Robert
Bird
Group

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

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Schematic Design Report

Albert Street OSD

Issue: E

21 December 2022

Prepared For: CRR Albert Street Pty Ltd (ACN 660 319 693) as trustee for CRR Albert Street Trust

Project No.: 22131S

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Report Amendment Register

Issue Ref	Amended Section(s)	Issue / Amendment Details	Author(s)	Reviewer	Date
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1 Introduction

1.1 Purpose of Report

This report sets out the currently proposed structural design solution as at the Schematic Design Phase proposed for the Albert Street Over Station Development (**OSD**) and the approach to the various building elements. The report also addresses issues relating to the adjoining Cross River Rail assets and how the design addresses the imposed site constraints.

The report should be read in conjunction with the Project Design Criteria Report and Structural Schematic Drawings attached in **Appendix A**.

This document is a live document and will be updated throughout the life of the Project. Items highlighted in Red are live items that require close-out. Updates may be proposed by any member of the RBG engineering team. Updates will only be made with the authority of the Project Engineer. At the end of the Project, this document will form part of the RBG record of the structural design.

1.2 Site Details

The proposed Albert Street OSD is located on Lot 2 of the Albert Street Station site for Cross River Rail (**CRR**). The site is located opposite the proposed Albert Street CRR Station. The site is noted as FOSD Lot 2 on the map below in **Figure 1**.

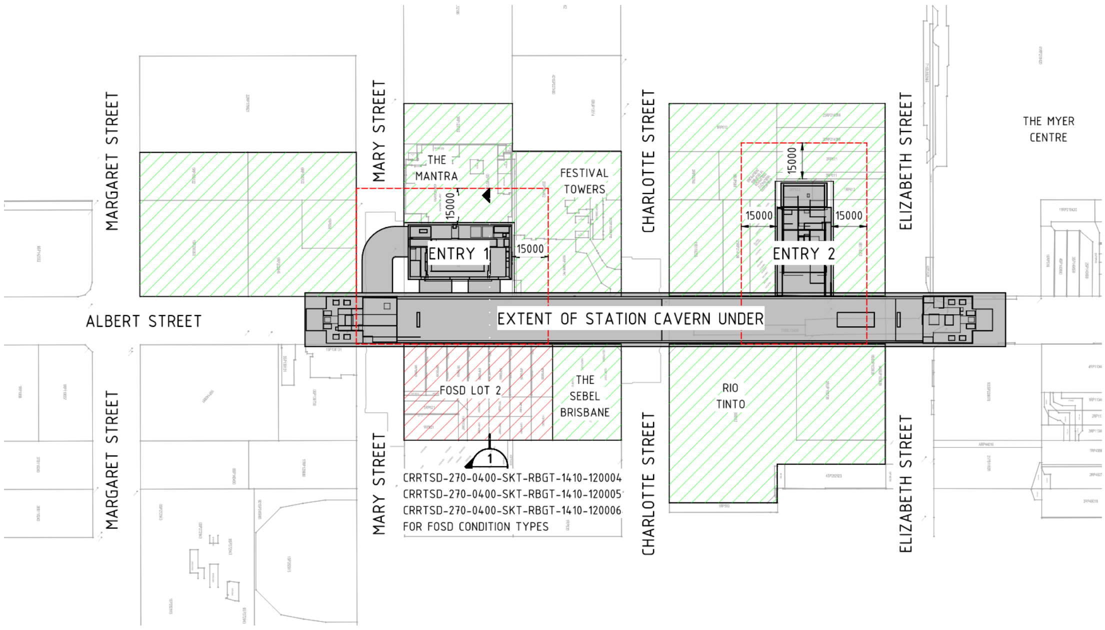


Figure 1 - Site Map

The site abuts the CRR Station Cavern that runs under Albert Street and sits between Mary Street and the Brisbane Sebel development. Two developments abut the Northern boundary, being 110 Mary Street and 119 Charlotte Street. Refer to Figure 2 below.

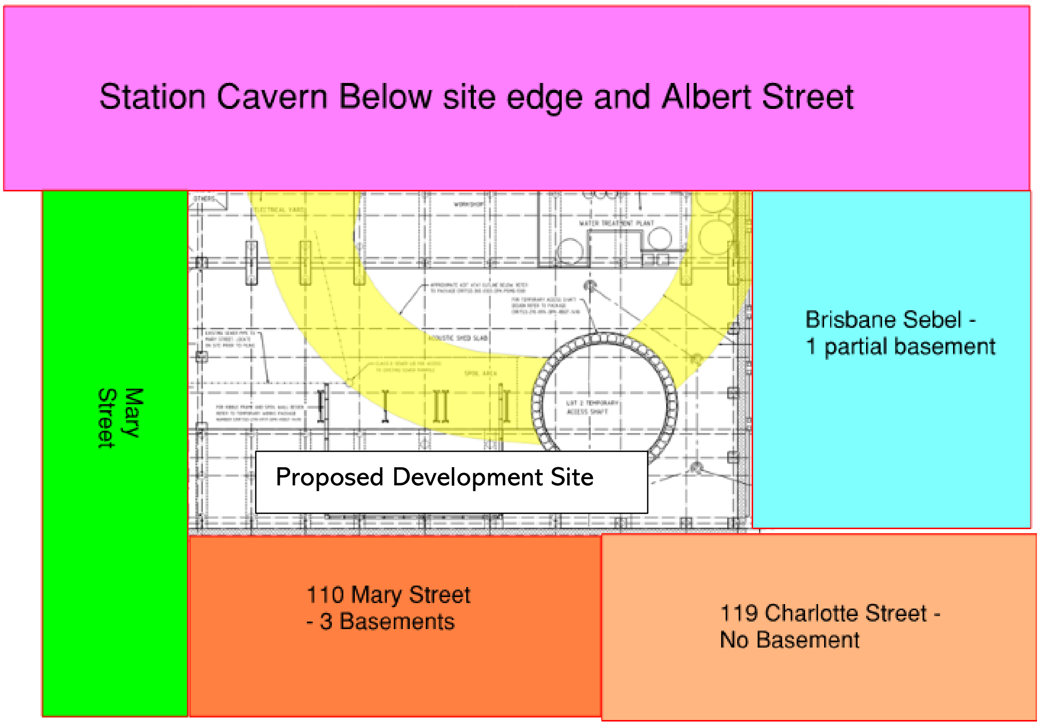


Figure 2 - Site Plan

The development site is currently occupied by the temporary CRR acoustic shed. The acoustic shed has a typical slab on grade with a minimum 300mm thickness with a top surface level of RL +4.0m. The slab thickness is up to 600mm thick in some locations and is supported off ground beams up to 1200mm deep.

1.3 Proposed Development

The proposed development is anticipated to comprise a predominantly commercial tower above Podium retail and basement parking. Level 2 will be the main commercial lobby. The commercial tower will be split into four rises, Low, Mid, High and Sky Rise. Above the last commercial level (L37) will be a Destination Rooftop with an external terrace.

The building will include two and a half basement levels over the full site, with B01 containing the Loading Facilities with the balance of B1 and B2 being car parking. The half level will house the End of Trip facilities and will sit between B1 and the Ground floor. The finished floor level of Basement 2 is currently proposed at RL -5.0m.

Figure 3 - Proposed Tower Render (By Henning Larsen/Architectus)

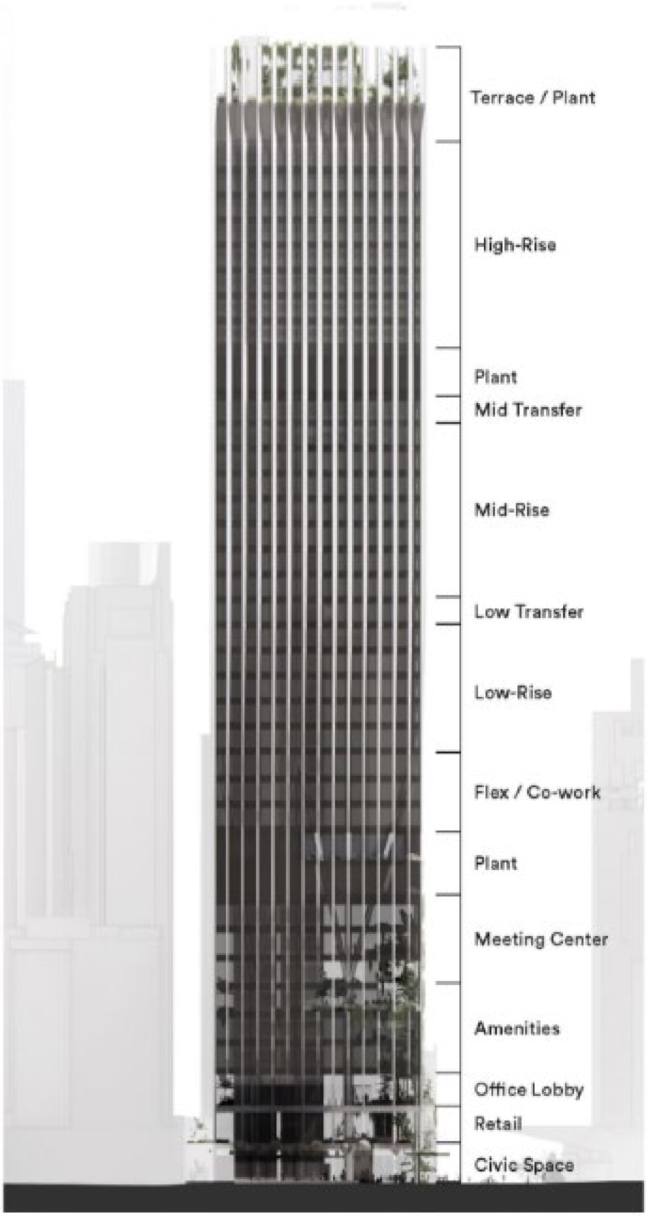


Figure 4 - Proposed Elevation (By Henning Larsen/Architectus)

1.4 Cross River Rail Assets

The development site is adjacent to and partially over major CRR Assets associated with the Albert Street Station. The major adjoining asset of most importance is the Station Cavern that runs under Albert Street. This cavern sits just under the site boundary to Albert Street. The cavern is a mined arched structure with its base at circa RL -30m and its crown at circa RL -13m. There are duct and escape passages below the cavern that link back to the primary station structure located on the opposite side of Albert Street.

Figure 5 illustrates the location of the cavern and station relative to the development site.

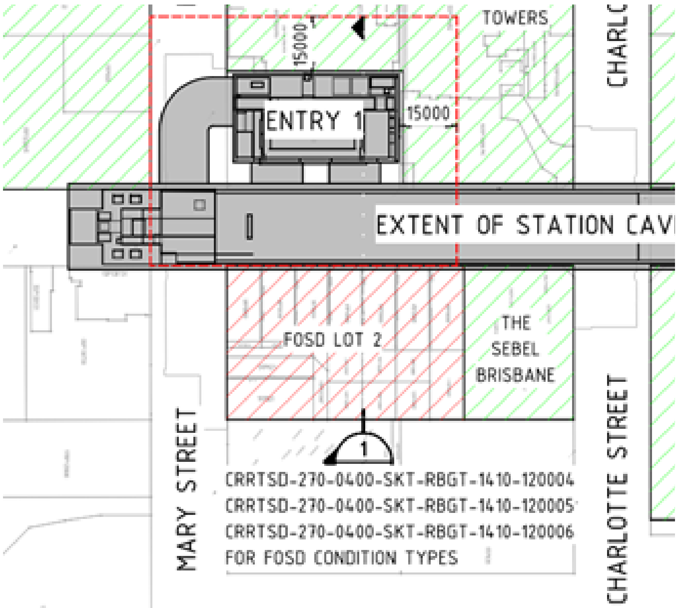


Figure 5 - Development Site and CRR Assets

Figure 6 below illustrates a section through the development site and the adjacent cavern and station structure. The extent of the proposed basement on the development site is also illustrated.

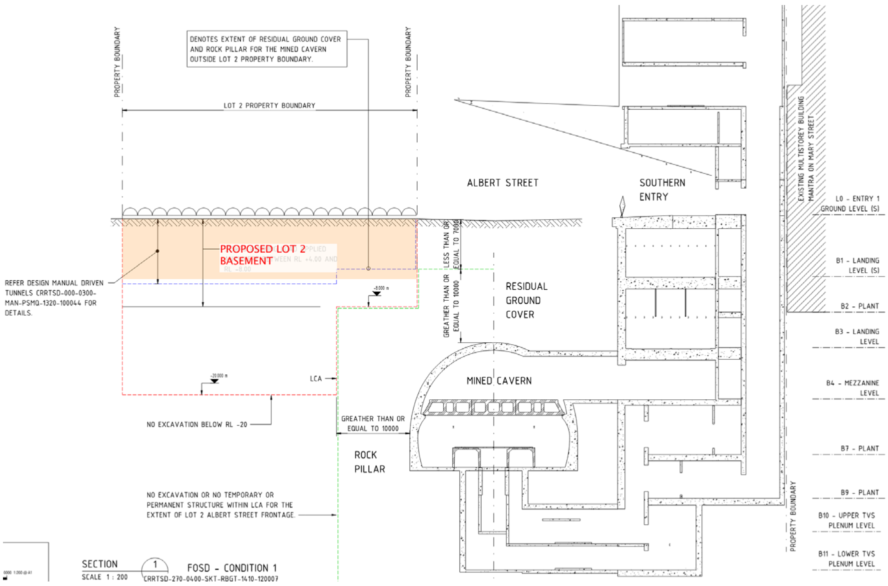


Figure 6 - Section through Prosed Development site and CRR Assets

The development site is currently occupied by an acoustic shed as part of the construction of the Albert Street Station. Within the shed is a 12m diameter temporary access shaft that extends down to nearly RL -30m. This access shaft links to two temporary adit shafts that curve and join to the station cavern.

The acoustic shed, access shaft and connecting adits are all temporary structures. Upon completion of the station, we understand that the acoustic shed and its base slab will be removed with the founding piles to remain for their extent below the Proposed Lot 2 Basement, as discussed further in Section 1.6. The adits and the access shaft, we understand, will be concrete filled.

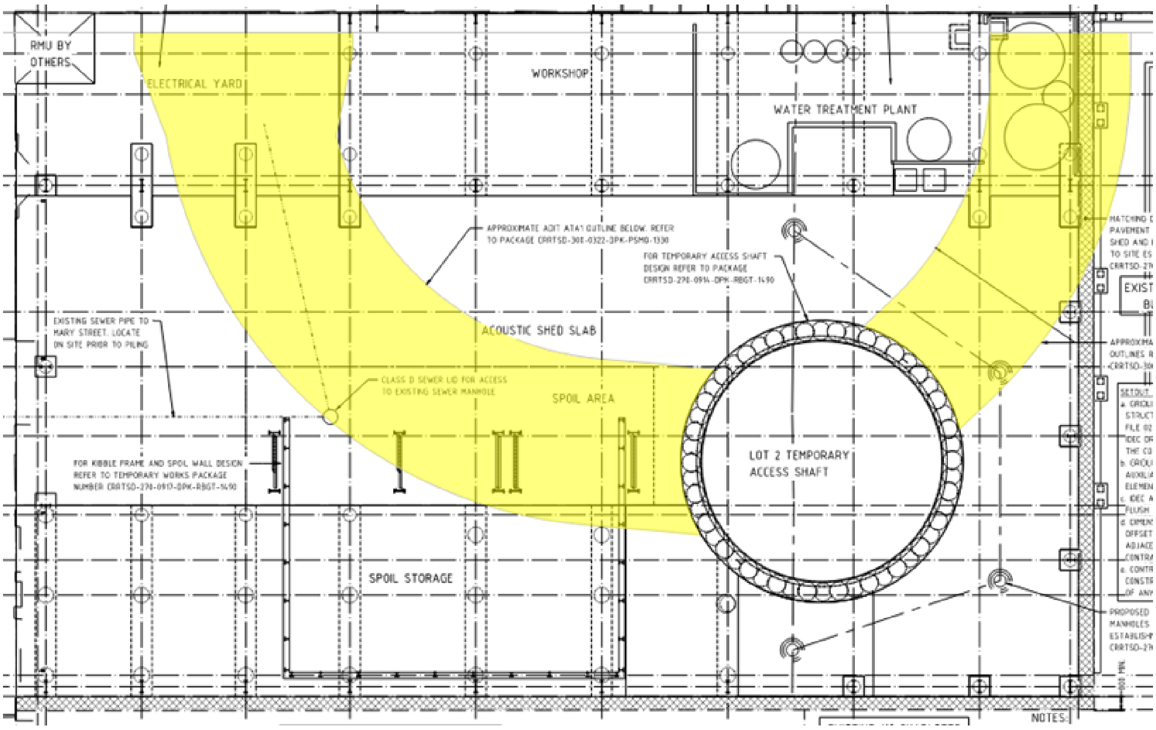


Figure 7 - Acoustic Shed, Access Shaft and Temporary Adits

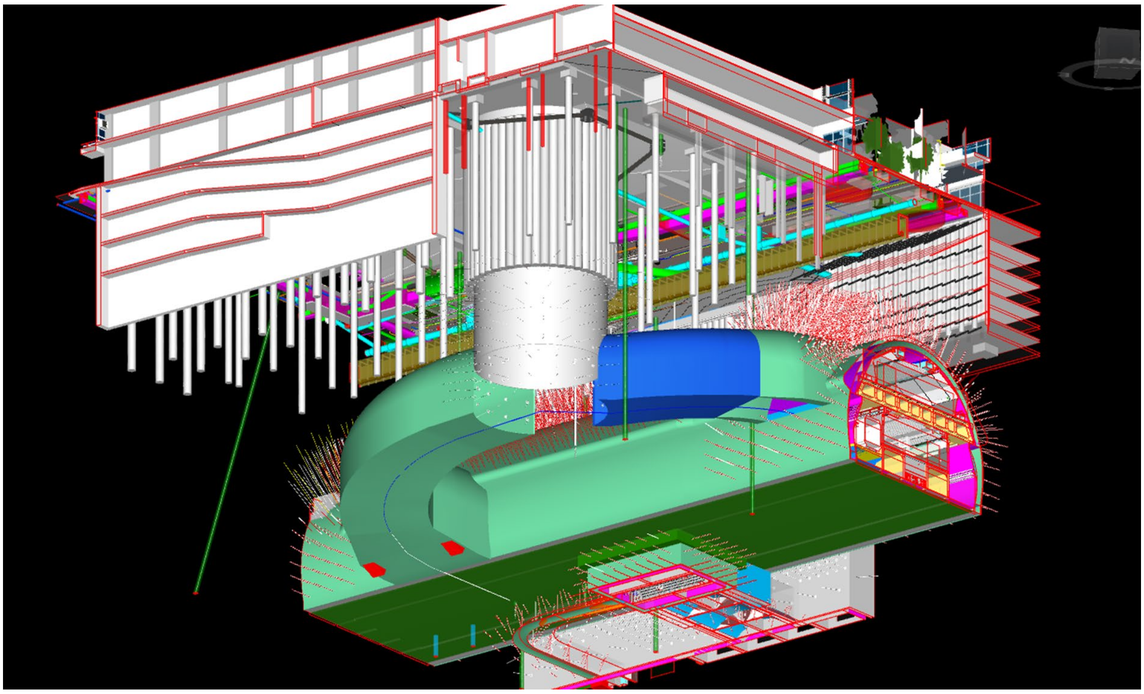


Figure 8 - Extract of Digital Model below Lot 2

1.5 Proximity to Cross River Rail Assets

As discussed in Section 1.5, there is a raft of existing temporary and permanent CRR Assets both within and adjacent to the development site. The below Proximity Diagrams show the approximate as-built locations of the CRR Assets that are to fully or partially remain post-completion of the station, including the temporary acoustic shed foundations, shaft, adits and CRR cavern against the proposed development structure based on the current proposed schematic design structural solution.

These have been produced for the current proposed development Basement 2 finished floor level RL -5.0m, above the no excavation level RL -8.0m, and for the no excavation level RL -20m. The structure for each CRR Asset and structure for the proposed development has been shaded with a different colour to illustrate their proximity to each other both in the plan and section. The shaft and adit structure is shaded green; the acoustic shed structure is shaded red; CRR Cavern is shaded aqua blue, and the proposed development structure is shaded blue.

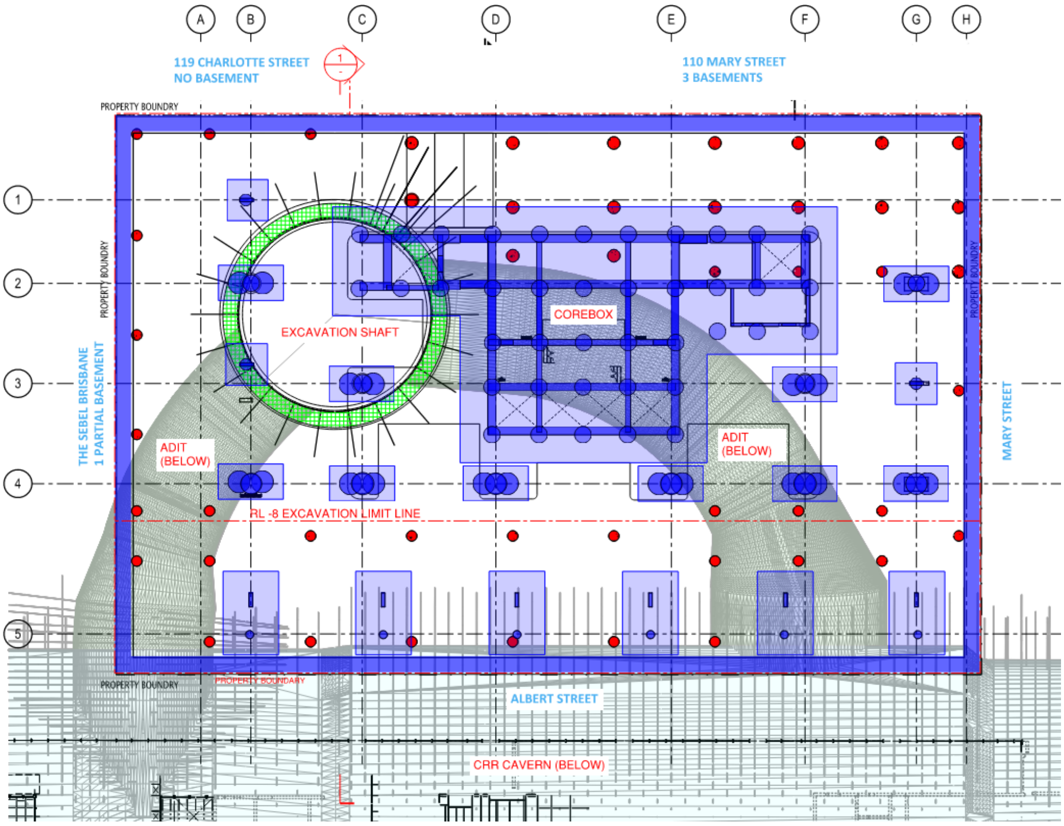


Figure 9 - CRR Asset and Proposed Development Structure Proximity Diagram – RL -5.0m

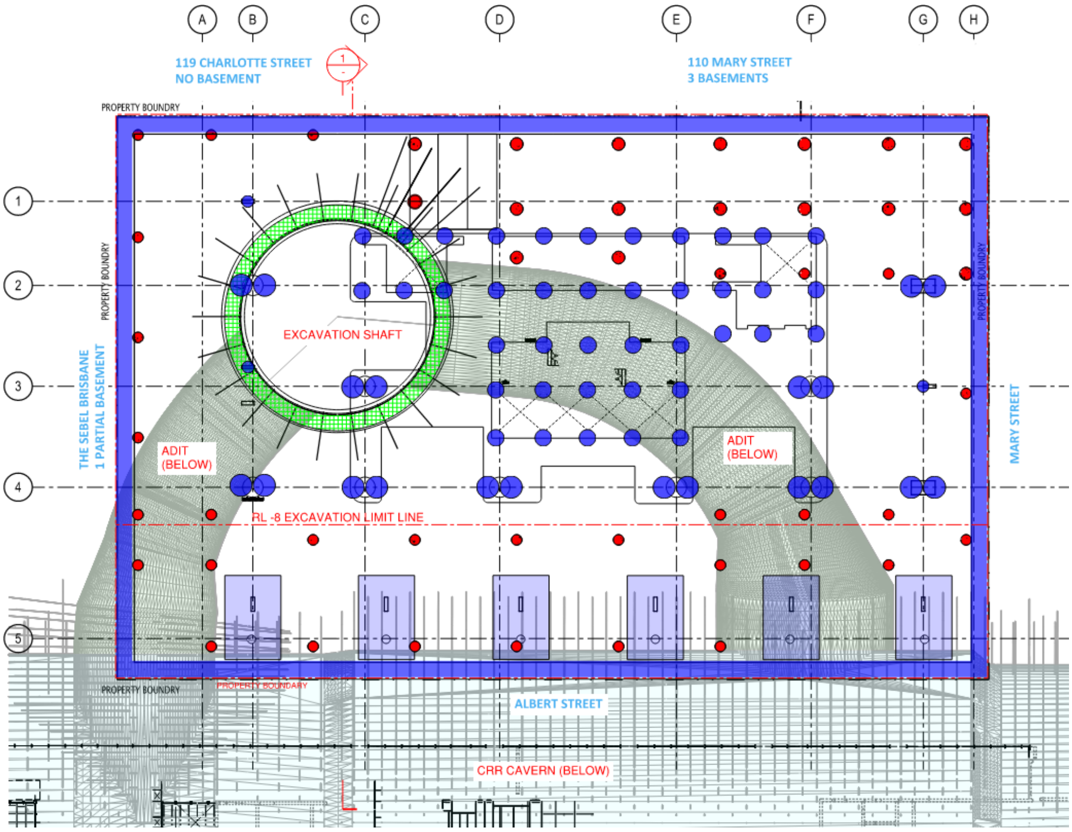


Figure 10 - CRR Asset and Proposed Development Structure Proximity Diagram – RL -8.0m

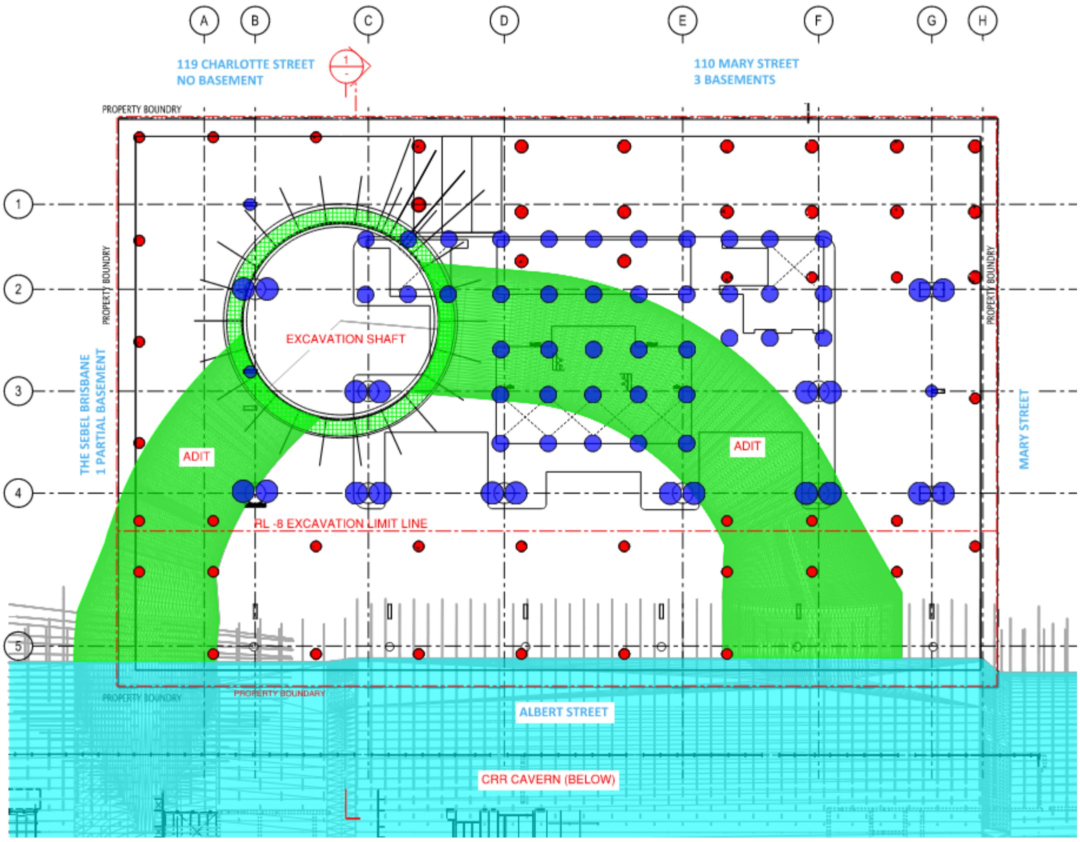


Figure 11 - CRR Asset and Proposed Development Structure Proximity Diagram – RL -20m

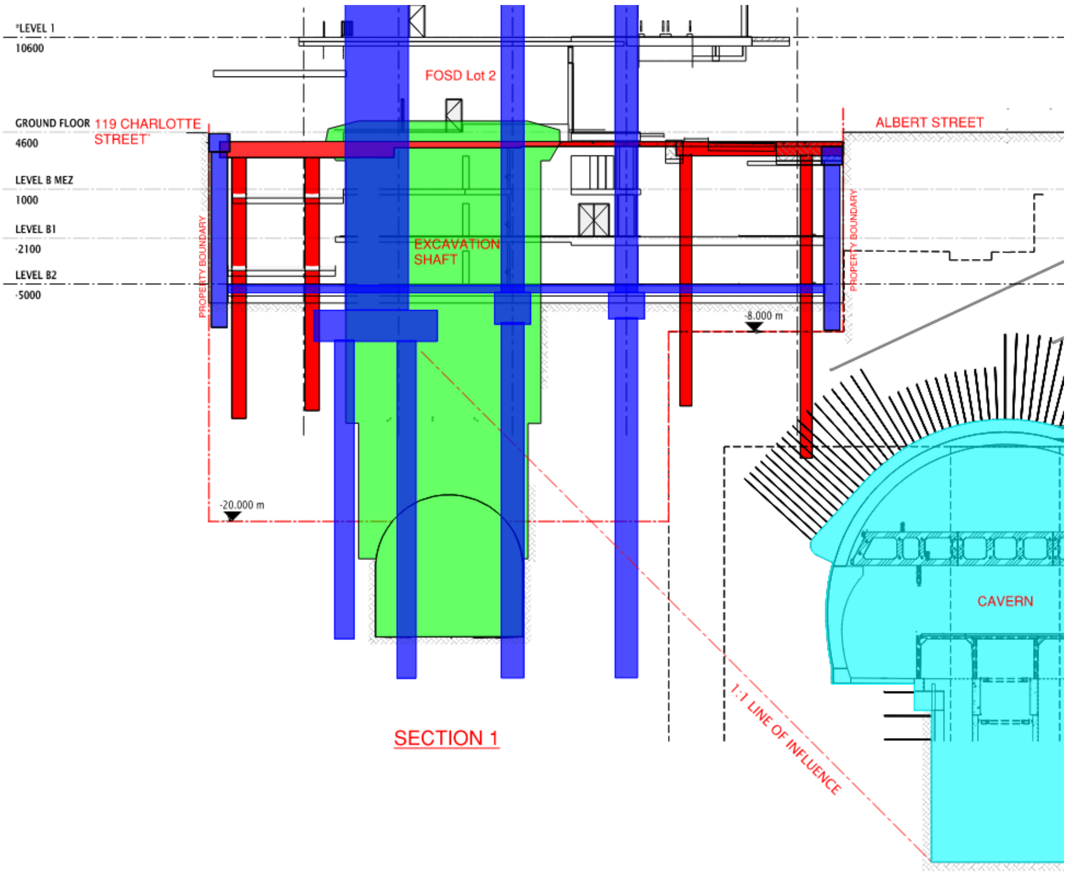


Figure 12 - CRR Asset and Proposed Development Structure Proximity Section

As per **Figure 9**, generally, once inboard of the proposed shoring wall, the majority of the current proposed development structure is clear of the acoustic shed piles, provided the piles are demolished down to the bulk excavation level of circa RL -5.7m. There are some clashes between the acoustic shed piles and proposed pad footings and pile caps. We would expect that these piles would be further demolished down below the new structure.

For the perimeter of the development's basement, there are some acoustic shed piles that clash with the proposed 1200mm shoring zone. Further demolition of the acoustic shed piles or coordination of the proposed soldier piles will be required to resolve these clashes.

As per **Figure 11**, there are some clashes between the shaft wall and proposed bored piers to the corebox and tower columns. Further coordination will be required to shift the proposed bored piers to avoid a piling rig needing to drill into the shaft wall structure. This may require deepening of the pile caps to span either side of the shaft walls. Additionally, there are clashes between proposed bored piers and the adits. The final depth of the bored piers is subject to the founding rock strength and achieving the CRR Cavern stress criteria. If bored piers need to be drilled through the adits, as illustrated in **Figure 12**, their final length will be subject to the material used to fill the adits.

Further, advice from a piling contractor and geotechnical consultant is required to determine the best methodology of drilling through the adit structure.

2 Referenced Documents

2.1 Standards and Codes

The following Standards and Codes are applicable for the design of the structural elements:

- National Construction Code of Australia – 2022.
- AS1170.0:2002 General Principles (Up to and Including Amdt 5).
- AS1170.1:2002 Imposed Loads (Up to and Including Amdt 2).
- AS1170.2:2021 Wind Code.
- AS1170.4:2007 Earthquake Code (Up to and Including Amdt 2).
- AS3600:2018 Concrete Structures (Up to and Including Amdt 2).
- AS3735:2001 Concrete Structures Retaining Liquid (Up to and Including Supp1).
- AS3700-2018 Masonry Structures.
- AS4100-2020 Steel Structures (Up to and Including Amdt 1).
- AS4678:2002 Earth-retaining structures (Up to and Including Amdt 2).
- AS2327-2017 Composite Structures – Simply Supported Beams (Up to and Including Amdt 1).
- AS2159-2009 Piling – Design and Installation (Up to and Including Amdt 1).

Any code referenced in this report is to be interpreted as the revisions specified above.

2.2 Referenced Cross River Rail Reports

In preparing RBG's design response, we have made reference to and placed reliance on several existing documents. These include but are not limited to:

- Design Manual – Stations CRRTSD-000-0401-MAN-RBGT-1470-191101
- Design Manual – Driven Tunnels CRRTSD-000-0300-MAN-PSMQ-1320-100044
- Geotechnical Interpretive Report (GIR) CRRTSD-000-351DPK-PSMQ-1120-000100

- Hydrogeological Interpretive Report (HIR) CRRTSD-000-0354-RPT-PSMQ-1120-040028
- Albert Street Temporary Access Shaft – Rev C CRRTSD_270-0460-DAN-PSMQ-1120
- Factual Report on Geotechnical Investigation Cross River Rail-Tunnel, Stations, and Development – Douglas Partners – CRRTSD- 97335.00.IFI.00.01
- Albert Street Station Main and Northern Entrance Shafts – CRRTSD-270-0940-DAN-PSMQ-1490-230078
- Station Cavern and Adit Loads – CRRTSD-000-0401- DAN-RBGT-1490-190380
- Albert Street Station Utilities Assessment -CRRTSD-000-0352-DAN-PSMQ-1124-060063
- Geotechnical Interpretive Report (GIR) – CRRTSD-000-0351-RPT-PSMQ-1120-030021
- Albert Street Station – CRRTSD-270-0904-DPK-RBGT-1490-000100
- Albert Street Lot 2: Temporary Retention and Bulk Excavation – CRRTSD-270-0914-DPK-RBGT-1490-231400
- Albert Street Station Design of Acoustic Shed and Foundations - CRRTSD-270-0904-DPK-RBGT-1490-000100
- Permanent Works Design report – Permanent Lining (Tunnel- Albert Street) – CRRTSD-300-0323-RPT-PSMQ-1330-190089

2.3 Design Criteria Report

The proposed design criteria for the Project are set out in a separate report – Design Criteria Report Albert Street OSD 22131S-RBG-ZZ-XX-RP-ST-00001, by Robert Bird Group. Reference should be made to this report for the adopted design criteria.

2.4 Geotechnical

EDG Consulting has been appointed as the Project Geotechnical Engineers. The site, as noted above, is currently fully covered by an acoustic shed as part of the CRR site works. There are adjoining buildings on two sides of the site, and the Station Cavern is under construction under the Albert Street frontage of the site. As such, at this Schematic Stage, the geotechnical input is based on a desktop review of all available existing geotechnical studies in the site proximity. A physical site investigation for verification purposes is proposed when the site is handed over to the applicant.

Please refer to **Appendix C** for the Stage 1 EDG Geotechnical Engineering Report.

2.4.1 Summary of Anticipated Ground Conditions

Based on available geotechnical investigation data, as referenced within the EDG Geotechnical Engineering Report, the general geological stratigraphy described by EDG for the development site and proposed basement includes potential uncontrol or controlled surface fill material and/or soft to firm alluvium underlain by residual soils overlying various Neranleigh-Fernvale Group (NFG) weathered rock.

Based on the geotechnical cross sections developed by EDG, extremely weathered rock (NFG5) is expected at approximately RL-6.5 with potential localised areas of residual soil. NFG3 rock is expected between RL-15 and RL-10 and NFG2/1 below RL-15.

Two of the interpreted geotechnical sections from the EDG Report have been shown below for reference. The section in Figure 13 is cut along the site boundary, looking towards The Sebel. The top of the extremely weathered rock (NFG5) looks to be highest on the development site closest to Albert Street and then gradually drops away as you move away from the Albert Street elevation towards the 110 Mary and 119 Charlotte boundaries.

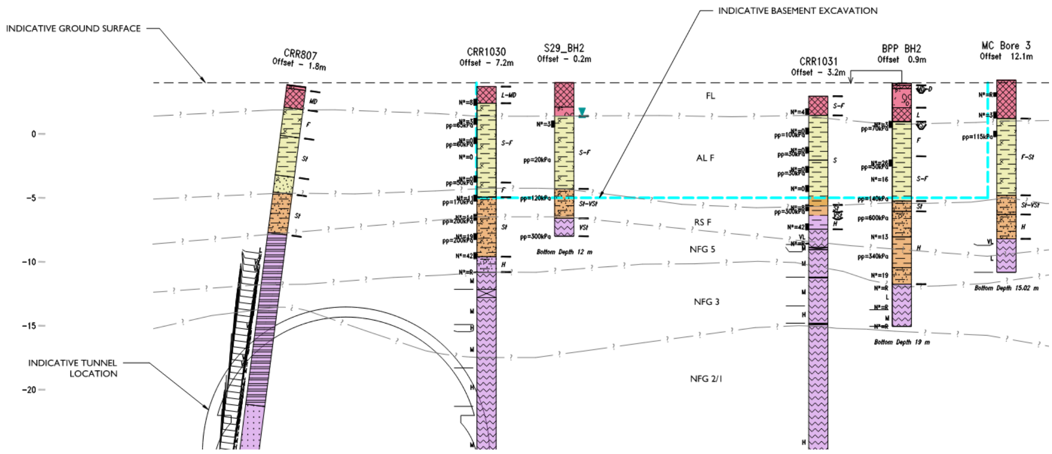


Figure 13 - EDG Interpreted Geotechnical Section B – Looking towards The Sebel

The section in **Figure 14** is cut along the Albert Street boundary looking towards the CRR Cavern

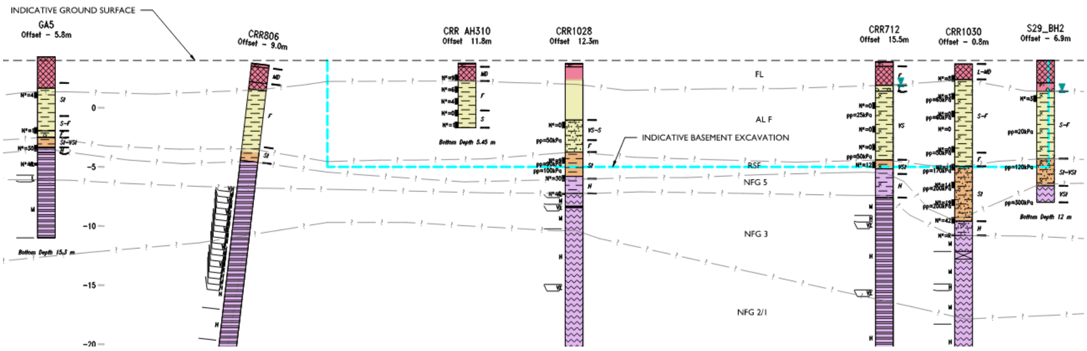


Figure 14 - EDG Interpreted Geotechnical Section D – Looking towards Albert Street

2.4.2 Excavation

The proposed bulk excavation level for the development is RL -5.7m which complies with the Licence Construction Area and RL -8.0m maximum excavation level constraint discussed in the above Sections.

Post installation of the shoring and retention system, alternating staged demolition and bulk excavation will be required across the basement footprint to create the new formation level to accommodate the proposed subfloor drainage system and Basement 2 diaphragm slab/slab-on-ground.

The extent of bulk excavation for the subfloor drainage is to be reviewed by the Geotechnical Engineer following the demolition of the existing acoustic shed slab when the extent of groundwater can be determined. Therefore, the extent of bulk excavation may be refined following further Geotechnical Investigation.

Detailed excavation will be required for the building pad, raft and pile cap footings, in-ground services and tanks. Secondary shoring, potentially in the form of sheet piles, will be needed to enable detailed excavation to the deeper pile caps were located above the rock in the residual soil layer. A Survey of the existing footings and in-ground services will be required following the demolition of the existing acoustic shed slab. Existing footings clashing with proposed footings, in-ground services and tank locations will need to be removed and, where directed, backfilled with mass concrete (weak mix). Detailed excavation for new footings will then be saw-cut through low-strength rock/weak mix concrete.

2.4.3 Anticipated Groundwater Conditions

Groundwater levels taken from available geotechnical engineering boreholes indicate groundwater levels are quite variable across the site and are typically below the lowest proposed development Basement B2 level with anticipated levels between RL-5m to RL-10m. It is also likely that a temporary perched water table will exist within the fill materials within the top 1m to 3m of the site.

Therefore, consideration is to be given to the basement design and whether it is to be a full or partial hydrostatic basement. The basement treatment to adjacent 110 Mary, Festival Towers, and CRR station have drained basement systems. Adjacent Sebel has a partial single-tanked basement.

Based on the above, a hydrostatic shoring wall is proposed around the perimeter of the basement to control groundwater infiltration into the basement combined with a drained Basement B2 slab. Water below the B2 slab is proposed to be collected via a subfloor drainage system. The subfloor drainage system will be designed by the Hydraulic Engineer based on inflow rates provided by the Geotechnical Engineer.

Further, advice from the Geotechnical Engineer is required on the extent of groundwater seepage along with additional investigations following the demolition of the existing basement slab/end of the bulk excavation, at which time pumps and sumps can be appropriately sized and located. The drainage system is to be designed with an effective means of access for inspection, cleaning and maintenance.

2.4.4 Future Proposed Investigations

The future proposed geotechnical investigations to be undertaken are proposed to be completed in two further stages as outlined below:

Stage 2 – Desktop Analysis of Proposed Scheme for Compliance to CRRDA Constraints

Cross River Rail has set out design constraints in the Cavern and Station Design Manuals with respect to future development above and adjoining the CRRDA assets. The geotechnical consultant is required to fully familiarise themselves with the CRRDA requirements. As part of the planning process, the team will need to demonstrate compliance with the criteria in a suitable report.

Initial analysis has been undertaken appropriate for proof-of-concept assessment. Please refer to **Appendix D** for the EDG Cavern Assessment Report, respectively.

Stage 3 – Verification Testing and Reporting

As the initial stages will rely on existing geotechnical data, a verification stage geotechnical investigation is proposed once access to the site is obtained for drilling and testing.

The complete scope for each of the above additional stages of investigation are outlined in the Geotechnical Brief document attached in **Appendix E.**

Vibration

During the Detailed Design Stage a site specific construction phase vibration assessment can be undertaken by a suitable specialist to confirm vibration and noise effects on the CRR cavern are within acceptable limits. This will examine the anticipated vibration levels at the cavern from excavation and installation of bored piles including through the backfilled adits.

3 Materials

Material selection is a key component of the schematic design of the Project. To meet Environmental Sustainability Design (**ESD**) targets, RBG has carried out preliminary investigations into different floor plate systems and benchmarked results against a completed commercial building in Brisbane CBD – 145 Ann Street. RBG obtained environmental product declarations (**EPD**) from Boral, Bluescope (**BS**), Infrabuild (**IB**), and ArcelorMittal (**AM**) to develop floor framing options for –

- Steel (SP1) consists of composite steel floors, concrete-filled steel tube columns, concrete corebox and concrete substructure.
- Concrete (SP2) consists of PT Banded Beams and Slabs, concrete columns, concrete corebox and concrete substructure.

This embodied carbon study was completed using the IStructE Carbon Tool. Refer to below **Table 1** for explored floor plate options and **Figure 15** for the embodied carbon of each floor plate.

Table 1 - Floor Plate Options

Floor Plate Option Name	Concrete Choice	Structural Steel Choice
SP1A	Green Boral 40MPa	30% welded beam (BS) 70% universal beam (IB)
SP1B	Boral Envisia 40MPa	30% welded beam (BS) 70% universal beam (IB)
SP1C	Boral Envisia 40MPa	100% welded beam (BS), subject to fabrication line capability
SP1D	Boral Envisia 40MPa	100% Global sections
SP1E	Boral Envisia 40MPa	AM XCarb – recycled steel produced using renewable electricity
SP2A	PT Green Boral 40MPa Reinforcement from IB	N/A
SP2B	Boral Envisia 40MPa Reinforcement from IB	N/A

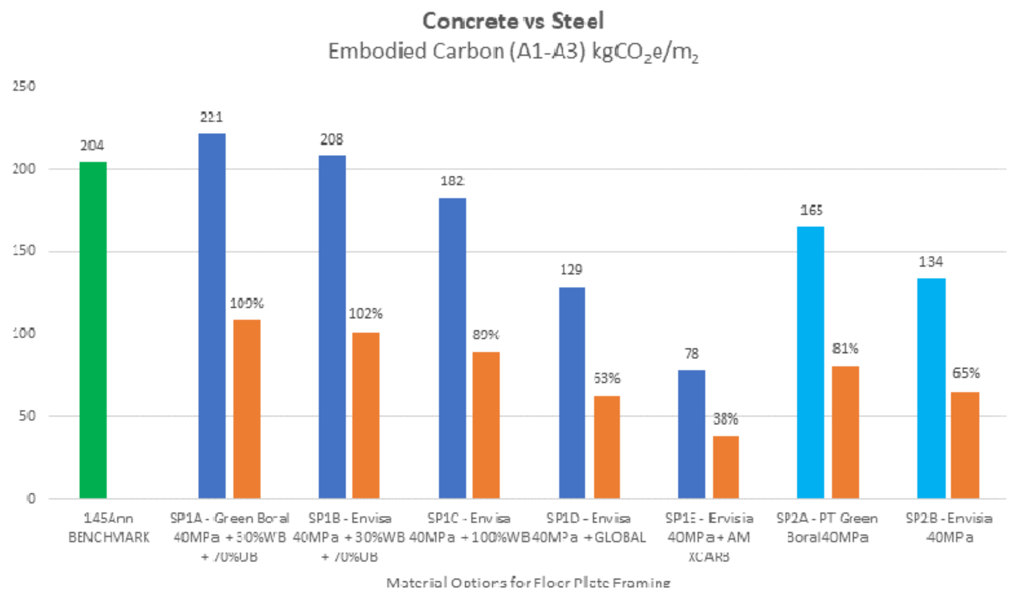


Figure 15 - Embodied Carbon Assessment of Floor Plates

3.1 Proposed Concrete Mixes

Concrete mixes with cementitious replacement of up to 50% have been considered to meet the Environmental Sustainability Design (**ESD**) targets of the Project. Embodied CO2 equivalent kg per tonne of concrete was compared between a baseline concrete product without cementitious replacement and varying 'greener' concrete products available to the Australian market. A comparison of these is provided in **Figure 16** below.

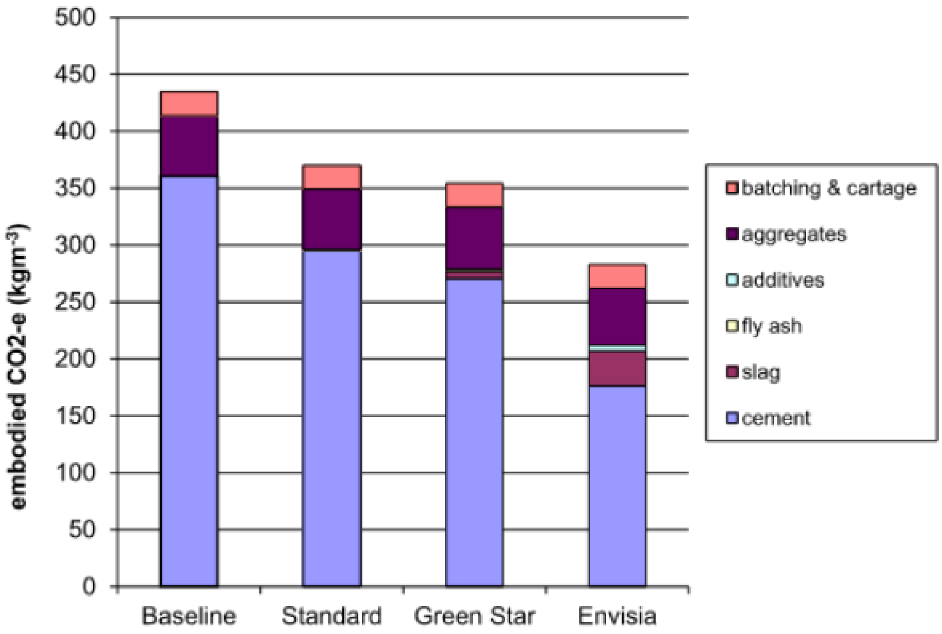


Figure 16 - Concrete Embodied Carbon Equivalents

Creep coefficients and shrinkage strain limits will be developed in line with the recommendations of AS3600. Horizontal elements will likely be controlled by shrinkage strain properties. Vertical elements will be sensitive to creep/Young's Modulus as the building is susceptible to shortening effects.

Exposure classifications are developed for reinforced concrete elements in accordance with AS 3600 Section 4.3. The Project is within 50km of the coastline.

- Elements in contact with the ground = TBC pending Geotechnical engineering advice when on site investigation can occur.
- Internal above-ground elements = A2.
- External above-ground elements = B1

3.2 Structural Steel

Structural steel is to be in accordance with AS 4100, AS 4131 and AS 2312. Minimum grades will vary between components, between 300 and 450.

Corrosivity Category C1 and C3 will be used for internal and external structural steel, respectively. These shall be considered in specifying coating requirements or assessing to a mild steel corrosion rate nominated in AS 4312. External steelwork will be coated either in hot dip galvanising or a paint system, subject to architectural finish requirements. Exposed steelwork will be subject to periodic inspection and maintenance regimes.

The extent and specification of fire rating systems to the structural steel is subject to Fire Engineering advice. It is expected that at least primary steelwork will require protection.

3.3 Reinforcement

Reinforcement steel is to be in accordance with AS 4671:2009.

4 Trunk Services Diversions

Existing 450mm diameter stormwater services originating from 110 Mary Street and passing through the Project site are to be diverted around the basement perimeter, connecting to existing infrastructure on the Albert St retention wall. Site rainwater capture connects directly to the Mary Street trunk. Refer to **Figure 17** below.

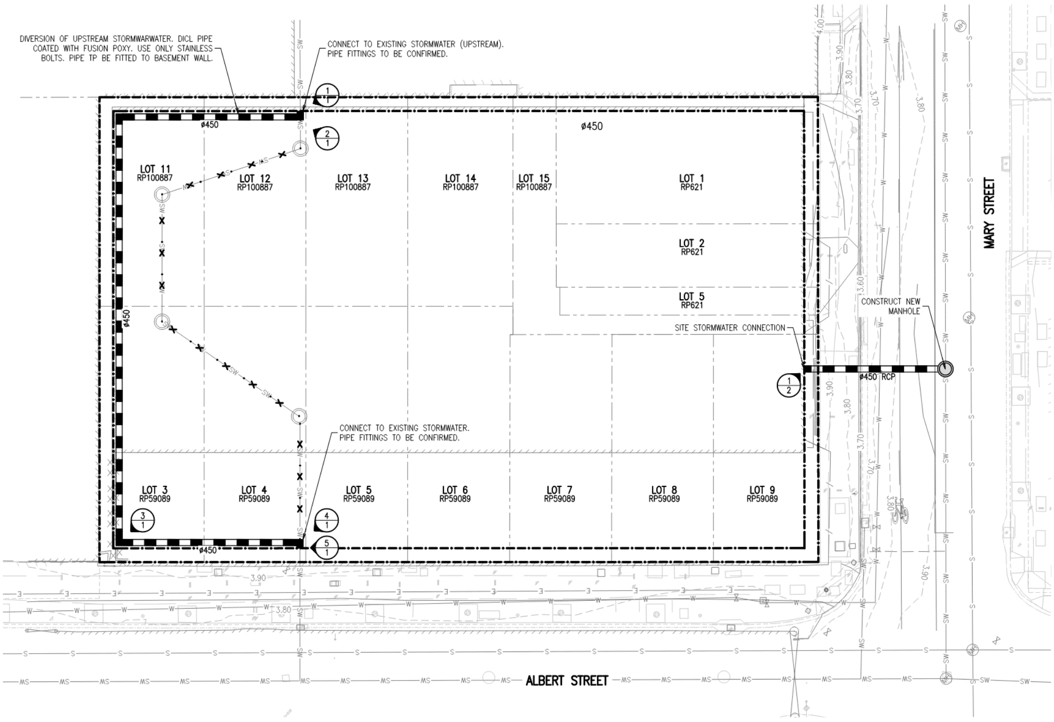


Figure 17- Stormwater Drainage Plan

Refer to 22131-RBG-ZZ-XX-RP-CV-00001 for further detail.

5 Proposed Structure

5.1 Shoring and Retention System

The retention system shall be designed to limit lateral movement at the site boundaries and to provide stability to the required basement excavation. It shall be designed as the permanent retention system and be designed to resist the boundary surcharges as set out in Design Criteria Report. The effect of vertical ground movement on finished levels and inground buried infrastructure will be assessed at the Detailed Design Stage.

The retention system shall be designed in accordance with the codes and standards listed in the Design Criteria Report, together with other relevant Australian Standards. The retention wall shall be designed to resist a full hydrostatic load in addition to soil dead and live load surcharges with the water level at the 1% ARI flood level of RL 4.6m.

The shoring system is to comprise bored cast-in-place reinforced concrete piles. Currently, 900mm diameter soldier piles have been investigated to the Albert Street, Mary Street and 119 Charlotte/110Mary basement elevations at 1800mm centres. 600mm diameter contiguous piles have been investigated to the Sebel basement elevation. Final set out of piles to be reviewed against existing acoustic shed piles as discussed in Section 1.6. A permanent reinforced concrete shotcrete wall shall be constructed progressively between the soldier piles. Geotechnical engineer to confirm maximum excavation lifts. The piles to the Albert Street face and 10m of the return faces to the Brisbane Sebel and to Mary Street are not to extend below RL -8.0m. (in the Licence Construction Area) as illustrated in **Figure 18** below.

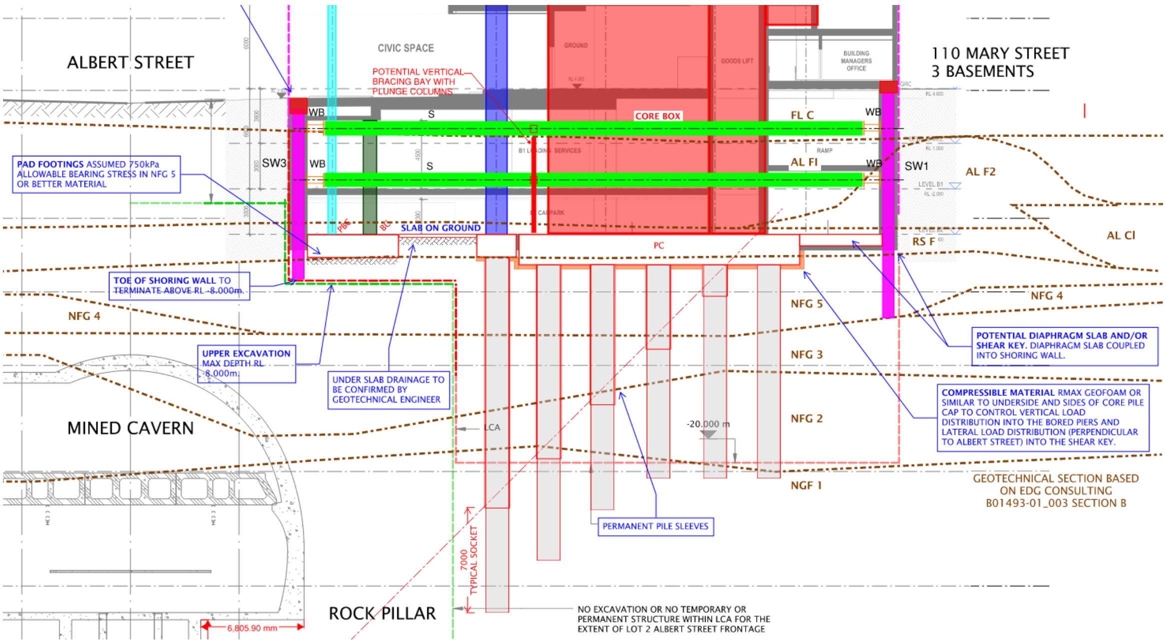


Figure 18 – Basement Section with Licence Construction Area

The shoring system is to be internally strutted with no rock anchors (temporary or permanent). Internal struts are to support a temporary steel perimeter waler beam that, in turn, supports the soldier piles. The geotechnical engineer is to model the combined system to demonstrate predicted maximum displacements and determine if one or two rows of internal strutting is required.

The shoring system including internal strutting system and walers shall be designed for various groundwater and flood conditions as outlined in the geotechnical report. Two layers of struts and whalers are proposed, as illustrated in **Figure 18** above. Two strut and whaler options are being investigated through the Schematic Design Phase and are described below:

Option 1: As per **Figure 19** - Typical whaler beams consisting of twin 1200WB455 I sections welded and orientated with the web laying horizontal. Larger whaler beams are proposed for the 110 Mary Street and Albert Street elevations for the extent of the larger strut spacings adjacent to the corebox, as illustrated in blue in **Figure 19**. The two longer struts are located through the corebox to have temporary plunge columns with a vertical bracing bay to reduce the strut's effective lengths. The plunge columns are proposed to be cast into the corebox bored piers.

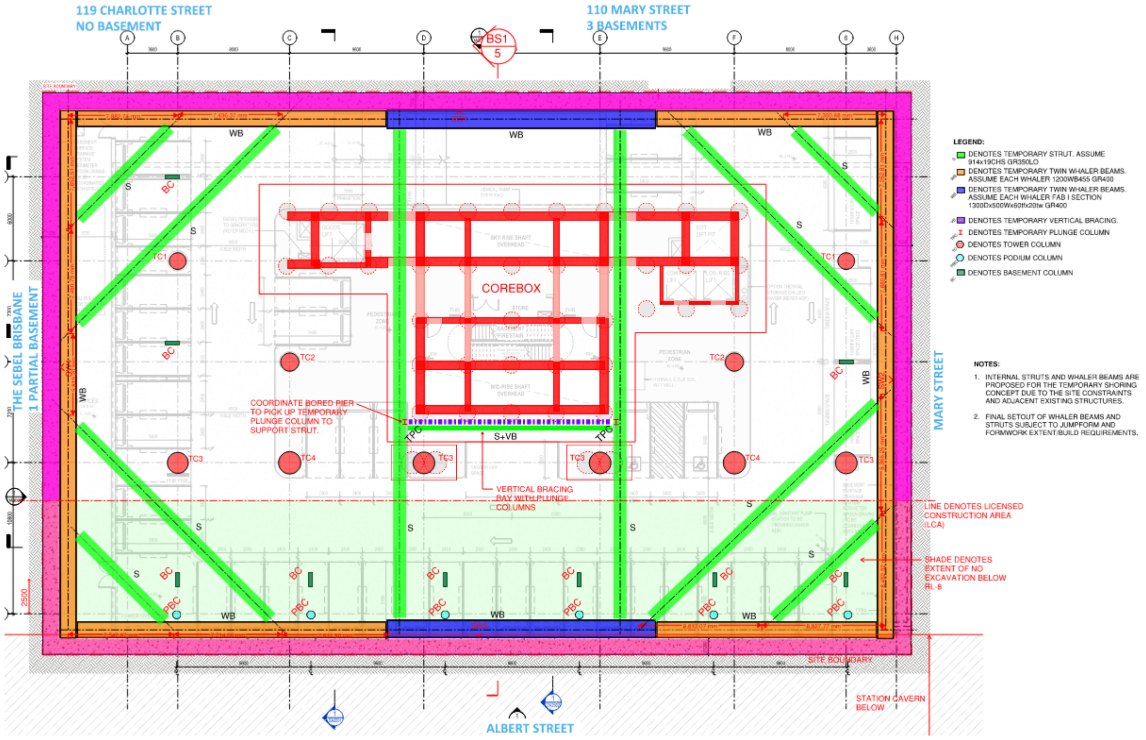


Figure 19 - Internal Strut and Whaler - Option 1

Option 2: As per **Figure 20** - Typical whaler beams consisting of twin 1200WB455 I sections welded and orientated with the web laying horizontal. To avoid locally increasing the whaler beam size as per Option 1, horizontal bracing bays are proposed for the 110 Mary Street and Albert Street elevations for the extent of the larger strut spacings adjacent to the corebox. The two longer struts located through the corebox are to have temporary plunge columns with two vertical bracing bays to reduce the strut's effective lengths. The plunge columns are proposed to be cast into the corebox bored piers.

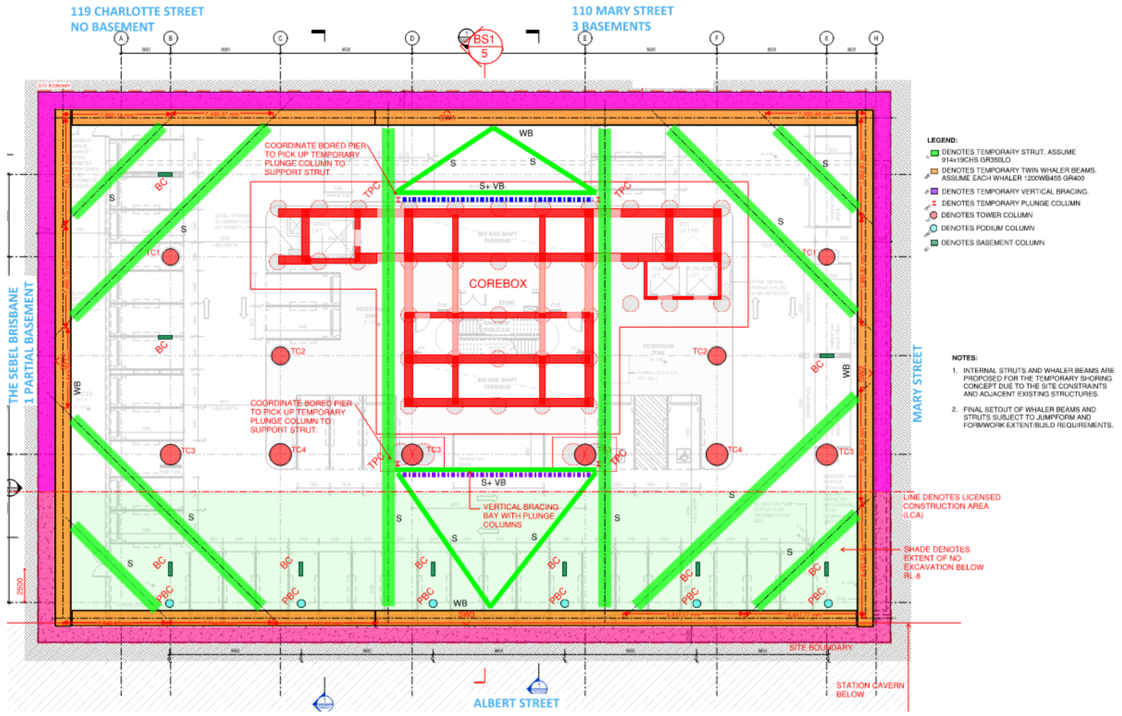


Figure 20 - Internal Strut and Whaler - Option 2

The two longer struts located through the corebox have been set-out to align with door openings and also to allow the corebox to be potentially split into three boxes through the basement levels.

For both strut and whaler options, the geotechnical engineer is to advise the degree of pre-loading for the struts to achieve the design displacement. Steel struts to be externally insulated to reduce thermal effects.

Other pile or wall systems such as secant piles, contiguous piles and diaphragm walls and their required spatial requirements are to be investigated by the team to determine the preferred shoring system for the development.

A detailed design brief will be prepared during the tender documentation phase.

5.1.1 Groundwater Response

Based on available groundwater information EDG have advised that the typical long term groundwater level could range between RL-4m AHD and RL-10 AHD. Based on groundwater level RL-4m, sump elevation RL-6m and localized zones of more permeable material, preliminary groundwater inflow analysis shows potential inflow quantities of maximum 20m^3/day, subject to further detailed groundwater assessment during the Detailed Design Stage. Based on this a drained basement is achievable.

5.2 Foundation System

To respond to the CRR Cavern design criteria, the development's tower columns and corebox were located as far as possible away from the CRR Albert Street Station Cavern outside of the RL -8.0m maximum excavation zone (green shaded extent), as illustrated in **Figure 21** below.

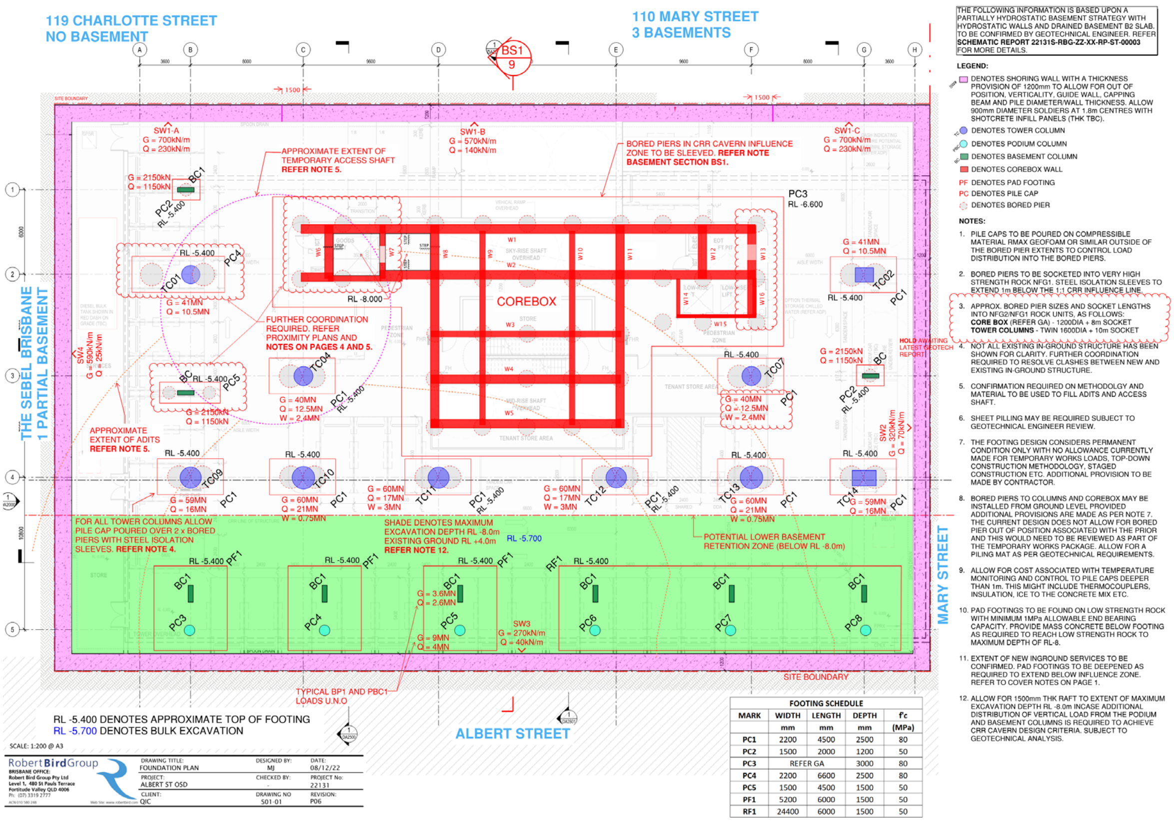


Figure 21 - Proposed Foundation Arrangement

The proposed foundation system for the tower columns and corebox consists of pile caps and large diameter bored piers with twin 1600mm diameter bored piers for each tower column and approximately thirty-five 1200mm diameter bored piers for the corebox. These bored piers are to be lined (if required, subject to geotechnical analysis) in the influence zone and have their full vertical capacity developed below the influence zone of the CRR Cavern, as shown in **Figure 22**.

The line of podium columns along the Albert Street frontage (light blue) and the first row of carpark-only columns (green), are to be found on high-level pad and/or raft foundations above the licence cavern area (above RL-8.0m). If the bearing strata at that level is not suitable, it may be required to replace the pad footings with a raft foundation(s) to reach a suitable bearing stratum without extending below RL-8m. Current data indicates the required bearing stratum can be achieved through pad foundations and raft foundation as per **Figure 21**.

The basement-only columns that are also located outside of the maximum RL -8.0m excavation zone will be supported on pile caps with single 900mm diameter bored piers.

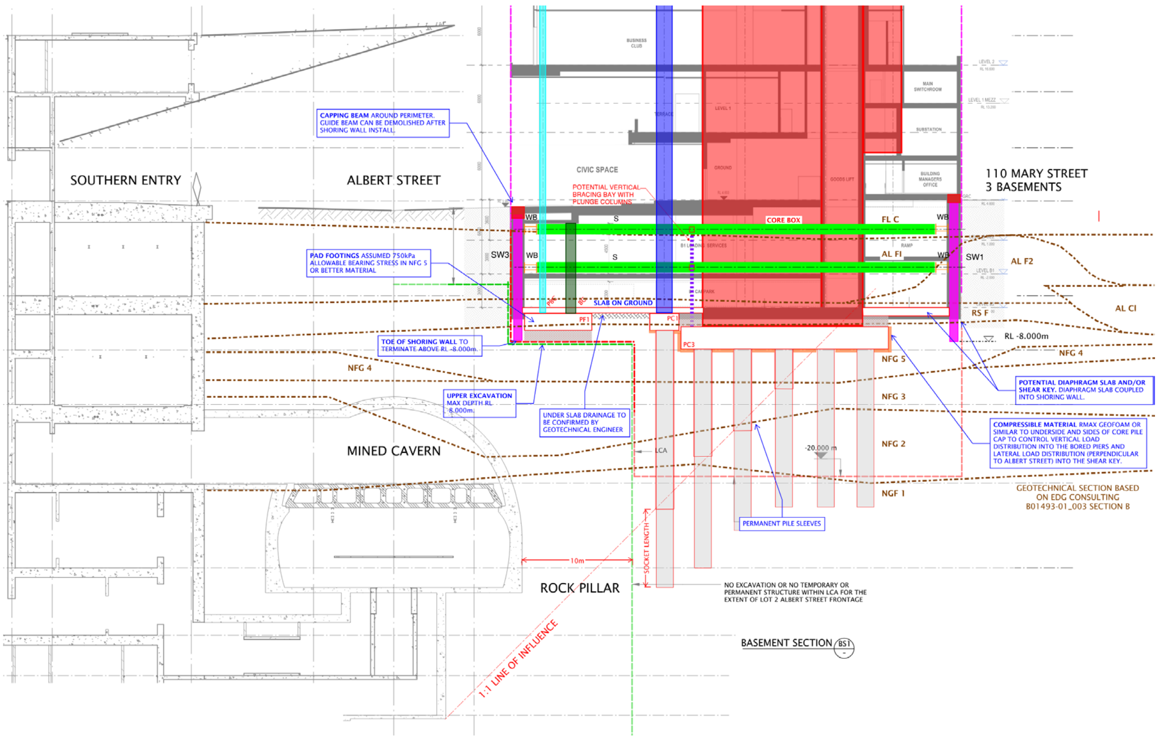


Figure 22 - Proposed Foundation

Design Criteria for the piers will be covered by the geotechnical consultant as per the Design Criteria Report.

A geotechnical assessment of the normal stress on the cavern lining and cavern vertical and horizontal distortion based on the proposed building vertical and lateral loads has been undertaken by EDG to demonstrate these are below that arising from the CRR PSTR FOSD load cases. Please refer to **Appendix D**.

The proposed bored piers are likely to be installed from the existing site level. A suitable piling matt will be required. Specifications for this will be examined by the piling contractor and reviewed by the geotechnical engineer.

5.3 Tower Lateral Load Resisting System

The Lateral Stability System consists of a cantilevered concrete corebox extending the full height of the building. The corebox is built up from a series of concrete shear walls around the lifts and lobbies with interconnecting coupling beams. To achieve the key requirements of the development, the corebox has been offset to the side of the typical floor plate furthest from Albert Street and CRR cavern, as illustrated in **Figure 23** below.

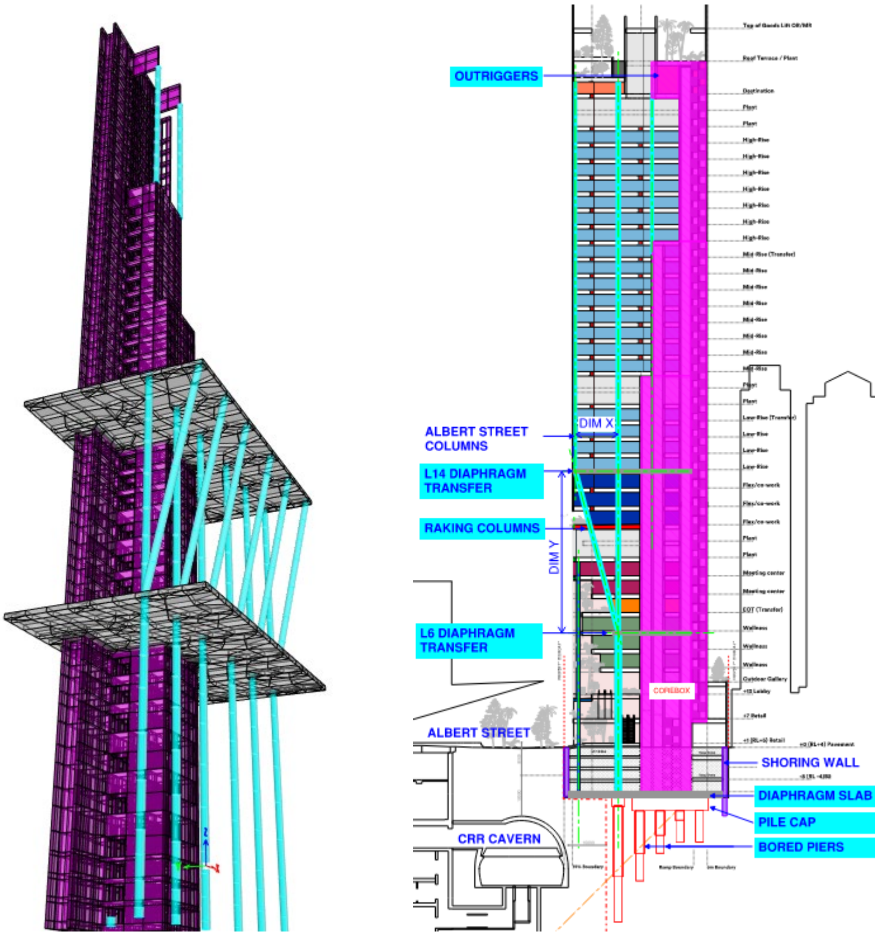


Figure 23 i) & ii) - 3D View and Section of the Lateral Stability System

Due to the offset core, a larger area of the floor plate and, therefore, mass is applied to the internal core walls than that to the external core walls. This imbalance of loading on the core results in a horizontal gravity movement of the core towards Albert Street. The heavier the floor plate, the greater the horizontal gravity movement. This movement is, however, partially counteracted by the stairbox that hangs off the external side of the core.

The corebox at the base of the building is approximately 32m in length (parallel to Albert Street or Direction-X) and 14.4m in width (perpendicular to Albert Street or Direction-Y). Due to the length-to-width ratio, the corebox has more stiffness in Direction-X and also less load than that in Direction-Y. Due to this, additional stiffness was required in Direction-Y to achieve the required horizontal movement limits to the top of the tower. This was achieved by adding two reinforced concrete wall outriggers between the high-rise (HR) lift shaft and adjacent tower columns.

The low-rise corebox, as shown in **Figure 24**, reduces in size with the termination of the low-rise (LR) lift shaft at Level 9 (the last floor served Level 8), mid-rise (MR) lift shaft at Level 22 (the last floor served Level 19), high-rise (HR) lift shaft at Level 29 (the last floor served Level 27), and sky-rise (SR) and goods lift (GL) lift shafts at Roof (the last floor served Level 37).

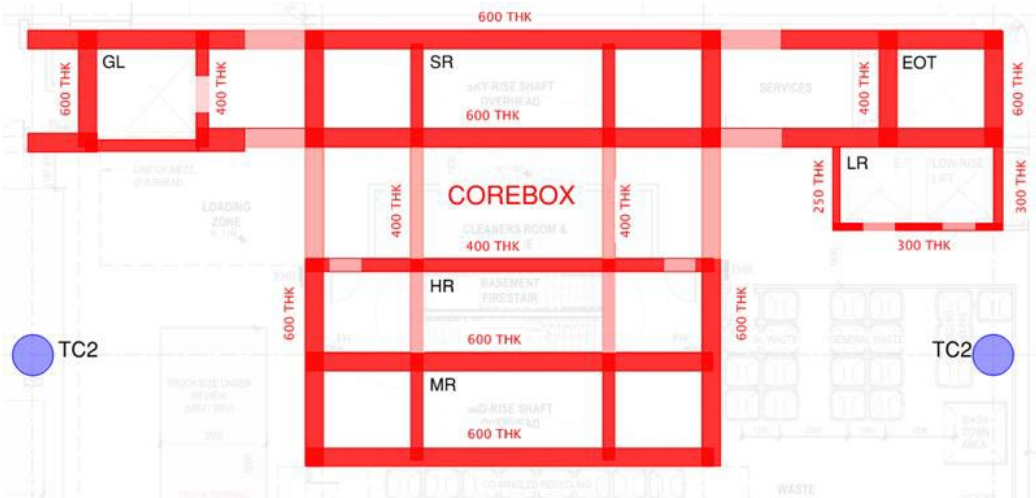


Figure 24 - Low-rise Corebox Arrangement and Wall Thicknesses

In order to respond to the site constraints and achieve the tower column positions as discussed in Section 5.3.2 with all tower columns being located outside of the RL -8.0m maximum excavation zone, a critical building transfer occurs to the base of the office floors in Direction-Y where the Albert Street tower column grid shifts inboard via raking columns between Levels 14 and 6 as shown in **Figure 25** below.

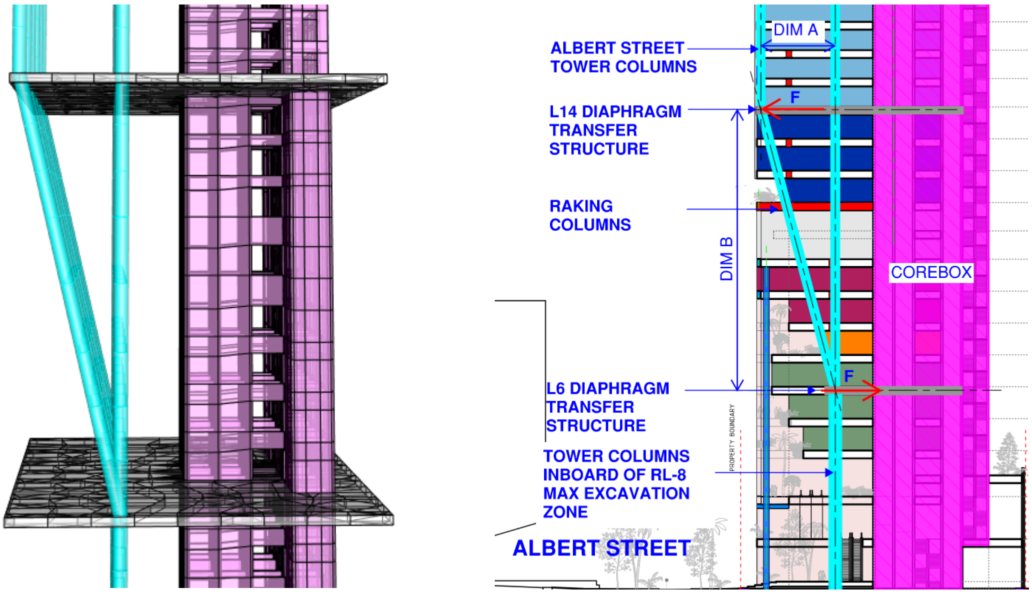


Figure 25 i) & ii) - 3D View and Section of the Single Directional Building Transfer

The building transfer has been adopted to shift the tower columns and tower load away from the CRR cavern. The Schematic Design is based on Dimensions A and B from **Figure 25,** being maximum 10.55m and 40m, respectively.

Additionally to the Direction-Y transfer, there is a secondary building transfer in Direction-X to achieve inboard columns to the Sebel and Mary Street elevations. This is also facilitated by raking the Sebel and Mary Street tower columns inwards from both edges at Level 14 to 3.6m inboard from both edges at Level 6. The magnitude of the tower column transfers to both Sebel and Mary Street elevations was coordinated to be equal and opposite in order to offset each other as much as possible and minimise the impact on the global lateral stability system. The direction-X transfer does have a local impact on the transfer diaphragm structures, as discussed further in Section 5.3.1. Below **Figure 26** is an illustration showing the bi-directional building transfer.

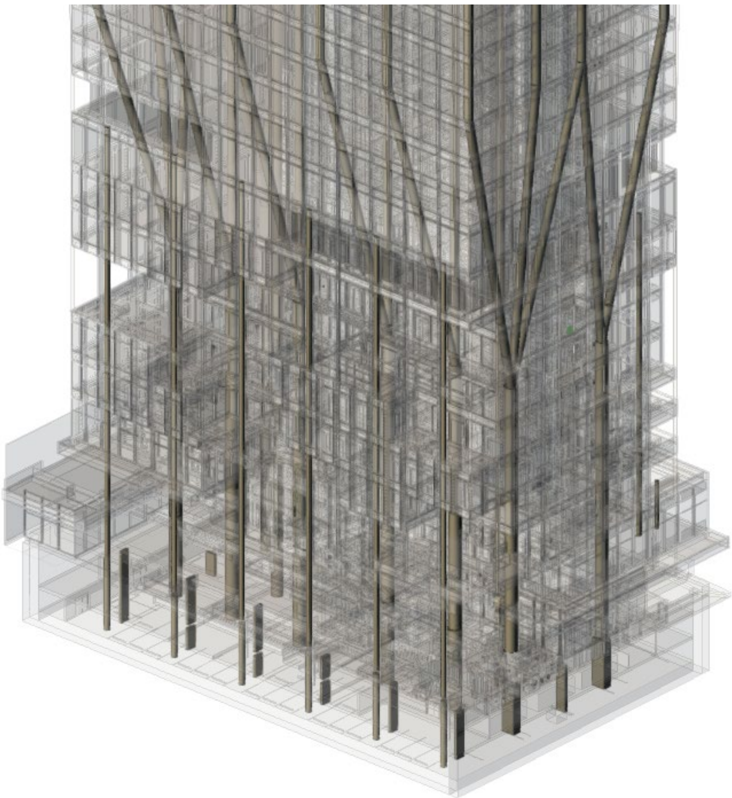


Figure 26 - 3D View of the Bi-Directional Building Transfer

The building transfers induce significant horizontal forces through the floor structure at Level 14, where the columns begin to rake and at Level 6, where the columns straighten, requiring diaphragm transfer structure at both noted levels as discussed further in Section 5.3.1. The induced horizontal forces strut and tie through the diaphragm transfer structure. The Direction-Y building transfer induces large shear forces and moments on the core, adding additional local and global stresses to the corebox and foundations. Due to the critical nature of the building transfer, the corebox and tower columns from Level 14 and below; Level 6 and 14 diaphragm floor framing and connections; and corebox pile cap and bored piers shall be designed to maintain elastic behaviour during a seismic event.

The corebox is supported off a large pile cap and diameter bored piers, as discussed in Section 5.2 with the aim to use the bored piers to transfer the lateral load from the corebox into the medium to high-strength rock. There is currently provision for additional lateral stability structure at the foundation level, as discussed further in Section 6.3.

ADP are the Vertical Transportation Consultant for the development. The lift pit overrun requirements will be coordinated with the final pile cap top of footing level and arrangement. The aim is to avoid folding the pile cap around the pits in order to minimise construction joints and complex and congested reinforcement detailing to the folds. The final design to be further developed during the Detailed Design Stage with the intent to produce the most optimum pile cap arrangement possible. We expect the final pile cap top of footing level will be at similar or higher RL to that currently documented, subject to final lift requirements.

The result of combining the building transfer and offset core is a lateral stability system with higher loads and horizontal movement than that of a conventional building which would only generally see wind or seismic loads. The horizontal movement limits for combined effects of dead load, live load, and serviceability wind load or single effect of serviceability wind are discussed within the Design Criteria Report.

5.3.1 Levels 6 and 14 Transfer Diaphragm Structure

The critical building transfer that is facilitated via raking columns between Levels 6 and 14 in both Direction-X and Direction-Y requires a transfer diaphragm structure connecting the top and base of the raking columns to the corebox. The proposed transfer diaphragm structure has been shown below for levels 6 and 14.

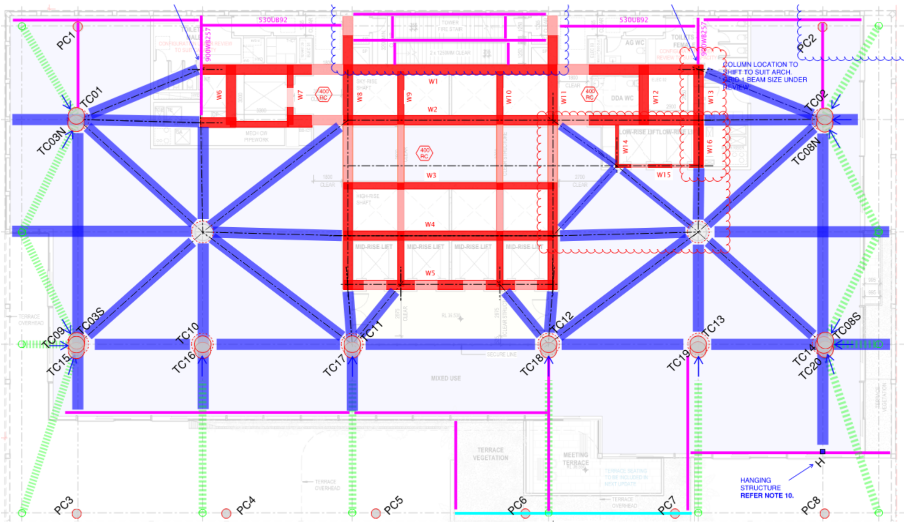


Figure 27 - Plan View of the Level 6 Diaphragm Structure

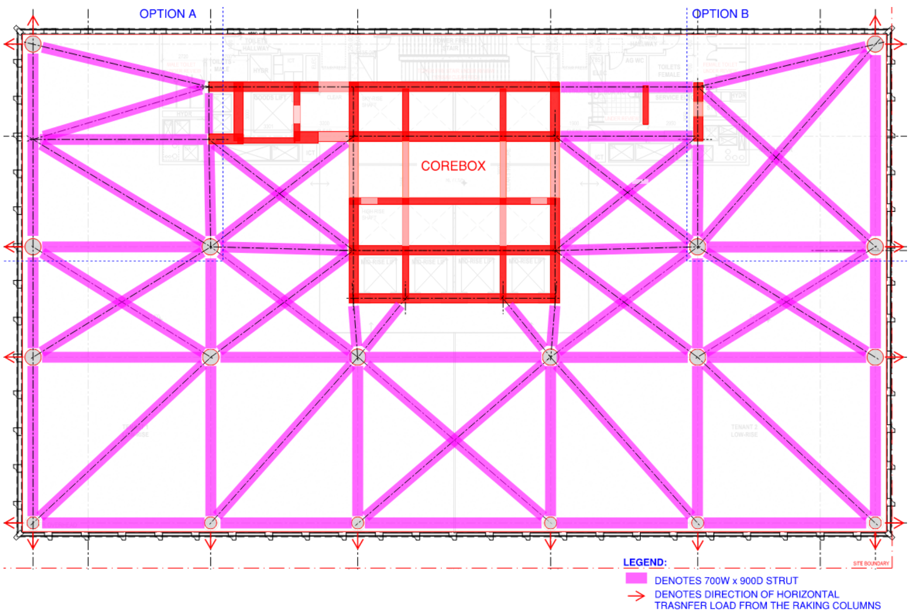


Figure 28 - Plan View of the Level 14 Diaphragm Structure

The current design proposes an integrated floor framing and transfer diaphragm structure consisting of fabricated structural steel I-section bracing members. A post-tensioned flat slab could be adopted as an alternative framing solution.

All service reticulation is to occur below the transfer diaphragm structure, as penetrations through the bracing members will be difficult. Further coordination with ADP is required to ensure the bracing members can node out with the walls, as shown above.

Under dead and live load actions, the building transfer imposes significant permanent horizontal forces through the transfer diaphragm structures, which in turn induces additional shear force and moment in the corebox. The dead and live horizontal loads generated by the transfer and imposed on the transfer diaphragm structure and core in Direction-Y is illustrated in **Figure 29** below. The total ultimate wind load on the building has also been added to **Figure 29** to illustrate the magnitude of the Direction-Y loads generated by the building transfer vs the total wind load on the building or 35.5MN vs 34MN.

The larger the column loads, the larger the demand on the diaphragm and core. The inclination of the raking columns also has a direct impact on the magnitude of the horizontal forces, and therefore it is critical that the Direction-X transfer is mirrored to both Sebel and Mary Street elevations in order to minimise any global impacts on the lateral stability system. Pattern loading will be considered during Detailed Design to ensure the worst unbalanced case is considered.

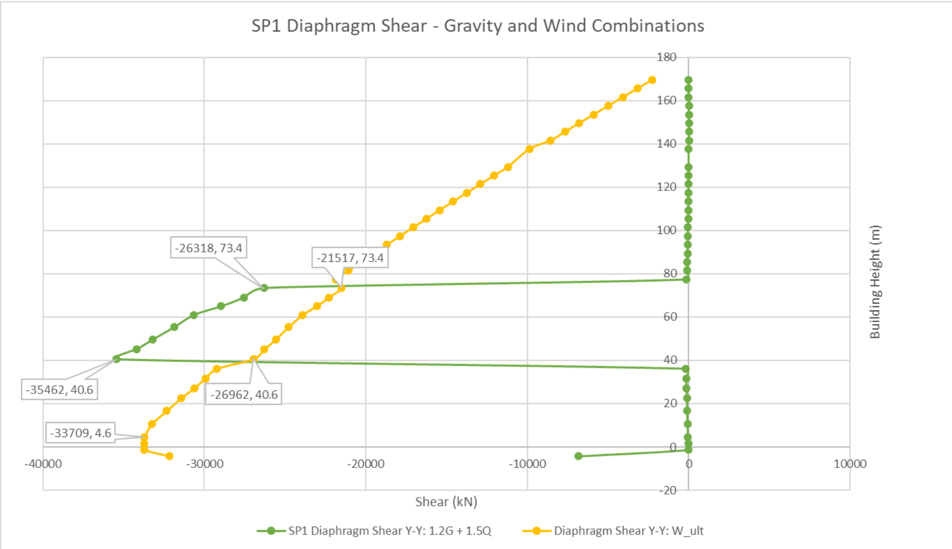


Figure 29 - Direction-Y Building Horizontal Load Summary

Note that a conventional building would only see and respond to wind or seismic loads. Due to the critical nature of the building transfer, the proposed transfer diaphragm framing allows for several alternative load paths to offer additional redundancy to avoid the risk of progressive collapse.

Further work is needed to assess in detail the full impact of the horizontal loads on the transfer diaphragm framing and corebox extent between the upper and lower diaphragms. Additionally, further detailed work is required to verify how the transfer diaphragm framing will connect to the corebox and if an additional local structure is required, such as an additional wall structure or cast-in nodes to connect the diaphragm framing to the walls, stressed high-grade bars and additional reinforcement.

5.3.2 Raking Column and Transfer Diaphragm Structure Set-out

The set-out of raking columns, vertical columns and transfer diaphragm structure at their intersecting points or nodes is critical to avoid any parasitic actions being introduced into the structural systems. Typically at node locations, all members should intersect at their centre points, similar to that illustrated in **Figure 30** below.

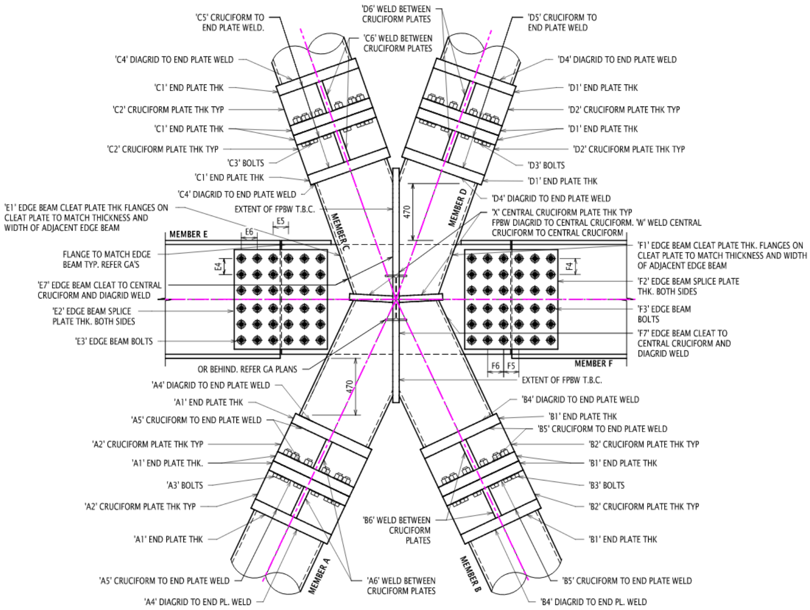


Figure 30 - Example of Set-out at a Raking Column Node Location

Therefore in elevation, the set-out of the raking columns shall allow the centre lines of the raking column, vertical column and mid-depth of the diaphragm structure (-450mm from the top of steel) to intersect at a common point to create a node to the top and bottom of the raking columns.

In the plan, the transfer diaphragm structure shall be set-out with centres of struts nodding out at columns and typically with the centre of the wall similar to that shown in **Figure 31** below.

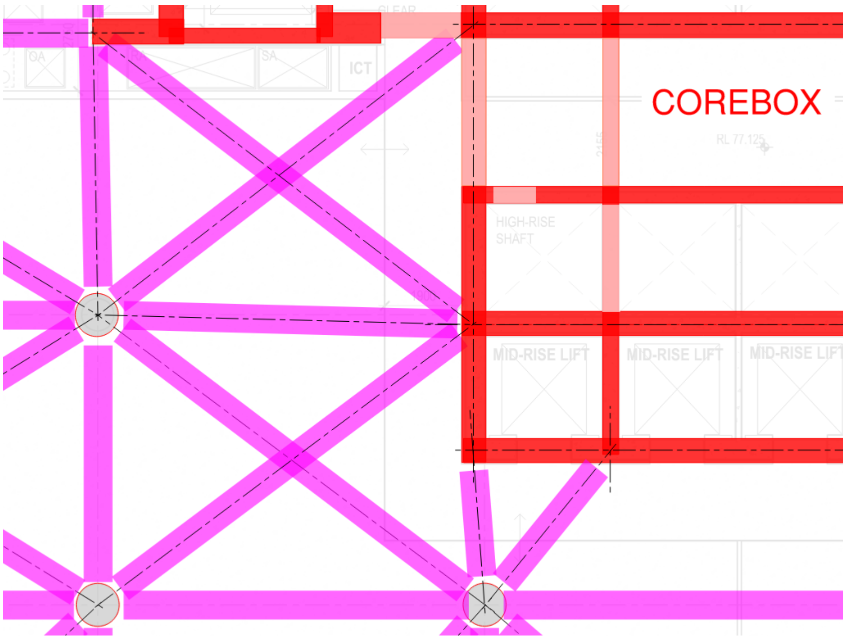


Figure 31 - Part Plan - Example of Set-out at a Corebox Node Location

5.3.3 Gravity Lean

As a side core tower lateral movements under gravity need to be considered. **Figure 32** shows the elastic lean towards Albert Street assuming correction during construction. Peak movements are in the order of 20-25mm which is small compared to the total allowable under a performance criterion of height/500 equivalent to approximately 350mm (but inclusive of lateral loads and time dependent effects). Peak gravity movements also occur at mid-height of building compared to lateral load movements which peak at the top level. Cumulatively these movements therefore don't add to produce a significantly worse effect and the gravity lean is considered to be a minor issue.

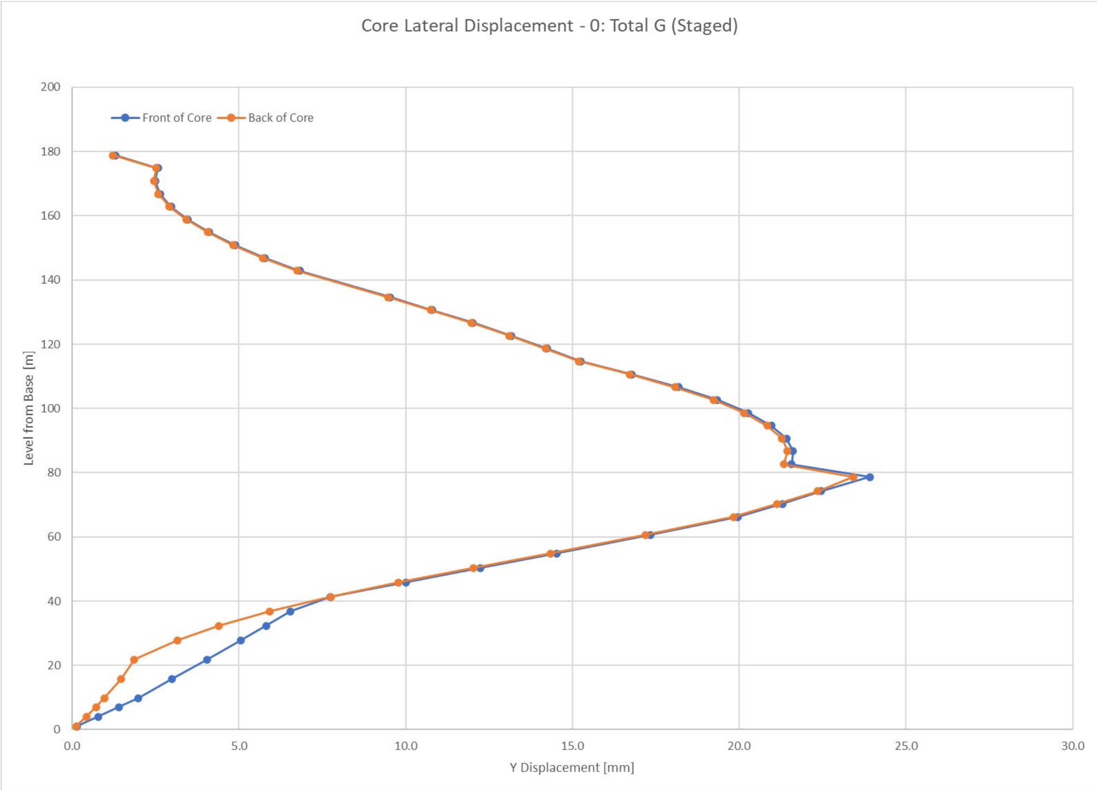


Figure 32 - Tower Gravity Lean (SW+SIDL, Staged, No f(t))

5.4 Gravity Load Resisting System

Gravity loads in the tower are resisted conventionally by columns and core walls. **See Figure 33.** The core walls are traditional reinforced concrete and will most likely be jump-formed as is the prevailing practice locally. Core wall thickness decreases up the tower according to demand, with the primary external walls being 600mm thick at the tower base and decreasing incrementally throughout the tower. The minimum achievable wall thicknesses are yet to be determined and will be subject to a lateral displacement study.

There are three distinct groups of columns throughout the development as summarized below:

Basement Columns - extend only up to underside of ground level and are traditional reinforced concrete of primarily rectangular shape in the order of 1000x300mm.

Podium Columns - continue to as high as the underside of level 10. These are conventional reinforced concrete through the basements to ground level in the order of 700mm diameter, above which they convert to concrete filled steel tubes in the order of 600mm diameter.

Tower Columns – continue from footing through the tower. These are conventional reinforced concrete through the basements to ground level in the order of 1100x1700mm or 1600mm diameter, above which they convert to concrete filled steel tubes ranging from 1600mm diameter at ground level to 600mm diameter at roof.

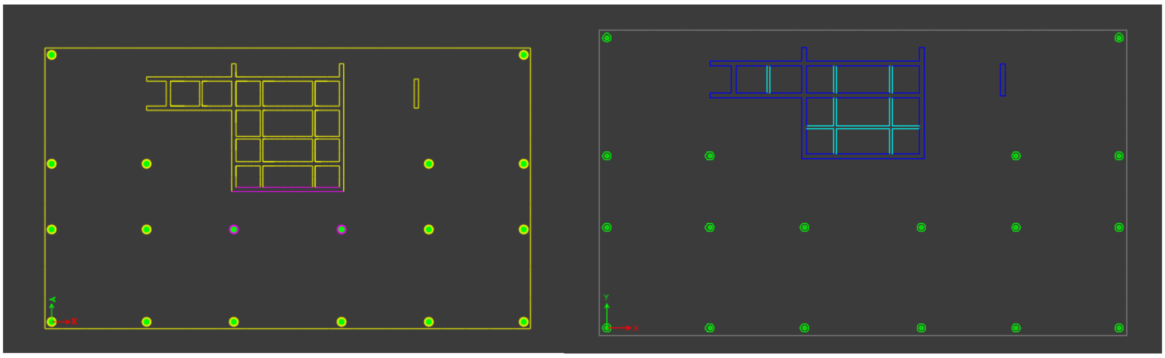


Figure 33 - Gravity Load Resisting System (Low-rise and High-rise)

5.4.1 Axial Shortening

Axial shortening is a relevant consideration for any structure. It often begins governing gravity system design for towers above 30-40 storeys or beyond 150m. At approximately 180m effective height, the development is of a height that axial shortening can influence vertical element design/geometry. Past experience has shown that correct concrete specification and coordination with the façade consultant is sufficient to overcome most issues in this intermediate height range. Nevertheless an axial shortening analysis will be performed to validate the geometry of gravity resisting elements during detailed design stage. Such an analysis is beyond the scope of schematic design.

Qualitatively, the composite floor system will generally be favourable for axial shortening as it is lightweight and the pinned beam-column connections minimise secondary moments from differential settlement. Similarly, the composite concrete filled tube columns help to reduce axial shortening by effectively preventing drying shrinkage and opposing creep movements with large equivalent steel percentages. The concrete specified to meet ESD targets is also beneficial for axial shortening as it typically entails large cement replacement and by association lower shrinkage.

In the absence of a detailed study, two aspects of the structure that have been identified for further consideration at schematic stage:

(1) Gravity lean. With a side core the tower will tend to lean away from the edge where the core is positioned, and this will be cumulative with lateral load displacements. This is discussed further in Section 5.3.3.

(2) Columns in close proximity to the core. The left hand side image in **Figure 33** highlights the relevant core wall and columns and **Figure 34** shows the elastic shortening differential throughout the height of the tower. This is based on a reinforced concrete column only; no account is made of the steel tube, higher column reinforcement percentage or differential concrete specification between the two concrete elements. The peak differential is approximately 20mm at the most unfavourable level for an element spacing of approximately 4,900mm. This is equivalent to approximately span/250 (elastic) compared to a typical performance criterion of span/300 (inelastic). Whether correcting the simplifying assumptions mentioned is sufficient to overcome the additional settlement from inelastic material properties (creep and shrinkage) will become evident following detailed study at a later project stage. Additional mitigation measures such as additional reinforcement, tube thickness or column size and/or pre-setting will be introduced as required to meet the performance criterion.

Secondary floor beam bending moments will be considered and incorporated into the design as required.

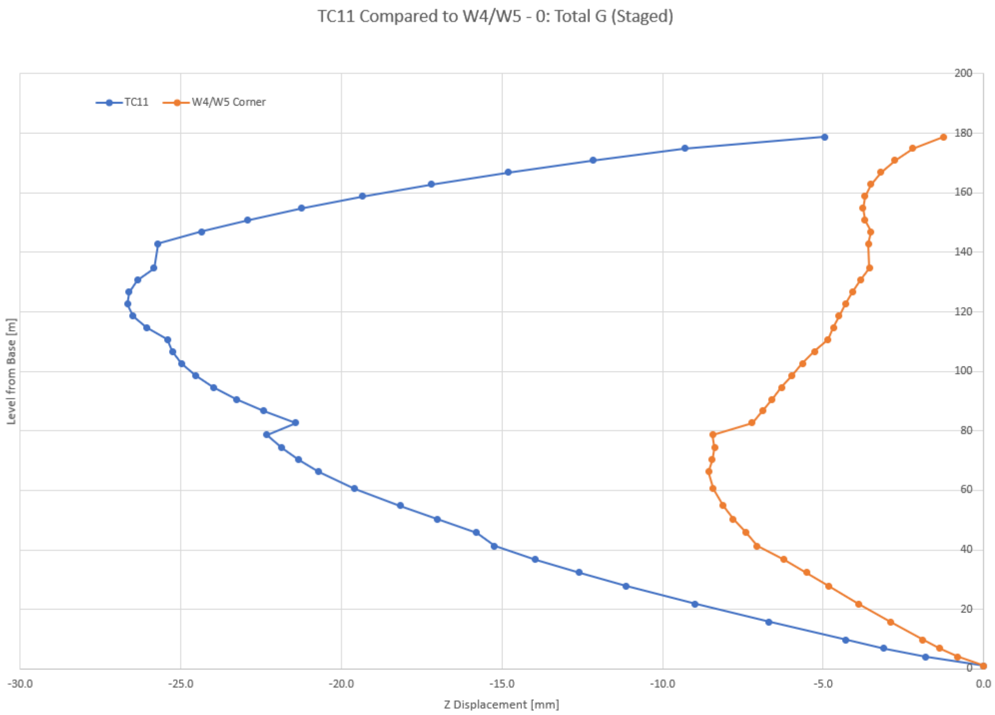


Figure 34 - TC11 and Core Differential Axial Shortening (SW+SIDL, Corrected, No *f(t)*)

5.5 Floor Plate Systems

Typically, reinforced concrete is proposed for the floor plate system and columns for Basement B1 and Ground Level. Above the Ground floor, composite steel framing is proposed for the floors and columns.

5.5.1 Basements

Basement B2 is designed to be a non-spanning, non-hydrostatic slab on the ground. The slab is to be cast over a drainage layer with an embedded drain system connecting to sump pumps. The drainage system shall be designed for water inflows as directed by the Geotechnical engineer and be designed by the building hydraulics engineer. We recommend the sump pump system have access to backup generator power in case of a power outage to reduce the risk of water ingress to the basement. The Basement B2 slab design and articulation to be developed during Detailed Design to potentially consider a pump failure condition. B2 would be designed to be pressure relieved by the drainage system linked to grated drains and drain outlets in the B2 slab such that flooding will occur after prolonged pump failure rather than failing the slab on ground.

Basement B1 is designed as a conventionally reinforced two-way flat slab to accommodate higher imposed live loads related to the loading dock area. The slab is minimum 350mm thick with 425mm thick through the loading dock area and between the corebox and Albert Street shoring wall. The slab has been designed to allow for a shallow 50mm deep spoon drain to be cast into the surface of the slab for the perimeter of the basement. Service reticulation is to occur below the soffit of the slab.

5.5.2 Podium

The Podium levels are proposed to be framed with composite steel floor framing and columns.

Additional podium columns are required to support the varying floorplate corners and edges where the Tower Columns have been transferred inboard. These podium columns typically extend up to the underside of Level 10. The Albert Street podium column extends down to the foundation level. The podium columns to the Sebel/119 Charlotte Street and 110 Mary/Mary Street corners transfer at Level 1. In some areas where cantilevered edges are too large, there have been hanging columns introduced.

5.5.3 Typical Tower Floors

As the typical commercial office floors make up the bulk of the structure and load to the tower, so it is critical to achieve the most efficient column grid set out and structural floor framing solution possible to both minimise the building transfer, materials, cost and embodied carbon. The typical commercial office levels (external to the core box) are designed as composite steel consisting of steel beams and a 130mm thick condeck slab which produces a floor to the NLA with a self-weight mass of approximately 377kg/m2. The slab in the corebox and stair box is conventionally reinforced and formed concrete slab.

The typical commercial floor-to-floor height is 4000mm. This floor-to-floor build-up comprises the following zones, as outlined in Table 2.

Table 2 - Typical Floor-to-Floor Height Provision

Floor-to-Floor Height Zones	Provision (mm)
Overall floor-to-floor height	4000
Clear floor-to-ceiling height	2700
Raised floor	150
Ceiling and lighting zone	320TBC
Tenant zone	
Structure and service zone	830

Typically the floor plates comprise primary steel beams aligned perpendicular to Albert Street, spanning between the tower columns and corebox. Secondary steel beams span between the primary beams and core box at circa maximum 2.8m centres and on each column grid.

Primary steel beams are circa 460mm/530mm/610mm/700mm deep, and secondary steel beams are circa 410mm/460mm deep, with the typical arrangement illustrated in **Figure 35** below.

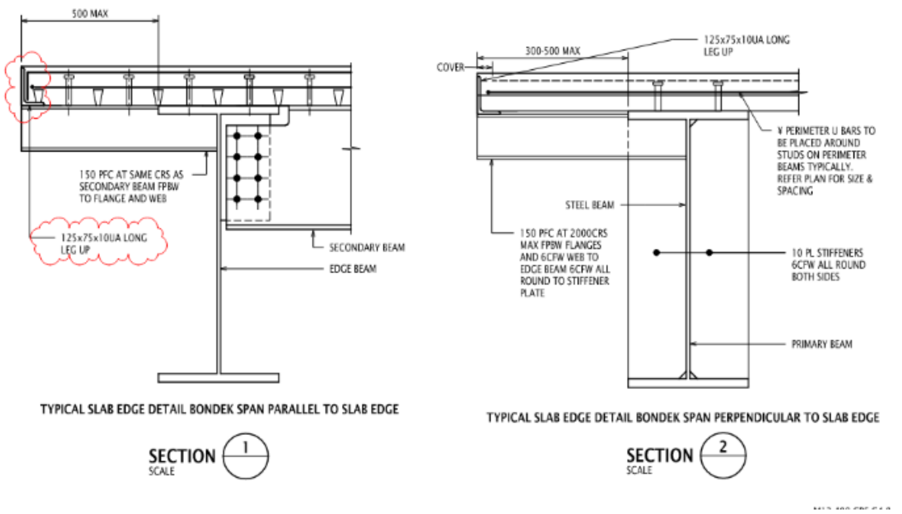


Figure 35: Typical Composite Steel Edge Beam Details

Shear studs will be welded off to the tops of the steel beams to engage composite action with the condeck slab. Steel beams will be pre-cambered to suit the self-weight deflection.

The service and structural zone integration being targeted looks to run services out of the risers below the secondary beams which typically run across and in front of the risers; these services are then to traverse to each floor bay by passing below the shallower primary beams. The larger primary beams are to be detailed with service penetrations located at the mid-depth of the beam. The penetration sizes and locations are coordinated with services engineers to optimise beam design and services distribution. No penetrations are being considered for the smaller primary beams or any secondary beams at this time.

Fire protection is proposed for all beams at this time with the aim to refine this via Fire Engineering to primary beams and secondary beams on column grid lines only.

5.6 Construction Sequence

The sequence of works of the primary structural elements will be as follows –

(1) Pile retention piles and capping beam.

(2) Install bored piers to the columns and corebox. The level at which bored piers to be install will be reviewed during Detailed Design.

(3) Excavate to retention prop level(s).

(4) Install retention props and continue excavation to Basement 2.

(5) Erect formwork, install reinforcement and place concrete (**FRP**) foundations, columns and basement slabs from the bottom up, removing temporary retention props sequentially.

(6) Commence core jump system from the ground floor (Contractor can opt to do this within the excavation if coordinated with temporary retention props), progressing ahead of the completed levels by 10 storeys or as otherwise required for gravity lean correction, subject to detailed study.

(7) FRP ground floor. Install a temporary access deck over sunken planters for construction access.

(8) Transition RC basement columns to steel tube tower and podium columns, temporary bracing to columns if required.

(9) Erect Level 1 steel beams with temporary bracing to the RC core, thus laterally restraining the steel columns and providing a temporary diaphragm.

(10) Place steel decking, install reinforcement and place concrete to the column below and level 1 steel deck.

(11) Hang level 3 terrace from level 4 using local falsework over the ground floor, e.g. Temporary columns. Falsework is to be removed once levels 2 to 4 achieve concrete transfer strength. Refer to **Figure 36** below. Similar sequence for Level 6 which has a hanger back to level 7.

Figure 36 - Hanging Structure to Podium

(12) Repeat steps 8 to 10 between levels 2 and 6. Level corrections to columns may be required for the self-weight lean of the tower towards Albert St, pending a detailed study.

(13) Install raking columns commencing at level 6 and completing at level 14, progressing two levels ahead of constructed levels, temporarily braced. Splice detail TBC.

(14) Repeat steps 8 to 10 between levels 7 and 14. Raking columns to be concrete filled with every steel deck.

(15) Repeat steps 8 to 10 between levels 14 and 40.

(16) FRP of level 40 outriggers.

(17) Install roof crown ring beam and crown fins.

6 Compliance to CRRDA Constraints

6.1 Proposed Excavation

Based on the current geotechnical investigation information, it is expected that most of the excavation will be done through fill, alluvium, residual soil and some low-grade Neranleigh-Fernvale Group (NFG) rock.

For the shoring wall, a combination of 900mm diameter soldier piles at 2.0 x bored pier diameter spacing and 600mm diameter contiguous piles will be founded to RL -8.0m. These will be braced with two rows of internal struts. Refer to further detail in Section 5.1 of this report.

The general excavation depth is to RL -5.7m, allowing for up to a 400mm thick Basement 2 slab and 300mm sub-slab drainage layer. Deeper column pile caps outside of the LCA will be locally excavated further.

The proposal complies with the excavation limit of RL-8.0m over the CRR cavern rock pillar zone

The core pile cap excavation will be created with potentially sheet piles in the residual soil or temporary batters if within weak rock. Excavation depth of RL-9.6m.

The rear area excavation does not exceed the RL-20m excavation zone.

6.2 Tower Vertical and Lateral Load Paths and Methodology

The main site constraint of the CRR Cavern excavation and load limits has been a key driver for the currently proposed structural design solution. The below sections discuss how the gravity and lateral stability systems have been tailored to ensure compliance with the CRR Cavern design constraints.

RBG has provided the proposed building loads for permanent and transient load cases to EDG for inclusion in the cavern assessment modelling. These included both vertical and lateral loads for the corebox, vertical loads for the columns and shoring walls.

A summary of the proposed building preliminary corebox bored pier, column and shoring wall loads has been attached in **Appendix B**. All loads have a minimum provision of 10% to allow for any unknowns or minor change during detailed design.

6.2.1 Tower Columns Loads and Compliance

The tower is supported by up to 20 tower columns on a varying orthogonal grid up to 10.8 x 12.6m, and an eccentric corebox that is positioned towards the 119 Charlotte Street/110 Mary Street boundary of the site furthest from the CRR cavern. This support grid is maintained from the top of the building to Level 14. At level 14, a bi-directional building transfer occurs whereby the columns on Grid 5 (Albert Street elevation) rake inboard, moving up to 10.55m horizontally towards Grid 4, then straightening at Level 6. Columns on Grid H (Mary Street elevation) rake inboard, moving up to 3.6m horizontally towards Grid G between Levels 6 and 14 (mirrored column rake to Grids A-B (The Sebel elevation). Refer to **Figure 37** below.

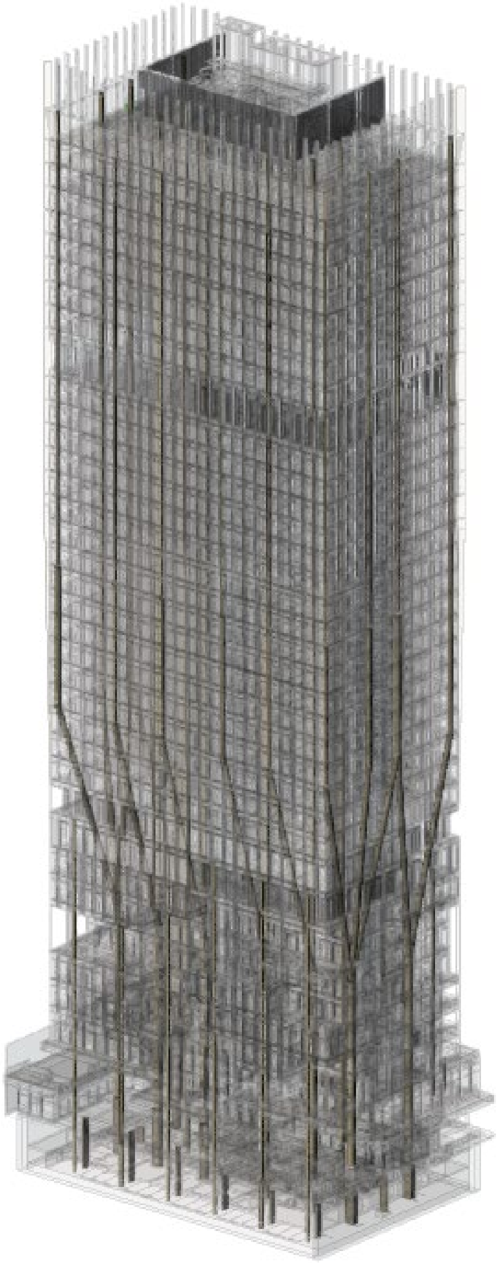


Figure 37 - Building Columns

The column rake perpendicular to Albert St is required to direct the tower loads away from the CRR cavern and to locate the tower columns inboard of the maximum excavation zone at RL-8.0m (within 10m of the CRR cavern). The tower load strategy and the adoption of raking columns supported on large diameter bored piers outside the LCA and founding below the CRR cavern influence zone to satisfy the load intent of the CRR cavern design manual.

6.2.2 Podium Loads and Compliance

Where the tower columns rake inboard additional podium only columns are introduced to provide sufficient support to some of the edges and corners to the podium floors up to Level 10. The podium columns along the Albert Street frontage are spaced at 9.6m centres and extend down to foundation level. Podium Levels 1 to 8 vary in extent on the Albert Street frontage with some of the podium columns clear spanning over several levels. Two hanging columns are required to support a section of Level 3 and one hanging column is required to support a section of Level 6; refer to Section 5.2 and **Figure 38** below.

Additionally, to the podium columns there are basement only columns that break down the ground and basement slab spans. Both the podium and basement columns that found above the maximum excavation RL-8m extent are supported from shallow foundations consisting of pad and raft foundations that do not extend into the LCA.

The podium and basement columns that found above the maximum excavation RL-8m extent have been load limited by only extending the columns to a maximum height of Level 10 to ensure the resultant pressures are less than those for the stated CRR PSTR load and excavation cases. The total sum of the developments shoring wall and footing loads above the licenced cavern area equate to an actual stress of 220kPa if distributed over the extent of the RL-8m excavation.

Figure 38 - Albert Street and Mary Street Frontage

6.2.3 Corebox Loads and Compliance

The corebox has been positioned to the side of the development site furthest from the CRR cavern to minimize the lateral load imposed on the CRR cavern. Additionally to this and given the level of the corebox pile cap it is expected that much of the proposed building lateral load will distribute above the CRR cavern.

The corebox load strategy also looks to adopt a pile cap and large diameter bored piers outside the LCA and founding below the CRR cavern influence zone to satisfy the load intent of the CRR cavern design manual.

The overall tower's lateral load path is discussed in Section 5.3. The only additional item to note includes a structural provision allowance at the Basement B2 level for a 400mm thick diaphragm slab to allow for connectivity of the entire basement structure and additional distribution of the corebox lateral load should it be needed.

The current geotechnical modelling undertaken for the cavern assessment has considered that all lateral load is currently assumed to be applied to the corebox bored piers as per the actual load case shown in the Design Criteria Report.

6.3 Current Geotechnical Modelling

In order to verify the proposed structural design solution described above complies with the CRR PSTR load and excavation cases geotechnical modelling has been undertaken by EDG which consists of the assessment of the normal stress on the cavern lining and cavern vertical and horizontal distortion based on the proposed building vertical and lateral loads and demonstrating these are below that arising from the CRR PSTR FOSD load cases.

The results of this analysis have been presented within EDG Geotechnical Report - Albert Street Cavern Assessment Report - B01493-1AE as attached in **Appendix D**. The outcome of the geotechnical assessment suggest that the predicted effects associated with the proposed building loads are within the effects associated with the PSTR design load cases.

6.4 Proposed Geotechnical Modelling

Further work will be required to the EDG cavern assessment modelling during Detailed Design Stage including further development of the geotechnical model and updates to include buried infrastructure such as the shaft and adits that connect the shaft to the cavern.

APPENDICES

Appendix A RBG Structural Schematic Drawings

ALBERT STREET OSD

GENERAL NOTES

1. THESE ENGINEERING DRAWINGS ARE TO BE READ IN CONJUNCTION WITH PROJECT SPECIFICATIONS AND OTHER CONSULTANTS DRAWINGS ON THE PROJECT.
2. THESE ENGINEERING DRAWINGS HAVE BEEN PREPARED FROM INFORMATION AVAILABLE AT THE TIME OF ISSUE. AS THIS INFORMATION MAY BE THE SUBJECT OF CHANGE PRIOR TO OR DURING CONSTRUCTION THE CONTRACTOR IS TO ADVISE THE ENGINEER WHERE DISCREPANCIES OCCUR.
3. THE STRUCTURE HAS BEEN DESIGNED FOR THE IN-SERVICE LOADS ACTING WHEN THE STRUCTURE IS COMPLETE ONLY. LOADS OR ACTIONS DUE TO CONSTRUCTION AND INSTALLATION METHODOLOGIES AND/OR EQUIPMENT HAVE NOT BEEN CONSIDERED UNLESS CLEARLY STATED OTHERWISE.
4. THESE DRAWINGS SHALL NOT BE USED FOR FINAL SETOUT OF THE PROJECT UNLESS SPECIFICALLY STATED.
5. WHERE STRUCTURAL CERTIFICATION IS REQUIRED, INSPECTIONS ARE TO BE PERFORMED BY A DULY APPOINTED INSPECTOR FROM 'ROBERT BIRD GROUP'. THESE INSPECTIONS ARE TO BE PERFORMED IN ACCORDANCE WITH THE INSPECTION & TEST PLANS PREPARED BY 'ROBERT BIRD GROUP.' THE INSPECTOR IS TO BE GIVEN A MINIMUM OF 48 HOURS NOTICE THAT AN INSPECTION IS REQUIRED.
6. PRIOR TO THE COMMENCEMENT OF WORKS THE CONTRACTOR IS TO IDENTIFY ALL EXISTING SERVICES. ANY SERVICES SHOWN ON 'ROBERT BIRD GROUP' DRAWINGS ARE INDICATIVE ONLY.
7. THE CONTRACTOR SHALL CHECK OR OBTAIN ALL DIMENSIONS RELEVANT TO SETTING OUT OF SITE WORKS, AND THE PROVISION OF ANY TEMPORARY BRACING, INCLUDING DESIGN, IN ACCORDANCE WITH THE SPECIFICATION.
8. DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE STABILITY OF THE WORKS AND ENSURE NO PART IS OVERSTRESSED. THE DESIGN AND CERTIFICATION OF ALL FORMWORK AND BACKPROPPING IS TO BE THE RESPONSIBILITY OF THE CONTRACTOR. (REFER TO CONCRETE NOTES FOR STRIPPING PROCEDURES FOR IN-SITU CONCRETE).
9. THE CONTRACTOR IS TO OBTAIN DESIGN ADVICE FROM A SUITABLY QUALIFIED ENGINEER REGARDING DEMOLITION, RETROFITTING, TEMPORARY WORKS, HEALTH & SAFETY AND NUISANCE. THIS HAS BEEN REFERRED TO AS THE "CONTRACTORS ENGINEER" THROUGHOUT THE REMAINING NOTES.
10. WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT AUSTRALIAN STANDARDS AND NCC STATUTORY REQUIREMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT SUFFICIENT TOLERANCES ARE PROVIDED AND INTEGRATED THROUGHOUT ALL ELEMENTS OF THE WORKS.
12. ALL NON-LOAD BEARING ELEMENTS SHALL BE KEPT CLEAR OF THE STRUCTURE SOFFIT BY AN ALLOWANCE DETERMINED FROM SPAN/250 OR CANTILEVER/125 BUT NOT LESS THAN 20mm, UNLESS NOTED OTHERWISE ON THE DRAWINGS.
13. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
14. SUPERIMPOSED DEAD LOADS AND LIVE LOADS HAVE BEEN DETERMINED IN ACCORDANCE WITH AS1170 AND ARE SHOWN ON THE LOADING PLANS.
15. WIND AND EARTHQUAKE LOADS HAVE BEEN DETERMINED IN ACCORDANCE WITH AS1170 BASED ON THE FOLLOWING DESIGN CRITERIA :-

NCC STRUCTURAL IMPORTANCE LEVEL: 3

WIND LOADS:		EARTH QUAKE LOADS:	
ANNUAL PROBABILITY OF EXCEEDANCE	1:1000	ANNUAL PROBABILITY OF EXCEEDANCE	1:1000
REGION	B	PROBABILITY FACTOR Kp	1.3
TERRAIN CATEGORY	4	HAZARD FACTOR	0.08
REGIONAL WIND SPEED V_R (m/s)	60	SITE SUB-SOIL CLASS	C
SHIELDING M_S	I	STRUCTURAL DUCTILITY FACTOR u * DUCTILITY 2 ADOPTED ABOVE L14	1*
TOPOGRAPHIC Mt	I	STRUCTURAL PERFORMANCE FACTOR Sp	0.77
		EARTHQUAKE DESIGN CATEGORY	III

16. THE GEOTECHNICAL ENGINEERING INVESTIGATION HAS BEEN PERFORMED BY EDG CONSULTING REPORT NO : B01494-IAC DATE : 1 NOV 2022

EARTHWORKS NOTES

1. REFER TO THE GEOTECHNICAL ENGINEERING REPORT SPECIFIED IN THE GENERAL NOTES.
2. STRIP SITE OF ALL TOPSOIL, VEGETATION AND DELETERIOUS MATTER TO A MINIMUM DEPTH OF 150mm.
3. PROOF ROLL SUBGRADE TO REVEAL SOFT SPOTS. SOFT SPOTS TO BE REMOVED AND BACKFILLED. ALL NATURAL SUBGRADE IS TO BE COMPACTED TO 98% STANDARD COMPACTION IN ACCORDANCE WITH AS1289 PRIOR TO PLACEMENT OF FILL MATERIAL.
4. MATERIAL WON FROM THE SITE TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER FOR APPROVAL PRIOR TO USE AS FILL. ANY IMPORTED FILL TO HAVE A MINIMUM CBR VALUE OF 15%. ALL FILL TO BE COMPACTED TO 98% STANDARD COMPACTION IN 200mm MAXIMUM THICK LAYERS IN ACCORDANCE WITH AS1289.
5. TEST CERTIFICATES ON THE FILL MATERIAL SHALL BE SUPPLIED TO THE SUPERINTENDENT FOR APPROVAL PRIOR TO THE USE OF THE FILL MATERIAL.

GENERAL SHORING NOTES

1. REFER TO THE GEOTECHNICAL REPORT FOR A DETAILED DESCRIPTION OF ANTICIPATED STRATA.
2. IT IS THE SUBCONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL SHORING WALLS INSTALLED DO NOT DAMAGE ADJACENT STRUCTURES OR SERVICES.
3. A VIBRATION & MOVEMENT MONITORING PLAN MUST BE PREPARED AND MONITORING RESULTS ARE TO BE REPORTED REGULARLY TO THE MANAGING CONTRACTOR.
4. WHERE MONITORING RESULTS ARE BEYOND ACCEPTABLE CRITERIA, AS OUTLINED WITHIN THE ENGINEERING DOCUMENTS, THE ENGINEER SHALL BE ADVISED IMMEDIATELY.
5. THE SUBCONTRACTOR'S GEOTECHNICAL ENGINEER SHALL ADVISE ON ALLOWABLE TEMPORARY BATTER ANGLES AS EXCAVATION PROCEEDS.
6. NOTIFY THE ENGINEER IF ANY REINFORCED PILE IS DAMAGED IN ANY WAY.
7. REFER TO RELEVANT SERVICE CONSULTANTS DRAWINGS FOR SIZE AND POSITION OF ALL SERVICE PENETRATIONS. UNLESS DIRECTED BY THE HEAD CONTRACTOR.
8. THE PRESENCE OF UNCONTROLLED FILL (REFER SOILS REPORT) MAY CONTAIN ELEMENTS WHICH WILL NEED TO BE REMOVED AND REPLACED BEFORE SHORING INSTALLATION CAN PROCEED.
9. THE SHORING CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS OF THE SHORING WALLS FOR THE ANCHORING SUBCONTRACTOR'S USE IN PREPARING THE ANCHOR SETOUT SHOP DRAWINGS.
10. THE AS BUILT DRAWINGS ARE TO BE PROVIDED WITHIN 2 WEEKS OF COMPLETION OF SHORING AND ARE TO CONTAIN ALL INFORMATION AS DESCRIBED IN THE SPECIFICATION. ALL RECORDS ARE TO BE SUBMITTED BEFORE EXCAVATION PROCEEDS.
11. AN ENCROACHMENT SURVEY INCLUDING FOOTING TEST PITS IS TO BE CARRIED OUT PRIOR TO SHORING INSTALLATION.
12. THE SHORING CONTRACTOR IS TO CONFIRM CLEARANCE AND TOLERANCE REQUIREMENTS. REFER GEOTECHNICAL REPORT FOR ACTUAL ROCK TYPES AND DESCRIPTION TO JUDGE EASE OF EXCAVATION.
13. IT IS THE SUBCONTRACTORS RESPONSIBILITY TO ENSURE THAT EXCAVATION STAGING ACROSS THE SITE DOES NOT OVERLOAD ANY STRUCTURAL MEMBER TO BOTH THE EXISTING SURROUNDING STRUCTURES AND THE NEW STRUCTURE BEING CONSTRUCTED.

HEALTH & SAFETY

1. THE CONTRACTOR SHALL DEVELOP, IMPLEMENT AND ADMINISTER A WORKPLACE HEALTH AND SAFETY PROGRAM THAT WILL ENSURE THAT ALL CONSTRUCTION ACTIVITIES ARE PERFORMED TO THE RELEVANT WORKPLACE HEALTH AND SAFETY REQUIREMENTS AND ANY OTHER RELEVANT STATUTORY REQUIREMENTS.
2. THE WORKPLACE HEALTH AND SAFETY PROGRAM MUST BE CO-ORDINATED WITH ADJOINING PROPERTY OWNERS AND ALL RELEVANT PARTIES AS NECESSARY TO ENSURE A SAFE BUILDING ENVIRONMENT AT ALL TIMES.

NUISANCE

1. THE CONTRACTOR SHALL DEVELOP, IMPLEMENT, AND ADMINISTER A PLAN THAT WILL ENSURE THE MANAGEMENT OF NOISE AND VIBRATION RESULTING FROM CONSTRUCTION WORKS. REFER TO SPECIFICATIONS FOR REQUIRED LIMITS, OTHERWISE, CONTACT ENGINEER FOR GUIDANCE.
2. THE CONTRACTOR WILL NEED TO ENSURE ALL ADJOINING PROPERTY REQUIREMENTS RELATING TO NOISE AND VIBRATION ARE MET.
3. IF IT IS ESTABLISHED THAT THERE ARE NO SITE SPECIFIC REQUIREMENTS, THEN THE CONTRACTOR SHALL REFER TO MINIMUM REQUIREMENTS FOR ABATEMENT OF NOISE AND VIBRATION NOMINATED BY RELEVANT STATUTORY REQUIREMENTS
4. THE CONTRACTOR WILL NEED TO PREPARE AND ADVISE ON MONITORING AND MANAGEMENT OF NOISE AND VIBRATION BASED ON PROFESSIONAL ADVICE FROM SUITABLY QUALIFIED PERSON OR PERSONS.

TEMPORARY WORKS

1. THE CONTRACTOR SHALL ALLOW FOR IN THEIR PRICE ALL COSTS ASSOCIATED WITH THE DESIGN, SUPPLY, INSTALLATION AND REMOVAL OF ALL TEMPORARY BACK PROPPING, SAFETY SCREENS, SCAFFOLDING AND OTHER REQUIREMENTS OF THE CONSTRUCTION PROCESS. THE CONTRACTOR SHALL ENGAGE SUITABLY QUALIFIED ENGINEER REFEREED TO AS "CONTRACTORS ENGINEER". TO DESIGN INSPECT AND CERTIFY ALL TEMPORARY WORKS, AND DEMOLITION WORKS.
2. THE CONTRACTOR IS TO PROVIDE ALL TEMPORARY WORKS CONTRACTOR ENGINEERING DRAWINGS TO THE STRUCTURAL ENGINEER FOR INFORMATION.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THE OVERALL STABILITY OF THE STRUCTURE AND NO PART IS OVERSTRESSED DUE TO CONSTRUCTION & INSTALLATION METHODOLOGIES AND/OR EQUIPMENT DURING CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ADVICE FROM THE CONTRACTORS ENGINEER.
4. THE CONTRACTOR IS TO HAVE CONSTRUCTION METHODOLOGY STATEMENTS PREPARED AND SUBMITTED FOR GENERAL REVIEW TO ENSURE IT IS IN ACCORDANCE WITH THE DESIGN INTENT.
5. ALL VERTICAL DISPLACEMENTS AND MOVEMENTS ARE TO BE LIMITED TO ENSURE THE STRUCTURE IS NOT SUBJECTED TO LOADS OR MOVEMENTS CAUSING STRUCTURAL DISTRESS TO ANY ELEMENT WHILE THE STRUCTURE IS BEING TEMPORARILY SUPPORTED.
6. DEPENDING ON THE CONTRACTORS PREFERRED CONSTRUCTION SEQUENCE, PRE-LOADING OF STRUCTURAL ELEMENTS MAY BE REQUIRED TO LIMIT TOTAL VERTICAL DISPLACEMENTS.
7. STRUCTURE TO BE ADEQUATELY BRACED TO PREVENT ANY HORIZONTAL MOVEMENT OR DEFLECTIONS.

LEGEND/ABBREVIATIONS

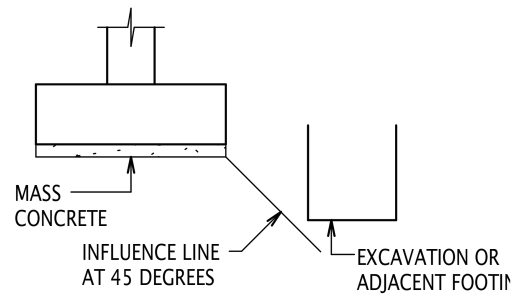
ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
HORIZ	HORIZONTAL	N/S	NEAR SIDE
VERT	VERTICAL	F/S	FAR SIDE
CENT	CENTRALLY PLACED	B/S	BOTH SIDES
CRS	CENTRES	U/S	UNDER SIDE
B or BTM	BOTTOM FACE	LG	LENGTH/LONG
T	TOP FACE	w	WIDTH/WIDE
T&B	TOP & BOTTOM	h	HEIGHT/HIGH
NF	NEAR FACE	d	DEPTH/DEEP
FF	FAR FACE	NOM	NOMINAL
EF	EACH FACE	REQ'D	REQUIRED
EW	EACH WAY	REINF	REINFORCEMENT
EQ	EQUAL	OPP	OPPOSITE
NSOP	NOT SHOWN ON PLAN	SIM	SIMILAR
NSOE	NOT SHOWN ON ELEVATION	GA	GENERAL ARRANGEMENT
UNO	UNLESS NOTED OTHERWISE	PT	POST TENSION
TYP	TYPICAL	DWG	DRAWINGS
CL	CENTRE LINE	NTS	NOT TO SCALE
PL	PLATE	LL	LIVE LOAD
CFW	CONTINUOUS FILLET WELD	SDL	SUPERIMPOSED DEAD LOAD
FSBW	FULL STRENGTH BUTT WELD	THRU	THROUGH
FPBW	FULL PENETRATION BUTT WELD	NLB	NON LOAD BEARING
LB	LOAD BEARING	SOG	SLAB ON GROUND

BORED PIER NOTES

1. BORED PIERS SHALL BE IN ACCORDANCE WITH AS2159 AND WITH THE PROJECT SPECIFICATIONS.
2. REFER TO THE GEOTECHNICAL ENGINEERING REPORT SPECIFIED IN THE GENERAL NOTES FOR SITE SPECIFIC GEOTECHNICAL INFORMATION.
3. ALL BORED PIERS SHALL FOUND IN MATERIAL HAVING AN ALLOWABLE BEARING CAPACITY OF 25000 kPa. FURTHER GEOTECHNICAL ANALYSIS IS REQUIRED TO ASSESS IMPACTS TO THE CRR STATION CAVERN.
4. THE CONTRACTOR SHALL ENGAGE AND PAY FOR A GEOTECHNICAL ENGINEER TO VERIFY THE BEARING CAPACITY OF THE FOUNDING MATERIAL AND BORED PIER CAPACITY PRIOR TO THE PLACEMENT OF REINFORCEMENT OR POURING OF CONCRETE.
5. REFER TO THE FOUNDATION LOADING PLAN DRAWING FOR DESIGN LOADS.
6. BORED PIERS SHALL BE DESIGNED TO CARRY THE DESIGN LOADS AT 75mm ECCENTRICITY TO MAKE ALLOWANCE FOR CONSTRUCTION TOLERANCE. ALL PIER CENTRELINES ARE TO BE CHECKED BEFORE ANY CONCRETE IS POURED. IF A VECTOR ECCENTRICITY GREATER THAN 75mm IS MEASURED `ROBERT BIRD GROUP' ARE TO BE CONTACTED IMMEDIATELY.
7. UNLESS NOTED OTHERWISE THE CENTRELINE OF THE BORED PIER IS TO COINCIDE WITH CENTRELINE OF COLUMN ABOVE. REFER TO THE ARCHITECTURAL DRAWINGS FOR COLUMN SETOUT DETAILS.
8. BORED PIERS SHALL BE DRILLED USING A RIG CAPABLE OF BORING A HOLE WITH A VERTICAL TOLERANCE OF 1:100 INCLINATION.
9. NOTIFY `ROBERT BIRD GROUP' IMMEDIATELY OF ANY OBSTRUCTIONS ENCOUNTERED DURING BORING, OTHER THAN THOSE INDICATED IN THE SITE INVESTIGATION.
10. THE BORED PIERS MAY HAVE TO BE LINED TO RETAIN LOOSE FILL.
11. REMOVE ALL LOOSE OR DISTURBED MATERIAL FROM THE SHAFT AND BASE OF THE BORED PIER.
12. BORED PIERS NOT CONCRETE FILLED BY THE END OF THE DAY WILL REQUIRE RE-DRILLING TO REMOVE ANY LOOSE MATERIAL.
13. PLACE CONCRETE TO ENSURE A SOUND MONOLITHIC COMPACTED CONCRETE SHAFT OF THE FULL DIAMETER REQUIRED TO CUT-OFF LEVEL. TAKE ADEQUATE MEASURES TO AVOID SEGREGATION, BLEEDING AND GROUT DEFICIENCY OF THE PIER.
14. EACH PIER SHALL BE TRIMMED TO ±25mm OF THE CUT-OFF LEVEL. ANY DAMAGE CAUSED TO THE BORED PIER DURING TRIMMING AND CAPPING IS TO BE REMOVED AND ADEQUATELY REPAIRED.

FOUNDATION NOTES

1. REFER TO THE GEOTECHNICAL ENGINEERING REPORT SPECIFIED IN THE GENERAL NOTES FOR SITE SPECIFIC GEOTECHNICAL INFORMATION.
2. FOOTINGS TO BE FOUNDED ON MATERIAL HAVING AN ALLOWABLE BEARING CAPACITY OF 1000 kPa U.N.O. WHERE DIFFICULTY IN REACHING THE REQUIRED CAPACITY IS EXPERIENCED, 'ROBERT BIRD GROUP' IS TO BE CONTACTED TO REASSESS THE FOOTING DESIGN.
3. THE MAXIMUM BEARING PRESSURE UNDER THE STRUCTURE IS LIMITED TO 679 kPa DUE TO THE EXISTING TUNNEL UNDER THE SITE U.N.O.
4. THE CONTRACTOR IS TO ENGAGE AND PAY A GEOTECHNICAL ENGINEER TO VERIFY THE BEARING CAPACITY OF THE FOUNDATIONS PRIOR TO PLACEMENT OF THE BLINDING LAYER.
5. ALL LOOSE MATERIAL AND WATER TO BE CLEANED OUT OF THE FOUNDATION. FORM WORK TO BE USED WHERE THE SIDES OF THE FOUNDATION ARE NOT STABLE.
6. A 50mm MINIMUM BLINDING LAYER SHOULD BE APPLIED TO THE BASE OF ALL FOUNDATIONS IMMEDIATELY AFTER VERIFICATION OF THE BEARING CAPACITY BY THE GEOTECHNICAL ENGINEER. WHERE THE FOUNDING MATERIAL IS DEEPER THAN REQUIRED FOR THE FOOTING THE EXCAVATION IS TO BE BACKFILLED WITH A WEAK MIX CONCRETE (N10) TO THE UNDERSIDE OF THE FOOTING.
7. WHERE AN EXCAVATION IS REQUIRED OR EXISTS BELOW THE BASE OF A FOOTING THE SIDE OF THE EXCAVATION SHALL BE LOCATED AWAY FROM EDGE OF FOOTING BY THE SAME DISTANCE THAT THE EXCAVATION IS BELOW FOOTING BASE. WHERE THIS CANNOT BE ACHIEVED, 'ROBERT BIRD GROUP' SHALL BE CONTACTED FOR FURTHER DIRECTION. MASS CONCRETE IS TO EXTEND TO THE INFLUENCE LINE AS REQUIRED.



