Ground and Project CONSULTANTS LTD

40 Leighton Road

Ground Movement and Building Damage Assessment Report

May 2022

Mat Jones and Louise Willocks
40 Leighton Rd
Kentish Town
London
NW5 2QE

Final Report

Report No. 70572-2 Rev 2

Document Verification

Prepared for	Prepared by
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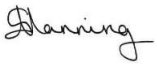
Signatures and Approvals				
Reviewer	G Manning BSc (Hons) MSc FGS		Date	16/05/2022
Author	J Smithson BSc (Hons) MSc FGS CGeol		Date	16/05/2022
Approver	Phil Henry MEng CEng MICE Croft Structural Engineers		Date	16/05/22

Report Number	Revision	Date	Comments
70572	0	29/07/2022	Draft
	1	14/04/2022	Update to address Campbell Reith Comments
	2	16/05/2022	Update to address Campbell Reith Comments

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The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Ground and Project Consultants Ltd at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

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Non-Technical Summary

The Land Stability BIA and GMA reports were carried out by Jon Smithson, Director of Ground and Project Consultants Ltd, Chartered Geologist (CGeol), with over 35 years' experience.

The BIA (Report Ref 70572-1) concluded that the construction of a basement at the site should not have any significant impacts on land stability. However, geotechnical testing of the London Clay Formation determined it to have very high plasticity and volume change potential. This increases the risk of movement and damage to medium due to this development. There is risk to trees on site that are within a conservation zone. Foundations should be placed at appropriate depths to avoid the effects of water content changes and root damage.

Detailed GMA and Building Damage Assessment found the potential risk to neighbouring properties to be in the Very Slight category. This is understood to be an acceptable level of risk. Most ground movement will occur during excavation of the basement and construction so the adequacy of the temporary support will be critical in limiting ground movements. Monitoring should be carried out to make sure the movements are within acceptable limits.

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Appendices

1 Introduction

Ground and Project Consultants Ltd (GPCL) have been instructed by Mat Jones and Louise Willocks to carry out a Ground Movement Assessment for the proposed basement at 40 Leighton Road. A Basement Impact Assessment has been previously carried out (Reference 70572-1), dated April 2021.

The objectives of this report are to ascertain the expected ground movements and degree of any building damage at the structures adjacent to the site.

The scope of this report and approach are as follows:

- Summarise the expected ground conditions at the site;
- Develop an understanding of the proposals and their relationship to adjacent structures;
- Carry out an assessment of ground movement following the principles and procedures set out in C760 "Guidance on Embedded Retaining Wall Design";
- Carry out a parallel check using Geo5 'Sheeting Check' software and GEO5 'FEM'.

This report has been prepared and approved by Jon Smithson, BSc, MSC, FGS, CGeol who is a chartered geologist with over 35 years' experience.

2 Background Information

2.1 Site Description

The site is located at 40 Leighton Road, Kentish Town, London, NW5 2QE. The site is in the London Borough of Camden. The National Grid Reference for the site is 529199, 185173.

The site is currently a two-storey terraced property with basement. It is understood the basement is approximately 2.5m in height. A small area of hardstanding is present to the front of the property and a garden with semi-mature trees to the rear of the property approximately 14m in length. The garden is accessed from the basement via steps which has a level higher than the basement but lower than the ground floor.

The site is bound and adjoined by Leighton Road to the north, 38 Leighton Road to the west, 42 Leighton Road to the east. Peckwater Health Centre is to the south. The terraces to the east of the property (No. 42) appear to have partial basements from Google Earth with stairs leading up to the front door. It is understood that the basement of No. 42 extends beneath the footprint of the main building. The property to the west (No. 38) has a basement extension visible on photos from the Existing Drawings and Photos in Appendix A. It is understood that the basement at No. 38 starts approximately 5m or 6m back from the front of the property and extending below a rear extension and external patio.

It is believed that the walls of the existing structure are underpinned by adjacent basement walls of the neighbouring properties or the original footings where no basement extensions have taken place.

There is a mature tree on the pavement to the front of the property.

No underground railways are anticipated beneath the site.

The site is in a Conservation Area.

The site is at approximately 40.2m AOD. The wider area slopes gently to the southeast at less than 2 degrees.

2.2 Proposals

The proposals for the site comprise the redevelopment of an existing residential property including the deepening of the existing basement to approximately 3.5m bgl (***excavating approximately 1m deeper than existing***), the addition of a basement light well to the front of the property, an extension with skylight to the rear of the property, removal of internal walls (including in the basement), extension of the first floor to the rear and the addition of a loft floor with new roof plan. A new garden room is also proposed to the rear of the garden to the very south of the site.

The construction method proposed includes casting new retaining walls in segments, installing lateral props at high and low level as the excavations progress. The floor slab is proposed to be partially suspended.

2.3 Geology

The ground investigation revealed that the geology comprises Made Ground to depths of up to 1.4m bgl, overlying firm to stiff London Clay Formation proven to 10.45m bgl. Roots were recorded to 1.5m bgl.

2.4 Hydrogeology

The London Clay Formation is an unproductive aquifer. Groundwater was not encountered during drilling or monitoring (>5.3m bgl), well below basement depth. However, groundwater levels may vary seasonally.

3 Assessment of Ground Movement

Movements have been assessed for the neighbouring properties and structures as follows:

- 38 Leighton Road
- 42 Leighton Road

Drawings which have been used in assessing basement and distances to adjoining and nearby structures are included in Appendix A. It is understood that the existing basement is to be deepened from approximately 2.5m bgl to 3.5m bgl, level with the proposed basement extension.

This assessment has taken into account that the underpinning will be in a hit and miss sequence and that shoring and horizontal propping will be used. Whilst it is acknowledged that the basement depth and excavation will be shallow relative to existing foundations ***the construction method should not leave existing foundations unsupported or vulnerable to ground movement from unsupported excavations or steeply battered excavation slopes.***

It is important to note that CIRIA report C760 is written for embedded retaining walls. Whereas the basement wall is constructed in short panels and each is cast against the exposed soil. Therefore, movement calculations for the excavation of soil and installation of underpins does not strictly apply to C760. There is no recognised method for calculating ground movements due to underpinned basements. C760 is used as a convenient and recognised approach. Calculations have been carried out using Geo5 Sheeting Check software for the basement retaining walls. For comparison we have allowed for wall installation.

It is recognised that settlements are generally minor where care in construction and appropriate precautionary measures are taken in this type of basement construction.

It is recommended that where the understanding of movements is significant, appropriate instrumentation should be installed to monitor ground movement before and during construction.

Design drawings developed by the engineer have been reviewed and used to inform this assessment.

The following key assumptions have been made:

- The detailed design of the basement (and associated temporary works) has been carried out by an appropriately qualified and experienced structural engineer, to current professional standards and best practice.
- The maximum excavation depth is approximately 3.5m below existing ground level.

- The method of basement construction will be as per the drawings, see note above, and will be carried out with due skill and care by an appropriately experienced contractor.
- A high wall stiffness has been assumed.
- The wall will be propped promptly using closely spaced props in the temporary case.
- In the permanent case the wall will be permanently propped at floor level and ceiling level.

For the purposes of the calculations, the parameters of the subject properties have been estimated as included in Table 1.

Table 1: Property Dimensions and Proximity

Property	Distance from basement (m)	Height (m)	Length (m)	Width (m)	Differential Basement depth (m)*[3]
38 Leighton Road	0	9	16.5	5	3.5*[1]
42 Leighton Road	0	9.5	10	5	2*[2]

***[1]Front part of house only, rear has existing 2.5m basement**
***[2] Maximum anticipated differential depth.**
***[3] Note that the basement is largely being deepening by 1m.**

It is assumed that the soils are competent soils as encountered in the ground investigation. Made Ground was encountered to approximately 1.4m bgl, overlying firm to stiff clay of the London Clay Formation. Groundwater was not encountered.

The ground model used during the analyses is shown in Table 2 below. Characteristic values have been assigned to the weathered London Clay obtained from SPT correlations and published research. Values of Young's modulus have been derived using the empirical formula $E_u=400C_u$ outlined in CIRIA C580.

Table 2: Ground Model

Strata	Unit Weight (kN/m^2)	Effective angle of friction (deg)	Effective cohesion (kPa)	Drained Youngs Modulus, E' (MPa) [1]	Poisson Ratio
Made Ground	17	20	0	8	0.3
London Clay	19	22	0	14	0.2

[1]Based on E' = $0.6E_u$ for stiff clays. Look, B., 2007. *Handbook of geotechnical investigation and design tables*.

4 Assessment of Building Damage

4.1 Movement due to wall installation and excavation following C760

The following ground movements have been calculated in relation to ground movements, using Figure 6.16 in C760.

Table 3: Damage Assessment using the Burland Scale

Property	Maximum Vertical Deflection Δ (mm)	Maximum Horizontal Movement dh (mm)	Building Damage Assessment
38 Leighton Road	3	2	1 Very Slight
42 Leighton Road	3	2	1 Very Slight

Ground movement contour plots are included in Appendix A.

*In addition to assessing ground movement, some consideration should be given whether to include an allowance for the shrinkage of the dry pack at the wall. It is considered (and the experience of past project reports) that the dry pack may shrink nominally at the wall only.

Burland Scale categories 0, 1, and 2 refer to aesthetic damage, category 3 and 4 relate to serviceability and function, and 5 represents damage which relates to stability. The main objective of design and construction is to maintain a level of risk to buildings no higher than category 2 where only aesthetic damage is considered acceptable.

Note that the figures above do not necessarily represent the total ground movement but the maximum differential movements which are predicted to be experienced by the building. The ground movement and building damage calculations are appended.

The calculations assume that the wall is propped and that the wall and excavation are adequately supported in the temporary case.

There are a number of key points to note in using this assessment:

- Most ground movement will occur during excavation of the basement and construction so the adequacy of temporary support will be critical in limiting ground movements.
- The speed of propping and support is key to limiting ground movements and limiting unpropped wall heights.
- Good workmanship will contribute to minimising ground movements.

- The calculation assumes the wall is in competent soil as per the findings of the ground investigation.

Ground movement can be minimised by adopting a number of measures, including:

- Ensuring that adequate propping and support is in place at all times during construction.
- Installation of the first (stiff) support quickly and early in the construction sequence.
- Avoid leaving ground unsupported.
- Minimise deterioration of the unexcavated soil mass by the use of blinding/ covering with a waterproof membrane.
- Avoid overbreak.
- The control and appropriate design of any dewatering process must ensure that fines removal and drawdown are minimised.

It must be noted that the movements are calculated values based on the findings and methods of CIRIA C760. Larger movements may be generated if anyone or any combination of the above recommendations and/or assumptions are not heeded or if ground conditions are different from those anticipated by the investigation.

The actual magnitude of these movements will depend upon a number of factors described above and the nature of the ground expected may give rise to larger movements.

4.2 Geo5 Sheeting Check Analysis

Further assessment of the basement construction on the adjacent properties has been carried out using "Sheeting Check" developed by GEO5 for 1m of basement deepening. The results are included in Table 4 below.

Table 4: Geo 5 Sheeting Check Results

Property	Maximum Vertical Movement (mm)	Distance from the wall (m)	Maximum Horizontal Movement (mm)	Building Damage Assessment
38 Leighton Road	1	~0.7	0	0 Negligible
42 Leighton Road	1	~0.7	0	0 Negligible

The results are broadly in line with the CIRIA C760 method results. The output sheets are provided in Appendix D. Note that since a basement already exists the maximum movement is taken for the last stage only.

Computer analysis demonstrates that ground movements are highly sensitive to prop and wall stiffness, so the use of stiff props both in the temporary and permanent cases is essential.

4.3 Geo5 FEM Analysis

Analysis of ground movement has been carried out using GEO5 FEM software to provide a check and generate a visualisation of ground movement.

The location of the services modelled in our analysis are shown in Appendix C. An electricity service has been modelled at a depth of 0.5m bgl and at a distance of 0.5m from the excavation, a water utility has been modelled 1.2m bgl and at a distance of 2.5m from the excavation and a sewage utility has been modelled 2m bgl and at a distance of 4.5m from the excavation beneath the road.

Table 5: Geo 5 FEM Results

Structure	Maximum Vertical Movement (mm)	Maximum Horizontal Movement (mm)
38 Leighton Road	1	0
42 Leighton Road	1	0
Utilities	1	0

The calculated settlements are similar to those calculated using the C760 method. The output is included within Appendix C.

5 Monitoring

Expected movements are such that they may not manifest themselves in monitoring through survey work. The GMA has predicted that building damage will fall into the "very slight" category. We suggest the system of alerts and actions in table 3 below. These should be developed and finalised by the Structural Engineer.

