CampbellReith
consulting engineers

32 Torrington Square
London, WC1E 7JL

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12727-04

Revision: F1

November 2017

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Project Name	32 Torrington Square
Planning Reference	2017/4300/P

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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 32 Torrington Square, London WC1E 7JL (planning reference 2017/4300/P). The basement is considered to fall within Category C as defined by the Terms of Reference.

1.2. Subsequent to the issue of the initial audit, the BIA was revised by Webb Yates Engineers, dated 22 November 2017.

1.3. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.4. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.5. The BIA has been prepared by Webb Yates Engineers with supporting documents prepared by BRD Environmental Ltd. The authors' qualifications are in accordance with LBC guidance.

1.6. The proposed work involves the construction of a four storey building plus basement on a currently vacant site between 32 Torrington Square and the Warburg Institute. The building at 32 Torrington Square is Grade II listed and the site lies within the Bloomsbury Conservation Area.

1.7. The site investigation undertaken identifies the Lynch Hill Gravel Formation to be present beneath the site overlying the London Clay Formation. Made Ground was locally encountered.

1.8. The proposed basement will generally be located above the water table with the lift pit locally extending beneath the water table surface. Further investigation should be undertaken in advance of the excavation to confirm the groundwater conditions.

1.9. The site investigation and BIA have been informed by a desk study. The new documentation received includes correspondence with various utility providers and Camden Council regarding underground infrastructure within the vicinity of the site.

1.10. The construction methodology originally indicated that the basement was to be formed by a sheet piled retaining wall towards Torrington Square and underpinning along the other development boundaries. In order to mitigate vibration from installation of sheets piles, and due to ease of installation, the retaining wall has been changed to a contiguous piled retaining wall, which will also allow groundwater flow between the piles.

1.11. Resin grouting was originally proposed to reduce groundwater flow and stabilise soils. Grouting is no longer proposed and, where required, local groundwater control techniques will be used to during excavation.

1.12. A Ground Movement Assessment (GMA) has been undertaken. The predicted movements are broadly as expected for a development of this scale and depth, considering the construction methods. It is accepted that, in conjunction with monitoring strategy presented, damage to neighbouring structures can be limited to a maximum of Category 1 (Very Slight). Protection of utility assets should be agreed with the relevant asset owners.

1.13. An outline construction programme is presented.

1.14. The proposed scheme will not increase the proportion of impermeable area given the existing site is currently covered in hardstanding.

1.15. The Flood Risk Assessment has identified a surface water flood risk and proposes appropriate mitigation measures.

1.16. The proposed development will not impact the wider hydrogeological environment.

1.17. Non-technical summaries should be presented with any future BIA submissions.

1.18. Queries and matters requiring further information or clarification are discussed in Section 4 and summarised in Appendix 2. Considering the revised information submitted, the BIA meets the criteria of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 14 September 2017 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 32 Torrington Square, London WC1E 7JL, Camden Reference 2017/4300/P.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. Subsequent to the issue of the above initial audit, the BIA was revised by Webb Yates Engineers, dated 22 November 2017A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within:

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- The Local Plan (A5 Basements) 2017.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment; and,

c) avoid cumulative impacts upon structural stability or the water environment in the local area;

and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Planning Portal describes the planning proposal as: "Restoration of 32 Torrington Square including internal changes together with erection of a 4-storey new annex building (plus basement) within the gap land to the north to accommodate a research facility (Toddler Lab) for Birkbeck, University of London (Class D1 Use)".

2.6. LBC's Planning Portal confirms that the site lies within the Bloomsbury Conservation Area and that the terrace of 27 to 32 Torrington Square is Grade II listed.

2.7. CampbellReith accessed LBC's Planning Portal on 26 September 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment dated 21 July 2017 (ref J2889-S-RP-0009) by Webb Yates Engineers Ltd including:
    - Phase I Geo-Environmental Desk Study (ref BRD2903-OR1-A) dated April 2017 by BRD Environmental Ltd.
    - Geo-Environmental Site Investigation (ref BRD002903-OR2-B) dated July 2017 by BRD Environmental Ltd.
    - Flood Risk Assessment and Drainage Strategy Report (ref J2889-C-RP-0002) dated 21 July 2017 by Webb Yates Engineers Ltd.
- Proposed and Existing plans dated 17 January 2017 by Bisset Adams.
- Design and Access Statement dated July 2017 (ref BB029-BA-00-RO-Z-Design and Access-SO-P1) by Bisset Adams.
- Construction Management Plan dated July 2017 (ref BB029-BA-Z0-XX-RO-A-0000-CMP-170717) by Bisset Adams.
- Historic Environmental Desk-Based Assessment dated June 2017 (ref 12926) by Pre-Construct Archaeology Ltd.
- Planning Statement dated July 2017 by Turley.
- Heritage Statement dated July 2017 by Turley.
- Comments and objections to the proposed development from local residents.

2.8. The audit was subsequently updated based on a review of the following documents:

- Basement Impact Assessment dated 22 November 2017 (ref J2889-S-RP-0013) by Webb Yates Engineers Ltd, including:
- Outline construction programme by Webb Yates Engineers Ltd.
- Monitoring Scope for Neighbouring Properties dated 8 November 2017 (ref J2889-S-RP-0014) by Webb Yates Engineers.

- Underground utilities report dated 21 November 2016 (ref 18676JS) by Groundwise Searches Ltd.
- Frew calculation of contiguous pile retaining wall dated 8 November 2017 (ref J2889) by Webb Yates Engineers Ltd.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	The qualifications of the authors of the BIA prepared by Webb Yates Engineers Ltd are in accordance with CPG4 guidelines.
Is data required by Cl.233 of the GSD presented?	Yes	Underground infrastructure confirmed (Underground utilities report including information from various telephone services, UK Power Networks, National Grid, Thames Water and Camden Council provided). Outline construction programme presented.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA and supporting documents.
Are suitable plans/maps included?	Yes	Information within the Desk study and BIA report is broadly in line with the information required by GSD Appendix G1.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	As above.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Original BIA report – Section 2.1, Appendix B2.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Original BIA – Section 2.1, Appendix B1.

Item	Yes/No/NA	Comment
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Original BIA – Section 2.1, Appendix B3. See Audit paragraphs 4.12 to 4.14.
Is a conceptual model presented?	Yes	Original BIA, Figure 3.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Original and revised BIA, Section 2.2.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Original and revised BIA, Section 2.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Original and revised BIA, Section 2.2. See Audit paragraphs 4.12 to 4.14.
Is factual ground investigation data provided?	Yes	Original BIA report Section 8 and Appendix E (Geo-Environmental Site Investigation dated July 2017 by BRD Environmental Ltd.)
Is monitoring data presented?	Yes	Original BIA report Section 8 and Appendix E (monitoring records in Appendix 2 of Geo-Environmental Site Investigation dated July 2017 by BRD Environmental Ltd.)
Is the ground investigation informed by a desk study?	Yes	Original BIA report Section 8 and Appendix D (Phase I Geo-Environmental Desk Study dated April 2017 by BRD Environmental Ltd.)
Has a site walkover been undertaken?	Yes	Desk study
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Presence of basements beneath 32 Torrington Square and at the adjacent Warburg Institute indicated.

Item	Yes/No/NA	Comment
Is a geotechnical interpretation presented?	Yes	Original BIA report Section 8.2 and Appendix E (Geo-Environmental Site Investigation dated July 2017 by BRD Environmental Ltd.)
Does the geotechnical interpretation include information on retaining wall design?	Yes	Geotechnical design parameters presented. Retaining wall design reassessed (revised BIA report Section 4).
Are reports on other investigations required by screening and scoping presented?	Yes	Ground movement assessment provided in Section 4.2 and Appendix E of revised BIA. Flood Risk Assessment and Drainage Strategy Report provided as Appendix F of original BIA by Webb Yates Engineers.
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	BIA report – Section 9
Are estimates of ground movement and structural impact presented?	Yes	Ground movement assessment provided for 32 Torrington Square and the Warburg Institute.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Flood risk, drainage, structural monitoring and temporary works
Has the need for monitoring during construction been considered?	Yes	Monitoring Scope for Neighbouring Properties report provided.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Damage to neighbours limited to Category 1.

Item	Yes/No/NA	Comment
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	See Audit paragraphs 4.5, 4.6, 4.9 and 4.10.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Original BIA, Appendix F (Flood Risk Assessment and Drainage Strategy Report dated 21 July 2017 by Webb Yates Engineers Ltd.)
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Updated in revised submissions.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Damage to be no greater than Category 1.
Are non-technical summaries provided?	Yes	Section 2 of the revised BIA.

4.0 DISCUSSION

4.1. The BIA has been prepared by Webb Yates Engineers with supporting documents prepared by BRD Environmental Ltd. The qualifications of the authors are in accordance with CPG4 guidelines.

4.2. The BIA indicates that the proposed work involves the construction of office and research facilities in a building of four storeys plus basement on a currently empty site between 32 Torrington Square and the Warburg Institute. The proposed basement will be at a depth of 4.30m from street level at the part of the basement closest to Torrington Square. The site currently comprises a ramp that leads from Torrington Square to the rear courtyard. The building at 32 Torrington Square is Grade II listed and the site lies within the Bloomsbury Conservation Area.

4.3. The site investigation undertaken identifies the Lynch Hill Gravel Member to be present beneath the site overlying the London Clay. Made Ground was encountered beneath the vehicle ramp and within the small garden of No. 32 Torrington Square. Interpretative geotechnical information in accordance with the GSD Appendix G3 is presented. The site investigation and BIA have been informed by a desk study broadly in accordance with the GSD Appendix G1. The new documentation received includes information from various telephone services, UK Power Networks, National Grid, Thames Water and Camden Council regarding underground infrastructure within the vicinity of the site.

4.4. Groundwater was encountered at 4m below ground level (bgl) during the site investigation. Subsequent monitoring has indicated a groundwater level of approximately 2.50m bgl which is assessed in the BIA as perched water within the base of the superficial deposits resting upon the London Clay. The BIA indicates that the proposed basement will generally be located above the water table with the lift pit locally extending beneath the water table surface. Originally it was stated that local excavations below the water table would be enabled by stabilisation of the gravels by injection of resin grouting. However, in the revised proposals, it is expected that excavation will only extend slightly below ground water level and that other groundwater control techniques will be used to locally allow for excavation, when and if required. As stated in the report, it is recommended that further groundwater monitoring is undertaken in advance of excavation to further inform temporary works contingency planning and control of construction and to assess any variation with seasonal or other weather effects.

4.5. The construction methodology originally indicated that the basement was to be formed by a sheet piled retaining wall towards Torrington Square and underpinning along the other development boundaries. In order to mitigate vibration from installation, and due to ease of installation, the piled retaining wall has been changed to a contiguous piled retaining wall of

roughly similar stiffness to the previously proposed sheet pile structure. This is assessed to allow for installation with minimal vibration impact on neighbouring buildings. All piles will extend to full depth and the gaps in between the piles will allow groundwater flow.

4.6. Sequencing and propping information and retaining wall design calculations are provided for review and have been updated in the revised submission.

4.7. The proposed development will not impact the wider hydrogeological environment.

4.8. An outline construction programme is presented.

4.9. A Ground Movement Assessment (GMA) is presented that considers the movements related to installation of the pile wall and the excavation of the basement behind it. The movements in relation to the proposed underpinning have been assessed but calculations are not presented in detail. However, it is noted that the two stages of underpinning originally proposed, below the existing 32 Torrington Square building, have been replaced by a single stage of underpinning. The movements predicted are therefore broadly as expected from a development of this scale and depth, considering the construction methodology and propping arrangements. The damage to neighbouring structures is predicted to be a maximum of Category 1 (Very Slight). Protection of utility assets should be agreed in consultation with the asset owner.

4.10. The proposed structural monitoring strategy is presented, which includes trigger levels and contingency actions, that should ensure construction is controlled and impacts are limited, as predicted.

4.11. Torrington Square is within a Critical Drainage Area (Group 3-003), although this was not identified within the BIA screening or scoping process. The site did not flood in either 2002 or 1975. The Flood Risk Assessment (FRA) has identified that surface water flooding is generally contained within the courtyard, garden area to the rear of the development, and around the perimeter of The Warburg Institute at lower level. Surface water flooding within these areas is low to medium risk, indicated by referenced Environment Agency data.

4.12. The FRA confirms that a new drainage system to deal with any surface water runoff from and around the building will be installed and any drainage connecting directly to the public sewer from the new proposed basement will be fitted with non-return valves to prevent any surcharge from the public sewer backing up into the building drainage. Surrounding proposed ground levels will also be made to slope away from the building to prevent surface water flows entering into the building. A secondary, emergency exit from the basement will also be installed.

4.13. The proposed scheme will not increase the proportion of impermeable area given the existing site is currently covered in hardstanding. A SUDS design, including use of an attenuation tank, is proposed in line with current guidance.

4.14. The proposed development will not impact the wider hydrological environment.

4.15. Queries and matters requiring further information or clarification are summarised in Appendix 2.

5.0 CONCLUSIONS

5.1. The authors' qualifications are in accordance with the requirements of CPG4.

5.2. The Lynch Hill Gravels will be the bearing formation for the proposed foundations, underlying Made Ground. It is accepted that the basement will generally be located above the water table although the contractor should confirm groundwater conditions in advance of the construction works.

5.3. The proposed development will not impact the wider hydrogeological environment.

5.4. The proposed basement is to be formed by a contiguous piled retaining wall and underpinning. Temporary works sequencing is presented. Resin grouting is no longer proposed and local groundwater control techniques will be used to locally allow for excavation, if required.

5.5. Damage to neighbours is predicted to be a maximum of Category 1 (Very Slight), based on a ground movement assessment.

5.6. A structural monitoring strategy is presented that should protect neighbouring structures, maintaining a maximum of Category 1 damage. Protection for utility assets should be agreed with asset owners, as required.