8. ALL WALLS AND COLUMNS SHALL BE CONCENTRIC WITH THE SUPPORTING FOOTINGS UNLESS NOTED OTHERWISE ON THE DRAWINGS.

ALBERT STREET OSD - RENDER BY HENNING LARSEN AND ARCHITECTUS

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DRAWING TITLE:	DESIGNED BY:	DATE:
GENERAL NOTES SHEET 1	LK	07/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: MA	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S00-01	REVISION: P01

STEELWORK NOTES

1.0 GENERAL

1.1 **CERTIFICATION**

ALL TENDERERS (FABRICATORS) MUST HAVE DOCUMENTED CURRENT EVIDENCE OF HAVING FULFILLED 'STAGE 1' OF THE SCA CERTIFICATION PROCESS, INCLUDING A GAP ANALYSIS OF THE NECESSARY ACTIONS TO MEET THE REQUIRED CONSTRUCTION CATEGORY. THE SUCCESSFUL FABRICATOR(S) MUST SUBMIT DOCUMENTARY EVIDENCE OF CURRENT FULL CERTIFICATION TO THE RELEVANT CONSTRUCTION CATEGORY BEFORE WORK COMMENCES ON THE PROJECT. THE CERTIFICATION MUST BE MAINTAINED FOR THE DURATION OF THE PROJECT.

1.2 CONSTRUCTION CATEGORY

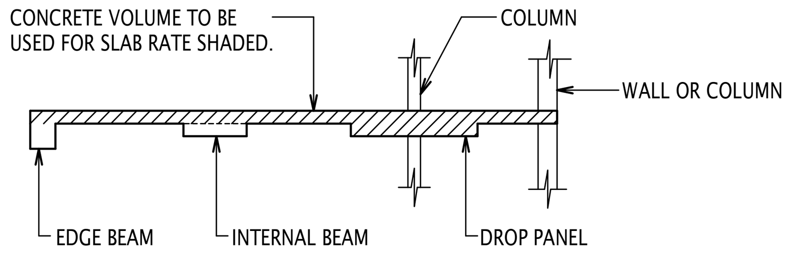
IN ACCORDANCE WITH THE REQUIREMENTS OF AS/NZS 5131 THE CONSTRUCTION CATEGORIES FOR THIS PROJECT ARE DEFINED IN THE TABLE BELOW:

ELEMENT	IMPORTANCE LEVEL	SERVICE CATEGORY	FABRICATION CATEGORY	CONSTRUCTION CATEGORY
ALL STRUCTURAL STEELWORK UNO	IL3	SC1	FC2	CC3

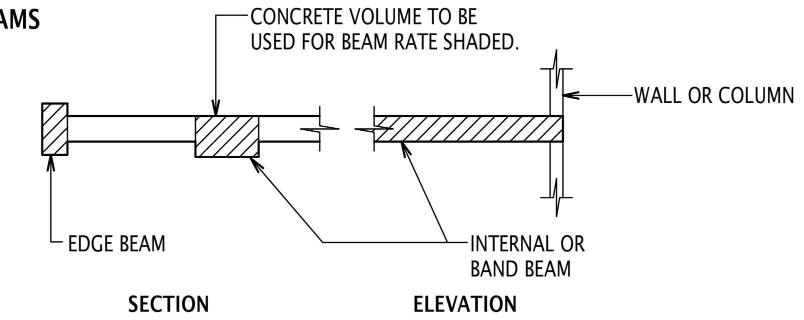
REINFORCEMENT QUANTITIES

1. RATES QUOTED DO NOT INCLUDE ROLLING MARGIN OR REINFORCEMENT NECESSARY FOR CONSTRUCTION PURPOSES SUCH AS LACER BARS, SUPPORT BARS OR SPACERS. WHERE PROVISIONAL REINFORCEMENT RATES ARE NOTED QUANTITIES SHALL BE CALCULATED AS FOLLOWS:

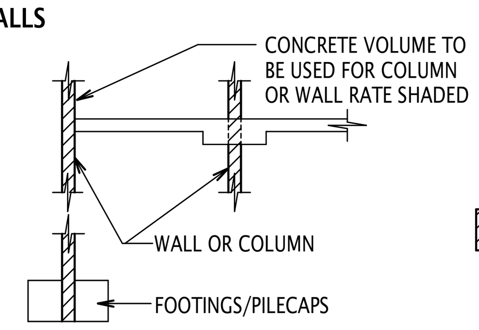
SLABS



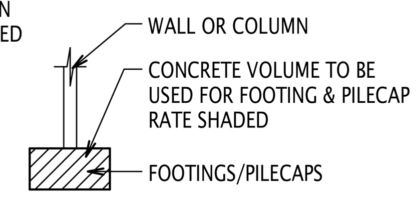
BEAMS



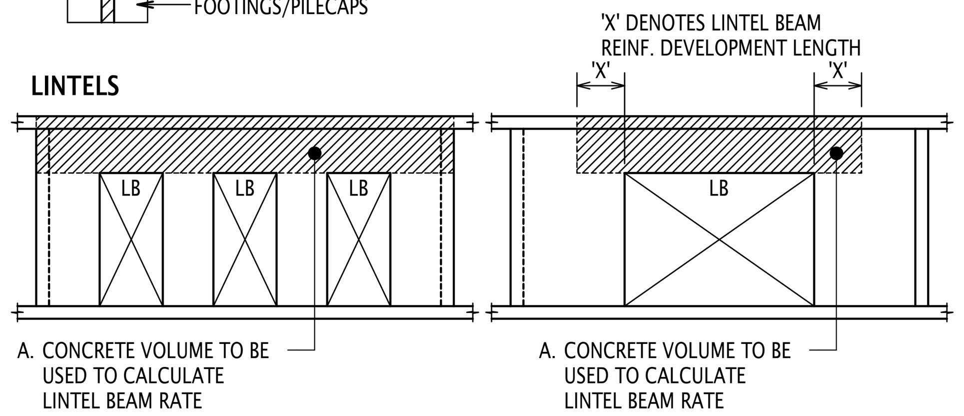
WALLS



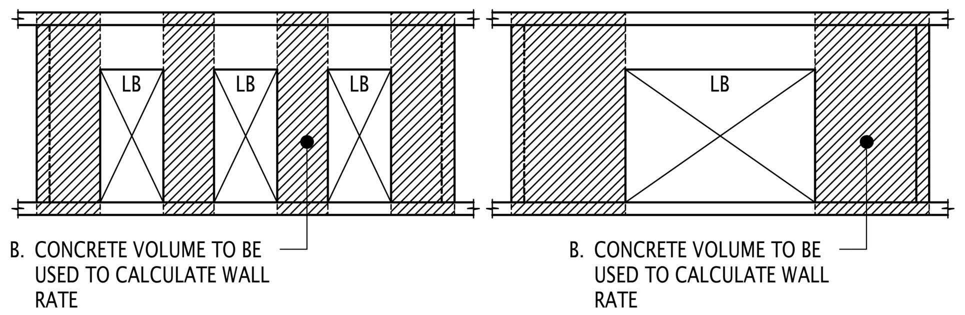
FOOTINGS/PILECAPS



LINTELS



WALLS



APPLY RATES THROUGH INTERSECTING ELEMENTS. QUANTITIES DO NOT INCLUDE PULL OUT BARS, AND IF REQUIRED ARE TO SUIT THE CONTRACTORS CONSTRUCTION METHOD, ALLOWANCE TO BE MADE BY THE CONTRACTOR.

2. ALL REINFORCEMENT RATES FOR SLABS AND BEAMS DO NOT MAKE ANY ALLOWANCE FOR SLAB STRENGTHENING THAT MAY BE REQUIRED TO SUPPORT TEMPORARY WORKS DURING CONSTRUCTION, INCLUDING BUT NOT LIMITED TO LOADING PLATFORMS, HOISTS, CRANE TIES, FORMWORK OR SAFETY SCREENS, OR OTHER TEMPORARY WORKS. THE CONTRACTOR SHOULD MAKE ADDITIONAL ALLOWANCE FOR THIS.
3. ALL REINFORCEMENT RATES MAKE ALLOWANCE ONLY FOR DOWEL OR CONSTRUCTION JOINTS SHOWN ON THE DRAWINGS AT THE TIME OF TENDER. SHOULD THE CONTRACTOR INTRODUCE ADDITIONAL DOWEL OR CONSTRUCTION JOINTS, ADDITIONAL REINFORCEMENT ALLOWANCE SHOULD BE MADE BY THE CONTRACTOR.
4. CONTRACTOR TO MAKE AN ALLOWANCE FOR REINFORCEMENT COUPLERS & TERMINATORS WHERE NOMINATED ON PLANS, THESE HAVE NOT BEEN ALLOWED FOR IN THE RATES PROVIDED.
5. THE RATES PROVIDED DO NOT INCLUDE ALLOWANCE FOR A CONTINUOUS TOP MAT OF REINFORCEMENT. WHERE REQUIRED BY THE CONTRACTOR FOR CONSTRUCTION, THE CONTRACTOR IS TO MAKE ALLOWANCE FOR THIS EXTRA REINFORCEMENT.
6. ALL SLAB PENETRATIONS ARE TO BE COVERED WITH A CAST IN GALVANISED SAFETY MESH. THE RATES NOTED DO NOT INCLUDE ANY ALLOWANCE FOR THIS SAFETY MESH.
7. WALL & COLUMN REINFORCEMENT RATES ARE BASED ON CONVENTIONAL LAPPING OF VERTICAL BARS, WITH LAPS OCCURRING AT EACH FLOOR SLAB LEVEL ONLY.
8. ALL REINFORCEMENT RATES FOR SLABS & BEAMS DO NOT MAKE ALLOWANCE FOR SUPPORT & SPACER BARS FOR THE MAIN REINFORCEMENT
9. UNLESS OTHERWISE NOTED, THE REINFORCEMENT RATES FOR SLABS & BEAMS DO NOT INCLUDE AN ALLOWANCE FOR ANTI-BURST REINFORCEMENT OR PUNCHING SHEAR REINFORCEMENT
10. CONTRACTOR TO MAKE AN ALLOWANCE FOR INSTALLATION OF TIES TO WALL VERTICAL REINFORCEMENT WHERE NOMINATED ON WALL ELEVATIONS.
11. **STEELWORK QUANTITIES**
WHEN CALCULATING STEELWORK QUANTITIES FROM PRELIMINARY DRAWINGS, MULTIPLY PRELIMINARY STEELWORK BY 1.15 (I.E. 15% ALLOWANCE) FOR SPLICE PLATES, STIFFENERS, BOLTS ETC AND A FURTHER 1.15 (I.E. 15% ALLOWANCE) FOR MEMBERS SUCH AS TRIMMERS, MINOR BRACES, GUSSETS, STIFFENERS ETC THAT ARE DESIGNED DURING DETAILED DESIGN STAGE.

FOOTING LAP CHART - FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)							
	32		40		50		≥ 65	
	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP
N12	500	600	500	600	500	600	500	600
N16	650	800	650	800	650	800	650	800
N20	800	1000	800	950	800	1000	800	950
N24	1050	1350	950	1200	950	1150	950	1150
N28	1350	1750	1200	1550	1100	1400	1100	1350
N32	1650	2150	1500	1950	1300	1700	1300	1550
N36	2000	2600	1800	2300	1600	2050	1450	1800
N40	2350	3050	2100	2700	1900	2450	1650	2150

- MINIMUM COVER TO LAPPED BAR = 50mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS BEING LAPPED = 100mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3600-2009 (A1+A2), AS3600-2018, AS5100-5:2017 (+A1)
- FOR STRAIGHT DEVELOPMENT LENGTH, DIVIDE ABOVE LAP LENGTHS BY 1.25
- MULTIPLY TABULATED VALUES BY:
  - 1.3 LIGHT WEIGHT CONCRETE
  - 1.5 FOR EPOXY COATED BARS

BEAM LAP CHART - FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)							
	32		40		50		≥ 65	
	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP
N12	500	600	500	600	500	600	500	600
N16	650	850	650	800	650	800	650	800
N20	900	1150	800	1050	800	1000	800	1000
N24	1200	1500	1050	1350	950	1200	950	1150
N28	1450	1900	1300	1700	1200	1500	1150	1350
N32	1800	2300	1600	2100	1450	1850	1300	1650
N36	2150	2700	1900	2450	1700	2200	1500	1950
N40	2450	3150	2150	2800	1950	2550	1700	2250

- MINIMUM COVER TO LAPPED BAR = 35mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS BEING LAPPED = 70mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3600-2009 (A1+A2), AS3600-2018, AS5100-5:2017 (+A1)
- FOR STRAIGHT DEVELOPMENT LENGTH, DIVIDE ABOVE LAP LENGTHS BY 1.25
- MULTIPLY TABULATED VALUES BY:
  - 1.3 LIGHT WEIGHT CONCRETE
  - 1.3 FOR ELEMENTS BUILT WITH SLIP FORMS (REQUIRED FOR AS3600-2009 (A1+A2) & AS5100-5:2017 (A1))
  - 1.5 FOR EPOXY COATED BARS

WALL VERTICAL REINFORCEMENT TENSION LAP CHART (UNO) FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)				
	25	32	40	50	≥ 65
N12	500	500	500	500	500
N16	800	700	650	650	650
N20	1100	950	850	800	800
N24	1400	1200	1100	1000	900
N28	1700	1500	1350	1200	1100
N32	2050	1800	1600	1450	1300
N36	2400	2100	1850	1700	1500
N40	2750	2450	2150	1950	1700

WALL HORIZONTAL REINFORCEMENT TENSION LAP CHART (UNO) FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)				
	25	32	40	50	≥ 65
N12	700	650	600	600	600
N16	1000	900	800	800	800
N20	1400	1250	1150	1000	1000
N24	1800	1600	1450	1250	1200
N28	2200	1950	1750	1600	1400
N32	2600	2350	2100	1850	1650
N36	3100	2700	2450	2200	1900
N40	3550	3150	2800	2500	2200

- MINIMUM COVER TO LAPPED BAR = 30mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS BEING LAPPED = 100mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3600-2009 (A1+A2), AS3600-2018, AS5100-5:2017 (+A1)
- FOR STRAIGHT DEVELOPMENT LENGTH, DIVIDE ABOVE LAP LENGTHS BY 1.25
- MULTIPLY TABULATED VALUES BY:
  - 1.3 LIGHT WEIGHT CONCRETE
  - 1.3 FOR ELEMENTS BUILT WITH SLIP FORMS (REQUIRED FOR AS3600-2009 (A1+A2) & AS5100-5:2017 (A1))
  - 1.5 FOR EPOXY COATED BARS

BLOCKWALL LAP CHART

BAR SIZE	VERTICAL REINFORCEMENT TENSION LAP LENGTH (UNO)	HORIZONTAL REINFORCEMENT LAP LENGTH (UNO)
N12	650	825
N16	950	1225
N20	1250	1625
N24	1575	2025

- MINIMUM GROUT STRENGTH = 20MPa
- MINIMUM COVER FROM FACE OF BAR TO EXTERNAL FACE OF BLOCK = 50mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS = 170mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3700-2001 (A1+A2+A3) & AS3600-2009 (A1+A2) & AS3600:2018

COLUMN REINFORCEMENT LAP CHART (UNO) - FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)			
	32	40	50	≥ 65
N12	500	500	500	500
N16	650	650	650	650
N20	900	800	800	800
N24	1150	1050	1000	1000
N28	1450	1300	1150	1150
N32	1750	1600	1400	1300
N36	2100	1850	1700	1450
N40	2450	2150	1950	1700

- MINIMUM COVER TO LAPPED BAR = 35mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS BEING LAPPED = 70mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3600-2009 (A1+A2), AS3600-2018, AS5100-5:2017 (+A1)
- FOR STRAIGHT DEVELOPMENT LENGTH, DIVIDE ABOVE LAP LENGTHS BY 1.25
- MULTIPLY TABULATED VALUES BY:
  - 1.3 LIGHT WEIGHT CONCRETE
  - 1.3 FOR ELEMENTS BUILT WITH SLIP FORMS (REQUIRED FOR AS3600-2009(A1+A2) & AS5100-5:2017 (A1))
  - 1.5 FOR EPOXY COATED BARS

SLAB LAP CHART ≤ 300 THICK - FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)		
	32	40	50
N12	500	500	500
N16	700	650	650
N20	950	850	800
N24	1250	1150	1000
N28	1550	1400	1200
N32	1800	1600	1500
N36	2150	1900	1700
N40	2450	2150	2000

- MINIMUM COVER TO LAPPED BAR=30mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS BEING LAPPED = 100mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3600-2009 (A1+A2), AS3600-2018, AS5100-5:2017 (+A1)
- FOR STRAIGHT DEVELOPMENT LENGTH, DIVIDE ABOVE LAP LENGTHS BY 1.25
- MULTIPLY TABULATED VALUES BY:
  - 1.3 LIGHT WEIGHT CONCRETE
  - 1.3 FOR ELEMENTS BUILT WITH SLIP FORMS(REQURIED FOR AS3600-2009 (A1+A2) & AS5100-5:2017 (A1))
  - 1.5 FOR EPOXY COATED BARS

SLAB LAP CHART > 300 THICK - FOR D500N REINF BARS

BAR SIZE	MIN CONCRETE STRENGTH (MPa)					
	32		40		50	
	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP
N12	500	650	500	600	500	600
N16	700	900	650	800	650	800
N20	950	1250	850	1150	800	1000
N24	1250	1600	1150	1450	1000	1250
N28	1550	1950	1400	1750	1200	1600
N32	1800	2350	1600	2100	1500	1850
N36	2150	2700	1900	2450	1700	2200
N40	2450	3150	2150	2800	1950	2500

- MINIMUM COVER TO LAPPED BAR = 30mm
- MINIMUM CLEAR DISTANCE BETWEEN BARS BEING LAPPED = 100mm
- LAP LENGTHS ARE IN ACCORDANCE WITH AS3600-2009 (A1+A2), AS3600-2018, AS5100-5:2017 (+A1)
- FOR STRAIGHT DEVELOPMENT LENGTH, DIVIDE ABOVE LAP LENGTHS BY 1.25
- MULTIPLY TABULATED VALUES BY:
  - 1.3 LIGHT WEIGHT CONCRETE
  - 1.3 FOR ELEMENTS BUILT WITH SLIP FORMS (REQUIRED FOR AS3600-2009 (A1+A2) & AS5100-5:2017 (A1))
  - 1.5 FOR EPOXY COATED BARS

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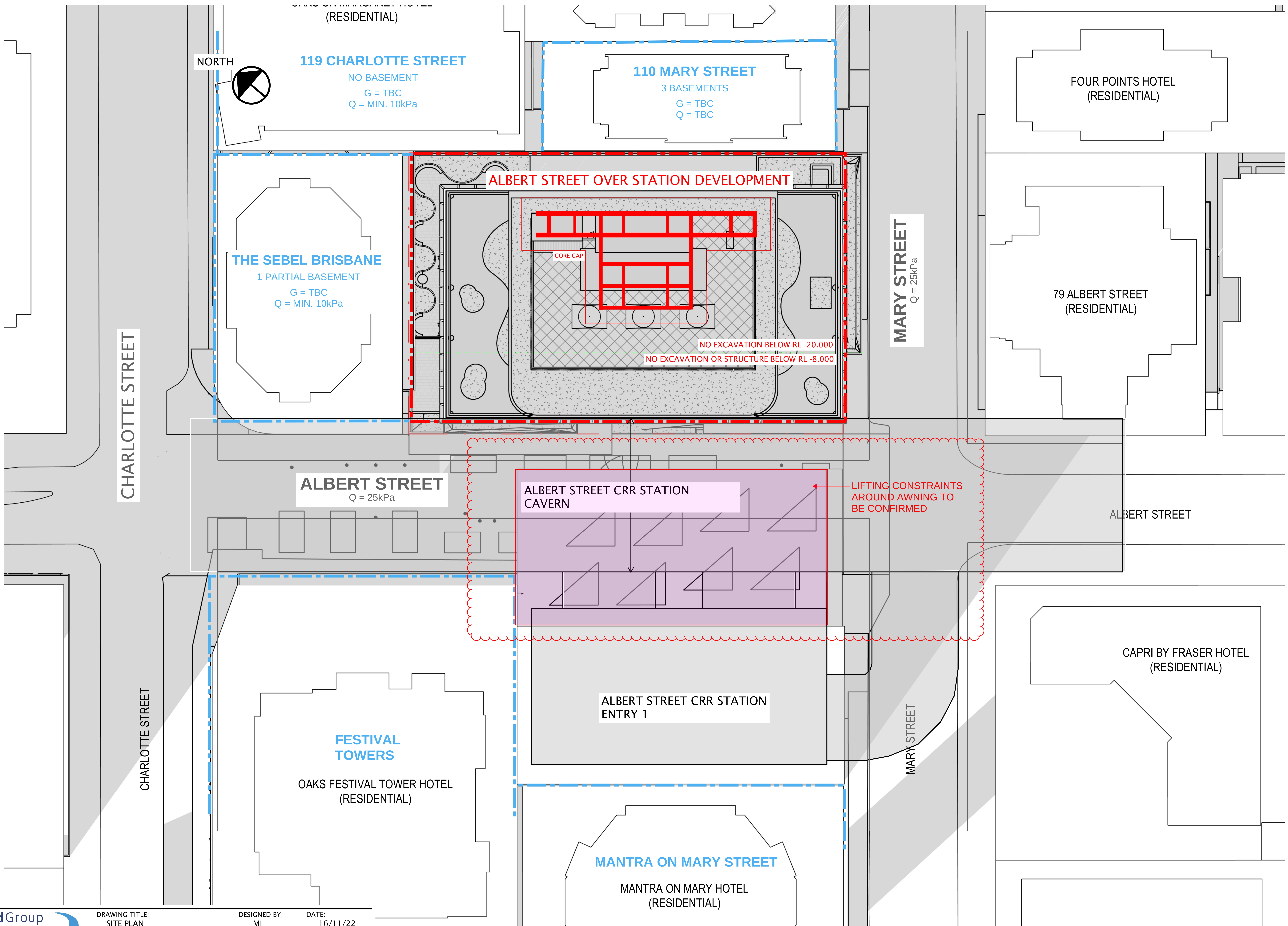
DRAWING TITLE:	DESIGNED BY:	DATE:
GENERAL NOTES SHEET 2	LK	07/11/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	MA	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S00-02	P01



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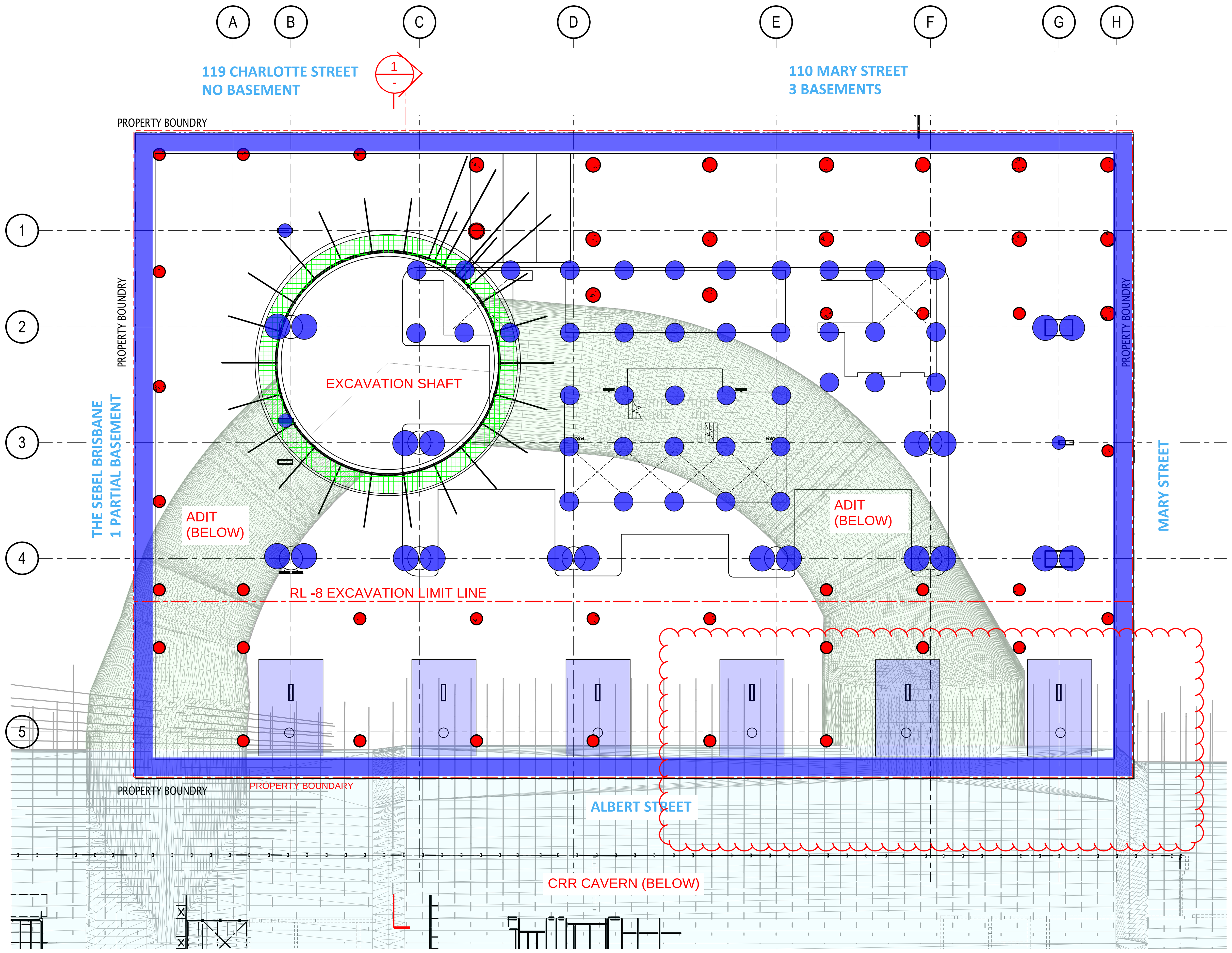
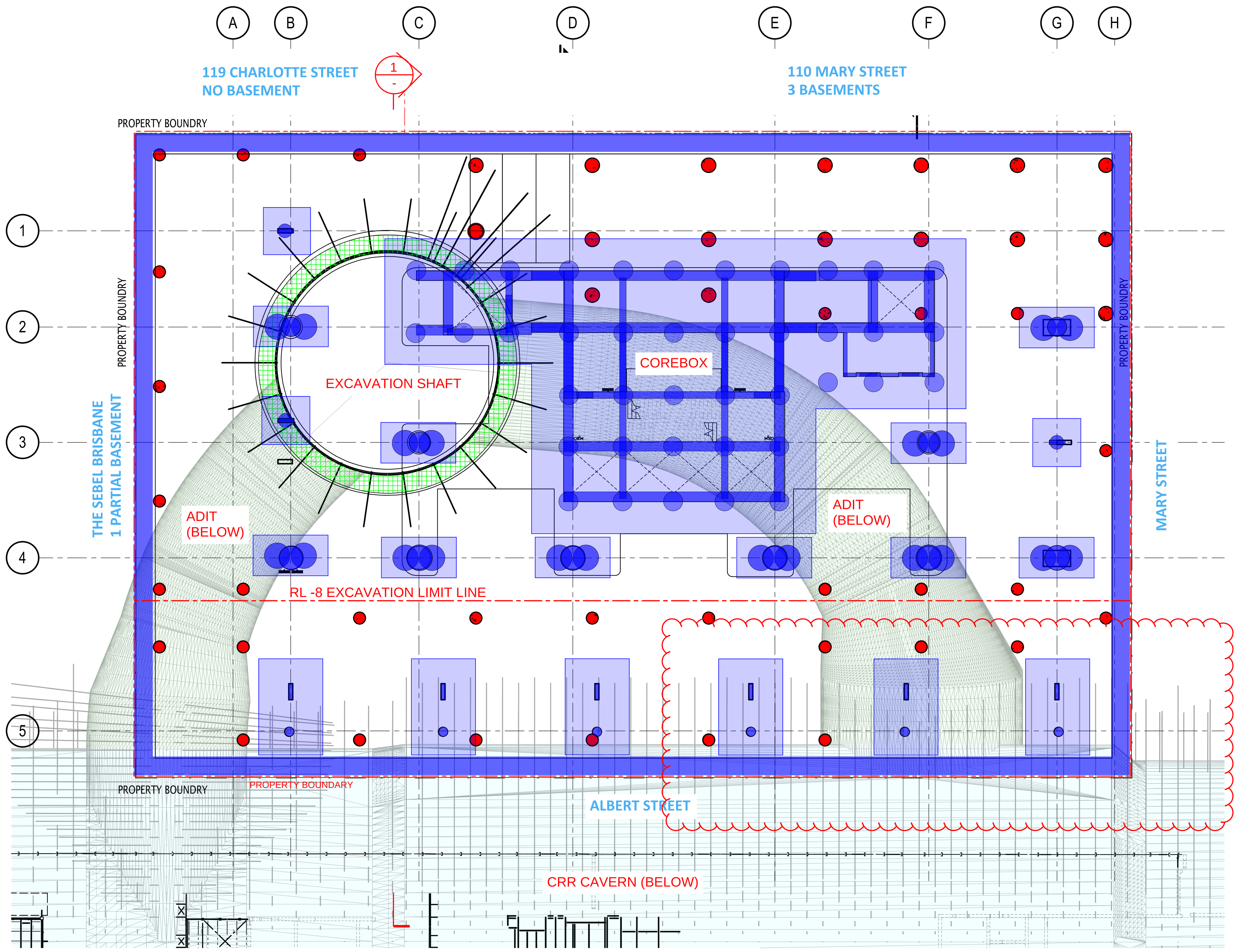
DRAWING TITLE: SITE PLAN	DESIGNED BY: MJ	DATE: 16/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S00-05	REVISION: P02



CRR ASSET AND PROPOSED DEVELOPMENT
STRUCTURE PROXIMITY DIAGRAM - RL -5.0m



CRR ASSET AND PROPOSED DEVELOPMENT
STRUCTURE PROXIMITY DIAGRAM - RL -8.0m

NOTES:

1. THE CURRENT PROPOSED STRUCTURAL DESIGN SOLUTION AS AT THE SCHEMATIC DESIGN PHASE ASSUMES THE FOLLOWING WILL BE COMPLETED PRIOR TO THE DEVELOPMENT SITE HANDOVER TO QIC:

   - DECOMMISSIONING, DEMOLITION AND REMOVAL OF ALL ACCOUSTIC SHED SUPERSTRUCTURE; AND SUBSTRUCTURE INCLUDING PILE CAPS, PAD FOOTINGS, GROUND BEAMS AND SLAB ETC.
   - DECOMMISSIONING, DEMOLITION AND REMOVAL OF ANY TEMPORARY INGROUND SERVICES SYCH AS SUMPS, TANKS, MANHOLES, ELECTRICAL AND HYDRAULIC SERVICES ETC.
   - FILLING OF ADITS AND SHAFT WITH CEMENTITIOUS MATERIAL OF SIMILAR STIFFNESS TO THE ADJACENT GROUND MATERIAL, UP TO RL-9.6. BACKFILL WITH ENGINEERED MATERIALS ABOVE RL -9.6.
   - DEMOLITION AND REMOVAL OF THE SHAFT STRUCTURE FROM THE TOP OF PILE LEVELS AND ABOVE.
2. ALLOW FOR COST ASSOCIATED WITH REMOVAL OF ACCOUSTIC SHED PILES DURING BULK EXCAVATION. SHORING WALL PILES TO BE COORDINATED AROUND PERIMETER ACCOUSTIC SHED PILES.
3. NOT ALL EXISTING IN-GROUND STRUCTURE HAS BEEN SHOWN. FURTHER COORDINATION REQUIRED TO RESOLVE CLASHES BETWEEN NEW AND EXISTING IN-GROUND STRUCTURE.
4. NO EXISTING SERVICES HAVE BEEN SHOWN.

NOTES CONT:

5. WHERE NEW DEVELOPMENT BORED PIERS CLASH WITH THE CRR SHAFT STRUCTURE ALLOW FOR RELOCATION OF THE PROPOSED BORED PIERS; ALLOW ADDITIONAL BORED PIERS AND/OR PROVISION FOR THE PILE CAP SIZE TO INCREASE FROM THAT SHOWN ON THE PROPOSED FOOTING PLAN ON P7.

   BASED ON THE CURRENT PROXIMITY PLANS THE FOLLOWING PROPOSED STRUCTURE LOOKS TO BE IMPACTED AND WILL NEED THE FOLLOWING MINIMUM CHANGES TO THAT SHOWN ON THE SCHEMATIC DRAWINGS:

   COREBOX GRIDS 1 AND 2 - RELOCATE TWO BORED PIERS THAT ARE CLASHING. PILE CAP SIZE TO BE REVIEWED. AIM TO USE COREBOX WALLS TO STIFFEN PILE CAP LOCALLY TO MITIGATE ANY INCREASE TO PILE CAP SIZE.
   TOWER COLUMN GRID B/2 - LARGER PILE CAP REQ'D.
   BASEMENT COLUMN GRID B/3 - RELOCATE BORED PIER THAT IS CLASHING + ADDITIOANL BORED PIER + LARGER PILE CAP REQ'D.
6. CONFIRMATION REQUIRED ON METHODOLGY AND MATERIAL TO BE USED TO FILL ADITS AND ACCESS SHAFT.
7. PILING CONTRACTOR AND GEOTECHNICAL ENGINEER TO ADVISE ON FEASIBILITY OF DRILLING NEW DEVELOPMENT BORED PIERS THROUGH THE ADIT STRUCTURE AND IMPACT TO PILING TIMEFRAME.

THE FOLLOWING INFORMATION IS BASED UPON AVAILABLE CRR INFORMATION AT THE TIME OF THIS DOCUMENT ISSUE. THE LOCATION AND SIZE OF CRR ASSETS ARE INDICATIVE ONLY AND TO BE CONFIRMED. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- DENOTES CRR SHAFT AND ADIT STRUCTURE
- DENOTES CRR CAVERN STRUCTURE
- DENOTES CRR ACCOUSTIC SHED
- DENOTES PROPOSED DEVELOPMENT STRUCTURE

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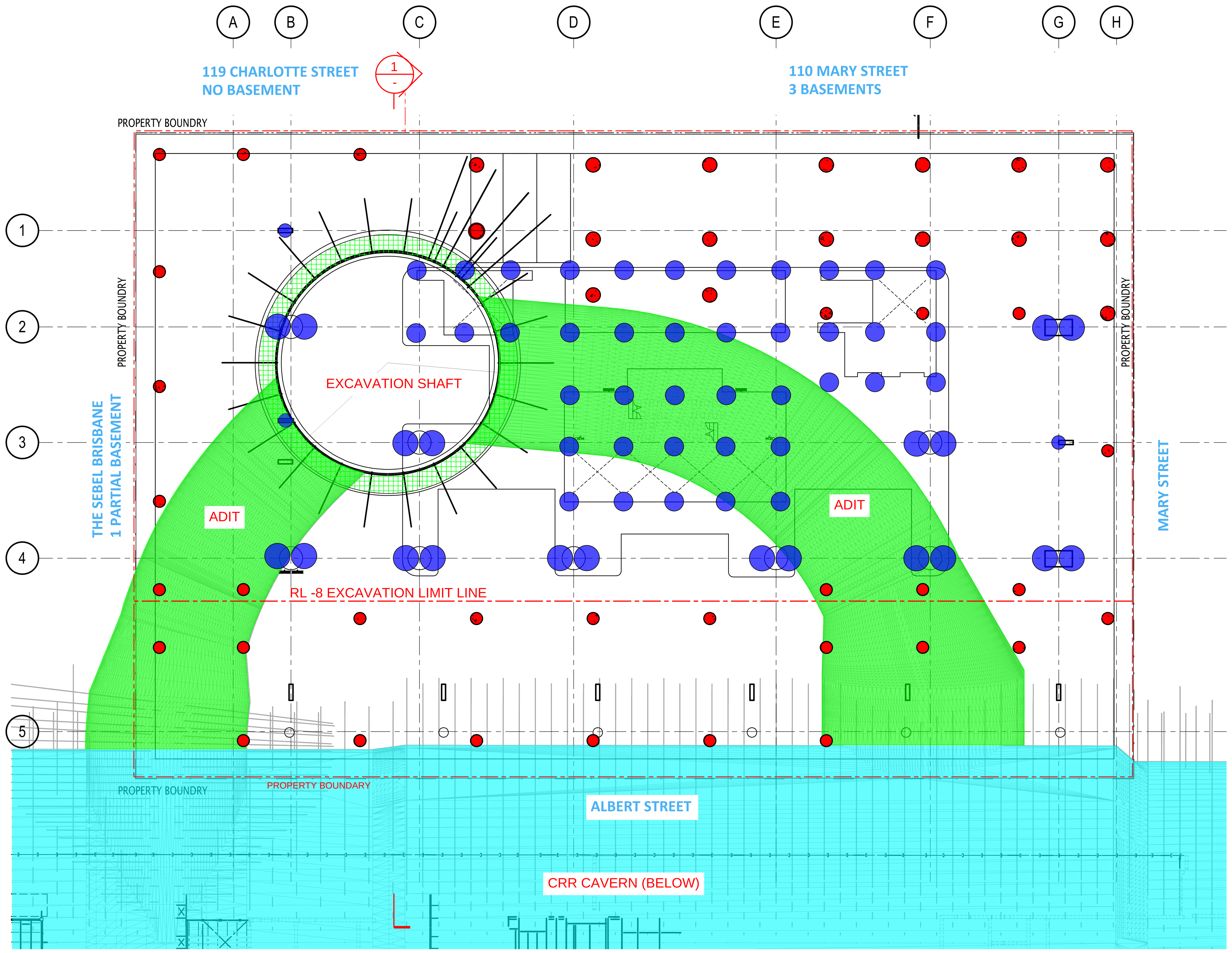
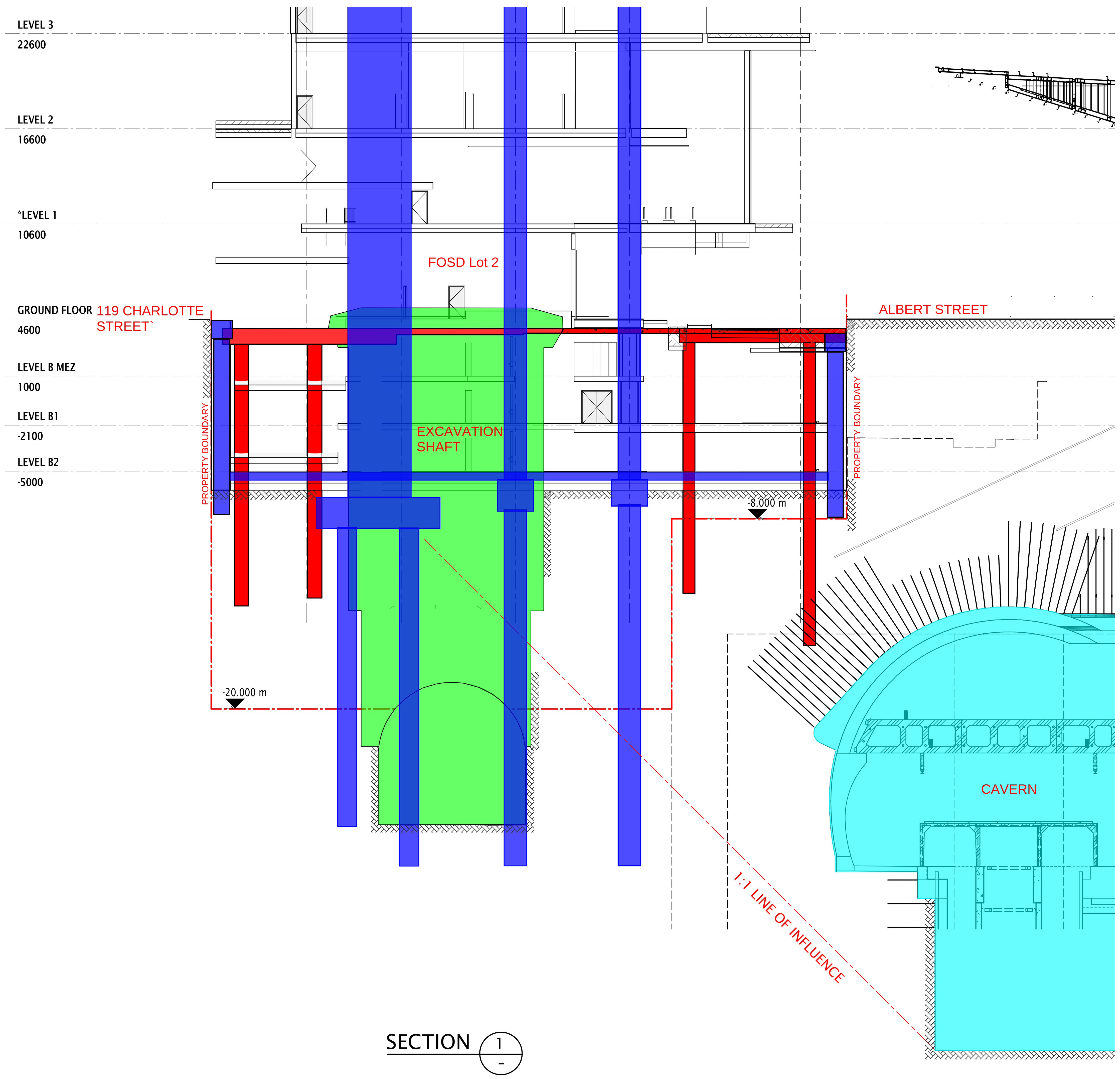
DRAWING TITLE:	DESIGNED BY:	DATE:
CRR ASSET PROXIMITY PLANS 1	MJ	08/12/22
PROJECT: ALBERT ST OSD	CHECKED BY:	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S00-06	REVISION: P03



CRR ASSET AND PROPOSED DEVELOPMENT
STRUCTURE PROXIMITY DIAGRAM - RL -5.0m



SECTION 1

NOTES:

1. THE CURRENT PROPOSED STRUCTURAL DESIGN SOLUTION AS AT THE SCHEMATIC DESIGN PHASE ASSUMES THE FOLLOWING WILL BE COMPLETED PRIOR TO THE DEVELOPMENT SITE HANDOVER TO QIC:

   - DECOMMISSIONING, DEMOLITION AND REMOVAL OF ALL ACCOUSTIC SHED SUPERSTRUCTURE; AND SUBSTRUCTURE INCLUDING PILE CAPS, PAD FOOTINGS, GROUND BEAMS AND SLAB ETC.
   - DECOMMISSIONING, DEMOLITION AND REMOVAL OF ANY TEMPORARY INGROUND SERVICES SYCH AS SUMPS, TANKS, MANHOLES, ELECTRICAL AND HYDRAULIC SERVICES ETC.
   - FILLING OF ADITS AND SHAFT WITH CEMENTITIOUS MATERIAL OF SIMILAR STIFFNESS TO THE ADJACENT GROUND MATERIAL, UP TO RL-9.6. BACKFILL WITH ENGINEERED MATERIALS ABOVE RL -9.6.
   - DEMOLITION AND REMOVAL OF THE SHAFT STRUCTURE FROM THE TOP OF PILE LEVELS AND ABOVE.
2. ALLOW FOR COST ASSOCIATED WITH REMOVAL OF ACCOUSTIC SHED PILES DURING BULK EXCAVATION. SHORING WALL PILES TO BE COORDINATED AROUND PERIMETER ACCOUSTIC SHED PILES.
3. NOT ALL EXISTING IN-GROUND STRUCTURE HAS BEEN SHOWN. FURTHER COORDINATION REQUIRED TO RESOLVE CLASHES BETWEEN NEW AND EXISTING IN-GROUND STRUCTURE.
4. NO EXISTING SERVICES HAVE BEEN SHOWN.

NOTES CONT:

5. WHERE NEW DEVELOPMENT BORED PIERS CLASH WITH THE CRR SHAFT STRUCTURE ALLOW FOR RELOCATION OF THE PROPOSED BORED PIERS; ALLOW ADDITIONAL BORED PIERS AND/OR PROVISION FOR THE PILE CAP SIZE TO INCREASE FROM THAT SHOWN ON THE PROPOSED FOOTING PLAN ON P7.

   BASED ON THE CURRENT PROXIMITY PLANS THE FOLLOWING PROPOSED STRUCTURE LOOKS TO BE IMPACTED AND WILL NEED THE FOLLOWING MINIMUM CHANGES TO THAT SHOWN ON THE SCHEMATIC DRAWINGS:

   COREBOX GRIDS 1 AND 2 - RELOCATE TWO BORED PIERS THAT ARE CLASHING. PILE CAP SIZE TO BE REVIEWED. AIM TO USE COREBOX WALLS TO STIFFEN PILE CAP LOCALLY TO MITIGATE ANY INCREASE TO PILE CAP SIZE.
   TOWER COLUMN GRID B/2 - LARGER PILE CAP REQ'D.
   BASEMENT COLUMN GRID B/3 - RELOCATE BORED PIER THAT IS CLASHING + ADDITIOANL BORED PIER + LARGER PILE CAP REQ'D.
6. CONFIRMATION REQUIRED ON METHODOLGY AND MATERIAL TO BE USED TO FILL ADITS AND ACCESS SHAFT.
7. PILING CONTRACTOR AND GEOTECHNICAL ENGINEER TO ADVISE ON FEASIBILITY OF DRILLING NEW DEVELOPMENT BORED PIERS THROUGH THE ADIT STRUCTURE AND IMPACT TO PILING TIMEFRAME.

THE FOLLOWING INFORMATION IS BASED UPON AVAILABLE CRR INFORMATION AT THE TIME OF THIS DOCUMENT ISSUE. THE LOCATION AND SIZE OF CRR ASSETS ARE INDICATIVE ONLY AND TO BE CONFIRMED. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- DENOTES CRR SHAFT AND ADIT STRUCTURE
- DENOTES CRR CAVERN STRUCTURE
- DENOTES CRR ACCOUSTIC SHED
- DENOTES PROPOSED DEVELOPMENT STRUCTURE

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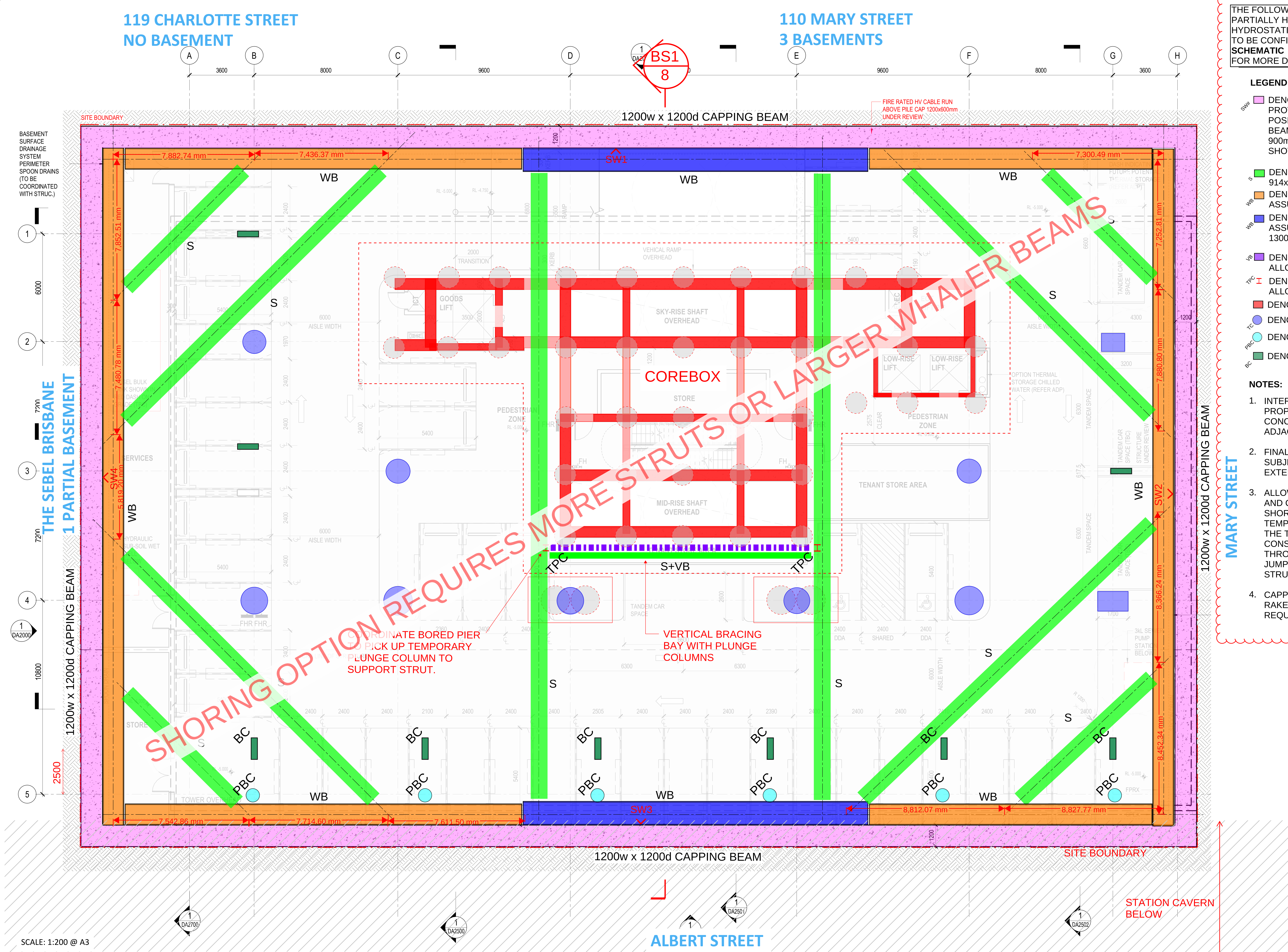
DRAWING TITLE: CRR ASSET PROXIMITY PLANS 2	DESIGNED BY: MJ	DATE: 08/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S00-07	REVISION: P03



THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- SW: DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- S: DENOTES TEMPORARY STRUT. ASSUME 914x19CHS GR350LO
- WB: DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER 1200WB455 GR400
- WB: DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER FAB I SECTION 1300Dx500Wx60tfx20tw GR400
- VB: DENOTES TEMPORARY VERTICAL BRACING. ALLOW 400kg/m STEELWORK.
- TPC: DENOTES TEMPORARY PLUNGE COLUMN ALLOW 400kg/m STEELWORK.
- DENOTES COREBOX WALL
- TC: DENOTES TOWER COLUMN
- PBC: DENOTES PODIUM COLUMN
- BC: DENOTES BASEMENT COLUMN

NOTES:

1. INTERNAL STRUTS AND WHALER BEAMS ARE PROPOSED FOR THE TEMPORARY SHORING CONCEPT DUE TO THE SITE CONSTRAINTS AND ADJACENT EXISTING STRUCTURES.
2. FINAL SETOUT OF WHALER BEAMS AND STRUTS SUBJECT TO JUMPFORM AND FORMWORK EXTENT/BUILD REQUIREMENTS.
3. ALLOWANCE TO BE MADE WITH THE JUMPFORM AND COREBOX TO ALLOW FOR TEMPORARY SHORING STRUTS. THIS MIGHT INCLUDE TEMPORARY WALL PENETRATIONS, SPLICES TO THE TEMPORARY STRUTS, STAGED COREBOX CONSTRUCTION WITH THREE JUMPFORMS THROUGH THE BASEMENTS LEVELS AND SINGLE JUMPFORM ABOVE THE UPPER MOST LAYER OF STRUTS.
4. CAPPING BEAM ADJACENT RAMP MAY NEED TO RAKE TO SUIT THE RAMP CLEAR WIDTH REQUIREMENTS.

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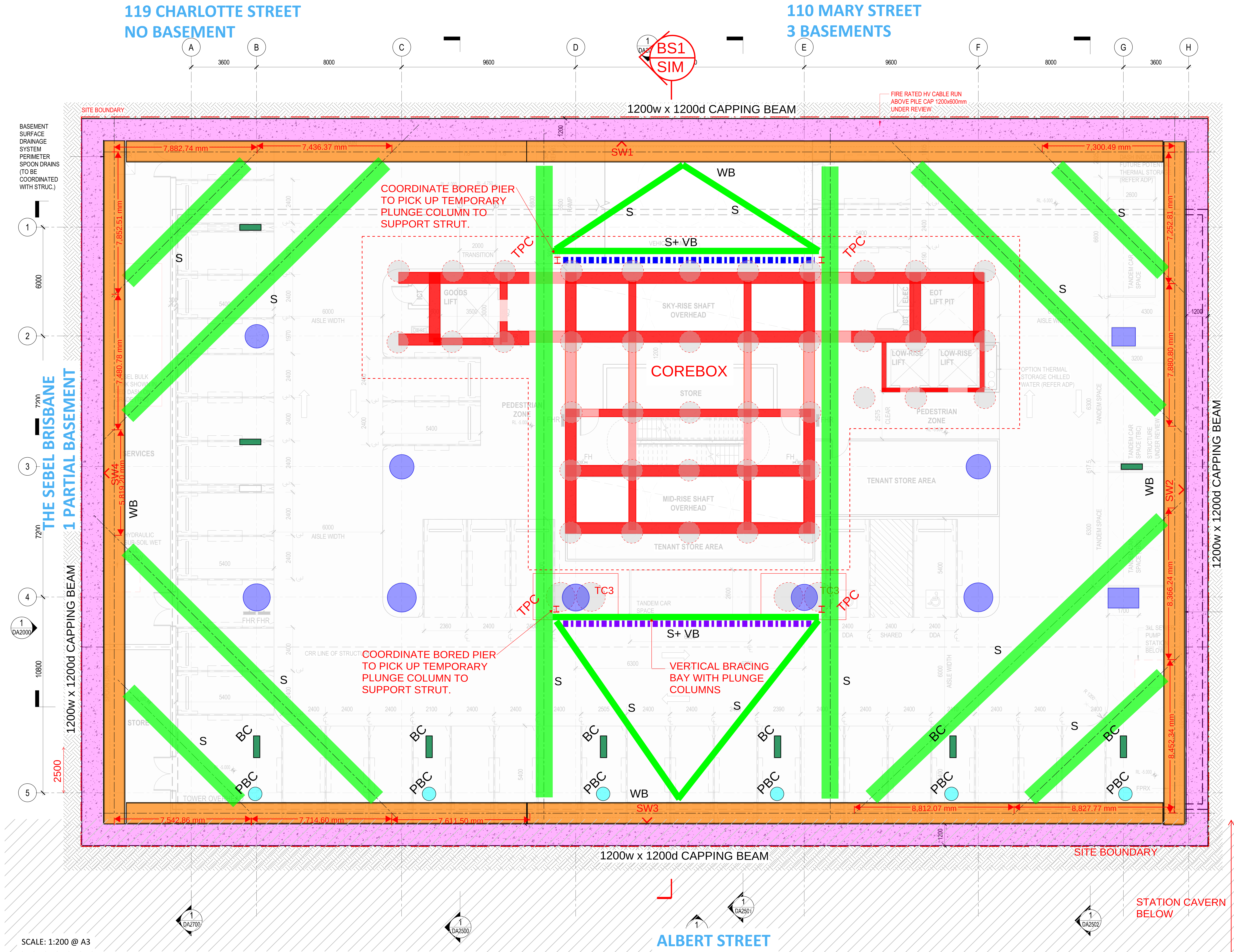
DRAWING TITLE: TEMPORARY SHORING PLAN - OPTION 1	DESIGNED BY: LK	DATE: 07/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: MA	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S00-08	REVISION: P01



THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS. THE CURRENT TEMPORARY SHORING SYSTEM CONSISTS PERIMETER RETAINING WALL AND 2 LAYERS OF TEMPORARY STRUTS AND WHALERS.

LEGEND:

- SW DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- S DENOTES TEMPORARY STRUT. ASSUME 914x19CHS GR350LO
- WB DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER 1200WB455 GR400
- WB DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER FAB I SECTION 1300Dx500Wx60tfx20tw GR400
- VB DENOTES TEMPORARY VERTICAL BRACING. ALLOW 400kg/m STEELWORK.
- TPC DENOTES TEMPORARY PLUNGE COLUMN ALLOW 400kg/m STEELWORK.
- DENOTES COREBOX WALL
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN

NOTES:

1. 2 LAYERS OF INTERNAL STRUTS AND WHALER BEAMS ARE PROPOSED FOR THE TEMPORARY SHORING CONCEPT DUE TO THE SITE CONSTRAINTS AND ADJACENT EXISTING STRUCTURES AS DESCRIBED BELOW:

   110 MARY ST - 3 LEVELS OF BASEMENT BLOCK TEMPORARY ANCHORS.

   THE SEBEL - 1 BASEMENT SUPPORTED ON PILES. TEMPORARY ANCHORS WOULD NEED TO BE COORDINATED TO MISS THE SEBEL INGROUND STRUCTURE.

   ALBERT ST - CRR LCA AND EXISTING SERVICES BELOW THE STREET LIMIT ZONES FOR TEMPORARY ANCHORS.

   MARY ST - EXISTING SERVICES BELOW THE STREET LIMIT ZONES FOR TEMPORARY ANCHORS.

   FURTHER ANALYSIS AND COORDINATION TO BE UNDERTAKEN TO DETERMINE IF A STIFFER PERIMETER RETAINING WALL IS POSSIBLE AND IF IT CAN REDUCE OR REMOVE THE NUMBER OF LAYERS OF STRUTS AND WHALERS. THE FINAL RETAINING WALL THICKNESS TO BE COORDINATED WITH THE BASEMENT SET-OUT.

2. FINAL SETOUT OF WHALER BEAMS AND STRUTS SUBJECT TO JUMPFORM AND FORMWORK EXTENT/BUILD REQUIREMENTS INCLUDING WHETHER A TOP DOWN METHODOLOGY IS ADOPTED NOTING STRUTS WILL NEED TO BE COORDINATED AROUND ANY BORED PIERS INSTALLED FROM EXISTING GROUND LEVEL. CYRRENTLY STRUTS ARE ONLY COORDINATED AROUND COLUMNS.

3. ALLOWANCE TO BE MADE WITH THE JUMPFORM AND COREBOX TO ALLOW FOR TEMPORARY SHORING STRUTS. THIS MIGHT INCLUDE TEMPORARY WALL PENETRATIONS, SPLICES TO THE TEMPORARY STRUTS, STAGED COREBOX CONSTRUCTION WITH THREE JUMPFORMS THROUGH THE BASEMENTS LEVELS AND SINGLE JUMPFORM ABOVE THE UPPER MOST LAYER OF STRUTS.

4. CAPPING BEAM ADJACENT RAMP MAY NEED TO RAKE TO SUIT THE RAMP CLEAR WIDTH REQUIREMENTS.

SCALE: 1:200 @ A3

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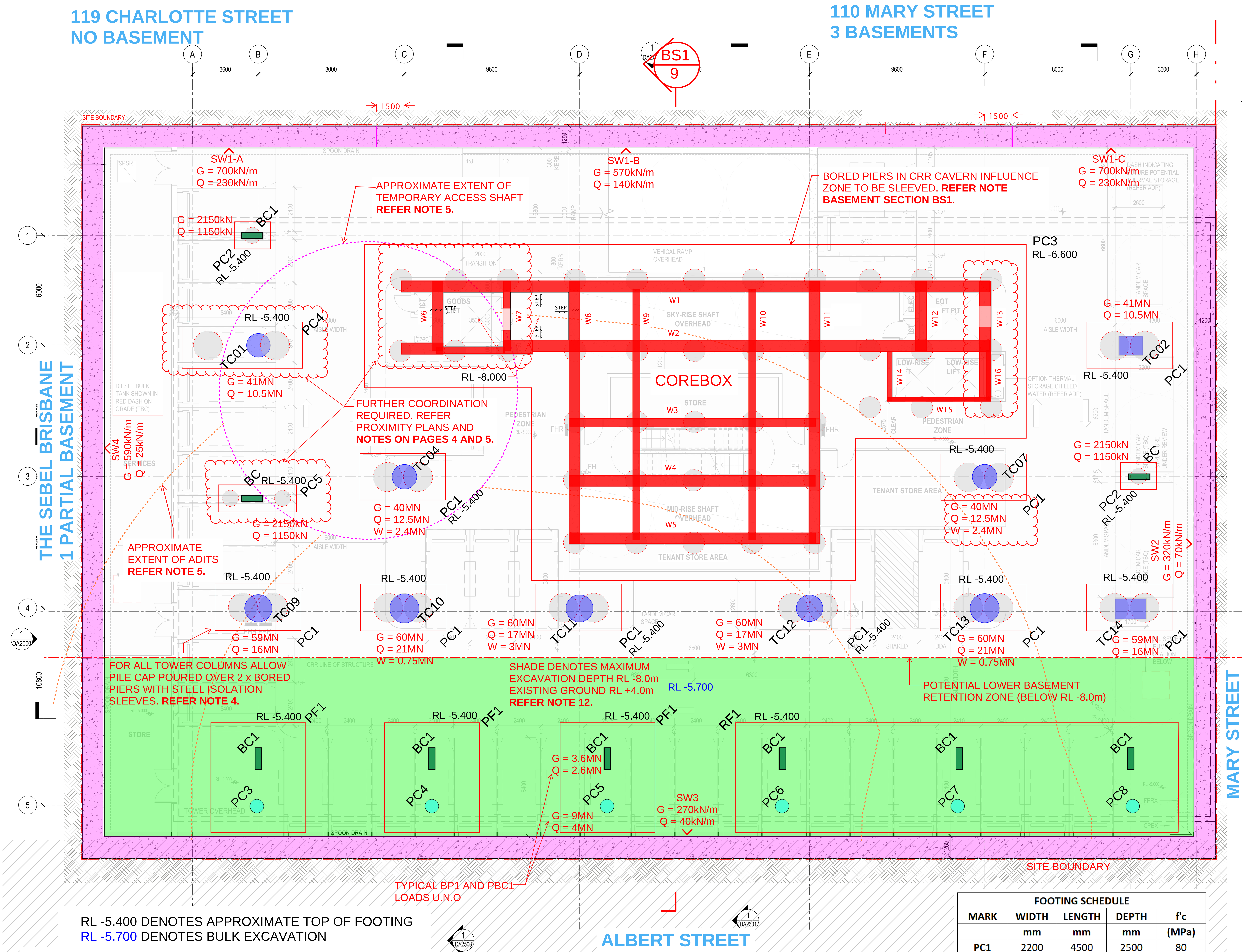
	PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
	CLIENT: QIC	DRAWING NO S00-09	REVISION: P03



RL -5.400 DENOTES APPROXIMATE TOP OF FOOTING
RL -5.700 DENOTES BULK EXCAVATION

SCALE: 1:200 @ A3

THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- DENOTES TOWER COLUMN
- DENOTES PODIUM COLUMN
- DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL
- PF DENOTES PAD FOOTING
- PC DENOTES PILE CAP
- DENOTES BORED PIER

NOTES:

1. PILE CAPS TO BE POURED ON COMPRESSIBLE MATERIAL RMAX GEOFOAM OR SIMILAR OUTSIDE OF THE BORED PIER EXTENTS TO CONTROL LOAD DISTRIBUTION INTO THE BORED PIERS.
2. BORED PIERS TO BE SOCKETED INTO VERY HIGH STRENGTH ROCK NFG1. STEEL ISOLATION SLEEVES TO EXTEND 1m BELOW THE 1:1 CRR INFLUENCE LINE.
3. APPROX. BORED PIER SIZES AND SOCKET LENGTHS INTO NFG2/NFG1 ROCK UNITS, AS FOLLOWS:
   CORE BOX (REFER GA) - 1200DIA WITH 16.5m MAX. SOCKET.
   TOWER COLUMNS - TWIN 1600DIA WITH 13m MAX. SOCKET.
4. NOT ALL EXISTING IN-GROUND STRUCTURE HAS BEEN SHOWN FOR CLARITY. FURTHER COORDINATION REQUIRED TO RESOLVE CLASHES BETWEEN NEW AND EXISTING IN-GROUND STRUCTURE.
5. CONFIRMATION REQUIRED ON METHODOLGY AND MATERIAL TO BE USED TO FILL ADITS AND ACCESS SHAFT.
6. SHEET PILLING MAY BE REQUIRED SUBJECT TO GEOTECHNICAL ENGINEER REVIEW.
7. THE FOOTING DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, STAGED CONSTRUCTION ETC. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
8. BORED PIERS TO COLUMNS AND COREBOX MAY BE INSTALLED FROM GROUND LEVEL PROVIDED ADDITIONAL PROVISIONS ARE MADE AS PER NOTE 7. THE CURRENT DESIGN DOES NOT ALLOW FOR BORED PIER OUT OF POSITION ASSOCIATED WITH THE PRIOR AND THIS WOULD NEED TO BE REVIEWED AS PART OF THE TEMPORARY WORKS PACKAGE. ALLOW FOR A PILING MAT AS PER GEOTECHNICAL REQUIREMENTS.
9. ALLOW FOR COST ASSOCIATED WITH TEMPERATURE MONITORING AND CONTROL TO PILE CAPS DEEPER THAN 1m. THIS MIGHT INCLUDE THERMOCOUPLERS, INSULATION, ICE TO THE CONCRETE MIX ETC.
10. PAD FOOTINGS TO BE FOUND ON LOW STRENGTH ROCK WITH MINIMUM 1MPa ALLOWABLE END BEARING CAPACITY. PROVIDE MASS CONCRETE BELOW FOOTING AS REQUIRED TO REACH LOW STRENGTH ROCK TO MAXIMUM DEPTH OF RL-8.
11. EXTENT OF NEW INGROUND SERVICES TO BE CONFIRMED. PAD FOOTINGS TO BE DEEPENED AS REQUIRED TO EXTEND BELOW INFLUENCE ZONE. REFER TO COVER NOTES ON PAGE 1.
12. ALLOW FOR 1500mm THK RAFT TO EXTENT OF MAXIMUM EXCAVATION DEPTH RL -8.0m INCASE ADDITIONAL DISTRIBUTION OF VERTICAL LOAD FROM THE PODIUM AND BASEMENT COLUMNS IS REQUIRED TO ACHIEVE CRR CAVERN DESIGN CRITERIA. SUBJECT TO GEOTECHNICAL ANALYSIS.

FOOTING SCHEDULE

MARK	WIDTH	LENGTH	DEPTH	f'c
	mm	mm	mm	(MPa)
PC1	2200	4500	2500	80
PC2	1500	2000	1200	50
PC3	REFER GA		3000	80
PC4	2200	6600	2500	80
PC5	1500	4500	1500	50
PF1	5200	6000	1500	50
RF1	24400	6000	1500	50

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DRAWING TITLE: FOUNDATION PLAN	DESIGNED BY: MJ	DATE: 14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S01-01	REVISION: P07

SCALE: 1:200 @ A3

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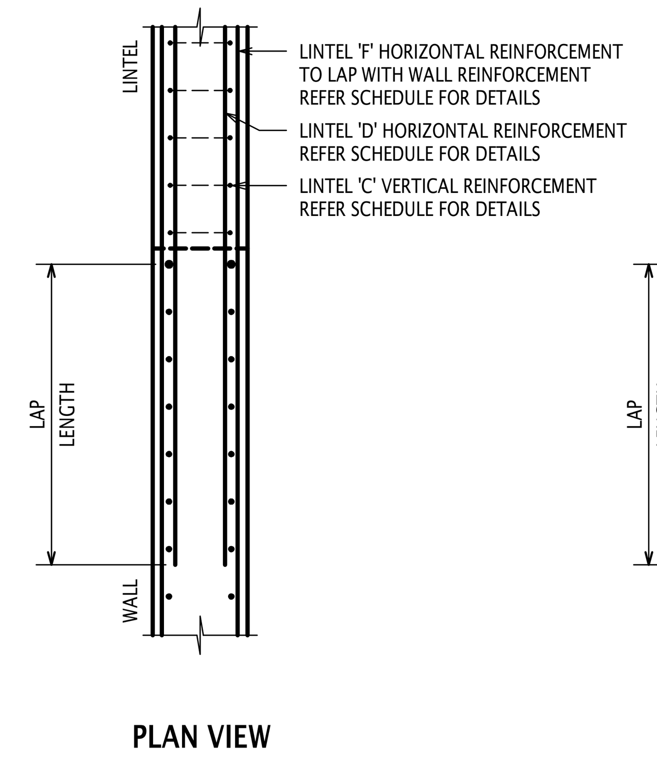
DRAWING TITLE: BASEMENT SECTION 1	DESIGNED BY: LK	DATE: 04/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: MA	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S01-02	REVISION: P01

WALL SCHEDULE																	
MARK	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	f'c
LEVEL	THK(mm)																(MPa)
FTG - G	600	600	400	600	600	600	400	600	300	300	600	400	600	300	300	300	100
G-L9	600	600	400	600	600	600	400	600	300	300	600	400	600[2]	300	300	300[2]	80
L9 - L14	600	600	400	600	600	600	400	600	300	300	600	400	600	300	300	300	80
L14 - L22	600	500	300	400	500	500	300	500	300	300	500		500				65
L22-L29	600	500	300	400[1]	400	500	300	500	300	300	500		500				65
L29-R	600	500				400	300	400	300	300	400		400				50

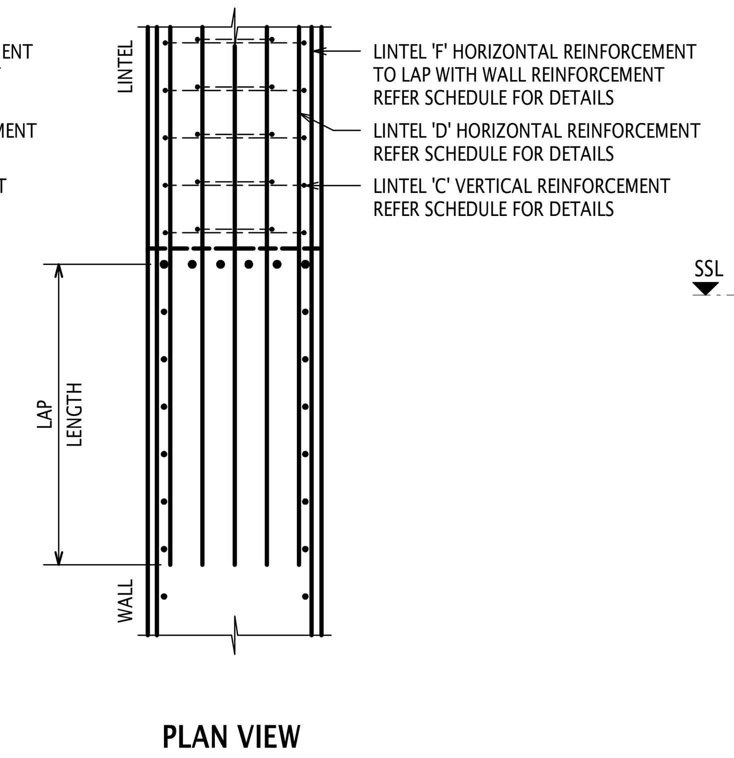
NOTES:
1. WALL W4 TO BE PENETRATION FOR THE STOREY BELOW THE SKY-RISE TOWER COLUMNS TC05 AND TC06.
2. WALLS W13 AND W16 TO BE 800mm THK AND 500mm THK, RESPECTIVELY AT LEVELS 5 AND 6.

COLUMN SCHEDULE						
	Reinforced Concrete	Concrete Filled Tube (CFT)				
Level	B2-GND	GND-L6	L6-L14	L14-L22	L22-L32	L32-Roof
Label	mm	mm	mm	mm	mm	mm
TC01	R1050x1300/1300	1300	1050	1050	900	600
TC02	R1050x1300/1300	1300	1050	1050	900	600
TC03	-	-	-	1050	900	600
TC03N	-	-	1050	-	-	-
TC03S	-	-	1050	-	-	-
TC04	R1050x1400/1350	1350	1200	1050	900	800
TC05	-	-	-	-	900	800
TC06	-	-	-	-	900	800
TC07	R1050x1400/1350	1350	1200	1050	900	800
TC08	-	-	-	1050	900	600
TC08N	-	-	1050	-	-	-
TOC8S	-	-	1050	-	-	-
TC09	R1100x1700/1600	1600	1050	1050	900	800
TC10	R1200x1700/1600	1600	1200	1050	900	800
TC11	R1100x1700/1600	1600	1200	1050	900	800
TC12	R1100x1700/1600	1600	1200	1050	900	800
TC13	R1200x1700/1600	1600	1200	1050	900	800
TC14	R1100x1700/1600	1600	1050	1050	900	800
TC15	-	-	1050	1050	900	600
TC16	-	-	1200	1050	900	600
TC17	-	-	1050	1050	900	600
TC18	-	-	1050	1050	900	600
TC19	-	-	1200	1050	900	600
TC20	-	-	1050	1050	900	600
PC1	-	600	600	-	-	-
PC2	750	600	600	-	-	-
PC3	750	600	600	-	-	-
PC4	750	600	600	-	-	-
PC5	750	600	600	-	-	-
PC6	750	600	600	-	-	-
PC7	750	600	600	-	-	-
PC8	750	600	600	-	-	-
BC1	R1000 x 350	-	-	-	-	-

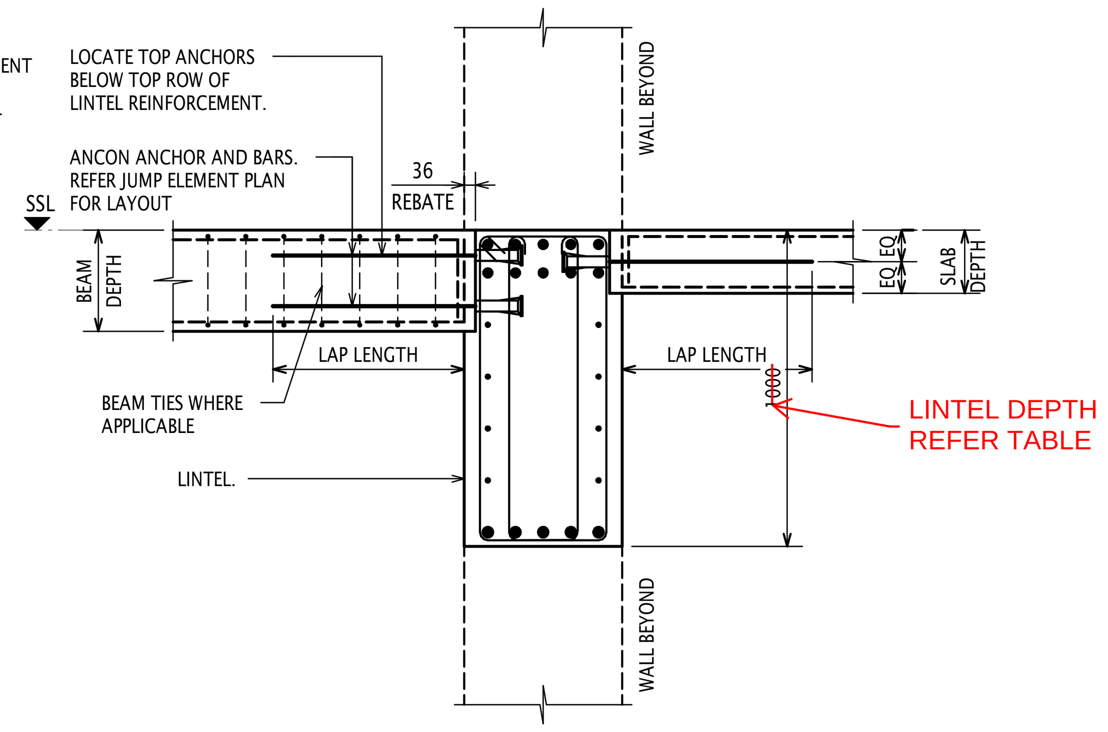
- ALL COLUMNS ARE CIRCULAR WITH DIAMETER NOTED U.N.O
- 'R' DENOTES RECTANGULAR COLUMN
- STEEL TUBE THK - 12mm FOR COLUMNS DIA < 750mm
- STEEL TUBE THK - 16mm FOR COLUMNS 750mm<DIA<1300mm
- STEEL TUBE THK - 20mm FOR COLUMNS DIA>1300mm
- CONCRETE STRENGTHS: B2 - L6 (100MPa); L6 - L14 (80MPa); L14 - L29 (65MPa); L29 - R (50MPa)



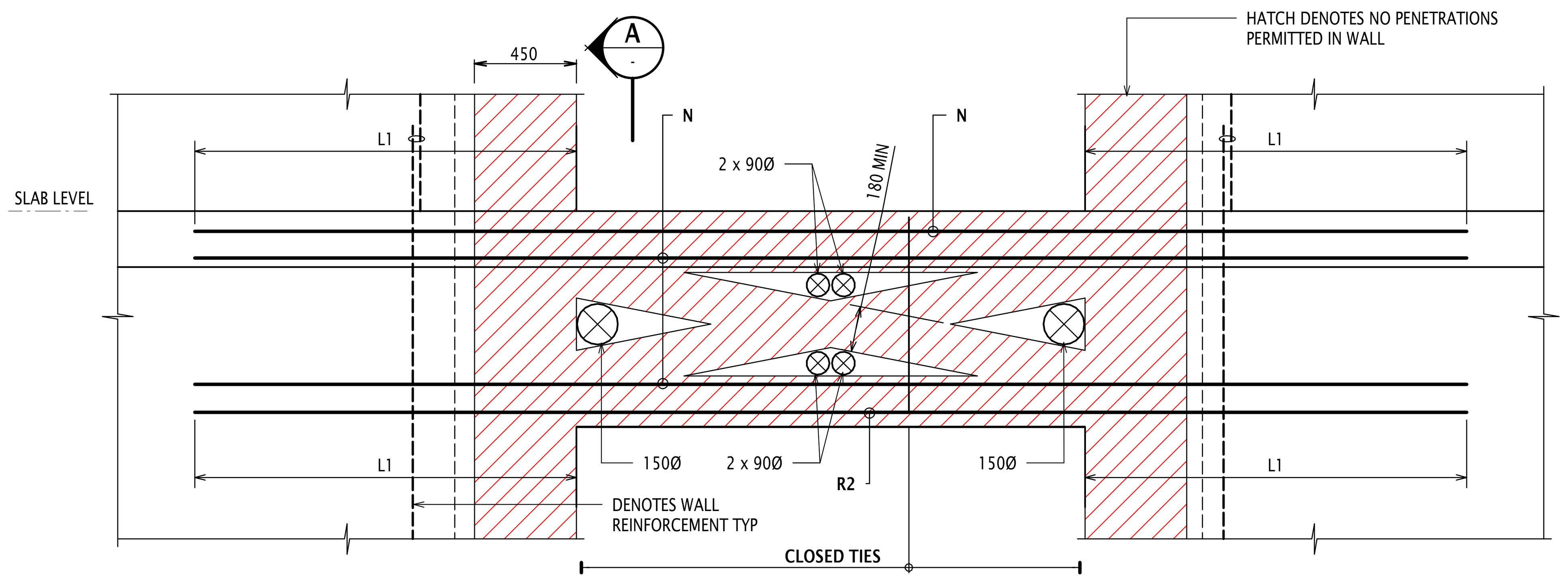
LINTEL/ WALL REINFORCEMENT TRANSITION DETAIL FOR WALLS < 400 THK



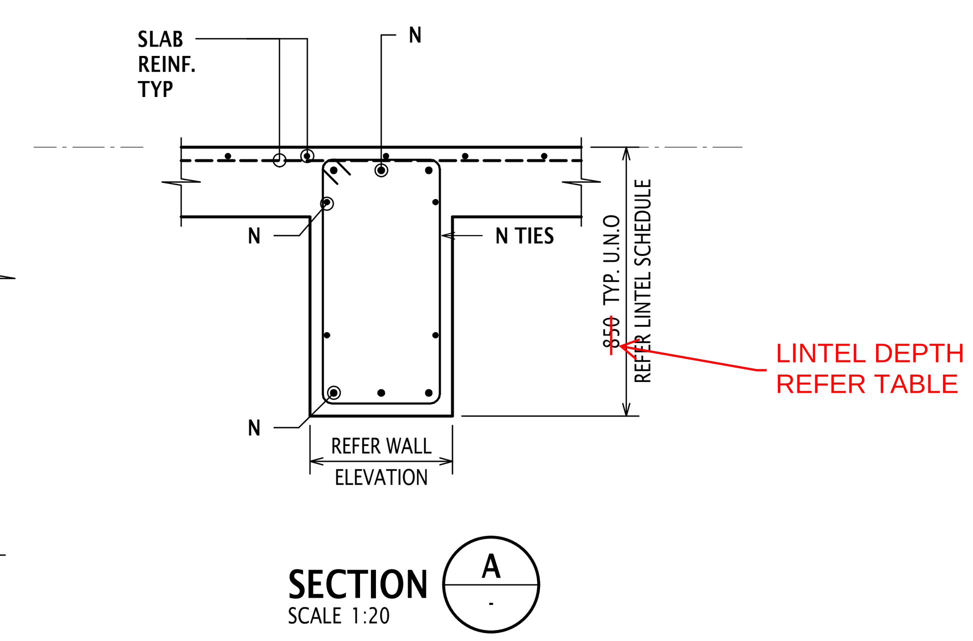
LINTEL/ WALL REINFORCEMENT TRANSITION DETAIL FOR WALLS ≥ 400 THK



TYPICAL ANCON ANCHOR DETAIL
(BEAM & SLAB TO LINTEL FACE)
SCALE 1:20



TYPICAL LOBBY LINTEL BEAM DETAIL (LB1)
SCALE 1:20



SECTION A
SCALE 1:20

TYPICAL DOOR OPENING HEIGHTS		
LOCATION	OPENING HEIGHT	LINTEL DEPTH
L/M/H LIFT	2600	1400
GL/SL	2900	1100
LOBBY	2900	1100
CORRIDOR ADJACENT CORE	2900	1100
BOH/STAIR	2600	1400

BASED ON FLOOR TO FLOOR HEIGHT = 4m
LINTEL DEPTH TO REDUCE/INCREASE FOR SMALLER/LARGER FLOOR TO FLOOR HEIGHTS.

SCALE 1:100 @ A1

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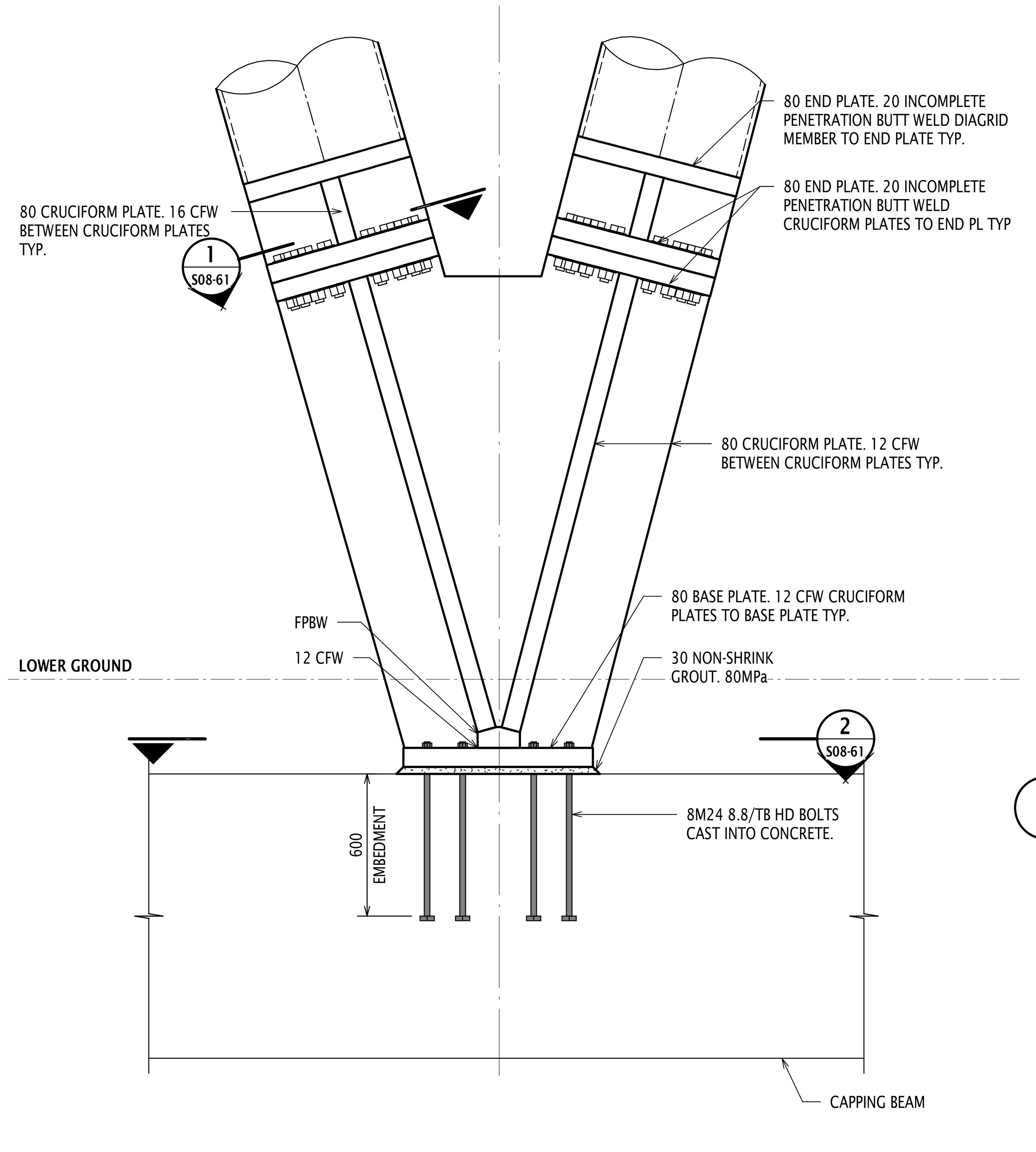
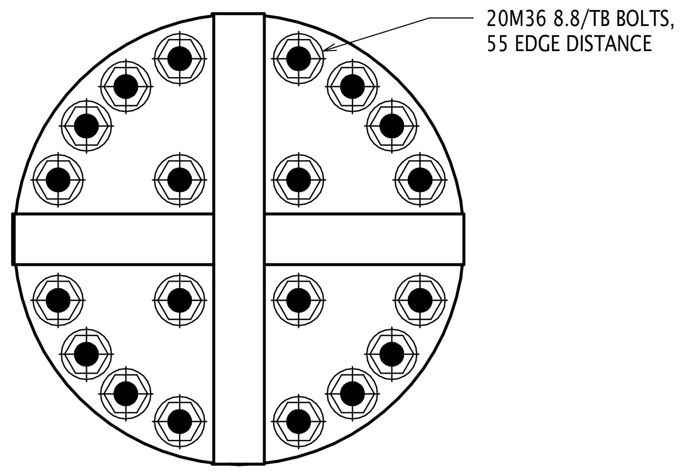
DRAWING TITLE: TYPICAL COLUMN AND WALL DETAILS	DESIGNED BY: MJ	DATE: 14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S01-05	REVISION: P07



TYPE A - NODE BASE ELEVATION

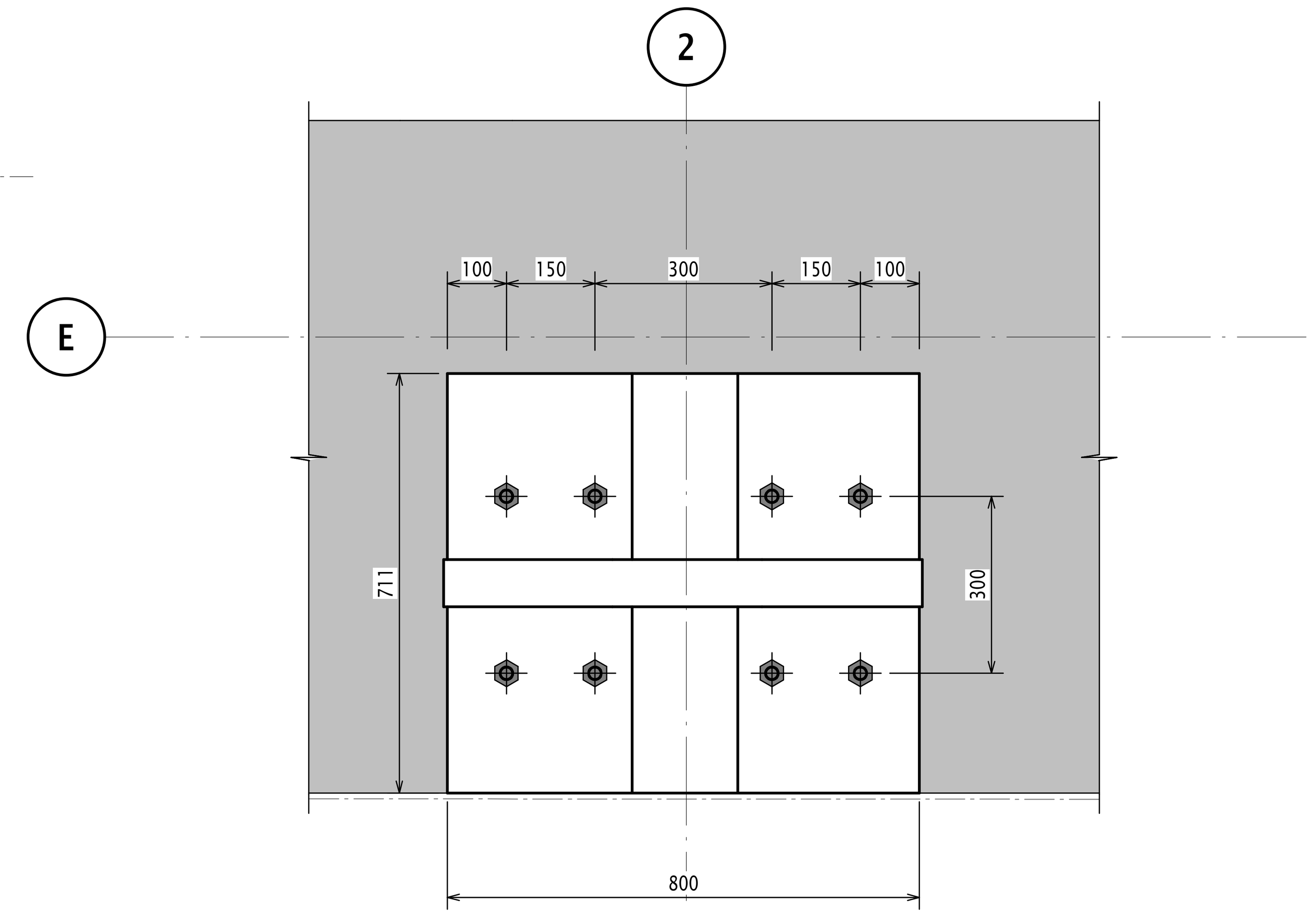
SCALE 1 : 20

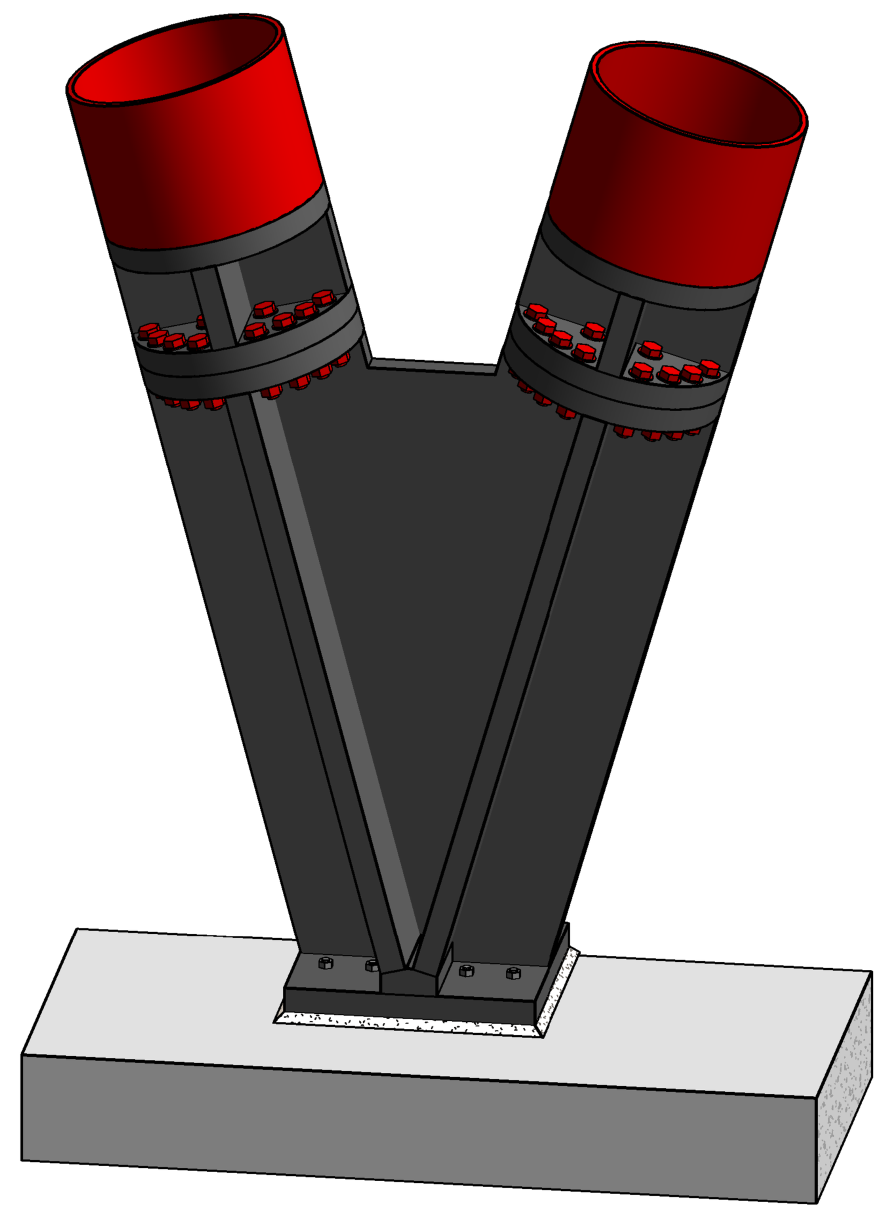
EXAMPLE OF COMPOSITE COLUMN
BASE DETAIL AT GROUND



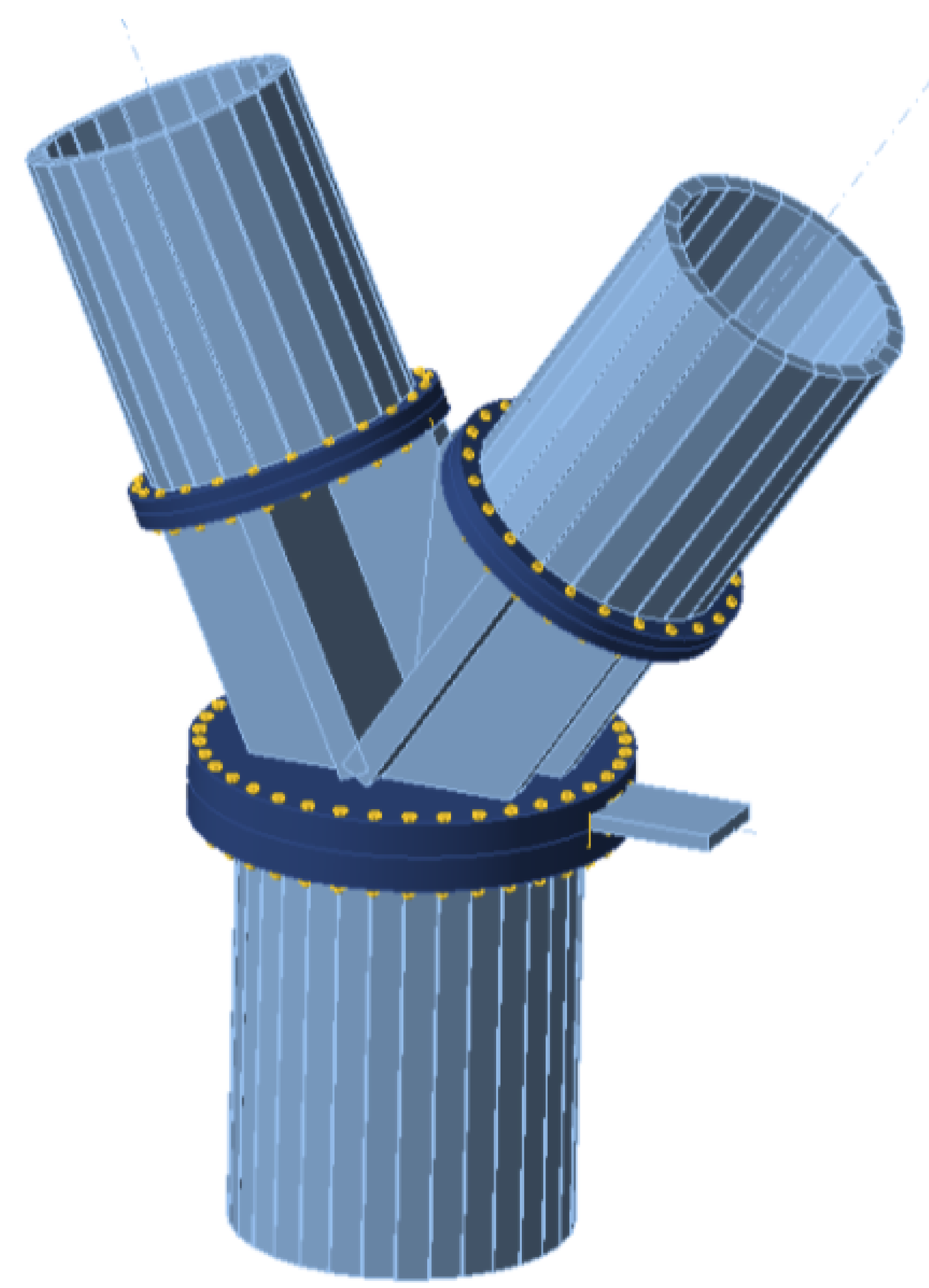
SECTION 1 S08-61

SCALE 1 : 10

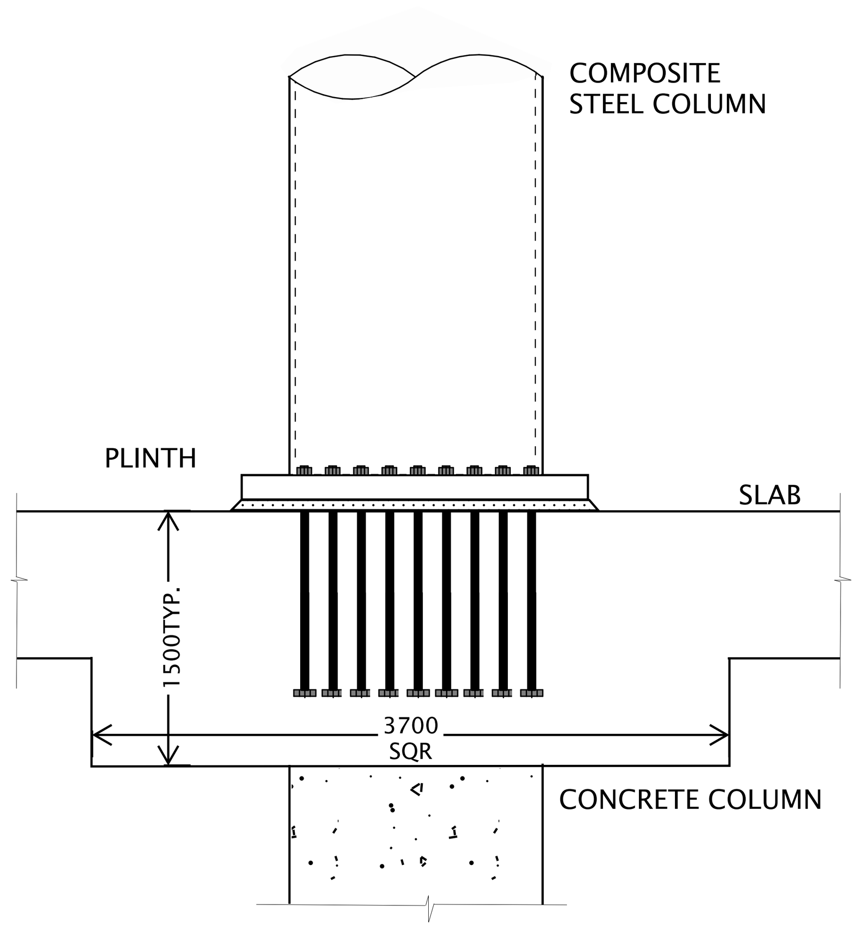




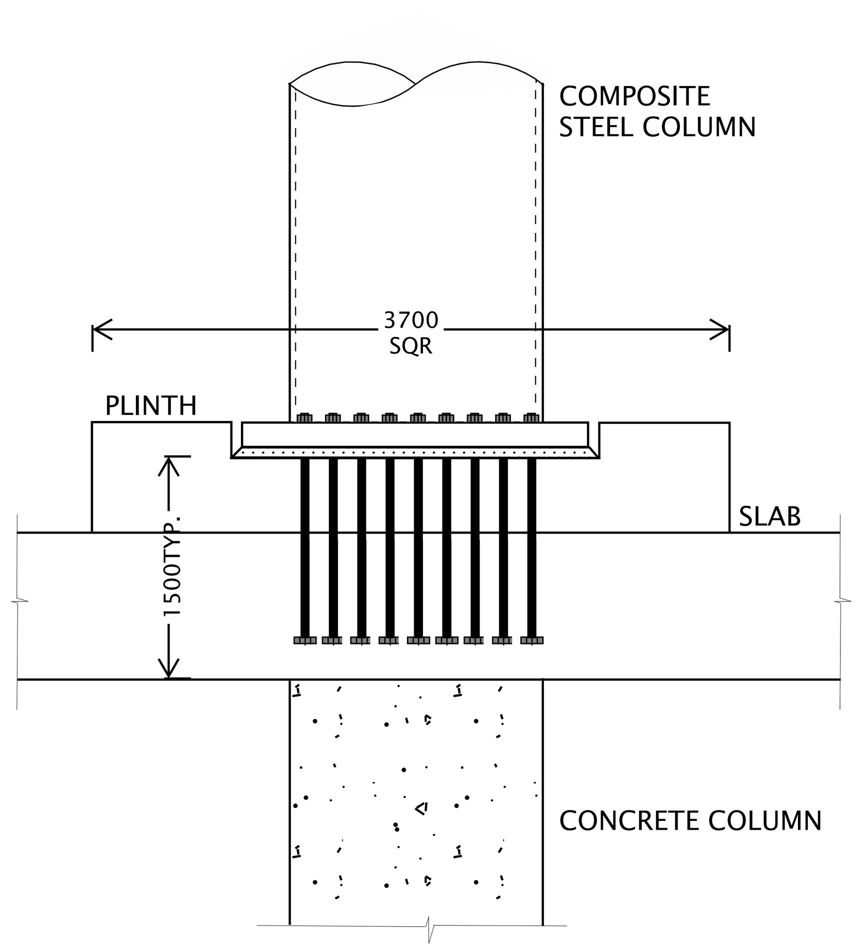
TYPE A - 3D VIEW



EXAMPLE OF COMPOSITE COLUMN AT
RAKING COLUMN NODES (LEVELS 6 AND 14)



OPTION 1



OPTION 2

COMPOSITE STEEL COLUMN GROUND FLOOR DETAILS

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DRAWING TITLE: TYPICAL TOWER COLUMN NODES 1	DESIGNED BY: LK	DATE: 07/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: MA	PROJECT No: 22131
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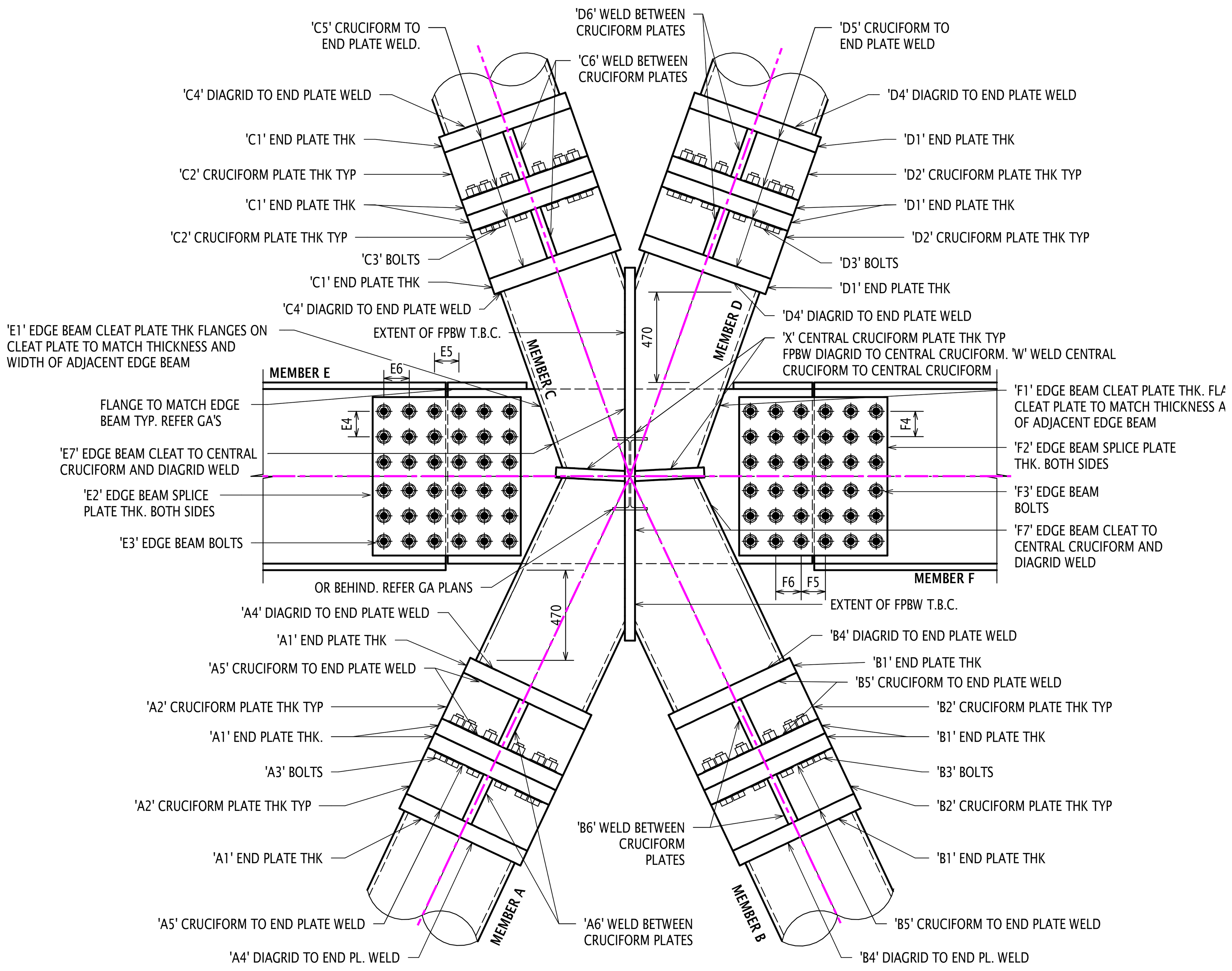
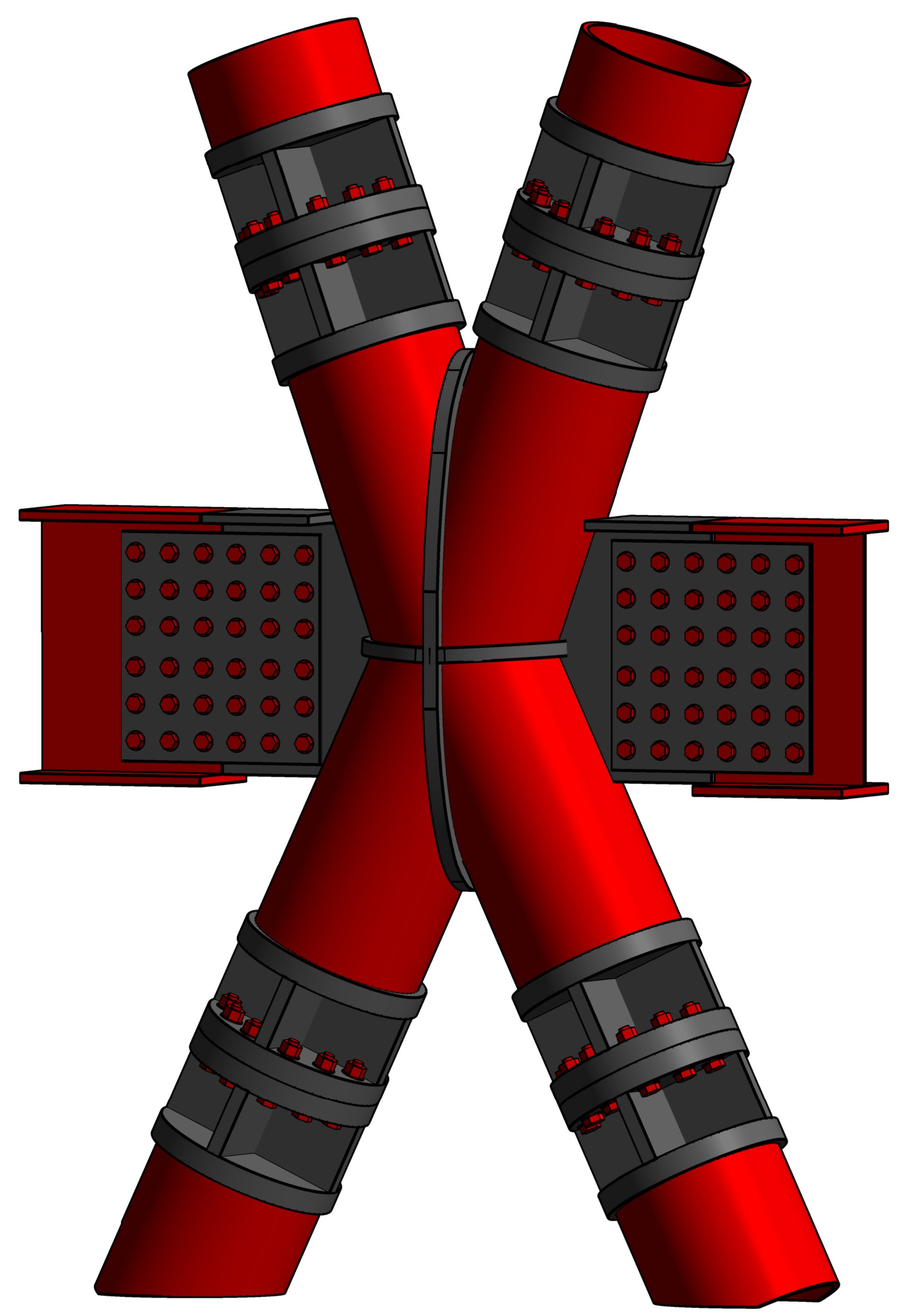


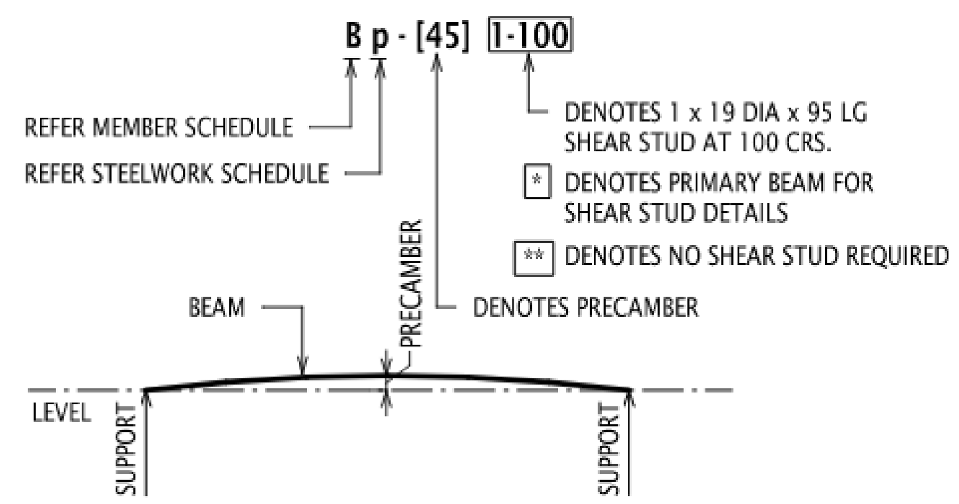
TYPE D - NODE ELEVATION

SCALE 1 : 20

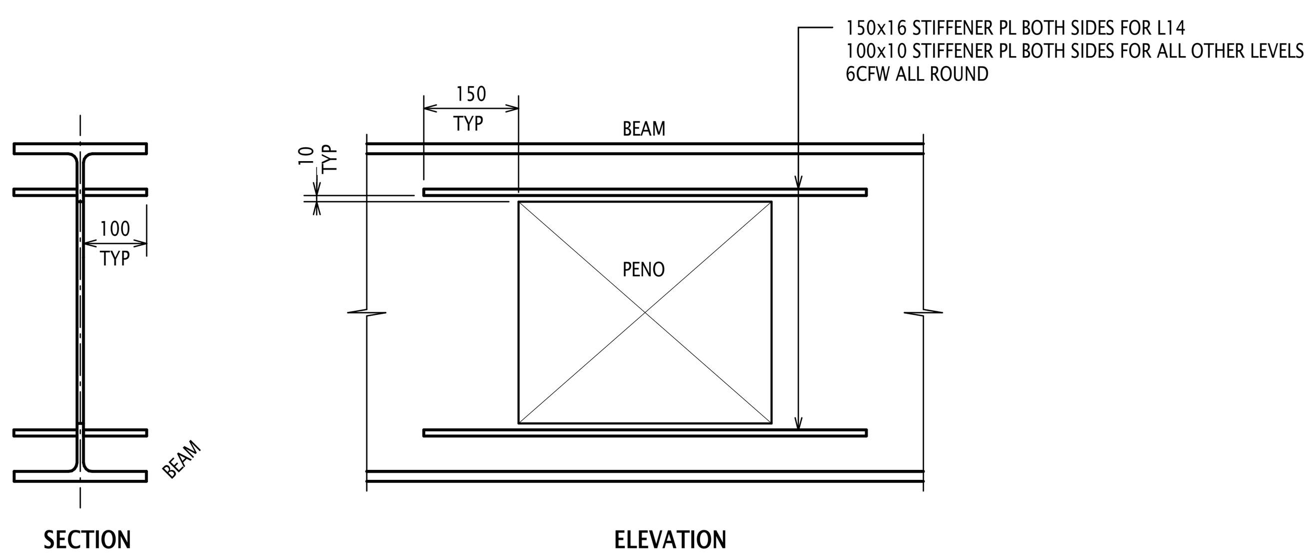
EXAMPLE OF COMPOSITE COLUMN AT RAKING COLUMN NODES (LEVELS 6 AND 14)



TYPE D - 3D VIEW

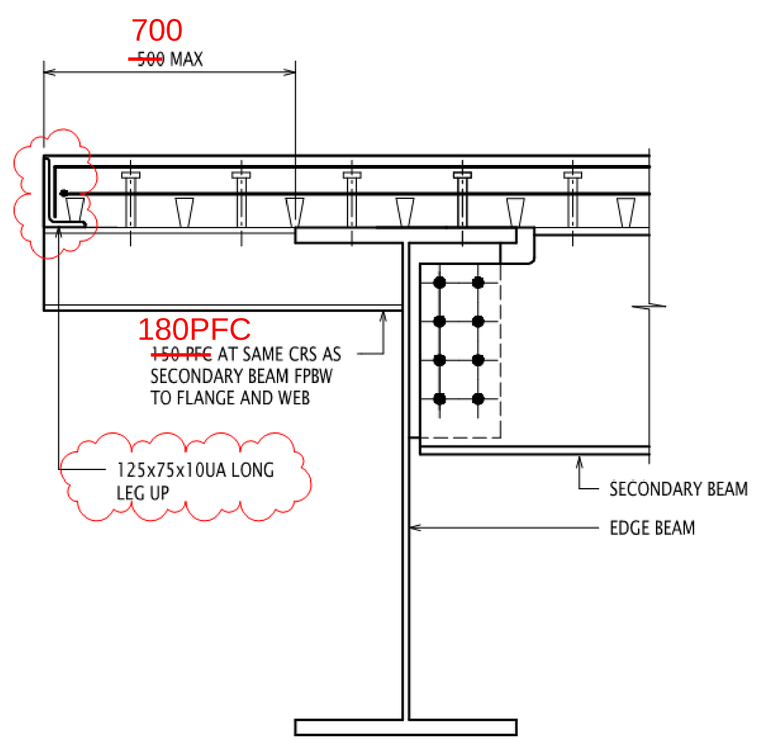


PRECAMBER DIAGRAM



TYPICAL STEEL BEAM PENETRATION STIFFENER DETAIL (RP)

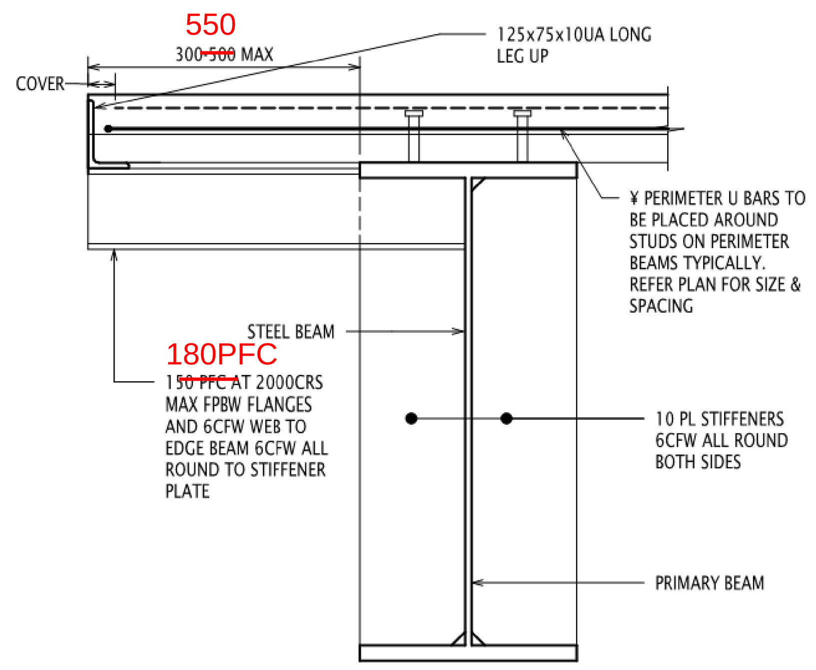
SCALE 1 : 10



TYPICAL SLAB EDGE DETAIL BONDEK SPAN PARALLEL TO SLAB EDGE

SECTION 1

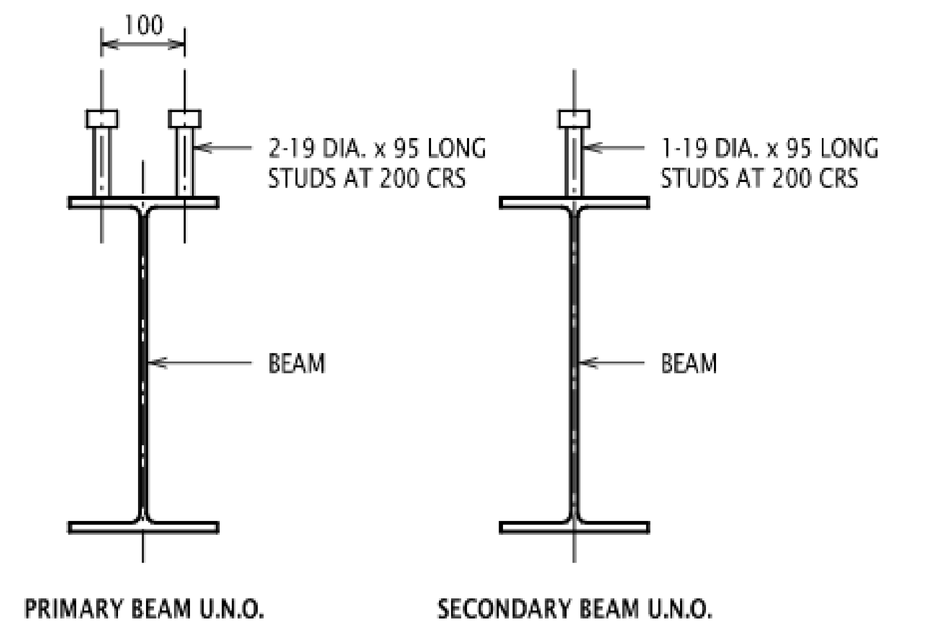
SCALE



TYPICAL SLAB EDGE DETAIL BONDEK SPAN PERPENDICULAR TO SLAB EDGE

SECTION 2

SCALE

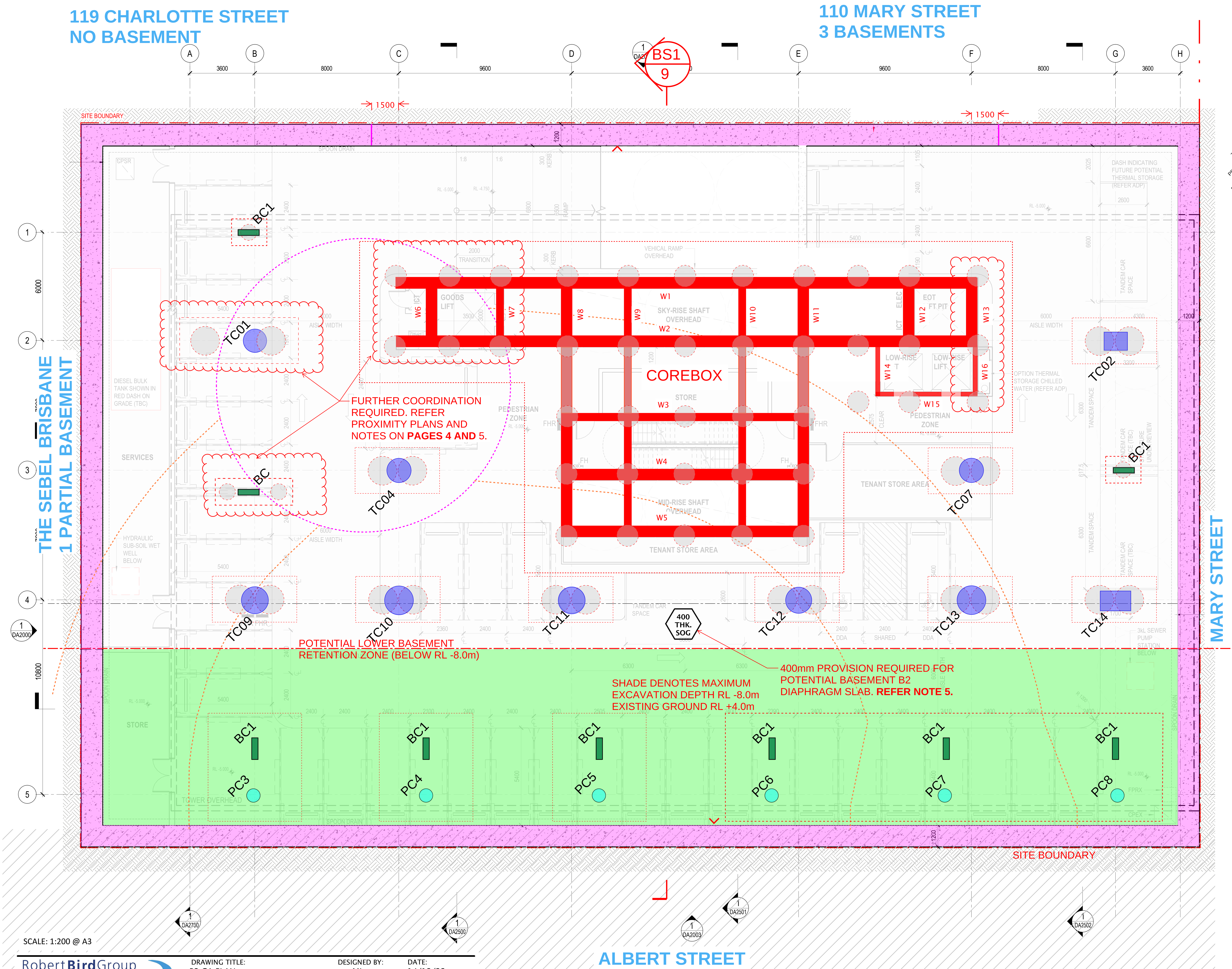


SHEAR STUD DETAILS

SCALE 1:10

TYPICAL MR, HR AND SR COMPOSITE STEEL FLOOR DETAILS

Robert Bird Group BRISBANE OFFICE: Robert Bird Group Pty Ltd Level 1, 480 St Pauls Terrace Fortitude Valley QLD 4006 Ph: (07) 3319 2777 ACN 010 580 248 Web Site: www.robertbird.com	DRAWING TITLE: TYPICAL TOWER COLUMN NODES 2	DESIGNED BY: LK	DATE: 07/11/22
	PROJECT: ALBERT ST OSD	CHECKED BY: MA	PROJECT No: 22131
	CLIENT: QIC	DRAWING NO S01-07	REVISION: P01



SCALE: 1:200 @ A3

THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL
- DENOTES SLAB THICKNESS
- DENOTES BORED PIER

NOTES:

1. SLAB TO BE POURED ONTO A MEMBRANE.
2. SLAB THICKNESS TO BE INCREASED LOCALLY WHEN POURED DOWN ONTO PILECAPS, PAD FOOTING, CORE FOOTING OR STRIP FOOTINGS. ALLOW UP TO A MINIMUM OF DRAINAGE LAYER THICKNESS IN THESE LOCATIONS. SLAB TO BE THICKENED LOCALLY FOR SPOON DRAIN REQUIREMENTS TO BE CONFIRMED BY HYDRAULIC ENGINEER.
3. SLAB TO BE LAID ON DAMP PROOF MEMBRANE, 50mm BEDDING SAND, CRUSHED ROCK DRAINAGE LAYER WITH GEOFABRIC, AG LINES AND PUMP OUT PITS TO HYDRAULIC ENGINEER'S DETAILS. HYDRAULIC ENGINEER TO CONFIRM DRAINAGE LAYER THICKNESS AND DESIGN AND CERTIFY SYSTEM. A 300mm ZONE FOR THE ABOVE BEDDING AND DRAINAGE LAYER HAS BEEN ASSUMED AND WILL NEED TO BE CONFIRMED BY HYDRAULIC ENGINEER.
4. GEOTECHNICAL ENGINEER TO PROVIDE INFILTRATION FLOW RATES FOR DESIGN OF THE UNDER SLAB DRAINAGE SYSTEM. GEOTECHNICAL ENGINEER TO CERTIFY INFLOW RATES.
5. ALLOW FOR 400mm THK DIAPHRAGM SLAB TO BASEMENT B2 INCASE ADDITIONAL DISTRIBUTION OF LATERAL LOAD FROM THE COREBOX IS REQUIRED TO ACHIEVE CRR CAVERN DESIGN CRITERIA. SUBJECT TO GEOTECHNICAL ANALYSIS.
   ALLOW FOR COUPLERS BETWEEN SHORING WALL, COREBOX AND 400mm THK DIAPHRAGM SLAB. ALLOW ADDITIONAL REINFORCEMENT RATE FOR THE DIAPHRAGM SLAB.
6. FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
7. ALLOWANCE TO BE MADE WITH THE JUMPFORM AND COREBOX TO ALLOW FOR TEMPORARY SHORING STRUTS. THIS MIGHT INCLUDE TEMPORARY WALL PENETRATIONS, SPLICES TO THE TEMPORARY STRUTS, STAGED COREBOX CONSTRUCTION WITH THREE JUMPFORMS THROUGH THE BASEMENTS LEVELS AND SINGLE JUMPFORM ABOVE THE UPPER MOST LAYER OF STRUTS.
8. EXTENT OF NEW INGROUND SERVICES TO BE CONFIRMED. SLAB THICKNESS OVER SERVICES TO BE REVIEWED.

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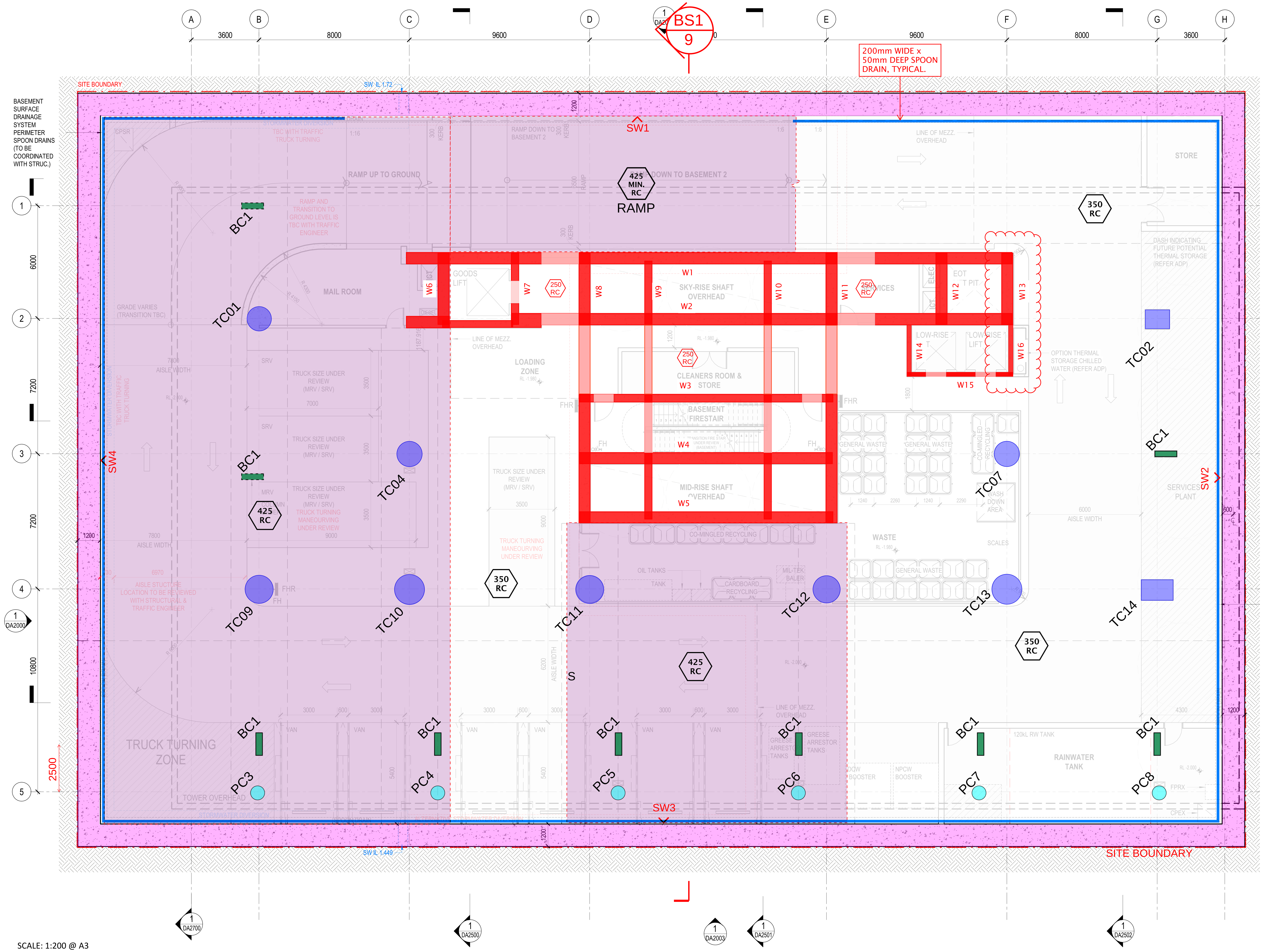
DRAWING TITLE:	DESIGNED BY:	DATE:
B2 GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-01	P05

THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.



SCALE: 1:200 @ A3

LEGEND:

- DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL
- DENOTES SLAB THICKNESS

NOTES:

1. ALLOW FOR 80MPa PUDDLE POURS TO SLAB AT ALL TOWER COLUMN LOCATIONS. EXTEND 1500mm BEYOND COLUMN FACE.
2. ALLOW FOR COUPLERS BETWEEN SHORING WALL, COREBOX AND SLAB.
3. FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
4. ALLOWANCE TO BE MADE WITH THE JUMPFORM AND COREBOX TO ALLOW FOR TEMPORARY SHORING STRUTS. THIS MIGHT INCLUDE TEMPORARY WALL PENETRATIONS, SPLICES TO THE TEMPORARY STRUTS, STAGED COREBOX CONSTRUCTION WITH THREE JUMPFORMS THROUGH THE BASEMENTS LEVELS AND SINGLE JUMPFORM ABOVE THE UPPER MOST LAYER OF STRUTS.
5. TANK LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.

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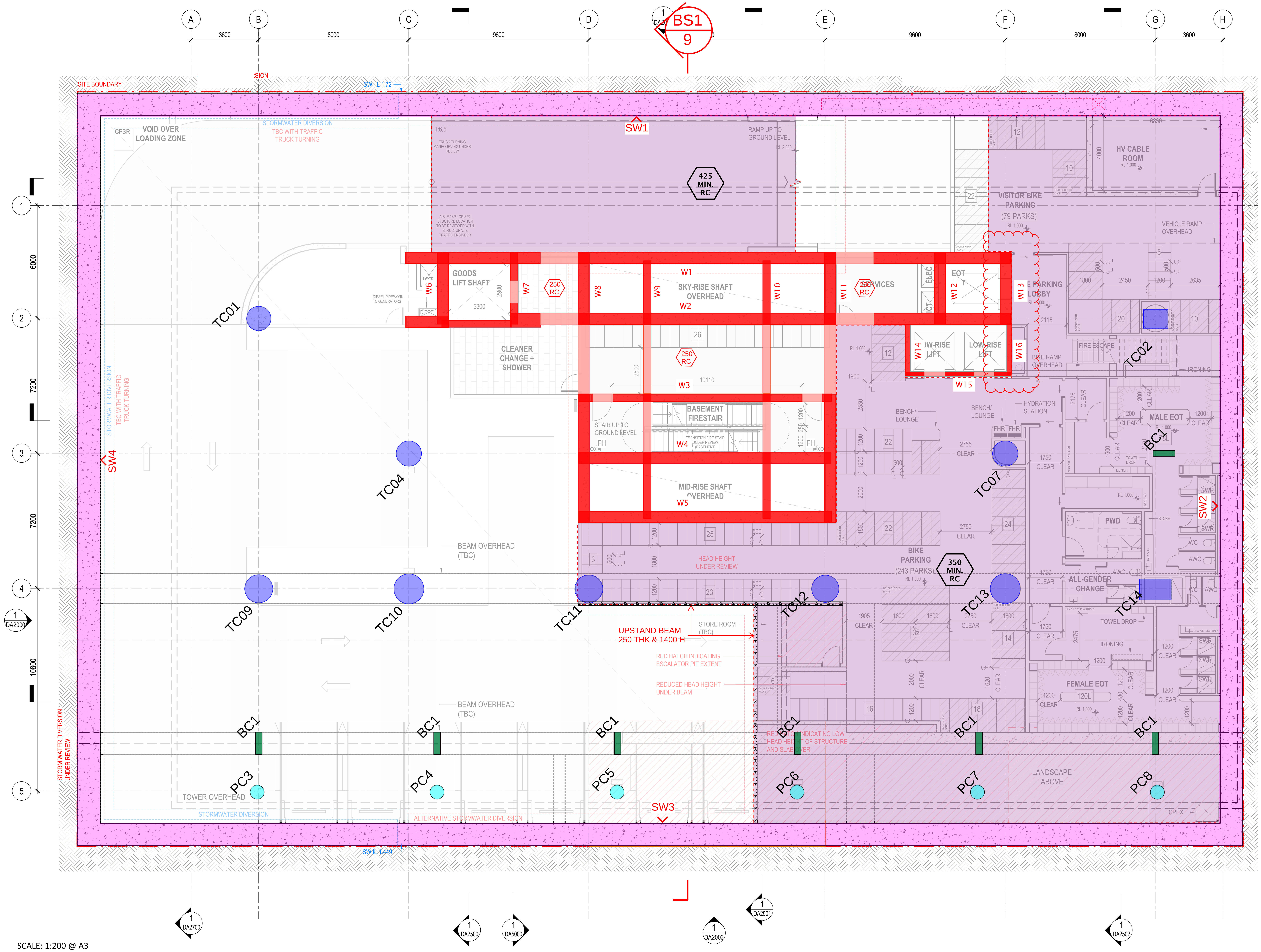
DRAWING TITLE:	DESIGNED BY:	DATE:
B1 GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-02	P05



THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL
- DENOTES SLAB THICKNESS

NOTES:

1. ALLOW FOR 80MPa PUDDLE POURS TO SLAB AT ALL TOWER COLUMN LOCATIONS. EXTEND 1500mm BEYOND COLUMN FACE.
2. ALLOW FOR COUPLERS BETWEEN SHORING WALL, COREBOX AND SLAB.
3. FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
4. ALLOWANCE TO BE MADE WITH THE JUMPFORM AND COREBOX TO ALLOW FOR TEMPORARY SHORING STRUTS. THIS MIGHT INCLUDE TEMPORARY WALL PENETRATIONS, SPLICES TO THE TEMPORARY STRUTS, STAGED COREBOX CONSTRUCTION WITH THREE JUMPFORMS THROUGH THE BASEMENTS LEVELS AND SINGLE JUMPFORM ABOVE THE UPPER MOST LAYER OF STRUTS.
5. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.

SCALE: 1:200 @ A3

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EOT GA PLAN	MJ	14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-03	REVISION: P05

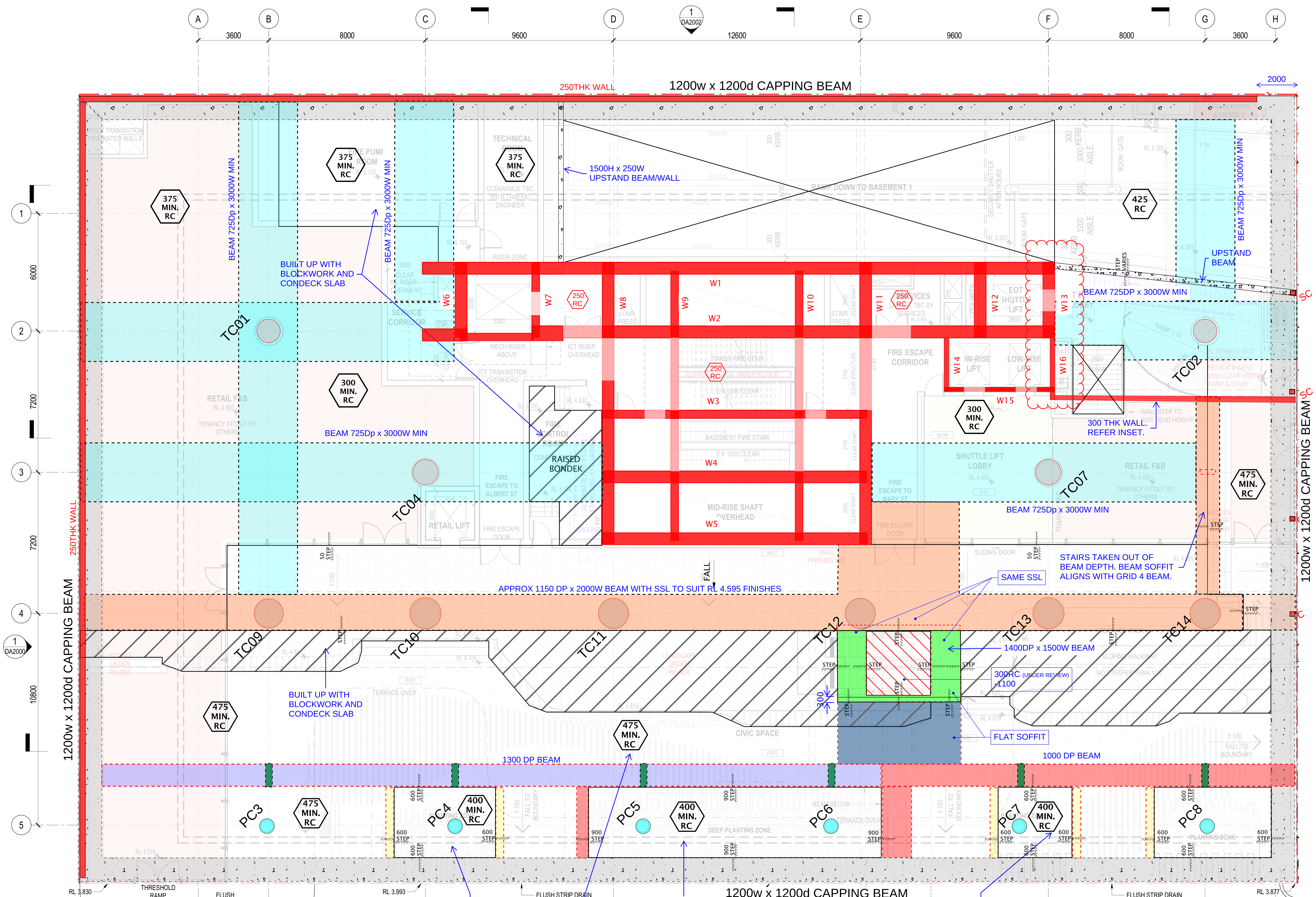
THE FOLLOWING INFORMATION IS BASED UPON A A FLOOD RL5.2. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

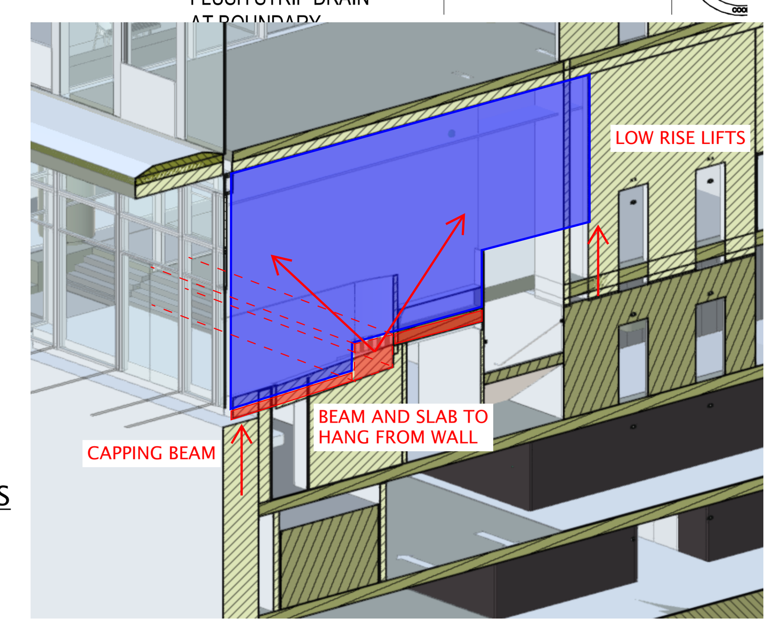
LEGEND:

- DENOTES SHORING WALL BELOW WITH 1200d X 1200w CAPPING BEAM. ALLOW FOR TEMPORARY SLIP JOINT BETWEEN CAPPING BEAM AND GROUND SLABS AND BEAMS TO ALLOW FOR POST TENSIONING. LOCK UP AT 56 DAYS.
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL/PERIMETER WALL
- THK RC DENOTES SLAB THICKNESS

NOTES:

1. ALLOW FOR 80MPa PUDDLE POURS TO SLAB AT ALL TOWER COLUMN LOCATIONS. EXTEND 1500mm BEYOND COLUMN FACE.
2. ALLOW FOR COUPLERS BETWEEN SHORING WALL, COREBOX AND SLAB.
3. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS (15kPa LL HAS BEEN ALLOWED BETWEEN ALBERT STREET AND GRID 4), TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
4. ALLOWANCE TO BE MADE WITH THE JUMPFORM AND COREBOX TO ALLOW FOR TEMPORARY SHORING STRUTS. THIS MIGHT INCLUDE TEMPORARY WALL PENETRATIONS, SPLICES TO THE TEMPORARY STRUTS, STAGED COREBOX CONSTRUCTION WITH THREE JUMPFORMS THROUGH THE BASEMENTS LEVELS AND SINGLE JUMPFORM ABOVE THE UPPER MOST LAYER OF STRUTS.
5. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
6. LANDSCAPING LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
7. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
8. THE CURRENT STRATEGY IS TO TERMINATE COMPOSITE STEEL COLUMNS AT GROUND. REFER PAGE 10 BASE OF COMPOSITE STEEL COLUMN BASE EXAMPLE DETAILS.





