



LMB GEOSOLUTIONS LTD

BASEMENT IMPACT ASSESSMENT

LAND TO REAR OF 11 WOLSELEY ROAD, LONDON, N8

March 2020

DOCUMENT RECORD

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EXECUTIVE SUMMARY

Executive Summary

Site Details	Land to Rear of 11 Wolseley Road, London N8 8RR
Proposed Development	It is understood that the client wishes to demolish the existing garage structure and construct a new split level two to four storey residential dwelling with single storey basement.
Anticipated Ground & Groundwater Conditions	Made Ground overlying London Clay Formation. Local borehole records record groundwater in the London Clay Formation at depths of between 2.90m and 7.20m bgl. However, rather than being representative of a permanent and laterally continuous aquifer unit, the groundwater is present as discrete units within (for example) micro fissures and local mudstone horizons and the recorded groundwater level will most likely be reflective of the pore water pressures within these discrete features.
Desk Study	Low to moderate environmental sensitivity.
Geotechnical Advice	Information provided by the structural engineer for the project has indicated that the basement development will comprise a contiguous pile wall around three sides of the perimeter of the structure, with the western wall comprising reinforced concrete cast as a series of pins in a hit and miss sequence. These walls will form the retaining wall structure for the basement. The floor slab will comprise a 300mm reinforced concrete raft foundation cast of compressible sub-base. A number of internal masonry walls will be formed on the raft foundation.
Basement Impact Assessment	The assessment completed indicates that potential impacts resulting from the basement development are likely to be negligible.
Recommendations	The full set of recommendations should be reviewed, but in summary the following are provided: • It is recommended that maintenance and construction workers involved in below ground works adopt appropriate management procedures to mitigate potential risks. • It is recommended that movement monitoring is undertaken as part of basement construction.

This executive summary is not a stand alone document and should be read in conjunction with the full report text, including conclusions and recommendations.

INTRODUCTION

Introduction

AUTHORISATION

LMB Geosolutions Ltd (LMB) was instructed by Cassion Castle Architecture (Architects) on behalf of Mr David Scheinmann (the Client) in February 2020 to complete a Basement Impact Assessment in relation to the proposed development at Land to Rear of 11 Wolseley Road, London N8 8RR (the Site).

PROJECT AND SITE DETAILS

Site Address	Land to Rear of 11 Wolseley Road, London N8 8RR (the Site). A site Location Plan is provided as Figure 1 .
Proposed Development	The site currently comprises an area of open ground and a single storey garage to the rear of the residential property at 11 Wolseley Road. It is understood that the client wishes to demolish the existing garage structure and construct a new split level two to four storey residential dwelling with single storey basement. Due to the slope of the site the finished floor level will vary between approximately 2.60m and 3.60m below pavement level. A development schematic is included in Appendix A.
Background	The scope of works and requirements of this report were based on the information provided by the Architect and review of information within a pre-application enquiry (ref. PRE/2019/0017, dated 8 th February 2019).

AIMS & OBJECTIVES

This report aims to provide details of the local ground and groundwater conditions beneath the site to enable completion of a Basement Impact Assessment in accordance with London Borough of Haringey (LBH) Policy DM18 'Residential Basement Development and Light Wells' and the Draft Basement Development Guidance Note (June 2012).

SCOPE OF WORKS

The following scope of works has been completed:

Desk Study

- Completion of a site reconnaissance survey to make a preliminary assessment of the site and surrounding area;

INTRODUCTION

- Review of information on the planning portal for records pertaining to development on the site and in the neighbouring area;
- Assessment of the 'sensitivity' of the site location as determined by factors such as hydrogeology, proximity of watercourses, neighbouring land use, ecologically sensitive uses and geology detailed on British Geological Survey (BGS) maps;
- Completion of an interpretive report section that includes:
 - Details of current site conditions based on the reconnaissance survey;
 - The site environmental setting;
 - The likely local ground and groundwater conditions; and
 - A summary of the site environmental sensitivity.

Basement Impact Assessment (BIA)

The BIA will follow the guidance within the relevant LBH documents and also reference elements of the framework prescribed by London Borough of Camden in the relevant guidance documents and will comprise the following:

- Desk Study;
- Screening;
- Scoping; and
- Impact Assessment.

CONTRIBUTORS

This report has been compiled by Philip Lewis, a hydrogeologist and chartered Geologist with over twenty years experience as a geoscience professional, including over eighteen years experience as a professional adviser (consultant) in hydrogeology, engineering geology and contaminated land.

The Ground Movement Assessment has been completed by Corrado Candian a geotechnical engineer and chartered engineer (CEng, MICE) with over ten years experience.

LIMITATIONS

LMB has prepared this report solely for the use of the named Client and those parties with whom a warranty agreement and/or assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from LMB and the Client.

LMB accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) issue of this document to any third party with whom an agreement has not been executed.

INTRODUCTION

The risk assessment and opinions provided, among other things, take in to consideration currently available guidance and best available techniques relating to acceptable contamination concentrations and interpretation of these values. No liability can be accepted for the retrospective effects of any future changes or amendments to these value.

BASELINE DATA & CRITERIA

Baseline Data & Criteria

INTRODUCTION

This section provides the baseline (desk study) data used to complete the Basement Impact Assessment (BIA) in relation to the proposed development. Reference information used for this purpose is outlined below:

- British Geological Survey – 1:50,000 Geological Sheet 256, North London (Solid & Drift);
- British Geological Survey borehole archive records;
- Environment Agency Groundwater Vulnerability Mapping (1:100,000 series) Sheet 40, Thames;
- Information contained on the gov.uk website (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>);
- NERC (2008). UK Hydrometric Register;
- River Basin Management Plan (RBMP). Thames River Basin District (2009); and
- Barton, N.J. (1982). Lost Rivers of London.

Guidance and Frameworks

The proposed development is located in the London Borough of Haringey (LBH) and as such will follow the guidance outlined in the following documents:

- Haringey Council Planning Regeneration & Economy. Draft Basement Development Guidance Note (June 2012);
- London Borough of Haringey (LBH) Policy DM18: Residential Basement Development and Light Wells;

The BIA will also utilise the framework set out in the following documents, which are considered to be relevant:

- Camden Planning Guidance: Basements (CPG Basements, March 2018);
- Camden Planning Guidance: Basements and Lightwells (CPG 4, 2015); and
- LBC: Camden geological, hydrogeological and hydrological study Guidance for subterranean development (Issue 01, November 2010).

About this Assessment

In the context of this assessment greatest emphasis has been placed on the requirements highlighted above relating to potential impacts on drainage, flooding from all sources, groundwater conditions and ground stability.

In accordance with the referenced guidance this report includes the following elements:

- Desk Study;

BASELINE DATA & CRITERIA

- Screening & Scoping;
- Interpretation and ground movement assessment; and
- Impact Assessment.

Consultation

LBC Planning

A pre-planning application enquiry meeting in relation to the proposed development was undertaken on 8th February 2019 and an advice document was subsequently issued (ref. PRE/2019/0017). In summary the advice document suggests that a Basement Impact Assessment (BIA) would need to be submitted as part of any future planning application. The BIA *should be submitted with application in order to comply with Policy DM18 'Residential Basement Development and light Wells' within the Development Management (DPD) 2017.*

SIGNIFICANCE CRITERIA

The assessment of potential effects from the proposed development has taken into account both the construction and operational phases. The significance level attributed to each effect has been assessed based on the magnitude of change due to the development proposals and the sensitivity of the effected receptor/receiving environment to change, as well as a number of other factors.

Assessment criteria developed from the guidance and frameworks referenced have been used to determine the significance of the potential effects as a result of construction and operation of the proposed development.

The significance of potential effects has been determined by considering the magnitude of the effect, in terms of a change in existing baseline conditions.

Significance Measures

The following terms have been used to define the significance of the effects identified:

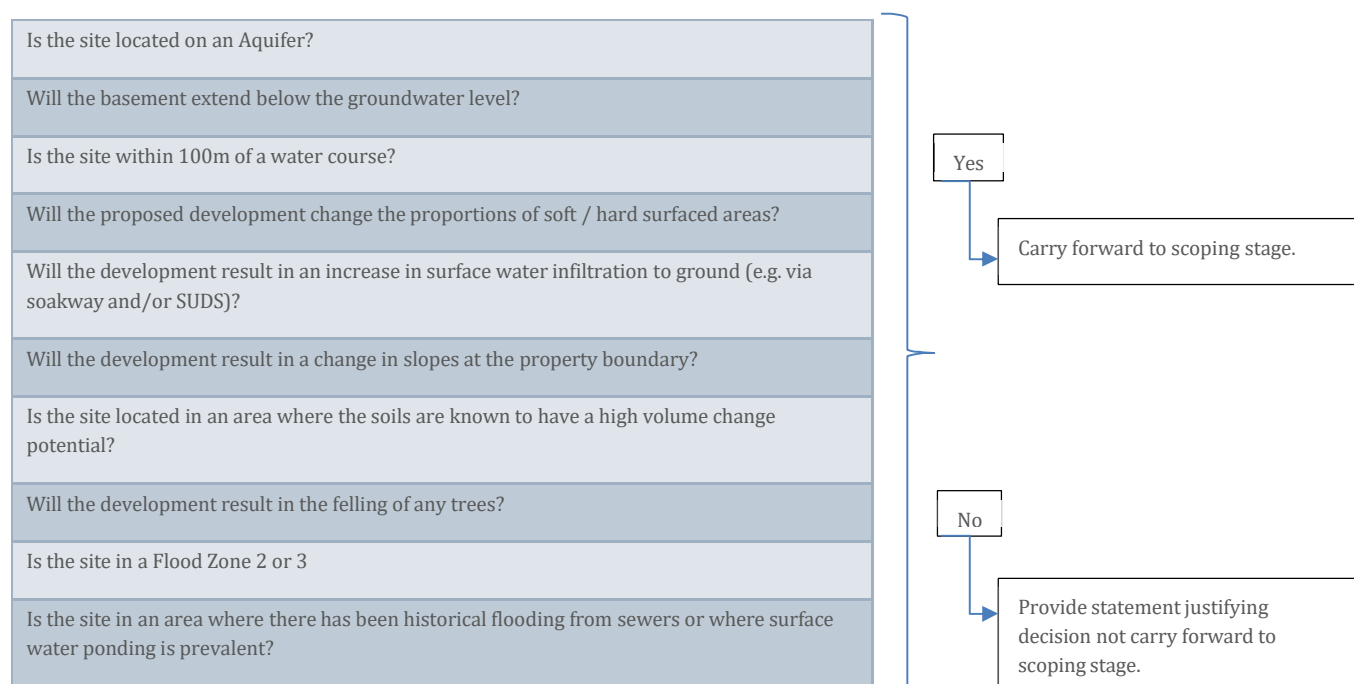
- **Major effect:** where the proposed development could be expected to have a very significant effect (either positive or negative) e.g. significant risk of flooding effect, an improvement in water quality class, allowing new uses to be made of the water resource (e.g. potable water supply) or impacts from contamination issued e.g. risk to groundwater or future site users;
- **Moderate effect:** where the proposed development could be expected to have a noticeable effect (either positive or negative) e.g. moderate flooding effect;
- **Minor effect:** where the proposed development could be expected to result in a small, barely noticeable effect (either positive or negative), but where current uses could still be maintained; and
- **Negligible:** where no discernible effect is expected as a result of the proposed development.

