31 Daleham Gardens, London, NW3 5BU

Ground Movement Assessment Report

Project Code: 2023-002-SIM-DAL

Report No: Rep.004

Date: 27/04/2023

Geofirma Ltd
Cardinal Point
Park Road
Rickmansworth
Herts
WD3 1RE

01923 437840
geofirmaconsultants.co.uk

DOCUMENT CONTROL SHEET

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PREAMBLE

The work undertaken to provide the basis of this report comprised a study of the available documented information from a variety of sources, together with (where appropriate) meetings and discussions with relevant authorities and other interested parties. The information reviewed should not be considered exhaustive and has been accepted in good faith by Geofirma Ltd as providing a true description of site conditions. However, no liability can be accepted for the detailed accuracy or otherwise of any of the reports or documents prepared by others for the Client or for third parties, or for any associated errors or omissions.

The GMA analysis and conclusions included in this report assumes the underpinning and excavation works is undertaken by a competent and experienced contractor.

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APPENDICES

1. INTRODUCTION

1.1 PURPOSE OF ASSESSMENT

Geofirma Ltd has been instructed by NW3 CLT, the client for the project, to undertake a ground movement assessment (GMA) for a building redevelopment at 31 Daleham Gardens, NW3 5BU.

1.2 PROPOSED DEVELOPMENT

The previous building on this site suffered extensive damage in a fire in 2017, leaving it structurally unsound and hence the building was demolished. At the time of the ground investigation the site was vacant land with no visible buildings present.

The current proposal for the redevelopment is understood to include the following:

- The proposed project includes the redevelopment of the site to deliver a multi- storey apartment block, consisting of approximately 14 new units over 5 levels.
- The site levels fall from the western site boundary to eastern boundary and hence the ground floor of the western part of the building shall cut into this slope to form a part basement.
- Due to the sloping profile of the site the ground floor slab will be approximately 3.5 m below existing ground level (approximately 81.5 m OD) at the western extent of the proposed building. At the eastern extent adjacent to the pavement of Daleham Gardens, the ground floor slab will be close to the slab SSL of approximately 77.2 m OD, hence no basement.

1.3 QUALIFICATION OF CONTRIBUTORS

Table 1 – List of main contributors to this and accompanying reports

Name	Report Contributed to	Qualifications
Ebenezer Adenmosun	Basement Impact Assessment. Geotechnical Interpretative Report Ground Movement Assessment.	**BEng(Hons) ACGI MSc DIC CEng MICE FGS** **RoGEP (Grade - Adviser)**
Luis Simoes	Ground Movement Assessment.	**Post Graduate Degree in Geotechnics, BEng, Chartered Engineer (Portuguese equivalent).**

2. RELEVANT DRAWINGS AND ACCOMPANYING REPORTS

The relevant drawings and reports used in the preparation of this report are listed in Table 2 and Table 3

Table 2 – Relevant Drawings

Drawing/Sketch No.	Revision	Date	Drawing/Sketch Title	Issuing Company
1803-XX-SK-03	0.0	07/01/23	-SOIL PROFILE SECTION -COLUMNS AND WALLS FOUNDATIONS ESTIMATED LOADS	Simple Works
1803-SW-XX-00-DR-S-0001	P01	17/03/23	LOWER GROUND FLOOR PLAN	Simple Works
1803-SW-XX-02-DR-S-0001	P01	17/03/23	FIRST FLOOR PLAN	Simple Works
1803-SW-XX-03-DR-S-0001	P01	17/03/23	SECOND FLOOR PLAN	Simple Works
1803-SW-XX-04-DR-S-0001	P01	17/03/23	THIRD FLOOR PLAN	Simple Works
1803-SW-XX-05-DR-S-0001	P01	17/03/23	FOURTH FLOOR PLAN	Simple Works
1803-SW-XX-XX-DR-S-0201	P01	03/04/23	SECTIONS SHEET 1	Simple Works
1803-SW-XX-XX-DR-S-0202	P01	03/04/23	SECTIONS SHEET 2	Simple Works
1803-SW-XX-06-DR-S-0001	P01	21/03/23	ROOF PLAN	Simple Works
1803-XX-SK-05	0.0	03/04/23	BOUNDARY RETAINIG WALL SECTIONS	Simple Works
1803-XX-SK-04a	0.0	07/03/23	NR TUNNEL ZONE OF INFLUENCE – FOUNDATION OPTION A	Simple Works
1803-XX-SK-04b	0.0	07/03/23	NR TUNNEL ZONE OF INFLUENCE – FOUNDATION OPTION B	Simple Works

Drawing/Sketch No.	Revision	Date	Drawing/Sketch Title	Issuing Company
1803-XX-SK-04c	0	07/03/23	NR TUNNEL ZONE OF INFLUENCE – FOUNDATION OPTION C	Simple Works

Table 3 – Relevant Reports

Report No.	Last Revision	Date	Title	Issuing Company
2023-002-SIM-AL/Rep.002	1	20/04/23	Geotechnical Interpretative Report	Geofirma Ltd
2023-002-SIM-AL/Rep.003	0	27/04/23	Basement Impact Assessment	Geofirma Ltd

3. SITE LOCATION & LAYOUT

3.1 SITE LOCATION AND DESCRIPTION

The site summary is in Table 4 below:

Table 4: Site Summary

Location	The site is located within the Fitzjohns and Netherhall Conservation Area in north Camden and encloses an area of Hampstead to the northeast of Finchley Road.
Full Address	31 Daleham Gardens, NW3 5BU
Grid Reference	National Grid Reference 526673 185076
Area & Shape	The site is rectangular in shape and covers an area of some 0.07 ha.
Development Proposals	Development of a 5-storey residential building with a part basement comprising 14 units

3.2 SITE HISTORY

The property was likely built in the 1800's as a single large residential property which was divided into flats later in the 20th century. The main building suffered extensive damage in a fire in 2017, leaving it structurally unsound and hence the building was demolished. The demolition of the building and the clearing up of the site was completed at the end of 2021. At the time of the ground investigation the site was vacant land with no visible buildings present.

4. GROUND CONDITIONS

4.1 DESK STUDY SUMMARY

The site is also very close to the alignment of the Belsize Railway Line, which passes under 31a Daleham Gardens according to available information. The tunnel was built between 1865 and 1867 as part of the Midland Main Line.

The published geology based on the British Geological Survey (BGS) map 1:50,000 geological map series, solid and drift Ref. 1, indicates the site is underlain directly by the Claygate Member.

Table 5: Ground Conditions Inferred from Ground Investigation (BGS 2023)

Geological Unit	Description	Composition	BGS Lexicon Description
Superficial	None	-	-
Bedrock	Claygate Member	Clay, silt and sand	Comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts, and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.
	London Clay Formation	Clay, silt and sand	Comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.

4.2 GROUND INVESTIGATION

The site-specific ground investigation is discussed in report ref 2023-002-SIM-DAL/Rep.002 produced by Geofirma Ltd describes the ground conditions in further details. A ground investigation was carried out between 31st January 2023 and 3rd February 2023 by Geofirma Ltd and comprised the following:

1. The drilling of 2No Cable Percussion boreholes, BH1A and BH2, to depths of 25.45 m and 15.5 m bgl respectively. Borehole BH1 hit an obstruction in the Made Ground at 0.55 m bgl and hence was terminated. Standard Penetration Tests (SPTs) were performed in the borehole together with sampling at varying intervals.
2. The excavation of 2No. trial pits, TP1 and TP3, to expose building foundation for the previously demolished building. Both trial pits were taken to a depth of 3.5 m bgl.
3. Performance of 6 CBR tests to provide data for road pavement design.

Table 6: Proven Ground Conditions

Strata	Depth to Top (m bgl)	Thickness (m)
Made Ground	0.00	0.9 (BH2) to 3.6 BH1A)
Claygate Member	0.9 to 3.6	2.5
London Clay Formation	5.5 (BH1A) to 6.5 (BH2)	Not proven

The ground condition beneath the site comprises Made Ground, which typically comprises a mixture of clayey gravelly SAND and gravelly sandy CLAY with the gravels being fragments of fine to coarse flint, brick, tile, and concrete. Underlying the Made Ground is the Claygate Member, which typically comprises firm greyish orange mottled brown gravelly sandy CLAY, however, in BH2 at 2.0 m bgl a medium dense brown orange mottled clayey SAND band is present. Beneath the Claygate Formation is the London Clay generally comprising firm to stiff slightly sandy fissured silty CLAY with micaceous inclusions on the fissured surfaces. The thicknesses and depths of the strata are summarised in Table 6.

4.3 GEOTECHNICAL PARAMETERS

The approach to determining the geotechnical parameters adopted in the GMA analysis are explained in detail in the interpretative report for the project (Geofirma Report ref 2023-002-SIM-DAL/Rep.002).

Tabulated below in Table 7 is the summary of the parameters adopted solely for the GMA assessment. Two sets of stiffness parameters were provided for the analysis to represent the difference strain levels associated with lateral and foundation movements. The more conservative parameters associated with foundation movements were adopted in the analysis.

Table 7: Summary of Geotechnical Parameters

Stratum	Typical thickness Range (m)	Bulk Density (kN/m³)	C_u (kN/m²)	Φ'_{cv} (°)	m_v (m²/MN)	$E_{u\ (ULS)\ wall}$ (MN/m²)	$E_{u\ (SLS)\ wall}$ (MN/m²)	$E_{u\ settlemsnt}$ (MN/m²)	$E'_{(ULS)wall}$ (MN/m²)	$E'_{(SLS)\ wall}$ (MN/m²)	$E'_{settlemsnt}$ (MN/m²)
Made Ground	0.9 to 3.6	18	-	28	-	10	10	-	7.5	7.5	-
Claygate Member	2.5	18	50	24	0.2	25	50	15	18.75	37.5	12.5
London Clay Formation	Not Proven	19	80 + 5z	23	0.1	40 +2.5z	80 + 5z	24 + 5z	30 + 1.875z	60 + 3.75z	18 + 1.125z

(1) z is measured below the surface of the London Clay

5. GROUND MOVEMENT ASSESSMENT

5.1 INTRODUCTION

Ground movements at the site can occur because of the following construction process:

- Installation of the retaining wall
- Undertaking the basement dig
- Final loadings from the new building

5.2 HEAVE DUE TO EXCAVATION

The max dig to form the basement to the west of the site will involve the excavation of up to 5 m of soil, which corresponds to the removal of approximately 90 kPa over the footprint of the rear basement area. Using PLAXIS 2D, it has been assessed that the total heave in the centre of the excavation could be up to 25 mm. Note this heave has been calculated for the maximum dig of 5 m, and we must bear in mind that to the east of the site, close to the pedestrian way, the excavation is unlikely to exceed 1.5 m. The average heave is therefore likely to be closer to 10 mm.

Of the total settlement 20% to 25% is likely to be short term and the rest long term. This value is likely to have a negligible effect on the adjacent structures outside the excavation footprint, especially with the building loads applied to the excavated surface. It has been assessed that the maximum settlement of the building is unlikely to exceed 15 mm, which will compensate for the heave in the long term.

5.3 LATERAL AND HORIZONTAL MOVEMENTS DUE TO THE BASEMENT UNDERPINNING AND EXCAVATION PROCESS

The construction process which is most likely to have an influence on the adjoining structures.

To better assess the effect of underpinning and excavation, the following assumptions have been made in the PLAXIS analysis:

1. Installation of retaining wall – It is assumed that when the retaining wall is installed the lateral wall movements caused by the process can be estimated from Table 6.1 of CIRIA760. Our excavation depth varies, hence the lateral movements if predicted using this approach will vary between 0 and 5 mm (0.04% of the wall height). This movements occurs before the excavation phase.
2. The excavation phase – It is assumed during the excavation phase that the ground will respond in an undrained manner. This stage has been analysed using PLAXIS 2D. It has been assumed the excavation is formed primarily without propping. The wall on the side next to 31a Daleham Gardens is assumed to be analysed without propping,

whilst the wall next to the boundary with 33a Daleham Gardens has been analysed with and without propping. The categories of damage have been considered for both scenarios.

3. Installation of the slab and building – During this stage, a load as stated in drawing 1803-XX-SK-01 are applied to the base of the excavation to model the placement of the slab. Again, the soil is assumed to behave in an undrained mode.
4. Relaxation due to switch from undrained to drained – The stresses are assumed to relax, and the soil behaviour switches from undrained to drained. This replicates the long-term behaviour of the basement.

It has been assumed for the retaining wall adjacent to 33a Daleham Gardens could be permanently propped to keep the damage level comfortable within category 0, however, permanent propping is not shown in the current drawings.

For the purpose of analysis two sections (see Figure 1) have been considered for the following reasons:

Section A-A is close to the middle of the site where the retaining wall (and the dig) is closest to the actual properties, 31a Daleham Gardens and 33a Daleham Gardens. This allows the assessment of the damage category for both buildings to be assessed. Based on the available drawing Sketch No 1803-XX-SK-05, the maximum dig in this area is unlikely to exceed 2.5 m in front of the sheet pile wall.

Section B-B is to the rear of the site where the retaining height is at the maximum and the impact on the boundary walls most critical (particularly the boundary wall with 33a Daleham Gardens) rather than the impact on the buildings. The boundary wall cannot be assessed using the Burland scale because the wall is a narrow longitudinal structure, however, an estimation of the deflections have been provided for enable discussions with the party wall surveyors.

The sheet pile wall used in this analysis was an Arcelor AU14. Note this may not be the actual wall used for the project, hence the movements provided in this report are indicative, rather than exact. It has also been assumed in the movement assessment that 31a Daleham Gardens is 2 m from the sheet pile retaining wall and 33a Daleham Gardens is 5.5 m from the retaining wall (see Figure 2).

Figure 1: Selected A-A and B-B with plan showing 31a and 33a Daleham Gardens

Figure 2: Section through main houses - Section A-A.

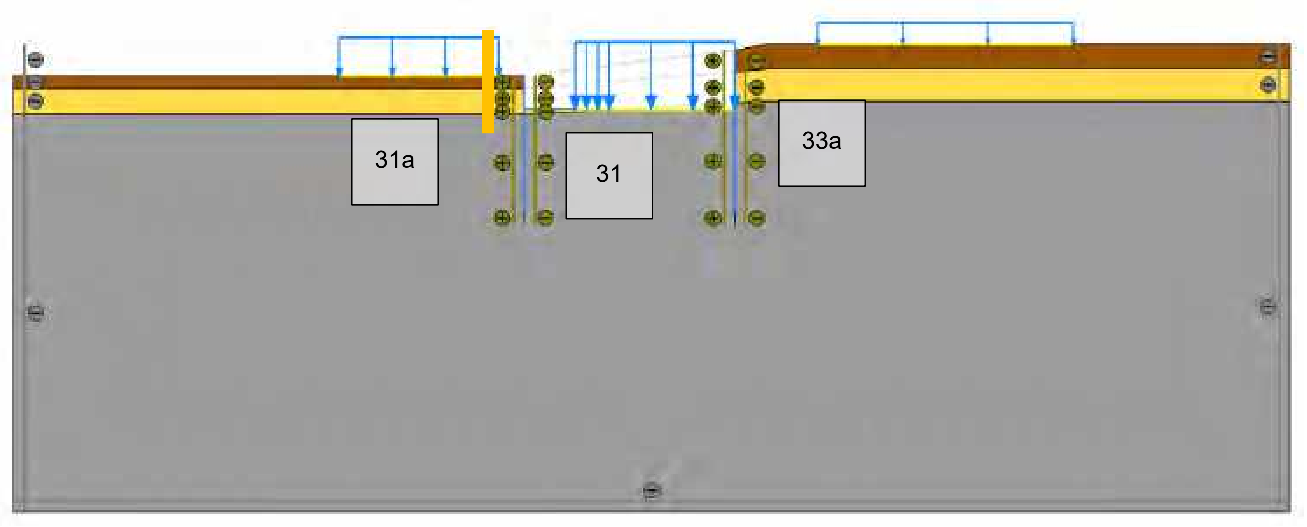
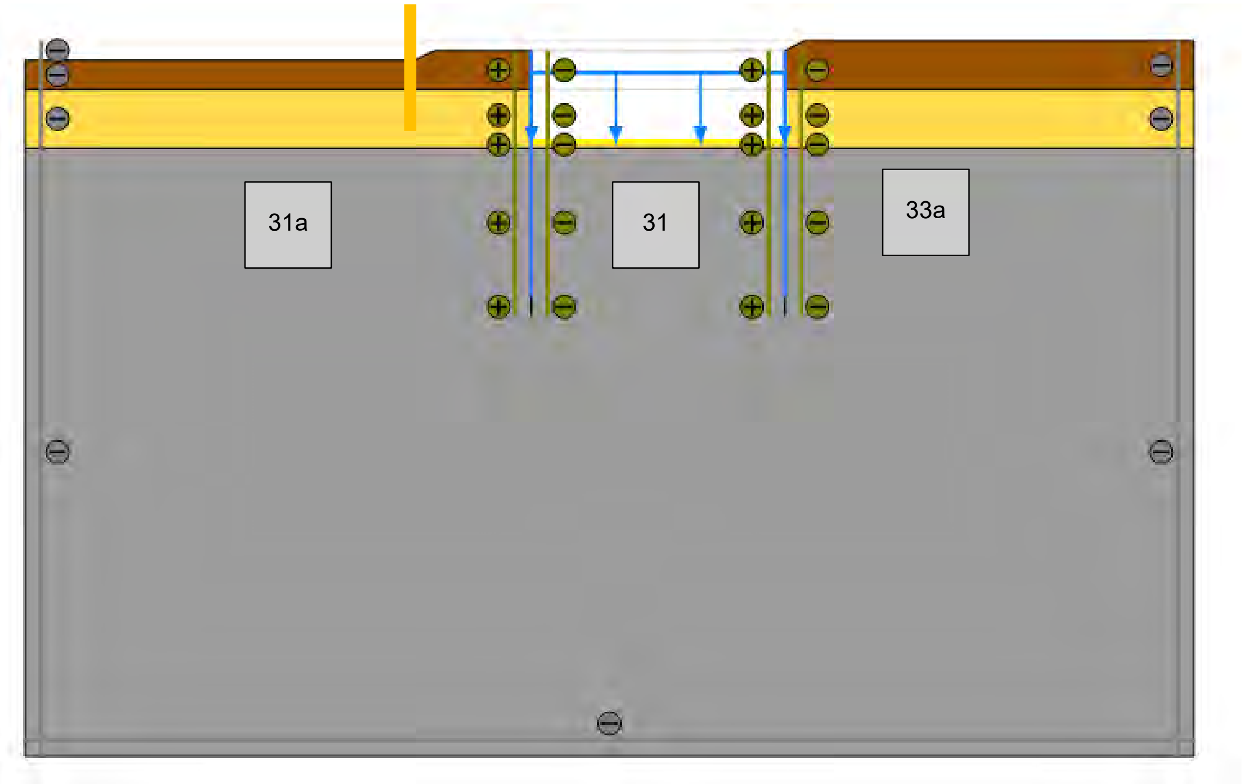


Figure 3: Section through building gardens – Section B-B.

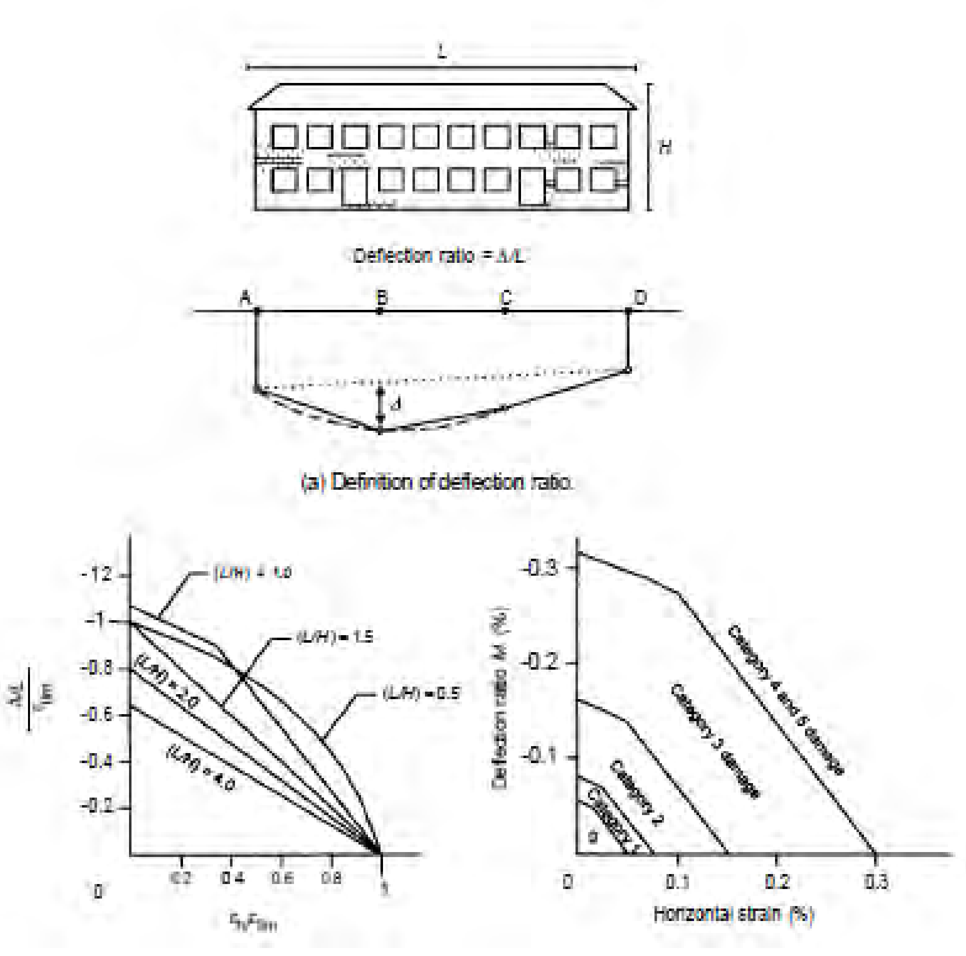


5.4 SUMMARY OF MOVEMENTS IN ADJACENT PROPERTIES

5.4.1 Assessment Approach

From the predicted relative horizontal and vertical ground movements in the vicinity of the foundations of neighbouring structures, it is possible to categorise the typical damage that might be experienced by these structures. This has been based on the visible damage criteria of Burland et. al. (1977) as modified by Boscardin and Cording (1989) and Burland (2001), and is the criteria incorporated into the CIRIA C760 Building Damage Category classification.

Figure 1 - Relationship between damage category, deflection ratio and horizontal tensile strain (after Burland, 2001)



The damage assessment is based on the magnitude of tensile strain that the masonry wall will develop due to the horizontal and vertical ground movements. Burland et. al. (1977) provided the following damage classification based on tensile strain approach:

Table 8 - Classification of visible damage to walls CIRIA C760

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

The damage category using Table 8 has been derived using the approach presented in Figure 5 (after CIRIA 760).

Figure 5: Procedure for Damage Category assessment

The following steps should be undertaken in making a stage 2 assessment of the damage to a structure:

(i) establish *L* and *H* for the structure (see Figure 2.18(a) for definitions of *L* and *H*)

(ii) determine (*L/H*)

(iii) determine relationship between (Δ/L) and ε_h for the required *(L/H)* from Figure 2.18(b) for ε_{lim} values from Table 2.5

(iv) estimate vertical and horizontal ground surface movements in the vicinity of the structure from Figure 2.14

(v) determine (Δ/L) and ε_h (= δh/L) where δ_h is the horizontal movement

(vi) estimate damage category from the relationship between *(AIL)* and ε_h established from step (iii) above.

5.4.2 No 31a Daleham Gardens

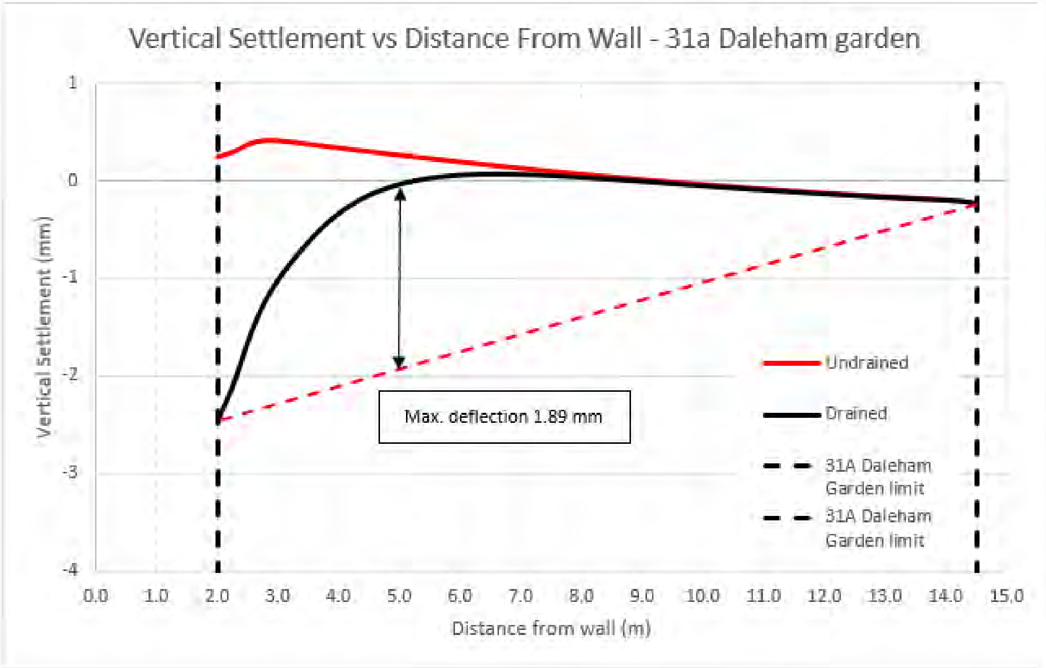
31a Daleham Gardens is on the other side of a boundary wall from 31 Daleham Gardens. The closest footing is assumed to be 2 m away from the excavation and the furthest footing is assumed 14.5 m away from the excavation and a length to height (L/H) ratio of property is assumed to be 0.5.

The lateral and vertical deflections of the foundations have been calculated using a model developed in PLAXIS 2D. The respective maximum horizontal and vertical displacements of the foundations closest the excavation is predicted to be approximately 3.5 mm and 2.5 mm respectively (see Figure 6).

To determine the worst-case damage category for the building, the deflection ratio which is a key parameter which has then been determined by initially calculating δV using guidance given by Burland et al (2001). Based on our analysis, the horizontal strain and the deflection ratio have been estimated to be 0.024% and 0.026% respectively. Using the above guidance, the damage category has been determined for the worst-case scenario, section A-A, by plotting the horizontal strain and the deflection ratio on the graph developed for the L/H of 0.5 relating the damage category, deflection ratio and horizontal tensile strain (See Figure 9).

The above ground movement assessment indicates a predicted Damage Category of 0.

Figure 6: Vertical Settlement related to distance from the wall for No 31a Section A



5.4.3 No 31a Daleham Gardens – Boundary wall

Using PLAXIS 2D it has been calculated that the lateral deflection of the wall is approximately 4 mm for section closest to 31a Daleham Gardens. From Table 6.1 of CIRIA760, it is estimating another 4 mm of lateral movement could occur hence the lateral deflection of the wall could be in the region of 8 to 10 mm. It this lateral deflection is deemed excessive, propping of the wall should be undertaken.

5.4.4 No 33a Daleham Gardens

33a Daleham Gardens is on the other side of a boundary wall from 31 Daleham Gardens. The closest footing is assumed to be 5.5 m away from the excavation and the furthest footing is assumed 26.5 m away from the excavation and a length to height (L/H) ratio of property is assumed to be 0.5.

The lateral and vertical deflections predicted using have been modelled using PLAXIS 2D. assuming the excavation is constructed without propping as should be the case on site. The maximum horizontal and vertical displacements shall be approximately 4 mm and 3 mm respectively closest to the excavation (see Figure 7 and 8). For the propped case the maximum horizontal and vertical displacements shall be approximately 1.5 mm and 1 mm respectively closest to the excavation (see Figure 7 and 8).

To determine the worst case damage category for the building, the deflection ratio which is a key parameter which has then been determined by initially calculating δV using guidance given by Burland et al (2001). Based on our analysis, the horizontal strain and the deflection ratio for the unpropped case has been estimated to be 0.025% and 0.019% respectively. For the case where the wall is propped the horizontal strain and the deflection ratio are estimated to be 0.016% and 0.014% respectively. Using the above guidance, the damage category has been determined for the worst-case scenario, section B-B to the rear of the property, by plotting the horizontal strain and the deflection ratio on the graph developed for the L/H of 0.5 relating the damage category, deflection ratio and horizontal tensile strain (See Figure 9). The representation for the propped case is shown in Figure 10.

The above ground movement assessment indicates a predicted Damage Category of 0 for the propped case and Damage Category 0 for unpropped case.

5.4.5 Sheet Pile Wall Deflections and other Boundary Walls

Using PLAXIS 2D it has been calculated that the lateral deflection of the wall to the rear of the site behind 31a and 33a Daleham Gardens. The PLAXIS 2D analysis indicates the maximum wall deflection at the top of the sheet pile wall will be 11 mm. The maximum excavation depth is assessed to be 4.65 m in the long term with the slab installed, hence using the rule of thumb of estimating the deflection at the top of a cantilever retaining wall to be 0.4%, a lateral deflection of 19 mm is predicted. Based on both values, and those computed in Table 9, the maximum lateral deflection of the top of the retaining wall is not anticipated to exceed 15 mm.

Based on the PLAXIS 2D analysis discussed in section 5.3, the boundary walls behind the sheet pile wall are anticipated to move up to 4 mm (see Table 9). Taking into account the possible installation movements of up to 5 mm, the total horizontal movements of the boundary walls surrounding the site (to the rear and sides) could range between 6 to 9 mm.

Figure 7: Vertical Settlement related to distance from the wall for No 33a Section A-A Unpropped

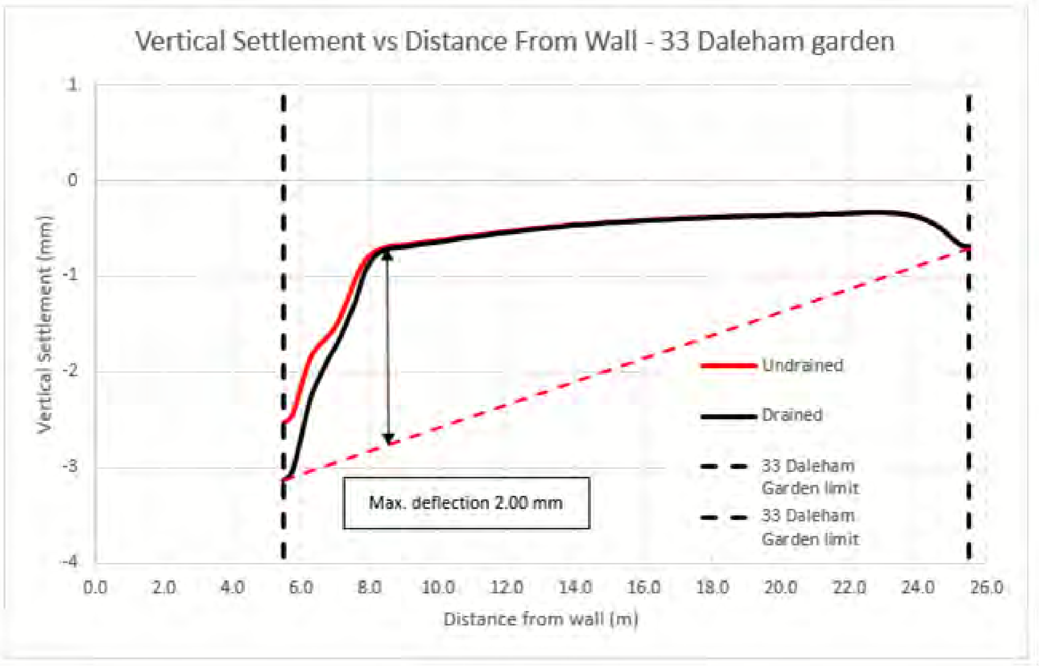


Figure 8: Settlement related to distance from the wall for No 33a Section A-A Propped

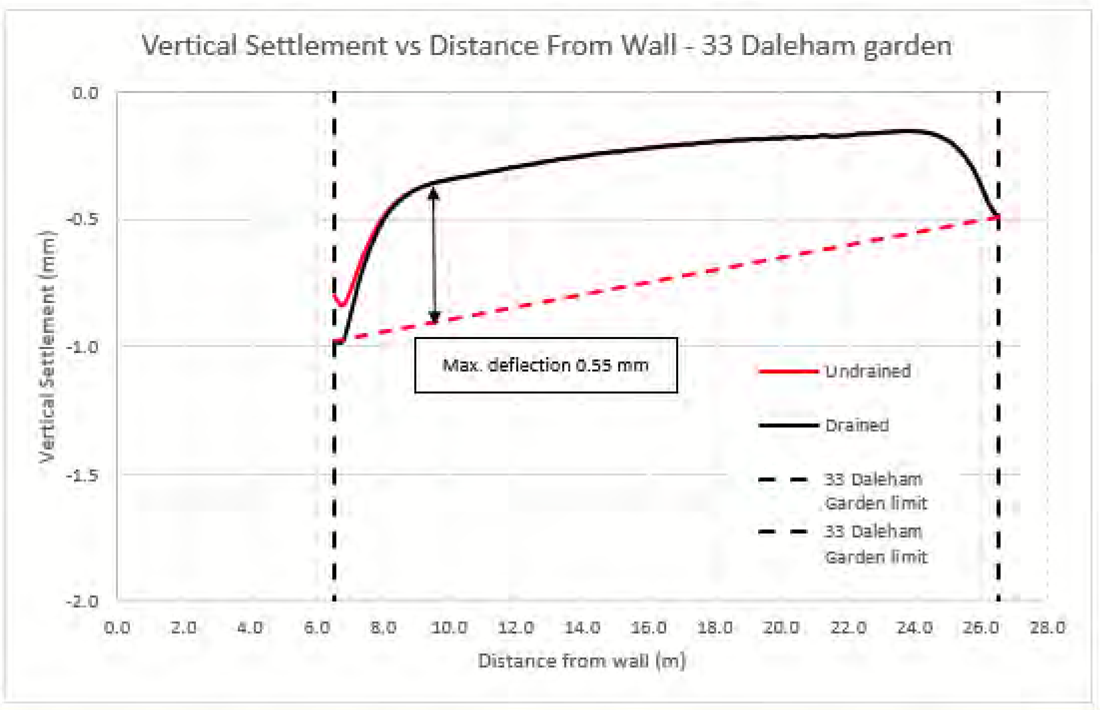


Figure 9: Relationship between Damage Category, Deflection Ratio and Tensile Strain Section A – A

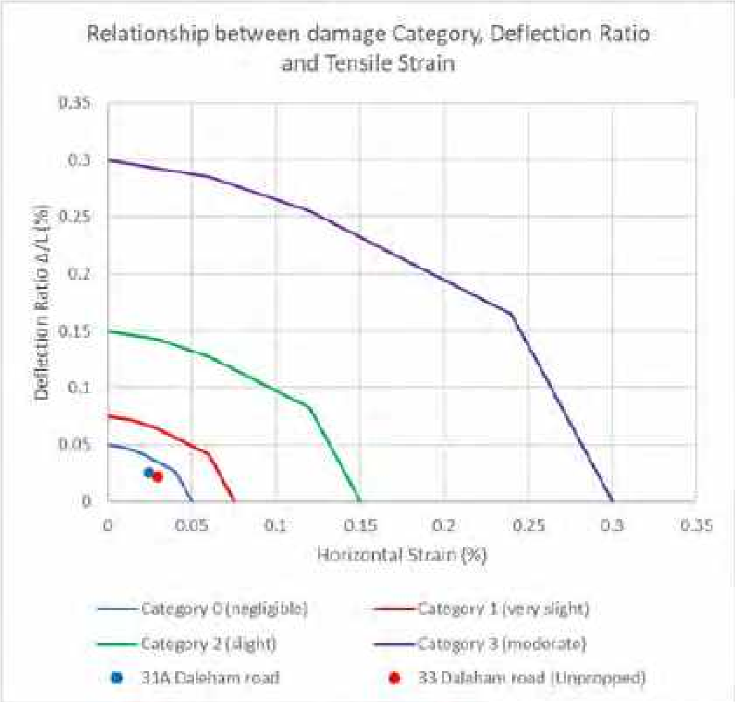


Figure 10: Relationship between Damage Category, Deflection Ratio and Tensile Strain Section A - Propped

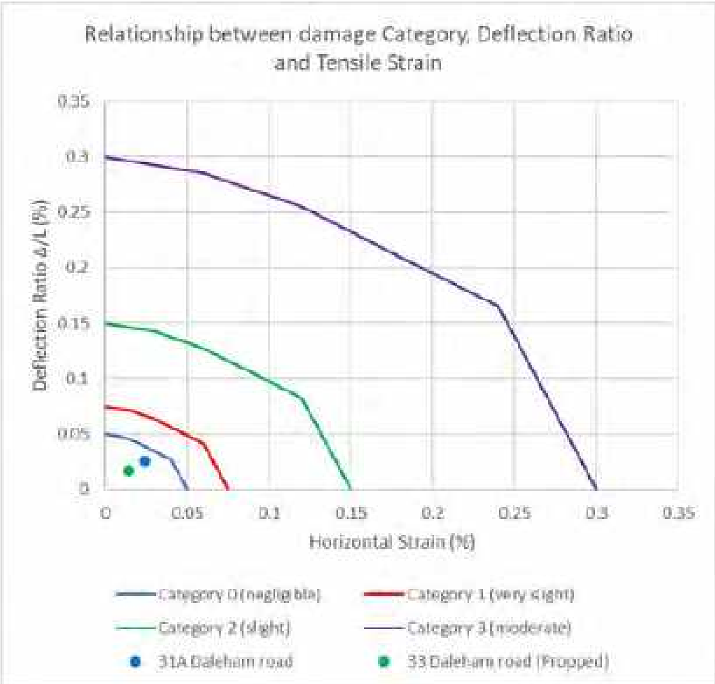


Table 9: Summary of Ground Movements of buildings, retaining wall and boundary wall

		Foundation 31a		Boundary wall		Left wall (31a side)		right wall (33a side)		Foundation 33a	
		Propped	Unpropped	Propped	Unpropped	Propped	Unpropped	Propped	Unpropped	Propped	Jnproppec
Section A-A	Horizontal	-	3.5	-	4.0	-	5.5	2.5	17.0	1.5	4.0
	Vertical	-	2.5	-	1.0	-	2.0	1.0	1.0	1.0	3.0
Section B-B	Horizontal	-	-	-	3.0	-	10.0	2.5	11.0	-	-
	Vertical	-	-	-	1.0	-	0.5	1.0	0.5	-	-

*Note boundary wall movements do not include installation effect which could be up to 5 mm in accordance with CIRIA760 guidance. All units in mm.

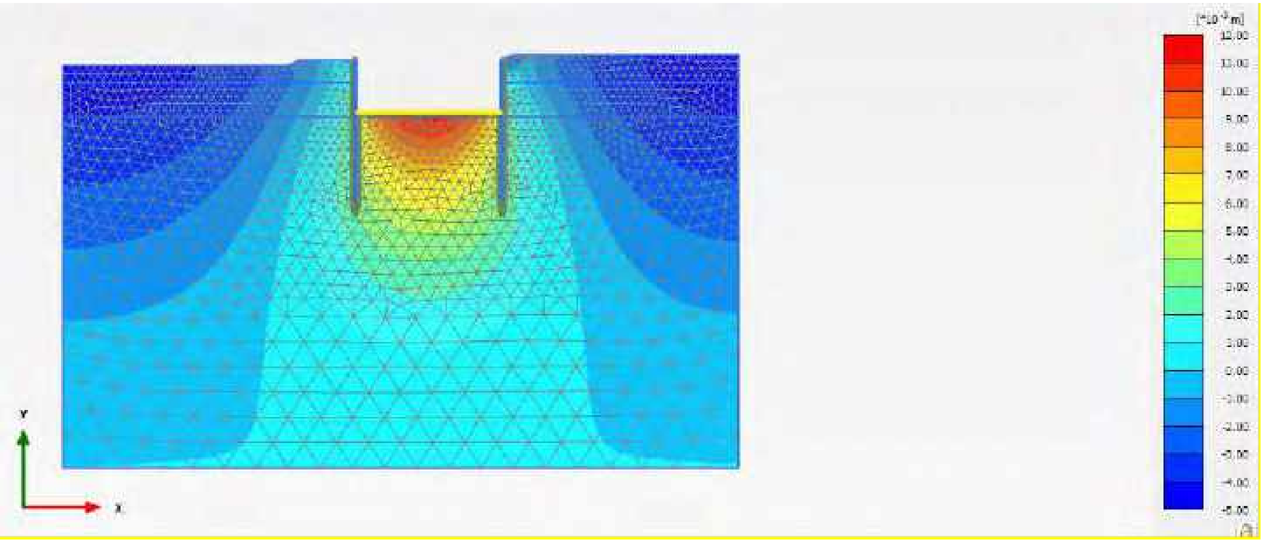
5.5 SUMMARY OF SETTLEMENTS BENEATH 31 DALEHAM GARDENDS

The ground will be subjected to stress relief due to the removal of up to 5 m to the rear of 31 Daleham Gardens site.

To compensate against the potential heave, the increase in loading applied to the site footprint has been inferred from Sketch No:1803-XX-SK-01, which assumed a load DL of 55 kN/m^2 and a LL of 25 kN/m^2 is applied to a 600 mm thick slab.

The settlement has been modelled using PLAXIS, and the resulting undrained and drained settlement contours are modelled in Figure 11. The maximum settlement is calculated to be 12 mm, which is reasonable for this type of structure. If the heave is taken into account to the rear of the site where the excavation is maximum, the net settlement becomes negligible.

Figure 11 - Settlement below 31 Daleham Basement



6. CONCLUSIONS

The excavation and construction of the basement has the potential to cause movements in the surrounding ground and the resultant ground movements depend primarily on the quality of the workmanship and the adequacy of the ground support system utilised. High quality workmanship and the use of best practice methods of temporary support are therefore crucial to the satisfactory control of ground movements adjacent to the basement excavations. The ground movements predicted in this report are all based on the assumptions that the works is undertaken to a high standard of quality by an experienced contractor and the temporary works support required for the wall are designed by a competent specialist to ensure the movements are well controlled. However, the movement, if any, will be managed through proper design of permanent and temporary works and in conjunction with the requirement of the Party Wall Act (1996).

The analysis undertaken estimates that the strain levels fall within Damage Category 0 for both 31a Daleham Gardens and 33a Daleham Gardens assuming the excavations are formed using controlled methods.

It is therefore imperative that the main contractor is properly vetted and has undertaken similar projects to this one in similar ground conditions. It should be noted the ground conditions at this site are the Claygate Member, which can be highly variable, and hence the construction methods should be adapted to suite the ground conditions encountered. Based on the groundwater monitoring results, the groundwater is deemed to be beneath the formation level of the basement, however, if water is encountered the contractor must ensure the appropriate systems of groundwater control and exclusion are engaged. The methodology for the use of these techniques should be included in the RAMS produced for this scheme.

In order to establish a baseline condition of the buildings against which the effects of the movement due to the construction works can be assessed, a condition survey should be carried out prior to the installation of the basement wall, and subsequent surveys carried out during and after the excavation of the basement.

In order to ensure that the ground movements are in line with predictions, the external walls of each building shall be monitored at critical locations by the use of appropriate instrumentation. The wall monitoring programme shall be agreed between all parties involved and should be established to follow a conventional traffic light trigger system in line with CIRIA C760 guidance.

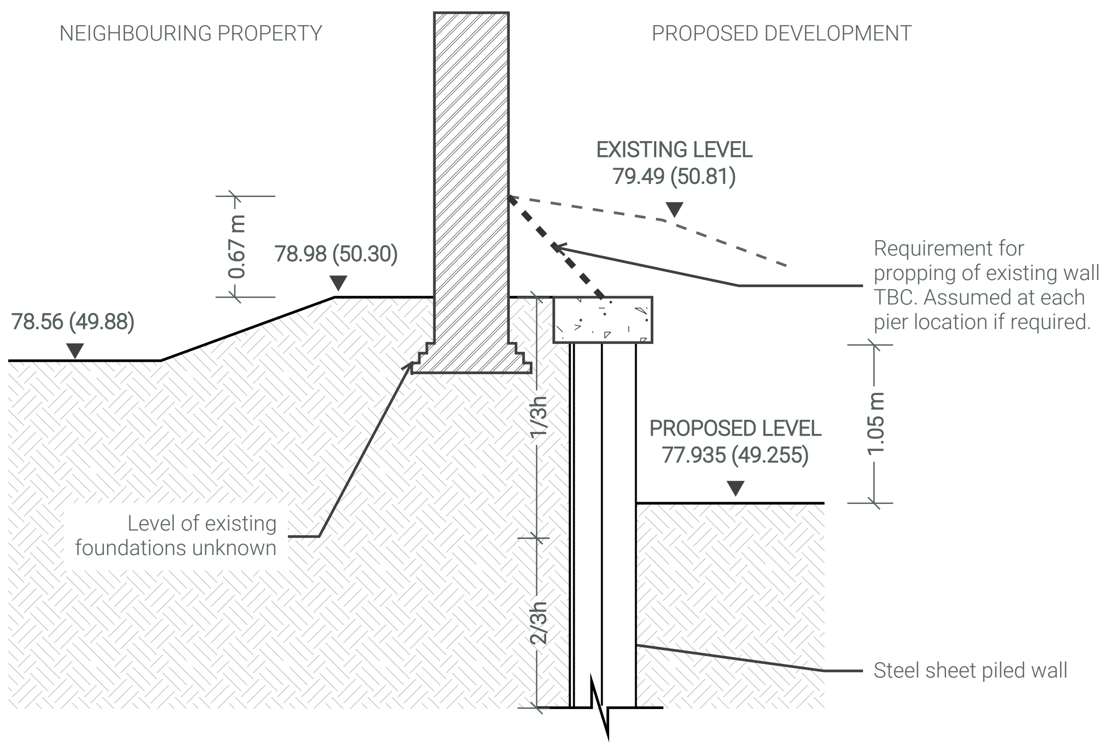
Trigger levels should be set such that mitigation measures can be implemented to restrict ground movements to levels associated with Category 1 building damage.

The settlements due to the redevelopment at the site beneath 31 Daleham Gardens have also been estimated using PLAXIS 2D with the values unlikely to exceed 15 mm.

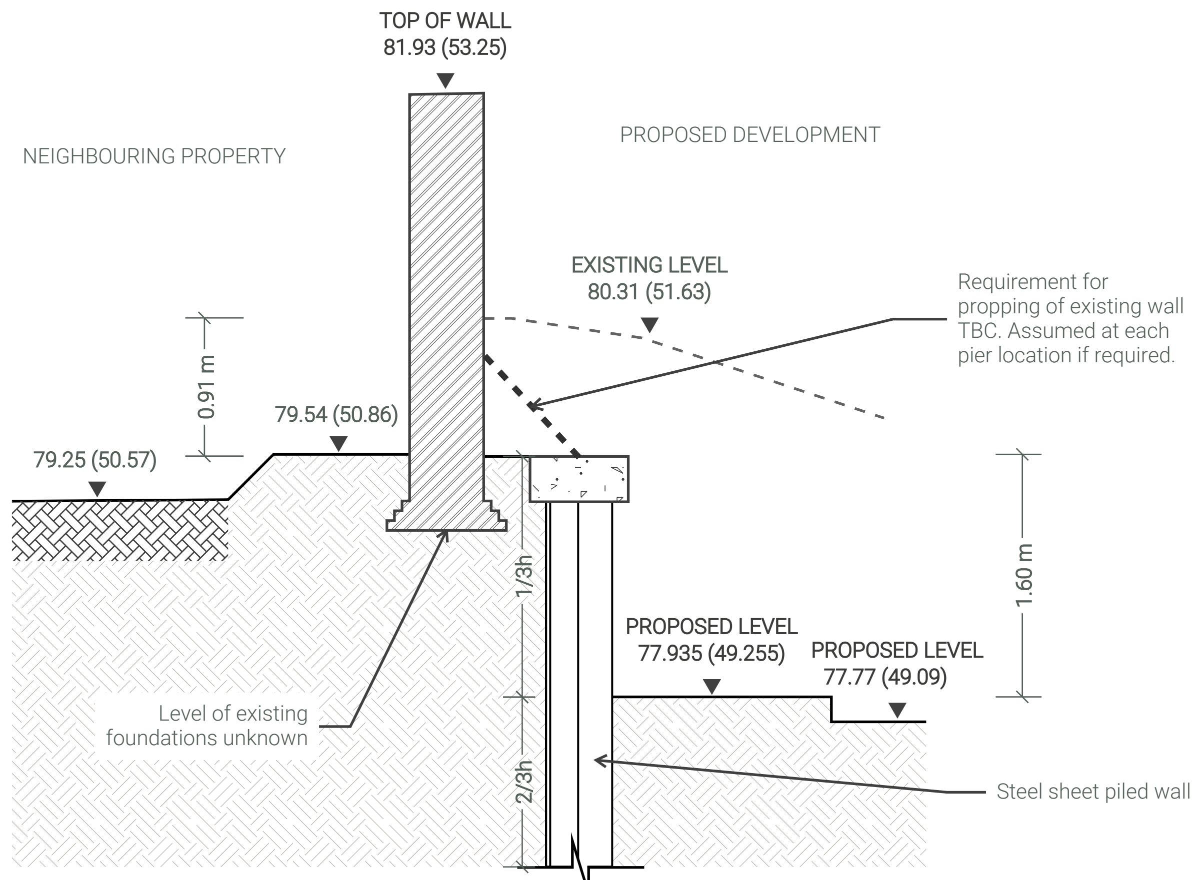
APPENDIX A – RELEVANT DRAWINGS

NOTE: Installation of sheet piled wall to be carried out without water jetting to minimise disturbance to/movement of existing foundations

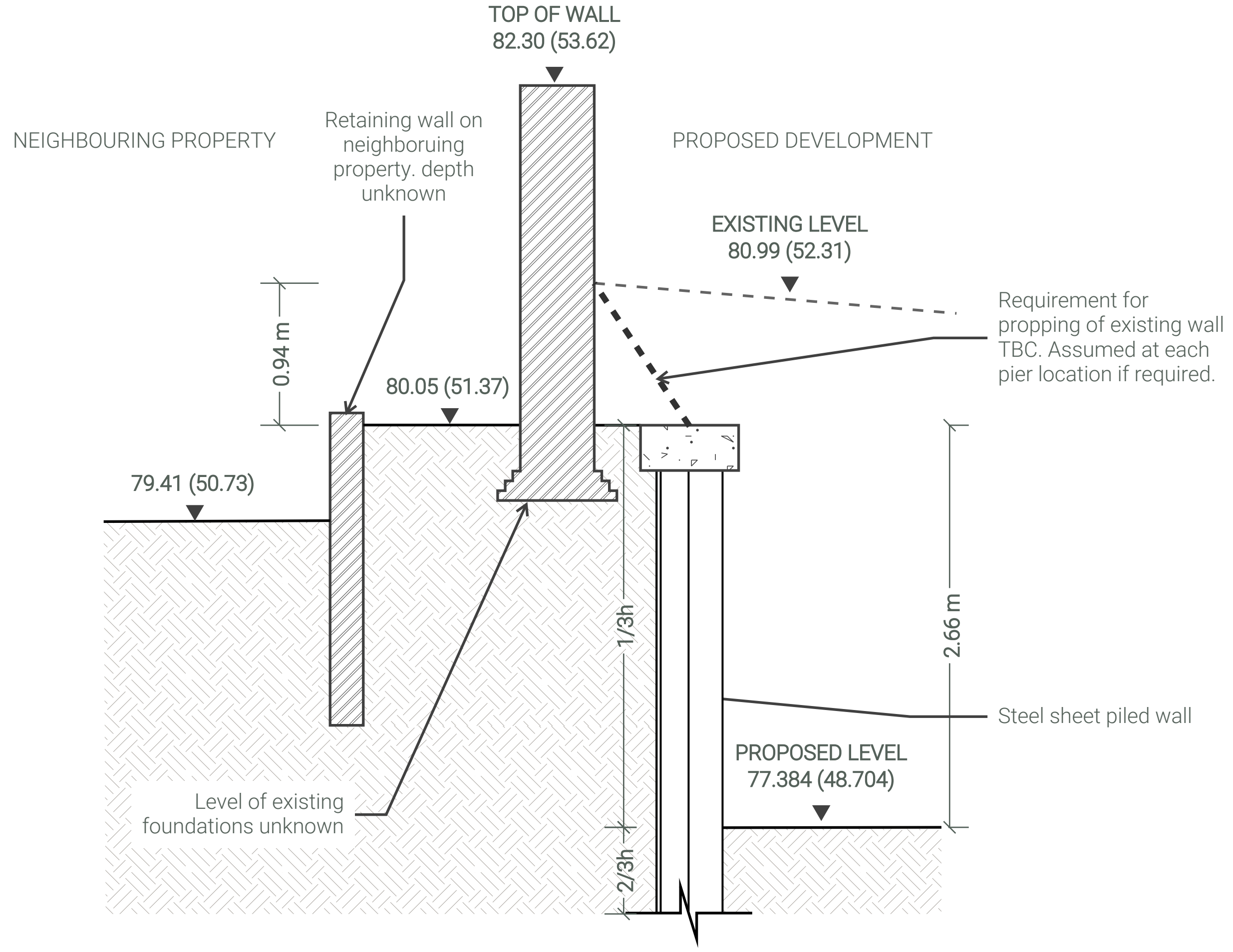
NOTE: Sheet pile installation in proximity of existing retaining wall carries a risk of damage to the existing wall. Monitoring of existing wall is recommended.



SECTION A



SECTION B



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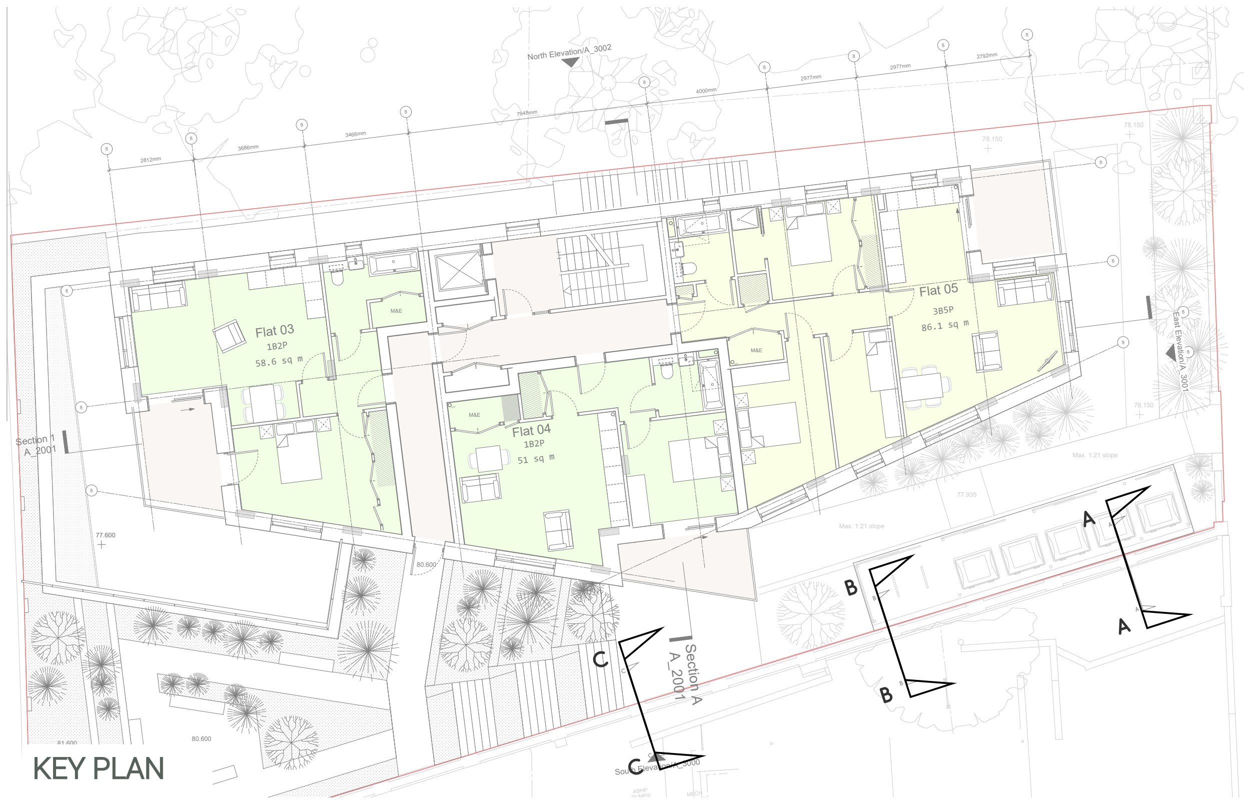


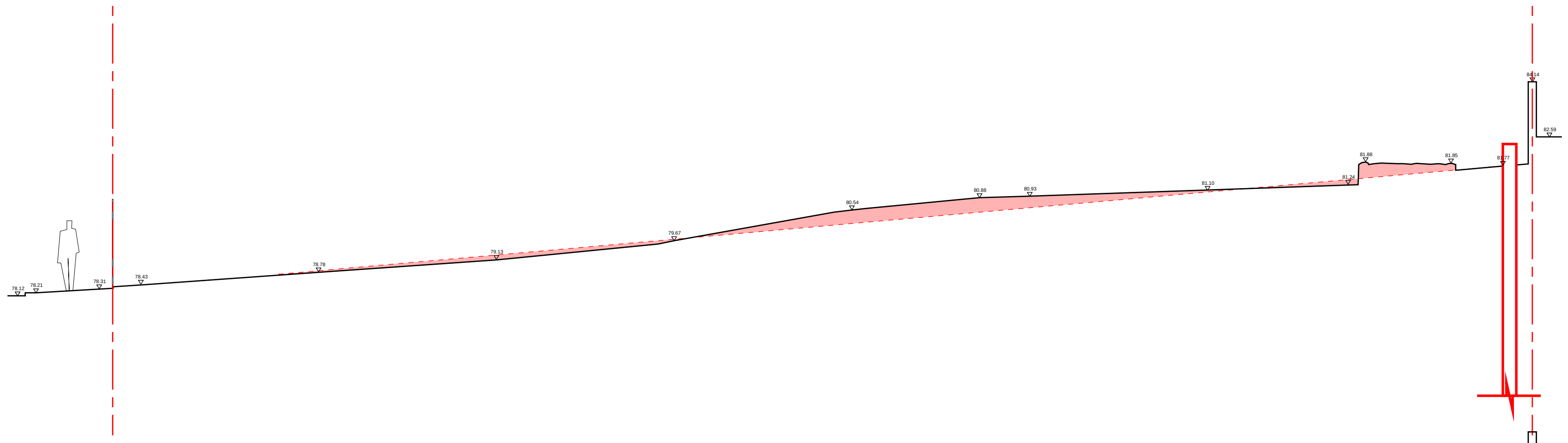
KEY PLAN

PROJECT: DALEHAM GARDENS
SKETCH No: 1803-XX-SK-05
REV: 00
DATE: 03/04/23
TITLE: BOUNDARY RETAINIG WALL SECTIONS
DRAWN BY (CHECK): CE (AC)

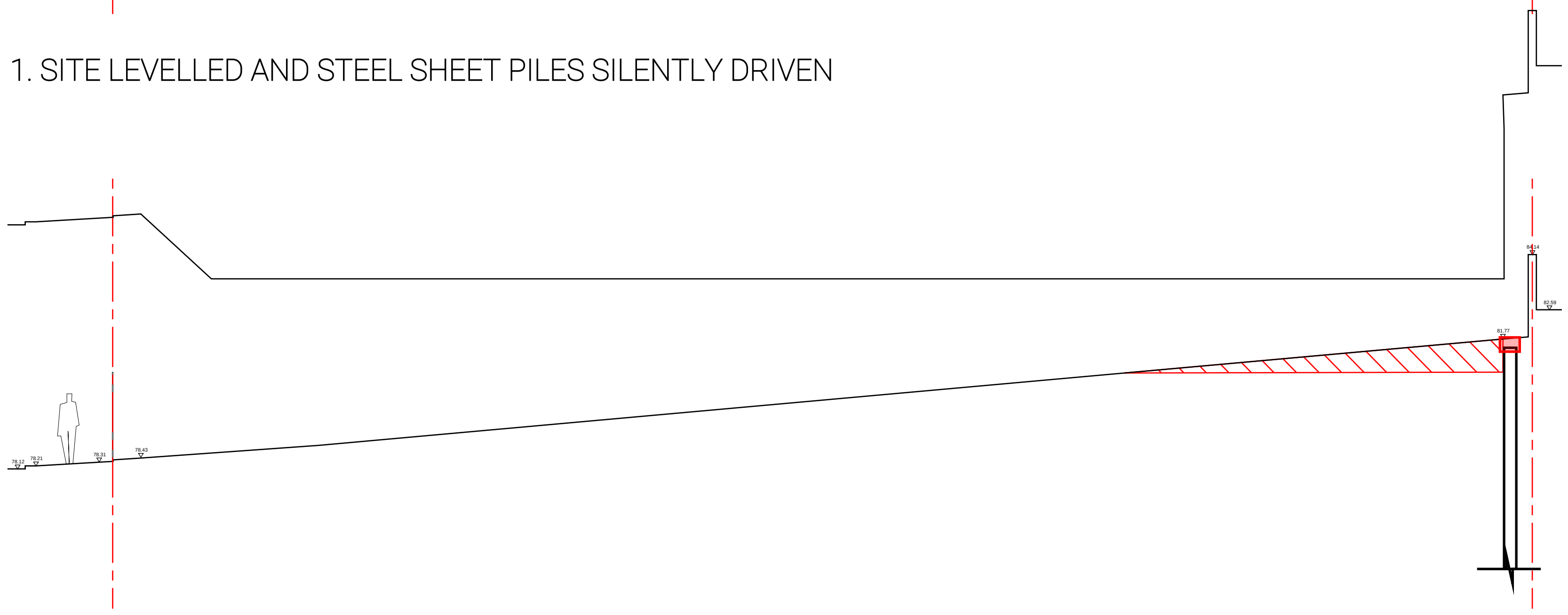
SIMPLE WORKS, UNIT 301, 203/213
MARE ST STUDIOS, LONDON, E8 3JS

Construction Sequence

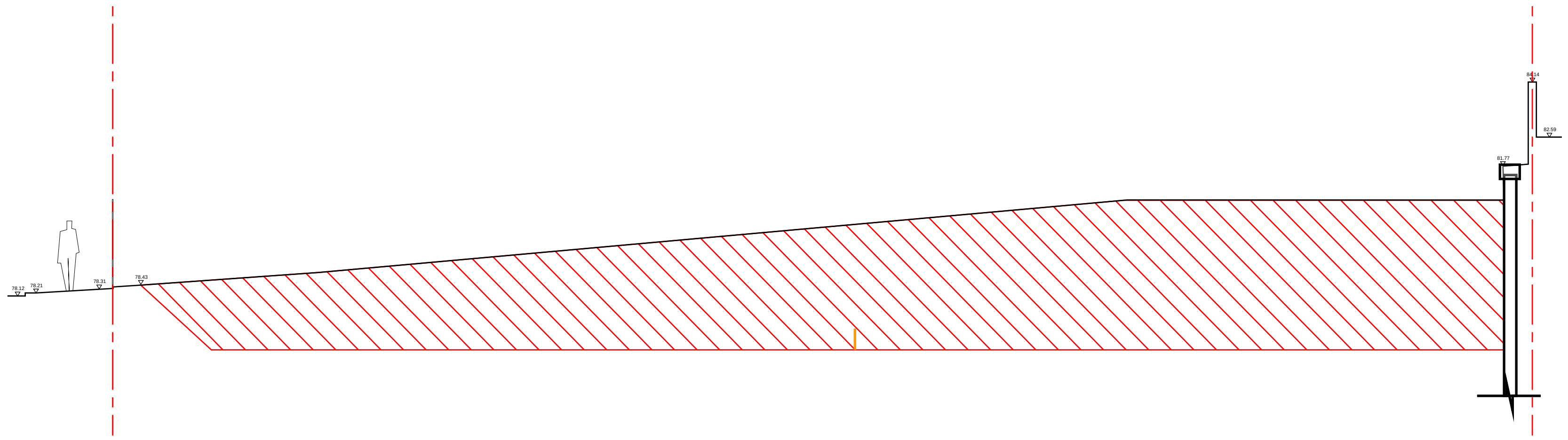
Site Section A-A



1. SITE LEVELLED AND STEEL SHEET PILES SILENTLY DRIVEN

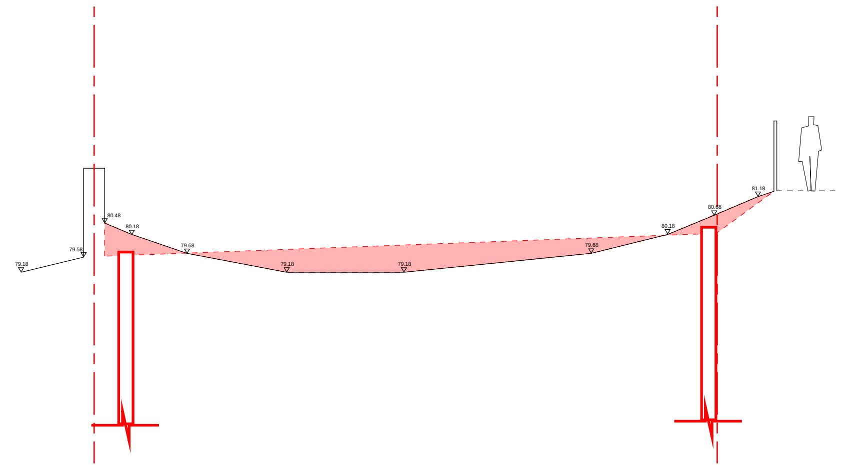


2. SITE PARTIALLY EXCAVATED, PILE CAP CAST IN SITU



3. SITE EXCAVATED

Site Section B-B



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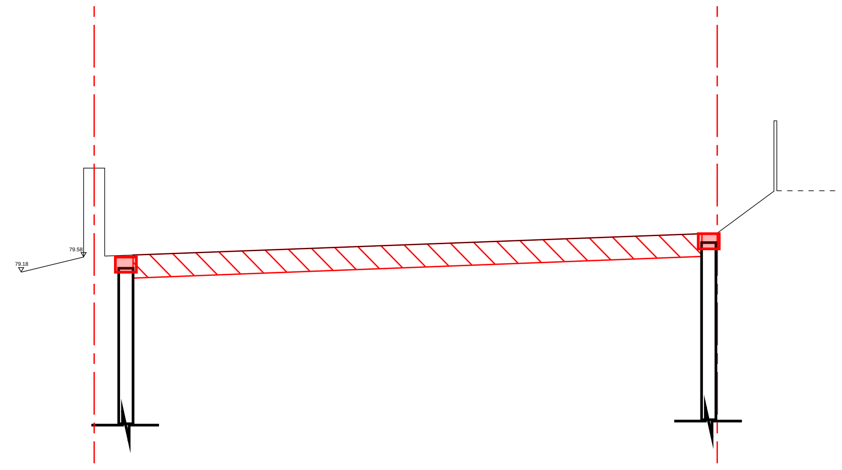
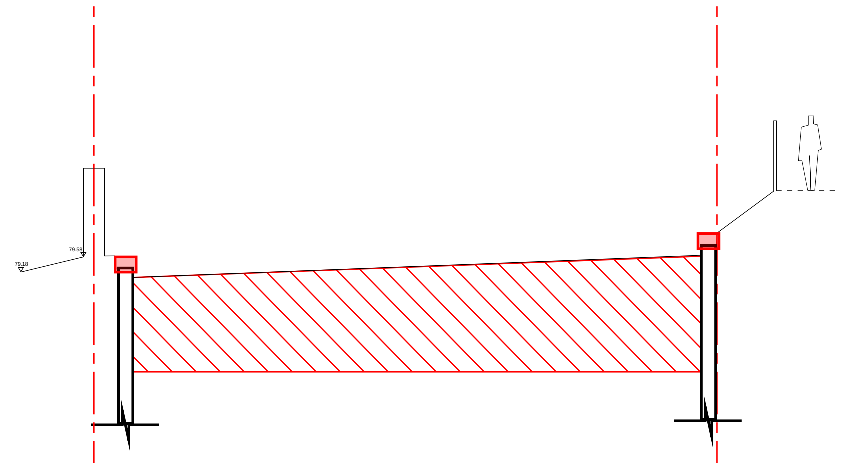


2. SITE PARTIALLY EXCAVATED, PILE CAP CAST IN SITU



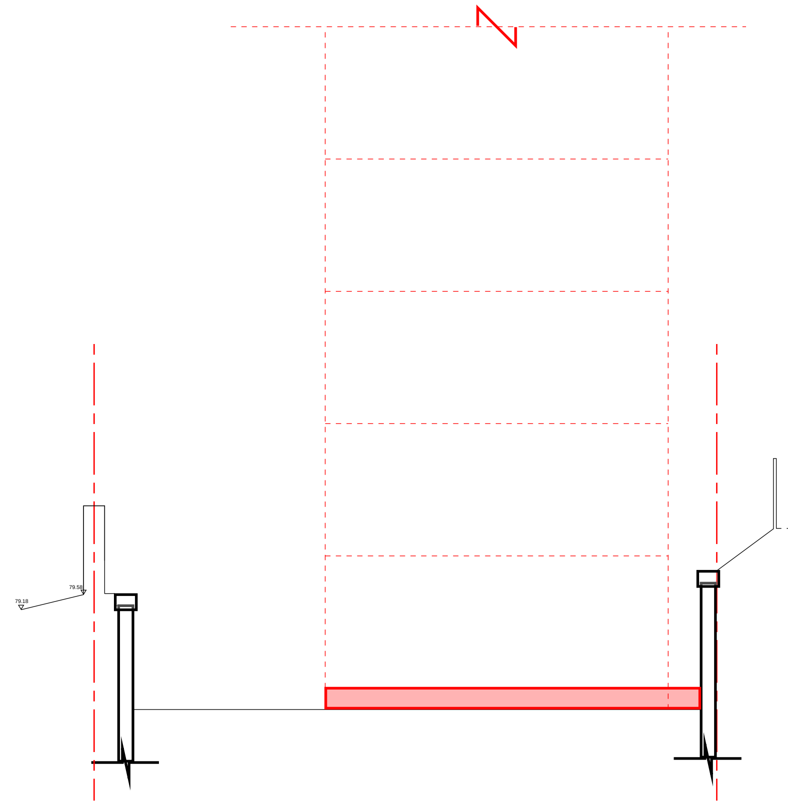
3. SITE EXCAVATED

Construction Sequence

Site Section A-A

4. RAFT SLAB CAST IN SITU AND BOTTOM-UP CONSTRUCTION OF PROPOSED BUILDING

Site Section B-B



4. RAFT SLAB CAST IN SITU AND BOTTOM-UP CONSTRUCTION OF PROPOSED BUILDING

SIMPLE WORKS, UNIT 301, 203/213
MARE ST STUDIOS, LONDON, E8 3JS

MATERIALS

THE FOLLOWING MATERIAL GRADES ARE TO BE USED IN CONSTRUCTION U.N.O.

- BLOCKWORK = 10.4 N
- BRICKWORK = 7.3 N
- ENGINEERING BRICK = CLASS B
- MORTAR = M6
- STEEL = S275
- CONCRETE = C30/37
- REINFORCEMENT STEEL = B500B
- TIMBER = C24

STRUCTURE KEY

(red line)	AREA SITE BOUNDARY LINE
(dark grey)	CONCRETE COLUMN
(light grey)	CONCRETE WALL
(small square)	STEEL COLUMN
(zigzag)	STEEL SHEET PILED WALL

CONCRETE COLUMN SCHEDULE

C-01 200x600mm
C-02 250x250mm

STEEL COLUMN SCHEDULE

SC-01 SHS 100x100x5

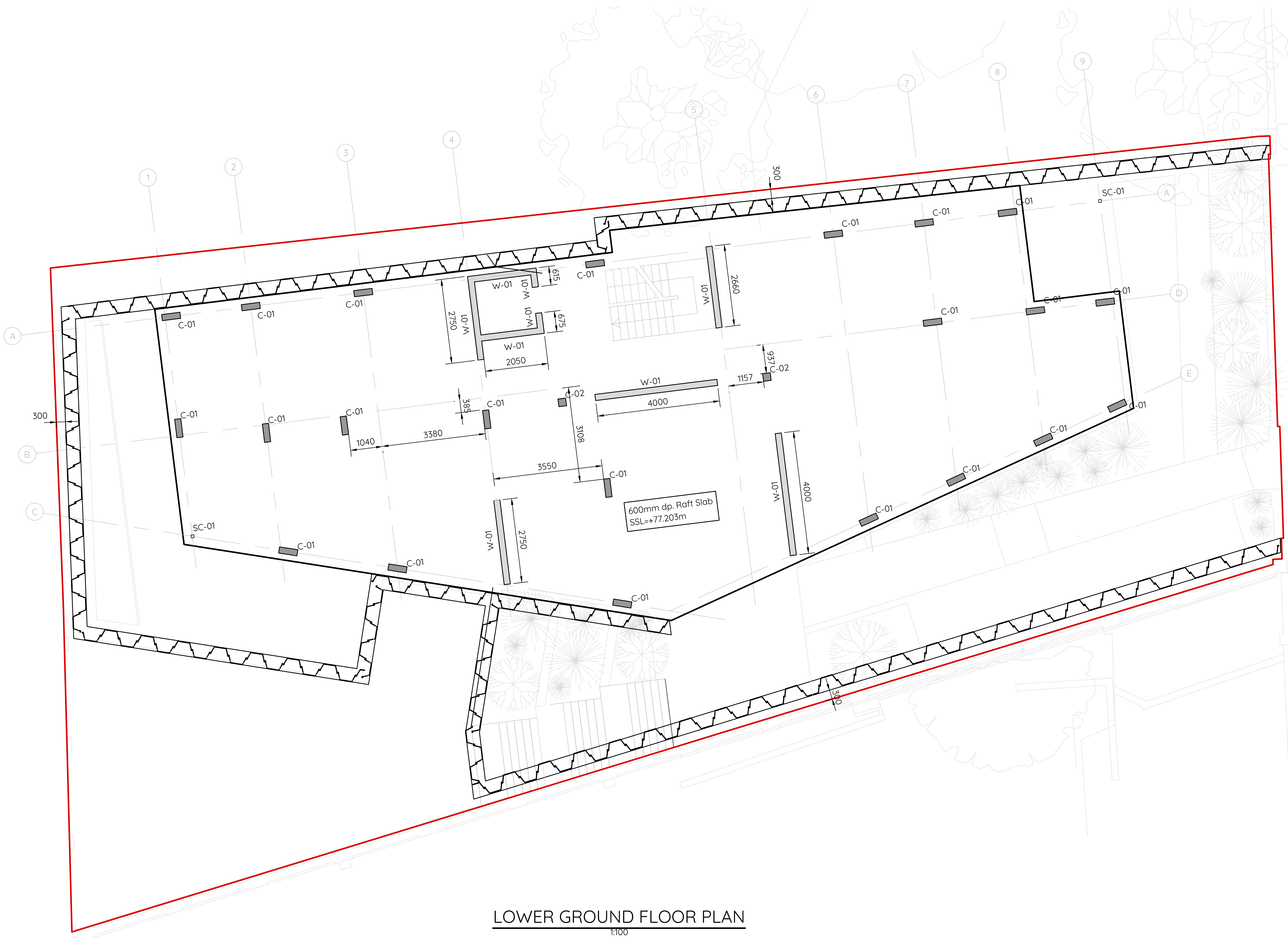
WALL SCHEDULE

W-01 200 Thk.

STEEL SHEET PILE SCHEDULE

STEEL SHEET PILE PROFILE PU32 FROM ACELOR MITTAL OR SIMILAR APPROVED

REINFORCEMENT WEIGHTS	
REFERENCE	QUANTITY
RAFT SLAB	115kg/m³
WALLS	70kg/m³
COLUMNS	260kg/m³
NOTE: REINFORCEMENT QUANTITIES INDICATIVE	



LOWER GROUND FLOOR PLAN
1:100

NOTES:
1. NO DIMS TO BE SCALED FROM THIS DRAWING
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT, SERVICES AND ENGINEERS DRAWINGS TOGETHER WITH THE RELEVANT SPECIFICATIONS AND GENERAL NOTES.
3. ANY NON-STRUCTURAL ITEMS SUCH AS WATERPROOFING, CLADDING, FINISHES, FIRE STOPPING ARE TO THE ARCHITECT'S SPECIFICATION.
4. ALL PROPRIETARY PRODUCTS ARE TO BE USED AND INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS' DETAILS AND REQUIREMENTS
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7. ALL LEVELS AND SETTING OUT TO BE PROVIDED BY ARCHITECT
8. ALL STEEL TO STEEL CONNECTIONS DESIGNED BY CONTRACTOR. ASSUME MINIMUM M20 BOLTS AND 8mm FILLET WELDS
9. ALL LINTELS TO BE DESIGNED BY CONTRACTOR
10. FIRE PROTECTION OF STRUCTURE AND OTHER ELEMENTS TO ARCHITECT'S SPECIFICATIONS
11. DETAILING OF REINFORCING STEEL BY OTHERS

NOT FOR CONSTRUCTION

simple works

Rev	Date	Desc.	By

Project name: DALEHAM GARDENS		Drawn/Checked: NC/AC	Status: PRELIMINARY
Client name: NW3 CLT		Title: LOWER GROUND FLOOR PLAN	
Project No: 2102	Scale: 1:100 @A2	Drawing No.: 1803-SW-XX-00-DR-S-0100 Rev: P01	Date: 17/03/2023

MATERIALS

THE FOLLOWING MATERIAL GRADES ARE TO BE USED IN CONSTRUCTION U.N.O.

- BLOCKWORK = 10.4 N
- BRICKWORK = 7.3 N
- ENGINEERING BRICK = CLASS B
- MORTAR = M6
- STEEL = S275
- CONCRETE = C30/37
- REINFORCEMENT STEEL = B500B
- TIMBER = C24

STRUCTURE KEY

- AREA SITE BOUNDARY LINE
- CONCRETE COLUMN
- CONCRETE WALL
- STEEL COLUMN
- STEEL BEAM
- DIRECTION OF METAL LIGHT GAUGE FRAMING FOR BALCONY FLOOR
- DIRECTION OF TIMBER JOIST
- STEEL SHEET PILED WALL UNDER

CONCRETE COLUMN SCHEDULE

C-01 200x600mm
C-02 250x250mm

STEEL COLUMN SCHEDULE

SC-01 SHS 100x100x5

WALL SCHEDULE

W-01 200 Thk.

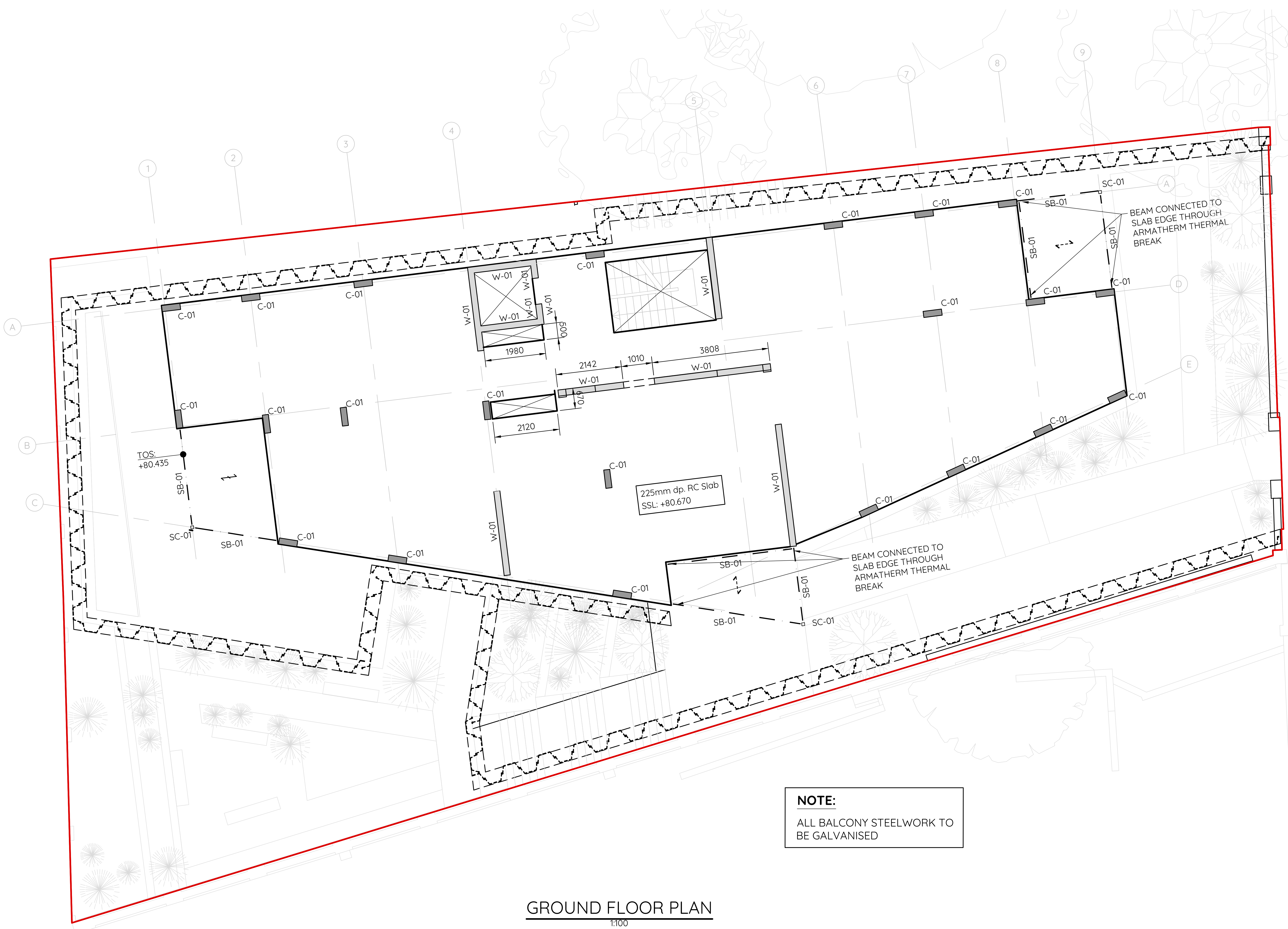
STEEL BEAM SCHEDULE

SB-01 UB 203x102x23

TIMBER JOIST SCHEDULE

47x150mm @ 400mm C/C SPACING

REINFORCEMENT WEIGHTS	
REFERENCE	QUANTITY
RAFT SLAB	175kg/m³
WALLS	70kg/m³
COLUMNS	260kg/m³
NOTE: REINFORCEMENT QUANTITIES INDICATIVE	



NOTE:
ALL BALCONY STEELWORK TO BE GALVANISED

GROUND FLOOR PLAN
1:100

NOTES:
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11. DETAILING OF REINFORCING STEEL BY OTHERS

NOT FOR CONSTRUCTION

Rev	Date	Desc.	By

Project name: DALEHAM GARDENS		Drawn/Checked: NC/AC	Status: PRELIMINARY
Client name: NW3 CLT		Title: GROUND FLOOR PLAN	
Project No: 2102	Scale: 1:100 @A2	Drawing No.: 1803-SW-XX-01-DR-S-0101 Rev: P01	Date: 17/03/2023

MATERIALS

THE FOLLOWING MATERIAL GRADES ARE TO BE USED IN CONSTRUCTION U.N.O.

- BLOCKWORK = 10.4 N
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- ENGINEERING BRICK = CLASS B
- MORTAR = M6
- STEEL = S275
- CONCRETE = C30/37
- REINFORCEMENT STEEL = B500B
- TIMBER = C24

STRUCTURE KEY

- CONCRETE COLUMN
- CONCRETE WALL
- STEEL COLUMN
- STEEL BEAM
- DIRECTION OF METAL LIGHT GAUGE FRAMING FOR BALCONY FLOOR

CONCRETE COLUMN SCHEDULE

C-01 200x600mm

STEEL COLUMN SCHEDULE

SC-01 SHS 100x100x5

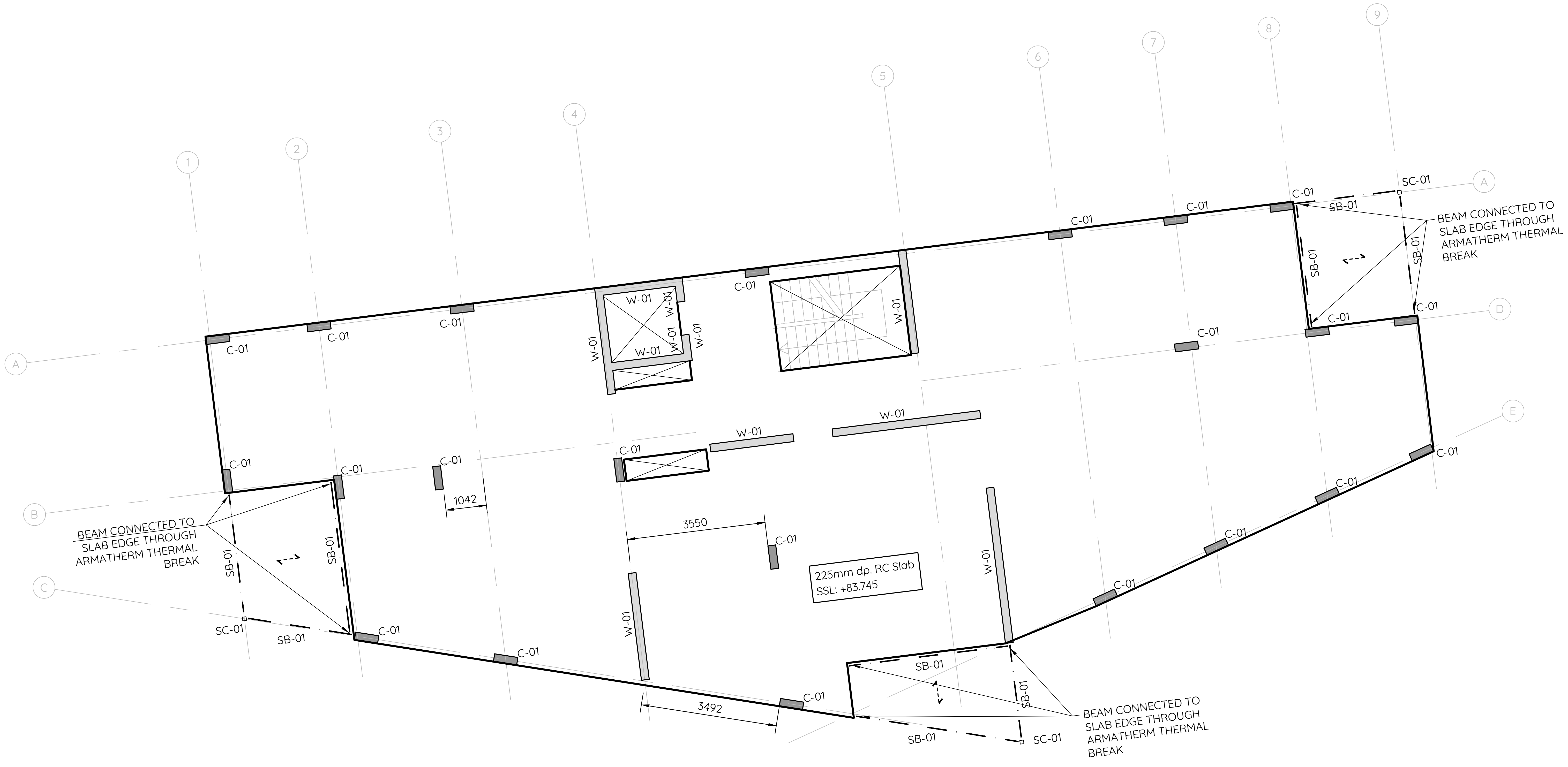
WALL SCHEDULE

W-01 200 Thk.

STEEL BEAM SCHEDULE

SB-01 UB 203x102x23

REINFORCEMENT WEIGHTS	
REFERENCE	QUANTITY
RAFT SLAB	175kg/m³
WALLS	70kg/m³
COLUMNS	260kg/m³
NOTE: REINFORCEMENT QUANTITIES INDICATIVE	



NOTE:
ALL BALCONY STEELWORK TO BE GALVANISED

FIRST FLOOR PLAN

1:100

simple works

NOTES:
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NOT FOR CONSTRUCTION

Rev	Date	Desc.	By

Project name: DALEHAM GARDENS		Drawn/Checked: NC/AC	Status: PRELIMINARY
Client name: NW3 CLT		Title: FIRST FLOOR PLAN	
Project No: 2102	Scale: 1:100 @A2	Drawing No.: 1803-SW-XX-02-DR-S-0102	Rev: P01 Date: 17/03/2023

MATERIALS

THE FOLLOWING MATERIAL GRADES ARE TO BE USED IN CONSTRUCTION U.N.O.

- BLOCKWORK = 10.4 N
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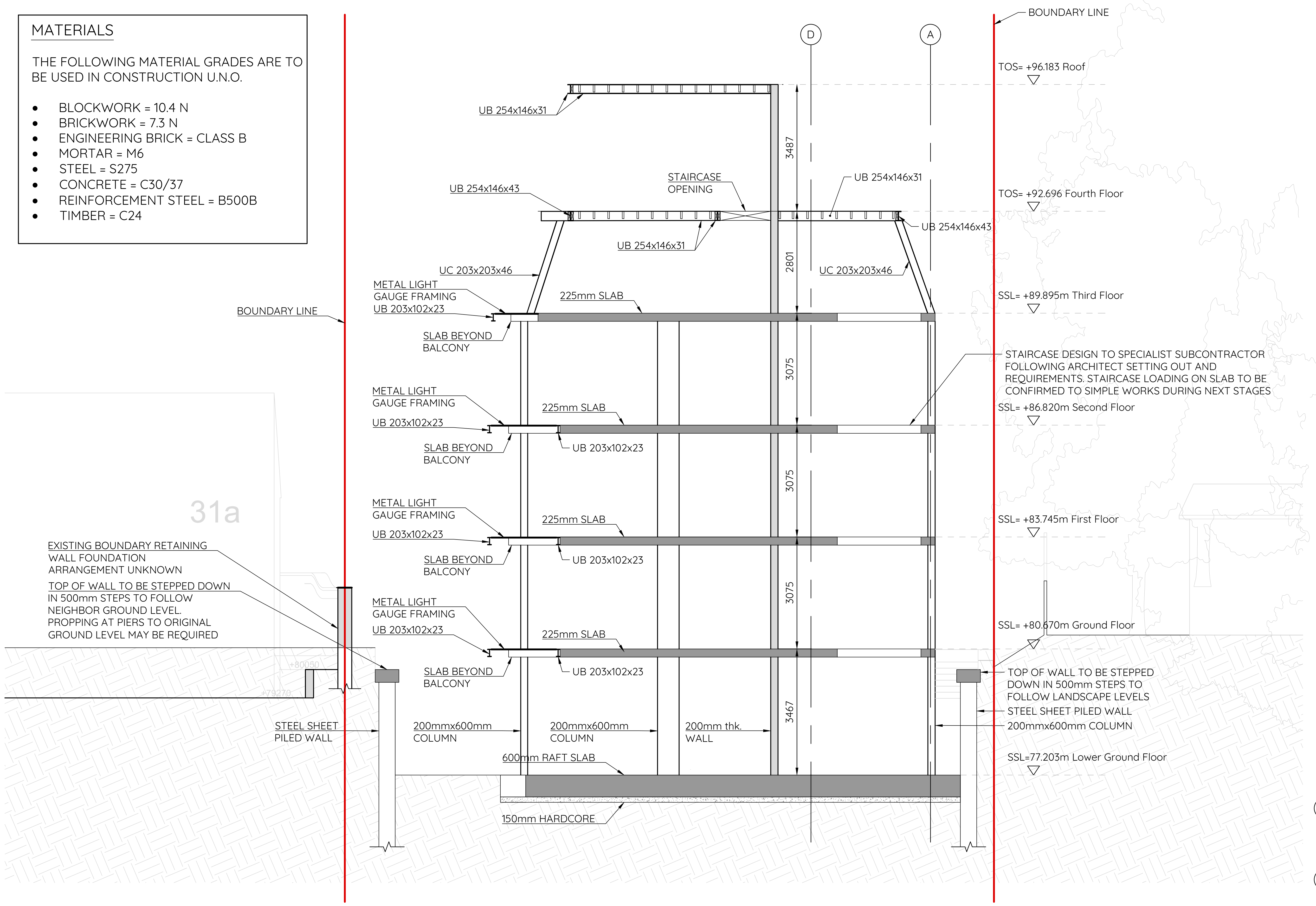
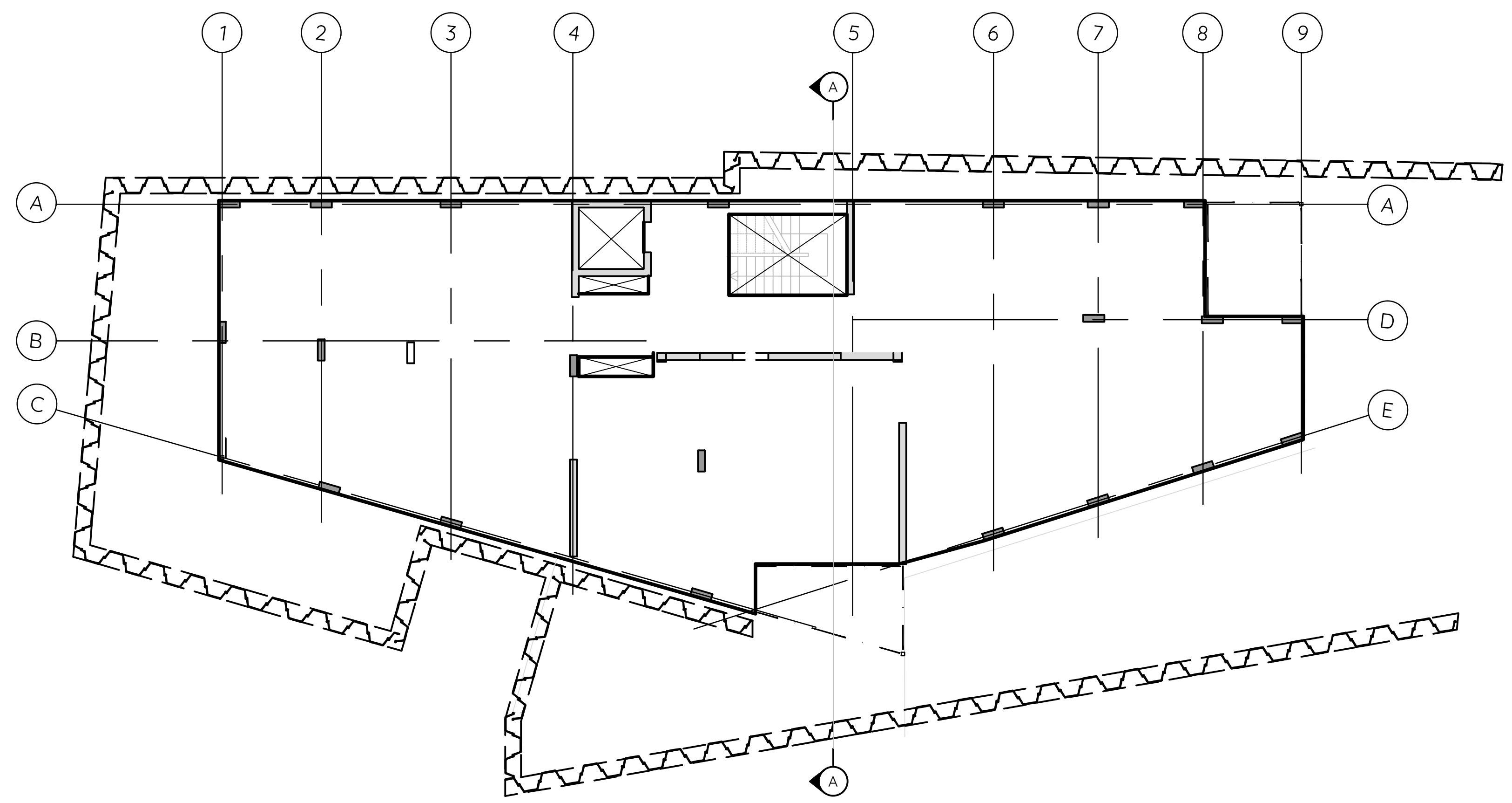
- MORTAR = M6
- STEEL = S275
- CONCRETE = C30/37
- REINFORCEMENT STEEL = B500B
- TIMBER = C24



SECTION A-A
1:100

NOTE:
DEPTH OF MADE GROUND ON SITE IS SIGNIFICANT. FURTHER INVESTIGATIONS TO DETERMINE MORE ACCURATELY THE DEPTH ACROSS THE SITE ARE REQUIRED DURING THE NEXT STAGE

NOTE:
FURTHER SITE INVESTIGATION MIGHT BE REQUIRED TO INFORM DETAILED DESIGN OF RAFT SLAB FOUNDATION AND ASSESS FEASIBILITY OF GROUND IMPROVEMENT TECNIQUES



KEY PLAN AT GROUND FLOOR
1:100

simple works

NOTES:
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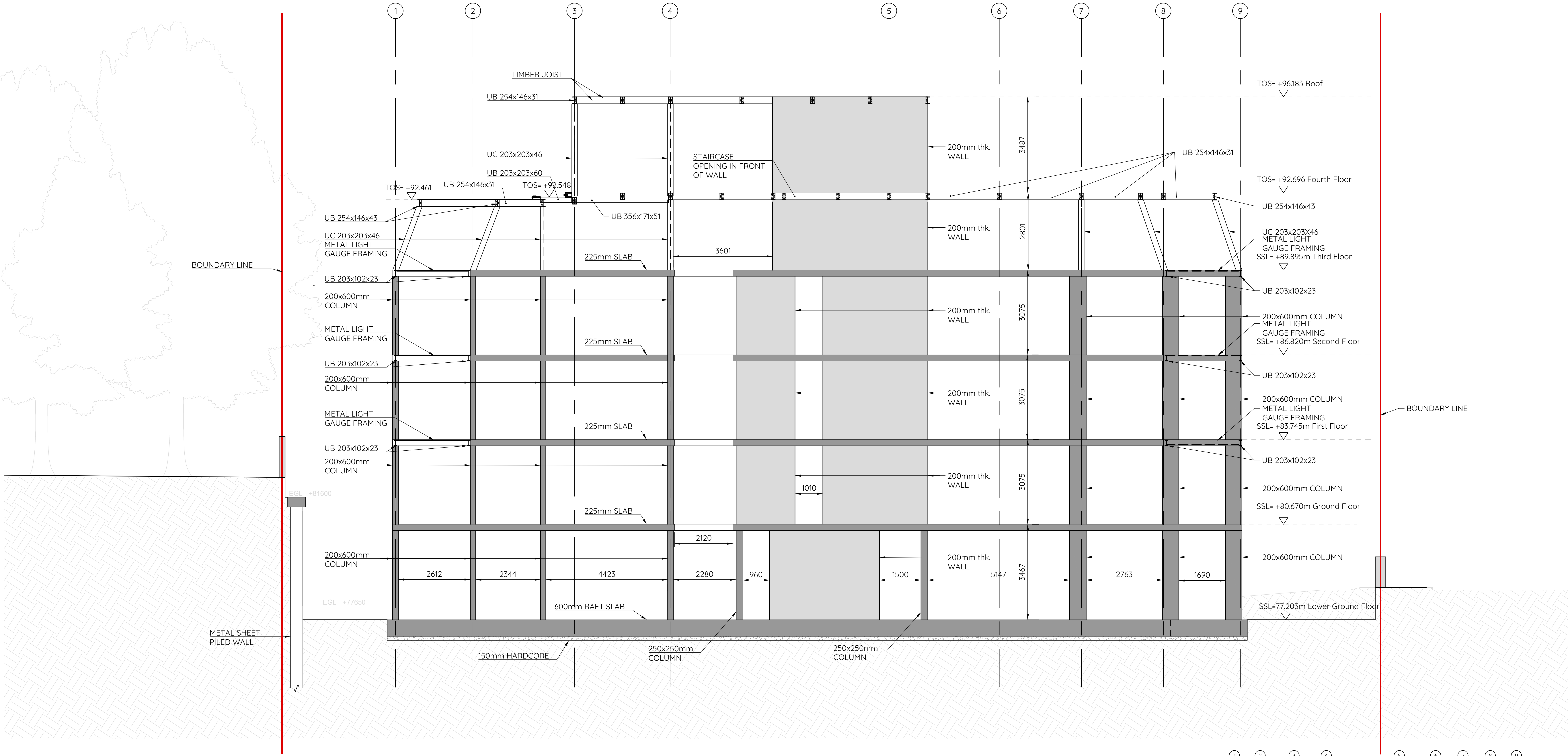
NOT FOR CONSTRUCTION

Rev	Date	Desc.	By

Project name: DALEHAM GARDENS
Client name: NW3 CLT
Project No: 2102
Scale: AS SHOWN @A2
Drawn/Checked: NC/AC
Status: PRELIMINARY
Title: SECTIONS SHEET 1
Drawing No.: 1803-SW-XX-XX-DR-S-0201
Rev: P01
Date: 03/04/2023



SECTION B-B

1:100

MATERIALS

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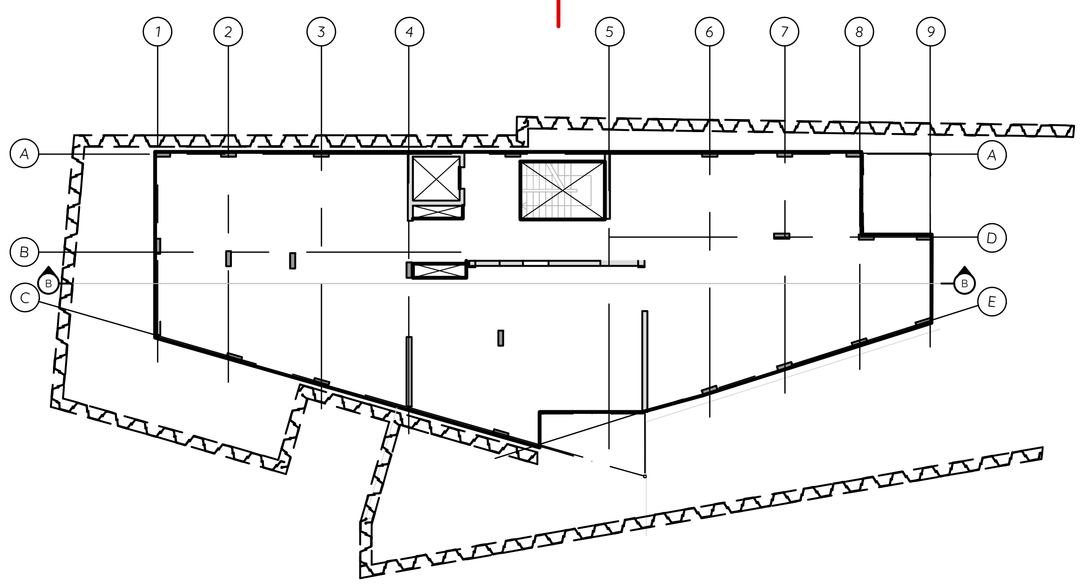

KEY PLAN AT GROUND FLOOR

1:300

simple works

NOTES:
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NOT FOR CONSTRUCTION

Rev	Date	Desc.	By

Project name: DALEHAM GARDENS	Drawn/Checked: NC/AC	Status: PRELIMINARY
Client name: NW3 CLT	Title: SECTIONS SHEET 2	
Project No: 2102	Scale: AS SHOWN @A2	
Drawing No.: 1803-SW-XX-XX-DR-S-0202	Rev: P01	Date: 03/04/2023

APPENDIX B – GROUND INVESTIGATION

31 Daleham Gardens, London, NW3 5BU

Geotechnical Interpretative Report

Report / Project No: 2023-002-SIM-DAL Rep 002

Date: 20 / 04 / 2023

Geofirma Ltd
Cardinal Point
Park Road
Rickmansworth
Herts
WD3 1RE

01923 437840
geofirmaconsultants.co.uk

DOCUMENT CONTROL SHEET

Project	**31 Daleham Gardens, London, NW3 5BU**
Document	**Geotechnical Interpretative Report**
Project/Report No	**2023-002-SIM-DAL/Rep.002**
Client	**NW3 CLT**

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Client Issue	Client Issue	Client Issue	
Date	17/03/2023	20/04/2023		
Prepared by	Ebenezer Adenmosun/Laura Espinosa	Ebenezer Adenmosun		
Signature				
Checked by	Ebenezer Adenmosun	Ebenezer Adenmosun		
Signature				
Authorised by	Ebenezer Adenmosun	Ebenezer Adenmosun		
Signature				
Method of issue	Email			

Name	Role	Qualifications
Ebenezer Adenmosun	Prepared, Checked and Authorised by	**BEng(Hons) ACGI MSc DIC CEng MICE FGS RoGEP (Grade - Adviser)**
Laura Espinosa	Prepared by	**BEng, MSc**

PREAMBLE

The work undertaken to provide the basis of this report comprised a study of the available documented information from a variety of sources, together with (where appropriate) meetings and discussions with relevant authorities and other interested parties. The information reviewed should not be considered exhaustive and has been accepted in good faith by Geofirma Ltd as providing a true description of site conditions. However, no liability can be accepted for the detailed accuracy or otherwise of any of the reports or documents prepared by others for the Client or for third parties, or for any associated errors or omissions.

