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Report on
Impact Assessment - TfNSW Assets

Proposed Commercial Development
8-10 Lee Street, Haymarket

Prepared for
Built Obayashi Joint Venture (BOJV)

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Report on Impact Assessment - TfNSW Assets
Proposed Commercial Development
8-10 Lee Street, Haymarket

1. Introduction

This report presents the results of geotechnical numerical modelling undertaken to assess the potential impacts of the proposed basement excavation and construction works at 8-10 Lee Street, Haymarket on existing Transport for New South Wales (TfNSW) assets. The work was commissioned by Miles Nagle of Built Obayashi Joint Venture (BOJV), and was undertaken in accordance with Douglas Partners' proposal SYD190190.P.010.Rev0 dated 10 June 2021.

It is understood that the development of the site will include demolition of the existing YHA hostel with the heritage Parcels Shed retained, and the construction of a 41-storey mixed-use building with a two-level basement and a Basement 2 Access Tunnel (also known as 'Link Tunnel') at Basement 2 level in the south western corner. Two break-throughs will be made from the Basement 2 Access Tunnel to the adjacent future basements of Dexus Fraser and Toga sites.

The following TfNSW assets are understood to be within the 'zone of influence' of the proposed basement that require impact assessment:

- Central multi storey building that is located next to the northern shoring wall (near the eastern end) and the eastern shoring wall (near the northern end);
- Baggage Tunnel and Baggage Lift (to the east of the site, on the northeast corner);
- Central Station Platform 01 and then Central Station Railway corridor next to the eastern shoring walls;
- Devonshire Pedestrian Tunnel Slab next to the southern shoring walls; and
- Adina Hotel to the west of the proposed main basement.

The locations of the TfNSW assets are shown on Drawings M2, M3 and M5 in Appendix C.

It is understood that Ambulance Avenue (to the north of the site, a TfNSW asset) will be demolished and replaced with new structures and therefore does not require impact assessment.

This report presents the results of geotechnical soil-structure interaction analyses undertaken to provide estimates of the potential movements of the TfNSW assets located to the north, east, south, and west of the site that may be induced during the excavation and construction of the proposed basement.

The predicted movements of TfNSW assets have also been used to assess potential damage to the structures and tracks using the following methods:

- Potential damage category for building structures has been assessed using the Burland (2001) method (cited in CIRIA 760) which uses strain limits to assess the potential for damage;

- Potential track deformations and recommended monitoring parameters and limits for the railway tracks have been assessed in accordance with Assets Standard Authority (ASA) standard SPC 207 – "Track Monitoring Requirements for Undertrack Excavation" that outlines alarm levels for deformations of rail track assets including track twist, settlement and lateral displacement for excavation works adjacent to railways.

The geotechnical analyses comprised two separate three-dimensional (3D) numerical models of the excavation and construction of the proposed basement using the geotechnical finite element analysis software - PLAXIS 3D. One model was used to analyse the proposed works and affected TfNSW assets in the northern and eastern areas (Model 1) and the other model was used to analyse the proposed works and affected TfNSW assets in the southern area (Model 2). Details of both the analyses, results and recommendations are provided in this report.

Specialist Engineering Assessments (SEA) were previously carried out by DP for Sydney Water's Building Plan Approvals (BPAs) to assess the impacts to the Bondi Ocean Outfall Sewer which runs across the north western corner of the site, a 1,500 mm diameter stormwater pipe and a 400 mm diameter sewer running above the Link Tunnel. The results of the SEAs were included in the following reports and are not repeated in this report.

- Report on Geotechnical Component of Specialist Engineering Assessment - Sydney Water Assets, Proposed Commercial Development (BPA1a), 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.04.R.008.Rev1 dated October 2021.
- Report on Geotechnical Component of Specialist Engineering Assessment - Sydney Water Assets, Proposed Commercial Development (BPA1b), 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.04.R.009.Rev0 dated October 2021.
- Report on Geotechnical Impact Assessment for Bondi Sewer, Proposed Commercial Development, 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.04.R.006.Rev0 dated November 2021.

2. Background Information

DP has been provided with the following information:

- AFC Drawing titled: "Notes Sheet", Drawing No. ST-00A-00-01, Rev. A, dated 15/02/2022, prepared by Taylor Thomson Whitting (TTW);
- AFC Drawing titled: "Footing and Shoring Context Plan", Drawing No. ST-30B-A01-00, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: "Footing and Shoring Plan - Part 1", Drawing No. ST-30B-A01-01, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: "Footing and Shoring Plan - Part 2", Drawing No. ST-30B-A01-02, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: "Capping Beam Outline Plan", Drawing No. ST-30B-A02-01, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: "Shoring Elevation - Sheet 1 to Sheet 5", Drawing Nos. ST-30C-A01-01 to ST-30C-A01-05, Rev. A, dated 15/02/2022, prepared by TTW;

- AFC Drawing titled: “Shoring Sections - Sheet 1 to Sheet 7”, Drawing Nos. ST-30D-A01-01 to ST-30D-A01-07, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: “Shoring and Pile Element Schedule”, Drawing No. ST-31Y-TXX-10, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: “Typical Shoring Details”, Drawing Nos. ST-35B-A01-02 to ST-35B-A01-04, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: “North-East Corner Plans and Elevation”, Drawing No. CE-71B-01-01, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: “North-East Corner Sections Sheet 1 and Sheet 2”, Drawing Nos. CE-71D-01-01 and CE-71D-01-02, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: “North-East Corner Details Sheet 2”, Drawing No. CE-71D-01-12, Rev. A, dated 15/02/2022, prepared by TTW;
- AFC Drawing titled: “Tunnel Construction - Stage 1 to Stage 7”, Drawing Nos. ST-30C-A02-31 to ST-30C-A02-37, Rev. A, dated 15/02/2022, prepared by TTW;
- Aconex correspondence, RE: Design Package IDR2 75% - Geotechnical Assessments, Ref: TTW-ADVICE-000102, Mail no. DP-RTRFI-000006, dated 12/01/2022;
- Ambulance Avenue Mobile Crane Setup sketch, Ref: 21-P0021-MARR-010-28-0001-R2 TC1 Proposed GMK6400 Location - Ambulance Ave;
- Document titled: “BPA Application Construction Staging, Atlassian Central Building”, dated March 2021, prepared by BOJV;
- Information provided in Aconex correspondence from NOMA Consulting dated 13 July Ref: NOMA-GCOR-000002;
- Information provided in Aconex correspondence from NOMA Consulting regarding the steel set beam cross section used for the Link Tunnel (500 WC 383), dated 21 July Ref: NOMA-GCOR-000003;
- Information provided in an email from TTW dated 24 September 2021 Ref: RE: Atlassian Access Tunnel - Revised design;
- Technical Notes titled “Atlassian - B2 Access Tunnel – Primary Support Design Assessment” prepared by Noma Consulting Ref: ATB2-TUNS-NOM-STR-TWO-TNO-0002, RevA, dated 22 June 2021;
- Plaxis 2D analysis staging and results, Ref: Plaxis result - Tubes Section 324mm V1;
- Preliminary Under Review Drawings titled: “Tunnel Construction Methodology -Sheet 4 and 5”, Drawing Nos. ST-30C-B03-23 and ST-30C-B03-24, print dated 06/10/2021, prepared by TTW;
- Information provided in an email from TTW dated 16 September, Ref: RE: Final Wall Stiffness for BPA1

3. Previous Investigations

DP has undertaken geotechnical and environmental investigations within the site for the proposed development. These investigations comprised drilling of 33 boreholes that included the following:

- 16 shallow boreholes;
- 4 diatube boreholes below the existing retaining walls on the site boundaries; and
- 13 rock cored boreholes, with 10 boreholes terminating between 3 m and 5 m below the lowest proposed basement level.

The results of the geotechnical investigations are provided in the following report:

- Report on Supplementary Geotechnical Investigation, Proposed Commercial Development, 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.00.R.006.Rev5 dated November 2020.

DP has also undertaken a geotechnical investigation at the location of the proposed access tunnel. This investigation included the drilling of three rock cored boreholes (BH201 to BH203). The results of the investigation are provided in the following report:

- Report on Geotechnical Investigation, Link Tunnel, 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.07.R.001.Rev0 dated November 2020.

The locations of the boreholes are shown on Drawings 1 and 2 in Appendix B.

DP has also undertaken numerical modelling for various aspects of the proposed basement excavation, with the results presented in the following reports:

- Report on Preliminary Geotechnical Analyses of Shoring Walls, Proposed Commercial Development, 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.04.R.001.Rev1 dated August 2020.
- Report on Groundwater Modelling, Proposed Commercial Development, 8-10 Lee Street, Haymarket. Douglas Partners Pty Ltd, Ref: 86767.04.R.003.Rev1 dated October 2020.

4. Geotechnical Model

Reference to the Sydney 1:100 000 Geological Series Sheet (Geological Survey of NSW: Herbert, 1983) indicates that the site is underlain by Triassic aged Ashfield Shale overlying Hawkesbury Sandstone. The site is also located near mapped deposits of Quaternary aged alluvial sediments, including transgressive dune sands. Although not shown on the geological map, the Mittagong Formation is likely to be present at the transition between the Ashfield Shale and Hawkesbury Sandstone geological units.

Typical descriptions of the materials within each of the geological units are summarised below:

- Quaternary sediments - medium to fine grained marine sand.
- Ashfield Shale - black to dark grey shales and laminite.
- Mittagong Formation - interbedded shale, laminite and fine-grained quartz sandstone.
- Hawkesbury Sandstone - horizontally bedded and vertically jointed, massive and cross-bedded, medium grained quartz sandstone with a few shale interbeds.

The Devonshire Street Pedestrian Tunnel is inferred to be aligned sub-parallel to and either co-incident with or adjacent to the line of a former creek.

The detailed site investigations encountered alluvial and residual soils, and sandstone bedrock consistent with the Mittagong Formation and Hawkesbury Sandstone.

The subsurface conditions encountered on the site are summarised in Table 1.

Table 1: Generalised Subsurface Profile

CONCRETE:	Single or multiple concrete slabs, with or without a brick pavement, asphalt layer, or surface ballast layer;
FILL	Gravel, sand or clay fill to depths ranging between about 2 m and 6 m;
ALLUVIAL SAND:	Loose to medium dense, alluvial sand, about 1 m thick (5 m thick at the location of the Link Tunnel*);
RESIDUAL SILTY CLAY:	Soft to hard, residual silty clay, with some ironstone gravel (1 - 2 m thick);
RESIDUAL SANDY CLAY:	Very stiff to hard, residual sandy clay (up to 1 m thick);
SANDSTONE (FINE to MEDIUM):	Very low to low strength, fine to medium grained sandstone with some medium or high strength, iron-cemented bands (up to 2 m thick). Numerous clay seams were encountered;
SANDSTONE (MEDIUM):	Medium or high strength, medium grained sandstone

The subsurface conditions encountered in the boreholes at the proposed Link Tunnel location were consistent with the investigation results for the rest of the site, except for localised deeper alluvial sand (inferred to be a previous creek) and hence the residual clay and rock started about 2 m deeper than over the rest of the site.

The upper fine to medium grained sandstone is interpreted to be part of the Mittagong Formation, and the underlying medium grained sandstone is interpreted to be Hawkesbury Sandstone.

Seven geotechnical cross-sections showing the interpreted subsurface profile within the site are provided in Appendix B of this report as follows:

- Sections A-A to F-F (Drawing Nos. 2 - 7 extracted from Ref: 86767.00.R.006.Rev5): These sections show interpreted geotechnical divisions of underlying soil and rock, together with the proposed basement floor level
- Section A-A (Drawing No. 2 extract from Ref: 86767.07.R.001.Rev0): This section shows interpreted geotechnical divisions of underlying soil and rock (with localised deep sand and clay) in relation to the position of the proposed Link Tunnel.

Groundwater measurements from standpipe piezometers on site indicate that there is a relatively consistent permanent (perennial) groundwater table within the residual soils and upper, fine grained, fractured sandstone (Mittagong Formation) that flows in a north westerly direction towards Lee Street, with an average level of around RL13.7 m in the centre of the site. The measured groundwater levels in piezometers screened in the lower, medium grained, less fractured sandstone (Hawkesbury Sandstone) were generally lower, by approximately 0.3 m in the centre of the site, increasing to 2 m lower towards Lee Street.

Intermittent perched groundwater is also present, near the soil-rock interface and also within the alluvial sand. The upper perched groundwater is likely to be recharged by surface infiltration into sandy layers following periods of heavy rainfall. The upper groundwater in alluvium and the lower groundwater in the sandstone appeared to be relatively independent, separated by low permeable residual clay, as there was minimal variability in groundwater levels observed in the sandstone even after some heavy rainfall periods between July 2019 and June 2020.

5. TfNSW Assets

Table 2 below includes a list of the key TfNSW Assets (infrastructure and building) close to the proposed basement excavation.

Table 2: Key TfNSW Assets Surrounding the Site

Site Boundary	Key Structure /Infrastructure (1)	Location/Description
Northern Boundary	Three-storey Central Building	• Immediately adjacent to the basement excavation in the north-eastern corner.
	Heritage-listed masonry arch wall	• Immediately adjacent to the basement excavation along the rest of the northern boundary.
Eastern Boundary	Baggage Tunnel	• Immediately adjacent to the basement excavation in the north-eastern corner.
	Baggage Lift	• Immediately adjacent to the basement excavation in the north-eastern corner (to the south of Baggage Tunnel).
	Central Station Platform 01	• Immediately adjacent to the basement excavation
	Railway Corridors and other Platforms	• Next to Platform 01 at RL 20.25 m AHD
Southern Boundary	Devonshire Pedestrian Tunnel, including underground and above ground structures	• Devonshire Tunnel (underground portion) starts from south eastern corner of the excavation and extends to the east and away from the basement excavation • Devonshire Pedestrian Slab (above ground portion) starts from south eastern corner of the excavation and extends to the west and Immediately adjacent to the southern boundary of the basement excavation
Western Boundary	Adina Hotel's basement car park, the open-air area and the pool above	• Immediately adjacent to the basement excavation to the west

Notes: (1) Assessment on Sydney Water assets were carried out separately and are not included in the above list

6. Proposed Excavation and Construction Works

Based on the information and drawings for the shoring walls provided by TTW, structural engineers, it is understood that the proposed excavation will be about 12 m deep along the southern, western, and northern boundaries of the site and about 17 m deep along the eastern boundary.

The existing YHA building on site has an existing lower ground level with a finished floor level at RL 15.5 m AHD. The lower ground level extends close to the site boundaries, except for the eastern boundary where the existing lower ground level has a setback of approximately 7 m from the site boundary.

It is understood that the minimum setbacks between the proposed basement excavation and the site boundary are 1 m to the south and north, and 0.5 m to the west. The excavation and shoring on the eastern side will be along the site boundary.

6.1 Proposed Basement and Shoring Walls (Northern Area and Eastern Area – Model 1)

The construction of the proposed shoring walls along the northern and eastern sides of the basement will comprise the following:

Eastern Area of Northern Shoring Walls (SW2, SW3, and SW4 - Adjacent to Central Building and Heritage Wall):

- Soldier pile walls consisting of 750 mm diameter reinforced concrete piles with shotcrete infill of the gaps between piles. The maximum spacing of the piles is at 1.8 m centres;
- One row of temporary 'tie-back' anchors to provide temporary lateral restraint to the northern shoring walls prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is 1.8 m (installed at every shoring pile);
- Permanent lateral support to be provided by the internal suspended slabs (i.e., Basement 1, and Lower Ground Floor slab) as shown in the sections provided by TTW and attached in Appendix B;
- All of the shoring piles will terminate at least 1.5 m below the design bulk excavation level (BEL) with localised deepening adjacent to footing or tank excavations.

Northern End of the Eastern Shoring Walls (SW5 - including SW5_1, SW5_2-900mm, SW5_2-750mm, and SW5_3)

- SW5_1 (Next to Baggage Tunnel Base Slab)
  - Closely spaced pile walls consisting of 750 mm diameter reinforced concrete piles with an alternating "one long pile / two short piles" pattern. Shotcrete infill of the gaps between piles will be provided from the capping beam (Baggage Tunnel Slab) to BEL (Short Piles).
  - Short piles will terminate 0.5 m below design BEL, and long piles will terminate at least 1.5 m below BEL.
  - One row of temporary 'tie-back' anchors to provide temporary lateral restraint to the shoring walls prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is 0.9 m;

- Permanent lateral support to be provided by the internal suspended slab (i.e., Lower Ground Floor slab). It is noted that Basement 1 slab will not be connected to this part of the shoring wall;

- SW5_2_900mm (Next to Lift Void – Northern End)
  - Two closely spaced piles immediately adjacent to the Baggage Tunnel portal, consisting of 900 mm diameter reinforced concrete piles with shotcrete infill of the gaps between piles from the capping beam. The maximum spacing of the two piles is at 1.05 m centres;
  - Two rows of temporary 'tie-back' anchors to provide temporary lateral restraint to the shoring walls prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is 1.05 m (installed at every shoring pile);
  - Permanent lateral support to be provided by the internal suspended slabs (i.e., Basement 1, Lower Ground Floor slab and Upper Ground Floor slab).

- SW5_2_750mm (Next to Lift Void – Southern End) and SW5_3
  - Beside the two 900mm piles, the shoring pile diameter reduce to 750 mm diameter reinforced concrete piles with shotcrete infill of the gaps between piles, with an alternating "one long piles / two short piles" pattern. Short piles will terminate at about RL 9.2 m (ie. minimum 1 m below Basement 1 slab, whereas the long piles will terminate at least 1.5 m below BEL;
  - Two rows of temporary 'tie-back' anchors to provide temporary lateral restraint to the long shoring piles prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is 0.9 m for the first row and 2.7 m for the second row;
  - One row of temporary anchors declined at 30 degrees and one row of toe bolts declined at 15 degrees to provide temporary lateral restraint to short shoring piles;
  - Permanent lateral support to be provided by the internal suspended slabs (i.e., Basement 1, Lower Ground Floor slab and Upper Ground Floor slab);

<u>Eastern Shoring Walls (SW7 - Adjacent to Platform 01 and Rail Corridor)</u>

- Closely spaced pile walls consisting of 750 mm diameter reinforced concrete piles with shotcrete infill of the gaps between piles, with an alternating "one long piles / two short piles" pattern. Short piles will terminate at about RL 8 m (ie. minimum 1 m below Basement 1 slab, whereas the long piles will terminate at least 1.5 m below BEL;
- Two rows of temporary 'tie-back' anchors to provide temporary lateral restraint to the long shoring piles prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is 0.9 m for the first row and 2.7 m for the second row;
- One row of temporary anchors declined at 30 degrees and one row of toe bolts declined at 15 degrees to provide temporary lateral restraint to short shoring piles;
- Permanent lateral support to be provided by the internal suspended slabs (i.e., Basement 1, Lower Ground Floor slab and Upper Ground Floor slab) as shown in the sections provided by TTW and attached in Appendix B.

6.2 Proposed Basement and Shoring Walls (Southern Area – Model 2)

The construction of the proposed shoring walls along the southern side of the basement (SW8) will comprise the following:

- Eastern Area Beyond Tunnelling Zone (SW8 and SW8A_1):
  - Closely spaced pile walls consisting of 750 mm diameter reinforced concrete piles with shotcrete infill of the gaps between piles. The maximum spacing of the piles is at 900 mm centres;
  - One row of temporary 'tie-back' anchors to provide temporary lateral restraint to the southern shoring walls prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is 1.8 m (installed at every second shoring pile);
  - Permanent lateral support to be provided by the internal suspended slabs (i.e., Basement 1, and Lower Ground Floor slab) as shown in the sections provided by TTW and attached in Appendix B.

- Western Area Within Tunnelling Zone (SW8A_2):
  - Closely spaced pile walls consisting of alternating one 750 mm diameter reinforced concrete pile and two 450 mm diameter reinforced concrete piles. The maximum spacing of the 750 mm diameter piles is at 1,850 mm centres;
  - One row of temporary 'tie-back' anchors to provide temporary lateral restraint to the southern shoring walls prior to the construction of the internal slabs. The anchors are declined at 30 degrees and the maximum spacing of the anchors is at 1.85 m (to be installed into every 750 mm pile);
  - Permanent lateral support to be provided by the internal suspended slabs (i.e., Basement 1, and Lower Ground Floor slab) as shown in the sections provided by TTW and attached in Appendix B.

Copies of the shoring wall drawings are provided in Appendix B.

6.3 Proposed Link Tunnel (Model 2)

The proposed Link Tunnel will be excavated and constructed at the south-western corner of Basement 2 (B2) level and after completion of basement 2 permanent structure. This tunnel will be located below the existing Sydney Water assets and will be constructed after the basement permanent supports (i.e., slabs) are constructed.

The impact assessment presented in this report includes the effect from the construction of the proposed Link Tunnel on the TfNSW assets along the southern boundary.

The tunnel will be initially used as a truck turning bay and will be connected at a later stage to the adjoining basements of two future developments to the south (Dexus Fraser) and to the west (Toga) of the site via two other future access tunnels (called 'south breakthrough tunnel' and 'west breakthrough

tunnel' from here on in this report). The Link Tunnel requires excavation down to about RL 3.6 m but the finished floor level of the tunnel will be the same as the B2 slab (i.e. at RL 5.0 m). In the analysis a factored bulk excavation level of RL 3.1 m was adopted for the tunnel. For more detail of the geometry of the tunnel refer to Drawings M5 to M7 in Appendix C.

The primary support for this tunnel comprises steel canopy tubes supported by steel sets (comprising 500WC383 horizontal beams and vertical UC305x305x137 posts), with steel mesh reinforced shotcrete and face support. The canopy tubes will be 323.9 mm diameter with a wall thickness of 12.7 mm. The reinforced shotcrete lining is to be 200 mm thick on the walls and 150 mm thick on the roof.

The ground surrounding the canopy tubes, including any alluvial sand and residual clay, will be grouted at least 1 m in each direction, prior to and during the tunnel excavation.

The permanent support of the tunnel comprises a 900 mm thick reinforced or post tensioned concrete roof and 600 mm thick reinforced concrete walls. The steel sets (i.e. 500 WC 383 beams and UC305x305x137 posts) will be removed after the permanent support is installed.

Detailed tunnel support design and the construction sequences are illustrated in the drawings prepared by NOMA Consulting, copies of which are attached in Appendix B.

6.4 Breakthrough to Neighbouring Basement (Model 2)

It is understood that similar tunnels will be constructed from neighbours' future basements and connected to the Link Tunnel to the south and west via breakthroughs in the Link Tunnel side walls. The design of these future tunnels has not been finalised, but the following preliminary details have been assumed:

- South breakthrough tunnel (to Dexus Fraser site): This tunnel is currently proposed to be excavated via a breakthrough in the tunnel end wall and is to be aligned approximately north south. This tunnel is currently proposed to be 8.0 m wide and 4.8 m high above its finished floor level.
- West breakthrough tunnel (to Toga site): This tunnel is currently proposed to be excavated via a breakthrough in the tunnel eastern wall and is to be aligned approximately east west. This tunnel is currently proposed to be 6.5 m wide and 4.0 m high above its finished floor level.

Both breakthrough tunnels were modelled as 20 m long with no future neighbouring basements explicitly modelled. For more details of these breakthrough tunnels refer to Drawing M5 in Appendix C.

It is understood that the future tunnels' finished floor level will be at the same level as the Link Tunnel finished floor level, hence in the analysis a factored bulk excavation level of RL 3.1 m (i.e. same as Link Tunnel) was adopted for these future breakthrough tunnels.

The structural details of the future tunnels support and excavation scheme are not finalised, therefore in the analysis each of the future tunnels were excavated in one stage with permanent lining 'wished in place' at same stage. The breakthrough tunnels' floor, roof and wall linings were assumed to be 450 mm thick plate elements with long term elastic modulus of 18.7 GPa.

6.5 Proposed Underpinnings, Temporary Works and Construction Activities

Based on the information provided by TTW, structural engineers, and BOJV, it is understood that the following works and construction activities will occur next to the TfNSW Assets or within their zone of influence:

- Central Building footing will be underpinned to sandstone bedrock before the basement excavation in the north eastern area.
- Baggage Tunnel portal will temporarily be supported until the basement permanent wall is constructed. The temporary support will comprise trench box walls and a steel frame (comprising horizontal, vertical and diagonal WC40b, UB, and UC members) with the frame footing underpinned to sandstone bedrock. It is understood that the Baggage Tunnel slab and ceiling will locally be demolished to install the frame column and footing. The details of the Baggage Tunnel footing and ceiling is pending further investigation. Temporary reaction of the Baggage Tunnel support is to be resisted by the north eastern shoring walls.
- Mobile Crane set up on Ambulance Avenue at RL 15.3 m AHD with about 9.5 m offset from the northern shoring walls

7. Numerical Modelling

7.1 Methodology

The numerical analysis was undertaken using PLAXIS 3D (V21), a three-dimensional finite element program. PLAXIS 3D is a program used for modelling of soil, rock and structural behaviour. PLAXIS is ideally suited for modelling geotechnical problems that consist of several stages, such as sequential excavation, loading and unloading.

7.2 Key Assumptions

The following inputs and key assumptions have been adopted for the geotechnical analysis:

- The geometrical and structural properties of the basement shoring elements were determined from the properties for the shoring piles, capping beams, and anchors provided on the shoring drawings by TTW;
- Locations, levels, and dimensions of the existing assets were extracted from Drawings provided by TTW;
- The ground has been modelled as a continuum. The rock mass modulus values adopted in the numerical modelling are lower than the typical intact rock values, in order to take into account jointing and other rock defects.
- The Basement 1 and lower ground floor slabs were modelled as elastic plate elements with a long-term elastic modulus of 25 GPa;
- The upper ground floor slab was modelled as fixed end anchors with a long-term elastic modulus of 25 GPa;
- The capping beams were modelled as elastic beam elements with a long-term elastic modulus of 25 GPa;

- An elastic material model was adopted for all basement structural elements. It is assumed that the structural members have been designed to behave elastically for the serviceability limit-state condition;
- A 0.75 m offset was adopted for the surcharge loads behind the eastern and northern shoring walls;
- All shoring walls are designed to be 'drained' during bulk excavation and in the long term except the southern shoring walls within the Link Tunnel Zone. This shoring wall is designed to be 'drained' during bulk excavation, until the soil / rock surrounding the B2 Access Tunnel is grouted and water proofing is applied then this localised area will become watertight;
- The Link Tunnel will be drained during construction until the soil and rock surrounding the Link Tunnel is grouted and water proofing is applied, and this localised area will become watertight, therefore the Link Tunnel was analysed as drained (i.e. no hydrostatic pressure around the tunnel) during construction and long-term water table at RL 13.0 was adopted after the Link Tunnel construction is complete and permanent lining is in place (Model 1);
- An accidental rise of groundwater table within the highly permeable soil layers (i.e. fill and alluvium) has been also adopted to account for potential flooding and blockage of drainage between shoring piles, which was adopted in the long-term case with water table at RL 15.2 m (Model 2);
- In the 3D Model 1, the temporary lateral supports of southern shoring structures for the basement were not explicitly modelled and the side faces of the excavation were kept stable in the model by using an elastic material model for the soil and weak rock behind these shoring walls.
- In the 3D model 2, the temporary lateral supports of the eastern and northern shoring structures for the basement were not explicitly modelled and the side faces of the excavation were kept stable in the model by using an elastic material model for the soil and weak rock behind these shoring walls

7.3 Geotechnical Profile and Parameters

The geotechnical parameters used in the analyses have been derived from past experience, published data, and site investigations undertaken by DP (Reports Ref: 86767.00.R.006.Rev5).

The geotechnical parameters and model adopted for each of the geotechnical units are summarised in Table 3 and Table 4.

Table 3: Adopted Geotechnical Material Parameters

Unit	Material	Material Model	E' (MPa)	E_{ur} (MPa)	ν_{ur}	ν	γ (kN/m^3)	c' (kPa)	c_u (kPa)	ϕ' (deg)
1a	FILL/very loose Sand/soft Clay (2) (Model 2)	Hardening Soil	10	30	0.2	-	18	0	-	28
1b	Fill material below Central Station platforms and tracks and Ambulance Avenue (Model 1)		20	60	0.2	-	18	2	-	30
2	vst-h Residual CLAY or EL Sandstone(3)		20	60	0.2	--	20	3	-	25
3	M Sandstone	Mohr coulomb - drained	3,000	-	-	0.2	24	300	-	40
4	H Sandstone		3,000	-	-	0.2	24	1,500	-	40
*	Treated Soil Surrounding Link Tunnel Roof	Mohr coulomb - Undrained	150	-	-	0.5	20	-	300	-

Notes: E' = Young's Modulus , ν = Poisson's Ratio, γ = unit weight, c' = drained cohesion, c_u = undrained cohesion
ϕ' = drained friction angle, vst-h = Very Stiff to Hard, EL = Extremely Low Strength; M = Medium strength, H = High Strength
(2) Fill and alluvial sand were combined as one unit in the model for simplicity
(3) residual clay and extremely low strength sandstone were combined as one unit in the model for simplicity

Table 4: Adopted Geotechnical Profile in PLAXIS 3D models

Unit	Material	Model 1 - Northern and Eastern Area (Ambulance Avenue and Central Station)	Model 2 - Southern Area (Link Tunnel)
		Top RL (m, AHD)	Top RL (m, AHD)
1a	FILL/very loose Sand/soft Clay	-	21.4
1b	FILL material below Central Station and Ambulance Avenue	21.4	-
2	vst-h Residual CLAY or EL Sandstone	13.2	13.2
3	M Sandstone	10.6	10.6
4	H Sandstone	0.0	0.0

For simplicity, the geotechnical strata were assumed to be horizontal across each of the models.

Virtually no inclined jointing or fracturing was observed in the rock core samples of the Hawkesbury sandstone during the geotechnical investigations, therefore the medium and high strength sandstone has been modelled as Mohr-Coulomb rock mass model with no explicit modelling of adverse rock defects. Geotechnical inspections will be carried out during the rock excavation to identify the presence

of any adverse rock defects and stabilisation measures such as rock bolts or anchors will be undertaken where necessary.

7.4 In-situ stress

The following in-situ stress relationships have been adopted for the medium strength and high strength bedrock on the site to generate in situ stress values similar to the recommended rock stress relationship by Oliveira and Parker (2014)[1] ($\sigma_1 = 1.2 + 3.8 \times \sigma_v$ (MPa)).

$\sigma_{h\,(NS)} = 8.0 \times \sigma_v$
$\sigma_{h\,(EW)} = 5.6 \times \sigma_v$
$\sigma_v = \gamma \times H$

where,

$\sigma_{h\,(NS)}$	= horizontal stress in north-south direction (major horizontal in-situ stress direction)
$\sigma_{h\,(EW)}$	= horizontal stress in east-west direction
σ_v	= vertical stress in y direction
γ	= unit weight (kN/m^3)
H	= depth below surface (m)

The initial horizontal stresses in the soils were calculated by applying the 'at-rest' earth pressure coefficient K_0 (i.e. $\sigma_h = K_0 \times \sigma_v$). Values of $K_0 = 0.5$ and $K_0 = 0.6$ were adopted for the fill/alluvial soil, and residual clay respectively.

7.5 Earthquake Loading

The earthquake loading was analysed using a pseudo-static method in accordance with Appendix I of AS 4678-2002 "Earth-retaining Structures", assuming a structure importance level of 3 and an AEP of 1/500. In addition to the long term case, the earthquake loading was also applied during the temporary anchoring stage, to satisfy the conditions of the "Rock Anchor Concession" imposed by TfNSW (ref: SW0108:2021).

The horizontal coefficient of acceleration (a_h) was defined using:

$a_h = 1.0 \times a \times S$

where: a = peak ground acceleration coefficient for deep rock motions from AS 1170.4 was taken as 0.08 for Sydney region.

S = site factor and was taken as 1.375 for the site (interpolation between Ce and De site).

The vertical coefficient of acceleration was taken as zero.

In accordance with Section 3 of AS 5100.3-2017, for soil-supporting structures where the loads are imposed predominantly from the soil and rock, the design loads and other actions should be combined

[1] Oliveira, D A F and Parker, C J, 2014. An alternative approach for assessing in situ stresses in Sydney, in Proceedings 15th Australasian Tunnelling Conference 2014, pp 189-194 (The Australasian Institute of Mining and Metallurgy: Melbourne).

with a load factor of 1.0 for each of these loads. The load factor is applicable for both strength load cases (eg. earthquake, or accidental high water pressure from a burst watermain or similar) and serviceability load cases.
In accordance with Section 2 of AS 5100.3-2017, the soil and rock parameters are unfactored in the geotechnical analysis in determining the design action effects.

7.6 Model Geometry and Structural Elements

The idealised model geometry analysed is shown on Drawings M1 to M8, which are attached in Appendix C.

Table 5 to Table 8 detail the surcharge loads adopted in the analyses. A summary of the shoring walls geometry is given in Table 9.

More details of the proposed shoring walls and lateral support are provided in Table 10 and Table 11.

Properties and parameters of other various components adopted in the numerical model are summarised in Table 12 to Table 15.

Table 5: Adopted Surcharge Loads – Model 1

Description	Surcharge Location	Load (kN/m/m)	RL (m, AHD)	Offset from Shoring Wall/Excavation (m)[2]	Analysis Stage
General	Behind SW2	10	15.3	0.7	Existing Conditions
Construction		20	15.3	0.7	All (except for existing conditions)
Mobile Crane		28	15.3	9.5	Mobile Crane Stage
Central Building Surcharge	Behind SW3 and SW4	45	15.3	0.7	From Existing Conditions stage until before Underpinning Works (stage 7)
Central Building (slab on ground)		10	15.3	0.7	From Stage 7 and onward
Central Building (underpinning)		35	10.6	0.7	
Central Station Platform 01	Behind SW3, SW5_1 to SW5_3, and SW7	25*	21.4	SW3: 12.4 SW5_1 to SW5_3: 3.0 SW7: 0.8	All
Other platforms		10	21.4	SW3: 27.6 SW5_1 to SW5_3:18.2 SW7: 16.0	
Train Loads		85	21.4	SW3: 18.6 SW5_1 to SW5_3: 9.2 SW7: 7.0	
Baggage Tunnel temporary Support	Behind SW4	345	10.6	0.2	From Stage 7 until permanent slabs are installed
Baggage Tunnel Slab	Behind SW5_1	10	14.0	nil	From Existing Conditions stage until before Temporary Works (stage 7) and after permanent slabs are installed
		20	14.0		From Stage 7 until permanent slabs are installed
Baggage Tunnel Temporary Support Lateral Pressure	Behind SW5_2	From RL 21.4 to RL 19.1: 5 kPa to 43 kPa (Linearly increasing) From RL 19.1 to RL 18.1: 43 kPa to 20 kPa (Linearly decreasing)	21.4 to 18.1	-	From Stage 7 until permanent slabs are installed
Baggage Lift		20	14.0	0.7	All
General (between the platform and shoring wall)	Behind SW5_3	10	21.4	0.7	All

Note * platform surcharge comprises 10kPa general surcharge and 15kPa platform concrete surcharge above modelled ground

Table 6: Construction Equipment and Baggage Tunnel Temporary Works Surcharge Dimensions in Plan – Model 1

Description	Bearing Plate Dimensions (width (m) x length (m))	Load (kPa)
Mobile Crane	2.7 x 10.5 (2 x plates)	28.0
Baggage Tunnel Support Footing	0.5 x 2.0	345

Table 7: Adopted Surcharge Loads – Model 2

Analysis Stage	Description	Location	RL (m AHD)	Offset from Shoring Wall (m)
All Stages	General 10 kPa Surcharge	Behind the southern shoring walls and up to model boundary (except for locations where construction loads are applied)	16.4	0.75
Stage 3	Piling Rig Surcharge	Within the basement footprint and in front of eastern shoring wall	21.4	1.2
Stage 4	Excavator Surcharge	Within the basement footprint and in front of eastern shoring wall		1.2

Analysis Stage	Description	Location	RL (m AHD)	Offset from Shoring Wall (m)
Stage 6	Piling Rig Surcharge	Within the basement footprint and in front of southern shoring wall (eastern part)	16.4	1.2
Stage 7		Within the basement footprint and in front of southern shoring wall (western part)		1.2
Stage 8	Excavator Surcharge	On DST Slab (Behind southern shoring walls)		1.2
Stage 9		Within the basement footprint and in front of southern shoring wall (western part)		1.2
Stage 10		Within the basement footprint and in front of southern shoring wall (eastern part)		1.2

Table 8: Construction Equipment Surcharge Dimensions in Plan – Model 2

Description	Dimensions (width (m) x length (m))	Load (kPa)
Piling Rig Surcharge	4.7 x 5.7	35.5
Excavator	2.4 x 5.3	40.0

Table 9: Adopted Basement Shoring Wall Geometry

Comments	Shoring Wall ID	Location	Pile Spacing (m, Centres)	Capping Beam Level (RL m AHD) (4)	Factored BEL(5) (RL m AHD)
Refer to Note (1)	SW2	Along the northern boundary	1.8	15.3	4.0
	SW3				
	SW4				
	SW5_1	Along the eastern boundary	From RL 15.3 to RL 4.0: 0.9 (Short Piles) From RL 4.0 to RL 3.0: 2.7 (Long Piles)	14.0	
	SW5_2_900mm		1.05	21.4	
	SW5_2_750mm and SW5_3		From Capping Beam to RL 9.2: 0.9 (Short Piles) From RL 9.2 to RL 3.0: 2.7 (Long Piles)		
	SW6		From Capping Beam to RL 10.8: 0.9 (Short Piles) From RL 10.8 to RL 3.0: 1.8 (Long Piles)		
	SW7		From Capping Beam to RL 8.0: 0.9 (Short Piles) From RL 8.0 to RL 3.0: 2.7 (Long Piles)		
Refer to Note (2)	SW8	Along the southern boundary	0.9 – 1.85	16.4	
	SW8A_1				
	SW8A_2				
	SW11	Along the western boundary	N.A.(3)	15.3	

Notes: (1) TfNSW Assets that are located within the zone of Influence of excavation in front of these walls are analysed in Model 1
(2) TfNSW Assets that are located within the zone of Influence of excavation in front of these walls are analysed in Model 2
(3) This shoring wall comprises reinforced shotcrete wall to be poured against rock
(4) RLs based on the drawings provided by TTW.
(5) The factored bulk excavation level (fBEL) was assumed as the lowest basement slab surface level minus assumed slab thickness (0.5 m) and additional 0.5 m to account for disturbance and accidental over-excavation;

All piles in SW2 to SW4 and long piles in SW5_1 to SW8 extend to at least 1.5m below bulk excavation level.

Table 10: Summary of the Shoring Walls Details

Shoring Wall ID	Temporary Anchor Levels (RL m AHD)	Number of Anchor Strands[1]	Lock-off Load (kN) (% working capacity)	Temporary Toe Bolt Levels	Long Term Floor Slab / Propping to Wall level (m)[2]
SW2	1st Row: 12.4	1st Row: 4 2nd Row (if applicable): 4	1st Row: 480 (80%) 2nd Row (if applicable): 480 (80%)	N.A.	Lower Ground (LG): 15.3 Basement 1 (B1): 10.3
SW3	1st Row: 11.3				
SW4	1st Row: 11.3				
SW5_1[3]	1st Row: 11.3				Lower Ground (LG): 15.3
SW5_2	1st Row: 14.3 2nd Row: 11.3			9.7	UG: 21.4 LG: 15.3
SW5_3	1st Row: 17.5 2nd Row: 11.3				
SW6	-			11.3	UG: 21.4 LG: 15.3 B1: 10.3
SW7	1st Row: 17.5 2nd Row: 11.3			8.5	
SW8 and SW8A_1	1st Row: 11.7	1st Row: 4	1st Row: 480 (80%)	N.A.	LG: 15.3 B1: 10.3
SW8A_2		1st Row: 5	1st Row: 600 (80%)		

Notes: (1) Number of strands based on 15.2 mm Super-strands and governed by 'disturbing force' associated with the induced lateral pressure within the fill material and weak rock behind the wall;
(2) the slabs were assumed to be 200mm thick with axial stiffness of 5 x 10^5 kN/m^2;
(3) The retaining wall of Baggage Tunnel support above SW5_1 will also be supported by UG at RL 21.4

Table 11: Adopted Parameters for Shoring Pile Walls

Shoring Wall ID	Requirements/Explanation	Input adopted	
		Short Term Values for Pile Stiffnesses[1] (MN. m²/m)	Long Term Values for Pile Stiffnesses[1],[2] (MN. m²/m)
SW2, SW3, and SW4	750 mm diameter pile with 1,800 mm spacing centre-to centre (c/c)	EI_{1w} = 227.5 EI_{2w} = 1.8	EI_{1w} = 136.5 EI_{2w} = 1.1
SW5_1	From RL 15.3 to RL 9.2 (SW5_1_top): 750 mm diameter pile with 900 mm spacing centre-to centre (c/c) From RL 9.2 to RL 2.85 (SW5_1_bot): 750 mm diameter pile with 2,700 mm spacing centre-to centre (c/c)	SW5_1_top: EI_{1w} = 455 SW5_1_top: EI_{2w} = 1.8 SW5_1_bot: EI_{1w} = 152 SW5_1_bot: EI_{2w} = 1.8	SW5_1_top: EI_{1w} = 273 SW5_1_top: EI_{2w} = 1.1 SW5_1_bot: EI_{2w} = 91 SW5_1_bot: EI_{2w} = 1.1
SW5_2_900mm	Based on 900 mm diameter pile with 1,050 mm spacing centre-to centre (c/c)	EI_w = 390 EI_w = 1.8	EI_{1w} = 234 EI_{2w} = 1.1
SW5_2_750mm and SW5_3	From RL 21.4 to RL 9.2 (SW5_2_top): 750 mm diameter pile with 900 mm spacing centre-to centre (c/c) From RL 9.2 to RL 2.85 (SW5_2_bot): 750 mm diameter pile with 2,700 mm spacing centre-to centre (c/c)	SW5_3_top: EI_{1w} = 455 SW5_3_top: EI_{2w} = 1.8 SW5_3_bot: EI_{1w} = 152 SW5_3_bot: EI_{2w} = 1.8	SW5_3_top: EI_{1w} = 273 SW5_3_top: EI_{2w} = 1.1 SW5_3_bot: EI_{1w} = 91 SW5_3_bot: EI_{2w} = 1.1
SW7	From RL 21.4 to RL 8.0 (SW7_top): 750 mm diameter pile with 900 mm spacing centre-to centre (c/c) From RL 8.0 to RL 2.85 (SW7_bot): 750 mm diameter pile with 2,700 mm spacing centre-to centre (c/c)	SW7_top: EI_{1w} =455 SW7_top: EI_{2w} = 1.8 SW7_bot: EI_{1w} = 151.7 SW7_bot: EI_{1w} = 1.8	SW7_top: EI_{1w} = 273 SW7_top: EI_{2w} = 1.1 SW5_1_bot: EI_{1w} = 91.0 SW5_1_bot: EI_{2w} = 1.1
SW8, SW8A_1	750 mm diameter pile with 900 mm spacing centre-to centre (c/c)	EI_{1w} = 455 EI_{2w} = 1.8	EI_{1w} = 273 EI_{2w} = 1.1
SW8A_2	750 mm diameter pile with 1,850 mm spacing centre-to centre (c/c)	EI_{1w} = 221 EI_{2w} = 1.8	EI_{1w} = 133 EI_{2w} = 1.1

Notes (1) the pile stiffness for both short term and long term cases were provided by TTW
(2) The long-term values (ie. 60% of short-term values) for pile stiffnesses are applied for the final stage of the model

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Table 12: Adopted Parameters for the Shoring Walls Beam Elements (Capping Beams and Walers)

Shoring Wall ID	Structural (Beam) Element	Input adopted
SW2, SW3, SW4, SW8	CB8 (1520 x 500)	E = 2.5E+03 MPa A = 0.76 m^2 I_2 = 9.51E-02 m^4 I_3 = 1.03E-02 m^4
SW5, SW6	CB4 (1500 x 650)	E = 2.5E+03 MPa A = 0.98 m^2 I_2 = 1.19E-01 m^4 I_3 = 2.23E-02 m^4
SW7	CB5 (1900 x 650)	E = 2.5E+03 MPa A = 1.23 m^2 I_2 = 2.41E-01 m^4 I_3 = 2.83E-02 m^4
SW2 to SW7 (except SW5)	Waler 250 PFC	E = 2.0E+05 MPa A = 4.52E-03 m^2 I_2 = 4.51E-05 m^4 I_3 = 3.64E-06 m^4
SW8	Waler 2/250 PFC	E = 2.0E+05 MPa A = 9.04E-03 m^2 I_2 = 9.02E-05 m^4 I_3 = 4.14E-05 m^4

Notes: E = Young's Modulus; D = Diameter, A = Cross Section Area, I_2 = section second moment of inertia around major axis, I_3 = section second moment of inertia around minor axis

Table 13: Primary and Permanent Support Details of the Link Tunnel

Type of Support	Structural Elements	Proposed Section and Material	Pattern Of Canopy Tubes (1)	'Centre to Centre' Spacing(1)
Primary and Permanent	Canopy Tubes on the tunnel roof span	concrete filled ϕ323.9 x 12.7 mm steel tube tubes	triple tubes with 0.6 m centre to centre spacing	1.85 m between each triple canopy tube set
	Canopy Tubes on the eastern edge of the tunnel roof		single tube	-
Primary	Steel Set - Beams	500 WC 383	-	2.5 m -3.0 m
	Steel Set - Posts	UC305x305x137		3 m x 4 m
Permanent	Tunnel Roof Slab	900 mm thick reinforced or post tensioned concrete		-
	Tunnel face and side walls	600 mm thick reinforced concrete		-

Notes (1) for more details of the geometry of the structures refer to Link Tunnel mark-up drawing in Appendix B.

Table 14: Adopted Parameters for Link Tunnel Primary Support

Structural Element	Input adopted
Concrete Infilled Canopy Tubes	E_eq = 2.0E+05 MPa I_eq = 1.973E-04 m^4
Steel Set - Beam	E = 2.0E+05 MPa A = 0.0488 m^2 I_2 = 1.89E-03 m^4 I_3 = 7.51E-04 m^4
Steel Set - Post	EA = 3.49E+03 MPa
Tunnel Roof Slab (post tensioned reinforced concrete)	t = 900 mm E = 36.27 E+03 MPa
Tunnel side walls (reinforced concrete)	t = 600 mm E = 18.7 E+03 MPa

Notes: E_eq = equivalent Young's Modulus of composite section; I_eq = equivalent composite section second moment of inertia; A = Cross Section Area; I_2 = section second moment of inertia around major axis; I_3 = section second moment of inertia around minor axis; t = Thickness.

Table 15: Adopted Parameters for TfNSW Assets and Adjacent Structures

Asset	Input adopted
Central Building	• Slab on ground level: RL15.3

Baggage Tunnel	• Base Slab Level: RL 14.0
	• Ceiling Level: RL 18.6
	• Tunnel Lining Plates:
	  ○ E = 25.0 E+03MPa
	  ○ t = 200 mm
	• Tunnel Temporary Support Plate:
	  ○ E = 25.0 E+03MPa
	  ○ t = 600 mm

Baggage Lift	• Base Slab Level: RL 14.0
	• Lift Box Lining Plates:
	  ○ E = 25.0 E+03MPa
	  ○ t = 200 mm

Platform 01	• Concrete Volume Element for Platform Base:
	  ○ Elevation: from RL 21.4 to RL 21.0
	  ○ E = 25.0 E+03MPa
	  ○ t = 400 mm

Devonshire Pedestrian Tunnel Slab	• Slab Level: RL 16.4 • E = 25.0 E+03MPa • t = 600 mm

Devonshire Pedestrian Tunnel Lining	• Ceiling Level: RL 21.4
	• Tunnel Lining Plates:
	  ○ E = 25.0 E+03MPa
	  ○ t = 500 mm

7.7 Modelling Sequence

The analysis has been carried out assuming a simplified construction staging based on the supplied information.

Table 16 and Table 17 show the general construction stages adopted for the analyses in Models 1 and 2, respectively.

Table 16: Adopted Construction Stages – Model 1

Construction Phase	Description
1	Set up geology, geometry and initial stress conditions
2	Activate the existing conditions (i.e. surcharges, existing lower ground floor, Baggage Tunnel, Platform 01)
3	Reset displacements, activate the eastern shoring piles (with short-term cracked moduli) and their capping beams
4	Excavate the existing ground surface down to RL 16.4 and activate Baggage Tunnel retaining wall and lateral support load behind SW5_2_900mm (Stage E1)
5	install and prestress the first row of anchors for SW5_3 and SW7 (at RL 17.5)
6	Excavate to RL 15.3 (Stage E2)
7	Activate the northern shoring piles (with short-term cracked moduli) and their capping beams and increase Ambulance Avenue Surcharge to 20 kPa (general construction surcharge)
8	• Central Building underpinning (35kPa of total surcharge of 45 kPa from Central Building superstructure transferred to bedrock) • apply Baggage Tunnel temporary support loads (i.e. underpinning to rock behind SW4 (350 kPa surcharge) • Increase Baggage Tunnel slab surcharge to 20 kPa (general construction surcharge)
9	Excavate to maximum 1 m below next row of anchors (SW5_2 anchors at RL 14.3) (Stage E3)
10	Install and prestress SW5_2 first row of anchors
11	Excavate to maximum 1 m below next row of anchors (SW2 anchors at RL 12.4) (Stage E4)
12	Install and prestress SW2 single row of anchors
13	Excavate to maximum 1 m below next row of anchors at RL 11.3 (first row for SW3, SW4, SW5_1 and second row for SW5_2, SW5_3, SW7) (Stage E5)
14	Install first row for SW3, SW4, SW5_1 and second row for SW5_2, SW5_3, SW7 and corresponding walers. Install SW6 toe bolt
15	Excavate to RL 9.2 m (maximum 0.5 m below SW5 toe bolts) (Stage E6)
16	Install SW5 toe bolts
17	Excavate to RL 8.0 m (maximum 0.5 m below SW7 toe bolts) (Stage E7)
18	Install SW7 toe bolts
19	Complete the excavation to fBEL

Construction Phase	Description
19_1	Apply horizontal ground acceleration of 0.11g in north-south direction (earthquake loading as per the Anchor Concession conditions of TfNSW for Shoring Walls SW2 to SW4 and SW6)
19_2	Apply horizontal ground acceleration of 0.11g in east-west direction (earthquake loading as per the Anchor Concession conditions of TfNSW for eastern Shoring Walls SW3, SW5 and SW7)
20	Apply mobile crane surcharge behind SW2 (i.e. 2 x 28 kPa)
21	Install basement 1, lower ground, and upper ground floor slabs (Permanent supports for the basement)
22	Remove Baggage Tunnel temporary works loads and surcharges.
23	Destress the anchors and toe bolts
24	Change the shoring wall stiffness to long term cracked moduli
25_1	Increase the water level within fill and alluvium to RL 15.2
25_2	Apply horizontal ground acceleration of 0.11g in east-west direction
25_3	Apply horizontal ground acceleration of 0.11g in north-south direction

Table 17: Adopted Construction Stages – Model 2

Construction Phase	Description
1	Set up geology, geometry and initial stress conditions
2	Activate the existing conditions (i.e. surcharges, existing lower ground floor, Sydney Water Assets, and Devonshire Slab)
3	Reset displacements, apply piling rig load surcharge within the basement footprint at RL 21.4 to install the eastern shoring walls (in the southeastern corner)
4	Activate the eastern shoring piles (with short-term cracked moduli) and their capping beams, apply excavator surcharge within the basement footprint at RL 21.4 (on the south-eastern corner)
5	Excavate the existing ground surface down to RL 16.4
6	Apply piling rig load surcharge within the basement footprint at RL 16.4 to install the southern shoring walls (the south-eastern part)
7	Apply piling rig load surcharge within the basement footprint at RL 16.4 to install the southern shoring walls (the south western part)
8	Activate the southern shoring piles (with short-term cracked moduli) and their capping beams, apply excavator surcharge on DST slab
9	Apply excavator surcharge within the basement footprint at RL 16.4 (on the southwestern corner)
10	Apply excavator surcharge within the basement footprint at RL 16.4 (in the south-eastern corner)
11	Excavate to a maximum depth of 1 m below the first row of anchors

Construction Phase	Description
12	Instal walers and install and prestress the anchors
13	Complete the excavation to fBEL
13_1	Apply horizontal ground acceleration of 0.11g in north-south direction (earthquake loading as per the Anchor Concession conditions of TfNSW for Shoring Wall SW8)
14	Change the material of the Link Tunnel roof (RL10.6 to RL 9.4 at the Link Tunnel zone) to treated ground material and install the canopy tubes
15	Install basement 1 and lower ground floor slabs (Permanent supports for the basement)
16	Destress the anchors
17	Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone
18	Excavate the first stage of the Link Tunnel (1 m advance)
19	Install first row of steel set support
20	Excavate the second stage of the Link Tunnel (2 m advance)
21	Install second row of steel set support
22	Excavate the third stage of the Link Tunnel (2 m advance)
23	Install third row of steel set support
24	Excavate the fourth stage of the Link Tunnel (2 m advance)
25	Install 4th row of steel set support
26	Excavate the fifth stage of the Link Tunnel (2 m advance)
27	Install 5th row of steel set support
28	Complete the Link Tunnel excavation to the end wall (up to 2.5 m advance)
29	Install tunnel permanent roof and base slabs and side walls
30	Remove temporary steel sets
31	Change the surcharge behind the shoring walls and above the tunnel zone to 30 kPa (part of Devonshire Tunnel protection works)
32	Change the shoring wall stiffness to long term cracked moduli and apply water table at RL 13.0
32_1	Apply horizontal ground acceleration of 0.11g in north-south direction (for pseudostatic analysis of Shoring Wall SW8 in the long term)
32_2	Apply horizontal ground acceleration of 0.11g in east-west direction (for pseudostatic analysis of western excavation face in the long term)
33	Excavate south breakthrough tunnel and activate permanent lining
34	Excavate west breakthrough tunnel and activate permanent lining

7.8 Modelling Results

The results of the modelling are illustrated on the following plots included in Appendix C:

- Drawing M1 to M8 - Plots showing different views of the PLAXIS 3D model;
- Drawings M9 to M52 - Plots of predicted displacements for Model 1;
- Drawings M53 to M92 - Plots of predicted displacements for Model 2

The results of the numerical analysis for various stages are summarised in Table 18 to Table 24.

Table 18: Predicted Maximum Total Displacements at Central Building

Stage	Maximum Vertical Displacement (mm)	Maximum Total Displacement (mm)
Stage 9 (E3)	<1	<1
Stage 11 (E4)	<1	<2
Stage 13 (E5)	<1	2
Stage 15 (E6)	<1	4
Stage 17 (E7)	<1	6
Stage 19 (fBEL)	2	11
Stage 19_1 (earthquake loading on anchors in east-west direction)	2	13
Stage 19_2 (earthquake loading on anchors in north-south direction)	2	13
Stage 20 (Mobile Crane)	2	11
Stage 23 (Decommission the Anchors)	2	12
Stage 24 (Pile long term stiffness)	2	12
Stage 25_1 Water Rise	2	12
Stage 25_2 (horizontal ground acceleration in east-west direction)	2	13
Stage 25_3 (horizontal ground acceleration in north-south direction)	2	13

Note: The displacements have been rounded to the closest 1 mm.
Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

Table 19: Predicted Maximum Differential Displacements at Central Building

Stage	Maximum Total Differential Displacement (mm) – East West Direction	Maximum Total Differential Displacement (mm) – North South Direction
Stage 9 (E3)	<1	<1
Stage 11 (E4)	<1	<1
Stage 13 (E5)	1	1
Stage 15 (E6)	2	2
Stage 17 (E7)	3	3
Stage 19 (fBEL)	5	4
Stage 19_1 (earthquake loading on anchors in east-west direction)	5	5
Stage 19_2 (earthquake loading on anchors in north-south direction)	5	4
Stage 20 (Mobile Crane)	5	4
Stage 23 (Decommission the Anchors)	5	4
Stage 24 (Pile long term stiffness)	5	4
Stage 25_1 Water Rise	5	4
Stage 25_2 (horizontal ground acceleration in east-west direction)	6	5
Stage 25_3 (horizontal ground acceleration in north-south direction)	6	5

Note: The displacements have been rounded to the closest 1 mm.

Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

Table 20: Predicted Maximum Displacements at Railway Track

Stage	Maximum Vertical Displacement (mm)	Maximum Horizontal Displacement (East-west direction) (mm)	Maximum Total Displacement (mm)
Stage 4 (E1)	4	7	8
Stage 6 (E2)	5	1	5
Stage 9 (E3)	5	2	5
Stage 11 (E4)	5	2	5
Stage 13 (E5)	5	2	5
Stage 15 (E6)	5	3	6
Stage 17 (E7)	5	4	6
Stage 19 (fBEL)	7	8	10
Stage 19_1 (earthquake loading on anchors in east-west direction)	9	15	18
Stage 19_2 (earthquake loading on anchors in north-south direction)	8	8	13
Stage 23 (Decommission the Anchors)	10	11	15
Stage 24 (Pile long term stiffness)	10	11	15
Stage 25_1 Water Rise	10	11	15
Stage 25_2 (horizontal ground acceleration in east-west direction)	13	17	21
Stage 25_3 (horizontal ground acceleration in north-south direction)	12	11	18

Note: The displacements have been rounded to the closest 1 mm.

Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

Table 21: Predicted Maximum Displacements at Platform 01

Stage	Maximum Vertical Displacement (mm)	Maximum Horizontal Displacement (East-west direction) (mm)	Maximum Total Displacement (mm)
Stage 4 (E1)	10	8	13
Stage 6 (E2)	10	2	10
Stage 9 (E3)	10	2	10
Stage 11 (E4)	10	2	10
Stage 13 (E5)	10	3	10
Stage 15 (E6)	10	3	10
Stage 17 (E7)	10	4	11
Stage 19 (fBEL)	11	8	13
Stage 19_1 (earthquake loading on anchors in east-west direction)	12	16	20
Stage 19_2 (earthquake loading on anchors in north-south direction)	11	8	16
Stage 23 (Decommission the Anchors)	13	11	17
Stage 24 (Pile long term stiffness)	13	11	17
Stage 25_1 Water Rise	13	11	17
Stage 25_2 (horizontal ground acceleration in east-west direction)	14	17	21
Stage 25_3 (horizontal ground acceleration in north-south direction)	13	11	19

Note: The displacements have been rounded to the closest 1 mm.

Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

Table 22: Predicted Maximum Displacements at Devonshire Tunnel Lining

Stage	Maximum Vertical Displacement (mm)	Maximum Total Displacement (mm)
Stage 8 - Excavator Surcharge on DST slab	<1	<1
Stage 11 - Excavate 1 m below the anchors	1	4
Stage 13 - Complete the excavation to fBEL	2	8
13_1 (earthquake loading on anchors in north-south direction)	5	25
Stage 16 - Destress the anchors	2	8
Stage 17 - Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone	2	8
Stage 28 - 6th (last) Tunnel excavation advance	2	8
Stage 30 - Remove steel sets	2	8
Stage 31 - Devonshire Tunnel Protection works (Temporary 30 kPa surcharge)	4	9
Stage 32 - Shoring Pile long term moduli and water table	2	9
32_1 - Apply horizontal ground acceleration of 0.11g in north-south direction	5	24
32_2 - Apply horizontal ground acceleration of 0.11g in east-west direction	3	12
Stage 33 - Southern Breakthrough Tunnel excavation permanent lining	2	9
Stage 34 - Western Breakthrough Tunnel excavation permanent lining	2	8

Note: The displacements have been rounded to the closest 1 mm.

Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

Table 23: Predicted Maximum Displacements at Devonshire Tunnel Slab

Stage	Maximum Vertical Displacement (mm)	Maximum Total Displacement (mm)
Stage 8 - Excavator Surcharge on DST slab	2	2
Stage 11 - Excavate 1 m below the anchors	4	6
Stage 13 - Complete the excavation to fBEL	6	14
Stage 13_1 – earthquake loading on anchors	8	20
Stage 16 - Destress the anchors	7	15
Stage 17 - Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone	7	16
Stage 28 - 6th (last) Tunnel excavation advance	11	19
Stage 30 - Remove steel sets	13	20
Stage 31 - Devonshire Tunnel Protection works (Temporary 30 kPa surcharge)	18	24
Stage 32 - Shoring Pile long term moduli and water table	14	21
32_1 - Apply horizontal ground acceleration of 0.11g in north-south direction	14	24
32_2 - Apply horizontal ground acceleration of 0.11g in east-west direction	14	23
Stage 33 - Southern Breakthrough Tunnel excavation permanent lining	14	21
Stage 34 - Western Breakthrough Tunnel excavation permanent lining	14	21

Note: The displacements have been rounded to the closest 1 mm.
Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

Table 24: Predicted Maximum Displacements at Adina Hotel Boundary Adjacent to The Basement one the West

Stage	Maximum Vertical Displacement (mm)	Maximum Total Displacement (mm)
Stage 9 - Excavator Surcharge on Southwestern Corner	<1	<1
Stage 11 - Excavate 1 m below the anchors	10	18
Stage 13 - Complete the excavation to fBEL	11	26
Stage 13_1 – earthquake loading on anchors	11	27
Stage 16 - Destress the anchors	11	27
Stage 17 - Remove the lower part of southern shoring wall	11	27
Stage 28 - 6th (last) Tunnel excavation advance	11	27
Stage 30 - Remove steel sets	11	27
Stage 32 - Shoring Pile long term moduli and water table	11	27
32_1 - Apply horizontal ground acceleration of 0.11g in north-south direction	11	27
32_2 - Apply horizontal ground acceleration of 0.11g in east-west direction	11	35
Stage 33 - Southern Breakthrough Tunnel excavation permanent lining	11	27
Stage 34 - Western Breakthrough Tunnel excavation permanent lining	11	27

Note: The displacements have been rounded to the closest 1 mm.

Grey-out values are not displacements in serviceability limit state, therefore not used for impact assessment.

8. Impact Assessment

8.1 Building Damage Category Assessment

A Potential Damage Category assessment for building structures has been undertaken in accordance with Burland's (2001) method (reproduced in CIRIA 760) that provides strain limits for continuous structures based on the acceptable damage criteria. The input of the excavation-induced ground movement profiles was taken using east-west and north-south 2D sections from the 3D ground displacement space contour of PLAXIS 3D modelling.

The Potential Damage Category assessment was undertaken assuming all structures are masonry structures. Some of the TfNSW assets surrounding the site are, for example, reinforced concrete-framed structures which are more flexible in shear and consequently less susceptible to damage. These structures have not been assessed separately.

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain, ε_{lim} (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	**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 to 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 to 0.15
3 Moderate	**The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.** Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 to 15 or a number of cracks >3	0.15 to 0.3
4 Severe	**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. Services pipes disrupted.	15 to 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 numbers of cracks	

Figure 1. Classification of visible damage to walls (Table 6.4 of CIRIA 760)

Table 25: Damage Category Evaluation of Assets

Asset	Maximum Predicted Settlement (mm)	Maximum Predicted Horizontal Displacement (mm)	Calculated Deflection Ratio (%) in NS and EW directions*	Differential settlement ratio (angular distortion) – for Slabs and Pavements**	Predicted Horizontal Strain	Damage Category	Critical Stage
Heritage Arch	3	12	EW: 0.03	-	EW: <0.05%	1- Very Slight	Bulk Excavation Level
Central Building	2	13	NS: 0.013 EW: 0.010	-	NS: 0.05% EW: <0.05%	2- Slight	Pile Long term Modulus
Baggage Tunnel	1	7	NS: 0.005 EW: 0.007	-	NS: < 0.05% EW: < 0.05%	1- Very Slight	Pile Long term Modulus
Baggage Lift Core	2	10	NS: 0.02 EW: 0.07	-	NS: <0.05% EW: 0.07%	2- Slight	Pile Long term Modulus
Platform 01	13	11	NS: 0.02 EW:0.09	-	NS: <0.05% EW: <0.05%	1- Very Slight	Pile Long term Modulus
Devonshire Tunnel	4	7	NS: 0.04 EW: 0.05	-	NS: <0.05% EW: < 0.05%	1- Very Slight	Devonshire Tunnel Protection Works
Devonshire Tunnel Slab/Henry Deanne Plaza	18	16	-	NS: 1:950 EW: <1:5,000	NS: < 0.05% EW: < 0.05%	**	Devonshire Tunnel Protection Works
Retail Area	2	8	-	NS: <1:5,000 EW: 1:5,000		**	Western Breakthrough
Adina Wall/Pool	2	9	NS: 0.01 EW: 0.03	-	NS: 0.08% EW: <0.05%	2- Slight	Western Breakthrough
Adina footing	1	15	NS: 0.01 EW: 0.01	-	NS: <0.05% EW: 0.09%	2- Slight	Western Breakthrough

* NS = North - South Direction ; EW = East - West Direction

**Burland's method is not applicable to pavements or slabs. A total settlement of less than 20 mm and a differential settlement ratio (angular distortion) of less than 1:500 is considered acceptable.

8.2 Performance criteria for the Nearest Track (UP MAIN)

The potential track deformations and recommended monitoring parameters and limits for the Railway Track have been assessed in accordance with the Assets Standard Authority (ASA) standard SPC 207 Track Monitoring Requirements for Undertrack Excavation as summarised in Figure 2.

Monitoring Parameters	Normal limits					
	Track Speed (Normal /XPT) km/hr					
	20/20	40/40	60/60	80/90	100/115	115/160
100% (ie the next mm down from) (Note 1)						
Top (4m)	27	24	21	18	14	14
Line (8m)	36	27	19	14	11	11
Short Twist (2m)	18	16	15	13	11	11
Long Twist (14m)	52	46	40	35	30	30
75% (Note 1)						
Top (4m)	23	21	18	16	12	12
Line (8m)	31	23	16	12	10	10
Short Twist (2m)	16	14	13	11	10	10
Long Twist (14m)	45	40	35	30	26	26
50% (minimum 6mm) (Note 1)						
Top (4m)	17	15	13	11	9	9
Line (8m)	22	17	12	9	7	7
Short Twist (2m)	11	10	9	8	7	7
Long Twist (14m)	32	28	24	21	18	18
25% (minimum 5mm) (Note 1)						
Top (4m)	14	12	11	9	7	7
Line (8m)	18	14	10	7	6	6
Short Twist (2m)	9	8	8	7	6	6
Long Twist (14m)	26	23	20	18	15	15

Note: 1. the levels are not proportional limits (i.e. 25% is not 25% of normal limits)

Table 2 - Normal limits for track monitoring

Alarm Level		
1	2	3
> 25% but ≤ 50% of Normal limit	> 50% but ≤ 75% of Normal limit	sudden movement > 50% of Normal limit

Table 3 - Default Alarm levels

Figure 2. Performance Criteria for Central Station Rail Track (Ref: RailCorp Engineering Specification – Track Monitoring Requirements for Undertrack Excavation)

Based on the predicted displacements summarised in Table 20, the maximum total movement of the track is predicted to be 15 mm. The maximum predicted settlement of the Track is 10 mm and the maximum predicted horizontal movement of the track is 11 mm.

Considering that the UP MAIN terminates at Central Station, a conservative speed limit of 40 km/hr has been used for the performance criteria. For this case, an Alarm Level of 1 is suggested with the 25% limit as a target value for monitoring rail deformations.

Table 26. Evaluation of A06 - UP MAIN

ASA SPC 207 Requirement	25% Limit Value (mm)	Predicted Value (mm)	Critical Stage
Top (Settlement)	12	10	Pile Long term Modulus
Line (Lateral Displacement)	14	11	
Short Twist (Differential Settlement)	8	5	

9. Summary

The impact assessment of the proposed development on the adjacent TfNSW assets has been carried out using detailed 3D finite element numerical modelling, with the induced settlements and lateral displacements (predicted by the modelling) assessed against relevant criteria (ASA SPC207 for railway track geometry and the Burland's method for building damage category).

The results of the modelling indicate that the impacts from the proposed development are likely to be very slight to slight to the adjacent TfNSW structures and the induced track geometry changes are likely to be below the 25% thresholds of the specified Normal track limits.

The detailed analysis indicates that the proposed development is unlikely to adversely impact the serviceability of the existing TfNSW assets.

10. Limitations

Douglas Partners (DP) has prepared this report for this project at 8-10 Lee Street, Haymarket in accordance with DP's proposal SYD190190.P.010.Rev0 dated 26 August 2021. The work was carried out as a variation to the existing contract negotiated between DP and Vertical First Pty Ltd for this project. This report is provided for the exclusive use of Atlassian Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are based on the sub-surface conditions interpreted from specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Extract Drawings

GENERAL NOTES

1. These drawings are for structural purposes only and are to be read in conjunction with the specification, architectural drawings, other contract documentation and the requirements of the relevant authorities.
2. Verify all setting out dimensions with the Architect.
3. Do not obtain dimensions by scaling the structural elements.
4. Should any ambiguity, error, omission, discrepancy, inconsistency or other fault exist or seem to exist in the contract documents, immediately notify in writing to the Superintendent.
5. Maintain the structure in a stable condition during construction. Temporary bracing/shoring shall be provided by the contractor to keep the structure and excavations stable at all times, ensuring that no part of the documented structure becomes overstressed. For all temporary batters obtain geotechnical engineer's recommendations.
6. All workmanship and materials shall be in accordance with the requirements of current Standards Australia codes and the bylaws, ordinances or other requirements of the relevant building authorities.
7. All proprietary items are to be installed and fixed in accordance with the manufacturers specifications and instructions.
8. All work is to be carried out in accordance with all Workcover requirements and occupational health and safety act regulations
9. Construction using these drawings shall not commence until a Construction Certificate is issued by the Principal Certifying Authority.

DESIGN LOADS:

Importance Level :
The importance level of Atlassian central is 3 as per NCC requirements, except for;
1. The rail corridor retaining structure which is importance level 4 to meet TfNSW requirements.
2. Wind and earthquake loading for the structure which is based on importance level 4 to meet TfNSW requirements.

Wind Loads : Vx = 48 m/s Where R = 2500 years
Region = A2
Terrain Category = 3

Earthquake Loads: Design Category = EDC III
Site Sub-soil class = Be
Hazard Factor Z = 0.08
Probability Factor kp = 1.8

SAFETY IN DESIGN

Taylor Thomson Whitting (NSW) Pty Ltd operates under Safe Work Australia's Code of Conduct for the Safe Design of Structures.
These drawings shall be read in conjunction with the Taylor Thomson Whitting Transfer of Information Letter and Structural Risk and Solutions Register.
Under the Code of Conduct it is the Client's responsibility to provide a copy of the Structural Risk and Solutions Register to the Principal Contractor.
It is the Principal Contractor's responsibility to review the hazards and risks identified during the design process to ensure a safe workplace is maintained for the construction, maintenance and eventual demolition of the structure.

CONCRETE NOTES

EXPOSURE CLASSIFICATION : External - B1
Internal - A2

Refer
Refer ST-31Y-TXX-01 for concrete grades
REFER ST-31Z-XXX-A2 concrete spec shotcrete and bored piers
REFER ST-31Z-XXX-B1 B80 concrete specification
REFER ST-31Z-XXX-C1 PT specification below level 01
REFER ST-31R-XXX-01 durability report
REFER ST-31R-XXX-02 durability assessment on shoring piles

1. Use Type 'GP' cement, unless otherwise specified.
2. All concrete shall be subject to project assessment and testing to AS 1379.
3. Consolidate by mechanical vibration. Cure all concrete surfaces as directed in the Specification.
4. For all falls in slab, drip grooves, reglets, chamfers etc. refer to the architect's drawings and specifications.
5. Unless shown on the drawings, the location of all construction joints shall be submitted to engineer for review.
6. No holes or chases shall be made in the slab without the approval of the Engineer.
7. Conduits and pipes are to be fixed to the underside of the top reinforcement layer.
8. Slurry used to lubricate concrete pump lines is not to be used in any structural members.
9. All slabs cast on ground require sand blinding with a Concrete Underlay
10. (175) Indicates slab or band thickness

FORMWORK

1. The design, certification, construction and performance of the formwork, falsework and backpropping is the responsibility of the contractor.
2. The proposed method of installation and removal of formwork is to be submitted to the Superintendent for comment prior to work being carried out.
3. Refer concrete finish class diagram on ST-00A-00-01 for concrete finishes

FOOTING NOTES

1. Foundations have been designed for:
   Allowable Bearing Pressure - 6 MPa
   Reactivity Class - Class A to AS 2870
2. Foundation material is to be inspected and approved by the geotechnicalengineer before casting footings.
3. Refer to geotechnical report No. 86767.04.R.011.Rev0 dated 10 February 2022 by Douglas Partners
4. Locate all pipes, retaining walls and excavation outside a 1:2 (vertical:horizontal) zone of influence from the bottom edge of the footing.
5. Where side shear is required to be developed, clean and roughen thesides of the excavation to the satisfaction of the geotechnical engineer.
6. Footings shall be located centrally under walls and columns unless noted otherwise.
7. Footings to be constructed and backfilled as soon as possible following excavation to avoid softening or drying out by exposure.
8. Contractor is to allow for cost of geotechnical inspections and any required certification.

TENSION LAPS - SECURITY

BAR SIZE	TOP BARS IN BANDS AND BEAMS	ALL OTHER BARS
N12	670	510
N16	1020	780
N20	1400	1070
N24	1800	1380
N28	2240	1720
N32	2700	2070
N36	3150	2420

TENSION LAPS - CORE WALLS

BAR SIZE	HORIZONTAL BARS	VERTICAL BARS
N12	450	350
N16	650	500
N20	900	700
N24	1100	900
N28	1350	1050
N32	1600	1250
N36	1900	1450

COMPRESSION LAPS

BAR SIZE	TYPICAL	SECURITY
N16	640	840
N20	800	1040
N24	960	1250
N28	1120	1460
N32	1280	1670
N36	1440	1880

REINFORCEMENT NOTES

1. Fix reinforcement as shown on drawings.
   The type and grade is indicated by a symbol as shown below.
   On the drawings this is followed by a numeral which indicates the size in millimetres of the reinforcement.

N	Hot rolled ribbed bar	grade D500N
R	Plain round bar	grade R250N
SL	Square mesh	grade 500L
RL	Rectangular mesh	grade 500L

2. Provide bar supports or spacers to give the following concrete cover to all reinforcement unless otherwise noted on drawings.

120 YEAR DESIGN LIFE:
The covers below are based on 40MPa concrete. For 50MPa or higher, a reduction of 5mm to nominated covers is acceptable.

Footings - 60 if in contact with ground and protected by DPM
- 80 when cast directly in contact with ground.
Slabs - 50 top, 50 bottom, 50 sides. Generally
- 60 if in contact with ground and protected by DPM
- 80 when cast directly in contact with ground.
Beams - 50 bottom, 50 sides, 50 top to ties. Generally
- If in contact with ground and protected by DPM 60, otherwise 80
Columns - 50 to ties and spirals. Generally
- 60 if in contact with ground and protected by DPM
- 80 when cast directly in contact with ground.
Piles - 50 to ties and spirals. Generally
- 60 if in contact with ground and protected by DPM
- 80 when cast directly in contact with ground.
Walls - 50. Generally.
- 60 if in contact with ground and protected by DPM
- 80 when cast directly in contact with ground.

100 YEAR DESIGN LIFE:
The covers below are based on 40MPa concrete. For 50MPa or higher, a reduction of 5mm to nominated covers is acceptable.
Footings - 55 if in contact with ground and protected by DPM
- 75 when cast directly in contact with ground.
Slabs - 45 top, 45 bottom, 45 sides. Generally
- 55 if in contact with ground and protected by DPM
- 75 when cast directly in contact with ground.
Beams - 45 bottom, 45 sides, 45 top to ties. Generally
- 55 if in contact with ground and protected by DPM
- 75 when cast directly in contact with ground.
Columns - 45 to ties and spirals. Generally
- 55 if in contact with ground and protected by DPM
- 75 when cast directly in contact with ground.
Piles - 45 to ties and spirals. Generally
- 55 if in contact with ground and protected by DPM
- 75 when cast directly in contact with ground.
Walls - 45. Generally
- 55 if in contact with ground and protected by DPM
- 75 when cast directly in contact with ground.

50 YEAR DESIGN LIFE:
The covers below are based on 40MPa concrete. For 50MPa or higher, a reduction of 5mm to nominated covers is acceptable.
Footings - N/A
Slabs - 30 top, 30 bottom, 30 sides. Generally
- 40 if in contact with ground and protected by DPM
- 60 when cast directly in contact with ground.
Beams - 30 bottom, 30 sides, 30 top to ties. Generally
- 40 if in contact with ground and protected by DPM
- 60 when cast directly in contact with ground.
Columns - 30 to ties and spirals. Generally
- 40 if in contact with ground and protected by DPM
- 60 when cast directly in contact with ground.
Walls - 30 generally. Generally
- 40 if in contact with ground and protected by DPM
- 60 when cast directly in contact with ground.

3. Cover to reinforcement ends to be 50 mm UNO.
4. Provide N12-450 support bars to top reinforcement as required. Tension Lap UNO
5. Maintain cover to all pipes, conduits, reglets, drip grooves etc.
6. All cogs to be standard cogs unless noted otherwise.
7. Fabric end and side laps are to be placed strictly in accordance with the manufacturers requirements to achieve a full tensile lap. Fabric shall be laid so that there is a maximum of 3 layers at any location.

FABRIC LAPS

8. Laps in reinforcement shall be made only where shown on the drawings unless otherwise approved. Lap lengths as per table below.
   Gap between lapped bars to be no more than 3 bar diameters as per AS3600 clause 13.2

TENSION LAPS - TYPICAL

BAR SIZE	TOP BARS IN BANDS AND BEAMS	ALL OTHER BARS
N12	510	390
N16	780	600
N20	1070	830
N24	1380	1070
N28	1720	1330
N32	2070	1590
N36	2420	1870

REINFORCEMENT LEGEND

1. Denotes the extent of area covered by bars.
2. Denotes a change in bar shape and/or length.
3. T1 Indicates to repeat bars tagged thus (T1) etc.
   LAY BARS IN DIRECTION INDICATED BY ARROW
4. Bars shown staggered on plan are to be placed alternately.
5. ALT. denotes bars of different length and/or shape to be laid alternately.
6. 13N16 / 10-250=3 Indicates 10 bars at 250 centres plus 3 bars placed one per space centrally over column.

ABBREVIATIONS USED ON DRAWINGS :

UNO	-	Unless Noted Otherwise	EW	-	Each Way
NSOP	-	Not Shown On Plan	EF	-	Each Face
NSOE	-	Not Shown On Elevation	NF	-	Near Face
NSOS	-	Not Shown On Schedule	FF	-	Far Face
LV	-	Bar Lengths Vary			
NTS	-	Not To Scale			

SLAB ON GROUND NOTES

Refer to Geotechnical report No. 86767.00 dated 23 July 2020 by Douglas Partners for all subgrade and subbase/Basecourse requirements and unless directed otherwise the following requirements apply.
1. Strip all topsoil from the construction area and remove from the site.
2. Before placing fill, proof roll exposed subgrade with 6 passes of a 10 tonne minimum roller to test subgrade and then remove soft spots (areas with more than 3mm movement under roller). Soft spots to be replaced with select fill as per table:

SIEVE APERTURE (mm) TO AS1152	PERCENTAGE PASSED (BY MASS)
75.0	100
9.5	100 to 50
2.36	100 to 30
0.6	50 to 15
0.075	<25

Plasticity index to be > or = 2% and < or = 15%
Non dispersive (a rating of nil as defined by the "dispersion" test AS1289.3.8.1) Submit proposed select fill for Engineers approval.
3. Compact fill areas and subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.
4. All basecourse material to comply with the following table below and compacted to minimum 98% modified standard dry density in accordance with AS 1289 5.2.1.

SIEVE APERTURE (mm) TO AS1152	PERCENTAGE PASSED (BY MASS)
26.5	100
19.0	95 to 100
13.2	75 to 90
9.5	60 to 90
4.75	42 to 76
2.36	28 to 60
0.425	10 to 28
0.075	2 to 10

- Plasticity Index: Not greater than 10%
- Liquid Limit: Not greater than 25%
- California Bearing Ratio: Not less than 35%
- Unsound rock: Not greater than 20%
- Nondispersive (a rating of nil as defined by the dispersion test AS1289.3.8.1)
- Submit proposed basecourse for Engineers approval.

5. Place sand blinding to areas where Concrete Underlays are required.

PILING NOTES

Refer ST-36Z-XXX-C1 B59 bored piles without permanent casing.
1. Piles are to be designed in accordance with AS5100 and AS2159 by the contractor for the axial loads and moments listed in the piling schedule and all requirements of the specification.
2. The pile design and installation shall follow the recommendations outlined in the geotechnical report No. 86767.04.R.011.Rev0 dated 10 February 2022 by Douglas Partners.
   Any additional geotechnical investigation work deemed necessary shall be at the contractor's expense.
3. Pile spacing and pile cap design is based on [750 diameter bored piles]. Any necessary re-design of of pile caps to suit alternative systems shall be at the expense of the contractor.
4. All piles or pile groups are to be centred under columns and walls UNO
5. Prior to commencing on site, the contractor must submit for approval:
   (a) pile type proposed
   (b) pile size(s), reinforcement details, founding depths and design certificate. The design certificate is to certify the pile design is in accordance with AS5100 and AS2159 for the loads listed in the piling schedule and be signed by a NPER registered engineer experienced in the type of piling proposed.
   (c) a shop drawing setting out all pile locations from grid
6. The contractor is to coordinate the location of all underground services and to be responsible for ensuring that these are either avoided or relocated as appropriate.
7. The contractor shall provide a NPER registered engineer to supervise the pile installation.
8. At the satisfactory completion of the work the contractor shall provide an inspection certificate signed by a NPER registered engineer.

SHORING NOTES

1. Test records shall be provided for test loadings of all anchors.
2. Any variation in the location or inclination of anchors will require re-calculation of the required working loads and shall be notified to the engineer for approval.
3. All anchors shall be located so as to avoid all services and pits.

SHORING WALL NOTES

GROUND ANCHORS, ROCK BOLTS AND SOIL NAILS
Refer ST-36Z-XXX-A1 B114 ground anchor specification
1. The design, supply, installation and tensioning of ground anchors, bolts and nails shall be carried out in compliance with the relevant Australian Standards and the Geotechnical Report.
   Anchorage lengths and curing times shall be determined by the Geotechnical Engineer.
2. Anchors, bolts and nail holes should be thoroughly cleaned and the bond grout should be allowed to cure before proof stressing.
3. Grouting shall conform to the requirements of AS 3600 and The Concrete Institute "Recommended Practice For Grouting 1982"
4. For proof stressing loads refer to the Geotech Report.
5. Records of all anchor extensions and test loadings are to be submitted to the Geotechnical Engineer for review.
6. Modifications to the arrangement shown on the drawings will require recalcuation of the required working loads and shall be notified to the Geotechnical Engineer for approval.
7. Safe Working load shown is the force required after all losses of prestress, including draw in.
8. All anchors, bolts and nails shall be located so as to avoid all services and pits etc.The contractor is to determine the location of all services etc prior to installation of anchors.
9. Any variation in location or inclination of anchors, nails and bolts shall be submitted to the Geotechnical Engineer for approval.
10. For ratio of ultimate load capacity of anchor to safe working load refer to the Specification.
11. For temporary and semi-permanent anchors the length of tendon protruding beyond wedge grip is not to be less than 600mm to enable monitoring.
12. For corrosion protection requirements refer to the Geotechnical Report.
13. Do not destress temporary or semi-permanent anchors until the Geotechnical Engineer's approval has been obtained.
14. For temporary and semi-permanent anchors :
    After destressing anchors, remove anchor head and wales.
    Cut strands at the face of pile and grout fill ducts. Make good piles with an approved epoxy repair mortar. Note: this is a minimum requirement. Contractor is to refer to TfNSW AND ASA requirements if anchors are to be fully removed.

PNEUMATICALLY APPLIED CONCRETE

1. Concrete to shoring walls to be pneumatically applied in one continuous operation. Concrete to be proportioned to achieve a batch target strength of 32MPa.
2. The pneumatically applied concrete shall be cured by keeping continuously wet over a period of not less than 7 days after placement or by other approved means.
3. Pneumatically applied concrete is to be placed by an experienced operator.

CONSTRUCTION SEQUENCE

1. Set out and drill holes for soldiers.
2. Install and plumb soldiers as detailed and backfill holes with 1 : 12 - cement : sand mix.
3. Excavate locally and place top row of anchors as specified.
4. Place wedges on ground anchors to resist movement of wall.
5. Excavate down to horizontal CJ.
6. Place shotcrete wall as per the drawings.
7. Stress the ground anchors to Design Loads after concrete is a minimum of 4 days old.
8. Continue second stage as above.

MASONRY NOTES

1. Temporary bracing shall be provided by the contractor to keep the masonry stable at all times.
2. Masonry to be in accordance with AS 3700
3. Masonry units shall comply with AS/NZS 4455 and as follows:

Type of masonry unit	Characteristic unconfined compressive strength (f'uc)	Characteristic lateral modulus of rupture (f'ut)
Clay & Calcium silicate	15 MPa	0.8 MPa
Concrete	15 MPa (hollow units) 10 MPa (solid or cored units)	0.8 MPa

4. Mortar shall consist of the following:
   M3 for general applications
   1 part Type GP cement: 5 parts sand plus water thickener
   M4 for elements in interior environments subject to saline wetting and drying; below a damp-proof course or in contact with ground in aggressive soils; in severe marine environments; in saline or contaminated water including tidal splash zones; and within 1km of an industry producing chemical pollutants.
   1 part Type GP cement: 4 parts sand plus water thickener
5. Provide vertical control joints in masonry over permanent floor joints and as per the architectural drawings.
6. Masonry walls shown on the structural plans are load-bearing UNO. Non-loadbearing walls shall be separated from the concrete structure above with 20mm compressible filler. Masonry walls supporting slabs shall have a layer of mortar troweled smooth on top. Provide MET slipjoint to separate floor slabs and masonry. Provide Hercules HERCUSLIP COMPOSITE to separate roof slabs and masonry.
7. Other than what is allowed in the specification no chasing or rebates may be made in masonry walls without written approval.
8. The contractor shall provide records that demonstrate all masonry bed joint reinforcement, masonry ties and masonry wall stiffeners have been installed in accordance with the drawings and specification.
9. All load bearing concrete masonry walls shall have all cores filled with grout UNO. Core filling grout shall be thoroughly compacted. Grout to be in accordance with AS3700 and as follows:

Location	f'cg MPa	Specified Slump	Max' Aggregate size
Grout	20	230	10mm

10. All core filled blockwalls shall be constructed with "Double U" blocks
11. In core filled blockwalls cleanout openings shall be provided at the bottom of each core and shall be cleaned of mortar protrusions before grouting.
12. All core filled block walls shall have all cores filled with grout UNO. Core filling grout to be in accordance with note 4.
13. Cover to reinforcement to be 50mm to face of block UNO.
14. Provide bed joint reinforcement as follows :
    MET galvanized masonry reo where M3 mortar is used (supplied by DUNSTONE MAZE in NSW)
    Ancon stainless steel where M4 mortar is used and located as follows
    - in 2 bed joints below and above head and sill flashings to openings
    - in 2 bed joints below and above openings
    - in third bed joint above bottom of wall
    - in second bed joint below top of wall

STRUCTURAL TIMBER NOTES

1. The manufacturer, supply and installation of structural timber are to be in accordance with AS1720.1 Timber Structures.
2. All timber supplied is to be in accordance with characteristic strengths labeled in the schedules on the drawings.
   Alternative products are to be submitted to the engineer for review.
3. All timber is to be provided to site at a moisture content of 10-12%. If moisture content of timber member exceeds 14% on site, the Engineer must be notified.
4. All timber dimensions are to be labeled depth first and breadth / thickness second.
5. Production tolerances are to be ± 3mm or to the manufacturers specifications, whichever is lesser.
6. The contractor is to provide temporary bracing to maintain stability of timber during lifting and installation.
7. Refer to Timber Specification and AS1604.1 for durability classifications and preservative treatments.
8. Submit all shop drawings to the engineer for review before commencing manufacture, a review period of a minimum of 10 working days is required. Drawings are to include all product specifications, including timber species, strength grade and adhesive product data.
9. All timber connections at fire rated locations must satisfy fire requirements. The contractor is to provide fire lining to all timber elements to satisfy fire rating requirements, unless noted otherwise.
10. CLT floors on levels 3, 4 and 5 will rely on charring to achieve an FRL of 90 mins if not clad (soffit exposed).

STRUCTURAL STEELWORK NOTES

1. Provide temporary bracing to maintain stability of steelwork during construction.
2. Do not grout under base plates until first level steelwork is plumb and fixed by welding or bolting.
3. Submit all shop drawings to the Superintendent before commencing fabrication.

4. GENERAL UNO
   a. Use 10mm thick gusset, fin and end plates welded all round.
   b. Provide 6mm seal plate to all open ends of tube members.
   c. Provide all cleats and holes necessary for fixing Timber and other elements to the steel whether or not detailed on the Structural drawings.
   d. Studs are to be fabricated to AS1554.2.
   e. Shear studs (composite slab to steel) to be grade 410 MPa.
   f. Threaded studs (steel to steel) grade 380 MPa.
   g. Turnbuckles to be quality grade 'S' to AS2319

5. BOLTING U.N.O.
   a. All bolts 20mm dia.
   b. All bolts to be grade 8.8/S. (including purlin / girt bolts).
   c. All holding down bolts are grade 4.6.
   d. All bolts, including holding down bolts are to be hot dip galvanized.
   e. All connections to have a minimum of 2 bolts.
   f. Washers are to be in accordance with AS4100.
      Holes 3mm or more greater than the bolt diameter and slotted holes are to have plate washers of minimum 4mm thickness and are to extend a minimum of 0.5 the bolt diameter past the edge of the hole.

Bolting categories are identified on the drawings in the following manner.

4.6/S Commercial bolts of grade 4.6 snug tightened.
8.8/S High strength bolts of grade 8.8 snug tightened.
8.8/TB High strength bolts of grade 8.8 fully tensioned to AS4100 as a bearing type joint.
8.8/TF High strength bolts of grade 8.8 fully tensioned to AS4100 as a friction type joint with faying surfaces left uncoated.
Note: Grade 8.8 bolts are NOT to be welded.

6. WELDING U.N.O.
   a. All welds to be 6mm continuous fillet.
   b. All welds to be category SP.
   c. All weld metal is to have a nominal weld metal tensile strength of 490MPa.
   d. Butt weld all flanges at end plates and at all mitre cuts.
   e. Gussets to end plates to be butt welded.
   f. All butt welds shall be full penetration, grade SP.
   g. Chip all welds free of slag.
   h. The contractor is to confirm with Architect as to where exposed welds are to be ground flush / smooth.