Table 6: Monitoring Alerts and Actions

Amount of horizontal/vertical movement recorded	**Action**	**Comments**
0 to 3mm	None, continue monitoring	Damage likely to be negligible
3 to 8 mm	Inform engineer, engineer to visit site	Damage likely to be negligible or very slight
>8 mm	Cease work. Inform engineer, engineer to visit site and advise on changes to working practice etc	Damage likely to be slight or worse

6 Conclusions

The results of the Ground Movement Assessment and Building Damage Assessment have found that the potential risk to the neighbouring properties is in the Very Slight category. This is understood to be an acceptable level of risk. The results of the FEM analysis indicate <1mm of ground movement to surrounding utilities.

The basement will be constructed mainly in the London Clay Formation with some Made Ground near the surface. Uncontrolled groundwater seepages may cause fines to washout in the short term. Most ground movement will occur during excavation of the basement and construction so the adequacy of the temporary support will be critical in limiting ground movements.

Monitoring should be carried out to make sure the movements are within acceptable limits.

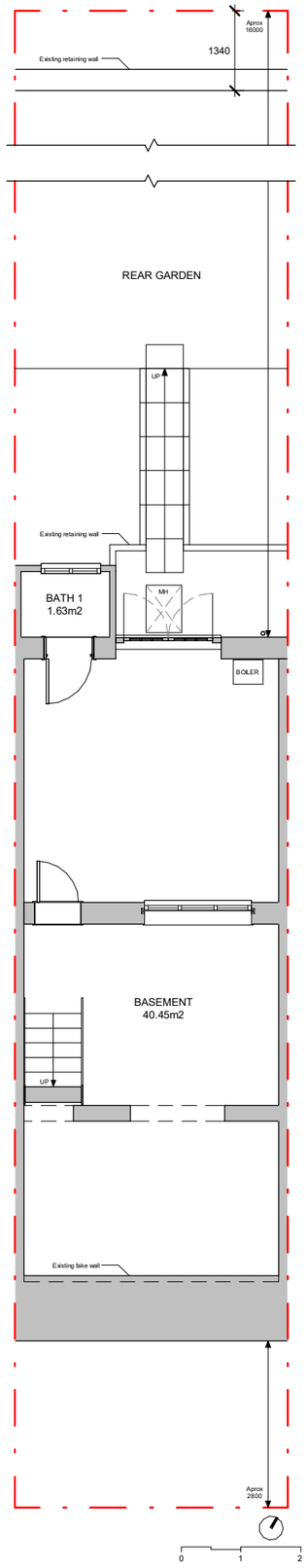
Appendix A

Drawings

EXISTING PLANS

KEY LABEL

- Boundery line
- Existing walls



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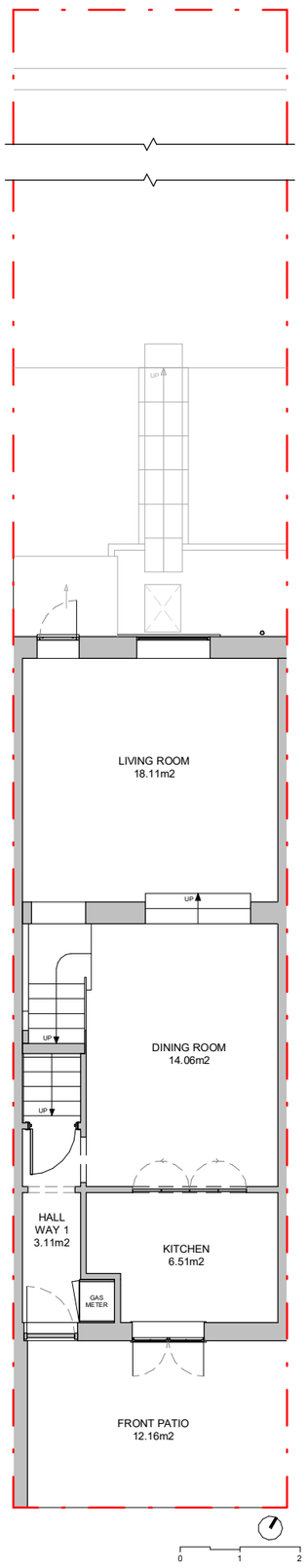
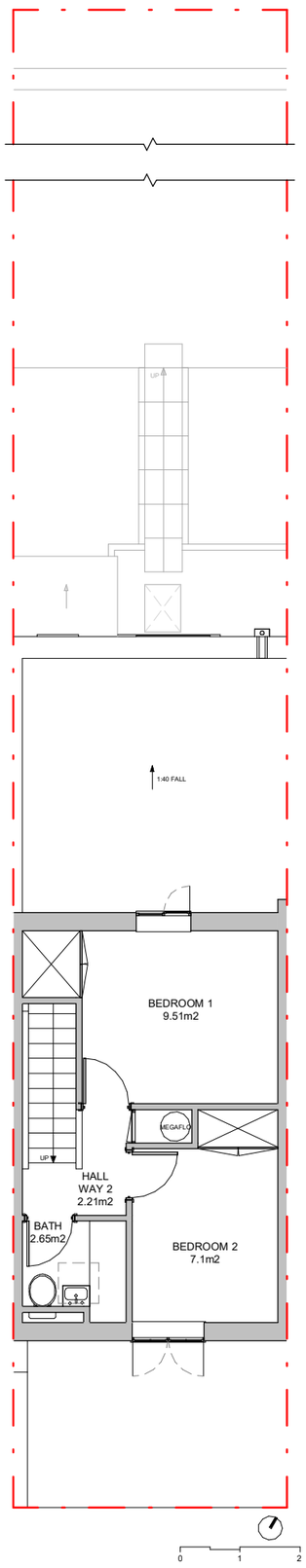


GROUND FLOOR PLAN — SCALE 1:100 @A3



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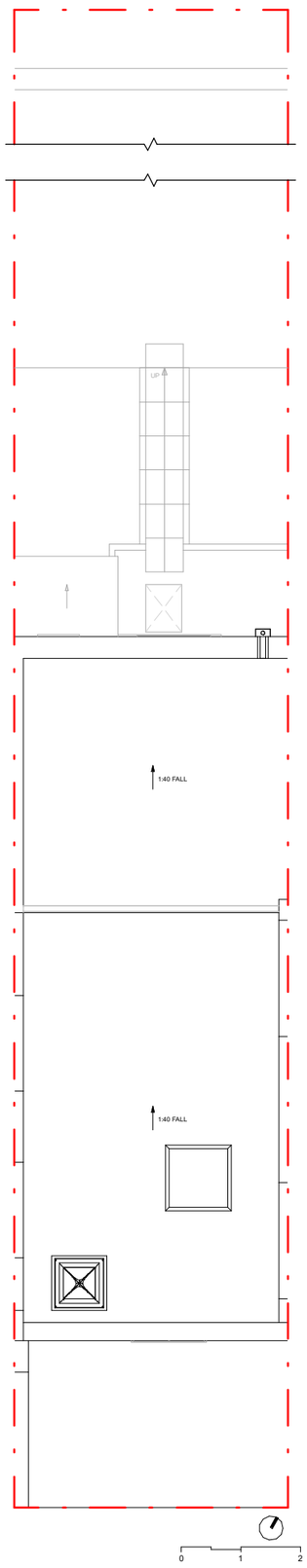

ROOF PLAN — SCALE 1:100 @A3

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2. All dimensions are in milimeters.
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PROJECT:
BASEMENT EXTENSION + ONE STOREY REAR EXTENSION + MANSARD

ADDRESS:
40 LEIGHTON RD, LONDON
NW5 2QE

TITLE:
EXISTING
PLANS

DATE:	PROJECT NUM:
08/01/2021	P-019
SCALE: 1/100 (@ A3)	DRAWING NUM: EX-01
REV: A	STATUS:

EXISTING ELEVATIONS

KEY LABEL

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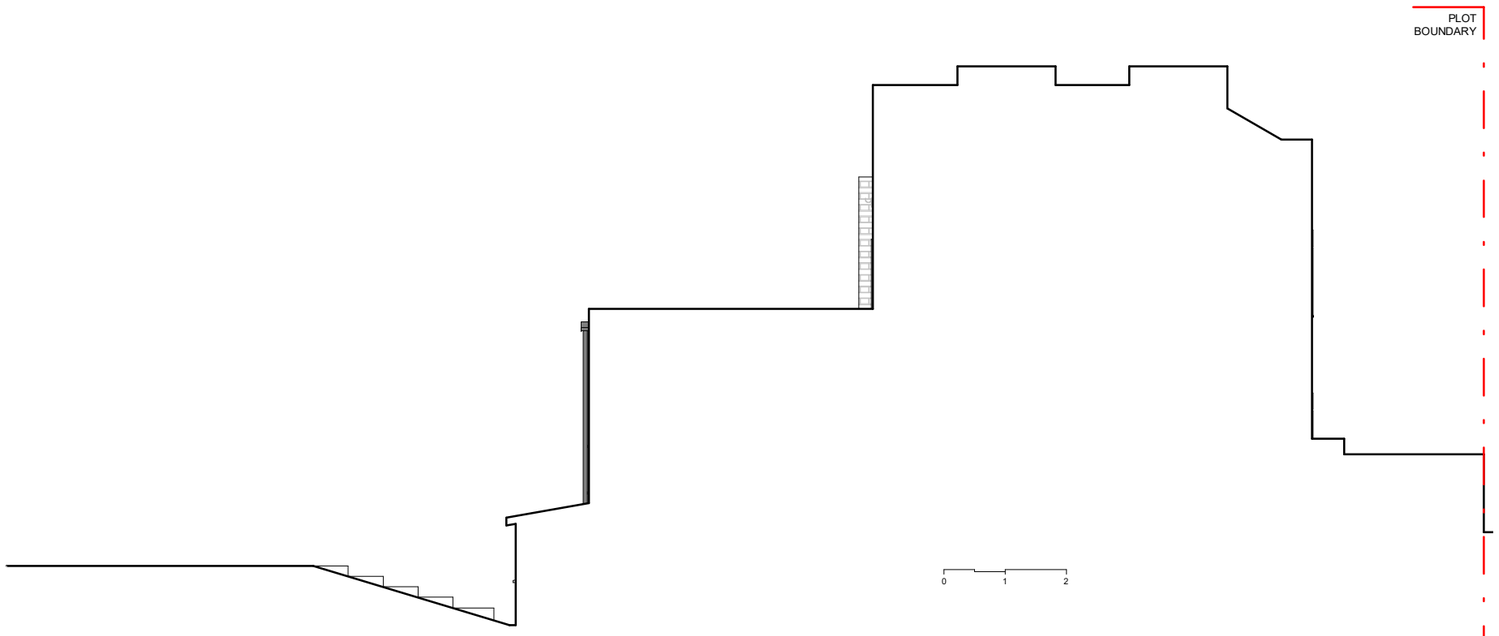
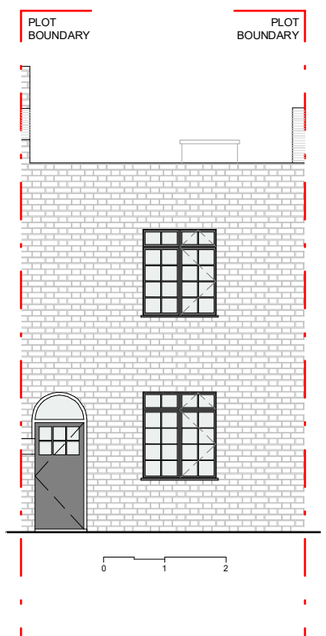