BASELINE DATA & CRITERIA

Screening Assessment

The information presented within the LBC guidance provides decision-making matrices to enable an initial screening assessment to be made in relation to potential impacts and issues related to proposed basement development.

The matrices specifically focus on Land Stability, Groundwater Movement and Surface flow and Flooding. An example of the type of matrix is presented below:



DESK STUDY

Desk Study

A desk study has been undertaken and is presented in this section in order to provide further background and context for the Basement Impact Assessment presented in the later sections of this report.

SITE DESCRIPTION

The site currently comprises a single storey two bedroomed guest house used with adjoining rear garden area. The existing structure shares a party wall with a small outhouse at 11 Wolseley Road but does not adjoin any wall/structure on the neighbouring property at 45 Clifton Road (see Photo X). The rear garden area comprises grassed lawn and a number of mature tree (see Photos 2 & 3).

The site is located on a hillside setting and slopes gently to the north west. Based on visual observations, neighbouring properties are not thought to include lower ground and/or basement levels.

No obvious signs of structural damage such as cracked bricks/masonry were observed on the garage building, either internally or externally.

A Photographic record is provided in **Appendix B**.

ENVIRONMENTAL SETTING

Published Geology & Aquifer Designations	Reference to British Geological Survey (BGS) Digital Map (1:50,000) indicates that the site is directly underlain by the London Clay Formation. No superficial deposits are anticipated at the site based on available sources of information. The London Clay Formation is designated as Unproductive Strata and anticipated to be approximately 40m in thickness in this area.
Local Hydrology	Reference to information on local mapping indicates that there are no surface water features within 500m of the site. The nearest known surface water feature is New River located approximately 1.2km to the east of the site and a tributary of Mutton Brook is located approximately 1.4km west of the site. Reference to the <i>Lost Rivers of London</i> (Barton, N.J, 1982) suggests that the site is located approximately 2km north west of the former course of a tributary of Hackney Brook. Information relating to the Thames region within the UK Hydrometric Register indicates that the average annual rainfall in the region is 710mm. Information on the gov.uk website indicates that the site is located in an area at very low risk of flooding from rivers and sea and from surface water flooding. The site is not considered to be located in an area prone to groundwater flooding.

DESK STUDY

Resource Potential & Ecological Quality	Surface Water: Based on available information there are no identified surface water features within 500m of the site. Groundwater: The groundwater in the London Clay Formation is designated Unproductive Strata and as such is not characterised as a groundwater body within the relevant River Basins Management Plan. In addition, the site is not located within an EA designated Source Protection Zone (SPZ).
Surrounding Land Use	Surrounding land uses are primarily residential with associated nearby amenities.
Local Designations	Reference to information contained on the Defra Magic website indicates that the site is located approximately 550m north and 650m east of the Parkland Walk and Queens Wood local nature reserves respectively. There are no other known designations (e.g. Sites of Special Scientific Interest) within 500m of the site.

SUMMARY OF LIKELY GROUND & GROUNDWATER CONDITIONS

The information presented in the following sections is based on review of available BGS borehole logs for the local area and interpretation of BGS mapping.

The interpretation of this information should be considered preliminary pending completion of site specific ground investigation works.

Local Ground & Groundwater Conditions

The three nearest BGS borehole records have been reviewed, which are located approximately 200m west (ref. TQ28NE46) and 200m south (ref. TQ28NE316 & TQ28NE317) of the site respectively.

Borehole log TQ28NE46 records c. 0.23m of 'stoney fill' and c. 1.0m of 'clay fill' overlying soft becoming firm brown mottled clay to a depth of c. 7.3m below ground level (bgl) which overlies London Blue Clay to c. 9.90m bgl (interpreted to represent the London Clay Formation).

A groundwater seepage was recorded at c. 4.5m and a standing water level recorded at c. 2.90m bgl.

Borehole logs TQ28NE316 & TQ28NE317 record 0.45m of topsoil overlying c. 3.35m of Made Ground (brown clay) which in turn overlies c. 0.76m of soft clay with peat and c. 1.5m of firm brown clay (interpreted to represent the London Clay Formation).

A groundwater strike was recorded at c. 3.9m and a standing water level recorded at c. 4.2m bgl.

Groundwater is commonly recorded within the London Clay Formation during monitoring. However, rather than being representative of a permanent and laterally continuous aquifer unit, the groundwater is present

DESK STUDY

as discrete units within (for example) micro fissures and local mudstone horizons and the recorded groundwater level will most likely be reflective of the pore water pressures within these discrete features.

Local Ground Investigation

Review of planning applications on the London Borough of Haringey website identified an existing ground investigation report relating to a proposed development at land to the rear of 45 Wolsey Road, located approximately 200m east-north-east of the site (ref. GWPR1582/GIR/AUGUST 2016).

The site investigation works completed comprise 1no. dynamic (windowless) sampler borehole to 12.45m bgl, 1no. hand held window sampler borehole to 8.0m bgl and a hand excavated trial pit.

The ground conditions were found to comprise between 0.45m and 1.20m of Made Ground soils overlying the London Clay Formation. A groundwater strike was recorded at 7.20m bgl in BH1.

A monitoring well was installed in BH1 to a depth of 6.00m bgl and groundwater was recorded at 0.80m bgl during return monitoring.

REVIEW OF LOCAL PLANNING

A search of planning applications on the London Borough of Haringey website has been completed to review any existing and proposed development in the vicinity of the site. The majority of planning applications relate to building extensions and renovation. The nearest planning decision notices to the site are as follows:

- 15 Wolseley Road, London N8 8RR (ref. HGY/2020/0198). Excavation of part of the front garden to provide lightwell addition to one window and one new entrance door at lower ground floor. Re-arrangement of front garden flower beds and removal of 1 x tree.
- 17 Wolseley Road London N8 8RR (ref. HGY/2019/3237). Demolition and rebuilding of existing single storey rear extension to greater width, formation of rear roof dormer extension and insertion of front and rear roof lights.
- Land to the rear of 45 Wolseley Road (ref. HGY/2018/0035). Demolition of three existing garages and erection of a three storey, four bedroom dwelling, including basement excavation and the removal of three trees.

The only recent application viewed relating to a new basement development was the above referenced at 45 Wolseley Road. This proposal is not anticipated to influence the proposal at the subject site.

ENVIRONMENTAL SENSITIVITY

Overall, the site setting is considered to be of **low to moderate** environmental sensitivity, for the following reasons:

- The Site is located in a predominantly residential land use area;
- The published geological data suggests that the Site is underlain by the London Clay Formation, which is designated as Unproductive Strata;

DESK STUDY

- The Site is not located within an EA designated SPZ;
- The site is located within an area with very low risk of flooding from rivers and sea and surface water;
- There are no known surface water features within 250m of the site; and
- The site is located within 600m of a local nature reserve.

SCREENING & SCOPING ASSESSMENT

Screening & Scoping Assessment

SCREENING ASSESSMENT

The decision-making matrices presented in the Screening Assessment below have been completed based on the information presented in the previous sections.

Groundwater Flow

Is the site located on an Aquifer?	No The site is underlain by the London Clay Formation which is designated as an Unproductive Strata.
Will the basement extend below the groundwater level?	No Local BGS borehole logs and site investigation data suggest standing groundwater was recorded at depths of between approximately 2.90m and 7.20m bgl. However, rather than being representative of a permanent and laterally continuous aquifer unit, the groundwater is present as discrete units within (for example) micro fissures and local mudstone horizons and the recorded groundwater level will most likely be reflective of the pore water pressures within these discrete features.
Is the site within 100m of a water course, well or potential springline?	No Based on the desk study information, no known surface water courses are located within 500m of the site.
Is the site within the catchment of local surface water courses?	No Based on the desk study information, no known surface water courses are located within 500m of the site and the site lies outside the catchment.
Will the proposed development change the proportions of soft / hard surfaced areas?	Yes Based on the information reviewed areas of hard surfacing are predicted to increase and occupy areas currently comprising the rear garden and associated trees/vegetation.
Will the development result in an increase in surface water infiltration to ground (e.g. via soakaway and/or SUDS)?	No The development will decrease the area of soft surfacing / vegetation and there are no plans to introduce infiltration drainage.
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	No There are no known surface water courses within 500m of the site.

SCREENING & SCOPING ASSESSMENT

water level in any local surface water feature or spring line.

Land Stability

Does the existing site include slopes, natural or manmade, greater than 7°?	No Observations during a site visit, reference to proposed development schematics and local mapping suggests that there are no slopes > 7°.
Will the proposed re-profiling or landscaping at the site change slopes at the property boundary to more than 7°?	No Information presented on the proposed development schematics confirms that there will be no slopes > 7° following development.
Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No Observations during a site visit and reference to proposed development schematics indicates that there are no slopes > 7°.
Is the site within a wider hillside setting in which the general slope is greater than 7°?	Yes The site is located off Wolseley Road which joins onto Shepherds Hill.
Is the London Clay the shallowest strata at the site?	No Reference to BGS borehole logs and local site investigation data suggests that Made Ground soils overlie the London Clay Formation.
Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?	Yes A number of trees will be felled to enable the development.
Is there a history of seasonal shrink swell subsidence in the local area and/or evidence of such effects at the site?	Unknown The London Clay has a high plasticity with a high volume change potential. However, in general movement that causes subsidence is due to trees and/or drains or poor subsoil and there is no visible evidence of such movement at the site.
Is the site within 100m of a water course or potential springline?	No Based on the desk study information, no known surface water courses are located within 500m of the site.
Is the site in an area of previously worked ground?	No Reference to published geological mapping indicates the site is not in an area of worked ground.

SCREENING & SCOPING ASSESSMENT

Is the site within an aquifer?	No The site is underlain by the London Clay Formation which is designated as an Unproductive Strata.
Is the site within 5m of a highway or pedestrian right of way?	Yes The development is within 5m the pavement of a public highway.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes The neighbouring properties are not believed to include lower ground floors and although there are no shared party walls, the basement excavation will result in differential depth of foundations.
Is the site over any tunnels e.g. railway lines?	No Enquiries with assets holders have also been undertaken and confirm that the site is not located over any known tunnels.

Surface Flow and Flooding

Is the site within the catchment of local surface water courses?	No Based on the desk study information, no known surface water courses are located within 500m of the site and the site lies outside the catchment.
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 The development is small scale and is not anticipated to significantly alter drainage and surface water flows.
Is the site within 100m of a water course, well or potential springline?	No Based on the desk study information, no known surface water courses are located within 500m of the site.
Will the proposed development change the proportions of soft / hard surfaced areas?	Yes Based on the information reviewed areas of hard surfacing are predicted to increase and occupy areas currently comprising the rear garden and associated trees/vegetation.
Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	No There are no proposals to alter the site drainage and surface water flows following development and there is not anticipated to be any significant alteration to the profile of inflows being received downstream of the site (if applicable).