STEEL GRADES

Type of steel	Minimum Grade
UC, UB, BT, CT, PFC	300 and 350
WC, WB	300 and 400
SHS, RHS	350 and 450
CHS	250, 350 and 450
EA, UA	300
Rods, Flats, Plates	250, 300 and 350
Stainless steel	316L UNO

PURLINS AND GIRTS

1. All purlins to be grade AS1397/G450-Z350 UNO
2. Unless noted otherwise, the fixing of purlins, girts, bridging, sheeting and any other component shall be in accordance with the manufacturer's specification and recommendations.
3. Sheeting / cladding is to be screw fixed to the purlins / girts to provide lateral restraint to the purlins/girts in accordance with the manufacturer's requirements.
4. Provide double purlins at expansion joints in roof sheeting.
5. Purlin / girt sizes shown are based on the current BLUESCOPE LYSAGHT purlins and girts design data, including restraint from roof sheeting and bridging. The manufacturer should confirm any alternative systems used are equivalent or redesign the purlins / girts to provide an equivalent system.
6. Purlin / girt cleats are to be in accordance with the Manufacturers details. Where the distance between the bottom flange of the purlin and the rafter is greater than 100mm use 75 x 75 x 8 EA cleats.
7. Provide 75 x 75 x 4 duragal galvanized angle trimmers to support
8. roof sheeting edges at all hips,valleys and angled sheet edges. Fix to each purlin with one No. 14 Tek screw.
9. Bridging shall be designed and erected in accordance with the manufacturer's requirements. Rod bridging is not acceptable unless approved in writing.
10. For bridging members to purlins at curved roof areas provide bridging suitable for curved roofs to manufacturer's details.

STEELWORK FINISHES - COMPLYING WITH AS/NZS 2312.1

All paint thicknesses are dry film thickness
Figures in brackets refer to AS/NZS 2312 System designation.

All surface preparations to AS/NZS 2312, AS1627 and in strict accordance with paint manufacturers specifications and requirements.
Where decorative finishes are required refer to architects specification.

Definitions :

Internal: Steelwork concealed within the building facade and exposed to clean atmosphere within the building.
External: Steelwork external to the building facade, exposed to view, weather and external atmosphere.

Concrete Encased steelwork
Do not prime

Fire Sprayed Steelwork
Primer to Fire Spray Manufacturers/Suppliers Requirements.

Fire Resistant Steelwork
Primer and Protective coats to manufacture's specification.
All steelwork from at the OSD level and below is 2 hours UNO

Internal Non decorative - Category C1 and C2
75 microns of Epoxy zinc phosphate

Internal Decorative - Category C1 and C2 and/or
External Non decorative - Category C1 and C2 (PUR2)
External Decorative - Category C1 and C2 (PUR2)
75 microns of Epoxy zinc phosphate
50 microns of High Solids Polyurethane

Internal Non decorative - Category C3, C4 and C5
75 microns of Zinc rich epoxy

Internal decorative - Category C3, C4 and C5
75 microns of Zinc rich epoxy
75 microns of High Solids Polyurethane

External Non decorative - Category C3, C4 and C5 (EHB4)
75 microns of Zinc rich epoxy
200 microns of High-Build Epoxy MIO

External Decorative - Category C3, C4 and C5 (PUR5)
75 microns of Zinc rich epoxy
200 microns of High-Build Epoxy MIO
75 microns of High Solids Polyurethane

EXTERNAL - Category C4 and steel in contact with masonry
and concrete (HDG600) Hot dip galvanize - 600g/m2

EXTERNAL - Category C4 (TSZ100)
100 microns of electric arc sprayed zinc coat

UNDERGROUND Environment (EUH4)
1200 microns of ultra high build two pack epoxy primer
1200 microns of ultra high build two pack epoxy primer

GREEN BUILDINGS

Internal Non decorative - Category C1, C2, C3, C4 and C5
50 microns of waterborne inorganic zinc conforming to
AS/NZS 3750.15 Type 3 VOC < 15 g/lt

Internal decorative - Category C1, C2, C3, C4 and C5
50 microns of waterborne inorganic zinc conforming to
AS/NZS 3750.15 Type 3 VOC < 15 g/lt
40 microns of waterborne acrylic Conforming to
AS/NZS 3750.16 VOC < 75 g/lt

External Non decorative - Category C1, C2, C3, C4 and C5 (IZS2)
75 microns of waterborne inorganic zinc conforming to
AS/NZS 3750.15 Type 3 VOC < 15 g/lt

External decorative - Category C1 and C2 (IZS2)
75 microns of waterborne inorganic zinc conforming to
AS/NZS 3750.15 Type 3 VOC < 15 g/lt
40 microns of waterborne Acrylic Conforming to
AS/NZS 3750.16 VOC < 75 g/lt

External decorative - Category C3, C4 and C5 (IZS2)
75 microns of waterborne inorganic zinc conforming to
AS/NZS 3750.15 Type 3 VOC < 15 g/lt
50 microns of waterborne epoxy Conforming to
AS/NZS 3750.13 VOC < 20 g/lt
40 microns of waterborne Acrylic Conforming to
AS/NZS 3750.16 VOC < 75 g/lt

POST-TENSIONED CONCRETE NOTES

GENERAL

1. Submit all test certificates, theoretical extensions, calculations and shop drawing to the Superintendent as required by the Specification prior to construction.
2. All reactions from post-tensioning shall be supplied to the formwork contractor for formwork design.
3. Stressing contractor is to pay particular attention to concrete compaction where ducts cross columns and at all tendon anchors and ensure that pump lines are adequately chaired and restrained so as to be kept separate from tendons and reinforcement.
4. Provide mesh over bands where band depth exceeds 350mm or as required by Workcover (Refer typical post tensioning details). Holes cored through post-tensioned slabs must be approved by the structural Engineer in writting.
5. Holes cored through post-tensioned slabs must be approved by the structural Engineer in writing.

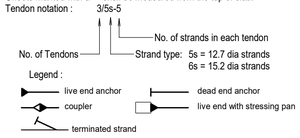
DESIGN ASSUMPTIONS

The design assumptions used in the calculation of stressing losses for slab tendons in galvanised flat ducts were:

Friction curvature coefficient	μ = 0.2
Wobble (rad. per m)	β = 0.024
Draw-in at anchorage	= 6mm
Relaxation of stressed steel (after 1 000 hours at 0.70 fp)	= 2.5%

TENDONS

1. All Strands shall be 7 wire ordinary strands with Class 2 relaxation in accordance with AS 4672.1 and AS 4672.2 unless noted otherwise.
2. Bar shall be high-tensile alloy steel bars in accordance with AS 4672.1 and AS 4672.2 with a nominal tensile strength of 1030 MPa unless noted otherwise.
3. Locate and fix tendons as shown on the drawings & co-ordinate with cast in bolts, conduits & penetrations etc.
4. Tendon profiles to be parabolic unless noted otherwise and vertical offsets shall be measured from the deck (i.e. soffit of the concrete) to the underside of the duct, except for soffit of concrete to centreline of duct at anchorage unless noted otherwise.
5. Offsets marked with a * shall be measured from the top of slab.
6. Tendon notation : 3/5s-5



7. Ducting for slab tendons shall be galvanised steel:
   - 70 x 19 for 5 x 12.7dia strand tendons
   - 90 x 19 for 5 x 15.2dia strand tendons
8. Seal off all ducts and securely tape joints to prevent ingress of mortar during concreting.
9. The performance of the post tensioning anchorages is the responsibility of the stressing contractor and they shall provide any additional bursting reinforcement needed to meet the requirements of their post tensioning system.

TENSIONING AND GROUTING

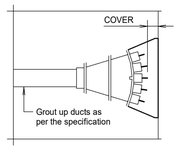
1. Tendons shall be stressed to the following jacking forces unless noted otherwise. 12.7dia strand tendons - 156 kN (0.85 UTS) per strand.
   15.2dia strand tendons - 212 kN (0.85 UTS) per strand.
2. The first stage of stressing is for 25% of the jacking force to be applied between 18 and 36 hours after concrete placement (fcp = 9 MPa minimum) followed by the remainder of the jacking force at - fcp = 22 MPa unless noted otherwise below. Each individual strand or bar shall be tensioned during the first stage unless noted otherwise.
3. Records of net tendon elongation and other aspects of the tensioning operation required by the Specification shall be submitted to the Engineer and approved prior to cutting of tendons and grouting the ducts.
4. All tendons to be grouted in accordance with the specification.
5. Post-tensioning anchorage pockets shall be fully grouted with a polymer modified repair mortar. Minimum cover to any tendons or anchorage plate shall be as for the element in which they are located.
6. Concrete test cylinders used for assessing strength for tensioning are to be site cured in similar conditions to the concrete element being stressed.

ANCHORAGE RECESS GROUTING
NOT EXPOSED TO WEATHER (INTERNAL)
Exposure Class A1 as per AS3600

1. After final stressing and approval of extensions by TTW, cut off strands to give 30mm minimum cover to ends of strands.
2. Provide records of measured cover at each anchor recess for TTW to inspect and provide the opportunity for TTW to inspect recesses.
3. Thoroughly clean anchorage pocket (use high pressure water jet if necessary) to remove all laitance, polystyrene etc.
4. Prime all concrete surfaces with 'Nitobond EP' or approved equivalent.
5. Grout up recess with 3:1 Sand: Cement grout mix or 'Renderoc HB'. Infill is to be finished flush with surrounding concrete surface.
6. The contractor shall provide records that demonstrate steps 3,4 & 5 have been satisfactorily completed at each anchor recess.

ANCHORAGE RECESS GROUTING
EXPOSED TO WEATHER (EXTERNAL)
Exposure Class B1 as per AS3600 - Near Coastal/Industrial
Exposure Class B2 as per AS3600 - Within 1km of coastline

1. After final stressing and approval of extensions by TTW cut off strands to give 30mm minimum cover to ends of strands.
2. Provide records of measured cover at each anchor recess for TTW to inspect and provide the opportunity for TTW to inspect recesses.
3. Thoroughly clean anchorage recess (use high pressure water jet if necessary) to remove all laitance, polystyrene etc.
4. Prime all metal surfaces with 'Nitoprime Zincrich' or approved equivalent.
5. Prime all concrete surfaces with 'Nitobond EP' or approved equivalent.
6. Grout up recess with 'Renderoc HB40' - applied as per manufacturers instructions. Infill is to be finished flush with surrounding concrete surface to the Superintendents requirements. A test sample is to be submitted for approval and used for acceptance/rejection criteria.
7. The contractor shall provide records that demonstrate steps 3,4,5 & 6 have been satisfactorily completed at each anchor recess.
8. Alternative products may be used as follows:
   SikaTop 110 in lieu of Nitoprime Zincrich and Nitobond EP Sika MonoTop 615 in lieu of Renderoc HB40



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NOTE
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS & SPECIFICATIONS.
THE CONTRACTOR IS TO BE RESPONSIBLE FOR ALL DIMENSIONS & FOR THE CORRECT SETTING OUT OF THE WORKS ON SITE.
DO NOT SCALE FROM THIS DRAWING.

Rev	Date	Description	Eng	Draft
01	20.08.20	REVISED CONCEPT DESIGN	JRV	RB
02	04.09.20	50% SD ISSUE	JRV	RB
03	30.09.20	100% SD ISSUE	JRV	RB
04	16.04.21	FOR INFORMATION - SD	KPB	RB
05	23.04.21	ISSUED FOR SD 2.0	KPB	RB
06	12.05.21	REFERENCES REVISED	JVR	RB
07	30.06.21	25%DD D&C TENDER ISSUE	JVR	RB
08	22.09.21	50% DD STAGE 3 ISSUE	JVR	RB
09	01.12.21	75% DD SHORING PACKAGE	CG	RB
10	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB

Rev	Date	Description	Eng	Draft
11	15.12.21	STAGE 3 50%DD	DM	RB
12	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
13	15.02.22	25%DD CONTRACT SET	HD	RB
A	15.02.22	AFC	HD	RB

ARCHITECT	STRUCTURAL & FACADE ENGINEER	TOWN PLANNER	CLIENT
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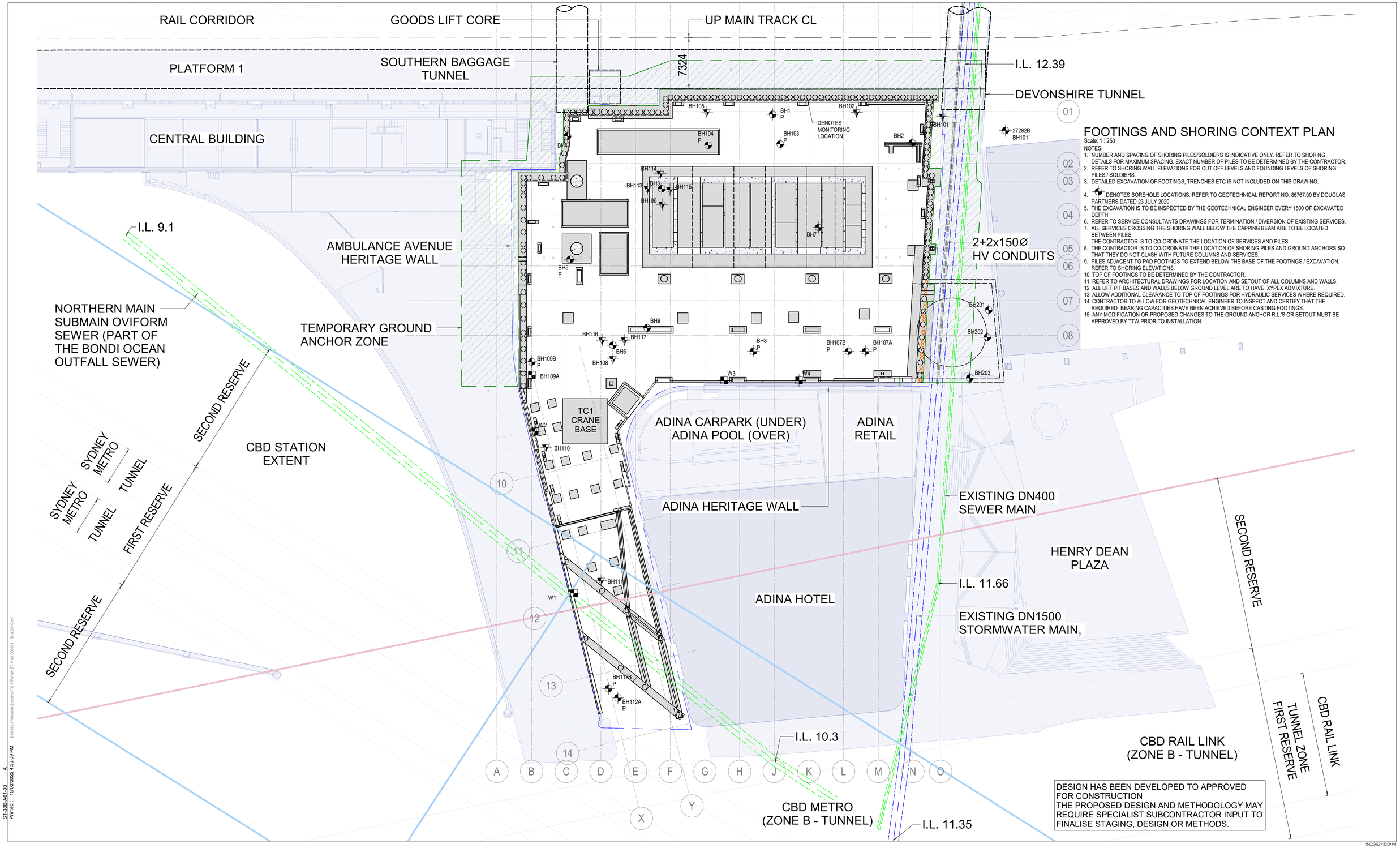
TEL +61 2 8297 7200	TEL +61 2 9439 7288	TEL +61 2 8233 9900	
ARCHITECT	MEP ENGINEER & VT CONSULTANT	BCA/DDA CONSULTANT	
SHoP Architects	LCI	Blackett Maguire + Goldsmith	
TEL +1 212 889 9005	TEL +61 2 9157 0570	TEL +61 2 9211 7777	
CLIMATE CONSULTANT	ACOUSTIC CONSULTANT	FIRE ENGINEER	PROJECT
Transsolar	STANTEC	Holmes Fire	ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TEL +49 711 679 76 0	TEL +61 2 8484 7000	TEL +61 2 9264 4658	
LANDSCAPE ARCHITECT	STRUCTURAL & CIVIL ENGINEER	LIGHTING CONSULTANT	TTW PROJECT NUMBER
ASPECT Studios	TTW	ISP Design	191797
TEL +61 2 9699 7182



FOOTINGS AND SHORING CONTEXT PLAN

Scale: 1 : 250

NOTES:

1. NUMBER AND SPACING OF SHORING PILES/SOLDIERS IS INDICATIVE ONLY. REFER TO SHORING DETAILS FOR MAXIMUM SPACING. EXACT NUMBER OF PILES TO BE DETERMINED BY THE CONTRACTOR.
2. REFER TO SHORING WALL ELEVATIONS FOR CUT OFF LEVELS AND FOUNDING LEVELS OF SHORING PILES / SOLDIERS.
3. DETAILED EXCAVATION OF FOOTINGS, TRENCHES ETC IS NOT INCLUDED ON THIS DRAWING.
4. ⌖ DENOTES BOREHOLE LOCATIONS. REFER TO GEOTECHNICAL REPORT NO. 86767.00 BY DOUGLAS PARTNERS DATED 23 JULY 2020
5. THE EXCAVATION IS TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER EVERY 1500 OF EXCAVATED DEPTH.
6. REFER TO SERVICE CONSULTANTS DRAWINGS FOR TERMINATION / DIVERSION OF EXISTING SERVICES.
7. ALL SERVICES CROSSING THE SHORING WALL BELOW THE CAPPING BEAM ARE TO BE LOCATED BETWEEN PILES.
   THE CONTRACTOR IS TO CO-ORDINATE THE LOCATION OF SERVICES AND PILES.
8. THE CONTRACTOR IS TO CO-ORDINATE THE LOCATION OF SHORING PILES AND GROUND ANCHORS SO THAT THEY DO NOT CLASH WITH FUTURE COLUMNS AND SERVICES.
9. PILES ADJACENT TO PAD FOOTINGS TO EXTEND BELOW THE BASE OF THE FOOTINGS / EXCAVATION. REFER TO SHORING ELEVATIONS.
10. TOP OF FOOTINGS TO BE DETERMINED BY THE CONTRACTOR.
11. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION AND SETOUT OF ALL COLUMNS AND WALLS.
12. ALL LIFT PIT BASES AND WALLS BELOW GROUND LEVEL ARE TO HAVE XYPEX ADMIXTURE.
13. ALLOW ADDITIONAL CLEARANCE TO TOP OF FOOTINGS FOR HYDRAULIC SERVICES WHERE REQUIRED.
14. CONTRACTOR TO ALLOW FOR GEOTECHNICAL ENGINEER TO INSPECT AND CERTIFY THAT THE REQUIRED BEARING CAPACITIES HAVE BEEN ACHIEVED BEFORE CASTING FOOTINGS.
15. ANY MODIFICATION OR PROPOSED CHANGES TO THE GROUND ANCHOR R.L.'S OR SETOUT MUST BE APPROVED BY TTW PRIOR TO INSTALLATION.

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02	04.09.20	50% SD ISSUE	JRV	RB
03	30.09.20	100% SD ISSUE	JRV	RB
04	05.11.20	REVISED AS NOTED	JRV	RB
05	16.04.21	FOR INFORMATION - SD	KPB	RB
06	23.04.21	ISSUED FOR SD 2.0	KPB	RB
07	12.05.21	REFERENCES REVISED	JVR	RB
08	30.06.21	25%DD D&C TENDER ISSUE	JVR	RB
09	17.09.21	FOR APPROVAL - SYDNEY WATER	JVR	RB
10	22.09.21	50% DD STAGE 3 ISSUE	JVR	RB
11	11.10.21	50% DD SHORING PACKAGE	JVR	RB

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13	01.12.21	75% DD SHORING PACKAGE	CG	RB
14	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB
15	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
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LIGHTING CONSULTANT	ISP Design TEL +1 305 278 1565
CLIENT	Atlassian
PROJECT	ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER	191797
STATUS	FOR CONSTRUCTION

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE 0 2000 5000
Scale : A1 DRAWN RB AUTHORISED KPB
As indicated

DRAWING
FOOTING AND SHORING CONTEXT PLAN
DRAWING NUMBER ST-30B-A01-00 ISSUE A

NOTES:
1. REFER FOOTING AND SHORING CONTEXT PLAN ON DRAWING ST-30B-A01-00 FOR GENERAL SHORING AND FOOTING NOTES
2. SLABS ON ROCK TO BE CAST ON 2 LAYERS OF CONCRETE UNDERLAY (0.2mm THICK HIGH IMPACT RESISTANCE FILM TO AS/NZS 4347) OVER 100mm FREE DRAINING BASECOURSE.
3. ALL FOOTING LEVELS TO ARCHITECTS DETAILS.
4. DENOTES FOOTINGS REQUIRED FOR CONSTRUCTION ENGINEERING AND EARLY WORKS PACKAGES.
5. DENOTES VERTICALLY STRESSED GROUND ANCHORS ASSOCIATED WITH CRANE BASE. CRANE BASE AND ANCHOR DESIGN BY CRANE CONTRACTOR'S ENGINEER.
6. REFER TO DRAWING ST-31Y-TXX-01 FOR PAD FOOTING SIZES, CONCRETE STRENGTHS AND REINFORCEMENT RATES.
7. DENOTES EXTENT OF 50mm THICK VOID FORMER UNDER SLAB.

DESIGN HAS BEEN DEVELOPED TO APPROVED FOR CONSTRUCTION
THE PROPOSED DESIGN AND METHODOLOGY MAY REQUIRE SPECIALIST SUBCONTRACTOR INPUT TO FINALISE STAGING, DESIGN OR METHODS.

PROXIMITY OF PILES TO EXISTING FOOTING TO BE CONFIRMED BY SITE INVESTIGATION.

UNDERPINNING REQUIRED TO EXISTING BUILDING FOUNDATIONS TO MEDIUM STRENGTH ROCK

FOOTING FOR SUPPORT OF TEMPORARY BRACING. REFER DRAWING ST-30C-A02-32.

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11	06.07.21	REVISED 25%DD D&C TENDER	JVR	RB
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14	11.10.21	50% DD SHORING PACKAGE	JVR	RB

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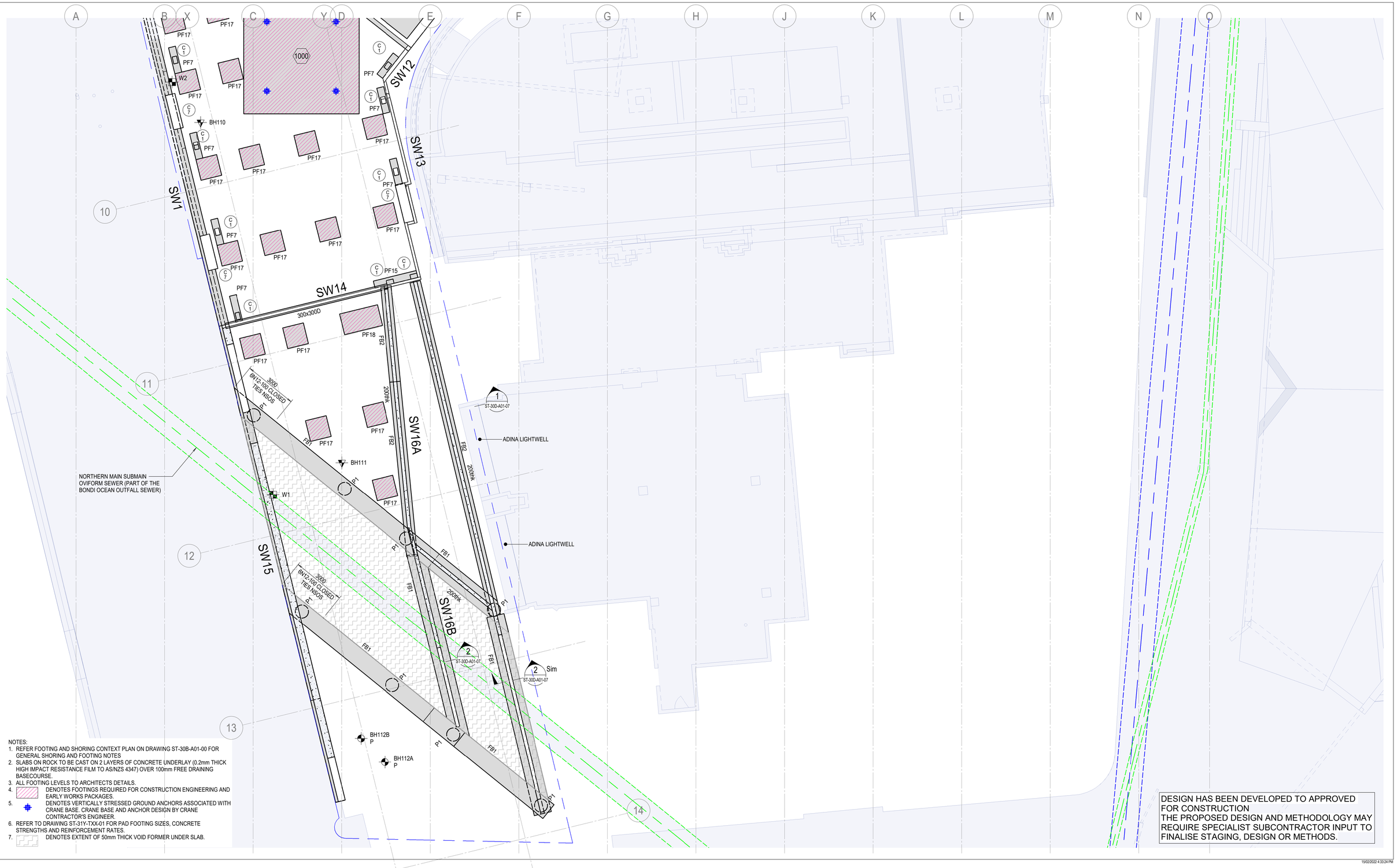
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE 0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB
STATUS
FOR CONSTRUCTION

DRAWING
FOOTING AND SHORING PLAN - PART 1
DRAWING NUMBER ST-30B-A01-01
ISSUE A



NOTES:

1. REFER FOOTING AND SHORING CONTEXT PLAN ON DRAWING ST-30B-A01-00 FOR GENERAL SHORING AND FOOTING NOTES
2. SLABS ON ROCK TO BE CAST ON 2 LAYERS OF CONCRETE UNDERLAY (0.2mm THICK HIGH IMPACT RESISTANCE FILM TO AS/NZS 4347) OVER 100mm FREE DRAINING BASECOURSE.
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7. DENOTES EXTENT OF 50mm THICK VOID FORMER UNDER SLAB.

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04	04.09.20	50% SD ISSUE	JRV	RB
05	30.09.20	100% SD ISSUE	JRV	RB
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16	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH

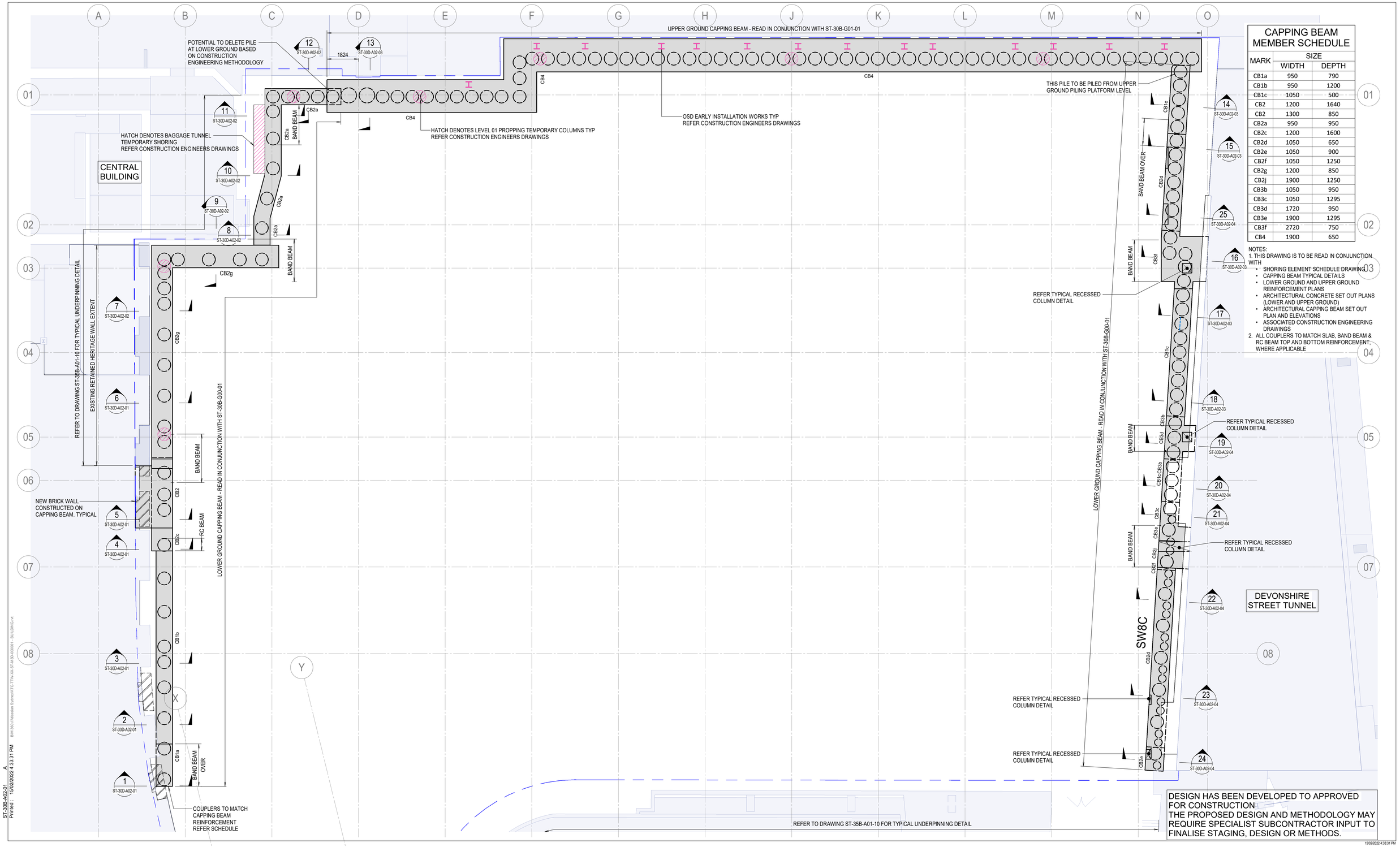
GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

STATUS
FOR CONSTRUCTION

DRAWING
FOOTING AND SHORING PLAN - PART 2

DRAWING NUMBER ST-30B-A01-02
ISSUE A



CAPPING BEAM MEMBER SCHEDULE

MARK	SIZE	
	WIDTH	DEPTH
CB1a	950	790
CB1b	950	1200
CB1c	1050	500
CB2	1200	1640
CB2	1300	850
CB2a	950	950
CB2c	1200	1600
CB2d	1050	650
CB2e	1050	900
CB2f	1050	1250
CB2g	1200	850
CB2j	1900	1250
CB3b	1050	950
CB3c	1050	1295
CB3d	1720	950
CB3e	1900	1295
CB3f	2720	750
CB4	1900	650

NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH
   - SHORING ELEMENT SCHEDULE DRAWING
   - CAPPING BEAM TYPICAL DETAILS
   - LOWER GROUND AND UPPER GROUND REINFORCEMENT PLANS
   - ARCHITECTURAL CONCRETE SET OUT PLANS (LOWER AND UPPER GROUND)
   - ARCHITECTURAL CAPPING BEAM SET OUT PLAN AND ELEVATIONS
   - ASSOCIATED CONSTRUCTION ENGINEERING DRAWINGS
2. ALL COUPLERS TO MATCH SLAB, BAND BEAM & RC BEAM TOP AND BOTTOM REINFORCEMENT, WHERE APPLICABLE

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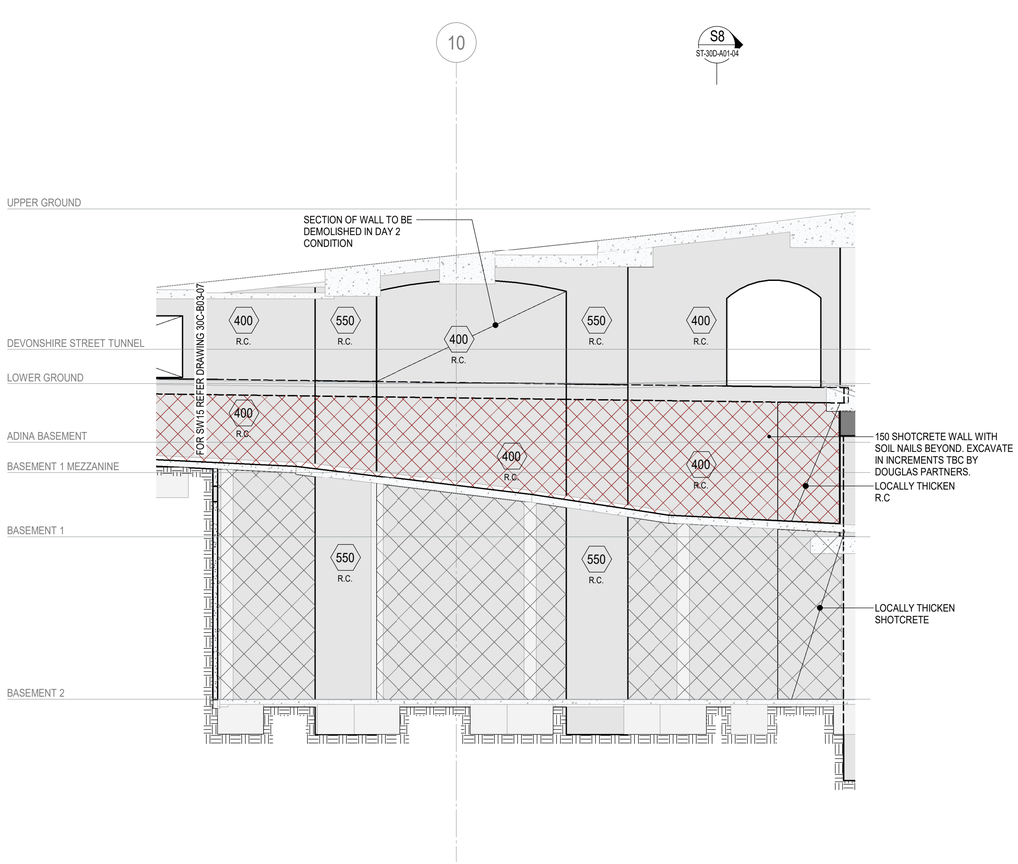
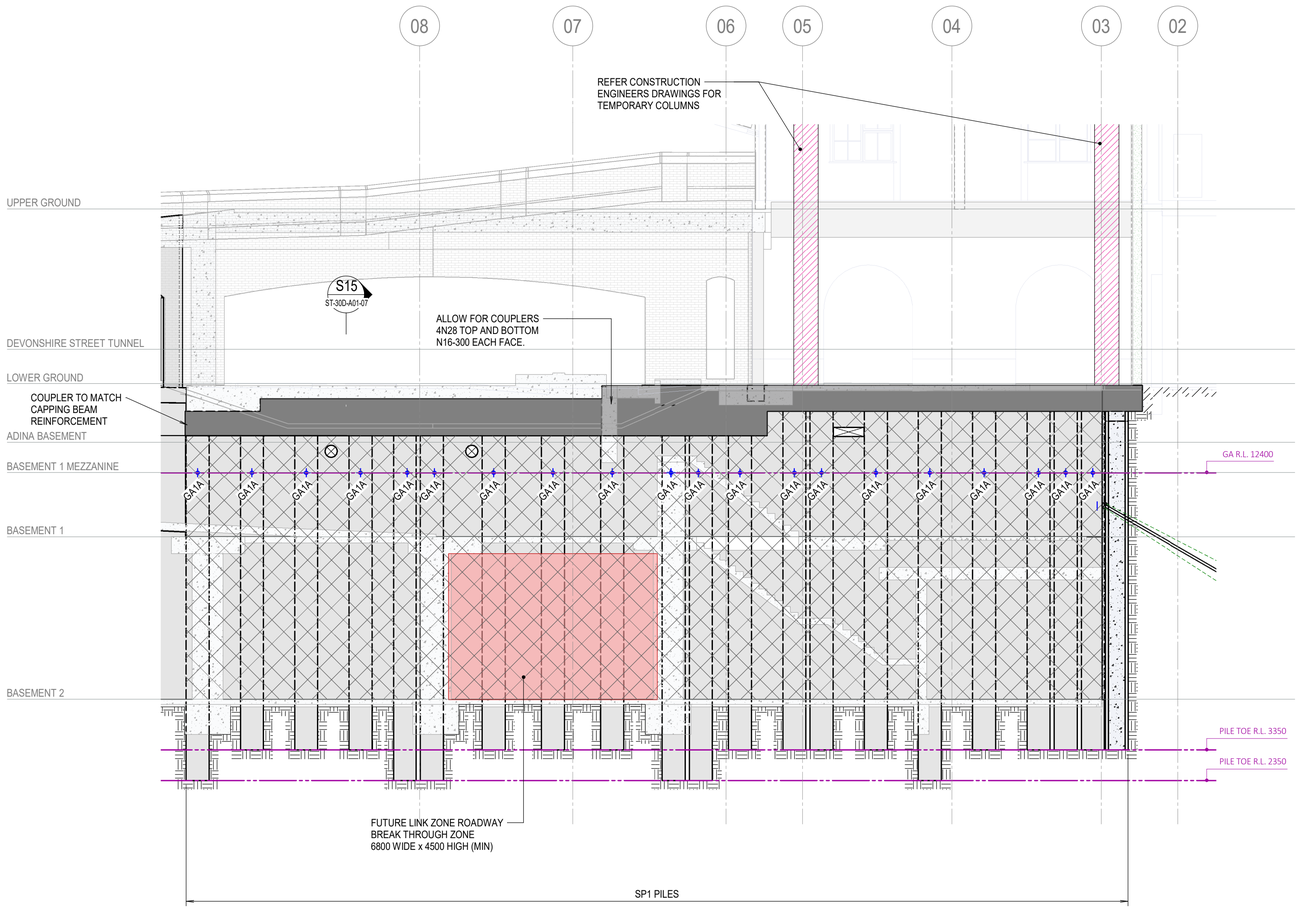
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE 0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB
STATUS
FOR CONSTRUCTION

DRAWING
CAPPING BEAM OUTLINE PLAN
DRAWING NUMBER ST-30B-A02-01
ISSUE A





SW1 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. ROCK ANCHORS SUBJECT TO ADVERSE DIPPING JOINTS FOUND ON EXCAVATION. GEOTECHNICAL ENGINEER TO REVIEW DURING EXCAVATION.
3. DENOTES SHOTCRETE 200 MIN THICK, SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.
4. DENOTES SHOTCRETE 150 MIN THICK WITH SOIL NAILS BEYOND, EXCAVATE IN INCREMENTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER.

SW2 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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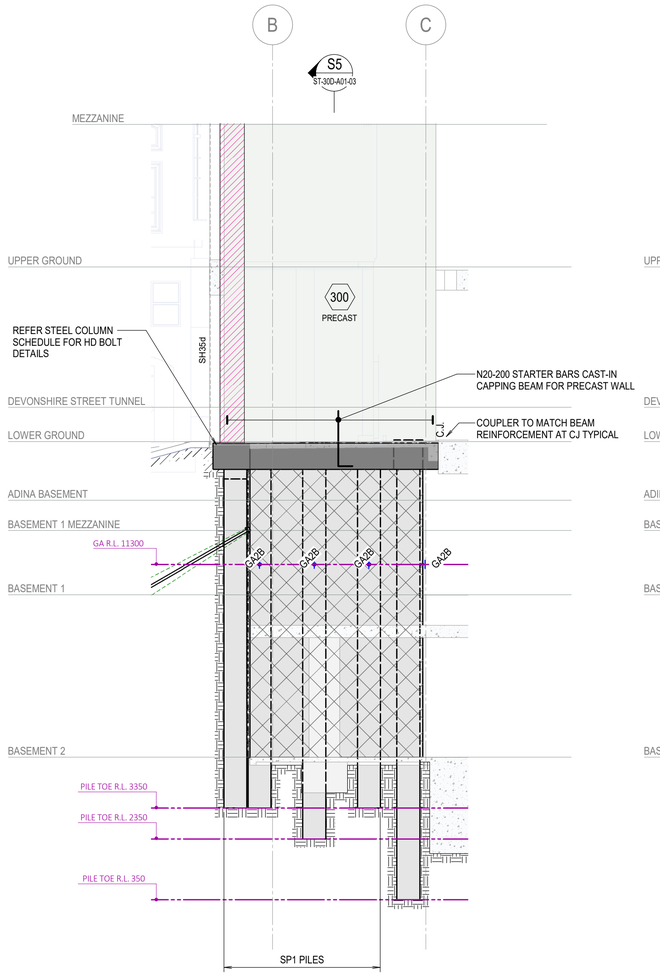
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE 0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB
STATUS
FOR CONSTRUCTION

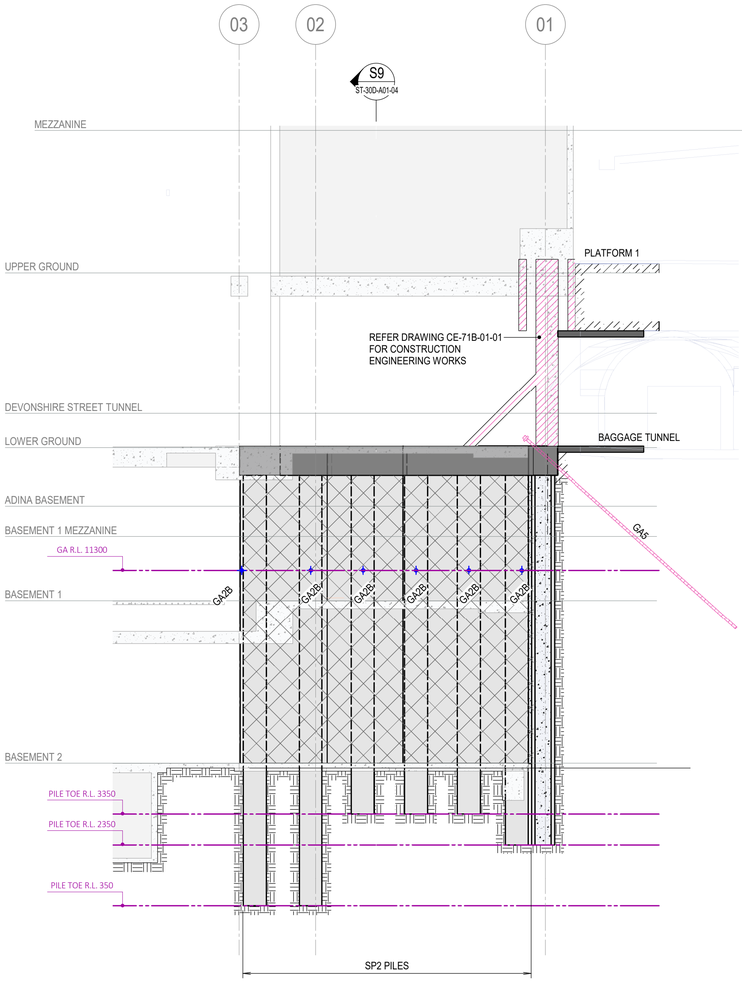
DRAWING
SHORING ELEVATION - SHEET 1
DRAWING NUMBER ST-30C-A01-01
ISSUE A



SW3 - ELEVATION

Scale: 1 : 100

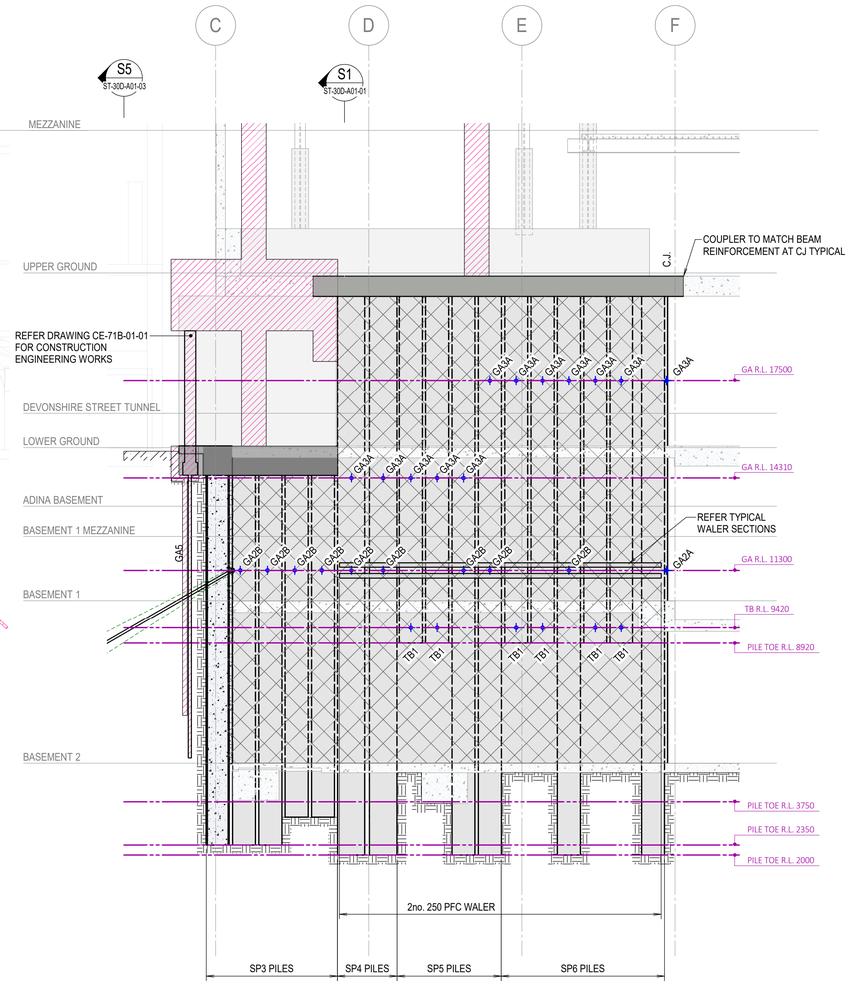
1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.



SW4 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.



SW5 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

DESIGN HAS BEEN DEVELOPED TO APPROVED FOR CONSTRUCTION
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Rev	Date	Description	Eng	Draft
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12	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB
13	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH

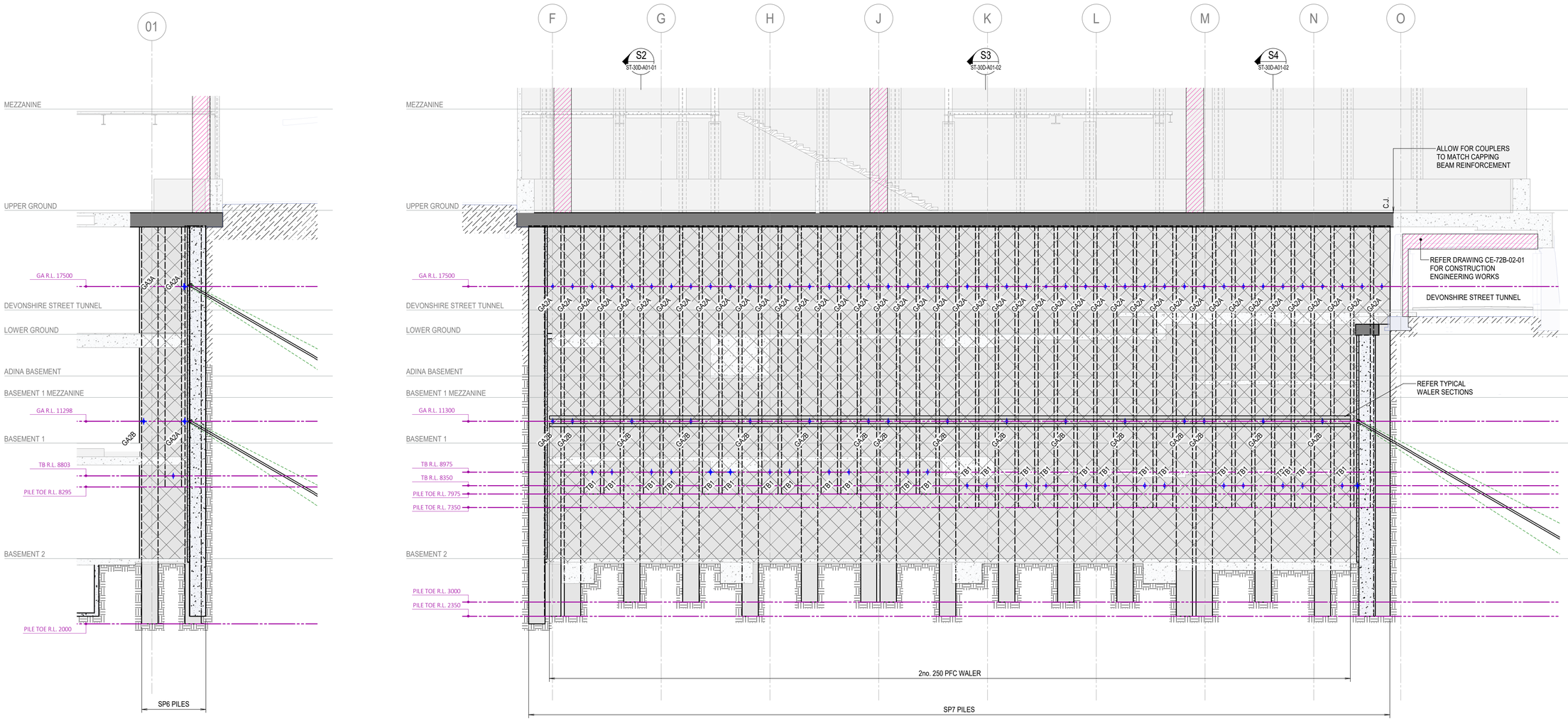
GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN RB AUTHORISED KPB
As indicated

STATUS
FOR CONSTRUCTION

DRAWING
SHORING ELEVATION - SHEET 2

DRAWING NUMBER ST-30C-A01-02
ISSUE A



SW6 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.

SW7 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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10	11.10.21	50% DD SHORING PACKAGE	JVR	RB

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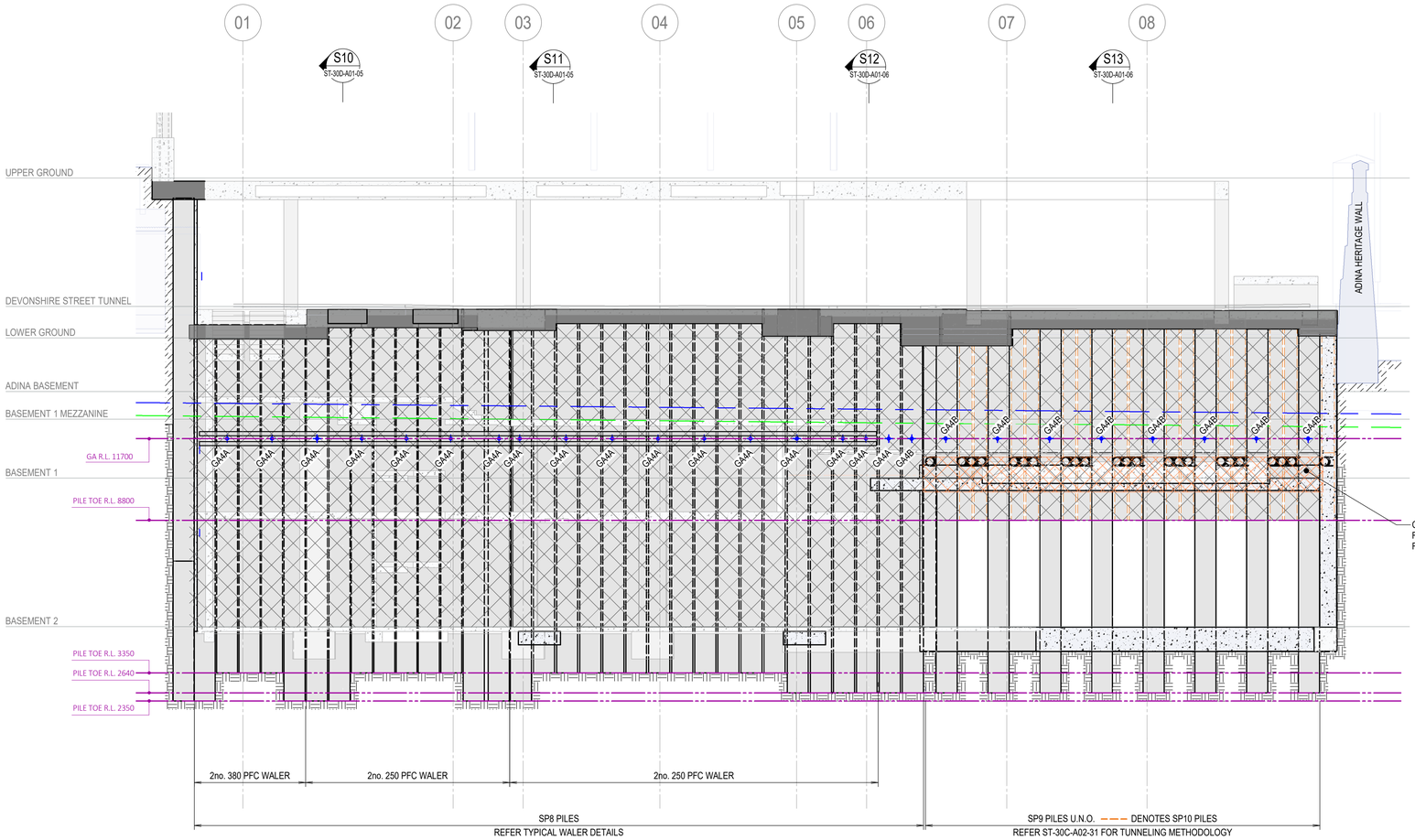
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797
STATUS
FOR CONSTRUCTION

TRUE NORTH
PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

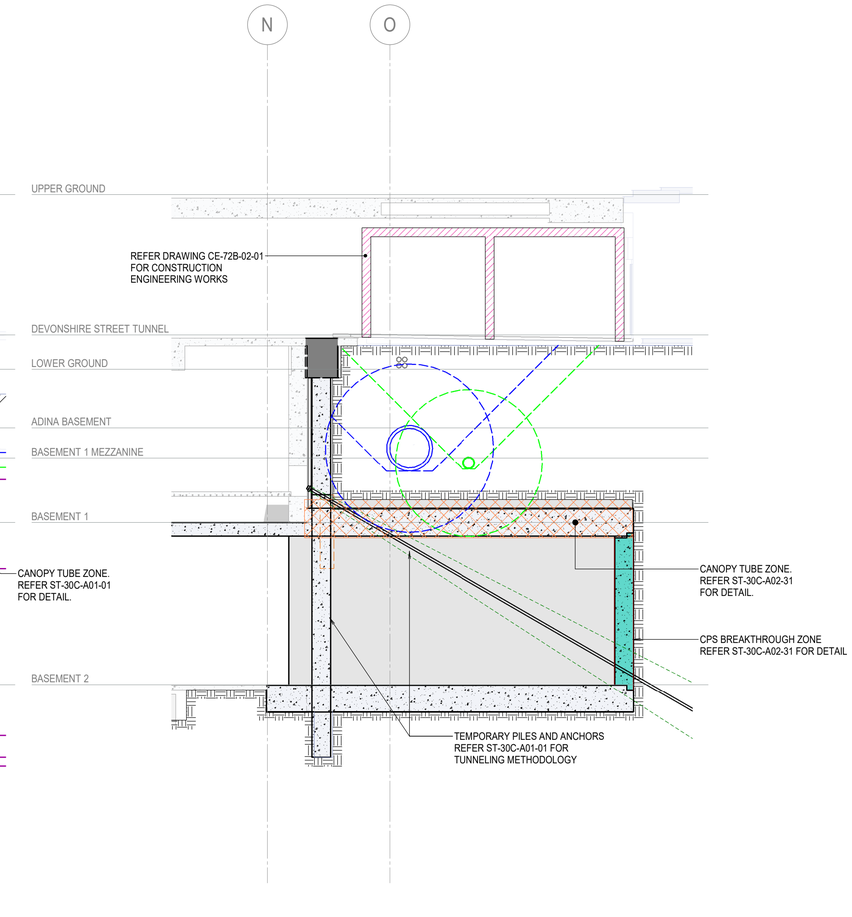
DRAWING
SHORING ELEVATION - SHEET 3
DRAWING NUMBER ST-30C-A01-03
ISSUE A



SW8 - ELEVATION

Scale: 1 : 100

1. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
2. PROVIDE TEMPORARY STEEL CASING TO PILES WHERE EXCAVATION MAY COLLAPSE. (e.g. ABOVE FINE TO MEDIUM GRAIN SANDSTONE)
3. SW8 CASED PILES REQUIRED FROM BASEMENT 1 TO LOWER GROUND
4. DENOTES SHOTCRETE 100 MIN THICK U.N.O. SHOTCRETE LIFTS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER BASED ON SITE CONDITIONS.



SW9 - ELEVATION

Scale: 1 : 100

1. 600 THICK R.C. U.N.O. WALL TO BE POURED AGAINST ROCK.
2. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
3. ROCK ANCHORS SUBJECT TO ADVERSE DIPPING JOINTS FOUND ON EXCAVATION. GEOTECHNICAL ENGINEER TO REVIEW DURING EXCAVATION.

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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15	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH
PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

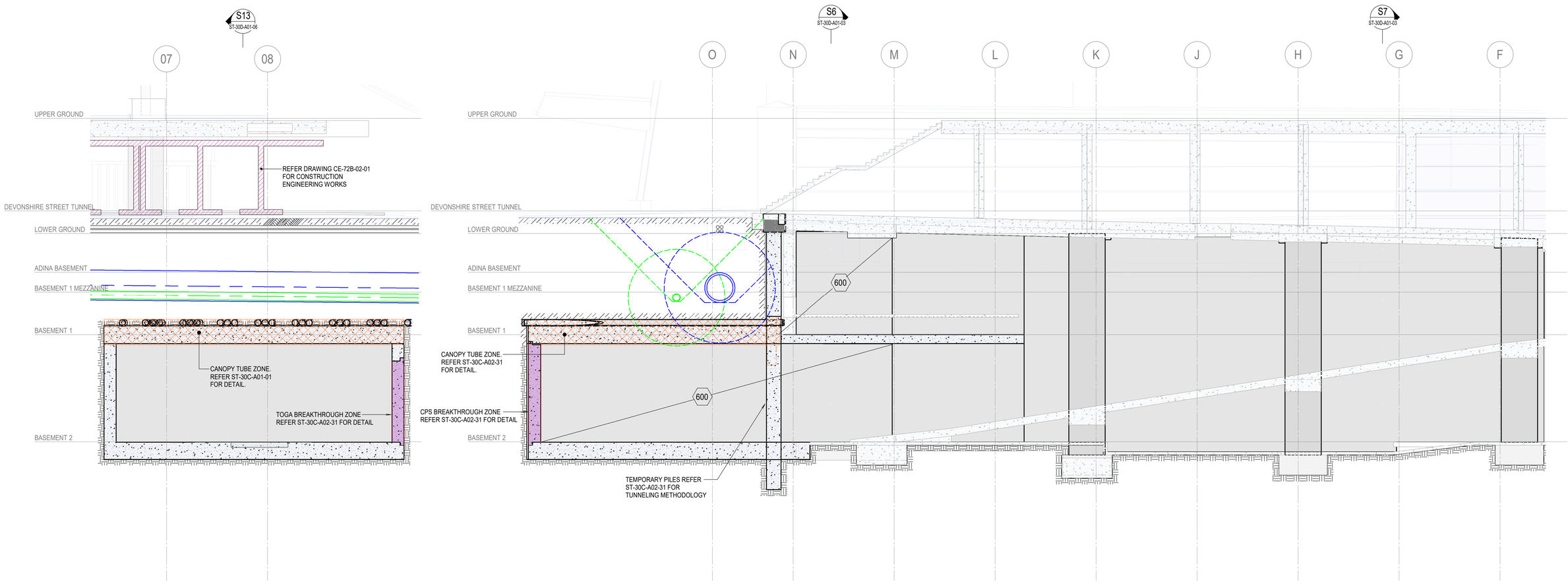
Scale : A1 | DRAWN | AUTHORISED
As indicated | RB | KPB

STATUS
FOR CONSTRUCTION

DRAWING
SHORING ELEVATION - SHEET 4

DRAWING NUMBER
ST-30C-A01-04

ISSUE
A



SW10 - ELEVATION

Scale: 1 : 100

1. 600 THICK R.C. U.N.O. WALL TO BE POURED AGAINST ROCK.
2. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
3. ROCK ANCHORS SUBJECT TO ADVERSE DIPPING JOINTS FOUND ON EXCAVATION. GEOTECHNICAL ENGINEER TO REVIEW DURING EXCAVATION.

SW11 - ELEVATION

Scale: 1 : 100

1. 200 THICK REINFORCED CONCRETE U.N.O. WALL TO BE POURED AGAINST ROCK.
2. GEOTECHNICAL ENGINEER TO INSPECT DURING EXCAVATION.
3. ROCK ANCHORS SUBJECT TO ADVERSE DIPPING JOINTS FOUND ON EXCAVATION. GEOTECHNICAL ENGINEER TO REVIEW DURING EXCAVATION.

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

✦ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

STATUS
FOR CONSTRUCTION

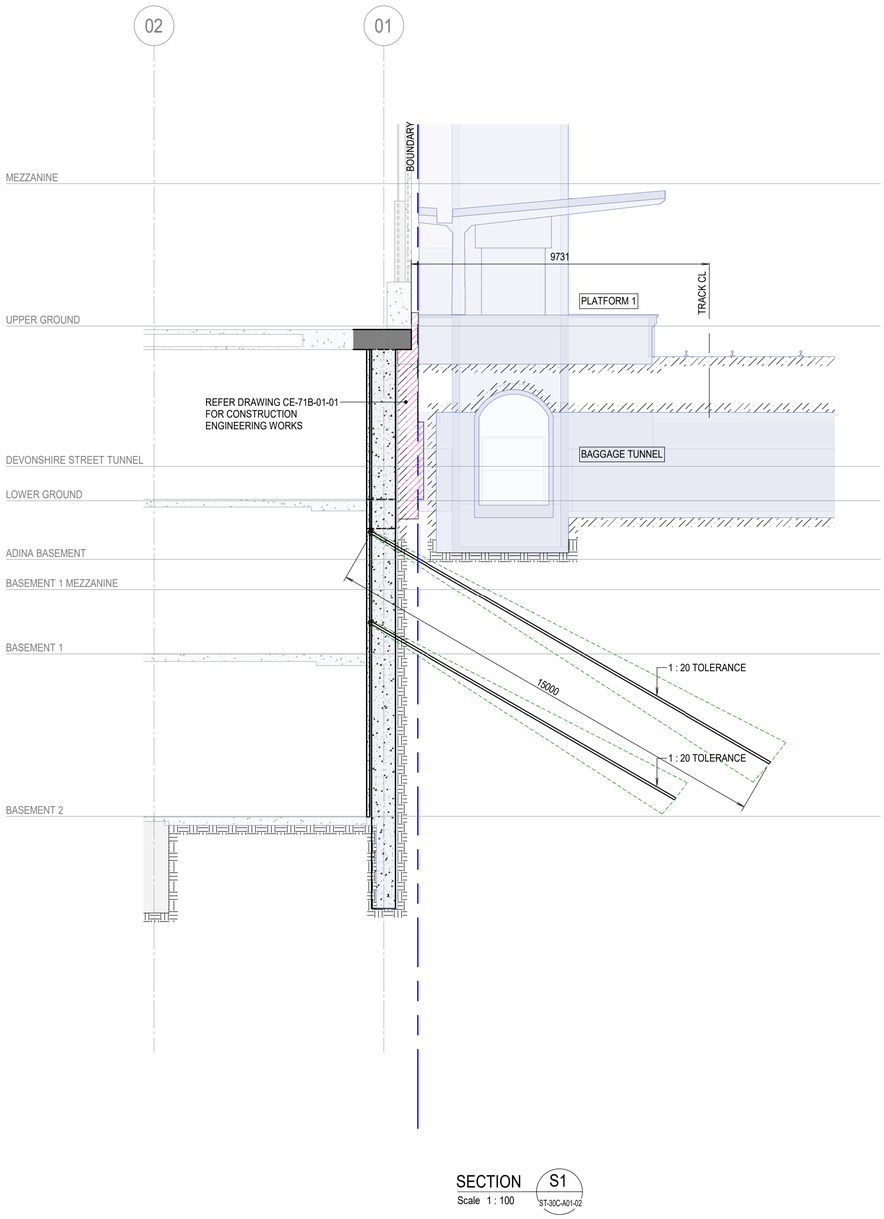
TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

DRAWING
SHORING ELEVATION - SHEET 5

DRAWING NUMBER ST-30C-A01-05
ISSUE A



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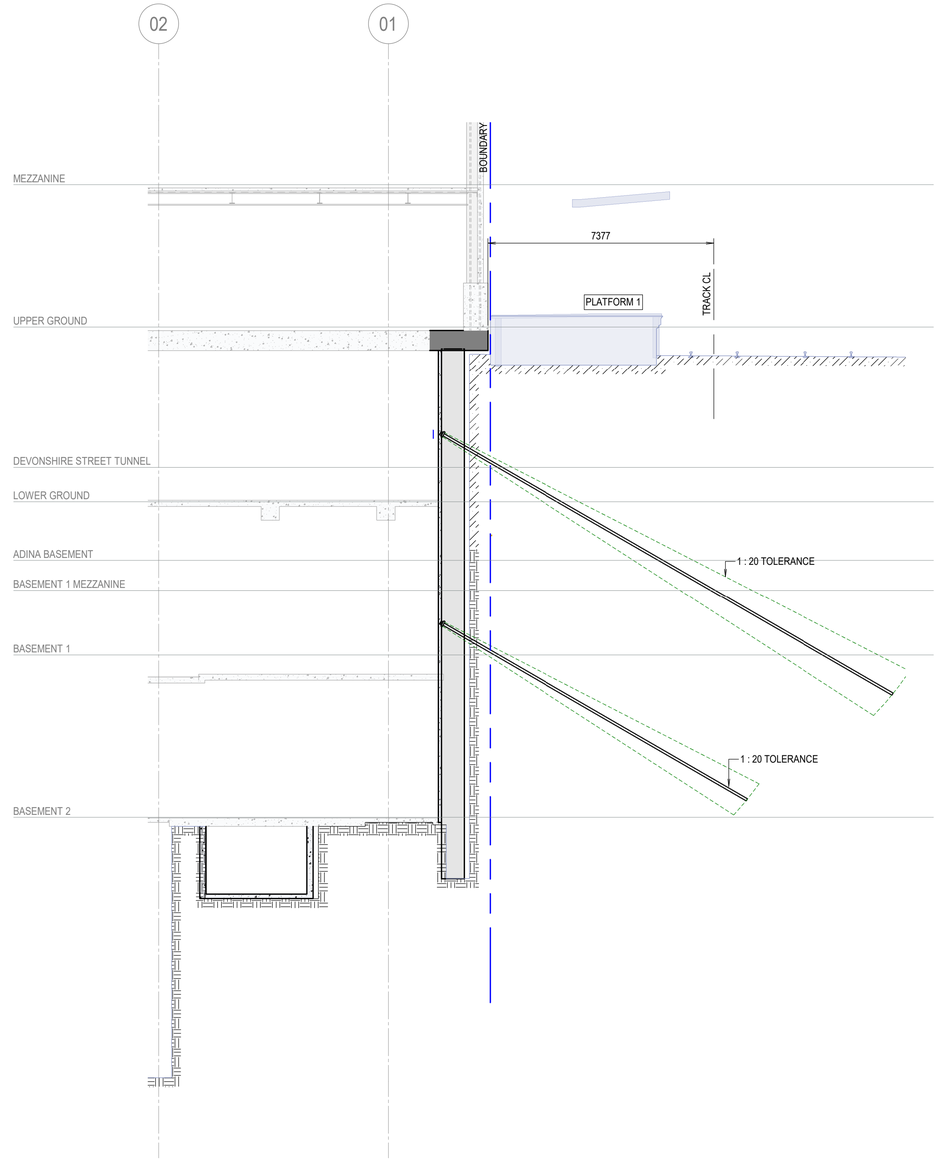

SECTION S2
Scale 1 : 100
ST-30C-A01-03

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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Rev	Date	Description	Eng	Draft
01	20.08.20	REVISED CONCEPT DESIGN	JRV	RB
02	04.09.20	50% SD ISSUE	JRV	RB
03	30.09.20	100% SD ISSUE	JRV	RB
04	16.04.21	FOR INFORMATION - SD	KPB	RB
05	23.04.21	ISSUED FOR SD 2.0	KPB	RB
06	12.05.21	REFERENCES REVISED	JVR	RB
07	30.06.21	25%DD D&C TENDER ISSUE	JVR	RB
08	22.09.21	50% DD STAGE 3 ISSUE	JVR	RB
09	11.10.21	50% DD SHORING PACKAGE	JVR	RB
10	21.10.21	50% DD SHORING REISSUE	JVR	RB

Rev	Date	Description	Eng	Draft
11	01.12.21	75% DD SHORING PACKAGE	CG	RB
12	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB
13	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH

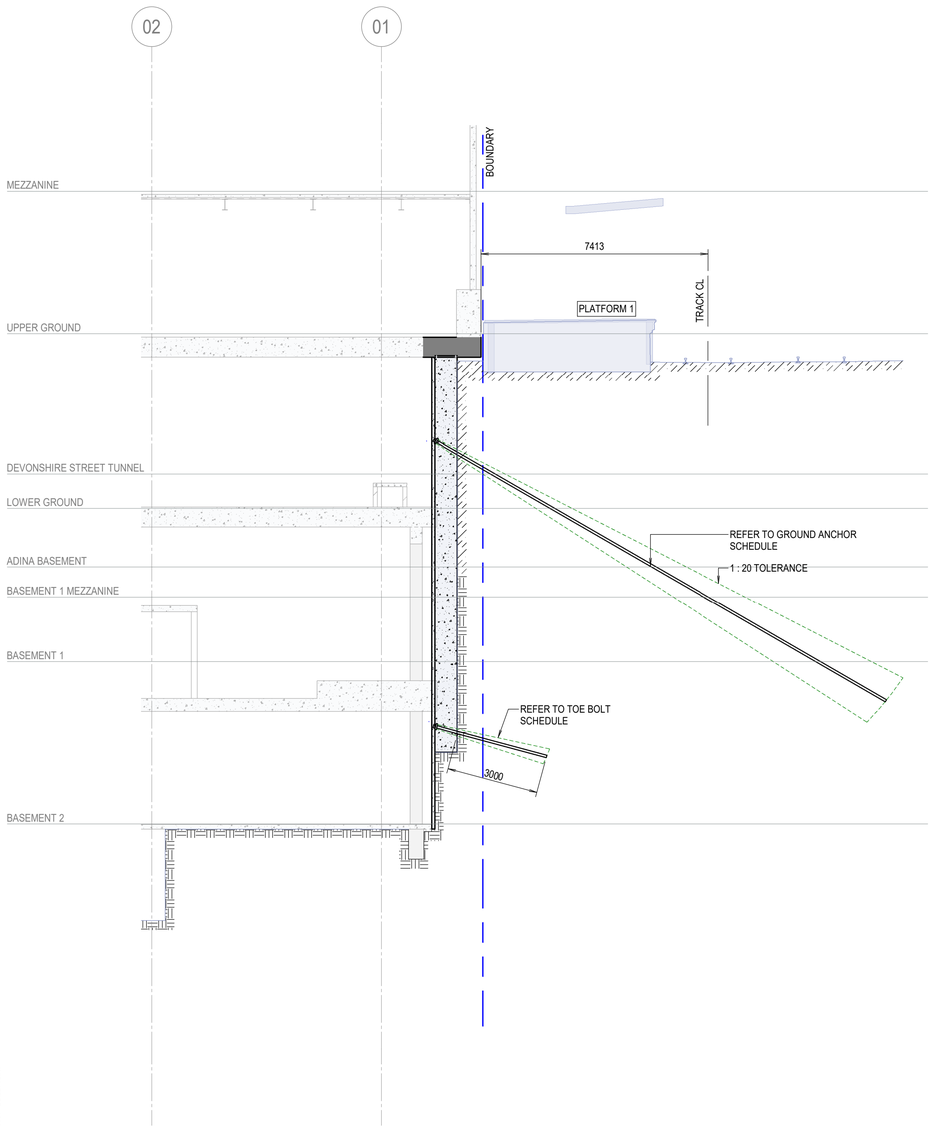
GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

STATUS
FOR CONSTRUCTION

DRAWING
SHORING SECTIONS - SHEET 1

DRAWING NUMBER ISSUE
ST-30D-A01-01 A



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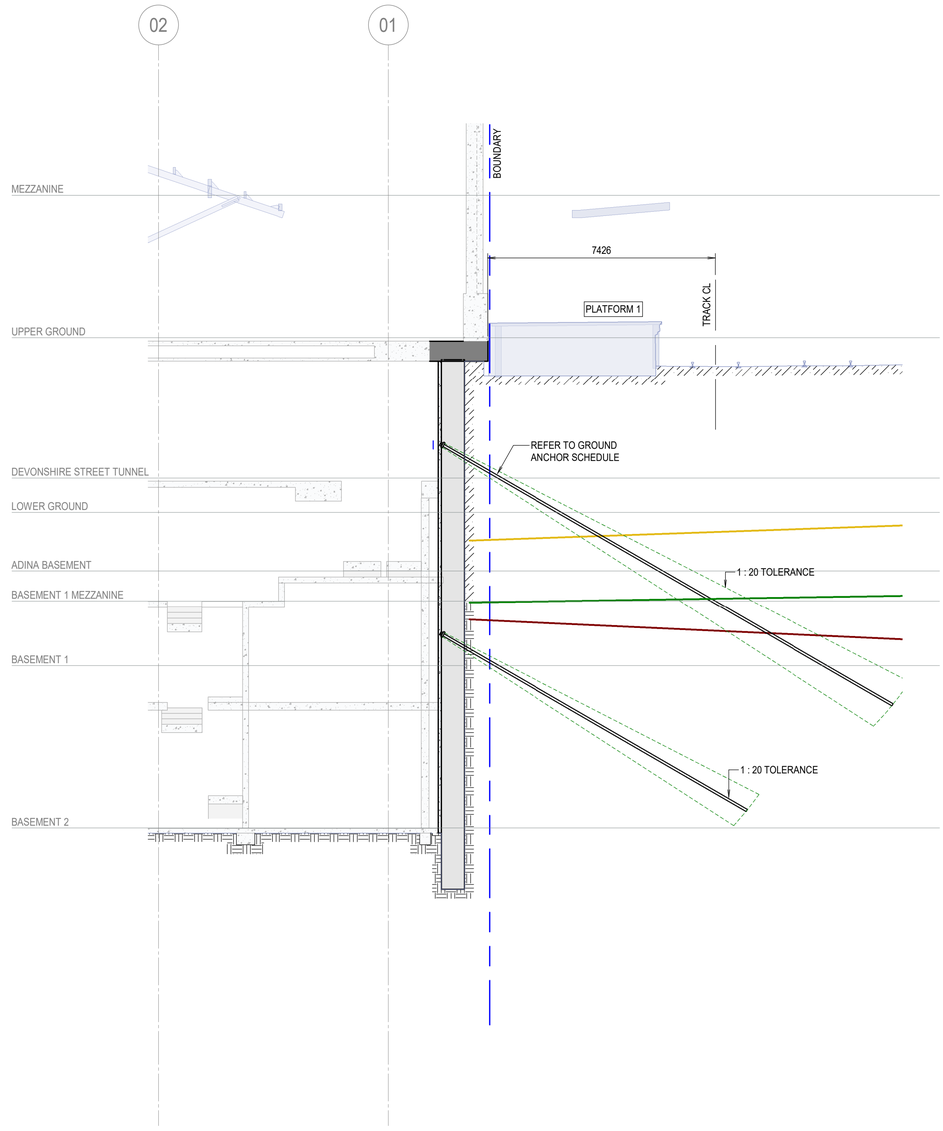

SECTION S4
Scale 1 : 100 ST-30C-A01-03

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

DESIGN HAS BEEN DEVELOPED TO APPROVED FOR CONSTRUCTION
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05	23.04.21	ISSUED FOR SD 2.0	KPB	RB
06	12.05.21	REFERENCES REVISED	JVR	RB
07	30.06.21	25%DD D&C TENDER ISSUE	JVR	RB
08	17.09.21	FOR APPROVAL - SYDNEY WATER	JVR	RB
09	22.09.21	50% DD STAGE 3 ISSUE	JVR	RB
10	11.10.21	50% DD SHORING PACKAGE	JVR	RB

Rev	Date	Description	Eng	Draft
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12	01.12.21	75% DD SHORING PACKAGE	CG	RB
13	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB
14	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

STATUS
FOR CONSTRUCTION

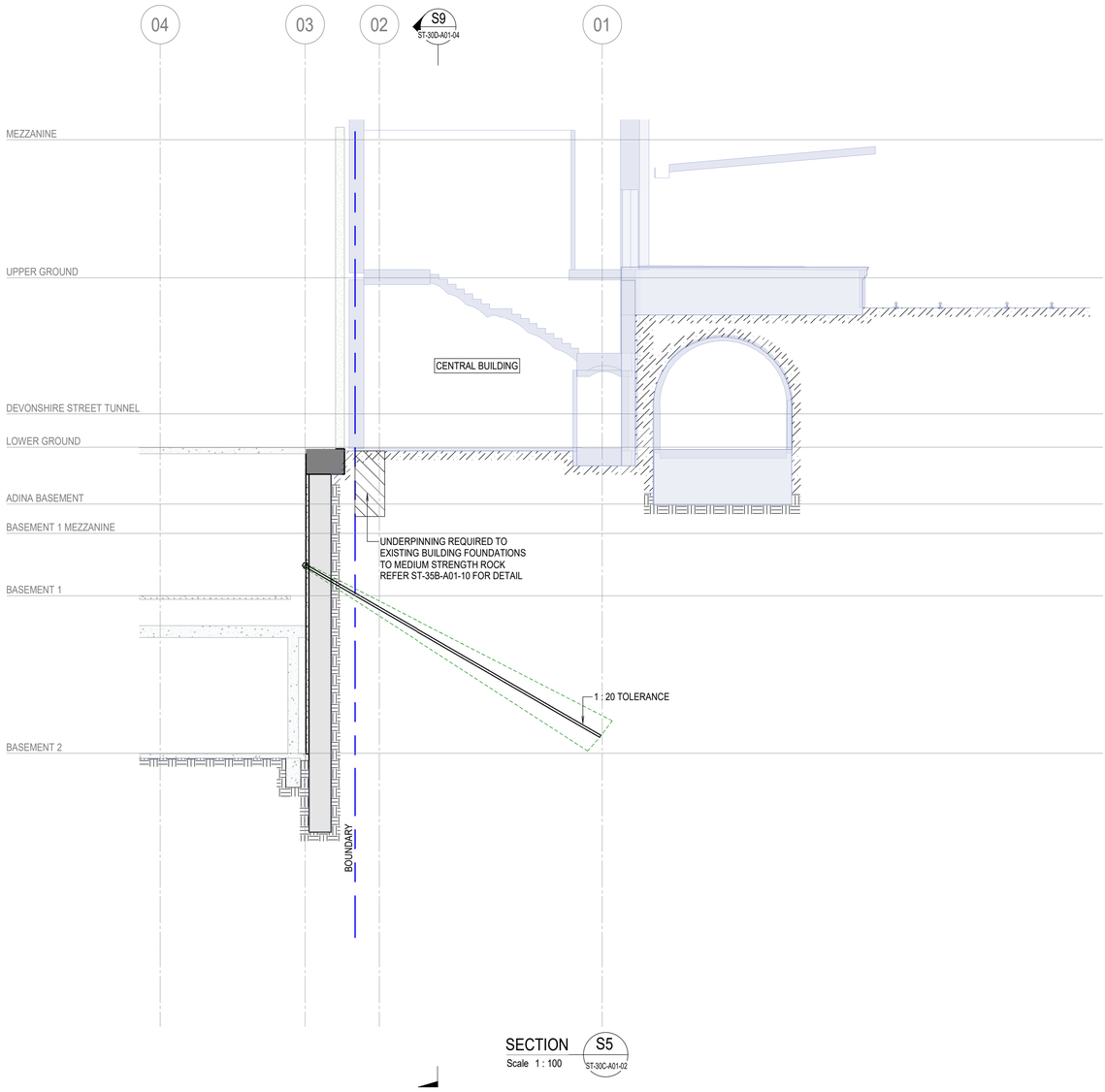
TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

DRAWING
SHORING SECTIONS - SHEET 2

DRAWING NUMBER ST-30D-A01-02
ISSUE A



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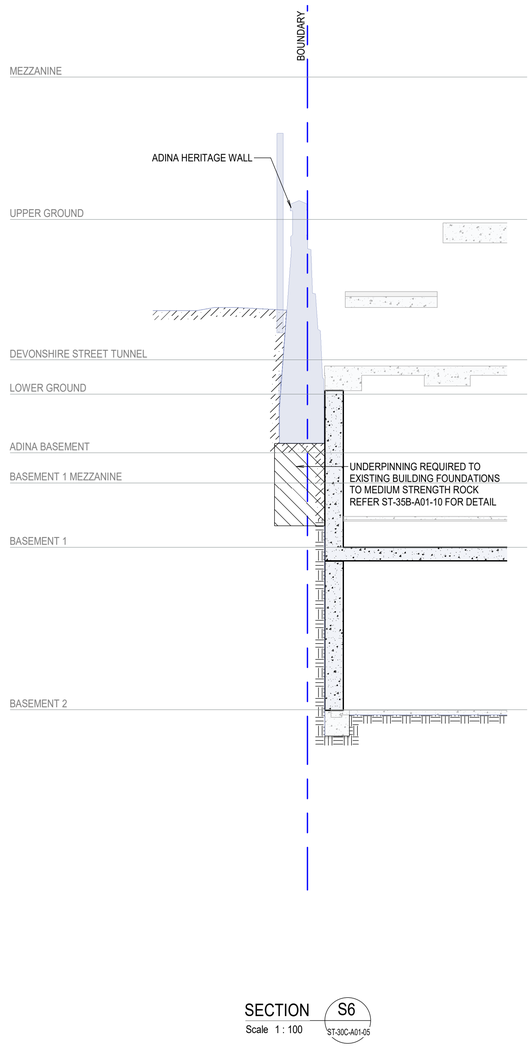

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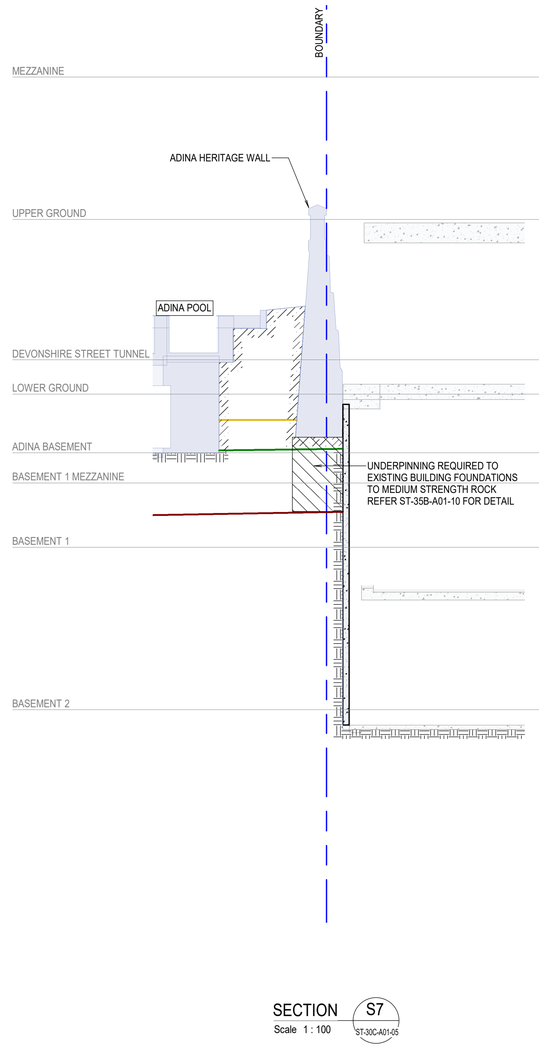

SECTION S7
Scale 1 : 100
ST-30C-A01-05

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE,
GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR
GROUND ANCHOR SCHEDULE

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10	21.10.21	50% DD SHORING REISSUE	JVR	RB

Rev	Date	Description	Eng	Draft
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12	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB
13	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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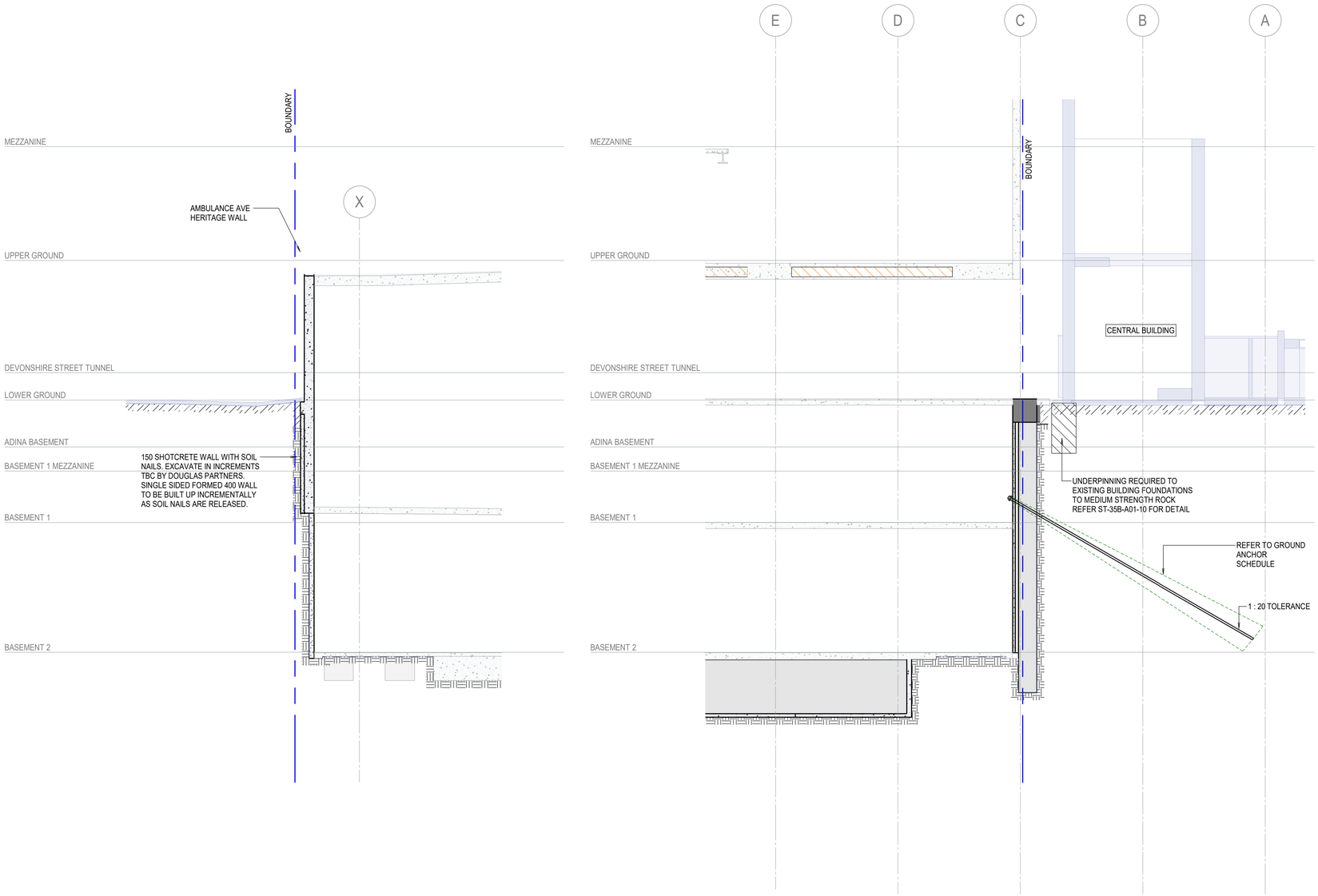
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB
STATUS
FOR CONSTRUCTION

DRAWING
SHORING SECTIONS - SHEET 3
DRAWING NUMBER ISSUE
ST-30D-A01-03 A



SECTION S8
Scale 1 : 100
ST-30C-A01-01

SECTION S9
Scale 1 : 100
ST-30C-A01-02

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

✦ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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10	21.10.21	50% DD SHORING REISSUE	JVR	RB

Rev	Date	Description	Eng	Draft
11	01.12.21	75% DD SHORING PACKAGE	CG	RB
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13	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH
PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

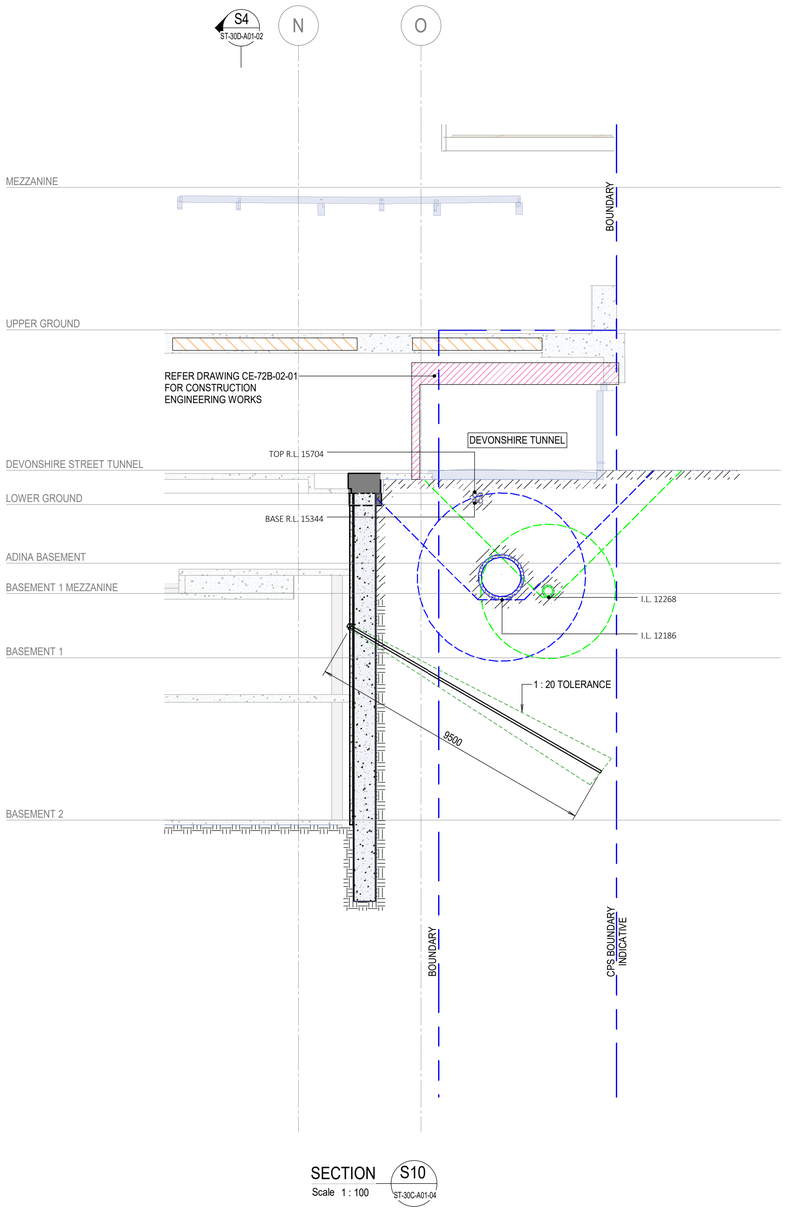
Scale : A1 DRAWN RB AUTHORISED KPB
As indicated

