Basement Impact Assessment
4 Murray Mews NW1 9RJ

Geotechnical Interpretative Report and Ground Movement Assessment

March 2023

MAUND GEO-CONSULTING

Produced for:
Croft Structural Engineers Ltd

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Report Title	Basement Impact Assessment	Site Address	4 Murray Mews NW1 9RJ
Work Stage	Geotechnical Interpretative Report and Ground Movement Assessment	Report Date	March 2023
Brief Description of the Report Contents	Geotechnical interpretation of the ground and groundwater conditions, to provide a ground movement assessment, as part of a Basement Impact Assessment for 4 Murray Mews.		

Document Control Sheet

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Distribution

Organisation	Contact
Croft Structural Engineers	V. Dubagunta

Contents

1 Non-Technical Summary

A basement impact assessment (BIA) has been undertaken for hydrogeology and land stability in general accordance with CPG Basements (2021) for the site at 4 Murray Mews, NW1 9RJ, in the London Borough of Camden.

The proposed building is located on an undeveloped site. The proposed basement will occupy an area of approximately 160 m^2. The site is adjacent to a railway in cutting supported by a retaining wall with a height of about 7m.

The BIA report considered relevant information from existing sources included in the 'Guidance for subterranean development' produced for the London Borough of Camden' (November 2010), historical maps and BGS records.

A ground investigation at the site was undertaken by Herts and Essex Site investigation Ltd in March 2007 (including 3 St Augustine's Rd) and May 2022 which in total comprised 9 boreholes and two hand dug trial pits. The boreholes were drilled up to 20.0 m below ground level (bgl). The investigation included geotechnical and contamination sampling and testing. The ground investigation confirmed the ground conditions as a layer of Made Ground of gravelly composition to a depth of approximately 0.8m which overlies firm to still slightly sandy flint gravelly clay which in turn overlies firm to very stiff silty clay of the London Clay Formation. Groundwater was not encountered during the ground investigation to a depth of 20.0 bgl. Subsequent monitoring indicated no groundwater in an installation to 7.00m bgl (approx. 28.0m AOD).

An assessment of hydrogeology has shown that the strata underlying site is considered non-productive strata of very low permeability and is not designated as an aquifer within Environment Agency (EA) guidelines. The proposed basement will have a negligible impact on groundwater flow.

An assessment of land stability has been made from the excavation and construction of the basement. It has been calculated that heave in the centre of the basement is not expected to exceed 15 mm resulting from the excavation and construction. The building will be supported by a piled foundation with piles end bearing at least 3m below the railway level.

The maximum damage category for the adjacent properties of 6 Murray Mews has been calculated to be Category 1 (very slight damage). The assessment has also indicated a potential movement of 1.8 mm vertical and 4.8mm horizontal for the footway of Murray Mews. A sewer at a depth of about 3m in the centre of Murray Mews highway will not be impacted by ground movement.

A vertical ground movement of 5.75mm from heave has been calculated at the interface with the railway retaining wall. An appropriate monitoring regime should be adopted and maintained throughout construction to manage risk and potential damage to the neighbouring structures as construction progresses onsite.

2 Introduction

2.1 Terms of Reference

Maund Geo-Consulting Ltd (MGC) was instructed on 09/09/22 by Croft Structural Engineers Ltd (Croft) to undertake a Basement Impact Assessment (BIA) for land stability, hydrogeology and ground movement assessment for the site at 4 Murray Mews.

2.2 Terms and Conditions

This report has been prepared for Croft in consideration of the proposed development of the site. The geotechnical information relates to the site only and should not be used in a different context without reference to MGC.

MGC has used reasonable skill, care and diligence in the investigation, calculations and design recommendations for the project. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths at the time of the investigation. At intermediate locations, conditions can only be inferred. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

2.3 Scope and Objective

The scope and objective of the report is as follows:

- An assessment of land stability and hydrogeological risks associated with the proposed development
- An assessment of the ground conditions at the site and derivation of geotechnical parameters to be used in a ground movement assessment (GMA).
- Modelling of the ground movement in relation to the imposed loads from the proposed development in general accordance with CIRIA C760,
- Determination of the Burland Damage Assessment Category

2.4 Author

This report has been prepared by Dr Julian Maund, director of Maund Geo Consulting Ltd, who is a chartered engineer and chartered geologist with over 35 years' experience. Dr Maund is a UK and Ireland Registered Ground Engineering Adviser and a member of the Association of Geotechnical Specialists.

2.5 Sources of Information

Background information has been derived from the ground investigation report by Hertfordshire and Essex Site Investigation Ltd (HESI) and sources of published information.

The list of information sources is shown below in Table 1.1:

Table 1.1 Information type and sources

Information Type	Source
Geological mapping	BGS/ GSD*
Hydrogeological data	BGS / EA / GSD
Ground and groundwater conditions	Geotechnical Factual Reports 4 Murray Mews, HESI CSG/7769 20/03/07 and DAH/17433 10/06/22
Historical Mapping	National Highways GDMS
Environmental designations	Groundsure / EA
Structural Drawings	Croft Structural Engineers
Pre app Scheme Drawings	tasou associates October 2021

* Guidance for Subterranean Development for LBC - Arup 2010

Relevant scheme drawings are included in Appendix A. Historical maps are included in Appendix C.

3 Information on the Site

3.1 Location

4 Murray Mews is situated within the London Borough of Camden. The ground level is approximately 35.00 m AOD at the front of the property. Top of railway retaining wall is indicated as 36.87m on Drawing 1116/PP01. Ground levels are indicated in Layout plan 1 in Appendix A.

3.2 Description

The site is currently undeveloped with open ground as indicated in Figure 3.1, with a shed locaated in the south east corner of the site. The site is bound to the north east by a 3 to 4 storey property (6 Murray Mews), to the south east by a 4 to 5 storey residential appartment building (3 St. Augustine's Rd),to the south west by a railway line in cutting supported by retaining walls linking to a tunnel below Murray Mews, with the site facing on to Murray Mews to the northwest. The level difference between the site ground level and the railway is approximately 7m at 28.0m.

Figure 3.1 View of site Google Earth (2022).

The existing ground level is at approximately 35.12 to 34.48m. The lower groundfloor surface is at approximately 33.53m. The assumed excavation depth for the foundation is at 33.20m. The dimension have been obtained from Section B (1116/PP07) included in Appendix A. These dimension have formed the basis for the ground movment assessment.

3.3 Present use

An undeveloped site.

3.4 Proposed development

The proposed development is understood to comprise a 4-storey house. One of the storeys is a lower ground floor / partial basement. The lower ground floor extends to approximately 1.5 to 1.7m below existing ground level. The proposed building has a 3m easement from the railway retaining wall which is to form a garden area at the same level as the lower ground floor at approximately 33.53m. Drawings by tasou associates to show the proposed development which are included in Appendix A.

3.5 Geology

Geological information obtained from http://mapapps.bgs.ac.uk/geologyofbritain3d/ British Geological Survey (BGS) mapping at 1 50 000 scale shows the site to be directly underlain by the London Clay Formation (LFC), which comprises a predominantly silty clay formed during the Tertiary period.

3.6 Natural Hazards

The assessment of natural hazards is summarised in Table 3.1.

Table 3.1 Natural Hazards

Natural Hazard	Risk (Stated by BGS)	Comment
Shrink-Swell	Moderate	The site is underlain by the London Clay Formation (LFC) which comprises plasticity clays. This material has potential shrink swell properties.
Running Sand	Very Low	Not applicable to the site geology
Compressible Ground	Negligible	Clay soil of the LCF is subject to consolidation from additional imposed loads, which are limited by appropriate foundation design
Collapsible deposits	Very Low	Not applicable to the site geology
Landslide	Very Low	Not applicable to the site geology/topography
Soluble Rock	Negligible	Not applicable to the site geology
Radon	<1%	No Radon protection measures are necessary

3.7 Hydrogeology/groundwater

The property is located on the bedrock geology of the LCF which is classified as an 'unproductive stratum' which is effectively impermeable. The site does not lie within a ground water protection zone.

3.8 Surface Water and Flood risk

The site is located in Flood Zone 1, an area with a low probability of flooding from rivers. The Environment Agency indicate there is a very low to low risk of surface water flooding at the subject property as indicated in Figure 3.2. The ground surface of the site is understood to a concrete hard standing associated with the former garages, with a gravel surface elsewhere.

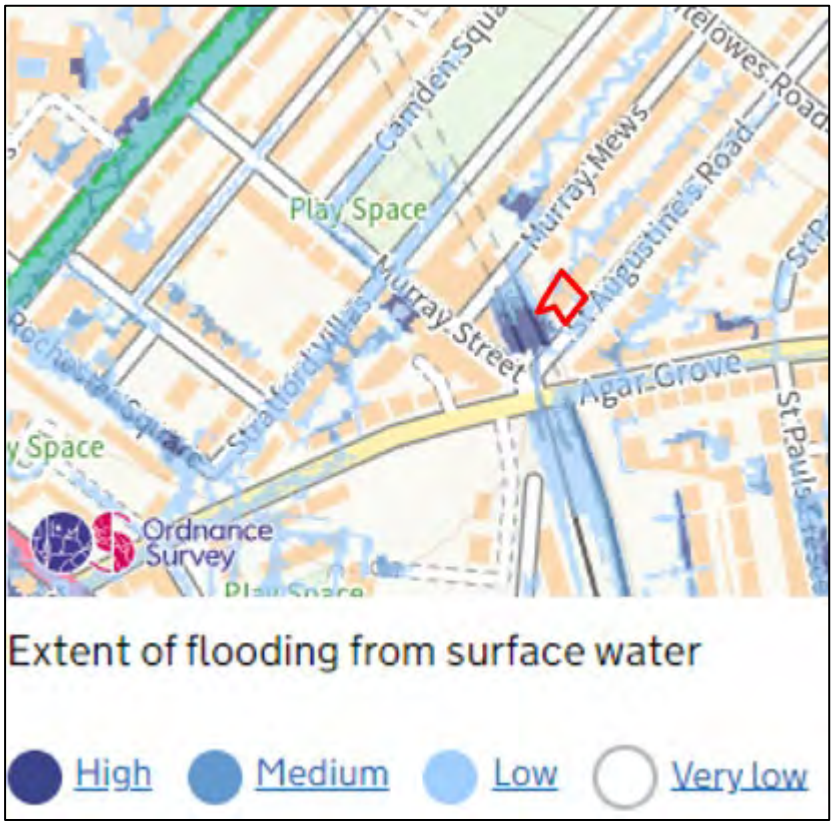
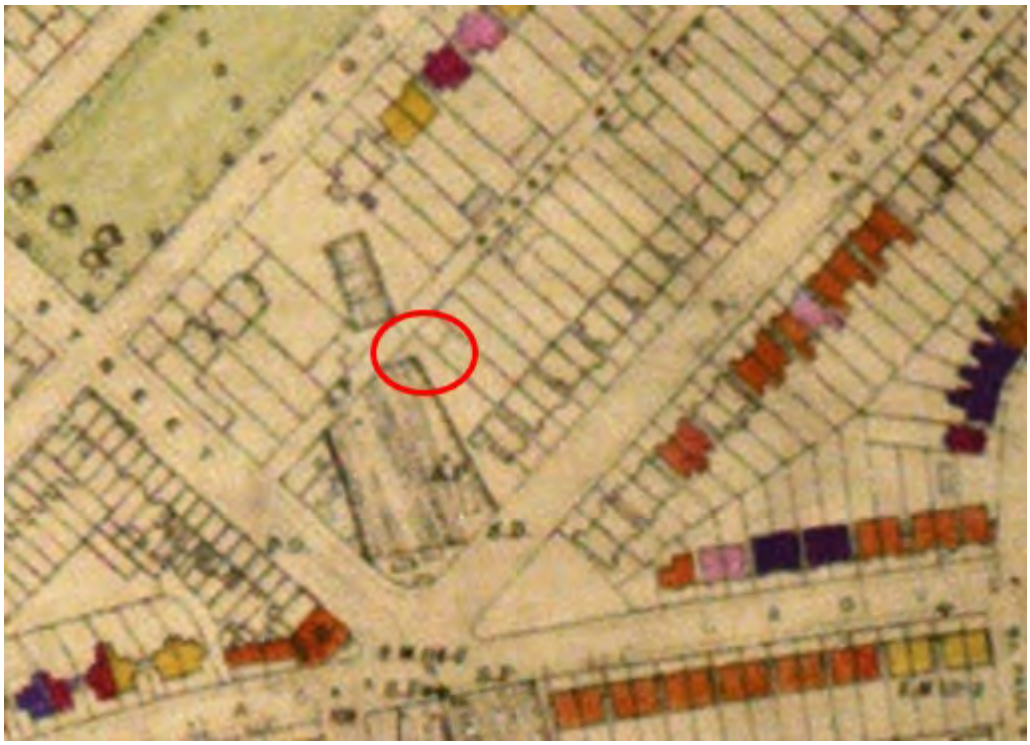


Figure 3.2 Extent of flooding from surface water

3.9 Site History

The review of mapping from 1895 indicate the site has never been developed with a permanent building. The railway and the road of Murray Mews was present from at least the 1895 mapping. The 1985 map indicates the presence of a possible row of garages/sheds against the boundary with 6 Murray Mews, which were no longer apparent in a Google Earth Image of 1999. The adjacent site at 3 St Augustine's Rd was developed in 2016. Selected maps at mostly 1:1,250 scale are included in Appendix C.

A review of LCC Bomb damage maps 1939 to 1945 show the property or the immediate neighbourhood was not affected by bombing.



Key:
Black Total Destruction
Purple: Damage beyond repair
Dark red: Seriously damaged – repair doubtful
Light red: Seriously damaged – repairable at cost
Orange: General blast damage – not structural
Yellow: Blast damage – minor in nature

Figure 3.3 Bomb locations from WWII

3.10 Underground Utilities

A search for underground utilities has been undertaken by Croft. A gas pie is located on the north (far) side of Murray Mews. A water supply pipe is present in the centre of Murray Mews. A sewer runs below the easement parallel to the railway. The invert level of the sewer is 26.07m AOD below the railway at approximately 28.0 m AOD. Due to the depth of the sewer at approximately 9m bgl it is assumed the sewer was formed by tunnelling methods. No other underground utilities have been identified in the vicinity of the site. Underground utilities asset drawings are included in Appendix D.

4 Ground Investigation

A ground investigation was undertaken by HESI in 2007 for both geotechnical and contaminated land purposes. A further borehole was added in 2022 with a groundwater monitoring installation. The factual information of the exploratory hole record and laboratory testing results are included in a factual report in Appendix B. At the time of the 2007 investigation the site included 3 St Augustine's Rd as well as 4 Murrays Mews. For completeness the whole ground investigation scope is included below

The site investigation comprised:

- 2 No. Cable percussive boreholes to 20.0m bgl
- 7 No. Window sampler borehole to 1.0 to 7.0 m bgl.
- 1 No groundwater monitoring installation to 7.0m bgl
- Undisturbed soil samples were obtained from the exploratory holes for laboratory geotechnical testing and further examination.
- 2 No. Trial pits to 0.5 to 0.9 m bgl

The location of the exploratory hole is shown in Figure 4.1.

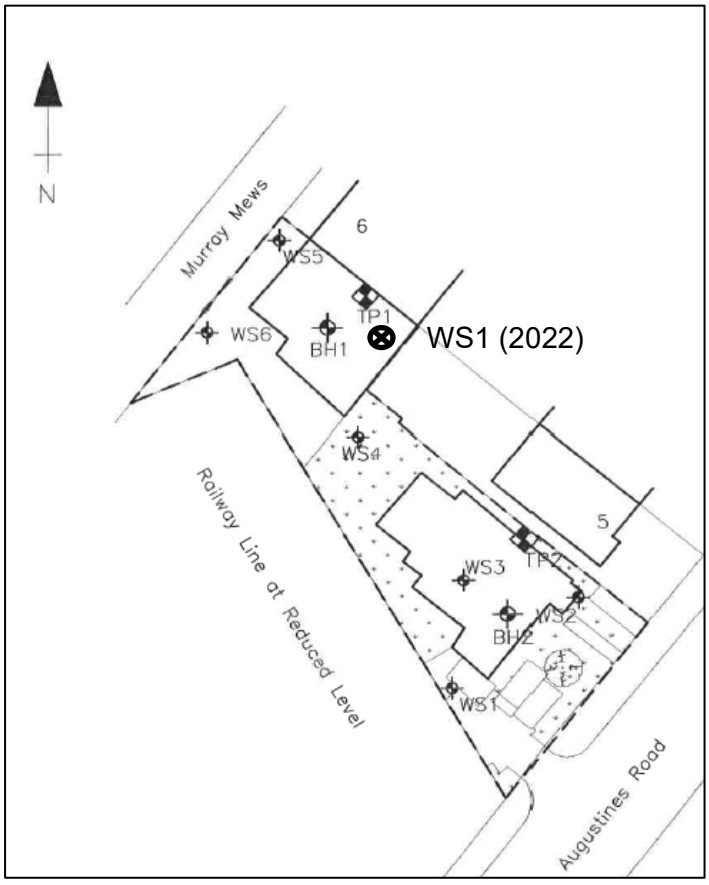


Figure 4.1 Exploratory Hole Locations

4.1 Laboratory Testing

Laboratory tests to determine the geotechnical and contaminative properties of the soil were undertaken by HESI in 2007. The tests are indicated in Table 4.1.

Table 4.1 Laboratory Testing

Test type	No. of tests	Test Method
Moisture Content	22	BS1377:1990
Plasticity Index - 1 point Liquid Limit	7	BS1377:1990
Undrained unconsolidated triaxial tests	15	BS1377:1990
pH, and water-soluble sulphate,	5	BRE SD1
Standard Spectrum Suite: Asbestos Screen & ID , pH, TOC, Total Sulphate, Sulphide, Monohydric Phenols, Total Cyanide, W/S Boron, As, Cr, Cu, Pb, Se, Zn, Cd, Hg, Ni, Speciated PAH, TPH1 & TPH CWG	7	MCERTS

The laboratory test reports are included in Appendix B.

4.2 Groundwater Monitoring

During the drilling of BH01 in 2007 to a depth of 20.00 m bgl the borehole was dry. The groundwater level was monitored in the 2022 borehole installation on completion of drilling on 24/05/22. On completion of drilling the borehole was dry to 7.0m. A groundwater monitoring installation was installed to 7.00m. The results of the monitoring shown in Table 4.2 indicate the borehole is dry to a depth of at least 7.0m below ground level.