LEFT HAND SIDE ELEVATION

SCALE 1:100 @A3



FRONT ELEVATION

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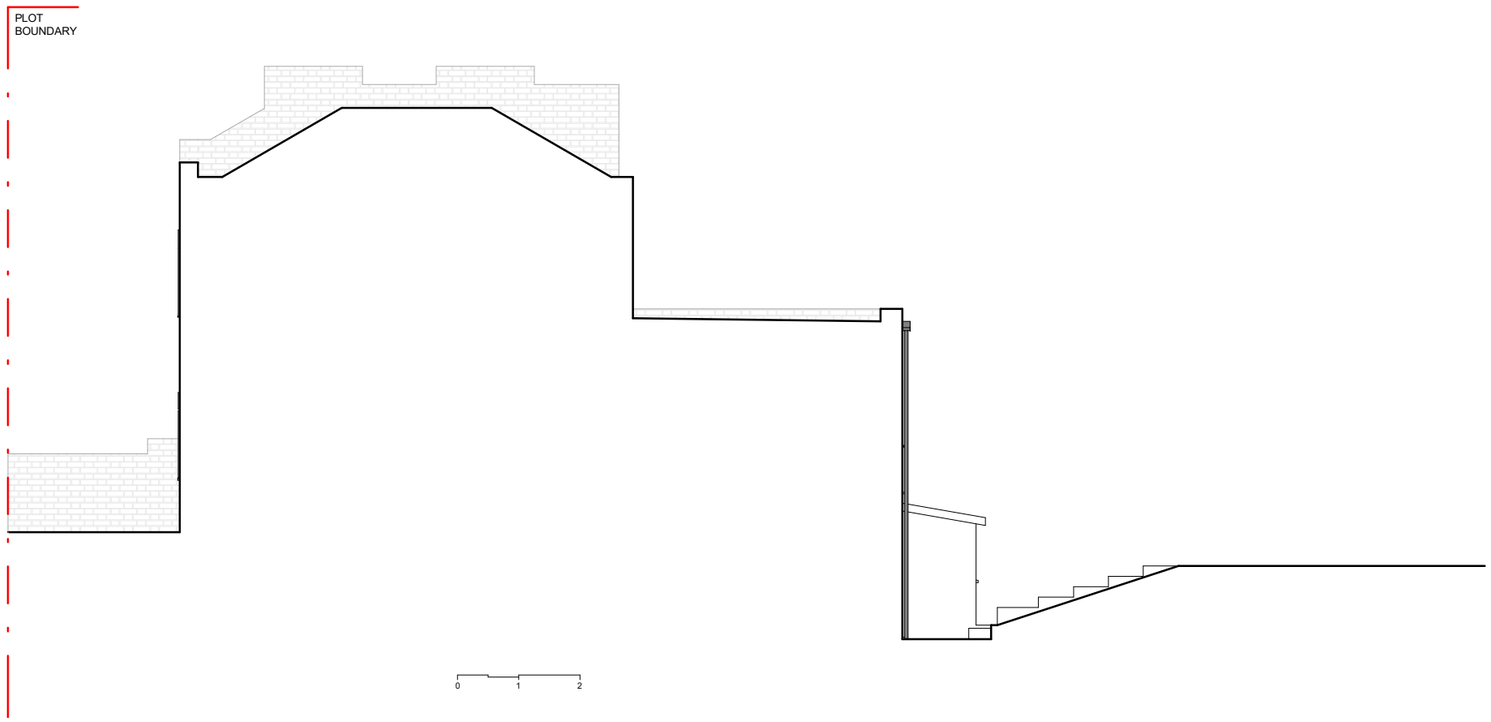

RIGHT HAND SIDE ELEVATION

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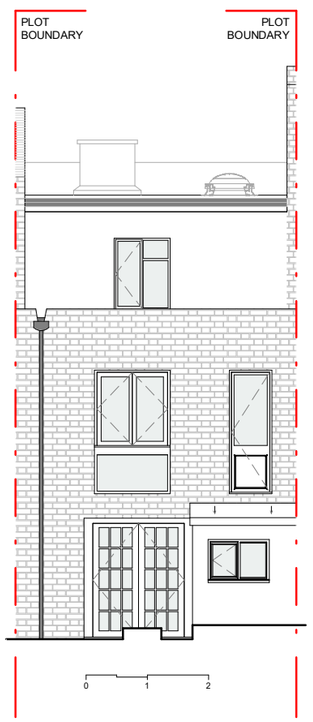

REAR ELEVATION

SCALE 1:100 @A3

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ADDRESS:
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TITLE:
EXISTING
ELEVATIONS

DATE:	PROJECT NUM:
08/01/2021	P-019
SCALE: 1/100 (@ A3)	DRAWING NUM: EX-02
REV: A	STATUS:

SITE PHOTOGRAPHS

01 11/12/2020

- No.40 Front Elevation

02 11/12/2020

- No.40 Front Elevation context

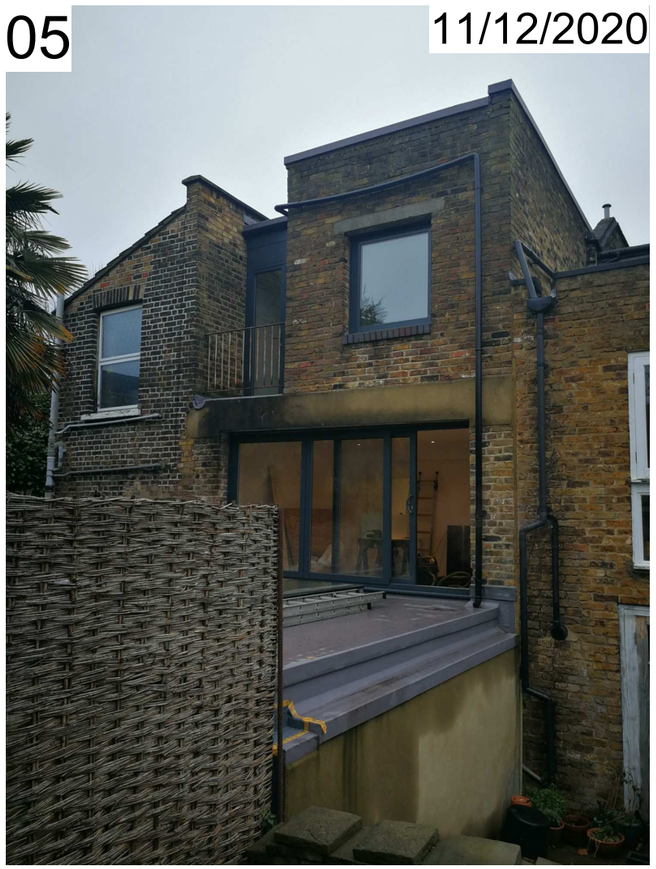
03 11/12/2020

- No.40 Rear Elevation

04 11/12/2020

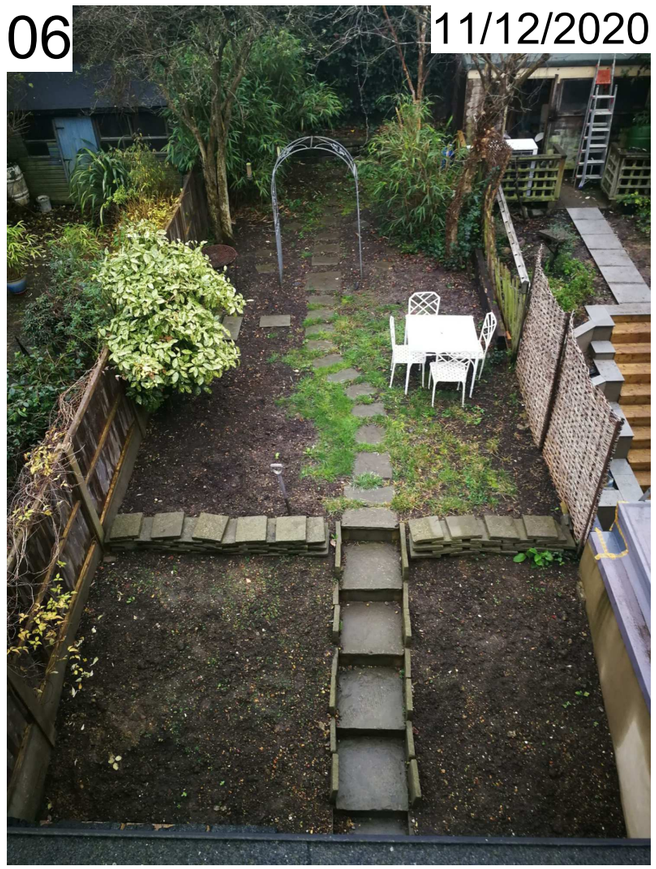
- No.42 (Left Hand Side Neighbour) rear elevation context

05 11/12/2020



- No.38 (Rigth Hand Side Neighbour) rear elevation context

06 11/12/2020



- No.40 Rear Garden

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PHOTOGRAPHS

DATE:	PROJECT NUM:
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SCALE: 1/100 (@ A3)	DRAWING NUM: EX-03
REV: A	STATUS:

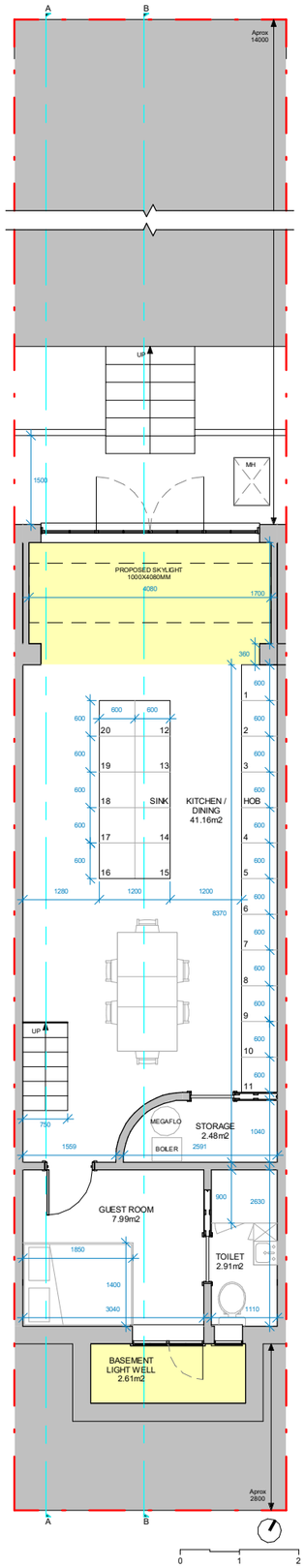
PROPOSED PLANS

NOTE:

- DEMOLITIONS OMITTED FOR CLARITY
- DESIGN SUBJECT TO INVESTIGATION

KEY LABEL

- Boundery line
- Existing walls
- Proposed Stud wall
- Proposed External wall
- Proposed new floor
- Proposed new roof
- Demolished wall



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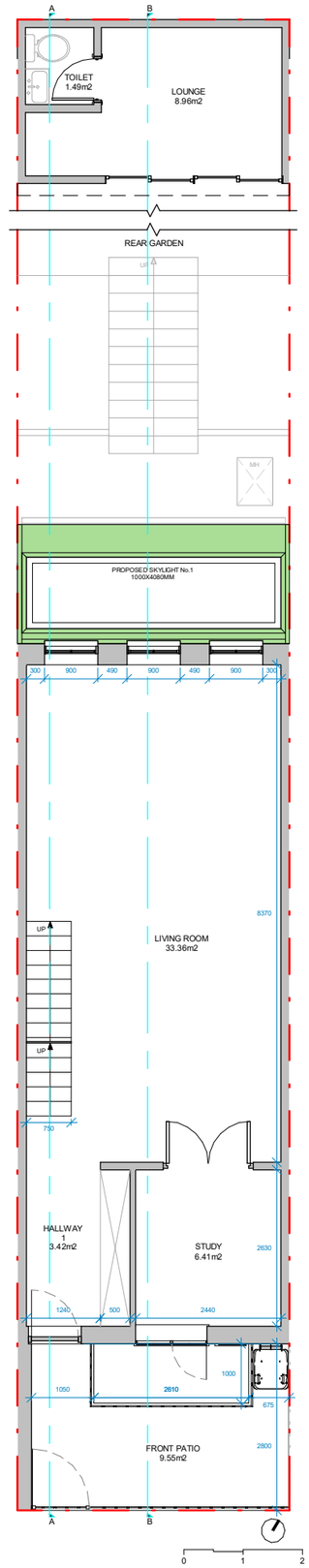

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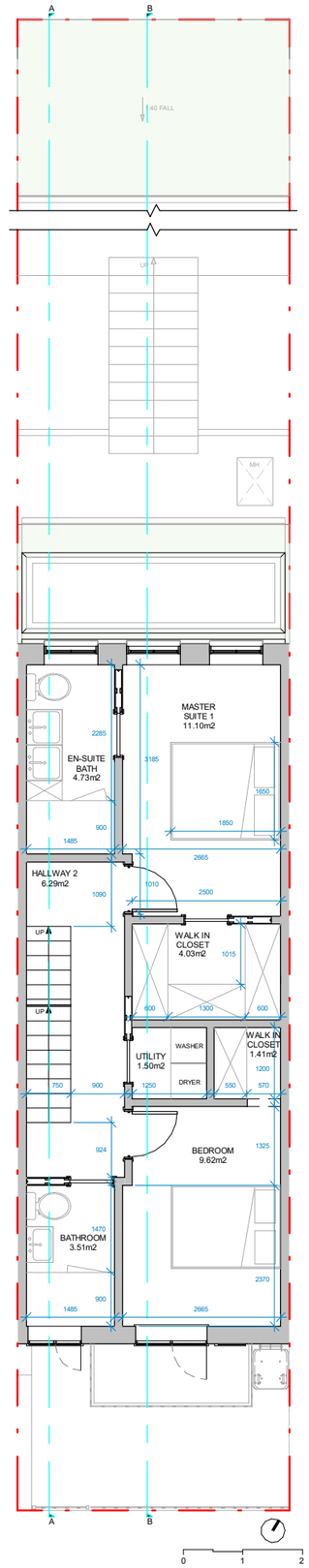