HANGING WALL ABOVE EOT STAIRS VIEWED FROM NORTH-EAST

SCALE 1:100 @ A1

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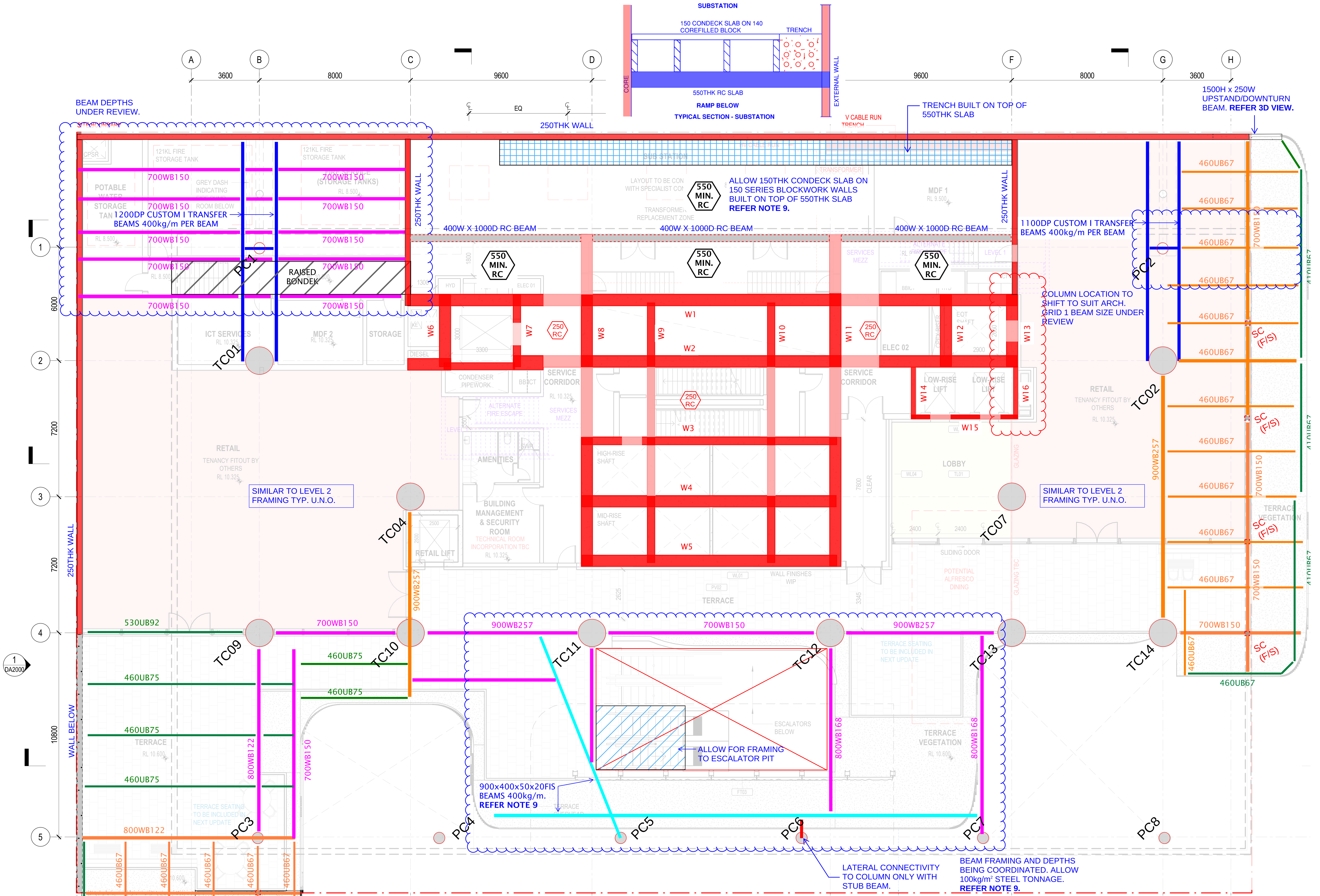
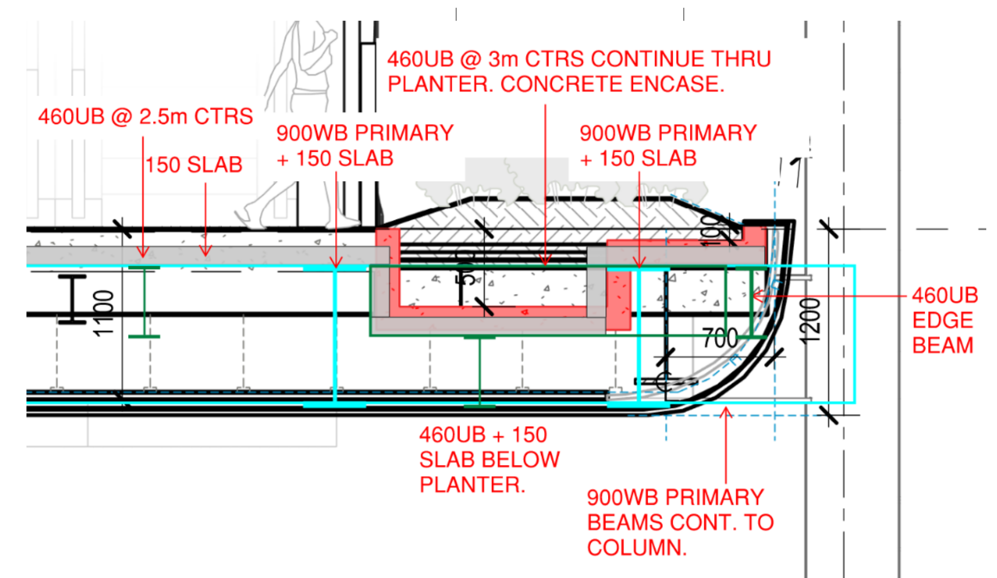
DRAWING TITLE:	DESIGNED BY:	DATE:
GROUND FLOOR GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-04	P06





SECTION THROUGH L1 EDGE GRID D

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.

LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.
10. SUBSTATION ASSUMPTIONS AND INFORMATION TBC:
    - PENETRATION REQUIREMENTS INCLUDING ACCESS HATCH TO SUBSTATION FLOOR TO BE CONFIRMED.
    - LIVE LOAD 7.5kPa, SIDL 2.5kPa AND BLAST LOADING 2kPa. ACCESS HATCH LOADING?
    - TRENCH TO BE CONCRETE FILLED.
    - CRANE RAIL TO SIT ABOVE SUBSTATION, CONNECTED OFF SWITCHROOM SLAB OVER WITH 6TONNE LOAD PROVISION
    - PROTECTION SHIELDING ZONE TO BE ALLOWED FOR IN ADDITION TO STRUCTURE

SCALE 1:100 @ A1

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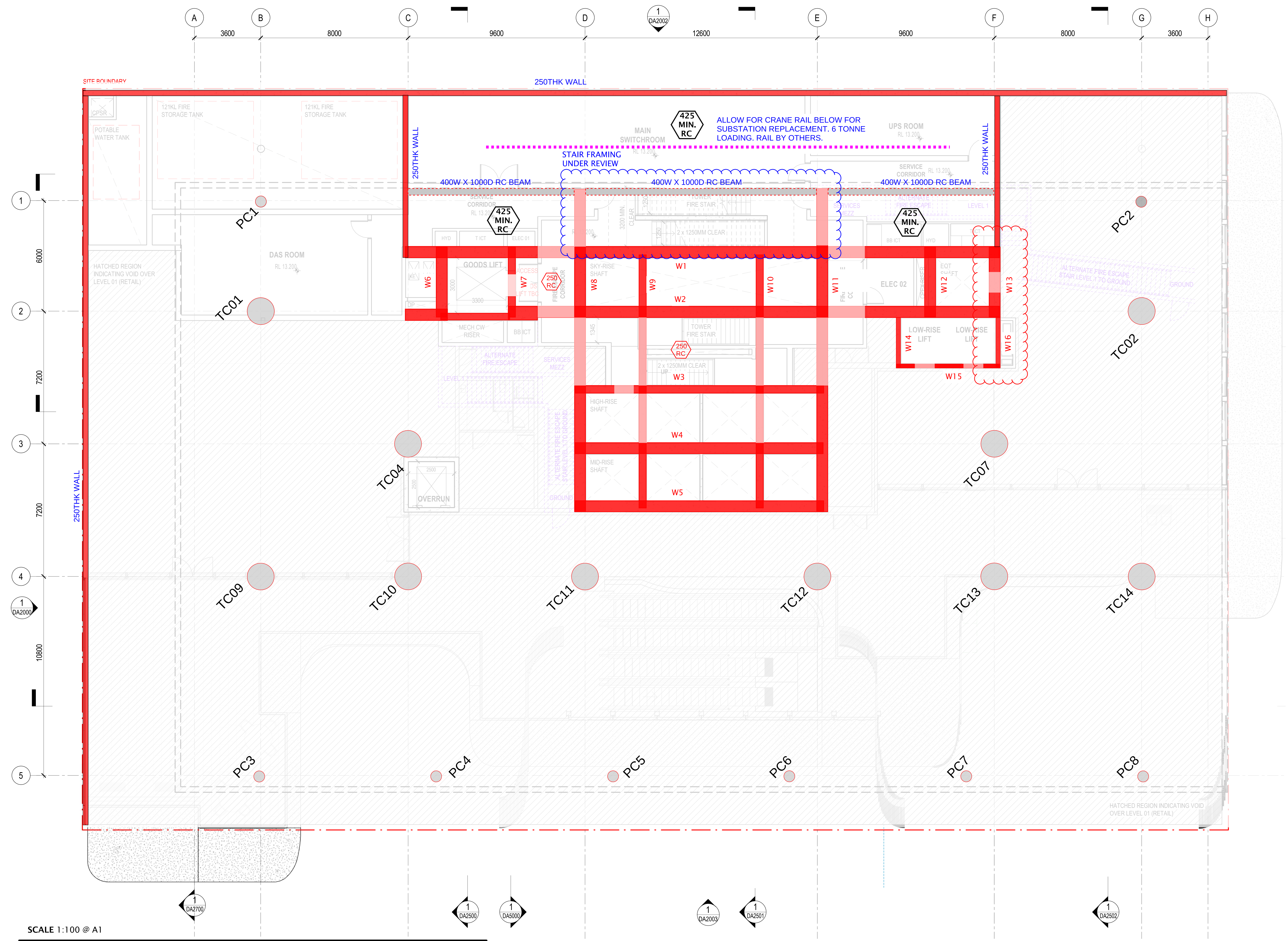
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 1 GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-05	P06

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.



SCALE 1:100 @ A1

LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.
10. SWITCH ROOM ASSUMPTIONS AND INFORMATION TBC:
    - PENETRATION REQUIREMENTS.
    - LIVE LOAD 5.0kPa, SIDL 2.5kPa AND BLAST LOADING 2kPa TO SOFFIT.
    - CRANE RAIL TO SIT ABOVE SUBSTATION, CONNECTED OFF SWITCHROOM SLAB OVER WITH 6TONNE LOAD PROVISION

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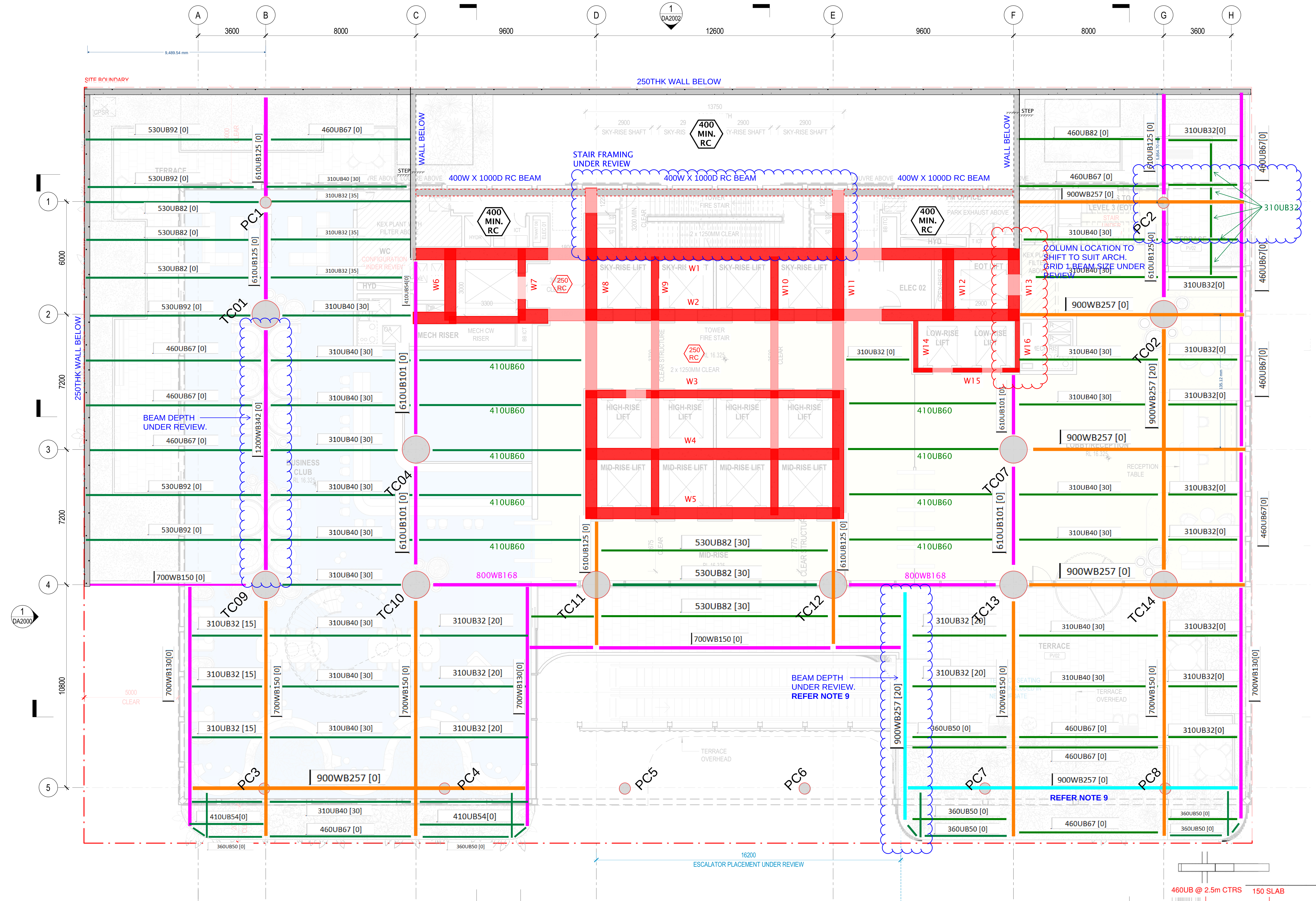
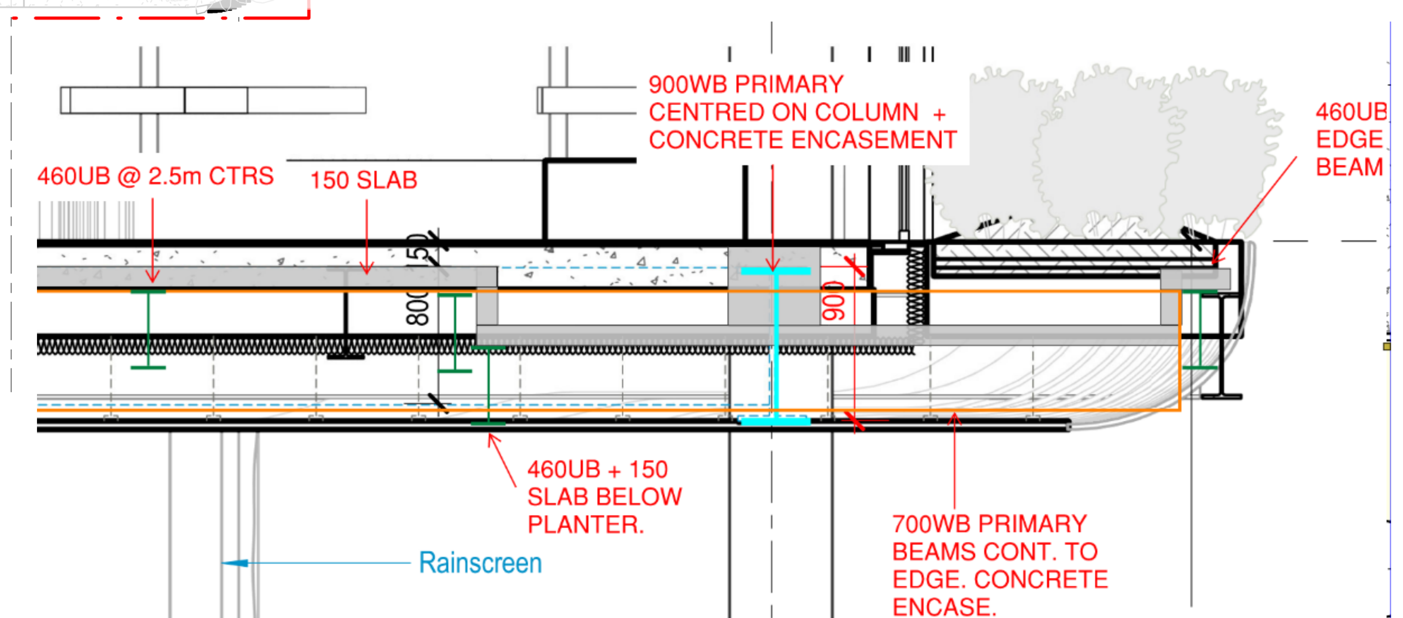
DRAWING TITLE:	DESIGNED BY:	DATE:
FIRE MEZ GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-06	P04

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.





SECTION THROUGH L2 EDGE
GRID F

LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
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5. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
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9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.

SCALE 1:100 @ A1

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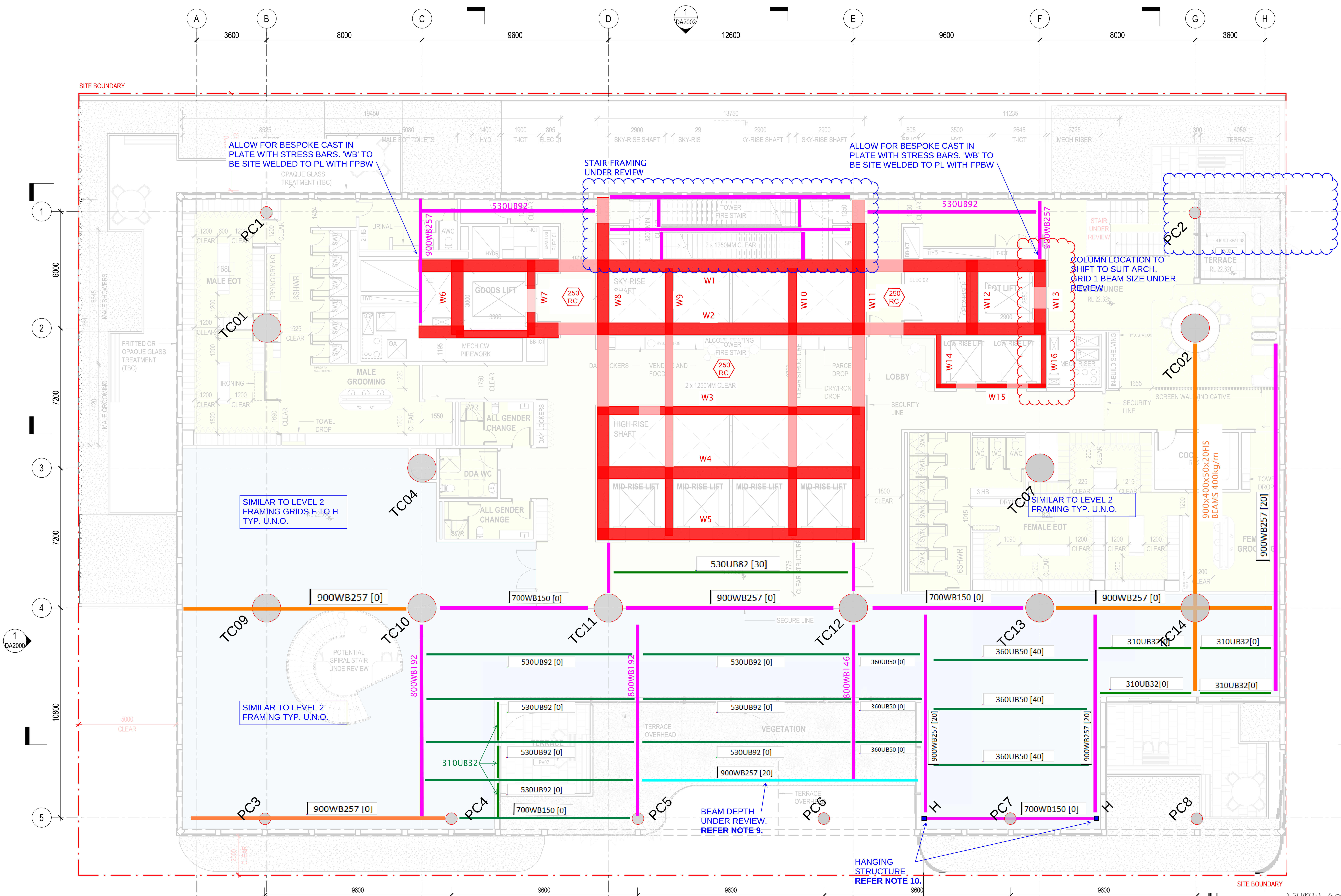
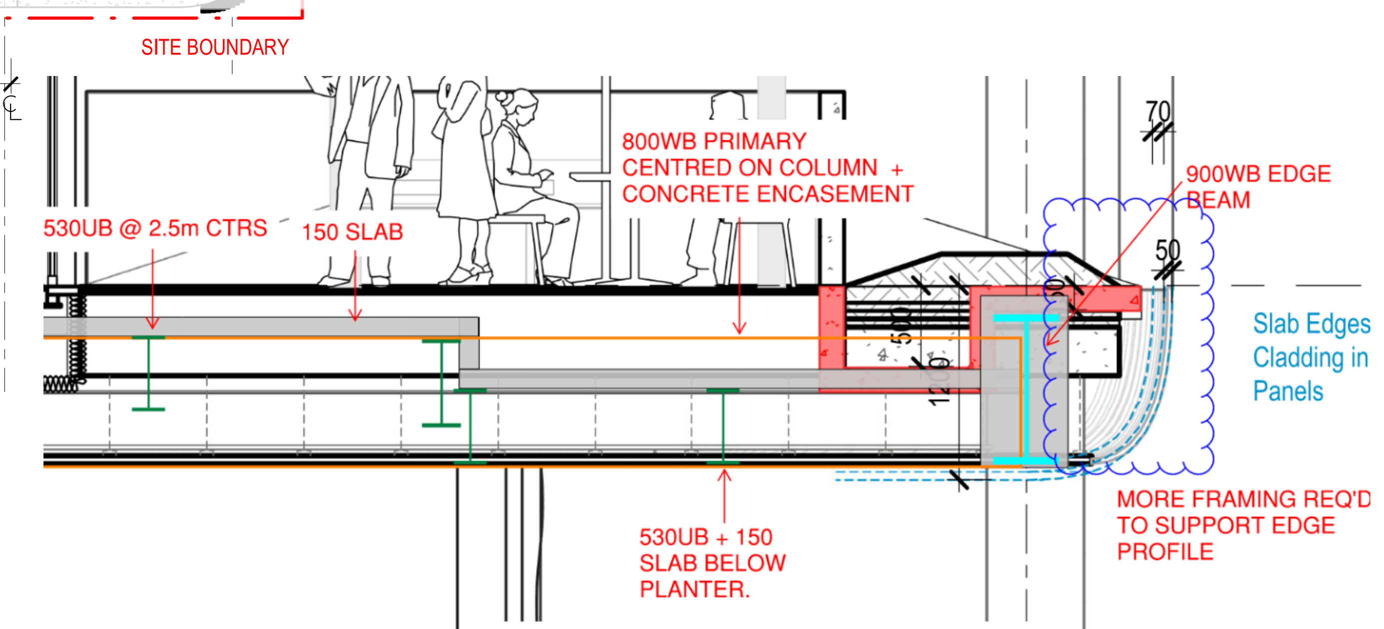
DRAWING TITLE: LEVEL 2 GA PLAN	DESIGNED BY: DL	DATE: 14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: MJ	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-07	REVISION: P05

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.





SECTION THROUGH L3 EDGE GRID E

LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
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6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.
10. LEVEL 4 FLOOR FRAMING TO BE FULLY ERECTED AND CONNECTED TO LEVEL 3 HANGING COLUMNS PRIOR TO DE-PROPPING LEVEL 3 FLOOR FRAMING.

SCALE 1:100 @ A1

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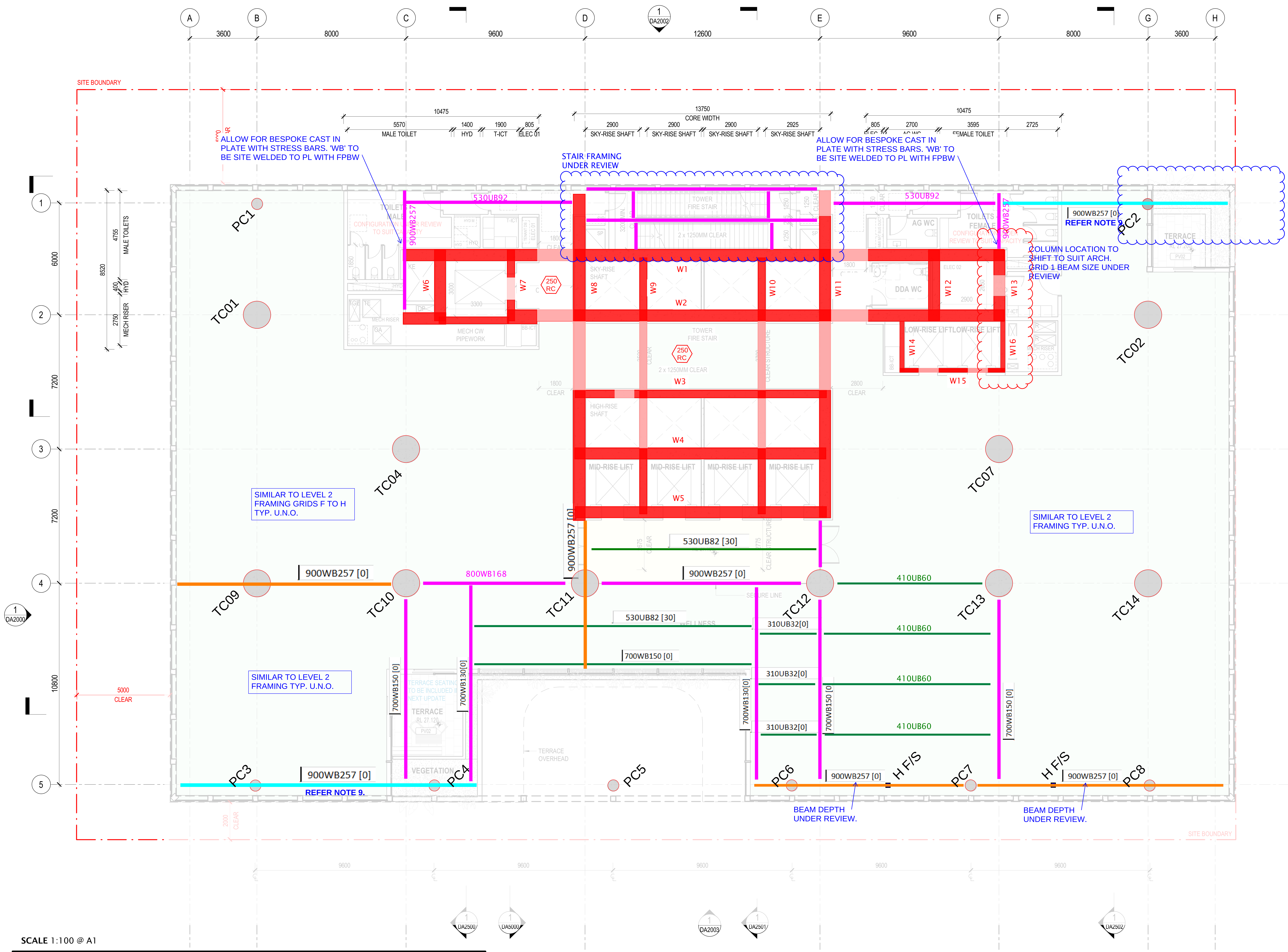
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 3 GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-08	P05

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
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7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.

SCALE 1:100 @ A1

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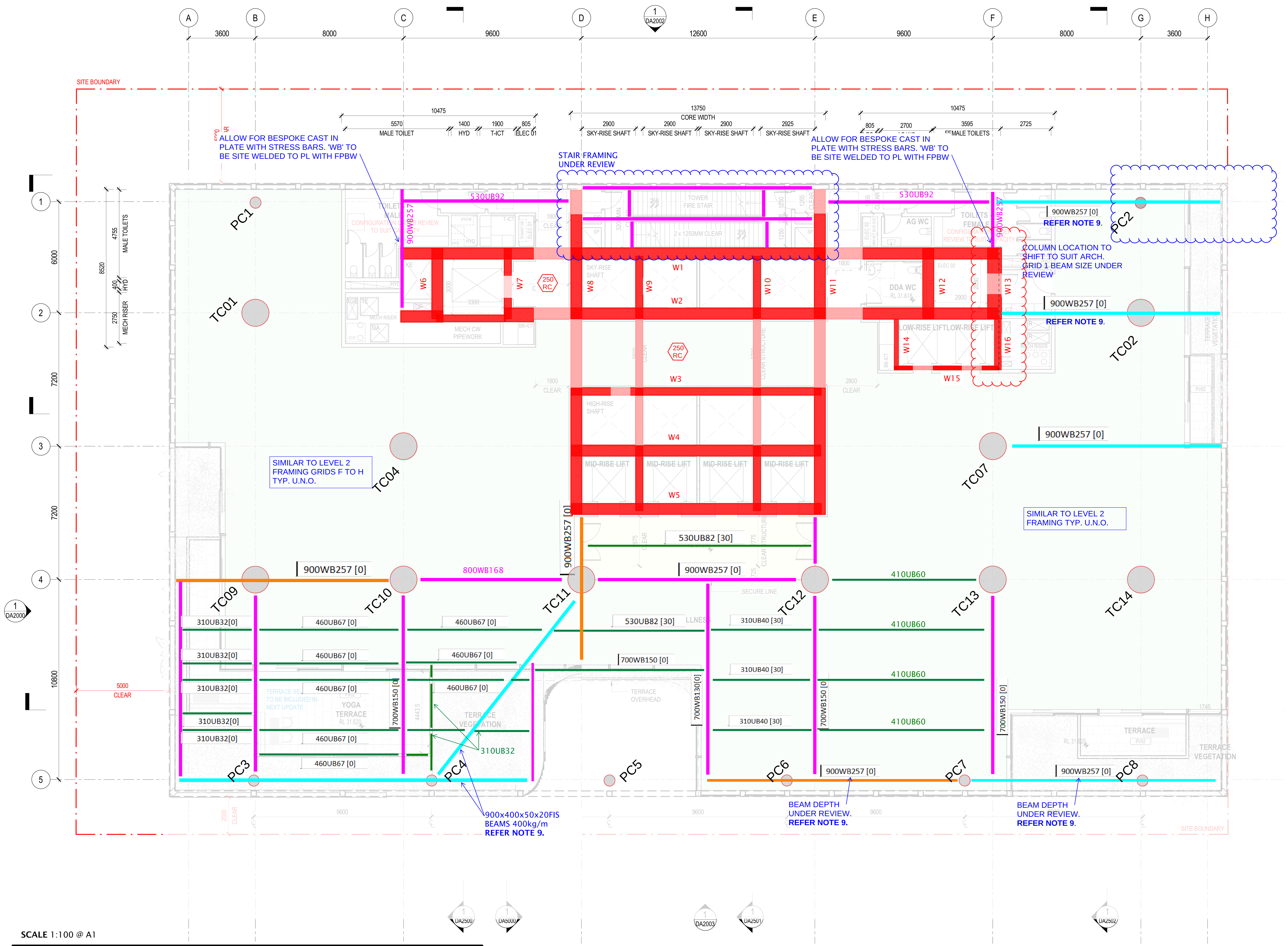
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 4 GA PLAN	MJ	14/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-09	P04

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
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- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
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SCALE 1:100 @ A1

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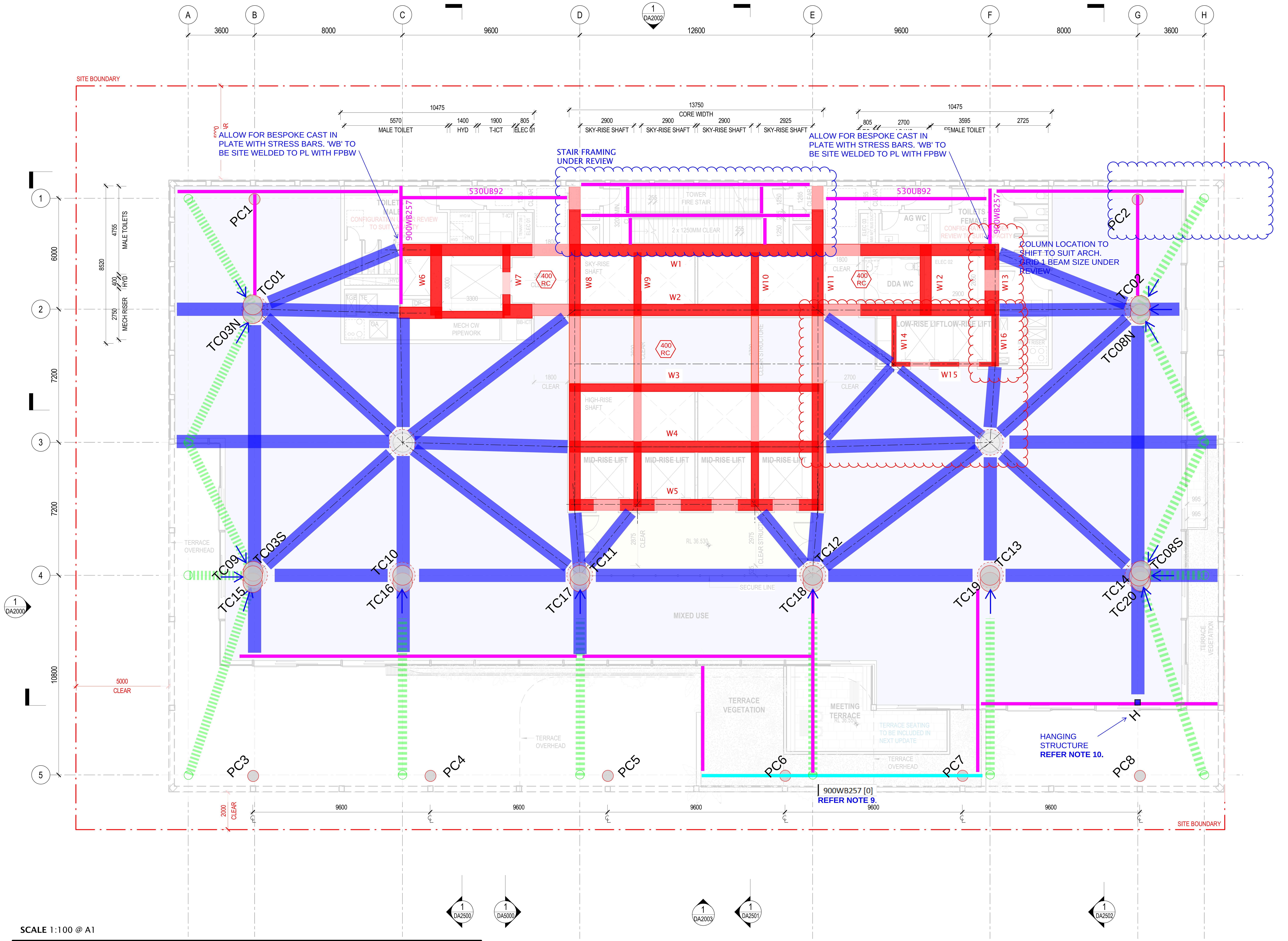
DRAWING TITLE: LEVEL 5 GA PLAN	DESIGNED BY: MJ	DATE: 14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-10	REVISION: P03



DIAPHRAGM TRANSFER FLOOR: STRUCTURAL SIZES DO NOT ALLOW FOR ANY INTERGRATED STRUCTURAL/SERVICE ZONE. ALL SERVICES TO RETICULATE AROUND BRACING MEMBERS BOTH VERTICALLY AND HORIZONTALLY. INTER-TENACNY VOIDS TO BE AVOIDED TO L6 AND L14

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.

LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES FLOOR TRANSFER BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES 500W x 900D FAB 'I' SECTION BRACING MEMBER. ALLOW 500kg/m TONNAGE.
- DENOTES DIRECTION OF HORIZONTAL TRANSFER LOAD FROM THE RAKING COLUMNS.
- DENOTES RAKING COLUMNS OVER
- DENOTES SLAB THICKNESS AND SPAN

ALL FOR SECONDARY BEAMS @ 2500CTRS BETWEEN PRIMARY BEAMS AND BRACING MEMBERS. ALLOW ADDITIONAL 55kg/m² TONNAGE FOR PRIMARY AND SECONDARY BEAMS.

ALLOW MINIMUM 175RC SLAB ON 1.0BMT CONDECK METAY TRAY. 100kg/m2 REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. ALLOW FOR CAST-IN STEEL SECTIONS AND STRESS BARS BETWEEN BRACING MEMBERS AND COREBOX.
3. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
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5. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN, BEAM AND END OF RAKING COLUMN NODE EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.
10. THE RAKING COLUMNS WHICH EXTEND BETWEEN L6 AND L14 ARE NOT STABLE IN THE PERMANENT CONDITION UNTILL THE COREBOX HAS BEEN CONSTRUCTED ABOVE L19 AND L6 AND L14 HAVE BEEN FULLY CONSTRUCTED WITH ALL STEELWORK ERECTED.
11. LEVEL 7 FLOOR FRAMING TO BE FULLY ERECTED AND CONNECTED TO LEVEL 6 HANGING COLUMN PRIOR TO DE-PROPPING LEVEL 6 FLOOR FRAMING.

SCALE 1:100 @ A1

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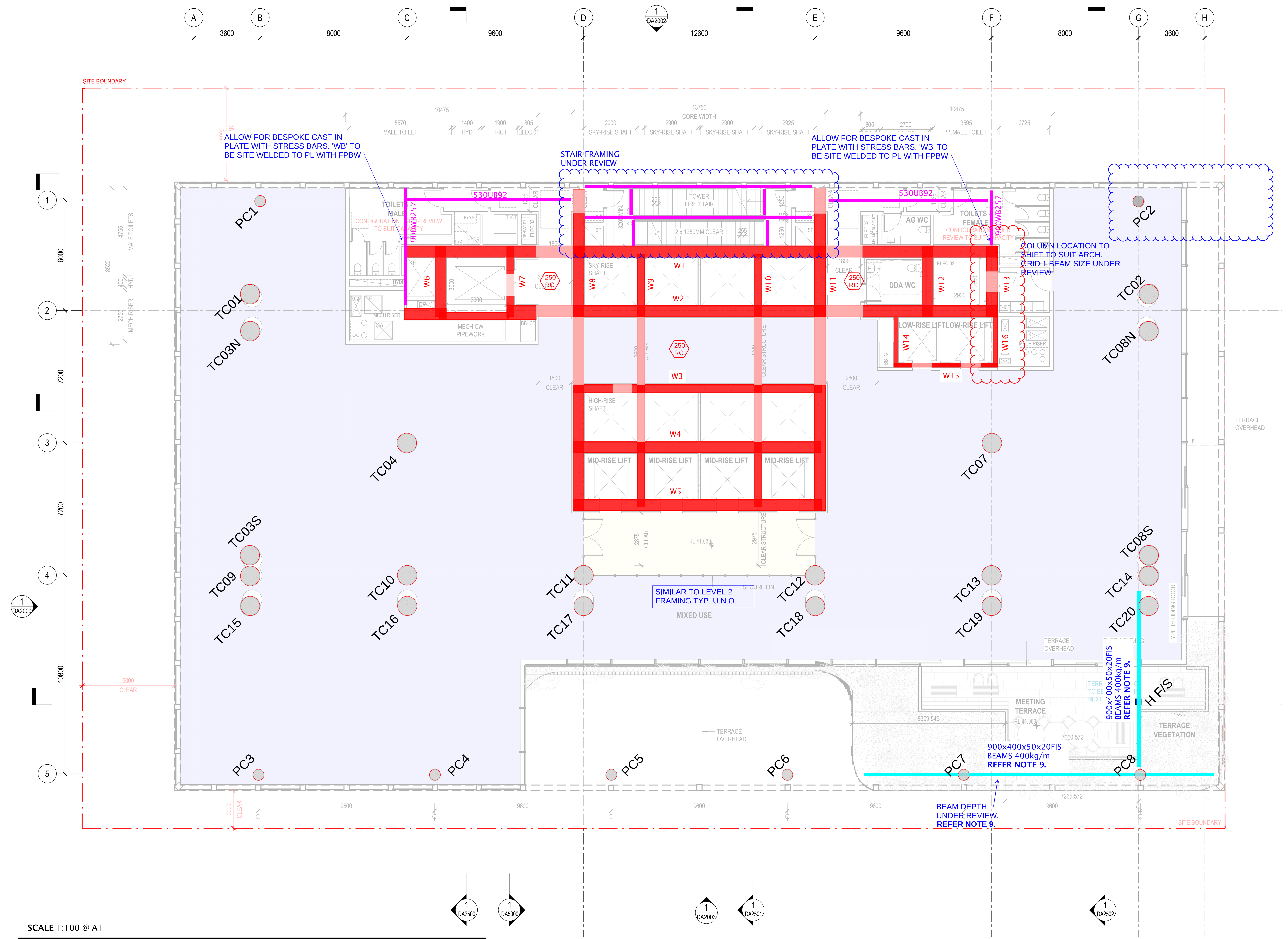
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 6 DIAPHRAGM T FRAMING GA	MJ	14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-11	REVISION: P03



SCALE 1:100 @ A1

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.

LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.

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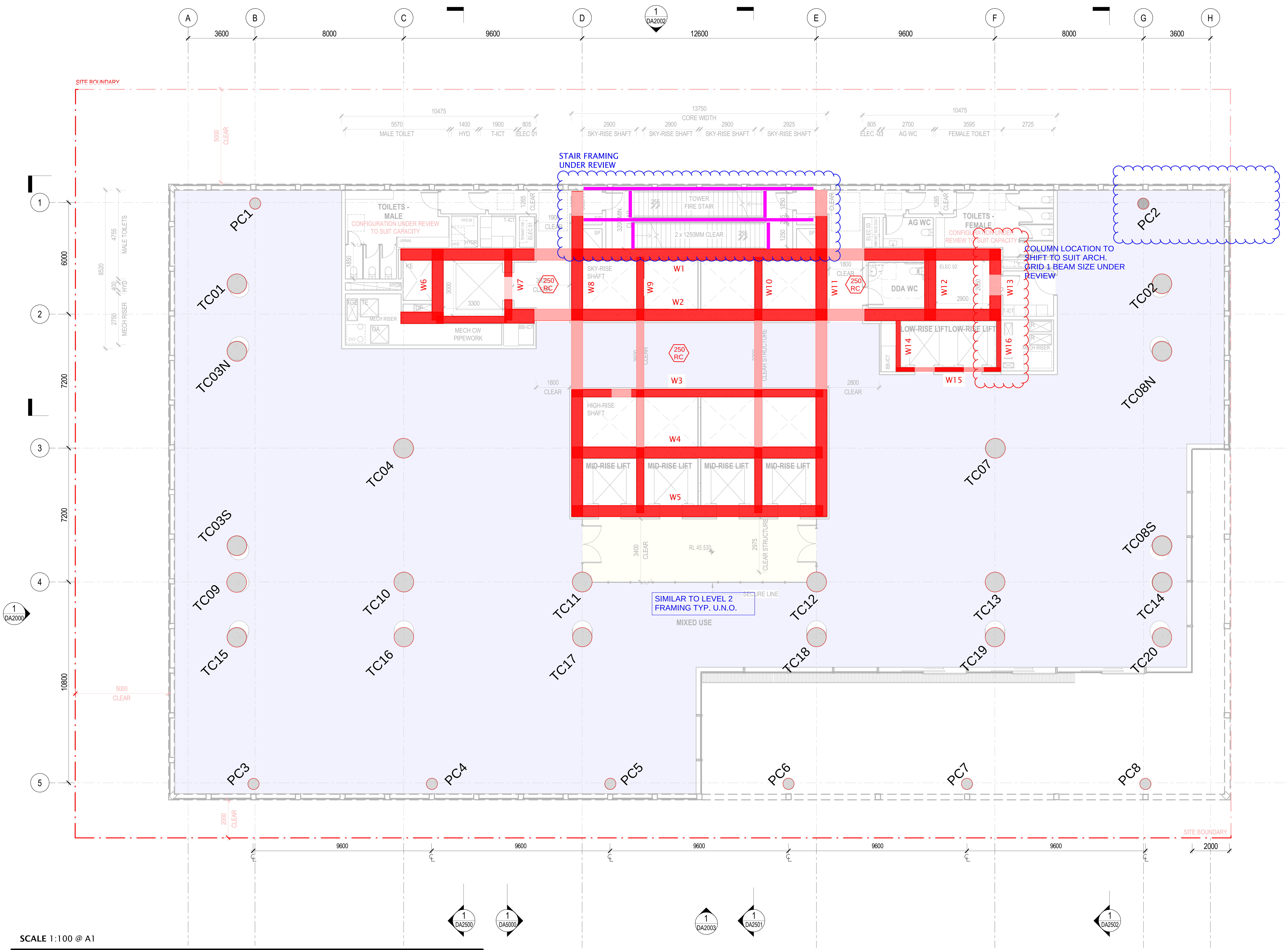
DRAWING TITLE: LEVEL 7 GA PLAN	DESIGNED BY: MJ	DATE: 14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-12	REVISION: P03

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.

SCALE 1:100 @ A1

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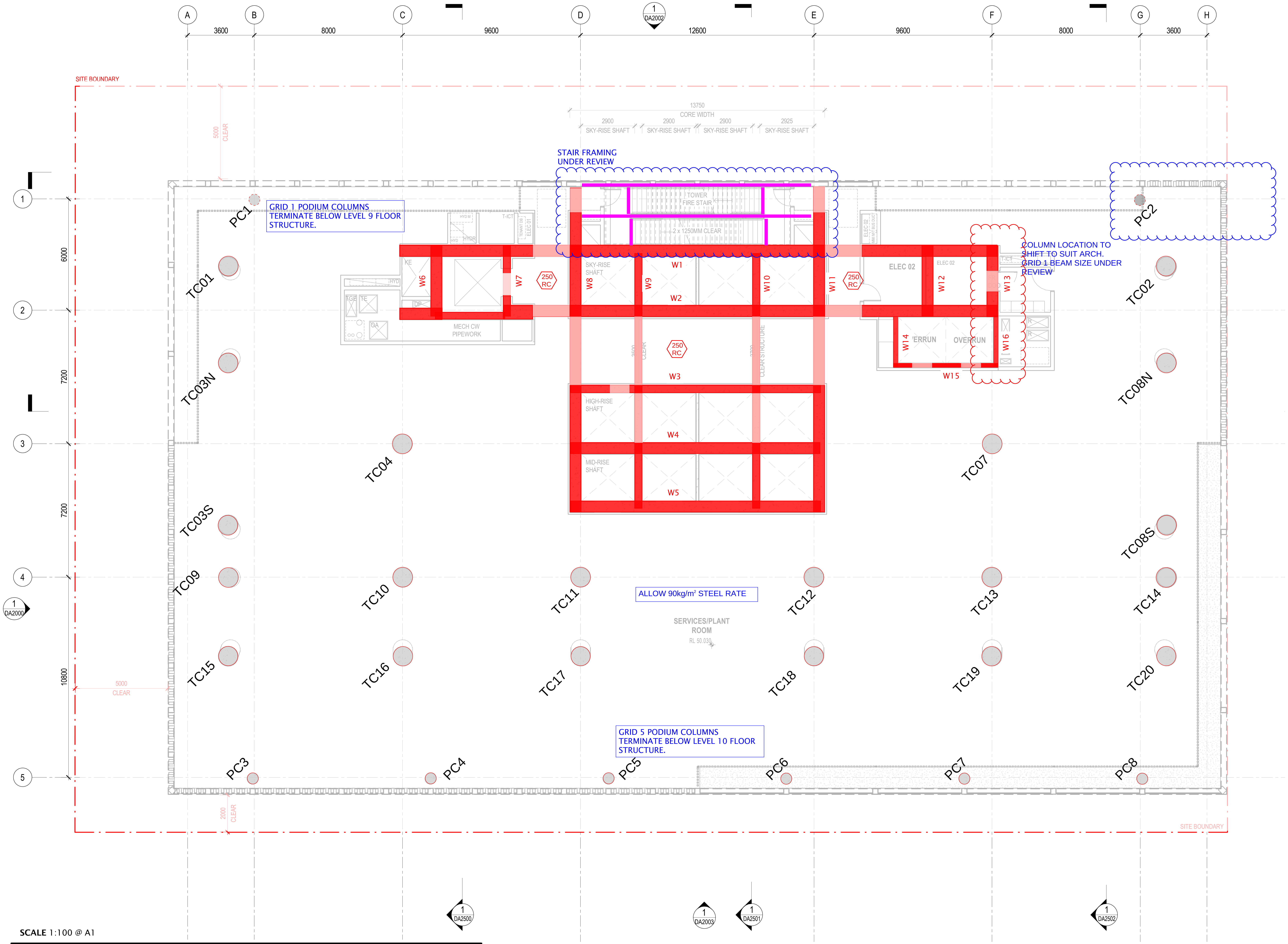
DRAWING TITLE: LEVEL 8 GA PLAN	DESIGNED BY: MJ	DATE: 14/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-13	REVISION: P03

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPING DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY; AND PENETRATION REQUIREMENTS.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. WALL THICKNESS TO CHARLOTTE/MARY BOUNDARY BASED ON INSITU. THICKNESS TO BE REVIEWED IF PRECAST ADOPTED.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE PROPOSED 900mm DEEP BEAMS TO THE EXTERNAL AREAS ARE PROPOSED TO BE LOCATED WITH A HIGHER TOP OF STEEL LEVEL THAN THE TYPICAL EXTERNAL BEAMS BY EMBEDDING THE BEAMS IN PLANTER UPSTANDS ETC.

SCALE 1:100 @ A1

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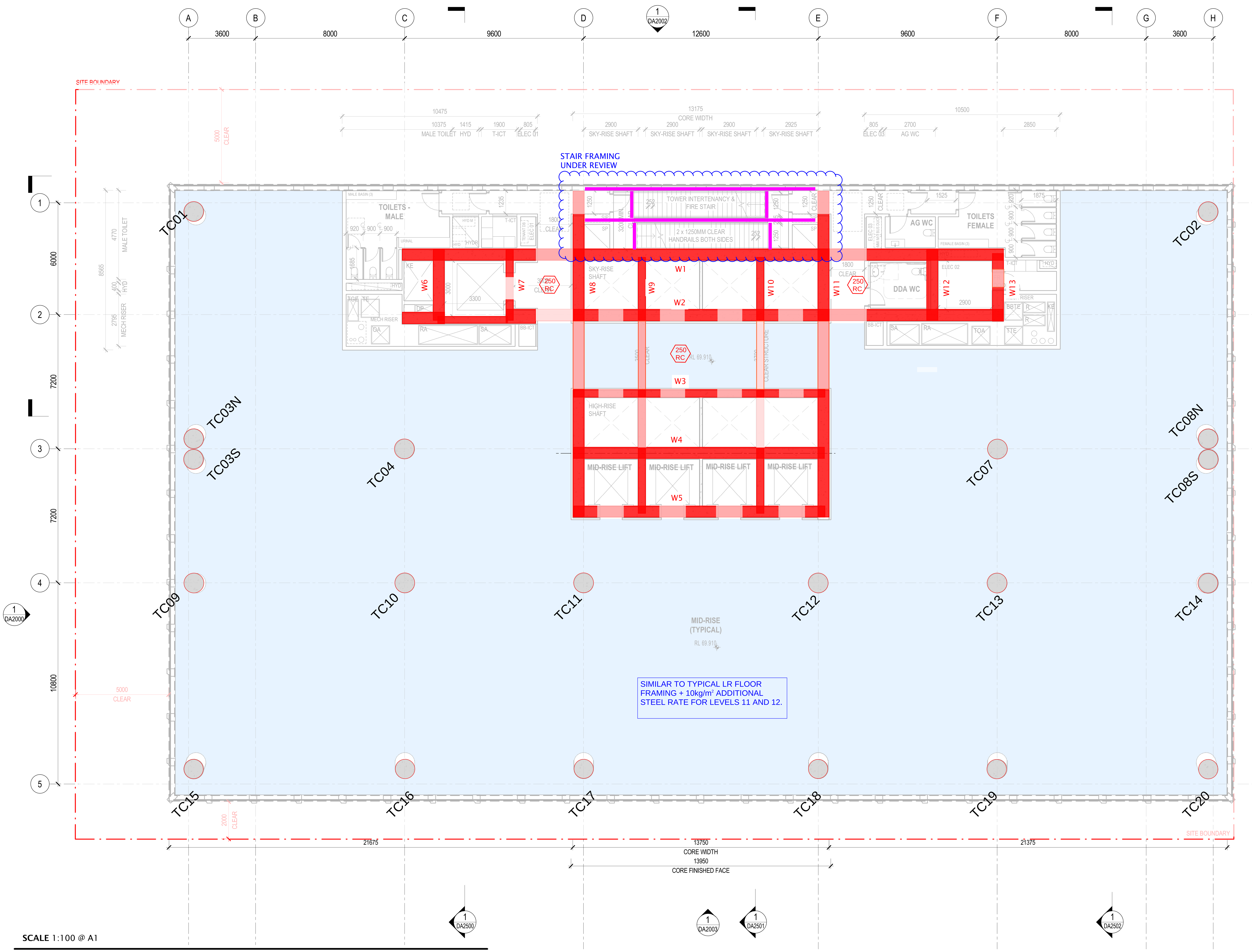
DRAWING TITLE: LEVEL 9 GA PLAN (10 SIMILAR)		DESIGNED BY: MJ	DATE: 14/12/22
PROJECT: ALBERT ST OSD		CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC		DRAWING NO S02-14	REVISION: P03

BEAM DEPTHS SUBJECT TO CONFIRMATION OF SERVICE PENETRATION REQUIREMENTS. THE CURRENT PROVISION IS AS SHOWN BELOW.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES TOWER COLUMN
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY BEAM
- RP DENOTES 600Lx350DEEP PENETRATION WITH STIFFENERS. REFER DETAIL ON P11.
- DENOTES SLAB THICKNESS AND SPAN ALLOW MINIMUM 130RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m2 REINF'T TYP. U.N.O

ALL FOR SECONDARY BEAMS @ 2500CTRS BETWEEN PRIMARY BEAMS

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. BEAM DEPTHS SUBJECT TO HIGH LOAD AREAS AND INTER-TENANCY VOIDS BEING CONFIRMED.
4. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
5. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
6. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING
7. HANGING LOAD FOR SERVICES AND CEILING BELOW LEVELS 11 AND 29 TO BE CONFIRMED.

SCALE 1:100 @ A1

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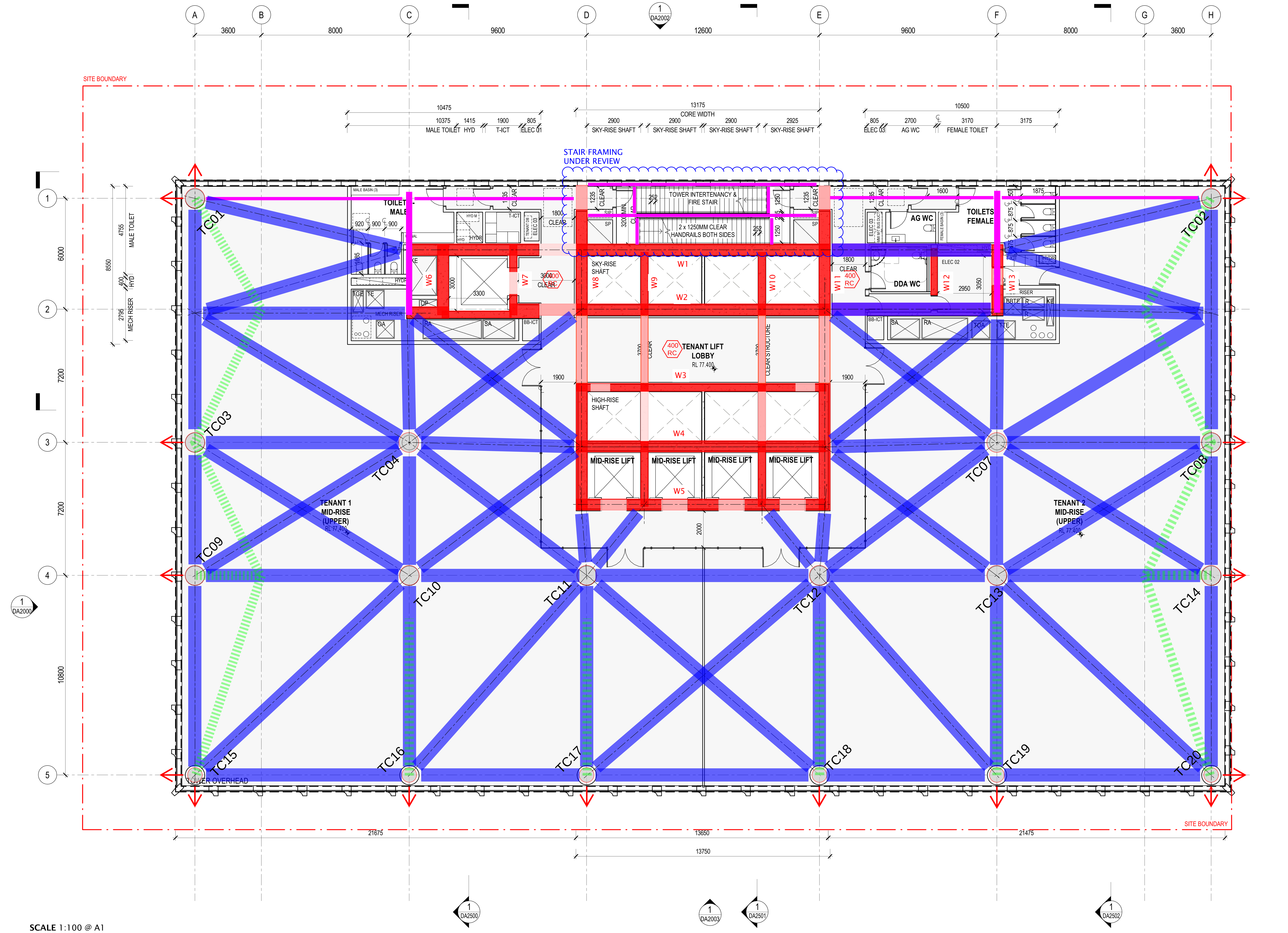
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 13 GA PLAN (11 AND 12 SIMILAR)	MJ	02/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-18	REVISION: P02



DIAPHRAGM TRANSFER FLOOR: STRUCTURAL SIZES DO NOT ALLOW FOR ANY INTERGRATED STRUCTURAL/SERVICE ZONE. ALL SERVICES TO RETICULATE AROUND BRACING MEMBERS BOTH VERTICALLY AND HORIZONTALLY. INTER-TENACNY VOIDS TO BE AVOIDED TO L6 AND L14

LEGEND:

- DENOTES COREBOX WALL
- TC DENOTES TOWER COLUMN
- H DENOTES TOWER COLUMN
- DENOTES FLOOR TRANSFER BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES 500W x 900D FAB 'I' SECTION BRACING MEMBER. ALLOW 500kg/m TONNAGE.
- DENOTES DIRECTION OF HORIZONTAL TRANSFER LOAD FROM THE RAKING COLUMNS.
- DENOTES RAKING COLUMNS BELOW
- THK DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 175RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m2 REINF'T TYP. U.N.O

ALL FOR SECONDARY BEAMS @ 2500CTRS BETWEEN PRIMARY BEAMS AND BRACING MEMBERS. ALLOW ADDITIONAL 55kg/m² TONNAGE FOR PRIMARY AND SECONDARY BEAMS.

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. ALLOW FOR CAST-IN STEEL SECTIONS AND STRESS BARS BETWEEN BRACING MEMBERS AND COREBOX.
3. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
4. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
5. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN, BEAM AND END OF RAKING COLUMN NODE EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. THE RAKING COLUMNS WHICH EXTEND BETWEEN L6 AND L14 ARE NOT STABLE IN THE PERMANENT CONDITION UNTILL THE COREBOX HAS BEEN CONSTRUCTED ABOVE L19 AND L6 AND L14 HAVE BEEN FULLY CONSTRUCTED WITH ALL STEELWORK ERECTED.

SCALE 1:100 @ A1

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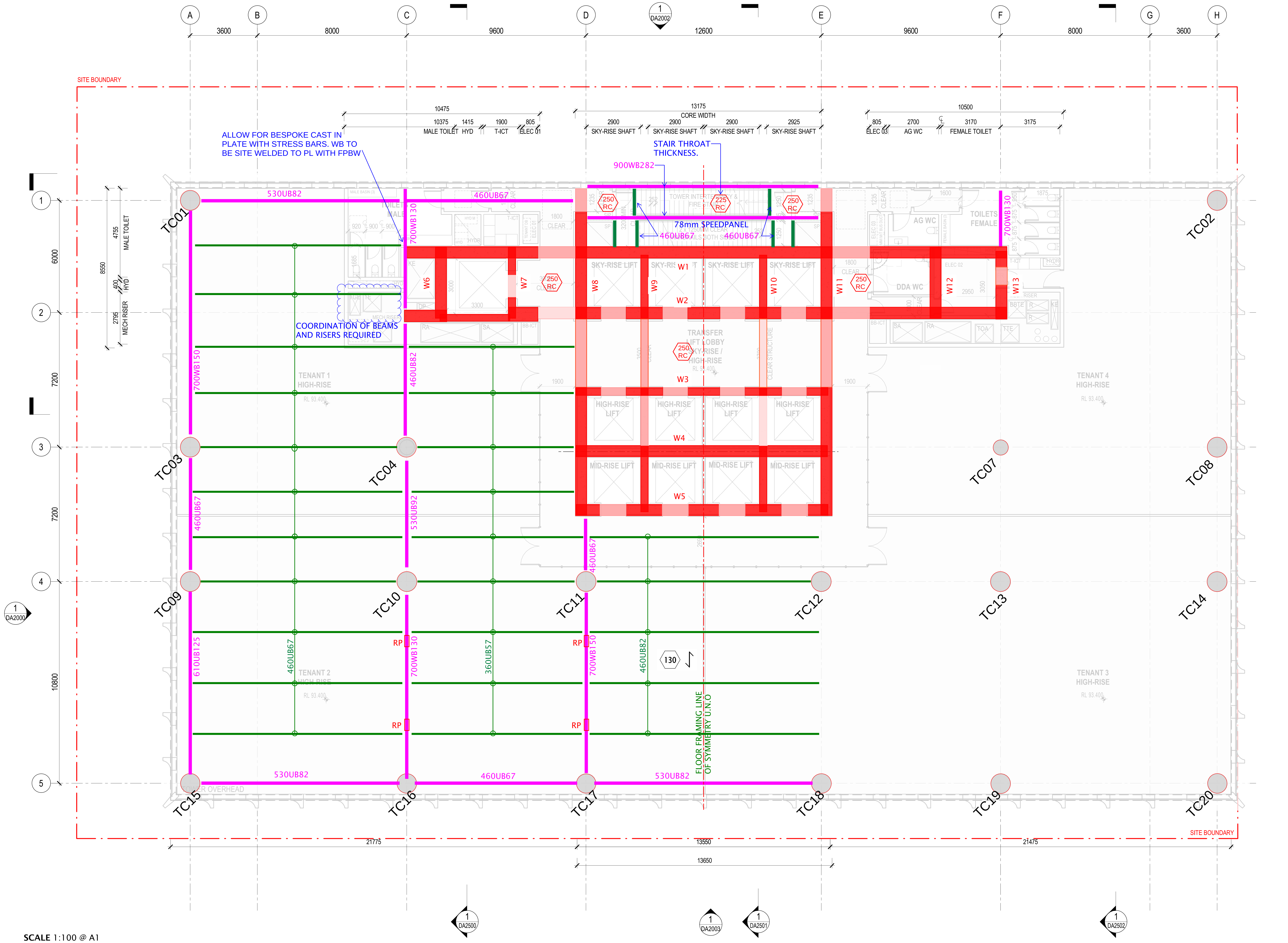
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 14 DIAPHRAGM T FRAMING	MJ	22/11/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-19	P03

BEAM DEPTHS SUBJECT TO CONFIRMATION OF SERVICE PENETRATION REQUIREMENTS. THE CURRENT PROVISION IS AS SHOWN BELOW.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES TOWER COLUMN
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY BEAM
- RP DENOTES 600Lx350DEEP PENETRATION WITH STIFFENERS. REFER DETAIL ON P11.
- DENOTES SLAB THICKNESS AND SPAN ALLOW MINIMUM 130RC SLAB ON 1.0BMT CONDECK METAY TRAY. 60kg/m2 REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. BEAM DEPTHS SUBJECT TO HIGH LOAD AREAS AND INTER-TENANCY VOIDS BEING CONFIRMED.
4. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
5. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
6. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING

SCALE 1:100 @ A1

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Web Site: www.robertbird.com

DRAWING TITLE: Typical Mid-Rise GA	DESIGNED BY: MJ	DATE: 02/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-20	REVISION: P04

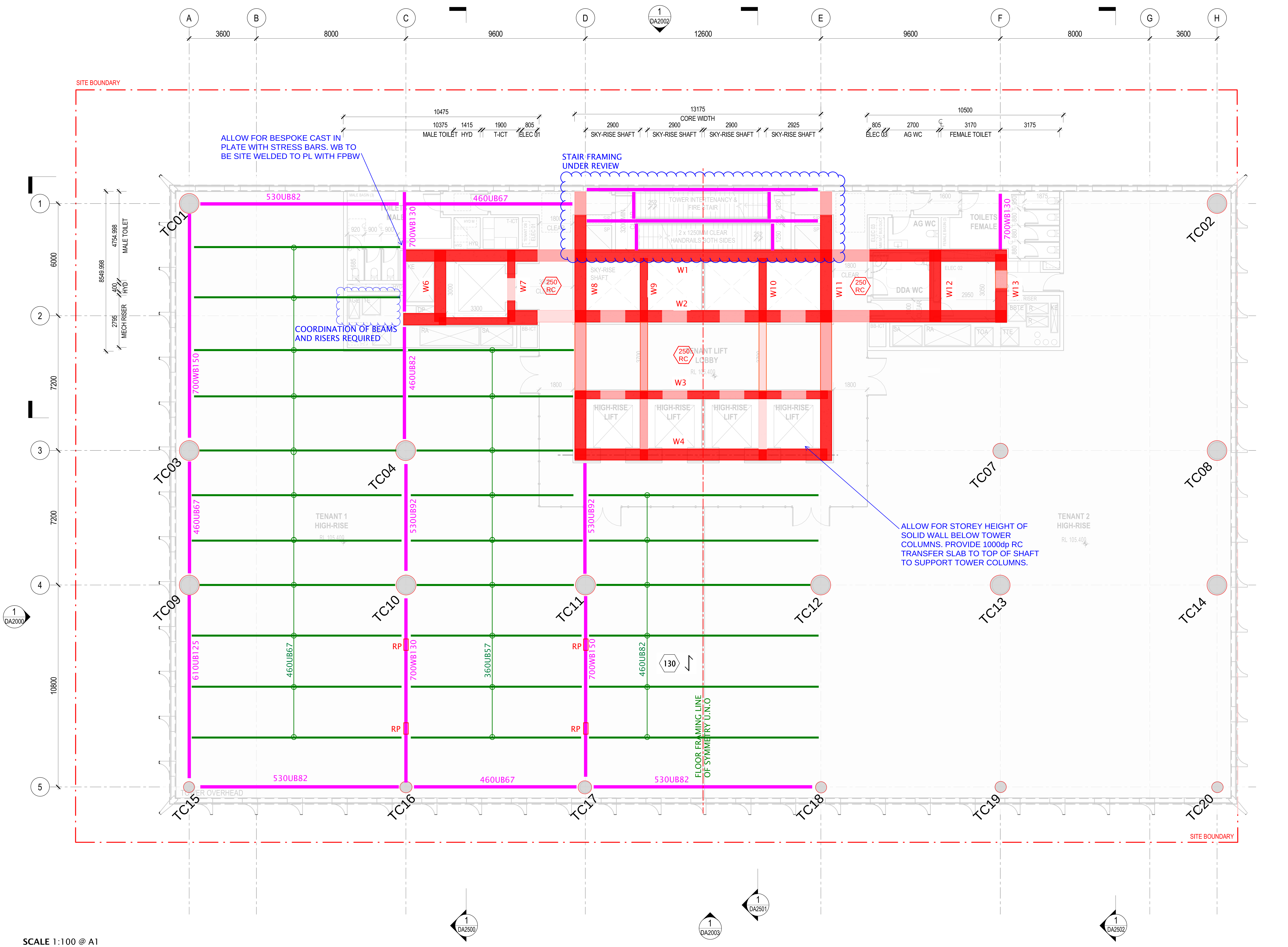
BEAM DEPTHS SUBJECT TO CONFIRMATION OF SERVICE PENETRATION REQUIREMENTS. THE CURRENT PROVISION IS AS SHOWN BELOW.

LEGEND:

- DENOTES COREBOX WALL
- TC DENOTES TOWER COLUMN
- H DENOTES TOWER COLUMN
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY BEAM
- RP DENOTES 600Lx350DEEP PENETRATION WITH STIFFENERS. REFER DETAIL ON P11.
- THK RC DENOTES SLAB THICKNESS AND SPAN ALLOW MINIMUM 130RC SLAB ON 1.0BMT CONDECK METAY TRAY. 60kg/m2 REINF'T TYP. U.N.O

NOTES:

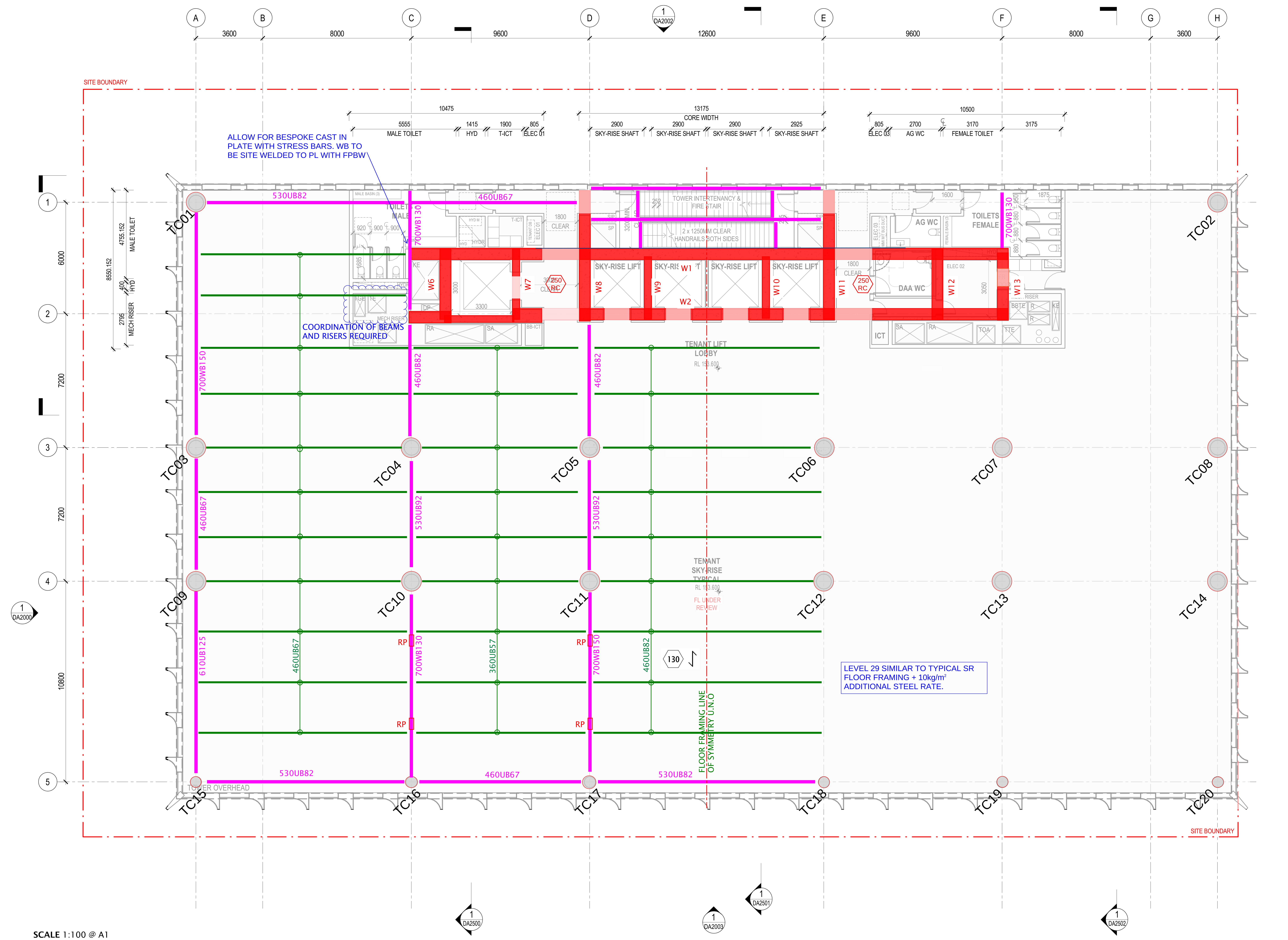
1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. BEAM DEPTHS SUBJECT TO HIGH LOAD AREAS AND INTER-TENANCY VOIDS BEING CONFIRMED.
4. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
5. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
6. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING



SCALE 1:100 @ A1

Robert Bird Group BRISBANE OFFICE: Robert Bird Group Pty Ltd Level 1, 480 St Pauls Terrace Fortitude Valley QLD 4006 Ph: (07) 3319 2777 ACN 010 580 248 Web Site: www.robertbird.com	DRAWING TITLE: Typical High-Rise GA	DESIGNED BY: MJ	DATE: 22/11/22
	PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
	CLIENT: QIC	DRAWING NO S02-21	REVISION: P03

BEAM DEPTHS SUBJECT TO CONFIRMATION OF SERVICE PENETRATION REQUIREMENTS. THE CURRENT PROVISION IS AS SHOWN BELOW.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES TOWER COLUMN
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY BEAM
- RP DENOTES 600Lx350DEEP PENETRATION WITH STIFFENERS. REFER DETAIL ON P11.
- DENOTES SLAB THICKNESS AND SPAN ALLOW MINIMUM 130RC SLAB ON 1.0BMT CONDECK METAY TRAY. 60kg/m2 REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. BEAM DEPTHS SUBJECT TO HIGH LOAD AREAS AND INTER-TENANCY VOIDS BEING CONFIRMED.
4. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
5. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
6. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
7. HANGING LOAD FOR SERVICES AND CEILING BELOW LEVELS 11 AND 29 TO BE CONFIRMED.

SCALE 1:100 @ A1

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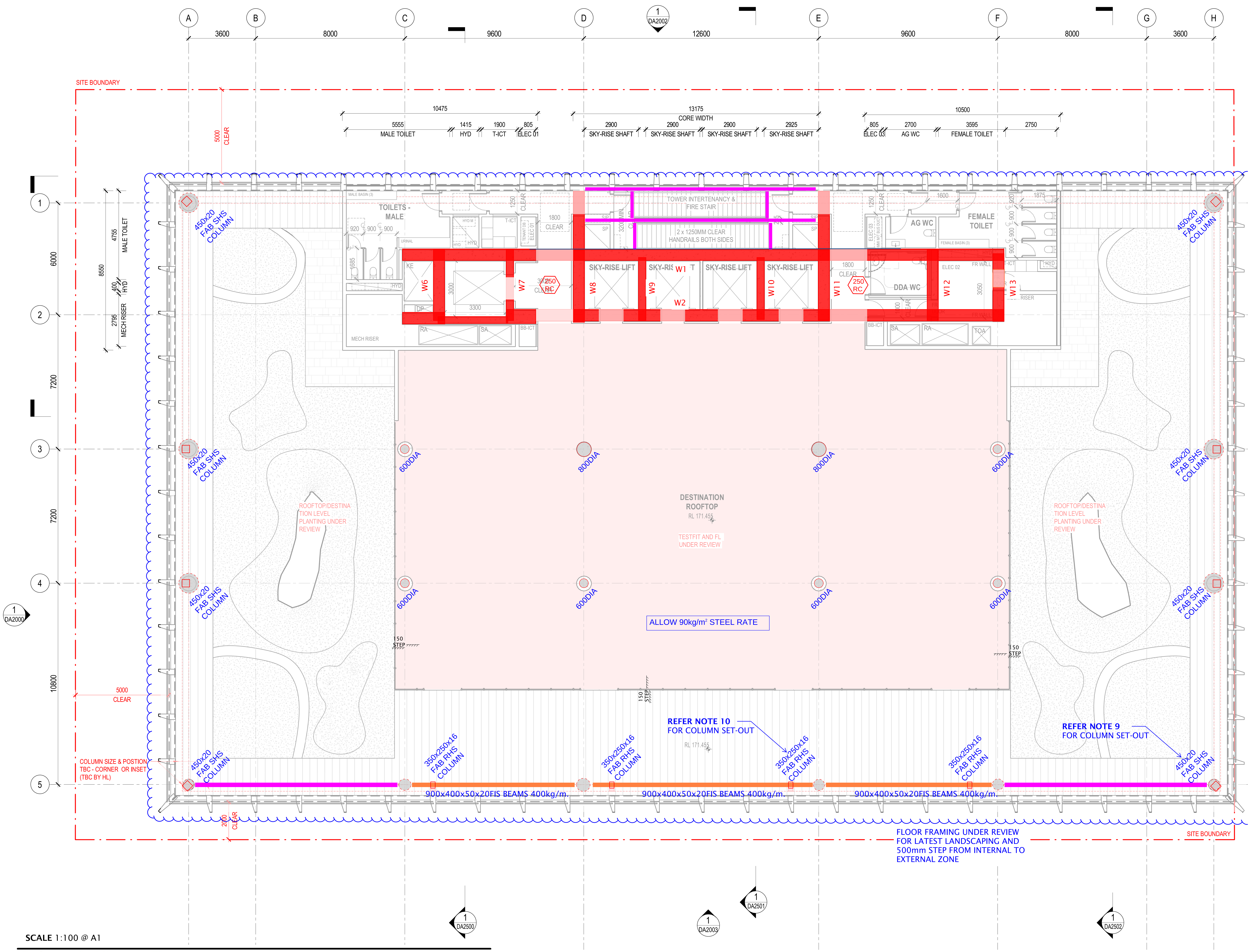
DRAWING TITLE:	DESIGNED BY:	DATE:
Typical Sky-Rise GA	MJ	02/12/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S02-22	REVISION: P04

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. TERRACE FLOOR DEPTH SUBJECT TO CONFIRMATION OF PLANTER SET-OUT, DEPTH AND PLANTING LOADS AND DRAINAGE REQUIREMENTS.
6. BEAM DEPTHS SUBJECT TO DETAILED FOOTFALL ANALYSIS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.
9. TYPICALLY LEVEL 37 PERIMETER COLUMNS TO BE SET-OUT WITHIN EXTENT OF LEVEL 38 COLUMNS TO ALLOW CONTINUITY OF COLUMN.
10. LEVEL 37 PERIMETER COLUMNS BETWEEN GRIDS C AND E TO BE SET-OUT CENTRE OF TRANSFER BEAM TO AVOID ECCENTRIC LOADING OF THE TRASNFER BEAM AND ADDITIONAL TRANSFER STRUCTURE.

SCALE 1:100 @ A1

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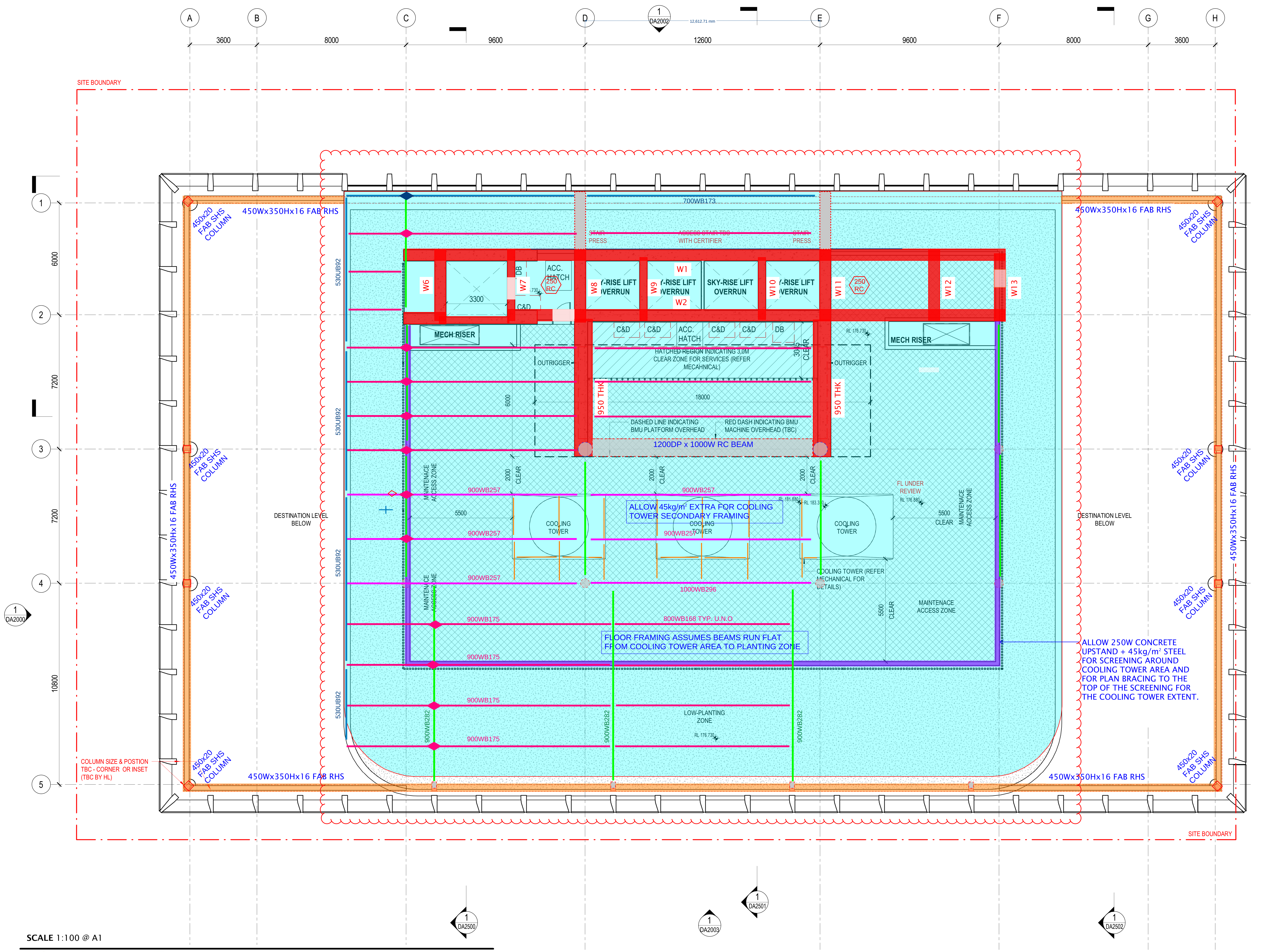
DRAWING TITLE: LEVEL 37 ROOF TERRACE GA		DESIGNED BY: MJ	DATE: 22/11/22
PROJECT: ALBERT ST OSD		CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC		DRAWING NO S02-24	REVISION: P01

BEAM DEPTHS SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: LANDSCAPE DEPTHS AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS; COOLING TOWER SET-OUT AND LOADS.



LEGEND:

- DENOTES COREBOX WALL
- DENOTES TOWER COLUMN
- DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM

DENOTES SLAB THICKNESS AND SPAN
ALLOW MINIMUM 150RC SLAB ON 1.0BMT CONDECK METAY TRAY. 70kg/m² REINF'T TYP. U.N.O

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. COOLING TOWER FLOOR DEPTH SUBJECT TO CONFIRMATION OF COOLING TOWER SET-OUT, COOLING TOWER AND PLANTING LOADS AND DRAINAGE REQUIREMENTS.
6. BEAM DEPTHS BASEDON RUNNING FLAT WITH NO STEPS.
7. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
8. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.

SCALE 1:100 @ A1

RobertBirdGroup
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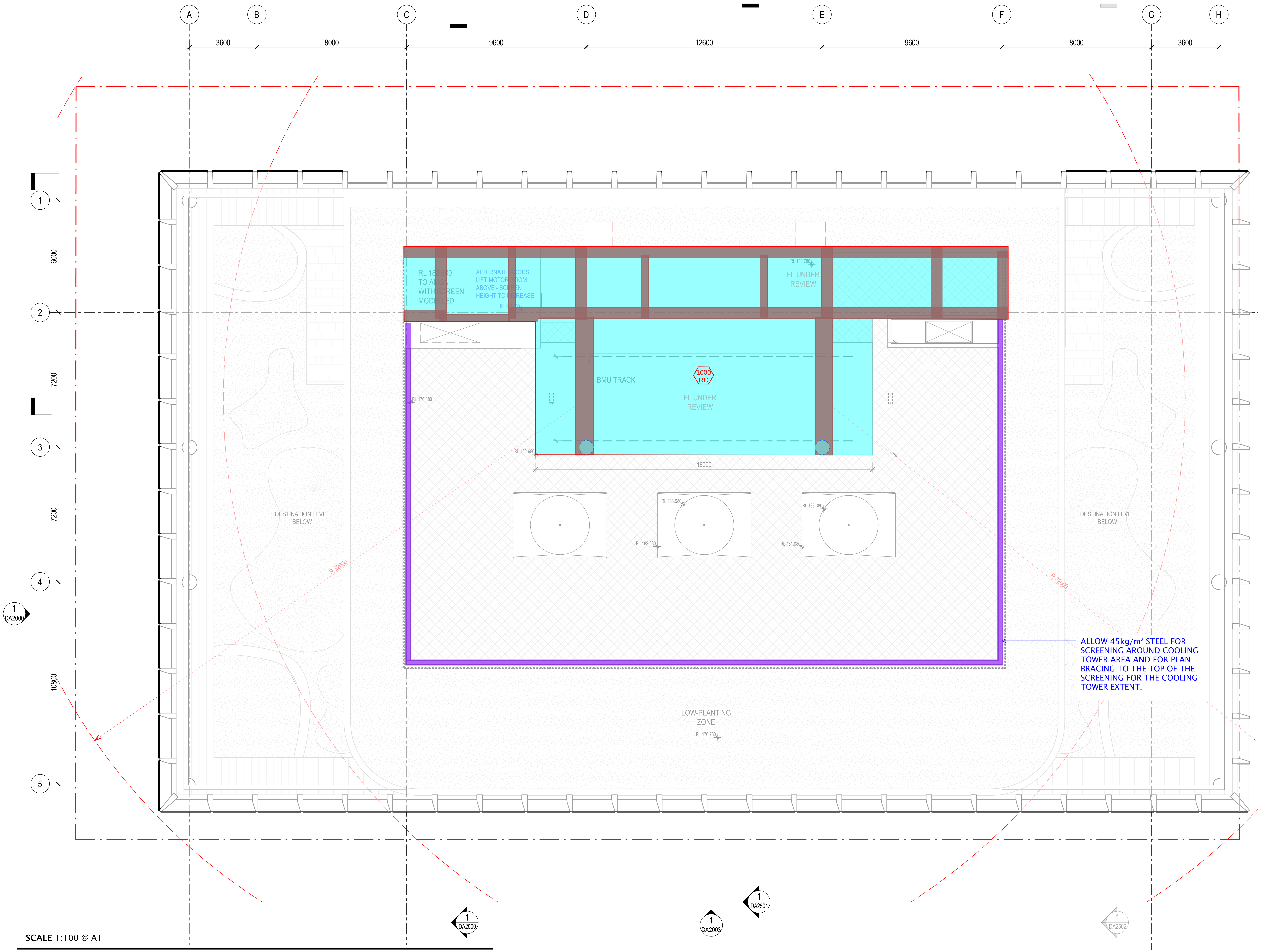
DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 38 CROWN GA	MJ	02/12/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-25	P02



BMU SLAB DEPTH SUBJECT TO FURTHER COORDINATION AND CONFIRMATION OF THE FOLLOWING: BMU LAY-OUT AND LOADS; STEPS TO EXTERNAL AREAS; FALLS AND DRAINAGE STRATEGY AND PENETRATION REQUIREMENTS.

LEGEND:

- DENOTES COREBOX WALL
- TC DENOTES TOWER COLUMN
- H DENOTES HANGING COLUMN
- DENOTES COLUMN TRANSFER BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY BEAM WELDED THROUGH COLUMN/TRANSVERSE BEAM
- DENOTES PRIMARY FLOOR BEAM
- DENOTES SECONDARY FLOOR BEAM
- DENOTES SLAB THICKNESS AND SPAN

NOTES:

1. ALLOW FOR CAST-IN PLATES TO COREBOX TO PICK UP STEEL BEAMS.
2. GENERALLY FLOORPLATE DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, PROTECTION SCREENS, PLATFORMS, STAGED CONSTRUCTION ETC. U.N.O. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
3. PLANT LOCATION, EXTENT AND LOAD TO BE CONFIRMED. LOCAL THICKENING OF SLAB MAY BE REQUIRED.
4. TERRACE BEAM SIZES SUBJECT TO INTERNAL/EXTERNAL STEP DIMENSION AND LANDSCAPING LOCATION, EXTENT, LOAD AND DRAINAGE STRATEGY.
5. BMU SLAB THICKNESS SUBJECT TO CONFIRMATION OF BMU SET-OUT, LOADS, BUILDUPS/FALLS AND DRAINAGE REQUIREMENTS.
6. REFER PAGES 10 AND 11 FOR TYPICAL COMPOSITE STEEL COLUMN EXAMPLE DETAILS.
7. ALLOW FOR FIRE TREATMENT TO ALL STEELWORK SUBJECT TO FIRE ENGINEERING.

SCALE 1:100 @ A1

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DRAWING TITLE:	DESIGNED BY:	DATE:
LEVEL 38 CROWN GA	MJ	22/11/22
PROJECT:	CHECKED BY:	PROJECT No:
ALBERT ST OSD	-	22131
CLIENT:	DRAWING NO	REVISION:
QIC	S02-25	P01

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
C4	ISSUE FOR INFORMATION	20.10.2022
P1	ISSUE FOR COORDINATION	24.10.2022
P2	ISSUE FOR COORDINATION	25.10.2022
P4	ISSUE FOR COORDINATION	31.10.2022
P5	ISSUE FOR COORDINATION	08.11.2022

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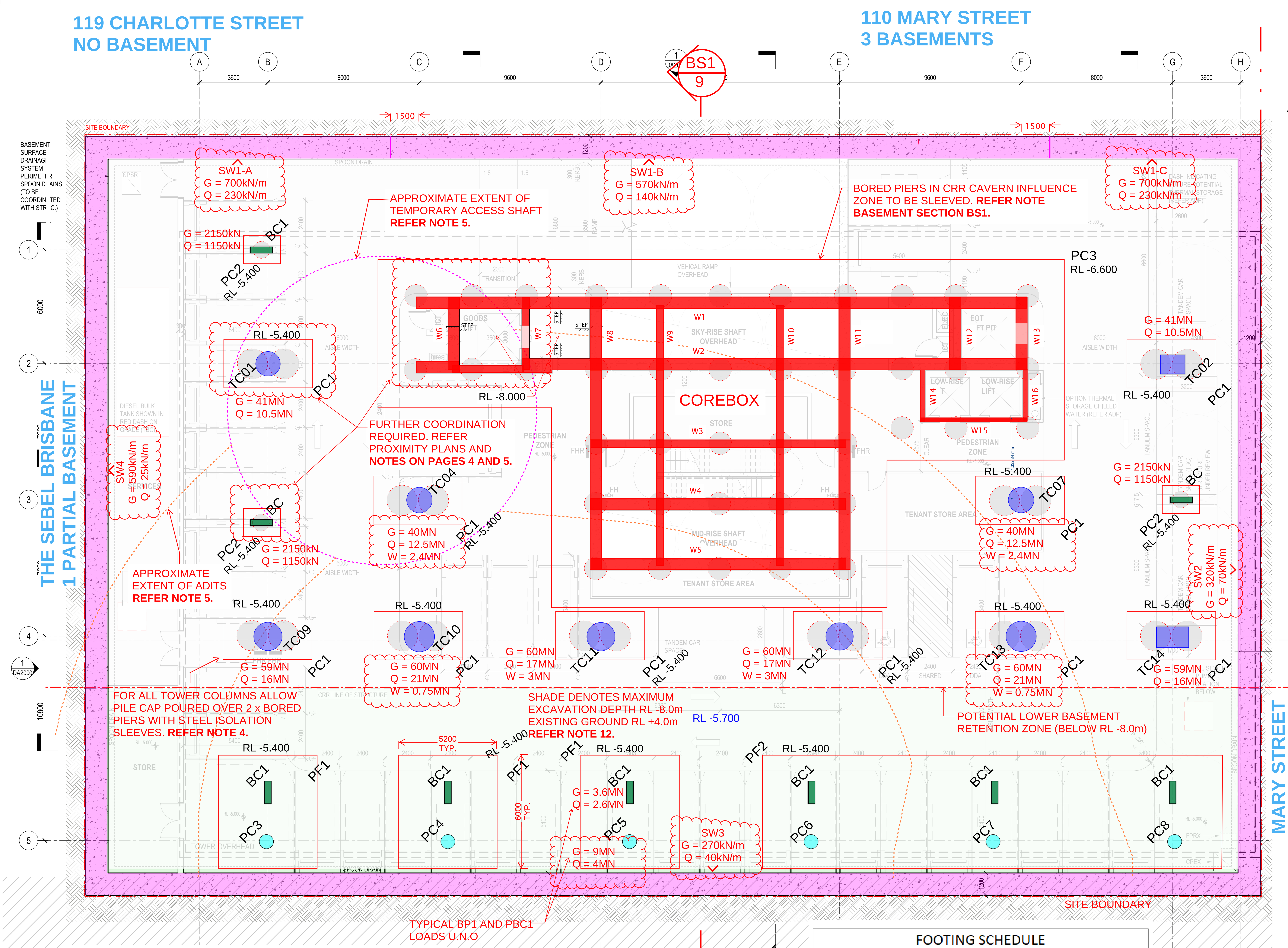
project: Albert Street Cross River Rail
phase: Development Application
drawing: LEVEL 00 - GROUNDFLOOR
drawn: TC
checked: KN
drawing no. short: DA1003
drawing no. long: ALB-ARC-DRW-DA1003
sheet issue date: 21/10/2022
scale: 1 : 100@A1
project no: 200048.00
issue: P5

WIP - FOR INPUT & COORDINATION
DRAWING IS FOR SKETCH AND COORDINATION ONLY

Appendix B RBG Proposed Building Corebox and Column Loads



RL -5.400 DENOTES APPROXIMATE TOP OF FOOTING
RL -5.700 DENOTES BULK EXCAVATION

SCALE: 1:200 @ A3

THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- SW# DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL
- PF DENOTES PAD FOOTING
- PC DENOTES PILE CAP
- DENOTES BORED PIER

NOTES:

1. PILE CAPS TO BE POURED ON COMPRESSIBLE MATERIAL RMAX GEOFOAM OR SIMILAR OUTSIDE OF THE BORED PIER EXTENTS TO CONTROL LOAD DISTRIBUTION INTO THE BORED PIERS.
2. BORED PIERS TO BE SOCKETED INTO VERY HIGH STRENGTH ROCK NFG1. STEEL ISOLATION SLEEVES TO EXTEND 1m BELOW THE 1:1 CRR INFLUENCE LINE.
3. BORED PIER SIZES AND SOCKET LENGTHS INTO NFG2/NFG1, AS FOLLOWS:
   CORE BOX (REFER GA) - 1200DIA + 8m SOCKET
   TOWER COLUMNS - TWIN 1600DIA + 10m SOCKET
4. NOT ALL EXISTING IN-GROUND STRUCTURE HAS BEEN SHOWN FOR CLARITY. FURTHER COORDINATION REQUIRED TO RESOLVE CLASHES BETWEEN NEW AND EXISTING IN-GROUND STRUCTURE.
5. CONFIRMATION REQUIRED ON METHODOLGY AND MATERIAL TO BE USED TO FILL ADITS AND ACCESS SHAFT.
6. SHEET PILLING MAY BE REQUIRED SUBJECT TO GEOTECHNICAL ENGINEER REVIEW.
7. THE FOOTING DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, STAGED CONSTRUCTION ETC. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
8. BORED PIERS TO COLUMNS AND COREBOX MAY BE INSTALLED FROM GROUND LEVEL PROVIDED ADDITIONAL PROVISIONS ARE MADE AS PER NOTE 7. THE CURRENT DESIGN DOES NOT ALLOW FOR BORED PIER OUT OF POSITION ASSOCIATED WITH THE PRIOR AND THIS WOULD NEED TO BE REVIEWED AS PART OF THE TEMPORARY WORKS PACKAGE. ALLOW FOR A PILING MAT AS PER GEOTECHNICAL REQUIREMENTS.
9. ALLOW FOR COST ASSOCIATED WITH TEMPERATURE MONITORING AND CONTROL TO PILE CAPS DEEPER THAN 1m. THIS MIGHT INCLUDE THERMOCOUPLES, INSULATION, ICE TO THE CONCRETE MIX ETC.
10. PAD FOOTINGS TO BE FOUND ON LOW STRENGTH ROCK WITH MINIMUM 1MPa ALLOWABLE END BEARING CAPACITY. PROVIDE MASS CONCRETE BELOW FOOTING AS REQUIRED TO REACH LOW STRENGTH ROCK TO MAXIMUM DEPTH OF RL-8.
11. EXTENT OF NEW INGROUND SERVICES TO BE CONFIRMED. PAD FOOTINGS TO BE DEEPENED AS REQUIRED TO EXTEND BELOW INFLUENCE ZONE. REFER TO COVER NOTES ON PAGE 1.
12. ALLOW FOR 1500mm THK RAFT TO EXTENT OF MAXIMUM EXCAVATION DEPTH RL -8.0m INCASE ADDITIONAL DISTRIBUTION OF VERTICAL LOAD FROM THE PODIUM AND BASEMENT COLUMNS IS REQUIRED TO ACHIEVE CRR CAVERN DESIGN CRITERIA. SUBJECT TO GEOTECHNICAL ANALYSIS.

FOOTING SCHEDULE

MARK	WIDTH	LENGTH	DEPTH	f'c
	mm	mm	mm	(MPa)
PC1	2000	4500	2500	80
PC2	1500	2000	1200	50
PC3	REFER GA		3000	80
PF1	5200	6000	1500	50
PF2	24400	6000	1500	50

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DRAWING TITLE: FOUNDATION PLAN	DESIGNED BY: MJ	DATE: 30/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S01-01	REVISION: P04

COREBOX BORED PIER LOADS

	0: Total G (Staged)						0: Total Q						EQ(Response Spectrum)						0: Wind Envelope						0: Robustness Envelope					
Pile	P_{MAX} [kN]	P_{MIN} [kN]	$V_{x,MAX}$ [kN]	$V_{x,MIN}$ [kN]	$V_{y,MAX}$ [kN]	$V_{y,MIN}$ [kN]	P_{MAX} [kN]	P_{MIN} [kN]	$V_{x,MAX}$ [kN]	$V_{x,MIN}$ [kN]	$V_{y,MAX}$ [kN]	$V_{y,MIN}$ [kN]	P_{MAX} [kN]	P_{MIN} [kN]	$V_{x,MAX}$ [kN]	$V_{x,MIN}$ [kN]	$V_{y,MAX}$ [kN]	$V_{y,MIN}$ [kN]	P_{MAX} [kN]	P_{MIN} [kN]	$V_{x,MAX}$ [kN]	$V_{x,MIN}$ [kN]	$V_{y,MAX}$ [kN]	$V_{y,MIN}$ [kN]	P_{MAX} [kN]	P_{MIN} [kN]	$V_{x,MAX}$ [kN]	$V_{x,MIN}$ [kN]	$V_{y,MAX}$ [kN]	$V_{y,MIN}$ [kN]
CP01	7844	0	581	-202	244	0	1491	0	94	0	30	0	6693	-6693	1149	-1149	660	-660	10142	-10142	1325	-1325	680	-680	5132	-5132	784	-784	250	-250
CP02	16110	0	490	0	50	-200	3524	0	37	0	0	-26	14889	-14889	1357	-1357	1692	-1692	24050	-24050	1169	-1169	1888	-1888	11322	-11322	446	-446	684	-684
CP03	12201	0	3	-79	169	0	2439	0	0	-31	3	0	10484	-10484	2090	-2090	841	-841	20780	-20780	1364	-1364	971	-971	9559	-9559	202	-202	402	-402
CP04	13817	0	407	-6	92	-386	2701	0	77	0	0	-74	11224	-11224	2525	-2525	1771	-1771	22208	-22208	1987	-1987	2192	-2192	11692	-11692	410	-410	987	-987
CP05	12268	0	135	-33	84	-349	2331	0	33	0	0	-76	9767	-9767	3019	-3019	1019	-1019	21054	-21054	1903	-1903	1276	-1276	11717	-11717	294	-294	699	-699
CP06	9022	0	0	-103	150	0	1646	0	0	-9	9	0	6786	-6786	2948	-2948	153	-153	15535	-15535	1722	-1722	201	-201	9122	-9122	169	-169	151	-151
CP07	11818	0	23	-291	83	-319	2258	0	0	-45	0	-71	10002	-10002	2940	-2940	910	-910	21043	-21043	2084	-2084	1098	-1098	12188	-12188	337	-337	673	-673
CP08	10402	0	6	-516	61	-361	2025	0	0	-90	0	-74	10140	-10140	2432	-2432	1450	-1450	19314	-19314	2155	-2155	1781	-1781	10808	-10808	586	-586	856	-856
CP09	4900	0	94	0	129	0	925	0	27	0	4	0	5855	-5855	1730	-1730	291	-291	11254	-11254	1066	-1066	332	-332	5155	-5155	59	-59	156	-156
CP10	8830	0	0	-505	157	0	1822	0	0	-82	9	0	12075	-12075	2163	-2163	787	-787	21382	-21382	1545	-1545	821	-821	10063	-10063	296	-296	299	-299
CP11	9831	0	294	-358	264	-122	1884	0	0	-75	0	-29	13639	-13639	1551	-1551	2265	-2265	20285	-20285	1911	-1911	2479	-2479	9606	-9606	755	-755	899	-899
CP12	8497	0	853	-47	0	-136	1884	0	198	0	17	0	6759	-6759	1147	-1147	683	-683	4843	-4843	722	-722	603	-603	4118	-4118	683	-683	203	-203
CP13	17933	0	492	0	237	-129	4379	0	88	0	105	0	13984	-13984	745	-745	1654	-1654	10739	-10739	447	-447	1431	-1431	8409	-8409	564	-564	455	-455
CP14	12907	0	34	-68	0	-166	3028	0	0	-25	16	0	6079	-6079	1019	-1019	828	-828	4988	-4988	606	-606	790	-790	2915	-2915	534	-534	303	-303
CP15	12577	0	283	0	0	-296	2949	0	71	0	0	-65	4923	-4923	702	-702	2283	-2283	6492	-6492	371	-371	2088	-2088	3366	-3366	439	-439	775	-775
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CP18	10795	0	0	-30	0	-230	2620	0	0	-1	0	-62	2288	-2288	416	-416	948	-948	5342	-5342	166	-166	615	-615	2585	-2585	237	-237	380	-380
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CP24	4580	0	0	-132	0	-88	1160	0	0	-25	0	-13	4262	-4262	395	-395	301	-301	4811	-4811	270	-270	269	-269	1743	-1743	231	-231	103	-103
CP25	4979	0	54	-115	205	-57	1115	0	0	-36	69	0	5538	-5538	289	-289	1190	-1190	5297	-5297	235	-235	959	-959	1693	-1693	234	-234	264	-264
CP26	12010	0	345	-78	49	-570	3371	0	110	0	0	-248	6897	-6897	565	-565	2452	-2452	6278	-6278	402	-402	1911	-1911	4373	-4373	367	-367	656	-656
CP27	11973	0	73	0	27	-380	3476	0	13	0	0	-164	3646	-3646	341	-341	1143	-1143	4155	-4155	190	-190	762	-762	2190	-2190	208	-208	355	-355
CP28	4620	0	4	-1	9	-3	1148	0	2	0	2	0	515	-515	330	-330	43	-43	264	-264	182	-182	49	-49	58	-58	203	-203	48	-48
CP29	11335	0	0	-71	24	-358	3304	0	0	-14	0	-160	3109	-3109	324	-324	958	-958	3734	-3734	186	-186	520	-520	1913	-1913	194	-194	304	-304
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CP36	14977	0	341	-192	1158	-61	4536	0	130	0	358	0	9293	-9293	1105	-1105	1593	-1593	18359	-18359	1225	-1225	2337	-2337	10670	-10670	584	-584	1227	-1227
CP37	18662	0	275	0	749	-53	6003	0	61	0	236	0	11171	-11171	1467	-1467	1107	-1107	24716	-24716	1070	-1070	1612	-1612	14209	-14209	691	-691	914	-914
CP38	9864	0	0	-35	0	-113	3026	0	0	-7	0	-1	5081	-5081	1608	-1608	132	-132	12223	-12223	1181	-1181	194	-194	7102	-7102	723	-723	142	-142
CP39	17820	0	0	-226	734	-36	5820	0	0	-63	229	0	10721	-10721	1464	-1464	981	-981	24205	-24205	1187	-1187	1393	-1393	14000	-14000	681	-681	875	-875
CP40	13797	0	178	-294	1024	-67	4206	0	0	-122	332	0	9219	-9219	1104	-1104	1433	-1433	18649	-18649	1293	-1293	2046	-2046	10398	-10398	556	-556	1149	-1149

NOTES:

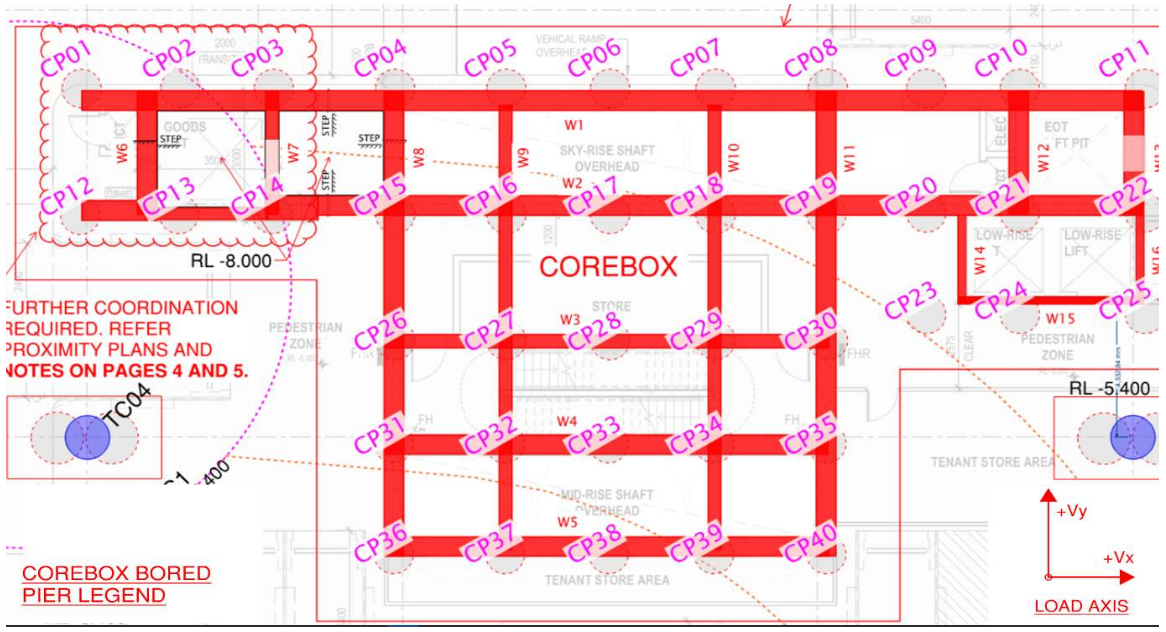
1 (+P) DENOTES VERTICAL LOAD IN SAME DIRECTION AS GRAVITY
(-P) DENOTES VERTICAL LOAD IN OPPOSITE DIRECTION AS GRAVITY (TENSION)

2 WIND LOADS SHOWN ARE ULTIMATE. APPLY 0.64 FACTOR TO CONVERT TO PERMISSIBLE.

3 SEISMIC (EQ) LOADS SHOWN ARE ULTIMATE. APPLY 0.5 FACTOR TO CONVERT TO PERMISSIBLE.

4 WIND AND SEISMIC LOADS ARE FULLY REVERSIBLE.

5 ALLOW AN CONTINGENCY FACTOR OF 1.1 ON ALL LOADS FOR FUTURE CHANGES.



Appendix C EDG Geotechnical Engineering Report

Geotechnical Engineering Report Albert Street - Future Over Station Development Brisbane, QLD

Prepared for:
QIC

Document Reference:
B01493-1AC

Version:
8 December 2022

Document:
Geotechnical Engineering Report
Albert Street - Future Over Station Development
Brisbane, QLD

Prepared for:
QIC
Level 1, 480 St Pauls Terrace
Brisbane Qld 4006

Document Reference:
B01493-1AC

Version:
8 December 2022

Prepared by:
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Author:
David Cunliffe

Reviewer:
Greg Hackney

Notes:

Table of Contents

Appendices

1 Project Background

The Queensland Investment Corporation (QIC) has been awarded the development rights for the Cross River Rail (CRR) precincts, including the proposed development at Albert Street in the Brisbane CBD.

The Albert Street development will consist of a commercial tower, which will be in the order of 200m tall with approximately 45 above ground levels. The building will include a multi-level basement, which must be designed to satisfy the requirements of the Cross River Rail Delivery Authority (CRRDA), due to the presence of CRR assets below.

RCP Australia Pty Ltd (RCP) has, on behalf of QIC, engaged EDG Consulting Pty Ltd (EDG) to provide geotechnical services for the project in three stages:

- Stage 1 – Geotechnical advice to help inform the Development Application (DA).
- Stage 2 – Geotechnical design as part of the detailed design of the building.
- Stage 3 – Geotechnical investigation and reporting to verify the basis of the design.

This report presents our preliminary assessment of the geotechnical conditions at the site and geotechnical design advice relating to the temporary retention system and permanent building foundations as part of the Stage 1 deliverables. Geotechnical advice relating to assessment of building foundation loads on the cavern lining will be reported in a separate document, issued prior to lodgement of the DA.

2 Site Description

The site is located in Brisbane's CBD and is approximately 40m width and 62m length in plan dimensions. The site was referred to as 'Albert Street Lot 2' during the CRR project, and currently contains a temporary acoustic structure above ground and an access shaft and two mined adits below ground, that provide temporary construction access for the CRR project.

The site is bounded by the Albert Street to the south west, including the Albert Street Station cavern that runs parallel to Albert Street, approximately 17m below ground. The site is bounded by the Sebel Brisbane Hotel to the north west, the buildings located at 110 Mary Street and 119 Charlotte Street to the north east and Mary street to the south-east. The site layout and adjacent properties are shown on Diagram 1.

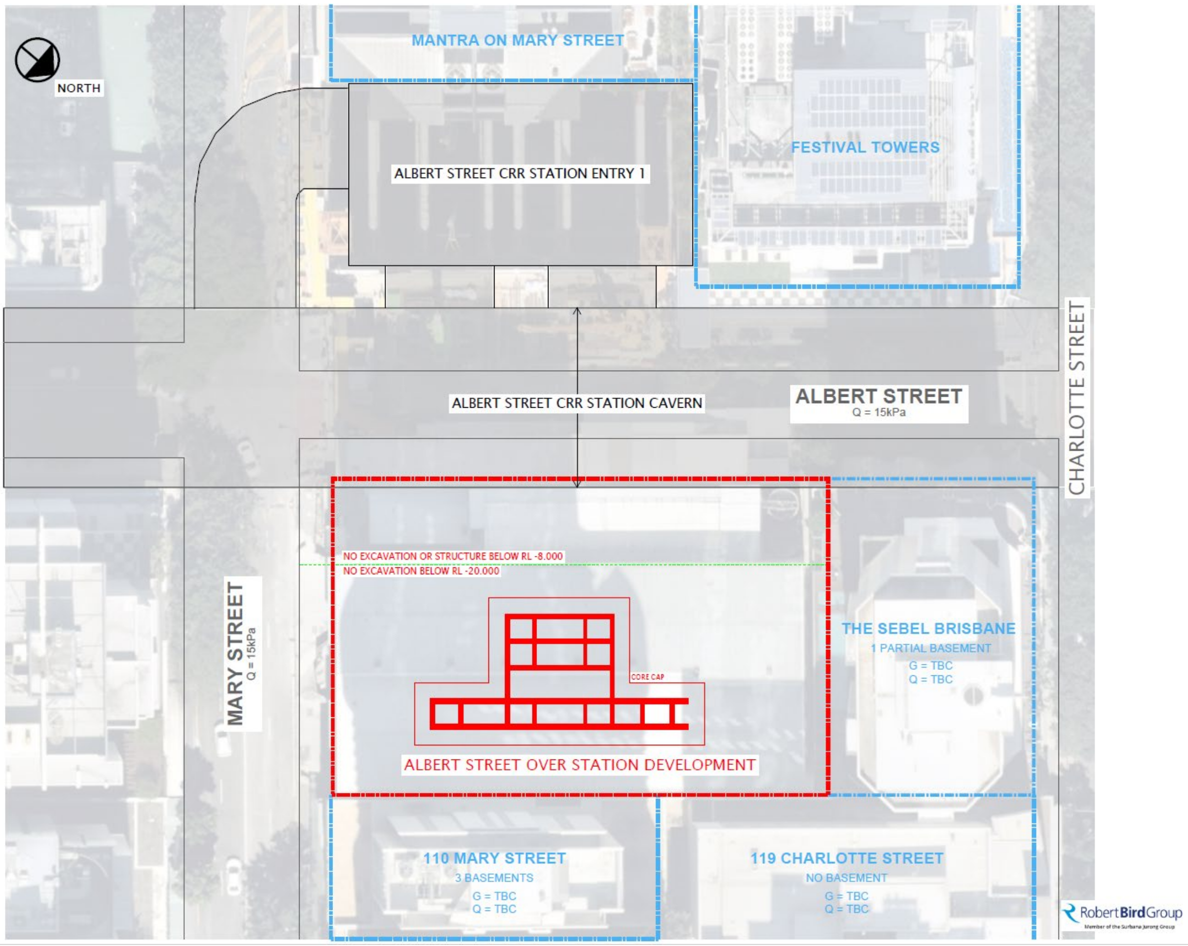

Diagram 1 – Site Layout

3 Ground Conditions

3.1 Overview of Geological History and General Stratigraphy

From the Devonian period to the Carboniferous period (about 360 million years ago), the sediments of the Neranleigh Fernvale Group were deposited off the edge of a broad continental shelf. Over tens of millions of years, these materials were lithified, then folded, faulted, recrystallised and uplifted to form much of the coastal land surface of south-east Queensland. Subsequently, a significant thickness of the deeply and variably weathered land surface was removed through erosion to form the irregular bedrock surface of the present.

Up to about 200 million years ago, various stress fields developed within the rocks underlying Brisbane through episodic volcanism and mild compression, leading to the formation of a foliation as the distinct fabric within the rock, and well developed sets of joints. Natural processes of weathering at surface level and along structures within the rock mass have resulted residual soils near the old ground surface and a weathering profile with depth in the rock.

During the past 10,000 or so years Holocene aged alluvial materials have been deposited as a result is sea level rise, including within the broad west to east trending valley through Brisbane city, which according to published geological maps, is about 160m wide at the Albert Street site.

More recently, fill materials have been placed over the ground surface, and may be present to a depth of up to about 3m within the vicinity of the site. Table 1 provides a summary of the major geological units.

Table 1 – Summary of Geological Units

Age	Formation or Origin	Lithology or Soil Type and Fabric
Recent	Fill	Mixed fine and coarse grained soils, may be controlled or uncontrolled.
Holocene (Recent <10,000 years)	Alluvium	Fine and coarse grained soils.
Carboniferous to Devonian 330 to 360 MA	Neranleigh Fernvale Group	Argillite, greywacke, greenstone, phyllite. Undulating foliation dipping variably towards the north-east.

3.2 Published Information

Based on a review of the 1:100,000 series Brisbane geological map (2015), the site is underlain by Holocene Alluvium, in turn, underlain by weathered rock of the Devonian age, Neranleigh-Fernvale Beds.

Fill may be present from previous development of the site and general regrading associated with the alluvial areas predating the early development. The published geological information is reproduced in Diagram 2.

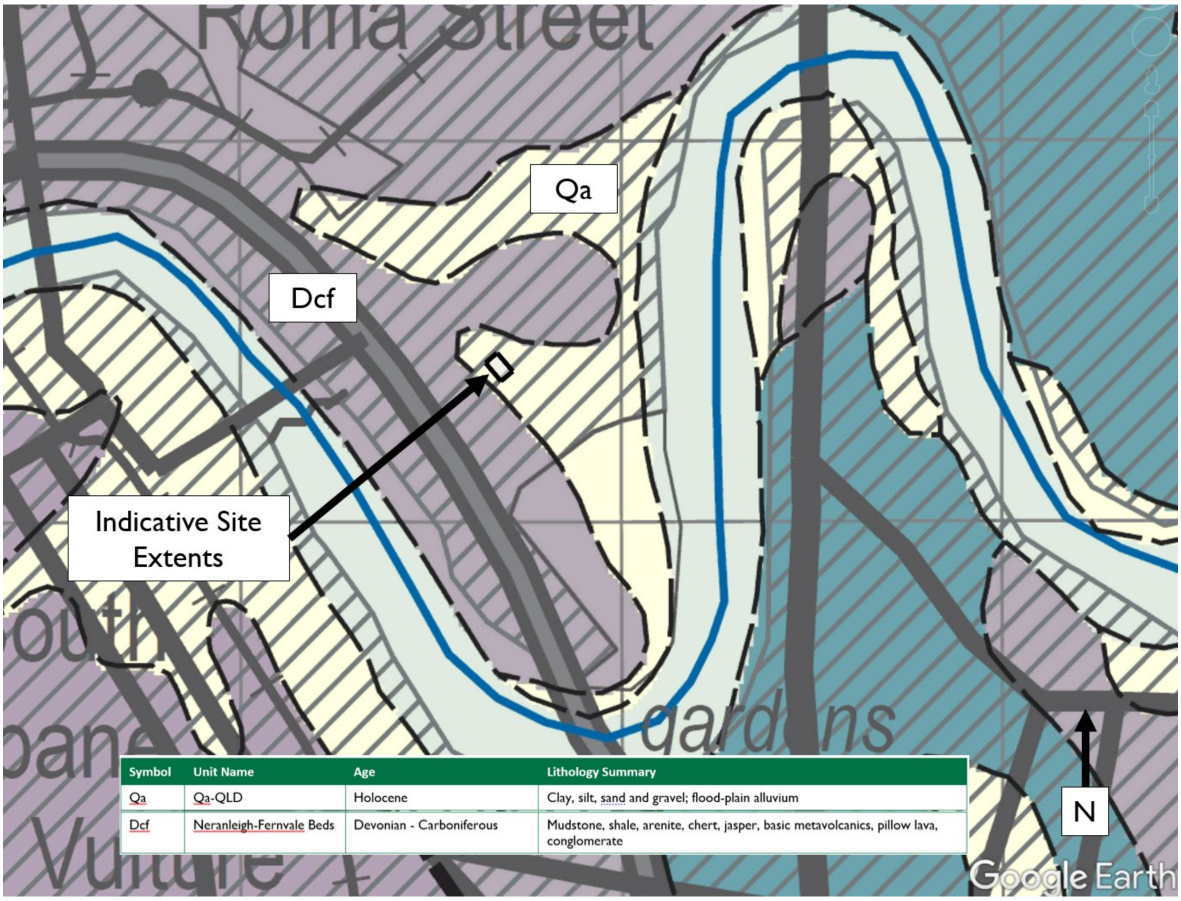

Diagram 2 – Published Geological Information

3.3 Site Investigation Information

Several geotechnical ground investigations have been carried out at or near to the site, for the CRR project as well as the development of adjacent buildings. The available geotechnical investigation data mainly comprises boreholes, with a limited number of piezocones. The boreholes used in the assessment are summarised in Table A1 in Appendix A and engineering logs are also included in Appendix A.

3.4 Stratigraphy

The available geotechnical investigation data has been relied upon and interpreted to develop a series of geological cross sections which are shown on drawings B01493-01-B2 to B5 presented in Appendix B. The cross sections depict the interpreted distribution of the geotechnical units along each boundary of the site. The general geological stratigraphy and engineering description relating to each of the geotechnical units is presented in Table 2.

Several defect sets are present within rock, with the dominant set being a generally well developed foliation, sub-parallel to bedding which in the project area dips variably to the north-east at angles between 30° and 60°.

Table 2 – Interpreted Geotechnical Units

Material Unit	General Description
Fill (FL)	Sand / Sandy Clay: medium plasticity, brown, fine to coarse sand and sub-rounded gravel, stiff / medium dense. Fill is uncontrolled and is variable in nature
Holocene Alluvium (AL)	Clay: soft to firm, high plasticity, dark grey, with some sand
Residual Soil (RS F)	Clay: high plasticity, red-brown motley grey, some/trace sand and gravel, very stiff to hard
Extremely Weathered Material (NFG5)	Sandy Gravelly Clay: low to medium plasticity, brown and grey, fine to coarse angular gravel and sand, hard with visible rock structure
NFG4	Phyllite: fine grained, grey and orange brown, indistinct laminations, dipping at 60° to 65°, very low to low strength, highly weathered to moderately weathered.
NFG3	Phyllite: fine grained, grey and pale brown, distinct laminations, dipping at 60° to 65°, medium strength, moderately weathered.
NFG1 / NFG2	Phyllite: fine grained, pale grey-blue, distinctly laminated, high strength, fresh.

3.5 Groundwater

Several groundwater monitoring instruments comprising standpipe piezometers and vibrating wire piezometers have been installed in boreholes located within proximity of the site. The available groundwater monitoring readings are summarised on the plan attached in Appendix C.

Based on a review of the available data (CRR202 and CRR712) and considering the interpretation of measured groundwater heads presented in the CRR Hydrogeological Interpretive Report (HIR), the existing groundwater level is expected to be approximately between RL -5m to RL -10m.

It is highlighted however, that there is limited groundwater monitoring data available and that the data that does exist does not provide continuous monitoring through a long enough period to establish long term groundwater levels. Therefore, at this stage we recommend that the design of the retention system considers groundwater conditions based on the hydrogeological modelling carried out by PSM as reported in the CRR HIR. The outcomes of the hydrogeological modelling are attached in

Appendix C. On that basis, a groundwater level of RL -4m AHD should be considered, representing typical long term (or non-flood) conditions.

We understand that the design of the building will also consider a flood level of RL 4.6m AHD. Should this flood case occur during construction, it would result in flooding of the basement excavation as the excavation is completely open, therefore balancing water pressures on either side of the retaining wall.

During construction the least favourable condition arising from temporary elevated water levels due to flooding would be where the flood level is approximately at RL 4m whereby there is additional load on the retaining system due to water pressure, however there is no balancing water pressure within the excavation. This would be a temporary case applicable for the duration of the elevated water condition. Considering the low permeability of the alluvium we do not anticipate that elevated water pressures associated with the flood condition would permeate into the alluvial clay over the time of the elevated water condition. Elevated water pressures could exist within the fill and therefore design of the retention system during construction should allow for the fill becoming fully saturated, as well as the long term groundwater level of RL -4m AHD as described above.

Following completion of construction, it may be possible during a flood event that elevated water pressures could exist outside of the building, however be prevented from entering the basement due to flooding prevention measures. Therefore, a reasonable approach could be to design the long term retention system during to consider full hydrostatic load associated with a flood level of RL 4.6m.

The various groundwater conditions that apply to different design cases are summarised in Table 3.

Table 3 – Groundwater Cases

Groundwater Case	Applicable Design Scenarios	Details
1	Design of retention system for construction phase loading	Groundwater level of RL -4m AHD
2	Design of retention system for construction phase loading, and flood loading	Groundwater level of RL -4m AHD, combined with an additional water force equal to hydrostatic pressures within the fill.
3	Design of retention system for permanent load cases	Hydrostatic pressures based on a flood groundwater level of RL 4.6m AHD.

We have been advised by the CRRDA that additional groundwater information and hydrogeological interpretation has been carried out during the CRR project, which may suggest groundwater scenarios other than those shown in Table 3. We are currently seeking that information and will incorporate in the detailed design where applicable.

4 Geotechnical Engineering Parameters

Geotechnical parameters have been developed adopting a 'moderately conservative' basis for the materials units present at the site based on the results of field and laboratory testing, supplemented with published data, correlations and previous experience. The basis of parameter selection is presented in Table 4. The recommended material parameters are summarised in Table D1 in Appendix D.

Table 4 – Basis of Geotechnical Parameter Interpretation

Parameter	Basis of Interpretation
Unit weight of soil	Previous experience with similar soils and rock, along with engineering judgement.
At rest earth pressure coefficient (K0)	Previous experience with similar soils and rock, along with engineering judgement.
Undrained shear strength parameters (Su)	Interpretation of results of in-situ testing including hand shear vane and pocket penetrometer testing.
Drained shear strength parameters (c´, ϕ')	Results of available triaxial shear strength testing along with previous experience with similar soils and rock, and engineering judgement. Assessment using RocLab based on rock mass characterisation to assess equivalent Mohr-Coulomb parameters.
Unconfined Compressive Strength of Rock Units	Interpretation of available point load and UCS test data.
Soil and Rock Elastic Modulus	Previous experience with similar soils and rock, along with engineering judgement.
Rock Mass Elastic Modulus	Assessment of the rock mass GSI and use of the Generalised Hoek and Diederichs equation (2006).
Poisson's Ratio	Previous experience with similar soils and rock, along with engineering judgement.

5 Retention System

5.1 Concept Arrangement

The proposed development comprises a two-level underground basement that will be constructed following a bottom-up methodology. Therefore, a temporary retention system will be required to support the excavation, control wall deformations and control groundwater infiltration until the loads are transferred onto the permanent structure.

Based on previous discussions with RBG, the retention system would likely comprise an internally braced retaining wall. At this stage RBG has suggested that the retaining wall would generally comprise 900mm diameter reinforced concrete bored soldier piles, except along the boundary with the Brisbane Sebel, where 600mm diameter bored piles would be adopted due to space constraints. Shotcrete reinforced with either steel fibres of steel mesh would be applied in between the soldier piles to prevent loss of material and control groundwater inflows.

The concrete piles would be connected at existing ground level by a reinforced concrete capping beam, and would be laterally supported by a series of steel props and waler beams installed at two elevations, (i.e. an upper and lower row). The concept level arrangement of the retention system is presented on the marked-up sketches in Appendix E.

Construction of the retention system is expected to be carried out in line with the following process:

- Installation of bored piles and construction of capping beam.
- Excavation of first lift of material. Based on the variable nature of the fill and the relatively low strength of the alluvium, it is expected that lift heights would be limited to approximately 1.5m. This would be further assessed at detailed design and modified (if required) during construction.
- Application of shotcrete and reinforcement.

- Further excavation to below upper row of props, followed by installation of props and application of shotcrete.
- Repeat process of excavation, installation of props and application of shotcrete in vertical lift heights of approximately 1.5m.

5.2 Retaining Wall Analysis

Preliminary analysis of the temporary retention system has been carried out using the commercially available software package WALLAP. The software carries out 2D analysis based on the plane-strain assumption, and calculates wall structural actions and deflections. Note that WALLAP is not able to calculate ground settlements behind the retaining wall, and therefore such ground settlements will be assessed during the detailed design stage. Several analysis sections have been selected to investigate the impacts of pile diameter, pile spacing, ground conditions, pile toe level and surface surcharge. The locations of the analysis sections are shown on Diagram 3.

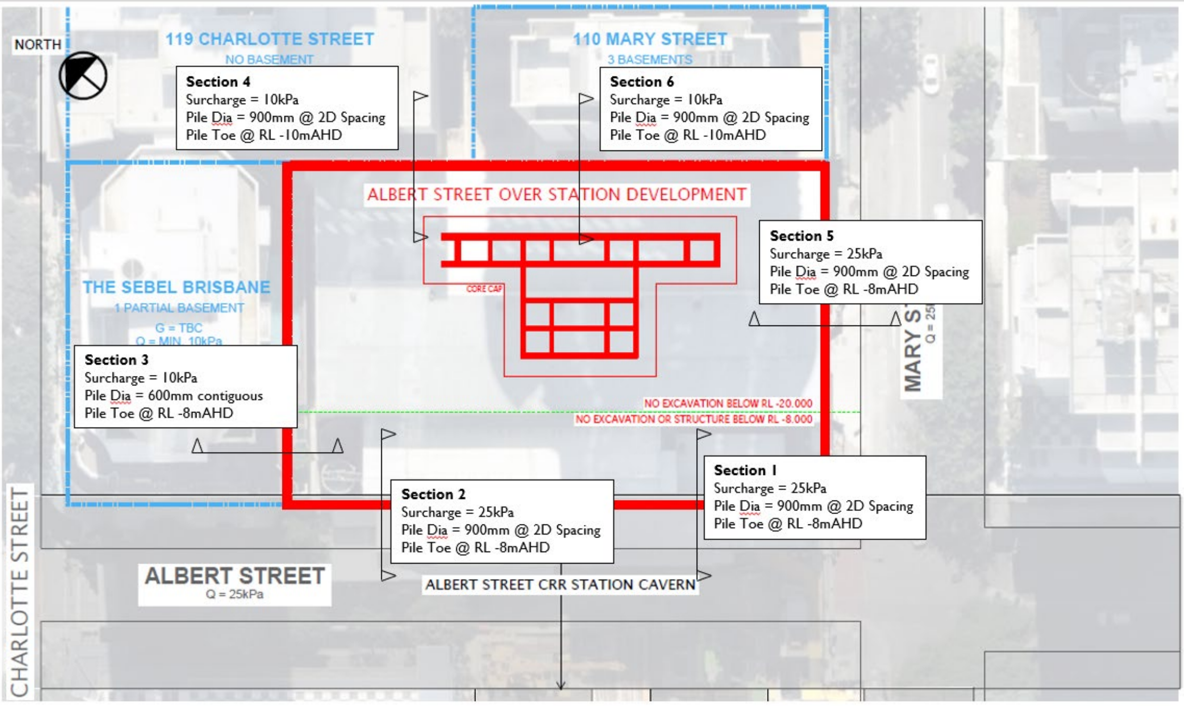

Diagram 3 – Retaining Wall Analysis Sections

The retaining wall analysis has considered the geotechnical parameters summarised in Table D1 in Appendix D, and has followed the construction sequence summarised in Table 5.

Table 5 – Retaining Wall Analysis Construction Sequence

Stage	Action
0	Groundwater is at RL -4m AHD
1	Apply ground surcharge
2	Excavate to RL 2m AHD
3	Install upper row of props at RL 2m AHD
4	Excavate to RL -1.5m AHD

Stage	Action
5	Install lower row of props at RL -1.3m AHD
6	Excavate to RL to RL -4m AHD
7	Lower groundwater level on excavation side to RL -5m AHD
8	Excavate to RL to RL -5m AHD
9	Include additional water force equal to hydrostatic pressures within the fill (as per Groundwater Case 2 in Table 3), to allow for flood conditions.
10	Remove additional flood load (as applied in Stage 9)
11	Construct Basement B2 slab
12	Construct Basement B1 slab
13	Remove lower row of props (RL -1.3m AHD)
14	Construct Basement EOT slab (where applicable)
15	Construct Ground slab (where applicable)
16	Remove upper row of props (RL 2m AHD)
17	Increase water pressures (as per Groundwater Case 3 in Table 3), to allow for flood conditions
18	Reduce wall bending stiffness to 70% to account for long term effects

The retaining wall arrangements considered in the analysis are summarised in Diagram 3 and are presented in Table 6. Note that pre-stress was not applied in any of the analysis cases.

Table 6 – Retaining Wall Arrangements

Analysis Section	Pile Diameter (mm)	Pile C2C Spacing (mm)	Ground Surcharge (kPa)	Pile Toe Elevetion (mAHD)	Prop Details	Reference Borehole
1	900	1,800	25	-8	914x19CHS GR350LO @ 7.5m C2C horizontal spacing. No pre-stress.	CRR 1028
2	900	1,800	25	-8		CRR 1030
3	600	600	10	-8		S29 BH2
4	900	1,800	10	-10		BPP BH2
5	900	1,800	25	-8		ASM Bore 3
6	900	1,800	10	-10		ASM Bore 1

The outcomes of the analysis relating to the retaining wall and temporary props are summarised in Table 7, whereas the analysis outcomes relating to the permanent basement slabs are summarised in Table 8, and are provided in detailed format in Appendix F. Please note that all results presented in Tables 7 and 8 are unfactored. All prop forces are perpendicular to the wall and therefore should be converted to reflect the orientation of the prop relative to the wall.

Table 7 – Retaining Wall Analysis Preliminary Outcomes

Analysis Section	Construction Stages (As per Table 5)	Groundwater Case (As per Table 3)	Max Wall Deflection (mm)	Max Bending Moment (kN.m/m)	Max Shear Force (kN/m)	Max Temp Prop Force Upper Row (kN/m)	Max Temp Prop Force Lower Row (kN/m)
1	Up to Stage 8	1	14	271	146	105	181
	Stage 9	2	15	262	150	138	190
	Stage 18	3	15	213	180	-	-
2	Up to Stage 8	1	17	285	156	121	191
	Stage 9	2	17	282	158	114	191
	Stage 18	3	18	184	197	-	-
3	Up to Stage 8	1	15	222	145	103	189
	Stage 9	2	15	217	147	115	193
	Stage 18	3	17	155	201	-	-
4	Up to Stage 8	1	18	316	165	117	199
	Stage 9	2	18	306	168	137	207
	Stage 18	3	19	186	207	-	-
5	Up to Stage 8	1	18	290	162	118	200
	Stage 9	2	18	281	166	131	208
	Stage 18	3	19	182	173	-	-
6	Up to Stage 8	1	21	413	195	127	225
	Stage 9	2	21	404	198	142	236
	Stage 18	3	22	263	196	-	-

Table 8 – Basement Slab Axial Forces Preliminary Outcomes

Analysis Section	Construction Stages (As per Table 5)	Groundwater Case (As per Table 3)	Max Permanent Prop Force (kN/m)			
			Level B2 (RL -5m)	Level B1 (RL -2m)	Level B MEZ (RL 1m)	Ground Floor (RL 4 m)
1	Up to Stage 16	1	-2	164	85	38
	Stage 18	3	138	295	128	33
2	Up to Stage 16	1	-16	238	-	71
	Stage 18	3	171	382	-	83
3	Up to Stage 16	1	-20	234	-	59
	Stage 18	3	140	385	-	74
4	Up to Stage 16	1	-15	243	-	70
	Stage 18	3	176	391	-	81
5	Up to Stage 16	1	-5	181	81	36
	Stage 18	3	209	288	120	34
6	Up to Stage 16	1	-5	164	167	-
	Stage 18	3	238	266	197	-

The analysis has considered 2D plane-strain conditions and a uniform horizontal spacing for the props. It is noted that RBG is considering two separate options for the prop arrangement, with Option 1 comprising props typically horizontally spaced at 7.5m, with a larger horizontal span of 15m between the central props. In comparison, Option 2, comprises a typical prop horizontal spacing of 7.5m along the full perimeter of the retention system.

Based on our analysis, increasing the horizontal prop spacing to 15m is expected to result in unacceptable lateral deflections and therefore our recommendation is to adopt a prop arrangement similar to that shown in Option 2 as per the marked-up sketches in Appendix E.

It is also understood that as an alternative to a soldier pile or contiguous pile wall, a diaphragm wall (D-Wall) may be considered. From a geotechnical perspective we have no objection two adopting a D-Wall wall and are confident that the stiffness of the wall could be designed to control wall deflections within required limits. Further assessment of the retention system would be carried out at detailed design stage.

5.3 Seepage Analysis

As discussed in Section 3.5, the typical groundwater level could range between approximately RL -4m AHD and RL -10m AHD. We have therefore carried out a preliminary assessment of groundwater inflow based on 2D steady state conditions comprising the following cases:

- **Typical case:** Groundwater level of RL -4m, and a sump elevation of RL -6m.
- **Sensitivity case:** As above, but also considering localised zones of more permeable material.

The preliminary outcomes from the analysis show that steady state inflow quantities are expected to range between zero to approximately 3m^3/day for typical conditions, and up to approximately 20m^3/day when considering the presence of more permeable zones as per the sensitivity case.

Should a drained basement be selected, design of the permanent building pumps should consider these flows. The assessed groundwater flows would be revisited at detailed design stage, where transient seepage analysis may be carried out.

6 Shallow Foundations

6.1 Bearing Capacity

It is proposed to adopt shallow footings along the Albert Street side of the development to support loads from podium and basement columns. The elevation of the base of those footings is not confirmed at this stage, however is expected to be approximately RL -6.5m AHD, but no deeper that RL -8m AHD to satisfy the CRR requirements.

The material at the proposed foundation level is expected to be extremely weathered material (NFG5), however based on the available geotechnical investigation information, there could be localised areas where the base of footing is situated within Residual Soil.

We have assessed bearing capacity and foundation requirements on either a residual soil foundation or an extremely weathered material foundation. The assessment has considered the working loads as per the marked-up sketch in Appendix E, along with the relative position of the loads. For clarity, the resultant working load is based on the summation of a podium column load of 15.5MN (G=11.5MN and Q=4MN), and a basement column load of 6.2MN (G=3.6MN and Q=2.6MN).

The outcomes of our assessment are summarised in Table 9. Note that the allowable bearing capacity has been calculated using a factor of safety of 2.5 applied to the ultimate bearing capacity.

Note that estimates of bearing capacity have not been provided for the Fill and Alluvium as we do not recommend that footings are founded in those materials.

This advice is based on the footing loading being applied gradually over the construction of the building. Should the critical load cases include a significant portion of the footing load applied instantly (such as wind and or seismic loads), resulting in undrained conditions within the foundation material, the bearing capacity may be reduced and the foundation requirements may change.

Should the assessed footing dimensions be unfeasible, alternative options could include increasing the thickness of the footing (and therefore recuing the base of footing level to RL -8m AHD, connecting several shallow footings together resulting in a larger footing, or replacing the individual shallow footings with a raft, that covers the entire area where excavation is limited to RL -8m.

Table 9 – Summary of Shallow Footing Assessment

Material	Ultimate Bearing Capacity (kPa)	Allowable Bearing Capacity (kPa)	Resultant Working Vertical Force (MN)[1]	Max Applied Pressure (kPa)[2]	Minimum Required Foundation Dimensions
Residual Soil	1,653[3]	679[3]	21.7	676	6 x 8.7
NFG 5	2,419	988	21.7	974	5.2 × 6

Notes: 1 Resultant vertical force applied 0.514m from centre of footing.
2 Max applied pressure considers rigid footing.
3 Based on a gradual rate of loading. Not applicable to rapid loading or transient loading.

6.2 Foundation Stiffness

Estimates of vertical modulus of subgrade reaction have been assessed using the software FLEA. This software accounts for the size and shape of the footing, applied loading and layering of the soil profile.

The outcomes of our assessment are summarised in Table 10 and are applicable for the footing sizes provided in Table 8. We recommend that RBG consider the average values of modulus of subgrade reaction presented in Table 7, and carry out sensitivity analysis based on the recommended range.

Table 10 – Reccomended Modulus of Subgrade Reaction

Material	Vertical Modulus of Subgrade Reaction Range (kPa/m)	Limiting Vertical Pressure (kPa)
Residual Soil	10,000 to 20,000	679
NFG 5	50,000 to 100,000	988

7 Piled Foundations

7.1 Pile Types

The piled foundations are to comprise reinforced concrete bored piles. At this stage the piles will be sleeved with permanent liners to help distribute pile loads to the ground below the zone of influence, as indicatively shown in Diagram 4. It may be possible to reduce or remove the permanent steel liners, however this would be further investigated during the detailed design of the building foundations.