5.7. The Flood Risk Assessment confirms appropriate flood risk mitigation measures to be adopted.

5.8. An outline construction programme is presented

5.9. A SUDS design, including use of an attenuation tank, is proposed.

5.10. The proposed development will not impact the wider hydrological environment.

5.11. Non-technical summaries should be presented with any future BIA submissions.

5.12. Queries and matters requiring further information or clarification are summarised in Appendix 2. Considering the revised submissions, the BIA meets the requirements of CPG4.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA Format	BIA authors' qualifications	Closed – the qualifications of the authors of the BIA prepared by Webb Yates Engineers Ltd are in accordance with CPG4 guidelines	November 2017
2	Desk Study	Identify underground infrastructure within proposed development's zone of influence	Closed – new information includes correspondence with various telephone services, UK Power Networks, National Grid, Thames Water and Camden Council regarding underground infrastructure within the vicinity of the site.	November 2017
3	Groundwater	Further groundwater monitoring should be undertaken.	Contractor to confirm groundwater levels in advance of construction as 4.4	N/A
4	Stability	The method of installation of sheet piles should be clarified, with the impact of any vibrations on any adjacent structures or infrastructure assets assessed.	Closed – N/A	N/A
5	Stability	- Resin grouting to reduce groundwater flow and stabilise soils. - Vibration impacts from sheet piling.	Closed – N/A	- N/A
6	Desk Study	Outline construction programme	Closed – outline construction programme provided.	November 2017
7	Stability	GMA and damage impact assessment	Closed	November 2017
8	Stability	Structural monitoring strategy	Closed	November 2017
9	BIA Format	Non-technical summaries	Closed – section 2 of revised BIA.	November 2017

Appendix 3: Supplementary Supporting Documents

Basement Impact Assessment dated 22 November 2017
(ref J2889-S-RP-0013) by Webb Yates Engineers Ltd

WEBB YATES ENGINEERS

Basement Impact Assessment – Supplementary Information

J2889 Toddler Lab, 32 Torrington Square

Ref: J2889-S-RP-0013
Revision: 00
Status: S9

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GENERAL NOTES

REVISION HISTORY

Revision	Status	Date	Author	Reviewer	Approver
00	Information	22.11.2017	CP	TW	RW

1 INTRODUCTION

A Basement Impact Assessment (including Site Investigation), referenced J2889-S-RP-0009, Revision 02 has been submitted as part of a planning application for a proposed development of a proposed basement at the empty site previously known as 33 Torrington Square, London, located between 32 Torrington Square and the Warburg Institute. The Basement Impact Assessment (BIA) was prepared by Webb Yates Engineers Ltd (WYE) and BRD Environmental Limited (BRD).

Campbell Reith Hill LLP (CampbellReith) has undertaken a Basement Impact Assessment Audit, Rev D1, dated November 2017, which identified items to be addressed in order to complete the audit.

This document provides supplementary information which addresses the items identified by CampbellReith. This document shall be read in conjunction with the original BIA, referenced J2889-S-RP-0009, Revision 02.

2 NON-TECHNICAL SUMMARY

This report is a supplement to the Basement Impact Assessment (including Site Investigation), referenced J2889-S-RP-0009, Revision 02. The non-technical summary includes the non-technical summary of Basement Impact Assessment referenced J2889-S-RP-0009, Revision 02, supplemented with additional information to Basement Impact Assessment Audit, Rev D1, dated November 2017 by Campbell Reith.

Supplementary non-technical summary is found in section 2.5 (Stage 4 - Supplementary impact assessment).

2.1 STAGE 1 – SCREENING

In order to assess the potential impact of the basement a number of checklists provided in the guidance document were used that outline key issues related to Subterranean Groundwater Flow, Slope Stability and Surface Flow and Flooding. If the answer to the checklist questions was either yes or unknown, further work was undertaken to assess the extent of the impact. 11 items were identified which required consideration at the scoping stage.

This stage is described in full in Appendix B.

2.2 STAGE 2 – SCOPING

Following the screening process outlined above, several potential impacts were identified where further work was required as detailed below:

- Subterranean Groundwater Flow

  The site is located directly over a secondary A aquifer. Due to the proximity of the River Thames, groundwater present is likely to be perched within the upper few metres of stratum, above the London Clay Formation.

  At the time of the screening works it was not known whether the basement would extend beneath the level of the water table and therefore it was identified that this would need to be determined as part of the Site Investigation works.

- Slope Stability

  The underlying ground conditions and existing foundations at the site were unknown and therefore it was identified that Site Investigation works would be required to determine the existing ground conditions and foundations.

  The part of the site with the new basement is adjacent to Torrington Square, the Warburg Institute and its raised rear garden, and the building of 32 Torrington Square. The proposed excavations may impact on the adjacent infrastructure and neighbouring land and buildings. This identified the need to undertake an assessment of the ground settlement impacts. Liaison has been undertaken with the relevant neighbouring parties.

As the depth of the new basement is deeper than the depth of the existing foundations there is potential for differential movement to occur. The underpinning works and construction sequence will therefore be carefully planned to ensure that this is minimised and the impact is negligible or very slight.

A large tree is present in the rear garden of 31 Torrington Square, approximately 7m from the proposed basement development. As such the foundations will need to be sufficiently deep to avoid any impacts of heave behaviour.

London Clay was not expected to be the shallowest strata at the site. Site investigation works would be required to determine the existing ground conditions.

The site was identified as being within an area of worked ground due to the previous Georgian terraced house, once connected to 32 Torrington Square, that is known to have occupied the site of 33 Torrington Square. The depth of previously worked ground would need to be determined through a site investigation.

The site was identified to be within a Secondary A Aquifer, water level was unknown in the screening phase. The water level was to be identified through site investigation to determine if the proposed basement extend below the water table such that dewatering would be required during construction.

The site was identified to be within 5m of a highway or pedestrian right of way on Torrington Square. This identified the need to undertake an assessment of the ground settlement impacts.

- Surface Flow and Flooding

As the existing site is currently all hardstanding there will be no increase in surface water flow. A Flood Risk Assessment of the site has been carried out and the site has been identified as in Flood Zone 1 and currently we are not aware of any sewer flooding incidents in the area. A CCTV survey scope of works has been prepared for surrounding drains in the area to identify any potential problems with the existing drains and to identify the existing drainage routes of the site.

2.3 STAGE 3 – SITE INVESTIGATION

Following the screening and scoping stages, a geotechnical site investigation was carried out. One cable percussive borehole and three windowless sample boreholes were drilled to assess the underlying strata and determine groundwater levels. Two trial pits were also dug by hand to determine the soil strata beneath the existing building and to determine the existing foundation construction. The investigation was supplemented by a series of laboratory tests to determine geotechnical and environmental parameters. As a result, a conceptual ground model and a conceptual hydrological model were built.

2.4 STAGE 4 – IMPACT ASSESSMENT

The impacts identified at each of the stages above have been assessed as described below:

- Subterranean Groundwater Flow

  The site investigation identified that the site is located upon superficial deposits of the Lynch Hill Gravel designated a Secondary A Aquifer. During drilling, groundwater was struck at 4.0m below ground in borehole BH1 and then rose during the following 20 minutes. In the subsequent two monitoring visits the water level in BH01 was found approximately at level +20.3, approximately 0.5m above the top of the London Clay. This meets with expectations of groundwater perched within the base of the gravel deposits resting upon the London Clay. The other monitoring well in borehole WS02 was dry, but this is as expected as it was located at a higher topographic level and the density of the gravel meant that the bottom of the well was above the groundwater level anticipated from BH01. Due to the level of the perched groundwater and the minimal intrusion into it by the proposed structure, the proposed basement will have minimal impact on the groundwater flow. The piled wall could offer an impact to flow, but this is only for one short side of the basement box so the effect would be minimal and the piles can be designed to minimise any impact on flow. Groundwater monitoring will be undertaken during construction with contingency plans in place should the conditions vary from those expected.

- Slope Stability

  The underlying ground conditions and existing foundations at the site have been confirmed and the foundations and construction methodology specified and designed to minimise the impacts.

  The predicted ground settlement due to the sheet piled retaining wall has been determined, resulting a maximum settlement of 8mm at approximately 7m away from the face of the wall. The maximum settlement occurs over the road of Torrington Square which partly house the North Heating Chamber facility which is approximately 6m below the ground level. As the structure is below the proposed basement, it was deemed not necessary to provide a Burland scale crack assessment. Refer to figure appendix I for Ground movement predictions.

  The long-term deflections of the proposed RC retaining wall has been assessed. The predicted long-term horizontal deflection of the wall is approximately 2mm. The damage to the neighbouring facades have been using the Burland Scale method and was found to be Category 0 negligible to very slight, less than 0.1mm crack widths.

  A comprehensive monitoring scheme has been proposed to survey displacements during construction and appropriate contingency plans have been proposed.

  The proposed construction sequence minimises the anticipated displacements.

  The foundations and basement structure will be designed to be sufficiently deep to avoid any impacts of heave behaviour from the tree located in vicinity of the proposed development. The deep piled retaining

structure towards Torrington Square and raft foundation have been used to mitigate the effects of heave behaviour of the clay due to seasonal changes.

- Surface Flow and Flooding

  The basement was determined to have no impact on the surface water run off by designing drainage to discharge to the combined sewer at Torrington Square. An attenuation tank has been included to provide a minimum betterment of 50% runoff from the existing site, and the building has a brown roof which will also increase the interception storage available for the site via increased evapotranspiration.

  The site was identified as being in Flood Zone 1 and the proposed annex basement has been designed with a drained cavity system and structurally integral waterproofing with reinforced concrete walls to provide flood resilience considering the risks of climate change and surface water/sewer flooding. Two egress routes are available from basement level units in the instance of flooding.

2.5 STAGE 4 - SUPPLEMENTARY IMPACT ASSESSMENT

An outlined construction programme is appended to this report. This is to be updated by the contractor once appointed.

- Subterranean Groundwater Flow

  Ground water levels will be monitored by contractor prior to construction.

  Resin grouting of the ground to allow for excavation below the ground water level is no longer proposed as a method to allow for excavation below ground water level. Grouting was originally described as a groundwater cut off method for a worst-case scenario. As part of a later additional assessment of the excavation works, it is expected that excavation will only extend slightly below ground water level or not extend below ground water level and that other groundwater control techniques are to be used to locally allow for excavation. This is to be detailed by the contractor as part of the detailed temporary works design.

- Slope Stability

  Piled retaining wall has been changed from sheet pile retaining wall to contiguous piled retaining wall to mitigate impact and vibration from installation. The maximum deflection of the proposed contiguous piled retaining wall is equal to the maximum deflection of the previously proposed sheet pile retaining wall.

  Ground movement from underpinning is minor and damages to adjacent buildings have been assessed through the Burland Scale and are categorized as very slight and easy repairable. Vertical settlement from underpinning of 32 Torrington Square has been mitigated through the use of single stage underpins to minimize the vertical settlement due to shrinkage of dry pack.

  Monitoring scope to ensure the condition of adjacent buildings is appended to this report.

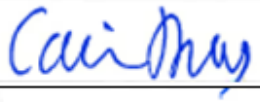
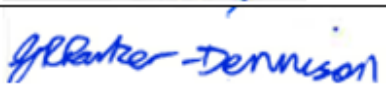
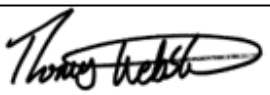
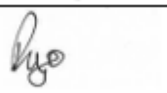
There are no services shown on asset search records from the utility companies, entering the site. Asset search records from utility companies are appended to this report. Heating pipes running across the site from the North Heating Chamber will be rerouted prior to basement excavation and construction as shown on rerouting strategy appended to this report.

2.6 STAGE 5 – REVIEW AND DECISION MAKING

The impacts identified at each of the stages above have been assessed and the basement has been deemed to have no adverse effect on the surface or subterranean water regimes, or on the slope stability as justified above.

3 TECHNICAL PERSONNEL

Additional information on technical personnel;

Name	Company	Qualifications	Signature
Camilla Ingemann Parby	WYE	Danish Equivalent BEng (Hons)	
Guy Roy Parker-Dennison	WYE	Engineering Design and Appropriate Technology MEng (Hons)	
Tom Webster	WYE	MEng CEng MICE MIStructE	
Richard Mayo	WYE	Meng CEng MICE	
Brian Devonshire	BRD	BEng(Hons) MSc	
Ana Leon Gomez	BRD	Spanish equivalent BSc & MSc, EurGeol [Note: EurGeol is a higher qualification than CGeol]	

4 SLOPE STABILITY

4.1 PILED RETAINING WALL

The type of piled retaining structure has been reassessed as part of the detailed design phase after submission of the Basement Impact Assessment. In order to mitigate vibration from installation and due to ease of installation, the piled retaining wall has been changed to a contiguous piled retaining wall of roughly similar stiffness to the previously proposed sheet pile structure. This is assessed to allow for installation with minimal vibration impact on neighbouring buildings. All piles will extend to full depth however as it is a contiguous pile wall there will be gaps in between the piles to allow water to flow through. An additional calculation has been carried out through FREW analysis to ensure that the deformation will not increase with the contiguous piled structure compared to the originally proposed sheet pile retaining wall.

Previously assumed stiffness of sheet pile retaining wall (EI): 65436 kNm^2/m

The stiffness of the contiguous piled retaining wall is based on a 450mm diameter concrete piles at 600mm c/c. The reinforcement in the piles have not been considered when assessing the long-term stiffness and the pile stiffness will therefore be higher than assumed.

Assumed stiffness of contiguous piled retaining wall (long term EI): 57035 kNm^2/m

Refer to appendix E for FREW analysis of retaining wall with contiguous piled retaining wall. The maximum horizontal pile deflection of approximately 17mm is equal to the previous analysis.

4.2 GROUND MOVEMENT ASSESSMENT OF UNDERPINNING

Vertical settlement from underpinning of 32 Torrington Square has been mitigated through the use of single stage underpins to minimize the vertical settlement due to shrinkage of dry pack.

The underpins, proposed to be constructed by the façade of the Warburg Institute and 32 Torrington Square are to be temporarily propped during construction and permanently horizontally supported by the reinforced concrete retaining wall formed as part of the basement box. The movement of the reinforced concrete retaining walls has been assessed and are found in appendix I of the Basement Impact Assessment.

The assessment, considering the movement related to the installation of underpins, horizontally supported by reinforced concrete retaining wall as part of the basement development has been undertaken. The vertical ground movement related to the horizontal deformation of the reinforced concrete retaining walls has been assessed to be maximum 1mm, based on a maximum long-term deflection of the reinforced concrete retaining wall of 2mm.

Based on assessments after the Burland Scale, this will be categorized as negligible movement with very slight and easily repairable damages.

The vertical ground movement, incurred by the horizontal movement of the piled retaining wall does not lead to damages of existing structures as structures are located in a distance to the piled retaining wall so that these are not implicated by the movement of the piled retaining structure. Although the North Heating Chamber is located within the zone of vertical ground settlement, these will not impact on the North Heating Chamber as the heating chamber structure is a below ground structure founded at a depth of approximately 5.0m below ground.

