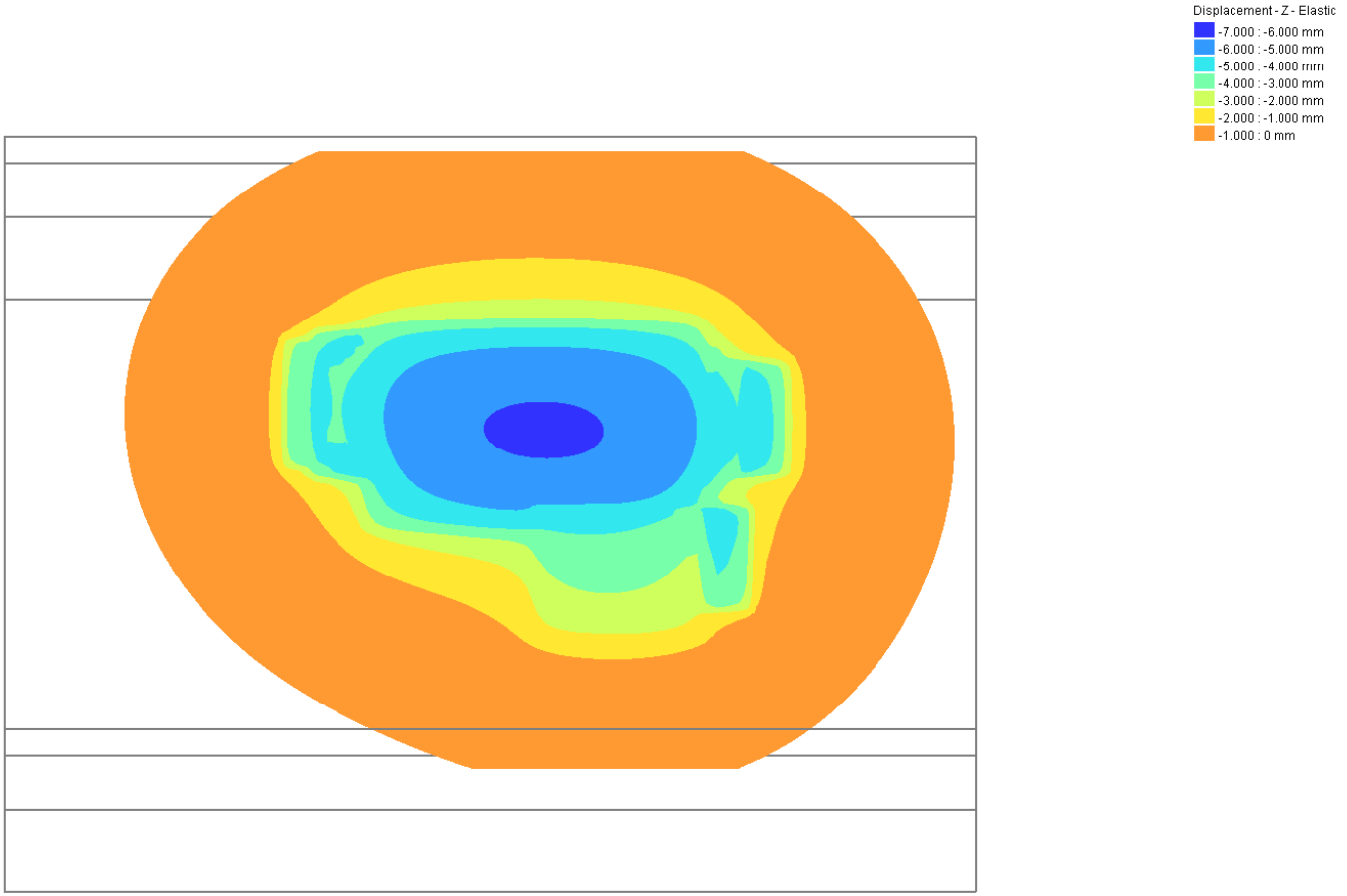


Appendix D - Stage 1 – PDISP Undrained unloading settlement movements

28 Canfield Gardens

Ground Movement Assessment

Heave analysis



Titles

Job No.: 117401
Job Title: 28 Canfield Gardens
Sub-title: Ground Movement Assessment
Calculation Heading: Heave analysis
Initials: HB
Checker: AS
Date Saved:
Date Checked: 15 Jan 2020
Notes:
File Name: 117401 - 28 Canfield Gardens Stage 1 HB - Lightwell.pdd
File Path: X:\a_PROJECTS\117401 - 28 Canfield Gardens, NW6\Geotech\Model\PDisp

History

Date	Time	By	Notes
28-Nov-2016	17:03	ocolas	
28-Nov-2016	17:09	ocolas	
28-Nov-2016	17:11	ocolas	
28-Nov-2016	17:21	ocolas	
29-Nov-2016	10:09	ocolas	
29-Nov-2016	12:09	ocolas	
12-Dec-2019	15:20	hbrock	
12-Dec-2019	15:25	hbrock	
12-Dec-2019	15:37	hbrock	
12-Dec-2019	15:50	hbrock	
18-Dec-2019	12:42	tjanusz	
18-Dec-2019	16:46	tjanusz	
20-Dec-2019	10:47	asmith	
20-Dec-2019	11:22	asmith	
03-Jan-2020	14:04	hbrock	
03-Jan-2020	14:36	hbrock	
08-Jan-2020	12:18	hbrock	
15-Jan-2020	09:43	hbrock	Open

Analysis Options

General
Global Poisson's ratio: 0.50
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -15.00 [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: No

Consolidation
Consolidation : No

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	Non-linear curve
1	Made Ground	0.0	6	5000.0	5000.0	0.50000	None
2	London Clay Formation	-2.4000	10	23000.	43000.	0.45000	None
3	London Clay Formation (base)	-7.4000	16	43000.	43000.	0.45000	None

Non-linear Curve Coordinates - Non-linear Curve 1

Point	Strain [%]	Factor

Soil Zones

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile
1	Soil Zone #	0.0	28.850	0.0	18.600	Soil Profile 1

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon : Rect. tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Main Basement	-3.00000	(10.7,13.3) (20.4,13.3) (20.8,13.3) (20.8,12.7) (21.9,11.9) (21.9,8.71) (20.8,7.86) (20.8,7.41) (15.7,7.48) (15.7,6.71) (10.6,6.76) (10.6,8.82) (9.62,9.6) (9.63,11.9) (10.7,12.7)	10.000	8	-50.400
2	Lower GF Excavation	-3.00000	(15.7,7.33) (20.8,7.36) (20.8,3.33) (15.7,3.34) (15.7,7.41)	10.000	0	-26.400
3	Lightwell (Front)	-1.50000	(10.7,13) (9.01,13.1) (8.29,12.5) (8.3,8.97) (9.01,8.39) (10.8,8.39) (10.7,8.74) (9.61,9.6) (9.61,11.8) (10.7,12.7)	10.000	8	-24.000
4	Lightwell (Rear, NW)	-1.50000	(21.6,12.1) (23.3,12.1) (23.3,8.44) (21.6,8.45) (21.9,8.71) (21.9,11.8)	10.000	3	-24.000
5	Lightwell (Rear, NE)	-1.50000	(20.9,7.51) (22.2,7.51) (22.2,4.22) (20.8,4.23) (20.8,7.51)	10.000	1	-24.000

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 : Main Basement					
(Edge 13 optimal)					
1	9.87739	10.76101	-0.46723	0.50304	2.7197
2	10.38031	10.74414	-0.46723	0.50304	3.4642
3	13.21792	10.01174	-0.46723	5.0002	6.5529
4	18.03957	10.36514	-0.46723	4.6370	5.8358
5	20.58466	10.36015	-0.46723	0.45307	5.8924
6	21.11367	10.27832	-0.46723	0.51700	4.4338
7	21.63064	10.27361	-0.46723	0.51700	3.6144
8	21.90855	9.49030	-0.46723	0.051570	1.6024
Load 2 : Lower GF Excavation					
(Edge 2 optimal)					
1	18.25062	5.36252	-90.465	4.0263	5.0818
2	19.51539	7.33246	-90.465	0.066033	2.5400
Load 3 : Lightwell (Front)					
(Edge 1 optimal)					
1	10.54303	12.80692	179.41	0.36750	0.47138
2	10.17400	12.66059	179.41	0.36750	0.77165
3	9.80497	12.51425	179.41	0.36750	1.0719
4	9.31959	10.72219	179.41	0.56627	4.6659
5	8.65386	10.74655	179.41	0.66936	4.0913
6	10.54083	8.63481	179.41	0.37463	0.49088
7	10.16767	8.77876	179.41	0.37463	0.77880
8	9.79450	8.92271	179.41	0.37463	1.0667
Load 4 : Lightwell (Rear, NW)					
(Edge 2 optimal)					
1	22.59820	10.27641	-90.388	3.1355	1.3486
2	22.52580	8.57703	-90.388	0.26418	1.5083
3	22.52814	11.95651	-90.388	0.22372	1.4740
Load 5 : Lightwell (Rear, NE)					
(Edge 2 optimal)					
1	21.49379	5.86991	-90.000	3.2708	1.3540

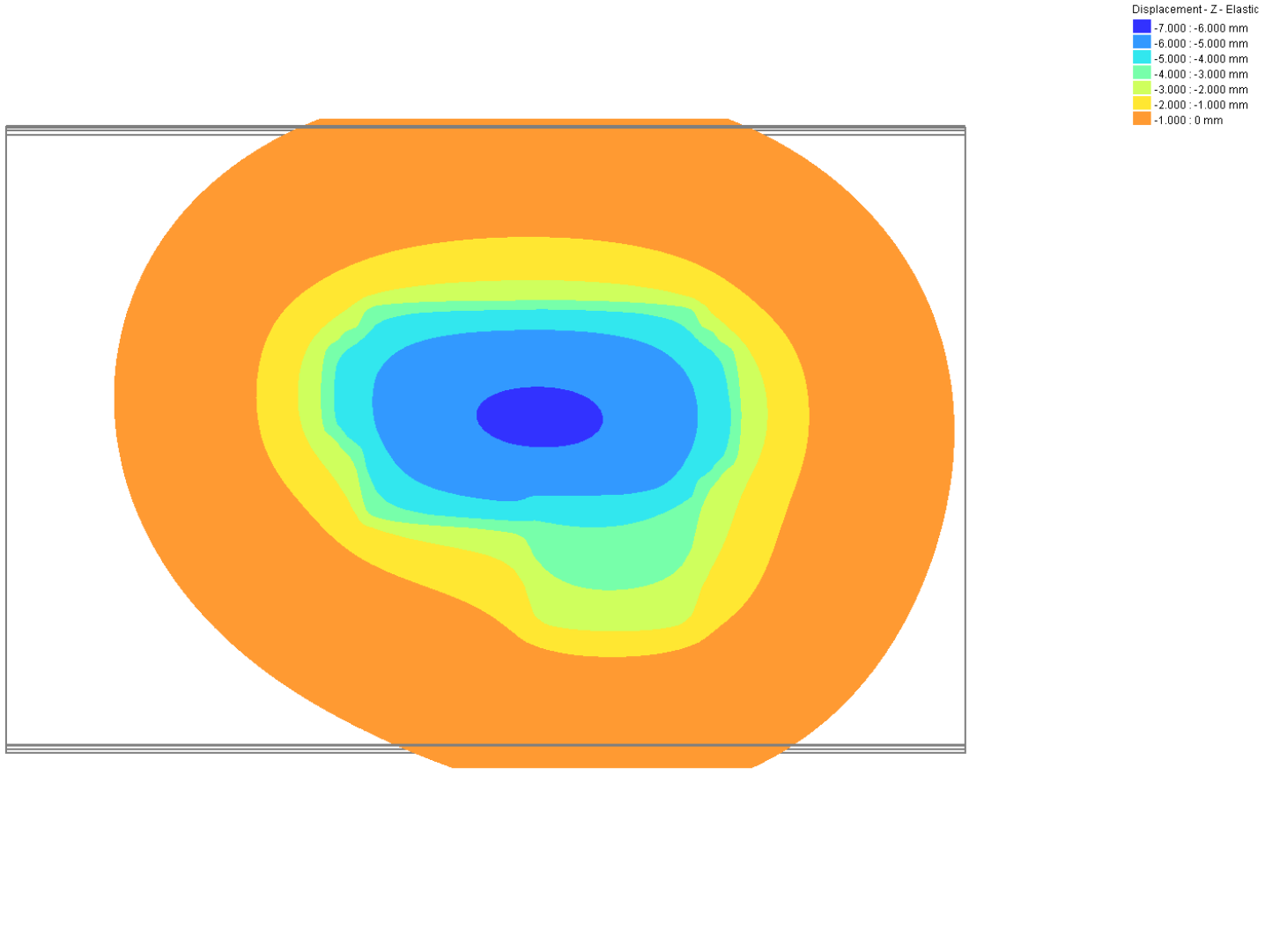
Displacement Grids

Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate	Detailed Results
Grid 1	Global Y	-0.19545	-0.71666	-1.50000	29.46441	-	-1.50000	100	19.36605	100	Yes	No

Warnings

(1)The displacement location of Grid 1 at (-0.195, -0.717, -1.500)m lies wide of all soil zones. The first soil profile will be used.There are more displacement locations for which this warning applies. Only one is detailed here.

(2)The load at (15.709, 10.208, -3.000)m lies wide of all soil zones. Displacements at its centre have been requested. The first soil profile will be used.


Displacement - Z - Elastic
-7.000 : -6.000 mm
-6.000 : -5.000 mm
-5.000 : -4.000 mm
-4.000 : -3.000 mm
-3.000 : -2.000 mm
-2.000 : -1.000 mm
-1.000 : 0 mm
y
z
x

Titles

Job No.: 117401
Job Title: 28 Canfield Gardens
Sub-title: Ground Movement Assessment
Calculation Heading: Settlement analysis
Initials: HB
Checker:
Date Saved:
Date Checked:
Notes:
File Name: 117401 - 28 Canfield Gardens Stage 1 HB - Main Excavation.pdd
File Path: X:\a_PROJECTS\117401 - 28 Canfield Gardens, NW6\Geotech\Model\PDisp

History

Date	Time	By	Notes
28-Nov-2016	17:03	ocolas	
28-Nov-2016	17:09	ocolas	
28-Nov-2016	17:11	ocolas	
28-Nov-2016	17:21	ocolas	
29-Nov-2016	10:09	ocolas	
29-Nov-2016	12:09	ocolas	
12-Dec-2019	15:20	hbrock	
12-Dec-2019	15:25	hbrock	
12-Dec-2019	15:37	hbrock	
12-Dec-2019	15:50	hbrock	
18-Dec-2019	12:42	tjanusz	
18-Dec-2019	16:46	tjanusz	
20-Dec-2019	10:47	asmith	
20-Dec-2019	11:22	asmith	
03-Jan-2020	14:04	hbrock	
03-Jan-2020	14:40	hbrock	
08-Jan-2020	12:20	hbrock	
15-Jan-2020	15:13	hbrock	Open

Analysis Options

General
Global Poisson's ratio: 0.50
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -15.00 [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: No

Consolidation
Consolidation : No

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	Non-linear curve
1	Made Ground	0.0	6	5000.0	5000.0	0.50000	None
2	London Clay Formation	-2.4000	10	23000.	43000.	0.45000	None
3	London Clay Formation (base)	-7.4000	16	43000.	43000.	0.45000	None

Non-linear Curve Coordinates - Non-linear Curve 1

Point	Strain [%]	Factor

Soil Zones

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile
1	Soil Zone #	0.0	28.850	0.0	18.600	Soil Profile 1

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon : Rect. tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Main Basement	-3.00000	(10.7,13.3) (20.4,13.3) (20.8,13.3) (20.8,12.7) (21.9,11.9) (21.9,8.71) (20.8,7.86) (20.8,7.41) (15.7,7.48) (15.7,6.71) (10.6,6.76) (10.6,8.82) (9.62,9.6) (9.63,11.9) (10.7,12.7)	10.000	8	-50.400
2	Lower GF Excavation	-3.00000	(15.7,7.33) (20.8,7.36) (20.8,3.33) (15.7,3.34) (15.7,7.41)	10.000	0	-26.400
3	Lightwell (Front)	-1.50000	(10.7,13) (9.01,13.1) (8.29,12.5) (8.3,8.97) (9.01,8.39) (10.8,8.39) (10.7,8.74) (9.61,9.6) (9.61,11.8) (10.7,12.7)	10.000	8	-24.000
4	Lightwell (Rear, NW)	-1.50000	(21.6,12.1) (23.3,12.1) (23.3,8.44) (21.6,8.45) (21.9,8.71) (21.9,11.8)	10.000	3	-24.000
5	Lightwell (Rear, NE)	-1.50000	(20.9,7.51) (22.2,7.51) (22.2,4.22) (20.8,4.23) (20.8,7.51)	10.000	1	-24.000

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 : Main Basement					
(Edge 13 optimal)					
1	9.87739	10.76101	-0.46723	0.50304	2.7197
2	10.38031	10.74414	-0.46723	0.50304	3.4642
3	13.21792	10.01174	-0.46723	5.0002	6.5529
4	18.03957	10.36514	-0.46723	4.6370	5.8358
5	20.58466	10.36015	-0.46723	0.45307	5.8924
6	21.11367	10.27832	-0.46723	0.51700	4.4338
7	21.63064	10.27361	-0.46723	0.51700	3.6144
8	21.90855	9.49030	-0.46723	0.051570	1.6024
Load 2 : Lower GF Excavation					
(Edge 2 optimal)					
1	18.25062	5.36252	-90.465	4.0263	5.0818
2	19.51539	7.33246	-90.465	0.066033	2.5400
Load 3 : Lightwell (Front)					
(Edge 1 optimal)					
1	10.54303	12.80692	179.41	0.36750	0.47138
2	10.17400	12.66059	179.41	0.36750	0.77165
3	9.80497	12.51425	179.41	0.36750	1.0719
4	9.31959	10.72219	179.41	0.56627	4.6659
5	8.65386	10.74655	179.41	0.66936	4.0913
6	10.54083	8.63481	179.41	0.37463	0.49088
7	10.16767	8.77876	179.41	0.37463	0.77880
8	9.79450	8.92271	179.41	0.37463	1.0667
Load 4 : Lightwell (Rear, NW)					
(Edge 2 optimal)					
1	22.59820	10.27641	-90.388	3.1355	1.3486
2	22.52580	8.57703	-90.388	0.26418	1.5083
3	22.52814	11.95651	-90.388	0.22372	1.4740
Load 5 : Lightwell (Rear, NE)					
(Edge 2 optimal)					
1	21.49379	5.86991	-90.000	3.2708	1.3540

Displacement Grids

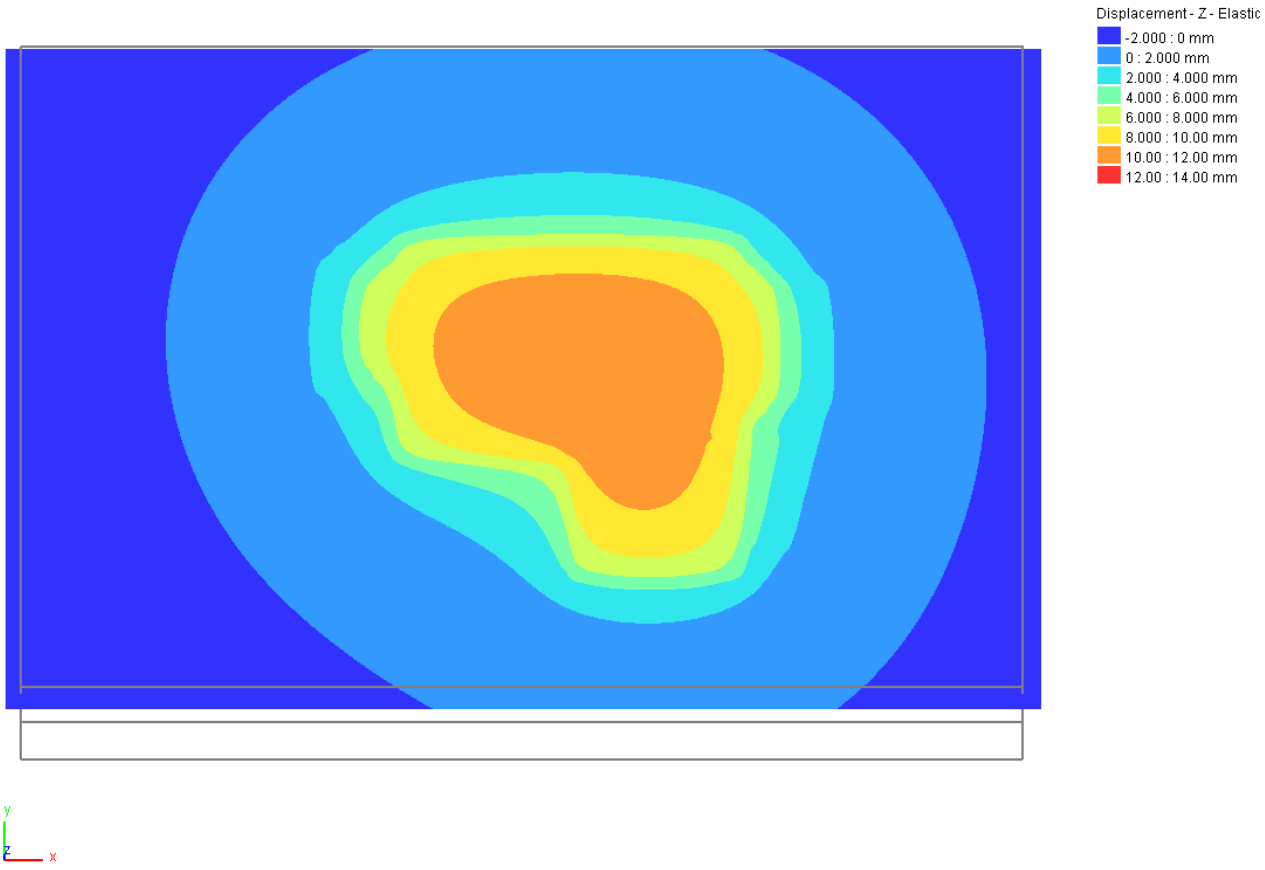
Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate	Detailed Results
Grid 1	Global Y	-0.42348	-0.65151	-3.00000	29.22009	-	-3.00000	100	19.52893	100	Yes	No

Warnings

(1)The displacement location of Grid 1 at (-0.423, -0.652, -3.000)m lies wide of all soil zones. The first soil profile will be used.There are more displacement locations for which this warning applies. Only one is detailed here.

(2)The load at (15.709, 10.208, -3.000)m lies wide of all soil zones. Displacements at its centre have been requested. The first soil profile will be used.