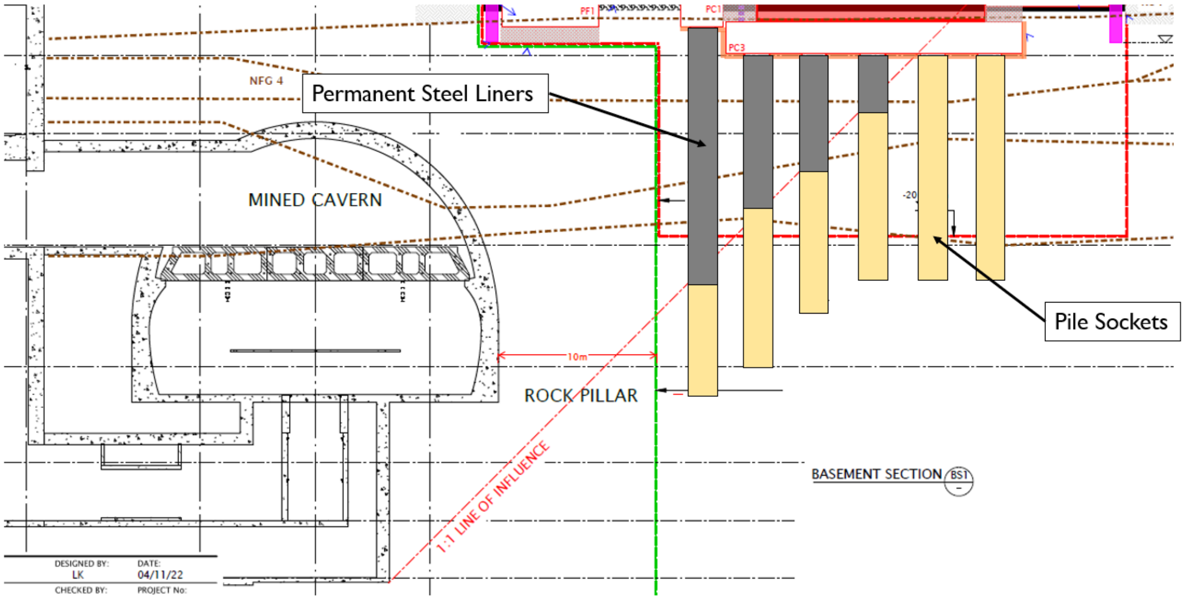

Diagram 4 – Indicative Arrangement of Permanent Steel Liners

7.2 Geotechnical Reduction Factor

A geotechnical strength reduction factor of $ø_g$ = 0.5 is recommended at this stage in accordance with the process in AS2159:2009 Piling, based on the quality and quantity of information available.

The geotechnical reduction factor considers that no pile load testing will be carried out during construction, however, it would be possible to increase the geotechnical strength reduction factor should pile load testing be carried out during construction, as well as additional geotechnical investigation and in-situ testing.

7.3 Pile Design Parameters

Design values of ultimate skin friction and ultimate end bearing have been assessed for all rock units. Ultimate skin friction and end bearing have been calculated based on the method proposed by Zhang and Einstein (1998)[1]. Recommended values of ultimate skin friction and ultimate end bearing are summarised in Table 11.

Table 11 – Ultimate Pile Design Parameters

Material	Fs, Ultimate Skin Friction (kPa)	Fbu, Ultimate End Bearing (MPa)
Residual Soil	50	N/A
NFG 5	75	N/A
NFG 3	700	15
NFG 2/1	1300	25

[1] Zhang, L. and Einstein, H. (1998). "End bearing capacity of drilled shafts in rock." ASCE Jnl. Geot. Eng., Vol. 124 (7), 574-584)

7.4 Pile Design

A preliminary estimate of pile socket lengths has been carried out based on the design method proposed by Pells (1999), that considers the sidewall slip based on the work done by Rowe and Armitage (1987). Estimates of socket length has been carried out for the podium and core piles considering selected load cases based on the pile loads shown on the marked-up sketches in Appendix E.

7.4.1 Podium Piles

Two pile arrangements have been considered as illustrated in Diagram 5. Pile arrangement A shows a pile group comprising two piles of 1.6m diameter, spaced horizontally at 2.5 pile diameters centre to centre (i.e. 4m C2C). Pile arrangement B shows a two pile group, also comprising two piles of 1.6m diameter, horizontally spaced at one pile diameter centre to centre (i.e. no horizontal gap between piles).

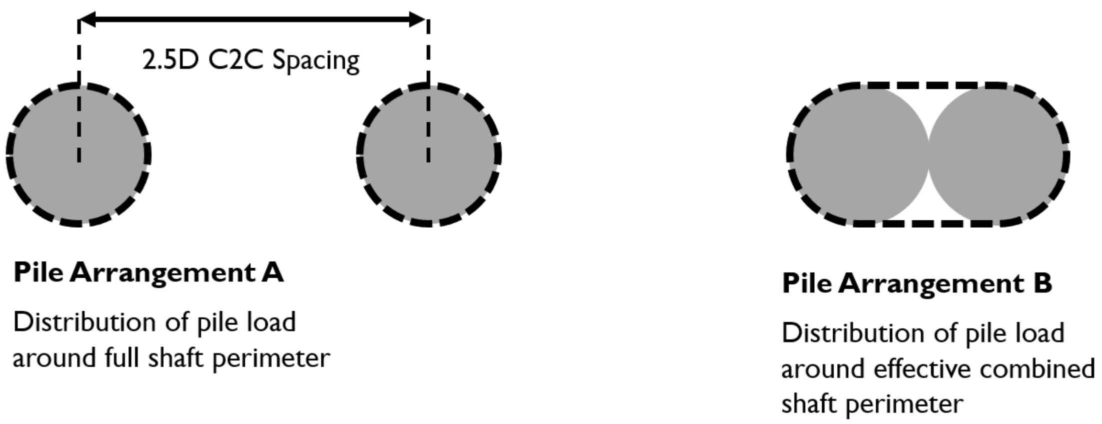

Diagram 5 – Podium Pile Arrangements

Based on our assessment of pile interaction, we consider that for pile sockets founded within the NFG1, NFG2 or NFG3 geotechnical units, piles spaced horizontally at 2.5D as per Pile Arrangement A will experience little interaction and therefore the axial pile capacity is unaffected by the adjacent pile. For more closely spaced piles such as Pile Arrangement B, the shaft is unable to distribute load around it's full perimeter and therefore a reduced shaft capacity will be achieved. The reduction in shaft capacity is related to the reduced effective perimeter, which can be considered as a 20% reduction on the total shaft capacity.

The pile end bearing capacity will be unaffected even for closely space piles as recommended by the work of Meyerhof 1976[2].

The recommended minimum podium pile socket lengths are summarised in Table 12. Note that the actual pile toe levels may be controlled by the depth required to limit pile stresses to the Albert St cavern lining.

[2] Meyerhof, G.G. 1976. Bearing capacity and settlement of pile foundations. *Journal of Geotechnical Engineering Division, ASCE*, 102(GT3): 195–228.

Table 12 – Estimated Pile Socket Lengths – Podium Piles

Load Case	Ultimate Column Load (MN)	Ultimate Load Per Pile (MN)	Serviceability Column Load (MN)	Serviceability Load Per Pile (MN)	Minimum Socket Length (in NFG 2/1)	
					Pile Arrangement A	Pile Arrangement B
1	65	32.5	51.5	25.8	3.5	4
2	74.6	37.3	61.4	30.7	4	5
3	95	47.4	75	37.5	7	9
4	115.6	57.8	91.8	45.9	10.5	13

7.4.2 Core Piles

The core piles will be 1.2m in diameter and will be connected to a 2.4m thick core cap at the pile head. The piles will be horizontally spaced at approximately 3m centres and are therefore considered to be not significantly affected by interaction with adjacent piles.

The recommended minimum core pile socket lengths are summarised in Tables 13 and 14. Note that the actual pile toe levels may be controlled by the depth required to limit pile stresses to the Albert St cavern lining.

Table 13 – Estimated Core Pile Socket Lengths for Compression

Load Case	Ultimate Compressive Load Per Pile (MN)	Serviceability Compressive Load Per Pile (MN)	Minimum Socket Length (in NFG 2/1)
1	25	20	4
2	40	32	10.5
3	55	44	16.5

Table 14 – Estimated Core Pile Socket Lengths for Tension

Load Case	Ultimate Tension Load Per Pile (MN)	Serviceability Tension Load Per Pile (MN)	Minimum Socket Length (in NFG 2/1)
1	7	5.6	3
2	11	8.8	5
3	14	11.2	6

7.5 Pile Stiffnesses

An assessment of the axial and lateral pile stiffness of the proposed core and podium piles has been carried out for consideration by RBG in the structural modelling of the building. The assessment of foundation stiffnesses was carried out using published methods, presented in Poulos[3], and was based on the ground stratigraphy shown on the interpreted geological sections included in Appendix B, and the geotechnical parameters presented in Appendix D.

The assessed values of foundation stiffness are summarised in Table 15 and are applicable for the pile diameters nominated. Single values are presented for vertical springs, which should be considered at the base of the pile. Lateral springs are provided at 1m increments along the pile length.

[3] Poulos, H. G. (2018). Rational assessment of modulus of subgrade reaction. *Geotechnical Engineering Journal of the SEAGS & AGSSEA*, *49*(1), 1-7.

We recommend that RBG consider the spring stiffnesses presented in Table 15, combined with a sensitivity range of 50% to 200% of the recommended values.

Table 15 – Pile Capacities and Stiffnesses

Material	Horizontal Spring (MN/m)	Limiting Lateral Force (MN)	Vertical Spring 0.9m Diameter Pile (MN/m)	Vertical Spring 1.2m Diameter Pile (MN/m)	Vertical Spring 1.6m Diameter Pile (MN/m)
Residual Soil	25	0.25	N/A	N/A	N/A
NFG 5	45	1.5	N/A	N/A	N/A
NFG 3	900	7	1,000	1,250	1,750
NFG 2/1	4,000	12	5,000	6,500	9,000

8 Temporary Batter Slope Angles

During excavation of the basement, temporary batter slopes may need to be excavated within Fill and Alluvium. Temporary batter slopes are not expected to be required for durations longer than 1 week. We therefore recommend that all temporary batter slopes are excavated no steeper than 1V:1H with a vertical height less than 2m.

Once the contractor confirms the proposed excavation geometry, a slope stability assessment should be carried out by the geotechnical temporary works engineer. Should batter slopes be required for durations longer than 1 week, the slope should be reduced to 1V:2H.

9 Earthquake Subsoil Class

Based on our interpretation of the ground conditions, the site sub-soil class is classified as Class C – Shallow Soil Site in accordance with Section 4 of AS 1170.4-2007.

10 Excavatability and Trafficability

The materials present within the proposed basement are expected to comprise surface fill, soft to firm alluvium, and residual soils overlying weathered argillite. Excavation of these materials is expected to be achievable using mechanical excavators.

Although not confirmed at this stage, it is likely that a lift core overrun pit will be included in the building design, that is expected to extend approximately 2m to 3m below the lowest basement slab. Its therefore possible that a relatively small volume of excavation could occur within low to medium strength rock. In such situations hard digging with a large mechanical excavator and/or use of a hydraulic rock hammer may be required. Advice relating to vibrations associated with rock hammers is presented in Section 11.

Most excavated materials will comprise alluvium, which is generally described as soft to firm in stiffness. It is therefore expected that poor trafficability conditions will be present, which would likely result in heavy rutting and/or heavy wheel mounted plant becoming bogged. Track mounted plant would be less affected, however further assessment of site trafficability conditions would be required following interpretation of additional geotechnical investigation data.

11 Ground Vibrations

Considering the proposed construction activities and methodologies as discussed with RBG, we anticipate that groundborne vibrations may arise from piling works and excavation within rock units, if there is rock strength material within the basement excavation and/or the lift core overrun pit.

Initial estimates of peak particle velocities arising from the anticipated construction activities are provided in the following sections, which are all based on a review of historical data from various sources.

11.1 Vibrations from Rotary Pile Drilling

A preliminary assessment of ground vibrations associated with rotary pile drilling has been carried out based on the information presented in TRL Report 429[4]. The report summarises empirical data of vibrations due to construction activities recorded from several construction projects.

Due to the lack of published data for bored piling techniques, this assessment considers available data for other similar activities. It is considered that the most comparable activity for which data is readily available is for mechanised tunnelling.

Figure F-1 in Appendix F provides the assessed relationship between ground peak particle velocity and distance from the source of vibration, which relates to mechanical tunnelling as published in TRL429. Based on our interpretation of the empirical data, we estimate peak particle velocities of approximately 0.2mm/s at a distance of 40m away from the vibration source.

11.2 Vibrations from Vibro-Driving of Steel Liners

The assessment of ground vibrations due to installation of pile liners is based on empirical data presented in CIRIA 142[5]. Figure F-1 in Appendix F provides the assessed relationship between ground peak particle velocity and distance from the source of vibration, which relates to vibro-driving of steel casing. Based on our interpretation of the empirical data, we estimate peak particle velocities of approximately 2mm/s at a distance of 40m away from the vibration source.

11.3 Vibrations from Rock Hammers

The assessment of ground vibrations due to installation of pile liners is based on empirical data presented in Hackney (2002)[6]. Figure F-1 in Appendix F provides the assessed relationship between ground peak particle velocity and distance from the source of vibration, which relates to excavation using rock hammer techniques. Based on our interpretation of the empirical data, we estimate peak particle velocities of approximately 1mm/s at a distance of 40m away from the vibration source.

11.4 Discussion

Note that due to the complexity and uncertainty of the variables involved, including attenuation properties of soils, distance from source, the variability of the energy applied to the ground when boring through different materials, the predictions of ground-borne vibration reported in the previous sections are estimates only.

Should any of the vibration estimates presented above exceed the nominated limits, we would recommend that specialist advice is sought on ground-borne vibrations. We expect that this would include advice to account for the specific site characteristics and proposed construction equipment during the detailed design stage. Construction stage monitoring of vibrations on-site associated with

[4] Hiller, D. M., & Crabb, G. I. (2000). Groundborne vibration caused by mechanised construction works.
[5] Head, J. M., & Jardine, F. M. (1992). Ground-borne vibrations arising from piling (No. 142).
[6] Hackney G.A. (2002). Excavation induced vibrations in Sydney sandstones, Proceedings 5th Australian New Zealand Young Geotechnical Professional Conference, Ed. Davies, T. , Rotorua, Australian Geomechanics Society, New Zealand, March 13.

bored piling and rock excavation activities, coupled with review of construction methods will be required.

Dilapidation surveys of sensitive structures should be carried out prior to construction.

12 Erosion and Sediment Control

12.1 Pre-Development Phase

Prior to construction commencing, the following erosion and sediment control measures will need to be installed around the subject site to minimise disturbance and ensure the quality of runoff discharging from the site is of an acceptable standard:

- Sediment barriers to be installed on all entrances to downstream stormwater infrastructure (i.e. gully pits).
- Designation of transport routes through the site to minimise vegetation disturbance.
- Install construction entry and exit shakedown areas.
- Sediment fences are to be installed on the downstream boundaries of the subject site; and Install dust control measures as required.
- All erosion and sediment control measures are to be designed and installed in accordance with IECA Guidelines. Further details regarding the proposed erosion and sediment control measures will be provided during the detailed design phase of the development.

12.2 Construction Phase

During the construction phase of the development, there is a risk of sedimentation transport due to large areas of disturbed land. The following erosion and sediment control measures will need to be installed in addition to the measures described in the section above:

- Construction of temporary diversion drains to divert water to sediment basins.
- Construction of temporary diversion drains to divert water to protect bioretention and treatment devices as required.
- Sediment barriers to be installed on all entrances to newly constructed stormwater infrastructure (i.e. gully pits).
- Sediment fences to be installed on the downstream side of any stockpiles and batters; and
- Re-vegetation of all disturbed areas.

All erosion and sediment control measures are to be designed and installed in accordance with IECA Guidelines. Further details regarding the proposed erosion and sediment control measures will be provided during the detailed design phase of the development.

12.3 Maintenance

All erosion and sediment control devices are to be maintained through the entire phase of the development leading up to the operational phase. Erosion and sediment control devices will need to be monitored closely throughout the entire project to ensure they are operating correctly and efficiently. No erosion and sediment control devices are to be removed unless otherwise authorized by a suitably qualified engineer or the site superintendent.

13 Backfilling of Temporary Shaft and Adits

The project site currently comprises a 14m diameter circular access shaft that extends approximately 35 metres below ground, and two temporary adits that provide construction access from the shaft to the Albert St cavern. Both the shaft and adits are temporary and therefore are required to be backfilled upon completion of the CRR works. All are also required to be disconnected from the Albert St cavern as part of the CRR works.

We recommend that the adits and shaft backfilled with a cementitious material of similar stiffness to the adjacent ground for materials located below the base of excavation (i.e. below RL -5m AHD) and engineered fill for materials above RL -5m AHD. A summary of recommended backfill material properties is presented in Table 16. Note that care would be required during backfilling to ensure all voids are filled.

Table 16 – Backfill Recommendations

Elevation Range	Expected Geotechnical Unit	Recommended Young's Modulus Range (MPa)
RL -5m to RL 4m	AL	10 to 20
RL -10m to RL -5m	RS / NFG 5	30 to 50
RL -15m to RL -10m	NFG 3	500 to 1,500
RL -30m to RL -15m	NFG 2 / 1	5,000 to 10,000

14 Construction Comments

The geotechnical aspects of the works are expected to encounter several challenges during construction. A commentary on construction issues / requirements identified at this stage is provided in the following sections.

14.1 Piling

Piles associated with the retention system are expected to be drilled through fill, alluvium, residual soil and extremely weathered material. It has been indicated by RBG that the retention piles will be reinforced concrete bored piles. Considering the relatively low strength and stiffness of the fill and alluvium, it is likely that the pile holes may collapse unless supported by pile liners, which could be either temporary or sacrificial. As an alternative to bored piles, it may be feasible to install the retention piles using Continuous Flight Auger (CFA) methods, that would mitigate the risk of pile hole collapse due to the method of installation. Building foundation piles are expected to be bored piles and will require (either temporary or permanent) liners.

All piles should be logged during construction to verify that the encountered materials satisfy the design requirements, and particularly for the permanent foundation piles that the required pile axial capacity has been achieved. Pile logging must be carried out by a suitably qualified and experienced geotechnical professional. We expect that video cameras would be required to confirm socket materials and cleanliness.

We recommend that pile load testing is carried out during the works to confirm the axial capacity of the piles. Specialist advice from a pile testing contractor should be sought to confirm the requirements associated with carrying out pile testing on site.

We anticipate that piling would be carried out from either the existing ground level or from the base of excavation level. Should piling be carried out from existing ground level, it may be possible to use the existing acoustic shed slab to support the piling rig track pressures, subject to assessment and approval by the temporary works engineer. If piling is be carried out from the base of excavation level, an assessment of the subgrade must be carried out by the temporary works engineer and if required a temporary piling platform would need to be designed and constructed.

The project site contains several buried structures associated with CRR temporary works. These structures include a 14m diameter, approximately 30m deep circular access shaft, two temporary construction adits that provide access between the temporary shaft and the Albert St cavern, and several reinforced concrete piles that currently support the temporary acoustic shed.

It is possible that some proposed building foundation piles may clash with this existing buried infrastructure. Specialist advice from a piling contractor should be sought to assess the ability of typical piling equipment to penetrate through those obstructions, however, we highlight the following key points based on our understanding of the CRR construction details:

- The arrangement of building foundations should aim to (where possible) avoid buried infrastructure.
- As discussed in Section 13, backfilling of the temporary shaft and adits should use backfill materials of similar stiffness to the adjacent ground, however the strength of the backfill should be limited (if possible) to reduce drilling resistance.
- Piling through unreinforced cementitious materials is expected to be achievable with conventional piling equipment, however the penetration rates may be reduced compared to drilling through natural rock units.
- Piling through concrete reinforced with steel of polypropylene fibres is expected to be as achievable with conventional piling equipment as for unreinforced concrete.
- Piling through concrete reinforced with steel bars or steel mesh is expected to be difficult and specialist advice from a piling contractor must be sought.

Diagram 6 shows the primary support details for the temporary adits. Two support classes are shown which comprise either, a relatively thin layer of shotcrete combined with steel rock bolts (Support Type 1&2), or a thicker layer of shotcrete without any rock bolts (Support Type 3A and 3B).

As mentioned above, piling through the shotcrete (as per Support Type 3A and 3B) is expected to be achievable, however it is expected that it will be difficult to achieve penetration should the piling rig clash with the steel rock bolts included in Support Type 1 and 2.

Nomination of tunnel face support types to be installed was based on the results of construction phase mapping of the tunnel face. We recommend that the construction mapping records are requested from CBGU so that we can confirm what support type was constructed along the length of the temporary adits. Specialist advice from a piling contractor must be sought to understand the ability of the piling equipment to penetrate a zone reinforced with steel rock bolts.

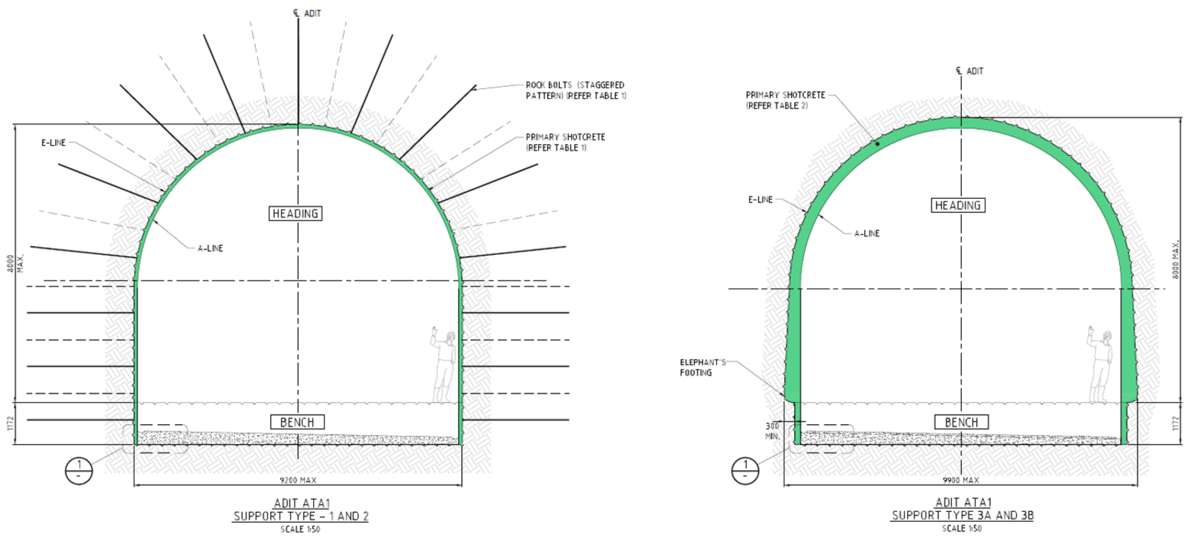

Diagram 6 – Adit Support Details

14.2 Shotcreting

Shotcrete is to be sprayed between the soldier piles that form the walls of the retention system. Excavation of the basement would be carried out in stages, such that each excavation stage is followed by application of shotcrete. The vertical height of each excavation stage must be limited such that materials in between the soldier piles do not become unstable. At this stage we anticipate that the excavation heights would be limited to approximately 1.5 metres. However, it may be possible to increase the excavation height, depending on the observed performance of the materials between the soldier piles during construction.

14.3 Shallow Footings

Several shallow footings are to be constructed to support the permanent building loads. Following excavation of the footings, geotechnical assessment must be carried out by an experienced geotechnical professional to verify that the design requirements have been achieved. The assessment process would likely comprise visual and tactile assessment along with in-situ testing.

14.4 Basement Slab

The finished level for the basement slab will be at RL -5m AHD, whereas the base of excavation is expected to be approximately RL -6m AHD. As discussed in Section 3.5, at this stage we estimate that the groundwater level would be approximately between RL -5m AHD to RL -10m AHD. Should the groundwater level be above or close to the base of excavation level, local dewatering measures may be required. Further assessment of groundwater levels will be carried out during detailed design and following completion of the additional geotechnical investigation.

15 Contaminated Land

Several of the available historical geotechnical investigation reports have included acid sulphate soil testing and have provided a commentary and interpretation of the results. Those reports are summarised in Table 17.

Table 17 – Backfill Recommendations

Report	Date	Summary of Acid Sulphate Soil Assessment
Geotechnical Investigation, River City Apartments, 79 Albert Street (Golder Associates Pty Ltd)	April 2001	Dark grey alluvial clay is potentially acid forming. Testing indicates a total potential acid of 25 to 30 mole/tonne. QASSIT Guidelines (1998) suggest a maximum total potential acid of 18 mole/tonne for soil quantities in excess of 1000 tonnes. Removal of dark grey alluvial clay will require an earthworks management plan and disposal off site to a controlled landfill.
Geotechnical Investigation, Festival Towers Development, Corner of Charlotte and Albert Streets (Butler Partners Pty Ltd)	April 2004	Field screening tests for acid sulphate soil were carried out on 25 Fill and Alluvial soil samples. The results of the screening tests indicate that the Fill samples tested do not appear to be acid sulphate soils, however, the screening tests strongly indicate that the underlying Alluvial dark grey Silty/Sandy Clays may be acid sulphate soil. Three samples of Alluvial Soil were selected and submitted to a laboratory for Total Acid Acidity and Chromium Reducible Sulfur analyses. Based on the results of the laboratory tests, the Alluvial Soil are considered to be acid sulfate soils and will require treatment to neutralize the acid generating potential.

Based on the information presented above we anticipate that the fill may contain potentially acid forming material, whereas it is likely that the alluvium will contain acid forming material. Construction phase sampling and testing will be required during excavation.

EDG has been advised that Contaminated Land (CL) and Acid Sulfate Soils (ASS) have been assessed during the Albert Street Station works for Cross River Rail Project as documented in:

- Cross River Rail Albert Street Stations: Soil Investigation and Waste Classification Status Update – AoPC_06B dated March 2020 by EMM;
- Cross River Rail Assessment of Overburden in Albert Street Station, AoPC_06B dated August 2020 by EMM.

EDG should be provided confidentiality clearance to review these, and any other available relevant documents.

16 Geotechnical Investigations

The advice presented in this document has considered the available geotechnical investigation data which predominantly is located outside of the boundary of the proposed development site. Additional geotechnical investigations will therefore be required to verify the geotechnical conditions considered in the building design, and will be carried out following completion of the CRR works and removal of the acoustic shed.

The actual scope of the additional geotechnical investigation will be confirmed during the detailed design phase, however is expected to comprise approximately five to ten rotary cored boreholes and in-situ and laboratory testing to provide information on soil and rock strength and stiffness parameters, groundwater levels and confirm properties of the adit and shaft backfill material.

17 Risks and Limitations

There are several key geotechnical risks that are identified at this stage and will be investigated further in the detailed design stage. A commentary on key geotechnical risks and limitations associated with this stage of geotechnical assessment is provided In Table 18.

Table 18 – Risks and Limitations

Issue	Discussion
Interpretation of ground conditions	The majority of the available geotechnical investigation data is from outside of the site extents and therefore we have assessed the ground conditions within the site based an interpretation of the nearby data. To help reduce uncertainty and risk associated with the interpretation of ground conditions, an additional geotechnical investigation will be carried out once the CRR work are complete and the site is handed over to QIC.
Groundwater levels	At this stage, we have been provided with limited information relating to site groundwater levels. During subsequent design stages, it is required to gain a better understanding of the local groundwater conditions to develop the retention system design, B2 basement slab design and better understand temporary and permanent groundwater control measures. Definition of site groundwater levels would be a key requirement of the additional geotechnical investigation. We are also currently seeking additional site groundwater information associated with the CRR project and will incorporate relevant information in the detailed design.
Surface settlements behind retention system	Note that the retaining wall analysis carried out at this stage is limited to calculation of wall movements only, and therefore ground surface settlements outside of the retention system have not been assessed at this stage. Ground surface settlements will be assessed during the detailed design stage for assessment of the performance of any sensitive buried infrastructure.
Ground-borne vibrations affecting Cavern	This assessment has provided preliminary estimates of ground-borne vibrations associated with the anticipated construction activities, which are based on published empirical data. Note that due to the complexity and uncertainty of the variables involved, including attenuation properties of soils, distance from source, the variability of the energy applied to the ground when boring through different materials, the estimates of ground-borne vibration are imprecise. Should any of the vibration profiles presented above be in excess of the nominated limits, we would recommend that specialist advice is sought on ground-borne vibrations relating to the specific site details and proposed construction equipment be sought during the detailed design stage. Construction stage work may include monitoring of vibrations on-site associated with bored piling and rock excavation activities and re-calibrating the vibration levels for the observed measurements.
Piling obstructions	As discussed in Section 14, it is possible that there are steel buried rock bolts beneath the site associated with the primary support for the temporary adits. The presence of steel rock bolts in pile locations is expected to create difficulties associated with drilling to the nominated pile toe depths. We recommend that QIC seeks advice from a specialist piling contractor regarding piling through the buried CRR temporary infrastructure and also obtains construction records that confirm the type of primary support installed within the temporary adits.

Issue	Discussion
Bearing capacity and stiffness of shallow footings	The available geotechnical investigation data suggests some variability in soil strength and stiffness at that proposed elevation of the base of the shallow footings along the Albert St side of the site. We will therefore further investigate parameters affecting the capacity and stiffness or shallow footings during the additional geotechnical investigation.
ASS in Alluvium	Interpretation of the available geotechnical investigation data suggests that the alluvium is PASS. We therefore recommend that QIC obtains records of the construction phase environmental sampling and testing associated with excavation of the CRR Albert St Lot 2 temporary shaft.

For and on behalf of EDG Consulting Pty Ltd

David Cunliffe
Principal

Ground conditions and the natural environment often present the highest potential risks to project construction and operation. Helping our clients manage their geotechnical risk is fundamental to the role of EDG. We have prepared these notes to assist our clients to understand the information we provide and to help them to manage their risk. Where there is uncertainty about the site, project or geotechnical conditions, contact EDG for assistance.

Scope of Services

The information provided in this document is based on the scope of services defined in the client's agreement with EDG Consulting Pty Ltd (EDG). In undertaking the work, EDG has relied on information provided by the client and other individuals and organisations. Unless stated in the document, EDG has not verified the accuracy of that information and does not accept responsibility for the conclusions, recommendations or designs developed based on that information should it be incorrect, misrepresented or withheld.

Unless specifically stated to the contrary, this document does not cover geo-environmental issues, which require significantly different equipment, techniques and personnel. A geo-environmental specialist should be engaged to provide such advice.

The document is based on specific project details

The information provided in this document is relevant to the subject site and project only. The document has been prepared based on the specific details and requirements of your project and may not be relevant if any changes to the project occur. Should changes occur, must review the report to identify if and how such changes will affect the conclusions, recommendations or designs provided. EDG accepts no responsibility if the client elects not to consult in the event of changes to the project.

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Should you choose to engage an alternative party for advice based on the information in the document, it must be understood that the alternative party will be less familiar with the site conditions and basis of information provided, and there is a potential for misinterpretation. EDG will not be held liable in any way from such misinterpretation.

EDG will not be liable to update or revise the document to take into account information any events or circumstances or facts occurring or becoming apparent after the date of the report.

All site conditions cannot be identified

The scope of work undertaken represents a professional assessment of the information cited to develop a basic geotechnical model of the site based on EDG's understanding of the client's risk profile. In some cases, increasing the frequency of investigations and/or sampling, or considering alternative investigation techniques may improve the interpretation, but may not identify all relevant subsurface conditions at the site.

The document presents an interpretation

Geotechnical information is an interpretation of conditions evident based on a limited number of facts established during a site investigation. Engineering logs are an interpretation of observations of samples and test results at discrete locations in the subsurface profile. A geotechnical model is an interpretation of site conditions, developed using information from discrete locations on the site and an understanding of geological processes. Interpreted conditions at and between investigation locations may be different to those inferred on the engineering logs and geotechnical model. The client must consider how variations in conditions could affect the project and seek advice to reduce risk if it is unacceptable to the client.

Conditions can change

The geotechnical information provided is based on the conditions observed at the time of the investigation. Such conditions may be time dependent and subject to external influences. Many things could influence the site conditions, including geological processes, variation in groundwater or surface water levels, other natural cycles and influence from human activities (on this site or nearby sites). Specific advice should be sought if conditions on site change from those observed at the time the report was prepared.

How to deal with different site conditions

The sub-surface conditions on the site may not be as inferred in this report. Geotechnical uncertainties can be managed throughout the project life cycle, but particularly during construction.

Knowledge of site conditions must be further developed as the ground is exposed during construction and/or operation. It is essential that the client implements the nominated design and construction requirements, including observation, interpretation and assessment of the exposed conditions during construction and operation using skilled staff familiar with the design assumptions and assumed geotechnical conditions, or engaging EDG to undertake this role on your behalf. EDG will not be held liable in any way from such misinterpretation.

Appendix A

Available Geotechnical Investigation Data

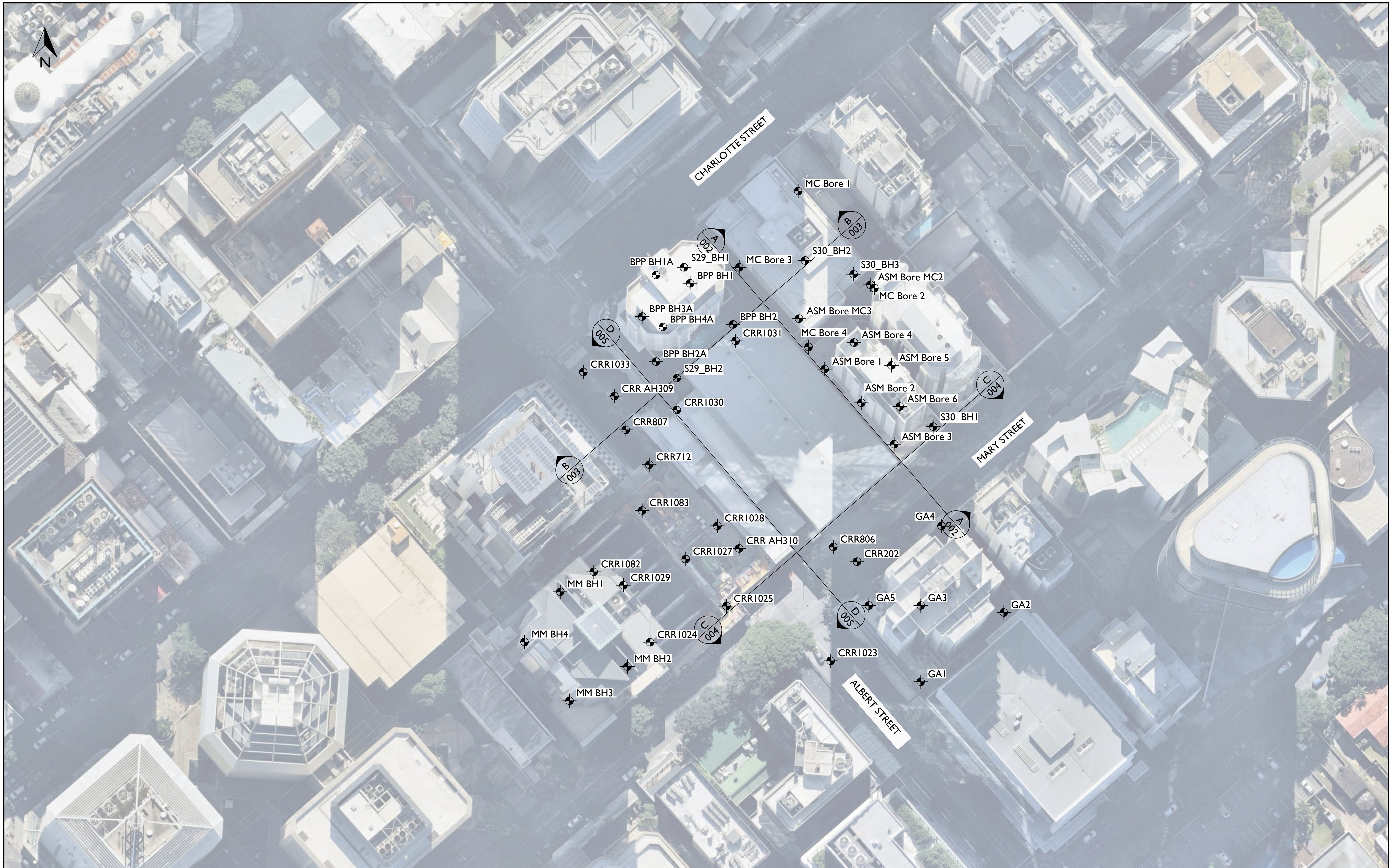
Table A1 – Summary of Borehole Logs

Borehole ID	Borehole Top RL (mAHD)	Total Depth (m)	Date Drilled
ASM Bore 1	4.4	22.7	November 2006
ASM Bore 2	4.4	3.5	November 2006
ASM Bore 3	4.2	22.6	November 2006
ASM Bore 4	4.2	12	November 2006
ASM Bore 5	4.2	3.5	November 2006
ASM Bore 6	4.2	12	November 2006
ASM Bore MC2	4.3	13	September 1999
ASM Bore MC3	4.3	15	September 1999
BPP BH1	3.76	18.25	January 1997
BPP BH1A	4	15	April 1986
BPP BH2	3.95	19	January 1997
BPP BH2A	4	12	April 1986
BPP BH3A	4	0.8	April 1986
BPP BH4A	4	4.5	April 1986
CRR AH309	3.742	5.45	September 2020
CRR AH310	3.766	5.45	May 2020
CRR1023	3.849	40.4	May 2020
CRR1024	5.045	60	February 2020
CRR1025	3.985	54	May 2020
CRR1027	3.891	88.1	April 2020
CRR1028	3.759	44.2	April 2020
CRR1029	2.62	59	April 2020
CRR1030	3.7	44	February 2020
CRR1031	2.95	44.4	January 2020
CRR1033	3.728	40.44	January 2020
CRR1082	5.264	55.45	March 2020
CRR1083	3.796	57.5	April 2020
CRR202	4	45.07	October 2010
CRR712	3.9	39.14	October 2017
CRR806	3.69	50.4	May 2018
CRR807	3.76	51.3	April 2018
GA1	4.5	15.07	January 2001
GA2	4.3	22.2	January 2001
GA3	4.1	16.03	February 2001

Borehole ID	Borehole Top RL (mAHD)	Total Depth (m)	Date Drilled
GA4	4	18.5	February 2001
GA5	4.3	15.3	February 2001
MC Bore 1	4.5	10.05	September 1999
MC Bore 2	4.3	13	September 1999
MC Bore 3	4.2	15.02	September 1999
MC Bore 4	4.2	13	September 1999
MM BH1	4.3	24.5	June 2004
MM BH2	4.7	17	July 2004
MM BH3	6.1	22.2	July 2004
MM BH4	3.6	15.6	June 2004
S29_BH1	4	15	Unknown
S29_BH2	4	12	Unknown
S30_BH1	4	19.5	Unknown
S30_BH2	4	16.6	Unknown
S30_BH3	4	17.3	Unknown

Appendix B

Interpreted Geological Sections



A	INITIAL ISSUE	DL	30/09/2022	SP
	Revisions/Descriptions	Drawn	Date	Approved

Dwg_Filename.dwg

SURVEY DATA

Coordinate System

Height Datum

Base Plan

1:1000 0 12.5 25m

Dimensions shown in metres except where shown otherwise

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

Drawn	DL
Checked	SP
Designed	DL
Verified	SP

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QUEENSLAND INVESTMENT CORPORATION
ALBERT STREET DEVELOPMENT
BRISBANE
PLAN

Job No.	B01493-01	
DRG No.	B01493-01_B1	A
Client Ref.	Client Ref.	

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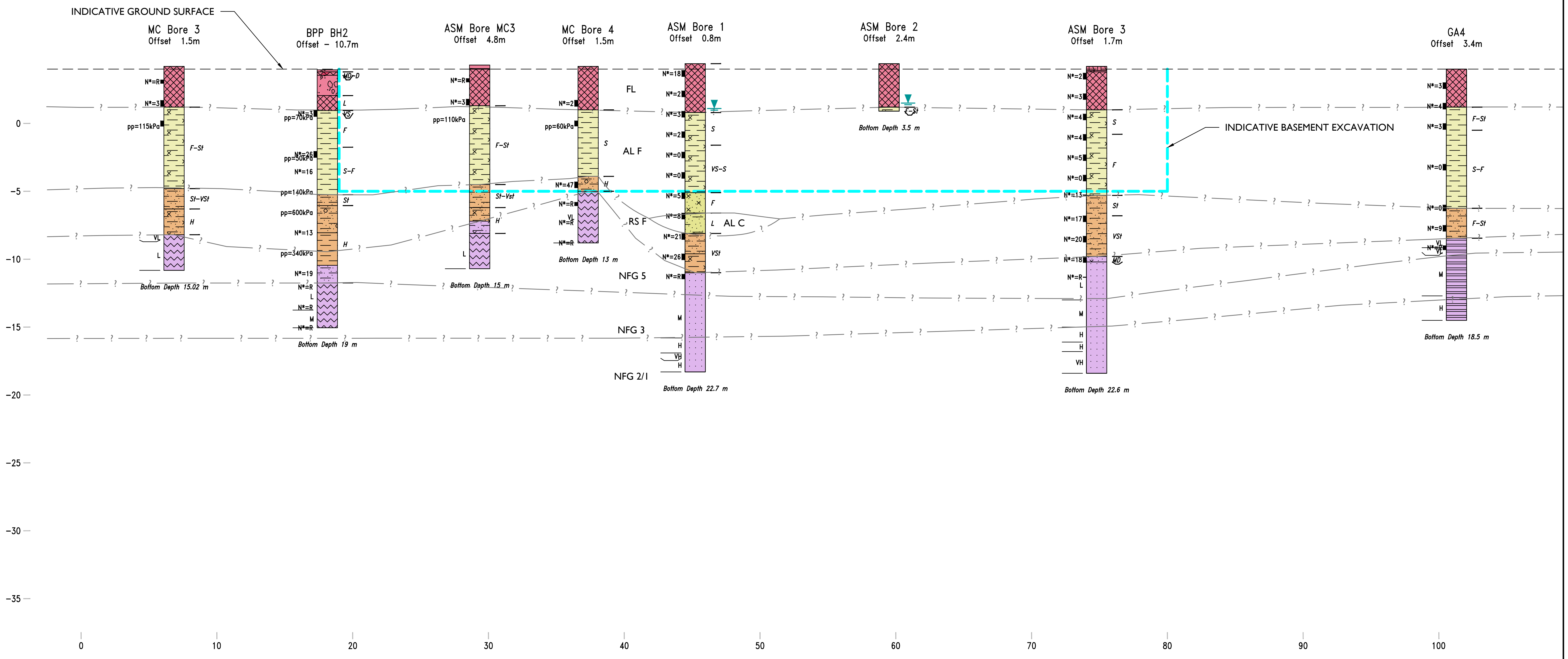

LEGEND

▼ Water Level	FILL	SANDY CLAY	SILTY SAND	CLAY	CORE LOSS	FL
N*=17 Standard Penetration Test Results	SILTY CLAY	GREYWACKE	GRAVEL	PHYLLITE	GRAVELLY CLAY	RS F
IV Rock Classification (Pells et al, 1998)	SANDY SILT	TOPSOIL	CLAYEY GRAVEL	SILTY SANDY CLAY		AL F/AL C
XW Weathering (see Explanation Sheets)	CLAYEY SAND	CONCRETE	ASPHALT	SANDY GRAVELLY CLAY		NFG

A	INITIAL ISSUE	DL	30/09/2022	SP
	Revisions/Descriptions	Drawn	Date	Approved

Dwg_Filename.dwg

SURVEY DATA

Coordinate System

Height Datum

Base Plan

1:300 0 3.75 7.5m

Dimensions shown in metres except where shown otherwise

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

Drawn	DL
Checked	SP
Designed	DL
Verified	SP

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BRISBANE
SECTION A - NORTH EAST

Job No.	B01493-01	
DRG No.	B01493-01_B2	A
Client Ref.	Client Ref.	

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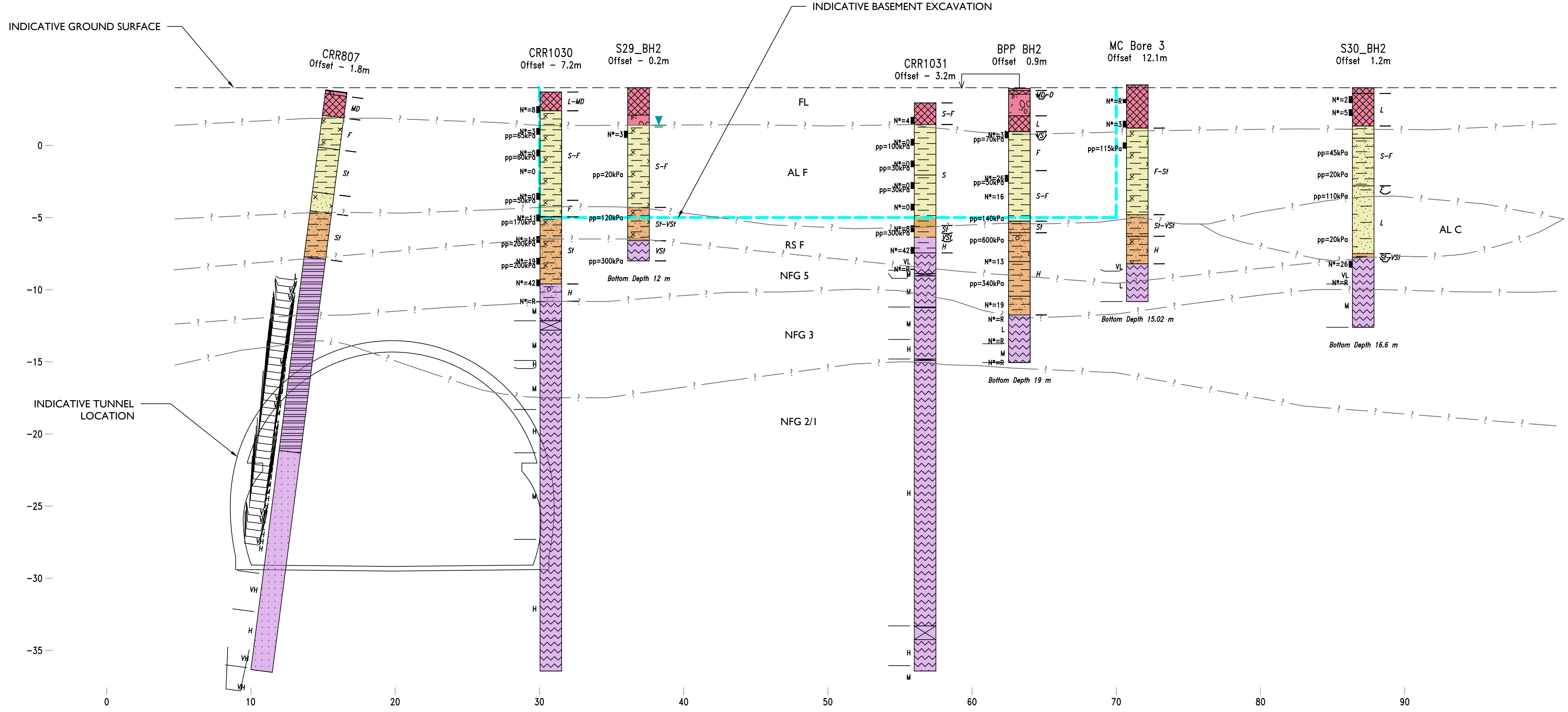

LEGEND

▼	Water Level
N*=17	Standard Penetration Test Results
IV	Rock Classification (Pells et al, 1998)
XW	Weathering (see Explanation Sheets)

ASPHALT
FILL
SILTY CLAY
SANDY CLAY
SILTY SANDY CLAY
PHYLLITE
CONCRETE
CLAY
GRAVELLY CLAY
CLAYEY SAND
SANDY SILTY CLAY
SANDY GRAVELLY CLAY
GRAVELLY SANDY CLAY
CORE LOSS
SILTY SAND
ARGILLITE
GREYWACKE
BITUMINOUS SEAL

FL
RS F
AL F/AL C
NFG

Rev	Revisions/Descriptions	Drawn	Date	Approved
A	INITIAL ISSUE	DL	30/09/2022	SP

SURVEY DATA
Coordinate System
Height Datum
Base Plan

1:300 0 3.75 7.5m

Dimensions shown in metres except where shown otherwise
ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

Drawn	DL
Checked	SP
Designed	DL
Verified	SP

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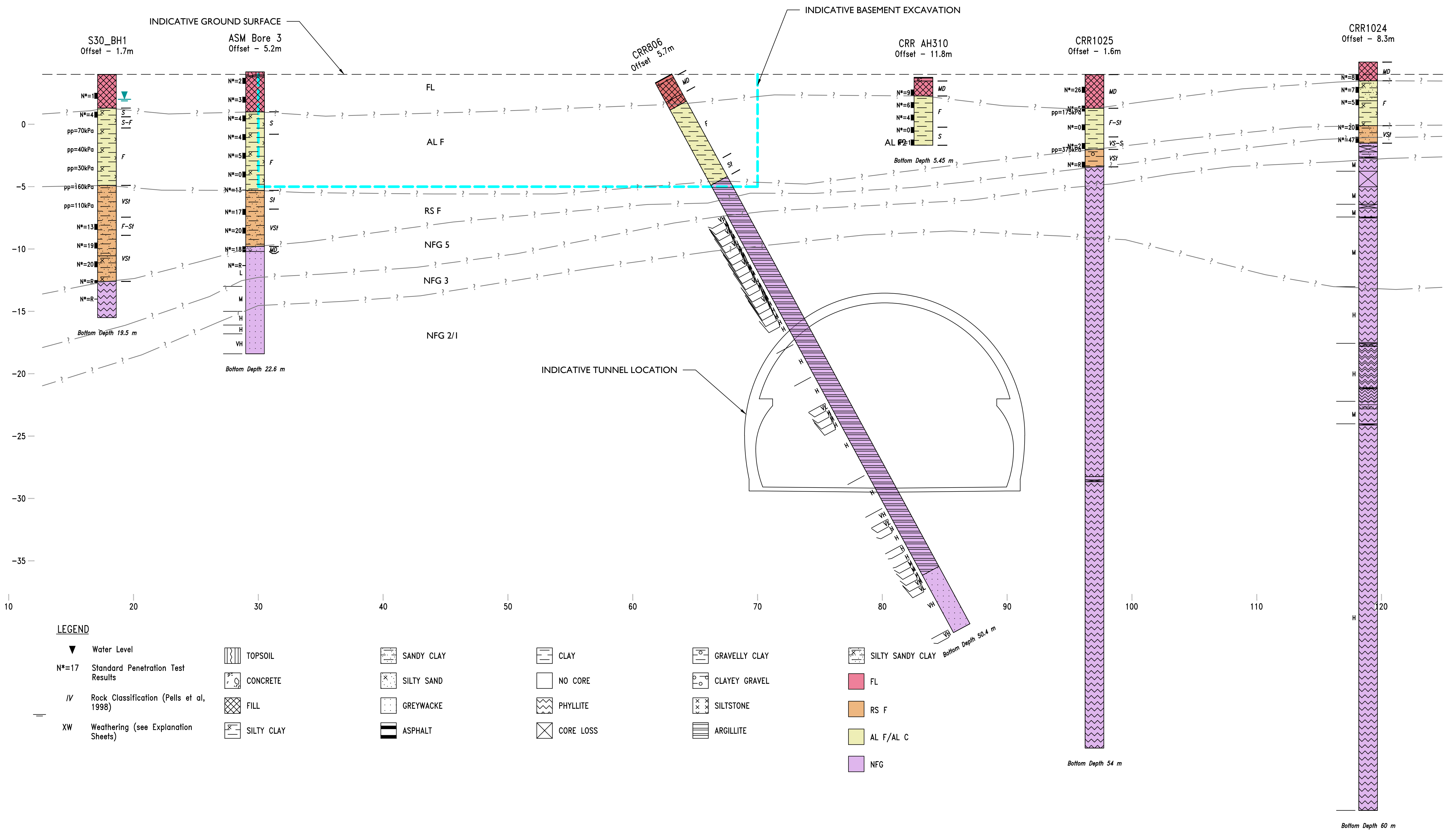
ALBERT STREET DEVELOPMENT
BRISBANE
SECTION B - NORTH WEST

Job No.	B01493-01	
DRG No.	B01493-01_B3	A
Client Ref.	Client Ref.	

File Location: F:/Projects/B01017-1......

Dwg_Filename.dwg



A	INITIAL ISSUE	DL	30/09/2022	SP
	Revisions/Descriptions	Drawn	Date	Approved

Dwg_Filename.dwg

SURVEY DATA

Coordinate System

Height Datum

Base Plan

1:300 0 3.75 7.5m

Dimensions shown in metres except where shown otherwise

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

Drawn	DL
Checked	SP
Designed	DL
Verified	SP

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QUEENSLAND INVESTMENT CORPORATION
ALBERT STREET DEVELOPMENT
BRISBANE
SECTION C - SOUTH EAST

Job No.	B01493-01	
DRG No.	B01493-01_B4	A
Client Ref.	Client Ref.	

File Location:
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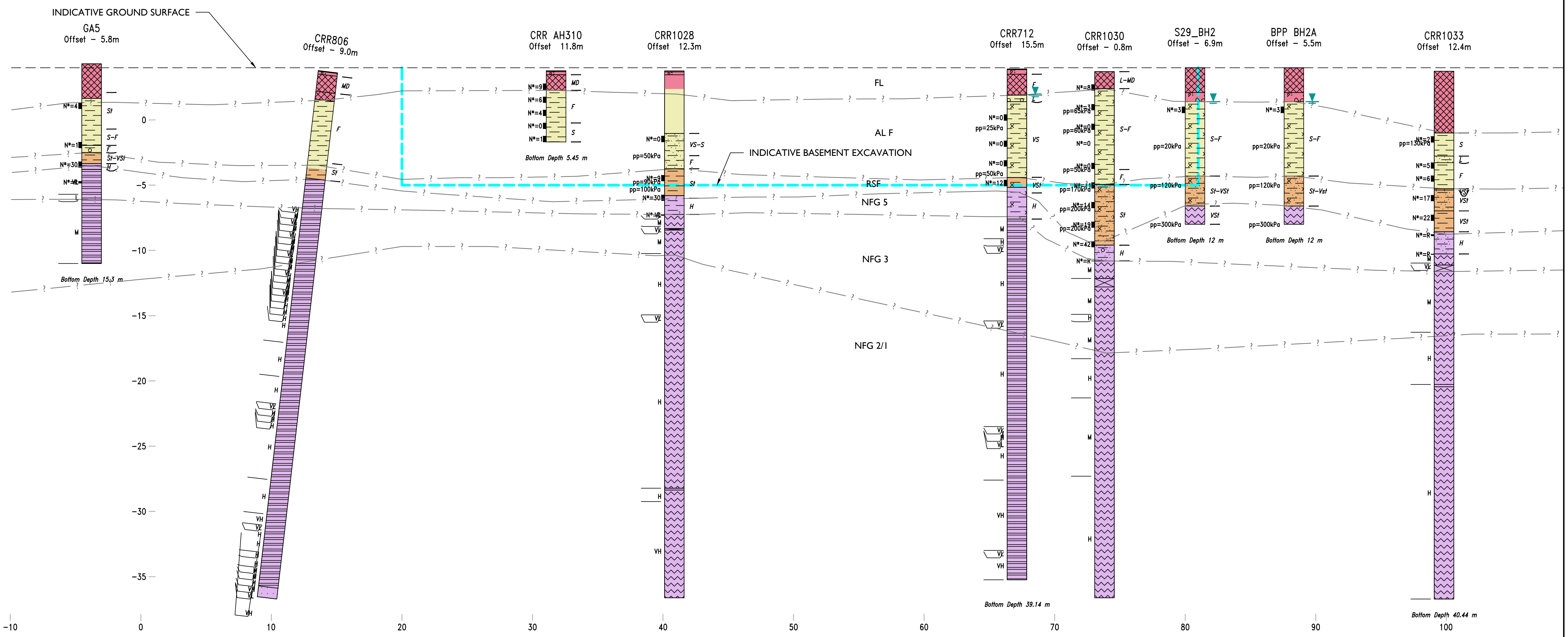

LEGEND

- ▼ Water Level
- N*=17 Standard Penetration Test Results
- IV Rock Classification (Pells et al, 1998)
- XW Weathering (see Explanation Sheets)

ASPHALT	NO CORE	GRAVELLY CLAY	CLAYEY GRAVEL	GREYWACKE	FL
CONCRETE	SANDY CLAY	SILTY CLAY	SILTSTONE	SILTY SANDY CLAY	RS F
FILL	PHYLLITE	SANDY SILTY CLAY	ARGILLITE		AL F/AL C
CLAY	CORE LOSS	GRAVELLY SANDY CLAY	SILTY SAND		NFG

A	INITIAL ISSUE	DL	30/09/2022	SP
	Revisions/Descriptions	Drawn	Date	Approved

Dwg_Filename.dwg

SURVEY DATA

Coordinate System

Height Datum

Base Plan

1:300 0 3.75 7.5m

Dimensions shown in metres except where shown otherwise

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

Drawn	DL
Checked	SP
Designed	DL
Verified	SP

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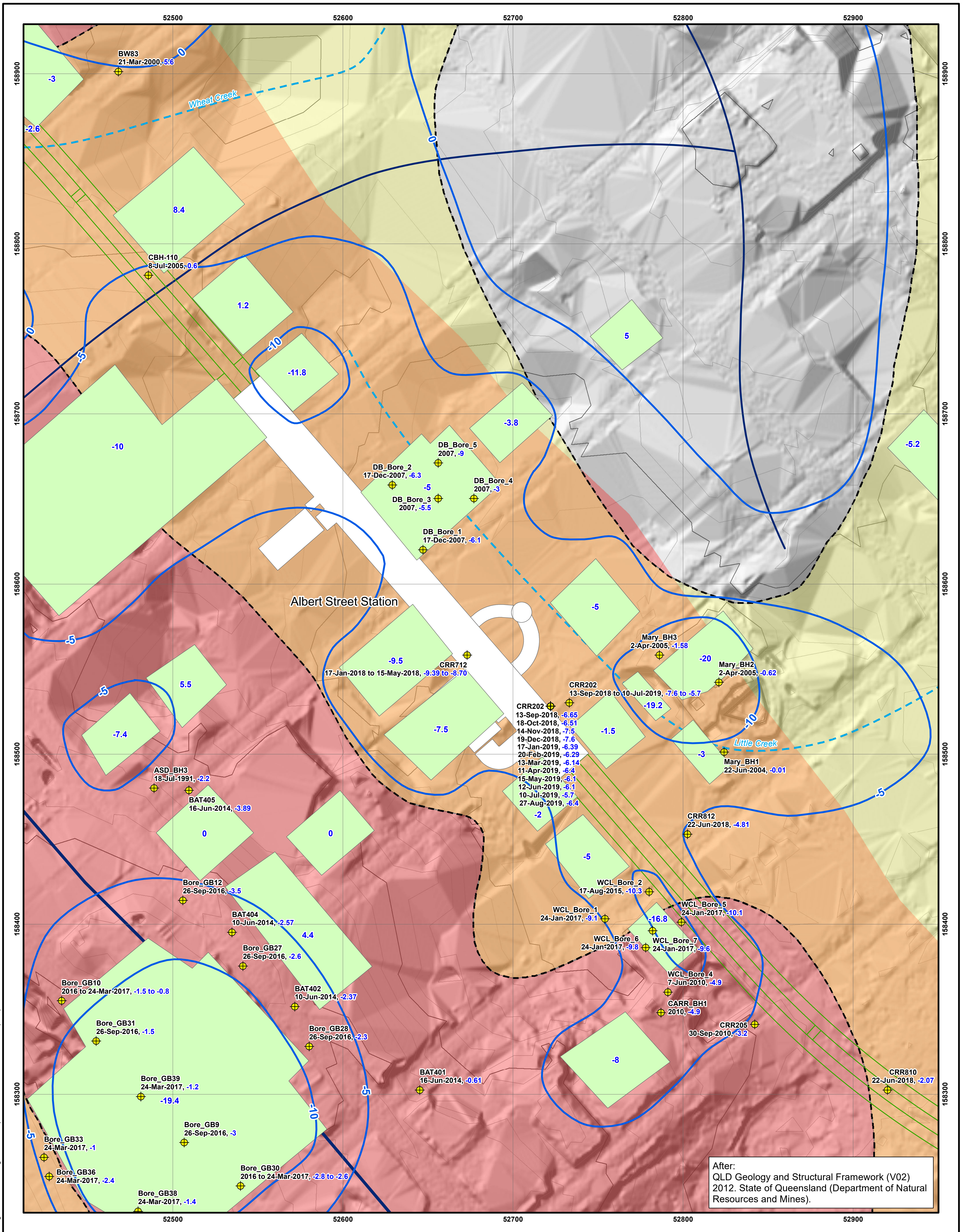
QUEENSLAND INVESTMENT CORPORATION
ALBERT STREET DEVELOPMENT
BRISBANE
SECTION D - SOUTH WEST

Job No.	B01493-01	
DRG No.	B01493-01_B5	A
Client Ref.	Client Ref.	

File Location:
F:/Projects/B01017-1......

Appendix C

Groundwater Monitoring and Modelling Summary



Legend

- Borehole
- -2.4 Interpreted Groundwater Heads (m AHD)
- Interpreted Water Table Contours (m AHD)
- Project Alignment
- Cavern and Shaft Excavation
- Inferred Original Drainage
- Catchment Divide
- Sub-catchment Divide
- Topography Contours
- Alluvium
- Unconformity Zones
- Inferred Normanby Fault Zone - Outcrop in NFG
- -9.5 Basements and Bottom Elevations (m AHD)

N

Scale 1:2,000

0 12.5 25 50 75 100 m

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 BCSG02

PSM

Created By: MB	Revision: B2
Date: 18 Mar 2020	Paper Size: A3

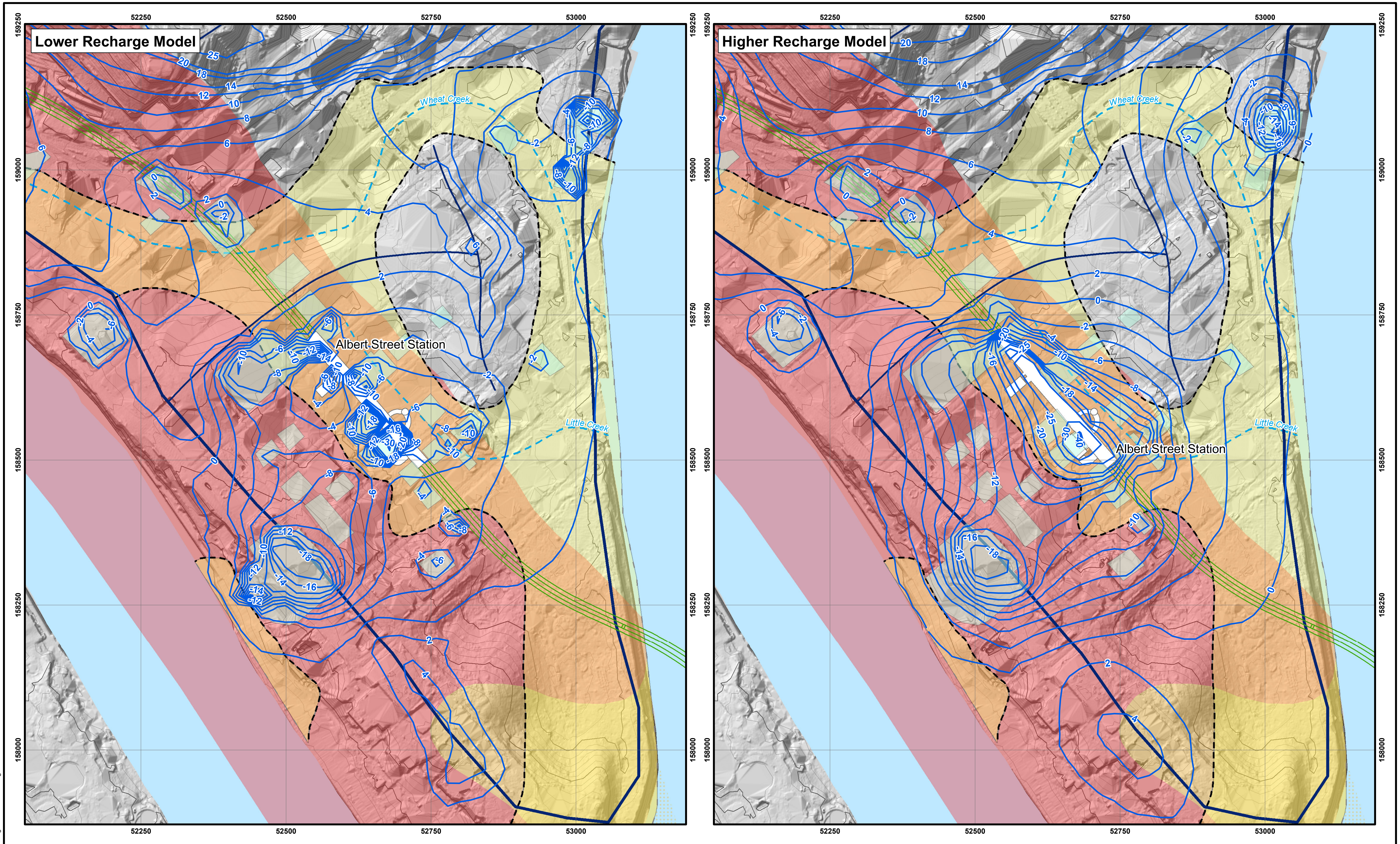
CPB Ghella Bam UGL
Hydrogeological Interpretive Report
Cross River Rail

INTERPRETED GROUNDWATER HEAD CONTOURS (2020) AT ALBERT STREET STATION

CRRTSD-000-0354-DPK-PSMQ-1120-000100

Figure A107

X:\ArcGIS_Working\PSM3700 CRR\03_Figures\HR Figures\Revision B2\Figure A107 Interpreted Groundwater Head Contours (2020) at Albert Street Station.mxd



Legend

- Project Alignment
- Cavern and Shaft Excavation
- Inferred Original Drainage
- Catchment Divide
- Sub-catchment Divide
- Topography Contours
- Water Table (m AHD)
- Alluvium
- Unconformity Zones
- Inferred Normanby Fault Zone - Outcrop in NFG
- Southeast Projection of Normanby Fault Zone - Subcrop beneath Alluvium, Brisbane Tuff and Aspley Formation
- River Crossing - Subcrop beneath Aspley Formation
- Basements

After:
QLD Geology and Structural Framework (V02) 2012. State of Queensland (Department of Natural Resources and Mines).

N

Scale 1:6,000

0 0.1 0.2 0.3 Km

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 BCSG02

PSM

Created By:	Revision:
MB	B2
Date:	Paper Size:
11 Mar 2020	A3

CPB Ghella Bam UGL
Hydrogeological Interpretive Report
Cross River Rail

PREDICTED WATER TABLE
AT 100 YEARS
AT ALBERT ST STATION

CRRTSD-000-0354-DPK-PSMQ-1120-000100

Figure A146

X:\ArcGIS_Working\PSM3700 CRR\03_Figures\HIR Figures\Revision B2\Figure A146 Predicted Water Table at 100 Years at Albert St Station.mxd

Appendix D

Geotechnical Parameters

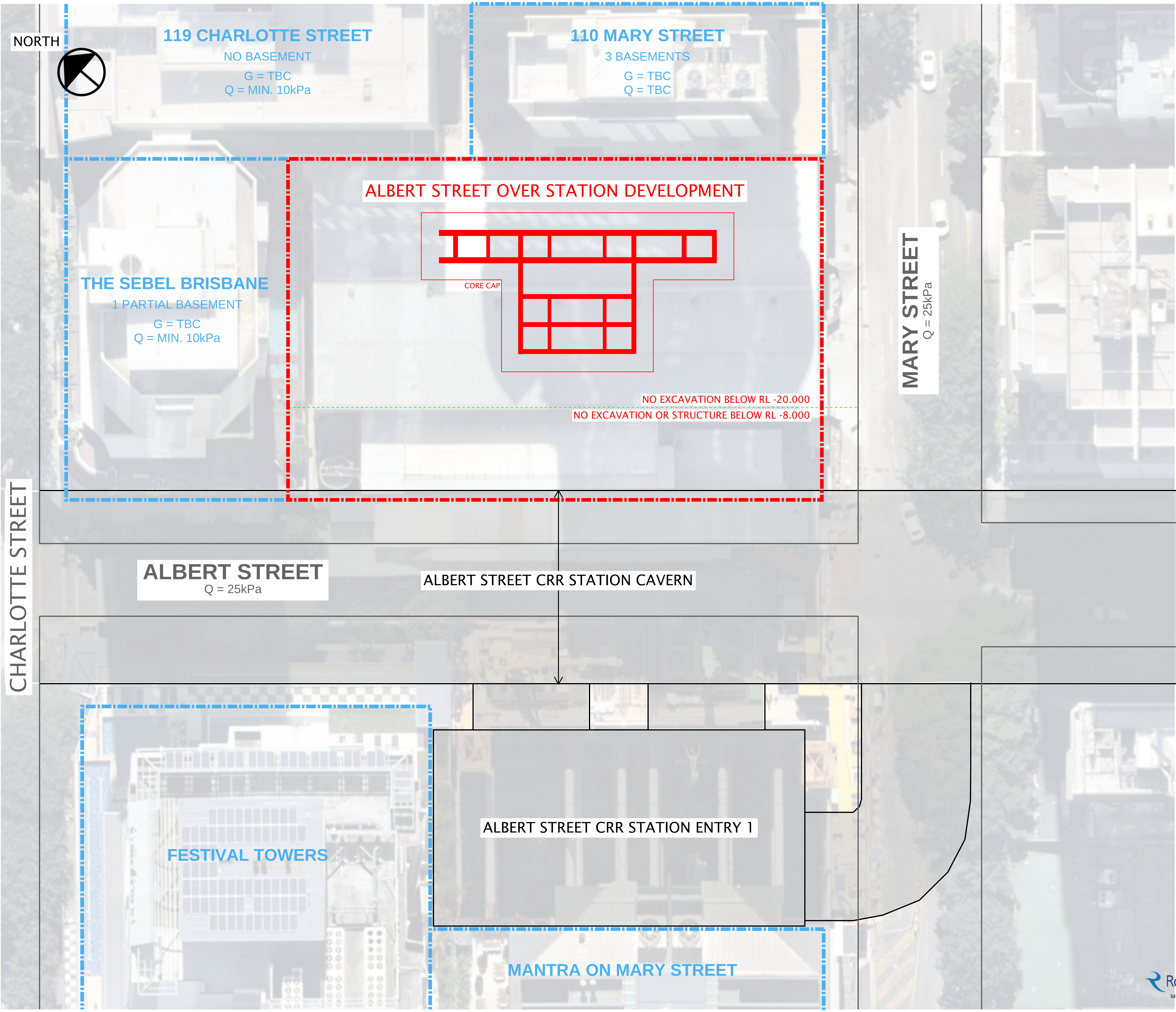
Table D1 – Summary of Material Parameters

Geological Age	Unit	Sub Unit	Materials	Unit Weight	Undrained Shear Strength	Drained Cohesion	Drained Friction Angle	Tensile Strength	Drained Young's Modulus	Drained Poisson's Ratio	Secant Stiffness in Standard Drained Triaxial Test [1]	Tangent Stiffness for Primary Oedometer Loading [1]	Unloading / Reloading Stiffness [1]	Over Consolidation Ratio	At Rest Earth Pressure Coefficient [2]	Vertical Coefficient of Permeability	Horizontal Coefficient of Permeability
				(kN/m^3)	s_u (kPa)	c' (kPa)	θ' (degrees)	σ_t (kPa)	E' (MPa)	ν'	E_{50}^{ref} (MPa)	E_{oed}^{ref} (MPa)	E_{ur}^{ref} (MPa)	OCR	K_0	k_v (m/s)	k_h (m/s)
Holocene	Fill	Fill (FL)	Various material including concrete, bricks, granular and fine grained fill	17	N/A	0	25	N/A	10	0.3	N/A	N/A	N/A	N/A	0.7	1E-06	1E-06
	Holocene Alluvium	Holocene Clay (AL F)	Mainly clay (soft to firm)	17	25 + 2z	4	26	N/A	5 + 0.4z	0.3	3.0	2.0	20	1.5	0.7	1E-08	1E-08
Devonian	Neranleigh Fernvale Beds	Residual Soil (RS F)	Mainly clay (stiff to hard)	20	100	10	30	N/A	25	0.3	N/A	N/A	N/A	3.0	1	1E-08	1E-08
		Extremely Weathered Material to Very Low Strength Rock (NFG 5)	Silt and sand sized sedimentary rocks; slightly metamorphosed (typically called greywacke, phyllite, argillite)	23	N/A	20	30	N/A	50	0.3	N/A	N/A	N/A	N/A	1	1E-07	1E-07
		Medium Strength Rock (NFG 3)		27	N/A	250	45	15	1,000	0.2	N/A	N/A	N/A	N/A	1	1E-08	1E-08
		High to Very High Strength Rock (NFG 2/1)		27	N/A	400	55	70	5,000	0.2	N/A	N/A	N/A	N/A	1	1E-08	1E-08

Notes: [1] All stiffness parameters associated with the Hardening Soil Model are presented based on a reference pressure equal to 100 kPa.
[2] Based on $K_0 = (1-\sin(\phi))(OCR)^{\sin(\theta')}$. (Mayne P.W. and Kulhawy F.H., 1982)
[3] The permeability values shown for the rock units do not consider the presence of fault and/or sheared zones.

Appendix E

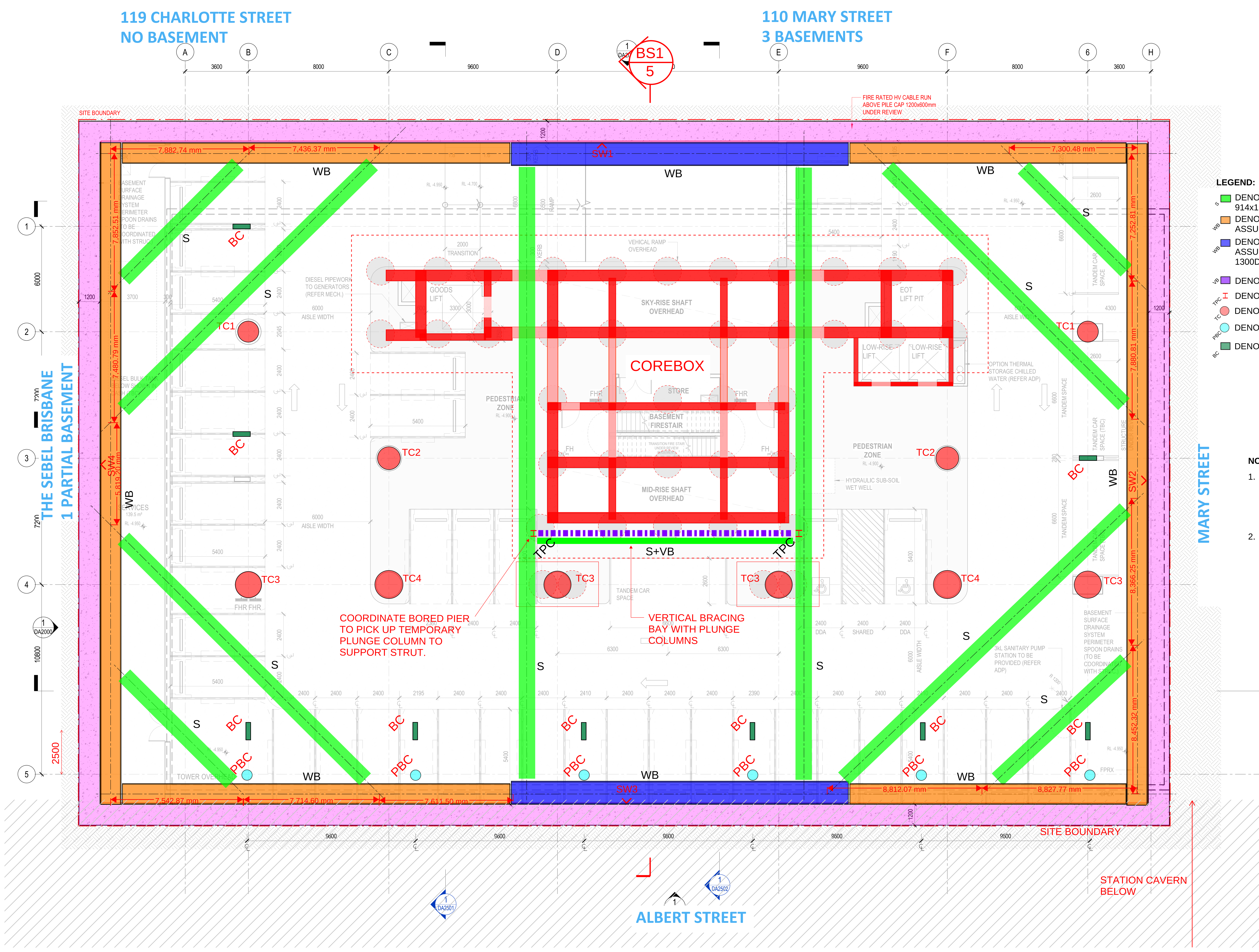
Retention System and Building Foundation Arrangement



SITE PLAN

SCALE: 1:400 @ A3
DESIGNER: MJ/LK

Robert Bird Group
Member of the Surbana Jurong Group



LEGEND:

- DENOTES TEMPORARY STRUT. ASSUME 914x19CHS GR350LO
- DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER 1200WB455 GR400
- DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER FAB I SECTION 1300Dx500Wx60tfx20tw GR400
- DENOTES TEMPORARY VERTICAL BRACING.
- DENOTES TEMPORARY PLUNGE COLUMN
- DENOTES TOWER COLUMN
- DENOTES PODIUM COLUMN
- DENOTES BASEMENT COLUMN

NOTES:

1. INTERNAL STRUTS AND WHALER BEAMS ARE PROPOSED FOR THE TEMPORARY SHORING CONCEPT DUE TO THE SITE CONSTRAINTS AND ADJACENT EXISTING STRUCTURES.
2. FINAL SETOUT OF WHALER BEAMS AND STRUTS SUBJECT TO JUMPFORM AND FORMWORK EXTENT/BUILD REQUIREMENTS.

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date

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project
Albert Street Cross River Rail

phase
Schematic Deign

drawing
LEVEL B2 - CARPARK

drawn
drawing no. short
DA1000

checked
drawing no. long
ALB-ARC-DRW-DA1000

sheet issue date

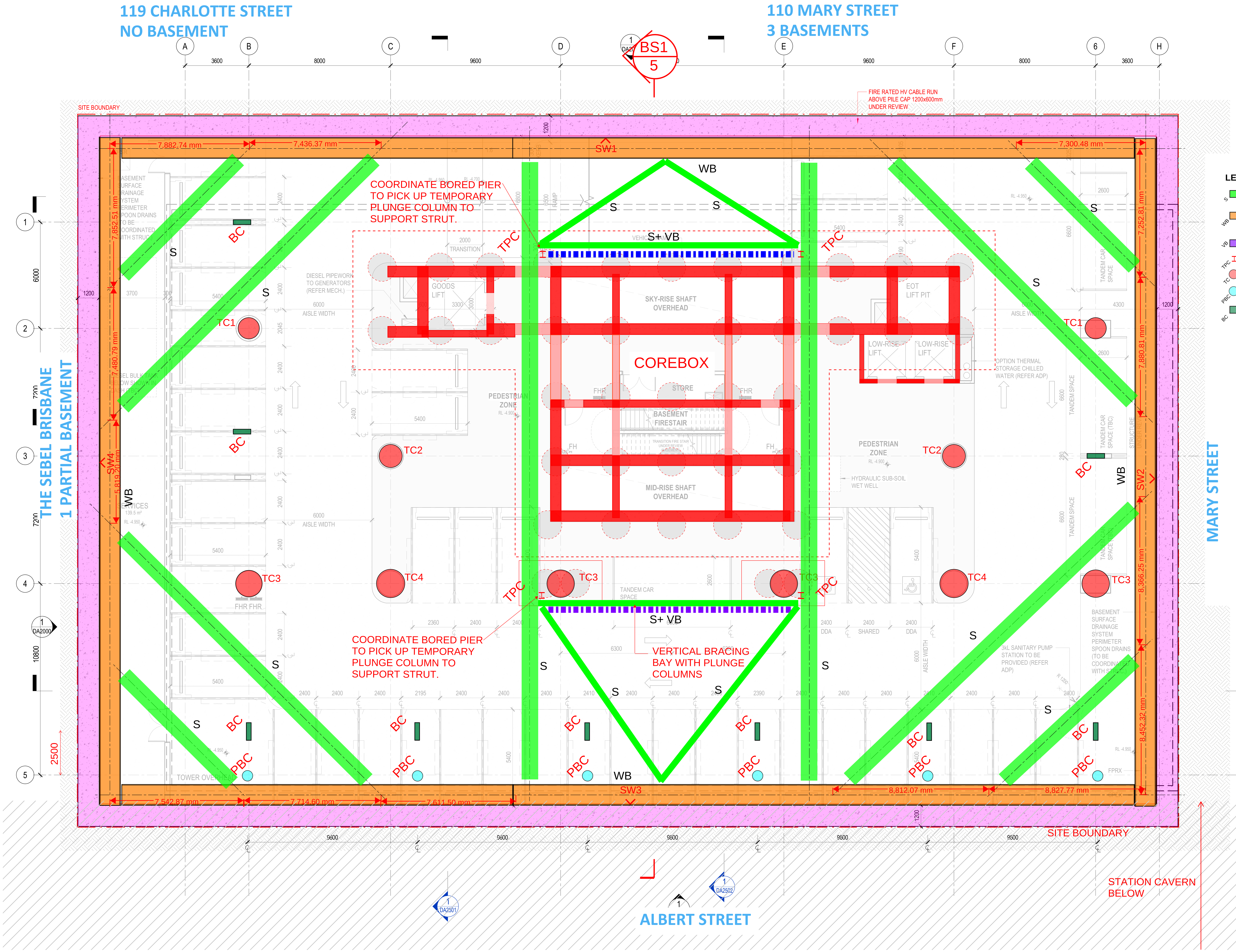
scale
1 : 100@A1

issue

project no
200048.00

TEMPORARY SHORING PLAN - OPTION 1

SCALE: 1:200 @ A3
DESIGNER: MJ



LEGEND:

- DENOTES TEMPORARY STRUT. ASSUME 914x19CHS GR350LO
- DENOTES TEMPORARY TWIN WHALER BEAMS. ASSUME EACH WHALER 1200WB455 GR400
- DENOTES TEMPORARY VERTICAL BRACING.
- DENOTES TEMPORARY PLUNGE COLUMN
- DENOTES TOWER COLUMN
- DENOTES PODIUM COLUMN
- DENOTES BASEMENT COLUMN

NOTES:

1. INTERNAL STRUTS AND WHALER BEAMS ARE PROPOSED FOR THE TEMPORARY SHORING CONCEPT DUE TO THE SITE CONSTRAINTS AND ADJACENT EXISTING STRUCTURES.
2. FINAL SETOUT OF WHALER BEAMS AND STRUTS SUBJECT TO JUMPFORM AND FORMWORK EXTENT/BUILD REQUIREMENTS.

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date

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ABN 90 131 245 684

project: Albert Street Cross River Rail

phase: Schematic Deign

drawing: LEVEL B2 - CARPARK

drawn

drawing no. short: DA1000

checked

drawing no. long: ALB-ARC-DRW-DA1000

sheet issue date

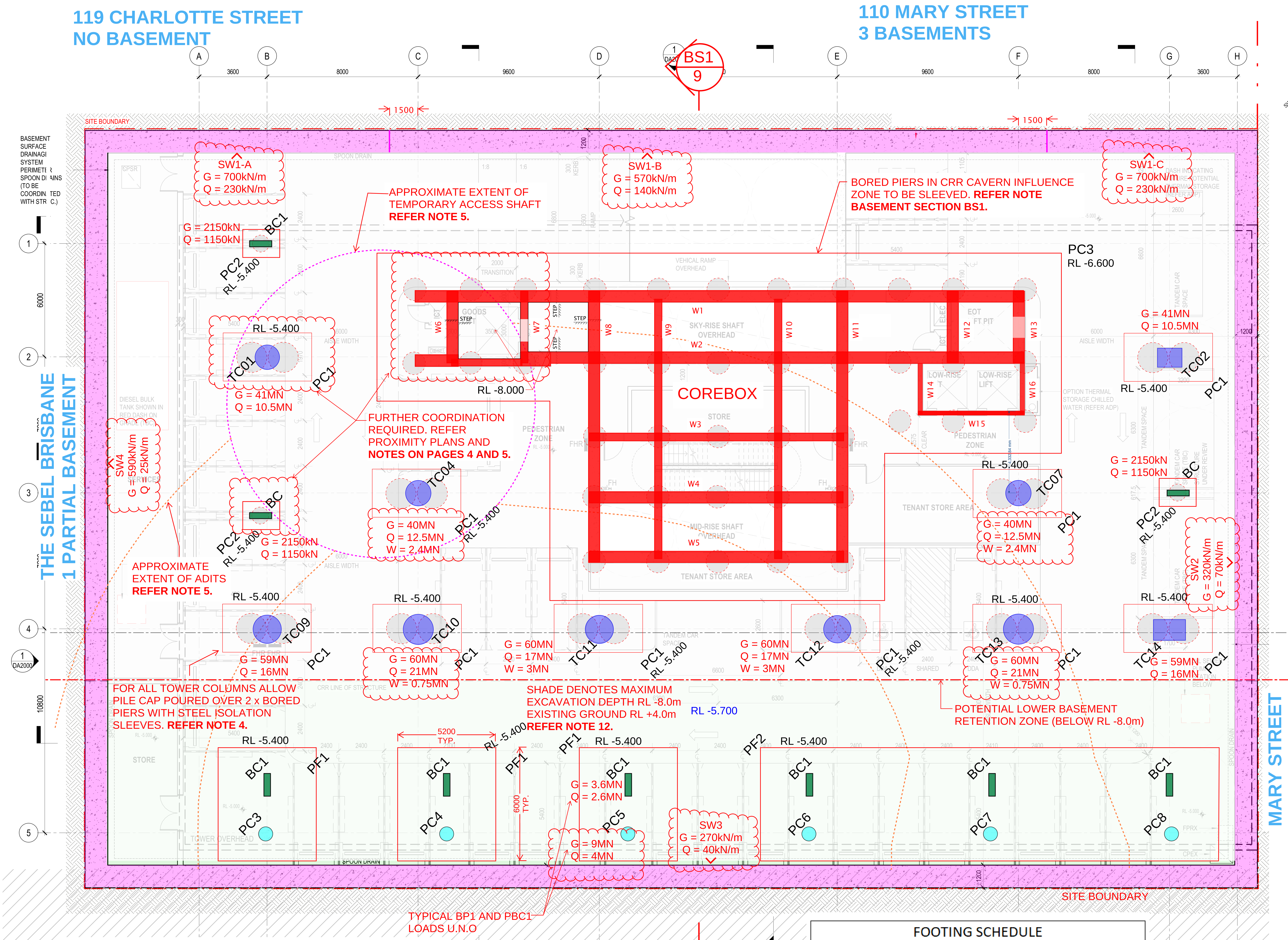
scale: 1 : 100@A1

issue

project no: 200048.00

TEMPORARY SHORING PLAN - OPTION 2

SCALE: 1:200 @ A3
DESIGNER: MJ



RL -5.400 DENOTES APPROXIMATE TOP OF FOOTING
RL -5.700 DENOTES BULK EXCAVATION

SCALE: 1:200 @ A3

THE FOLLOWING INFORMATION IS BASED UPON A PARTIALLY HYDROSTATIC BASEMENT STRATEGY WITH HYDROSTATIC WALLS AND DRAINED BASEMENT B2 SLAB. TO BE CONFIRMED BY GEOTECHNICAL ENGINEER. REFER **SCHEMATIC REPORT 22131S-RBG-ZZ-XX-RP-ST-00003** FOR MORE DETAILS.

LEGEND:

- SW# DENOTES SHORING WALL WITH A THICKNESS PROVISION OF 1200mm TO ALLOW FOR OUT OF POSITION, VERTICALITY, GUIDE WALL, CAPPING BEAM AND PILE DIAMETER/WALL THICKNESS. ALLOW 900mm DIAMETER SOLDIERS AT 1.8m CENTRES WITH SHOTCRETE INFILL PANELS (THK TBC).
- TC DENOTES TOWER COLUMN
- PBC DENOTES PODIUM COLUMN
- BC DENOTES BASEMENT COLUMN
- DENOTES COREBOX WALL
- PF DENOTES PAD FOOTING
- PC DENOTES PILE CAP
- DENOTES BORED PIER

NOTES:

1. PILE CAPS TO BE POURED ON COMPRESSIBLE MATERIAL RMAX GEOFOAM OR SIMILAR OUTSIDE OF THE BORED PIER EXTENTS TO CONTROL LOAD DISTRIBUTION INTO THE BORED PIERS.
2. BORED PIERS TO BE SOCKETED INTO VERY HIGH STRENGTH ROCK NFG1. STEEL ISOLATION SLEEVES TO EXTEND 1m BELOW THE 1:1 CRR INFLUENCE LINE.
3. BORED PIER SIZES AND SOCKET LENGTHS INTO NFG2/NFG1, AS FOLLOWS:
   CORE BOX (REFER GA) - 1200DIA + 8m SOCKET
   TOWER COLUMNS - TWIN 1600DIA + 10m SOCKET
4. NOT ALL EXISTING IN-GROUND STRUCTURE HAS BEEN SHOWN FOR CLARITY. FURTHER COORDINATION REQUIRED TO RESOLVE CLASHES BETWEEN NEW AND EXISTING IN-GROUND STRUCTURE.
5. CONFIRMATION REQUIRED ON METHODOLGY AND MATERIAL TO BE USED TO FILL ADITS AND ACCESS SHAFT.
6. SHEET PILLING MAY BE REQUIRED SUBJECT TO GEOTECHNICAL ENGINEER REVIEW.
7. THE FOOTING DESIGN CONSIDERS PERMANENT CONDITION ONLY WITH NO ALLOWANCE CURRENTLY MADE FOR TEMPORARY WORKS LOADS, TOP-DOWN CONSTRUCTION METHODOLOGY, STAGED CONSTRUCTION ETC. ADDITIONAL PROVISION TO BE MADE BY CONTRACTOR.
8. BORED PIERS TO COLUMNS AND COREBOX MAY BE INSTALLED FROM GROUND LEVEL PROVIDED ADDITIONAL PROVISIONS ARE MADE AS PER NOTE 7. THE CURRENT DESIGN DOES NOT ALLOW FOR BORED PIER OUT OF POSITION ASSOCIATED WITH THE PRIOR AND THIS WOULD NEED TO BE REVIEWED AS PART OF THE TEMPORARY WORKS PACKAGE. ALLOW FOR A PILING MAT AS PER GEOTECHNICAL REQUIREMENTS.
9. ALLOW FOR COST ASSOCIATED WITH TEMPERATURE MONITORING AND CONTROL TO PILE CAPS DEEPER THAN 1m. THIS MIGHT INCLUDE THERMOCOUPLERS, INSULATION, ICE TO THE CONCRETE MIX ETC.
10. PAD FOOTINGS TO BE FOUND ON LOW STRENGTH ROCK WITH MINIMUM 1MPa ALLOWABLE END BEARING CAPACITY. PROVIDE MASS CONCRETE BELOW FOOTING AS REQUIRED TO REACH LOW STRENGTH ROCK TO MAXIMUM DEPTH OF RL-8.
11. EXTENT OF NEW INGROUND SERVICES TO BE CONFIRMED. PAD FOOTINGS TO BE DEEPENED AS REQUIRED TO EXTEND BELOW INFLUENCE ZONE. REFER TO COVER NOTES ON PAGE 1.
12. ALLOW FOR 1500mm THK RAFT TO EXTENT OF MAXIMUM EXCAVATION DEPTH RL -8.0m INCASE ADDITIONAL DISTRIBUTION OF VERTICAL LOAD FROM THE PODIUM AND BASEMENT COLUMNS IS REQUIRED TO ACHIEVE CRR CAVERN DESIGN CRITERIA. SUBJECT TO GEOTECHNICAL ANALYSIS.

FOOTING SCHEDULE

MARK	WIDTH mm	LENGTH mm	DEPTH mm	f'c (MPa)
PC1	2000	4500	2500	80
PC2	1500	2000	1200	50
PC3	REFER GA		3000	80
PF1	5200	6000	1500	50
PF2	24400	6000	1500	50

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DRAWING TITLE: FOUNDATION PLAN	DESIGNED BY: MJ	DATE: 30/11/22
PROJECT: ALBERT ST OSD	CHECKED BY: -	PROJECT No: 22131
CLIENT: QIC	DRAWING NO S01-01	REVISION: P04

BASEMENT SECTION 1

SCALE: 1.5:200 @ A3
DESIGNER: MJ/LK

RobertBirdGroup
Member of the Surbana Jurong Group

Appendix F

Calculation Outputs

Pile Calculations

client:	QIC	*job no:*	B01493-1
project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.2	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	10	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	20000	kN	Serviceability Load
S^*	25000	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	3.77	m	Pile Perimeter
Area	1.13	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	5.10	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	4.25	-	
P_b	6786	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	27.1	%	where P_t = Strength Limit State Load S*
I_δ	0.50	-	Settlement Influence Factor as per design chart
L/D	3.10	-	Required pile length to diameter ratio as per design chart
L	3.72	m	Required pile length
δ_v	2.22	mm	Predicted Settlement under Serviceability Load
R_{ug}	50.33	MN	Ultimate Geotechnical Strength of Pile
R_g^*	25.16	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

client:	QIC	*job no:*	B01493-1
project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.2	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	10	mm	Serviceability Settlement Limit
$\tau_{avg. Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	32000	kN	Serviceability Load
$S*$	40000	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	3.77	m	Pile Perimeter
Area	1.13	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	8.16	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	6.80	-	
P_b	6786	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	17.0	%	where P_t = Strength Limit State Load S*
I_δ	0.70	-	Settlement Influence Factor as per design chart
L/D	8.80	-	Required pile length to diameter ratio as per design chart
L	10.56	m	Required pile length
δ_v	4.98	mm	Predicted Settlement under Serviceability Load
R_{ug}	80.03	MN	Ultimate Geotechnical Strength of Pile
R_g*	40.01	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

client:	QIC	*job no:*	B01493-1
project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

EDG consulting
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title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.2	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	10	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	44000	kN	Serviceability Load
$S*$	55000	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	3.77	m	Pile Perimeter
Area	1.13	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	11.22	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	9.35	-	
P_b	6786	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	12.3	%	where P_t = Strength Limit State Load S*
I_δ	0.70	-	Settlement Influence Factor as per design chart
L/D	13.90	-	Required pile length to diameter ratio as per design chart
L	16.68	m	Required pile length
δ_v	6.84	mm	Predicted Settlement under Serviceability Load
R_{ug}	110.02	MN	Ultimate Geotechnical Strength of Pile
R_g*	55.01	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

client:	QIC	*job no:*	B01493-1
project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		**Units**	**Description**
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	25800	kN	Serviceability Load
S^*	32500	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	4.97	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	3.11	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		**Units**	**Description**
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	37.1	%	where P_t = Strength Limit State Load S*
I_δ	0.54	-	Settlement Influence Factor as per design chart
L/D	1.95	-	Required pile length to diameter ratio as per design chart
L	3.13	m	Required pile length
δ_v	2.32	mm	Predicted Settlement under Serviceability Load
R_{ug}	70.70	MN	Ultimate Geotechnical Strength of Pile
R_g^*	35.35	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

client:	QIC	*job no:*	B01493-1
project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1040	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	25800	kN	Serviceability Load
S^*	32500	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	6.22	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	3.89	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	37.1	%	where P_t = Strength Limit State Load S*
I_δ	0.55	-	Settlement Influence Factor as per design chart
L/D	2.44	-	Required pile length to diameter ratio as per design chart
L	3.91	m	Required pile length
δ_v	2.37	mm	Predicted Settlement under Serviceability Load
R_{ug}	70.70	MN	Ultimate Geotechnical Strength of Pile
R_g^*	35.35	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

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project:	Albert Street Development	date:	1/11/2022
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title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	30700	kN	Serviceability Load
S^*	37300	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	5.71	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	3.57	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	32.3	%	where P_t = Strength Limit State Load S*
I_δ	0.53	-	Settlement Influence Factor as per design chart
L/D	2.41	-	Required pile length to diameter ratio as per design chart
L	3.86	m	Required pile length
δ_v	2.71	mm	Predicted Settlement under Serviceability Load
R_{ug}	75.50	MN	Ultimate Geotechnical Strength of Pile
R_g^*	37.75	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

client:	QIC	*job no:*	B01493-1
project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

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title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1040	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	30700	kN	Serviceability Load
S^*	37300	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	7.14	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	4.46	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	32.3	%	where P_t = Strength Limit State Load S*
I_δ	0.55	-	Settlement Influence Factor as per design chart
L/D	3.02	-	Required pile length to diameter ratio as per design chart
L	4.83	m	Required pile length
δ_v	2.81	mm	Predicted Settlement under Serviceability Load
R_{ug}	75.50	MN	Ultimate Geotechnical Strength of Pile
R_g^*	37.75	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

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title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	37500	kN	Serviceability Load
S^*	47400	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	7.25	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	4.53	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	25.5	%	where P_t = Strength Limit State Load S*
I_δ	0.58	-	Settlement Influence Factor as per design chart
L/D	4.30	-	Required pile length to diameter ratio as per design chart
L	6.88	m	Required pile length
δ_v	3.63	mm	Predicted Settlement under Serviceability Load
R_{ug}	95.22	MN	Ultimate Geotechnical Strength of Pile
R_g^*	47.61	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

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project:	Albert Street Development	*date:*	1/11/2022
location:	Brisbane	*by:*	DL

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title: *Single Pile Capacity - Rowe and Armitage Method*

This page summarises the required inputs and the outputs using the design method proposed by Pells (1999) that considers the sidewall slip based on the work done by Rowe and Armitage (1987) [Refer to References]

Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1040	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	37500	kN	Serviceability Load
S^*	47400	kN	Strength Limit State Load
$\emptyset_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	9.07	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	5.67	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	25.5	%	where P_t = Strength Limit State Load S*
I_δ	0.58	-	Settlement Influence Factor as per design chart
L/D	5.40	-	Required pile length to diameter ratio as per design chart
L	8.64	m	Required pile length
δ_v	3.63	mm	Predicted Settlement under Serviceability Load
R_{ug}	95.43	MN	Ultimate Geotechnical Strength of Pile
R_g*	47.72	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

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location:	Brisbane	*by:*	DL

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Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1300	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	45900	kN	Serviceability Load
S^*	57800	kN	Strength Limit State Load
$\varnothing_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	8.85	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	5.53	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	20.9	%	where P_t = Strength Limit State Load S*
I_δ	0.53	-	Settlement Influence Factor as per design chart
L/D	6.30	-	Required pile length to diameter ratio as per design chart
L	10.08	m	Required pile length
δ_v	4.05	mm	Predicted Settlement under Serviceability Load
R_{ug}	116.13	MN	Ultimate Geotechnical Strength of Pile
R_g^*	58.07	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

Rowe, R.K. and Armitage, H.H. (1987). A design method for drilled piers in soft rock.

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location:	Brisbane	*by:*	DL

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Inputs

Term		Units	Description
D	1.6	m	Pile Diameter
ϕ_g	0.50	-	Geotechnical Reduction Factor
δ_v (Serv.)	5	mm	Serviceability Settlement Limit
$\tau_{avg.\ Peak}$	1040	kPa	Ultimate Side Shear Stress
q_{be}	6	MPa	Serviceability End Bearing Stress (Linear Elastic Behaviour)
$q_{b\ ult}$	25	MPa	Ultimate End Bearing Stress
E_b	5000	MPa	Young's modulus of rock beneath the pile base
E_p	35000	MPa	Young's modulus of pile
E_r	5000	MPa	Young's modulus of rock around pile shaft
Serv. Load	45900	kN	Serviceability Load
S^*	57800	kN	Strength Limit State Load
$\emptyset_m$	0.75	-	Modulus Reduction Factor for long term serviceability
Perimeter	5.03	m	Pile Perimeter
Area	2.01	m^2	Area of Pile Base
E_b/E_r	1	-	Ratio of Base to Surrounding Rock Young's Modulus
E_p/E_r	7	-	Ratio of Pile to Rock Young's Modulus
L_{MAX}	11.06	m	Maximum length of pile required for strength limit state load taken in side shear
L_{MAX} / D	6.91	-	
P_b	12064	kN	Maximum base load at limit of linearly elastic behaviour

Outputs

Term		Units	Description
Pile Response	Side Slip	-	As per Pells, P.J.N. (1999) and Rowe, R.K. and Armitage, H.H. (1984).
Design Chart	A2	-	Relevant design chart as referenced per Pells, P.J.N. (1999)
P_b / P_t	20.9	%	where P_t = Strength Limit State Load S*
I_δ	0.53	-	Settlement Influence Factor as per design chart
L/D	7.90	-	Required pile length to diameter ratio as per design chart
L	12.64	m	Required pile length
δ_v	4.05	mm	Predicted Settlement under Serviceability Load
R_{ug}	116.34	MN	Ultimate Geotechnical Strength of Pile
R_g^*	58.17	MN	Design Geotechnical Strength of Pile

References:

Pells, P.J.N. (1999). State of Practice for the Design of Socketed Piles in Rock. 8th ANZ Geomechanics Conference, Hobart

Rowe, R.K. and Armitage, H.H. (1984). The Design of Piles Socketed into Weak Rock. Research Report GEOT_11_84.

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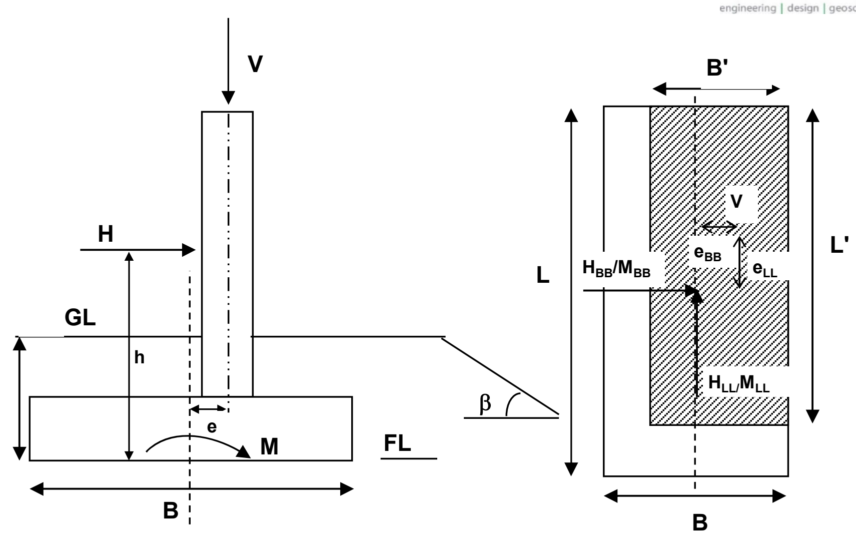
Footing Calculations

Bearing Capacity

client:	RCP	*job no:*	B01493-1
project:	Albert Street Development	*date:*	28/10/2022
location:	Brisbane	*by:*	YL
title:	Bearing Capacity for Shallow Footings	*checked:*	DL



GL=	-5.000	**m, Datum**
FL=	-6.500	**m, Datum**
GWL=	-6.500	**m, Datum**

Water level within B' of founding level?	**Yes**
Horizontal force acting along B or L axis?	**L**
Include additional over-burden stress at footing?	**Yes**

Drained: $q_{ult} = cN_c s_c d_c i_c b_c g_c + p_0 N_q s_q d_q i_q b_q g_q + \frac{1}{2}\gamma' B' N_\gamma s_\gamma d_\gamma i_\gamma b_\gamma g_\gamma$

Undrained: $q_{ult} = c_u N_c s_c d_c i_c b_c + p_0 N_q s_q d_q i_q b_q - 2\beta c_u$

D (m)	B (m)	L (m)	e_B (m)	e_L (m)	B' (m)	L' (m)	ϕ' (deg)	c'/c_u (kPa)	γ (kN/m³)	γ_w (kN/m³)	h_w (m)	γ' (kN/m³)	ϕ' (rad)
1.50	5.20	6.00	0.000	0.514	4.97	5.20	30	20	23	9.807	0	13.193	0.52

H (kN)	h (m)	V (kN)	N_c	N_q	N_γ	d_q	d_c	s_c	s_q	s_γ	p'$_o$	FoS
0	0.00	21700	30.14	18.40	15.07	1.09	1.09	1.58	1.55	0.62	34.50	2.5

M (kNm)	β (deg)	β (rad)	g_c	g_q	g_γ	i_c	i_q	i_γ	m
0	0.00	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.489

$q_{ultimate}$= **2419** **kPa**

Resultant force is within middle 1/3

q_{max} = 974 kPa

$q_{allowable}$= **988** **kPa**

Bearing capacity is satisfactory

Notes:

1. All equations, bearing factors and relationships have been obtained from:

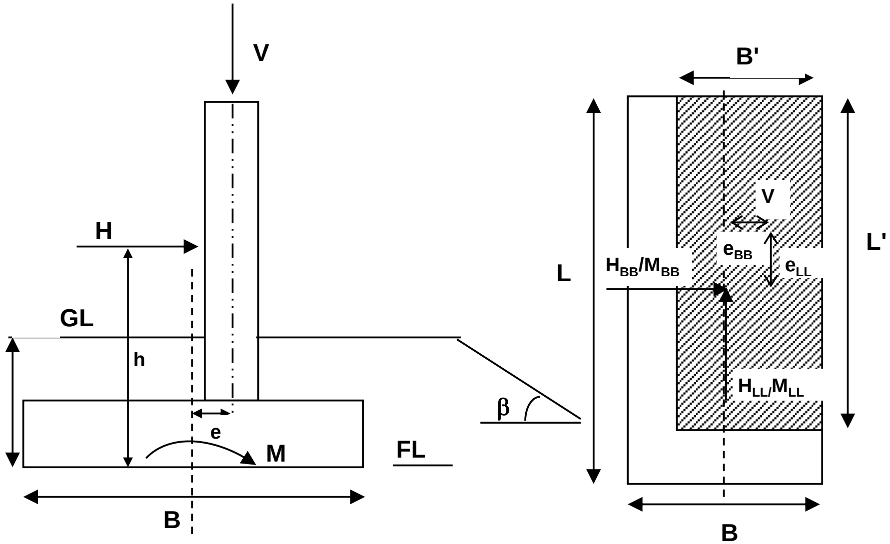
i. GE Barnes *Soil Mechanics - Principles and Practice* 2nd Edition (2000)

ii. MJ Tomlinson *Foundation Design and Construction* 6th Edition (1995)

2. Additional over-burden stress is the existing stress at the footing level prior to excavation (i.e. p'$_o$ is added to the Net Bearing Capacity)

Bearing Capacity

client:	RCP	*job no:*	B01493-1
project:	Albert Street Development	*date:*	28/10/2022
location:	Brisbane	*by:*	YL
title:	Bearing Capacity for Shallow Footings	*checked:*	DL



GL=	-5.000	**m, Datum**
FL=	-6.500	**m, Datum**
GWL=	-6.500	**m, Datum**

Water level within B' of founding level?	**Yes**
Horizontal force acting along B or L axis?	**B**
Include additional over-burden stress at footing?	**Yes**

Drained: $$q_{ult} = cN_c s_c d_c i_c b_c g_c + p_0 N_q s_q d_q i_q b_q g_q + \tfrac{1}{2}\gamma' B' N_\gamma s_\gamma d_\gamma i_\gamma b_\gamma g_\gamma$$

Undrained: $$q_{ult} = c_u N_c s_c d_c i_c b_c + p_0 N_q s_q d_q i_q b_q - 2\beta c_u$$

D (m)	**B (m)**	**L (m)**	**e_B (m)**	**e_L (m)**	**B' (m)**	**L' (m)**	**φ' (deg)**	**c'/c_u (kPa)**	**γ (kN/m³)**	**γ_w (kN/m³)**	**h_w (m)**	**γ' (kN/m³)**	**φ' (rad)**
1.50	6.00	8.70	0.514	0.000	4.97	8.70	30	10	20	9.807	0	10.193	0.52

H (kN)	**h (m)**	**V (kN)**	**N_c**	**N_q**	**N_γ**	**d_q**	**d_c**	**s_c**	**s_q**	**s_γ**	**p'_o**	**FoS**
0	0.00	21700	30.14	18.40	15.07	1.09	1.09	1.35	1.33	0.77	30.00	2.5

M (kNm)	**β (deg)**	**β (rad)**	**g_c**	**g_q**	**g_γ**	**i_c**	**i_q**	**i_γ**	**m**
0	0.00	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.636

$q_{ultimate}$= **1537** **kPa** **Resultant force is within middle 1/3**

q_{max} = 629 kPa

$q_{allowable}$= **633** **kPa** **Bearing capacity is satisfactory**

Notes:

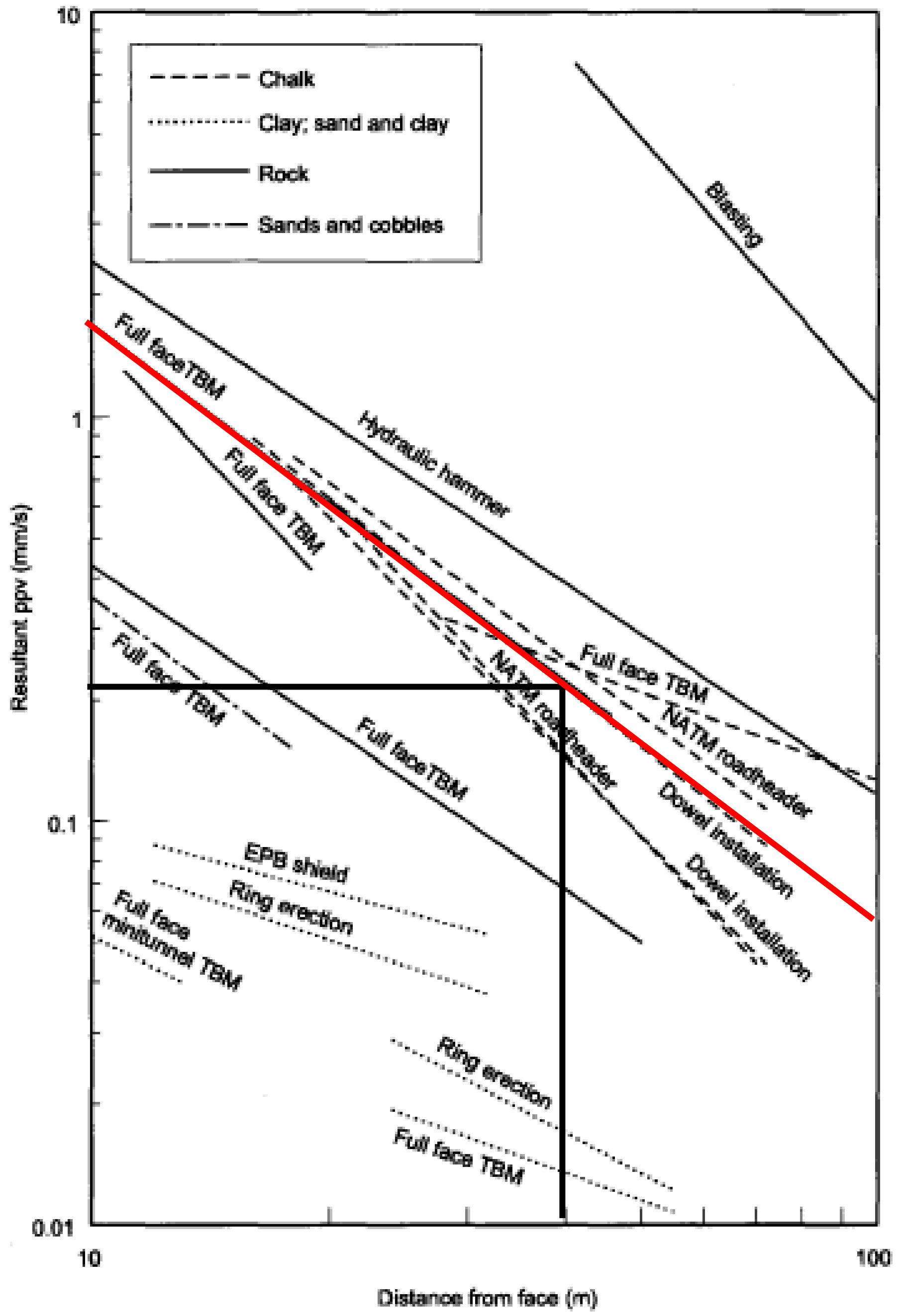
1. All equations, bearing factors and relationships have been obtained from:

i. GE Barnes *Soil Mechanics - Principles and Practice* 2nd Edition (2000)

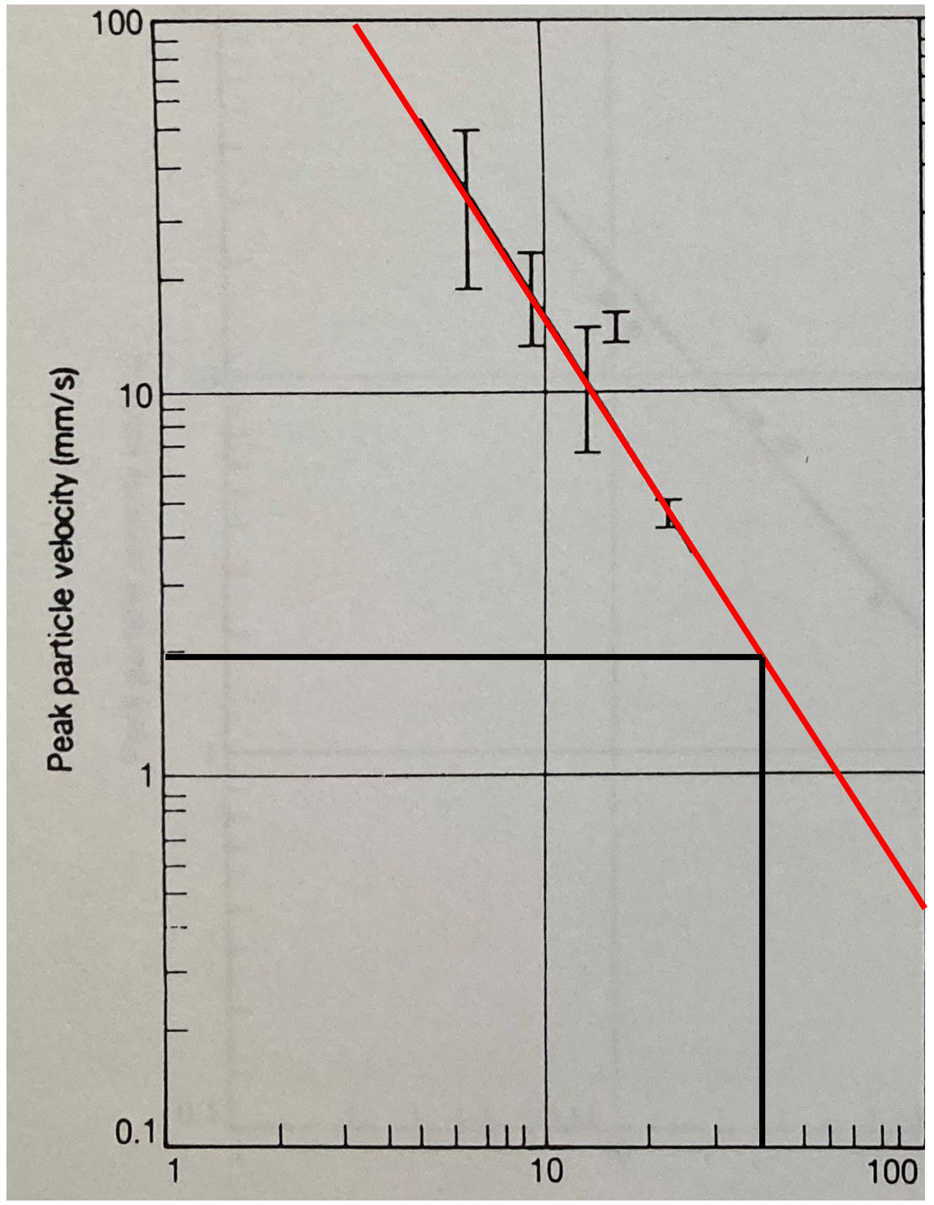
ii. MJ Tomlinson *Foundation Design and Construction* 6th Edition (1995)

2. Additional over-burden stress is the existing stress at the footing level prior to excavation (i.e. p'_o is added to the Net Bearing Capacity)

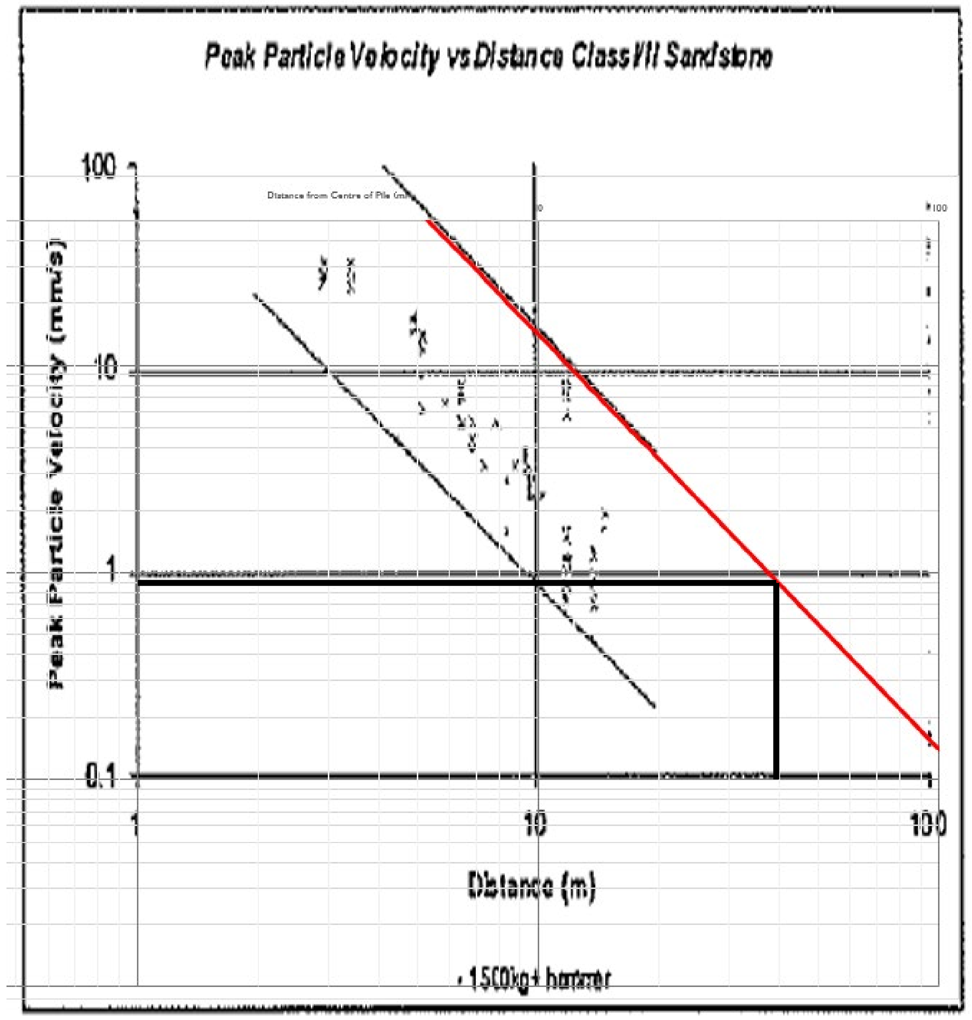
Groundborne Vibrations



Log peak particle velocity vs log distance for mechanised tunnelling (Ref. Hiller, D. M., & Crabb, G. I. (2000).



Log peak particle velocity vs log distance for vibro-driving of pile liners (Ref. Head, J. M., & Jardine, F. M. 1992).



Log peak particle velocity vs log distance for rock excavation using large rock hammers (Ref. Hackney G.A. 2002).

by:	DJC	*client:*	QIC
date:	16/11/22	*project:*	Albert Street – Future Over Station Development
approved:	DJC	*location:*	Brisbane CBD
scale:	NTS	*title:*	*Peak particle velocities from empirical data*
		job no:	B01493-01

EDG consulting
engineering | design | geosciences

figure: *F-1*

WALLAP Analyses

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Left side		Soil types Right side	
1	4.00	1	FL	1	FL
2	1.00	2	AL F	2	AL F
3	-3.50	4	RS F	4	RS F
4	-5.75	5	NFG 5	5	NFG 5
5	-8.50	6	NFG 3	6	NFG 3

SOIL PROPERTIES

-- Soil type -- No. Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1 FL	17.00	10000	0.700	OC	0.309	3.868	
				(0.300)	(0.000)	(0.000)	
2 AL F	17.00	5000	0.700	OC	0.351	3.442	4.000d
(1.00)		(500.0)		(0.300)	(1.391)	(5.007)	
3 Not defined							
4 RS F	20.00	30000	1.000	OC	0.283	4.369	10.00d
				(0.300)	(1.241)	(5.836)	
5 NFG 5	23.00	50000	1.000	OC	0.292	4.369	20.00d
				(0.300)	(1.226)	(5.836)	
6 NFG 3	27.00	1000000	1.000	OC	0.146	13.89	250.0d
				(0.200)	(0.854)	(12.886)	

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No. Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 FL	28.00	0.670	0.00	28.00	0.500	0.00
2 AL F	25.00	0.670	0.00	26.00	0.500	0.00
3 Not defined						
4 RS F	30.00	0.670	0.00	30.00	0.500	0.00
5 NFG 5	30.00	0.500	0.00	30.00	0.500	0.00
6 NFG 3	45.00	0.500	0.00	45.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-4.00	-4.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Left side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Right side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	4.00	4.00	0.0	1	-5.00	-5.00	0.0
2	1	-4.00	-4.00	0.0	1	-5.00	-5.00	0.0

WALL PROPERTIES

```
                         Type of structure = Soldier Pile Wall
                        Soldier Pile width =  0.90 m
                      Soldier Pile spacing =  1.80 m
               Passive mobilisation factor =  3.00
                  Elevation of toe of wall = -8.00
             Maximum finite element length =  0.60 m
                  Youngs modulus of wall E = 3.2000E+07 kN/m2
               Moment of inertia of wall I = 0.017889 m4/m run
                                           = 0.032200 m4 per pile
                                       E.I = 572444 kN.m2/m run
                      Yield Moment of wall = Not defined
```

STRUTS and ANCHORS

Prop no.	Elev.	Prop spacing m	Cross-section area sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /prop kN	Strut or Anchor	Allow tension ?	L/R
1	2.00	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
2	-1.30	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
3	-5.00	1.00	0.150000	3.280E+07	20.00	0.00	0	Strut	Yes	R
4	-2.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
5	1.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
6	4.00	1.00	0.400000	3.280E+07	20.00	0.00	0	Strut	Yes	R

HORIZONTAL and MOMENT LOADS/RESTRAINTS

Load no.	Elevation	Horizontal load kN/m run	Moment load kN.m/m run	Moment restraint kN.m/m/rad	Partial factor (Category)
1	2.10	45.00	0	0	N/A
2	2.10	-45.00	0	0	N/A

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge kN/m2 Near edge	Surcharge kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	4.00	2.00(L)	100.00	100.00	25.00	=	N/A	N/A

Note: L = Left side, R = Right side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 4.00
2	Excavate to elevation 2.00 on RIGHT side
3	Install strut or anchor no.1 at elevation 2.00
4	Excavate to elevation -1.50 on RIGHT side
5	Install strut or anchor no.2 at elevation -1.30
6	Apply water pressure profile no.2
7	Excavate to elevation -5.00 on RIGHT side
8	Apply load no.1 at elevation 2.10
9	Apply load no.2 at elevation 2.10
10	Install strut or anchor no.3 at elevation -5.00
11	Install strut or anchor no.4 at elevation -2.00
12	Remove strut or anchor no.2 at elevation -1.30
13	Install strut or anchor no.5 at elevation 1.00
14	Install strut or anchor no.6 at elevation 4.00
15	Remove strut or anchor no.1 at elevation 2.00
16	Change EI of wall to 400711 kN.m2/m run Allow wall to relax with new modulus value
17	Apply water pressure profile no.1

FACTORS OF SAFETY and ANALYSIS OPTIONS

```
 Stability analysis:
  Method of analysis  -  Burland-Potts
  Factor on passive for calculating wall depth = 1.50

 Parameters for undrained strata:
  Minimum equivalent fluid density            =   5.00 kN/m3
  Maximum depth of water filled tension crack  =   0.00 m

 Bending moment and displacement calculation:
  Method  -  2-D finite element model
  Open Tension Crack analysis? - No
  Active limit arching modelled?  -  Yes
  Non-linear Modulus Parameter (L) = 9.000 m

 Boundary conditions:
  Length of wall (normal to plane of analysis) = 60.00 m

  Width of excavation on Left  side of wall  = 40.00 m
  Width of excavation on Right side of wall  = 40.00 m

  Distance to rigid boundary on Left side  = 30.00 m
  Distance to rigid boundary on Right side = 20.00 m
  Elevation of rigid lower boundary = -20.00

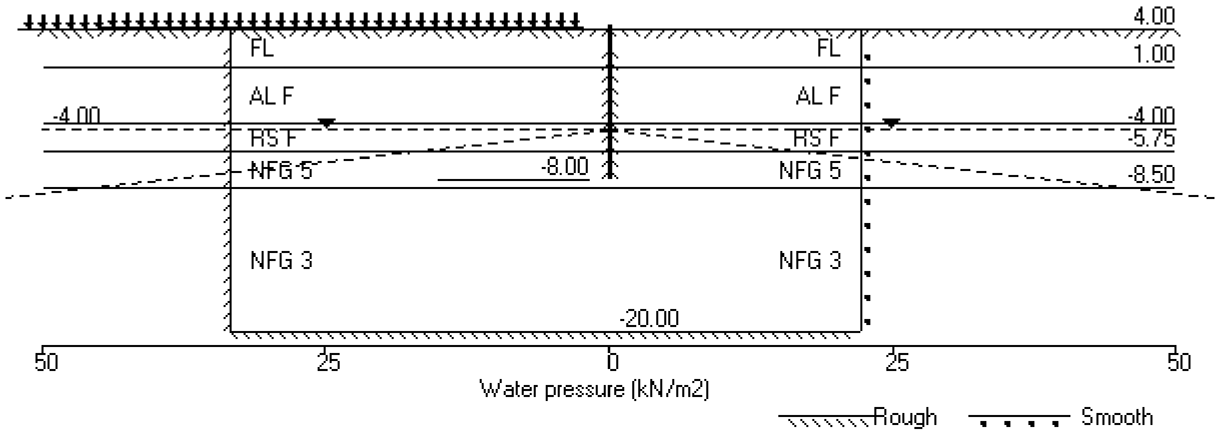
  Lower rigid boundary at elevation -20.00 - Rough
  Rigid boundary on Left side           - Rough
  Rigid boundary on Right side          - Smooth
  Wall / soil interface                   - Rough
```

OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 4.00	Yes	Yes	Yes
2	Excav. to elev. 2.00 on RIGHT side	Yes	Yes	Yes
3	Install prop no.1 at elev. 2.00	Yes	Yes	Yes
4	Excav. to elev. -1.50 on RIGHT side	Yes	Yes	Yes
5	Install prop no.2 at elev. -1.30	Yes	Yes	Yes
6	Apply water pressure profile no.2	Yes	Yes	Yes
7	Excav. to elev. -5.00 on RIGHT side	Yes	Yes	Yes
8	Apply load no.1 at elev. 2.10	Yes	Yes	Yes
9	Apply load no.2 at elev. 2.10	Yes	Yes	Yes
10	Install prop no.3 at elev. -5.00	Yes	Yes	Yes
11	Install prop no.4 at elev. -2.00	Yes	Yes	Yes
12	Remove prop no.2 at elev. -1.30	Yes	Yes	Yes
13	Install prop no.5 at elev. 1.00	Yes	Yes	Yes
14	Install prop no.6 at elev. 4.00	Yes	Yes	Yes
15	Remove prop no.1 at elev. 2.00	Yes	Yes	Yes
16	Change EI of wall to 400711kN.m2/m run	Yes	Yes	Yes
17	Apply water pressure profile no.1	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

```
EDG CONSULTING PTY LTD                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58             | Job No.  B01493
                             Licensed from GEOSOLVE             | Made by :   DJC
Data filename/Run ID: Section_1                                 |
Albert Street Development                                       | Date:16-11-2022
Section 1                                                       | Checked :
-------------------------------------------------------------------------------
                                                   Units: kN,m
```

Stage No.1   Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 4.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr-ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.001	1.90E-05	0.0	-0.0		572444
2	3.50	-4.16	0.001	1.89E-05	-1.0	0.0		572444
3	3.00	-3.19	0.001	1.94E-05	-2.9	-1.0		572444
4	2.55	-2.42	0.001	2.08E-05	-4.1	-2.6		572444
5	2.10	-1.61	0.001	2.37E-05	-5.0	-4.7		572444
6	2.00	-1.37	0.001	2.46E-05	-5.2	-5.2		572444
7	1.50	-0.41	0.001	3.03E-05	-5.6	-8.0		572444
8	1.00	0.51	0.001	3.85E-05	-5.6	-10.8		572444
		2.03	0.001	3.85E-05	-5.6	-10.8		
9	0.50	2.21	0.001	4.90E-05	-4.6	-13.3		572444
10	0.00	2.57	0.001	6.15E-05	-3.4	-15.3		572444
11	-0.60	3.01	0.001	7.84E-05	-1.7	-16.8		572444
12	-0.95	3.18	0.001	8.88E-05	-0.6	-17.2		572444
13	-1.30	3.37	0.001	9.93E-05	0.5	-17.2		572444
14	-1.50	3.40	0.001	1.05E-04	1.2	-17.1		572444
15	-2.00	3.63	0.001	1.19E-04	3.0	-16.0		572444
16	-2.38	3.69	0.001	1.29E-04	4.3	-14.6		572444
17	-2.75	3.70	0.001	1.38E-04	5.7	-12.7		572444
18	-3.13	3.48	0.001	1.46E-04	7.1	-10.3		572444
19	-3.50	3.07	0.001	1.52E-04	8.3	-7.4		572444
		-9.96	0.001	1.52E-04	8.3	-7.4		
20	-4.00	-4.02	0.001	1.57E-04	4.8	-4.5		572444
21	-4.50	-1.92	0.001	1.60E-04	3.3	-2.6		572444
22	-5.00	-0.91	0.001	1.62E-04	2.6	-1.2		572444
23	-5.38	-0.57	0.001	1.62E-04	2.3	-0.3		572444
24	-5.75	-0.80	0.001	1.62E-04	2.1	0.6		572444
		-6.63	0.001	1.62E-04	2.1	0.6		
25	-6.18	-2.72	0.000	1.62E-04	0.1	0.9		572444
26	-6.60	-0.67	0.000	1.61E-04	-0.6	0.7		572444
27	-7.20	0.67	0.000	1.60E-04	-0.6	0.2		572444
28	-7.60	1.23	0.000	1.60E-04	-0.2	-0.0		572444
29	-8.00	-0.03	0.000	1.60E-04	0.0	0.0		0

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
30	-8.15	-0.01	0.000	0	-0.0	0.0		0
31	-8.50	8.17	0.000	0	1.4	0.0		0
		-1.67	0.000	0	1.4	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	-0.00	0.000	0	-0.0	0.0		0
34	-14.40	0.01	0.000	0	-0.0	0.0		0
35	-16.80	0.01	0.000	0	-0.0	0.0		0
36	-18.40	0.00	0.000	0	-0.0	0.0		0
37	-20.00	0.00	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	3.94	3.94	9974
3	3.00	0.00	18.01	5.57	69.68	10.56	10.56	9974
4	2.55	0.00	27.07	8.37	104.72	16.60	16.60	9974
5	2.10	0.00	36.44	11.26	140.98	22.73	22.73	9974
6	2.00	0.00	38.54	11.91	149.09	24.12	24.12	9974
7	1.50	0.00	49.00	15.14	189.53	30.97	30.97	9974
8	1.00	0.00	59.29	18.32	229.36	37.77	37.77	9974
		0.00	59.29	15.26	224.13	38.51	38.51	4987
9	0.50	0.00	69.38	18.81	258.84	44.89	44.89	5236
10	0.00	0.00	79.25	22.27	292.82	51.31	51.31	5486
11	-0.60	0.00	90.84	26.35	332.74	58.97	58.97	5785
12	-0.95	0.00	97.50	28.68	355.65	63.37	63.37	5960
13	-1.30	0.00	104.09	31.00	378.32	67.77	67.77	6134
14	-1.50	0.00	107.82	32.31	391.18	70.23	70.23	6234
15	-2.00	0.00	117.09	35.56	423.07	76.46	76.46	6483
16	-2.38	0.00	123.97	37.98	446.76	81.07	81.07	6670
17	-2.75	0.00	130.80	40.38	470.29	85.63	85.63	6857
18	-3.13	0.00	137.60	42.77	493.67	90.08	90.08	7044
19	-3.50	0.00	144.35	45.14	516.93	94.40	94.40	7231
		0.00	144.35	28.49	689.10	126.14	126.14	29922
20	-4.00	0.00	154.81	31.45	734.80	139.24	139.24	29922
21	-4.50	5.00	160.22	32.99	758.43	145.37	150.37	29922
22	-5.00	10.00	165.59	34.51	781.88	150.96	160.96	29922
23	-5.38	13.75	169.59	35.64	799.36	154.93	168.68	29922
24	-5.75	17.50	173.57	36.77	816.76	158.59	176.09	29922
		17.50	173.57	26.21	875.12	155.68	173.18	49871
25	-6.18	21.75	179.34	27.89	900.31	163.24	184.99	49871
26	-6.60	26.00	185.08	29.57	925.43	169.83	195.83	49871
27	-7.20	32.00	193.17	31.94	960.75	178.36	210.36	49871
28	-7.60	36.00	198.54	33.51	984.22	183.88	219.88	49871
29	-8.00	40.00	203.90	35.07	1007.64	188.47	228.47	49871
30	-8.15	41.50	205.91	35.66	1016.41	190.39	231.89	49871
31	-8.50	45.00	210.59	37.03	1036.85	199.09	244.09	49871
		45.00	210.59	0.00	6145.66	192.54	237.54	997417
32	-10.25	62.50	240.86	0.00	6566.09	223.19	285.69	997417
33	-12.00	80.00	271.00	0.00	6984.53	252.98	332.98	997417
34	-14.40	104.00	312.15	0.00	7556.03	293.81	397.81	997417
35	-16.80	128.00	353.16	0.00	8125.48	334.61	462.61	997417
36	-18.40	144.00	380.44	0.00	8504.23	361.80	505.80	997417
37	-20.00	160.00	407.67	0.00	8882.38	389.53	549.53	997417

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
		RIGHT side						
				Effective stresses				
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9951
2	3.50	0.00	8.50	2.63	32.88	8.10	8.10	9951
3	3.00	0.00	17.00	5.25	65.76	13.75	13.75	9951
4	2.55	0.00	24.65	7.62	95.35	19.02	19.02	9951
5	2.10	0.00	32.30	9.98	124.95	24.34	24.34	9951
6	2.00	0.00	34.00	10.51	131.52	25.49	25.49	9951
7	1.50	0.00	42.50	13.13	164.40	31.38	31.38	9951
8	1.00	0.00	51.00	15.76	197.28	37.26	37.26	9951
		0.00	51.00	12.35	195.58	36.48	36.48	4976
9	0.50	0.00	59.50	15.34	224.84	42.68	42.68	5225
10	0.00	0.00	68.00	18.32	254.10	48.74	48.74	5473
11	-0.60	0.00	78.20	21.91	289.21	55.96	55.96	5772
12	-0.95	0.00	84.15	24.00	309.69	60.19	60.19	5946
13	-1.30	0.00	90.10	26.09	330.17	64.40	64.40	6120
14	-1.50	0.00	93.50	27.28	341.88	66.84	66.84	6220
15	-2.00	0.00	102.00	30.27	371.14	72.83	72.83	6468
16	-2.38	0.00	108.37	32.50	393.08	77.37	77.37	6655
17	-2.75	0.00	114.75	34.74	415.03	81.93	81.93	6842
18	-3.13	0.00	121.12	36.98	436.97	86.60	86.60	7028
19	-3.50	0.00	127.50	39.22	458.91	91.33	91.33	7215
		0.00	127.50	23.71	615.46	136.09	136.09	29854
20	-4.00	0.00	137.50	26.55	659.15	143.26	143.26	29854
21	-4.50	5.00	142.50	27.96	681.00	147.29	152.29	29854
22	-5.00	10.00	147.50	29.38	702.84	151.86	161.86	29854
23	-5.38	13.75	151.25	30.44	719.23	155.50	169.25	29854
24	-5.75	17.50	155.00	31.51	735.61	159.38	176.88	29854
		17.50	155.00	20.78	793.97	162.31	179.81	49757
25	-6.18	21.75	160.53	22.40	818.11	165.96	187.71	49757
26	-6.60	26.00	166.05	24.01	842.26	170.50	196.50	49757
27	-7.20	32.00	173.85	26.29	876.34	177.69	209.69	49757
28	-7.60	36.00	179.05	27.81	899.06	182.64	218.64	49757
29	-8.00	40.00	184.25	29.33	921.78	188.49	228.49	49757
30	-8.15	41.50	186.20	29.90	930.30	190.40	231.90	49757
31	-8.50	45.00	190.75	31.23	950.18	190.92	235.92	49757
		45.00	190.75	0.00	5870.23	194.21	239.21	995147
32	-10.25	62.50	220.50	0.00	6283.34	223.19	285.69	995147
33	-12.00	80.00	250.25	0.00	6696.44	252.99	332.99	995147
34	-14.40	104.00	291.05	0.00	7262.99	293.81	397.81	995147
35	-16.80	128.00	331.85	0.00	7829.54	334.60	462.60	995147
36	-18.40	144.00	359.05	0.00	8207.23	361.79	505.79	995147
37	-20.00	160.00	386.25	0.00	8584.93	389.52	549.52	995147

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EDG CONSULTING PTY LTD                                            | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58               | Job No.  B01493
                            Licensed from GEOSOLVE                | Made by :   DJC
Data filename/Run ID: Section_1                                   |
Albert Street Development                                         | Date:16-11-2022
Section 1                                                         | Checked :
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                                                    Units: kN,m
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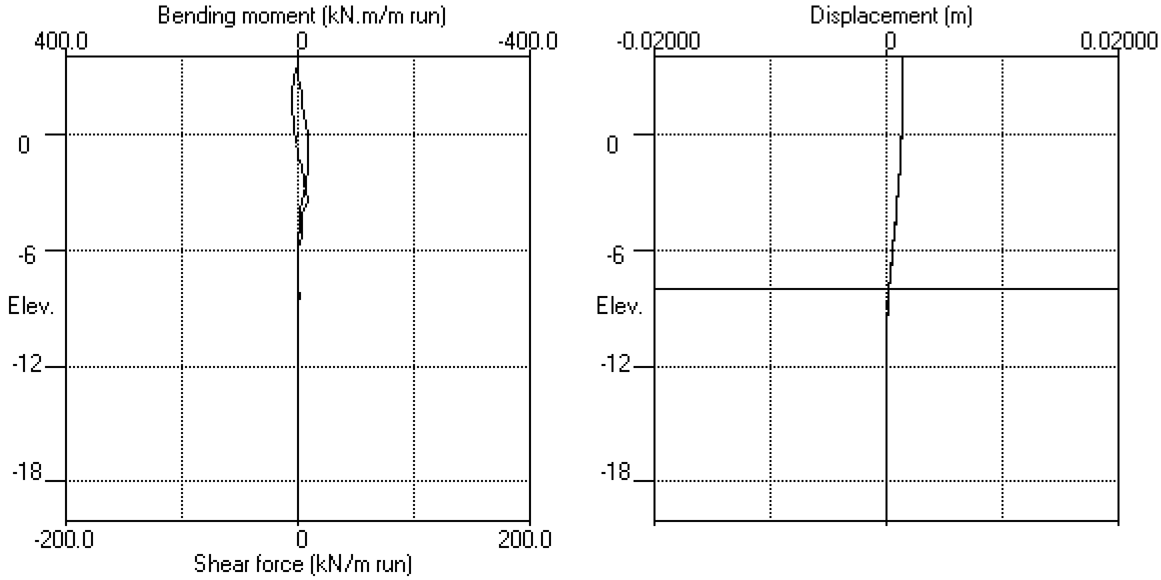
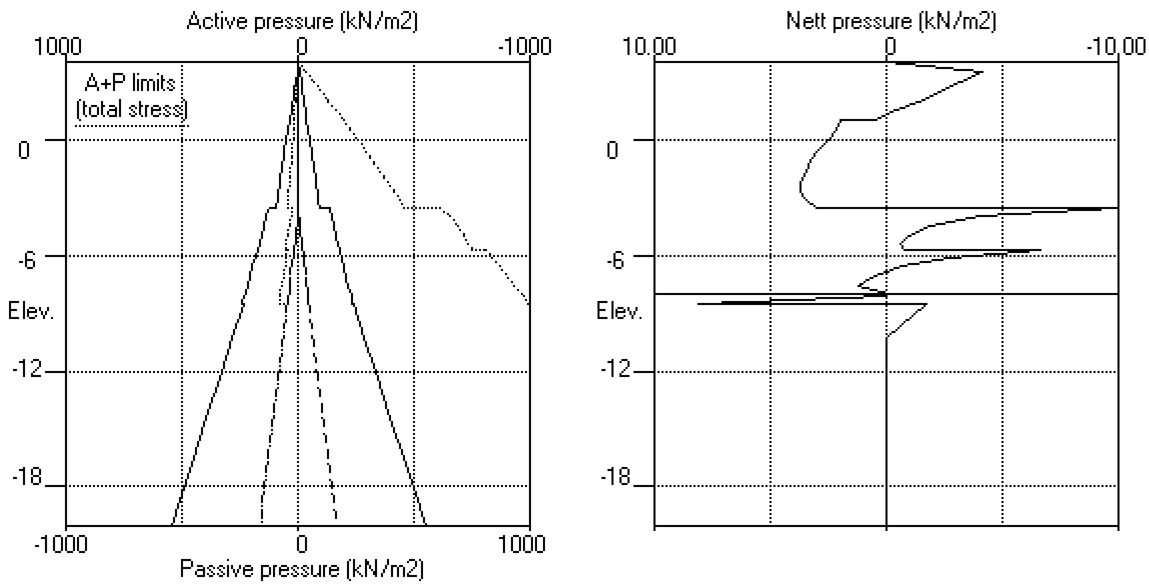
Stage No.1 Apply surcharge no.1 at elev. 4.00