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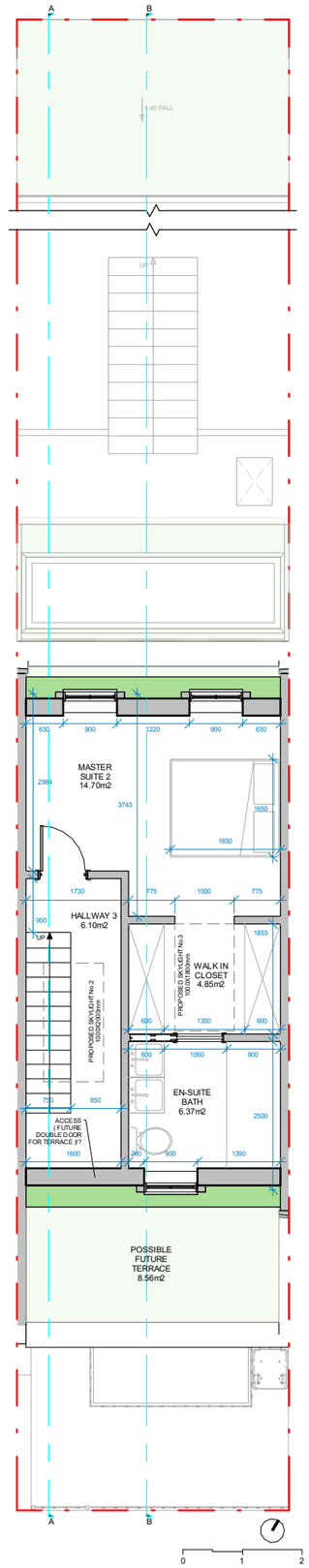

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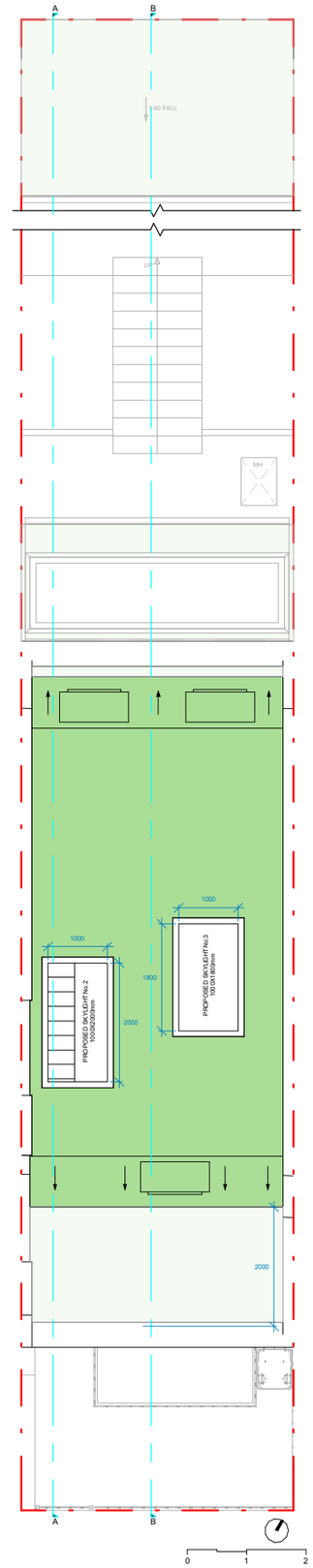

ROOF PLAN ***SCALE 1:100 @A3***

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PROJECT:
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TITLE:
PROPOSED
PLANS

DATE: 19/01/2021

PROJECT NUM: P-019

SCALE: 1/100 (@ A3)

DRAWING NUM: PR-01

REV: A

STATUS:

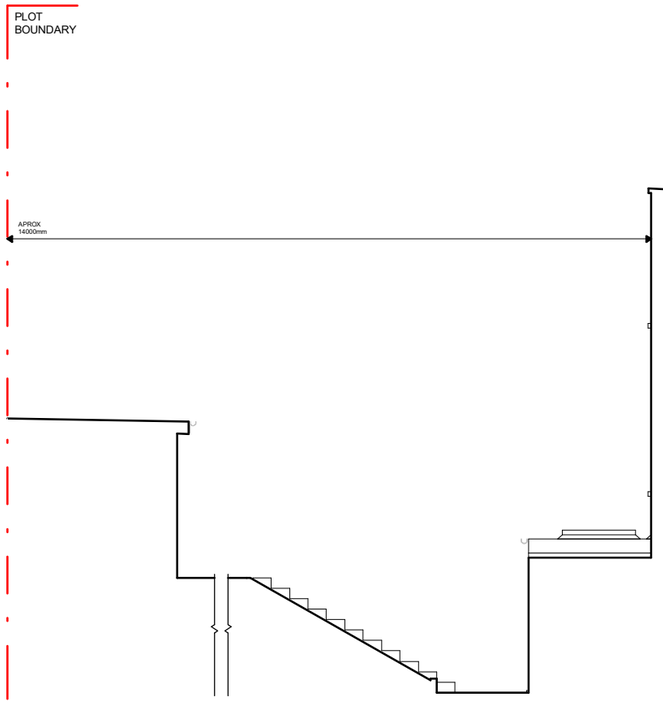
PROPOSED ELEVATIONS

NOTE:

- DEMOLITIONS OMITTED FOR CLARITY
- DESIGN SUBJECT TO INVESTIGATION

KEY LABEL

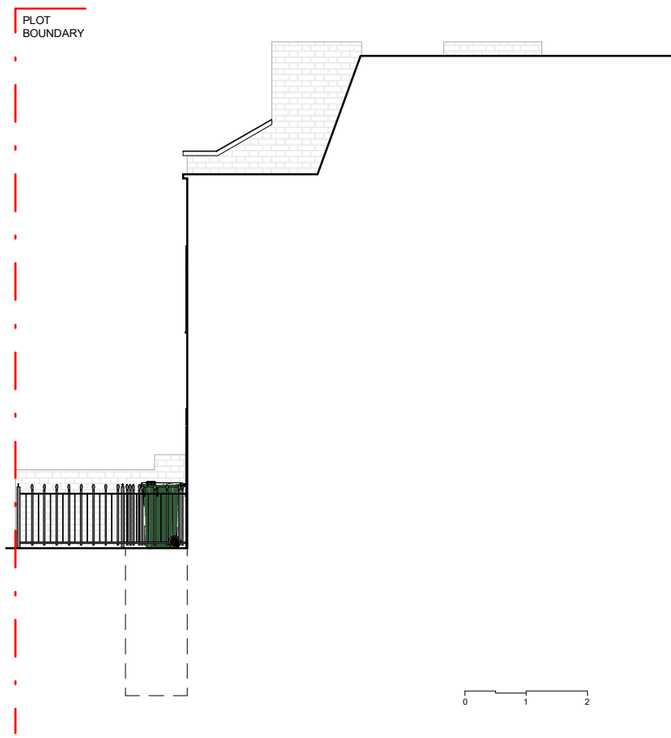
- Boundery line



LEFT HAND SIDE ELEVATION

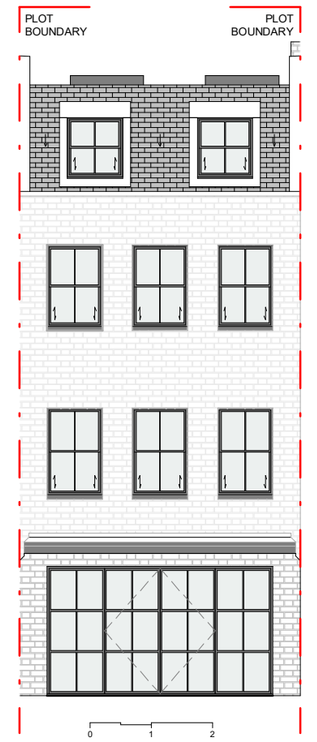
SCALE 1:100 @A3

FRONT ELEVATION ***SCALE 1:100 @A3***



RIGHT HAND SIDE ELEVATION

SCALE 1:100 @A3



REAR ELEVATION ***SCALE 1:100 @A3***

Proficiency
Design & Build

663 FINCHLEY ROAD, HAMPSTEAD
LONDON
NW2 2HN

TEL.02074356231
PROFICIENCYARCHITECT@GMAIL.COM
WWW.PROFICIENCYLTD.CO.UK

RIBA Royal Institute of British Architects

arb Architects Registration Board

PLEASE NOTE

1. All dimensions to be verified on site.
2. All dimensions are in milimeters.
3. No work shall commence until all approvals and agreements have been obtained.
These include, Planning, Building Regulations, Thames Water and party Wall.
4.