Appendix E- Stage 2 – PDISP Undrained reloading settlement movements


Displacement - Z - Elastic
-2.000 : 0 mm
0 : 2.000 mm
2.000 : 4.000 mm
4.000 : 6.000 mm
6.000 : 8.000 mm
8.000 : 10.00 mm
10.00 : 12.00 mm
12.00 : 14.00 mm
y
z
x

Titles

Job No.: 117401
Job Title: 28 Canfield Gardens
Sub-title: Ground Movement Assessment
Calculation Heading: Heave analysis
Initials: OC
Checker:
Date Saved:
Date Checked:
Notes:
File Name: 117401 - 28 Canfield Gardens Stage 2 HB - Lightwell.pdd
File Path: X:\a_PROJECTS\117401 - 28 Canfield Gardens, NW6\Geotech\Model\PDisp\SS

History

Date	Time	By	Notes
28-Nov-2016	17:03	ocolas	
28-Nov-2016	17:09	ocolas	
28-Nov-2016	17:11	ocolas	
28-Nov-2016	17:21	ocolas	
29-Nov-2016	10:09	ocolas	
29-Nov-2016	12:09	ocolas	
12-Dec-2019	15:20	hbrock	
12-Dec-2019	15:25	hbrock	
12-Dec-2019	15:37	hbrock	
12-Dec-2019	15:50	hbrock	
18-Dec-2019	12:42	tjanusz	
18-Dec-2019	16:46	tjanusz	
20-Dec-2019	10:47	asmith	
20-Dec-2019	11:22	asmith	
03-Jan-2020	14:04	hbrock	
03-Jan-2020	14:08	hbrock	
03-Jan-2020	15:45	hbrock	
08-Jan-2020	09:25	hbrock	
08-Jan-2020	09:48	hbrock	
08-Jan-2020	12:24	hbrock	
15-Jan-2020	11:11	hbrock	

Analysis Options

General
Global Poisson's ratio: 0.50
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -15.00 [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: No

Consolidation
Consolidation : No

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	Non-linear curve
1	Made Ground	0.0	6	5000.0	5000.0	0.50000	None
2	London Clay Formation	-2.4000	10	23000.	43000.	0.45000	None
3	London Clay Formation (base)	-7.4000	16	43000.	43000.	0.45000	None

Non-linear Curve Coordinates - Non-linear Curve 1

Point	Strain [%]	Factor

Soil Zones

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile
1	Soil Zone #	0.0	28.850	0.0	18.600	Soil Profile 1

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon : Rect. tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Main Basement	-3.00000	(10.7,13.3) (20.4,13.3) (20.8,13.3) (20.8,12.7) (21.9,11.9) (21.9,8.71) (20.8,7.86) (20.8,7.41) (15.7,7.48) (15.7,6.71) (10.6,6.76) (10.6,8.82) (9.62,9.6) (9.63,11.9) (10.7,12.7)	10.000	8	95.000
2	Lower GF Excavation	-3.00000	(15.7,7.33) (20.8,7.36) (20.8,3.33) (15.7,3.34) (15.7,7.41)	10.000	0	95.000
3	Lightwell (Front)	-1.50000	(10.7,13) (9.01,13.1) (8.29,12.5) (8.3,8.97) (9.01,8.39) (10.8,8.39) (10.7,8.74) (9.61,9.6) (9.61,11.8) (10.7,12.7)	10.000	8	5.0000
4	Lightwell (Rear, NW)	-1.50000	(21.6,12.1) (23.3,12.1) (23.3,8.44) (21.6,8.45) (21.9,8.71) (21.9,11.8)	10.000	3	5.0000
5	Lightwell (Rear, NE)	-1.50000	(20.9,7.51) (22.2,7.51) (22.2,4.22) (20.8,4.23) (20.8,7.51)	10.000	1	5.0000

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 : Main Basement					
(Edge 13 optimal)					
1	9.87739	10.76101	-0.46723	0.50304	2.7197
2	10.38031	10.74414	-0.46723	0.50304	3.4642
3	13.21792	10.01174	-0.46723	5.0002	6.5529
4	18.03957	10.36514	-0.46723	4.6370	5.8358
5	20.58466	10.36015	-0.46723	0.45307	5.8924
6	21.11367	10.27832	-0.46723	0.51700	4.4338
7	21.63064	10.27361	-0.46723	0.51700	3.6144
8	21.90855	9.49030	-0.46723	0.051570	1.6024
Load 2 : Lower GF Excavation					
(Edge 2 optimal)					
1	18.25062	5.36252	-90.465	4.0263	5.0818

No.	Centre : Centre x	Centre : Centre y	Angle of local x from global X	Width x	Depth y
2	19.51539	7.33246	-90.465	0.066033	2.5400
Load 3 : Lightwell (Front)					
(Edge 1 optimal)					
1	10.54303	12.80692	179.41	0.36750	0.47138
2	10.17400	12.66059	179.41	0.36750	0.77165
3	9.80497	12.51425	179.41	0.36750	1.0719
4	9.31959	10.72219	179.41	0.56627	4.6659
5	8.65386	10.74655	179.41	0.66936	4.0913
6	10.54083	8.63481	179.41	0.37463	0.49088
7	10.16767	8.77876	179.41	0.37463	0.77880
8	9.79450	8.92271	179.41	0.37463	1.0667
Load 4 : Lightwell (Rear, NW)					
(Edge 2 optimal)					
1	22.59820	10.27641	-90.388	3.1355	1.3486
2	22.52580	8.57703	-90.388	0.26418	1.5083
3	22.52814	11.95651	-90.388	0.22372	1.4740
Load 5 : Lightwell (Rear, NE)					
(Edge 2 optimal)					
1	21.49379	5.86991	-90.000	3.2708	1.3540

Displacement Grids

Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate	Detailed Results
Grid 1	Global Y	-0.42348	-0.42348	-1.50000	29.39926	-	-1.50000	100	19.18688	100	Yes	No

Warnings

(1)The displacement location of Grid 1 at (-0.423, -0.423, -1.500)m lies wide of all soil zones. The first soil profile will be used.There are more displacement locations for which this warning applies. Only one is detailed here.

(2)The load at (15.709, 10.208, -3.000)m lies wide of all soil zones. Displacements at its centre have been requested. The first soil profile will be used.

Oasys

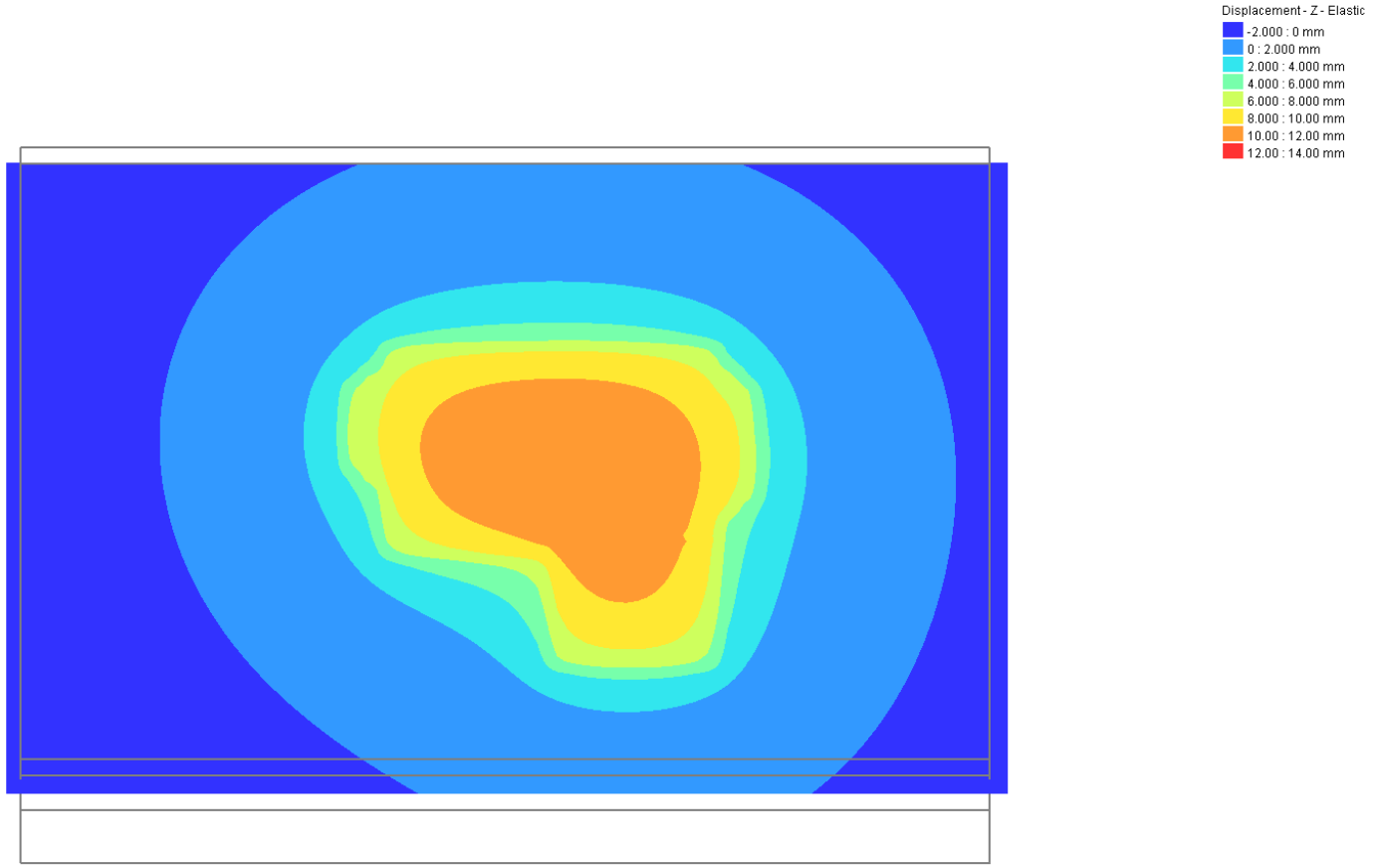
W A FAIRHURST AND PARTNERS - GLASGOW

Job No.	Sheet No.	Rev.
117401		

Drg. Ref.

Made by HB | Date | Checked

28 Canfield Gardens
Ground Movement Assessment
Heave analysis



Titles

Job No.: 117401
Job Title: 28 Canfield Gardens
Sub-title: Ground Movement Assessment
Calculation Heading: Settlement Analysis
Initials: HB
Checker:
Date Saved:
Date Checked:
Notes:
File Name: 117401 - 28 Canfield Gardens Stage 2 HB - Main Excavation.pdd
File Path: X:\a_PROJECTS\117401 - 28 Canfield Gardens, NW6\Geotech\Model\PDisp

History

Date	Time	By	Notes
28-Nov-2016	17:03	ocolas	
28-Nov-2016	17:09	ocolas	
28-Nov-2016	17:11	ocolas	
28-Nov-2016	17:21	ocolas	
29-Nov-2016	10:09	ocolas	
29-Nov-2016	12:09	ocolas	
12-Dec-2019	15:20	hbrock	
12-Dec-2019	15:25	hbrock	
12-Dec-2019	15:37	hbrock	
12-Dec-2019	15:50	hbrock	
18-Dec-2019	12:42	tjanusz	
18-Dec-2019	16:46	tjanusz	
20-Dec-2019	10:47	asmith	
20-Dec-2019	11:22	asmith	
03-Jan-2020	14:04	hbrock	
03-Jan-2020	14:08	hbrock	
03-Jan-2020	15:43	hbrock	
08-Jan-2020	09:28	hbrock	
08-Jan-2020	09:50	hbrock	
08-Jan-2020	12:26	hbrock	
15-Jan-2020	11:41	hbrock	

Analysis Options

General
Global Poisson's ratio: 0.50
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -15.00 [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: No

Consolidation
Consolidation : No

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	Non-linear curve
1	Made Ground	0.0	6	5000.0	5000.0	0.50000	None
2	London Clay Formation	-2.4000	10	23000.	43000.	0.45000	None
3	London Clay Formation (base)	-7.4000	16	43000.	43000.	0.45000	None

Non-linear Curve Coordinates - Non-linear Curve 1

Point	Strain [%]	Factor

Soil Zones

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile
1	Soil Zone #	0.0	28.850	0.0	18.600	Soil Profile 1

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon : Rect. tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Main Basement	-3.00000	(10.7,13.3) (20.4,13.3) (20.8,13.3) (20.8,12.7) (21.9,11.9) (21.9,8.71) (20.8,7.86) (20.8,7.41) (15.7,7.48) (15.7,6.71) (10.6,6.76) (10.6,8.82) (9.62,9.6) (9.63,11.9) (10.7,12.7)	10.000	8	95.000
2	Lower GF Excavation	-3.00000	(15.7,7.33) (20.8,7.36) (20.8,3.33) (15.7,3.34) (15.7,7.41)	10.000	0	95.000
3	Lightwell (Front)	-1.50000	(10.7,13) (9.01,13.1) (8.29,12.5) (8.3,8.97) (9.01,8.39) (10.8,8.39) (10.7,8.74) (9.61,9.6) (9.61,11.8) (10.7,12.7)	10.000	8	5.0000
4	Lightwell (Rear, NW)	-1.50000	(21.6,12.1) (23.3,12.1) (23.3,8.44) (21.6,8.45) (21.9,8.71) (21.9,11.8)	10.000	3	5.0000
5	Lightwell (Rear, NE)	-1.50000	(20.9,7.51) (22.2,7.51) (22.2,4.22) (20.8,4.23) (20.8,7.51)	10.000	1	5.0000

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 : Main Basement					
(Edge 13 optimal)					
1	9.87739	10.76101	-0.46723	0.50304	2.7197
2	10.38031	10.74414	-0.46723	0.50304	3.4642
3	13.21792	10.01174	-0.46723	5.0002	6.5529
4	18.03957	10.36514	-0.46723	4.6370	5.8358
5	20.58466	10.36015	-0.46723	0.45307	5.8924
6	21.11367	10.27832	-0.46723	0.51700	4.4338
7	21.63064	10.27361	-0.46723	0.51700	3.6144
8	21.90855	9.49030	-0.46723	0.051570	1.6024
Load 2 : Lower GF Excavation					
(Edge 2 optimal)					
1	18.25062	5.36252	-90.465	4.0263	5.0818
2	19.51539	7.33246	-90.465	0.066033	2.5400
Load 3 : Lightwell (Front)					
(Edge 1 optimal)					
1	10.54303	12.80692	179.41	0.36750	0.47138
2	10.17400	12.66059	179.41	0.36750	0.77165
3	9.80497	12.51425	179.41	0.36750	1.0719
4	9.31959	10.72219	179.41	0.56627	4.6659
5	8.65386	10.74655	179.41	0.66936	4.0913
6	10.54083	8.63481	179.41	0.37463	0.49088
7	10.16767	8.77876	179.41	0.37463	0.77880
8	9.79450	8.92271	179.41	0.37463	1.0667
Load 4 : Lightwell (Rear, NW)					
(Edge 2 optimal)					
1	22.59820	10.27641	-90.388	3.1355	1.3486
2	22.52580	8.57703	-90.388	0.26418	1.5083
3	22.52814	11.95651	-90.388	0.22372	1.4740
Load 5 : Lightwell (Rear, NE)					
(Edge 2 optimal)					
1	21.49379	5.86991	-90.000	3.2708	1.3540

Displacement Grids

Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate	Detailed Results
Grid 1	Global Y	-0.42348	-0.42348	-3.00000	29.39926	-	-3.00000	100	19.18688	100	Yes	No

Warnings

(1)The displacement location of Grid 1 at (-0.423, -0.423, -3.000)m lies wide of all soil zones. The first soil profile will be used.There are more displacement locations for which this warning applies. Only one is detailed here.

(2)The load at (15.709, 10.208, -3.000)m lies wide of all soil zones. Displacements at its centre have been requested. The first soil profile will be used.

Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate Detailed Results

Appendix F - Stage 3 – PDISP Drained reloading settlement movements

Oasys

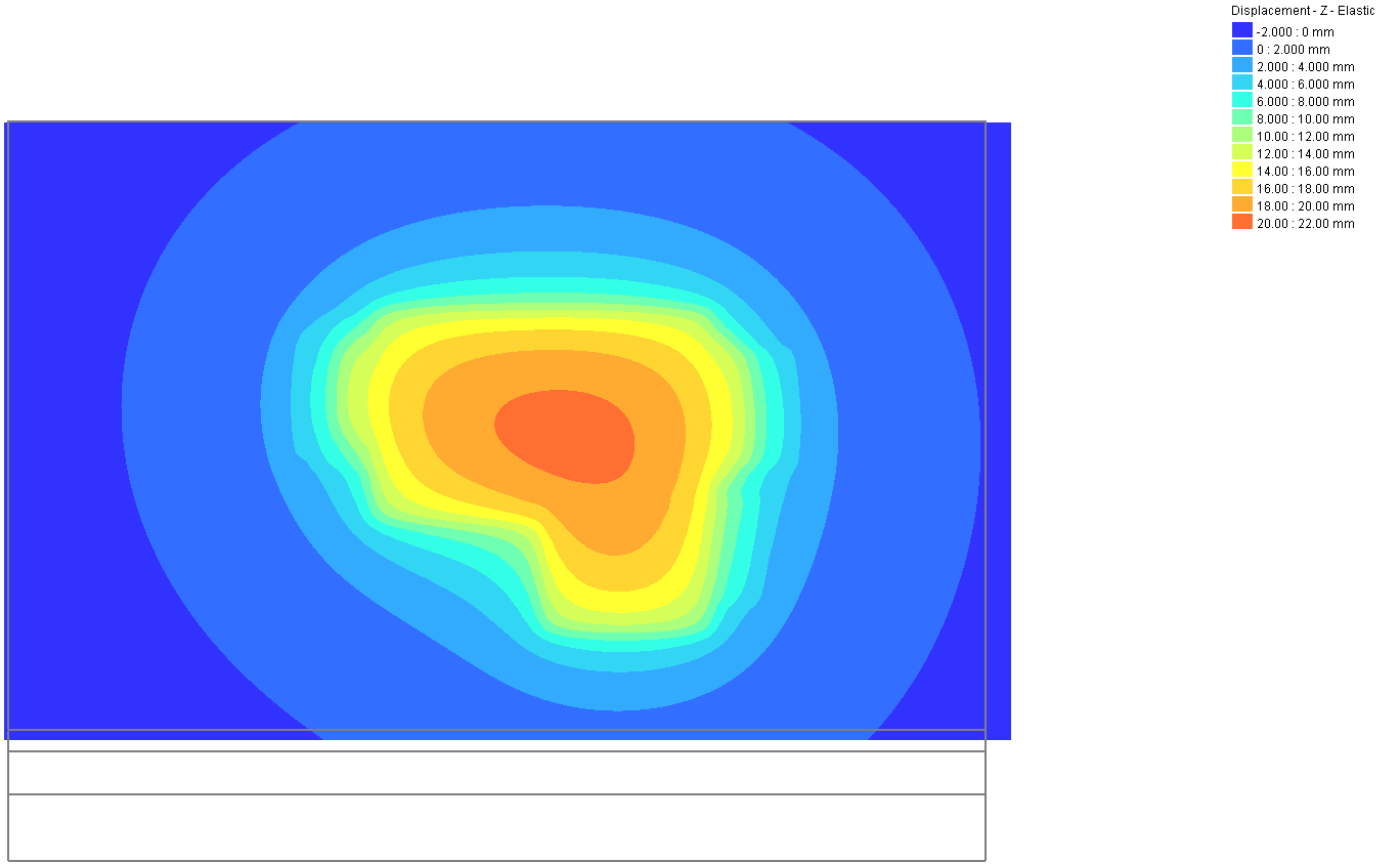
W A FAIRHURST AND PARTNERS - GLASGOW

Job No.	Sheet No.	Rev.
117401		

Drg. Ref.

Made by HB | Date | Checked

28 Canfield Gardens
Ground Movement Assessment
Settlement Analysis



Titles

Job No.: 117401
Job Title: 28 Canfield Gardens
Sub-title: Ground Movement Assessment
Calculation Heading: Settlement Analysis
Initials: HB
Checker:
Date Saved:
Date Checked:
Notes:
File Name: 117401 - 28 Canfield Gardens Stage 3 HB - Lightwell.pdd
File Path: X:\a_PROJECTS\117401 - 28 Canfield Gardens, NW6\Geotech\Model\PDisp

History

Date	Time	By	Notes
28-Nov-2016	17:03	ocolas	
28-Nov-2016	17:09	ocolas	
28-Nov-2016	17:11	ocolas	
28-Nov-2016	17:21	ocolas	
29-Nov-2016	10:09	ocolas	
29-Nov-2016	12:09	ocolas	
12-Dec-2019	15:20	hbrock	
12-Dec-2019	15:25	hbrock	
12-Dec-2019	15:37	hbrock	
12-Dec-2019	15:50	hbrock	
18-Dec-2019	12:42	tjanusz	
18-Dec-2019	16:46	tjanusz	
20-Dec-2019	10:47	asmith	
20-Dec-2019	11:22	asmith	
03-Jan-2020	14:04	hbrock	
03-Jan-2020	14:08	hbrock	
03-Jan-2020	14:15	hbrock	
03-Jan-2020	15:29	hbrock	
08-Jan-2020	09:33	hbrock	
08-Jan-2020	09:53	hbrock	
08-Jan-2020	12:28	hbrock	
08-Jan-2020	12:33	hbrock	
15-Jan-2020	11:46	hbrock	

Analysis Options

General
Global Poisson's ratio: 0.50
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -15.00 [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: No

Consolidation
Consolidation : No

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	Non-linear curve
1	Made Ground	0.0	6	2500.0	2500.0	0.40000	None
2	London Clay Formation	-2.4000	10	13000.	26000.	0.40000	None
3	London Clay Formation (base)	-7.4000	16	26000.	26000.	0.40000	None

Non-linear Curve Coordinates - Non-linear Curve 1

Point	Strain [%]	Factor

Soil Zones

Zone	Name	X min	X max	Y min	Y max	Profile

		[m]	[m]	[m]	[m]	
1	Soil Zone #	0.0	28.850	0.0	18.600	Soil Profile 1

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon : Rect. tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Lightwell (Front)	-1.50000	(10.7,13) (9.01,13.1) (8.29,12.5) (8.3,8.97) (9.01,8.39) (10.8,8.39) (10.7,8.74) (9.61,9.6) (9.61,11.8) (10.7,12.7)	10.000	8	5.0000
2	Lightwell (Rear, NW)	-1.50000	(21.6,12.1) (23.3,12.1) (23.3,8.44) (21.6,8.45) (21.9,8.71) (21.9,11.8)	10.000	3	5.0000
3	Lightwell (Rear, NE)	-1.50000	(20.9,7.51) (22.2,7.51) (22.2,4.22) (20.8,4.23) (20.8,7.51)	10.000	1	5.0000
4	Main Basement	-3.00000	(10.7,13.3) (20.4,13.3) (20.8,13.3) (20.8,12.7) (21.9,11.9) (21.9,8.71) (20.8,7.86) (20.8,7.41) (15.7,7.48) (15.7,6.71) (10.6,6.76) (10.6,8.82) (9.62,9.6) (9.63,11.9) (10.7,12.7)	10.000	8	95.000
5	Lower GF Excavation	-3.00000	(15.7,7.33) (20.8,7.36) (20.8,3.33) (15.7,3.34) (15.7,7.41)	10.000	0	95.000

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 : Lightwell (Front)					
(Edge 1 optimal)					
1	10.54303	12.80692	179.41	0.36750	0.47138
2	10.17400	12.66059	179.41	0.36750	0.77165
3	9.80497	12.51425	179.41	0.36750	1.0719
4	9.31959	10.72219	179.41	0.56627	4.6659
5	8.65386	10.74655	179.41	0.66936	4.0913
6	10.54083	8.63481	179.41	0.37463	0.49088
7	10.16767	8.77876	179.41	0.37463	0.77880
8	9.79450	8.92271	179.41	0.37463	1.0667
Load 2 : Lightwell (Rear, NW)					
(Edge 2 optimal)					
1	22.59820	10.27641	-90.388	3.1355	1.3486
2	22.52580	8.57703	-90.388	0.26418	1.5083
3	22.52814	11.95651	-90.388	0.22372	1.4740
Load 3 : Lightwell (Rear, NE)					
(Edge 2 optimal)					
1	21.49379	5.86991	-90.000	3.2708	1.3540
Load 4 : Main Basement					
(Edge 13 optimal)					
1	9.87739	10.76101	-0.46723	0.50304	2.7197
2	10.38031	10.74414	-0.46723	0.50304	3.4642
3	13.21792	10.01174	-0.46723	5.0002	6.5529
4	18.03957	10.36514	-0.46723	4.6370	5.8358
5	20.58466	10.36015	-0.46723	0.45307	5.8924
6	21.11367	10.27832	-0.46723	0.51700	4.4338
7	21.63064	10.27361	-0.46723	0.51700	3.6144
8	21.90855	9.49030	-0.46723	0.051570	1.6024
Load 5 : Lower GF Excavation					
(Edge 2 optimal)					
1	18.25062	5.36252	-90.465	4.0263	5.0818
2	19.51539	7.33246	-90.465	0.066033	2.5400

Displacement Grids

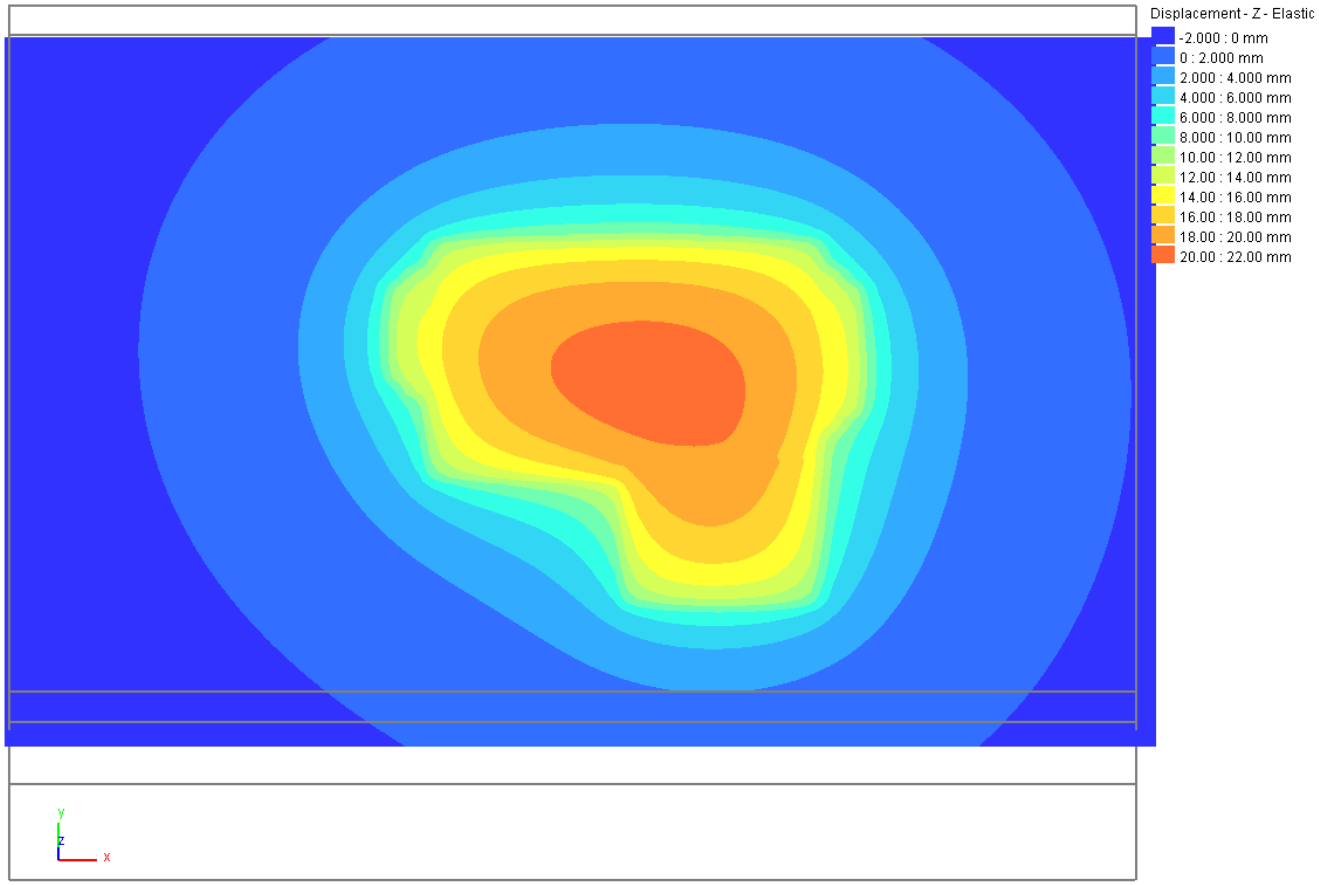
Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate Detailed Results
Grid 1	Global Y	-0.13030	0.09773	-1.50000	29.57842	-	-1.50000	100	18.84484	100	Yes No

Warnings

(1)The displacement location of Grid 1 at (-0.130, 0.098, -1.500)m lies wide of all soil zones. The first soil profile will be used.There are more displacement locations for which this warning applies. Only one is detailed here.