The investigation of the site has been carried out to provide information concerning the ground conditions to allow a reasonable site assessment to be made.

The exploratory holes undertaken during the fieldwork only represent a small volume of the ground in relation to the size of the site and can therefore only provide a general indication of the site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised variations in the ground condition or 'hot spots' of contamination where elevated levels of contaminants may be significantly higher than those encountered. It should be noted that this ground investigation comprises 2No cable percussion boreholes and 2No machine dug trial pits. A desk study was undertaken by others to assess historical risks, however, no liability for unforeseen geotechnical or contamination hazards can be accepted by Geofirma Ltd.

The comments and recommendations given in this report are based on the ground conditions apparent at the borehole and trial pit locations. It is likely ground conditions elsewhere on the site have not been disclosed by this investigation and have therefore not been included in this report.

The comments made on groundwater conditions are based on observations made at the time that site works were undertaken. It should be noted that groundwater levels can vary owing to seasonal or other effects, and additional groundwater measurements should be conducted immediately prior and during the construction works.

In relation to asbestos, we are unable to accept the associated liability as indemnity covering asbestos related matters is restricted from our policy. This is typically the industry norm. If we do find or suspect the presence of asbestos, we will state in the exploratory logs and notify the client, and it will be their responsibility to engage a specialist contractor to investigate the issue further.

The scope of the investigation was decided in consultation with the Client and the limitations of which were made clear. This report is produced solely for the use of the Client and his/her agent and should not be relied upon in any way by any third party.

TABLE OF CONTENTS

APPENDICES

APPENDIX J – DEMOLITION SITE REPORT

1. INTRODUCTION

1.1 APPOINTMENT AND BRIEF SITE SUMMARY

Geofirma Ltd has been appointed by NW3 CLT to carry out a ground investigation and undertake the interpretative reporting for the proposed development at 31 Daleham Gardens, NW3 5BU.

The site is located within the Fitzjohns and Netherhall Conservation Area in north Camden, and encloses an area of Hampstead to the north east of Finchley Road. The property was likely built in the 1800's as a single large residential property which was divided into flats later in the 20th century. The main building suffered extensive damage in a fire in 2017, leaving it structurally unsound and hence the building was demolished. The demolition of the building and the clearing up of the site was completed at the end of 2021. At the time of the ground investigation the site was vacant land with no visible buildings present.

The proposed project includes the redevelopment of the site to deliver a multi- storey apartment block, consisting of approximately 14 new units over 5 levels. The site levels fall from the western site boundary to eastern boundary and hence the ground floor of the western part of the building shall cut into the sloping site profile to form a part basement. The ground floor slab will be approximately 3.5 m below existing ground level (approximately 81.5 m OD) at the western extent of the proposed building. At the eastern extent adjacent to the pavement of Daleham Gardens, the ground floor slab and hence the ground floor slab will be close to the existing ground level.

The site is bounded by 31a Daleham Gardens to the south, the pavement of Daleham Gardens to the east, 33a Daleham Gardens to the north. Other residential properties lie to the west of the site.

Of particular note is the presence of the Belsize tunnel which is owned by Network Rail and runs beneath 31a Daleham Gardens.

The national grid reference of the site is 526673 185076 and the site is approximately 0.07 Ha.

1.2 REPORT CONTEXT

The current proposal for the redevelopment is understood to comprise the redevelopment of the above named site to comprise a 5 storey block of flats with the western part of the lower ground floor being formed as a basement due to the sloping profile of the site from the west (approximately 81.5 m OD) to the east (approximately 78 m OD).

The purpose of this report is to present the findings of the ground investigation and provide geotechnical advice to aid with the design and construction of the building. The main aspects to be addressed in this report shall relate to the proposed building foundations and the formation of the basement structures at the site.

1.3 OBJECTIVES AND METHODOLOGY

The main objectives of this report are to provide assessments on the following areas:

- Geology of the site;
- To record details of the ground investigation works undertaken;
- To discuss site groundwater and ground conditions established from the intrusive works;
- To derive geotechnical parameters to inform the design of a suitable foundations and the proposed basement;
- To determine the sulphate classification of the site concrete selection for buried structures at the site;
- To provide advice on the constructability of the proposed basement and present feasible retaining wall options;
- To present finding on the contamination status of the site;
- Present geotechnical advice on other ground related issues.

2. SITE DETAILS

2.1 SITE LOCATION AND DESCRIPTION

The site summary is in Table 1 below:

Table 1: Site Summary

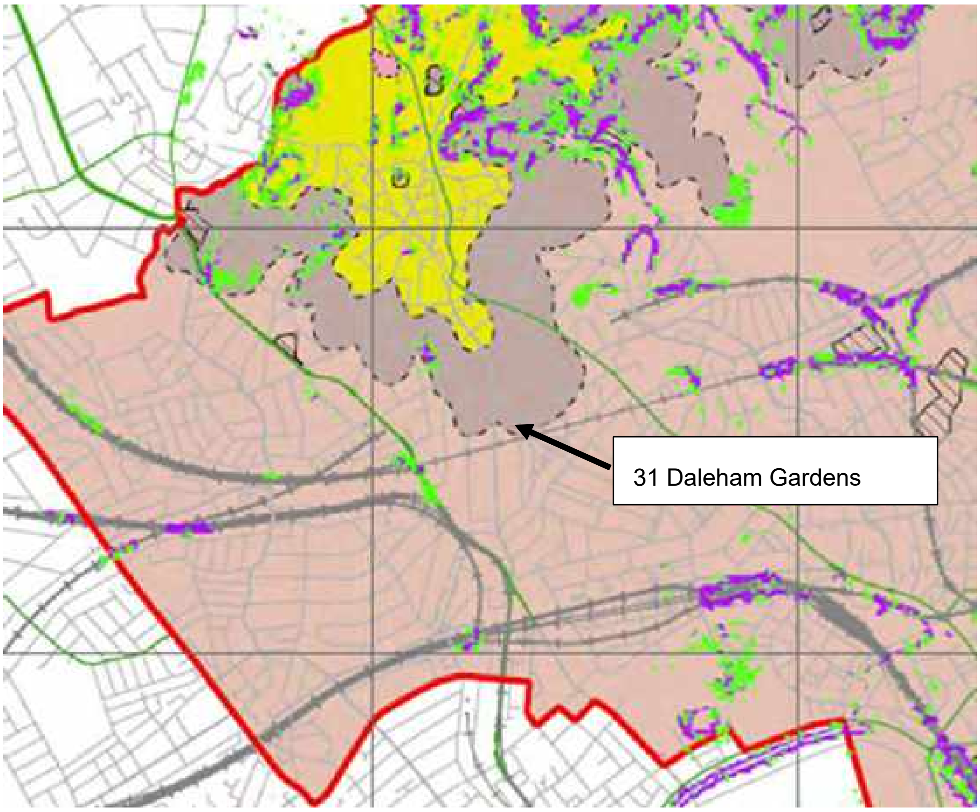
Location	The site is located in the Belsize electoral ward, within the London borough of Camden and the English Parliamentary constituency of Hampstead and Kilburn
Full Address	31 Daleham Gardens, London NW3 5BU, England
National Grid Reference	526673 185076
Area & Shape	The site has a rectangular shape and occupies an area of approximately 0.07 Ha
Development Proposals	Development of a 5 storey residential building with a part basement comprising 14 units,

Figure 1. Site Location

2.2 GEOLOGY

The published geology based on the British Geological Survey (BGS) map 1:50,000 geological map series, solid and drift Ref. 1, indicates the site is underlain directly by the Claygate Member. It should also be noted that the site lies very close to where the boundary of the Claygate Member and London Clay outcropping boundary (Figure 2).

Figure 2 Site Geology



The published geology (BGS) for the Site consists of the Claygate Member of the London Clay Formation, comprising dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. The stratum is underlain by the London Clay Formation, comprising silty clay diffusely interbedded with sandy clayey silt; it is commonly glauconitic, with several layers of calcareous concretions.

The Claygate Member is distinguished from the underlying London Clay Formation by the laminated character and the relative abundance of sand and is the most recent layer of the London Clay Formation. The boundary is drawn at the base of the lowest sand bed, conformable on silty clay with common sandy clayey silt interbeds. In practical terms, it is taken at the 'lowest sandy horizon mappable in the field' (Lake et al., 1986).

Underlying the Claygate Member is the London Clay.

The geological sequence is summarised in **Table 2** below.

Table 2: Summary of Published Geology

Geological Unit	Description	Composition	BGS Lexicon Description
Superficial	None	-	-
Bedrock	Claygate Member (Parent unit is the London Clay Formation)	Clay, silt and sand	Comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.
	London Clay Formation	Clay, silt and sand	Comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.

2.3 HYDROGEOLOGY

Due to the moderately permeable nature of the Claygate Member deposits when compared to the London Clay Formation, surface water precipitation tends to flow through them and be stored within the stratum as a local aquifer, with spring lines forming at the ground surface at the junction with the Claygate Member (medium permeability) and at the junction of the Claygate Member with the London Clay Formation (low permeability). The Environment Agency classifies the Claygate Member as a Secondary A Aquifer of medium vulnerability and of mixed permeability.

The aquifer status for the identified strata together with an estimate of vulnerability is given in Table 3, below.

Table 3: Aquifer Designation and Strata Vulnerability

Geological Unit	Strata	Aquifer Designation	Vulnerability
Bedrock	Claygate Member	Secondary A. Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifer. The stratum is underlain by the London Clay Formation, which is designated as unproductive strata.	Medium

2.4 HYDROLOGY

There are no surface water bodies located within 250 m of the site based on the Groundsure Report which was included in the Phase 1 Desk Study produced by STM Environmental in August 2021. The closest surface water body to the site is Hampstead No 1 pond, which is approximately 1.2 km from the site as dictated by the Hampstead Heath Map (see Figure 13 of the Camden Geological, Hydrogeological and Hydrological Study).

A review of the 'Watercourses' plan from Bartons 'Lost Rivers of London' (see Figure 11 of the Camden Geological, Hydrogeological and Hydrological Study) indicates various historical water courses that were present within the Camden area. The closest historical water body to 31 Daleham Gardens was the lost River Tyburn. The main source of the River Tyburn was Shepherd's Well (shown as Conduit Wells in the 1870-1871 Groundsure Historical Map), which was located at the corner of Fitzjohn's Avenue and Lyndhurst Road which is approximately 150 m to the north of our site. In the late 1870's, when the houses were built on Fitzjohn's Avenue, the water was culverted into a sewer to the west of the property boundary to flow south to Regent's Park and into the Thames.

The culvert is likely to be positioned at its closest point approximately 50 m to the west of our site traversing from north to south, towards Regent's Park.

3. GROUND INVESTIGATION

3.1 FIELDWORK

The investigation was carried out on the 31st January to the 3rd February 2023 by Geofirma Ltd and comprised the following:

1. The drilling of 2No Cable Percussion boreholes, BH1A and BH2, to depths of 25.45 m and 15.5 m bgl respectively. Borehole BH1 hit an obstruction in the Made Ground at 0.55 m bgl and hence was terminated. Standard Penetration Tests (SPTs) were performed in the borehole together with sampling at varying intervals.
2. The excavation of 2No. trial pits, TP1 and TP3, to expose building foundation for the previously demolished building. Both trial pits were taken to a depth of 3.5 m bgl.
3. Performance of 6 CBR tests to provide data for road pavement design.

The fieldwork was supervised by Geofirma Ltd with due regard to existing standards and guidelines including BS EN 1997-2 (2005), BS 5930 (2015), BS EN ISO 22476-3 (2011) and TRL PR/INT/277 (2004).

All soil description and sample logging were carried out in accordance with BS 5930:2015 and BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. The exploratory hole records are included in Appendix A, and locations of the exploratory holes are shown on the Exploration Hole Locations Plan, Appendix B.

Disturbed and undisturbed samples were recovered from the exploratory holes as necessary to facilitate sample description and for subsequent laboratory testing.

Observations of groundwater encountered during the fieldwork are included on the relevant exploratory hole records.

Groundwater and gas monitoring visits were undertaken on the 6th February and 9th March 2023 and records are included in appendix H.

3.2 LABORATORY TESTING

Routine geotechnical laboratory testing comprising Moisture Content (MC), Atterberg Limits, Particle Size Distribution Determination (PSD), Quick Undrained Triaxial Testing and sulphate tests were performed on selected samples. WAC tests and chemical tests were also carried out on selected samples to assess potential contamination levels of tested samples. The laboratory testing was carried out in accordance with BS EN ISO 17892-1:2014 and BS 1377-2:1990 at an Independent UKAS accredited laboratory and the results are presented in Appendix C and D; details of the tests and results are discussed in Section 4 and Section 5 of this report. A summary of the geotechnical and chemical laboratory testing is presented in Table 4 below.

Table 4: Summary of Geotechnical and Chemical Laboratory Testing

Laboratory Testing	Test Method	No. samples scheduled
Classification / Compaction		
Moisture Content	BS EN ISO 17892-1:2014	16
Liquid / plastic limits	BS1377: Part 2: 1990	4
Particle Size Distribution	BS EN ISO 17892-4:2016	4
Strength / Consolidation		
Undrained Triaxial Compression Test	BS1377: Part 8: 1990	8
Concrete		
BRE SD1 Suite – water soluble sulphate, total sulphur and pH		6
Chemical Tests		
WAC		1
Geofirma Chemical Suite		2

3.3 GROUNDWATER MONITORING

During the ground investigation it appears a fast groundwater inflow was recorded at 1.8 m bgl in borehole BH1A during the first day of drilling. This appears to have been perched water because the flow subsequently stopped during the site works and is not in continuity with the groundwater encountered during the groundwater monitoring (see Table 5).

Table 5: Summary of Groundwater Readings

	Response Zone	Stratum	Date of Groundwater Monitoring and depth m bgl (estimated levels in m OD)	
			06/02/23	**09/03/23**
BH1A	6 to 10	London Clay	3.25 (75.00)	3.20 (75.05)
BH2	2 to 6	Claygate Member/London	5.49 (74.94)	Dry

4. GROUND CONDITIONS

4.1 INTRODUCTION

Full details of the ground conditions encountered are presented on the exploratory hole records included in Appendix A.

Table 5: Proven Ground Conditions

Strata	Depth to Top (m bgl)	Thickness (m)
Made Ground	0.00	0.9 (BH2) to 3.6 BH1A)
Claygate Member	0.9 to 3.6	2.5
London Clay	5.5 (BH1A) to 6.5 (BH2)	Not proven

4.2 MADE GROUND

Made Ground was encountered in all the exploratory holes excavated on site and was variable. Typically, the Made Ground was encountered as a mixture of clayey gravelly SAND and gravelly sandy CLAY with the gravels being fragments of fine to coarse flint, brick, tile and concrete.

Based on the description of the material and inference from BS8002, a unit weight of 18 kN/m^3 is assumed suitable for this material. Based on the descriptions of the material being predominantly granular an angle of friction of 28° is deemed acceptable for design purposes.

5No samples were recovered from BH1A and BH2 from within the Made Ground to determine its moisture contents. The results ranged between 28% to 38%, as shown in Figure 3.

An Atterberg limit test was also performed on a selected sample from BH1A at 2.00 m bgl. The result of the test recorded liquid limit of 50%, plastic limit of 17% with plasticity index of 33. The modified plasticity index is 29 which suggests a medium volume change potential cohesive material.

SPT N values ranging between 4 and 10 were measured in the Made Ground, therefore assuming a correlation E' = 2N MPa, a drained Youngs Modulus of 10 MPa is assumed suitable.

4.3 CLAYGATE MEMBER

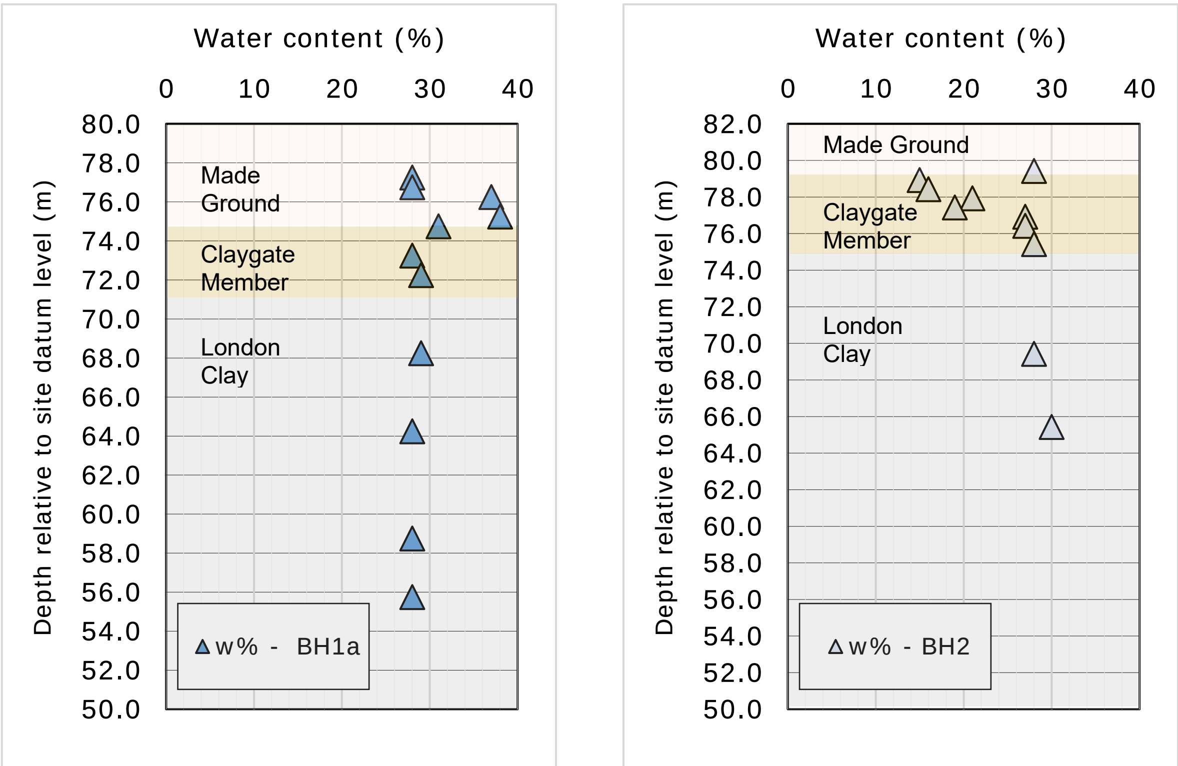
4.3.1 General Classification

Beneath the Made Ground, a stratum interpreted as Claygate Member was encountered in all the exploratory boreholes. In BH1A this material was found at depths from 3.6 m to 6.5 m bgl, and in BH2 at depths from 0.9 m to 5.5 m bgl. It predominantly comprises firm greyish orange mottled brown gravelly sandy CLAY, however, in BH2 at 2.0 m bgl a medium dense brown orange mottled clayey SAND band is present. The material is described in the logs as being occasionally described as being 'soft' after recovery and this is due to the high granular content which means the sample degrades when retrieved from the drilling shoe and SPT hammer when split. In-situ the SPT N values are greater than 10, hence in the soil is either firm (cohesive), or medium dense (granular).

4.3.2 Moisture Contents

12No. natural moisture contents were measured on samples taken from depths ranging between 1.0 m (BH2) and 6.0 m (BH1A) with values ranging between 15 % and 31 %. The moisture content variation against the estimated relative datum level is plotted in Figure 3.

Figure 3. Moisture content w% vs depth (a) BH1A (b) BH2



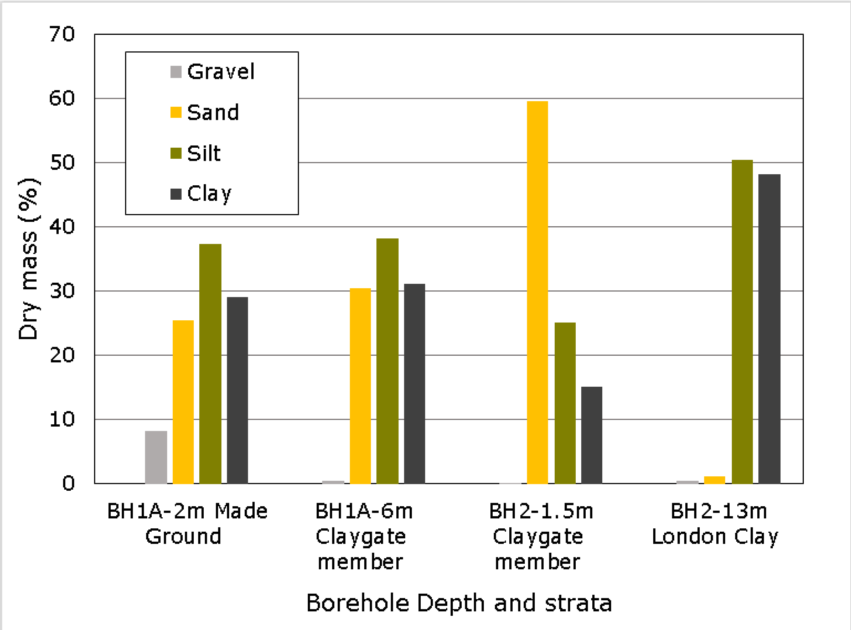
(a) (b)

4.3.3 Particle Size Distribution (PSD)

Particle Size Distribution (PSD) test was carried out on 2No samples of the Claygate Member recovered from BH1A and BH2.

The results indicate the recovered samples are sandy silty SAND/sandy silty CLAY, with between 30% to 60% granular composition, which is typical of the Claygate Formation. Figure 4 below summarises the PSD result.

Fig 4: Results of the Grading Analysis



4No. Atterberg limit tests were also performed on selected samples within the boreholes at depths of between 3.0 and 6.0 m bgl (BH2). The result of the test recorded liquid limits of 43% to 51%, plastic limits of 16% to 18% with plasticity indices of 29 and 33, indicative of clay of medium plasticity. Typically, particles of all samples tested passed through the 425µm sieve and therefore, there is no requirement to modify plasticity indices.

4.3.4 Strength Characteristics

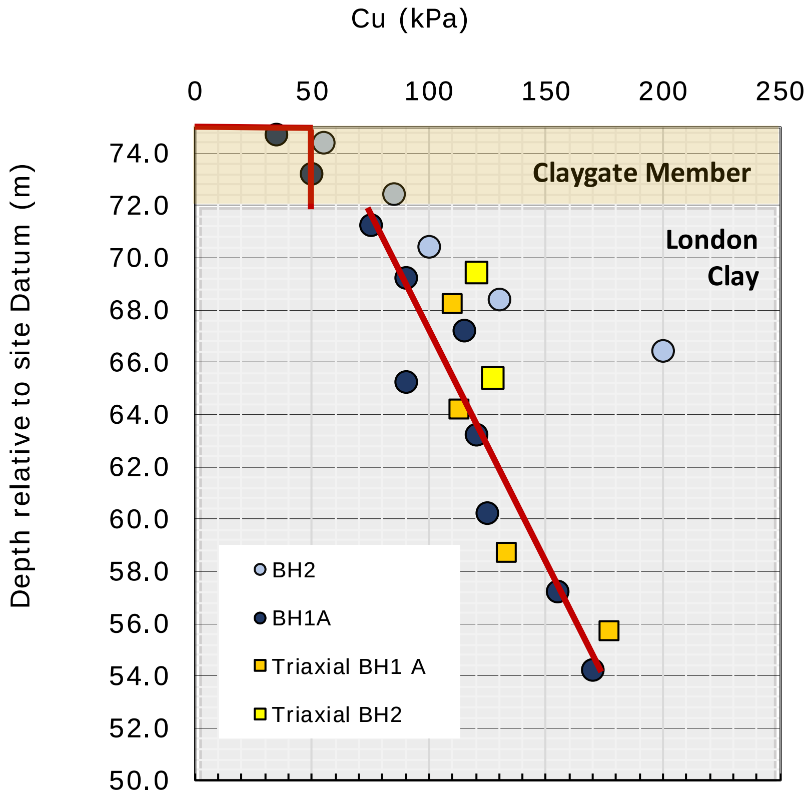
Standard Penetration Testing was carried out and the uncorrected SPT 'N' Values were recorded on the exploratory hole records. The data indicates N-values ranging between 7 and 11.

Undrained triaxial tests have been undertaken on representative sample of the Claygate Member recovered. The 2No tests undertaken in this material indicated strengths of 51 and 59 kPa.

Shear strengths were also derived from SPT 'N' using the empirical formula Cu = 5*N (Stroud and Butler (1975) and CIRIA 143 Ref. [2]).

Based on the data the following undrained shear strength has been adopted as shown in Figure 3: C_u = 50 kPa

Fig 5: Results of the Undrained Shear Strength vs Depth



4.3.5 Frictional Angle

4No Atterberg limit test results have been obtained for samples retrieved within the Claygate Member to determine the index properties of the soil, and hence derive the characteristic critical state effective angles of friction using guidelines from BS8002 (2015). The critical state angles of friction derived based on the plasticity indices yielded values of between 23° and 25°. However, angle of friction of 24° is considered representative for this material. The worst case characteristic critical state effective cohesion *c'* is assumed to be zero.

4.3.6 Young Modulus/Compressibility

The value of undrained Young's Modulus, E_u, of the Claygate Member can be determined by using SPT 'N' values and CIRIA recommendations in CIRIA 760 for ULS retaining wall design the relationship of $E_u = 500C_u$ is a reasonable estimation. However, for the SLS assessments/Ground Movement Assessment, due to the small strain range of stiffnesses used for the calculation of lateral movements associated with retaining walls an $E_u = 1000C_u$ may be adopted. Since the movements associated with foundations are due to larger strains and the stiffness of soil is strain dependant a reduced E_u = 300 C_u should be adopted for calculation of foundation settlements.

Therefore, for retaining wall analysis and the GMA assessment an E_u = 50 MPa may be adopted. For the ULS design of the retaining wall an E_u = 25 MPa maybe be adopted, whilst for settlement calculations a E_u = 15 MPa is recommended.

Assuming a Poisson's ratio (ν') of 0.15, an *E'* (drained Young modulus) of 0.75 * E_u should be adopted. Therefore, for the retaining wall analysis and the GMA assessment an E' = 37.5 MPa may be adopted. For the ULS design of the retaining wall an E' = 18.75 MPa maybe be adopted, whilst for settlement calculations a E'= 12.5 MPa is recommended.

The coefficient of compressibility (m_v) has been estimated for the underlying Claygate Member based on the expressions:

$$m_v = 1/f_2N \ m^2/MN$$

Based on the above correlation, a m_v of 0.2 m^2/MN is deemed realistic for the estimation of settlement under loadings.

4.4 LONDON CLAY

4.4.1 General Classification

Beneath the Claygate Member, is the London Clay. The clay was encountered in the BH1A and BH2 at depths of between 5.50 m bgl and 6.50 m bgl respectively. The full thickness of the material was unproven. In the boreholes the stratum was described as generally comprising firm to stiff slightly sandy fissured silty CLAY with micaceous inclusions on the fissured surfaces.

Based on the description on the laboratory test results carried out within this material at 6.60 m bgl, a bulk unit weight of 19 kN/m^3 was recorded. Based on the descriptions of the material being predominantly cohesive and well documented data about London Clay Formation, an effective critical state angle of friction of 24° is deemed acceptable for design purposes.

4.4.2 Moisture Contents

6No. natural moisture contents were measured on samples taken from depths ranging between 10.0 m bgl and 22.5 m bgl with values ranging between 28% and 30%.

4.4.3 Particle Size Distribution (PSD)

Particle Size Distribution (PSD) test was carried out on 1No samples of the London Clay taken from borehole BH2.

The results indicate the recovered samples are silty CLAY, which is typical of London Clay. Figure 4 below summarises the PSD result.

1No Atterberg limit tests was also performed on a selected sample taken from BH2 at 5 m bgl. The results of the test recorded a liquid limit of 54 %, a plastic limit of 18 % with a plasticity index of 36, indicative of a clay of intermediate plasticity. Typically, all samples passed through the 425µm sieve and therefore, there is no requirement to modify plasticity indices.

4.4.4 Strength Characteristics

Standard Penetration Testing was carried out and the uncorrected SPT 'N' Values were recorded on the exploratory hole records. The data indicates a general trend of increasing N-value with depth ranging between 18 and 40.

Undrained triaxial tests have been undertaken on representative sample of the London Clay recovered. The 2No tests undertaken in this material indicated strengths of 110 and 117 kPa.

Shear strengths were also derived from SPT 'N' using the empirical formula Cu = 5*N (Stroud and Butler (1975) and CIRIA 143 Ref. [2]).

Based on the data the following undrained shear strength vs depth relationship has been adopted as shown in Figure 5:

$C_u = 80 + 5z$ kPa (z is the depth below the surface of the London Clay assume 72 m OD)

4.4.5 Frictional Angle

A significant amount of geotechnical data relating to the London Clay is available from historical archives. Furthermore, 1No Atterberg limit test results have been obtained for samples retrieved within the London Clay to determine the index properties of the soil, and hence derive the characteristic critical state effective angles of friction using guidelines from BS8002 (2015). The critical state angles of friction derived based on the plasticity indices yielded values of between 23°. An angle of friction of 23° is considered representative for this material. The worst case characteristic critical state effective cohesion *c'* is assumed to be zero, however, for retaining wall designs ranging between 0 kPa to 5 kPa maybe adopted subject to the softening of the clay and its long-term behaviour under loading.

4.4.6 Young Modulus/Compressibility

The value of undrained Young's Modulus, E_u, of the London Clay can be determined by using SPT 'N' values and CIRIA recommendations in CIRIA 760 for ULS retaining wall design the relationship of $E_u = 500C_u$ is a reasonable estimation. However, for the SLS assessments/Ground Movement Assessment, due to the small strain range of stiffnesses used for the calculation of lateral movements associated with retaining walls an $E_u = 1000C_u$ may be adopted. Since the movements associated with foundations are due to larger strains and the stiffness of soil is strain dependant a reduced $E_u = 300\ C_u$ should be adopted for calculation of foundation settlements.

Therefore for retaining wall analysis and the GMA assessment an E_u = 80 + 5z MPa may be adopted. For the ULS design of the retaining wall an E_u = 40 + 2.5z MPa maybe be adopted, whilst for settlement calculations a E_u = 24 + 1.5z MPa is recommended.

Assuming a Poisson's ratio (ν') of 0.15, an *E'* (drained Young modulus) of 0.75 * E_u should be adopted. Therefore for the retaining wall analysis and the GMA assessment an E' = 60 + 3.75z MPa may be adopted. For the ULS design of the retaining wall an E' = 30 + 1.875z MPa maybe be adopted, whilst for settlement calculations a E' = 18 + 1.125 MPa is recommended.

The coefficient of compressibility (m_v) has been estimated for the underlying Claygate Member based on the expressions:

$$m_v = 1/f_2N \ m^2/MN$$

Based on the above correlation, a m_v of 0.1 m^2/MN is deemed realistic for the estimation of settlement under loadings.

4.5 SUMMARY OF GEOTECHNICAL PARAMETERS

Based on the ground investigation and laboratory testing, the following design parameters have been derived and presented in Table 6 below. These may be relied upon in the design of geotechnical structures.

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Table 6: Summary of Geotechnical Parameters

Stratum	Typical thickness Range (m)	Bulk Density (kN/m³)	C_u (kN/m²)	Φ'_{cv} (°)	m_v (m²/MN)	$E_{u\ (ULS)\ wall}$ (MN/m²)	$E_{u\ (SLS)\ wall}$ (MN/m²)	$E_{u\ settlemsnt}$ (MN/m²)	$E'_{(ULS)wall}$ (MN/m²)	$E'_{(SLS)\ wall}$ (MN/m²)	$E'_{settlemsnt}$ (MN/m²)
Made Ground	0.9 to 3.6	18	-	28	-	10	10	-	7.5	7.5	-
Claygate Member	2.5	18	50	24	0.2	25	50	15	18.75	37.5	12.5
London Clay Formation	Not Proven	19	80 + 5z	23	0.1	40 +2.5z	80 + 5z	24 + 5z	30 + 1.875z	60 + 3.75z	18 + 1.125z

(1) z is measured below the surface of the London Clay

5. ENGINEERING CONSIDERATIONS

5.1 FOUNDATION DESIGN ISSUES

5.1.1 Introduction

The preliminary estimated loads on the proposed foundations are stated in Sketch No. 1803-XX-SK-01. The drawings indicate the SLS loads applied by typical columns to the foundations could range between 580 kN and 675 kN. Based on the ground investigation, there could be up to 3 m of Made Ground within the previous building footprint, whilst to the rear of the site the Made Ground thickness could be less than 1 m. Hence there is the possibility different foundation options can be adopted for this scheme.

5.1.2 Shallow Foundations

The original 3 to 4 storey building at the site was constructed on shallow foundations founded in the Claygate Member. From this important observation it would be sensible to infer that the natural ground underlying the site is capable of carrying the loading for the new development on shallow foundations.

In areas of the site surrounding the previous footprint of the original site building the Made Ground is less than 1 m thick. If the foundations for the proposed building are constructed outside the zone of the Made Ground, shallow foundations can be used. The Atterberg Limit tests indicate the Claygate Member have medium volume change potential, hence this must be considered in the design of shallow foundations at this site, especially to the rear of the site where trees are present. Taking the above into account, it is important to note that the moisture content values measured in the top 3 to 4 m of BH2 (which is closest to the trees) are typically lower than those measured in BH1A, which is further away from the trees. This may be sign of desiccation in the top 3 to 4 m, or could just be because the Claygate Member is more granular in borehole BH2 (a clayey medium SAND) and hence holds less water in its soil matrix.

If shallow foundations are to be used, an assumed undrained shear strength (C_u) of 50 kPa may be adopted for the Claygate Formation based on the SPT and triaxial test data. This value is assumed to be conservative because the 3 to 4 storey building was previously located at this site, hence the 'actual' undrained shear strength for the building to have performed satisfactorily over the 150 years plus of it is service would exceed this value.

The expression used to determine the allowable bearing capacity of foundations in clay is:

$$q_{all} = N_c\, d_c\, S_c\, Cu \;/\; FOS + q$$

N_c = Bearing capacity factor corrected for depth/breadth ratio and shape factor (see fig.6)

Cu = Undrained shear strength

FOS = Factor of safety = 3

q = Overburden above foundation formation level

Fig.6 Bearing Capacity Factor after Skempton

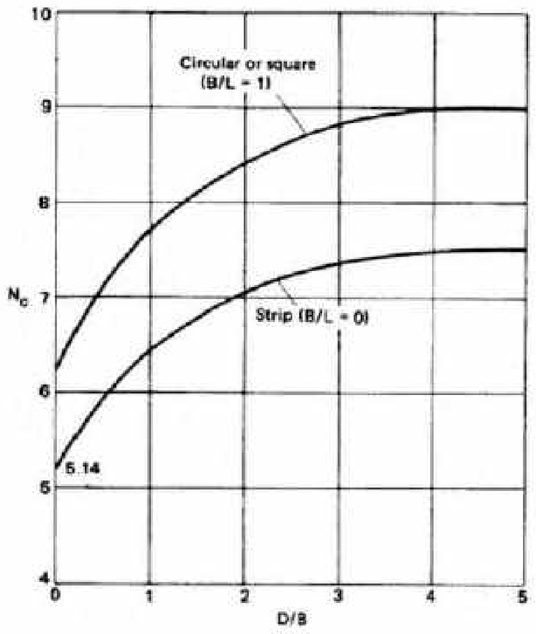

Figure 8.5 Skempton's values of N_c for $\phi_u = 0$. (Reproduced from A.W. Skempton (1951) *Proceedings of the Building Research Congress*, Division I, p. 181, by permission of the Building Research Establishment, © Crown copyright.)

Table 7: Summary of Assessment of Allowable Bearing Capacity

Depth below ground level (base of footing)	1.0 m bgl	1.5 m bgl	2 m bgl
Est Undrained Shear Strength Cu (kN/m²)	50	50	50
Allowable Bearing Capacity (kN/m²) (assuming foundations are a 0.6 m strip and FOS = 3)	125	150	160
Allowable Bearing Capacity (kN/m²) (assuming foundations are a pad 1.5 x 1.5 m and FOS = 3)	150	160	175
Allowable Bearing Capacity (kN/m²) (assuming foundations are a pad 2 x 2 m and FOS = 3)	125	150	165

Based on the calculated allowable bearing capacity values in Table 7, 1.5 m and 2.0 m pads can carry a column loads approximately 500 kN and 600 kN respectively. The above bearing capacities have been calculated using the traditional approach with a factor of safety (FOS) = 3.

Using the Eurocode approach, and assuming the foundations are at a depth of 1.5 m bgl, **the required pad** size to carry the maximum column internal load design action of *1 x 465 + 1.3 x 210 = 738 kN,* and external column design action of *1 x 465 + 1.3 x 115 = 615 kN* is determined assessing the design resistance of ground, R_d.

The design resistance R_d at formation level 1.5 m bgl for an assumed 1.5 m by 1.5 m pad

$$\frac{R_d}{Area} = N_c \frac{Cu}{1.4} + p_o$$

Assuming the N_c for a pad = 7.7 (see Figure 6) and the undrained shear strength is 50 KPa.

$$R_d = 1.5 \times 1.5 \times \left(7.7 \times \frac{50}{1.4} + 1.5 \times 18\right)$$

$$R_d = 1.5 \times 1.5 \times (302\ kN/m^2)$$

$$R_d = 680\ kN > 615\ kN$$

A 1.5 m x 1.5 m pad founded 1.5 m bgl in the Claygate Formation can carry the external column load.

The design resistance R_d at formation level 1.5 m bgl for an assumed 1.75 m by 1.75 m pad

$$\frac{R_d}{Area} = N_c \frac{Cu}{1.4} + p_o$$

Assuming the N_c for a pad = 7.4 (see Figure 6) and the undrained shear strength is 50 KPa.

$$R_d = 1.75 \times 1.75 \times \left(7.4 \times \frac{50}{1.4} + 1.5 \times 18\right)$$

$$R_d = 1.75 \times 1.75 \times (290\ kN/m^2)$$

$$R_d = 888\ kN > 738\ kN$$

A 1.75 m x 1.75 m pad founded 1.5 m bgl in the Claygate Member can carry the internal column load. A quick settlement check has been performed to satisfy the Eurocode requirements and it is anticipated total settlements of up to 25 mm could be achieved for the heavier column loads, although it is recommended the pad sizes are increased to 2 m x 2 m for the larger loads to control the settlement – or a raft used. If total settlements of this level are deemed excessive, piled foundations should be used.

To assess whether shallow foundations may be used on the site, additional trial pitting is necessary to confirm the thickness of the Made Ground in more detail across the site.

5.1.3 Piled Foundations

To mitigate the risk associated with the use of shallow foundations at this site, it may be considered appropriate to use piled foundations. However, if piles are to be used the interaction between the piles and the tunnel beneath 31a Daleham Gardens have to be assessed. In order to undertake the assessment competently the tunnel properties need to be known, with the most important being the location of the tunnel, that is its depth and alignment. The predicted tunnel alignment and depth is shown in sketch 1803-XX-SK-04b (see appendix F).

The information provided by the sketch indicates the top section of all the pile should be sleeved within the arching zone (assumed to be 45 degrees from the tunnel invert in the sketch) above the Network rail tunnel that underlies 31A Daleham Gardens. The pile Eurocode 7 design resistances are tabulated in Table 9 with the reduced shaft friction attributed to the piles. This approach is deemed to be conservative, therefore it is suggested numerical analysis is undertaken to assess more accurately the interaction of the tunnel and the proposed pile. If this process is undertaken, it is possible that pile capacities more akin with the values in Table 8 maybe adopted with the full skin friction of the pile included in the shaft resistance calculation.

The piling contractor must undertake their own design to satisfy themselves on the validity of design resistances provided in Tables 8 and 9.

Obstructions are potentially present in the Made Ground overlying the site, hence it advisable these are removed in advance of the pile installation.

Table 8: *Summary of Design Action DA1-2 with pile design length (measured below foundation level)*

Reduced level (m)	Pile length (m)	Design Action DA1-2 (kN)			
		Ø = 0.3	Ø = 0.35	Ø = 0.45	Ø = 0.6
76	**2**	0	0	0	0
74	**4**	22	28	41	66
72	**6**	43	52	73	109
70	**8**	88	107	148	218
68	**10**	132	158	215	310
66	**12**	180	215	289	411
64	**14**	232	277	370	522
62	**16**	290	344	458	642
60	**18**	352	417	553	771
58	**20**	419	496	656	911
56	**22**	491	580	765	1059
54	**24**	562	664	873	1202

Table 9: ***Summary of Design Action DA1-2 with pile design length (measured below foundation level) following*** **Network Rail's** ***guidance notes for works in the vicinity of tunnels***

Reduced level (m)	Pile length (m)	Design Action DA1-2 (kN)			
		Ø = 0.3	Ø = 0.35	Ø = 0.45	Ø = 0.6
76	**2**	0	0	0	0
74	**4**	0	0	0	0
72	**6**	0	0	0	0
70	**8**	0	0	0	0
68	**10**	0	0	0	0
66	**12**	48	60	90	145
64	**14**	98	120	168	251
62	**16**	153	184	252	365
60	**18**	212	254	342	488
58	**20**	275	328	439	619
56	**22**	343	407	542	759
54	**24**	415	491	651	907
52	**26**	491	580	767	1063
50	**28**	571	674	888	1228

5.2 RETAINING WALLS FOR UNDERGROUND STRUCTURES

Based on the existing drawings the maximum retained height for the proposed basement will be up to 5m. The retained height shall reduce from west to east across the site.

A sheet pile wall can be used to aid in the formation of the excavation for the dig, and with the benefit of having a smaller footprint dimension width/profile of typically 300 mm to 500 mm would result in more useable space of the development due to the constraints on the site width. However, the likelihood of vibrations being induced during the pile driving must be taken into account. If the adjacent buildings and the party walls surrounding the site are also deemed sensitive, the driving impact of the sheet piling could detrimentally impact these structures. Also, due to the residential nature of the area, the noise which occurs as a result of the driving process may cause disturbance.

A contiguous bored pile retaining wall could also be the used for constructing the basement. Based on the current proposed maximum retaining height, a maximum pile diameter of 450 mm or 600 mm would be deemed acceptable. A contiguous bored pile wall does have gaps between the individual piles, and the ground investigation does indicate there may be perched water trapped in the Claygate Formation, however, it is anticipated the groundwater is below the dig level, so even if encountered can be controlled by using pumping. The site is in a residential area, hence noise caused by drilling using boring rig would be less in comparison to driving sheet piling into the ground using high impact methods. Also being located next to a party wall, the use of bored piles will cause less vibrations to the neighbouring properties. Since bored pile may also be used to carry the internal column loads, there will be cost and programme savings in using bored pile for both the retaining walls and foundation piles.

Obstructions are potentially present in the Made Ground overlying the site, hence it advisable these are removed in advance of forming the retaining wall.

Also of particular interest there will be sections of the retaining wall installed immediately adjacent to the site boundary party walls. The base of the party wall walls are likely to protrude into 31 Daleham Gardens and hence potential obstruct the line of the piled walls. It is therefore recommended the base of these party walls are exposed in areas to confirm the wall foundation type and projection on to the development footprint.

Suitable geotechnical parameters to use in the design of the basement walls can be obtained from Table 6.

Due to the proximity of the retaining walls to sensitive structures, temporary propping will be necessary to limit lateral movement of the adjacent structures towards the excavation. Coordination will be required between the retaining wall designer and the temporary works designer to ensure movements are with tolerable levels.

5.3 EXCAVATIONS

Open cut excavation techniques may be used to form certain areas of the basement excavation where there is sufficient space to form temporary safe slopes. Based on the description of the material and the results of the correlations used to determine an angle of friction for the Made Ground and Claygate formation safe temporary slope would be 1V:2H, however, these may have to be slackened if the site is subject to sustained rainfall.

As noted on the borehole log for BH1A, a groundwater strike was encountered at 1.8 m bgl in the Made Ground (approx. 76.5 m OD), and on the last groundwater monitoring visit the groundwater was encountered in BH1A at approximately 75 m OD. The difference in the water strike level and the monitored groundwater level would indicate that both water bodies are not necessary in continuity, with the water in the Made Ground almost certainly being perched. Therefore, any localised ingress from the Made Ground should be controllable by sump pumping, if required. Note currently that the monitored groundwater level is approximately 1.5 m below the proposed dig level, however, the groundwater is likely to fluctuate seasonally and possibly in response to rainfall. It is therefore recommended that groundwater monitoring is performed up until the construction phase to enable a decision to be made on whether dewatering is necessary, and if so, the proposed technique and methodology.

Based on our experience during the trial pits, the excavation of the materials encountered during the ground investigation should be easily achieved using conventional digging techniques, however, obstruction maybe encountered since the site did previously have a building located on it. Records of the site demolition and clear up with photographs are in Appendix J.

Care should be taken to limit the exposure of any excavation surface before the actual placement of the concrete as groundwater or rainwater could result in deterioration of the formation surface. Foundation excavations should be inspected by qualified personnel and any soft or loose materials that are encountered should be removed and replaced with a blinding layer as quickly as possible.

5.4 PAVEMENT DESIGN

In situ CBR results indicated test values ranging between 0.81% and 5.4%. The values seem low, however, it should be noted the CBR values measured appear to be highly dependent on the moisture content of the soil.

Based on the data obtained a CBR value of 2% is recommended for the site, however, it would be prudent that the top 500 mm of soil is removed and the exposed surface is proof-rolled before placement of any road or pavement build up is commenced.

5.5 CONCRETE SULPHATE RESISTANCE

4No soil samples were tested for sulphates with the water-soluble sulphate values varying between 70 mg/l and 620 mg/l. Total sulphur tests were also performed, and when converted the total potential sulphate varied between 0.72 % and 1.89 %.

Hence in accordance with BRE Guidance Special Digest 1:2005, and assuming mobile groundwater and brownfield location, a Design Sulphate Class of DS-4 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-3s should be used for the design of buried concrete structures at the site.

5.6 CONTAMINATION ASSESSMENT

5.6.1 Human Health Risk Assessment

The site previously housed the original 31 Daleham Gardens, which was damaged by fire and then was demolished. As part of the demolition process it would appear both demolition material and soil were taken of site as part of this process. The quantities of construction waste taken off site and material imported on to site are documented in the 'Demolition Recycling Report' and the logs sheets which were produced by M & M Demolition (see appendix J).

A Tier 1 (generic) quantitative risk assessment has been undertaken by screening measured contaminant concentrations derived from the ground investigation works against reference values for chronic (long term) risk to human health known as Generic Assessment Criteria (GAC).

In line with the conceptual site model, GAC for the residential without plant uptake exposure scenario have been utilised. The GAC are predominantly based on the LQM / CIEH S4ULs and DEFRA C4SL.

The below contaminants have subsequently been targeted for chemical analysis.

Table 8: Tier 1 Generic Risk Assessment

Determinant	Measured Concentration*		GAC (Conservative assumption of 1% Soil Organic Matter)	Number of results above GAC (No. of samples tested)
	Minimum	Maximum		
Arsenic	9.6	15	35	0 (2)
Cadmium	<0.2	<0.2	85	0 (2)
Chromium (hexavalent)	<1.2	<1.2	4.3	0 (2)
Chromium III	12	36	630	0 (2)
Copper	12	20	6200	0 (2)
Lead	32	48	313	0 (2)
Mercury	<0.3	<0.3	1.5	0 (2)
Nickel	9.9	11	130	0 (2)
Selenium	<1	<1	430	0 (2)
Zinc	39	82	40,000	0 (2)
Total Phenols	<1	<1	10	0 (2)
Acenaphthene	<0.05	<0.05	210	0 (2)
Acenaphthylene	<0.05	<0.05	170	0 (2)

Anthracene	<0.05	<0.05	2,300	0 (2)
Benzo(a)anthracene	<0.05	0.44	11	0 (2)
Benzo(a)pyrene	<0.05	0.53	5.3	0 (2)
Benzo(b)fluoranthene	<0.05	0.99	3.9	0 (2)
Benzo(ghi)perylene	<0.05	0.37	44	0 (2)
Benzo(k)fluoranthene	<0.05	0.99	8.5	0 (2)
Chrysene	<0.05	0.44	6	0 (2)
Dibenz(a,h)anthracene	<0.05	<0.05	0.31	0(2)
Fluoranthene	<0.05	0.59	260	0 (2)
Fluorene	<0.05	<0.05	160	0 (2)
Indeno(1,2,3-cd)pyrene	<0.05	0.31	3.2	0 (2)
Naphthalene	<0.05	<0.05	1.5	0 (2)
Phenanthrene	<0.05	0.18	92	0 (2)
Pyrene	<0.05	0.59	560	0 (2)
BTEX, MTBE and TPH	All fractions are either below laboratory limit of detection or their respective GAC. Expect for TPH-CWG – Aliphatic with a 12 mg/kg which is low and near to the detection limit.			
Asbestos	None detected in the two samples.			
**Concentration expressed in mg/kg except where listed*				
[X]Based on Insert Waste Landfill Acceptance Criteria				

Notes:

** Source of GAC: 1 = LQM / CIEH (2014) S4UL3785 | 2 = Defra (2014) C4SL*

** *For asbestos, the number of detections is shown and does not relate to any GAC*

Direct analysis of all the chemical assessment data indicates the contaminants are all below their relevant GAC for all contaminants within both the Made Ground and natural strata.

Although no elevated contaminants were encountered it would be prudent that mitigation measures stated in Table 11 are adhered to. This is especially relevant due to the history of the site, even though the information in appendix J does contain information indicating the site clear up was performed to the satisfaction of Camden Council.

A copy of the laboratory chemical assessment data is presented in Appendix C of this Report.

5.6.2 Ground Gas Risk Assessment

2No gas monitoring visits were undertaken on the 6th February and 9th March 2023.

Table 9: Summary of Maximum Ground Gas Readings

Summary of Maximum Gas Monitoring Results								
Date	**Atm Pressure (mB)**	**Hole Ref.**	**Flow (l/h)**	**CH_4 (%)**	**CO_2 (%)**	**CO (%)**	**O_2 (%)**	**H_2S (ppm)**
06/02/2023	1032	BH1A	0	0	0.1	0	14.2	0
		BH2	0	0	3.3	0	16.3	0
09/03/2023	982	BH1A	0	0	0.2	0	18.9	0
		BH2	0	0	5.4	0	14.5	0

Gas Screening Values (GSV) have been calculated based on the above data. CIRIA (2007b) and NHBC (2007) provide methods for assessment of CO2 and CH4 based upon gas screening values (GSV) utilising flow rates and concentrations measured in appropriate standpipes. To enable calculation of the GSV, the flowrates have been adopted as 0.1 l/hr.

The GSVs within CIRIA (2007b) are based upon all buildings other than standard residential houses. The NHBC (2007) GSV are based upon standard residential houses with precast concrete floors (block and beam). As such, based upon the currently proposed end use of the site the NHBC guidance should be adopted.

Table 10: Summary of Maximum Gas Screening Values and Site Classification

Summary Gas Screening Values (GSV)							
Hole Ref.	**Assumed Flow (l/h)**	**CH_4 (%)**	**CO_2 (%)**	**CH_4 GSV (l/hr)**	**NHBC**	**CO_2 GSV (l/hr)**	**NHBC**
BH2 (max)	0.1	0	5.4	0	Green/ CS1	0.0054	Green/ CS1

Since methane was not detected, and with the gas screening value for carbon dioxide being significantly below the thresholds for the NHBC, the site classification is Green and CS1. The absence of other gases during the monitoring events also supports the site being very low risk.

Based on the above, ground gas protection measures are not considered to be required for this site.

5.6.3 Waste Acceptance Criteria (WAC)

WAC testing was carried out on a single sample retrieved from TP3 at a depth of 0.1 m bgl within the Topsoil. A Loss on Ignition (LOI) of 10.1% and a Total Organic Carbon (TOC) of 5% were measured, which exceed the Hazardous Waste for LOI, and stable non-reactive hazard waste in a non-hazardous landfill criteria for TOC of 10% and 3% respectively.

The single sample tested may not representative of the considerable amount of material likely to be won during the excavation works, especially since only one sample was tested. Therefore, further testing must be performed by the earthworks contractor during construction prior to removal of any spoil off site to classify the site soils to be transported to a suitably licenced landfill facility to enable a more rigorous assessment to be undertaken.

5.6.4 Review of Qualitative Risk Assessment Following Investigation

Risk classification is a function of the severity of a potential impact or health effect, and the perceived likelihood of such harm occurring. Qualitative assessment of the risks posed by the potentially significant pollutant linkages identified in Section 5.6.1 is summarised in Table 11- below and is supplemented by the quantitative data obtained as part of the ground investigation.

Based on the findings of this Phase 2 report for the site the risks to human health are considered to be **acceptably low**, providing appropriate mitigation measures are adopted at the site. It is particularly important that the mitigation measures are employed during the earthworks because of the site history.

The assessment within the report has been undertaken to determine the potential risks posed to identified receptors based on the proposed development at the time of writing. Should revisions in the development plans result in a change in the assessment parameters included in this report, a reassessment of the conceptual model and risk should be carried out

Table 11: Phase II Conceptual Site Model

Source	Pathway	Receptor	Consequence	Likelihood	Classification*	Rationale / Mitigation
Organic and inorganic contaminants potentially present in Made Ground	Dermal contact, ingestion, particulate inhalation	Nearby site occupants & users (from on-site sources) Future site occupants & users	Low to Medium	Unlikely	Low to moderate	No elevated results and no asbestos encountered during the ground investigation. Reports and logs produced M & M demolition infer the cleanup of the site. Appropriate PPE to be worn by site workers during basement excavation and construction works and COSHH assessment to be carried out. Risk is considered low if PPE is worn and general hygiene rules are followed on site.. On completion of construction works the majority of the site will be covered by building/hardstanding, hence risk to future site users will be low.
	Diffusion through plastic water supply pipes	Water supply pipes	Low	Unlikely	Very Low	Relates to local deposits of Made Ground / fill associated with construction of foundations and hardstanding. No organics observed during the ground investigation or elevated TPH results so risk to water pipes is negligible.
	Leaching into groundwater; subsurface migration.	Secondary A Aquifer	Low to Medium	Unlikely	Low to moderate	Low permeability London Clay Formation underlying the Claygate Formation is classed as unproductive strata and will restrict vertical migration. The site is not designated to be within Groundwater Source Protection Zones within 2000m radius of site. Leachate testing recommended to confirm this assessment.

Source	Pathway	Receptor	Consequence	Likelihood	Classification*	Rationale / Mitigation
Potential asbestos containing materials in structure	Release of asbestos fibres; subsequent inhalation	Site occupants & users Construction workers	Low	Unlikely	Very Low to negligible	No asbestos encountered during the ground investigation. Asbestos already moved as part of site clear up by M & M Demolition (See appendix J). Further records available from the client, NW3 CLT).

6. REFERENCES

[1] British Geology Society , BGS Geology of Britain Viewer, BGS: www.bgs.ac.uk, 2018.

[2] Clayton C, CIRIA Report 143. The Standard Penetration Test (SPT): Method and Use, London: CIRIA, 1995.

[3] Padfield C.J, and Sharrock M.J CIRIA Special Publication 27. Settlement of structures on clay soils, 1983 .

[4] Building Research Establishment, BRE Special Digest 1- Concrete in Aggressive Ground., London: BRE, 2005.

[5] British Standard Institution, BS 5930:2015, Code of Practice for Site Investigation., London: BSI, 2015.

[6] British Standard Institution, BS EN 1997_2 - Geotechnical Design Part 2: Ground Investigation, BSI, 2005.

[7] British Standard Institution, BS EN ISO 14688-2 2004 - Soil test principal of classification, BSI, 2004.

[8] British Standard Institution, BS EN ISO 22476 Part 3 2005 + A1 2011 - Geotechnical Field testing, Standard Penetration Test (SPT), BSI, 2011.

[9] British Standards Institution, BS10175:2011+A1:2013, Investigation of Potentially Contaminated Sites – Code of Practice and its Investigation, London: BSI, 2013.

[10] British Standards Institution, BS8004, Code of practice for foundation design, London: BSI, 2015.

[11] CIRIA, C552, Contaminated Land Risk Assessment; a Guide to Good Practice., London: CIRIA, 2001.

[12] British Standards Institution, Methods for tests for soils for civil engineering purposes, BS1377, BSI., London., 1990.

[13] NHBC, Standards - Part 4, Foundations, NHBC, 2020.

[14] British Standards Institution, BS8002, Code of practice for earth retaining structures, London: BSI, 2015.

APPENDIX A –

EXPLORATORY HOLE RECORDS

Key to Exploratory Hole Logs

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Soil and Rock Legend

Made Ground	Clay	Sand	Silt
Gravel	Boulders and Cobbles	Clay & Silt	Clay & Sand
Clay & Gravel	Sand & Silt	Gravel & Silt	Gravel & Sand
Boulders and Cobbles & Clay	Boulders and Cobbles & Silt	Boulders and Cobbles and Sand	Boulders and Cobbles and Gravel
Mudstone	Siltstone	Sandstone	Coal
Limestone	Chalk	Evaporites	Breccia
Conglomeraate	Pyroclastics	Igneous- Fine Grained	Igneous- Medim Grained
Igneous- Coarse Grained	Metamorphic- Fine Grained	Metamorphic- Medium Grained	Metamorphic- Coarse Grained

Installation/ Backfill Legend

Arisings	Bentinite
Cement/ Bentonite Grout	Concrete
Gravel	Sand
Plain Pipe	Slotted Pipe
Porous Tip	

Sampling and In-Situ Testing

B: Bulk Sample

BLK: Block Sample

C: Chemical Sample

CBR: CBR Mould Sample

CS: Core Sub-Sample

D: Disturbed Sample

P: Piston Sample

S: SPT Split Spoon Sample

U: Undisturbed Sample

UT: Undisturbed Thinwall Sample

W: Water Sample

X: Dynamic Sample

BHVP: Borehole Vane Peak Strength

BHVR: Borehole Vane Residual Strength

HVP: Hand Vane Peak Strength

HVR: Hand Vane Residual Strength

Kch: Constant Head Permeability Test

Kfh: Falling Head Permeability Test

Kpf: Packer Free-Flow Permeability Test

Kpi: Packer Injection Permeability Test

Krh: Rising Head Permeability Test

PLTa: Point Load Test- Axial

PLTd: Point Load Test- Diametral

PLTil: Point Load Test- Irregular Lump

PP: Pocket Penetrometer

PM: Pressuremeter Test

SPT: Standard Penetration Test (Split Spoon Sampler)

SPTC: Standard Penetration Test (Solid Cone)

Mechanical and Discontinuity Log

AZCL: Assumed Zone of Core Loss

CRF: Core Recovered From The Following Run

NI: Non-Intact

NM: Not Measured

NR: No Recovery

TCR: Total Core Recovery as percentage of Core Run

SCR: Solid Core Recovery as percentage of Core Run. Solid Core = At least 1 full core diameter

RQD: Rock Quality Designation as percentage of Core Run. Lengths of Solid Core greater than or equal to 100mm

IF: Fracture Spacing in mm. Minimumm, maximumm and typical spacings given

FI: Fracture Index- No.of fractures per m. Minimumm, maximum and typical given

Notes:

1. Unless indicated, the exploratory hole is vertical and all depths are measured along its axis from ground level.
2. Descriptions: BSEN ISO 14688-9 2002&2003, BS5930 2015. Weathering: EN ISO 14689-1.
3. Chalk is logged in general accordance with Lord et al (2002) CIRIA C574.
4. Description is based on qualitative field assessment except where noted.
5. Granular soils density = N Value. Bedding, banding, discontinuity spacing: measured. Rock strength: geological hammer.
6. Consistency of cohesive materials is based on qualitative field assessment.
7. Core loss assumed to be at top of core run unless strong indication as to where loss has occurred.
8. Drilling and handling induced discontinuities where discernible omitted from SCR,RQD and IF/ FI.
9. In-situ test values are uncorrected.
10. Pocket Penetrometer used is ELE-29-3729. Readings=Kg/cm2 range:0.5-4.5Kg/cm2. Or similar.
11. For deatils of other In-situ test equipment used see log.
12. Water levels are recorded during drilling or excavating and may not represent standing levels.
13. Where flush is used groundwater observations not possible other than significant strikes.
14. Unless stated otherwise core photography undertaken rig side. Core washed prior to photography from rock-head.

31 Daleham Gardens, London, NW3 5BU

BH1

Start Date: **01/02/2023**
Finish Date: **01/02/2023**
Termination Depth (mBGL): **0.55**

Eastings:
Northings:
Elevation (mAD):

Drilled By: **Geofirma Ltd**
Drill Rig/ Team: **Dando 2000**
Driller: **CB/ BW**

Logged By: **E Smith**
Checked By: **J Wills**

Exploratory Hole Progress, Details with Depth and General Remarks

Hole Depth (mBGL)	Hole Diameter (mm)	Casing Depth (mBGL)	Casing Diameter (mm)	Depth to Water (mBGL)	Comments
0.00	PIT	NA	NA	NR	Hand-dug pit
0.55	PIT	NA	NA	NR	End of hole

Water Strikes

Depth of Strike (mBGL)	Depth of Casing (mBGL)	Date and Time	Post Strike Depth (mBGL)	Minutes After Strike	Sealed at (mBGL)	Remarks
						No groundwater encountered

Termination: Refusal from demolition debris. Location moved to BH1A.

Groundwater: None encountered

Sampling: None encountered

Backfill: Hole backfilled with arisings

Weather: Cold, sunny

Notes:

1. SPT Hammer SDA3
2. 1 hour chiselling recorded by driller

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31 Daleham Gardens, London, NW3 5BU

BH1

Start Date: **01/02/2023** Eastings: Drilled By: **Geofirma Ltd**
Finish Date: **01/02/2023** Northings: Drill Rig/ Team: **Dando 2000** Logged By: **E Smith**
Termination Depth (mBGL): **0.55** Elevation (mAD): Driller: **CB/ BW** Checked By: **J Wills**

Legend	Depth From/ To (mBGL)	Description	Depth and Thickness (mBGL) (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
	0.00-0.30	MADE GROUND. Black very organic slightly clayey slightly gravelly medium sand with abundant rootlets	Thickness: 0.30 0							
	0.30-0.55		Thickness: 0.25							

Hand excavated pit

Refusal from demolition debris. Location moved to BH1A.

For explanation of abbreviations and legend refer to Key

Cable Percussion BH Log

31 Daleham Gardens, London, NW3 5BU

BH1A

StartDate:**02/02/2023**
Finish Date: **03/02/2023**
Termination Depth (mBGL): **25.45**

Eastings:
Northings:
Elevation:

Drilled By:**Geofirma Ltd**
Drill Rig/ Team: **Dando 2000**
Driller: **CB/ BW**

Logged By: **E Smith**
Checked By:**J Wills**

Exploratory Hole Progress, Details with Depth and General Remarks

Hole Depth (mBGL)	Hole Diameter (mm)	Casing Depth (mBGL)	Casing Diameter (mm)	Depth to Water (mBGL)	Comments
0.00	PIT	NA	NA	Dry	Hand-dug pit
1.50	150	NA	NA	Dry	SPT
2.50	150	NA	150	Dry	SPT
3.50	150	4.5	150	Dry	SPT
4.00	150	4.5	150	Dry	Undisturbed sampling
5.00	150	4.5	150	Dry	SPT
6.00	150	4.5	150	Dry	Undisturbed sampling
7.00	150	4.5	150	Dry	SPT
8.00	150	4.5	150	Dry	Undisturbed sampling
9.00	150	4.5	150	Dry	SPT
10.00	150	4.5	150	Dry	Undisturbed sampling
11.00	150	4.5	150	Dry	SPT
12.00	150	4.5	150	Dry	Undisturbed sampling
13.00	150	4.5	150	Dry	SPT
14.00	150	4.5	150	Dry	Undisturbed sampling
15.00	150	4.5	150	Dry	SPT
16.50	150	4.5	150	Dry	Undisturbed sampling
18.00	150	4.5	150	Dry	SPT
19.50	150	4.5	150	Dry	Undisturbed sampling
21.00	150	4.5	150	Dry	SPT

Water Strikes

Depth of Strike (mBGL)	Depth of Casing (mBGL)	Date and Time	Post Strike Depth (mBGL)	Minutes After Strike	Sealed at (mBGL)	Remarks
1.80	NR	NR	NR	NR	NR	Perched water

Termination: 25.45m bgl. Geofirma specification met.

Groundwater: Water strike at 1.8 m bgl when drilling, driller recorded as fast water flow. No water was was recorded next day 03/02/2023.

Sampling: 2No. B, 20No. D, 4No. ES, 12No. SPTD, 10No. U.

Backfill: Slotted standpipe installed on completion. Refer to installation column. log. Cold, sunny

Weather:

Notes:

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31 Daleham Gardens, London, NW3 5BU

BH1A

Start Date: **02/02/2023**	Eastings:	Drilled By: **Geofirma Ltd**	
Finish Date: **03/02/2023**	Northings:	Drill Rig/ Team: **Dando 2000**	Logged By: **E Smith**
Termination Depth (mBGL): **25.45**	Elevation (mAD):	Driller: **CB/ BW**	Checked By: **J Wills**

Depth From/ To (mBGL)	Description	Depth and Thickness (mBGL) (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records
0.00-0.30	MADE GROUND Black slightly clayey slightly gravelly medium sand with abundant rootlets. Gravel is angular to rounded fine to coarse flint and brick. (TOPSOIL)	Thickness: 0.30	0.30	ES	1			
0.30-0.55	MADE GROUND.Grey clayey sandy gravel (demo crush)	Thickness: 0.25	0.50	ES	2			
0.55-1.00	MADE GROUND Grey and brown clayey sandy gravel of angular to subangular fine to coarse concrete brick and tile.	Thickness: 0.45						
1.00-3.60	MADE GROUND Soft light orangeish brown slightly gravelly slightly sandy CLAY. Remolded Claygate with occasional inclUsion of demolition debris (brick and concrete). Gravel is angular to subangular fine to coarse brick and concrete.	Thickness: 2.60	1.00	D	3			
			1.50-1.95 1.50	SPT ES	4 5	1.50-1.95	SPT N=10	1,3/3,1,3,3
			2.00	D	6			
			2.50-2.95	SPT D	7	2.50-2.95	SPT N=4	1,1/1,1,1,1
			3.00 3.00	D ES	8 9			
			3.50-3.95	SPT D	10	3.50-3.95	SPT N=7	1,1/2,2,1,2
3.60-6.50	CLAYGATE MEMBER Soft to firm greyish brown sandy CLAY. Sand is fine.	Thickness: 2.90	4.00 4.00-4.45 4.00-4.50	D U B	11 12 13	4.00-4.45	U No Recov	12 blows
			5.00-5.45	SPT D	14	5.00-5.45	SPT N=10	2,1/1,4,2,3
			5.50	D	15			
			6.00-6.45	U	16	6.00-6.45	U 90% Recov	12 blows
6.50-8.50	LONDON CLAY. Firm grey sandy CLAY. Micaeous inclusion present in sand. Sand is fine and sub angular.	Thickness: 2.00	6.50	D	17			
			7.00-7.45	SPT D	18	7.00-7.45	SPT N=15	2,2/3,4,4,4
			7.50	D	19			
			8.00-8.45	U	20	8.00-8.45	U 50% Recov	24 blows
8.50-11.50	LONDON CLAY. Firm grey sandy CLAY. Micaeous inclusion present in sand. Sand is fine and sub angular.	Thickness: 3.00	8.50	D	21			
			9.00-9.45	SPT D	22	9.00-9.45	SPT N=18	3,2/3,5,5,5
			9.50	D	23			

Hand excavated pit to 1.20m then hole advanced using cable percussive tools. Standpipe installed to 10 m bgl with slotted zone between 6 m bgl and 10 m bgl. Water strike at 1.8 m bgl when drilling, driller recorded as fast water flow. No water was was recorded next day 03/02/2023.

For explanation of abbreviations and legend refer to Key

Cable Percussion BH Log

GEOFIRMA
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

31 Daleham Gardens, London, NW3 5BU

BH1A

Start Date: **02/02/2023**	Eastings:	Drilled By: **Geofirma Ltd**	
Finish Date: **03/02/2023**	Northings:	Drill Rig/ Team: **Dando 2000**	Logged By: **E Smith**
Termination Depth (mBGL): **25.45**	Elevation (mAD):	Driller: **CB/ BW**	Checked By: **J Wills**

Legend	Depth From/ To (mBGL)	Description	Depth and Thickness (mBGL) (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
		LONDON CLAY Firm grey sandy CLAY. Micaeous inclusion present in sand. Sand is fine with sub angular particles.		10.00-10.45	U	24	10.00-10.45	U 100% Recov	31 blows	
				10.50	D	25				
			11	11.00-11.45	SPT D	26	11.00-11.45	SPT N=23	3,4/5,6,6,6	
	11.50-25.15	LONDON CLAY Stiff grey slightly sandy micaceous fissured CLAY. Fissures are randomly orientated widely spaced smooth, undulating and clean. Micaceous inclusion present on firssured surfaces.	Thickness: 13.65	11.50	D	27				
			12	12.00-12.45	U	28	12.00-12.45	U 100% Recov	34 blows	
				12.50	D	29				
			13	13.00-13.45	SPT D	30	13.00-13.45	SPT N=18	3,4/3,5,4,6	
				13.50	D	31				
			14	14.00-14.45	U	32	14.00-14.45	U 100% Recov	54 blows	
				14.50	D	33				
			15	15.00-15.45	SPT D	34	15.00-15.45	SPT N=24	3,4/5,6,5,8	
				15.50	D	35				
			16							
				16.50-16.95 16.50-17.00	U B	36 37	16.50-16.95	U Recov NR	64 blows	
			17							
			18	18.00-18.45	SPT D	38	18.00-18.45	SPT N=25	4,4/6,5,7,7	
				18.50	D	39				
			19							
				19.50-19.95	U	40	19.50-19.95	U 80% Recov	74 blows	
			20							

Hand excavated pit to 1.20m bgl then hole advanced using cable percussive tools. Standpipe installed to 10 m bgl with slotted zone between 6 m bgl and 10 m bgl. Water strike at 1.8 m bgl when drilling,driller recorded as fast water flow. No water was was recorded next day 03/02/2023.

For explanation of abbreviations and legend refer to Key

GEOFIRMA
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

31 Daleham Gardens, London, NW3 5BU

BH1A

Start Date: **02/02/2023** | Eastings: | Drilled By: **Geofirma Ltd**

Finish Date: **03/02/2023** | Northings: | Drill Rig/ Team: **Dando 2000** | Logged By: **E Smith**

Termination Depth (mBGL): **25.45** | Elevation (mAD): | Driller: **CB/ BW** | Checked By: **J Wills**

Legend	Depth From/ To (mBGL)	Description	Depth and Thickness (mBGL) (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
		LONDON CLAY Stiff grey slightly sandy micaceous fissured CLAY. Fissures are randomly orientated widely spaced smooth, undulating and clean. Micaceous inclusion on present on firssured surfaces.		20.00	D	41				
			21	21.00-21.45	SPT D	42	21.00-21.45	SPT N=31	4,5/7,8,8,8	
				21.50	D	43				
			22							
				22.50-22.95	U	44	22.50-22.95	U 100% Recov	76 blows	
			23	23.00	D	45				
			24	24.00-24.45	SPT D	46	24.00-24.45	SPT N=34	4,5/7,8,9,10	
				24.50	D	47				
			25	25.00-25.45	U	48	25.00-25.45	U 100% Recov	70 blows	
	25.15-25.45	LONDON CLAY. Claystone band	Thickness: 0.30							

Hand excavated pit to 1.20m then hole advanced using cable percussive tools. Standpipe installed to 10 m bgl with slotted zone between 6 m bgl and 10 m bgl. . Water strike at 1.8 m bgl when drilling,driller recorded as fast water flow. No water was was recorded next day 03/02/2023.

For explanation of abbreviations and legend refer to Key

31 Daleham Gardens, London, NW3 5BU

BH2

Start Date: **01/02/2023**
Finish Date: **01/02/2023**
Termination Depth (mBGL): **15.50**

Eastings:
Northings:
Elevation (mAD):

Drilled By: **Geofirma Ltd**
Drill Rig/ Team: **Dando 2000**
Driller: **CB/ BW**

Logged By: **E Smith**
Checked By: **J Wills**

Exploratory Hole Progress, Details with Depth and General Remarks

Hole Depth (mBGL)	Hole Diameter (mm)	Casing Depth (mBGL)	Casing Diameter (mm)	Depth to Water (mBGL)	Comments
0.00	PIT	NA	NA	Dry	Hand-dug pit
1.00	150	NA	NA	Dry	SPT
1.50	150	NA	NA	Dry	Undisturbed sampling
2.50	150	NA	NA	Dry	SPT
3.50	150	2.50	150	Dry	Undisturbed sampling
4.50	150	2.50	150	Dry	SPT
5.00	150	2.50	150	Dry	Undisturbed sampling
6.00	150	2.50	150	Dry	SPT
7.00	150	2.50	150	Dry	Undisturbed sampling
8.00	150	2.50	150	Dry	SPT
9.00	150	2.50	150	Dry	Undisturbed sampling
10.00	150	2.50	150	Dry	SPT
11.00	150	2.50	150	Dry	Undisturbed sampling
12.00	150	2.50	150	Dry	SPT
13.00	150	2.50	150	Dry	Undisturbed sampling
14.00	150	2.50	150	Dry	SPT
15.00	150	2.50	150	Dry	Undisturbed sampling then end of hole @15.45m

Water Strikes

Depth of Strike (mBGL)	Depth of Casing (mBGL)	Date and Time	Post Strike Depth (mBGL)	Minutes After Strike	Sealed at (mBGL)	Remarks
						No groundwater encountered

Termination: 15.50m bgl. Geofirma specification met.

Groundwater: None encountered

Sampling: 0No. B, 16No. D, 3No. ES, 8No. SPTD, 8No. U.

Backfill: Slotted standpipe installed on completion. Refer to installation column on log.

Weather: Cold, sunny

Notes:

GEOFIRMA
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31 Daleham Gardens, London, NW3 5BU

BH2

Start Date: **01/02/2023**	Eastings:	Drilled By: **Geofirma Ltd**	
Finish Date: **01/02/2023**	Northings:	Drill Rig/ Team: **Dando 2000**	Logged By: **E Smith**
Termination Depth (mBGL): **15.50**	Elevation (mAD):	Driller: **CB/ BW**	Checked By: **J Wills**

Legend	Depth From/ To (mBGL)	Description	Depth and Thickness (mBGL) (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
	0.00-0.30	MADE GROUND Soft dark brown slightly gravelly sandy CLAY. Gravel is angular to rounded fine to coarse flint and brick. (TOPSOIL)	Thickness: 0.30	0.20	ES	1				
	0.30-0.90	MADE GROUND Soft brown slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to coarse flint and brick	Thickness: 0.60	0.50	ES	2				
	0.90-2.00	CLAYGATE MEMBER Soft light orangeish brown mottled grey slightly sandy CLAY. Sand is fine to medium.	Thickness: 1.10	1.00 1.00 1.00-1.45	D ES SPT D	3 4 5	1.00-1.45	SPT N=12	1,1/3,2,3,4	
				1.50-1.95	U	6	1.50-1.95	U 100% Recov	30 blows	
	2.00-3.00	CLAYGATE MEMBER Brown orangeish mottled grey clayey medium SAND	Thickness: 1.00	2	D	7				
				2.50-2.95	SPT D	8	2.50-2.95	SPT N=17	2,3/4,4,4,5	
	3.00-5.50	WEATHERED/REWORKED LONDON CLAY. Soft to firm light orange brown mottled grey slightly gravelly sandy CLAY. Sand is fine.	Thickness: 2.50	3.00	D	9				
				3.50-3.95	U	10	3.50-3.95	U 100% Recov	34 blows	
				4.00	D	11				
				4.50-4.95	SPT D	12	4.50-4.95	SPT N=10	2,1/2,3,2,3	
				5.00 5.00-5.45	D U	13 14	5.00-5.45	U 100% Recov	28 blows	
	5.50-8.00	LONDON CLAY Firm grey CLAY with sand inclusions. Sand is fine to medium.	Thickness: 2.50	5.50	D	15				
				6.00-6.45	SPT D	16	6.00-6.45	SPT N=11	1,2/3,2,3,3	
				6.50	D	17				
				7.00-7.45	U	18	7.00-7.45	U 100% Recov	35 blows	
				7.50	D	19				
	8.00-12.00	LONDON CLAY Firm becoming stiff fissured grey sandy CLAY. Sand is fine	Thickness: 4.00	8.00-8.45	SPT D	20	8.00-8.45	SPT N=17	3,3/3,4,5,5	
				8.50	D	21				
				9.00-9.45	U	22	9.00-9.45	U 60% Recov	20 blows	
				9.50	D	23				

Hand excavated pit to 1.20m then hole advanced using cable percussive tools. Standpipe installed to 6 m bgl with slotted zone between 2 m bgl and 6 m bgl.

For explanation of abbreviations and legend refer to Key

GEOFIRMA
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

31 Daleham Gardens, London, NW3 5BU

BH2

Start Date: **01/02/2023** | Eastings: | Drilled By: **Geofirma Ltd**

Finish Date: **01/02/2023** | Northings: | Drill Rig/ Team: **Dando 2000** | Logged By: **E Smith**

Termination Depth (mBGL): **15.50** | Elevation (mAD): | Driller: **CB/ BW** | Checked By: **J Wills**

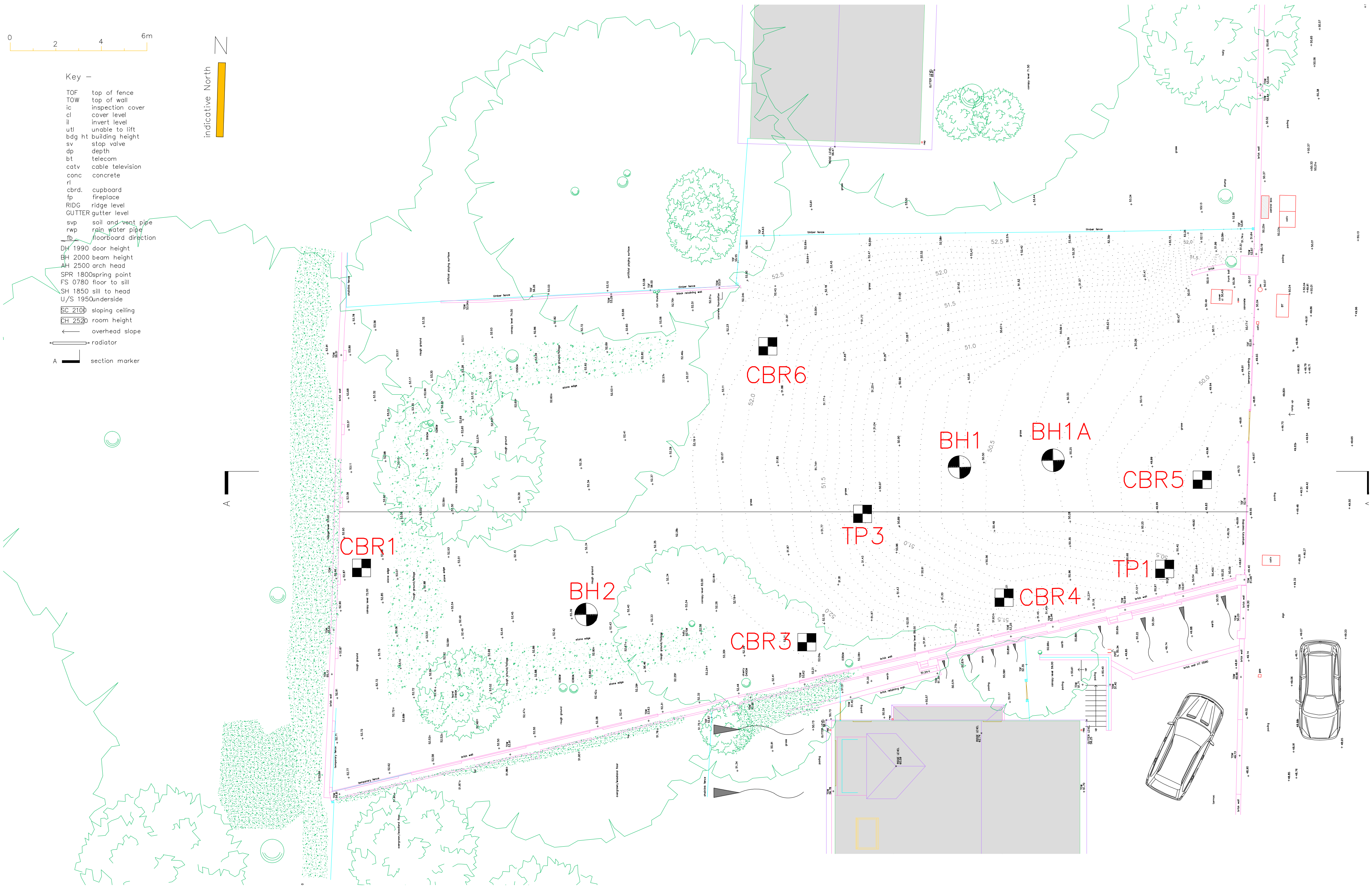
Legend	Depth From/ To (mBGL)	Description	Depth and Thickness (mBGL) (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
		LONDON CLAY.Firm becoming stiff fissured grey sandy CLAY. Sand is fine		10.00-10.45	SPT D	24	10.00-10.45	SPT N=20	3,3/4,5,5,6	
				10.50	D	25				
			11	11.00-11.45	U	26	11.00-11.45	U 100% Recov	42 blows	
				11.50	D	27				
	12.00-15.50	LONDON CLAY. Stiff slightly sandy fissured CLAY. Fissures are randomly orientated widely spaced smooth, undulating and clean. Micaeous inclusion present on fissured surfaces	Thickness: 3.50 12	12.00-12.45	SPT D	28	12.00-12.45	SPT N=26	2,5/4,6,8,8	
				12.50	D	29				
			13	13.00-13.45	U	30	13.00-13.45	U 100% Recov	56 blows	
				13.50	D	31				
			14	14.00-14.45	SPT D	32	14.00-14.45	SPT N=40	4,3/5,7,9,19	
				14.50	D	33				
			15	15.00-15.45	U	34	15.00-15.45	U 100% Recov	61 blows	

Hand excavated pit to 1.20m then hole advanced using cable percussive tools. Standpipe installed to 6 m bgl with slotted zone between 4 m bgl and 6 m bgl.

For explanation of abbreviations and legend refer to Key

APPENDIX B –

EXPLORATORY HOLE LOCATION PLAN



0 2 4 6m
indicative North
N
Key -
TOF top of fence
TOW top of wall
ic inspection cover
cl cover level
il invert level
utl unable to lift
bdg ht building height
sv stop valve
dp depth
bt telecom
catv cable television
conc concrete
rl
cbrd. cupboard
fp fireplace
RIDG ridge level
GUTTER gutter level
svp soil and vent pipe
rwp rain water pipe
fb floorboard direction
DH 1990 door height
BH 2000 beam height
AH 2500 arch head
SPR 1800 spring point
FS 0780 floor to sill
SH 1850 sill to head
U/S 1950 underside
SC 2100 sloping ceiling
CH 2520 room height
overhead slope
radiator
A section marker
CBR6
BH1
BH1A
CBR5
TP3
CBR1
BH2
TP1
CBR4
CBR3

APPENDIX C –

GEOTECHNICAL LABORATORY TEST RESULTS

K4 SOILS

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test type.