STATUS
FOR CONSTRUCTION

DRAWING
SHORING SECTIONS - SHEET 4

DRAWING NUMBER
ST-30D-A01-04

ISSUE
A



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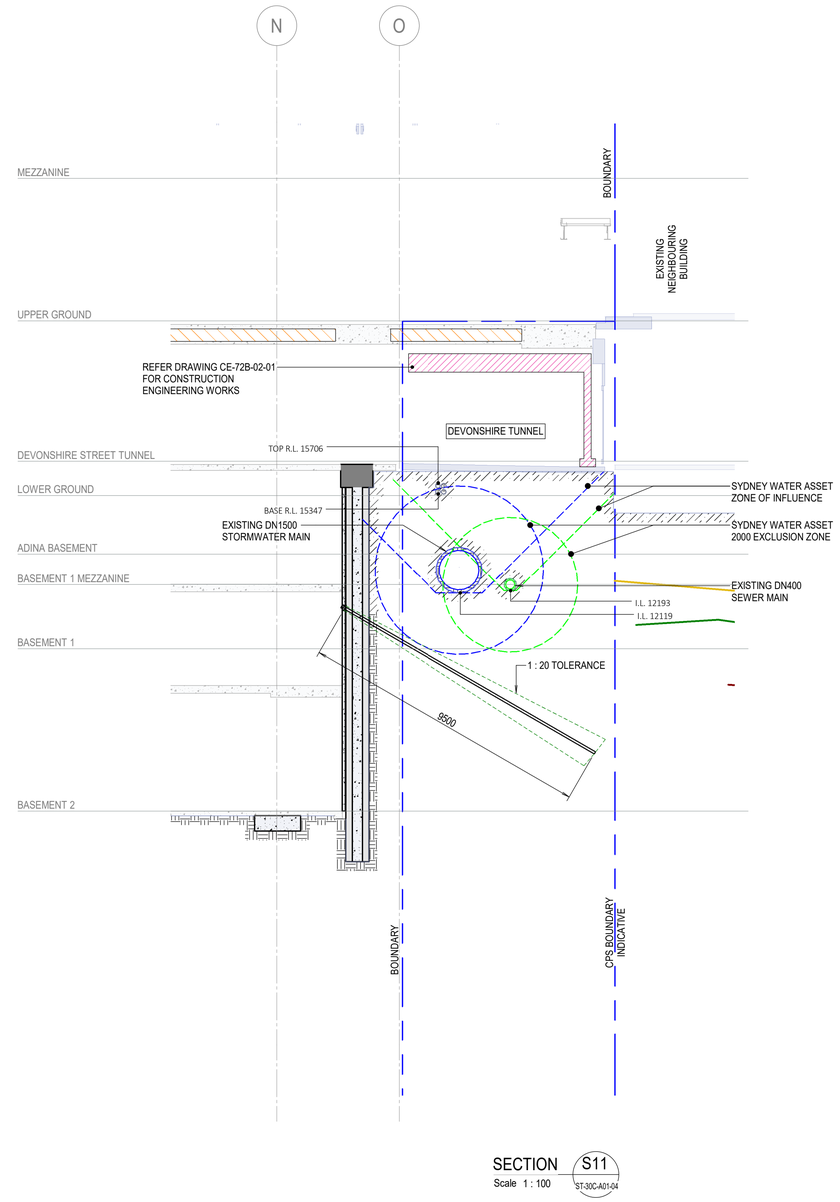

SECTION S11
Scale 1 : 100 ST-30C-A01-04

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE,
GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR
GROUND ANCHOR SCHEDULE

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Rev	Date	Description	Eng	Draft
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A	15.02.22	AFC	HD	RB

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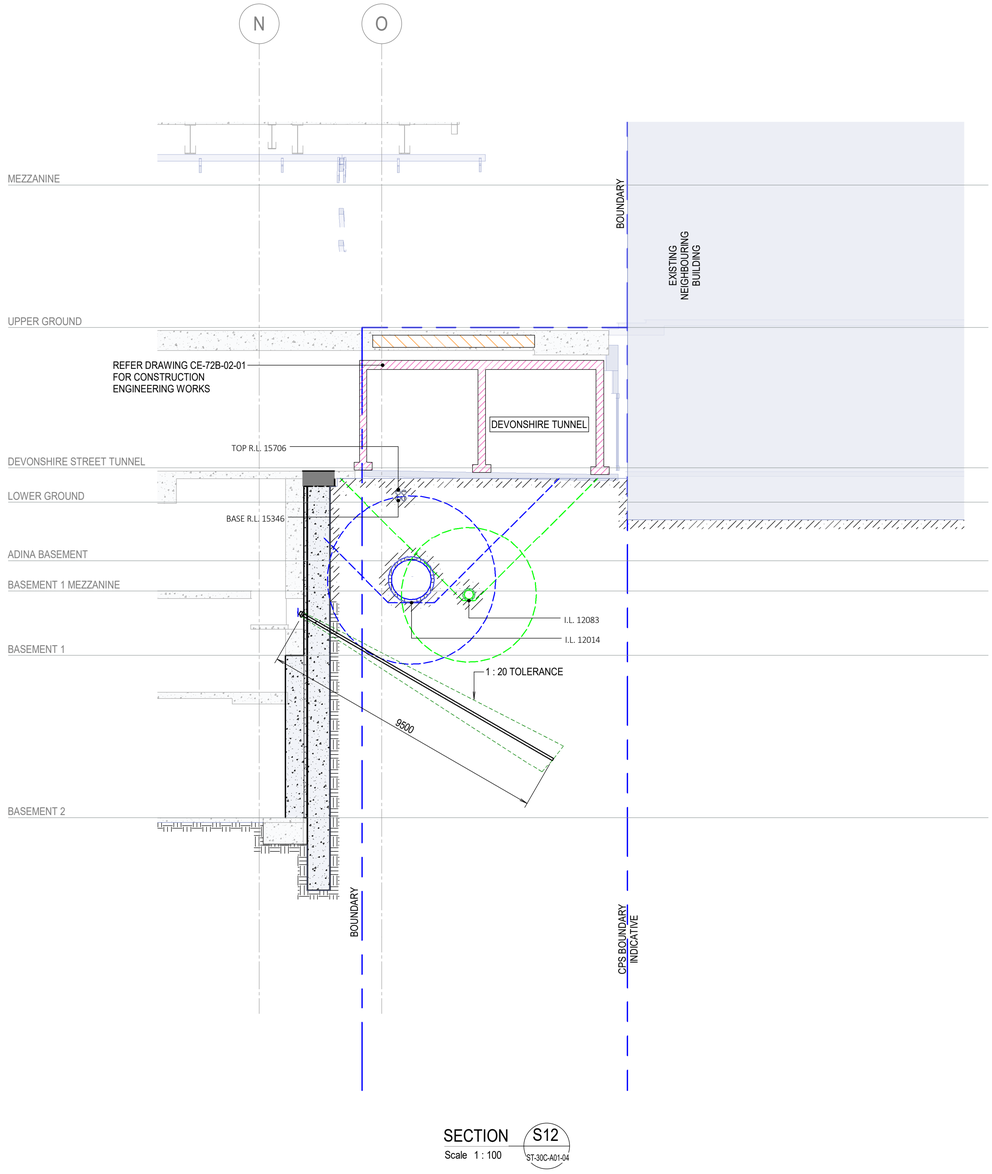
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797
STATUS
FOR CONSTRUCTION

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

DRAWING
SHORING SECTIONS - SHEET 5
DRAWING NUMBER ST-30D-A01-05
ISSUE A



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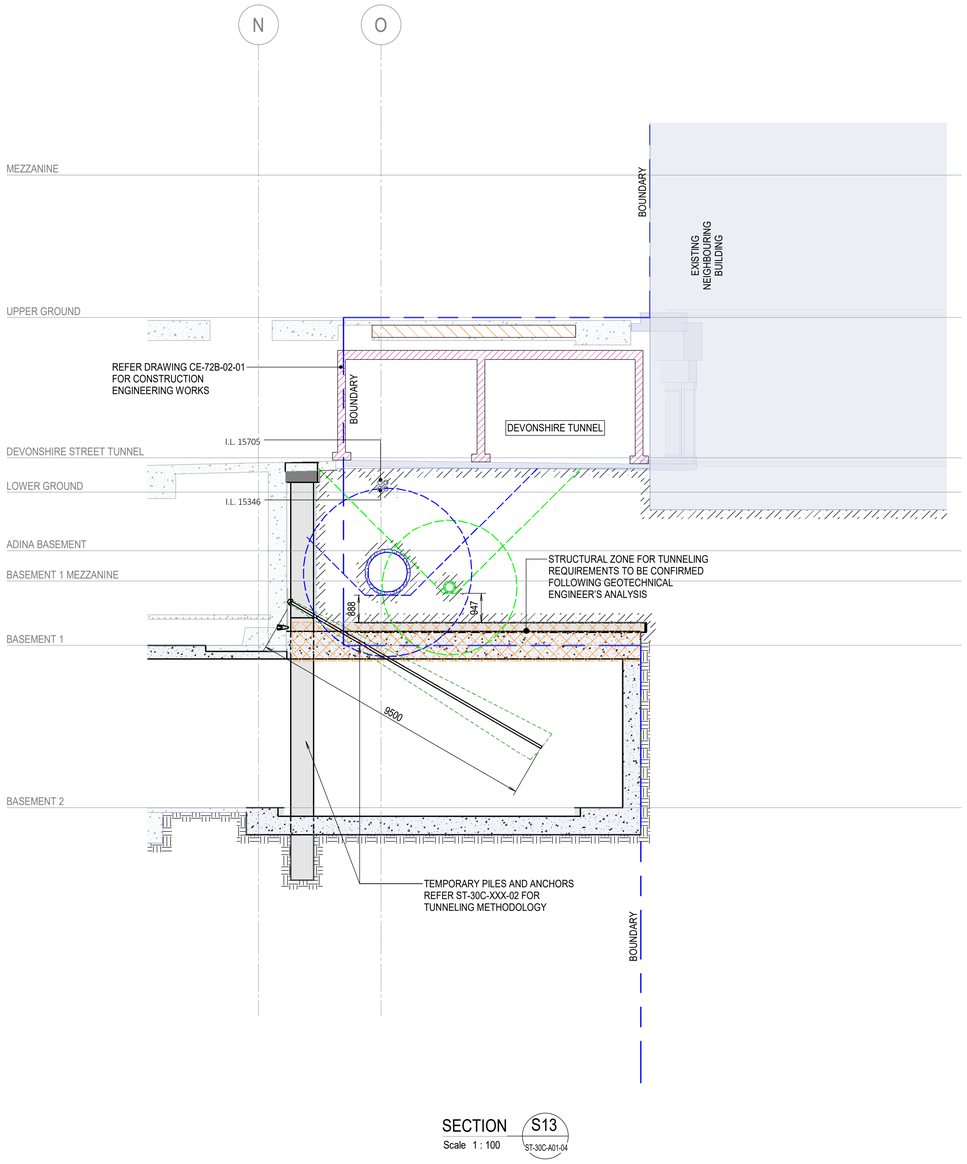

SECTION S13
Scale 1 : 100 ST-30C-A01-04

SCHEDULES

REFER SHEET ST-31Y-TXX-10 FOR SHORING PILE, GROUND ANCHOR AND CAPPING BEAM SCHEDULES

GROUND ANCHOR LEGEND

+ DENOTES GROUND ANCHOR AND ROCK BOLT LOCATIONS

REFER SHEET ST-31Y-TXX-10 FOR GROUND ANCHOR SCHEDULE

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH

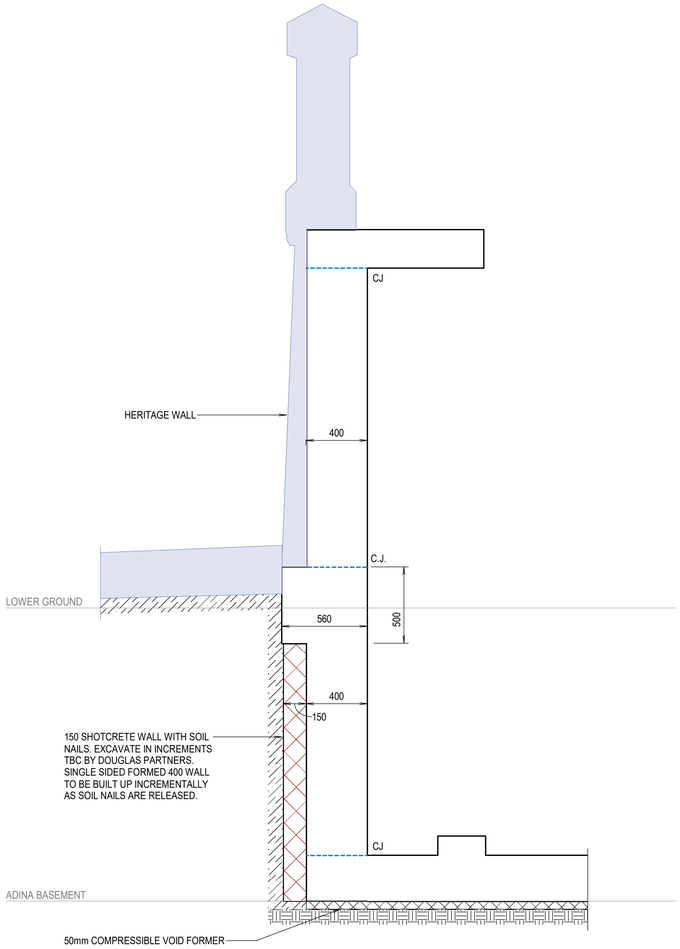
GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

STATUS
FOR CONSTRUCTION

DRAWING
SHORING SECTIONS - SHEET 6

DRAWING NUMBER ISSUE
ST-30D-A01-06 A



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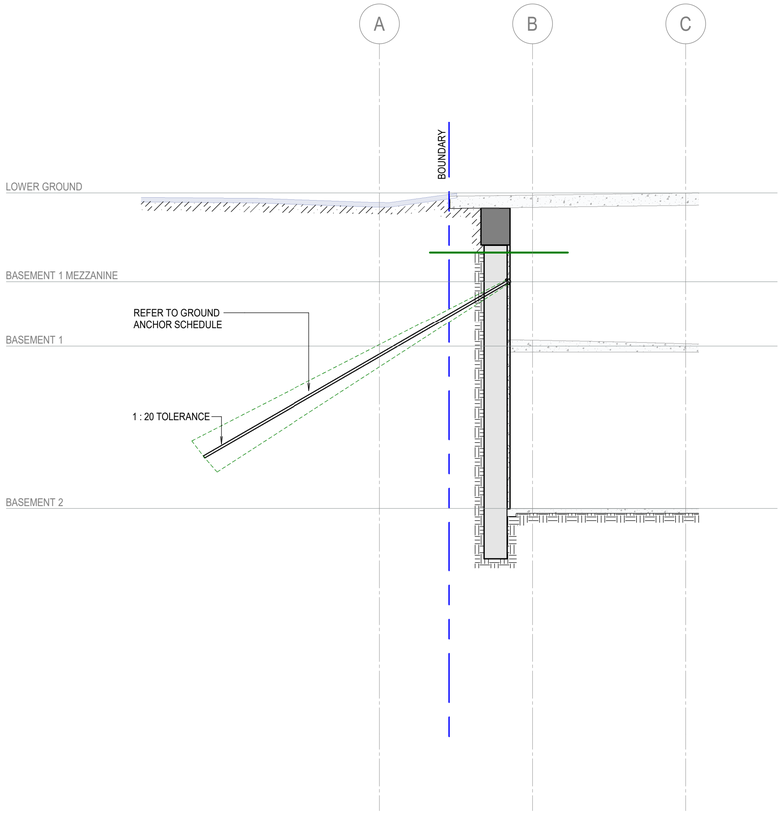
ST-30C-A01-07



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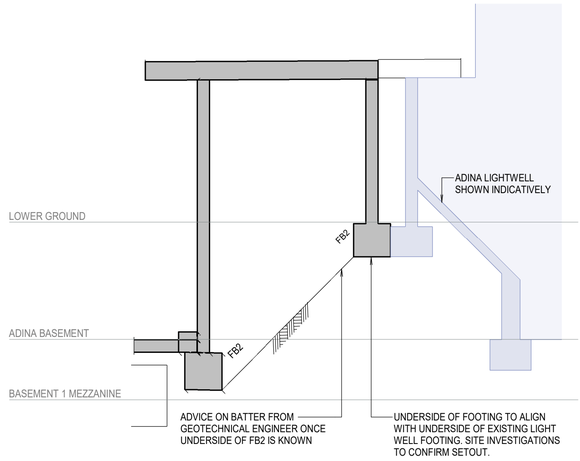

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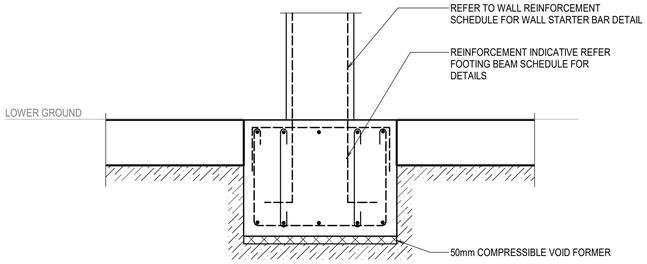
ST-30B-A01-02



SECTION 2
Scale 1 : 20
ST-30B-A01-01

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Rev	Date	Description	Eng	Draft
01	30.06.21	25%DD D&C TENDER ISSUE	JVR	RB
02	22.09.21	50% DD STAGE 3 ISSUE	JVR	RB
03	11.10.21	50% DD SHORING PACKAGE	JVR	RB
04	21.10.21	50% DD SHORING REISSUE	JVR	RB
05	01.12.21	75% DD SHORING PACKAGE	CG	RB
06	14.12.21	75% EARTHWORKS AND RETENTION	CG	RB
07	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

TRUE NORTH
PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB
STATUS
FOR CONSTRUCTION

DRAWING
SHORING SECTIONS - SHEET 7
DRAWING NUMBER ISSUE
ST-30D-A01-07 A

SHORING PILE SCHEDULE

MARK	DIAMETER	F'C (Mpa)	SOCKET LENGTH	VERTICAL REINFORCEMENT	TIES	
					CLOSED TIES	ADDITIONAL CLOSED LIGATURES IN ZONE A
SP1	750	50	1.5	8N32 (Y) +8N20 (X)	N16-200 CTS	2N16-200 CTS
SP2	750	50	1.5	10N32	N16-150 CTS	2N16-150 CTS
SP3	750	50	1.5	10N28	N16-200 CTS	2N16-200 CTS
SP4	900	50	1.5	16N32	N16-200 CTS	2N16-200 CTS
SP5 (LONG)	750	50	1.5	10N28	N16-150 CTS	2N16-150 CTS
SP5 (SHORT)	750	50	0	10N28	N16-150 CTS	2N16-150 CTS
SP6 (LONG)	750	50	1.5	8N40 (Y)+8N28 (X)	N16-150 CTS	2N16-150 CTS
SP6 (SHORT)	750	50	0	8N40 (Y)+8N28 (X)	N16-150 CTS	2N16-150 CTS
SP7 (LONG)	750	50	1.5	8N32 (Y) +8N20 (X)	N16-150 CTS	2N16-150 CTS
SP7 (SHORT)	750	50	0	8N32 (Y) +8N20 (X)	N16-150 CTS	2N16-150 CTS
SP8	750	50	1.5	8N32 (Y) +8N20 (X)	N16-200 CTS	NA
SP9	750	50	1.5	15N32	N16-200 CTS	2N16-200 CTS
SP10	450	50	1	5N20	N12-300	NA

NOTE:
SOCKET LENGTH REFERS TO LENGTH BELOW BASE EXCAVATION LEVEL

CAPPING BEAM SCHEDULE

MARK	SIZE		REINFORCEMENT			
	WIDTH	DEPTH	BOTTOM	TOP	SIDE	TIES
CB1a	950	790	2 ROWS 5N32	5N32	N16-200	5N16-100
CB1b	950	1200	3 ROWS 5N32	5N36	N16-200	5N16-200
CB1c	1050	500	5N20	5N20	N16-200	3N12-250
CB2	1200	1640	2 ROWS 5N32	5N36	N16-200	5N16-200
CB2	1300	850	5N20	5N20	N16-200	3N12-250
CB2a	950	950	5N20	5N20	N16-200	3N12-250
CB2c	1200	1600	3 ROWS 5N32	5N36	N16-200	5N16-200
CB2d	1050	650	5N20	5N20	N16-200	3N12-250
CB2e	1050	900	5N20	5N20	N16-200	3N12-250
CB2f	1050	1250	5N28	5N20	N16-200	3N12-250
CB2g	1200	850	5N20	5N20	N16-200	3N12-250
CB2j	1900	1250	5N28	5N20	N16-200	3N12-250
CB3b	1050	950	5N28	5N20	N16-200	3N12-250
CB3c	1050	1295	5N28	5N20	N16-200	3N12-250
CB3d	1720	950	5N28	5N20	N16-200	3N12-250
CB3e	1900	1295	5N28	5N20	N16-200	3N12-250
CB3f	2720	750	5N28	5N20	N16-200	3N12-250
CB4	1900	650	REFER DETAILS ON DRAWING ST-35B-A01-05			

PILE SCHEDULE

MARK	DIAMETER	PILE LENGTH	VERTICAL REINFORCEMENT	HELIX TIES
P1	750	8000	8N36	N12-300 PITCH

FOOTING BEAM SCHEDULE

MARK	SIZE		REINFORCEMENT			
	WIDTH	DEPTH	BOTTOM	TOP	SIDE	TIES
FB1	1000	1000	6N32	6N32	2N16 E.F.	4 LEGS N12-300 (U.N.O.)
FB2	600	600	4N20	4N20	1N16 E.F.	2 LEGS N12-300
FB3	1300	910	9N24	9N24	2N16 E.F.	6 LEGS N16-300
FB4	800	910	6N24	6N24	2N16 E.F.	4 LEGS N16-300
FB5	600	250	5N16	5N16	-	N10-300 CLOSED TIES

TEMPORARY GROUND ANCHOR SCHEDULE

MARK	DESIGN WORKING LOAD (kN) Td	LOCK OFF LOAD (kN) To	ANGLE	FREE LENGTH	BOND LENGTH	MIN HOLE DIAMETER	COMMENTS
GA1A	600	480	30.00°	7000	4500	100	
GA2A	600	480	30.00°	10000	7000	100	
GA2B	600	480	30.00°	6000	5500	100	
GA3A	600	480	30.00°	9500	5500	100	
GA4A	600	480	30.00°	5500	4000	150	
GA4B	750	600	30.00°	5500	4000	150	5 x 15.2 SUPER-STRANDS
GA5	TEMPORARY WORKS ANCHOR - REFER TO CE - 71D-01-12 FOR DETAILS						

NOTE:
1. REFER TO SPECIFICATION ST-36Z-XXX-A1 FOR GROUND ANCHOR TESTING AND INSTALLATION REQUIREMENTS AND ST-36Z-XXX-C1 FOR PILING INSTALLATION REQUIREMENTS.
2. GROUND ANCHORS ARE TO HAVE A DESIGN LIFE OF 10 YEARS OR IF DESIGNED AS TEMPORARY ANCHORS SHALL BE REPLACED WITH PERMANENT SUPPORT WITHIN 2 YEARS.
3. ALL TEMPORARY ANCHORS TO BE DESTRESSED WITH THE ANCHOR HEAD REMOVED AND PROTRUDING TENDONS OR BARS TO BE CUT FLUSH.
4. ALL ANCHORS CONSIST OF 4 x 15.2 SUPER-STRANDS U.N.O.
5. ALL FREE LENGTH HOLES TO BE GROUT FILLED AFTER DESTRESSING

PILE TOE ROCK BOLT SCHEDULE

MARK	ANGLE	MIN BOND LENGTH	MIN BOLT DIA	MIN HOLE DIA
TB1	15	3000	25	100

UNDERPINNING ROCK BOLT SCHEDULE

MARK	ANGLE	HORIZONTAL SPACING	MIN BOND LENGTH	MIN BOLT DIA	MIN HOLE DIA
RB1	30	2000	3000	25	100

NOTE:
1. BOND LENGTH INTO MEDIUM STRENGTH OR BETTER SANDSTONE

ROCK FACE SUPPORT BOLT SCHEDULE

MARK	ANGLE	PATTERN SPACING	MIN BOND LENGTH	MIN BOLT DIA	MIN HOLE DIA
RB2	30	2000 x 2000	7000	25	100

NOTE:
1. APPLIED OVER FULL HEIGHT OF THE ROCK FACE EXPOSED
2. THE ABOVE TABLE IS SUITABLE FOR VERTICAL UNSUPPORTED ROCK FACE UP TO A MAXIMUM 8m IN HEIGHT

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01	17.09.21	FOR APPROVAL - SYDNEY WATER	JVR	RB
02	20.09.21	FOR APPROVAL - SYDNEY WATER	JVR	RB
03	22.09.21	50% DD STAGE 3 ISSUE	JVR	RB
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TTW PROJECT NUMBER
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TRUE NORTH PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
Scale : A1 DRAWN AUTHORISED
1 : 1 RB KPB
STATUS
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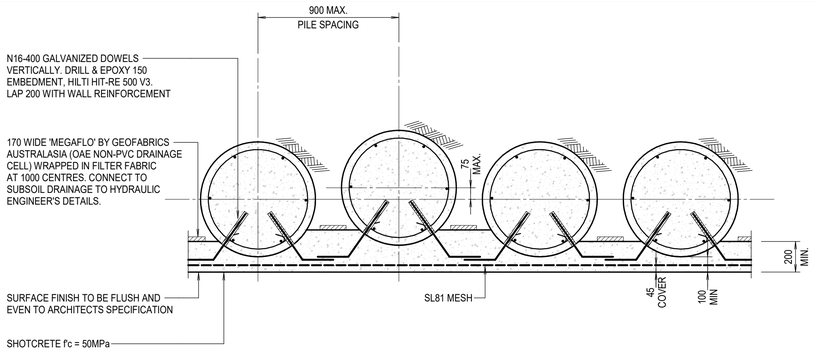
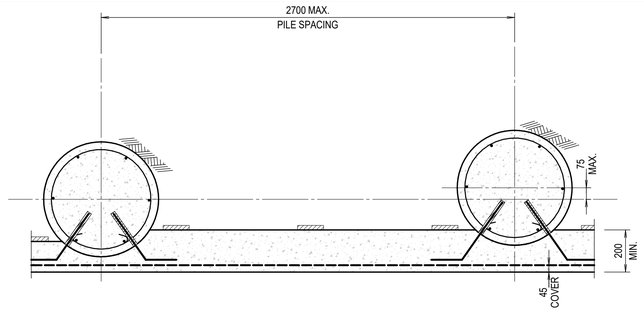
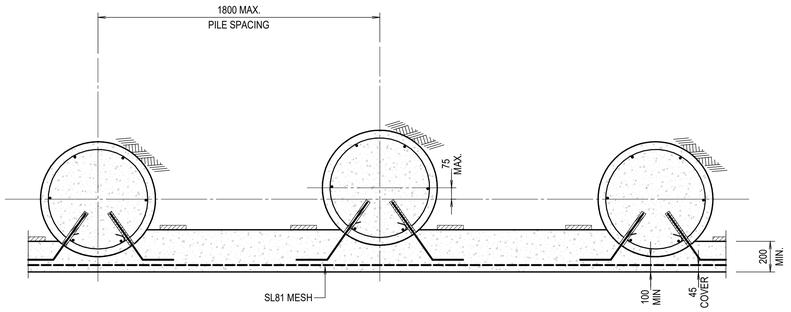
DRAWING
SHORING AND PILING ELEMENT SCHEDULE
DRAWING NUMBER ST-31Y-TXX-10
ISSUE A



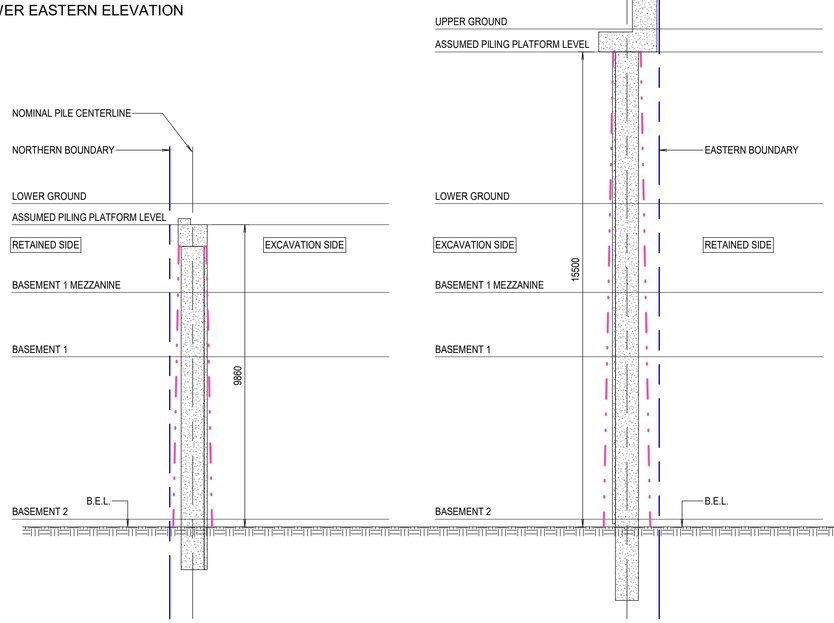
TYPICAL SOLDIER PILE WALL PLAN



TYPICAL SOLDIER PILE WALL PLAN FOR NORTHERN ELEVATION
REFER TYPICAL SOLDIER PILE WALL PLAN FOR TYPICAL DETAILS

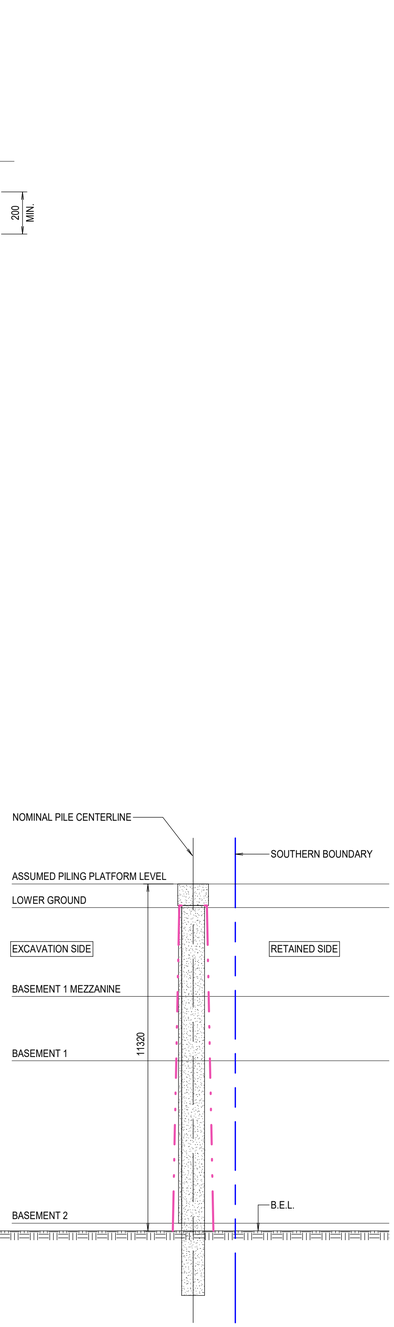


TYPICAL SOLDIER PILE WALL PLAN FOR LOWER EASTERN ELEVATION
REFER TYPICAL SOLDIER PILE WALL PLAN FOR TYPICAL DETAILS

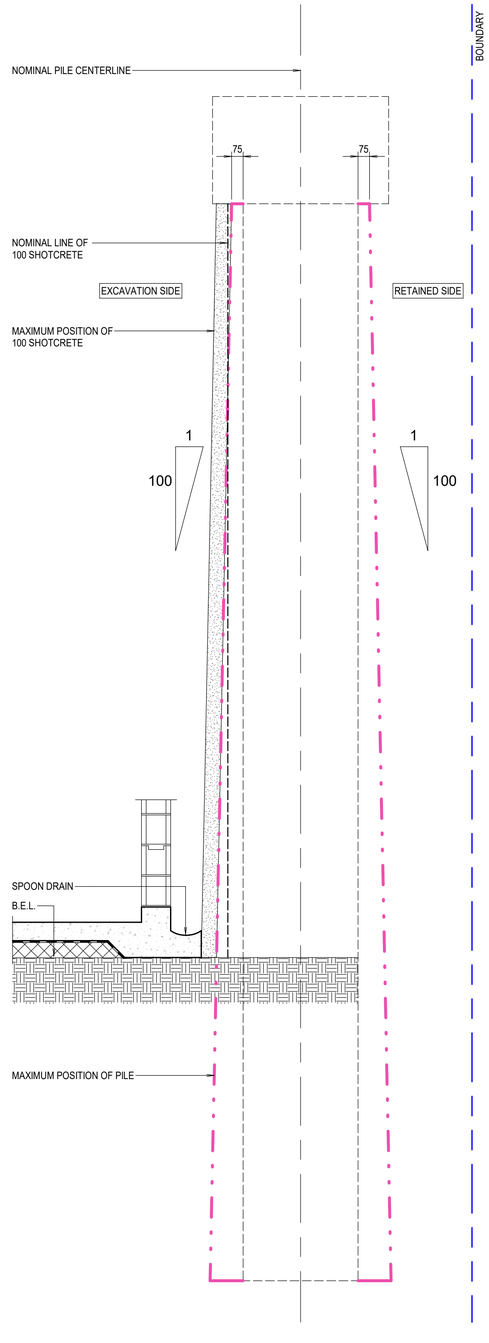


NORTHERN ELEVATION

EASTERN ELEVATION



SOUTHERN ELEVATION



TYPICAL PILE TOLERANCES

Scale: 1 : 100

MAXIMUM PLAN POSITION TOLERANCE INTO THE EXCAVATION +/- 75mm
MAXIMUM VERTICALITY TOLERANCE +/- 1% (1:100)

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A	15.02.22	AFC	HD	RB

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Scale : A1 DRAWN AUTHORISED
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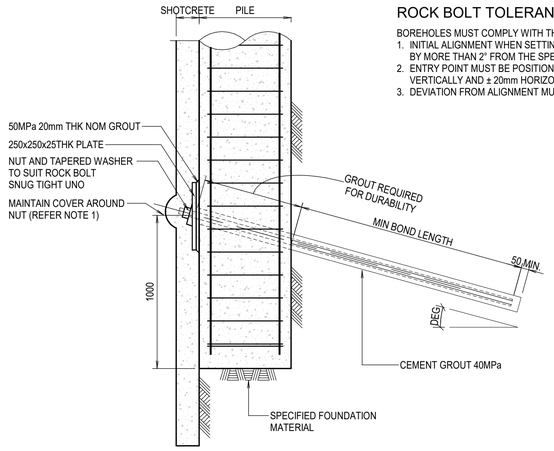
DRAWING
TYPICAL SHORING DETAILS
DRAWING NUMBER ST-35B-A01-02
ISSUE A



ROCK BOLT TOLERANCE

BOREHOLES MUST COMPLY WITH THE FOLLOWING:

1. INITIAL ALIGNMENT WHEN SETTING UP THE DRILL RIG MUST NOT DEVIATE BY MORE THAN 2° FROM THE SPECIFIED AXIS OF THE BOREHOLE.
2. ENTRY POINT MUST BE POSITIONED WITHIN A TOLERANCE OF ± 75mm VERTICALLY AND ± 20mm HORIZONTALLY.
3. DEVIATION FROM ALIGNMENT MUST NOT EXCEED 1 IN 20

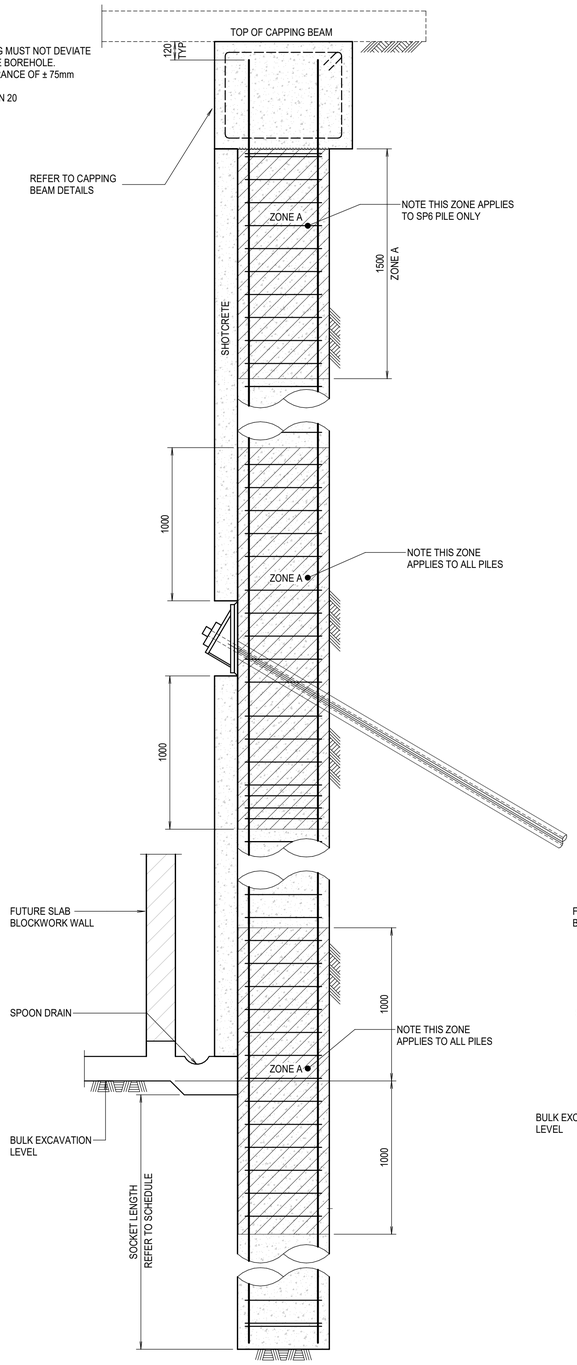
TYPICAL TOE BOLT DETAIL

(TEMPORARY 10 YR DESIGN LIFE)

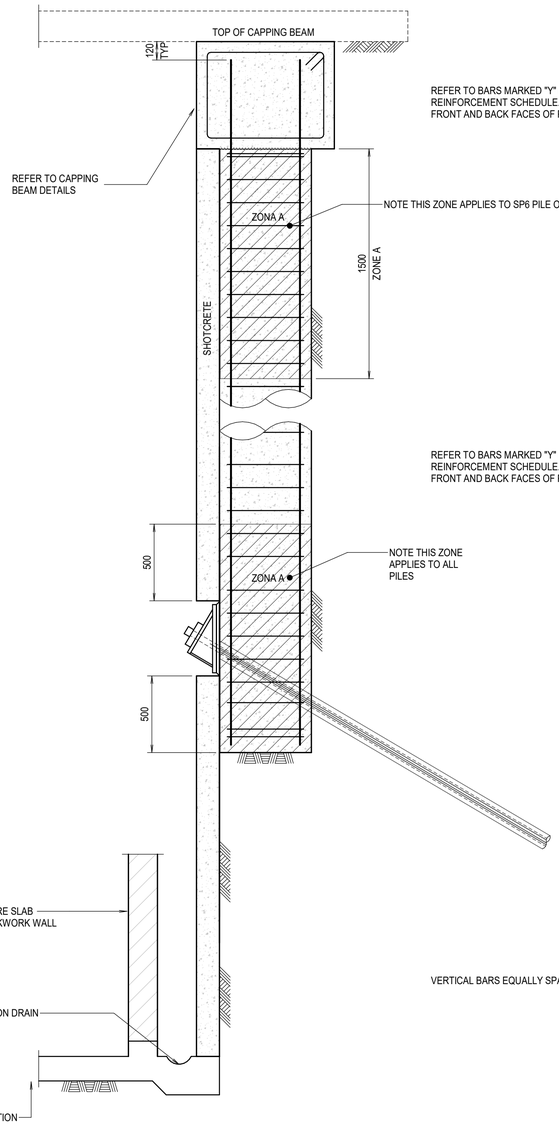
NOTE:

1. ALTERNATIVELY, IF BOLT HEAD ASSEMBLIES ARE TO BE REMOVED ONCE PERMANENT SLABS ARE INSTALLED, LEAVE WINDOW IN SHOTCRETE WALL, REMOVE ASSEMBLIES AND GROUT FILL WINDOW

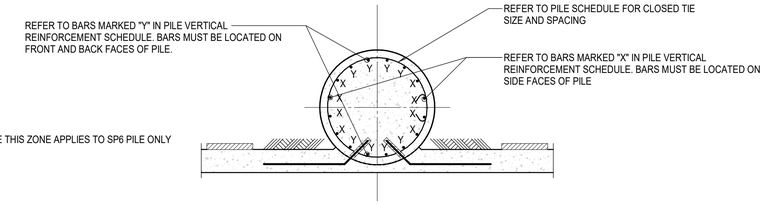
TYPICAL ROCK BOLT FACE SUPPORT DETAIL



TYPICAL LONG PILE DETAILS

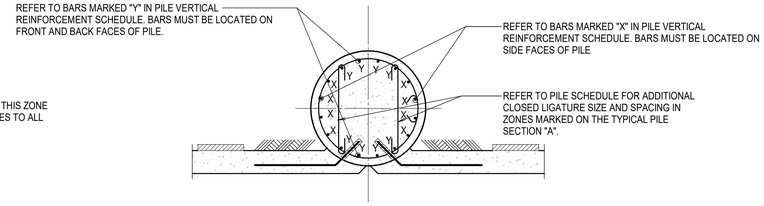


TYPICAL SHORT PILE DETAILS

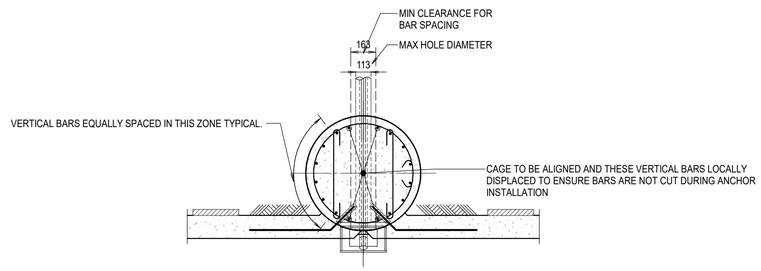


TYPICAL SECTION THROUGH PILE

NOTES:
VERTICAL BARS ARE NOT TO BE LAPPED. IF SPLICES ARE REQUIRED, FULL STRENGTH BT COUPLERS WITH THREADED BARS ARE TO BE USED.



TYPICAL SECTION THROUGH PILES AT ZONES MARKED "A"



TYPICAL SECTION THROUGH PILE AT ANCHOR LOCATION

NOTES:
MAX ALLOWABLE HOLE DIAMETER IS BASED ON LARGEST DRILL HOLE DIAMETER FOR THE GIVEN NUMBER OF STRANDS AND INCLUDES AN ALLOWANCE FOR A SLEEVE WHEN IN LOOSE GRANULAR MATERIAL.
ANCHORING CONTRACTOR TO CONFIRM DRILLING METHODOLOGY INCORPORATING GROUND CONDITIONS
DESIGNER TO BE INFORMED IMMEDIATELY IF MORE THAN ONE BAR ON FRONT FACE AND ONE BAR ON BACK FACE ARE CUT DURING ANCHOR HOLE CORING.

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01	12.02.22	HEAD CONTRACT SET (25% DD 2.0)	HD	RB
A	15.02.22	AFC	HD	RB

Rev	Date	Description	Eng	Draft

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LIGHTING CONSULTANT	ISP Design TEL +1 305 278 1565
CLIENT	Atlassian
PROJECT	ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER	191797
STATUS	FOR CONSTRUCTION

TRUE NORTH PROJECT NORTH

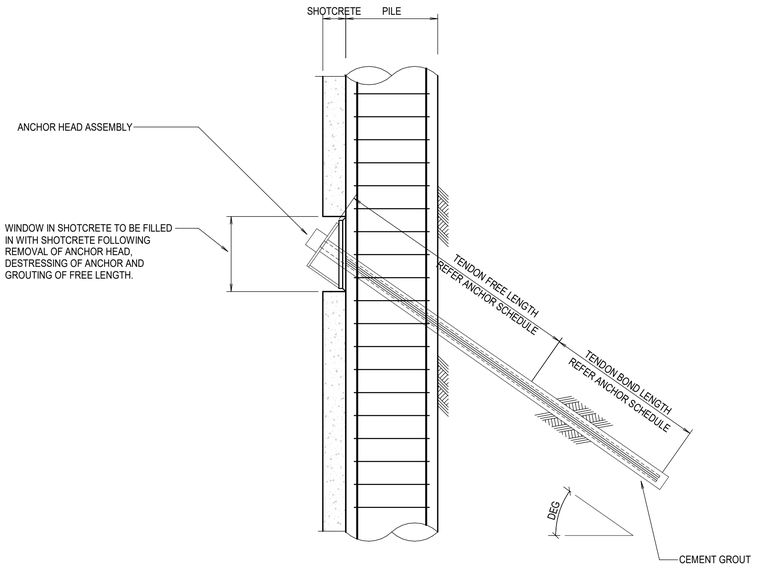
GRAPHIC SCALE 0 2000 5000

Scale : A1 | DRAWN | AUTHORISED

As indicated | RB | KPB

DRAWING: TYPICAL SHORING DETAILS

DRAWING NUMBER: ST-35B-A01-03 | ISSUE: A

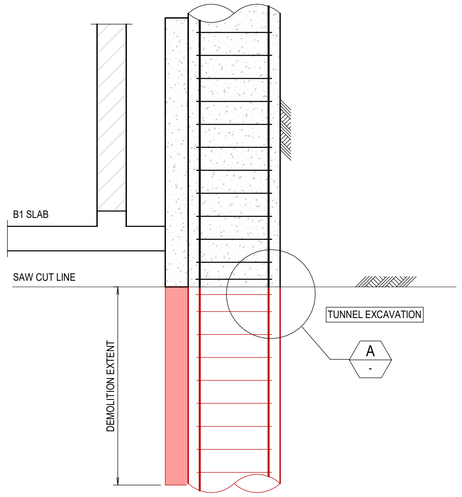


TYPICAL ROCK ANCHOR DETAIL

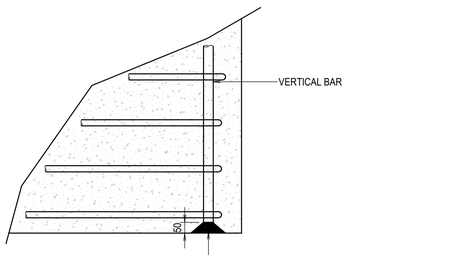
(TEMPORARY 10 YR DESIGN LIFE)

NOTES:

1. ANCHOR DETAILS ARE INDICATIVE AND ARE INTENDED TO COMMUNICATE THE DESIGN INTENT. FINAL ANCHOR DETAILS SHALL BE PER THE SUPPLIER'S DETAILS.

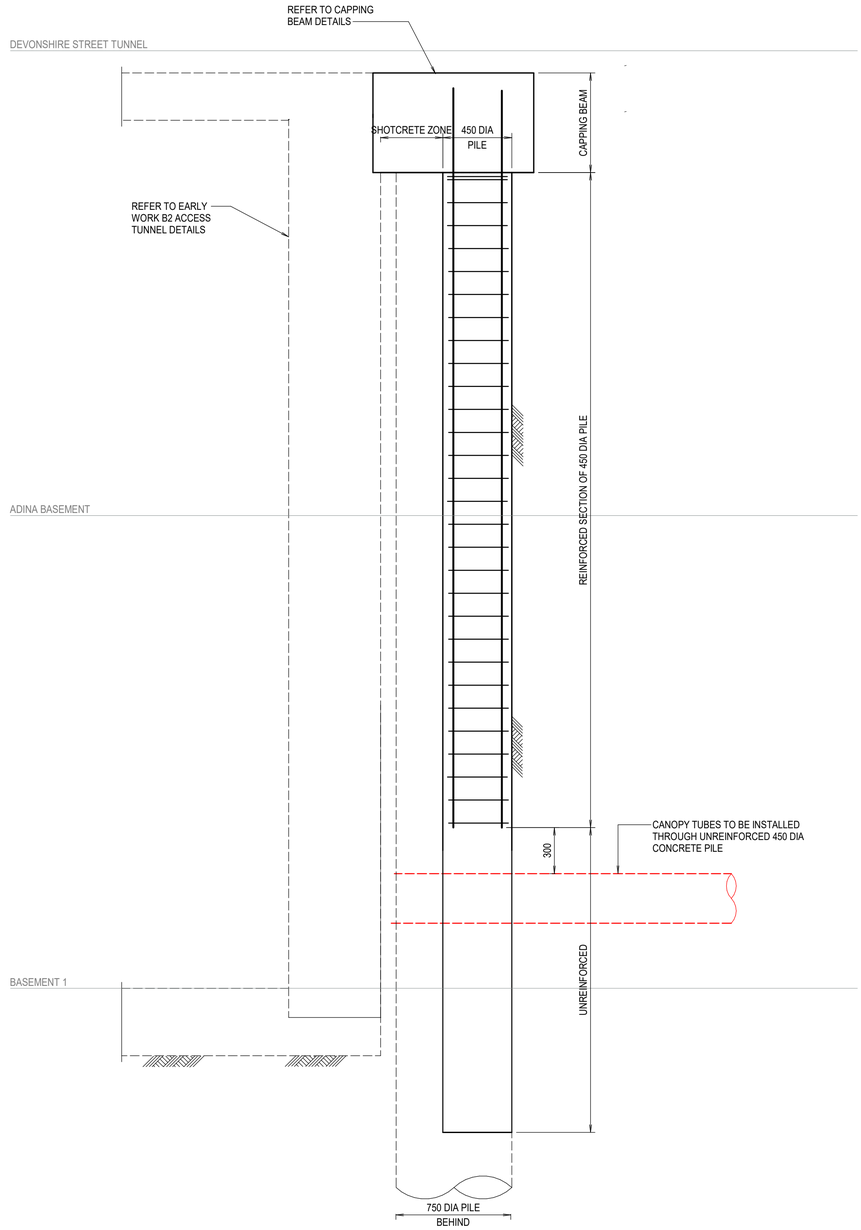


TYPICAL PILE BREAK THROUGH DETAIL



TYPICAL REPAIR DETAIL FOR PROJECT WIDE BREAK THROUGH ELEMENT

DETAIL A
SCALE 1:10 -



SECTION THROUGH SP10 PILES

Scale: 1 : 20

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH

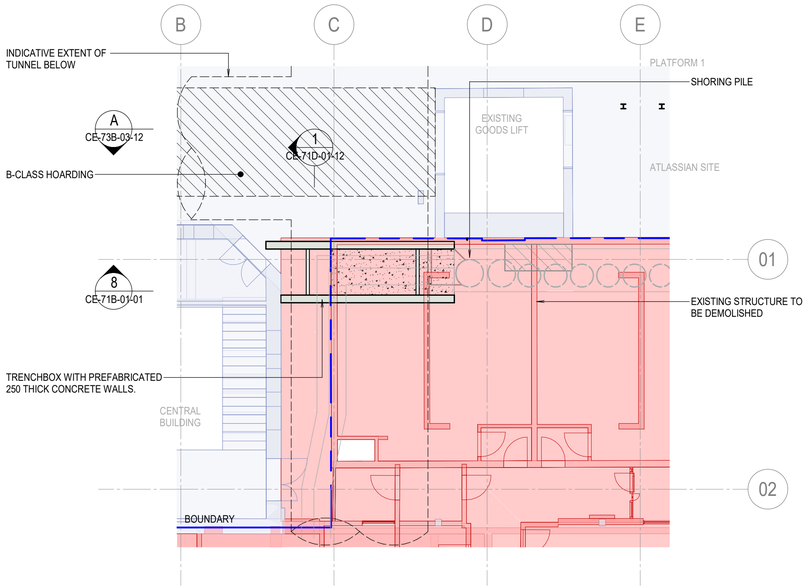
GRAPHIC SCALE
0 2000 5000

Scale : A1 | DRAWN | AUTHORISED
As indicated | RB | KPB

STATUS
FOR CONSTRUCTION

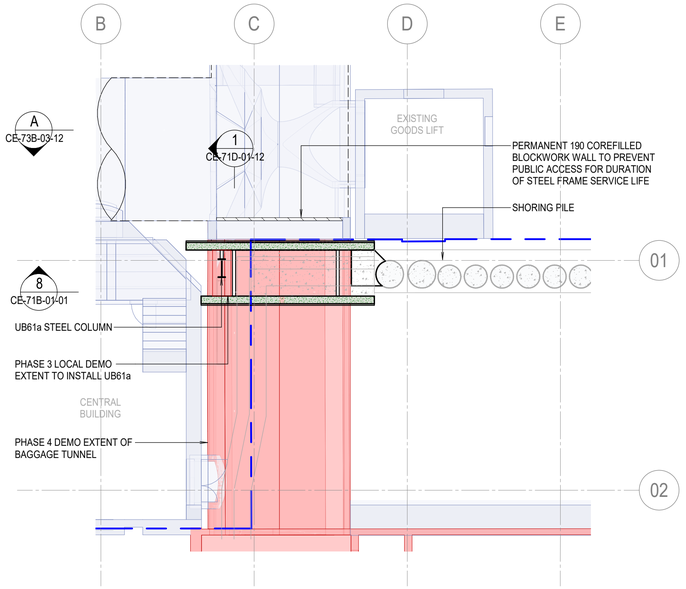
DRAWING
TYPICAL SHORING DETAILS

DRAWING NUMBER | ISSUE
ST-35B-A01-04 | A



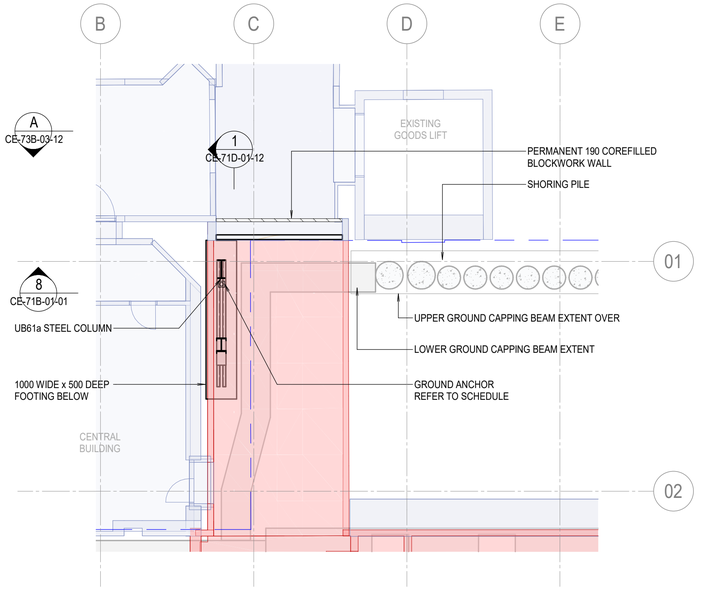
NORTH EAST CORNER PLATFORM 1 LEVEL

Scale: 1 : 100



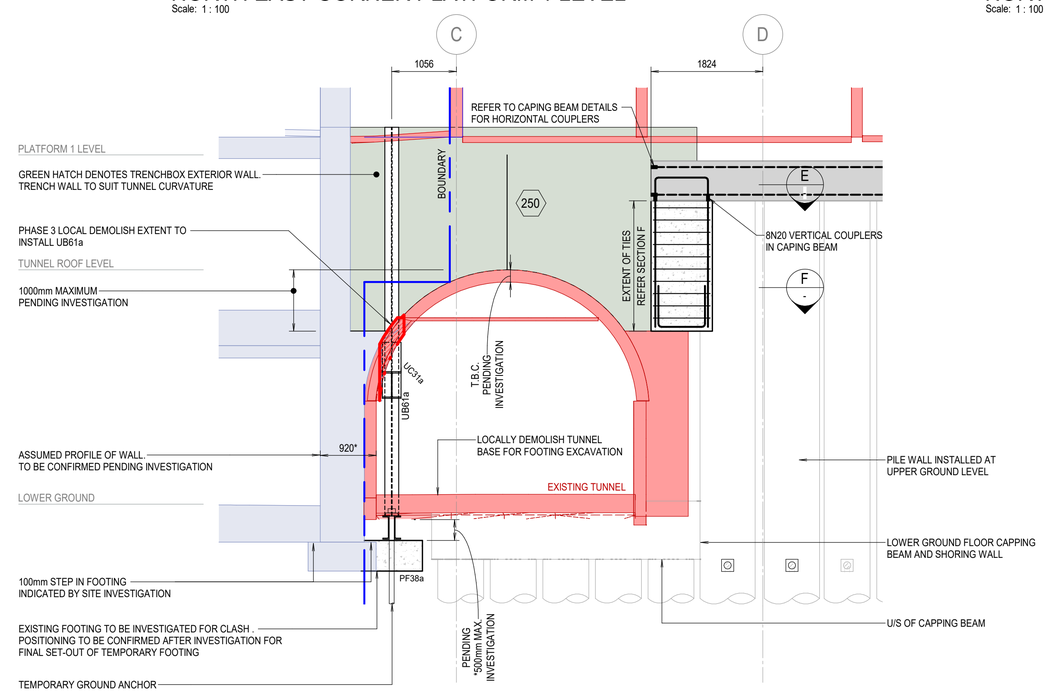
NORTH EAST CORNER AT TUNNEL ROOF LEVEL

Scale: 1 : 100



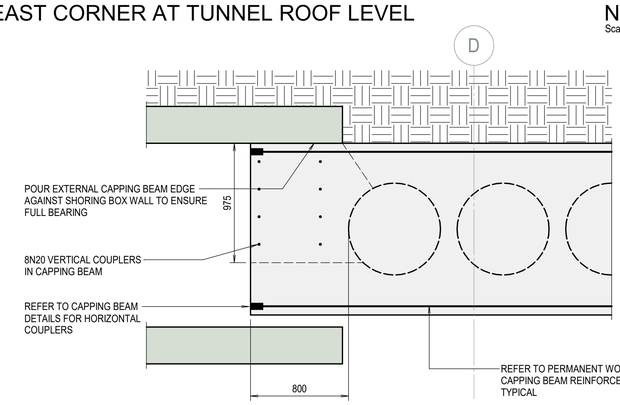
NORTH EAST CORNER AT TUNNEL LOWER GROUND LEVEL

Scale: 1 : 100



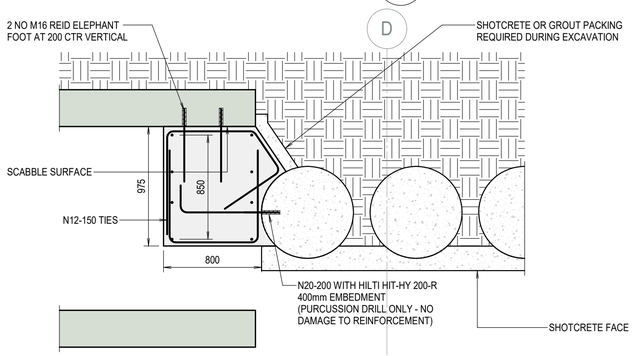
NE CORNER ELEVATION

Scale: 1 : 50



SECTION E

SCALE 1:25



SECTION F

SCALE 1:25

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

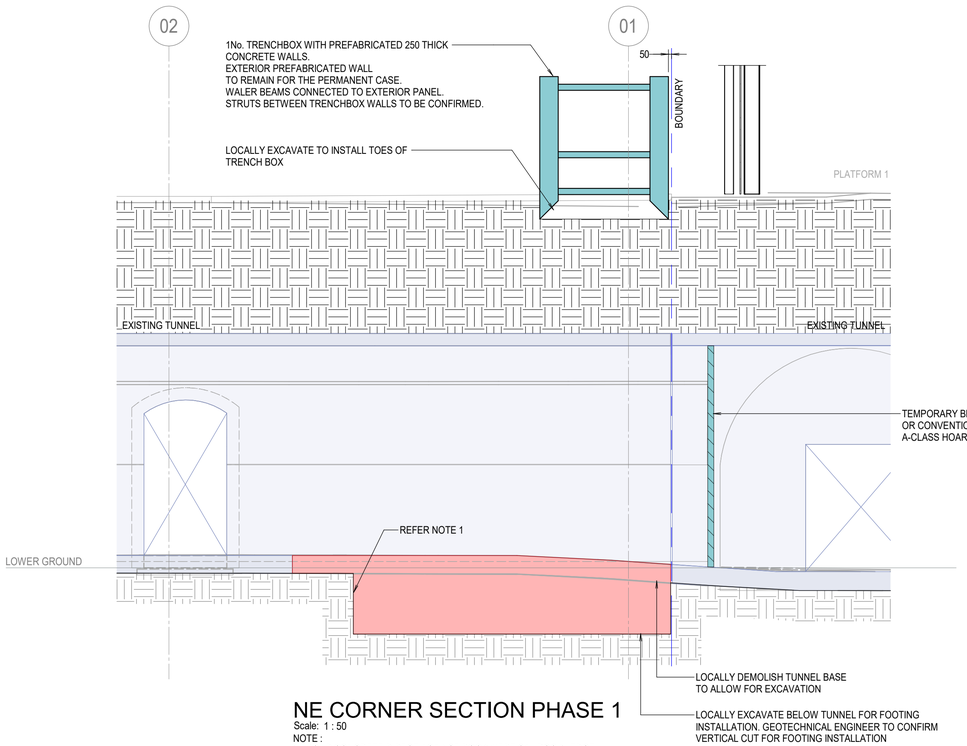
TRUE NORTH
PROJECT NORTH
GRAPHIC SCALE
0 2000 5000

Scale : A1	DRAWN	AUTHORISED
As indicated	LC	KPB

STATUS
FOR CONSTRUCTION

DRAWING
NORTH-EAST CORNER PLANS AND ELEVATION

DRAWING NUMBER	ISSUE
CE-71B-01-01	A

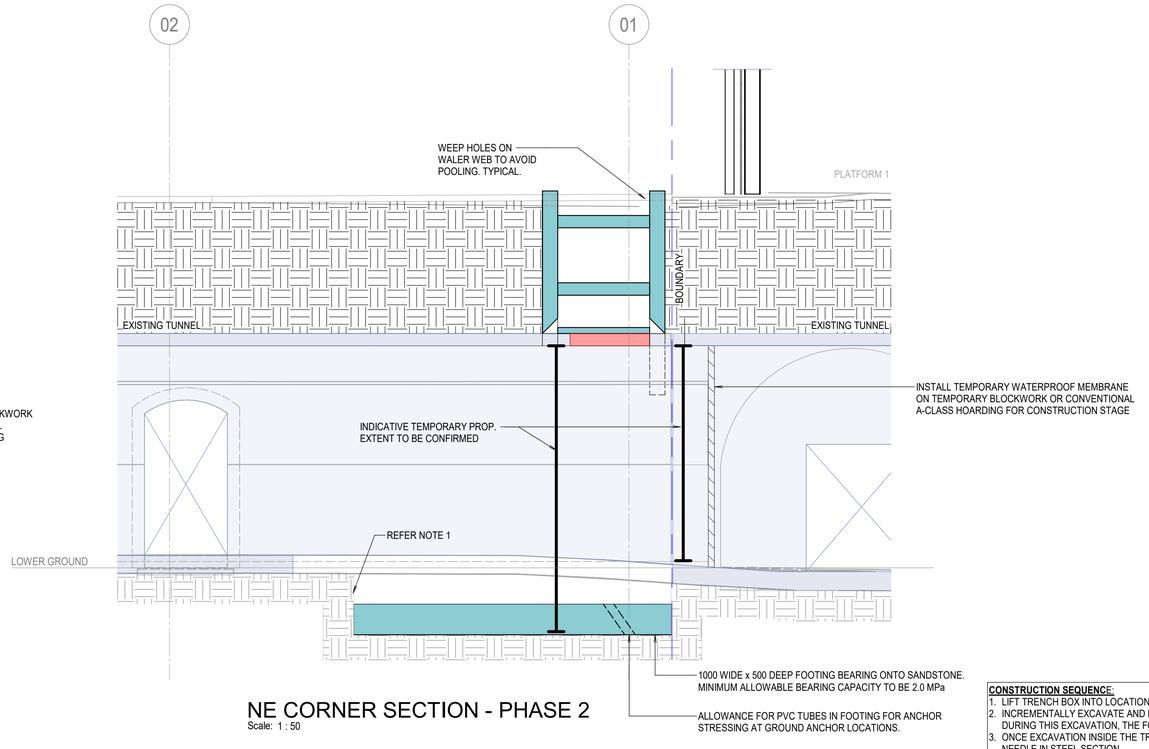


NE CORNER SECTION PHASE 1

Scale: 1 : 50

NOTE :

1. POUR CONCRETE DIRECT AGAINST ROCK. VERTICAL ROCK LEDGE TO BE INSPECTED BY GEOTECHNICAL ENGINEER - 2000kPa REQUIRED FOR LATERAL LOADS IF THIS IS NOT ACHIEVABLE AN ADDITIONAL GROUND ANCHOR IS REQUIRED

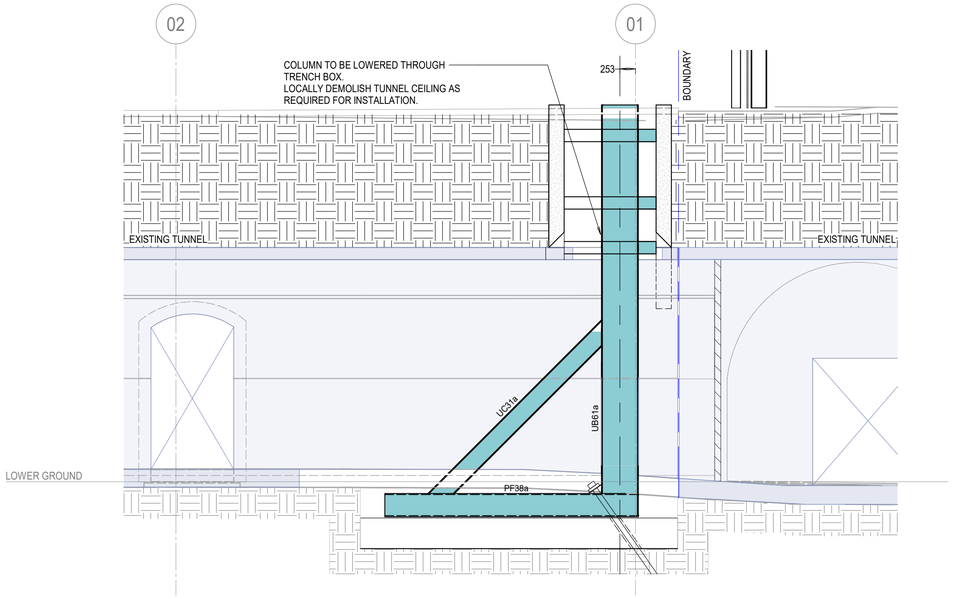


NE CORNER SECTION - PHASE 2

Scale: 1 : 50

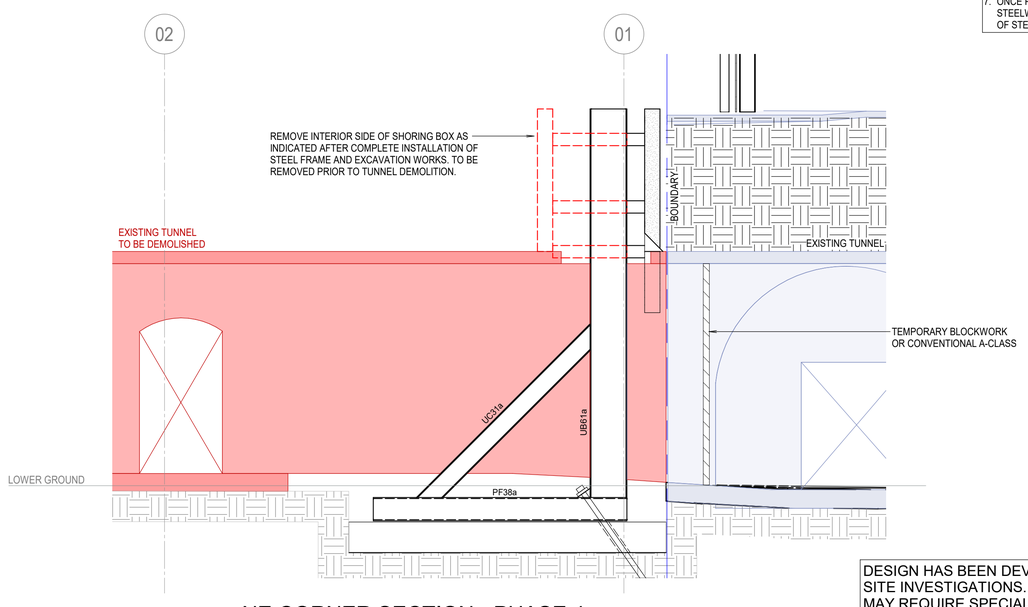
CONSTRUCTION SEQUENCE:

1. LIFT TRENCH BOX INTO LOCATION AND LOCALLY EXCAVATE AT THE BOTTOM OF THE TUNNEL.
2. INCREMENTALLY EXCAVATE AND PUSH TRENCHBOX UNTIL IT ALIGNS WITH TUNNEL CEILING. DURING THIS EXCAVATION, THE FOOTING FOR THE STEEL FRAME TO BE POURED.
3. ONCE EXCAVATION INSIDE THE TRENCHBOX IS COMPLETED, LOCALLY DEMOLISH CEILING TO NEEDLE IN STEEL SECTION.
   INSTALL STEELWORK AND STRESS GROUND ANCHORS. TEMPORARY STABILITY TO BE CONFIRMED DURING ERECTION. GROUND ANCHOR DESIGN BY OTHERS.
4. REMOVE ONE HALF OF THE TRENCHBOX INDICATED ON PHASE 4.
5. INSTALL FORMWORK FOR PERMANENT WALL.
6. POUR PERMANENT WALL.
7. ONCE PERMANENT RETENTION SYSTEM IS INSTALLED TO REPLACE STEEL FRAME, STEELWORK CAN BE REMOVED. CONTRACTOR TO CONFIRM WITH TTW PRIOR TO REMOVAL OF STEEL FRAME.



NE CORNER SECTION - PHASE 3

Scale: 1 : 50



NE CORNER SECTION - PHASE 4

Scale: 1 : 50

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH | PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

Scale : A1 | DRAWN | AUTHORISED
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STATUS
FOR CONSTRUCTION

DRAWING
NORTH-EAST CORNER SECTIONS SHEET 1

DRAWING NUMBER
CE-71D-01-01

ISSUE
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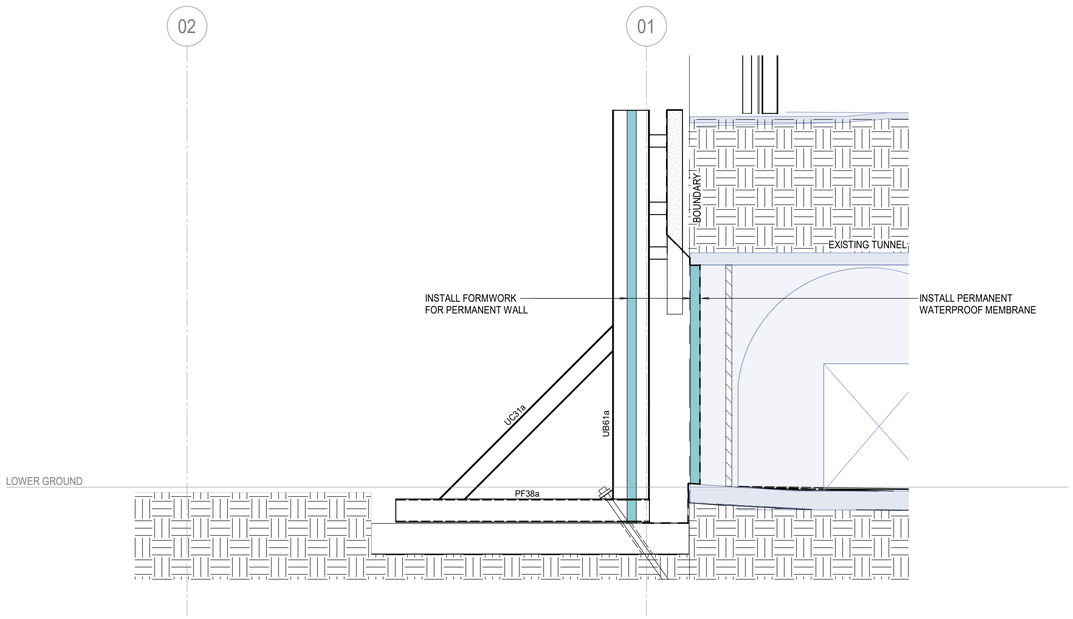

NE CORNER SECTION - PHASE 5
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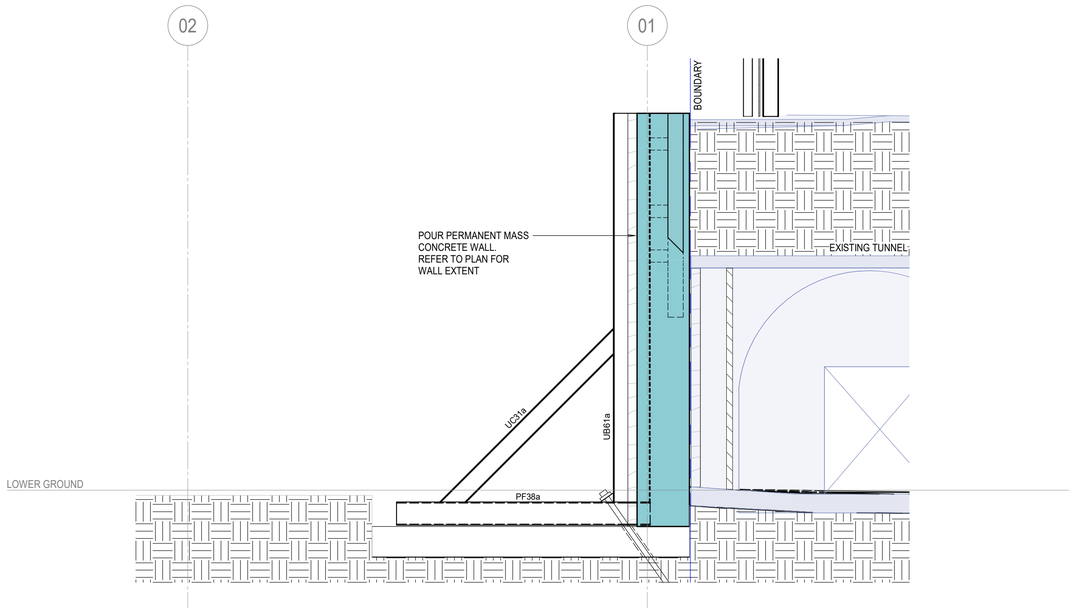

NE CORNER SECTION - PHASE 6
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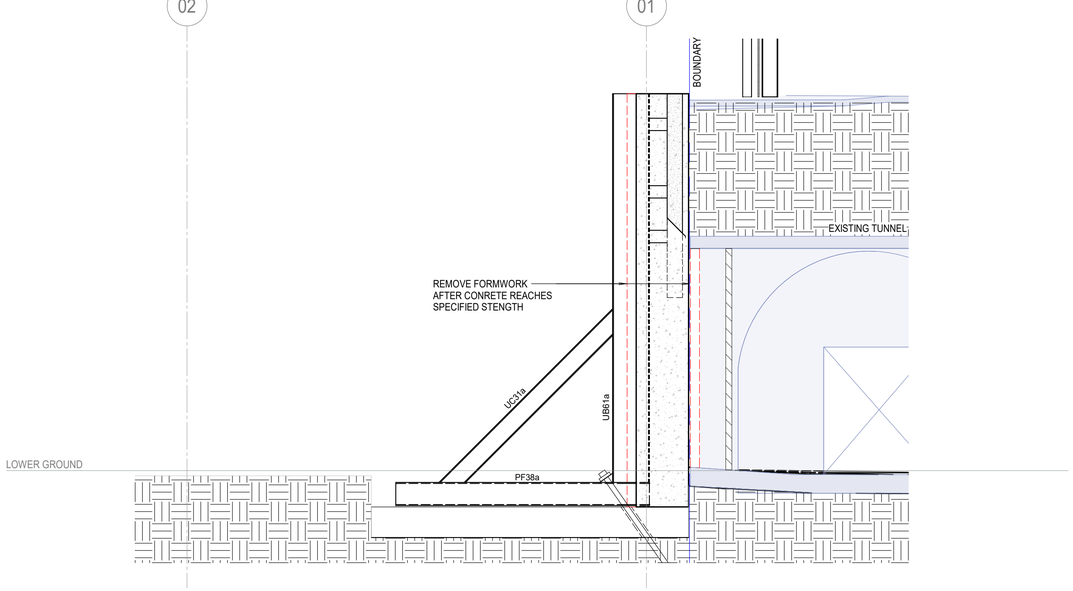

NE CORNER SECTION - PHASE 7
Scale: 1 : 50

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PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET

TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

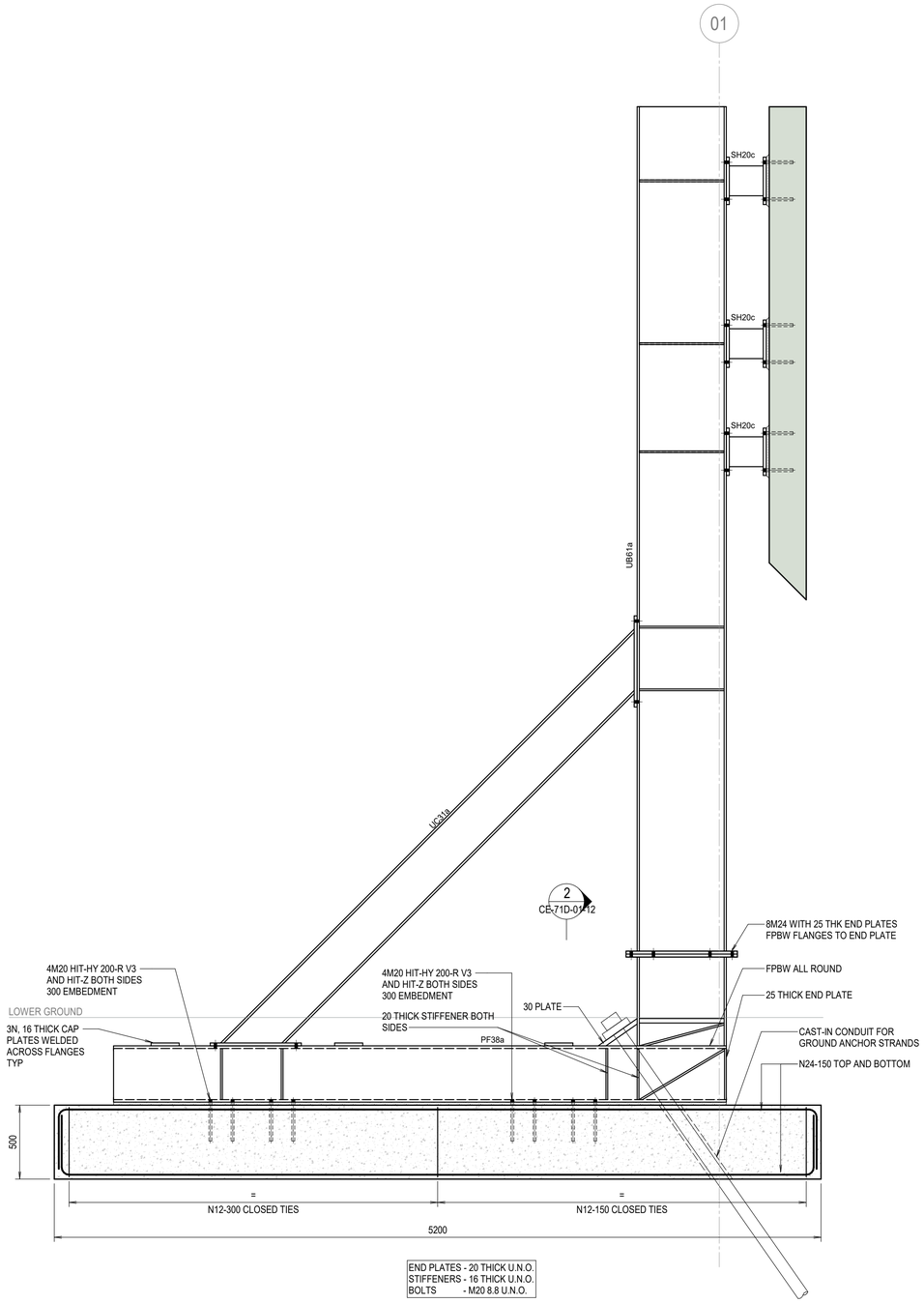
Scale : A1 DRAWN AUTHORISED
As indicated LC KPB

STATUS
FOR CONSTRUCTION

DRAWING
NORTH-EAST CORNER SECTIONS SHEET 2

DRAWING NUMBER
CE-71D-01-02

ISSUE
A



SECTION 1 (CE-71B-01-01)
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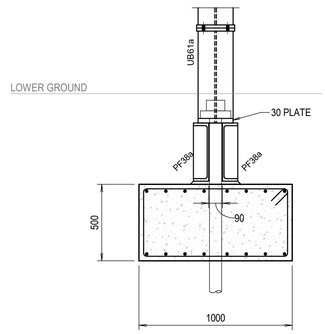
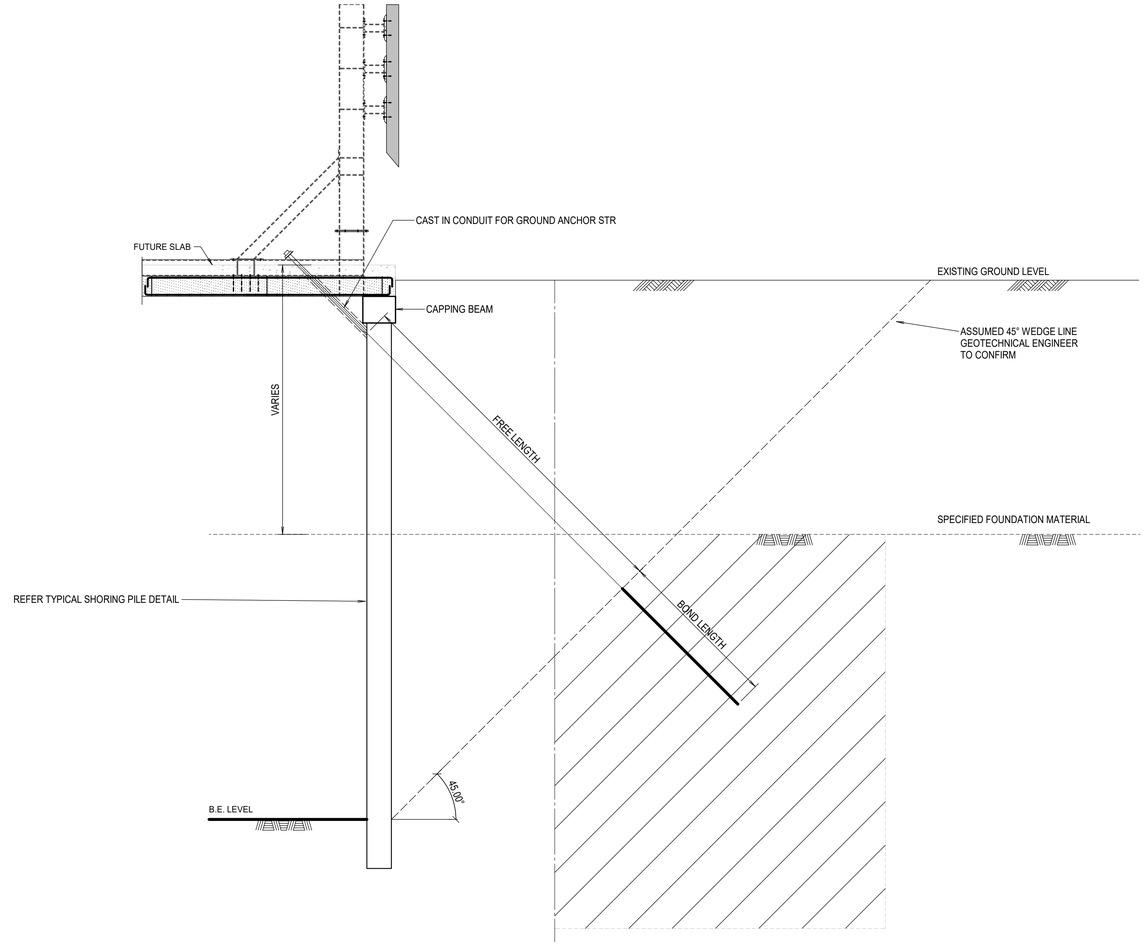


SECTION 2 (CE-71D-01-12)
Scale 1 : 20



GROUND ANCHOR FREE LENGTH DETAIL

NOT TO SCALE

GROUND ANCHOR SCHEDULE						
MARK	DESIGN WORKING LOAD (kN) T_D	LOCK OFF LOAD (kN) T_O	ANGLE	FREE LENGTH	BOTH LENGTH	MIN HOLE DIAMETER
GA5	450	360	45°	7000	3000	100

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01	14.12.21	75% EARTHWORKS AND RETENTION	AS	LC
02	28.01.22	APPROVED FOR CONSTRUCTION	CG	LC
A	15.02.22	AFC	CG	RB

Rev	Date	Description	Eng	Draft

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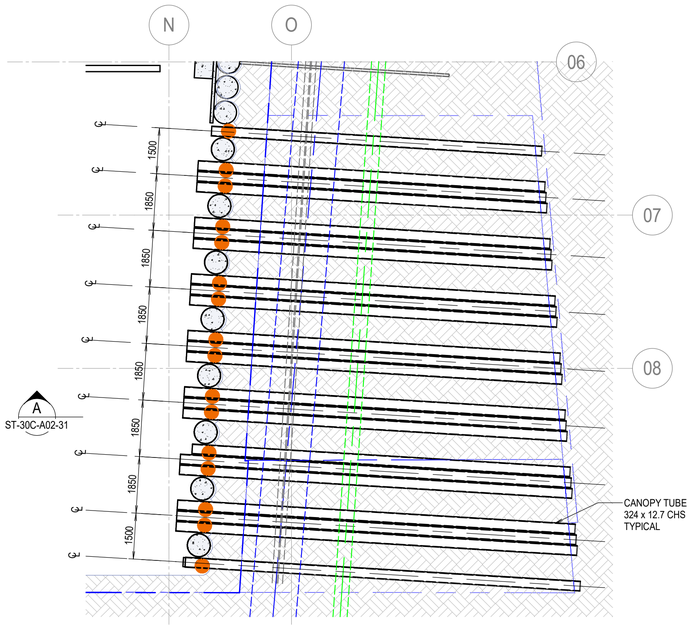
PROJECT
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

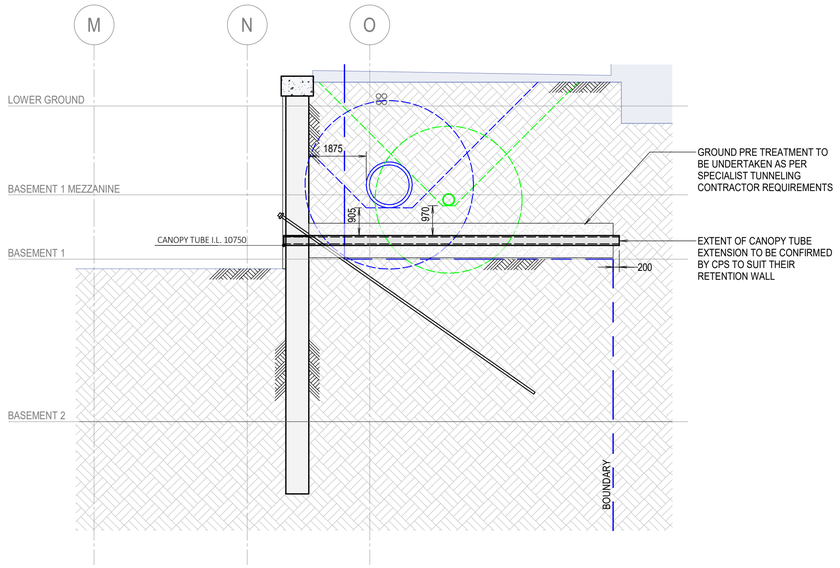
TRUE NORTH PROJECT NORTH
GRAPHIC SCALE 0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated Author KPB
STATUS
FOR CONSTRUCTION

DRAWING
NORTH-EAST CORNER DETAILS SHEET 2
DRAWING NUMBER CE-71D-01-12
ISSUE A



STAGE 1 - BASEMENT 1 - CANOPY TUBE SETOUT

Scale: 1 : 100



SECTION A

Scale 1:100 ST-30C-A02-31

TUNNEL CONSTRUCTION METHODOLOGY

STAGE 1:
1. INSTALL PILES AND PILE CAP
2. EXCAVATE TO BASEMENT 1, INSTALL GROUND ANCHORS, AND SHOTCRETE PROGRESSIVELY.
3. GROUND PRE TREATMENT TO BE UNDERTAKEN AS PER SPECIALIST TUNNELING CONTRACTOR REQUIREMENTS
4. INSTALL CANOPY TUBES AND GROUT FILL MIN 20MPa.