Table 4.2 Groundwater Monitoring

Date of Monitoring	Groundwater (depth metres below ground level)
-/03/07	Borehole dry to base of boreholes at 20.00m bgl
24/05/22	Borehole WS1 dry to base of borehole at 7.00 m bgl
31/05/22	Borehole WS1 dry to base of installation at 7.00 m bgl

During the 2007 investigation boreholes to a depth of 20m bgl were also dry.

5 Ground Conditions

5.1 Stratigraphy

The ground conditions encountered are summarised in Table 5.1 below. For a full description refer to the exploratory records in Appendix B.

Table 5.1 Summary of ground conditions

Stratum	Description	Depth at top of Strata (mbgl)	Approx. level (m AOD)	Thickness of Stratum (m)	Cu Values kPa
Made Ground	Loose dark brown sandy topsoil fill with brick fragments and flint gravel	0	35.0	0.5 to 0.8	n/a
Possible Made Ground	Firm to stiff brown slightly sandy CLAY with much flint gravel	0.5 to 0.8	34.2 to 34.5	0.8 to 2.4	135
London Clay Formation	Stiff to very stiff brown silty CLAY Becoming grey at 9.7m	1.6 to 2.9	33.4 to 32.1	16.6 (proven)	79 to 150

5.2 Groundwater

Groundwater was not reported during drilling to a depth of 7.0m on 24/05/22. Subsequent monitoring on the 31/05/22 indicated no groundwater to the depth of the groundwater monitoring installation at 7.00m. The previous investigation in 2007 did not strike water to a depth of 20 m bgl.

5.3 Consideration of the individual stratum, with reference to the basement.

The anticipated level of the basement excavation will be approximately 2.2m below existing ground level at circa 33.0 m AOD. The base if the excavation will be in either stiff sandy clay with much flint gravel which may be made ground, or stiff London Clay Formation. It is considered that the clay with flints may represent an infill behind the railway retaining wall from a temporary cutting during its construction.

An overall ground model is illustrated in the conceptual model in Section 8.2 below.

Possible Made Ground

The possible made ground comprises natural materials of a stiff flint gravelly sandy clay was encountered to 1.6 to 2.9 m bgl in BH1. Based on an SPTN of 30 an E' of 30 MPa is assumed (CIRIA 143 1995) for purposes of settlement/heave modelling.

5.3.1 London Clay Formation (LCF))

The LCF is soft becoming stiff brown to mottled grey, silty clay. The SPT N values show a gradual increase from 6 at 1.00 m depth to 17 at 5.00m. The LCF is likely to extend to a greater depth as a very stiff over consolidated clay. The SPT N plot is shown n Figure 5.1

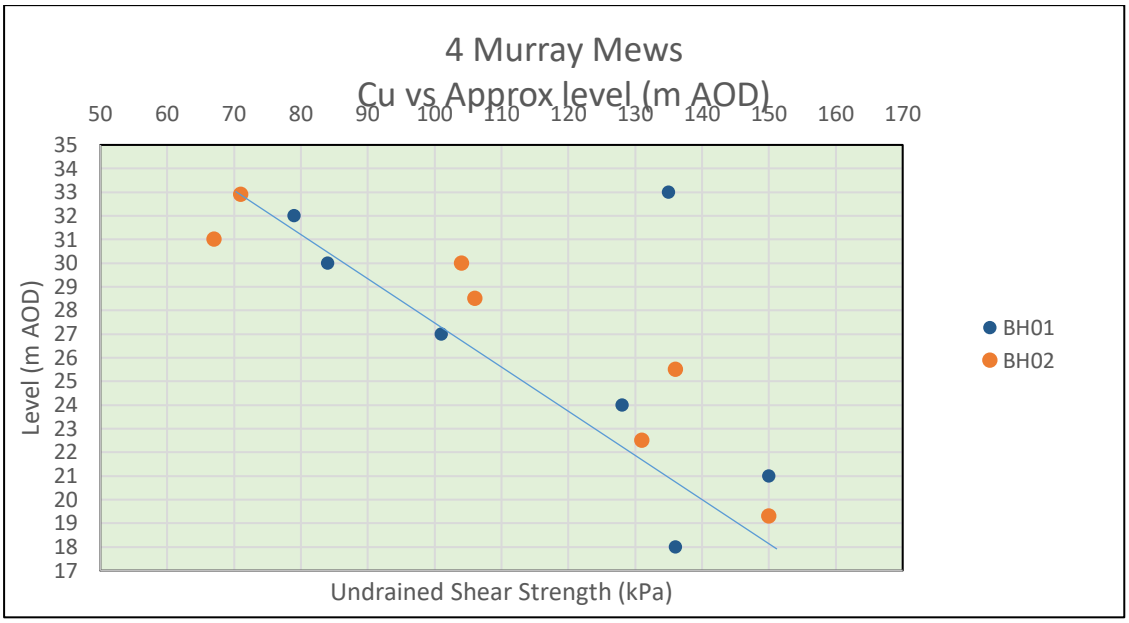


Figure 5.1 SPT N value against depth

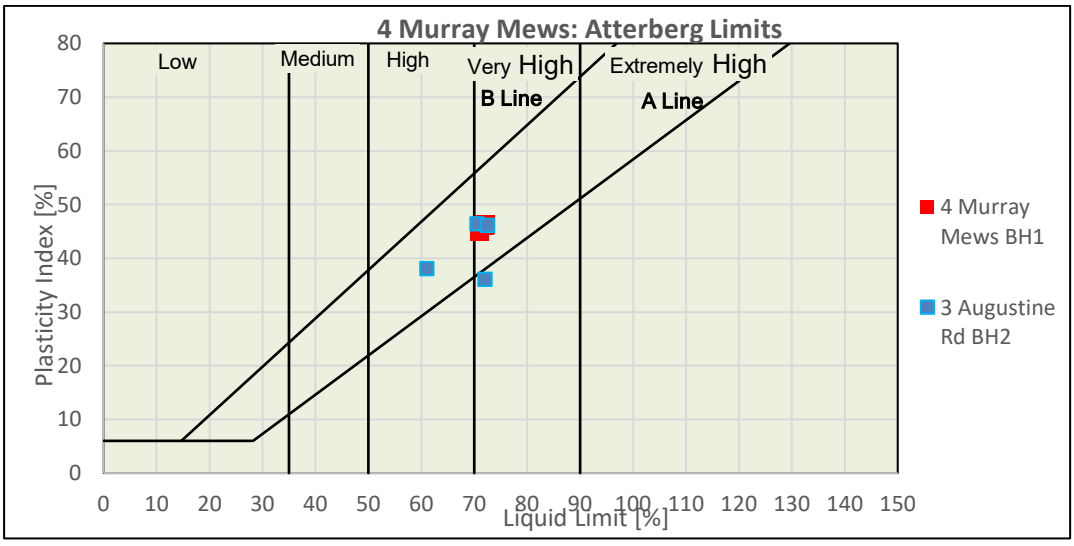


Figure 5.2 Atterberg Chart Ulysses

Seven Atterberg Limit tests showed a mean plasticity index of 43% and a mean liquid limit of 70%, indicating a clay of high plasticity, characteristic of the LCF as shown in Figure 5.2. Triaxial testing indicates an undrained shear strength (c_u) is extrapolated to range from 70 kPa at 2.00m to 150 kPa at 19.00m. C_u = 5z+70, where z is depth in metres.

The deformation moduli (E_u and E') of the LCF has been cautiously estimated from the relationship between undrained cohesion for an axial strain of 0.1% and plasticity of the LCF where E_u is based on a PI of 43% and an OCR >4 giving an E_u/C_u ~ 400 (after Jamiolkowski et al. 1979). and E' is 0.75 Eu after Burland, Standing J.R., and Jardine F.M. (eds.) (2001). Poisson Ratio is taken as v_u = 0.5 undrained and v' = 0.2 drained.

As there is a clear linear relationship of C_u with depth, the corresponding E_u / E' is assessed to increase linearly with depth from ~28/21 MPa at the interface with made ground at 2.0m bgl to 60/45 MPa at 19.00 m AOD. These parameters have been used for purposes of settlement / heave modelling in Section 6.

The characteristic values of geotechnical parameters are a cautious estimate based on the data obtained from the ground investigation (Appendix B) have been summarised in Table 5.2 as follows:

Table 5.2 Geotechnical Design Parameters

	Design Level	Class	Undrained Cohesion	Effective angle of shearing resistance	Bulk unit weight	Deformation Modulus $E_{u\ (E')}$	K_a	K_p
Strata	**m bgl**		**Cu (kPa)**	**MPa**	**kN/m^3**	**MPa**		
Possible made ground	35.0		135	21**	20**	40 (30)	0.49	2.3
London Clay Formation	33.0	CH	5z+70	21**	20**	28+2.3z*** (21+1.8z)*	0.49	2.3

Notes:
* Burland, Standing J.R., and Jardine F.M. (eds.) (2001)
**BS8004 2015
***E_u is based on 400 C_u. (Jamiolkowski et al. 1979). E' based on 0.75E_u. (Burland, Standing J.R., and Jardine F.M. (eds.) 2001).
Active and Passive pressure coefficients k_a and k_p from BS EN 1997-1 Annex C
The parameters in Table 4.2 are unfactored (Serviceability Limit State) and considered to be 'a cautious estimate'.
Groundwater is assumed to be at >7.0 m bgl or <28.0 m AOD.

6 Geotechnical Assessment of Ground Conditions

6.1 Introduction

The information obtained from the ground investigation on the soil conditions in relation to the proposed basement construction has been assessed for impacts on existing building structures. The principal impacts are ground movements from the installation and excavation for the basement. These movements are vertical and horizontal movements of the foundation formation level from isostatic readjustment from the excavation and possible vertical and horizontal impacts of existing structures from the basement wall construction.

6.2 Presumed Bearing Resistance

The foundation formation level of the basement will be at approximately 33 m AOD or about 2.0 m below ground level. At the formation level an undrained shear strength of the soil has been evaluated as 70 kPa, giving an allowable bearing pressure of at least 140 kPa. However, the proposed foundation will be piled foundations to take the load of the structure to below the railway retaining wall. Assuming a pile length of at least 10m the pile toe will be at approximately 23m AOD where an undrained shear strength of at least 120 kPa is anticipated. To avoid any lateral pressure from the piled foundations on the railway retaining wall consideration will have to be given to minimise skin friction on piles within influencing distance of the retaining wall during the detailed design.

The underpin load with 6 Murray Mews has a dead load of 55.5 kN/m and a live load of 15.8 kN/m (Croft Drawing SL-03 in Appendix A) The load acting over an underpin with a width of 0.6m giving a pressure of 119 kPa, within the allowable bearing pressure. Other load bearing walls will be supported by ground beams and piled foundations, as indicated in Croft drawings (Appendix A).

6.3 Effect of Heave from soil excavation

Assuming an existing ground level of 35.00m AOD, the proposed basement will require the excavation from the exiting ground levels of approximately 35 to 34.5m AOD to the basement level of 33 mAOD. Based on a unit weight of the soil (γ_k) to be removed as 20 kN/m^3 giving an overall negative load of 30 to 40 kPa.

Dimensions of the excavation is based on the Drawings included Appendix A.

The ground model is based on the ground conditions assessment in Section 5. The effects of short term un-drained and long term drained conditions have been considered cumulatively, which is a conservative assessment as a worst case. The long and cross sections in Figures 6.1 and 6.2 have been drawing to intersect the greatest movement contours from the PDisp plot.

The heave has been evaluated using Pdisp version 20.12, which shows a maximum heave of up to – 6.7 mm[1] under short term undrained conditions as shown in Figures 6.1, 6.3 and 6.4 below. Long term drained conditions are shown in Figure 6.2 where up to 7.5 mm heave in the centre of the site reducing to insignificant settlement at the boundary with 6 Murray Mews.

As can be seen from Figures 6.3 and 6.4 the short-term displacement becomes less than 4 mm heave at the boundary with 6 Murray Mews, 3.5mm with boundary with 3 St Augustine's boundary, less than 1mm at 3 St. Augustine house and 1.25mm with the railway retaining wall.

Similarly, long term movements reduce range from 0mm settlement at 6 Murray Mews, 2.5mm heave at 3 St Augustine's boundary and 0.75mm heave at railway retaining wall respectively (Figure 6.5 and 6.5). The combined movements are discussed further in Section 10 and 11.

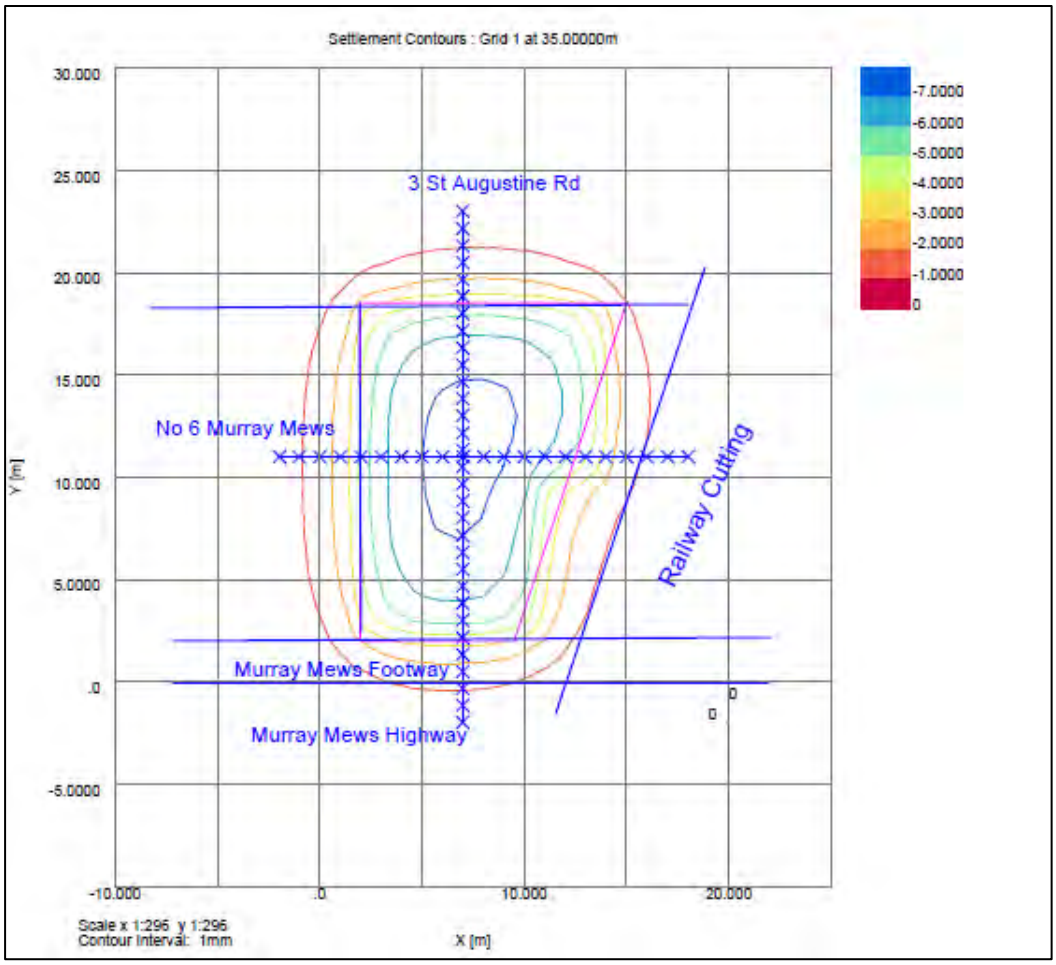


Figure 6.1 Heave- short term undrained condition

[1] Note that heave is stated as a negative number in PDisp, but is a positive number in the Ground Movement Assessment in Section 9