4.3 MONITORING

A monitoring scope describing requirements of monitoring of the neighbouring properties is included in appendix B. The scope includes monitoring of horizontal and vertical movement of facades of existing neighbouring buildings and below ground heating chamber in proximity to the site. Trigger values are identified and in the event of these values being reached/exceeded, contingency plans are to be put in place. Should this occur a modified sequence/method of construction may need to be implemented with the agreement of the Structural Engineer and neighbouring parties. Details of the monitoring programme and contingency plans will be added to this document once confirmed with the contractor once appointed.

4.4 UTILITY COMPANIES AND BELOW GROUND SERVICES

Asset search records from utility companies are attached as appendix C.

An existing heating pipe is currently crossing the site, running from the North Heating Chamber, along the site boundary in proximity to the proposed piled retaining wall to the Warburg Institute. As part of the development, the heating pipes will be diverted prior to any excavation or piling works. The heating pipe diversion will temporarily run at high level during basement construction. Following completion of the basement box, the heating pipes will be installed at their permanent location internally through the basement in proximity to the existing heating pipe run parallel to the piled retaining wall. Refer to appendix D for heating pipe diversion scheme. An existing electric cable is running along the ramp which is proposed to be rerouted as part of the development.

There are no other utility services shown on the utility records provided by the utility companies within the site boundary of the proposed basement development. The affected services shown on the list in Appendix C are in vicinity to the site but are not running within the site boundary and are picked up on the Randall Surveys drawings DWG No. 14241/MC/1 also included in Appendix C. Below ground services are shown on the asset search information below Torrington Square in proximity to the piled retaining wall. The contractor is to ensure that existing services are not damaged during construction through investigation prior to pile installation.

5 SUBTERRANEAN GROUND WATER FLOW

5.1 GROUND WATER LEVEL

The contractor is to monitor ground water level further prior to excavation and construction. Contractor has been instructed to submit groundwater monitoring proposal for review by WYE and to report any changes is water level above excavation level.

5.2 EXCAVATION BELOW GROUNDWATER TABLE

Method of excavation below the groundwater table has been reassessed as part of the detailed design phase after submission of the Basement Impact Assessment. Resin grouting of the ground to allow for excavation below the ground water level is no longer proposed as a method to allow for excavation below ground water level. Grouting was originally described as a groundwater cut off method for a worst-case scenario. As part of a later additional assessment of the excavation works, it is expected that excavation will only extend slightly below ground water level and that other groundwater control techniques are being used to locally allow for excavation. This is to be detailed by the contractor as part of the detailed temporary works design.

6 PROGRAMME

6.1 OUTLINED CONSTRUCTION PROGRAMME

An outlined construction programme is attached as appendix A. An updated outlined construction programme is to be provided by the contractor once appointed.

APPENDIX A – OUTLINED CONSTRUCTION PROGRAMME

Outlined construction programme by Gardiner & Theobald is shown in the table below.

Appointment of Main Contractor	January 2018
Commencement of Works on site	February 2018
Enabling Works	February 2018 – March 2018
Basement Works	March 2018 – June 2018
Remaining Construction Works	July 2018 - April 2019

Construction programme is to be updated once a contractor is appointed.

APPENDIX B – MONITORING SCOPE FOR NEIGHBOURING BUILDINGS

Monitoring Scope for Neighbouring Properties

J2889 Toddler Lab, 32 Torrington Square

Ref: J2889-S-RP-0014
Revision: 00

CONTENTS

GENERAL NOTES

REVISION HISTORY

Revision	Status	Date	Author	Reviewer	Approver
00	Information	08.11.2017	CP	RM	TW

1 INTRODUCTION

A new development is proposed at 32 Torrington Square, London to host Birkbeck Toddler Lab. The proposal is a refurbishment and annex to the existing building located at 32 Torrington Square towards the neighbouring Warburg Institute. What was formerly 33 Torrington Square is currently an empty site between the two buildings, hosting a ramp that leads from the square to the rear courtyard. The ramp is going to be relocated as part of the development and is located at ground floor level of the proposed annex. The proposed development is providing office and research facilities in a building of 4 storeys plus basement.

This document sets out the intended monitoring regime for neighbouring properties during works at 32 Torrington Square and the extension on the site previously known as 33 Torrington Square, located between 32 Torrington Square and the Warburg Institute, London. It is to be submitted for the acceptance of neighbouring property owners potentially affected by the development.

The location of the site and the proximity to neighbouring properties is shown in Figure 1. The proposed new structure will consist of a load bearing stone frame above ground level. The basement will be constructed from secant pile retaining walls and reinforced concrete internal walls and slabs. The proposed building will be founded on piled foundations.

The existing building located at 32 Torrington Square is Grade II listed.

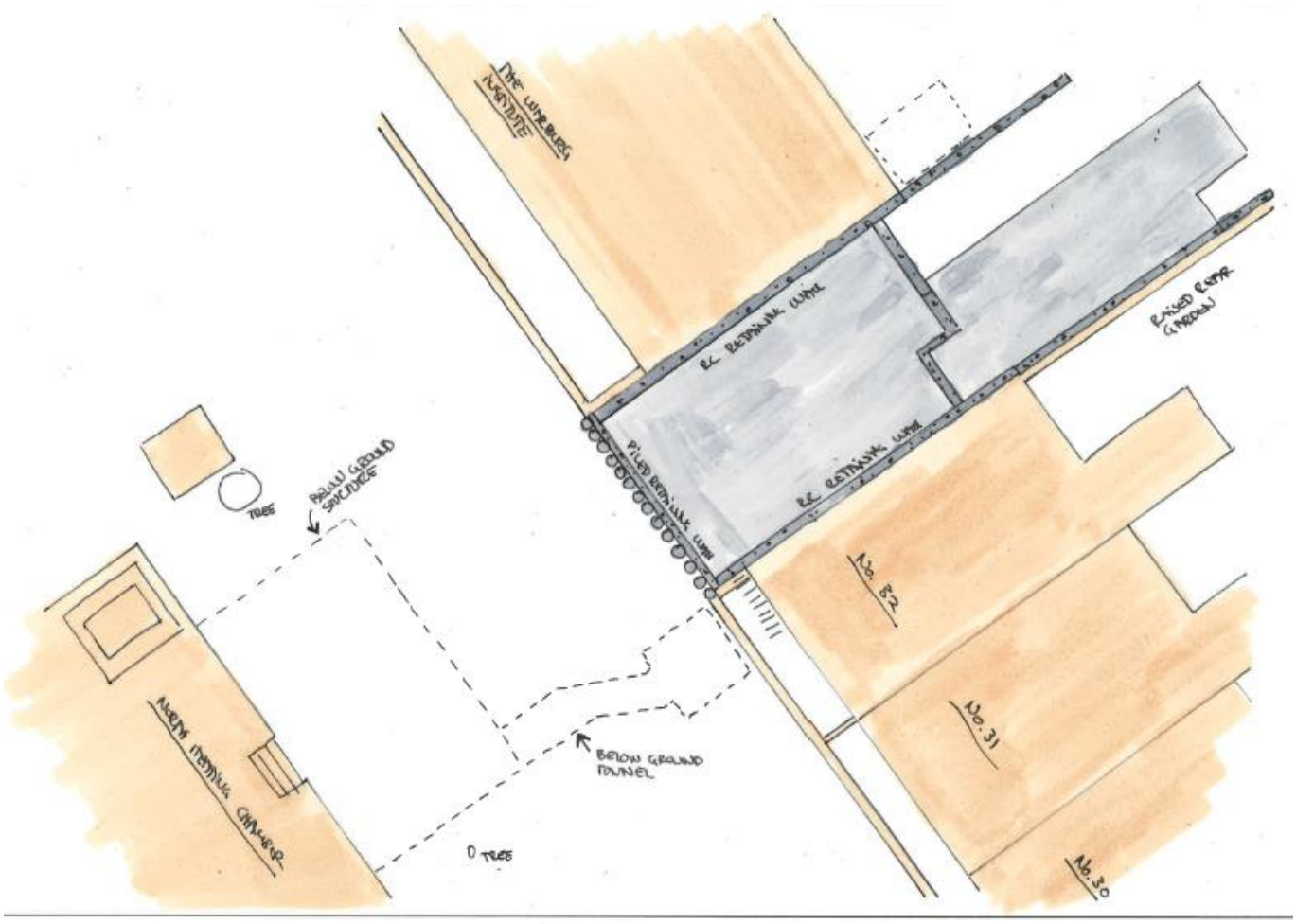


Figure 1: Site layout

2 IMPACTS

The design of the foundations, substructure and superstructure has been planned to minimise as far as practical the extent of ground movements to neighbouring properties. The anticipated ground movements, subject to final temporary works design, are shown in Figure 2.

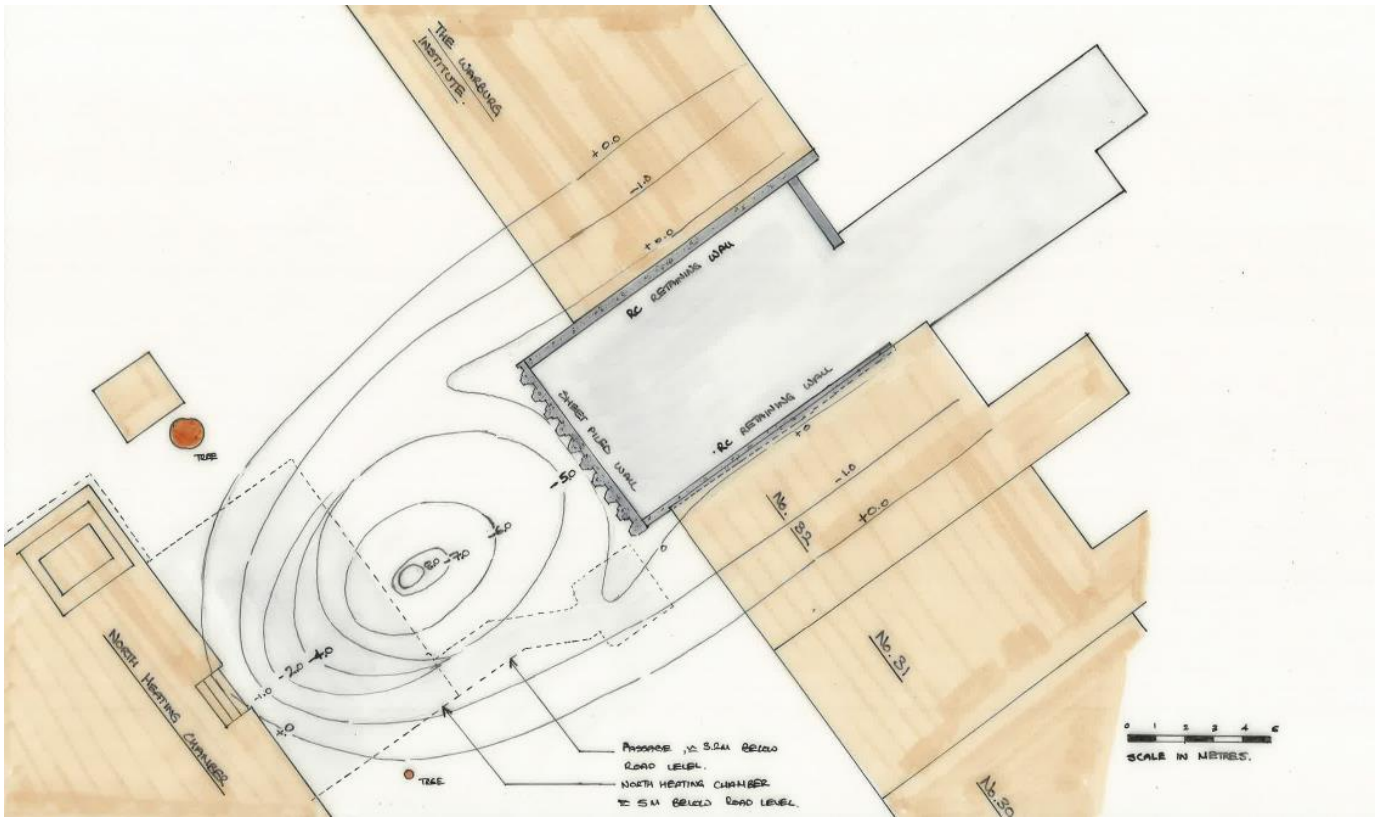


Figure 2: Predicted vertical ground movements

3 PROGRAMME

The target commencement dates are to be confirmed by the contractor.

4 MONITORING SYSTEM

4.1 PROPERTIES TO BE MONITORED

Monitoring is proposed for the following properties:

- 32 Torrington Square
- The Warburg Institute
- Below ground structure leading to the North Heating Chamber
- North Heating Chamber

4.2 MONITORING SYSTEM

It is proposed that the neighbouring assets within 10m of the site will be monitored by:

- A visual condition survey of 32 Torrington Square and assets within 10m of the site will be undertaken prior to commencement of construction and excavation works. A report of condition with records and photographs of damaged or defective areas will be prepared. Recommendations are to be included for repair or monitoring of defects that could adversely affect structural adequacy whilst temporarily supported.
- Monitoring targets will be installed on the exterior face of the assets within 10 of the site including 32 Torrington Square, the Warburg Institute and the North Heating Chamber to monitor vertical and horizontal displacements,

using tamper resistant targets. Elevations to be monitored are indicated in Figure 3. Monitoring accuracy; Levels: +-1mm, Horizontal movements +-1mm

- Depending on the outcome of the visual condition survey, specific monitoring at any areas showing signs of previous or ongoing movement may also be provided.
- A visual inspect of the assets will be undertaken each day. If movement cracking or other signs of distress are noted, works will be stopped and the findings investigated. If new or extended cracks are found, additional monitoring will be installed if required.
- A visual condition survey of each asset will be undertaken on completion.
- Monitoring specialist to advise on the use of pavement monitoring, with or in lieu of prisms/prismatic targets on the neighbouring properties.

All monitoring targets and tilt meters will be screw fixed to existing facades, ensuring that the weatherproof capacity of the existing façade is not compromised. Following completion of monitoring the targets will be removed and any holes filled and made good to match existing finishes.

The proposed positions and extent of the monitoring targets are indicated in Figure 3.