REFER DOUGLAS PARTNERS GEOTECHNICAL REPORT No.86767.07.R.001.Rev0 DATED NOVEMBER 2020 FOR GROUND STRATUM LEVELS

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TTW PROJECT NUMBER
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TRUE NORTH PROJECT NORTH

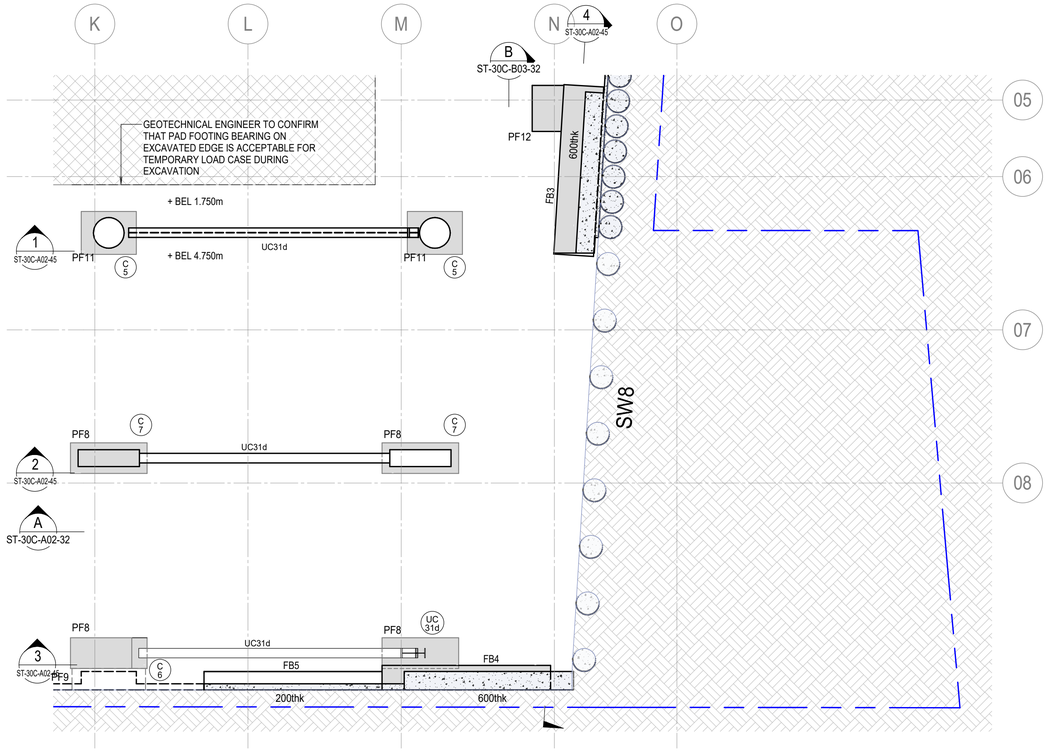
GRAPHIC SCALE
0 2000 5000

Scale : A1 DRAWN AUTHORISED
As indicated RB KPB

STATUS
FOR CONSTRUCTION

DRAWING
TUNNEL CONSTRUCTION - STAGE 1

DRAWING NUMBER ISSUE
ST-30C-A02-31 A



STAGE 2 - BASEMENT 2

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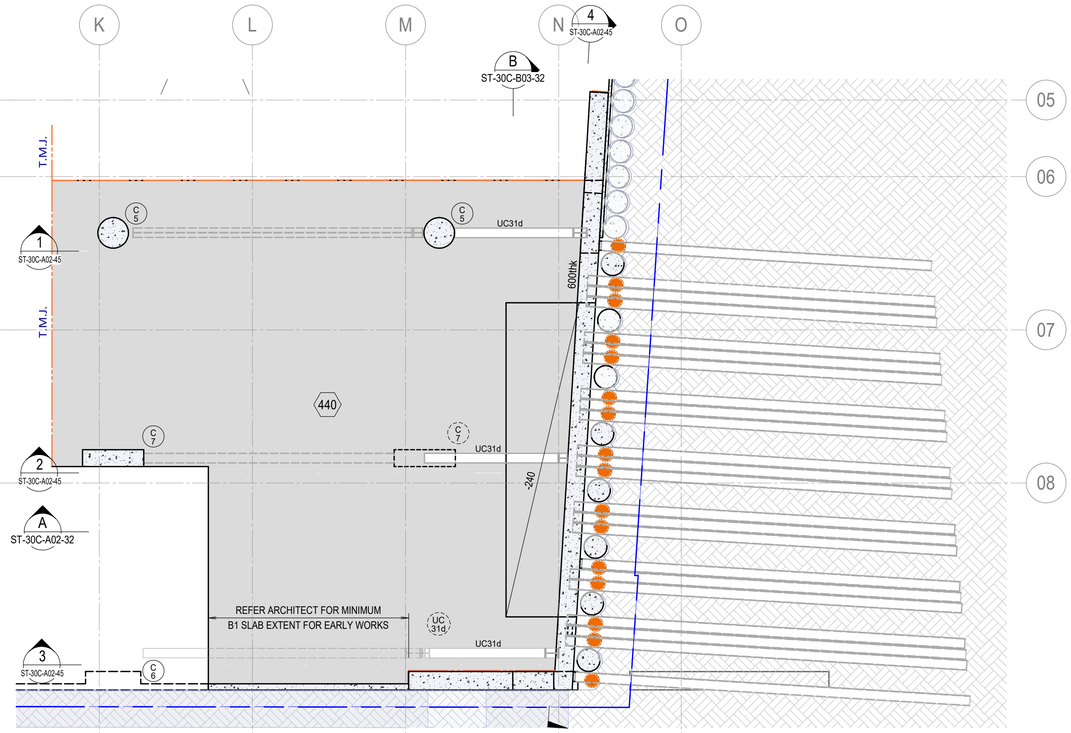

STAGE 2 - BASEMENT 1

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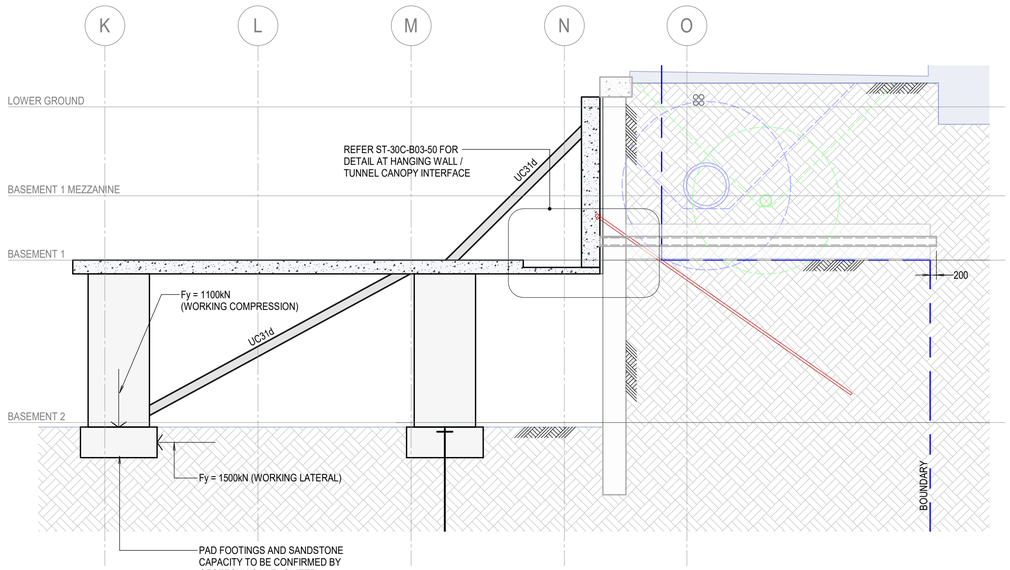
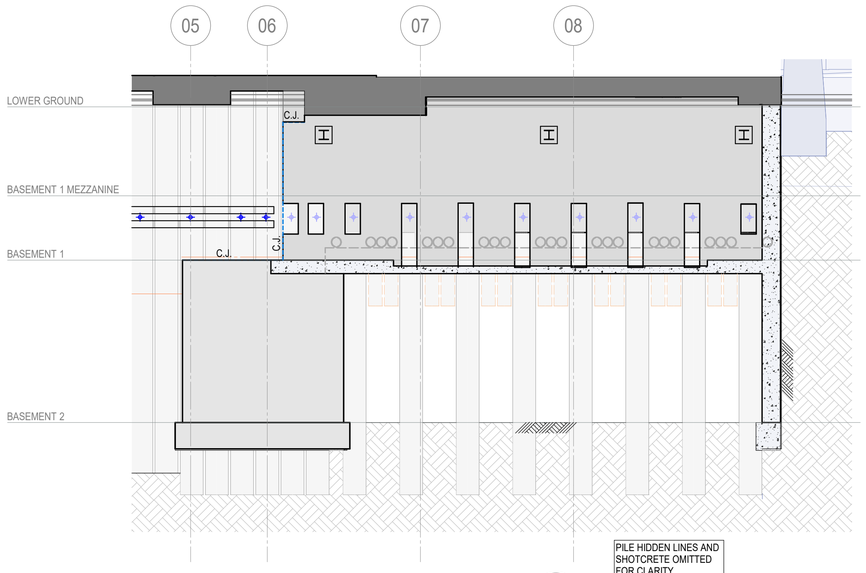


SECTION A

Scale 1:100 ST-30C-A02-32



PILE HIDDEN LINES AND SHOTCRETE OMITTED FOR CLARITY

SECTION B

Scale 1:100 ST-30C-A02-32

TUNNEL CONSTRUCTION METHODOLOGY

STAGE 2 :

1. EXCAVATE TO B2 AND SHOTCRETE PROGRESSIVELY
2. INSTALL TEMPORARY GROUND ANCHORS AND ALL ASSOCIATED FOOTINGS
3. INSTALL PERMANENT AND TEMPORARY COLUMNS AND BRACING
4. CONSTRUCT B1 SLAB
5. CONSTRUCT 600THK RC WALL TO U/S OF CAPPING BEAM AT LOWER GROUND SLAB
6. INSTALL B1 TO LOWER GROUND TEMPORARY BRACES

HOLD POINT - TTW TO INSPECT AND SIGN OFF BEFORE COMMENCING NEXT STEPS

7. DESTRESS RETENTION ANCHORS FROM B1 LEVEL

REFER DOUGLAS PARTNERS GEOTECHNICAL REPORT No.86767.07.R.001.Rev0 DATED NOVEMBER 2020 FOR GROUND STRATUM LEVELS

ALL WORKS ASSOCIATED WITH THIS STAGE ARE THE RESPONSIBILITY OF VERTICAL FIRST UNLESS NOTED OTHERWISE ON STAGING DOCUMENTS

NOTES:
1. C5 DENOTES 1000 DIAMETER CONCRETE COLUMN REINFORCED WITH 24N28 LONGITUDINAL REINFORCEMENT AND N16-100 SPIRAL TIES. 80MPa.
2. C7 DENOTES 550x2000 CONCRETE COLUMN REINFORCED WITH 30N28 LONGITUDINAL REINFORCEMENT AND N16-150 TIES TO ALL LONGITUDINAL REINFORCEMENT. 80MPa

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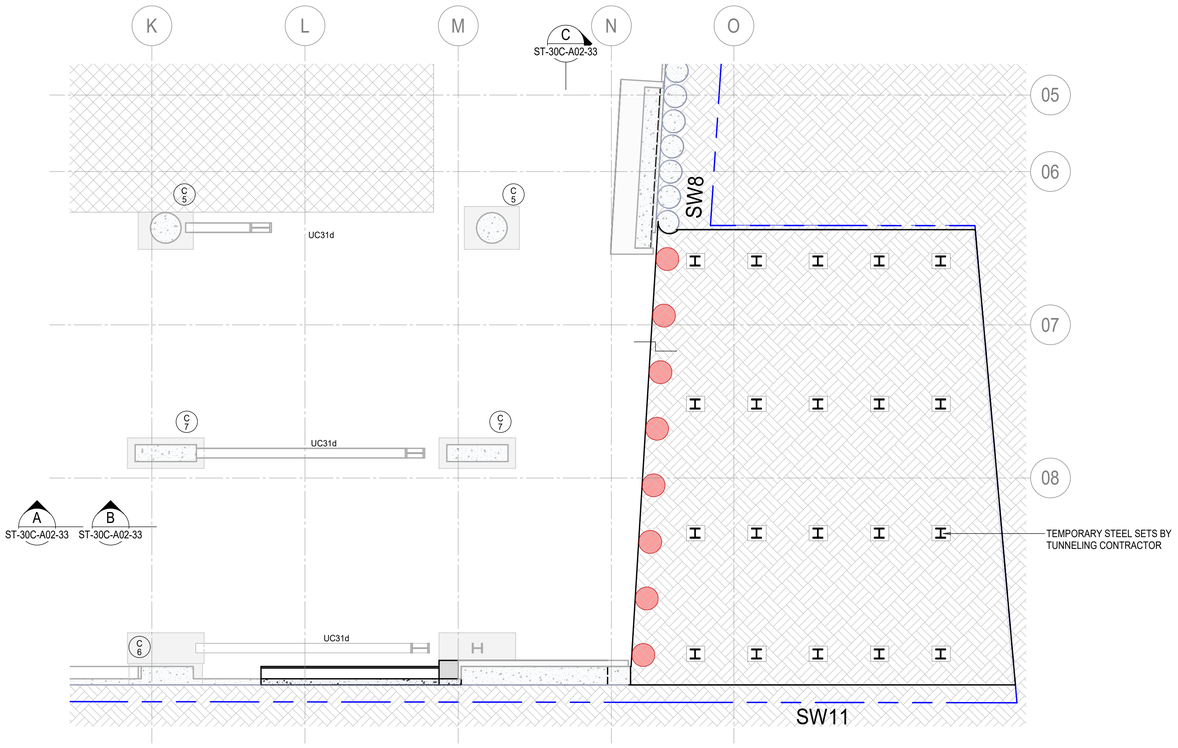
ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
Scale : A1 DRAWN AUTHORISED
As indicated RB KPB
STATUS
FOR CONSTRUCTION

DRAWING
TUNNEL CONSTRUCTION - STAGE 2
DRAWING NUMBER ST-30C-A02-32
ISSUE A



STAGE 3 - BASEMENT 2

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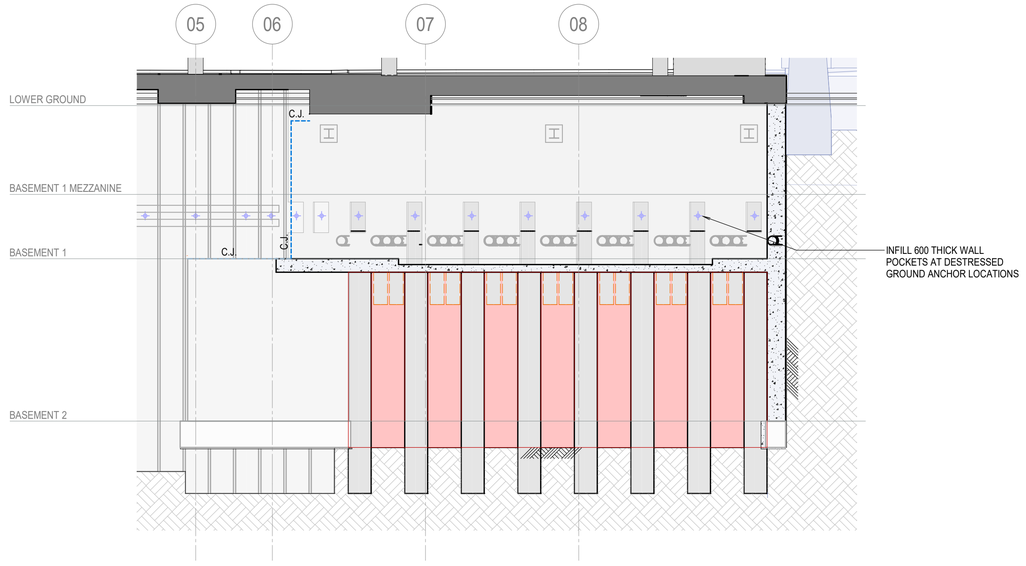

SECTION C

Scale 1:100 ST-30C-A02-33

TUNNEL CONSTRUCTION METHODOLOGY

STAGE 3:
1. SAW CUT RETENTION PILES AT U/S OF B1 SLAB AND TO BULK EXCAVATION LEVEL.
2. EXCAVATE AND INSTALL SETS AS PER TUNNELING CONTRACTORS METHODOLOGY.
3. HAND DEMOLITION OF RETENTION PILE FROM U/S OF B1 SLAB TO U/S OF CANOPY TUBES.

REFER DOUGLAS PARTNERS GEOTECHNICAL REPORT No.86767.07.R.001.Rev0 DATED NOVEMBER 2020 FOR GROUND STRATUM LEVELS

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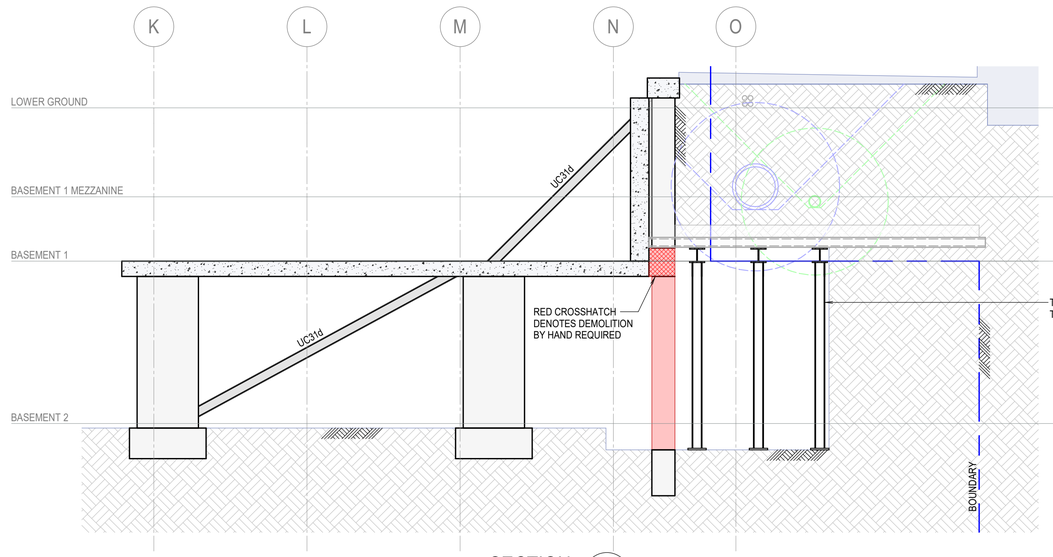
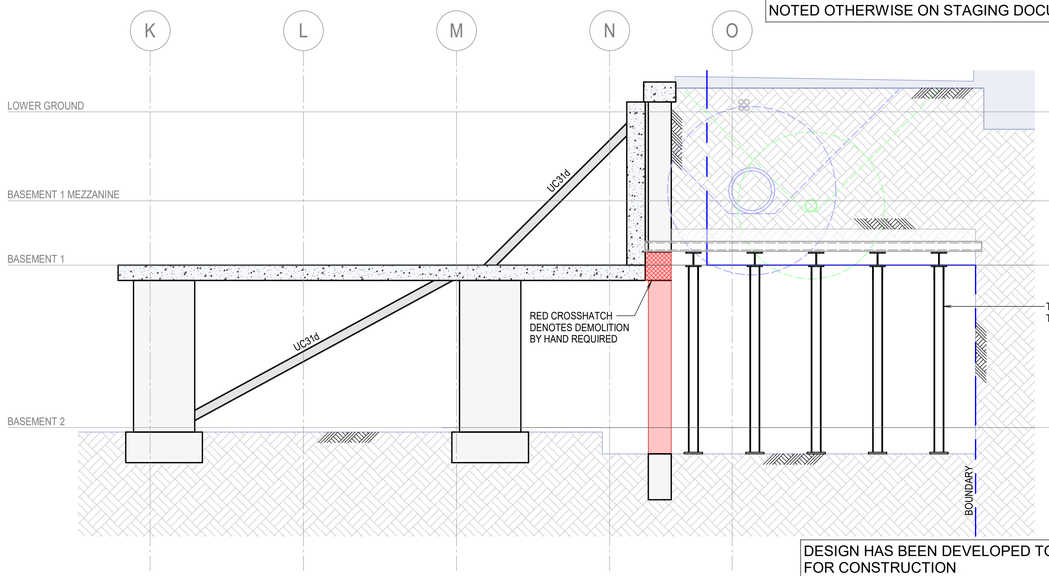


SECTION A

Scale 1:100 ST-30C-A02-33



SECTION B

Scale 1:100 ST-30C-A02-33

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STAGED EXCAVATION SECTION

DESIGN AFC NOTE ORIGINAL

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TTW PROJECT NUMBER
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TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000

Scale : A1	DRAWN	AUTHORISED
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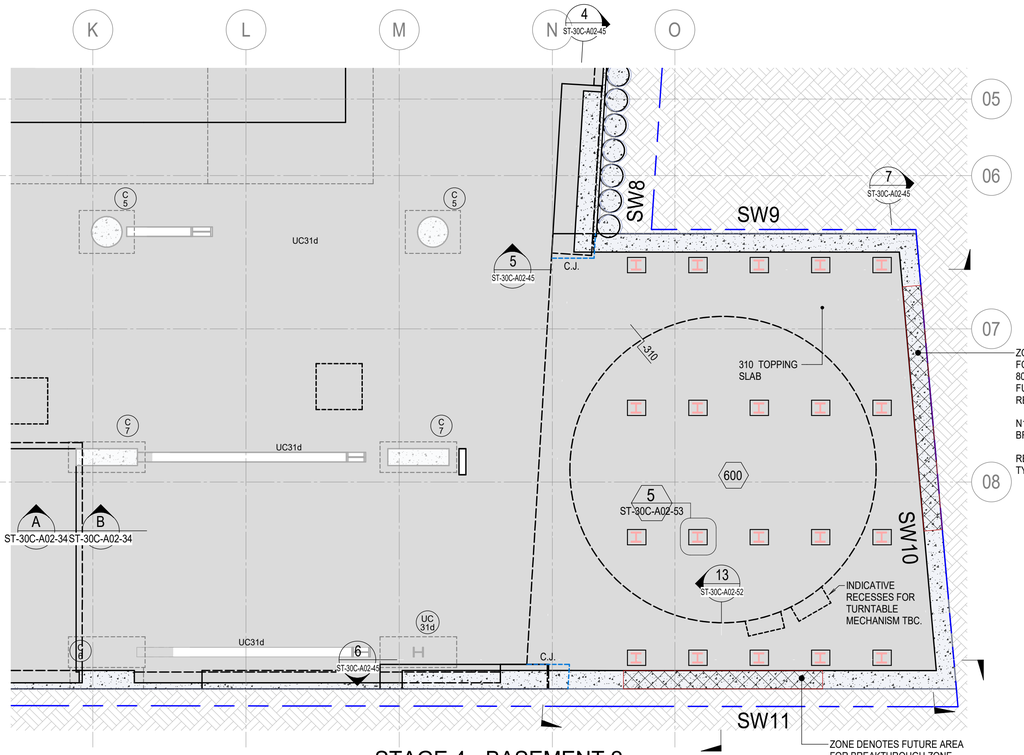
STATUS
FOR CONSTRUCTION

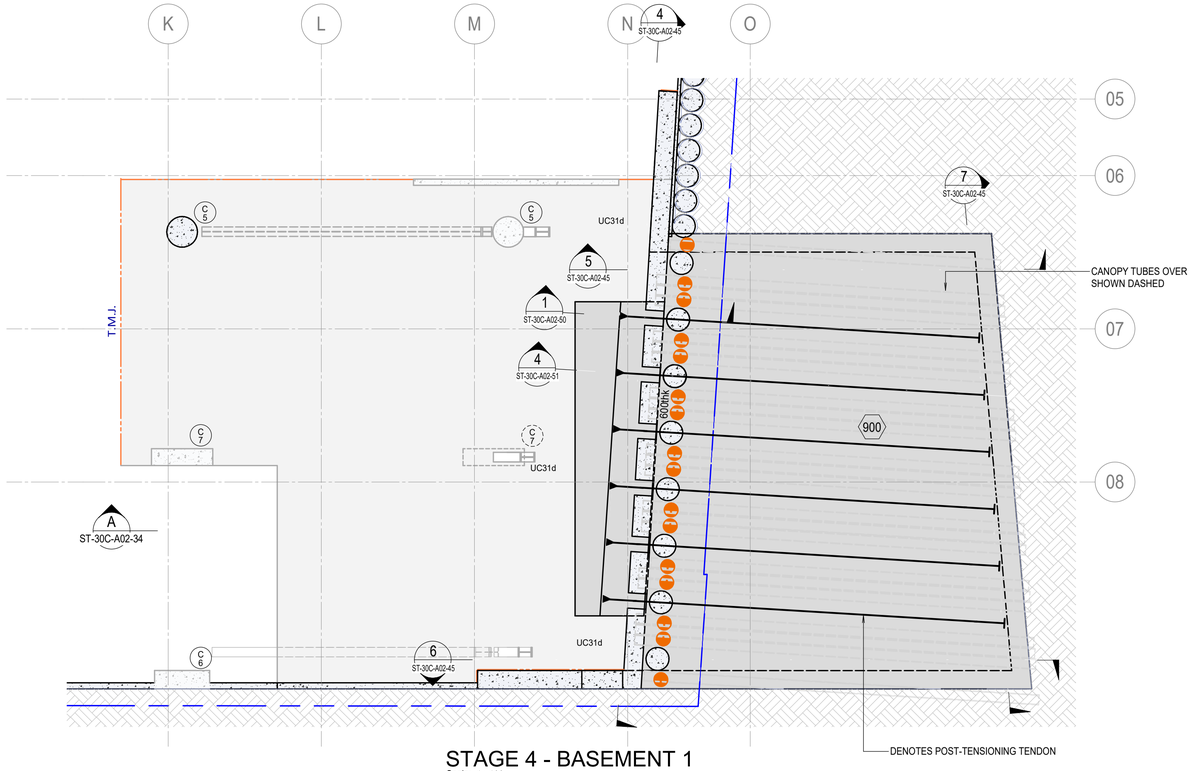
DRAWING
TUNNEL CONSTRUCTION - STAGE 3

DRAWING NUMBER	ISSUE
ST-30C-A02-33	A



STAGE 4 - BASEMENT 2

Scale: 1 : 100



STAGE 4 - BASEMENT 1

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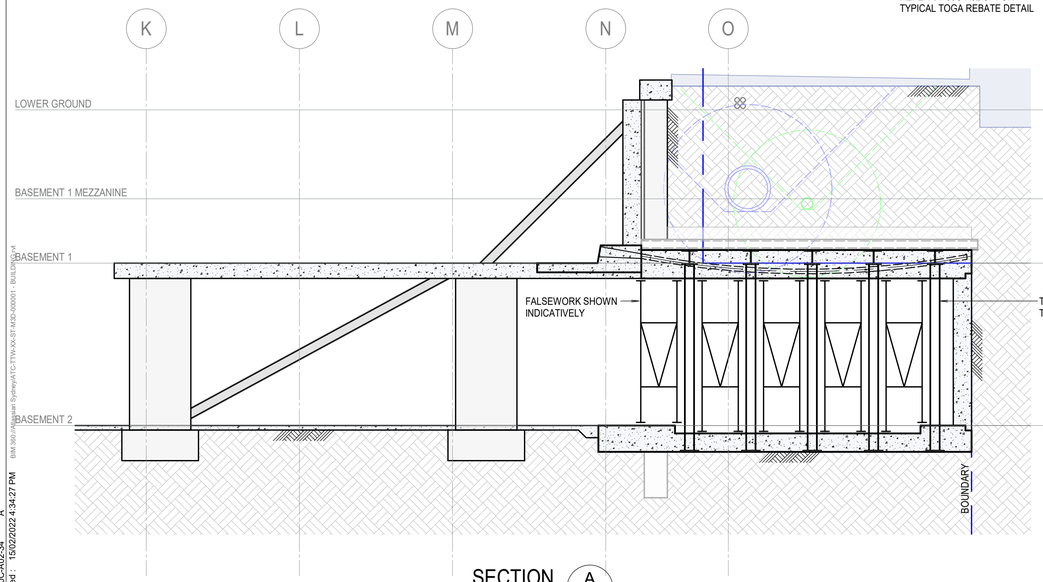
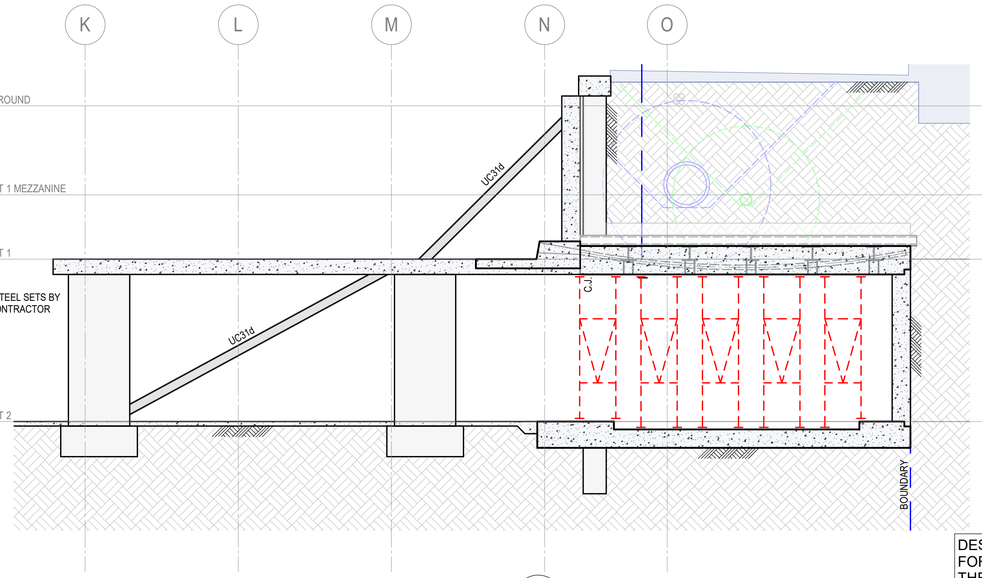


SECTION A

Scale 1 : 100 ST-30C-A02-35



SECTION B

Scale 1 : 100 ST-30C-A02-34

TYPICAL SECTION FOR WALL AND ROOF

TUNNEL CONSTRUCTION METHODOLOGY

STAGE 4:

1. INSTALL ALL B2 SLAB REINFORCEMENT AND PERIMETER WALL STARTER BAR
2. POUR B2 SLAB. BLOCKOUTS AROUND SET COLUMNS REQUIRED
3. INSTALL ALL PERIMETER WALL AND ROOF REINFORCEMENT INCLUDING PT DUCTING, STANDS, SWAGGED END CONNECTIONS AND LIVE END TRUMPET
4. INSTALL WALL FORMWORK
5. POUR PERIMETER WALLS
6. INSTALL ROOF FORMWORK INCORPORATING SET COLUMNS
7. POUR ROOF SLAB AN STRESS BLOCK
8. STRESS MULISTRAND PT AND GROUT
9. REMOVE FORMWORK AND SET COLUMNS MINIMUM 28 DAYS AFTER ROOF SLAB POUR
10. INFILL B2 SLAB BLOCKOUTS
11. FORM TURNTABLE RECESS AND POUR TOPPING SLAB

REFER DOUGLAS PARTNERS GEOTECHNICAL REPORT No.86767.07.R.001.Rev0 DATED NOVEMBER 2020 FOR GROUND STRATUM LEVELS

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ATLASSIAN CENTRAL No.8-10 LEE STREET, HAYMARKET
TTW PROJECT NUMBER
191797

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Scale : A1 DRAWN AUTHORISED
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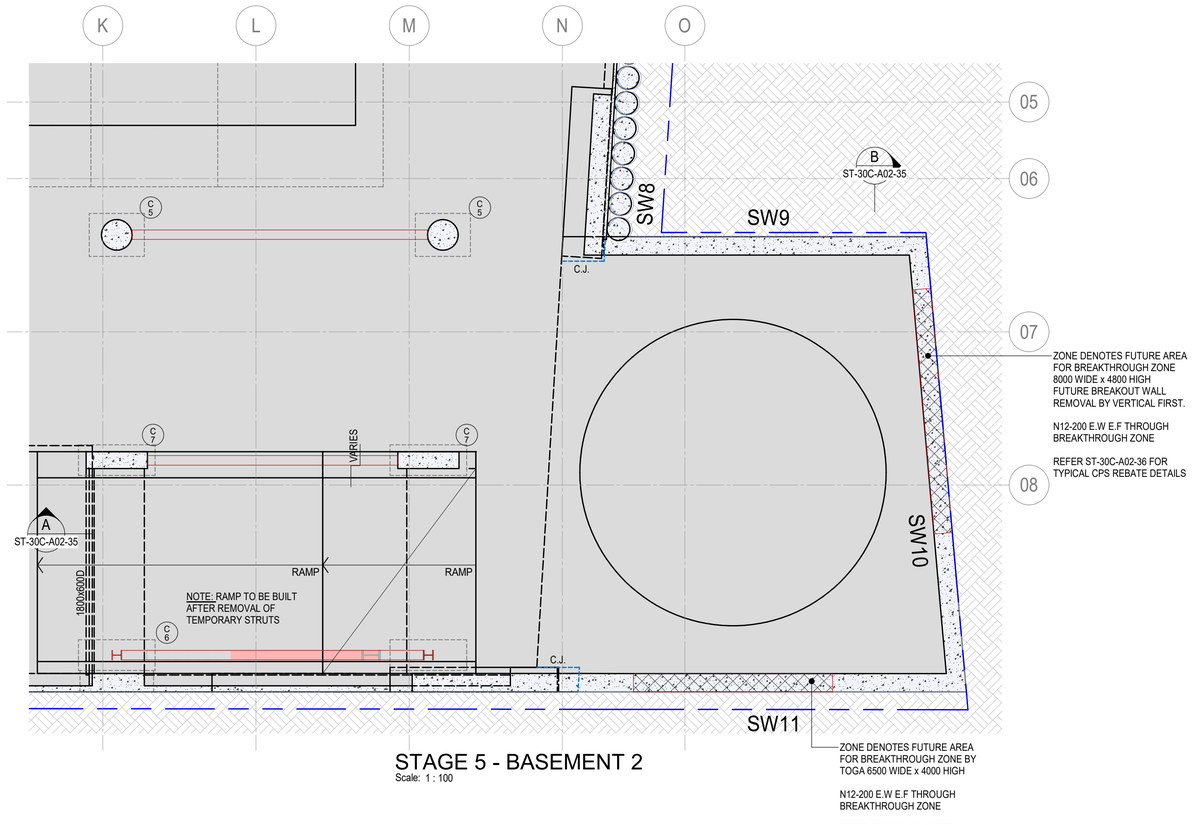
STATUS
FOR CONSTRUCTION

DRAWING
TUNNEL CONSTRUCTION - STAGE 4
DRAWING NUMBER ST-30C-A02-34
ISSUE A



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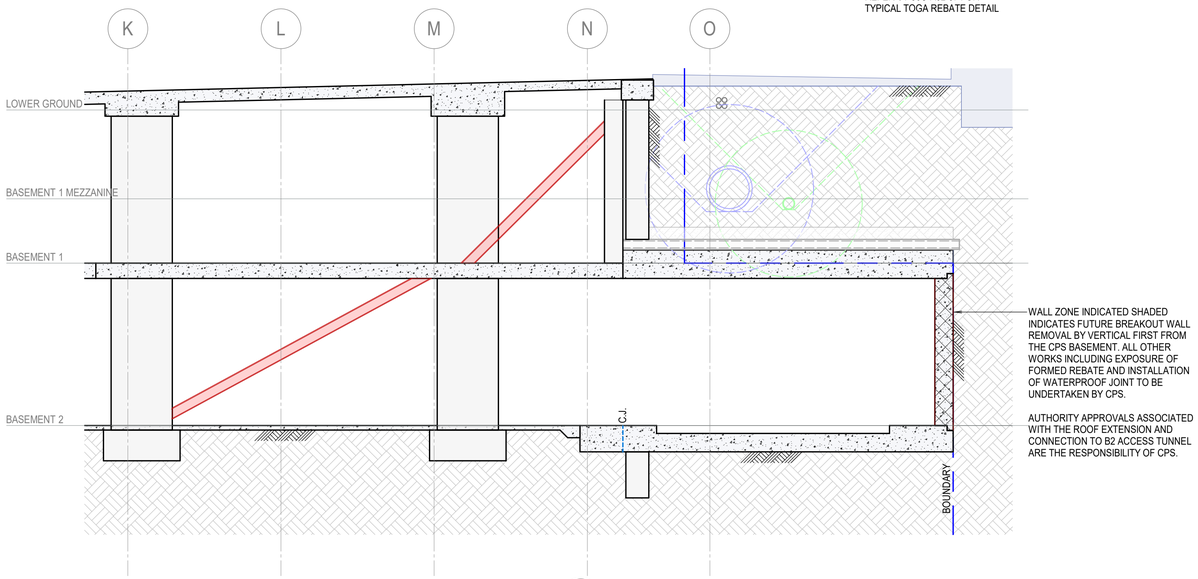

SECTION A
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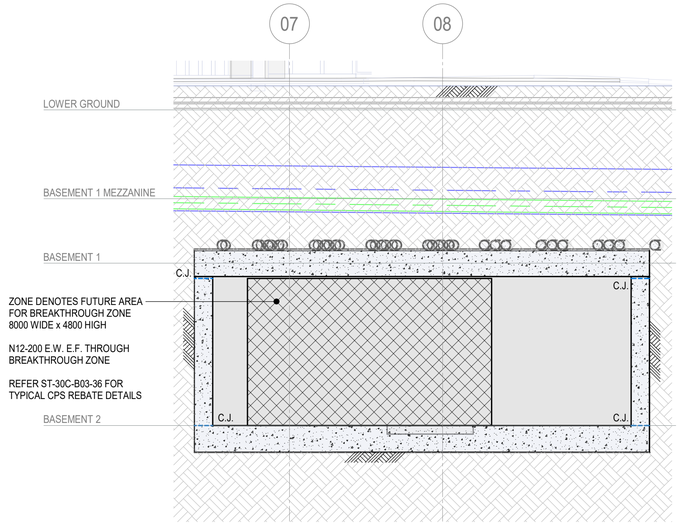

SECTION B
Scale 1 : 100 ST-30C-A02-35

TUNNEL CONSTRUCTION METHODOLOGY

STAGE 5:
1. POUR LOWER GROUND SLAB TO ENGAGE 500THK RC WALL TO CAPPING BEAM.

HOLD POINT - ALL ASSOCIATED TMJ's AT LOWER GROUND LEVEL TO BE FULLY GROUTED AND ENGAGED PRIOR TO STEP 2. (I.E. ALLOW 90 DAYS AFTER LOWER GROUND POUR)

2. REMOVE BRACING MEMBERS AT B1 AND B2
3. POUR RAMP

REFER DOUGLAS PARTNERS GEOTECHNICAL REPORT No.86767.07.R.001.Rev0 DATED NOVEMBER 2020 FOR GROUND STRATUM LEVELS

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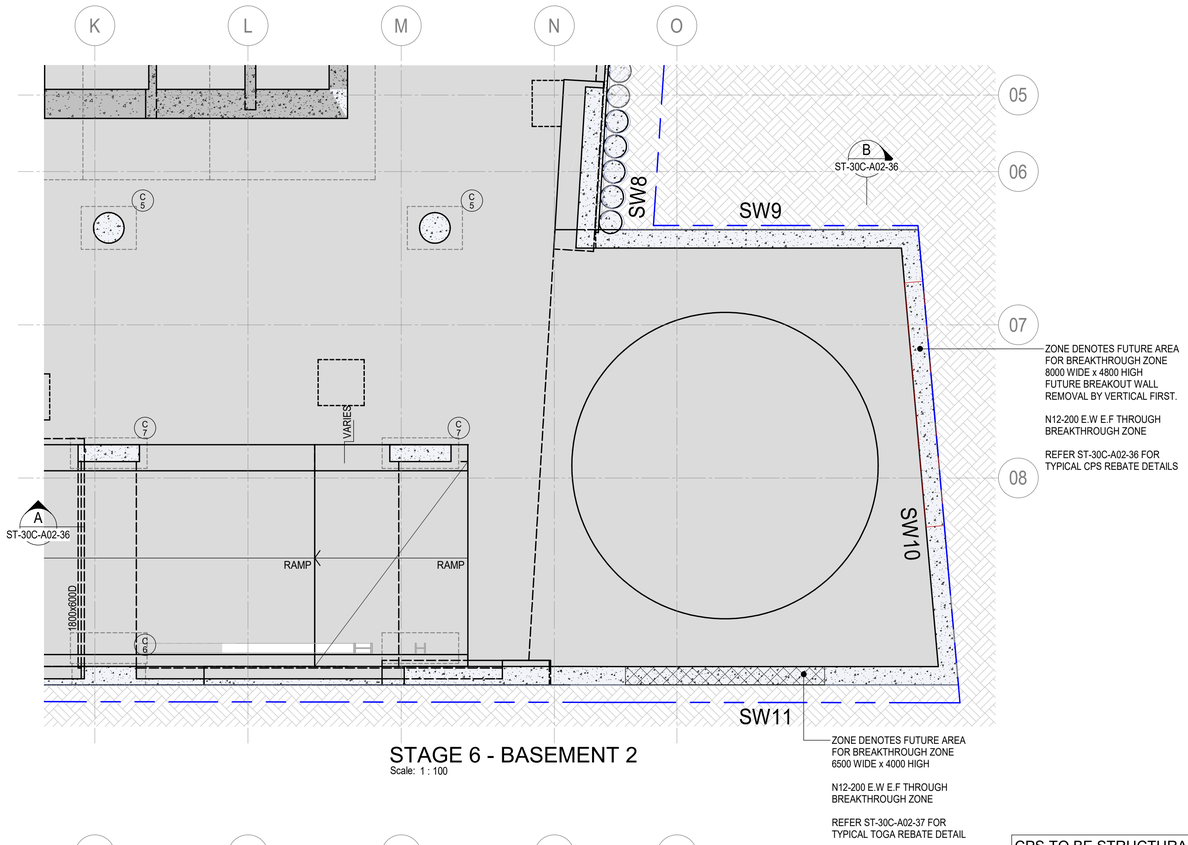
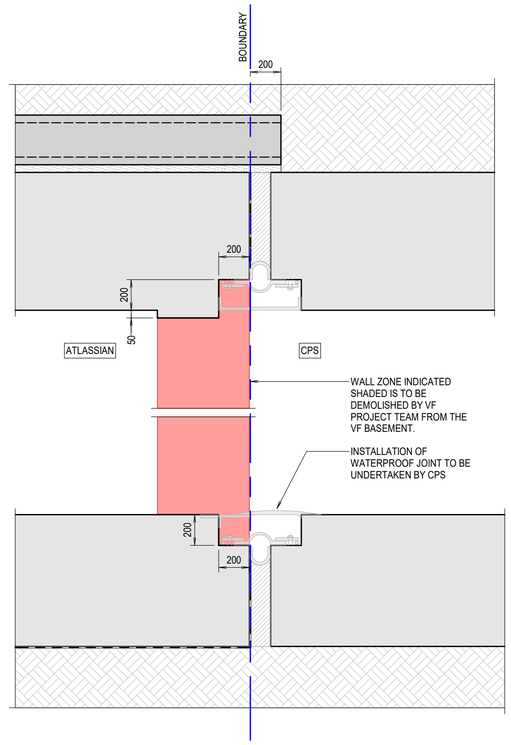
TUNNEL CONSTRUCTION - STAGE 5
DRAWING NUMBER ST-30C-A02-35
ISSUE A



STAGE 6 - BASEMENT 2

Scale: 1 : 100



BREAKOUT ZONE REBATE DETAIL - CPS NORTHERN CUT

Scale: 1 : 20

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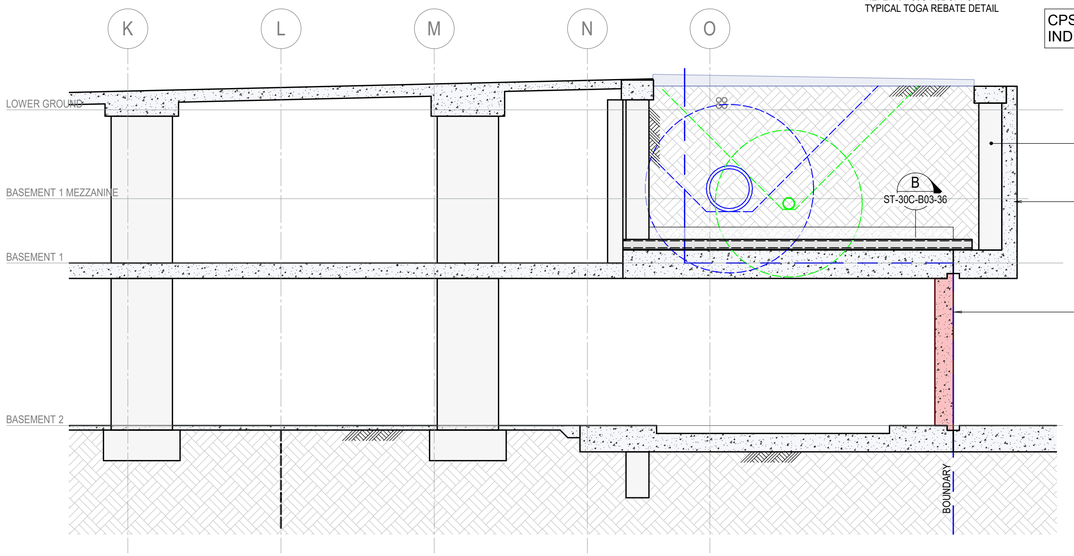
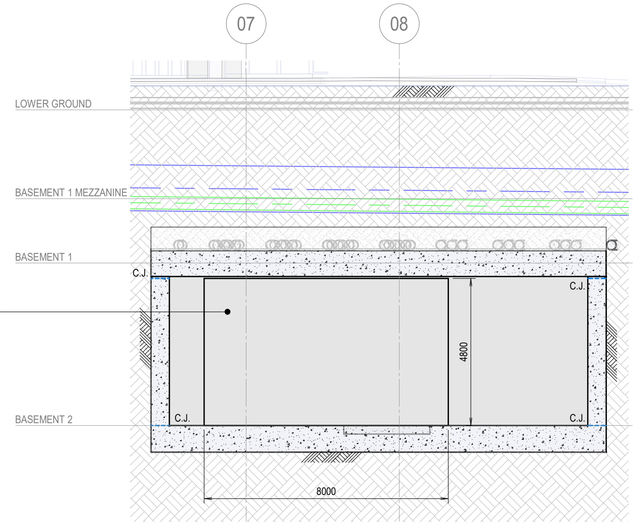


CPS TO BE STRUCTURALLY INDEPENDENT OF ATLASSIAN

SECTION A

Scale 1 : 100 ST-30C-A02-36



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TTW PROJECT NUMBER
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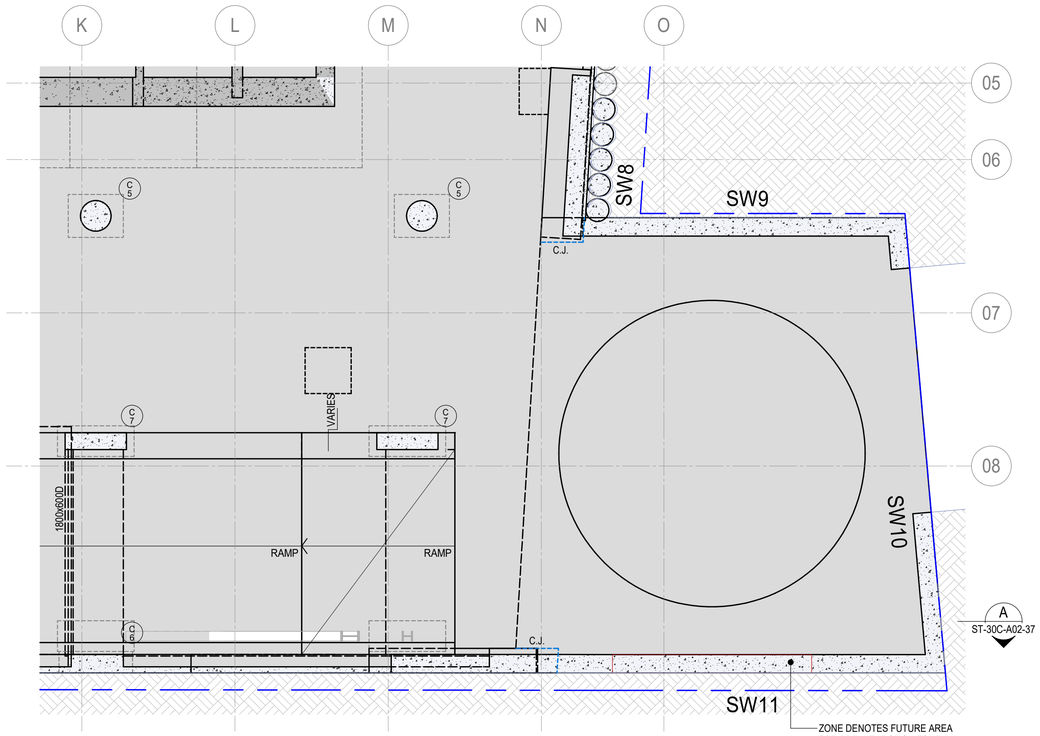
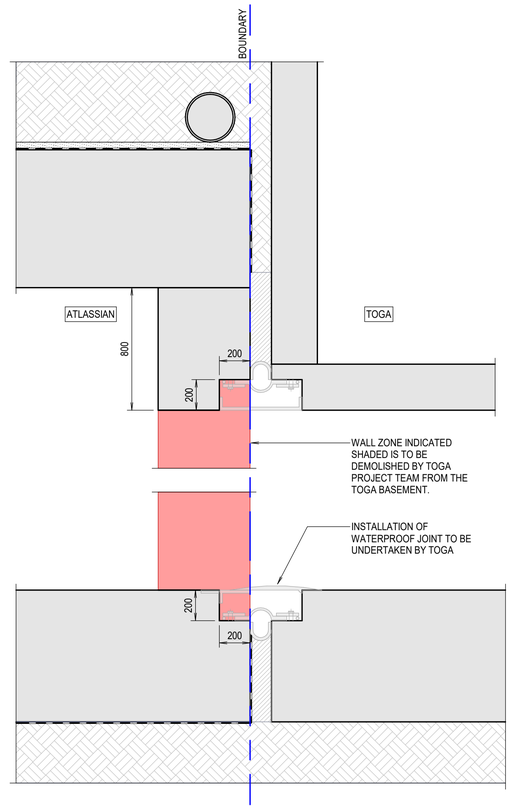


ZONE DENOTES FUTURE AREA FOR BREAKTHROUGH ZONE 6500 WIDE x 4000 HIGH

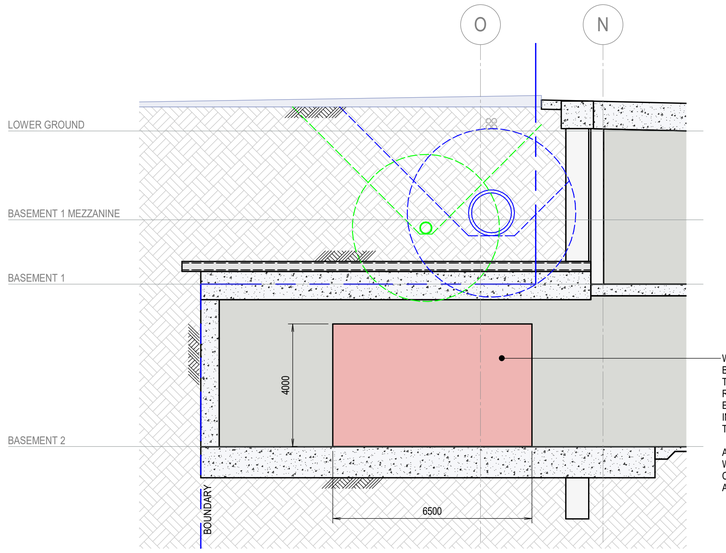
N12-200 E.W E.F THROUGH BREAKTHROUGH ZONE

REFER ST-30C-A02-38 FOR TYPICAL TOGA REBATE DETAIL

STAGE 7 - BASEMENT 2
Scale: 1 : 100



TYPICAL BREAKOUT ZONE REBATE DETAIL - TOGA
Scale: 1 : 20



WALL ZONE INDICATED SHADED IS TO BE DEMOLISHED BY TOGA PROJECT TEAM FROM THE TOGA BASEMENT. REMOVAL OF BREAKOUT ZONE, EXPOSURE OF FORMED REBATE AND INSTALLATION OF WATERPROOF JOINT TO BE UNDERTAKEN BY TOGA.

AUTHORITY APPROVALS ASSOCIATED WITH THE ROOF EXTENSION AND CONNECTION TO B2 ACCESS TUNNEL ARE THE RESPONSIBILITY OF TOGA.

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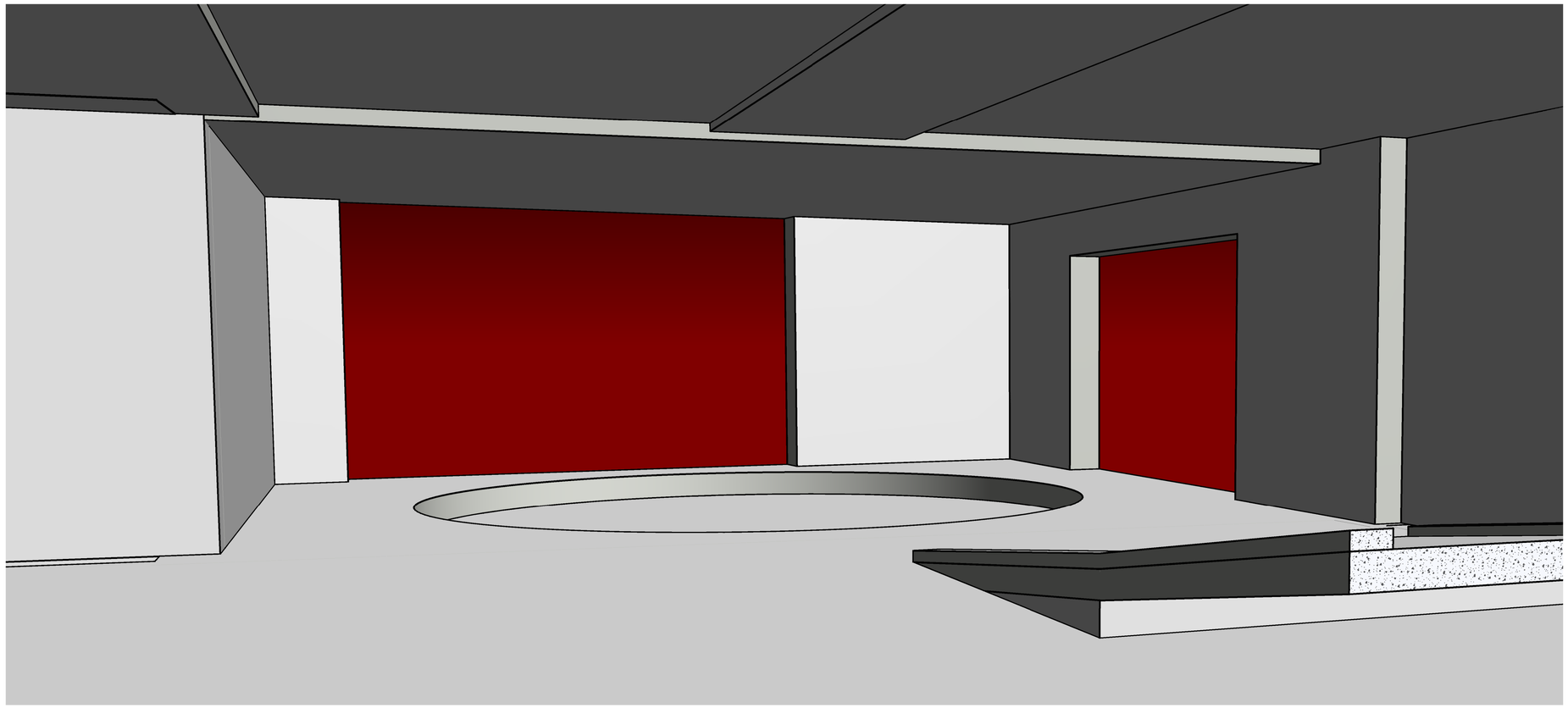

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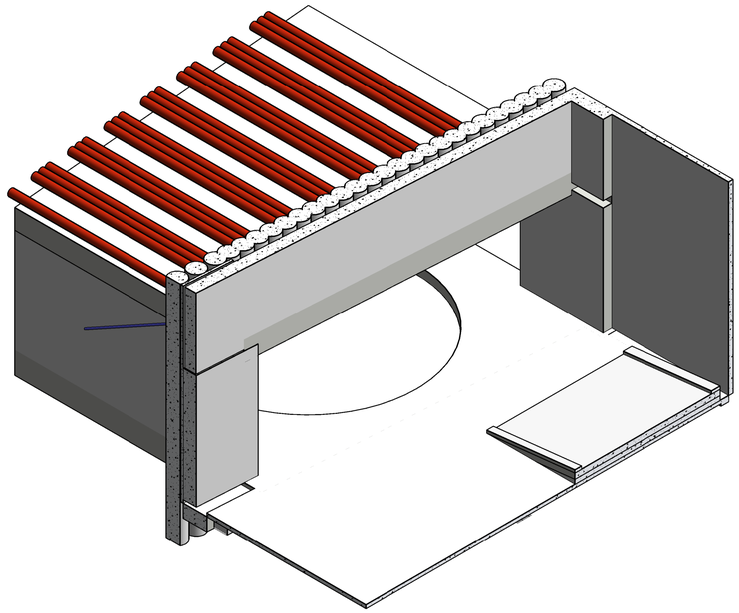

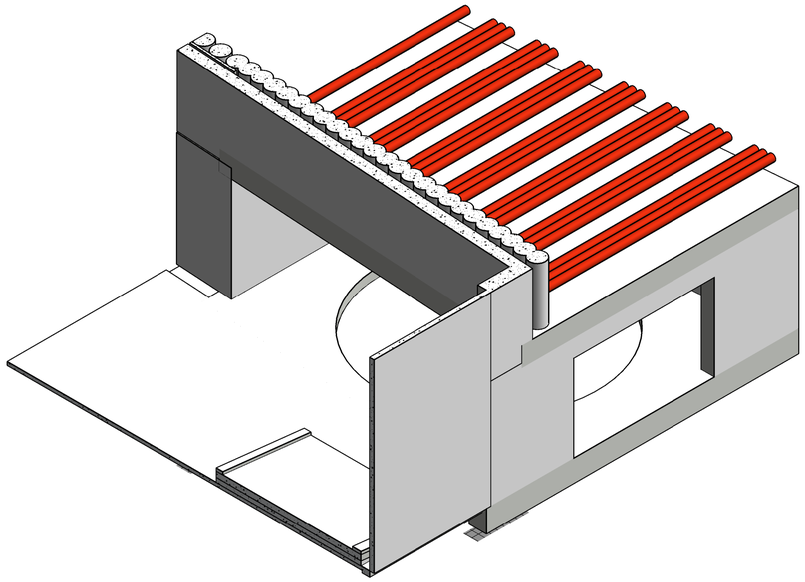

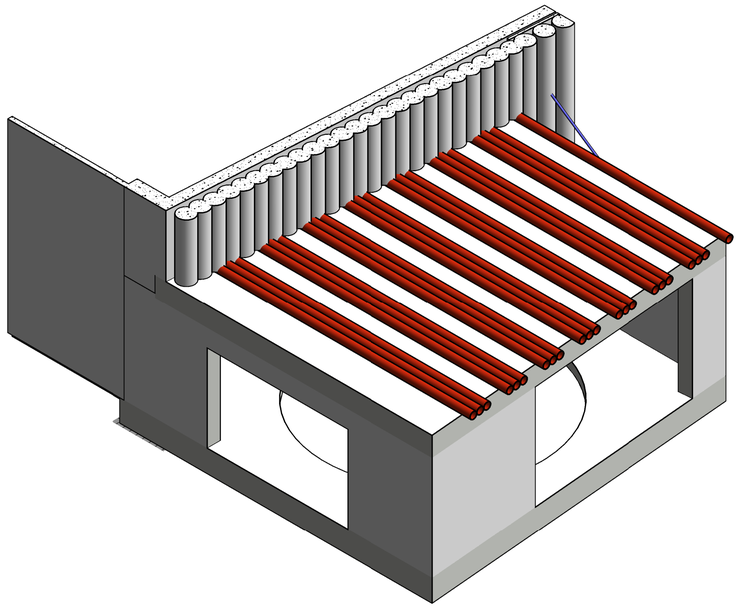

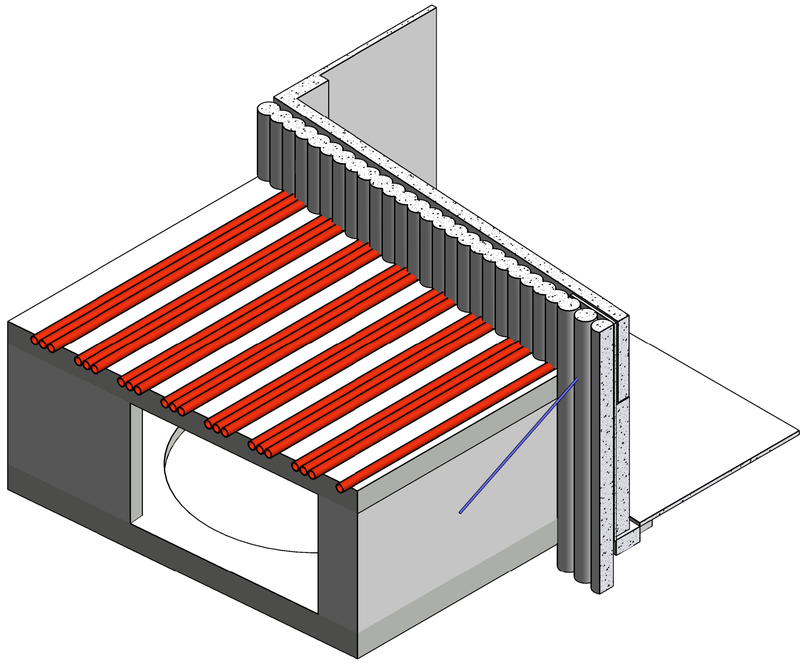

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TUNNEL CONSTRUCTION METHODOLOGY - SHEET 5

DRAWING NUMBER ST-30C-B03-24

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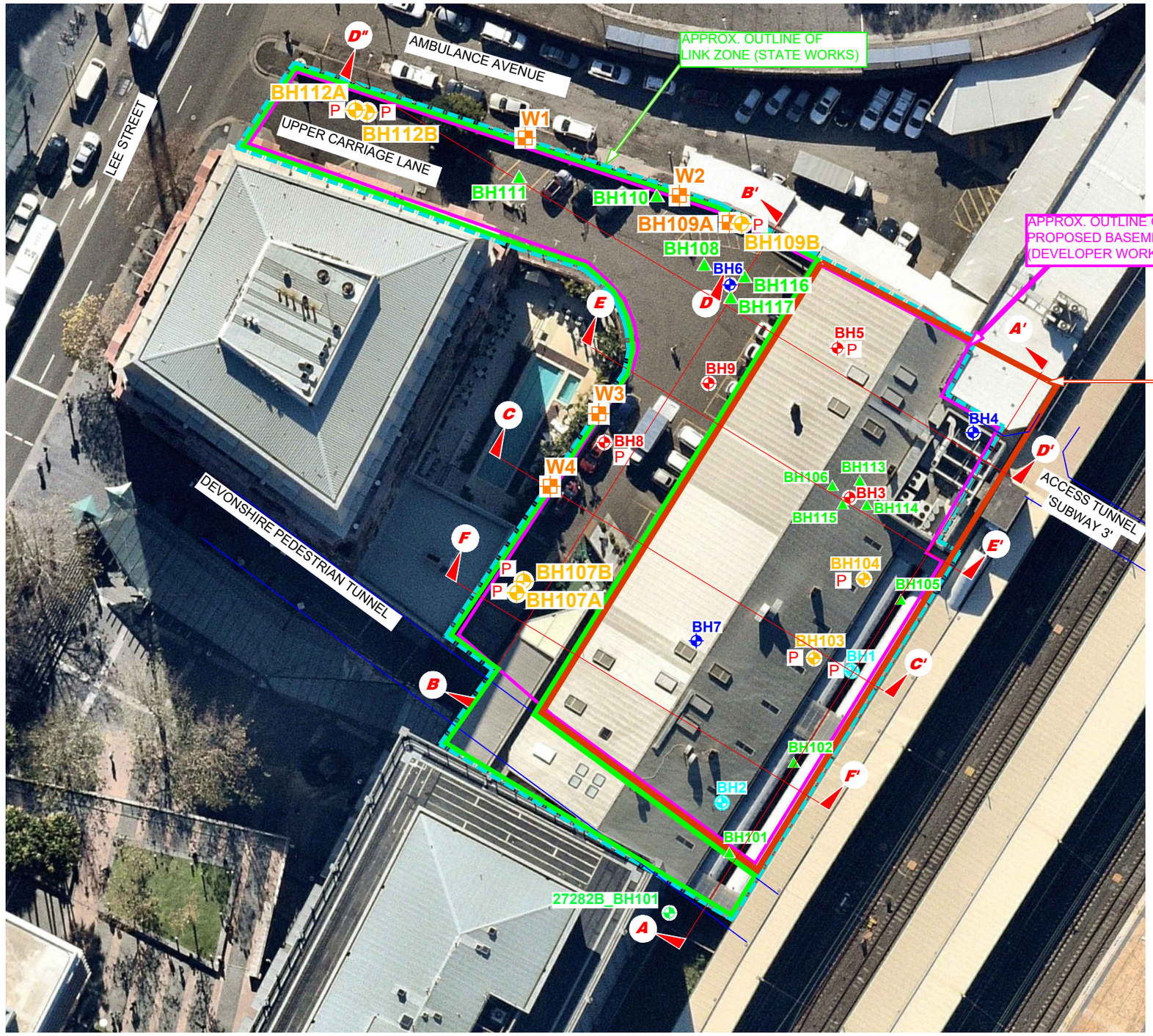

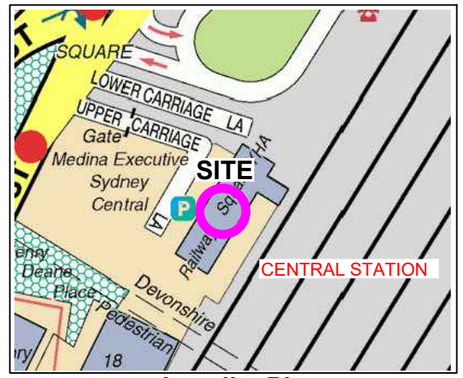

Locality Plan

NOTE:
1: Base image from Nearmap.com (Dated 1 July 2019)
2: Test locations are approximate only and are shown with reference to existing features.
3. Approximate Development Outlines are as provided by Avenor Pty Ltd on 12 August 2019.

0 5 10 15 20 30 40 50m
1:500 @ A3

LEGEND

- Previous geotechnical borehole (DP Project 27282B, dated 1999)
- Environmental borehole - Lower Ground Floor (DP Report 86767.01.R.001.DftB, dated 29 August 2019)
- Geotechnical & environmental borehole - Lower Ground Floor (DP Report 86767.00.R.001.Rev0, dated 26 August 2019)
- Geotechnical & environmental borehole - Upper Ground Floor (DP Report 86767.00.R.001.Rev0, dated 26 August 2019)
- Environmental borehole
- Geotechnical & environmental borehole
- Geotechnical borehole
- P Standpipe piezometer
- A A' Geotechnical Cross Section A-A'
- Approximate site boundary

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Test Location Plan** **Proposed Commercial Development** **8-10 Lee Street, HAYMARKET**
OFFICE: Sydney	DRAWN BY: HDS	
SCALE: 1:500 @ A3	DATE: 03.07.2020	

N

PROJECT No:	86767.00
DRAWING No:	1
REVISION:	9

A

A'

SITE BOUNDARY/ STATE WORKS BOUNDARY

INTERSECTION F-F'

INTERSECTION C-C'

INTERSECTION E-E'

INTERSECTION D-D'

PROPERTY / DEVELOPER WORKS BOUNDARY (LOT 118)

APPROX. LIMIT OF 'TOWER ZONE'

APPROX. DEVONSHIRE STREET TUNNEL

DEVELOPER WORKS

BUILDING ABOVE

BUILDING ABOVE

27282B_BH101
Offset 4.2m
Bottom Depth 14.2 m

BH101
Offset 1.5m
Bottom Depth 1.8 m

BH2
Offset 5.7m
Bottom Depth 23.27 m

BH102
Offset - 0.5m
Bottom Depth 5 m

BH1
Offset - 0.7m
Bottom Depth 20 m

BH104
Offset 4.6m
Bottom Depth 20 m

BH105

BH3
Offset 10.3m
Bottom Depth 15 m

BH4
Offset 3.3m
Bottom Depth 2.35 m

RAIL BALLAST

RAIL BALLAST

PEDESTRIAN TUNNEL

Stormwater Pipe

FILL

FILL

Concrete

Concrete footing on rock (BH105)

RAIL ACCESS TUNNEL

Concrete

(during drilling)

ALLUVIAL SAND

SAND

(BH103 standpiper)

(BH104 standpiper)

RESIDUAL SANDY CLAY

RESIDUAL SILTY CLAY

RESIDUAL SILTY CLAY

VERY LOW STRENGTH SANDSTONE

WITH HIGH STRENGTH BANDS

RESIDUAL SILTY CLAY

RESIDUAL SANDY CLAY

refusal

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

BASEMENT 2: RL 5.0m

PROPOSED BASEMENT PROFILE

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

NOTE:
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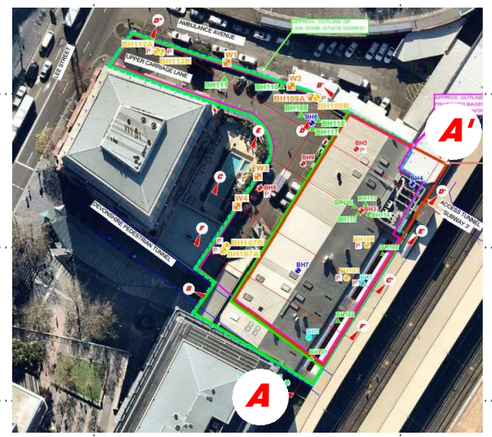
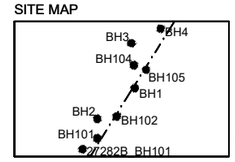


LEGEND

Concrete
Bricks
Fill
Sandy Clay
Sand
Silty Clay
Sandstone
Core Loss

TESTS / OTHER
N - Standard penetration test value
- Water level

SITE MAP



0 4
Horizontal Scale (metres)
Natural Scale

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section A-A'**	PROJECT No: 86767.00
OFFICE: Sydney	DRAWN BY: HDS	**Proposed Commercial Development**	DRAWING No: 2
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 03.07.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 4

B

B'

SITE BOUNDARY

INTERSECTION F-F'

INTERSECTION C-C'

INTERSECTION E-E'

INTERSECTION D-D'

SITE BOUNDARY

APPROX. DEVONSHIRE STREET TUNNEL

STATE WORKS 'LINK ZONE'

Brick parapet

Metal awning

ASPHALT SURFACED CAR PARKING AND LOADING ZONE (UPPER CARRIAGE LANE)

SUSPENDED FLOOR

CURVED METAL ROOF

STAIRS

PEDESTRIAN AREA

STORAGE AREA / CORRIDOR

ACCESS CORRIDOR/ VOID

LOWER CARRIAGE LANE/ AMBULANCE AVENUE

BH107A Offset 1.3m

BH107B Offset 2.4m

Concrete

BH8 Offset 0.1m

BH9 Offset - 2.5m

Concrete

BH6 Offset 0.3m

BH109B Offset 3.0m

BURIED SERVICES CORRIDOR

RESIDUAL SANDY CLAY

FILL

?

W4 Offset 5.4m

ALLUVIAL SAND

W3 Offset 4.8m

RESIDUAL SILTY CLAY

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS

Bottom Depth 3.9 m

Bottom Depth 2.4 m

Bottom Depth 1.2 m

Bottom Depth 1.27 m

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

RL 5.0m

PROPOSED BASEMENT 2 PROFILE

Bottom Depth 15 m

Bottom Depth 15 m

Bottom Depth 14.6 m

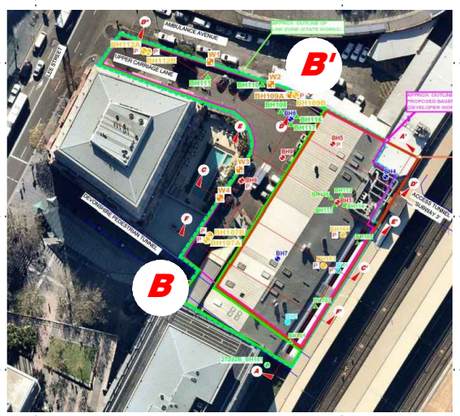
Bottom Depth 15 m

ELEVATION (AHD)

30 25 20 15 10 5 0 -5 -10

0 10 20 30 40 50 60 70

DISTANCE ALONG PROFILE (m)



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6. Layout of internal areas is approximate only.

LEGEND

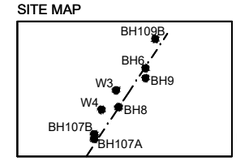
- Core Loss
- Asphaltic Concrete
- Clay
- Concrete
- Filling
- Sand
- Sandstone
- Silty Clay
- Silty Clay

TESTS / OTHER

N - Standard penetration test value

- Water level

SITE MAP



0 4

Horizontal Scale (metres)

Natural Scale

Douglas Partners

Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section B-B'**	PROJECT No: 86767.00
OFFICE: Sydney	DRAWN BY: HDS	**Proposed Commercial Development**	DRAWING No: 3
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 3.07.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 4

C

C'

SITE BOUNDARY

STATE WORKS 'LINK ZONE'

DEVELOPER WORKS

PROPERTY BOUNDARY (LOT 118)

INTERSECTION B-B'

INTERSECTION A-A'

YHA BUILDING ABOVE

Parapet

Masonry wall

ASPHALT SURFACED CAR PARK

Concrete

Concrete Platform

BH103
Offset - 2.2m

BH1
Offset 0.0m

CENTRAL STATION PLATFORM

SUSPENDED FLOOR

SUSPENDED FLOOR

SWIMMING POOL

Masonry wall

Underpin

Machine Rooms?

BH8
Offset 4.0m

BH7
Offset - 6.8m

Concrete

Concrete

FILL

FILL

ALLUVIAL SAND

ALLUVIAL SAND

W4
Offset - 0.3m

ADINA HOTEL BASEMENT RL13.4m

Bottom Depth 2.4 m

Bottom Depth 2.4 m

RESIDUAL SILTY CLAY

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS (MITTAGONG FORMATION)

Bottom Depth 10.8 m

(Standpipe dry)

RESIDUAL SILTY CLAY

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

RL 5.0m

PROPOSED BASEMENT 2 PROFILE

Bottom Depth 15 m

Bottom Depth 20 m

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

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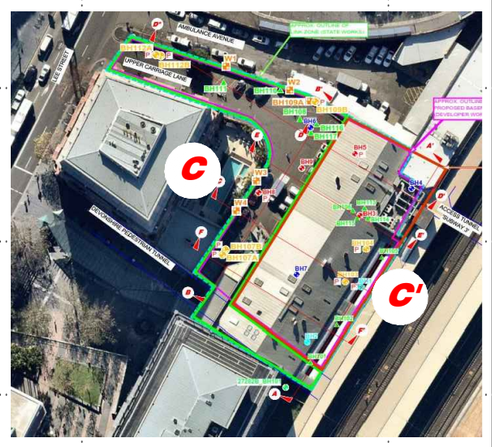


LEGEND

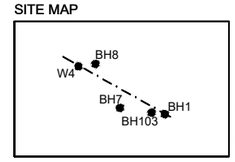
- Core Loss
- Bricks
- Concrete
- Filling
- Sand
- Sandstone
- Silty Clay
- Sandy Clay

TESTS / OTHER

N - Standard penetration test value

▽ - Water level

SITE MAP



0 4

Horizontal Scale (metres)

Natural Scale

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		
OFFICE: Sydney	DRAWN BY: HDS	
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 03.07.2020	

TITLE: **Interpreted Geotechnical Cross-Section C-C'**
Proposed Commercial Development
8-10 Lee Street, HAYMARKET

PROJECT No:	86767.00
DRAWING No:	4
REVISION:	4

D" D

PROPERTY BOUNDARY

ADINA HOTEL BASEMENT ENTRY PORTAL

STATE WORKS 'LINK ZONE'

INTERSECTION B-B' JOINS SECTION D-D'

DEVELOPER WORKS

YHA BUILDING ABOVE

BRICK RETAINING WALL (NEAR WALL TERMINATION)

ASPHALT SURFACED RAMP (UPPER CARRIAGE LANE)

PROPOSED RAMP

ASPHALT SURFACED CAR PARK

SUSPENDED FLOOR

Concrete

SUSPENDED FLOOR/METAL ROOF

COMMERCIAL SPACE

BIN ROOM

CORRIDOR

AMBULANCE AVENUE

FOOTPATH (OBLIQUE)

FILL

ALLUVIAL SAND

RESIDUAL SILTY CLAY

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS (MITTAGONG FORMATION)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

ADINA HOTEL BASEMENT ACCESS PORTAL TO AMBULANCE AVENUE

LOW STRENGTH WITH VERY LOW STRENGTH BANDS

LINK ZONE LOADING DOCK AREA

PROPOSED VEHICLE LINK ZONE

RL 5.0m

PROPOSED BASEMENT 2 PROFILE

BH112A Offset - 3.4m, Bottom Depth 4.5 m; N = 20, refusal

BH112B Offset - 3.2m, Bottom Depth 15 m

BH111 Offset 0.3m, Bottom Depth 5.4 m

W1 Offset 4.2m, Bottom Depth 2.46 m

BH110 Offset 6.0m, Bottom Depth 0.6 m

W2 Offset 8.4m, Bottom Depth 1.33 m

BH108 Offset 3.4m, Bottom Depth 1.2 m

BH109B Offset 8.9m, Bottom Depth 1.27 m

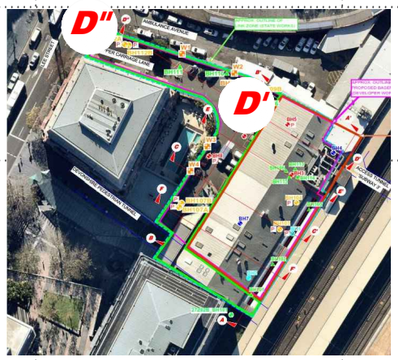
BH6 Offset 2.3m, Bottom Depth 1.2 m

BH117 Offset 1.1m, Bottom Depth 1.2 m

Bottom Depth 15 m

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)



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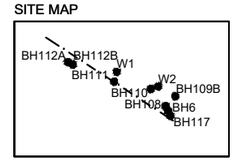
LEGEND

Core Loss
Asphaltic Concrete
Clay
Concrete
Fill
Sand
Sandstone
Sandy Clay
Silty Clay

SITE MAP



Horizontal Scale (metres) Natural Scale

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section D"-D (extended)**	PROJECT No: 86767.00
OFFICE: Sydney	DRAWN BY: HDS/ PSCH	**Proposed Commercial Development**	DRAWING No: 5
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 03.07.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 3

D

D'

INTERSECTION B-B'

INTERSECTION A-A'

PROPERTY BOUNDARY (LOT 118)

STATE WORKS 'LINK ZONE'

DEVELOPER WORKS

YHA BUILDINGS ABOVE

Concrete

CENTRAL STATION PLATFORM

ASPHALT SURFACED CAR PARK

SUSPENDED FLOOR

SUSPENDED FLOOR/METAL ROOF

FILL ABOVE TUNNEL?

BIN ROOM

ACCESS CORRIDOR

COMMERCIAL SPACE / VOID

RAIL ACCESS TUNNEL ('SUBWAY 3')

BH108 Offset 2.8m
BH6 Offset 1.5m
BH117 Offset 0.3m
BH5 Offset 1.8m
BH4 Offset - 0.8m

Concrete

Concrete

RESIDUAL CLAY

LOW STRENGTH

WITH VERY LOW STRENGTH BANDS

(HAWKESBURY SANDSTONE)

RESIDUAL SILTY CLAY

FILL

RESIDUAL SILTY CLAY

Bottom Depth 1.2 m
Bottom Depth 1.27 m
Bottom Depth 1.2 m
Bottom Depth 2.35 m

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

RL 5.0m

PROPOSED BASEMENT 2 PROFILE

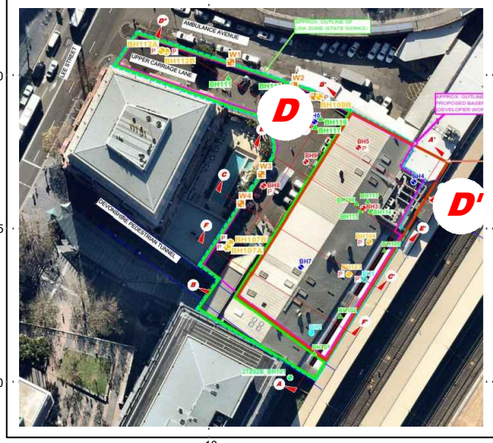
Bottom Depth 15.27 m

ELEVATION (AHD)

30 25 20 15 10 5 0 -5 -10

-10 0 10 20 30 40 50

DISTANCE ALONG PROFILE (m)



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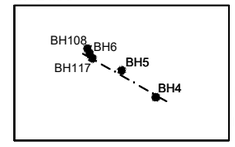
LEGEND

- Core Loss
- Asphaltic Concrete
- Concrete
- Fill
- Sandstone
- Sandy Clay
- Silty Clay
- Clay

TESTS / OTHER
N - Standard penetration test value
▽ - Water level

SITE MAP



0 4
Horizontal Scale (metres)
Natural Scale

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section D-D'**	PROJECT No: 86767.00
OFFICE: Sydney	DRAWN BY: HDS	**Proposed Commercial Development**	DRAWING No: 5A
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 03.07.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 4

E

E'

INTERSECTION B-B'

INTERSECTION A-A'

PROPERTY BOUNDARY

PROPERTY BOUNDARY

STATE WORKS 'LINK ZONE'

DEVELOPER WORKS YHA BUILDING ABOVE

MASONRY WALL

SWIMMING POOL

Underpin

ADINA HOTEL BASEMENT RL13.4m

ASPHALT SURFACED CAR PARK

SUSPENDED FLOOR

ACCESS CORRIDOR VOID AND BIN ROOMS

SUSPENDED FLOOR

COMMERCIAL SPACE

Concrete

CONCRETE

FILL

RESIDUAL SILTY CLAY

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS (MITTAGONG FORMATION)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

RAIL DORMITORY CARRIAGES AND RAIL BALLAST

CENTRAL STATION PLATFORM

CONCRETE FOOTING

ALLUVIAL SAND

FILL

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS (MITTAGONG FORMATION)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

RL 5.0m
PROPOSED BASEMENT 2 PROFILE

PROPOSED VEHICLE LINK ZONE

W3 Offset - 7.8m Bottom Depth 1.2 m

BH9 Offset 3.1m Bottom Depth 14.6 m

BH106 Offset 0.1m Bottom Depth 1.25 m

BH3 Offset 0.4m Bottom Depth 15 m

BH114 Offset 0.7m Bottom Depth 0.3 m

BH104 Offset - 6.5m Bottom Depth 20 m

BH105 Offset - 5.4m Bottom Depth 6.5 m

N = 4

N = 4

N = 3

N = 13

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

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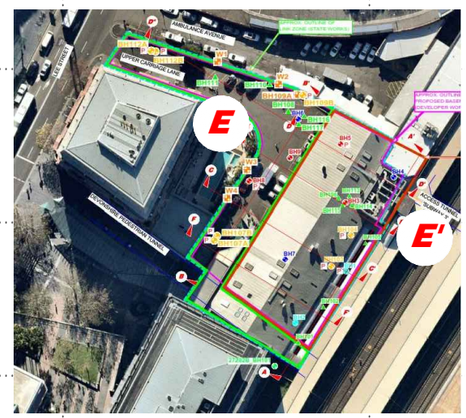
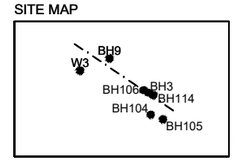


LEGEND

Core Loss
Bricks
Clay
Concrete
Fill
Sand
Sandstone
Silty Clay

TESTS / OTHER
N - Standard penetration test value
▽ - Water level

SITE MAP



0 4
Horizontal Scale (metres)
Natural Scale

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section E-E'**	PROJECT No: 86767.00
OFFICE: Sydney	DRAWN BY: HDS/ PSCH	**Proposed Commercial Development**	DRAWING No: 6
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 03.07.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 3

F

F'

PROPERTY BOUNDARY

INTERSECTION B-B'

INTERSECTION A-A'

PROPERTY BOUNDARY

STATE WORKS 'LINK ZONE'

DECK AND BUILDING ABOVE

DEVELOPER WORKS YHA BUILDING ABOVE

BUILDING

Concrete

BH2
Offset - 5.3m

RAIL DORMITORY CARRIAGES AND RAIL BALLAST

BH102
Offset - 0.2m

CENTRAL STATION PLATFORM

RAMP

Stairs

SUSPENDED FLOOR

N = 2

N = 0

N = 4

N = 2

N = 1

refusal

STORAGE AREA

COMMERCIAL SPACE

BH107B
Offset 1.2m

BH7
Offset 5.8m

(during drilling)

FILL

Bottom Depth 5 m

RESIDUAL SANDY CLAY

RESIDUAL SILTY CLAY

Level in BH104

RESIDUAL SANDY CLAY

RESIDUAL SILTY CLAY

Bottom Depth 2.4 m

FILL

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS

VERY LOW STRENGTH WITH HIGH STRENGTH BANDS

RESIDUAL SANDY CLAY

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

MEDIUM TO HIGH STRENGTH SANDSTONE

(HAWKESBURY SANDSTONE)

RL 5.0m

PROPOSED BASEMENT 2 PROFILE

Bottom Depth 15 m

Bottom Depth 23.27 m

ELEVATION (AHD)

30 25 20 15 10 5 0 -5 -10

0 10 20 30 40 50 60 70

DISTANCE ALONG PROFILE (m)

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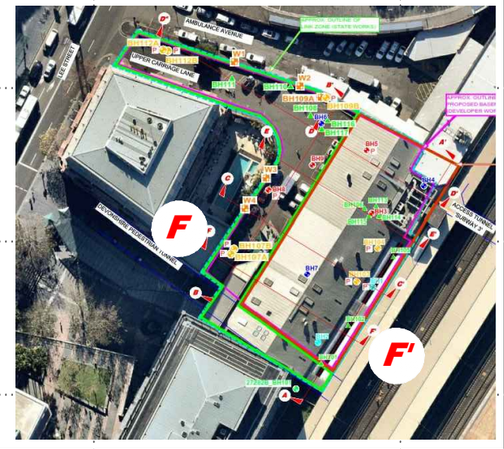


LEGEND

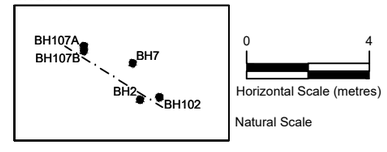
- Core Loss
- Concrete
- Filling
- Sandstone
- Sandy Clay
- Silty Clay

TESTS / OTHER

N - Standard penetration test value

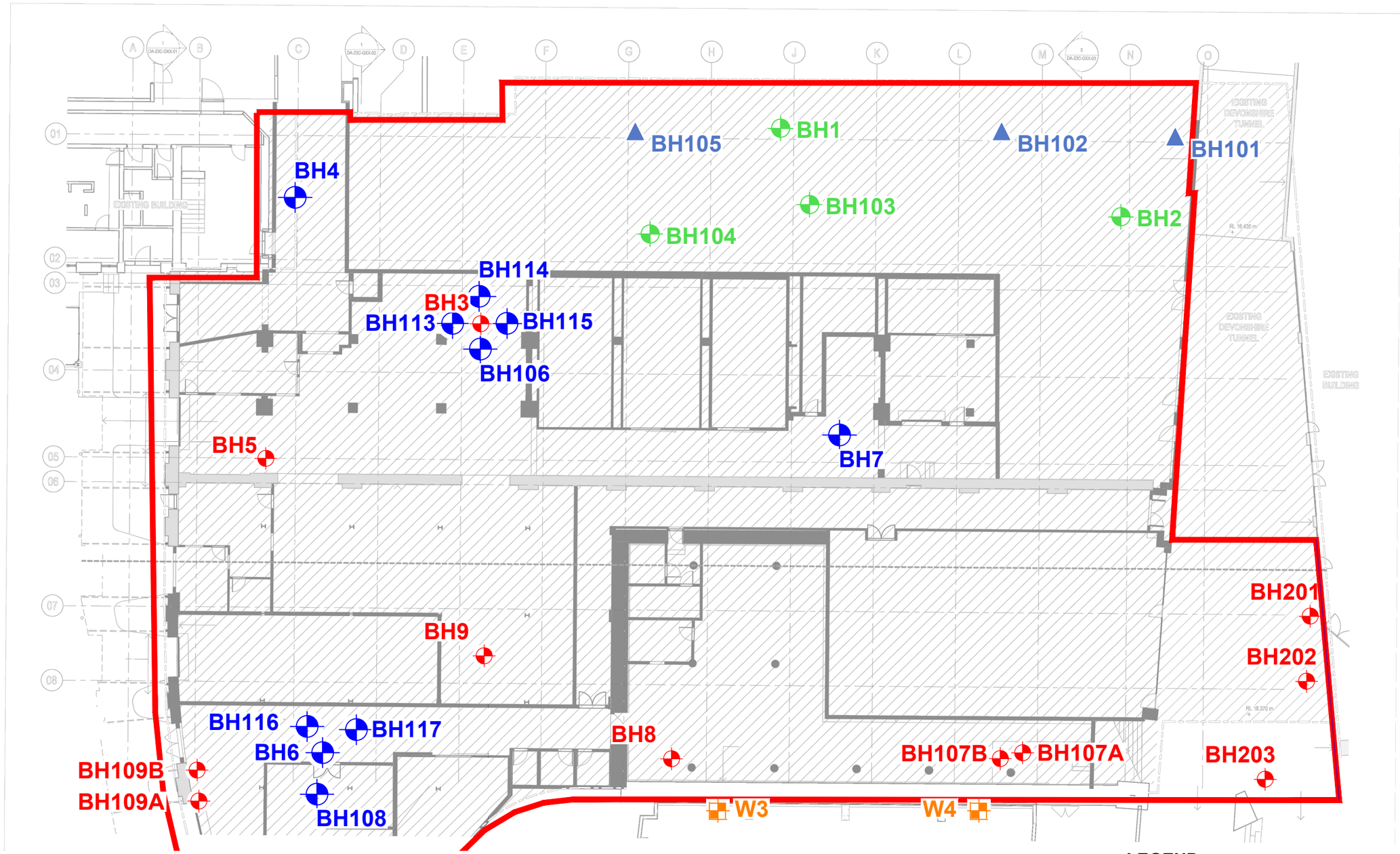
▽ - Water level

SITE MAP



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section F-F'**	PROJECT No: 86767.00
OFFICE: Sydney	DRAWN BY: HDS	**Proposed Commercial Development**	DRAWING No: 7
SCALE: 1:200 (H) 1:200 (V) @ A3	DATE: 03.07.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 3



NOTE:
1: Base image taken from "DA-23B-G00-01" DEMOLITION PLAN LOWER GROUND PART 1", Rev 1 dated 28 August 2020 prepared by BVN Architecture Pty Ltd
2. North arrow aligned to True North as per "DA-23B-G00-01" DEMOLITION PLAN LOWER GROUND PART 1", Rev 1 dated 28 August 2020 prepared by BVN Architecture Pty Ltd.