SCREENING & SCOPING ASSESSMENT

Is the site in an area known to be at risk from surface water flooding?	No Information reviewed indicates that the site is in an area at very low risk from surface water flooding.
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Summary

Based on the Screening Assessment presented above, the following potential issues have been carried forward to the scoping stage of the assessment:

- A number of trees will be felled to enable the development.
- Parts of the site and proposed development are within 5.0m of a pavement with a public highway beyond.
- There is no known history of seasonal shrink swell subsidence in the local area and/or evidence of such effects at the site, but it does lie on the London Clay Formation which is a high plasticity clay with high volume change potential.
- The neighbouring properties are not believed to include lower ground floors and although there are no shared party walls, the basement excavation will result in differential depth of foundations.
- Based on the information reviewed areas of hard surfacing are predicted to increase and occupy areas currently comprising the rear garden and associated trees/vegetation.

SCOPING ASSESSMENT

The potential issues identified within the screening assessment are considered within the following scoping sub-sections:

Surface Water Flow & Flooding

The proposed development will extend over an area currently comprising a rear garden with associated trees/vegetation. As such the proportion of hard surfacing will increase following development. However, the development itself is relatively small scale and as such the relative increase in hard surfacing area will be small and is not anticipated to result in an adverse impact.

Land Stability

The site and proposed basement development are within 5.0m of a pavement on a sloping site and lies on the London Clay Formation, which is a high plasticity clay with high volume change potential. In addition, the development will result in differential depth relative to foundations in neighbouring properties.

As such a Ground Movement Assessment (GMA) has been undertaken to appraise the potential impacts on neighbouring properties.

The GMA is provided in the following sections, with the calculation worksheets provided in **Appendix C**.

SUMMARY OF STRUCTURAL SCHEME & FOUNDATION DESIGN

Summary of Structural Scheme & Foundation Design

INTRODUCTION

Information provided by Form London Ltd (Structural Engineers) on a series of structural plan drawings (ref. A527 100, 05/03/20) has been reviewed to summarise the proposed structural scheme and foundations

Basement

The drawing reviewed indicate that the structural scheme for the basement development will comprise a contiguous pile wall around three sides of the perimeter of the structure, with the western wall comprising reinforced concrete cast as a series of piers in a hit and miss sequence. These walls will form the retaining wall structure for the basement.

The floor slab will comprise a 300mm reinforced concrete raft foundation cast of compressible sub-base. A number of internal masonry walls will be formed on the raft foundation.

Lower Ground Floor

The lower ground floor level will utilise a combination of reinforced concrete columns set onto the raft, a capping beam set on the head of the contiguous piled wall and steel beams set on to the head of the reinforced concrete retaining wall (western side).

GROUND MOVEMENT ASSESSMENT

Ground Movement Assessment

INTRODUCTION

There is the potential for ground movements due to the proposed development from the wall installation and from the excavation process. It has been assumed that the excavation will be undertaken using contiguous piles. The site is on a slope and the excavation depth varies between approximately 2.70m bgl and 3.90m bgl. Therefore, an average excavation depth of 3.30m bgl has been considered in this assessment. The new retaining walls are considered to provide 'high stiffness' for the purpose of assessment.

The magnitude and extent of ground movements resulting from installation of a piled wall and excavation in front of such a wall are typically estimated based on the guidance given in the CIRIA publication C760 'Guidance on embedded retaining wall design'. The guidance in the CIRIA publication is based on the behaviour of embedded walls at numerous sites in London, which are predominantly walls embedded in London Clay, though typically with some near surface deposits consisting of River Terrace Deposits and Made Ground.

BUILDING DAMAGE ASSESSMENT

CIRIA C760 provides curves estimating horizontal and vertical ground surface movements due to piled wall installation and to excavation in front of wall. Total ground movements resulting from the excavation will be the combination of the installation movements and the excavation movements.

Oasys XDisp software has been used to inform the assessment. Oasys XDisp considers curves shown in CIRIA C760 (Fig. 6.9a, 6.9b, 6.15a, 6.15b) to make a prediction of ground movement assuming a high support stiffness wall. Potential corner stiffening effects have not been applied.

Ground Movements – Wall Installation

For movement due to contiguous pile wall installation, the magnitudes of the movements are dependent on the total wall depth (Fig. 6.8a and Fig. 6.8b in CIRIA C760). Since the depth of the piles has not yet been confirmed, it is assumed that they will be 5m in length. Maximum vertical movements occur at the wall itself. C760 indicates movements will be 0.04% of the wall depth, with negligible vertical movement at twice the wall depth from the wall. On this basis, maximum vertical movements due to wall installation of approx. 2mm are predicted with vertical movements extending to a maximum of approx. 6.6m from the wall. Anticipated maximum horizontal movements due to wall installation are 0.04% of the wall depth, with negligible horizontal movement twice the wall depth from the wall. Maximum horizontal movements are therefore predicted to be approx. 2mm with horizontal movements extending to a maximum of approx. 6.6m from the wall.

GROUND MOVEMENT ASSESSMENT

Ground Movements – Excavation in Front of Wall

Consideration has been given to account for the nature of the soil to be excavated which is anticipated to primarily comprise the London Clay formation. Fig. 6.15a and Fig. 6.16b from CIRIA C760 have been used to reflect the nature of the soil excavated.

For movements due to excavation in front of the retaining wall, the magnitudes of the movements are dependent on the excavation depth. Based on the assumption that a stiffly propped method of excavation will be adopted, C760 indicates maximum vertical movements of 0.10% of excavation depth, with negligible movement three and a half times excavation depth from the wall. Maximum vertical movements due to excavation of approx. 3mm are predicted, extending 12m from the wall.

Anticipated maximum horizontal movement due to excavation are 0.15% of the excavation depth, with negligible horizontal movements four times the excavation depth from the wall. Maximum horizontal movements are predicted to be approx. 5mm, extending 13m from the wall.

Details of calculation and relevant charts are presented in **Appendix C**.

Sensitivity Analysis

As discussed above the magnitudes of the movements due to the installation of a contiguous piled wall in stiff clay is dependent on the overall wall depth (not excavation depth). Similarly, the distance from the wall to the point where negligible movements will occur is also related to overall wall depth. While C760 provides estimates of horizontal movement from pile installation, these are based on very limited data; more recent projects have shown that piling undertaken to current standards of quality and workmanship cause no significant horizontal movement. Maximum vertical movements occur at the pile wall itself. C760 suggests that such movements will be 0.05% of the pile length, with negligible vertical movement at twice the pile length from the wall. However, more recent projects have shown that such movements are generally less than the CIRIA guide indicates, and actually amount to 0.025% of the pile length, extending to no further than 1.5 times the pile length.

To provide a sensitivity check of the methodology adopted, the movement values predicted have been compared with consideration of a 'low stiffness' construction methodology (i.e. without the use of temporary propping to restrain movements), which indicates up to 12/13mm vertical /horizontal movements. This conservative approach could be considered a worst-case scenario, if propping was omitted for instance.

Damage category

Using these predicted movements, estimates of possible damage have been made for the surrounding structures, based on the Damage Classification Scheme proposed by Burland and Wroth (1974), and later supplemented by the work of Boscardin and Cording. This methodology is described within Box 6.3 in CIRIA C760 (and preceding CIRIA publications).

The 'Burland Scale' damage categories are presented in the table below:

GROUND MOVEMENT ASSESSMENT

Category of damage	Description of typical damage (ease of repair is underlined>	Approximate crack width (mm)	Limiting tensile strain, ϵ_{sm} (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	<u>Fine cracks that can easily be treated during normal decoration.</u> Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05 to 0.075
2 Slight	<u>Cracks easily filled. Redecoration probably required.</u> Several slight fractures showing inside of building. Cracks are visible externally and <u>some repointing may be required externally</u> to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075 to 0.15
3 Moderate	<u>The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.</u> Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 to 15 or a number of cracks >3	0.15 to 0.3
4 Severe	<u>Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.</u> Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Services pipes disrupted.	15 to 25, but also depends on number of cracks	>0.3
5 Very severe	<u>This requires a major repair, involving partial or complete rebuilding.</u> Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25, but depends on numbers of cracks	

Damage categories 1 and 2 are generally considered to represent aesthetic damage only.

Summary of Results

Copies of worksheets calculations and graphical representation of the results are presented in **Appendix C** and are summarised in the table below:

Nearby Building / Structure	Estimated Damage Category No.	Category of Damage
11 Wolseley Road	0	Negligible
11a Wolseley Road	1	Very Slight
13 Wolseley Road	0	Negligible
45 Clifton Road	1	Very Slight
42 Clifton Road	n/a	Outside Zone of Influence

The ground movement assessment undertaken indicates that damage to surrounding properties will generally be Burland Category 0 (Negligible) to 1 (Very Slight).

GROUND MOVEMENT ASSESSMENT

The results achieved in the GMA, adopting the C760 empirical assessment approach, are considered to represent an upper bound of theoretical movements, based on historical data. These movements should be reduced by adopting modern techniques, a suitable sequence of works, and a high stiffness propping system. In addition, it should be noted that the potential presence of existing basements at some of the surrounding buildings has not been considered in the analyses. The presence of such basements would typically reduce the effects of ground movements. In addition, potential corner stiffening effects have not been applied.

In general, ground movements can be minimised by careful design, sequencing and supervision of the works, ensuring that a high quality of workmanship is maintained.

ADDITIONAL CONSIDERATIONS

Heave

The excavation of about 3.30m thickness of soil will generate a maximum unloading of around 65kPa.

This will result in a measure of short-term heave and long term swelling of the underlying London Clay, which theoretically takes a number of years to complete. The new basement slab will be designed to withstand the potential heave forces and movements. About 30 to 50% of soil heave pressure would normally be expected to occur prior to construction of the slab (for a normal construction programme). As such 50% to 70% of potential heave will remain after excavation. Due to the current lack of information regarding to groundwater it is considered prudent to assume a water pressure due to a groundwater level of 1.0m bgl in the slab design, in addition to the soil heave pressure.

The excavation depth and modest dimensions of the site are such that heave movement associated with unloading of the clay is unlikely to exceed a few millimetres or to have any significant impact on the surrounding structures. Any movement that does occur will be further mitigated by the necessarily slow rate of the excavation and construction.

Ground Movement & Construction

The predicted building damage during construction is based on a conservative approach and it is recommended that the contractor gives consideration to the Association of Specialist Underpinning Contractors (ASUC) guidelines which should provide some mitigation and reduce the potential movements.

Ground Movements Monitoring

It is recommended that movement monitoring should be undertaken with surveying points set up prior to commencement of the works and it is recommended that monitoring be undertaken at weekly intervals. It is recommended that trigger values for monitoring are based on the predicted ground movements to ensure conservatism and that they are agreed under the Party Wall Act.

IMPACT ASSESSMENT & MITIGATION MEASURES

Impact Assessment & Mitigation Measures

SUMMARY OF POTENTIAL IMPACTS & MITIGATION MEASURES

The table below provides a summary of the potential impacts and mitigation measures adopted to ensure that residual risks are minimised:

Description of Potential Impact		Significance of Impact	Summary of Mitigation Measures	Residual & Cumulative Effects following Mitigation
Land Stability	Impact on local properties/structures	Minor negative	- The GMA completed suggests that potential damage associated with the additional excavation would be negligible to very slight. - Adoption of appropriate management procedures for basement excavation/ construction. - Surveying and monitoring of surrounding buildings / structures will be undertaken. - Repair and maintenance in accordance with C760.	Negligible

CONCLUSIONS AND RECOMMENDATIONS

Conclusions and Recommendations

CONCLUSIONS

Anticipated Ground & Groundwater Conditions

The anticipated ground conditions based on review of local borehole records comprises Made Ground overlying the London Clay Formation, which is anticipated to comprise firm becoming stiff brown to dark grey brown clay.