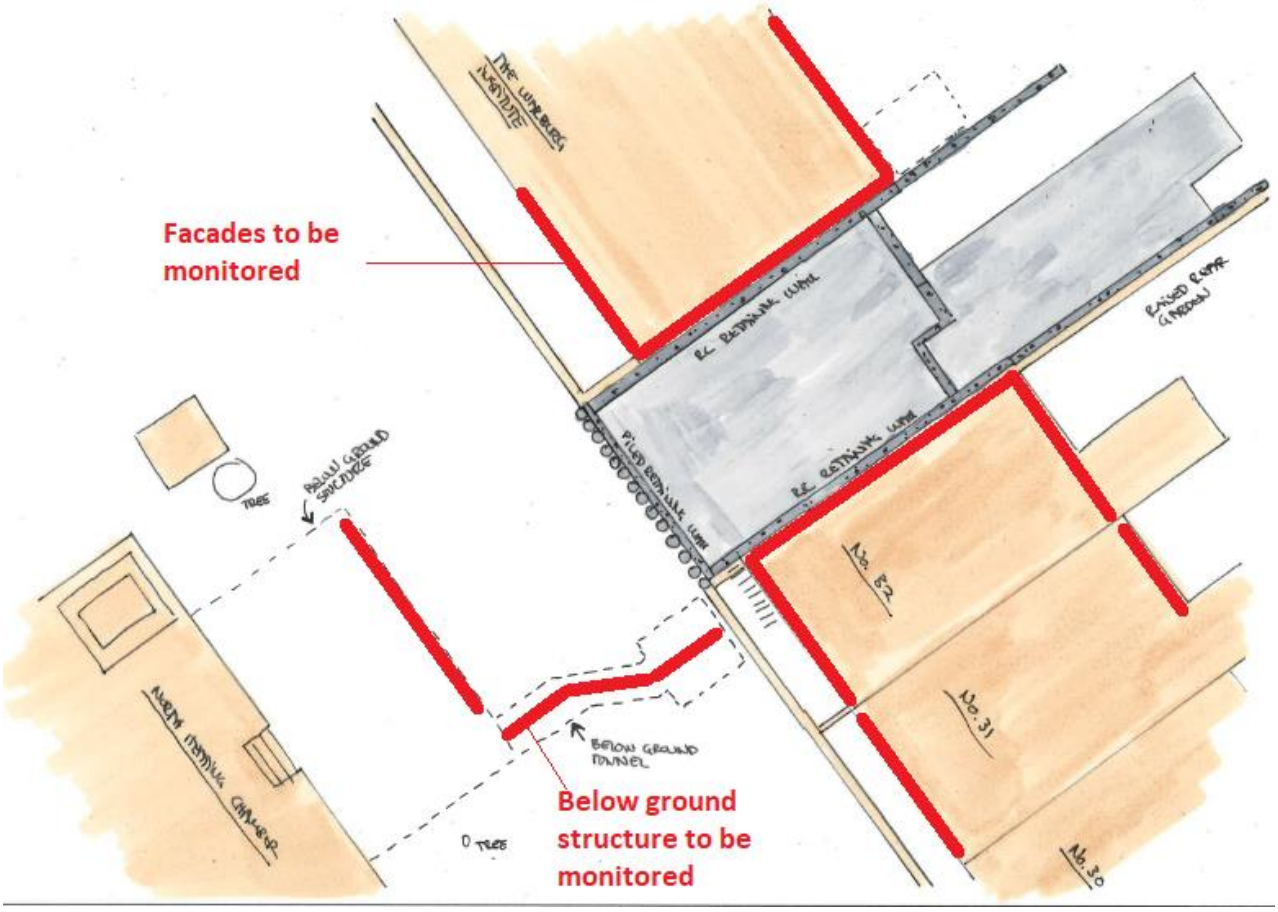


Figure 3: Proposed monitoring locations

4.3 FREQUENCY OF MONITORING

Monitoring frequencies to be as follows:

- Baseline readings for the automated system will be established for a minimum of four weeks prior to construction and excavation works commencing.
- Weekly readings are to be taken during piling, excavation and structural construction works until primary structure is completed.

4.4 DURATION OF MONITORING

Monitoring duration is envisaged to be in place 4 weeks prior to commencement of construction until completion of main contract.

Baseline readings will be taken prior to piling and excavation for a duration of four weeks. It is envisaged that the monitoring will be in place until primary structural works is completed – however this will be subject to review during construction. The contractor will provide programme dates required.

4.5 TRIGGER LEVELS

Proposed trigger levels are shown in Table 1. The trigger levels are based on achieving Burland Scale Categories of less than 1 or "very slight" and easily repairable.

Table 1: Proposed trigger levels

Asset	Displacement Action Value	Displacement Trigger Level
Building facades	±5.0 mm (horizontal at top of wall), or 1:600 (verticality) 2.0 mm across 10 m (differential vertical)	70% of action values
Embedded retaining wall	±10.0 mm (horizontal displacement), or 1:300 (verticality) ±5mm (vertical displacement)	70% of action values

In the event that trigger levels are exceeded, the designated representative of the Contractor will inform the design engineer, the client, and any affected parties and determine the appropriate course of action.

4.6 REPORTING

Reporting will be web based, with data uploaded at regular intervals to be agreed with the monitoring company. Affected residents will be provided with access details to the web page upon request.

APPENDIX C – BELOW GROUND UTILITY RECORDS

Groundwise Searches Limited
Suite 8 Chichester House,
45 Chichester Road, Southend-on-Sea,
Essex, SS1 2JU
Telephone 01702 615566
Fax 01702 460239
mail@groundwise.com
www.groundwise.com

Mr David Damant
Randall Surveys LLP
High Street
Bures
CO8 5HZ

Purchase Order: DRD/J14241
Our ref: 18676JS

21 November, 2016

Dear Mr Damant

Site: 32 & 33 Torrington Street, London, WC1E 7YL
Grid reference: 529798,182120

Please find enclosed information for the Utility Report on the above site.

Affected Utilities

The following utilities have provided details of their network. Refer to the enclosed plans and notes for further information.

Data Supplier	Type	Date Received	Sent to client	Map(s)
BT	Telecom	1/11	21/11	X
Camden Council	Street Lighting	9/11	21/11	X
Instalcom Ltd	Telecom	7/11	21/11	X
LinesearchbeforeUdig	Various	1/11	21/11	
Mast Data	Mobile Phone Masts	1/11	21/11	X
National Grid Gas Plc	Gas	2/11	21/11	X
Plancast	Telecom	2/11	21/11	X
Thames Water	Water Mains	7/11	21/11	X
Thames Water	Sewers	7/11	21/11	X
UK Power Networks	Electricity	21/11	21/11	X
Vodafone	Telecom	17/11	21/11	X

Unaffected Utilities

The following utilities have notified us that their apparatus are not present.

Data Supplier	Type	Date Received	Sent to client	Map(s)
BskyB Telecommunications Services Ltd	Telecom	4/11	21/11	
C.A. Telecom - Colt	Telecom	11/11	21/11	
Citigen	District Energy	2/11	21/11	
CityFibre	Telecom	1/11	21/11	
Crossrail	Transport	2/11	21/11	
Energetics	Electricity/Gas	7/11	21/11	
GTC	Electricity/Gas	1/11	21/11	
Interoute Vtesse Ltd	Telecom	16/11	21/11	
London Overground	Transport	11/11	21/11	
London Underground	Transport	2/11	21/11	
London Underground HV Power Assets	Transport	21/11	21/11	
MOD	Tunnels	8/11	21/11	
Network Rail	Transport	2/11	21/11	
SSE	Various	1/11	21/11	
Telent	Telecom	3/11	21/11	
Trafficmaster	Telecom	1/11	21/11	
Transmitters (DAB / Freeview / FM MW LW)	Masts	1/11	21/11	
Transport for London	Transport	14/11	21/11	
Verizon	Telecom	1/11	21/11	
Zayo	Telecom	1/11	21/11	

Awaiting Information

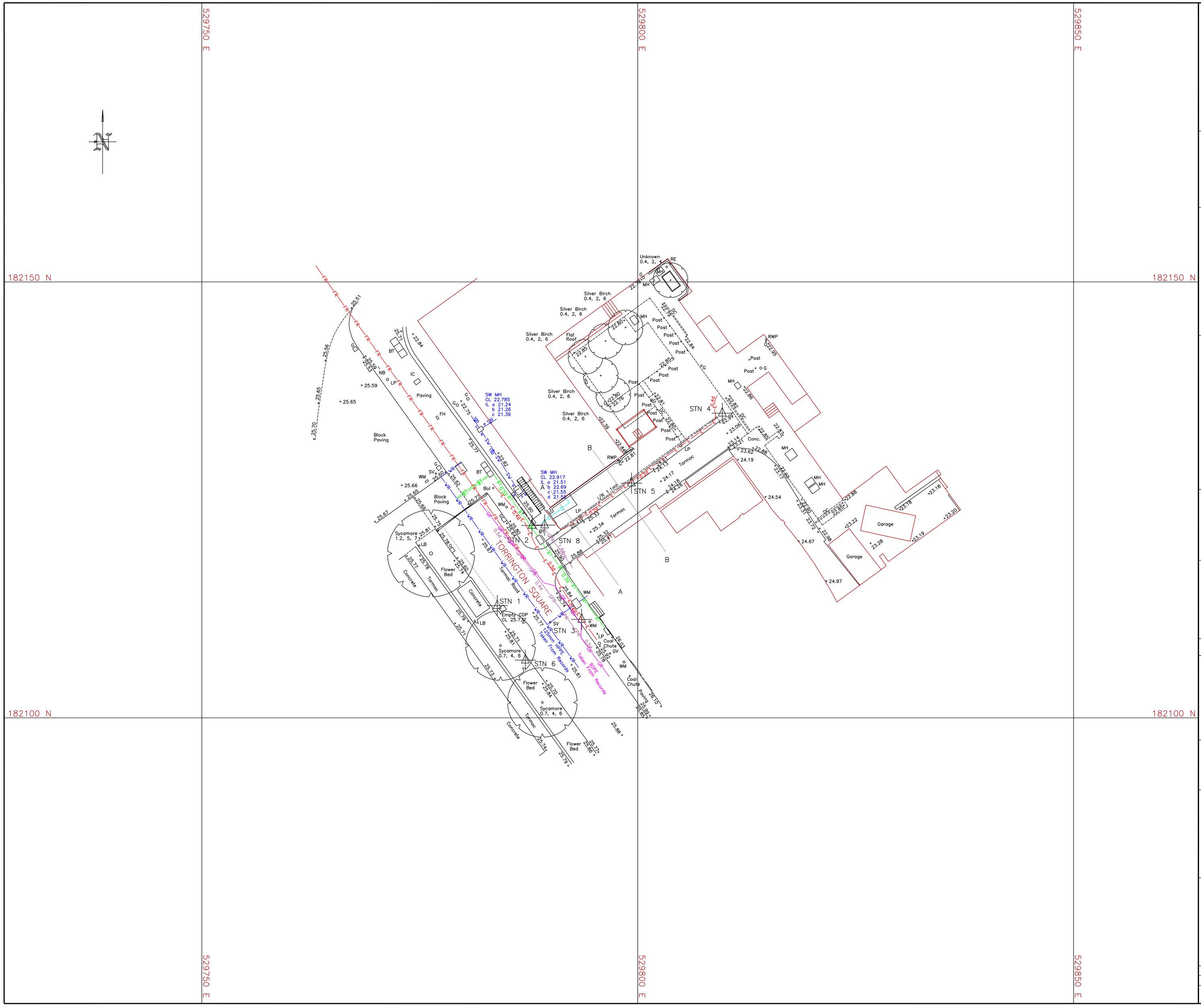
We are currently awaiting information from the following utilities.

Data Supplier	Type	Date Received	Sent to client	Map(s)
euNetworks	Telecom	Awaiting		
McNicholas - KPN	Telecom	Awaiting		
McNicholas - TATA	Telecom	Awaiting		
Virgin Media	Telecom	Awaiting		

We will continue to chase the utilities concerned and forward any relevant information on receipt. If you have any queries regarding this report do not hesitate to give me a call.

Yours sincerely

Joe Shawyer
Groundwise Searches Ltd
Email: jshawyer@groundwise.com



CONTROL DATA

Survey stations — STN
Boundary posts — BP

LEVEL DATA

Spot levels +43.62
Contours 43
Steep slopes

TREES

1,4,7 Girth (Circumference) , spread (radius), height
Cmp Clump
Trees shown on this drawing have been identified to the best of the surveyors' ability. Where guaranteed identification of tree species may become important in the project design we would strongly recommend that the services of a specialist arboriculturist be employed. It should be noted that Randall Surveys LLP are not specialists in the field of tree identification.

Datum used : Newlyn. All units are metric.

FEATURES

Fences shown thus
Walls shown thus
Hedges shown thus
Undefined Boundary
Gates

OVERHEAD CABLES

British Telecom
Electric

FENCE TYPES

B/W	Barbed wire	I/R	Iron railing
C/B	Close boarded	P/F	Picket fence
C/I	Corrugated iron	P/R	Post and rail
C/L	Chain link	P/W	Post and wire
C/P	Chestnut paling	W/F	Wooden fence
C/W	Chicken Wire		

ABBREVIATIONS

BB Bekeisha beacon	CNT Could not trace	G Gulley	PM Parking meter	SVP Soil vent pipe
BD Back drop	CPL Coping level	GV Gas valve	PS Paving slabs	TCB Telephone call box
BH Borehole	DC Drainage Channel	IC Inspection cover	RC Rising cable	TCP Tactile paving
Bol Bollard	DK Drop kerb	IL Invert level	RE Rodding eye	TL Traffic light
BT British Telecom cover	EJB Elec. junction box	JB Junction box	Ret. Retaining	TP Telegraph pole
BTJB BT junction box	EOR End of record	KO Kerb outlet	RS Road sign	TPL Top of pipe level
CATV Cable TV cover	EOT End of trace	LP Lamp post	RWP Rain water pipe	TS Traffic signal
CDP Cable draw pit	EP Electricity pole	MH Manhole	SC Stop cock	VP Vent pipe
CL Cover level	ER Earth rod	Mkr Marker	SL Sump level	WL Weir level
CM Cable marker	FB Flower bed	NB Name board	SP Sign post	WO Washout
CNF Could not find	FH Fire hydrant	OF Outfall	ST Stand pipe	WM Water meter
CNL Could not lift	FL Floodlight	PB Post box	SV Stop valve	WSC Water stop cock

IMPORTANT NOTES

The details and information shown hereon relating to underground drains, cables etc. are as obtained by normal field survey observations subject to the restrictions listed in the NJHSC guidelines. Service Co. and sewer records will only have been consulted on specific request and, although all reasonable effort will have been made, no guarantee of accuracy of these records can be given.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed. Where precise sewer details will be critical to the project design we would recommend that entry into the chamber be undertaken using a specialist team, appropriately qualified for confined space entry. These teams can be supplied upon request.