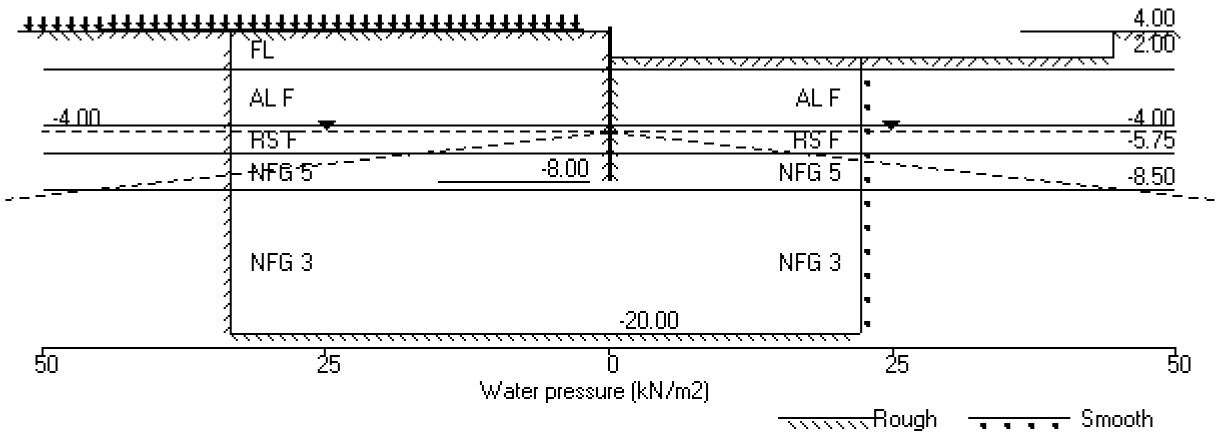


Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No. 2 Excavate to elevation 2.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
2	4.00	2.00	Cant.	11.788	-6.50	-0.18	2.18	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	1.65E-03	0.0	-0.0		572444
2	3.50	2.67	0.015	1.65E-03	0.7	0.3		572444
3	3.00	5.57	0.014	1.65E-03	2.7	1.3		572444
4	2.55	8.37	0.014	1.65E-03	5.9	3.2		572444
5	2.10	11.26	0.013	1.64E-03	10.3	6.9		572444
6	2.00	11.91	0.013	1.64E-03	11.4	8.0		572444
7	1.50	-13.47	0.012	1.63E-03	11.0	14.8		572444
8	1.00	-7.36	0.011	1.62E-03	5.8	18.7		572444
		5.38	0.011	1.62E-03	5.8	18.7		
9	0.50	3.30	0.010	1.60E-03	8.0	22.3		572444
10	0.00	3.60	0.010	1.58E-03	9.7	26.8		572444
11	-0.60	4.47	0.009	1.55E-03	12.2	33.3		572444
12	-0.95	4.93	0.008	1.53E-03	13.8	37.8		572444
13	-1.30	5.38	0.008	1.50E-03	15.6	42.9		572444
14	-1.50	5.51	0.007	1.49E-03	16.7	46.2		572444
15	-2.00	5.92	0.007	1.44E-03	19.6	55.2		572444
16	-2.38	5.83	0.006	1.40E-03	21.8	63.0		572444
17	-2.75	5.29	0.005	1.36E-03	23.8	71.6		572444
18	-3.13	3.36	0.005	1.31E-03	25.5	80.9		572444
19	-3.50	-0.09	0.005	1.25E-03	26.1	90.7		572444
		-68.70	0.005	1.25E-03	26.1	90.7		
20	-4.00	-31.45	0.004	1.17E-03	1.0	95.1		572444
21	-4.50	-17.13	0.003	1.09E-03	-11.1	91.7		572444
22	-5.00	-10.56	0.003	1.01E-03	-18.0	84.0		572444
23	-5.38	-7.99	0.002	9.65E-04	-21.5	76.5		572444
24	-5.75	-8.87	0.002	9.17E-04	-24.7	67.9		572444
		-29.77	0.002	9.17E-04	-24.7	67.9		
25	-6.18	-10.47	0.002	8.72E-04	-33.2	54.7		572444
26	-6.60	1.57	0.001	8.37E-04	-35.1	39.7		572444
27	-7.20	11.67	0.001	8.06E-04	-31.1	18.9		572444
28	-7.60	25.93	0.001	7.97E-04	-23.6	7.4		572444
29	-8.00	67.02	0.000	7.94E-04	-5.0	0.0		0

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
30	-8.15	-0.01	0.000	0	-0.0	0.0		0
31	-8.50	22.08	0.000	0	3.9	0.0		0
		-4.45	0.000	0	3.9	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.00	0.000	0	-0.0	0.0		0
34	-14.40	0.01	0.000	0	0.0	0.0		0
35	-16.80	-0.00	0.000	0	0.0	0.0		0
36	-18.40	0.00	0.000	0	0.0	0.0		0
37	-20.00	-0.02	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	2.67	2.67a	9974
3	3.00	0.00	18.01	5.57	69.68	5.57	5.57a	9974
4	2.55	0.00	27.07	8.37	104.72	8.37	8.37a	9974
5	2.10	0.00	36.44	11.26	140.98	11.26	11.26a	9974
6	2.00	0.00	38.54	11.91	149.09	11.91	11.91a	9974
7	1.50	0.00	49.00	15.14	189.53	19.41	19.41	9974
8	1.00	0.00	59.29	18.32	229.36	29.31	29.31	9974
		0.00	59.29	15.26	224.13	34.28	34.28	4987
9	0.50	0.00	69.38	18.81	258.84	39.16	39.16	5236
10	0.00	0.00	79.25	22.27	292.82	45.29	45.29	5486
11	-0.60	0.00	90.84	26.35	332.74	52.99	52.99	5785
12	-0.95	0.00	97.50	28.68	355.65	57.43	57.43	5960
13	-1.30	0.00	104.09	31.00	378.32	61.89	61.89	6134
14	-1.50	0.00	107.82	32.31	391.18	64.36	64.36	6234
15	-2.00	0.00	117.09	35.56	423.07	70.61	70.61	6483
16	-2.38	0.00	123.97	37.98	446.76	75.09	75.09	6670
17	-2.75	0.00	130.80	40.38	470.29	79.35	79.35	6857
18	-3.13	0.00	137.60	42.77	493.67	82.94	82.94	7044
19	-3.50	0.00	144.35	45.14	516.93	85.61	85.61	7231
		0.00	144.35	28.49	689.10	89.78	89.78	29922
20	-4.00	0.00	154.81	31.45	734.80	118.67	118.67	29922
21	-4.50	5.00	160.22	32.99	758.43	130.84	135.84	29922
22	-5.00	10.00	165.59	34.51	781.88	139.15	149.15	29922
23	-5.38	13.75	169.59	35.64	799.36	144.21	157.96	29922
24	-5.75	17.50	173.57	36.77	816.76	147.41	164.91	29922
		17.50	173.57	26.21	875.12	137.04	154.54	49871
25	-6.18	21.75	179.34	27.89	900.31	152.39	174.14	49871
26	-6.60	26.00	185.08	29.57	925.43	163.91	189.91	49871
27	-7.20	32.00	193.17	31.94	960.75	176.77	208.77	49871
28	-7.60	36.00	198.54	33.51	984.22	189.00	225.00	49871
29	-8.00	40.00	203.90	35.07	1007.64	215.97	255.97	49871
30	-8.15	41.50	205.91	35.66	1016.41	182.24	223.74	49871
31	-8.50	45.00	210.59	37.03	1036.85	198.84	243.84	49871
		45.00	210.59	0.00	6145.66	187.49	232.49	997417
32	-10.25	62.50	240.86	0.00	6566.09	219.56	282.06	997417
33	-12.00	80.00	271.00	0.00	6984.53	249.32	329.32	997417
34	-14.40	104.00	312.15	0.00	7556.03	290.09	394.09	997417
35	-16.80	128.00	353.16	0.00	8125.48	330.82	458.82	997417
36	-18.40	144.00	380.44	0.00	8504.23	357.94	501.94	997417
37	-20.00	160.00	407.67	0.00	8882.38	386.46	546.46	997417

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	9957
7	1.50	0.00	8.50	2.63	32.88	32.88	32.88p	9957
8	1.00	0.00	17.00	5.25	65.76	36.67	36.67	9957
		0.00	17.00	0.41	78.55	28.90	28.90	4979
9	0.50	0.00	25.50	3.39	107.81	35.86	35.86	5227
10	0.00	0.00	34.00	6.38	137.07	41.70	41.70	5476
11	-0.60	0.00	44.20	9.96	172.19	48.53	48.53	5775
12	-0.95	0.00	50.16	12.05	192.68	52.50	52.50	5949
13	-1.30	0.00	56.11	14.14	213.17	56.52	56.52	6124
14	-1.50	0.00	59.51	15.34	224.88	58.84	58.84	6223
15	-2.00	0.00	68.01	18.33	254.15	64.70	64.70	6472
16	-2.38	0.00	74.39	20.57	276.11	69.26	69.26	6659
17	-2.75	0.00	80.77	22.81	298.07	74.06	74.06	6846
18	-3.13	0.00	87.15	25.05	320.04	79.57	79.57	7032
19	-3.50	0.00	93.54	27.29	342.00	85.70	85.70	7219
		0.00	93.54	14.09	467.06	158.48	158.48	29871
20	-4.00	0.00	103.55	16.93	510.80	150.12	150.12	29871
21	-4.50	5.00	108.56	18.35	532.70	147.97	152.97	29871
22	-5.00	10.00	113.57	19.77	554.61	149.71	159.71	29871
23	-5.38	13.75	117.34	20.83	571.05	152.21	165.96	29871
24	-5.75	17.50	121.10	21.90	587.49	156.28	173.78	29871
		17.50	121.10	10.87	645.85	166.81	184.31	49786
25	-6.18	21.75	126.64	12.49	670.07	162.85	184.60	49786
26	-6.60	26.00	132.19	14.11	694.29	162.35	188.35	49786
27	-7.20	32.00	140.02	16.40	728.50	165.10	197.10	49786
28	-7.60	36.00	145.24	17.93	751.31	163.07	199.07	49786
29	-8.00	40.00	150.46	19.45	774.14	148.94	188.94	49786
30	-8.15	41.50	152.42	20.03	782.70	182.25	223.75	49786
31	-8.50	45.00	156.99	21.36	802.67	176.76	221.76	49786
		45.00	156.99	0.00	5401.45	191.94	236.94	995713
32	-10.25	62.50	186.87	0.00	5816.38	219.55	282.05	995713
33	-12.00	80.00	216.79	0.00	6231.80	249.32	329.32	995713
34	-14.40	104.00	257.87	0.00	6802.32	290.08	394.08	995713
35	-16.80	128.00	299.03	0.00	7373.76	330.82	458.82	995713
36	-18.40	144.00	326.50	0.00	7755.22	357.94	501.94	995713
37	-20.00	160.00	353.99	0.00	8137.03	386.48	546.48	995713

Note: 11.91 a Soil pressure at active limit
32.88 p Soil pressure at passive limit

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EDG CONSULTING PTY LTD                                    | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58       | Job No.  B01493
                           Licensed from GEOSOLVE         | Made by :   DJC
Data filename/Run ID: Section_1                           |
Albert Street Development                                 | Date:16-11-2022
Section 1                                                 | Checked :
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                                                   Units: kN,m
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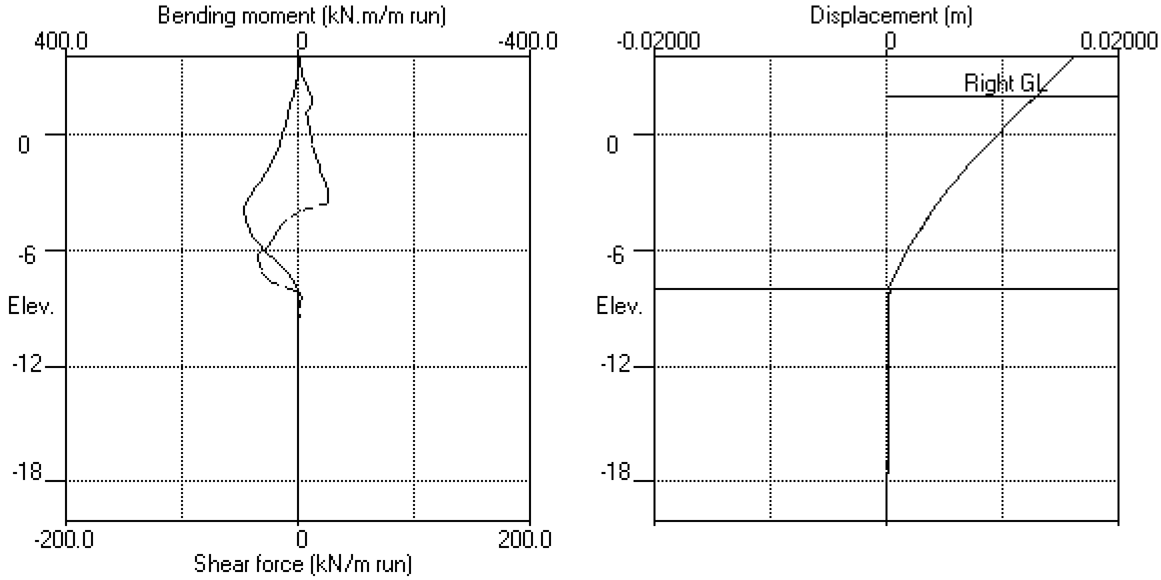
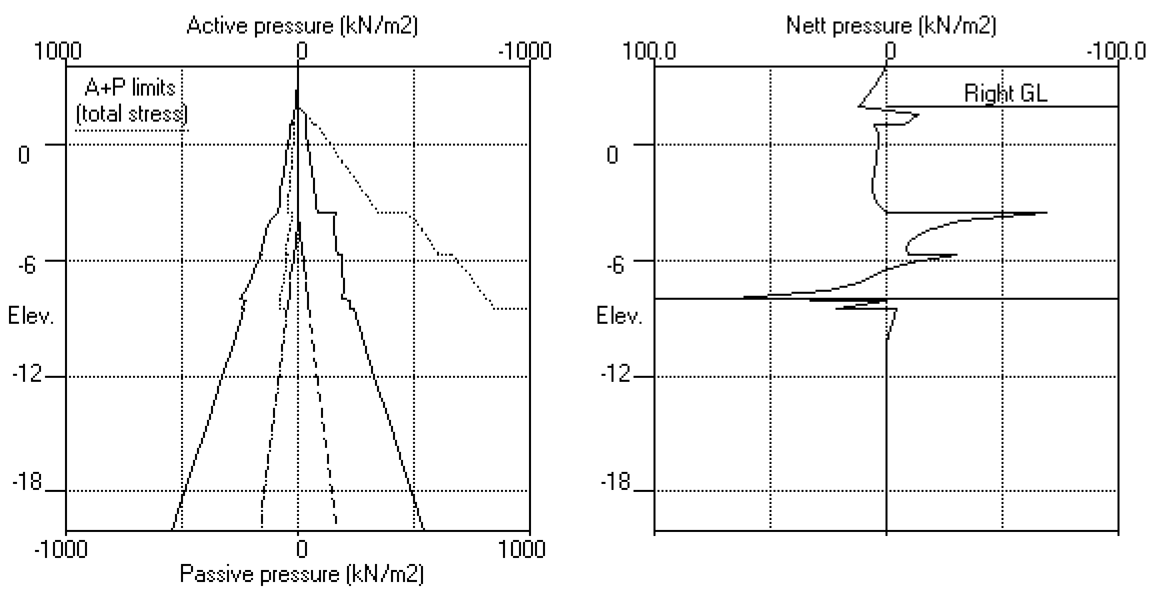
Stage No.2 Excav. to elev. 2.00 on RIGHT side



Stage No.2 Excav. to elev. 2.00 on RIGHT side



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Program: WALLAP  Version 6.07  Revision A55.B74.R58          | Job No.  B01493
                             Licensed from GEOSOLVE          | Made by :   DJC
Data filename/Run ID: Section_1                              |
Albert Street Development                                    | Date:16-11-2022
Section 1                                                    | Checked :
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                                                  Units: kN,m
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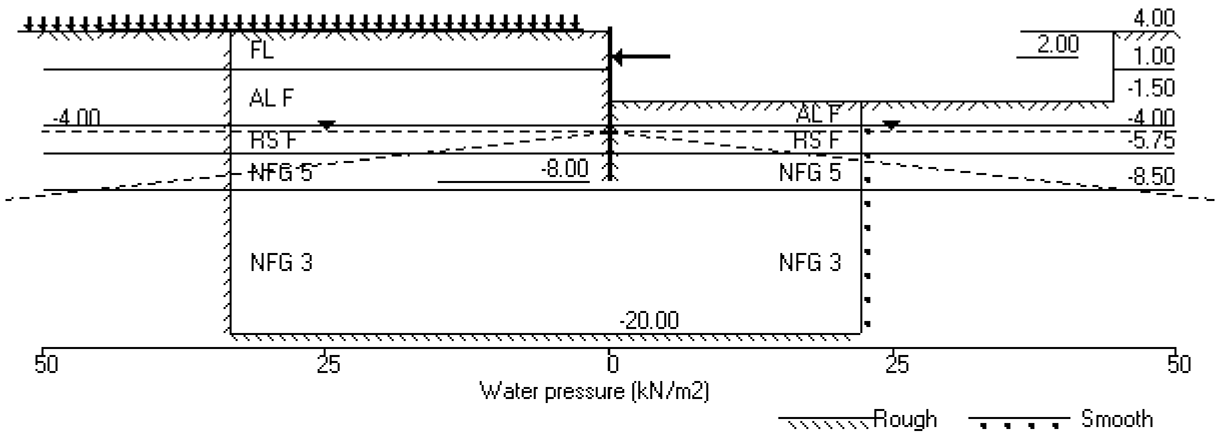
Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -1.50 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
4	4.00	-1.50	2.00	8.853	n/a	-3.48	1.98	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	8.06E-04	0.0	0.0		572444
2	3.50	6.05	0.016	8.06E-04	1.5	0.3		572444
3	3.00	7.28	0.015	8.04E-04	4.8	2.1		572444
4	2.55	8.75	0.015	8.02E-04	8.5	5.2		572444
5	2.10	10.72	0.014	7.96E-04	12.8	10.1		572444
6	2.00	10.39	0.014	7.94E-04	13.9	11.5	-104.8	572444
		10.39	0.014	7.94E-04	-90.9	11.5		
7	1.50	16.75	0.014	8.03E-04	-84.2	-31.8		572444
8	1.00	25.00	0.013	8.48E-04	-73.7	-71.6		572444
		32.13	0.013	8.48E-04	-73.7	-71.6		
9	0.50	36.31	0.013	9.24E-04	-56.6	-104.1		572444
10	0.00	41.82	0.013	1.02E-03	-37.1	-127.6		572444
11	-0.60	48.98	0.012	1.16E-03	-9.8	-141.9		572444
12	-0.95	52.95	0.011	1.25E-03	8.0	-142.2		572444
13	-1.30	57.15	0.011	1.33E-03	27.3	-136.1		572444
14	-1.50	59.30	0.011	1.38E-03	38.9	-129.5		572444
		39.27	0.011	1.38E-03	38.9	-129.5		
15	-2.00	20.70	0.010	1.48E-03	53.9	-105.7		572444
16	-2.38	20.31	0.009	1.55E-03	61.6	-84.0		572444
17	-2.75	19.11	0.009	1.59E-03	69.0	-59.5		572444
18	-3.13	15.91	0.008	1.62E-03	75.5	-32.2		572444
19	-3.50	10.72	0.008	1.63E-03	80.5	-2.8		572444
		-104.04	0.008	1.63E-03	80.5	-2.8		
20	-4.00	-48.81	0.007	1.62E-03	42.3	24.5		572444
21	-4.50	-28.46	0.006	1.60E-03	23.0	39.5		572444
22	-5.00	-18.91	0.005	1.56E-03	11.2	47.5		572444
23	-5.38	-15.36	0.005	1.53E-03	4.7	50.4		572444
24	-5.75	-17.12	0.004	1.49E-03	-1.3	51.1		572444
		-60.54	0.004	1.49E-03	-1.3	51.1		
25	-6.18	-26.92	0.003	1.46E-03	-19.9	45.0		572444
26	-6.60	-7.24	0.003	1.43E-03	-27.2	34.1		572444
27	-7.20	7.84	0.002	1.40E-03	-27.0	16.5		572444

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-7.60	23.98	0.001	1.39E-03	-20.6	6.3		572444
29	-8.00	57.65	0.001	1.39E-03	-4.3	0.0		0
30	-8.15	-0.01	0.001	0	-0.0	0.0		0
31	-8.50	46.60	0.000	0	8.2	0.0		0
		-9.35	0.000	0	8.2	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	0.0	0.0		0
34	-14.40	0.01	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 104.8 kN/m run

		LEFT side						
			Effective stresses					
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	6.05	6.05	9974
3	3.00	0.00	18.01	5.57	69.68	7.28	7.28	9974
4	2.55	0.00	27.07	8.37	104.72	8.75	8.75	9974
5	2.10	0.00	36.44	11.26	140.98	10.72	10.72A	9974
6	2.00	0.00	38.54	11.91	149.09	10.39	10.39A	9974
7	1.50	0.00	49.00	15.14	189.53	16.75	16.75	9974
8	1.00	0.00	59.29	18.32	229.36	25.00	25.00	9974
		0.00	59.29	15.26	224.13	32.13	32.13	4987
9	0.50	0.00	69.38	18.81	258.84	36.31	36.31	5236
10	0.00	0.00	79.25	22.27	292.82	41.82	41.82	5486
11	-0.60	0.00	90.84	26.35	332.74	48.98	48.98	5785
12	-0.95	0.00	97.50	28.68	355.65	52.95	52.95	5960
13	-1.30	0.00	104.09	31.00	378.32	57.15	57.15	6134
14	-1.50	0.00	107.82	32.31	391.18	59.30	59.30	6234
15	-2.00	0.00	117.09	35.56	423.07	65.33	65.33	6483
16	-2.38	0.00	123.97	37.98	446.76	69.50	69.50	6670
17	-2.75	0.00	130.80	40.38	470.29	73.43	73.43	6857
18	-3.13	0.00	137.60	42.77	493.67	76.42	76.42	7044
19	-3.50	0.00	144.35	45.14	516.93	78.29	78.29	7231
		0.00	144.35	28.49	689.10	59.49	59.49	29922
20	-4.00	0.00	154.81	31.45	734.80	97.34	97.34	29922
21	-4.50	5.00	160.22	32.99	758.43	112.50	117.50	29922
22	-5.00	10.00	165.59	34.51	781.88	122.30	132.30	29922
23	-5.38	13.75	169.59	35.64	799.36	127.88	141.63	29922
24	-5.75	17.50	173.57	36.77	816.76	130.56	148.06	29922
		17.50	173.57	26.21	875.12	108.95	126.45	49871
25	-6.18	21.75	179.34	27.89	900.31	131.54	153.29	49871
26	-6.60	26.00	185.08	29.57	925.43	146.87	172.87	49871
27	-7.20	32.00	193.17	31.94	960.75	162.20	194.20	49871
28	-7.60	36.00	198.54	33.51	984.22	175.38	211.38	49871
29	-8.00	40.00	203.90	35.07	1007.64	198.45	238.45	49871
30	-8.15	41.50	205.91	35.66	1016.41	169.53	211.03	49871
31	-8.50	45.00	210.59	37.03	1036.85	198.37	243.37	49871
		45.00	210.59	0.00	6145.66	178.08	223.08	997417
32	-10.25	62.50	240.86	0.00	6566.09	212.57	275.07	997417
33	-12.00	80.00	271.00	0.00	6984.53	242.34	322.34	997417
34	-14.40	104.00	312.15	0.00	7556.03	283.08	387.08	997417
35	-16.80	128.00	353.16	0.00	8125.48	323.76	451.76	997417

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
36	-18.40	144.00	380.44	0.00	8504.23	350.85	494.85	997417
37	-20.00	160.00	407.67	0.00	8882.38	380.84	540.84	997417

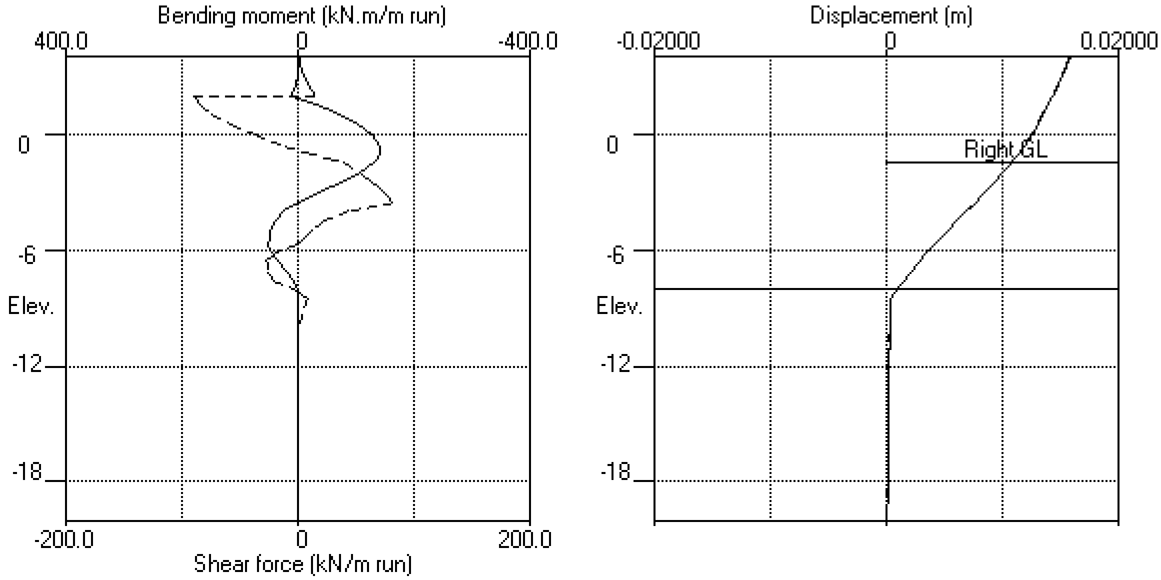
RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	6230
15	-2.00	0.00	8.50	0.00	49.29	44.62	44.62	6479
16	-2.38	0.00	14.88	0.00	71.23	49.19	49.19	6666
17	-2.75	0.00	21.25	1.90	93.18	54.32	54.32	6852
18	-3.13	0.00	27.63	4.14	115.13	60.51	60.51	7039
19	-3.50	0.00	34.00	6.38	137.08	67.57	67.57	7226
		0.00	34.00	0.00	206.94	163.54	163.54	29902
20	-4.00	0.00	44.01	0.06	250.65	146.15	146.15	29902
21	-4.50	5.00	49.02	1.48	272.53	140.96	145.96	29902
22	-5.00	10.00	54.03	2.90	294.42	141.21	151.21	29902
23	-5.38	13.75	57.79	3.96	310.85	143.24	156.99	29902
24	-5.75	17.50	61.55	5.03	327.28	147.67	165.17	29902
		17.50	61.55	0.00	385.64	169.49	186.99	49836
25	-6.18	21.75	67.09	0.00	409.85	158.46	180.21	49836
26	-6.60	26.00	72.63	0.00	434.07	154.11	180.11	49836
27	-7.20	32.00	80.46	0.00	468.29	154.36	186.36	49836
28	-7.60	36.00	85.69	0.52	491.12	151.40	187.40	49836
29	-8.00	40.00	90.92	2.05	513.96	140.80	180.80	49836
30	-8.15	41.50	92.88	2.63	522.53	169.53	211.03	49836
31	-8.50	45.00	97.46	3.96	542.54	151.77	196.77	49836
		45.00	97.46	0.00	4574.74	187.42	232.42	996727
32	-10.25	62.50	127.39	0.00	4990.45	212.57	275.07	996727
33	-12.00	80.00	157.41	0.00	5407.31	242.33	322.33	996727
34	-14.40	104.00	198.73	0.00	5981.06	283.07	387.07	996727
35	-16.80	128.00	240.23	0.00	6557.36	323.76	451.76	996727
36	-18.40	144.00	268.01	0.00	6942.99	350.85	494.85	996727
37	-20.00	160.00	295.86	0.00	7329.74	380.89	540.89	996727

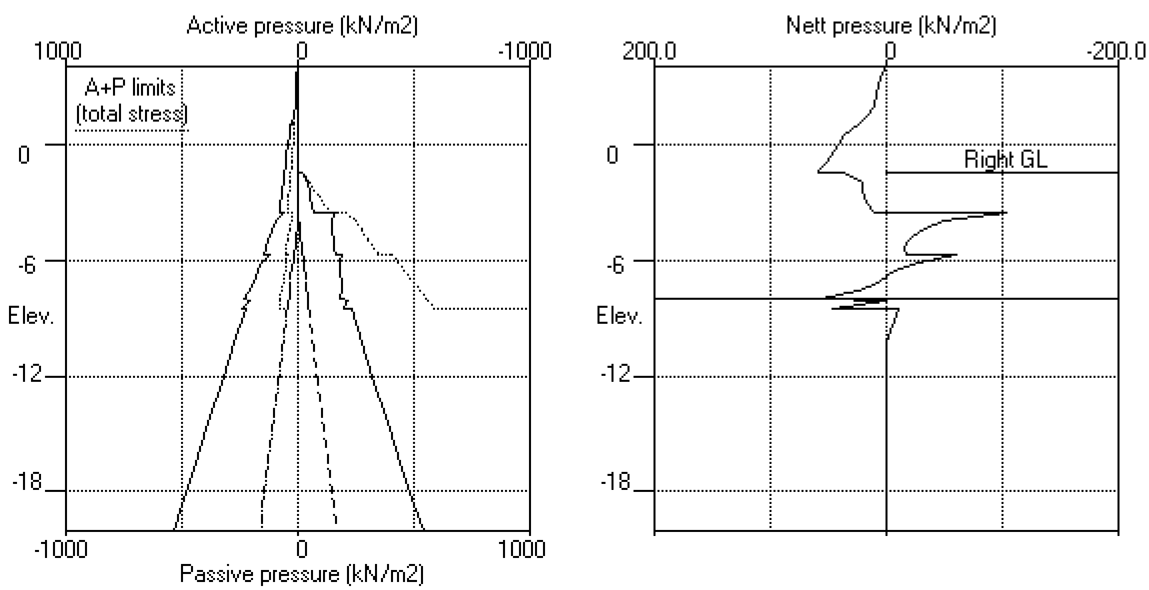
Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit
10.39A Arching - soil pressure below active limit

Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side

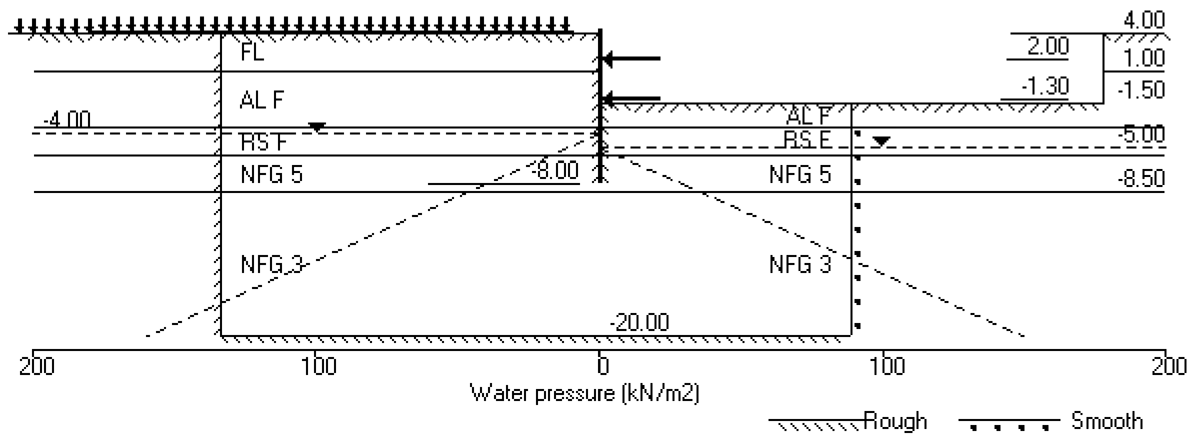


Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No. 6 Apply water pressure profile no.2

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
6	4.00	-1.50		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	7.91E-04	0.0	0.0		572444
2	3.50	6.16	0.015	7.91E-04	1.5	0.3		572444
3	3.00	7.37	0.015	7.90E-04	4.9	2.1		572444
4	2.55	8.83	0.015	7.87E-04	8.6	5.3		572444
5	2.10	10.79	0.014	7.81E-04	13.0	10.2		572444
6	2.00	10.45	0.014	7.79E-04	14.0	11.6	-104.0	572444
		10.45	0.014	7.79E-04	-90.0	11.6		
7	1.50	16.80	0.014	7.88E-04	-83.2	-31.1		572444
8	1.00	25.04	0.013	8.32E-04	-72.7	-70.4		572444
		32.15	0.013	8.32E-04	-72.7	-70.4		
9	0.50	36.33	0.013	9.08E-04	-55.6	-102.5		572444
10	0.00	41.83	0.013	1.00E-03	-36.1	-125.5		572444
11	-0.60	48.99	0.012	1.14E-03	-8.8	-139.1		572444
12	-0.95	52.96	0.012	1.23E-03	9.0	-139.1		572444
13	-1.30	57.15	0.011	1.31E-03	28.3	-132.6	-3.5	572444
		57.15	0.011	1.31E-03	24.8	-132.6		
14	-1.50	59.29	0.011	1.35E-03	36.5	-126.5		572444
		39.30	0.011	1.35E-03	36.5	-126.5		
15	-2.00	20.71	0.010	1.46E-03	51.5	-103.9		572444
16	-2.38	20.27	0.010	1.52E-03	59.2	-83.1		572444
17	-2.75	19.02	0.009	1.56E-03	66.5	-59.5		572444
18	-3.13	15.76	0.008	1.59E-03	73.0	-33.2		572444
19	-3.50	10.50	0.008	1.61E-03	78.0	-4.7		572444
		-104.94	0.008	1.61E-03	78.0	-4.7		
20	-4.00	-49.84	0.007	1.60E-03	39.3	21.2		572444
21	-4.50	-27.00	0.006	1.57E-03	20.1	34.7		572444
22	-5.00	-14.91	0.005	1.54E-03	9.6	41.5		572444
23	-5.38	-11.65	0.005	1.51E-03	4.6	44.0		572444
24	-5.75	-13.69	0.004	1.48E-03	-0.1	45.0		572444
		-58.64	0.004	1.48E-03	-0.1	45.0		
25	-6.18	-24.99	0.004	1.45E-03	-17.9	39.6		572444
26	-6.60	-5.81	0.003	1.43E-03	-24.5	29.7		572444

(continued)

Stage No.6 Apply water pressure profile no.2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-7.20	8.42	0.002	1.40E-03	-23.7	14.0		572444
28	-7.60	22.29	0.002	1.40E-03	-17.5	5.2		572444
29	-8.00	47.54	0.001	1.40E-03	-3.6	0.0		0
30	-8.15	-0.01	0.001	0	-0.0	0.0		0
31	-8.50	51.89	0.000	0	9.1	0.0		0
		-10.40	0.000	0	9.1	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	0.0	0.0		0
34	-14.40	0.01	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 104.0 kN/m run
At elev. -1.30 Prop force = 3.5 kN/m run

		LEFT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	6.16	6.16	9974
3	3.00	0.00	18.01	5.57	69.68	7.37	7.37	9974
4	2.55	0.00	27.07	8.37	104.72	8.83	8.83	9974
5	2.10	0.00	36.44	11.26	140.98	10.79	10.79A	9974
6	2.00	0.00	38.54	11.91	149.09	10.45	10.45A	9974
7	1.50	0.00	49.00	15.14	189.53	16.80	16.80	9974
8	1.00	0.00	59.29	18.32	229.36	25.04	25.04	9974
		0.00	59.29	15.26	224.13	32.15	32.15	4987
9	0.50	0.00	69.38	18.81	258.84	36.33	36.33	5236
10	0.00	0.00	79.25	22.27	292.82	41.83	41.83	5486
11	-0.60	0.00	90.84	26.35	332.74	48.99	48.99	5785
12	-0.95	0.00	97.50	28.68	355.65	52.96	52.96	5960
13	-1.30	0.00	104.09	31.00	378.32	57.15	57.15	6134
14	-1.50	0.00	107.82	32.31	391.18	59.29	59.29	6234
15	-2.00	0.00	117.09	35.56	423.07	65.30	65.30	6483
16	-2.38	0.00	123.97	37.98	446.76	69.45	69.45	6670
17	-2.75	0.00	130.80	40.38	470.29	73.36	73.36	6857
18	-3.13	0.00	137.60	42.77	493.67	76.33	76.33	7044
19	-3.50	0.00	144.35	45.14	516.93	78.18	78.18	7231
		0.00	144.35	28.49	689.10	59.03	59.03	29922
20	-4.00	0.00	154.81	31.45	734.80	96.81	96.81	29922
21	-4.50	5.00	160.22	32.99	758.43	111.79	116.79	29922
22	-5.00	10.00	165.59	34.51	781.88	121.43	131.43	29922
23	-5.38	13.75	169.59	35.64	799.36	126.87	140.62	29922
24	-5.75	17.50	173.57	36.77	816.76	129.41	146.91	29922
		17.50	173.57	26.21	875.12	107.04	124.54	49871
25	-6.18	21.75	179.34	27.89	900.31	129.64	151.39	49871
26	-6.60	26.00	185.08	29.57	925.43	144.73	170.73	49871
27	-7.20	32.00	193.17	31.94	960.75	159.64	191.64	49871
28	-7.60	36.00	198.54	33.51	984.22	171.71	207.71	49871
29	-8.00	40.00	203.90	35.07	1007.64	190.37	230.37	49871
30	-8.15	41.50	205.91	35.66	1016.41	166.79	208.29	49871
31	-8.50	45.00	210.59	37.03	1036.85	198.16	243.16	49871
		45.00	210.59	0.00	6145.66	173.91	218.91	997417
32	-10.25	62.50	240.86	0.00	6566.09	208.91	271.41	997417
33	-12.00	80.00	271.00	0.00	6984.53	238.67	318.67	997417

(continued)

Stage No.6 Apply water pressure profile no.2

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-14.40	104.00	312.15	0.00	7556.03	279.41	383.41	997417
35	-16.80	128.00	353.16	0.00	8125.48	320.06	448.06	997417
36	-18.40	144.00	380.44	0.00	8504.23	347.16	491.16	997417
37	-20.00	160.00	407.67	0.00	8882.38	377.89	537.89	997417

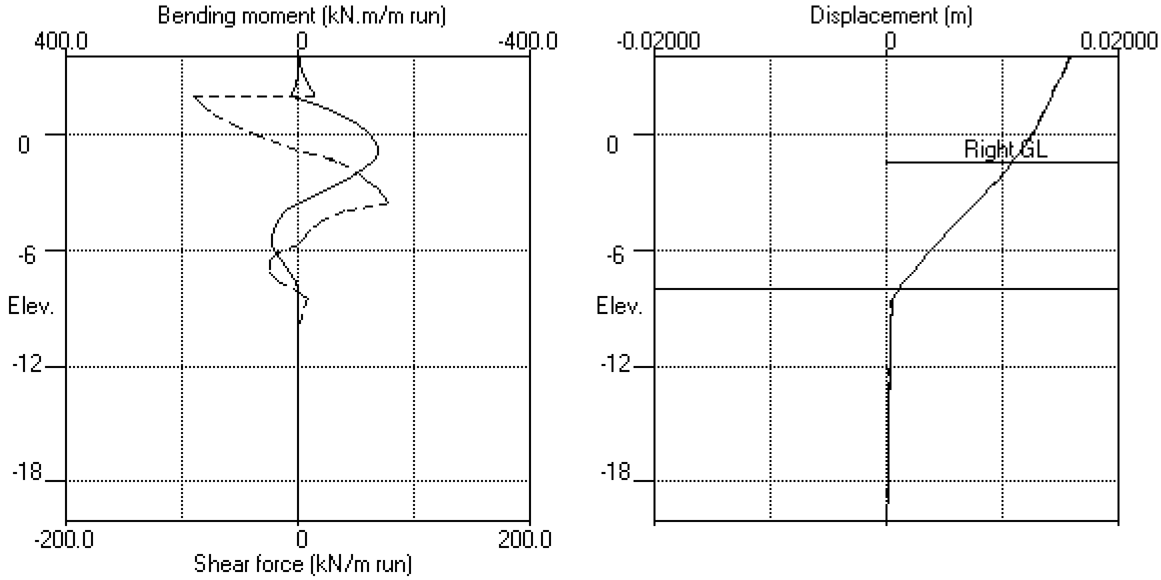
RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.98	19.98	6230
15	-2.00	0.00	8.50	0.00	49.29	44.59	44.59	6479
16	-2.38	0.00	14.88	0.00	71.23	49.18	49.18	6666
17	-2.75	0.00	21.25	1.90	93.18	54.34	54.34	6852
18	-3.13	0.00	27.63	4.14	115.13	60.57	60.57	7039
19	-3.50	0.00	34.00	6.38	137.08	67.68	67.68	7226
		0.00	34.00	0.00	206.94	163.97	163.97	29902
20	-4.00	0.00	44.01	0.06	250.65	146.65	146.65	29902
21	-4.50	0.00	54.02	2.89	294.38	143.79	143.79	29902
22	-5.00	0.00	64.03	5.73	338.12	146.34	146.34	29902
23	-5.38	3.75	67.79	6.79	354.54	148.52	152.27	29902
24	-5.75	7.50	71.55	7.86	370.98	153.10	160.60	29902
		7.50	71.55	0.00	429.34	175.68	183.18	49836
25	-6.18	11.75	77.09	0.00	453.54	164.63	176.38	49836
26	-6.60	16.00	82.63	0.00	477.76	160.53	176.53	49836
27	-7.20	22.00	90.46	1.92	511.98	161.22	183.22	49836
28	-7.60	26.00	95.69	3.45	534.81	159.42	185.42	49836
29	-8.00	30.00	100.92	4.97	557.66	152.83	182.83	49836
30	-8.15	31.50	102.88	5.55	566.23	176.79	208.29	49836
31	-8.50	35.00	107.46	6.89	586.23	156.27	191.27	49836
		35.00	107.46	0.00	4713.60	194.31	229.31	996727
32	-10.25	52.50	137.39	0.00	5129.31	218.90	271.40	996727
33	-12.00	70.00	167.41	0.00	5546.17	248.66	318.66	996727
34	-14.40	94.00	208.73	0.00	6119.92	289.40	383.40	996727
35	-16.80	118.00	250.23	0.00	6696.22	330.07	448.07	996727
36	-18.40	134.00	278.01	0.00	7081.85	357.15	491.15	996727
37	-20.00	150.00	305.86	0.00	7468.60	387.94	537.94	996727

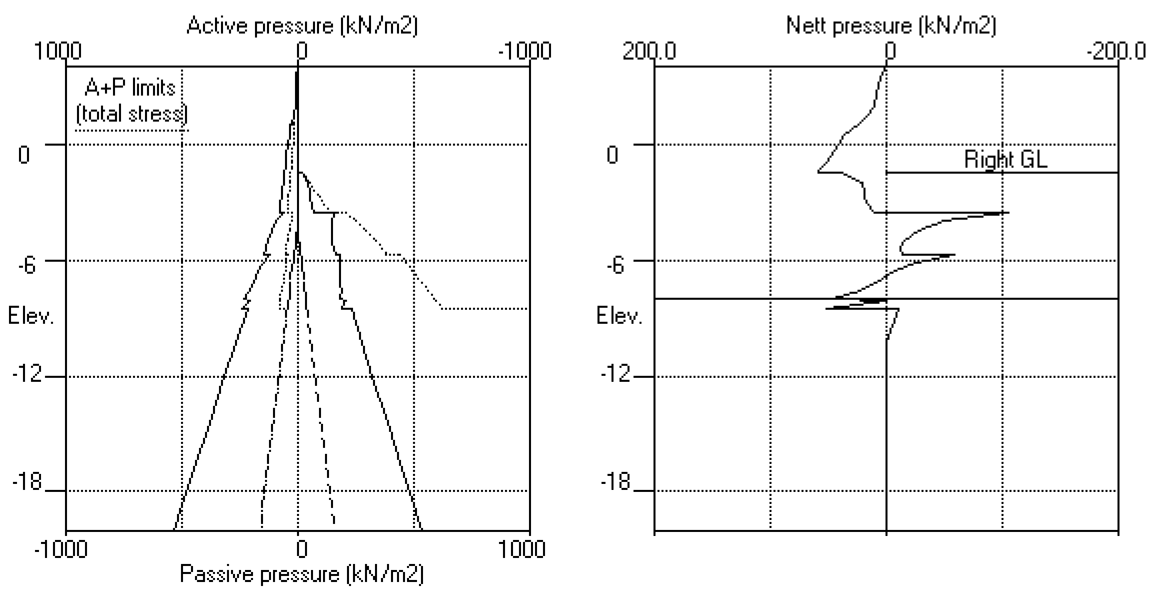
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
10.45A Arching - soil pressure below active limit

Units: kN,m

Stage No.6 Apply water pressure profile no.2

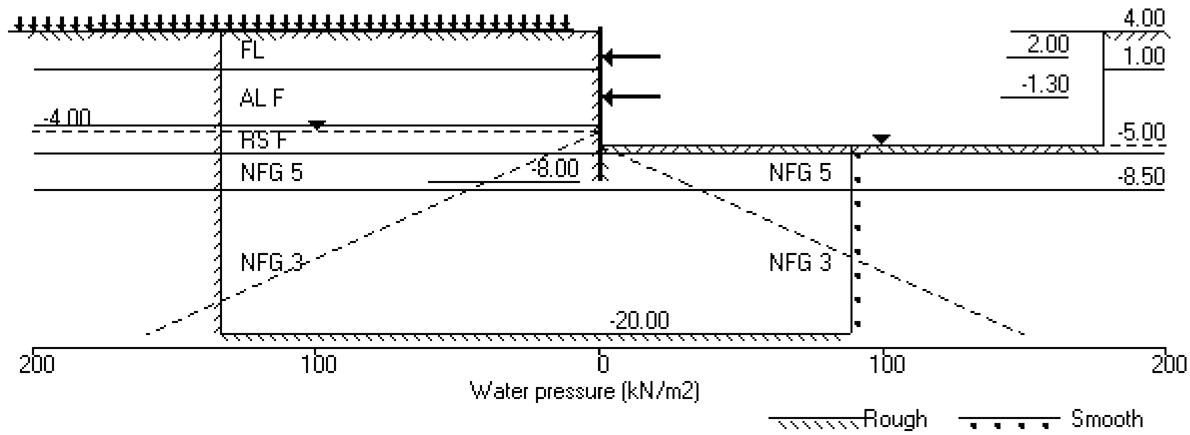


Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -5.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
7	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	7.78E-05	0.0	0.0		572444
2	3.50	10.94	0.014	7.76E-05	2.7	0.3		572444
3	3.00	10.76	0.014	7.60E-05	8.2	3.3		572444
4	2.55	11.25	0.014	7.15E-05	13.1	8.3		572444
5	2.10	12.55	0.014	6.21E-05	18.5	15.5		572444
6	2.00	11.56	0.014	5.92E-05	19.7	17.4	-100.8	572444
		11.56	0.014	5.92E-05	-81.1	17.4		
7	1.50	17.19	0.014	6.07E-05	-73.9	-20.7		572444
8	1.00	24.41	0.014	9.39E-05	-63.5	-55.3		572444
		31.83	0.014	9.39E-05	-63.5	-55.3		
9	0.50	35.78	0.014	1.54E-04	-46.6	-82.8		572444
10	0.00	40.93	0.014	2.34E-04	-27.4	-101.4		572444
11	-0.60	47.67	0.014	3.45E-04	-0.9	-110.0		572444
12	-0.95	51.14	0.014	4.11E-04	16.4	-107.3		572444
13	-1.30	54.90	0.014	4.74E-04	35.0	-98.3	-181.2	572444
		54.90	0.014	4.74E-04	-146.2	-98.3		
14	-1.50	56.36	0.013	5.14E-04	-135.1	-126.5		572444
15	-2.00	61.59	0.013	6.50E-04	-105.6	-186.5		572444
16	-2.38	64.74	0.013	7.84E-04	-81.9	-221.7		572444
17	-2.75	67.69	0.013	9.38E-04	-57.1	-247.7		572444
18	-3.13	69.58	0.012	1.10E-03	-31.4	-264.2		572444
19	-3.50	70.45	0.012	1.28E-03	-5.1	-270.9		572444
		27.05	0.012	1.28E-03	-5.1	-270.9		
20	-4.00	67.73	0.011	1.51E-03	18.6	-270.8		572444
21	-4.50	86.65	0.010	1.74E-03	57.2	-253.0		572444
22	-5.00	100.88	0.009	1.95E-03	104.1	-213.4		572444
		42.52	0.009	1.95E-03	104.1	-213.4		
23	-5.38	31.18	0.009	2.07E-03	117.9	-171.7		572444
24	-5.75	16.34	0.008	2.17E-03	126.8	-125.6		572444
		-85.68	0.008	2.17E-03	126.8	-125.6		
25	-6.18	-76.69	0.007	2.24E-03	92.3	-79.4		572444
26	-6.60	-56.39	0.006	2.29E-03	64.0	-47.1		572444

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-7.20	-35.77	0.004	2.33E-03	36.4	-18.8		572444
28	-7.60	-28.33	0.004	2.34E-03	23.5	-7.2		572444
29	-8.00	-65.01	0.003	2.34E-03	4.9	-0.0		0
30	-8.15	-0.01	0.002	0	-0.0	0.0		0
31	-8.50	78.32	0.001	0	13.7	0.0		0
		-15.70	0.001	0	13.7	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 100.8 kN/m run
At elev. -1.30 Prop force = 181.2 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	10.94	10.94	9974
3	3.00	0.00	18.01	5.57	69.68	10.76	10.76	9974
4	2.55	0.00	27.07	8.37	104.72	11.25	11.25	9974
5	2.10	0.00	36.44	11.26	140.98	12.55	12.55	9974
6	2.00	0.00	38.54	11.91	149.09	11.56	11.56A	9974
7	1.50	0.00	49.00	15.14	189.53	17.19	17.19	9974
8	1.00	0.00	59.29	18.32	229.36	24.41	24.41	9974
		0.00	59.29	15.26	224.13	31.83	31.83	4987
9	0.50	0.00	69.38	18.81	258.84	35.78	35.78	5236
10	0.00	0.00	79.25	22.27	292.82	40.93	40.93	5486
11	-0.60	0.00	90.84	26.35	332.74	47.67	47.67	5785
12	-0.95	0.00	97.50	28.68	355.65	51.14	51.14	5960
13	-1.30	0.00	104.09	31.00	378.32	54.90	54.90	6134
14	-1.50	0.00	107.82	32.31	391.18	56.36	56.36	6234
15	-2.00	0.00	117.09	35.56	423.07	61.59	61.59	6483
16	-2.38	0.00	123.97	37.98	446.76	64.74	64.74	6670
17	-2.75	0.00	130.80	40.38	470.29	67.69	67.69	6857
18	-3.13	0.00	137.60	42.77	493.67	69.58	69.58	7044
19	-3.50	0.00	144.35	45.14	516.93	70.45	70.45	7231
		0.00	144.35	28.49	689.10	27.05	27.05A	29922
20	-4.00	0.00	154.81	31.45	734.80	67.73	67.73	29922
21	-4.50	5.00	160.22	32.99	758.43	81.65	86.65	29922
22	-5.00	10.00	165.59	34.51	781.88	90.88	100.88	29922
23	-5.38	13.75	169.59	35.64	799.36	95.92	109.67	29922
24	-5.75	17.50	173.57	36.77	816.76	97.47	114.97	29922
		17.50	173.57	26.21	875.12	53.81	71.31	49871
25	-6.18	21.75	179.34	27.89	900.31	86.94	108.69	49871
26	-6.60	26.00	185.08	29.57	925.43	107.27	133.27	49871
27	-7.20	32.00	193.17	31.94	960.75	124.92	156.92	49871
28	-7.60	36.00	198.54	33.51	984.22	133.62	169.62	49871
29	-8.00	40.00	203.90	35.07	1007.64	119.24	159.24	49871
30	-8.15	41.50	205.91	35.66	1016.41	154.80	196.30	49871
31	-8.50	45.00	210.59	37.03	1036.85	197.72	242.72	49871
		45.00	210.59	0.00	6145.66	165.06	210.06	997417
32	-10.25	62.50	240.86	0.00	6566.09	202.31	264.81	997417
33	-12.00	80.00	271.00	0.00	6984.53	231.67	311.67	997417

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-14.40	104.00	312.15	0.00	7556.03	272.10	376.10	997417
35	-16.80	128.00	353.16	0.00	8125.48	312.52	440.52	997417
36	-18.40	144.00	380.44	0.00	8504.23	339.47	483.47	997417
37	-20.00	160.00	407.67	0.00	8882.38	371.80	531.80	997417

RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
23	-5.38	3.75	3.75	0.00	74.74	74.74	78.49p	29934
24	-5.75	7.50	7.50	0.00	91.13	91.13	98.63p	29934
		7.50	7.50	0.00	149.49	149.49	156.99p	49890
25	-6.18	11.75	13.03	0.00	173.64	173.64	185.39p	49890
26	-6.60	16.00	18.55	0.00	197.79	173.66	189.66	49890
27	-7.20	22.00	26.36	0.00	231.90	170.69	192.69	49890
28	-7.60	26.00	31.57	0.00	254.65	171.95	197.95	49890
29	-8.00	30.00	36.78	0.00	277.42	194.25	224.25	49890
30	-8.15	31.50	38.73	0.00	285.96	164.81	196.31	49890
31	-8.50	35.00	43.29	0.00	305.89	129.40	164.40	49890
		35.00	43.29	0.00	3822.67	190.76	225.76	997795
32	-10.25	52.50	73.15	0.00	4237.22	212.30	264.80	997795
33	-12.00	70.00	103.10	0.00	4653.06	241.66	311.66	997795
34	-14.40	94.00	144.36	0.00	5226.11	282.08	376.08	997795
35	-16.80	118.00	185.90	0.00	5802.91	322.53	440.53	997795
36	-18.40	134.00	213.76	0.00	6189.76	349.46	483.46	997795
37	-20.00	150.00	241.76	0.00	6578.53	381.86	531.86	997795

Note: 12.34 a Soil pressure at active limit
185.39 p Soil pressure at passive limit
27.05A Arching - soil pressure below active limit

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EDG CONSULTING PTY LTD                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58             | Job No.  B01493
                              Licensed from GEOSOLVE            | Made by :   DJC
Data filename/Run ID: Section_1                                 |
Albert Street Development                                       | Date:16-11-2022
Section 1                                                       | Checked :
------------------------------------------------------------------------------
                                                          Units: kN,m
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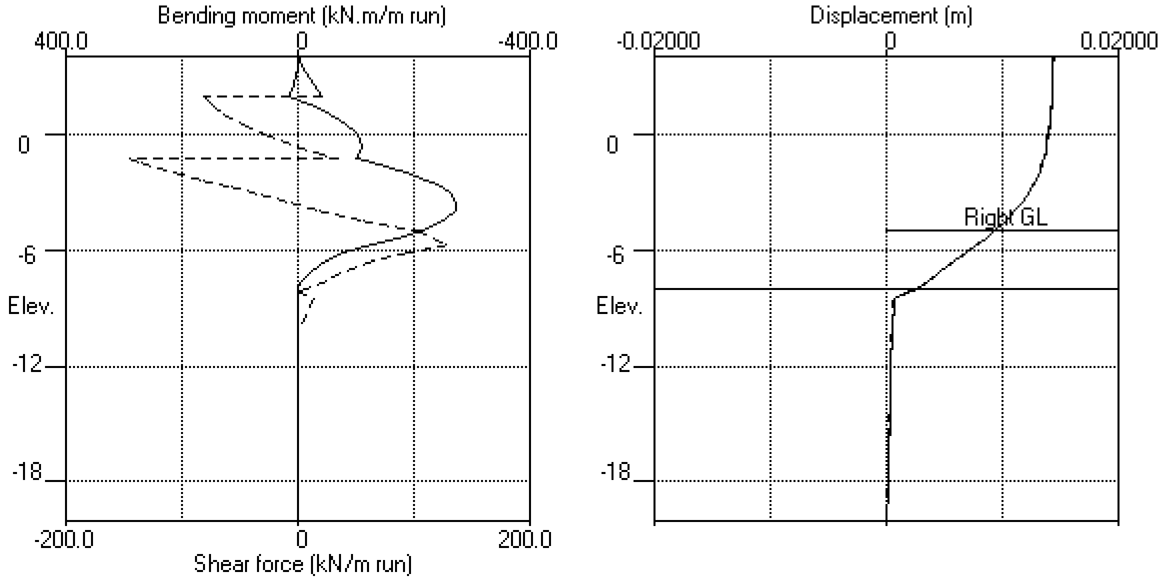
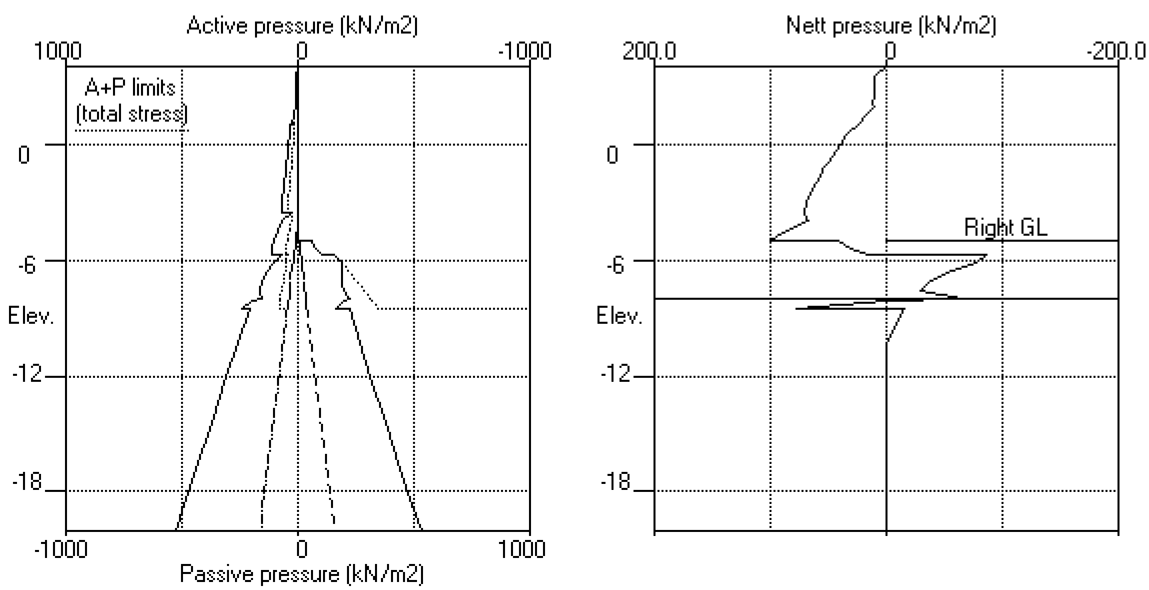
Stage No.7 Excav. to elev. -5.00 on RIGHT side

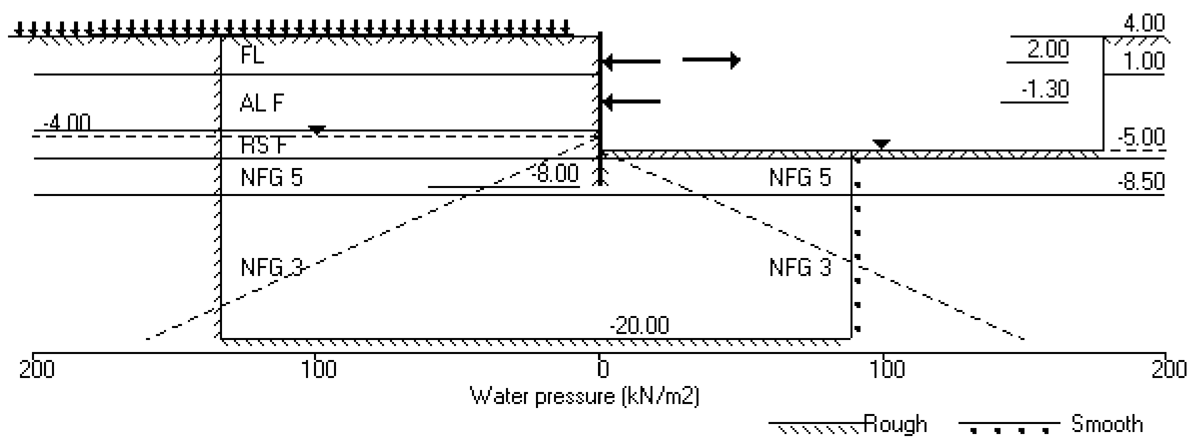


Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.10



Units: kN,m

Stage No. 8 Apply load no.1 at elevation 2.10

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
8	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	2.22E-04	0.0	0.0		572444
2	3.50	9.27	0.015	2.21E-04	2.3	0.3		572444
3	3.00	9.52	0.015	2.20E-04	7.0	2.9		572444
4	2.55	10.27	0.015	2.16E-04	11.5	7.2		572444
5	2.10	11.74	0.015	2.08E-04	16.4	13.6	45.0	572444
		11.74	0.015	2.08E-04	61.4	13.6		
6	2.00	10.92	0.015	2.05E-04	62.6	19.8	-138.3	572444
		10.92	0.015	2.05E-04	-75.7	19.8		
7	1.50	16.75	0.015	2.03E-04	-68.8	-15.7		572444
8	1.00	24.25	0.015	2.31E-04	-58.6	-47.8		572444
		31.75	0.015	2.31E-04	-58.6	-47.8		
9	0.50	35.66	0.014	2.84E-04	-41.7	-72.8		572444
10	0.00	40.85	0.014	3.54E-04	-22.6	-89.0		572444
11	-0.60	47.63	0.014	4.51E-04	4.0	-94.7		572444
12	-0.95	51.13	0.014	5.07E-04	21.2	-90.3		572444
13	-1.30	54.92	0.014	5.59E-04	39.8	-79.7	-189.6	572444
		54.92	0.014	5.59E-04	-149.8	-79.7		
14	-1.50	56.40	0.014	5.92E-04	-138.7	-108.5		572444
15	-2.00	61.64	0.013	7.14E-04	-109.2	-170.3		572444
16	-2.38	64.79	0.013	8.37E-04	-85.5	-206.8		572444
17	-2.75	67.75	0.013	9.82E-04	-60.6	-234.2		572444
18	-3.13	69.62	0.012	1.14E-03	-34.9	-252.0		572444
19	-3.50	70.46	0.012	1.30E-03	-8.6	-260.1		572444
		27.07	0.012	1.30E-03	-8.6	-260.1		
20	-4.00	67.98	0.011	1.53E-03	15.2	-261.7		572444
21	-4.50	86.98	0.010	1.75E-03	53.9	-245.6		572444
22	-5.00	101.24	0.009	1.95E-03	100.9	-207.6		572444
		43.12	0.009	1.95E-03	100.9	-207.6		
23	-5.38	31.76	0.009	2.07E-03	115.0	-167.0		572444
24	-5.75	16.95	0.008	2.17E-03	124.1	-121.9		572444
		-84.67	0.008	2.17E-03	124.1	-121.9		
25	-6.18	-75.77	0.007	2.24E-03	90.0	-76.8		572444

(continued)

Stage No.8 Apply load no.1 at elevation 2.10

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
26	-6.60	-55.50	0.006	2.29E-03	62.1	-45.4		572444
27	-7.20	-34.86	0.004	2.32E-03	35.0	-18.1		572444
28	-7.60	-27.17	0.004	2.33E-03	22.6	-6.9		572444
29	-8.00	-62.48	0.003	2.33E-03	4.7	-0.0		0
30	-8.15	-0.01	0.002	0	-0.0	0.0		0
31	-8.50	78.32	0.001	0	13.7	0.0		0
		-15.70	0.001	0	13.7	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 138.3 kN/m run
At elev. -1.30 Prop force = 189.6 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	9.27	9.27	9974
3	3.00	0.00	18.01	5.57	69.68	9.52	9.52	9974
4	2.55	0.00	27.07	8.37	104.72	10.27	10.27	9974
5	2.10	0.00	36.44	11.26	140.98	11.74	11.74	9974
6	2.00	0.00	38.54	11.91	149.09	10.92	10.92A	9974
7	1.50	0.00	49.00	15.14	189.53	16.75	16.75	9974
8	1.00	0.00	59.29	18.32	229.36	24.25	24.25	9974
		0.00	59.29	15.26	224.13	31.75	31.75	4987
9	0.50	0.00	69.38	18.81	258.84	35.66	35.66	5236
10	0.00	0.00	79.25	22.27	292.82	40.85	40.85	5486
11	-0.60	0.00	90.84	26.35	332.74	47.63	47.63	5785
12	-0.95	0.00	97.50	28.68	355.65	51.13	51.13	5960
13	-1.30	0.00	104.09	31.00	378.32	54.92	54.92	6134
14	-1.50	0.00	107.82	32.31	391.18	56.40	56.40	6234
15	-2.00	0.00	117.09	35.56	423.07	61.64	61.64	6483
16	-2.38	0.00	123.97	37.98	446.76	64.79	64.79	6670
17	-2.75	0.00	130.80	40.38	470.29	67.75	67.75	6857
18	-3.13	0.00	137.60	42.77	493.67	69.62	69.62	7044
19	-3.50	0.00	144.35	45.14	516.93	70.46	70.46	7231
		0.00	144.35	28.49	689.10	27.07	27.07A	29922
20	-4.00	0.00	154.81	31.45	734.80	67.98	67.98	29922
21	-4.50	5.00	160.22	32.99	758.43	81.98	86.98	29922
22	-5.00	10.00	165.59	34.51	781.88	91.24	101.24	29922
23	-5.38	13.75	169.59	35.64	799.36	96.28	110.03	29922
24	-5.75	17.50	173.57	36.77	816.76	97.81	115.31	29922
		17.50	173.57	26.21	875.12	54.38	71.88	49871
25	-6.18	21.75	179.34	27.89	900.31	87.45	109.20	49871
26	-6.60	26.00	185.08	29.57	925.43	107.75	133.75	49871
27	-7.20	32.00	193.17	31.94	960.75	125.40	157.40	49871
28	-7.60	36.00	198.54	33.51	984.22	134.21	170.21	49871
29	-8.00	40.00	203.90	35.07	1007.64	120.55	160.55	49871
30	-8.15	41.50	205.91	35.66	1016.41	154.77	196.27	49871
31	-8.50	45.00	210.59	37.03	1036.85	197.72	242.72	49871
		45.00	210.59	0.00	6145.66	165.10	210.10	997417
32	-10.25	62.50	240.86	0.00	6566.09	202.34	264.84	997417

(continued)

Stage No.8 Apply load no.1 at elevation 2.10

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Effective stresses Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
33	-12.00	80.00	271.00	0.00	6984.53	231.68	311.68	997417
34	-14.40	104.00	312.15	0.00	7556.03	272.11	376.11	997417
35	-16.80	128.00	353.16	0.00	8125.48	312.53	440.53	997417
36	-18.40	144.00	380.44	0.00	8504.23	339.47	483.47	997417
37	-20.00	160.00	407.67	0.00	8882.38	371.79	531.79	997417

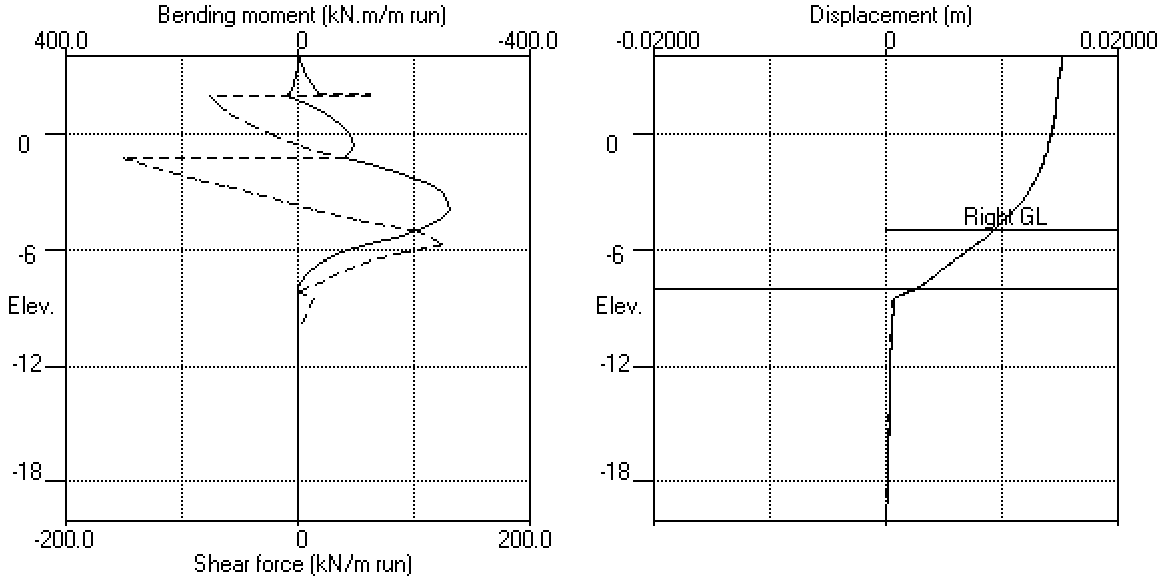
RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Effective stresses Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.11	58.11	29934
23	-5.38	3.75	3.75	0.00	74.74	74.51	78.26	29934
24	-5.75	7.50	7.50	0.00	91.13	90.86	98.36	29934
		7.50	7.50	0.00	149.49	149.04	156.54	49890
25	-6.18	11.75	13.03	0.00	173.64	173.22	184.97	49890
26	-6.60	16.00	18.55	0.00	197.79	173.25	189.25	49890
27	-7.20	22.00	26.36	0.00	231.90	170.26	192.26	49890
28	-7.60	26.00	31.57	0.00	254.65	171.38	197.38	49890
29	-8.00	30.00	36.78	0.00	277.42	193.03	223.03	49890
30	-8.15	31.50	38.73	0.00	285.96	164.78	196.28	49890
31	-8.50	35.00	43.29	0.00	305.89	129.40	164.40	49890
		35.00	43.29	0.00	3822.67	190.80	225.80	997795
32	-10.25	52.50	73.15	0.00	4237.22	212.33	264.83	997795
33	-12.00	70.00	103.10	0.00	4653.06	241.67	311.67	997795
34	-14.40	94.00	144.36	0.00	5226.11	282.09	376.09	997795
35	-16.80	118.00	185.90	0.00	5802.91	322.53	440.53	997795
36	-18.40	134.00	213.76	0.00	6189.76	349.46	483.46	997795
37	-20.00	150.00	241.76	0.00	6578.53	381.86	531.86	997795

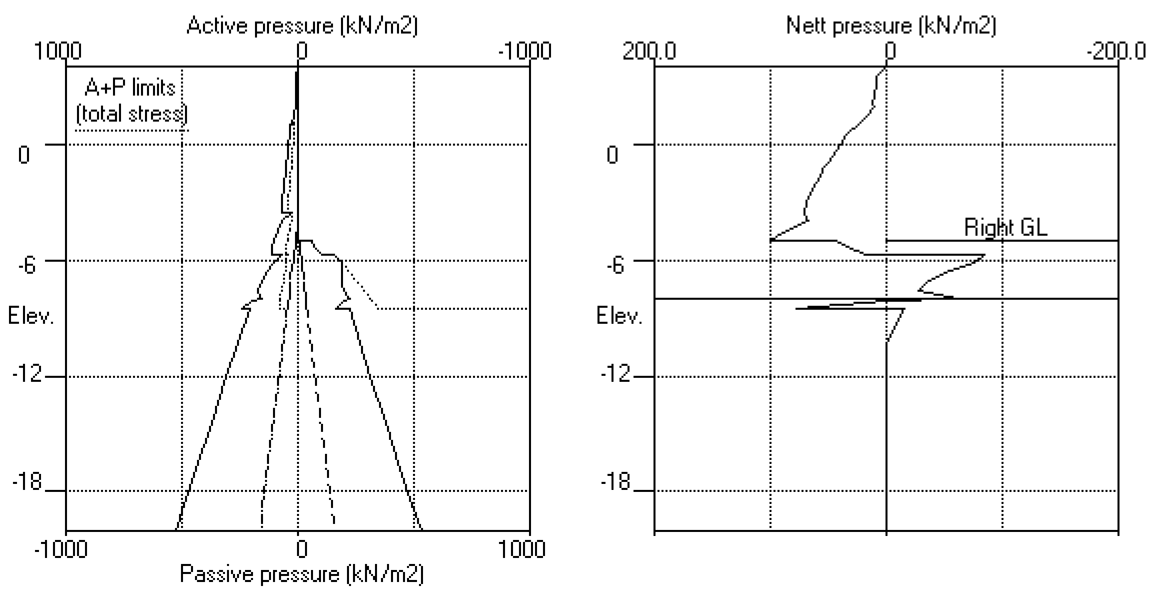
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
27.07A Arching - soil pressure below active limit

Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.10

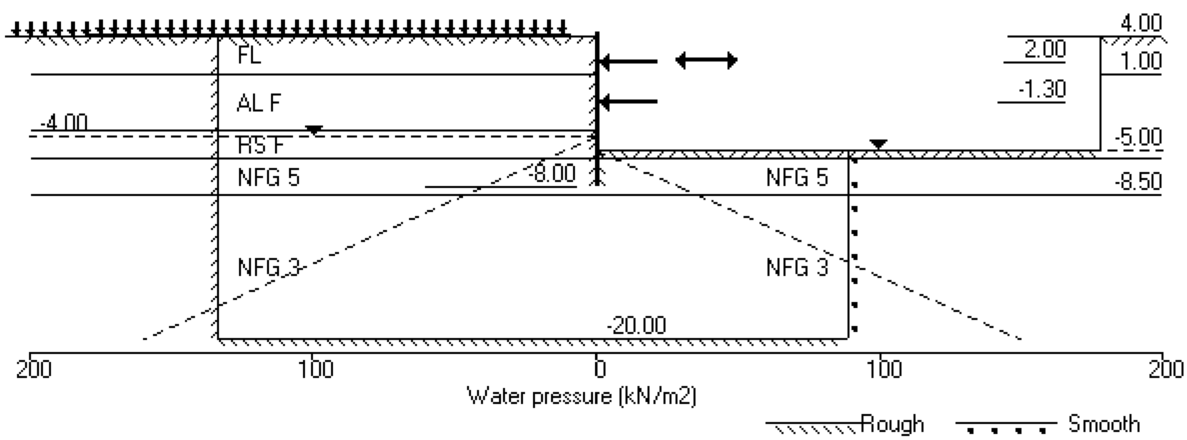


Stage No.8 Apply load no.1 at elev. 2.10



Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.10



Units: kN,m

Stage No. 9 Apply load no.2 at elevation 2.10

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00 Factor of Safety	FoS for toe elev. = -8.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
9	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	7.78E-05	0.0	0.0		572444
2	3.50	10.94	0.014	7.76E-05	2.7	0.3		572444
3	3.00	10.76	0.014	7.60E-05	8.2	3.3		572444
4	2.55	11.25	0.014	7.15E-05	13.1	8.3		572444
5	2.10	12.55	0.014	6.21E-05	18.5	15.5		572444
6	2.00	11.56	0.014	5.92E-05	19.7	17.4	-100.8	572444
		11.56	0.014	5.92E-05	-81.1	17.4		
7	1.50	17.19	0.014	6.07E-05	-73.9	-20.7		572444
8	1.00	24.41	0.014	9.39E-05	-63.5	-55.3		572444
		31.83	0.014	9.39E-05	-63.5	-55.3		
9	0.50	35.78	0.014	1.54E-04	-46.6	-82.8		572444
10	0.00	40.93	0.014	2.34E-04	-27.4	-101.4		572444
11	-0.60	47.67	0.014	3.45E-04	-0.9	-110.0		572444
12	-0.95	51.14	0.014	4.11E-04	16.4	-107.3		572444
13	-1.30	54.90	0.014	4.74E-04	35.0	-98.3	-181.2	572444
		54.90	0.014	4.74E-04	-146.2	-98.3		
14	-1.50	56.36	0.013	5.14E-04	-135.1	-126.5		572444
15	-2.00	61.59	0.013	6.50E-04	-105.6	-186.5		572444
16	-2.38	64.74	0.013	7.84E-04	-81.9	-221.7		572444
17	-2.75	67.69	0.013	9.38E-04	-57.1	-247.7		572444
18	-3.13	69.58	0.012	1.10E-03	-31.4	-264.2		572444
19	-3.50	70.45	0.012	1.28E-03	-5.1	-270.9		572444
		27.05	0.012	1.28E-03	-5.1	-270.9		
20	-4.00	67.73	0.011	1.51E-03	18.6	-270.8		572444
21	-4.50	86.65	0.010	1.74E-03	57.2	-253.0		572444
22	-5.00	100.88	0.009	1.95E-03	104.1	-213.4		572444
		42.52	0.009	1.95E-03	104.1	-213.4		
23	-5.38	31.18	0.009	2.07E-03	117.9	-171.7		572444
24	-5.75	16.34	0.008	2.17E-03	126.8	-125.6		572444
		-85.68	0.008	2.17E-03	126.8	-125.6		
25	-6.18	-76.69	0.007	2.24E-03	92.3	-79.4		572444
26	-6.60	-56.39	0.006	2.29E-03	64.0	-47.1		572444

(continued)

Stage No.9 Apply load no.2 at elevation 2.10

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-7.20	-35.77	0.004	2.33E-03	36.4	-18.8		572444
28	-7.60	-28.33	0.004	2.34E-03	23.5	-7.2		572444
29	-8.00	-65.01	0.003	2.34E-03	4.9	-0.0		0
30	-8.15	-0.01	0.002	0	-0.0	0.0		0
31	-8.50	78.32	0.001	0	13.7	0.0		0
		-15.70	0.001	0	13.7	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 100.8 kN/m run
At elev. -1.30 Prop force = 181.2 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	10.94	10.94	9974
3	3.00	0.00	18.01	5.57	69.68	10.76	10.76	9974
4	2.55	0.00	27.07	8.37	104.72	11.25	11.25	9974
5	2.10	0.00	36.44	11.26	140.98	12.55	12.55	9974
6	2.00	0.00	38.54	11.91	149.09	11.56	11.56A	9974
7	1.50	0.00	49.00	15.14	189.53	17.19	17.19	9974
8	1.00	0.00	59.29	18.32	229.36	24.41	24.41	9974
		0.00	59.29	15.26	224.13	31.83	31.83	4987
9	0.50	0.00	69.38	18.81	258.84	35.78	35.78	5236
10	0.00	0.00	79.25	22.27	292.82	40.93	40.93	5486
11	-0.60	0.00	90.84	26.35	332.74	47.67	47.67	5785
12	-0.95	0.00	97.50	28.68	355.65	51.14	51.14	5960
13	-1.30	0.00	104.09	31.00	378.32	54.90	54.90	6134
14	-1.50	0.00	107.82	32.31	391.18	56.36	56.36	6234
15	-2.00	0.00	117.09	35.56	423.07	61.59	61.59	6483
16	-2.38	0.00	123.97	37.98	446.76	64.74	64.74	6670
17	-2.75	0.00	130.80	40.38	470.29	67.69	67.69	6857
18	-3.13	0.00	137.60	42.77	493.67	69.58	69.58	7044
19	-3.50	0.00	144.35	45.14	516.93	70.45	70.45	7231
		0.00	144.35	28.49	689.10	27.05	27.05A	29922
20	-4.00	0.00	154.81	31.45	734.80	67.73	67.73	29922
21	-4.50	5.00	160.22	32.99	758.43	81.65	86.65	29922
22	-5.00	10.00	165.59	34.51	781.88	90.88	100.88	29922
23	-5.38	13.75	169.59	35.64	799.36	95.92	109.67	29922
24	-5.75	17.50	173.57	36.77	816.76	97.47	114.97	29922
		17.50	173.57	26.21	875.12	53.81	71.31	49871
25	-6.18	21.75	179.34	27.89	900.31	86.94	108.69	49871
26	-6.60	26.00	185.08	29.57	925.43	107.27	133.27	49871
27	-7.20	32.00	193.17	31.94	960.75	124.92	156.92	49871
28	-7.60	36.00	198.54	33.51	984.22	133.62	169.62	49871
29	-8.00	40.00	203.90	35.07	1007.64	119.24	159.24	49871
30	-8.15	41.50	205.91	35.66	1016.41	154.80	196.30	49871
31	-8.50	45.00	210.59	37.03	1036.85	197.72	242.72	49871
		45.00	210.59	0.00	6145.66	165.06	210.06	997417
32	-10.25	62.50	240.86	0.00	6566.09	202.31	264.81	997417
33	-12.00	80.00	271.00	0.00	6984.53	231.67	311.67	997417

(continued)

Stage No.9 Apply load no.2 at elevation 2.10

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-14.40	104.00	312.15	0.00	7556.03	272.10	376.10	997417
35	-16.80	128.00	353.16	0.00	8125.48	312.52	440.52	997417
36	-18.40	144.00	380.44	0.00	8504.23	339.47	483.47	997417
37	-20.00	160.00	407.67	0.00	8882.38	371.80	531.80	997417

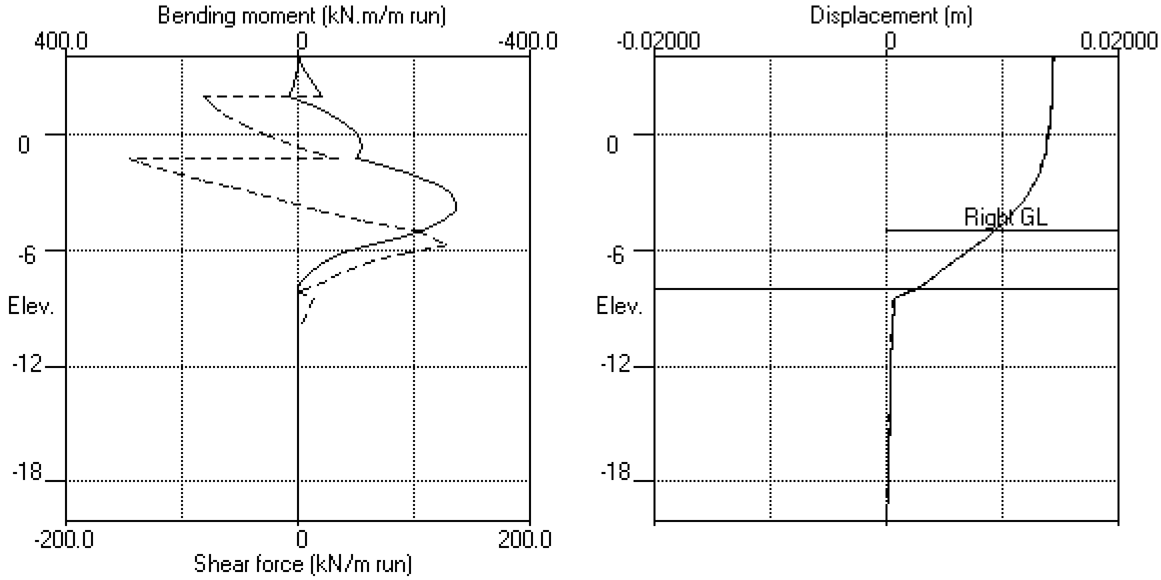
RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
23	-5.38	3.75	3.75	0.00	74.74	74.74	78.49p	29934
24	-5.75	7.50	7.50	0.00	91.13	91.13	98.63p	29934
		7.50	7.50	0.00	149.49	149.49	156.99p	49890
25	-6.18	11.75	13.03	0.00	173.64	173.64	185.39p	49890
26	-6.60	16.00	18.55	0.00	197.79	173.66	189.66	49890
27	-7.20	22.00	26.36	0.00	231.90	170.69	192.69	49890
28	-7.60	26.00	31.57	0.00	254.65	171.95	197.95	49890
29	-8.00	30.00	36.78	0.00	277.42	194.25	224.25	49890
30	-8.15	31.50	38.73	0.00	285.96	164.81	196.31	49890
31	-8.50	35.00	43.29	0.00	305.89	129.40	164.40	49890
		35.00	43.29	0.00	3822.67	190.76	225.76	997795
32	-10.25	52.50	73.15	0.00	4237.22	212.30	264.80	997795
33	-12.00	70.00	103.10	0.00	4653.06	241.66	311.66	997795
34	-14.40	94.00	144.36	0.00	5226.11	282.08	376.08	997795
35	-16.80	118.00	185.90	0.00	5802.91	322.53	440.53	997795
36	-18.40	134.00	213.76	0.00	6189.76	349.46	483.46	997795
37	-20.00	150.00	241.76	0.00	6578.53	381.86	531.86	997795

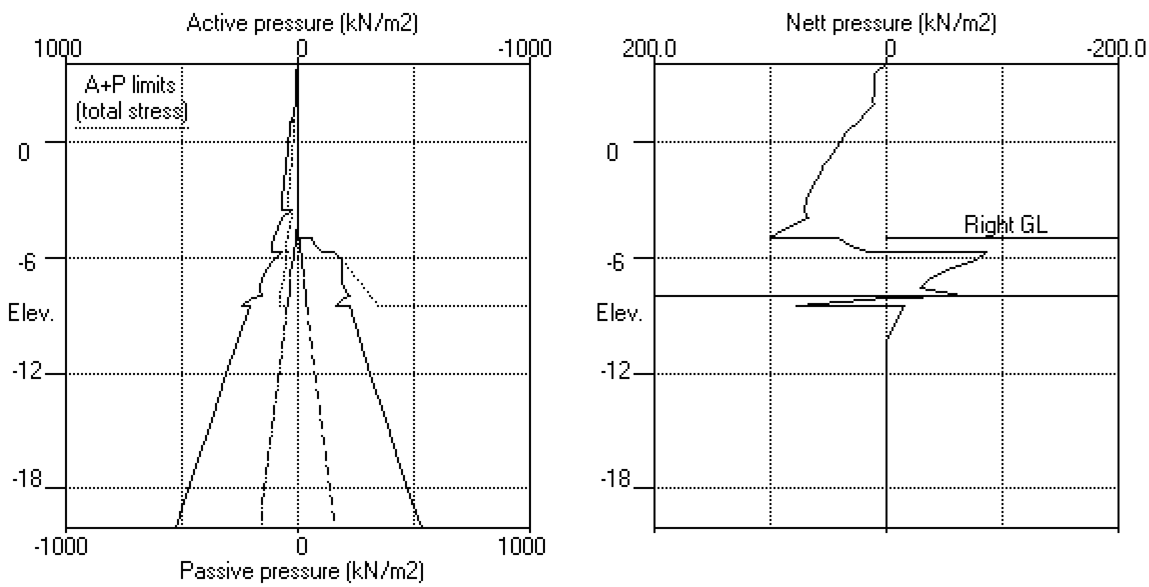
Note: 12.34 a Soil pressure at active limit
185.39 p Soil pressure at passive limit
27.05A Arching - soil pressure below active limit

Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.10

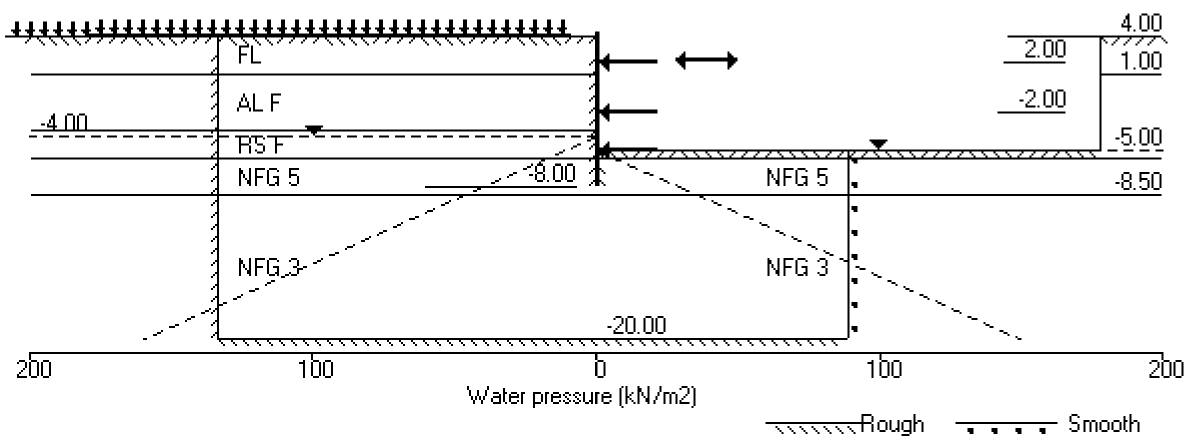


Stage No.9 Apply load no.2 at elev. 2.10



Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No. 12 Remove strut or anchor no.2 at elevation -1.30

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
12	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.76E-05	0.0	0.0		572444
2	3.50	11.08	0.015	-1.77E-05	2.8	0.3		572444
3	3.00	10.70	0.015	-1.93E-05	8.2	3.4		572444
4	2.55	11.02	0.015	-2.39E-05	13.1	8.3		572444
5	2.10	12.19	0.015	-3.33E-05	18.3	15.6		572444
6	2.00	11.07	0.015	-3.62E-05	19.5	17.5	-123.5	572444
		11.07	0.015	-3.62E-05	-104.0	17.5		
7	1.50	16.54	0.015	-2.98E-05	-97.1	-32.2		572444
8	1.00	23.50	0.015	1.85E-05	-87.1	-78.5		572444
		31.38	0.015	1.85E-05	-87.1	-78.5		
9	0.50	35.19	0.015	1.04E-04	-70.4	-117.8		572444
10	0.00	40.24	0.014	2.20E-04	-51.6	-148.3		572444
11	-0.60	46.90	0.014	3.88E-04	-25.4	-171.6		572444
12	-0.95	50.35	0.014	4.94E-04	-8.4	-177.5		572444
13	-1.30	54.14	0.014	6.03E-04	9.9	-177.3		572444
14	-1.50	55.74	0.014	6.64E-04	20.9	-174.2		572444
15	-2.00	61.16	0.013	8.08E-04	50.1	-156.3	-160.5	572444
		61.16	0.013	8.08E-04	-110.4	-156.3		
16	-2.38	64.44	0.013	9.23E-04	-86.8	-193.3		572444
17	-2.75	67.45	0.013	1.05E-03	-62.1	-221.2		572444
18	-3.13	69.34	0.012	1.21E-03	-36.5	-239.6		572444
19	-3.50	70.13	0.012	1.36E-03	-10.3	-248.2		572444
		25.73	0.012	1.36E-03	-10.3	-248.2		
20	-4.00	67.40	0.011	1.58E-03	13.0	-250.9		572444
21	-4.50	86.74	0.010	1.80E-03	51.5	-235.9		572444
22	-5.00	101.15	0.009	1.99E-03	98.5	-199.1	-0.6	572444
		42.80	0.009	1.99E-03	97.9	-199.1		
23	-5.38	31.53	0.009	2.10E-03	111.8	-159.7		572444
24	-5.75	16.77	0.008	2.19E-03	120.9	-115.9		572444
		-84.97	0.008	2.19E-03	120.9	-115.9		
25	-6.18	-75.55	0.007	2.26E-03	86.8	-72.2		572444
26	-6.60	-54.84	0.006	2.31E-03	59.0	-42.1		572444

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-7.20	-33.76	0.004	2.34E-03	32.5	-16.6		572444
28	-7.60	-25.14	0.003	2.34E-03	20.7	-6.3		572444
29	-8.00	-56.95	0.003	2.35E-03	4.3	-0.0		0
30	-8.15	-0.01	0.002	0	-0.0	0.0		0
31	-8.50	78.32	0.001	0	13.7	0.0		0
		-15.70	0.001	0	13.7	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 123.5 kN/m run
At elev. -2.00 Prop force = 160.5 kN/m run
At elev. -5.00 Prop force = 0.6 kN/m run

LEFT side

			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	11.08	11.08	9974
3	3.00	0.00	18.01	5.57	69.68	10.70	10.70	9974
4	2.55	0.00	27.07	8.37	104.72	11.02	11.02	9974
5	2.10	0.00	36.44	11.26	140.98	12.19	12.19	9974
6	2.00	0.00	38.54	11.91	149.09	11.07	11.07A	9974
7	1.50	0.00	49.00	15.14	189.53	16.54	16.54	9974
8	1.00	0.00	59.29	18.32	229.36	23.50	23.50	9974
		0.00	59.29	15.26	224.13	31.38	31.38	4987
9	0.50	0.00	69.38	18.81	258.84	35.19	35.19	5236
10	0.00	0.00	79.25	22.27	292.82	40.24	40.24	5486
11	-0.60	0.00	90.84	26.35	332.74	46.90	46.90	5785
12	-0.95	0.00	97.50	28.68	355.65	50.35	50.35	5960
13	-1.30	0.00	104.09	31.00	378.32	54.14	54.14	6134
14	-1.50	0.00	107.82	32.31	391.18	55.74	55.74	6234
15	-2.00	0.00	117.09	35.56	423.07	61.16	61.16	6483
16	-2.38	0.00	123.97	37.98	446.76	64.44	64.44	6670
17	-2.75	0.00	130.80	40.38	470.29	67.45	67.45	6857
18	-3.13	0.00	137.60	42.77	493.67	69.34	69.34	7044
19	-3.50	0.00	144.35	45.14	516.93	70.13	70.13	7231
		0.00	144.35	28.49	689.10	25.73	25.73A	29922
20	-4.00	0.00	154.81	31.45	734.80	67.40	67.40	29922
21	-4.50	5.00	160.22	32.99	758.43	81.74	86.74	29922
22	-5.00	10.00	165.59	34.51	781.88	91.15	101.15	29922
23	-5.38	13.75	169.59	35.64	799.36	96.27	110.02	29922
24	-5.75	17.50	173.57	36.77	816.76	97.82	115.32	29922
		17.50	173.57	26.21	875.12	54.40	71.90	49871
25	-6.18	21.75	179.34	27.89	900.31	87.68	109.43	49871
26	-6.60	26.00	185.08	29.57	925.43	108.15	134.15	49871
27	-7.20	32.00	193.17	31.94	960.75	125.99	157.99	49871
28	-7.60	36.00	198.54	33.51	984.22	135.25	171.25	49871
29	-8.00	40.00	203.90	35.07	1007.64	123.43	163.43	49871
30	-8.15	41.50	205.91	35.66	1016.41	154.71	196.21	49871
31	-8.50	45.00	210.59	37.03	1036.85	197.72	242.72	49871
		45.00	210.59	0.00	6145.66	165.14	210.14	997417
32	-10.25	62.50	240.86	0.00	6566.09	202.36	264.86	997417

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
33	-12.00	80.00	271.00	0.00	6984.53	231.69	311.69	997417
34	-14.40	104.00	312.15	0.00	7556.03	272.11	376.11	997417
35	-16.80	128.00	353.16	0.00	8125.48	312.53	440.53	997417
36	-18.40	144.00	380.44	0.00	8504.23	339.47	483.47	997417
37	-20.00	160.00	407.67	0.00	8882.38	371.79	531.79	997417

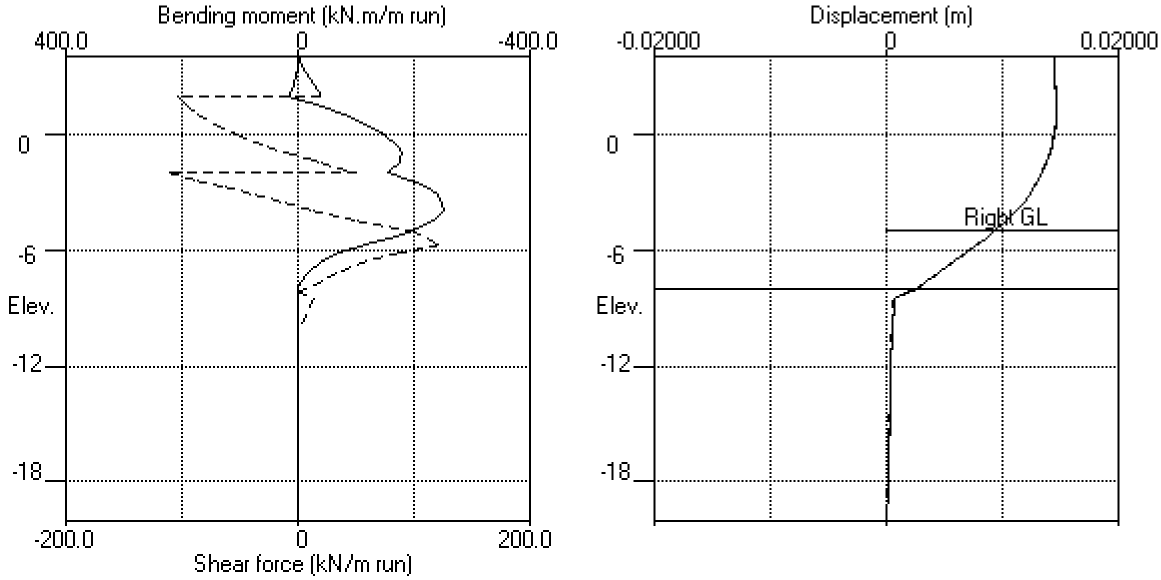
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
23	-5.38	3.75	3.75	0.00	74.74	74.74	78.49p	29934
24	-5.75	7.50	7.50	0.00	91.13	91.06	98.56	29934
		7.50	7.50	0.00	149.49	149.37	156.87	49890
25	-6.18	11.75	13.03	0.00	173.64	173.23	184.98	49890
26	-6.60	16.00	18.55	0.00	197.79	172.99	188.99	49890
27	-7.20	22.00	26.36	0.00	231.90	169.75	191.75	49890
28	-7.60	26.00	31.57	0.00	254.65	170.38	196.38	49890
29	-8.00	30.00	36.78	0.00	277.42	190.37	220.37	49890
30	-8.15	31.50	38.73	0.00	285.96	164.72	196.22	49890
31	-8.50	35.00	43.29	0.00	305.89	129.40	164.40	49890
		35.00	43.29	0.00	3822.67	190.83	225.83	997795
32	-10.25	52.50	73.15	0.00	4237.22	212.35	264.85	997795
33	-12.00	70.00	103.10	0.00	4653.06	241.68	311.68	997795
34	-14.40	94.00	144.36	0.00	5226.11	282.09	376.09	997795
35	-16.80	118.00	185.90	0.00	5802.91	322.53	440.53	997795
36	-18.40	134.00	213.76	0.00	6189.76	349.46	483.46	997795
37	-20.00	150.00	241.76	0.00	6578.53	381.86	531.86	997795

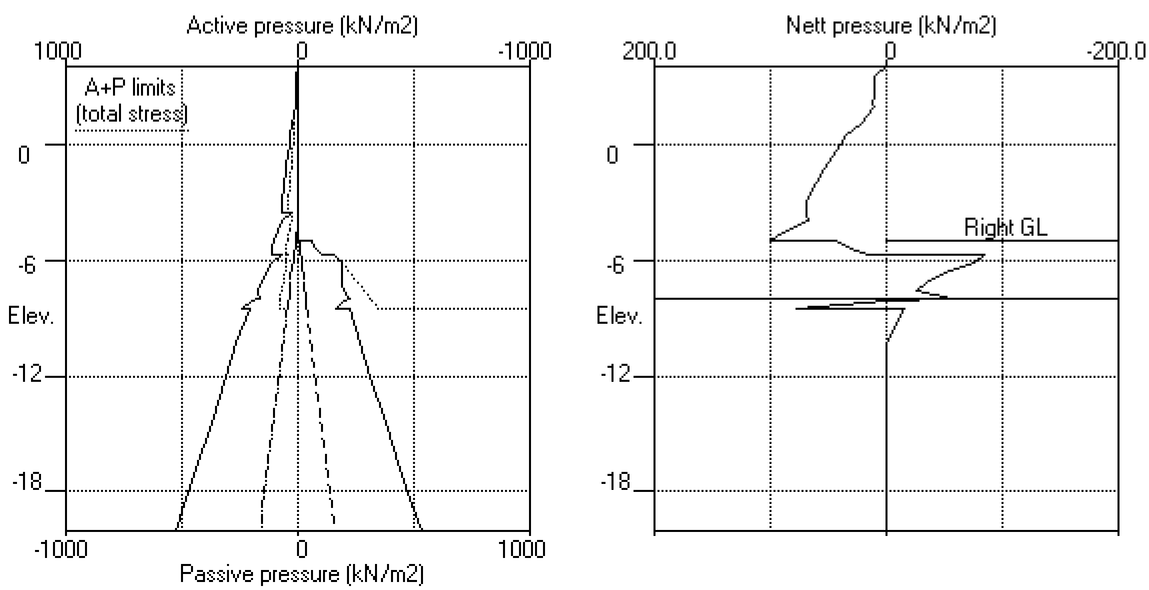
Note: 12.34 a Soil pressure at active limit
78.49 p Soil pressure at passive limit
25.73A Arching - soil pressure below active limit

Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Stage No.12 Remove prop no.2 at elev. -1.30



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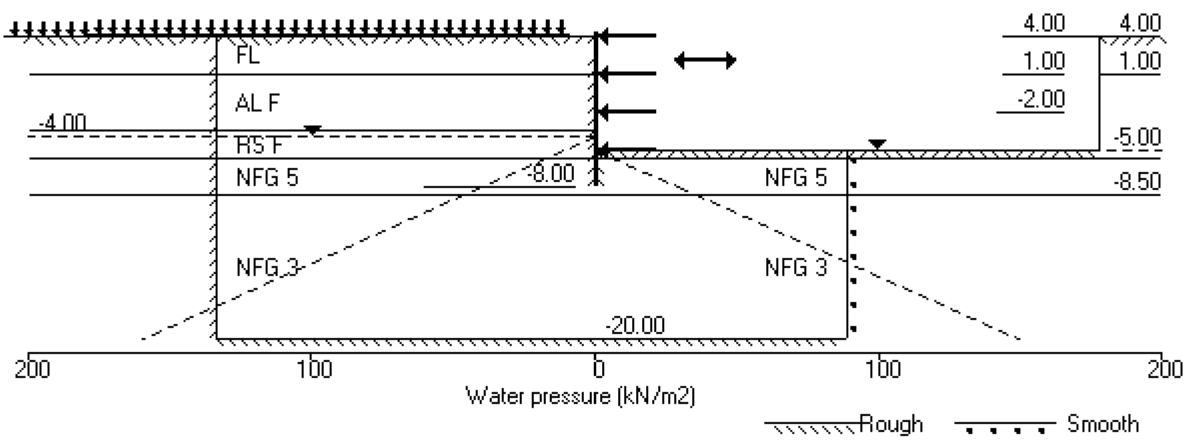
EDG CONSULTING PTY LTD                                            | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58               | Job No.  B01493
                             Licensed from GEOSOLVE               | Made by :   DJC
Data filename/Run ID: Section_1                                   |
Albert Street Development                                         | Date:16-11-2022
Section 1                                                         | Checked :
------------------------------------------------------------------------------
                                                      Units: kN,m
```

Stage No.15   Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No. 15 Remove strut or anchor no.1 at elevation 2.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
15	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.34E-04	-37.6	0.0	-37.6	572444
2	3.50	11.12	0.015	-1.26E-04	-34.8	-18.5		572444
3	3.00	10.34	0.015	-1.03E-04	-29.4	-34.2		572444
4	2.55	10.42	0.015	-7.17E-05	-24.8	-46.2		572444
5	2.10	11.50	0.015	-3.15E-05	-19.8	-56.1		572444
6	2.00	10.42	0.015	-2.16E-05	-18.7	-58.0		572444
7	1.50	16.07	0.015	3.21E-05	-12.1	-65.1		572444
8	1.00	23.35	0.015	9.07E-05	-2.3	-69.0	-84.7	572444
		31.30	0.015	9.07E-05	-87.0	-69.0		
9	0.50	35.14	0.015	1.68E-04	-70.4	-108.3		572444
10	0.00	40.22	0.015	2.76E-04	-51.5	-138.8		572444
11	-0.60	46.92	0.014	4.33E-04	-25.4	-162.0		572444
12	-0.95	50.38	0.014	5.34E-04	-8.4	-167.9		572444
13	-1.30	54.19	0.014	6.37E-04	9.9	-167.7		572444
14	-1.50	55.80	0.014	6.95E-04	20.9	-164.6		572444
15	-2.00	61.23	0.013	8.31E-04	50.2	-146.7	-163.8	572444
		61.23	0.013	8.31E-04	-113.6	-146.7		
16	-2.38	64.51	0.013	9.39E-04	-90.1	-184.9		572444
17	-2.75	67.52	0.013	1.07E-03	-65.3	-214.0		572444
18	-3.13	69.40	0.012	1.21E-03	-39.6	-233.6		572444
19	-3.50	70.18	0.012	1.37E-03	-13.5	-243.4		572444
		25.92	0.012	1.37E-03	-13.5	-243.4		
20	-4.00	67.58	0.011	1.58E-03	9.9	-247.6		572444
21	-4.50	86.89	0.010	1.79E-03	48.5	-234.2		572444
22	-5.00	101.28	0.009	1.98E-03	95.6	-198.9	1.9	572444
		43.12	0.009	1.98E-03	97.5	-198.9		
23	-5.38	31.75	0.009	2.10E-03	111.5	-159.6		572444
24	-5.75	16.95	0.008	2.19E-03	120.7	-115.8		572444
		-84.66	0.008	2.19E-03	120.7	-115.8		
25	-6.18	-75.34	0.007	2.26E-03	86.7	-72.2		572444
26	-6.60	-54.71	0.006	2.30E-03	59.0	-42.2		572444
27	-7.20	-33.69	0.004	2.33E-03	32.5	-16.6		572444

(continued)

Stage No.15 Remove strut or anchor no.1 at elevation 2.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-7.60	-25.14	0.003	2.34E-03	20.7	-6.3		572444
29	-8.00	-57.12	0.003	2.34E-03	4.3	-0.0		0
30	-8.15	-0.01	0.002	0	-0.0	0.0		0
31	-8.50	78.32	0.001	0	13.7	0.0		0
		-15.70	0.001	0	13.7	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 37.6 kN/m run
At elev. 1.00 Prop force = 84.7 kN/m run
At elev. -2.00 Prop force = 163.8 kN/m run
At elev. -5.00 Prop force = -1.9 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	11.12	11.12	9974
3	3.00	0.00	18.01	5.57	69.68	10.34	10.34	9974
4	2.55	0.00	27.07	8.37	104.72	10.42	10.42	9974
5	2.10	0.00	36.44	11.26	140.98	11.50	11.50	9974
6	2.00	0.00	38.54	11.91	149.09	10.42	10.42A	9974
7	1.50	0.00	49.00	15.14	189.53	16.07	16.07	9974
8	1.00	0.00	59.29	18.32	229.36	23.35	23.35	9974
		0.00	59.29	15.26	224.13	31.30	31.30	4987
9	0.50	0.00	69.38	18.81	258.84	35.14	35.14	5236
10	0.00	0.00	79.25	22.27	292.82	40.22	40.22	5486
11	-0.60	0.00	90.84	26.35	332.74	46.92	46.92	5785
12	-0.95	0.00	97.50	28.68	355.65	50.38	50.38	5960
13	-1.30	0.00	104.09	31.00	378.32	54.19	54.19	6134
14	-1.50	0.00	107.82	32.31	391.18	55.80	55.80	6234
15	-2.00	0.00	117.09	35.56	423.07	61.23	61.23	6483
16	-2.38	0.00	123.97	37.98	446.76	64.51	64.51	6670
17	-2.75	0.00	130.80	40.38	470.29	67.52	67.52	6857
18	-3.13	0.00	137.60	42.77	493.67	69.40	69.40	7044
19	-3.50	0.00	144.35	45.14	516.93	70.18	70.18	7231
		0.00	144.35	28.49	689.10	25.92	25.92A	29922
20	-4.00	0.00	154.81	31.45	734.80	67.58	67.58	29922
21	-4.50	5.00	160.22	32.99	758.43	81.89	86.89	29922
22	-5.00	10.00	165.59	34.51	781.88	91.28	101.28	29922
23	-5.38	13.75	169.59	35.64	799.36	96.38	110.13	29922
24	-5.75	17.50	173.57	36.77	816.76	97.92	115.42	29922
		17.50	173.57	26.21	875.12	54.55	72.05	49871
25	-6.18	21.75	179.34	27.89	900.31	87.78	109.53	49871
26	-6.60	26.00	185.08	29.57	925.43	108.22	134.22	49871
27	-7.20	32.00	193.17	31.94	960.75	126.03	158.03	49871
28	-7.60	36.00	198.54	33.51	984.22	135.25	171.25	49871
29	-8.00	40.00	203.90	35.07	1007.64	123.34	163.34	49871
30	-8.15	41.50	205.91	35.66	1016.41	154.72	196.22	49871
31	-8.50	45.00	210.59	37.03	1036.85	197.72	242.72	49871
		45.00	210.59	0.00	6145.66	165.14	210.14	997417
32	-10.25	62.50	240.86	0.00	6566.09	202.37	264.87	997417

(continued)

Stage No.15 Remove strut or anchor no.1 at elevation 2.00

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
33	-12.00	80.00	271.00	0.00	6984.53	231.69	311.69	997417
34	-14.40	104.00	312.15	0.00	7556.03	272.11	376.11	997417
35	-16.80	128.00	353.16	0.00	8125.48	312.53	440.53	997417
36	-18.40	144.00	380.44	0.00	8504.23	339.47	483.47	997417
37	-20.00	160.00	407.67	0.00	8882.38	371.79	531.79	997417

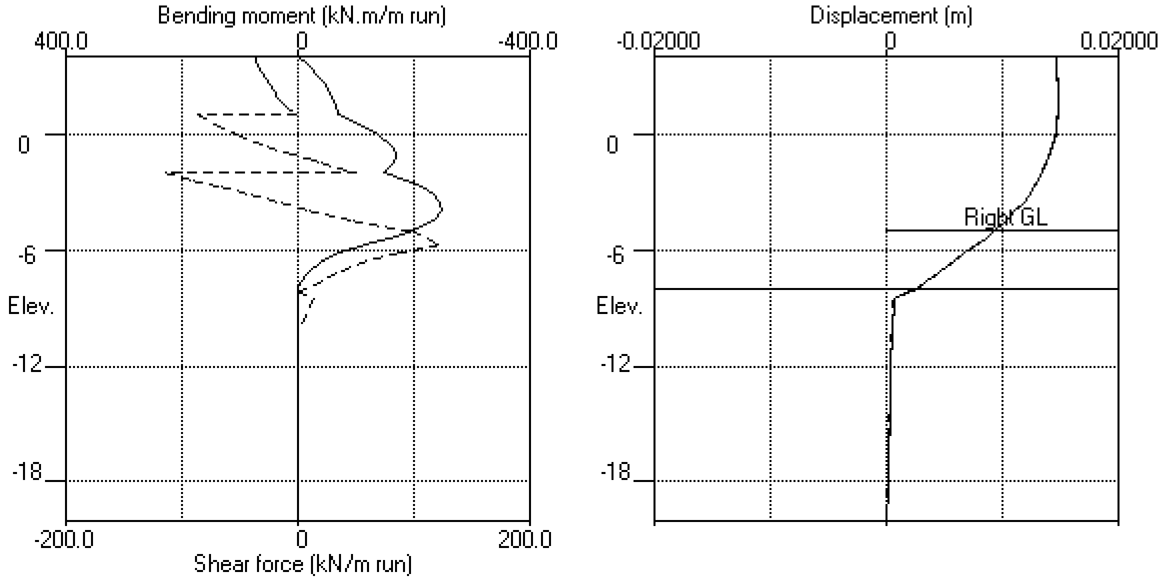
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.16	58.16	29934
23	-5.38	3.75	3.75	0.00	74.74	74.63	78.38	29934
24	-5.75	7.50	7.50	0.00	91.13	90.96	98.46	29934
		7.50	7.50	0.00	149.49	149.21	156.71	49890
25	-6.18	11.75	13.03	0.00	173.64	173.12	184.87	49890
26	-6.60	16.00	18.55	0.00	197.79	172.93	188.93	49890
27	-7.20	22.00	26.36	0.00	231.90	169.72	191.72	49890
28	-7.60	26.00	31.57	0.00	254.65	170.39	196.39	49890
29	-8.00	30.00	36.78	0.00	277.42	190.46	220.46	49890
30	-8.15	31.50	38.73	0.00	285.96	164.73	196.23	49890
31	-8.50	35.00	43.29	0.00	305.89	129.40	164.40	49890
		35.00	43.29	0.00	3822.67	190.84	225.84	997795
32	-10.25	52.50	73.15	0.00	4237.22	212.36	264.86	997795
33	-12.00	70.00	103.10	0.00	4653.06	241.68	311.68	997795
34	-14.40	94.00	144.36	0.00	5226.11	282.10	376.10	997795
35	-16.80	118.00	185.90	0.00	5802.91	322.54	440.54	997795
36	-18.40	134.00	213.76	0.00	6189.76	349.46	483.46	997795
37	-20.00	150.00	241.76	0.00	6578.53	381.86	531.86	997795

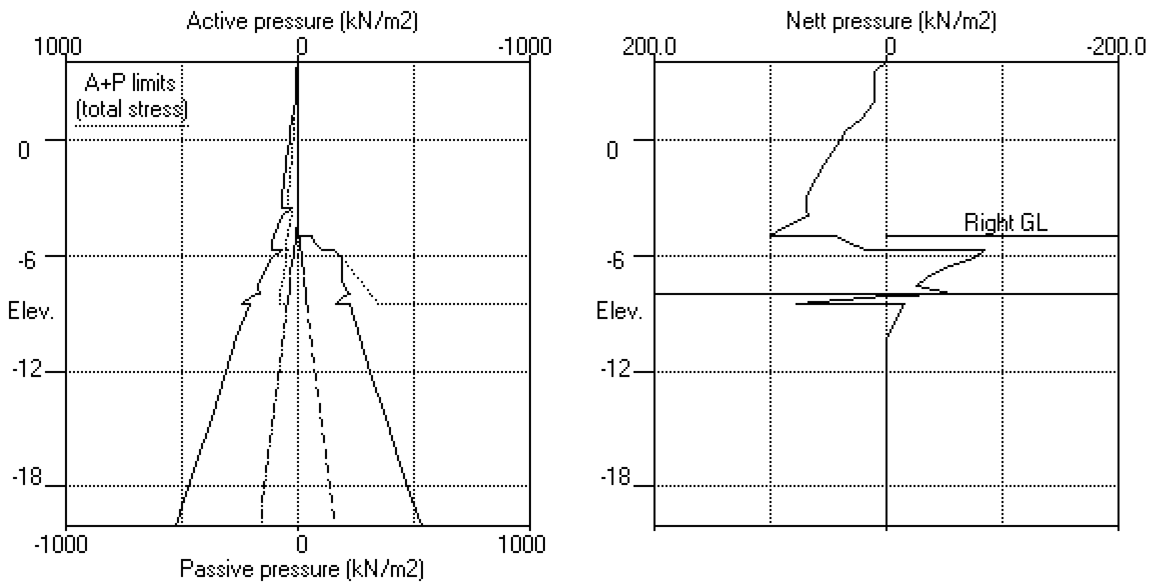
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
25.92A Arching - soil pressure below active limit

Units: kN,m

Stage No.15 Remove prop no.1 at elev. 2.00

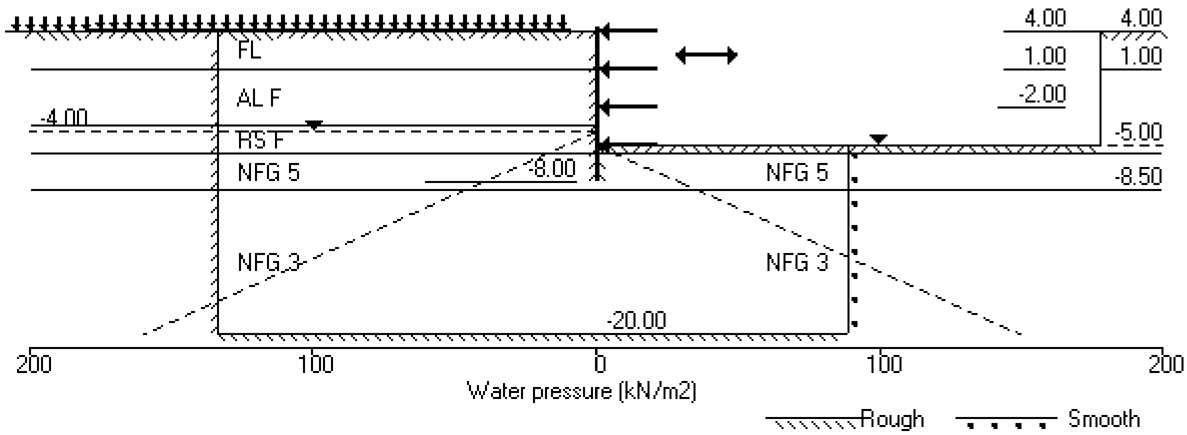


Stage No.15 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No.16 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No. 16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00 Factor of Safety	FoS for toe elev. = -8.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
16	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.38E-04	-28.6	0.0	-28.6	400711
2	3.50	11.15	0.015	-1.30E-04	-25.8	-15.0		400711
3	3.00	10.36	0.015	-1.05E-04	-20.4	-27.3		400711
4	2.55	10.44	0.015	-7.30E-05	-15.7	-36.2		400711
5	2.10	11.53	0.015	-3.25E-05	-10.8	-42.9		400711
6	2.00	10.45	0.015	-2.26E-05	-9.7	-44.2		400711
7	1.50	16.11	0.015	2.88E-05	-3.1	-47.8		400711
8	1.00	23.38	0.015	8.15E-05	6.8	-48.2	-82.0	400711
		31.32	0.015	8.15E-05	-75.2	-48.2		
9	0.50	35.14	0.015	1.54E-04	-58.6	-82.9		400711
10	0.00	40.21	0.015	2.63E-04	-39.8	-108.9		400711
11	-0.60	46.90	0.014	4.25E-04	-13.6	-126.7		400711
12	-0.95	50.37	0.014	5.27E-04	3.4	-129.4		400711
13	-1.30	54.19	0.014	6.28E-04	21.7	-126.0		400711
14	-1.50	55.81	0.014	6.84E-04	32.7	-121.1		400711
15	-2.00	61.23	0.013	8.04E-04	62.0	-98.7	-180.9	400711
		61.23	0.013	8.04E-04	-118.9	-98.7		
16	-2.38	64.46	0.013	9.01E-04	-95.4	-138.4		400711
17	-2.75	67.38	0.013	1.03E-03	-70.6	-169.0		400711
18	-3.13	69.19	0.012	1.18E-03	-45.0	-190.2		400711
19	-3.50	69.92	0.012	1.35E-03	-18.9	-201.6		400711
		24.86	0.012	1.35E-03	-18.9	-201.6		
20	-4.00	66.34	0.011	1.60E-03	3.9	-208.0		400711
21	-4.50	85.69	0.010	1.83E-03	41.9	-197.0		400711
22	-5.00	100.35	0.009	2.05E-03	88.4	-164.3	-7.5	400711
		41.99	0.009	2.05E-03	80.9	-164.3		
23	-5.38	31.03	0.009	2.17E-03	94.6	-129.9		400711
24	-5.75	16.49	0.008	2.27E-03	103.5	-91.1		400711
		-85.42	0.008	2.27E-03	103.5	-91.1		
25	-6.18	-74.62	0.007	2.34E-03	69.5	-53.1		400711
26	-6.60	-51.61	0.006	2.38E-03	42.7	-28.6		400711

(continued)

Stage No.16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-7.20	-27.97	0.004	2.40E-03	18.8	-10.2		400711
28	-7.60	-14.22	0.003	2.41E-03	10.3	-3.8		400711
29	-8.00	-27.28	0.002	2.41E-03	2.0	-0.0		0
30	-8.15	-0.01	0.002	0	-0.0	0.0		0
31	-8.50	78.32	0.001	0	13.7	0.0		0
		-15.70	0.001	0	13.7	0.0		
32	-10.25	0.01	0.000	0	-0.0	0.0		0
33	-12.00	0.01	0.000	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 28.6 kN/m run
At elev. 1.00 Prop force = 82.0 kN/m run
At elev. -2.00 Prop force = 180.9 kN/m run
At elev. -5.00 Prop force = 7.5 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	0.00	8.65	2.67	33.48	11.15	11.15	9974
3	3.00	0.00	18.01	5.57	69.68	10.36	10.36	9974
4	2.55	0.00	27.07	8.37	104.72	10.44	10.44	9974
5	2.10	0.00	36.44	11.26	140.98	11.53	11.53	9974
6	2.00	0.00	38.54	11.91	149.09	10.45	10.45A	9974
7	1.50	0.00	49.00	15.14	189.53	16.11	16.11	9974
8	1.00	0.00	59.29	18.32	229.36	23.38	23.38	9974
		0.00	59.29	15.26	224.13	31.32	31.32	4987
9	0.50	0.00	69.38	18.81	258.84	35.14	35.14	5236
10	0.00	0.00	79.25	22.27	292.82	40.21	40.21	5486
11	-0.60	0.00	90.84	26.35	332.74	46.90	46.90	5785
12	-0.95	0.00	97.50	28.68	355.65	50.37	50.37	5960
13	-1.30	0.00	104.09	31.00	378.32	54.19	54.19	6134
14	-1.50	0.00	107.82	32.31	391.18	55.81	55.81	6234
15	-2.00	0.00	117.09	35.56	423.07	61.23	61.23	6483
16	-2.38	0.00	123.97	37.98	446.76	64.46	64.46	6670
17	-2.75	0.00	130.80	40.38	470.29	67.38	67.38	6857
18	-3.13	0.00	137.60	42.77	493.67	69.19	69.19	7044
19	-3.50	0.00	144.35	45.14	516.93	69.92	69.92	7231
		0.00	144.35	28.49	689.10	24.86	24.86A	29922
20	-4.00	0.00	154.81	31.45	734.80	66.34	66.34	29922
21	-4.50	5.00	160.22	32.99	758.43	80.69	85.69	29922
22	-5.00	10.00	165.59	34.51	781.88	90.35	100.35	29922
23	-5.38	13.75	169.59	35.64	799.36	95.78	109.53	29922
24	-5.75	17.50	173.57	36.77	816.76	97.63	115.13	29922
		17.50	173.57	26.21	875.12	54.07	71.57	49871
25	-6.18	21.75	179.34	27.89	900.31	88.34	110.09	49871
26	-6.60	26.00	185.08	29.57	925.43	109.90	135.90	49871
27	-7.20	32.00	193.17	31.94	960.75	128.97	160.97	49871
28	-7.60	36.00	198.54	33.51	984.22	140.71	176.71	49871
29	-8.00	40.00	203.90	35.07	1007.64	138.77	178.77	49871
30	-8.15	41.50	205.91	35.66	1016.41	154.34	195.84	49871
31	-8.50	45.00	210.59	37.03	1036.85	197.72	242.72	49871
		45.00	210.59	0.00	6145.66	165.16	210.16	997417

(continued)

Stage No.16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
32	-10.25	62.50	240.86	0.00	6566.09	202.39	264.89	997417
33	-12.00	80.00	271.00	0.00	6984.53	231.70	311.70	997417
34	-14.40	104.00	312.15	0.00	7556.03	272.11	376.11	997417
35	-16.80	128.00	353.16	0.00	8125.48	312.52	440.52	997417
36	-18.40	144.00	380.44	0.00	8504.23	339.47	483.47	997417
37	-20.00	160.00	407.67	0.00	8882.38	371.78	531.78	997417

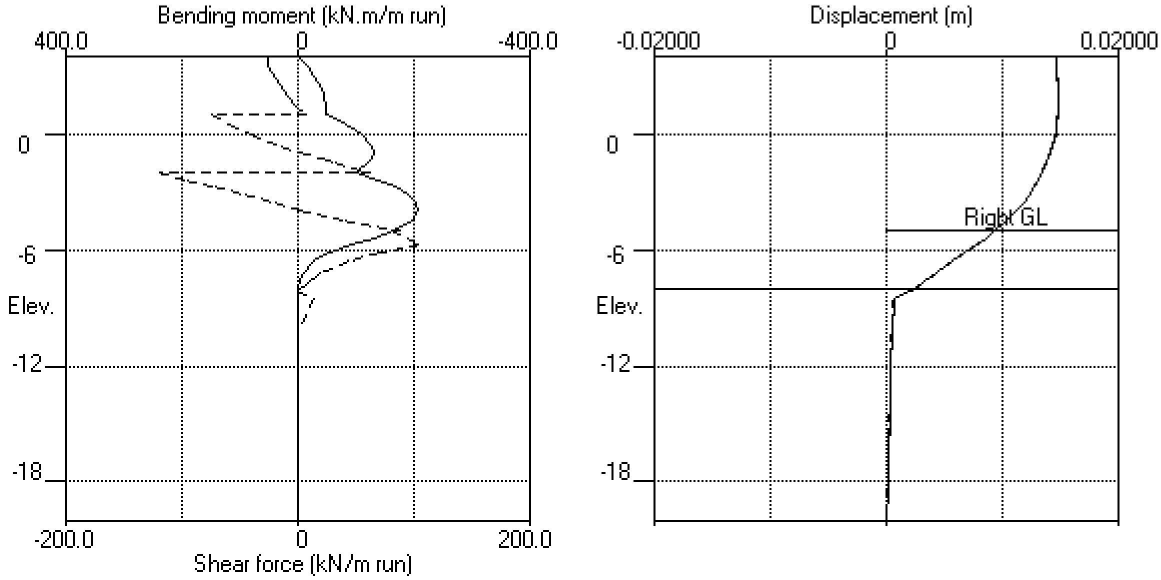
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
23	-5.38	3.75	3.75	0.00	74.74	74.74	78.49p	29934
24	-5.75	7.50	7.50	0.00	91.13	91.13	98.63p	29934
		7.50	7.50	0.00	149.49	149.49	156.99p	49890
25	-6.18	11.75	13.03	0.00	173.64	172.96	184.71	49890
26	-6.60	16.00	18.55	0.00	197.79	171.51	187.51	49890
27	-7.20	22.00	26.36	0.00	231.90	166.94	188.94	49890
28	-7.60	26.00	31.57	0.00	254.65	164.93	190.93	49890
29	-8.00	30.00	36.78	0.00	277.42	176.05	206.05	49890
30	-8.15	31.50	38.73	0.00	285.96	164.35	195.85	49890
31	-8.50	35.00	43.29	0.00	305.89	129.40	164.40	49890
		35.00	43.29	0.00	3822.67	190.86	225.86	997795
32	-10.25	52.50	73.15	0.00	4237.22	212.38	264.88	997795
33	-12.00	70.00	103.10	0.00	4653.06	241.68	311.68	997795
34	-14.40	94.00	144.36	0.00	5226.11	282.09	376.09	997795
35	-16.80	118.00	185.90	0.00	5802.91	322.53	440.53	997795
36	-18.40	134.00	213.76	0.00	6189.76	349.46	483.46	997795
37	-20.00	150.00	241.76	0.00	6578.53	381.85	531.85	997795

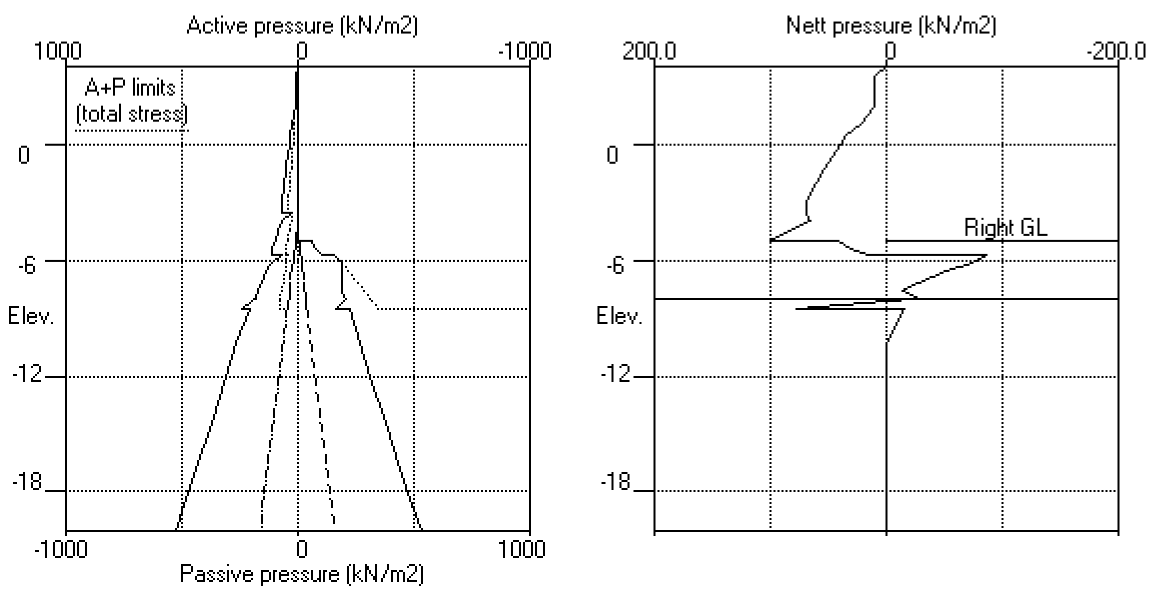
```
Stage No.16  Change EI of wall to 400711 kN.m2/m run
              Allow wall to relax with new modulus value
Note:     12.34 a  Soil pressure at active limit
         156.99 p  Soil pressure at passive limit
          24.86A  Arching - soil pressure below active limit
```

```
EDG CONSULTING PTY LTD                                             | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58                | Job No.  B01493
                                Licensed from GEOSOLVE             | Made by :   DJC
Data filename/Run ID: Section_1                                    |
Albert Street Development                                          | Date:16-11-2022
Section 1                                                          | Checked :
---------------------------------------------------------------------------------------
                                                            Units: kN,m
```

Stage No.16 Change EI of wall to 400711kN.m2/m run

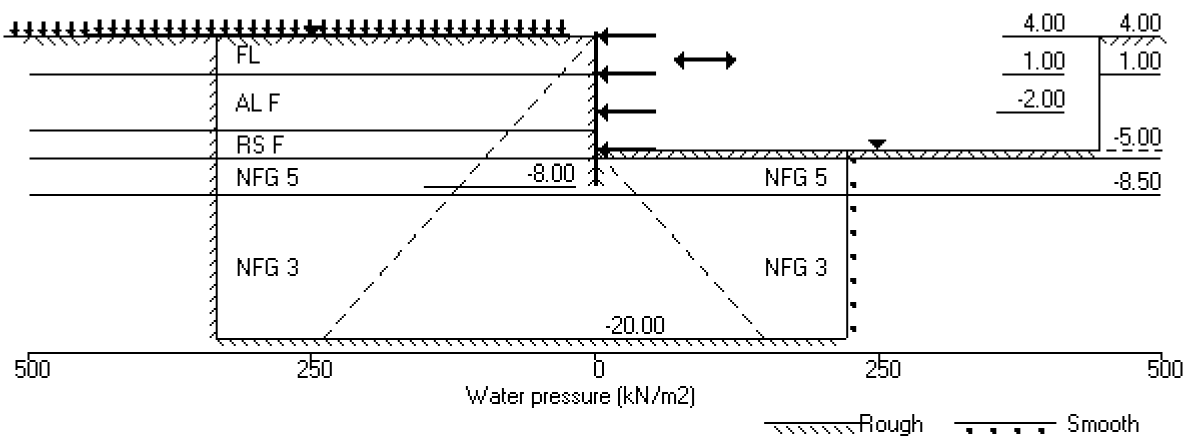


Stage No.16 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No.17 Apply water pressure profile no.1



Units: kN,m

Stage No. 17 Apply water pressure profile no.1

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
17	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.70E-04	-33.3	0.0	-33.3	400711
2	3.50	14.11	0.015	-1.60E-04	-29.8	-17.3		400711
3	3.00	16.16	0.015	-1.32E-04	-22.2	-31.1		400711
4	2.55	18.81	0.015	-9.55E-05	-14.4	-40.1		400711
5	2.10	22.47	0.015	-5.15E-05	-5.1	-45.3		400711
6	2.00	21.98	0.015	-4.11E-05	-2.9	-45.9		400711
7	1.50	30.54	0.015	9.44E-06	10.3	-44.6		400711
8	1.00	40.70	0.015	5.27E-05	28.1	-36.4	-128.2	400711
		48.55	0.015	5.27E-05	-100.2	-36.4		
9	0.50	55.20	0.015	1.17E-04	-74.2	-81.3		400711
10	0.00	63.11	0.015	2.28E-04	-44.7	-112.5		400711
11	-0.60	73.24	0.014	3.94E-04	-3.8	-128.9		400711
12	-0.95	78.74	0.014	4.96E-04	22.8	-126.6		400711
13	-1.30	84.60	0.014	5.90E-04	51.4	-114.6		400711
14	-1.50	87.40	0.014	6.38E-04	68.6	-103.1		400711
15	-2.00	95.70	0.014	7.22E-04	114.4	-58.6	-294.5	400711
		95.70	0.014	7.22E-04	-180.1	-58.6		
16	-2.38	101.00	0.013	7.92E-04	-143.2	-118.8		400711
17	-2.75	105.96	0.013	9.12E-04	-104.4	-164.8		400711
18	-3.13	109.81	0.013	1.06E-03	-63.9	-195.8		400711
19	-3.50	112.61	0.012	1.24E-03	-22.2	-211.4		400711
		75.00	0.012	1.24E-03	-22.2	-211.4		
20	-4.00	111.26	0.012	1.49E-03	24.3	-213.4		400711
21	-4.50	130.35	0.011	1.73E-03	84.7	-186.5		400711
22	-5.00	144.62	0.010	1.91E-03	153.5	-126.9	-138.4	400711
		86.26	0.010	1.91E-03	15.1	-126.9		
23	-5.38	74.44	0.009	2.01E-03	45.2	-114.0		400711
24	-5.75	58.88	0.008	2.10E-03	70.2	-90.6		400711
		-45.26	0.008	2.10E-03	70.2	-90.6		
25	-6.18	-36.87	0.007	2.18E-03	52.8	-63.1		400711
26	-6.60	-25.88	0.007	2.23E-03	39.5	-42.4		400711
27	-7.20	-10.10	0.005	2.27E-03	28.7	-21.2		400711

(continued)

Stage No.17 Apply water pressure profile no.1

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-7.60	-12.73	0.004	2.28E-03	24.1	-9.4		400711
29	-8.00	-78.36	0.003	2.29E-03	5.9	-0.0		0
30	-8.15	-0.01	0.003	0	-0.0	0.0		0
31	-8.50	120.61	0.001	0	21.1	0.0		0
		-24.15	0.001	0	21.1	0.0		
32	-10.25	0.01	0.001	0	-0.0	0.0		0
33	-12.00	0.01	0.001	0	-0.0	0.0		0
34	-14.40	0.02	0.000	0	0.0	0.0		0
35	-16.80	-0.01	0.000	0	0.0	0.0		0
36	-18.40	0.01	0.000	0	0.0	0.0		0
37	-20.00	-0.06	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 33.3 kN/m run
At elev. 1.00 Prop force = 128.2 kN/m run
At elev. -2.00 Prop force = 294.5 kN/m run
At elev. -5.00 Prop force = 138.4 kN/m run

		LEFT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.50	5.00	3.65	1.13	14.14	9.11	14.11	9974
3	3.00	10.00	8.01	2.48	31.00	6.16	16.16	9974
4	2.55	14.50	12.57	3.88	48.63	4.31	18.81	9974
5	2.10	19.00	17.44	5.39	67.48	3.47	22.47A	9974
6	2.00	20.00	18.54	5.73	71.72	1.98	21.98A	9974
7	1.50	25.00	24.00	7.42	92.82	5.54	30.54A	9974
8	1.00	30.00	29.29	9.05	113.32	10.70	40.70	9974
		30.00	29.29	4.73	120.86	18.55	48.55	4987
9	0.50	35.00	34.38	6.51	138.37	20.20	55.20	5236
10	0.00	40.00	39.25	8.22	155.13	23.11	63.11	5486
11	-0.60	46.00	44.84	10.19	174.39	27.24	73.24	5785
12	-0.95	49.50	48.00	11.30	185.26	29.24	78.74	5960
13	-1.30	53.00	51.09	12.38	195.88	31.60	84.60	6134
14	-1.50	55.00	52.82	12.99	201.86	32.40	87.40	6234
15	-2.00	60.00	57.09	14.49	216.53	35.70	95.70	6483
16	-2.38	63.75	60.22	15.59	227.32	37.25	101.00	6670
17	-2.75	67.50	63.30	16.67	237.94	38.46	105.96	6857
18	-3.13	71.25	66.35	17.74	248.41	38.56	109.81	7044
19	-3.50	75.00	69.35	18.80	258.76	37.61	112.61	7231
		75.00	69.35	7.24	361.40	0.00	75.00A	29922
20	-4.00	80.00	74.81	8.79	385.25	31.26	111.26	29922
21	-4.50	85.00	80.22	10.32	408.88	45.35	130.35	29922
22	-5.00	90.00	85.59	11.84	432.33	54.62	144.62	29922
23	-5.38	93.75	89.59	12.97	449.81	59.19	152.94	29922
24	-5.75	97.50	93.57	14.10	467.21	60.01	157.51	29922
		97.50	93.57	2.83	525.56	14.23	111.73	49871
25	-6.18	101.75	99.34	4.51	550.76	46.77	148.52	49871
26	-6.60	106.00	105.08	6.19	575.87	65.38	171.38	49871
27	-7.20	112.00	113.17	8.56	611.20	80.63	192.63	49871
28	-7.60	116.00	118.54	10.13	634.67	84.39	200.39	49871
29	-8.00	120.00	123.90	11.69	658.09	55.09	175.09	49871
30	-8.15	121.50	125.91	12.28	666.86	97.66	219.16	49871
31	-8.50	125.00	130.59	13.65	687.30	161.77	286.77	49871
		125.00	130.59	0.00	5034.78	111.74	236.74	997417
32	-10.25	142.50	160.86	0.00	5455.21	153.03	295.53	997417

(continued)

Stage No.17 Apply water pressure profile no.1

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
33	-12.00	160.00	191.00	0.00	5873.66	182.34	342.34	997417
34	-14.40	184.00	232.15	0.00	6445.16	222.69	406.69	997417
35	-16.80	208.00	273.16	0.00	7014.61	262.97	470.97	997417
36	-18.40	224.00	300.44	0.00	7393.35	289.90	513.90	997417
37	-20.00	240.00	327.67	0.00	7771.51	328.13	568.13	997417

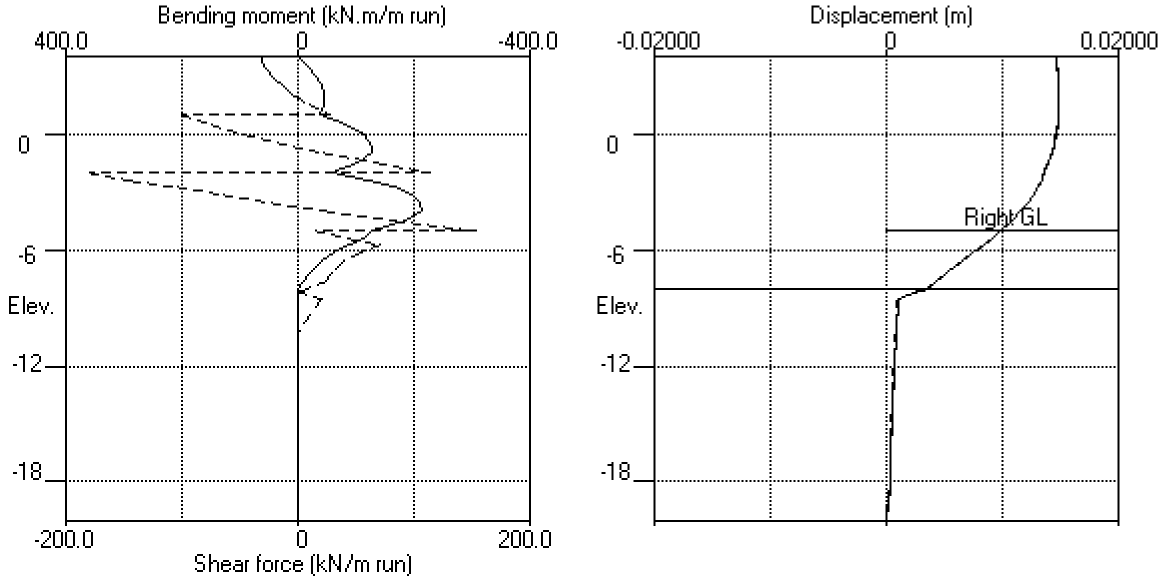
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
23	-5.38	3.75	3.75	0.00	74.74	74.74	78.49p	29934
24	-5.75	7.50	7.50	0.00	91.13	91.13	98.63p	29934
		7.50	7.50	0.00	149.49	149.49	156.99p	49890
25	-6.18	11.75	13.03	0.00	173.64	173.64	185.39p	49890
26	-6.60	16.00	18.55	0.00	197.79	181.26	197.26	49890
27	-7.20	22.00	26.36	0.00	231.90	180.73	202.73	49890
28	-7.60	26.00	31.57	0.00	254.65	187.11	213.11	49890
29	-8.00	30.00	36.78	0.00	277.42	223.44	253.44	49890
30	-8.15	31.50	38.73	0.00	285.96	187.66	219.16	49890
31	-8.50	35.00	43.29	0.00	305.89	131.16	166.16	49890
		35.00	43.29	0.00	3822.67	225.90	260.90	997795
32	-10.25	52.50	73.15	0.00	4237.22	243.02	295.52	997795
33	-12.00	70.00	103.10	0.00	4653.06	272.33	342.33	997795
34	-14.40	94.00	144.36	0.00	5226.11	312.68	406.68	997795
35	-16.80	118.00	185.90	0.00	5802.91	352.98	470.98	997795
36	-18.40	134.00	213.76	0.00	6189.76	379.89	513.89	997795
37	-20.00	150.00	241.76	0.00	6578.53	418.19	568.19	997795

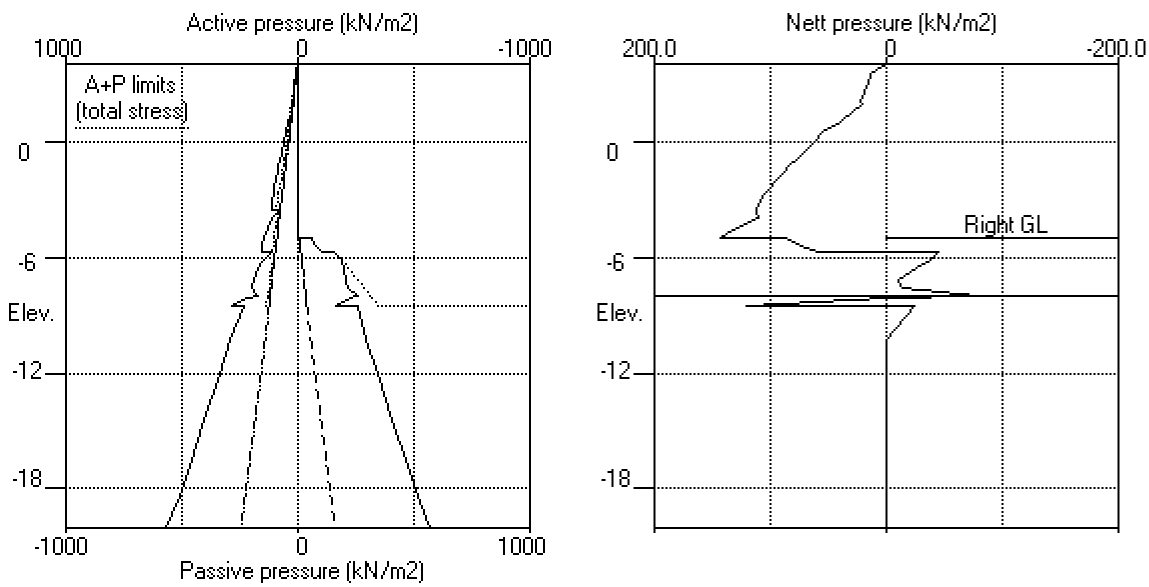
Note: 12.34 a Soil pressure at active limit
185.39 p Soil pressure at passive limit
75.00A Arching - soil pressure below active limit

Units: kN,m

Stage No.17 Apply water pressure profile no.1



Stage No.17 Apply water pressure profile no.1



Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

				FoS for toe elev. = -8.00		**Toe elev. for FoS = 1.500**		
Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				
2	4.00	2.00	Cant.	11.788	-6.50	-0.18	2.18	L to R
3	4.00	2.00		No analysis at this stage				
4	4.00	-1.50	2.00	8.853	n/a	-3.48	1.98	L to R
5	4.00	-1.50		No analysis at this stage				

All remaining stages have more than one prop - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries:	Left side 30.00 from wall	Rough boundary
	Right side 20.00 from wall	Smooth boundary
Lower rigid boundary at elevation -20.00		Rough boundary

Bending moment, shear force and displacement envelopes

Node	Y	Displacement		Bending moment		Shear force	
no.	coord	maximum	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	4.00	0.016	0.000	0.0	-0.0	0.0	-37.6
2	3.50	0.016	0.000	0.3	-18.5	2.8	-34.8
3	3.00	0.015	0.000	3.4	-34.2	8.2	-29.4
4	2.55	0.015	0.000	8.3	-46.2	13.1	-24.8
5	2.10	0.015	0.000	15.6	-56.1	61.4	-19.8
6	2.00	0.015	0.000	19.8	-58.0	62.6	-104.0
7	1.50	0.015	0.000	14.8	-65.1	11.0	-97.1
8	1.00	0.015	0.000	18.7	-78.5	28.1	-100.2
9	0.50	0.015	0.000	22.3	-117.8	8.0	-74.2
10	0.00	0.015	0.000	26.8	-148.3	9.7	-51.6
11	-0.60	0.014	0.000	33.3	-171.6	12.2	-25.4
12	-0.95	0.014	0.000	37.8	-177.5	22.8	-8.4
13	-1.30	0.014	0.000	42.9	-177.3	51.4	-149.8
14	-1.50	0.014	0.000	46.2	-174.2	68.6	-138.7
15	-2.00	0.014	0.000	55.2	-186.5	114.4	-180.1
16	-2.38	0.013	0.000	63.0	-221.7	61.6	-143.2
17	-2.75	0.013	0.000	71.6	-247.7	69.0	-104.4
18	-3.13	0.013	0.000	80.9	-264.2	75.5	-63.9
19	-3.50	0.012	0.000	90.7	-270.9	80.5	-22.2
20	-4.00	0.012	0.000	95.1	-270.8	42.3	0.0
21	-4.50	0.011	0.000	91.7	-253.0	84.7	-11.1
22	-5.00	0.010	0.000	84.0	-213.4	153.5	-18.0
23	-5.38	0.009	0.000	76.5	-171.7	117.9	-21.5
24	-5.75	0.008	0.000	67.9	-125.6	126.8	-24.7
25	-6.18	0.007	0.000	54.7	-79.4	92.3	-33.2
26	-6.60	0.007	0.000	39.7	-47.1	64.0	-35.1
27	-7.20	0.005	0.000	18.9	-21.2	36.4	-31.1
28	-7.60	0.004	0.000	7.4	-9.4	24.1	-23.6
29	-8.00	0.003	0.000	0.0	-0.0	5.9	-5.0
30	-8.15	0.003	0.000	0.0	0.0	0.0	-0.0
31	-8.50	0.001	0.000	0.0	0.0	21.1	0.0
32	-10.25	0.001	0.000	0.0	0.0	0.0	-0.0
33	-12.00	0.001	0.000	0.0	0.0	0.0	-0.0
34	-14.40	0.000	0.000	0.0	0.0	0.0	-0.0
35	-16.80	0.000	0.000	0.0	0.0	0.0	-0.0
36	-18.40	0.000	0.000	0.0	0.0	0.0	-0.0
37	-20.00	0.000	0.000	0.0	0.0	0.0	0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force			
no.	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	0.9	-6.18	-17.2	-1.30	8.3	-3.50	-5.6	1.50
2	95.1	-4.00	-0.0	4.00	26.1	-3.50	-35.1	-6.60
3	No calculation at this stage							
4	51.1	-5.75	-142.2	-0.95	80.5	-3.50	-90.9	2.00
5	No calculation at this stage							
6	45.0	-5.75	-139.1	-0.60	78.0	-3.50	-90.0	2.00
7	17.4	2.00	-270.9	-3.50	126.8	-5.75	-146.2	-1.30
8	19.8	2.00	-261.7	-4.00	124.1	-5.75	-149.8	-1.30
9	17.4	2.00	-270.9	-3.50	126.8	-5.75	-146.2	-1.30
10	No calculation at this stage							
11	No calculation at this stage							
12	17.5	2.00	-250.9	-4.00	120.9	-5.75	-110.4	-2.00
13	No calculation at this stage							
14	No calculation at this stage							
15	0.0	4.00	-247.6	-4.00	120.7	-5.75	-113.6	-2.00
16	0.0	4.00	-208.0	-4.00	103.5	-5.75	-118.9	-2.00
17	0.0	4.00	-213.4	-4.00	153.5	-5.00	-180.1	-2.00

Maximum and minimum displacement at each stage

Stage	Displacement				
no.	maximum	elev.	minimum	elev.	Stage description
	m		m		
1	0.001	4.00	0.000	4.00	Apply surcharge no.1 at elev. 4.00
2	0.016	4.00	0.000	4.00	Excav. to elev. 2.00 on RIGHT side
3	No calculation at this stage				Install prop no.1 at elev. 2.00
4	0.016	4.00	0.000	4.00	Excav. to elev. -1.50 on RIGHT side
5	No calculation at this stage				Install prop no.2 at elev. -1.30
6	0.016	4.00	0.000	4.00	Apply water pressure profile no.2
7	0.014	4.00	0.000	4.00	Excav. to elev. -5.00 on RIGHT side
8	0.015	4.00	0.000	4.00	Apply load no.1 at elev. 2.10
9	0.014	4.00	0.000	4.00	Apply load no.2 at elev. 2.10
10	No calculation at this stage				Install prop no.3 at elev. -5.00
11	No calculation at this stage				Install prop no.4 at elev. -2.00
12	0.015	1.00	0.000	4.00	Remove prop no.2 at elev. -1.30
13	No calculation at this stage				Install prop no.5 at elev. 1.00
14	No calculation at this stage				Install prop no.6 at elev. 4.00
15	0.015	2.00	0.000	4.00	Remove prop no.1 at elev. 2.00
16	0.015	2.00	0.000	4.00	Change EI of wall to 400711kN.m2/m run
17	0.015	1.50	0.000	4.00	Apply water pressure profile no.1

Summary of results (continued)

Prop forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 --- at elev. 2.00		--- Strut no. 2 --- at elev.-1.30		--- Strut no. 3 --- at elev.-5.00	
	kN/m run	kN/prop	kN/m run	kN/prop	kN/m run	kN/prop
4	104.83	786.22	---	---	---	---
6	104.03	780.25	3.47	26.00	---	---
7	100.77	755.81	181.22	1359.18	---	---
8	138.29	1037.14	189.62	1422.17	---	---
9	100.77	755.81	181.22	1359.18	---	---
12	123.46	925.97	---	---	0.61	0.61
15	---	---	---	---	-1.92	-1.92
16	---	---	---	---	7.48	7.48
17	---	---	---	---	138.36	138.36

Stage no.	--- Strut no. 4 --- at elev.-2.00		--- Strut no. 5 --- at elev. 1.00		--- Strut no. 6 --- at elev. 4.00	
	kN/m run	kN/prop	kN/m run	kN/prop	kN/m run	kN/prop
12	160.48	160.48	---	---	---	---
15	163.83	163.83	84.73	84.73	37.58	37.58
16	180.89	180.89	82.02	82.02	28.58	28.58
17	294.49	294.49	128.24	128.24	33.34	33.34