Name	Extrusion: Direction	X1	Y1	Z1	X2	Y2	Z2	Intervals Along Line	Extrusion: Distance	Extrusion: Intervals Along	Calculate Detailed Results
		[m]	[m]	[m]	[m]	[m]	[m]	[No.]	[m]	[No.]	

(2)The load at (9.237, 10.721, -1.500)m lies wide of all soil zones. Displacements at its centre have been requested. The first soil profile will be used.


Displacement - Z - Elastic
-2.000 : 0 mm
0 : 2.000 mm
2.000 : 4.000 mm
4.000 : 6.000 mm
6.000 : 8.000 mm
8.000 : 10.00 mm
10.00 : 12.00 mm
12.00 : 14.00 mm
14.00 : 16.00 mm
16.00 : 18.00 mm
18.00 : 20.00 mm
20.00 : 22.00 mm
y
z
x

Titles

Job No.: 117401
Job Title: 28 Canfield Gardens
Sub-title: Ground Movement Assessment
Calculation Heading: Settlement Analysis
Initials: HB
Checker:
Date Saved:
Date Checked:
Notes:
File Name: 117401 - 28 Canfield Gardens Stage 3 HB - Main Excavation.pdd
File Path: X:\a_PROJECTS\117401 - 28 Canfield Gardens, NW6\Geotech\Model\PDisp

History

Date	Time	By	Notes
28-Nov-2016	17:03	ocolas	
28-Nov-2016	17:09	ocolas	
28-Nov-2016	17:11	ocolas	
28-Nov-2016	17:21	ocolas	
29-Nov-2016	10:09	ocolas	
29-Nov-2016	12:09	ocolas	
12-Dec-2019	15:20	hbrock	
12-Dec-2019	15:25	hbrock	
12-Dec-2019	15:37	hbrock	
12-Dec-2019	15:50	hbrock	
18-Dec-2019	12:42	tjanusz	
18-Dec-2019	16:46	tjanusz	
20-Dec-2019	10:47	asmith	
20-Dec-2019	11:22	asmith	
03-Jan-2020	14:04	hbrock	
03-Jan-2020	14:08	hbrock	
03-Jan-2020	14:09	hbrock	
03-Jan-2020	14:18	hbrock	
03-Jan-2020	15:39	hbrock	
03-Jan-2020	16:06	hbrock	
08-Jan-2020	09:56	hbrock	
08-Jan-2020	12:31	hbrock	
15-Jan-2020	11:52	hbrock	

Analysis Options

General
Global Poisson's ratio: 0.50
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -15.00 [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: No

Consolidation
Consolidation : No

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	Non-linear curve
1	Made Ground	0.0	6	2500.0	2500.0	0.40000	None
2	London Clay Formation	-2.4000	10	13000.	26000.	0.40000	None
3	London Clay Formation (base)	-7.4000	16	26000.	26000.	0.40000	None

Non-linear Curve Coordinates - Non-linear Curve 1

Point	Strain [%]	Factor

Soil Zones

Zone	Name	X min [m]	X max [m]	Y min [m]	Y max [m]	Profile
1	Soil Zone #	0.0	28.850	0.0	18.600	Soil Profile 1

Polygonal Load Data

Load ref.	Name	Position : Level [m]	Position : Polygon : Coords. [m]	Position : Polygon : Rect. tolerance [%]	No. of Rectangles	Value : Normal (local z) [kN/m²]
1	Main Basement	-3.00000	(10.7,13.3) (20.4,13.3) (20.8,13.3) (20.8,12.7) (21.9,11.9) (21.9,8.71) (20.8,7.86) (20.8,7.41) (15.7,7.48) (15.7,6.71) (10.6,6.76) (10.6,8.82) (9.62,9.6) (9.63,11.9) (10.7,12.7)	10.000	8	95.000
2	Lower GF Excavation	-3.00000	(15.7,7.33) (20.8,7.36) (20.8,3.33) (15.7,3.34) (15.7,7.41)	10.000	0	95.000
3	Lightwell (Front)	-1.50000	(10.7,13) (9.01,13.1) (8.29,12.5) (8.3,8.97) (9.01,8.39) (10.8,8.39) (10.7,8.74) (9.61,9.6) (9.61,11.8) (10.7,12.7)	10.000	8	5.0000
4	Lightwell (Rear, NW)	-1.50000	(21.6,12.1) (23.3,12.1) (23.3,8.44) (21.6,8.45) (21.9,8.71) (21.9,11.8)	10.000	3	5.0000
5	Lightwell (Rear, NE)	-1.50000	(20.9,7.51) (22.2,7.51) (22.2,4.22) (20.8,4.23) (20.8,7.51)	10.000	1	5.0000

Polygonal Loads' Rectangles

No.	Centre : Centre x [m]	Centre : Centre y [m]	Angle of local x from global X [Degrees]	Width x [m]	Depth y [m]
Load 1 : Main Basement					
(Edge 13 optimal)					
1	9.87739	10.76101	-0.46723	0.50304	2.7197
2	10.38031	10.74414	-0.46723	0.50304	3.4642
3	13.21792	10.01174	-0.46723	5.0002	6.5529
4	18.03957	10.36514	-0.46723	4.6370	5.8358
5	20.58466	10.36015	-0.46723	0.45307	5.8924
6	21.11367	10.27832	-0.46723	0.51700	4.4338
7	21.63064	10.27361	-0.46723	0.51700	3.6144
8	21.90855	9.49030	-0.46723	0.051570	1.6024

No.	Centre : x	Centre : y	Angle of local x from global X	Width x	Depth y
Load 2 : Lower GF Excavation					
(Edge 2 optimal)					
1	18.25062	5.36252	-90.465	4.0263	5.0818
2	19.51539	7.33246	-90.465	0.066033	2.5400
Load 3 : Lightwell (Front)					
(Edge 1 optimal)					
1	10.54303	12.80692	179.41	0.36750	0.47138
2	10.17400	12.66059	179.41	0.36750	0.77165
3	9.80497	12.51425	179.41	0.36750	1.0719
4	9.31959	10.72219	179.41	0.56627	4.6659
5	8.65386	10.74655	179.41	0.66936	4.0913
6	10.54083	8.63481	179.41	0.37463	0.49088
7	10.16767	8.77876	179.41	0.37463	0.77880
8	9.79450	8.92271	179.41	0.37463	1.0667
Load 4 : Lightwell (Rear, NW)					
(Edge 2 optimal)					
1	22.59820	10.27641	-90.388	3.1355	1.3486
2	22.52580	8.57703	-90.388	0.26418	1.5083
3	22.52814	11.95651	-90.388	0.22372	1.4740
Load 5 : Lightwell (Rear, NE)					
(Edge 2 optimal)					
1	21.49379	5.86991	-90.000	3.2708	1.3540

Displacement Grids

Name	Extrusion: Direction	X1 [m]	Y1 [m]	Z1 [m]	X2 [m]	Y2 [m]	Z2 [m]	Intervals Along Line [No.]	Extrusion: Distance [m]	Extrusion: Intervals Along [No.]	Calculate	Detailed Results
Grid 1	Global Y	-0.13030	-0.47234	-3.00000	29.35040	-	-3.00000	100	19.23575	100	Yes	No

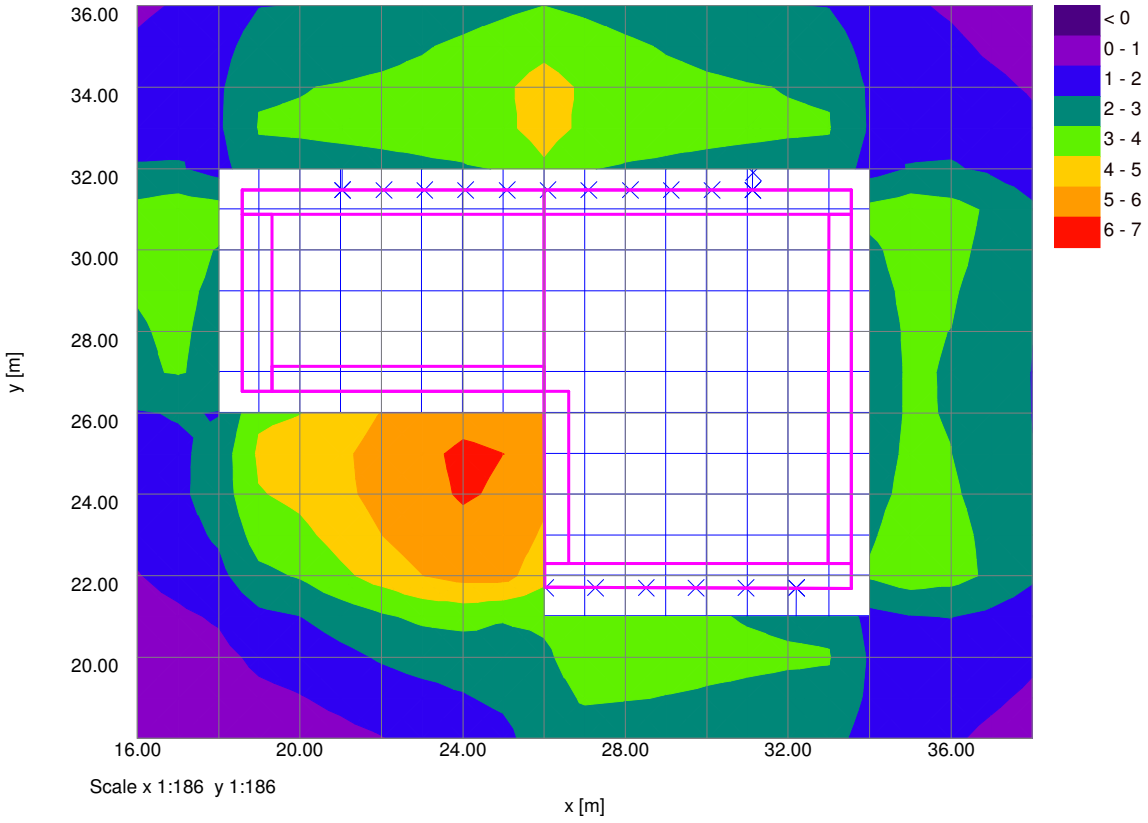
Warnings

(1)The displacement location of Grid 1 at (-0.130, -0.472, -3.000)m lies wide of all soil zones. The first soil profile will be used.There are more displacement locations for which this warning applies. Only one is detailed here.

(2)The load at (15.709, 10.208, -3.000)m lies wide of all soil zones. Displacements at its centre have been requested. The first soil profile will be used.

Appendix G - XDISP Analysis

Vertical Settlement Contours: Grid 1 (level 0.000m) (Interval 1mm)



Scale x 1:186 y 1:186

Problem Type

Problem Type : Tunnelling and Embedded Wall Excavations

Displacement Data

Type	Name	Direction of extrusion	Point/Line/Line for extrusion						No. of intervals across extrusion/line	Extrusion depth	No. of intervals along extrusion	Calculate	Surface type for tunnels
			First point			Second point							
			X [m]	Y [m]	Z(level) [m]	X [m]	Y [m]	Z(level) [m]		[m]			
Grid	Grid 1	Global X	10.00000	0.00000	0.00000	-	50.00000	0.00000	50	30.00000	30	Yes	Surface
Line	No.30_1	-	32.11050	41.32417	0.00000	32.09042	36.41190	0.00000	10	-	-	Yes	Surface
Line	No.30_2	-	32.09042	36.41190	0.00000	31.15768	35.66880	0.00000	10	-	-	Yes	Surface
Line	No.30_3	-	31.15768	35.66880	0.00000	31.11906	31.47646	0.00000	10	-	-	Yes	Surface
Line	No.30_4	-	31.11906	31.47646	0.00000	21.04214	31.47646	0.00000	10	-	-	Yes	Surface
Line	No.30_5	-	21.04214	31.47646	0.00000	21.07171	41.25273	0.00000	10	-	-	Yes	Surface
Line	No.26_1	-	19.79055	11.95090	0.00000	19.87833	21.70409	0.00000	10	-	-	Yes	Surface
Line	No.26_2	-	19.87833	21.70409	0.00000	32.19559	21.69694	0.00000	10	-	-	Yes	Surface
Line	No.26_3	-	32.19559	21.69694	0.00000	32.15596	11.92815	0.00000	10	-	-	Yes	Surface

Vertical Ground Movement Curves (Excavations)

Curve Name: **No vertical ground movement**
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)(%)]
[0.000,0.000,0.000][1.000,0.000,0.000][0.000,1.000,0.000][1.000,1.000,0.000]
Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = 0.0x + 0.0
Coeff. of Determination: -2147483648.E+2147483647

Curve Name: **Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))**
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)(%)]
[0.000,0.000,0.040][2.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = -2.0E-2x + 4.0E-2
Coeff. of Determination: 1.0

Curve Name: **Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)**
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)(%)]
[0.000,0.000,0.039][0.100,0.000,0.049][0.200,0.000,0.056][0.300,0.000,0.062]
[0.400,0.000,0.067][0.500,0.000,0.070][0.600,0.000,0.072][0.700,0.000,0.073]
[0.800,0.000,0.073][0.900,0.000,0.072][1.000,0.000,0.070][1.100,0.000,0.068]
[1.200,0.000,0.065][1.300,0.000,0.061][1.400,0.000,0.058][1.500,0.000,0.054]
[1.600,0.000,0.050][1.700,0.000,0.046][1.800,0.000,0.042][1.900,0.000,0.038]
[2.000,0.000,0.034][2.100,0.000,0.030][2.200,0.000,0.027][2.300,0.000,0.023]
[2.400,0.000,0.020][2.500,0.000,0.017][2.600,0.000,0.014][2.700,0.000,0.012]
[2.800,0.000,0.010][2.900,0.000,0.008][3.000,0.000,0.007][3.100,0.000,0.005]
[3.200,0.000,0.004][3.300,0.000,0.004][3.400,0.000,0.003][3.500,0.000,0.002]
[3.600,0.000,0.002][3.700,0.000,0.002][3.800,0.000,0.001][3.900,0.000,0.001]
[4.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 4
y Order: 0
Polynomial: z = $-2.6455E-3x^4 + 2.8495E-2x^3 - 1.0051E-1x^2 + 1.0569E-1x + 3.8990E-2$
Coeff. of Determination: 9.9991E-1

Horizontal Ground Movement Curves (Excavations)

Curve Name: **No horizontal ground movement**
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)(%)]
[0.000,0.000,0.000][1.000,0.000,0.000][0.000,1.000,0.000][1.000,1.000,0.000]
Curve Fitting Method: Polynomial
x Order: 0
y Order: 0
Polynomial: z = 0.0
Coeff. of Determination: -2147483648.E+2147483647

Curve Name: **Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))**
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)(%)]
[0.000,0.000,0.041][0.050,0.000,0.039][0.100,0.000,0.036][0.150,0.000,0.034]
[0.200,0.000,0.032][0.250,0.000,0.030][0.300,0.000,0.029][0.350,0.000,0.027]
[0.400,0.000,0.025][0.450,0.000,0.023][0.500,0.000,0.022][0.550,0.000,0.020]
[0.600,0.000,0.019][0.650,0.000,0.018][0.700,0.000,0.016][0.750,0.000,0.015]
[0.800,0.000,0.014][0.850,0.000,0.013][0.900,0.000,0.012][0.950,0.000,0.010]
[1.000,0.000,0.009][1.050,0.000,0.008][1.100,0.000,0.007][1.150,0.000,0.006]
[1.200,0.000,0.005][1.250,0.000,0.004][1.300,0.000,0.004][1.350,0.000,0.003]
[1.400,0.000,0.002][1.450,0.000,0.001][1.500,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 3
y Order: 0
Polynomial: z = $-4.2486E-3x^3 + 1.9096E-2x^2 - 4.6221E-2x + 4.0729E-2$
Coeff. of Determination: 1.0000

Curve Name: **Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))**
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)(%)]
[0.000,0.000,0.150][4.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = -3.75E-2x + 1.50E-1
Coeff. of Determination: 1.00

Polygonal Excavations

Excavation Name: **Install #1 (Internal Underpin)**
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x	y	Base Level	Stiffened	Previous Side d	Previous Side p1	Previous Side p2*	Next Side d	Next Side p1	Next Side p2*

	[m]	[m]	[m]		[m]	[%]	[%]	[m]	[%]	[%]
1	19.302	27.141	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	26.005	27.144	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	26.005	26.543	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	19.302	26.541	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Vertical	Horizontal
1	19.302	27.141	26.005	27.144	No vertical ground movement	No horizontal ground movement
2	26.005	27.144	26.005	26.543	No vertical ground movement	No horizontal ground movement
3	26.005	26.543	19.302	26.541	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
4	19.302	26.541	19.302	27.141	No vertical ground movement	No horizontal ground movement

Excavation Name: Install #2 (No.30)
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	33.565	31.476	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	33.565	30.876	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	18.584	30.876	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	18.589	31.476	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Vertical	Horizontal
1	33.565	31.476	33.565	30.876	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
2	33.565	30.876	18.584	30.876	No vertical ground movement	No horizontal ground movement
3	18.584	30.876	18.589	31.476	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
4	18.589	31.476	33.565	31.476	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))

Excavation Name: Install #3 (Rear Wall)]
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	33.565	30.876	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	33.565	22.295	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	32.985	22.295	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	32.993	30.876	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Vertical	Horizontal
1	33.565	30.876	33.565	22.295	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
2	33.565	22.295	32.985	22.295	No vertical ground movement	No horizontal ground movement
3	32.985	22.295	32.993	30.876	No vertical ground movement	No horizontal ground movement
4	32.993	30.876	33.565	30.876	No vertical ground movement	No horizontal ground movement

Excavation Name: Install #4 (Front Wall)
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	19.302	30.876	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	18.587	30.876	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	18.588	26.541	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	19.302	26.541	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Vertical	Horizontal
1	19.302	30.876	18.587	30.876	No vertical ground movement	No horizontal ground movement
2	18.587	30.876	18.588	26.541	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
3	18.588	26.541	19.302	26.541	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
4	19.302	26.541	19.302	30.876	No vertical ground movement	No horizontal ground movement

Excavation Name: Excavation - Front
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	26.003	31.476	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	18.589	31.476	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	18.588	26.541	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	26.005	26.542	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Vertical	Horizontal
1	26.003	31.476	18.589	31.476	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
2	18.589	31.476	18.588	26.541	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
3	18.588	26.541	26.005	26.542	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
4	26.005	26.542	26.003	31.476	No vertical ground movement	No horizontal ground movement

Excavation Name: Install #5 (No.26)
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	26.006	22.291	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	33.565	22.295	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	33.565	21.693	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	26.006	21.715	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Vertical	Horizontal

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
1	26.006	22.291	33.565	22.295	No vertical ground movement	No horizontal ground movement
2	33.565	22.295	33.565	21.693	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
3	33.565	21.693	26.006	21.715	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
4	26.006	21.715	26.006	22.291	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))

Excavation Name: **Install #6 (Internal Underpin)**
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	26.005	26.542	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	26.611	26.542	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	26.611	22.291	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	26.006	22.291	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
1	26.005	26.542	26.611	26.542	No vertical ground movement	No horizontal ground movement
2	26.611	26.542	26.611	22.291	No vertical ground movement	No horizontal ground movement
3	26.611	22.291	26.006	22.291	No vertical ground movement	No horizontal ground movement
4	26.006	22.291	26.005	26.542	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))

Excavation Name: **Excavation - Rear**
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	33.565	31.476	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	26.003	31.476	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	26.005	26.542	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	26.010	21.715	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
5	33.565	21.693	-3.0000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
1	33.565	31.476	26.003	31.476	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
2	26.003	31.476	26.005	26.542	No vertical ground movement	No horizontal ground movement
3	26.005	26.542	26.010	21.715	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
4	26.010	21.715	33.565	21.693	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
5	33.565	21.693	33.565	31.476	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))

Damage Category Strains

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

Specific Structures - Geometry

Structure Name	Sub-Structure Name	Displacement Line	Start Distance Along Line [m]	End Distance Along Line [m]	Vertical Offsets from Line for Vertical Movement Calculations [m]	Vertical Displacement Limit Sensitivity [mm]	Damage Category Strains	Poisson's Ratio	E/G
No.30		1 No.30_1	0.00000	4.91200	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.30		2 No.30_2	0.00000	1.19200	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.30		3 No.30_3	0.00000	4.19200	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.30		4 No.30_4	0.00000	10.07600	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.30		5 No.30_5	0.00000	9.77600	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.26		1 No.26_1	0.00000	9.75300	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.26		2 No.26_2	0.00000	12.31700	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No.26		3 No.26_3	0.00000	9.76800	0.0	0.10000	Burland Strain Limits	0.20000	2.6000

Specific Structures - Bending Parameters

Structure Name	Sub-Structure Name	Height [m]	Default Properties	Hogging 2nd Moment of Area (per unit width) [m³]	Hogging Distance of Bending Strain from N.A. [m]	Hogging Distance of N.A. from Edge of Beam in Tension [m]	Sagging 2nd Moment of Area (per unit width) [m³]	Sagging Distance of Bending Strain from N.A. [m]	Sagging Distance of N.A. from Edge of Beam in Tension [m]
No.30	1	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.30	2	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.30	3	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.30	4	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.30	5	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.26	1	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.26	2	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000
No.26	3	14.000	Yes	914.67	14.000	14.000	228.67	7.0000	7.0000

Building Segment Combinations

Structure Name	Sub-Structure Name	Vertical Offset from Line for Vertical Movement Calculations [m]	Segment Start [m]	Length [m]	Curvature	Combined Segment

No structures have segments combined.