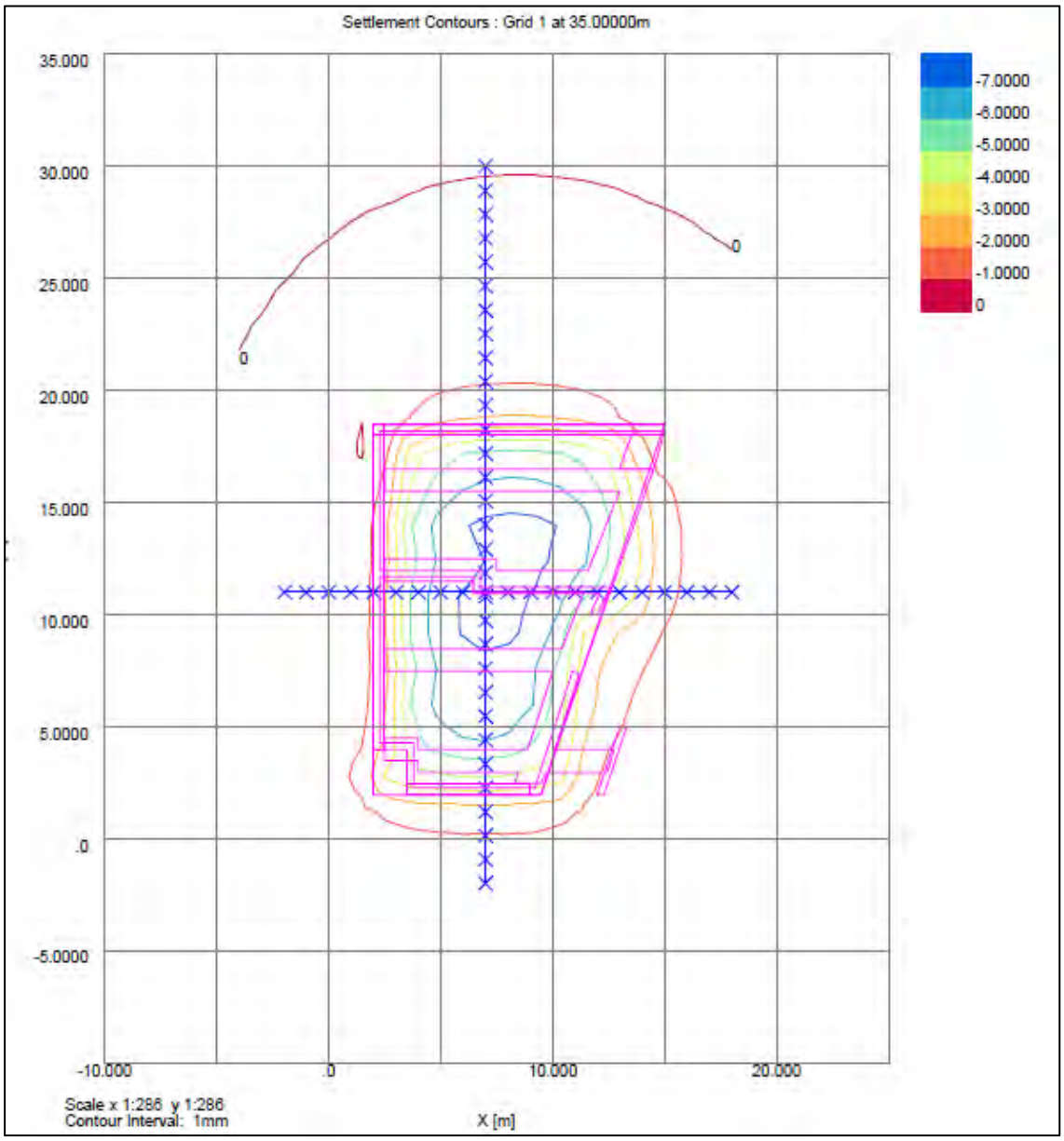


Figure 6.2 Heave- long term drained condition

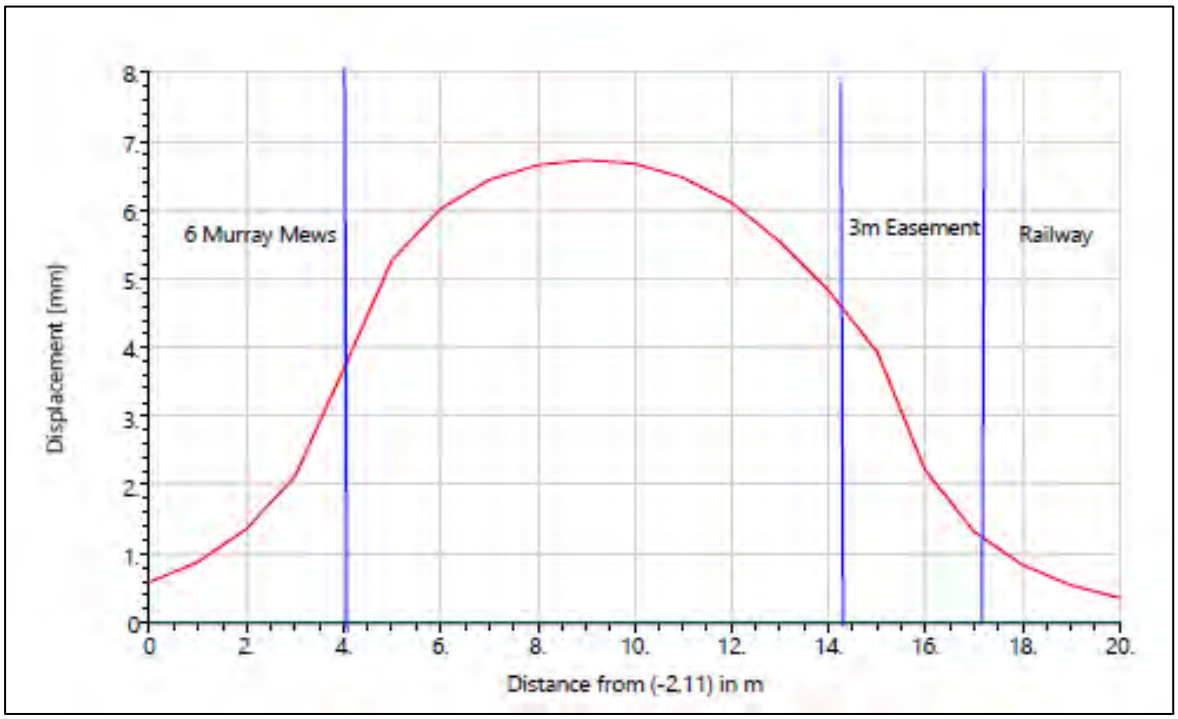


Figure 6.3 Heave- short term undrained condition in excavation- Section 1-1'

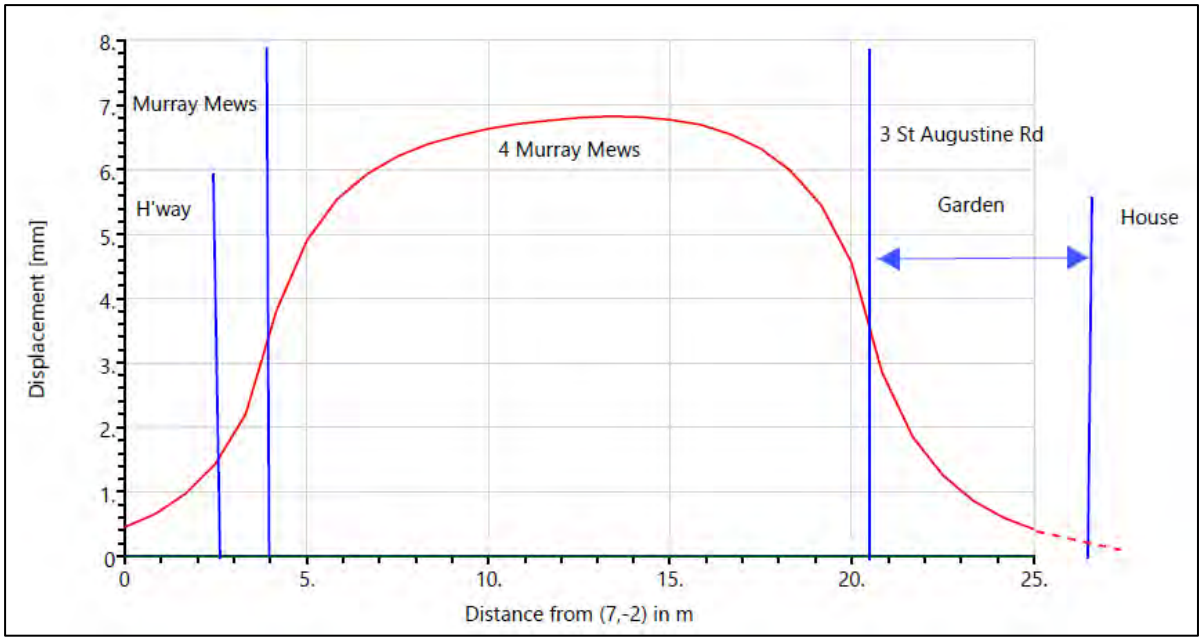


Figure 6.4 Heave- short term undrained condition in excavation- Section 2-2'

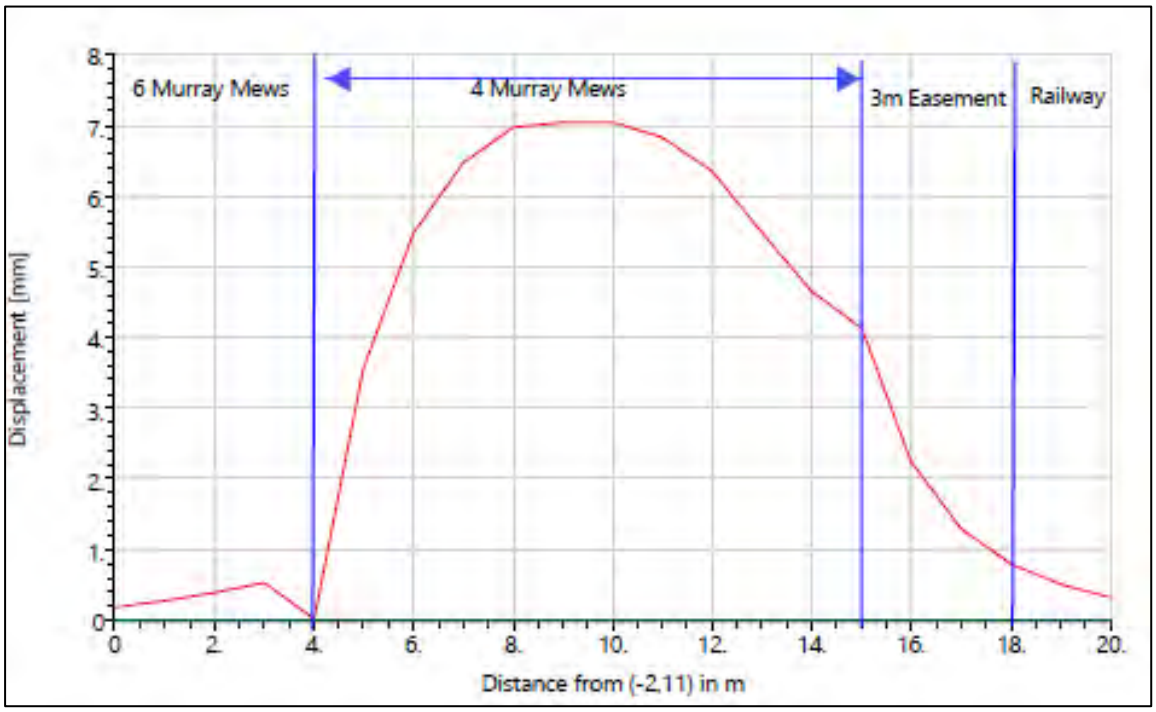


Figure 6.5 Heave- long term drained condition- Section 1-1'

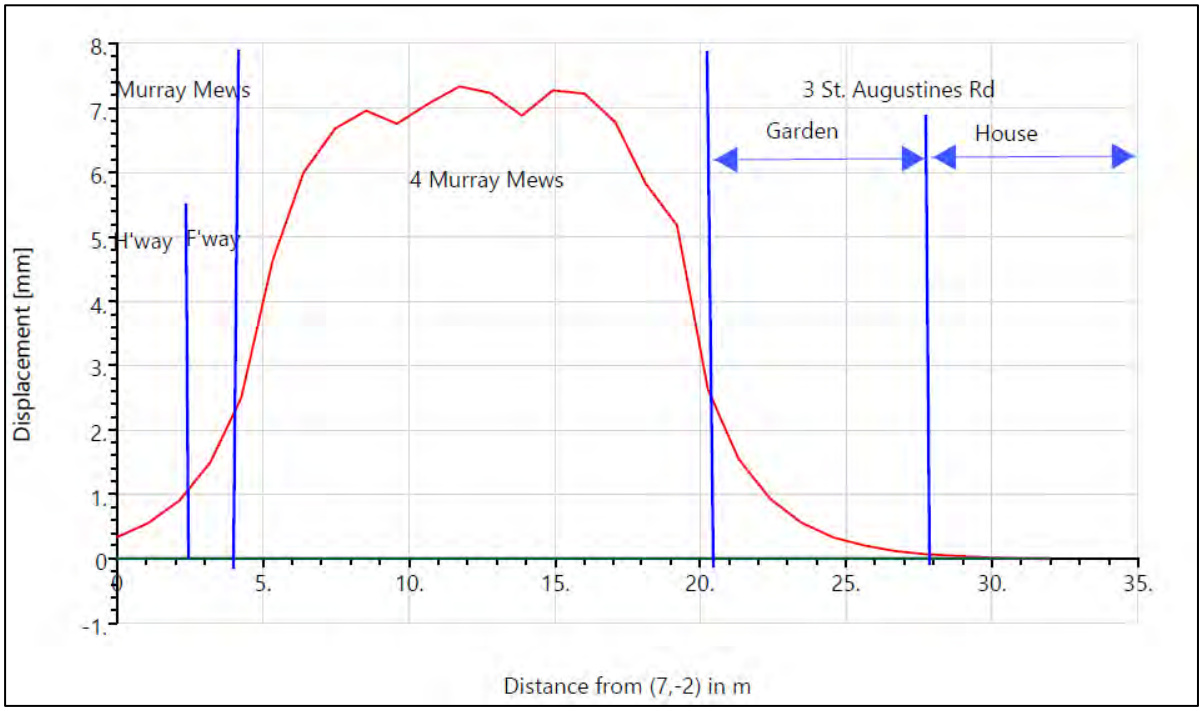


Figure 6.6 Heave- long term drained condition- Section 2-2'

6.4 Sub –surface Concrete

The results of lab testing for sulphate and pH are summarised below in Table 6.1. The full analysis is included in Appendix D.

Table 6.1 Sulphate and pH categories

Sample depth	Soil Type	Total Sulphate as S04	Sulphate S04 2:1 extract	pH	Sulphate Class (DS)	ACEC Class
0.5	Made ground	720 mg/kg	0.017 g/l	8.4	DS-1	AC1s
1.0	London Clay Formation	320 mg/kg	0.017 g/l	7.7	DS-1	AC1s

It is recommended that an overall design sulphate class of DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) class of AC1s is adopted for the basement slab and underpinning.

7 Screening

7.1 Introduction

Screening is undertaken as outlined in Section 6.2 of the GSD recommendations. It identifies if there are hydrogeological and land stability issues associated with the proposed development that requires detailed analysis and investigation. If there are no significant issues identified in the screening stage, then further stages are not required. The report follows the flow charts set out in CPG 4 (2018) and makes reference to the GSD.

7.2 Subterranean (Groundwater) flow

This section answers questions in Figure 1 of CPG4:

The source of information for the assessment of subterranean flow is from the GSD and along with the ground investigation undertaken at 4 Murray Mews in 2007 and 2022 (Appendix B).

Table 7.1: Responses to Figure 1, CPG4

Question	Response	Action required
1a. Is the site located directly above an aquifer?	No. The site is underlain by the London Clay Formation. This is considered an unproductive stratum.	None
1b. Will the proposed basement extend beneath the water table surface?	Groundwater was not struck during investigation to 20m bgl. Post investigation monitoring indicated groundwater was not encountered to a depth of at least 7.00m (approximately 28.00m AOD). A railway runs in cutting at a level of 28m AOD adjacent to the site.	None
2. Is the site within 100m of a watercourse, well, or potential spring line?	No. There are no known wells or spring-lines within 100 m of the site[b,c].	None

Question	Response	Action required
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No. The site is not within the catchment of the ponds [b]	None
4. Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	Yes The build will be constructed on undeveloped land but on the London Clay Formation, therefore the impact on groundwater will be negligible	None
5. As part of site drainage, will more surface water than at present be discharged to ground (e.g., via soakaways and/or SUDS)?	No soakaway drainage will not be suitable for the site	None. Due to the geology of the London Clay Formation close to ground level, soakaway drainage will not be suitable
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring lines?	No. There are no recorded local ponds or spring lines within 250 m of the site	None

a. Camden Geological, Hydrogeological, and Hydrological Study, Arup, 2010. (Fig. 8).
b. Camden Geological, Hydrogeological, and Hydrological Study, Arup, 2010. (Fig. 11).
c. Camden Geological, Hydrogeological, and Hydrological Study, Arup, 2010. (Fig. 14).

In summary, the site is located on the London Clay Formation. Post investigation monitoring of 1 No. boreholes drilled at the site to a depth of 7.0 m bgl indicated that groundwater was not encountered to a depth of at least 5.0 m below the basement excavation level of 33 m AOD .

7.3 Slope / Land Stability

This section answers questions posed by Figure 2 in CPG4.

Table 7.2: Responses to Figure 2, CPG4

Question	Response	Action required
1. Does the site include slopes, natural or man-made, greater than about 1 in 8?	No. The site is essentially level at approximately 34.5 to 35m AOD	None
2. Will the proposed re-profiling of the landscaping at site change slopes at the property boundary to greater than about	No.	None
3. Does the development neighbour's land including railway cuttings and the like with a slope greater than about 1 in 8?	Yes. The southwest boundary of the site has a retaining wall supporting a railway cutting. The railway is at 28 m AOD approximately 6.5m below the site ground level	Assess impact of ground movement from the development on the railway retaining walls.
4. Is the site within a wider hillside setting in which the general slope is greater than about 1 in 8?	No.	None
5. Is the London Clay the shallowest stratum on site?	No. A layer of made ground (0.5 to 0.8m) and possible made ground, comprising sandy clay with flint gravel (up to 2.4m thick).	Determine heave and ground movement from the excavation of the sandy clay with gravel and London Clay and construction of basement walls.
6. 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?	No trees will be felled.	None

Question	Response	Action required
7. Is there a history of shrink/swell subsidence in the local area and/or evidence of such at the site.	No records.	None
8. Is the site within 100 m of a watercourse or a potential spring line?	No [a,b].	None
9. Is the site within an area of previously worked ground?	Possibly A layer of made ground (0.5 to 0.8m) and possible made ground, comprising sandy clay with flint gravel (up to 2.4m thick).	Determine heave and ground movement from the excavation of the sandy clay with gravel and London Clay and construction of basement walls.
10. Is the site within an aquifer?	No. The site is underlain by the London Clay. This is considered an unproductive stratum in EA classifications.	None
11. Is the site within 50m of the Hampstead Heath Ponds?	No.	None
12. Is the site within 5 m of a highway or pedestrian right of way?	Yes The basement lightwell will be about 0.5 m from the pedestrian walkway and about 1.8 m from the highway.	Assess the ground movement from the basement construction on the pedestrian walkway.

Question	Response	Action required
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes. No. 6 Murray Mews does not have a basement. However, the building loads will be supported on piled foundations, end bearing below the railway embankment	A ground movement assessment will be undertaken to assess impact (Burland Damage Assessment) as a precaution
14. Is the site over (or within the exclusion zone of) any tunnels?	No.	None.

a. Camden Geological, Hydrogeological, and Hydrological Study, Arup, 2010. (Fig. 8).
b. Camden Geological, Hydrogeological, and Hydrological Study, Arup, 2010. (Fig. 11).
c. Camden Geological, Hydrogeological, and Hydrological Study, Arup, 2010. (Fig. 14).
d. Groundsure Report (Appendix C) September 2016

In summary, the proposed basement is located on level ground and will be founded within the London Clay Formation, which is present from 0.8 m depth below the site surface. A cutting for a railway supported by a 6.5m retaining wall is present on the southwest boundary of the site which has a 3m easement from the boundary to the proposed development.

8 Scoping

8.1 Introduction

This section considers the output from the screening survey where further actions are required. It considers the scope of information required in addressing these actions and what the potential impacts are of the basement construction. The existing ground conditions and the location of the basement can be summarised in a conceptual site model as indicated in Figure 8.1.