Local borehole records record groundwater in the London Clay Formation at depths of between 2.90m and 7.20m bgl. However, rather than being representative of a permanent and laterally continuous aquifer unit, the groundwater is present as discrete units within (for example) micro fissures and local mudstone horizons and the recorded groundwater level will most likely be reflective of the pore water pressures within these discrete features.

Summary of Structural Scheme & Foundations

Information provided by the structural engineer for the project has indicated that the basement development will comprise a contiguous pile wall around three sides of the perimeter of the structure, with the western wall comprising reinforced concrete cast as a series of pins in a hit and miss sequence. These walls will form the retaining wall structure for the basement.

The floor slab will comprise a 300mm reinforced concrete raft foundation cast of compressible sub-base. A number of internal masonry walls will be formed on the raft foundation.

Basement Impact Assessment

Assuming the correct mitigation measures are adopted, the assessment completed indicates that potential impacts on groundwater flow, land stability and local surface water resulting from the basement development are likely to be negligible.

RECOMMENDATIONS

It is recommended that movement monitoring should be undertaken with surveying points set up prior to commencement of the works and it is recommended that monitoring be undertaken at weekly intervals. It is recommended that trigger values for monitoring are based on the predicted ground movements to ensure conservatism and that they are agreed under the Party Wall Act.

REFERENCES & GUIDANCE

REFERENCES & GUIDANCE

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¹ This document has been withdrawn but is considered to remain useful in providing technical background for designing ground investigation works.

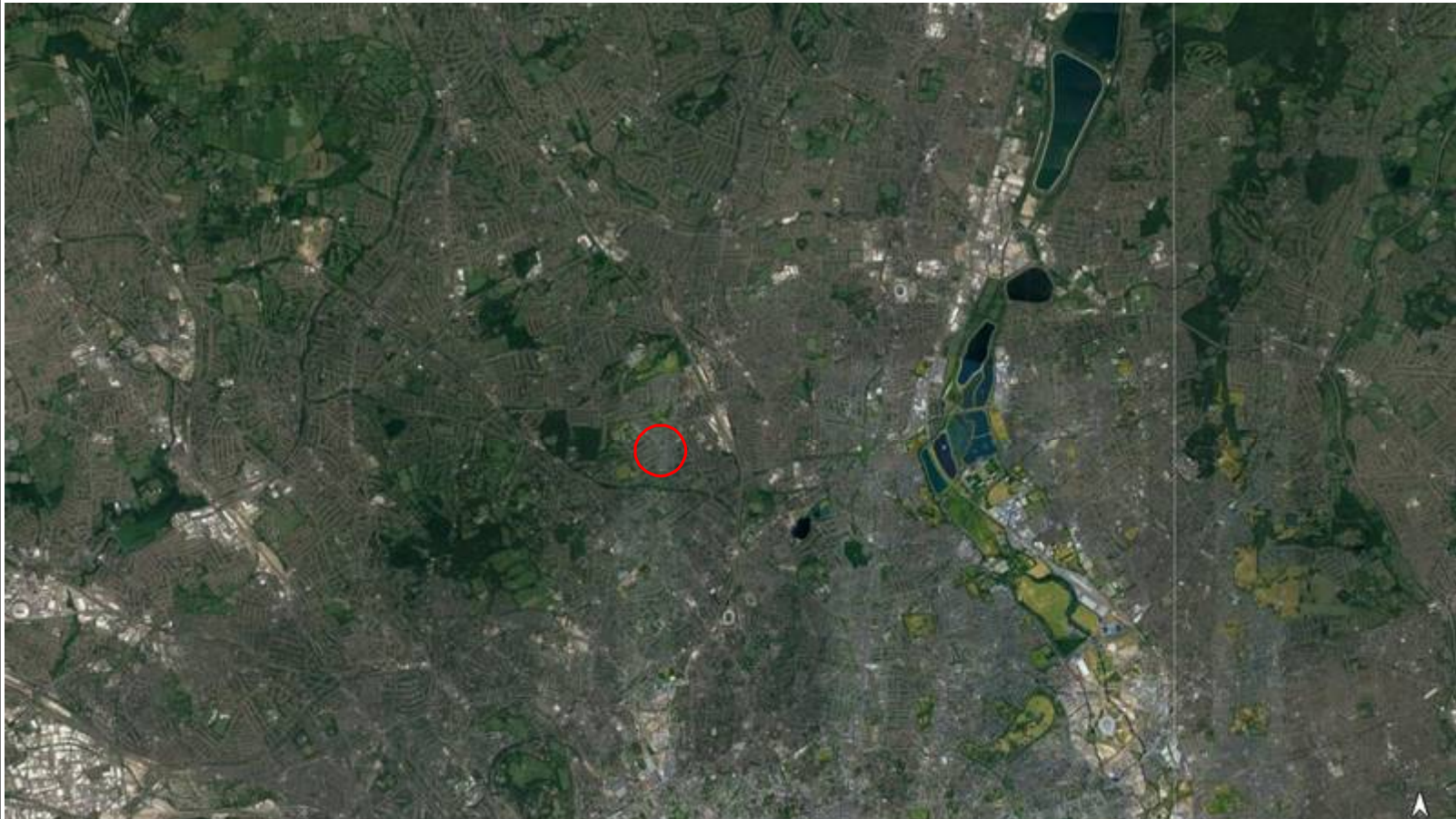
² This document has been withdrawn but is considered to remain useful in providing technical background for designing ground investigation works.

REFERENCES & GUIDANCE

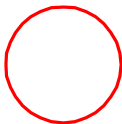
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FIGURES

FIGURES



Key:



Approximate site location

IMPORTANT – Please Read

This drawing is for illustrative purposes only and is for use only in conjunction with associated reports relating to the project details below. LMB accepts no liability for the mis-interpretation or use of this illustration by any other parties.



Site:
Clifton Road, London SW12

Figure Number: Figure 1

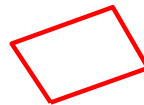
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Project No:	Created By: PIL	Date: Feb 2020
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Client: Mr David Scheinmann



Key:



Approximate site location

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*Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology*

Site:

Clifton Road, London SW12

Figure Number: Figure 2

Title: Neighbouring Properties

Project No:

Created By:
PIL

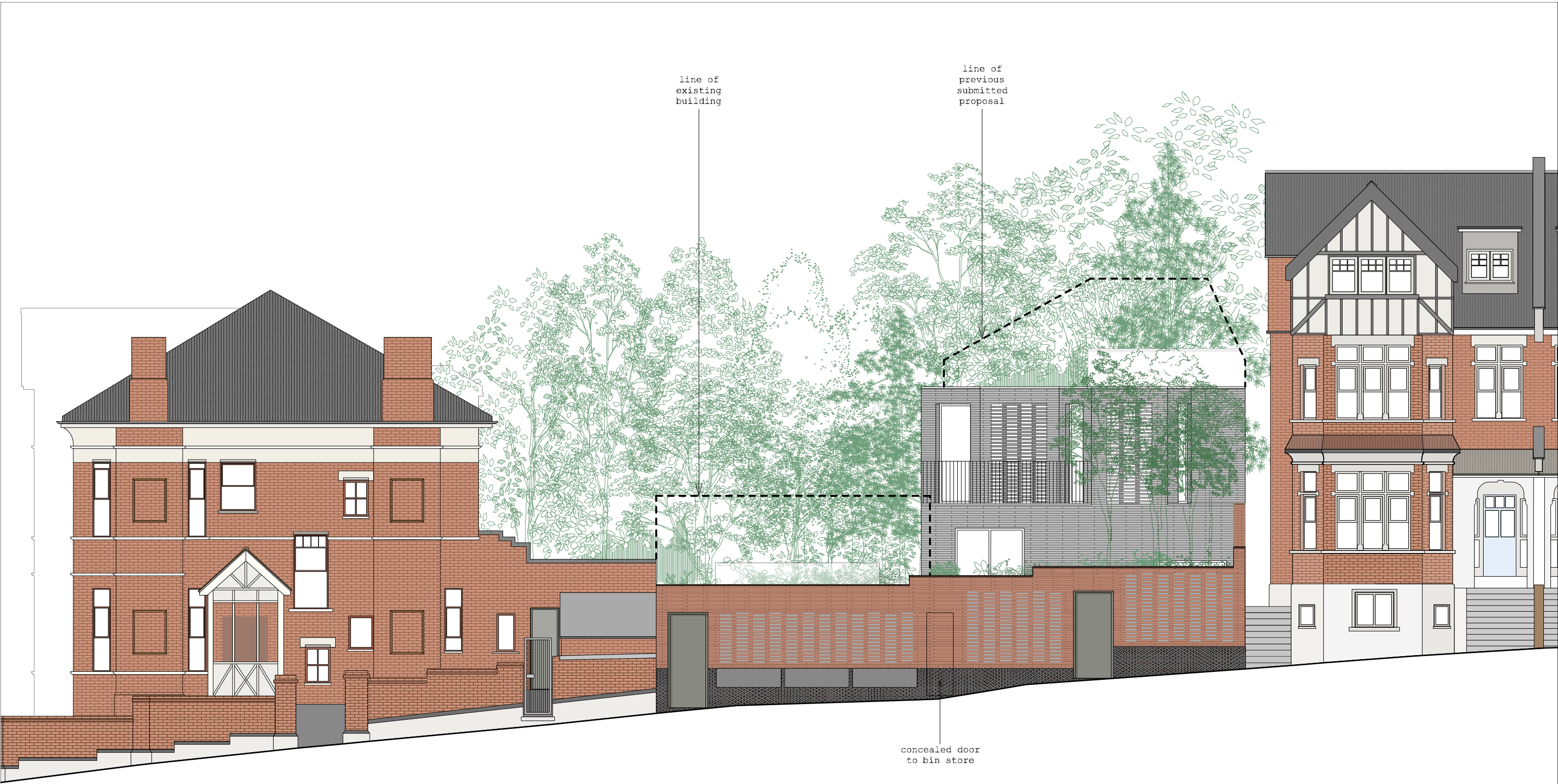
Date:
Feb 2020

Client: Mr David Scheinmann

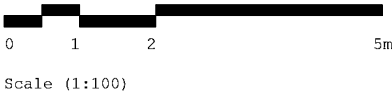
APPENDICES

Appendices

APPENDIX A DEVELOPMENT SCHEMATIC



rev	details	date
-	for approval	15/06/18



CASSION CASTLE ARCHITECTS

10 Old Dairy Court, 17 Crouch Hill, London N7 7NU,
E: info@cassioncastle.com T: 020 7703 4584

Project:
Clifton Road, London, N8 8JA

Drg.No:	Rev:	Date:
1803/PRE/P201	-	15/06/2018
		Scale: 1:100 @ A3

Title:
PROPOSED STREET ELEVATION

APPENDICES

APPENDIX B PHOTOGRAPHIC RECORD



Photo 1 – View of site from Clifton Rd



Photo 2 – view of rear garden area from 11 Wolseley Road



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Land to
Rear of 11 Wolseley
Road

Photos 1 & 2



Photo 3 – view of rear garden area toward 45 Clifton Road.



*Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology*

Photographic Record

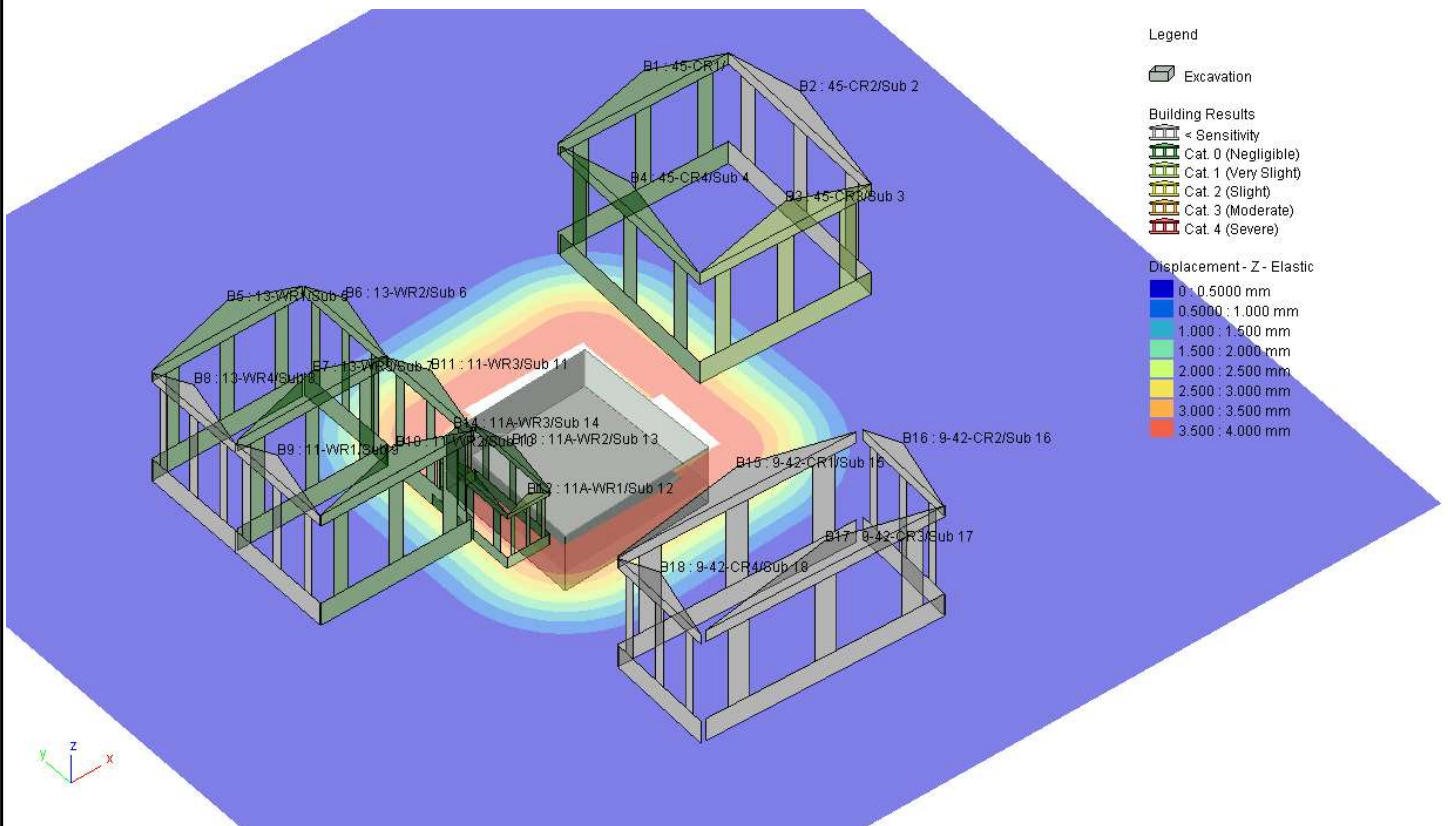
Project: Land to
Rear of 11 Wolseley
Road

Photo 3

APPENDICES

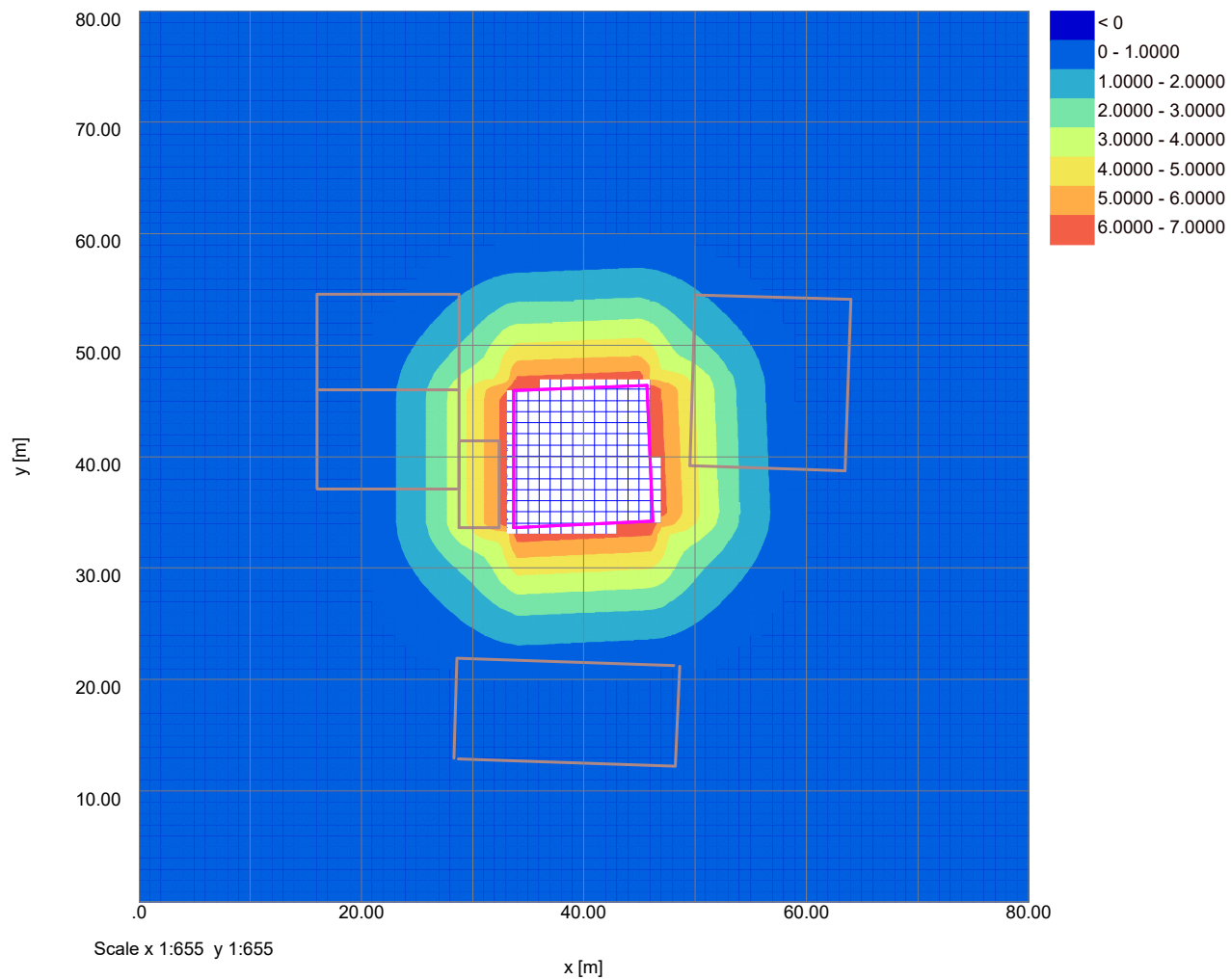
APPENDIX C GMA CALCULATION WORKSHEETS

Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked



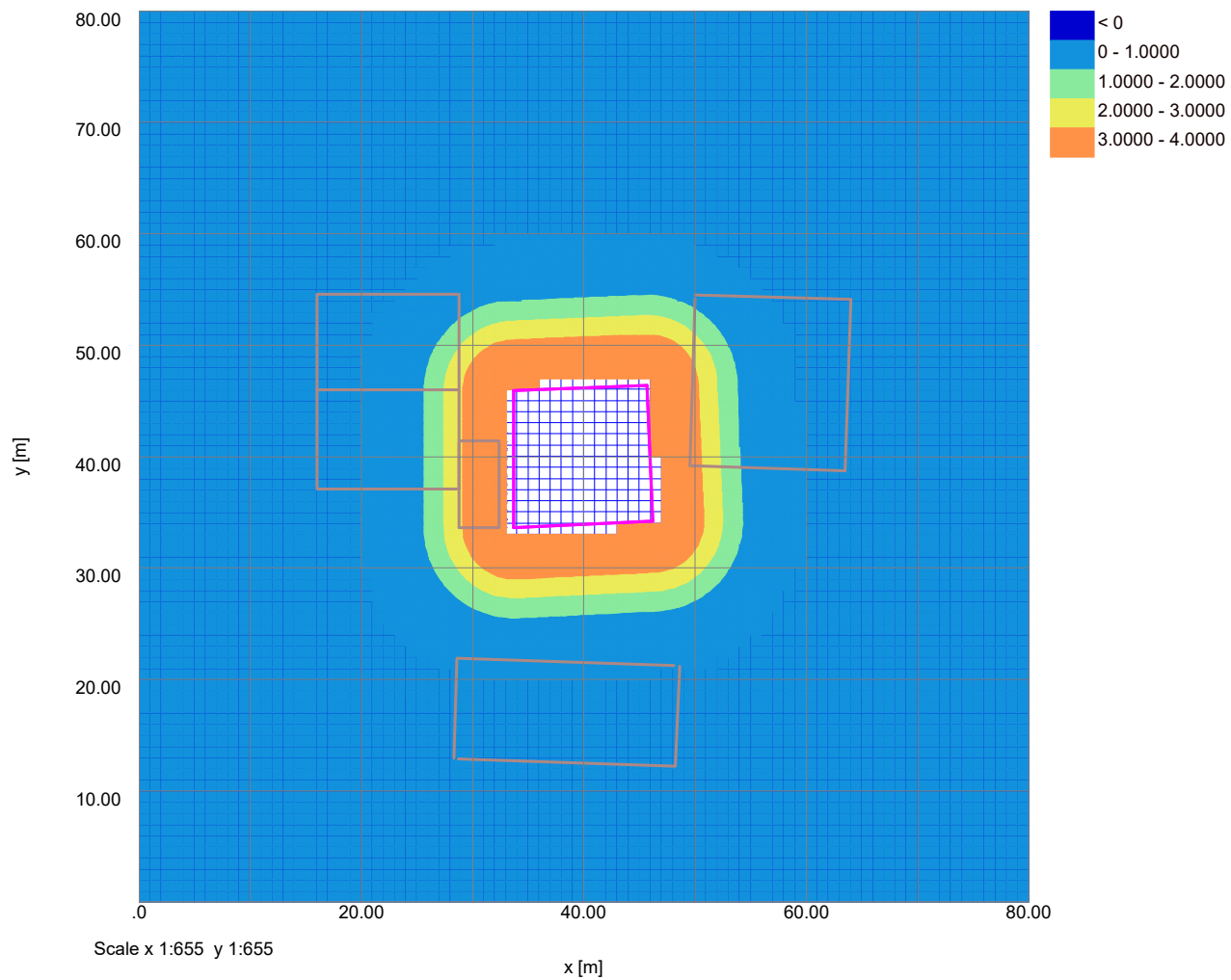
Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked

Horizontal Displacement Contours: Grid 1 (level 100.000m) Interval 1mm



Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked

Vertical Settlement Contours: Grid 1 (level 100.000m) (Interval 1mm)





MILVUM ENGINEERING SERVICES LTD

Clifton Road

Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked

Titles

Job No.:
Job Title: Clifton Road
Sub-title:
Calculation Heading:
Initials: CC
Checker:
Date Saved: 22-Feb-2020
Date Checked:
Notes:
File Name: CR_Rev01.xdd
File Path: C:\Users\sgk\lmb-BR

History

Date	Time	By	Notes
15-Feb-2020	08:43	gk i t e	New
15-Feb-2020	09:38	gk i t e	
22-Feb-2020	11:17	gk i t e	

Displacement Lines

Ref.	Name	x1	y1	z1	x2	y2	z2	Interval s	Surface type for tunnels	Interpol ate imported displacements	Calculate
		[m]	[m]	[m]	[m]	[m]	[m]	[No.]			
1	45-CR-1	50.00000	54.50000	100.00000	64.00000	54.10000	100.00000	10	Surface	Yes	Yes
2	45-CR-2	64.00000	54.10000	100.00000	63.50000	38.70000	100.00000	10	Surface	Yes	Yes
3	45-CR-3	63.50000	38.70000	100.00000	49.50000	39.20000	100.00000	10	Surface	Yes	Yes
4	45-CR-4	49.50000	39.20000	100.00000	50.00000	54.50000	100.00000	10	Surface	Yes	Yes
5	13-WR-1	16.00000	54.60000	100.00000	28.80000	54.60000	100.00000	10	Surface	Yes	Yes
6	13-WR-2	28.80000	54.60000	100.00000	28.80000	46.00000	100.00000	10	Surface	Yes	Yes
7	13-WR-3	28.80000	46.00000	100.00000	16.00000	46.00000	100.00000	10	Surface	Yes	Yes
8	13-WR-4	16.00000	46.00000	100.00000	16.00000	54.60000	100.00000	10	Surface	Yes	Yes
9	11-WR-1	16.00000	46.00000	100.00000	16.00000	37.10000	100.00000	10	Surface	Yes	Yes
10	11-WR-2	16.00000	37.10000	100.00000	28.80000	37.10000	100.00000	10	Surface	Yes	Yes
11	11-WR-3	28.80000	37.10000	100.00000	28.80000	46.00000	100.00000	10	Surface	Yes	Yes
12	11A-WR-1	28.80000	33.60000	100.00000	32.40000	33.60000	100.00000	10	Surface	Yes	Yes
13	11A-WR-2	32.40000	33.60000	100.00000	32.40000	41.40000	100.00000	10	Surface	Yes	Yes
14	11A-WR-3	32.40000	41.40000	100.00000	28.80000	41.40000	100.00000	10	Surface	Yes	Yes
15	9-42-CR-1	28.60000	21.90000	100.00000	48.60000	21.20000	100.00000	10	Surface	Yes	Yes
16	9-42-CR-2	48.60000	21.20000	100.00000	48.20000	12.20000	100.00000	10	Surface	Yes	Yes
17	9-42-CR-3	48.20000	12.20000	100.00000	28.30000	12.90000	100.00000	10	Surface	Yes	Yes
18	9-42-CR-4	28.30000	12.90000	100.00000	28.60000	21.90000	100.00000	10	Surface	Yes	Yes
19	11A-WR-4	28.80000	33.60000	100.00000	28.60000	41.40000	100.00000	10	Surface	Yes	Yes

Displacement Grids

Ref.	Name	Extrusion: Direction	Base line start: X	Base line start: Y	Base line start: Z(level)	Base line end: X	Base line end: Y	Base line end: Z(level)	Base line: Intervals	Extrusion: Distance	Extrusion: Intervals	Surface type for tunnels	Calculate
			[m]	[m]	[m]	[m]	[m]	[m]	[No.]	[m]	[No.]		
1	1	Global X	0.00000	0.00000	100.00000	-	80.00000	100.00000	80	80.00000	80	Surface	Yes

Polygonal Excavations

Ref.	1				Excavation							
Excavation Name:					100.00							
Surface level [m]:					Positive							
Contribution on:												
Corner	x	y	Base Level	Arc Enabled	Stiffened	Prev. Side: d	Prev. Side: p1	Prev. Side: p2*	Next Side: d	Next Side: p1	Next Side: p2*	
	[m]	[m]	[m]			[m]	[%]	[%]	[m]	[%]	[%]	
1	33.700	33.600	96.700	Yes	No	-	-	-	-	-	-	
2	46.200	34.200	96.700	Yes	No	-	-	-	-	-	-	
3	45.700	46.400	96.700	Yes	No	-	-	-	-	-	-	
4	33.700	45.900	96.700	Yes	No	-	-	-	-	-	-	
Side	x1	y1	x2	y2	G.M. Curve: Vertical				G.M. Curve: Horizontal			
	[m]	[m]	[m]	[m]								
1	33.700	33.600	46.200	34.200	Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(b))				Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(a))			
2	46.200	34.200	45.700	46.400	Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(b))				Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(a))			
3	45.700	46.400	33.700	45.900	Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(b))				Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(a))			
4	33.700	45.900	33.700	33.600	Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(b))				Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(a))			
Ref.	2				Installation							
Excavation Name:					100.00							
Surface level [m]:					Positive							
Contribution on:												
Corner	x	y	Base Level	Arc Enabled	Stiffened	Prev. Side: d	Prev. Side: p1	Prev. Side: p2*	Next Side: d	Next Side: p1	Next Side: p2*	
	[m]	[m]	[m]			[m]	[%]	[%]	[m]	[%]	[%]	
1	33.700	33.600	95.000	Yes	No	-	-	-	-	-	-	
2	46.200	34.200	95.000	Yes	No	-	-	-	-	-	-	
3	45.700	46.400	95.000	Yes	No	-	-	-	-	-	-	
4	33.700	45.900	95.000	Yes	No	-	-	-	-	-	-	
Side	x1	y1	x2	y2	G.M. Curve: Vertical				G.M. Curve: Horizontal			
	[m]	[m]	[m]	[m]								
1	33.700	33.600	46.200	34.200	Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(b))				Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(a))			
2	46.200	34.200	45.700	46.400	Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(b))				Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(a))			



Clifton Road

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Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked

Side	x1 [m]	y1 [m]	x2 [m]	y2 [m]	G. M. Curve: Vertical	G. M. Curve: Horizontal
3	45.700	46.400	33.700	45.900	Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(b))	Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(a))
4	33.700	45.900	33.700	33.600	Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(b))	Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(a))

Circular Excavations

Vertical Ground Movement Curves

Curve Name: Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(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: Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(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-3x⁴ + 2.8495E-2x³ - 1.0051E-1x² + 1.0569E-1x + 3.8990E-2
Coeff. of Determination: 9.9991E-1

Horizontal Ground Movement Curves

Curve Name: Inst. of contiguous bored pile wall in stiff clay (CI RIA C760 Fig. 6.8(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, 0.038] [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, 0.011] [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-3x³ + 1.9096E-2x² - 4.6221E-2x + 4.0729E-2
Coeff. of Determination: 1.0000

Curve Name: Exc. in front of high stiffness wall in stiff clay (CI RIA C760 Fig. 6.15(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

Damage Category Strains

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

Specific Buildings - Geometry

Ref.	Building Name	Sub-Building Name	Displacement Line	Distance Along Line: Start	Distance Along Line: End	Vertical Offsets from Line for Vertical Movement Calculations	Vertical Displacement Limit Sensitivity	Damage Category Strains	Poisson's Ratio	E/G
				[m]	[m]	[m]	[mm]			
1	45-CR1		45-CR-1	0.00000	14.00000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
2	45-CR2	Sub 2	45-CR-2	0.00000	15.40000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
3	45-CR3	Sub 3	45-CR-3	0.00000	14.00000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
4	45-CR4	Sub 4	45-CR-4	0.00000	15.00000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
5	13-WR1	Sub 5	13-WR-1	0.00000	12.60000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
6	13-WR2	Sub 6	13-WR-2	0.00000	8.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
7	13-WR3	Sub 7	13-WR-3	0.00000	12.60000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
8	13-WR4	Sub 8	13-WR-4	0.00000	8.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
9	11-WR1	Sub 9	11-WR-1	0.00000	8.80000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
10	11-WR2	Sub 10	11-WR-2	0.00000	12.60000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
11	11-WR3	Sub 11	11-WR-3	0.00000	8.80000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
12	11A-WR1	Sub 12	11A-WR-1	0.00000	3.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
13	11A-WR2	Sub 13	11A-WR-2	0.00000	7.70000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
14	11A-WR3	Sub 14	11A-WR-3	0.00000	3.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
15	9-42-CR1	Sub 15	9-42-CR-1	0.00000	19.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
16	9-42-CR2	Sub 16	9-42-CR-2	0.00000	8.90000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
17	9-42-CR3	Sub 17	9-42-CR-3	0.00000	19.50000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
18	9-42-CR4	Sub 18	9-42-CR-4	0.00000	8.90000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
19	11A-WR4	Sub 19	11A-WR-4	0.00000	7.70000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000

Specific Buildings - Bending Parameters

Ref.	Building Name	Sub-Building Name	Height	Default	Hogging: 2nd Mom	Hogging: Dist. of	Hogging: Dist. of	Sagging: 2nd Mom	Sagging: Dist. of	Sagging: Dist. of
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Clifton Road

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Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked

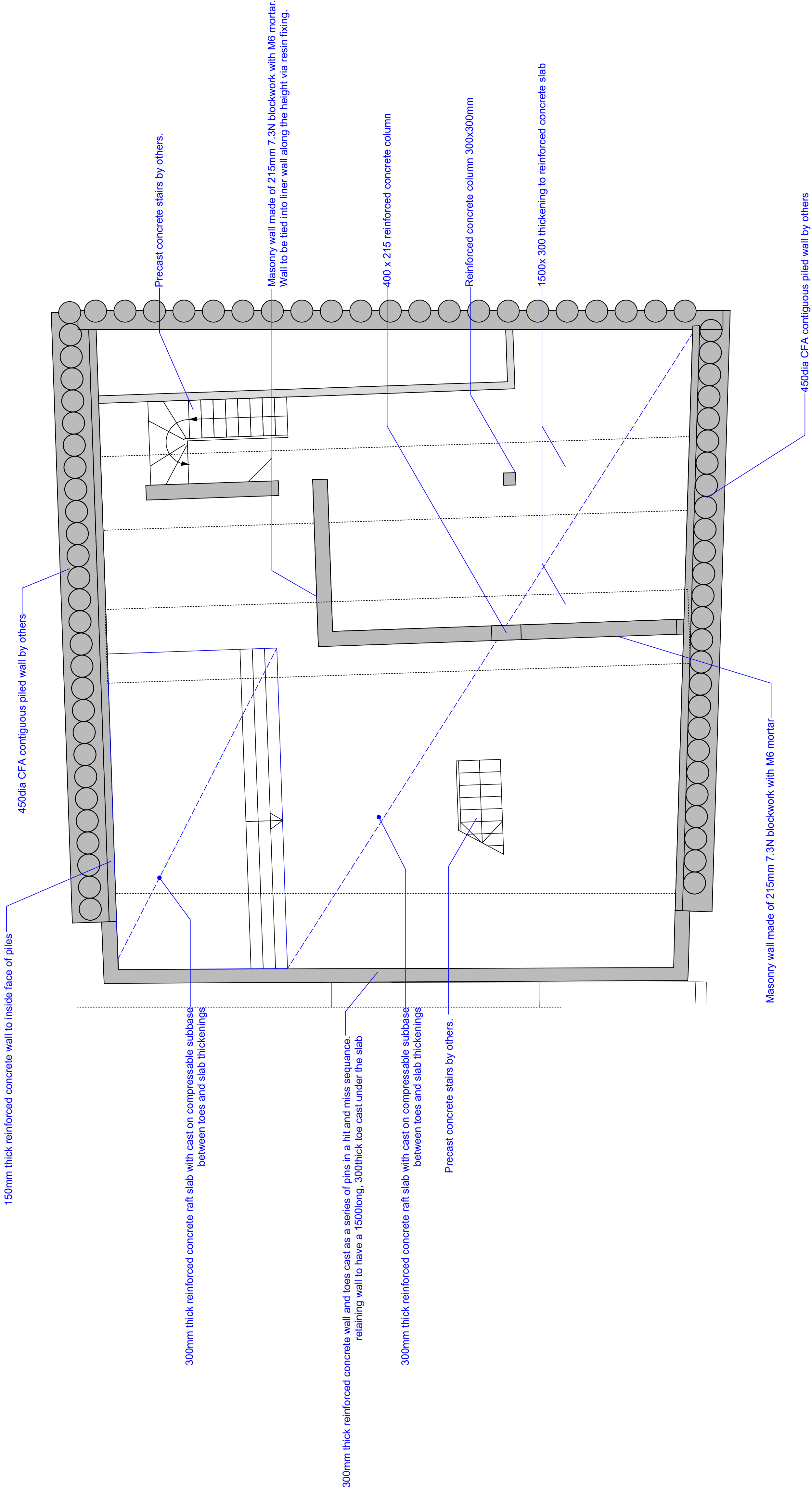
				of Area (per unit width)	Bending Strain from N. A.	N. A. from Edge of Beam in Tension	of Area (per unit width)	Bending Strain from N. A.	N. A. from Edge of Beam in Tension
		[m]		[m ²]	[m]	[m]	[m ²]	[m]	[m]
1 45- CR1		10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
2 45- CR2	Sub 2	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
3 45- CR3	Sub 3	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
4 45- CR4	Sub 4	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
5 13- WR1	Sub 5	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
6 13- WR2	Sub 6	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
7 13- WR3	Sub 7	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
8 13- WR4	Sub 8	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
9 11- WR1	Sub 9	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
10 11- WR2	Sub 10	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
11 11- WR3	Sub 11	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
12 11A- WR1	Sub 12	5.0000	Yes	41.667	5.0000	5.0000	10.417	2.5000	2.5000
13 11A- WR2	Sub 13	5.0000	Yes	41.667	5.0000	5.0000	10.417	2.5000	2.5000
14 11A- WR3	Sub 14	5.0000	Yes	41.667	5.0000	5.0000	10.417	2.5000	2.5000
15 9-42- CR1	Sub 15	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
16 9-42- CR2	Sub 16	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
17 9-42- CR3	Sub 17	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
18 9-42- CR4	Sub 18	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
19 11A- WR4	Sub 19	5.0000	Yes	41.667	5.0000	5.0000	10.417	2.5000	2.5000

Job No.	Sheet No.	Rev.
Drg. Ref.		
Made by CC	Date 22-Feb-2020	Checked

Specific Building Damage Results - Critical Segments within Each Building

Stage Ref.	Stage Name	Specific Building Ref.	Specific Building Name	Parameter	Critical Sub-Building	Critical Segment	Start [m]	End [m]	Curvature	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	M n Radius of Curvature (Hogging) [m]	M n Radius of Curvature (Sagging) [m]	Damage Category
0	Base Model	0	45- CR1	Max Slope		1	0.0	2.8011	Sagging	184.45E-6	0.50522	0.0027339	-	12116.0	0 (Negligible)
				Max Settlement		1	0.0	2.8011	Sagging	184.45E-6	0.50522	0.0027339	-	12116.0	0 (Negligible)
				Max Tensile Strain		1	0.0	2.8011	Sagging	184.45E-6	0.50522	0.0027339	-	12116.0	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	45- CR2	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	45- CR3	Max Slope	Sub 3	1	7.0045	11.677	Sagging	602.75E-6	2.2663	0.047433	-	8082.3	0 (Negligible)
				Max Settlement	Sub 3	2	11.677	14.000	Sagging	602.75E-6	3.5608	0.059532	-	13363.1	1 (Very Slight)
				Max Tensile Strain	Sub 3	2	11.677	14.000	Sagging	602.75E-6	3.5608	0.059532	-	13363.1	1 (Very Slight)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	45- CR4	Max Slope	Sub 4	1	0.0	12.659	Sagging	459.91E-6	3.5655	0.0037417	-	10704.0	0 (Negligible)
				Max Settlement	Sub 4	1	0.0	12.659	Sagging	459.91E-6	3.5655	0.0037417	-	10704.0	0 (Negligible)
				Max Tensile Strain	Sub 4	2	12.659	15.000	Sagging	459.91E-6	1.6348	0.015691	-	18633.0	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	13- VR1	Max Slope	Sub 5	1	11.520	12.600	Sagging	58.859E-6	0.19726	0.0019180	-	51966.0	0 (Negligible)
				Max Settlement	Sub 5	1	11.520	12.600	Sagging	58.859E-6	0.19726	0.0019180	-	51966.0	0 (Negligible)
				Max Tensile Strain	Sub 5	1	11.520	12.600	Sagging	58.859E-6	0.19726	0.0019180	-	51966.0	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	13- VR2	Max Slope	Sub 6	1	0.0	3.3087	Sagging	406.45E-6	1.4090	0.012770	-	19046.0	0 (Negligible)
				Max Settlement	Sub 6	2	3.3087	8.5000	Sagging	406.45E-6	2.8201	0.0052351	-	7860.0	0 (Negligible)
				Max Tensile Strain	Sub 6	1	0.0	3.3087	Sagging	406.45E-6	1.4090	0.012770	-	19046.0	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	13- VR3	Max Slope	Sub 7	1	0.0	5.1200	Sagging	604.62E-6	2.8264	0.049173	-	6906.8	0 (Negligible)
				Max Settlement	Sub 7	1	0.0	5.1200	Sagging	604.62E-6	2.8264	0.049173	-	6906.8	0 (Negligible)
				Max Tensile Strain	Sub 7	1	0.0	5.1200	Sagging	604.62E-6	2.8264	0.049173	-	6906.8	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	13- VR4	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	11- VR1	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	11- VR2	Max Slope	Sub 10	1	7.6800	12.600	Sagging	604.70E-6	2.7060	0.049401	-	6905.1	0 (Negligible)
				Max Settlement	Sub 10	1	7.6800	12.600	Sagging	604.70E-6	2.7060	0.049401	-	6905.1	0 (Negligible)
				Max Tensile Strain	Sub 10	1	7.6800	12.600	Sagging	604.70E-6	2.7060	0.049401	-	6905.1	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	11- VR3	Max Slope	Sub 11	2	6.2300	8.8000	Sagging	0.0	2.8270	331.70E-6	-	1.0062E+6	0 (Negligible)
				Max Settlement	Sub 11	1	0.0	6.2300	Sagging	0.0	2.8270	0.0	-	0	0 (Negligible)
				Max Tensile Strain	Sub 11	2	6.2300	8.8000	Sagging	0.0	2.8270	331.70E-6	-	1.0062E+6	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	11A- VR1	Max Slope	Sub 12	1	0.0	3.5000	Sagging	578.25E-6	3.9836	0.074081	-	2199.9	1 (Very Slight)
				Max Settlement	Sub 12	1	0.0	3.5000	Sagging	578.25E-6	3.9836	0.074081	-	2199.9	1 (Very Slight)
				Max Tensile Strain	Sub 12	1	0.0	3.5000	Sagging	578.25E-6	3.9836	0.074081	-	2199.9	1 (Very Slight)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	11A- VR2	Max Slope	Sub 13	1	0.0	7.7000	Sagging	0.0	3.9413	0.0	-	0	0 (Negligible)
				Max Settlement	Sub 13	1	0.0	7.7000	Sagging	0.0	3.9413	0.0	-	0	0 (Negligible)
				Max Tensile Strain	Sub 13	1	0.0	7.7000	Sagging	0.0	3.9413	0.0	-	0	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	11A- VR3	Max Slope	Sub 14	1	0.0	3.5000	Sagging	578.25E-6	3.9836	0.074909	-	2606.3	1 (Very Slight)
				Max Settlement	Sub 14	1	0.0	3.5000	Sagging	578.25E-6	3.9836	0.074909	-	2606.3	1 (Very Slight)
				Max Tensile Strain	Sub 14	1	0.0	3.5000	Sagging	578.25E-6	3.9836	0.074909	-	2606.3	1 (Very Slight)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
0		0	9- 42- CR1	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	9- 42- CR2	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	9- 42- CR3	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	9- 42- CR4	All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
				All vertical displacements are less than the limit sensitivity.											
0		0	11A- VR4	Max Slope	Sub 19	1	0.0	7.7000	Sagging	0.0	2.8270	0.0	-	0	0 (Negligible)
				Max Settlement	Sub 19	1	0.0	7.7000	Sagging	0.0	2.8270	0.0	-	0	0 (Negligible)
				Max Tensile Strain	Sub 19	1	0.0	7.7000	Sagging	0.0	2.8270	0.0	-	0	0 (Negligible)
				M n Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
				M n Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-

General Notes:
1. This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and specifications. Discrepancies between the drawing and specifications shall be resolved by the Engineer on site to the engineer prior to commencement of works.
2. Concrete to be GC35, steel to be S275, unless otherwise specified.
3. All steelwork to be painted with zinc phosphate primer prior to installation of frame.
4. All necessary temporary propping to existing structure shall be provided by the contractor.
5. All new sections of new masonry to be joined to existing masonry by resin fixing.
6. All new sections of new masonry to be joined to existing masonry by resin fixing.
7. All new sections of new masonry to be joined to existing masonry by resin fixing.
8. New sections of new masonry to be joined to existing masonry by resin fixing.
9. Where elements of structure are specified by third parties, all responsibility and liability for said elements shall remain with the third party.
10. Brick ties in cavity wall construction to architects specification.
11. All steel work to be made with steel grade S275 unless notified otherwise.