0 1 2 3 4 5 6 7 8 9 10 15 20 25m
1:250 @ A3

LEGEND

- Environmental borehole - Lower Ground Floor
- Environmental borehole - Upper Ground Floor
- Geotechnical & Environmental borehole - Lower Ground Floor
- Geotechnical & Environmental borehole - Upper Ground Floor
- Retaining Wall Investigation borehole

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Vertical First Pty Ltd		TITLE: **Test Locations - Lower Ground Floor Plan**	PROJECT No: 86767.07
OFFICE: Sydney	DRAWN BY: HDS/LH	**Link Tunnel**	DRAWING No: 2
SCALE: 1:250 @ A3	DATE: 09.11.2020	**8-10 Lee Street, HAYMARKET**	REVISION: 0

A

A'

SITE BOUNDARY

SITE BOUNDARY

BH203
Offset 0.5m
Rock Strength
EL VL L M H VH

BH202
Offset - 0.4m
Rock Strength
EL VL L M H VH

BH201
Offset 0.6m
Rock Strength
EL VL L M H VH

TILED/PAVED SURFACE

RL16.4m LOWER GROUND FLOOR (varies)

CONCRETE

FILL

FILL

OLD FOOTING

N = 3

12/11/2020

ALLUVIAL SAND

During Drilling

RL12.05m INVERT LEVEL OF 1.5m DIAMETER STORMWATER PIPE

CLAY

N = 12

RESIDUAL CLAY

RESIDUAL CLAY

RL10.03m BASEMENT B1 LEVEL

VERY LOW AND LOW STRENGTH WITH MEDIUM STRENGTH BANDS

CLAY

MEDIUM TO HIGH STRENGTH SANDSTONE (HAWKESBURY SANDSTONE)

APPROXIMATE OUTLINE OF B2 LINK TUNNEL

RL5.0 m BASEMENT B2 LEVEL

Bottom Depth 13.43 m

Bottom Depth 13.77 m

Bottom Depth 13.84 m

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

- Pavers
- Concrete
- Fill
- Sand
- Silty Clay
- Sandstone

NOTES

1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Stormwater invert levels inferred from the provided sketch from TTW Pty Ltd 'SK-0049 Issue 1' dated 18 Aug 2020 (levels to be confirmed)
4. Levels for lower ground floor, Basement B1 and B2 taken from Drawing 'DA-11D-XXX-04 Issue 2' dated 18 Sept 2020, prepared by BVN Architects Pty Ltd'
5. Stormwater pipe invert level is based on a straight line between survey invert levels.

TESTS / OTHER

- N - Standard penetration test value
- - Water level
- - Interpreted geotechnical boundary

ROCK STRENGTH

- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH- Very High

SITE MAP

BH203
BH202
BH201

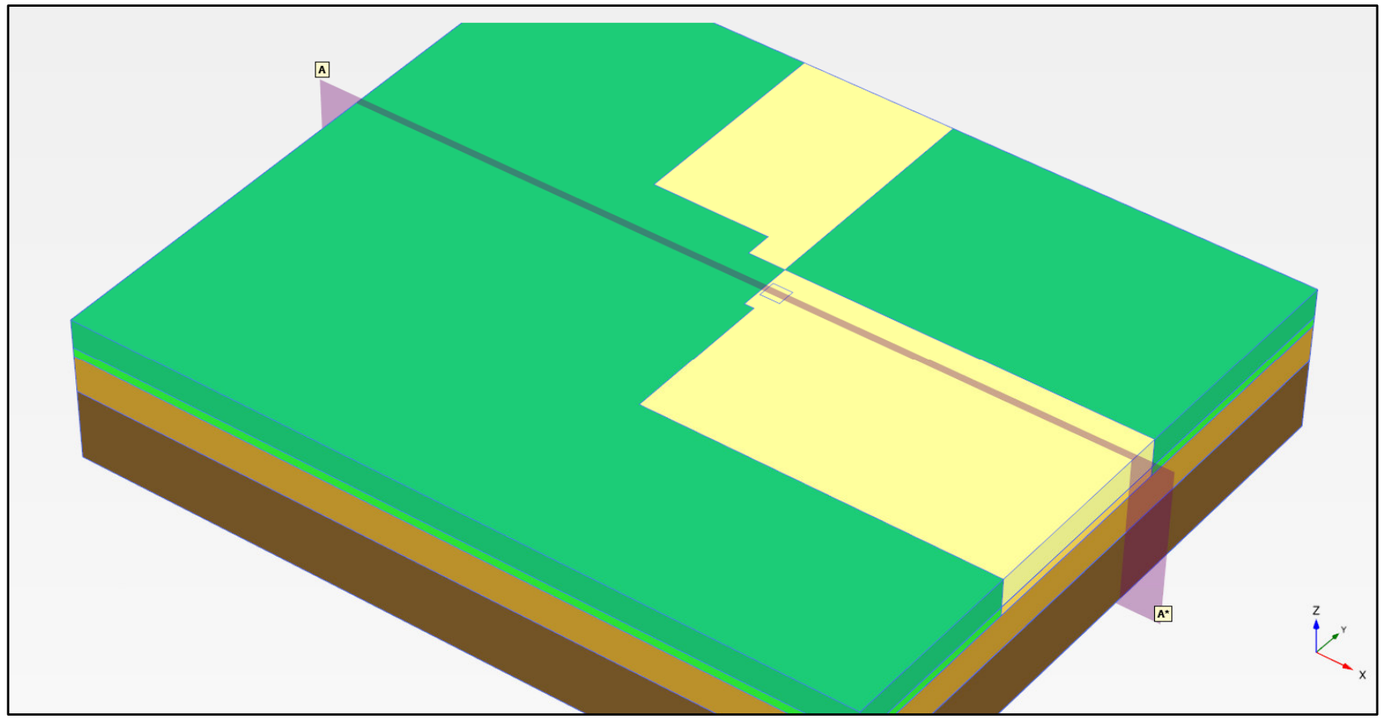
0 2
Horizontal Scale (metres)
Natural Scale

Douglas Partners
Geotechnics / Environment / Groundwater

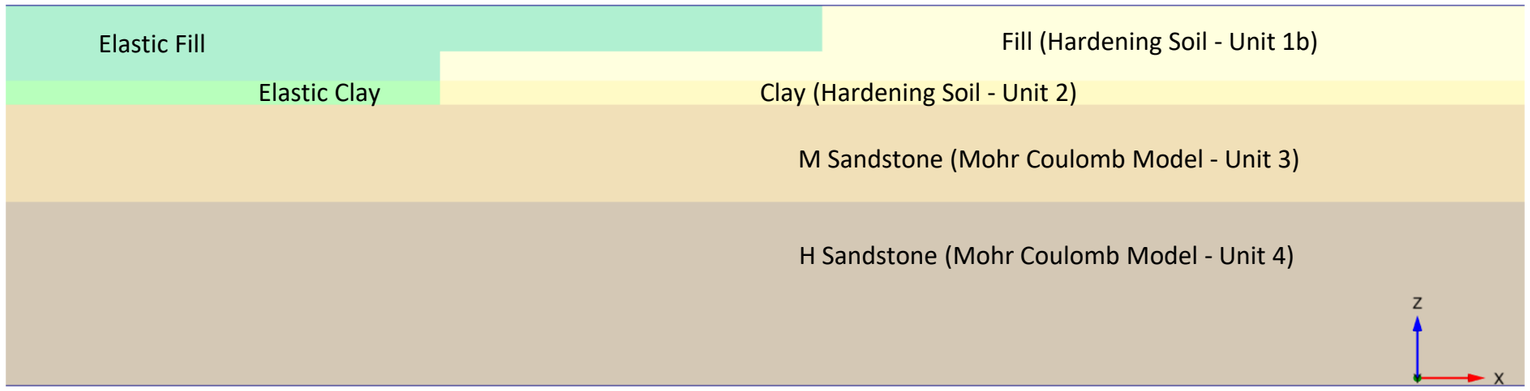
CLIENT: Vertical First Pty Ltd		TITLE: **Inferred Geotechnical Cross-Section A-A'** **Link Tunnel** **8-10 Lee Street, Haymarket**	PROJECT No: 86767.07
OFFICE: Sydney	DRAWN BY: HDS/CJ		DRAWING No: 3
SCALE: 1:75 (H) 1:75 (V) @ A3	DATE: 17.11.2020		REVISION: 0

Appendix C

Analysis Outputs

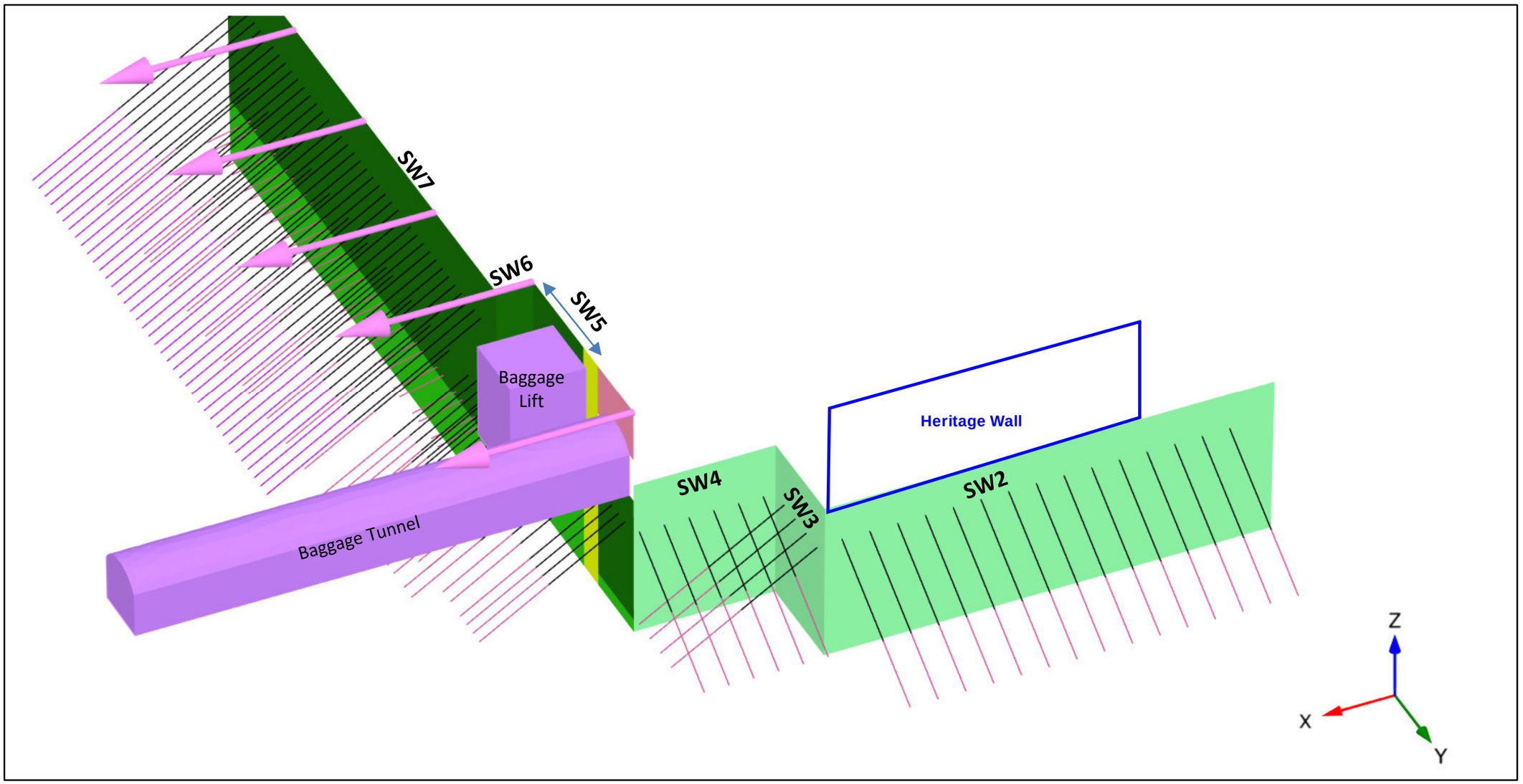


3D View

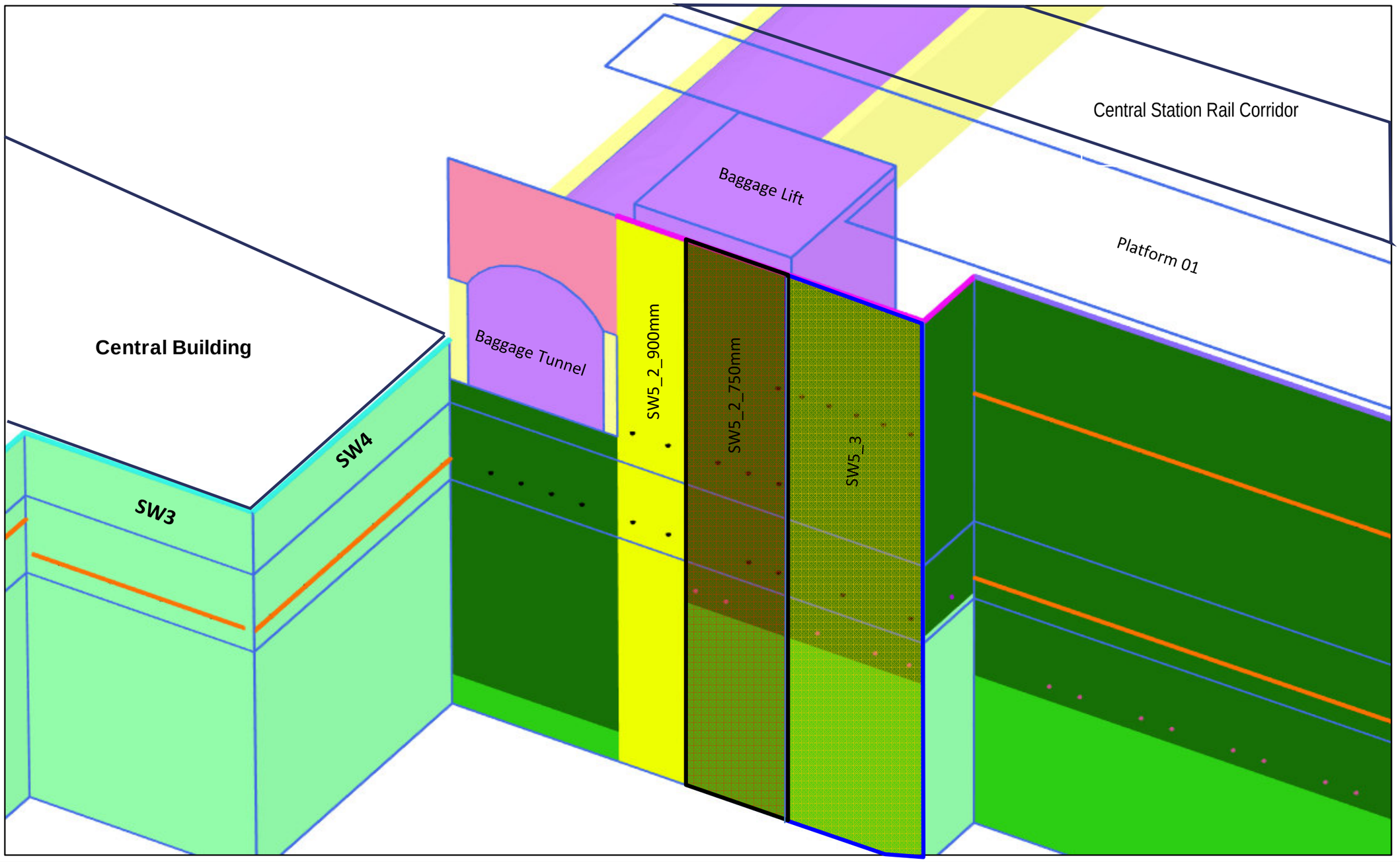


Cross Section View

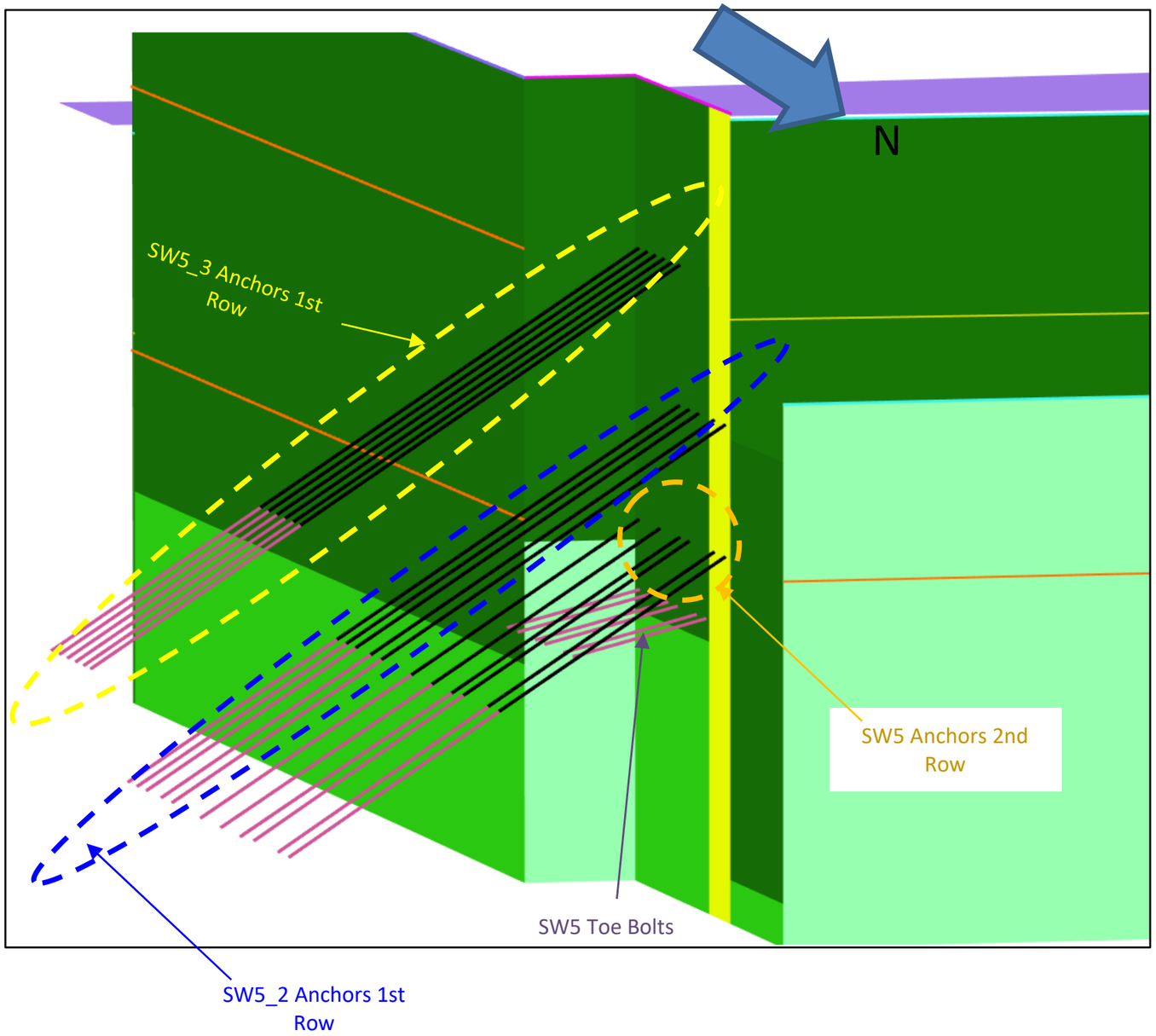
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)	**Model 1 Geometry (Geotechnical Profile)**	PROJECT No: 86767.04
	OFFICE: Sydney	**Proposed Commercial Development**	DWG No: M1
	DATE: 14 Feb 2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



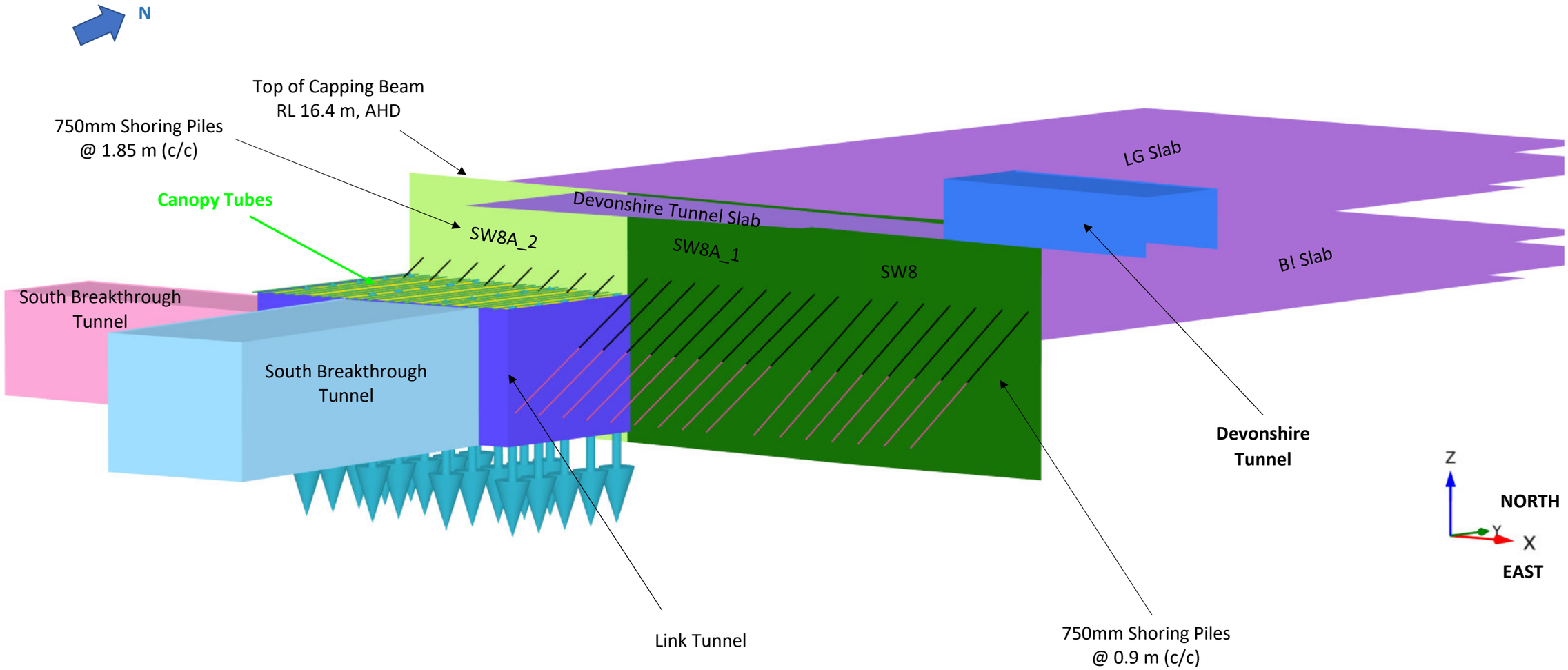
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)	**Model 1 Geometry (Structural View - General)**	PROJECT No: 86767.04
	OFFICE: Sydney	**Proposed Commercial Development**	DWG No: M2
	DATE: 14 Feb 2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



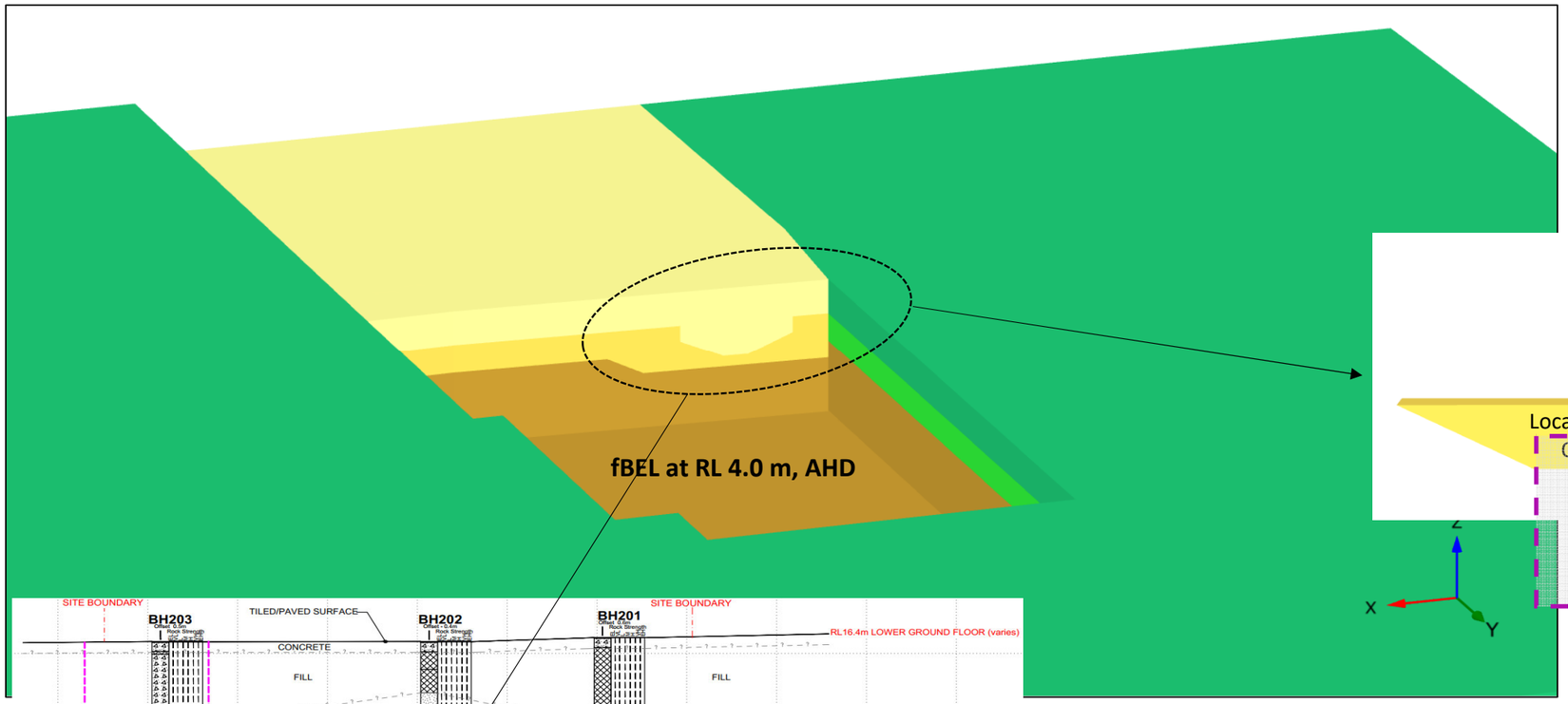
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)	**Model 1 Geometry (Structural View - SW5)**	PROJECT No: 86767.04
	OFFICE: Sydney	**Proposed Commercial Development**	DWG No: M3
	DATE: 14 Feb 2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

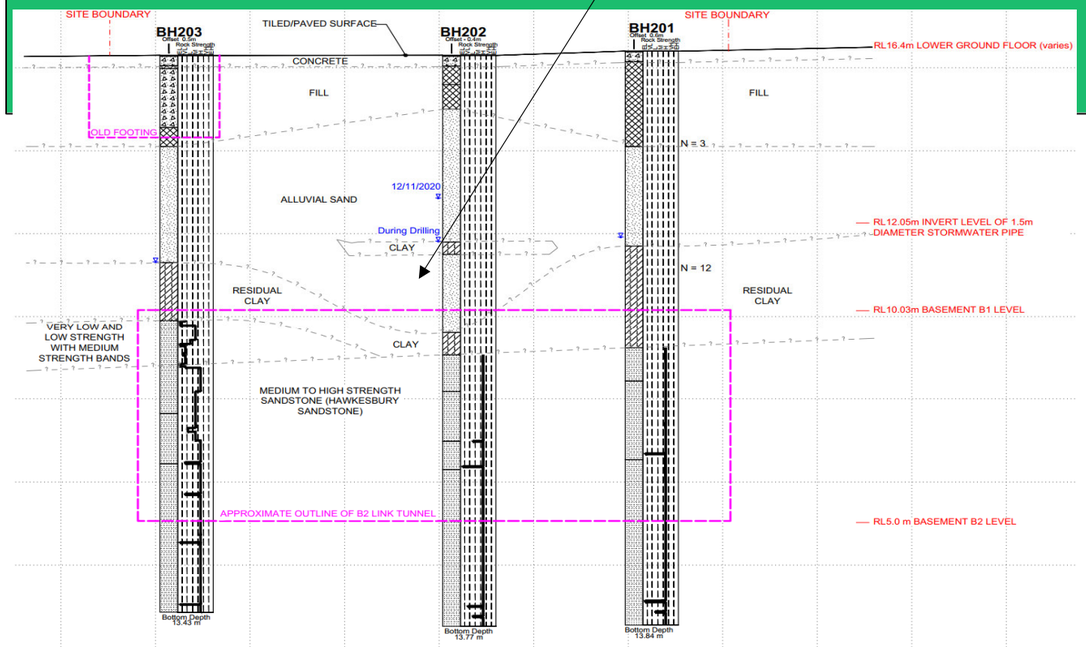


Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)	**3D Model Geometry (Structural View - SW5 Anchors and Toe bolts)**	PROJECT No: 86767.04
	OFFICE: Sydney	**Proposed Commercial Development**	DWG No: M4
	DATE: 14 Feb 2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

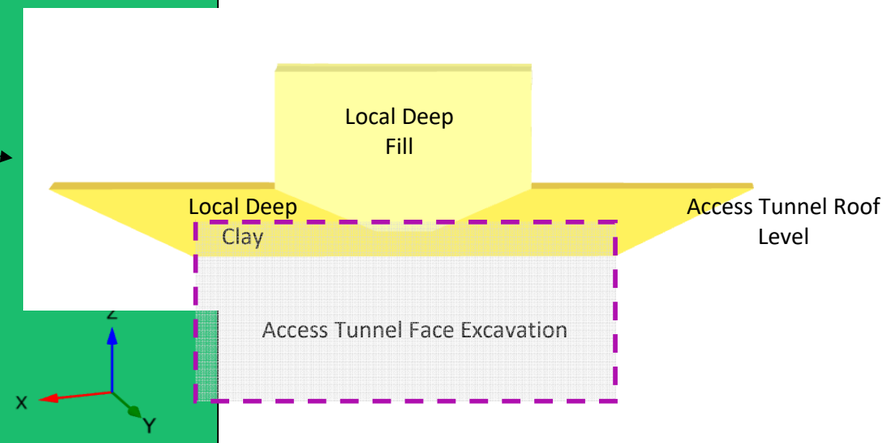


Douglas Partners Geotechnics / Environment / Groundwater	CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Model 2 Geometry - Structural Elements**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH		**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M5
	SCALE: As Shown	DATE: 14/02/2022		**8-10 Lee Street, Haymarket**	REVISION: Rev 0



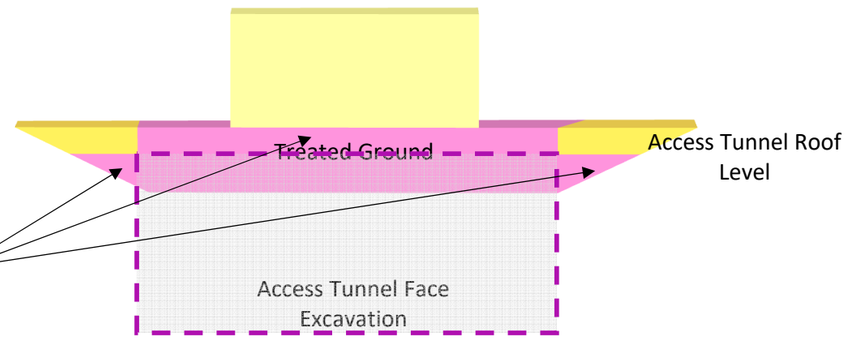


Initial ground Conditin within Link Tunnel Zone:



Ground Condition after treatment within Link Tunnel Zone:

Secondary support / treatment measures on tunnel roof and side walls such as rock bolts and shotcrete not explicitly modelled, intead combined in the 'Treated Ground Material'



Douglas Partners
Geotechnics / Environment / Groundwater

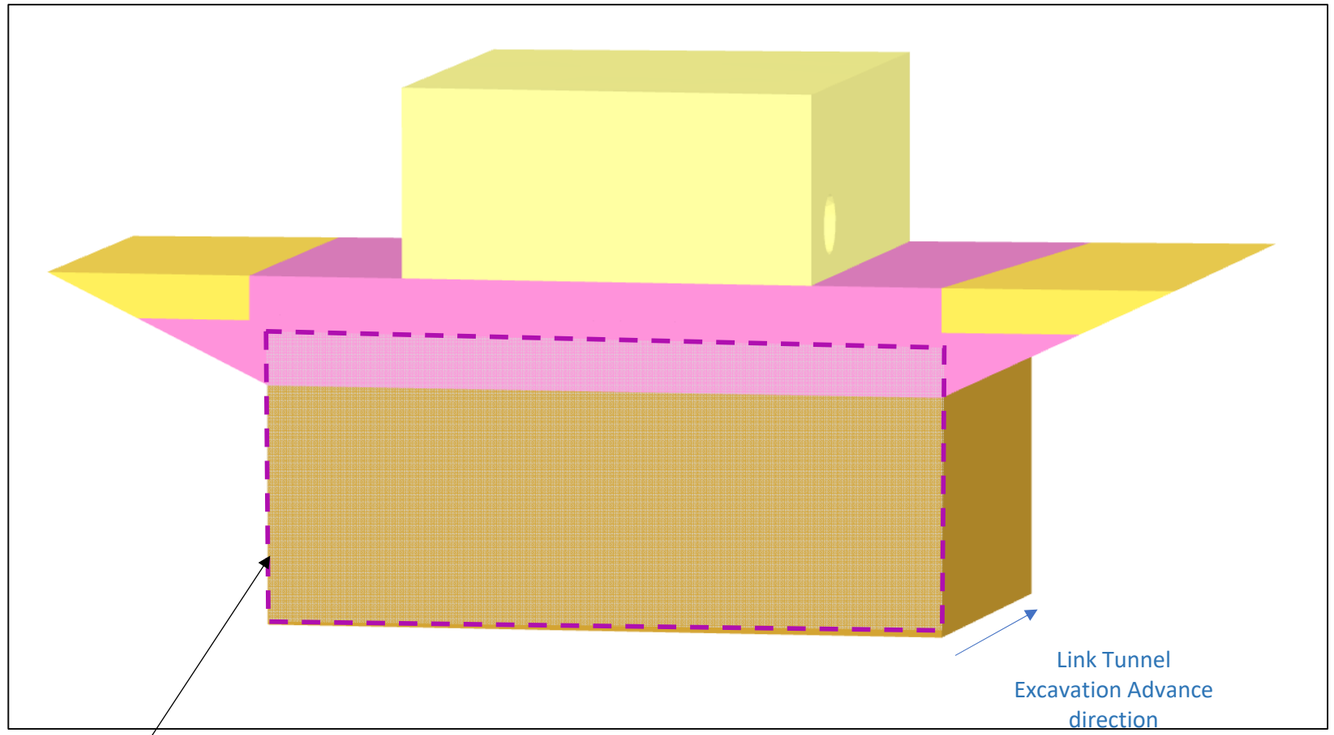
CLIENT:	Atlassian Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

TITLE: **Model 2 Geometry - Local Ground Conditions Above B2 Access Tunnel**

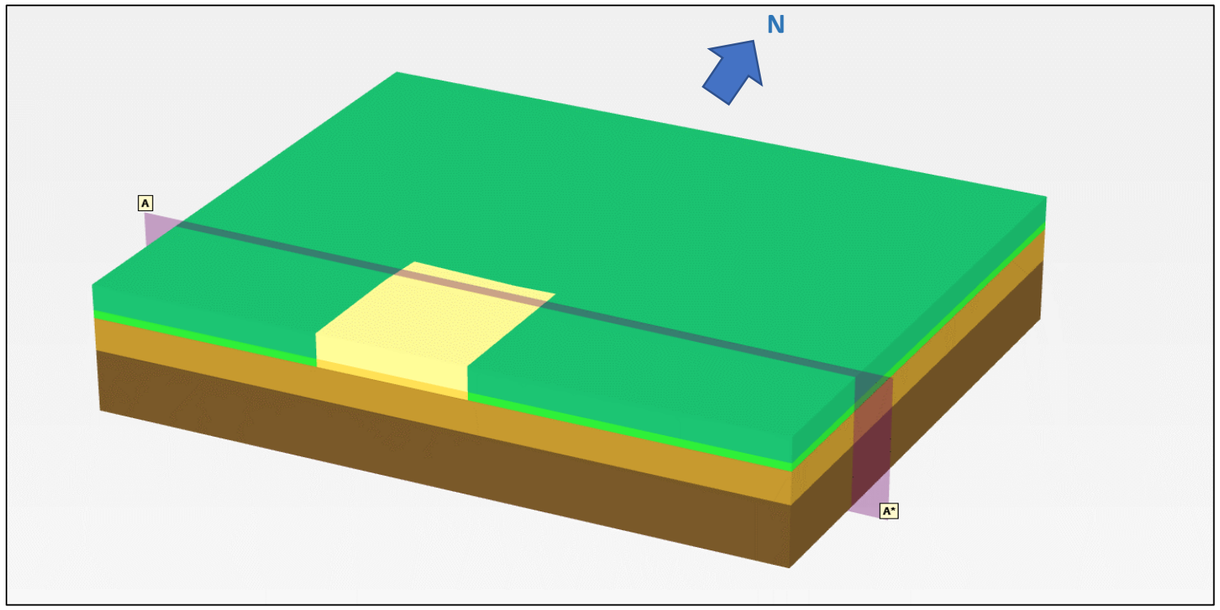
Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

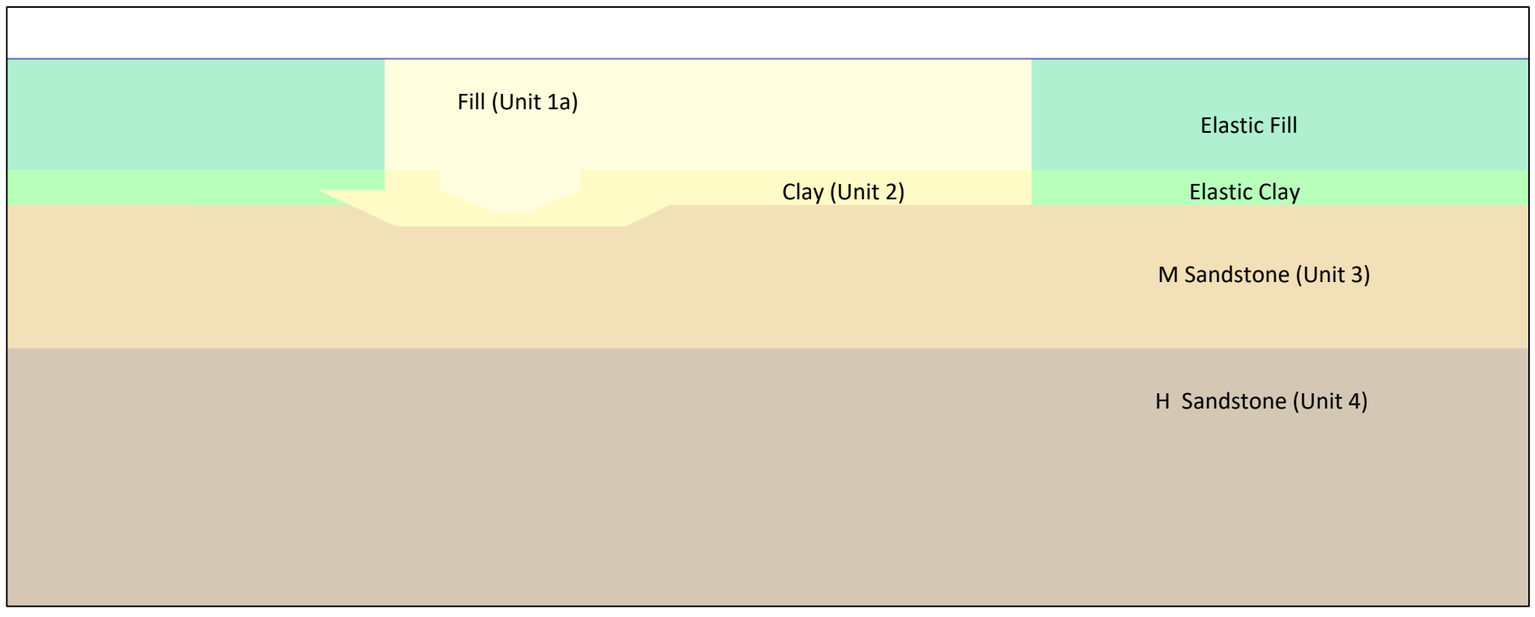
PROJECT No:	86767.04
DRAWING No:	M6
REVISION:	Rev0



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Atlassian Pty Ltd		TITLE: **Model 2 Geometry - Ground Conditions Within Link Tunnel Zone**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M7	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	

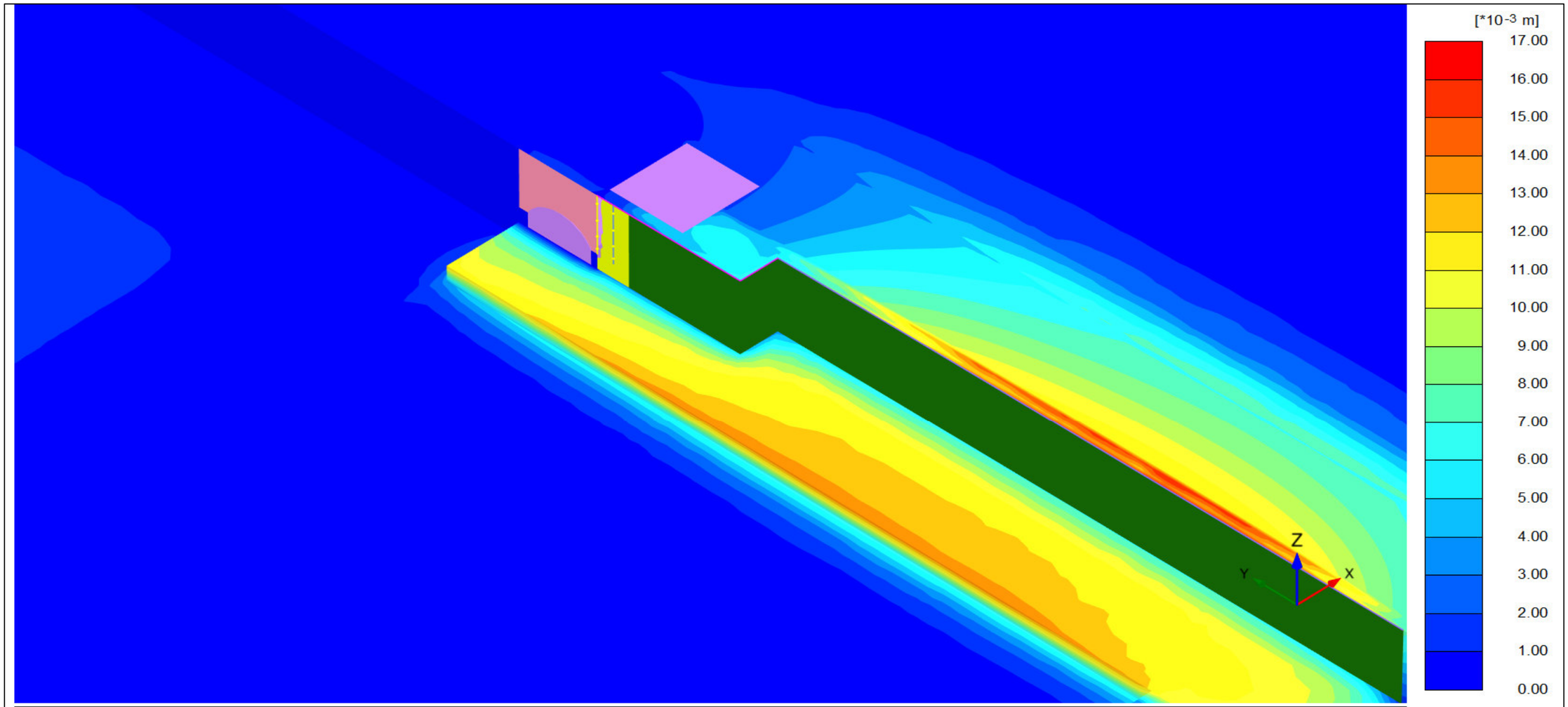


3D View



Cross Section View

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Atlassian Pty Ltd		TITLE: **Model 2 Geometry -Geotechnical Profile**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M8
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

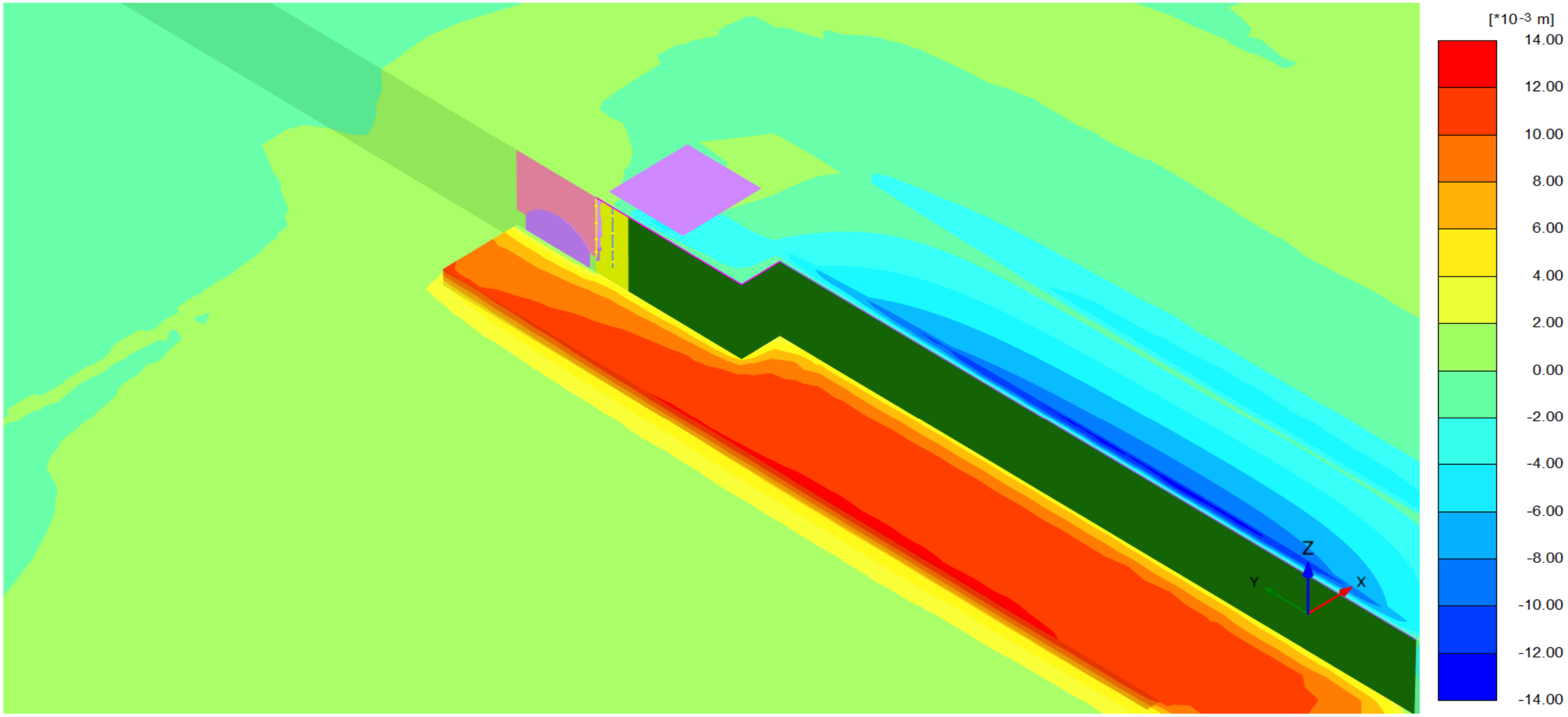
Maximum value = 0.01651 m (Element 31218 at Node 117226)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 4 - Stage E1)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M9
REVISION:	Rev0



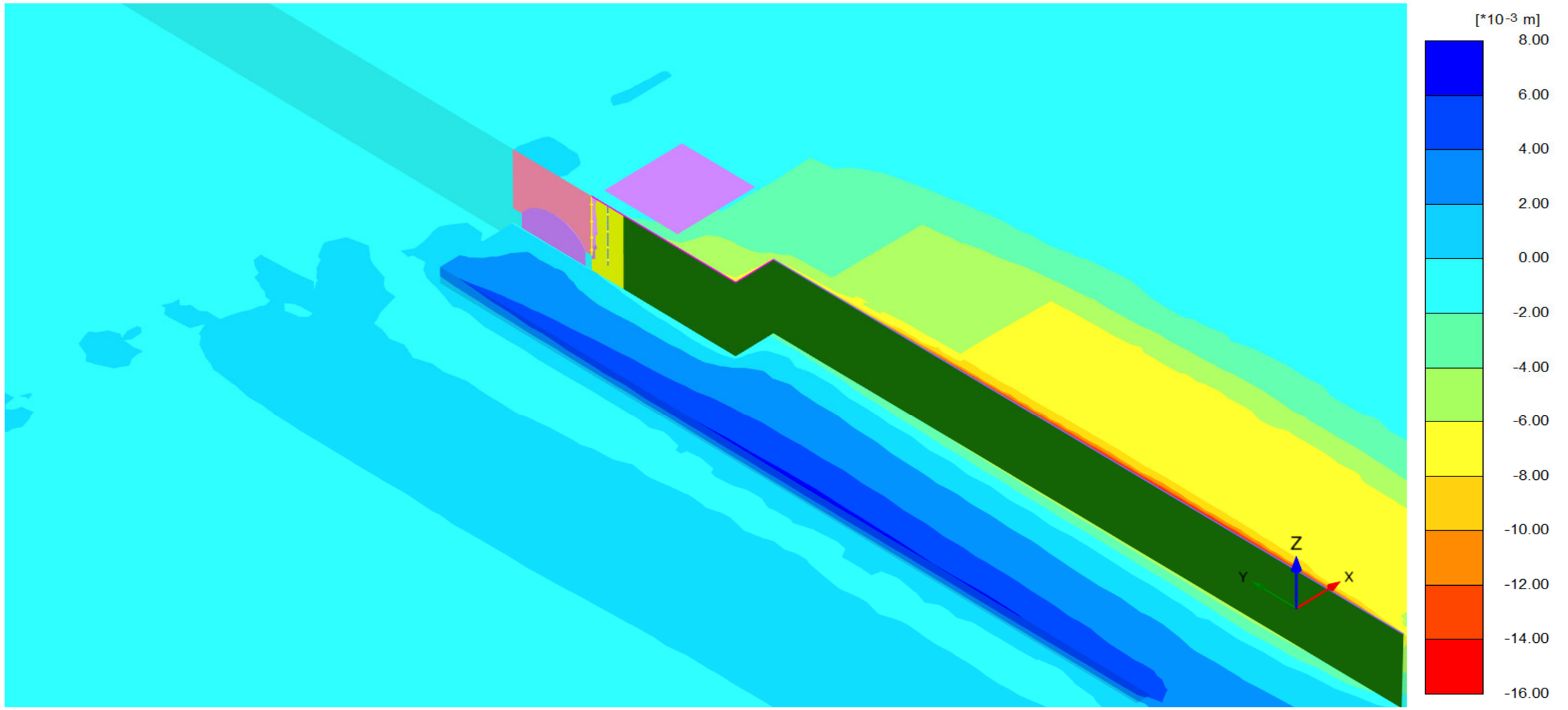
Total displacements u_z

Maximum value = 0.01239 m (Element 39726 at Node 17635)

Minimum value = -0.01304 m (Element 31529 at Node 126712)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 4 - Stage E1)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M10
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0

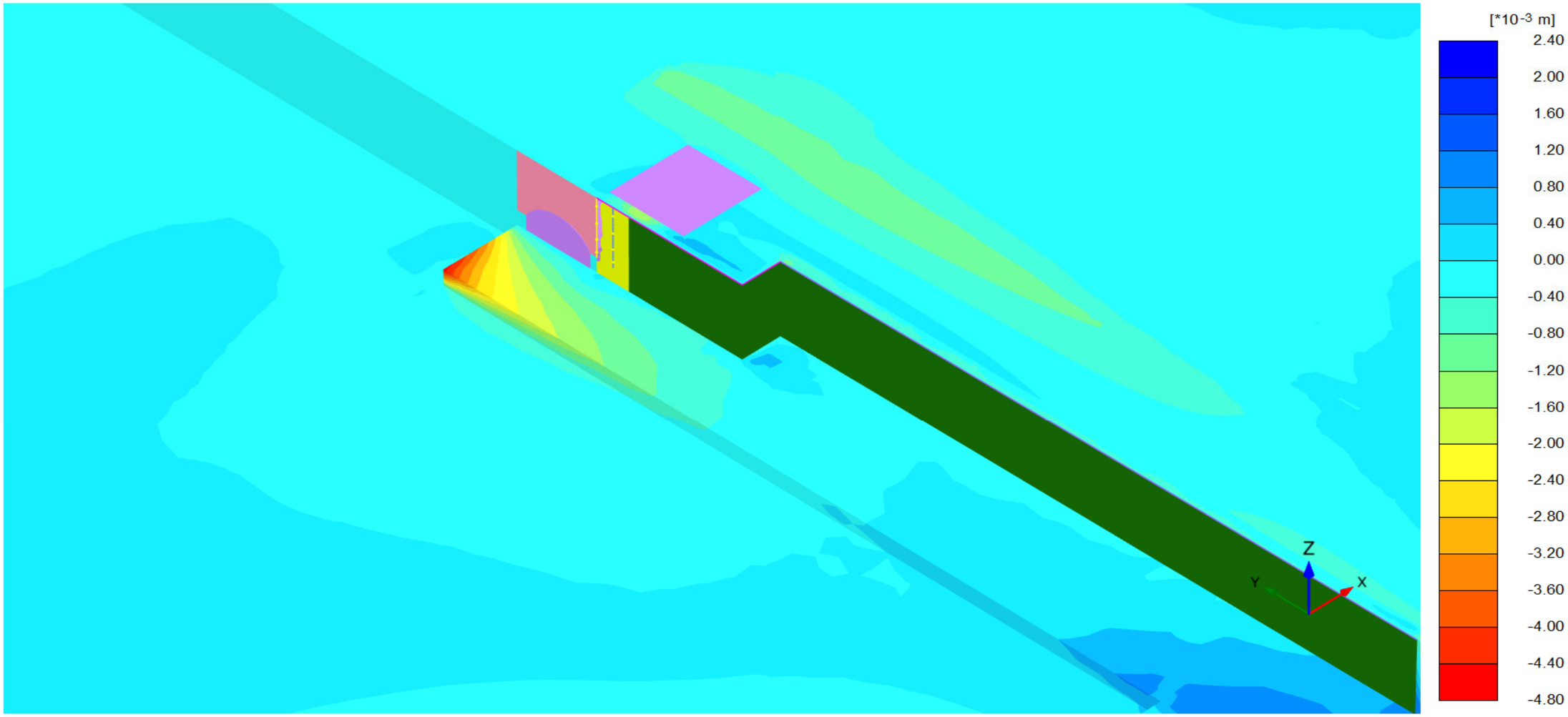


Total displacements u_x

Maximum value = $6.294*10^{-3}$ m (Element 39754 at Node 17646)

Minimum value = -0.01564 m (Element 31218 at Node 18438)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 1 (Stage 4 - Stage E1)**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M11
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements u_y

Maximum value = $2.234*10^{-3}$ m (Element 39860 at Node 243147)

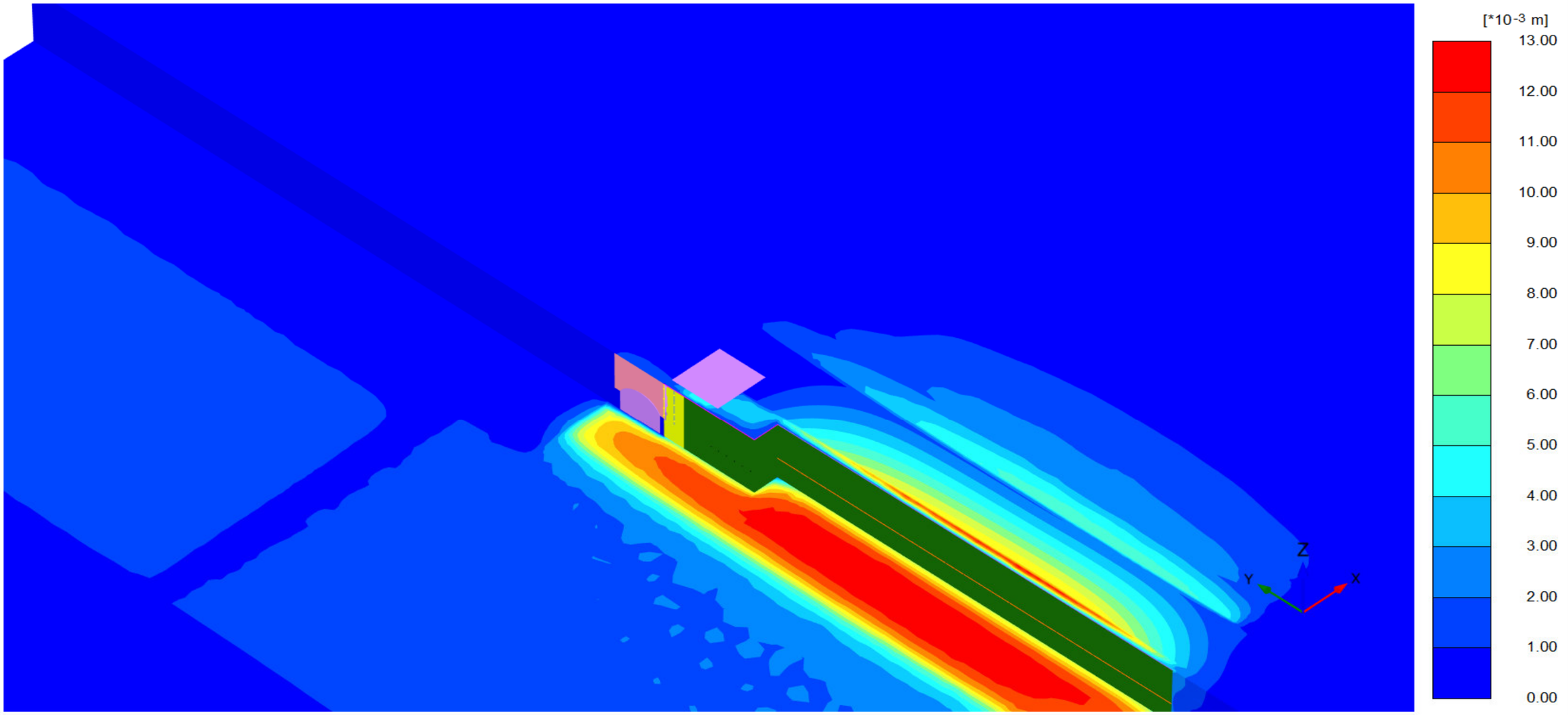
Minimum value = $-4.603*10^{-3}$ m (Element 39900 at Node 1269)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Horizontal Displacement Contours in North South Direction - Model 1 (Stage 4 - Stage E1)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M12
REVISION:	Rev0



Total displacements |u|

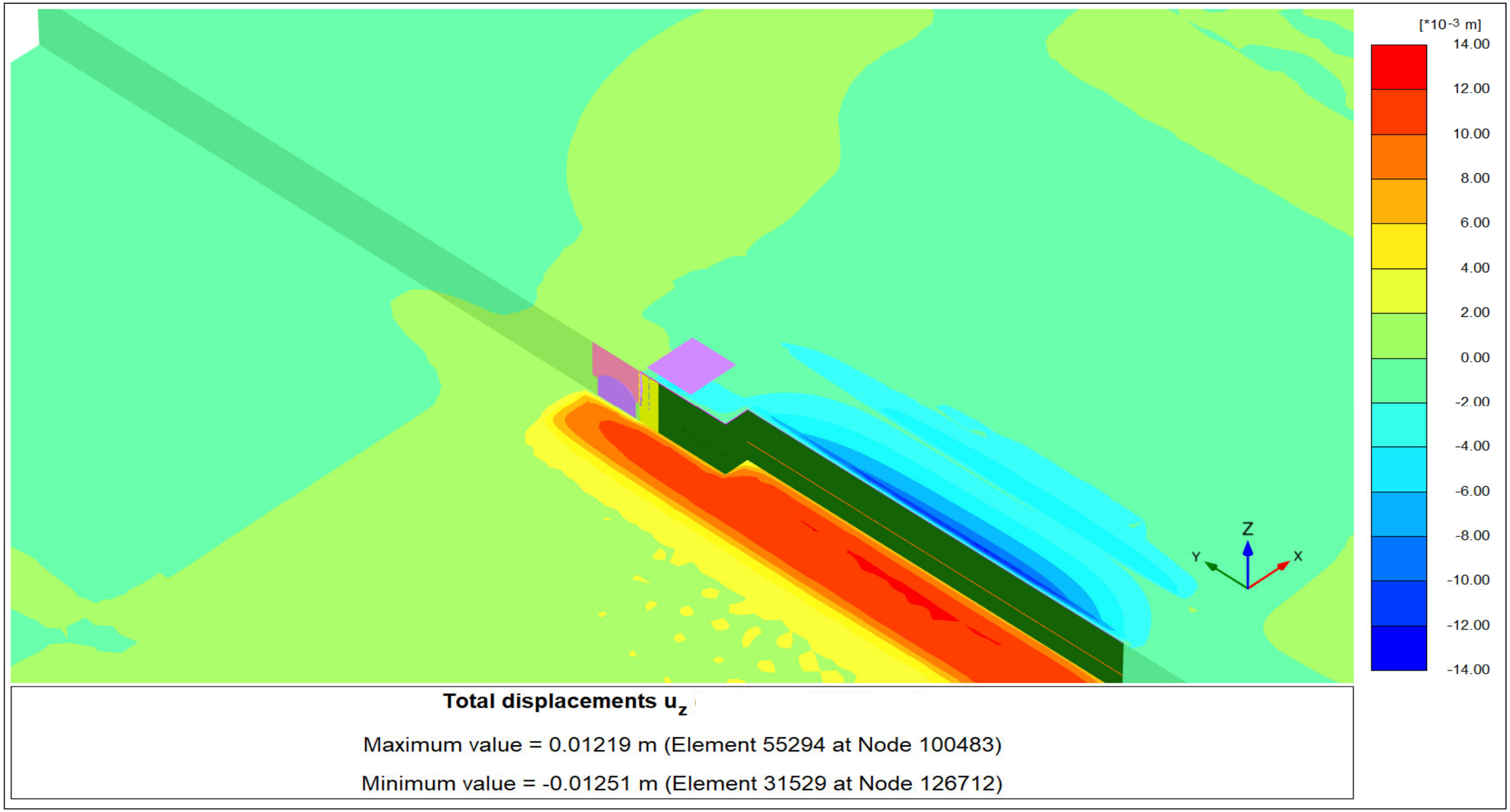
Maximum value = 0.01276 m (Element 55787 at Node 100316)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 6 - Stage E2)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M13
REVISION:	Rev0



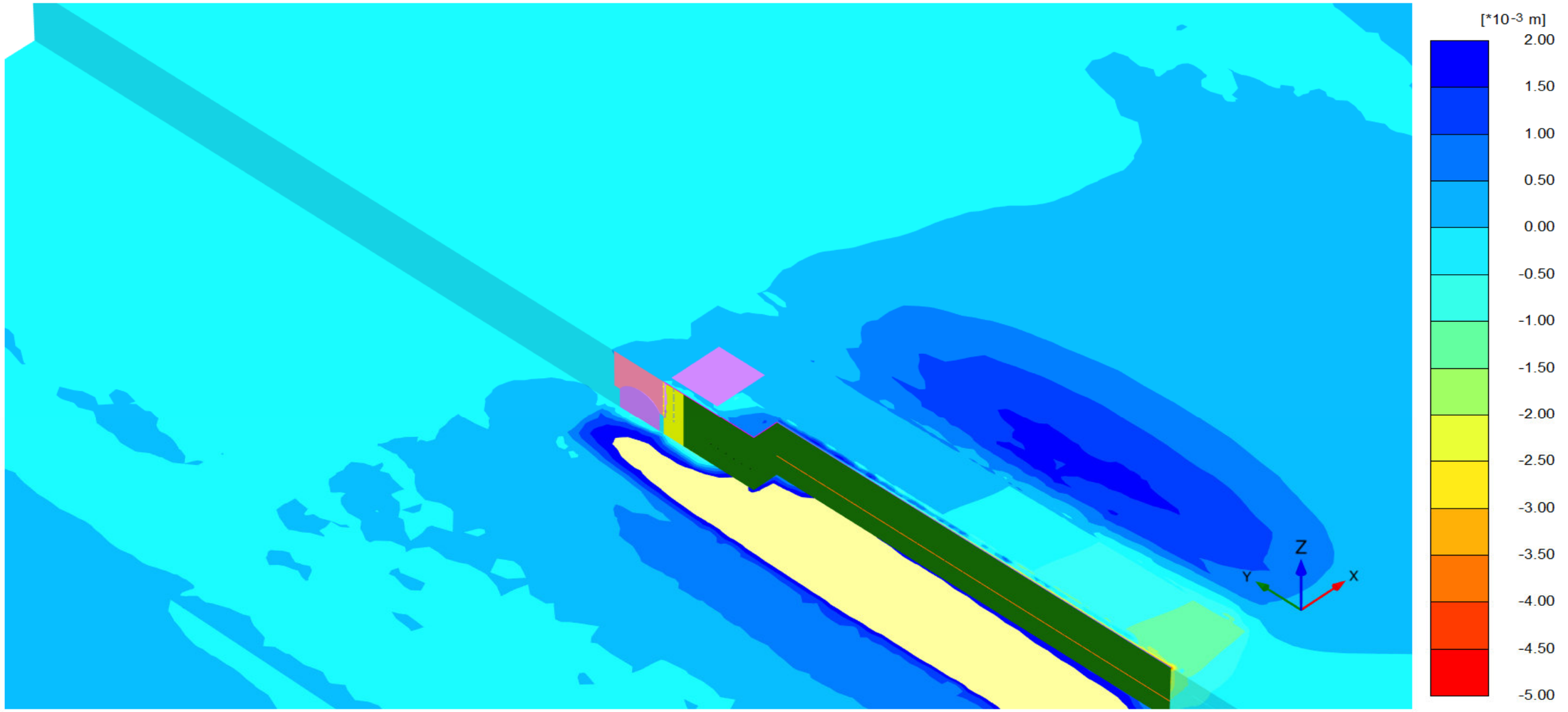
Total displacements u_z

Maximum value = 0.01219 m (Element 55294 at Node 100483)

Minimum value = -0.01251 m (Element 31529 at Node 126712)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 6 - Stage E2)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M14
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



Total displacements u_x

Maximum value = $4.606*10^{-3}$ m (Element 55276 at Node 100328)

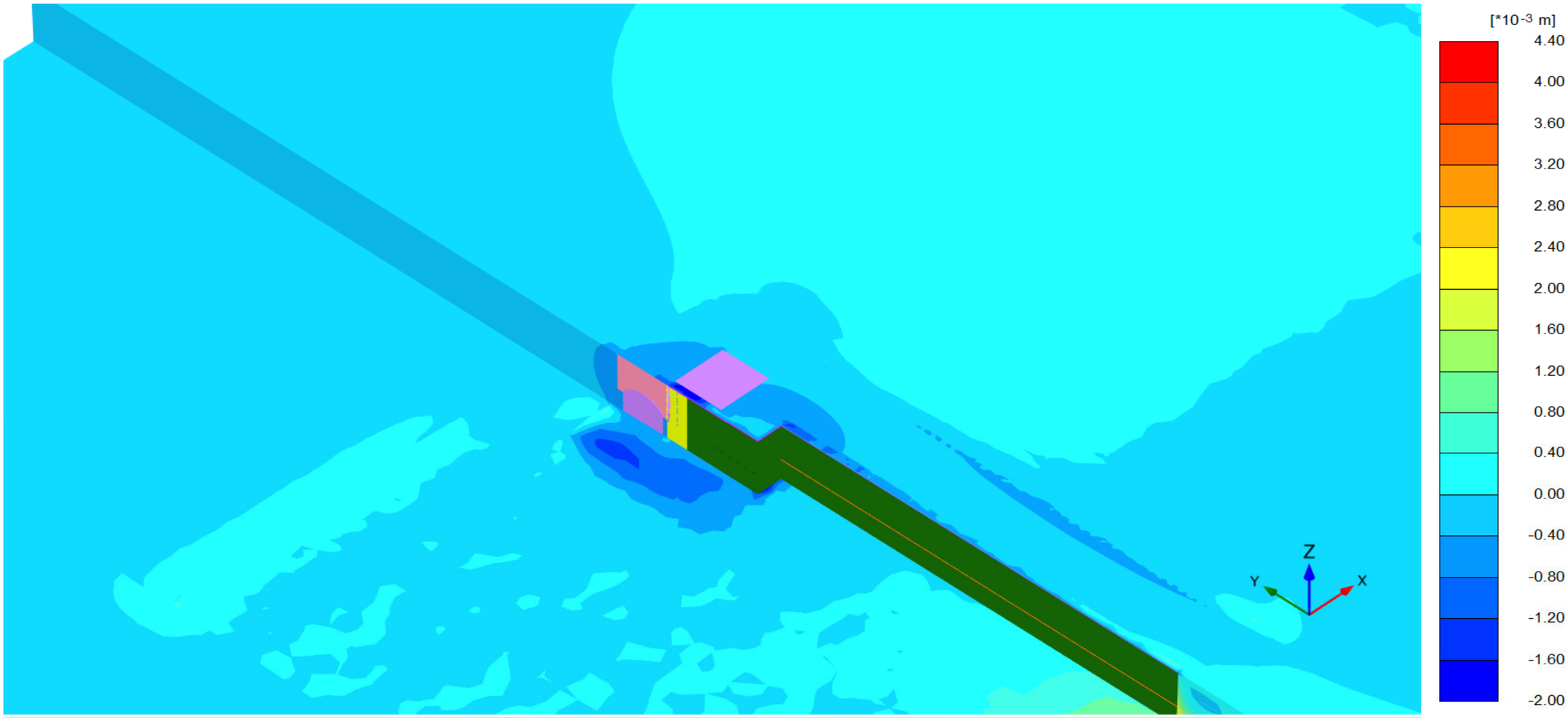
Minimum value = $-4.029*10^{-3}$ m (Element 4122 at Node 679)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Horizontal Displacement Contours in East West Direction - Model 1 (Stage 6 - Stage E2)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M15
REVISION:	Rev0



Total displacements u_y

Maximum value = $4.254*10^{-3}$ m (Element 52896 at Node 13095)

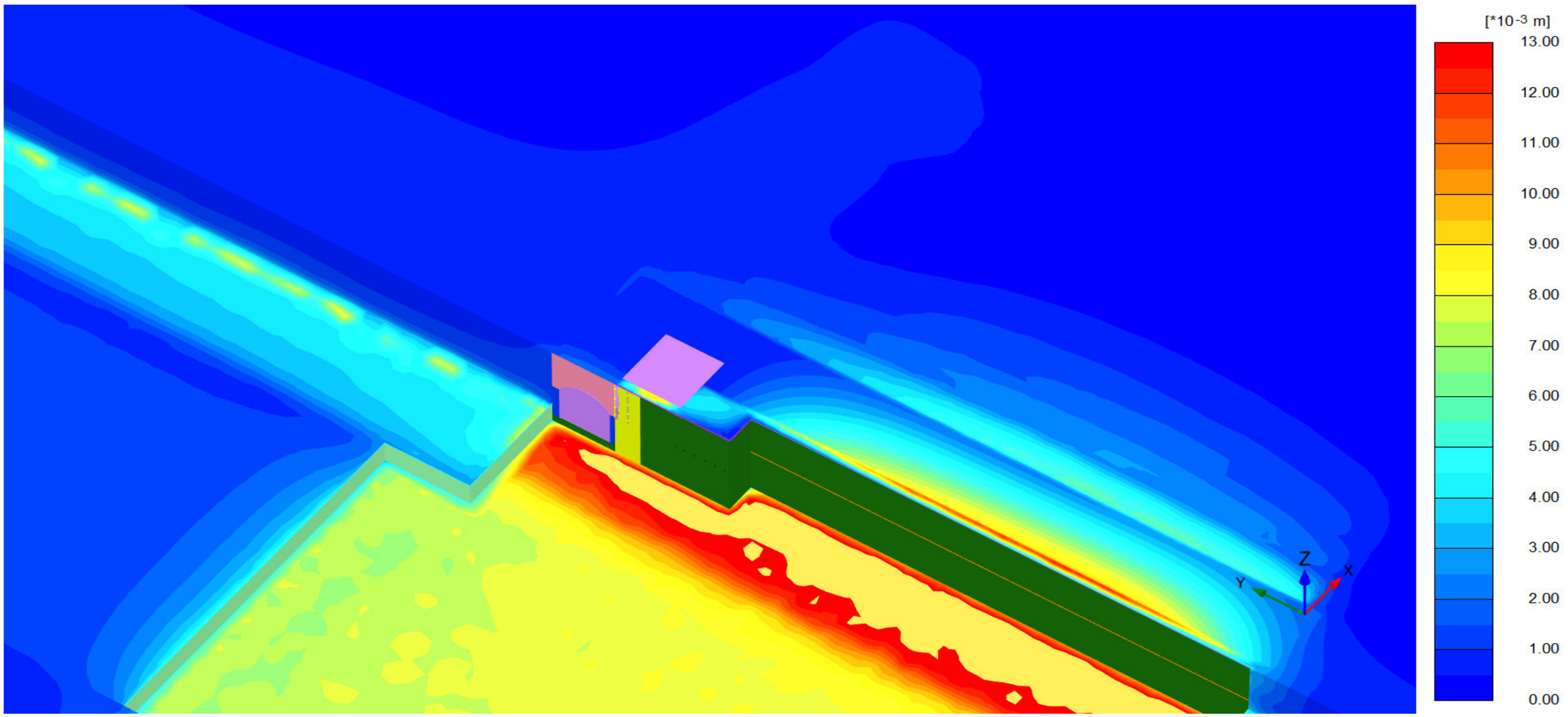
Minimum value = $-1.968*10^{-3}$ m (Element 31339 at Node 121209)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Horizontal Displacement Contours in North South Direction - Model 1 (Stage 6 - Stage E2)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M16
REVISION:	Rev0



Total displacements |u|

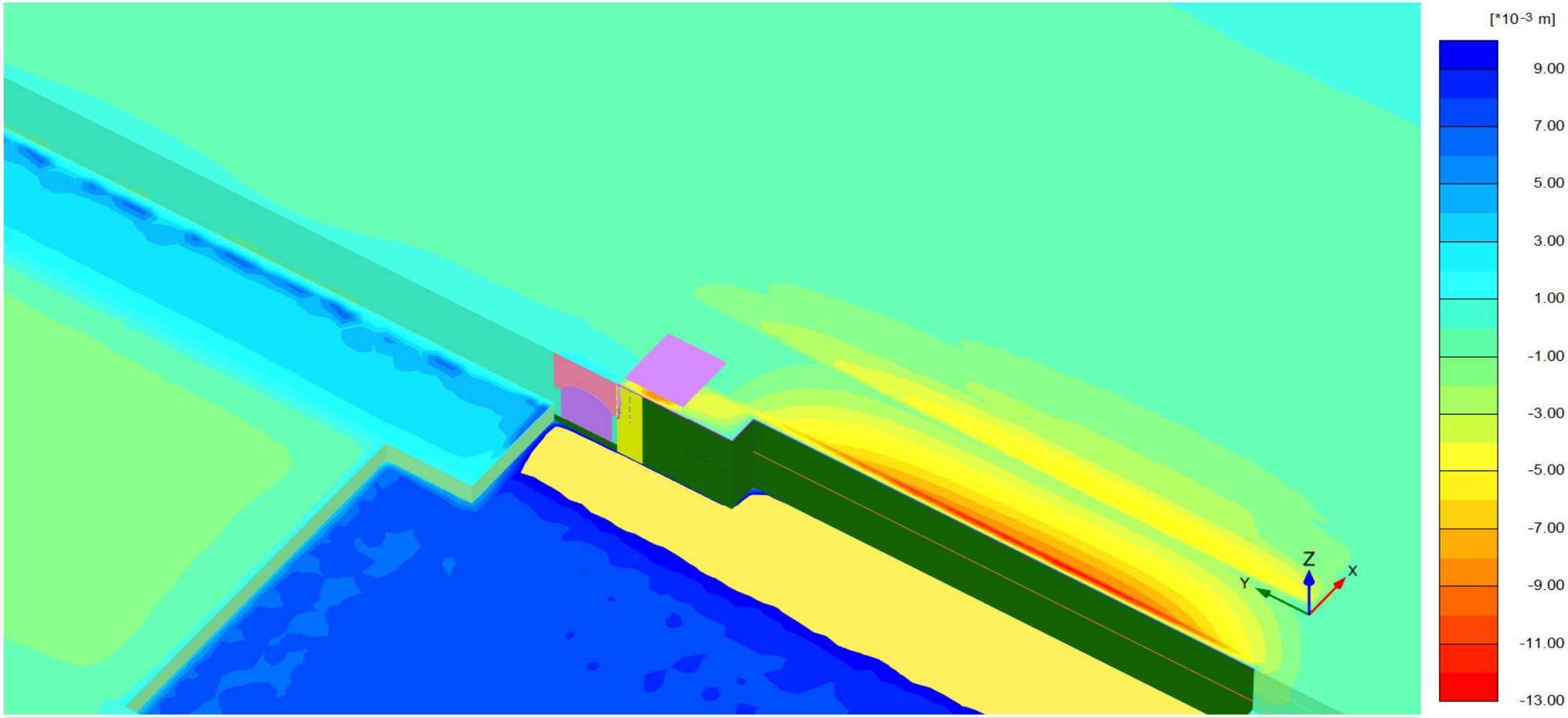
Maximum value = 0.01502 m (Element 66275 at Node 96421)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 9 - Stage E3)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M17
REVISION:	Rev0



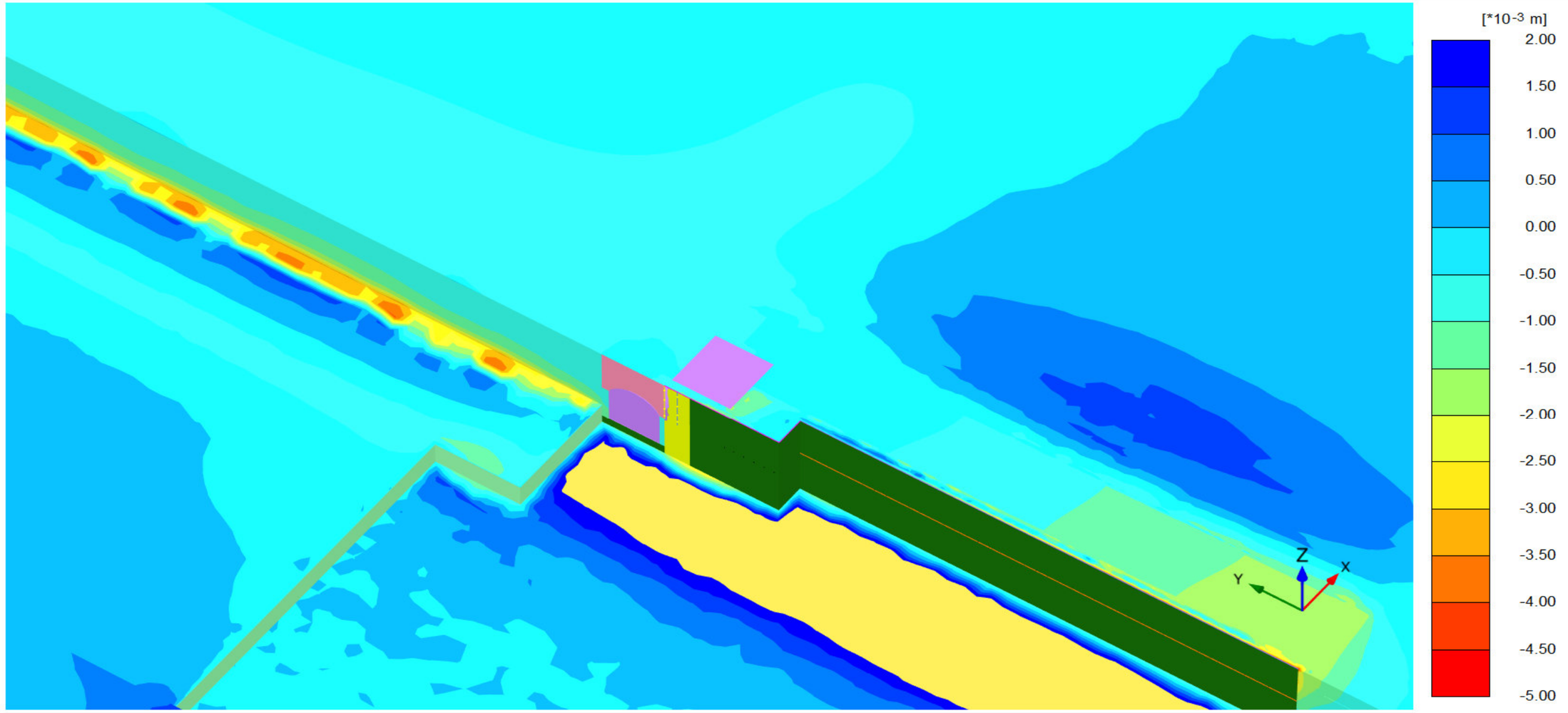
Total displacements u_z

Maximum value = 0.01491 m (Element 66275 at Node 96421)

Minimum value = -0.01246 m (Element 31529 at Node 126712)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 9 - Stage E3)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M18
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



Total displacements u_x

Maximum value = $6.324*10^{-3}$ m (Element 54004 at Node 53769)

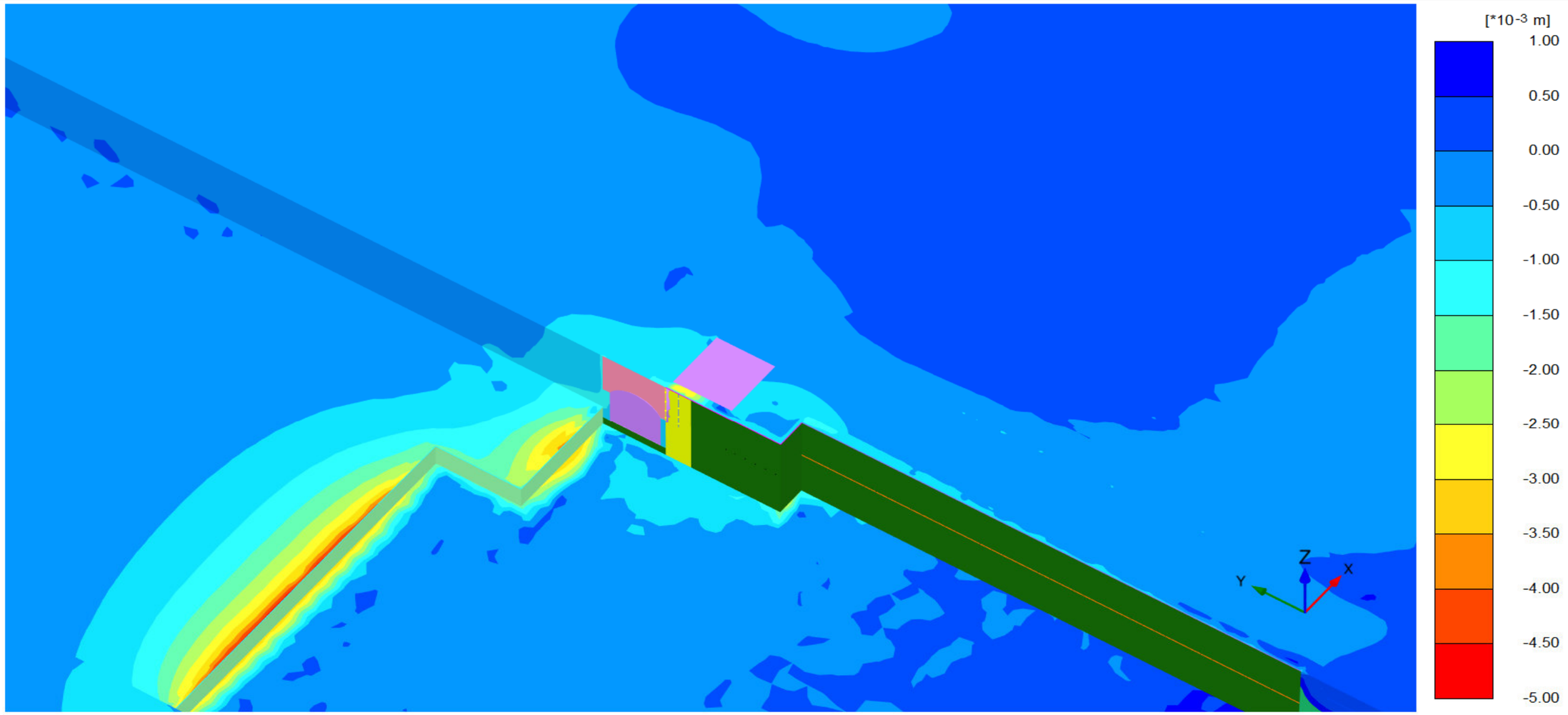
Minimum value = $-4.314*10^{-3}$ m (Element 4122 at Node 679)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Horizontal Displacement Contours in East West Direction - Model 1 (Stage 9 - Stage E3)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M19
REVISION:	Rev0

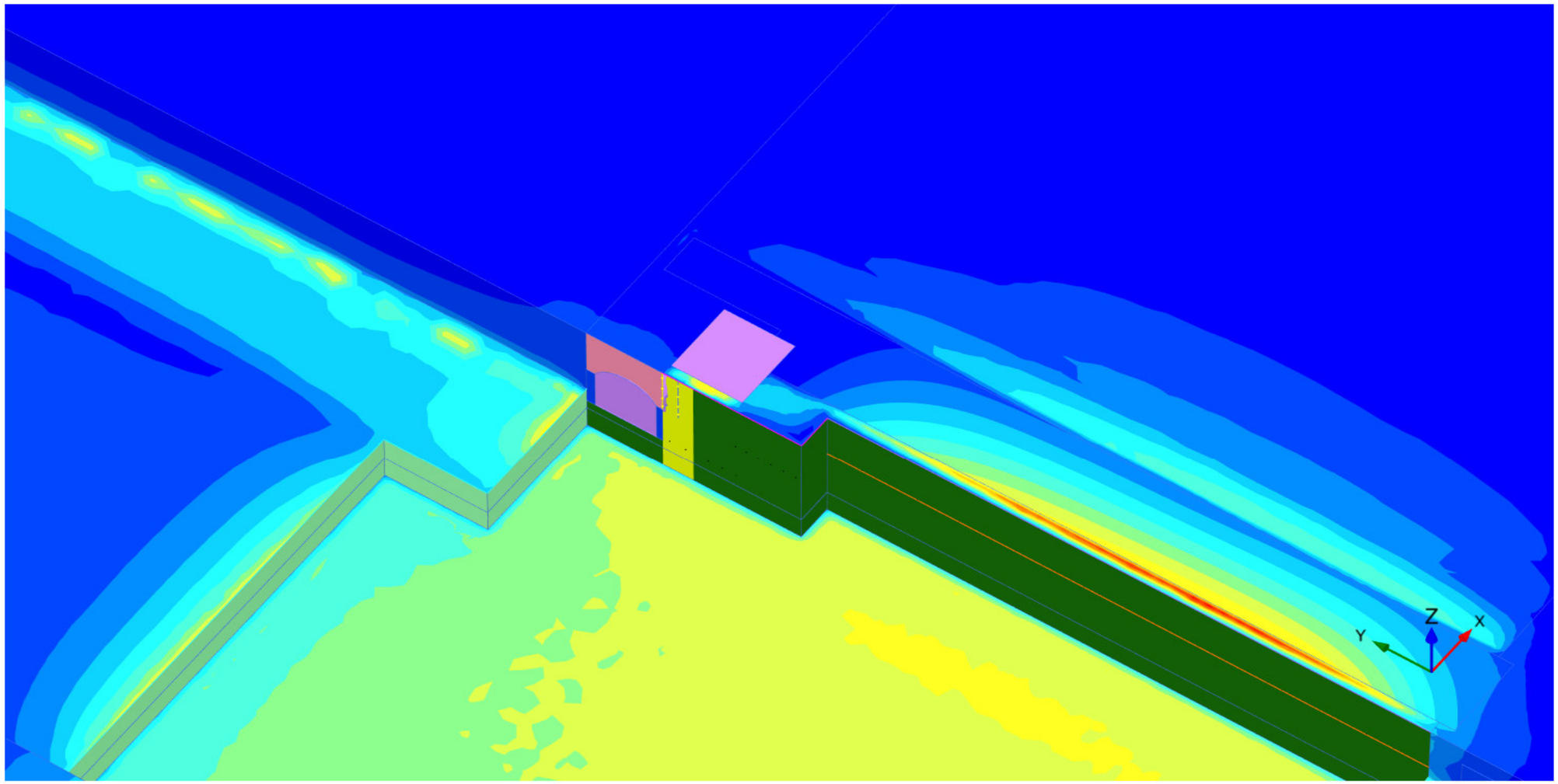


Total displacements u_y

Maximum value = 8.129*10-3 m (Element 52896 at Node 13095)

Minimum value = -4.748*10-3 m (Element 61162 at Node 17175)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 1 (Stage 9 - Stage E3)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M20	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	