Job No.	Project Name	Programme	
32976	31 Daleham Gardens	Samples received	03/02/2023
		Schedule received	08/02/2023
Project No.	Client	Project started	09/02/2023
2023-002-SIM-DAL	Geofirma	Testing Started	15/02/2023

Hole No.	Sample Ref	Top (m)	Base (m)	Type	Soil Description	Test Type	Density bulk (Mg/m3)	Density dry (Mg/m3)	w (%)	Length (mm)	Diameter (mm)	σ3 (kPa)	At failure: Axial strain (%)	σ1 - σ3 (kPa)	cu (kPa)	Mode	Remarks
BH1A	-	10.00	10.45	U	High strength dark grey silty CLAY	UU	1.96	1.51	29	198	102	170	6.6	221	110	B	
BH1A	-	14.00	14.45	U	High strength dark grey silty CLAY with occasional pockets of sand and rare decomposed shell fragments	UU	2.03	1.58	28	198	102	250	5.1	226	113	B	
BH1A	-	19.50	19.94	U	High strength dark grey silty CLAY	UU	1.97	1.54	28	198	102	300	4.5	266	133	B	
BH1A	-	22.50	22.95	U	Dark grey silty CLAY with pockets of black slightly sandy peat with occasional wood fragments becoming @ 22.65 m very high strength dark grey silty CLAY	UU	2.02	1.57	29	198	102	330	6.1	355	177	B	Test carried out on silty CLAY section from 22.65m onwards
BH2	-	3.50	3.95	U	Medium strength brown mottled orangish brown sandy silty CLAY with occasional fmc sandstone fragments	UU	1.89	1.48	28	198	102	50	5.6	117	59	B	
BH2	-	5.00	5.45	U	Medium strength dark grey slightly mottled brown slightly fine sandy silty CLAY	UU	1.96	1.53	28	198	102	70	16	101	51	C	
BH2	-	11.00	11.45	U	High strength dark grey silty CLAY	UU	2.01	1.57	28	198	102	170	14	240	120	C	
BH2	-	15.00	15.45	U	High strength dark grey silty CLAY	UU	2.00	1.54	30	198	102	210	5.6	254	127	B	

Legend
UU - single stage test (single and multiple specimens)
UUM - Multistage test on a single specimen
suffix R - remoulded or recompacted

σ3 Cell pressure
σ1 - σ3 Maximum corrected deviator stress
cu Undrained shear strength, ½ (σ1 - σ3)

Mode of failure ; B - Brittle, P - Plastic, C - Compound

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: james@k4soils.com
Email: james@k4soils.com

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Checked and Approved
Initials: J.P
Date: 24/02/2023

MSF-5-R7b

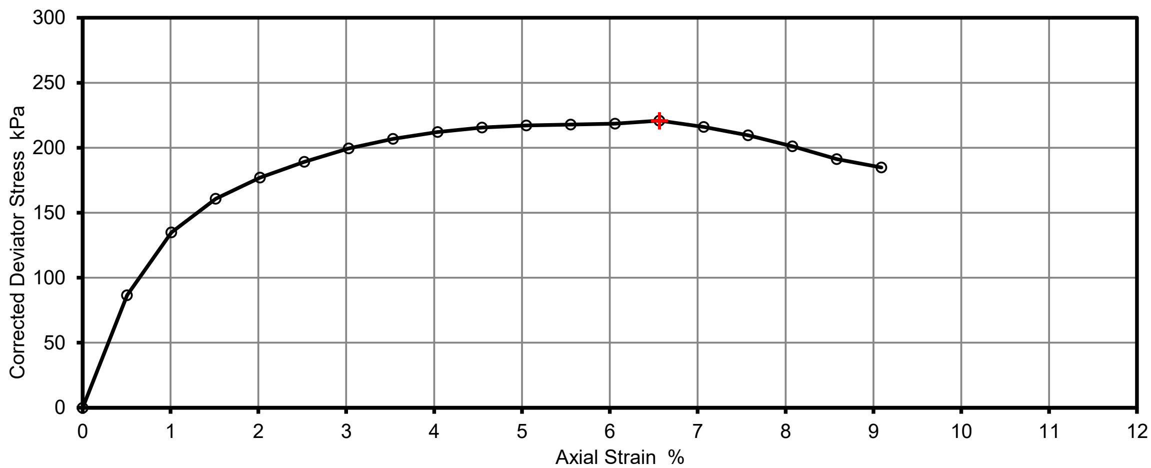
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**	Job Ref	32976
		Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL Client Geofirma	Depth Top	10.00 m
Soil Description	High strength dark grey silty CLAY	Depth Base	10.45 m
		Sample Type	U
		Samples received	03/02/2023
		Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	15/02/2023

Remarks

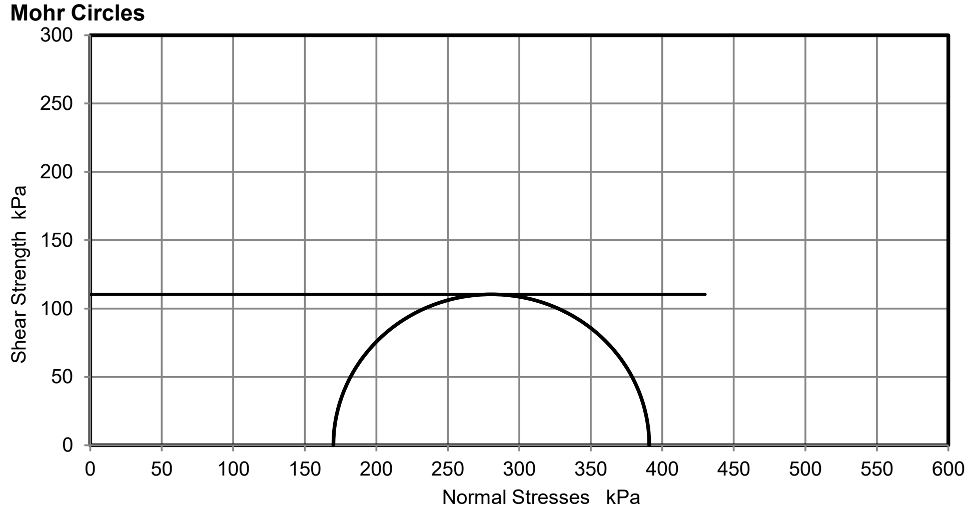
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.96	Mg/m3
Moisture Content	29	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	170	kPa
Axial Strain	6.6	%
Deviator Stress, (σ1 - σ3)f	221	kPa
Undrained Shear Strength, cu	110	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

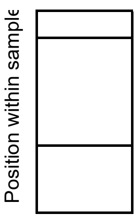
UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R7

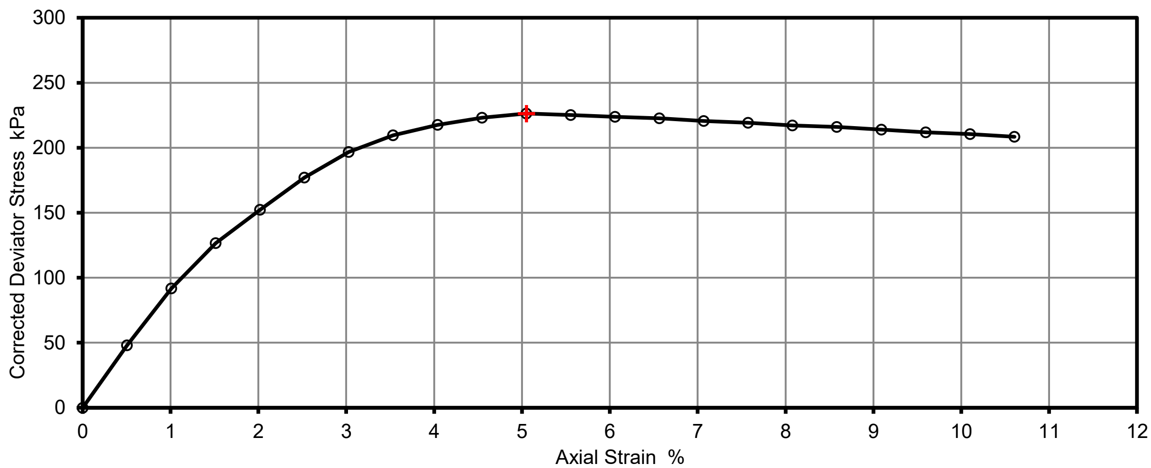
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**	Job Ref	32976
		Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL Client: Geofirma	Depth Top	14.00 m
Soil Description	High strength dark grey silty CLAY with occasional pockets of sand and rare decomposed shell fragments	Depth Base	14.45 m
		Sample Type	U
		Samples received	03/02/2023
		Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	15/02/2023

Remarks

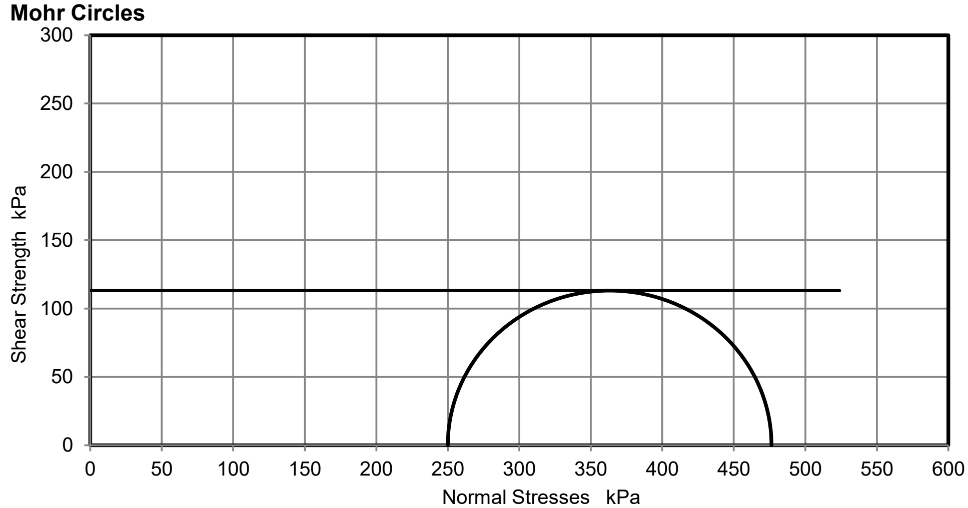


Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.03	Mg/m3
Moisture Content	28	%
Dry Density	1.58	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	250	kPa
Axial Strain	5.1	%
Deviator Stress, (σ1 - σ3)f	226	kPa
Undrained Shear Strength, cu	113	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

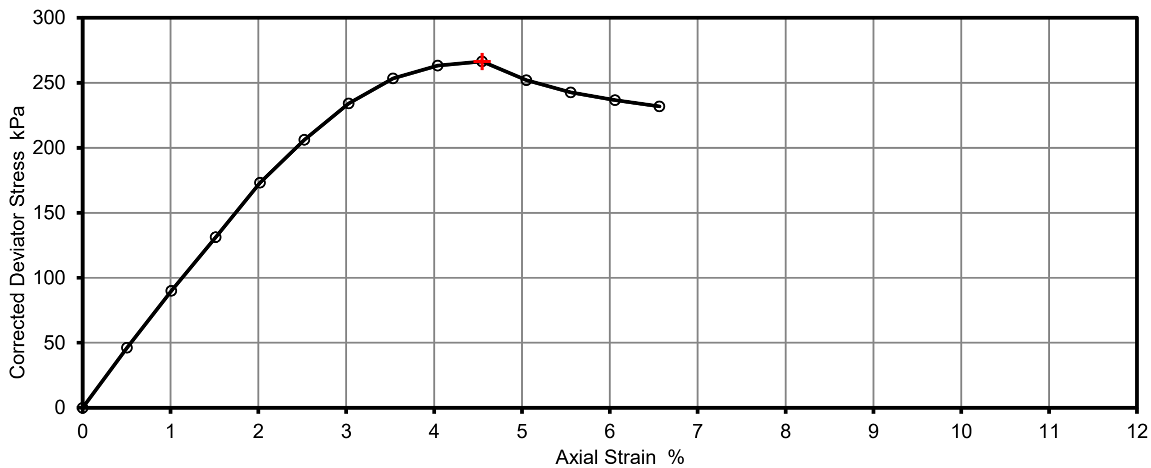
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**	Job Ref	32976
		Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL Client Geofirma	Depth Top	19.50 m
Soil Description	High strength dark grey silty CLAY	Depth Base	19.94 m
		Sample Type	U
		Samples received	03/02/2023
		Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	15/02/2023

Remarks

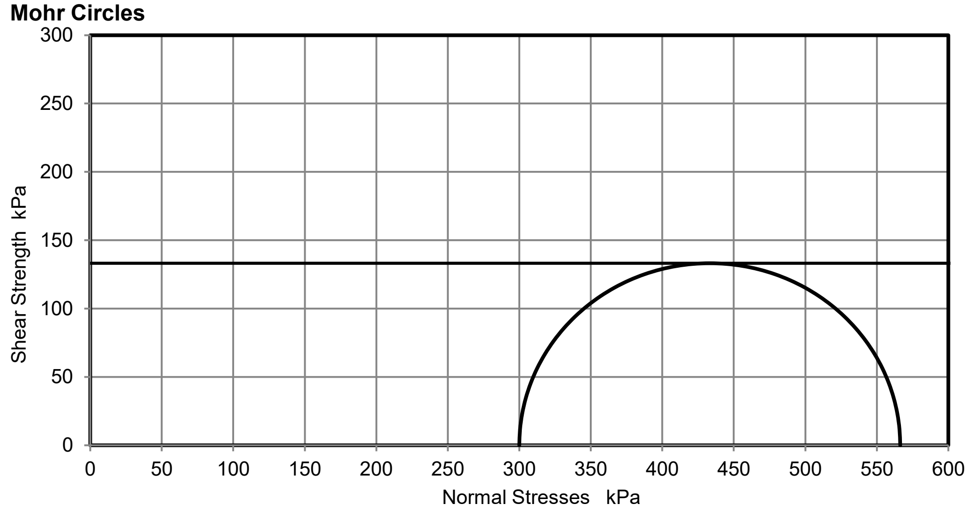
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.97	Mg/m3
Moisture Content	28	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	300	kPa
Axial Strain	4.5	%
Deviator Stress, (σ1 - σ3)f	266	kPa
Undrained Shear Strength, cu	133	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

UKAS TESTING 2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

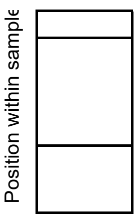
Checked and Approved
Initials: J.P
Date 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	22.50 m
Soil Description	Dark grey silty CLAY with pockets of black slightly sandy peat with occasional wood fragments becoming @ 22.65 m very high strength dark grey silty CLAY			Depth Base	22.95 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

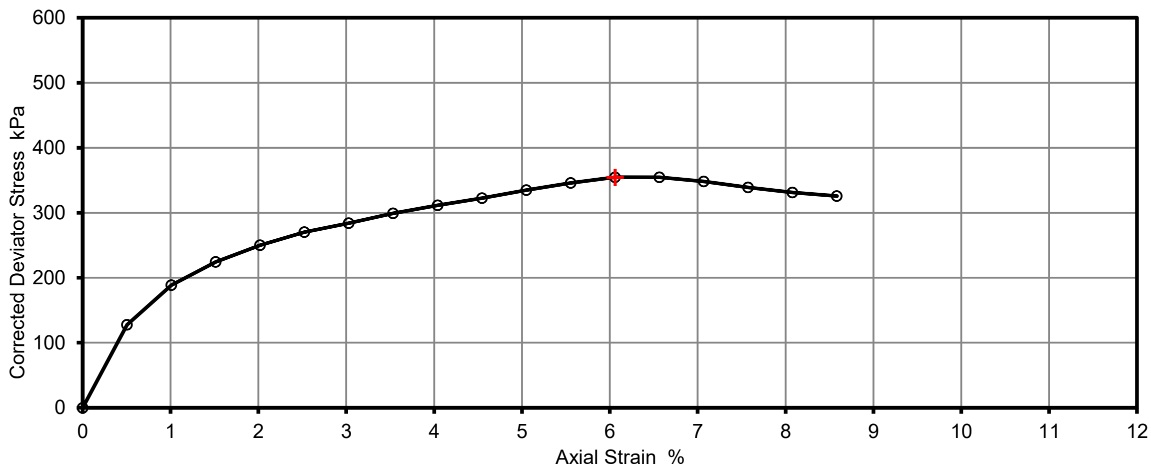
Remarks

Test carried out on silty CLAY section from 22.65m onwards

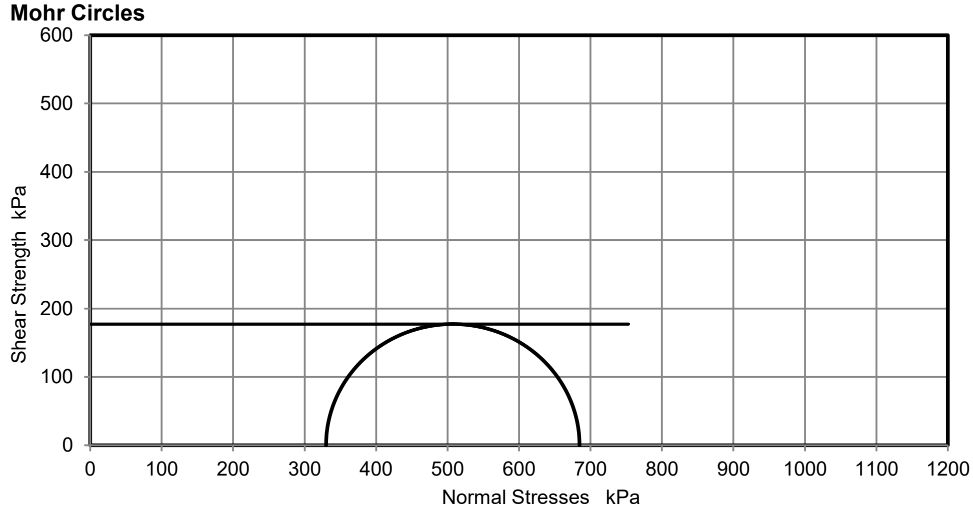


Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.02	Mg/m3
Moisture Content	28	%
Dry Density	1.57	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	330	kPa
Axial Strain	6.1	%
Deviator Stress, (σ1 - σ3)f	355	kPa
Undrained Shear Strength, cu	177	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

UKAS TESTING 2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

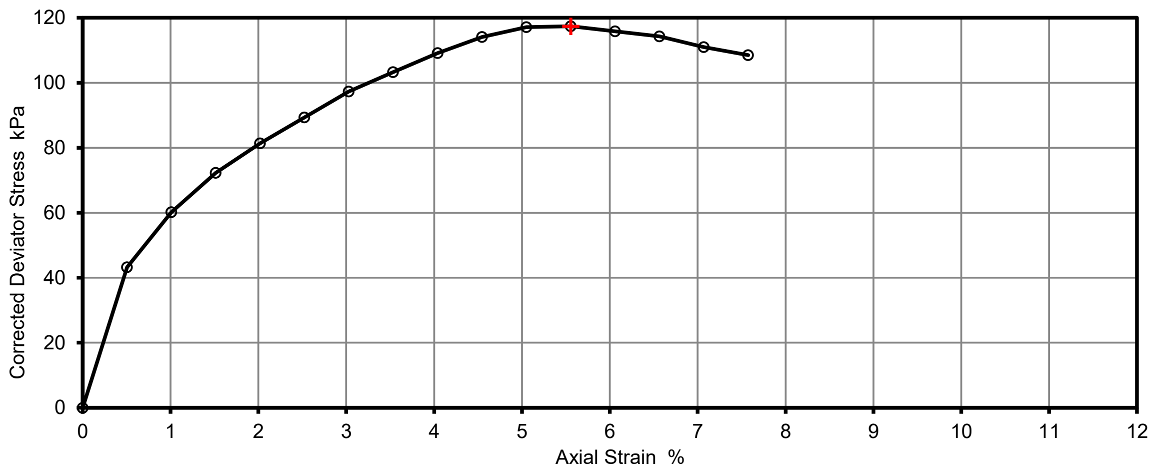
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	3.50 m
Soil Description	Medium strength brown mottled orangish brown sandy silty CLAY with occasional fmc sandstone fragments			Depth Base	3.95 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

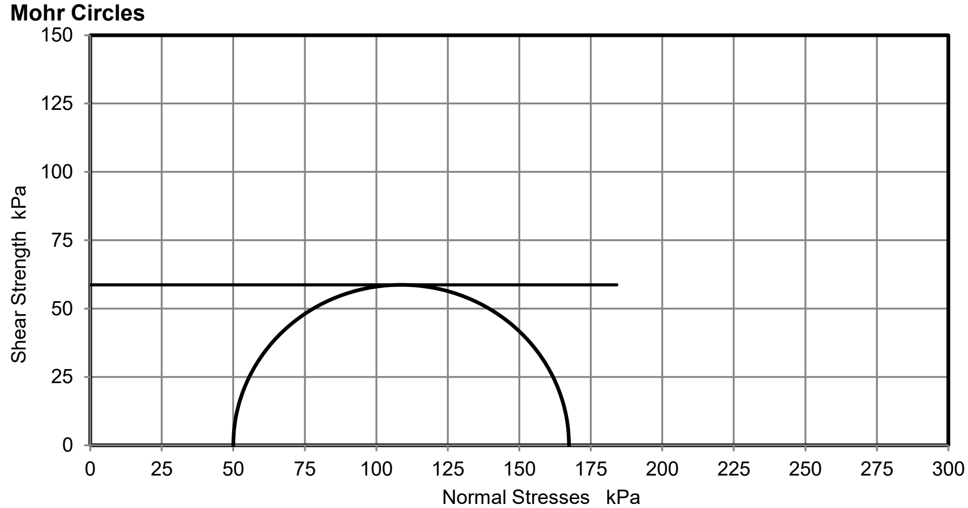
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.89	Mg/m3
Moisture Content	28	%
Dry Density	1.48	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	50	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	117	kPa
Undrained Shear Strength, cu	59	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

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UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

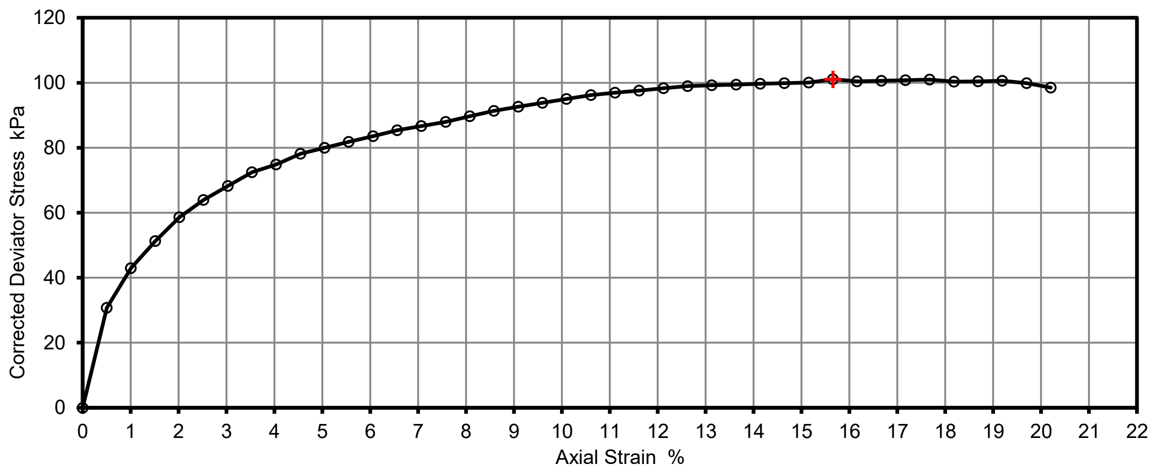
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	5.00 m
Soil Description	Medium strength dark grey slightly mottled brown slightly fine sandy silty CLAY			Depth Base	5.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

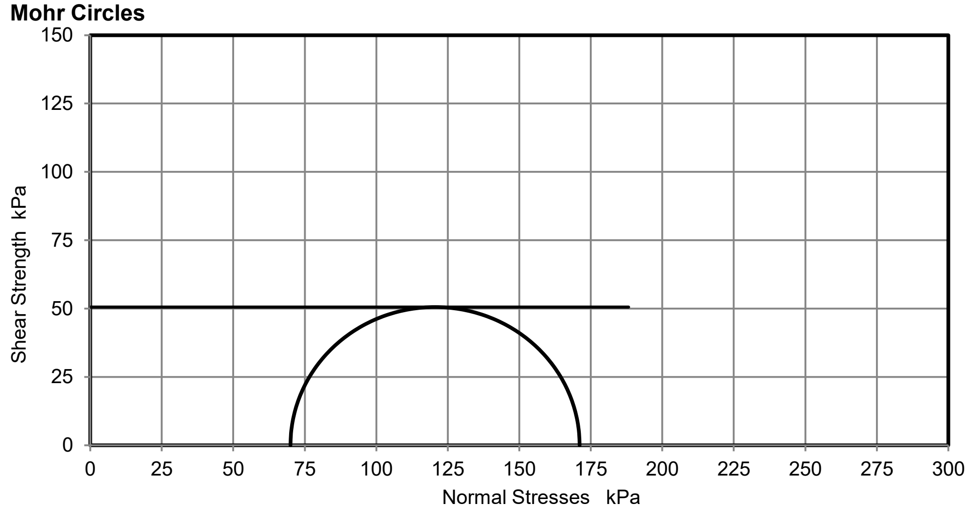
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.96	Mg/m3
Moisture Content	28	%
Dry Density	1.53	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	70	kPa
Axial Strain	16	%
Deviator Stress, (σ1 - σ3)f	101	kPa
Undrained Shear Strength, cu	51	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

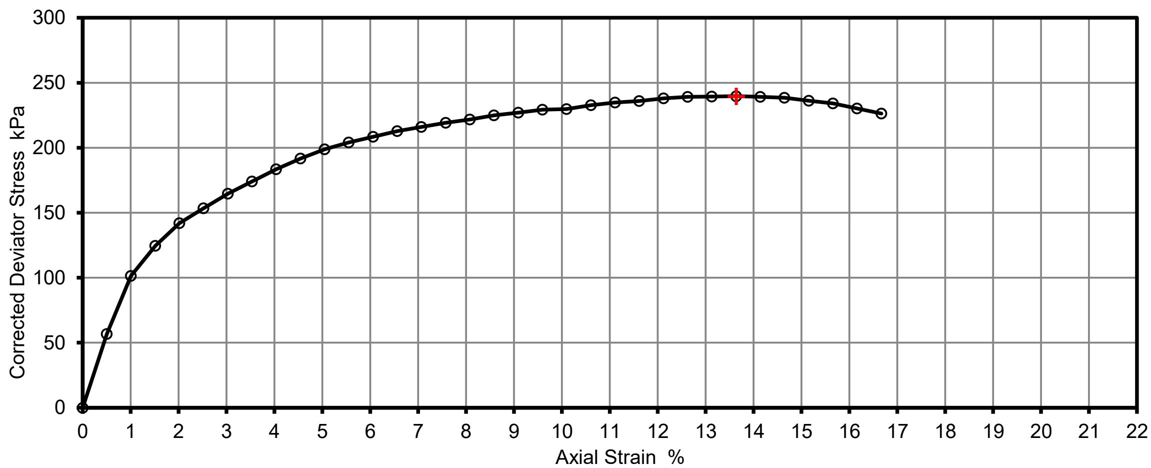
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	11.00 m
Soil Description	High strength dark grey silty CLAY			Depth Base	11.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

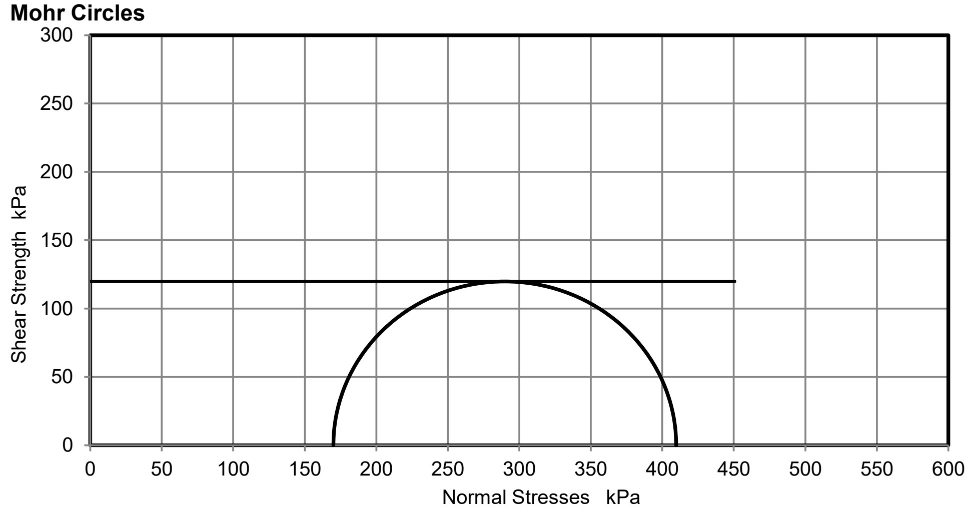
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.01	Mg/m3
Moisture Content	28	%
Dry Density	1.57	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	170	kPa
Axial Strain	14	%
Deviator Stress, (σ1 - σ3)f	240	kPa
Undrained Shear Strength, cu	120	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

UKAS TESTING 2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

These results only apply to the items tested. The report shall not be reproduced except in full without authority of the laboratory

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Checked and Approved
Initials: J.P
Date 24/02/2023

MSF-5 R7

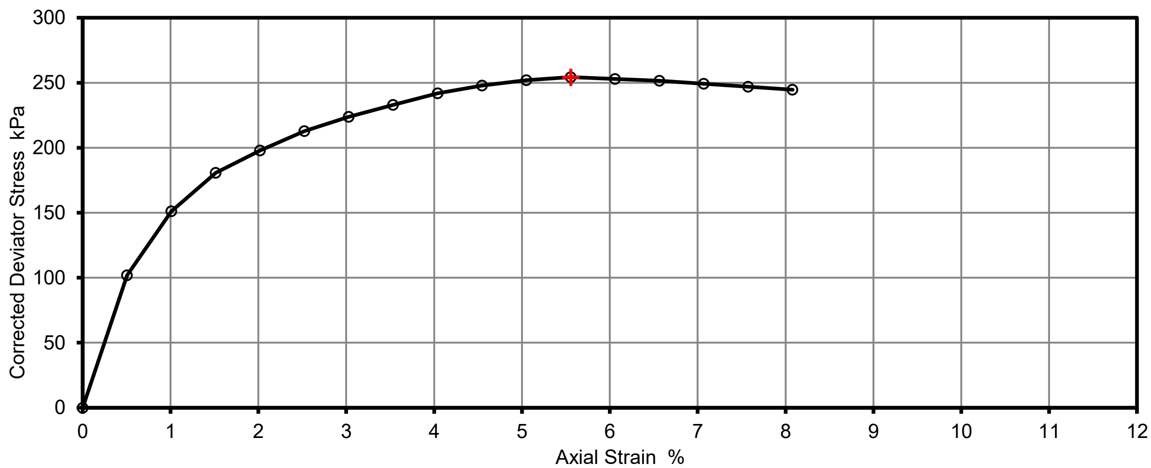
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	15.00 m
				Depth Base	15.45 m
Soil Description	High strength dark grey silty CLAY			Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

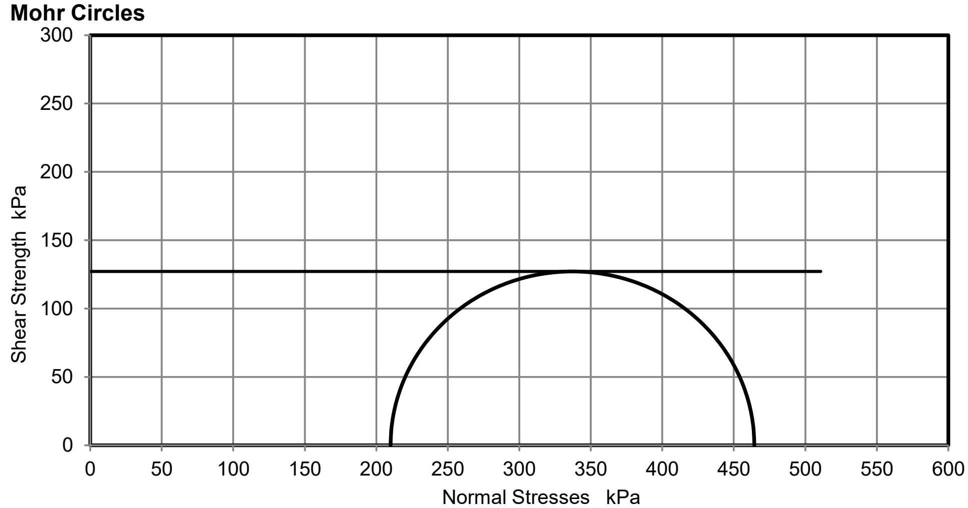
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.00	Mg/m3
Moisture Content	30	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	210	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	254	kPa
Undrained Shear Strength, cu	127	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



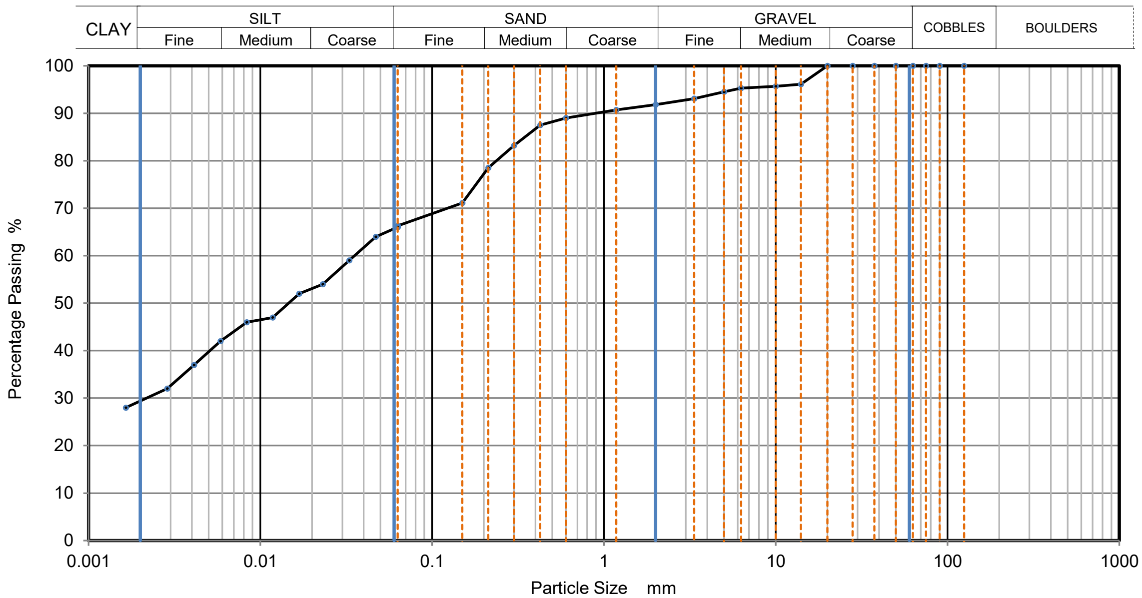
Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

PARTICLE SIZE DISTRIBUTION

Site Name	31 Daleham Gardens			Job Ref	32976
Project No.	2023-002-SIM-DAL	Client	Geofirma	Borehole/Pit No.	BH1A
Soil Description	Brown slightly gravelly slightly sandy silty CLAY with occasional fine carbonaceous deposits (gravel is fm concrete and pottery fragments)			Sample No.	-
				Depth Top	2.00 m
				Depth Base	- m
				Sample Type	D
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/02/2023
				Date tested	16/02/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	66
90	100	0.0469	64
75	100	0.0329	59
63	100	0.0231	54
50	100	0.0168	52
37.5	100	0.0118	47
28	100	0.0083	46
20	100	0.0058	42
14	96	0.0041	37
10	96	0.0029	32
6.3	95	0.0016	28
5	95		
3.35	93		
2	92		
1.18	91		
0.6	89	Particle density	(assumed)
0.425	88	2.70	Mg/m3
0.3	83		
0.212	79		
0.15	71		
0.063	66		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	8.2
Sand	25.4
Silt	37.3
Clay	29.1

Grading Analysis	
D100 mm	
D60 mm	0.0353
D30 mm	0.00224
D10 mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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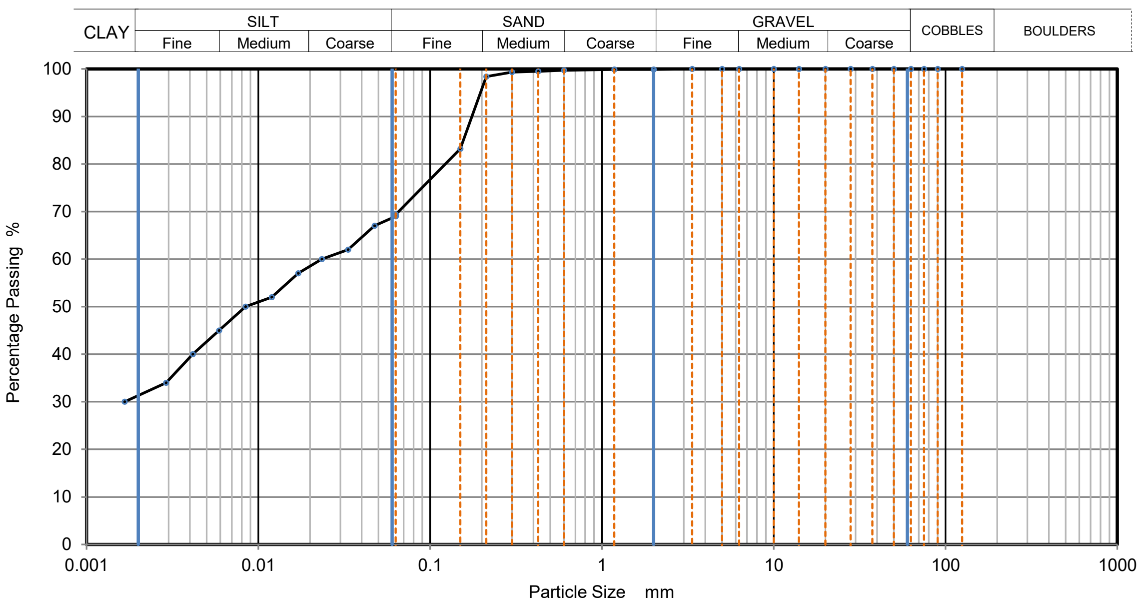
	# PARTICLE SIZE DISTRIBUTION	Job Ref	32976
		Borehole/Pit No.	BH1A

Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	6.00 m
Soil Description	Dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments			Depth Base	6.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/02/2023
				Date tested	17/02/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	69
90	100	0.0474	67
75	100	0.0333	62
63	100	0.0234	60
50	100	0.0170	57
37.5	100	0.0120	52
28	100	0.0084	50
20	100	0.0059	45
14	100	0.0041	40
10	100	0.0029	34
6.3	100	0.0017	30
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.70	Mg/m3
0.3	99		
0.212	98		
0.15	83		
0.063	69		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.1
Sand	30.5
Silt	38.2
Clay	31.2

Grading Analysis	
D100 mm	
D60 mm	0.025
D30 mm	0.00175
D10 mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: J.P

Date: 24/02/2023

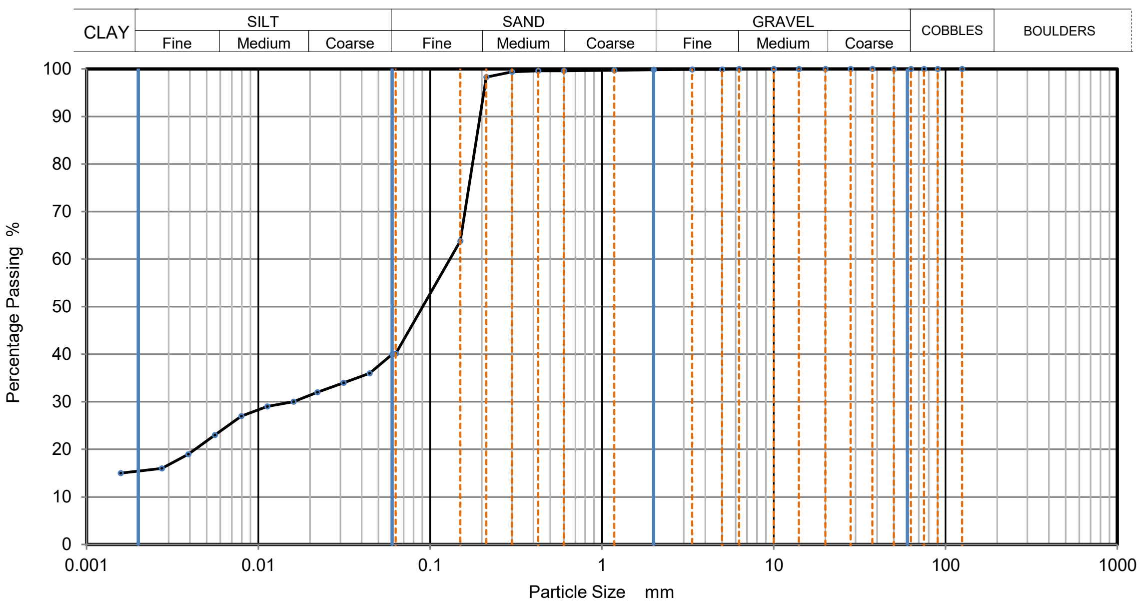
UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

K4 SOILS	**PARTICLE SIZE DISTRIBUTION**			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	1.50 m
Soil Description	Brown, light grey and orangish brown fine sandy silty CLAY with rare intrusion of black possiby carbonaceous deposit			Depth Base	1.95 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/02/2023
				Date tested	17/02/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0603	40
90	100	0.0445	36
75	100	0.0313	34
63	100	0.0220	32
50	100	0.0160	30
37.5	100	0.0113	29
28	100	0.0079	27
20	100	0.0056	23
14	100	0.0039	19
10	100	0.0027	16
6.3	100	0.0016	15
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.70	Mg/m3
0.3	99		
0.212	98		
0.15	64		
0.063	40		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.2
Sand	59.6
Silt	25.1
Clay	15.1

Grading Analysis	
D100 mm	
D60 mm	0.13
D30 mm	0.0147
D10 mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks

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Date: 24/02/2023

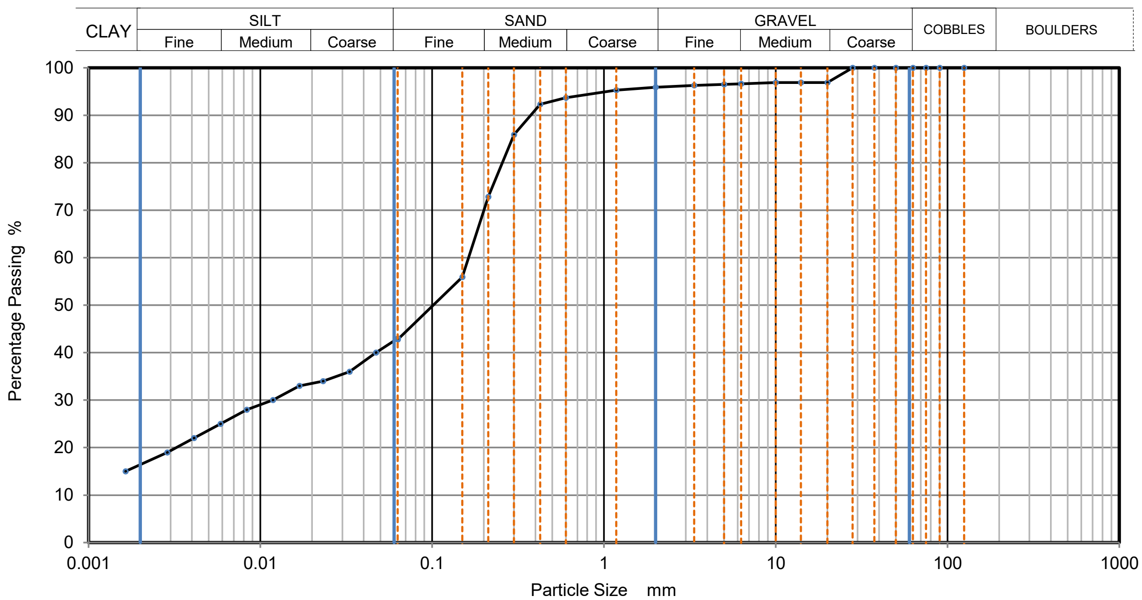
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	31 Daleham Gardens			Job Ref	32976
Project No.	2023-002-SIM-DAL	Client	Geofirma	Borehole/Pit No.	BH2
Soil Description	Medium strength brown mottled orangish brown sandy silty CLAY with occasional fmc sandstone fragments			Sample No.	-
				Depth Top	3.50 m
				Depth Base	3.95 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/02/2023
				Date tested	17/02/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	43
90	100	0.0471	40
75	100	0.0330	36
63	100	0.0232	34
50	100	0.0169	33
37.5	100	0.0118	30
28	100	0.0083	28
20	97	0.0058	25
14	97	0.0041	22
10	97	0.0029	19
6.3	97	0.0016	15
5	97		
3.35	96		
2	96		
1.18	95		
0.6	94	Particle density	(assumed)
0.425	92	2.70	Mg/m3
0.3	86		
0.212	73		
0.15	56		
0.063	43		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	4.1
Sand	53.1
Silt	26.5
Clay	16.3

Grading Analysis		
D100	mm	
D60	mm	0.163
D30	mm	0.0123
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Email: james@k4soils.com
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Date: 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

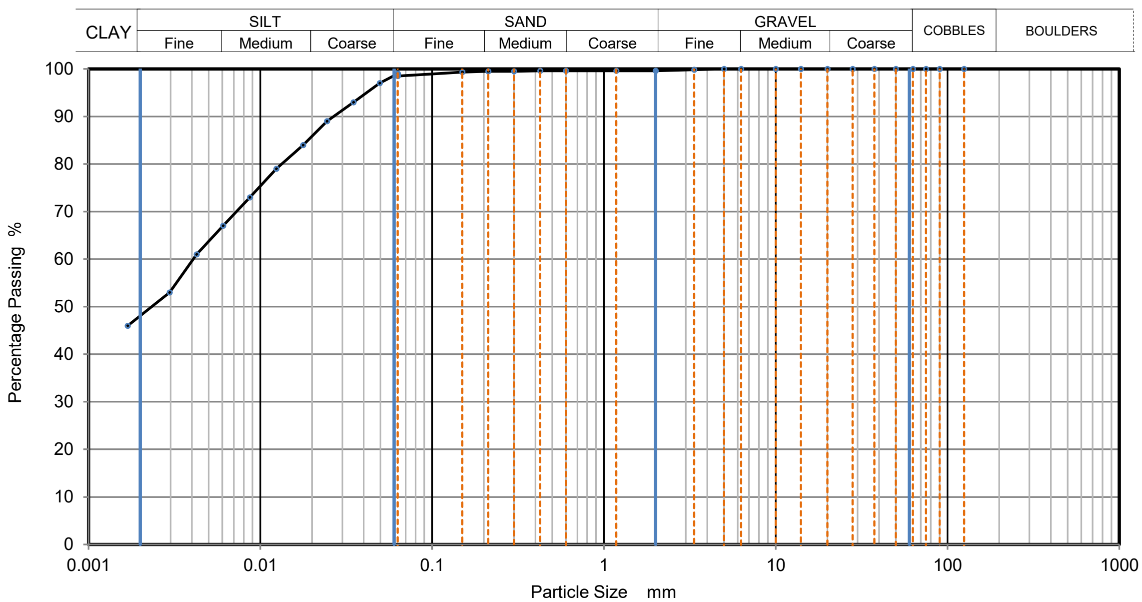
MSF-5-R3

PARTICLE SIZE DISTRIBUTION

K4 SOILS

				Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	13.00 m
Soil Description	Dark grey silty CLAY			Depth Base	13.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/02/2023
				Date tested	17/02/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	99
90	100	0.0494	97
75	100	0.0348	93
63	100	0.0244	89
50	100	0.0177	84
37.5	100	0.0124	79
28	100	0.0087	73
20	100	0.0061	67
14	100	0.0043	61
10	100	0.0030	53
6.3	100	0.0017	46
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.70	Mg/m3
0.3	100		
0.212	100		
0.15	99		
0.063	99		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.4
Sand	1.1
Silt	50.4
Clay	48.1

Grading Analysis	
D100 mm	
D60 mm	0.00411
D30 mm	
D10 mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks

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Email: james@k4soils.com
Tel: 01923 711288

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Initials: **J.P**

Date: 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
32976	31 Daleham Gardens	Samples received	03/02/2023
		Schedule received	08/02/2023
Project No.	**Client**	Project started	09/02/2023
2023-002-SIM-DAL	Geofirma	Testing Started	21/02/2023

Hole No.	Sample Ref	Sample Top m	Sample Base m	Sample Type	Soil Description	NMC %	Passing 425µm %	LL %	PL %	PI %	Remarks
BH1A	-	1.00	-	D	Greyish brown slightly sandy gravelly silty CLAY with slag and pottery fragments (gravel is fmc and angular to sub-angular)	28					
BH1A	-	1.50	-	D	Brownish grey silty CLAY with frequent lenses of yellowish brown silt	28					
BH1A	-	2.00	-	D	Brown slightly gravelly slightly sandy silty CLAY with occasional fine carbonaceous deposits (gravel is fm concrete and pottery fragments)	37	88	50	17	33	Sample washed to obtain test fraction
BH1A	-	3.00	-	D	Greyish brown slightly sandy silty CLAY with brick fragments and rare fmc sub-angular and tabular gravel	38					
BH1A	-	3.50	-	D	Grey silty CLAY	31					
BH1A	-	5.00	-	D	Grey silty CLAY with rare fine sub-angular gravel	28	98	51	18	33	
BH1A	-	6.00	6.45	U	Dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments	29	100	49	16	33	
BH1A	-	10.00	10.45	U	High strength dark grey silty CLAY	29					
BH1A	-	14.00	14.45	U	High strength dark grey silty CLAY with occasional pockets of sand and rare decomposed shell fragments	28					
BH1A	-	19.50	19.94	U	High strength dark grey silty CLAY	28					
BH1A	-	22.50	22.95	U	Dark grey silty CLAY with pockets of black slightly sandy peat with occasional wood fragments becoming @ 22.65 m very high strength dark grey silty CLAY	28					
BH2	-	1.00	-	D	Orangish brown fine sandy silty CLAY with traces of roots and rootlets	28	100	43	18	25	

UKAS TESTING
2519

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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Watford Herts WD18 9RU

Tel: 01923 711 288
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Initials J.P
Date: 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
32976	31 Daleham Gardens	Samples received	03/02/2023
		Schedule received	08/02/2023
Project No.	Client	Project started	09/02/2023
2023-002-SIM-DAL	Geofirma	Testing Started	21/02/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH2	-	1.50	1.95	U	Brown, light grey and orangish brown fine sandy silty CLAY with rare intrusion of black possiby carbonaceous deposit	15					
BH2	-	2.00	-	D	Yellowish brown slightly sandy very silty CLAY	16					
BH2	-	2.50	-	D	Brownish grey silty CLAY with frequent lenses of yellowish brown silt	21					
BH2	-	3.00	-	D	Orangish brown and occasional grey fine sandy silty CLAY	19	100	47	18	29	
BH2	-	3.50	3.95	U	Medium strength brown mottled orangish brown sandy silty CLAY with occasional fmc sandstone fragments	27					
BH2	-	4.00	-	D	Brown slightly sandy very silty CLAY	27					
BH2	-	5.00	5.45	U	Medium strength dark grey slightly mottled brown slightly fine sandy silty CLAY	28	100	54	18	36	
BH2	-	11.00	11.45	U	High strength dark grey silty CLAY	28					
BH2	-	15.00	15.45	U	High strength dark grey silty CLAY	30					

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

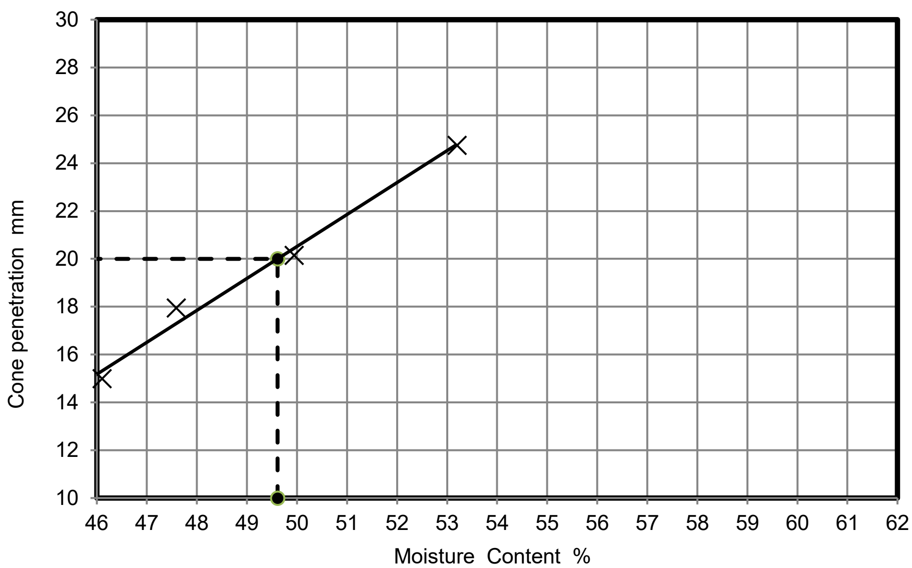
Checked and Approved
Initials J.P
Date: 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R1

	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX	Job No.	32976
		Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL Client Geofirma	Depth Top	2.00 m
Soil Description	Brown slightly gravelly slightly sandy silty CLAY with occasional fine carbonaceous deposits (gravel is fm concrete and pottery fragments)	Depth Base	- m
		Sample Type	D
		Samples received	03/02/2023
		Schedules received	08/02/2023
		Project Started	09/02/2023
		Date Tested	21/02/2023

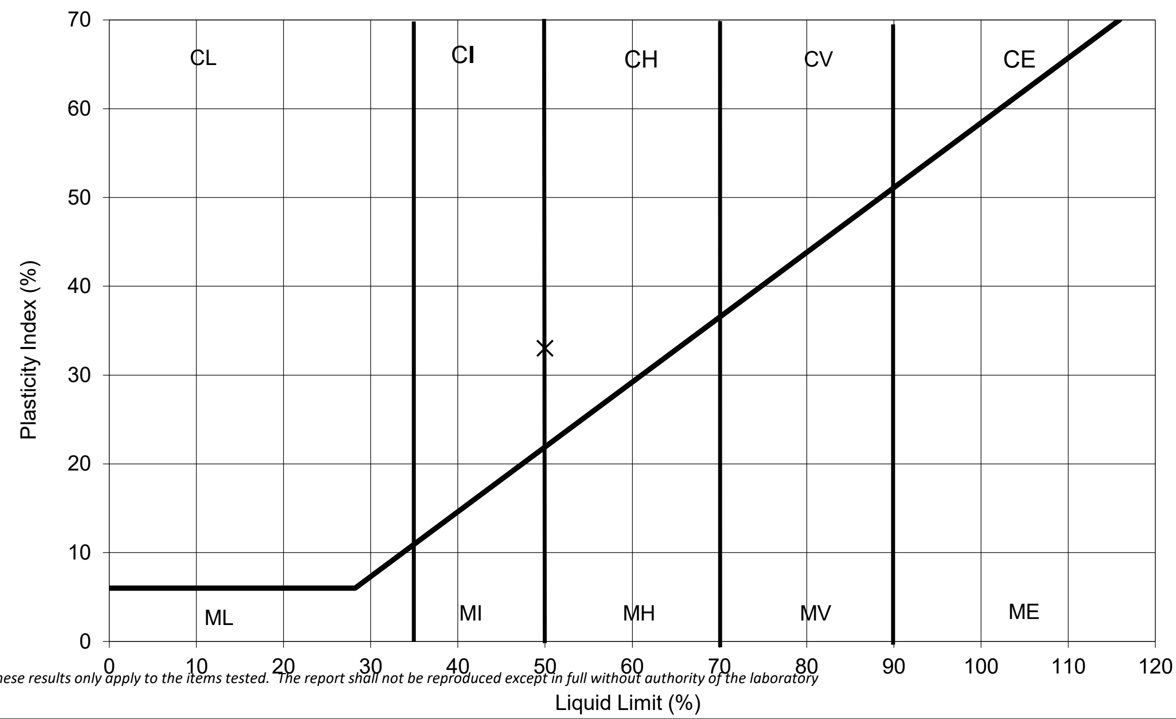


NATURAL MOISTURE CONTENT	37	%
% PASSING 425µm SIEVE	88	%
LIQUID LIMIT	50	%
PLASTIC LIMIT	17	%
PLASTICITY INDEX	33	%

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



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TEST METHOD
BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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Tel: 01923 711 288 Email: James@k4soils.com

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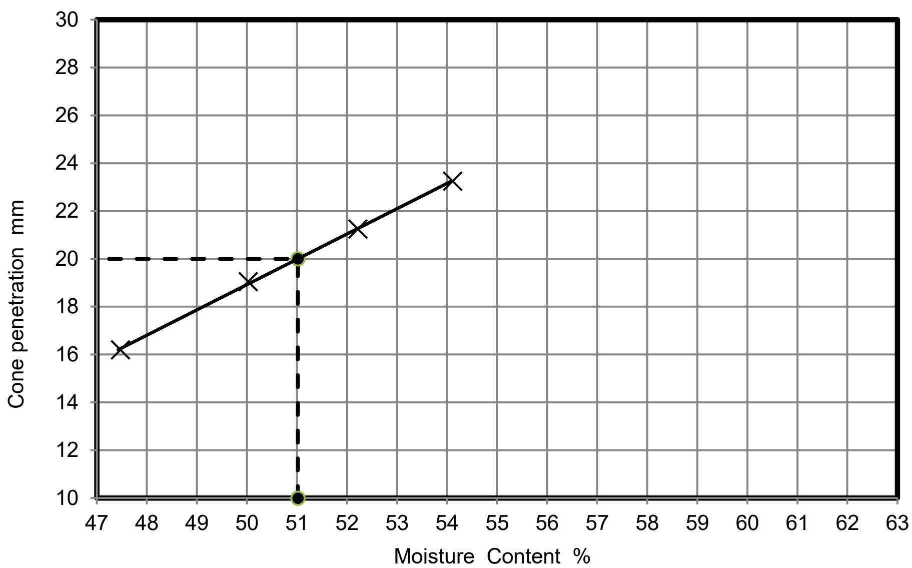
UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

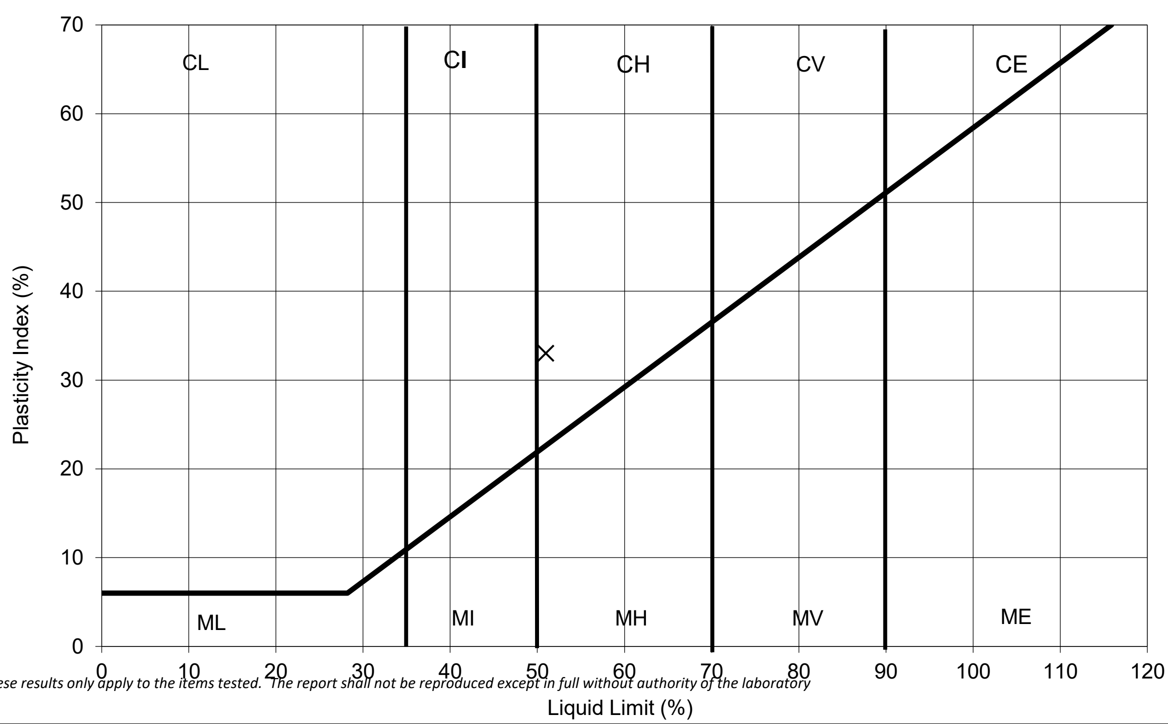
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	32976
				Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	5.00 m
Soil Description	Grey silty CLAY with rare fine sub-angular gravel			Depth Base	- m
				Sample Type	D
				Samples received	03/02/2023
				Schedules received	08/02/2023
				Project Started	09/02/2023
				Date Tested	21/02/2023



NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**98**	**%**
LIQUID LIMIT	**51**	**%**
PLASTIC LIMIT	**18**	**%**
PLASTICITY INDEX	**33**	**%**

Remarks

PLASTICITY INDEX



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UKAS TESTING

TEST METHOD
BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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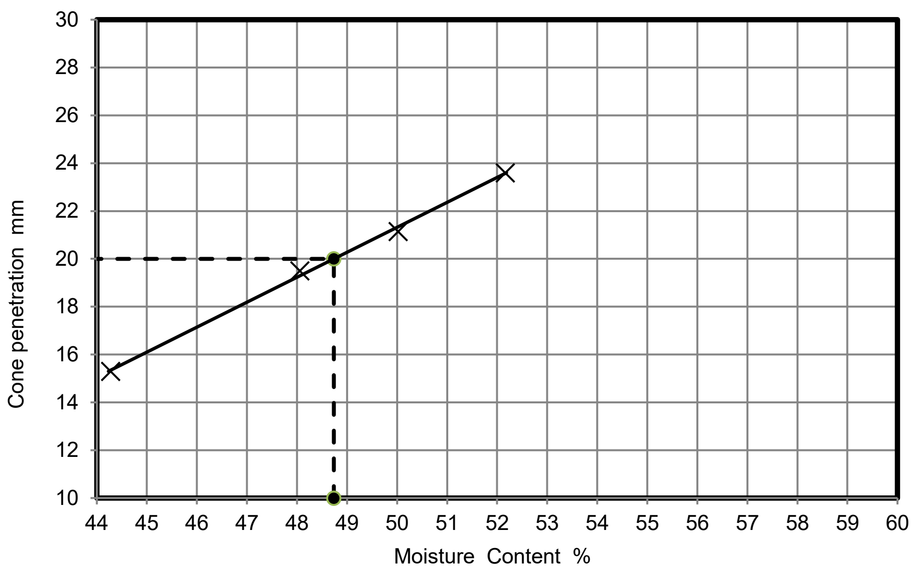
Tel: 01923 711 288 Email: James@k4soils.com

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

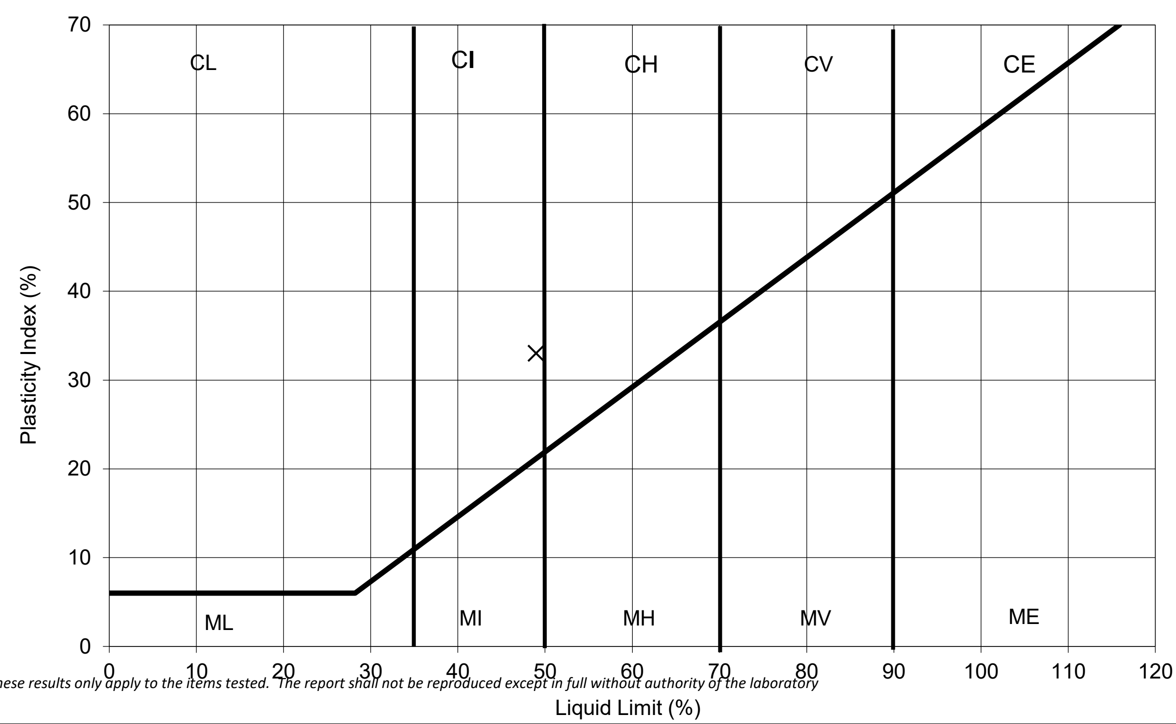
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	32976
				Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	6.00 m
Soil Description	Dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments			Depth Base	6.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
				Project Started	09/02/2023
				Date Tested	21/02/2023



NATURAL MOISTURE CONTENT	**29**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**49**	**%**
PLASTIC LIMIT	**16**	**%**
PLASTICITY INDEX	**33**	**%**

Remarks

PLASTICITY INDEX



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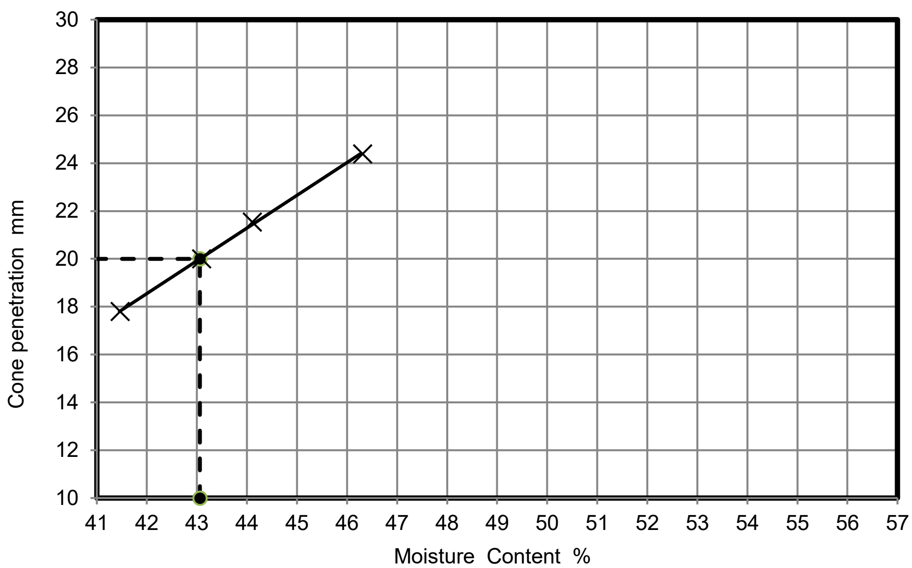
UKAS TESTING	**TEST METHOD** BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying	**Checked and Approved** Initials: J.P
	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com	Date: 24/02/2023
2519	*Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)*	MSF-5 R2

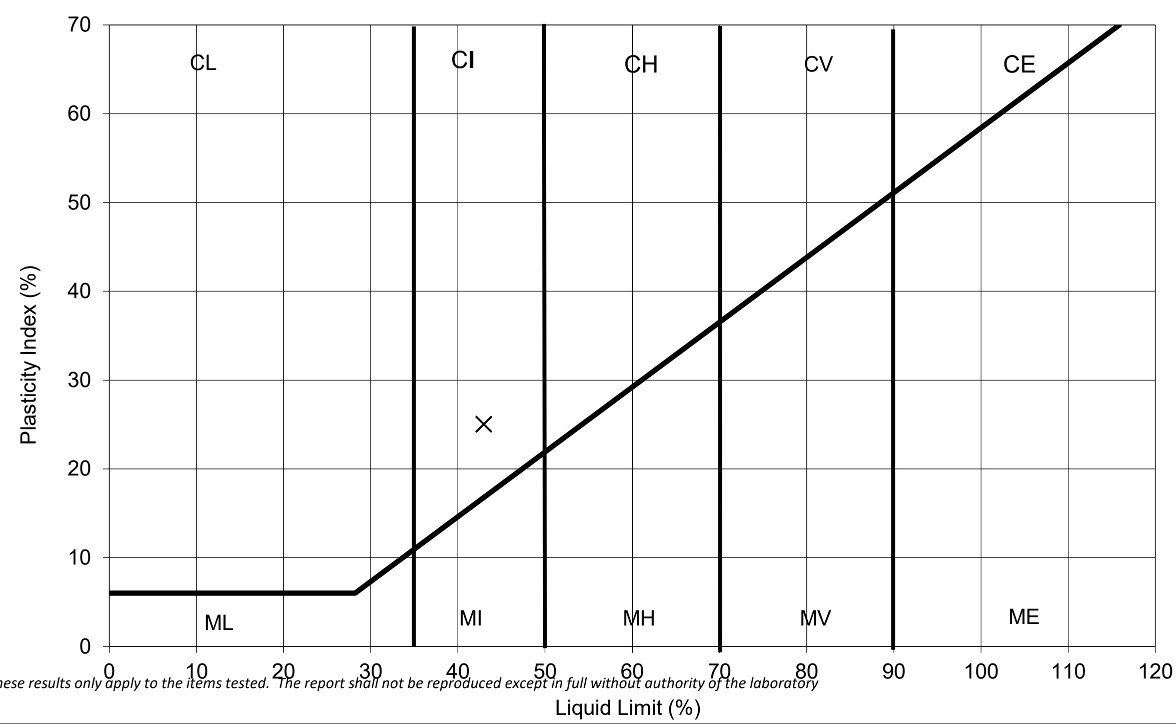
K4 SOILS	**LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX**	Job No.	32976
		Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL Client Geofirma	Depth Top	1.00 m
		Depth Base	- m
		Sample Type	D
Soil Description	Orangish brown fine sandy silty CLAY with traces of roots and rootlets	Samples received	03/02/2023
		Schedules received	08/02/2023
		Project Started	09/02/2023
		Date Tested	21/02/2023



NATURAL MOISTURE CONTENT	**28**	%
% PASSING 425µm SIEVE	**100**	%
LIQUID LIMIT	**43**	%
PLASTIC LIMIT	**18**	%
PLASTICITY INDEX	**25**	%

Remarks

PLASTICITY INDEX



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TEST METHOD
BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
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UKAS TESTING 2519

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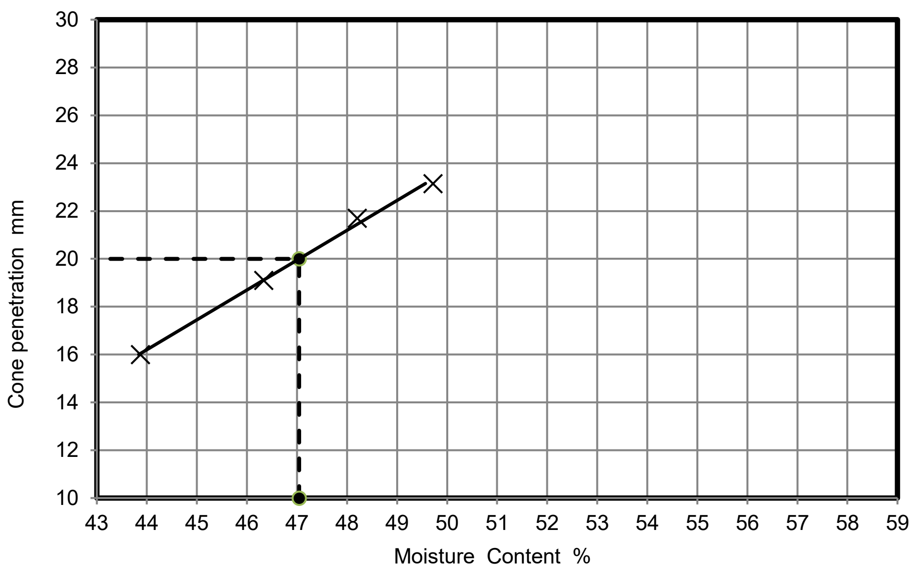
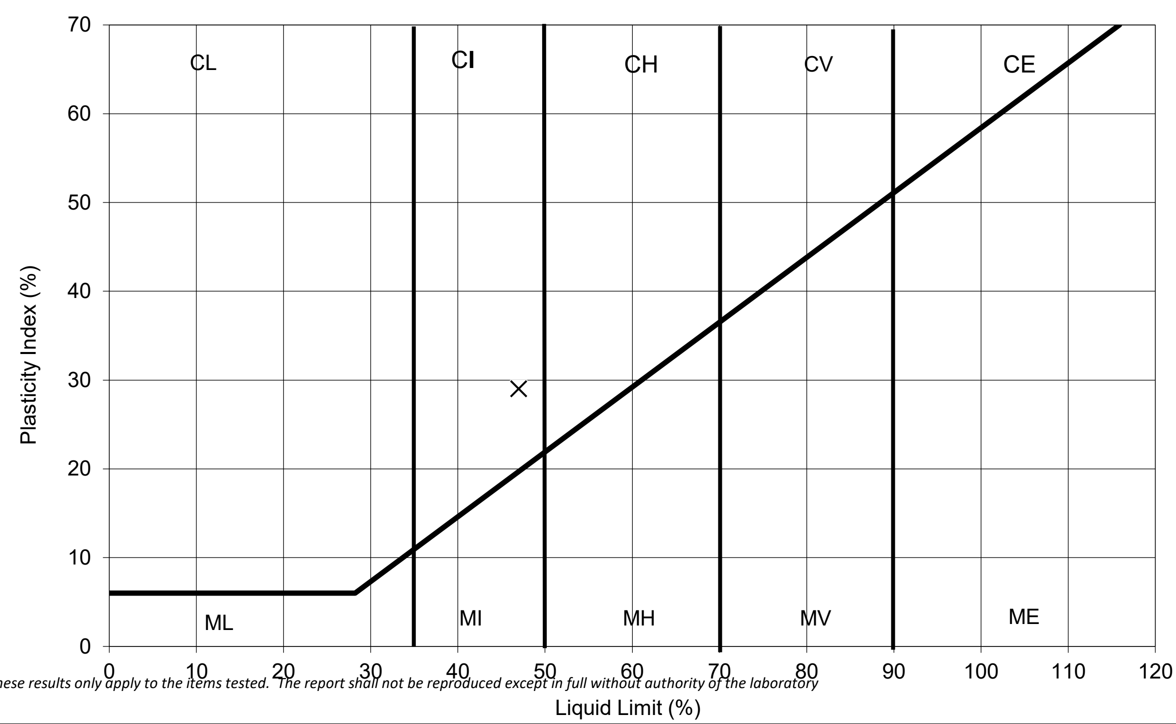
K4 SOILS	**LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX**			Job No.	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	3.00 m
Soil Description	Orangish brown and occasional grey fine sandy silty CLAY			Depth Base	- m
				Sample Type	D
				Samples received	03/02/2023
				Schedules received	08/02/2023
				Project Started	09/02/2023
				Date Tested	21/02/2023



NATURAL MOISTURE CONTENT	**19**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**47**	**%**
PLASTIC LIMIT	**18**	**%**
PLASTICITY INDEX	**29**	**%**

Remarks

PLASTICITY INDEX



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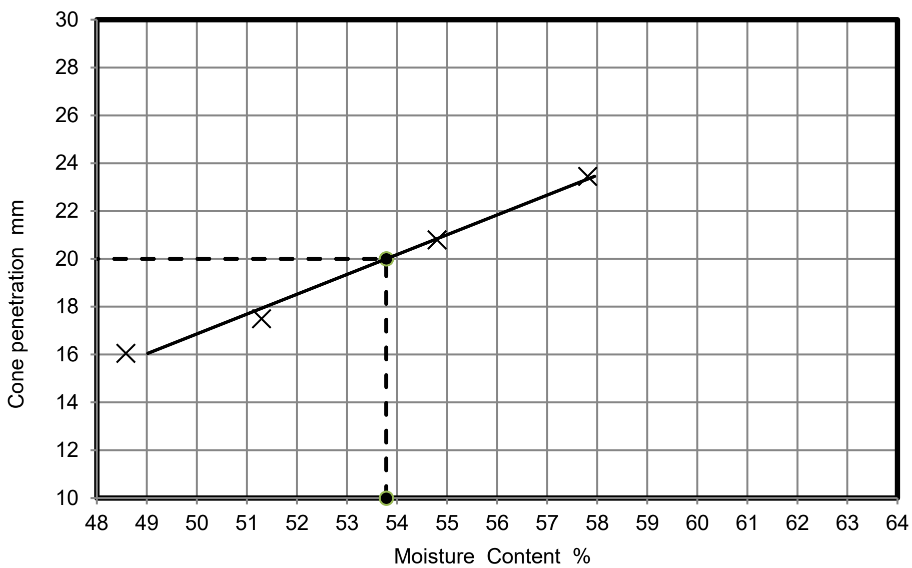
UKAS TESTING	**TEST METHOD** BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying	**Checked and Approved** Initials: J.P
	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com	Date: 24/02/2023
2519	*Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)*	MSF-5 R2

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

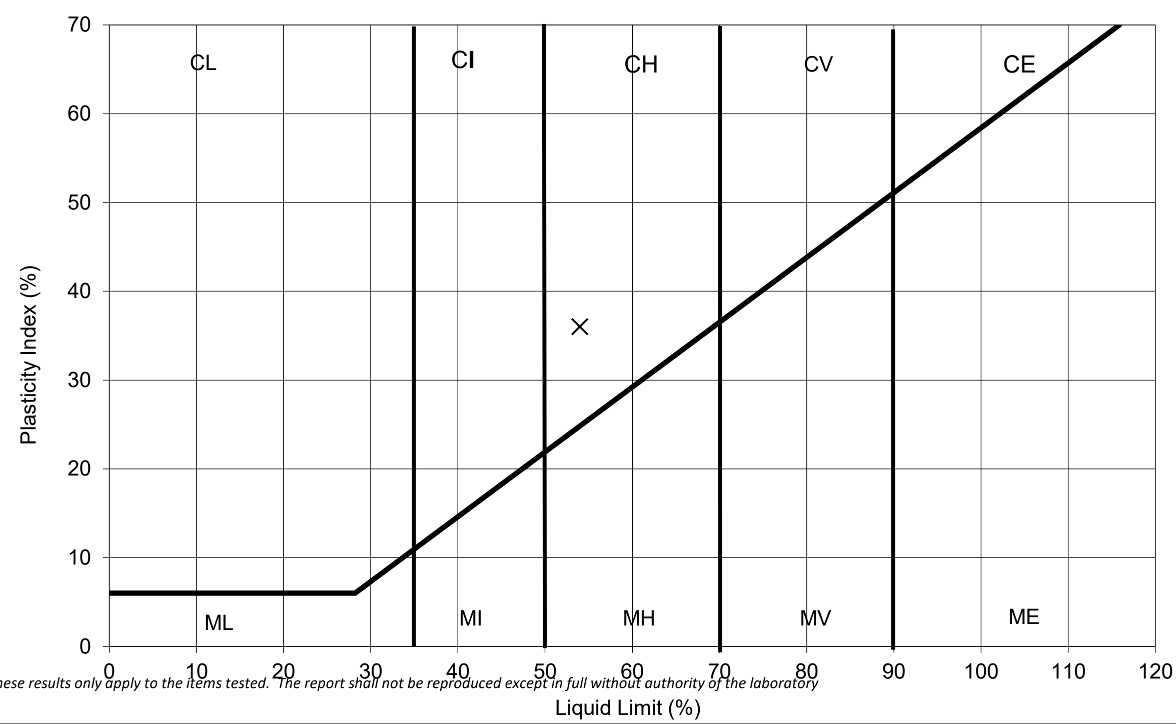
K4 SOILS	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	5.00 m
Soil Description	Medium strength dark grey slightly mottled brown slightly fine sandy silty CLAY			Depth Base	5.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
				Project Started	09/02/2023
				Date Tested	21/02/2023



NATURAL MOISTURE CONTENT	28	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	54	%
PLASTIC LIMIT	18	%
PLASTICITY INDEX	36	%

Remarks

PLASTICITY INDEX



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UKAS TESTING	**TEST METHOD** BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying	**Checked and Approved** Initials: J.P
	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com	Date: 24/02/2023
2519	*Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)*	MSF-5 R2

APPENDIX D –

INSITU CBR TEST RESULTS

K4 SOILS	In Situ California Bearing Ratio (CBR)			Job Ref	32972
				CBR No.	CBR1
Site Name	31 Daleham Gardens, Finchley, London, NW3 5BU			Depth m	0.30
Project No.	2023-002-SIM-DAL	Client	Geofirma	Date of Test	02/02/2023
Soil Description	Brown slightly sandy silty CLAY with occasional rootlets and traces of fine brick fragments				
Test Method	BS1377 : Part 9 : 1990, clause 4.3			CBR Test Number	1

Note: Test only applicable when maximum particle size beneath the plunger does not exceed 20mm

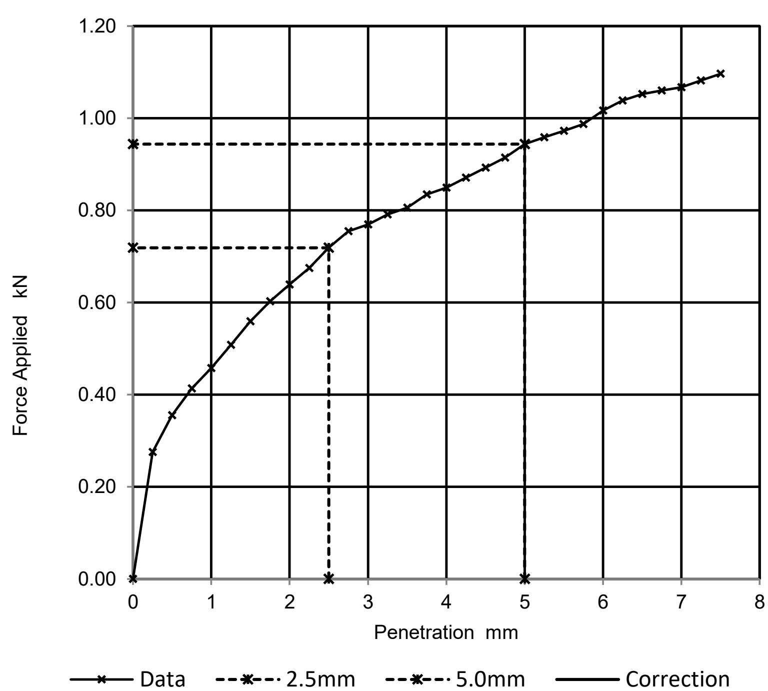
Rate if Strain	1.00	mm/min
Mass of Surcharge	4.5	kg
Proving Ring Factor	7.26	N/div

Temperature	11	0C
Environmental Conditions	Partly sunny	

Readings

Penetration of Plunger mm	Force on Plunger Dial Reading	Force on Plunger Load kN
0.00	0	0.00
0.25	38	0.28
0.50	49	0.36
0.75	57	0.41
1.00	63	0.46
1.25	70	0.51
1.50	77	0.56
1.75	83	0.60
2.00	88	0.64
2.25	93	0.68
2.50	99	0.72
2.75	104	0.76
3.00	106	0.77
3.25	109	0.79
3.50	111	0.81
3.75	115	0.83
4.00	117	0.85
4.25	120	0.87
4.50	123	0.89
4.75	126	0.91
5.00	130	0.94
5.25	132	0.96
5.50	134	0.97
5.75	136	0.99
6.00	140	1.02
6.25	143	1.04
6.50	145	1.05
6.75	146	1.06
7.00	147	1.07
7.25	149	1.08
7.50	151	1.10

Force versus Penetration Plot



Remarks

Results

Curve correction applied	CBR Values, % Penetration 2.5mm	CBR Values, % Penetration 5mm	CBR Value	Moisture Content %
No	5.4	4.7	**5.4**	23

UKAS TESTING 2519

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Checked and Approved
Initials: **J.P**
Date: 10/02/2023

MSF-5-R16

	In Situ California Bearing Ratio (CBR)			Job Ref	32972
				CBR No.	CBR2
Site Name	31 Daleham Gardens, Finchley, London, NW3 5BU			Depth m	0.30
Project No.	2023-002-SIM-DAL	Client	Geofirma	Date of Test	02/02/2023
Soil Description	Brown slightly sandy silty CLAY with occasional rootlets and traces of fine brick fragments				
Test Method	BS1377 : Part 9 : 1990, clause 4.3			CBR Test Number	2

Note: Test only applicable when maximum particle size beneath the plunger does not exceed 20mm

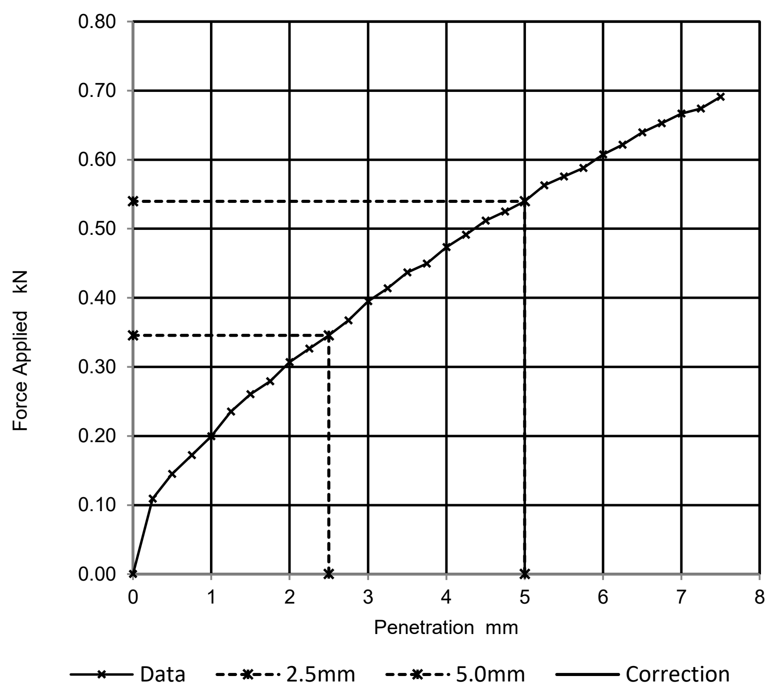
Rate if Strain	1.00	mm/min
Mass of Surcharge	4.5	kg
Proving Ring Factor	0.42	N/div

Temperature	11	0C
Environmental Conditions	Partly sunny	

Readings

Penetration of Plunger mm	Force on Plunger Dial Reading	Force on Plunger Load kN
0.00	0	0.00
0.25	260	0.11
0.50	345	0.14
0.75	410	0.17
1.00	475	0.20
1.25	560	0.24
1.50	620	0.26
1.75	665	0.28
2.00	730	0.31
2.25	777	0.33
2.50	823	0.35
2.75	875	0.37
3.00	940	0.39
3.25	985	0.41
3.50	1040	0.44
3.75	1070	0.45
4.00	1127	0.47
4.25	1170	0.49
4.50	1218	0.51
4.75	1250	0.53
5.00	1285	0.54
5.25	1340	0.56
5.50	1370	0.58
5.75	1400	0.59
6.00	1446	0.61
6.25	1480	0.62
6.50	1523	0.64
6.75	1554	0.65
7.00	1587	0.67
7.25	1605	0.67
7.50	1645	0.69

Force versus Penetration Plot



Remarks

Results

Curve correction applied	CBR Values, % Penetration 2.5mm	CBR Values, % Penetration 5mm	CBR Value	Moisture Content %
No	2.6	2.7	**2.7**	25

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Watford Herts WD18 9RU
Tel: 01923 711 288
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UKAS TESTING 2519

Checked and Approved

Initials: J.P

Date: 10/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

In Situ California Bearing Ratio (CBR)

Job Ref	32972				
CBR No.	CBR3				
Site Name	31 Daleham Gardens, Finchley, London, NW3 5BU			Depth m	0.40
Project No.	2023-002-SIM-DAL	Client	Geofirma	Date of Test	02/02/2023
Soil Description	Brown slightly sandy silty CLAY with occasional rootlets and traces of fine brick fragments				
Test Method	BS1377 : Part 9 : 1990, clause 4.3			CBR Test Number	3

Note: Test only applicable when maximum particle size beneath the plunger does not exceed 20mm

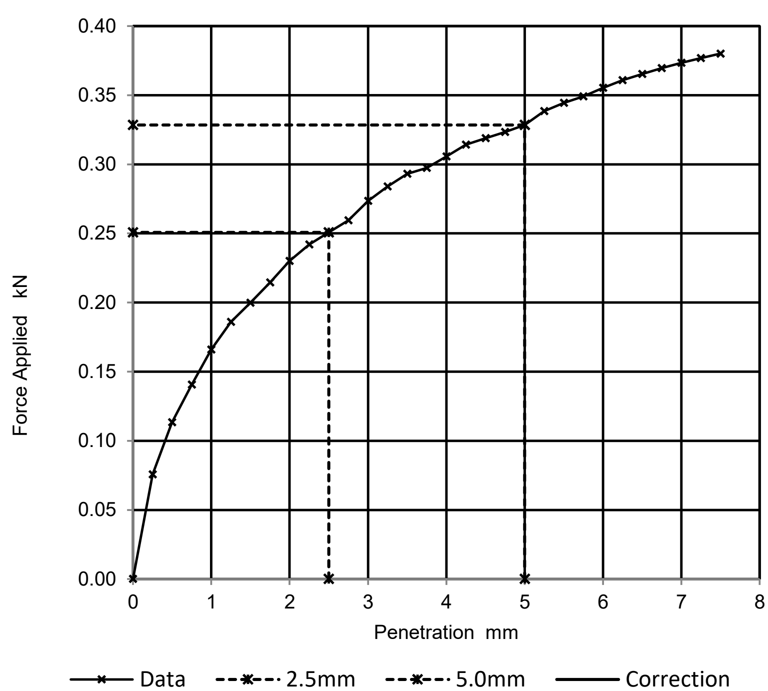
Rate if Strain	1.00	mm/min
Mass of Surcharge	4.5	kg
Proving Ring Factor	0.42	N/div

Temperature	11	0C
Environmental Conditions	Partly sunny	

Readings

Penetration of Plunger mm	Force on Plunger: Dial Reading	Force on Plunger: Load kN
0.00	0	0.00
0.25	180	0.08
0.50	270	0.11
0.75	335	0.14
1.00	395	0.17
1.25	443	0.19
1.50	476	0.20
1.75	511	0.21
2.00	548	0.23
2.25	576	0.24
2.50	597	0.25
2.75	618	0.26
3.00	651	0.27
3.25	676	0.28
3.50	698	0.29
3.75	708	0.30
4.00	728	0.31
4.25	748	0.31
4.50	759	0.32
4.75	770	0.32
5.00	782	0.33
5.25	806	0.34
5.50	820	0.34
5.75	831	0.35
6.00	846	0.36
6.25	859	0.36
6.50	870	0.37
6.75	880	0.37
7.00	889	0.37
7.25	897	0.38
7.50	905	0.38

Force versus Penetration Plot



Remarks

Results

Curve correction applied	CBR Values, % Penetration 2.5mm	5mm	CBR Value	Moisture Content %
No	1.9	1.6	**1.9**	27

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Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

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Checked and Approved
Initials: J.P
Date: 10/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16

In Situ California Bearing Ratio (CBR)

Job Ref	32972				
CBR No.	CBR4				
Site Name	31 Daleham Gardens, Finchley, London, NW3 5BU			Depth m	0.00
Project No.	2023-002-SIM-DAL	Client	Geofirma	Date of Test	02/02/2023
Soil Description	Dark grey sandy silty CLAY				
Test Method	BS1377 : Part 9 : 1990, clause 4.3			CBR Test Number	4

Note: Test only applicable when maximum particle size beneath the plunger does not exceed 20mm

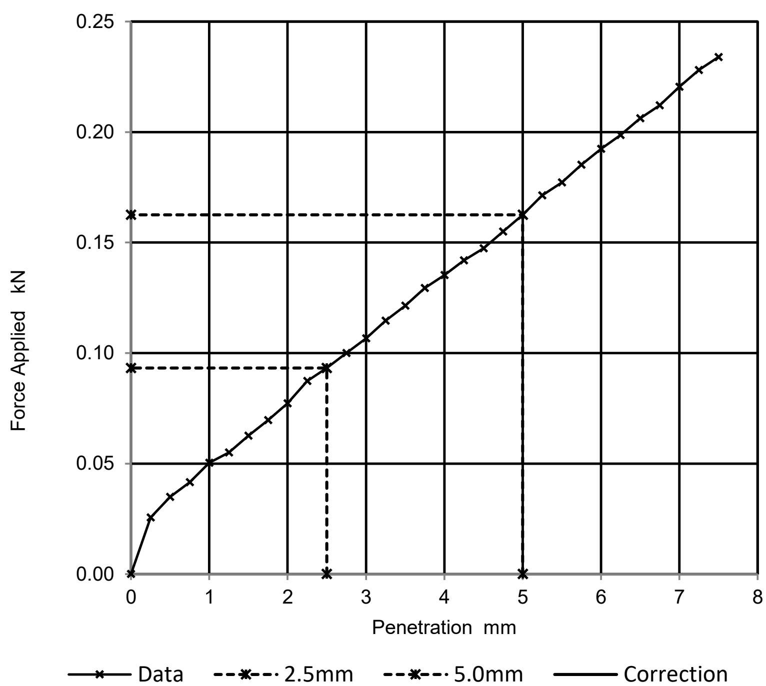
Rate if Strain	1.00	mm/min
Mass of Surcharge	4.5	kg
Proving Ring Factor	0.42	N/div

Temperature	11	0C
Environmental Conditions	Partly sunny	

Readings

Penetration of Plunger mm	Force on Plunger Dial Reading	Force on Plunger Load kN
0.00	0	0.00
0.25	61	0.03
0.50	83	0.03
0.75	99	0.04
1.00	120	0.05
1.25	131	0.06
1.50	149	0.06
1.75	166	0.07
2.00	184	0.08
2.25	208	0.09
2.50	222	0.09
2.75	238	0.10
3.00	254	0.11
3.25	273	0.11
3.50	289	0.12
3.75	308	0.13
4.00	322	0.14
4.25	338	0.14
4.50	351	0.15
4.75	369	0.15
5.00	387	0.16
5.25	408	0.17
5.50	422	0.18
5.75	441	0.19
6.00	458	0.19
6.25	473	0.20
6.50	491	0.21
6.75	505	0.21
7.00	525	0.22
7.25	543	0.23
7.50	557	0.23

Force versus Penetration Plot



Remarks

Results

Curve correction applied	CBR Values, % Penetration 2.5mm	CBR Values, % Penetration 5mm	CBR Value	Moisture Content %
No	0.71	0.81	**0.81**	39

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

UKAS TESTING 2519

Checked and Approved
Initials: J.P
Date: 10/02/2023

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16

In Situ California Bearing Ratio (CBR)

Job Ref	32972				
CBR No.	CBR5				
Site Name	31 Daleham Gardens, Finchley, London, NW3 5BU			Depth m	0.00
Project No.	2023-002-SIM-DAL	Client	Geofirma	Date of Test	02/02/2023
Soil Description	Dark grey sandy silty CLAY				
Test Method	BS1377 : Part 9 : 1990, clause 4.3			CBR Test Number	5

Note: Test only applicable when maximum particle size beneath the plunger does not exceed 20mm

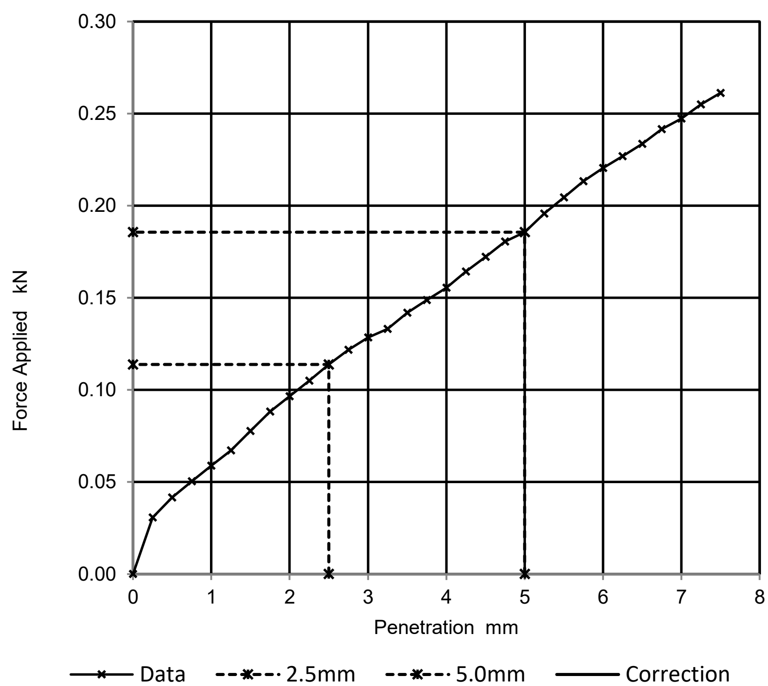
Rate if Strain	1.00	mm/min
Mass of Surcharge	4.5	kg
Proving Ring Factor	0.42	N/div

Temperature	11	0C
Environmental Conditions	Partly sunny	

Readings

Penetration of Plunger mm	Force on Plunger Dial Reading	Load kN
0.00	0	0.00
0.25	73	0.03
0.50	99	0.04
0.75	120	0.05
1.00	140	0.06
1.25	160	0.07
1.50	185	0.08
1.75	210	0.09
2.00	230	0.10
2.25	250	0.11
2.50	271	0.11
2.75	290	0.12
3.00	306	0.13
3.25	317	0.13
3.50	338	0.14
3.75	354	0.15
4.00	370	0.16
4.25	391	0.16
4.50	410	0.17
4.75	430	0.18
5.00	442	0.19
5.25	466	0.20
5.50	487	0.20
5.75	508	0.21
6.00	525	0.22
6.25	540	0.23
6.50	556	0.23
6.75	575	0.24
7.00	589	0.25
7.25	607	0.25
7.50	622	0.26

Force versus Penetration Plot



Remarks

Results

Curve correction applied	CBR Values, % Penetration 2.5mm	5mm	CBR Value	Moisture Content %
No	0.86	0.93	**0.93**	36

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Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 10/02/2023

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MSF-5-R16

	In Situ California Bearing Ratio (CBR)			Job Ref	32972
				CBR No.	CBR6
Site Name	31 Daleham Gardens, Finchley, London, NW3 5BU			Depth m	0.45
Project No.	2023-002-SIM-DAL	Client	Geofirma	Date of Test	02/02/2023
Soil Description	Brown slightly sandy silty CLAY with occasional rootlets and traces of fine brick fragments				
Test Method	BS1377 : Part 9 : 1990, clause 4.3			CBR Test Number	6

Note: Test only applicable when maximum particle size beneath the plunger does not exceed 20mm

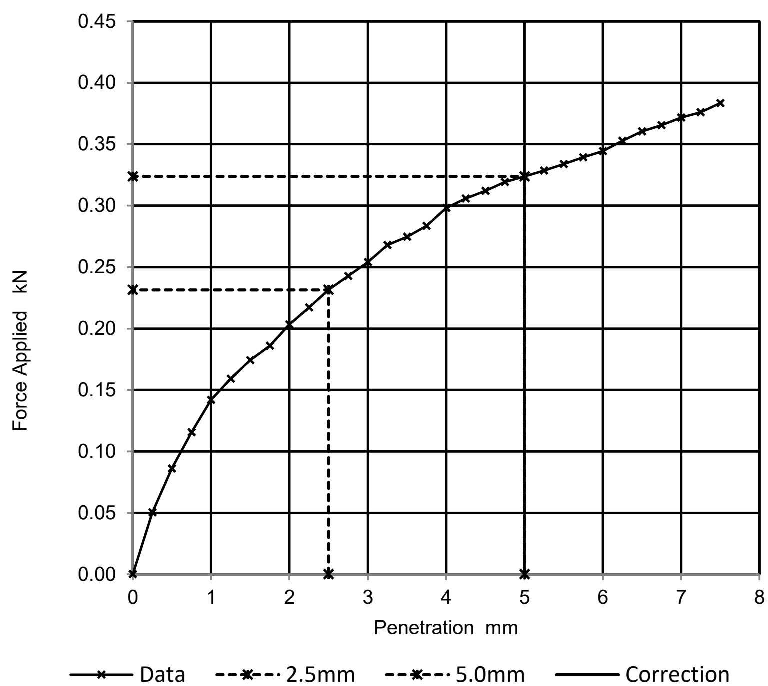
Rate if Strain	1.00	mm/min
Mass of Surcharge	4.5	kg
Proving Ring Factor	0.42	N/div

Temperature	11	0C
Environmental Conditions	Partly sunny	

Readings

Penetration of Plunger mm	Force on Plunger Dial Reading	Load kN
0.00	0	0.00
0.25	120	0.05
0.50	205	0.09
0.75	275	0.12
1.00	338	0.14
1.25	379	0.16
1.50	415	0.17
1.75	443	0.19
2.00	484	0.20
2.25	517	0.22
2.50	551	0.23
2.75	578	0.24
3.00	605	0.25
3.25	638	0.27
3.50	654	0.27
3.75	675	0.28
4.00	710	0.30
4.25	728	0.31
4.50	743	0.31
4.75	760	0.32
5.00	771	0.32
5.25	782	0.33
5.50	795	0.33
5.75	808	0.34
6.00	820	0.34
6.25	840	0.35
6.50	858	0.36
6.75	870	0.37
7.00	885	0.37
7.25	895	0.38
7.50	913	0.38

Force versus Penetration Plot



Remarks

Results

Curve correction applied	CBR Values, % Penetration 2.5mm	5mm	CBR Value	Moisture Content %
No	1.8	1.6	**1.8**	34

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Watford Herts WD18 9RU
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Email: James@k4soils.com

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MSF-5-R16

APPENDIX C – SOIL STRENGTH DATA

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test type.