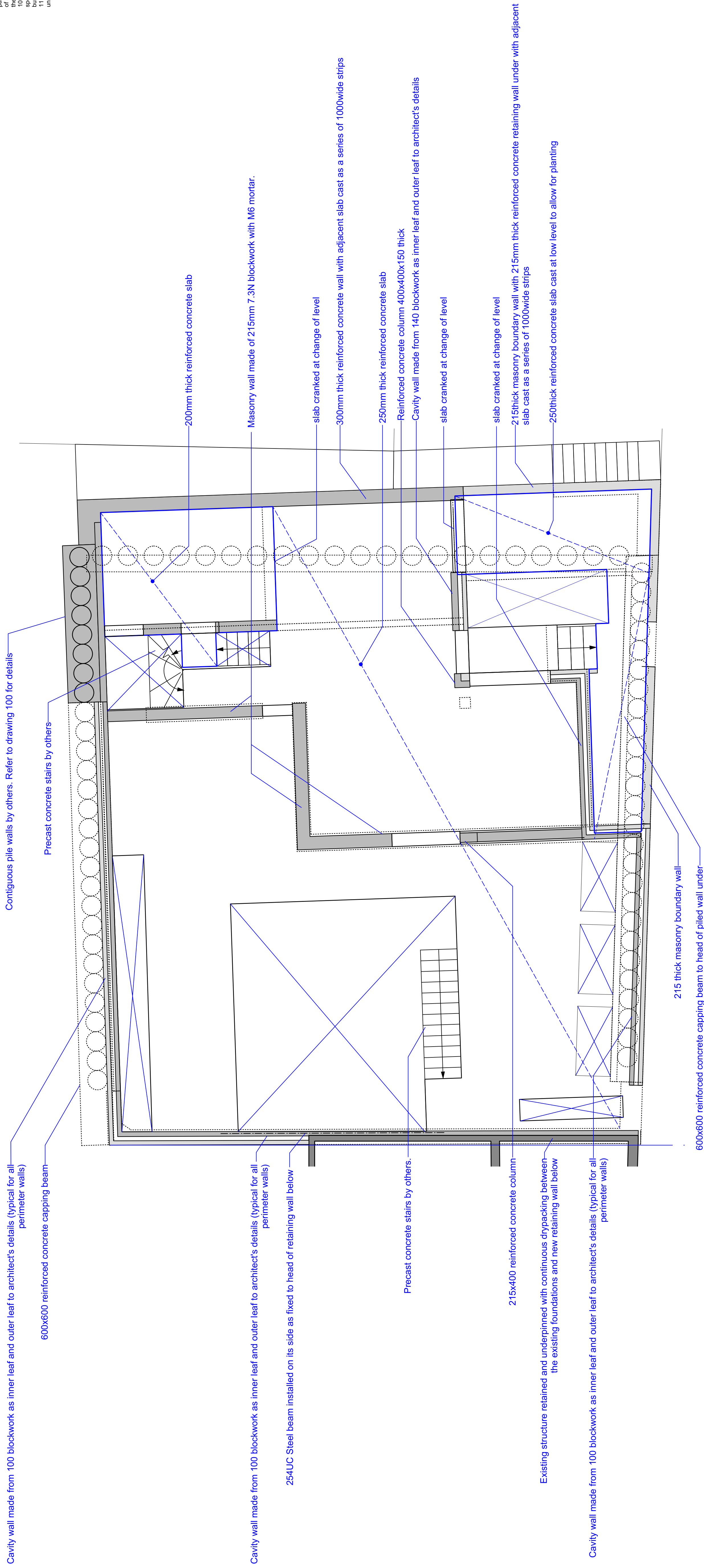


100.1 STRUCTURAL BASEMENT FLOOR PLAN AS PROPOSED

KEY

- existing building fabric
- new load bearing structure, refer to annotations
- demolition
- new non loadbearing partitions, refer to architect's drawings

General Notes:	Do not scale from this drawing. Coordinate all work with the City of Chicago Department of Public Works and all relevant Engineers and Architects drawings and specifications. Report any discrepancies between this drawing and the specifications to the Engineer. On site to the Engineer prior to commencement of work. Concrete to be RC30 where denoted by a "C" and reinforced concrete and FIN20 where described as reinforced concrete. Use a minimum 4" formwork to slabs unless otherwise noted. All steel beams to be painted with zinc phosphate primer. All necessary temporary propping to existing structure is the sole responsibility of the contractor. Excavation to be done in accordance with the existing contract and founded on virgin subsoil. 8 new sections of new masonry to be joined to existing masonry. Existing steel wall starters unless notified otherwise. Where elements of structure are specified by third parties, the Engineer shall be responsible for the specification of structure being the third parties that specified them. Use a quality wall construction to achieve the specification and in accordance with the relevant building regulations. Use a minimum 100mm thick wall grade S275 unless notified otherwise.
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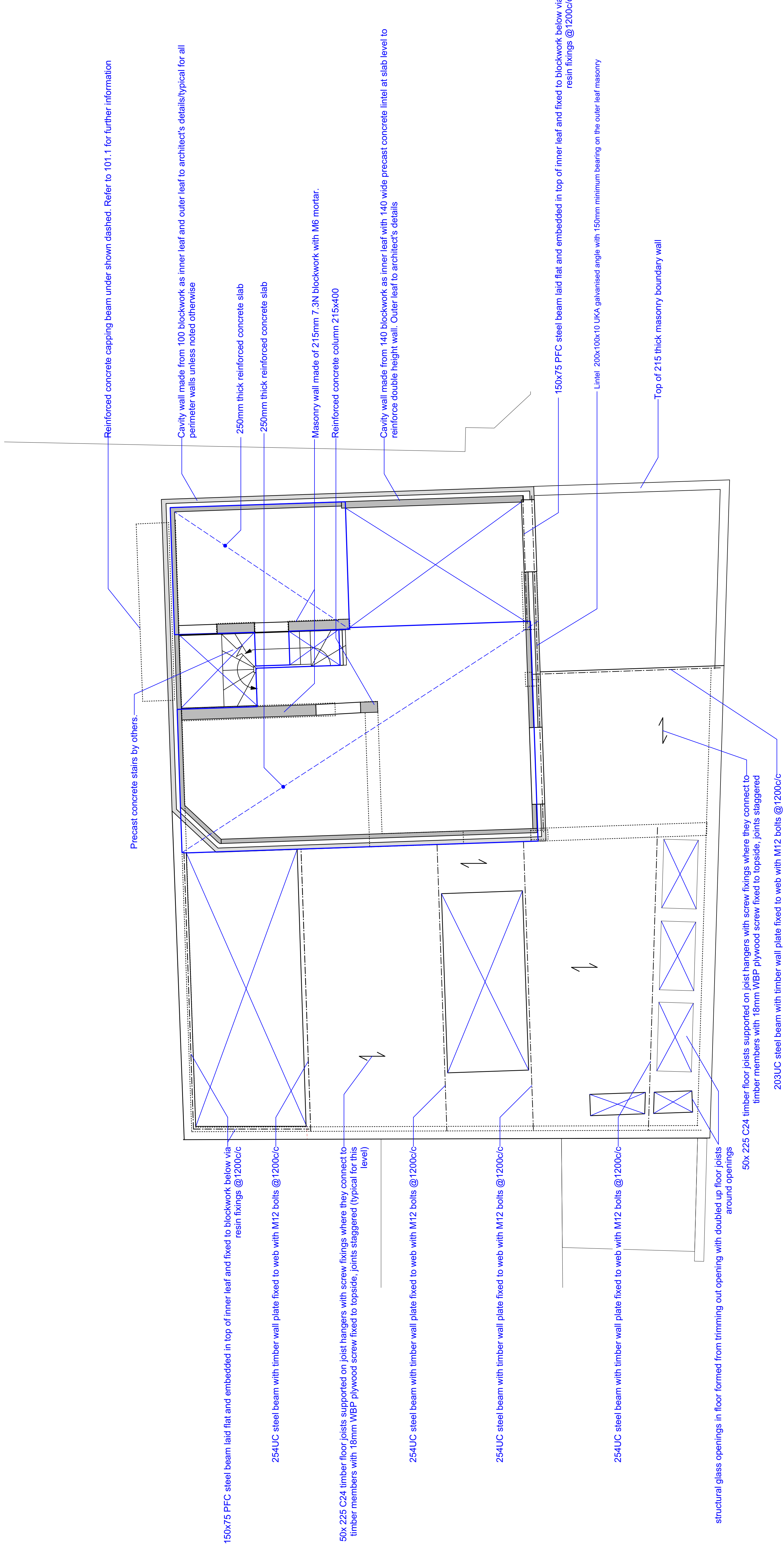
101.1 STRUCTURAL LOWER GROUND FLOOR PLAN AS PROPOSED

KEY

- existing building fabric
- new load bearing structure, refer to annotations
- demolition
- new non loadbearing partitions, refer to architect's drawings

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102.1 STRUCTURAL UPPER GROUND FLOOR PLAN AS PROPOSED

KEY

- existing building fabric
- new load bearing structure. refer to annotations
- demolition
- new non loadbearing partitions. refer to architect's drawings

200x100x10 galvanised steel lintel to outer leaf with 150 minimum bearing on supports

2no. 50x225 C24 trimmer joists with 18mm WBP plywood screwfixed to topside

50x2x25mm C24 timber joists @400c/c with 18mm WBP plywood screwed to topside supported on joists
hangers with screw fixings, where joists meet external masonry walls, last joist at each end of run resin
fixed to adjacent wall via M12 resin anchors @1200c/c. Timber wall plates at each support point resin
fixed to walls via M12 bolts @600c/c

cavity wall construction under with catnic lintels over openings

103.2 STRUCTURAL ROOF PLAN AS PROPOSED

50x200, C24, timber joists @400c/c with 18mm WBP plywood screwed to topside supported on joists. Timber wall plates @1200c/c. Timber wall plates at each support point resin fixed to adjacent wall via M12 resin anchors @1200c/c. Timber wall plates @600c/c fixed to walls via M12 bolts @600c/c

Precast concrete stairs by others

Masonry wall made of 140mm 7.3N blockwork with M6 mortar.

Cavity wall made from 100 blockwork as inner leaf and outer leaf to architect's details/typical for all perimeter walls.

Masonry wall made of 140mm 7.3N blockwork with M6 mortar.

200x100x10 galvanised steel lintel to outer leaf with 150 minimum bearing on supports

KEY

- | | |
|---|---|
|  | existing building fabric |
|  | new load bearing structure, refer to annotations |
|  | demolition |
|  | new non loadbearing partitions, refer to architect's drawings |

103.1 STRUCTURAL FIRST FLOOR PLAN AS PROPOSED

Project	11 WOLESLEY ROAD N8 8JA	Drawing No.	A527 103	Revision	-
Drawing Title	structural first floor and roof plan	Drawing Date	06/03/2020	Scale	1:100
Status	Stage 1	Project No.	A527	Drawn	AD
CAD Ref.	A527 proposed	Drawn	AD	Check	AD

* Design and Planning Act 1999 has been considered.
 © Design and Planning Act 1999 has been considered.

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