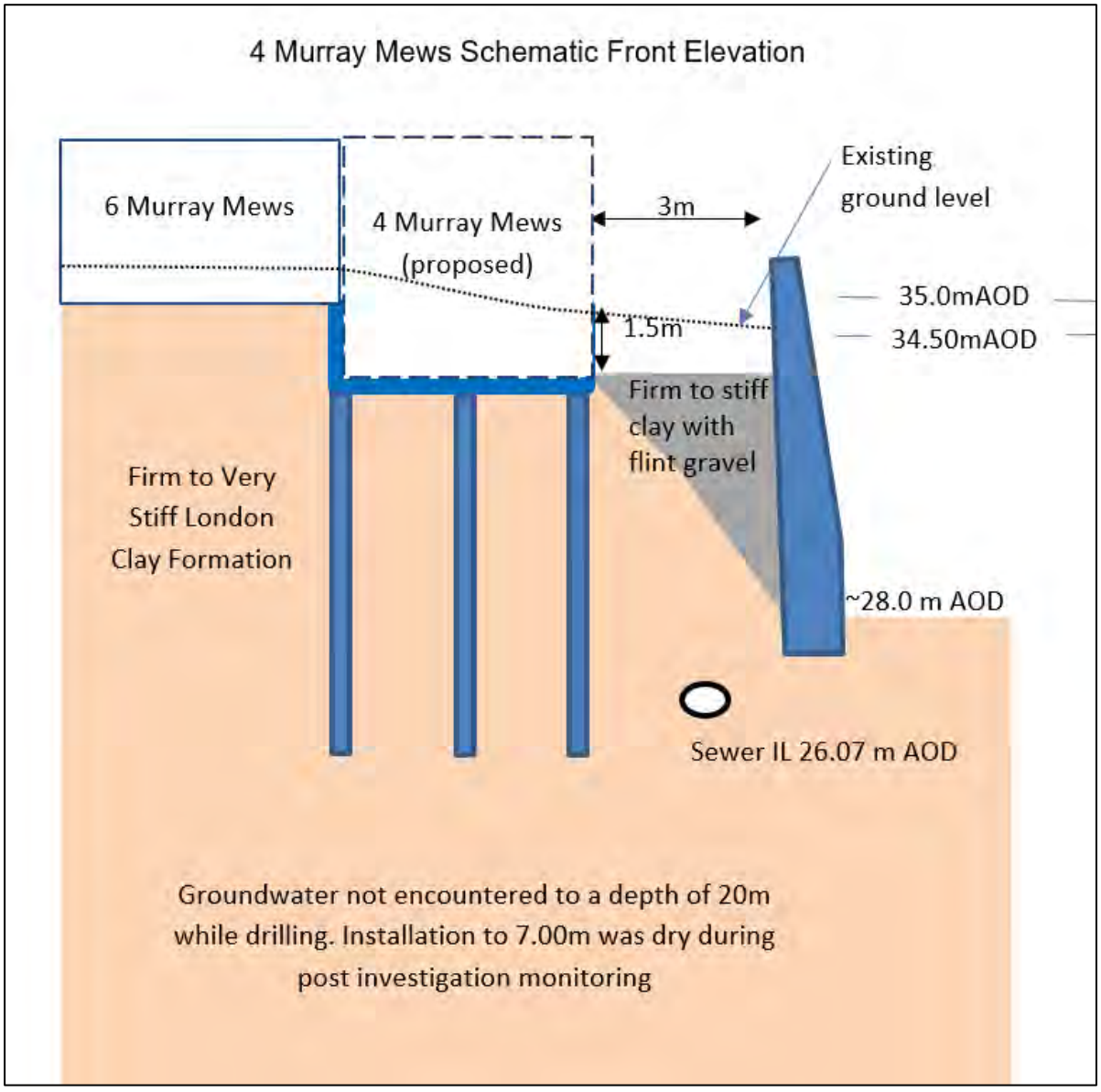


Figure 8.1 Conceptual Site Model (Not to scale)

There is no requirement for groundwater mitigation measures for groundwater due to the depth of groundwater, as summarised in Table 8.1 taken from Table 7.1

Table 8.1 Summary of Scoping Requirements - Hydrogeology

Screening questions of concern - Hydrogeology	Potential Impact	Mitigation
None	None	None

The land stability issue relates to the ground movements resulting from the excavation within the London Clay Formation which will be addressed by a ground movement analysis as summarised in Table 8.2 taken from Table 7.2

Table 8.2 Summary of Scoping Requirements – Land Stability

Screening questions of concern - Land Stability	Potential Impact	Mitigation
3. Does the development neighbour's land including railway cuttings and the like with a slope greater than about 1 in 8?	Yes. The southwest boundary of the site has a retaining wall supporting a railway cutting. The railway is at 28 m AOD approximately 7.0m below the site ground level.	Assess impact of ground movement from the development on the railway retaining walls.
5. Is the London Clay the shallowest stratum on site?	No. A layer of made ground (0.5 to 0.8m) and possible made ground, comprising sandy clay with flint gravel (up to 2.4m thick).	Determine heave and ground movement from the excavation of the sandy clay with gravel and London Clay and construction of basement walls.
9. Is the site within an area of previously worked ground?	Possibly A layer of made ground (0.5 to 0.8m) and possible made ground, comprising sandy clay with flint gravel (up to 2.4m thick).	Determine heave and ground movement from the excavation of the sandy clay with gravel and London Clay and construction of basement walls.

Screening questions of concern - Land Stability	Potential Impact	Mitigation
12. Is the site within 5 m of a highway or pedestrian right of way?	Yes The basement lightwell will be about 0.5m m from the pedestrian walkway and ~1.8 m from the highway.	Assess the ground movement from the basement construction on the pedestrian walkway and highway.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes. No. 6 Murray Mews does not have a basement. However, the building loads will be supported on piled foundations, end bearing below the railway embankment.	A ground movement assessment will be undertaken to assess impact (Burland Damage Assessment) as a precaution

9 Impact Assessment

9.1 Groundwater

9.1.1 Groundwater level

The screening process has shown from borehole information that groundwater was not encountered to a depth of at least 7.0m bgl approximately 28.0m AOD.

While the investigation indicates that groundwater will not be encountered during the basement construction it is proposed that any localised seepages, should they occur, be dealt with sump pumps in the low permeability London Clay Formation, and this is included in the Basement Method Statement.

9.2 Land Stability

The screening process has identified four issues which require an impact assessment listed below from Table 8.2

- Presence of slightly sandy clay with gravel and London Clay (excepting a thin layer of granular made ground of < 0.8m),
- Proximity to a railway cutting supported by a retaining wall,
- Proximity to the highway and
- Proximity of an adjacent structure with differential depth of foundations.

9.2.1 Presence of the London Clay Formation at the surface

The ground investigation indicates that the soil comprises a firm to stiff slightly sandy clay with flint gravel overlying the firm to very stiff London Clay Formation (LCF). The plasticity of the clay with gravel and SPT profile appears similar to the LCF therefore for purposes of ground movement no distinction is made and both deposits are treated as a cohesive material. The material can be readily excavated using conventional plant appropriate for the access constraints imposed by the location of the property. Groundwater is not anticipated to be encountered, based on monitoring records from the site investigation for the full depth of the excavation, although allowance for seepage is recommended.

The impact of the excavation on ground heave has been assessed in Section 6 of this report, which concludes that total heave within the centre of the plot will be less than 15mm, which is considered within normal construction tolerance. For evaluation of all ground movements both short term during excavation and long term after construction it was considered necessary to undertake a Ground Movement Assessment, which is included in Section 10 of this report.

The ground movement assessment evaluates ground movement in relation to neighbouring properties No. 6 Murray Mews, No. 3 St Augustine's, the railway and the footway/highway.

9.2.2 Stability of Temporary Excavations

It is proposed that the basement retaining walls will be constructed using a hit and miss technique, with temporary propping supporting the excavation, which is set out in the Drawings included in Appendix A.

9.2.3 Groundwater Control

As discussed in Section 9.1.1 groundwater is not anticipated to affect the construction works. If localised seepages are encountered of groundwater that is likely to impact the works, groundwater could be controlled by pumping. Discharge of the groundwater could be made to the sewer subject to an agreement at detailed design stage from the local water company in terms of water quality, flow rate and quantity.

9.2.4 Monitoring of groundwater and ground movements

Groundwater levels if present should be monitored before the works as a precaution. Monitoring of adjacent structures and the highway should be carried out before, during and after construction.

10 Ground Movement Assessment

10.1 Introduction

This section provides an assessment of ground movement that may result from the construction of the basement and to determine how these may affect the adjacent building structures, the highway, and the subject property. The ground movements may arise from the excavation and subsequent loading of the ground. Particular attention is focused on the party wall with No. 6 Murray Mews, as well as other structures, highway and railway located in the vicinity of No. 4 Murray Mews.

The proposed construction sequence for the basement is summarised in the Drawings by Croft included in Appendix A.

The assessment of ground movements is based on guidance provided by CIRIA C760, although it is acknowledged this does not include underpins. The ground conditions of the site are essentially the London Clay Formation. A conceptual model of the proposed basement is shown in Figure 8.1.

The proposed construction sequence comprises 3 phases indicated by Croft in their Drawing TW-10 (included in Appendix A) and summarised as:

Stage 1

1. Clear the site
2. Place piling Mat
3. Install piles as per piling contractors method statement

Stage 2

1. Excavate the retaining wall pins next to the party wall / boundary in segments and prop except at ground beam location. Wait for 48 hours for casting adjacent pin.

Stage 3

2. Cast the pins and prop

Stage 4

1. After completing the segmental pins, excavate down at ground beam locations and cut the piles
2. Cast the ground beam

Stage 5

1. Complete the ground floor structure and superstructure

Ground movements resulting from underpinning are not well documented and there is no specific method for assessing their magnitude. It should be noted that CIRIA C760 (2017), which is often used as a reference for ground movement assessments, is for embedded retaining walls and not concrete underpins or L shaped retaining walls.

When underpinning is carried out in a well-controlled manner, movements are typically small. A widely accepted movement from the installation of underpins is for 5mm of horizontal and vertical movement for a single stage underpinning, in addition to the global movements from excavation and subsequent settlement from the imposed loads acting on the underpins.

The ground conditions at 4 Murray Mews are predominantly London Clay, which will display heave from excavation and long term movement from the imposed loads, although CIRIA C760 indicate long term movement are limited beyond the excavation as indicated in Figure 10.1.

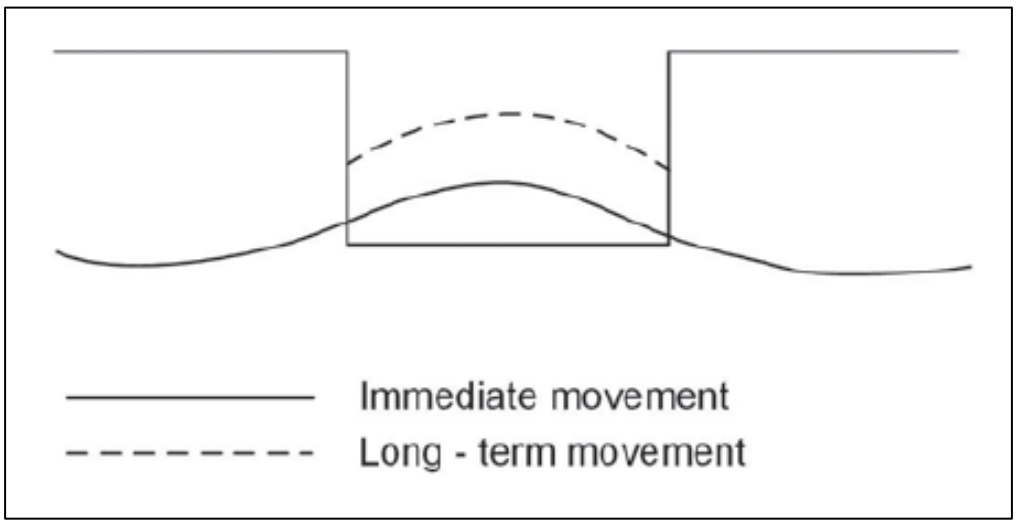


Figure 10.1 Impact of short term immediate undrained and long term movement (From CIRIA C760 Fig 6.10)

The following ground movements have been assessed:

- **Short term vertical heave / settlement movements**: London Clay and is susceptible to short term heave and time dependent swelling on unloading, which will occur because of basement excavation, generating upward ground movements. Short term heave has been analysed by Pdisp in the undrained condition.
- **Long term vertical ground movement in the drained condition:** The net loading / unloading on formation soils will generate ground movement, which could affect adjacent foundations which will happen over a period after construction. This has been modelled with Pdisp. This takes into account existing stress conditions, and the weight of soil removed and the load from the new basement.
- **Vertical and horizontal movement from underpin/retaining walls:** Underpins act as stiff concrete retaining walls, which limits the potential for wall deflection. However, deflections that do occur may generate surface settlements, which could impact adjacent properties.
  From experience within in the industry, at least 5mm of additional ground movement (both vertical and horizontal) is typically anticipated for the proposed single stage underpinning.

10.2 Modelling of movements due to vertical and horizontal stress changes

The predicted ground response due to vertical unloading of the ground through excavation for the proposed basement has been modelled using the OASYS program PDisp version 20.12.

PDisp assumes a linear elastic behaviour of the soil and a flexible structure. The finite stiffness of the structures will tend to redistribute or smooth out the movements, when compared to those predicted by PDisp. The settlement calculations therefore represent free field movements unaffected by the stiffness of the structures and are likely to be conservative (i.e., the distortions of the structure would be less than those obtained from the predicted movements).

The analysis was undertaken for the combination of short-term undrained movements and long-term drained movements. The 'hard layer' base to the analysis was taken as 10 m below ground level. In addition, it has been assumed for ground modelling that the soil mass is removed in its entirety before the underpins and are placed, when in reality this is an incremental process. When the overall mass of the soil removed relative to the load of the re-imposed structure is considered onto a cohesive soil this presents a reasonable scenario.

10.2.1 Vertical Movements due to excavation (Undrained/short term)

The excavation is assumed at 2.0m below existing ground level. Excavation of up to 2.0 m of soil will therefore produce an unload at new formation level of and 40 kPa. Poisson's Ratio for London Clay as v_u = 0.5.

A short term (undrained) analysis was undertaken using parameters in Table 5.3 above to determine the heave movements likely to arise as a result of the excavation (i.e., the movements likely to occur prior to the construction of the new structural elements and the consequential vertical loading of the soil). The analysis indicated a maximum heave of 6.7 mm occurring centrally within the excavation (Figures 6.1, 6.3 & 6.4), with 4.0 mm at the boundary with 6 Murray Mews and no movement at 3 St Augustine's building.

10.2.2 Vertical movements following construction of the new basement (drained/long-term)

The movements of the ground following construction are assessed for the long term (drained) case using parameters in Table 5.2 above.

The PDisp assessment indicates that peak heave movements in the long term again occur under the centre of the basement, with a magnitude of 7.5 mm occurring centrally (Figure 6.2, 6.5 & 6.6), with 0 mm at the boundary with 6 Murray Mews and 0mm at 3 St Augustine's building and 0.75mm at the railway embankment.

10.2.3 Vertical deflection from underpin installation

As indicated above in Section 9.1, 5mm of vertical movement is assumed for installation. The distance behind the wall to which negligible movement occurs has been assumed at 3.5 times the excavation depth.

10.2.4 Horizontal deflection from underpin installation

As indicated above in Section 9.1, 5mm of horizontal movement (δ_{max}) at the basement wall is assumed for installation. The distance behind the wall to which negligible movement occurs is assumed to be 4 times the height of the underpin of 2m. δ_h is the difference between δ_{max} and the movement of the far wall of the neighbouring property.

It should be reiterated that the movements due to vertical and horizontal stress changes do not occur in isolation to the other movements resulting from the basement construction process and the actual ground movements, particularly around and beyond the perimeter of the proposed basement, will be from the quality of workmanship during excavation and installation.

11 Damage Category Assessment

11.1 Introduction

The calculated ground movements have been used to assess potential 'damage categories' that may apply to neighbouring properties due to the proposed basement construction. The methodology proposed by Burland and Wroth and later supplemented by the work of Boscardin and Cording has been used, as described in *CIRIA Special Publication 200* and *CIRIA C760*. General damage categories are summarised in Table 11.1 below:

Table 11.1: Classification of damage visible to walls (reproduction of Table 6.4, CIRIA C760)

Category	Description	Approx. Crack Width (mm)	Limiting tensile Strain
0 (Negligible)	Negligible – hairline cracks	<0.1	0.0 – 0.05
1 (Very slight)	Fine cracks that can easily be treated during normal decoration	<1	0.05 – 0.075
2 (Slight)	Cracks easily filled; redecoration probably required. Some repointing may be required externally.	<5	0.075 – 0.15
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.	5 -15 or a number of cracks > 3	0.15 – 0.3
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.	15-25 but also depends on number of cracks	> 0.3
5 (Very Severe)	This requires a major repair involving partial or complete re-building.	> 25 but also depends on number of cracks	

The Damage Assessment has been undertaken for 6 Murray Mews. The other adjacent property 3 St Augustine's Rd has been shown to be too far from 4 Murray Mews, separated by a distance of 8.3m from rear garden of 3 St Augustine's Rd.

11.2 Damage Assessment Category - 6 Murray Mews

Vertical ground movement for a section through 6 Murray Mews is shown in Figure 11.1[2]. For this wall section, the combined impact of short-term heave and long-term settlement/ heave and installation has been shown. The location of the sections is shown diagrammatically in Figures 6.1/6.2.

Table 11.2 and Figure 11.4 incorporates superimposed horizontal and vertical movements derived from the wall deflection and heave/settlement due to excavation as outlined in Section 10. The assessment has been based on the limiting tensile strain for Category 1 of a strain of 0.075 %.

Table 11.2: Summary of ground movements and corresponding damage category 6 Murray Mews

Adjacent Property	6 Murray Mews
Building width - L (m)	8.0
Building height - H (m)	11.0
L/H	0.7
max deflection (Δ) in metres (from Fig 11.1)	0.00125
Δ/L (%)	0.016
εlim	0.075
Δ/L/εlim	0.21
length to negligible horizontal movement - 4x wall height (m)	8
δh_{max} (m)	0.005
δh (m)	0.005
δh/L (%) = εh	0.063
Damage Category	**1**

[2] Figures 11.1 to 11.4 are included after Section 14

11.3 3 St Augustine's Rd

St Augustine's Rd is located to the rear of 4 Murray Mews. The building is located 8.3m from the boundary with 4 Murray Mews. The distance is sufficient for ground movements to become negligible from the proposed basement construction at 4 Murray Mews (as indicated in Figures 6.4 and 6.6), therefore no further assessment of ground movement has been undertaken for 3 Augustine Rd.

11.4 Impact on Highway/Footway

The ground movement assessment has been undertaken for the footway and highway pavement of 4 Murray Mews, which is, ~0.5 m from the lightwell. Figure 11.2 indicates that a combined maximum vertical movement of 1.8 mm and a maximum horizontal movement of 4.8 mm. The horizontal movement reduces to a maximum of 4mm mm within the highway.

From an asset location search a number of services are records as present within Murray Mews.