Job No.	Project Name	Programme	
32976	31 Daleham Gardens	Samples received	03/02/2023
		Schedule received	08/02/2023
Project No.	Client	Project started	09/02/2023
2023-002-SIM-DAL	Geofirma	Testing Started	15/02/2023

Hole No.	Sample Ref	Sample Top (m)	Sample Base (m)	Sample Type	Soil Description	Test Type	Density bulk (Mg/m3)	Density dry (Mg/m3)	w (%)	Length (mm)	Diameter (mm)	σ3 (kPa)	At failure Axial strain (%)	At failure σ1 - σ3 (kPa)	At failure cu (kPa)	Mode	Remarks
BH1A	-	10.00	10.45	U	High strength dark grey silty CLAY	UU	1.96	1.51	29	198	102	170	6.6	221	110	B	
BH1A	-	14.00	14.45	U	High strength dark grey silty CLAY with occasional pockets of sand and rare decomposed shell fragments	UU	2.03	1.58	28	198	102	250	5.1	226	113	B	
BH1A	-	19.50	19.94	U	High strength dark grey silty CLAY	UU	1.97	1.54	28	198	102	300	4.5	266	133	B	
BH1A	-	22.50	22.95	U	Dark grey silty CLAY with pockets of black slightly sandy peat with occasional wood fragments becoming @ 22.65 m very high strength dark grey silty CLAY	UU	2.02	1.57	29	198	102	330	6.1	355	177	B	Test carried out on silty CLAY section from 22.65m onwards
BH2	-	3.50	3.95	U	Medium strength brown mottled orangish brown sandy silty CLAY with occasional fmc sandstone fragments	UU	1.89	1.48	28	198	102	50	5.6	117	59	B	
BH2	-	5.00	5.45	U	Medium strength dark grey slightly mottled brown slightly fine sandy silty CLAY	UU	1.96	1.53	28	198	102	70	16	101	51	C	
BH2	-	11.00	11.45	U	High strength dark grey silty CLAY	UU	2.01	1.57	28	198	102	170	14	240	120	C	
BH2	-	15.00	15.45	U	High strength dark grey silty CLAY	UU	2.00	1.54	30	198	102	210	5.6	254	127	B	

Legend
UU - single stage test (single and multiple specimens)
UUM - Multistage test on a single specimen
suffix R - remoulded or recompacted

σ3 Cell pressure
σ1 - σ3 Maximum corrected deviator stress
cu Undrained shear strength, ½ (σ1 - σ3)

Mode of failure ; B - Brittle, P - Plastic, C - Compound

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: james@k4soils.com
Email: james@k4soils.com

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Checked and Approved
Initials: J.P
Date: 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R7b

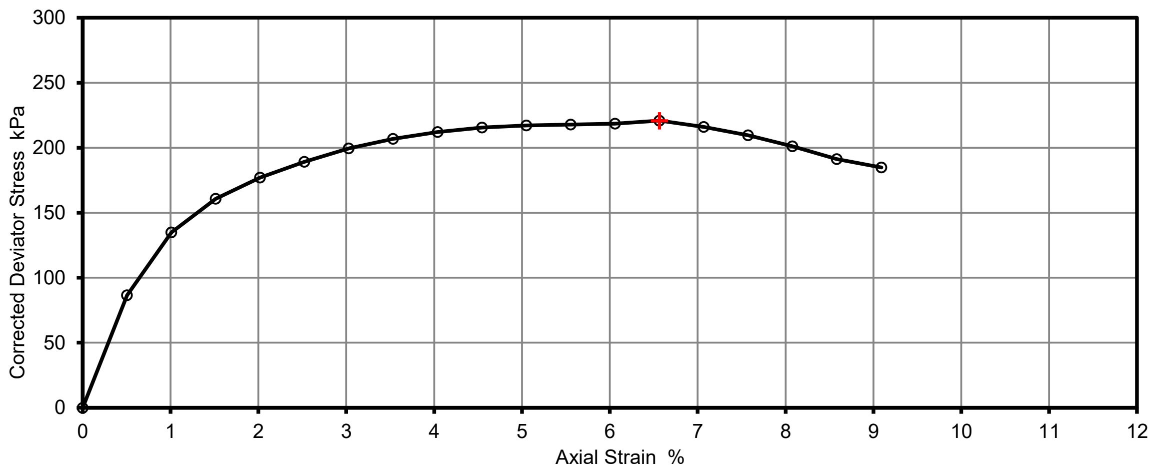
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**	Job Ref	32976
		Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL Client Geofirma	Depth Top	10.00 m
Soil Description	High strength dark grey silty CLAY	Depth Base	10.45 m
		Sample Type	U
		Samples received	03/02/2023
		Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	15/02/2023

Remarks

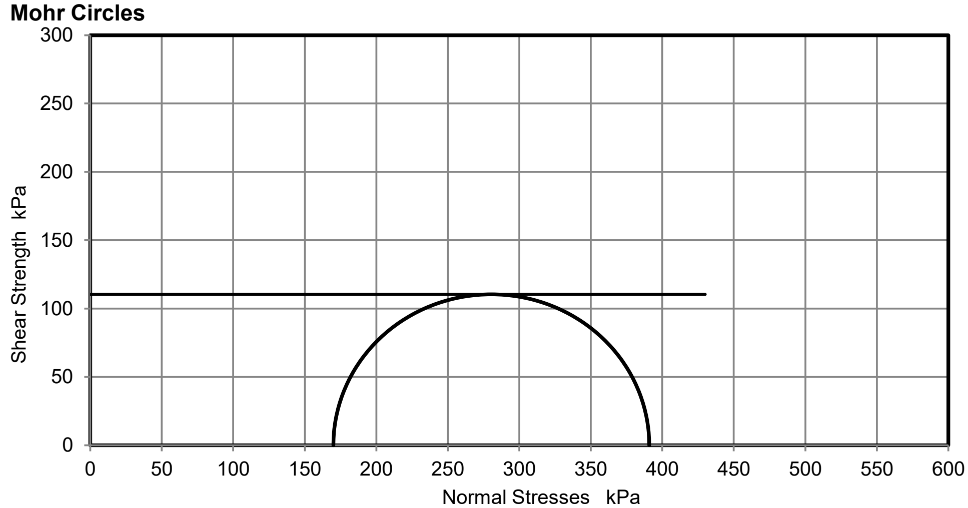
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.96	Mg/m3
Moisture Content	29	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	170	kPa
Axial Strain	6.6	%
Deviator Stress, (σ1 - σ3)f	221	kPa
Undrained Shear Strength, cu	110	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R7

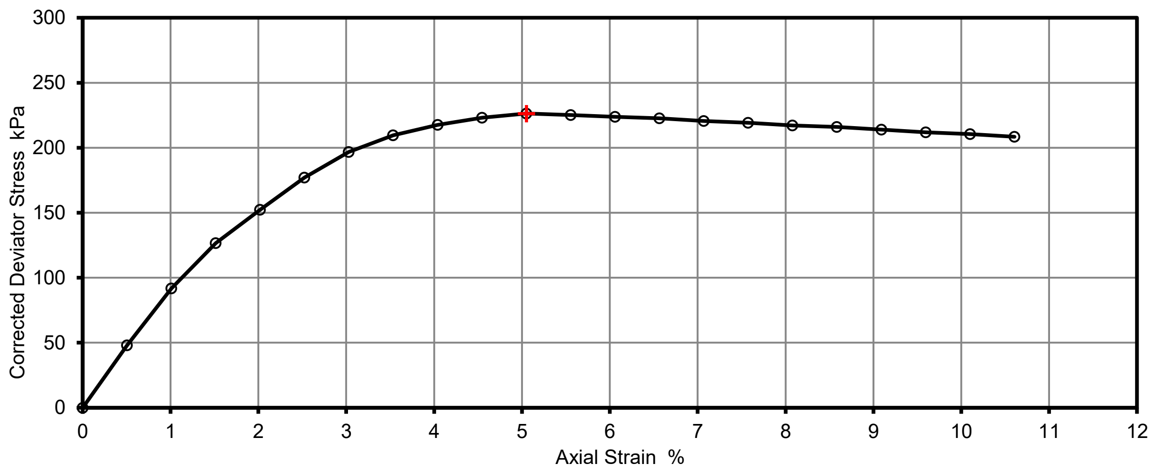
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	14.00 m
Soil Description	High strength dark grey silty CLAY with occasional pockets of sand and rare decomposed shell fragments			Depth Base	14.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

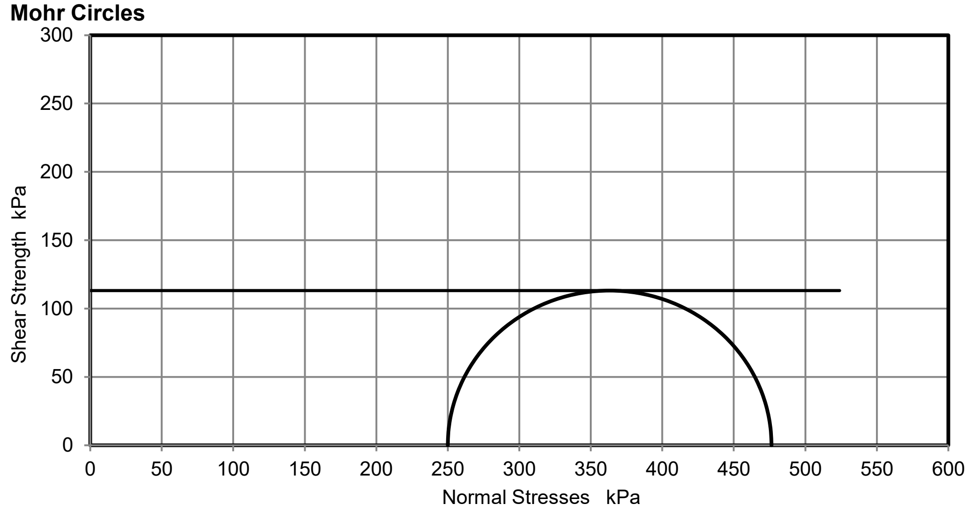
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.03	Mg/m3
Moisture Content	28	%
Dry Density	1.58	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	250	kPa
Axial Strain	5.1	%
Deviator Stress, (σ1 - σ3)f	226	kPa
Undrained Shear Strength, cu	113	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

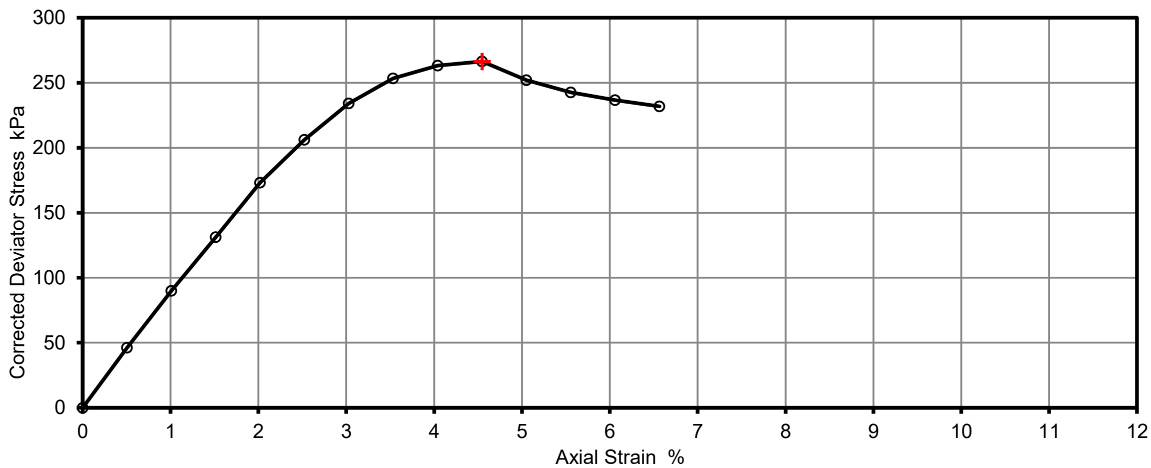
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	19.50 m
Soil Description	High strength dark grey silty CLAY			Depth Base	19.94 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

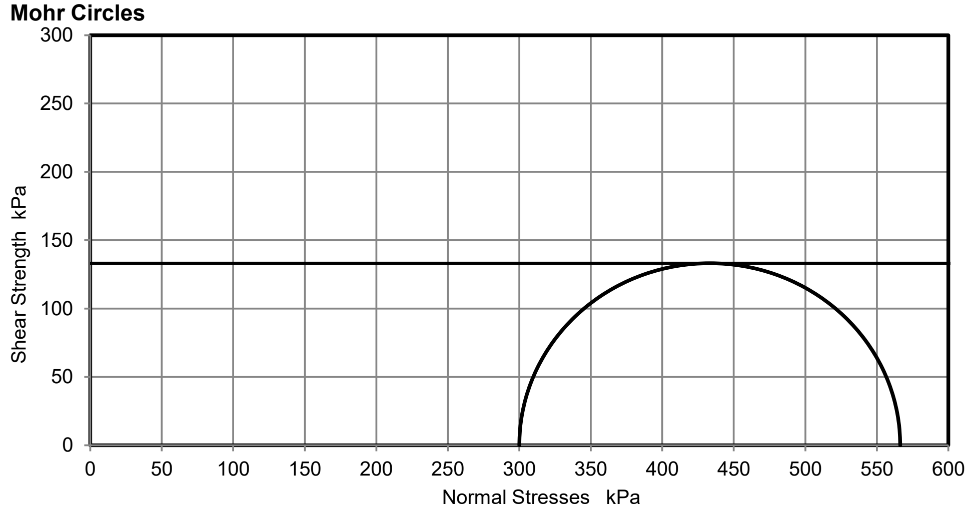
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.97	Mg/m3
Moisture Content	28	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	300	kPa
Axial Strain	4.5	%
Deviator Stress, (σ1 - σ3)f	266	kPa
Undrained Shear Strength, cu	133	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

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Date 24/02/2023

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	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH1A
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	22.50 m
Soil Description	Dark grey silty CLAY with pockets of black slightly sandy peat with occasional wood fragments becoming @ 22.65 m very high strength dark grey silty CLAY			Depth Base	22.95 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

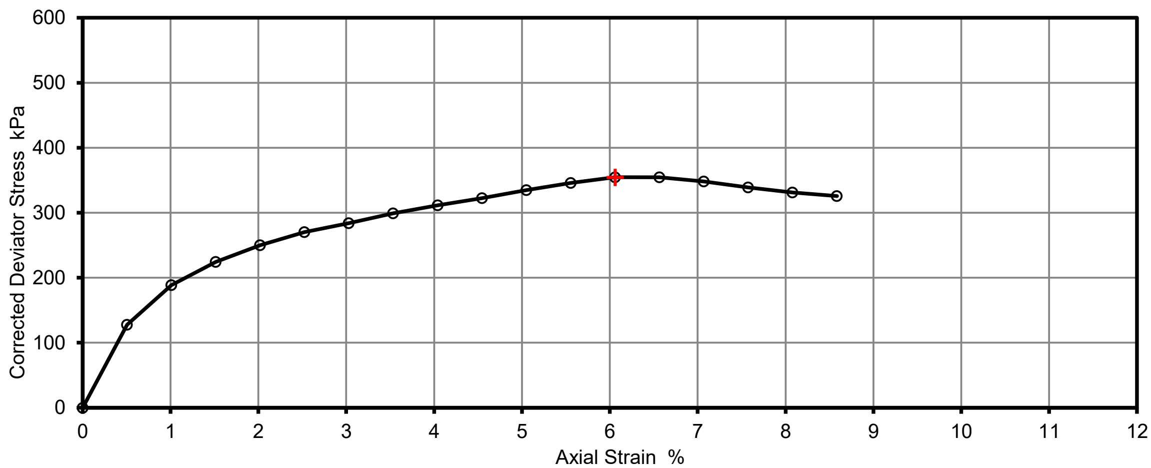
Remarks

Test carried out on silty CLAY section from 22.65m onwards

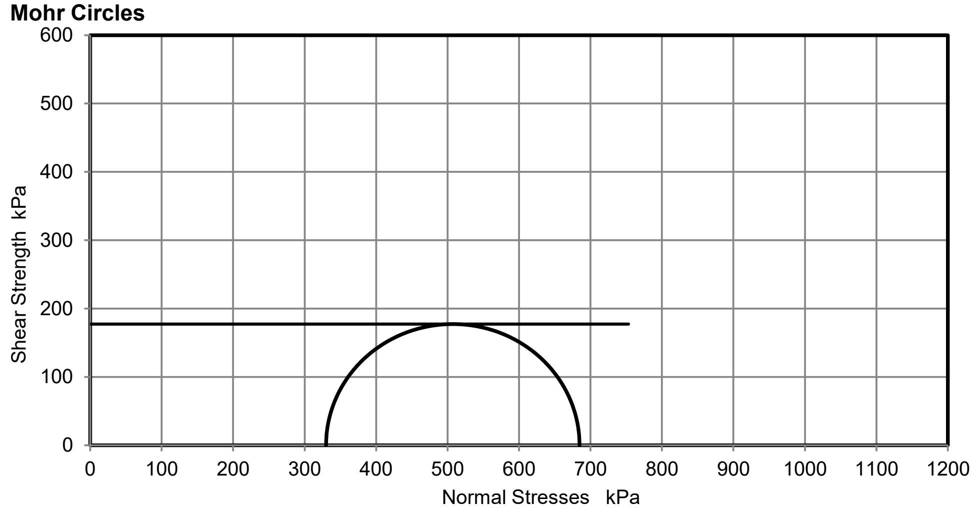
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.02	Mg/m3
Moisture Content	28	%
Dry Density	1.57	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	330	kPa
Axial Strain	6.1	%
Deviator Stress, (σ1 - σ3)f	355	kPa
Undrained Shear Strength, cu	177	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

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Checked and Approved
Initials: J.P
Date 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

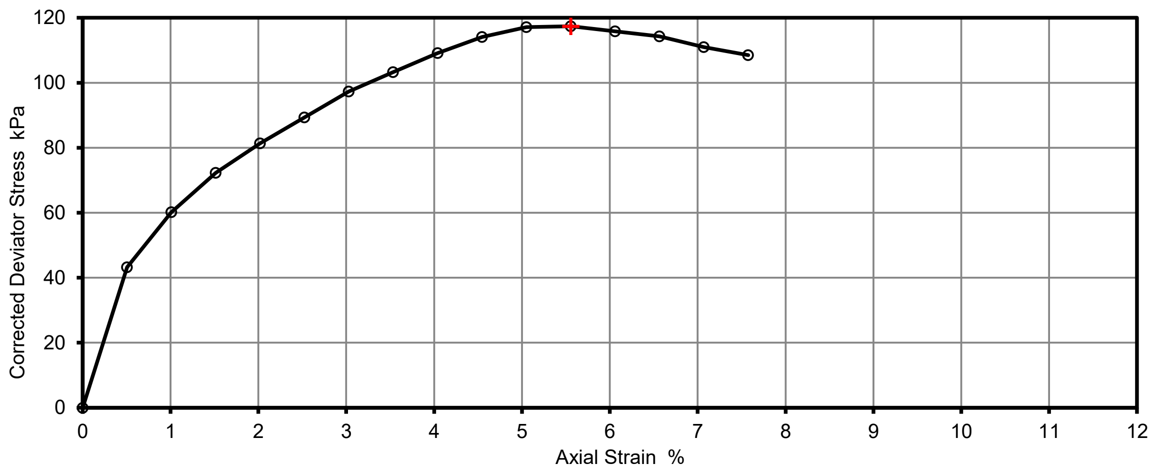
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	3.50 m
Soil Description	Medium strength brown mottled orangish brown sandy silty CLAY with occasional fmc sandstone fragments			Depth Base	3.95 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

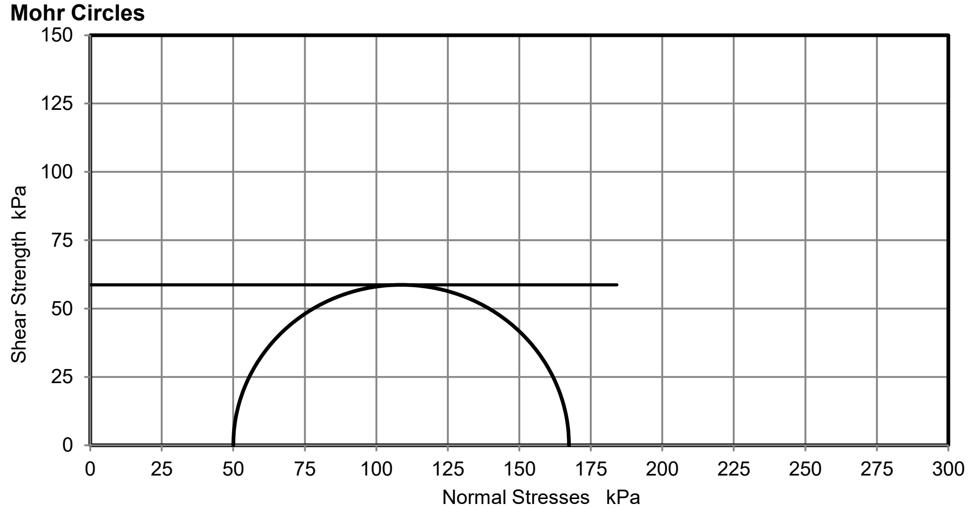
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.89	Mg/m3
Moisture Content	28	%
Dry Density	1.48	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	50	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	117	kPa
Undrained Shear Strength, cu	59	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

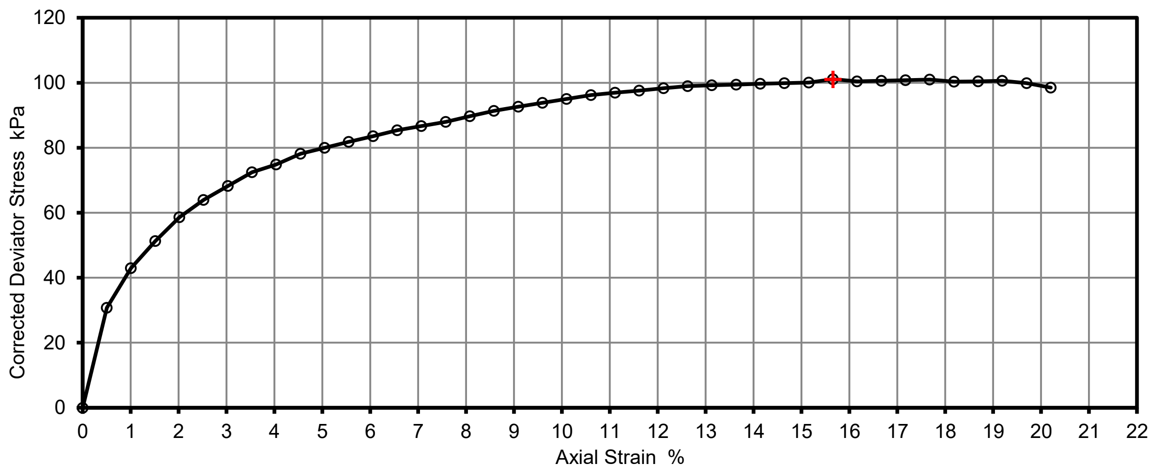
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	5.00 m
Soil Description	Medium strength dark grey slightly mottled brown slightly fine sandy silty CLAY			Depth Base	5.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

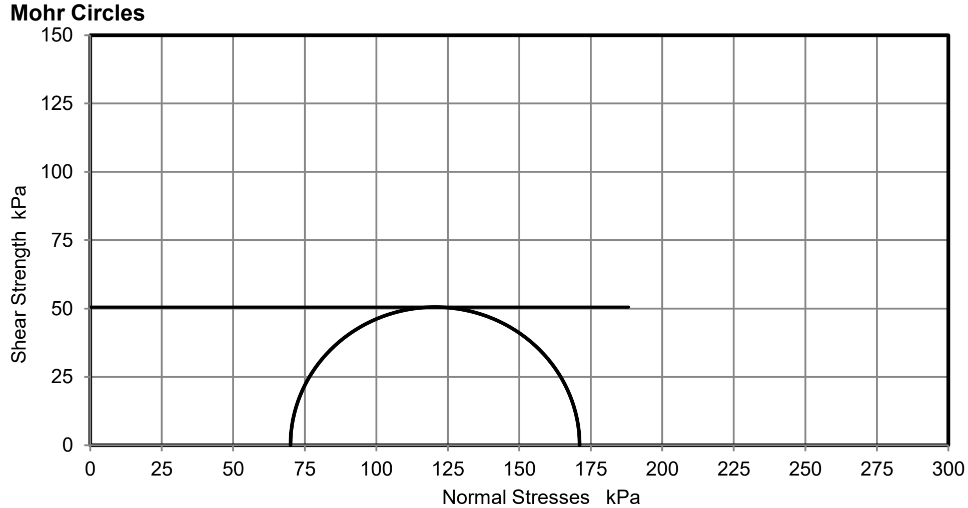
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.96	Mg/m3
Moisture Content	28	%
Dry Density	1.53	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	70	kPa
Axial Strain	16	%
Deviator Stress, (σ1 - σ3)f	101	kPa
Undrained Shear Strength, cu	51	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

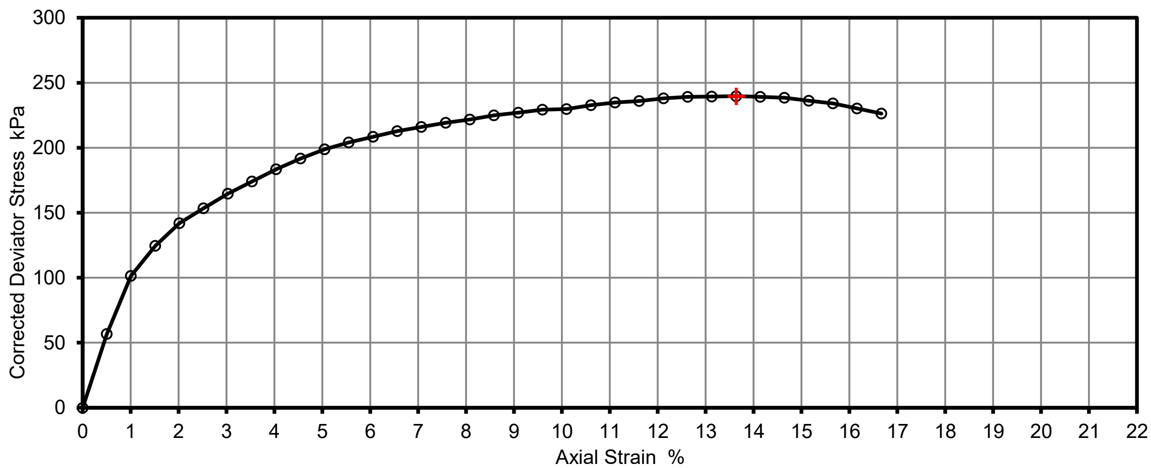
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**	Job Ref	32976
		Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens	Sample No.	-
Project No.	2023-002-SIM-DAL / Client: Geofirma	Depth Top	11.00 m
Soil Description	High strength dark grey silty CLAY	Depth Base	11.45 m
		Sample Type	U
		Samples received	03/02/2023
		Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	15/02/2023

Remarks

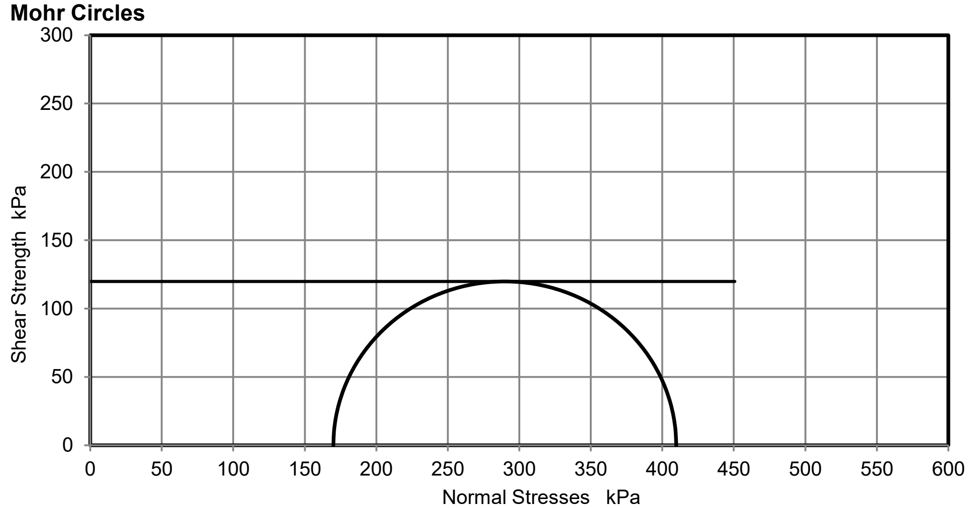
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.01	Mg/m3
Moisture Content	28	%
Dry Density	1.57	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	170	kPa
Axial Strain	14	%
Deviator Stress, (σ1 - σ3)f	240	kPa
Undrained Shear Strength, cu	120	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Checked and Approved
Initials: J.P
Date 24/02/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

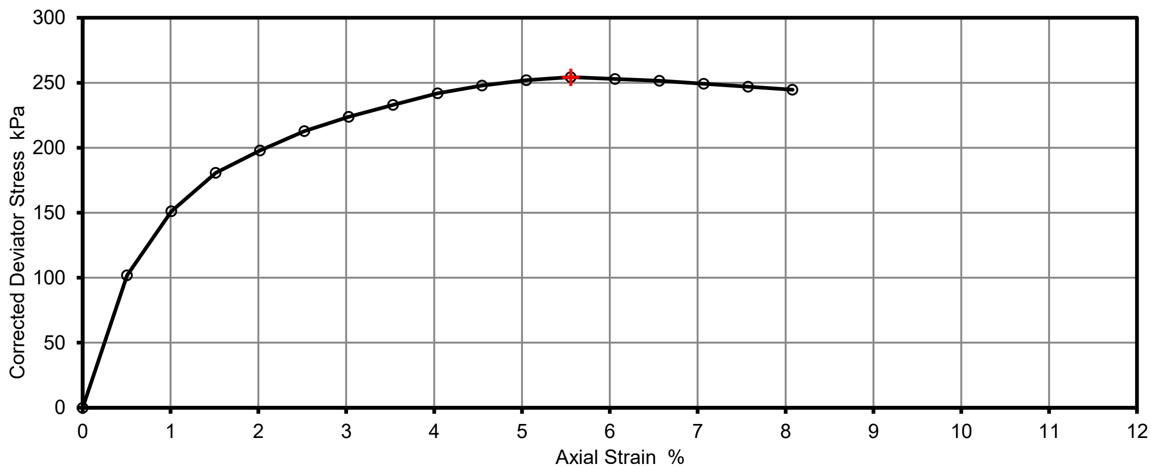
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	32976
				Borehole/Pit No.	BH2
Site Name	31 Daleham Gardens			Sample No.	-
Project No.	2023-002-SIM-DAL	Client	Geofirma	Depth Top	15.00 m
Soil Description	High strength dark grey silty CLAY			Depth Base	15.45 m
				Sample Type	U
				Samples received	03/02/2023
				Schedules received	08/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/02/2023

Remarks

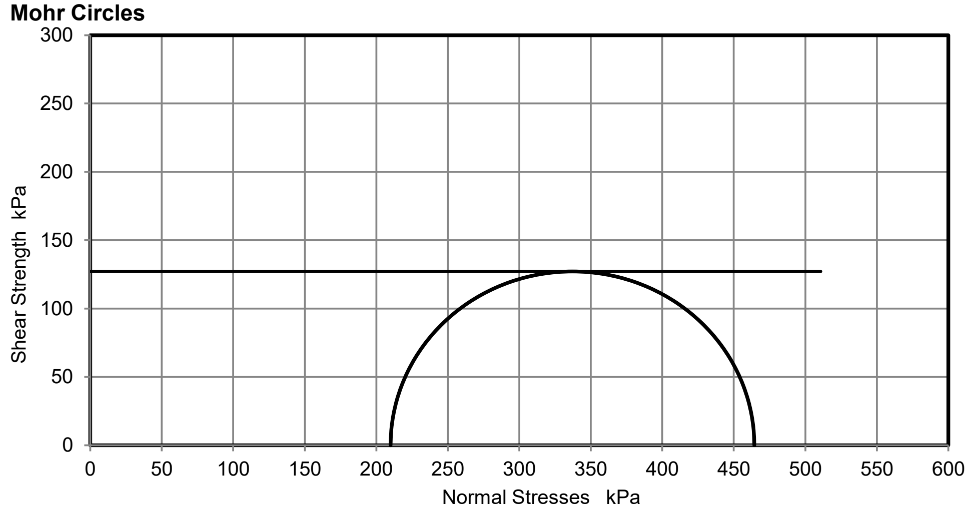
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.00	Mg/m3
Moisture Content	30	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	210	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	254	kPa
Undrained Shear Strength, cu	127	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/02/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

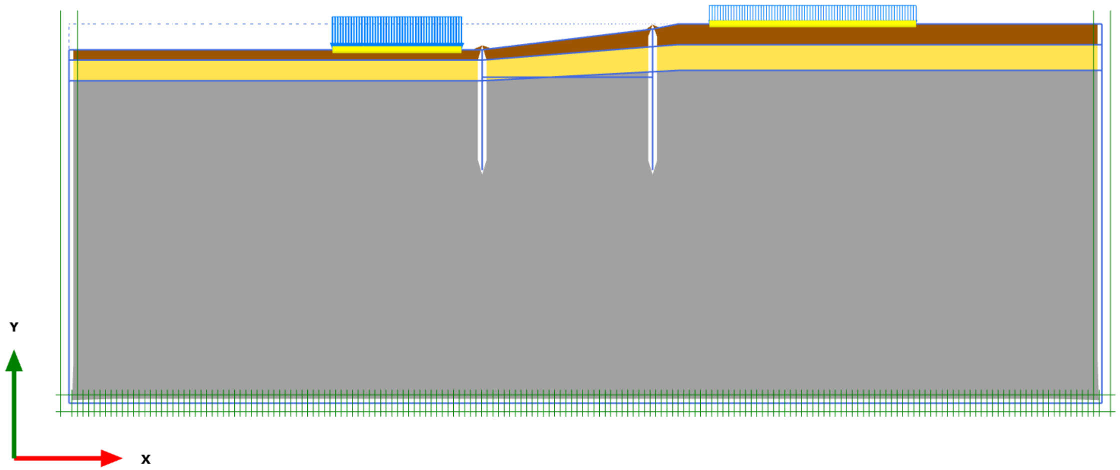
MSF-5 R7

APPENDIX D – PLAXIS ANALYSIS

PLAXIS Report

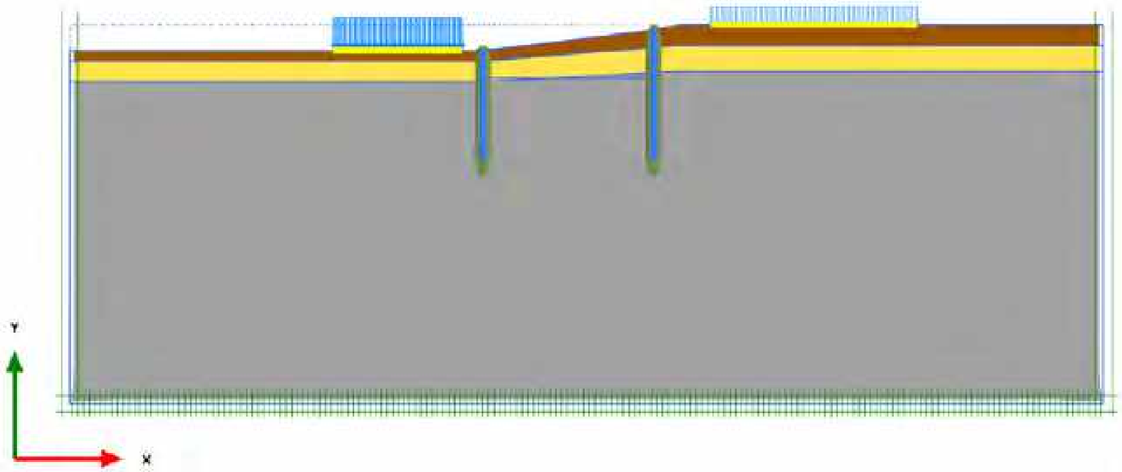
Filename	**Daleham 31 A-A_5_5m.p2dx**
Directory	D:\fortisNEXUM\01-Em Curso\T23012 - 31 Daleham\A - EX\GEO\B-Calculos\PLAXIS\Finais\
Title	Daleham 31 A-A
Model	Plane strain
Elements	15-Noded
PLAXIS Version	Version 20.0.0.119

1.1.1.1 Calculation results, Terrain [Phase_1] (1/11), Fixities plot



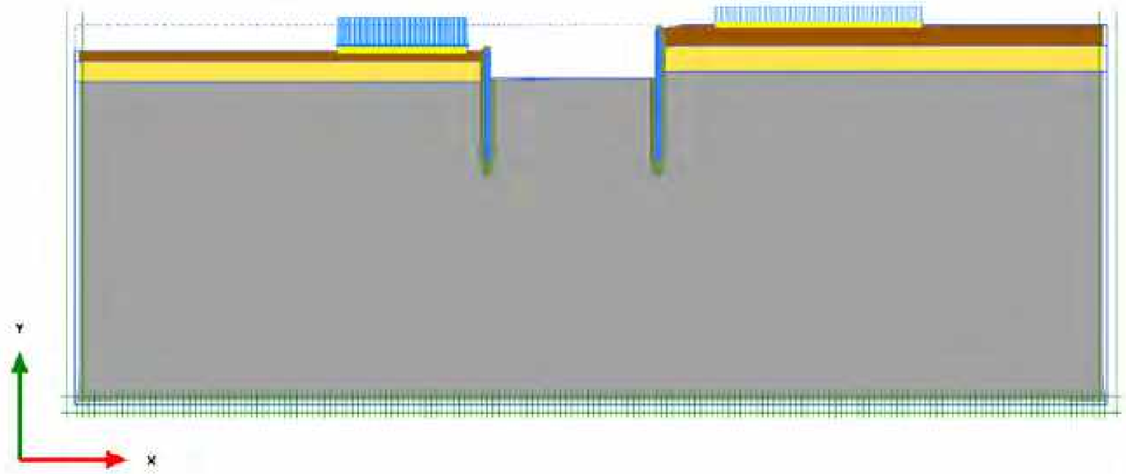
Fixities plot

1.1.1.2 Calculation results, Wall construction [Phase_2] (2/13), Fixities plot



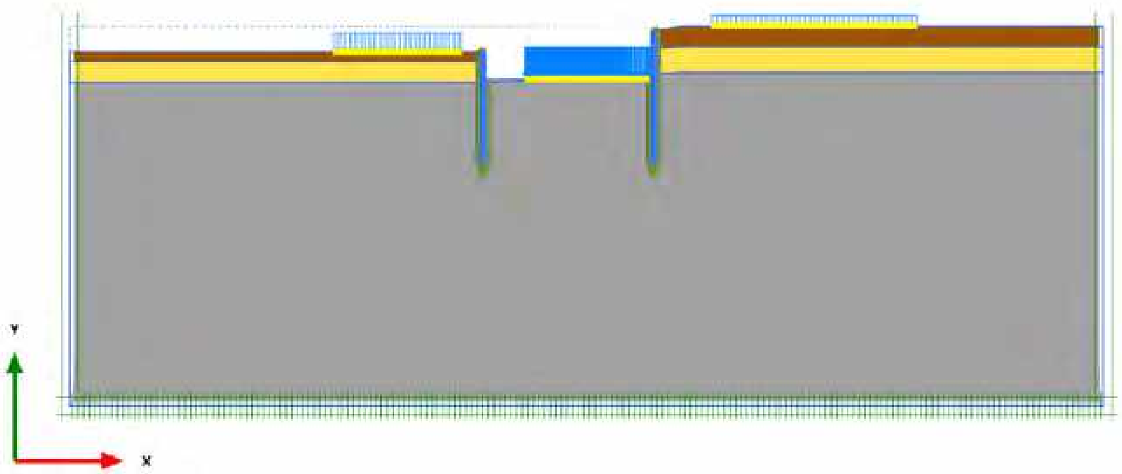
Fixities plot

1.1.1.3 Calculation results, Excavation [Phase_3] (3/21), Fixities plot



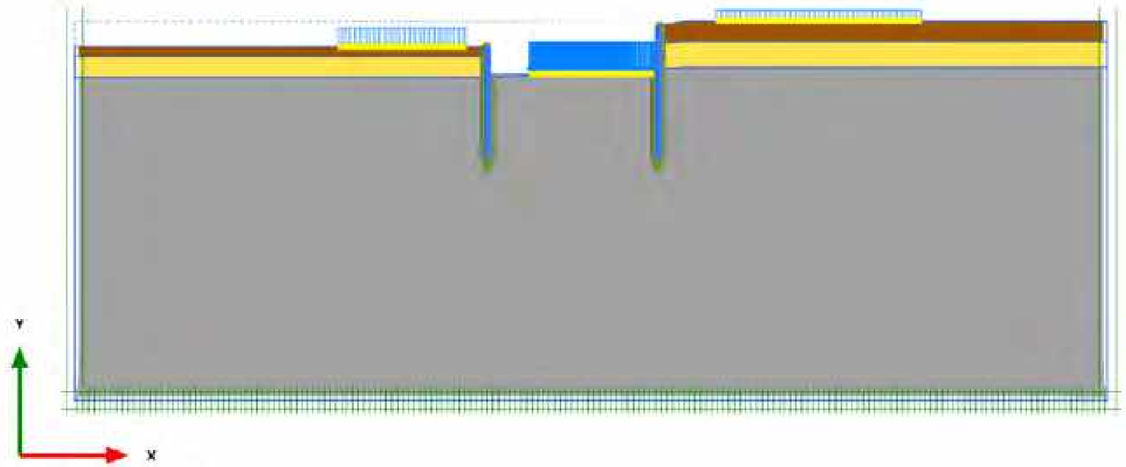
Fixities plot

1.1.1.4 Calculation results, Construction [Phase_4] (4/25), Fixities plot



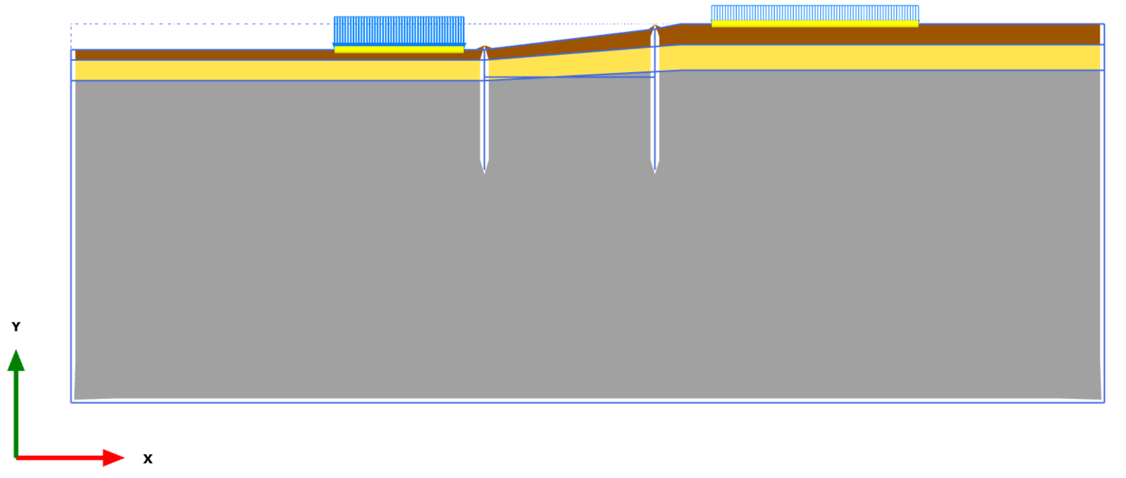
Fixities plot

1.1.1.5 Calculation results, Drained [Phase_5] (5/64), Fixities plot



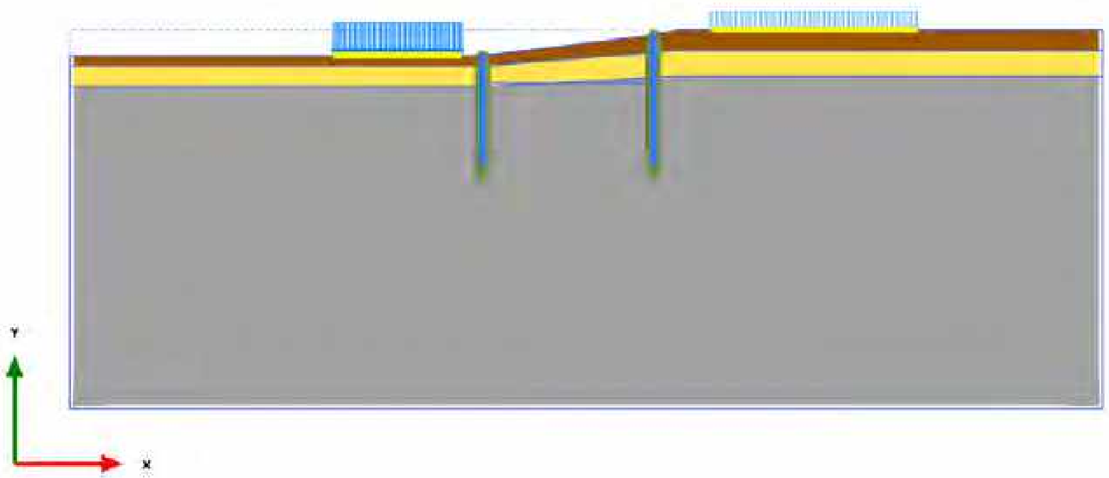
Fixities plot

1.1.2.1 Calculation results, Terrain [Phase_1] (1/11), Active loads plot



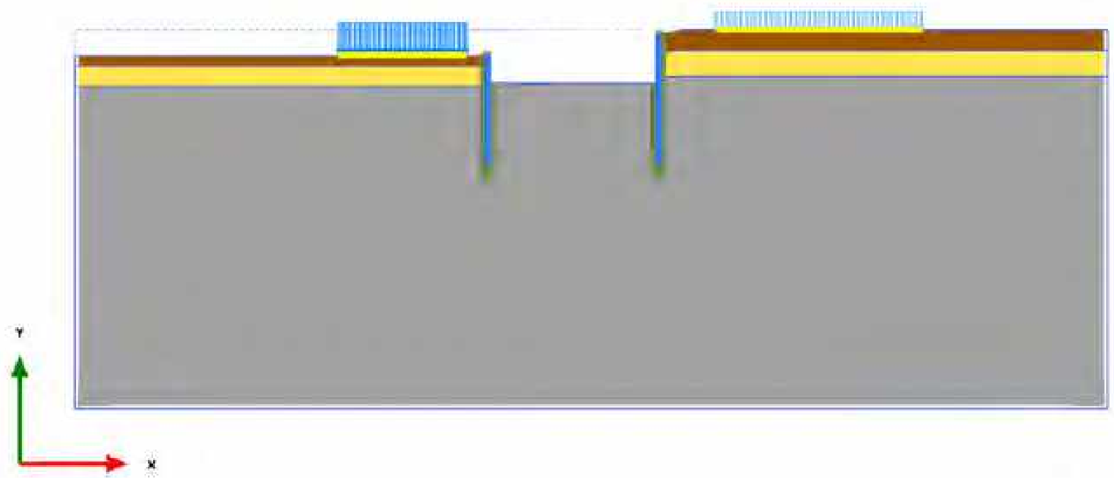
Active loads plot

1.1.2.2 Calculation results, Wall construction [Phase_2] (2/13), Active loads plot



Active loads plot

1.1.2.3 Calculation results, Excavation [Phase_3] (3/21), Active loads plot

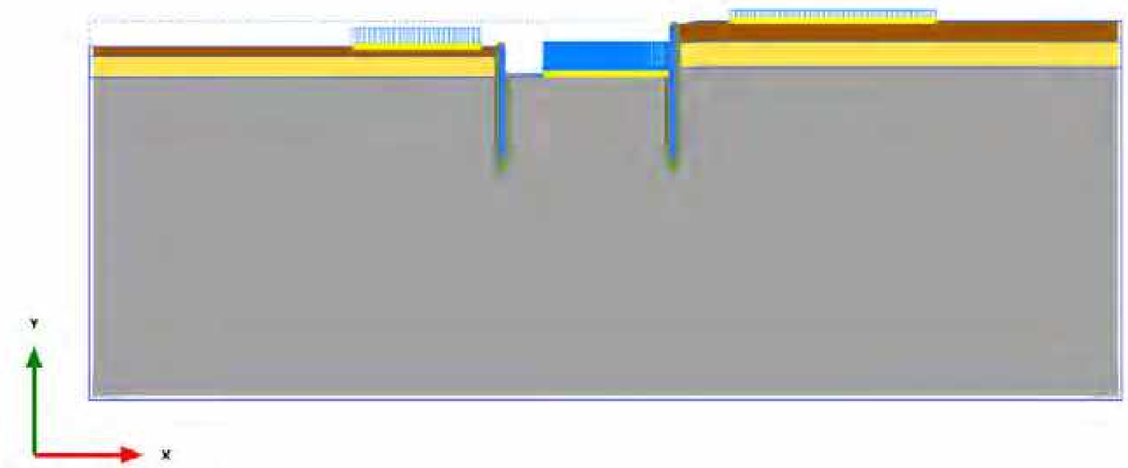


Active loads plot

1.1.2.4 Calculation results, Construction [Phase_4] (4/25), Active loads plot

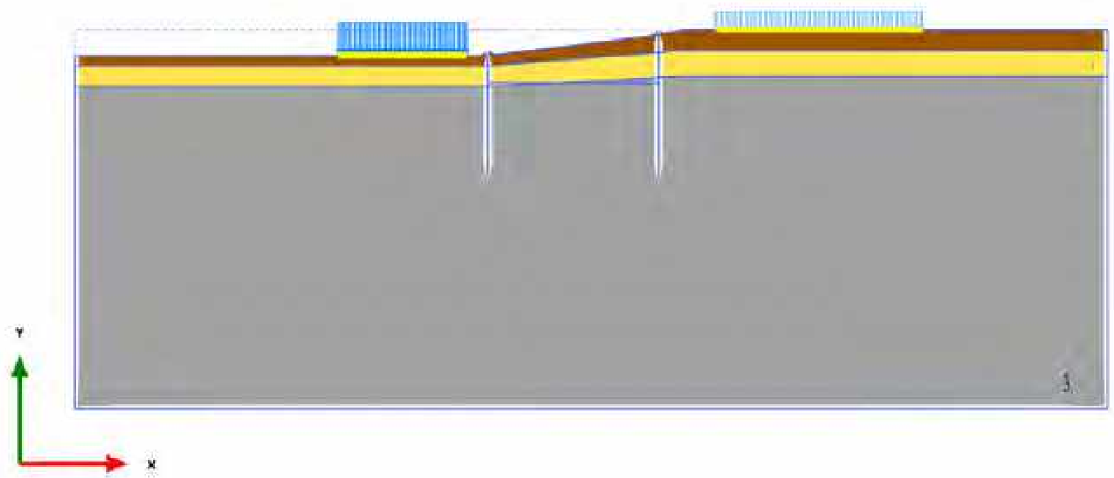
Active loads plot

1.1.2.5 Calculation results, Drained [Phase_5] (5/64), Active loads plot



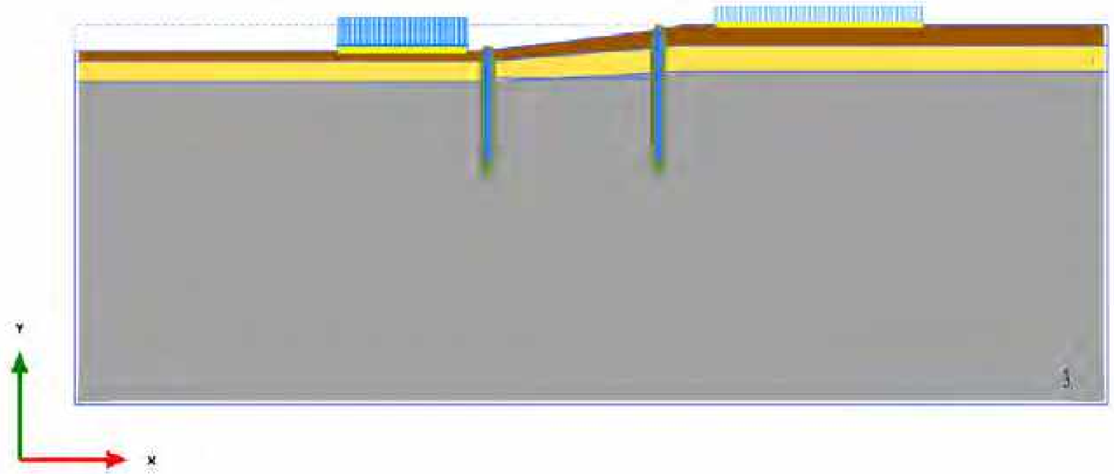
Active loads plot

1.1.3.1 Calculation results, Terrain [Phase_1] (1/11), Materials plot



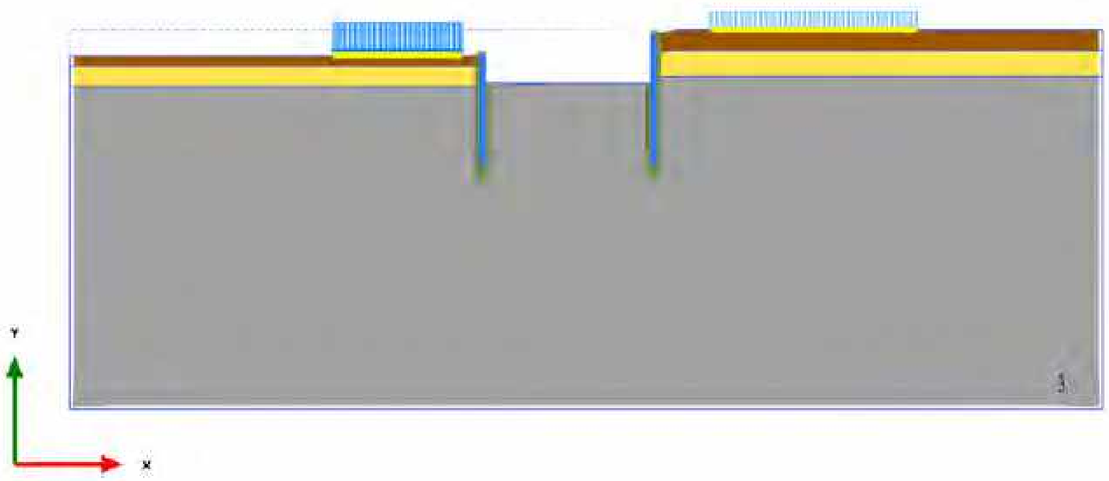
Materials plot

1.1.3.2 Calculation results, Wall construction [Phase_2] (2/13), Materials plot



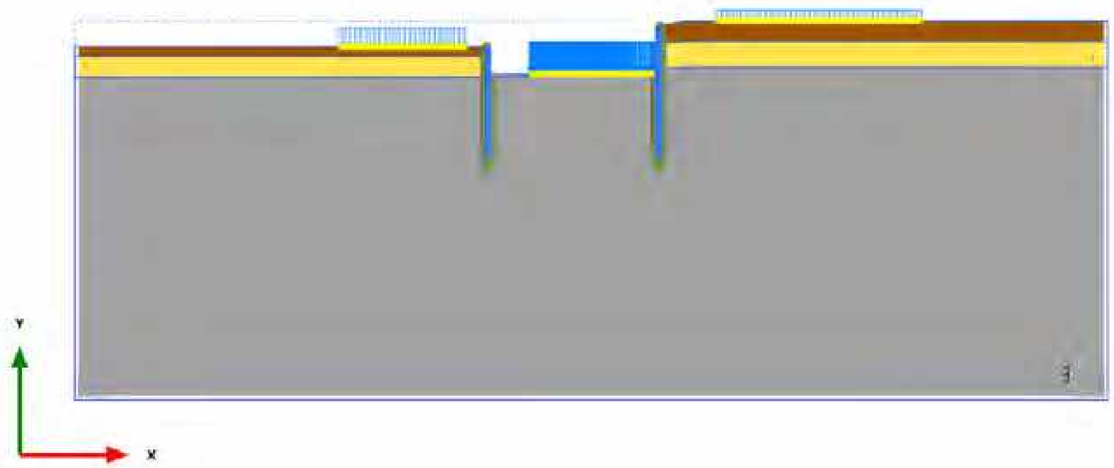
Materials plot

1.1.3.3 Calculation results, Excavation [Phase_3] (3/21), Materials plot



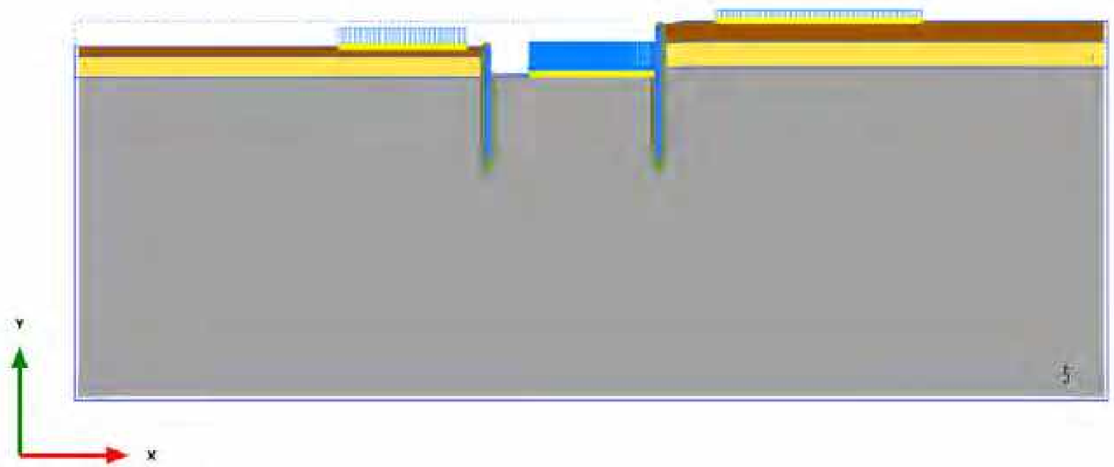
Materials plot

1.1.3.4 Calculation results, Construction [Phase_4] (4/25), Materials plot



Materials plot

1.1.3.5 Calculation results, Drained [Phase_5] (5/64), Materials plot



Materials plot

1.1.4.1.1 Materials - Soil and interfaces - Mohr-Coulomb

Identification		**1 - Made Ground**	**2 - Clay Gate (U)**	**3 - London Clay (U)**	**2 - Clay Gate (D)**	**3 - London Clay (D)**
Identification number		1	2	3	4	5
Drainage type		Drained	Undrained (C)	Undrained (C)	Drained	Drained
Colour						
Comments						
γ_{unsat}	kN/m³	18.00	18.00	19.00	18.00	19.00
γ_{sat}	kN/m³	19.00	18.00	19.00	18.00	19.00
Dilatancy cut-off		No	No	No	No	No
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
e_{min}		0.000	0.000	0.000	0.000	0.000
e_{max}		999.0	999.0	999.0	999.0	999.0
Rayleigh α		0.000	0.000	0.000	0.000	0.000
Rayleigh β		0.000	0.000	0.000	0.000	0.000
E	kN/m²	10.00E3	25.00E3	40.00E3	18.75E3	30.00E3
ν (nu)		0.3000	0.4950	0.4950	0.3500	0.3000
G	kN/m²	3846	8361	13.38E3	6944	11.54E3
E_{oed}	kN/m²	13.46E3	844.5E3	1.351E6	30.09E3	40.38E3
c_{ref}	kN/m²	1.000	50.00	80.00	10.00	10.00
ϕ (phi)	°	25.00	0.000	0.000	24.00	23.00

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
ψ (psi)	°	0.000	0.000	0.000	0.000	0.000
V_s	m/s	45.78	67.50	83.11	61.52	77.18
V_p	m/s	85.65	678.4	835.2	128.1	144.4
Set to default values		Yes	No	No	Yes	No
E_{inc}	kN/m²/m	0.000	0.000	2500	0.000	1875
y_{ref}	m	0.000	0.000	76.20	0.000	0.000
c_{inc}	kN/m²/m	0.000	0.000	5.000	0.000	0.000
y_{ref}	m	0.000	0.000	76.20	0.000	0.000
Tension cut-off		Yes	No	No	Yes	Yes
Tensile strength	kN/m²	0.000	10.00E6	10.00E6	0.000	0.000
Undrained behaviour		Standard	Standard	Standard	Standard	Standard
Skempton-B		0.9783	0.000	0.000	0.9699	0.9783
ν_u		0.4950	0.4950	0.4950	0.4950	0.4950
$K_{w,ref}$ / n	kN/m²	375.0E3	0.000	0.000	671.3E3	1.125E6
$C_{v,ref}$	m²/day	0.000	0.000	0.000	0.000	0.000
Stiffness		Standard	Standard	Standard	Standard	Standard
Strength		Rigid	Rigid	Rigid	Rigid	Rigid
R_{inter}		1.000	1.000	1.000	1.000	1.000
Consider gap closure		Yes	Yes	Yes	Yes	Yes
δ_{inter}		0.000	0.000	0.000	0.000	0.000

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
Cross permeability		Impermeable	Impermeable	Impermeable	Impermeable	Impermeable
Drainage conductivity, dk	m^3/day/m	0.000	0.000	0.000	0.000	0.000
K_0 determination		Automatic	Automatic	Automatic	Automatic	Automatic
$K_{0,x} = K_{0,z}$		Yes	Yes	Yes	Yes	Yes
$K_{0,x}$		0.5774	0.5000	0.5000	0.5933	0.6093
$K_{0,z}$		0.5774	0.5000	0.5000	0.5933	0.6093
Data set		Standard	Standard	Standard	Standard	Standard
Type		Coarse	Coarse	Coarse	Coarse	Coarse
< 2 µm	%	10.00	10.00	10.00	10.00	10.00
2 µm - 50 µm	%	13.00	13.00	13.00	13.00	13.00
50 µm - 2 mm	%	77.00	77.00	77.00	77.00	77.00
Use defaults		None	None	None	None	None
k_x	m/day	0.000	0.000	0.000	0.000	0.000
k_y	m/day	0.000	0.000	0.000	0.000	0.000
$-\psi_{unsat}$	m	10.00E3	10.00E3	10.00E3	10.00E3	10.00E3
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
S_s	1/m	0.000	0.000	0.000	0.000	0.000
c_k		1000E12	1000E12	1000E12	1000E12	1000E12

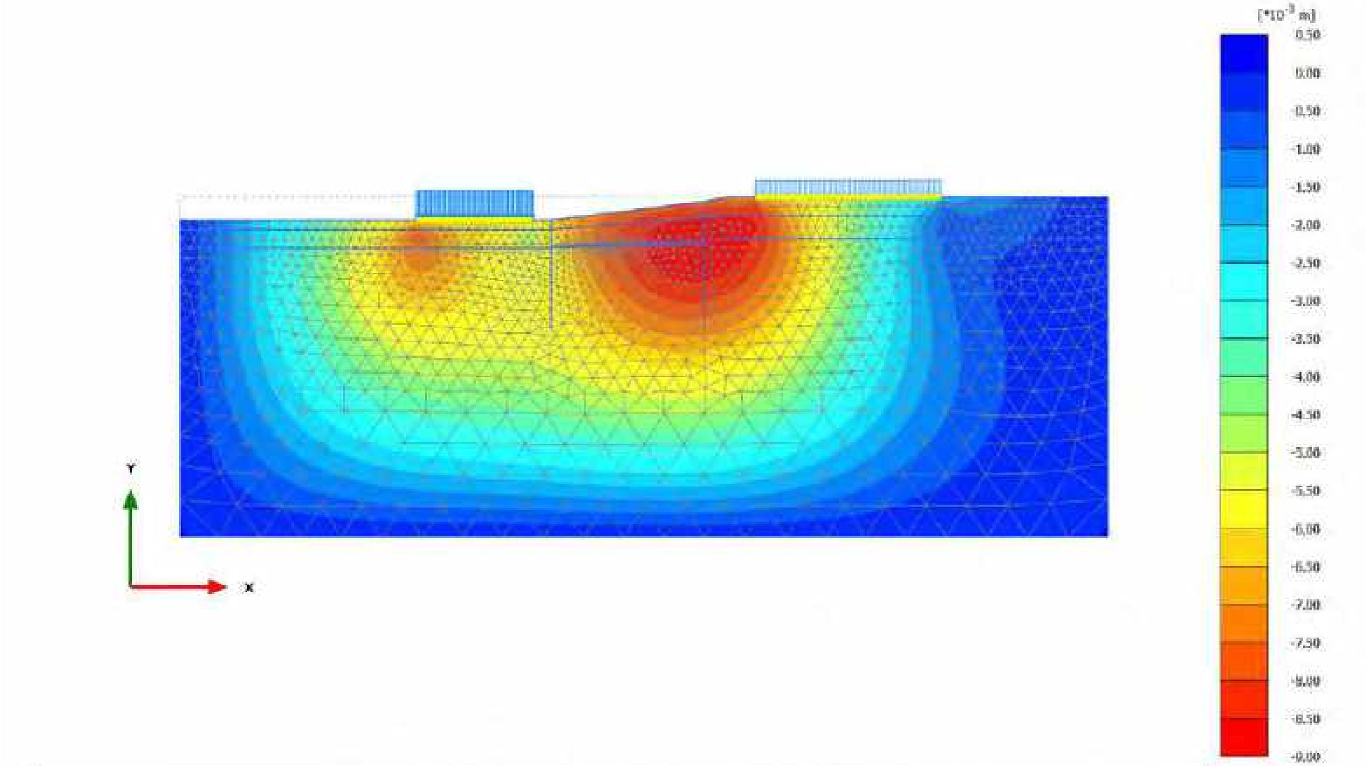
1.1.4.2 Materials - Plates -

Identification		**AU25**	**AU14**
Identification number		1	2
Comments			
Colour			
Material type		Elastic	Elastic
Isotropic		Yes	Yes
EA_1	kN/m	3.760E6	2.640E6
EA_2	kN/m	3.760E6	2.640E6
EI	kN m^2/m	112.5E3	57.36E3
d	m	0.5991	0.5106
w	kN/m/m	1.000	0.000
ν (nu)		0.2000	0.000
Rayleigh α		0.000	0.000
Rayleigh β		0.000	0.000
Prevent punching		No	No
Identification number		1	2

1.1.4.3 Materials - Geogrids -

Identification		ficticious
Identification number		1
Comments		
Colour		
Material type		Elastic
Isotropic		Yes
EA_1	kN/m	1.000
EA_2	kN/m	1.000
Identification number		1
Identification number		1

2.1.1.1.1 Calculation results, Terrain [Phase_1] (1/11), Total displacements u_x

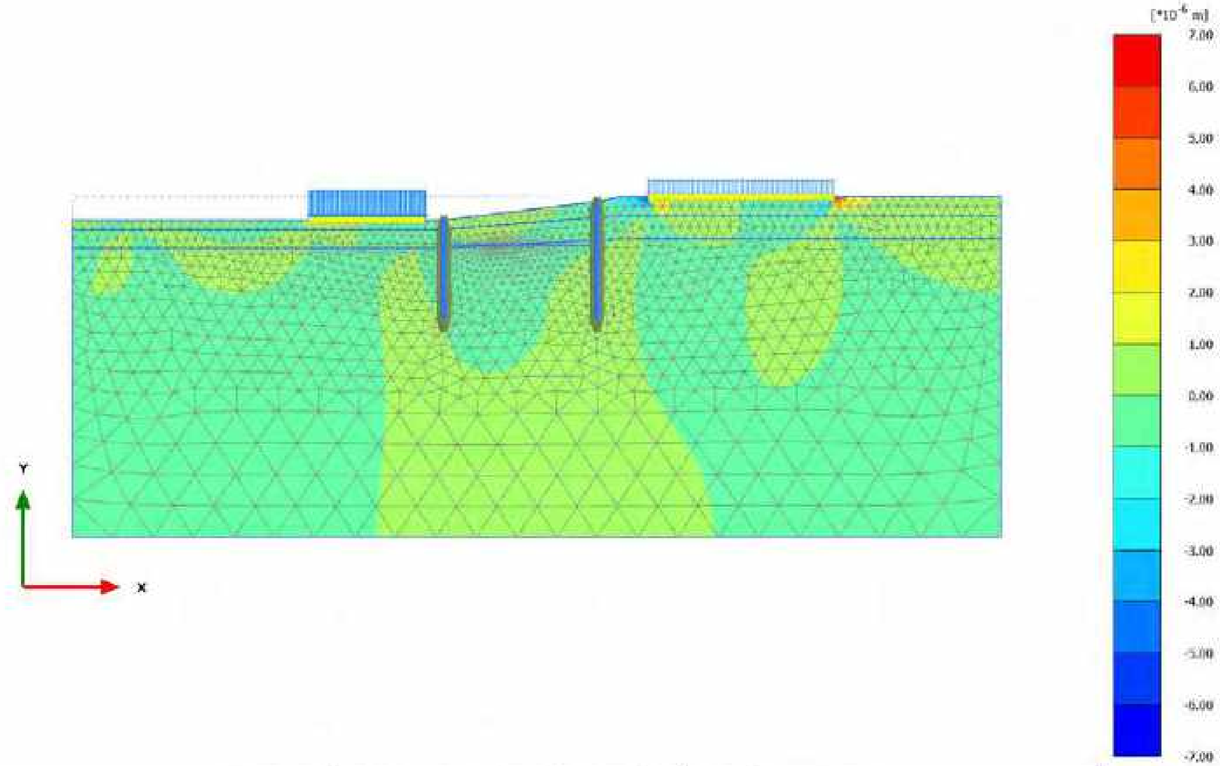


Total displacements u_x (scaled up 500 times)

Maximum value = 0.02176×10^{-3} m (Element 388 at Node 25540)

Minimum value = -8.922×10^{-3} m (Element 649 at Node 9613)

2.1.1.1.2 Calculation results, Wall construction [Phase_2] (2/13), Total displacements u_x

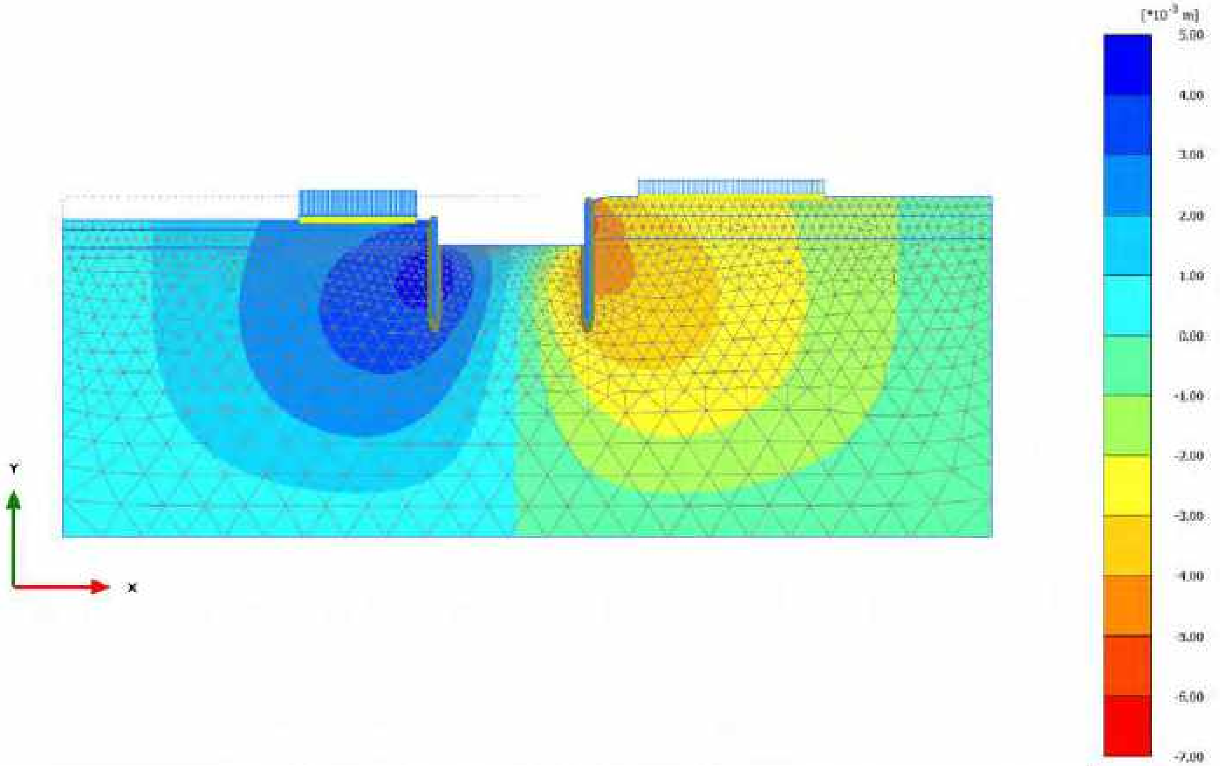


Total displacements u_x (scaled up $200*10^3$ times)

Maximum value = $6.913*10^{-6}$ m (Element 28 at Node 617)

Minimum value = $-6.904*10^{-6}$ m (Element 390 at Node 21297)

2.1.1.1.3 Calculation results, Excavation [Phase_3] (3/21), Total displacements u_x

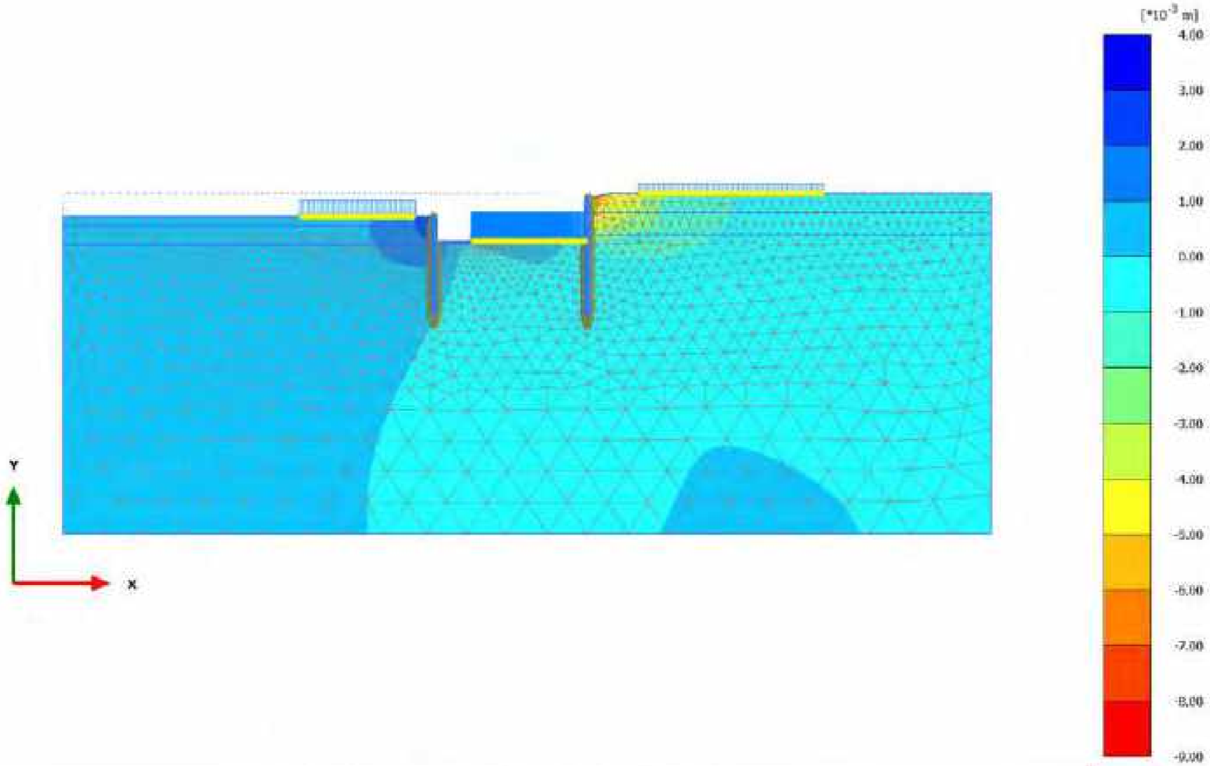


Total displacements u_x (scaled up 200 times)

Maximum value = $4.522*10^{-3}$ m (Element 2813 at Node 15141)

Minimum value = $-6.766*10^{-3}$ m (Element 167 at Node 12612)

2.1.1.1.4 Calculation results, Construction [Phase_4] (4/25), Total displacements u_x

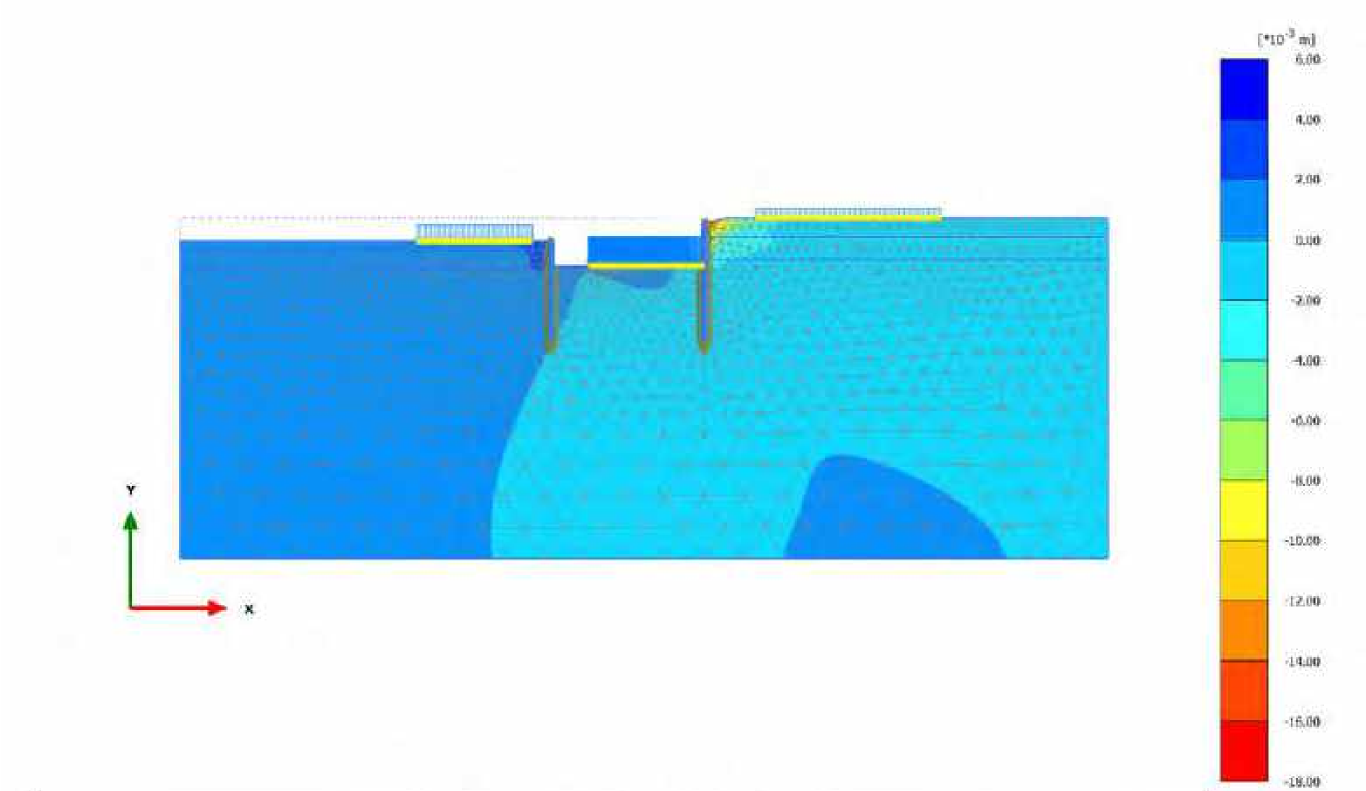


Total displacements u_x (scaled up 200 times)

Maximum value = 3.282×10^{-3} m (Element 425 at Node 20290)

Minimum value = -8.620×10^{-3} m (Element 167 at Node 12612)

2.1.1.1.5 Calculation results, Drained [Phase_5] (5/64), Total displacements u_x

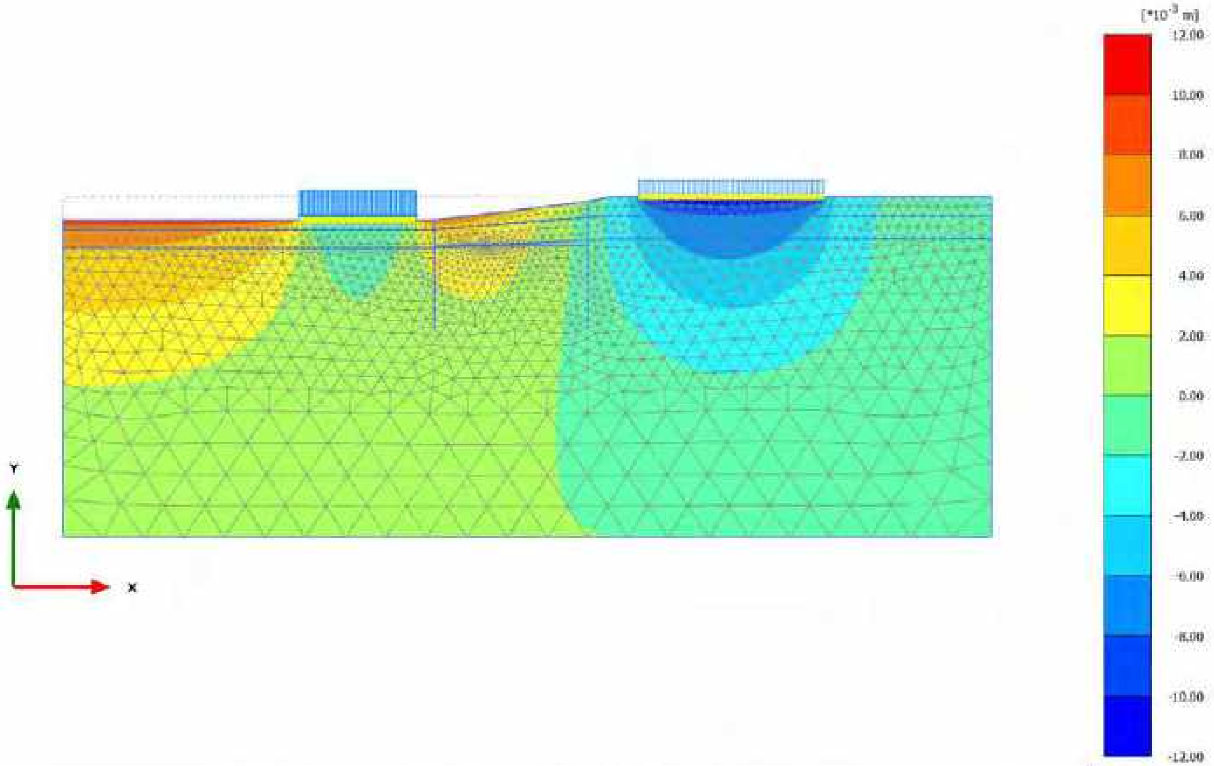


Total displacements u_x (scaled up 200 times)

Maximum value = $4.957*10^{-3}$ m (Element 425 at Node 20290)

Minimum value = -0.01704 m (Element 167 at Node 12612)

2.1.1.2.1 Calculation results, Terrain [Phase_1] (1/11), Total displacements u_y

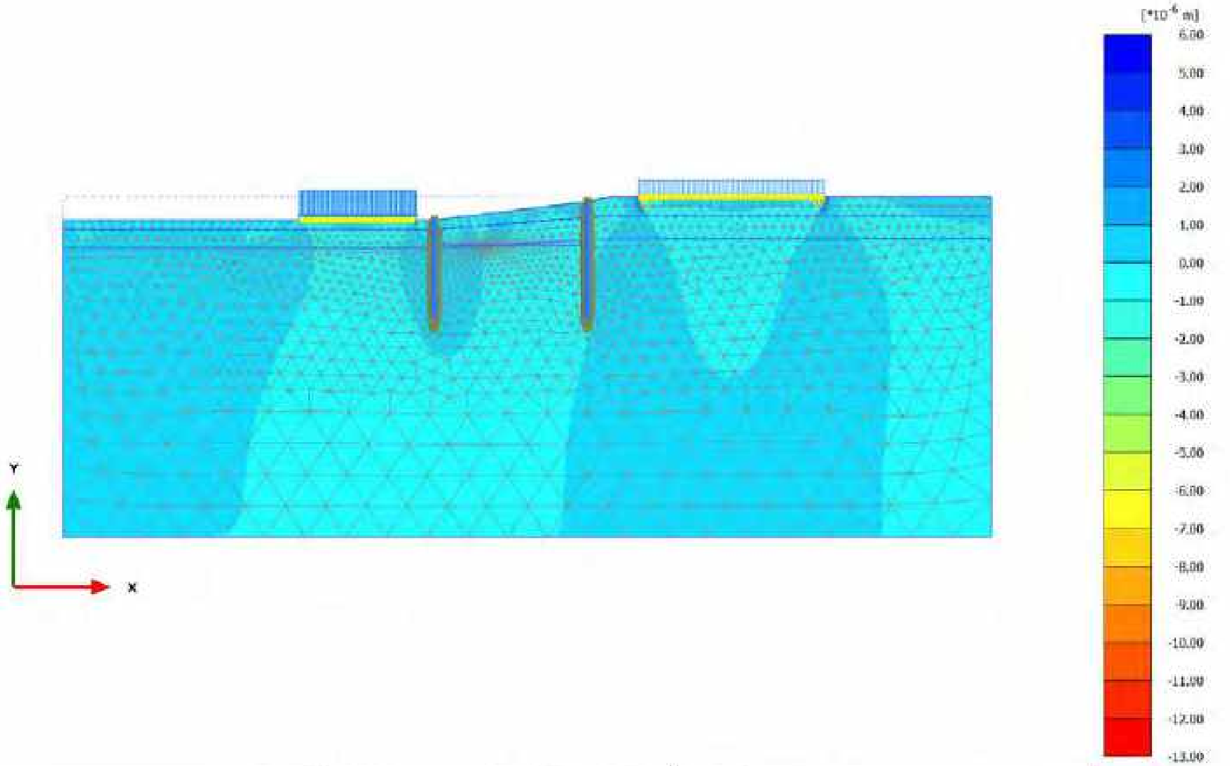


Total displacements u_y (scaled up 200 times)

Maximum value = 0.01011 m (Element 388 at Node 25540)

Minimum value = -0.01180 m (Element 59 at Node 2755)

2.1.1.2.2 Calculation results, Wall construction [Phase_2] (2/13), Total displacements u_y

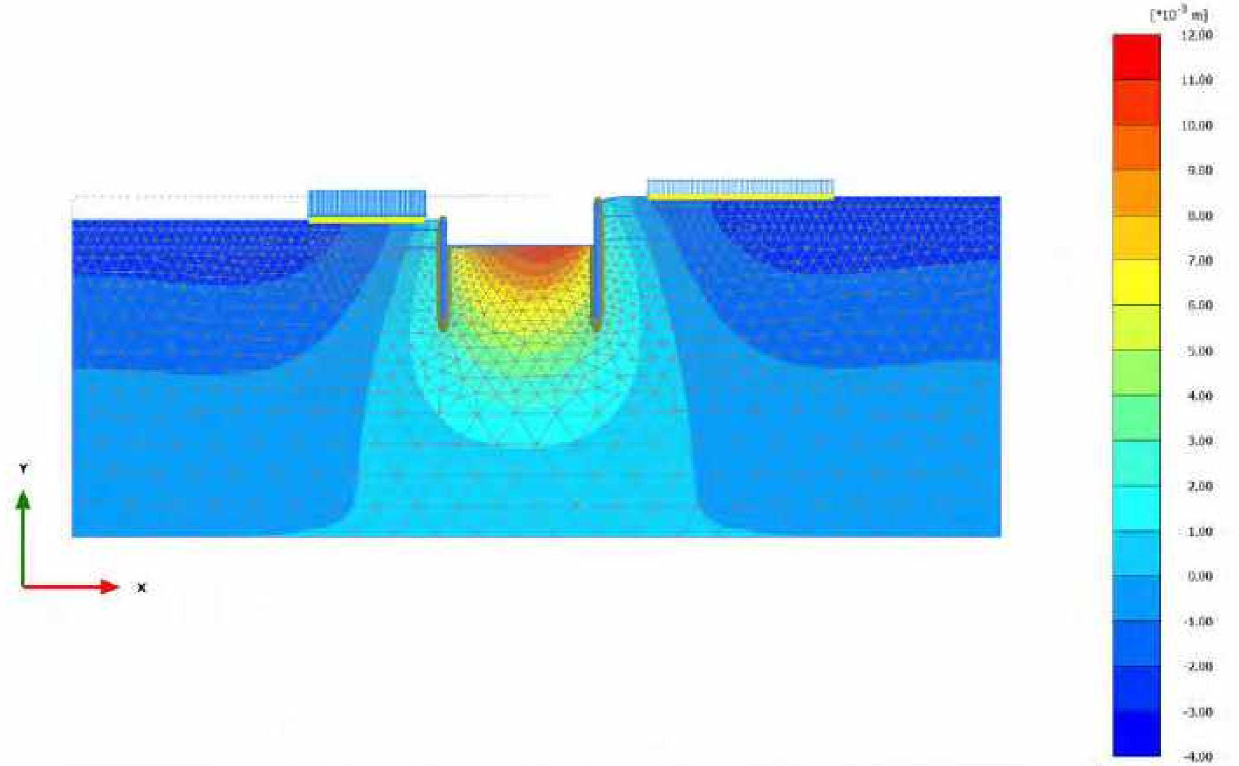


Total displacements u_y (scaled up $200*10^3$ times)

Maximum value = $5.729*10^{-6}$ m (Element 390 at Node 21297)

Minimum value = $-0.01199*10^{-3}$ m (Element 39 at Node 966)

2.1.1.2.3 Calculation results, Excavation [Phase_3] (3/21), Total displacements u_y

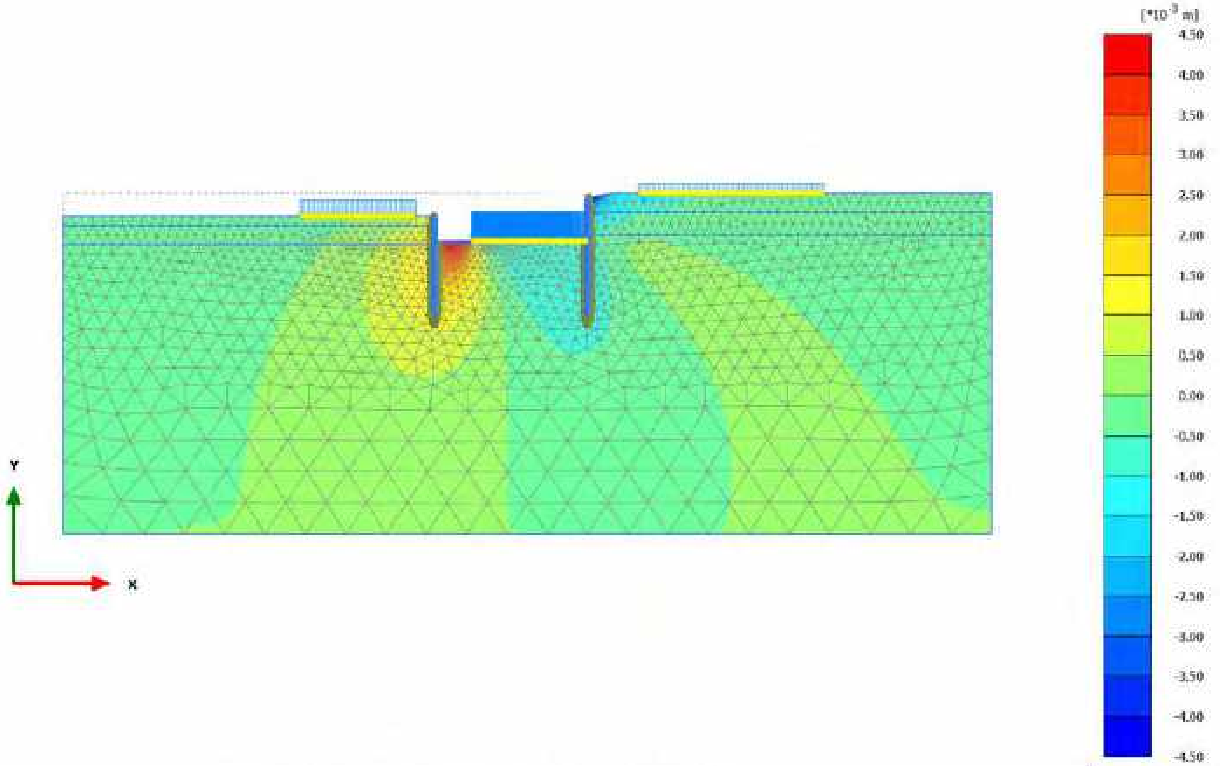


Total displacements u_y (scaled up 200 times)

Maximum value = 0.01112 m (Element 2975 at Node 11850)

Minimum value = $-3.031 \cdot 10^{-3}$ m (Element 39 at Node 966)

2.1.1.2.4 Calculation results, Construction [Phase_4] (4/25), Total displacements u_y

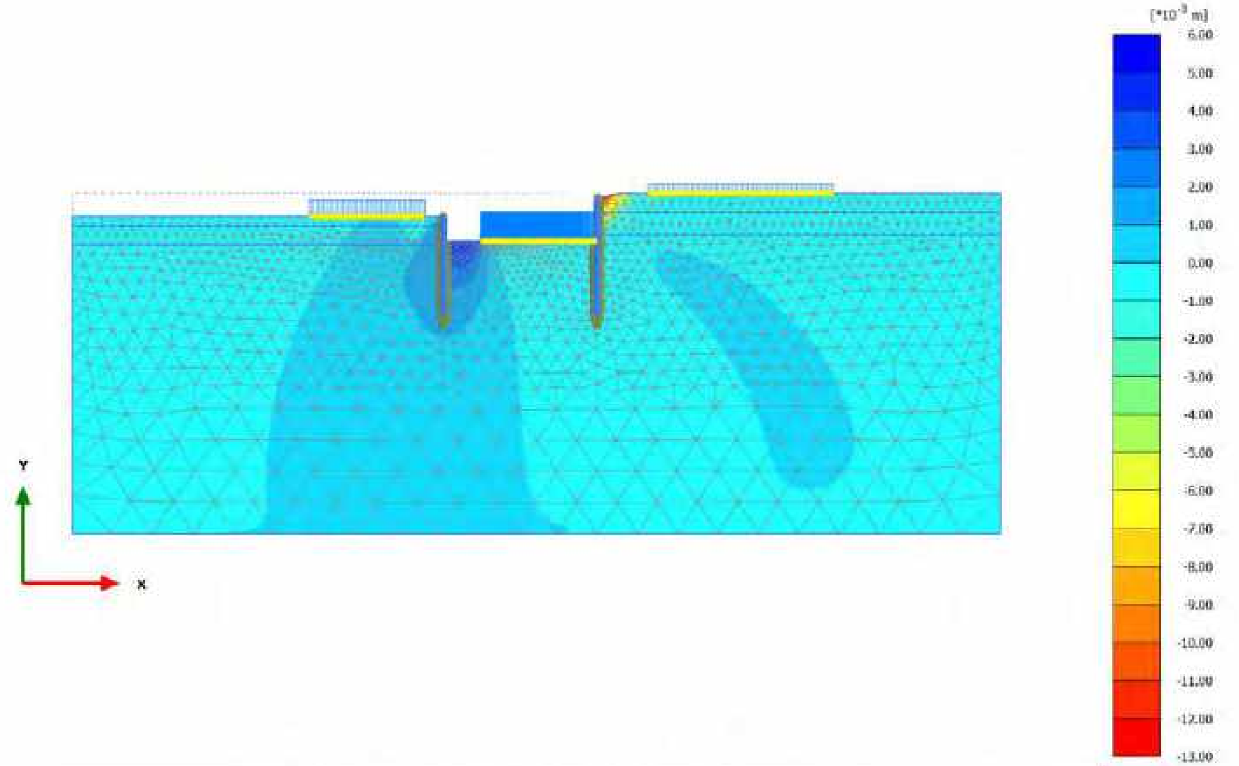


Total displacements u_y (scaled up 500 times)

Maximum value = $4.427*10^{-3}$ m (Element 1094 at Node 17988)

Minimum value = $-4.343*10^{-3}$ m (Element 167 at Node 11701)

2.1.1.2.5 Calculation results, Drained [Phase_5] (5/64), Total displacements u_y

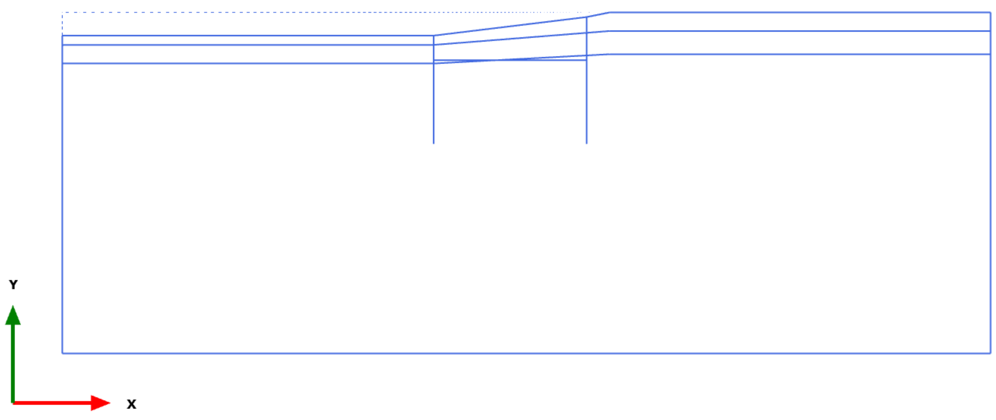


Total displacements u_y (scaled up 200 times)

Maximum value = $5.092*10^{-3}$ m (Element 1091 at Node 17992)

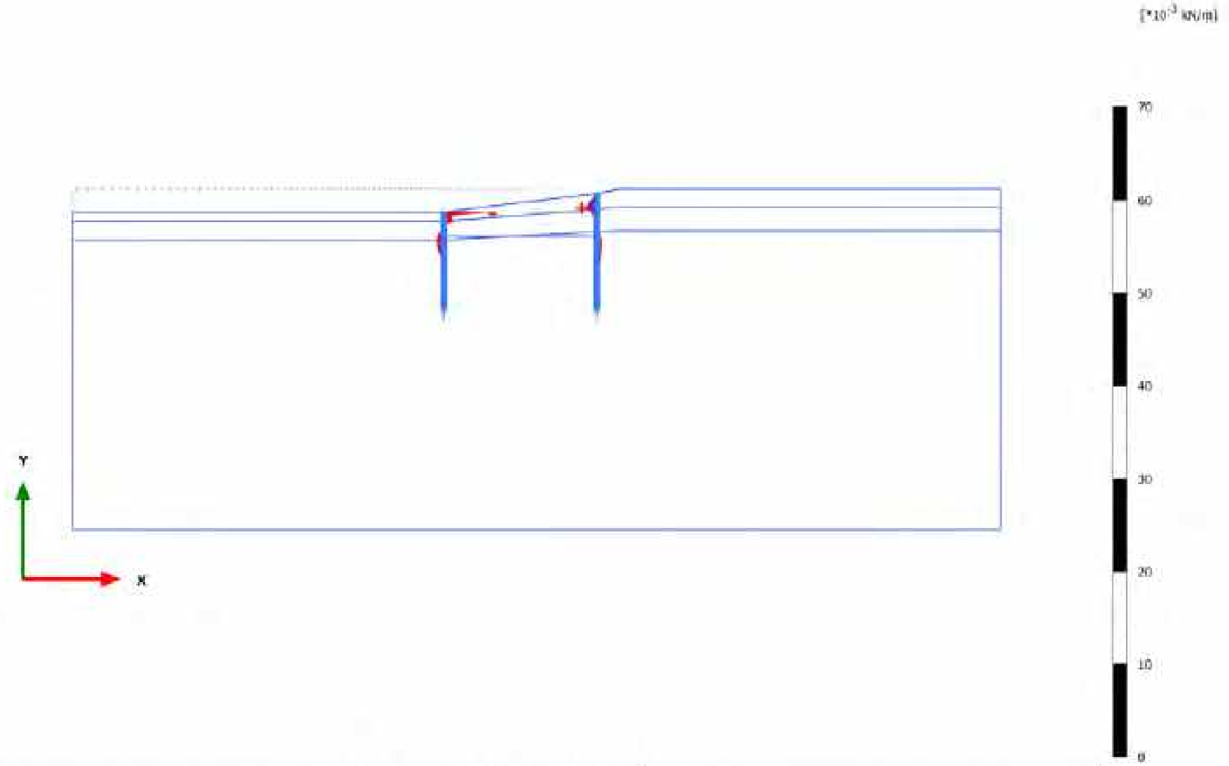
Minimum value = -0.01249 m (Element 167 at Node 11701)