The pipe and cable routes shown on this drawing have been located using electronic surface detection equipment and/or ground penetrating radar, no trial holes have been dug in order to confirm their presence and position. Whilst the information presented is believed to be correct at the time of the survey due care must be taken when any excavation is undertaken on the site. Trace depths are quoted in metres.

The portrayal of a service on this drawing may indicate the presence of multiple cables/pipes. The exact number will only be indicated where this could be accurately determined.

Hatching denotes an area containing possible services which could not be traced electronically or by GPR, where used, but have been abstracted from service drawings.

The plan position and depth of any service portrayed on this drawing is accurate to +/- 10% of the depth of that service.

Where the precise location and/or depth of a service is critical to design and/or construction, trial holes are recommended to confirm the details provided on this drawing.

This drawing should be read in conjunction with any record drawings available from the statutory authorities.

UNDERGROUND SERVICES – TRACED

TV	CATV
E	Electric
W	Water
T	Telemetry
G	Gas
O	Others
BT	British Telecom
GPR	Ground Probe Radar Trace
F	Foul Sewer
SW	Surface Water Sewer
C	Combined Sewer
OF	Overflow Sewer
U	Undetermined Sewer
PM	Pumping Main
WW	Washwater

UNDERGROUND SERVICES – NOT TRACED

TVR	CATV
ER	Electric
WR	Water
TR	Telemetry
GR	Gas
OR	Others
BTR	British Telecom
FR	Foul Sewer
SWR	Surface Water Sewer
CR	Combined Sewer
OFR	Overflow Sewer
UR	Undetermined Sewer
PMR	Pumping Main
WWR	Washwater

Where underground services have not been traced electronically or by GPR they have either been abstracted from record drawings or are assumptions based on local site conditions.

NOTES

PRELIMINARY DRAWING

PLAN PRODUCTION BY

RANDALL SURVEYS LLP

SURVEY & DESIGN CENTRE
HIGH STREET, BURES, SUFFOLK CO8 5HZ
Tel: 01787 227580 Fax: 01787 228329
WWW.RANDALLSURVEYS.CO.UK

Land and Hydrographic Surveyors
Architectural Building Surveyors
Underground Services Location

THE SURVEY ASSOCIATION — QMS ISO 9001 REGISTERED FIRM — RICS

PROJECT NAME

NO.S 32 & 33 TORRINGTON SQUARE

LONDON

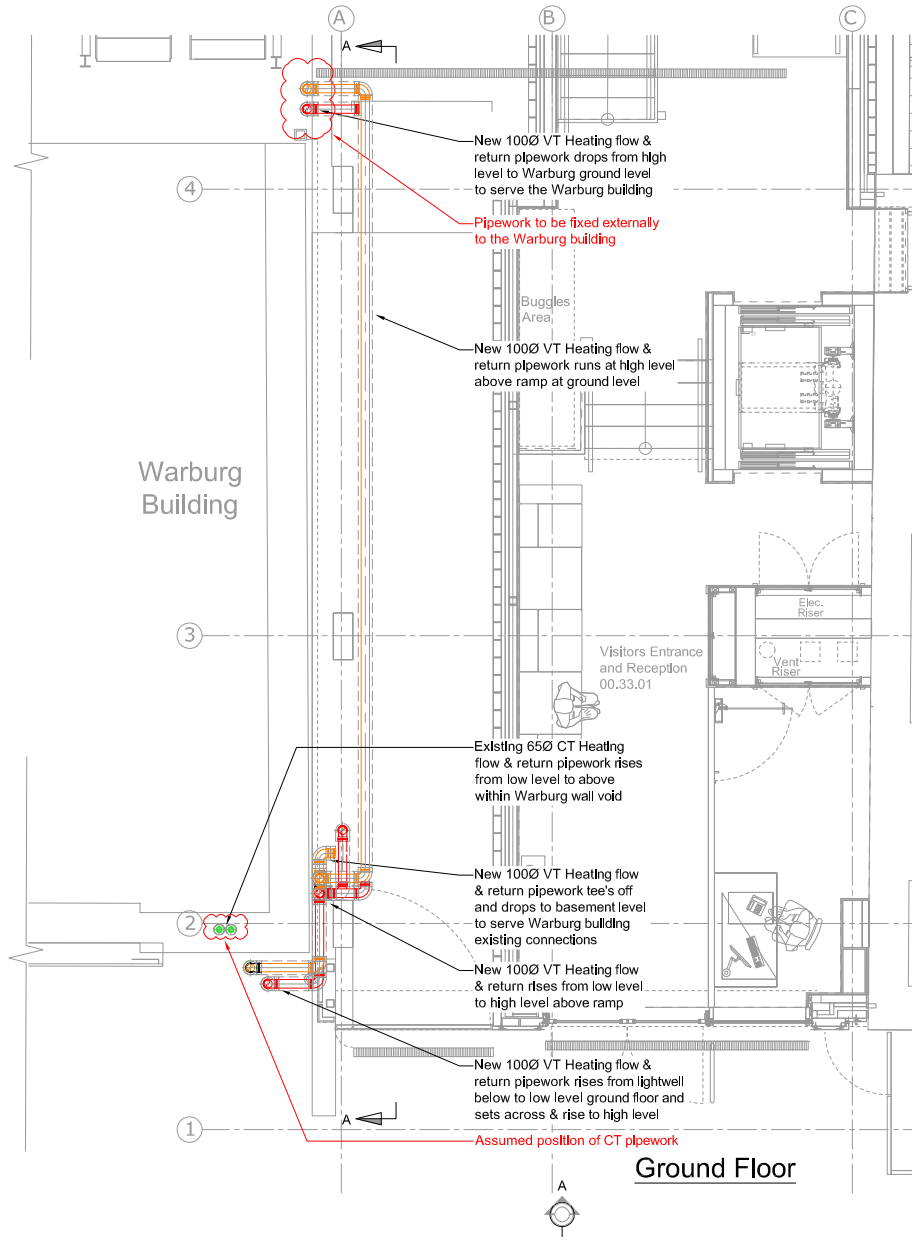
DRAWING TITLE

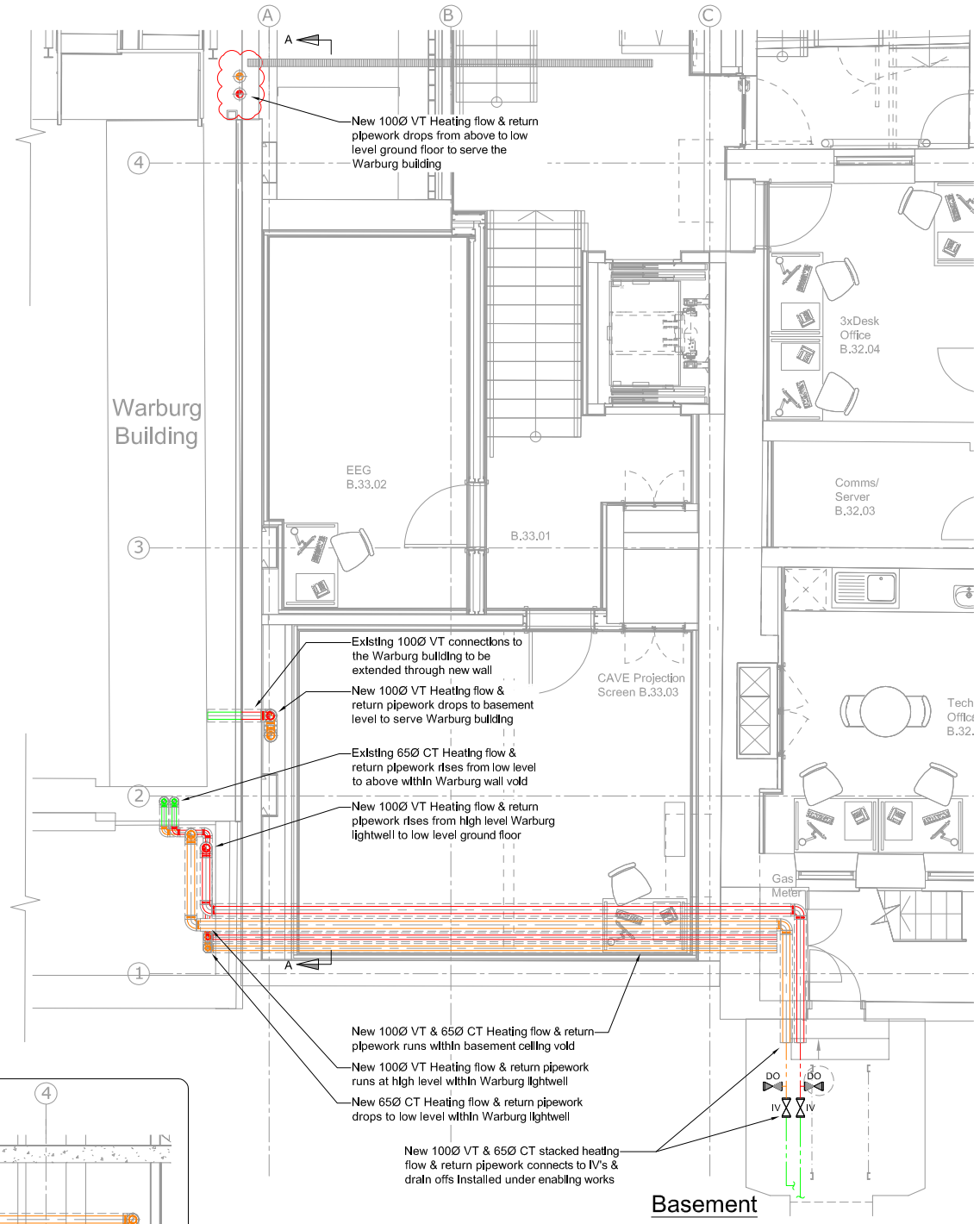
EXISTING SITE & SERVICES LAYOUT

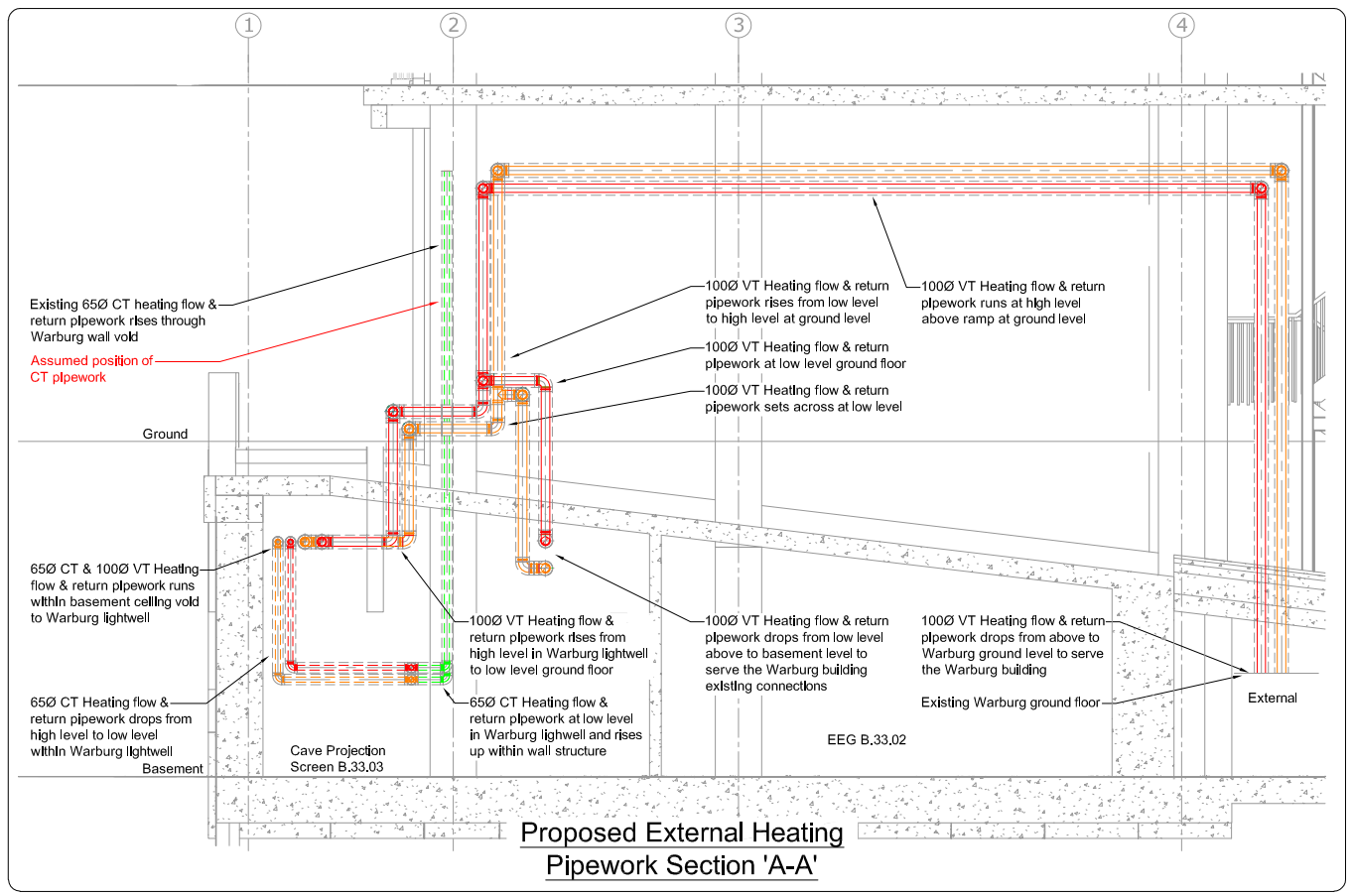
SCALE	1/200	DRAWN	MMC	PAPER SIZE	A1
DATE	December 2016	CHECKED	DRD	REVISION	PREL