Utility Strain Calculation Options

Neglect beneficial contribution of axial strains : No

Warnings

1 Multiple excavations have been specified. The displacements resulting from these excavations are calculated by summing the displacements resulting from each individual excavation. No account has been taken of the interactions between

Structure Name	Sub-Structure Name	Vertical Offset from Line for Vertical	Segment	Start	Length	Curvature	Combined Segment

excavations (e.g. overlapping zones of influence or 'shielding' of one excavation by another).

2 Embedded Wall Excavation PE1 : Install #1 (Internal Underpin) intersects PE4 : Install #4 (Front Wall), , PE5 : Excavation - Front, , PE7 : Install #6 (Internal Underpin), and PE8 : Excavation - Rear.

3 Embedded Wall Excavation PE2 : Install #2 (No.30) intersects PE3 : Install #3 (Rear Wall)], , PE4 : Install #4 (Front Wall), , PE5 : Excavation - Front, and PE8 : Excavation - Rear.

4 Embedded Wall Excavation PE3 : Install #3 (Rear Wall)] intersects PE2 : Install #2 (No.30), , PE6 : Install #5 (No.26), and PE8 : Excavation - Rear.

5 Embedded Wall Excavation PE4 : Install #4 (Front Wall) intersects PE1 : Install #1 (Internal Underpin), , PE2 : Install #2 (No.30), and PE5 : Excavation - Front.

6 Embedded Wall Excavation PE5 : Excavation - Front intersects PE1 : Install #1 (Internal Underpin), , PE2 : Install #2 (No.30), , PE4 : Install #4 (Front Wall), , PE7 : Install #6 (Internal Underpin), and PE8 : Excavation - Rear.

7 Embedded Wall Excavation PE6 : Install #5 (No.26) intersects PE3 : Install #3 (Rear Wall)], , PE7 : Install #6 (Internal Underpin), and PE8 : Excavation - Rear.

8 Embedded Wall Excavation PE7 : Install #6 (Internal Underpin) intersects PE1 : Install #1 (Internal Underpin), , PE5 : Excavation - Front, , PE6 : Install #5 (No.26), and PE8 : Excavation - Rear.

9 Embedded Wall Excavation PE8 : Excavation - Rear intersects PE1 : Install #1 (Internal Underpin), , PE2 : Install #2 (No.30), , PE3 : Install #3 (Rear Wall)], , PE5 : Excavation - Front, , PE6 : Install #5 (No.26), and PE7 : Install #6 (Internal Underpin).

Errors

None

Displacement and Strain Results

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement along Line	Horizontal displacement perpendicular to Line	to x Axis
	[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]
Grid 1	Grid 1	10.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	0.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	1.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	2.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		15.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	3.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	4.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	5.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	6.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-

Type/No.		Coordinates			Displacements				Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		32.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	7.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	8.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	9.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	10.00000	0.00000	0.0023499	0.024778	0.0069685	-	-	-
		25.00000	10.00000	0.00000	0.0025723	0.056693	0.012600	-	-	-
		26.00000	10.00000	0.00000	314.64E-6	0.10682	0.021892	-	-	-
		27.00000	10.00000	0.00000	317.89E-6	0.10793	0.022063	-	-	-
		28.00000	10.00000	0.00000	321.15E-6	0.10903	0.022234	-	-	-
		29.00000	10.00000	0.00000	324.40E-6	0.11014	0.022405	-	-	-
		30.00000	10.00000	0.00000	327.65E-6	0.11124	0.022575	-	-	-
		31.00000	10.00000	0.00000	330.91E-6	0.11234	0.022744	-	-	-
		32.00000	10.00000	0.00000	334.16E-6	0.11345	0.022913	-	-	-
		33.00000	10.00000	0.00000	337.41E-6	0.11455	0.023082	-	-	-
		34.00000	10.00000	0.00000	-0.0012131	0.072586	0.014991	-	-	-
		35.00000	10.00000	0.00000	-0.0031165	0.049532	0.011515	-	-	-
		36.00000	10.00000	0.00000	-0.0013583	0.011765	0.0042802	-	-	-
		37.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	10.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	11.00000	0.00000	0.0090186	0.028158	0.0085831	-	-	-
		22.00000	11.00000	0.00000	0.024119	0.10073	0.021374	-	-	-
		23.00000	11.00000	0.00000	0.028786	0.17150	0.029874	-	-	-
		24.00000	11.00000	0.00000	0.024734	0.23593	0.036177	-	-	-
		25.00000	11.00000	0.00000	0.014365	0.28863	0.040723	-	-	-
		26.00000	11.00000	0.00000	0.0014192	0.48182	0.064374	-	-	-
		27.00000	11.00000	0.00000	0.0014224	0.48292	0.064489	-	-	-
		28.00000	11.00000	0.00000	0.0014257	0.48403	0.064604	-	-	-
		29.00000	11.00000	0.00000	0.0014289	0.48513	0.064719	-	-	-
		30.00000	11.00000	0.00000	0.0014322	0.48624	0.064834	-	-	-
		31.00000	11.00000	0.00000	0.0014354	0.48734	0.064949	-	-	-
		32.00000	11.00000	0.00000	0.0014387	0.48845	0.065065	-	-	-
		33.00000	11.00000	0.00000	0.0014420	0.48955	0.065180	-	-	-
		34.00000	11.00000	0.00000	-0.0058060	0.31426	0.042789	-	-	-
		35.00000	11.00000	0.00000	-0.018842	0.27076	0.039349	-	-	-
		36.00000	11.00000	0.00000	-0.027251	0.21231	0.034032	-	-	-
		37.00000	11.00000	0.00000	-0.028265	0.14463	0.026968	-	-	-
		38.00000	11.00000	0.00000	-0.019751	0.072750	0.017193	-	-	-
		39.00000	11.00000	0.00000	-285.40E-6	798.96E-6	0.0016867	-	-	-
		40.00000	11.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-

Type/No.		Coordinates			Displacements				Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		18.00000	12.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	12.00000	0.00000	0.0014875	0.0025087	0.0022070	-	-	-
		20.00000	12.00000	0.00000	0.038331	0.081118	0.020274	-	-	-
		21.00000	12.00000	0.00000	0.061187	0.16726	0.031963	-	-	-
		22.00000	12.00000	0.00000	0.070205	0.25843	0.042695	-	-	-
		23.00000	12.00000	0.00000	0.066326	0.35078	0.054244	-	-	-
		24.00000	12.00000	0.00000	0.051449	0.43899	0.065852	-	-	-
		25.00000	12.00000	0.00000	0.028479	0.51645	0.075442	-	-	-
		26.00000	12.00000	0.00000	0.0025237	0.85682	0.12041	-	-	-
		27.00000	12.00000	0.00000	0.0025270	0.85792	0.12065	-	-	-
		28.00000	12.00000	0.00000	0.0025302	0.85902	0.12090	-	-	-
		29.00000	12.00000	0.00000	0.0025335	0.86013	0.12114	-	-	-
		30.00000	12.00000	0.00000	0.0025367	0.86123	0.12138	-	-	-
		31.00000	12.00000	0.00000	0.0025400	0.86234	0.12162	-	-	-
		32.00000	12.00000	0.00000	0.0025432	0.86344	0.12186	-	-	-
		33.00000	12.00000	0.00000	0.0025465	0.86455	0.12211	-	-	-
		34.00000	12.00000	0.00000	-0.011424	0.55419	0.079958	-	-	-
		35.00000	12.00000	0.00000	-0.037817	0.48614	0.072449	-	-	-
		36.00000	12.00000	0.00000	-0.058225	0.40323	0.061557	-	-	-
		37.00000	12.00000	0.00000	-0.069197	0.31265	0.049605	-	-	-
		38.00000	12.00000	0.00000	-0.068234	0.22048	0.038317	-	-	-
		39.00000	12.00000	0.00000	-0.053848	0.13141	0.027590	-	-	-
		40.00000	12.00000	0.00000	-0.025459	0.048649	0.014309	-	-	-
		10.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	13.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	13.00000	0.00000	0.014529	0.016750	0.0073149	-	-	-
		19.00000	13.00000	0.00000	0.066264	0.094585	0.024508	-	-	-
		20.00000	13.00000	0.00000	0.10243	0.18489	0.037603	-	-	-
		21.00000	13.00000	0.00000	0.12206	0.28682	0.053839	-	-	-
		22.00000	13.00000	0.00000	0.12484	0.39822	0.075641	-	-	-
		23.00000	13.00000	0.00000	0.11144	0.51510	0.10163	-	-	-
		24.00000	13.00000	0.00000	0.083891	0.63136	0.12787	-	-	-
		25.00000	13.00000	0.00000	0.045699	0.73876	0.14930	-	-	-
		26.00000	13.00000	0.00000	0.0036283	1.2318	0.24026	-	-	-
		27.00000	13.00000	0.00000	0.0036315	1.2329	0.24074	-	-	-
		28.00000	13.00000	0.00000	0.0036348	1.2340	0.24122	-	-	-
		29.00000	13.00000	0.00000	0.0036380	1.2351	0.24170	-	-	-
		30.00000	13.00000	0.00000	0.0036413	1.2362	0.24218	-	-	-
		31.00000	13.00000	0.00000	0.0036445	1.2373	0.24266	-	-	-
		32.00000	13.00000	0.00000	0.0036478	1.2384	0.24314	-	-	-
		33.00000	13.00000	0.00000	0.0036510	1.2395	0.24363	-	-	-
		34.00000	13.00000	0.00000	-0.018420	0.79175	0.15915	-	-	-
		35.00000	13.00000	0.00000	-0.061125	0.69372	0.14249	-	-	-
		36.00000	13.00000	0.00000	-0.095870	0.58150	0.11812	-	-	-
		37.00000	13.00000	0.00000	-0.11829	0.46430	0.091090	-	-	-
		38.00000	13.00000	0.00000	-0.12549	0.34948	0.066216	-	-	-
		39.00000	13.00000	0.00000	-0.11604	0.24219	0.046571	-	-	-
		40.00000	13.00000	0.00000	-0.089745	0.14555	0.032125	-	-	-
		10.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	14.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	14.00000	0.00000	0.015139	0.011735	0.0065556	-	-	-
		18.00000	14.00000	0.00000	0.085973	0.080801	0.024814	-	-	-
		19.00000	14.00000	0.00000	0.13937	0.16372	0.039209	-	-	-
		20.00000	14.00000	0.00000	0.17628	0.26449	0.060896	-	-	-
		21.00000	14.00000	0.00000	0.19368	0.38200	0.094082	-	-	-
		22.00000	14.00000	0.00000	0.19041	0.51493	0.13827	-	-	-
		23.00000	14.00000	0.00000	0.16658	0.65959	0.18889	-	-	-
		24.00000	14.00000	0.00000	0.12411	0.80919	0.23864	-	-	-
		25.00000	14.00000	0.00000	0.067209	0.95346	0.27907	-	-	-
		26.00000	14.00000	0.00000	0.0047328	1.6068	0.45063	-	-	-
		27.00000	14.00000	0.00000	0.0047360	1.6079	0.45140	-	-	-
		28.00000	14.00000	0.00000	0.0047393	1.6090	0.45216	-	-	-
		29.00000	14.00000	0.00000	0.0047426	1.6101	0.45292	-	-	-
		30.00000	14.00000	0.00000	0.0047458	1.6112	0.45369	-	-	-
		31.00000	14.00000	0.00000	0.0047491	1.6123	0.45445	-	-	-
		32.00000	14.00000	0.00000	0.0047523	1.6134	0.45522	-	-	-
		33.00000	14.00000	0.00000	0.0047556	1.6145	0.45599	-	-	-
		34.00000	14.00000	0.00000	-0.027330	1.0261	0.29728	-	-	-
		35.00000	14.00000	0.00000	-0.090385	0.89059	0.26557	-	-	-
		36.00000	14.00000	0.00000	-0.14249	0.74273	0.21981	-	-	-
		37.00000	14.00000	0.00000	-0.17804	0.59449	0.16830	-	-	-
		38.00000	14.00000	0.00000	-0.19380	0.45465	0.11925	-	-	-
		39.00000	14.00000	0.00000	-0.18871	0.32857	0.079030	-	-	-
		40.00000	14.00000	0.00000	-0.16328	0.21877	0.050665	-	-	-
		10.00000	15.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	15.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	15.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	15.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	15.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	15.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	15.00000	0.00000	0.0045443	0.035753	0.0093111	-	-	-
		17.00000	15.00000	0.00000	0.099679	0.13708	0.040155	-	-	-
		18.00000	15.00000	0.00000	0.17554	0.23662	0.059274	-	-	-
		19.00000	15.00000	0.00000	0.22553	0.38232	0.092474	-	-	-
		20.00000	15.00000	0.00000	0.26156	0.48713	0.13189	-	-	-
		21.00000	15.00000	0.00000	0.27853	0.61867	0.19126	-	-	-
		22.00000	15.00000	0.00000	0.27014	0.77348	0.26636	-	-	-
		23.00000	15.00000	0.00000	0.23525	0.94905	0.34965	-	-	-
		24.00000	15.00000	0.00000	0.17518	1.1384	0.43055	-	-	-
		25.00000	15.00000	0.00000	0.094832	1.3290	0.49703	-	-	-
		26.00000	15.00000	0.00000	0.0057967	2.1534	0.78594	-	-	-
		27.00000	15.00000	0.00000	0.0058176	2.0800	0.77389	-	-	-
		28.00000	15.00000	0.00000	0.0058291	2.0462	0.76952	-	-	-
		29.00000	15.00000	0.00000	0.0058435	2.0002	0.76224	-	-	-
		30.00000	15.00000	0.00000	0.0058503	1.9862	0.75885	-	-	-
		31.00000	15.00000	0.00000	0.0058536	1.9873	0.75987	-	-	-
		32.00000	15.00000	0.00000	0.0058569	1.9884	0.76089	-	-	-
		33.00000	15.00000	0.00000	0.0058601	1.9895	0.76191	-	-	-
		34.00000	15.00000	0.00000	-0.039006	1.2556	0.49554	-	-	-
		35.00000	15.00000	0.00000	-0.12812	1.0722	0.44230	-	-	-
		36.00000	15.00000	0.00000	-0.20152	0.88036	0.36785	-	-	-
		37.00000	15.00000	0.00000	-0.25197	0.69600	0.28413	-	-	-
		38.00000	15.00000	0.00000	-0.27619	0.52924	0.20279	-	-	-
		39.00000	15.00000	0.00000	-0.27406	0.38488	0.13331	-	-	-
		40.00000	15.00000	0.00000	-0.24744	0.26395	0.081527	-	-	-
		10.00000	16.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	16.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	16.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	16.00000	0.00000	0.0040574	0.010705	0.0044321	-	-	-
		14.00000	16.00000	0.00000	0.024690	0.085128	0.019423	-	-	-
		15.00000	16.00000	0.00000	0.033867	0.16043	0.029114	-	-	-
		16.00000	16.00000	0.00000	0.10279	0.26205	0.054360	-	-	-
		17.00000	16.00000	0.00000	0.20783	0.38672	0.078735	-	-	-
		18.00000	16.00000	0.00000	0.28463	0.50692	0.10601	-	-	-
		19.00000	16.00000	0.00000	0.33810	0.78977	0.17168	-	-	-
		20.00000	16.00000	0.00000	0.36728	0.88516	0.23211	-	-	-
		21.00000	16.00000	0.00000	0.37965	1.0199	0.31948	-	-	-
		22.00000	16.00000	0.00000	0.36839	1.1952	0.43005	-	-	-
		23.00000	16.00000	0.00000	0.32268	1.4041	0.55055	-	-	-
		24.00000	16.00000	0.00000	0.24208	1.6411	0.66773	-	-	-
		25.00000	16.00000	0.00000	0.13168	1.8913	0.79137	-	-	-
		26.00000	16.00000	0.00000	0.0068125	2.9034	1.2607	-	-	-
		27.00000	16.00000	0.00000	0.0068676	2.6858	1.2341	-	-	-
		28.00000	16.00000	0.00000	0.0068841	2.6306	1.2292	-	-	-
		29.00000	16.00000	0.00000	0.0069034	2.5638	1.2234	-	-	-
		30.00000	16.00000	0.00000	0.0069242	2.4909	1.2170	-	-	-
		31.00000	16.00000	0.00000	0.0069453	2.4166	1.2089	-	-	-
		32.00000	16.00000	0.00000	0.0069614	2.3634	1.1999	-	-	-
		33.00000	16.00000	0.00000	0.0069646	2.3645	1.2017	-	-	-
		34.00000	16.00000	0.00000	-0.054896	1.4780	0.77725	-	-	-

Type/No.		Coordinates			Displacements				Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		35.00000	16.00000	0.00000	-0.17849	1.2311	0.67388	-	-	-
		36.00000	16.00000	0.00000	-0.27830	0.98415	0.54925	-	-	-
		37.00000	16.00000	0.00000	-0.34511	0.75839	0.42863	-	-	-
		38.00000	16.00000	0.00000	-0.37649	0.56429	0.31065	-	-	-
		39.00000	16.00000	0.00000	-0.37455	0.40430	0.20732	-	-	-
		40.00000	16.00000	0.00000	-0.36067	0.29356	0.13379	-	-	-
		10.00000	17.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	17.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	17.00000	0.00000	0.029260	0.052755	0.015387	-	-	-
		13.00000	17.00000	0.00000	0.059633	0.13673	0.028625	-	-	-
		14.00000	17.00000	0.00000	0.075586	0.22799	0.039830	-	-	-
		15.00000	17.00000	0.00000	0.081423	0.32463	0.054756	-	-	-
		16.00000	17.00000	0.00000	0.21957	0.46822	0.095325	-	-	-
		17.00000	17.00000	0.00000	0.32949	0.61370	0.12937	-	-	-
		18.00000	17.00000	0.00000	0.40999	0.75576	0.17744	-	-	-
		19.00000	17.00000	0.00000	0.47177	1.1746	0.29149	-	-	-
		20.00000	17.00000	0.00000	0.51528	1.2702	0.38371	-	-	-
		21.00000	17.00000	0.00000	0.51264	1.3858	0.49036	-	-	-
		22.00000	17.00000	0.00000	0.49091	1.5640	0.62664	-	-	-
		23.00000	17.00000	0.00000	0.43680	1.8056	0.82825	-	-	-
		24.00000	17.00000	0.00000	0.33317	2.0984	1.0477	-	-	-
		25.00000	17.00000	0.00000	0.18340	2.4272	1.2269	-	-	-
		26.00000	17.00000	0.00000	0.0078284	3.6534	1.9321	-	-	-
		27.00000	17.00000	0.00000	0.0079185	3.2873	1.8787	-	-	-
		28.00000	17.00000	0.00000	0.0079411	3.2067	1.8660	-	-	-
		29.00000	17.00000	0.00000	0.0079662	3.1155	1.8524	-	-	-
		30.00000	17.00000	0.00000	0.0079922	3.0205	1.8404	-	-	-
		31.00000	17.00000	0.00000	0.0080177	2.9274	1.8310	-	-	-
		32.00000	17.00000	0.00000	0.0080419	2.8398	1.8232	-	-	-
		33.00000	17.00000	0.00000	0.0080642	2.7605	1.8138	-	-	-
		34.00000	17.00000	0.00000	-0.077670	1.6886	1.1689	-	-	-
		35.00000	17.00000	0.00000	-0.24879	1.3540	1.0238	-	-	-
		36.00000	17.00000	0.00000	-0.38138	1.0376	0.82329	-	-	-
		37.00000	17.00000	0.00000	-0.46459	0.76658	0.60046	-	-	-
		38.00000	17.00000	0.00000	-0.49942	0.54834	0.42738	-	-	-
		39.00000	17.00000	0.00000	-0.52160	0.40820	0.31025	-	-	-
		40.00000	17.00000	0.00000	-0.50312	0.30239	0.20736	-	-	-
		10.00000	18.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	18.00000	0.00000	0.049877	0.060728	0.018827	-	-	-
		12.00000	18.00000	0.00000	0.095148	0.14496	0.032524	-	-	-
		13.00000	18.00000	0.00000	0.12399	0.24216	0.047633	-	-	-
		14.00000	18.00000	0.00000	0.13556	0.35112	0.068746	-	-	-
		15.00000	18.00000	0.00000	0.20068	0.48392	0.11234	-	-	-
		16.00000	18.00000	0.00000	0.34660	0.64757	0.16538	-	-	-
		17.00000	18.00000	0.00000	0.46313	0.81586	0.22344	-	-	-
		18.00000	18.00000	0.00000	0.54990	0.98169	0.30277	-	-	-
		19.00000	18.00000	0.00000	0.62562	1.5352	0.49426	-	-	-
		20.00000	18.00000	0.00000	0.69352	1.6251	0.62186	-	-	-
		21.00000	18.00000	0.00000	0.71233	1.7383	0.76467	-	-	-
		22.00000	18.00000	0.00000	0.66441	1.8826	0.95874	-	-	-
		23.00000	18.00000	0.00000	0.58932	2.1290	1.2203	-	-	-
		24.00000	18.00000	0.00000	0.47100	2.5026	1.4821	-	-	-
		25.00000	18.00000	0.00000	0.27233	2.9788	1.7022	-	-	-
		26.00000	18.00000	0.00000	0.0092823	4.5446	2.6360	-	-	-
		27.00000	18.00000	0.00000	0.0093880	4.0249	2.5254	-	-	-
		28.00000	18.00000	0.00000	0.0094195	3.9138	2.4957	-	-	-
		29.00000	18.00000	0.00000	0.0094530	3.7943	2.4640	-	-	-
		30.00000	18.00000	0.00000	0.0094865	3.6749	2.4361	-	-	-
		31.00000	18.00000	0.00000	0.0095186	3.5617	2.4151	-	-	-
		32.00000	18.00000	0.00000	0.0095481	3.4589	2.4014	-	-	-
		33.00000	18.00000	0.00000	0.0095748	3.3685	2.3926	-	-	-
		34.00000	18.00000	0.00000	-0.11902	1.9931	1.5368	-	-	-
		35.00000	18.00000	0.00000	-0.36418	1.4611	1.3440	-	-	-
		36.00000	18.00000	0.00000	-0.52751	1.0183	1.1035	-	-	-
		37.00000	18.00000	0.00000	-0.62019	0.69917	0.83074	-	-	-
		38.00000	18.00000	0.00000	-0.69647	0.51432	0.59980	-	-	-
		39.00000	18.00000	0.00000	-0.71303	0.38532	0.43499	-	-	-
		40.00000	18.00000	0.00000	-0.67111	0.28380	0.29561	-	-	-
		10.00000	19.00000	0.00000	0.060970	0.049115	0.018779	-	-	-
		11.00000	19.00000	0.00000	0.12288	0.12156	0.032567	-	-	-
		12.00000	19.00000	0.00000	0.17023	0.21299	0.050858	-	-	-
		13.00000	19.00000	0.00000	0.19895	0.32239	0.080350	-	-	-
		14.00000	19.00000	0.00000	0.20694	0.44926	0.12282	-	-	-
		15.00000	19.00000	0.00000	0.32751	0.61082	0.20043	-	-	-
		16.00000	19.00000	0.00000	0.48220	0.79648	0.28023	-	-	-
		17.00000	19.00000	0.00000	0.60611	0.99091	0.37333	-	-	-
		18.00000	19.00000	0.00000	0.70052	1.1842	0.49182	-	-	-
		19.00000	19.00000	0.00000	0.79563	1.8713	0.79491	-	-	-
		20.00000	19.00000	0.00000	0.90000	1.9476	0.95877	-	-	-
		21.00000	19.00000	0.00000	0.95782	2.0478	1.1740	-	-	-
		22.00000	19.00000	0.00000	0.94631	2.1832	1.4790	-	-	-
		23.00000	19.00000	0.00000	0.85351	2.3903	1.6878	-	-	-
		24.00000	19.00000	0.00000	0.72084	2.8094	1.9241	-	-	-
		25.00000	19.00000	0.00000	0.44286	3.4613	2.1749	-	-	-
		26.00000	19.00000	0.00000	0.0084713	4.3476	2.5962	-	-	-
		27.00000	19.00000	0.00000	0.011033	4.8134	3.0954	-	-	-
		28.00000	19.00000	0.00000	0.011074	4.6642	3.0370	-	-	-
		29.00000	19.00000	0.00000	0.011116	4.5104	2.9761	-	-	-
		30.00000	19.00000	0.00000	0.011156	4.3627	2.9221	-	-	-
		31.00000	19.00000	0.00000	0.011194	4.2280	2.8804	-	-	-
		32.00000	19.00000	0.00000	0.011227	4.1098	2.8526	-	-	-
		33.00000	19.00000	0.00000	0.011256	4.0094	2.8365	-	-	-
		34.00000	19.00000	0.00000	-0.19984	2.3114	1.8111	-	-	-
		35.00000	19.00000	0.00000	-0.58341	1.4950	1.5749	-	-	-
		36.00000	19.00000	0.00000	-0.78325	0.90796	1.3051	-	-	-
		37.00000	19.00000	0.00000	-0.90647	0.60888	1.1179	-	-	-
		38.00000	19.00000	0.00000	-0.96427	0.44202	0.86284	-	-	-
		39.00000	19.00000	0.00000	-0.94187	0.32465	0.56609	-	-	-
		40.00000	19.00000	0.00000	-0.86145	0.23680	0.38917	-	-	-
		10.00000	20.00000	0.00000	0.14542	0.093571	0.032432	-	-	-
		11.00000	20.00000	0.00000	0.21517	0.16824	0.050849	-	-	-
		12.00000	20.00000	0.00000	0.25657	0.25340	0.081223	-	-	-
		13.00000	20.00000	0.00000	0.28660	0.37173	0.13393	-	-	-
		14.00000	20.00000	0.00000	0.29272	0.51546	0.20602	-	-	-
		15.00000	20.00000	0.00000	0.46099	0.69954	0.32247	-	-	-
		16.00000	20.00000	0.00000	0.62467	0.90985	0.43870	-	-	-
		17.00000	20.00000	0.00000	0.75492	1.1359	0.57389	-	-	-
		18.00000	20.00000	0.00000	0.85557	1.3636	0.73641	-	-	-
		19.00000	20.00000	0.00000	0.97338	2.1854	1.1823	-	-	-
		20.00000	20.00000	0.00000	1.1263	2.2394	1.3803	-	-	-
		21.00000	20.00000	0.00000	1.2436	2.3129	1.7260	-	-	-
		22.00000	20.00000	0.00000	1.3146	2.4211	2.0960	-	-	-
		23.00000	20.00000	0.00000	1.3769	2.6089	2.3524	-	-	-
		24.00000	20.00000	0.00000	1.1952	2.9209	2.4182	-	-	-
		25.00000	20.00000	0.00000	0.77861	3.7006	2.5674	-	-	-
		26.00000	20.00000	0.00000	0.012412	5.0251	2.8308	-	-	-
		27.00000	20.00000	0.00000	0.012829	5.6409	3.4702	-	-	-
		28.00000	20.00000	0.00000	0.012882	5.4436	3.3699	-	-	-
		29.00000	20.00000	0.00000	0.012934	5.2489	3.2688	-	-	-
		30.00000	20.00000	0.00000	0.012982	5.0698	3.1803	-	-	-
		31.00000	20.00000	0.00000	0.013026	4.9133	3.1117	-	-	-
		32.00000	20.00000	0.00000	0.013063	4.7816	3.0647	-	-	-
		33.00000	20.00000	0.00000	0.013093	4.6804	3.0374	-	-	-
		34.00000	20.00000	0.00000	-0.37596	2.4975	1.9054	-	-	-
		35.00000	20.00000	0.00000	-0.98137	1.2730	1.6474	-	-	-
		36.00000	20.00000	0.00000	-1.3225	0.71189	1.6021	-	-	-
		37.00000	20.00000	0.00000	-1.3746	0.46237	1.4469	-	-	-
		38.00000	20.00000	0.00000	-1.2896	0.31451	1.1323	-	-	-
		39.00000	20.00000	0.00000	-1.2006	0.22649	0.73530	-	-	-
		40.00000	20.00000	0.00000	-1.0654	0.16355	0.47596	-	-	-
		10.00000	21.00000	0.00000	0.24260	0.12167	0.047346	-	-	-
		11.00000	21.00000	0.00000	0.32487	0.19598	0.080020	-	-	-
		12.00000	21.00000	0.00000	0.37647	0.28298	0.13388	-	-	-
		13.00000	21.00000	0.00000	0.39067	0.38500	0.20630	-	-	-
		14.00000	21.00000	0.00000	0.39664	0.54073	0.31120	-	-	-
		15.00000	21.00000	0.00000	0.60102	0.74163	0.46798	-	-	-
		16.00000	21.00000	0.00000	0.77326	0.97950	0.62462	-	-	-
		17.00000	21.00000	0.00000	0.90619	1.2458	0.83289	-	-	-
		18.00000	21.00000	0.00000	1.0068	1.5210	1.1012	-	-	-
		19.00000	21.00000	0.00000	1.1455	2.4833	1.7708	-	-	-
		20.00000	21.00000	0.00000	1.3555	2.5074	1.9895	-	-	-