3.1.1.1.1 Calculation results, Plate, Terrain [Phase_1] (1/11), Shear forces Q



Shear forces Q (scaled up 1.00 times)
No results

3.1.1.1.2 Calculation results, Plate, Wall construction [Phase_2] (2/13), Shear forces Q

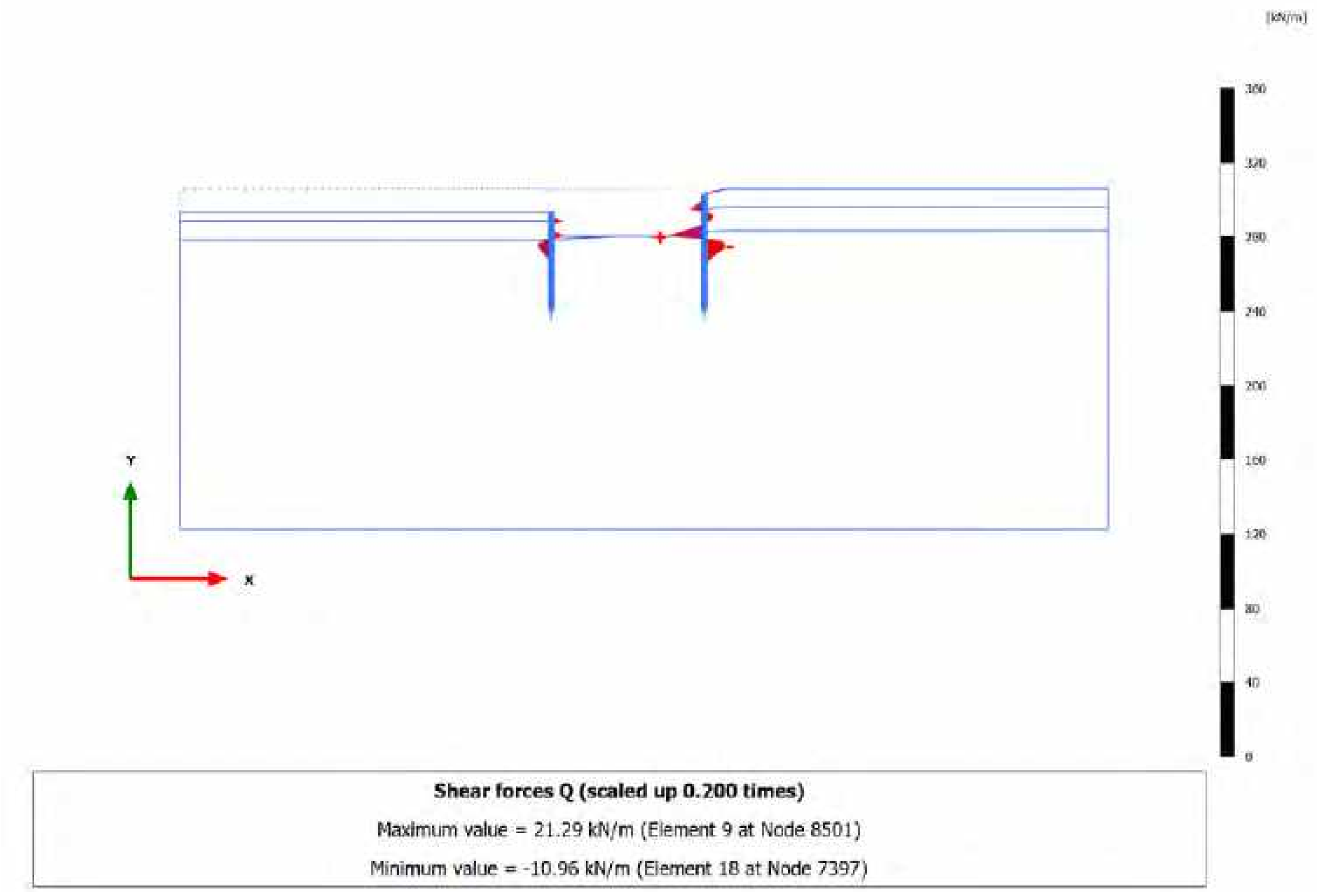


Shear forces Q (scaled up $1.00*10^3$ times)

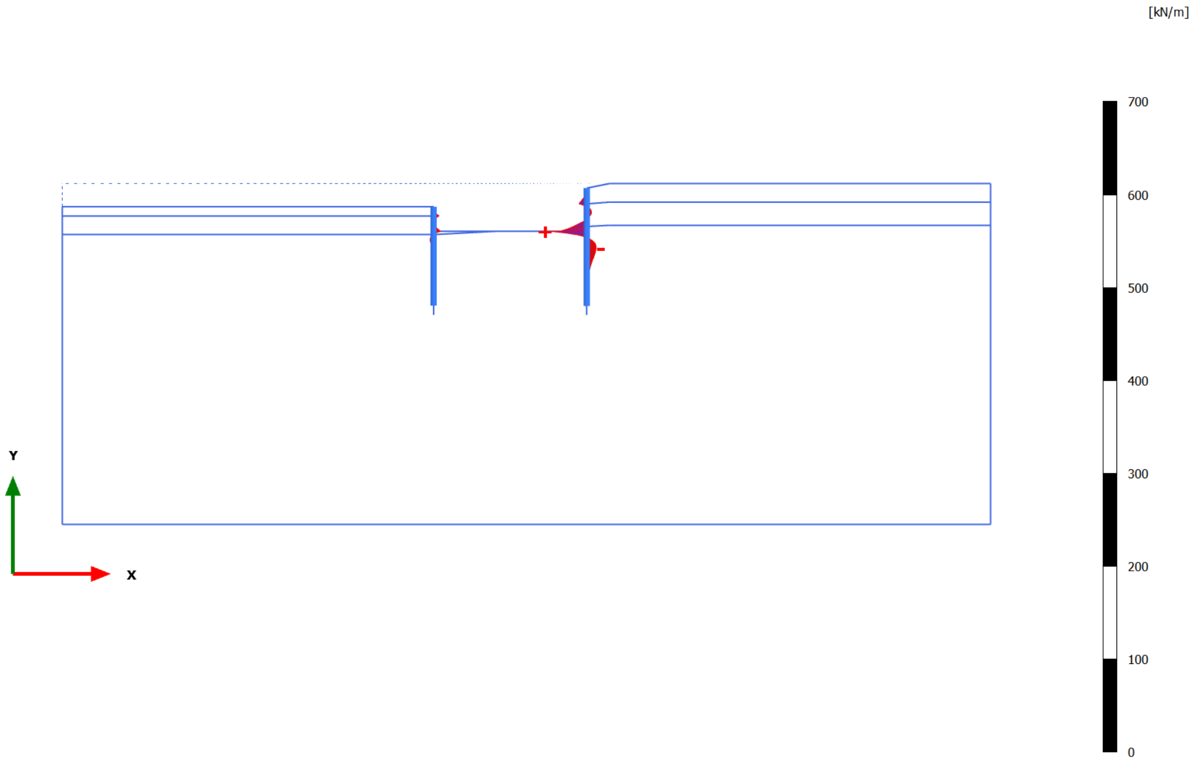
Maximum value = $1.047*10^{-3}$ kN/m (Element 1 at Node 10874)

Minimum value = $-4.693*10^{-3}$ kN/m (Element 3 at Node 19906)

3.1.1.1.3 Calculation results, Plate, Excavation [Phase_3] (3/21), Shear forces Q



3.1.1.1.4 Calculation results, Plate, Construction [Phase_4] (4/25), Shear forces Q

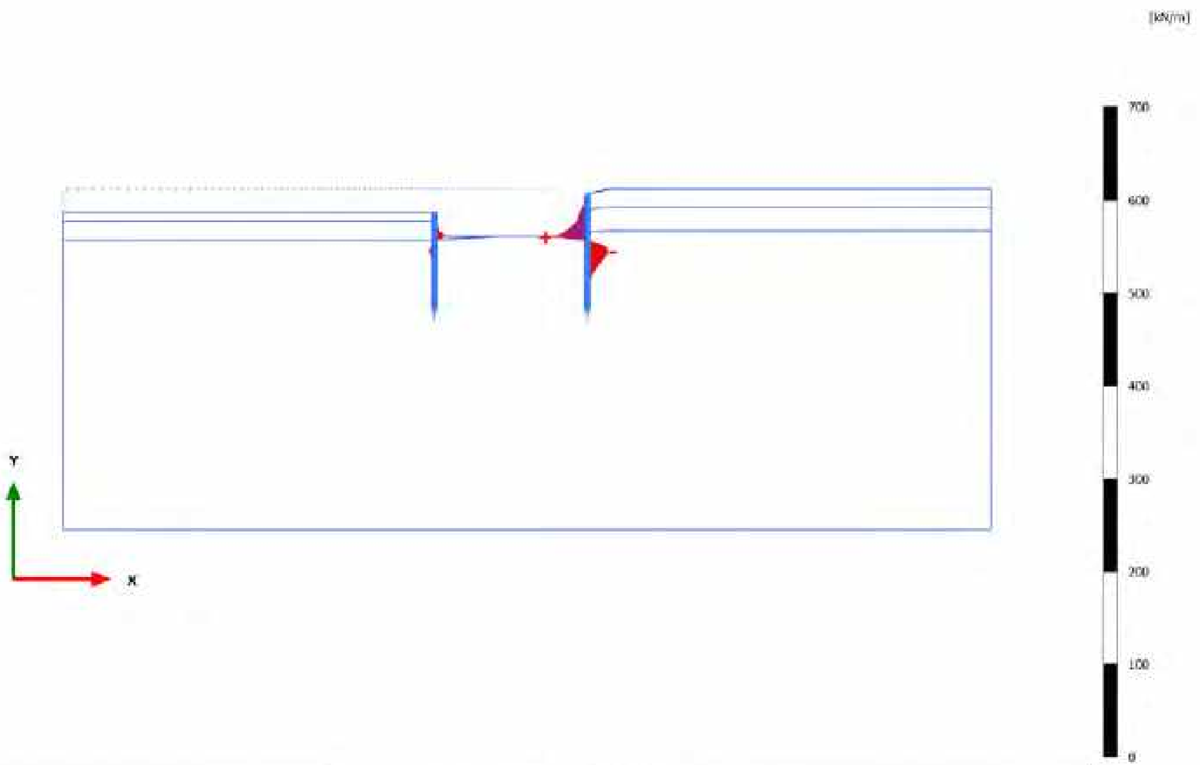


Shear forces Q (scaled up 0.100 times)

Maximum value = 38.92 kN/m (Element 19 at Node 8501)

Minimum value = -10.17 kN/m (Element 17 at Node 6891)

3.1.1.1.5 Calculation results, Plate, Drained [Phase_5] (5/64), Shear forces Q

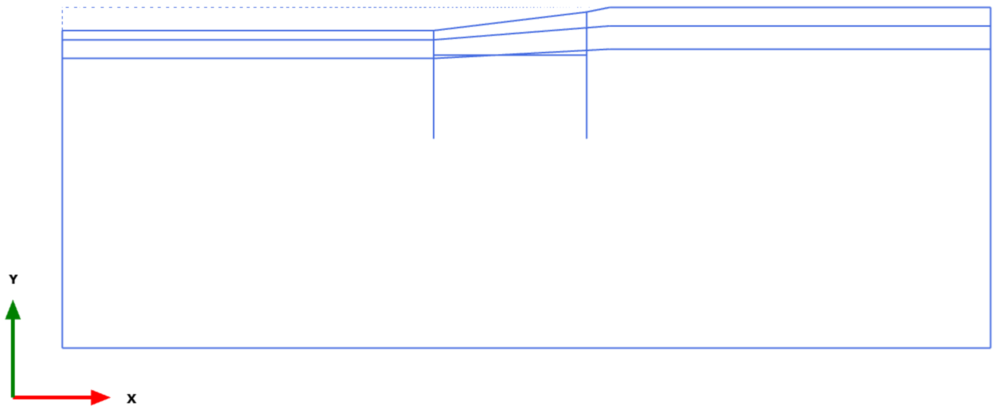


Shear forces Q (scaled up 0.100 times)

Maximum value = 40.13 kN/m (Element 19 at Node 8501)

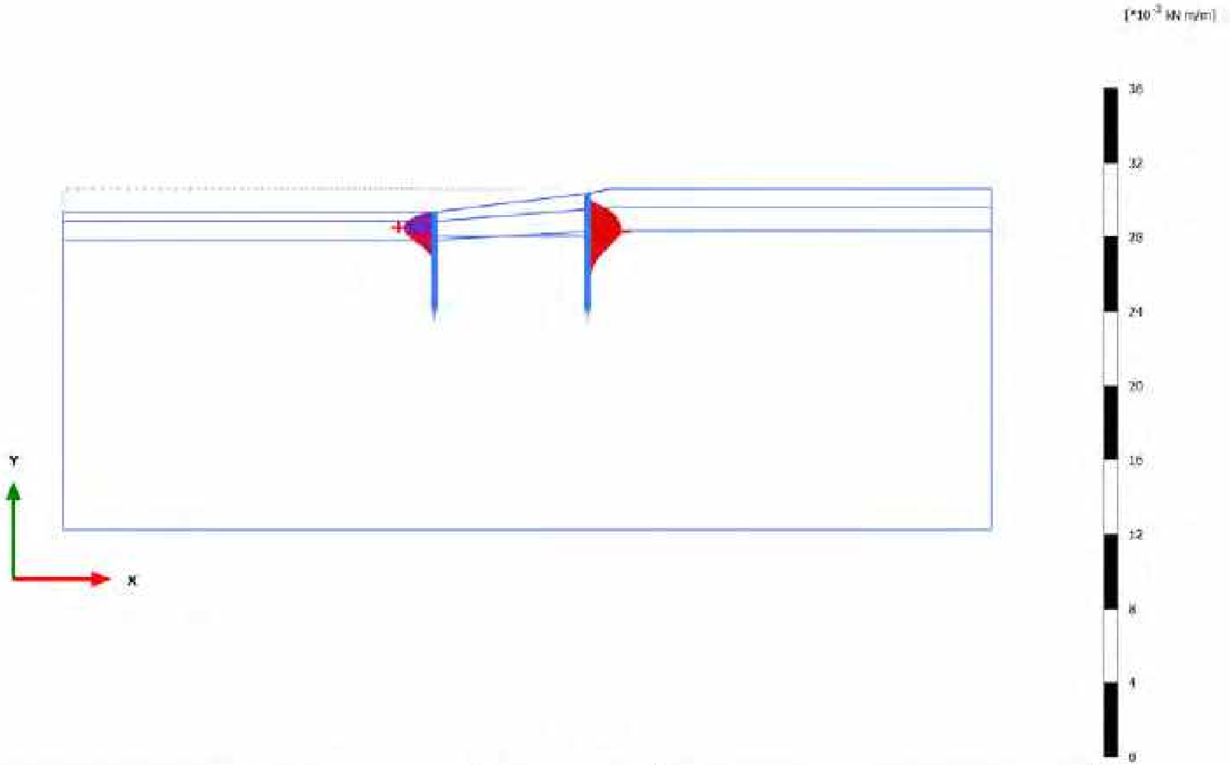
Minimum value = -22.01 kN/m (Element 17 at Node 7394)

3.1.1.2.1 Calculation results, Plate, Terrain [Phase_1] (1/11), Bending moments M



Bending moments M (scaled up 1.00 times)
No results

3.1.1.2.2 Calculation results, Plate, Wall construction [Phase_2] (2/13), Bending moments M

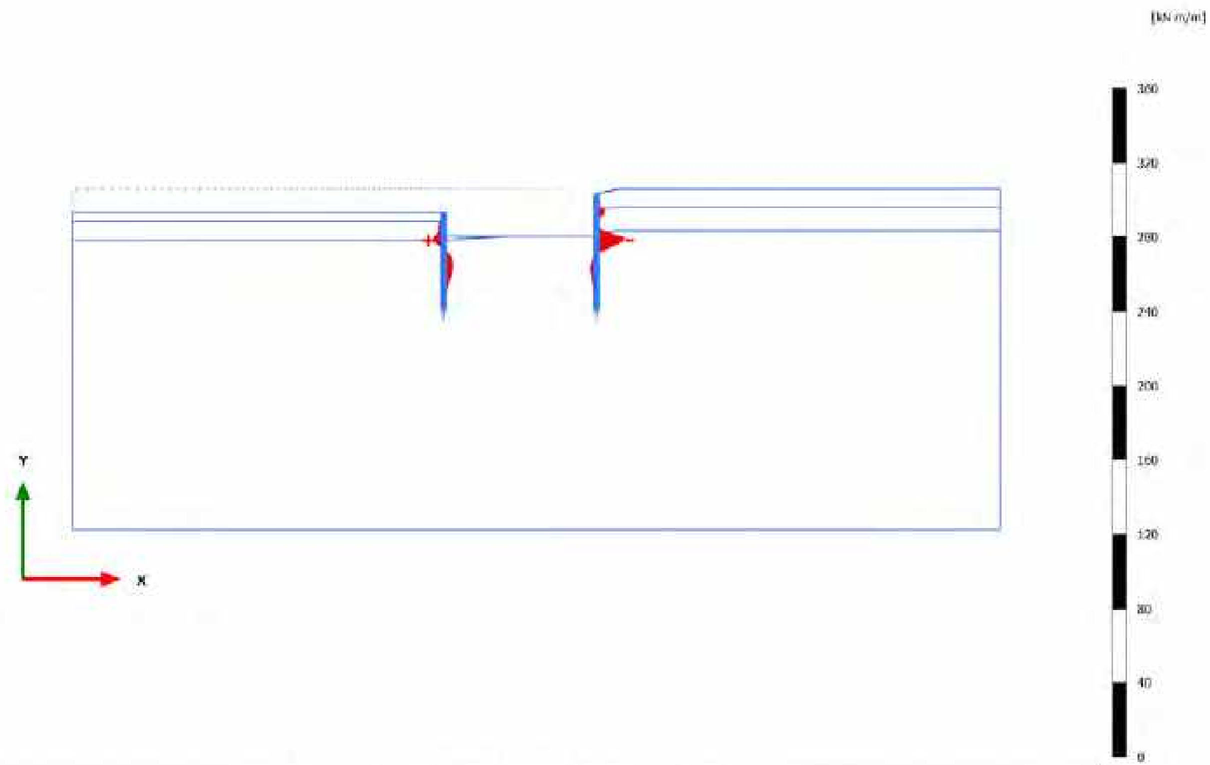


Bending moments M (scaled up $2.00*10^3$ times)

Maximum value = $1.670*10^{-3}$ kN m/m (Element 8 at Node 19356)

Minimum value = $-1.801*10^{-3}$ kN m/m (Element 4 at Node 8976)

3.1.1.2.3 Calculation results, Plate, Excavation [Phase_3] (3/21), Bending moments M

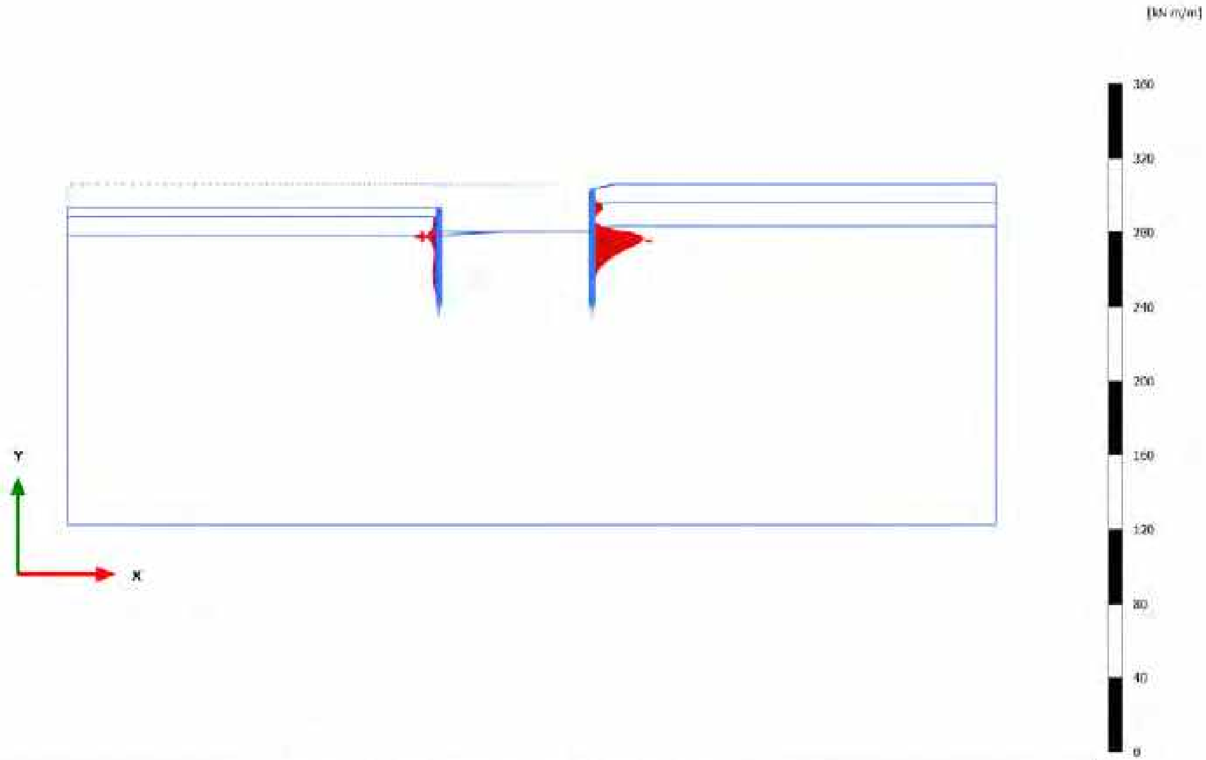


Bending moments M (scaled up 0.200 times)

Maximum value = 5.545 kN m/m (Element 10 at Node 18277)

Minimum value = -15.13 kN m/m (Element 19 at Node 7660)

3.1.1.2.4 Calculation results, Plate, Construction [Phase_4] (4/25), Bending moments M

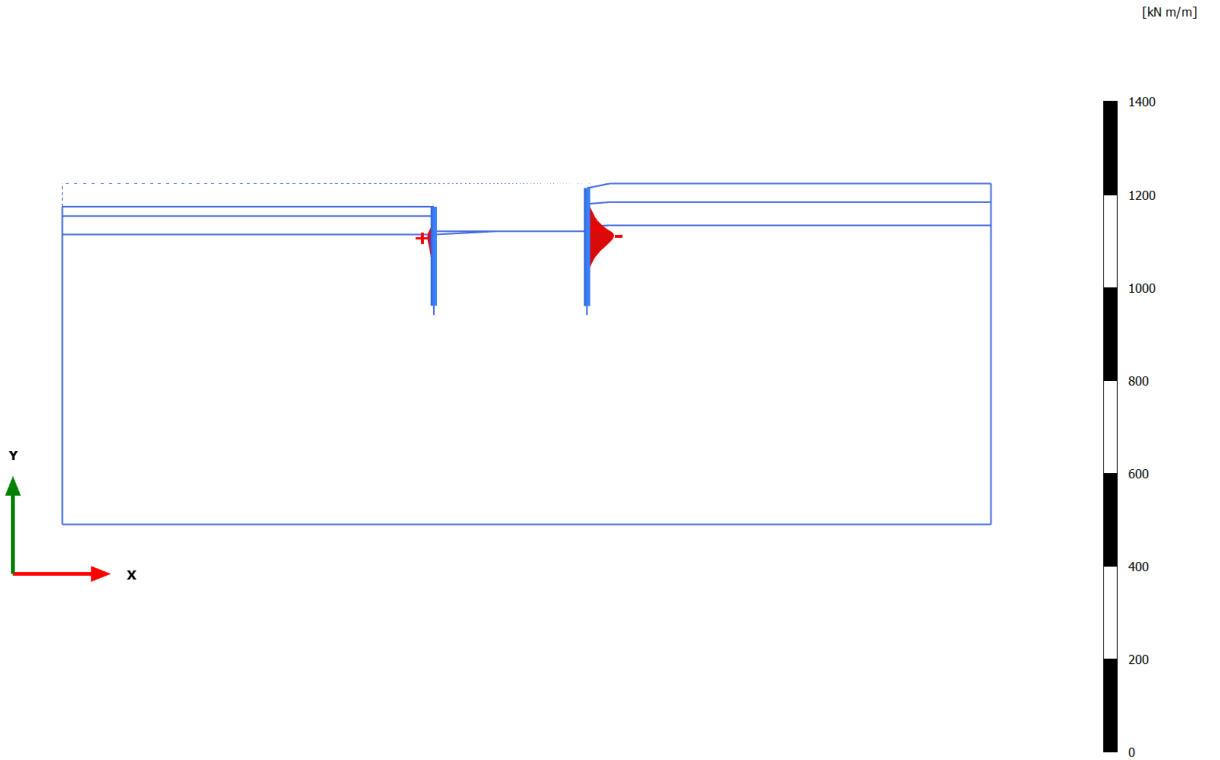


Bending moments M (scaled up 0.200 times)

Maximum value = 6.353 kN m/m (Element 10 at Node 18276)

Minimum value = -27.48 kN m/m (Element 19 at Node 7657)

3.1.1.2.5 Calculation results, Plate, Drained [Phase_5] (5/64), Bending moments M

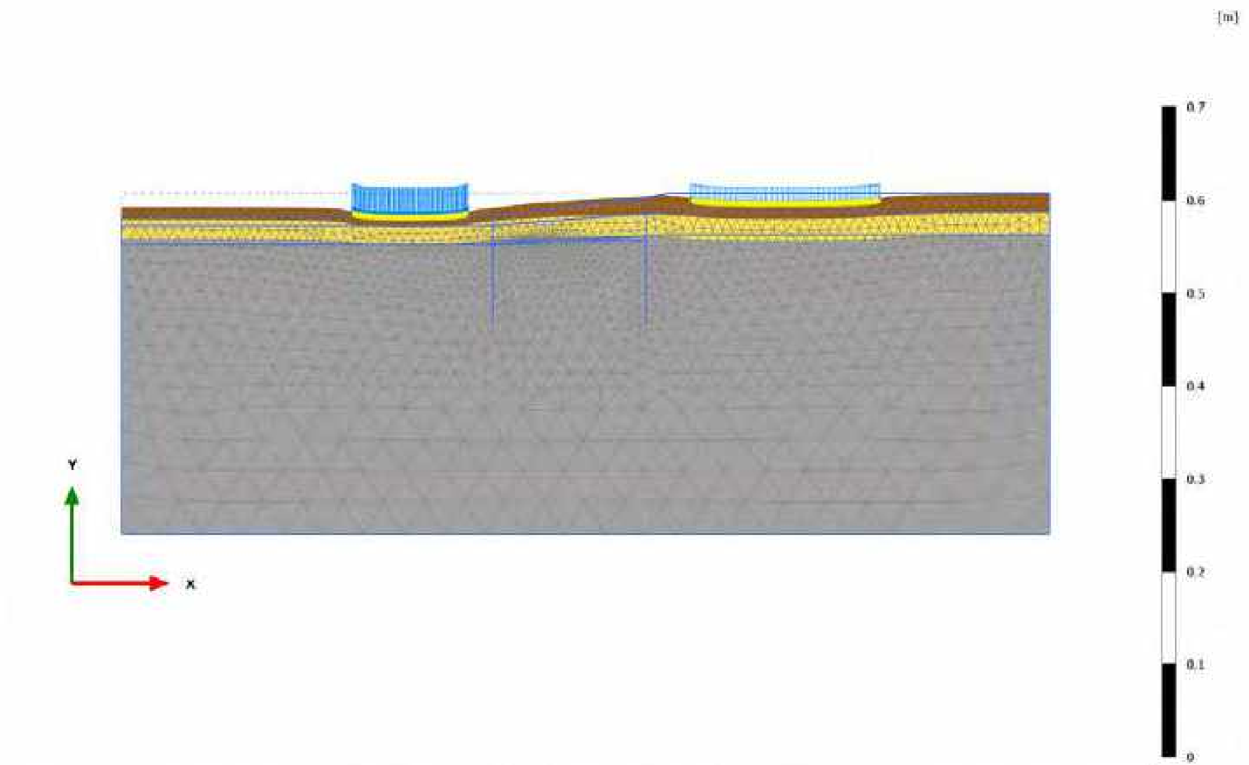


Bending moments M (scaled up 0.0500 times)

Maximum value = 13.13 kN m/m (Element 29 at Node 17672)

Minimum value = -57.51 kN m/m (Element 19 at Node 7659)

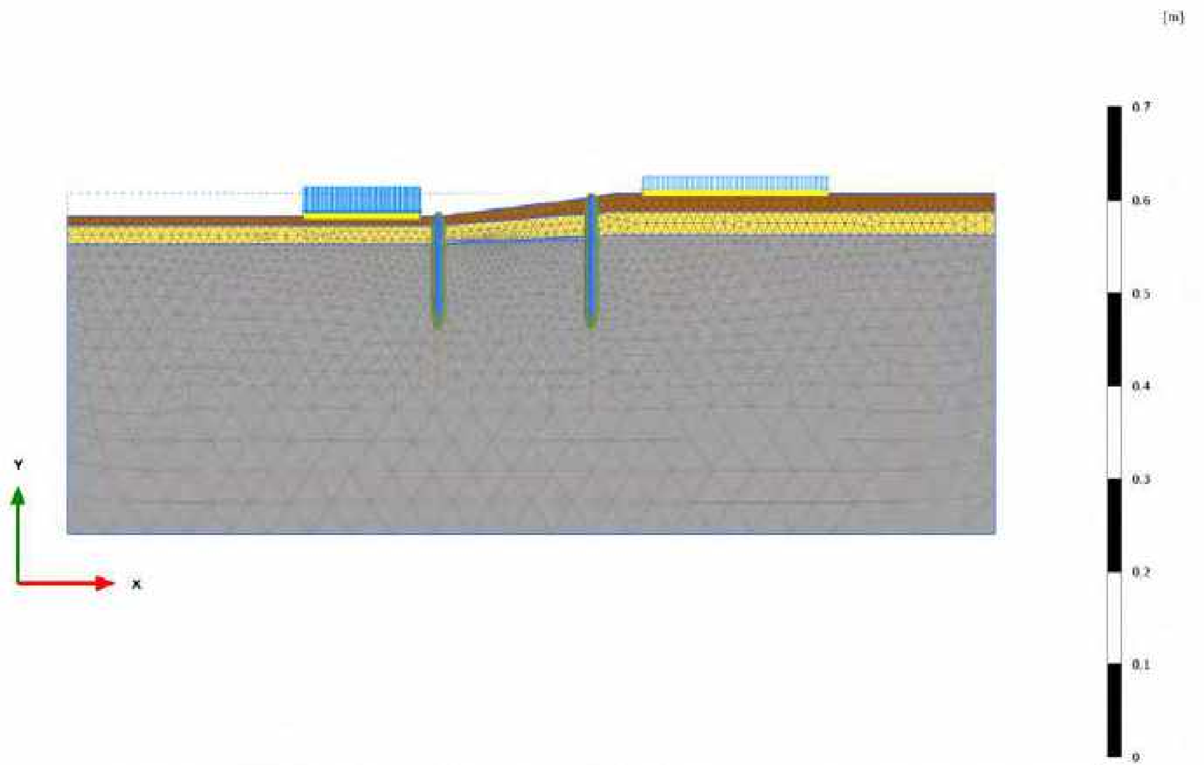
4.1.1 Calculation results, Terrain [Phase_1] (1/11), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.01297 m (Element 51 at Node 4073)

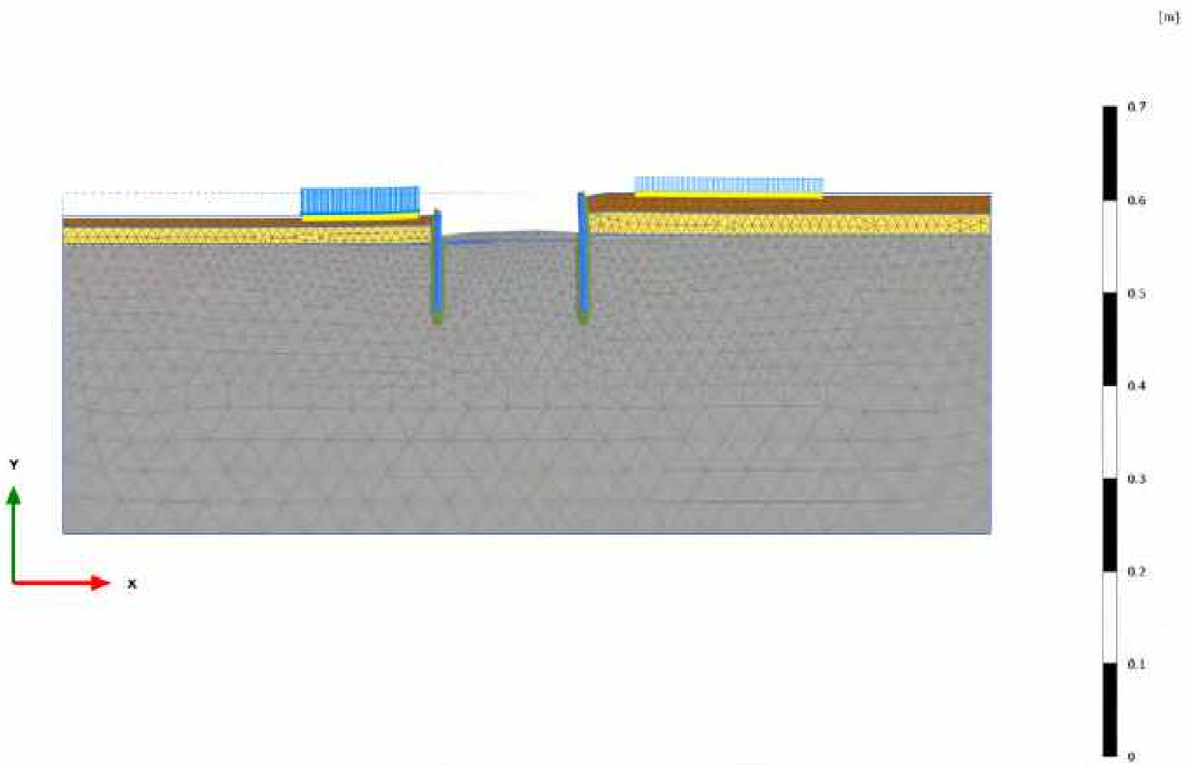
4.1.2 Calculation results, Wall construction [Phase_2] (2/13), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $0.01206 \cdot 10^{-3}$ m (Element 28 at Node 965)

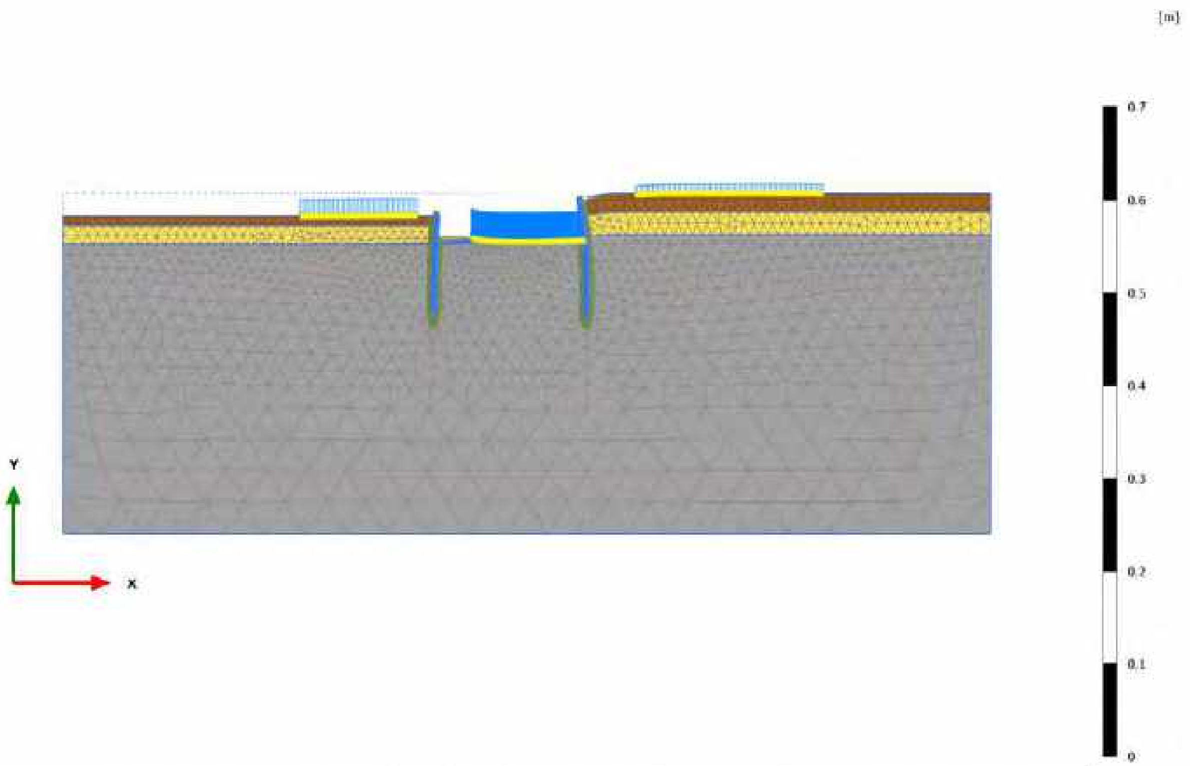
4.1.3 Calculation results, Excavation [Phase_3] (3/21), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.01112 m (Element 2975 at Node 11850)

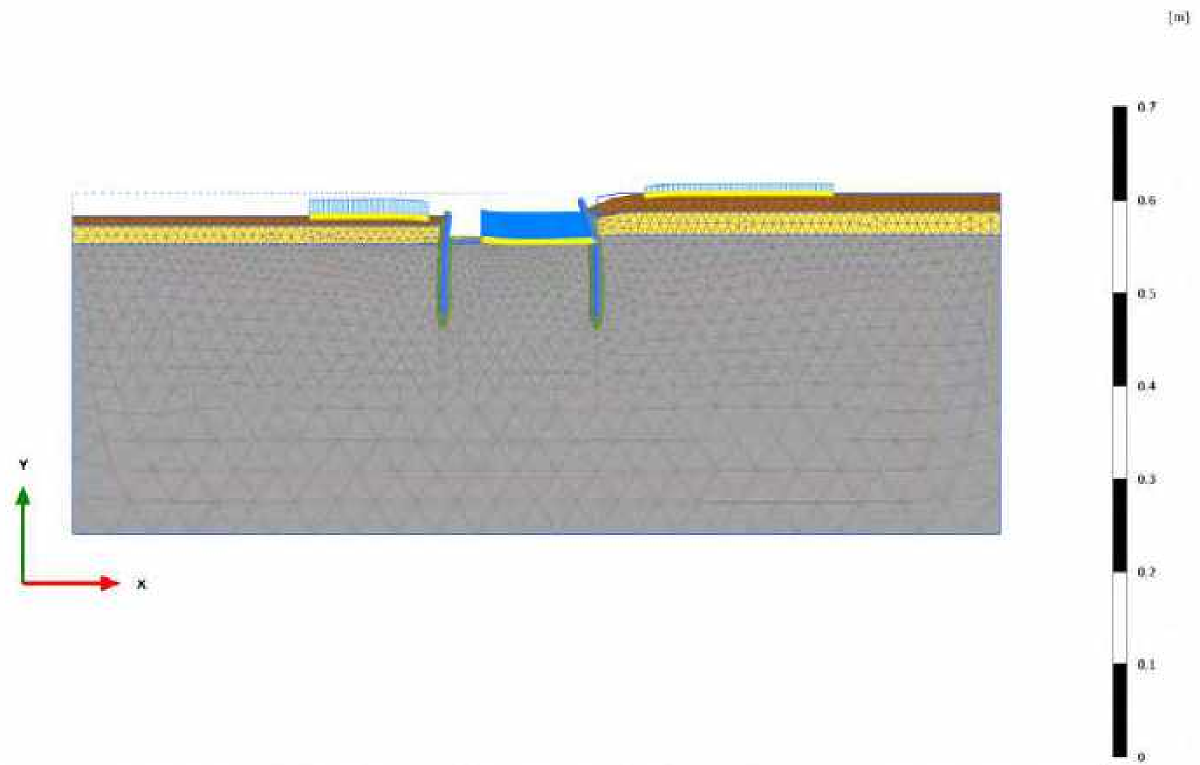
4.1.4 Calculation results, Construction [Phase_4] (4/25), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $9.199 \cdot 10^{-3}$ m (Element 167 at Node 11688)

4.1.5 Calculation results, Drained [Phase_5] (5/64), Deformed mesh |u|



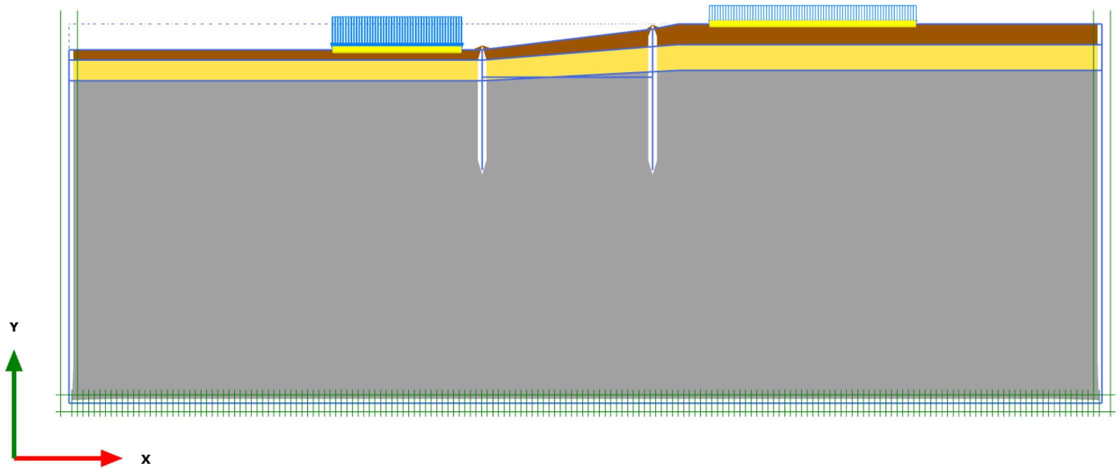
Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.02026 m (Element 167 at Node 11688)

PLAXIS Report

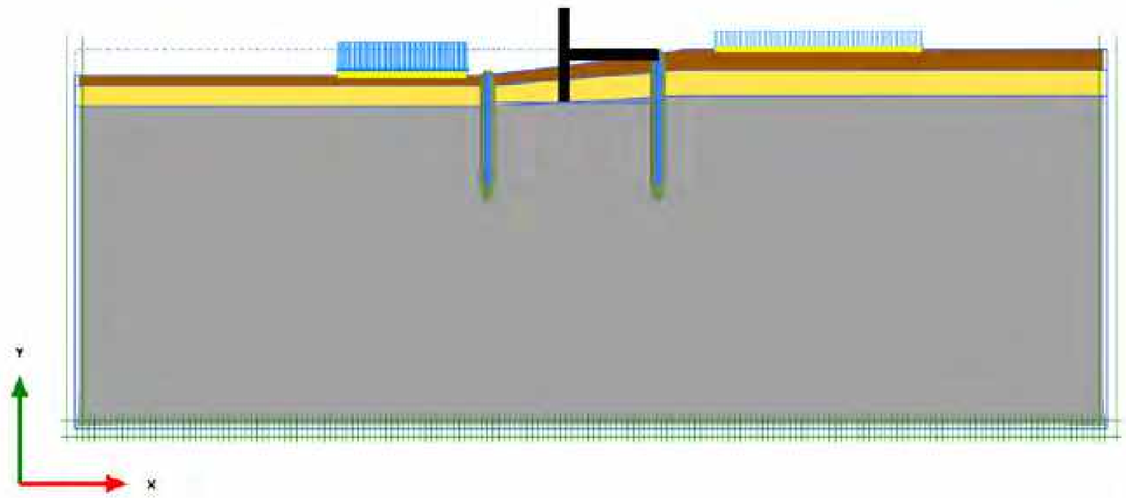
Filename	**Daleham 31 A-A_5_5m_propped.p2dx**
Directory	D:\fortisNEXUM\01-Em Curso\T23012 - 31 Daleham\A - EX\GEO\B-Calculos\PLAXIS\Finais\
Title	Daleham 31 A-A
Model	Plane strain
Elements	15-Noded
PLAXIS Version	Version 20.0.0.119

1.1.1.1 Calculation results, Terrain [Phase_1] (1/11), Fixities plot



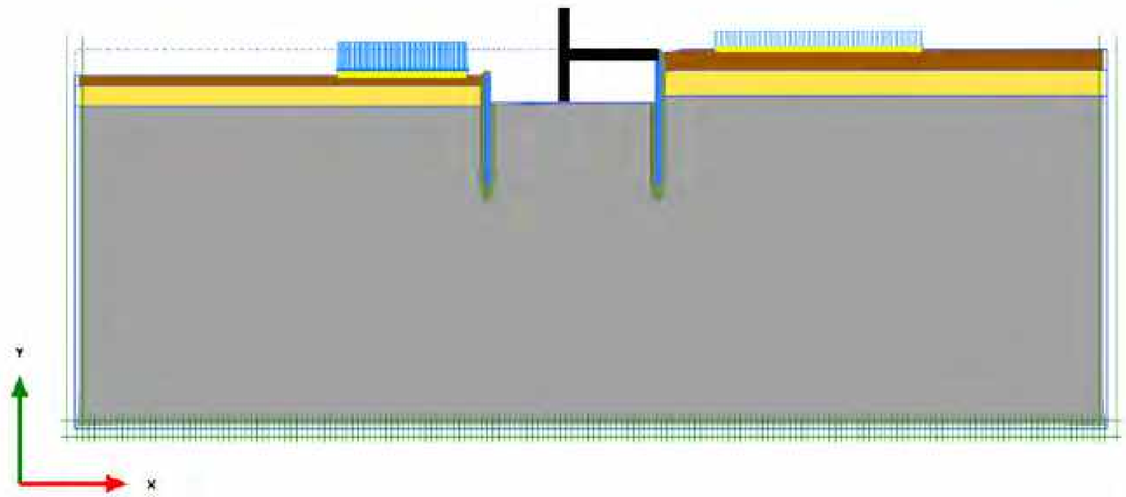
Fixities plot

1.1.1.2 Calculation results, Wall construction [Phase_2] (2/13), Fixities plot



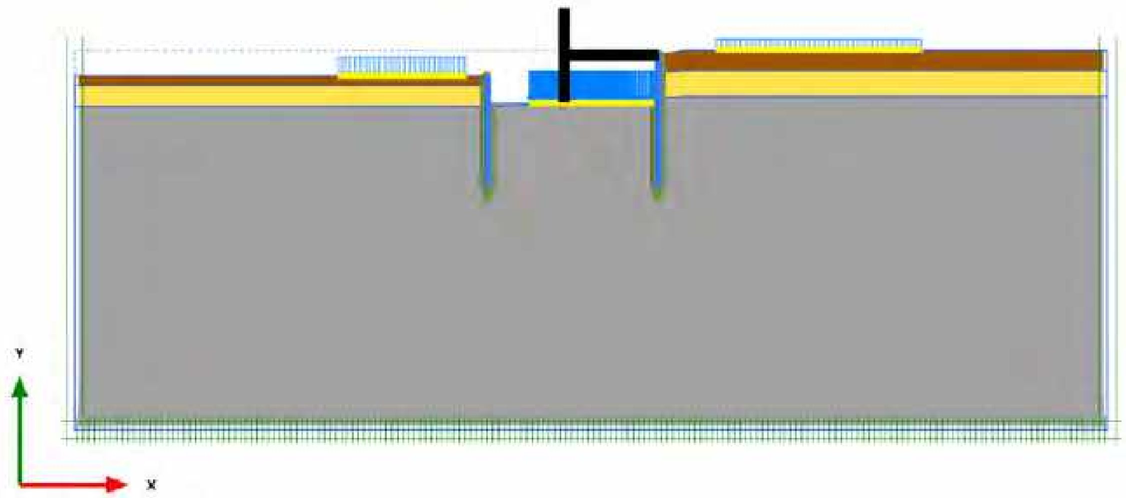
Fixities plot

1.1.1.3 Calculation results, Excavation [Phase_3] (3/17), Fixities plot



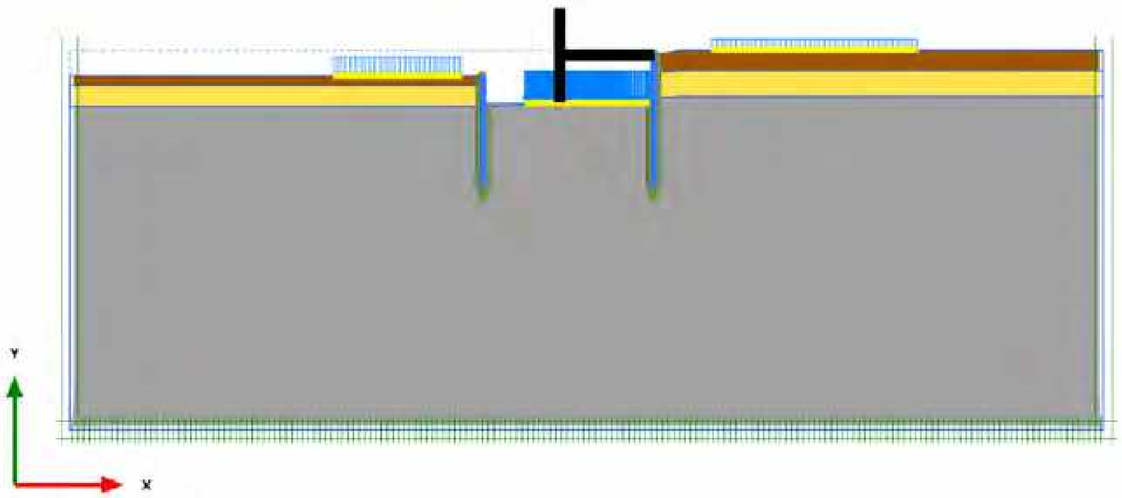
Fixities plot

1.1.1.4 Calculation results, Construction [Phase_4] (4/19), Fixities plot



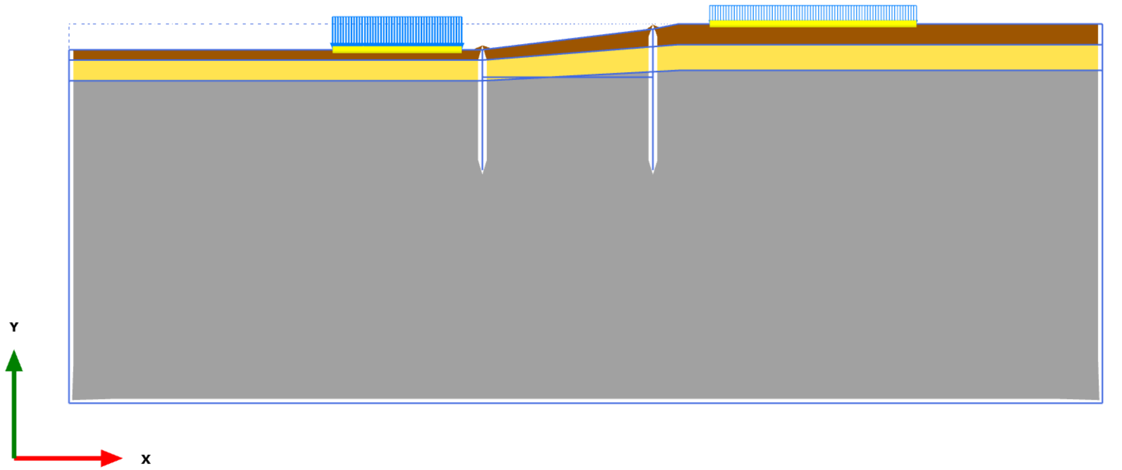
Fixities plot

1.1.1.5 Calculation results, Drained [Phase_5] (5/31), Fixities plot



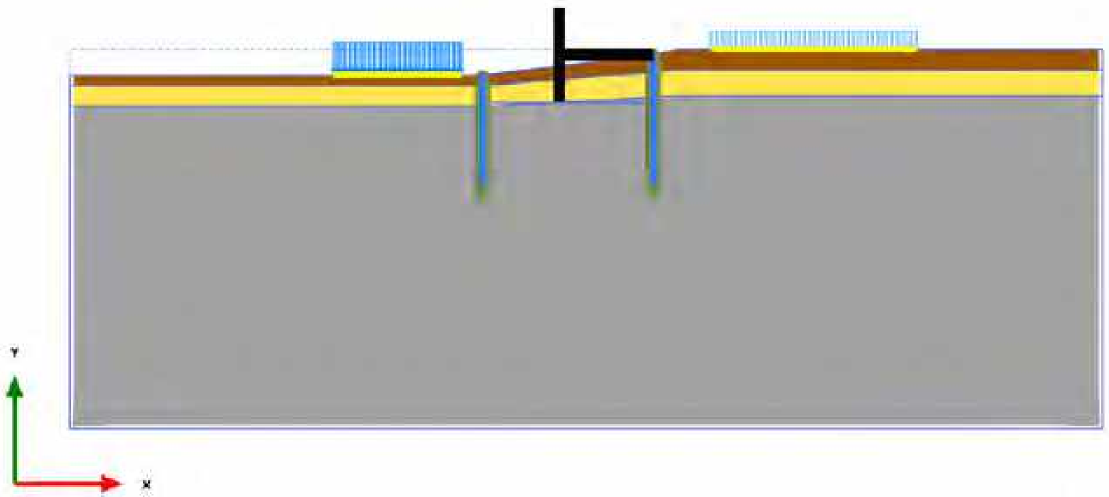
Fixities plot

1.1.2.1 Calculation results, Terrain [Phase_1] (1/11), Active loads plot



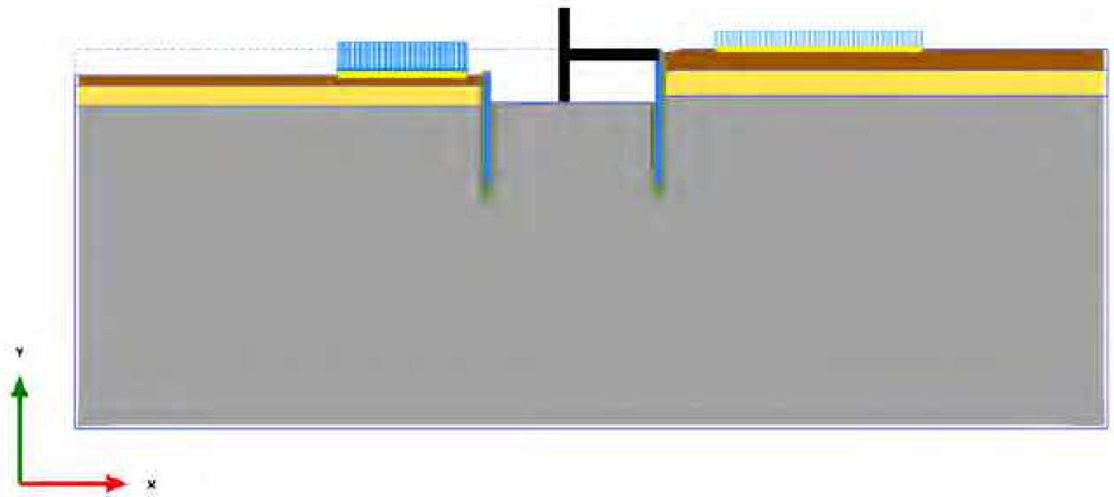
Active loads plot

1.1.2.2 Calculation results, Wall construction [Phase_2] (2/13), Active loads plot



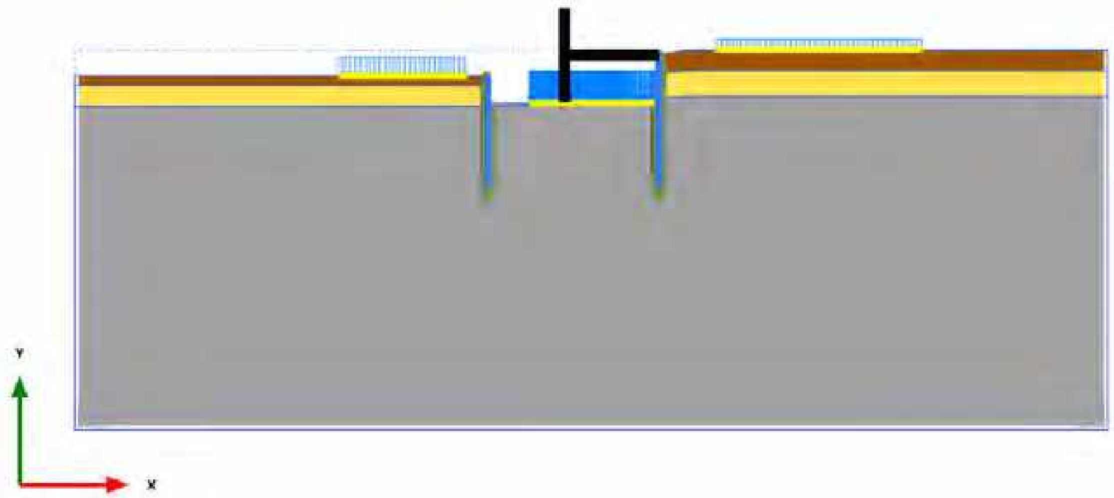
Active loads plot

1.1.2.3 Calculation results, Excavation [Phase_3] (3/17), Active loads plot



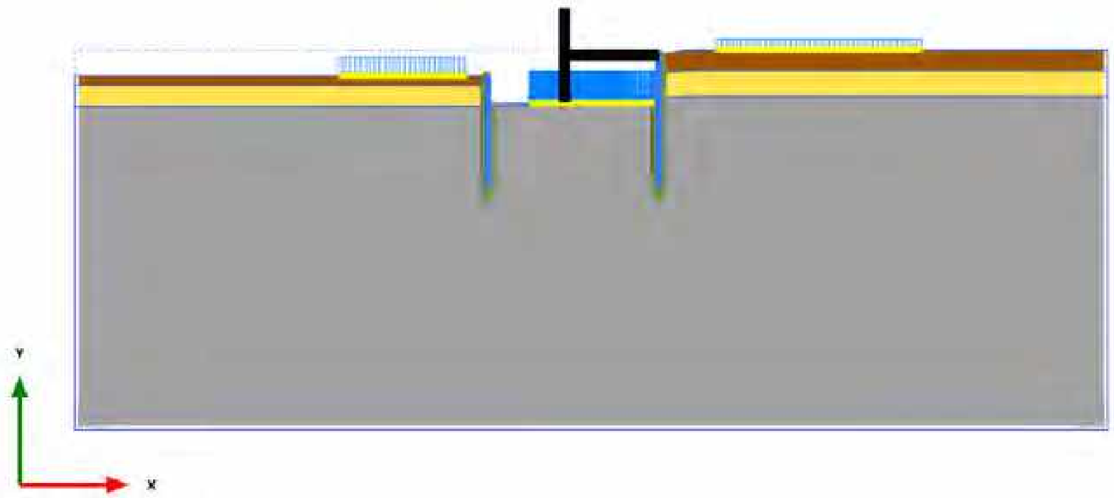
Active loads plot

1.1.2.4 Calculation results, Construction [Phase_4] (4/19), Active loads plot



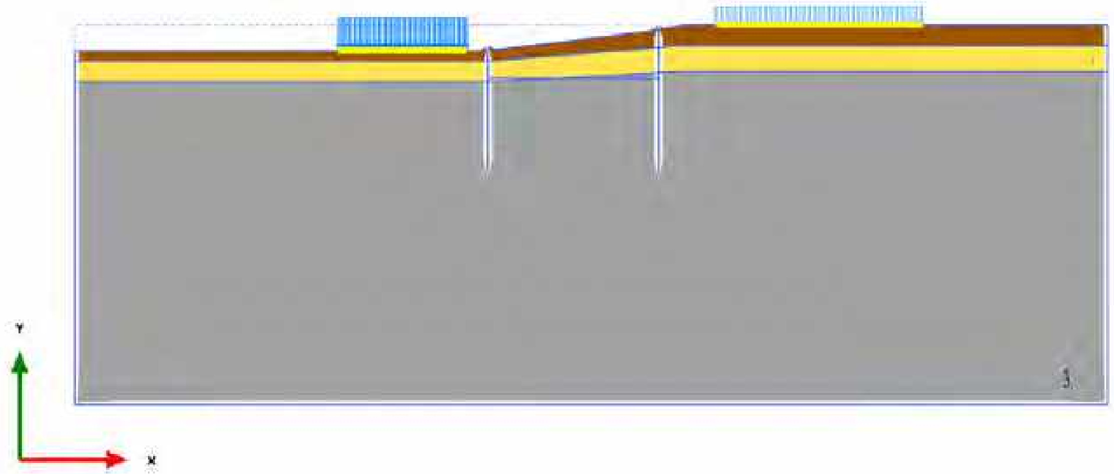
Active loads plot

1.1.2.5 Calculation results, Drained [Phase_5] (5/31), Active loads plot



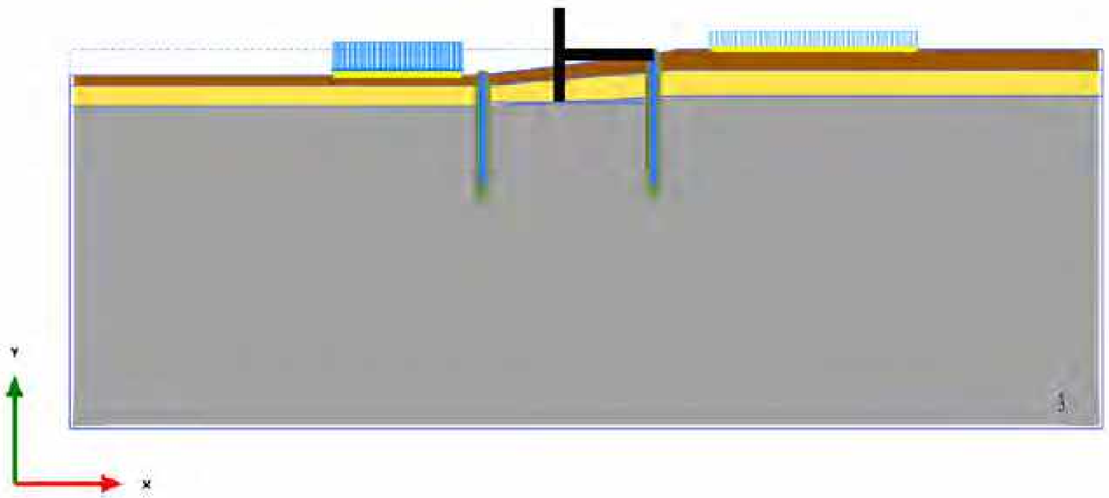
Active loads plot

1.1.3.1 Calculation results, Terrain [Phase_1] (1/11), Materials plot



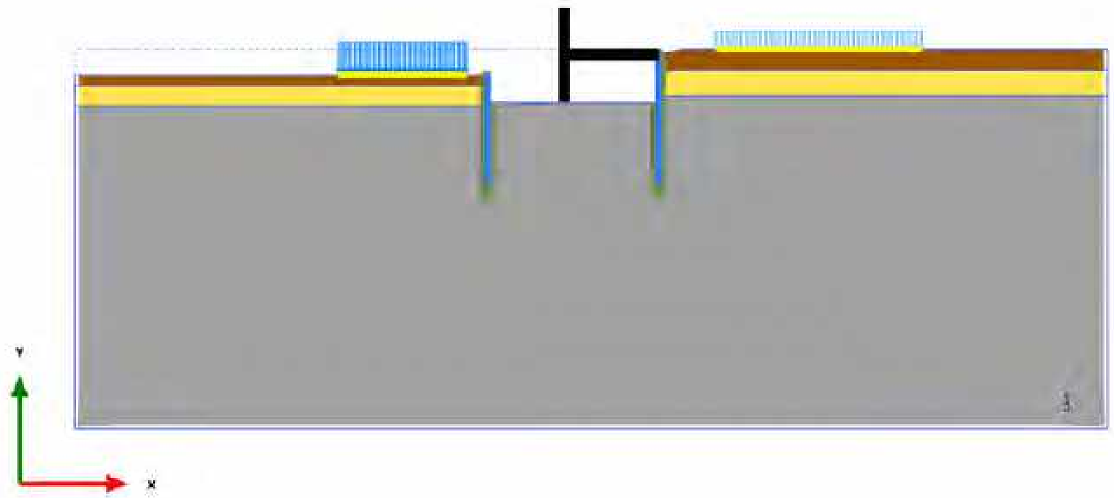
Materials plot

1.1.3.2 Calculation results, Wall construction [Phase_2] (2/13), Materials plot



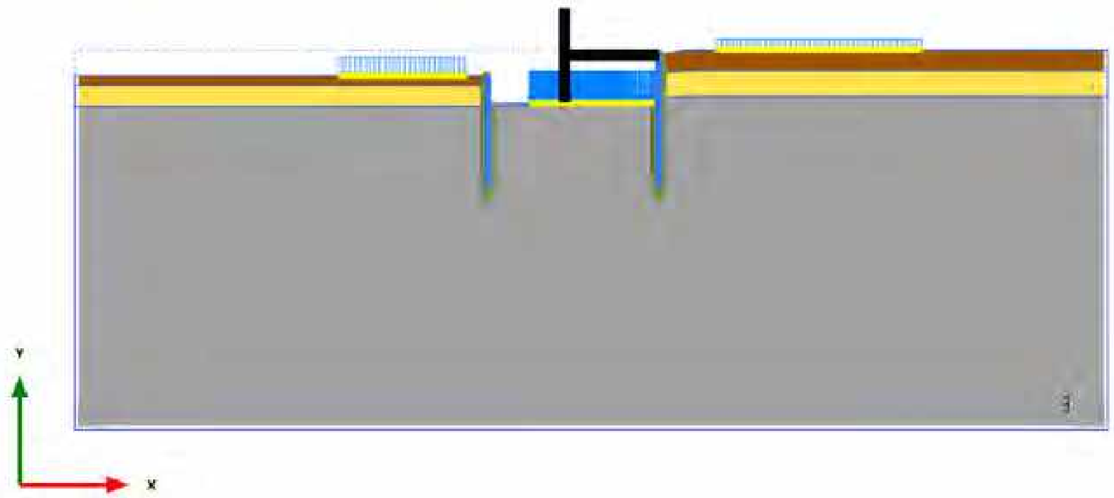
Materials plot

1.1.3.3 Calculation results, Excavation [Phase_3] (3/17), Materials plot



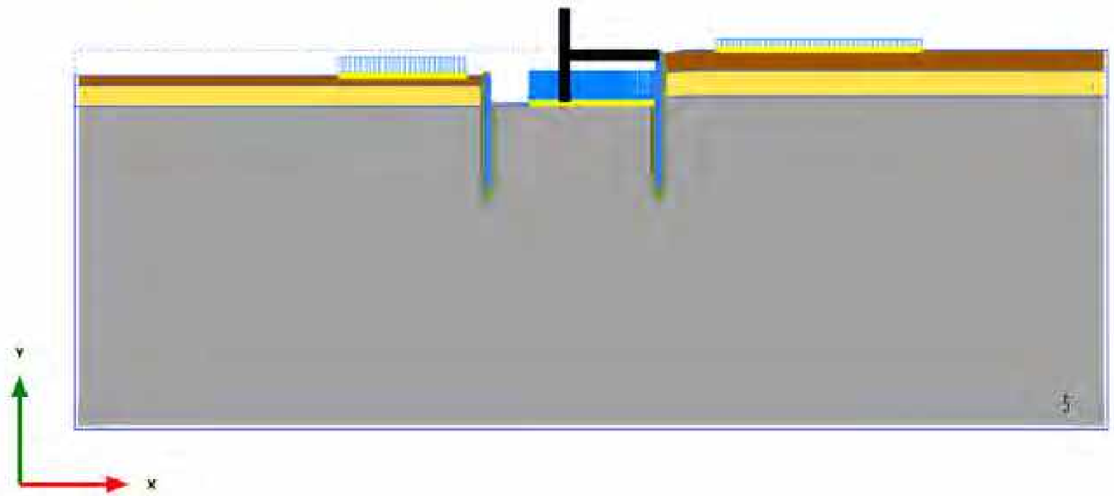
Materials plot

1.1.3.4 Calculation results, Construction [Phase_4] (4/19), Materials plot



Materials plot

1.1.3.5 Calculation results, Drained [Phase_5] (5/31), Materials plot



Materials plot

1.1.4.1.1 Materials - Soil and interfaces - Mohr-Coulomb

Identification		**1 - Made Ground**	**2 - Clay Gate (U)**	**3 - London Clay (U)**	**2 - Clay Gate (D)**	**3 - London Clay (D)**
Identification number		1	2	3	4	5
Drainage type		Drained	Undrained (C)	Undrained (C)	Drained	Drained
Colour						
Comments						
γ_{unsat}	kN/m³	18.00	18.00	19.00	18.00	19.00
γ_{sat}	kN/m³	19.00	18.00	19.00	18.00	19.00
Dilatancy cut-off		No	No	No	No	No
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
e_{min}		0.000	0.000	0.000	0.000	0.000
e_{max}		999.0	999.0	999.0	999.0	999.0
Rayleigh α		0.000	0.000	0.000	0.000	0.000
Rayleigh β		0.000	0.000	0.000	0.000	0.000
E	kN/m²	10.00E3	25.00E3	40.00E3	18.75E3	30.00E3
ν (nu)		0.3000	0.4950	0.4950	0.3500	0.3000
G	kN/m²	3846	8361	13.38E3	6944	11.54E3
E_{oed}	kN/m²	13.46E3	844.5E3	1.351E6	30.09E3	40.38E3
c_{ref}	kN/m²	1.000	50.00	80.00	10.00	10.00
ϕ (phi)	°	25.00	0.000	0.000	24.00	23.00

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
ψ (psi)	°	0.000	0.000	0.000	0.000	0.000
V_s	m/s	45.78	67.50	83.11	61.52	77.18
V_p	m/s	85.65	678.4	835.2	128.1	144.4
Set to default values		Yes	No	No	Yes	No
E_{inc}	kN/m²/m	0.000	0.000	2500	0.000	1875
y_{ref}	m	0.000	0.000	76.20	0.000	0.000
c_{inc}	kN/m²/m	0.000	0.000	5.000	0.000	0.000
y_{ref}	m	0.000	0.000	76.20	0.000	0.000
Tension cut-off		Yes	No	No	Yes	Yes
Tensile strength	kN/m²	0.000	10.00E6	10.00E6	0.000	0.000
Undrained behaviour		Standard	Standard	Standard	Standard	Standard
Skempton-B		0.9783	0.000	0.000	0.9699	0.9783
ν_u		0.4950	0.4950	0.4950	0.4950	0.4950
$K_{w,ref}$ / n	kN/m²	375.0E3	0.000	0.000	671.3E3	1.125E6
$C_{v,ref}$	m²/day	0.000	0.000	0.000	0.000	0.000
Stiffness		Standard	Standard	Standard	Standard	Standard
Strength		Rigid	Rigid	Rigid	Rigid	Rigid
R_{inter}		1.000	1.000	1.000	1.000	1.000
Consider gap closure		Yes	Yes	Yes	Yes	Yes
δ_{inter}		0.000	0.000	0.000	0.000	0.000

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
Cross permeability		Impermeable	Impermeable	Impermeable	Impermeable	Impermeable
Drainage conductivity, dk	m^3/day/m	0.000	0.000	0.000	0.000	0.000
K_0 determination		Automatic	Automatic	Automatic	Automatic	Automatic
$K_{0,x} = K_{0,z}$		Yes	Yes	Yes	Yes	Yes
$K_{0,x}$		0.5774	0.5000	0.5000	0.5933	0.6093
$K_{0,z}$		0.5774	0.5000	0.5000	0.5933	0.6093
Data set		Standard	Standard	Standard	Standard	Standard
Type		Coarse	Coarse	Coarse	Coarse	Coarse
< 2 µm	%	10.00	10.00	10.00	10.00	10.00
2 µm - 50 µm	%	13.00	13.00	13.00	13.00	13.00
50 µm - 2 mm	%	77.00	77.00	77.00	77.00	77.00
Use defaults		None	None	None	None	None
k_x	m/day	0.000	0.000	0.000	0.000	0.000
k_y	m/day	0.000	0.000	0.000	0.000	0.000
$-\psi_{unsat}$	m	10.00E3	10.00E3	10.00E3	10.00E3	10.00E3
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
S_s	1/m	0.000	0.000	0.000	0.000	0.000
c_k		1000E12	1000E12	1000E12	1000E12	1000E12

1.1.4.2 Materials - Plates -

Identification		**AU25**	**AU14**
Identification number		1	2
Comments			
Colour			
Material type		Elastic	Elastic
Isotropic		Yes	Yes
EA_1	kN/m	3.760E6	2.640E6
EA_2	kN/m	3.760E6	2.640E6
EI	kN m^2/m	112.5E3	57.36E3
d	m	0.5991	0.5106
w	kN/m/m	1.000	0.000
ν (nu)		0.2000	0.000
Rayleigh α		0.000	0.000
Rayleigh β		0.000	0.000
Prevent punching		No	No
Identification number		1	2

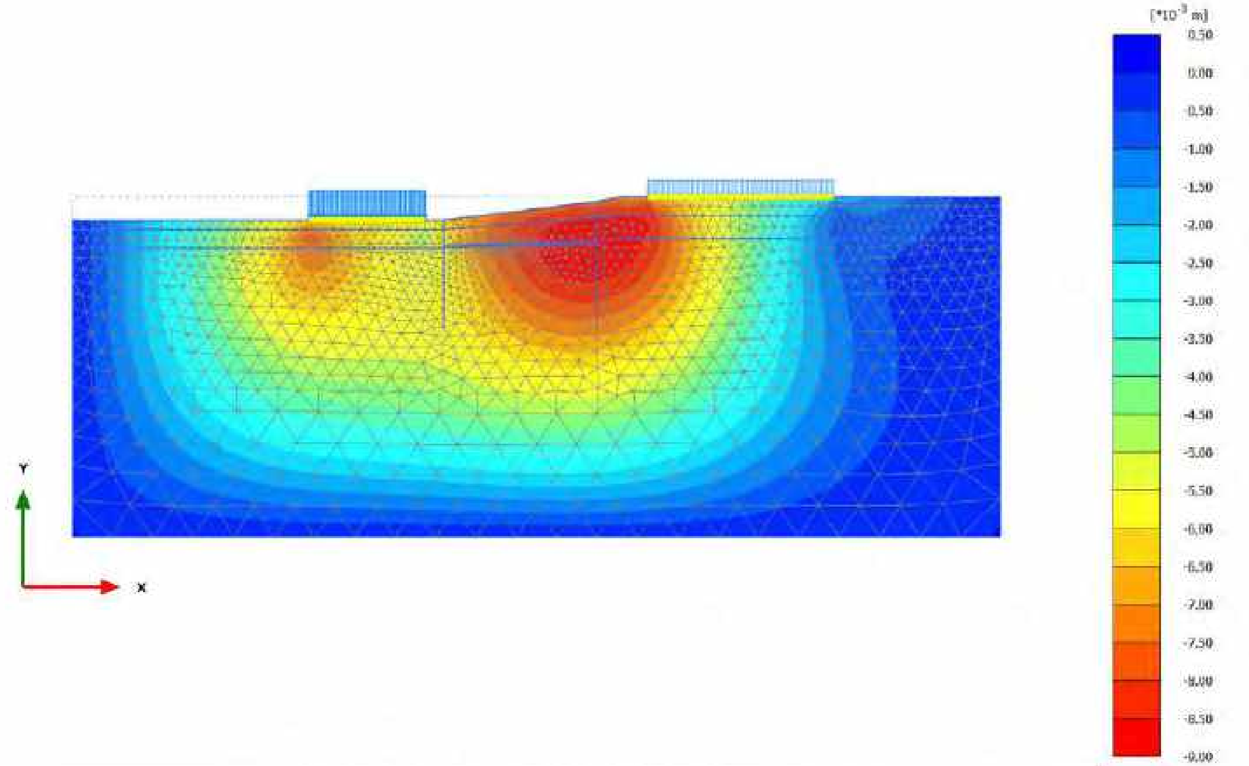
1.1.4.3 Materials - Geogrids -

Identification		**ficticious**
Identification number		1
Comments		
Colour		
Material type		Elastic
Isotropic		Yes
EA_1	kN/m	1.000
EA_2	kN/m	1.000
Identification number		1
Identification number		1

1.1.4.4 Materials - Anchors -

Identification		**Prop**
Identification number		1
Comments		
Colour		
Material type		Elastic
EA	kN	390.5E3
$L_{spacing}$	m	3.000
Identification number		1
Identification number		1
Identification number		1

2.1.1.1.1 Calculation results, Terrain [Phase_1] (1/11), Total displacements u_x

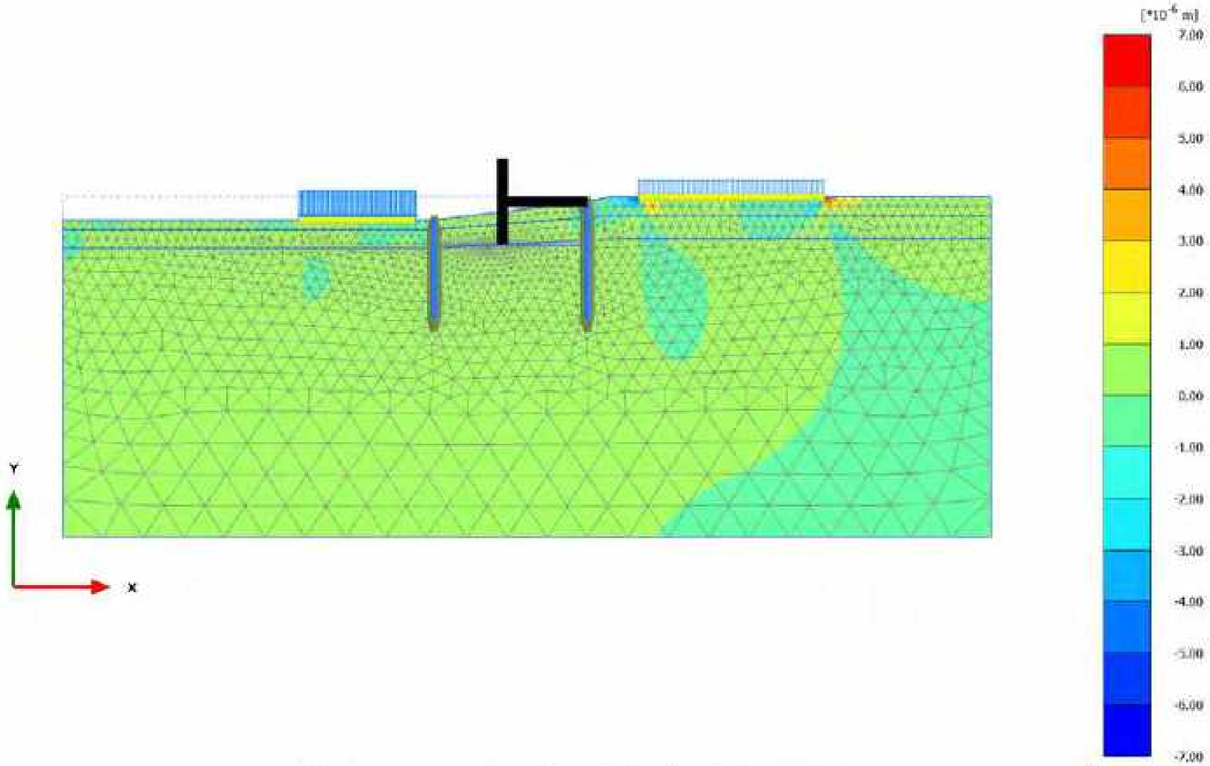


Total displacements u_x (scaled up 500 times)

Maximum value = 0.02176×10^{-3} m (Element 388 at Node 25540)

Minimum value = -8.922×10^{-3} m (Element 649 at Node 9613)

2.1.1.1.2 Calculation results, Wall construction [Phase_2] (2/13), Total displacements u_x

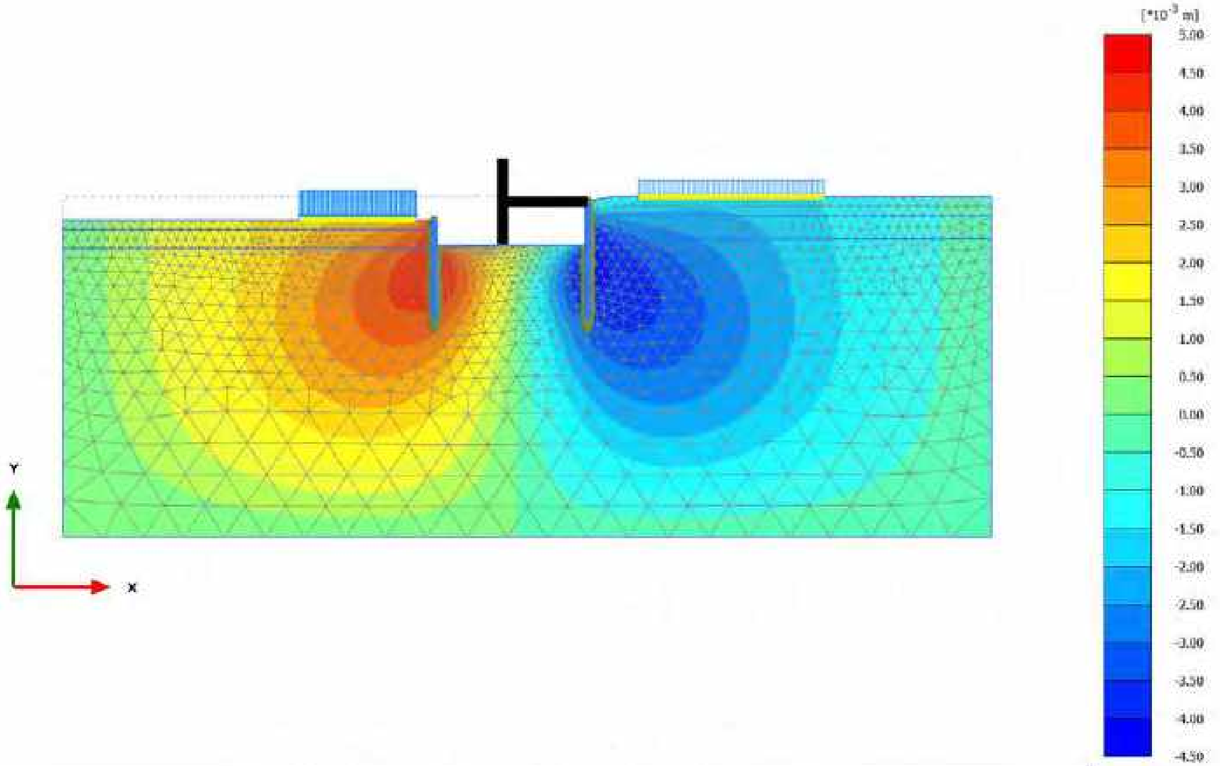


Total displacements u_x (scaled up $200*10^3$ times)

Maximum value = $6.937*10^{-6}$ m (Element 28 at Node 617)

Minimum value = $-6.869*10^{-6}$ m (Element 390 at Node 21297)

2.1.1.1.3 Calculation results, Excavation [Phase_3] (3/17), Total displacements u_x

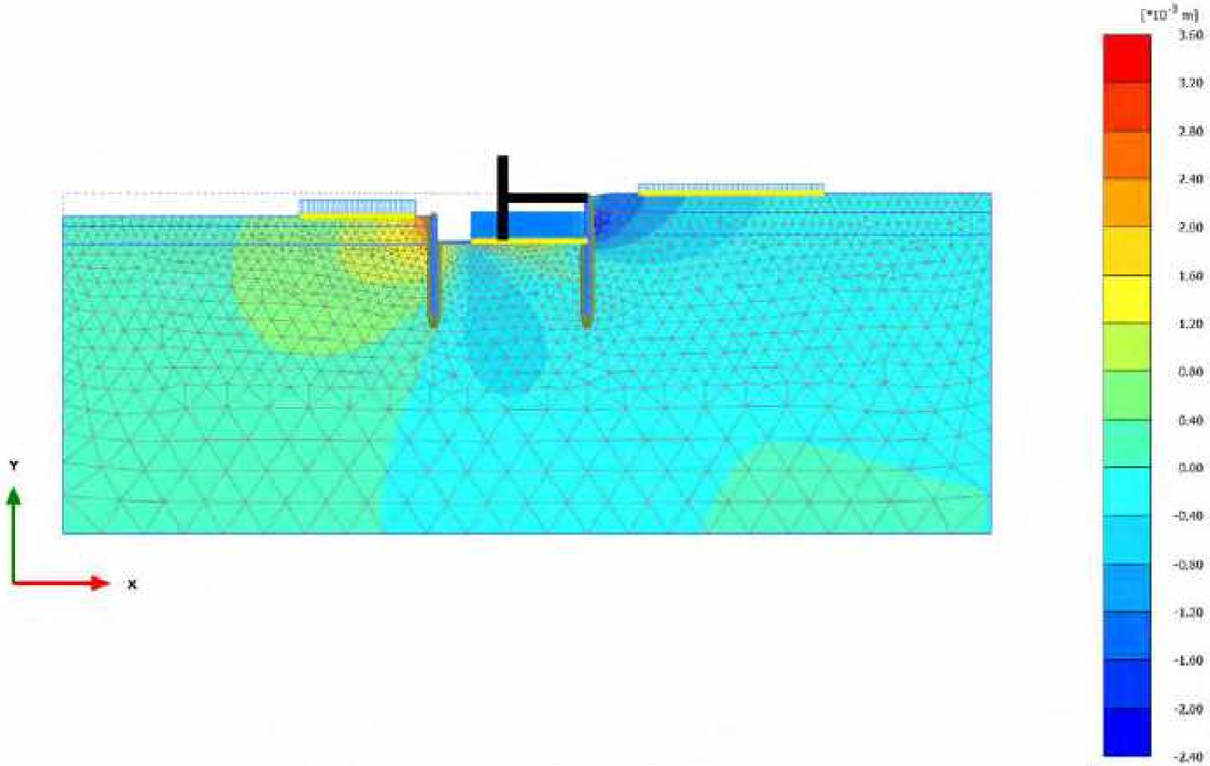


Total displacements u_x (scaled up 500 times)

Maximum value = $4.627*10^{-3}$ m (Element 2813 at Node 15141)

Minimum value = $-4.247*10^{-3}$ m (Element 2665 at Node 7891)

2.1.1.1.4 Calculation results, Construction [Phase_4] (4/19), Total displacements u_x

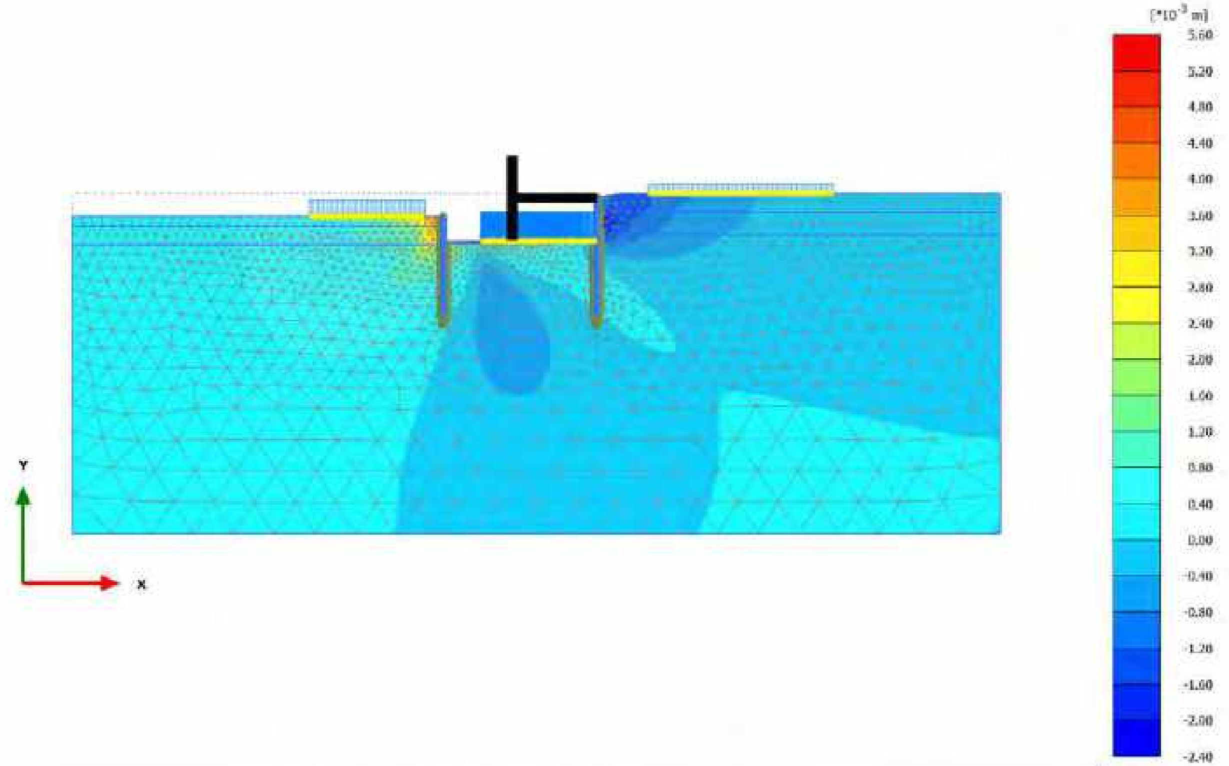


Total displacements u_x (scaled up 500 times)

Maximum value = $3.377*10^{-3}$ m (Element 425 at Node 20290)

Minimum value = $-2.196*10^{-3}$ m (Element 606 at Node 9316)

2.1.1.1.5 Calculation results, Drained [Phase_5] (5/31), Total displacements u_x

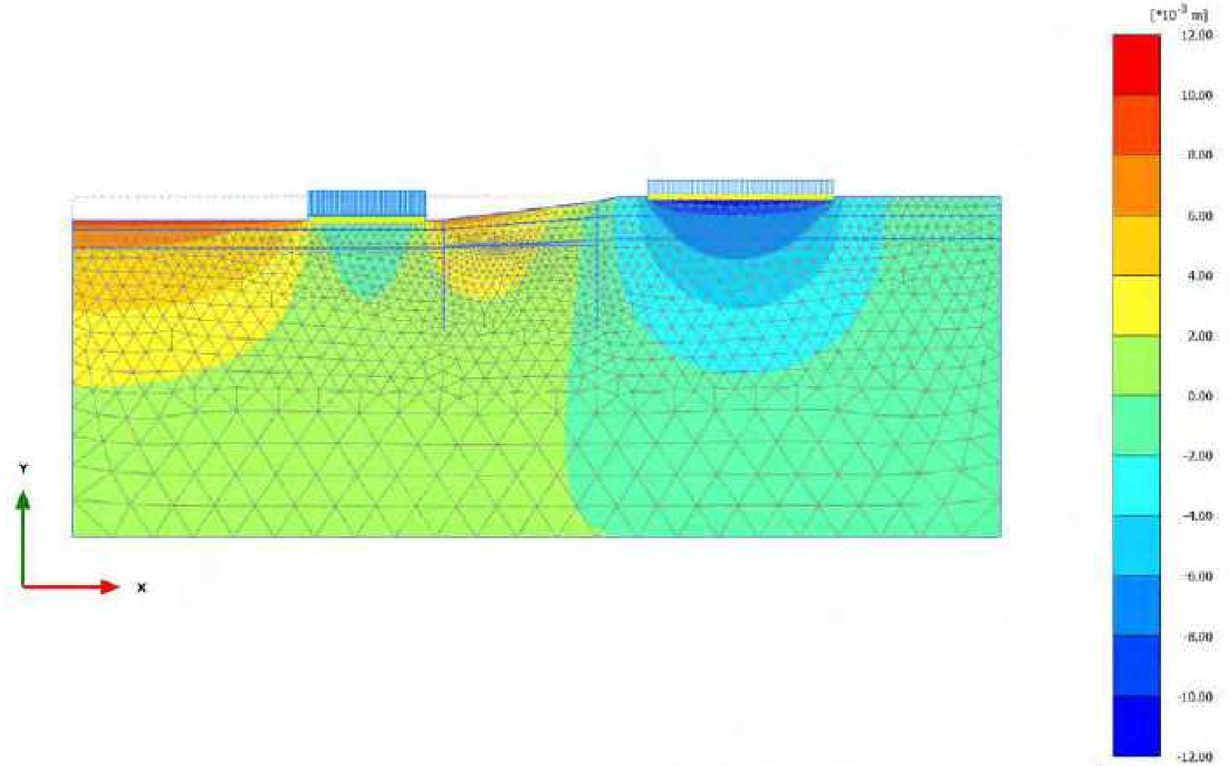


Total displacements u_x (scaled up 500 times)

Maximum value = $5.211*10^{-3}$ m (Element 425 at Node 20290)

Minimum value = $-2.110*10^{-3}$ m (Element 606 at Node 9316)

2.1.1.2.1 Calculation results, Terrain [Phase_1] (1/11), Total displacements u_y

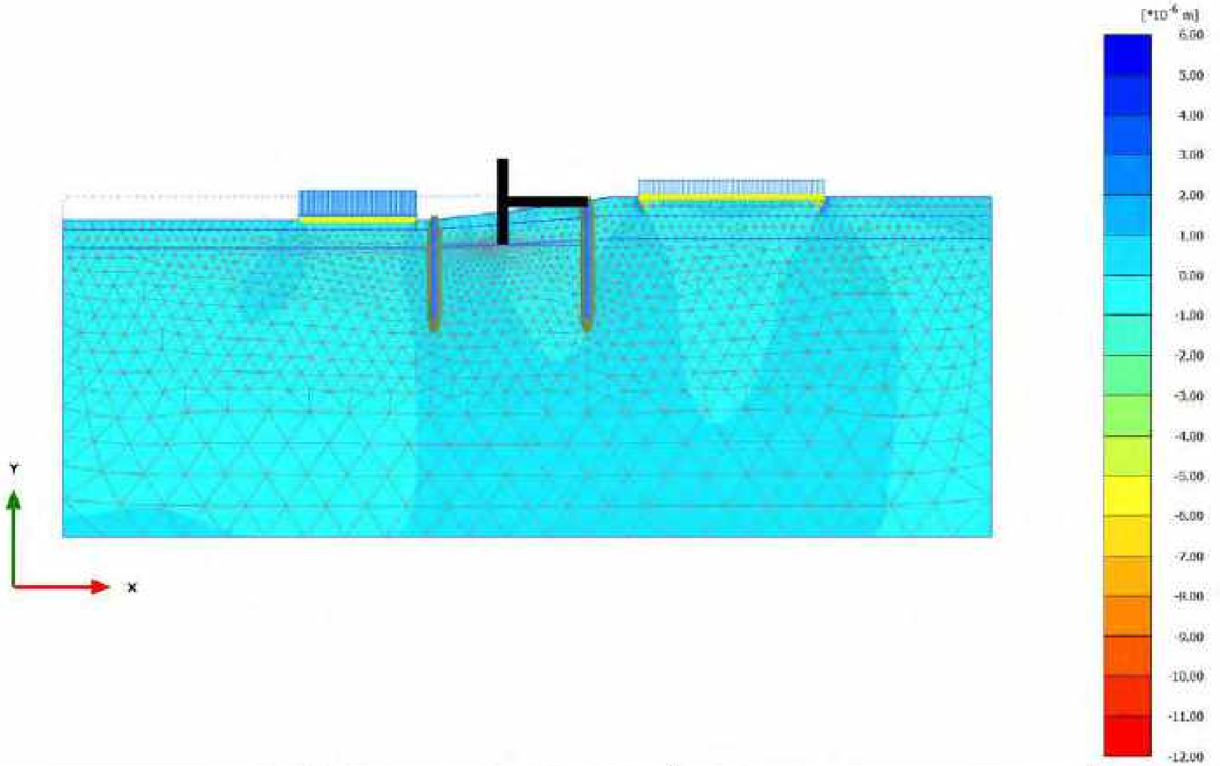


Total displacements u_y (scaled up 200 times)

Maximum value = 0.01011 m (Element 388 at Node 25540)

Minimum value = -0.01180 m (Element 59 at Node 2755)