Total displacements |u|

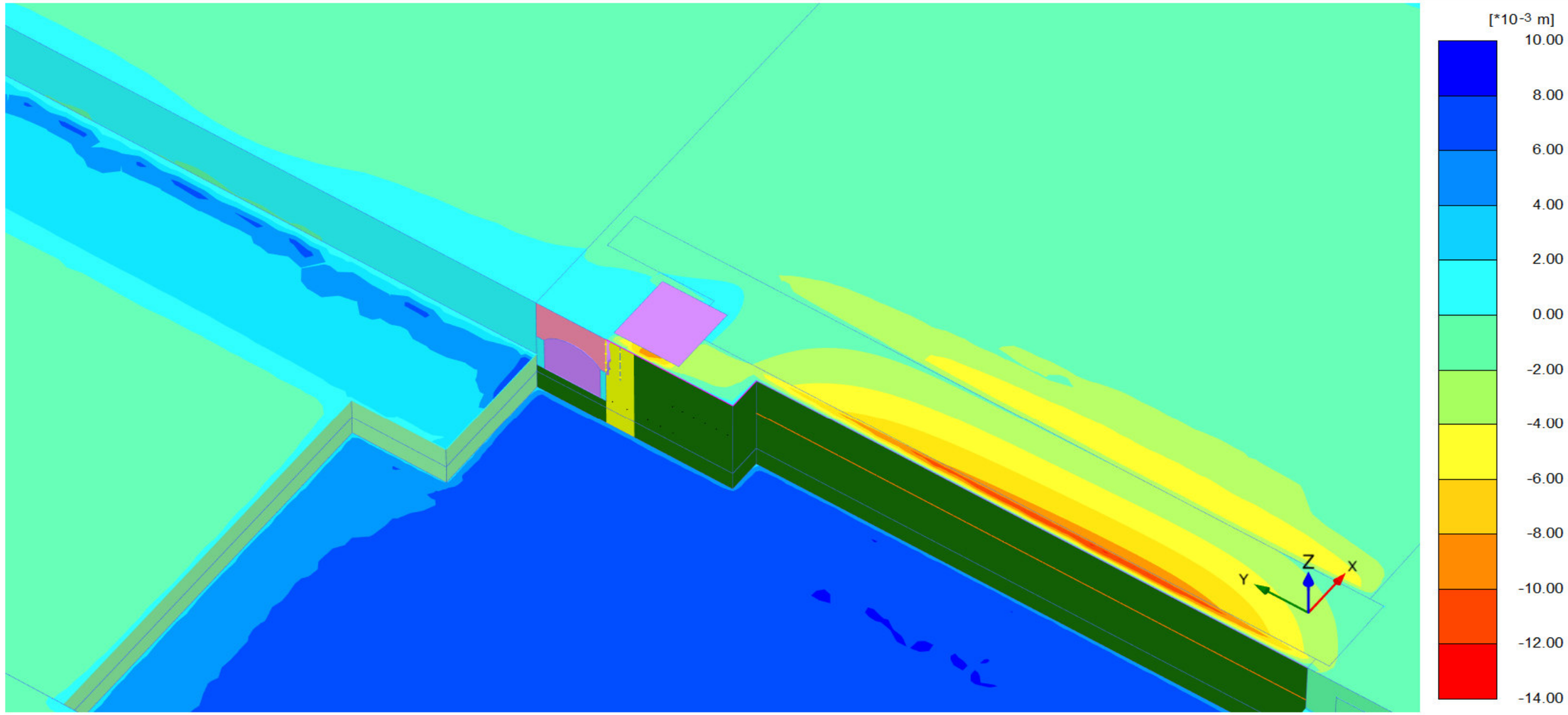
Maximum value = 0.01267 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 11 - Stage E4)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M21
REVISION:	Rev0



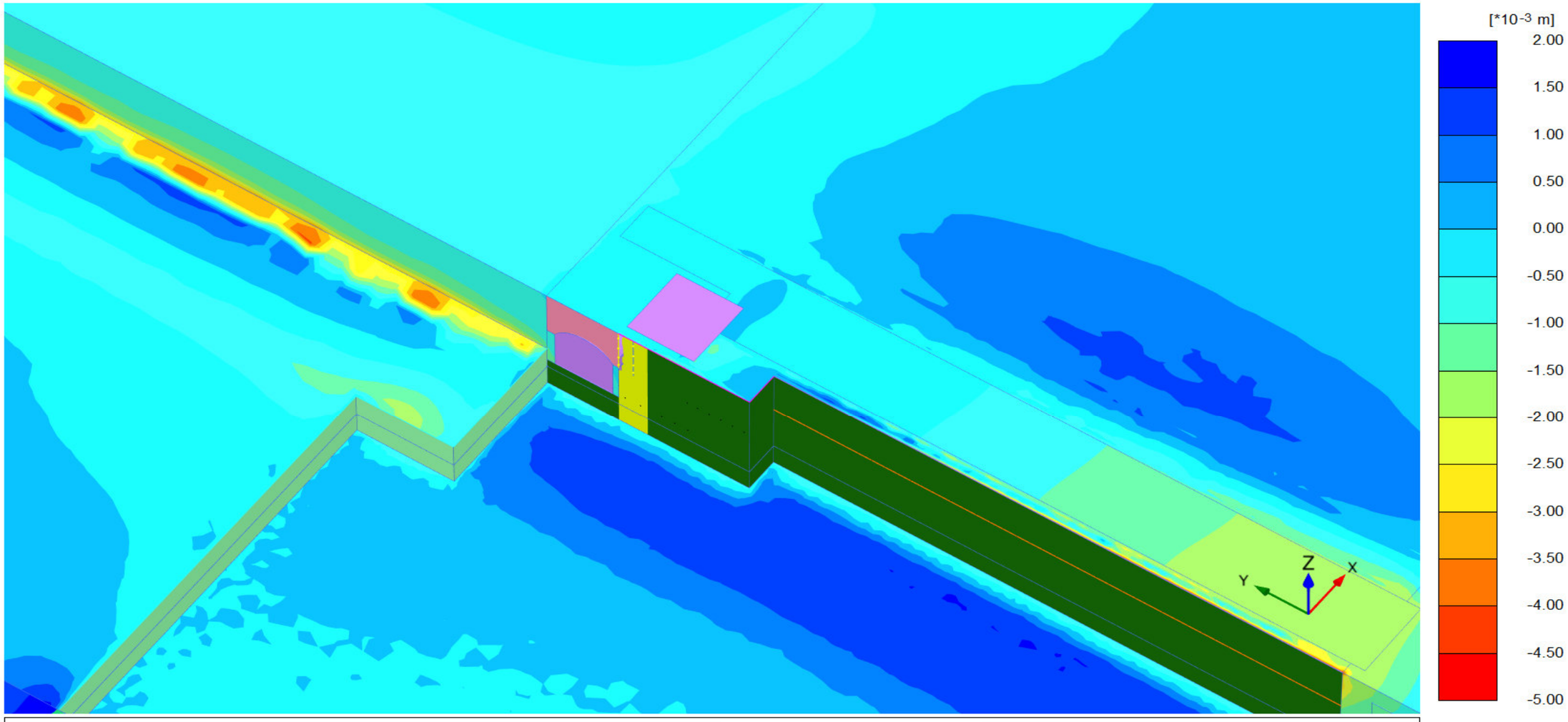
Total displacements u_z

Maximum value = 8.752*10-3 m (Element 92651 at Node 75036)

Minimum value = -0.01227 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 11 - Stage E4)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M22
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0

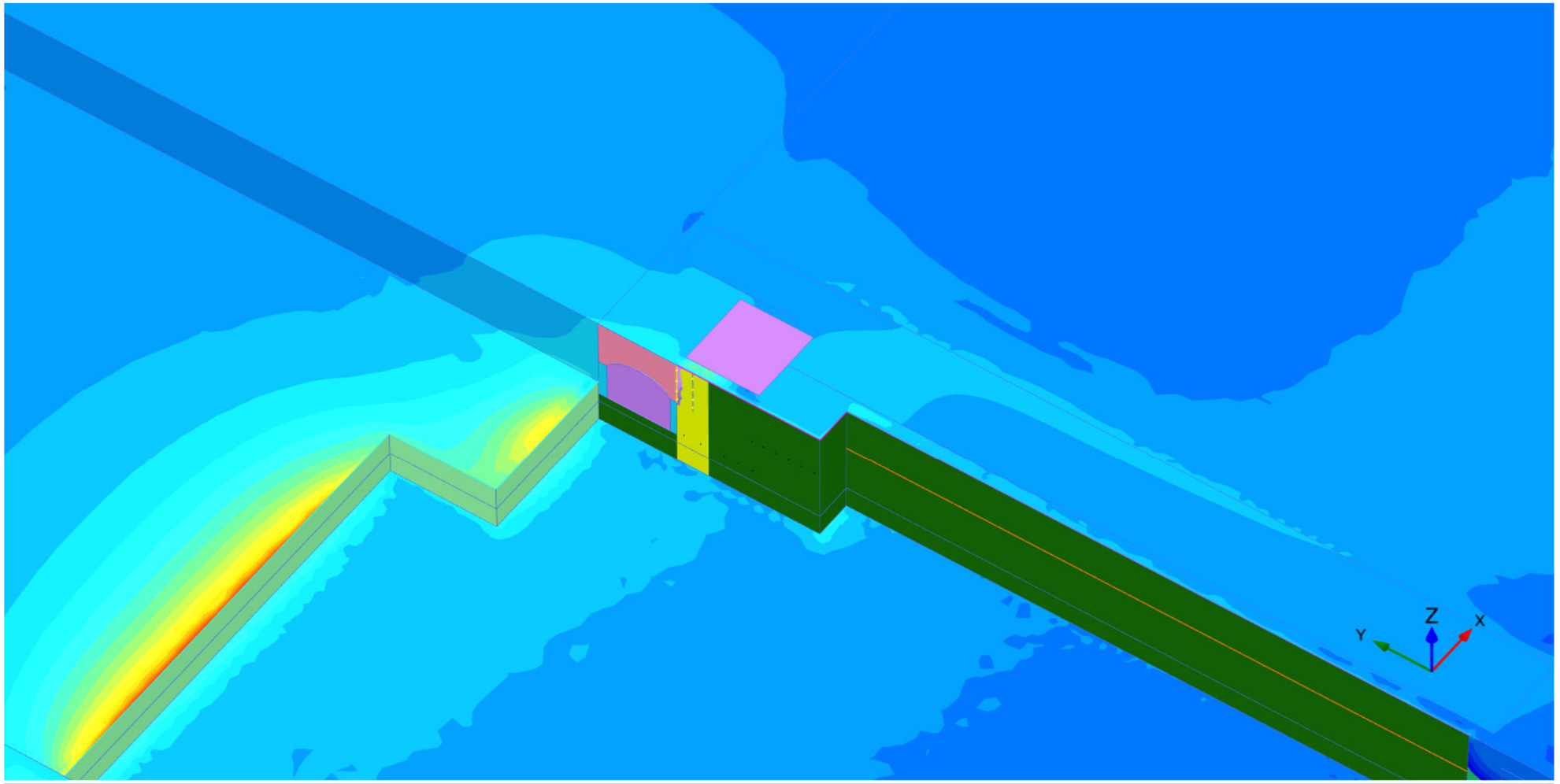


Total displacements u_x

Maximum value = 0.01136 m (Element 53744 at Node 12447)

Minimum value = -4.378*10-3 m (Element 32238 at Node 253323)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 1 (Stage 11 - Stage E4)**	PROJECT No:	86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No:	M23
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION:	Rev0



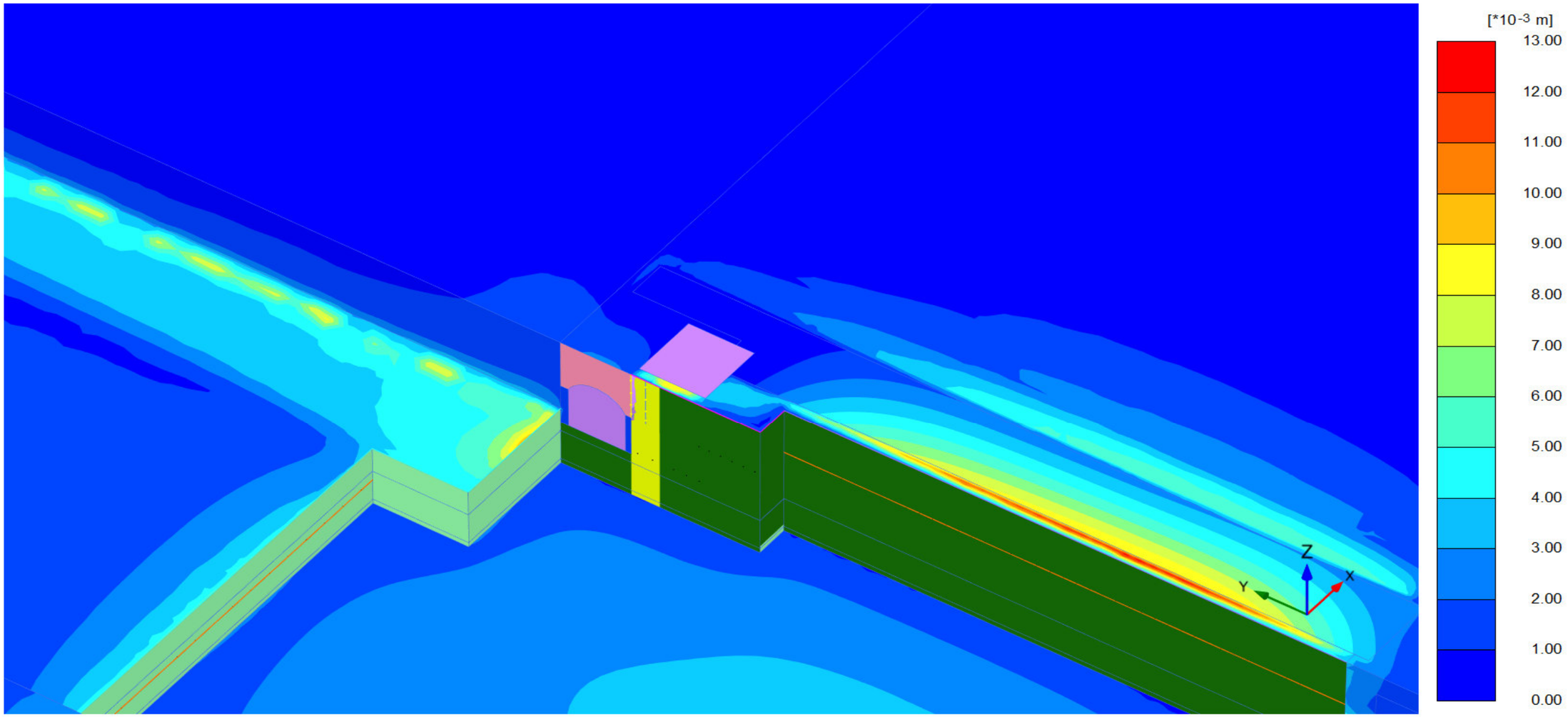
Total displacements u_y

Maximum value = 9.638*10-3 m (Element 52896 at Node 13095)

Minimum value = -8.050*10-3 m (Element 61162 at Node 17175)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 1 (Stage 11 - Stage E4)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M24
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

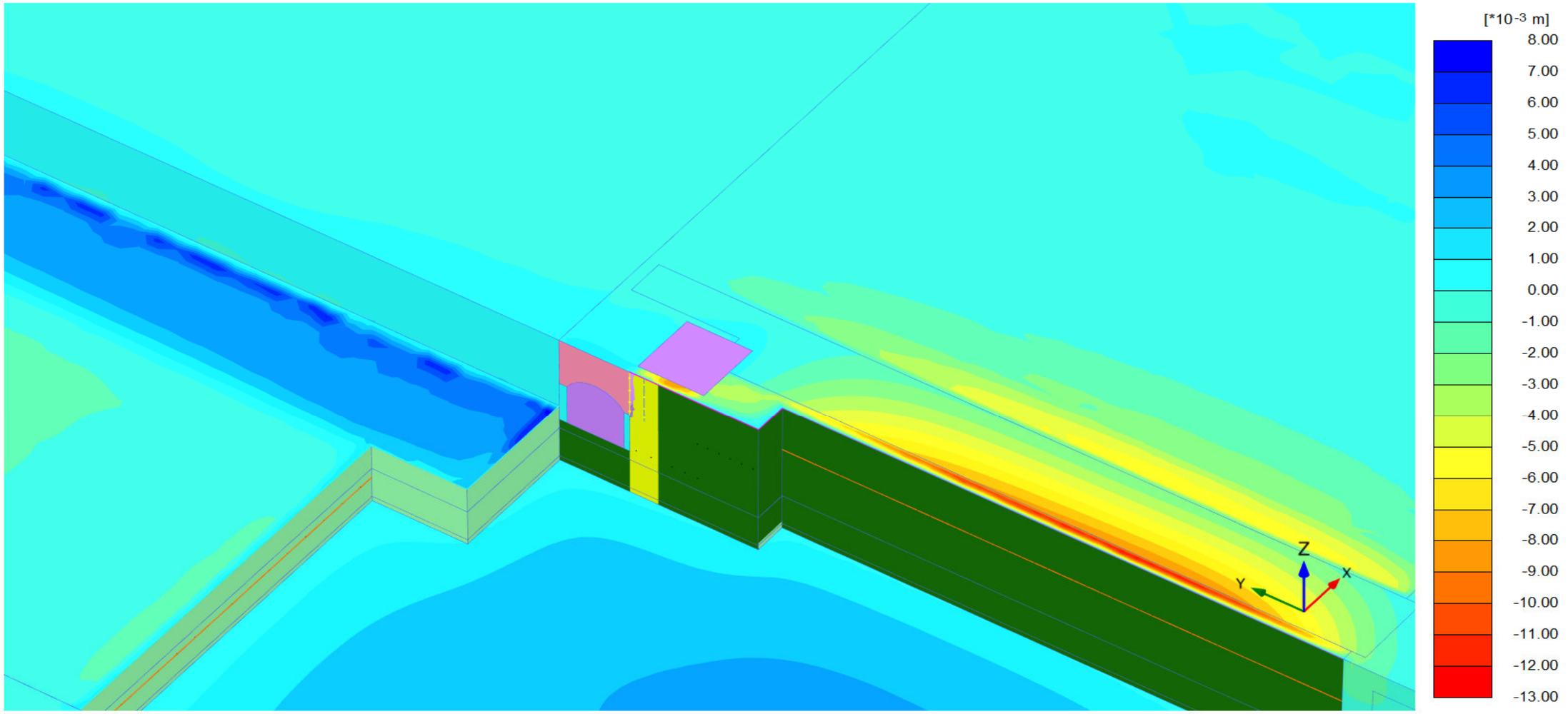
Maximum value = 0.01274 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 13 - Stage E5)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M25
REVISION:	Rev0



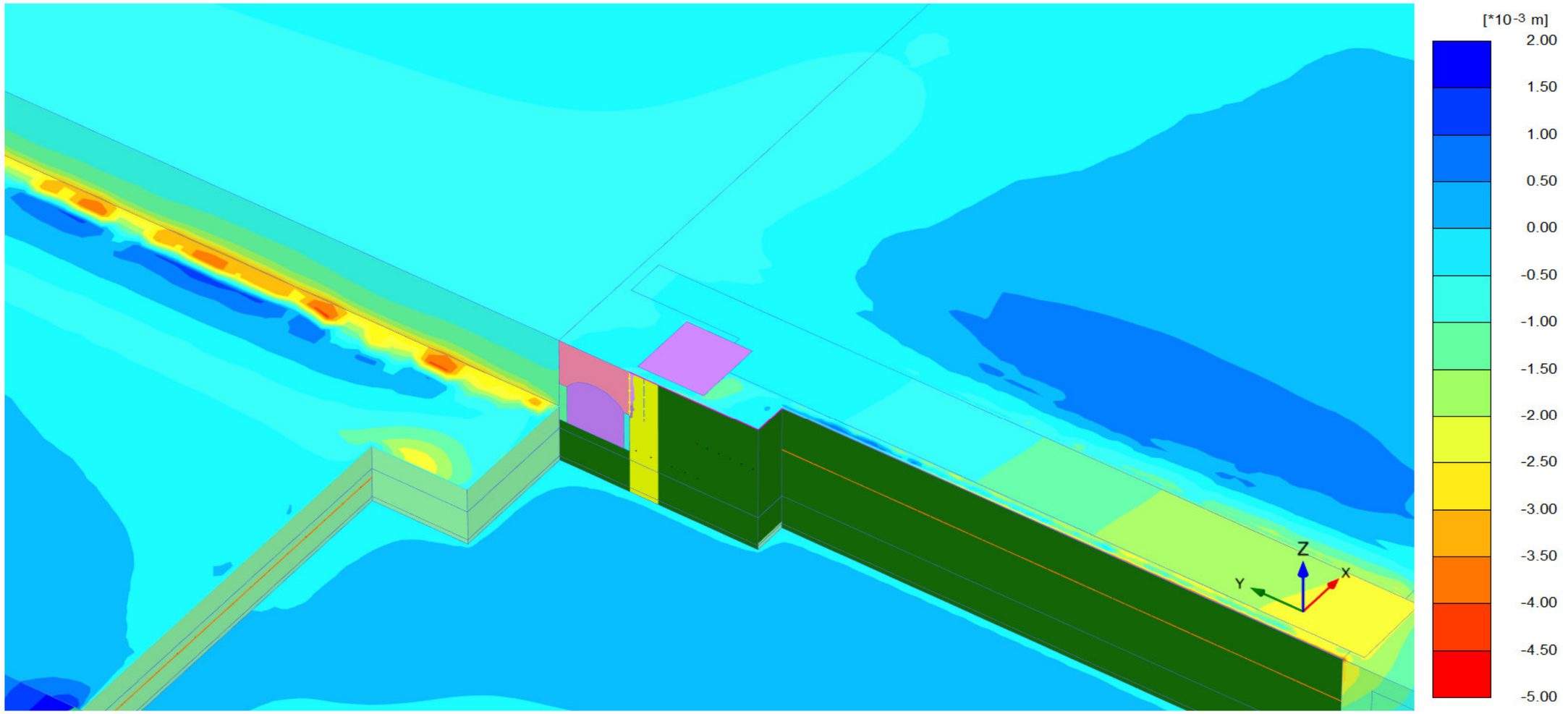
Total displacements u_z

Maximum value = $7.233*10^{-3}$ m (Element 61709 at Node 112459)

Minimum value = -0.01227 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 13 - Stage E5)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M26
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



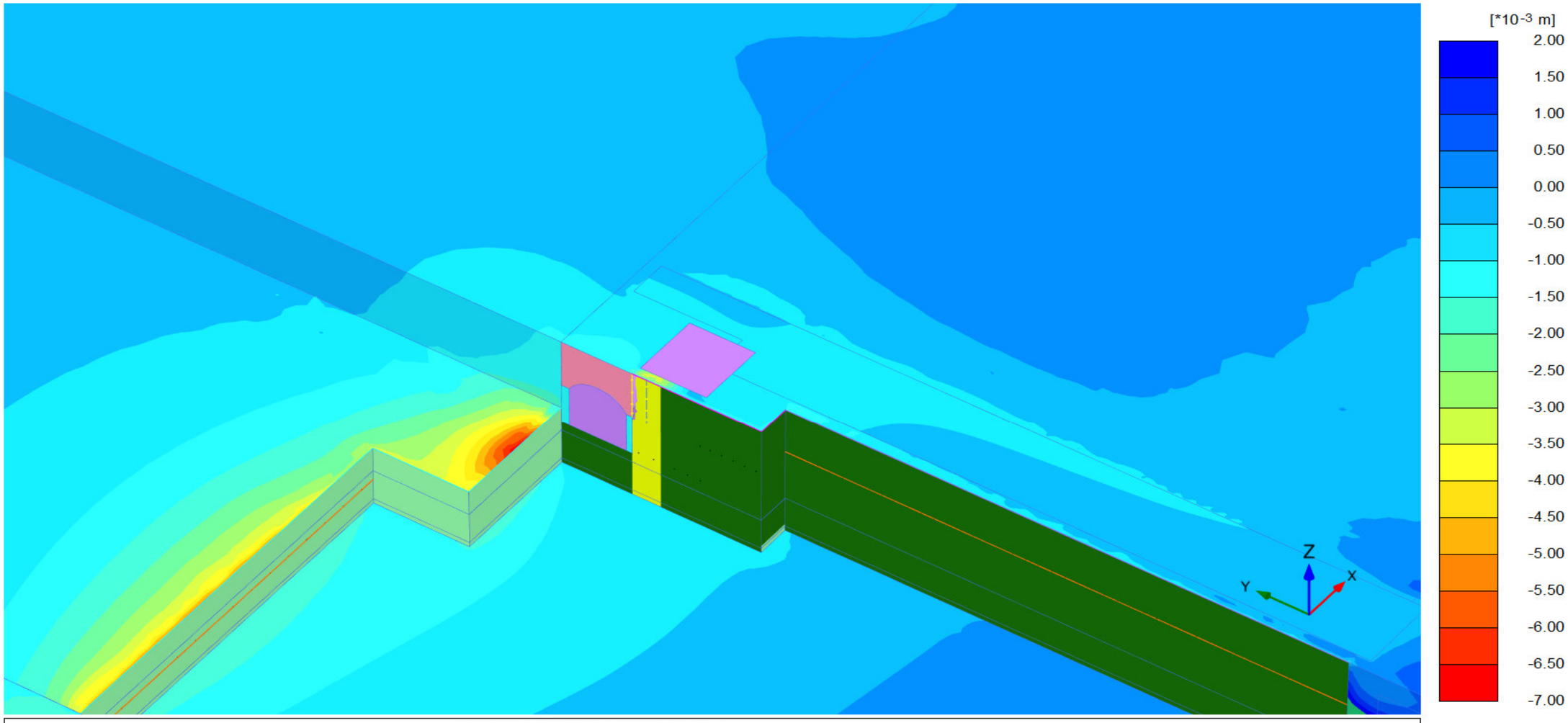
Total displacements u_x

Maximum value = 0.01205 m (Element 53744 at Node 12447)

Minimum value = -4.613*10^{-3} m (Element 32238 at Node 253323)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 1 (Stage 13 - Stage E5)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M27
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

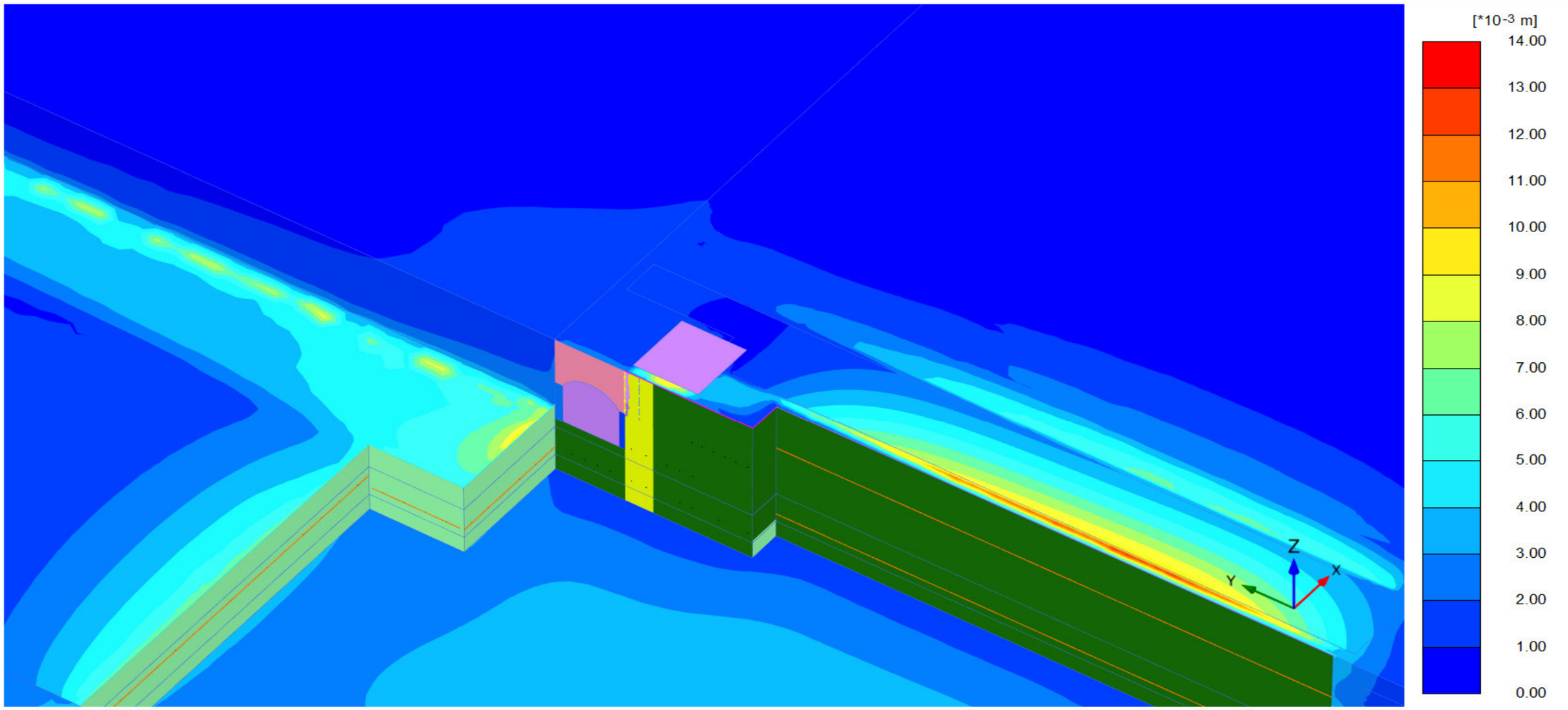


Total displacements u_y

Maximum value = 0.01113 m (Element 52896 at Node 13095)

Minimum value = -6.947*10-3 m (Element 61472 at Node 1213)

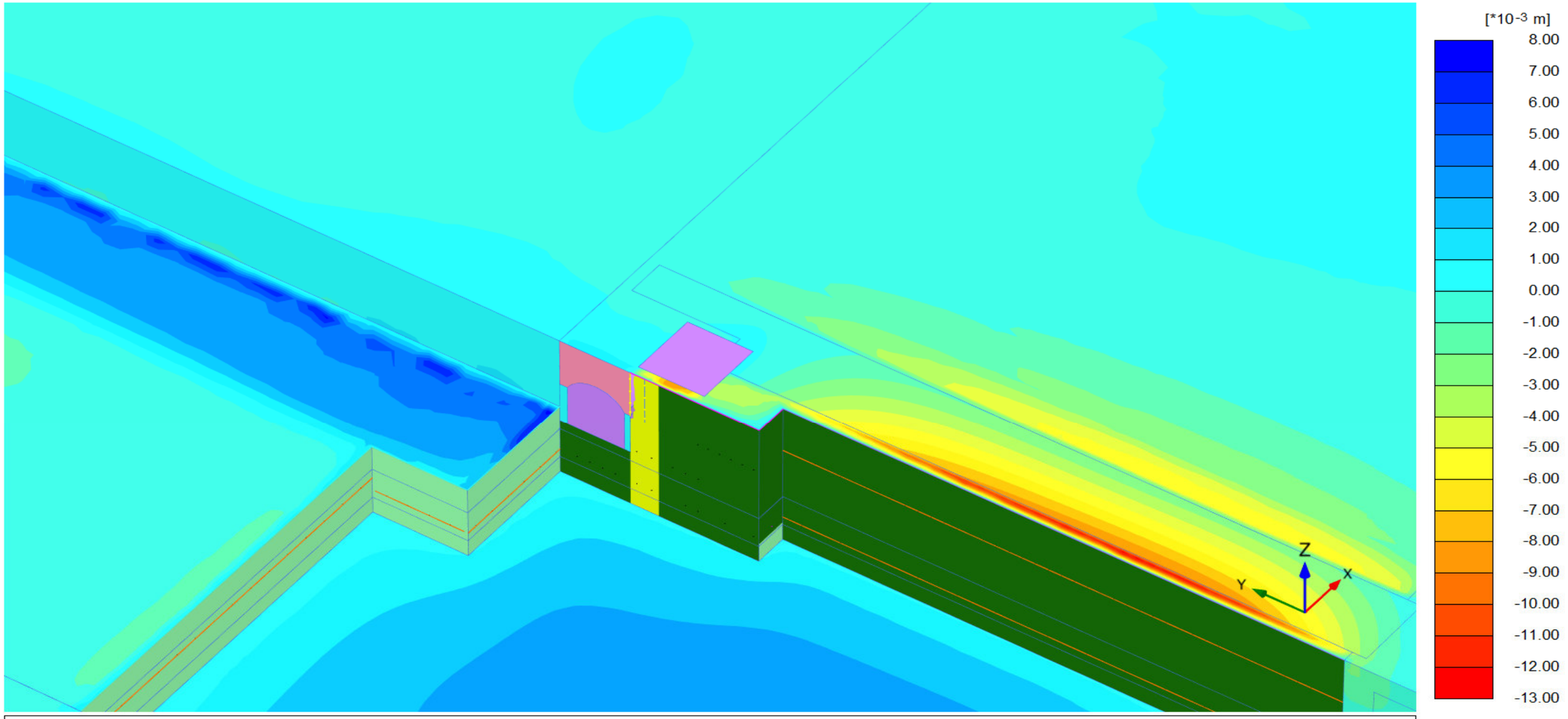
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 1 (Stage 13 - Stage E5)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M28	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	



Total displacements |u|

Maximum value = 0.01310 m (Element 31574 at Node 253205)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 1 (Stage 15 - Stage E6)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M29	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	



Total displacements u_z

Maximum value = 7.219*10-3 m (Element 61730 at Node 112627)

Minimum value = -0.01248 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

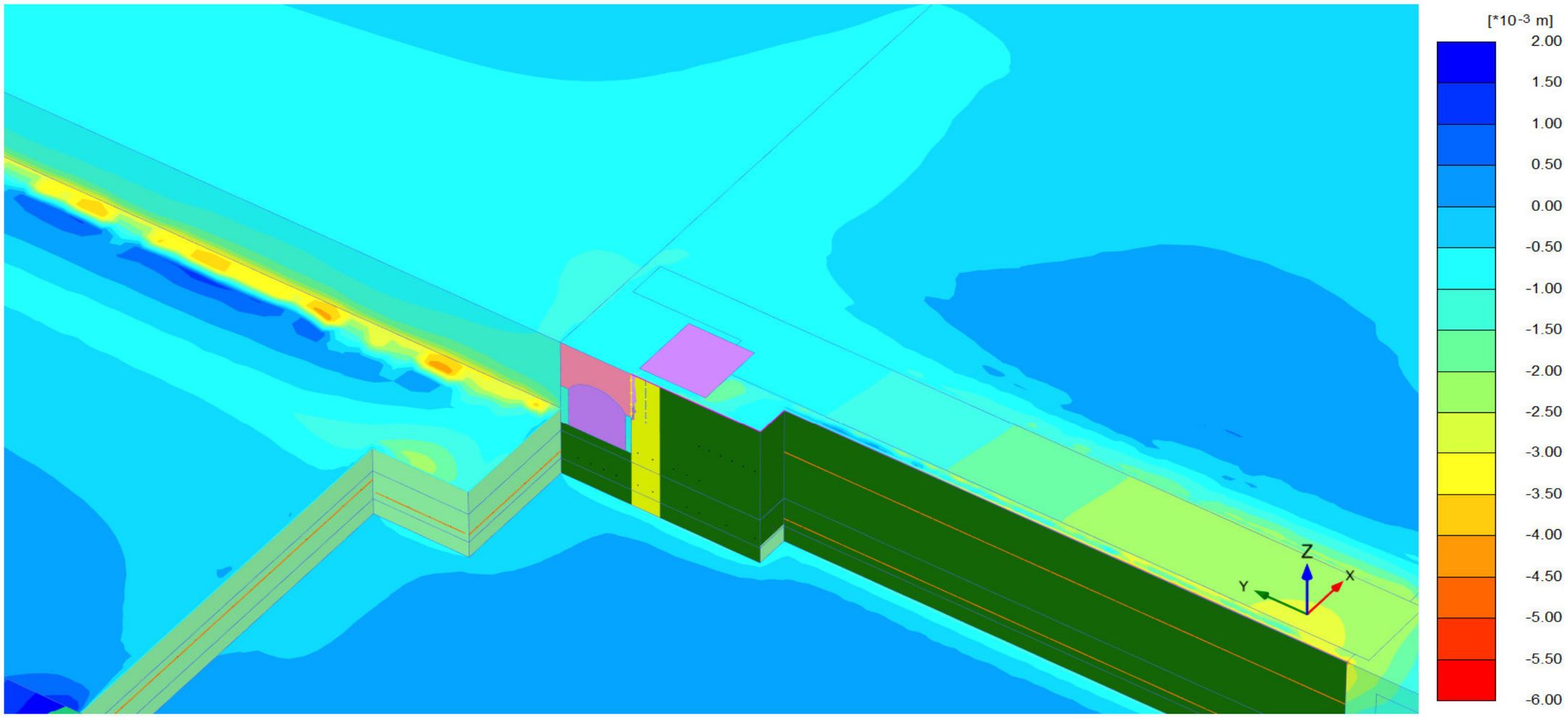
CLIENT:	Built Obayashi Joint Venture (BOJV)		
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

TITLE: **Vertical Displacement Contours - Model 1 (Stage 15 - Stage E6)**

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M30
REVISION:	Rev0



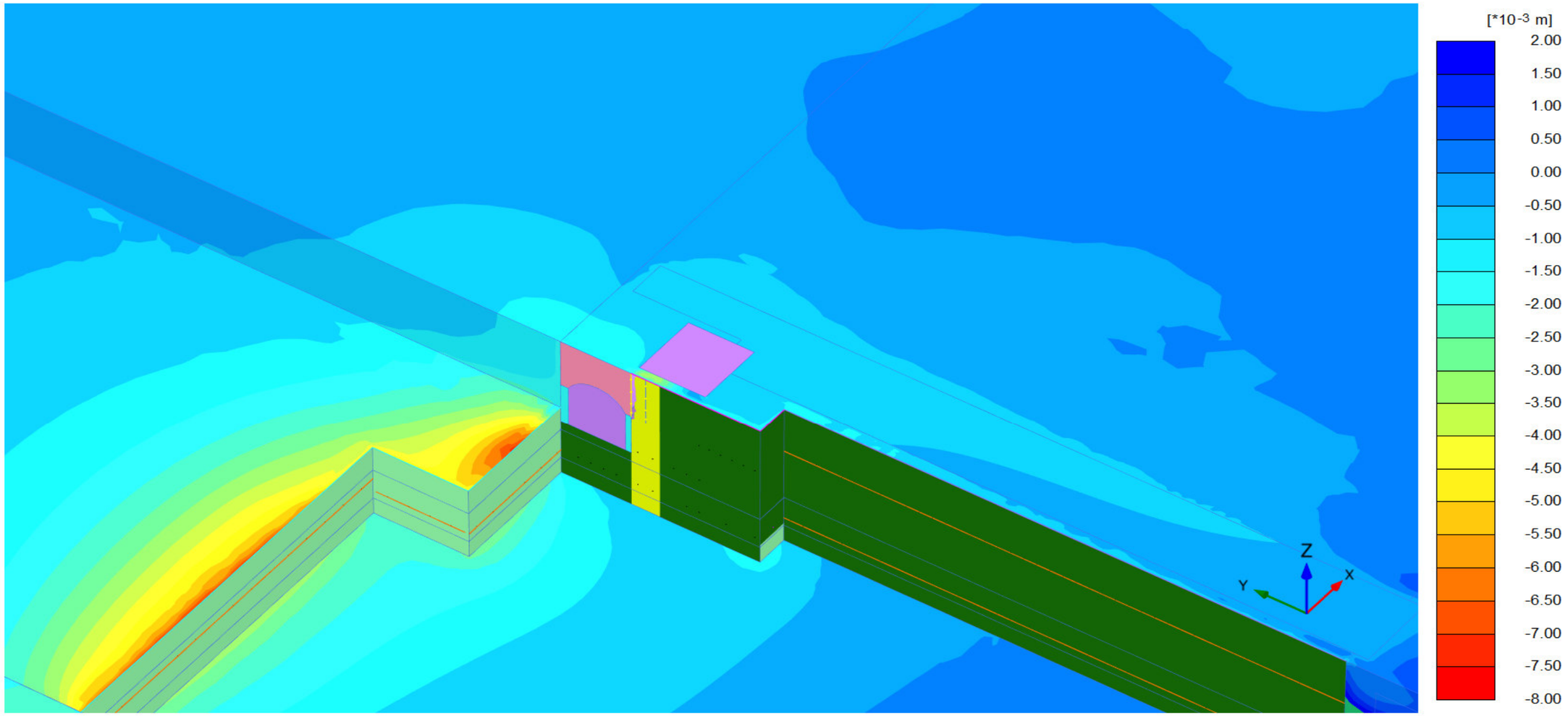
Total displacements u_x

Maximum value = 0.01298 m (Element 53744 at Node 12447)

Minimum value = $-5.155*10^{-3}$ m (Element 32238 at Node 253323)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 1 (Stage 15 - Stage E6)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M31
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



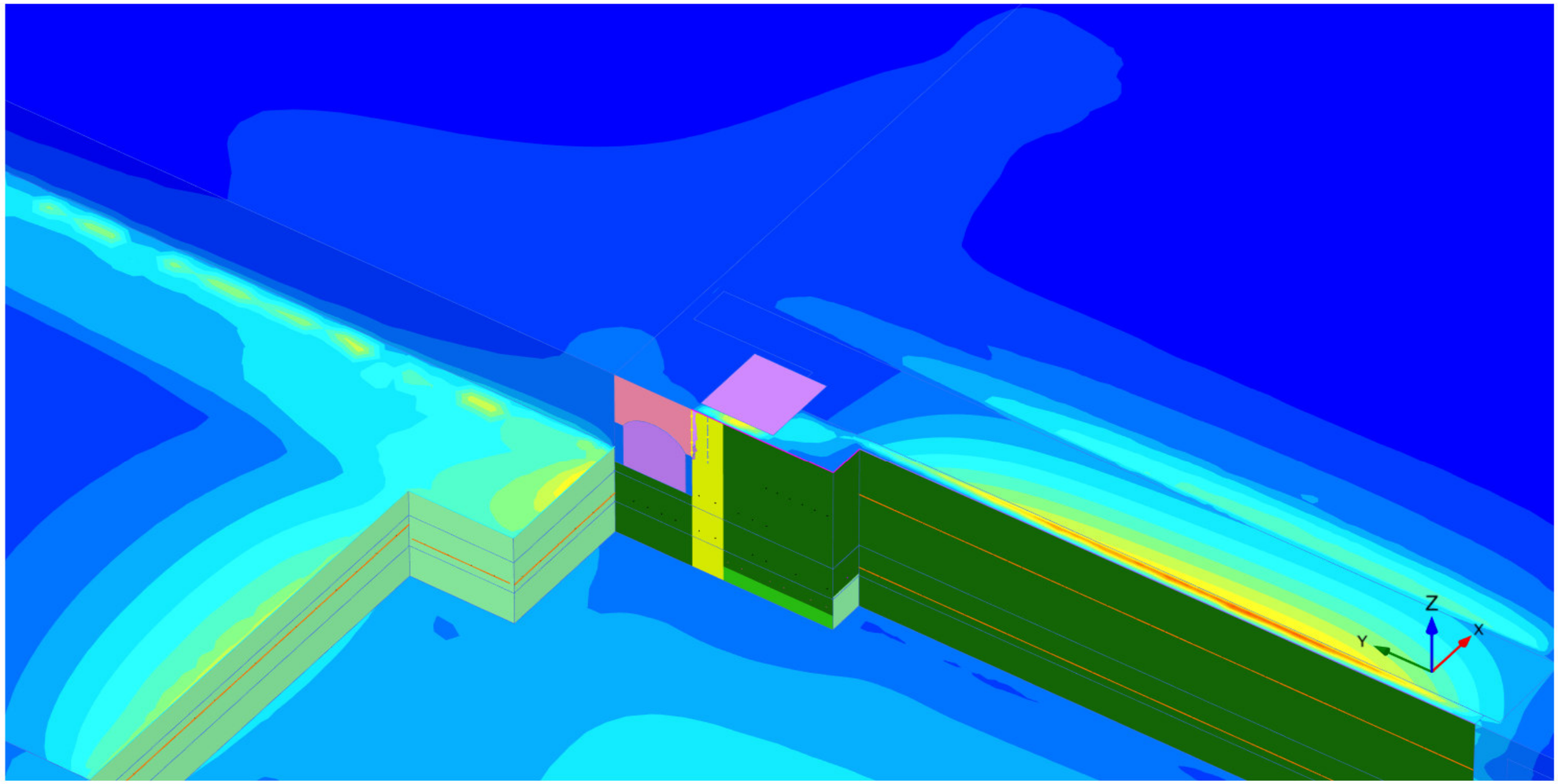
Total displacements u_y

Maximum value = 0.01078 m (Element 52896 at Node 13095)

Minimum value = $-7.306*10^{-3}$ m (Element 61472 at Node 1213)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 1 (Stage 15 - Stage E6)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M32
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

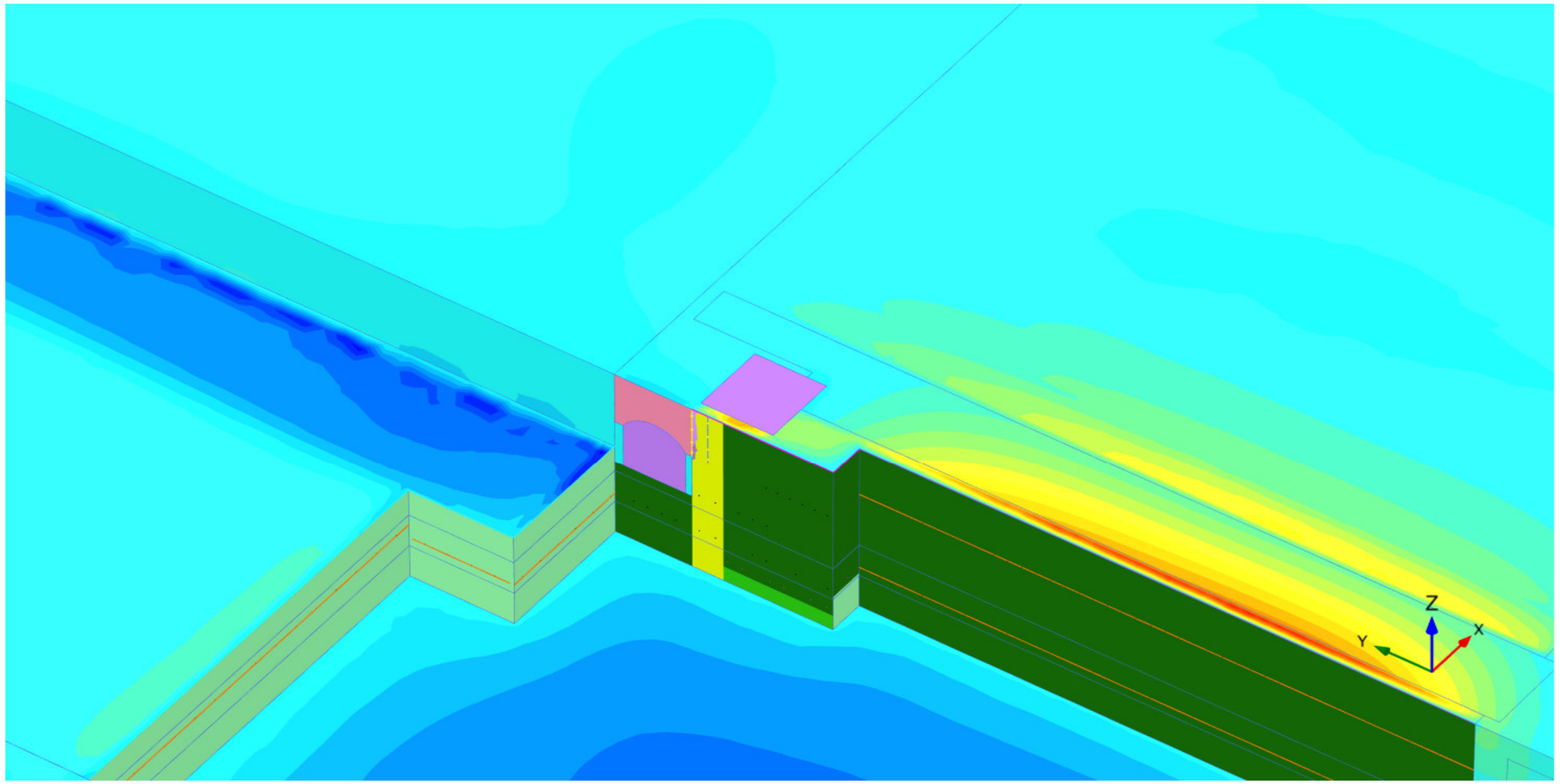
Maximum value = 0.01453 m (Element 83763 at Node 53308)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 17 - Stage E7)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M33
REVISION:	Rev0



Total displacements u_z

Maximum value = $7.347*10^{-3}$ m (Element 61730 at Node 112627)

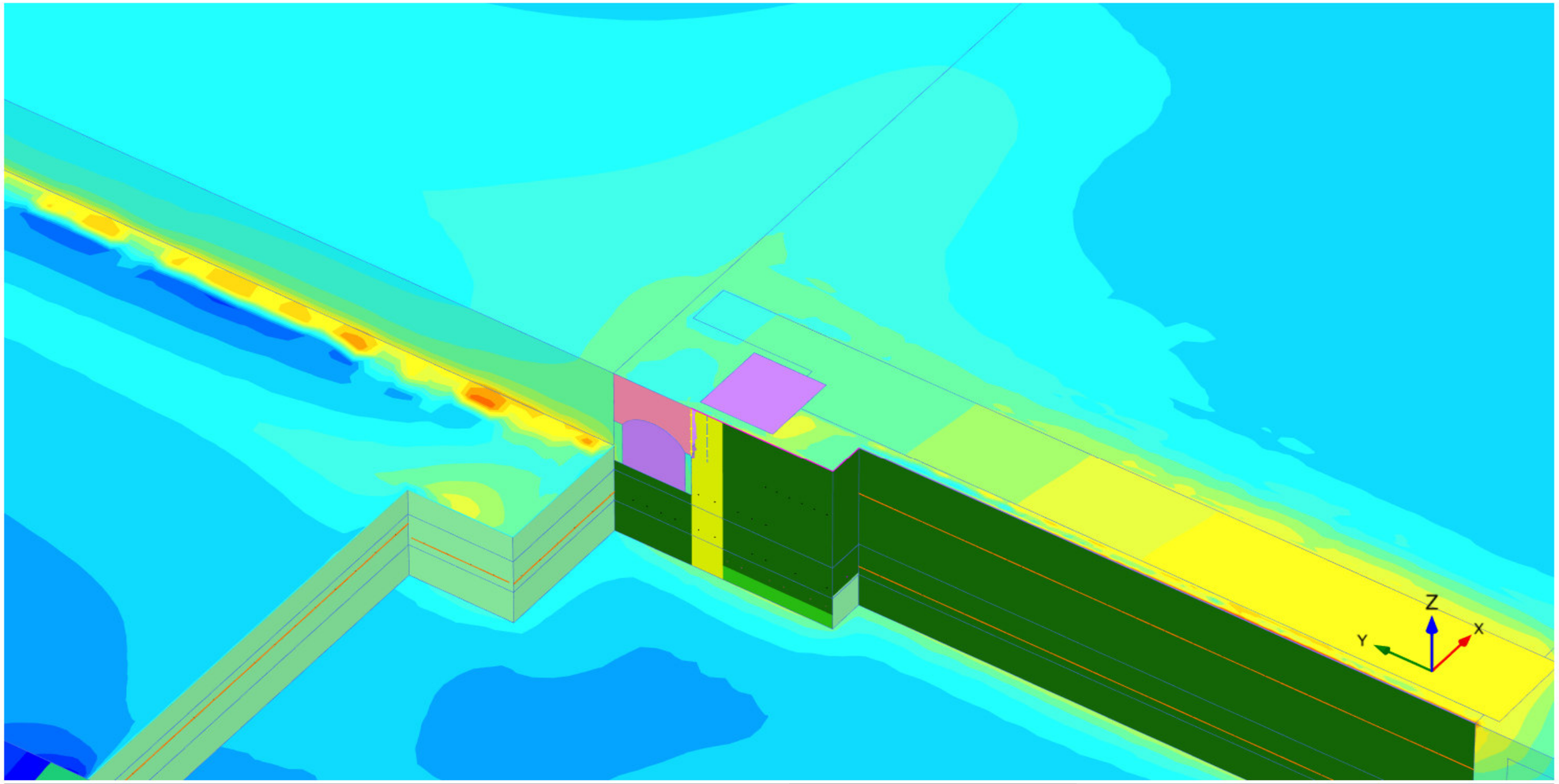
Minimum value = -0.01274 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Vertical Displacement Contours - Model 1 (Stage 17 - Stage E7)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M34
REVISION:	Rev0



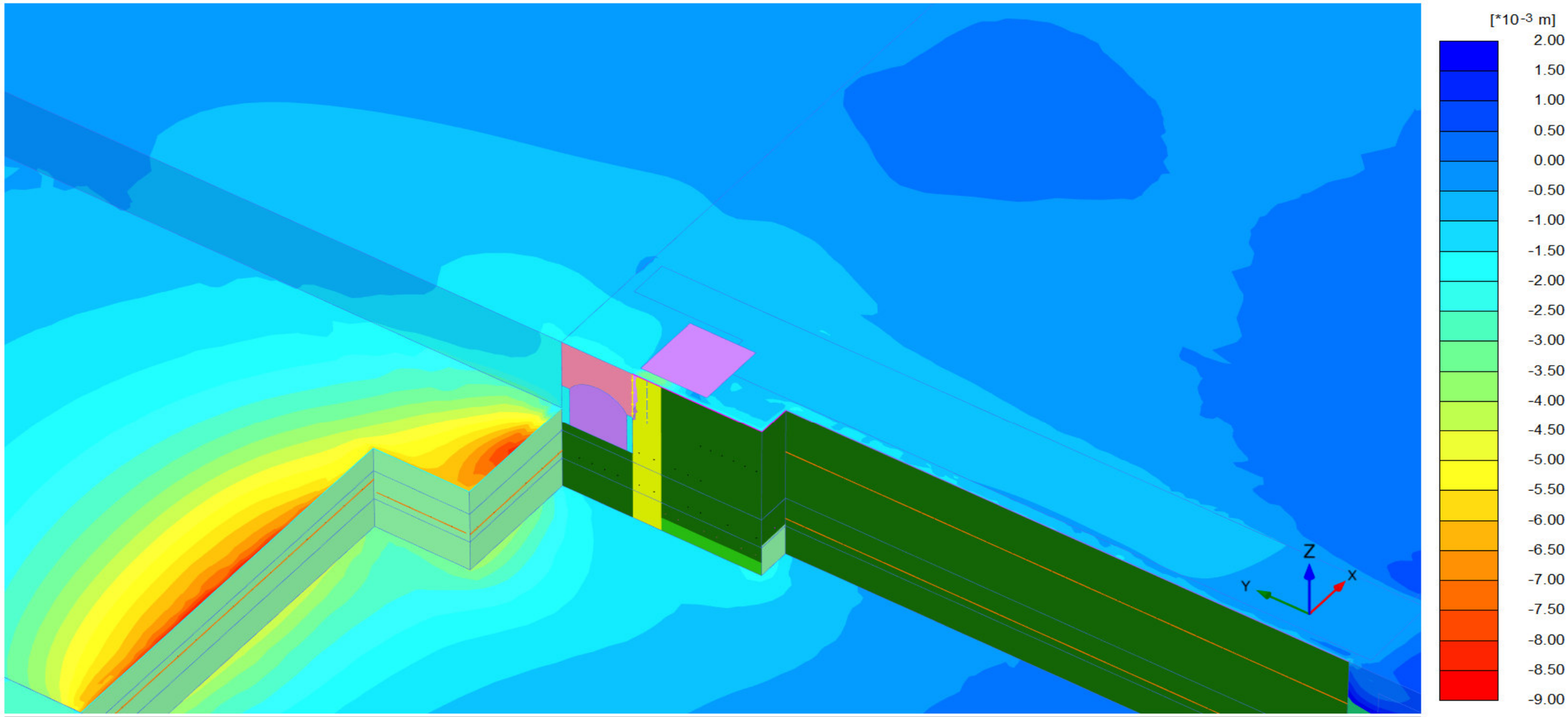
Total displacements u_x

Maximum value = 0.01452 m (Element 83763 at Node 53308)

Minimum value = -6.025*10-3 m (Element 32238 at Node 253323)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Horizontal Displacement Contours in East West Direction - Model 1 (Stage 17 - Stage E7)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M35
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



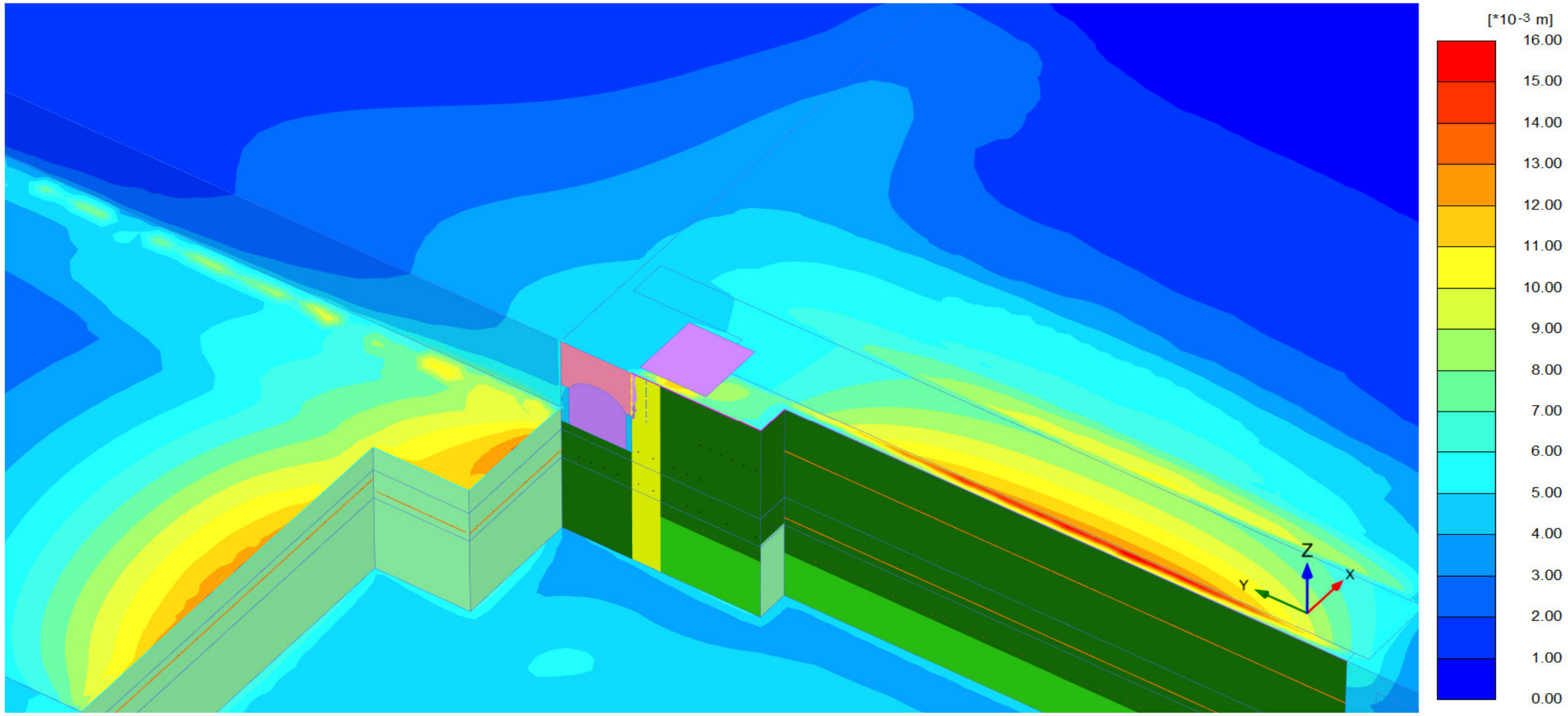
Total displacements u_y

Maximum value = 0.01179 m (Element 52912 at Node 13101)

Minimum value = $-8.611*10^{-3}$ m (Element 60789 at Node 17177)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Horizontal Displacement Contours in North South Direction - Model 1 (Stage 17 - Stage E7)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M36
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



Total displacements |u|

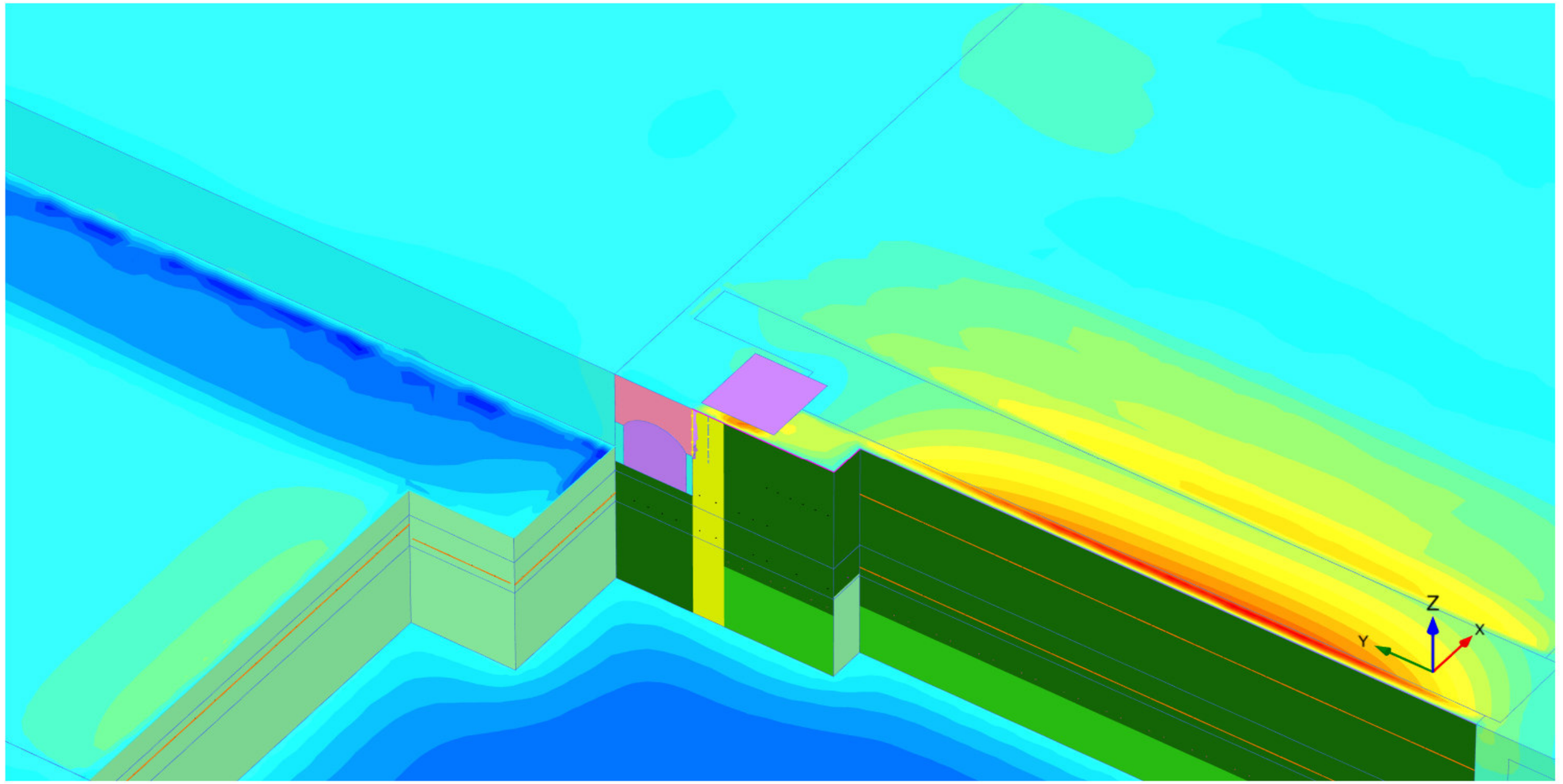
Maximum value = 0.02002 m (Element 83763 at Node 53308)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 19 - Stage BEL)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M37
REVISION:	Rev0



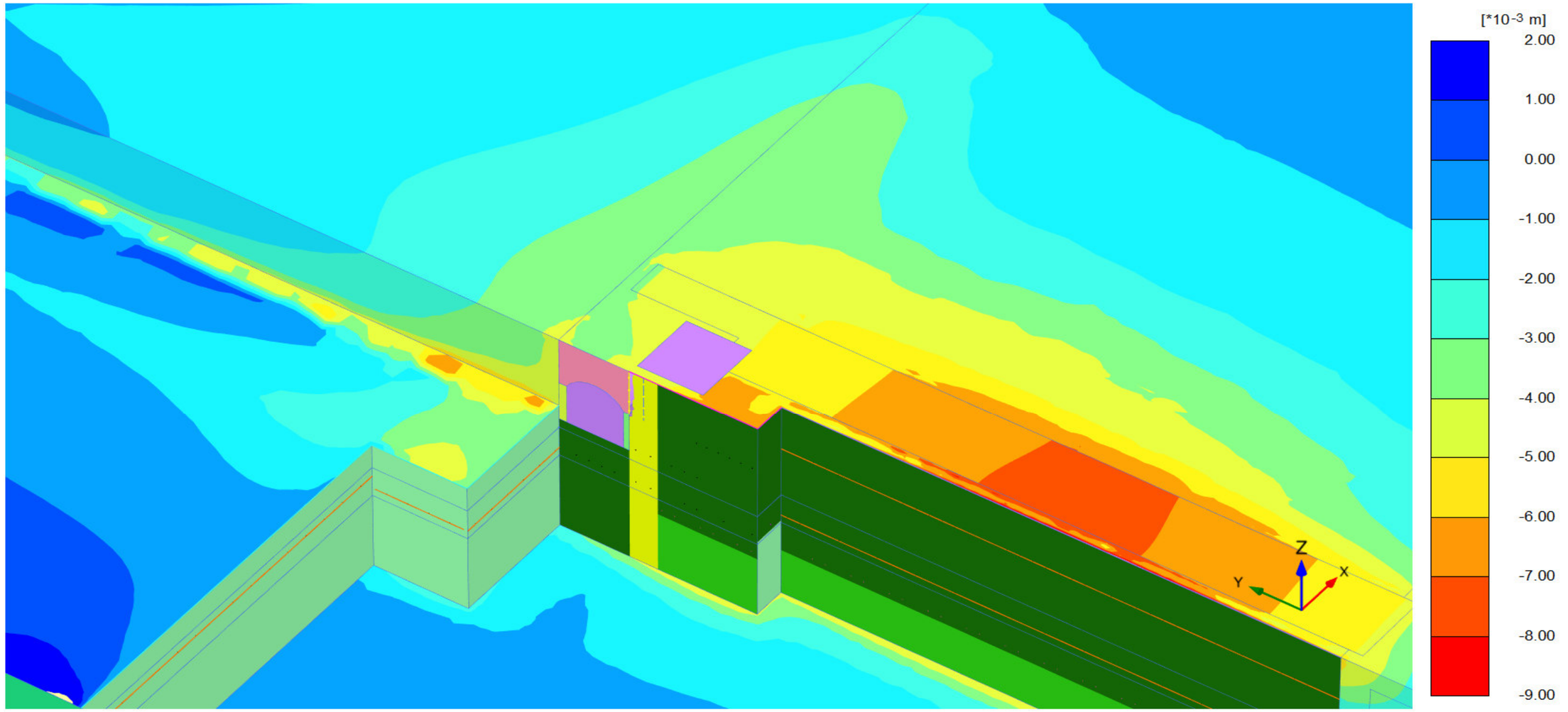
Total displacements u_z

Maximum value = $7.387*10^{-3}$ m (Element 61730 at Node 112627)

Minimum value = -0.01394 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 19 - Stage BEL)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M38
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



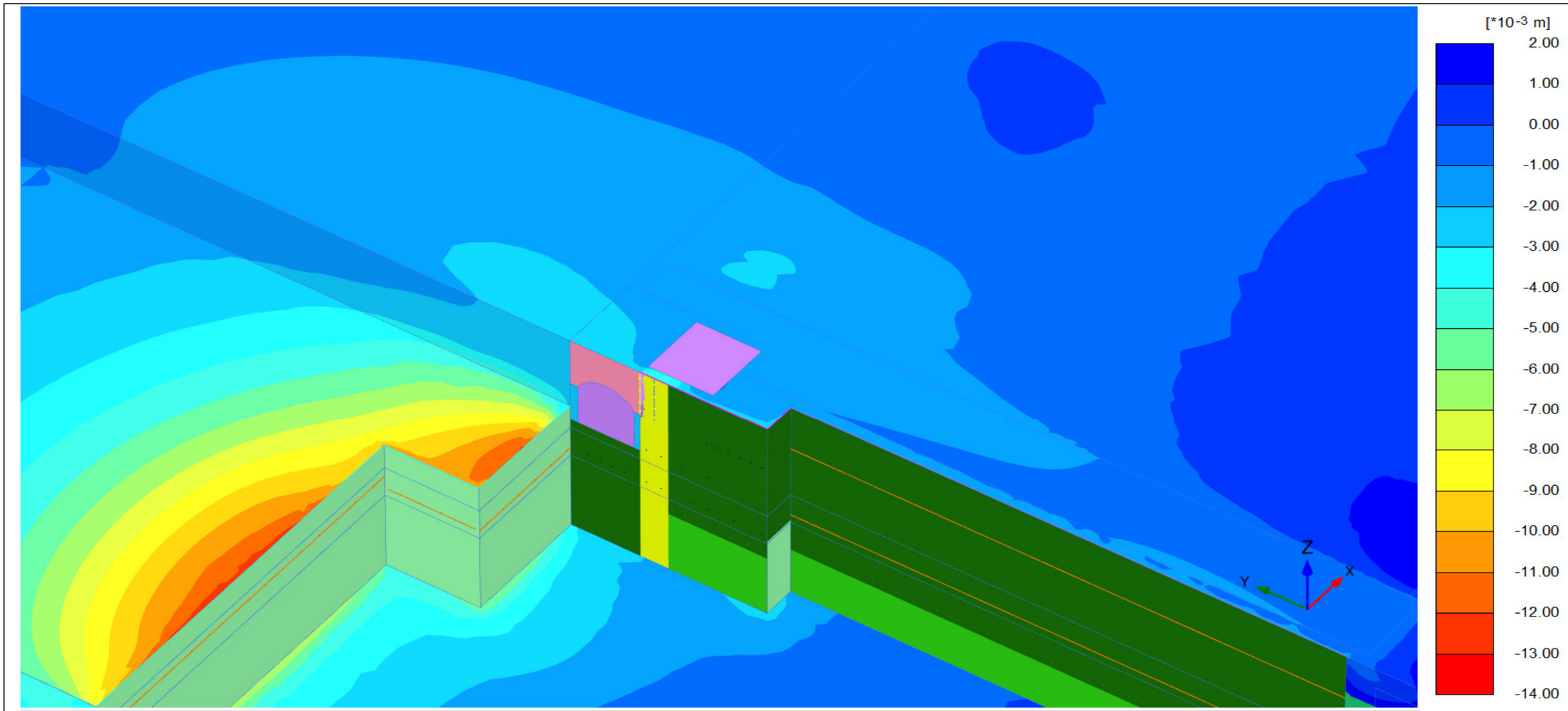
Total displacements u_x

Maximum value = 0.01997 m (Element 83763 at Node 53308)

Minimum value = -0.01081 m (Element 81583 at Node 98168)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 1 (Stage 19 - Stage BEL)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M39
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements u_y

Maximum value = 0.01546 m (Element 52936 at Node 13061)

Minimum value = -0.01320 m (Element 61390 at Node 17181)

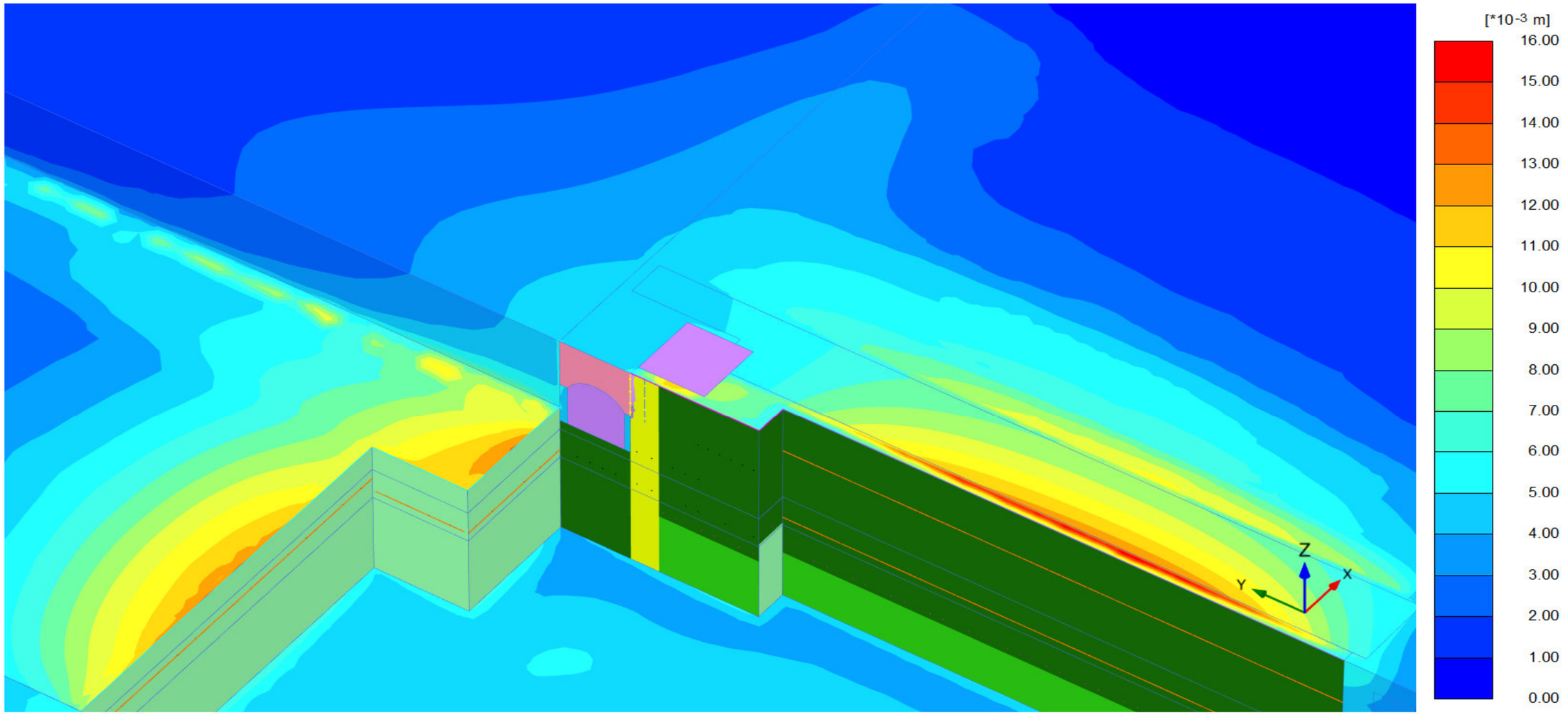
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Horizontal Displacement Contours in North South Direction - Model 1 (Stage 19 - Stage BEL)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M40
REVISION:	Rev0



Total displacements |u|

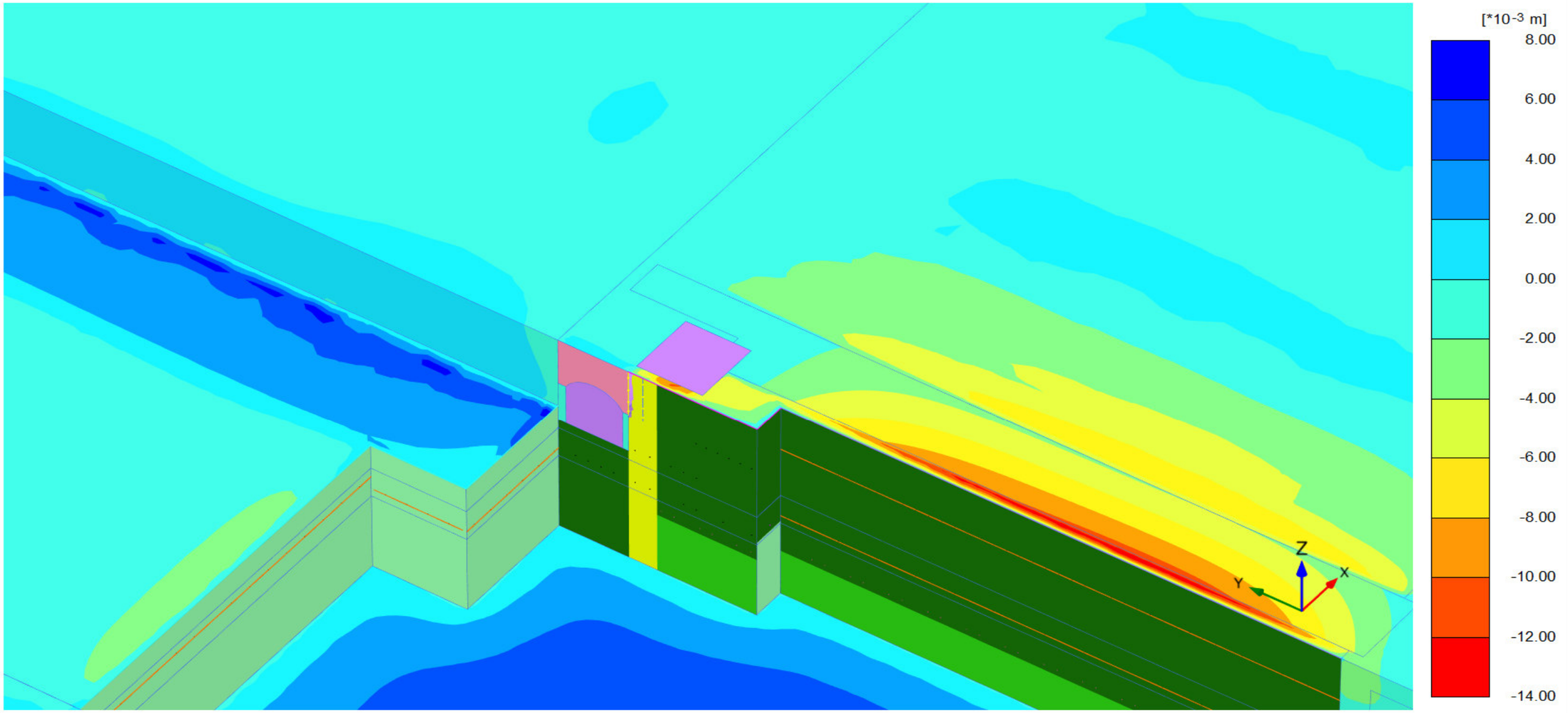
Maximum value = 0.02002 m (Element 83763 at Node 53308)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Total Displacement Contours - Model 1 (Stage 20 - Stage Mobile Crane)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M41
REVISION:	Rev0

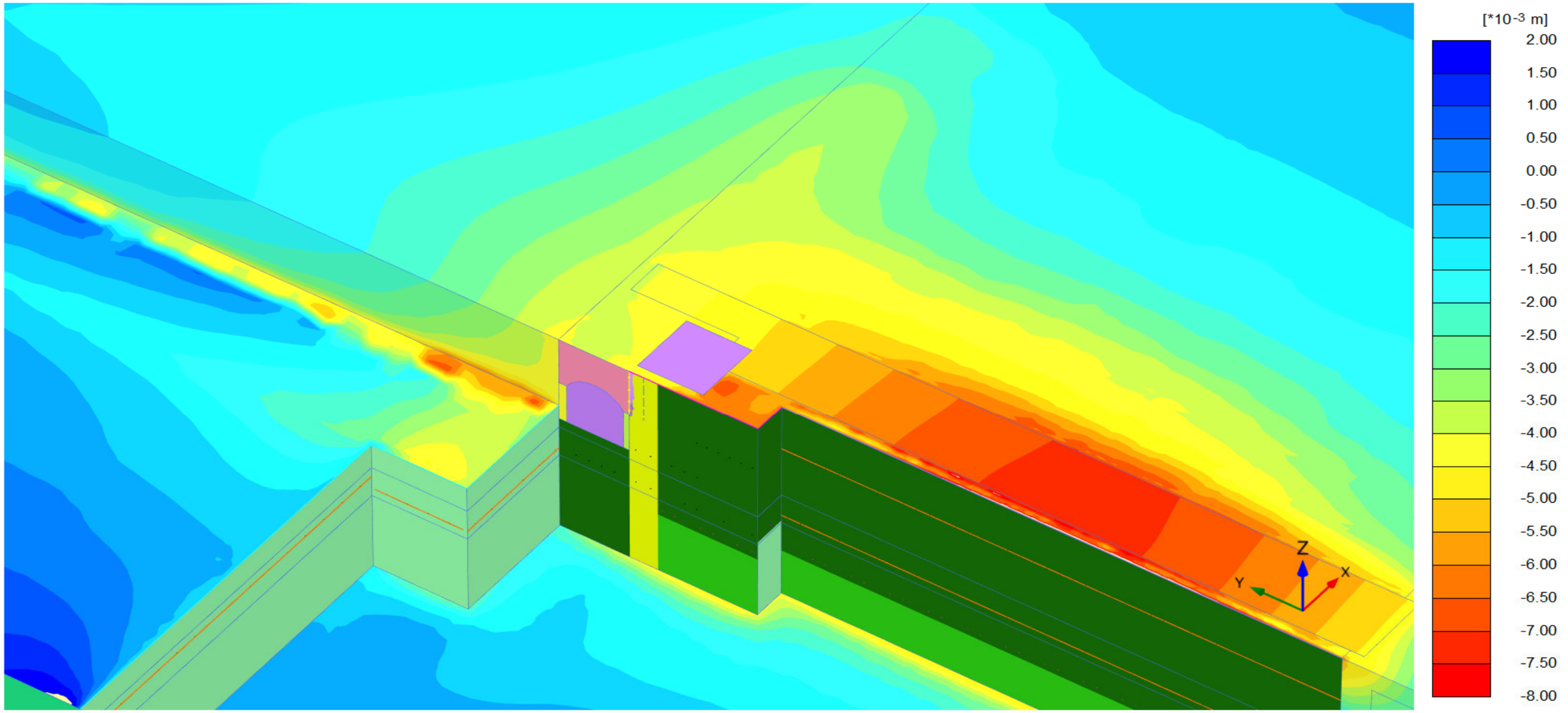


Total displacements u_z

Maximum value = $7.386*10^{-3}$ m (Element 61730 at Node 112627)

Minimum value = -0.01394 m (Element 31574 at Node 253205)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Vertical Displacement Contours - Model 1 (Stage 20 - Stage Mobile Crane)**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M42
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



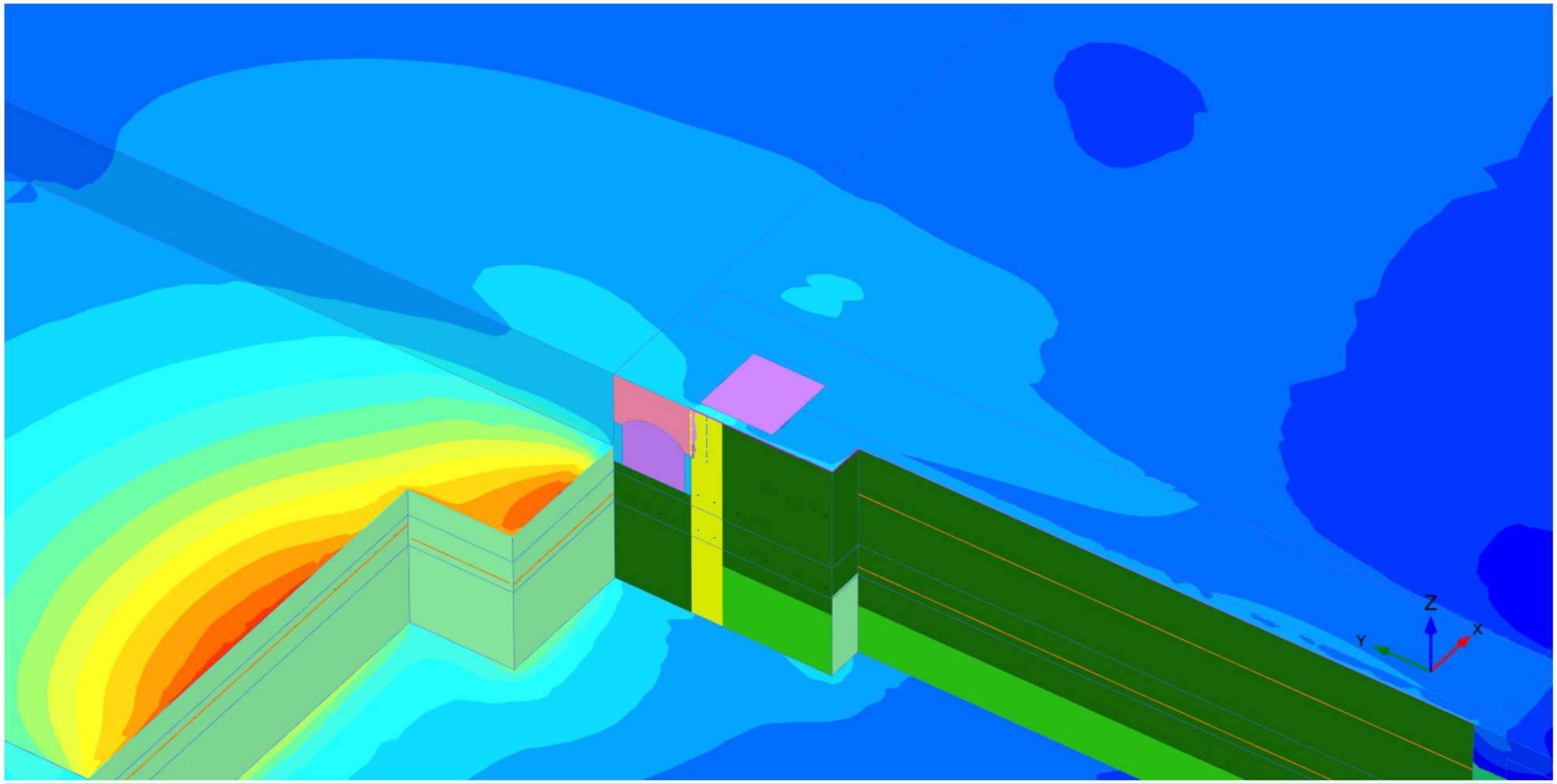
Total displacements u_x

Maximum value = 0.01997 m (Element 83763 at Node 53308)

Minimum value = -0.01081 m (Element 81583 at Node 98168)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Horizontal Displacement Contours in East West Direction - Model 1 (Stage 20 - Stage Mobile Crane)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M43
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



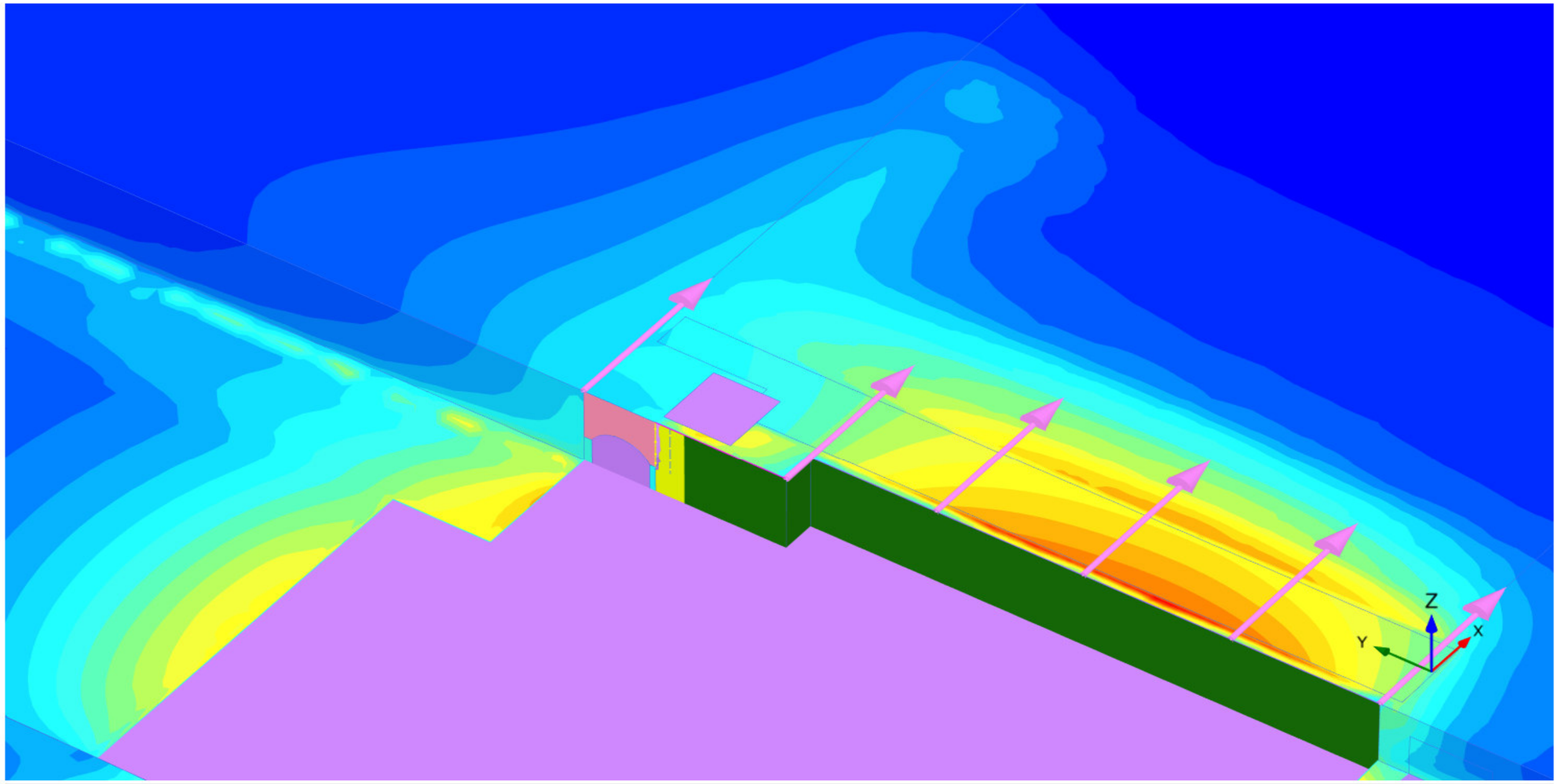
Total displacements u_y

Maximum value = 0.01546 m (Element 52936 at Node 13061)