CLIENT:
MAT & LOUISE

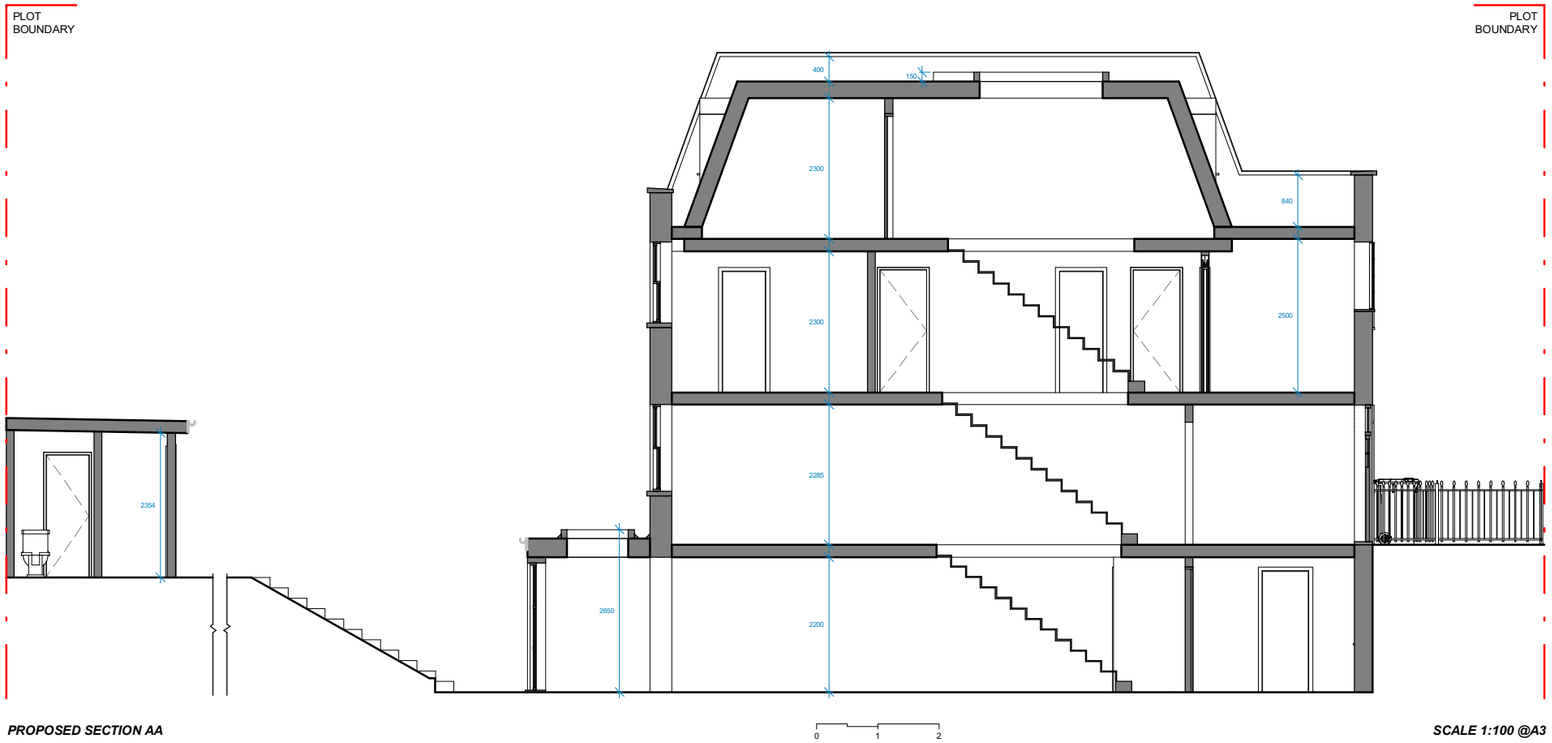
PROJECT:
BASEMENT EXTENSION + ONE STOREY REAR EXTENSION + MANSARD

ADDRESS:
40 LEIGHTON RD, LONDON
NW5 2QE

TITLE:
PROPOSED
ELEVATIONS

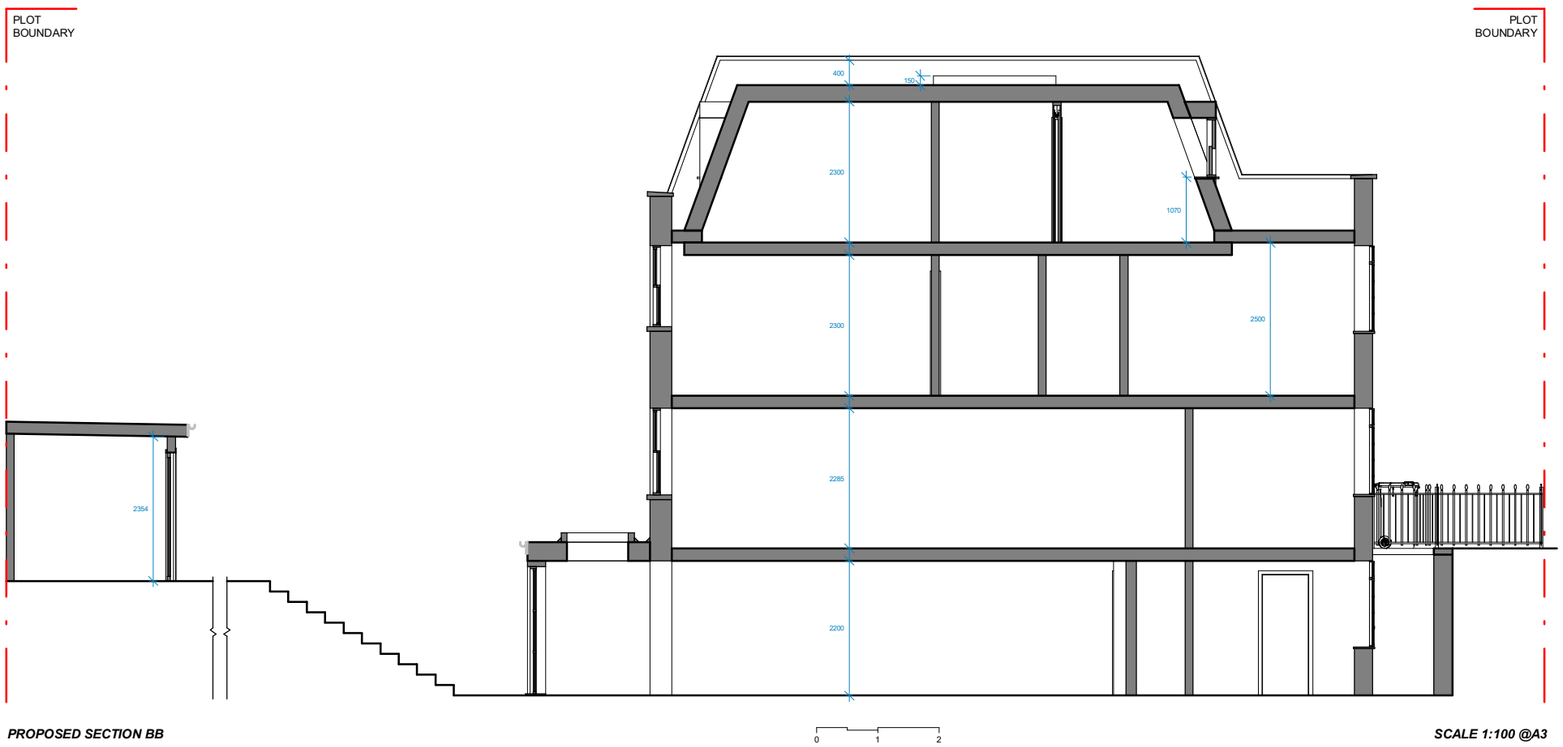
DATE:	PROJECT NUM:
19/01/2021	P-019
SCALE: 1/100 (@ A3)	DRAWING NUM: PR-02
REV: A	STATUS:

PROPOSED SECTIONS: AA & BB



PROPOSED SECTION AA

SCALE 1:100 @A3



PROPOSED SECTION BB

SCALE 1:100 @A3

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40 LEIGHTON RD, LONDON
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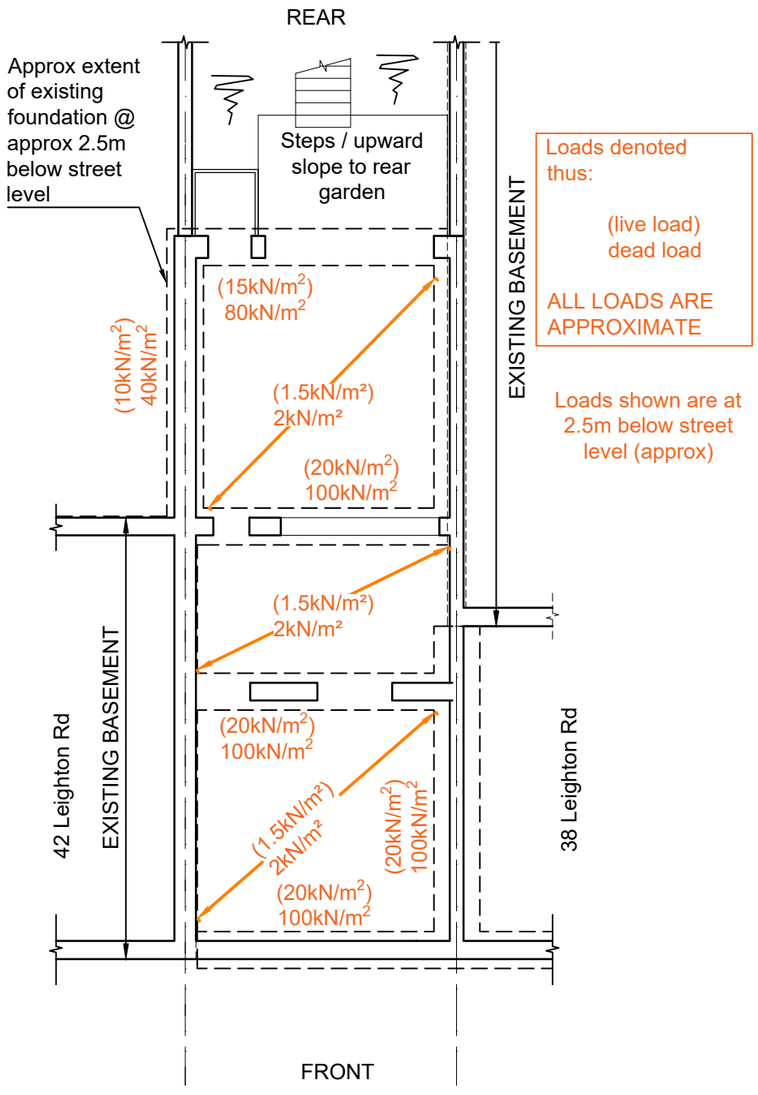
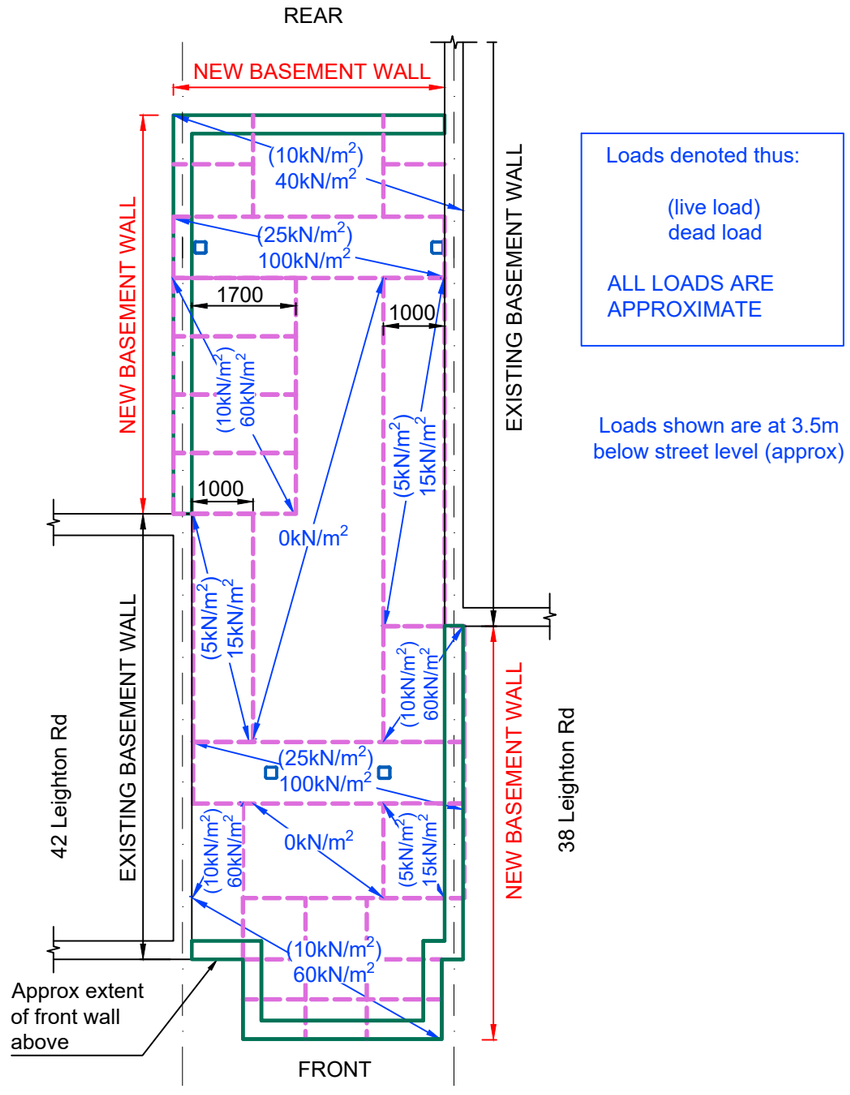
TITLE:
PROPOSED
SECTIONS: AA & BB

DATE:	PROJECT NUM:
19/01/2021	P-019
SCALE: 1/100 (@ A3)	DRAWING NUM: PR-02
REV: A	STATUS:



Basement Existing

Scale 1:100



Basement Proposed

Scale 1:100

Rev	Date	By	Amendments
-	09.03.2021	SC	First Issue

Job Number	Dwg Number
210221	SL-101
Scale: As shown @A1	Rev: -
By: SC	Approved by: GW

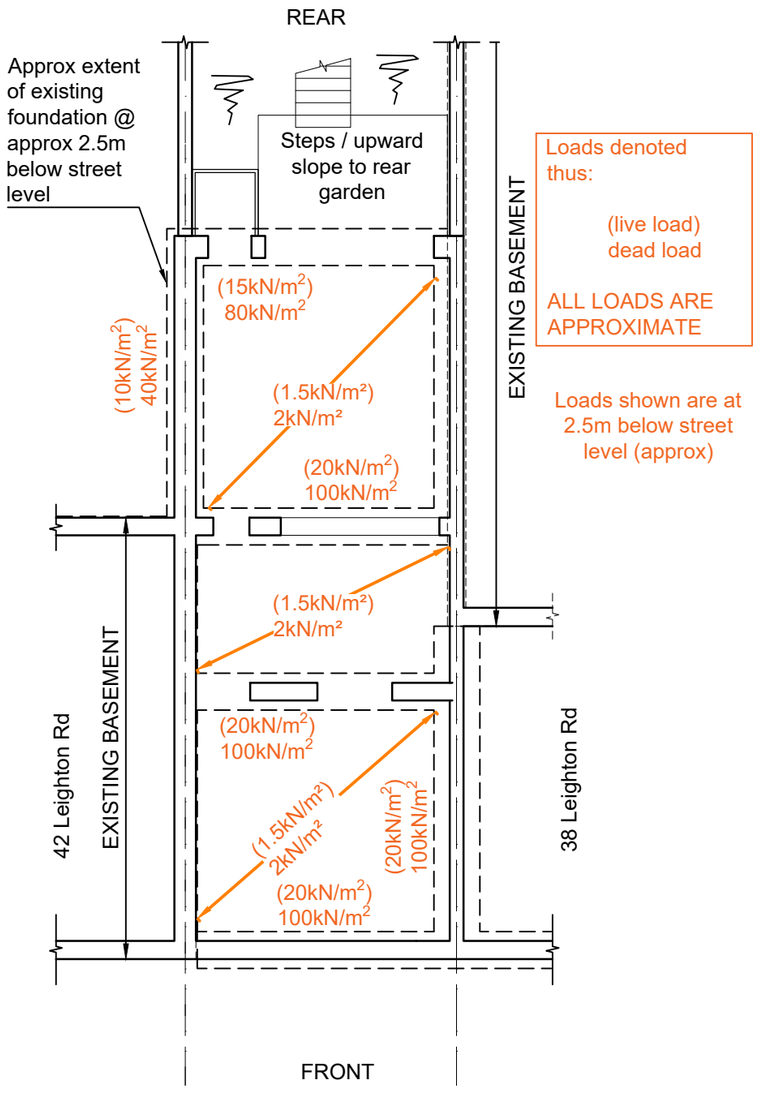
Client: Matthew Jones & Louise Willcocks