2.1.1.2.2 Calculation results, Wall construction [Phase_2] (2/13), Total displacements u_y

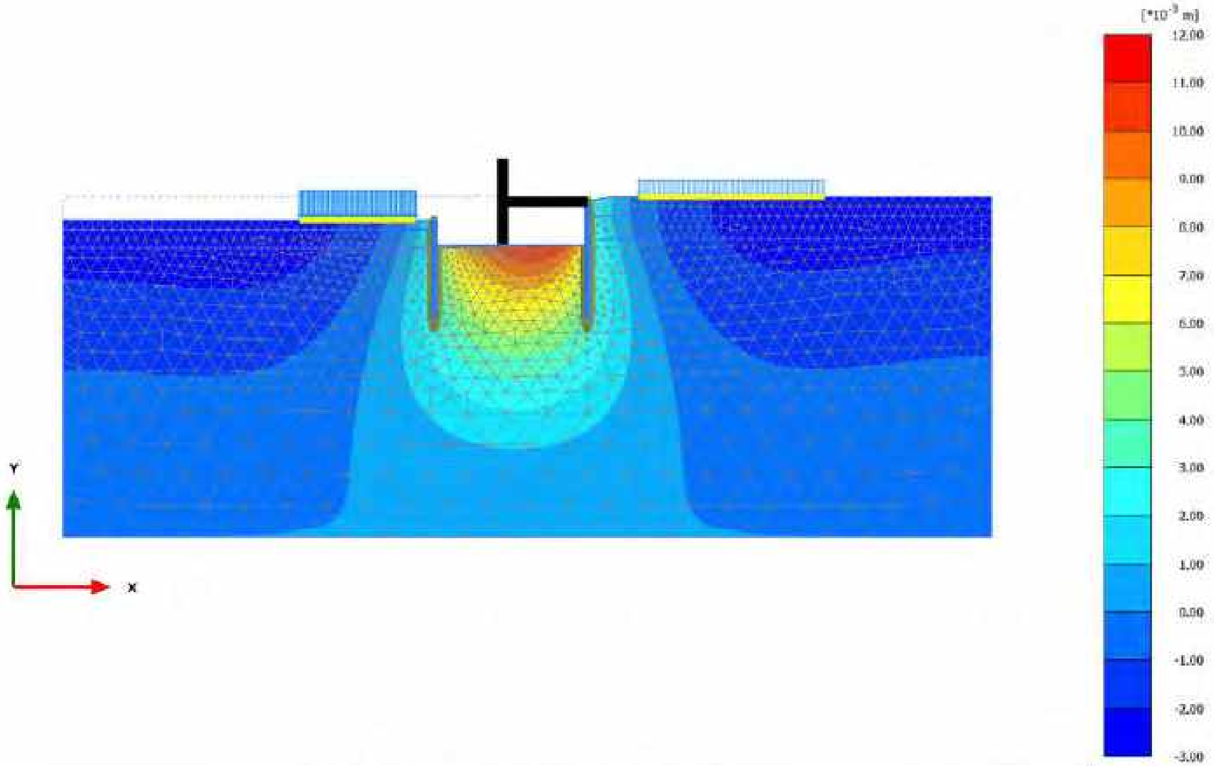


Total displacements u_y (scaled up $200*10^3$ times)

Maximum value = $5.719*10^{-6}$ m (Element 390 at Node 21297)

Minimum value = $-0.01197*10^{-3}$ m (Element 39 at Node 966)

2.1.1.2.3 Calculation results, Excavation [Phase_3] (3/17), Total displacements u_y

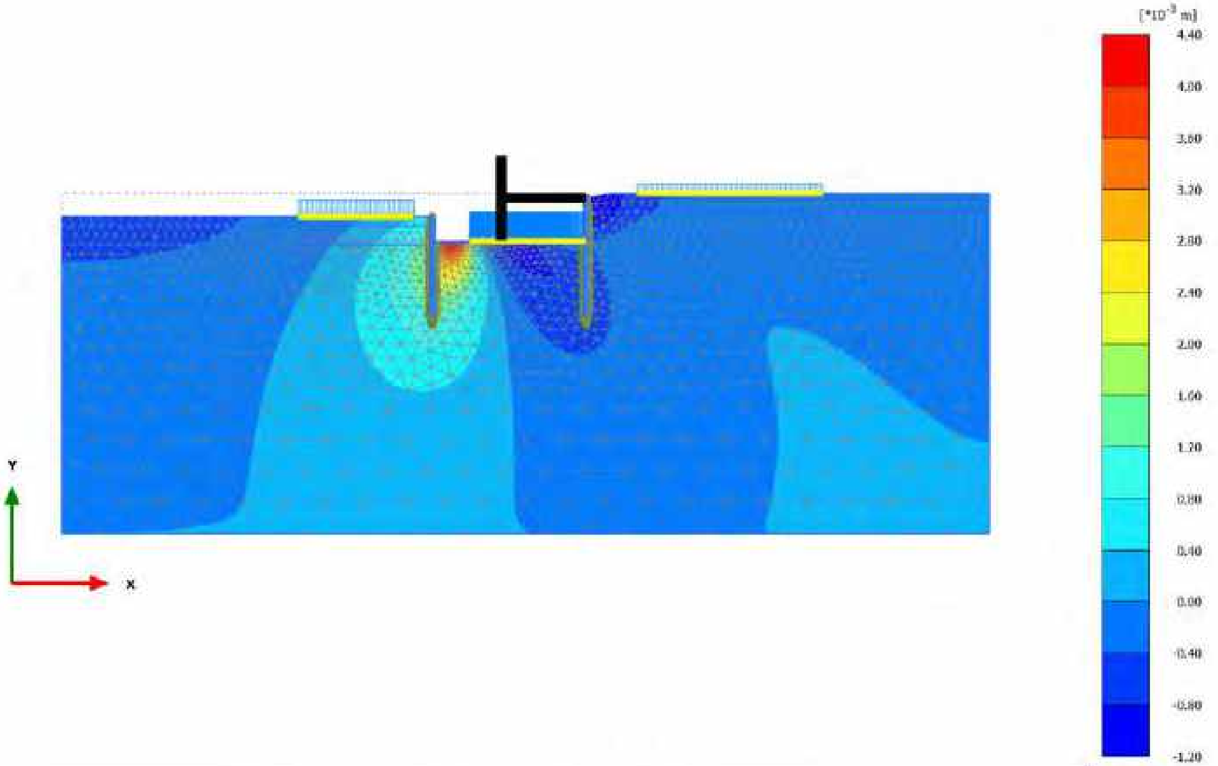


Total displacements u_y (scaled up 200 times)

Maximum value = 0.01114 m (Element 2959 at Node 11856)

Minimum value = $-2.775*10^{-3}$ m (Element 39 at Node 966)

2.1.1.2.4 Calculation results, Construction [Phase_4] (4/19), Total displacements u_y

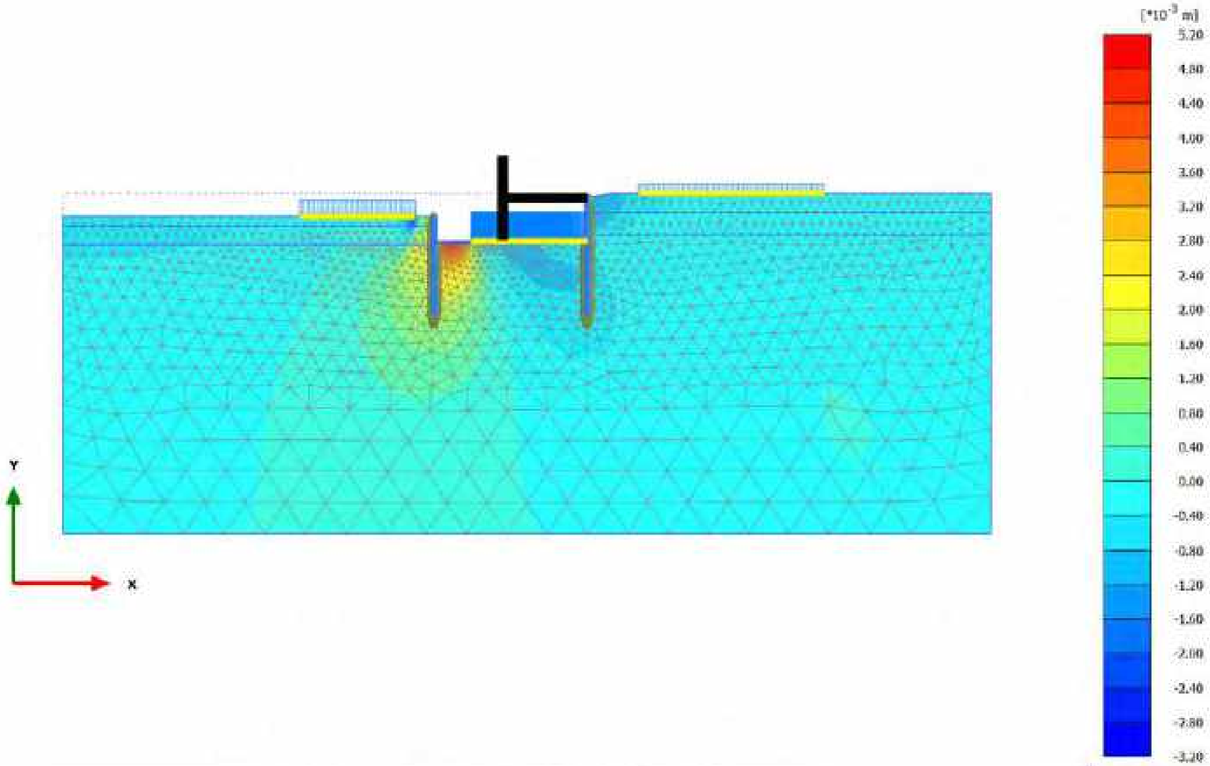


Total displacements u_y (scaled up 500 times)

Maximum value = $4.385 \cdot 10^{-3}$ m (Element 1094 at Node 17988)

Minimum value = $-1.133 \cdot 10^{-3}$ m (Element 164 at Node 9928)

2.1.1.2.5 Calculation results, Drained [Phase_5] (5/31), Total displacements u_y

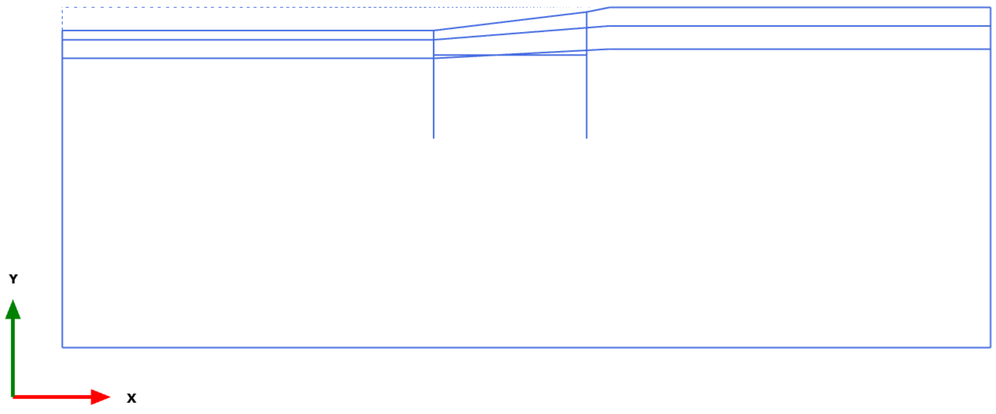


Total displacements u_y (scaled up 500 times)

Maximum value = $5.076*10^{-3}$ m (Element 1091 at Node 17992)

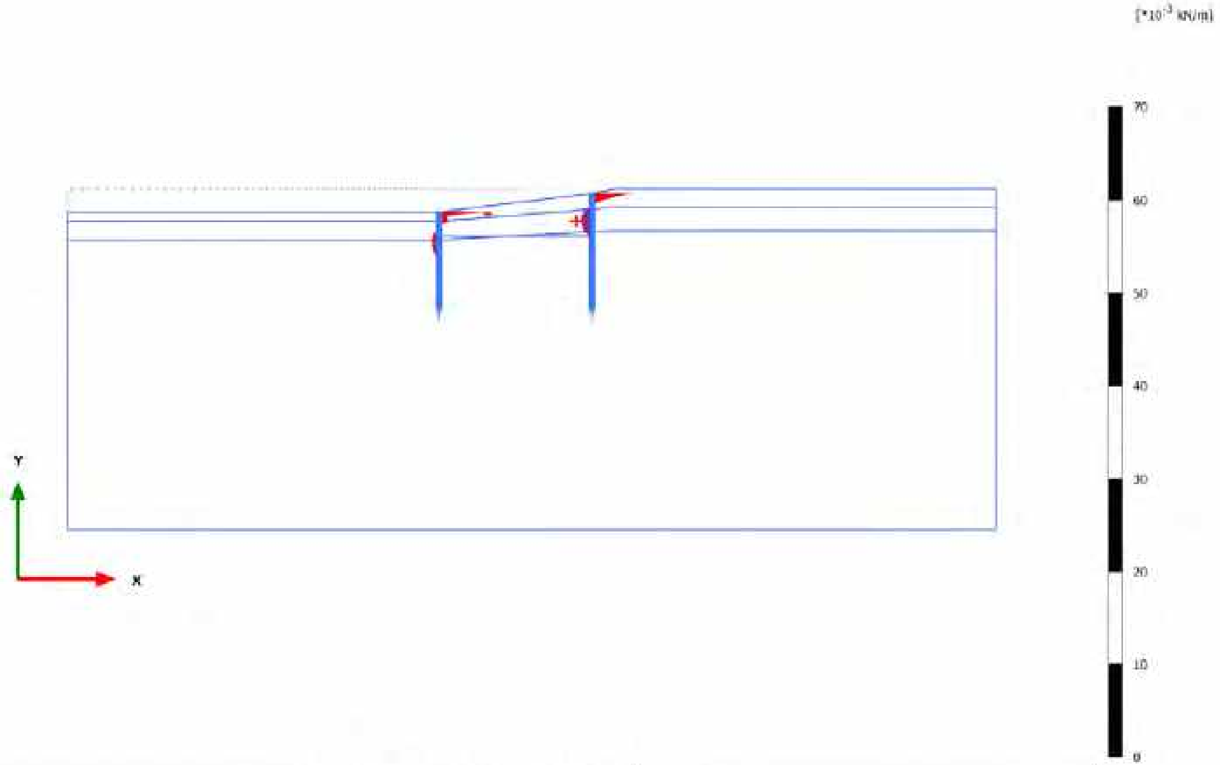
Minimum value = $-2.831*10^{-3}$ m (Element 390 at Node 21297)

3.1.1.1.1 Calculation results, Plate, Terrain [Phase_1] (1/11), Shear forces Q



Shear forces Q (scaled up 1.00 times)
No results

3.1.1.1.2 Calculation results, Plate, Wall construction [Phase_2] (2/13), Shear forces Q

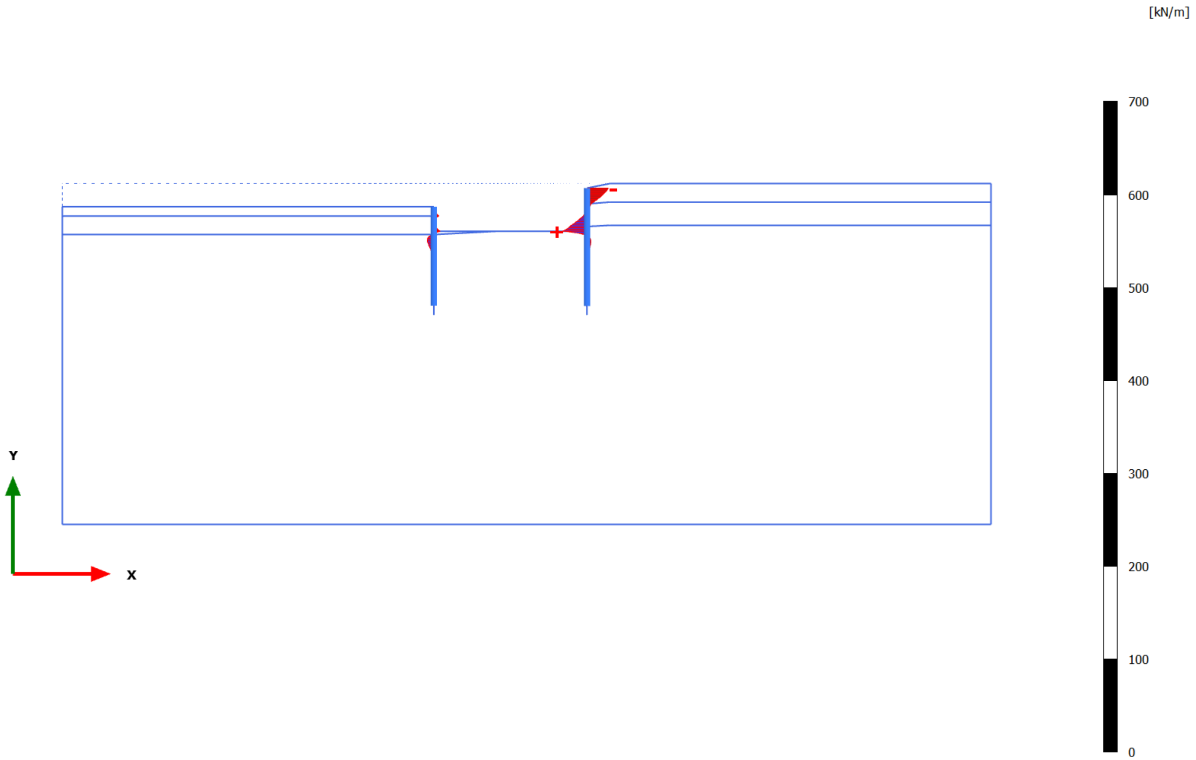


Shear forces Q (scaled up $1.00 \cdot 10^{3}$ times)

Maximum value = $1.160 \cdot 10^{-3}$ kN/m (Element 5 at Node 9322)

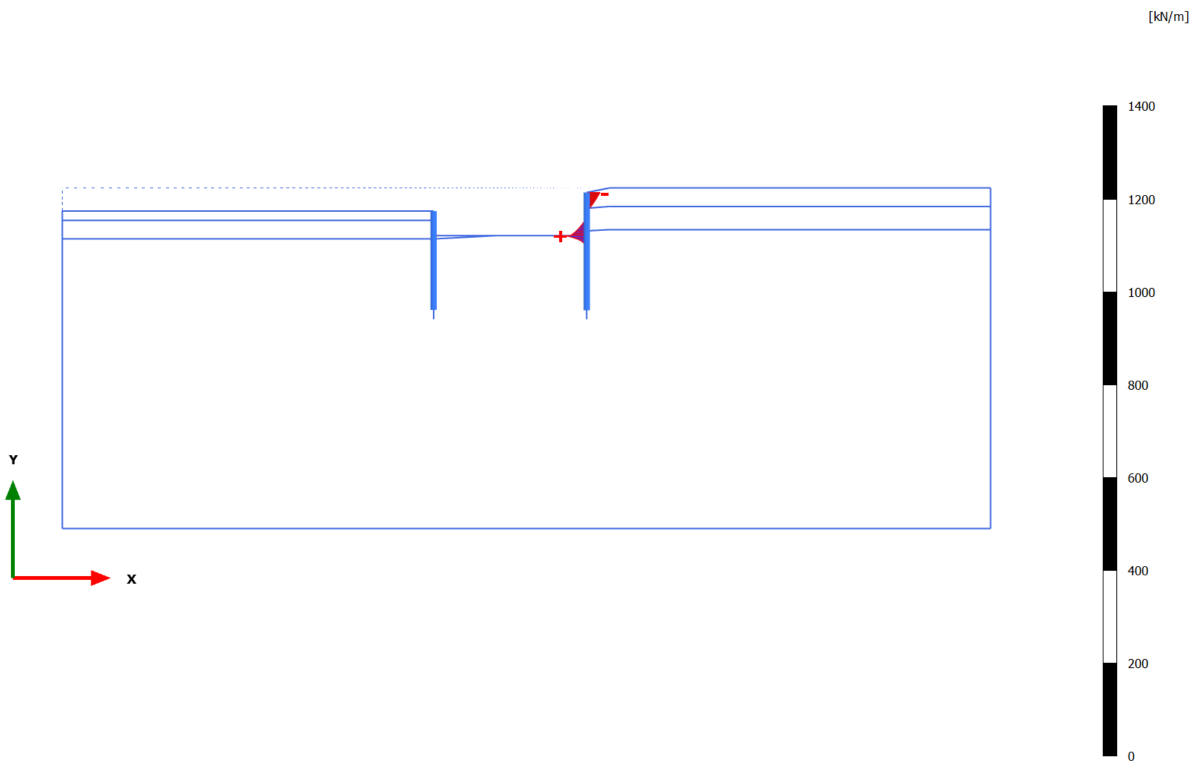
Minimum value = $-4.692 \cdot 10^{-3}$ kN/m (Element 3 at Node 19906)

3.1.1.1.3 Calculation results, Plate, Excavation [Phase_3] (3/17), Shear forces Q



Shear forces Q (scaled up 0.100 times)
Maximum value = 26.67 kN/m (Element 9 at Node 8501)
Minimum value = -23.11 kN/m (Element 2 at Node 11695)

3.1.1.1.4 Calculation results, Plate, Construction [Phase_4] (4/19), Shear forces Q

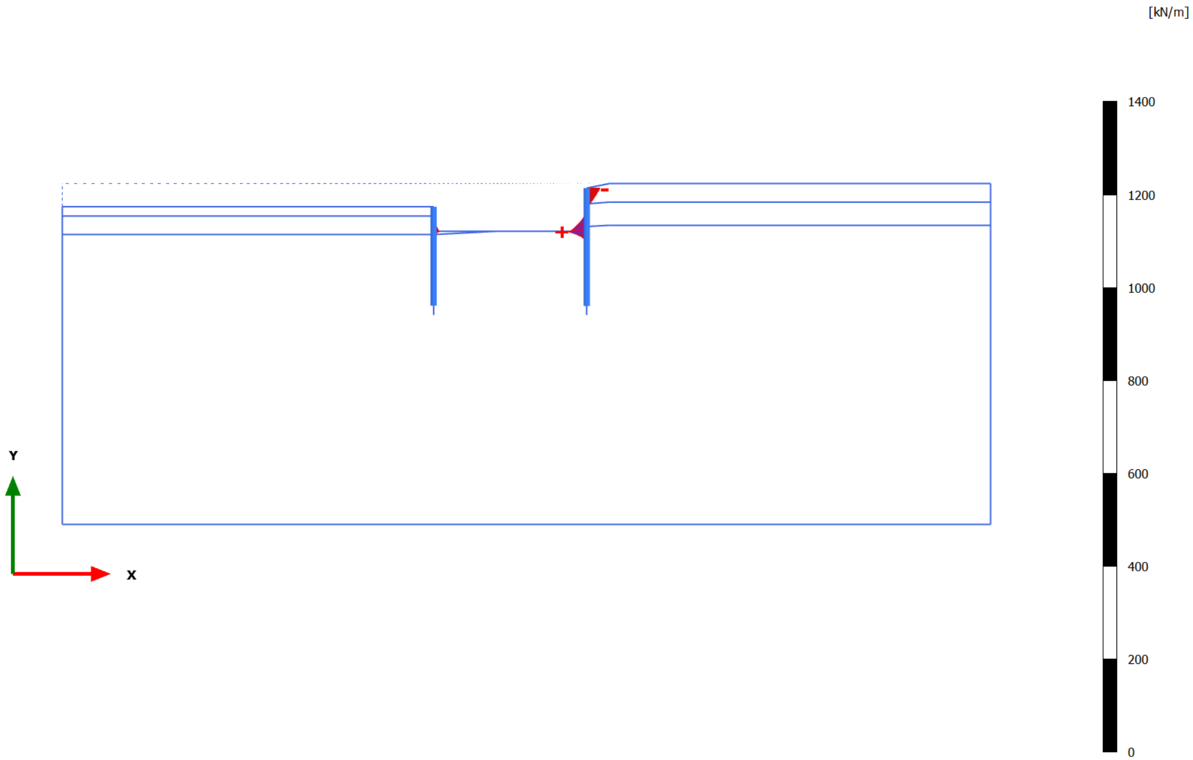


Shear forces Q (scaled up 0.0500 times)

Maximum value = 46.32 kN/m (Element 19 at Node 8501)

Minimum value = -28.87 kN/m (Element 2 at Node 11695)

3.1.1.1.5 Calculation results, Plate, Drained [Phase_5] (5/31), Shear forces Q

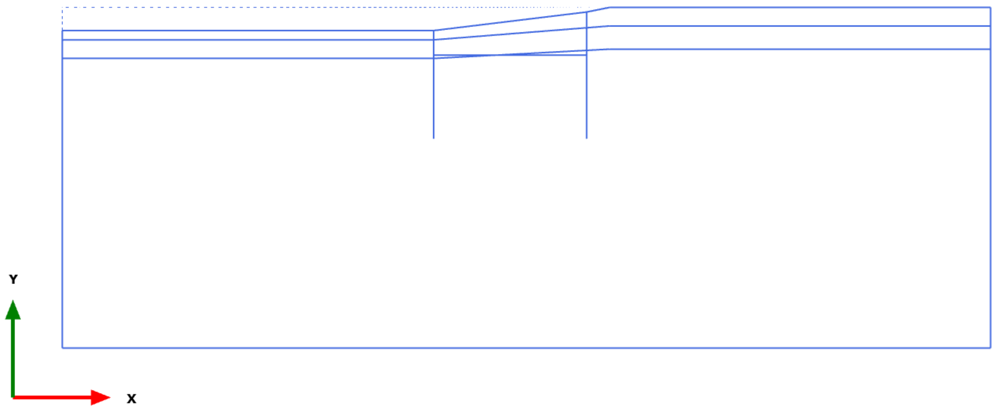


Shear forces Q (scaled up 0.0500 times)

Maximum value = 42.56 kN/m (Element 19 at Node 8501)

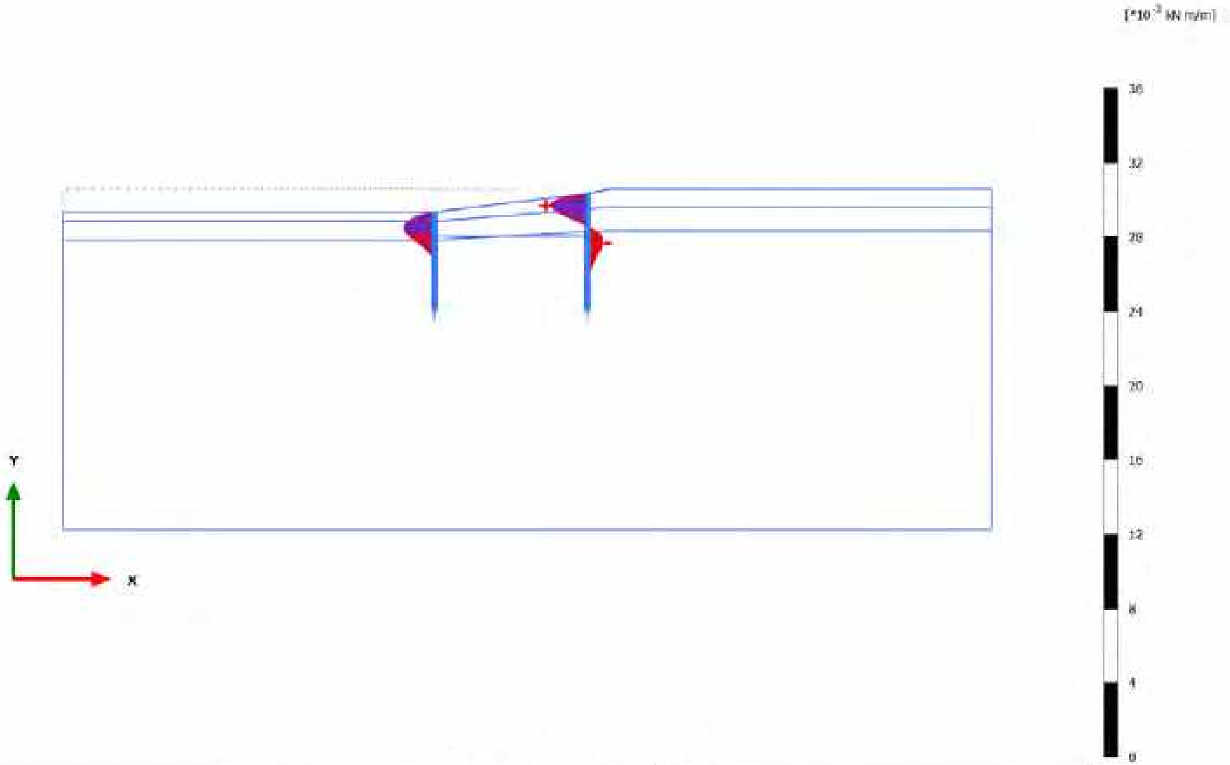
Minimum value = -28.62 kN/m (Element 2 at Node 11695)

3.1.1.2.1 Calculation results, Plate, Terrain [Phase_1] (1/11), Bending moments M



Bending moments M (scaled up 1.00 times)
No results

3.1.1.2.2 Calculation results, Plate, Wall construction [Phase_2] (2/13), Bending moments M

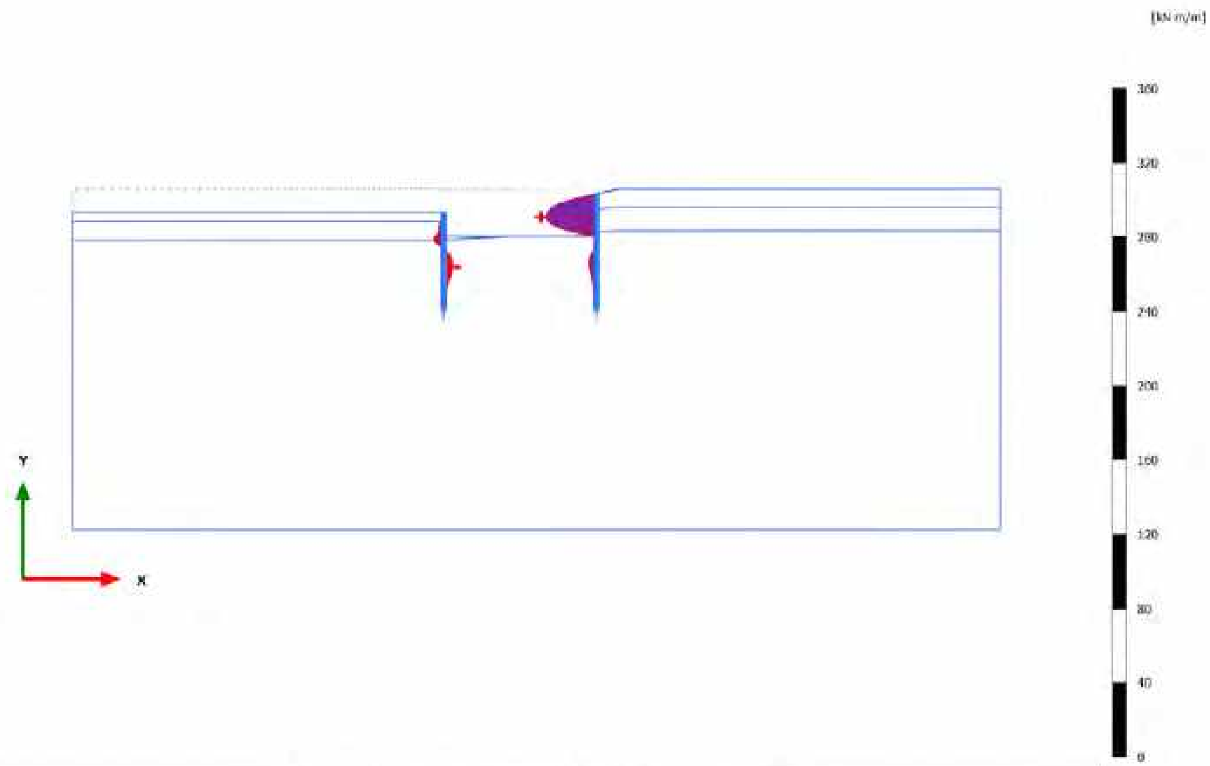


Bending moments M (scaled up $2.00*10^3$ times)

Maximum value = $1.987*10^{-3}$ kN m/m (Element 1 at Node 10875)

Minimum value = $-0.8300*10^{-3}$ kN m/m (Element 19 at Node 7658)

3.1.1.2.3 Calculation results, Plate, Excavation [Phase_3] (3/17), Bending moments M

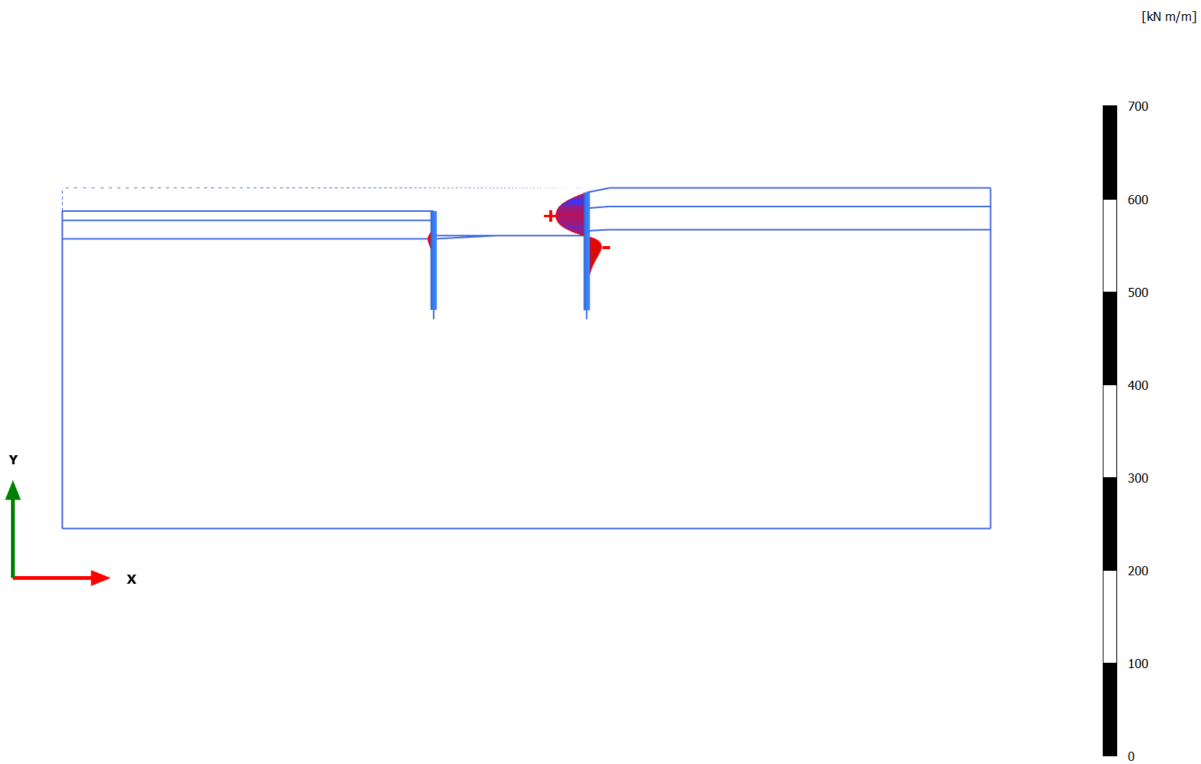


Bending moments M (scaled up 0.200 times)

Maximum value = 27.27 kN m/m (Element 6 at Node 10216)

Minimum value = -4.924 kN m/m (Element 25 at Node 15146)

3.1.1.2.4 Calculation results, Plate, Construction [Phase_4] (4/19), Bending moments M

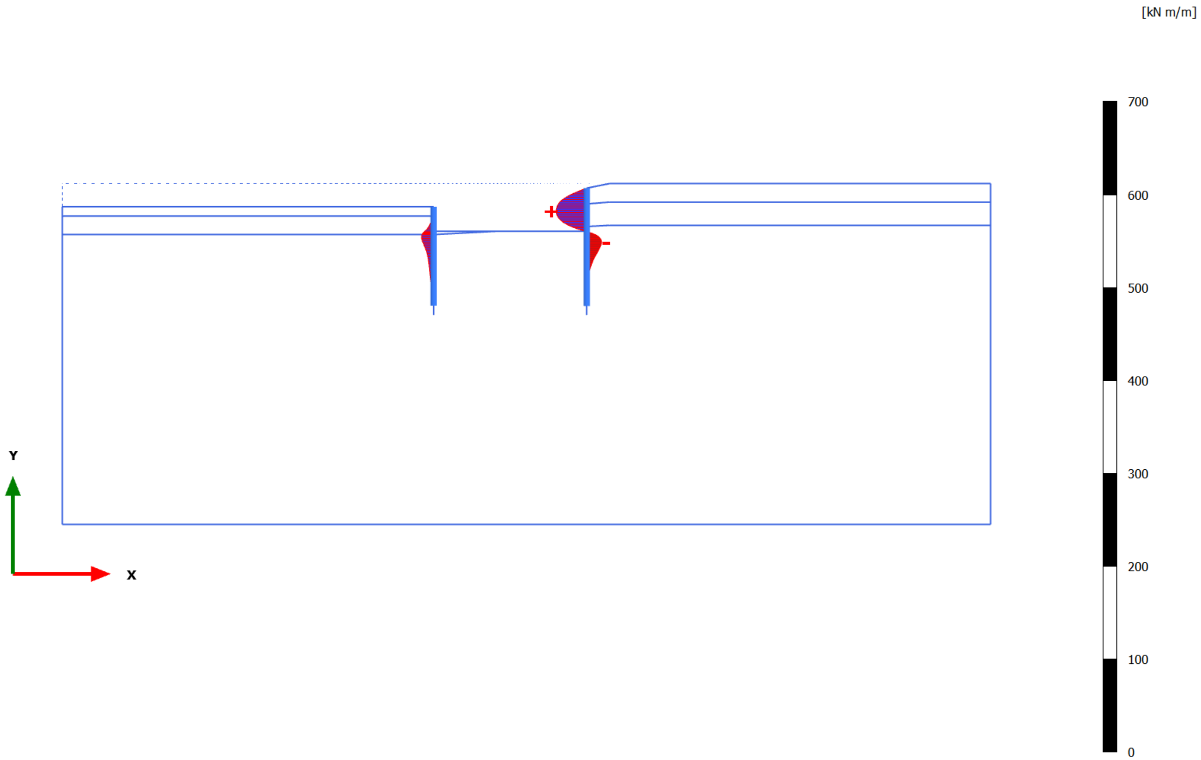


Bending moments M (scaled up 0.100 times)

Maximum value = 33.25 kN m/m (Element 6 at Node 10216)

Minimum value = -15.77 kN m/m (Element 18 at Node 7396)

3.1.1.2.5 Calculation results, Plate, Drained [Phase_5] (5/31), Bending moments M

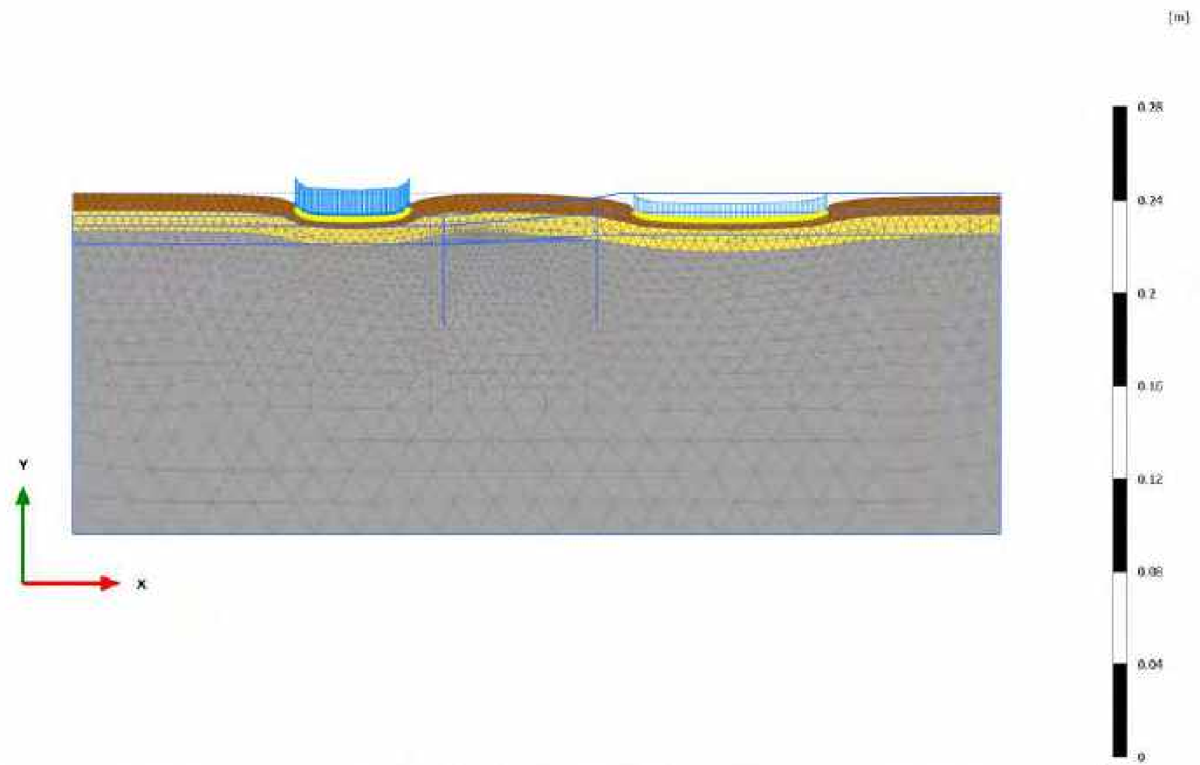


Bending moments M (scaled up 0.100 times)

Maximum value = 32.92 kN m/m (Element 6 at Node 10216)

Minimum value = -15.89 kN m/m (Element 18 at Node 7396)

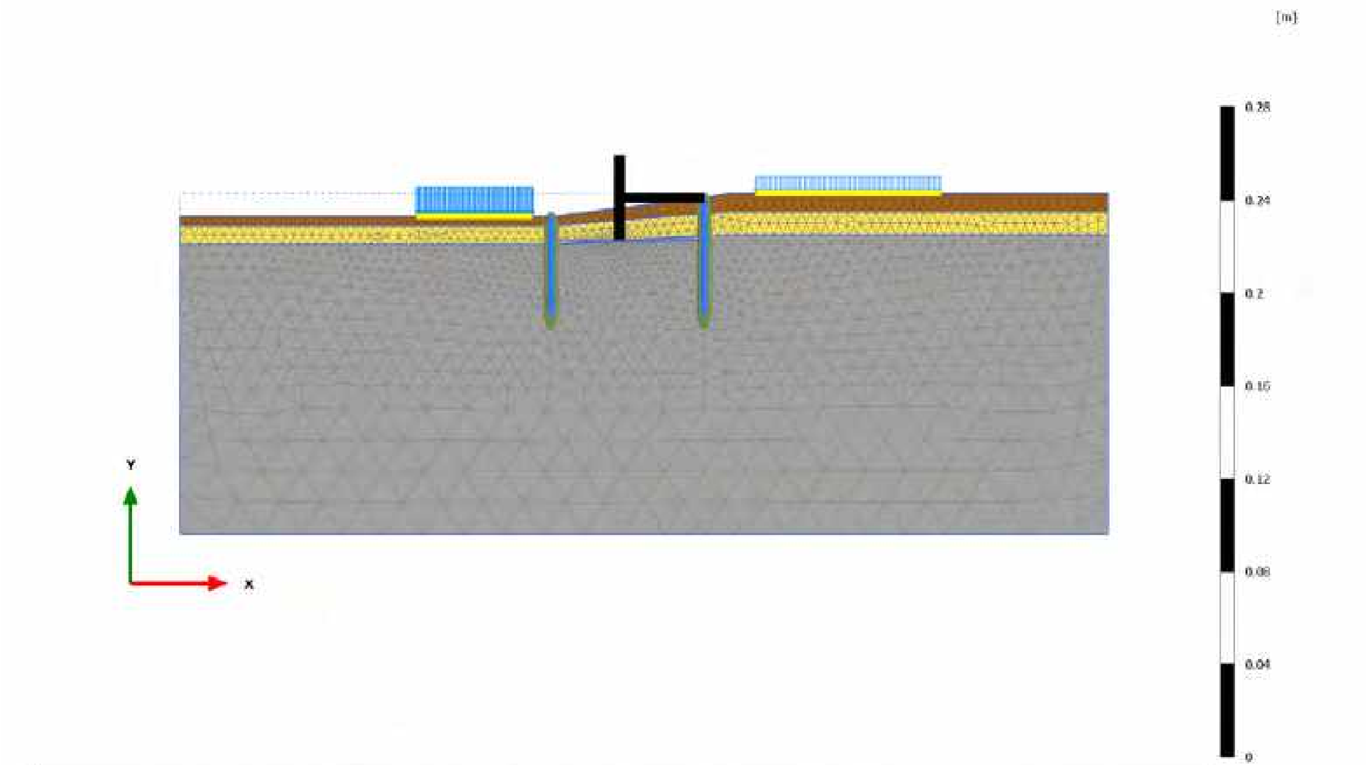
4.1.1 Calculation results, Terrain [Phase_1] (1/11), Deformed mesh |u|



Deformed mesh |u| (scaled up 250 times)

Maximum value = 0.01297 m (Element 51 at Node 4073)

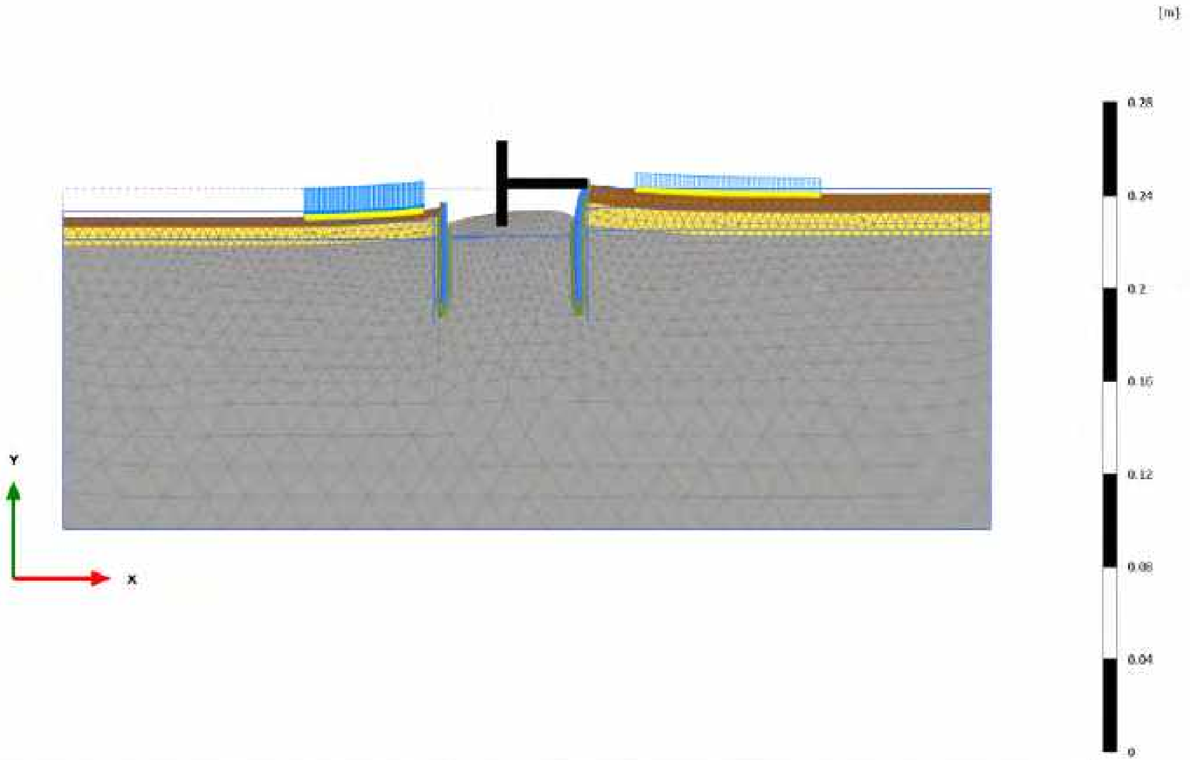
4.1.2 Calculation results, Wall construction [Phase_2] (2/13), Deformed mesh |u|



Deformed mesh |u| (scaled up 250 times)

Maximum value = 0.01204×10^{-3} m (Element 28 at Node 965)

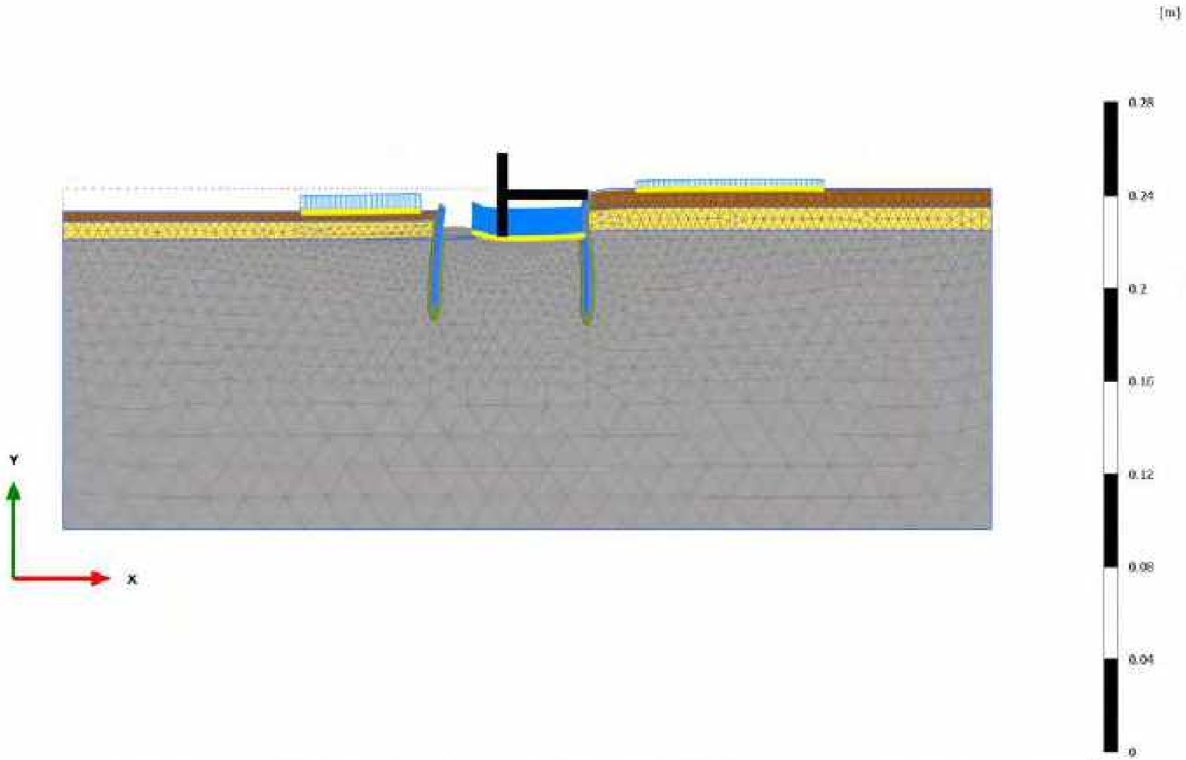
4.1.3 Calculation results, Excavation [Phase_3] (3/17), Deformed mesh |u|



Deformed mesh |u| (scaled up 250 times)

Maximum value = 0.01114 m (Element 2975 at Node 11850)

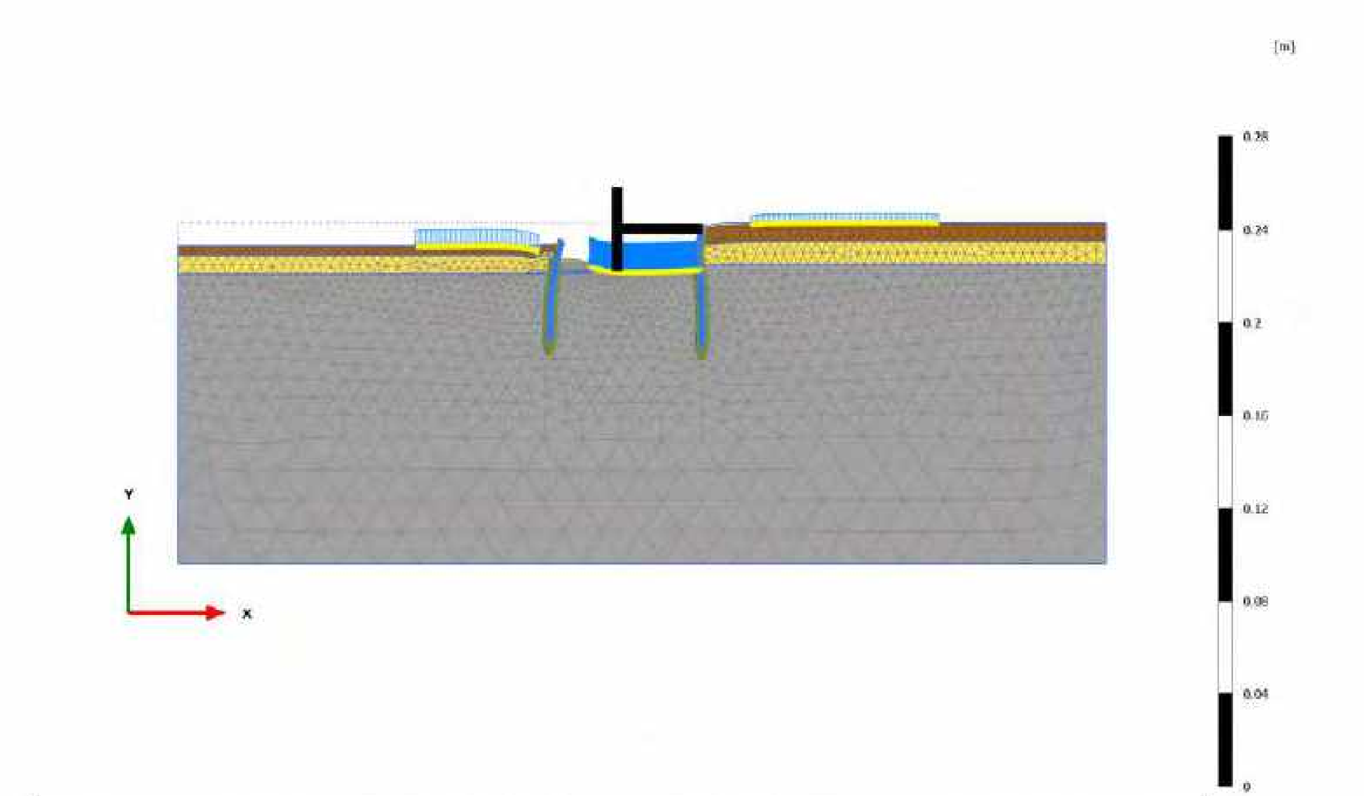
4.1.4 Calculation results, Construction [Phase_4] (4/19), Deformed mesh |u|



Deformed mesh |u| (scaled up 250 times)

Maximum value = $4.482*10^{-3}$ m (Element 1094 at Node 17988)

4.1.5 Calculation results, Drained [Phase_5] (5/31), Deformed mesh |u|



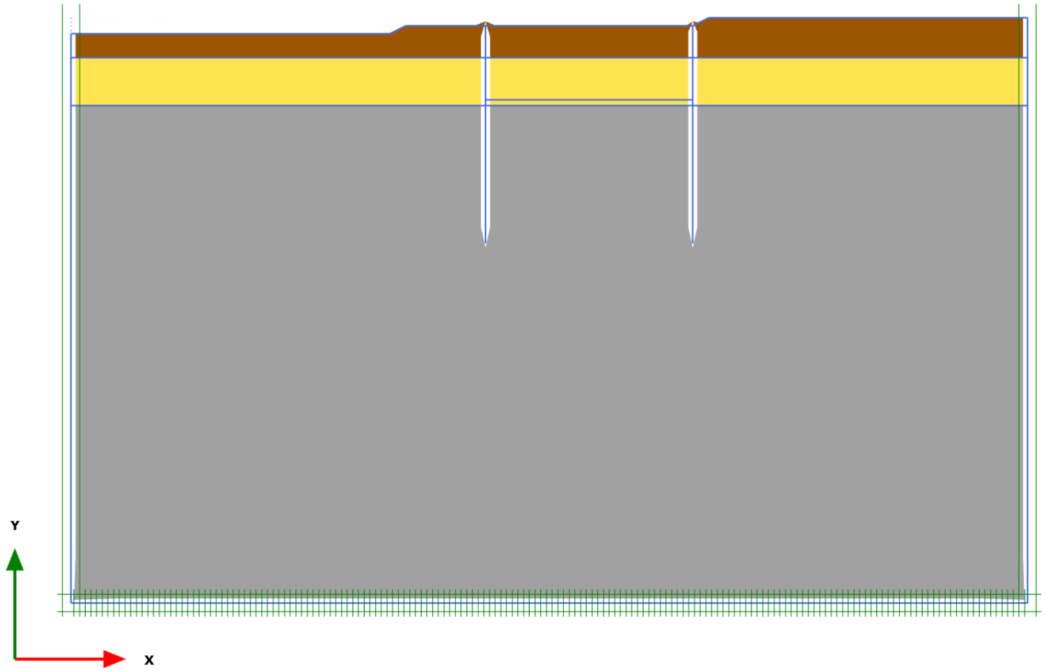
Deformed mesh |u| (scaled up 250 times)

Maximum value = $5.880*10^{-3}$ m (Element 0 at Node 19906)

PLAXIS Report

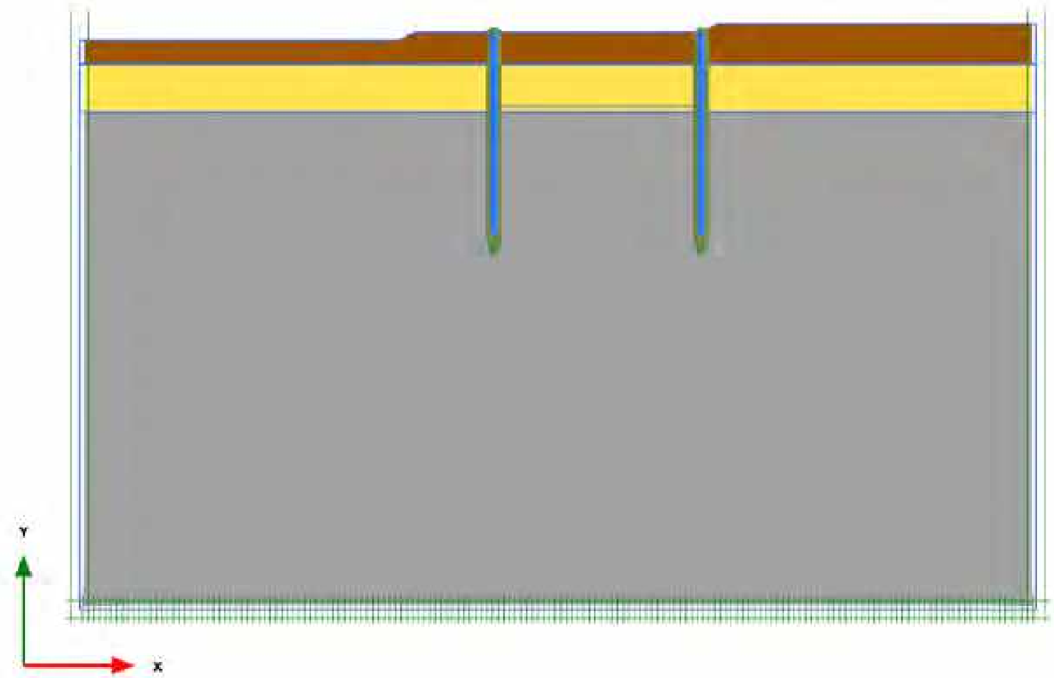
Filename	**Daleham 31 B-B.p2dx**
Directory	D:\fortisNEXUM\01-Em Curso\T23012 - 31 Daleham\A - EX\GEO\B-Calculos\PLAXIS\Finais\
Title	Daleham 31 B-B
Model	Plane strain
Elements	15-Noded
PLAXIS Version	Version 20.0.0.119

1.1.1.1 Calculation results, Terrain [Phase_1] (1/3), Fixities plot



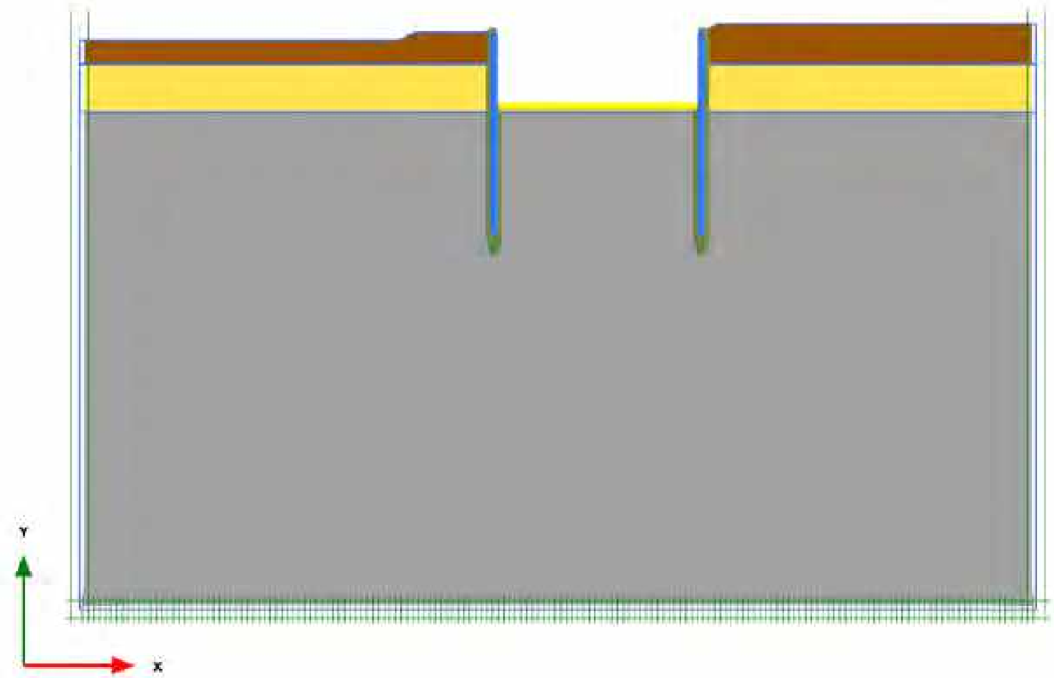
Fixities plot

1.1.1.2 Calculation results, Wall construction [Phase_2] (2/11), Fixities plot



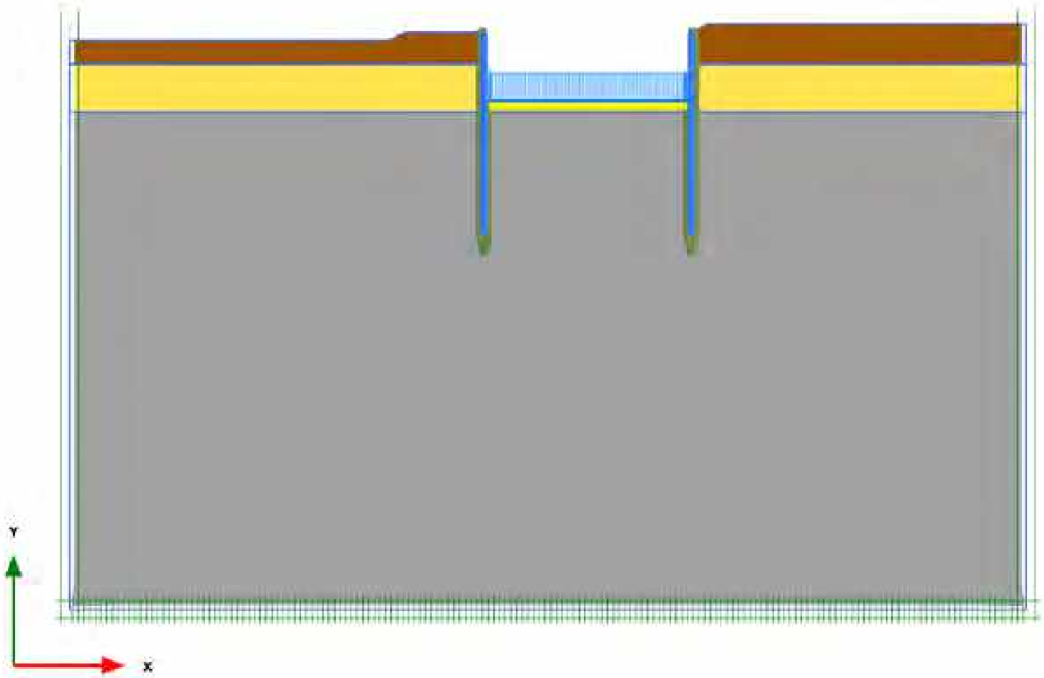
Fixities plot

1.1.1.3 Calculation results, Excavation [Phase_3] (3/40), Fixities plot



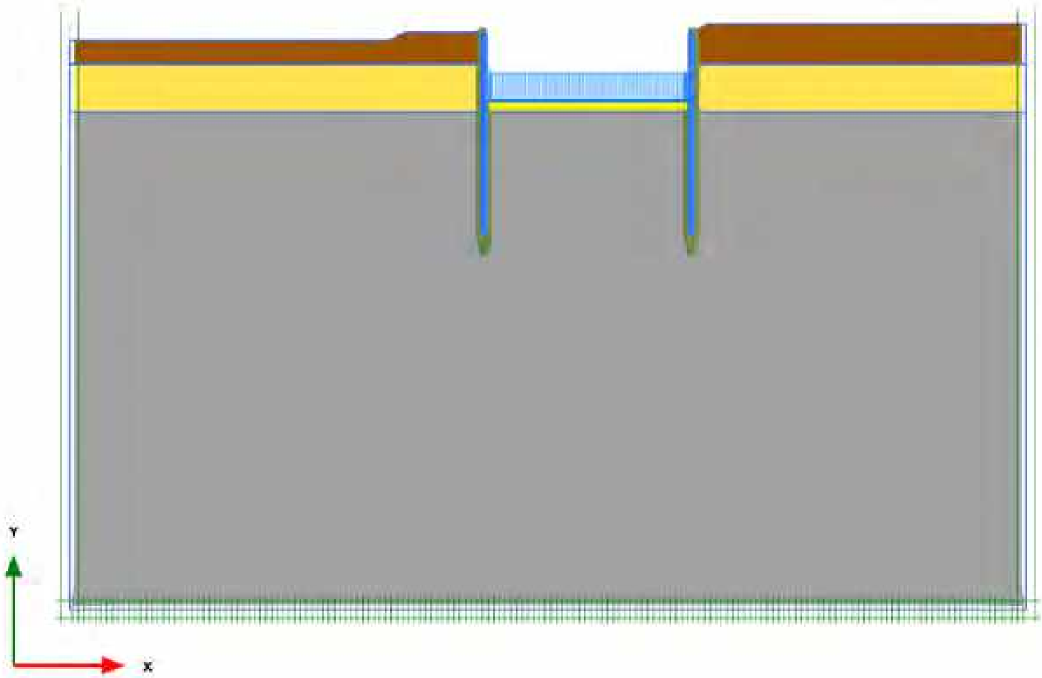
Fixities plot

1.1.1.4 Calculation results, Building [Phase_4] (4/48), Fixities plot



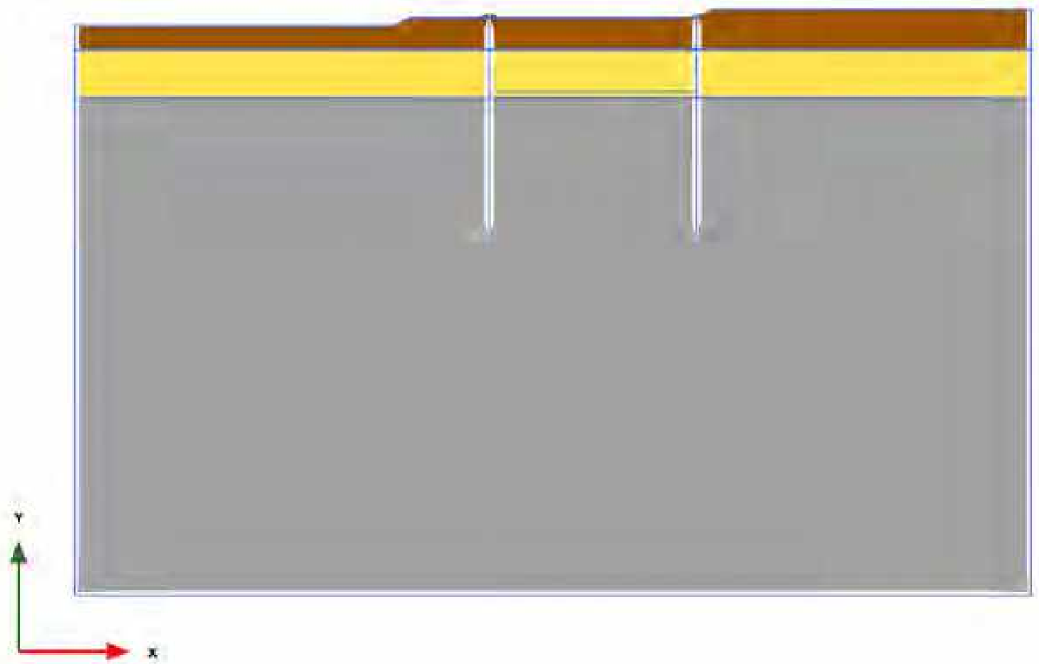
Fixities plot

1.1.1.5 Calculation results, Drained [Phase_5] (5/58), Fixities plot



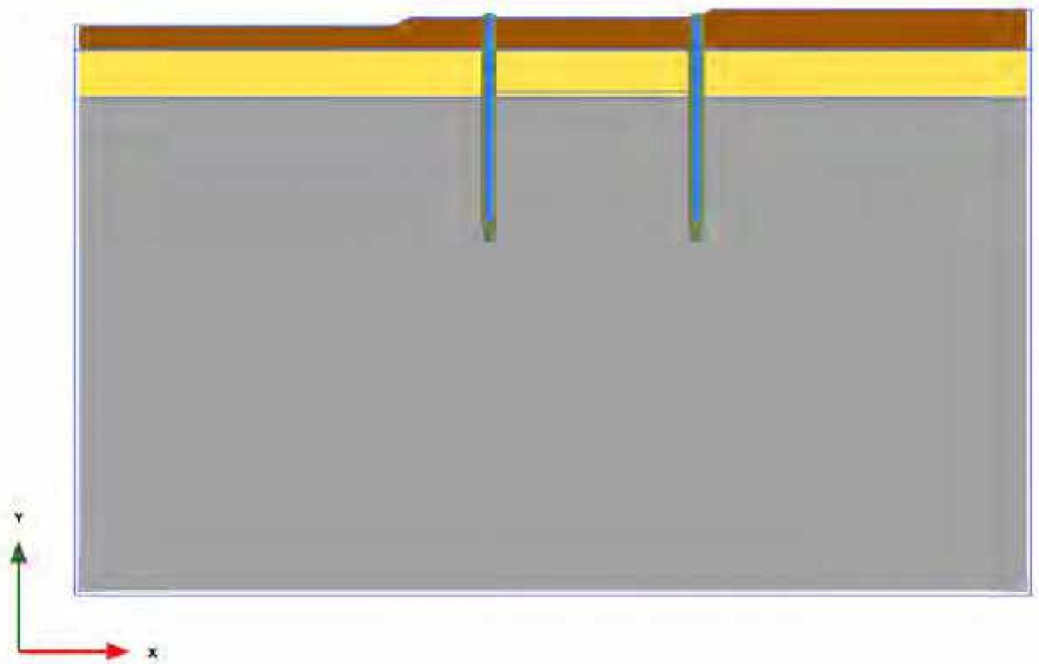
Fixities plot

1.1.2.1 Calculation results, Terrain [Phase_1] (1/3), Active loads plot



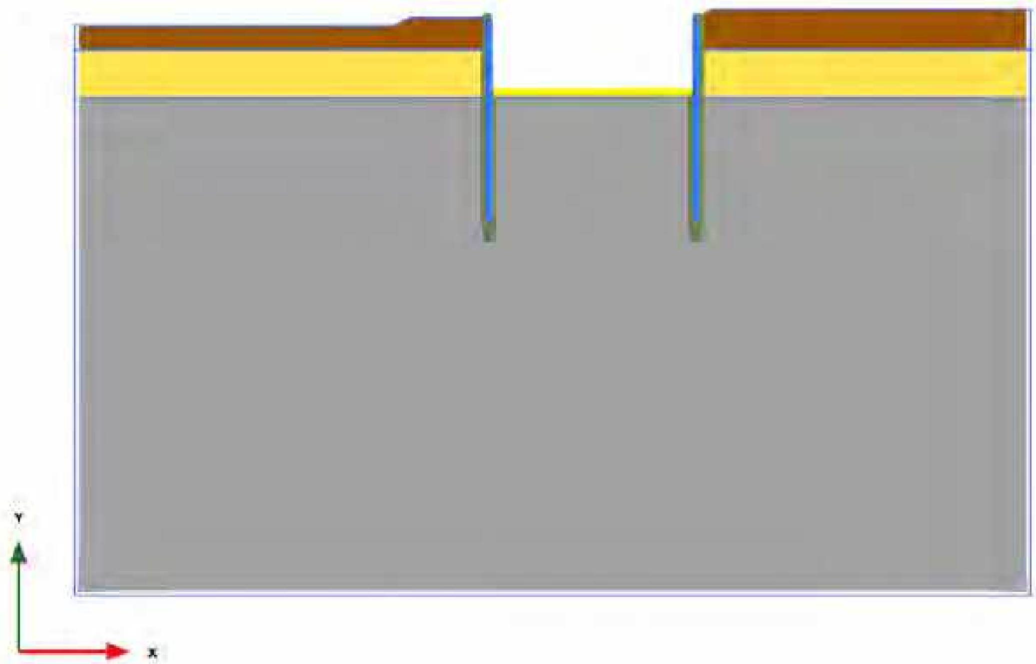
Active loads plot

1.1.2.2 Calculation results, Wall construction [Phase_2] (2/11), Active loads plot



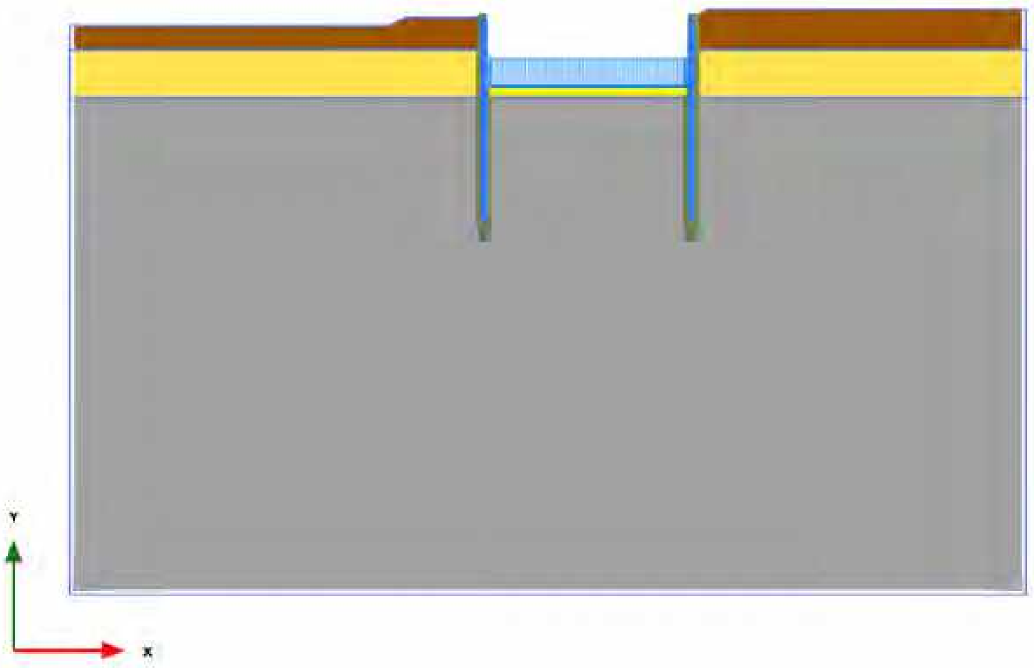
Active loads plot

1.1.2.3 Calculation results, Excavation [Phase_3] (3/40), Active loads plot



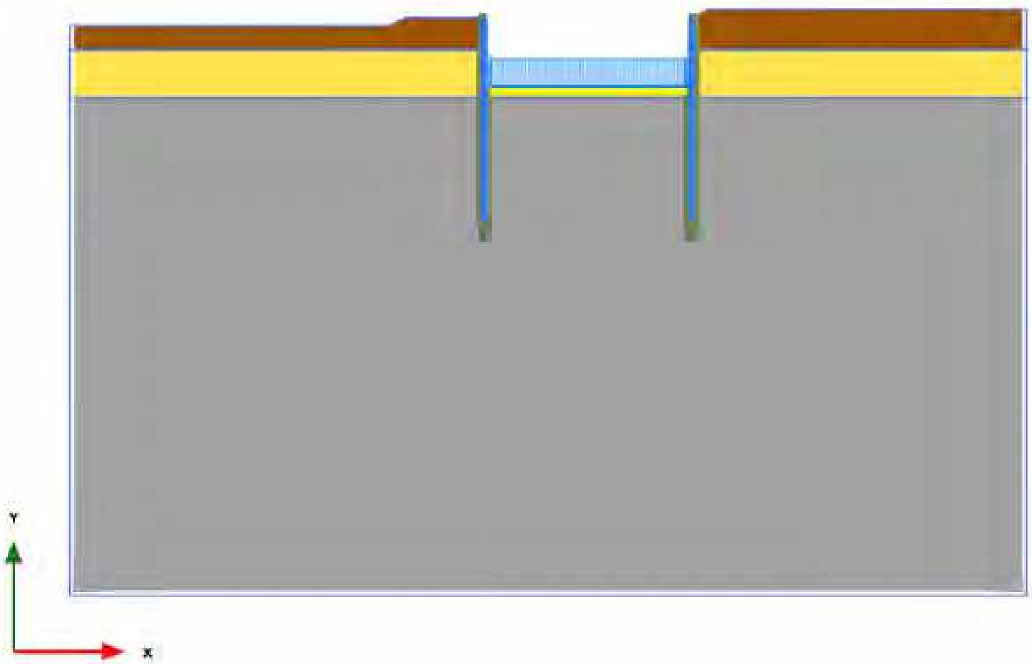
Active loads plot

1.1.2.4 Calculation results, Building [Phase_4] (4/48), Active loads plot



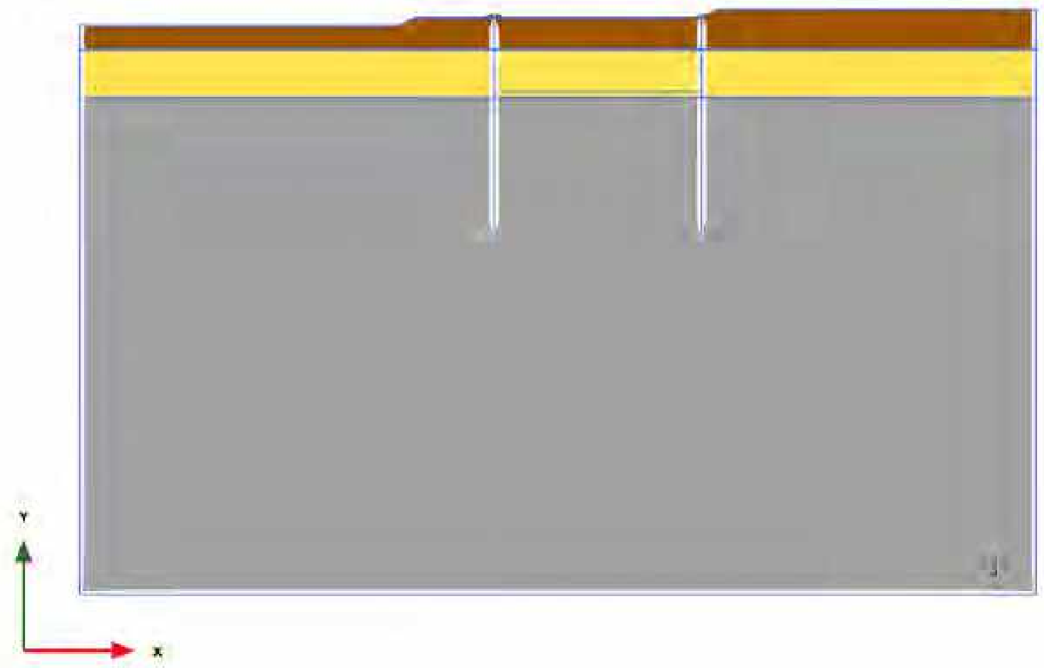
Active loads plot

1.1.2.5 Calculation results, Drained [Phase_5] (5/58), Active loads plot



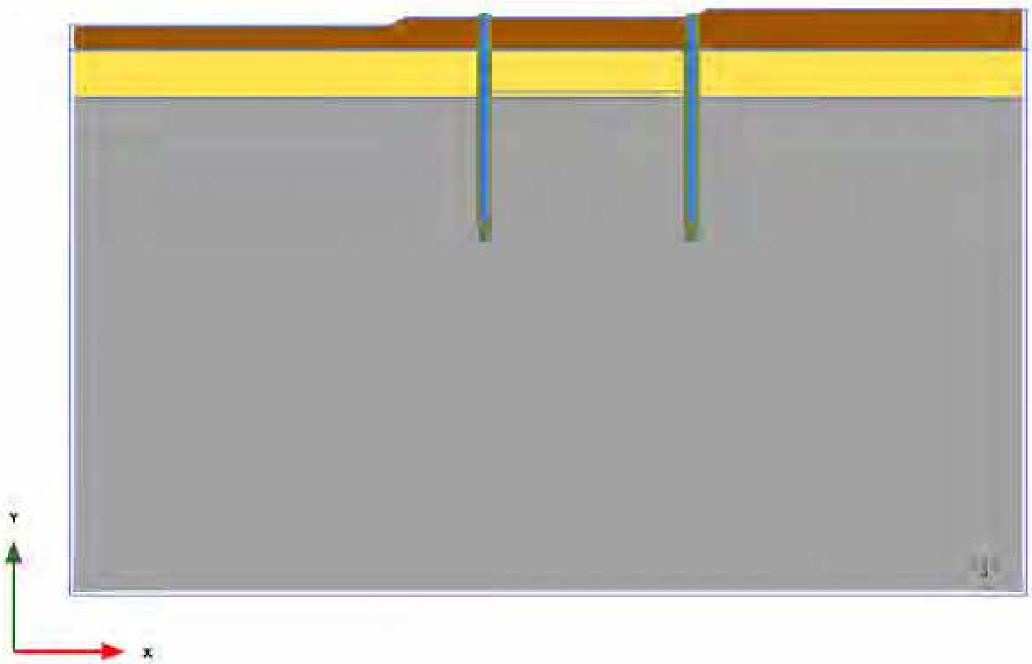
Active loads plot

1.1.3.1 Calculation results, Terrain [Phase_1] (1/3), Materials plot



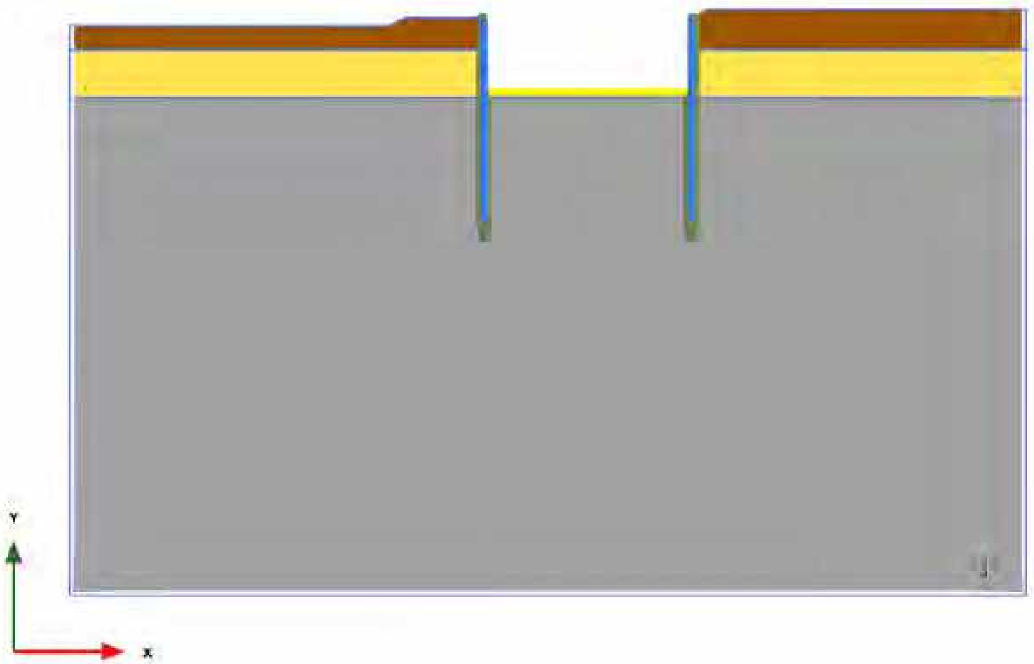
Materials plot

1.1.3.2 Calculation results, Wall construction [Phase_2] (2/11), Materials plot



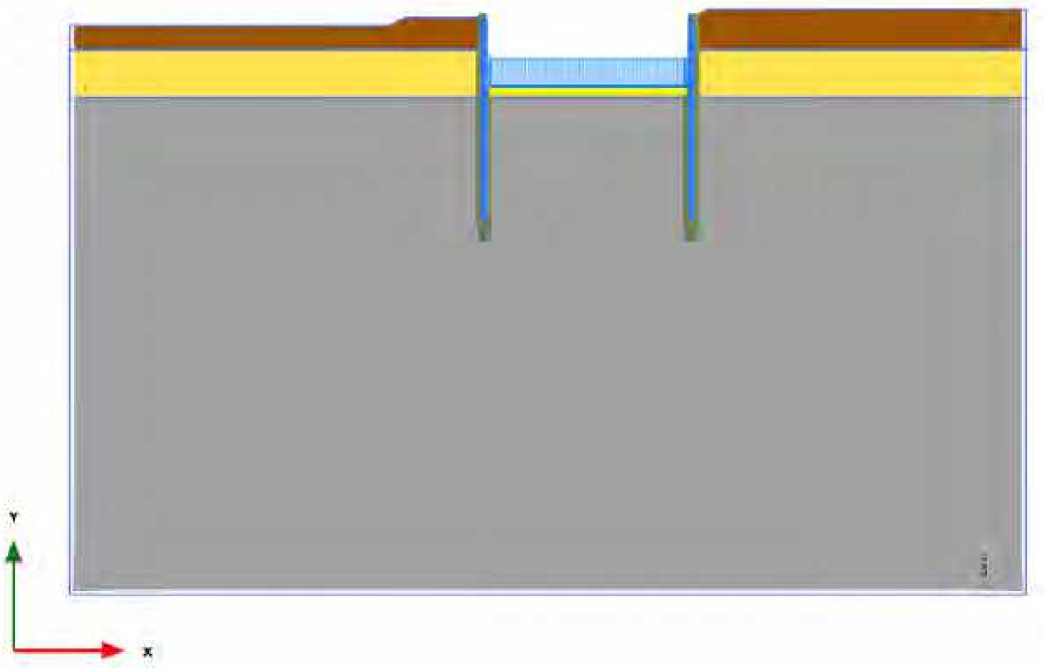
Materials plot

1.1.3.3 Calculation results, Excavation [Phase_3] (3/40), Materials plot



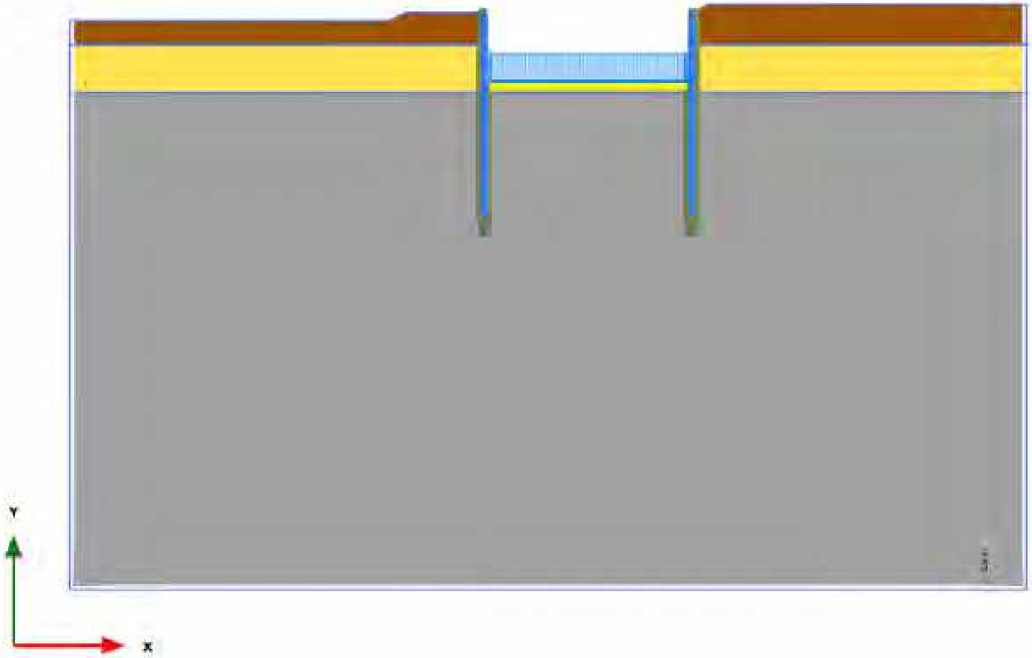
Materials plot

1.1.3.4 Calculation results, Building [Phase_4] (4/48), Materials plot



Materials plot

1.1.3.5 Calculation results, Drained [Phase_5] (5/58), Materials plot



Materials plot

1.1.4.1.1 Materials - Soil and interfaces - Mohr-Coulomb

Identification		**1 - Made Ground**	**2 - Clay Gate (U)**	**3 - London Clay (U)**	**2 - Clay Gate (D)**	**3 - London Clay (D)**
Identification number		1	2	3	4	5
Drainage type		Drained	Undrained (C)	Undrained (C)	Drained	Drained
Colour						
Comments						
γ_{unsat}	kN/m³	18.00	18.00	19.00	18.00	19.00
γ_{sat}	kN/m³	19.00	18.00	19.00	18.00	19.00
Dilatancy cut-off		No	No	No	No	No
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
e_{min}		0.000	0.000	0.000	0.000	0.000
e_{max}		999.0	999.0	999.0	999.0	999.0
Rayleigh α		0.000	0.000	0.000	0.000	0.000
Rayleigh β		0.000	0.000	0.000	0.000	0.000
E	kN/m²	10.00E3	25.00E3	40.00E3	18.75E3	30.00E3
ν (nu)		0.3000	0.4990	0.4950	0.3500	0.3000
G	kN/m²	3846	8339	13.38E3	6944	11.54E3
E_{oed}	kN/m²	13.46E3	4.178E6	1.351E6	30.09E3	40.38E3
c_{ref}	kN/m²	1.000	50.00	80.00	10.00	10.00
ϕ (phi)	°	25.00	0.000	0.000	24.00	23.00

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
ψ (psi)	°	0.000	0.000	0.000	0.000	0.000
V_s	m/s	45.78	67.41	83.11	61.52	77.18
V_p	m/s	85.65	1509	835.2	128.1	144.4
Set to default values		Yes	No	No	Yes	No
E_{inc}	kN/m²/m	0.000	0.000	2500	0.000	1875
y_{ref}	m	0.000	0.000	76.20	0.000	76.20
c_{inc}	kN/m²/m	0.000	0.000	5.000	0.000	0.000
y_{ref}	m	0.000	0.000	76.20	0.000	76.20
Tension cut-off		Yes	No	No	Yes	Yes
Tensile strength	kN/m²	0.000	10.00E6	10.00E6	0.000	0.000
Undrained behaviour		Standard	Standard	Standard	Standard	Standard
Skempton-B		0.9783	0.000	0.000	0.9699	0.9783
ν_u		0.4950	0.4990	0.4950	0.4950	0.4950
$K_{w,ref}$ / n	kN/m²	375.0E3	0.000	0.000	671.3E3	1.125E6
$C_{v,ref}$	m²/day	0.000	0.000	0.000	0.000	0.000
Stiffness		Standard	Standard	Standard	Standard	Standard
Strength		Rigid	Rigid	Rigid	Rigid	Rigid
R_{inter}		1.000	1.000	1.000	1.000	1.000
Consider gap closure		Yes	Yes	Yes	Yes	Yes
δ_{inter}		0.000	0.000	0.000	0.000	0.000

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
Cross permeability		Impermeable	Impermeable	Impermeable	Impermeable	Impermeable
Drainage conductivity, dk	m^3/day/m	0.000	0.000	0.000	0.000	0.000
K_0 determination		Automatic	Automatic	Automatic	Automatic	Automatic
$K_{0,x} = K_{0,z}$		Yes	Yes	Yes	Yes	Yes
$K_{0,x}$		0.5774	0.5000	0.5000	0.5933	0.6093
$K_{0,z}$		0.5774	0.5000	0.5000	0.5933	0.6093
Data set		Standard	Standard	Standard	Standard	Standard
Type		Coarse	Coarse	Coarse	Coarse	Coarse
< 2 µm	%	10.00	10.00	10.00	10.00	10.00
2 µm - 50 µm	%	13.00	13.00	13.00	13.00	13.00
50 µm - 2 mm	%	77.00	77.00	77.00	77.00	77.00
Use defaults		None	None	None	None	None
k_x	m/day	0.000	0.000	0.000	0.000	0.000
k_y	m/day	0.000	0.000	0.000	0.000	0.000
$-\psi_{unsat}$	m	10.00E3	10.00E3	10.00E3	10.00E3	10.00E3
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
S_s	1/m	0.000	0.000	0.000	0.000	0.000
c_k		1000E12	1000E12	1000E12	1000E12	1000E12

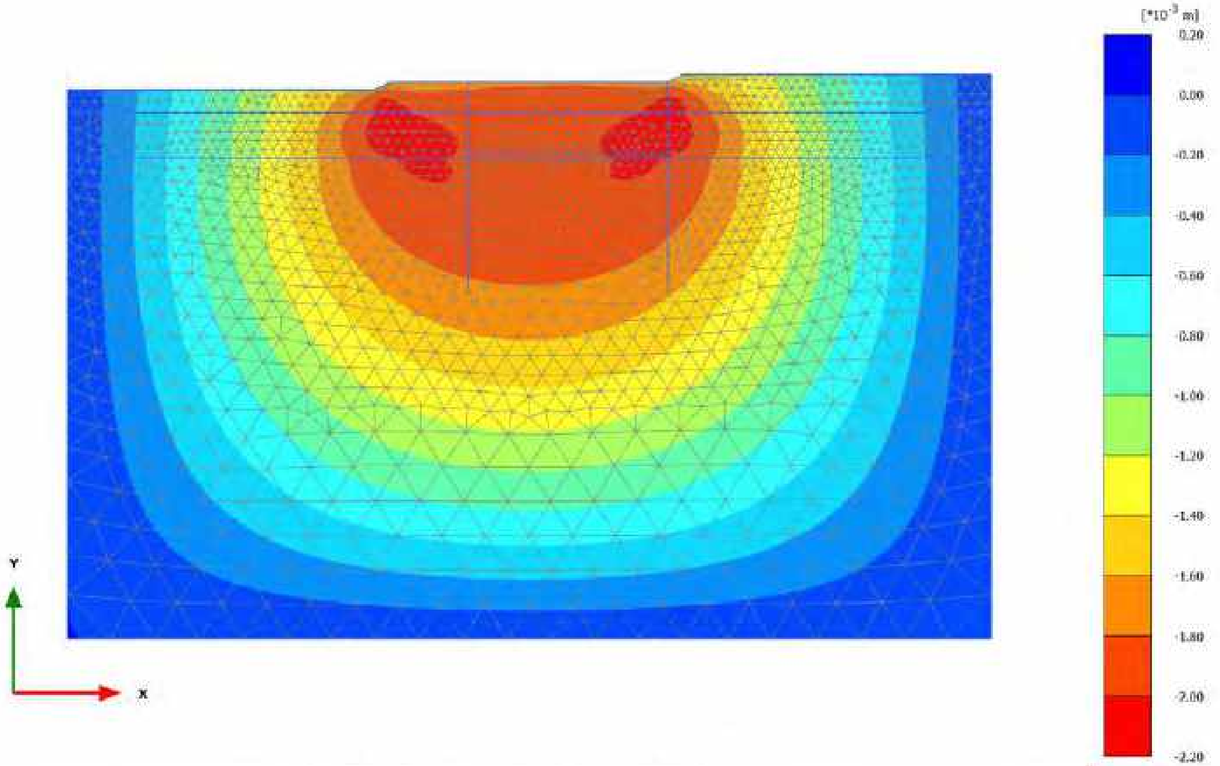
1.1.4.2 Materials - Plates -

Identification		**AU25**	**AU14**
Identification number		1	2
Comments			
Colour			
Material type		Elastic	Elastic
Isotropic		Yes	Yes
EA_1	kN/m	3.760E6	2.640E6
EA_2	kN/m	3.760E6	2.640E6
EI	kN m²/m	112.5E3	57.36E3
d	m	0.5991	0.5106
w	kN/m/m	1.000	0.000
ν (nu)		0.2000	0.000
Rayleigh α		0.000	0.000
Rayleigh β		0.000	0.000
Prevent punching		No	No
Identification number		1	2

1.1.4.3 Materials - Geogrids -

Identification		**ficticious**
Identification number		1
Comments		
Colour		
Material type		Elastic
Isotropic		Yes
EA_1	kN/m	1.000
EA_2	kN/m	1.000
Identification number		1
Identification number		1