```
EDG CONSULTING PTY LTD                                      | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58         | Job No.  B01493
                             Licensed from GEOSOLVE         | Made by :   DJC
Data filename/Run ID: Section_1                             |
Albert Street Development                                   | Date:16-11-2022
Section 1                                                   | Checked :
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                                                  Units: kN,m
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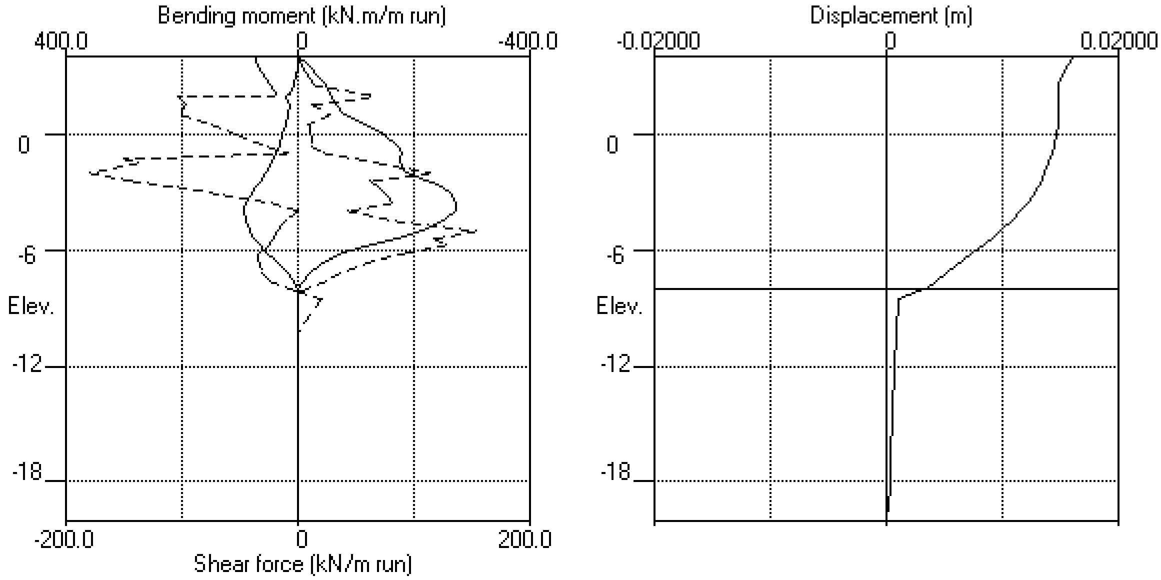
Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Left side		Soil types Right side	
1	4.00	1	FL	1	FL
2	2.40	2	AL F	2	AL F
3	-5.00	4	RS F	4	RS F
4	-9.60	5	NFG 5	5	NFG 5
5	-10.80	6	NFG 3	6	NFG 3

SOIL PROPERTIES

-- Soil type -- No.	Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	FL	17.00	10000	0.700	OC	0.309	3.868	
					(0.300)	(0.000)	(0.000)	
2	AL F	17.00	5000	0.700	OC	0.351	3.442	4.000d
	(2.40)		(500.0)		(0.300)	(1.391)	(5.007)	
3	Not defined							
4	RS F	20.00	30000	1.000	OC	0.283	4.369	10.00d
					(0.300)	(1.241)	(5.836)	
5	NFG 5	23.00	50000	1.000	OC	0.292	4.369	20.00d
					(0.300)	(1.226)	(5.836)	
6	NFG 3	27.00	1000000	1.000	OC	0.146	13.89	250.0d
					(0.200)	(0.854)	(12.886)	

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No.	Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	FL	28.00	0.670	0.00	28.00	0.500	0.00
2	AL F	25.00	0.670	0.00	26.00	0.500	0.00
3	Not defined						
4	RS F	30.00	0.670	0.00	30.00	0.500	0.00
5	NFG 5	30.00	0.500	0.00	30.00	0.500	0.00
6	NFG 3	45.00	0.500	0.00	45.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-4.00	-4.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Left side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Right side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	4.00	4.00	0.0	1	-5.00	-5.00	0.0
2	1	-4.00	-4.00	0.0	1	-5.00	-5.00	0.0

WALL PROPERTIES

```
                        Type of structure = Soldier Pile Wall
                       Soldier Pile width =  0.90 m
                     Soldier Pile spacing =  1.80 m
              Passive mobilisation factor =  3.00
                 Elevation of toe of wall = -8.00
            Maximum finite element length =  0.60 m
                 Youngs modulus of wall E = 3.2000E+07 kN/m2
              Moment of inertia of wall I = 0.017889 m4/m run
                                          = 0.032200 m4 per pile
                                      E.I = 572444 kN.m2/m run
                     Yield Moment of wall = Not defined
```

STRUTS and ANCHORS

Prop no.	Elev.	Prop spacing m	Cross-section area sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /prop kN	Strut or Anchor	Allow tension ?	L/R
1	2.00	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
2	-1.30	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
3	-5.00	1.00	0.150000	3.280E+07	20.00	0.00	0	Strut	Yes	R
4	-2.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
5	4.00	1.00	0.400000	3.280E+07	20.00	0.00	0	Strut	Yes	R

HORIZONTAL and MOMENT LOADS/RESTRAINTS

Load no.	Elevation	Horizontal load kN/m run	Moment load kN.m/m run	Moment restraint kN.m/m/rad	Partial factor (Category)
1	2.90	13.00	0	0	N/A
2	2.90	-13.00	0	0	N/A

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	4.00	3.00(L)	100.00	100.00	25.00	=	N/A	N/A

Note: L = Left side, R = Right side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 4.00
2	Excavate to elevation 2.00 on RIGHT side
3	Install strut or anchor no.1 at elevation 2.00
4	Excavate to elevation -1.50 on RIGHT side
5	Install strut or anchor no.2 at elevation -1.30
6	Apply water pressure profile no.2
7	Excavate to elevation -5.00 on RIGHT side
8	Apply load no.1 at elevation 2.90
9	Apply load no.2 at elevation 2.90
10	Install strut or anchor no.3 at elevation -5.00
11	Install strut or anchor no.4 at elevation -2.00
12	Remove strut or anchor no.2 at elevation -1.30
13	Install strut or anchor no.5 at elevation 4.00
14	Remove strut or anchor no.1 at elevation 2.00
15	Change EI of wall to 400788 kN.m2/m run Allow wall to relax with new modulus value
16	Apply water pressure profile no.1

FACTORS OF SAFETY and ANALYSIS OPTIONS

```
 Stability analysis:
  Method of analysis  -  Burland-Potts
  Factor on passive for calculating wall depth = 1.50

 Parameters for undrained strata:
  Minimum equivalent fluid density            =   5.00 kN/m3
  Maximum depth of water filled tension crack  =   0.00 m

 Bending moment and displacement calculation:
  Method  -  2-D finite element model
  Open Tension Crack analysis? - No
  Active limit arching modelled?  -  Yes
  Non-linear Modulus Parameter (L) = 9.000 m

 Boundary conditions:
  Length of wall (normal to plane of analysis) = 60.00 m

  Width of excavation on Left  side of wall  = 40.00 m
  Width of excavation on Right side of wall  = 40.00 m

  Distance to rigid boundary on Left side  = 30.00 m
  Distance to rigid boundary on Right side = 20.00 m
  Elevation of rigid lower boundary = -20.00

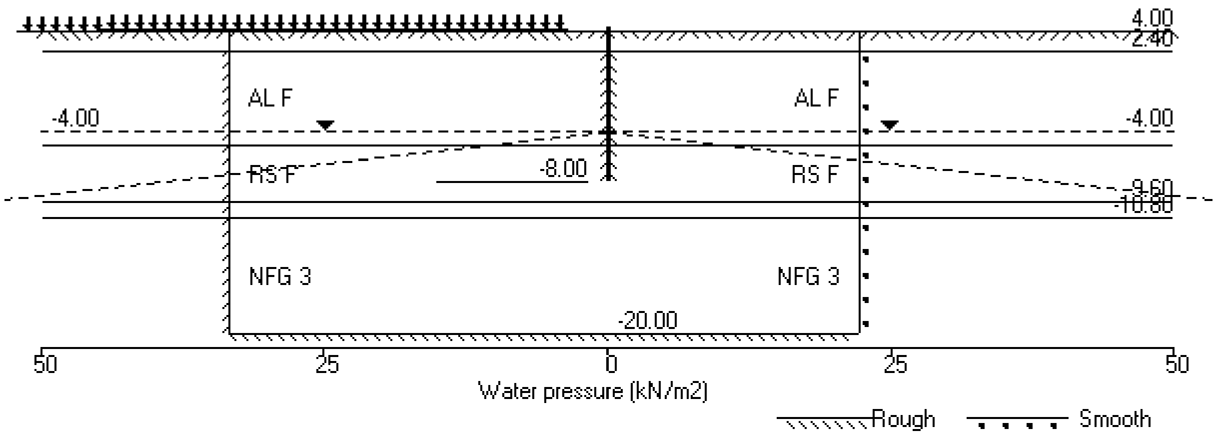
  Lower rigid boundary at elevation -20.00 - Rough
  Rigid boundary on Left side          - Rough
  Rigid boundary on Right side         - Smooth
  Wall / soil interface                  - Rough
```

OUTPUT OPTIONS

```
 Stage ------ Stage description ----------- ------- Output options -------
  no.                                       Displacement   Active,  Graph.
                                            Bending mom.   Passive  output
                                            Shear force   pressures
   1 Apply surcharge no.1 at elev. 4.00         Yes          Yes     Yes
   2 Excav. to elev. 2.00 on RIGHT side         Yes          Yes     Yes
   3 Install prop no.1 at elev. 2.00            Yes          Yes     Yes
   4 Excav. to elev. -1.50 on RIGHT side        Yes          Yes     Yes
   5 Install prop no.2 at elev. -1.30           Yes          Yes     Yes
   6 Apply water pressure profile no.2          Yes          Yes     Yes
   7 Excav. to elev. -5.00 on RIGHT side        Yes          Yes     Yes
   8 Apply load no.1 at elev. 2.90              Yes          Yes     Yes
   9 Apply load no.2 at elev. 2.90              Yes          Yes     Yes
  10 Install prop no.3 at elev. -5.00           Yes          Yes     Yes
  11 Install prop no.4 at elev. -2.00           Yes          Yes     Yes
  12 Remove prop no.2 at elev. -1.30            Yes          Yes     Yes
  13 Install prop no.5 at elev. 4.00            Yes          Yes     Yes
  14 Remove prop no.1 at elev. 2.00             Yes          Yes     Yes
  15 Change EI of wall to 400788kN.m2/m run     Yes          Yes     Yes
  16 Apply water pressure profile no.1          Yes          Yes     Yes
   * Summary output                             Yes           -      Yes
```

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 4.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.001	-2.86E-05	0.0	0.0		572444
2	3.45	-2.96	0.001	-2.86E-05	-0.8	0.0		572444
3	2.90	-2.32	0.001	-2.81E-05	-2.3	-0.9		572444
4	2.40	-1.75	0.001	-2.67E-05	-3.3	-2.3		572444
		-0.62	0.001	-2.67E-05	-3.3	-2.3		
5	2.00	-0.63	0.001	-2.47E-05	-3.5	-3.7		572444
6	1.60	-0.39	0.001	-2.16E-05	-3.7	-5.1		572444
7	1.20	-0.11	0.001	-1.75E-05	-3.8	-6.6		572444
8	0.60	0.40	0.001	-9.41E-06	-3.8	-8.9		572444
9	0.00	0.85	0.001	1.04E-06	-3.4	-11.0		572444
10	-0.60	1.29	0.001	1.35E-05	-2.7	-12.9		572444
11	-0.95	1.47	0.001	2.17E-05	-2.3	-13.8		572444
12	-1.30	1.68	0.001	3.03E-05	-1.7	-14.5		572444
13	-1.50	1.73	0.001	3.54E-05	-1.4	-14.8		572444
14	-2.00	2.02	0.001	4.85E-05	-0.4	-15.2		572444
15	-2.50	2.23	0.001	6.18E-05	0.6	-15.2		572444
16	-3.00	2.42	0.001	7.47E-05	1.8	-14.6		572444
17	-3.50	2.57	0.001	8.69E-05	3.0	-13.3		572444
18	-4.00	2.66	0.001	9.78E-05	4.4	-11.5		572444
19	-4.50	2.53	0.001	1.06E-04	5.7	-9.0		572444
20	-5.00	2.17	0.001	1.13E-04	6.8	-5.8		572444
		-8.29	0.001	1.13E-04	6.8	-5.8		
21	-5.50	-3.80	0.001	1.17E-04	3.8	-3.4		572444
22	-6.00	-2.17	0.001	1.19E-04	2.3	-2.0		572444
23	-6.60	-1.21	0.001	1.21E-04	1.3	-1.0		572444
24	-7.20	-0.63	0.001	1.21E-04	0.7	-0.4		572444
25	-7.60	-0.55	0.001	1.22E-04	0.5	-0.2		572444
26	-8.00	-1.46	0.001	1.22E-04	0.1	-0.0		0
27	-8.15	-0.09	0.001	0	-0.0	0.0		0
28	-9.60	1.81	0.000	0	1.2	0.0		0
		-2.13	0.000	0	1.2	0.0		
29	-10.80	7.44	0.000	0	4.4	0.0		0
		-4.96	0.000	0	4.4	0.0		

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	-0.00	0.000	0	-0.0	0.0		0
32	-16.80	0.01	0.000	0	-0.0	0.0		0
33	-18.40	0.00	0.000	0	-0.0	0.0		0
34	-20.00	0.01	0.000	0	-0.0	0.0		---

		LEFT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	5.12	5.12	9974
3	2.90	0.00	19.15	5.92	74.07	12.07	12.07	9974
4	2.40	0.00	28.39	8.77	109.82	18.46	18.46	9974
		0.00	28.39	4.41	117.75	19.01	19.01	4987
5	2.00	0.00	36.01	7.09	143.99	23.94	23.94	5187
6	1.60	0.00	43.77	9.81	170.71	29.03	29.03	5386
7	1.20	0.00	51.61	12.56	197.69	34.15	34.15	5586
8	0.60	0.00	63.39	16.70	238.25	41.88	41.88	5885
9	0.00	0.00	75.11	20.82	278.59	49.57	49.57	6184
10	-0.60	0.00	86.71	24.90	318.51	57.23	57.23	6483
11	-0.95	0.00	93.41	27.25	341.58	61.65	61.65	6658
12	-1.30	0.00	100.07	29.59	364.48	66.07	66.07	6832
13	-1.50	0.00	103.85	30.91	377.50	68.56	68.56	6932
14	-2.00	0.00	113.24	34.21	409.82	74.84	74.84	7181
15	-2.50	0.00	122.54	37.48	441.84	81.07	81.07	7431
16	-3.00	0.00	131.77	40.72	473.60	87.27	87.27	7680
17	-3.50	0.00	140.92	43.94	505.11	93.43	93.43	7929
18	-4.00	0.00	150.02	47.13	536.42	99.55	99.55	8179
19	-4.50	5.00	154.05	48.55	550.32	102.06	107.06	8428
20	-5.00	10.00	158.05	49.95	564.06	104.42	114.42	8678
		10.00	158.05	32.37	748.92	142.11	152.11	29922
21	-5.50	15.00	163.49	33.91	772.72	149.46	164.46	29922
22	-6.00	20.00	168.90	35.44	796.35	155.37	175.37	29922
23	-6.60	26.00	175.34	37.27	824.51	161.94	187.94	29922
24	-7.20	32.00	181.75	39.08	852.48	168.31	200.31	29922
25	-7.60	36.00	185.99	40.29	871.02	172.41	208.41	29922
26	-8.00	40.00	190.22	41.49	889.50	175.98	215.98	29922
27	-8.15	41.50	191.80	41.93	896.42	178.20	219.70	29922
28	-9.60	56.00	207.00	46.24	962.83	193.78	249.78	29922
		56.00	207.00	35.98	1021.19	191.82	247.82	49871
29	-10.80	68.00	223.07	40.67	1091.40	212.28	280.28	49871
		68.00	223.07	0.00	6319.03	204.54	272.54	997417
30	-12.60	86.00	254.23	0.00	6751.68	237.69	323.69	997417
31	-14.40	104.00	285.25	0.00	7182.41	268.33	372.33	997417
32	-16.80	128.00	326.44	0.00	7754.42	309.16	437.16	997417
33	-18.40	144.00	353.82	0.00	8134.61	336.36	480.36	997417
34	-20.00	160.00	381.14	0.00	8514.03	364.09	524.09	997417

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9951
2	3.45	0.00	9.35	2.89	36.17	8.09	8.09	9951
3	2.90	0.00	18.70	5.78	72.34	14.39	14.39	9951
4	2.40	0.00	27.20	8.41	105.22	20.21	20.21	9951
		0.00	27.20	3.99	113.66	19.63	19.63	4976
5	2.00	0.00	34.00	6.38	137.07	24.57	24.57	5175
6	1.60	0.00	40.80	8.77	160.47	29.41	29.41	5374
7	1.20	0.00	47.60	11.16	183.88	34.26	34.26	5573
8	0.60	0.00	57.80	14.74	218.99	41.48	41.48	5871
9	0.00	0.00	68.00	18.32	254.10	48.72	48.72	6170
10	-0.60	0.00	78.20	21.91	289.21	55.94	55.94	6468
11	-0.95	0.00	84.15	24.00	309.69	60.18	60.18	6643
12	-1.30	0.00	90.10	26.09	330.17	64.39	64.39	6817
13	-1.50	0.00	93.50	27.28	341.88	66.82	66.82	6916
14	-2.00	0.00	102.00	30.27	371.14	72.82	72.82	7165
15	-2.50	0.00	110.50	33.25	400.40	78.84	78.84	7414
16	-3.00	0.00	119.00	36.24	429.66	84.85	84.85	7663
17	-3.50	0.00	127.50	39.22	458.91	90.86	90.86	7911
18	-4.00	0.00	136.00	42.21	488.17	96.90	96.90	8160
19	-4.50	5.00	139.50	43.44	500.22	99.53	104.53	8409
20	-5.00	10.00	143.00	44.67	512.27	102.24	112.24	8658
		10.00	143.00	28.11	683.18	150.40	160.40	29854
21	-5.50	15.00	148.00	29.52	705.03	153.27	168.27	29854
22	-6.00	20.00	153.00	30.94	726.88	157.54	177.54	29854
23	-6.60	26.00	159.00	32.64	753.09	163.15	189.15	29854
24	-7.20	32.00	165.00	34.34	779.31	168.94	200.94	29854
25	-7.60	36.00	169.00	35.47	796.79	172.96	208.96	29854
26	-8.00	40.00	173.00	36.61	814.26	177.43	217.43	29854
27	-8.15	41.50	174.50	37.03	820.82	178.29	219.79	29854
28	-9.60	56.00	189.00	41.14	884.17	191.97	247.97	29854
		56.00	189.00	30.72	942.53	193.95	249.95	49757
29	-10.80	68.00	204.60	35.28	1010.70	204.84	272.84	49757
		68.00	204.60	0.00	6062.55	209.50	277.50	995147
30	-12.60	86.00	235.20	0.00	6487.46	237.68	323.68	995147
31	-14.40	104.00	265.80	0.00	6912.37	268.33	372.33	995147
32	-16.80	128.00	306.60	0.00	7478.92	309.15	437.15	995147
33	-18.40	144.00	333.80	0.00	7856.61	336.36	480.36	995147
34	-20.00	160.00	361.00	0.00	8234.31	364.08	524.08	995147

```
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                              Licensed from GEOSOLVE           | Made by :   DJC
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Albert Street Development                                      | Date:16-11-2022
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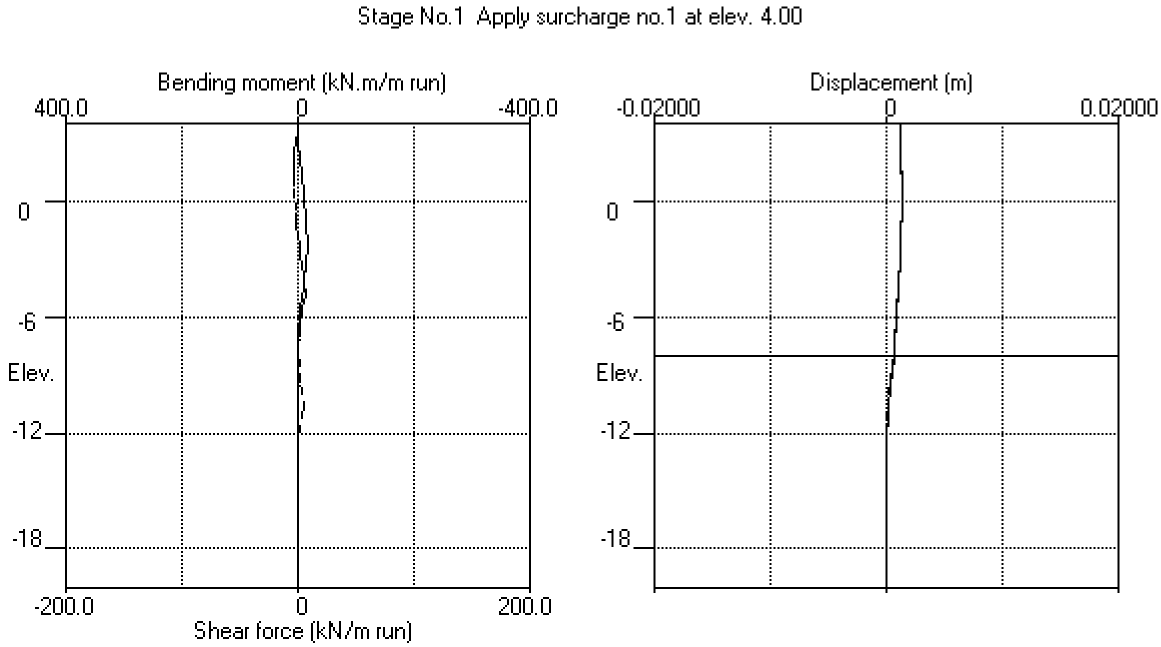
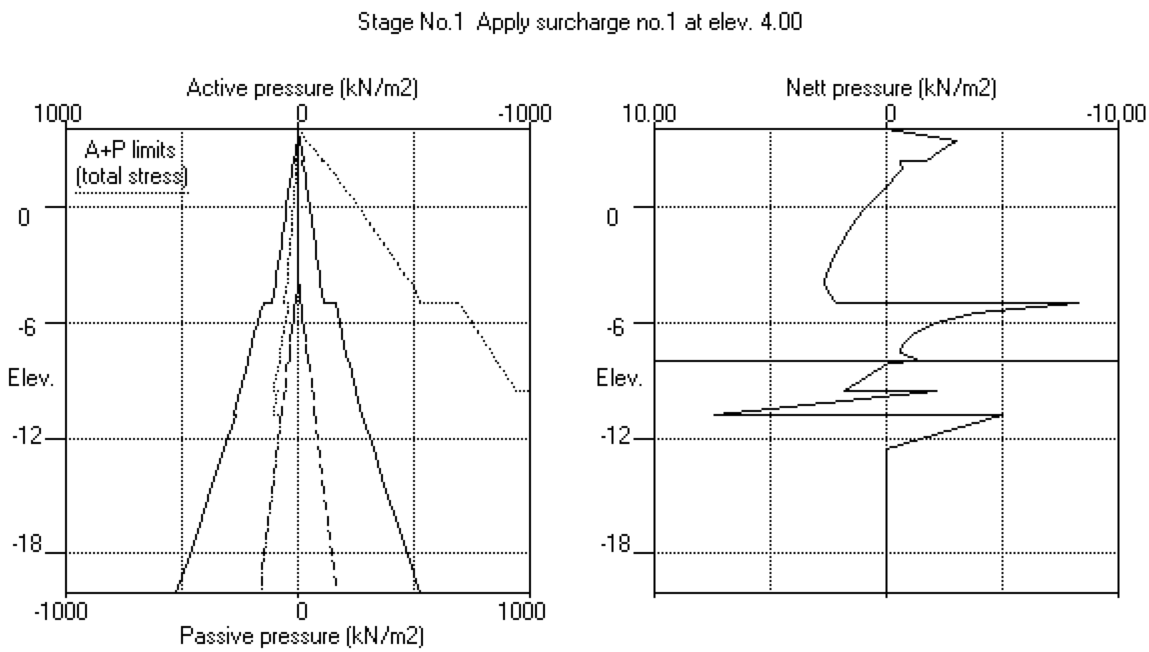
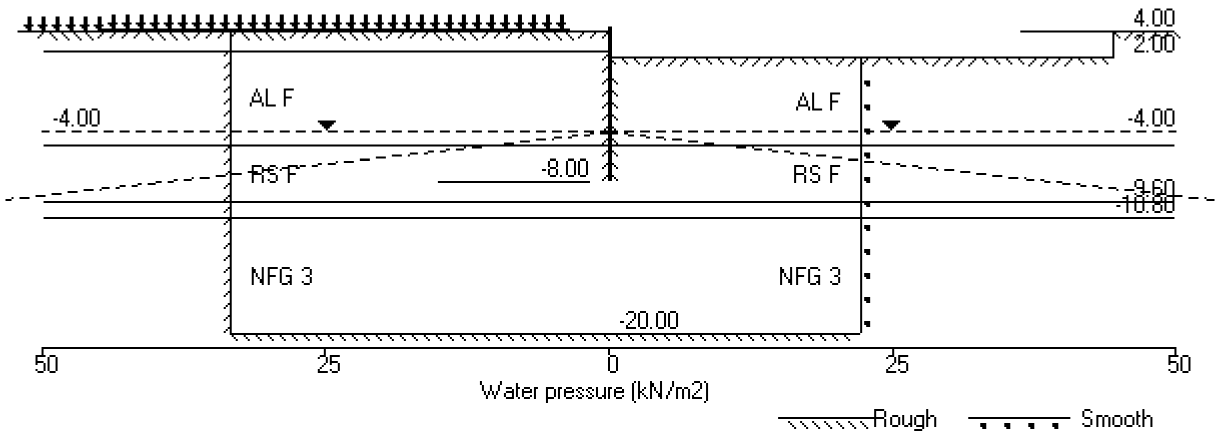




Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No. 2 Excavate to elevation 2.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
2	4.00	2.00	Cant.	11.615	-6.43	0.43	1.57	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	1.43E-03	0.0	-0.0		572444
2	3.45	2.91	0.016	1.43E-03	0.8	0.4		572444
3	2.90	5.92	0.015	1.42E-03	3.2	1.6		572444
4	2.40	8.77	0.014	1.42E-03	6.9	4.2		572444
		12.27	0.014	1.42E-03	6.9	4.2		
5	2.00	15.81	0.014	1.42E-03	12.5	8.1		572444
		-4.22	0.014	1.42E-03	12.5	8.1		
6	1.60	-8.87	0.013	1.41E-03	9.9	12.8		572444
7	1.20	-5.76	0.012	1.40E-03	7.0	16.0		572444
8	0.60	-3.63	0.012	1.38E-03	4.2	19.2		572444
9	0.00	-1.93	0.011	1.36E-03	2.5	21.1		572444
10	-0.60	-0.55	0.010	1.34E-03	1.7	22.3		572444
11	-0.95	0.24	0.009	1.32E-03	1.7	22.9		572444
12	-1.30	0.90	0.009	1.31E-03	1.9	23.5		572444
13	-1.50	1.32	0.009	1.30E-03	2.1	23.9		572444
14	-2.00	2.16	0.008	1.28E-03	3.0	25.1		572444
15	-2.50	2.92	0.007	1.26E-03	4.3	26.9		572444
16	-3.00	3.53	0.007	1.23E-03	5.9	29.4		572444
17	-3.50	3.91	0.006	1.21E-03	7.7	32.8		572444
18	-4.00	3.85	0.006	1.17E-03	9.7	37.2		572444
19	-4.50	2.47	0.005	1.14E-03	11.2	42.5		572444
20	-5.00	-0.80	0.004	1.10E-03	11.7	48.4		572444
		-54.14	0.004	1.10E-03	11.7	48.4		
21	-5.50	-25.33	0.004	1.06E-03	-8.2	47.5		572444
22	-6.00	-12.19	0.003	1.02E-03	-17.6	40.2		572444
23	-6.60	-2.96	0.003	9.89E-04	-22.1	27.5		572444
24	-7.20	5.24	0.002	9.67E-04	-21.4	13.7		572444
25	-7.60	16.19	0.002	9.61E-04	-17.2	5.6		572444
26	-8.00	50.59	0.001	9.59E-04	-3.8	-0.0		0
27	-8.15	-0.08	0.002	0	-0.0	0.0		0
28	-9.60	5.15	0.001	0	3.7	0.0		0
		-6.18	0.001	0	3.7	0.0		

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	20.96	0.000	0	12.5	0.0		0
		-13.97	0.000	0	12.5	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.01	0.000	0	-0.0	0.0		0
32	-16.80	0.01	0.000	0	0.0	0.0		0
33	-18.40	0.00	0.000	0	0.0	0.0		0
34	-20.00	-0.01	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	2.91	2.91a	9974
3	2.90	0.00	19.15	5.92	74.07	5.92	5.92a	9974
4	2.40	0.00	28.39	8.77	109.82	8.77	8.77a	9974
		0.00	28.39	4.41	117.75	12.27	12.27	4987
5	2.00	0.00	36.01	7.09	143.99	15.81	15.81	5187
6	1.60	0.00	43.77	9.81	170.71	20.70	20.70	5386
7	1.20	0.00	51.61	12.56	197.69	25.90	25.90	5586
8	0.60	0.00	63.39	16.70	238.25	33.85	33.85	5885
9	0.00	0.00	75.11	20.82	278.59	41.81	41.81	6184
10	-0.60	0.00	86.71	24.90	318.51	49.75	49.75	6483
11	-0.95	0.00	93.41	27.25	341.58	54.36	54.36	6658
12	-1.30	0.00	100.07	29.59	364.48	58.95	58.95	6832
13	-1.50	0.00	103.85	30.91	377.50	61.56	61.56	6932
14	-2.00	0.00	113.24	34.21	409.82	68.06	68.06	7181
15	-2.50	0.00	122.54	37.48	441.84	74.50	74.50	7431
16	-3.00	0.00	131.77	40.72	473.60	80.86	80.86	7680
17	-3.50	0.00	140.92	43.94	505.11	87.09	87.09	7929
18	-4.00	0.00	150.02	47.13	536.42	93.11	93.11	8179
19	-4.50	5.00	154.05	48.55	550.32	94.97	99.97	8428
20	-5.00	10.00	158.05	49.95	564.06	95.76	105.76	8678
		10.00	158.05	32.37	748.92	112.24	122.24	29922
21	-5.50	15.00	163.49	33.91	772.72	131.85	146.85	29922
22	-6.00	20.00	168.90	35.44	796.35	143.46	163.46	29922
23	-6.60	26.00	175.34	37.27	824.51	154.12	180.12	29922
24	-7.20	32.00	181.75	39.08	852.48	164.25	196.25	29922
25	-7.60	36.00	185.99	40.29	871.02	173.67	209.67	29922
26	-8.00	40.00	190.22	41.49	889.50	195.83	235.83	29922
27	-8.15	41.50	191.80	41.93	896.42	170.92	212.42	29922
28	-9.60	56.00	207.00	46.24	962.83	188.34	244.34	29922
		56.00	207.00	35.98	1021.19	182.75	238.75	49871
29	-10.80	68.00	223.07	40.67	1091.40	211.87	279.87	49871
		68.00	223.07	0.00	6319.03	196.27	264.27	997417
30	-12.60	86.00	254.23	0.00	6751.68	233.96	319.96	997417
31	-14.40	104.00	285.25	0.00	7182.41	264.58	368.58	997417
32	-16.80	128.00	326.44	0.00	7754.42	305.36	433.36	997417
33	-18.40	144.00	353.82	0.00	8134.61	332.50	476.50	997417
34	-20.00	160.00	381.14	0.00	8514.03	361.05	521.05	997417

(continued)

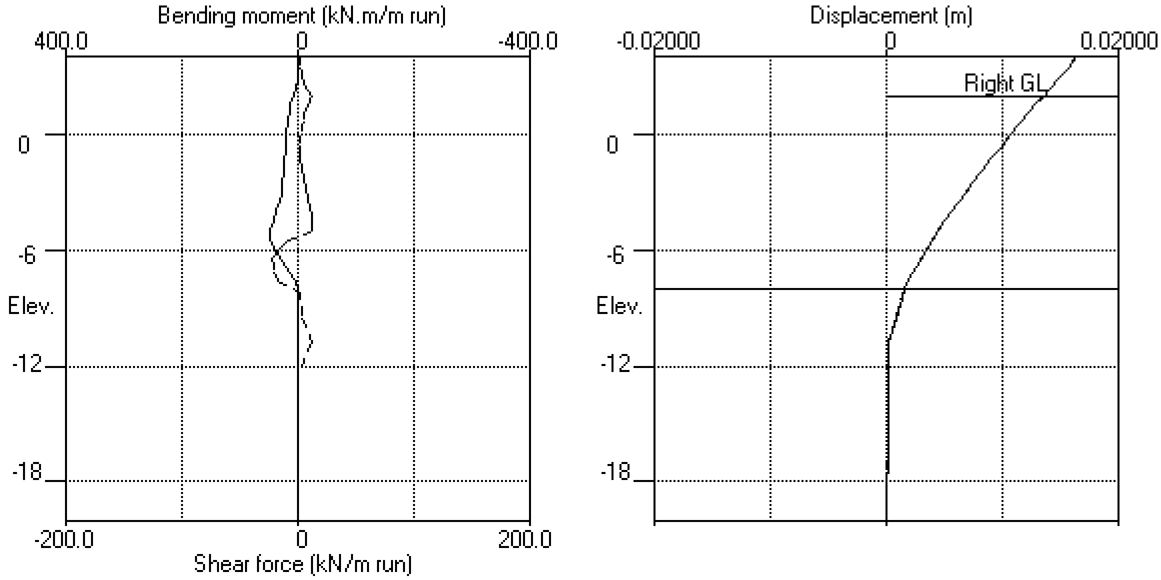
Stage No.2 Excavate to elevation 2.00 on RIGHT side

		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	5178
6	1.60	0.00	6.80	0.00	43.44	29.57	29.57	5377
7	1.20	0.00	13.60	0.00	66.84	31.66	31.66	5576
8	0.60	0.00	23.80	2.80	101.96	37.48	37.48	5875
9	0.00	0.00	34.00	6.38	137.07	43.74	43.74	6173
10	-0.60	0.00	44.20	9.96	172.19	50.30	50.30	6472
11	-0.95	0.00	50.16	12.05	192.68	54.13	54.13	6646
12	-1.30	0.00	56.11	14.14	213.17	58.05	58.05	6821
13	-1.50	0.00	59.51	15.34	224.88	60.24	60.24	6920
14	-2.00	0.00	68.01	18.33	254.15	65.90	65.90	7169
15	-2.50	0.00	76.52	21.31	283.43	71.58	71.58	7418
16	-3.00	0.00	85.03	24.30	312.71	77.33	77.33	7667
17	-3.50	0.00	93.54	27.29	342.00	83.18	83.18	7916
18	-4.00	0.00	102.05	30.28	371.30	89.25	89.25	8165
19	-4.50	5.00	105.56	31.52	383.39	92.50	97.50	8414
20	-5.00	10.00	109.07	32.75	395.49	96.56	106.56	8663
		10.00	109.07	18.49	534.95	166.38	176.38	29871
21	-5.50	15.00	114.09	19.91	556.87	157.18	172.18	29871
22	-6.00	20.00	119.11	21.34	578.80	155.65	175.65	29871
23	-6.60	26.00	125.14	23.04	605.13	157.07	183.07	29871
24	-7.20	32.00	131.17	24.75	631.47	159.01	191.01	29871
25	-7.60	36.00	135.19	25.89	649.04	157.47	193.47	29871
26	-8.00	40.00	139.21	27.03	666.62	145.24	185.24	29871
27	-8.15	41.50	140.72	27.46	673.21	170.99	212.49	29871
28	-9.60	56.00	155.32	31.60	737.01	183.18	239.18	29871
		56.00	155.32	20.87	795.37	188.93	244.93	49786
29	-10.80	68.00	171.02	25.46	863.97	190.91	258.91	49786
		68.00	171.02	0.00	5596.27	210.24	278.24	995713
30	-12.60	86.00	201.80	0.00	6023.72	233.95	319.95	995713
31	-14.40	104.00	232.62	0.00	6451.70	264.57	368.57	995713
32	-16.80	128.00	273.78	0.00	7023.14	305.35	433.35	995713
33	-18.40	144.00	301.25	0.00	7404.60	332.50	476.50	995713
34	-20.00	160.00	328.74	0.00	7786.41	361.07	521.07	995713

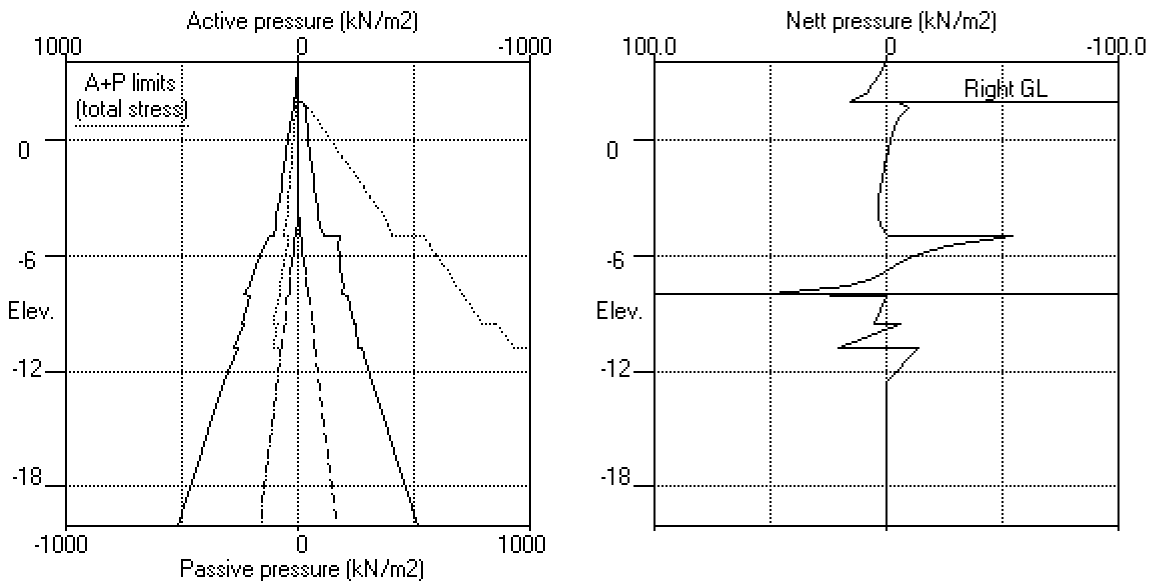
Note: 8.77 a Soil pressure at active limit
20.03 p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side

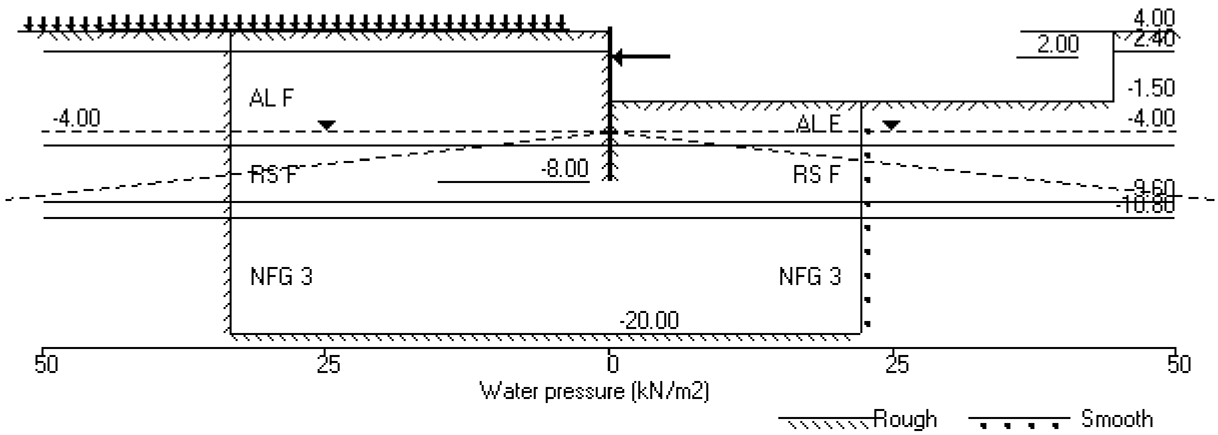


Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -1.50 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
4	4.00	-1.50	2.00	6.952	n/a	-3.40	1.90	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	2.21E-04	0.0	-0.0		572444
2	3.45	7.85	0.016	2.21E-04	2.2	0.4		572444
3	2.90	8.17	0.015	2.19E-04	6.6	3.1		572444
4	2.40	8.92	0.015	2.14E-04	10.8	7.7		572444
		12.35	0.015	2.14E-04	10.8	7.7		
5	2.00	15.34	0.015	2.07E-04	16.4	13.1	-121.1	572444
		15.34	0.015	2.07E-04	-104.7	13.1		
6	1.60	19.61	0.015	2.12E-04	-97.7	-27.3		572444
7	1.20	23.94	0.015	2.44E-04	-89.0	-64.7		572444
8	0.60	30.85	0.015	3.37E-04	-72.6	-113.4		572444
9	0.00	37.66	0.015	4.76E-04	-52.0	-151.0		572444
10	-0.60	44.69	0.014	6.47E-04	-27.3	-175.0		572444
11	-0.95	48.59	0.014	7.56E-04	-11.0	-181.7		572444
12	-1.30	52.76	0.014	8.67E-04	6.7	-182.5		572444
13	-1.50	54.92	0.014	9.31E-04	17.5	-180.1		572444
		34.89	0.014	9.31E-04	17.5	-180.1		
14	-2.00	14.00	0.013	1.08E-03	29.7	-167.6		572444
15	-2.50	14.12	0.013	1.22E-03	36.8	-150.9		572444
16	-3.00	13.98	0.012	1.34E-03	43.8	-130.8		572444
17	-3.50	13.70	0.011	1.44E-03	50.7	-107.1		572444
18	-4.00	12.92	0.010	1.53E-03	57.4	-80.0		572444
19	-4.50	10.04	0.010	1.58E-03	63.1	-49.7		572444
20	-5.00	4.34	0.009	1.61E-03	66.7	-16.9		572444
		-98.91	0.009	1.61E-03	66.7	-16.9		
21	-5.50	-50.05	0.008	1.62E-03	29.5	4.1		572444
22	-6.00	-29.46	0.007	1.61E-03	9.6	12.6		572444
23	-6.60	-15.69	0.006	1.60E-03	-4.0	13.0		572444
24	-7.20	-4.71	0.005	1.59E-03	-10.1	7.8		572444
25	-7.60	6.24	0.005	1.58E-03	-9.8	3.4		572444
26	-8.00	31.01	0.004	1.58E-03	-2.3	-0.0		0
27	-8.15	-0.07	0.004	0	-0.0	0.0		0
28	-9.60	11.07	0.002	0	8.0	0.0		0
		-13.32	0.002	0	8.0	0.0		

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
29	-10.80	44.90	0.000	0	26.9	0.0		0
		-29.92	0.000	0	26.9	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.04	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 121.1 kN/m run

		LEFT side						
				Effective stresses			Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	7.85	7.85	9974
3	2.90	0.00	19.15	5.92	74.07	8.17	8.17	9974
4	2.40	0.00	28.39	8.77	109.82	8.92	8.92	9974
		0.00	28.39	4.41	117.75	12.35	12.35	4987
5	2.00	0.00	36.01	7.09	143.99	15.34	15.34	5187
6	1.60	0.00	43.77	9.81	170.71	19.61	19.61	5386
7	1.20	0.00	51.61	12.56	197.69	23.94	23.94	5586
8	0.60	0.00	63.39	16.70	238.25	30.85	30.85	5885
9	0.00	0.00	75.11	20.82	278.59	37.66	37.66	6184
10	-0.60	0.00	86.71	24.90	318.51	44.69	44.69	6483
11	-0.95	0.00	93.41	27.25	341.58	48.59	48.59	6658
12	-1.30	0.00	100.07	29.59	364.48	52.76	52.76	6832
13	-1.50	0.00	103.85	30.91	377.50	54.92	54.92	6932
14	-2.00	0.00	113.24	34.21	409.82	61.03	61.03	7181
15	-2.50	0.00	122.54	37.48	441.84	67.06	67.06	7431
16	-3.00	0.00	131.77	40.72	473.60	73.09	73.09	7680
17	-3.50	0.00	140.92	43.94	505.11	79.05	79.05	7929
18	-4.00	0.00	150.02	47.13	536.42	84.75	84.75	8179
19	-4.50	5.00	154.05	48.55	550.32	85.93	90.93	8428
20	-5.00	10.00	158.05	49.95	564.06	85.58	95.58	8678
		10.00	158.05	32.37	748.92	77.15	87.15	29922
21	-5.50	15.00	163.49	33.91	772.72	106.81	121.81	29922
22	-6.00	20.00	168.90	35.44	796.35	122.13	142.13	29922
23	-6.60	26.00	175.34	37.27	824.51	135.05	161.05	29922
24	-7.20	32.00	181.75	39.08	852.48	146.59	178.59	29922
25	-7.60	36.00	185.99	40.29	871.02	156.04	192.04	29922
26	-8.00	40.00	190.22	41.49	889.50	173.08	213.08	29922
27	-8.15	41.50	191.80	41.93	896.42	158.30	199.80	29922
28	-9.60	56.00	207.00	46.24	962.83	178.58	234.58	29922
		56.00	207.00	35.98	1021.19	166.49	222.49	49871
29	-10.80	68.00	223.07	40.67	1091.40	211.12	279.12	49871
		68.00	223.07	0.00	6319.03	181.26	249.26	997417
30	-12.60	86.00	254.23	0.00	6751.68	226.93	312.93	997417
31	-14.40	104.00	285.25	0.00	7182.41	257.55	361.55	997417
32	-16.80	128.00	326.44	0.00	7754.42	298.29	426.29	997417
33	-18.40	144.00	353.82	0.00	8134.61	325.42	469.42	997417
34	-20.00	160.00	381.14	0.00	8514.03	355.50	515.50	997417

(continued)

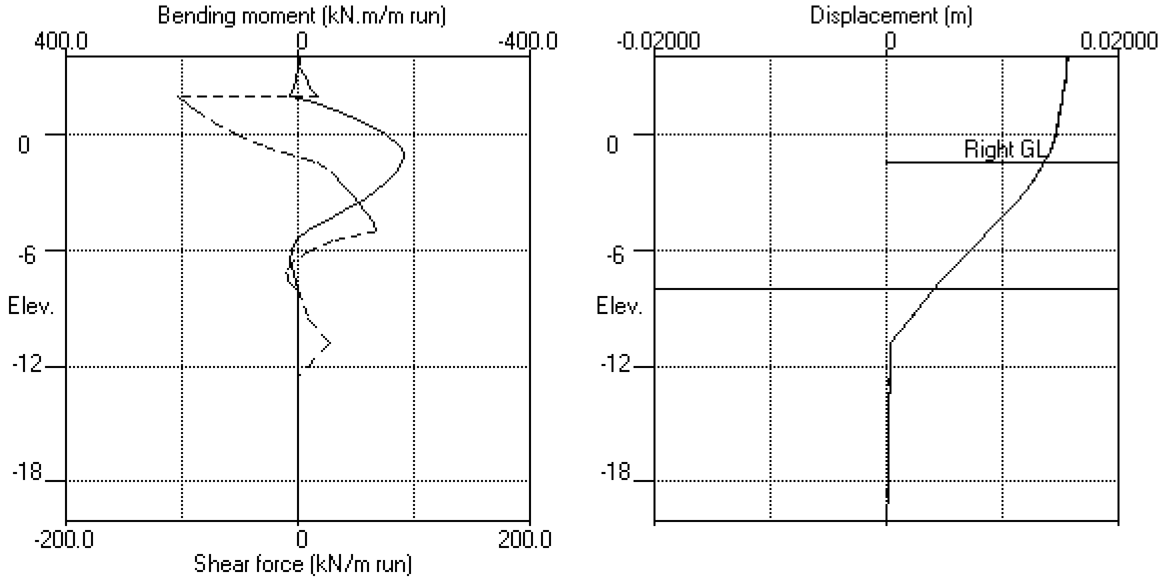
Stage No.4 Excavate to elevation -1.50 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	6927
14	-2.00	0.00	8.50	0.00	49.29	47.03	47.03	7176
15	-2.50	0.00	17.00	0.41	78.55	52.94	52.94	7426
16	-3.00	0.00	25.50	3.39	107.81	59.12	59.12	7675
17	-3.50	0.00	34.00	6.38	137.08	65.35	65.35	7924
18	-4.00	0.00	42.51	9.37	166.36	71.83	71.83	8173
19	-4.50	5.00	46.02	10.60	178.43	75.90	80.90	8422
20	-5.00	10.00	49.53	11.83	190.51	81.25	91.25	8672
		10.00	49.53	1.62	274.76	176.06	186.06	29902
21	-5.50	15.00	54.54	3.04	296.66	156.86	171.86	29902
22	-6.00	20.00	59.56	4.46	318.58	151.59	171.59	29902
23	-6.60	26.00	65.58	6.17	344.91	150.74	176.74	29902
24	-7.20	32.00	71.61	7.88	371.26	151.30	183.30	29902
25	-7.60	36.00	75.64	9.02	388.85	149.80	185.80	29902
26	-8.00	40.00	79.67	10.16	406.45	142.07	182.07	29902
27	-8.15	41.50	81.18	10.59	413.05	158.37	199.87	29902
28	-9.60	56.00	95.81	14.74	477.01	167.52	223.52	29902
		56.00	95.81	3.48	535.37	179.82	235.82	49836
29	-10.80	68.00	111.57	8.09	604.20	166.22	234.22	49836
		68.00	111.57	0.00	4770.72	211.18	279.18	996727
30	-12.60	86.00	142.48	0.00	5199.89	226.92	312.92	996727
31	-14.40	104.00	173.48	0.00	5630.44	257.53	361.53	996727
32	-16.80	128.00	214.98	0.00	6206.74	298.29	426.29	996727
33	-18.40	144.00	242.76	0.00	6592.37	325.41	469.41	996727
34	-20.00	160.00	270.61	0.00	6979.12	355.54	515.54	996727

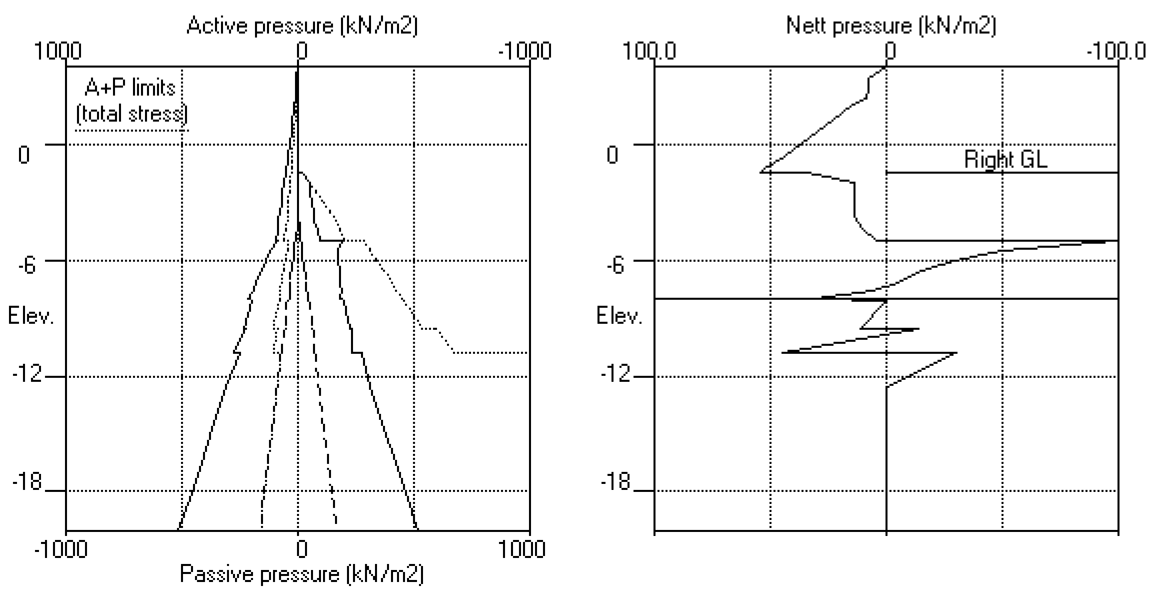
Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side

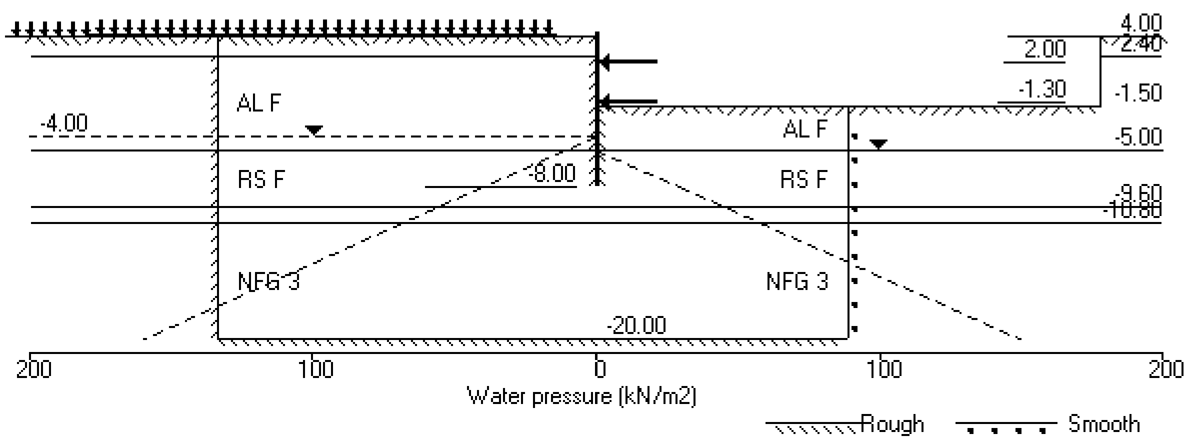


Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No. 6 Apply water pressure profile no.2

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
6	4.00	-1.50		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	1.96E-04	0.0	-0.0		572444
2	3.45	8.06	0.015	1.96E-04	2.2	0.4		572444
3	2.90	8.33	0.015	1.94E-04	6.7	3.2		572444
4	2.40	9.07	0.015	1.90E-04	11.1	7.8		572444
		12.42	0.015	1.90E-04	11.1	7.8		
5	2.00	15.42	0.015	1.82E-04	16.6	13.4	-119.2	572444
		15.42	0.015	1.82E-04	-102.6	13.4		
6	1.60	19.68	0.015	1.87E-04	-95.6	-26.1		572444
7	1.20	24.02	0.015	2.18E-04	-86.8	-62.7		572444
8	0.60	30.93	0.015	3.08E-04	-70.3	-110.1		572444
9	0.00	37.74	0.015	4.43E-04	-49.7	-146.3		572444
10	-0.60	44.75	0.014	6.08E-04	-25.0	-168.9		572444
11	-0.95	48.64	0.014	7.13E-04	-8.6	-174.9		572444
12	-1.30	52.81	0.014	8.20E-04	9.1	-174.8	-5.8	572444
		52.81	0.014	8.20E-04	3.3	-174.8		
13	-1.50	54.94	0.014	8.81E-04	14.0	-173.1		572444
		35.05	0.014	8.81E-04	14.0	-173.1		
14	-2.00	14.10	0.013	1.02E-03	26.3	-162.3		572444
15	-2.50	14.11	0.013	1.16E-03	33.4	-147.3		572444
16	-3.00	13.84	0.012	1.28E-03	40.4	-128.9		572444
17	-3.50	13.41	0.011	1.38E-03	47.2	-106.9		572444
18	-4.00	12.48	0.011	1.46E-03	53.7	-81.7		572444
19	-4.50	12.28	0.010	1.52E-03	59.8	-53.2		572444
20	-5.00	9.26	0.009	1.56E-03	65.2	-21.6		572444
		-95.91	0.009	1.56E-03	65.2	-21.6		
21	-5.50	-47.20	0.008	1.57E-03	29.5	-0.9		572444
22	-6.00	-27.32	0.008	1.56E-03	10.8	7.9		572444
23	-6.60	-14.42	0.007	1.55E-03	-1.7	9.5		572444
24	-7.20	-4.51	0.006	1.54E-03	-7.4	5.9		572444
25	-7.60	4.58	0.005	1.54E-03	-7.4	2.6		572444
26	-8.00	23.44	0.004	1.54E-03	-1.8	-0.0		0
27	-8.15	-0.07	0.004	0	-0.0	0.0		0

(continued)

Stage No.6 Apply water pressure profile no.2

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
28	-9.60	12.39	0.002	0	8.9	0.0		0
		-14.92	0.002	0	8.9	0.0		
29	-10.80	50.06	0.000	0	30.0	0.0		0
		-33.37	0.000	0	30.0	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.04	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 119.2 kN/m run
At elev. -1.30 Prop force = 5.8 kN/m run

LEFT side

Node no.	Y coord	Water press.	Effective stresses Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	8.06	8.06	9974
3	2.90	0.00	19.15	5.92	74.07	8.33	8.33	9974
4	2.40	0.00	28.39	8.77	109.82	9.07	9.07	9974
		0.00	28.39	4.41	117.75	12.42	12.42	4987
5	2.00	0.00	36.01	7.09	143.99	15.42	15.42	5187
6	1.60	0.00	43.77	9.81	170.71	19.68	19.68	5386
7	1.20	0.00	51.61	12.56	197.69	24.02	24.02	5586
8	0.60	0.00	63.39	16.70	238.25	30.93	30.93	5885
9	0.00	0.00	75.11	20.82	278.59	37.74	37.74	6184
10	-0.60	0.00	86.71	24.90	318.51	44.75	44.75	6483
11	-0.95	0.00	93.41	27.25	341.58	48.64	48.64	6658
12	-1.30	0.00	100.07	29.59	364.48	52.81	52.81	6832
13	-1.50	0.00	103.85	30.91	377.50	54.94	54.94	6932
14	-2.00	0.00	113.24	34.21	409.82	61.02	61.02	7181
15	-2.50	0.00	122.54	37.48	441.84	67.00	67.00	7431
16	-3.00	0.00	131.77	40.72	473.60	72.98	72.98	7680
17	-3.50	0.00	140.92	43.94	505.11	78.87	78.87	7929
18	-4.00	0.00	150.02	47.13	536.42	84.50	84.50	8179
19	-4.50	5.00	154.05	48.55	550.32	85.61	90.61	8428
20	-5.00	10.00	158.05	49.95	564.06	85.19	95.19	8678
		10.00	158.05	32.37	748.92	75.78	85.78	29922
21	-5.50	15.00	163.49	33.91	772.72	105.36	120.36	29922
22	-6.00	20.00	168.90	35.44	796.35	120.32	140.32	29922
23	-6.60	26.00	175.34	37.27	824.51	132.82	158.82	29922
24	-7.20	32.00	181.75	39.08	852.48	143.83	175.83	29922
25	-7.60	36.00	185.99	40.29	871.02	152.36	188.36	29922
26	-8.00	40.00	190.22	41.49	889.50	166.31	206.31	29922
27	-8.15	41.50	191.80	41.93	896.42	155.47	196.97	29922
28	-9.60	56.00	207.00	46.24	962.83	176.39	232.39	29922
		56.00	207.00	35.98	1021.19	162.84	218.84	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.85	278.85	49871
		68.00	223.07	0.00	6319.03	175.87	243.87	997417
30	-12.60	86.00	254.23	0.00	6751.68	223.25	309.25	997417
31	-14.40	104.00	285.25	0.00	7182.41	253.86	357.86	997417
32	-16.80	128.00	326.44	0.00	7754.42	294.59	422.59	997417
33	-18.40	144.00	353.82	0.00	8134.61	321.71	465.71	997417
34	-20.00	160.00	381.14	0.00	8514.03	352.55	512.55	997417

(continued)

Stage No.6 Apply water pressure profile no.2

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.89	19.89	6927
14	-2.00	0.00	8.50	0.00	49.29	46.93	46.93	7176
15	-2.50	0.00	17.00	0.41	78.55	52.89	52.89	7426
16	-3.00	0.00	25.50	3.39	107.81	59.14	59.14	7675
17	-3.50	0.00	34.00	6.38	137.08	65.46	65.46	7924
18	-4.00	0.00	42.51	9.37	166.36	72.02	72.02	8173
19	-4.50	0.00	51.02	12.36	195.64	78.32	78.32	8422
20	-5.00	0.00	59.53	15.35	224.93	85.92	85.92	8672
		0.00	59.53	4.45	318.45	181.70	181.70	29902
21	-5.50	5.00	64.54	5.87	340.36	162.56	167.56	29902
22	-6.00	10.00	69.56	7.30	362.27	157.65	167.65	29902
23	-6.60	16.00	75.58	9.00	388.60	157.24	173.24	29902
24	-7.20	22.00	81.61	10.71	414.95	158.33	180.33	29902
25	-7.60	26.00	85.64	11.85	432.54	157.78	183.78	29902
26	-8.00	30.00	89.67	12.99	450.14	152.87	182.87	29902
27	-8.15	31.50	91.18	13.42	456.74	165.54	197.04	29902
28	-9.60	46.00	105.81	17.57	520.70	174.00	220.00	29902
		46.00	105.81	6.41	579.06	187.76	233.76	49836
29	-10.80	58.00	121.57	11.01	647.90	170.78	228.78	49836
		58.00	121.57	0.00	4909.57	219.23	277.23	996727
30	-12.60	76.00	152.48	0.00	5338.75	233.24	309.24	996727
31	-14.40	94.00	183.48	0.00	5769.30	263.84	357.84	996727
32	-16.80	118.00	224.98	0.00	6345.60	304.59	422.59	996727
33	-18.40	134.00	252.76	0.00	6731.23	331.71	465.71	996727
34	-20.00	150.00	280.61	0.00	7117.98	362.59	512.59	996727

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EDG CONSULTING PTY LTD                                       | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58          | Job No.  B01493
                            Licensed from GEOSOLVE           | Made by :   DJC
Data filename/Run ID: Section_2                              |
Albert Street Development                                    | Date:16-11-2022
Section 2                                                    | Checked :
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                                                               Units: kN,m
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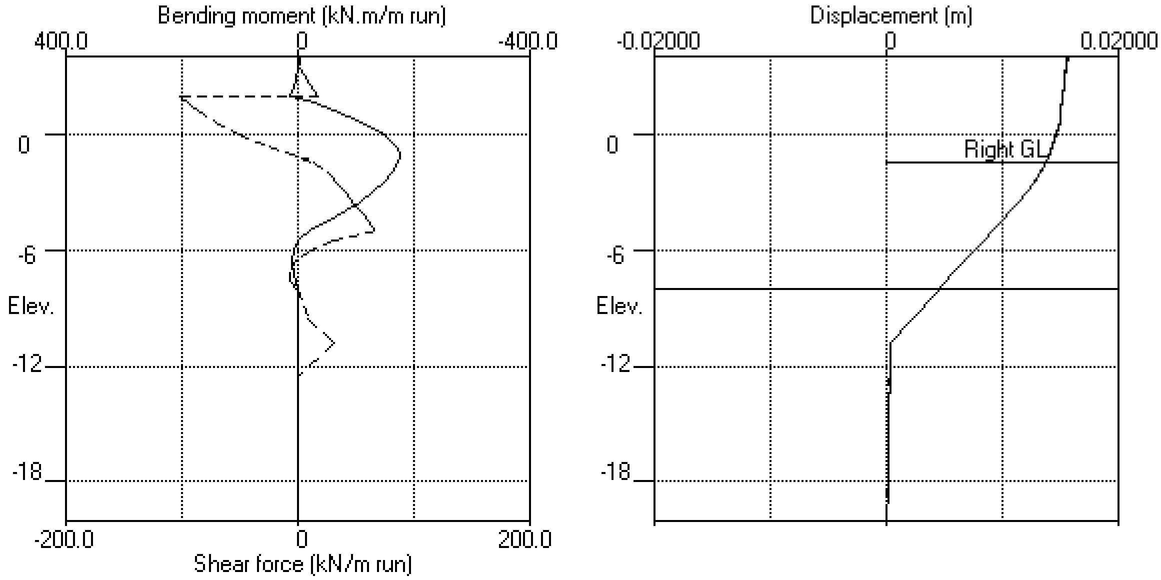
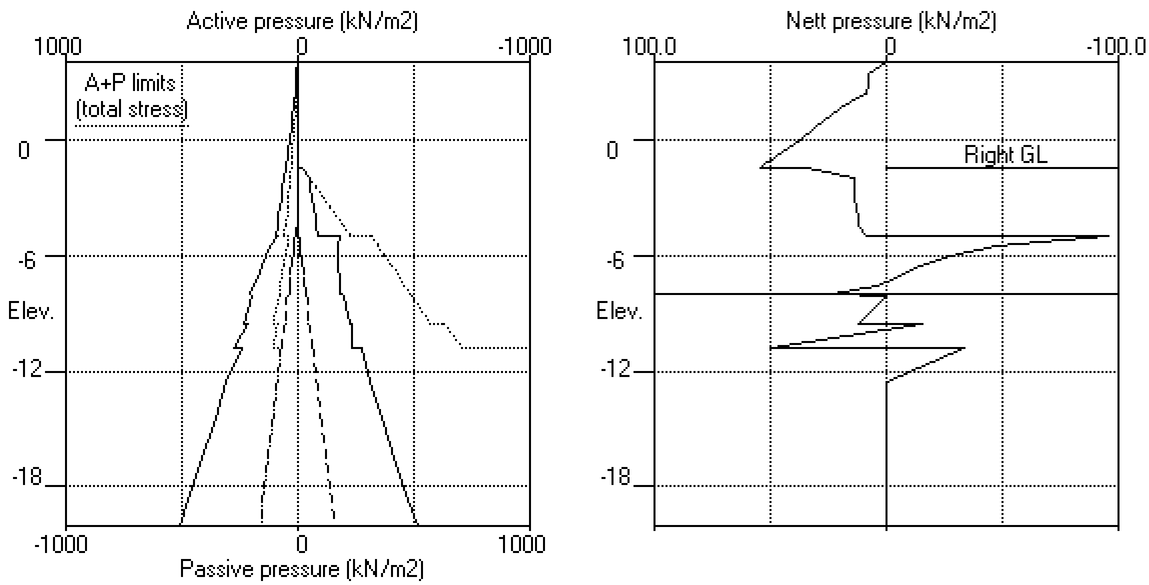
Stage No.6 Apply water pressure profile no.2



Stage No.6 Apply water pressure profile no.2



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Program: WALLAP  Version 6.07  Revision A55.B74.R58          | Job No.  B01493
                             Licensed from GEOSOLVE          | Made by :   DJC
Data filename/Run ID: Section_2                              |
Albert Street Development                                    | Date:16-11-2022
Section 2                                                    | Checked :
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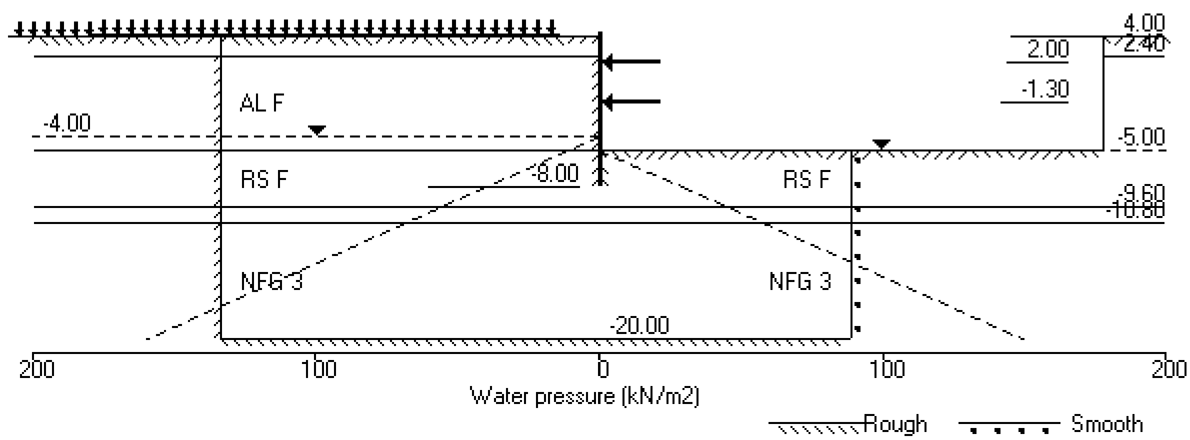
Stage No.7   Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -5.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
7	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-5.59E-04	0.0	-0.0		572444
2	3.45	13.24	0.014	-5.60E-04	3.6	0.4		572444
3	2.90	12.00	0.014	-5.62E-04	10.6	4.7		572444
4	2.40	11.74	0.015	-5.69E-04	16.5	11.8		572444
		13.76	0.015	-5.69E-04	16.5	11.8		
5	2.00	16.68	0.015	-5.80E-04	22.6	19.6	-100.3	572444
		16.68	0.015	-5.80E-04	-77.7	19.6		
6	1.60	20.79	0.015	-5.84E-04	-70.2	-9.8		572444
7	1.20	24.89	0.015	-5.68E-04	-61.0	-36.2		572444
8	0.60	31.50	0.016	-5.13E-04	-44.1	-67.9		572444
9	0.00	37.87	0.016	-4.31E-04	-23.3	-88.3		572444
10	-0.60	44.40	0.016	-3.35E-04	1.4	-95.0		572444
11	-0.95	47.76	0.016	-2.78E-04	17.5	-91.7		572444
12	-1.30	51.46	0.016	-2.25E-04	34.9	-82.6	-190.8	572444
		51.46	0.016	-2.25E-04	-155.9	-82.6		
13	-1.50	52.86	0.016	-1.91E-04	-145.5	-112.7		572444
14	-2.00	57.95	0.017	-6.40E-05	-117.8	-178.3		572444
15	-2.50	62.60	0.017	1.14E-04	-87.6	-229.7		572444
16	-3.00	67.20	0.016	3.30E-04	-55.2	-265.4		572444
17	-3.50	71.75	0.016	5.70E-04	-20.4	-284.3		572444
18	-4.00	76.07	0.016	8.19E-04	16.5	-285.3		572444
19	-4.50	80.76	0.015	1.06E-03	55.7	-267.1		572444
20	-5.00	84.06	0.015	1.27E-03	96.9	-228.7		572444
		-10.93	0.015	1.27E-03	96.9	-228.7		
21	-5.50	1.51	0.014	1.45E-03	94.6	-183.3		572444
22	-6.00	-6.24	0.013	1.59E-03	93.4	-136.9		572444
23	-6.60	-21.84	0.012	1.71E-03	85.0	-83.6		572444
24	-7.20	-40.72	0.011	1.77E-03	66.2	-36.7		572444
25	-7.60	-60.90	0.011	1.79E-03	45.9	-13.5		572444
26	-8.00	-122.58	0.010	1.79E-03	9.2	0.0		0
27	-8.15	-0.08	0.009	0	-0.0	0.0		0
28	-9.60	18.33	0.004	0	13.2	0.0		0
		-22.09	0.004	0	13.2	0.0		

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	74.13	0.001	0	44.4	0.0		0
		-49.41	0.001	0	44.4	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 100.3 kN/m run
At elev. -1.30 Prop force = 190.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	13.24	13.24	9974
3	2.90	0.00	19.15	5.92	74.07	12.00	12.00	9974
4	2.40	0.00	28.39	8.77	109.82	11.74	11.74	9974
		0.00	28.39	4.41	117.75	13.76	13.76	4987
5	2.00	0.00	36.01	7.09	143.99	16.68	16.68	5187
6	1.60	0.00	43.77	9.81	170.71	20.79	20.79	5386
7	1.20	0.00	51.61	12.56	197.69	24.89	24.89	5586
8	0.60	0.00	63.39	16.70	238.25	31.50	31.50	5885
9	0.00	0.00	75.11	20.82	278.59	37.87	37.87	6184
10	-0.60	0.00	86.71	24.90	318.51	44.40	44.40	6483
11	-0.95	0.00	93.41	27.25	341.58	47.76	47.76	6658
12	-1.30	0.00	100.07	29.59	364.48	51.46	51.46	6832
13	-1.50	0.00	103.85	30.91	377.50	52.86	52.86	6932
14	-2.00	0.00	113.24	34.21	409.82	57.95	57.95	7181
15	-2.50	0.00	122.54	37.48	441.84	62.60	62.60	7431
16	-3.00	0.00	131.77	40.72	473.60	67.20	67.20	7680
17	-3.50	0.00	140.92	43.94	505.11	71.75	71.75	7929
18	-4.00	0.00	150.02	47.13	536.42	76.07	76.07	8179
19	-4.50	5.00	154.05	48.55	550.32	75.76	80.76	8428
20	-5.00	10.00	158.05	49.95	564.06	74.06	84.06	8678
		10.00	158.05	32.37	748.92	37.43	47.43	29922
21	-5.50	15.00	163.49	33.91	772.72	71.71	86.71	29922
22	-6.00	20.00	168.90	35.44	796.35	85.82	105.82	29922
23	-6.60	26.00	175.34	37.27	824.51	96.44	122.44	29922
24	-7.20	32.00	181.75	39.08	852.48	103.81	135.81	29922
25	-7.60	36.00	185.99	40.29	871.02	101.14	137.14	29922
26	-8.00	40.00	190.22	41.49	889.50	56.98	96.98	29922
27	-8.15	41.50	191.80	41.93	896.42	143.47	184.97	29922
28	-9.60	56.00	207.00	46.24	962.83	166.57	222.57	29922
		56.00	207.00	35.98	1021.19	146.47	202.47	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.10	278.10	49871
		68.00	223.07	0.00	6319.03	160.97	228.97	997417
30	-12.60	86.00	254.23	0.00	6751.68	216.29	302.29	997417
31	-14.40	104.00	285.25	0.00	7182.41	246.85	350.85	997417
32	-16.80	128.00	326.44	0.00	7754.42	287.49	415.49	997417
33	-18.40	144.00	353.82	0.00	8134.61	314.52	458.52	997417
34	-20.00	160.00	381.14	0.00	8514.03	346.95	506.95	997417

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		RIGHT side						
			Effective stresses					
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
21	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	29934
22	-6.00	10.00	10.00	0.00	102.06	102.06	112.06p	29934
23	-6.60	16.00	16.00	0.00	128.29	128.29	144.29p	29934
24	-7.20	22.00	22.01	0.00	154.53	154.53	176.53p	29934
25	-7.60	26.00	26.02	0.00	172.04	172.04	198.04p	29934
26	-8.00	30.00	30.03	0.00	189.56	189.56	219.56p	29934
27	-8.15	31.50	31.53	0.00	196.13	153.55	185.05	29934
28	-9.60	46.00	46.10	0.65	259.78	158.24	204.24	29934
		46.00	46.10	0.00	318.14	178.56	224.56	49890
29	-10.80	58.00	61.79	0.00	386.72	145.97	203.97	49890
		58.00	61.79	0.00	4079.54	220.38	278.38	997795
30	-12.60	76.00	92.63	0.00	4507.70	226.28	302.28	997795
31	-14.40	94.00	123.59	0.00	4937.65	256.84	350.84	997795
32	-16.80	118.00	165.11	0.00	5514.16	297.49	415.49	997795
33	-18.40	134.00	192.95	0.00	5900.75	324.51	458.51	997795
34	-20.00	150.00	220.92	0.00	6289.20	357.01	507.01	997795

Note: 12.34 a Soil pressure at active limit
219.56 p Soil pressure at passive limit

```
EDG CONSULTING PTY LTD                                        | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58           | Job No.  B01493
                              Licensed from GEOSOLVE          | Made by :   DJC
Data filename/Run ID: Section_2                               |
Albert Street Development                                     | Date:16-11-2022
Section 2                                                     | Checked :
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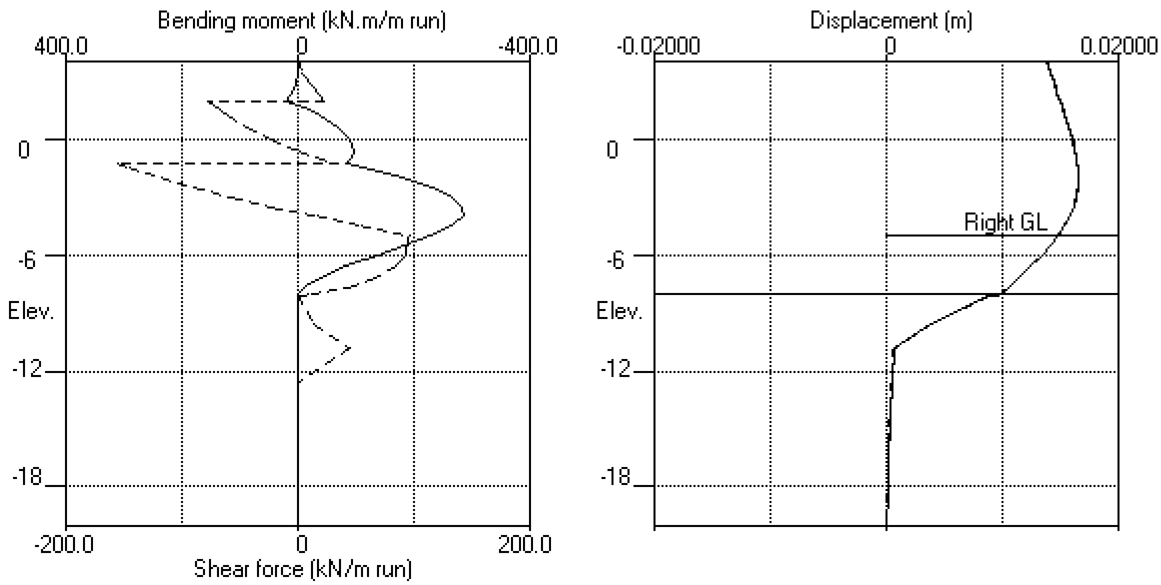
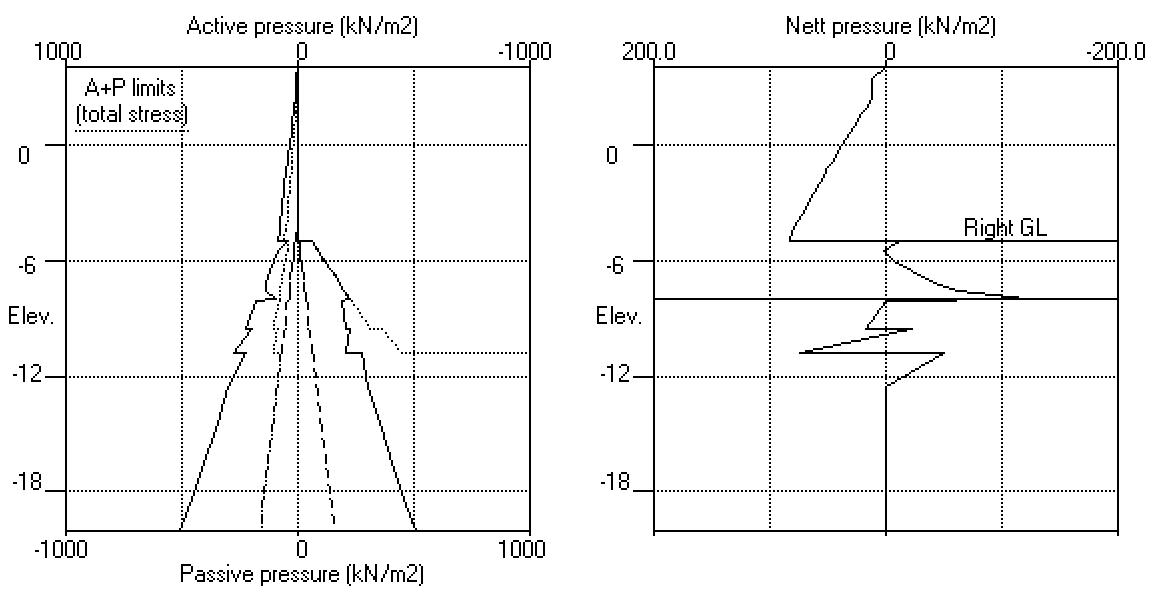
Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side

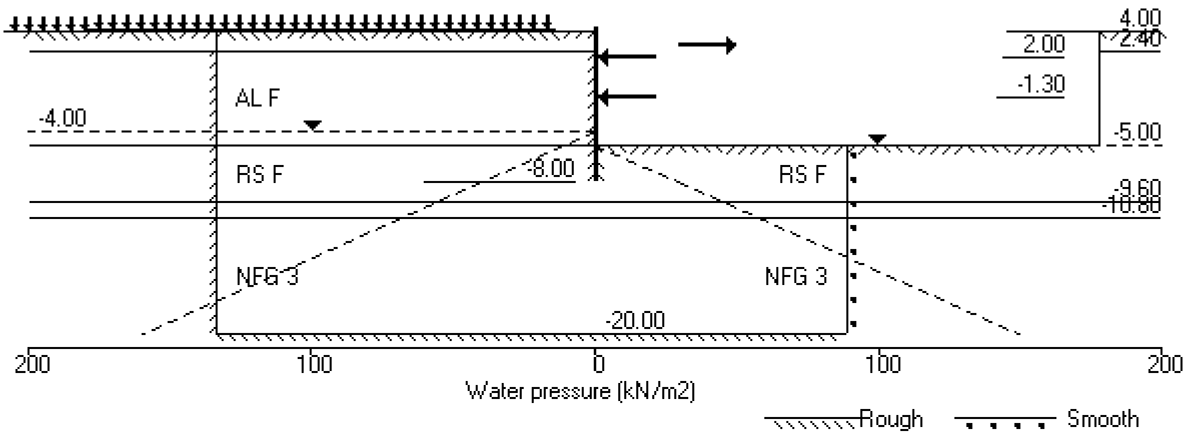


Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.90



Units: kN,m

Stage No. 8 Apply load no.1 at elevation 2.90

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
8	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-4.70E-04	0.0	-0.0		572444
2	3.45	12.50	0.014	-4.70E-04	3.4	0.4		572444
3	2.90	11.56	0.015	-4.72E-04	10.1	4.5	13.0	572444
		11.56	0.015	-4.72E-04	23.1	4.5		
4	2.40	11.53	0.015	-4.82E-04	28.8	17.7		572444
		13.65	0.015	-4.82E-04	28.8	17.7		
5	2.00	16.58	0.015	-4.99E-04	34.9	30.5	-113.5	572444
		16.58	0.015	-4.99E-04	-78.6	30.5		
6	1.60	20.71	0.015	-5.10E-04	-71.2	0.6		572444
7	1.20	24.85	0.016	-5.01E-04	-62.1	-26.1		572444
8	0.60	31.48	0.016	-4.56E-04	-45.2	-58.5		572444
9	0.00	37.88	0.016	-3.84E-04	-24.4	-79.5		572444
10	-0.60	44.44	0.016	-2.97E-04	0.3	-86.9		572444
11	-0.95	47.82	0.016	-2.45E-04	16.5	-83.9		572444
12	-1.30	51.52	0.016	-1.96E-04	33.9	-75.1	-191.4	572444
		51.52	0.016	-1.96E-04	-157.5	-75.1		
13	-1.50	52.93	0.016	-1.65E-04	-147.1	-105.6		572444
14	-2.00	58.03	0.017	-4.38E-05	-119.3	-172.0		572444
15	-2.50	62.68	0.017	1.29E-04	-89.2	-224.1		572444
16	-3.00	67.29	0.016	3.40E-04	-56.7	-260.6		572444
17	-3.50	71.84	0.016	5.77E-04	-21.9	-280.3		572444
18	-4.00	76.16	0.016	8.22E-04	15.1	-281.9		572444
19	-4.50	80.85	0.015	1.06E-03	54.4	-264.4		572444
20	-5.00	84.15	0.015	1.27E-03	95.6	-226.7		572444
		-10.30	0.015	1.27E-03	95.6	-226.7		
21	-5.50	1.96	0.014	1.45E-03	93.5	-181.9		572444
22	-6.00	-5.84	0.013	1.59E-03	92.6	-136.0		572444
23	-6.60	-21.49	0.012	1.70E-03	84.4	-83.1		572444
24	-7.20	-40.39	0.011	1.77E-03	65.8	-36.5		572444
25	-7.60	-60.54	0.011	1.78E-03	45.6	-13.4		572444
26	-8.00	-121.88	0.010	1.79E-03	9.1	0.0		0
27	-8.15	-0.08	0.009	0	-0.0	0.0		0

(continued)

Stage No.8 Apply load no.1 at elevation 2.90

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-9.60	18.33	0.004	0	13.2	0.0		0
		-22.09	0.004	0	13.2	0.0		
29	-10.80	74.13	0.001	0	44.4	0.0		0
		-49.41	0.001	0	44.4	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 113.5 kN/m run
At elev. -1.30 Prop force = 191.4 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	12.50	12.50	9974
3	2.90	0.00	19.15	5.92	74.07	11.56	11.56	9974
4	2.40	0.00	28.39	8.77	109.82	11.53	11.53	9974
		0.00	28.39	4.41	117.75	13.65	13.65	4987
5	2.00	0.00	36.01	7.09	143.99	16.58	16.58	5187
6	1.60	0.00	43.77	9.81	170.71	20.71	20.71	5386
7	1.20	0.00	51.61	12.56	197.69	24.85	24.85	5586
8	0.60	0.00	63.39	16.70	238.25	31.48	31.48	5885
9	0.00	0.00	75.11	20.82	278.59	37.88	37.88	6184
10	-0.60	0.00	86.71	24.90	318.51	44.44	44.44	6483
11	-0.95	0.00	93.41	27.25	341.58	47.82	47.82	6658
12	-1.30	0.00	100.07	29.59	364.48	51.52	51.52	6832
13	-1.50	0.00	103.85	30.91	377.50	52.93	52.93	6932
14	-2.00	0.00	113.24	34.21	409.82	58.03	58.03	7181
15	-2.50	0.00	122.54	37.48	441.84	62.68	62.68	7431
16	-3.00	0.00	131.77	40.72	473.60	67.29	67.29	7680
17	-3.50	0.00	140.92	43.94	505.11	71.84	71.84	7929
18	-4.00	0.00	150.02	47.13	536.42	76.16	76.16	8179
19	-4.50	5.00	154.05	48.55	550.32	75.85	80.85	8428
20	-5.00	10.00	158.05	49.95	564.06	74.15	84.15	8678
		10.00	158.05	32.37	748.92	37.73	47.73	29922
21	-5.50	15.00	163.49	33.91	772.72	71.95	86.95	29922
22	-6.00	20.00	168.90	35.44	796.35	86.03	106.03	29922
23	-6.60	26.00	175.34	37.27	824.51	96.63	122.63	29922
24	-7.20	32.00	181.75	39.08	852.48	103.98	135.98	29922
25	-7.60	36.00	185.99	40.29	871.02	101.32	137.32	29922
26	-8.00	40.00	190.22	41.49	889.50	57.34	97.34	29922
27	-8.15	41.50	191.80	41.93	896.42	143.47	184.97	29922
28	-9.60	56.00	207.00	46.24	962.83	166.57	222.57	29922
		56.00	207.00	35.98	1021.19	146.47	202.47	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.10	278.10	49871
		68.00	223.07	0.00	6319.03	160.97	228.97	997417
30	-12.60	86.00	254.23	0.00	6751.68	216.29	302.29	997417
31	-14.40	104.00	285.25	0.00	7182.41	246.85	350.85	997417
32	-16.80	128.00	326.44	0.00	7754.42	287.49	415.49	997417
33	-18.40	144.00	353.82	0.00	8134.61	314.52	458.52	997417
34	-20.00	160.00	381.14	0.00	8514.03	346.95	506.95	997417

(continued)

Stage No.8 Apply load no.1 at elevation 2.90

		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.04	58.04	29934
21	-5.50	5.00	5.00	0.00	80.21	79.99	84.99	29934
22	-6.00	10.00	10.00	0.00	102.06	101.87	111.87	29934
23	-6.60	16.00	16.00	0.00	128.29	128.12	144.12	29934
24	-7.20	22.00	22.01	0.00	154.53	154.37	176.37	29934
25	-7.60	26.00	26.02	0.00	172.04	171.86	197.86	29934
26	-8.00	30.00	30.03	0.00	189.56	189.22	219.22	29934
27	-8.15	31.50	31.53	0.00	196.13	153.55	185.05	29934
28	-9.60	46.00	46.10	0.65	259.78	158.24	204.24	29934
		46.00	46.10	0.00	318.14	178.56	224.56	49890
29	-10.80	58.00	61.79	0.00	386.72	145.97	203.97	49890
		58.00	61.79	0.00	4079.54	220.39	278.39	997795
30	-12.60	76.00	92.63	0.00	4507.70	226.28	302.28	997795
31	-14.40	94.00	123.59	0.00	4937.65	256.84	350.84	997795
32	-16.80	118.00	165.11	0.00	5514.16	297.49	415.49	997795
33	-18.40	134.00	192.95	0.00	5900.75	324.51	458.51	997795
34	-20.00	150.00	220.92	0.00	6289.20	357.00	507.00	997795

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EDG CONSULTING PTY LTD                                        | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58           | Job No.  B01493
                             Licensed from GEOSOLVE           | Made by :   DJC
Data filename/Run ID: Section_2                               |
Albert Street Development                                     | Date:16-11-2022
Section 2                                                     | Checked :
-------------------------------------------------------------------------------
                                                   Units: kN,m
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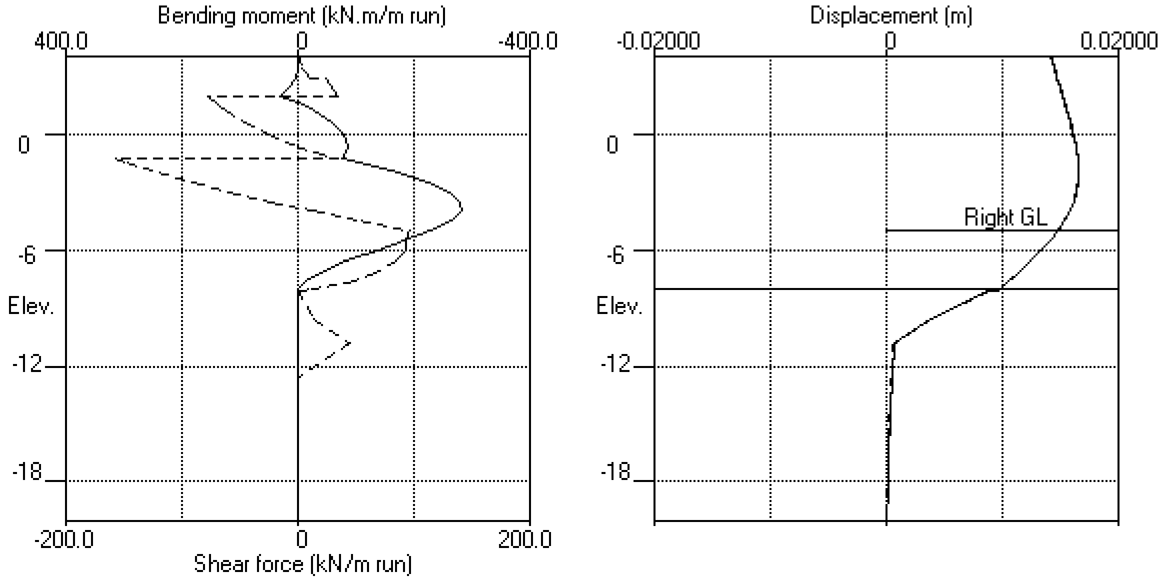
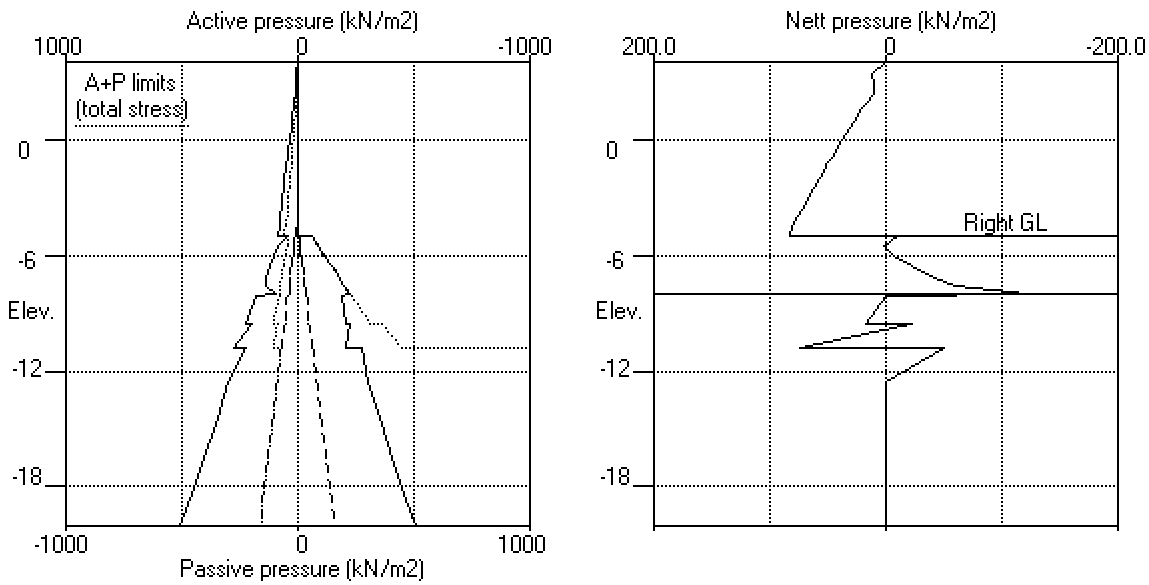
Stage No.8 Apply load no.1 at elev. 2.90

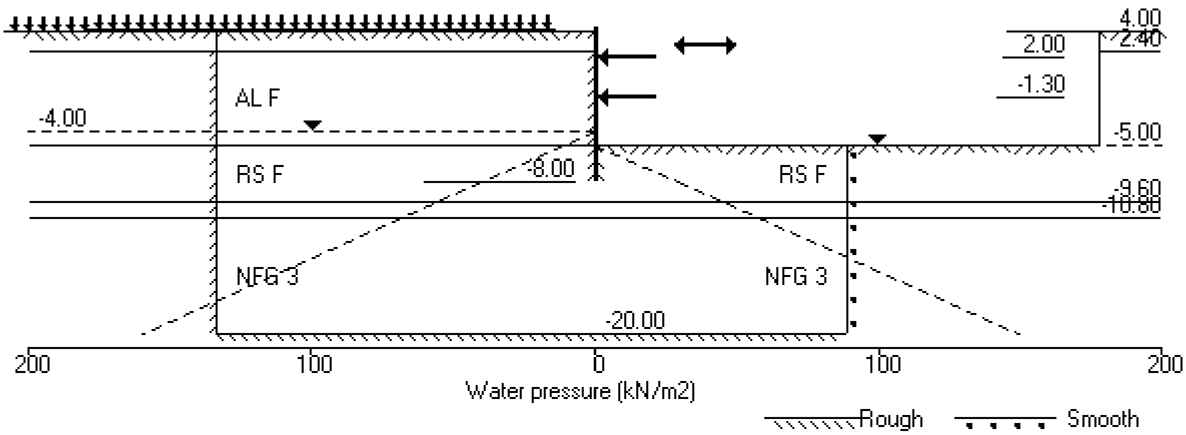


Stage No.8 Apply load no.1 at elev. 2.90



Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.90



Units: kN,m

Stage No. 9 Apply load no.2 at elevation 2.90

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr-ation	Direction of failure
9	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-5.59E-04	0.0	-0.0		572444
2	3.45	13.24	0.014	-5.60E-04	3.6	0.4		572444
3	2.90	12.00	0.014	-5.62E-04	10.6	4.7		572444
4	2.40	11.74	0.015	-5.69E-04	16.5	11.8		572444
		13.76	0.015	-5.69E-04	16.5	11.8		
5	2.00	16.68	0.015	-5.80E-04	22.6	19.6	-100.3	572444
		16.68	0.015	-5.80E-04	-77.7	19.6		
6	1.60	20.79	0.015	-5.84E-04	-70.2	-9.8		572444
7	1.20	24.89	0.015	-5.68E-04	-61.0	-36.2		572444
8	0.60	31.50	0.016	-5.13E-04	-44.1	-67.9		572444
9	0.00	37.87	0.016	-4.31E-04	-23.3	-88.3		572444
10	-0.60	44.40	0.016	-3.35E-04	1.4	-95.0		572444
11	-0.95	47.76	0.016	-2.78E-04	17.5	-91.7		572444
12	-1.30	51.46	0.016	-2.25E-04	34.9	-82.6	-190.8	572444
		51.46	0.016	-2.25E-04	-155.9	-82.6		
13	-1.50	52.86	0.016	-1.91E-04	-145.5	-112.7		572444
14	-2.00	57.95	0.017	-6.40E-05	-117.8	-178.3		572444
15	-2.50	62.60	0.017	1.14E-04	-87.6	-229.7		572444
16	-3.00	67.20	0.016	3.30E-04	-55.2	-265.4		572444
17	-3.50	71.75	0.016	5.70E-04	-20.4	-284.3		572444
18	-4.00	76.07	0.016	8.19E-04	16.5	-285.3		572444
19	-4.50	80.76	0.015	1.06E-03	55.7	-267.1		572444
20	-5.00	84.06	0.015	1.27E-03	96.9	-228.7		572444
		-10.93	0.015	1.27E-03	96.9	-228.7		
21	-5.50	1.51	0.014	1.45E-03	94.6	-183.3		572444
22	-6.00	-6.24	0.013	1.59E-03	93.4	-136.9		572444
23	-6.60	-21.84	0.012	1.71E-03	85.0	-83.6		572444
24	-7.20	-40.72	0.011	1.77E-03	66.2	-36.7		572444
25	-7.60	-60.90	0.011	1.79E-03	45.9	-13.5		572444
26	-8.00	-122.58	0.010	1.79E-03	9.2	0.0		0
27	-8.15	-0.08	0.009	0	-0.0	0.0		0
28	-9.60	18.33	0.004	0	13.2	0.0		0
		-22.09	0.004	0	13.2	0.0		

(continued)

Stage No.9 Apply load no.2 at elevation 2.90

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	74.13	0.001	0	44.4	0.0		0
		-49.41	0.001	0	44.4	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 100.3 kN/m run
At elev. -1.30 Prop force = 190.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	13.24	13.24	9974
3	2.90	0.00	19.15	5.92	74.07	12.00	12.00	9974
4	2.40	0.00	28.39	8.77	109.82	11.74	11.74	9974
		0.00	28.39	4.41	117.75	13.76	13.76	4987
5	2.00	0.00	36.01	7.09	143.99	16.68	16.68	5187
6	1.60	0.00	43.77	9.81	170.71	20.79	20.79	5386
7	1.20	0.00	51.61	12.56	197.69	24.89	24.89	5586
8	0.60	0.00	63.39	16.70	238.25	31.50	31.50	5885
9	0.00	0.00	75.11	20.82	278.59	37.87	37.87	6184
10	-0.60	0.00	86.71	24.90	318.51	44.40	44.40	6483
11	-0.95	0.00	93.41	27.25	341.58	47.76	47.76	6658
12	-1.30	0.00	100.07	29.59	364.48	51.46	51.46	6832
13	-1.50	0.00	103.85	30.91	377.50	52.86	52.86	6932
14	-2.00	0.00	113.24	34.21	409.82	57.95	57.95	7181
15	-2.50	0.00	122.54	37.48	441.84	62.60	62.60	7431
16	-3.00	0.00	131.77	40.72	473.60	67.20	67.20	7680
17	-3.50	0.00	140.92	43.94	505.11	71.75	71.75	7929
18	-4.00	0.00	150.02	47.13	536.42	76.07	76.07	8179
19	-4.50	5.00	154.05	48.55	550.32	75.76	80.76	8428
20	-5.00	10.00	158.05	49.95	564.06	74.06	84.06	8678
		10.00	158.05	32.37	748.92	37.43	47.43	29922
21	-5.50	15.00	163.49	33.91	772.72	71.71	86.71	29922
22	-6.00	20.00	168.90	35.44	796.35	85.82	105.82	29922
23	-6.60	26.00	175.34	37.27	824.51	96.44	122.44	29922
24	-7.20	32.00	181.75	39.08	852.48	103.81	135.81	29922
25	-7.60	36.00	185.99	40.29	871.02	101.14	137.14	29922
26	-8.00	40.00	190.22	41.49	889.50	56.98	96.98	29922
27	-8.15	41.50	191.80	41.93	896.42	143.47	184.97	29922
28	-9.60	56.00	207.00	46.24	962.83	166.57	222.57	29922
		56.00	207.00	35.98	1021.19	146.47	202.47	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.10	278.10	49871
		68.00	223.07	0.00	6319.03	160.97	228.97	997417
30	-12.60	86.00	254.23	0.00	6751.68	216.29	302.29	997417
31	-14.40	104.00	285.25	0.00	7182.41	246.85	350.85	997417
32	-16.80	128.00	326.44	0.00	7754.42	287.49	415.49	997417
33	-18.40	144.00	353.82	0.00	8134.61	314.52	458.52	997417
34	-20.00	160.00	381.14	0.00	8514.03	346.95	506.95	997417

(continued)

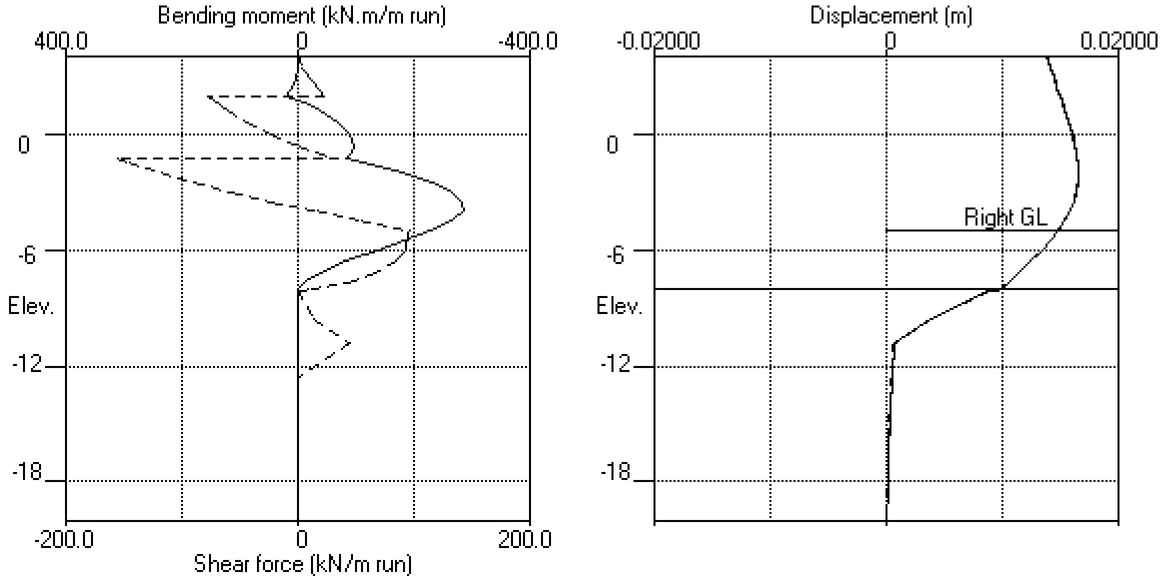
Stage No.9 Apply load no.2 at elevation 2.90

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
21	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	29934
22	-6.00	10.00	10.00	0.00	102.06	102.06	112.06p	29934
23	-6.60	16.00	16.00	0.00	128.29	128.29	144.29p	29934
24	-7.20	22.00	22.01	0.00	154.53	154.53	176.53p	29934
25	-7.60	26.00	26.02	0.00	172.04	172.04	198.04p	29934
26	-8.00	30.00	30.03	0.00	189.56	189.56	219.56p	29934
27	-8.15	31.50	31.53	0.00	196.13	153.55	185.05	29934
28	-9.60	46.00	46.10	0.65	259.78	158.24	204.24	29934
		46.00	46.10	0.00	318.14	178.56	224.56	49890
29	-10.80	58.00	61.79	0.00	386.72	145.97	203.97	49890
		58.00	61.79	0.00	4079.54	220.38	278.38	997795
30	-12.60	76.00	92.63	0.00	4507.70	226.28	302.28	997795
31	-14.40	94.00	123.59	0.00	4937.65	256.84	350.84	997795
32	-16.80	118.00	165.11	0.00	5514.16	297.49	415.49	997795
33	-18.40	134.00	192.95	0.00	5900.75	324.51	458.51	997795
34	-20.00	150.00	220.92	0.00	6289.20	357.01	507.01	997795

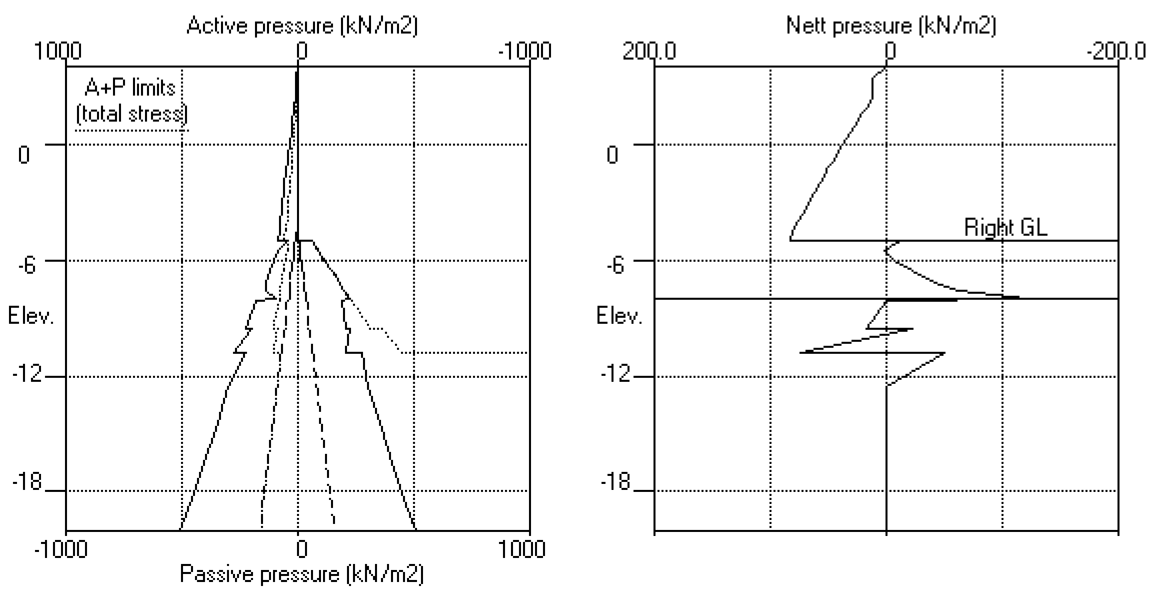
Note: 12.34 a Soil pressure at active limit
219.56 p Soil pressure at passive limit

Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.90

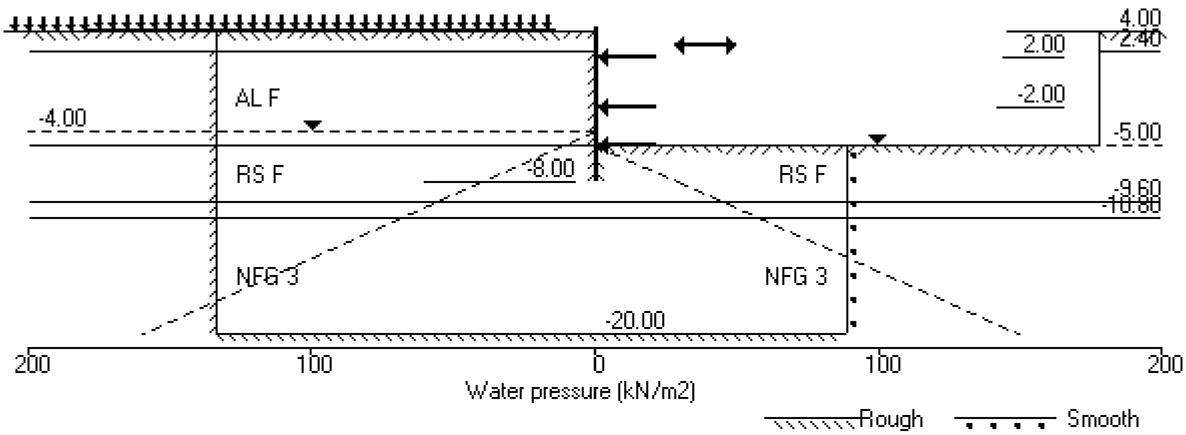


Stage No.9 Apply load no.2 at elev. 2.90



Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No. 12 Remove strut or anchor no.2 at elevation -1.30

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr-ation	Direction of failure
12	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-6.60E-04	0.0	-0.0		572444
2	3.45	13.34	0.014	-6.60E-04	3.7	0.4		572444
3	2.90	11.85	0.015	-6.63E-04	10.6	4.8		572444
4	2.40	11.36	0.015	-6.70E-04	16.4	11.8		572444
		13.57	0.015	-6.70E-04	16.4	11.8		
5	2.00	16.41	0.015	-6.81E-04	22.4	19.6	-124.3	572444
		16.41	0.015	-6.81E-04	-101.9	19.6		
6	1.60	20.42	0.016	-6.81E-04	-94.6	-19.6		572444
7	1.20	24.40	0.016	-6.55E-04	-85.6	-55.7		572444
8	0.60	30.86	0.016	-5.72E-04	-69.0	-102.3		572444
9	0.00	37.08	0.017	-4.46E-04	-48.6	-137.8		572444
10	-0.60	43.52	0.017	-2.90E-04	-24.5	-159.9		572444
11	-0.95	46.86	0.017	-1.91E-04	-8.7	-165.7		572444
12	-1.30	50.61	0.017	-8.97E-05	8.4	-165.7		572444
13	-1.50	52.19	0.017	-3.23E-05	18.7	-163.0		572444
14	-2.00	57.54	0.017	1.02E-04	46.1	-146.6	-170.2	572444
		57.54	0.017	1.02E-04	-124.1	-146.6		
15	-2.50	62.39	0.017	2.54E-04	-94.1	-201.2		572444
16	-3.00	67.11	0.017	4.47E-04	-61.7	-240.2		572444
17	-3.50	71.73	0.016	6.67E-04	-27.0	-262.4		572444
18	-4.00	76.09	0.016	8.98E-04	9.9	-266.6		572444
19	-4.50	80.78	0.015	1.12E-03	49.2	-251.8		572444
20	-5.00	84.03	0.015	1.32E-03	90.4	-216.6	1.5	572444
		-11.05	0.015	1.32E-03	91.9	-216.6		
21	-5.50	1.76	0.014	1.49E-03	89.6	-173.8		572444
22	-6.00	-5.52	0.013	1.63E-03	88.6	-129.9		572444
23	-6.60	-20.66	0.012	1.74E-03	80.8	-79.3		572444
24	-7.20	-39.03	0.011	1.80E-03	62.9	-34.7		572444
25	-7.60	-58.18	0.011	1.81E-03	43.4	-12.7		572444
26	-8.00	-115.59	0.010	1.82E-03	8.7	0.0		0
27	-8.15	-0.08	0.009	0	-0.0	0.0		0
28	-9.60	18.33	0.004	0	13.2	0.0		0
		-22.09	0.004	0	13.2	0.0		

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	74.13	0.001	0	44.4	0.0		0
		-49.41	0.001	0	44.4	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 124.3 kN/m run
At elev. -2.00 Prop force = 170.2 kN/m run
At elev. -5.00 Prop force = -1.5 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	13.34	13.34	9974
3	2.90	0.00	19.15	5.92	74.07	11.85	11.85	9974
4	2.40	0.00	28.39	8.77	109.82	11.36	11.36	9974
		0.00	28.39	4.41	117.75	13.57	13.57	4987
5	2.00	0.00	36.01	7.09	143.99	16.41	16.41	5187
6	1.60	0.00	43.77	9.81	170.71	20.42	20.42	5386
7	1.20	0.00	51.61	12.56	197.69	24.40	24.40	5586
8	0.60	0.00	63.39	16.70	238.25	30.86	30.86	5885
9	0.00	0.00	75.11	20.82	278.59	37.08	37.08	6184
10	-0.60	0.00	86.71	24.90	318.51	43.52	43.52	6483
11	-0.95	0.00	93.41	27.25	341.58	46.86	46.86	6658
12	-1.30	0.00	100.07	29.59	364.48	50.61	50.61	6832
13	-1.50	0.00	103.85	30.91	377.50	52.19	52.19	6932
14	-2.00	0.00	113.24	34.21	409.82	57.54	57.54	7181
15	-2.50	0.00	122.54	37.48	441.84	62.39	62.39	7431
16	-3.00	0.00	131.77	40.72	473.60	67.11	67.11	7680
17	-3.50	0.00	140.92	43.94	505.11	71.73	71.73	7929
18	-4.00	0.00	150.02	47.13	536.42	76.09	76.09	8179
19	-4.50	5.00	154.05	48.55	550.32	75.78	80.78	8428
20	-5.00	10.00	158.05	49.95	564.06	74.03	84.03	8678
		10.00	158.05	32.37	748.92	37.31	47.31	29922
21	-5.50	15.00	163.49	33.91	772.72	71.97	86.97	29922
22	-6.00	20.00	168.90	35.44	796.35	86.32	106.32	29922
23	-6.60	26.00	175.34	37.27	824.51	97.13	123.13	29922
24	-7.20	32.00	181.75	39.08	852.48	104.72	136.72	29922
25	-7.60	36.00	185.99	40.29	871.02	102.54	138.54	29922
26	-8.00	40.00	190.22	41.49	889.50	60.62	100.62	29922
27	-8.15	41.50	191.80	41.93	896.42	143.47	184.97	29922
28	-9.60	56.00	207.00	46.24	962.83	166.58	222.58	29922
		56.00	207.00	35.98	1021.19	146.49	202.49	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.10	278.10	49871
		68.00	223.07	0.00	6319.03	161.00	229.00	997417
30	-12.60	86.00	254.23	0.00	6751.68	216.31	302.31	997417
31	-14.40	104.00	285.25	0.00	7182.41	246.86	350.86	997417
32	-16.80	128.00	326.44	0.00	7754.42	287.49	415.49	997417
33	-18.40	144.00	353.82	0.00	8134.61	314.52	458.52	997417
34	-20.00	160.00	381.14	0.00	8514.03	346.95	506.95	997417

(continued)

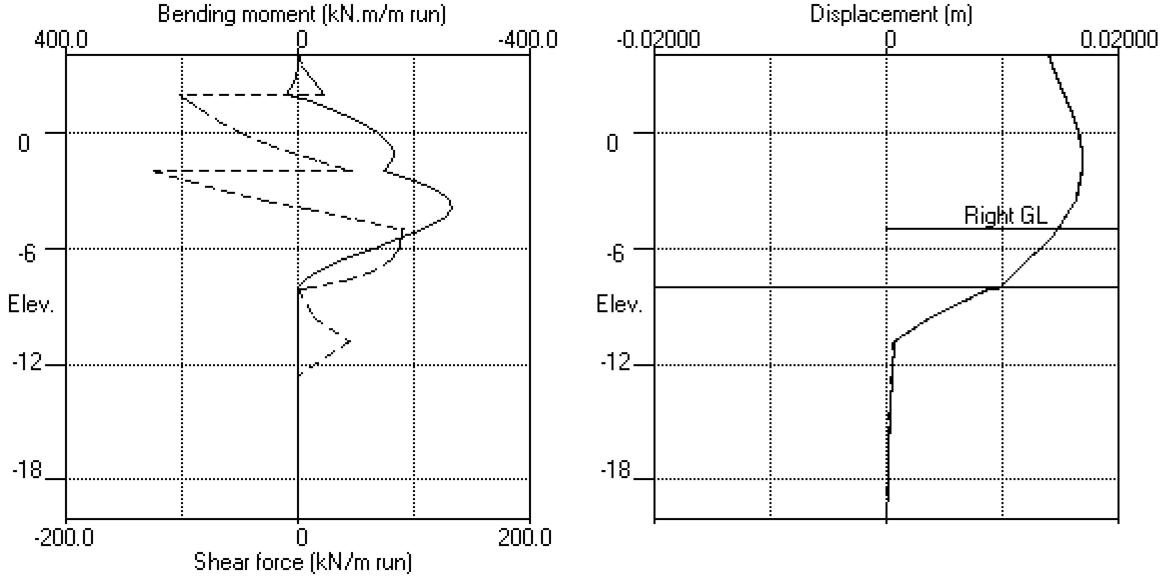
Stage No.12 Remove strut or anchor no.2 at elevation -1.30

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
21	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	29934
22	-6.00	10.00	10.00	0.00	102.06	101.84	111.84	29934
23	-6.60	16.00	16.00	0.00	128.29	127.79	143.79	29934
24	-7.20	22.00	22.01	0.00	154.53	153.75	175.75	29934
25	-7.60	26.00	26.02	0.00	172.04	170.72	196.72	29934
26	-8.00	30.00	30.03	0.00	189.56	186.22	216.22	29934
27	-8.15	31.50	31.53	0.00	196.13	153.55	185.05	29934
28	-9.60	46.00	46.10	0.65	259.78	158.25	204.25	29934
		46.00	46.10	0.00	318.14	178.58	224.58	49890
29	-10.80	58.00	61.79	0.00	386.72	145.97	203.97	49890
		58.00	61.79	0.00	4079.54	220.41	278.41	997795
30	-12.60	76.00	92.63	0.00	4507.70	226.30	302.30	997795
31	-14.40	94.00	123.59	0.00	4937.65	256.85	350.85	997795
32	-16.80	118.00	165.11	0.00	5514.16	297.49	415.49	997795
33	-18.40	134.00	192.95	0.00	5900.75	324.51	458.51	997795
34	-20.00	150.00	220.92	0.00	6289.20	357.00	507.00	997795

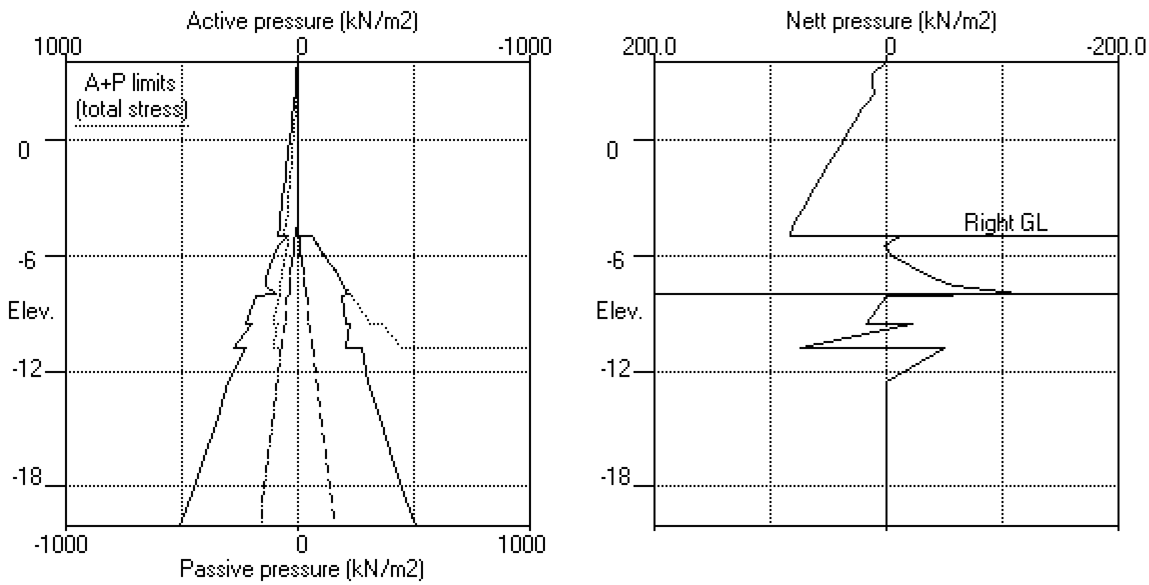
Note: 12.34 a Soil pressure at active limit
85.21 p Soil pressure at passive limit

```
EDG CONSULTING PTY LTD                                   | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58      | Job No.  B01493
                              Licensed from GEOSOLVE     | Made by :   DJC
Data filename/Run ID: Section_2                          |
Albert Street Development                                | Date:16-11-2022
Section 2                                                | Checked :
------------------------------------------------------------------------------
                                                   Units: kN,m
```

Stage No.12 Remove prop no.2 at elev. -1.30

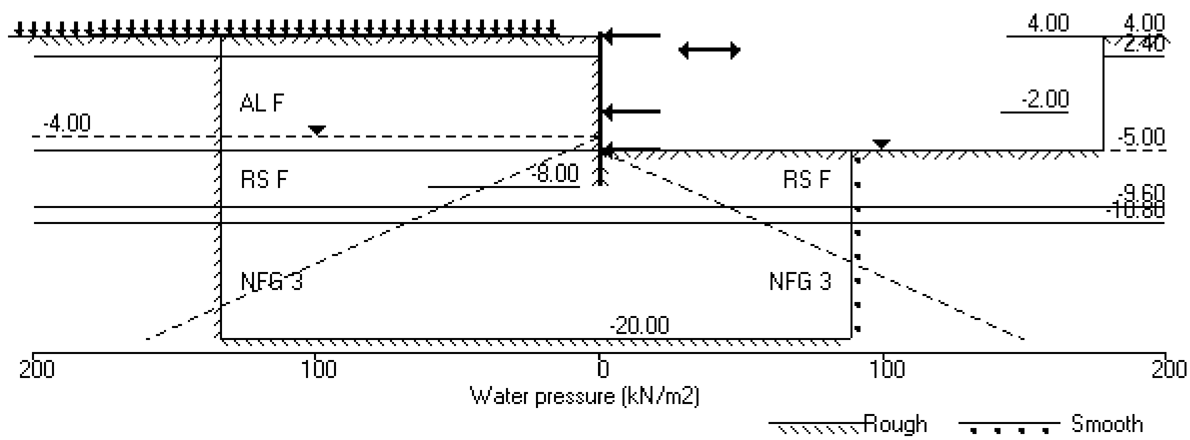


Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No. 14 Remove strut or anchor no.1 at elevation 2.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -8.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
14	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-1.02E-03	-71.0	-0.0	-71.0	572444
2	3.45	13.63	0.015	-1.00E-03	-67.2	-38.6		572444
3	2.90	10.94	0.015	-9.55E-04	-60.5	-73.2		572444
4	2.40	9.65	0.016	-8.79E-04	-55.3	-101.8		572444
		12.71	0.016	-8.79E-04	-55.3	-101.8		
5	2.00	15.32	0.016	-8.01E-04	-49.7	-122.8		572444
6	1.60	19.26	0.016	-7.08E-04	-42.8	-141.2		572444
7	1.20	23.24	0.017	-6.04E-04	-34.3	-156.7		572444
8	0.60	29.81	0.017	-4.32E-04	-18.4	-172.7		572444
9	0.00	36.24	0.017	-2.48E-04	1.4	-178.0		572444
10	-0.60	42.94	0.017	-6.57E-05	25.2	-170.2		572444
11	-0.95	46.50	0.017	3.47E-05	40.8	-158.7		572444
12	-1.30	50.42	0.017	1.26E-04	57.8	-141.4		572444
13	-1.50	52.18	0.017	1.73E-04	68.0	-128.9		572444
14	-2.00	57.71	0.017	2.68E-04	95.5	-87.8	-238.1	572444
		57.71	0.017	2.68E-04	-142.6	-87.8		
15	-2.50	62.68	0.017	3.72E-04	-112.5	-151.6		572444
16	-3.00	67.46	0.017	5.26E-04	-79.9	-199.7		572444
17	-3.50	72.08	0.016	7.14E-04	-45.1	-231.0		572444
18	-4.00	76.41	0.016	9.22E-04	-7.9	-244.2		572444
19	-4.50	81.06	0.015	1.13E-03	31.4	-238.3		572444
20	-5.00	84.24	0.015	1.32E-03	72.8	-212.0	16.1	572444
		-9.76	0.015	1.32E-03	88.9	-212.0		
21	-5.50	2.76	0.014	1.49E-03	87.1	-170.4		572444
22	-6.00	-4.63	0.013	1.62E-03	86.7	-127.6		572444
23	-6.60	-19.85	0.012	1.73E-03	79.3	-78.1		572444
24	-7.20	-38.27	0.011	1.79E-03	61.9	-34.2		572444
25	-7.60	-57.32	0.010	1.80E-03	42.8	-12.5		572444
26	-8.00	-113.87	0.010	1.81E-03	8.5	0.0		0
27	-8.15	-0.08	0.009	0	-0.0	0.0		0
28	-9.60	18.33	0.004	0	13.2	0.0		0
		-22.09	0.004	0	13.2	0.0		

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	74.13	0.001	0	44.4	0.0		0
		-49.41	0.001	0	44.4	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 71.0 kN/m run
At elev. -2.00 Prop force = 238.1 kN/m run
At elev. -5.00 Prop force = -16.1 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	13.63	13.63	9974
3	2.90	0.00	19.15	5.92	74.07	10.94	10.94	9974
4	2.40	0.00	28.39	8.77	109.82	9.65	9.65	9974
		0.00	28.39	4.41	117.75	12.71	12.71	4987
5	2.00	0.00	36.01	7.09	143.99	15.32	15.32	5187
6	1.60	0.00	43.77	9.81	170.71	19.26	19.26	5386
7	1.20	0.00	51.61	12.56	197.69	23.24	23.24	5586
8	0.60	0.00	63.39	16.70	238.25	29.81	29.81	5885
9	0.00	0.00	75.11	20.82	278.59	36.24	36.24	6184
10	-0.60	0.00	86.71	24.90	318.51	42.94	42.94	6483
11	-0.95	0.00	93.41	27.25	341.58	46.50	46.50	6658
12	-1.30	0.00	100.07	29.59	364.48	50.42	50.42	6832
13	-1.50	0.00	103.85	30.91	377.50	52.18	52.18	6932
14	-2.00	0.00	113.24	34.21	409.82	57.71	57.71	7181
15	-2.50	0.00	122.54	37.48	441.84	62.68	62.68	7431
16	-3.00	0.00	131.77	40.72	473.60	67.46	67.46	7680
17	-3.50	0.00	140.92	43.94	505.11	72.08	72.08	7929
18	-4.00	0.00	150.02	47.13	536.42	76.41	76.41	8179
19	-4.50	5.00	154.05	48.55	550.32	76.06	81.06	8428
20	-5.00	10.00	158.05	49.95	564.06	74.24	84.24	8678
		10.00	158.05	32.37	748.92	38.03	48.03	29922
21	-5.50	15.00	163.49	33.91	772.72	72.55	87.55	29922
22	-6.00	20.00	168.90	35.44	796.35	86.82	106.82	29922
23	-6.60	26.00	175.34	37.27	824.51	97.58	123.58	29922
24	-7.20	32.00	181.75	39.08	852.48	105.14	137.14	29922
25	-7.60	36.00	185.99	40.29	871.02	103.00	139.00	29922
26	-8.00	40.00	190.22	41.49	889.50	61.54	101.54	29922
27	-8.15	41.50	191.80	41.93	896.42	143.48	184.98	29922
28	-9.60	56.00	207.00	46.24	962.83	166.59	222.59	29922
		56.00	207.00	35.98	1021.19	146.51	202.51	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.11	278.11	49871
		68.00	223.07	0.00	6319.03	161.01	229.01	997417
30	-12.60	86.00	254.23	0.00	6751.68	216.33	302.33	997417
31	-14.40	104.00	285.25	0.00	7182.41	246.87	350.87	997417
32	-16.80	128.00	326.44	0.00	7754.42	287.50	415.50	997417
33	-18.40	144.00	353.82	0.00	8134.61	314.52	458.52	997417
34	-20.00	160.00	381.14	0.00	8514.03	346.95	506.95	997417

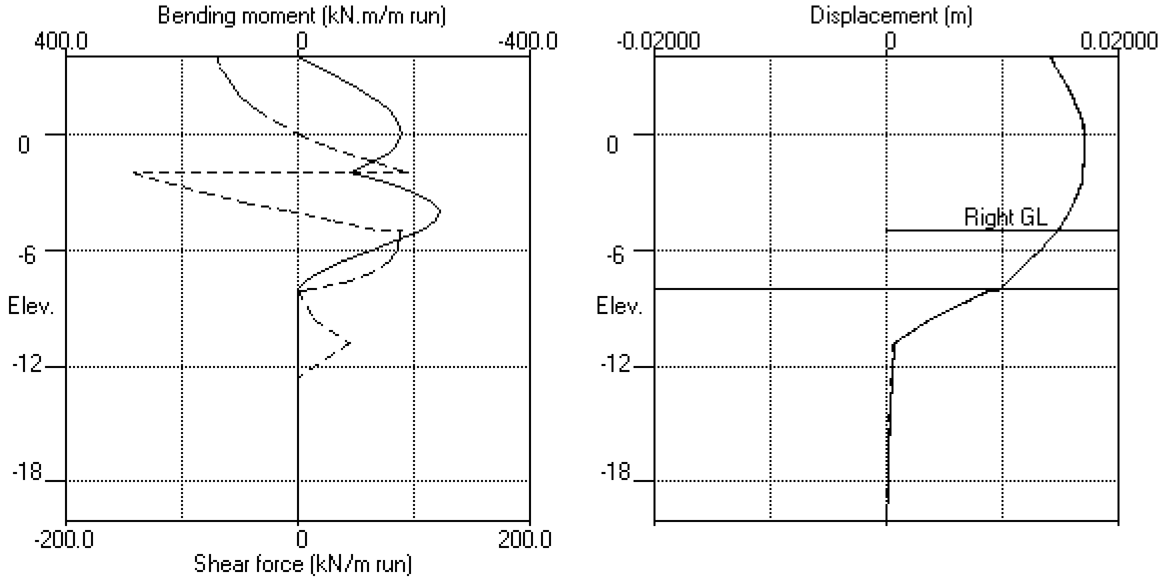
(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

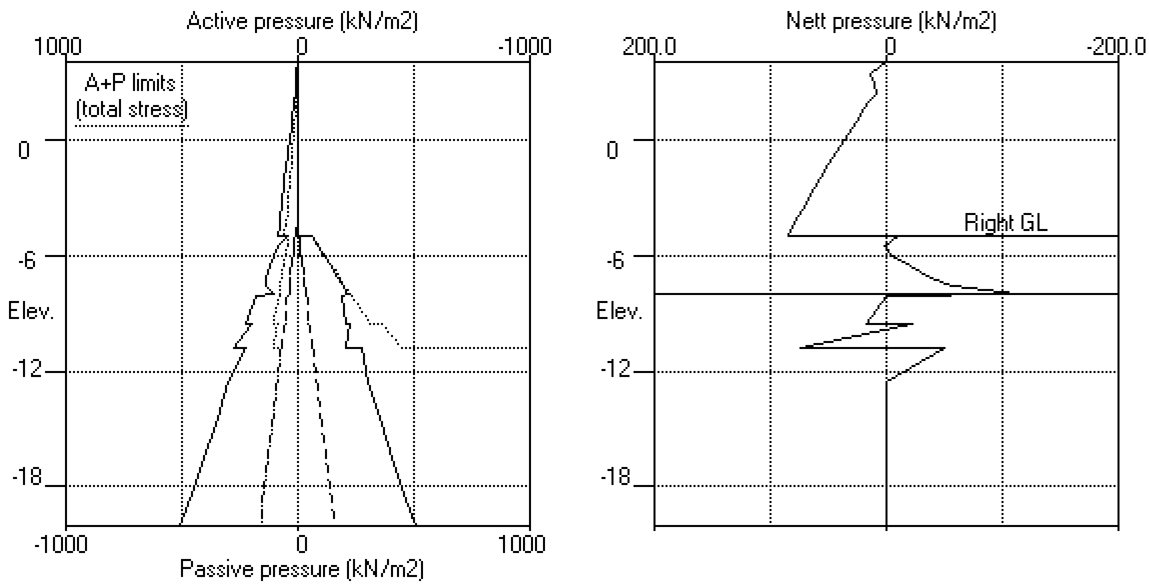
		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	57.78	57.78	29934
21	-5.50	5.00	5.00	0.00	80.21	79.79	84.79	29934
22	-6.00	10.00	10.00	0.00	102.06	101.46	111.46	29934
23	-6.60	16.00	16.00	0.00	128.29	127.44	143.44	29934
24	-7.20	22.00	22.01	0.00	154.53	153.41	175.41	29934
25	-7.60	26.00	26.02	0.00	172.04	170.31	196.31	29934
26	-8.00	30.00	30.03	0.00	189.56	185.40	215.40	29934
27	-8.15	31.50	31.53	0.00	196.13	153.56	185.06	29934
28	-9.60	46.00	46.10	0.65	259.78	158.26	204.26	29934
		46.00	46.10	0.00	318.14	178.60	224.60	49890
29	-10.80	58.00	61.79	0.00	386.72	145.97	203.97	49890
		58.00	61.79	0.00	4079.54	220.43	278.43	997795
30	-12.60	76.00	92.63	0.00	4507.70	226.32	302.32	997795
31	-14.40	94.00	123.59	0.00	4937.65	256.86	350.86	997795
32	-16.80	118.00	165.11	0.00	5514.16	297.50	415.50	997795
33	-18.40	134.00	192.95	0.00	5900.75	324.52	458.52	997795
34	-20.00	150.00	220.92	0.00	6289.20	357.00	507.00	997795

Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00

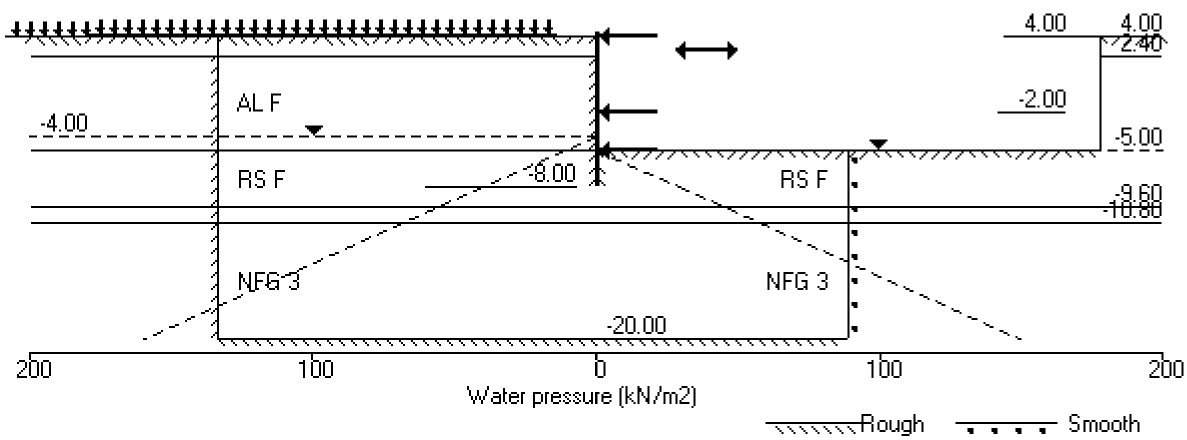


Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No.15 Change EI of wall to 400788kN.m2/m run