Property: 40 Leighton Road, Kentish Town, Camden, NW5 2QE

Drawing Title: Foundation Loading

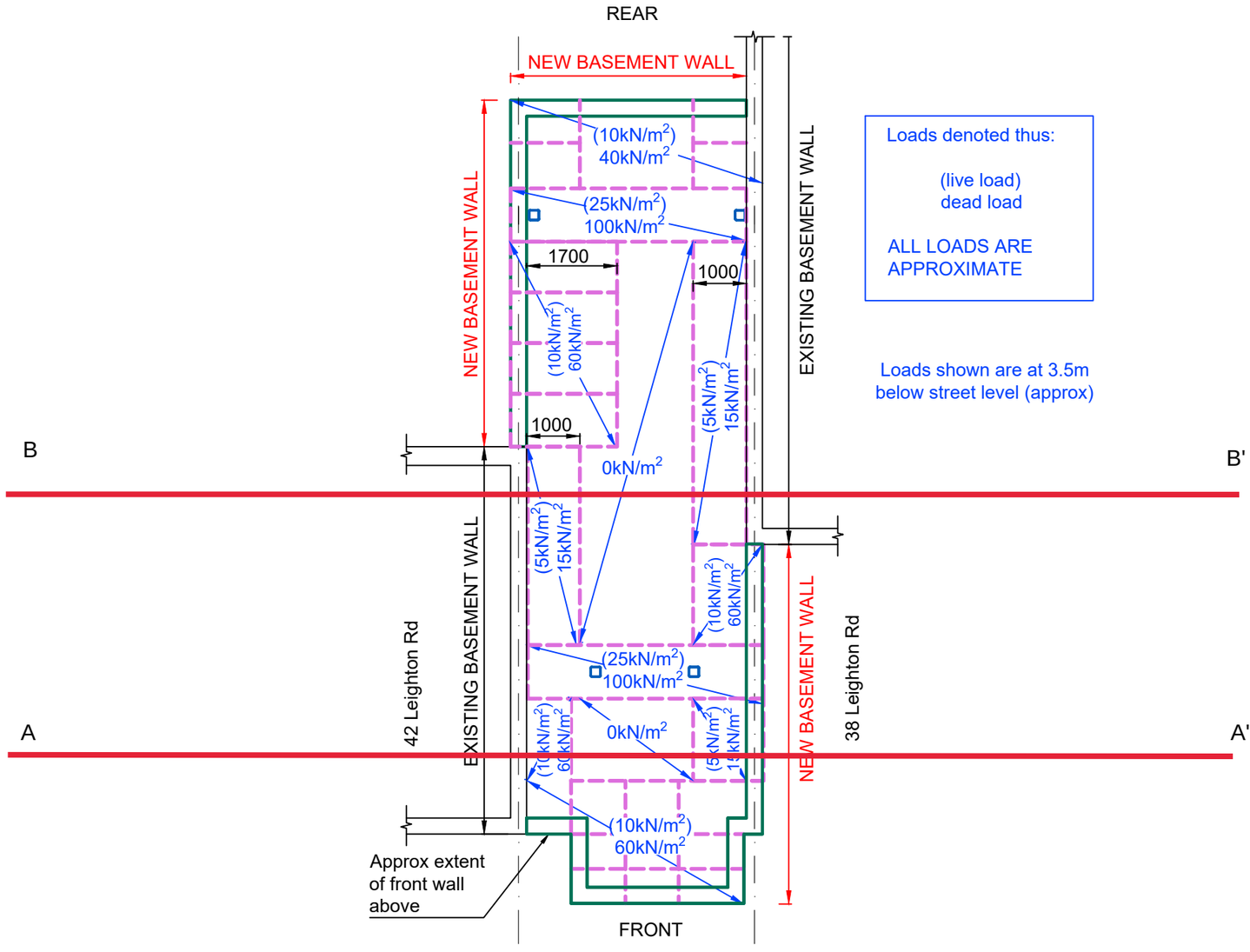
Croft Structural Engineers
Clockshop Mews,
r/o 60 Saxon Rd,
London, SE25 5EH.
020 8684 4744
www.croftse.co.uk

Issued for **INFORMATION ONLY**



Basement Existing

Scale 1:100



Basement Proposed

Scale 1:100

Rev	Date	By	Amendments
-	09.03.2021	SC	First Issue

Job Number	Dwg Number
210221	SL-101
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Appendix B

Calculation Spreadsheets

Ground and Project CONSULTANTS LTD

Project	40 Leighton Rd		
Project No.	70572		
Calc Title	Ground Movement Assessment adjoining properties		
Date	13 April 2022	**Rev**	1

House Details, Background Data and Assumptions

Calculations based on C760 Pg155,

Building	**38/42 Leighton Rd**
Ground Level (m AOD)	
Basement Depth (m)	1.0
Basement Floor level (m AOD)	
Effective Basement Depth (m)	1.0
Wall Depth (m)	1.0
Length (m)	5.0
Height (m)	9.5
Distance (m)	0.0
Far Side (m)	5.0

Movement Calculations for Wall Installation

Horizontal

Distance from wall/wall depth (m)	**Distance (m)**	**Movement/ Wall Depth (%)**	**Horizontal Movement (mm)**	**Relevance to Adjacent Properties**
0.0	0.0	0.080	0.80	NS
0.1	0.1	0.070	0.70	
0.2	0.2	0.075	0.75	
0.3	0.3	0.060	0.60	
0.4	0.4	0.050	0.50	
0.5	0.5	0.044	0.44	
0.6	0.6	0.040	0.40	
0.7	0.7	0.035	0.35	
0.8	0.8	0.030	0.30	
0.9	0.9	0.020	0.20	
1.0	1.0	0.018	0.18	
1.1	1.1	0.015	0.15	
1.2	1.2	0.012	0.12	
1.3	1.3	0.010	0.10	
1.4	1.4	0.005	0.05	
1.5	1.5	0.000	0.00	FS

Vertical

Distance from wall/wall depth (m)	**Distance (m)**	**Movement/ Wall Depth (%)**	**Vertical Movement (mm)**	**Relevance to Adjacent Properties**
0.0	0.0	0.050	0.5	NS
0.1	0.1	0.048	0.5	
0.2	0.2	0.046	0.5	
0.3	0.3	0.042	0.4	
0.4	0.4	0.040	0.4	
0.5	0.5	0.037	0.4	
0.6	0.6	0.035	0.4	
0.7	0.7	0.032	0.3	
0.8	0.8	0.029	0.3	
0.9	0.9	0.027	0.3	
1.0	1.0	0.025	0.3	
1.1	1.1	0.023	0.2	
1.2	1.2	0.020	0.2	
1.3	1.3	0.018	0.2	
1.4	1.4	0.016	0.2	
1.5	1.5	0.014	0.1	
1.6	1.6	0.011	0.1	
1.7	1.7	0.009	0.1	
1.8	1.8	0.007	0.1	
1.9	1.9	0.004	0.0	
2.0	2.0	0.000	0.0	FS

Deflection Ratio

	38/42 Leighton Rd
dh	0.8
Delta	0.5

Ground and Project CONSULTANTS LTD

Project:	40 Leighton Rd		
Project No.	70572		
Calc Title	Ground Movement Assessment adjoining properties		
Date:	13 April 2022	**Rev**	1

Assumptions

Calculations based on C760 Fig. 6.15 assume system stiffness =1000, FOS against base heave >3. zero at 3 x excavation depth as Fig. 6.11 a) and b)

High Stiffness	0.0075

Movement Calculations for Excavation

Horizontal **Distance from wall/excavation depth (m)**	**Distance (m)**	**Horizontal Movement/ Wall Depth (%)**	**Horizontal Movement (mm)**	**Relevance to Adjacent Properties**
0.0	0.0	0.15	1.5	NS
0.2	0.2	0.1425	1.4	
0.4	0.4	0.135	1.4	
0.6	0.6	0.1275	1.3	
0.8	0.8	0.12	1.2	
1.0	1.0	0.1125	1.1	
1.2	1.2	0.105	1.1	
1.4	1.4	0.0975	1.0	
1.6	1.6	0.09	0.9	
1.8	1.8	0.0825	0.8	
2.0	2.0	0.075	0.7	
2.2	2.2	0.0675	0.7	
2.4	2.4	0.06	0.6	
2.6	2.6	0.0525	0.5	FS
2.8	2.8	0.045	0.4	
3.0	3.0	0.0375	0.4	
3.2	3.2	0.03	0.3	
3.4	3.4	0.0225	0.2	
3.6	3.6	0.015	0.1	
3.8	3.8	0.0075	0.1	
4.0	4.0	0	0.0	
Vertical **Distance from wall/excavation (m) depth**	**Distance (m)**	**Settlement/ Excavation Depth (%)**	**Settlement (mm)**	**Relevance to Adjacent Properties**
0.0	0	0.040	0.40	NS
0.2	0.2	0.050	0.50	
0.4	0.4	0.070	0.70	
0.6	0.6	0.080	0.80	
0.8	0.8	0.075	0.75	
1.0	1	0.070	0.70	
1.2	1.2	0.060	0.60	
1.4	1.4	0.060	0.60	
1.6	1.6	0.050	0.50	
1.8	1.8	0.040	0.40	
2.0	2	0.035	0.35	
2.2	2.2	0.030	0.30	
2.4	2.4	0.025	0.25	
2.6	2.6	0.020	0.20	FS
2.8	2.8	0.015	0.15	
3.0	3	0.010	0.10	
3.2	3.2	0.005	0.05	
3.4	3.4	0.000	0.00	

Deflection Ratio

	38/42 Leighton Rd
dh	0.98
Delta	0.20

Ground and Project CONSULTANTS LTD

Project:	40 Leighton Rd		
Project No.	70572		
Calc Title	Ground Movement Assessment adjoining properties		
Date:	13 April 2022	**Rev**	1

Combined for Wall Installation and Excavation

	38/42 Leighton Rd
dh	1.8
Delta	3.4

Movement Assessment

38/42 Leighton Rd			
Horiz Strain (%)	dh/L	0.04	
Deflection Ratio (%)	Delta/L	0.07	
From Graph Fig 6.27 c	Damage Category	1 Very Slight	
From Graph Fig 6.27 b	Try elim	0.075	upper limit of damage category Table 6.4
L/H	0.53	Therefore eh/elim	0.5
Reading off Fig 6.27 b for closest L/H curve this gives Delta/L/ elim		0.9	
L	5000		
Therefore Delta = L x Reading x elim			
Delta (mm)	3.4		
Delta for combined wall installation and excavation is less :Damage category is confirmed as	1 Very Slight		