Dwg No. 14241/MC/1 PRELIMINARY

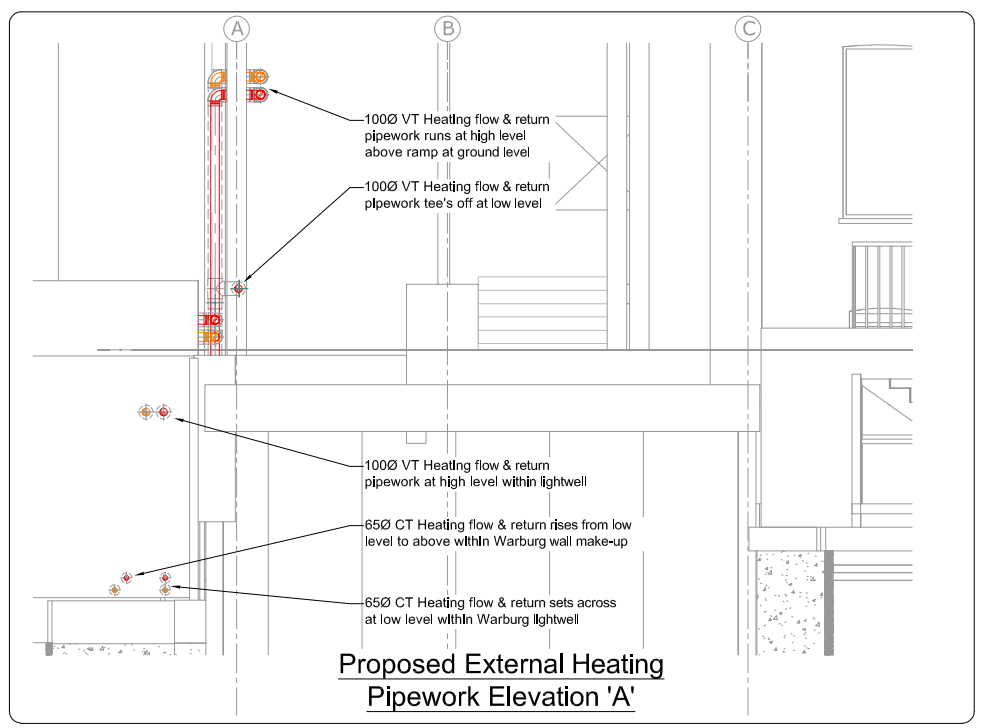
APPENDIX D – HEATING PIPE DIVERSION







Proposed External Heating
Pipework Section 'A-A'



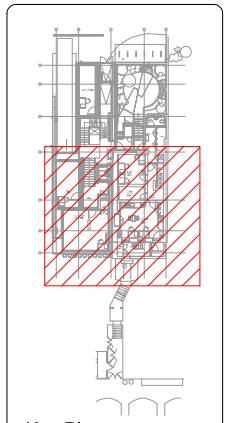
Proposed External Heating
Pipework Elevation 'A'

Legend

F&R	-	Flow & return
FCU	-	Fan coil unit
HTG	-	Heating
LST	-	Low surface temperature
R	-	Radiator
IV	-	Isolation valve
DO	-	Drain offs
CT	-	Constant temperature
VT	-	Variable temperature
	-	Heating flow pipework
	-	Heating return pipework
	-	Pipework within ceiling void
	-	Pipework within floor void
	-	Pipework at low level
	-	Existing services
	-	Insulated pipework

Drawing based on Bisset Adams drawing no. BB029-BA-Z2-B1-00-DR-A-1001-D2 - Rev P1

Drawing based on Bisset Adams drawing no. BB029-BA-Z0-01-DR-A-1202-D2- Rev P3



Key Plan

Notes

1. This drawing shall be read in conjunction with all Mechanical and Electrical drawings, Schedules and Specification.

2. Contractor to allow for on site co-ordination with the structure and other services and the production of fully dimensioned working drawings prior to installation.

3. All equipment to be installed in accordance with the manufacturers instructions

4. Drain off's to be fitted at low points.

5. Air vents to be fitted on all high points.

6. All Plant to be commissioned by manufacturer or approved Installer.

7. For futher pipework details & valve arrangements refer to schematic drawing.

8. All pipework penetrations through any structure to be sleeved with oversized tube of same material.

9. All radiators to be fitted with adjustable dynamic TRV's.

10. All radiators within communal areas to be fitted with tamperproof dynamic TRV's.

11. All pipework and valves to be insulated.

12. Access panels to be installed by main contractor to allow access to all valves.

13. All pipework to be copper table X.

14. All pipework to be earth bonded.

15. All gaps between pipework & sleeves to be fitted with fire resistant sealant.

16. All pressure gauges to be connected by pigtails.

17. All temperature gauges to be installed in a stainless steel pocket with heat conducting compound.

18. All pipework to run to fall to from bends & vents to aid draining & venting.

19. Primary Heating flow and return temperatures 80/60°C.

20. All equipment to be commissioned by manufacturer or approved Installer.

21. All pipework within No.32 to be routed through existing notched joists where possible.

Rev	Date	Description
T2	Oct'17	Tender Issue. Amendments clouded

Client

Birkbeck UNIVERSITY OF LONDON

Project Title

TODDLER LAB,
32 TORRINGTON SQUARE,
BIRKBECK, UNIVERSITY OF LONDON

Drawing Title

WARBURG HEATING
PROPOSED WORKS

MKPCONSULTANTS
ENGINEERING EXCELLENCE

Warren Farm Barn, Andover Road,
Micheldever Station, Winchester, SO21 3FL
Tel. 01962 774665, www.mkpg.com

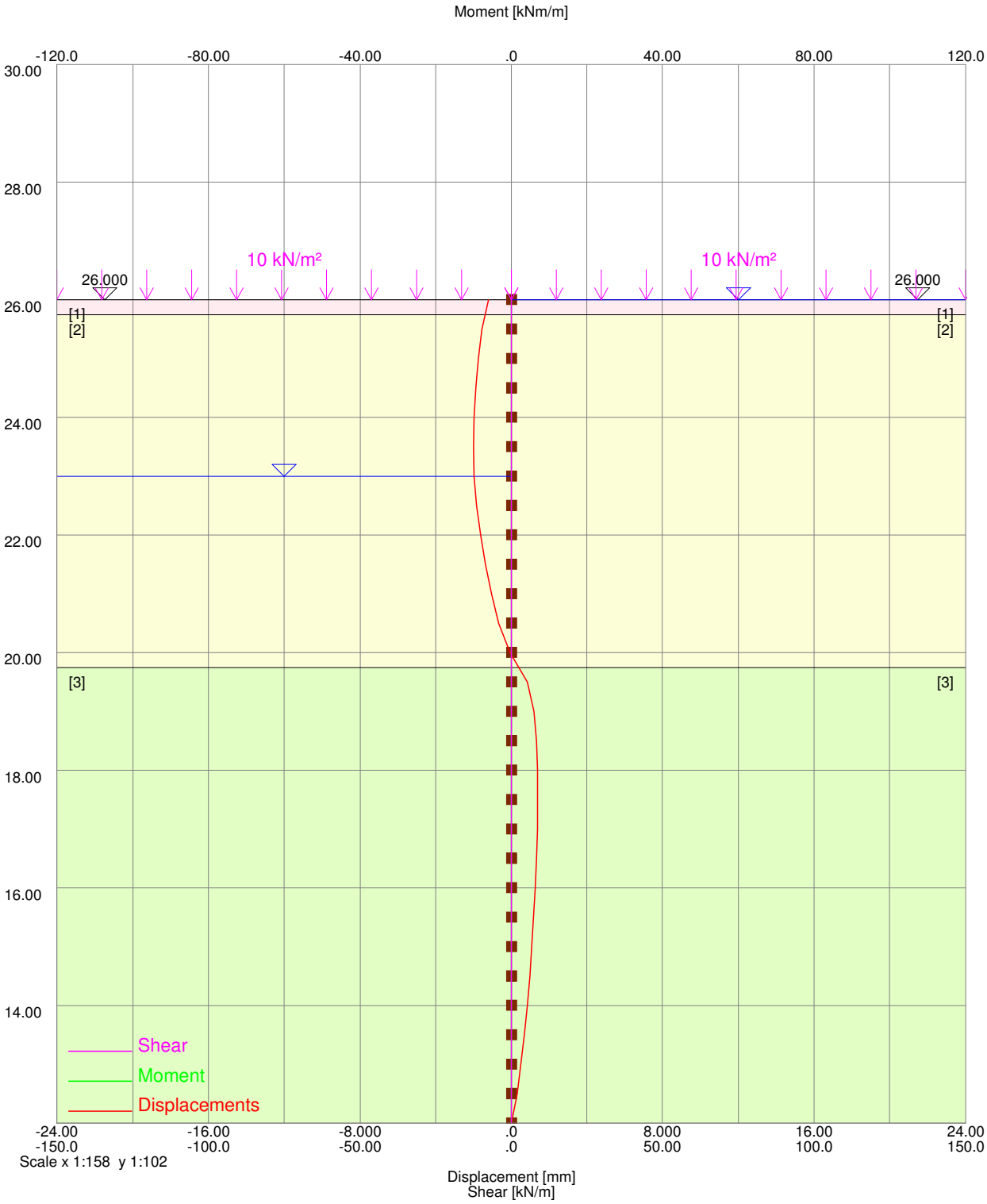
Drawn	Date	Checked	Approved
LS	SEP'17	PK	PK

Scale	Size	Issue
1:50	○ A4 ○ A3 ● A1 ○ A0	○ Preliminary ● Tender ○ Construction ○ Contract