11.4.1 Gas

A 90mm polyethylene gas pipe runs on the opposite side of Murray Mews, approximately 4.8m from the site boundary, where a vertical movement of 1.5mm and a horizontal movement of 2mm have been calculated (see Figure 11.2). This is not considered significant for a flexible pipe. The full Cadent drawing is included in Appendix D.

Figure 11.6 Gas pipe location

11.4.2 Water (supply and waste)

An asset location search by Thames Water indicated the presence of a trunk sewer 1372 x 962mm running under the easement with an invert level of 26.07m AOD about 9m below the site level. A local sewer with a diameter of 450mm along the centre of Murray Mews with an

invert level of 32.54 at a manhole 38m northeast along Murray Mews. As the local sewer feeds into the truck sewer the invert level in front of 4 Murray Mews will be deeper. As the sewers are deeper than the proposed basement ground movement impact will be negligible. A detailed survey will be required to confirm the location of the deep sewer to ensure there is adequate clearance for the proposed piled foundations.

A water supply runs along Murray Mews at approximately 3.8m from the site boundary. The level of the water supply is not known but is assumed to be within 0.5m of the pavement surface. Combined vertical movement is assessed as 1.5mm and horizontal movement as 2.5mm. The locations are indicated in Figure 11.7 and 11.8. The full asset search is included in Appendix D.

Figure 11.7 Sewer Location

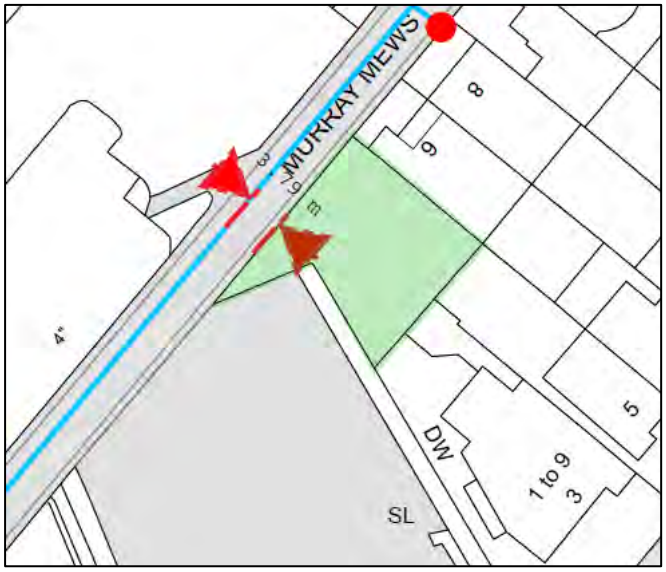


Figure 11.8 Water main location and approx. distance from the proposed basement

11.5 Impact on Railway Retaining Wall

A masonry retaining wall supports a cutting which is approximately 7m deep. The retaining wall inclines at approximately 80^0. The proposed basement will be 3m from the retaining wall as a consequence of an easement. The building loads will be carried by a piled foundation to bear on the strata at least 3m below the railway. It is assumed that the piles will be sleeved to avoid load shedding within influence of the retaining wall, subject to detailed design.

An assessment has been made on potential ground movement from the excavation of 1.5m of soil in the easement area where some heave will be generated and the impact this has on the railway retaining wall. The proposed basement construction does not include any retaining wall facing the easement due to the excavation of the basement being at the same level as the excavation in the easement. Therefore, the ground movement will relate to heave generated from the excavation only. As no account has to be taken of the excavation to include the base of the floor slabs and ground beams in the easement the effective depth of excavation is limited to the floor level of the basement at 33.53m AOD. The ground level slopes gently along the retaining wall from 35.07 to 34.17m AOD. Conservatively, taking the greatest height difference of 1.54m will give a reduction in load of 30.8 kPa. Figure 11.3 indicates a combined vertical movement of 5.75mm at the interface with the railway retaining wall.

12 Monitoring Strategy

The results of the ground movement analysis show that with good construction control, damage to adjacent structures generated by the assumed construction methods and sequence can be controlled to be within Category 1 ‘slight’ damage. A formal monitoring strategy should be implemented on site in order to observe and control ground movements during construction.

The system should operate broadly in accordance with the ‘Observational Method’ as defined in CIRIA Report 185. Monitoring can be undertaken by installing survey targets to the top of the wall and face of the adjacent building. Baseline values should be established prior to commencement of works. Monitoring of these targets should be carried out at regular time intervals and the results should be analysed to determine if any horizontal translation of the wall or tilt/settlement of the neighbouring structure is occurring. Regular monitoring of these targets will allow ground movement trends to be detected early and a mitigation strategy can be implemented to control further movement. Monitoring data should be checked against predefined trigger limits and can also be further analysed to assess and manage the damage category of the adjacent buildings as construction progresses.

It is recommended that a condition survey is undertaken on all adjacent property facades prior to the works commencing and ideally when monitoring baseline values are established. Existing cracks or structural defects should be carefully recorded, documented and regularly inspected as construction progresses.

13 Conclusions

The results of this Basement Impact Assessment are supported by site investigation data and outline construction methods and sequence provided by the structural engineer.

The maximum damage category for the adjacent properties has been calculated to be within Category 1 (slight damage) for 6 Murray Mews. Any ground movement at 3 St Augustine's Rd is negligible.

The assessment has also indicated there is no impact from ground movement on a sewer due to the sewer depth. Gas and water supply run along the far side and centre of Murray Mews from No 4 Murray Mews. Ground movement has been calculated as vertical 1.5mm for both utilities and 2mm and 2.5mm horizontal for the gas and water respectively.

A ground movement assessment has determined a potential vertical heave movement at the interface with railway retaining wall of 5.75mm.

An appropriate monitoring regime should be adopted and maintained throughout construction to manage risk and potential damage to the neighbouring structures as construction progresses on site.

14 References

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BS EN 1997-1 Eurocode 7 Geotech Design Part1 General Rules- inc. corrigendum Feb 2009

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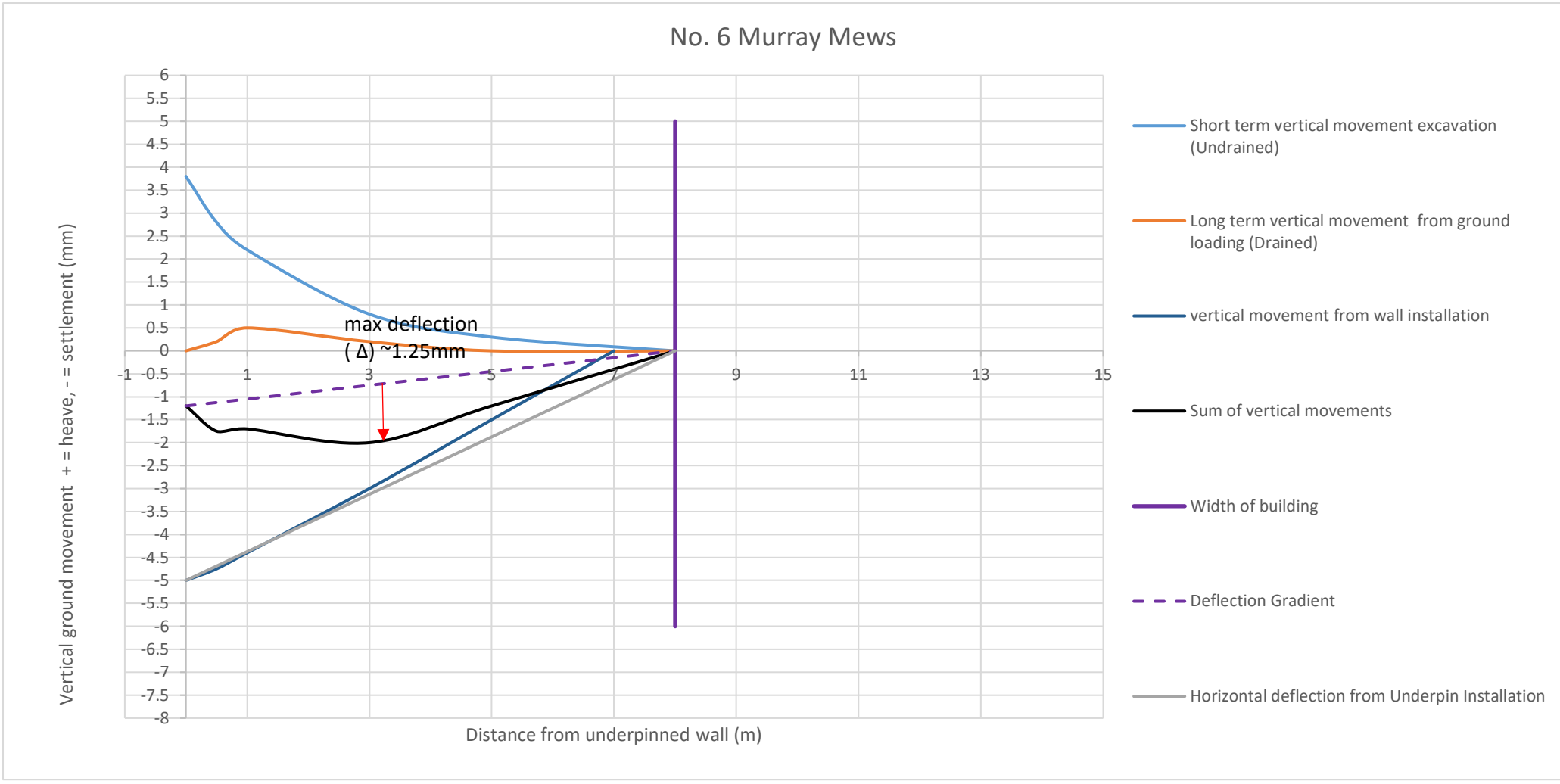
BS 8004: 2015 Code of practice for Foundations

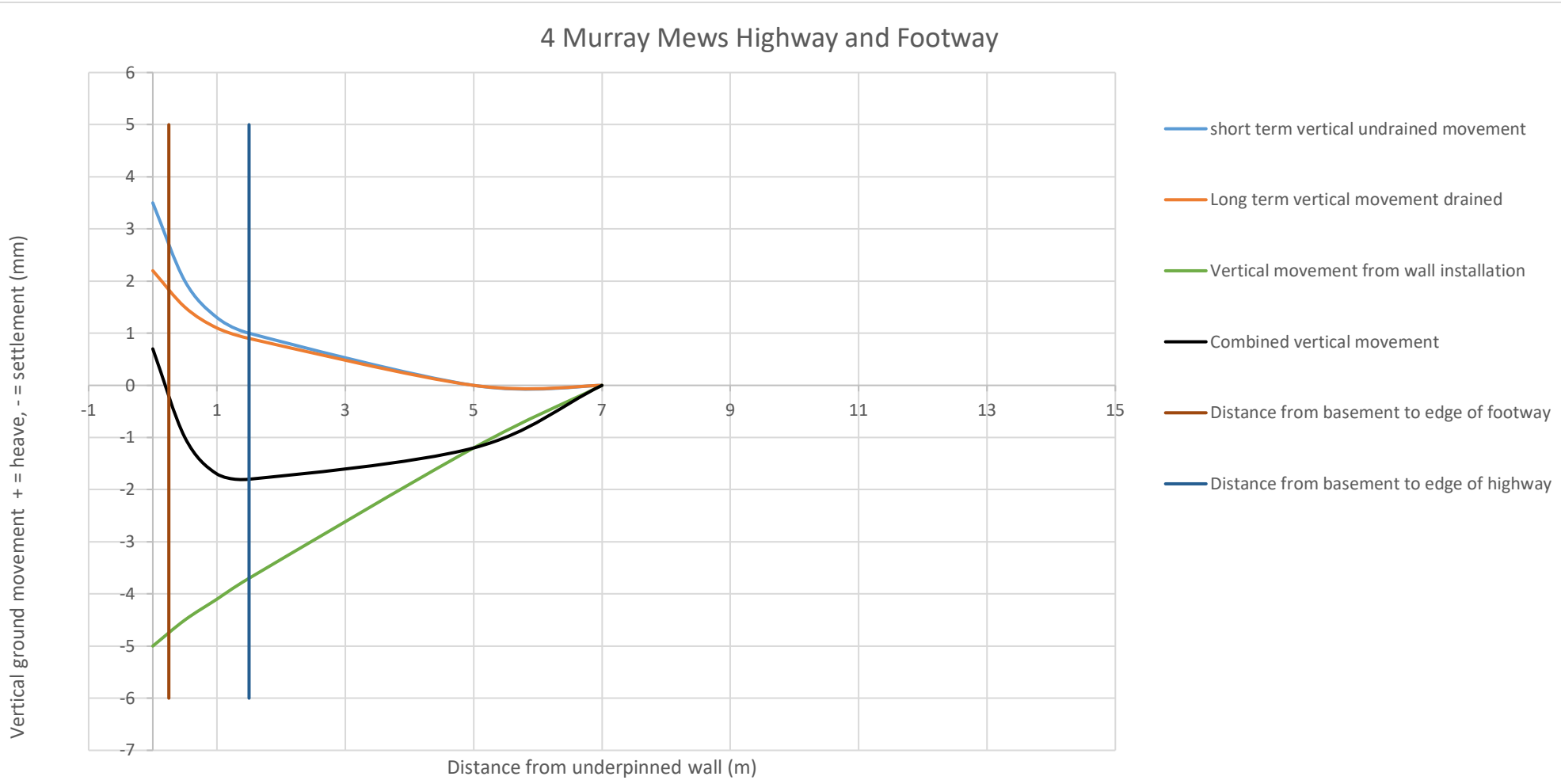
BGS Geoindex Onshore (https://mapapps2.bgs.ac.uk/geoindex/home*)*

CIRIA C760 Guidance on Embedded retaining wall design 2017.

Figures 11.1 to 11.5

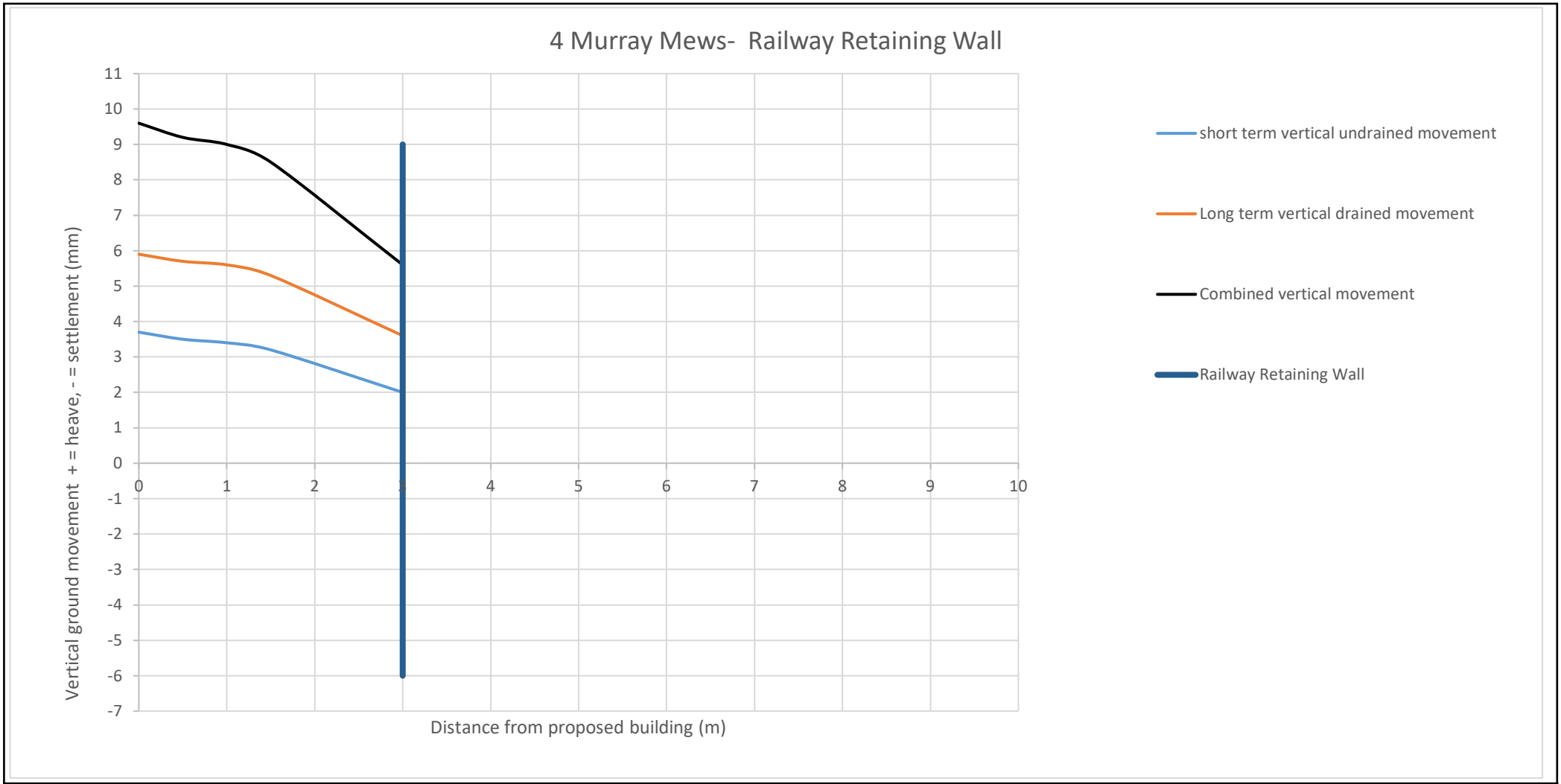


Client Croft Structural Engineers Ltd.	MAUND GEO-CONSULTING	Project 4 Murray Mews NW1 9RJ
Job No. MGC-GMA-22-40-V1	Title Combined Movements 6 Murray Mews	Figure 11.1