Appendix C

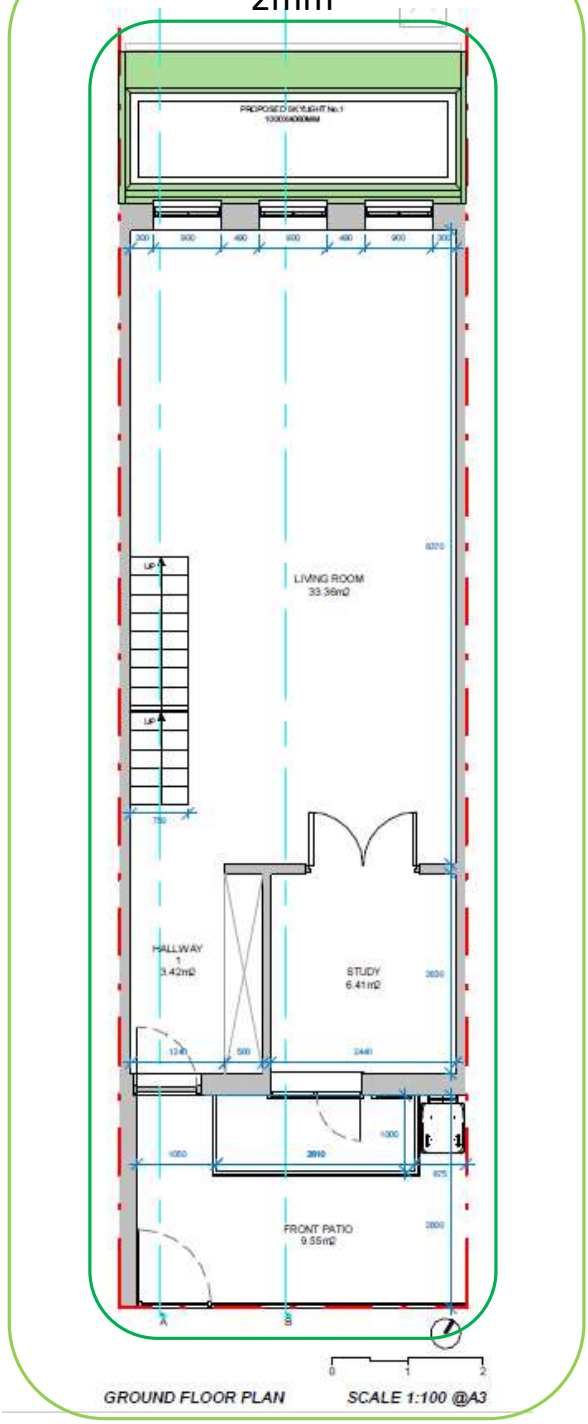
Geo5 Outputs

40 Leighton Road – Horizontal Movement Contours

0mm

1mm

2mm

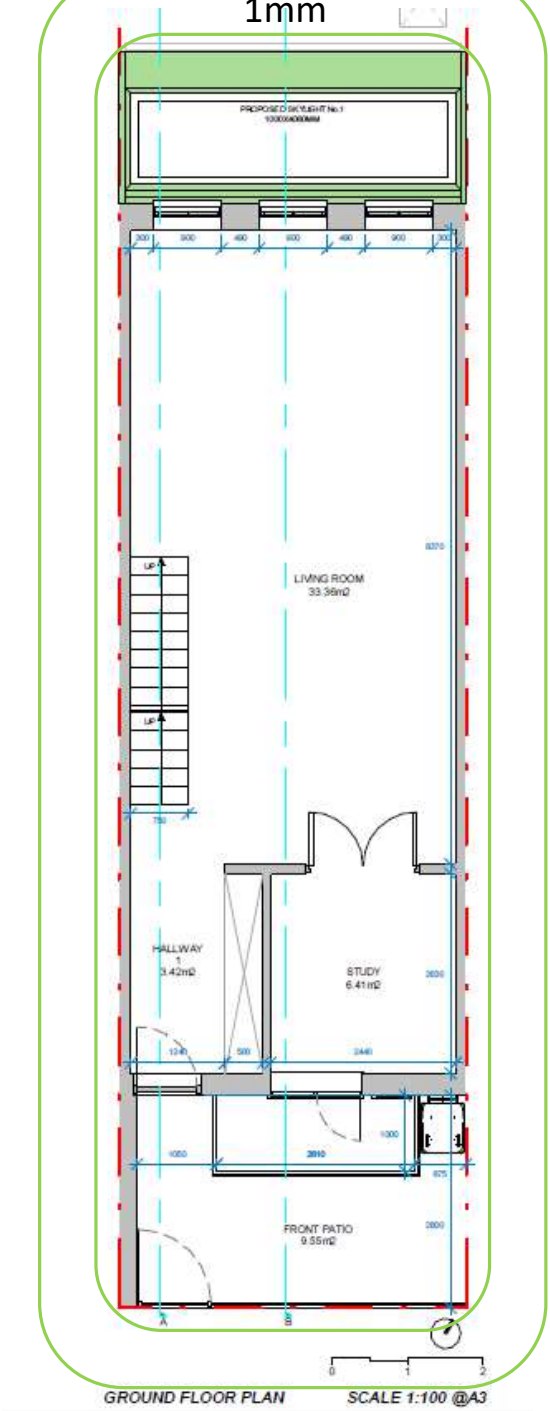


40 Leighton Road – Vertical Movement Contours

0mm

1mm

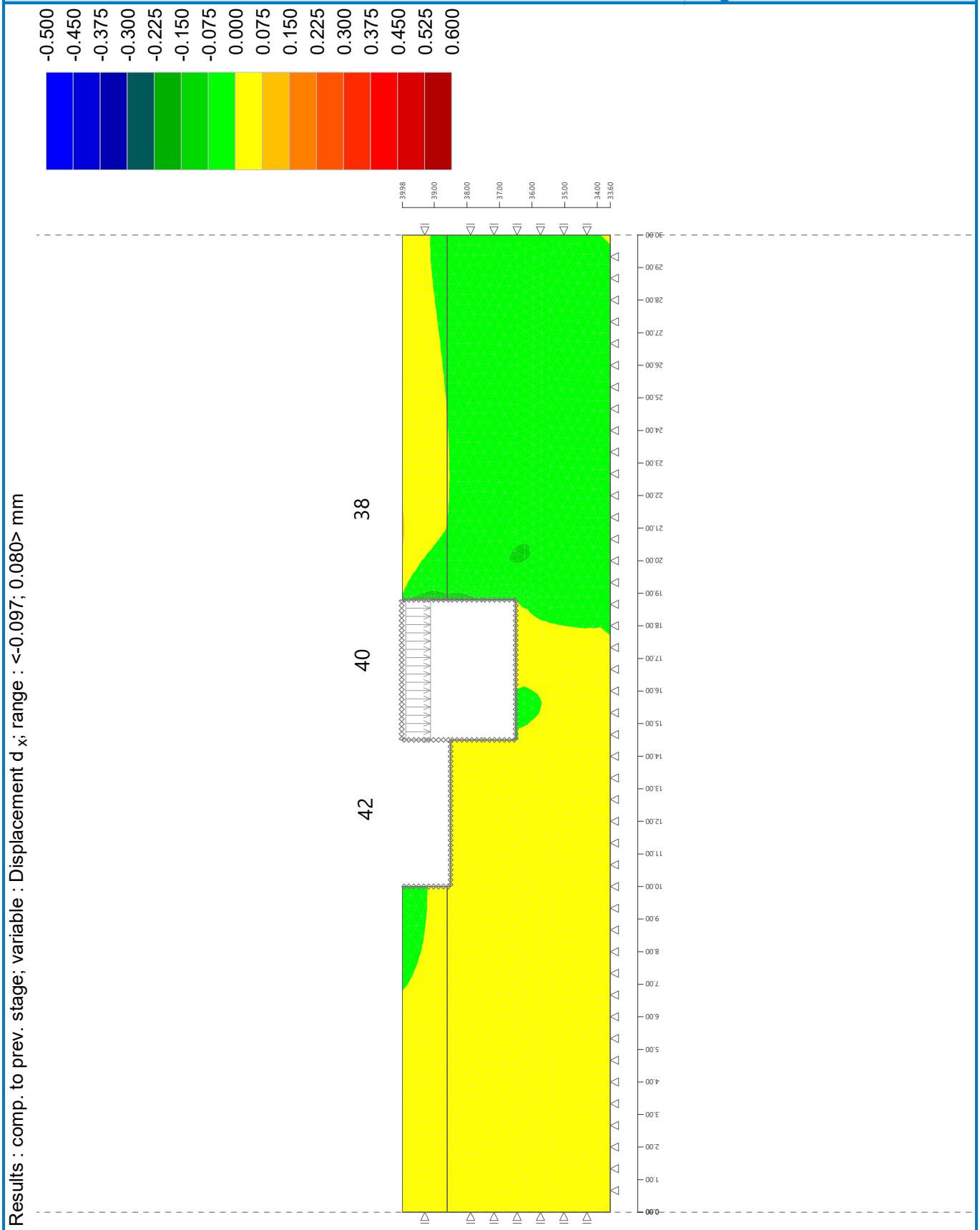
1mm



Appendix C

Geo5 Outputs

Name : **Stage : 3**

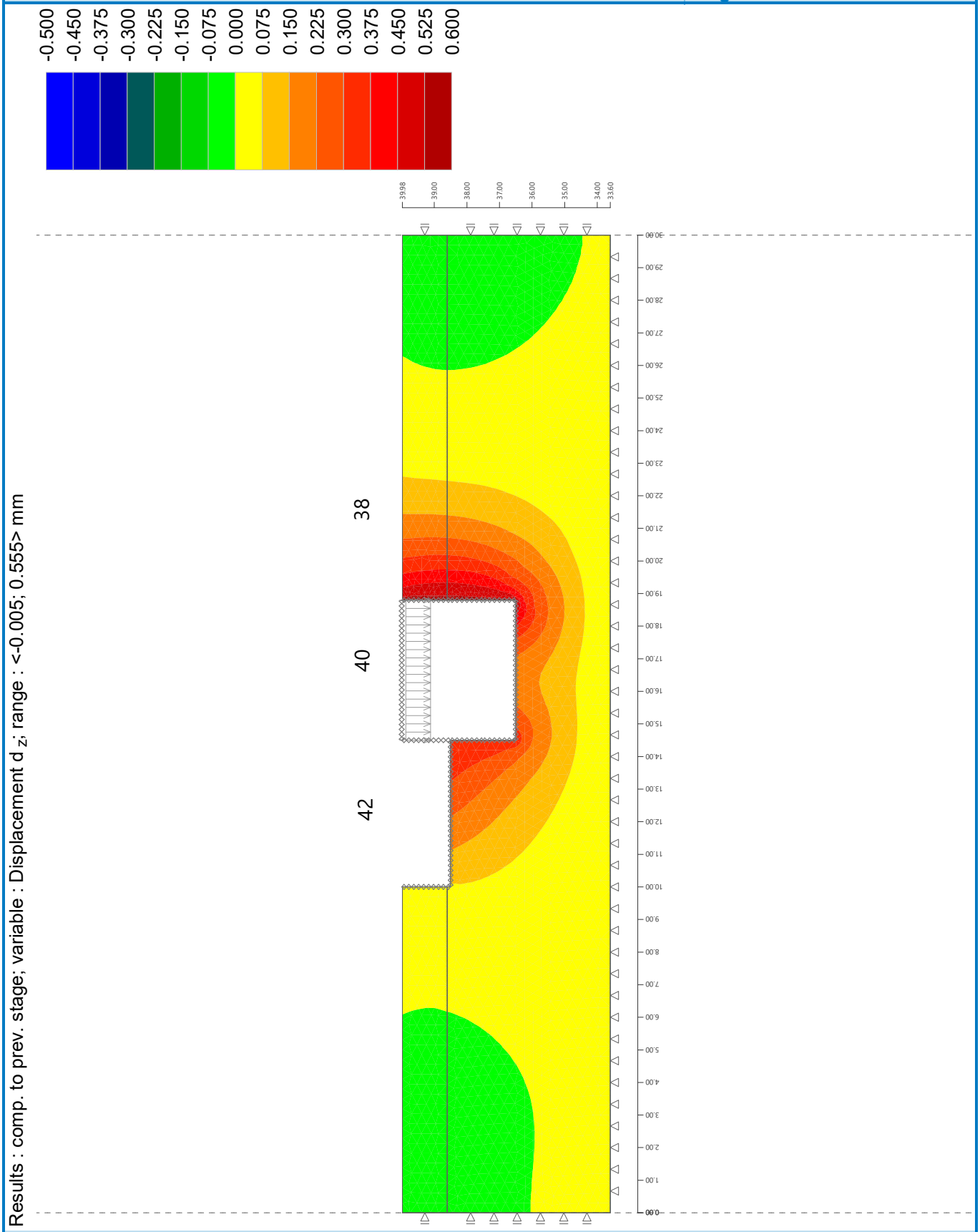


Stress analysis was successfully completed.

Analysis settings : **standard**

Attained loading = 100.00 %

Name : **Stage : 3**

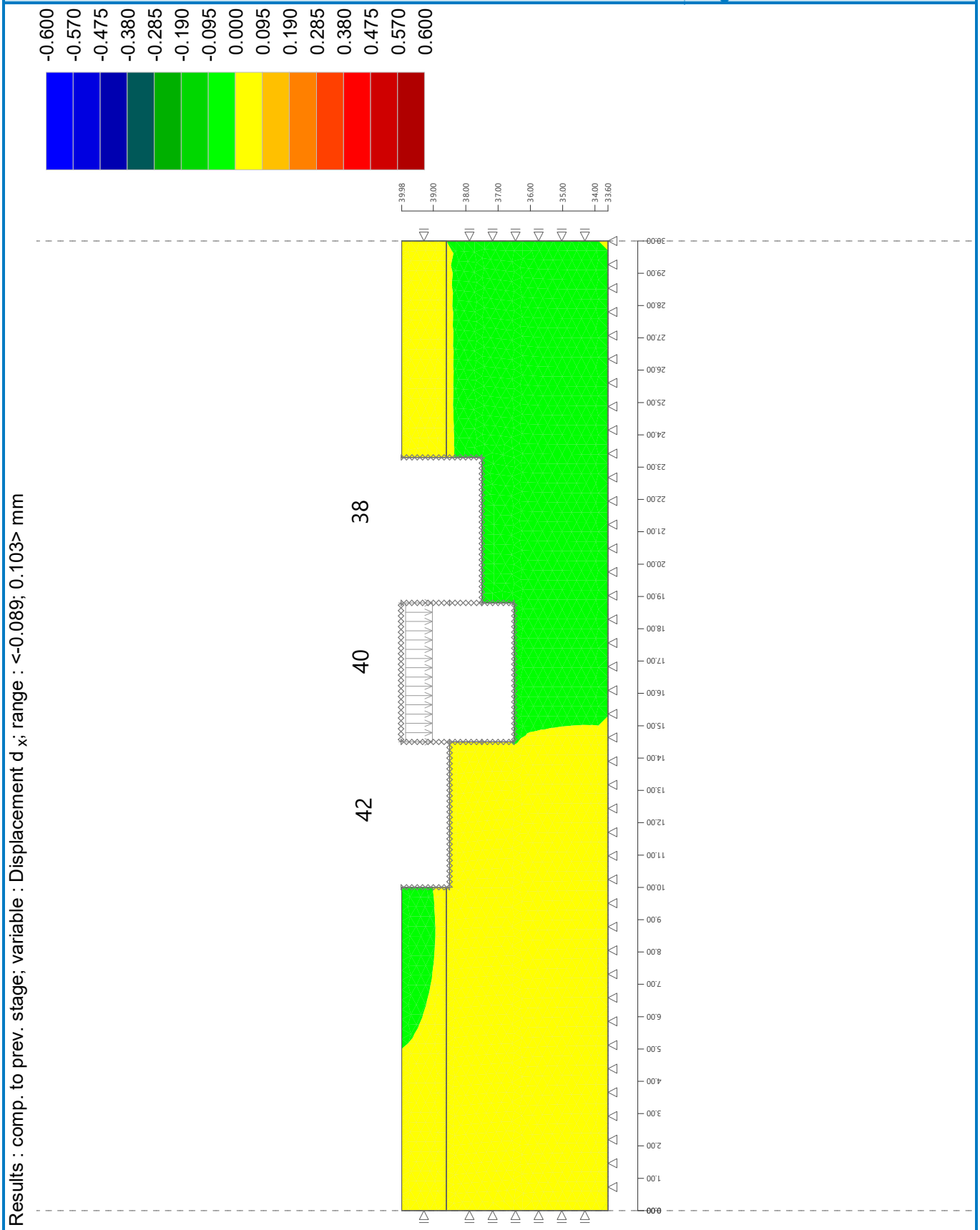


Stress analysis was successfully completed.