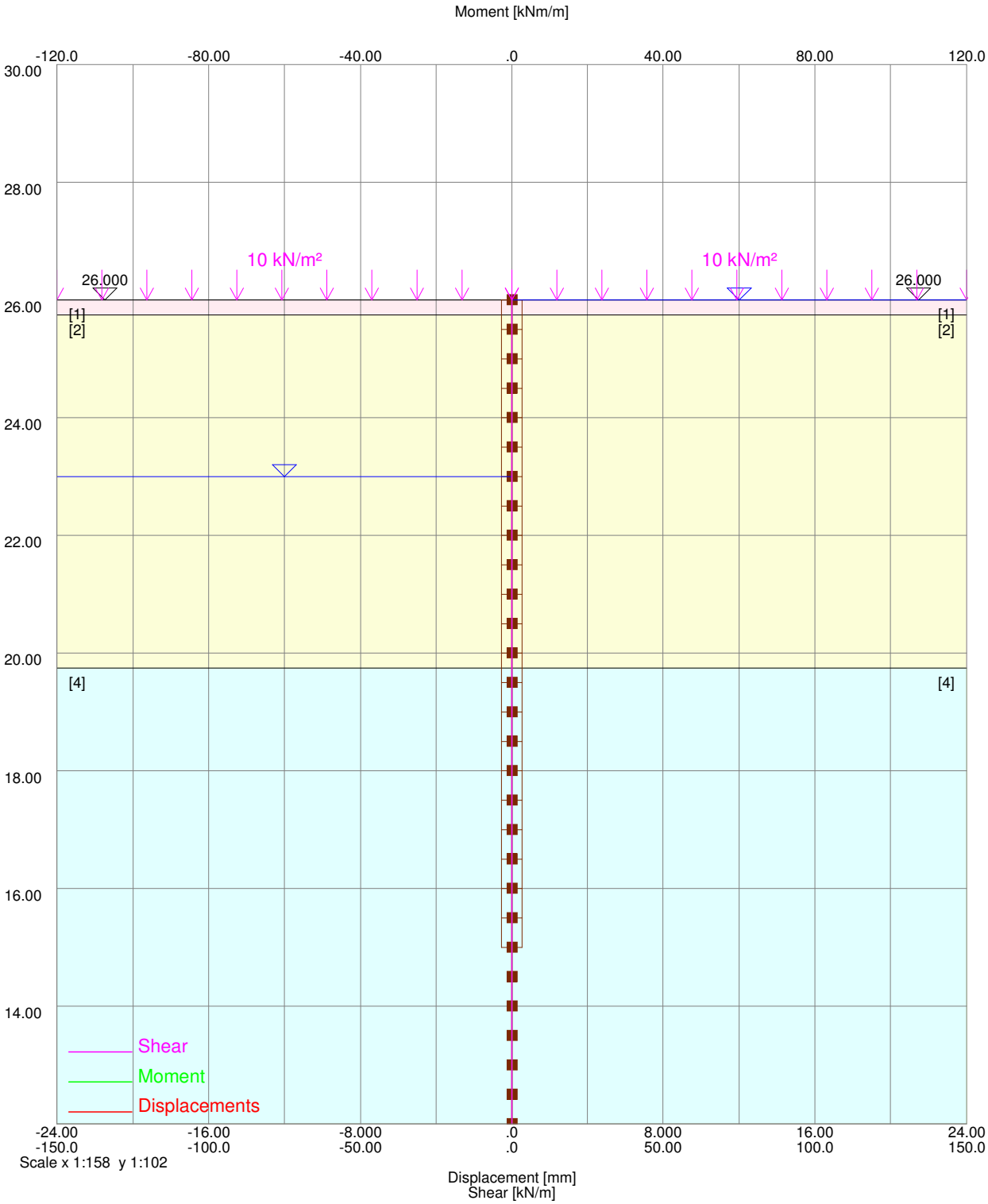
Drg. No. 2495-M-8002

Rev T2

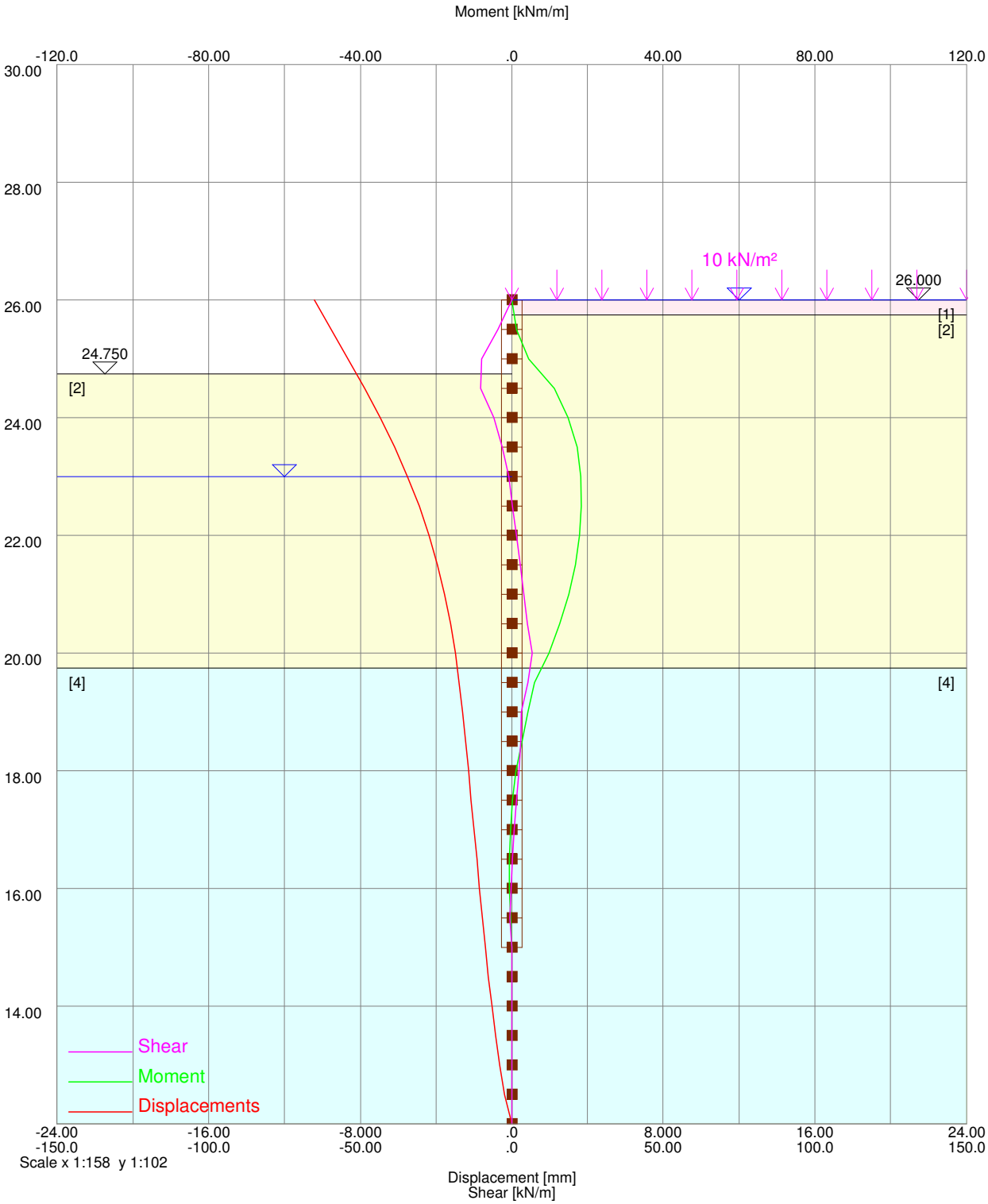
APPENDIX E – FREW CALCULATION OF CONTIGUOUS PILE RETAINING WALL



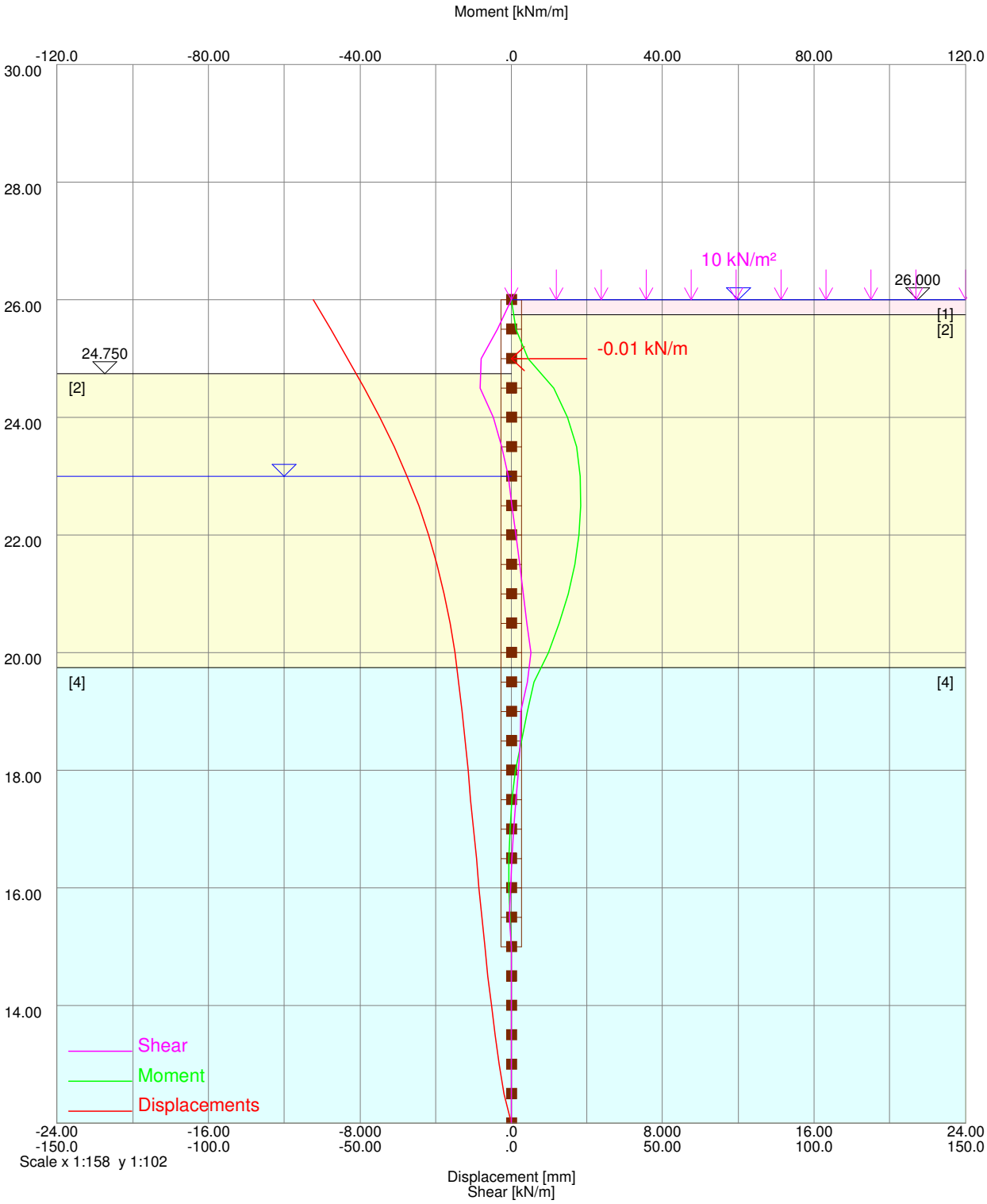
STAGE 0 : Initial condition



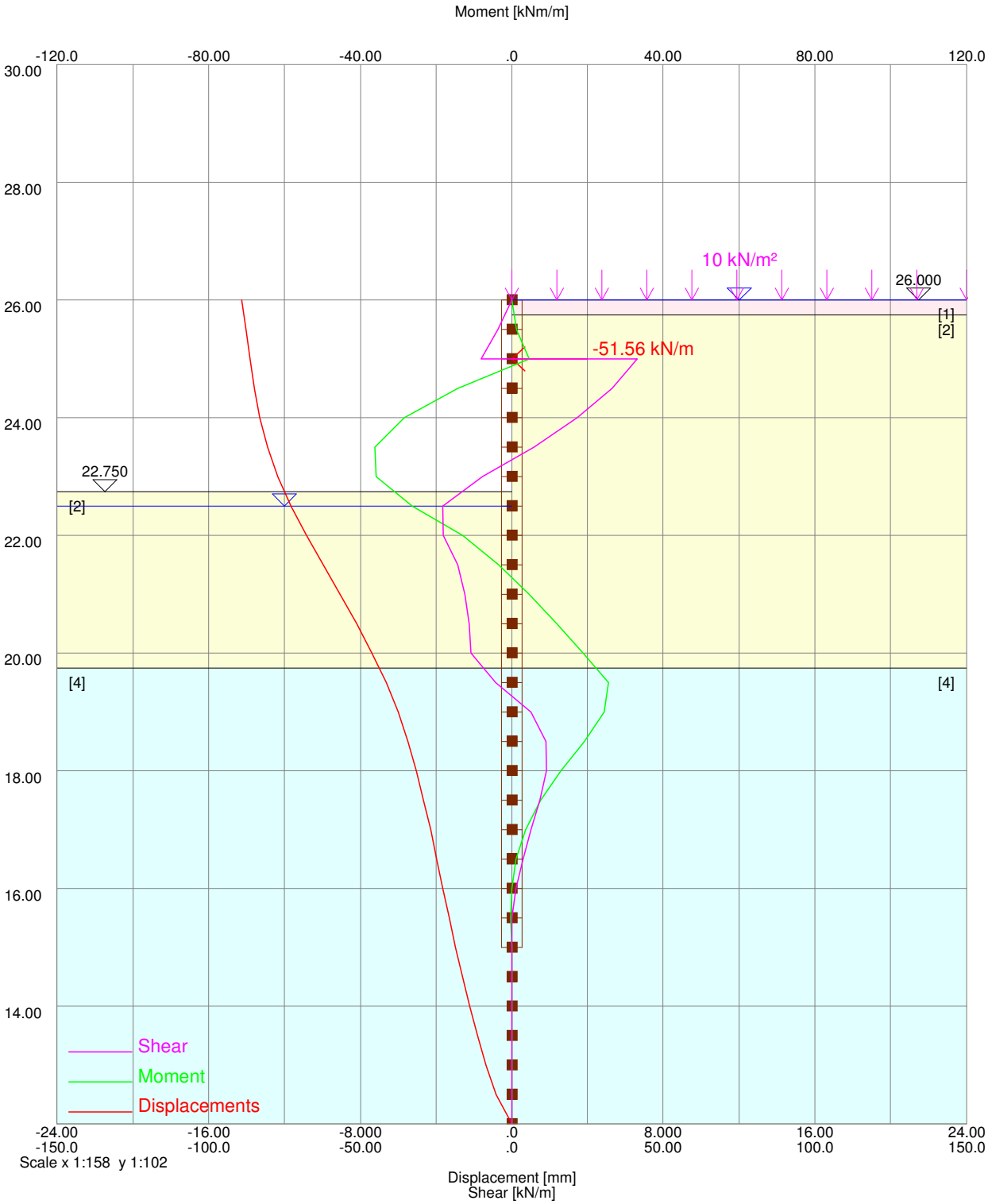
STAGE 1 : Install wall



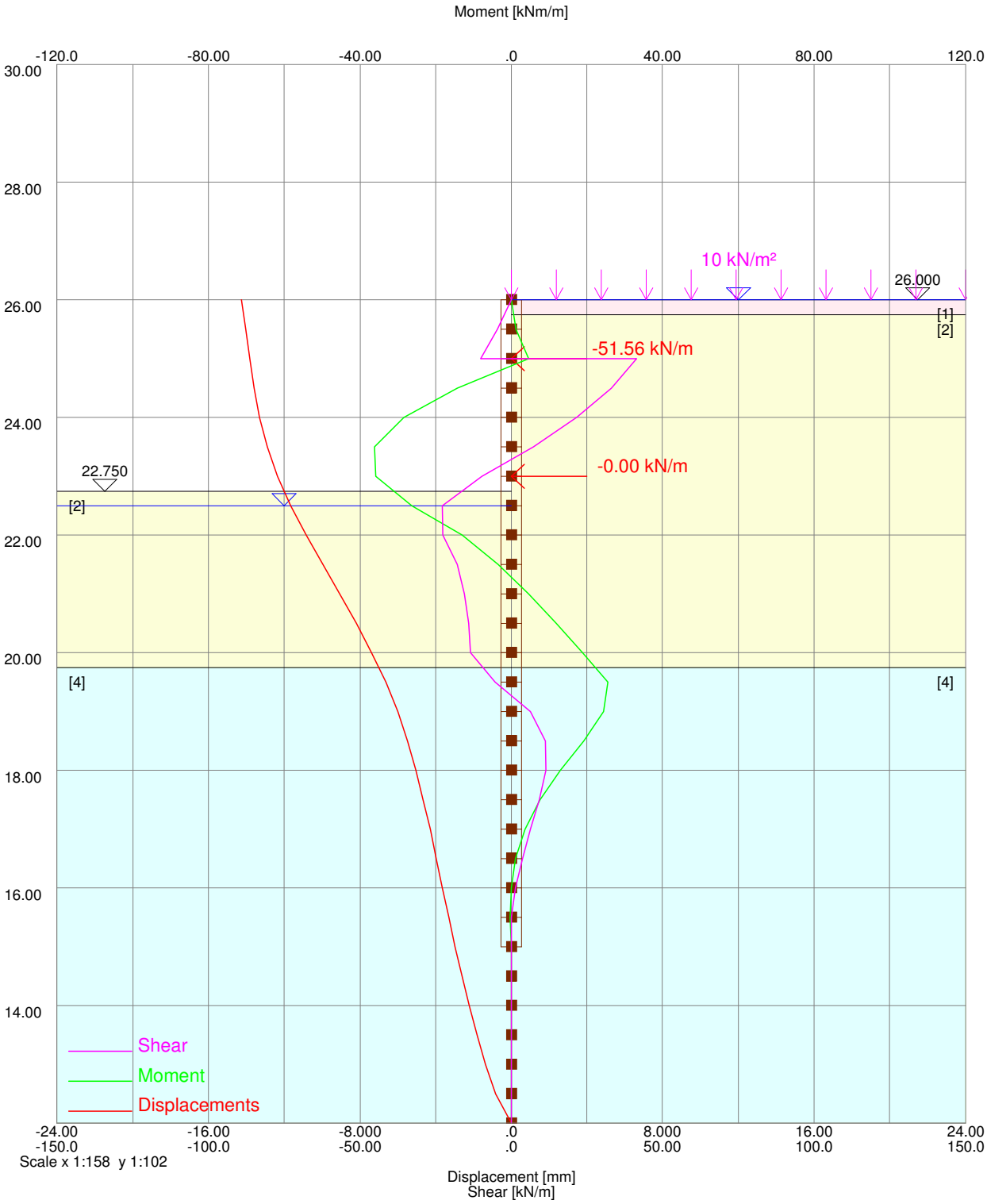
STAGE 2 : Excavate to -1.0m



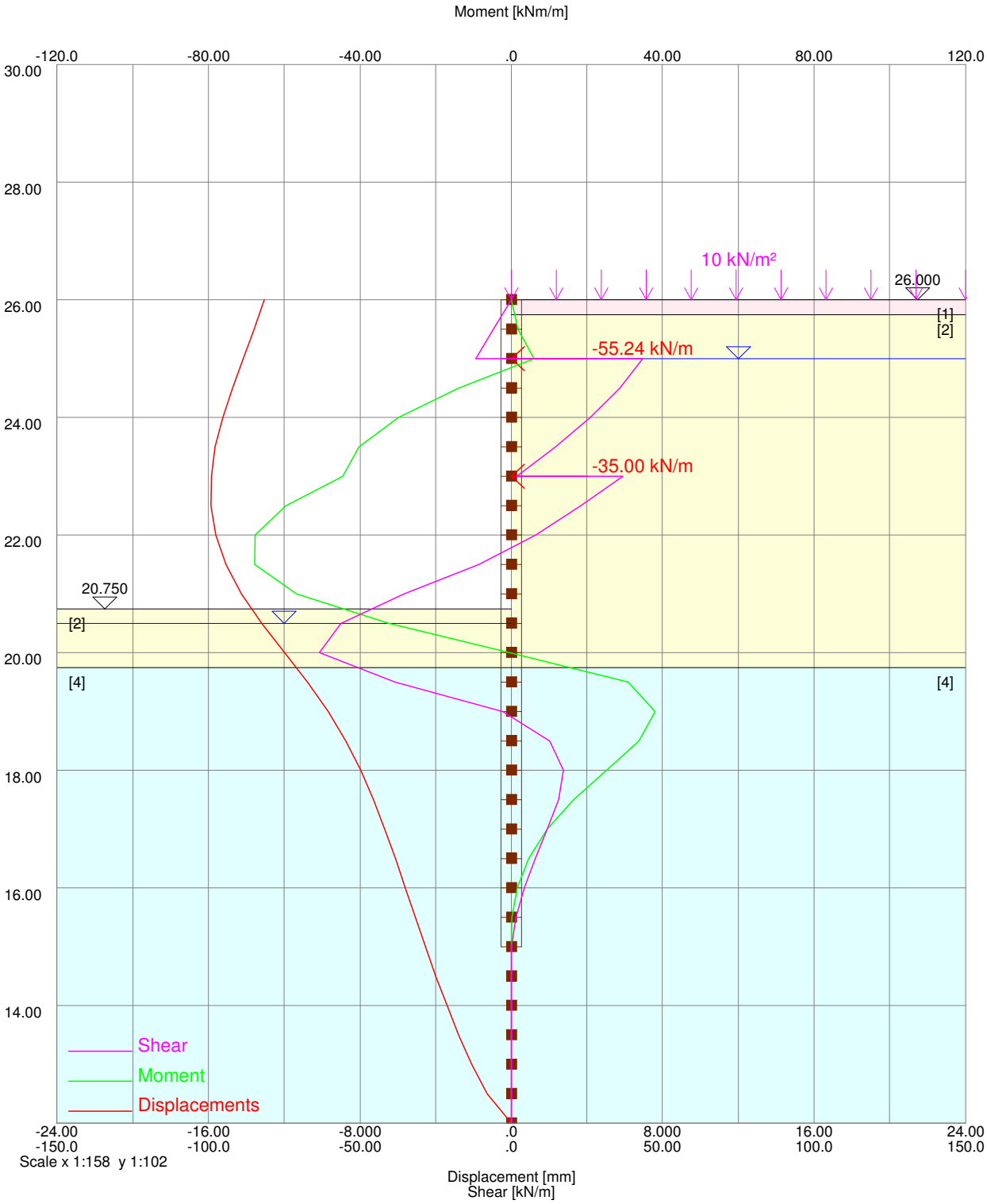