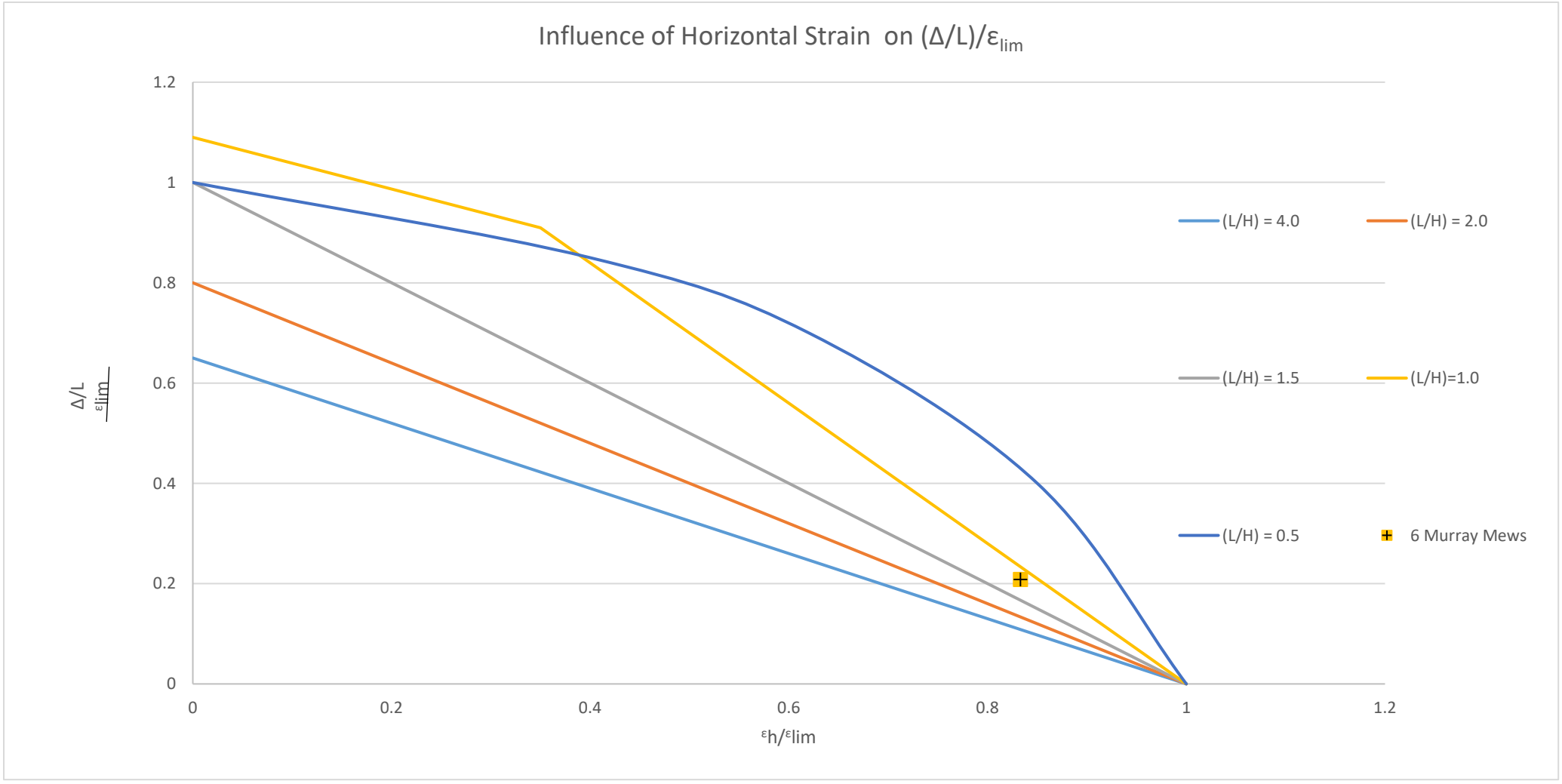
Client		Project
Croft Structural Engineers Ltd.	MAUND GEO-CONSULTING	4 Murray Mews NW1 9RJ

Job No.	Title	Figure
MGC-GMA-22-40-V1	Combined Movements Murray Mews Pavement	11.2

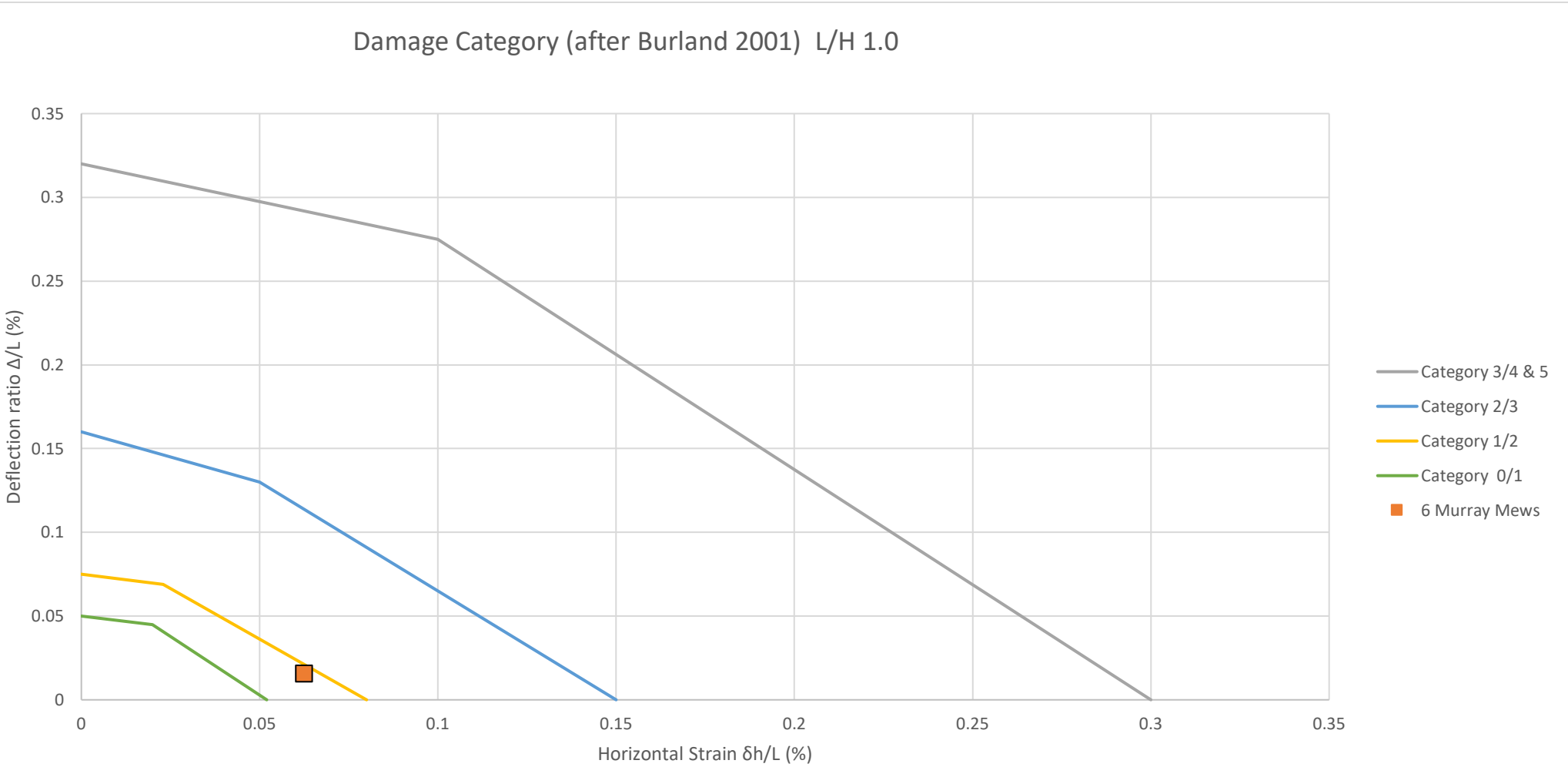


Client		Project
Croft Structural Engineers Ltd.	MAUND GEO-CONSULTING	4 Murray Mews NW1 9RJ

Job No.	Title	Figure
MGC-GMA-22-40-V1	Combined Movements Murray Mews Railway Retaining Wall	11.3

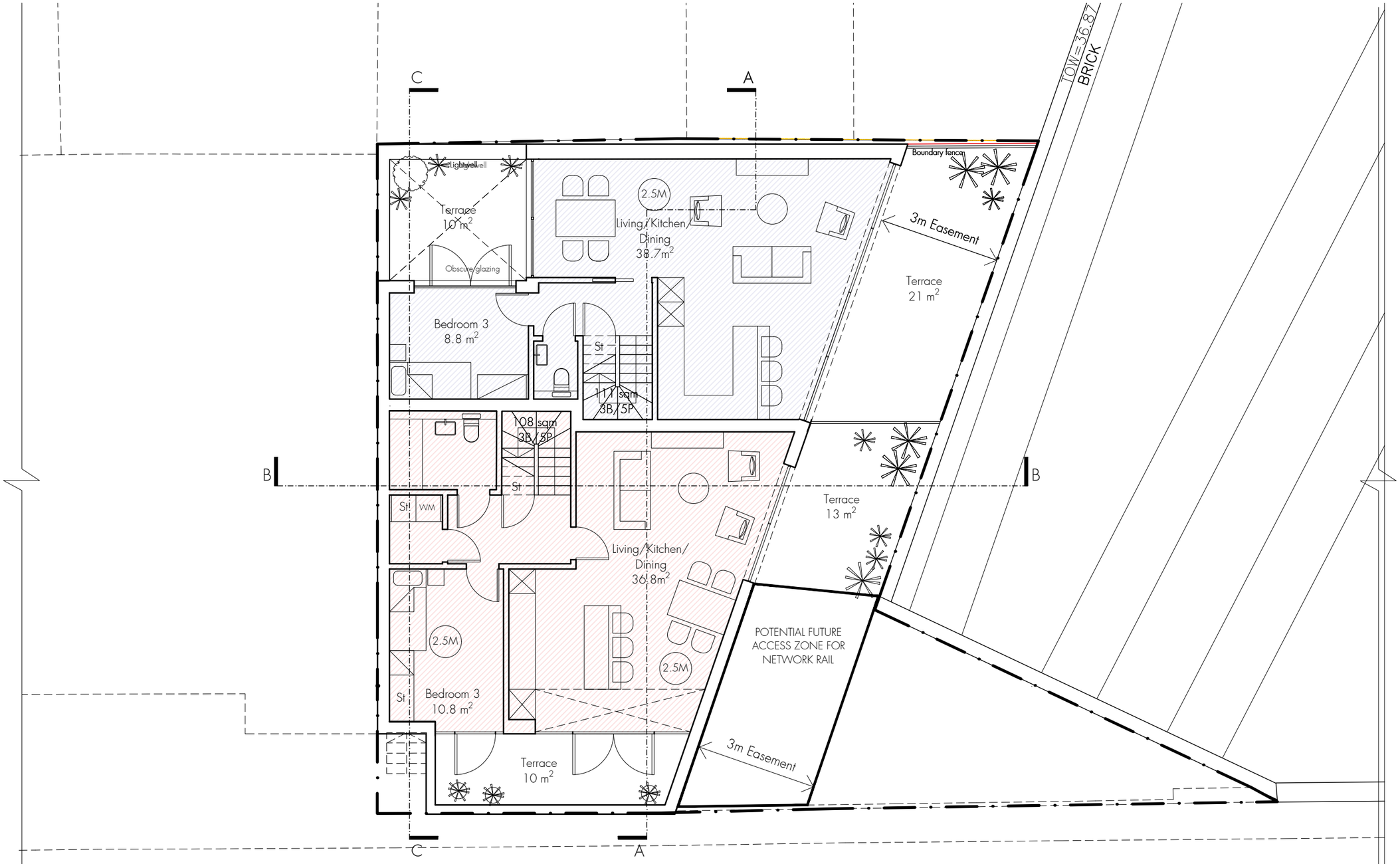


Client Croft Structural Engineers Ltd.	MAUND GEO-CONSULTING	Project 4 Murray Mews NW1 9RJ
Job No. MGC-GMA-22-40-V1	Title Influence of horizontal strain	Figure 11.4



Client Croft Structural Engineers Ltd.	MAUND GEO-CONSULTING	Project 4 Murray Mews NW1 9RJ
Job No. MGC-GMA-22-40-V1	Title Burland Damage Category 6 Murray Mews	Figure 11.5

Appendix A Drawings



Lower Ground Floor plan

5 4 3 2 1 0 5m

N

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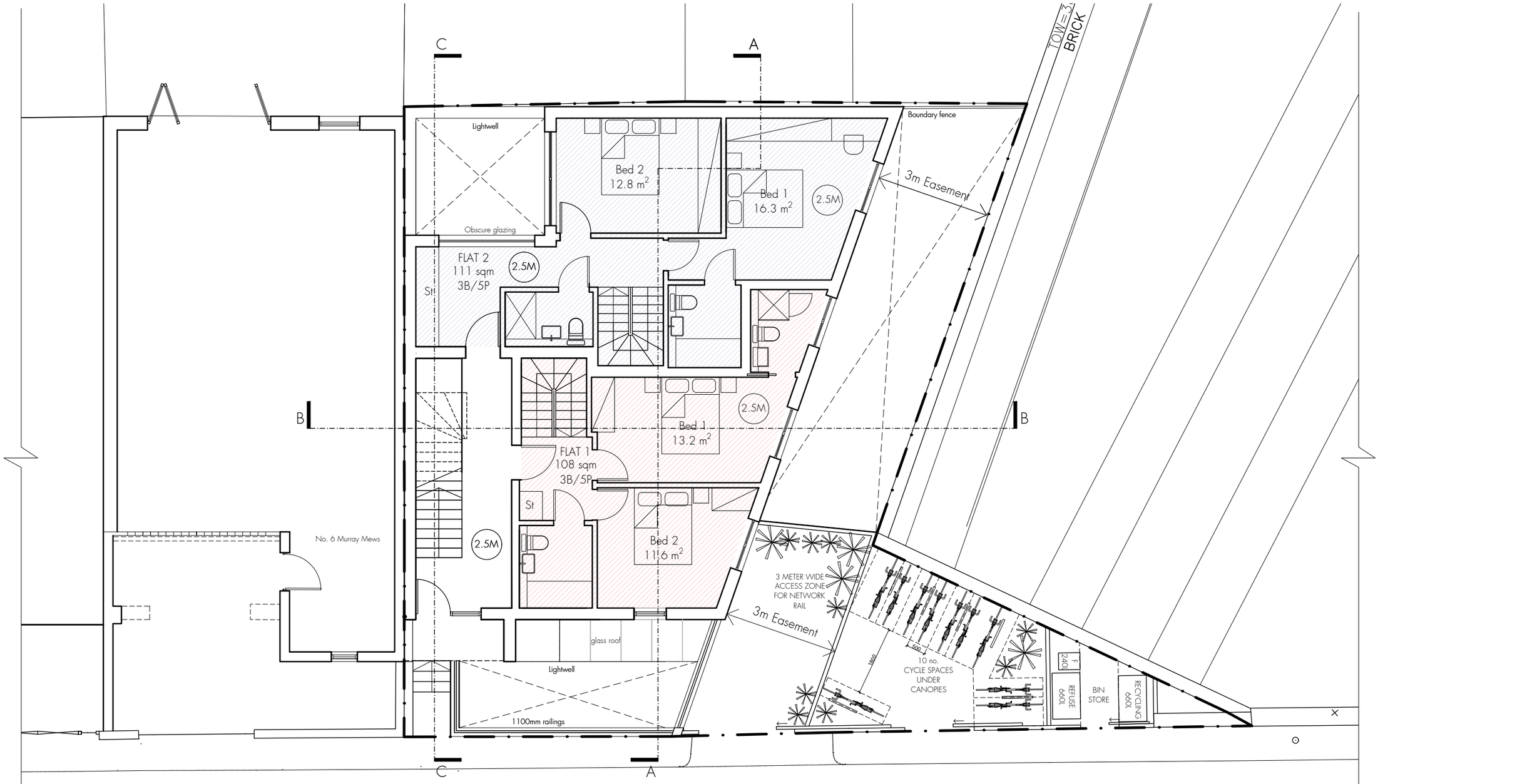
project	4 Murray Mews, London, NW1 9RJ
drwg title	Proposed Lower Ground Floor
job no.	1116
drwg no.	PP.01
rev.	
date	Oct 2021
scale @ A3	1:100



Upper Ground Floor plan

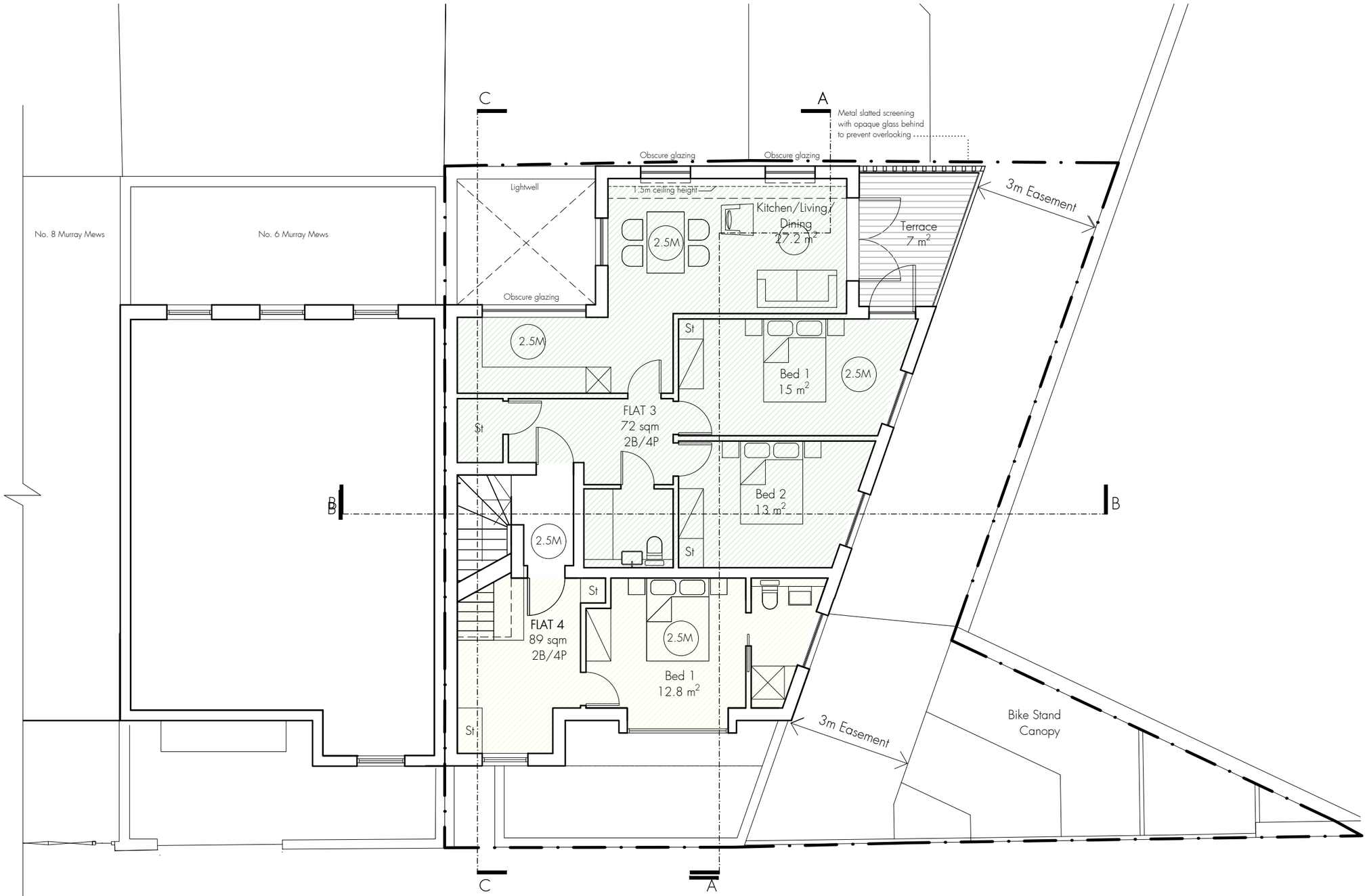
5 4 3 2 1 0 5m

A. 20.02.2023 - GATE ACCESS PROVIDED IN ACCORDANCE WITH NETWORK RAIL EASEMENT
- PLANTERS TO REAR OF PROPERTY REMOVED

N

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project	4 Murray Mews, London, NW1 9RJ
drwg title	Proposed Upper Ground Floor
job no.	1116
drwg no.	PP.02
rev.	A
date	Oct 2021
scale @ A3	1:100