Analysis settings : **standard**

Attained loading = 100.00 %

Name : **Stage : 3**

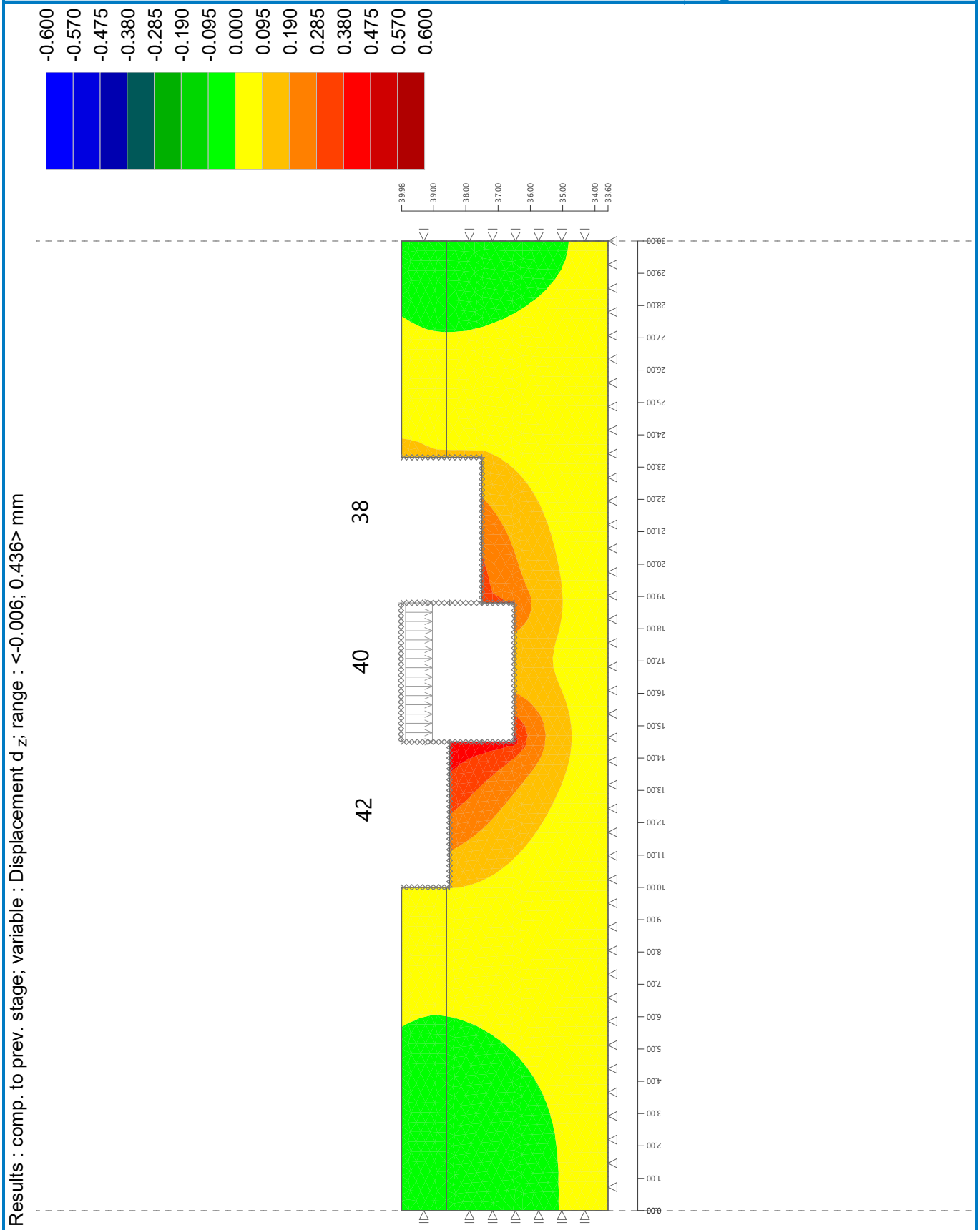


Stress analysis was successfully completed.

Analysis settings : **standard**

Attained loading = 100.00 %

Name : **Stage : 3**



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Analysis settings : **standard**

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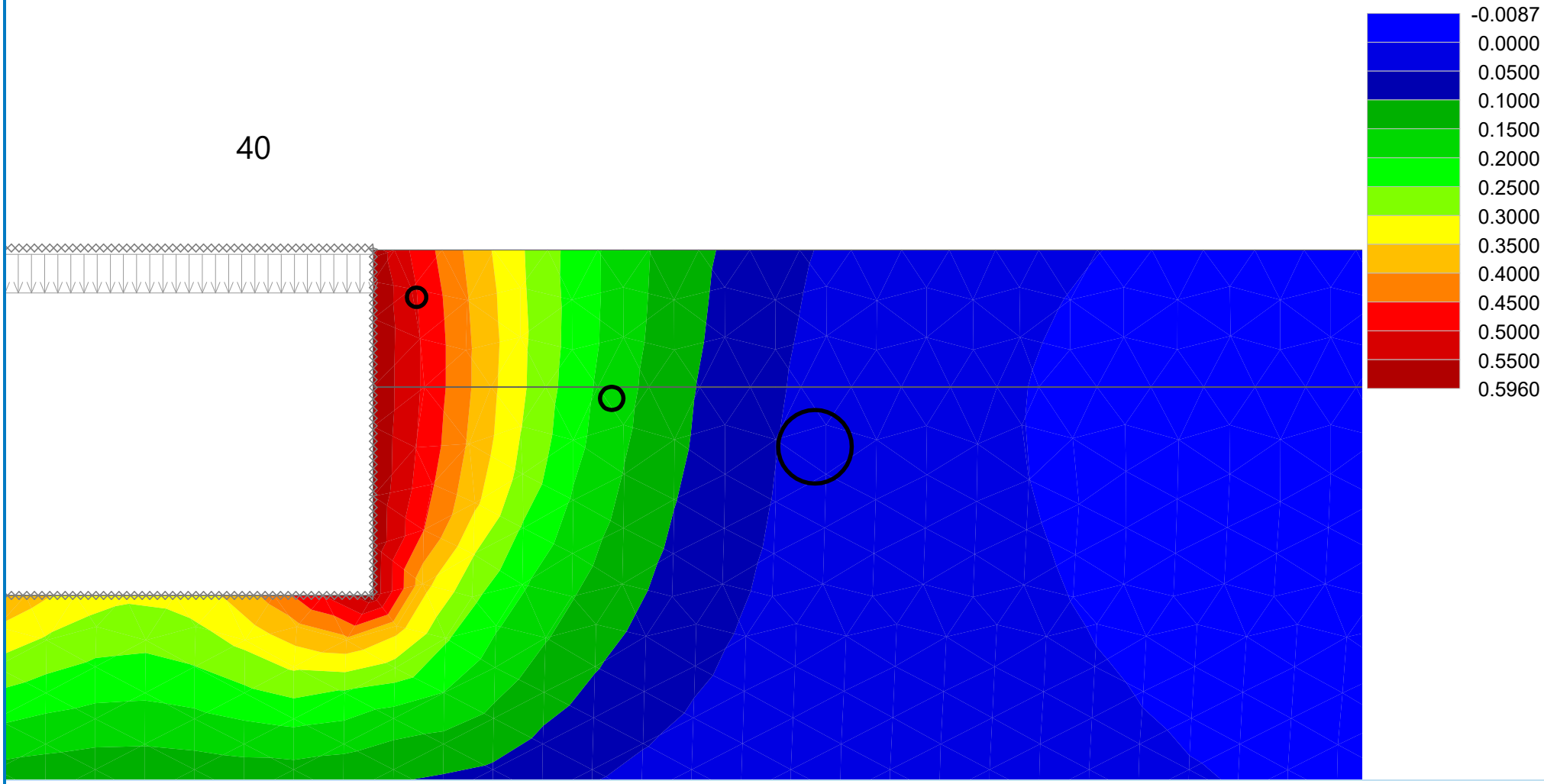

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Analysis settings : **user-defined**

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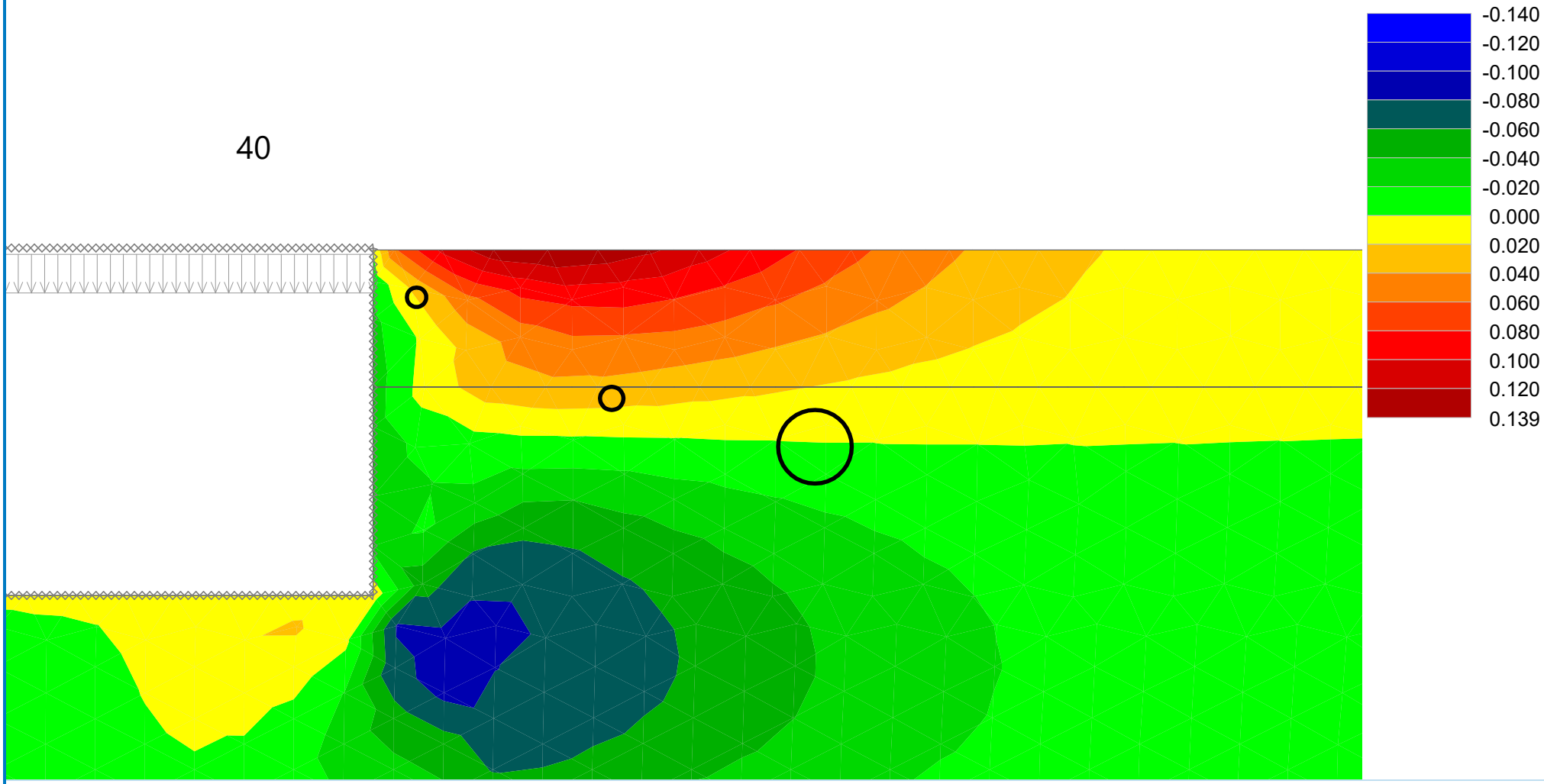
Results : comp. to prev. stage; variable : Displacement d_x; range : <-0.140; 0.139> mm



Stress analysis was successfully completed.

Analysis settings : **user-defined**

Attained loading = 100.00 %