STAGE 3 : Install temporary props at -1.0m



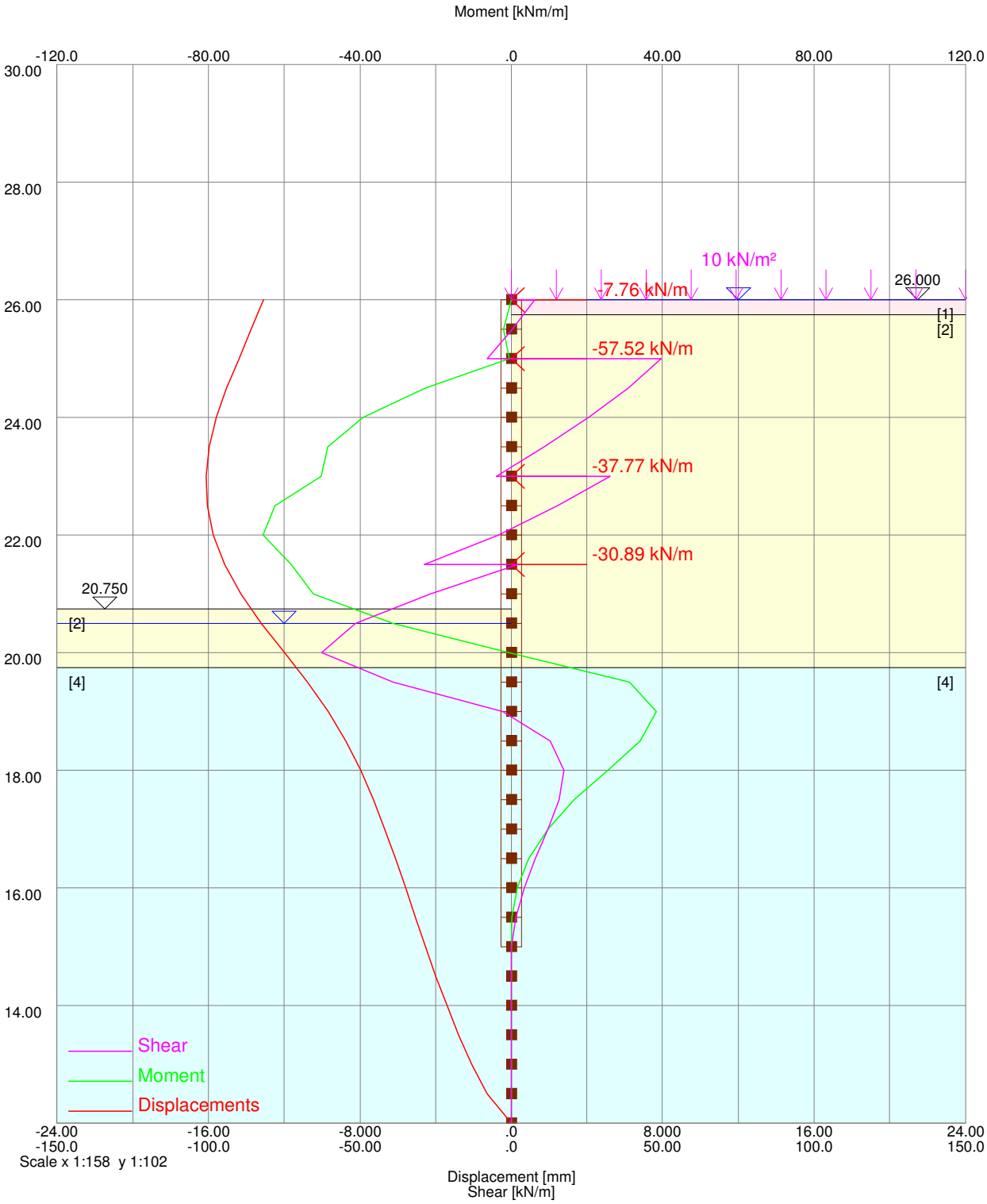
STAGE 4 : Excavate to -3.0m



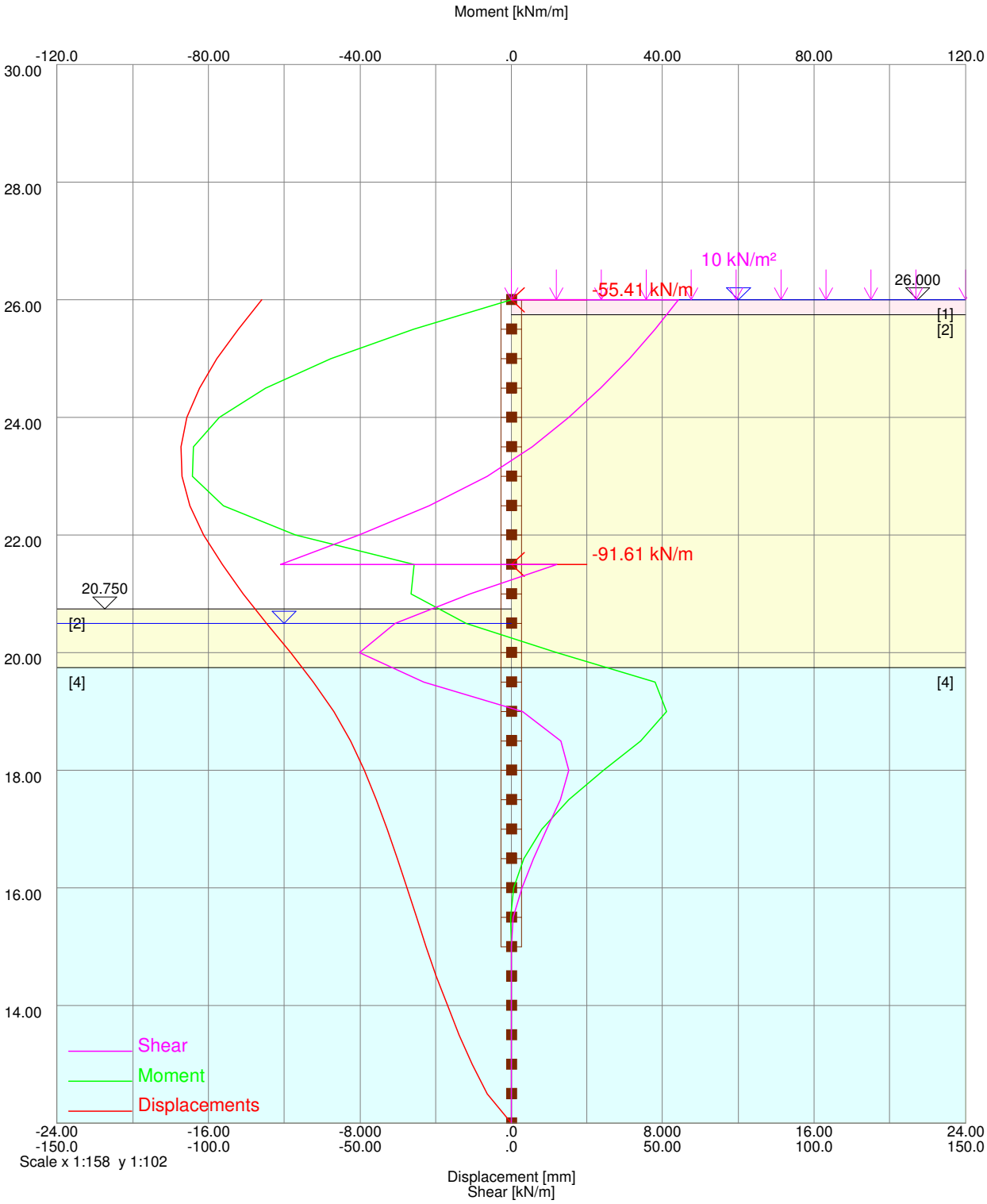
STAGE 5 : Install prop at lower level



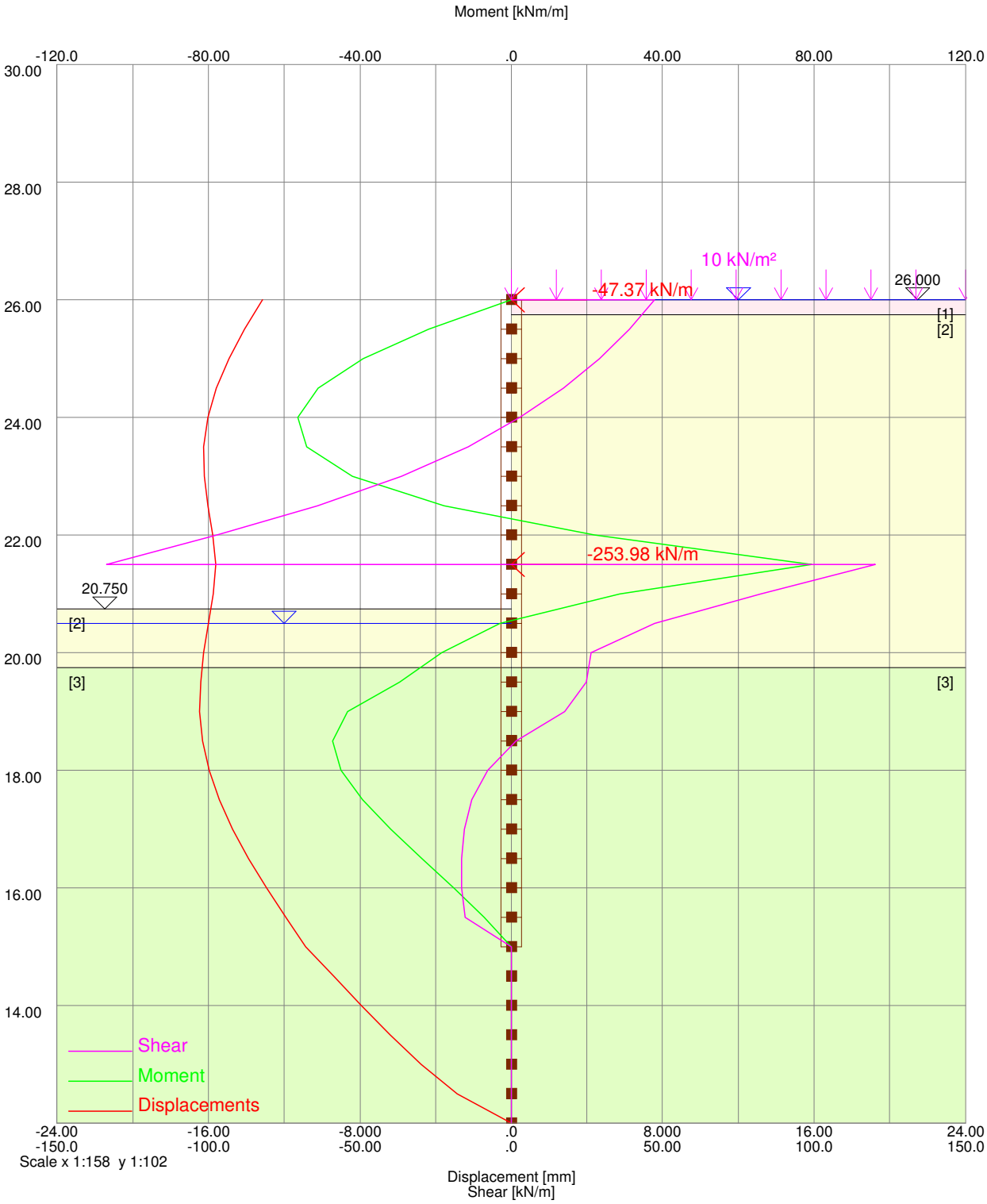
STAGE 6 : Excavate to final level 21.00



STAGE 7 : Install basement box (permanent props)



STAGE 8 : Remove temporary props



STAGE 9 : Undrained permanent condition

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