Minimum value = -0.01320 m (Element 61390 at Node 17181)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 1 (Stage 20 - Stage Mobile Crane)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M44
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

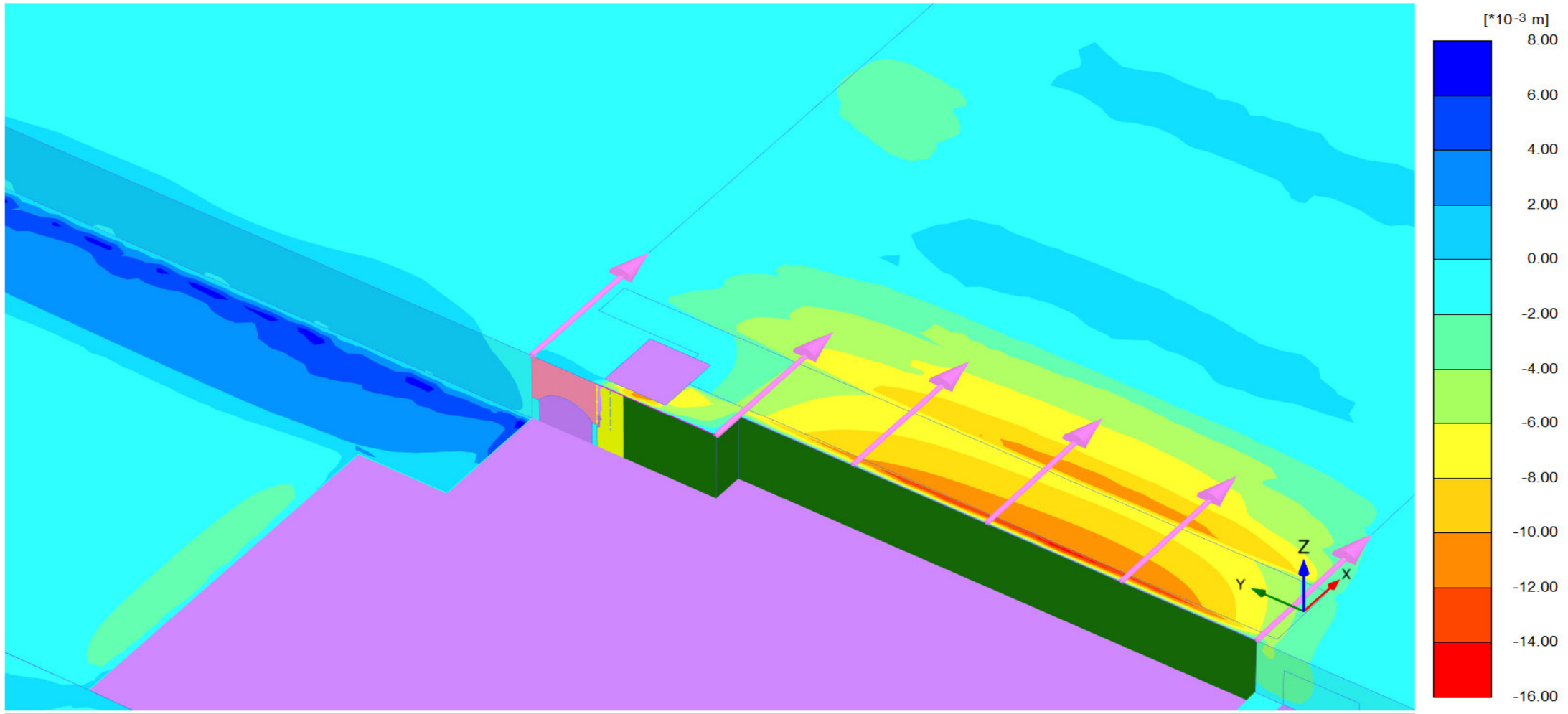
Maximum value = 0.01893 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 23 - Anchors Decommissioned)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M45
REVISION:	Rev0



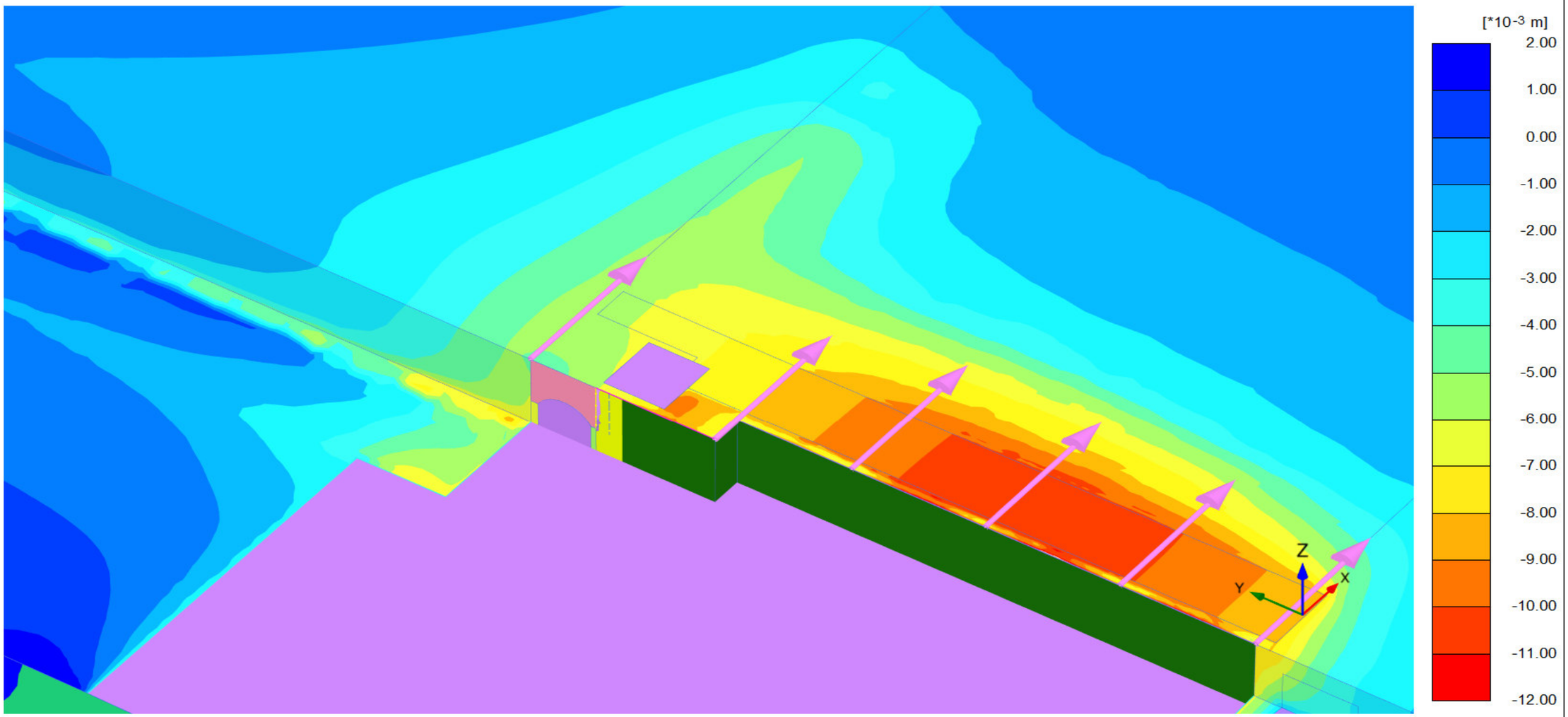
Total displacements u_z

Maximum value = $7.422*10^{-3}$ m (Element 61730 at Node 112627)

Minimum value = -0.01496 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 23 - Anchors Decommissioned)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M46
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



Total displacements u_x

Maximum value = 0.01888 m (Element 83585 at Node 53278)

Minimum value = -0.01535 m (Element 36749 at Node 18723)

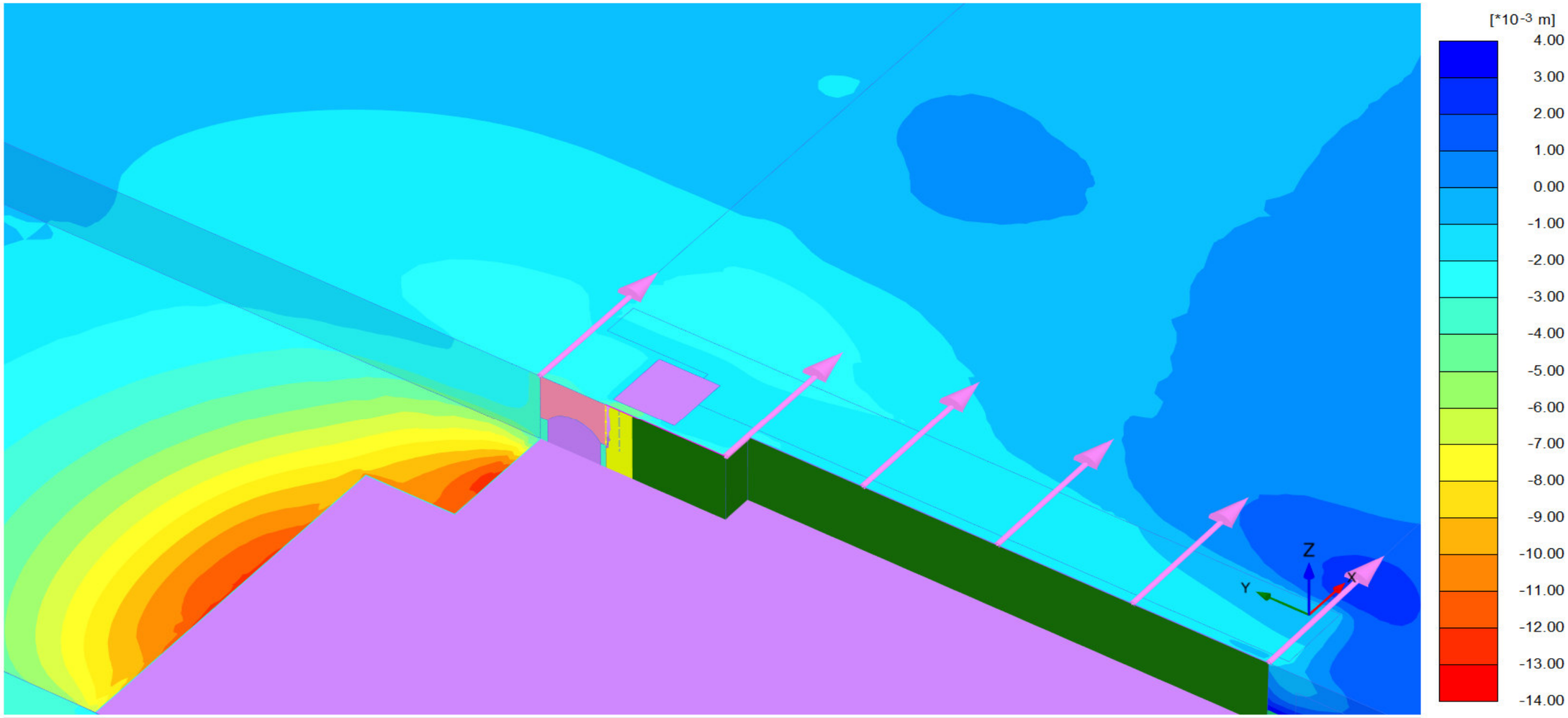
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Horizontal Displacement Contours in East West Direction - Model 1 (Stage 23 - Anchors Decommissioned)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M47
REVISION:	Rev0



Total displacements u_y

Maximum value = 0.01582 m (Element 52936 at Node 13061)

Minimum value = -0.01321 m (Element 61424 at Node 100203)

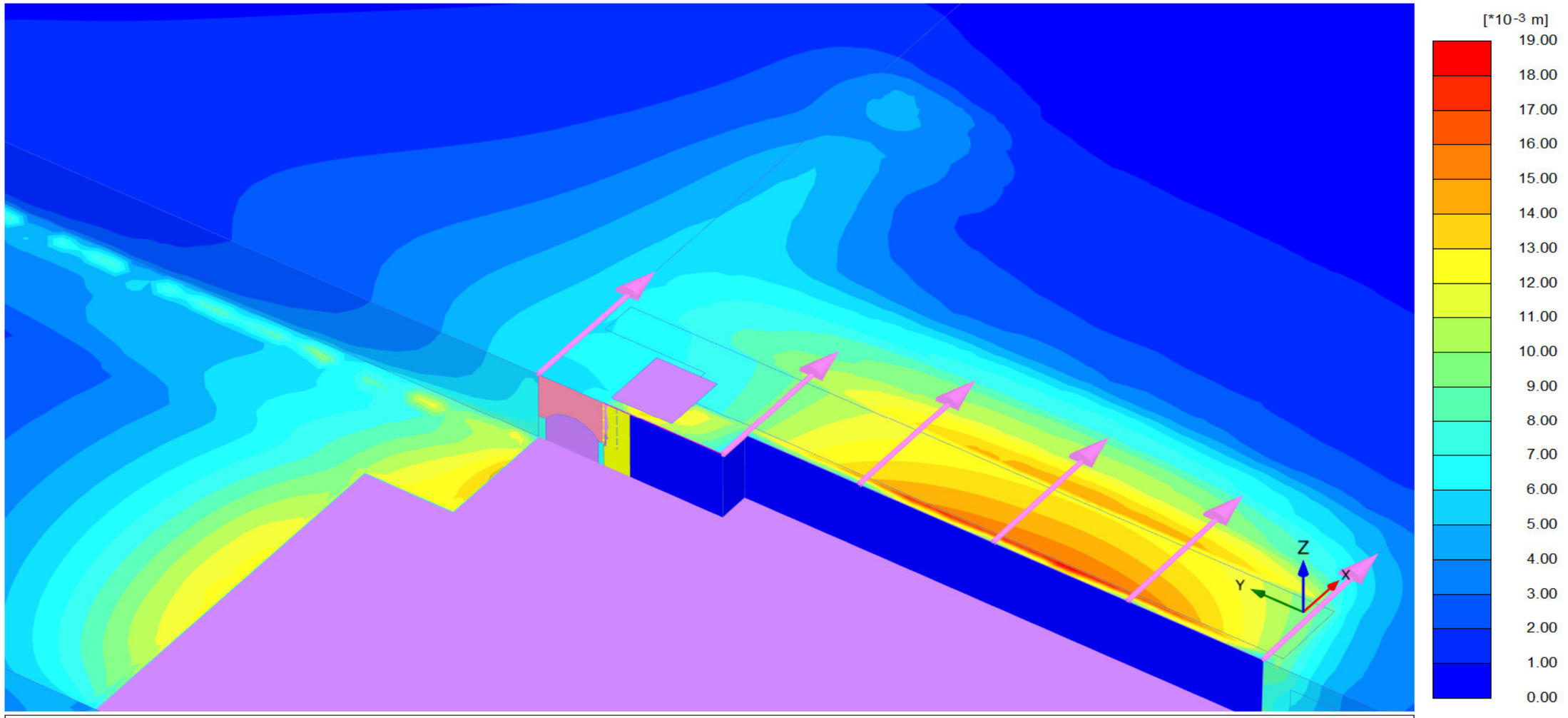
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Horizontal Displacement Contours in North South Direction - Model 1 (Stage 23 - Anchors Decommissioned)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M48
REVISION:	Rev0



Total displacements |u|

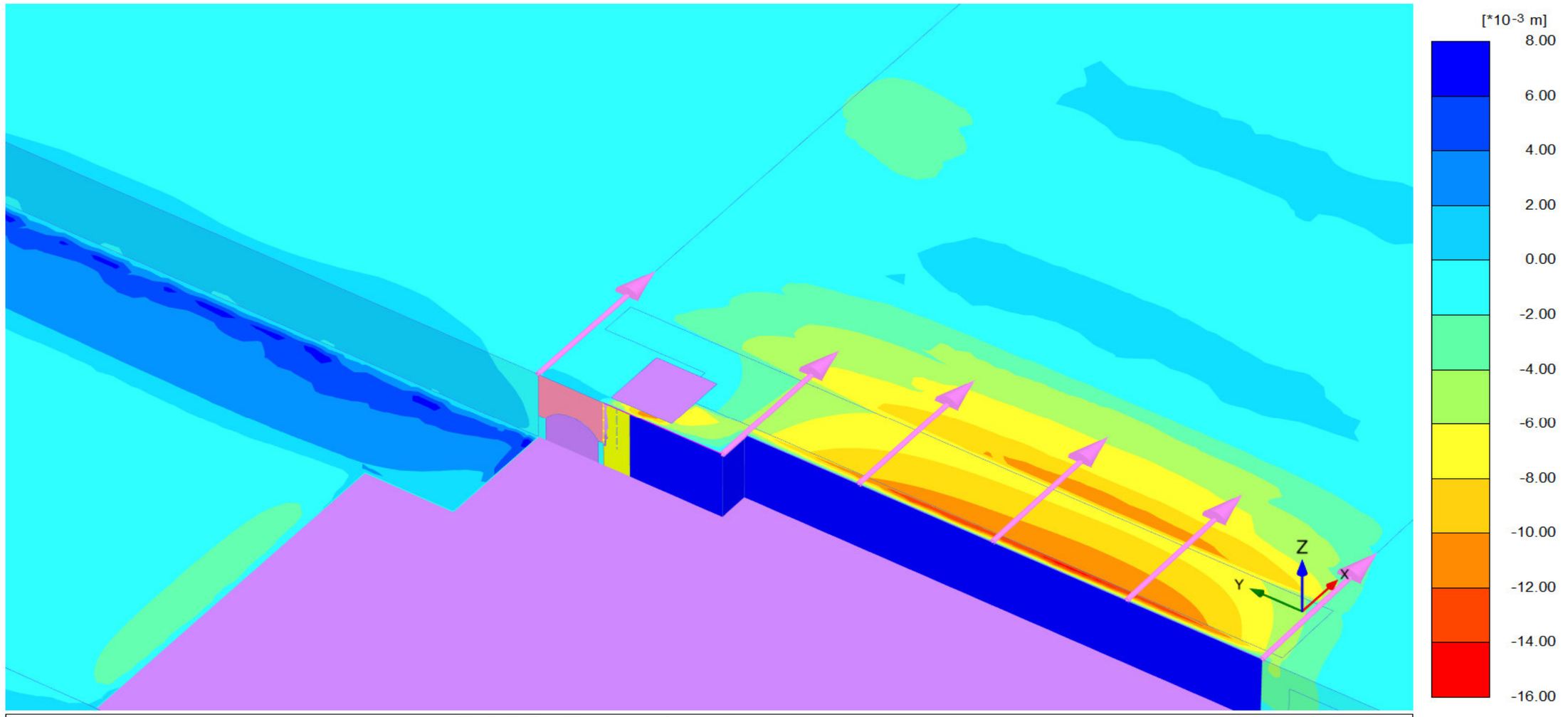
Maximum value = 0.01895 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Total Displacement Contours - Model 1 (Stage 25 - Pile Long Term Modulus and Water Rise)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M49
REVISION:	Rev0



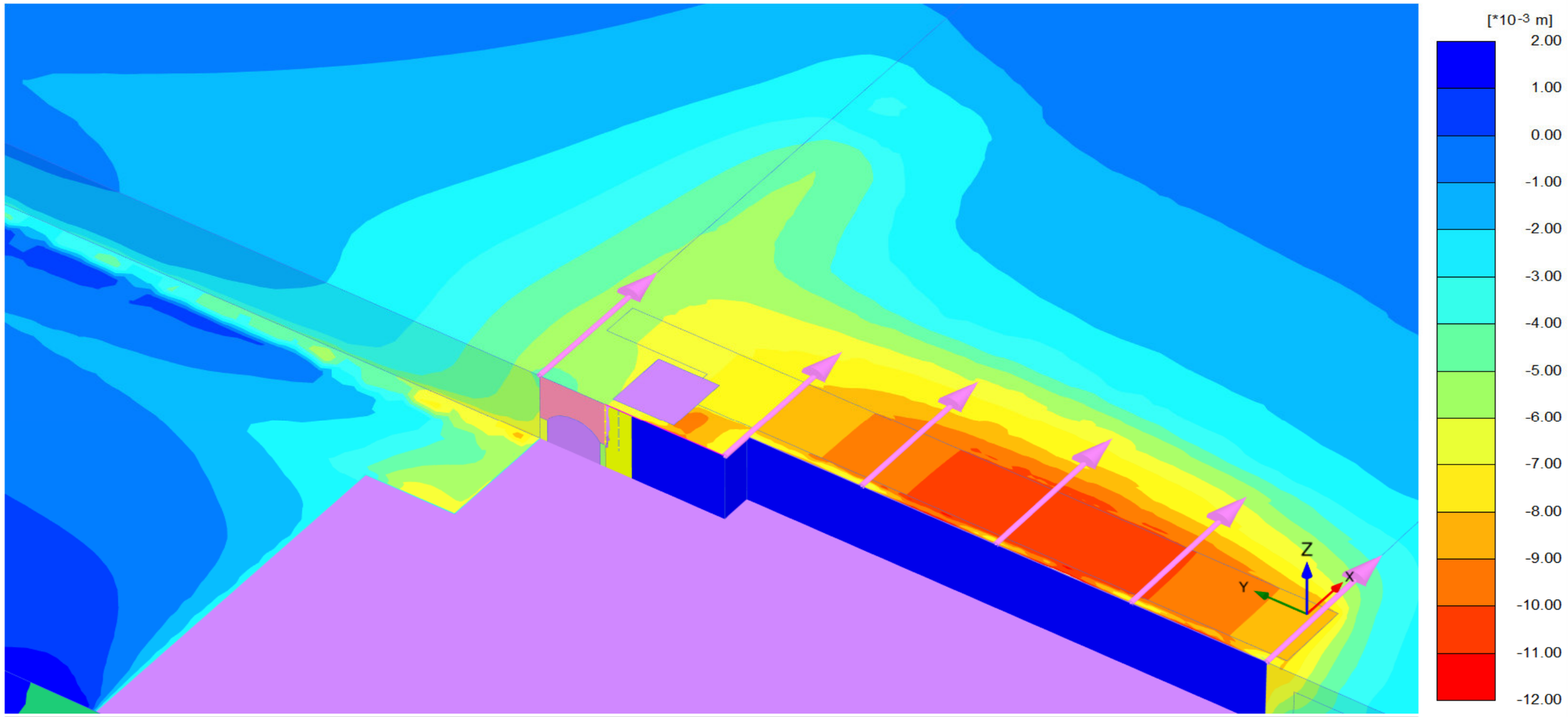
Total displacements u_z

Maximum value = $7.424*10^{-3}$ m (Element 61730 at Node 112627)

Minimum value = -0.01497 m (Element 31574 at Node 253205)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 1 (Stage 24 - Pile Long Term Modulus)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M50
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



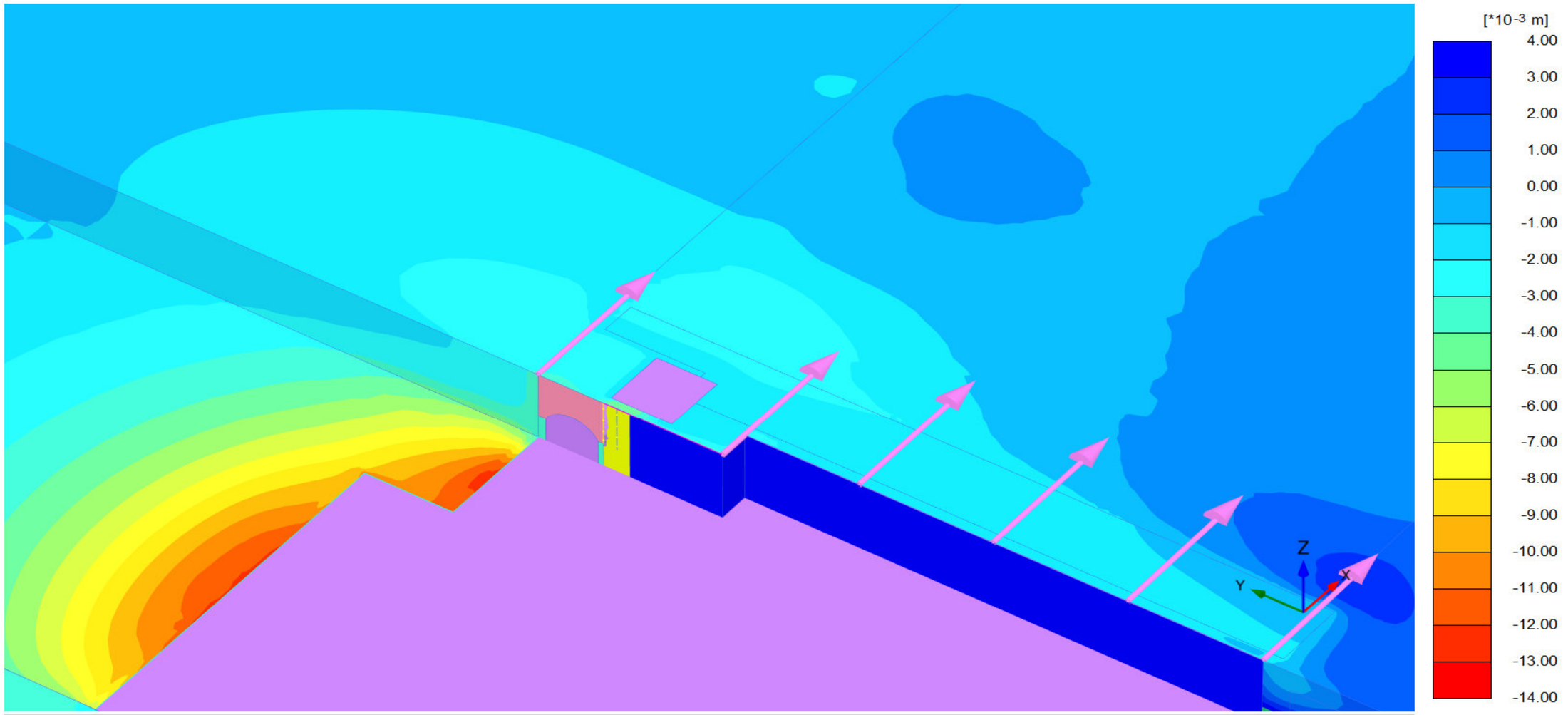
Total displacements u_x

Maximum value = 0.01887 m (Element 83585 at Node 53278)

Minimum value = -0.01539 m (Element 36749 at Node 18723)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 1 (Stage 24 - Pile Long Term Modulus)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M51
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements u_y

Maximum value = 0.01582 m (Element 52936 at Node 13061)

Minimum value = -0.01321 m (Element 61424 at Node 100203)

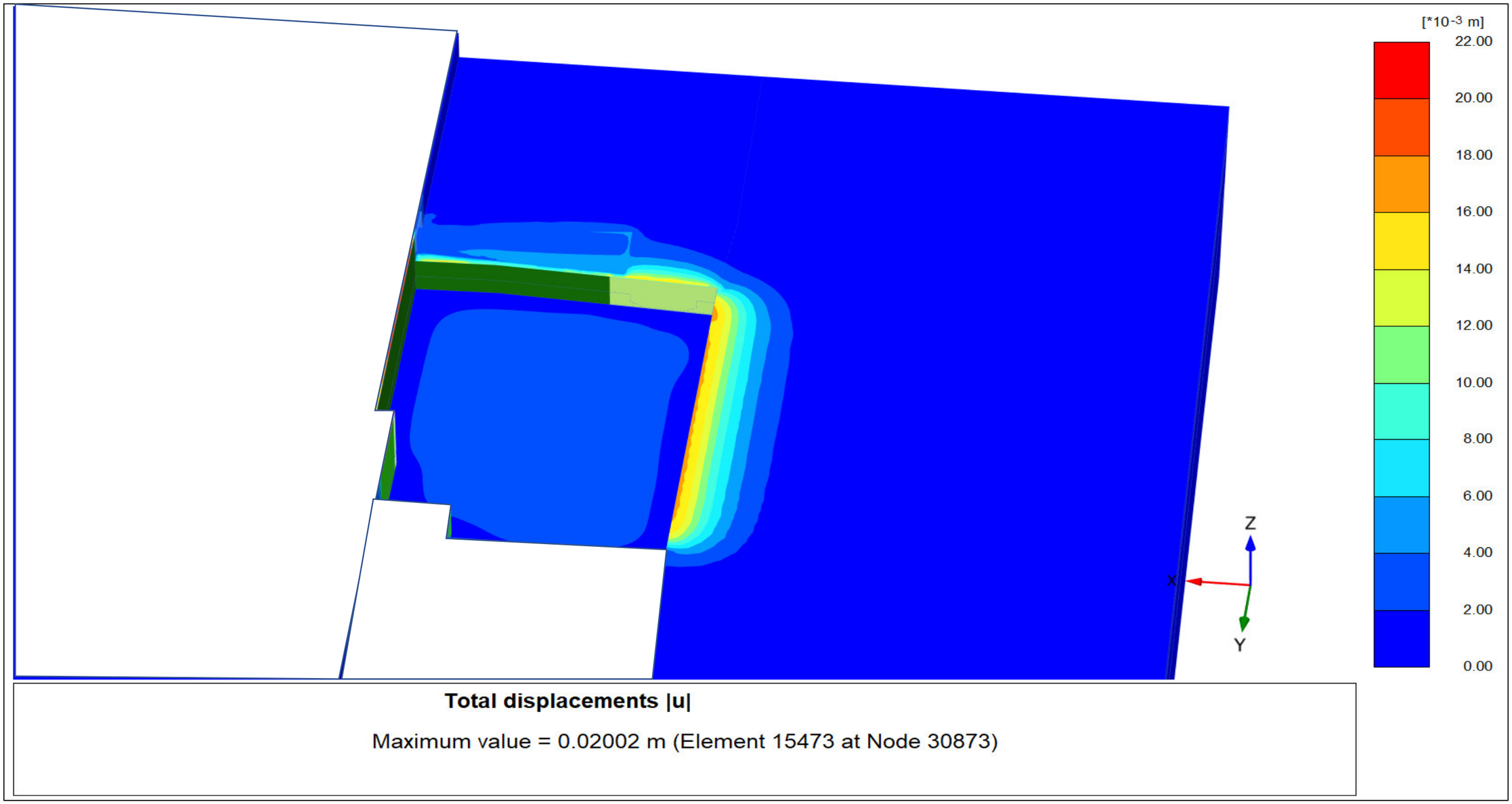
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Horizontal Displacement Contours in North South Direction - Model 1 (Stage 24 - Pile Long Term Modulus)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

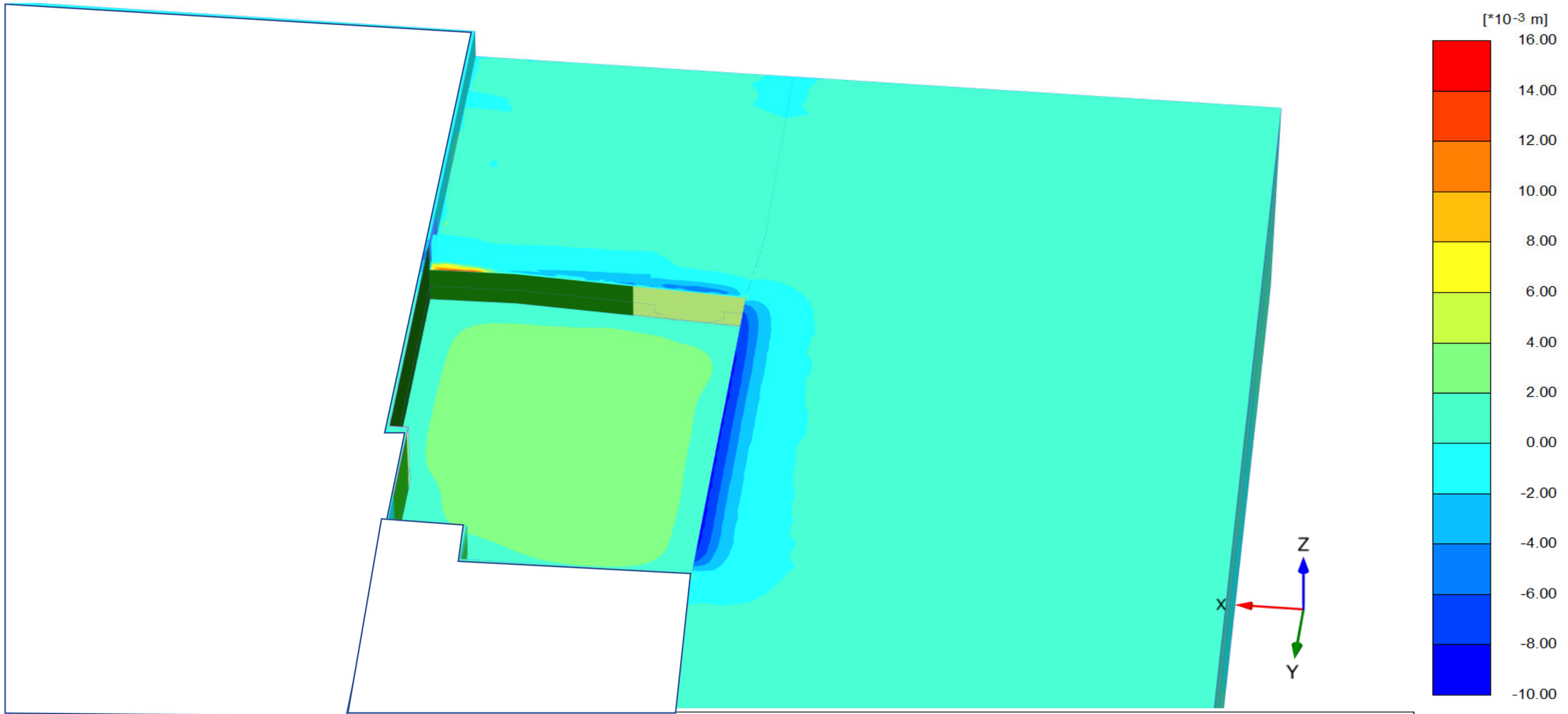
PROJECT No:	86767.04
DRAWING No:	M52
REVISION:	Rev0



Total displacements |u|

Maximum value = 0.02002 m (Element 15473 at Node 30873)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 8 - Excavator Surcharge on DST slab)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M53	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	

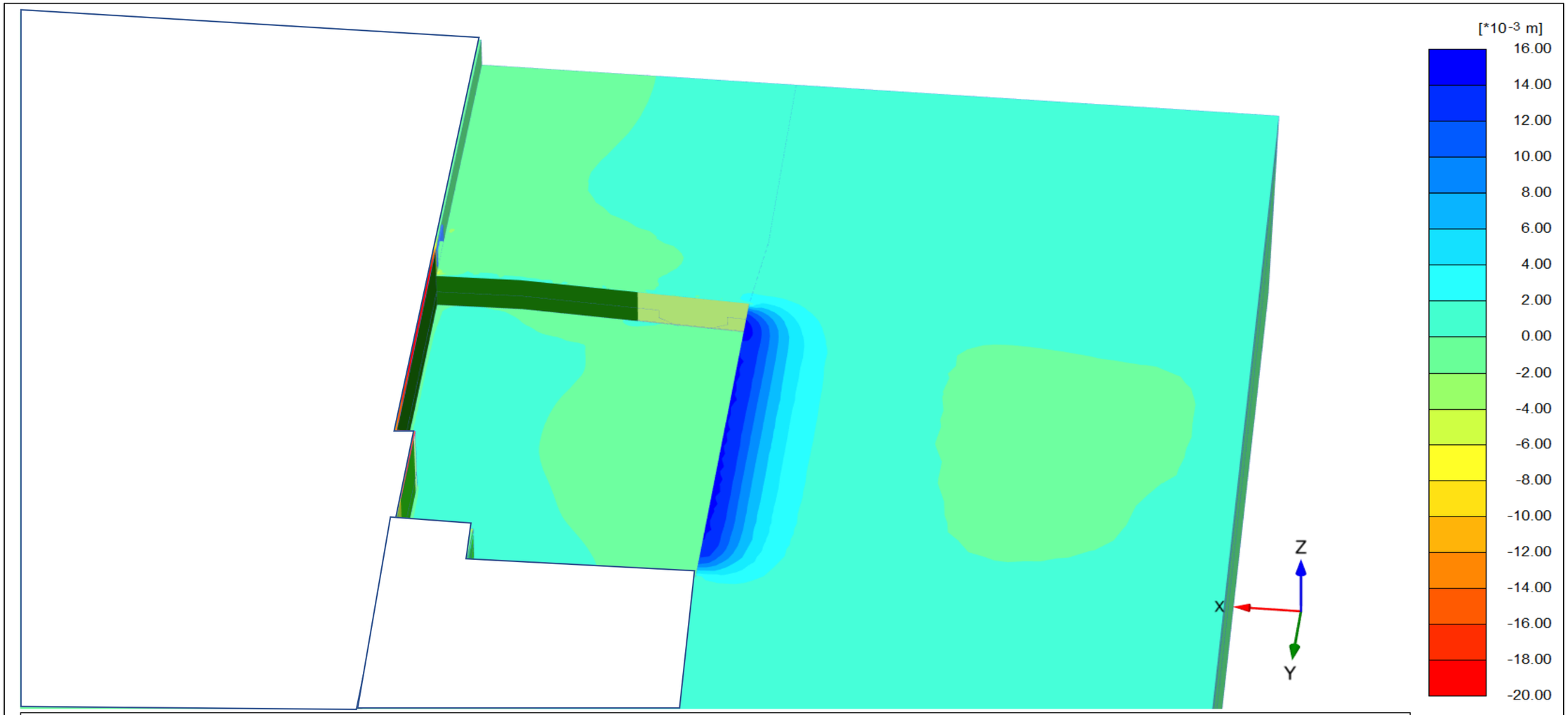


Total displacements u_z (scaled up 200 times)

Maximum value = 0.01548 m (Element 22540 at Node 18287)

Minimum value = -9.162*10-3 m (Element 27118 at Node 14587)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Vertical Displacement Contours - Model 2 (Stage 8 - Excavator Surcharge on DST slab)**		PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**		DRAWING No: M54
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**		REVISION: Rev0



Total displacements u_x

Maximum value = 0.01560 m (Element 29313 at Node 14537)

Minimum value = -0.01983 m (Element 14995 at Node 30837)

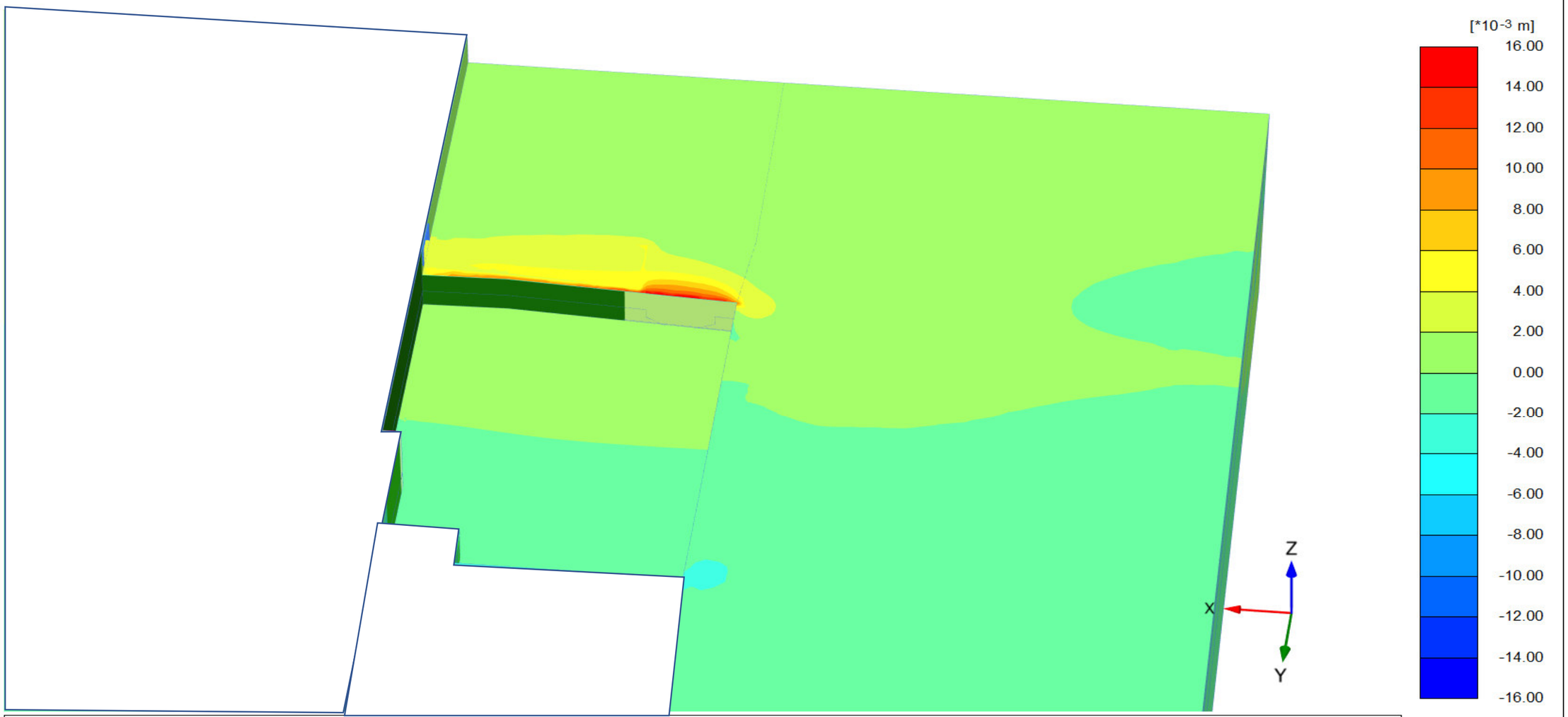
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Horizontal Displacement Contours in East West Direction - Model 2 (Stage 8 - Excavator Surcharge on DST slab)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M55
REVISION:	Rev0



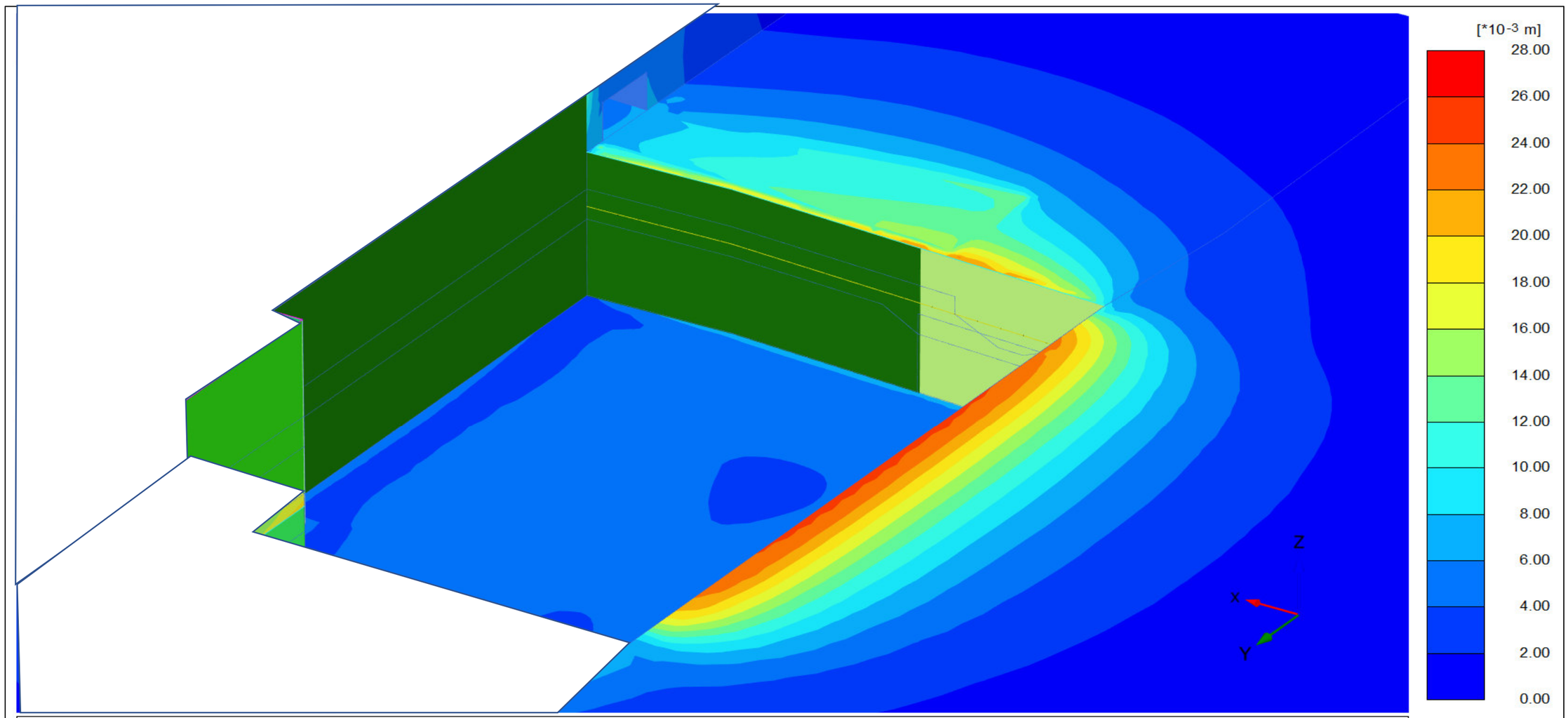
Total displacements u_y

Maximum value = 0.01578 m (Element 20330 at Node 18359)

Minimum value = -0.01423 m (Element 29009 at Node 14446)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 8 - Excavator Surcharge on DST slab)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M56
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

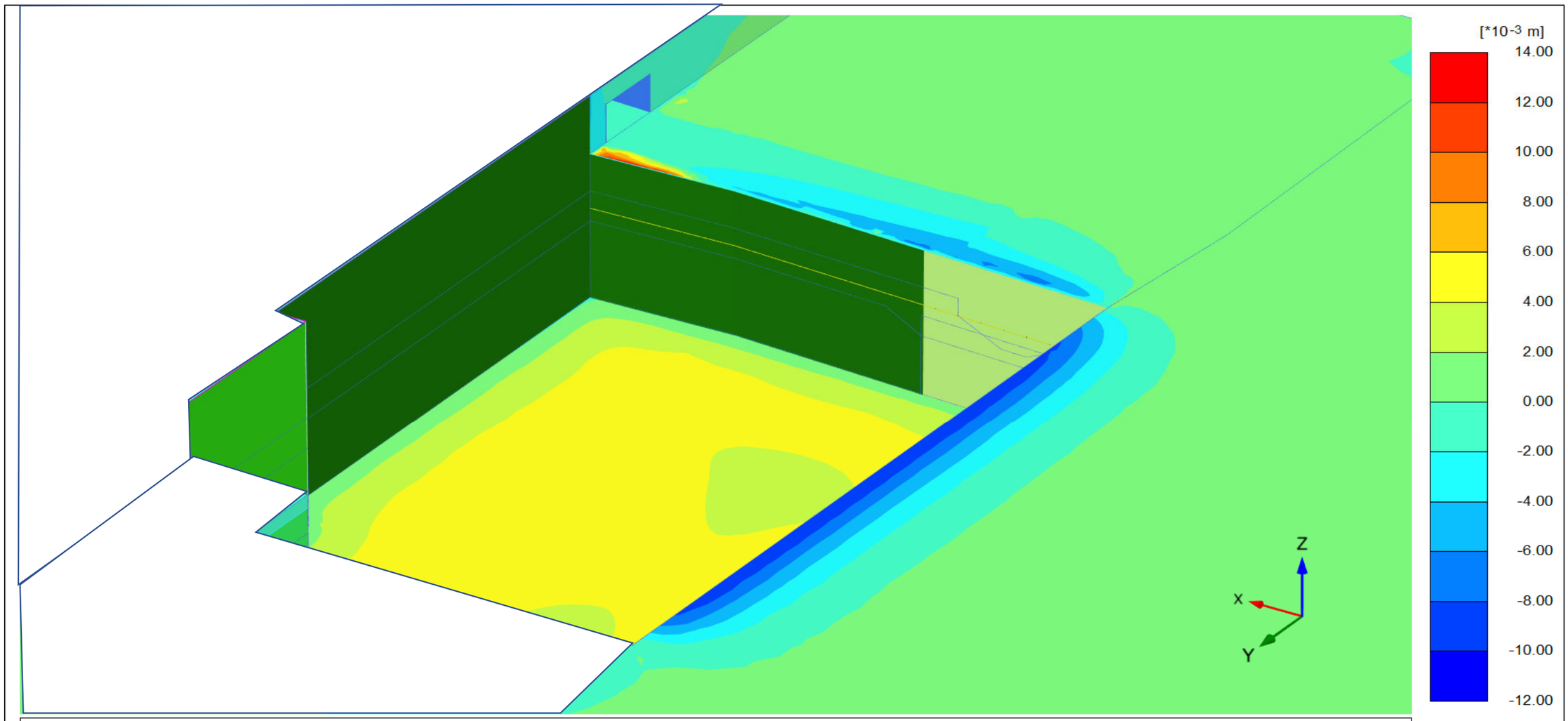
Maximum value = 0.03271 m (Element 14170 at Node 208696)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Total Displacement Contours - Model 2 (Stage 13 - Stage BEL)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M57
REVISION:	Rev0



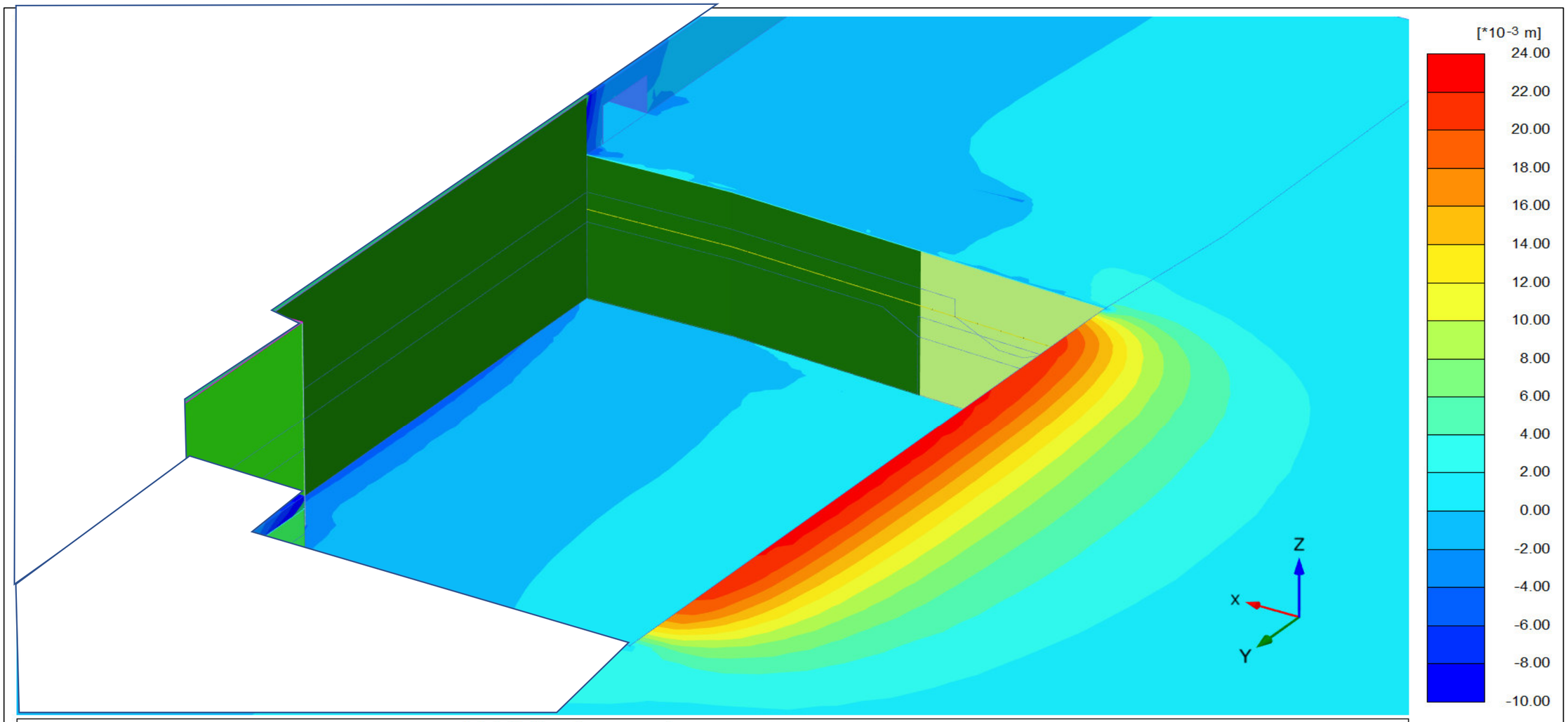
Total displacements u_z

Maximum value = 0.01382 m (Element 22540 at Node 18297)

Minimum value = -0.01027 m (Element 27118 at Node 14587)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 2 (Stage 13 - Stage BEL)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M58
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



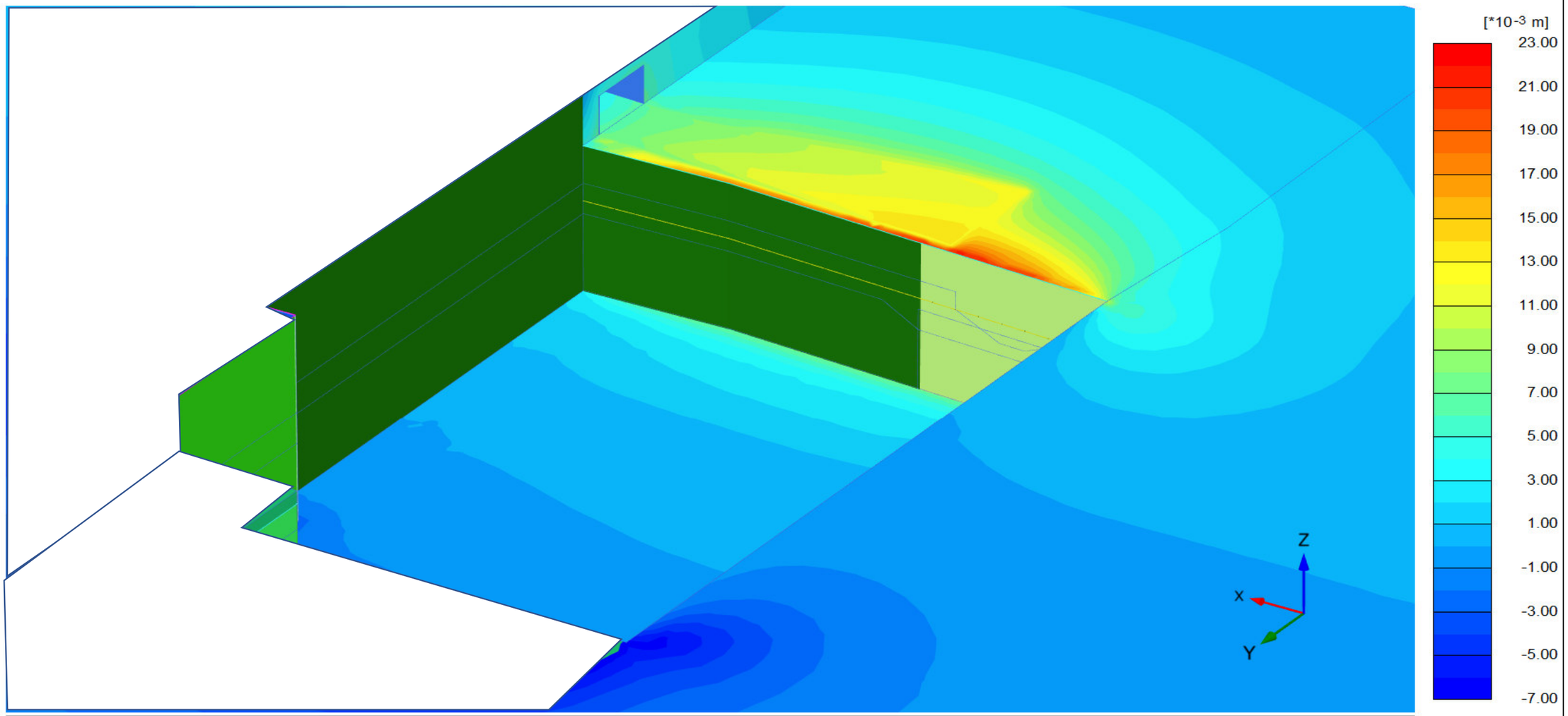
Total displacements u_x

Maximum value = 0.02329 m (Element 27172 at Node 14621)

Minimum value = -0.03266 m (Element 14170 at Node 208696)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 2 (Stage 13 - Stage BEL)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M59
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



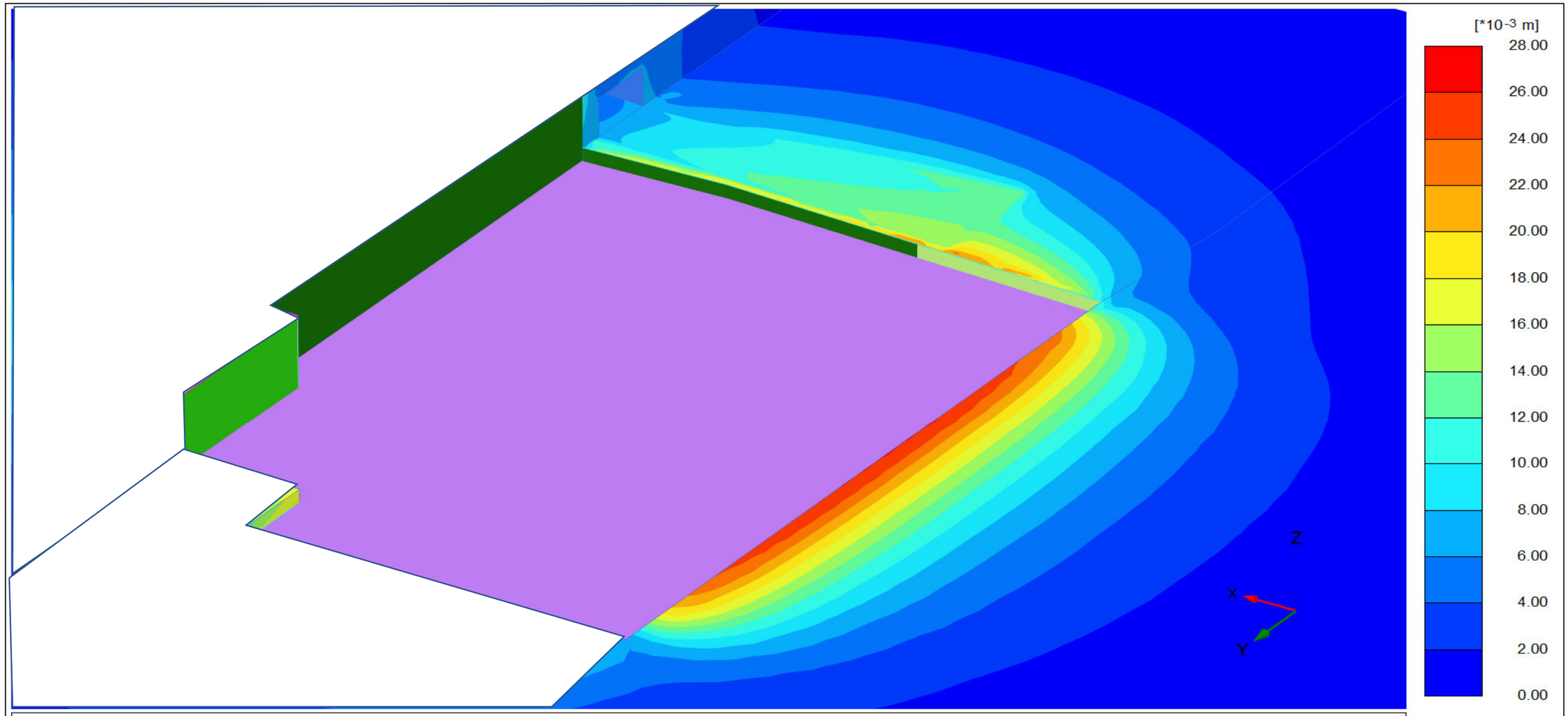
Total displacements u_y

Maximum value = 0.02157 m (Element 20292 at Node 18445)

Minimum value = -0.02399 m (Element 29009 at Node 14448)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 13 - Stage BEL)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M60
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

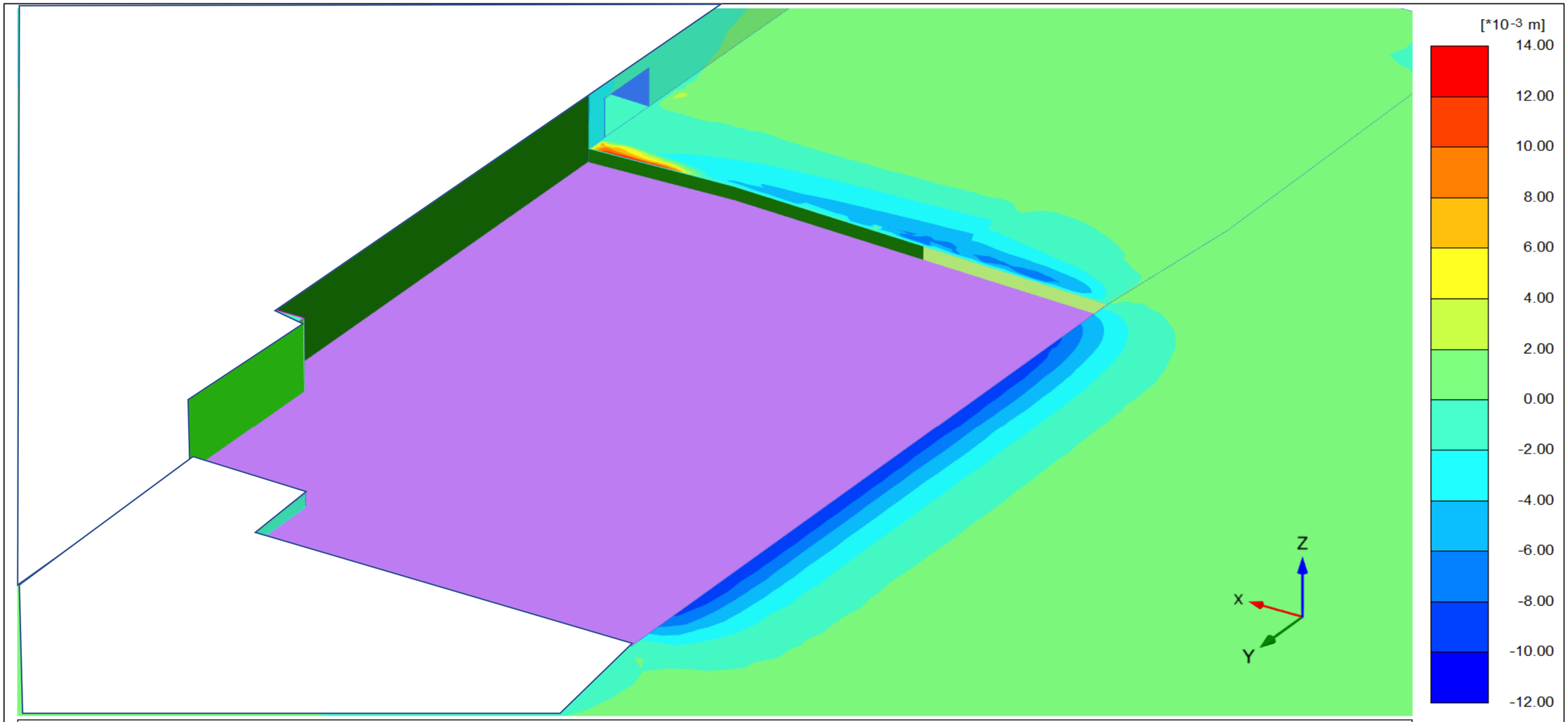


Total displacements |u|

Maximum value = 0.03272 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 16 - Anchors Decommissioned)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M61
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



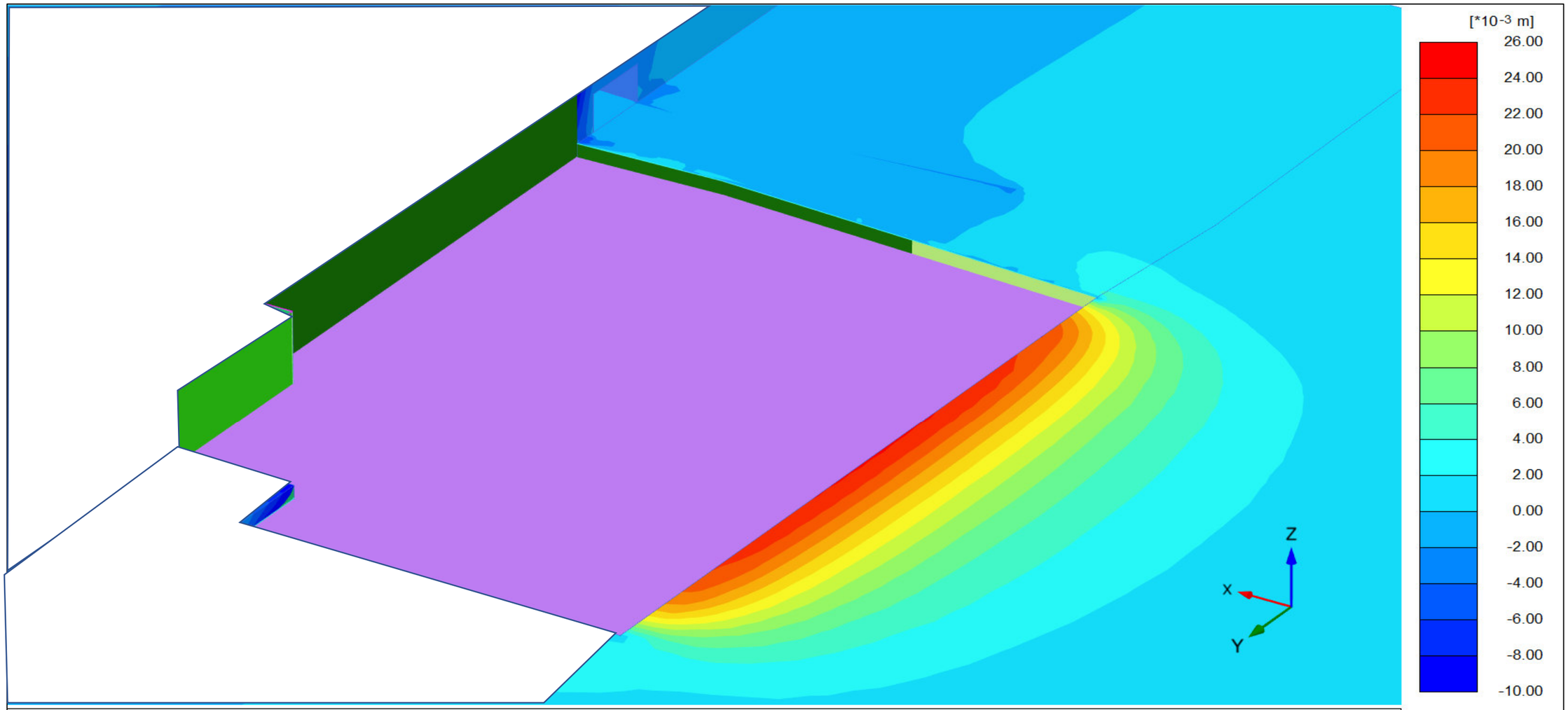
Total displacements u_z

Maximum value = 0.01389 m (Element 22540 at Node 18297)

Minimum value = -0.01032 m (Element 27272 at Node 14615)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Vertical Displacement Contours - Model 2 (Stage 16 - Anchors Decommissioned)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M62
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



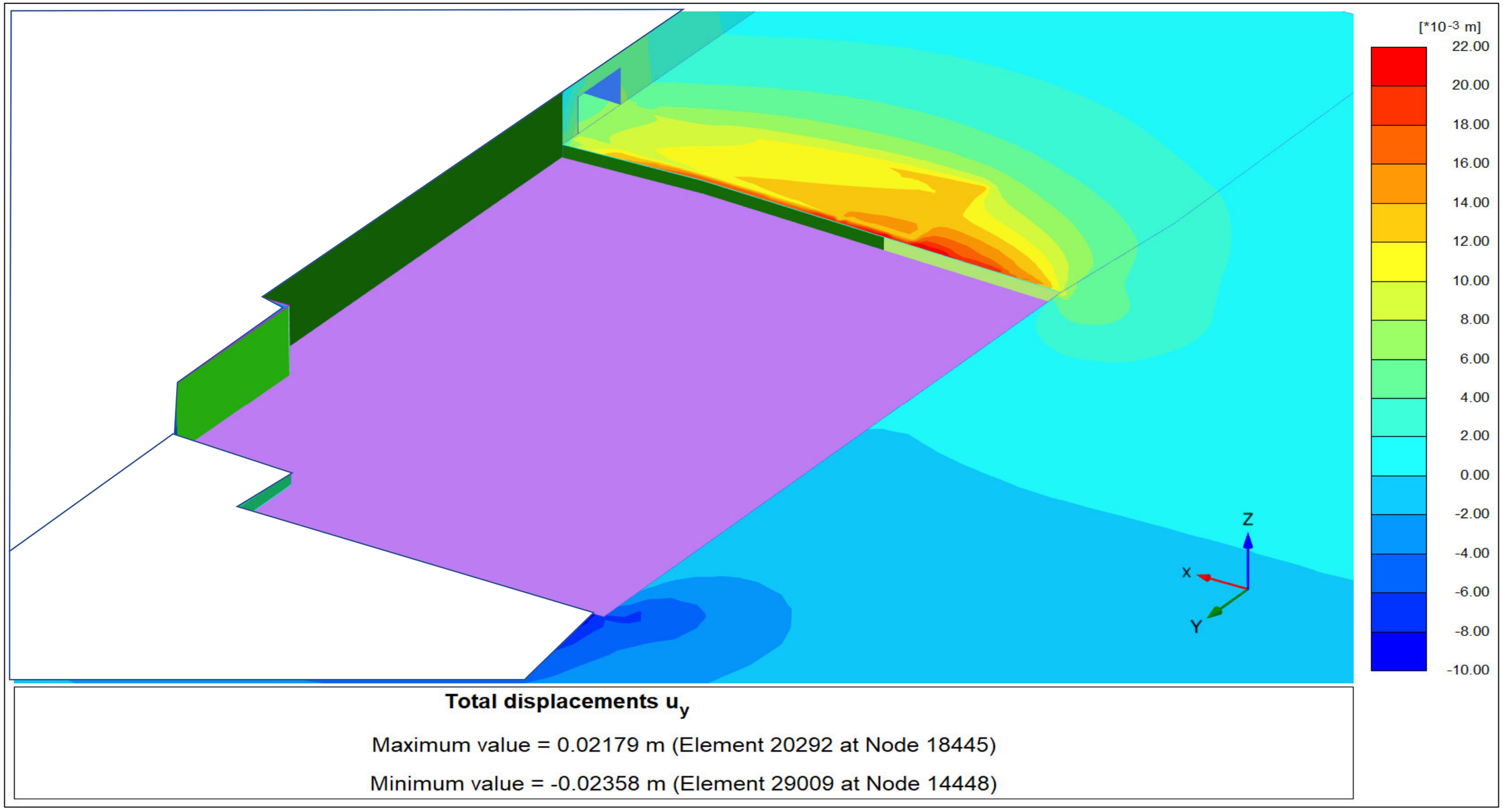
Total displacements u_x

Maximum value = 0.02431 m (Element 27989 at Node 14506)

Minimum value = -0.03268 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 2 (Stage 16 - Anchors Decommissioned)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M63
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

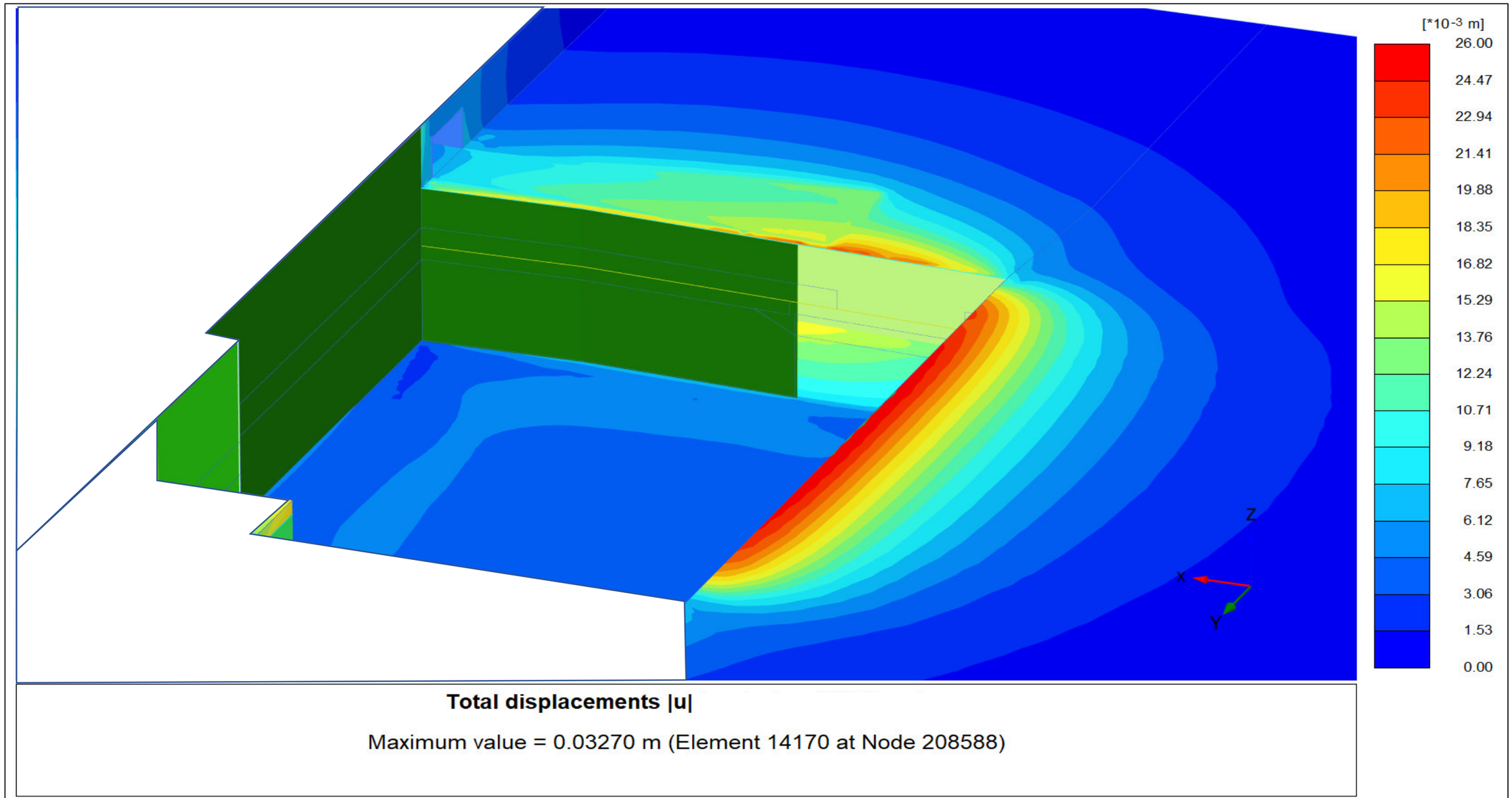


Total displacements u_y

Maximum value = 0.02179 m (Element 20292 at Node 18445)

Minimum value = -0.02358 m (Element 29009 at Node 14448)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 16 - Anchors Decommissioned)** **Geotechnical Analysis, Proposed Commercial Development** **8-10 Lee Street, Haymarket**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH		DRAWING No: M64
	SCALE: As Shown	DATE: 14/02/2022		REVISION: Rev0



Douglas Partners
Geotechnics / Environment / Groundwater

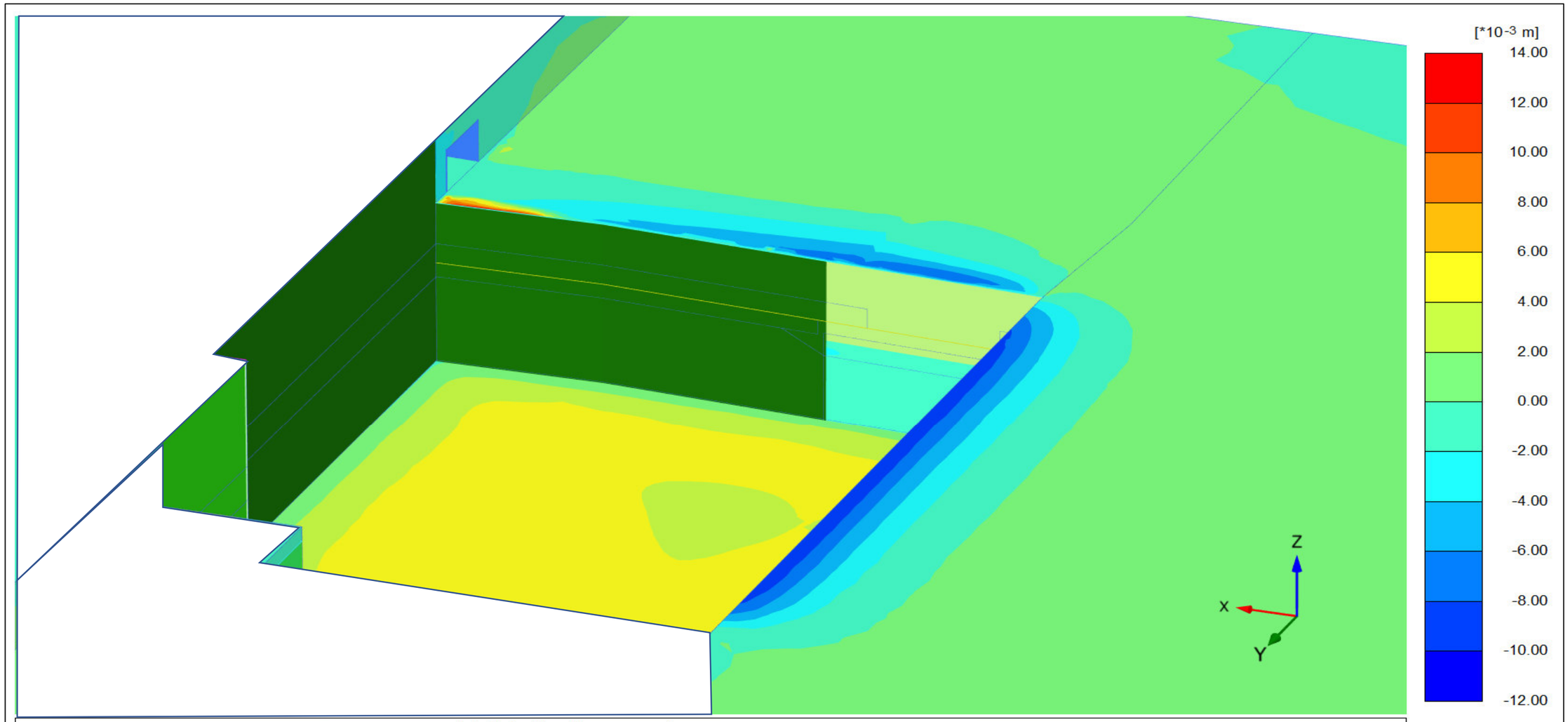
CLIENT:	Built Obayashi Joint Venture (BOJV)		
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

TITLE: **Total Displacement Contours - Model 2 (Stage 17 - Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone)**

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M65
REVISION:	Rev0



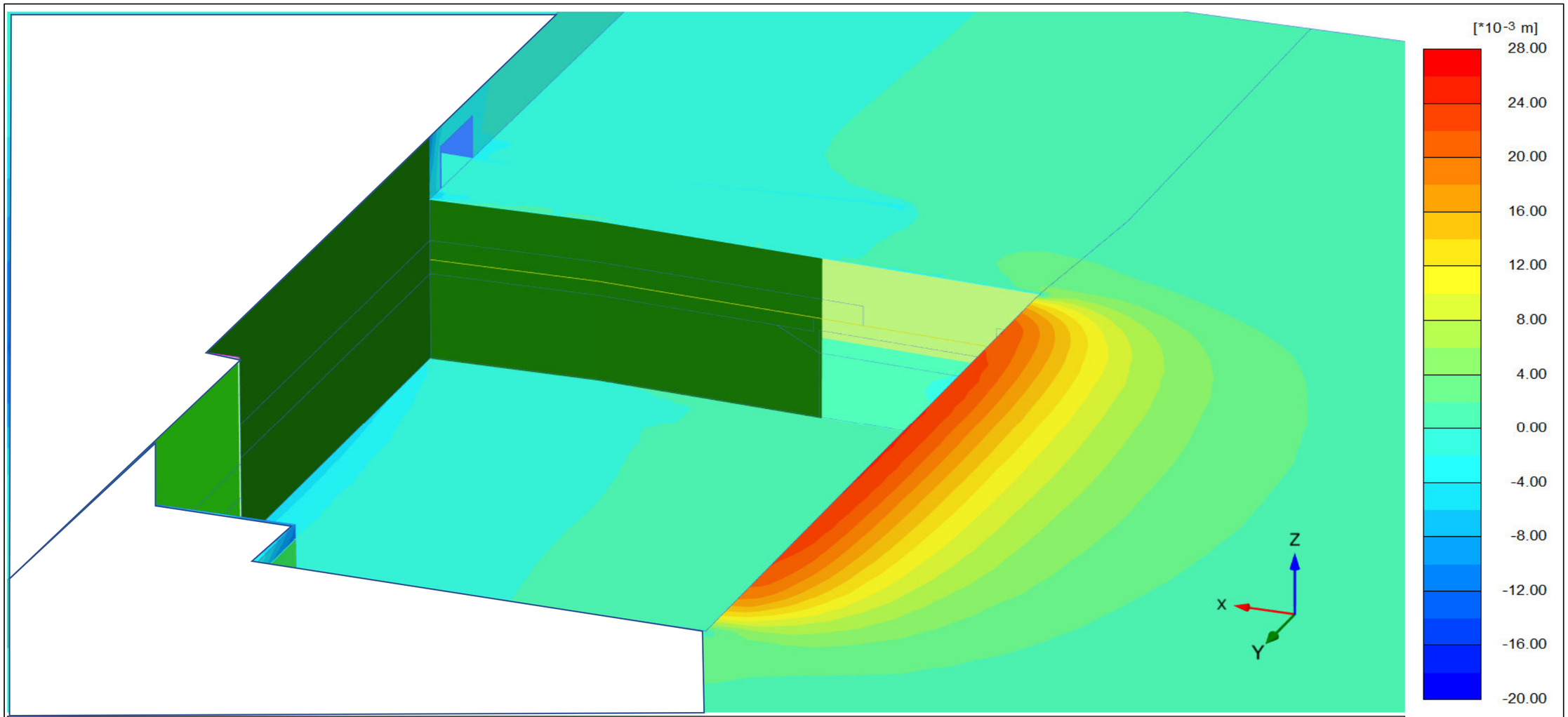
Total displacements u_z

Maximum value = 0.01390 m (Element 22540 at Node 18297)

Minimum value = -0.01032 m (Element 27272 at Node 14615)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 2 (Stage 17 - Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M66
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



Total displacements u_x (

Maximum value = 0.02431 m (Element 27989 at Node 14506)

Minimum value = -0.03266 m (Element 14170 at Node 208588)

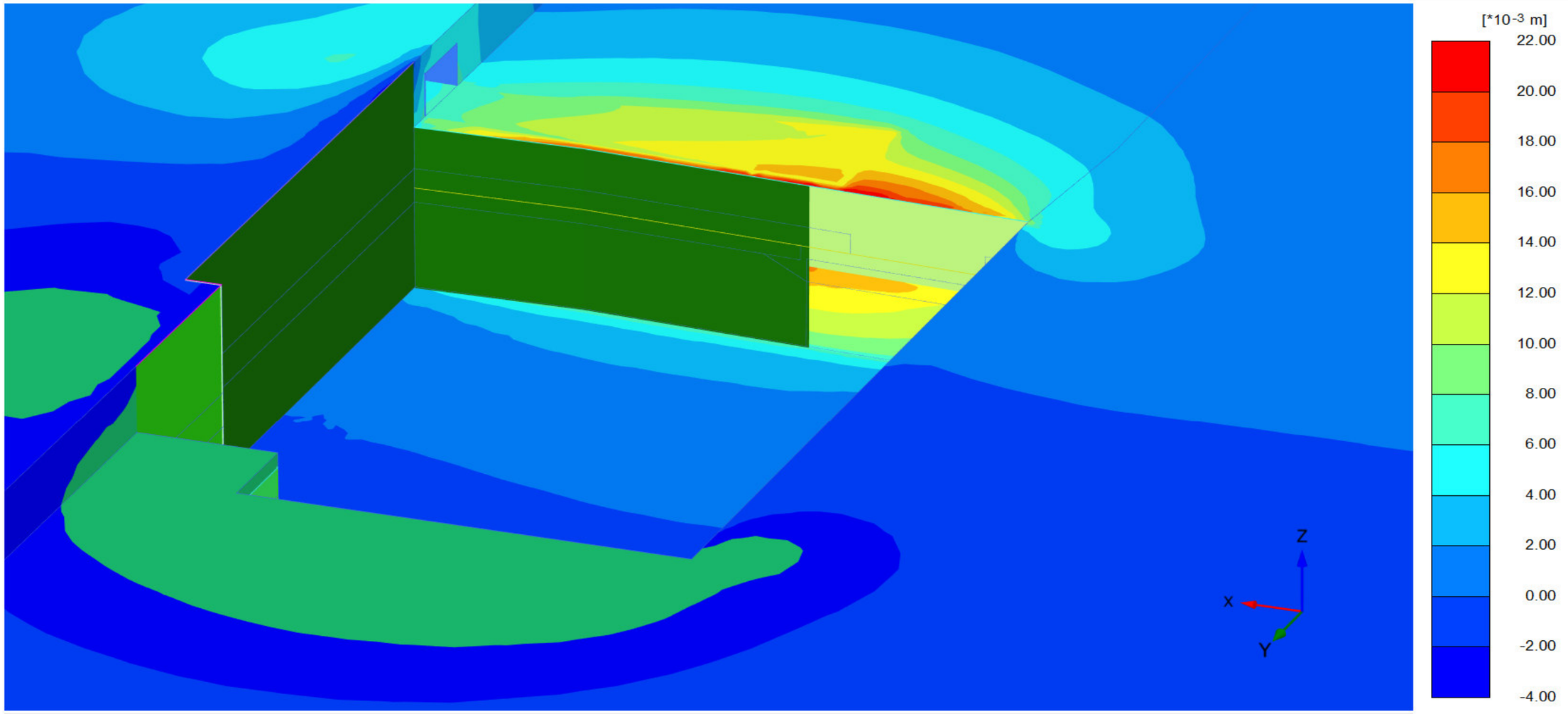
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Horizontal Displacement Contours in East West Direction - Model 2 (Stage 17 - Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M67
REVISION:	Rev0

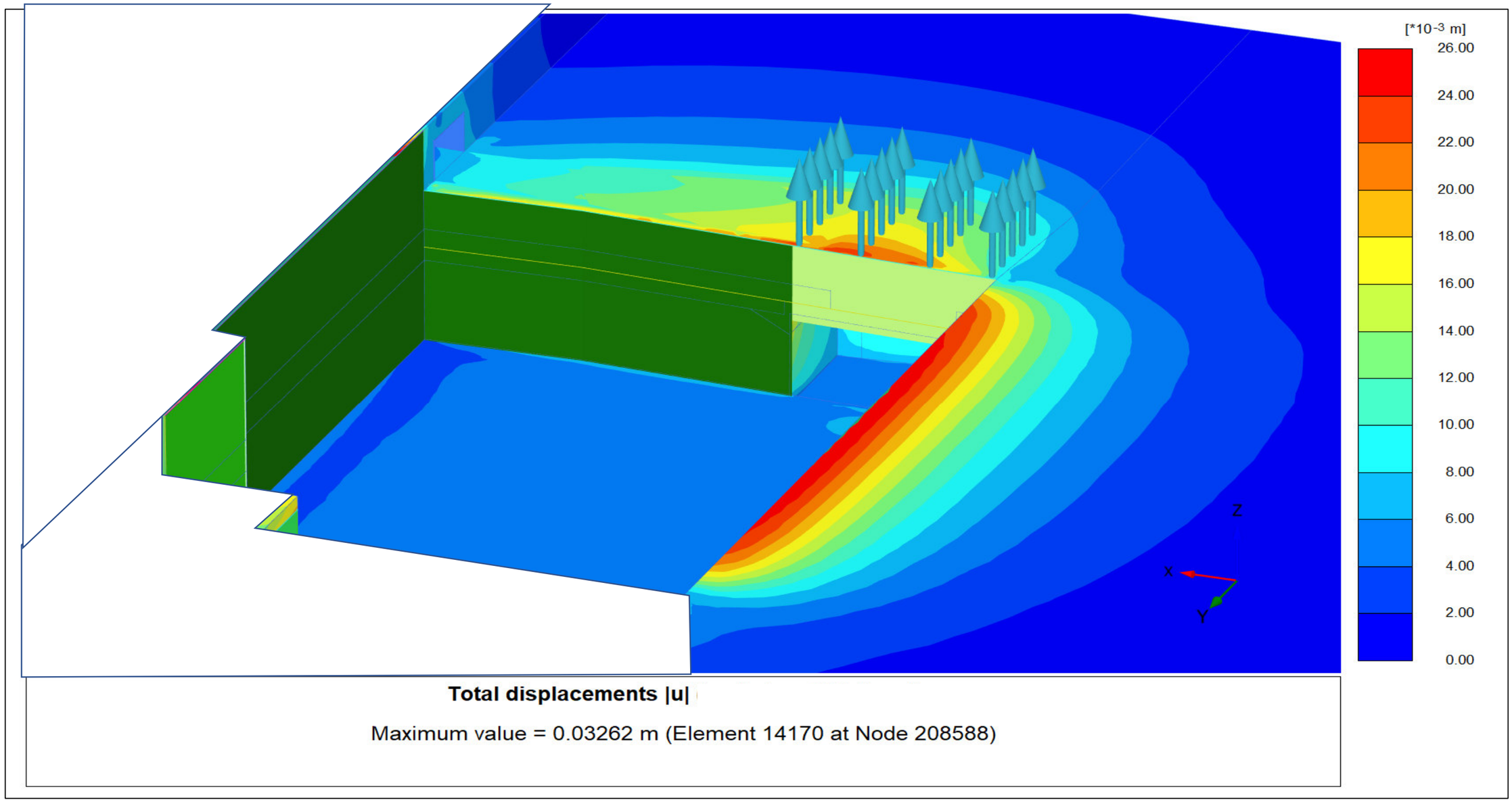


Total displacements u_y

Maximum value = 0.02192 m (Element 20292 at Node 18445)