2.1.1.1.1 Calculation results, Terrain [Phase_1] (1/3), Total displacements u_x

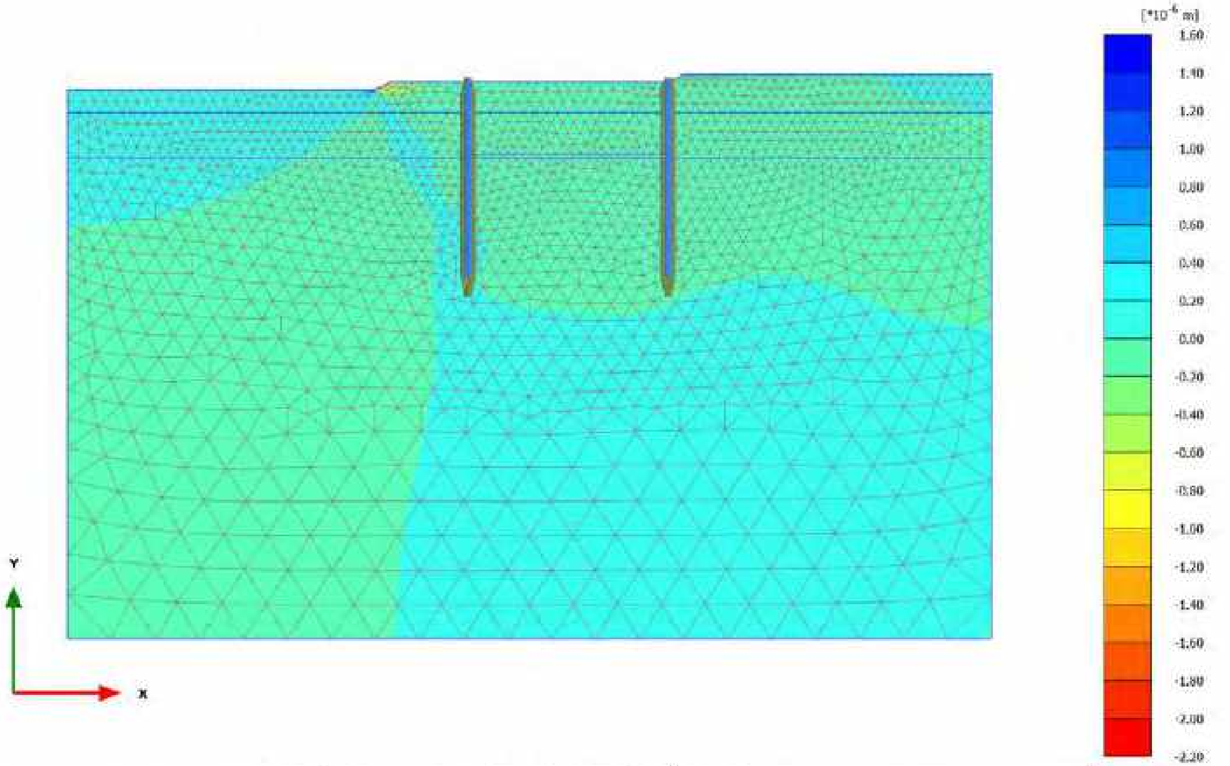


Total displacements u_x (scaled up 500 times)

Maximum value = 4.573×10^{-6} m (Element 1036 at Node 745)

Minimum value = -2.108×10^{-3} m (Element 891 at Node 25383)

2.1.1.1.2 Calculation results, Wall construction [Phase_2] (2/11), Total displacements u_x

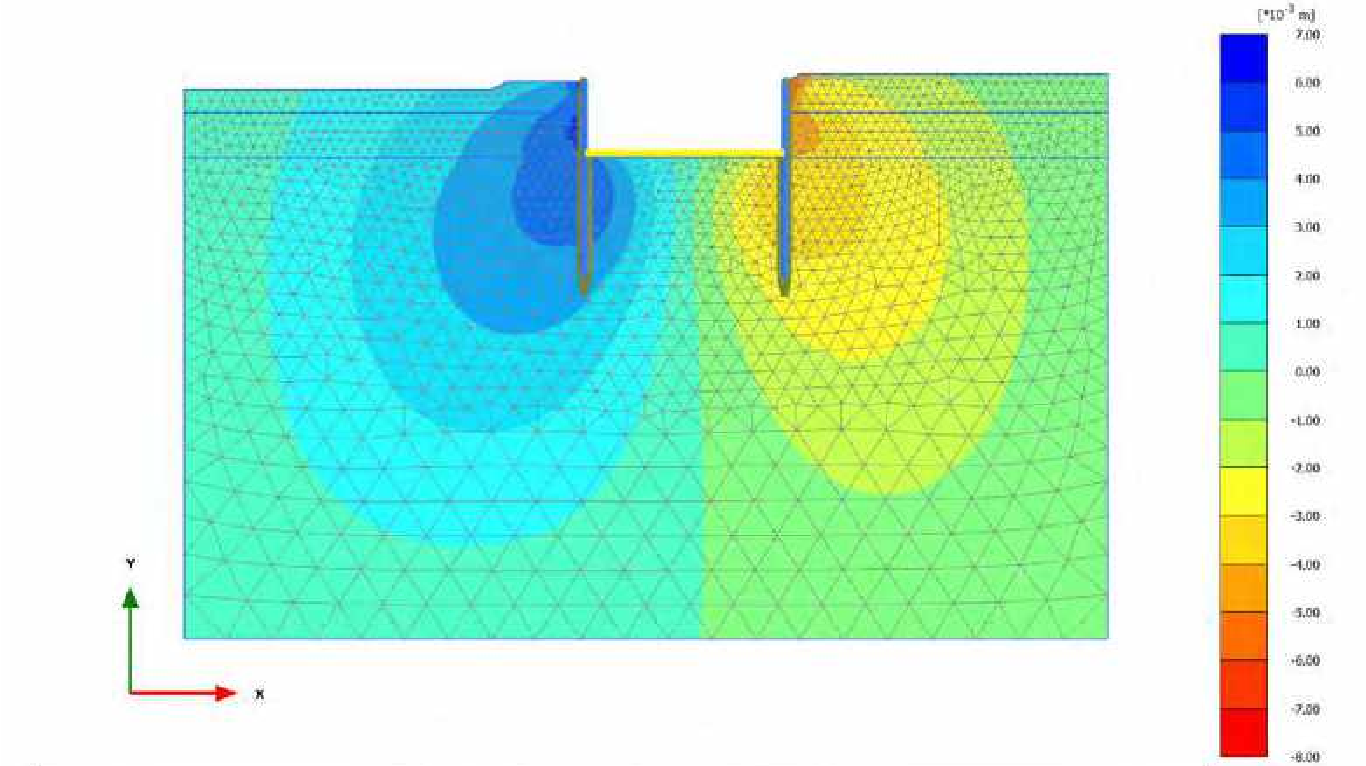


Total displacements u_x (scaled up $500*10^3$ times)

Maximum value = $1.480*10^{-6}$ m (Element 844 at Node 6337)

Minimum value = $-2.010*10^{-6}$ m (Element 846 at Node 6790)

2.1.1.1.3 Calculation results, Excavation [Phase_3] (3/40), Total displacements u_x

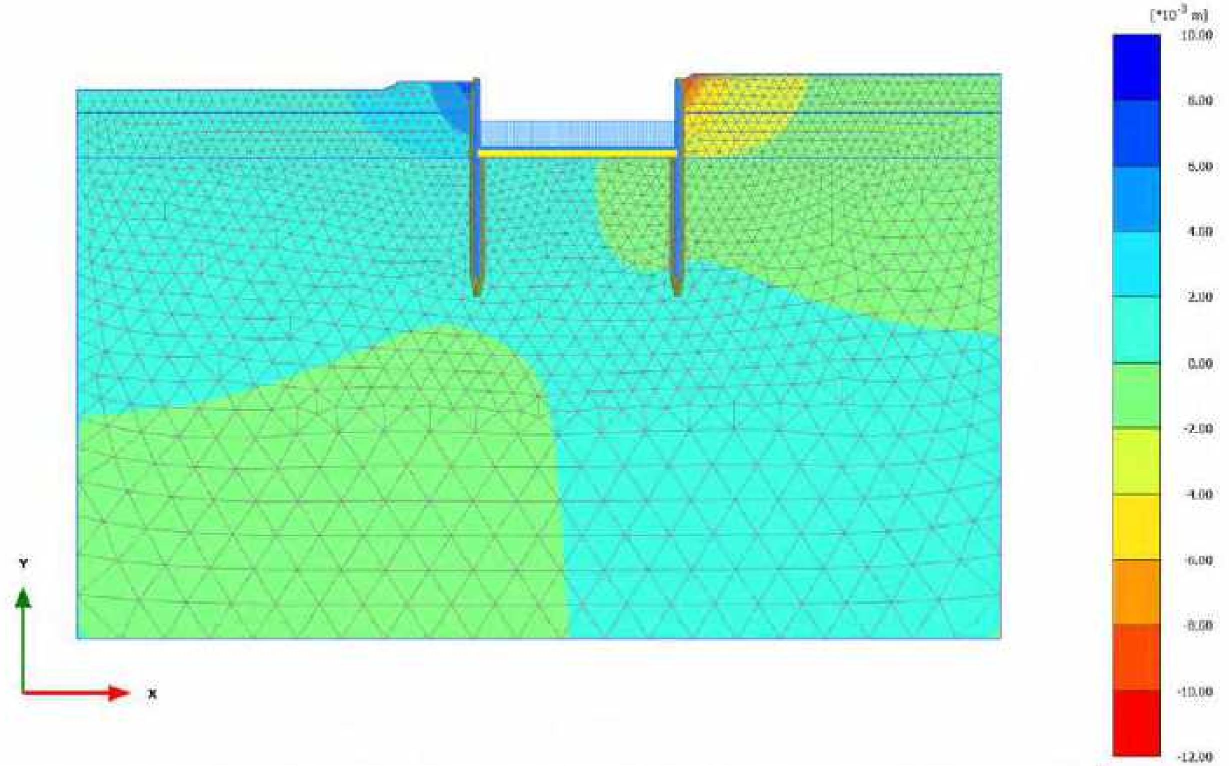


Total displacements u_x (scaled up 200 times)

Maximum value = $6.563*10^{-3}$ m (Element 711 at Node 13384)

Minimum value = $-7.489*10^{-3}$ m (Element 487 at Node 27036)

2.1.1.1.4 Calculation results, Building [Phase_4] (4/48), Total displacements u_x

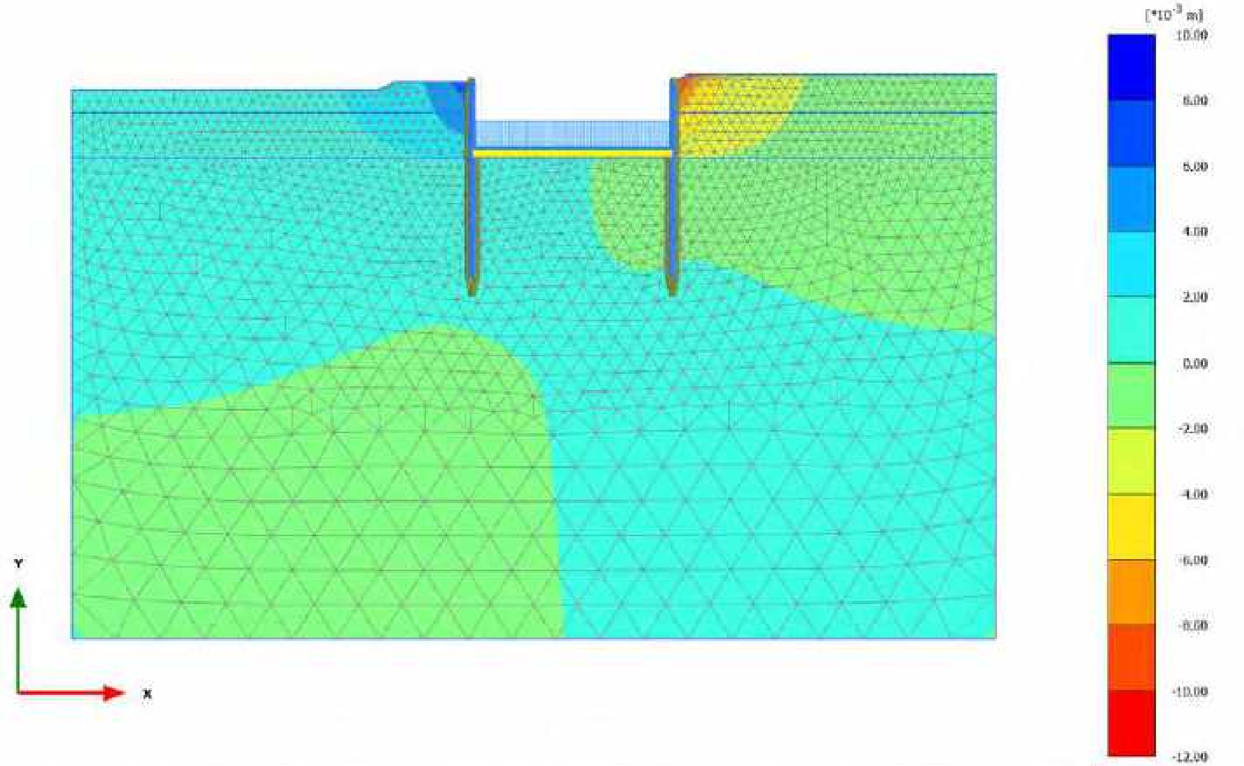


Total displacements u_x (scaled up 100 times)

Maximum value = $9.100*10^{-3}$ m (Element 711 at Node 13384)

Minimum value = -0.01091 m (Element 487 at Node 27036)

2.1.1.1.5 Calculation results, Drained [Phase_5] (5/58), Total displacements u_x

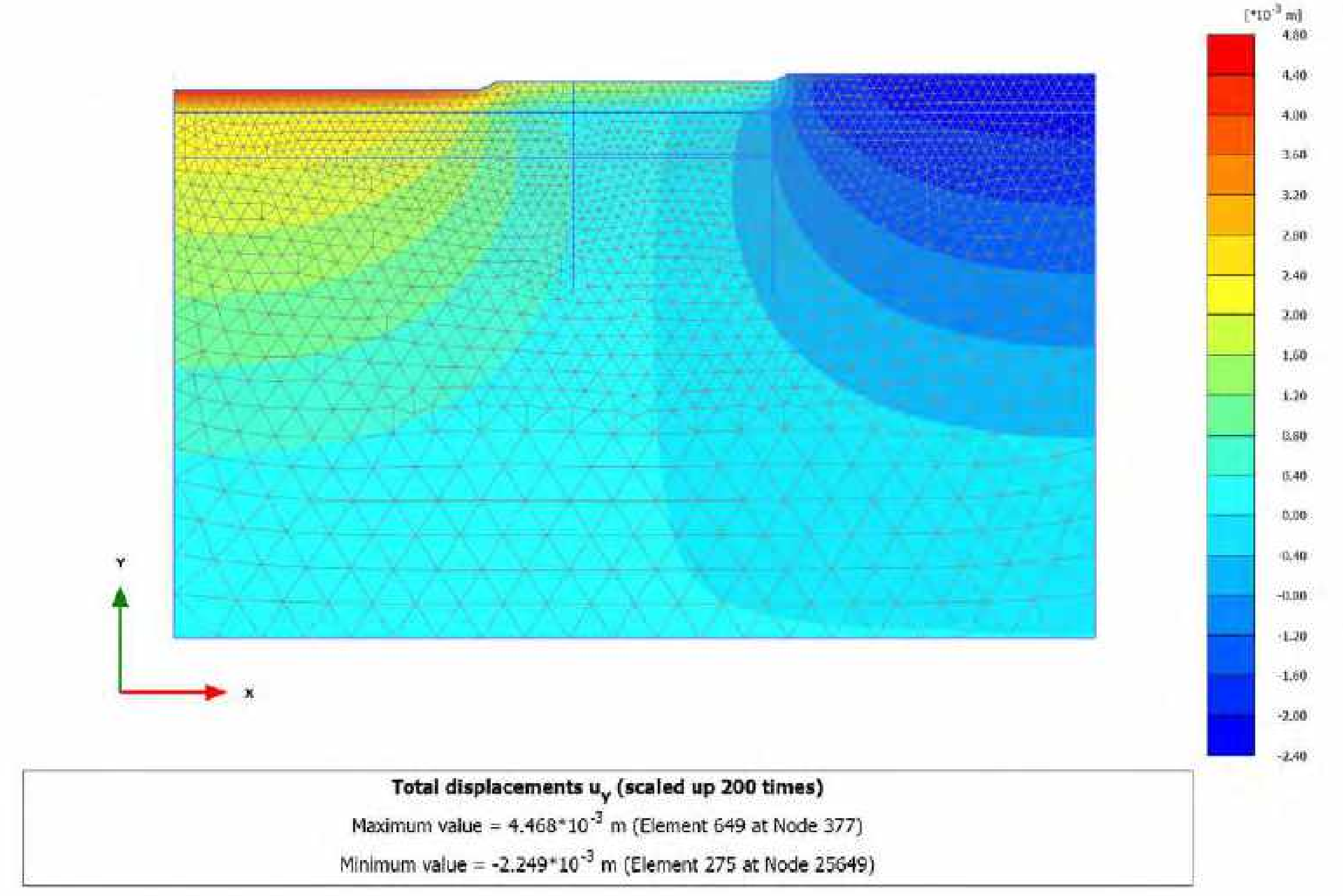


Total displacements u_x (scaled up 100 times)

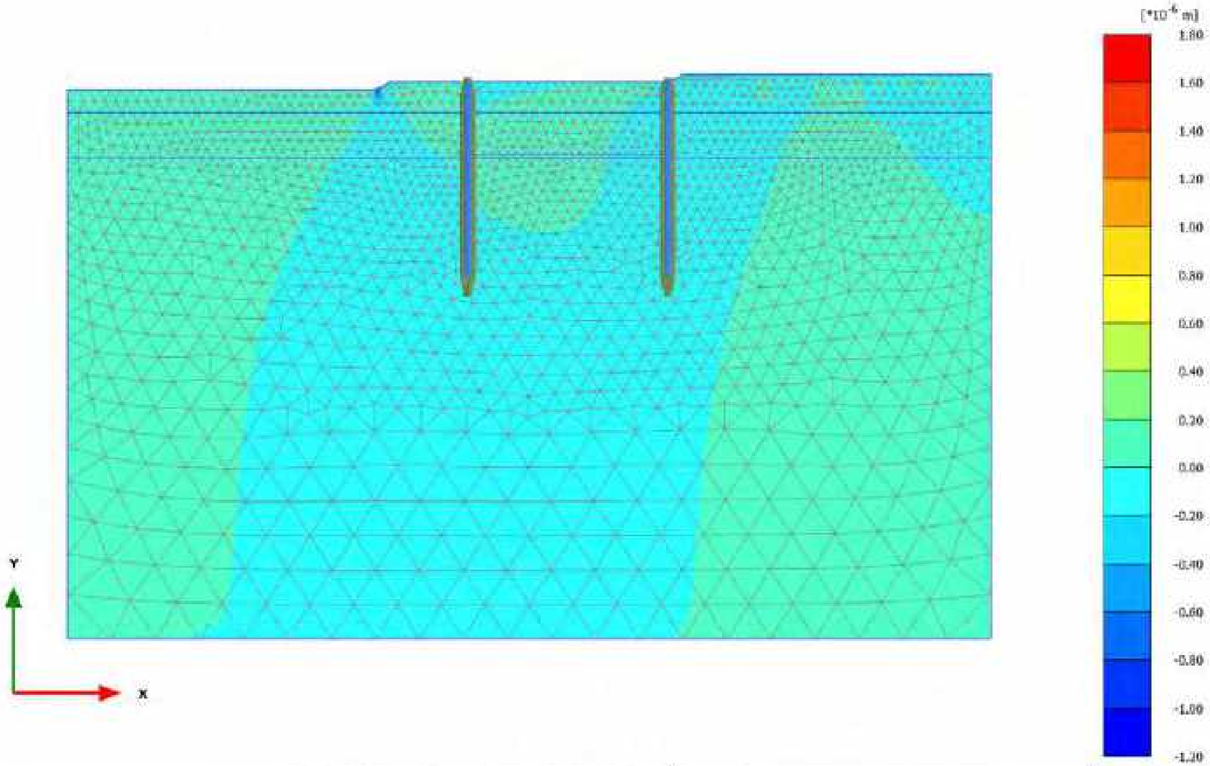
Maximum value = $9.107 \cdot 10^{-3}$ m (Element 711 at Node 13384)

Minimum value = -0.01092 m (Element 487 at Node 27036)

2.1.1.2.1 Calculation results, Terrain [Phase_1] (1/3), Total displacements u_y



2.1.1.2.2 Calculation results, Wall construction [Phase_2] (2/11), Total displacements u_y

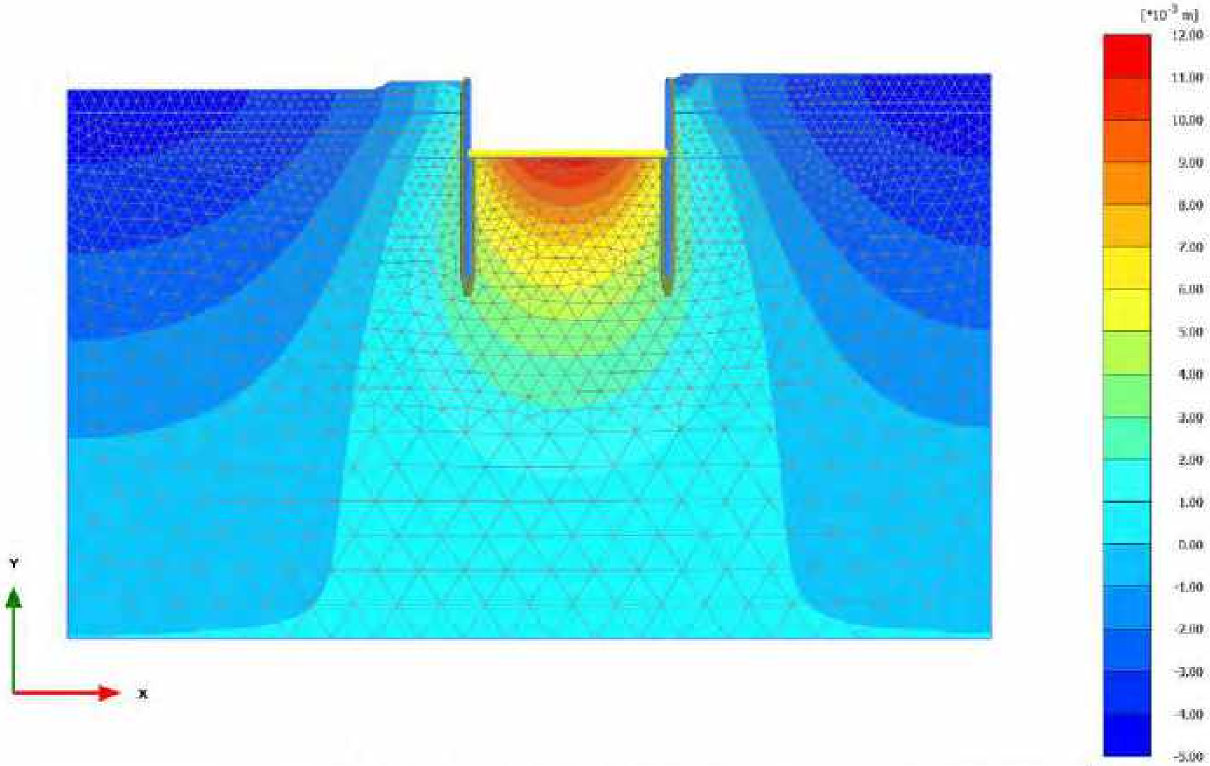


Total displacements u_y (scaled up $500*10^3$ times)

Maximum value = $1.682*10^{-6}$ m (Element 836 at Node 6788)

Minimum value = $-0.9931*10^{-6}$ m (Element 846 at Node 6795)

2.1.1.2.3 Calculation results, Excavation [Phase_3] (3/40), Total displacements u_y

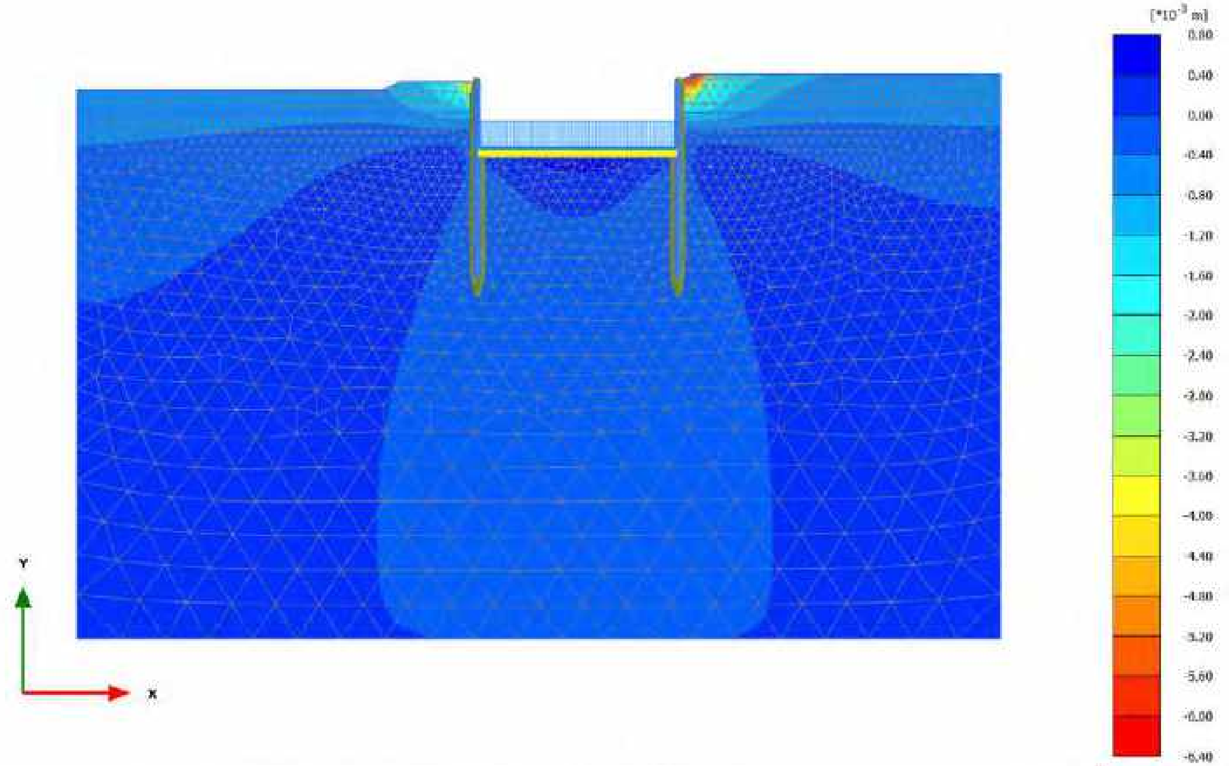


Total displacements u_y (scaled up 100 times)

Maximum value = 0.01147 m (Element 1702 at Node 18466)

Minimum value = $-4.574*10^{-3}$ m (Element 649 at Node 377)

2.1.1.2.4 Calculation results, Building [Phase_4] (4/48), Total displacements u_y

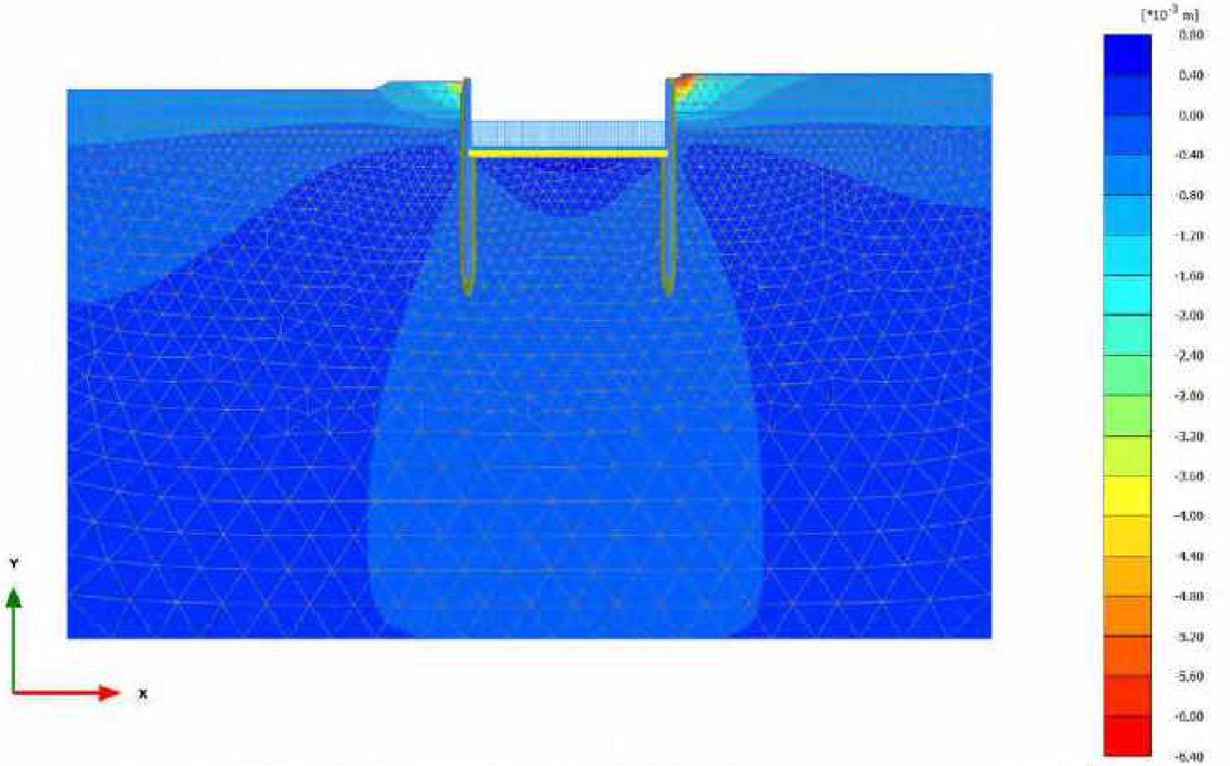


Total displacements u_y (scaled up 200 times)

Maximum value = $0.7817*10^{-3}$ m (Element 1728 at Node 24388)

Minimum value = $-6.028*10^{-3}$ m (Element 527 at Node 27645)

2.1.1.2.5 Calculation results, Drained [Phase_5] (5/58), Total displacements u_y

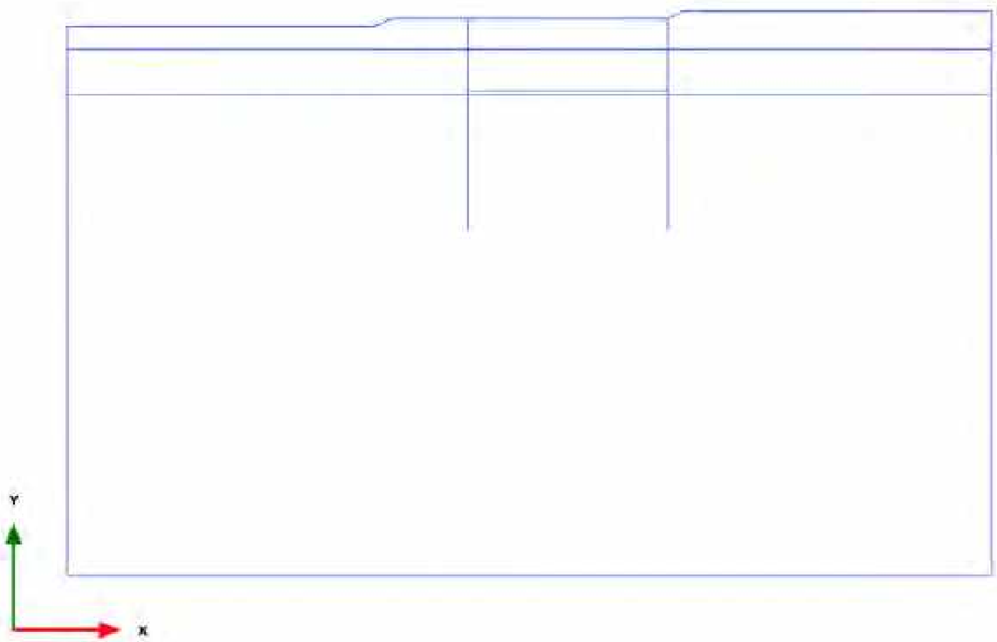


Total displacements u_y (scaled up 200 times)

Maximum value = $0.7815 \cdot 10^{-3}$ m (Element 1728 at Node 24388)

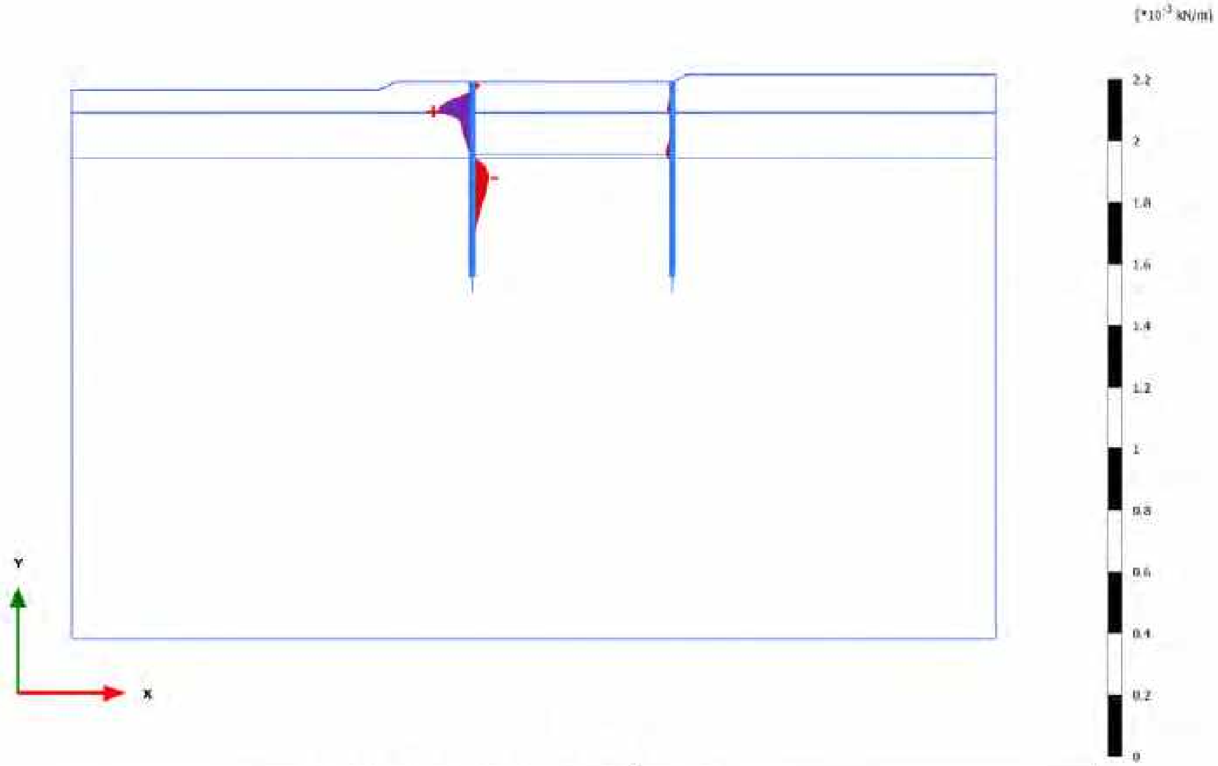
Minimum value = $-6.037 \cdot 10^{-3}$ m (Element 527 at Node 27645)

3.1.1.1.1 Calculation results, Plate, Terrain [Phase_1] (1/3), Shear forces Q



Shear forces Q (scaled up 1.00 times)
No results

3.1.1.1.2 Calculation results, Plate, Wall construction [Phase_2] (2/11), Shear forces Q

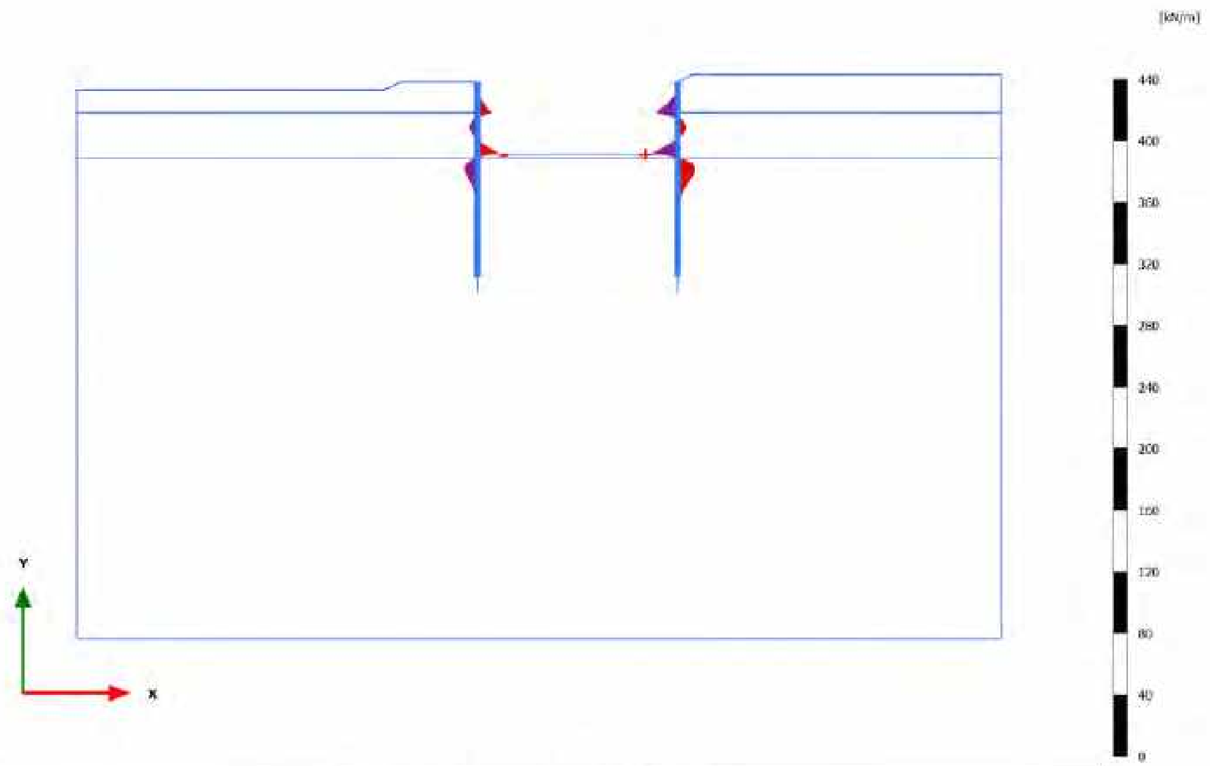


Shear forces Q (scaled up $20.0*10^{3}$ times)

Maximum value = $0.1097*10^{-3}$ kN/m (Element 1 at Node 12260)

Minimum value = $-0.05254*10^{-3}$ kN/m (Element 28 at Node 10141)

3.1.1.1.3 Calculation results, Plate, Excavation [Phase_3] (3/40), Shear forces Q

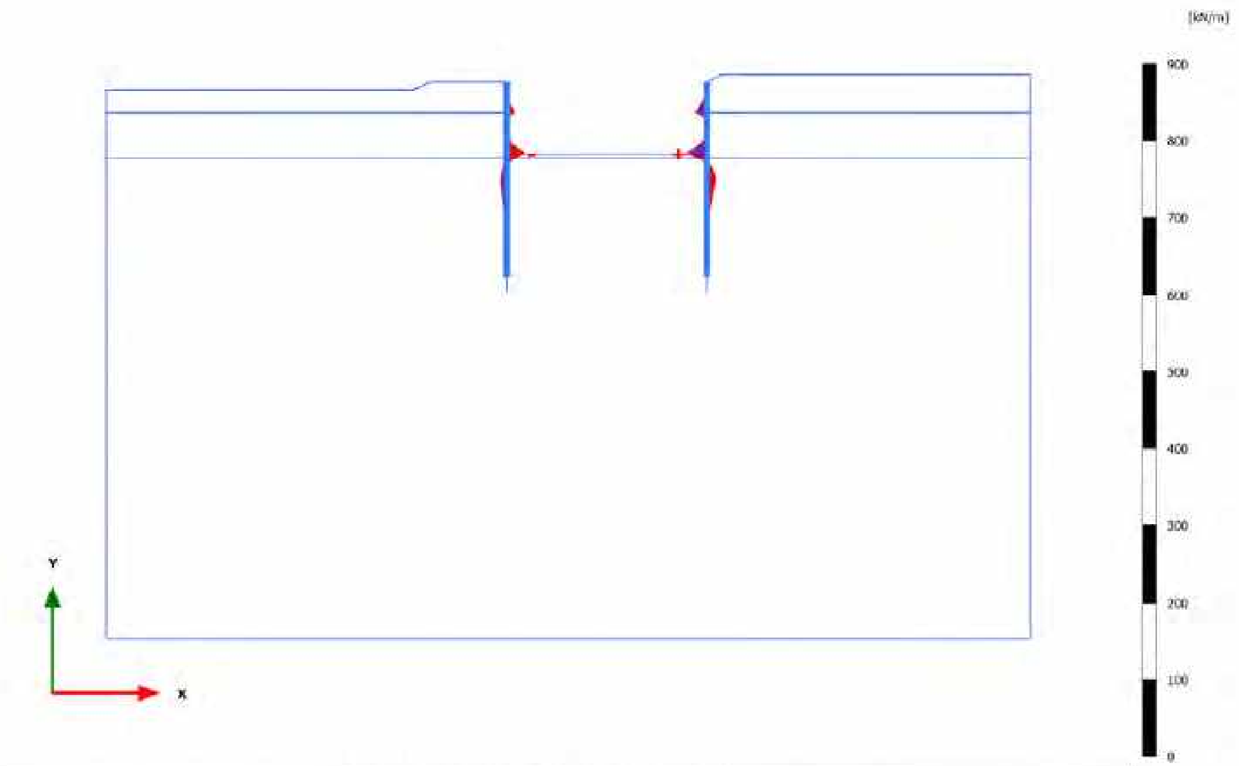


Shear forces Q (scaled up 0.100 times)

Maximum value = 17.18 kN/m (Element 12 at Node 24401)

Minimum value = -13.49 kN/m (Element 8 at Node 11900)

3.1.1.1.4 Calculation results, Plate, Building [Phase_4] (4/48), Shear forces Q

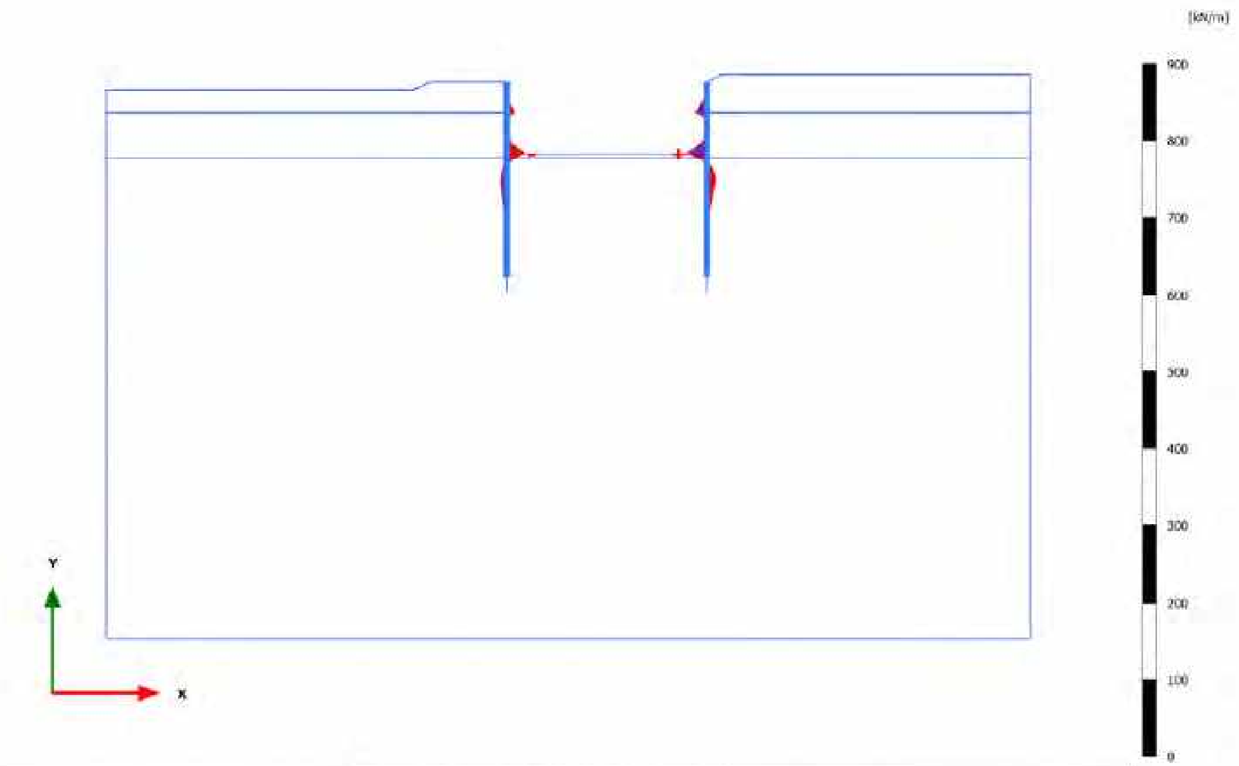


Shear forces Q (scaled up 0.0500 times)

Maximum value = 29.39 kN/m (Element 17 at Node 24401)

Minimum value = -25.72 kN/m (Element 16 at Node 11900)

3.1.1.1.5 Calculation results, Plate, Drained [Phase_5] (5/58), Shear forces Q

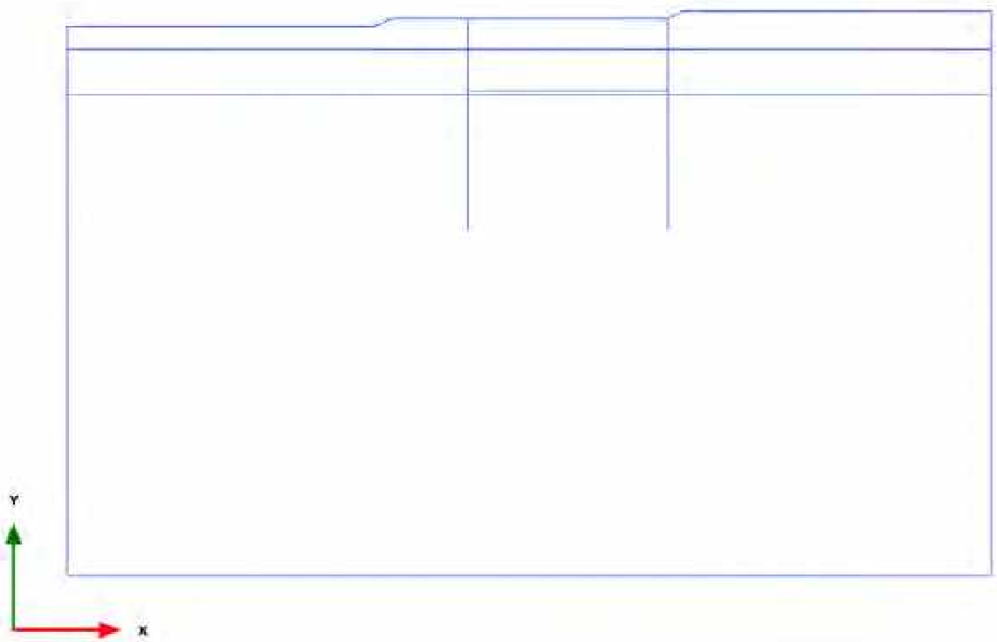


Shear forces Q (scaled up 0.0500 times)

Maximum value = 29.37 kN/m (Element 17 at Node 24401)

Minimum value = -25.70 kN/m (Element 16 at Node 11900)

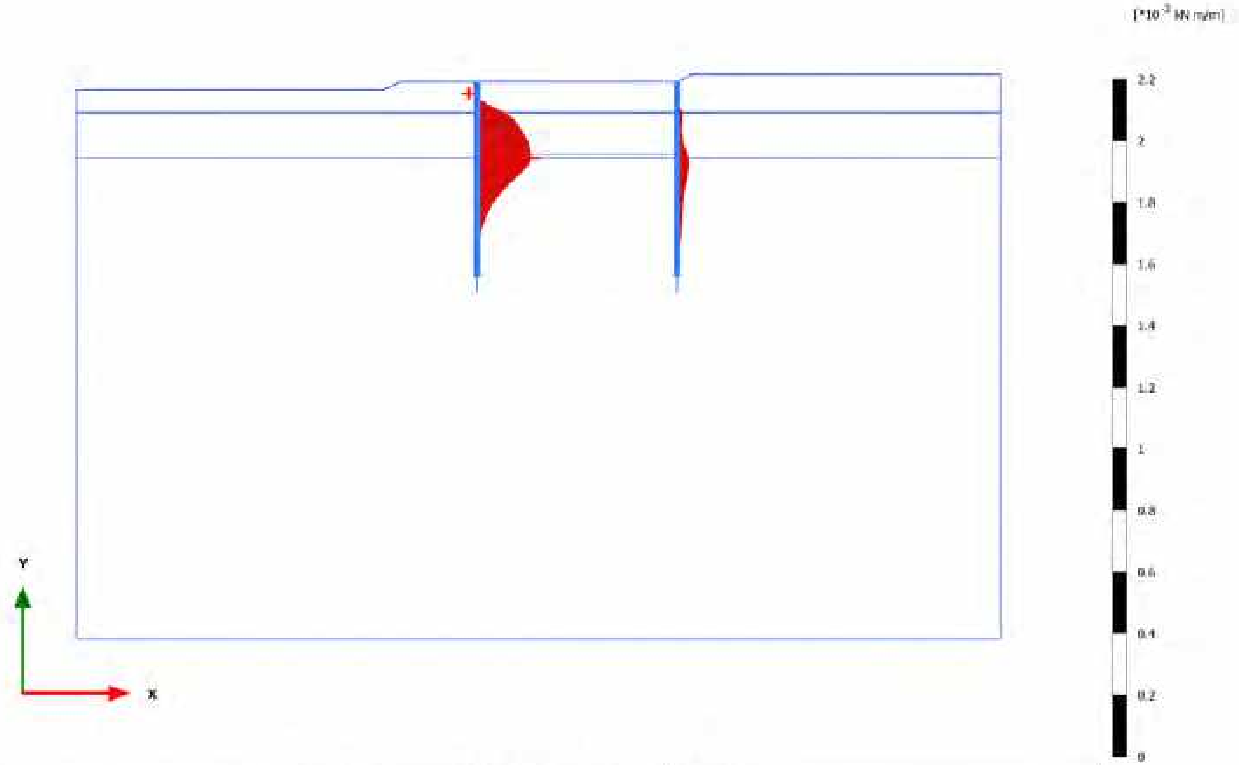
3.1.1.2.1 Calculation results, Plate, Terrain [Phase_1] (1/3), Bending moments M



Bending moments M (scaled up 1.00 times)

No results

3.1.1.2.2 Calculation results, Plate, Wall construction [Phase_2] (2/11), Bending moments M

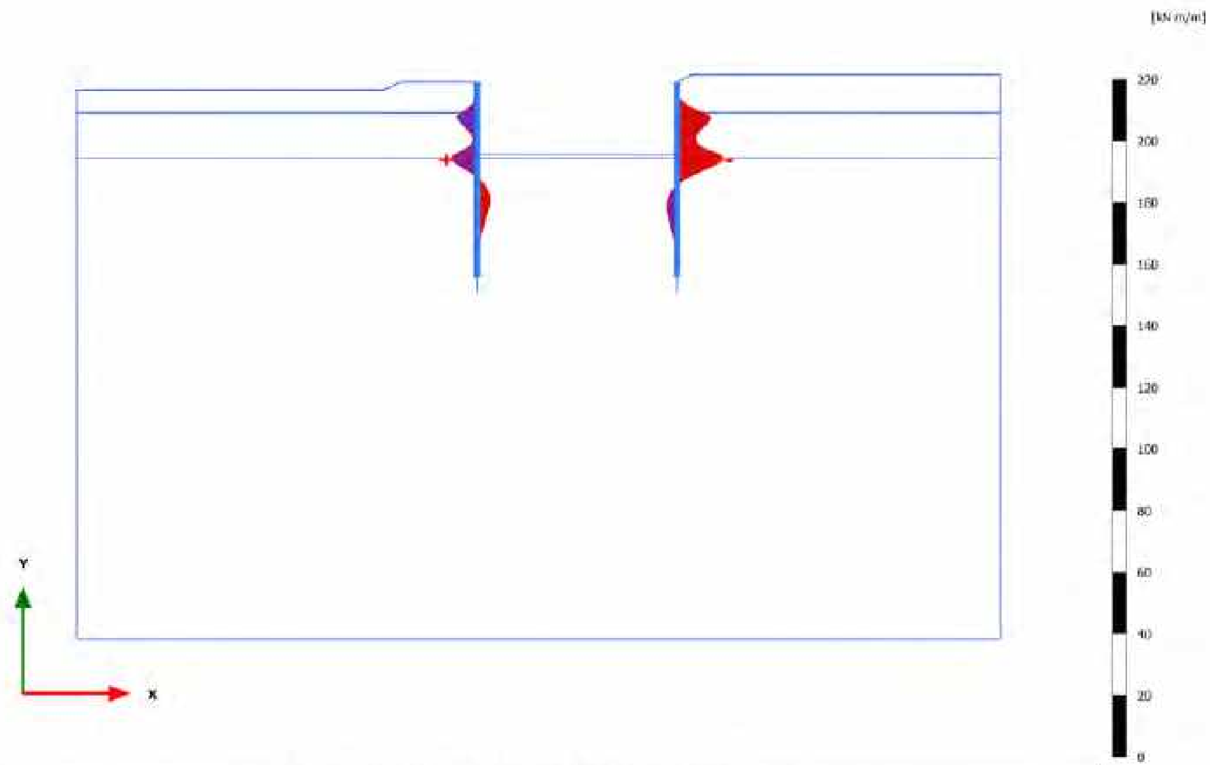


Bending moments M (scaled up $20.0*10^{3}$ times)

Maximum value = $9.920*10^{-6}$ kN m/m (Element 2 at Node 12729)

Minimum value = $-0.1759*10^{-3}$ kN m/m (Element 16 at Node 11811)

3.1.1.2.3 Calculation results, Plate, Excavation [Phase_3] (3/40), Bending moments M

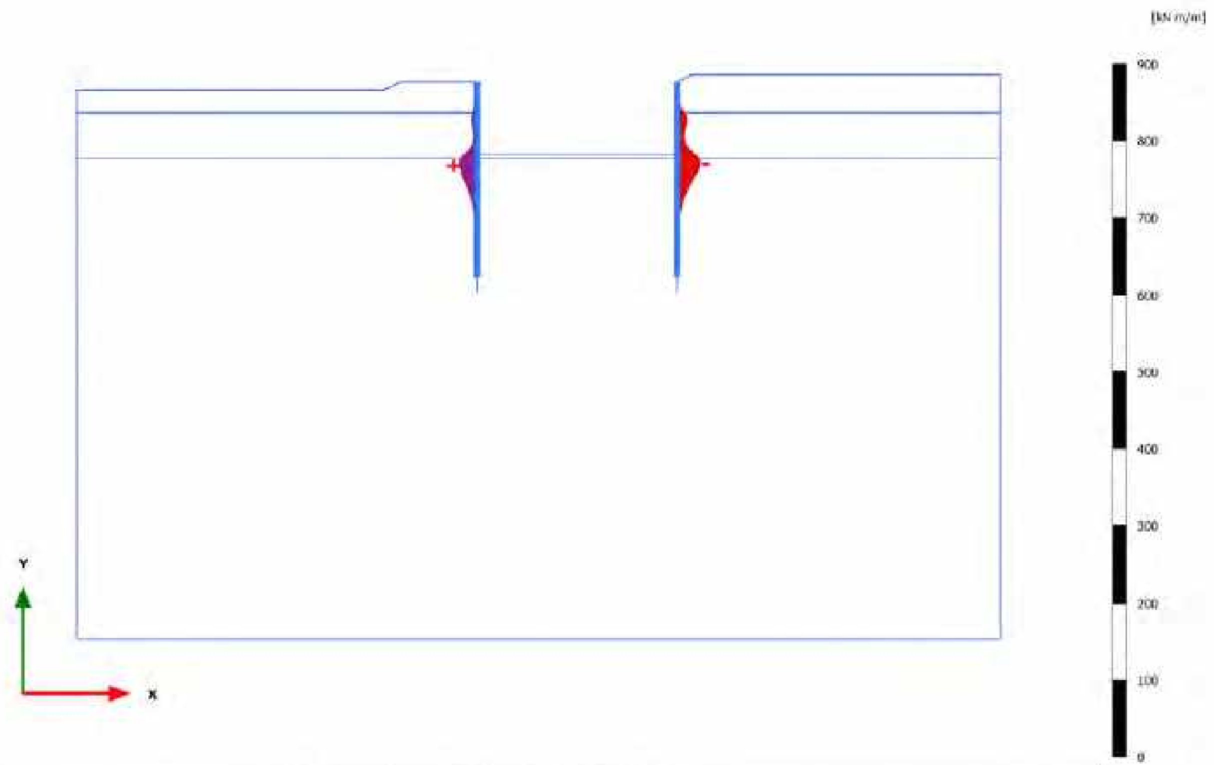


Bending moments M (scaled up 0.200 times)

Maximum value = 8.187 kN m/m (Element 16 at Node 11808)

Minimum value = -14.90 kN m/m (Element 43 at Node 23999)

3.1.1.2.4 Calculation results, Plate, Building [Phase_4] (4/48), Bending moments M

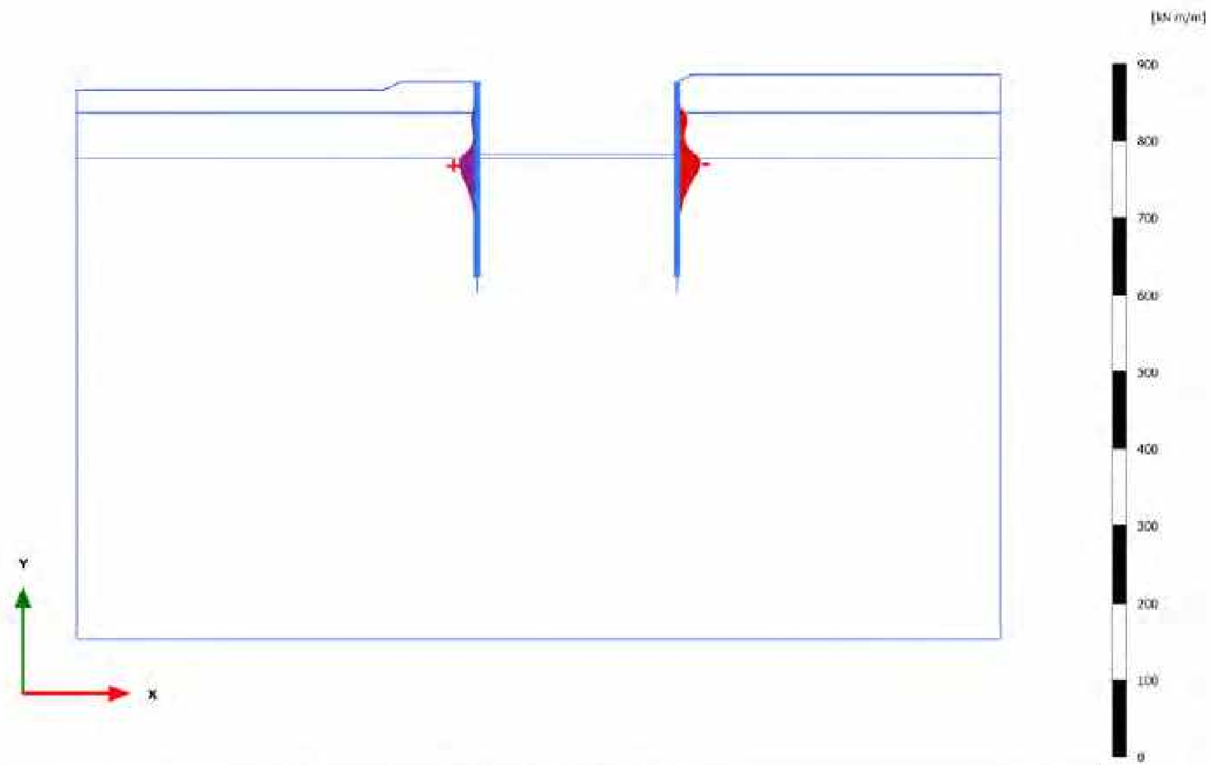


Bending moments M (scaled up 0.0500 times)

Maximum value = 23.30 kN m/m (Element 30 at Node 11417)

Minimum value = -30.00 kN m/m (Element 43 at Node 23727)

3.1.1.2.5 Calculation results, Plate, Drained [Phase_5] (5/58), Bending moments M

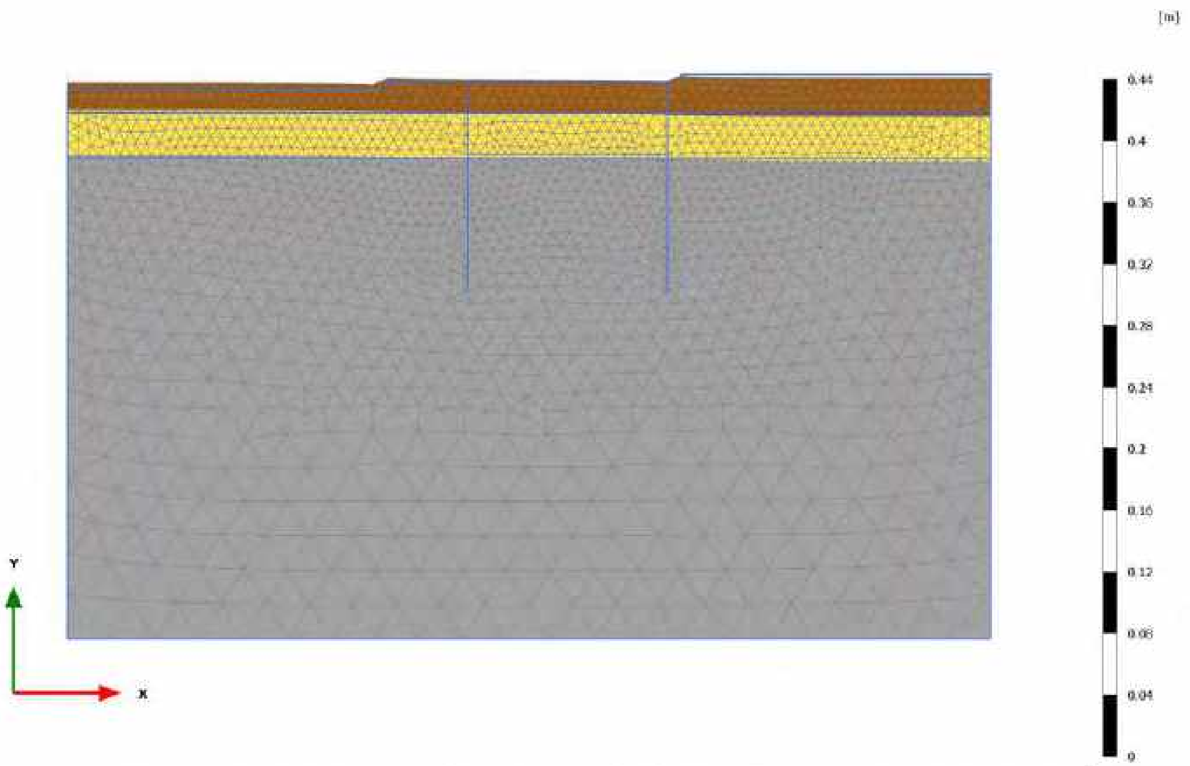


Bending moments M (scaled up 0.0500 times)

Maximum value = 23.31 kN m/m (Element 30 at Node 11417)

Minimum value = -30.03 kN m/m (Element 43 at Node 23727)

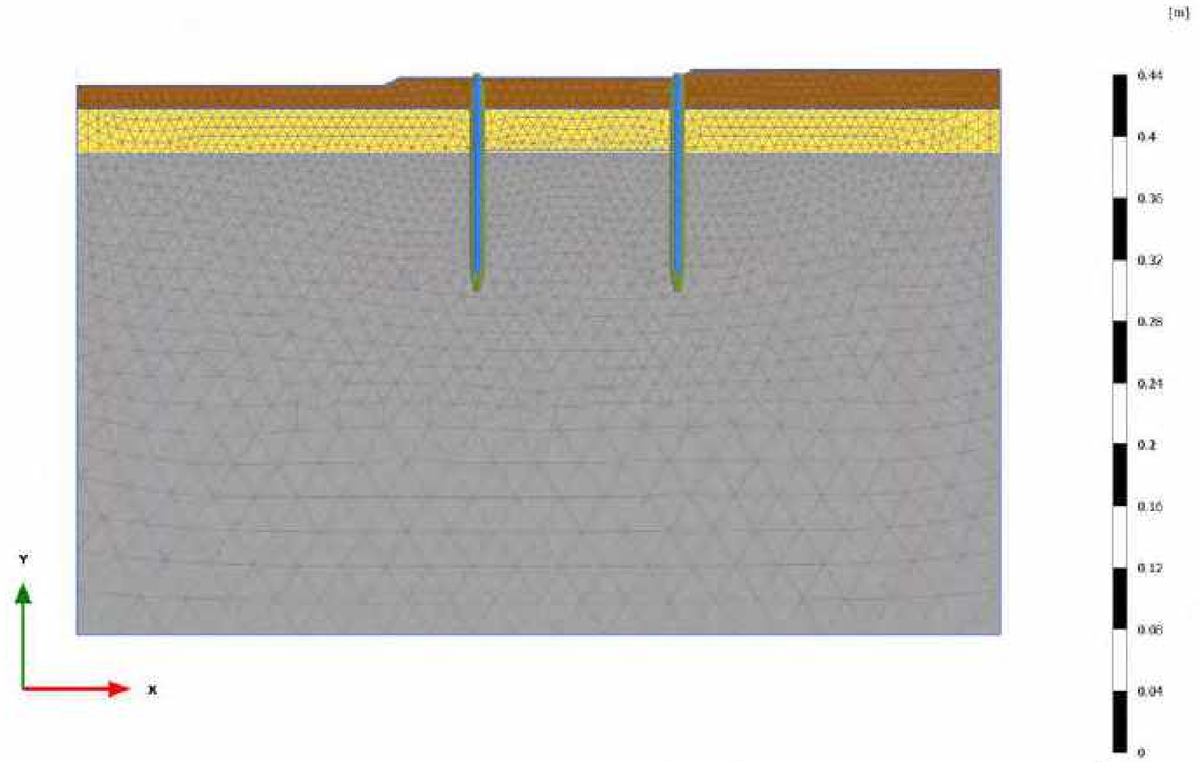
4.1.1 Calculation results, Terrain [Phase_1] (1/3), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $4.478*10^{-3}$ m (Element 742 at Node 983)

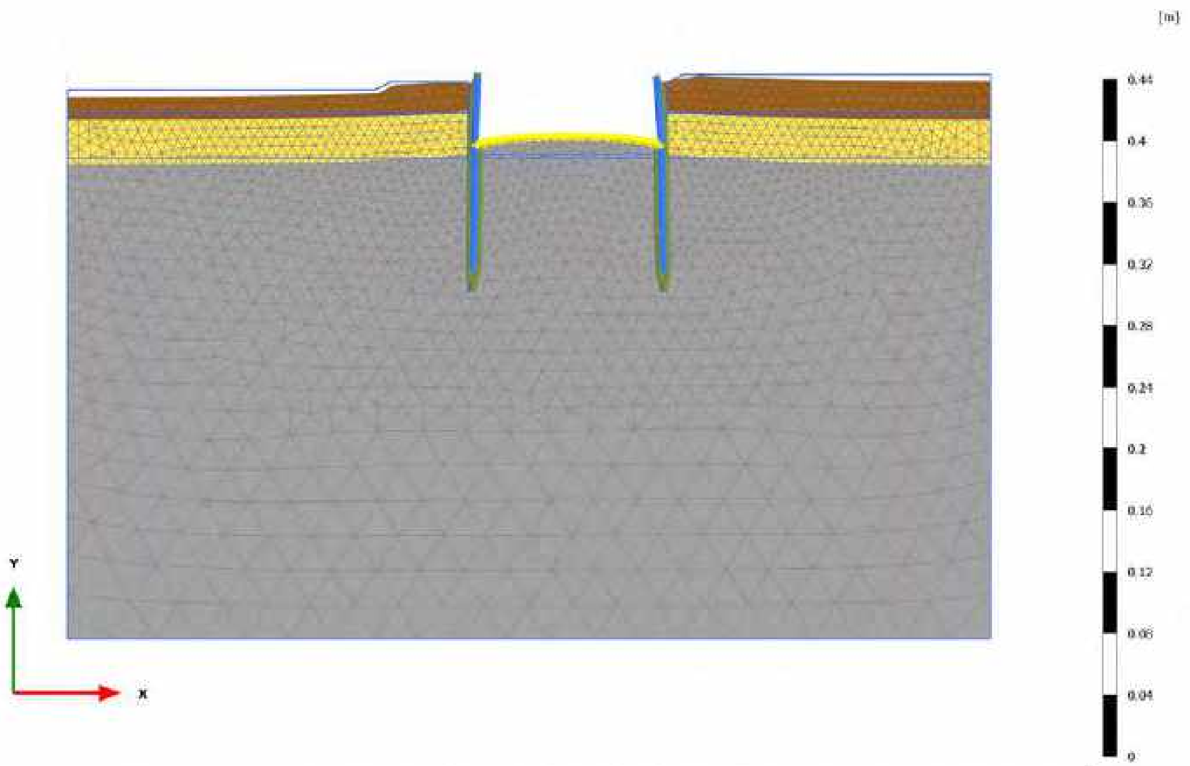
4.1.2 Calculation results, Wall construction [Phase_2] (2/11), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $2.132*10^{-6}$ m (Element 846 at Node 6791)

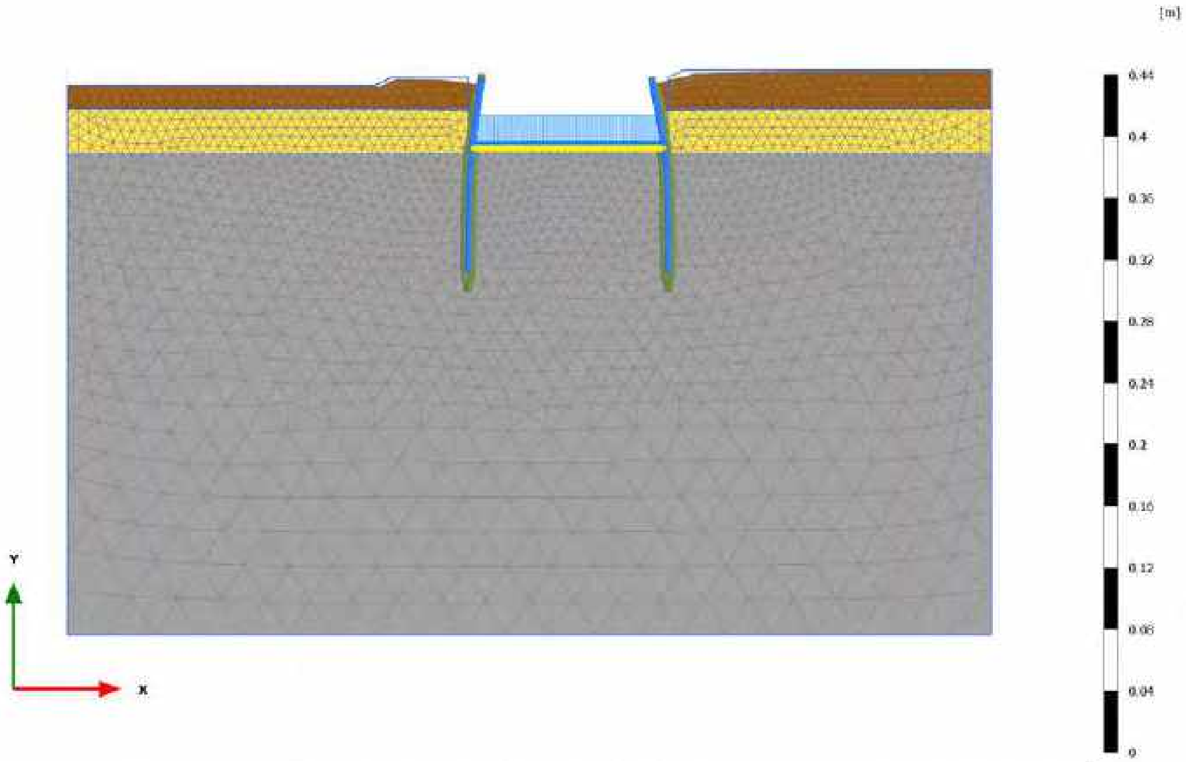
4.1.3 Calculation results, Excavation [Phase_3] (3/40), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.01149 m (Element 1702 at Node 18465)

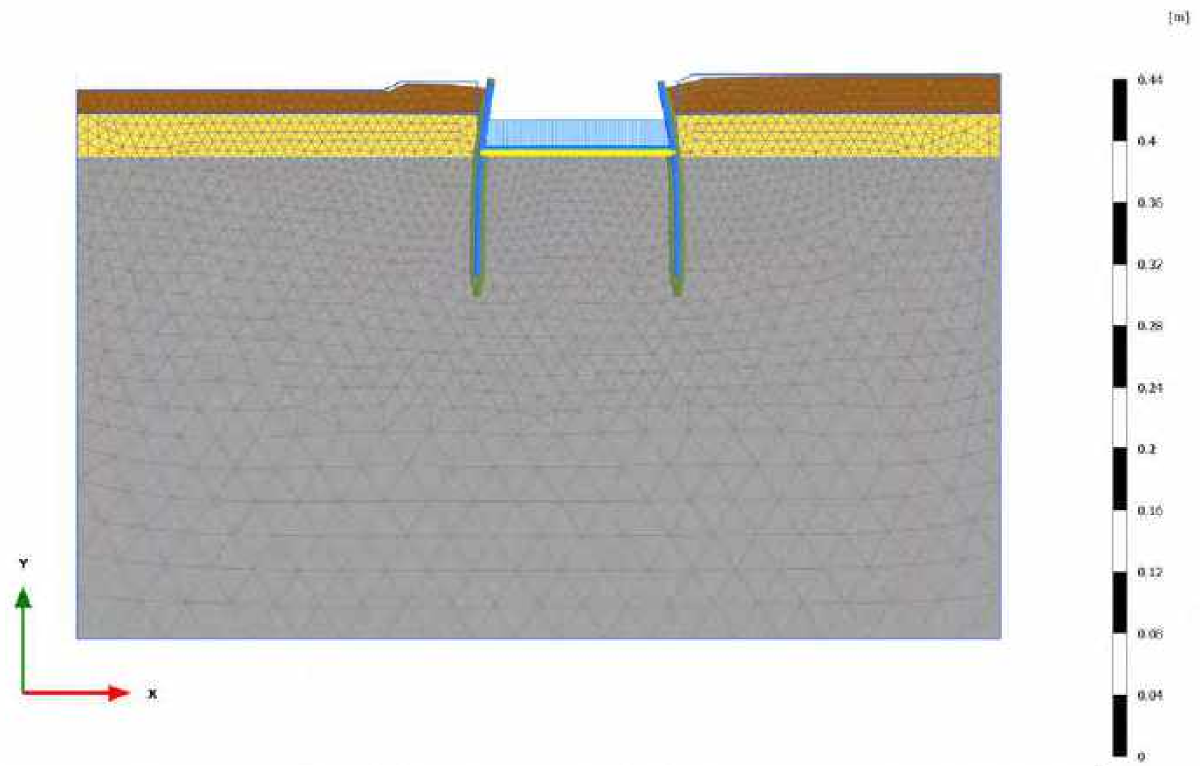
4.1.4 Calculation results, Building [Phase_4] (4/48), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.01134 m (Element 487 at Node 27032)

4.1.5 Calculation results, Drained [Phase_5] (5/58), Deformed mesh |u|



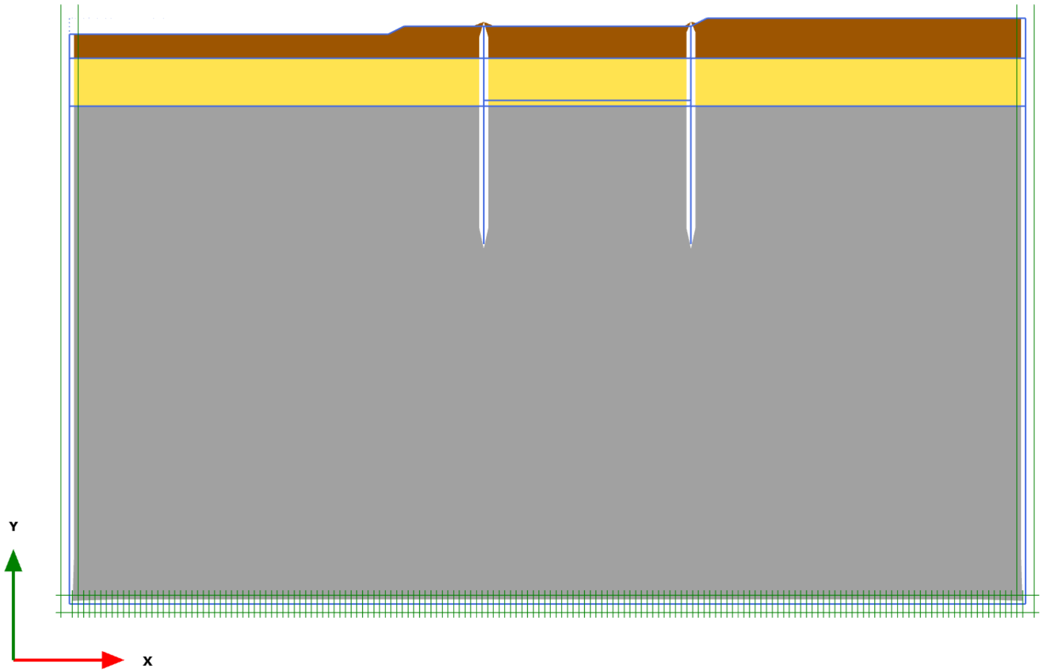
Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.01135 m (Element 487 at Node 27032)

PLAXIS Report

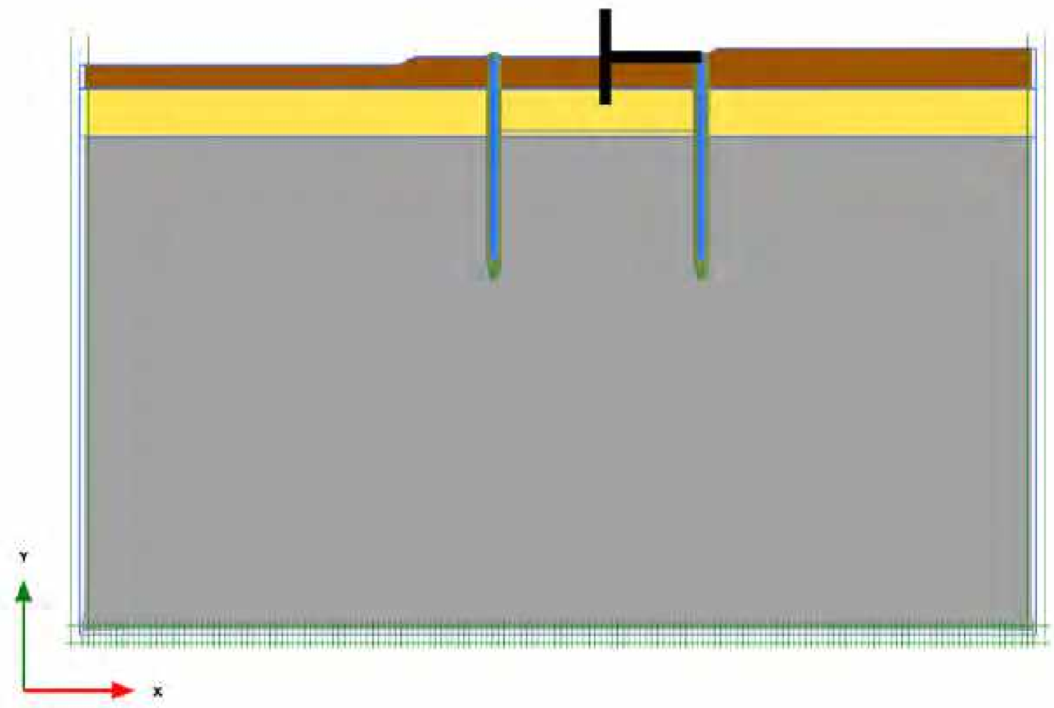
Filename	**Daleham 31 B-B_propped.p2dx**
Directory	D:\fortisNEXUM\01-Em Curso\T23012 - 31 Daleham\A - EX\GEO\B-Calculos\PLAXIS\Finais\
Title	Daleham 31 B-B
Model	Plane strain
Elements	15-Noded
PLAXIS Version	Version 20.0.0.119