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		21.00000	21.00000	0.00000	1.5490	2.5409	2.4209	-	-	-
		22.00000	21.00000	0.00000	1.7849	2.5950	2.8493	-	-	-
		23.00000	21.00000	0.00000	2.0700	2.6916	3.1936	-	-	-
		24.00000	21.00000	0.00000	2.1928	2.8798	3.3248	-	-	-
		25.00000	21.00000	0.00000	1.7589	3.3634	3.0769	-	-	-
		26.00000	21.00000	0.00000	0.027341	5.8511	3.1829	-	-	-
		27.00000	21.00000	0.00000	0.014861	6.5297	3.5344	-	-	-
		28.00000	21.00000	0.00000	0.014929	6.2703	3.3462	-	-	-
		29.00000	21.00000	0.00000	0.014994	6.0266	3.1853	-	-	-
		30.00000	21.00000	0.00000	0.015051	5.8142	3.0577	-	-	-
		31.00000	21.00000	0.00000	0.015100	5.6380	2.9605	-	-	-
		32.00000	21.00000	0.00000	0.015138	5.5090	2.8967	-	-	-
		33.00000	21.00000	0.00000	0.015167	5.4155	2.8581	-	-	-
		34.00000	21.00000	0.00000	-0.97374	2.0354	1.6856	-	-	-
		35.00000	21.00000	0.00000	-2.0897	0.74086	1.9569	-	-	-
		36.00000	21.00000	0.00000	-2.1844	0.38036	2.0158	-	-	-
		37.00000	21.00000	0.00000	-1.9651	0.21251	1.7702	-	-	-
		38.00000	21.00000	0.00000	-1.6522	0.13857	1.3702	-	-	-
		39.00000	21.00000	0.00000	-1.4698	0.098335	0.89946	-	-	-
		40.00000	21.00000	0.00000	-1.2676	0.070512	0.54298	-	-	-
		10.00000	22.00000	0.00000	0.35122	0.13261	0.068015	-	-	-
		11.00000	22.00000	0.00000	0.45170	0.20312	0.12183	-	-	-
		12.00000	22.00000	0.00000	0.52063	0.28791	0.20523	-	-	-
		13.00000	22.00000	0.00000	0.54900	0.39077	0.31137	-	-	-
		14.00000	22.00000	0.00000	0.52546	0.51619	0.42451	-	-	-
		15.00000	22.00000	0.00000	0.86710	0.72786	0.65514	-	-	-
		16.00000	22.00000	0.00000	1.1650	0.99854	0.95364	-	-	-
		17.00000	22.00000	0.00000	1.4099	1.3220	1.3108	-	-	-
		18.00000	22.00000	0.00000	1.6102	1.6739	1.7173	-	-	-
		19.00000	22.00000	0.00000	1.8707	2.7993	2.7409	-	-	-
		20.00000	22.00000	0.00000	2.2457	2.7996	3.0819	-	-	-
		21.00000	22.00000	0.00000	2.6207	2.7999	3.7557	-	-	-
		22.00000	22.00000	0.00000	3.1385	2.8002	4.4137	-	-	-
		23.00000	22.00000	0.00000	3.8211	2.8006	4.9751	-	-	-
		24.00000	22.00000	0.00000	4.5591	2.8010	5.3517	-	-	-
		25.00000	22.00000	0.00000	5.3539	2.8014	5.3402	-	-	-
		26.00000	22.00000	0.00000	5.7221	2.8018	4.2862	-	-	-
		27.00000	22.00000	0.00000		Point lies within an excavation.				
		28.00000	22.00000	0.00000		Point lies within an excavation.				
		29.00000	22.00000	0.00000		Point lies within an excavation.				
		30.00000	22.00000	0.00000		Point lies within an excavation.				
		31.00000	22.00000	0.00000		Point lies within an excavation.				
		32.00000	22.00000	0.00000		Point lies within an excavation.				
		33.00000	22.00000	0.00000		Point lies within an excavation.				
		34.00000	22.00000	0.00000	-5.7196	0.17305	3.0950	-	-	-
		35.00000	22.00000	0.00000	-5.0120	0.10740	3.5225	-	-	-
		36.00000	22.00000	0.00000	-4.2357	0.052021	3.3296	-	-	-
		37.00000	22.00000	0.00000	-3.5253	0.0048420	2.8270	-	-	-
		38.00000	22.00000	0.00000	-2.8557	0.0	2.1608	-	-	-
		39.00000	22.00000	0.00000	-2.4619	0.0	1.4303	-	-	-
		40.00000	22.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	23.00000	0.00000	0.46836	0.12646	0.094550	-	-	-
		11.00000	23.00000	0.00000	0.59349	0.18889	0.17337	-	-	-
		12.00000	23.00000	0.00000	0.68857	0.26598	0.28963	-	-	-
		13.00000	23.00000	0.00000	0.74284	0.36283	0.43247	-	-	-
		14.00000	23.00000	0.00000	0.74092	0.48656	0.60213	-	-	-
		15.00000	23.00000	0.00000	1.0333	0.64703	0.87391	-	-	-
		16.00000	23.00000	0.00000	1.3244	0.95660	1.2238	-	-	-
		17.00000	23.00000	0.00000	1.5450	1.4214	1.6431	-	-	-
		18.00000	23.00000	0.00000	1.6704	1.9952	2.1351	-	-	-
		19.00000	23.00000	0.00000	1.8710	3.4550	3.4172	-	-	-
		20.00000	23.00000	0.00000	2.2460	3.4394	3.7418	-	-	-
		21.00000	23.00000	0.00000	2.6210	3.3927	4.3652	-	-	-
		22.00000	23.00000	0.00000	3.1287	3.3518	4.9854	-	-	-
		23.00000	23.00000	0.00000	3.7937	3.3492	5.5132	-	-	-
		24.00000	23.00000	0.00000	4.4936	3.3495	5.8179	-	-	-
		25.00000	23.00000	0.00000	5.1905	3.3498	5.7054	-	-	-
		26.00000	23.00000	0.00000	5.7175	3.3501	4.8346	-	-	-
		27.00000	23.00000	0.00000		Point lies within an excavation.				
		28.00000	23.00000	0.00000		Point lies within an excavation.				
		29.00000	23.00000	0.00000		Point lies within an excavation.				
		30.00000	23.00000	0.00000		Point lies within an excavation.				
		31.00000	23.00000	0.00000		Point lies within an excavation.				
		32.00000	23.00000	0.00000		Point lies within an excavation.				
		33.00000	23.00000	0.00000		Point lies within an excavation.				
		34.00000	23.00000	0.00000	-5.5242	0.16216	2.8949	-	-	-
		35.00000	23.00000	0.00000	-4.9042	0.10452	3.3884	-	-	-
		36.00000	23.00000	0.00000	-4.1910	0.056787	3.2598	-	-	-
		37.00000	23.00000	0.00000	-3.5070	0.016692	2.7902	-	-	-
		38.00000	23.00000	0.00000	-2.8504	0.0	2.1401	-	-	-
		39.00000	23.00000	0.00000	-2.4619	0.0	1.4213	-	-	-
		40.00000	23.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	24.00000	0.00000	0.58906	0.10444	0.12379	-	-	-
		11.00000	24.00000	0.00000	0.74523	0.15408	0.22820	-	-	-
		12.00000	24.00000	0.00000	0.87612	0.21687	0.37759	-	-	-
		13.00000	24.00000	0.00000	0.97084	0.29840	0.55776	-	-	-
		14.00000	24.00000	0.00000	1.0119	0.40759	0.83007	-	-	-
		15.00000	24.00000	0.00000	1.3493	0.56306	1.1531	-	-	-
		16.00000	24.00000	0.00000	1.5877	0.82763	1.3863	-	-	-
		17.00000	24.00000	0.00000	1.7723	1.4126	1.8222	-	-	-
		18.00000	24.00000	0.00000	1.7783	2.2624	2.4052	-	-	-
		19.00000	24.00000	0.00000	1.8713	4.1589	3.9370	-	-	-
		20.00000	24.00000	0.00000	2.2462	4.1199	4.2336	-	-	-
		21.00000	24.00000	0.00000	2.6212	4.0263	4.7615	-	-	-
		22.00000	24.00000	0.00000	3.0964	3.9654	5.3309	-	-	-
		23.00000	24.00000	0.00000	3.7252	3.9319	5.8185	-	-	-
		24.00000	24.00000	0.00000	4.3641	3.9316	6.0603	-	-	-
		25.00000	24.00000	0.00000	5.0256	3.9319	5.9229	-	-	-
		26.00000	24.00000	0.00000	5.7160	3.9322	5.2394	-	-	-
		27.00000	24.00000	0.00000		Point lies within an excavation.				
		28.00000	24.00000	0.00000		Point lies within an excavation.				
		29.00000	24.00000	0.00000		Point lies within an excavation.				
		30.00000	24.00000	0.00000		Point lies within an excavation.				
		31.00000	24.00000	0.00000		Point lies within an excavation.				
		32.00000	24.00000	0.00000		Point lies within an excavation.				
		33.00000	24.00000	0.00000		Point lies within an excavation.				
		34.00000	24.00000	0.00000	-5.4155	0.13280	2.7784	-	-	-
		35.00000	24.00000	0.00000	-4.7391	0.087299	3.1805	-	-	-
		36.00000	24.00000	0.00000	-4.0908	0.050200	3.1069	-	-	-
		37.00000	24.00000	0.00000	-3.4563	0.019410	2.6935	-	-	-
		38.00000	24.00000	0.00000	-2.8490	0.0	2.0816	-	-	-
		39.00000	24.00000	0.00000	-2.4619	0.0	1.3897	-	-	-
		40.00000	24.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	25.00000	0.00000	0.70602	0.069322	0.15068	-	-	-
		11.00000	25.00000	0.00000	0.89833	0.10170	0.27785	-	-	-
		12.00000	25.00000	0.00000	1.0736	0.14341	0.45724	-	-	-
		13.00000	25.00000	0.00000	1.2236	0.19906	0.69755	-	-	-
		14.00000	25.00000	0.00000	1.3334	0.27670	1.0410	-	-	-
		15.00000	25.00000	0.00000	1.7960	0.40583	1.4032	-	-	-
		16.00000	25.00000	0.00000	2.1442	0.64561	1.6575	-	-	-
		17.00000	25.00000	0.00000	2.1883	1.0753	1.8001	-	-	-
		18.00000	25.00000	0.00000	2.0187	2.2853	2.3914	-	-	-
		19.00000	25.00000	0.00000	1.8715	4.9274	4.1639	-	-	-
		20.00000	25.00000	0.00000	2.2464	4.8333	4.4032	-	-	-
		21.00000	25.00000	0.00000	2.6214	4.6715	4.8241	-	-	-
		22.00000	25.00000	0.00000	3.0848	4.6113	5.3916	-	-	-
		23.00000	25.00000	0.00000	3.6734	4.5799	5.8619	-	-	-
		24.00000	25.00000	0.00000	4.3011	4.5691	6.1133	-	-	-
		25.00000	25.00000	0.00000	4.9724	4.5693	6.0011	-	-	-
		26.00000	25.00000	0.00000	5.7159	4.5696	5.3807	-	-	-
		27.00000	25.00000	0.00000		Point lies within an excavation.				
		28.00000	25.00000	0.00000		Point lies within an excavation.				
		29.00000	25.00000	0.00000		Point lies within an excavation.				
		30.00000	25.00000	0.00000		Point lies within an excavation.				
		31.00000	25.00000	0.00000		Point lies within an excavation.				
		32.00000	25.00000	0.00000		Point lies within an excavation.				
		33.00000	25.00000	0.00000		Point lies within an excavation.				
		34.00000	25.00000	0.00000	-5.3865	0.087879	2.7365	-	-	-
		35.00000	25.00000	0.00000	-4.6792	0.058346	3.0999	-	-	-
		36.00000	25.00000	0.00000	-4.0287	0.034542	3.0072	-	-	-
		37.00000	25.00000	0.00000	-3.4130	0.014956	2.6113	-	-	-

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		38.00000	25.00000	0.00000	-2.8490	0.0	2.0241	-	-	-
		39.00000	25.00000	0.00000	-2.4619	0.0	1.3589	-	-	-
		40.00000	25.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	26.00000	0.00000	0.80994	0.025421	0.16978	-	-	-
		11.00000	26.00000	0.00000	1.0407	0.037221	0.31354	-	-	-
		12.00000	26.00000	0.00000	1.2653	0.052584	0.51615	-	-	-
		13.00000	26.00000	0.00000	1.4805	0.073403	0.81138	-	-	-
		14.00000	26.00000	0.00000	1.6802	0.10319	1.1991	-	-	-
		15.00000	26.00000	0.00000	2.3175	0.15835	1.6037	-	-	-
		16.00000	26.00000	0.00000	2.9120	0.26494	1.9117	-	-	-
		17.00000	26.00000	0.00000	3.3352	0.49928	2.0680	-	-	-
		18.00000	26.00000	0.00000	2.8850	1.2915	1.9568	-	-	-
		19.00000	26.00000	0.00000	1.8718	5.6703	3.8253	-	-	-
		20.00000	26.00000	0.00000	2.2466	5.4697	3.9721	-	-	-
		21.00000	26.00000	0.00000	2.6216	5.3458	4.4438	-	-	-
		22.00000	26.00000	0.00000	3.0850	5.3107	5.0200	-	-	-
		23.00000	26.00000	0.00000	3.6512	5.2962	5.5131	-	-	-
		24.00000	26.00000	0.00000	4.2675	5.2901	5.7864	-	-	-
		25.00000	26.00000	0.00000	4.9483	5.2904	5.7024	-	-	-
		26.00000	26.00000	0.00000	5.7161	5.2906	5.1152	-	-	-
		27.00000	26.00000	0.00000				Point lies within an excavation.		
		28.00000	26.00000	0.00000				Point lies within an excavation.		
		29.00000	26.00000	0.00000				Point lies within an excavation.		
		30.00000	26.00000	0.00000				Point lies within an excavation.		
		31.00000	26.00000	0.00000				Point lies within an excavation.		
		32.00000	26.00000	0.00000				Point lies within an excavation.		
		33.00000	26.00000	0.00000				Point lies within an excavation.		
		34.00000	26.00000	0.00000	-5.3745	0.032373	2.7130	-	-	-
		35.00000	26.00000	0.00000	-4.6487	0.021590	3.0671	-	-	-
		36.00000	26.00000	0.00000	-3.9948	0.012949	2.9685	-	-	-
		37.00000	26.00000	0.00000	-3.4058	0.0058686	2.5544	-	-	-
		38.00000	26.00000	0.00000	-2.8490	0.0	1.9765	-	-	-
		39.00000	26.00000	0.00000	-2.4619	0.0	1.3589	-	-	-
		40.00000	26.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	27.00000	0.00000	1.2795	-133.49E-6	0.26166	-	-	-
		11.00000	27.00000	0.00000	1.6545	-172.62E-6	0.48426	-	-	-
		12.00000	27.00000	0.00000	2.0295	-211.74E-6	0.79934	-	-	-
		13.00000	27.00000	0.00000	2.4045	-250.87E-6	1.2660	-	-	-
		14.00000	27.00000	0.00000	2.7795	-289.99E-6	1.8727	-	-	-
		15.00000	27.00000	0.00000	3.3193	-290.18E-6	2.4653	-	-	-
		16.00000	27.00000	0.00000	3.8996	-280.80E-6	2.8981	-	-	-
		17.00000	27.00000	0.00000	4.5408	-309.82E-6	3.0506	-	-	-
		18.00000	27.00000	0.00000	5.2555	-253.70E-6	2.7838	-	-	-
		19.00000	27.00000	0.00000				Point lies within an excavation.		
		20.00000	27.00000	0.00000				Point lies within an excavation.		
		21.00000	27.00000	0.00000				Point lies within an excavation.		
		22.00000	27.00000	0.00000				Point lies within an excavation.		
		23.00000	27.00000	0.00000				Point lies within an excavation.		
		24.00000	27.00000	0.00000				Point lies within an excavation.		
		25.00000	27.00000	0.00000				Point lies within an excavation.		
		26.00000	27.00000	0.00000				Point lies within an excavation.		
		27.00000	27.00000	0.00000				Point lies within an excavation.		
		28.00000	27.00000	0.00000				Point lies within an excavation.		
		29.00000	27.00000	0.00000				Point lies within an excavation.		
		30.00000	27.00000	0.00000				Point lies within an excavation.		
		31.00000	27.00000	0.00000				Point lies within an excavation.		
		32.00000	27.00000	0.00000				Point lies within an excavation.		
		33.00000	27.00000	0.00000				Point lies within an excavation.		
		34.00000	27.00000	0.00000	-5.3732	0.0	2.7041	-	-	-
		35.00000	27.00000	0.00000	-4.6450	0.0	3.0614	-	-	-
		36.00000	27.00000	0.00000	-3.9925	0.0	2.9647	-	-	-
		37.00000	27.00000	0.00000	-3.4058	0.0	2.5520	-	-	-
		38.00000	27.00000	0.00000	-2.8490	0.0	1.9697	-	-	-
		39.00000	27.00000	0.00000	-2.4619	0.0	1.3589	-	-	-
		40.00000	27.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	28.00000	0.00000	1.2794	-133.49E-6	0.26165	-	-	-
		11.00000	28.00000	0.00000	1.6544	-172.61E-6	0.48423	-	-	-
		12.00000	28.00000	0.00000	2.0294	-211.74E-6	0.79930	-	-	-
		13.00000	28.00000	0.00000	2.4044	-250.86E-6	1.2660	-	-	-
		14.00000	28.00000	0.00000	2.7794	-289.99E-6	1.9157	-	-	-
		15.00000	28.00000	0.00000	3.3193	-290.16E-6	2.5170	-	-	-
		16.00000	28.00000	0.00000	3.9258	-476.70E-6	2.9469	-	-	-
		17.00000	28.00000	0.00000	4.5694	-523.94E-6	3.0925	-	-	-
		18.00000	28.00000	0.00000	5.2692	-356.18E-6	2.8030	-	-	-
		19.00000	28.00000	0.00000				Point lies within an excavation.		
		20.00000	28.00000	0.00000				Point lies within an excavation.		
		21.00000	28.00000	0.00000				Point lies within an excavation.		
		22.00000	28.00000	0.00000				Point lies within an excavation.		
		23.00000	28.00000	0.00000				Point lies within an excavation.		
		24.00000	28.00000	0.00000				Point lies within an excavation.		
		25.00000	28.00000	0.00000				Point lies within an excavation.		
		26.00000	28.00000	0.00000				Point lies within an excavation.		
		27.00000	28.00000	0.00000				Point lies within an excavation.		
		28.00000	28.00000	0.00000				Point lies within an excavation.		
		29.00000	28.00000	0.00000				Point lies within an excavation.		
		30.00000	28.00000	0.00000				Point lies within an excavation.		
		31.00000	28.00000	0.00000				Point lies within an excavation.		
		32.00000	28.00000	0.00000				Point lies within an excavation.		
		33.00000	28.00000	0.00000				Point lies within an excavation.		
		34.00000	28.00000	0.00000	-5.3837	0.0	2.7125	-	-	-
		35.00000	28.00000	0.00000	-4.6725	0.0	3.0828	-	-	-
		36.00000	28.00000	0.00000	-4.0219	0.0	2.9924	-	-	-
		37.00000	28.00000	0.00000	-3.4070	0.0	2.5974	-	-	-
		38.00000	28.00000	0.00000	-2.8490	0.0	2.0151	-	-	-
		39.00000	28.00000	0.00000	-2.4619	0.0	1.3589	-	-	-
		40.00000	28.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	29.00000	0.00000	1.2794	-133.48E-6	0.26163	-	-	-
		11.00000	29.00000	0.00000	1.6544	-172.61E-6	0.48421	-	-	-
		12.00000	29.00000	0.00000	2.0294	-211.73E-6	0.79926	-	-	-
		13.00000	29.00000	0.00000	2.4044	-250.86E-6	1.2767	-	-	-
		14.00000	29.00000	0.00000	2.7794	-289.99E-6	1.9684	-	-	-
		15.00000	29.00000	0.00000	3.3524	-537.68E-6	2.5907	-	-	-
		16.00000	29.00000	0.00000	3.9793	-876.93E-6	3.0338	-	-	-
		17.00000	29.00000	0.00000	4.6226	-921.82E-6	3.1631	-	-	-
		18.00000	29.00000	0.00000	5.3005	-589.91E-6	2.8412	-	-	-
		19.00000	29.00000	0.00000				Point lies within an excavation.		
		20.00000	29.00000	0.00000				Point lies within an excavation.		
		21.00000	29.00000	0.00000				Point lies within an excavation.		
		22.00000	29.00000	0.00000				Point lies within an excavation.		
		23.00000	29.00000	0.00000				Point lies within an excavation.		
		24.00000	29.00000	0.00000				Point lies within an excavation.		
		25.00000	29.00000	0.00000				Point lies within an excavation.		
		26.00000	29.00000	0.00000				Point lies within an excavation.		
		27.00000	29.00000	0.00000				Point lies within an excavation.		
		28.00000	29.00000	0.00000				Point lies within an excavation.		
		29.00000	29.00000	0.00000				Point lies within an excavation.		
		30.00000	29.00000	0.00000				Point lies within an excavation.		
		31.00000	29.00000	0.00000				Point lies within an excavation.		
		32.00000	29.00000	0.00000				Point lies within an excavation.		
		33.00000	29.00000	0.00000				Point lies within an excavation.		
		34.00000	29.00000	0.00000	-5.4081	0.0	2.7407	-	-	-
		35.00000	29.00000	0.00000	-4.7255	0.0	3.1501	-	-	-
		36.00000	29.00000	0.00000	-4.0771	0.0	3.0792	-	-	-
		37.00000	29.00000	0.00000	-3.4480	0.0	2.6750	-	-	-
		38.00000	29.00000	0.00000	-2.8490	0.0	2.0714	-	-	-
		39.00000	29.00000	0.00000	-2.4619	0.0	1.3836	-	-	-
		40.00000	29.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	30.00000	0.00000	1.2793	-133.48E-6	0.26161	-	-	-
		11.00000	30.00000	0.00000	1.6543	-172.60E-6	0.48418	-	-	-
		12.00000	30.00000	0.00000	2.0293	-211.73E-6	0.79923	-	-	-
		13.00000	30.00000	0.00000	2.4043	-250.86E-6	1.3064	-	-	-
		14.00000	30.00000	0.00000	2.7793	-289.98E-6	2.0227	-	-	-
		15.00000	30.00000	0.00000	3.3975	-875.28E-6	2.6790	-	-	-
		16.00000	30.00000	0.00000	4.0655	-0.0015221	3.1688	-	-	-
		17.00000	30.00000	0.00000	4.7576	-0.0019320	3.3376	-	-	-
		18.00000	30.00000	0.00000	5.3991	-0.0013272	2.9479	-	-	-
		19.00000	30.00000	0.00000				Point lies within an excavation.		
		20.00000	30.00000	0.00000				Point lies within an excavation.		
		21.00000	30.00000	0.00000				Point lies within an excavation.		
		22.00000	30.00000	0.00000				Point lies within an excavation.		
		23.00000	30.00000	0.00000				Point lies within an excavation.		