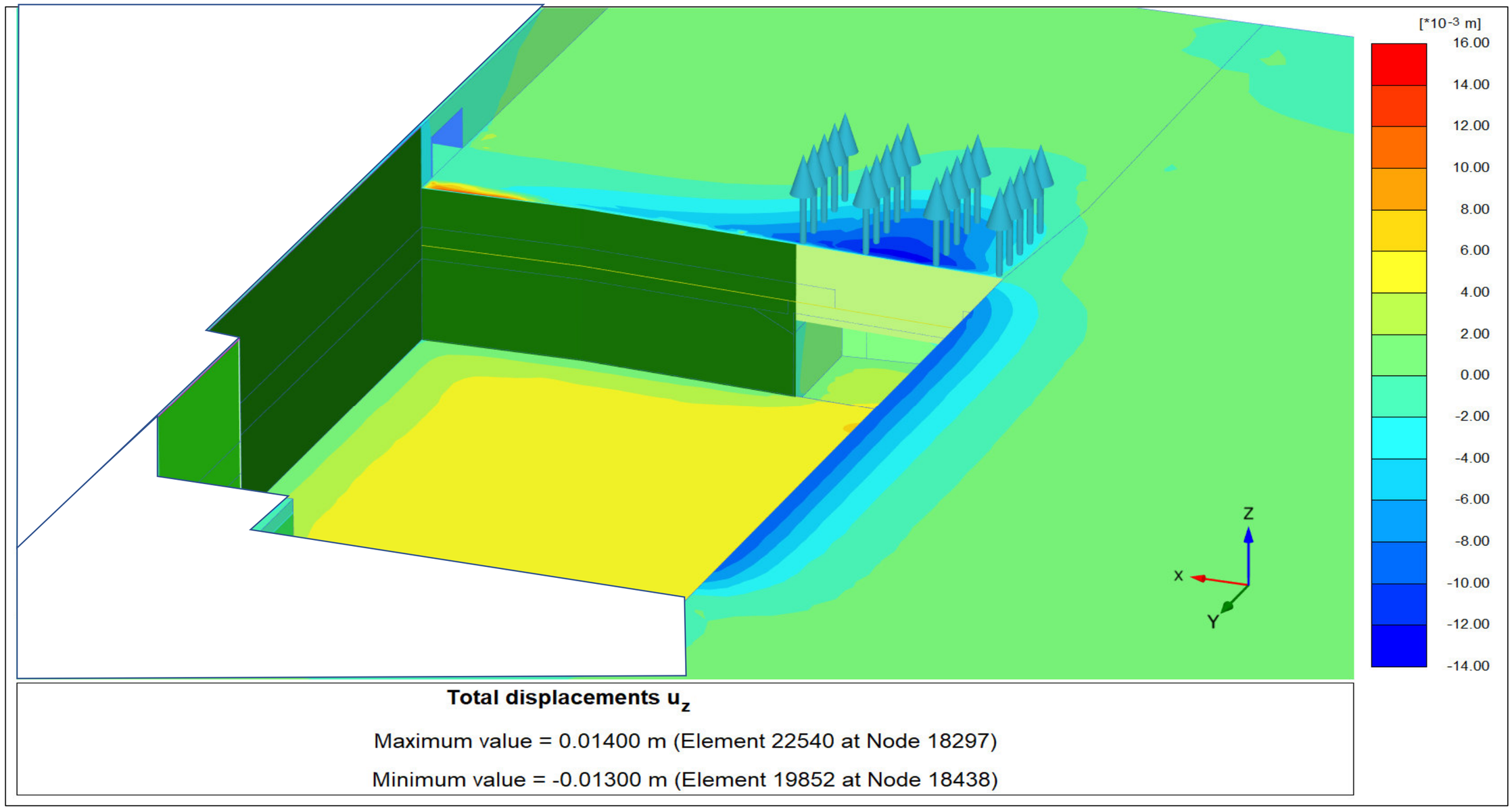
Minimum value = -0.02355 m (Element 29009 at Node 14448)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 17 - Remove the lower part of southern shoring wall that is in front of link tunnel excavation zone)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M68	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 28 - 6th (last) Tunnel excavation advance)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M69
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



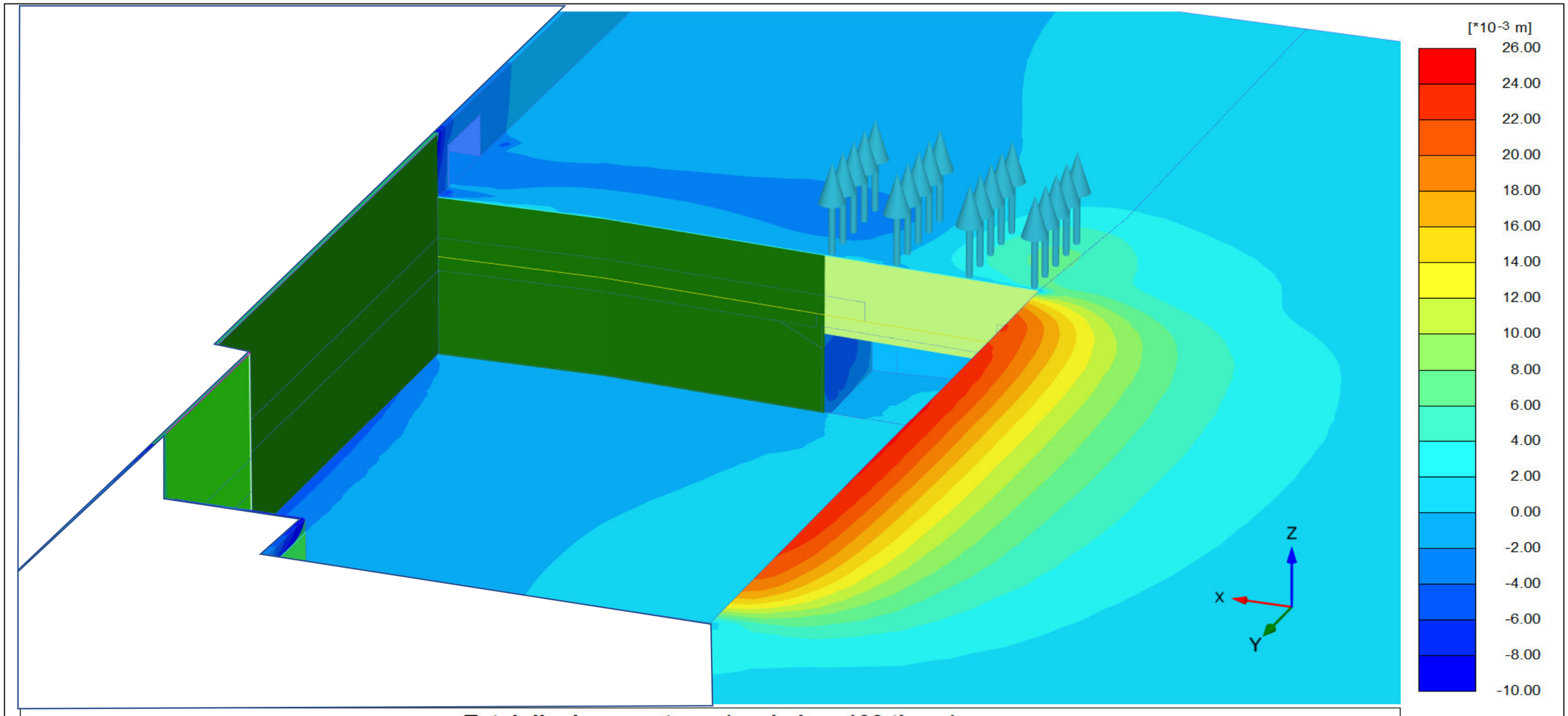
Total displacements u_z

Maximum value = 0.01400 m (Element 22540 at Node 18297)

Minimum value = -0.01300 m (Element 19852 at Node 18438)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 2 (Stage 28 - 6th (last) Tunnel excavation advance)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M70
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



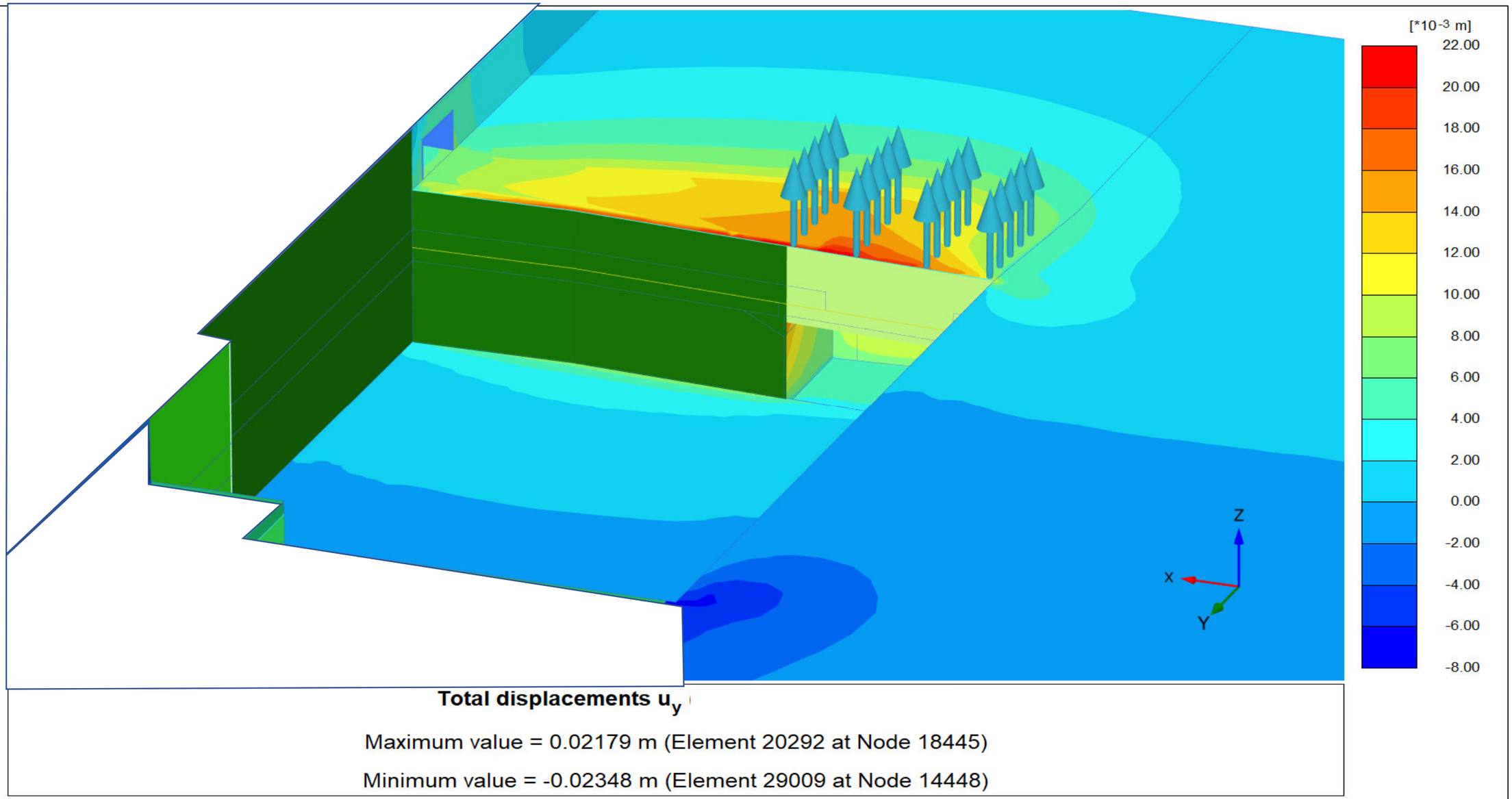
Total displacements u_x

Maximum value = 0.02436 m (Element 27989 at Node 14506)

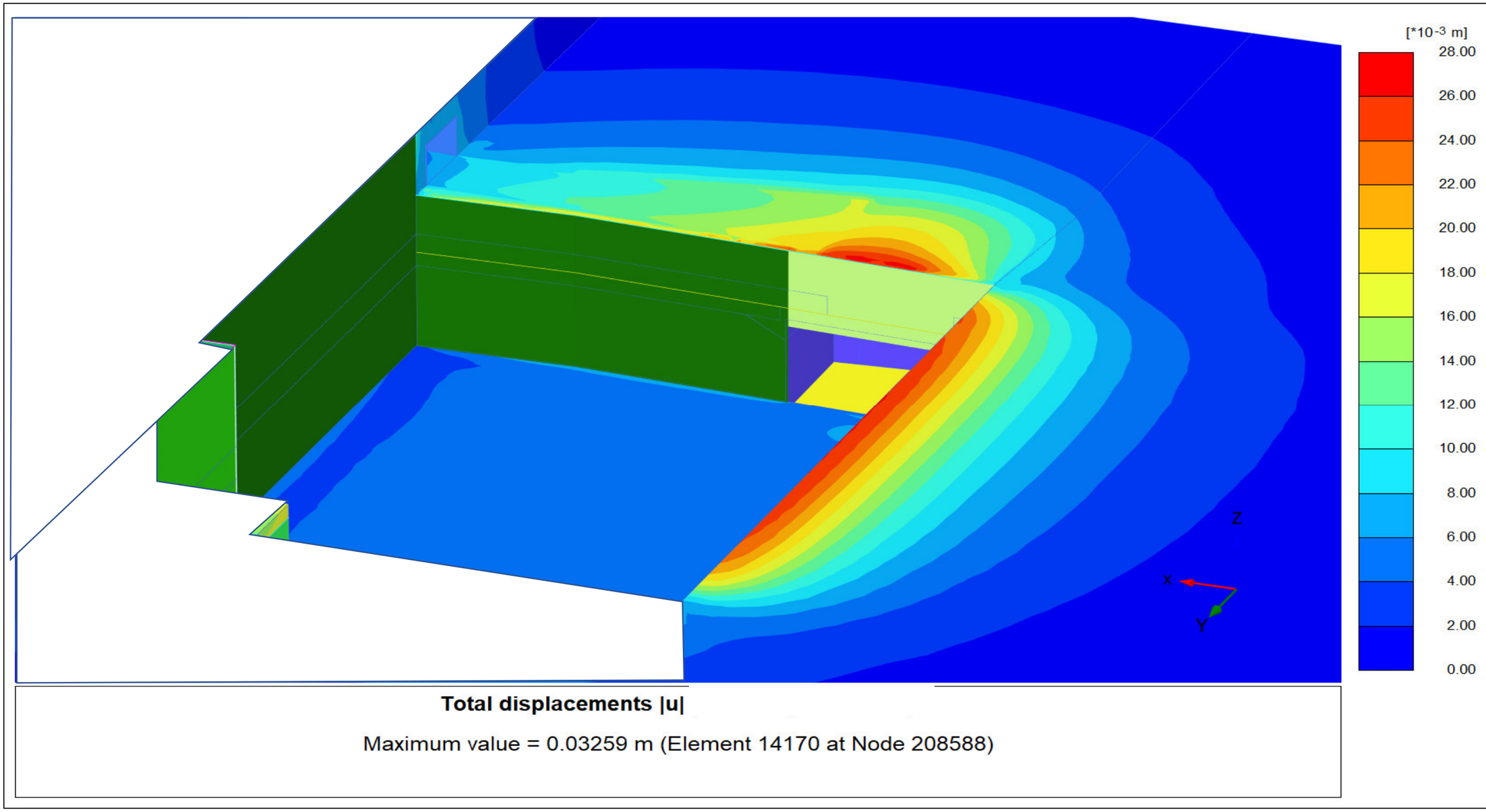
Minimum value = -0.03258 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 2 (Stage 28 - 6th (last) Tunnel excavation advance)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M71
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 28 - 6th (last) Tunnel excavation advance)**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M72
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

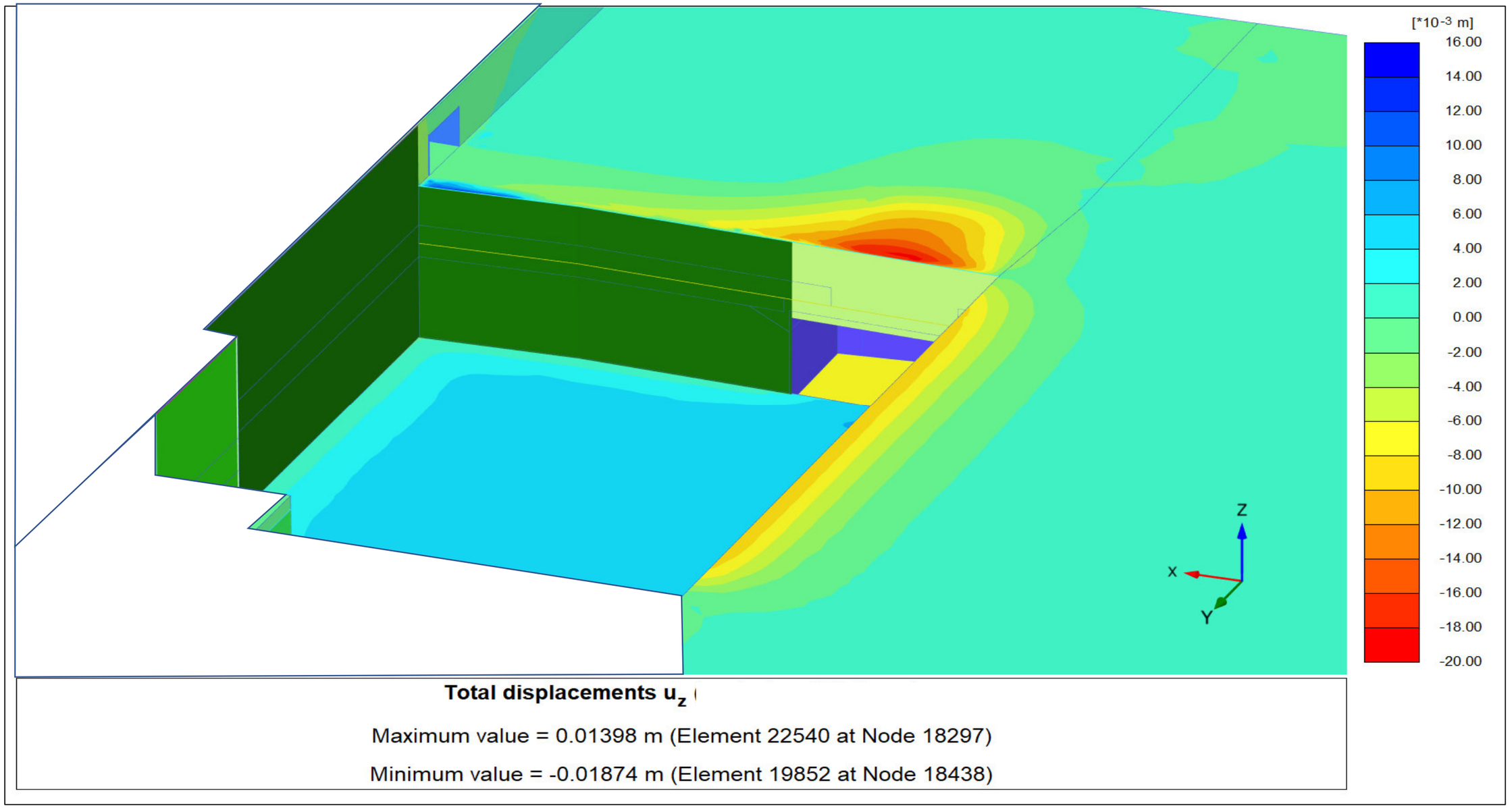


Total displacements |u|

Maximum value = 0.03259 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 30 - Remove Steel Set)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M73
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



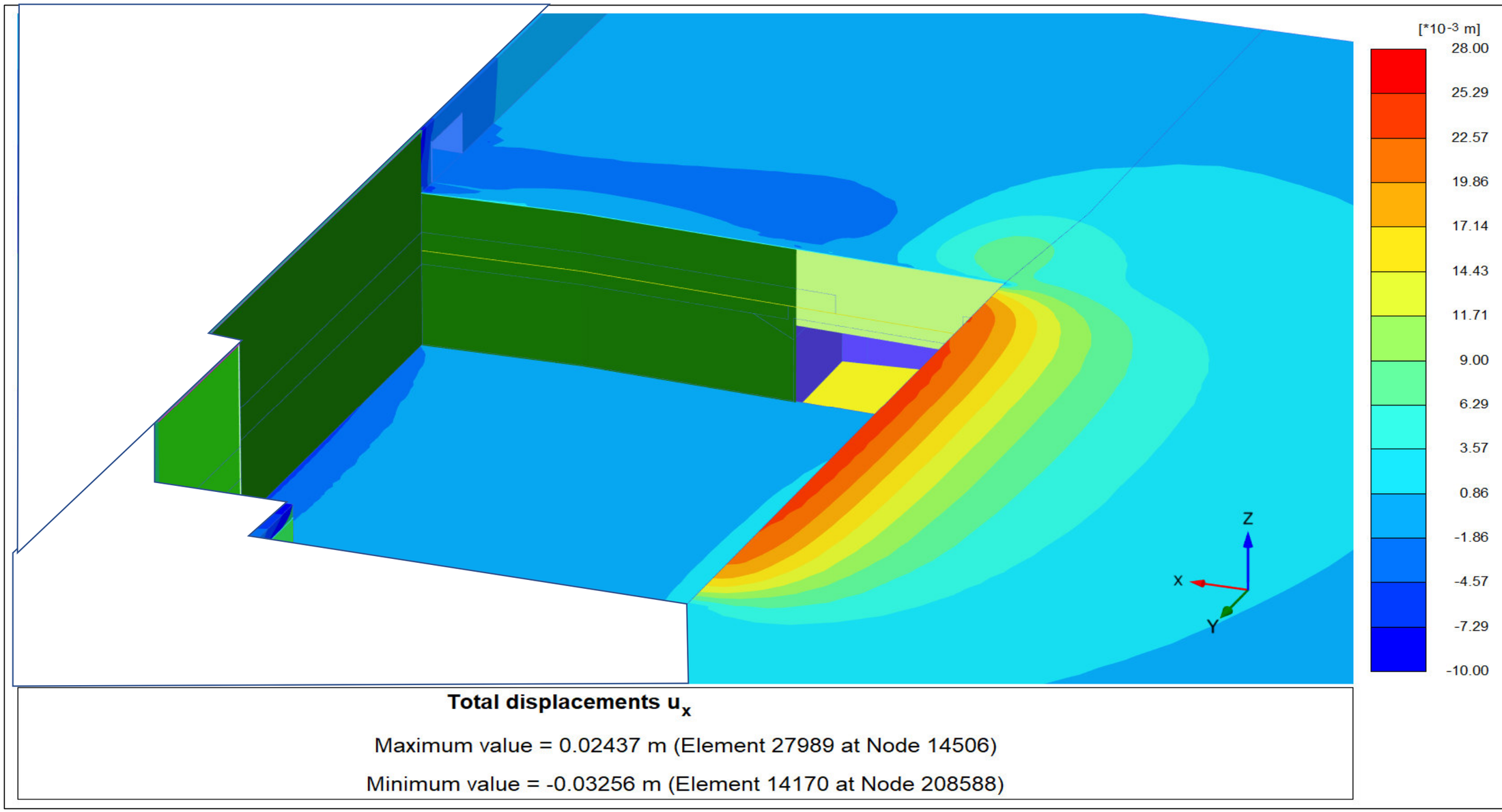
Total displacements u_z

Maximum value = 0.01398 m (Element 22540 at Node 18297)

Minimum value = -0.01874 m (Element 19852 at Node 18438)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 2 (Stage 30 - Remove Steel Set)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M74
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



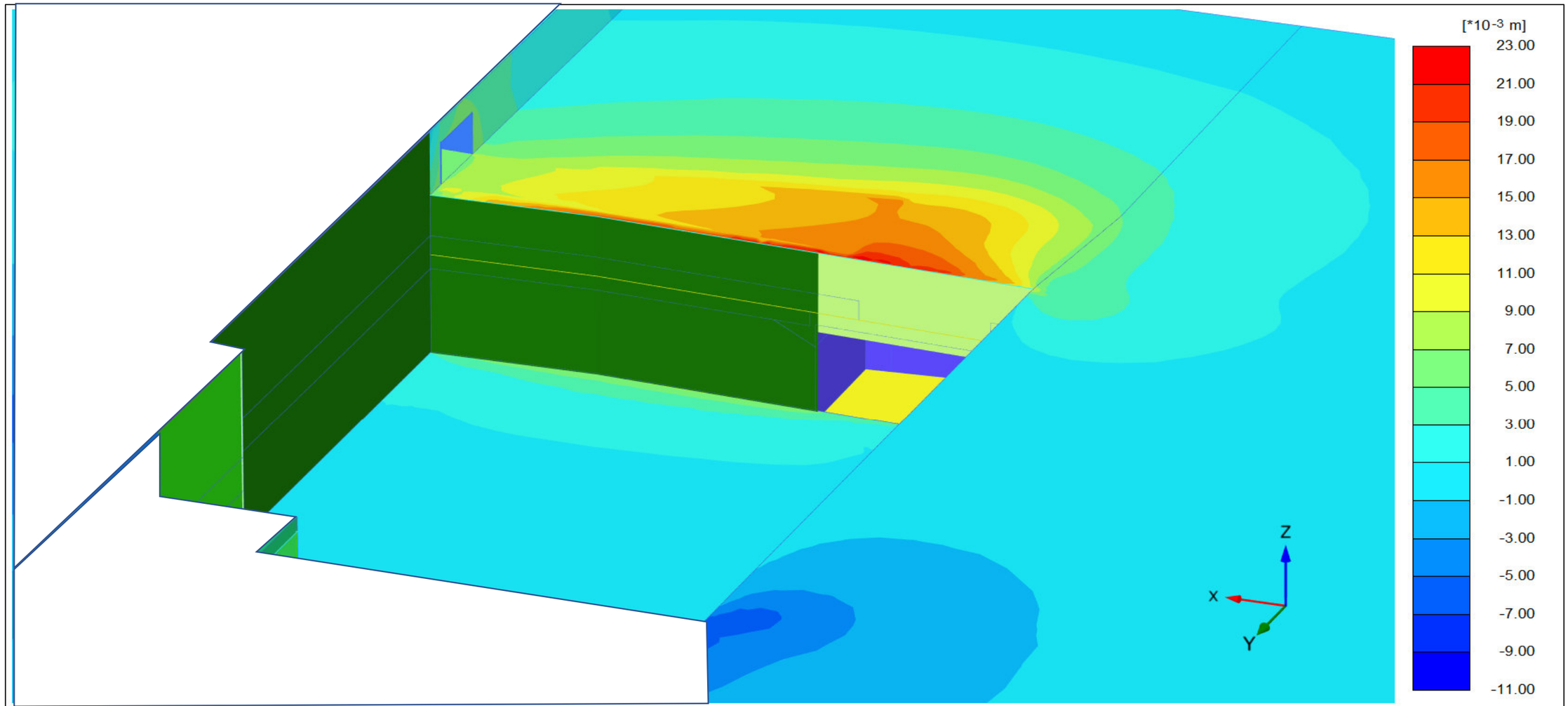
Total displacements u_x

Maximum value = 0.02437 m (Element 27989 at Node 14506)

Minimum value = -0.03256 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 2 (Stage 30 - Remove Steel Set)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M75
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0

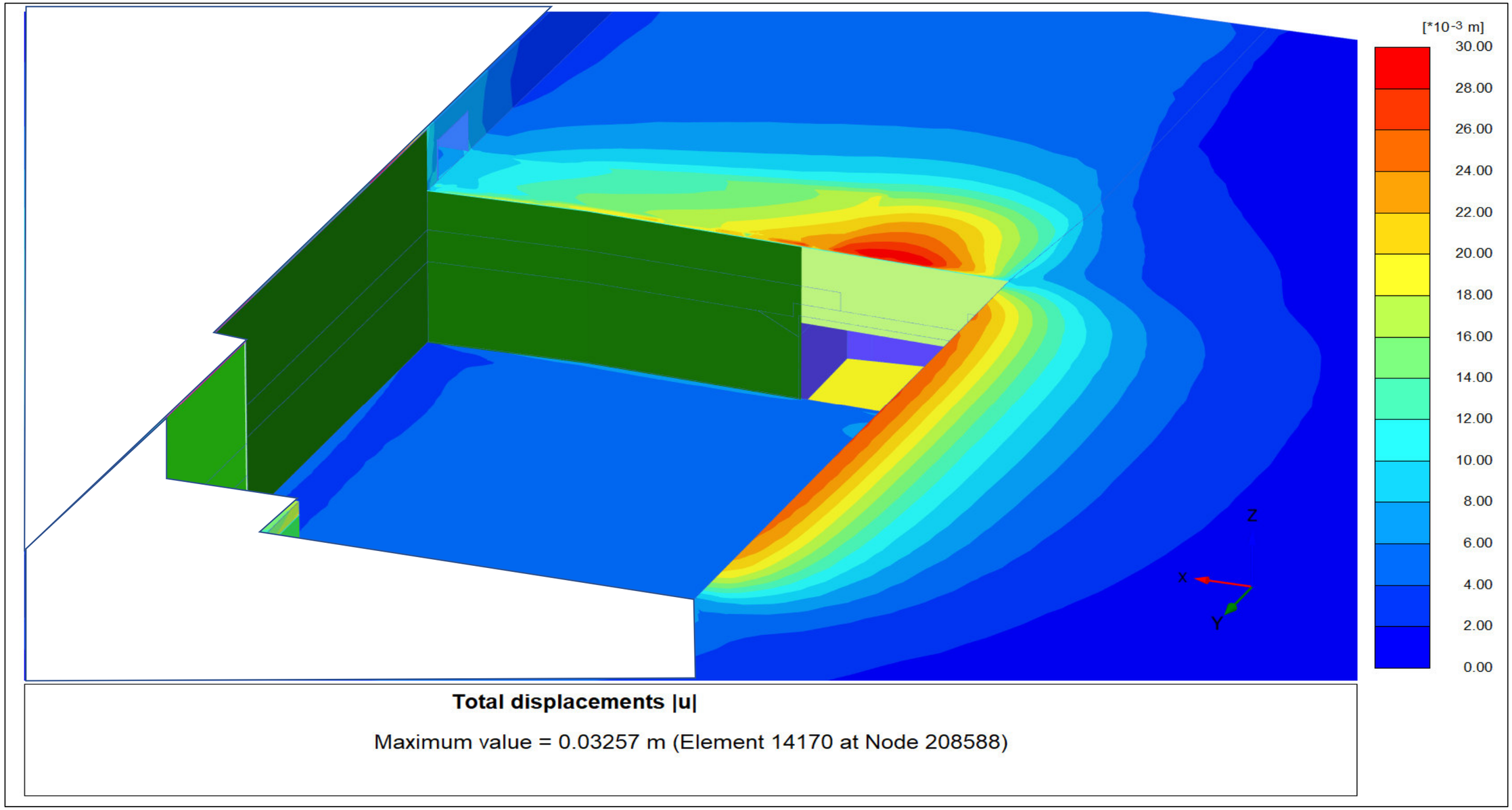


Total displacements u_y

Maximum value = 0.02230 m (Element 20292 at Node 18445)

Minimum value = -0.02344 m (Element 29009 at Node 14448)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 30 - Remove Steel Set)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M76	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	

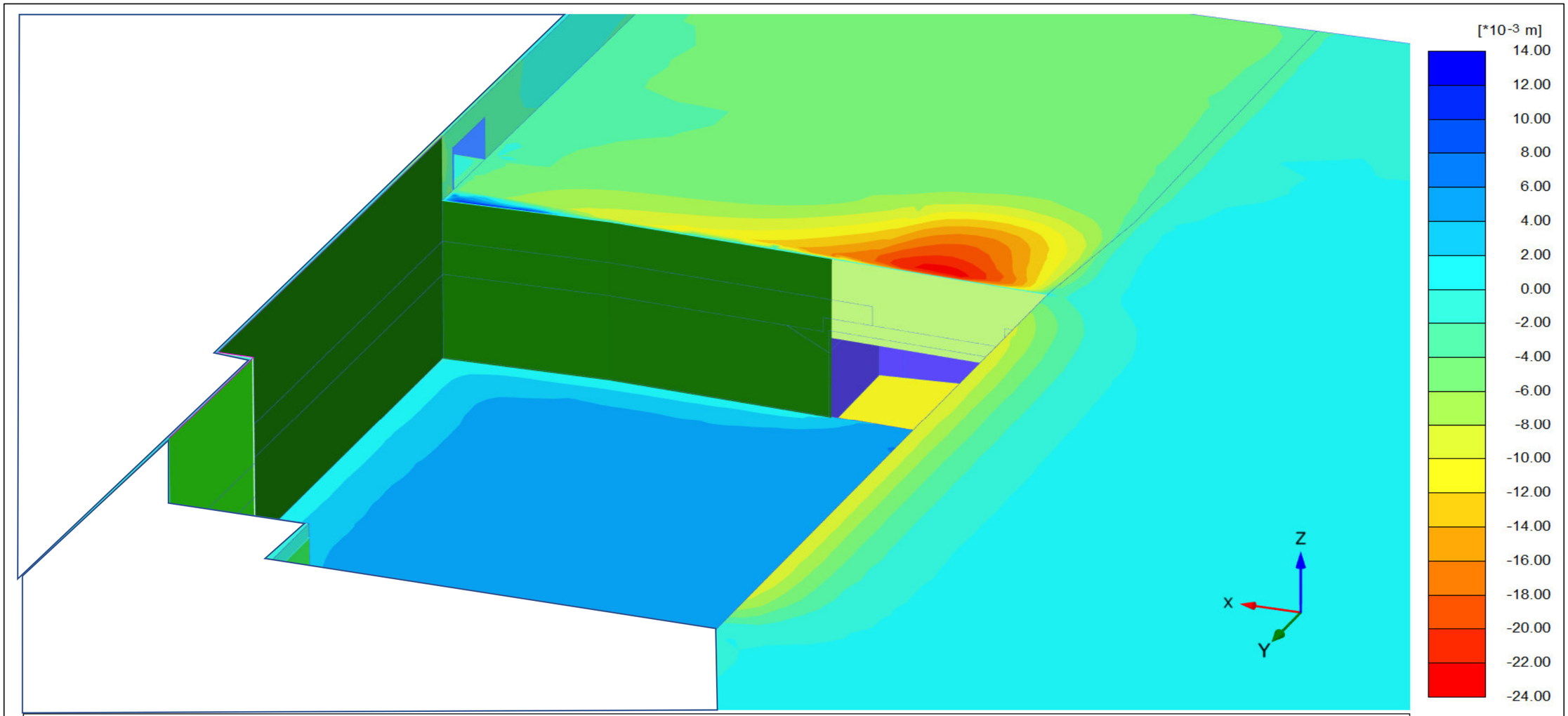


Total displacements |u|

Maximum value = 0.03257 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 31 - DST Protection Works)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M77
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements u_z

Maximum value = 0.01391 m (Element 22540 at Node 18297)

Minimum value = -0.02295 m (Element 19852 at Node 18438)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Vertical Displacement Contours - Model 2 (Stage 31 - DST Protection Works)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development
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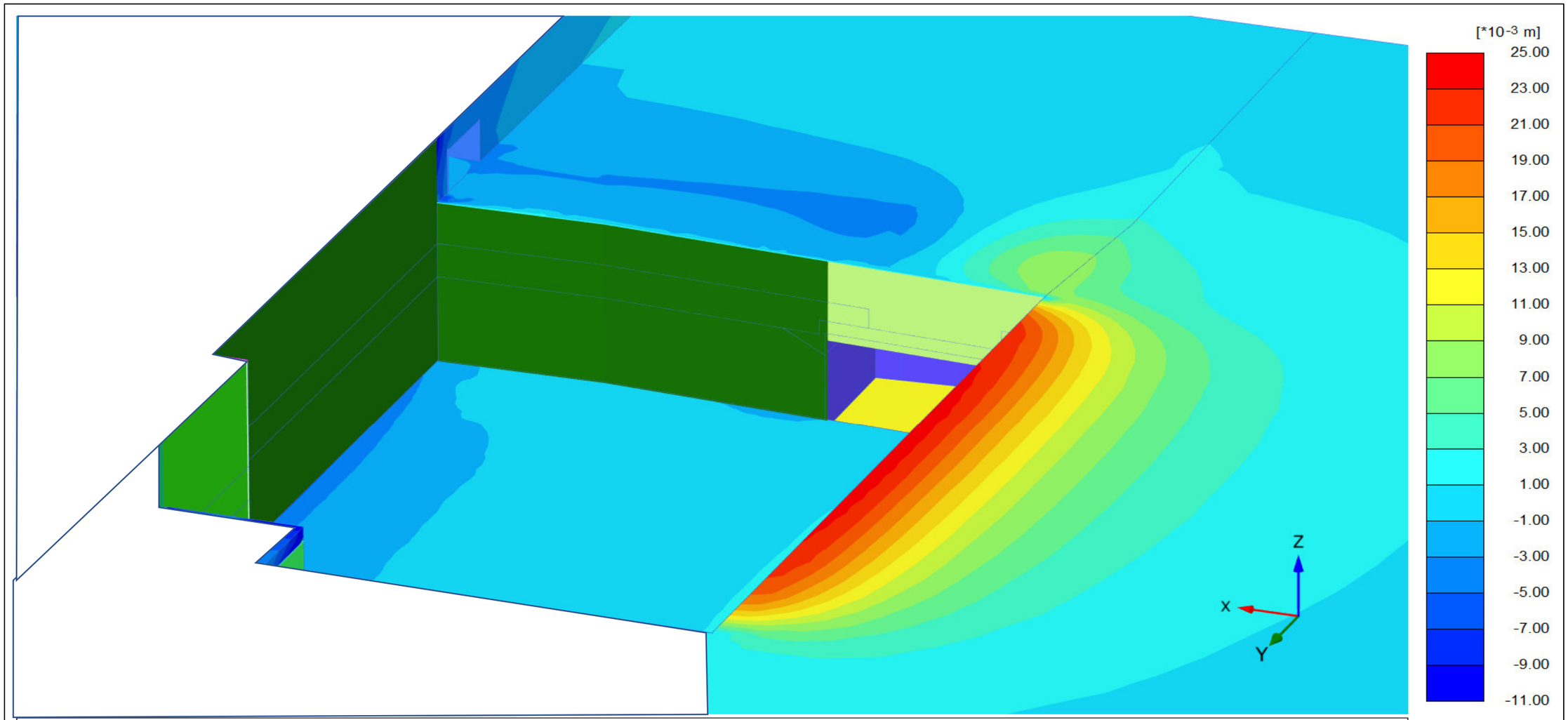
PROJECT No:	86767.04
DRAWING No:	M78
REVISION:	Rev0



Total displacements u_x

Maximum value = 0.02436 m (Element 27989 at Node 14506)

Minimum value = -0.03253 m (Element 14170 at Node 208588)

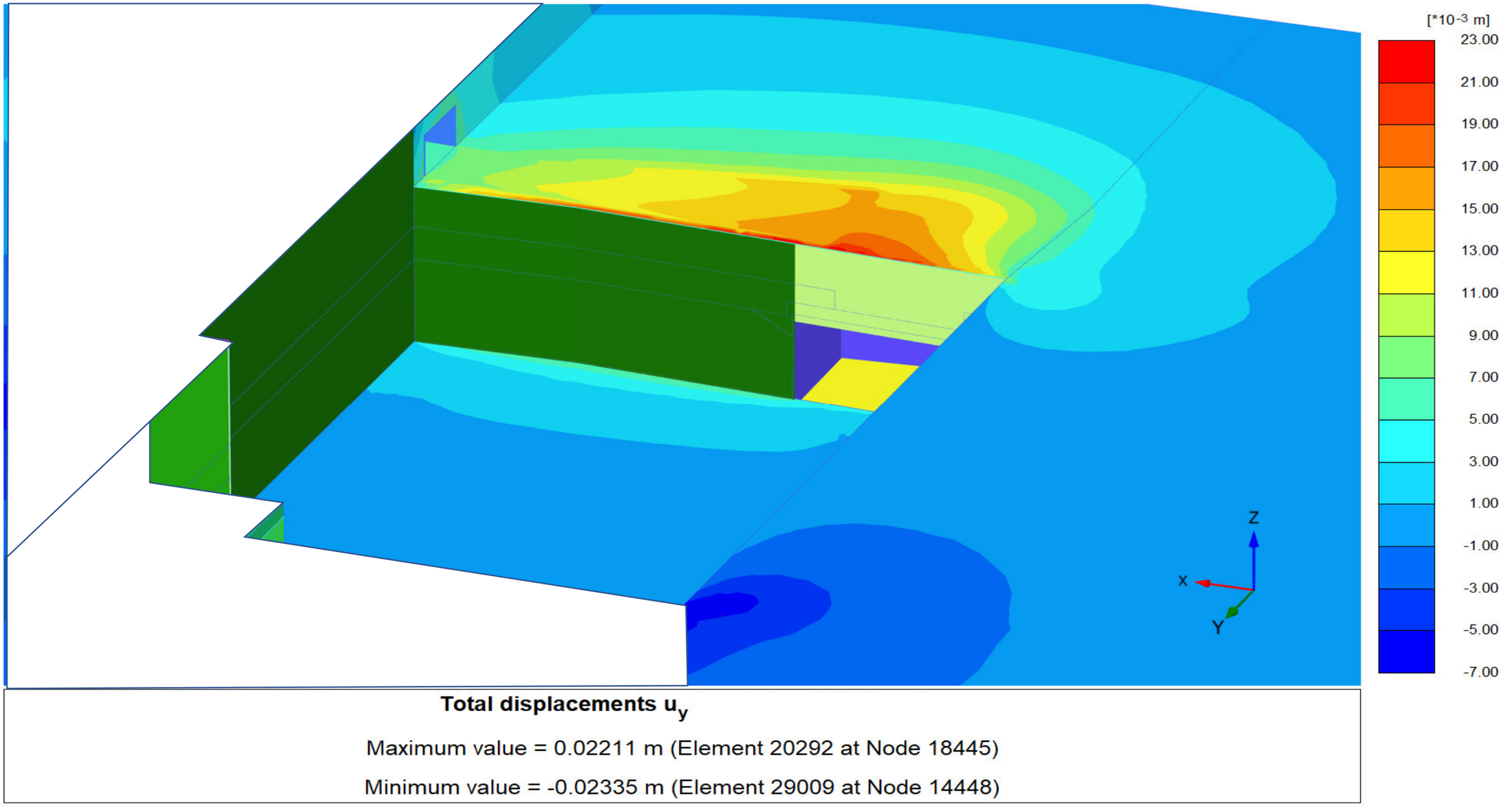
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	**Horizontal Displacement Contours in East West Direction - Model 2 (Stage 31 - DST Protection Works)**
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M79
REVISION:	Rev0



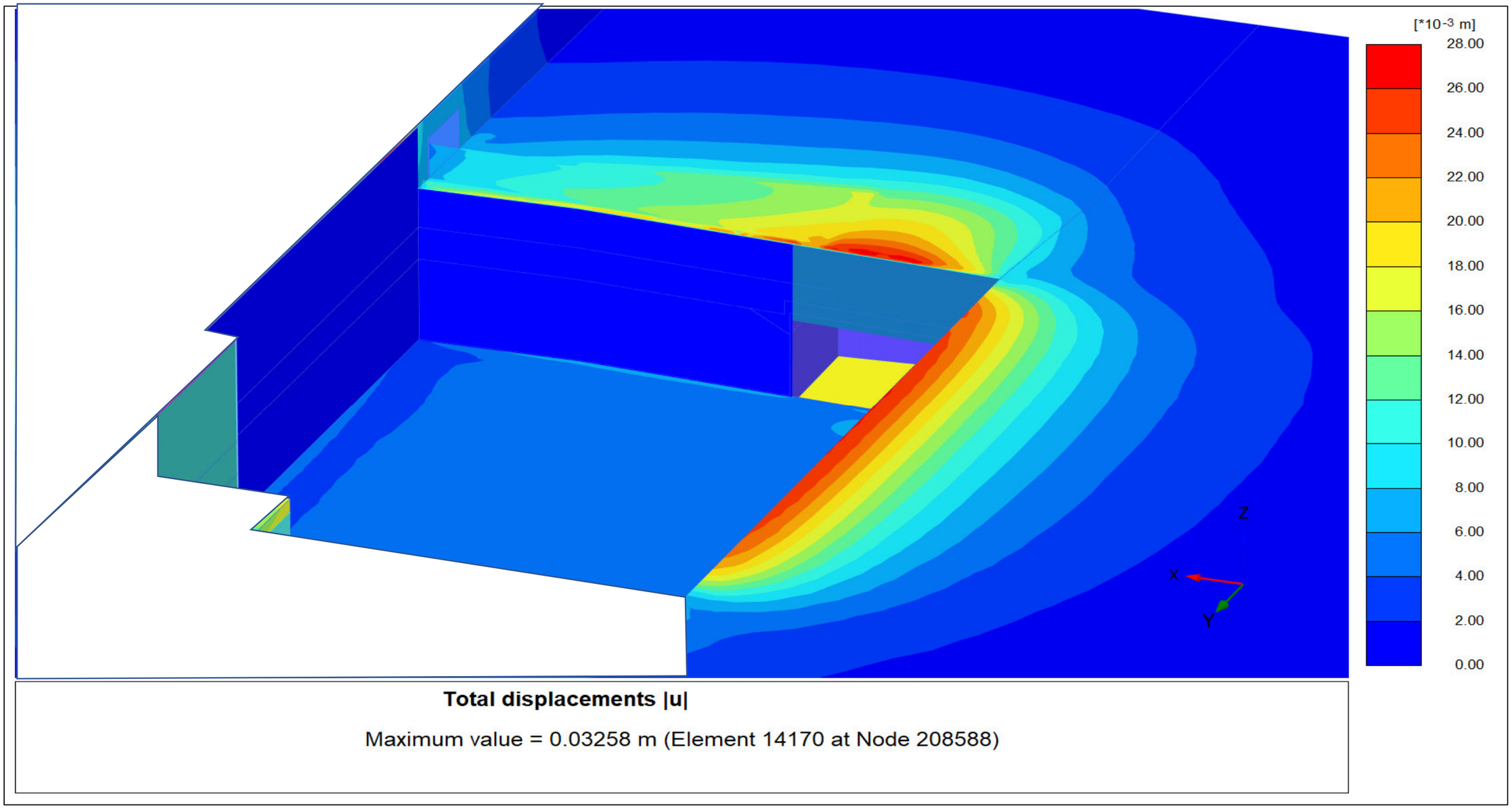
Total displacements u_y

Maximum value = 0.02211 m (Element 20292 at Node 18445)

Minimum value = -0.02335 m (Element 29009 at Node 14448)

Douglas Partners
Geotechnics / Environment / Groundwater

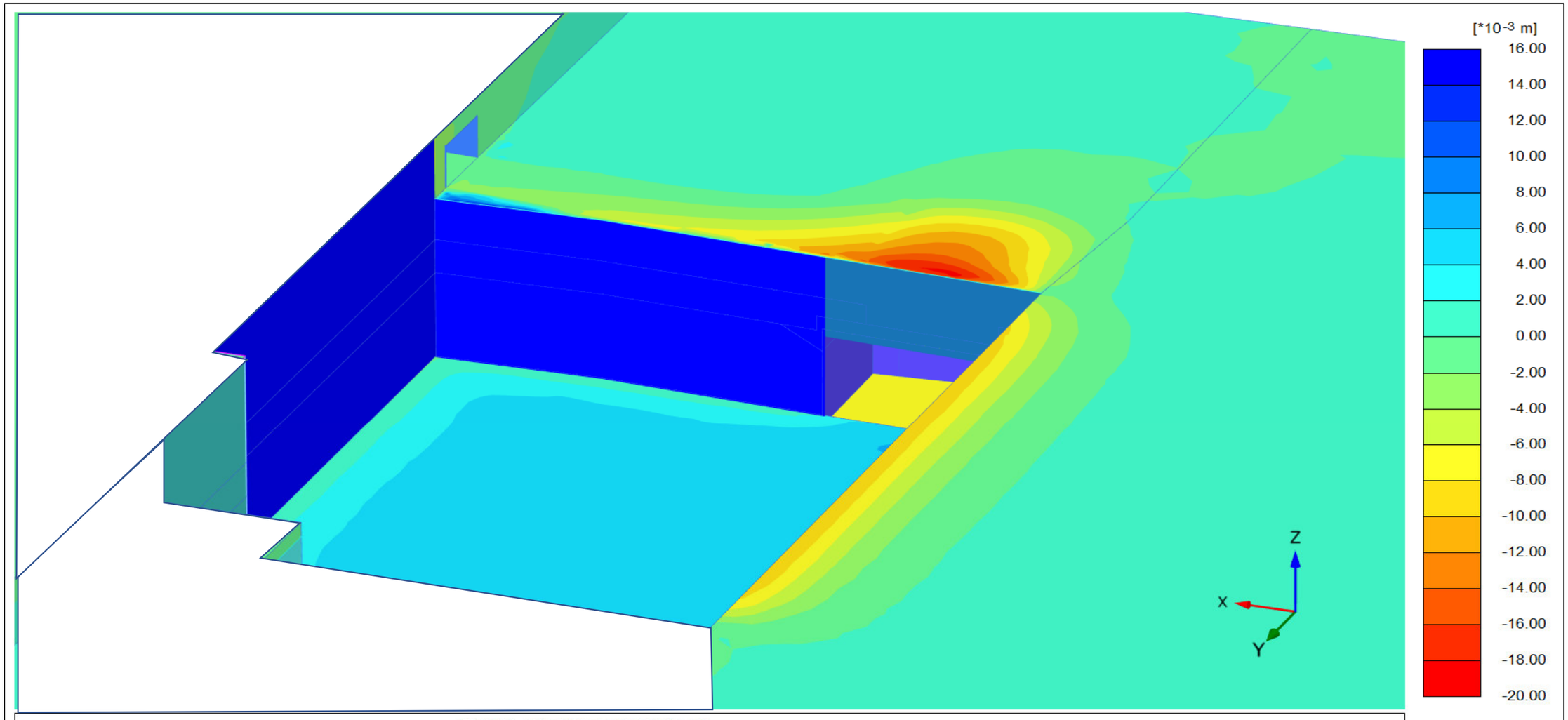
CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 31 - DST Protection Works)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M80
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

Maximum value = 0.03258 m (Element 14170 at Node 208588)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE:	**Total Displacement Contours - Model 2 (Stage 32 - Shoring Pile long term moduli and water table)**	PROJECT No: 86767.04
	OFFICE: Sydney	DRAWN BY: ZH		**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M81
	SCALE: As Shown	DATE: 14/02/2022		**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements u_z

Maximum value = 0.01399 m (Element 22540 at Node 18297)

Minimum value = -0.01876 m (Element 20323 at Node 100507)

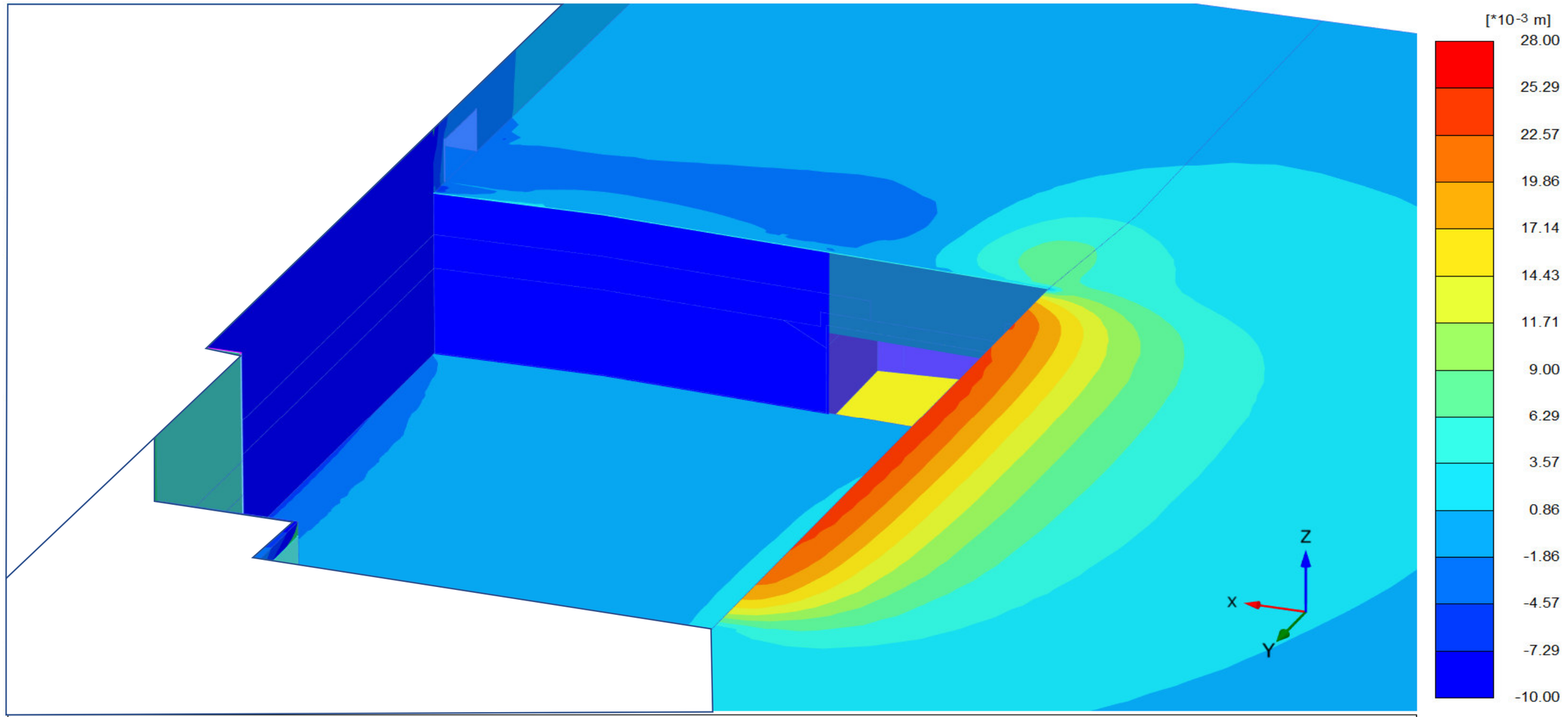
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Built Obayashi Joint Venture (BOJV)	TITLE:	Vertical Displacement Contours - Model 2 (Stage 32 - Shoring Pile long term moduli and water table)
OFFICE:	Sydney	DRAWN BY:	ZH
SCALE:	As Shown	DATE:	14/02/2022

Geotechnical Analysis, Proposed Commercial Development

8-10 Lee Street, Haymarket

PROJECT No:	86767.04
DRAWING No:	M82
REVISION:	Rev0

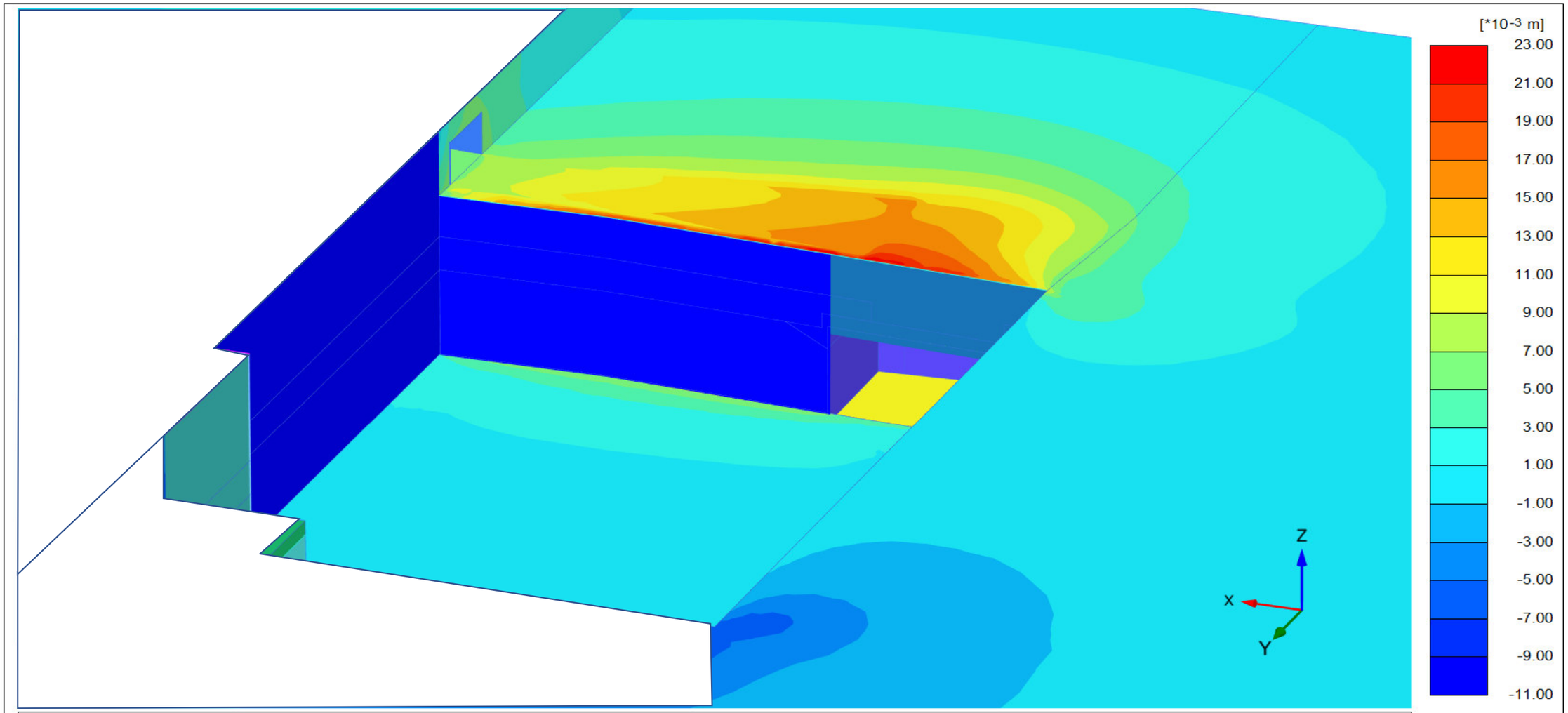


Total displacements u_x

Maximum value = 0.02437 m (Element 27989 at Node 14506)

Minimum value = -0.03255 m (Element 14170 at Node 208588)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 2 (Stage 32 - Shoring Pile long term moduli and water table)**	PROJECT No:	86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No:	M83
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION:	Rev0



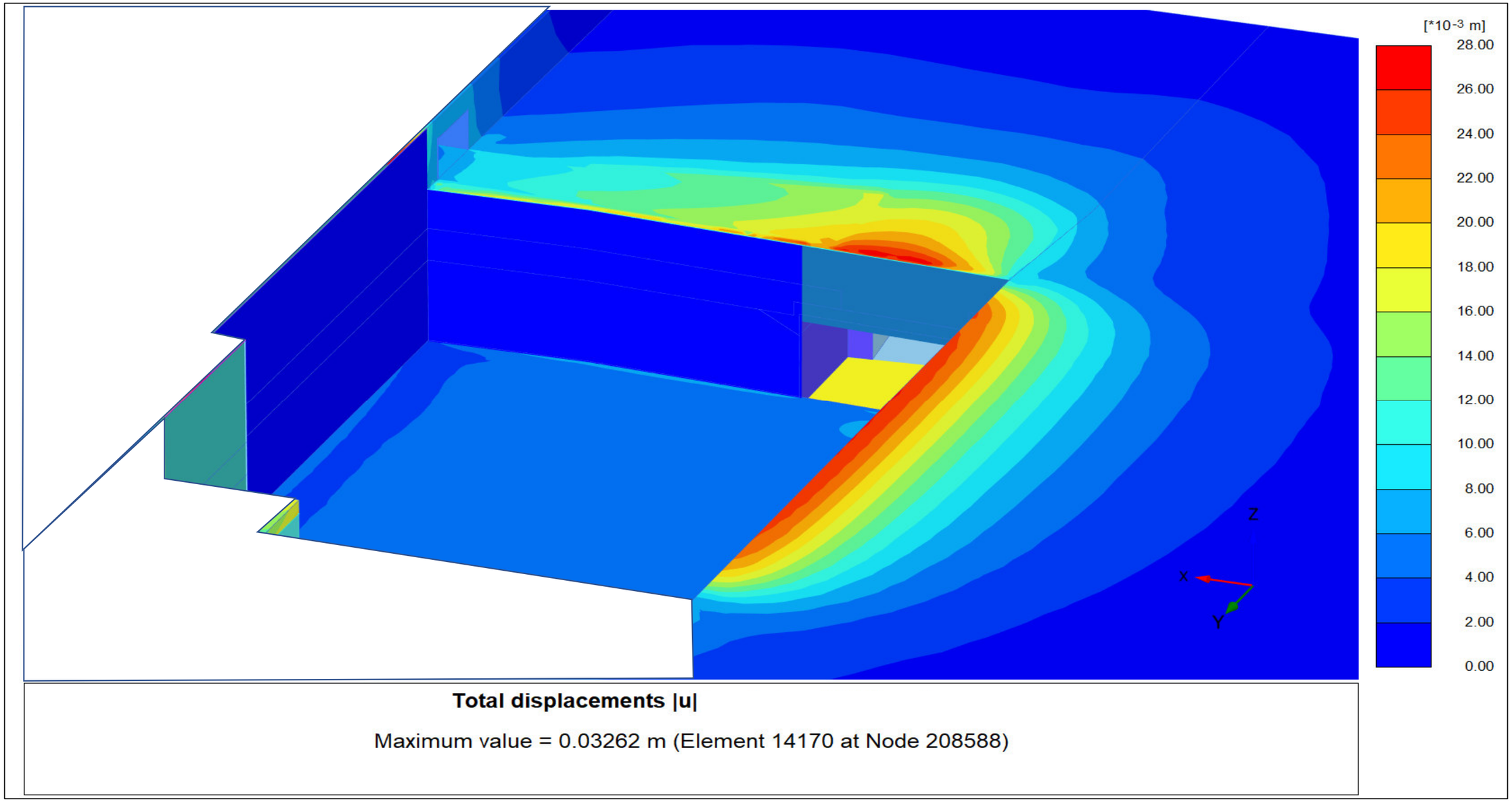
Total displacements u_y

Maximum value = 0.02252 m (Element 20292 at Node 18445)

Minimum value = -0.02341 m (Element 29009 at Node 14448)

Douglas Partners
Geotechnics / Environment / Groundwater

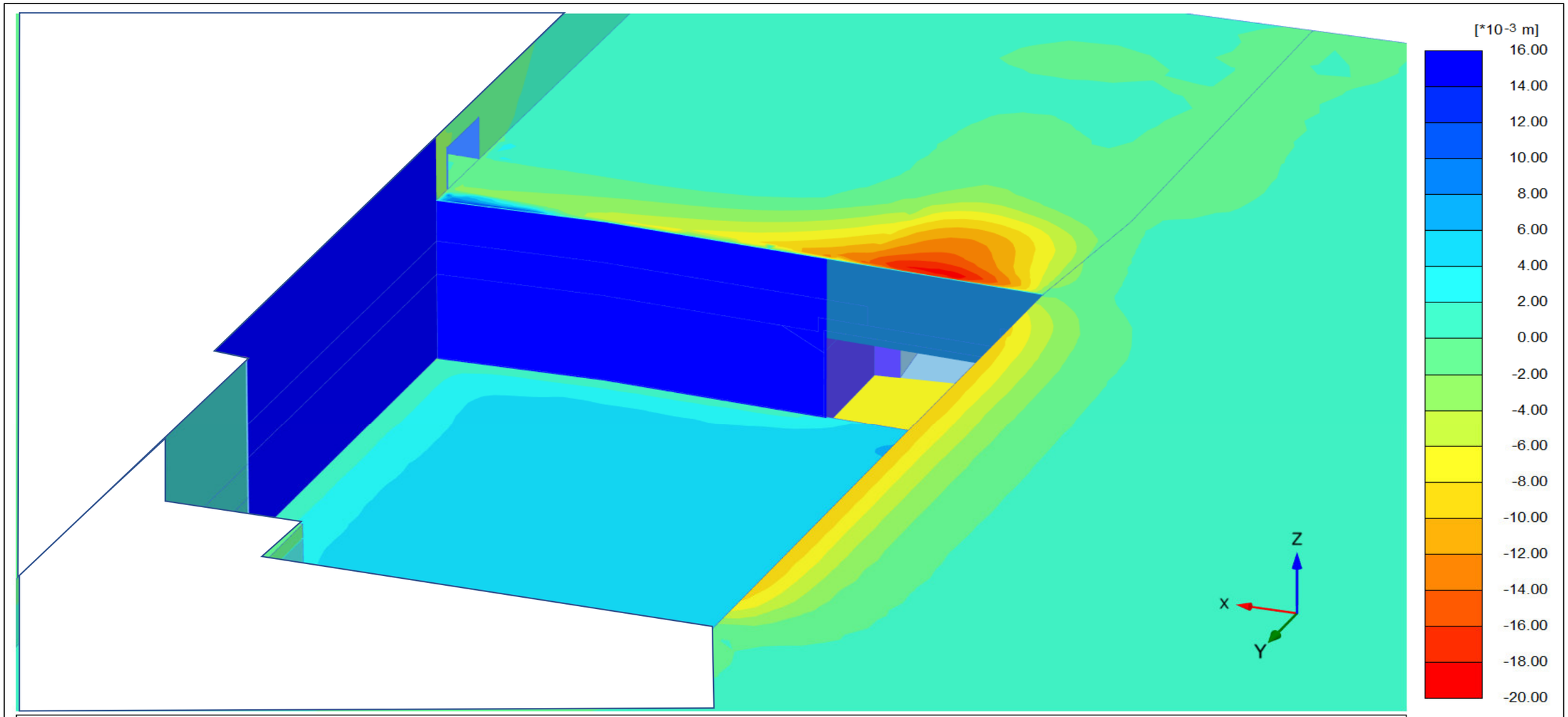
CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 32 - Shoring Pile long term moduli and water table)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M84
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

Maximum value = 0.03262 m (Element 14170 at Node 208588)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 33 - Southern Breakthrough Tunnel excavation permanent lining)**	PROJECT No: 86767.04	
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M85	
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0	



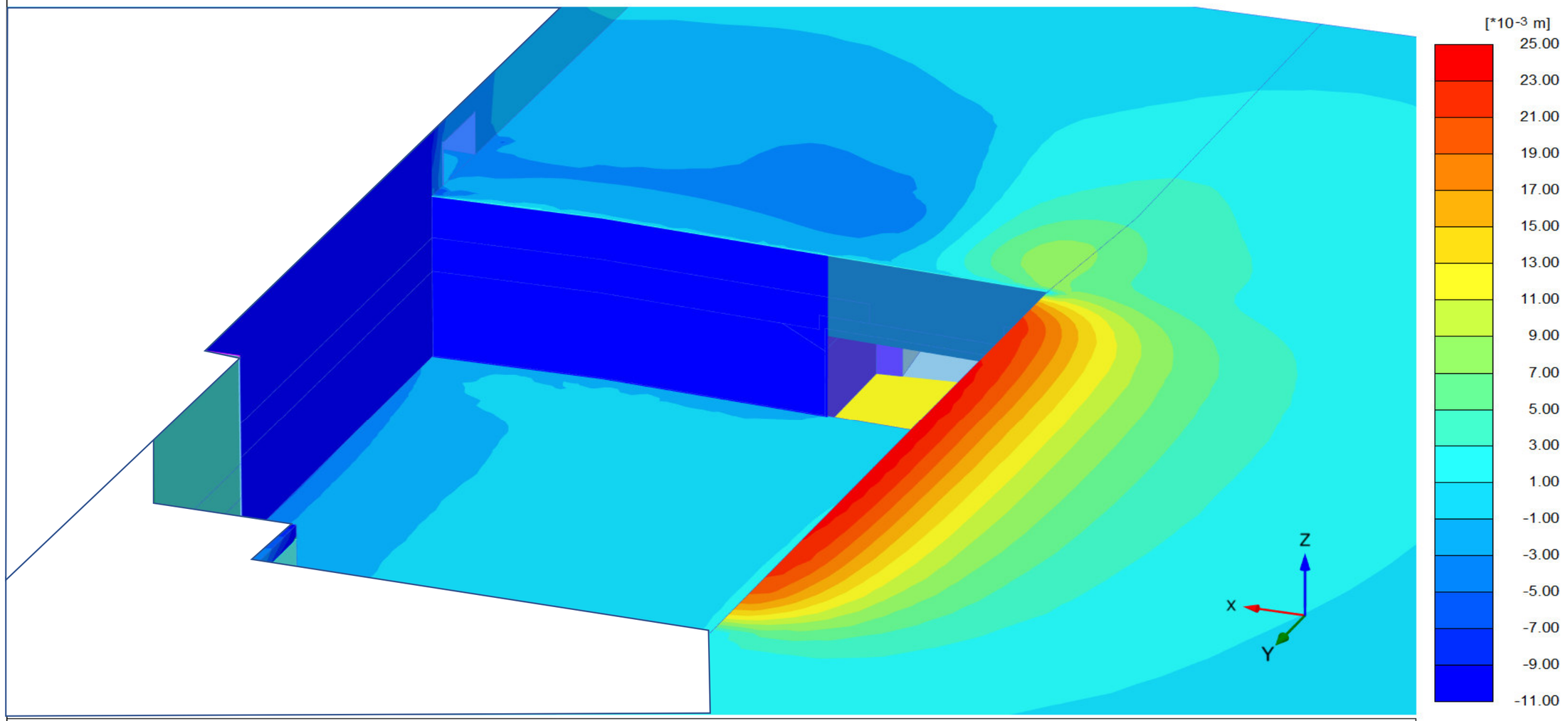
Total displacements u_z

Maximum value = 0.01411 m (Element 22540 at Node 18297)

Minimum value = -0.01905 m (Element 19852 at Node 18438)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours - Model 2 (Stage 33 - Southern Breakthrough Tunnel excavation permanent lining)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M86
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



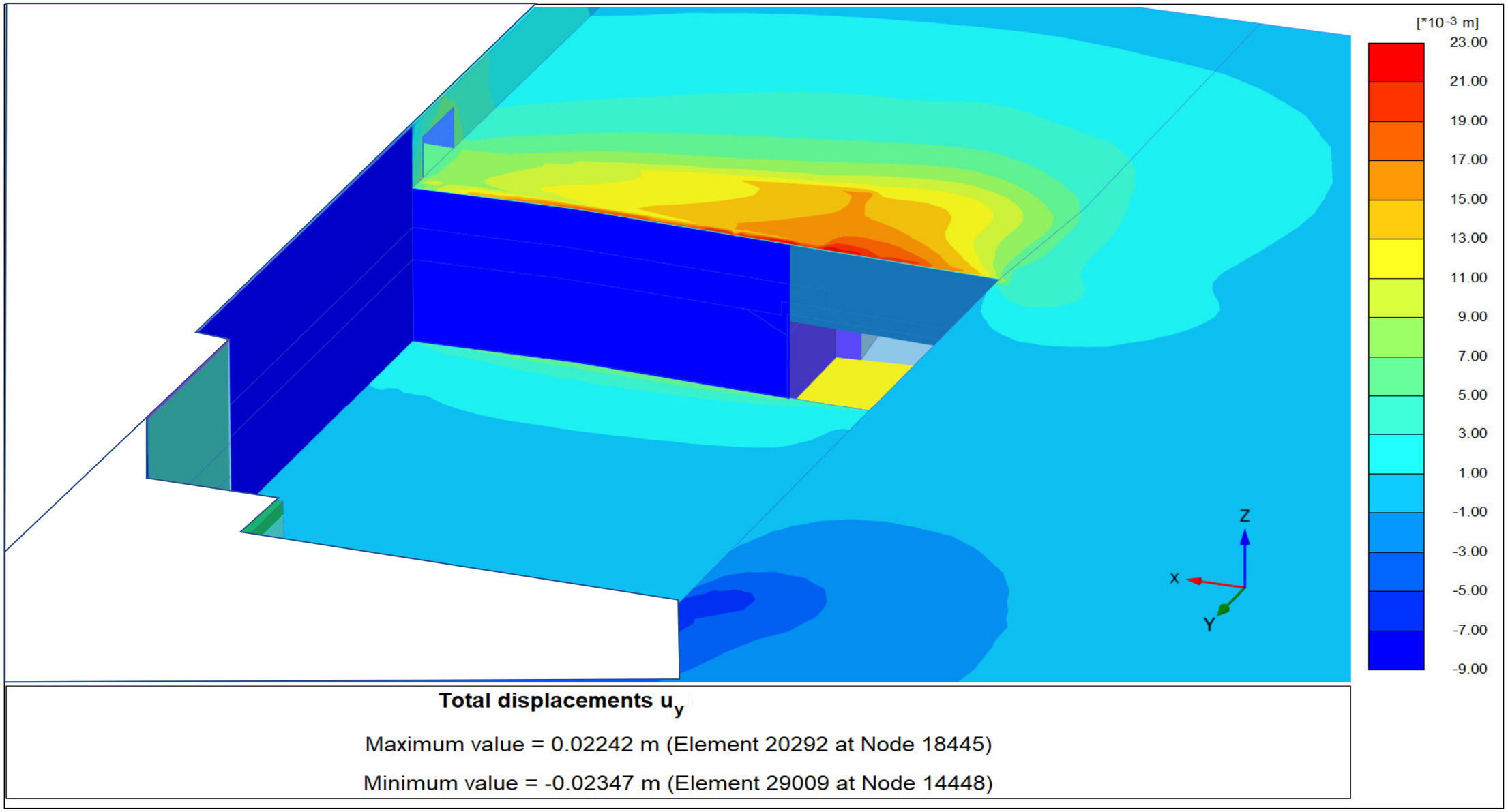
Total displacements u_x

Maximum value = 0.02434 m (Element 27989 at Node 14506)

Minimum value = -0.03259 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in East West Direction - Model 2 (Stage 33 - Southern Breakthrough Tunnel excavation permanent lining)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M87
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



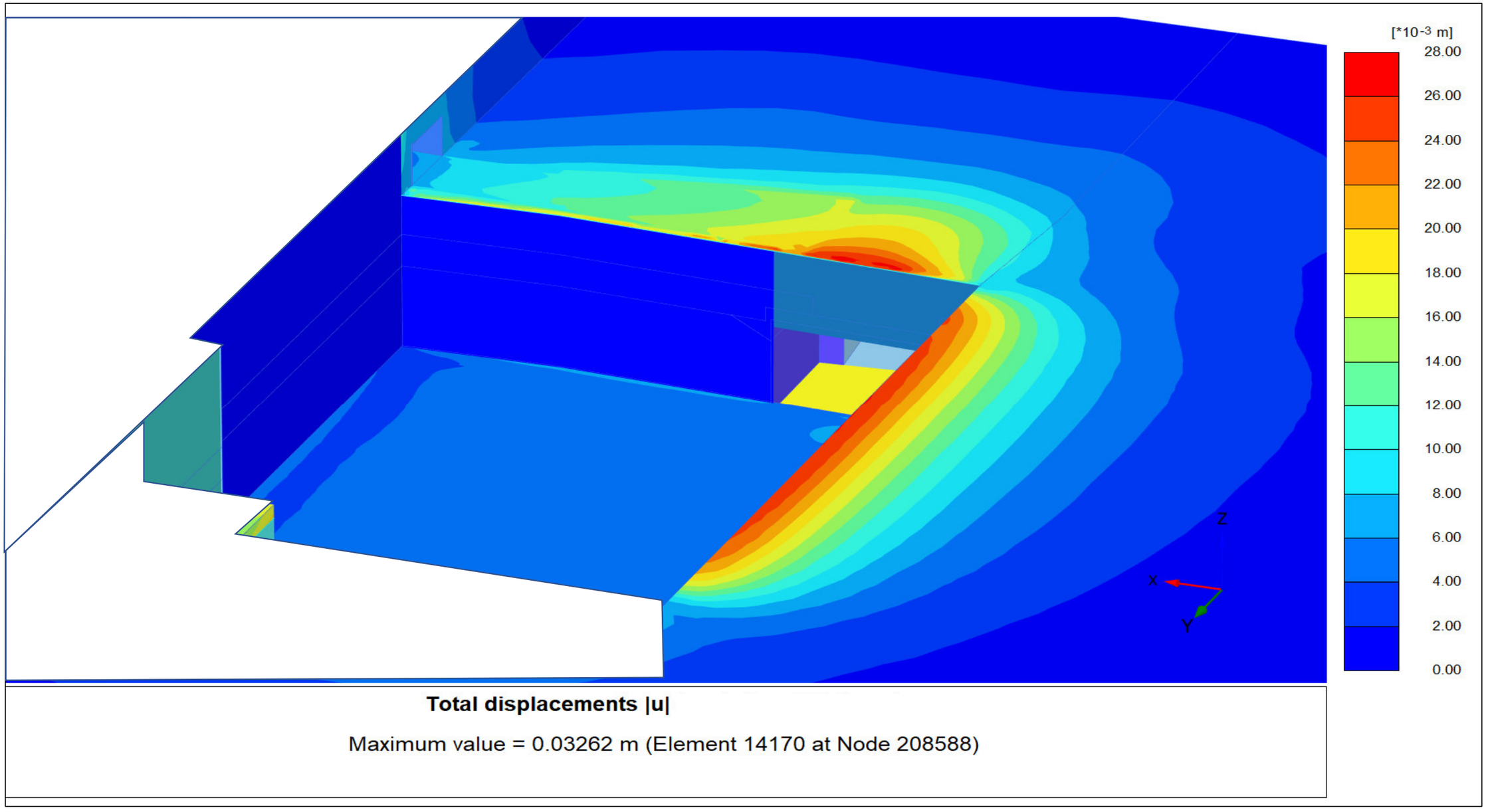
Total displacements u_y

Maximum value = 0.02242 m (Element 20292 at Node 18445)

Minimum value = -0.02347 m (Element 29009 at Node 14448)

Douglas Partners
Geotechnics / Environment / Groundwater

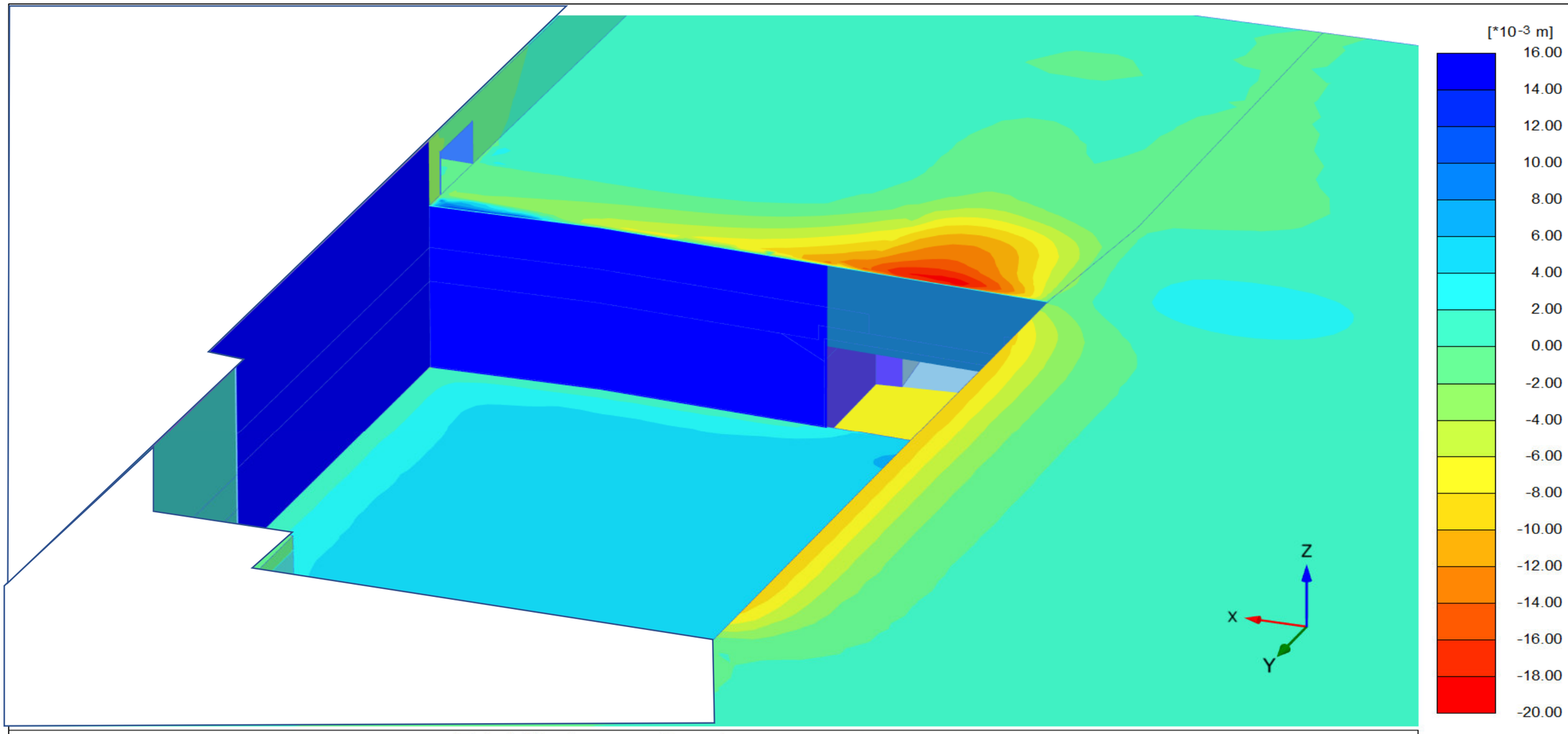
CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 33 - Southern Breakthrough Tunnel excavation permanent lining)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M88
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0



Total displacements |u|

Maximum value = 0.03262 m (Element 14170 at Node 208588)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Total Displacement Contours - Model 2 (Stage 34 - Western Breakthrough Tunnel excavation permanent lining)**	PROJECT No:	86767.04
	OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No:	M89
	SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION:	Rev0



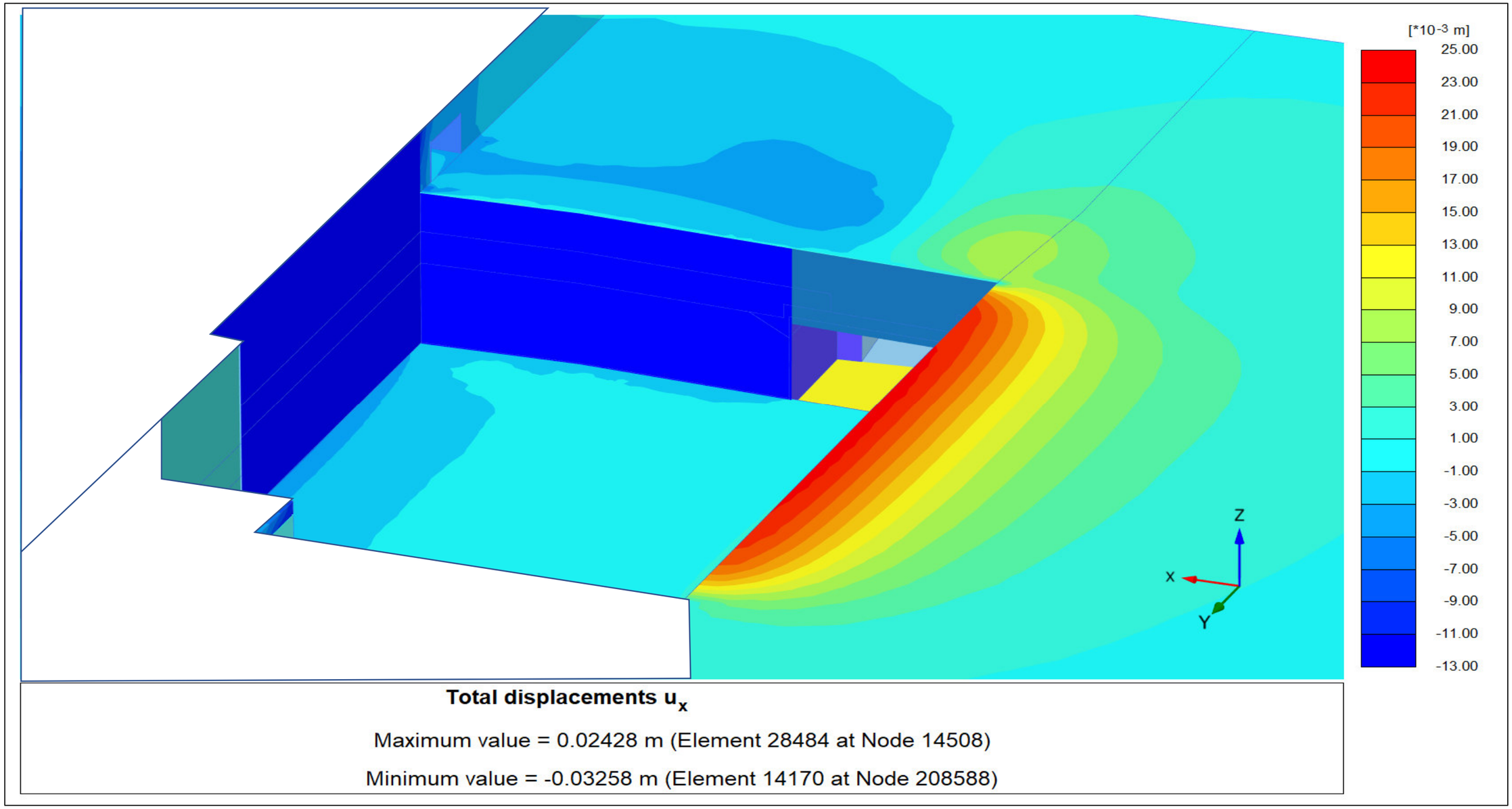
Total displacements u_z

Maximum value = 0.01412 m (Element 22540 at Node 18297)

Minimum value = -0.01909 m (Element 20323 at Node 100507)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Vertical Displacement Contours -Model 2 (Stage 34 - Western Breakthrough Tunnel excavation permanent lining)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M90
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



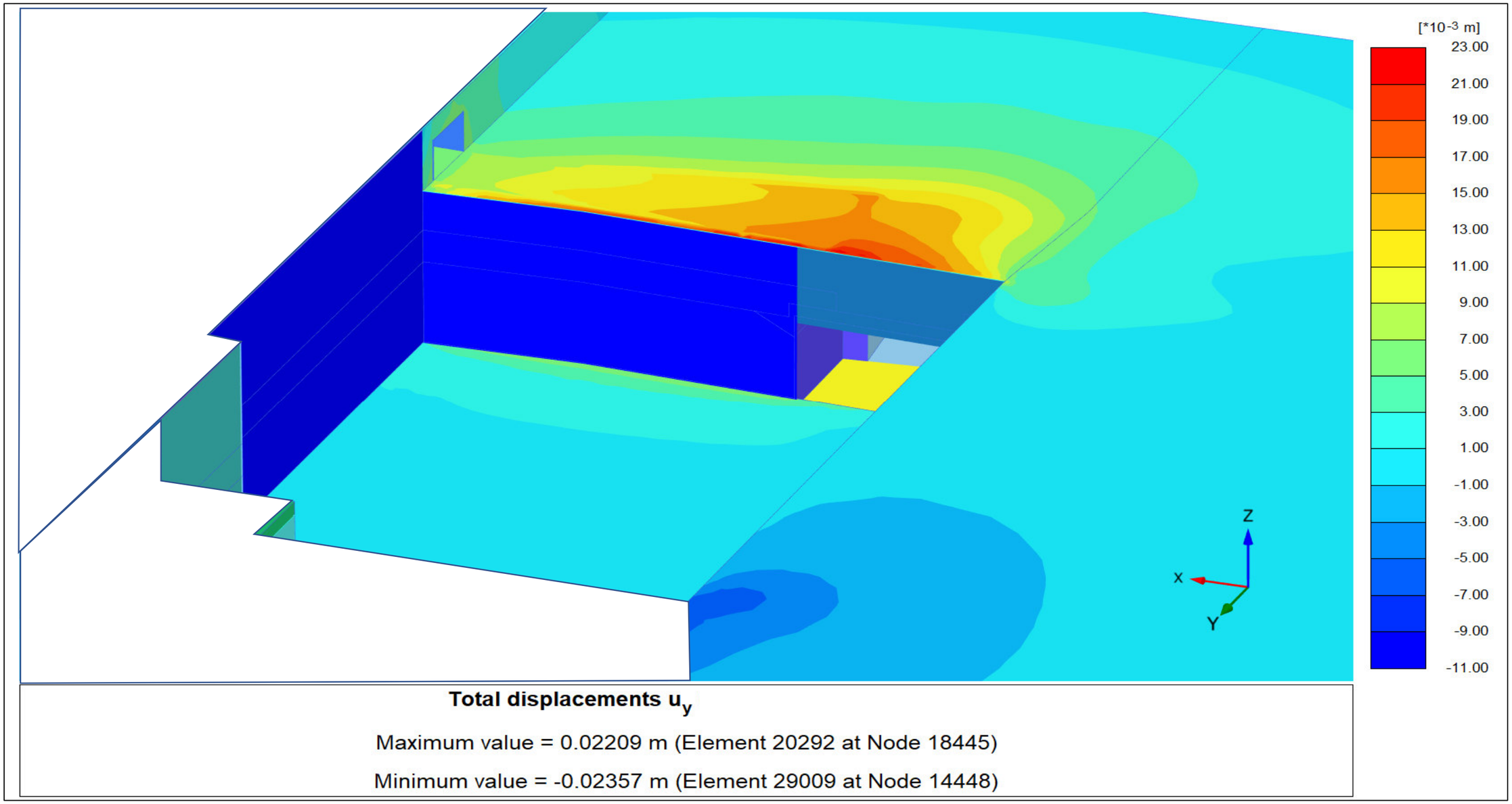
Total displacements u_x

Maximum value = 0.02428 m (Element 28484 at Node 14508)

Minimum value = -0.03258 m (Element 14170 at Node 208588)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: Horizontal Displacement Contours in East West Direction - Model 2 (Stage 34 - Western Breakthrough Tunnel excavation permanent lining)	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	Geotechnical Analysis, Proposed Commercial Development	DRAWING No: M91
SCALE: As Shown	DATE: 14/02/2022	8-10 Lee Street, Haymarket	REVISION: Rev0



Total displacements u_y

Maximum value = 0.02209 m (Element 20292 at Node 18445)

Minimum value = -0.02357 m (Element 29009 at Node 14448)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built Obayashi Joint Venture (BOJV)		TITLE: **Horizontal Displacement Contours in North South Direction - Model 2 (Stage 34 - Western Breakthrough Tunnel excavation permanent lining)**	PROJECT No: 86767.04
OFFICE: Sydney	DRAWN BY: ZH	**Geotechnical Analysis, Proposed Commercial Development**	DRAWING No: M92
SCALE: As Shown	DATE: 14/02/2022	**8-10 Lee Street, Haymarket**	REVISION: Rev0