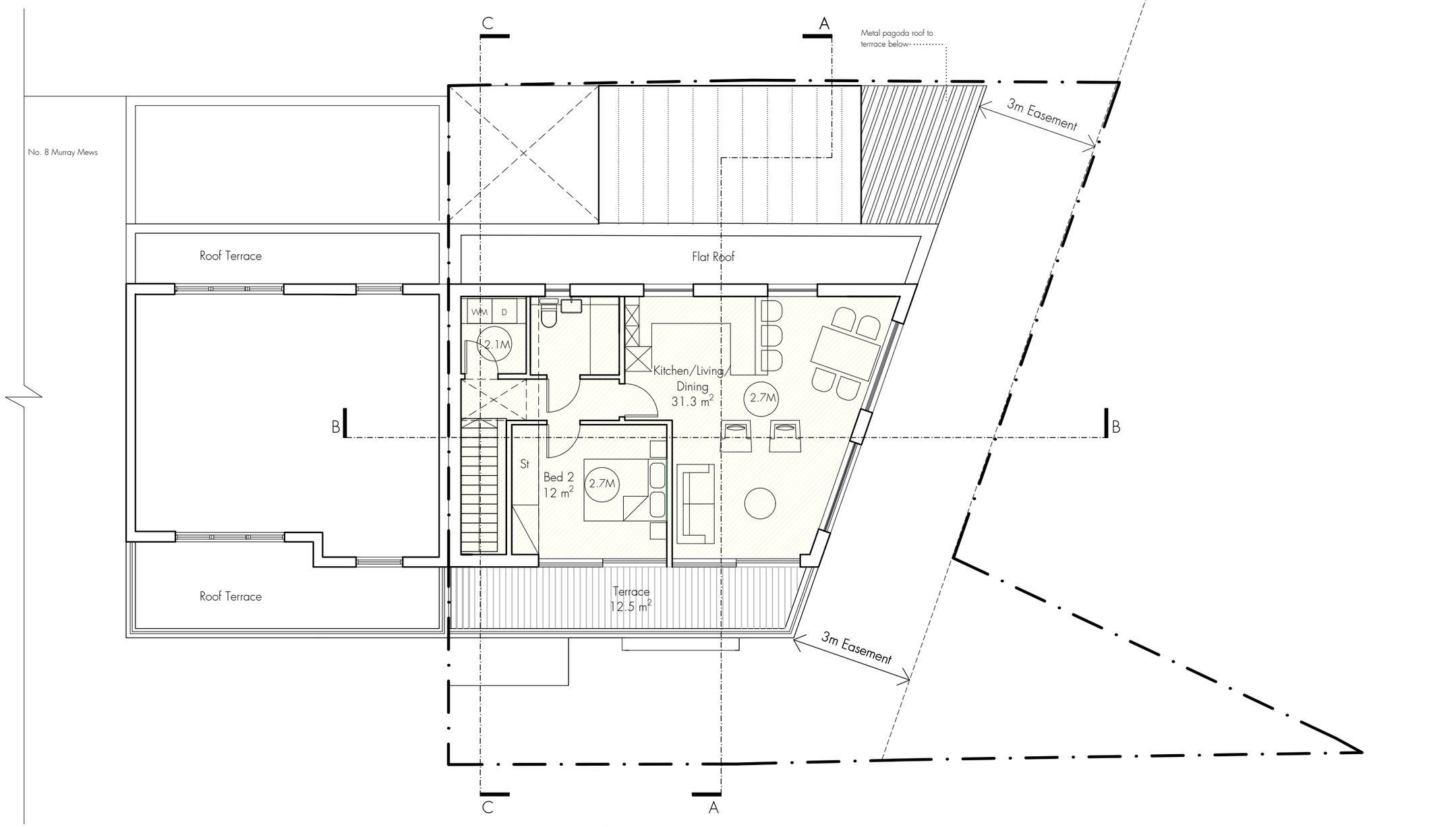
First Floor plan

5 4 3 2 1 0 5m

N

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project	4 Murray Mews, London, NW1 9RJ
drwg title	Proposed First Floor
job no.	1116
drwg no.	PP.03
rev.	
date	Oct 2021
scale @ A3	1:100



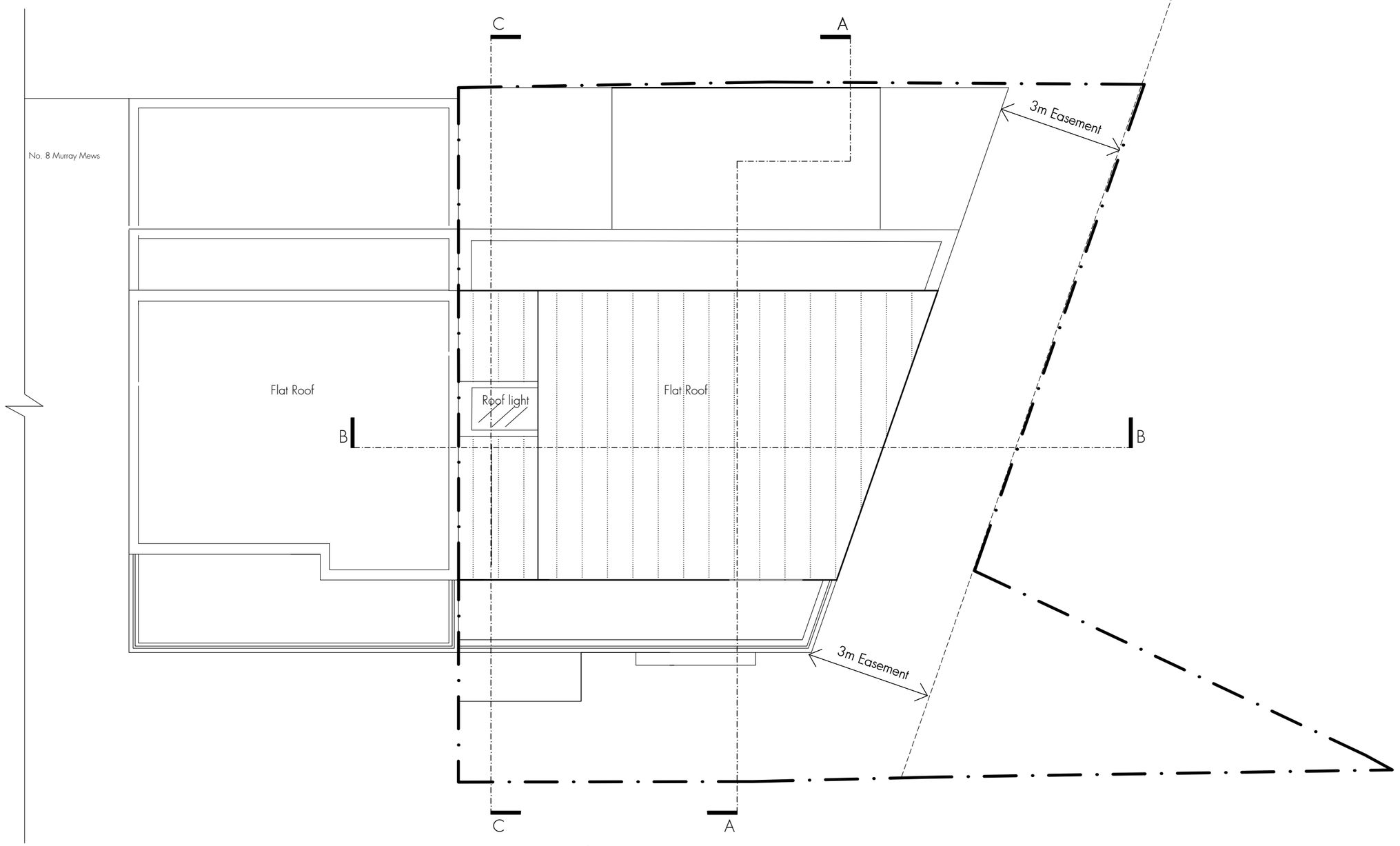
Second Floor plan

5 4 3 2 1 0 5m

N

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project	4 Murray Mews, London, NW1 9RJ
drwg title	Proposed Second Floor
job no.	1116
drwg no.	PP.04
rev.	
date	Oct 2021
scale @ A3	1:100



Roof plan

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

5 4 3 2 1 0 5m

N

project	4 Murray Mews, London, NW1 9RJ
drwg title	Proposed Roof Plan
job no.	1116
drwg no.	PP.11
rev.	
date	Oct 2021
scale @ A3	1:100

1. Brickwork
2. Metal Cladding
3. Metal Clad Projecting Box window
4. Metal Framed Sliding Glass Doors
5. Metal Framed Windows
6. Lockable Sliding Gate
7. Timber Fence
8. Glass Balustrade

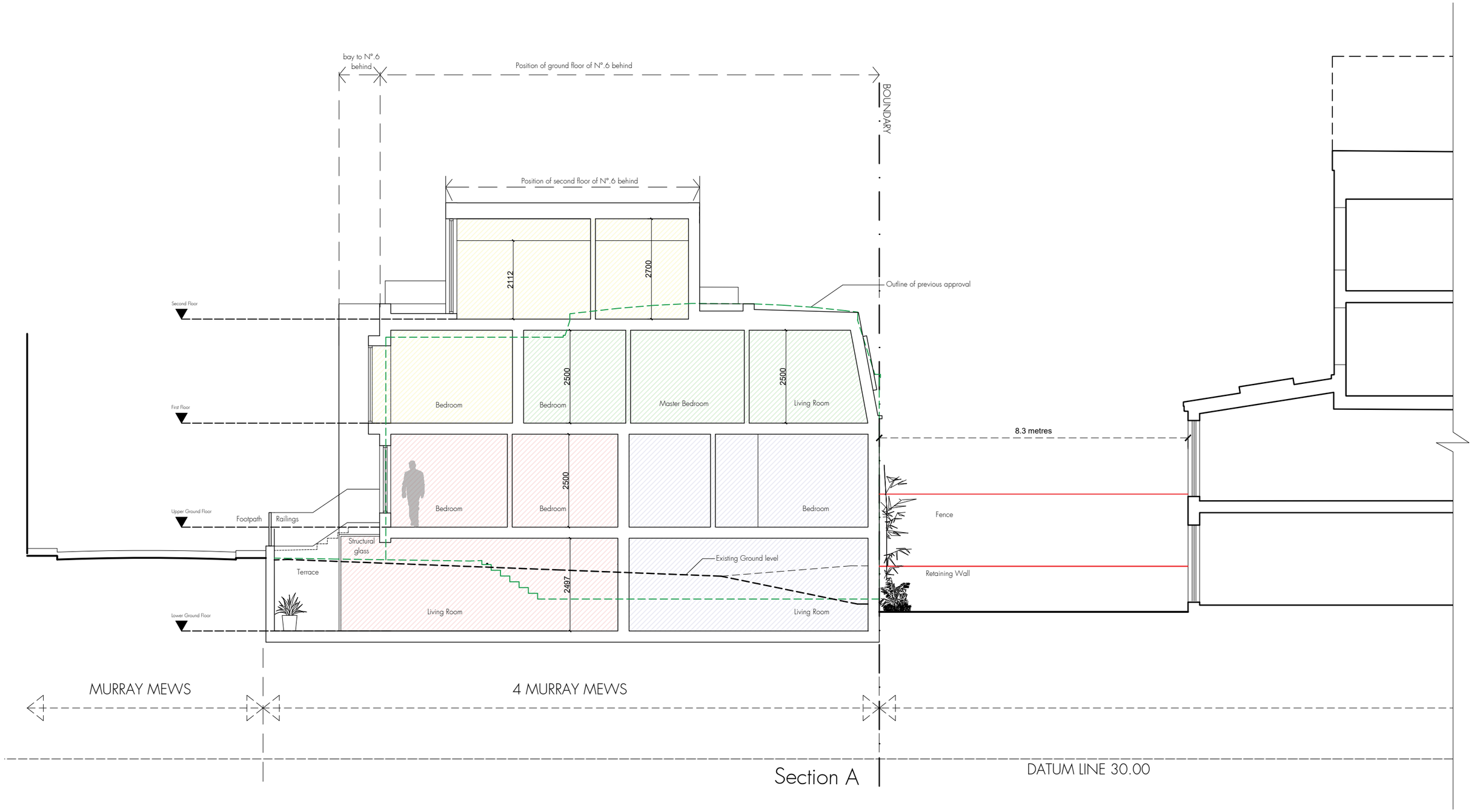
Front Elevation

A. 20.02.2023 - GATE ACCESS PROVIDED IN ACCORDANCE WITH NETWORK RAIL EASEMENT

5 4 3 2 1 0 5m

tasou associates architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project: 4 Murray Mews, London, NW1 9RJ
drwg title: Front Elevation
job no.: 1116
drwg no.: PP.05
rev.: A
date: Oct 2021
scale @ A3: 1:100



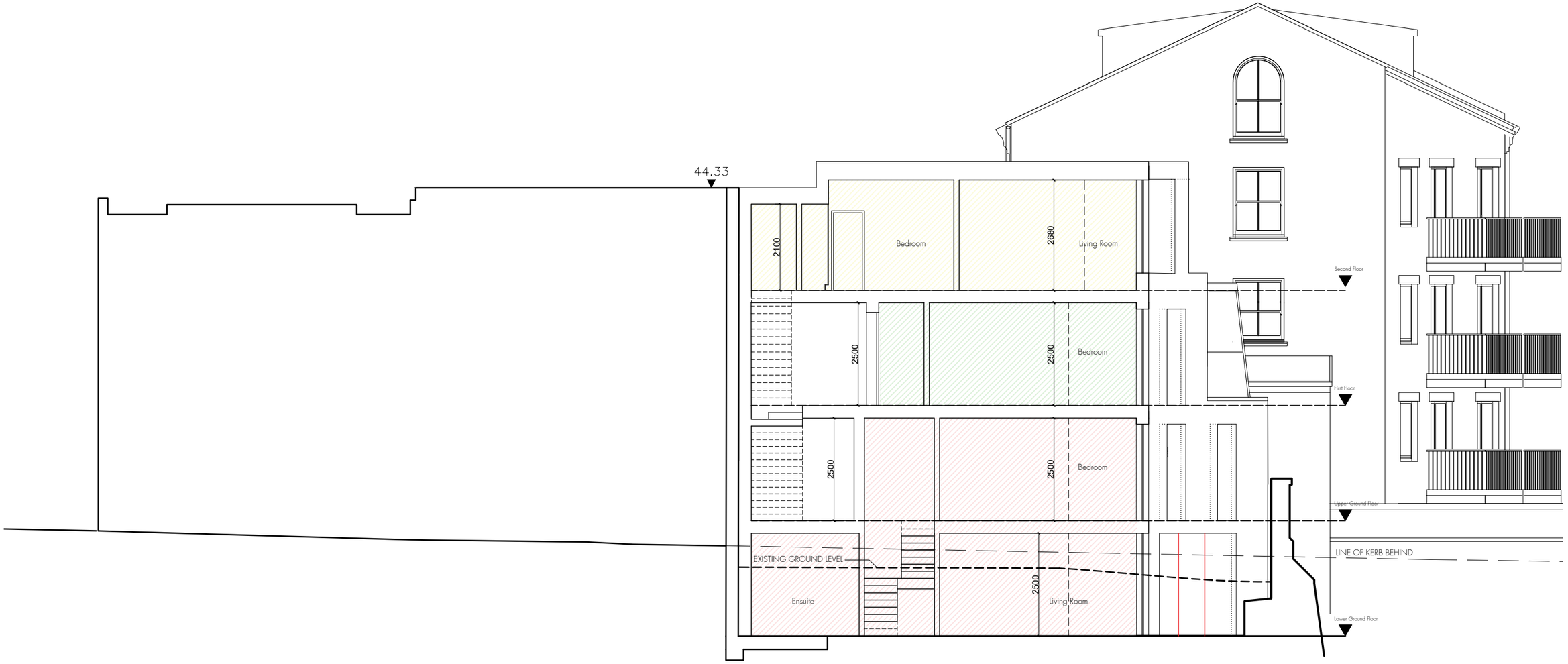
Section A

A. 20.02.2023 - GROUND LEVEL TO NO.3 ST AUGUSTINE INDICATED CORRECTLY AND REAR PLANTER REMOVED

5 4 3 2 1 0 5m

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project	4 Murray Mews, London, NW1 9RJ
drwg title	Section AA
job no.	1116
drwg no.	PP.06
rev.	A
date	Oct 2021
scale @ A3	1:100