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		24.00000	30.00000	0.00000		Point lies within an excavation.				
		25.00000	30.00000	0.00000		Point lies within an excavation.				
		26.00000	30.00000	0.00000		Point lies within an excavation.				
		27.00000	30.00000	0.00000		Point lies within an excavation.				
		28.00000	30.00000	0.00000		Point lies within an excavation.				
		29.00000	30.00000	0.00000		Point lies within an excavation.				
		30.00000	30.00000	0.00000		Point lies within an excavation.				
		31.00000	30.00000	0.00000		Point lies within an excavation.				
		32.00000	30.00000	0.00000		Point lies within an excavation.				
		33.00000	30.00000	0.00000		Point lies within an excavation.				
		34.00000	30.00000	0.00000	-5.4905	0.0	2.8289	-	-	-
		35.00000	30.00000	0.00000	-4.8645	0.0	3.3243	-	-	-
		36.00000	30.00000	0.00000	-4.1722	0.0	3.2237	-	-	-
		37.00000	30.00000	0.00000	-3.4985	0.0	2.7704	-	-	-
		38.00000	30.00000	0.00000	-2.8490	0.0	2.1307	-	-	-
		39.00000	30.00000	0.00000	-2.4619	0.0	1.4168	-	-	-
		40.00000	30.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	31.00000	0.00000	1.2793	-133.48E-6	0.26159	-	-	-
		11.00000	31.00000	0.00000	1.6543	-172.60E-6	0.48415	-	-	-
		12.00000	31.00000	0.00000	2.0293	-211.73E-6	0.79919	-	-	-
		13.00000	31.00000	0.00000	2.4043	-250.85E-6	1.3206	-	-	-
		14.00000	31.00000	0.00000	2.7793	-289.98E-6	2.0581	-	-	-
		15.00000	31.00000	0.00000	3.4270	-0.0015422	2.7460	-	-	-
		16.00000	31.00000	0.00000	4.1383	-0.0030883	3.2883	-	-	-
		17.00000	31.00000	0.00000	4.9294	-0.0050332	3.5608	-	-	-
		18.00000	31.00000	0.00000	5.7917	-0.0075977	3.3686	-	-	-
		19.00000	31.00000	0.00000		Point lies within an excavation.				
		20.00000	31.00000	0.00000		Point lies within an excavation.				
		21.00000	31.00000	0.00000		Point lies within an excavation.				
		22.00000	31.00000	0.00000		Point lies within an excavation.				
		23.00000	31.00000	0.00000		Point lies within an excavation.				
		24.00000	31.00000	0.00000		Point lies within an excavation.				
		25.00000	31.00000	0.00000		Point lies within an excavation.				
		26.00000	31.00000	0.00000		Point lies within an excavation.				
		27.00000	31.00000	0.00000		Point lies within an excavation.				
		28.00000	31.00000	0.00000		Point lies within an excavation.				
		29.00000	31.00000	0.00000		Point lies within an excavation.				
		30.00000	31.00000	0.00000		Point lies within an excavation.				
		31.00000	31.00000	0.00000		Point lies within an excavation.				
		32.00000	31.00000	0.00000		Point lies within an excavation.				
		33.00000	31.00000	0.00000		Point lies within an excavation.				
		34.00000	31.00000	0.00000	-5.9046	0.0	3.2608	-	-	-
		35.00000	31.00000	0.00000	-5.0583	0.0	3.5680	-	-	-
		36.00000	31.00000	0.00000	-4.2528	0.0	3.3505	-	-	-
		37.00000	31.00000	0.00000	-3.5317	0.0	2.8406	-	-	-
		38.00000	31.00000	0.00000	-2.8568	0.0	2.1682	-	-	-
		39.00000	31.00000	0.00000	-2.4619	0.0	1.4331	-	-	-
		40.00000	31.00000	0.00000	-2.0869	0.0	0.85460	-	-	-
		10.00000	32.00000	0.00000	0.81175	-0.024721	0.17001	-	-	-
		11.00000	32.00000	0.00000	1.0433	-0.036181	0.31399	-	-	-
		12.00000	32.00000	0.00000	1.2688	-0.051095	0.51696	-	-	-
		13.00000	32.00000	0.00000	1.4853	-0.071297	0.84705	-	-	-
		14.00000	32.00000	0.00000	1.6867	-0.10020	1.3362	-	-	-
		15.00000	32.00000	0.00000	2.0226	-0.15817	1.7702	-	-	-
		16.00000	32.00000	0.00000	2.3243	-0.25910	2.0654	-	-	-
		17.00000	32.00000	0.00000	2.4208	-0.47600	2.0896	-	-	-
		18.00000	32.00000	0.00000	1.5491	-1.2130	1.6183	-	-	-
		19.00000	32.00000	0.00000	0.0	-5.3448	2.7465	-	-	-
		20.00000	32.00000	0.00000	0.0	-5.3626	2.7590	-	-	-
		21.00000	32.00000	0.00000	0.0	-5.3873	2.7779	-	-	-
		22.00000	32.00000	0.00000	0.0	-5.4242	2.8056	-	-	-
		23.00000	32.00000	0.00000	0.0	-5.4850	2.8460	-	-	-
		24.00000	32.00000	0.00000	0.0	-5.6035	2.9131	-	-	-
		25.00000	32.00000	0.00000	0.0	-5.9244	3.0396	-	-	-
		26.00000	32.00000	0.00000	0.0	-8.1689	3.8213	-	-	-
		27.00000	32.00000	0.00000	0.0	-5.9279	3.0355	-	-	-
		28.00000	32.00000	0.00000	0.0	-5.6042	2.9091	-	-	-
		29.00000	32.00000	0.00000	0.0	-5.4850	2.8460	-	-	-
		30.00000	32.00000	0.00000	0.0	-5.4240	2.8055	-	-	-
		31.00000	32.00000	0.00000	0.0	-5.3870	2.7779	-	-	-
		32.00000	32.00000	0.00000	0.0	-5.3623	2.7589	-	-	-
		33.00000	32.00000	0.00000	0.0	-5.3446	2.7465	-	-	-
		34.00000	32.00000	0.00000	-1.2312	-1.5812	1.5803	-	-	-
		35.00000	32.00000	0.00000	-2.3862	-0.53005	2.0521	-	-	-
		36.00000	32.00000	0.00000	-2.3571	-0.27922	2.0887	-	-	-
		37.00000	32.00000	0.00000	-2.0733	-0.16848	1.8252	-	-	-
		38.00000	32.00000	0.00000	-1.7195	-0.10593	1.4070	-	-	-
		39.00000	32.00000	0.00000	-1.5172	-0.074966	0.92280	-	-	-
		40.00000	32.00000	0.00000	-1.3026	-0.053719	0.55250	-	-	-
		10.00000	33.00000	0.00000	0.70813	-0.068723	0.15108	-	-	-
		11.00000	33.00000	0.00000	0.90117	-0.10080	0.27860	-	-	-
		12.00000	33.00000	0.00000	1.0774	-0.14214	0.45849	-	-	-
		13.00000	33.00000	0.00000	1.2285	-0.19728	0.70224	-	-	-
		14.00000	33.00000	0.00000	1.3398	-0.27426	1.1192	-	-	-
		15.00000	33.00000	0.00000	1.4556	-0.41701	1.4669	-	-	-
		16.00000	33.00000	0.00000	1.4736	-0.65333	1.6646	-	-	-
		17.00000	33.00000	0.00000	1.1549	-1.0652	1.6360	-	-	-
		18.00000	33.00000	0.00000	0.56892	-2.2171	1.8619	-	-	-
		19.00000	33.00000	0.00000	0.0	-4.7011	3.0457	-	-	-
		20.00000	33.00000	0.00000	0.0	-4.7498	3.0791	-	-	-
		21.00000	33.00000	0.00000	0.0	-4.8164	3.1295	-	-	-
		22.00000	33.00000	0.00000	0.0	-4.9125	3.2022	-	-	-
		23.00000	33.00000	0.00000	0.0	-5.0613	3.3052	-	-	-
		24.00000	33.00000	0.00000	0.0	-5.3135	3.4541	-	-	-
		25.00000	33.00000	0.00000	0.0	-5.9457	3.7804	-	-	-
		26.00000	33.00000	0.00000	0.0	-7.2046	4.4146	-	-	-
		27.00000	33.00000	0.00000	0.0	-5.9523	3.7837	-	-	-
		28.00000	33.00000	0.00000	0.0	-5.3155	3.4552	-	-	-
		29.00000	33.00000	0.00000	0.0	-5.0622	3.3058	-	-	-
		30.00000	33.00000	0.00000	0.0	-4.9130	3.2025	-	-	-
		31.00000	33.00000	0.00000	0.0	-4.8166	3.1297	-	-	-
		32.00000	33.00000	0.00000	0.0	-4.7499	3.0793	-	-	-
		33.00000	33.00000	0.00000	0.0	-4.7011	3.0458	-	-	-
		34.00000	33.00000	0.00000	-0.43187	-2.4513	1.9034	-	-	-
		35.00000	33.00000	0.00000	-1.0823	-1.1761	1.6425	-	-	-
		36.00000	33.00000	0.00000	-1.4510	-0.69791	1.6732	-	-	-
		37.00000	33.00000	0.00000	-1.4713	-0.44318	1.5074	-	-	-
		38.00000	33.00000	0.00000	-1.3517	-0.28875	1.1777	-	-	-
		39.00000	33.00000	0.00000	-1.2485	-0.20734	0.76803	-	-	-
		40.00000	33.00000	0.00000	-1.1024	-0.14949	0.48990	-	-	-
		10.00000	34.00000	0.00000	0.59127	-0.10402	0.12428	-	-	-
		11.00000	34.00000	0.00000	0.74810	-0.15344	0.22912	-	-	-
		12.00000	34.00000	0.00000	0.87976	-0.21595	0.37908	-	-	-
		13.00000	34.00000	0.00000	0.97537	-0.29716	0.55992	-	-	-
		14.00000	34.00000	0.00000	1.0175	-0.40600	0.86246	-	-	-
		15.00000	34.00000	0.00000	0.98437	-0.58024	1.1456	-	-	-
		16.00000	34.00000	0.00000	0.86663	-0.86272	1.3091	-	-	-
		17.00000	34.00000	0.00000	0.68327	-1.4417	1.5742	-	-	-
		18.00000	34.00000	0.00000	0.29903	-2.2661	1.8300	-	-	-
		19.00000	34.00000	0.00000	0.0	-4.1268	2.9255	-	-	-
		20.00000	34.00000	0.00000	0.0	-4.1994	2.9725	-	-	-
		21.00000	34.00000	0.00000	0.0	-4.2954	3.0429	-	-	-
		22.00000	34.00000	0.00000	0.0	-4.4266	3.1422	-	-	-
		23.00000	34.00000	0.00000	0.0	-4.6124	3.2770	-	-	-
		24.00000	34.00000	0.00000	0.0	-4.9630	3.5059	-	-	-
		25.00000	34.00000	0.00000	0.0	-5.5666	3.8731	-	-	-
		26.00000	34.00000	0.00000	0.0	-6.3167	4.3215	-	-	-
		27.00000	34.00000	0.00000	0.0	-5.5714	3.8760	-	-	-
		28.00000	34.00000	0.00000	0.0	-4.9662	3.5079	-	-	-
		29.00000	34.00000	0.00000	0.0	-4.6138	3.2780	-	-	-
		30.00000	34.00000	0.00000	0.0	-4.4275	3.1429	-	-	-
		31.00000	34.00000	0.00000	0.0	-4.2959	3.0433	-	-	-
		32.00000	34.00000	0.00000	0.0	-4.1997	2.9728	-	-	-
		33.00000	34.00000	0.00000	0.0	-4.1270	2.9257	-	-	-
		34.00000	34.00000	0.00000	-0.22375	-2.3981	1.8626	-	-	-
		35.00000	34.00000	0.00000	-0.63750	-1.5475	1.6124	-	-	-
		36.00000	34.00000	0.00000	-0.84249	-0.92325	1.3380	-	-	-
		37.00000	34.00000	0.00000	-0.97505	-0.61311	1.1776	-	-	-
		38.00000	34.00000	0.00000	-1.0174	-0.42591	0.91070	-	-	-
		39.00000	34.00000	0.00000	-0.98574	-0.31173	0.58973	-	-	-
		40.00000	34.00000	0.00000	-0.89702	-0.22697	0.40535	-	-	-

Type/No.		Coordinates			Displacements				Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		10.00000	35.00000	0.00000	0.47054	-0.12628	0.095035	-	-	-
		11.00000	35.00000	0.00000	0.59622	-0.18857	0.17430	-	-	-
		12.00000	35.00000	0.00000	0.69189	-0.26551	0.29115	-	-	-
		13.00000	35.00000	0.00000	0.74678	-0.36221	0.43466	-	-	-
		14.00000	35.00000	0.00000	0.74543	-0.48585	0.60618	-	-	-
		15.00000	35.00000	0.00000	0.66641	-0.66249	0.83436	-	-	-
		16.00000	35.00000	0.00000	0.58171	-1.0115	1.1142	-	-	-
		17.00000	35.00000	0.00000	0.42859	-1.5074	1.3747	-	-	-
		18.00000	35.00000	0.00000	0.17815	-2.0968	1.5954	-	-	-
		19.00000	35.00000	0.00000	0.0	-3.5872	2.5259	-	-	-
		20.00000	35.00000	0.00000	0.0	-3.6750	2.5773	-	-	-
		21.00000	35.00000	0.00000	0.0	-3.7864	2.6538	-	-	-
		22.00000	35.00000	0.00000	0.0	-3.9301	2.7595	-	-	-
		23.00000	35.00000	0.00000	0.0	-4.1643	2.9241	-	-	-
		24.00000	35.00000	0.00000	0.0	-4.5284	3.1695	-	-	-
		25.00000	35.00000	0.00000	0.0	-4.9862	3.4681	-	-	-
		26.00000	35.00000	0.00000	0.0	-5.4834	3.7813	-	-	-
		27.00000	35.00000	0.00000	0.0	-4.9898	3.4703	-	-	-
		28.00000	35.00000	0.00000	0.0	-4.5312	3.1714	-	-	-
		29.00000	35.00000	0.00000	0.0	-4.1662	2.9255	-	-	-
		30.00000	35.00000	0.00000	0.0	-3.9311	2.7603	-	-	-
		31.00000	35.00000	0.00000	0.0	-3.7871	2.6543	-	-	-
		32.00000	35.00000	0.00000	0.0	-3.6755	2.5776	-	-	-
		33.00000	35.00000	0.00000	0.0	-3.5876	2.5262	-	-	-
		34.00000	35.00000	0.00000	-0.13272	-2.1803	1.6202	-	-	-
		35.00000	35.00000	0.00000	-0.39629	-1.5854	1.4092	-	-	-
		36.00000	35.00000	0.00000	-0.56452	-1.0732	1.1549	-	-	-
		37.00000	35.00000	0.00000	-0.65292	-0.69848	0.87174	-	-	-
		38.00000	35.00000	0.00000	-0.73885	-0.50774	0.64009	-	-	-
		39.00000	35.00000	0.00000	-0.75058	-0.37918	0.45778	-	-	-
		40.00000	35.00000	0.00000	-0.70320	-0.27887	0.31186	-	-	-
		10.00000	36.00000	0.00000	0.35325	-0.13271	0.068423	-	-	-
		11.00000	36.00000	0.00000	0.45416	-0.20315	0.12264	-	-	-
		12.00000	36.00000	0.00000	0.52351	-0.28789	0.20660	-	-	-
		13.00000	36.00000	0.00000	0.55226	-0.39074	0.31335	-	-	-
		14.00000	36.00000	0.00000	0.52898	-0.51625	0.42711	-	-	-
		15.00000	36.00000	0.00000	0.49847	-0.73178	0.60698	-	-	-
		16.00000	36.00000	0.00000	0.42121	-1.0498	0.84880	-	-	-
		17.00000	36.00000	0.00000	0.29052	-1.4294	1.0705	-	-	-
		18.00000	36.00000	0.00000	0.11490	-1.8483	1.2472	-	-	-
		19.00000	36.00000	0.00000	0.0	-3.0545	1.9674	-	-	-
		20.00000	36.00000	0.00000	0.0	-3.1493	2.0146	-	-	-
		21.00000	36.00000	0.00000	0.0	-3.2648	2.0853	-	-	-
		22.00000	36.00000	0.00000	0.0	-3.4352	2.1947	-	-	-
		23.00000	36.00000	0.00000	0.0	-3.6822	2.3561	-	-	-
		24.00000	36.00000	0.00000	0.0	-3.9859	2.5572	-	-	-
		25.00000	36.00000	0.00000	0.0	-4.3319	2.7808	-	-	-
		26.00000	36.00000	0.00000	0.0	-4.6807	2.9928	-	-	-
		27.00000	36.00000	0.00000	0.0	-4.3345	2.7825	-	-	-
		28.00000	36.00000	0.00000	0.0	-3.9882	2.5587	-	-	-
		29.00000	36.00000	0.00000	0.0	-3.6840	2.3573	-	-	-
		30.00000	36.00000	0.00000	0.0	-3.4366	2.1956	-	-	-
		31.00000	36.00000	0.00000	0.0	-3.2656	2.0858	-	-	-
		32.00000	36.00000	0.00000	0.0	-3.1499	2.0150	-	-	-
		33.00000	36.00000	0.00000	0.0	-3.0549	1.9676	-	-	-
		34.00000	36.00000	0.00000	-0.085314	-1.9027	1.2658	-	-	-
		35.00000	36.00000	0.00000	-0.26600	-1.4831	1.0991	-	-	-
		36.00000	36.00000	0.00000	-0.40452	-1.0968	0.88405	-	-	-
		37.00000	36.00000	0.00000	-0.48996	-0.76988	0.64221	-	-	-
		38.00000	36.00000	0.00000	-0.52442	-0.54233	0.44767	-	-	-
		39.00000	36.00000	0.00000	-0.55229	-0.40838	0.33083	-	-	-
		40.00000	36.00000	0.00000	-0.53074	-0.30236	0.22180	-	-	-
		10.00000	37.00000	0.00000	0.24442	-0.12204	0.047645	-	-	-
		11.00000	37.00000	0.00000	0.32700	-0.19635	0.080629	-	-	-
		12.00000	37.00000	0.00000	0.37888	-0.28339	0.13495	-	-	-
		13.00000	37.00000	0.00000	0.39328	-0.38550	0.20793	-	-	-
		14.00000	37.00000	0.00000	0.39881	-0.54092	0.31314	-	-	-
		15.00000	37.00000	0.00000	0.37233	-0.73464	0.43612	-	-	-
		16.00000	37.00000	0.00000	0.30868	-0.99841	0.56989	-	-	-
		17.00000	37.00000	0.00000	0.20904	-1.3143	0.72538	-	-	-
		18.00000	37.00000	0.00000	0.081684	-1.6463	0.85535	-	-	-
		19.00000	37.00000	0.00000	0.0	-2.6743	1.3495	-	-	-
		20.00000	37.00000	0.00000	0.0	-2.7698	1.3869	-	-	-
		21.00000	37.00000	0.00000	0.0	-2.9001	1.4494	-	-	-
		22.00000	37.00000	0.00000	0.0	-3.0785	1.5455	-	-	-
		23.00000	37.00000	0.00000	0.0	-3.2934	1.6722	-	-	-
		24.00000	37.00000	0.00000	0.0	-3.5400	1.8221	-	-	-
		25.00000	37.00000	0.00000	0.0	-3.8029	1.9783	-	-	-
		26.00000	37.00000	0.00000	0.0	-4.0548	2.1152	-	-	-
		27.00000	37.00000	0.00000	0.0	-3.8049	1.9795	-	-	-
		28.00000	37.00000	0.00000	0.0	-3.5419	1.8232	-	-	-
		29.00000	37.00000	0.00000	0.0	-3.2950	1.6731	-	-	-
		30.00000	37.00000	0.00000	0.0	-3.0797	1.5462	-	-	-
		31.00000	37.00000	0.00000	0.0	-2.9010	1.4499	-	-	-
		32.00000	37.00000	0.00000	0.0	-2.7705	1.3872	-	-	-
		33.00000	37.00000	0.00000	0.0	-2.6748	1.3497	-	-	-
		34.00000	37.00000	0.00000	-0.060594	-1.6857	0.86856	-	-	-
		35.00000	37.00000	0.00000	-0.19093	-1.3552	0.74687	-	-	-
		36.00000	37.00000	0.00000	-0.29556	-1.0367	0.58908	-	-	-
		37.00000	37.00000	0.00000	-0.36495	-0.76762	0.45577	-	-	-
		38.00000	37.00000	0.00000	-0.39701	-0.56825	0.33118	-	-	-
		39.00000	37.00000	0.00000	-0.39442	-0.40541	0.22173	-	-	-
		40.00000	37.00000	0.00000	-0.38365	-0.29800	0.14512	-	-	-
		10.00000	38.00000	0.00000	0.14700	-0.094208	0.032657	-	-	-
		11.00000	38.00000	0.00000	0.21697	-0.16893	0.051245	-	-	-
		12.00000	38.00000	0.00000	0.25853	-0.25418	0.081955	-	-	-
		13.00000	38.00000	0.00000	0.28836	-0.37238	0.13503	-	-	-
		14.00000	38.00000	0.00000	0.29450	-0.51643	0.20769	-	-	-
		15.00000	38.00000	0.00000	0.27345	-0.68502	0.29397	-	-	-
		16.00000	38.00000	0.00000	0.22466	-0.87827	0.38565	-	-	-
		17.00000	38.00000	0.00000	0.15073	-1.1409	0.47672	-	-	-
		18.00000	38.00000	0.00000	0.058545	-1.4077	0.54655	-	-	-
		19.00000	38.00000	0.00000	0.0	-2.2711	0.85417	-	-	-
		20.00000	38.00000	0.00000	0.0	-2.3737	0.88148	-	-	-
		21.00000	38.00000	0.00000	0.0	-2.5073	0.92876	-	-	-
		22.00000	38.00000	0.00000	0.0	-2.6659	0.99774	-	-	-
		23.00000	38.00000	0.00000	0.0	-2.8473	1.0869	-	-	-
		24.00000	38.00000	0.00000	0.0	-3.0447	1.1888	-	-	-
		25.00000	38.00000	0.00000	0.0	-3.2449	1.2902	-	-	-
		26.00000	38.00000	0.00000	0.0	-3.4288	1.3732	-	-	-
		27.00000	38.00000	0.00000	0.0	-3.2465	1.2909	-	-	-
		28.00000	38.00000	0.00000	0.0	-3.0462	1.1895	-	-	-
		29.00000	38.00000	0.00000	0.0	-2.8487	1.0875	-	-	-
		30.00000	38.00000	0.00000	0.0	-2.6670	0.99827	-	-	-
		31.00000	38.00000	0.00000	0.0	-2.5082	0.92913	-	-	-
		32.00000	38.00000	0.00000	0.0	-2.3744	0.88171	-	-	-
		33.00000	38.00000	0.00000	0.0	-2.2717	0.85429	-	-	-
		34.00000	38.00000	0.00000	-0.043408	-1.4366	0.55354	-	-	-
		35.00000	38.00000	0.00000	-0.13751	-1.1722	0.48791	-	-	-
		36.00000	38.00000	0.00000	-0.21479	-0.90901	0.39922	-	-	-
		37.00000	38.00000	0.00000	-0.26770	-0.71288	0.30785	-	-	-
		38.00000	38.00000	0.00000	-0.29304	-0.54075	0.22024	-	-	-
		39.00000	38.00000	0.00000	-0.29095	-0.39286	0.14502	-	-	-
		40.00000	38.00000	0.00000	-0.26363	-0.26983	0.088465	-	-	-
		10.00000	39.00000	0.00000	0.062292	-0.049995	0.019043	-	-	-
		11.00000	39.00000	0.00000	0.12435	-0.12253	0.032822	-	-	-
		12.00000	39.00000	0.00000	0.17167	-0.21397	0.051260	-	-	-
		13.00000	39.00000	0.00000	0.20044	-0.32359	0.081088	-	-	-
		14.00000	39.00000	0.00000	0.20841	-0.45082	0.12401	-	-	-
		15.00000	39.00000	0.00000	0.19470	-0.59366	0.17713	-	-	-
		16.00000	39.00000	0.00000	0.15997	-0.74727	0.23395	-	-	-
		17.00000	39.00000	0.00000	0.10709	-0.92537	0.29044	-	-	-
		18.00000	39.00000	0.00000	0.041509	-1.1407	0.33672	-	-	-
		19.00000	39.00000	0.00000	0.0	-1.8524	0.52447	-	-	-
		20.00000	39.00000	0.00000	0.0	-1.9546	0.54162	-	-	-
		21.00000	39.00000	0.00000	0.0	-2.0746	0.57063	-	-	-
		22.00000	39.00000	0.00000	0.0	-2.2114	0.61360	-	-	-
		23.00000	39.00000	0.00000	0.0	-2.3613	0.66910	-	-	-
		24.00000	39.00000	0.00000	0.0	-2.5175	0.73157	-	-	-
		25.00000	39.00000	0.00000	0.0	-2.6692	0.79170	-	-	-
		26.00000	39.00000	0.00000	0.0	-2.8028	0.83807	-	-	-