1.1.1.1 Calculation results, Terrain [Phase_1] (1/3), Fixities plot



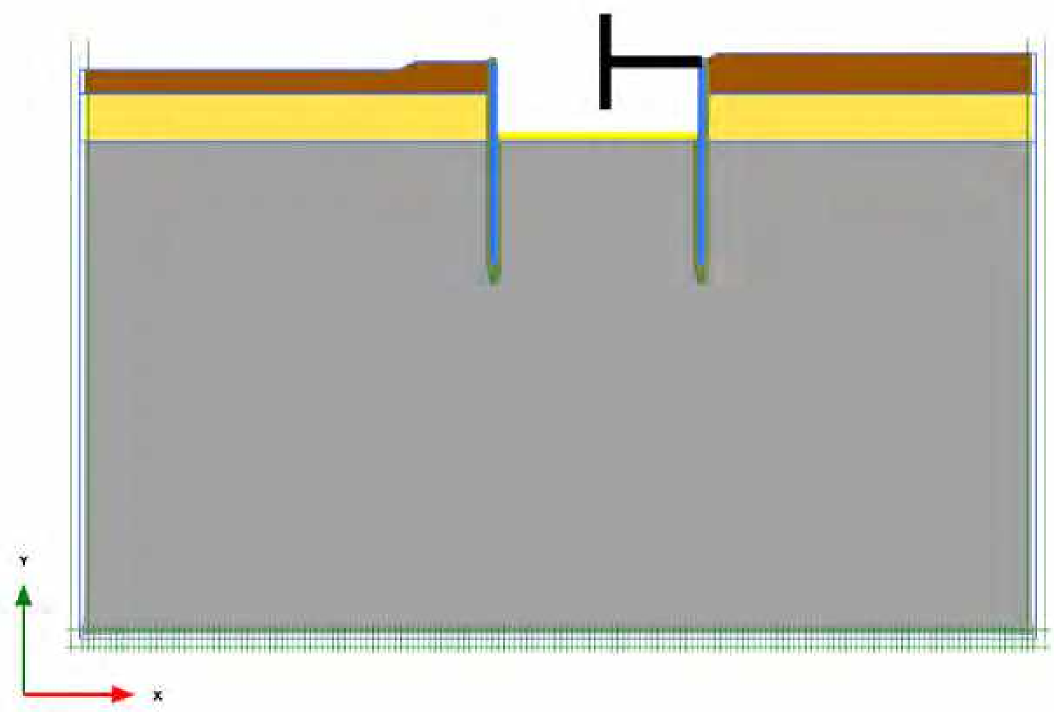
Fixities plot

1.1.1.2 Calculation results, Wall construction [Phase_2] (2/11), Fixities plot



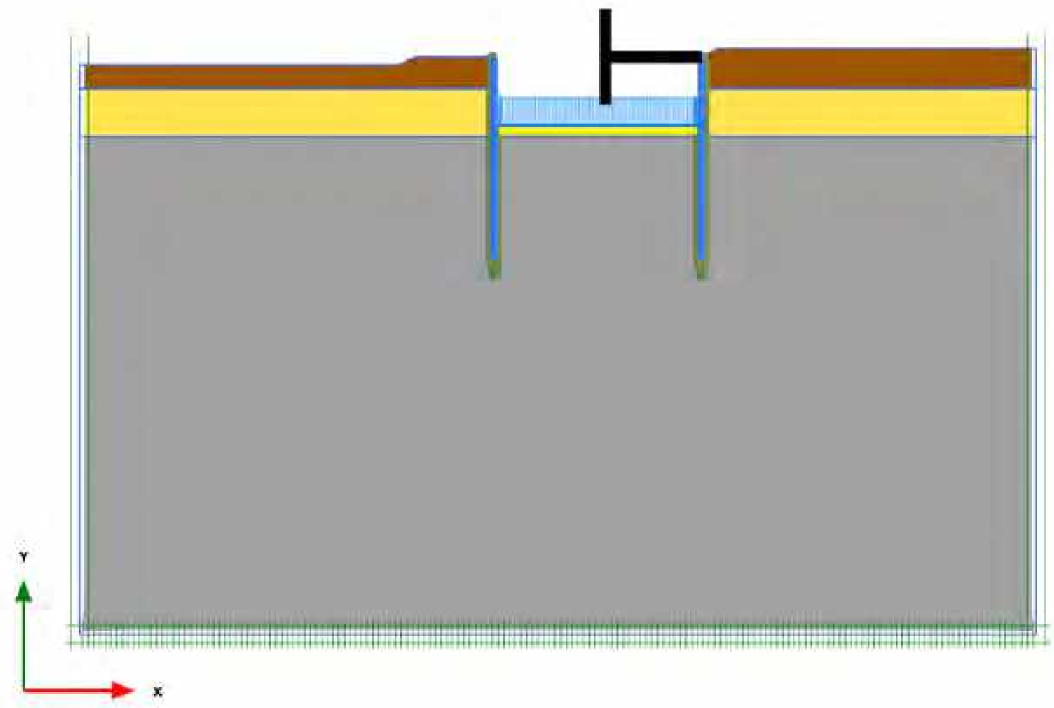
Fixities plot

1.1.1.3 Calculation results, Excavation [Phase_3] (3/29), Fixities plot



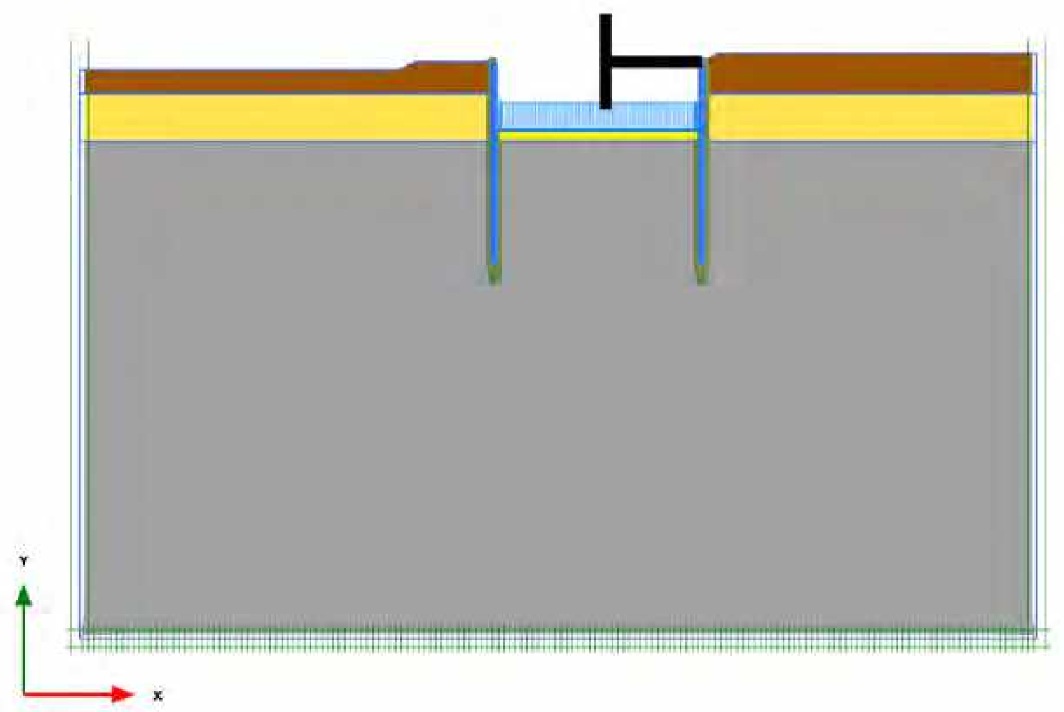
Fixities plot

1.1.1.4 Calculation results, Building [Phase_4] (4/37), Fixities plot



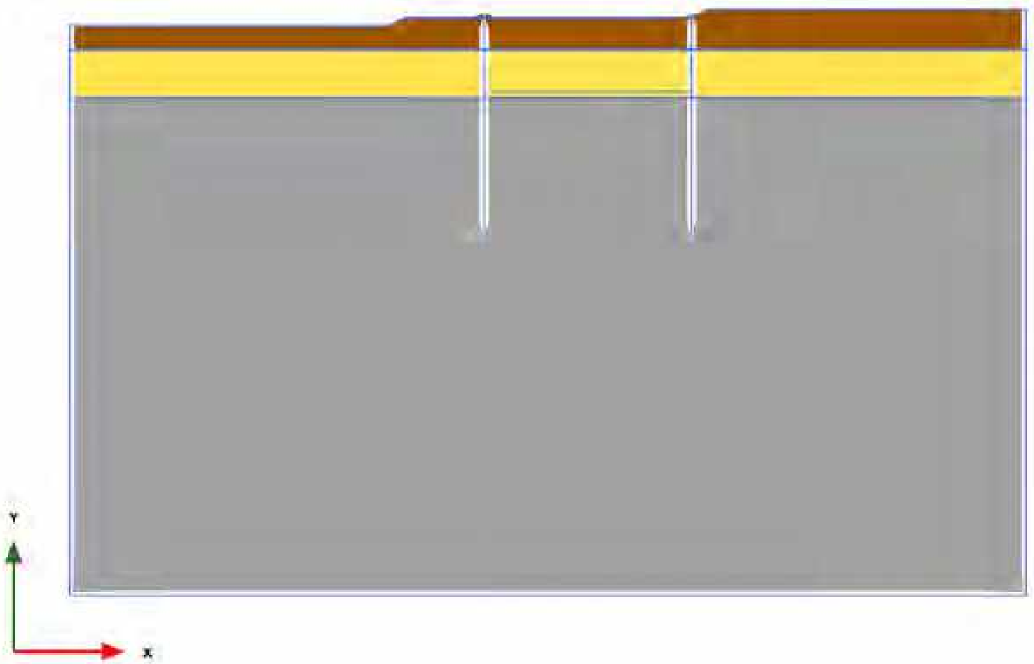
Fixities plot

1.1.1.5 Calculation results, Drained [Phase_5] (5/47), Fixities plot



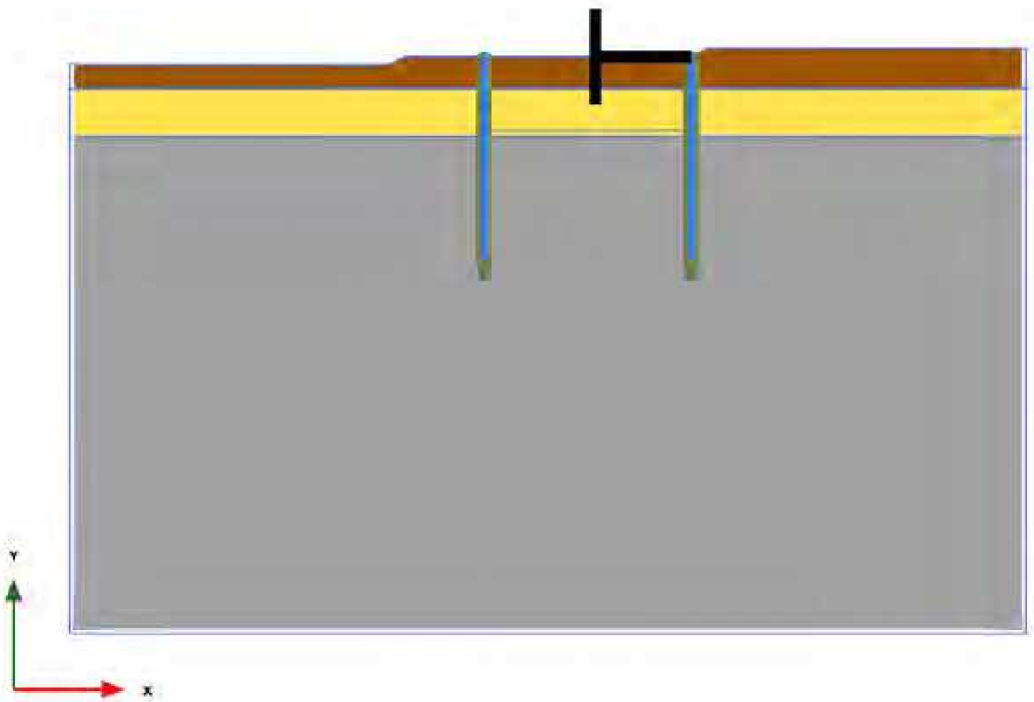
Fixities plot

1.1.2.1 Calculation results, Terrain [Phase_1] (1/3), Active loads plot



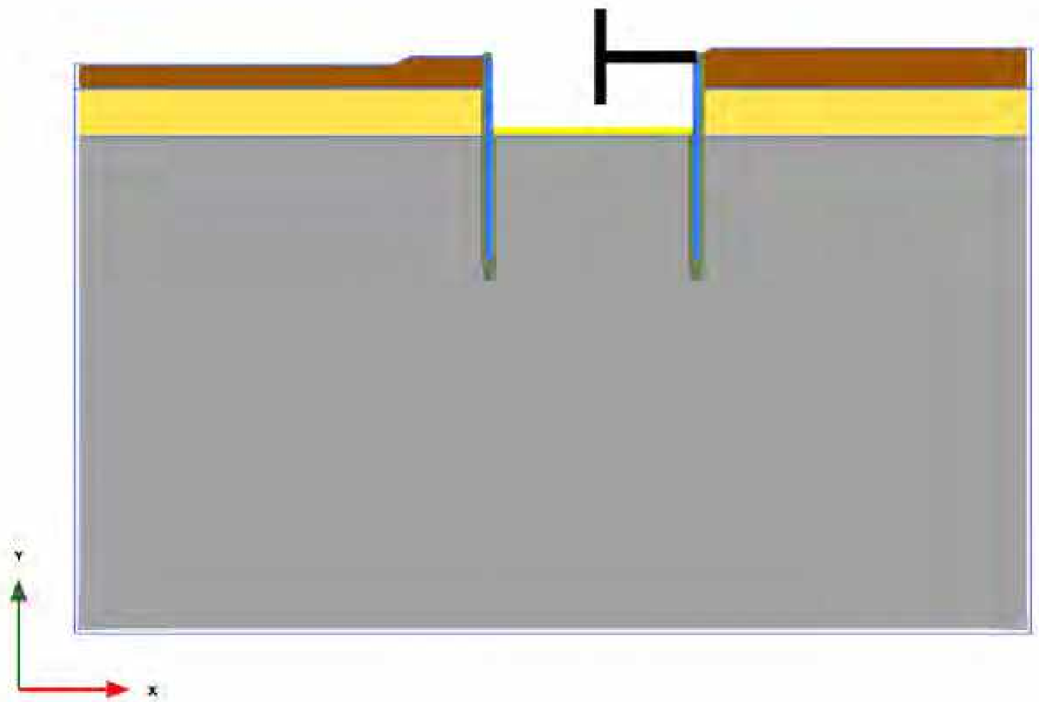
Active loads plot

1.1.2.2 Calculation results, Wall construction [Phase_2] (2/11), Active loads plot



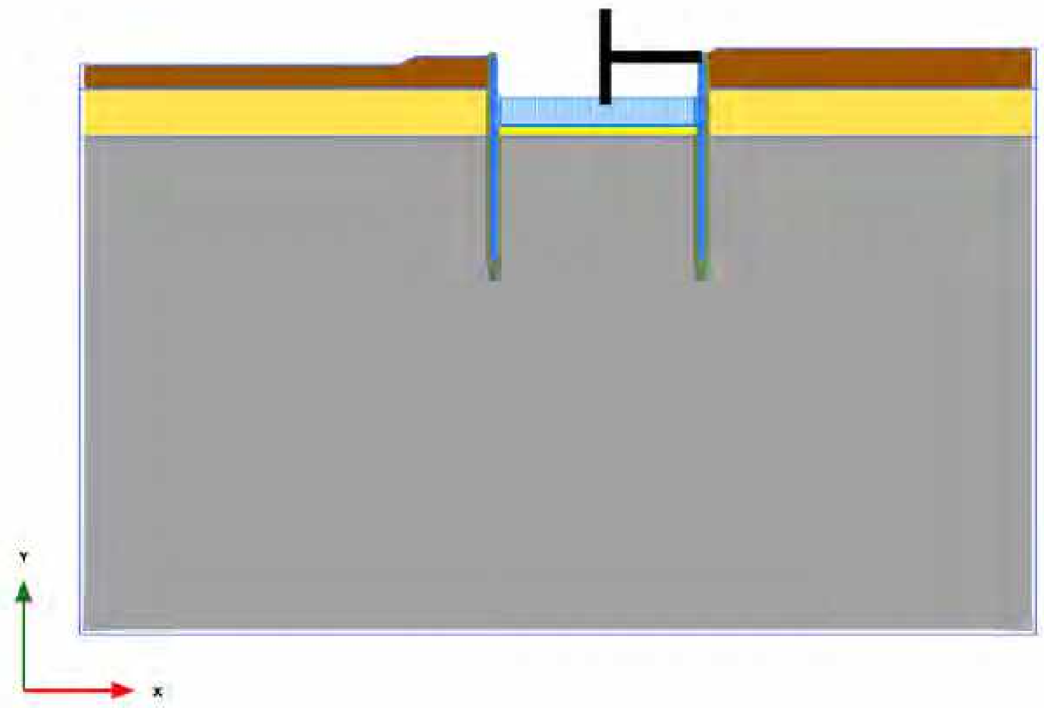
Active loads plot

1.1.2.3 Calculation results, Excavation [Phase_3] (3/29), Active loads plot



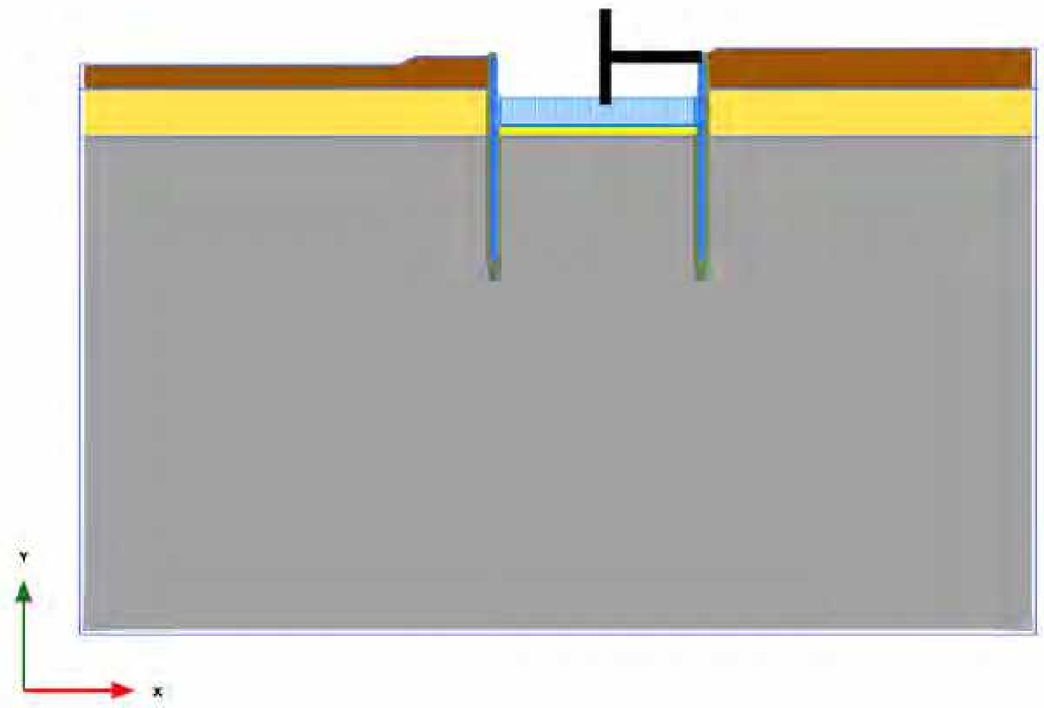
Active loads plot

1.1.2.4 Calculation results, Building [Phase_4] (4/37), Active loads plot



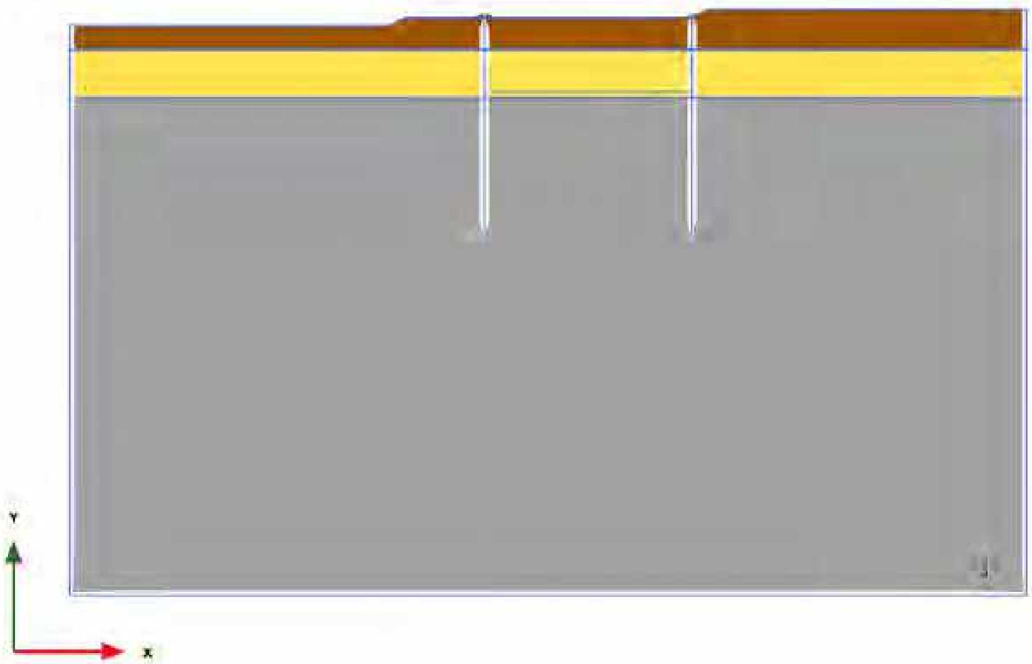
Active loads plot

1.1.2.5 Calculation results, Drained [Phase_5] (5/47), Active loads plot



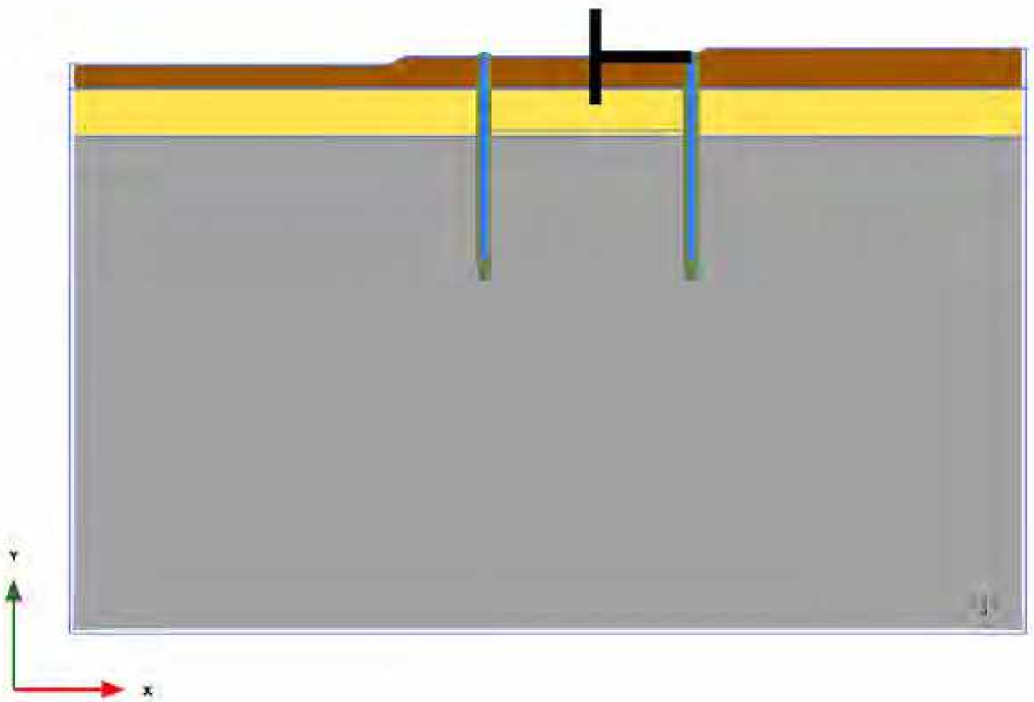
Active loads plot

1.1.3.1 Calculation results, Terrain [Phase_1] (1/3), Materials plot



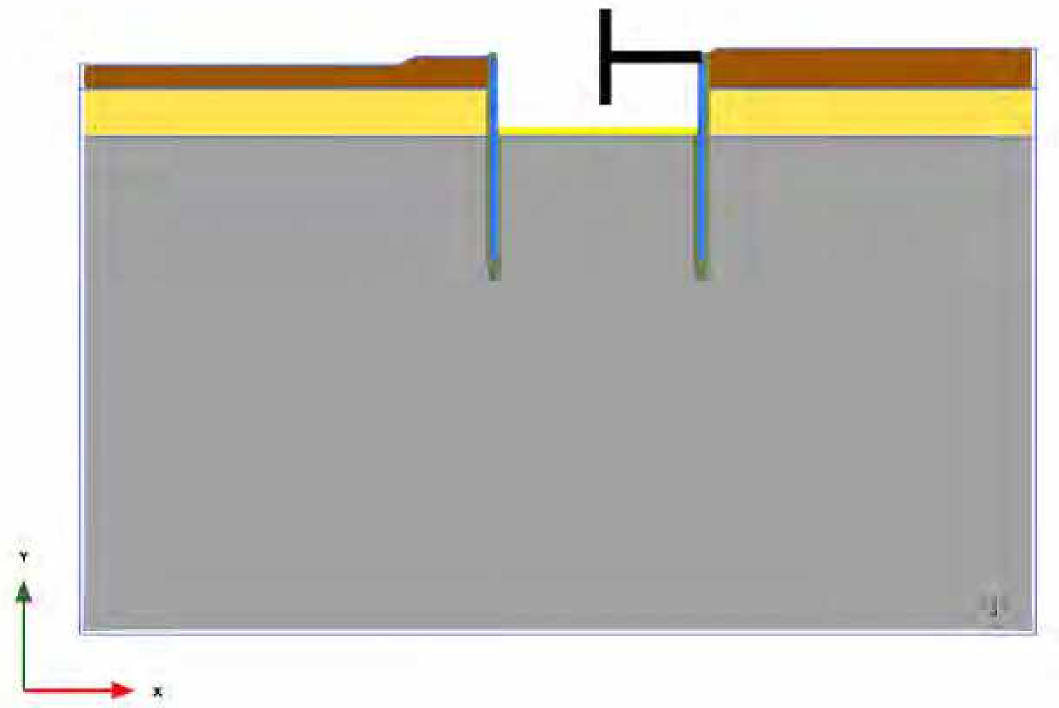
Materials plot

1.1.3.2 Calculation results, Wall construction [Phase_2] (2/11), Materials plot



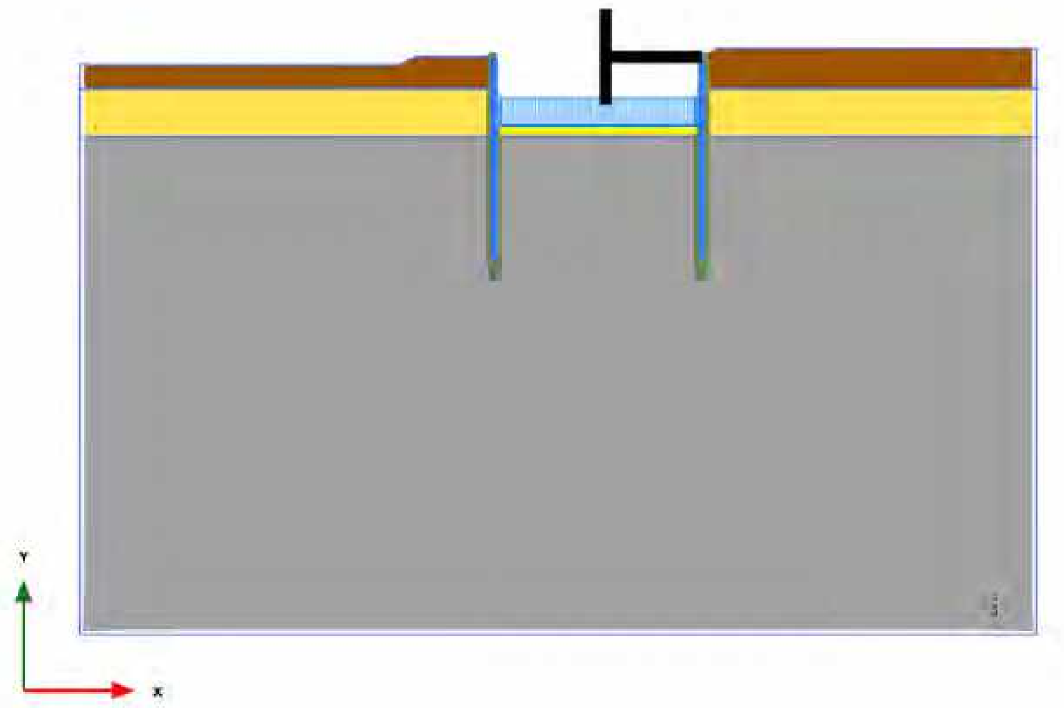
Materials plot

1.1.3.3 Calculation results, Excavation [Phase_3] (3/29), Materials plot



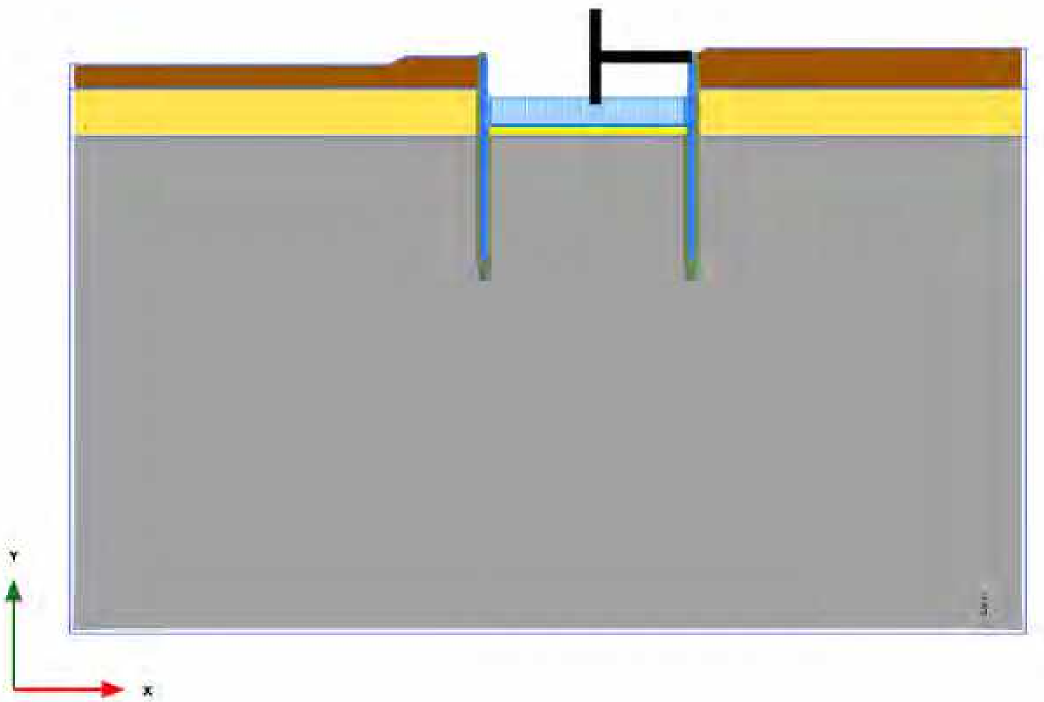
Materials plot

1.1.3.4 Calculation results, Building [Phase_4] (4/37), Materials plot



Materials plot

1.1.3.5 Calculation results, Drained [Phase_5] (5/47), Materials plot



Materials plot

1.1.4.1.1 Materials - Soil and interfaces - Mohr-Coulomb

Identification		**1 - Made Ground**	**2 - Clay Gate (U)**	**3 - London Clay (U)**	**2 - Clay Gate (D)**	**3 - London Clay (D)**
Identification number		1	2	3	4	5
Drainage type		Drained	Undrained (C)	Undrained (C)	Drained	Drained
Colour						
Comments						
γ_{unsat}	kN/m³	18.00	18.00	19.00	18.00	19.00
γ_{sat}	kN/m³	19.00	18.00	19.00	18.00	19.00
Dilatancy cut-off		No	No	No	No	No
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
e_{min}		0.000	0.000	0.000	0.000	0.000
e_{max}		999.0	999.0	999.0	999.0	999.0
Rayleigh α		0.000	0.000	0.000	0.000	0.000
Rayleigh β		0.000	0.000	0.000	0.000	0.000
E	kN/m²	10.00E3	25.00E3	40.00E3	18.75E3	30.00E3
ν (nu)		0.3000	0.4990	0.4950	0.3500	0.3000
G	kN/m²	3846	8339	13.38E3	6944	11.54E3
E_{oed}	kN/m²	13.46E3	4.178E6	1.351E6	30.09E3	40.38E3
c_{ref}	kN/m²	1.000	50.00	80.00	10.00	10.00
ϕ (phi)	°	25.00	0.000	0.000	24.00	23.00

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
ψ (psi)	°	0.000	0.000	0.000	0.000	0.000
V_s	m/s	45.78	67.41	83.11	61.52	77.18
V_p	m/s	85.65	1509	835.2	128.1	144.4
Set to default values		Yes	No	No	Yes	No
E_{inc}	kN/m²/m	0.000	0.000	2500	0.000	1875
y_{ref}	m	0.000	0.000	76.20	0.000	76.20
c_{inc}	kN/m²/m	0.000	0.000	5.000	0.000	0.000
y_{ref}	m	0.000	0.000	76.20	0.000	76.20
Tension cut-off		Yes	No	No	Yes	Yes
Tensile strength	kN/m²	0.000	10.00E6	10.00E6	0.000	0.000
Undrained behaviour		Standard	Standard	Standard	Standard	Standard
Skempton-B		0.9783	0.000	0.000	0.9699	0.9783
ν_u		0.4950	0.4990	0.4950	0.4950	0.4950
$K_{w,ref}$ / n	kN/m²	375.0E3	0.000	0.000	671.3E3	1.125E6
$C_{v,ref}$	m²/day	0.000	0.000	0.000	0.000	0.000
Stiffness		Standard	Standard	Standard	Standard	Standard
Strength		Rigid	Rigid	Rigid	Rigid	Rigid
R_{inter}		1.000	1.000	1.000	1.000	1.000
Consider gap closure		Yes	Yes	Yes	Yes	Yes
δ_{inter}		0.000	0.000	0.000	0.000	0.000

Identification		1 - Made Ground	2 - Clay Gate (U)	3 - London Clay (U)	2 - Clay Gate (D)	3 - London Clay (D)
Cross permeability		Impermeable	Impermeable	Impermeable	Impermeable	Impermeable
Drainage conductivity, dk	m^3/day/m	0.000	0.000	0.000	0.000	0.000
K_0 determination		Automatic	Automatic	Automatic	Automatic	Automatic
$K_{0,x} = K_{0,z}$		Yes	Yes	Yes	Yes	Yes
$K_{0,x}$		0.5774	0.5000	0.5000	0.5933	0.6093
$K_{0,z}$		0.5774	0.5000	0.5000	0.5933	0.6093
Data set		Standard	Standard	Standard	Standard	Standard
Type		Coarse	Coarse	Coarse	Coarse	Coarse
< 2 µm	%	10.00	10.00	10.00	10.00	10.00
2 µm - 50 µm	%	13.00	13.00	13.00	13.00	13.00
50 µm - 2 mm	%	77.00	77.00	77.00	77.00	77.00
Use defaults		None	None	None	None	None
k_x	m/day	0.000	0.000	0.000	0.000	0.000
k_y	m/day	0.000	0.000	0.000	0.000	0.000
$-\psi_{unsat}$	m	10.00E3	10.00E3	10.00E3	10.00E3	10.00E3
e_{init}		0.5000	0.5000	0.5000	0.5000	0.5000
S_s	1/m	0.000	0.000	0.000	0.000	0.000
c_k		1000E12	1000E12	1000E12	1000E12	1000E12

1.1.4.2 Materials - Plates -

Identification		**AU25**	**AU14**
Identification number		1	2
Comments			
Colour			
Material type		Elastic	Elastic
Isotropic		Yes	Yes
EA_1	kN/m	3.760E6	2.640E6
EA_2	kN/m	3.760E6	2.640E6
EI	kN m²/m	112.5E3	57.36E3
d	m	0.5991	0.5106
w	kN/m/m	1.000	0.000
ν (nu)		0.2000	0.000
Rayleigh α		0.000	0.000
Rayleigh β		0.000	0.000
Prevent punching		No	No
Identification number		1	2

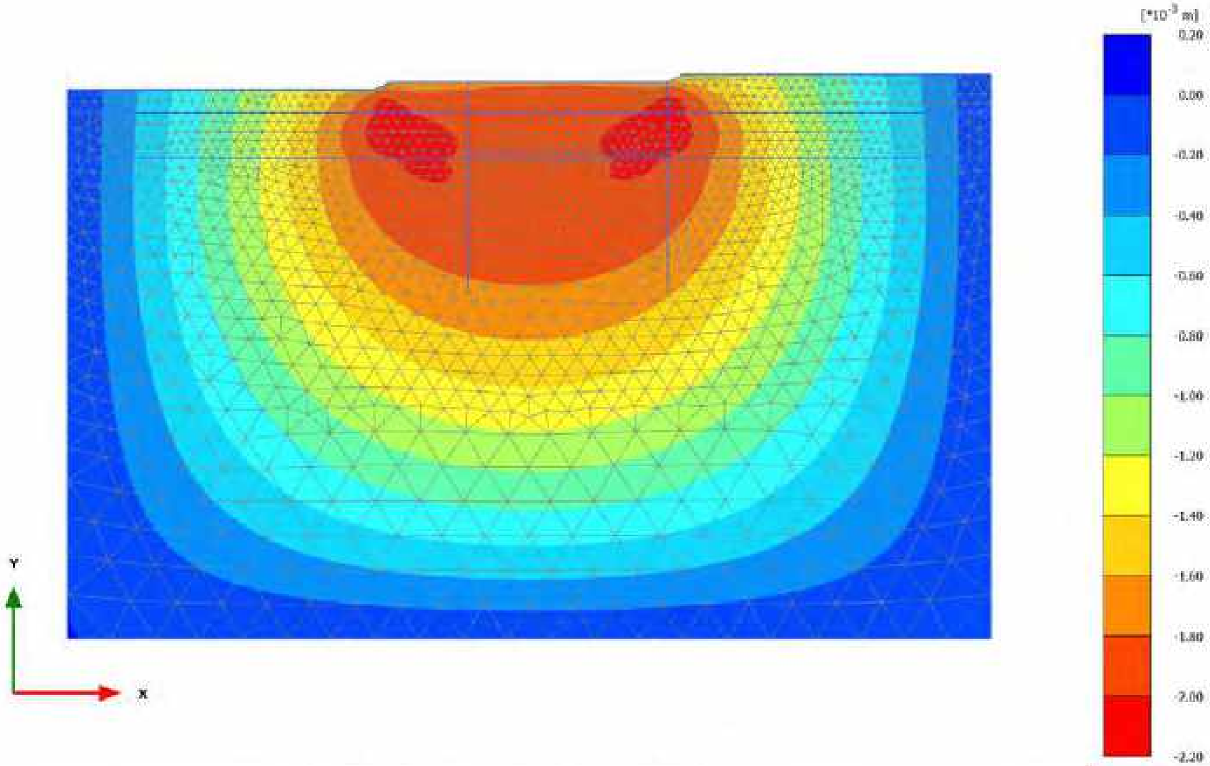
1.1.4.3 Materials - Geogrids -

Identification		**ficticious**
Identification number		1
Comments		
Colour		
Material type		Elastic
Isotropic		Yes
EA_1	kN/m	1.000
EA_2	kN/m	1.000
Identification number		1
Identification number		1

1.1.4.4 Materials - Anchors -

Identification		Prop
Identification number		1
Comments		
Colour		
Material type		Elastic
EA	kN	390.5E3
$L_{spacing}$	m	3.000
Identification number		1
Identification number		1
Identification number		1

2.1.1.1.1 Calculation results, Terrain [Phase_1] (1/3), Total displacements u_x

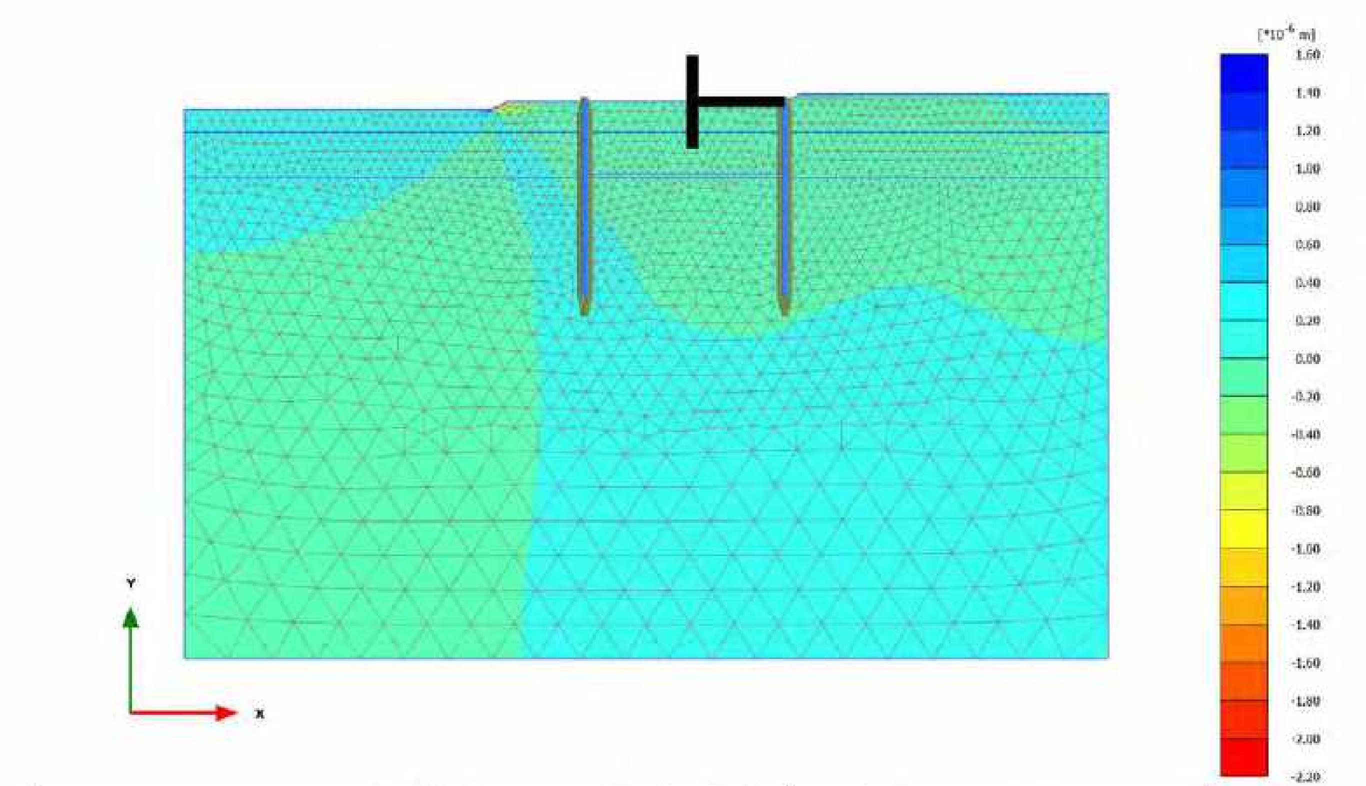


Total displacements u_x (scaled up 500 times)

Maximum value = $4.573 \cdot 10^{-6}$ m (Element 1036 at Node 745)

Minimum value = $-2.108 \cdot 10^{-3}$ m (Element 891 at Node 25383)

2.1.1.1.2 Calculation results, Wall construction [Phase_2] (2/11), Total displacements u_x

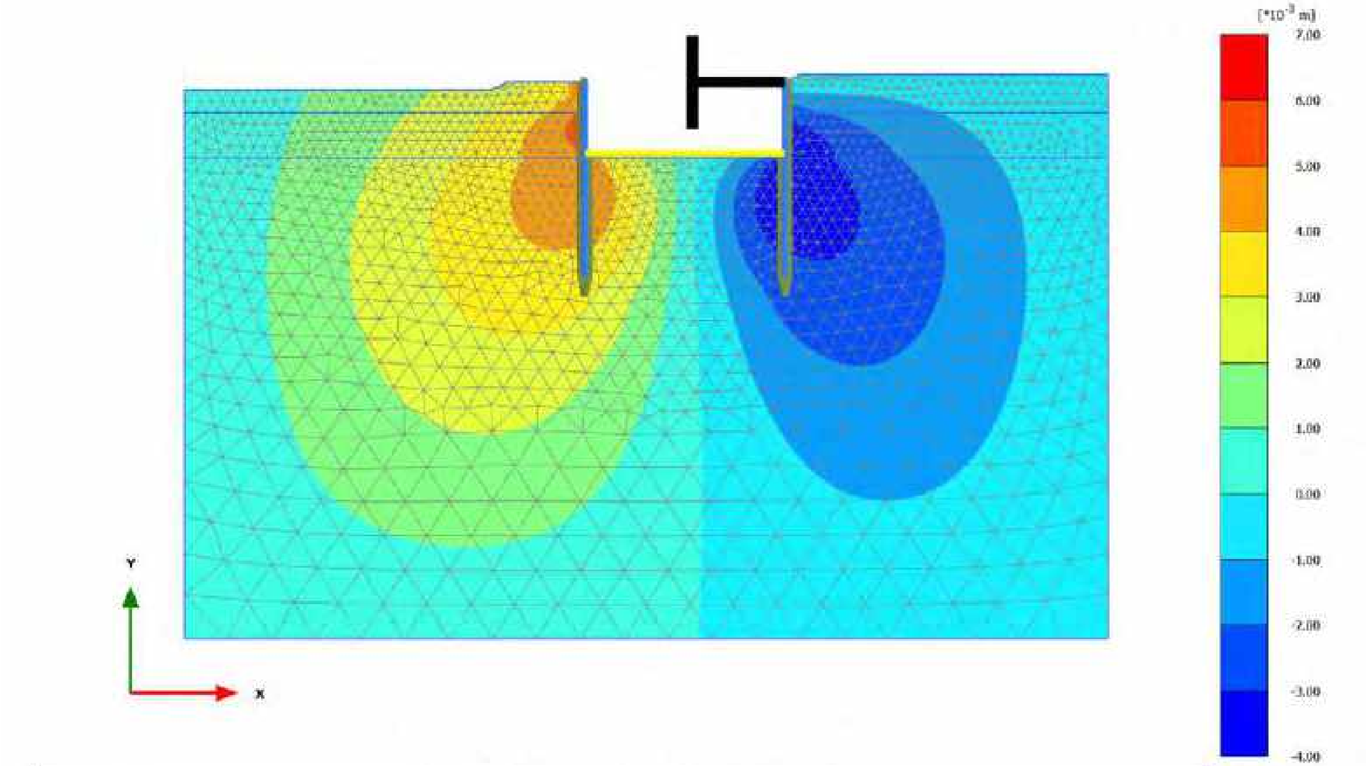


Total displacements u_x (scaled up $500*10^3$ times)

Maximum value = $1.482*10^{-6}$ m (Element 844 at Node 6337)

Minimum value = $-2.007*10^{-6}$ m (Element 846 at Node 6790)

2.1.1.1.3 Calculation results, Excavation [Phase_3] (3/29), Total displacements u_x

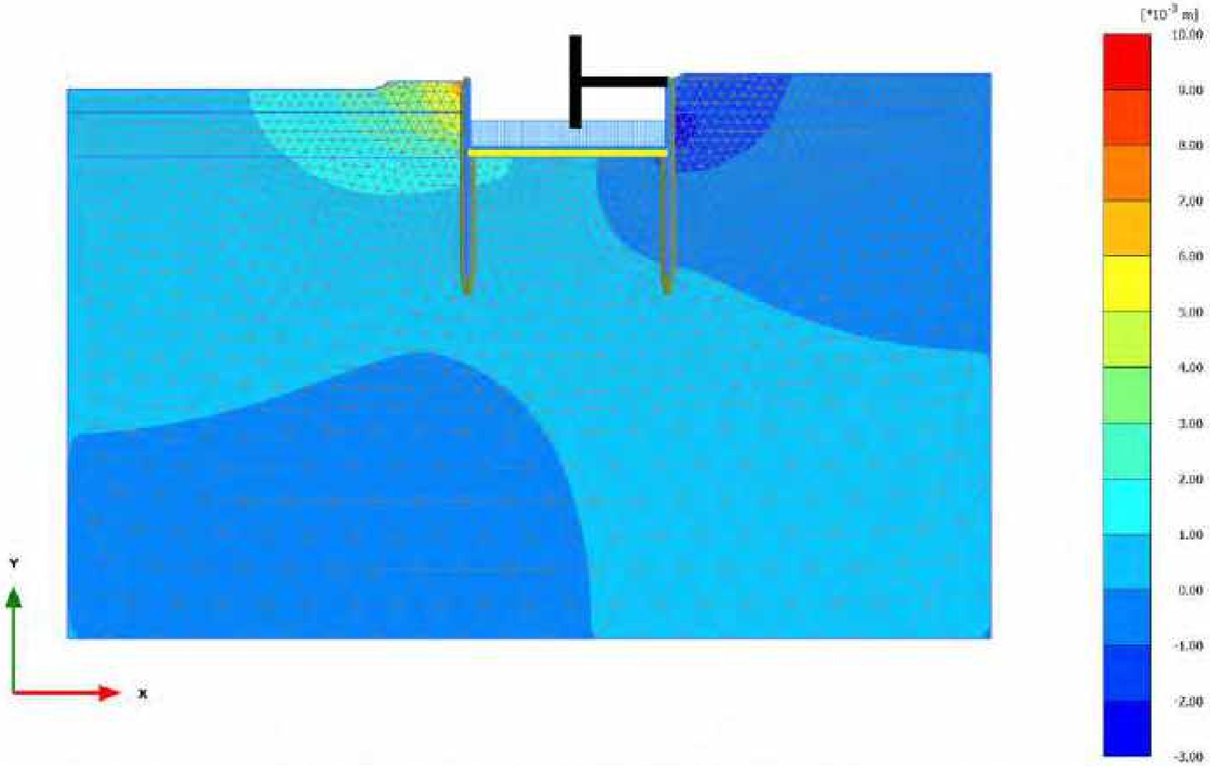


Total displacements u_x (scaled up 200 times)

Maximum value = 6.556×10^{-3} m (Element 711 at Node 13384)

Minimum value = -3.840×10^{-3} m (Element 3894 at Node 23272)

2.1.1.1.4 Calculation results, Building [Phase_4] (4/37), Total displacements u_x

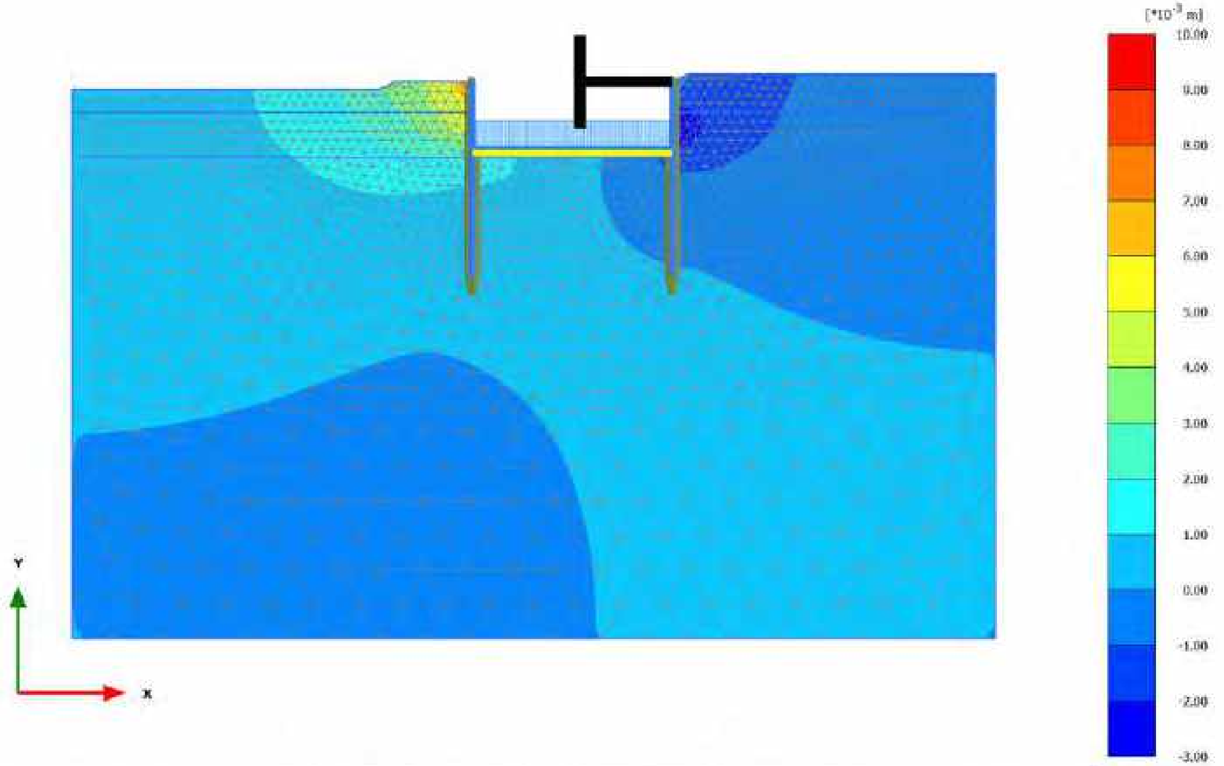


Total displacements u_x (scaled up 200 times)

Maximum value = $9.091*10^{-3}$ m (Element 711 at Node 13384)

Minimum value = $-2.558*10^{-3}$ m (Element 1463 at Node 25899)

2.1.1.1.5 Calculation results, Drained [Phase_5] (5/47), Total displacements u_x

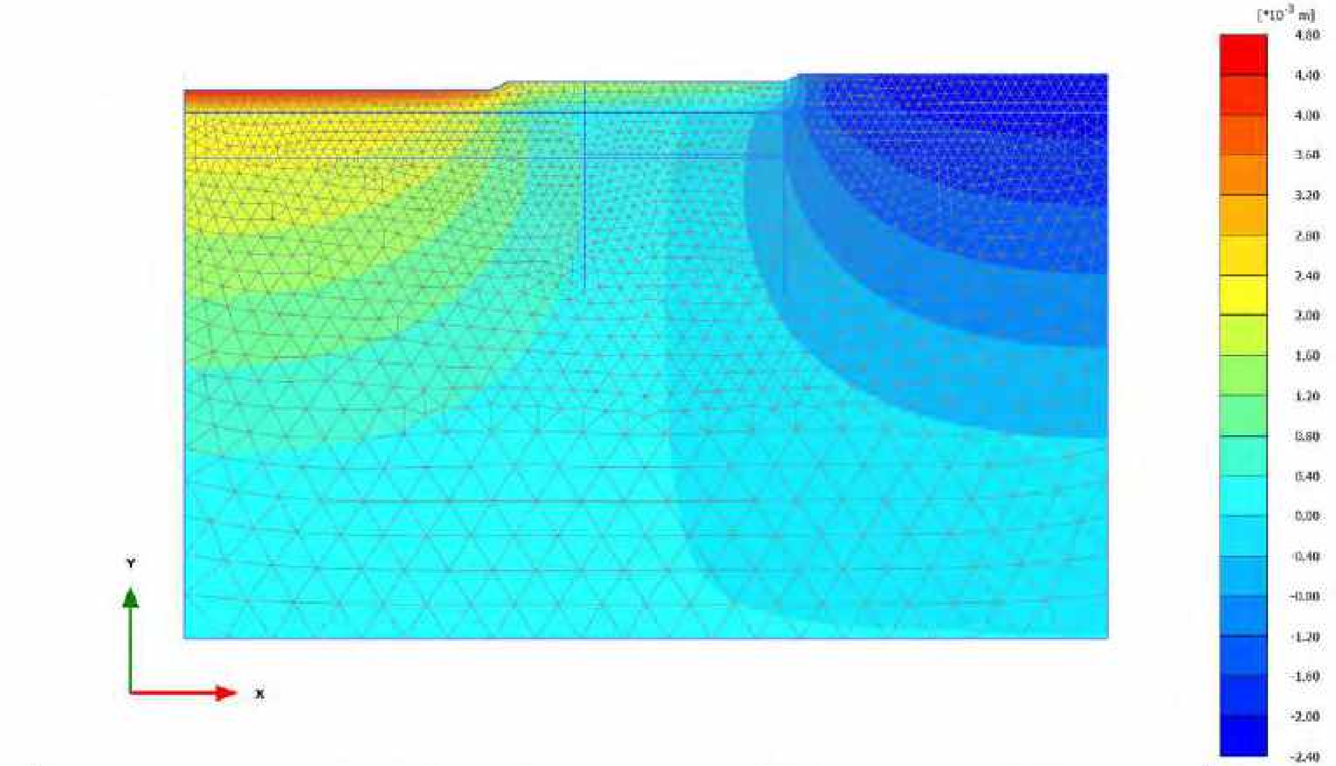


Total displacements u_x (scaled up 200 times)

Maximum value = $9.096*10^{-3}$ m (Element 711 at Node 13384)

Minimum value = $-2.558*10^{-3}$ m (Element 1463 at Node 25899)

2.1.1.2.1 Calculation results, Terrain [Phase_1] (1/3), Total displacements u_y

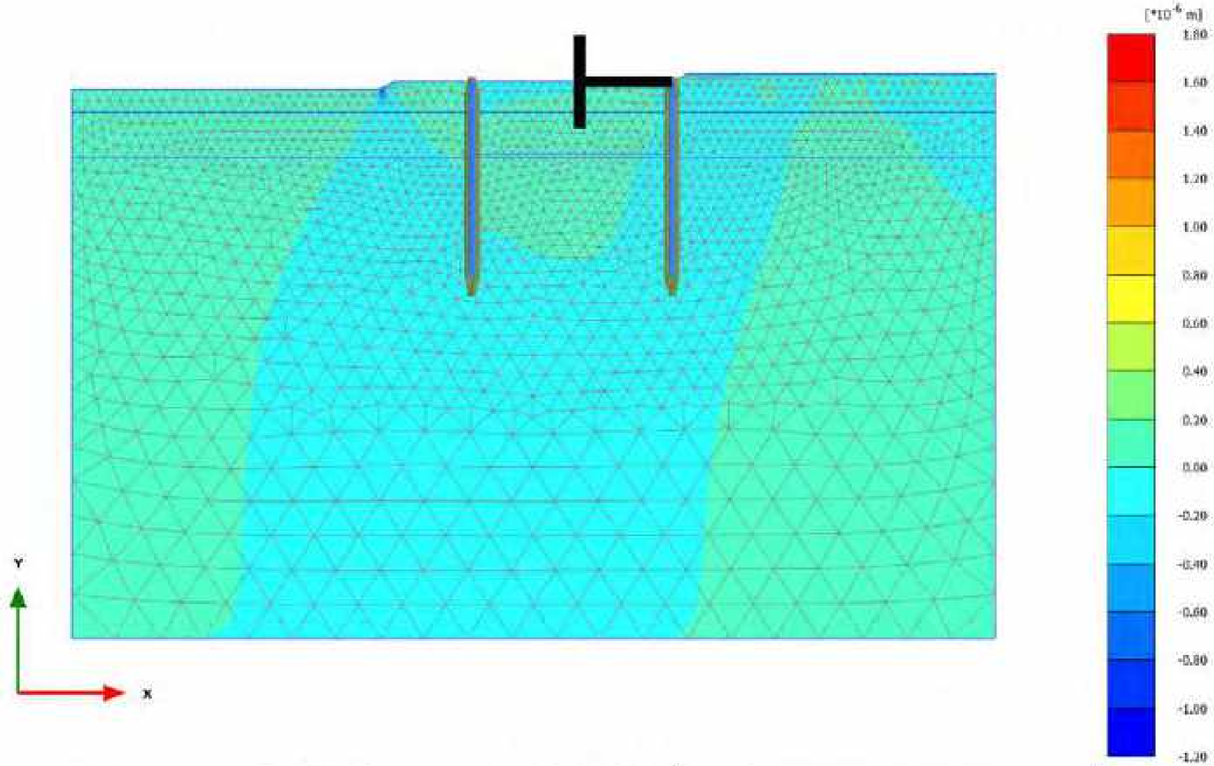


Total displacements u_y (scaled up 200 times)

Maximum value = 4.468×10^{-3} m (Element 649 at Node 377)

Minimum value = -2.249×10^{-3} m (Element 275 at Node 25649)

2.1.1.2.2 Calculation results, Wall construction [Phase_2] (2/11), Total displacements u_y

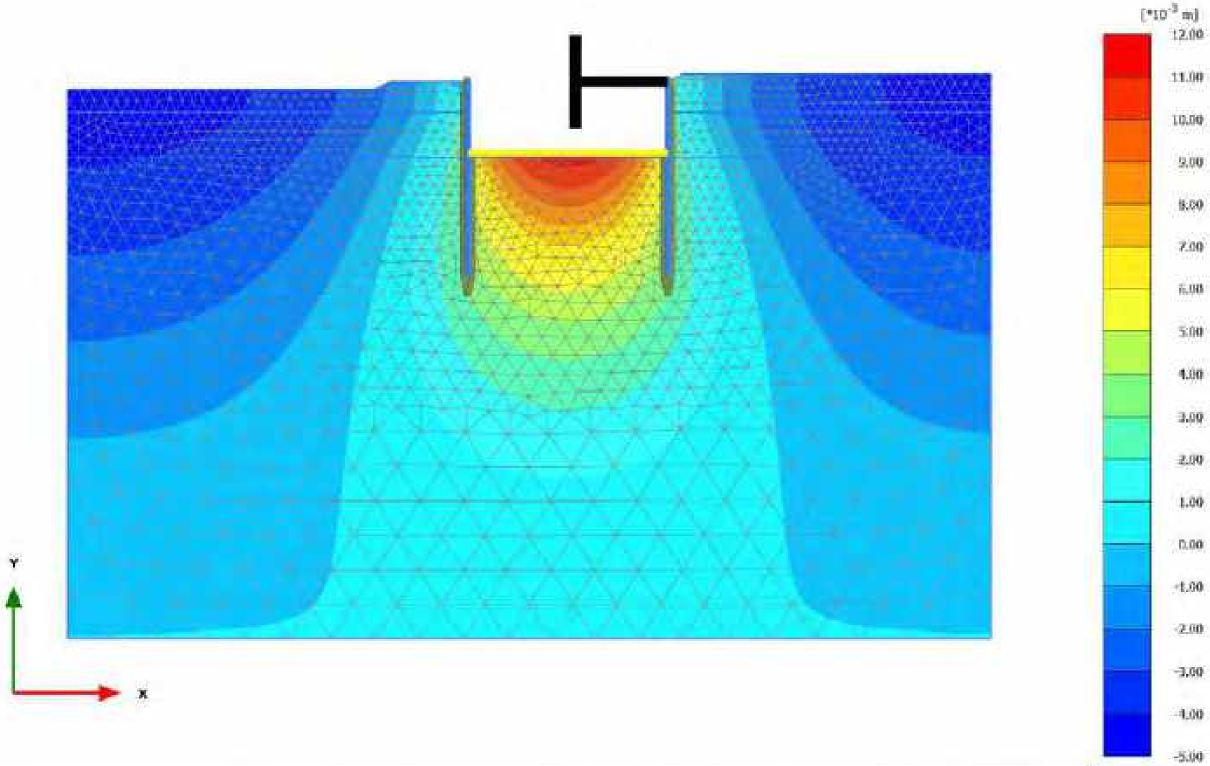


Total displacements u_y (scaled up $500*10^3$ times)

Maximum value = $1.681*10^{-6}$ m (Element 836 at Node 6788)

Minimum value = $-0.9939*10^{-6}$ m (Element 846 at Node 6795)

2.1.1.2.3 Calculation results, Excavation [Phase_3] (3/29), Total displacements u_y

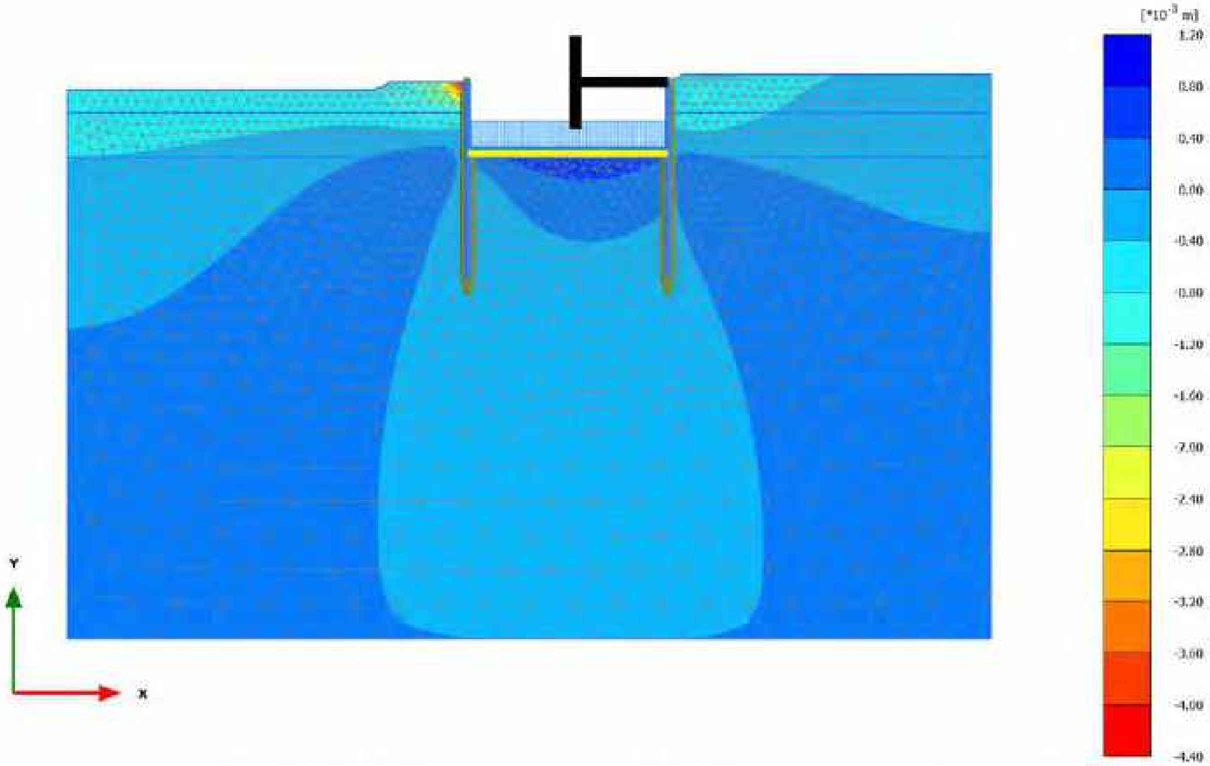


Total displacements u_y (scaled up 100 times)

Maximum value = 0.01151 m (Element 1702 at Node 18466)

Minimum value = $-4.604 \cdot 10^{-3}$ m (Element 649 at Node 377)

2.1.1.2.4 Calculation results, Building [Phase_4] (4/37), Total displacements u_y

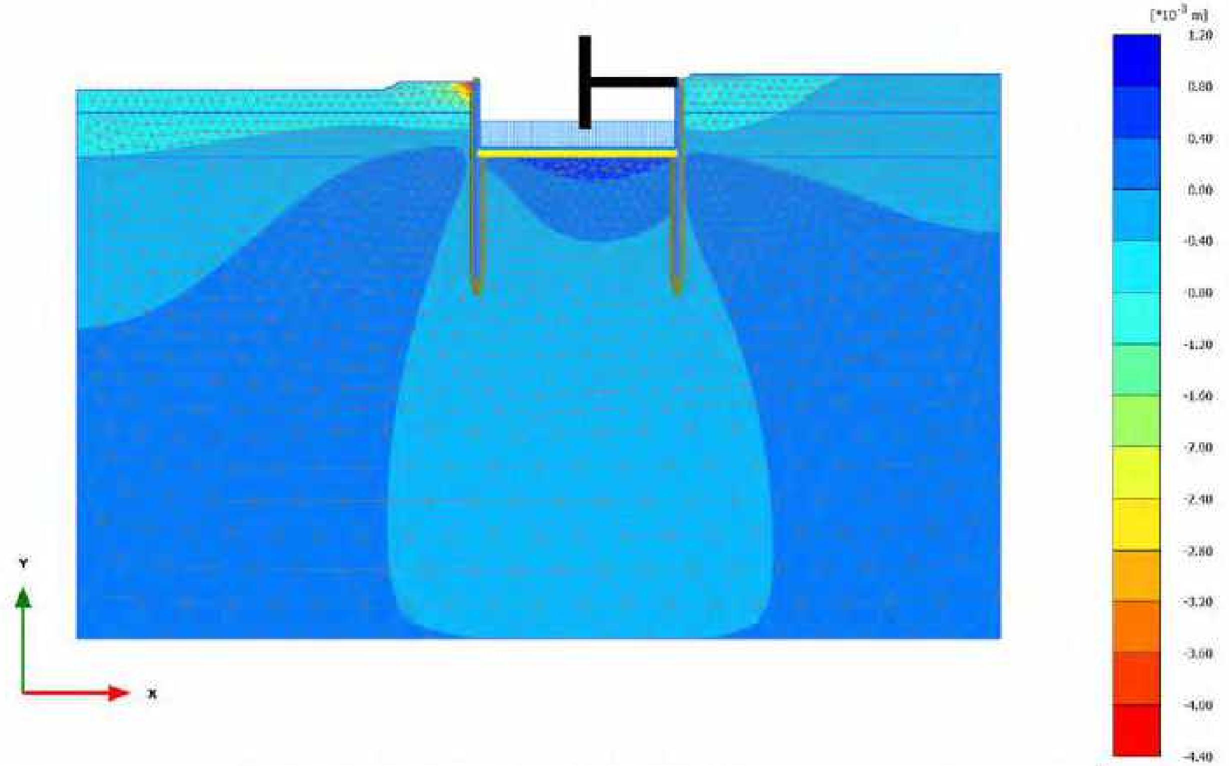


Total displacements u_y (scaled up 500 times)

Maximum value = $0.9051*10^{-3}$ m (Element 1728 at Node 24388)

Minimum value = $-4.382*10^{-3}$ m (Element 711 at Node 12718)

2.1.1.2.5 Calculation results, Drained [Phase_5] (5/47), Total displacements u_y

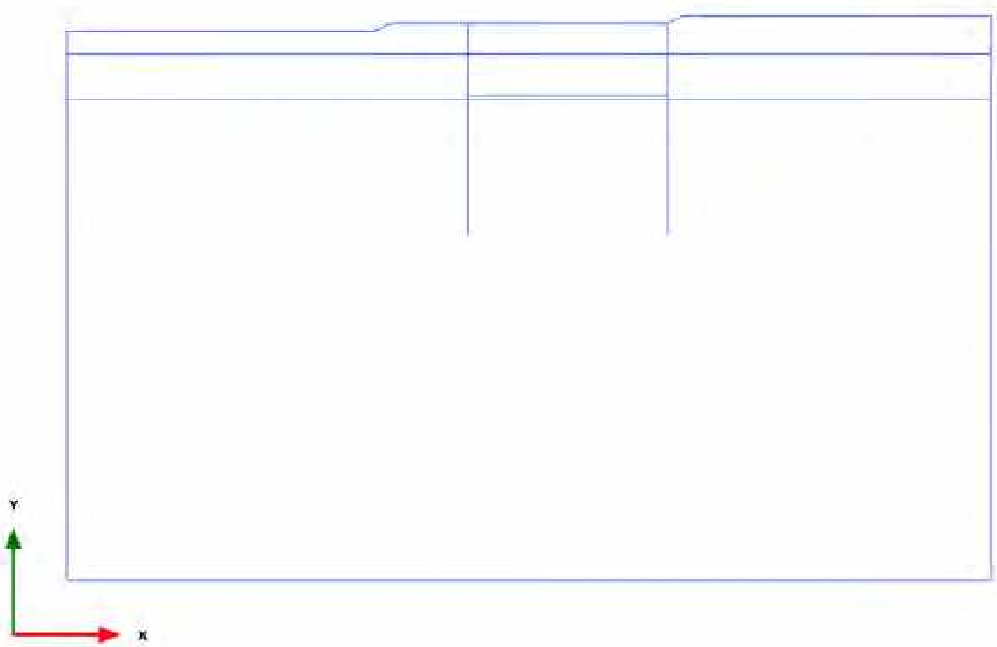


Total displacements u_y (scaled up 500 times)

Maximum value = $0.9050*10^{-3}$ m (Element 1728 at Node 24388)

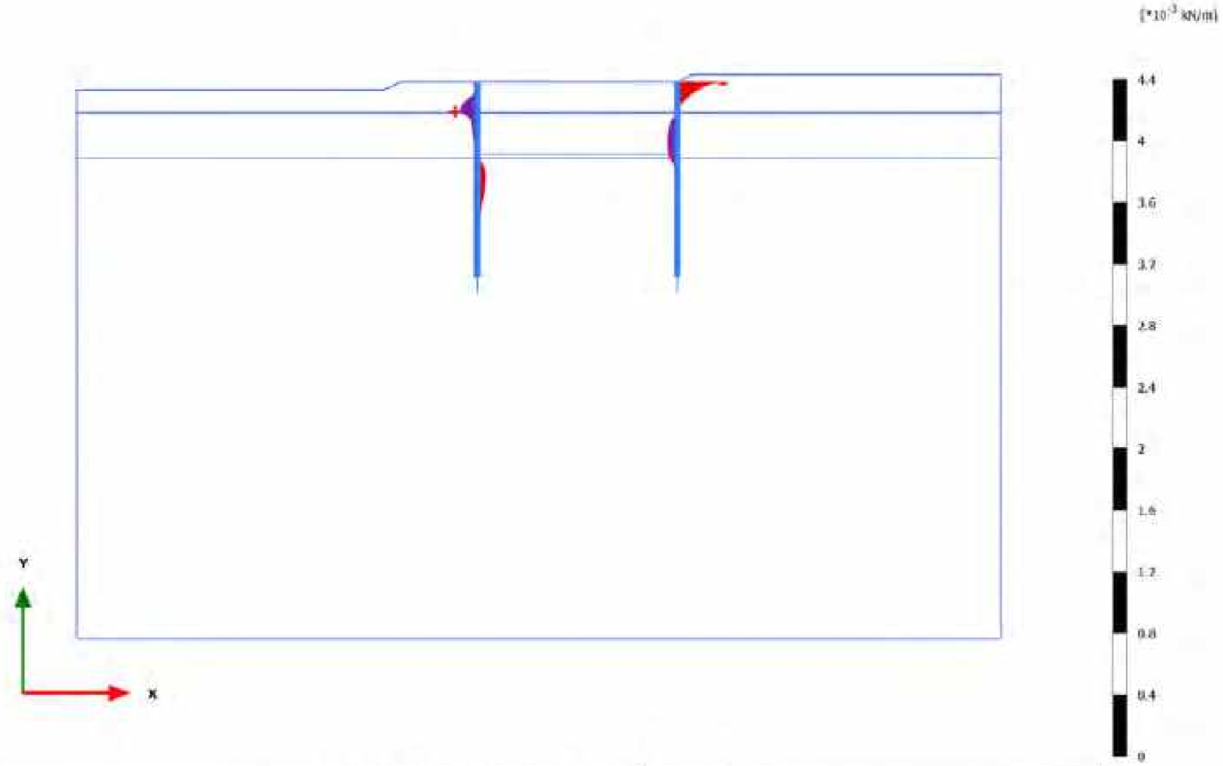
Minimum value = $-4.383*10^{-3}$ m (Element 711 at Node 12718)

3.1.1.1.1 Calculation results, Plate, Terrain [Phase_1] (1/3), Shear forces Q



Shear forces Q (scaled up 1.00 times)
No results

3.1.1.1.2 Calculation results, Plate, Wall construction [Phase_2] (2/11), Shear forces Q

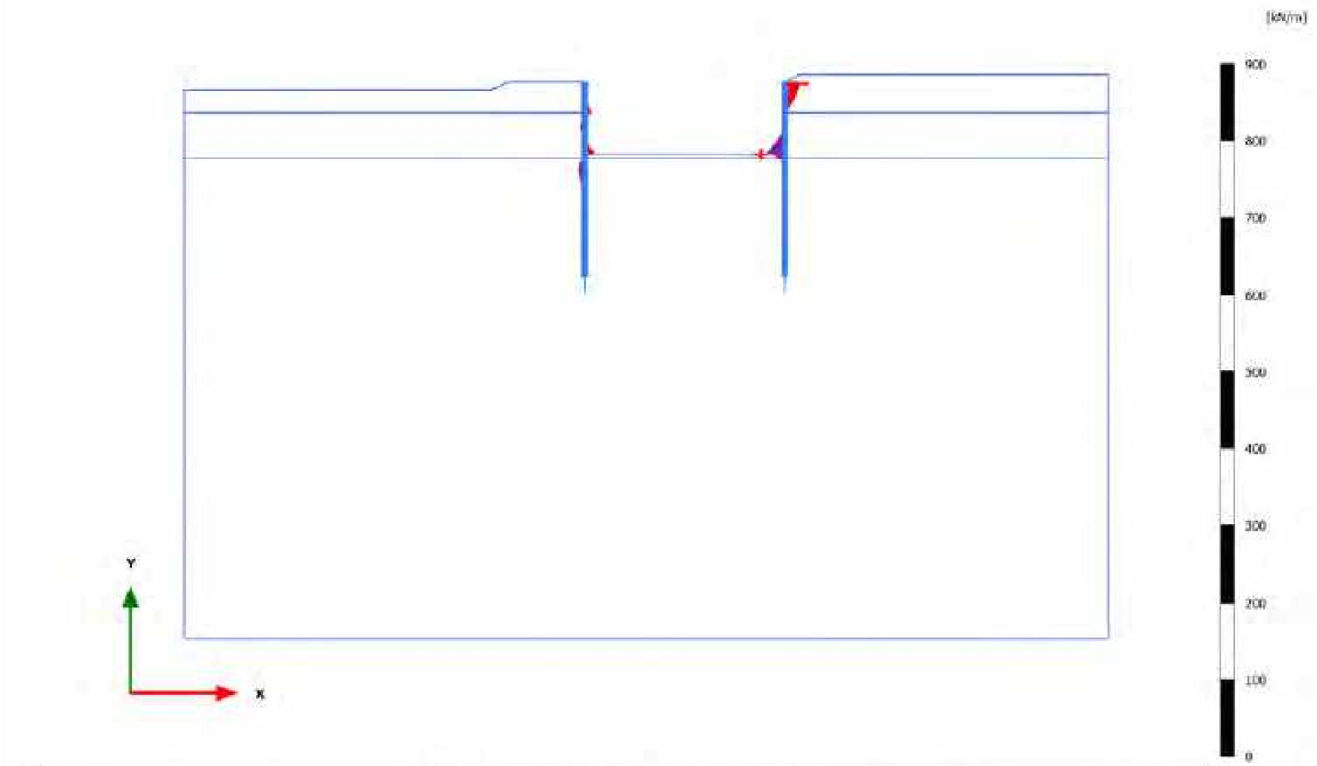


Shear forces Q (scaled up 10.0*10^{3} times)

Maximum value = 0.1102*10^{-3} kN/m (Element 1 at Node 12260)

Minimum value = -0.2611*10^{-3} kN/m (Element 7 at Node 26708)

3.1.1.1.3 Calculation results, Plate, Excavation [Phase_3] (3/29), Shear forces Q

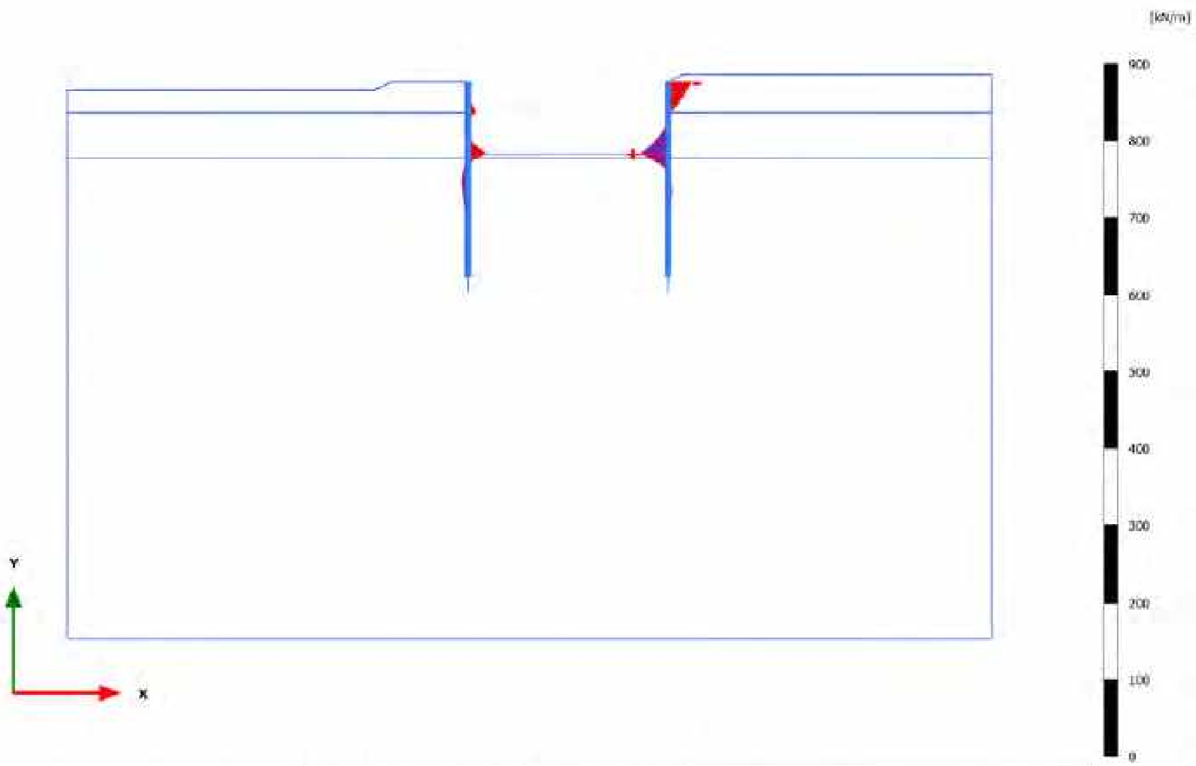


Shear forces Q (scaled up 0.0500 times)

Maximum value = 23.98 kN/m (Element 12 at Node 24401)

Minimum value = -18.83 kN/m (Element 7 at Node 26708)

3.1.1.1.4 Calculation results, Plate, Building [Phase_4] (4/37), Shear forces Q

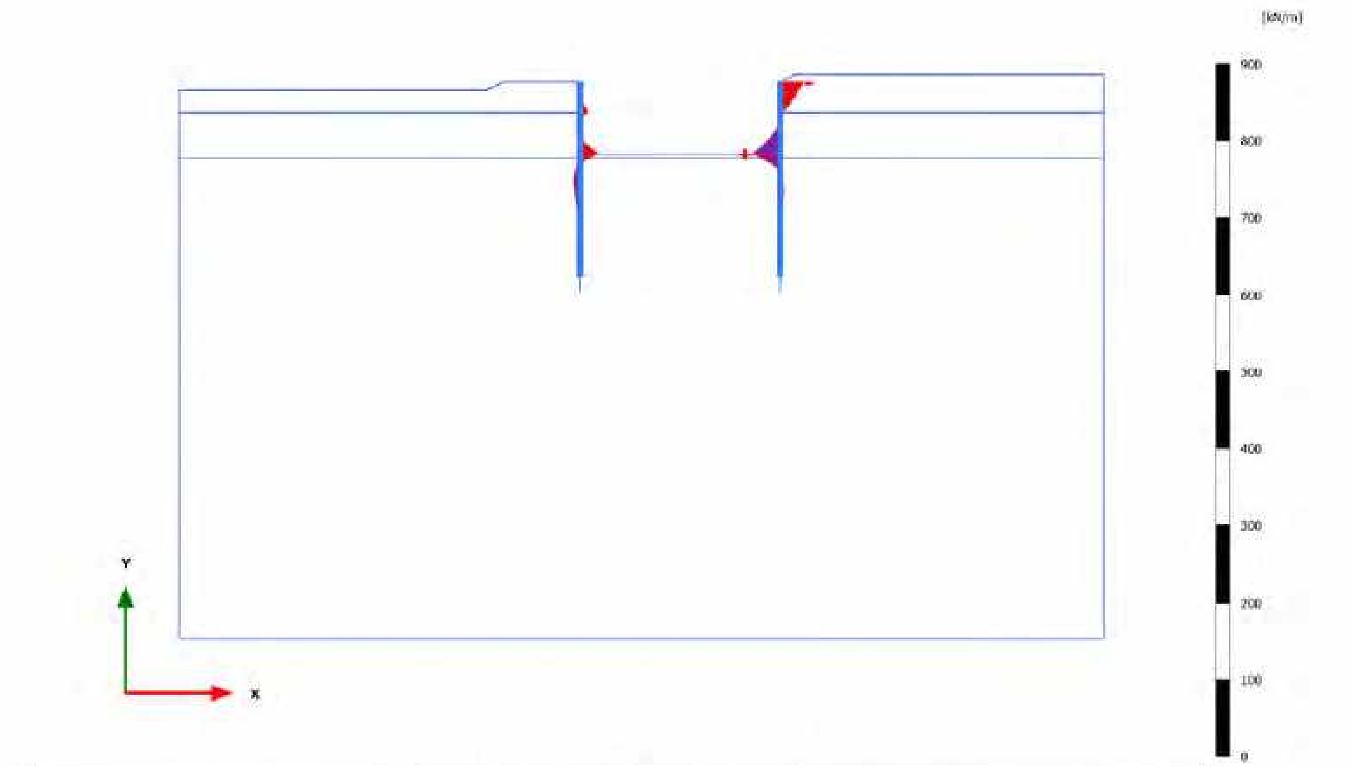


Shear forces Q (scaled up 0.0500 times)

Maximum value = 38.91 kN/m (Element 17 at Node 24401)

Minimum value = -30.41 kN/m (Element 7 at Node 26708)

3.1.1.1.5 Calculation results, Plate, Drained [Phase_5] (5/47), Shear forces Q

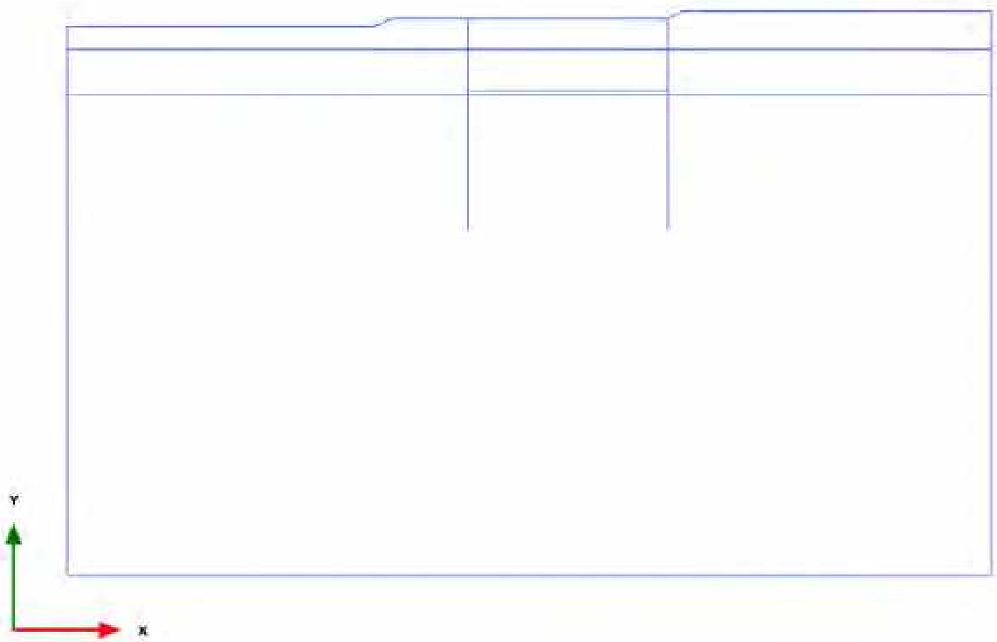


Shear forces Q (scaled up 0.0500 times)

Maximum value = 38.91 kN/m (Element 17 at Node 24401)

Minimum value = -30.42 kN/m (Element 7 at Node 26708)

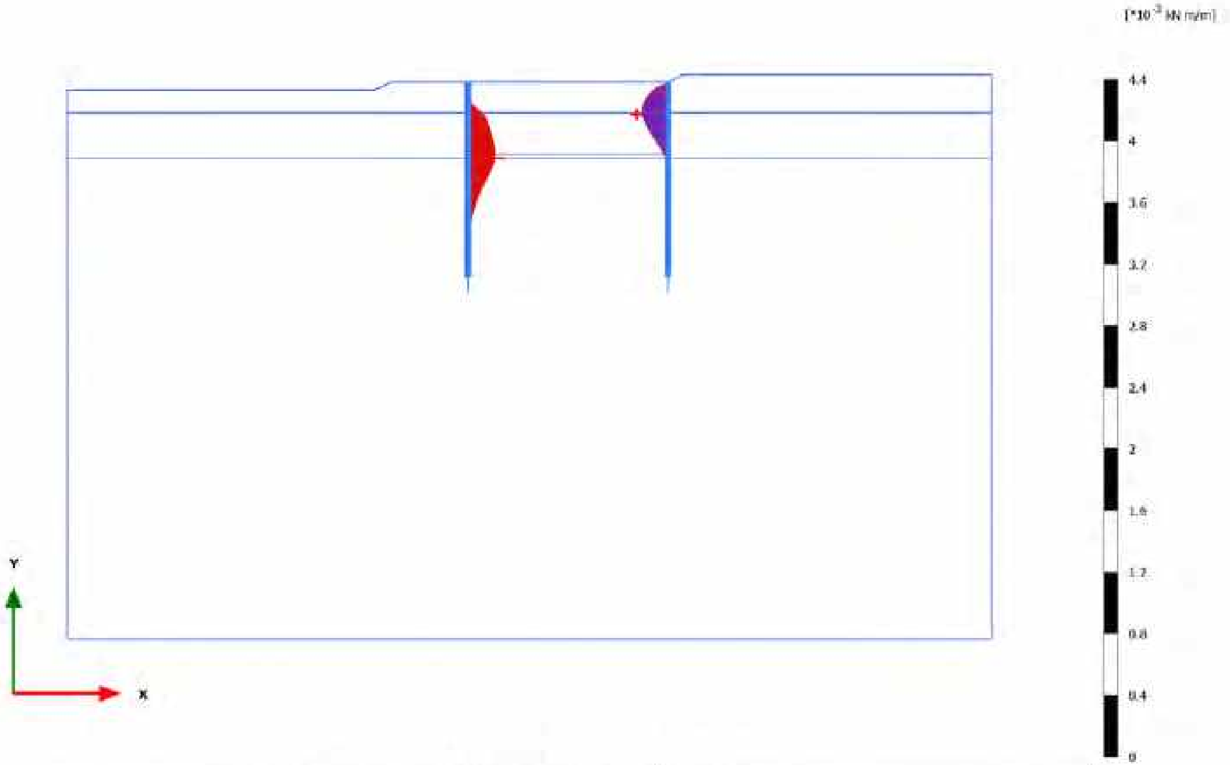
3.1.1.2.1 Calculation results, Plate, Terrain [Phase_1] (1/3), Bending moments M



Bending moments M (scaled up 1.00 times)

No results

3.1.1.2.2 Calculation results, Plate, Wall construction [Phase_2] (2/11), Bending moments M

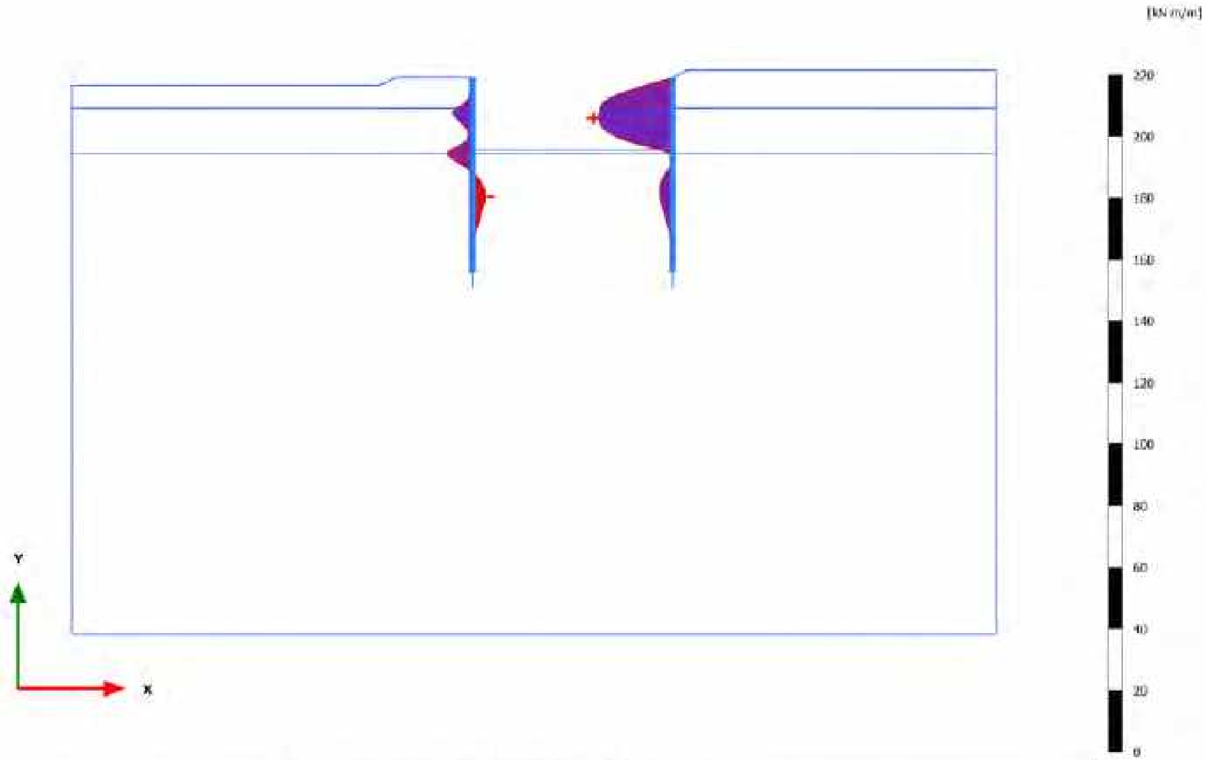


Bending moments M (scaled up $10.0*10^{3}$ times)

Maximum value = $0.1677*10^{-3}$ kN m/m (Element 15 at Node 25547)

Minimum value = $-0.1755*10^{-3}$ kN m/m (Element 16 at Node 11810)

3.1.1.2.3 Calculation results, Plate, Excavation [Phase_3] (3/29), Bending moments M



Bending moments M (scaled up 0.200 times)

Maximum value = 23.97 kN m/m (Element 15 at Node 25532)

Minimum value = -4.133 kN m/m (Element 25 at Node 10662)

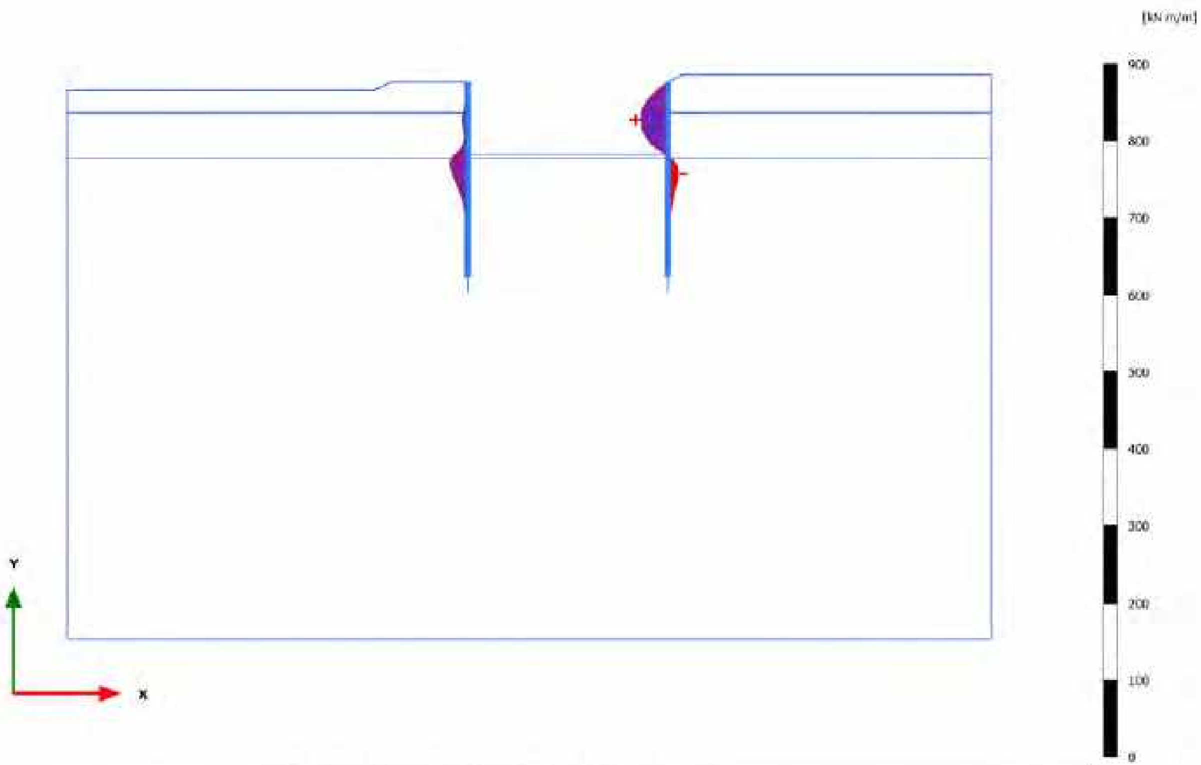
3.1.1.2.4 Calculation results, Plate, Building [Phase_4] (4/37), Bending moments M

Bending moments M (scaled up 0.0500 times)

Maximum value = 35.13 kN m/m (Element 15 at Node 25531)

Minimum value = -13.47 kN m/m (Element 42 at Node 23290)

3.1.1.2.5 Calculation results, Plate, Drained [Phase_5] (5/47), Bending moments M

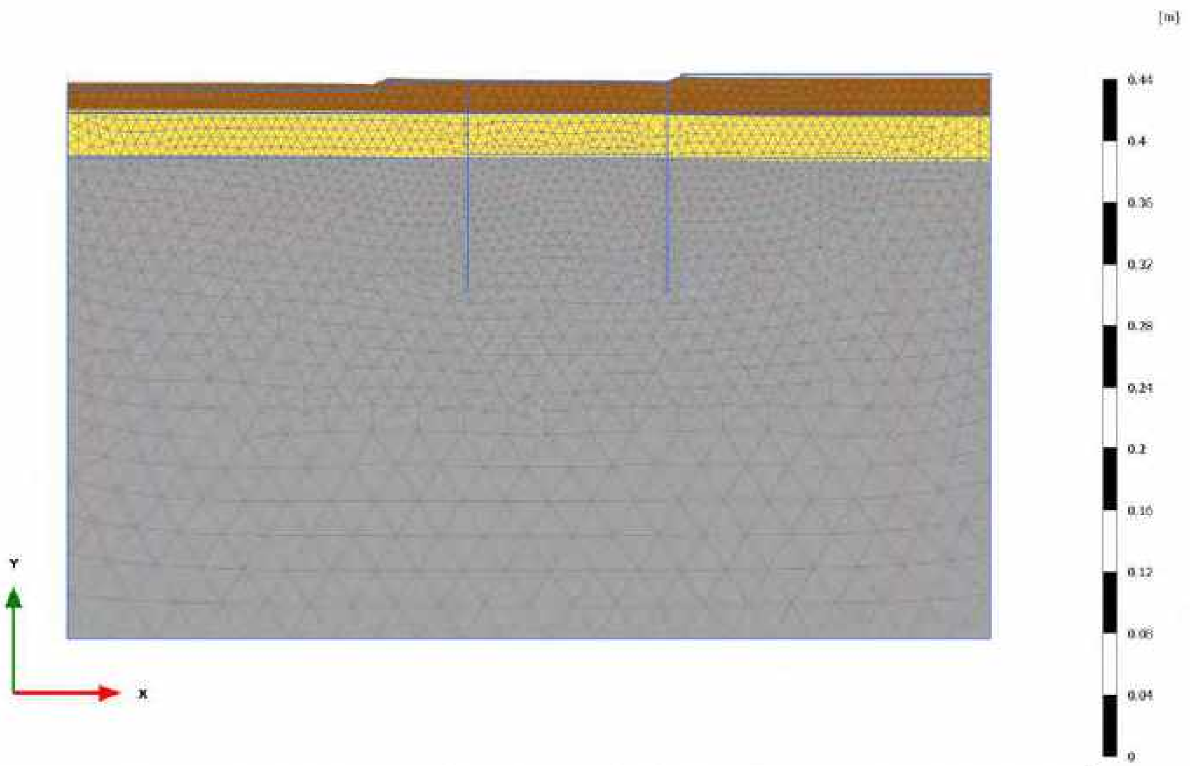


Bending moments M (scaled up 0.0500 times)

Maximum value = 35.13 kN m/m (Element 15 at Node 25531)

Minimum value = -13.47 kN m/m (Element 42 at Node 23290)

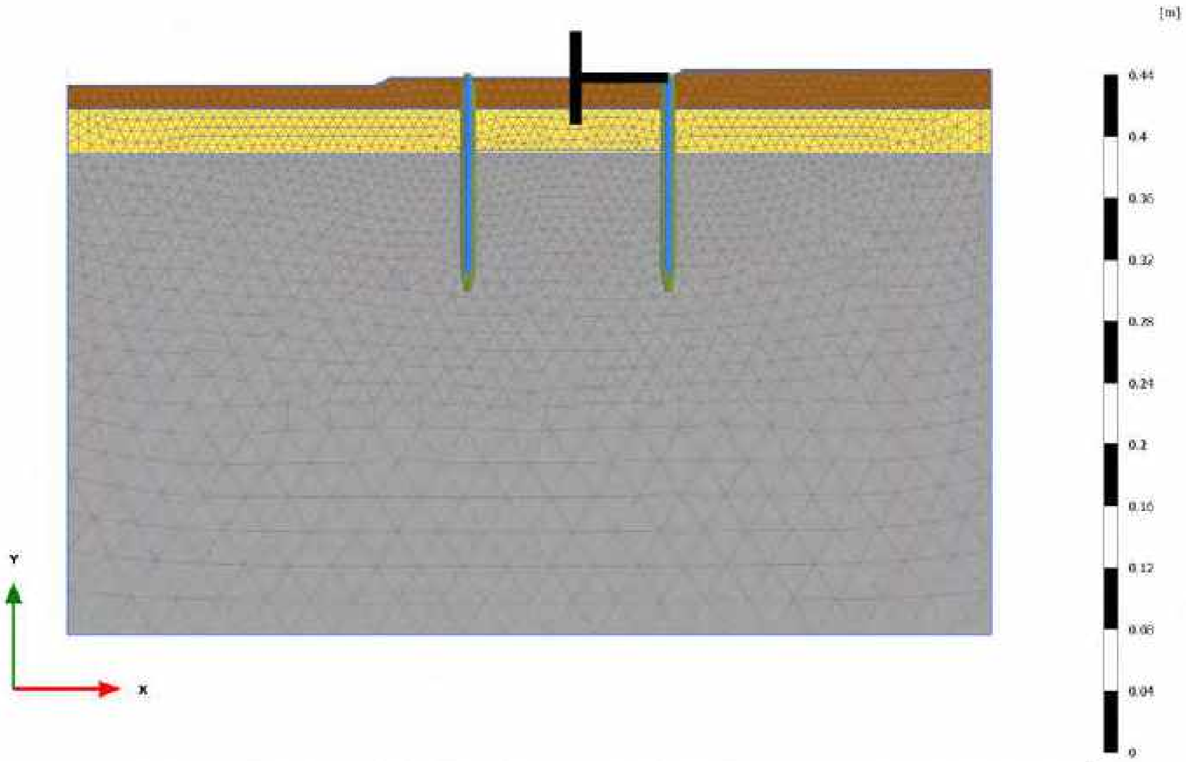
4.1.1 Calculation results, Terrain [Phase_1] (1/3), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $4.478*10^{-3}$ m (Element 742 at Node 983)

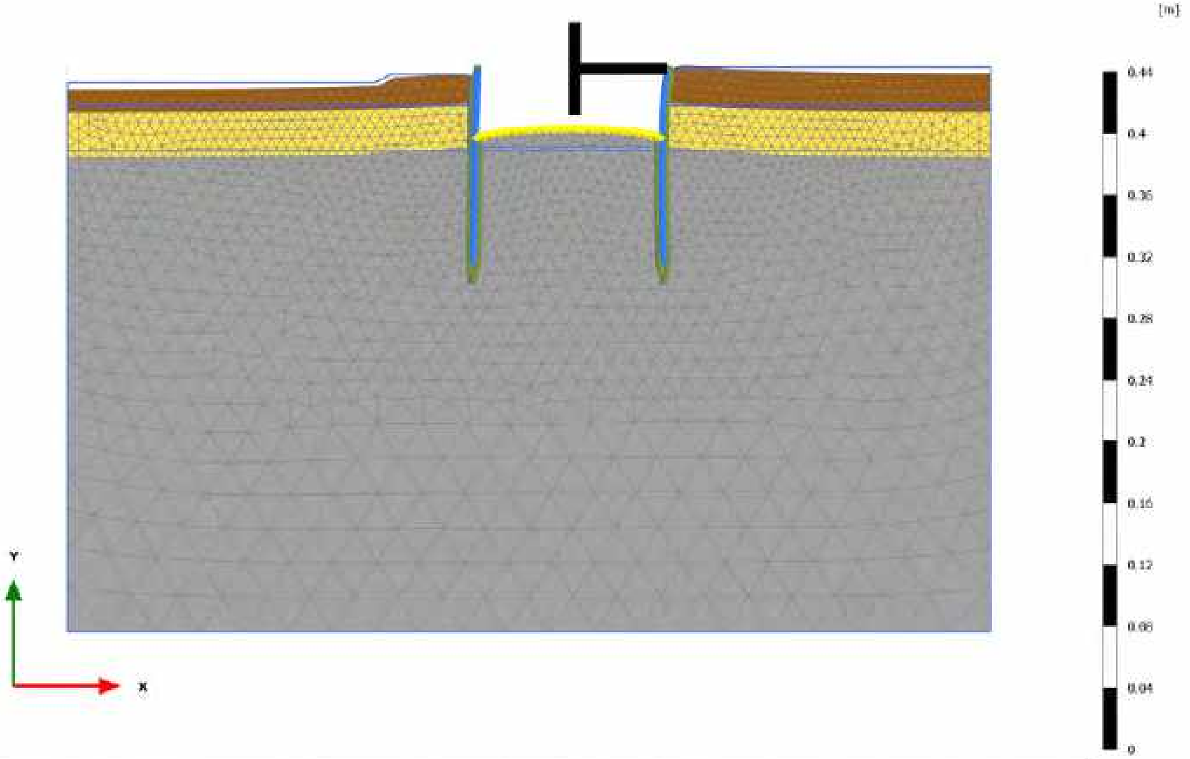
4.1.2 Calculation results, Wall construction [Phase_2] (2/11), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $2.130*10^{-6}$ m (Element 846 at Node 6791)

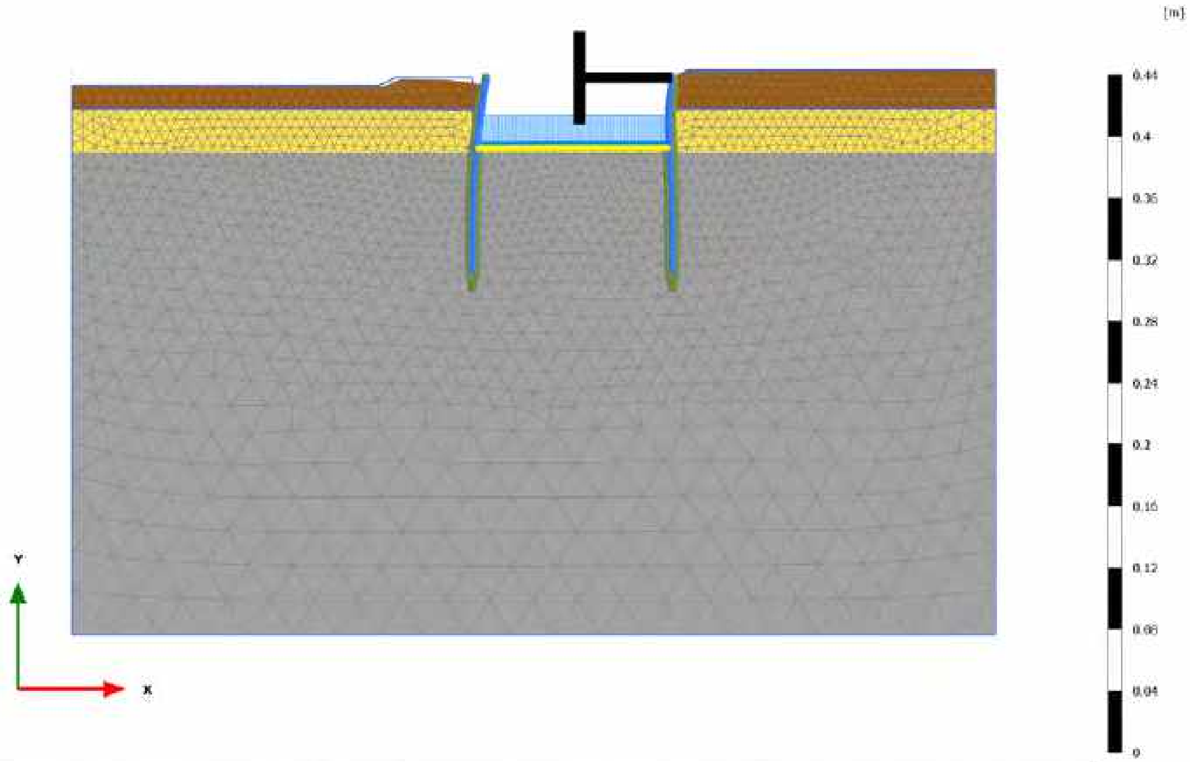
4.1.3 Calculation results, Excavation [Phase_3] (3/29), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = 0.01153 m (Element 1702 at Node 18465)

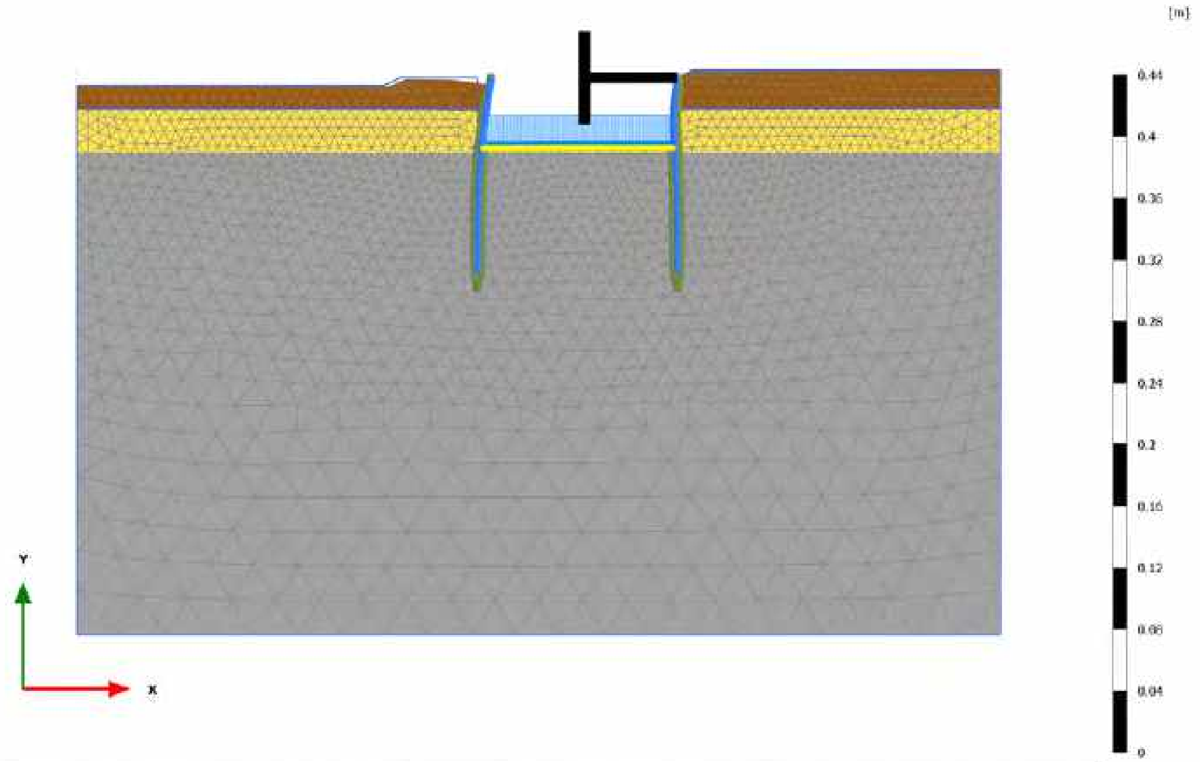
4.1.4 Calculation results, Building [Phase_4] (4/37), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = $9.476 \cdot 10^{-3}$ m (Element 711 at Node 12724)

4.1.5 Calculation results, Drained [Phase_5] (5/47), Deformed mesh |u|



Deformed mesh |u| (scaled up 100 times)

Maximum value = 9.482×10^{-3} m (Element 711 at Node 12724)