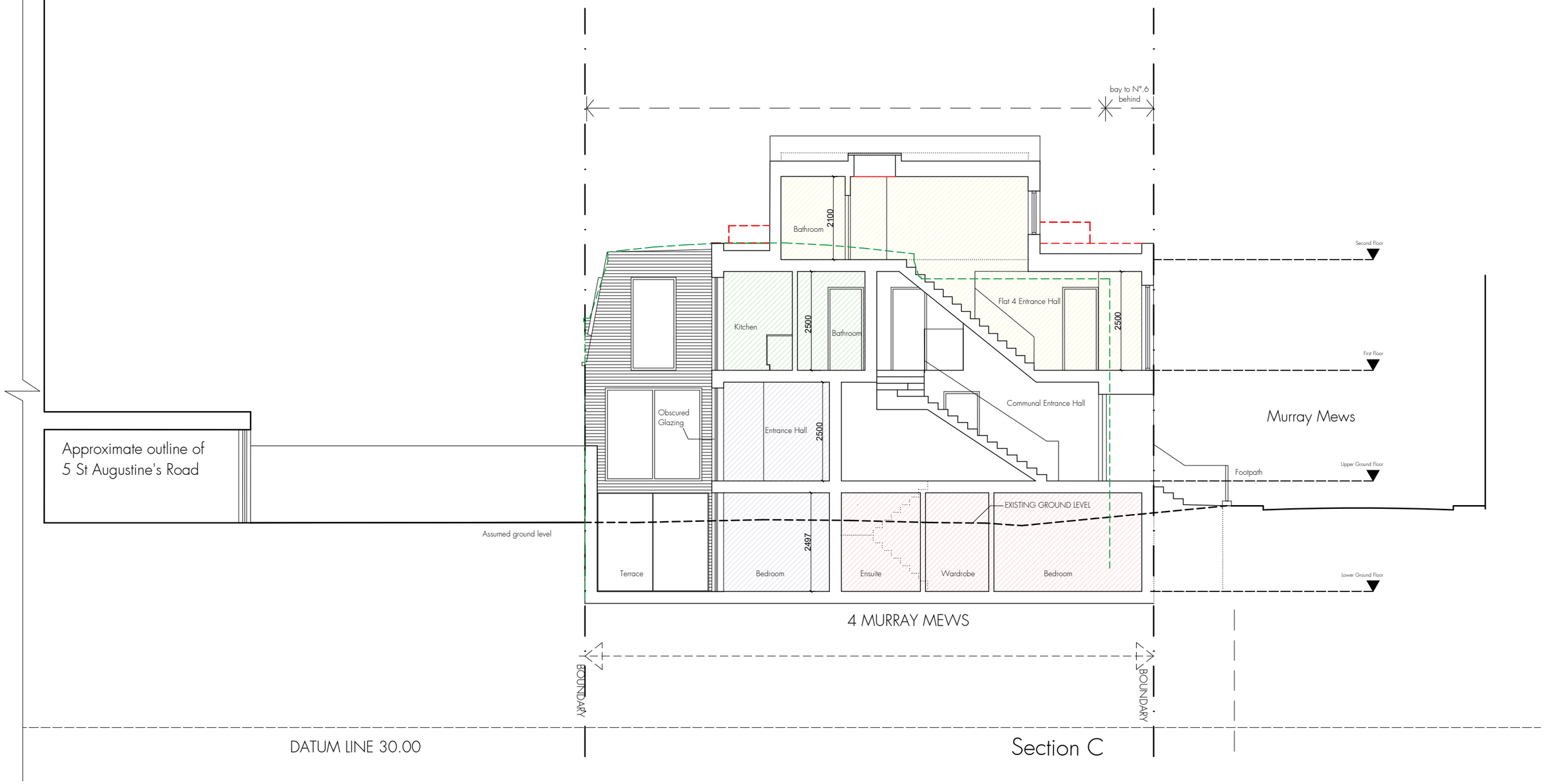
Section B

DATUM LINE 30.00

5 4 3 2 1 0 5m

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project	4 Murray Mews, London, NW1 9RJ		
drwg title	Section BB		
job no.	1116	drwg no. PP.07	rev.
date	Oct 2021	scale @ A3 1:100	



5 4 3 2 1 0 5m

tasou associates
architects + structural engineers

4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project: 4 Murray Mews, London, NW1 9RJ
drwg title: Section CC
job no.: 1116
drwg no.: PP.08
rev.:
date: Oct 2021
scale @ A3: 1:100

1. Brickwork
2. Metal Cladding
7. Timber Fence
9. Metal Framed Windows - Obscured Glazing Fixed Shut
10. Metal Slatted Screening With Obscured Glass Behind

A. 20.02.2023 - GROUND LEVEL TO NO.3 ST AUGUSTINE INDICATED CORRECTLY AND REAR PLANTER REMOVED

5 4 3 2 1 0 5m

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project: 4 Murray Mews, London, NW1 9RJ
drwg title: Rear Elevation
job no.: 1116
drwg no.: PP.09
rev.: A
date: Oct 2021
scale @ A3: 1:100

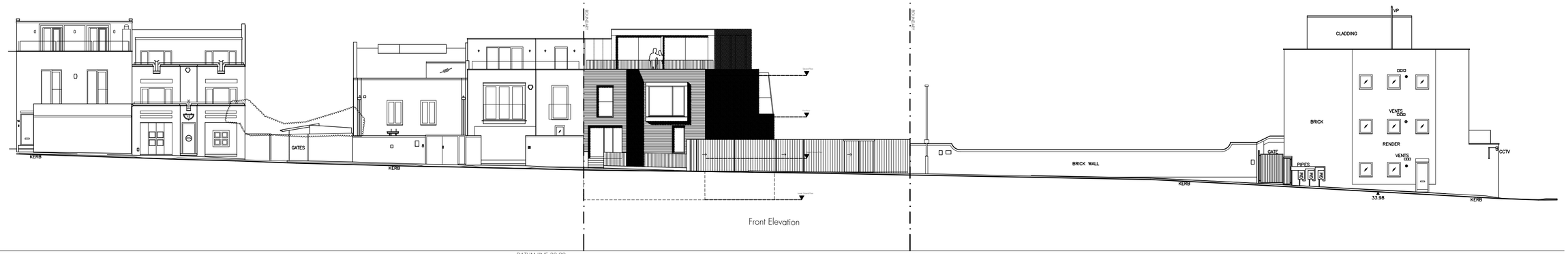
1. Brickwork
2. Metal Cladding
4. Metal Framed Sliding Glass Doors
5. Metal Framed Windows
6. Metal Railing
8. Glass Balustrade
10. Metal Slatted Screening With Obscured Glass Behind

5 4 3 2 1 0 5m

A. 20.02.2023 - GATE ACCESS PROVIDED IN ACCORDANCE WITH NETWORK RAIL EASEMENT
- GROUND LEVEL TO NO.3 ST AUGUSTINE INDICATED CORRECTLY AND REAR PLANTER REMOVED

tasou associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

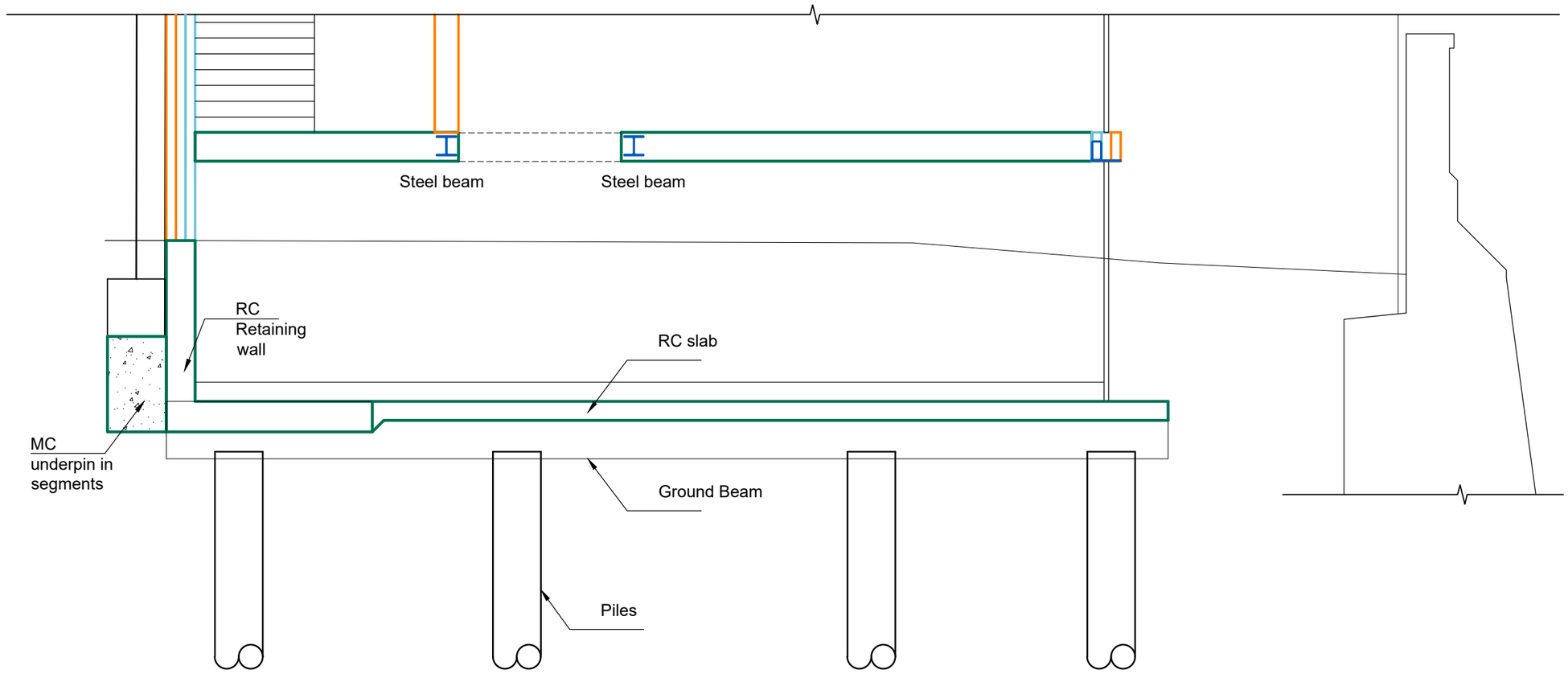
project: 4 Murray Mews, London, NW1 9RJ
drwg title: Railway Elevation
job no.: 1116
drwg no.: PP.10
rev.: A
date: Oct 2021
scale @ A3: 1:100



Front Elevation

tasou
associates
architects + structural engineers
4 Amwell Street, London. EC1R 1UQ T:020 7713 7070 F:020 7713 7071 E:tasou@tasou.co.uk

project: 4 Murray Mews, London, NW1 9RJ
drwg title: Long Elevation
job no.: 1116
drwg no.: PP.12
rev.:
date: DEC 2021
scale @ A2: 1:200



Section 1-1

Scale 1:50

Rev	Date	by	Amendments
-	Date	VLD	First Issue

Job Number	Dwg Number
220901	SD-01
Scale: As shown @A3	Rev: -
By: VLD	Approved by: VLD

Paul Stuart Ltd.

4 Murray Mews, NW1 9RJ

Section

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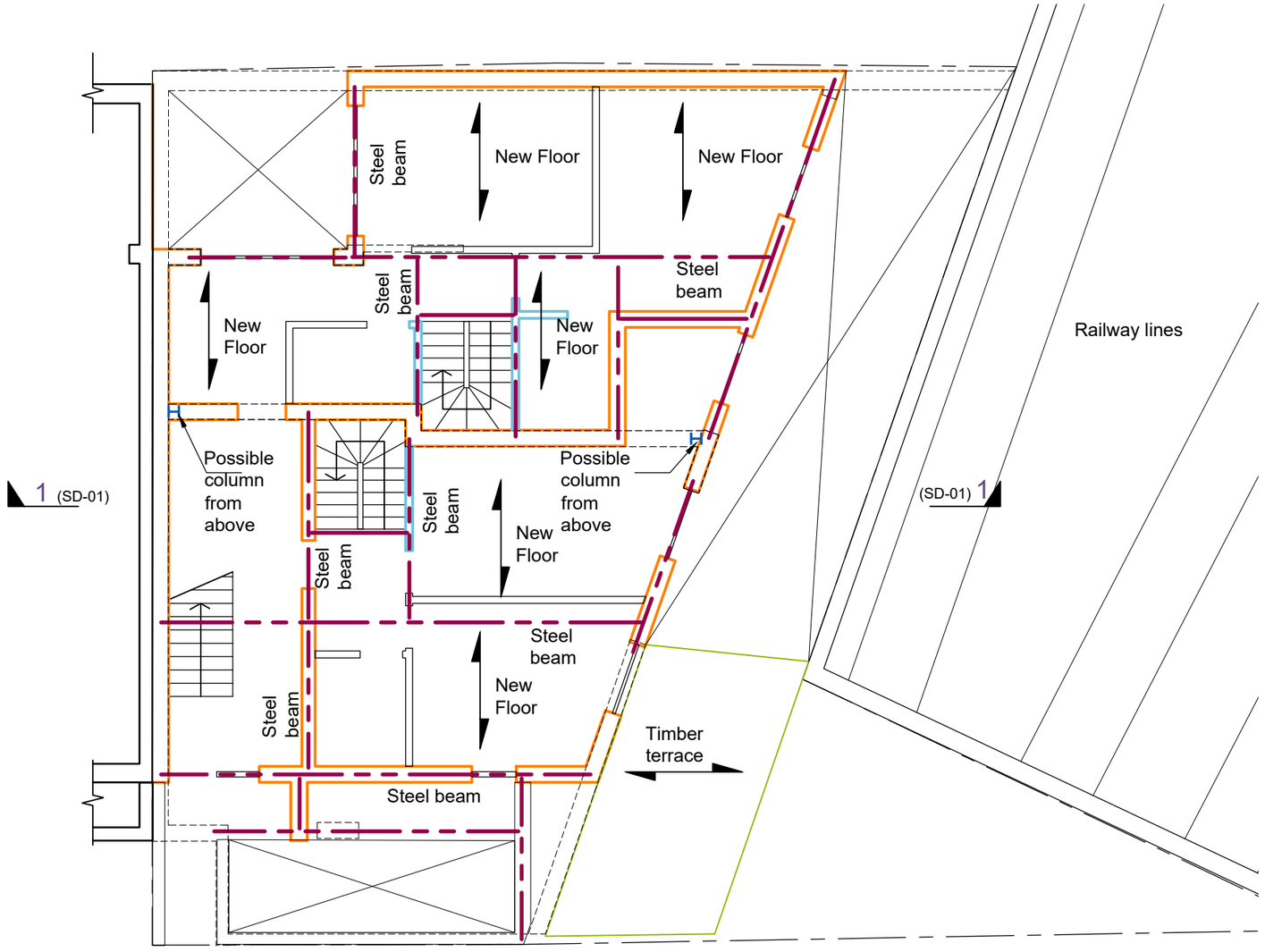

Proposed Upper Ground Floor Plan

Scale 1:100

Rev	Date	by	Amendments
-	Date	VLD	First Issue

Job Number	Dwg Number
220901	SL-02
Scale: As shown @A3	Rev: -
By: VLD	Approved by: VLD

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4 Murray Mews, NW1 9RJ

Proposed Ground Floor Plan

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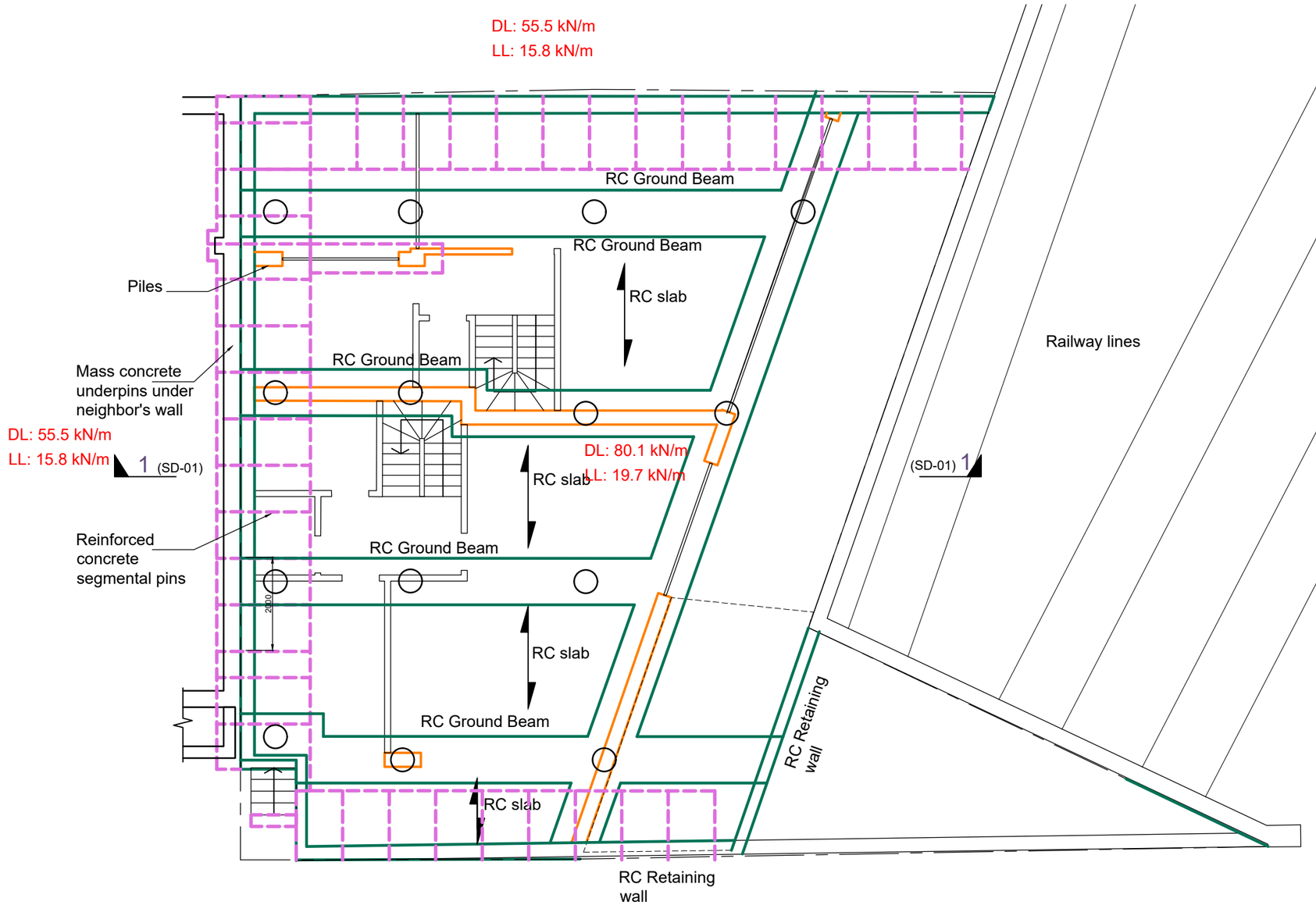

Proposed Lower Ground Floor Plan

Scale 1:100

Rev	Date	by	Amendments
-	30.09.22	VLD	First Issue

Job Number	Dwg Number
220901	SL-03
Scale: As shown @A3	Rev: -
By: VLD	Approved by: VLD

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