Type/No.		Coordinates			Displacements				Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		27.00000	39.00000	0.00000	0.0	-2.6704	0.79213	-	-	-
		28.00000	39.00000	0.00000	0.0	-2.5187	0.73203	-	-	-
		29.00000	39.00000	0.00000	0.0	-2.3624	0.66952	-	-	-
		30.00000	39.00000	0.00000	0.0	-2.2124	0.61394	-	-	-
		31.00000	39.00000	0.00000	0.0	-2.0755	0.57087	-	-	-
		32.00000	39.00000	0.00000	0.0	-1.9553	0.54176	-	-	-
		33.00000	39.00000	0.00000	0.0	-1.8530	0.52455	-	-	-
		34.00000	39.00000	0.00000	-0.030772	-1.1618	0.34083	-	-	-
		35.00000	39.00000	0.00000	-0.097655	-0.94919	0.29744	-	-	-
		36.00000	39.00000	0.00000	-0.15290	-0.77131	0.24246	-	-	-
		37.00000	39.00000	0.00000	-0.19066	-0.61670	0.18581	-	-	-
		38.00000	39.00000	0.00000	-0.20769	-0.47181	0.13163	-	-	-
		39.00000	39.00000	0.00000	-0.20302	-0.34200	0.086950	-	-	-
		40.00000	39.00000	0.00000	-0.17736	-0.22964	0.055001	-	-	-
		10.00000	40.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	40.00000	0.00000	0.051050	-0.061946	0.019108	-	-	-
		12.00000	40.00000	0.00000	0.096383	-0.14636	0.032785	-	-	-
		13.00000	40.00000	0.00000	0.12524	-0.24382	0.048045	-	-	-
		14.00000	40.00000	0.00000	0.13677	-0.35313	0.069437	-	-	-
		15.00000	40.00000	0.00000	0.13091	-0.47151	0.097058	-	-	-
		16.00000	40.00000	0.00000	0.10884	-0.59408	0.12767	-	-	-
		17.00000	40.00000	0.00000	0.073245	-0.71357	0.15605	-	-	-
		18.00000	40.00000	0.00000	0.028447	-0.85143	0.18274	-	-	-
		19.00000	40.00000	0.00000	0.0	-1.4134	0.28899	-	-	-
		20.00000	40.00000	0.00000	0.0	-1.5055	0.29930	-	-	-
		21.00000	40.00000	0.00000	0.0	-1.6101	0.31467	-	-	-
		22.00000	40.00000	0.00000	0.0	-1.7252	0.33746	-	-	-
		23.00000	40.00000	0.00000	0.0	-1.8467	0.36727	-	-	-
		24.00000	40.00000	0.00000	0.0	-1.9685	0.40085	-	-	-
		25.00000	40.00000	0.00000	0.0	-2.0819	0.43263	-	-	-
		26.00000	40.00000	0.00000	0.0	-2.1767	0.45604	-	-	-
		27.00000	40.00000	0.00000	0.0	-2.0828	0.43286	-	-	-
		28.00000	40.00000	0.00000	0.0	-1.9694	0.40110	-	-	-
		29.00000	40.00000	0.00000	0.0	-1.8476	0.36749	-	-	-
		30.00000	40.00000	0.00000	0.0	-1.7260	0.33764	-	-	-
		31.00000	40.00000	0.00000	0.0	-1.6109	0.31480	-	-	-
		32.00000	40.00000	0.00000	0.0	-1.5062	0.29938	-	-	-
		33.00000	40.00000	0.00000	0.0	-1.4140	0.28905	-	-	-
		34.00000	40.00000	0.00000	-0.021091	-0.86653	0.18494	-	-	-
		35.00000	40.00000	0.00000	-0.066825	-0.73106	0.15984	-	-	-
		36.00000	40.00000	0.00000	-0.10415	-0.61282	0.13231	-	-	-
		37.00000	40.00000	0.00000	-0.12851	-0.49020	0.10168	-	-	-
		38.00000	40.00000	0.00000	-0.13697	-0.37080	0.073320	-	-	-
		39.00000	40.00000	0.00000	-0.12814	-0.25987	0.050881	-	-	-
		40.00000	40.00000	0.00000	-0.10190	-0.16049	0.034853	-	-	-
		10.00000	41.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	41.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	41.00000	0.00000	0.030312	-0.054492	0.015768	-	-	-
		13.00000	41.00000	0.00000	0.060679	-0.13873	0.028924	-	-	-
		14.00000	41.00000	0.00000	0.076580	-0.23033	0.040192	-	-	-
		15.00000	41.00000	0.00000	0.078417	-0.32626	0.052741	-	-	-
		16.00000	41.00000	0.00000	0.067516	-0.42200	0.066538	-	-	-
		17.00000	41.00000	0.00000	0.046269	-0.51145	0.079552	-	-	-
		18.00000	41.00000	0.00000	0.018115	-0.58724	0.089027	-	-	-
		19.00000	41.00000	0.00000	0.0	-0.95085	0.14237	-	-	-
		20.00000	41.00000	0.00000	0.0	-1.0314	0.15346	-	-	-
		21.00000	41.00000	0.00000	0.0	-1.1203	0.16309	-	-	-
		22.00000	41.00000	0.00000	0.0	-1.2148	0.17434	-	-	-
		23.00000	41.00000	0.00000	0.0	-1.3113	0.18826	-	-	-
		24.00000	41.00000	0.00000	0.0	-1.4041	0.20384	-	-	-
		25.00000	41.00000	0.00000	0.0	-1.4865	0.21854	-	-	-
		26.00000	41.00000	0.00000	0.0	-1.5506	0.22922	-	-	-
		27.00000	41.00000	0.00000	0.0	-1.4872	0.21865	-	-	-
		28.00000	41.00000	0.00000	0.0	-1.4048	0.20396	-	-	-
		29.00000	41.00000	0.00000	0.0	-1.3120	0.18837	-	-	-
		30.00000	41.00000	0.00000	0.0	-1.2155	0.17443	-	-	-
		31.00000	41.00000	0.00000	0.0	-1.1209	0.16315	-	-	-
		32.00000	41.00000	0.00000	0.0	-1.0320	0.15352	-	-	-
		33.00000	41.00000	0.00000	0.0	-0.95134	0.14245	-	-	-
		34.00000	41.00000	0.00000	-0.013438	-0.59714	0.090006	-	-	-
		35.00000	41.00000	0.00000	-0.042289	-0.52416	0.081302	-	-	-
		36.00000	41.00000	0.00000	-0.064841	-0.43630	0.068653	-	-	-
		37.00000	41.00000	0.00000	-0.077513	-0.34111	0.054811	-	-	-
		38.00000	41.00000	0.00000	-0.077744	-0.24487	0.042005	-	-	-
		39.00000	41.00000	0.00000	-0.064053	-0.15237	0.030653	-	-	-
		40.00000	41.00000	0.00000	-0.035907	-0.066867	0.018152	-	-	-
		10.00000	42.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	42.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	42.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	42.00000	0.00000	0.0049295	-0.012971	0.0050368	-	-	-
		14.00000	42.00000	0.00000	0.025505	-0.087706	0.019848	-	-	-
		15.00000	42.00000	0.00000	0.034581	-0.16337	0.029482	-	-	-
		16.00000	42.00000	0.00000	0.03481	-0.23591	0.036995	-	-	-
		17.00000	42.00000	0.00000	0.024276	-0.30024	0.042869	-	-	-
		18.00000	42.00000	0.00000	0.0097386	-0.35048	0.047032	-	-	-
		19.00000	42.00000	0.00000	0.0	-0.55367	0.072189	-	-	-
		20.00000	42.00000	0.00000	0.0	-0.55367	0.072189	-	-	-
		21.00000	42.00000	0.00000	0.0	-0.61007	0.083196	-	-	-
		22.00000	42.00000	0.00000	0.0	-0.68577	0.092990	-	-	-
		23.00000	42.00000	0.00000	0.0	-0.76015	0.10125	-	-	-
		24.00000	42.00000	0.00000	0.0	-0.82854	0.10890	-	-	-
		25.00000	42.00000	0.00000	0.0	-0.88535	0.11563	-	-	-
		26.00000	42.00000	0.00000	0.0	-0.92447	0.12053	-	-	-
		27.00000	42.00000	0.00000	0.0	-0.88576	0.11568	-	-	-
		28.00000	42.00000	0.00000	0.0	-0.82902	0.10895	-	-	-
		29.00000	42.00000	0.00000	0.0	-0.76067	0.10131	-	-	-
		30.00000	42.00000	0.00000	0.0	-0.68629	0.093050	-	-	-
		31.00000	42.00000	0.00000	0.0	-0.61057	0.083271	-	-	-
		32.00000	42.00000	0.00000	0.0	-0.55367	0.072189	-	-	-
		33.00000	42.00000	0.00000	0.0	-0.55367	0.072189	-	-	-
		34.00000	42.00000	0.00000	-0.0072362	-0.35655	0.047466	-	-	-
		35.00000	42.00000	0.00000	-0.022309	-0.30901	0.043642	-	-	-
		36.00000	42.00000	0.00000	-0.032527	-0.24646	0.037906	-	-	-
		37.00000	42.00000	0.00000	-0.035026	-0.17483	0.030724	-	-	-
		38.00000	42.00000	0.00000	-0.027618	-0.099354	0.021558	-	-	-
		39.00000	42.00000	0.00000	-0.0088689	-0.024258	0.0078508	-	-	-
		40.00000	42.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	43.00000	0.00000	0.0049936	-0.039174	0.0099792	-	-	-
		17.00000	43.00000	0.00000	0.0060099	-0.082237	0.016983	-	-	-
		18.00000	43.00000	0.00000	0.0028113	-0.11122	0.020666	-	-	-
		19.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		20.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		21.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		22.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		23.00000	43.00000	0.00000	0.0	-0.19699	0.037125	-	-	-
		24.00000	43.00000	0.00000	0.0	-0.24447	0.045375	-	-	-
		25.00000	43.00000	0.00000	0.0	-0.27988	0.050760	-	-	-
		26.00000	43.00000	0.00000	0.0	-0.29833	0.053595	-	-	-
		27.00000	43.00000	0.00000	0.0	-0.28008	0.050792	-	-	-
		28.00000	43.00000	0.00000	0.0	-0.24476	0.045422	-	-	-
		29.00000	43.00000	0.00000	0.0	-0.19733	0.037192	-	-	-
		30.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		31.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		32.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		33.00000	43.00000	0.00000	0.0	-0.17867	0.032098	-	-	-
		34.00000	43.00000	0.00000	-0.0021088	-0.11411	0.020978	-	-	-
		35.00000	43.00000	0.00000	-0.0057298	-0.087724	0.017742	-	-	-
		36.00000	43.00000	0.00000	-0.0055185	-0.046509	0.011315	-	-	-
		37.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	43.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
		13.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	44.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	45.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	46.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	47.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-

Type/No. Name	Dist.	Coordinates x	y	z	Displacements x	y	z	Horizontal displacement	Horizontal displacement	Angle of Line to x Axis
		30.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	48.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	49.00000	0.00000	0.0	0.0	0.0	-	-	-
		10.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		11.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		12.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		13.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		14.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		15.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		16.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		17.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		18.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		19.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		20.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		21.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		22.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		23.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		24.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		25.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		26.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		27.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		28.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		29.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		30.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		31.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		32.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		33.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		34.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		35.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		36.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		37.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		38.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		39.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
		40.00000	50.00000	0.00000	0.0	0.0	0.0	-	-	-
No.30_1	Line 1	32.11050	41.32417	0.00000	0.0	-0.86480	0.12095	0.86479	0.0035365	269.77
	0.49123	32.10850	40.83294	0.00000	0.0	-1.1033	0.17119	1.1033	0.0045119	269.77
	0.98246	32.10649	40.34172	0.00000	0.0	-1.3368	0.23861	1.3367	0.0054665	269.77
	1.4737	32.10448	39.85049	0.00000	0.0	-1.5646	0.32772	1.5646	0.0063981	269.77
	1.9649	32.10247	39.35926	0.00000	0.0	-1.7863	0.44100	1.7863	0.0073047	269.77
	2.4562	32.10046	38.86803	0.00000	0.0	-2.0012	0.57900	2.0012	0.0081838	269.77
	2.9474	32.09845	38.37681	0.00000	0.0	-2.2089	0.74042	2.2088	0.0090328	269.77
	3.4386	32.09644	37.88558	0.00000	0.0	-2.4085	0.92210	2.4085	0.0098491	269.77
	3.9298	32.09443	37.39435	0.00000	0.0	-2.6036	1.1365	2.6035	0.010647	269.77
	4.4211	32.09242	36.90313	0.00000	0.0	-2.7940	1.4441	2.7989	0.011446	269.77
	4.9123	32.09042	36.41190	0.00000	0.0	-2.9878	1.7544	2.9877	0.012218	269.77
No.30_2	Line 2	32.09042	36.41190	0.00000	0.0	-2.9878	1.7544	1.8617	2.3368	218.54
	0.11926	31.99714	36.33759	0.00000	0.0	-3.0254	1.8060	1.8852	2.3663	218.54
	0.23851	31.90387	36.26328	0.00000	0.0	-3.0630	1.8578	1.9086	2.3957	218.54
	0.35777	31.81060	36.18897	0.00000	0.0	-3.1007	1.9097	1.9321	2.4251	218.54
	0.47702	31.71732	36.11466	0.00000	0.0	-3.1383	1.9618	1.9555	2.4546	218.54
	0.59628	31.62405	36.04035	0.00000	0.0	-3.1760	2.0139	1.9790	2.4840	218.54
	0.71553	31.53078	35.96604	0.00000	0.0	-3.2162	2.0660	2.0041	2.5155	218.54
	0.83479	31.43750	35.89173	0.00000	0.0	-3.2670	2.1180	2.0357	2.5552	218.54
	0.95405	31.34423	35.81742	0.00000	0.0	-3.3177	2.1700	2.0673	2.5949	218.54
	1.0733	31.25096	35.74311	0.00000	0.0	-3.3686	2.2219	2.0990	2.6346	218.54
	1.1926	31.15768	35.66880	0.00000	0.0	-3.4194	2.2736	2.1307	2.6744	218.54
No.30_3	Line 3	31.15768	35.66880	0.00000	0.0	-3.4194	2.2736	3.4193	0.031503	269.47
	0.41925	31.15382	35.24956	0.00000	0.0	-3.6393	2.5113	3.6392	0.033529	269.47
	0.83850	31.14996	34.83033	0.00000	0.0	-3.8556	2.7229	3.8554	0.035522	269.47
	1.2578	31.14609	34.41110	0.00000	0.0	-4.0700	2.9001	4.0698	0.037497	269.47
	1.6770	31.14223	33.99186	0.00000	0.0	-4.2846	3.0338	4.2844	0.039474	269.47
	2.0963	31.13837	33.57263	0.00000	0.0	-4.5016	3.1146	4.5014	0.041473	269.47
	2.5155	31.13451	33.15340	0.00000	0.0	-4.7234	3.1328	4.7232	0.043517	269.47
	2.9348	31.13064	32.73416	0.00000	0.0	-4.9530	3.0782	4.9528	0.045632	269.47
	3.3540	31.12678	32.31493	0.00000	0.0	-5.1935	2.9402	5.1933	0.047848	269.47
	3.7733	31.12292	31.89570	0.00000	0.0	-5.4484	2.7078	5.4482	0.050196	269.47
	4.1925	31.11906	31.47646	0.00000	0.0	-5.7219	2.3697	5.7216	0.052716	269.47
No.30_4	Line 4	31.11906	31.47646	0.00000	0.0	-5.7219	2.3697	0.0	5.7219	180.00
	1.0077	30.11136	31.47646	0.00000	0.0	-5.7219	2.3697	0.0	5.7219	180.00
	2.0154	29.10367	31.47646	0.00000	0.0	-5.7219	2.3697	0.0	5.7219	180.00
	3.0231	28.09598	31.47646	0.00000	0.0	-5.7219	2.3697	0.0	5.7219	180.00
	4.0308	27.08829	31.47646	0.00000	0.0	-5.7219	2.3697	0.0	5.7219	180.00
	5.0385	26.08060	31.47646	0.00000	0.0	-5.7219	2.3697	0.0	5.7219	180.00
	6.0462	25.07290	31.47646	0.00000	0.0	-5.7223	2.3815	0.0	5.7223	180.00
	7.0538	24.06521	31.47646	0.00000	0.0	-5.7222	2.3866	0.0	5.7222	180.00
	8.0615	23.05752	31.47646	0.00000	0.0	-5.7222	2.3786	0.0	5.7222	180.00
	9.0692	22.04983	31.47646	0.00000	0.0	-5.7222	2.3699	0.0	5.7222	180.00
	10.077	21.04214	31.47646	0.00000	0.0	-5.7221	2.3698	0.0	5.7221	180.00
No.30_5	Line 5	21.04214	31.47646	0.00000	0.0	-5.7221	2.3698	-5.7221	-0.017312	89.827
	0.97763	21.04509	32.45409	0.00000	0.0	-5.1214	3.0029	-5.1214	-0.015494	89.827
	1.9553	21.04805	33.43172	0.00000	0.0	-4.5925	3.1412	-4.5924	-0.013894	89.827
	2.9329	21.05101	34.40934	0.00000	0.0	-4.0935	2.9174	-4.0935	-0.012384	89.827
	3.9105	21.05397	35.38697	0.00000	0.0	-3.5934	2.4537	-3.5934	-0.010872	89.827
	4.8882	21.05692	36.36460	0.00000	0.0	-3.1364	1.8593	-3.1364	-0.0094890	89.827
	5.8658	21.05988	37.34222	0.00000	0.0	-2.7801	1.2357	-2.7801	-0.0084109	89.827
	6.8434	21.06284	38.31985	0.00000	0.0	-2.3817	0.80782	-2.3817	-0.0072057	89.827
	7.8210	21.06580	39.29747	0.00000	0.0	-1.9476	0.48507	-1.9476	-0.0058923	89.827
	8.7987	21.06875	40.27510	0.00000	0.0	-1.4849	0.26438	-1.4849	-0.0044925	89.827
	9.7763	21.07171	41.25273	0.00000	0.0	-0.99938	0.13888	-0.99937	-0.0030235	89.827
No.26_1	Line 6	19.79055	11.95090	0.00000	0.028820	0.058464	0.016155	0.058721	-0.028292	89.484
	0.97536	19.79933	12.92622	0.00000	0.091414	0.15910	0.033684	0.15991	-0.089978	89.484
	1.9507	19.80811	13.90154	0.00000	0.16292	0.23743	0.053300	0.23889	-0.16078	89.484
	2.9261	19.81688	14.87685	0.00000	0.24478	0.41512	0.11129	0.41731	-0.24104	89.484
	3.9014	19.82566	15.85217	0.00000	0.34574	0.80829	0.20401	0.81137	-0.33845	89.484
	4.8768	19.83444	16.82749	0.00000	0.48378	1.1888	0.33646	1.1931	-0.47306	89.484
	5.8522	19.84322	17.80281	0.00000	0.64912	1.5419	0.54669	1.5477	-0.63522	89.484
	6.8275	19.85200	18.77813	0.00000	0.84056	1.8657	0.85112	1.8731	-0.82374	89.484
	7.8029	19.86078	19.75345	0.00000	1.0519	2.1606	1.2420	2.1700	-1.0324	89.484
	8.7782	19.86955	20.72877	0.00000	1.2701	2.4316	1.7462	2.4429	-1.2482	89.484
	9.7536	19.87833	21.70409	0.00000	1.4748	2.6883	2.5097	2.7015	-1.4505	89.484
No.26_2	Line 7	19.87833	21.70409	0.00000	1.4748	2.6883	2.5097	1.4732	2.6892	359.97
	1.2317	21.11006	21.70338	0.00000	1.7836	2.6889	3.0623	1.7820	2.6899	359.97

Type/No.		Coordinates			Displacements					Angle of Line
Name	Dist.	x	y	z	x	y	z	Horizontal displacement	Horizontal displacement	to x Axis
	2.4635	22.34178	21.70266	0.00000	2.2752	2.6902	3.6135	2.2736	2.6915	359.97
	3.6952	23.57351	21.70195	0.00000	2.8798	2.6934	4.0387	2.8782	2.6951	359.97
	4.9269	24.80524	21.70123	0.00000	3.4918	2.7041	4.1030	3.4902	2.7061	359.97
	6.1586	26.03696	21.70052	0.00000	0.016392	7.4988	3.5285	0.012039	7.4989	359.97
	7.3904	27.26869	21.69980	0.00000	0.016492	7.1118	3.2446	0.012363	7.1118	359.97
	8.6221	28.50041	21.69909	0.00000	0.016589	6.7358	2.9386	0.012678	6.7358	359.97
	9.8538	29.73214	21.69837	0.00000	0.016670	6.4222	2.6864	0.012942	6.4222	359.97
	11.086	30.96387	21.69766	0.00000	0.016734	6.1875	2.5400	0.013142	6.1875	359.97
	12.317	32.19559	21.69694	0.00000	0.013177	4.8282	1.2572	0.010374	4.8282	359.97
No.26_3	Line 8	32.19559	21.69694	0.00000	0.013177	4.8282	1.2572	-4.8282	-0.0064122	269.77
	0.97689	32.19163	20.72006	0.00000	0.014534	5.2763	2.9826	-5.2763	-0.0068727	269.77
	1.9538	32.18766	19.74318	0.00000	0.012578	4.5842	3.0346	-4.5842	-0.0060213	269.77
	2.9307	32.18370	18.76630	0.00000	0.010829	3.9374	2.7607	-3.9374	-0.0051456	269.77
	3.9076	32.17974	17.78942	0.00000	0.0092115	3.3057	2.2854	-3.3057	-0.0042005	269.77
	4.8844	32.17577	16.81254	0.00000	0.0078438	2.7343	1.7061	-2.7343	-0.0032500	269.77
	5.8613	32.17181	15.83566	0.00000	0.0067804	2.3020	1.1017	-2.3020	-0.0025594	269.77
	6.8382	32.16785	14.85878	0.00000	0.0057014	1.9357	0.71274	-1.9357	-0.0021521	269.77
	7.8151	32.16388	13.88191	0.00000	0.0046224	1.5693	0.42526	-1.5693	-0.0017448	269.77
	8.7920	32.15992	12.90503	0.00000	0.0035434	1.2030	0.22803	-1.2030	-0.0013375	269.77
	9.7689	32.15596	11.92815	0.00000	0.0024644	0.83667	0.11613	-0.83667	-930.21E-6	269.77

Specific Building Damage Results - Horizontal Displacements

Structure: No.30 | Sub-structure: 1

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	32.11050	41.32417	0.00000	0.0	-0.86480	0.86479	0.0035365
0.49123	32.10850	40.83294	0.00000	0.0	-1.1033	1.1033	0.0045119
0.98246	32.10649	40.34172	0.00000	0.0	-1.3368	1.3367	0.0054665
1.4737	32.10448	39.85049	0.00000	0.0	-1.5646	1.5646	0.0063981
1.9649	32.10247	39.35926	0.00000	0.0	-1.7863	1.7863	0.0073047
2.4562	32.10046	38.86803	0.00000	0.0	-2.0012	2.0012	0.0081838
2.9474	32.09845	38.37681	0.00000	0.0	-2.2089	2.2088	0.0090328
3.4386	32.09644	37.88558	0.00000	0.0	-2.4085	2.4085	0.0098491
3.9298	32.09443	37.39435	0.00000	0.0	-2.6036	2.6035	0.010647
4.4211	32.09242	36.90313	0.00000	0.0	-2.7990	2.7989	0.011446
4.9123	32.09042	36.41190	0.00000	0.0	-2.9878	2.9877	0.012218

Structure: No.30 | Sub-structure: 2

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	32.09042	36.41190	0.00000	0.0	-2.9878	1.8617	2.3368
0.11926	31.99714	36.33759	0.00000	0.0	-3.0254	1.8852	2.3663
0.23851	31.90387	36.26328	0.00000	0.0	-3.0630	1.9086	2.3957
0.35777	31.81060	36.18897	0.00000	0.0	-3.1007	1.9321	2.4251
0.47702	31.71732	36.11466	0.00000	0.0	-3.1383	1.9555	2.4546
0.59628	31.62405	36.04035	0.00000	0.0	-3.1760	1.9790	2.4840
0.71553	31.53078	35.96604	0.00000	0.0	-3.2162	2.0041	2.5155
0.83479	31.43750	35.89173	0.00000	0.0	-3.2670	2.0357	2.5552
0.95405	31.34423	35.81742	0.00000	0.0	-3.3177	2.0673	2.5949
1.0733	31.25096	35.74311	0.00000	0.0	-3.3686	2.0990	2.6346
1.1926	31.15768	35.66880	0.00000	0.0	-3.4194	2.1307	2.6744

Structure: No.30 | Sub-structure: 3

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	31.15768	35.66880	0.00000	0.0	-3.4194	3.4193	0.031503
0.41925	31.15382	35.24956	0.00000	0.0	-3.6393	3.6392	0.033529
0.83850	31.14996	34.83033	0.00000	0.0	-3.8556	3.8554	0.035522
1.2578	31.14609	34.41110	0.00000	0.0	-4.0700	4.0698	0.037497
1.6770	31.14223	33.99186	0.00000	0.0	-4.2846	4.2844	0.039474
2.0963	31.13837	33.57263	0.00000	0.0	-4.5016	4.5014	0.041473
2.5155	31.13451	33.15340	0.00000	0.0	-4.7234	4.7232	0.043517
2.9348	31.13064	32.73416	0.00000	0.0	-4.9530	4.9528	0.045632
3.3540	31.12678	32.31493	0.00000	0.0	-5.1935	5.1933	0.047848
3.7733	31.12292	31.89570	0.00000	0.0	-5.4484	5.4482	0.050196
4.1925	31.11906	31.47646	0.00000	0.0	-5.7219	5.7216	0.052716

Structure: No.30 | Sub-structure: 4

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	31.11906	31.47646	0.00000	0.0	-5.7219	0.0	5.7219
1.0077	30.11136	31.47646	0.00000	0.0	-5.7219	0.0	5.7219
2.0154	29.10367	31.47646	0.00000	0.0	-5.7219	0.0	5.7219
3.0231	28.09598	31.47646	0.00000	0.0	-5.7219	0.0	5.7219
4.0308	27.08829	31.47646	0.00000	0.0	-5.7219	0.0	5.7219
5.0385	26.08060	31.47646	0.00000	0.0	-5.7219	0.0	5.7219
6.0462	25.07290	31.47646	0.00000	0.0	-5.7223	0.0	5.7223
7.0538	24.06521	31.47646	0.00000	0.0	-5.7222	0.0	5.7222
8.0615	23.05752	31.47646	0.00000	0.0	-5.7222	0.0	5.7222
9.0692	22.04983	31.47646	0.00000	0.0	-5.7222	0.0	5.7222
10.077	21.04214	31.47646	0.00000	0.0	-5.7221	0.0	5.7221

Structure: No.30 | Sub-structure: 5

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	21.04214	31.47646	0.00000	0.0	-5.7221	-5.7221	-0.017312
0.97763	21.04509	32.45409	0.00000	0.0	-5.1214	-5.1214	-0.015494
1.9553	21.04805	33.43172	0.00000	0.0	-4.5925	-4.5924	-0.013894
2.9329	21.05101	34.40934	0.00000	0.0	-4.0935	-4.0935	-0.012384
3.9105	21.05397	35.38697	0.00000	0.0	-3.5934	-3.5934	-0.010872
4.8882	21.05692	36.36460	0.00000	0.0	-3.1364	-3.1364	-0.0094890
5.8658	21.05988	37.34222	0.00000	0.0	-2.7801	-2.7801	-0.0084109
6.8434	21.06284	38.31985	0.00000	0.0	-2.3817	-2.3817	-0.0072057
7.8210	21.06580	39.29747	0.00000	0.0	-1.9476	-1.9476	-0.0058923
8.7987	21.06875	40.27510	0.00000	0.0	-1.4849	-1.4849	-0.0044925
9.7763	21.07171	41.25273	0.00000	0.0	-0.99938	-0.99937	-0.0030235

Structure: No.26 | Sub-structure: 1

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line

[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	19.79055	11.95090	0.00000	0.028820	0.058464	0.058721	-0.028292
0.97536	19.79933	12.92622	0.00000	0.091414	0.15910	0.15991	-0.089978
1.9507	19.80811	13.90154	0.00000	0.16292	0.23743	0.23889	-0.16078
2.9261	19.81688	14.87685	0.00000	0.24478	0.41512	0.41731	-0.24104
3.9014	19.82566	15.85217	0.00000	0.34574	0.80829	0.81137	-0.33845
4.8768	19.83444	16.82749	0.00000	0.48378	1.1888	1.1931	-0.47306
5.8522	19.84322	17.80281	0.00000	0.64912	1.5419	1.5477	-0.63522
6.8275	19.85200	18.77813	0.00000	0.84056	1.8657	1.8731	-0.82374
7.8029	19.86078	19.75345	0.00000	1.0519	2.1606	2.1700	-1.0324
8.7782	19.86955	20.72877	0.00000	1.2701	2.4316	2.4429	-1.2482
9.7536	19.87833	21.70409	0.00000	1.4748	2.6883	2.7015	-1.4505

Structure: No.26 | Sub-structure: 2

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	19.87833	21.70409	0.00000	1.4748	2.6883	1.4732	2.6892
1.2317	21.11006	21.70338	0.00000	1.7836	2.6889	1.7820	2.6899
2.4635	22.34178	21.70266	0.00000	2.2752	2.6902	2.2736	2.6915
3.6952	23.57351	21.70195	0.00000	2.8798	2.6934	2.8782	2.6951
4.9269	24.80524	21.70123	0.00000	3.4918	2.7041	3.4902	2.7061
6.1586	26.03696	21.70052	0.00000	0.016392	7.4988	0.012039	7.4989
7.3904	27.26869	21.69980	0.00000	0.016492	7.1118	0.012363	7.1118
8.6221	28.50041	21.69909	0.00000	0.016589	6.7358	0.012678	6.7358
9.8538	29.73214	21.69837	0.00000	0.016670	6.4222	0.012942	6.4222
11.086	30.96387	21.69766	0.00000	0.016734	6.1875	0.013142	6.1875
12.317	32.19559	21.69694	0.00000	0.013177	4.8282	0.010374	4.8282

Structure: No.26 | Sub-structure: 3

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	32.19559	21.69694	0.00000	0.013177	4.8282	-4.8282	-0.0064122
0.97689	32.19163	20.72006	0.00000	0.014534	5.2763	-5.2763	-0.0068727
1.9538	32.18766	19.74318	0.00000	0.012578	4.5842	-4.5842	-0.0060213
2.9307	32.18370	18.76630	0.00000	0.010829	3.9374	-3.9374	-0.0051456
3.9076	32.17974	17.78942	0.00000	0.0092115	3.3057	-3.3057	-0.0042005
4.8844	32.17577	16.81254	0.00000	0.0078438	2.7343	-2.7343	-0.0032500
5.8613	32.17181	15.83566	0.00000	0.0067804	2.3020	-2.3020	-0.0025594
6.8382	32.16785	14.85878	0.00000	0.0057014	1.9357	-1.9357	-0.0021521
7.8151	32.16388	13.88191	0.00000	0.0046224	1.5693	-1.5693	-0.0017448
8.7920	32.15992	12.90503	0.00000	0.0035434	1.2030	-1.2030	-0.0013375
9.7689	32.15596	11.92815	0.00000	0.0024644	0.83667	-0.83667	-930.21E-6

Specific Building Damage Results - Vertical Displacements

Structure: No.30 | Sub-structure: 1

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	32.11050	41.32417	0.00000	0.12095
0.49123	32.10850	40.83294	0.00000	0.17119
0.98246	32.10649	40.34172	0.00000	0.23861
1.4737	32.10448	39.85049	0.00000	0.32772
1.9649	32.10247	39.35926	0.00000	0.44100
2.4562	32.10046	38.86803	0.00000	0.57900
2.9474	32.09845	38.37681	0.00000	0.74042
3.4386	32.09644	37.88558	0.00000	0.92210
3.9298	32.09443	37.39435	0.00000	1.1365
4.4211	32.09242	36.90313	0.00000	1.4441
4.9123	32.09042	36.41190	0.00000	1.7544

Structure: No.30 | Sub-structure: 2

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	32.09042	36.41190	0.00000	1.7544
0.11926	31.99714	36.33759	0.00000	1.8060
0.23851	31.90387	36.26328	0.00000	1.8578
0.35777	31.81060	36.18897	0.00000	1.9097
0.47702	31.71732	36.11466	0.00000	1.9618
0.59628	31.62405	36.04035	0.00000	2.0139
0.71553	31.53078	35.96604	0.00000	2.0660
0.83479	31.43750	35.89173	0.00000	2.1180
0.95405	31.34423	35.81742	0.00000	2.1700
1.0733	31.25096	35.74311	0.00000	2.2219
1.1926	31.15768	35.66880	0.00000	2.2736

Structure: No.30 | Sub-structure: 3

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	31.15768	35.66880	0.00000	2.2736
0.41925	31.15382	35.24956	0.00000	2.5113
0.83850	31.14996	34.83033	0.00000	2.7229
1.2578	31.14609	34.41110	0.00000	2.9001
1.6770	31.14223	33.99186	0.00000	3.0338
2.0963	31.13837	33.57263	0.00000	3.1146
2.5155	31.13451	33.15340	0.00000	3.1328
2.9348	31.13064	32.73416	0.00000	3.0782
3.3540	31.12678	32.31493	0.00000	2.9402
3.7733	31.12292	31.89570	0.00000	2.7078
4.1925	31.11906	31.47646	0.00000	2.3697

Structure: No.30 | Sub-structure: 4

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	31.11906	31.47646	0.00000	2.3697
1.0077	30.11136	31.47646	0.00000	2.3697
2.0154	29.10367	31.47646	0.00000	2.3697
3.0231	28.09598	31.47646	0.00000	2.3697
4.0308	27.08829	31.47646	0.00000	2.3697
5.0385	26.08060	31.47646	0.00000	2.3697
6.0462	25.07290	31.47646	0.00000	2.3815
7.0538	24.06521	31.47646	0.00000	2.3866
8.0615	23.05752	31.47646	0.00000	2.3786
9.0692	22.04983	31.47646	0.00000	2.3699
10.077	21.04214	31.47646	0.00000	2.3698

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]

Structure: No.30 | Sub-structure: 5

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	21.04214	31.47646	0.00000	2.3698
0.97763	21.04509	32.45409	0.00000	3.0029
1.9553	21.04805	33.43172	0.00000	3.1412
2.9329	21.05101	34.40934	0.00000	2.9174
3.9105	21.05397	35.38697	0.00000	2.4537
4.8882	21.05692	36.36460	0.00000	1.8593
5.8658	21.05988	37.34222	0.00000	1.2357
6.8434	21.06284	38.31985	0.00000	0.80782
7.8210	21.06580	39.29747	0.00000	0.48507
8.7987	21.06875	40.27510	0.00000	0.26438
9.7763	21.07171	41.25273	0.00000	0.13888

Structure: No.26 | Sub-structure: 1

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	19.79055	11.95090	0.00000	0.016155
0.97536	19.79933	12.92622	0.00000	0.033684
1.9507	19.80811	13.90154	0.00000	0.053300
2.9261	19.81688	14.87685	0.00000	0.11129
3.9014	19.82566	15.85217	0.00000	0.20401
4.8768	19.83444	16.82749	0.00000	0.33646
5.8522	19.84322	17.80281	0.00000	0.54669
6.8275	19.85200	18.77813	0.00000	0.85112
7.8029	19.86078	19.75345	0.00000	1.2420
8.7782	19.86955	20.72877	0.00000	1.7462
9.7536	19.87833	21.70409	0.00000	2.5097

Structure: No.26 | Sub-structure: 2

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	19.87833	21.70409	0.00000	2.5097
1.2317	21.11006	21.70338	0.00000	3.0623
2.4635	22.34178	21.70266	0.00000	3.6135
3.6952	23.57351	21.70195	0.00000	4.0387
4.9269	24.80524	21.70123	0.00000	4.1030
6.1586	26.03696	21.70052	0.00000	3.5285
7.3904	27.26869	21.69980	0.00000	3.2446
8.6221	28.50041	21.69909	0.00000	2.9386
9.8538	29.73214	21.69837	0.00000	2.6864
11.086	30.96387	21.69766	0.00000	2.5400
12.317	32.19559	21.69694	0.00000	1.2572

Structure: No.26 | Sub-structure: 3

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	32.19559	21.69694	0.00000	1.2572
0.97689	32.19163	20.72006	0.00000	2.9826
1.9538	32.18766	19.74318	0.00000	3.0346
2.9307	32.18370	18.76630	0.00000	2.7607
3.9076	32.17974	17.78942	0.00000	2.2854
4.8844	32.17577	16.81254	0.00000	1.7061
5.8613	32.17181	15.83566	0.00000	1.1017
6.8382	32.16785	14.85878	0.00000	0.71274
7.8151	32.16388	13.88191	0.00000	0.42526
8.7920	32.15992	12.90503	0.00000	0.22803
9.7689	32.15596	11.92815	0.00000	0.11613

Specific Building Damage Results - All Segments

Structure: No.30 | Sub-structure: 1

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	4.6946	Hogging	0.0069095	0.043439	0.045208	-485.35E-6	-631.31E-6	4383.8	0 (Negligible)
	2	4.6946	0.21737	None	0.0	0.038435	0.038435	-384.21E-6	-631.31E-6	12033.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.30 | Sub-structure: 2

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	0.63219	Hogging	58.413E-6	0.019745	0.019747	-210.07E-6	-436.76E-6	82676.	0 (Negligible)
	2	0.63219	0.55981	Sagging	51.063E-6	0.025721	0.025725	-265.67E-6	-436.76E-6	81380.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.30 | Sub-structure: 3

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	4.1920	Sagging	0.019097	0.054914	0.063514	-651.75E-6	805.98E-6	1620.0	1 (Very Slight)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.30 | Sub-structure: 4

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	3.0231	None	0.0	0.0	0.0	0.0	0.0	-	0 (Negligible)
	2	3.0231	2.5525	Hogging	194.41E-6	0.0	194.01E-6	0.0	-11.727E-6	241210.	0 (Negligible)

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
	3	5.5756	2.6730	Sagging	373.40E-6	0.0	369.97E-6	0.0	-11.727E-6	121770.	0 (Negligible)
	4	8.2486	1.8274	Hogging	210.06E-6	0.0	209.82E-6	0.0	8.6138E-6	92517.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.30 | Sub-structure: 5

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	4.8762	Sagging	0.019908	0.052912	0.063258	-614.06E-6	-647.17E-6	1812.1	1 (Very Slight)
	2	4.8762	4.8998	Hogging	0.0074434	0.043726	0.045714	-496.41E-6	637.67E-6	7550.2	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.26 | Sub-structure: 1

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	2.9261	6.8269	Hogging	0.0092124	0.033456	0.036860	-403.85E-6	-782.48E-6	3219.0	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.26 | Sub-structure: 2

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	0.58540	None	0.0	0.025073	0.025073	-250.66E-6	-448.58E-6	51315.	0 (Negligible)
	2	0.58540	5.8281	Sagging	0.015334	-0.027589	0.011091	0.0028318	467.72E-6	4080.4	0 (Negligible)
	3	6.4135	2.4304	Sagging	295.19E-6	25.490E-6	303.52E-6	0.0	248.43E-6	20112.	0 (Negligible)
	4	8.8439	3.4731	Sagging	0.020170	-67.694E-6	0.019830	2.2470E-6	0.0010415	1048.4	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No.26 | Sub-structure: 3

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	4.7640	Sagging	0.033925	0.042473	0.059721	-707.94E-6	-0.0017670	474.56	1 (Very Slight)
	2	4.7640	5.0040	Hogging	0.0075112	0.039324	0.041372	-584.54E-6	618.38E-6	7511.1	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

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

Structure: No.30 | Sub-structure: 1

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	0.0069095	0.043439	-631.31E-6	1.7542	0.045208	-485.35E-6	-631.31E-6	4383.8	-	0 (Negligible)

Structure: No.30 | Sub-structure: 2

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	58.413E-6	0.025721	-436.76E-6	2.2734	0.025725	-265.67E-6	-436.76E-6	82676.	81380.	0 (Negligible)

Structure: No.30 | Sub-structure: 3

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	0.019097	0.054914	805.98E-6	3.1321	0.063514	-651.75E-6	805.98E-6	-	1620.0	1 (Very Slight)

Structure: No.30 | Sub-structure: 4

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	373.40E-6	0.0	-11.727E-6	2.3865	369.97E-6	0.0	-11.727E-6	92517.	121770.	0 (Negligible)

Structure: No.30 | Sub-structure: 5

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	0.019908	0.052912	-647.17E-6	3.1378	0.063258	-614.06E-6	-647.17E-6	7550.2	1812.1	1 (Very Slight)

Structure: No.26 | Sub-structure: 1

Vertical Offset from	Deflection Ratio	Average Horizontal	Max Slope	Max Settlement	Max Tensile	Max Gradient of	Max Gradient of Vertical	Min Radius of	Min Radius of	Damage Category

Line for Vertical Movement Calculations	Strain		Strain	Horizontal Displacement Curve	Displacement Curve	Curvature (Hogging)	Curvature (Sagging)	
[m]	[%]	[%]	[mm]	[%]		[m]	[m]	
0.0	0.0092124	0.033456	-782.48E-6	2.5092	0.036860	-403.85E-6	-782.48E-6	3219.0 - 0 (Negligible)

Structure: No.26 | Sub-structure: 2

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	0.020170	-0.027589	0.0010415	4.1005	0.025073	0.0028318	0.0010415	-	1048.4	0 (Negligible)

Structure: No.26 | Sub-structure: 3

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0.0	0.033925	0.042473	-0.0017670	3.0331	0.059721	-707.94E-6	-0.0017670	7511.1	474.56	1 (Very Slight)

Specific Building Damage Results - Critical Segments within Each Structure

Structure Name	Parameter	Critical Sub-Structure	Critical Segment	Start	End	Curvature	Max Slope	Max Settlement	Max Tensile Strain	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
				[m]	[m]			[mm]	[%]	[m]	[m]	
No.30	Max Slope	3	1	0.0	4.1920	Sagging	**805.98E-6**	3.1321	0.063514	-	1620.0	1 (Very Slight)
	Max Settlement	5	1	0.0	4.8762	Sagging	647.17E-6	**3.1378**	0.063258	-	1812.1	1 (Very Slight)
	Max Tensile Strain	3	1	0.0	4.1920	Sagging	805.98E-6	3.1321	**0.063514**	-	1620.0	1 (Very Slight)
	Min Radius of Curvature (Hogging)	1	1	0.0	4.6946	Hogging	631.31E-6	1.6169	0.045208	**4383.8**	-	0 (Negligible)
	Min Radius of Curvature (Sagging)	3	1	0.0	4.1920	Sagging	805.98E-6	3.1321	0.063514	-	**1620.0**	1 (Very Slight)
No.26	Max Slope	3	1	0.0	4.7640	Sagging	**0.0017670**	3.0331	0.059721	-	474.56	1 (Very Slight)
	Max Settlement	2	2	0.58540	6.4135	Sagging	467.72E-6	**4.1005**	0.011091	-	4080.4	0 (Negligible)
	Max Tensile Strain	3	1	0.0	4.7640	Sagging	0.0017670	3.0331	**0.059721**	-	474.56	1 (Very Slight)
	Min Radius of Curvature (Hogging)	1	1	2.9261	9.7530	Hogging	782.48E-6	2.5092	0.036860	**3219.0**	-	0 (Negligible)
	Min Radius of Curvature (Sagging)	3	1	0.0	4.7640	Sagging	0.0017670	3.0331	0.059721	-	**474.56**	1 (Very Slight)

www.fairhurst.co.uk

Aberdeen
Bristol
Birmingham
Dundee
Edinburgh
Elgin
Glasgow
Inverness
Leeds
London
Manchester
Newcastle upon Tyne
Sevenoaks
Sheffield
Taunton
Watford

FAIRHURST

CIVIL ENGINEERING • STRUCTURAL ENGINEERING • TRANSPORTATION • ROADS & BRIDGES
PORTS & HARBOURS • GEOTECHNICAL & ENVIRONMENTAL ENGINEERING • PLANNING &
DEVELOPMENT • WATER SERVICES • CDM COORDINATOR SERVICES