Units: kN,m

Stage No. 15 Change EI of wall to 400788 kN.m2/m run
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00 Factor of Safety	FoS for toe elev. = -8.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
15	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-1.11E-03	-60.3	-0.0	-60.3	400788
2	3.45	13.78	0.015	-1.08E-03	-56.5	-34.1		400788
3	2.90	10.81	0.015	-1.02E-03	-49.8	-64.2		400788
4	2.40	9.34	0.016	-9.32E-04	-44.7	-88.7		400788
		12.56	0.016	-9.32E-04	-44.7	-88.7		
5	2.00	15.12	0.016	-8.39E-04	-39.2	-106.4		400788
6	1.60	19.03	0.016	-7.31E-04	-32.4	-121.6		400788
7	1.20	22.99	0.017	-6.09E-04	-24.0	-133.9		400788
8	0.60	29.55	0.017	-4.12E-04	-8.2	-145.2		400788
9	0.00	36.03	0.017	-2.07E-04	11.5	-145.8		400788
10	-0.60	42.80	0.017	-1.43E-05	35.1	-133.4		400788
11	-0.95	46.44	0.017	8.59E-05	50.7	-119.2		400788
12	-1.30	50.43	0.017	1.70E-04	67.7	-99.3		400788
13	-1.50	52.24	0.017	2.10E-04	77.9	-85.2		400788
14	-2.00	57.80	0.017	2.71E-04	105.5	-40.3	-255.4	400788
		57.80	0.017	2.71E-04	-149.9	-40.3		
15	-2.50	62.68	0.017	3.46E-04	-119.8	-106.9		400788
16	-3.00	67.30	0.017	4.95E-04	-87.3	-157.9		400788
17	-3.50	71.76	0.016	6.98E-04	-52.6	-192.0		400788
18	-4.00	75.98	0.016	9.33E-04	-15.6	-208.2		400788
19	-4.50	80.56	0.015	1.17E-03	23.5	-205.2		400788
20	-5.00	83.72	0.015	1.40E-03	64.6	-182.0	11.0	400788
		-12.11	0.015	1.40E-03	75.6	-182.0		
21	-5.50	1.32	0.014	1.60E-03	72.9	-145.8		400788
22	-6.00	-5.15	0.013	1.75E-03	72.0	-108.6		400788
23	-6.60	-18.00	0.012	1.87E-03	65.0	-65.9		400788
24	-7.20	-33.55	0.011	1.94E-03	49.6	-28.4		400788
25	-7.60	-47.66	0.010	1.96E-03	33.3	-10.2		400788
26	-8.00	-86.46	0.009	1.96E-03	6.5	0.0		0
27	-8.15	-0.08	0.008	0	-0.0	0.0		0
28	-9.60	18.33	0.004	0	13.2	0.0		0
		-22.09	0.004	0	13.2	0.0		

(continued)

Stage No.15 Change EI of wall to 400788 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	74.13	0.001	0	44.4	0.0		0
		-49.41	0.001	0	44.4	0.0		
30	-12.60	0.01	0.000	0	-0.0	0.0		0
31	-14.40	0.02	0.000	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 60.3 kN/m run
At elev. -2.00 Prop force = 255.4 kN/m run
At elev. -5.00 Prop force = -11.0 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	0.00	9.41	2.91	36.41	13.78	13.78	9974
3	2.90	0.00	19.15	5.92	74.07	10.81	10.81	9974
4	2.40	0.00	28.39	8.77	109.82	9.34	9.34	9974
		0.00	28.39	4.41	117.75	12.56	12.56	4987
5	2.00	0.00	36.01	7.09	143.99	15.12	15.12	5187
6	1.60	0.00	43.77	9.81	170.71	19.03	19.03	5386
7	1.20	0.00	51.61	12.56	197.69	22.99	22.99	5586
8	0.60	0.00	63.39	16.70	238.25	29.55	29.55	5885
9	0.00	0.00	75.11	20.82	278.59	36.03	36.03	6184
10	-0.60	0.00	86.71	24.90	318.51	42.80	42.80	6483
11	-0.95	0.00	93.41	27.25	341.58	46.44	46.44	6658
12	-1.30	0.00	100.07	29.59	364.48	50.43	50.43	6832
13	-1.50	0.00	103.85	30.91	377.50	52.24	52.24	6932
14	-2.00	0.00	113.24	34.21	409.82	57.80	57.80	7181
15	-2.50	0.00	122.54	37.48	441.84	62.68	62.68	7431
16	-3.00	0.00	131.77	40.72	473.60	67.30	67.30	7680
17	-3.50	0.00	140.92	43.94	505.11	71.76	71.76	7929
18	-4.00	0.00	150.02	47.13	536.42	75.98	75.98	8179
19	-4.50	5.00	154.05	48.55	550.32	75.56	80.56	8428
20	-5.00	10.00	158.05	49.95	564.06	73.72	83.72	8678
		10.00	158.05	32.37	748.92	36.25	46.25	29922
21	-5.50	15.00	163.49	33.91	772.72	71.53	86.53	29922
22	-6.00	20.00	168.90	35.44	796.35	86.70	106.70	29922
23	-6.60	26.00	175.34	37.27	824.51	98.60	124.60	29922
24	-7.20	32.00	181.75	39.08	852.48	107.56	139.56	29922
25	-7.60	36.00	185.99	40.29	871.02	107.82	143.82	29922
26	-8.00	40.00	190.22	41.49	889.50	75.71	115.71	29922
27	-8.15	41.50	191.80	41.93	896.42	143.40	184.90	29922
28	-9.60	56.00	207.00	46.24	962.83	166.61	222.61	29922
		56.00	207.00	35.98	1021.19	146.53	202.53	49871
29	-10.80	68.00	223.07	40.67	1091.40	210.11	278.11	49871
		68.00	223.07	0.00	6319.03	161.01	229.01	997417
30	-12.60	86.00	254.23	0.00	6751.68	216.33	302.33	997417
31	-14.40	104.00	285.25	0.00	7182.41	246.87	350.87	997417
32	-16.80	128.00	326.44	0.00	7754.42	287.49	415.49	997417
33	-18.40	144.00	353.82	0.00	8134.61	314.52	458.52	997417
34	-20.00	160.00	381.14	0.00	8514.03	346.94	506.94	997417

(continued)

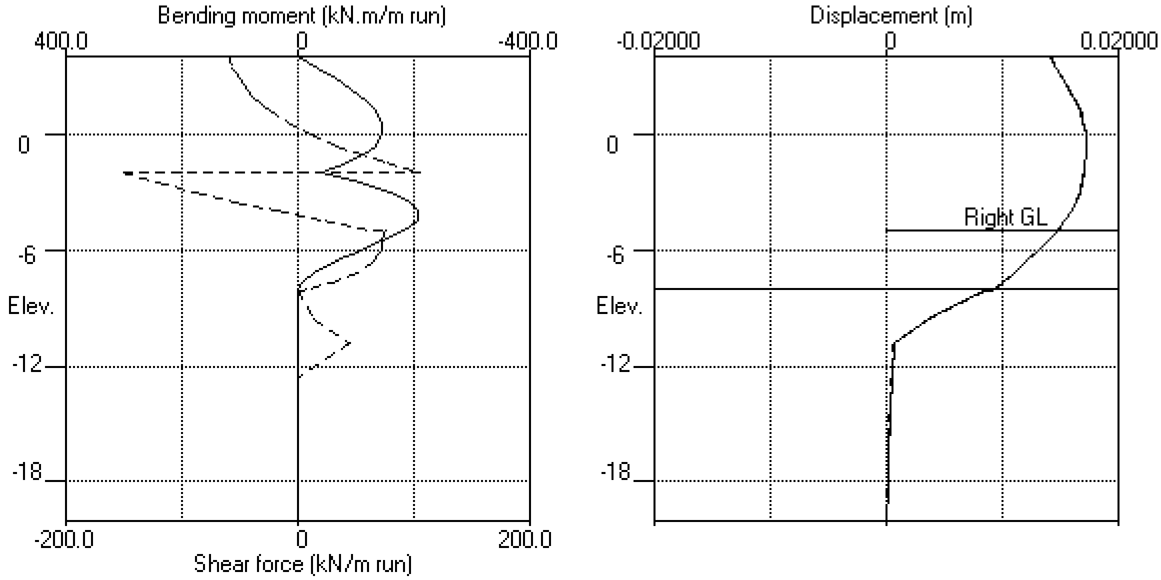
Stage No.15 Change EI of wall to 400788 kN.m2/m run
Allow wall to relax with new modulus value

		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	29934
21	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	29934
22	-6.00	10.00	10.00	0.00	102.06	101.85	111.85	29934
23	-6.60	16.00	16.00	0.00	128.29	126.60	142.60	29934
24	-7.20	22.00	22.01	0.00	154.53	151.11	173.11	29934
25	-7.60	26.00	26.02	0.00	172.04	165.48	191.48	29934
26	-8.00	30.00	30.03	0.00	189.56	172.17	202.17	29934
27	-8.15	31.50	31.53	0.00	196.13	153.48	184.98	29934
28	-9.60	46.00	46.10	0.65	259.78	158.28	204.28	29934
		46.00	46.10	0.00	318.14	178.63	224.63	49890
29	-10.80	58.00	61.79	0.00	386.72	145.97	203.97	49890
		58.00	61.79	0.00	4079.54	220.43	278.43	997795
30	-12.60	76.00	92.63	0.00	4507.70	226.32	302.32	997795
31	-14.40	94.00	123.59	0.00	4937.65	256.85	350.85	997795
32	-16.80	118.00	165.11	0.00	5514.16	297.49	415.49	997795
33	-18.40	134.00	192.95	0.00	5900.75	324.51	458.51	997795
34	-20.00	150.00	220.92	0.00	6289.20	356.99	506.99	997795

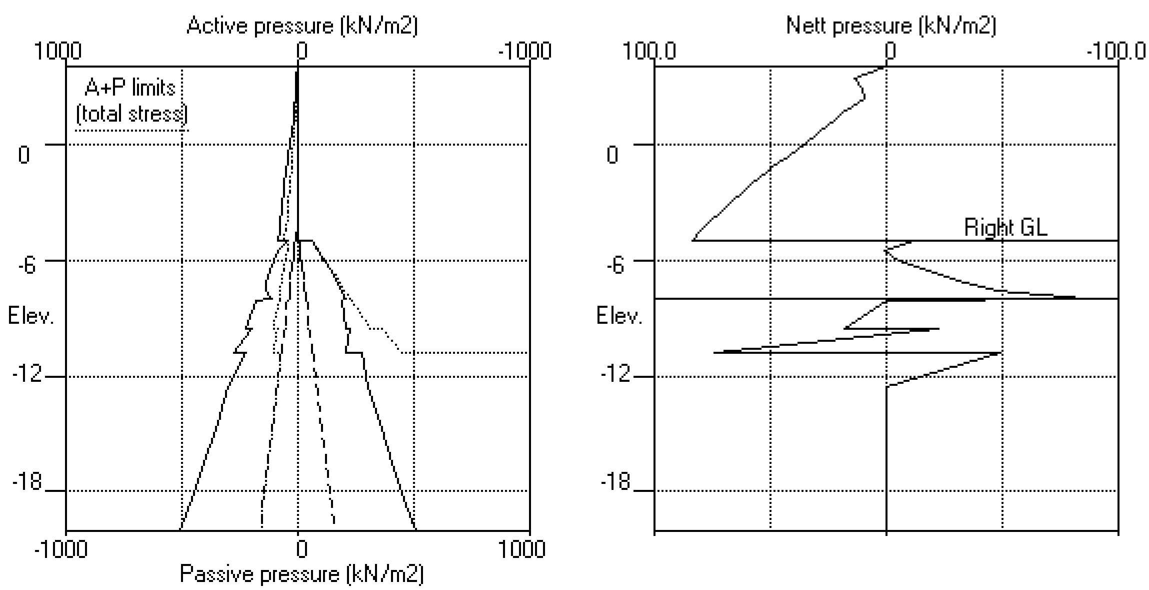
Note: 12.34 a Soil pressure at active limit
85.21 p Soil pressure at passive limit

Units: kN,m

Stage No.15 Change EI of wall to 400788kN.m2/m run

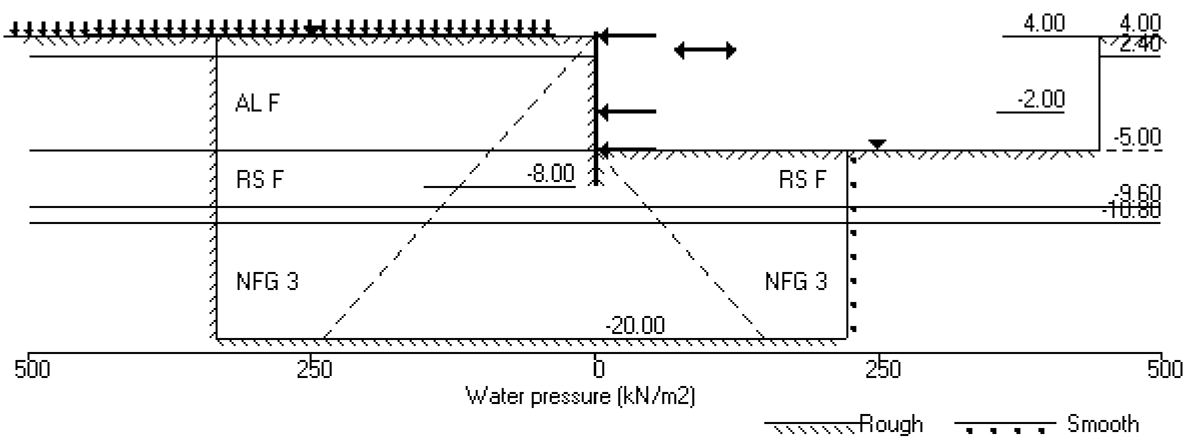


Stage No.15 Change EI of wall to 400788kN.m2/m run



Units: kN,m

Stage No.16 Apply water pressure profile no.1



Units: kN,m

Stage No. 16 Apply water pressure profile no.1

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
16	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-1.31E-03	-82.5	-0.0	-82.5	400788
2	3.45	17.27	0.015	-1.28E-03	-77.7	-46.2		400788
3	2.90	16.94	0.015	-1.20E-03	-68.3	-87.2		400788
4	2.40	18.01	0.016	-1.07E-03	-59.6	-120.1		400788
		21.47	0.016	-1.07E-03	-59.6	-120.1		
5	2.00	26.18	0.016	-9.48E-04	-50.1	-143.0		400788
6	1.60	32.30	0.017	-8.01E-04	-38.4	-161.6		400788
7	1.20	38.50	0.017	-6.39E-04	-24.2	-175.1		400788
8	0.60	48.52	0.017	-3.82E-04	1.9	-183.6		400788
9	0.00	58.55	0.018	-1.28E-04	34.0	-174.5		400788
10	-0.60	68.95	0.018	9.50E-05	72.3	-144.3		400788
11	-0.95	74.82	0.018	1.98E-04	97.4	-115.4		400788
12	-1.30	81.00	0.017	2.71E-04	124.7	-77.4		400788
13	-1.50	84.18	0.017	2.97E-04	141.2	-51.3		400788
14	-2.00	92.80	0.017	2.94E-04	185.5	29.3	-382.3	400788
		92.80	0.017	2.94E-04	-196.9	29.3		
15	-2.50	100.65	0.017	2.93E-04	-148.5	-56.3		400788
16	-3.00	108.15	0.017	3.85E-04	-96.3	-116.7		400788
17	-3.50	115.50	0.017	5.36E-04	-40.4	-150.1		400788
18	-4.00	122.62	0.016	7.12E-04	19.1	-154.6		400788
19	-4.50	127.27	0.016	8.76E-04	81.6	-128.4		400788
20	-5.00	130.39	0.016	9.88E-04	146.0	-70.3	-171.4	400788
		41.15	0.016	9.88E-04	-25.3	-70.3		
21	-5.50	49.89	0.015	1.07E-03	-2.6	-77.9		400788
22	-6.00	36.88	0.014	1.15E-03	19.1	-72.4		400788
23	-6.60	17.66	0.014	1.24E-03	35.5	-53.8		400788
24	-7.20	-4.99	0.013	1.30E-03	39.3	-27.7		400788
25	-7.60	-29.39	0.012	1.31E-03	32.4	-11.3		400788
26	-8.00	-96.45	0.012	1.32E-03	7.2	0.0		0
27	-8.15	-0.08	0.011	0	-0.0	0.0		0
28	-9.60	28.93	0.005	0	20.9	0.0		0
		-34.90	0.005	0	20.9	0.0		

(continued)

Stage No.16 Apply water pressure profile no.1

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-10.80	115.47	0.001	0	69.2	0.0		0
		-76.97	0.001	0	69.2	0.0		
30	-12.60	0.01	0.001	0	-0.0	0.0		0
31	-14.40	0.02	0.001	0	0.0	0.0		0
32	-16.80	-0.00	0.000	0	0.0	0.0		0
33	-18.40	0.01	0.000	0	0.0	0.0		0
34	-20.00	-0.05	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 82.5 kN/m run
At elev. -2.00 Prop force = 382.3 kN/m run
At elev. -5.00 Prop force = 171.4 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9974
2	3.45	5.50	3.91	1.21	15.14	11.77	17.27	9974
3	2.90	11.00	8.15	2.52	31.52	5.94	16.94	9974
4	2.40	16.00	12.39	3.83	47.92	2.01	18.01A	9974
		16.00	12.39	0.00	62.68	5.47	21.47	4987
5	2.00	20.00	16.01	0.06	75.15	6.18	26.18	5187
6	1.60	24.00	19.77	1.38	88.10	8.30	32.30	5386
7	1.20	28.00	23.61	2.73	101.30	10.50	38.50	5586
8	0.60	34.00	29.39	4.76	121.21	14.52	48.52	5885
9	0.00	40.00	35.11	6.77	140.90	18.55	58.55	6184
10	-0.60	46.00	40.71	8.74	160.17	22.95	68.95	6483
11	-0.95	49.50	43.91	9.86	171.19	25.32	74.82	6658
12	-1.30	53.00	47.07	10.97	182.05	28.00	81.00	6832
13	-1.50	55.00	48.85	11.59	188.18	29.18	84.18	6932
14	-2.00	60.00	53.24	13.14	203.28	32.80	92.80	7181
15	-2.50	65.00	57.54	14.65	218.09	35.65	100.65	7431
16	-3.00	70.00	61.77	16.13	232.64	38.15	108.15	7680
17	-3.50	75.00	65.92	17.59	246.95	40.50	115.50	7929
18	-4.00	80.00	70.02	19.03	261.04	42.62	122.62	8179
19	-4.50	85.00	74.05	20.45	274.94	42.27	127.27	8428
20	-5.00	90.00	78.05	21.85	288.68	40.39	130.39	8678
		90.00	78.05	9.70	399.37	5.24	95.24A	29922
21	-5.50	95.00	83.49	11.24	423.17	37.90	132.90	29922
22	-6.00	100.00	88.90	12.78	446.80	48.94	148.94	29922
23	-6.60	106.00	95.34	14.60	474.96	55.95	161.95	29922
24	-7.20	112.00	101.75	16.42	502.92	59.54	171.54	29922
25	-7.60	116.00	105.99	17.62	521.47	52.65	168.65	29922
26	-8.00	120.00	110.22	18.82	539.95	3.11	123.11A	29922
27	-8.15	121.50	111.80	19.27	546.87	86.25	207.75	29922
28	-9.60	136.00	127.00	23.57	613.28	114.71	250.71	29922
		136.00	127.00	12.60	671.64	82.90	218.90	49871
29	-10.80	148.00	143.07	17.29	741.85	173.66	321.66	49871
		148.00	143.07	0.00	5208.16	97.78	245.78	997417
30	-12.60	166.00	174.23	0.00	5640.80	166.76	332.76	997417
31	-14.40	184.00	205.25	0.00	6071.53	197.29	381.29	997417
32	-16.80	208.00	246.44	0.00	6643.55	237.83	445.83	997417
33	-18.40	224.00	273.82	0.00	7023.73	264.88	488.88	997417
34	-20.00	240.00	301.14	0.00	7403.16	303.29	543.29	997417

(continued)

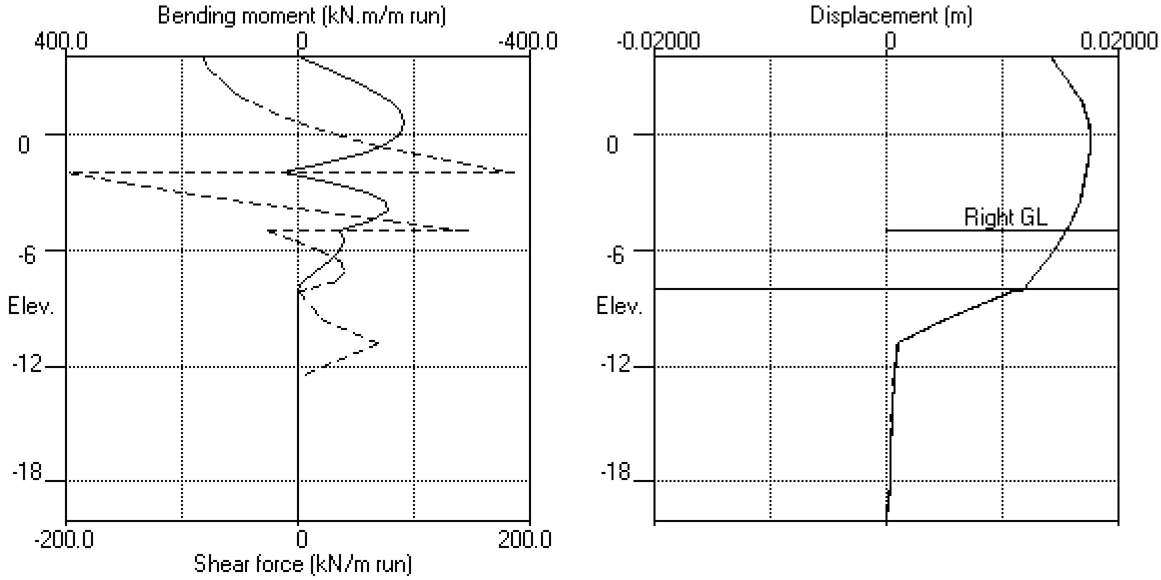
Stage No.16 Apply water pressure profile no.1

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	54.09	54.09	29934
21	-5.50	5.00	5.00	0.00	80.21	78.01	83.01	29934
22	-6.00	10.00	10.00	0.00	102.06	102.06	112.06p	29934
23	-6.60	16.00	16.00	0.00	128.29	128.29	144.29p	29934
24	-7.20	22.00	22.01	0.00	154.53	154.53	176.53p	29934
25	-7.60	26.00	26.02	0.00	172.04	172.04	198.04p	29934
26	-8.00	30.00	30.03	0.00	189.56	189.56	219.56p	29934
27	-8.15	31.50	31.53	0.00	196.13	176.33	207.83	29934
28	-9.60	46.00	46.10	0.65	259.78	175.78	221.78	29934
		46.00	46.10	0.00	318.14	207.80	253.80	49890
29	-10.80	58.00	61.79	0.00	386.72	148.19	206.19	49890
		58.00	61.79	0.00	4079.54	264.75	322.75	997795
30	-12.60	76.00	92.63	0.00	4507.70	256.75	332.75	997795
31	-14.40	94.00	123.59	0.00	4937.65	287.27	381.27	997795
32	-16.80	118.00	165.11	0.00	5514.16	327.83	445.83	997795
33	-18.40	134.00	192.95	0.00	5900.75	354.87	488.87	997795
34	-20.00	150.00	220.92	0.00	6289.20	393.34	543.34	997795

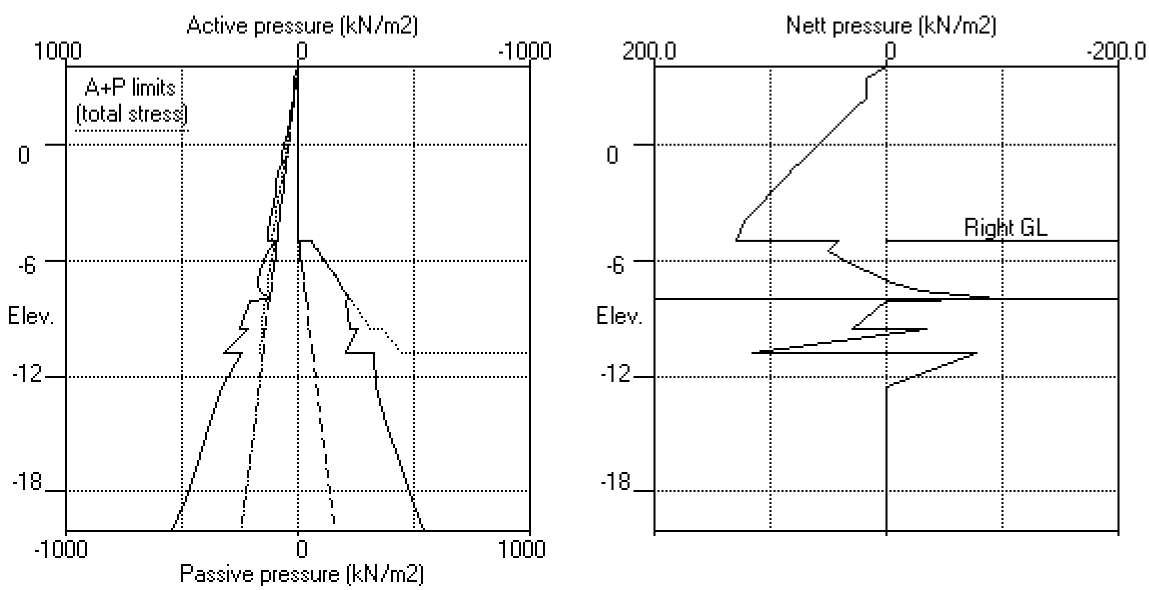
Note: 12.34 a Soil pressure at active limit
219.56 p Soil pressure at passive limit
123.11A Arching - soil pressure below active limit

Units: kN,m

Stage No.16 Apply water pressure profile no.1



Stage No.16 Apply water pressure profile no.1



Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				
2	4.00	2.00	Cant.	11.615	-6.43	0.43	1.57	L to R
3	4.00	2.00		No analysis at this stage				
4	4.00	-1.50	2.00	6.952	n/a	-3.40	1.90	L to R
5	4.00	-1.50		No analysis at this stage				

All remaining stages have more than one prop - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement maximum (m)	Displacement minimum (m)	Bending moment maximum (kN.m/m)	Bending moment minimum (kN.m/m)	Shear force maximum (kN/m)	Shear force minimum (kN/m)
1	4.00	0.016	0.000	0.0	-0.0	0.0	-82.5
2	3.45	0.016	0.000	0.4	-46.2	3.7	-77.7
3	2.90	0.015	0.000	4.8	-87.2	23.1	-68.3
4	2.40	0.016	0.000	17.7	-120.1	28.8	-59.6
5	2.00	0.016	0.000	30.5	-143.0	34.9	-104.7
6	1.60	0.017	0.000	12.8	-161.6	9.9	-97.7
7	1.20	0.017	0.000	16.0	-175.1	7.0	-89.0
8	0.60	0.017	0.000	19.2	-183.6	4.2	-72.6
9	0.00	0.018	0.000	21.1	-178.0	34.0	-52.0
10	-0.60	0.018	0.000	22.3	-175.0	72.3	-27.3
11	-0.95	0.018	0.000	22.9	-181.7	97.4	-11.0
12	-1.30	0.017	0.000	23.5	-182.5	124.7	-157.5
13	-1.50	0.017	0.000	23.9	-180.1	141.2	-147.1
14	-2.00	0.017	0.000	29.3	-178.3	185.5	-196.9
15	-2.50	0.017	0.000	26.9	-229.7	36.8	-148.5
16	-3.00	0.017	0.000	29.4	-265.4	43.8	-96.3
17	-3.50	0.017	0.000	32.8	-284.3	50.7	-52.6
18	-4.00	0.016	0.000	37.2	-285.3	57.4	-15.6
19	-4.50	0.016	0.000	42.5	-267.1	81.6	0.0
20	-5.00	0.016	0.000	48.4	-228.7	146.0	-25.3
21	-5.50	0.015	0.000	47.5	-183.3	94.6	-8.2
22	-6.00	0.014	0.000	40.2	-136.9	93.4	-17.6
23	-6.60	0.014	0.000	27.5	-83.6	85.0	-22.1
24	-7.20	0.013	0.000	13.7	-36.7	66.2	-21.4
25	-7.60	0.012	0.000	5.6	-13.5	45.9	-17.2
26	-8.00	0.012	0.000	0.0	-0.0	9.2	-3.8
27	-8.15	0.011	0.000	0.0	0.0	0.0	-0.0
28	-9.60	0.005	0.000	0.0	0.0	20.9	0.0
29	-10.80	0.001	0.000	0.0	0.0	69.2	0.0
30	-12.60	0.001	0.000	0.0	0.0	0.0	-0.0
31	-14.40	0.001	0.000	0.0	0.0	0.0	-0.0
32	-16.80	0.000	0.000	0.0	0.0	0.0	-0.0
33	-18.40	0.000	0.000	0.0	0.0	0.0	-0.0
34	-20.00	0.000	0.000	0.0	0.0	0.0	-0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment maximum kN.m/m	elev.	Bending moment minimum kN.m/m	elev.	Shear force maximum kN/m	elev.	Shear force minimum kN/m	elev.
1	0.0	3.45	-15.2	-2.00	6.8	-5.00	-3.8	1.20
2	48.4	-5.00	-0.0	4.00	12.5	-10.80	-22.1	-6.60
3	No calculation at this stage							
4	13.1	2.00	-182.5	-1.30	66.7	-5.00	-104.7	2.00
5	No calculation at this stage							
6	13.4	2.00	-174.9	-0.95	65.2	-5.00	-102.6	2.00
7	19.6	2.00	-285.3	-4.00	96.9	-5.00	-155.9	-1.30
8	30.5	2.00	-281.9	-4.00	95.6	-5.00	-157.5	-1.30
9	19.6	2.00	-285.3	-4.00	96.9	-5.00	-155.9	-1.30
10	No calculation at this stage							
11	No calculation at this stage							
12	19.6	2.00	-266.6	-4.00	91.9	-5.00	-124.1	-2.00
13	No calculation at this stage							
14	0.0	-8.00	-244.2	-4.00	95.5	-2.00	-142.6	-2.00
15	0.0	-8.00	-208.2	-4.00	105.5	-2.00	-149.9	-2.00
16	29.3	-2.00	-183.6	0.60	185.5	-2.00	-196.9	-2.00

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	Displacement minimum m	elev.	Stage description
1	0.001	0.00	0.000	4.00	Apply surcharge no.1 at elev. 4.00
2	0.016	4.00	0.000	4.00	Excav. to elev. 2.00 on RIGHT side
3	No calculation at this stage				Install prop no.1 at elev. 2.00
4	0.016	4.00	0.000	4.00	Excav. to elev. -1.50 on RIGHT side
5	No calculation at this stage				Install prop no.2 at elev. -1.30
6	0.016	4.00	0.000	4.00	Apply water pressure profile no.2
7	0.017	-2.00	0.000	4.00	Excav. to elev. -5.00 on RIGHT side
8	0.017	-2.00	0.000	4.00	Apply load no.1 at elev. 2.90
9	0.017	-2.00	0.000	4.00	Apply load no.2 at elev. 2.90
10	No calculation at this stage				Install prop no.3 at elev. -5.00
11	No calculation at this stage				Install prop no.4 at elev. -2.00
12	0.017	-1.50	0.000	4.00	Remove prop no.2 at elev. -1.30
13	No calculation at this stage				Install prop no.5 at elev. 4.00
14	0.017	-0.95	0.000	4.00	Remove prop no.1 at elev. 2.00
15	0.017	-0.60	0.000	4.00	Change EI of wall to 400788kN.m2/m run
16	0.018	-0.60	0.000	4.00	Apply water pressure profile no.1

Summary of results (continued)

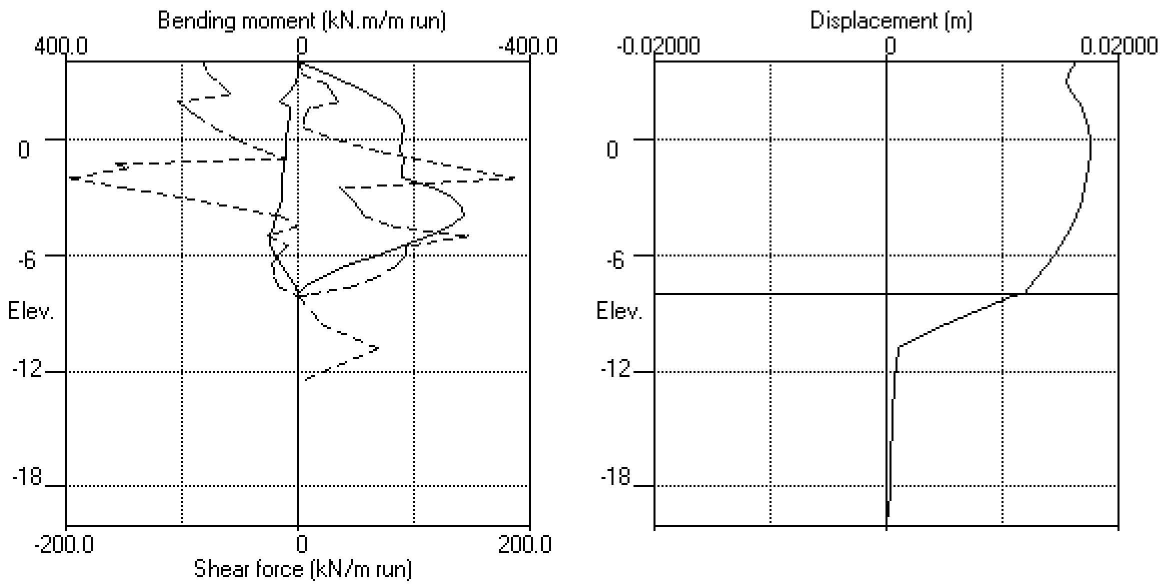
Prop forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 --- at elev. 2.00 kN/m run	kN/prop	--- Strut no. 2 --- at elev.-1.30 kN/m run	kN/prop	--- Strut no. 3 --- at elev.-5.00 kN/m run	kN/prop
4	121.09	908.15	---	---	---	---
6	119.22	894.17	5.84	43.77	---	---
7	100.26	751.94	190.76	1430.68	---	---
8	113.51	851.29	191.39	1435.45	---	---
9	100.26	751.94	190.76	1430.68	---	---
12	124.33	932.50	---	---	-1.53	-1.53
14	---	---	---	---	-16.14	-16.14
15	---	---	---	---	-11.03	-11.03
16	---	---	---	---	171.36	171.36

Stage no.	--- Strut no. 4 --- at elev.-2.00 kN/m run	kN/prop	--- Strut no. 5 --- at elev. 4.00 kN/m run	kN/prop
12	170.20	170.20	---	---
14	238.10	238.10	70.98	70.98
15	255.38	255.38	60.33	60.33
16	382.33	382.33	82.49	82.49

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types: Left side		Soil types: Right side	
1	4.00	1	FL	1	FL
2	1.40	2	AL F	2	AL F
3	-4.30	4	RS F	4	RS F
4	-6.60	5	NFG 5	5	NFG 5
5	-11.00	6	NFG 3	6	NFG 3

SOIL PROPERTIES

-- Soil type -- No. Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1 FL	17.00	10000	0.700	OC	0.309	3.868	
				(0.300)	(0.000)	(0.000)	
2 AL F	17.00	5000	0.700	OC	0.351	3.442	4.000d
(1.40)		(500.0)		(0.300)	(1.391)	(5.007)	
3 Not defined							
4 RS F	20.00	30000	1.000	OC	0.283	4.369	10.00d
				(0.300)	(1.241)	(5.836)	
5 NFG 5	23.00	50000	1.000	OC	0.292	4.369	20.00d
				(0.300)	(1.226)	(5.836)	
6 NFG 3	27.00	1000000	1.000	OC	0.146	13.89	250.0d
				(0.200)	(0.854)	(12.886)	

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No. Description	Ka: Soil friction angle	Ka: Wall adhesion coeff.	Ka: Back-fill angle	Kp: Soil friction angle	Kp: Wall adhesion coeff.	Kp: Back-fill angle
1 FL	28.00	0.670	0.00	28.00	0.500	0.00
2 AL F	25.00	0.670	0.00	26.00	0.500	0.00
3 Not defined						
4 RS F	30.00	0.670	0.00	30.00	0.500	0.00
5 NFG 5	30.00	0.500	0.00	30.00	0.500	0.00
6 NFG 3	45.00	0.500	0.00	45.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-4.00	-4.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Left: Point no.	Left: Elev. m	Left: Piezo elev. m	Left: Water press. kN/m2	Right: Point no.	Right: Elev. m	Right: Piezo elev. m	Right: Water press. kN/m2
1	1	4.00	4.00	0.0	1	-5.00	-5.00	0.0
2	1	-4.00	-4.00	0.0	1	-5.00	-5.00	0.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = -8.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 0.010742 m4/m run
E.I = 352338 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Prop no.	Elev.	Prop spacing m	Cross-section area sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /prop kN	Strut or Anchor	Allow tension ?	L/R
1	2.00	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
2	-1.30	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
3	-5.00	1.00	0.150000	3.280E+07	20.00	0.00	0	Strut	Yes	R
4	-2.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
5	4.00	1.00	0.400000	3.280E+07	20.00	0.00	0	Strut	Yes	R

HORIZONTAL and MOMENT LOADS/RESTRAINTS

Load no.	Elevation	Horizontal load kN/m run	Moment load kN.m/m run	Moment restraint kN.m/m/rad	Partial factor (Category)
1	2.30	34.00	0	0	N/A
2	2.30	-34.00	0	0	N/A

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge kN/m2 Near edge	Surcharge kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	4.00	3.00(L)	100.00	100.00	10.00	=	N/A	N/A

Note: L = Left side, R = Right side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 4.00
2	Excavate to elevation 2.00 on RIGHT side
3	Install strut or anchor no.1 at elevation 2.00
4	Excavate to elevation -1.50 on RIGHT side
5	Install strut or anchor no.2 at elevation -1.30
6	Apply water pressure profile no.2
7	Excavate to elevation -5.00 on RIGHT side
8	Apply load no.1 at elevation 2.30
9	Apply load no.2 at elevation 2.30
10	Install strut or anchor no.3 at elevation -5.00
11	Install strut or anchor no.4 at elevation -2.00
12	Remove strut or anchor no.2 at elevation -1.30
13	Install strut or anchor no.5 at elevation 4.00
14	Remove strut or anchor no.1 at elevation 2.00
15	Change EI of wall to 246637 kN.m2/m run Allow wall to relax with new modulus value
16	Apply water pressure profile no.1

FACTORS OF SAFETY and ANALYSIS OPTIONS

```
 Stability analysis:
  Method of analysis  -  Burland-Potts
  Factor on passive for calculating wall depth = 1.50

 Parameters for undrained strata:
  Minimum equivalent fluid density             =   5.00 kN/m3
  Maximum depth of water filled tension crack  =   0.00 m

 Bending moment and displacement calculation:
  Method  -  2-D finite element model
  Open Tension Crack analysis? - No
  Active limit arching modelled?  -  Yes
  Non-linear Modulus Parameter (L) = 9.000 m

 Boundary conditions:
  Length of wall (normal to plane of analysis) = 40.00 m

  Width of excavation on Left  side of wall  = 60.00 m
  Width of excavation on Right side of wall  = 60.00 m

  Distance to rigid boundary on Left side  = 20.00 m
  Distance to rigid boundary on Right side = 30.00 m
  Elevation of rigid lower boundary = -20.00

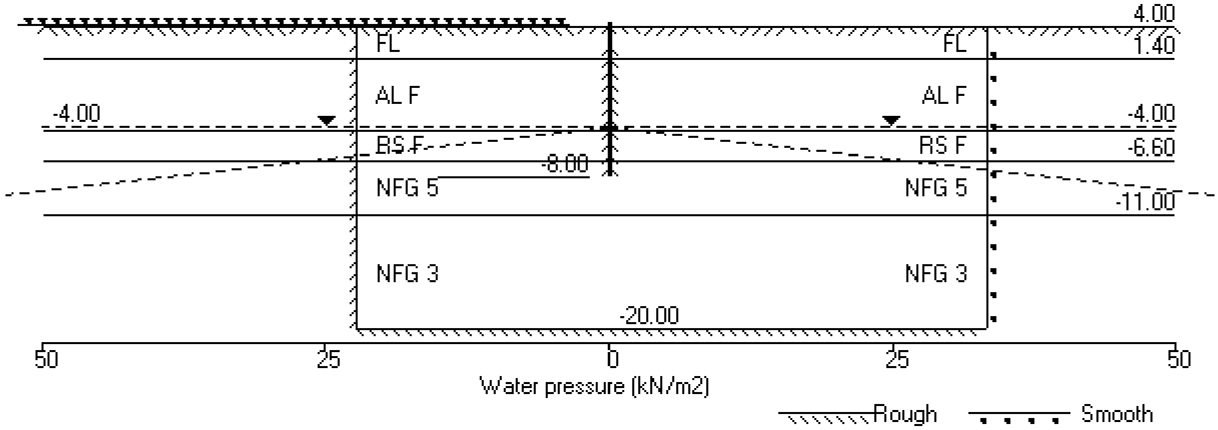
  Lower rigid boundary at elevation -20.00 - Rough
  Rigid boundary on Left side           - Rough
  Rigid boundary on Right side          - Smooth
  Wall / soil interface                   - Rough
```

OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 4.00	Yes	Yes	Yes
2	Excav. to elev. 2.00 on RIGHT side	Yes	Yes	Yes
3	Install prop no.1 at elev. 2.00	Yes	Yes	Yes
4	Excav. to elev. -1.50 on RIGHT side	Yes	Yes	Yes
5	Install prop no.2 at elev. -1.30	Yes	Yes	Yes
6	Apply water pressure profile no.2	Yes	Yes	Yes
7	Excav. to elev. -5.00 on RIGHT side	Yes	Yes	Yes
8	Apply load no.1 at elev. 2.30	Yes	Yes	Yes
9	Apply load no.2 at elev. 2.30	Yes	Yes	Yes
10	Install prop no.3 at elev. -5.00	Yes	Yes	Yes
11	Install prop no.4 at elev. -2.00	Yes	Yes	Yes
12	Remove prop no.2 at elev. -1.30	Yes	Yes	Yes
13	Install prop no.5 at elev. 4.00	Yes	Yes	Yes
14	Remove prop no.1 at elev. 2.00	Yes	Yes	Yes
15	Change EI of wall to 246637kN.m2/m run	Yes	Yes	Yes
16	Apply water pressure profile no.1	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 4.00

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.000	-2.31E-05	0.0	-0.0		352338
2	3.50	-0.86	0.000	-2.31E-05	-0.2	0.0		352338
3	3.00	-0.75	0.000	-2.29E-05	-0.6	-0.2		352338
4	2.65	-0.70	0.000	-2.26E-05	-0.9	-0.5		352338
5	2.30	-0.63	0.000	-2.20E-05	-1.1	-0.8		352338
6	2.00	-0.54	0.000	-2.11E-05	-1.3	-1.2		352338
7	1.40	-0.31	0.000	-1.84E-05	-1.5	-2.0		352338
		0.14	0.000	-1.84E-05	-1.5	-2.0		
8	1.00	0.18	0.000	-1.57E-05	-1.5	-2.6		352338
9	0.60	0.27	0.000	-1.24E-05	-1.4	-3.2		352338
10	0.00	0.45	0.000	-6.39E-06	-1.2	-4.0		352338
11	-0.60	0.62	0.000	8.69E-07	-0.8	-4.6		352338
12	-0.95	0.69	0.000	5.53E-06	-0.6	-4.8		352338
13	-1.30	0.77	0.000	1.04E-05	-0.4	-5.0		352338
14	-1.50	0.79	0.000	1.32E-05	-0.2	-5.0		352338
15	-2.00	0.91	0.000	2.04E-05	0.2	-5.0		352338
16	-2.50	0.99	0.000	2.73E-05	0.7	-4.8		352338
17	-3.00	1.06	0.000	3.38E-05	1.2	-4.3		352338
18	-3.50	1.10	0.000	3.95E-05	1.8	-3.6		352338
19	-4.00	1.06	0.000	4.38E-05	2.3	-2.6		352338
20	-4.30	0.84	0.000	4.57E-05	2.6	-1.8		352338
		-3.72	0.000	4.57E-05	2.6	-1.8		
21	-4.65	-1.70	0.000	4.72E-05	1.6	-1.2		352338
22	-5.00	-0.98	0.000	4.81E-05	1.2	-0.7		352338
23	-5.50	-0.52	0.000	4.88E-05	0.8	-0.2		352338
24	-6.00	-0.24	0.000	4.89E-05	0.6	0.1		352338
25	-6.60	-0.09	0.000	4.84E-05	0.5	0.4		352338
		-2.02	0.000	4.84E-05	0.5	0.4		
26	-7.20	-0.69	0.000	4.78E-05	-0.3	0.3		352338
27	-7.60	0.12	0.000	4.75E-05	-0.4	0.2		352338
28	-8.00	1.49	0.000	4.74E-05	-0.1	0.0		0
29	-8.15	-0.04	0.000	0	-0.0	0.0		0
30	-9.57	0.00	0.000	0	-0.0	0.0		0

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
31	-11.00	2.96	0.000	0	2.1	0.0		0
		-2.47	0.000	0	2.1	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	-0.00	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	-0.0	0.0		0
36	-20.00	0.00	0.000	0	0.0	0.0		---

LEFT side

			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	5.51	5.51	9981
3	3.00	0.00	17.14	5.30	66.30	11.54	11.54	9981
4	2.65	0.00	23.26	7.19	89.97	15.77	15.77	9981
5	2.30	0.00	29.45	9.10	113.93	20.02	20.02	9981
6	2.00	0.00	34.80	10.76	134.63	23.69	23.69	9981
7	1.40	0.00	45.59	14.09	176.37	31.07	31.07	9981
		0.00	45.59	10.45	176.98	31.30	31.30	4991
8	1.00	0.00	52.82	12.99	201.83	36.17	36.17	5190
9	0.60	0.00	60.04	15.53	226.69	41.07	41.07	5390
10	0.00	0.00	70.85	19.32	263.90	48.43	48.43	5689
11	-0.60	0.00	81.60	23.10	300.93	55.77	55.77	5989
12	-0.95	0.00	87.86	25.30	322.45	60.04	60.04	6163
13	-1.30	0.00	94.09	27.49	343.90	64.30	64.30	6338
14	-1.50	0.00	97.64	28.73	356.13	66.73	66.73	6438
15	-2.00	0.00	106.49	31.84	386.61	72.81	72.81	6687
16	-2.50	0.00	115.32	34.94	416.97	78.87	78.87	6937
17	-3.00	0.00	124.11	38.03	447.23	84.92	84.92	7186
18	-3.50	0.00	132.87	41.11	477.39	90.94	90.94	7436
19	-4.00	0.00	141.61	44.18	507.47	96.92	96.92	7685
20	-4.30	3.00	143.84	44.96	515.15	98.32	101.32	7835
		3.00	143.84	28.34	686.84	137.48	140.48	29943
21	-4.65	6.50	147.48	29.38	702.77	142.00	148.50	29943
22	-5.00	10.00	151.12	30.41	718.65	145.89	155.89	29943
23	-5.50	15.00	156.30	31.87	741.28	151.15	166.15	29943
24	-6.00	20.00	161.46	33.34	763.84	156.33	176.33	29943
25	-6.60	26.00	167.64	35.09	790.83	162.45	188.45	29943
		26.00	167.64	24.47	849.19	161.48	187.48	49905
26	-7.20	32.00	175.60	26.80	883.98	169.97	201.97	49905
27	-7.60	36.00	180.90	28.35	907.12	175.60	211.60	49905
28	-8.00	40.00	186.19	29.90	930.25	181.48	221.48	49905
29	-8.15	41.50	188.17	30.48	938.91	182.71	224.21	49905
30	-9.57	55.75	206.97	35.97	1021.06	201.31	257.06	49905
31	-11.00	70.00	225.72	41.45	1102.96	221.37	291.37	49905
		70.00	225.72	0.00	6355.77	217.95	287.95	998109
32	-12.70	87.00	254.82	0.00	6759.93	248.11	335.11	998109
33	-14.40	104.00	283.88	0.00	7163.41	277.03	381.03	998109
34	-16.80	128.00	324.84	0.00	7732.14	317.86	445.86	998109
35	-18.40	144.00	352.11	0.00	8110.84	345.08	489.08	998109
36	-20.00	160.00	379.36	0.00	8489.23	372.08	532.08	998109

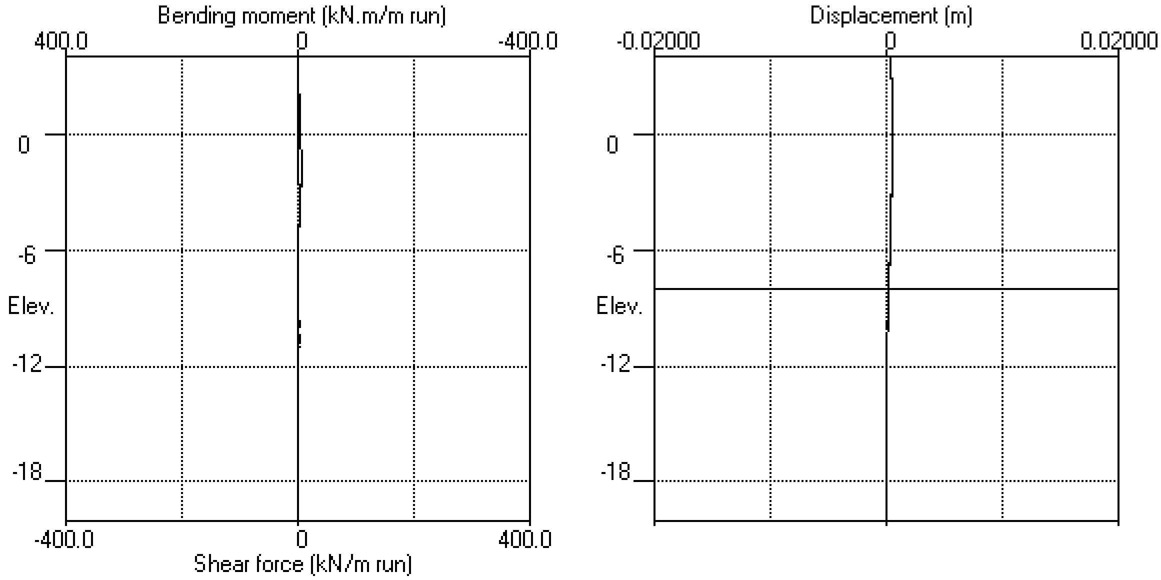
(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

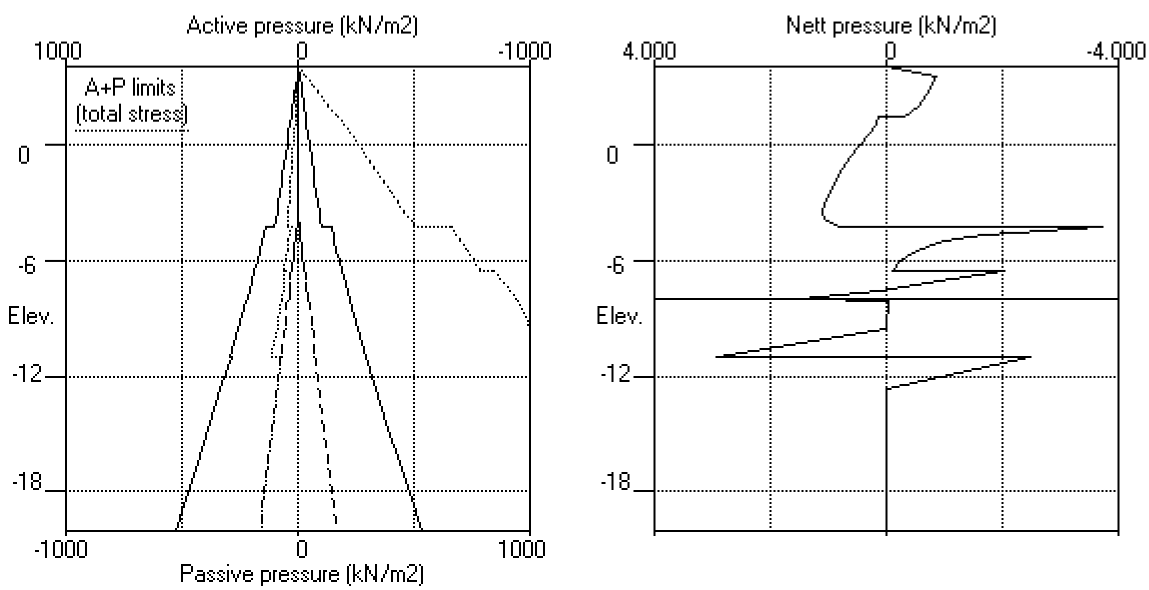
		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	10053
2	3.50	0.00	8.50	2.63	32.88	6.37	6.37	10053
3	3.00	0.00	17.00	5.25	65.76	12.29	12.29	10053
4	2.65	0.00	22.95	7.09	88.78	16.47	16.47	10053
5	2.30	0.00	28.90	8.93	111.79	20.65	20.65	10053
6	2.00	0.00	34.00	10.51	131.52	24.23	24.23	10053
7	1.40	0.00	44.20	13.66	170.98	31.38	31.38	10053
		0.00	44.20	9.96	172.18	31.16	31.16	5027
8	1.00	0.00	51.00	12.35	195.58	35.99	35.99	5228
9	0.60	0.00	57.80	14.74	218.99	40.80	40.80	5429
10	0.00	0.00	68.00	18.32	254.10	47.98	47.98	5730
11	-0.60	0.00	78.20	21.91	289.21	55.15	55.15	6032
12	-0.95	0.00	84.15	24.00	309.69	59.35	59.35	6208
13	-1.30	0.00	90.10	26.09	330.17	63.53	63.53	6384
14	-1.50	0.00	93.50	27.28	341.88	65.93	65.93	6484
15	-2.00	0.00	102.00	30.27	371.14	71.90	71.90	6736
16	-2.50	0.00	110.50	33.25	400.40	77.88	77.88	6987
17	-3.00	0.00	119.00	36.24	429.66	83.86	83.86	7238
18	-3.50	0.00	127.50	39.22	458.91	89.85	89.85	7490
19	-4.00	0.00	136.00	42.21	488.17	95.87	95.87	7741
20	-4.30	3.00	138.10	42.95	495.40	97.48	100.48	7892
		3.00	138.10	26.72	661.77	141.20	144.20	30160
21	-4.65	6.50	141.60	27.71	677.06	143.70	150.20	30160
22	-5.00	10.00	145.10	28.70	692.36	146.87	156.87	30160
23	-5.50	15.00	150.10	30.12	714.20	151.68	166.68	30160
24	-6.00	20.00	155.10	31.53	736.05	156.57	176.57	30160
25	-6.60	26.00	161.10	33.23	762.27	162.54	188.54	30160
		26.00	161.10	22.56	820.63	163.50	189.50	50266
26	-7.20	32.00	168.90	24.84	854.71	170.67	202.67	50266
27	-7.60	36.00	174.10	26.36	877.43	175.48	211.48	50266
28	-8.00	40.00	179.30	27.88	900.15	179.99	219.99	50266
29	-8.15	41.50	181.25	28.45	908.67	182.74	224.24	50266
30	-9.57	55.75	199.78	33.87	989.61	201.31	257.06	50266
31	-11.00	70.00	218.30	39.28	1070.56	218.41	288.41	50266
		70.00	218.30	0.00	6252.79	220.42	290.42	1005321
32	-12.70	87.00	247.20	0.00	6654.09	248.11	335.11	1005321
33	-14.40	104.00	276.10	0.00	7055.40	277.03	381.03	1005321
34	-16.80	128.00	316.90	0.00	7621.94	317.86	445.86	1005321
35	-18.40	144.00	344.10	0.00	7999.64	345.08	489.08	1005321
36	-20.00	160.00	371.30	0.00	8377.34	372.08	532.08	1005321

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00



Stage No.1 Apply surcharge no.1 at elev. 4.00



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Data filename/Run ID: Section_3                              |
Albert Street Development                                    | Date:16-11-2022
Section 3                                                    | Checked :
-----------------------------------------------------------------------------
                                                   Units: kN,m
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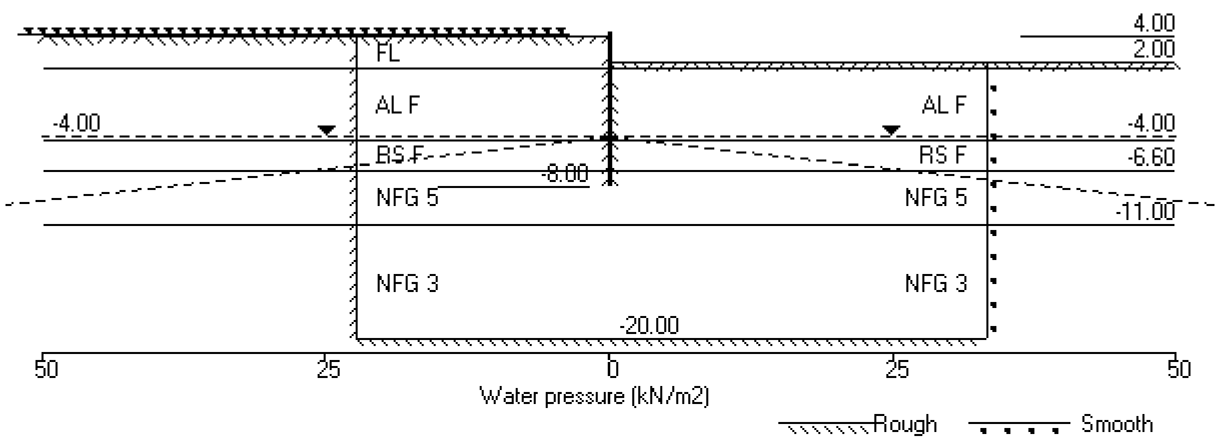
Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No. 2 Excavate to elevation 2.00 on RIGHT side

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00 Factor of Safety	FoS for toe elev. = -8.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
2	4.00	2.00	Cant.	12.309	-6.51	0.02	1.98	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries:	Left side 20.00 from wall	Rough boundary
	Right side 30.00 from wall	Smooth boundary
Lower rigid boundary at elevation -20.00		Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	1.72E-03	0.0	-0.0		352338
2	3.50	2.63	0.016	1.72E-03	0.7	0.3		352338
3	3.00	5.30	0.015	1.71E-03	2.6	1.2		352338
4	2.65	7.19	0.014	1.71E-03	4.8	2.5		352338
5	2.30	9.10	0.014	1.71E-03	7.7	4.7		352338
6	2.00	10.76	0.013	1.70E-03	10.7	7.5		352338
7	1.40	-17.90	0.012	1.68E-03	8.5	15.3		352338
		-1.36	0.012	1.68E-03	8.5	15.3		
8	1.00	-1.99	0.011	1.67E-03	7.8	18.6		352338
9	0.60	-1.79	0.011	1.64E-03	7.1	21.5		352338
10	0.00	-0.80	0.010	1.60E-03	6.3	25.5		352338
11	-0.60	0.20	0.009	1.56E-03	6.1	29.1		352338
12	-0.95	0.87	0.008	1.53E-03	6.3	31.3		352338
13	-1.30	1.41	0.008	1.49E-03	6.7	33.6		352338
14	-1.50	1.82	0.008	1.47E-03	7.0	34.9		352338
15	-2.00	2.47	0.007	1.42E-03	8.1	38.7		352338
16	-2.50	3.04	0.006	1.36E-03	9.5	43.0		352338
17	-3.00	3.31	0.005	1.30E-03	11.1	48.2		352338
18	-3.50	2.93	0.005	1.23E-03	12.6	54.1		352338
19	-4.00	1.19	0.004	1.15E-03	13.7	60.8		352338
20	-4.30	-3.19	0.004	1.09E-03	13.4	65.0		352338
		-60.21	0.004	1.09E-03	13.4	65.0		
21	-4.65	-29.02	0.003	1.03E-03	-2.3	66.0		352338
22	-5.00	-16.57	0.003	9.67E-04	-10.2	63.4		352338
23	-5.50	-9.21	0.003	8.82E-04	-16.7	56.2		352338
24	-6.00	-4.57	0.002	8.09E-04	-20.1	46.7		352338
25	-6.60	-2.43	0.002	7.40E-04	-22.2	33.8		352338
		-15.62	0.002	7.40E-04	-22.2	33.8		
26	-7.20	1.95	0.001	6.97E-04	-26.3	17.7		352338
27	-7.60	19.13	0.001	6.82E-04	-22.1	7.3		352338
28	-8.00	66.48	0.001	6.78E-04	-5.0	-0.0		0
29	-8.15	-0.03	0.001	0	-0.0	0.0		0
30	-9.57	0.00	0.001	0	-0.0	0.0		0

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
31	-11.00	16.48	0.000	0	11.7	0.0		0
		-13.81	0.000	0	11.7	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.00	0.000	0	-0.0	0.0		0
34	-16.80	0.00	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press.	Vertic -al	Effective stresses: Active limit	Effective stresses: Passive limit	Effective stresses: Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	2.63	2.63a	9981
3	3.00	0.00	17.14	5.30	66.30	5.30	5.30a	9981
4	2.65	0.00	23.26	7.19	89.97	7.19	7.19a	9981
5	2.30	0.00	29.45	9.10	113.93	9.10	9.10a	9981
6	2.00	0.00	34.80	10.76	134.63	10.76	10.76a	9981
7	1.40	0.00	45.59	14.09	176.37	19.68	19.68	9981
		0.00	45.59	10.45	176.98	25.61	25.61	4991
8	1.00	0.00	52.82	12.99	201.83	29.14	29.14	5190
9	0.60	0.00	60.04	15.53	226.69	33.76	33.76	5390
10	0.00	0.00	70.85	19.32	263.90	41.22	41.22	5689
11	-0.60	0.00	81.60	23.10	300.93	48.78	48.78	5989
12	-0.95	0.00	87.86	25.30	322.45	53.23	53.23	6163
13	-1.30	0.00	94.09	27.49	343.90	57.66	57.66	6338
14	-1.50	0.00	97.64	28.73	356.13	60.22	60.22	6438
15	-2.00	0.00	106.49	31.84	386.61	66.51	66.51	6687
16	-2.50	0.00	115.32	34.94	416.97	72.75	72.75	6937
17	-3.00	0.00	124.11	38.03	447.23	78.85	78.85	7186
18	-3.50	0.00	132.87	41.11	477.39	84.62	84.62	7436
19	-4.00	0.00	141.61	44.18	507.47	89.71	89.71	7685
20	-4.30	3.00	143.84	44.96	515.15	89.14	92.14	7835
		3.00	143.84	28.34	686.84	102.40	105.40	29943
21	-4.65	6.50	147.48	29.38	702.77	121.06	127.56	29943
22	-5.00	10.00	151.12	30.41	718.65	130.81	140.81	29943
23	-5.50	15.00	156.30	31.87	741.28	139.51	154.51	29943
24	-6.00	20.00	161.46	33.34	763.84	146.84	166.84	29943
25	-6.60	26.00	167.64	35.09	790.83	154.01	180.01	29943
		26.00	167.64	24.47	849.19	147.41	173.41	49905
26	-7.20	32.00	175.60	26.80	883.98	163.94	195.94	49905
27	-7.60	36.00	180.90	28.35	907.12	177.84	213.84	49905
28	-8.00	40.00	186.19	29.90	930.25	205.46	245.46	49905
29	-8.15	41.50	188.17	30.48	938.91	175.63	217.13	49905
30	-9.57	55.75	206.97	35.97	1021.06	193.97	249.72	49905
31	-11.00	70.00	225.72	41.45	1102.96	220.86	290.86	49905
		70.00	225.72	0.00	6355.77	207.77	277.77	998109
32	-12.70	87.00	254.82	0.00	6759.93	243.52	330.52	998109
33	-14.40	104.00	283.88	0.00	7163.41	272.45	376.45	998109
34	-16.80	128.00	324.84	0.00	7732.14	313.36	441.36	998109
35	-18.40	144.00	352.11	0.00	8110.84	340.68	484.68	998109
36	-20.00	160.00	379.36	0.00	8489.23	366.88	526.88	998109

(continued)

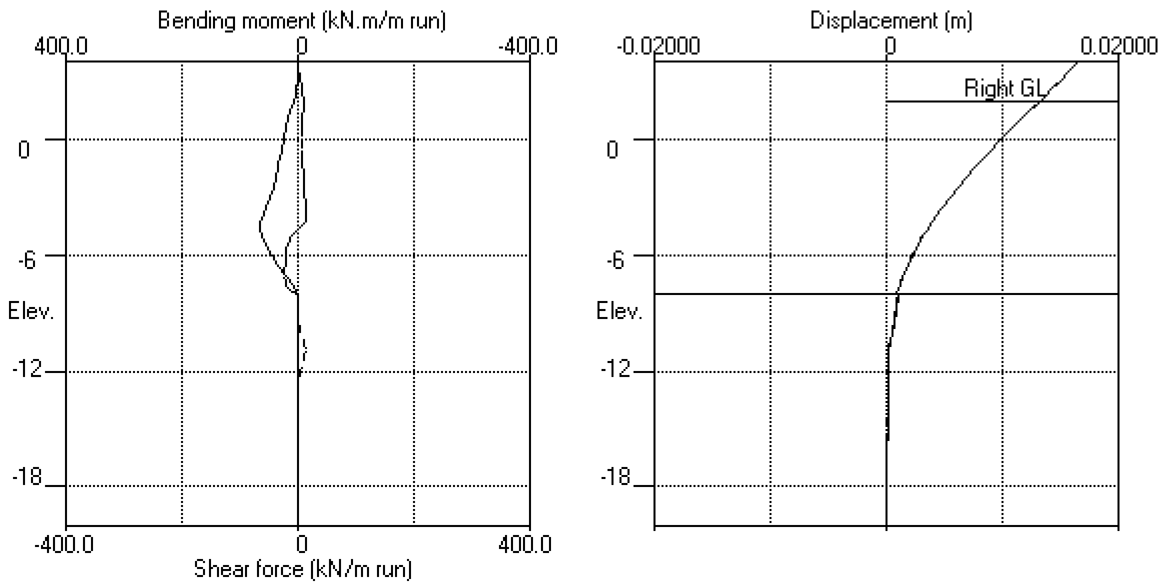
Stage No.2 Excavate to elevation 2.00 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	10048
7	1.40	0.00	10.20	3.15	39.46	37.58	37.58	10048
		0.00	10.20	0.00	55.14	26.97	26.97	5024
8	1.00	0.00	17.00	0.41	78.55	31.14	31.14	5225
9	0.60	0.00	23.80	2.80	101.96	35.55	35.55	5426
10	0.00	0.00	34.00	6.38	137.07	42.02	42.02	5727
11	-0.60	0.00	44.20	9.96	172.18	48.57	48.57	6029
12	-0.95	0.00	50.15	12.05	192.66	52.36	52.36	6205
13	-1.30	0.00	56.10	14.14	213.15	56.25	56.25	6381
14	-1.50	0.00	59.50	15.34	224.85	58.40	58.40	6481
15	-2.00	0.00	68.00	18.32	254.12	64.03	64.03	6732
16	-2.50	0.00	76.51	21.31	283.38	69.71	69.71	6984
17	-3.00	0.00	85.01	24.30	312.65	75.54	75.54	7235
18	-3.50	0.00	93.51	27.28	341.92	81.69	81.69	7486
19	-4.00	0.00	102.01	30.27	371.19	88.52	88.52	7737
20	-4.30	3.00	104.12	31.01	378.42	92.33	95.33	7888
		3.00	104.12	17.09	513.28	162.62	165.62	30145
21	-4.65	6.50	107.62	18.08	528.59	150.08	156.58	30145
22	-5.00	10.00	111.12	19.07	543.90	147.38	157.38	30145
23	-5.50	15.00	116.13	20.49	565.77	148.72	163.72	30145
24	-6.00	20.00	121.13	21.91	587.64	151.42	171.42	30145
25	-6.60	26.00	127.14	23.61	613.89	156.43	182.43	30145
		26.00	127.14	12.64	672.25	163.03	189.03	50241
26	-7.20	32.00	134.95	14.92	706.37	161.99	193.99	50241
27	-7.60	36.00	140.16	16.44	729.12	158.72	194.72	50241
28	-8.00	40.00	145.36	17.97	751.87	138.98	178.98	50241
29	-8.15	41.50	147.32	18.54	760.41	175.66	217.16	50241
30	-9.57	55.75	165.87	23.96	841.49	193.96	249.71	50241
31	-11.00	70.00	184.44	29.38	922.60	204.38	274.38	50241
		70.00	184.44	0.00	5782.59	221.58	291.58	1004823
32	-12.70	87.00	213.40	0.00	6184.72	243.52	330.52	1004823
33	-14.40	104.00	242.37	0.00	6587.03	272.45	376.45	1004823
34	-16.80	128.00	283.30	0.00	7155.33	313.36	441.36	1004823
35	-18.40	144.00	310.60	0.00	7534.42	340.67	484.67	1004823
36	-20.00	160.00	337.91	0.00	7913.70	366.89	526.89	1004823

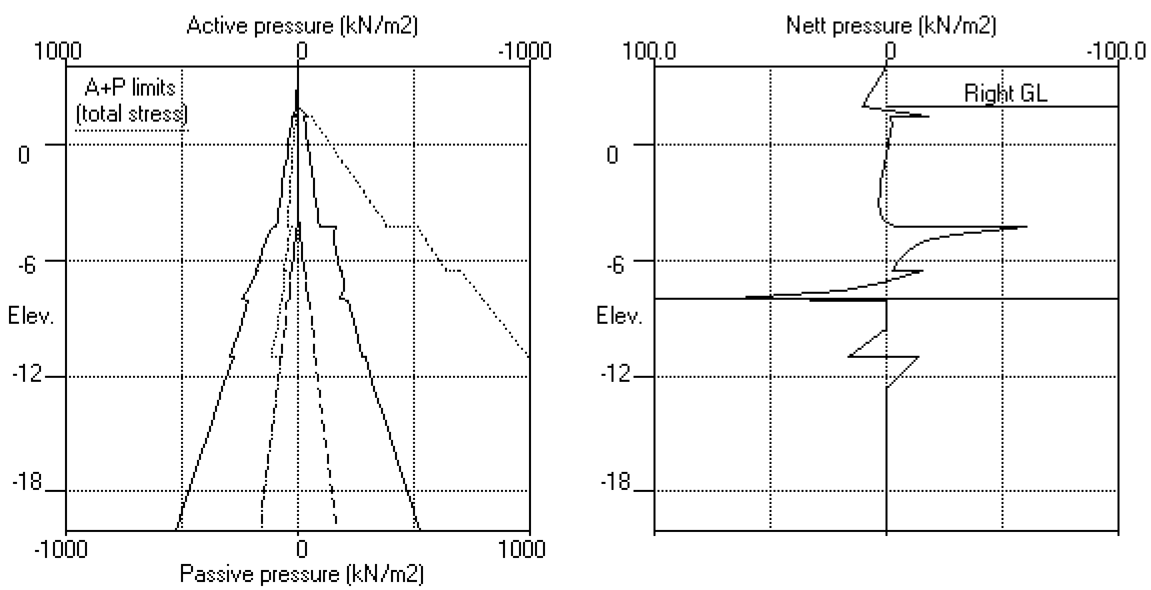
Note: 10.76 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side

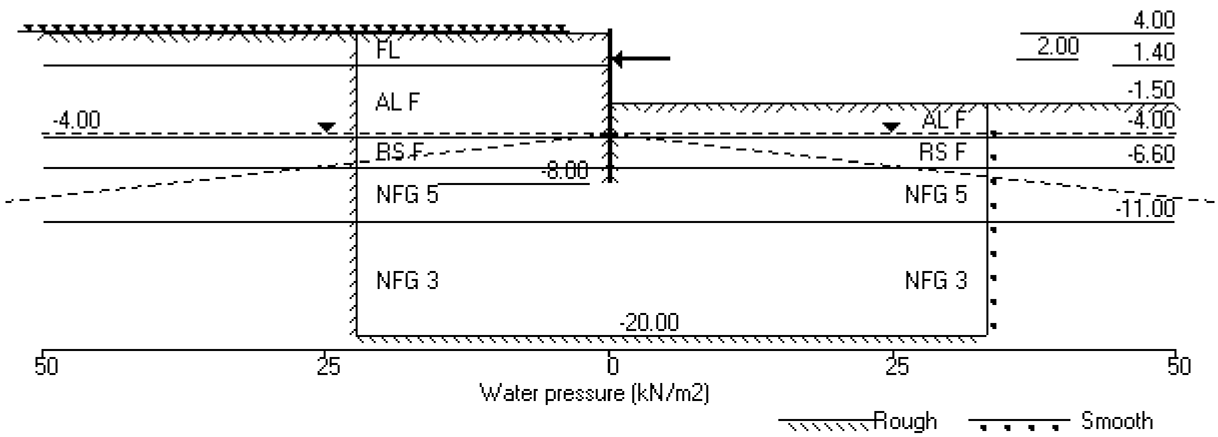


Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -1.50 on RIGHT side

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
4	4.00	-1.50	2.00	8.697	n/a	-3.28	1.78	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	3.32E-04	0.0	-0.0		352338
2	3.50	9.31	0.015	3.32E-04	2.3	0.3		352338
3	3.00	9.23	0.015	3.30E-04	7.0	2.8		352338
4	2.65	9.21	0.015	3.26E-04	10.2	5.9		352338
5	2.30	9.58	0.015	3.18E-04	13.5	10.2		352338
6	2.00	9.21	0.015	3.07E-04	16.3	14.7	-103.2	352338
		9.21	0.015	3.07E-04	-86.9	14.7		
7	1.40	15.68	0.014	3.24E-04	-79.4	-34.1		352338
		23.61	0.014	3.24E-04	-79.4	-34.1		
8	1.00	26.23	0.014	3.79E-04	-69.5	-63.9		352338
9	0.60	30.00	0.014	4.66E-04	-58.2	-89.4		352338
10	0.00	36.44	0.014	6.43E-04	-38.3	-118.5		352338
11	-0.60	43.09	0.013	8.59E-04	-14.4	-134.5		352338
12	-0.95	46.83	0.013	9.94E-04	1.3	-136.9		352338
13	-1.30	50.88	0.013	1.12E-03	18.4	-133.5		352338
14	-1.50	53.03	0.012	1.20E-03	28.8	-128.7		352338
		33.00	0.012	1.20E-03	28.8	-128.7		
15	-2.00	13.40	0.012	1.37E-03	40.4	-110.7		352338
16	-2.50	13.54	0.011	1.51E-03	47.2	-88.8		352338
17	-3.00	13.22	0.010	1.62E-03	53.8	-63.6		352338
18	-3.50	12.07	0.009	1.69E-03	60.2	-35.0		352338
19	-4.00	8.74	0.009	1.71E-03	65.4	-3.4		352338
20	-4.30	1.11	0.008	1.71E-03	66.8	16.6		352338
		-115.76	0.008	1.71E-03	66.8	16.6		
21	-4.65	-59.14	0.007	1.68E-03	36.2	32.9		352338
22	-5.00	-37.39	0.007	1.65E-03	19.3	42.0		352338
23	-5.50	-24.00	0.006	1.58E-03	4.0	47.0		352338
24	-6.00	-15.23	0.005	1.52E-03	-5.8	46.0		352338
25	-6.60	-10.82	0.004	1.45E-03	-13.6	39.7		352338
		-46.61	0.004	1.45E-03	-13.6	39.7		
26	-7.20	-10.64	0.004	1.39E-03	-30.8	23.2		352338
27	-7.60	19.77	0.003	1.37E-03	-29.0	10.0		352338
28	-8.00	91.00	0.002	1.37E-03	-6.8	-0.0		0

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-8.15	-0.03	0.003	0	-0.0	0.0		0
30	-9.57	0.01	0.002	0	-0.0	0.0		0
31	-11.00	40.24	0.000	0	28.7	0.0		0
		-33.72	0.000	0	28.7	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.00	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 103.2 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	9.31	9.31	9981
3	3.00	0.00	17.14	5.30	66.30	9.23	9.23	9981
4	2.65	0.00	23.26	7.19	89.97	9.21	9.21	9981
5	2.30	0.00	29.45	9.10	113.93	9.58	9.58	9981
6	2.00	0.00	34.80	10.76	134.63	9.21	9.21A	9981
7	1.40	0.00	45.59	14.09	176.37	15.68	15.68	9981
		0.00	45.59	10.45	176.98	23.61	23.61	4991
8	1.00	0.00	52.82	12.99	201.83	26.23	26.23	5190
9	0.60	0.00	60.04	15.53	226.69	30.00	30.00	5390
10	0.00	0.00	70.85	19.32	263.90	36.44	36.44	5689
11	-0.60	0.00	81.60	23.10	300.93	43.09	43.09	5989
12	-0.95	0.00	87.86	25.30	322.45	46.83	46.83	6163
13	-1.30	0.00	94.09	27.49	343.90	50.88	50.88	6338
14	-1.50	0.00	97.64	28.73	356.13	53.03	53.03	6438
15	-2.00	0.00	106.49	31.84	386.61	59.02	59.02	6687
16	-2.50	0.00	115.32	34.94	416.97	64.95	64.95	6937
17	-3.00	0.00	124.11	38.03	447.23	70.80	70.80	7186
18	-3.50	0.00	132.87	41.11	477.39	76.23	76.23	7436
19	-4.00	0.00	141.61	44.18	507.47	80.54	80.54	7685
20	-4.30	3.00	143.84	44.96	515.15	78.59	81.59	7835
		3.00	143.84	28.34	686.84	62.07	65.07	29943
21	-4.65	6.50	147.48	29.38	702.77	93.06	99.56	29943
22	-5.00	10.00	151.12	30.41	718.65	107.47	117.47	29943
23	-5.50	15.00	156.30	31.87	741.28	119.20	134.20	29943
24	-6.00	20.00	161.46	33.34	763.84	128.62	148.62	29943
25	-6.60	26.00	167.64	35.09	790.83	137.02	163.02	29943
		26.00	167.64	24.47	849.19	119.10	145.10	49905
26	-7.20	32.00	175.60	26.80	883.98	144.77	176.77	49905
27	-7.60	36.00	180.90	28.35	907.12	165.34	201.34	49905
28	-8.00	40.00	186.19	29.90	930.25	204.37	244.37	49905
29	-8.15	41.50	188.17	30.48	938.91	162.90	204.40	49905
30	-9.57	55.75	206.97	35.97	1021.06	181.15	236.90	49905
31	-11.00	70.00	225.72	41.45	1102.96	219.97	289.97	49905
		70.00	225.72	0.00	6355.77	190.00	260.00	998109
32	-12.70	87.00	254.82	0.00	6759.93	235.72	322.72	998109
33	-14.40	104.00	283.88	0.00	7163.41	264.70	368.70	998109
34	-16.80	128.00	324.84	0.00	7732.14	305.70	433.70	998109
35	-18.40	144.00	352.11	0.00	8110.84	333.09	477.09	998109
36	-20.00	160.00	379.36	0.00	8489.23	357.77	517.77	998109

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
		RIGHT side		Effective stresses				
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	6475
15	-2.00	0.00	8.50	0.00	49.29	45.62	45.62	6726
16	-2.50	0.00	17.00	0.41	78.55	51.41	51.41	6977
17	-3.00	0.00	25.50	3.39	107.81	57.58	57.58	7228
18	-3.50	0.00	34.00	6.38	137.07	64.16	64.16	7479
19	-4.00	0.00	42.50	9.37	166.33	71.79	71.79	7730
20	-4.30	3.00	44.60	10.10	173.57	77.48	80.48	7880
		3.00	44.60	0.23	253.25	177.83	180.83	30115
21	-4.65	6.50	48.11	1.22	268.55	152.21	158.71	30115
22	-5.00	10.00	51.61	2.21	283.85	144.86	154.86	30115
23	-5.50	15.00	56.61	3.63	305.72	143.20	158.20	30115
24	-6.00	20.00	61.62	5.05	327.59	143.85	163.85	30115
25	-6.60	26.00	67.62	6.75	353.84	147.84	173.84	30115
		26.00	67.62	0.00	412.20	165.71	191.71	50192
26	-7.20	32.00	75.43	0.00	446.32	155.41	187.41	50192
27	-7.60	36.00	80.64	0.00	469.07	145.57	181.57	50192
28	-8.00	40.00	85.85	0.57	491.83	113.37	153.37	50192
29	-8.15	41.50	87.80	1.14	500.37	162.93	204.43	50192
30	-9.57	55.75	106.37	6.57	581.49	181.15	236.90	50192
31	-11.00	70.00	124.95	12.00	662.69	179.73	249.73	50192
		70.00	124.95	0.00	4956.57	223.72	293.72	1003838
32	-12.70	87.00	153.95	0.00	5359.20	235.71	322.71	1003838
33	-14.40	104.00	182.97	0.00	5762.25	264.70	368.70	1003838
34	-16.80	128.00	224.01	0.00	6332.08	305.70	433.70	1003838
35	-18.40	144.00	251.41	0.00	6712.54	333.09	477.09	1003838
36	-20.00	160.00	278.84	0.00	7093.48	357.79	517.79	1003838

Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit
9.21A Arching - soil pressure below active limit

```
EDG CONSULTING PTY LTD                                      | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58         | Job No.  B01493
                          Licensed from GEOSOLVE            | Made by :   DJC
Data filename/Run ID: Section_3                             |
Albert Street Development                                   | Date:16-11-2022
Section 3                                                   | Checked :
-------------------------------------------------------------------------------
                                                      Units: kN,m
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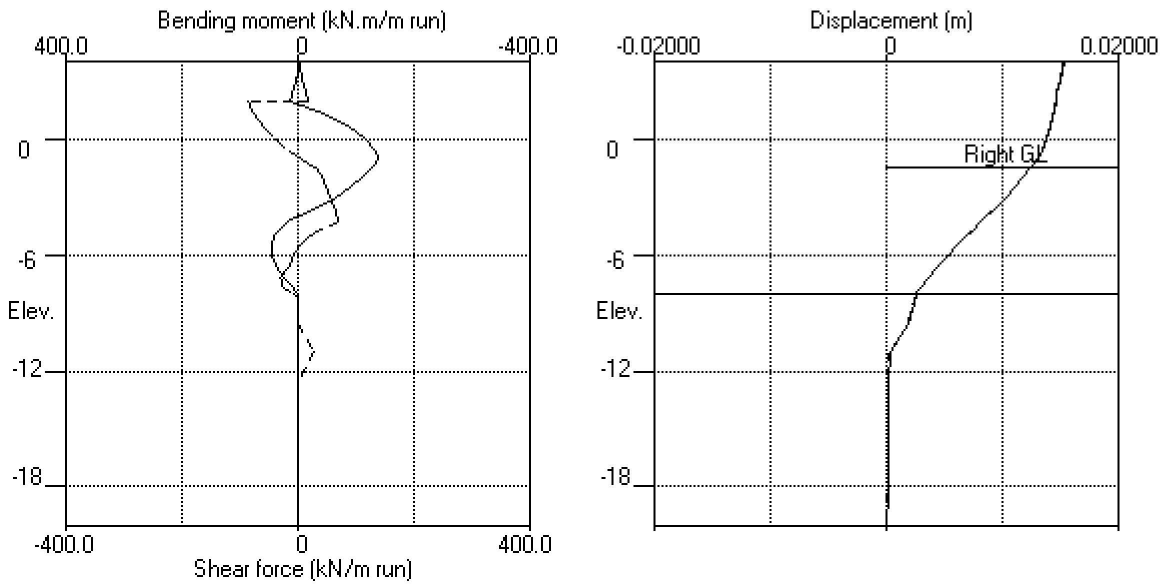
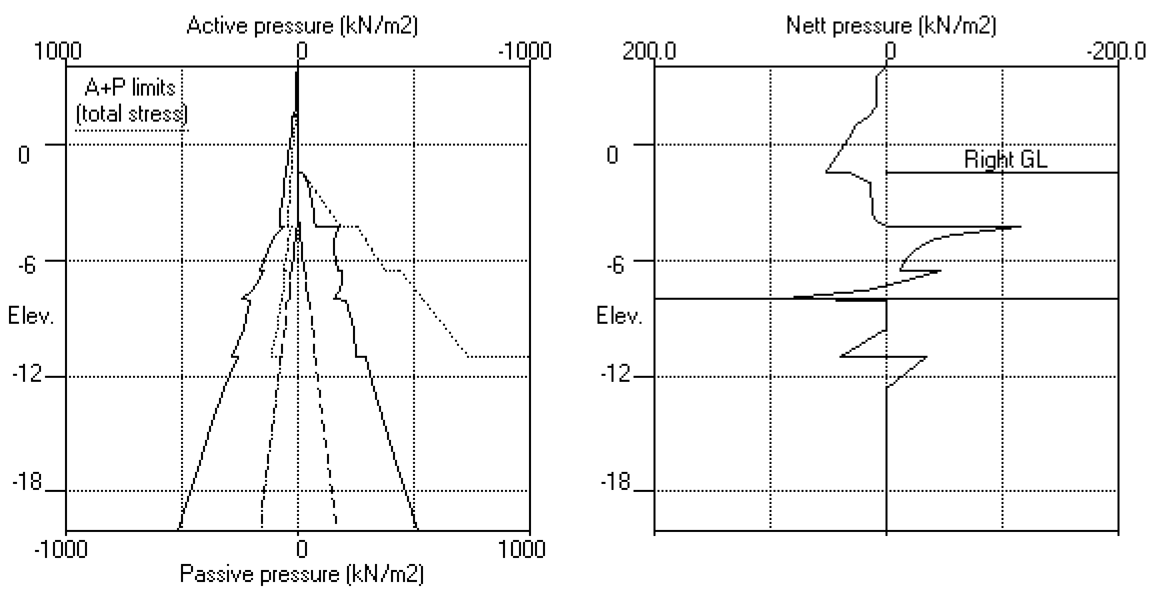
Stage No.4 Excav. to elev. -1.50 on RIGHT side

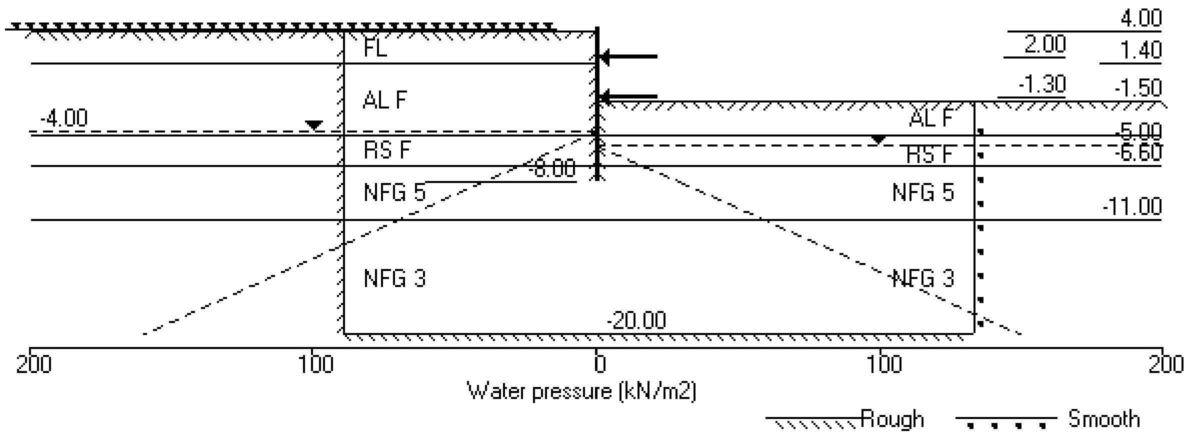


Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No. 6 Apply water pressure profile no.2

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
6	4.00	-1.50		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	3.17E-04	0.0	-0.0		352338
2	3.50	9.43	0.015	3.17E-04	2.4	0.3		352338
3	3.00	9.34	0.015	3.14E-04	7.1	2.9		352338
4	2.65	9.31	0.015	3.10E-04	10.3	6.0		352338
5	2.30	9.68	0.015	3.02E-04	13.6	10.3		352338
6	2.00	9.31	0.015	2.91E-04	16.5	14.9	-102.0	352338
		9.31	0.015	2.91E-04	-85.5	14.9		
7	1.40	15.78	0.014	3.07E-04	-78.0	-33.1		352338
		23.66	0.014	3.07E-04	-78.0	-33.1		
8	1.00	26.28	0.014	3.61E-04	-68.0	-62.2		352338
9	0.60	30.05	0.014	4.46E-04	-56.7	-87.2		352338
10	0.00	36.50	0.014	6.18E-04	-36.7	-115.4		352338
11	-0.60	43.15	0.013	8.28E-04	-12.8	-130.5		352338
12	-0.95	46.89	0.013	9.58E-04	2.9	-132.2		352338
13	-1.30	50.93	0.013	1.08E-03	20.0	-128.3	-4.5	352338
		50.93	0.013	1.08E-03	15.5	-128.3		
14	-1.50	53.05	0.012	1.15E-03	25.9	-124.1		352338
		33.18	0.012	1.15E-03	25.9	-124.1		
15	-2.00	13.51	0.012	1.32E-03	37.6	-107.5		352338
16	-2.50	13.55	0.011	1.46E-03	44.4	-87.0		352338
17	-3.00	13.12	0.010	1.56E-03	51.0	-63.1		352338
18	-3.50	11.84	0.010	1.63E-03	57.3	-36.0		352338
19	-4.00	8.40	0.009	1.66E-03	62.3	-5.8		352338
20	-4.30	2.38	0.008	1.66E-03	64.0	13.3		352338
		-115.74	0.008	1.66E-03	64.0	13.3		
21	-4.65	-57.18	0.008	1.64E-03	33.7	28.6		352338
22	-5.00	-33.86	0.007	1.61E-03	17.8	36.9		352338
23	-5.50	-20.91	0.006	1.55E-03	4.1	41.6		352338
24	-6.00	-12.60	0.006	1.49E-03	-4.3	41.0		352338
25	-6.60	-8.65	0.005	1.43E-03	-10.7	36.2		352338
		-46.81	0.005	1.43E-03	-10.7	36.2		
26	-7.20	-11.14	0.004	1.38E-03	-28.1	21.4		352338
27	-7.60	17.89	0.003	1.36E-03	-26.7	9.3		352338

(continued)

Stage No.6 Apply water pressure profile no.2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	84.12	0.003	1.36E-03	-6.3	-0.0		0
29	-8.15	-0.03	0.003	0	-0.0	0.0		0
30	-9.57	0.01	0.002	0	-0.0	0.0		0
31	-11.00	45.36	0.000	0	32.3	0.0		0
		-38.01	0.000	0	32.3	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.00	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 102.0 kN/m run
At elev. -1.30 Prop force = 4.5 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	9.43	9.43	9981
3	3.00	0.00	17.14	5.30	66.30	9.34	9.34	9981
4	2.65	0.00	23.26	7.19	89.97	9.31	9.31	9981
5	2.30	0.00	29.45	9.10	113.93	9.68	9.68	9981
6	2.00	0.00	34.80	10.76	134.63	9.31	9.31A	9981
7	1.40	0.00	45.59	14.09	176.37	15.78	15.78	9981
		0.00	45.59	10.45	176.98	23.66	23.66	4991
8	1.00	0.00	52.82	12.99	201.83	26.28	26.28	5190
9	0.60	0.00	60.04	15.53	226.69	30.05	30.05	5390
10	0.00	0.00	70.85	19.32	263.90	36.50	36.50	5689
11	-0.60	0.00	81.60	23.10	300.93	43.15	43.15	5989
12	-0.95	0.00	87.86	25.30	322.45	46.89	46.89	6163
13	-1.30	0.00	94.09	27.49	343.90	50.93	50.93	6338
14	-1.50	0.00	97.64	28.73	356.13	53.05	53.05	6438
15	-2.00	0.00	106.49	31.84	386.61	59.02	59.02	6687
16	-2.50	0.00	115.32	34.94	416.97	64.90	64.90	6937
17	-3.00	0.00	124.11	38.03	447.23	70.71	70.71	7186
18	-3.50	0.00	132.87	41.11	477.39	76.08	76.08	7436
19	-4.00	0.00	141.61	44.18	507.47	80.34	80.34	7685
20	-4.30	3.00	143.84	44.96	515.15	78.36	81.36	7835
		3.00	143.84	28.34	686.84	61.19	64.19	29943
21	-4.65	6.50	147.48	29.38	702.77	92.15	98.65	29943
22	-5.00	10.00	151.12	30.41	718.65	106.34	116.34	29943
23	-5.50	15.00	156.30	31.87	741.28	117.85	132.85	29943
24	-6.00	20.00	161.46	33.34	763.84	127.04	147.04	29943
25	-6.60	26.00	167.64	35.09	790.83	135.22	161.22	29943
		26.00	167.64	24.47	849.19	116.10	142.10	49905
26	-7.20	32.00	175.60	26.80	883.98	141.63	173.63	49905
27	-7.60	36.00	180.90	28.35	907.12	161.50	197.50	49905
28	-8.00	40.00	186.19	29.90	930.25	198.17	238.17	49905
29	-8.15	41.50	188.17	30.48	938.91	159.98	201.48	49905
30	-9.57	55.75	206.97	35.97	1021.06	178.28	234.03	49905
31	-11.00	70.00	225.72	41.45	1102.96	219.67	289.67	49905
		70.00	225.72	0.00	6355.77	184.04	254.04	998109
32	-12.70	87.00	254.82	0.00	6759.93	231.90	318.90	998109
33	-14.40	104.00	283.88	0.00	7163.41	260.89	364.89	998109
34	-16.80	128.00	324.84	0.00	7732.14	301.90	429.90	998109
35	-18.40	144.00	352.11	0.00	8110.84	329.30	473.30	998109

(continued)

Stage No.6 Apply water pressure profile no.2

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
36	-20.00	160.00	379.36	0.00	8489.23	353.23	513.23	998109

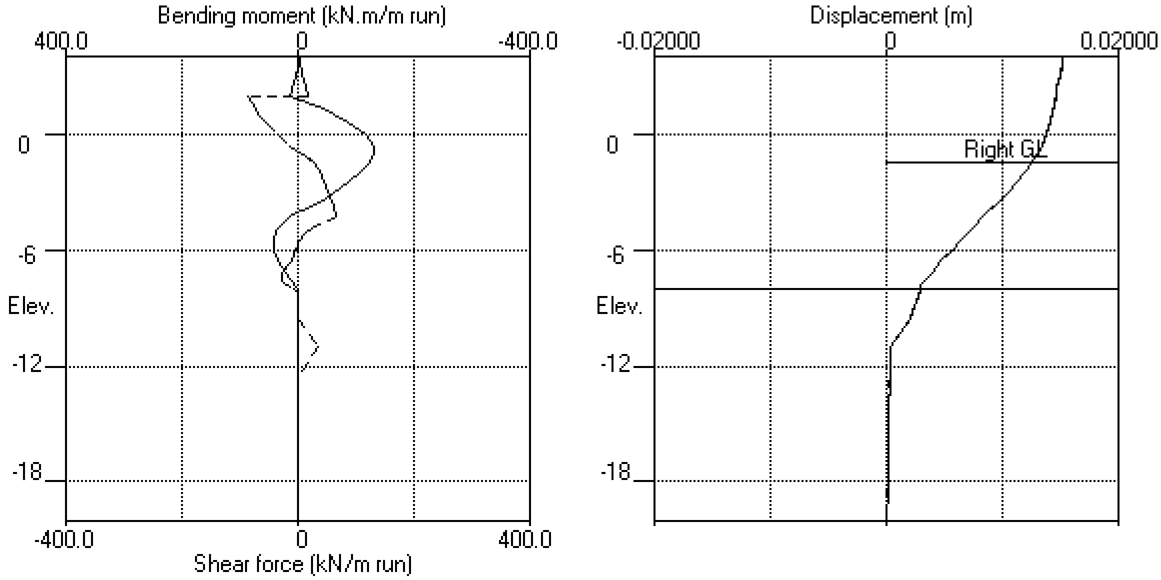
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.87	19.87	6475
15	-2.00	0.00	8.50	0.00	49.29	45.51	45.51	6726
16	-2.50	0.00	17.00	0.41	78.55	51.36	51.36	6977
17	-3.00	0.00	25.50	3.39	107.81	57.59	57.59	7228
18	-3.50	0.00	34.00	6.38	137.07	64.24	64.24	7479
19	-4.00	0.00	42.50	9.37	166.33	71.94	71.94	7730
20	-4.30	0.00	47.60	11.16	183.89	78.98	78.98	7880
		0.00	47.60	1.08	266.36	179.93	179.93	30115
21	-4.65	0.00	54.61	3.06	296.95	155.83	155.83	30115
22	-5.00	0.00	61.61	5.04	327.55	150.20	150.20	30115
23	-5.50	5.00	66.61	6.46	349.41	148.76	153.76	30115
24	-6.00	10.00	71.62	7.88	371.28	149.64	159.64	30115
25	-6.60	16.00	77.62	9.58	397.53	153.88	169.88	30115
		16.00	77.62	0.00	455.89	172.91	188.91	50192
26	-7.20	22.00	85.43	0.45	490.01	162.77	184.77	50192
27	-7.60	26.00	90.64	1.97	512.77	153.61	179.61	50192
28	-8.00	30.00	95.85	3.49	535.52	124.05	154.05	50192
29	-8.15	31.50	97.80	4.07	544.06	170.01	201.51	50192
30	-9.57	45.75	116.37	9.49	625.18	188.27	234.02	50192
31	-11.00	60.00	134.95	14.92	706.38	184.31	244.31	50192
		60.00	134.95	0.00	5095.43	232.05	292.05	1003838
32	-12.70	77.00	163.95	0.00	5498.05	241.89	318.89	1003838
33	-14.40	94.00	192.97	0.00	5901.11	270.88	364.88	1003838
34	-16.80	118.00	234.01	0.00	6470.94	311.90	429.90	1003838
35	-18.40	134.00	261.41	0.00	6851.40	339.30	473.30	1003838
36	-20.00	150.00	288.84	0.00	7232.34	363.24	513.24	1003838

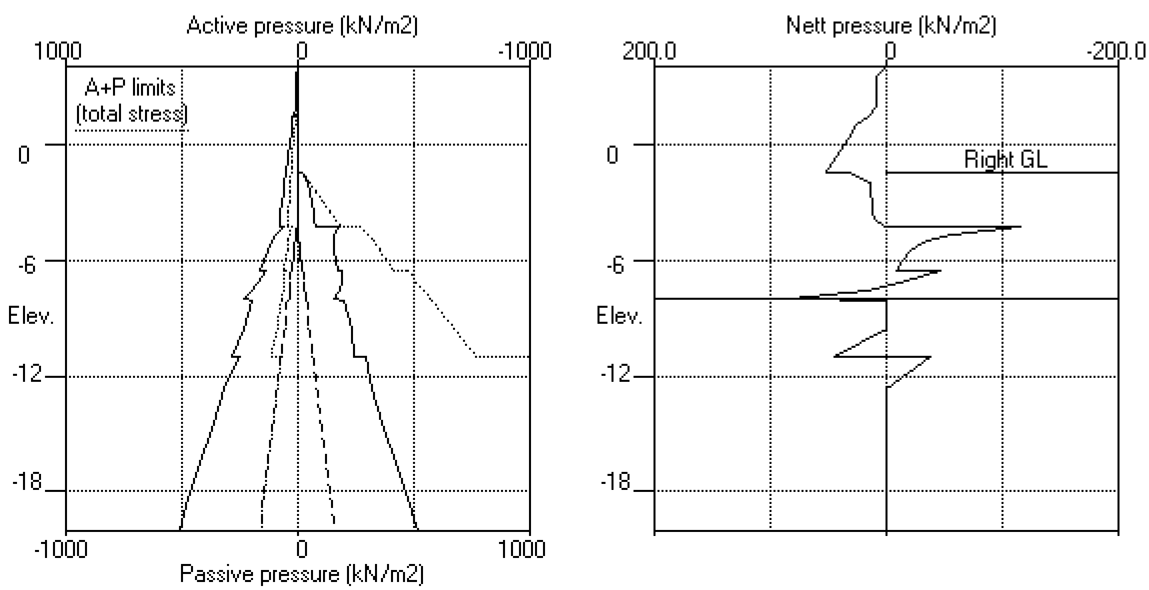
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
9.31A Arching - soil pressure below active limit

Units: kN,m

Stage No.6 Apply water pressure profile no.2

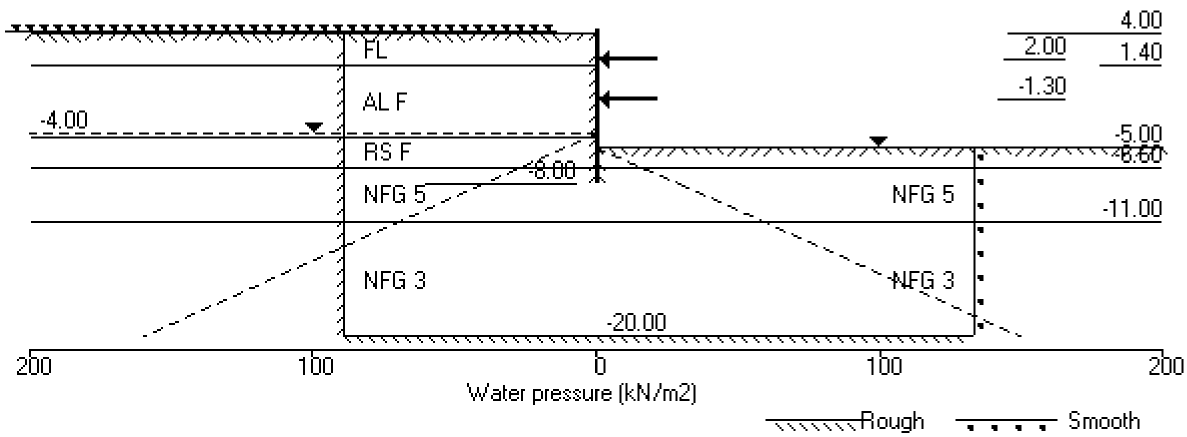


Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -5.00 on RIGHT side

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
7	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-3.73E-04	0.0	0.0		352338
2	3.50	14.27	0.014	-3.73E-04	3.6	0.3		352338
3	3.00	13.03	0.014	-3.76E-04	10.4	4.1		352338
4	2.65	12.29	0.014	-3.83E-04	14.8	8.6		352338
5	2.30	12.09	0.014	-3.94E-04	19.1	14.6		352338
6	2.00	11.03	0.014	-4.09E-04	22.6	21.0	-83.9	352338
		11.03	0.014	-4.09E-04	-61.3	21.0		
7	1.40	16.85	0.015	-4.17E-04	-53.0	-12.2		352338
		24.19	0.015	-4.17E-04	-53.0	-12.2		
8	1.00	26.72	0.015	-3.92E-04	-42.8	-31.3		352338
9	0.60	30.35	0.015	-3.48E-04	-31.4	-46.2		352338
10	0.00	36.51	0.015	-2.59E-04	-11.3	-59.1		352338
11	-0.60	42.74	0.015	-1.58E-04	12.5	-58.9		352338
12	-0.95	45.95	0.015	-1.03E-04	28.0	-51.9		352338
13	-1.30	49.49	0.015	-5.84E-05	44.7	-39.2	-189.4	352338
		49.49	0.015	-5.84E-05	-144.7	-39.2		
14	-1.50	50.75	0.015	-2.83E-05	-134.7	-67.1		352338
15	-2.00	55.52	0.015	1.09E-04	-108.1	-127.6		352338
16	-2.50	59.77	0.015	3.24E-04	-79.3	-174.4		352338
17	-3.00	63.90	0.015	5.94E-04	-48.4	-206.3		352338
18	-3.50	67.61	0.015	8.98E-04	-15.5	-222.3		352338
19	-4.00	70.31	0.014	1.21E-03	19.0	-221.2		352338
20	-4.30	70.05	0.014	1.39E-03	40.0	-212.2		352338
		20.97	0.014	1.39E-03	40.0	-212.2		
21	-4.65	61.58	0.013	1.60E-03	54.5	-197.4		352338
22	-5.00	79.59	0.013	1.78E-03	79.2	-174.6		352338
		21.23	0.013	1.78E-03	79.2	-174.6		
23	-5.50	11.70	0.012	2.00E-03	87.4	-133.3		352338
24	-6.00	0.20	0.011	2.16E-03	90.4	-89.0		352338
25	-6.60	-16.41	0.009	2.26E-03	85.5	-36.0		352338
		-116.12	0.009	2.26E-03	85.5	-36.0		
26	-7.20	-73.00	0.008	2.30E-03	28.8	-5.6		352338
27	-7.60	-36.03	0.007	2.30E-03	7.0	0.1		352338

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	0.76	0.006	2.30E-03	-0.1	-0.0		0
29	-8.15	-0.03	0.006	0	-0.0	0.0		0
30	-9.57	0.01	0.004	0	-0.0	0.0		0
31	-11.00	70.00	0.001	0	49.9	0.0		0
		-58.66	0.001	0	49.9	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.01	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 83.9 kN/m run
At elev. -1.30 Prop force = 189.4 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	14.27	14.27	9981
3	3.00	0.00	17.14	5.30	66.30	13.03	13.03	9981
4	2.65	0.00	23.26	7.19	89.97	12.29	12.29	9981
5	2.30	0.00	29.45	9.10	113.93	12.09	12.09	9981
6	2.00	0.00	34.80	10.76	134.63	11.03	11.03	9981
7	1.40	0.00	45.59	14.09	176.37	16.85	16.85	9981
		0.00	45.59	10.45	176.98	24.19	24.19	4991
8	1.00	0.00	52.82	12.99	201.83	26.72	26.72	5190
9	0.60	0.00	60.04	15.53	226.69	30.35	30.35	5390
10	0.00	0.00	70.85	19.32	263.90	36.51	36.51	5689
11	-0.60	0.00	81.60	23.10	300.93	42.74	42.74	5989
12	-0.95	0.00	87.86	25.30	322.45	45.95	45.95	6163
13	-1.30	0.00	94.09	27.49	343.90	49.49	49.49	6338
14	-1.50	0.00	97.64	28.73	356.13	50.75	50.75	6438
15	-2.00	0.00	106.49	31.84	386.61	55.52	55.52	6687
16	-2.50	0.00	115.32	34.94	416.97	59.77	59.77	6937
17	-3.00	0.00	124.11	38.03	447.23	63.90	63.90	7186
18	-3.50	0.00	132.87	41.11	477.39	67.61	67.61	7436
19	-4.00	0.00	141.61	44.18	507.47	70.31	70.31	7685
20	-4.30	3.00	143.84	44.96	515.15	67.05	70.05	7835
		3.00	143.84	28.34	686.84	17.97	20.97A	29943
21	-4.65	6.50	147.48	29.38	702.77	55.08	61.58	29943
22	-5.00	10.00	151.12	30.41	718.65	69.59	79.59	29943
23	-5.50	15.00	156.30	31.87	741.28	81.91	96.91	29943
24	-6.00	20.00	161.46	33.34	763.84	92.25	112.25	29943
25	-6.60	26.00	167.64	35.09	790.83	101.87	127.87	29943
		26.00	167.64	24.47	849.19	60.51	86.51	49905
26	-7.20	32.00	175.60	26.80	883.98	98.03	130.03	49905
27	-7.60	36.00	180.90	28.35	907.12	121.62	157.62	49905
28	-8.00	40.00	186.19	29.90	930.25	144.76	184.76	49905
29	-8.15	41.50	188.17	30.48	938.91	146.67	188.17	49905
30	-9.57	55.75	206.97	35.97	1021.06	165.18	220.93	49905
31	-11.00	70.00	225.72	41.45	1102.96	218.76	288.76	49905
		70.00	225.72	0.00	6355.77	165.86	235.86	998109
32	-12.70	87.00	254.82	0.00	6759.93	223.96	310.96	998109
33	-14.40	104.00	283.88	0.00	7163.41	252.91	356.91	998109
34	-16.80	128.00	324.84	0.00	7732.14	293.96	421.96	998109
35	-18.40	144.00	352.11	0.00	8110.84	321.40	465.40	998109

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
36	-20.00	160.00	379.36	0.00	8489.23	343.66	503.66	998109

RIGHT side

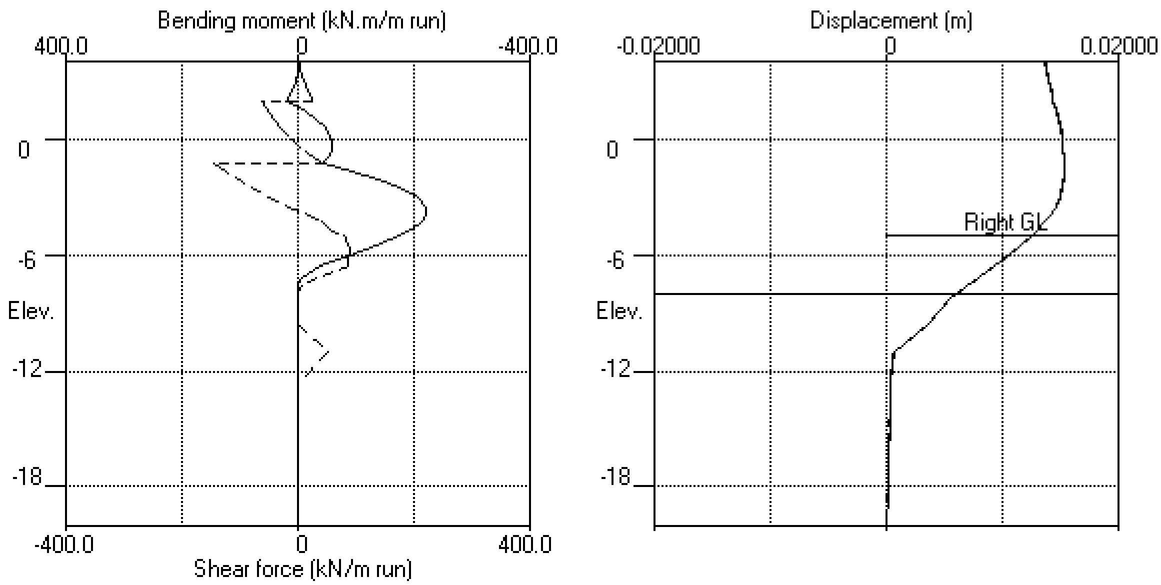
Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	30080
23	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	30080
24	-6.00	10.00	10.00	0.00	102.05	102.05	112.05p	30080
25	-6.60	16.00	16.00	0.00	128.28	128.28	144.28p	30080
		16.00	16.00	0.00	186.63	186.63	202.63p	50133
26	-7.20	22.00	23.80	0.00	220.72	181.03	203.03	50133
27	-7.60	26.00	29.01	0.00	243.45	167.64	193.64	50133
28	-8.00	30.00	34.21	0.00	266.19	154.00	184.00	50133
29	-8.15	31.50	36.16	0.00	274.71	156.71	188.21	50133
30	-9.57	45.75	54.70	0.00	355.74	175.17	220.92	50133
31	-11.00	60.00	73.27	0.00	436.84	158.77	218.77	50133
		60.00	73.27	0.00	4238.84	234.53	294.53	1002652
32	-12.70	77.00	102.24	0.00	4641.14	233.96	310.96	1002652
33	-14.40	94.00	131.25	0.00	5043.96	262.91	356.91	1002652
34	-16.80	118.00	172.28	0.00	5613.73	303.96	421.96	1002652
35	-18.40	134.00	199.69	0.00	5994.39	331.40	465.40	1002652
36	-20.00	150.00	227.16	0.00	6375.76	353.67	503.67	1002652

Note: 12.34 a Soil pressure at active limit
202.63 p Soil pressure at passive limit
20.97A Arching - soil pressure below active limit

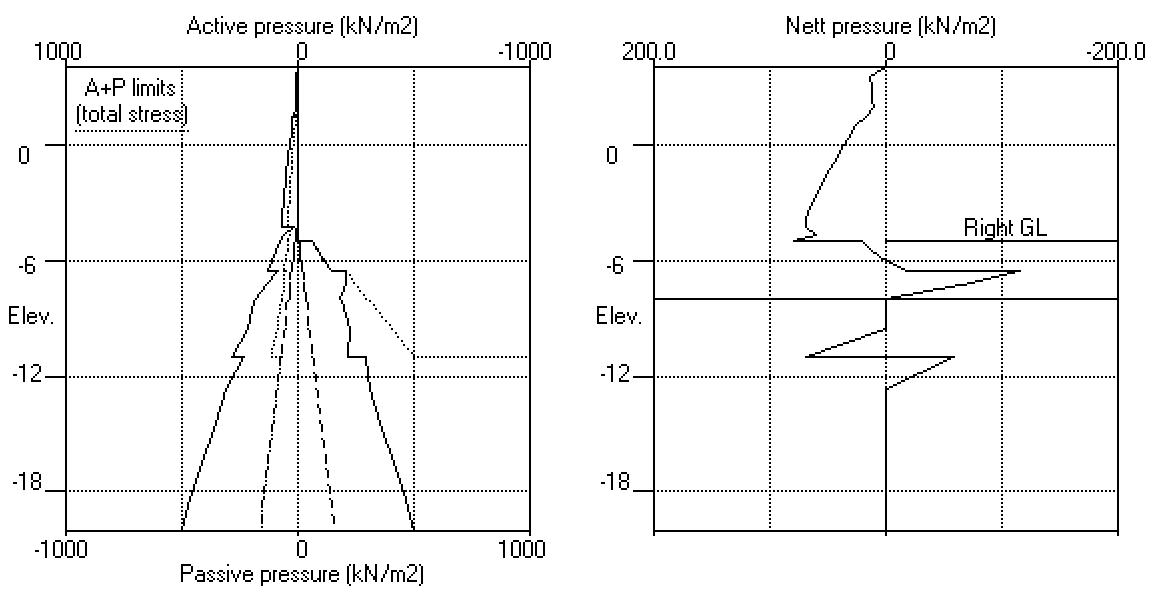
EDG CONSULTING PTY LTD | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. B01493
Licensed from GEOSOLVE | Made by : DJC
Data filename/Run ID: Section_3 |
Albert Street Development | Date:16-11-2022
Section 3 | Checked :

Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side

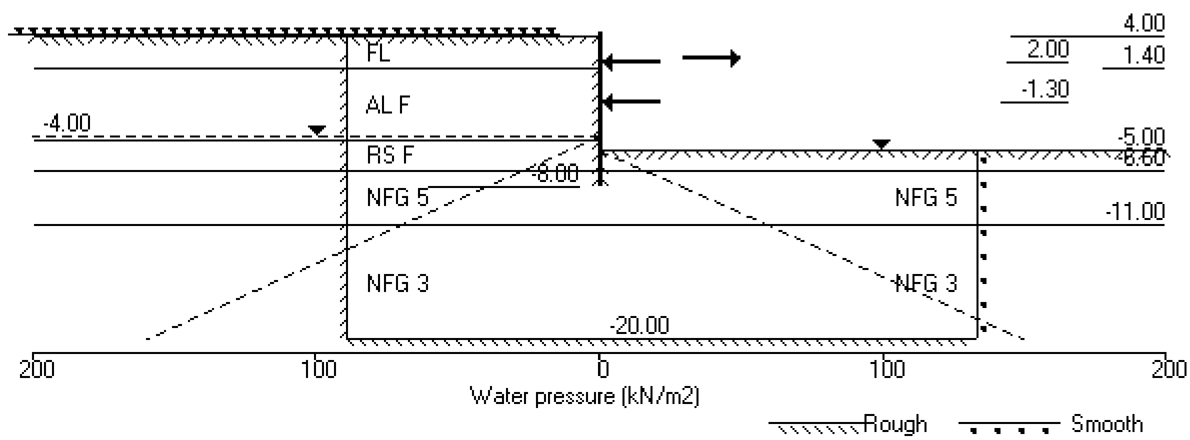


Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.30



Units: kN,m

Stage No. 8 Apply load no.1 at elevation 2.30

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
8	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-2.13E-04	0.0	0.0		352338
2	3.50	12.65	0.014	-2.13E-04	3.2	0.3		352338
3	3.00	11.85	0.015	-2.16E-04	9.3	3.7		352338
4	2.65	11.37	0.015	-2.22E-04	13.3	7.7		352338
5	2.30	11.38	0.015	-2.32E-04	17.3	13.2	34.0	352338
		11.38	0.015	-2.32E-04	51.3	13.2		
6	2.00	10.60	0.015	-2.50E-04	54.6	29.2	-114.8	352338
		10.60	0.015	-2.50E-04	-60.2	29.2		
7	1.40	16.71	0.015	-2.72E-04	-52.0	-3.4		352338
		24.12	0.015	-2.72E-04	-52.0	-3.4		
8	1.00	26.65	0.015	-2.58E-04	-41.9	-22.1		352338
9	0.60	30.29	0.015	-2.25E-04	-30.5	-36.6		352338
10	0.00	36.50	0.015	-1.52E-04	-10.4	-49.0		352338
11	-0.60	42.78	0.015	-6.92E-05	13.4	-48.3		352338
12	-0.95	46.03	0.015	-2.49E-05	28.9	-40.9		352338
13	-1.30	49.59	0.015	9.22E-06	45.6	-27.9	-193.0	352338
		49.59	0.015	9.22E-06	-147.3	-27.9		
14	-1.50	50.87	0.015	3.31E-05	-137.3	-56.4		352338
15	-2.00	55.65	0.015	1.56E-04	-110.6	-118.1		352338
16	-2.50	59.92	0.015	3.58E-04	-81.7	-166.2		352338
17	-3.00	64.05	0.015	6.18E-04	-50.8	-199.3		352338
18	-3.50	67.75	0.015	9.13E-04	-17.8	-216.4		352338
19	-4.00	70.46	0.014	1.22E-03	16.7	-216.5		352338
20	-4.30	70.18	0.014	1.40E-03	37.8	-208.2		352338
		21.46	0.014	1.40E-03	37.8	-208.2		
21	-4.65	62.01	0.013	1.60E-03	52.4	-194.1		352338
22	-5.00	79.98	0.013	1.78E-03	77.3	-172.0		352338
		22.13	0.013	1.78E-03	77.3	-172.0		
23	-5.50	12.40	0.012	1.99E-03	85.9	-131.6		352338
24	-6.00	0.80	0.011	2.15E-03	89.2	-87.9		352338
25	-6.60	-15.88	0.009	2.25E-03	84.7	-35.5		352338
		-115.25	0.009	2.25E-03	84.7	-35.5		
26	-7.20	-72.41	0.008	2.29E-03	28.4	-5.4		352338

(continued)

Stage No.8 Apply load no.1 at elevation 2.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-7.60	-35.61	0.007	2.29E-03	6.8	0.1		352338
28	-8.00	1.16	0.006	2.29E-03	-0.1	-0.0		0
29	-8.15	-0.03	0.006	0	-0.0	0.0		0
30	-9.57	0.01	0.004	0	-0.0	0.0		0
31	-11.00	70.00	0.001	0	49.9	0.0		0
		-58.66	0.001	0	49.9	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.01	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 114.8 kN/m run
At elev. -1.30 Prop force = 193.0 kN/m run

LEFT side

			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	12.65	12.65	9981
3	3.00	0.00	17.14	5.30	66.30	11.85	11.85	9981
4	2.65	0.00	23.26	7.19	89.97	11.37	11.37	9981
5	2.30	0.00	29.45	9.10	113.93	11.38	11.38	9981
6	2.00	0.00	34.80	10.76	134.63	10.60	10.60A	9981
7	1.40	0.00	45.59	14.09	176.37	16.71	16.71	9981
		0.00	45.59	10.45	176.98	24.12	24.12	4991
8	1.00	0.00	52.82	12.99	201.83	26.65	26.65	5190
9	0.60	0.00	60.04	15.53	226.69	30.29	30.29	5390
10	0.00	0.00	70.85	19.32	263.90	36.50	36.50	5689
11	-0.60	0.00	81.60	23.10	300.93	42.78	42.78	5989
12	-0.95	0.00	87.86	25.30	322.45	46.03	46.03	6163
13	-1.30	0.00	94.09	27.49	343.90	49.59	49.59	6338
14	-1.50	0.00	97.64	28.73	356.13	50.87	50.87	6438
15	-2.00	0.00	106.49	31.84	386.61	55.65	55.65	6687
16	-2.50	0.00	115.32	34.94	416.97	59.92	59.92	6937
17	-3.00	0.00	124.11	38.03	447.23	64.05	64.05	7186
18	-3.50	0.00	132.87	41.11	477.39	67.75	67.75	7436
19	-4.00	0.00	141.61	44.18	507.47	70.46	70.46	7685
20	-4.30	3.00	143.84	44.96	515.15	67.18	70.18	7835
		3.00	143.84	28.34	686.84	18.46	21.46A	29943
21	-4.65	6.50	147.48	29.38	702.77	55.51	62.01	29943
22	-5.00	10.00	151.12	30.41	718.65	69.98	79.98	29943
23	-5.50	15.00	156.30	31.87	741.28	82.26	97.26	29943
24	-6.00	20.00	161.46	33.34	763.84	92.56	112.56	29943
25	-6.60	26.00	167.64	35.09	790.83	102.14	128.14	29943
		26.00	167.64	24.47	849.19	60.96	86.96	49905
26	-7.20	32.00	175.60	26.80	883.98	98.33	130.33	49905
27	-7.60	36.00	180.90	28.35	907.12	121.83	157.83	49905
28	-8.00	40.00	186.19	29.90	930.25	144.96	184.96	49905
29	-8.15	41.50	188.17	30.48	938.91	146.68	188.18	49905
30	-9.57	55.75	206.97	35.97	1021.06	165.18	220.93	49905
31	-11.00	70.00	225.72	41.45	1102.96	218.76	288.76	49905
		70.00	225.72	0.00	6355.77	165.87	235.87	998109
32	-12.70	87.00	254.82	0.00	6759.93	223.97	310.97	998109
33	-14.40	104.00	283.88	0.00	7163.41	252.91	356.91	998109
34	-16.80	128.00	324.84	0.00	7732.14	293.96	421.96	998109

(continued)

Stage No.8 Apply load no.1 at elevation 2.30

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
35	-18.40	144.00	352.11	0.00	8110.84	321.40	465.40	998109
36	-20.00	160.00	379.36	0.00	8489.23	343.66	503.66	998109

RIGHT side

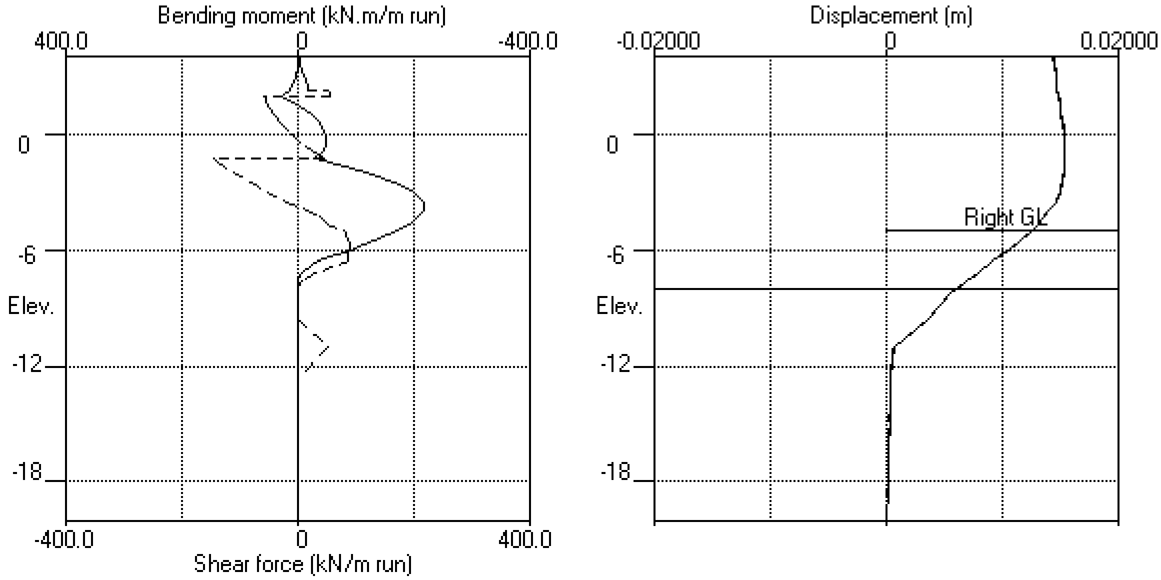
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	57.85	57.85	30080
23	-5.50	5.00	5.00	0.00	80.21	79.86	84.86	30080
24	-6.00	10.00	10.00	0.00	102.05	101.76	111.76	30080
25	-6.60	16.00	16.00	0.00	128.28	128.02	144.02	30080
		16.00	16.00	0.00	186.63	186.21	202.21	50133
26	-7.20	22.00	23.80	0.00	220.72	180.74	202.74	50133
27	-7.60	26.00	29.01	0.00	243.45	167.44	193.44	50133
28	-8.00	30.00	34.21	0.00	266.19	153.80	183.80	50133
29	-8.15	31.50	36.16	0.00	274.71	156.71	188.21	50133
30	-9.57	45.75	54.70	0.00	355.74	175.17	220.92	50133
31	-11.00	60.00	73.27	0.00	436.84	158.77	218.77	50133
		60.00	73.27	0.00	4238.84	234.54	294.54	1002652
32	-12.70	77.00	102.24	0.00	4641.14	233.96	310.96	1002652
33	-14.40	94.00	131.25	0.00	5043.96	262.91	356.91	1002652
34	-16.80	118.00	172.28	0.00	5613.73	303.96	421.96	1002652
35	-18.40	134.00	199.69	0.00	5994.39	331.39	465.39	1002652
36	-20.00	150.00	227.16	0.00	6375.76	353.67	503.67	1002652

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
21.46A Arching - soil pressure below active limit

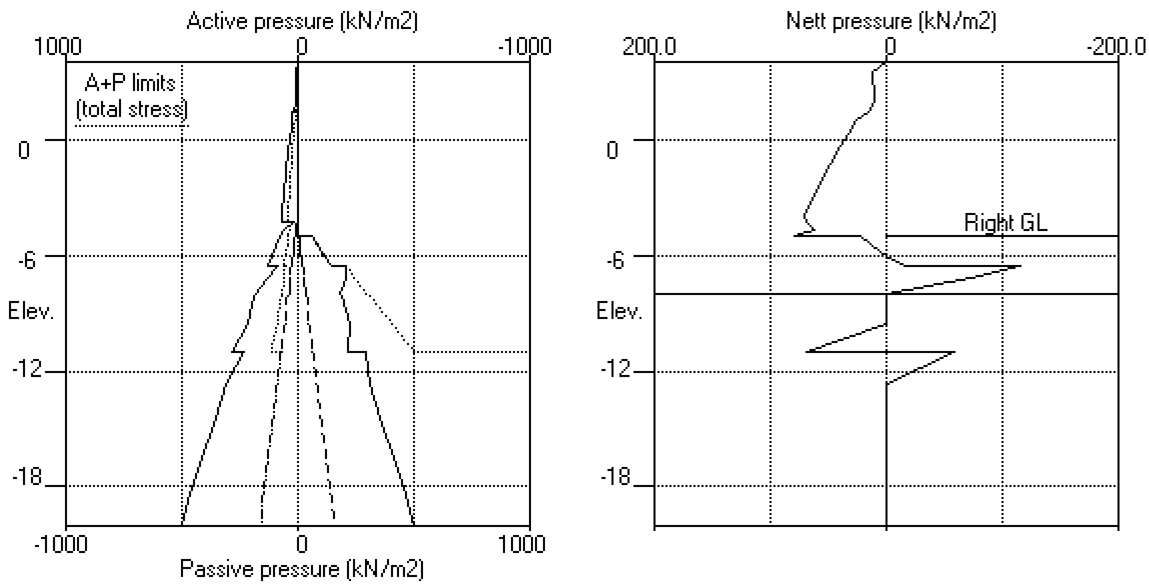
```
EDG CONSULTING PTY LTD                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58             | Job No.  B01493
                          Licensed from GEOSOLVE                | Made by :   DJC
Data filename/Run ID: Section_3                                 |
Albert Street Development                                       | Date:16-11-2022
Section 3                                                       | Checked :
------------------------------------------------------------------------------
```

Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.30

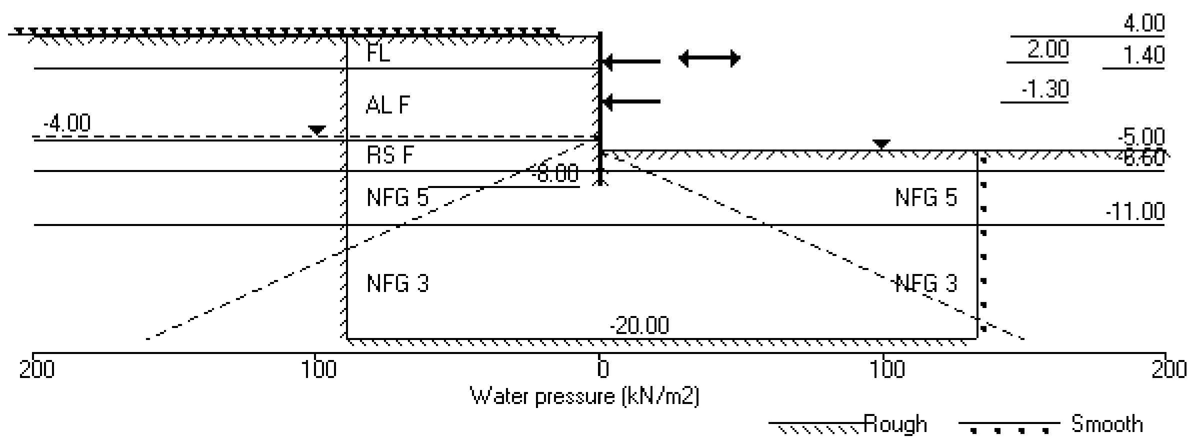


Stage No.8 Apply load no.1 at elev. 2.30



Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.30



Units: kN,m

Stage No. 9 Apply load no.2 at elevation 2.30

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
9	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-3.73E-04	0.0	0.0		352338
2	3.50	14.27	0.014	-3.73E-04	3.6	0.3		352338
3	3.00	13.03	0.014	-3.76E-04	10.4	4.1		352338
4	2.65	12.29	0.014	-3.83E-04	14.8	8.6		352338
5	2.30	12.09	0.014	-3.94E-04	19.1	14.6		352338
6	2.00	11.03	0.014	-4.09E-04	22.6	21.0	-83.9	352338
		11.03	0.014	-4.09E-04	-61.3	21.0		
7	1.40	16.85	0.015	-4.17E-04	-53.0	-12.2		352338
		24.19	0.015	-4.17E-04	-53.0	-12.2		
8	1.00	26.72	0.015	-3.92E-04	-42.8	-31.3		352338
9	0.60	30.35	0.015	-3.48E-04	-31.4	-46.2		352338
10	0.00	36.51	0.015	-2.59E-04	-11.3	-59.1		352338
11	-0.60	42.74	0.015	-1.58E-04	12.5	-58.9		352338
12	-0.95	45.95	0.015	-1.03E-04	28.0	-51.9		352338
13	-1.30	49.49	0.015	-5.84E-05	44.7	-39.2	-189.4	352338
		49.49	0.015	-5.84E-05	-144.7	-39.2		
14	-1.50	50.75	0.015	-2.83E-05	-134.7	-67.1		352338
15	-2.00	55.52	0.015	1.09E-04	-108.1	-127.6		352338
16	-2.50	59.77	0.015	3.24E-04	-79.3	-174.4		352338
17	-3.00	63.90	0.015	5.94E-04	-48.4	-206.3		352338
18	-3.50	67.61	0.015	8.98E-04	-15.5	-222.3		352338
19	-4.00	70.31	0.014	1.21E-03	19.0	-221.2		352338
20	-4.30	70.05	0.014	1.39E-03	40.0	-212.2		352338
		20.97	0.014	1.39E-03	40.0	-212.2		
21	-4.65	61.58	0.013	1.60E-03	54.5	-197.4		352338
22	-5.00	79.59	0.013	1.78E-03	79.2	-174.6		352338
		21.23	0.013	1.78E-03	79.2	-174.6		
23	-5.50	11.70	0.012	2.00E-03	87.4	-133.3		352338
24	-6.00	0.20	0.011	2.16E-03	90.4	-89.0		352338
25	-6.60	-16.41	0.009	2.26E-03	85.5	-36.0		352338
		-116.12	0.009	2.26E-03	85.5	-36.0		
26	-7.20	-73.00	0.008	2.30E-03	28.8	-5.6		352338
27	-7.60	-36.03	0.007	2.30E-03	7.0	0.1		352338

(continued)

Stage No.9 Apply load no.2 at elevation 2.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	0.76	0.006	2.30E-03	-0.1	-0.0		0
29	-8.15	-0.03	0.006	0	-0.0	0.0		0
30	-9.57	0.01	0.004	0	-0.0	0.0		0
31	-11.00	70.00	0.001	0	49.9	0.0		0
		-58.66	0.001	0	49.9	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.01	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 83.9 kN/m run
At elev. -1.30 Prop force = 189.4 kN/m run

		LEFT side						
				Effective stresses			Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	14.27	14.27	9981
3	3.00	0.00	17.14	5.30	66.30	13.03	13.03	9981
4	2.65	0.00	23.26	7.19	89.97	12.29	12.29	9981
5	2.30	0.00	29.45	9.10	113.93	12.09	12.09	9981
6	2.00	0.00	34.80	10.76	134.63	11.03	11.03	9981
7	1.40	0.00	45.59	14.09	176.37	16.85	16.85	9981
		0.00	45.59	10.45	176.98	24.19	24.19	4991
8	1.00	0.00	52.82	12.99	201.83	26.72	26.72	5190
9	0.60	0.00	60.04	15.53	226.69	30.35	30.35	5390
10	0.00	0.00	70.85	19.32	263.90	36.51	36.51	5689
11	-0.60	0.00	81.60	23.10	300.93	42.74	42.74	5989
12	-0.95	0.00	87.86	25.30	322.45	45.95	45.95	6163
13	-1.30	0.00	94.09	27.49	343.90	49.49	49.49	6338
14	-1.50	0.00	97.64	28.73	356.13	50.75	50.75	6438
15	-2.00	0.00	106.49	31.84	386.61	55.52	55.52	6687
16	-2.50	0.00	115.32	34.94	416.97	59.77	59.77	6937
17	-3.00	0.00	124.11	38.03	447.23	63.90	63.90	7186
18	-3.50	0.00	132.87	41.11	477.39	67.61	67.61	7436
19	-4.00	0.00	141.61	44.18	507.47	70.31	70.31	7685
20	-4.30	3.00	143.84	44.96	515.15	67.05	70.05	7835
		3.00	143.84	28.34	686.84	17.97	20.97A	29943
21	-4.65	6.50	147.48	29.38	702.77	55.08	61.58	29943
22	-5.00	10.00	151.12	30.41	718.65	69.59	79.59	29943
23	-5.50	15.00	156.30	31.87	741.28	81.91	96.91	29943
24	-6.00	20.00	161.46	33.34	763.84	92.25	112.25	29943
25	-6.60	26.00	167.64	35.09	790.83	101.87	127.87	29943
		26.00	167.64	24.47	849.19	60.51	86.51	49905
26	-7.20	32.00	175.60	26.80	883.98	98.03	130.03	49905
27	-7.60	36.00	180.90	28.35	907.12	121.62	157.62	49905
28	-8.00	40.00	186.19	29.90	930.25	144.76	184.76	49905
29	-8.15	41.50	188.17	30.48	938.91	146.67	188.17	49905
30	-9.57	55.75	206.97	35.97	1021.06	165.18	220.93	49905
31	-11.00	70.00	225.72	41.45	1102.96	218.76	288.76	49905
		70.00	225.72	0.00	6355.77	165.86	235.86	998109
32	-12.70	87.00	254.82	0.00	6759.93	223.96	310.96	998109
33	-14.40	104.00	283.88	0.00	7163.41	252.91	356.91	998109
34	-16.80	128.00	324.84	0.00	7732.14	293.96	421.96	998109
35	-18.40	144.00	352.11	0.00	8110.84	321.40	465.40	998109

(continued)

Stage No.9 Apply load no.2 at elevation 2.30

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
36	-20.00	160.00	379.36	0.00	8489.23	343.66	503.66	998109

RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	30080
23	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	30080
24	-6.00	10.00	10.00	0.00	102.05	102.05	112.05p	30080
25	-6.60	16.00	16.00	0.00	128.28	128.28	144.28p	30080
		16.00	16.00	0.00	186.63	186.63	202.63p	50133
26	-7.20	22.00	23.80	0.00	220.72	181.03	203.03	50133
27	-7.60	26.00	29.01	0.00	243.45	167.64	193.64	50133
28	-8.00	30.00	34.21	0.00	266.19	154.00	184.00	50133
29	-8.15	31.50	36.16	0.00	274.71	156.71	188.21	50133
30	-9.57	45.75	54.70	0.00	355.74	175.17	220.92	50133
31	-11.00	60.00	73.27	0.00	436.84	158.77	218.77	50133
		60.00	73.27	0.00	4238.84	234.53	294.53	1002652
32	-12.70	77.00	102.24	0.00	4641.14	233.96	310.96	1002652
33	-14.40	94.00	131.25	0.00	5043.96	262.91	356.91	1002652
34	-16.80	118.00	172.28	0.00	5613.73	303.96	421.96	1002652
35	-18.40	134.00	199.69	0.00	5994.39	331.40	465.40	1002652
36	-20.00	150.00	227.16	0.00	6375.76	353.67	503.67	1002652

Note: 12.34 a Soil pressure at active limit
202.63 p Soil pressure at passive limit
20.97A Arching - soil pressure below active limit

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EDG CONSULTING PTY LTD                                      | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58         | Job No.  B01493
                             Licensed from GEOSOLVE         | Made by :   DJC
Data filename/Run ID: Section_3                             |
Albert Street Development                                   | Date:16-11-2022
Section 3                                                   | Checked :
-----------------------------------------------------------------------------
                                                        Units: kN,m
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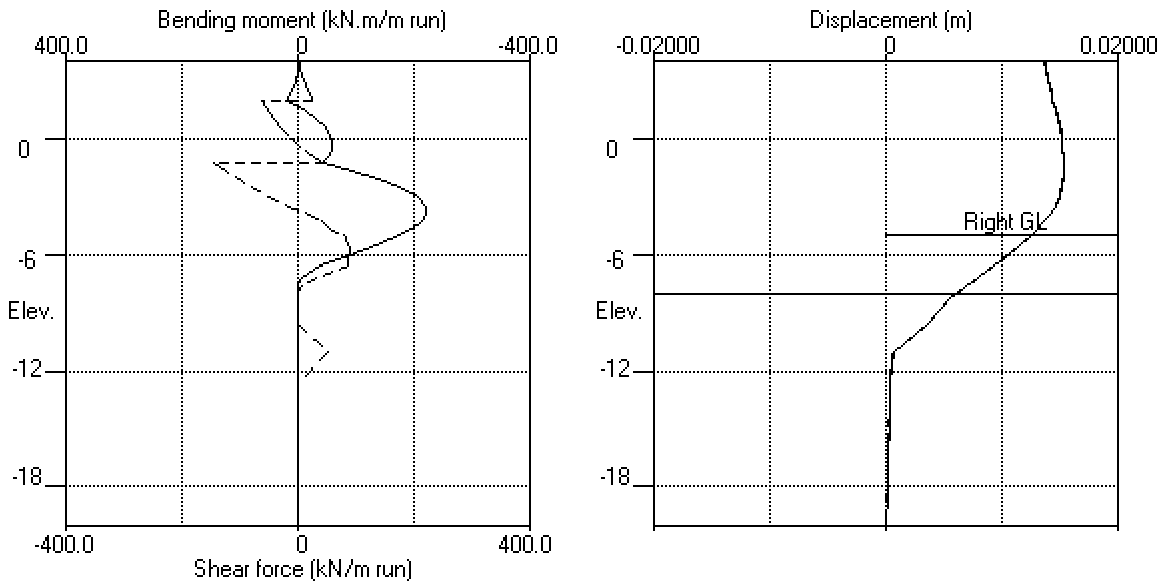
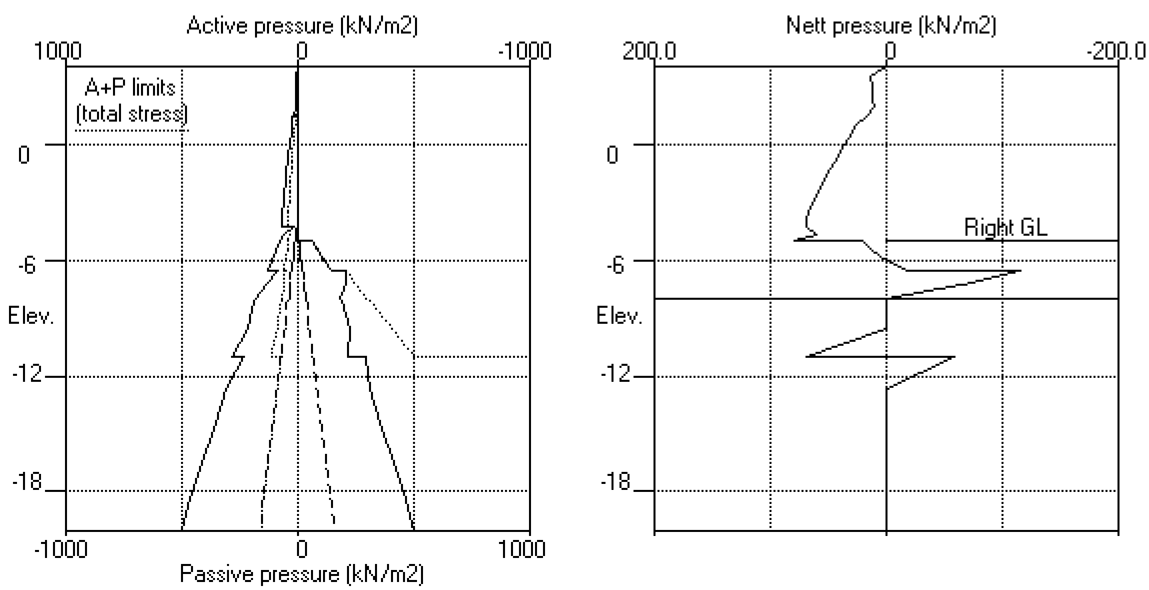
Stage No.9 Apply load no.2 at elev. 2.30

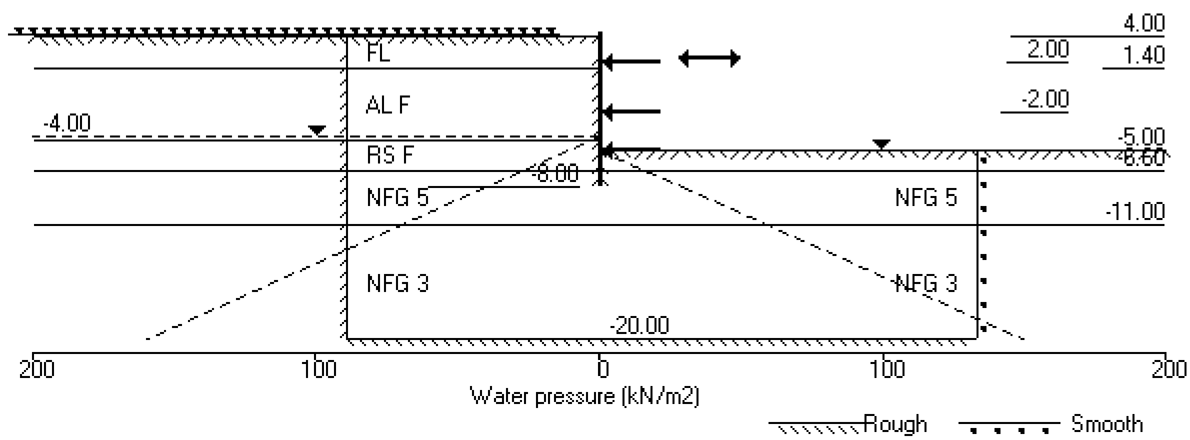


Stage No.9 Apply load no.2 at elev. 2.30



Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No. 12 Remove strut or anchor no.2 at elevation -1.30

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
12	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-5.33E-04	0.0	0.0		352338
2	3.50	14.81	0.014	-5.33E-04	3.7	0.3		352338
3	3.00	13.22	0.014	-5.36E-04	10.7	4.2		352338
4	2.65	12.21	0.014	-5.43E-04	15.2	8.9		352338
5	2.30	11.81	0.015	-5.55E-04	19.4	15.0		352338
6	2.00	10.46	0.015	-5.70E-04	22.7	21.4	-106.2	352338
		10.46	0.015	-5.70E-04	-83.5	21.4		
7	1.40	15.90	0.015	-5.67E-04	-75.6	-25.1		352338
		23.72	0.015	-5.67E-04	-75.6	-25.1		
8	1.00	26.08	0.015	-5.23E-04	-65.6	-53.3		352338
9	0.60	29.55	0.015	-4.48E-04	-54.5	-77.4		352338
10	0.00	35.54	0.016	-2.94E-04	-35.0	-104.3		352338
11	-0.60	41.66	0.016	-1.04E-04	-11.8	-118.5		352338
12	-0.95	44.85	0.016	1.40E-05	3.3	-120.0		352338
13	-1.30	48.47	0.016	1.31E-04	19.7	-116.0		352338
14	-1.50	49.99	0.016	1.95E-04	29.5	-111.1		352338
15	-2.00	55.13	0.016	3.38E-04	55.8	-89.5	-173.6	352338
		55.13	0.016	3.38E-04	-117.8	-89.5		
16	-2.50	59.66	0.015	5.01E-04	-89.1	-141.3		352338
17	-3.00	63.92	0.015	7.28E-04	-58.2	-178.1		352338
18	-3.50	67.68	0.015	9.96E-04	-25.3	-199.0		352338
19	-4.00	70.37	0.014	1.28E-03	9.2	-202.8		352338
20	-4.30	70.01	0.014	1.45E-03	30.3	-196.8		352338
		20.83	0.014	1.45E-03	30.3	-196.8		
21	-4.65	61.84	0.013	1.64E-03	44.7	-185.4		352338
22	-5.00	80.02	0.013	1.81E-03	69.6	-166.0	5.5	352338
		21.66	0.013	1.81E-03	75.0	-166.0		
23	-5.50	12.32	0.012	2.02E-03	83.5	-126.7		352338
24	-6.00	1.00	0.011	2.17E-03	86.9	-84.3		352338
25	-6.60	-15.55	0.009	2.27E-03	82.5	-33.3		352338
		-114.70	0.009	2.27E-03	82.5	-33.3		
26	-7.20	-71.54	0.008	2.30E-03	26.6	-4.4		352338
27	-7.60	-34.17	0.007	2.30E-03	5.5	0.5		352338

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	4.87	0.006	2.30E-03	-0.4	-0.0		0
29	-8.15	-0.03	0.006	0	-0.0	0.0		0
30	-9.57	0.01	0.004	0	-0.0	0.0		0
31	-11.00	70.00	0.001	0	49.9	0.0		0
		-58.66	0.001	0	49.9	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.01	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 106.2 kN/m run
At elev. -2.00 Prop force = 173.6 kN/m run
At elev. -5.00 Prop force = -5.5 kN/m run

		LEFT side						
			Effective stresses					
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	14.81	14.81	9981
3	3.00	0.00	17.14	5.30	66.30	13.22	13.22	9981
4	2.65	0.00	23.26	7.19	89.97	12.21	12.21	9981
5	2.30	0.00	29.45	9.10	113.93	11.81	11.81	9981
6	2.00	0.00	34.80	10.76	134.63	10.46	10.46A	9981
7	1.40	0.00	45.59	14.09	176.37	15.90	15.90	9981
		0.00	45.59	10.45	176.98	23.72	23.72	4991
8	1.00	0.00	52.82	12.99	201.83	26.08	26.08	5190
9	0.60	0.00	60.04	15.53	226.69	29.55	29.55	5390
10	0.00	0.00	70.85	19.32	263.90	35.54	35.54	5689
11	-0.60	0.00	81.60	23.10	300.93	41.66	41.66	5989
12	-0.95	0.00	87.86	25.30	322.45	44.85	44.85	6163
13	-1.30	0.00	94.09	27.49	343.90	48.47	48.47	6338
14	-1.50	0.00	97.64	28.73	356.13	49.99	49.99	6438
15	-2.00	0.00	106.49	31.84	386.61	55.13	55.13	6687
16	-2.50	0.00	115.32	34.94	416.97	59.66	59.66	6937
17	-3.00	0.00	124.11	38.03	447.23	63.92	63.92	7186
18	-3.50	0.00	132.87	41.11	477.39	67.68	67.68	7436
19	-4.00	0.00	141.61	44.18	507.47	70.37	70.37	7685
20	-4.30	3.00	143.84	44.96	515.15	67.01	70.01	7835
		3.00	143.84	28.34	686.84	17.83	20.83A	29943
21	-4.65	6.50	147.48	29.38	702.77	55.34	61.84	29943
22	-5.00	10.00	151.12	30.41	718.65	70.02	80.02	29943
23	-5.50	15.00	156.30	31.87	741.28	82.40	97.40	29943
24	-6.00	20.00	161.46	33.34	763.84	92.76	112.76	29943
25	-6.60	26.00	167.64	35.09	790.83	102.36	128.36	29943
		26.00	167.64	24.47	849.19	61.33	87.33	49905
26	-7.20	32.00	175.60	26.80	883.98	98.83	130.83	49905
27	-7.60	36.00	180.90	28.35	907.12	122.61	158.61	49905
28	-8.00	40.00	186.19	29.90	930.25	146.80	186.80	49905
29	-8.15	41.50	188.17	30.48	938.91	146.73	188.23	49905
30	-9.57	55.75	206.97	35.97	1021.06	165.20	220.95	49905
31	-11.00	70.00	225.72	41.45	1102.96	218.77	288.77	49905
		70.00	225.72	0.00	6355.77	165.89	235.89	998109
32	-12.70	87.00	254.82	0.00	6759.93	223.98	310.98	998109
33	-14.40	104.00	283.88	0.00	7163.41	252.92	356.92	998109
34	-16.80	128.00	324.84	0.00	7732.14	293.97	421.97	998109

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
35	-18.40	144.00	352.11	0.00	8110.84	321.40	465.40	998109
36	-20.00	160.00	379.36	0.00	8489.23	343.66	503.66	998109

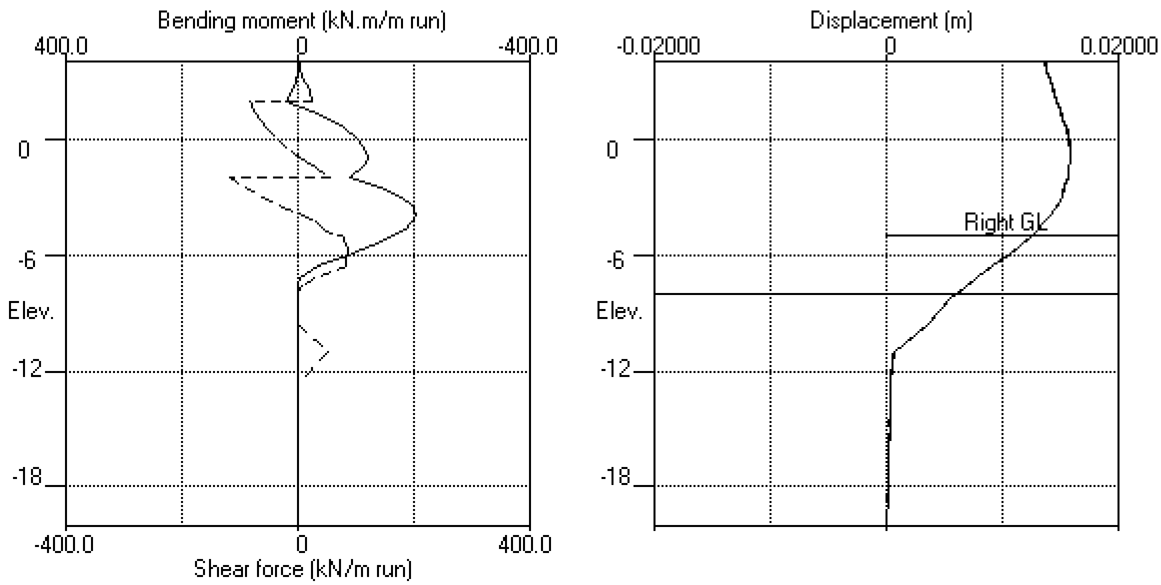
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	30080
23	-5.50	5.00	5.00	0.00	80.21	80.08	85.08	30080
24	-6.00	10.00	10.00	0.00	102.05	101.76	111.76	30080
25	-6.60	16.00	16.00	0.00	128.28	127.91	143.91	30080
		16.00	16.00	0.00	186.63	186.02	202.02	50133
26	-7.20	22.00	23.80	0.00	220.72	180.37	202.37	50133
27	-7.60	26.00	29.01	0.00	243.45	166.77	192.77	50133
28	-8.00	30.00	34.21	0.00	266.19	151.93	181.93	50133
29	-8.15	31.50	36.16	0.00	274.71	156.76	188.26	50133
30	-9.57	45.75	54.70	0.00	355.74	175.19	220.94	50133
31	-11.00	60.00	73.27	0.00	436.84	158.77	218.77	50133
		60.00	73.27	0.00	4238.84	234.55	294.55	1002652
32	-12.70	77.00	102.24	0.00	4641.14	233.98	310.98	1002652
33	-14.40	94.00	131.25	0.00	5043.96	262.92	356.92	1002652
34	-16.80	118.00	172.28	0.00	5613.73	303.97	421.97	1002652
35	-18.40	134.00	199.69	0.00	5994.39	331.40	465.40	1002652
36	-20.00	150.00	227.16	0.00	6375.76	353.68	503.68	1002652

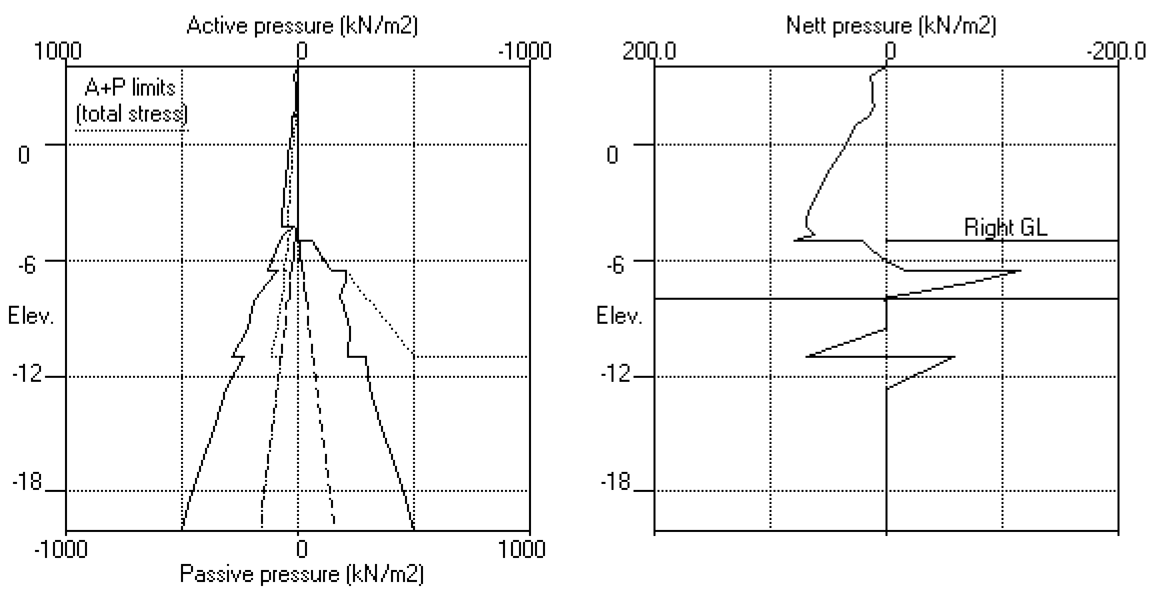
Note: 12.34 a Soil pressure at active limit
58.36 p Soil pressure at passive limit
20.83A Arching - soil pressure below active limit

Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30

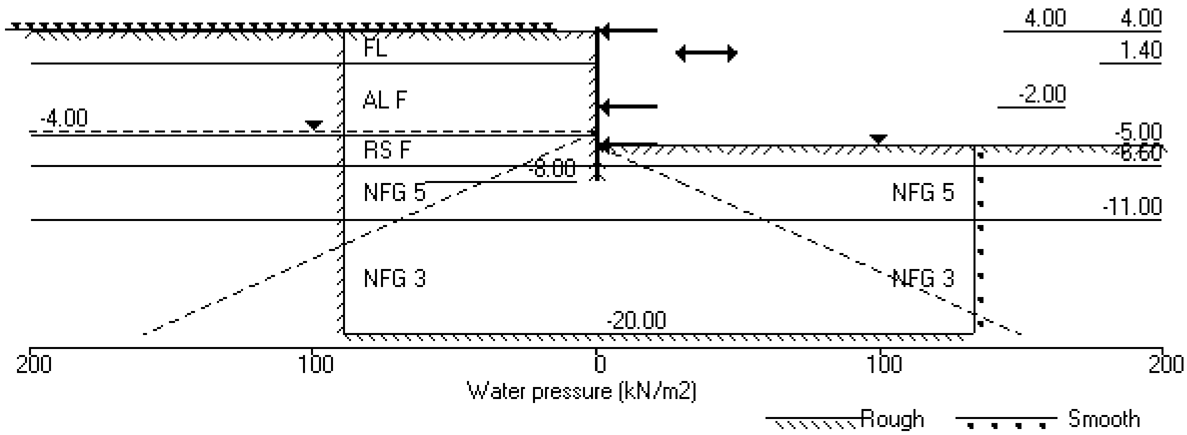


Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No. 14 Remove strut or anchor no.1 at elevation 2.00

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
14	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-1.02E-03	-59.1	0.0	-59.1	352338
2	3.50	15.58	0.014	-1.00E-03	-55.2	-29.3		352338
3	3.00	12.54	0.015	-9.43E-04	-48.2	-54.7		352338
4	2.65	10.63	0.015	-8.81E-04	-44.1	-70.7		352338
5	2.30	9.65	0.015	-8.03E-04	-40.6	-85.4		352338
6	2.00	7.98	0.016	-7.26E-04	-37.9	-97.1		352338
7	1.40	13.46	0.016	-5.44E-04	-31.5	-116.7		352338
		22.50	0.016	-5.44E-04	-31.5	-116.7		
8	1.00	24.79	0.016	-4.05E-04	-22.0	-127.4		352338
9	0.60	28.38	0.016	-2.57E-04	-11.4	-134.1		352338
10	0.00	34.62	0.016	-2.78E-05	7.5	-135.4		352338
11	-0.60	41.04	0.016	1.93E-04	30.2	-124.2		352338
12	-0.95	44.52	0.016	3.10E-04	45.2	-111.1		352338
13	-1.30	48.34	0.016	4.11E-04	61.4	-92.4		352338
14	-1.50	50.09	0.016	4.59E-04	71.3	-79.2		352338
15	-2.00	55.44	0.016	5.42E-04	97.7	-36.7	-233.6	352338
		55.44	0.016	5.42E-04	-135.9	-36.7		
16	-2.50	60.11	0.015	6.37E-04	-107.0	-97.5		352338
17	-3.00	64.41	0.015	8.08E-04	-75.9	-143.3		352338
18	-3.50	68.14	0.015	1.03E-03	-42.8	-172.9		352338
19	-4.00	70.78	0.014	1.28E-03	-8.0	-185.4		352338
20	-4.30	70.34	0.014	1.44E-03	13.1	-184.5		352338
		22.05	0.014	1.44E-03	13.1	-184.5		
21	-4.65	62.78	0.013	1.62E-03	28.0	-179.0		352338
22	-5.00	80.73	0.012	1.79E-03	53.1	-165.4	20.4	352338
		23.37	0.012	1.79E-03	73.5	-165.4		
23	-5.50	13.40	0.012	2.00E-03	82.6	-126.8		352338
24	-6.00	1.77	0.010	2.15E-03	86.4	-84.6		352338
25	-6.60	-15.00	0.009	2.25E-03	82.5	-33.7		352338
		-113.77	0.009	2.25E-03	82.5	-33.7		
26	-7.20	-71.16	0.008	2.28E-03	27.0	-4.7		352338
27	-7.60	-34.32	0.007	2.28E-03	5.9	0.4		352338
28	-8.00	3.54	0.006	2.28E-03	-0.3	-0.0		0

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-8.15	-0.03	0.006	0	-0.0	0.0		0
30	-9.57	0.01	0.003	0	-0.0	0.0		0
31	-11.00	70.00	0.001	0	49.9	0.0		0
		-58.66	0.001	0	49.9	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.01	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 59.1 kN/m run
At elev. -2.00 Prop force = 233.6 kN/m run
At elev. -5.00 Prop force = -20.4 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	15.58	15.58	9981
3	3.00	0.00	17.14	5.30	66.30	12.54	12.54	9981
4	2.65	0.00	23.26	7.19	89.97	10.63	10.63	9981
5	2.30	0.00	29.45	9.10	113.93	9.65	9.65	9981
6	2.00	0.00	34.80	10.76	134.63	7.98	7.98A	9981
7	1.40	0.00	45.59	14.09	176.37	13.46	13.46A	9981
		0.00	45.59	10.45	176.98	22.50	22.50	4991
8	1.00	0.00	52.82	12.99	201.83	24.79	24.79	5190
9	0.60	0.00	60.04	15.53	226.69	28.38	28.38	5390
10	0.00	0.00	70.85	19.32	263.90	34.62	34.62	5689
11	-0.60	0.00	81.60	23.10	300.93	41.04	41.04	5989
12	-0.95	0.00	87.86	25.30	322.45	44.52	44.52	6163
13	-1.30	0.00	94.09	27.49	343.90	48.34	48.34	6338
14	-1.50	0.00	97.64	28.73	356.13	50.09	50.09	6438
15	-2.00	0.00	106.49	31.84	386.61	55.44	55.44	6687
16	-2.50	0.00	115.32	34.94	416.97	60.11	60.11	6937
17	-3.00	0.00	124.11	38.03	447.23	64.41	64.41	7186
18	-3.50	0.00	132.87	41.11	477.39	68.14	68.14	7436
19	-4.00	0.00	141.61	44.18	507.47	70.78	70.78	7685
20	-4.30	3.00	143.84	44.96	515.15	67.34	70.34	7835
		3.00	143.84	28.34	686.84	19.05	22.05A	29943
21	-4.65	6.50	147.48	29.38	702.77	56.28	62.78	29943
22	-5.00	10.00	151.12	30.41	718.65	70.73	80.73	29943
23	-5.50	15.00	156.30	31.87	741.28	82.94	97.94	29943
24	-6.00	20.00	161.46	33.34	763.84	93.17	113.17	29943
25	-6.60	26.00	167.64	35.09	790.83	102.65	128.65	29943
		26.00	167.64	24.47	849.19	61.81	87.81	49905
26	-7.20	32.00	175.60	26.80	883.98	99.05	131.05	49905
27	-7.60	36.00	180.90	28.35	907.12	122.55	158.55	49905
28	-8.00	40.00	186.19	29.90	930.25	146.18	186.18	49905
29	-8.15	41.50	188.17	30.48	938.91	146.74	188.24	49905
30	-9.57	55.75	206.97	35.97	1021.06	165.21	220.96	49905
31	-11.00	70.00	225.72	41.45	1102.96	218.77	288.77	49905
		70.00	225.72	0.00	6355.77	165.90	235.90	998109
32	-12.70	87.00	254.82	0.00	6759.93	223.99	310.99	998109
33	-14.40	104.00	283.88	0.00	7163.41	252.93	356.93	998109
34	-16.80	128.00	324.84	0.00	7732.14	293.97	421.97	998109
35	-18.40	144.00	352.11	0.00	8110.84	321.40	465.40	998109

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
36	-20.00	160.00	379.36	0.00	8489.23	343.66	503.66	998109

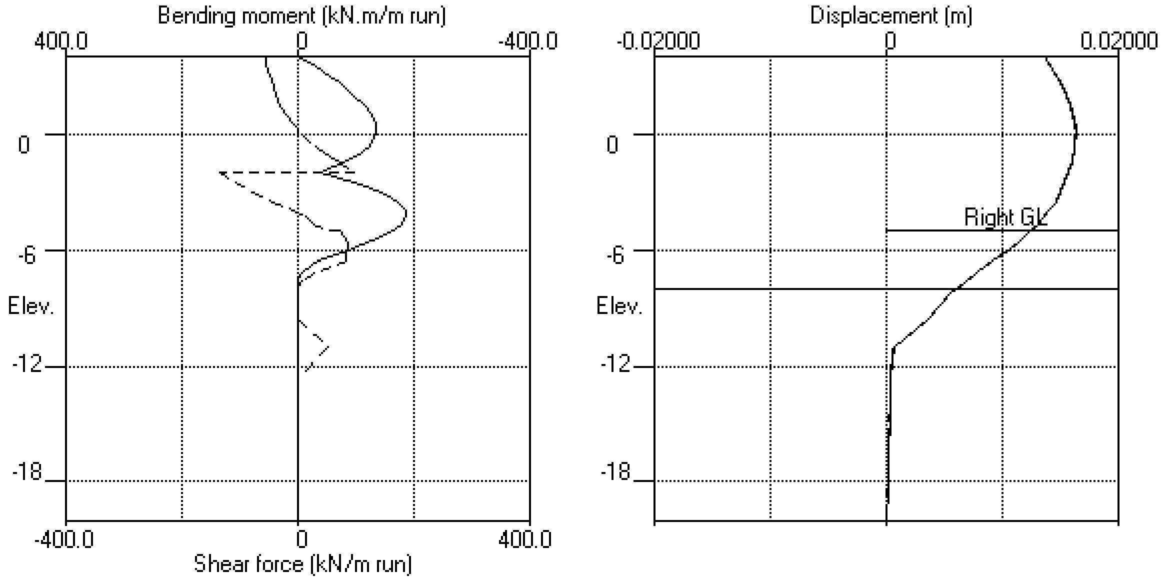
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	57.36	57.36	30080
23	-5.50	5.00	5.00	0.00	80.21	79.54	84.54	30080
24	-6.00	10.00	10.00	0.00	102.05	101.40	111.40	30080
25	-6.60	16.00	16.00	0.00	128.28	127.65	143.65	30080
		16.00	16.00	0.00	186.63	185.59	201.59	50133
26	-7.20	22.00	23.80	0.00	220.72	180.21	202.21	50133
27	-7.60	26.00	29.01	0.00	243.45	166.87	192.87	50133
28	-8.00	30.00	34.21	0.00	266.19	152.64	182.64	50133
29	-8.15	31.50	36.16	0.00	274.71	156.77	188.27	50133
30	-9.57	45.75	54.70	0.00	355.74	175.20	220.95	50133
31	-11.00	60.00	73.27	0.00	436.84	158.77	218.77	50133
		60.00	73.27	0.00	4238.84	234.56	294.56	1002652
32	-12.70	77.00	102.24	0.00	4641.14	233.99	310.99	1002652
33	-14.40	94.00	131.25	0.00	5043.96	262.92	356.92	1002652
34	-16.80	118.00	172.28	0.00	5613.73	303.97	421.97	1002652
35	-18.40	134.00	199.69	0.00	5994.39	331.40	465.40	1002652
36	-20.00	150.00	227.16	0.00	6375.76	353.68	503.68	1002652

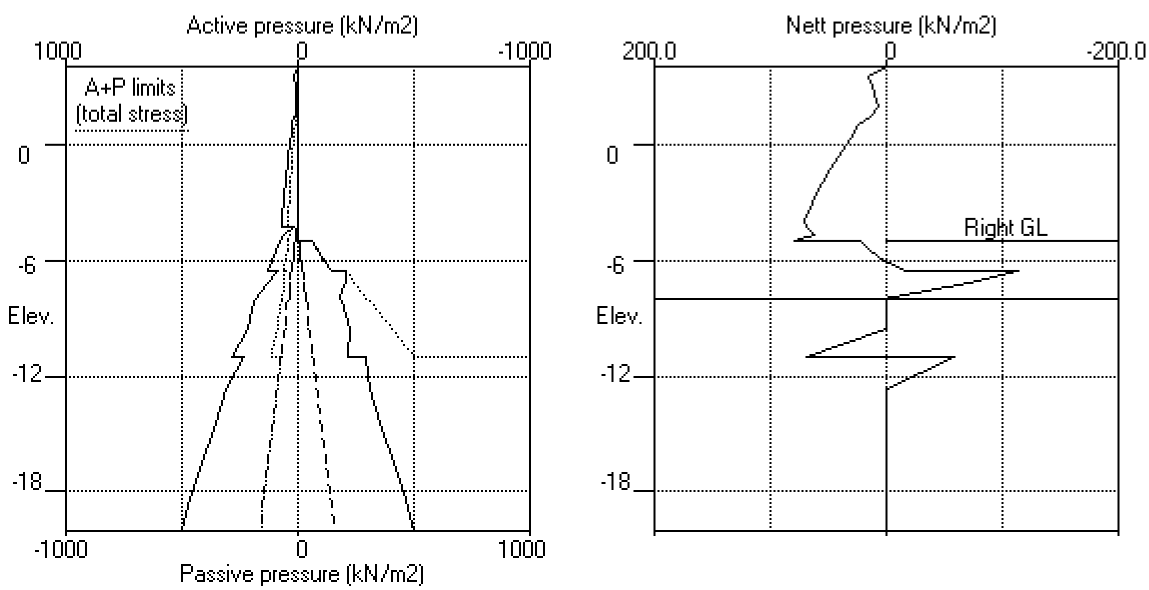
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
22.05A Arching - soil pressure below active limit

Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00

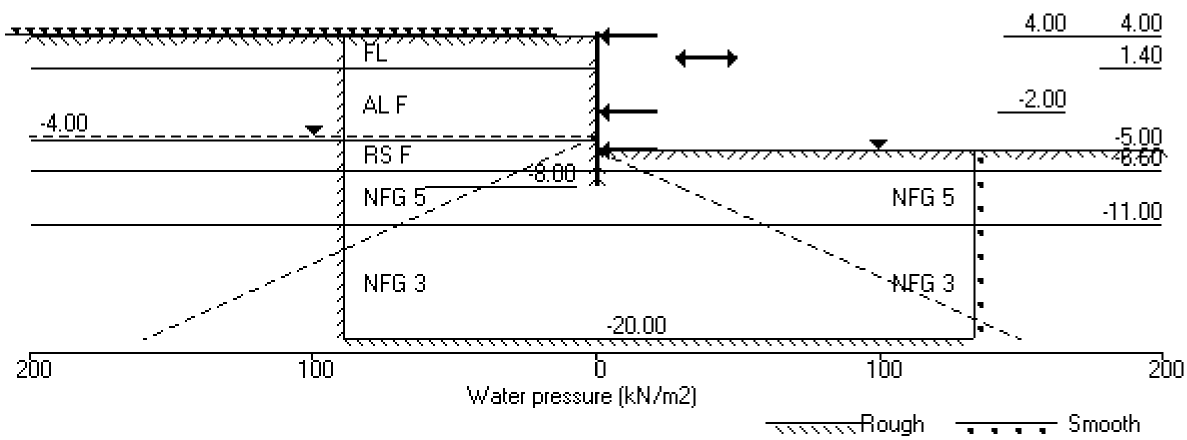


Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No.15 Change EI of wall to 246637kN.m2/m run



Units: kN,m

Stage No. 15 Change EI of wall to 246637 kN.m2/m run
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method
Factor of safety on nett available passive

				FoS for toe elev. = -8.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
15	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-1.13E-03	-51.3	0.0	-51.3	246637
2	3.50	15.82	0.014	-1.11E-03	-47.4	-26.3		246637
3	3.00	12.46	0.015	-1.03E-03	-40.3	-48.7		246637
4	2.65	10.35	0.015	-9.62E-04	-36.3	-62.5		246637
5	2.30	9.24	0.015	-8.68E-04	-32.9	-75.2		246637
6	2.00	7.47	0.016	-7.75E-04	-30.4	-85.1		246637
7	1.40	12.88	0.016	-5.58E-04	-24.3	-101.3		246637
		22.21	0.016	-5.58E-04	-24.3	-101.3		
8	1.00	24.47	0.016	-3.95E-04	-14.9	-109.8		246637
9	0.60	28.06	0.016	-2.23E-04	-4.4	-114.3		246637
10	0.00	34.36	0.016	3.70E-05	14.3	-112.4		246637
11	-0.60	40.88	0.016	2.75E-04	36.9	-98.2		246637
12	-0.95	44.48	0.016	3.92E-04	51.8	-83.2		246637
13	-1.30	48.40	0.016	4.84E-04	68.1	-62.8		246637
14	-1.50	50.23	0.016	5.21E-04	77.9	-48.6		246637
15	-2.00	55.64	0.016	5.55E-04	104.4	-3.5	-242.5	246637
		55.64	0.016	5.55E-04	-138.1	-3.5		
16	-2.50	60.21	0.015	6.05E-04	-109.1	-65.1		246637
17	-3.00	64.34	0.015	7.64E-04	-78.0	-111.7		246637
18	-3.50	67.89	0.015	1.00E-03	-44.9	-142.1		246637
19	-4.00	70.41	0.014	1.28E-03	-10.3	-155.5		246637
20	-4.30	69.91	0.014	1.46E-03	10.7	-155.1		246637
		20.41	0.014	1.46E-03	10.7	-155.1		
21	-4.65	61.33	0.013	1.66E-03	25.0	-150.3		246637
22	-5.00	79.55	0.013	1.86E-03	49.7	-137.6	11.5	246637
		21.19	0.013	1.86E-03	61.1	-137.6		
23	-5.50	12.03	0.012	2.09E-03	69.4	-103.9		246637
24	-6.00	1.32	0.010	2.25E-03	72.8	-67.0		246637
25	-6.60	-13.93	0.009	2.34E-03	69.0	-22.4		246637
		-111.99	0.009	2.34E-03	69.0	-22.4		
26	-7.20	-66.29	0.008	2.36E-03	15.5	0.6		246637
27	-7.60	-25.08	0.007	2.36E-03	-2.8	2.5		246637

(continued)

Stage No.15 Change EI of wall to 246637 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	28.28	0.006	2.36E-03	-2.1	-0.0		0
29	-8.15	-0.03	0.006	0	-0.0	0.0		0
30	-9.57	0.01	0.003	0	-0.0	0.0		0
31	-11.00	70.00	0.001	0	49.9	0.0		0
		-58.66	0.001	0	49.9	0.0		
32	-12.70	0.00	0.000	0	-0.0	0.0		0
33	-14.40	0.01	0.000	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 51.3 kN/m run
At elev. -2.00 Prop force = 242.5 kN/m run
At elev. -5.00 Prop force = -11.5 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.52	2.63	32.95	15.82	15.82	9981
3	3.00	0.00	17.14	5.30	66.30	12.46	12.46	9981
4	2.65	0.00	23.26	7.19	89.97	10.35	10.35	9981
5	2.30	0.00	29.45	9.10	113.93	9.24	9.24	9981
6	2.00	0.00	34.80	10.76	134.63	7.47	7.47A	9981
7	1.40	0.00	45.59	14.09	176.37	12.88	12.88A	9981
		0.00	45.59	10.45	176.98	22.21	22.21	4991
8	1.00	0.00	52.82	12.99	201.83	24.47	24.47	5190
9	0.60	0.00	60.04	15.53	226.69	28.06	28.06	5390
10	0.00	0.00	70.85	19.32	263.90	34.36	34.36	5689
11	-0.60	0.00	81.60	23.10	300.93	40.88	40.88	5989
12	-0.95	0.00	87.86	25.30	322.45	44.48	44.48	6163
13	-1.30	0.00	94.09	27.49	343.90	48.40	48.40	6338
14	-1.50	0.00	97.64	28.73	356.13	50.23	50.23	6438
15	-2.00	0.00	106.49	31.84	386.61	55.64	55.64	6687
16	-2.50	0.00	115.32	34.94	416.97	60.21	60.21	6937
17	-3.00	0.00	124.11	38.03	447.23	64.34	64.34	7186
18	-3.50	0.00	132.87	41.11	477.39	67.89	67.89	7436
19	-4.00	0.00	141.61	44.18	507.47	70.41	70.41	7685
20	-4.30	3.00	143.84	44.96	515.15	66.91	69.91	7835
		3.00	143.84	28.34	686.84	17.41	20.41A	29943
21	-4.65	6.50	147.48	29.38	702.77	54.83	61.33	29943
22	-5.00	10.00	151.12	30.41	718.65	69.55	79.55	29943
23	-5.50	15.00	156.30	31.87	741.28	82.24	97.24	29943
24	-6.00	20.00	161.46	33.34	763.84	93.11	113.11	29943
25	-6.60	26.00	167.64	35.09	790.83	103.27	129.27	29943
		26.00	167.64	24.47	849.19	62.86	88.86	49905
26	-7.20	32.00	175.60	26.80	883.98	101.59	133.59	49905
27	-7.60	36.00	180.90	28.35	907.12	127.30	163.30	49905
28	-8.00	40.00	186.19	29.90	930.25	158.21	198.21	49905
29	-8.15	41.50	188.17	30.48	938.91	146.90	188.40	49905
30	-9.57	55.75	206.97	35.97	1021.06	165.24	220.99	49905
31	-11.00	70.00	225.72	41.45	1102.96	218.77	288.77	49905
		70.00	225.72	0.00	6355.77	165.93	235.93	998109
32	-12.70	87.00	254.82	0.00	6759.93	224.02	311.02	998109
33	-14.40	104.00	283.88	0.00	7163.41	252.95	356.95	998109

(continued)

Stage No.15 Change EI of wall to 246637 kN.m2/m run
Allow wall to relax with new modulus value

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-16.80	128.00	324.84	0.00	7732.14	293.98	421.98	998109
35	-18.40	144.00	352.11	0.00	8110.84	321.41	465.41	998109
36	-20.00	160.00	379.36	0.00	8489.23	343.67	503.67	998109

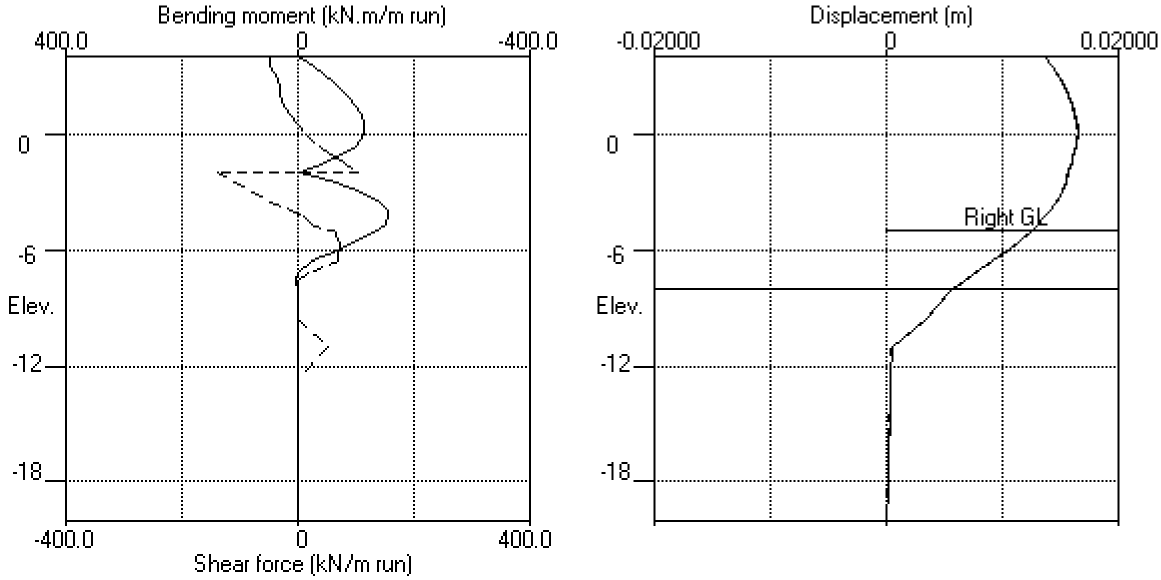
RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	58.36	58.36p	30080
23	-5.50	5.00	5.00	0.00	80.21	80.21	85.21p	30080
24	-6.00	10.00	10.00	0.00	102.05	101.79	111.79	30080
25	-6.60	16.00	16.00	0.00	128.28	127.20	143.20	30080
		16.00	16.00	0.00	186.63	184.85	200.85	50133
26	-7.20	22.00	23.80	0.00	220.72	177.88	199.88	50133
27	-7.60	26.00	29.01	0.00	243.45	162.38	188.38	50133
28	-8.00	30.00	34.21	0.00	266.19	139.94	169.94	50133
29	-8.15	31.50	36.16	0.00	274.71	156.93	188.43	50133
30	-9.57	45.75	54.70	0.00	355.74	175.24	220.99	50133
31	-11.00	60.00	73.27	0.00	436.84	158.77	218.77	50133
		60.00	73.27	0.00	4238.84	234.59	294.59	1002652
32	-12.70	77.00	102.24	0.00	4641.14	234.01	311.01	1002652
33	-14.40	94.00	131.25	0.00	5043.96	262.94	356.94	1002652
34	-16.80	118.00	172.28	0.00	5613.73	303.98	421.98	1002652
35	-18.40	134.00	199.69	0.00	5994.39	331.41	465.41	1002652
36	-20.00	150.00	227.16	0.00	6375.76	353.69	503.69	1002652

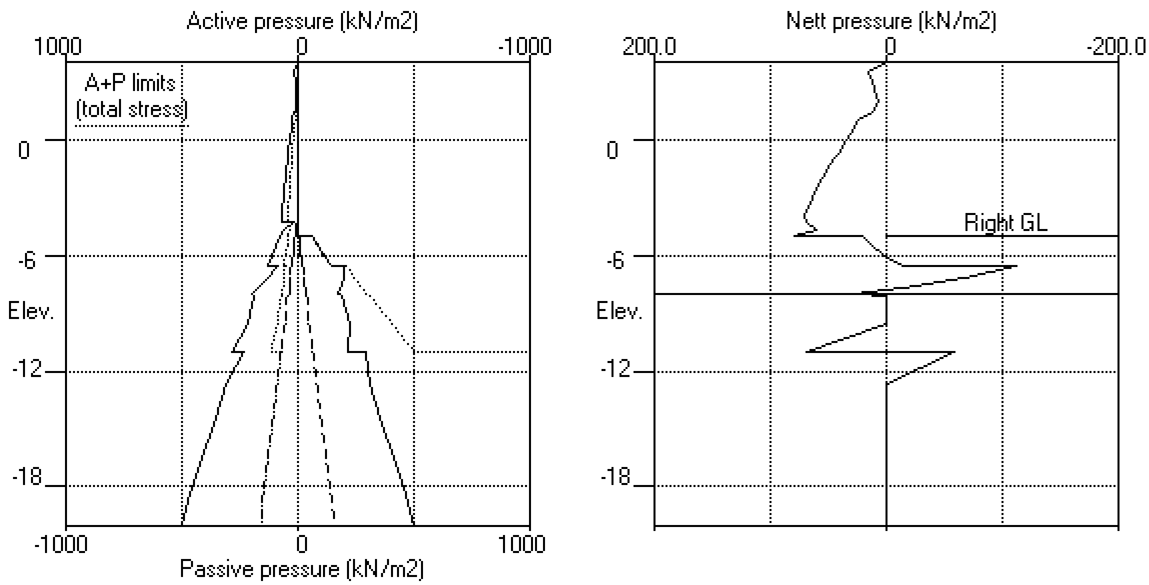
Note: 12.34 a Soil pressure at active limit
85.21 p Soil pressure at passive limit
20.41A Arching - soil pressure below active limit

Units: kN,m

Stage No.15 Change EI of wall to 246637kN.m2/m run

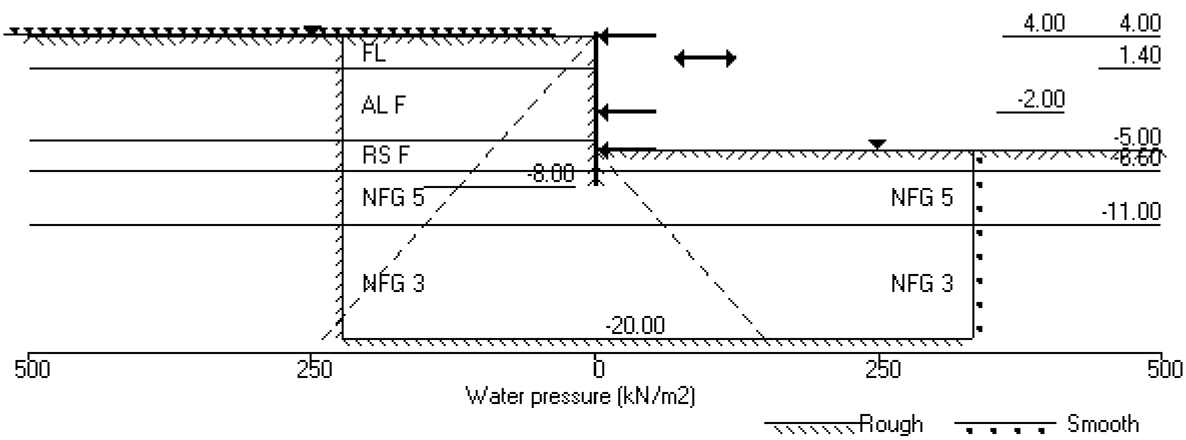


Stage No.15 Change EI of wall to 246637kN.m2/m run



Units: kN,m

Stage No.16 Apply water pressure profile no.1



Units: kN,m

Stage No. 16 Apply water pressure profile no.1

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -8.00		**Toe elev. for FoS = 1.500**		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
16	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries:	Left side 20.00 from wall	Rough boundary
	Right side 30.00 from wall	Smooth boundary
Lower rigid boundary at elevation -20.00		Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.014	-1.47E-03	-74.2	0.0	-74.2	246637
2	3.50	18.61	0.014	-1.44E-03	-69.5	-37.6		246637
3	3.00	17.99	0.015	-1.33E-03	-60.4	-70.6		246637
4	2.65	17.33	0.016	-1.22E-03	-54.2	-91.1		246637
5	2.30	17.87	0.016	-1.08E-03	-48.0	-109.5		246637
6	2.00	20.02	0.016	-9.47E-04	-42.3	-123.5		246637
7	1.40	30.59	0.017	-6.31E-04	-27.1	-144.5		246637
		36.32	0.017	-6.31E-04	-27.1	-144.5		
8	1.00	40.73	0.017	-3.98E-04	-11.7	-152.9		246637
9	0.60	46.62	0.017	-1.57E-04	5.7	-154.8		246637
10	0.00	56.50	0.017	1.89E-04	36.7	-143.4		246637
11	-0.60	66.73	0.017	4.81E-04	73.6	-111.5		246637
12	-0.95	72.64	0.017	6.07E-04	98.0	-82.1		246637
13	-1.30	78.82	0.016	6.84E-04	124.5	-43.7		246637
14	-1.50	82.10	0.016	7.01E-04	140.6	-17.5		246637
15	-2.00	90.63	0.016	6.36E-04	183.8	62.9	-384.5	246637
		90.63	0.016	6.36E-04	-200.7	62.9		
16	-2.50	98.13	0.016	5.78E-04	-153.5	-25.5		246637
17	-3.00	105.04	0.015	6.75E-04	-102.7	-89.3		246637
18	-3.50	111.41	0.015	8.75E-04	-48.6	-126.9		246637
19	-4.00	116.79	0.014	1.12E-03	8.4	-136.6		246637
20	-4.30	116.28	0.014	1.27E-03	43.4	-128.5		246637
		85.54	0.014	1.27E-03	43.4	-128.5		
21	-4.65	109.69	0.014	1.43E-03	77.6	-108.7		246637
22	-5.00	127.22	0.013	1.54E-03	119.0	-74.6	-139.9	246637
		72.79	0.013	1.54E-03	-20.8	-74.6		
23	-5.50	59.69	0.012	1.68E-03	12.3	-75.4		246637
24	-6.00	43.89	0.011	1.81E-03	38.2	-61.1		246637
25	-6.60	24.97	0.010	1.91E-03	58.8	-29.7		246637
		-77.63	0.010	1.91E-03	58.8	-29.7		
26	-7.20	-49.32	0.009	1.94E-03	20.8	-6.6		246637
27	-7.60	-23.48	0.008	1.95E-03	6.2	-1.2		246637
28	-8.00	-5.45	0.008	1.95E-03	0.4	-0.0		0

(continued)

Stage No.16 Apply water pressure profile no.1

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-8.15	-0.03	0.007	0	-0.0	0.0		0
30	-9.57	0.01	0.005	0	-0.0	0.0		0
31	-11.00	110.99	0.001	0	79.1	0.0		0
		-93.03	0.001	0	79.1	0.0		
32	-12.70	0.00	0.001	0	-0.0	0.0		0
33	-14.40	0.01	0.001	0	0.0	0.0		0
34	-16.80	0.00	0.000	0	0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.02	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 74.2 kN/m run
At elev. -2.00 Prop force = 384.5 kN/m run
At elev. -5.00 Prop force = 139.9 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	5.00	3.52	1.09	13.61	13.61	18.61p	9981
3	3.00	10.00	7.14	2.21	27.61	7.99	17.99	9981
4	2.65	13.50	9.76	3.02	37.75	3.83	17.33	9981
5	2.30	17.00	12.45	3.85	48.16	0.87	17.87A	9981
6	2.00	20.00	14.80	4.57	57.27	0.02	20.02A	9981
7	1.40	26.00	19.59	6.06	75.80	4.59	30.59A	9981
		26.00	19.59	1.32	87.48	10.32	36.32	4991
8	1.00	30.00	22.82	2.45	98.57	10.73	40.73	5190
9	0.60	34.00	26.04	3.58	109.66	12.62	46.62	5390
10	0.00	40.00	30.85	5.27	126.21	16.50	56.50	5689
11	-0.60	46.00	35.60	6.94	142.59	20.73	66.73	5989
12	-0.95	49.50	38.36	7.91	152.06	23.14	72.64	6163
13	-1.30	53.00	41.09	8.87	161.46	25.82	78.82	6338
14	-1.50	55.00	42.64	9.41	166.80	27.10	82.10	6438
15	-2.00	60.00	46.49	10.77	180.07	30.63	90.63	6687
16	-2.50	65.00	50.32	12.11	193.23	33.13	98.13	6937
17	-3.00	70.00	54.11	13.44	206.28	35.04	105.04	7186
18	-3.50	75.00	57.87	14.76	219.23	36.41	111.41	7436
19	-4.00	80.00	61.61	16.08	232.09	36.79	116.79	7685
20	-4.30	83.00	63.84	16.86	239.78	33.28	116.28	7835
		83.00	63.84	5.68	337.29	2.54	85.54A	29943
21	-4.65	86.50	67.48	6.71	353.22	23.19	109.69	29943
22	-5.00	90.00	71.12	7.74	369.10	37.22	127.22	29943
23	-5.50	95.00	76.30	9.21	391.73	47.87	142.87	29943
24	-6.00	100.00	81.46	10.67	414.29	55.94	155.94	29943
25	-6.60	106.00	87.64	12.42	441.28	63.25	169.25	29943
		106.00	87.64	1.09	499.64	19.01	125.01	49905
26	-7.20	112.00	95.60	3.42	534.42	52.32	164.32	49905
27	-7.60	116.00	100.90	4.97	557.57	70.36	186.36	49905
28	-8.00	120.00	106.19	6.52	580.70	84.48	204.48	49905
29	-8.15	121.50	108.17	7.10	589.36	89.24	210.74	49905
30	-9.57	135.75	126.97	12.59	671.51	107.86	243.61	49905
31	-11.00	150.00	145.72	18.07	753.41	182.10	332.10	49905
		150.00	145.72	0.00	5244.89	98.23	248.23	998109
32	-12.70	167.00	174.82	0.00	5649.05	173.51	340.51	998109
33	-14.40	184.00	203.88	0.00	6052.54	202.51	386.51	998109
34	-16.80	208.00	244.84	0.00	6621.27	243.66	451.66	998109
35	-18.40	224.00	272.11	0.00	6999.96	271.09	495.09	998109

(continued)

Stage No.16 Apply water pressure profile no.1

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
36	-20.00	240.00	299.36	0.00	7378.35	287.37	527.37	998109

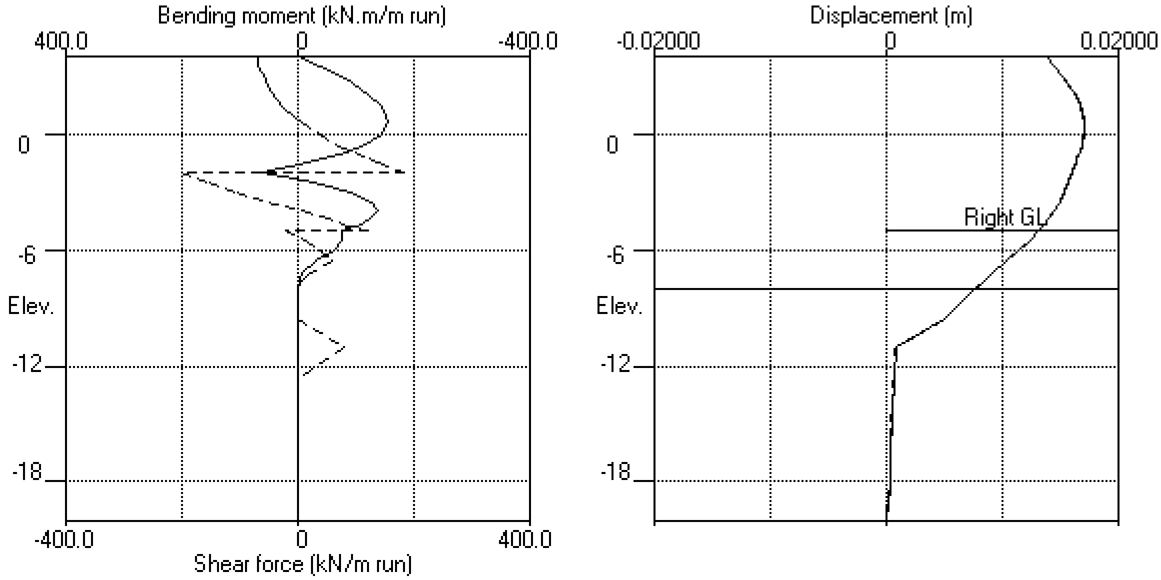
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	58.36	54.42	54.42	30080
23	-5.50	5.00	5.00	0.00	80.21	78.18	83.18	30080
24	-6.00	10.00	10.00	0.00	102.05	102.05	112.05p	30080
25	-6.60	16.00	16.00	0.00	128.28	128.28	144.28p	30080
		16.00	16.00	0.00	186.63	186.63	202.63p	50133
26	-7.20	22.00	23.80	0.00	220.72	191.64	213.64	50133
27	-7.60	26.00	29.01	0.00	243.45	183.84	209.84	50133
28	-8.00	30.00	34.21	0.00	266.19	179.93	209.93	50133
29	-8.15	31.50	36.16	0.00	274.71	179.27	210.77	50133
30	-9.57	45.75	54.70	0.00	355.74	197.86	243.61	50133
31	-11.00	60.00	73.27	0.00	436.84	161.10	221.10	50133
		60.00	73.27	0.00	4238.84	281.26	341.26	1002652
32	-12.70	77.00	102.24	0.00	4641.14	263.51	340.51	1002652
33	-14.40	94.00	131.25	0.00	5043.96	292.50	386.50	1002652
34	-16.80	118.00	172.28	0.00	5613.73	333.66	451.66	1002652
35	-18.40	134.00	199.69	0.00	5994.39	361.09	495.09	1002652
36	-20.00	150.00	227.16	0.00	6375.76	377.39	527.39	1002652

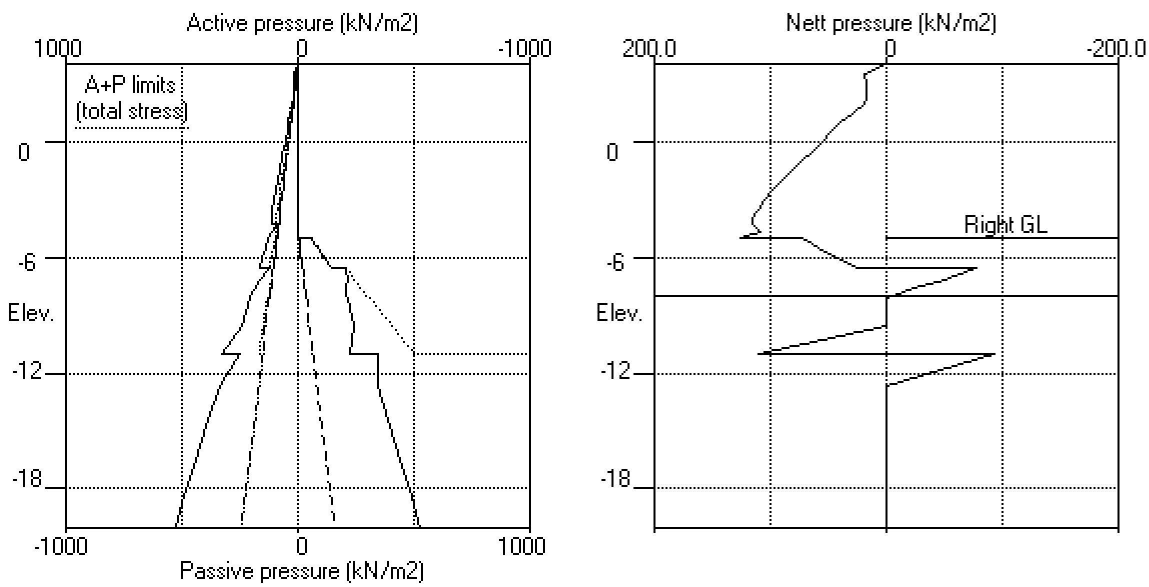
Note: 12.34 a Soil pressure at active limit
202.63 p Soil pressure at passive limit
85.54A Arching - soil pressure below active limit

Units: kN,m

Stage No.16 Apply water pressure profile no.1



Stage No.16 Apply water pressure profile no.1



Units: kN,m

Summary of results

STABILITY ANALYSIS of Fully Embedded Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -8.00		**Toe elev. for FoS = 1.500**		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				
2	4.00	2.00	Cant.	12.309	-6.51	0.02	1.98	L to R
3	4.00	2.00		No analysis at this stage				
4	4.00	-1.50	2.00	8.697	n/a	-3.28	1.78	L to R
5	4.00	-1.50		No analysis at this stage				

All remaining stages have more than one prop - FoS calculation n/a

---

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement maximum m	Displacement minimum m	Bending moment maximum kN.m/m	Bending moment minimum kN.m/m	Shear force maximum kN/m	Shear force minimum kN/m
1	4.00	0.017	0.000	0.0	-0.0	0.0	-74.2
2	3.50	0.016	0.000	0.3	-37.6	3.7	-69.5
3	3.00	0.015	0.000	4.2	-70.6	10.7	-60.4
4	2.65	0.016	0.000	8.9	-91.1	15.2	-54.2
5	2.30	0.016	0.000	15.0	-109.5	51.3	-48.0
6	2.00	0.016	0.000	29.2	-123.5	54.6	-86.9
7	1.40	0.017	0.000	15.3	-144.5	8.5	-79.4
8	1.00	0.017	0.000	18.6	-152.9	7.8	-69.5
9	0.60	0.017	0.000	21.5	-154.8	7.1	-58.2
10	0.00	0.017	0.000	25.5	-143.4	36.7	-38.3
11	-0.60	0.017	0.000	29.1	-134.5	73.6	-14.4
12	-0.95	0.017	0.000	31.3	-136.9	98.0	-0.6
13	-1.30	0.016	0.000	33.6	-133.5	124.5	-147.3
14	-1.50	0.016	0.000	34.9	-128.7	140.6	-137.3
15	-2.00	0.016	0.000	62.9	-127.6	183.8	-200.7
16	-2.50	0.016	0.000	43.0	-174.4	47.2	-153.5
17	-3.00	0.015	0.000	48.2	-206.3	53.8	-102.7
18	-3.50	0.015	0.000	54.1	-222.3	60.2	-48.6
19	-4.00	0.014	0.000	60.8	-221.2	65.4	-10.3
20	-4.30	0.014	0.000	65.0	-212.2	66.8	0.0
21	-4.65	0.014	0.000	66.0	-197.4	77.6	-2.3
22	-5.00	0.013	0.000	63.4	-174.6	119.0	-20.8
23	-5.50	0.012	0.000	56.2	-133.3	87.4	-16.7
24	-6.00	0.011	0.000	46.7	-89.0	90.4	-20.1
25	-6.60	0.010	0.000	39.7	-36.0	85.5	-22.2
26	-7.20	0.009	0.000	23.2	-6.6	28.8	-30.8
27	-7.60	0.008	0.000	10.0	-1.2	7.0	-29.0
28	-8.00	0.008	0.000	0.0	-0.0	0.4	-6.8
29	-8.15	0.007	0.000	0.0	0.0	0.0	-0.0
30	-9.57	0.005	0.000	0.0	0.0	0.0	-0.0
31	-11.00	0.001	0.000	0.0	0.0	79.1	0.0
32	-12.70	0.001	0.000	0.0	0.0	0.0	-0.0
33	-14.40	0.001	0.000	0.0	0.0	0.0	-0.0
34	-16.80	0.000	0.000	0.0	0.0	0.0	-0.0
35	-18.40	0.000	0.000	0.0	0.0	0.0	-0.0
36	-20.00	0.000	0.000	0.0	0.0	0.0	0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force			
no.	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	0.4	-6.60	-5.0	-1.50	2.6	-4.30	-1.5	1.40
2	66.0	-4.65	-0.0	-8.00	13.7	-4.00	-26.3	-7.20
3	No calculation at this stage							
4	47.0	-5.50	-136.9	-0.95	66.8	-4.30	-86.9	2.00
5	No calculation at this stage							
6	41.6	-5.50	-132.2	-0.95	64.0	-4.30	-85.5	2.00
7	21.0	2.00	-222.3	-3.50	90.4	-6.00	-144.7	-1.30
8	29.2	2.00	-216.5	-4.00	89.2	-6.00	-147.3	-1.30
9	21.0	2.00	-222.3	-3.50	90.4	-6.00	-144.7	-1.30
10	No calculation at this stage							
11	No calculation at this stage							
12	21.4	2.00	-202.8	-4.00	86.9	-6.00	-117.8	-2.00
13	No calculation at this stage							
14	0.4	-7.60	-185.4	-4.00	97.7	-2.00	-135.9	-2.00
15	2.5	-7.60	-155.5	-4.00	104.4	-2.00	-138.1	-2.00
16	62.9	-2.00	-154.8	0.60	183.8	-2.00	-200.7	-2.00

Maximum and minimum displacement at each stage

Stage	Displacement				
no.	maximum	elev.	minimum	elev.	Stage description
	m		m		
1	0.000	-0.60	0.000	4.00	Apply surcharge no.1 at elev. 4.00
2	0.017	4.00	0.000	4.00	Excav. to elev. 2.00 on RIGHT side
3	No calculation at this stage				Install prop no.1 at elev. 2.00
4	0.015	4.00	0.000	4.00	Excav. to elev. -1.50 on RIGHT side
5	No calculation at this stage				Install prop no.2 at elev. -1.30
6	0.015	4.00	0.000	4.00	Apply water pressure profile no.2
7	0.015	-1.50	0.000	4.00	Excav. to elev. -5.00 on RIGHT side
8	0.015	-1.30	0.000	4.00	Apply load no.1 at elev. 2.30
9	0.015	-1.50	0.000	4.00	Apply load no.2 at elev. 2.30
10	No calculation at this stage				Install prop no.3 at elev. -5.00
11	No calculation at this stage				Install prop no.4 at elev. -2.00
12	0.016	-0.95	0.000	4.00	Remove prop no.2 at elev. -1.30
13	No calculation at this stage				Install prop no.5 at elev. 4.00
14	0.016	0.00	0.000	4.00	Remove prop no.1 at elev. 2.00
15	0.016	0.00	0.000	4.00	Change EI of wall to 246637kN.m2/m run
16	0.017	0.60	0.000	4.00	Apply water pressure profile no.1

Summary of results (continued)

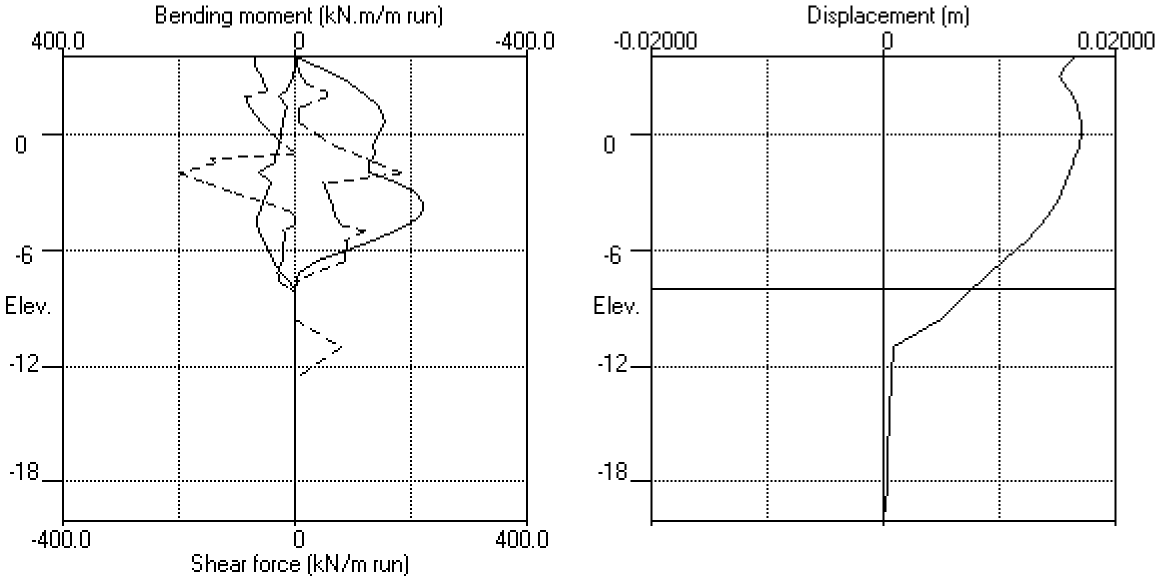
Prop forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 2.00 kN/m run	Strut no. 1 at elev. 2.00 kN/prop	Strut no. 2 at elev.-1.30 kN/m run	Strut no. 2 at elev.-1.30 kN/prop	Strut no. 3 at elev.-5.00 kN/m run	Strut no. 3 at elev.-5.00 kN/prop
4	103.19	773.90	---	---	---	---
6	101.97	764.76	4.49	33.67	---	---
7	83.90	629.23	189.38	1420.36	---	---
8	114.83	861.21	192.96	1447.17	---	---
9	83.90	629.23	189.38	1420.36	---	---
12	106.19	796.40	---	---	-5.49	-5.49
14	---	---	---	---	-20.36	-20.36
15	---	---	---	---	-11.46	-11.46
16	---	---	---	---	139.86	139.86

Stage no.	Strut no. 4 at elev.-2.00 kN/m run	Strut no. 4 at elev.-2.00 kN/prop	Strut no. 5 at elev. 4.00 kN/m run	Strut no. 5 at elev. 4.00 kN/prop
12	173.59	173.59	---	---
14	233.57	233.57	59.09	59.09
15	242.46	242.46	51.32	51.32
16	384.51	384.51	74.16	74.16

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Left side		Soil types Right side	
1	4.00	1	FL	1	FL
2	1.00	2	AL F	2	AL F
3	-5.20	4	RS F	4	RS F
4	-10.40	5	NFG 5	5	NFG 5
5	-11.70	6	NFG 3	6	NFG 3

SOIL PROPERTIES

-- Soil type -- No.	Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	FL	17.00	10000	0.700	OC	0.309	3.868	
					(0.300)	(0.000)	(0.000)	
2	AL F	17.00	5000	0.700	OC	0.351	3.442	4.000d
	(1.00)		(500.0)		(0.300)	(1.391)	(5.007)	
3	Not defined							
4	RS F	20.00	30000	1.000	OC	0.283	4.369	10.00d
					(0.300)	(1.241)	(5.836)	
5	NFG 5	23.00	50000	1.000	OC	0.292	4.369	20.00d
					(0.300)	(1.226)	(5.836)	
6	NFG 3	27.00	1000000	1.000	OC	0.146	13.89	250.0d
					(0.200)	(0.854)	(12.886)	

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No.	Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	FL	28.00	0.670	0.00	28.00	0.500	0.00
2	AL F	25.00	0.670	0.00	26.00	0.500	0.00
3	Not defined						
4	RS F	30.00	0.670	0.00	30.00	0.500	0.00
5	NFG 5	30.00	0.500	0.00	30.00	0.500	0.00
6	NFG 3	45.00	0.500	0.00	45.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-4.00	-4.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Left side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Right side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	4.00	4.00	0.0	1	-5.00	-5.00	0.0
2	1	-4.00	-4.00	0.0	1	-5.00	-5.00	0.0

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.90 m
Soldier Pile spacing = 1.80 m
Passive mobilisation factor = 3.00
Elevation of toe of wall = -10.00
Maximum finite element length = 0.80 m
Youngs modulus of wall E = 3.2000E+07 kN/m2
Moment of inertia of wall I = 0.017889 m4/m run
= 0.032200 m4 per pile
E.I = 572444 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Prop no.	Elev.	Prop spacing m	Cross-section area sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /prop kN	Strut or Anchor	Allow tension ?	L/R
1	2.00	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
2	-1.30	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
3	-5.00	1.00	0.150000	3.280E+07	20.00	0.00	0	Strut	Yes	R
4	-2.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
5	4.00	1.00	0.400000	3.280E+07	20.00	0.00	0	Strut	Yes	R

HORIZONTAL and MOMENT LOADS/RESTRAINTS

Load no.	Elevation	Horizontal load kN/m run	Moment load kN.m/m run	Moment restraint kN.m/m/rad	Partial factor (Category)
1	2.10	45.00	0	0	N/A
2	2.10	-45.00	0	0	N/A

SURCHARGE LOADS

Surch-arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge kN/m2 Near edge	Surcharge kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	4.00	1.00(L)	100.00	100.00	10.00	=	N/A	N/A

Note: L = Left side, R = Right side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 4.00
2	Excavate to elevation 2.00 on RIGHT side
3	Install strut or anchor no.1 at elevation 2.00
4	Excavate to elevation -1.50 on RIGHT side
5	Install strut or anchor no.2 at elevation -1.30
6	Apply water pressure profile no.2
7	Excavate to elevation -5.00 on RIGHT side
8	Apply load no.1 at elevation 2.10
9	Apply load no.2 at elevation 2.10
10	Install strut or anchor no.3 at elevation -5.00
11	Install strut or anchor no.4 at elevation -2.00
12	Remove strut or anchor no.2 at elevation -1.30
13	Install strut or anchor no.5 at elevation 4.00
14	Remove strut or anchor no.1 at elevation 2.00
15	Change EI of wall to 400711 kN.m2/m run Allow wall to relax with new modulus value
16	Apply water pressure profile no.1

FACTORS OF SAFETY and ANALYSIS OPTIONS

```
 Stability analysis:
  Method of analysis  -  Burland-Potts
  Factor on passive for calculating wall depth = 1.50

 Parameters for undrained strata:
  Minimum equivalent fluid density             =   5.00 kN/m3
  Maximum depth of water filled tension crack  =   0.00 m

 Bending moment and displacement calculation:
  Method  -  2-D finite element model
  Open Tension Crack analysis? - No
  Active limit arching modelled?  -  Yes
  Non-linear Modulus Parameter (L) = 9.000 m

 Boundary conditions:
  Length of wall (normal to plane of analysis) = 60.00 m

  Width of excavation on Left  side of wall  = 40.00 m
  Width of excavation on Right side of wall  = 40.00 m

  Distance to rigid boundary on Left side  = 30.00 m
  Distance to rigid boundary on Right side = 20.00 m
  Elevation of rigid lower boundary = -20.00

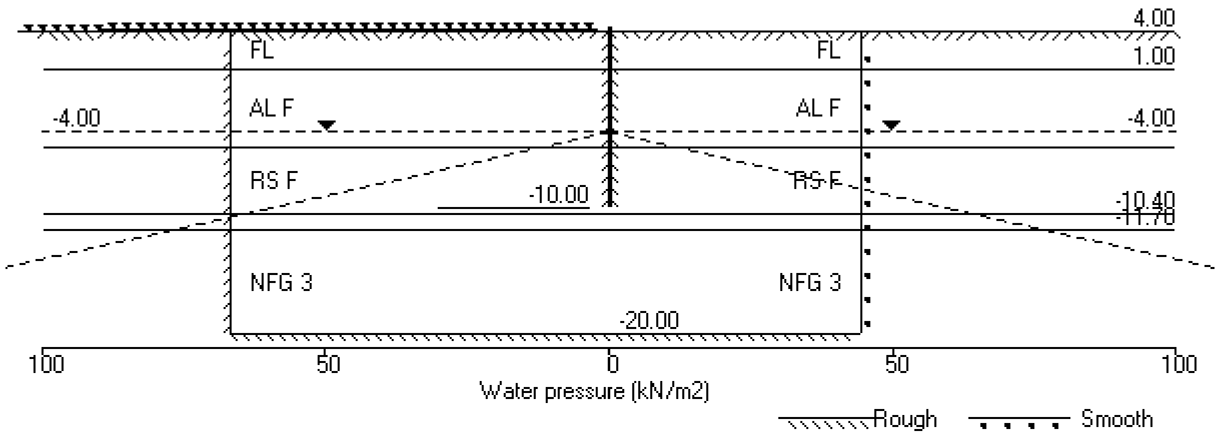
  Lower rigid boundary at elevation -20.00 - Rough
  Rigid boundary on Left side          - Rough
  Rigid boundary on Right side         - Smooth
  Wall / soil interface                  - Rough
```

OUTPUT OPTIONS

```
 Stage ------ Stage description ----------- ------- Output options -------
  no.                                       Displacement   Active,  Graph.
                                            Bending mom.   Passive  output
                                            Shear force   pressures
   1 Apply surcharge no.1 at elev. 4.00         Yes          Yes     Yes
   2 Excav. to elev. 2.00 on RIGHT side         Yes          Yes     Yes
   3 Install prop no.1 at elev. 2.00            Yes          Yes     Yes
   4 Excav. to elev. -1.50 on RIGHT side        Yes          Yes     Yes
   5 Install prop no.2 at elev. -1.30           Yes          Yes     Yes
   6 Apply water pressure profile no.2          Yes          Yes     Yes
   7 Excav. to elev. -5.00 on RIGHT side        Yes          Yes     Yes
   8 Apply load no.1 at elev. 2.10              Yes          Yes     Yes
   9 Apply load no.2 at elev. 2.10              Yes          Yes     Yes
  10 Install prop no.3 at elev. -5.00           Yes          Yes     Yes
  11 Install prop no.4 at elev. -2.00           Yes          Yes     Yes
  12 Remove prop no.2 at elev. -1.30            Yes          Yes     Yes
  13 Install prop no.5 at elev. 4.00            Yes          Yes     Yes
  14 Remove prop no.1 at elev. 2.00             Yes          Yes     Yes
  15 Change EI of wall to 400711kN.m2/m run     Yes          Yes     Yes
  16 Apply water pressure profile no.1          Yes          Yes     Yes
   * Summary output                             Yes           -      Yes
```

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 4.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.001	1.95E-05	0.0	-0.0		572444
2	3.20	-2.70	0.001	1.95E-05	-1.1	0.1		572444
3	2.65	-1.57	0.001	1.99E-05	-2.3	-0.9		572444
4	2.10	-0.88	0.001	2.14E-05	-2.9	-2.4		572444
5	2.00	-0.70	0.001	2.19E-05	-3.0	-2.7		572444
6	1.50	-0.21	0.001	2.49E-05	-3.2	-4.2		572444
7	1.00	0.23	0.001	2.93E-05	-3.2	-5.9		572444
		1.41	0.001	2.93E-05	-3.2	-5.9		
8	0.50	1.27	0.001	3.51E-05	-2.6	-7.3		572444
9	0.00	1.28	0.001	4.19E-05	-1.9	-8.4		572444
10	-0.65	1.33	0.001	5.20E-05	-1.1	-9.4		572444
11	-1.30	1.39	0.001	6.29E-05	-0.2	-9.8		572444
12	-1.50	1.34	0.001	6.63E-05	0.1	-9.8		572444
13	-2.00	1.37	0.001	7.48E-05	0.8	-9.6		572444
14	-2.60	1.39	0.001	8.45E-05	1.6	-8.9		572444
15	-3.20	1.38	0.001	9.32E-05	2.4	-7.7		572444
16	-4.00	1.39	0.001	1.02E-04	3.5	-5.3		572444
17	-4.50	1.26	0.001	1.06E-04	4.2	-3.4		572444
18	-5.00	1.05	0.001	1.08E-04	4.8	-1.1		572444
19	-5.20	0.83	0.001	1.08E-04	5.0	-0.1		572444
		-6.91	0.001	1.08E-04	5.0	-0.1		
20	-5.80	-3.22	0.001	1.07E-04	1.9	1.6		572444
21	-6.40	-1.73	0.001	1.05E-04	0.4	2.2		572444
22	-7.20	-0.78	0.000	1.02E-04	-0.6	2.0		572444
23	-8.00	-0.06	0.000	1.00E-04	-0.9	1.3		572444
24	-8.80	0.42	0.000	9.90E-05	-0.8	0.5		572444
25	-9.40	0.67	0.000	9.87E-05	-0.4	0.1		572444
26	-10.00	0.47	0.000	9.86E-05	-0.1	-0.0		0
27	-10.40	1.30	0.000	0	0.3	0.0		0
		-0.41	0.000	0	0.3	0.0		
28	-11.70	3.66	0.000	0	2.4	0.0		0
		-2.21	0.000	0	2.4	0.0		

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-13.85	0.00	0.000	0	-0.0	0.0		0
30	-16.00	0.00	0.000	0	-0.0	0.0		0
31	-18.00	0.00	0.000	0	0.0	0.0		0
32	-20.00	-0.00	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	8.46	8.46	9971
3	2.65	0.00	25.85	7.99	99.98	15.93	15.93	9971
4	2.10	0.00	36.59	11.31	141.55	23.12	23.12	9971
5	2.00	0.00	38.50	11.90	148.93	24.44	24.44	9971
6	1.50	0.00	47.88	14.80	185.22	30.83	30.83	9971
7	1.00	0.00	57.04	17.63	220.65	37.14	37.14	9971
		0.00	57.04	14.47	216.38	37.71	37.71	4985
8	0.50	0.00	66.05	17.64	247.37	43.70	43.70	5235
9	0.00	0.00	74.94	20.76	277.99	49.74	49.74	5484
10	-0.65	0.00	86.39	24.78	317.40	57.59	57.59	5808
11	-1.30	0.00	97.75	28.77	356.50	65.42	65.42	6132
12	-1.50	0.00	101.23	29.99	368.48	67.79	67.79	6232
13	-2.00	0.00	109.91	33.04	398.36	73.79	73.79	6481
14	-2.60	0.00	120.29	36.69	434.09	80.98	80.98	6780
15	-3.20	0.00	130.64	40.33	469.73	88.15	88.15	7079
16	-4.00	0.00	144.41	45.16	517.11	97.71	97.71	7478
17	-4.50	5.00	147.99	46.42	529.46	100.11	105.11	7727
18	-5.00	10.00	151.57	47.68	541.78	102.46	112.46	7977
19	-5.20	12.00	153.00	48.18	546.69	103.35	115.35	8076
		12.00	153.00	30.94	726.88	142.83	154.83	29913
20	-5.80	18.00	159.08	32.66	753.43	150.67	168.67	29913
21	-6.40	24.00	165.15	34.38	779.94	157.43	181.43	29913
22	-7.20	32.00	173.22	36.67	815.23	165.92	197.92	29913
23	-8.00	40.00	181.29	38.95	850.47	174.29	214.29	29913
24	-8.80	48.00	189.34	41.24	885.66	182.54	230.54	29913
25	-9.40	54.00	195.38	42.95	912.03	188.67	242.67	29913
26	-10.00	60.00	201.40	44.65	938.38	194.58	254.58	29913
27	-10.40	64.00	205.42	45.79	955.93	198.99	262.99	29913
		64.00	205.42	35.52	1014.29	198.14	262.14	49855
28	-11.70	77.00	222.37	40.47	1088.33	217.08	294.08	49855
		77.00	222.37	0.00	6309.29	213.37	290.37	997093
29	-13.85	98.50	258.96	0.00	6817.44	251.05	349.55	997093
30	-16.00	120.00	295.53	0.00	7325.15	287.59	407.59	997093
31	-18.00	140.00	329.52	0.00	7797.13	321.57	461.57	997093
32	-20.00	160.00	363.49	0.00	8268.84	355.36	515.36	997093

RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9945
2	3.20	0.00	13.60	4.20	52.61	11.16	11.16	9945
3	2.65	0.00	22.95	7.09	88.78	17.50	17.50	9945
4	2.10	0.00	32.30	9.98	124.95	24.00	24.00	9945

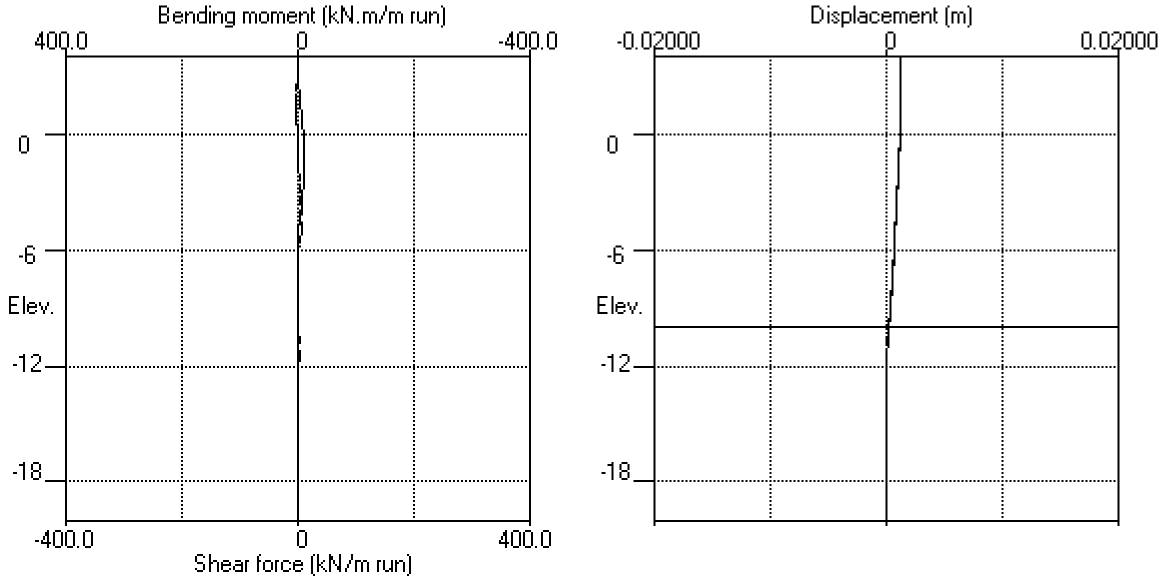
(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

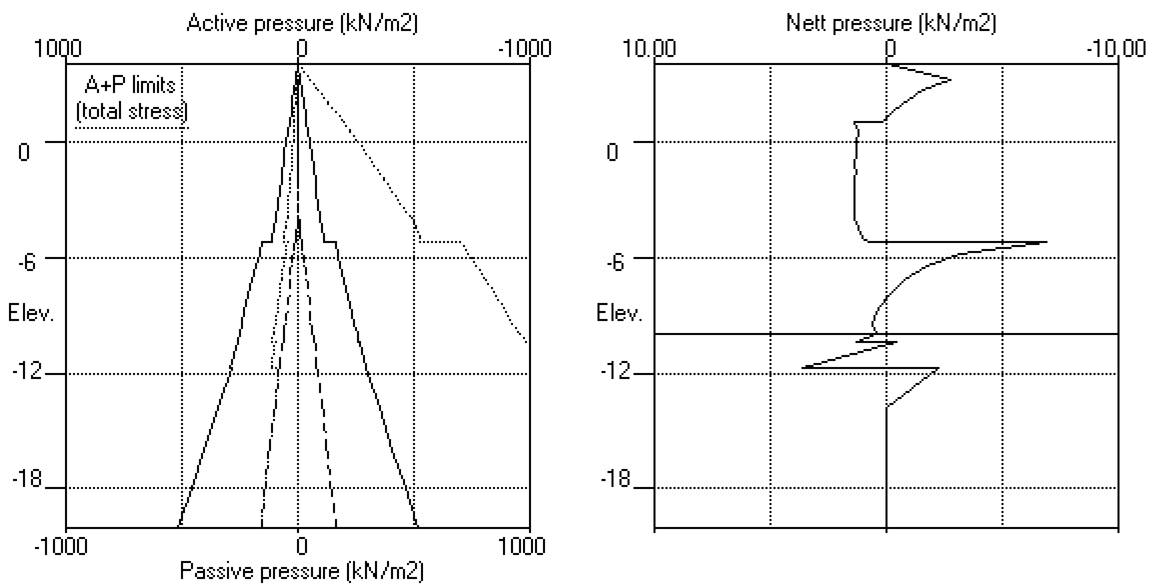
		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
5	2.00	0.00	34.00	10.51	131.52	25.15	25.15	9945
6	1.50	0.00	42.50	13.13	164.40	31.04	31.04	9945
7	1.00	0.00	51.00	15.76	197.28	36.91	36.91	9945
		0.00	51.00	12.35	195.58	36.31	36.31	4973
8	0.50	0.00	59.50	15.34	224.84	42.43	42.43	5221
9	0.00	0.00	68.00	18.32	254.10	48.46	48.46	5470
10	-0.65	0.00	79.05	22.20	292.14	56.26	56.26	5793
11	-1.30	0.00	90.10	26.09	330.17	64.03	64.03	6116
12	-1.50	0.00	93.50	27.28	341.88	66.45	66.45	6216
13	-2.00	0.00	102.00	30.27	371.14	72.42	72.42	6464
14	-2.60	0.00	112.20	33.85	406.25	79.59	79.59	6763
15	-3.20	0.00	122.40	37.43	441.36	86.77	86.77	7061
16	-4.00	0.00	136.00	42.21	488.17	96.32	96.32	7459
17	-4.50	5.00	139.50	43.44	500.22	98.85	103.85	7708
18	-5.00	10.00	143.00	44.67	512.27	101.42	111.42	7956
19	-5.20	12.00	144.40	45.16	517.09	102.52	114.52	8056
		12.00	144.40	28.50	689.30	149.74	161.74	29836
20	-5.80	18.00	150.40	30.20	715.52	153.88	171.88	29836
21	-6.40	24.00	156.40	31.90	741.73	159.16	183.16	29836
22	-7.20	32.00	164.40	34.17	776.69	166.70	198.70	29836
23	-8.00	40.00	172.40	36.44	811.64	174.35	214.35	29836
24	-8.80	48.00	180.40	38.70	846.60	182.12	230.12	29836
25	-9.40	54.00	186.40	40.40	872.81	188.00	242.00	29836
26	-10.00	60.00	192.40	42.10	899.03	194.11	254.11	29836
27	-10.40	64.00	196.40	43.24	916.51	197.69	261.69	29836
		64.00	196.40	32.88	974.87	198.55	262.55	49726
28	-11.70	77.00	213.30	37.82	1048.71	213.41	290.41	49726
		77.00	213.30	0.00	6183.36	215.59	292.59	994529
29	-13.85	98.50	249.85	0.00	6690.89	251.04	349.54	994529
30	-16.00	120.00	286.40	0.00	7198.42	287.59	407.59	994529
31	-18.00	140.00	320.40	0.00	7670.54	321.57	461.57	994529
32	-20.00	160.00	354.40	0.00	8142.66	355.36	515.36	994529

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00



Stage No.1 Apply surcharge no.1 at elev. 4.00



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Data filename/Run ID: Section_4                               |
Albert Street Development                                     | Date:16-11-2022
Section 4                                                     | Checked :
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                                                       Units: kN,m
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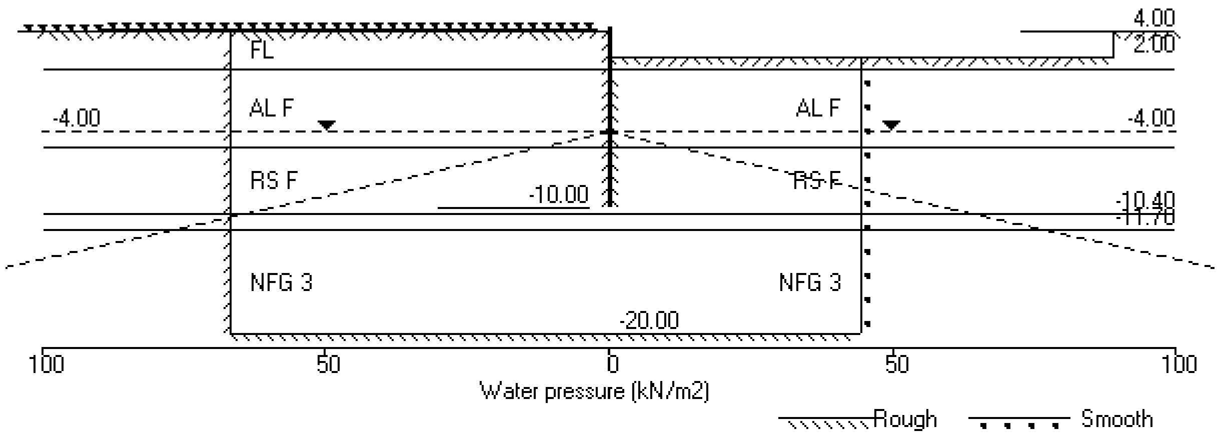
Stage No.2   Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No. 2 Excavate to elevation 2.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00 Factor of Safety	FoS for toe elev. = -10.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
2	4.00	2.00	Cant.	12.542	-7.69	-0.21	2.21	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.018	1.57E-03	0.0	-0.0		572444
2	3.20	4.57	0.017	1.57E-03	1.8	1.2		572444
3	2.65	7.99	0.016	1.57E-03	5.3	3.3		572444
4	2.10	11.31	0.015	1.57E-03	10.6	7.8		572444
5	2.00	11.90	0.015	1.56E-03	11.7	8.9		572444
6	1.50	-15.10	0.014	1.55E-03	10.9	15.8		572444
7	1.00	-10.43	0.013	1.54E-03	4.6	19.4		572444
		3.36	0.013	1.54E-03	4.6	19.4		
8	0.50	0.63	0.012	1.52E-03	5.6	22.1		572444
9	0.00	0.51	0.012	1.50E-03	5.8	25.0		572444
10	-0.65	1.03	0.011	1.47E-03	6.4	28.9		572444
11	-1.30	1.63	0.010	1.43E-03	7.2	33.3		572444
12	-1.50	1.86	0.009	1.42E-03	7.6	34.8		572444
13	-2.00	2.34	0.009	1.39E-03	8.6	38.8		572444
14	-2.60	2.88	0.008	1.35E-03	10.2	44.4		572444
15	-3.20	3.26	0.007	1.30E-03	12.0	51.0		572444
16	-4.00	3.42	0.006	1.22E-03	14.7	61.7		572444
17	-4.50	2.59	0.005	1.16E-03	16.2	69.4		572444
18	-5.00	0.75	0.005	1.10E-03	17.0	77.8		572444
19	-5.20	-1.29	0.005	1.07E-03	17.0	81.3		572444
		-54.06	0.005	1.07E-03	17.0	81.3		
20	-5.80	-24.10	0.004	9.87E-04	-6.5	81.7		572444
21	-6.40	-11.39	0.003	9.06E-04	-17.1	73.5		572444
22	-7.20	-3.73	0.003	8.15E-04	-23.2	56.2		572444
23	-8.00	2.05	0.002	7.51E-04	-23.8	36.4		572444
24	-8.80	6.45	0.002	7.13E-04	-20.4	18.0		572444
25	-9.40	11.69	0.001	7.00E-04	-15.0	6.9		572444
26	-10.00	23.00	0.001	6.96E-04	-4.6	0.0		0
27	-10.40	6.18	0.001	0	1.2	0.0		0
		-1.89	0.001	0	1.2	0.0		
28	-11.70	17.19	0.000	0	11.2	0.0		0
		-10.38	0.000	0	11.2	0.0		

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-13.85	0.00	0.000	0	0.0	0.0		0
30	-16.00	0.00	0.000	0	0.0	0.0		0
31	-18.00	0.00	0.000	0	0.0	0.0		0
32	-20.00	-0.03	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	4.57	4.57a	9971
3	2.65	0.00	25.85	7.99	99.98	7.99	7.99a	9971
4	2.10	0.00	36.59	11.31	141.55	11.31	11.31a	9971
5	2.00	0.00	38.50	11.90	148.93	11.90	11.90a	9971
6	1.50	0.00	47.88	14.80	185.22	17.78	17.78	9971
7	1.00	0.00	57.04	17.63	220.65	27.01	27.01	9971
		0.00	57.04	14.47	216.38	32.65	32.65	4985
8	0.50	0.00	66.05	17.64	247.37	37.11	37.11	5235
9	0.00	0.00	74.94	20.76	277.99	42.85	42.85	5484
10	-0.65	0.00	86.39	24.78	317.40	50.75	50.75	5808
11	-1.30	0.00	97.75	28.77	356.50	58.74	58.74	6132
12	-1.50	0.00	101.23	29.99	368.48	61.18	61.18	6232
13	-2.00	0.00	109.91	33.04	398.36	67.35	67.35	6481
14	-2.60	0.00	120.29	36.69	434.09	74.74	74.74	6780
15	-3.20	0.00	130.64	40.33	469.73	82.04	82.04	7079
16	-4.00	0.00	144.41	45.16	517.11	91.63	91.63	7478
17	-4.50	5.00	147.99	46.42	529.46	93.64	98.64	7727
18	-5.00	10.00	151.57	47.68	541.78	95.13	105.13	7977
19	-5.20	12.00	153.00	48.18	546.69	95.17	107.17	8076
		12.00	153.00	30.94	726.88	112.53	124.53	29913
20	-5.80	18.00	159.08	32.66	753.43	133.25	151.25	29913
21	-6.40	24.00	165.15	34.38	779.94	145.62	169.62	29913
22	-7.20	32.00	173.22	36.67	815.23	157.45	189.45	29913
23	-8.00	40.00	181.29	38.95	850.47	168.33	208.33	29913
24	-8.80	48.00	189.34	41.24	885.66	178.52	226.52	29913
25	-9.40	54.00	195.38	42.95	912.03	187.14	241.14	29913
26	-10.00	60.00	201.40	44.65	938.38	198.65	258.65	29913
27	-10.40	64.00	205.42	45.79	955.93	194.33	258.33	29913
		64.00	205.42	35.52	1014.29	190.38	254.38	49855
28	-11.70	77.00	222.37	40.47	1088.33	216.68	293.68	49855
		77.00	222.37	0.00	6309.29	205.48	282.48	997093
29	-13.85	98.50	258.96	0.00	6817.44	247.29	345.79	997093
30	-16.00	120.00	295.53	0.00	7325.15	283.80	403.80	997093
31	-18.00	140.00	329.52	0.00	7797.13	317.68	457.68	997093
32	-20.00	160.00	363.49	0.00	8268.84	350.72	510.72	997093

RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0

(continued)

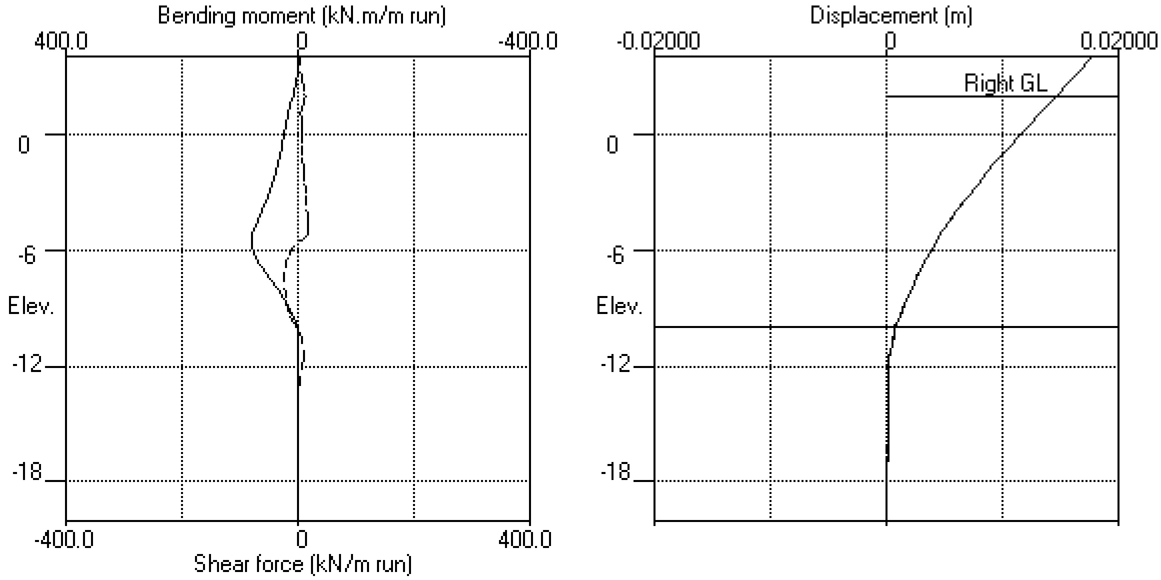
Stage No.2 Excavate to elevation 2.00 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	9951
6	1.50	0.00	8.50	2.63	32.88	32.88	32.88p	9951
7	1.00	0.00	17.00	5.25	65.76	37.44	37.44	9951
		0.00	17.00	0.41	78.55	29.29	29.29	4976
8	0.50	0.00	25.50	3.39	107.81	36.48	36.48	5225
9	0.00	0.00	34.00	6.38	137.07	42.34	42.34	5473
10	-0.65	0.00	45.05	10.26	175.12	49.72	49.72	5797
11	-1.30	0.00	56.11	14.14	213.17	57.11	57.11	6120
12	-1.50	0.00	59.51	15.34	224.88	59.32	59.32	6220
13	-2.00	0.00	68.01	18.33	254.15	65.02	65.02	6468
14	-2.60	0.00	78.22	21.91	289.29	71.86	71.86	6767
15	-3.20	0.00	88.43	25.50	324.43	78.78	78.78	7066
16	-4.00	0.00	102.05	30.28	371.30	88.21	88.21	7464
17	-4.50	5.00	105.56	31.52	383.39	91.05	96.05	7712
18	-5.00	10.00	109.07	32.75	395.49	94.39	104.39	7961
19	-5.20	12.00	110.48	33.24	400.33	96.46	108.46	8061
		12.00	110.48	18.89	541.09	166.59	178.59	29854
20	-5.80	18.00	116.50	20.60	567.40	157.35	175.35	29854
21	-6.40	24.00	122.53	22.30	593.73	157.01	181.01	29854
22	-7.20	32.00	130.57	24.58	628.85	161.18	193.18	29854
23	-8.00	40.00	138.61	26.86	664.00	166.28	206.28	29854
24	-8.80	48.00	146.66	29.14	699.18	172.07	220.07	29854
25	-9.40	54.00	152.70	30.86	725.58	175.46	229.46	29854
26	-10.00	60.00	158.75	32.57	752.00	175.65	235.65	29854
27	-10.40	64.00	162.78	33.71	769.63	188.16	252.16	29854
		64.00	162.78	23.06	827.99	192.27	256.27	49757
28	-11.70	77.00	179.81	28.03	902.37	199.49	276.49	49757
		77.00	179.81	0.00	5718.28	215.86	292.86	995147
29	-13.85	98.50	216.60	0.00	6229.22	247.28	345.78	995147
30	-16.00	120.00	253.45	0.00	6740.92	283.80	403.80	995147
31	-18.00	140.00	287.78	0.00	7217.55	317.68	457.68	995147
32	-20.00	160.00	322.14	0.00	7694.76	350.76	510.76	995147

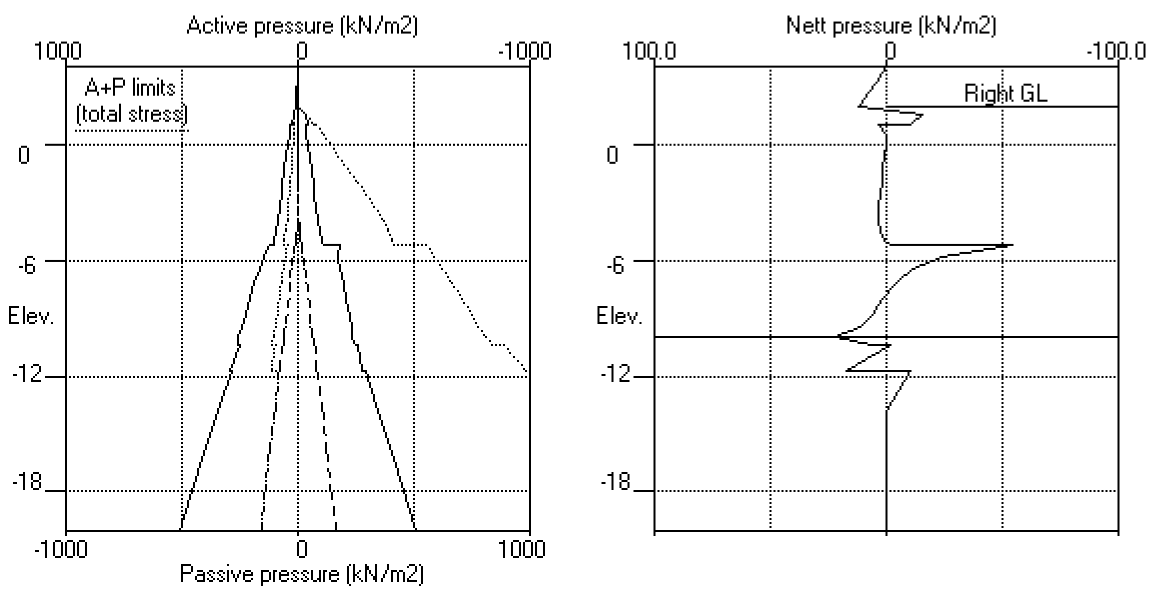
Note: 11.90 a Soil pressure at active limit
32.88 p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side

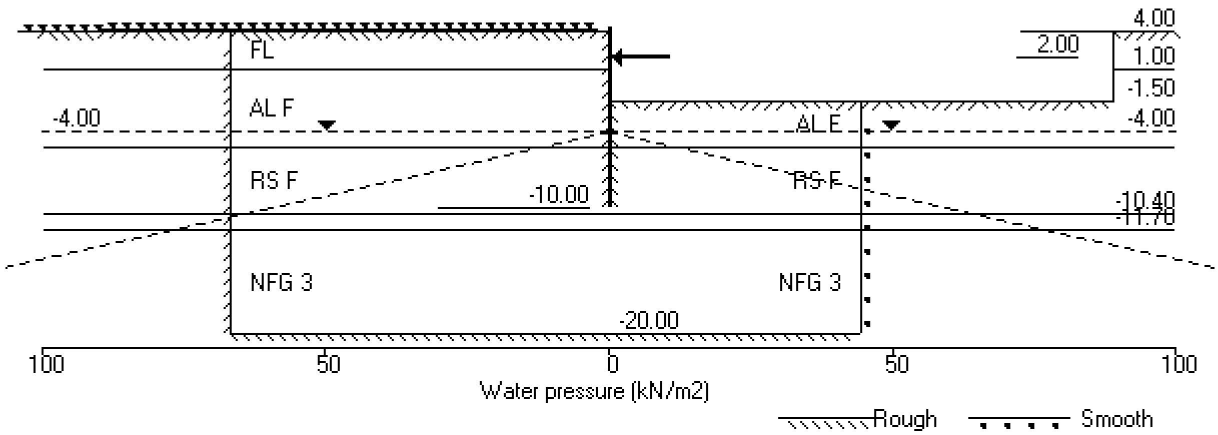


Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -1.50 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
4	4.00	-1.50	2.00	9.383	n/a	-3.36	1.86	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	2.83E-04	0.0	-0.0		572444
2	3.20	9.49	0.017	2.82E-04	3.8	1.2		572444
3	2.65	10.05	0.016	2.79E-04	9.2	5.1		572444
4	2.10	11.79	0.016	2.71E-04	15.2	12.0		572444
5	2.00	10.87	0.016	2.69E-04	16.3	13.6	-117.4	572444
		10.87	0.016	2.69E-04	-101.1	13.6		
6	1.50	15.16	0.016	2.78E-04	-94.5	-34.6		572444
7	1.00	22.08	0.016	3.28E-04	-85.2	-79.8		572444
		30.18	0.016	3.28E-04	-85.2	-79.8		
8	0.50	33.84	0.016	4.14E-04	-69.2	-118.3		572444
9	0.00	38.75	0.016	5.31E-04	-51.1	-148.5		572444
10	-0.65	45.74	0.015	7.13E-04	-23.6	-172.9		572444
11	-1.30	53.06	0.015	9.12E-04	8.5	-178.1		572444
12	-1.50	54.90	0.014	9.74E-04	19.3	-175.3		572444
		34.87	0.014	9.74E-04	19.3	-175.3		
13	-2.00	15.15	0.014	1.12E-03	31.8	-161.9		572444
14	-2.60	14.84	0.013	1.28E-03	40.8	-140.1		572444
15	-3.20	14.15	0.012	1.41E-03	49.5	-113.0		572444
16	-4.00	13.57	0.011	1.53E-03	60.6	-68.8		572444
17	-4.50	11.54	0.010	1.58E-03	66.8	-36.9		572444
18	-5.00	8.13	0.010	1.60E-03	71.8	-2.0		572444
19	-5.20	4.75	0.009	1.60E-03	73.1	12.5		572444
		-100.68	0.009	1.60E-03	73.1	12.5		
20	-5.80	-48.75	0.008	1.57E-03	28.2	38.2		572444
21	-6.40	-27.27	0.007	1.53E-03	5.4	46.4		572444
22	-7.20	-13.52	0.006	1.46E-03	-10.9	42.0		572444
23	-8.00	-2.75	0.005	1.41E-03	-17.4	28.9		572444
24	-8.80	4.92	0.004	1.38E-03	-16.5	14.1		572444
25	-9.40	10.97	0.003	1.37E-03	-11.8	5.1		572444
26	-10.00	16.97	0.002	1.37E-03	-3.4	-0.0		0
27	-10.40	14.79	0.002	0	3.0	0.0		0
		-4.53	0.002	0	3.0	0.0		

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	41.18	0.000	0	26.8	0.0		0
		-24.88	0.000	0	26.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.00	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.07	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 117.4 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	9.49	9.49	9971
3	2.65	0.00	25.85	7.99	99.98	10.05	10.05	9971
4	2.10	0.00	36.59	11.31	141.55	11.79	11.79	9971
5	2.00	0.00	38.50	11.90	148.93	10.87	10.87A	9971
6	1.50	0.00	47.88	14.80	185.22	15.16	15.16	9971
7	1.00	0.00	57.04	17.63	220.65	22.08	22.08	9971
		0.00	57.04	14.47	216.38	30.18	30.18	4985
8	0.50	0.00	66.05	17.64	247.37	33.84	33.84	5235
9	0.00	0.00	74.94	20.76	277.99	38.75	38.75	5484
10	-0.65	0.00	86.39	24.78	317.40	45.74	45.74	5808
11	-1.30	0.00	97.75	28.77	356.50	53.06	53.06	6132
12	-1.50	0.00	101.23	29.99	368.48	54.90	54.90	6232
13	-2.00	0.00	109.91	33.04	398.36	60.65	60.65	6481
14	-2.60	0.00	120.29	36.69	434.09	67.58	67.58	6780
15	-3.20	0.00	130.64	40.33	469.73	74.44	74.44	7079
16	-4.00	0.00	144.41	45.16	517.11	83.72	83.72	7478
17	-4.50	5.00	147.99	46.42	529.46	85.17	90.17	7727
18	-5.00	10.00	151.57	47.68	541.78	85.91	95.91	7977
19	-5.20	12.00	153.00	48.18	546.69	85.47	97.47	8076
		12.00	153.00	30.94	726.88	76.61	88.61	29913
20	-5.80	18.00	159.08	32.66	753.43	108.07	126.07	29913
21	-6.40	24.00	165.15	34.38	779.94	124.84	148.84	29913
22	-7.20	32.00	173.22	36.67	815.23	139.75	171.75	29913
23	-8.00	40.00	181.29	38.95	850.47	153.15	193.15	29913
24	-8.80	48.00	189.34	41.24	885.66	164.98	212.98	29913
25	-9.40	54.00	195.38	42.95	912.03	174.01	228.01	29913
26	-10.00	60.00	201.40	44.65	938.38	182.93	242.93	29913
27	-10.40	64.00	205.42	45.79	955.93	185.89	249.89	29913
		64.00	205.42	35.52	1014.29	176.30	240.30	49855
28	-11.70	77.00	222.37	40.47	1088.33	215.96	292.96	49855
		77.00	222.37	0.00	6309.29	191.06	268.06	997093
29	-13.85	98.50	258.96	0.00	6817.44	240.18	338.68	997093
30	-16.00	120.00	295.53	0.00	7325.15	276.70	396.70	997093
31	-18.00	140.00	329.52	0.00	7797.13	310.51	450.51	997093
32	-20.00	160.00	363.49	0.00	8268.84	342.30	502.30	997093

(continued)

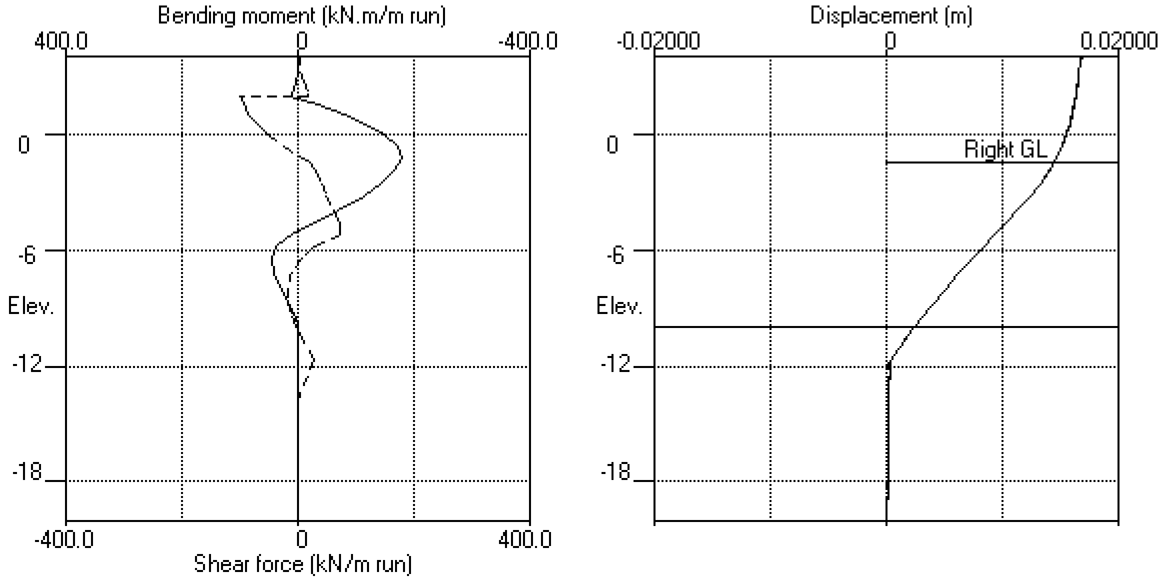
Stage No.4 Excavate to elevation -1.50 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	6226
13	-2.00	0.00	8.50	0.00	49.29	45.50	45.50	6475
14	-2.60	0.00	18.70	1.00	84.40	52.74	52.74	6774
15	-3.20	0.00	28.90	4.59	119.52	60.29	60.29	7073
16	-4.00	0.00	42.51	9.37	166.36	70.14	70.14	7471
17	-4.50	5.00	46.02	10.60	178.43	73.63	78.63	7720
18	-5.00	10.00	49.53	11.83	190.51	77.77	87.77	7969
19	-5.20	12.00	50.93	12.33	195.35	80.72	92.72	8069
		12.00	50.93	2.02	280.90	177.29	189.29	29884
20	-5.80	18.00	56.95	3.72	307.19	156.82	174.82	29884
21	-6.40	24.00	62.97	5.43	333.51	152.11	176.11	29884
22	-7.20	32.00	71.01	7.71	368.64	153.27	185.27	29884
23	-8.00	40.00	79.07	9.99	403.83	155.90	195.90	29884
24	-8.80	48.00	87.13	12.28	439.07	160.07	208.07	29884
25	-9.40	54.00	93.19	13.99	465.55	163.03	217.03	29884
26	-10.00	60.00	99.26	15.71	492.07	165.97	225.97	29884
27	-10.40	64.00	103.31	16.86	509.77	171.10	235.10	29884
		64.00	103.31	5.68	568.13	180.83	244.83	49807
28	-11.70	77.00	120.41	10.67	642.84	174.78	251.78	49807
		77.00	120.41	0.00	4893.49	215.94	292.94	996147
29	-13.85	98.50	157.40	0.00	5407.09	240.17	338.67	996147
30	-16.00	120.00	194.53	0.00	5922.71	276.70	396.70	996147
31	-18.00	140.00	229.20	0.00	6404.21	310.50	450.50	996147
32	-20.00	160.00	264.01	0.00	6887.47	342.37	502.37	996147

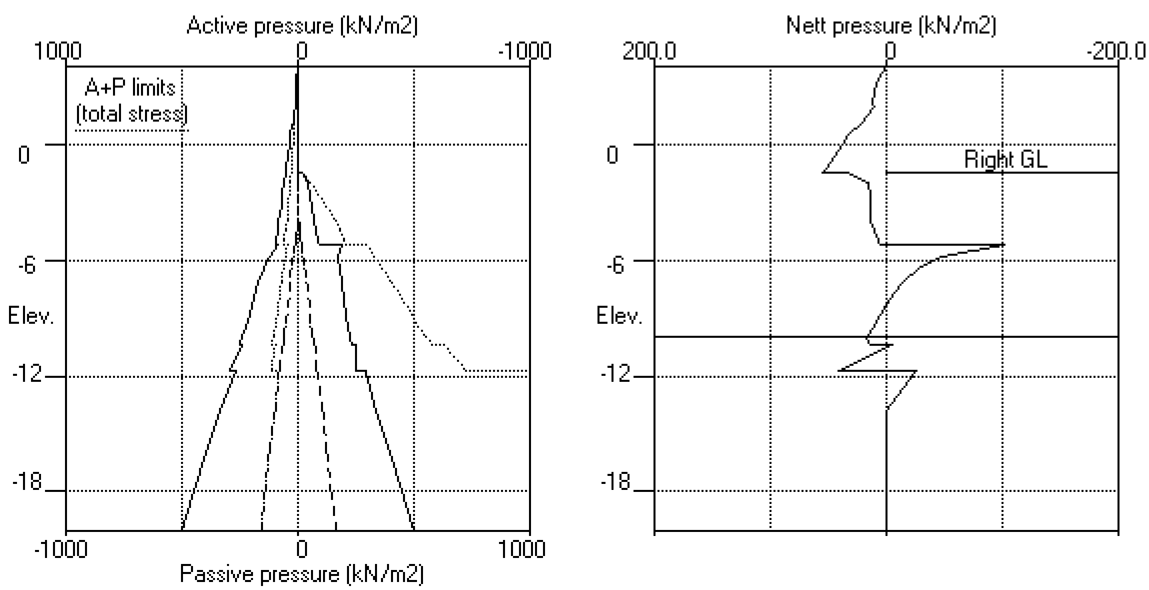
Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit
10.87A Arching - soil pressure below active limit

Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side



Stage No.4 Excav. to elev. -1.50 on RIGHT side



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                            Licensed from GEOSOLVE         | Made by :   DJC
Data filename/Run ID: Section_4                            |
Albert Street Development                                  | Date:16-11-2022
Section 4                                                  | Checked :
-----------------------------------------------------------------------------
                                                 Units: kN,m
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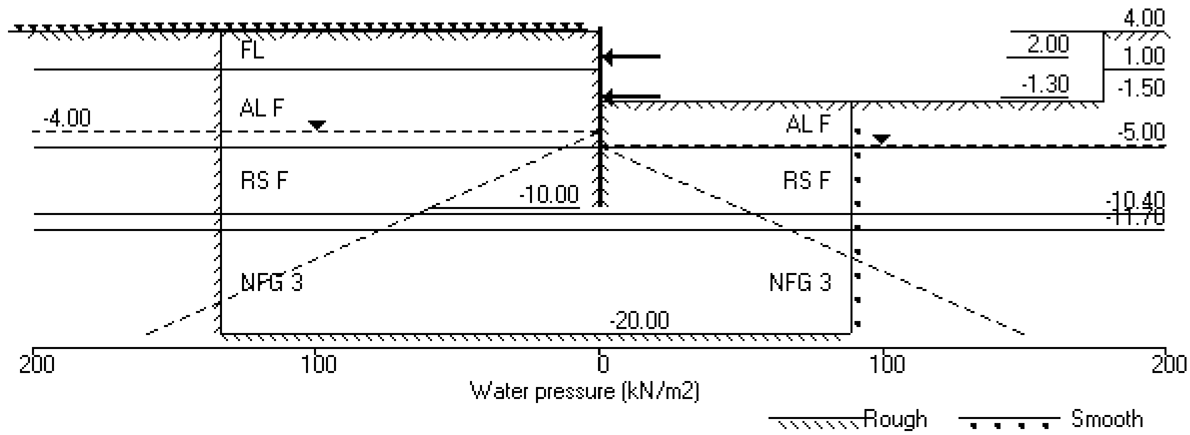
Stage No.6   Apply water pressure profile no.2



Units: kN,m

Stage No. 6 Apply water pressure profile no.2

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
6	4.00	-1.50		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	2.53E-04	0.0	-0.0		572444
2	3.20	9.71	0.017	2.52E-04	3.9	1.2		572444
3	2.65	10.22	0.016	2.49E-04	9.4	5.2		572444
4	2.10	11.94	0.016	2.41E-04	15.5	12.3		572444
5	2.00	11.00	0.016	2.39E-04	16.6	13.9	-115.5	572444
		11.00	0.016	2.39E-04	-98.9	13.9		
6	1.50	15.28	0.016	2.47E-04	-92.3	-33.3		572444
7	1.00	22.18	0.016	2.95E-04	-83.0	-77.3		572444
		30.24	0.016	2.95E-04	-83.0	-77.3		
8	0.50	33.89	0.016	3.79E-04	-66.9	-114.7		572444
9	0.00	38.80	0.016	4.92E-04	-48.8	-143.7		572444
10	-0.65	45.78	0.015	6.68E-04	-21.3	-166.6		572444
11	-1.30	53.08	0.015	8.60E-04	10.9	-170.3	-7.0	572444
		53.08	0.015	8.60E-04	3.8	-170.3		
12	-1.50	54.89	0.015	9.19E-04	14.6	-168.4		572444
		34.98	0.015	9.19E-04	14.6	-168.4		
13	-2.00	15.18	0.014	1.06E-03	27.2	-157.3		572444
14	-2.60	14.73	0.013	1.21E-03	36.1	-138.3		572444
15	-3.20	13.86	0.013	1.34E-03	44.7	-114.0		572444
16	-4.00	13.10	0.011	1.47E-03	55.5	-73.8		572444
17	-4.50	13.72	0.011	1.53E-03	62.2	-44.3		572444
18	-5.00	13.03	0.010	1.55E-03	68.9	-11.3		572444
19	-5.20	9.53	0.010	1.55E-03	71.1	2.7		572444
		-98.42	0.010	1.55E-03	71.1	2.7		
20	-5.80	-46.37	0.009	1.54E-03	27.7	27.7		572444
21	-6.40	-25.36	0.008	1.50E-03	6.2	36.0		572444
22	-7.20	-12.04	0.007	1.45E-03	-8.8	32.8		572444
23	-8.00	-1.72	0.005	1.42E-03	-14.3	21.9		572444
24	-8.80	5.32	0.004	1.39E-03	-12.8	10.0		572444
25	-9.40	9.80	0.003	1.39E-03	-8.3	3.2		572444
26	-10.00	10.72	0.003	1.39E-03	-2.1	-0.0		0
27	-10.40	16.72	0.002	0	3.3	0.0		0
		-5.12	0.002	0	3.3	0.0		

(continued)

Stage No.6 Apply water pressure profile no.2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	46.36	0.000	0	30.1	0.0		0
		-28.01	0.000	0	30.1	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.00	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.07	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 115.5 kN/m run
At elev. -1.30 Prop force = 7.0 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	9.71	9.71	9971
3	2.65	0.00	25.85	7.99	99.98	10.22	10.22	9971
4	2.10	0.00	36.59	11.31	141.55	11.94	11.94	9971
5	2.00	0.00	38.50	11.90	148.93	11.00	11.00A	9971
6	1.50	0.00	47.88	14.80	185.22	15.28	15.28	9971
7	1.00	0.00	57.04	17.63	220.65	22.18	22.18	9971
		0.00	57.04	14.47	216.38	30.24	30.24	4985
8	0.50	0.00	66.05	17.64	247.37	33.89	33.89	5235
9	0.00	0.00	74.94	20.76	277.99	38.80	38.80	5484
10	-0.65	0.00	86.39	24.78	317.40	45.78	45.78	5808
11	-1.30	0.00	97.75	28.77	356.50	53.08	53.08	6132
12	-1.50	0.00	101.23	29.99	368.48	54.89	54.89	6232
13	-2.00	0.00	109.91	33.04	398.36	60.61	60.61	6481
14	-2.60	0.00	120.29	36.69	434.09	67.48	67.48	6780
15	-3.20	0.00	130.64	40.33	469.73	74.25	74.25	7079
16	-4.00	0.00	144.41	45.16	517.11	83.44	83.44	7478
17	-4.50	5.00	147.99	46.42	529.46	84.81	89.81	7727
18	-5.00	10.00	151.57	47.68	541.78	85.48	95.48	7977
19	-5.20	12.00	153.00	48.18	546.69	85.00	97.00	8076
		12.00	153.00	30.94	726.88	74.87	86.87	29913
20	-5.80	18.00	159.08	32.66	753.43	106.38	124.38	29913
21	-6.40	24.00	165.15	34.38	779.94	122.91	146.91	29913
22	-7.20	32.00	173.22	36.67	815.23	137.61	169.61	29913
23	-8.00	40.00	181.29	38.95	850.47	150.79	190.79	29913
24	-8.80	48.00	189.34	41.24	885.66	162.31	210.31	29913
25	-9.40	54.00	195.38	42.95	912.03	170.53	224.53	29913
26	-10.00	60.00	201.40	44.65	938.38	176.98	236.98	29913
27	-10.40	64.00	205.42	45.79	955.93	183.98	247.98	29913
		64.00	205.42	35.52	1014.29	173.11	237.11	49855
28	-11.70	77.00	222.37	40.47	1088.33	215.70	292.70	49855
		77.00	222.37	0.00	6309.29	185.78	262.78	997093
29	-13.85	98.50	258.96	0.00	6817.44	236.45	334.95	997093
30	-16.00	120.00	295.53	0.00	7325.15	272.98	392.98	997093
31	-18.00	140.00	329.52	0.00	7797.13	306.76	446.76	997093
32	-20.00	160.00	363.49	0.00	8268.84	337.99	497.99	997093

(continued)

Stage No.6 Apply water pressure profile no.2

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.91	19.91	6226
13	-2.00	0.00	8.50	0.00	49.29	45.42	45.42	6475
14	-2.60	0.00	18.70	1.00	84.40	52.74	52.74	6774
15	-3.20	0.00	28.90	4.59	119.52	60.39	60.39	7073
16	-4.00	0.00	42.51	9.37	166.36	70.35	70.35	7471
17	-4.50	0.00	51.02	12.36	195.64	76.09	76.09	7720
18	-5.00	0.00	59.53	15.35	224.93	82.45	82.45	7969
19	-5.20	2.00	60.93	15.84	229.77	85.47	87.47	8069
		2.00	60.93	4.85	324.59	183.29	185.29	29884
20	-5.80	8.00	66.95	6.56	350.88	162.75	170.75	29884
21	-6.40	14.00	72.97	8.26	377.20	158.27	172.27	29884
22	-7.20	22.00	81.01	10.54	412.33	159.65	181.65	29884
23	-8.00	30.00	89.07	12.82	447.52	162.51	192.51	29884
24	-8.80	38.00	97.13	15.11	482.77	166.99	204.99	29884
25	-9.40	44.00	103.19	16.83	509.25	170.73	214.73	29884
26	-10.00	50.00	109.26	18.55	535.76	176.26	226.26	29884
27	-10.40	54.00	113.31	19.69	553.47	177.26	231.26	29884
		54.00	113.31	8.60	611.82	188.24	242.24	49807
28	-11.70	67.00	130.41	13.59	686.53	179.34	246.34	49807
		67.00	130.41	0.00	5032.35	223.79	290.79	996147
29	-13.85	88.50	167.40	0.00	5545.95	246.45	334.95	996147
30	-16.00	110.00	204.53	0.00	6061.57	282.98	392.98	996147
31	-18.00	130.00	239.20	0.00	6543.07	316.75	446.75	996147
32	-20.00	150.00	274.01	0.00	7026.33	348.06	498.06	996147

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
11.00A Arching - soil pressure below active limit

```
EDG CONSULTING PTY LTD                                        | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58           | Job No.  B01493
                               Licensed from GEOSOLVE         | Made by :   DJC
Data filename/Run ID: Section_4                               |
Albert Street Development                                     | Date:16-11-2022
Section 4                                                     | Checked :
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                                                   Units: kN,m
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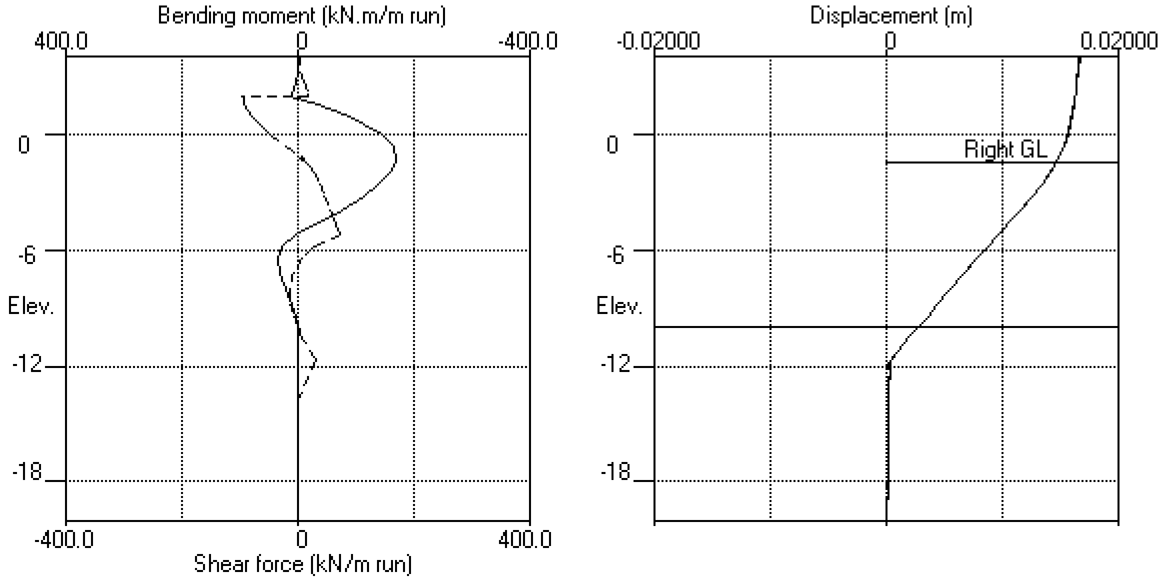
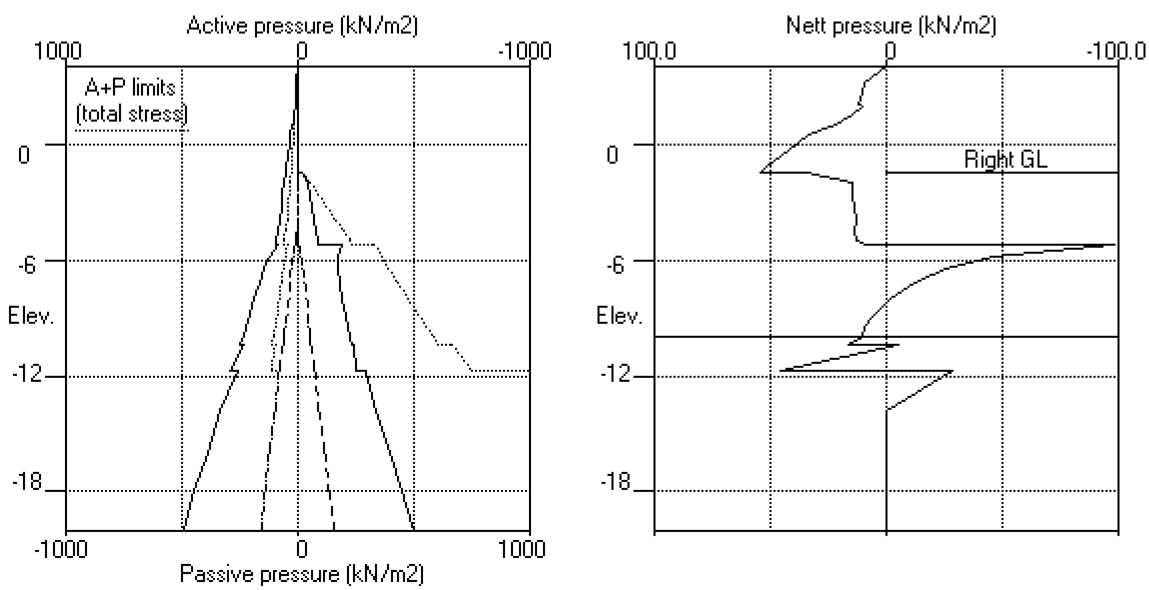
Stage No.6 Apply water pressure profile no.2

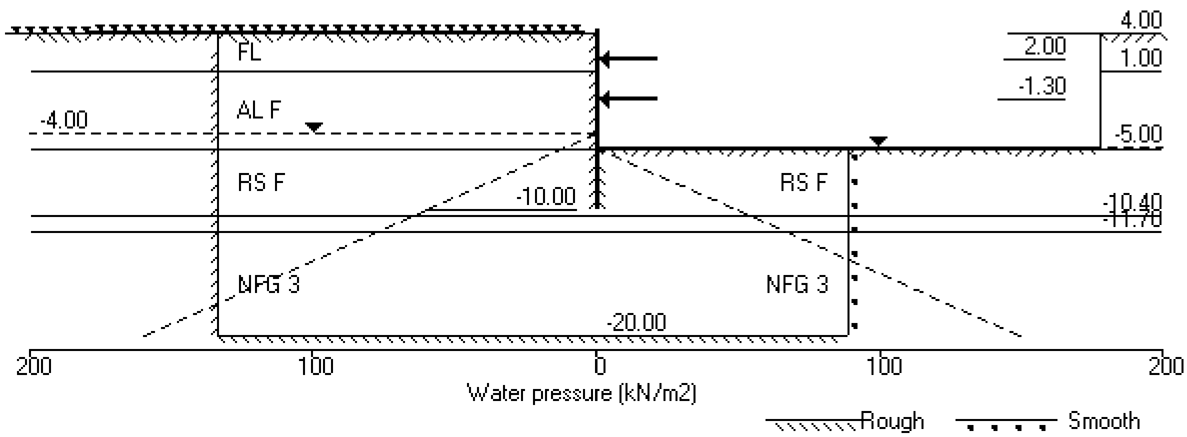


Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -5.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00 Factor of Safety	FoS for toe elev. = -10.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
7	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-5.34E-04	0.0	-0.0		572444
2	3.20	14.54	0.015	-5.35E-04	5.8	1.2		572444
3	2.65	13.55	0.016	-5.39E-04	13.5	7.0		572444
4	2.10	14.51	0.016	-5.50E-04	21.3	16.9		572444
5	2.00	12.87	0.016	-5.53E-04	22.6	19.1	-98.5	572444
		12.87	0.016	-5.53E-04	-75.9	19.1		
6	1.50	16.45	0.016	-5.54E-04	-68.6	-16.3		572444
7	1.00	22.44	0.017	-5.26E-04	-58.9	-48.4		572444
		30.36	0.017	-5.26E-04	-58.9	-48.4		
8	0.50	33.86	0.017	-4.73E-04	-42.8	-73.7		572444
9	0.00	38.46	0.017	-4.01E-04	-24.7	-90.6		572444
10	-0.65	44.93	0.017	-2.94E-04	2.4	-98.0		572444
11	-1.30	51.63	0.017	-1.89E-04	33.8	-86.5	-198.8	572444
		51.63	0.017	-1.89E-04	-165.0	-86.5		
12	-1.50	52.64	0.017	-1.53E-04	-154.6	-118.4		572444
13	-2.00	57.37	0.018	-1.98E-05	-127.1	-188.6		572444
14	-2.60	62.83	0.017	2.12E-04	-91.0	-254.1		572444
15	-3.20	67.92	0.017	5.01E-04	-51.8	-297.0		572444
16	-4.00	75.62	0.017	9.29E-04	5.6	-315.6		572444
17	-4.50	80.54	0.016	1.19E-03	44.6	-303.0		572444
18	-5.00	85.14	0.015	1.44E-03	86.1	-270.3		572444
		65.11	0.015	1.44E-03	86.1	-270.3		
19	-5.20	59.32	0.015	1.54E-03	98.5	-251.8		572444
		-19.70	0.015	1.54E-03	98.5	-251.8		
20	-5.80	-7.58	0.014	1.77E-03	90.3	-199.0		572444
21	-6.40	-14.96	0.013	1.95E-03	83.6	-148.0		572444
22	-7.20	-32.36	0.011	2.12E-03	64.6	-87.6		572444
23	-8.00	-25.72	0.010	2.21E-03	41.4	-46.3		572444
24	-8.80	-14.26	0.008	2.26E-03	25.4	-21.4		572444
25	-9.40	-10.98	0.007	2.28E-03	17.8	-8.7		572444
26	-10.00	-29.08	0.005	2.28E-03	5.8	0.0		0
27	-10.40	25.36	0.004	0	5.1	0.0		0
		-7.79	0.004	0	5.1	0.0		

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	70.52	0.001	0	45.8	0.0		0
		-42.62	0.001	0	45.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 98.5 kN/m run
At elev. -1.30 Prop force = 198.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	14.54	14.54	9971
3	2.65	0.00	25.85	7.99	99.98	13.55	13.55	9971
4	2.10	0.00	36.59	11.31	141.55	14.51	14.51	9971
5	2.00	0.00	38.50	11.90	148.93	12.87	12.87	9971
6	1.50	0.00	47.88	14.80	185.22	16.45	16.45	9971
7	1.00	0.00	57.04	17.63	220.65	22.44	22.44	9971
		0.00	57.04	14.47	216.38	30.36	30.36	4985
8	0.50	0.00	66.05	17.64	247.37	33.86	33.86	5235
9	0.00	0.00	74.94	20.76	277.99	38.46	38.46	5484
10	-0.65	0.00	86.39	24.78	317.40	44.93	44.93	5808
11	-1.30	0.00	97.75	28.77	356.50	51.63	51.63	6132
12	-1.50	0.00	101.23	29.99	368.48	52.64	52.64	6232
13	-2.00	0.00	109.91	33.04	398.36	57.37	57.37	6481
14	-2.60	0.00	120.29	36.69	434.09	62.83	62.83	6780
15	-3.20	0.00	130.64	40.33	469.73	67.92	67.92	7079
16	-4.00	0.00	144.41	45.16	517.11	75.62	75.62	7478
17	-4.50	5.00	147.99	46.42	529.46	75.54	80.54	7727
18	-5.00	10.00	151.57	47.68	541.78	75.14	85.14	7977
19	-5.20	12.00	153.00	48.18	546.69	74.17	86.17	8076
		12.00	153.00	30.94	726.88	34.77	46.77	29913
20	-5.80	18.00	159.08	32.66	753.43	73.11	91.11	29913
21	-6.40	24.00	165.15	34.38	779.94	91.96	115.96	29913
22	-7.20	32.00	173.22	36.67	815.23	109.55	141.55	29913
23	-8.00	40.00	181.29	38.95	850.47	125.90	165.90	29913
24	-8.80	48.00	189.34	41.24	885.66	139.64	187.64	29913
25	-9.40	54.00	195.38	42.95	912.03	147.22	201.22	29913
26	-10.00	60.00	201.40	44.65	938.38	144.45	204.45	29913
27	-10.40	64.00	205.42	45.79	955.93	175.41	239.41	29913
		64.00	205.42	35.52	1014.29	158.84	222.84	49855
28	-11.70	77.00	222.37	40.47	1088.33	214.98	291.98	49855
		77.00	222.37	0.00	6309.29	171.38	248.38	997093
29	-13.85	98.50	258.96	0.00	6817.44	229.33	327.83	997093
30	-16.00	120.00	295.53	0.00	7325.15	265.81	385.81	997093
31	-18.00	140.00	329.52	0.00	7797.13	299.45	439.45	997093
32	-20.00	160.00	363.49	0.00	8268.84	329.32	489.32	997093

(continued)

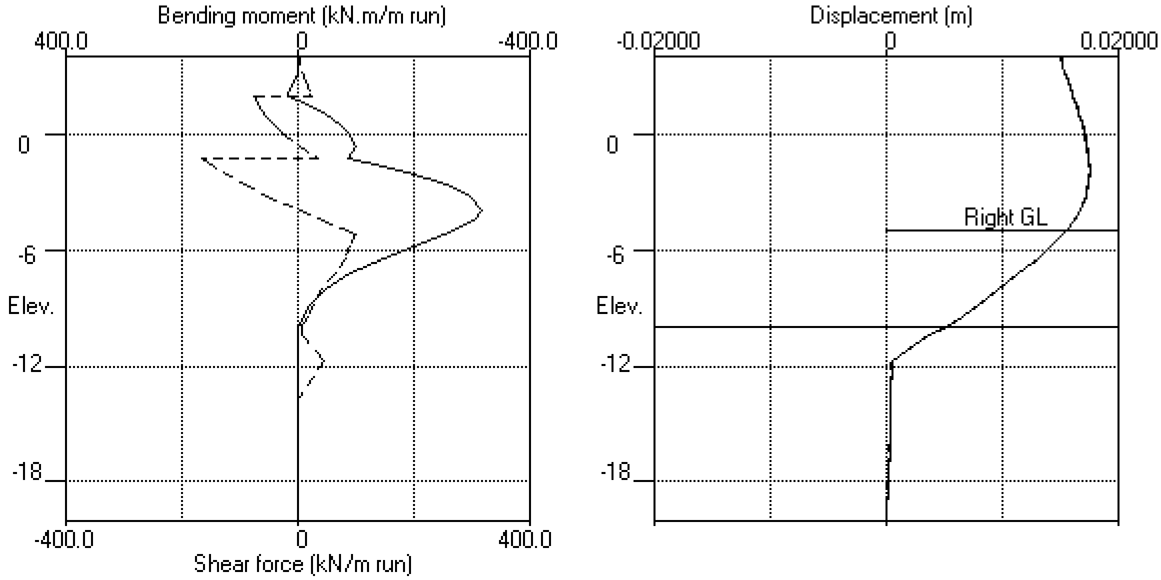
Stage No.7 Excavate to elevation -5.00 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.20	2.00	1.40	0.00	24.85	24.85	26.85p	8077
		2.00	1.40	0.00	64.48	64.48	66.48p	29915
20	-5.80	8.00	7.40	0.00	90.70	90.70	98.70p	29915
21	-6.40	14.00	13.40	0.00	116.92	116.92	130.92p	29915
22	-7.20	22.00	21.41	0.00	151.91	151.91	173.91p	29915
23	-8.00	30.00	29.43	0.00	186.94	161.62	191.62	29915
24	-8.80	38.00	37.46	0.00	222.02	163.90	201.90	29915
25	-9.40	44.00	43.49	0.00	248.36	168.20	212.20	29915
26	-10.00	50.00	49.52	1.62	274.75	183.53	233.53	29915
27	-10.40	54.00	53.56	2.76	292.37	160.05	214.05	29915
		54.00	53.56	0.00	350.73	176.63	230.63	49858
28	-11.70	67.00	70.60	0.00	425.18	154.46	221.46	49858
		67.00	70.60	0.00	4201.77	224.00	291.00	997169
29	-13.85	88.50	107.51	0.00	4714.42	239.32	327.82	997169
30	-16.00	110.00	144.64	0.00	5229.91	275.80	385.80	997169
31	-18.00	130.00	179.38	0.00	5712.28	309.44	439.44	997169
32	-20.00	150.00	214.32	0.00	6197.55	339.40	489.40	997169

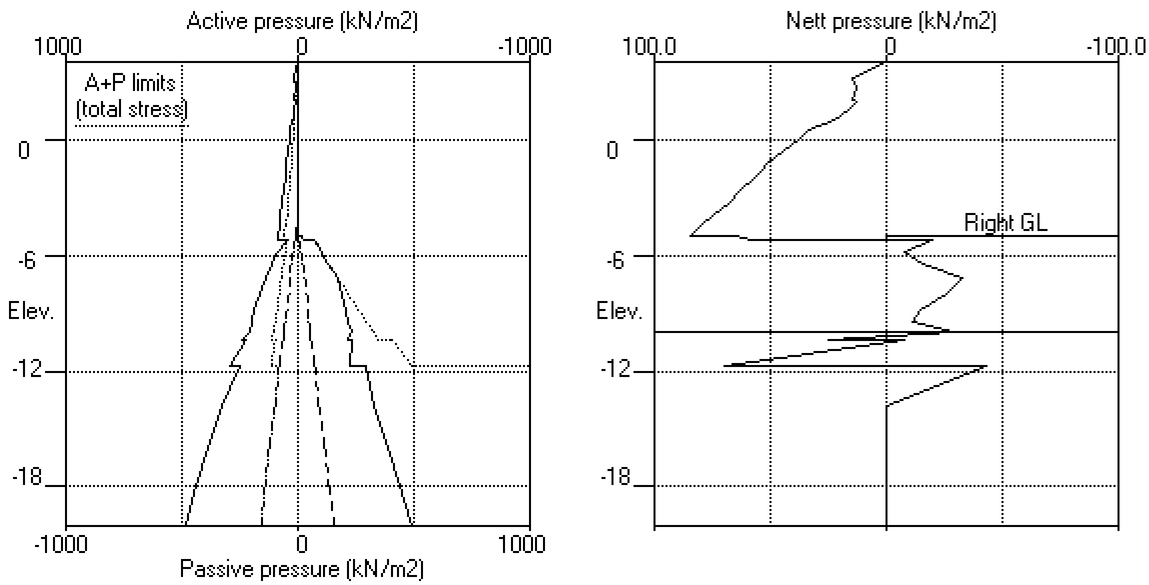
Note: 12.34 a Soil pressure at active limit
173.91 p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side

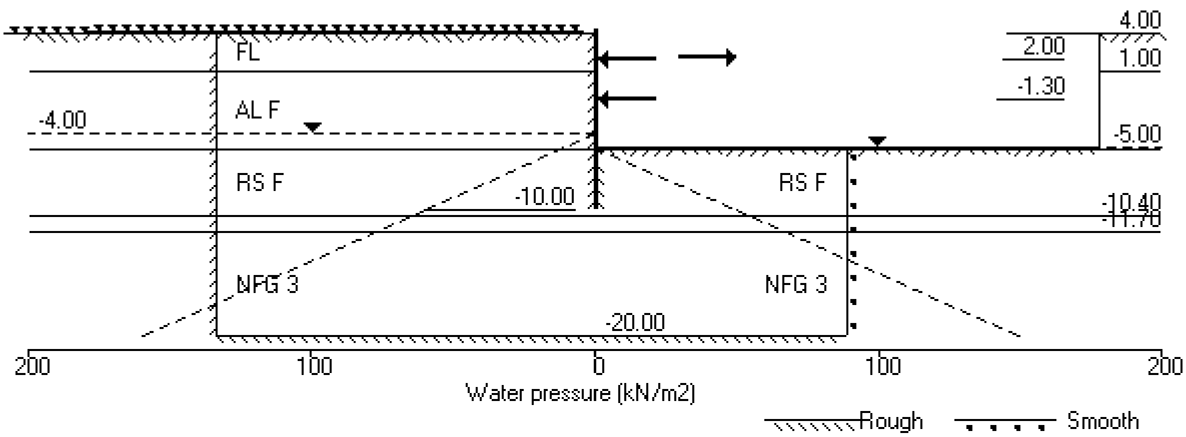


Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.10



Units: kN,m

Stage No. 8 Apply load no.1 at elevation 2.10

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
8	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	-3.84E-04	0.0	-0.0		572444
2	3.20	13.09	0.016	-3.85E-04	5.2	1.2		572444
3	2.65	12.52	0.016	-3.89E-04	12.3	6.5		572444
4	2.10	13.68	0.017	-3.99E-04	19.5	15.5	45.0	572444
		13.68	0.017	-3.99E-04	64.5	15.5		
5	2.00	12.24	0.017	-4.02E-04	65.8	22.0	-136.6	572444
		12.24	0.017	-4.02E-04	-70.8	22.0		
6	1.50	16.03	0.017	-4.07E-04	-63.7	-10.9		572444
7	1.00	22.28	0.017	-3.85E-04	-54.2	-40.6		572444
		30.29	0.017	-3.85E-04	-54.2	-40.6		
8	0.50	33.75	0.017	-3.39E-04	-38.1	-63.6		572444
9	0.00	38.39	0.017	-2.77E-04	-20.1	-78.2		572444
10	-0.65	44.92	0.017	-1.86E-04	7.0	-82.6		572444
11	-1.30	51.68	0.018	-1.00E-04	38.4	-68.1	-206.8	572444
		51.68	0.018	-1.00E-04	-168.4	-68.1		
12	-1.50	52.72	0.018	-7.14E-05	-158.0	-100.7		572444
13	-2.00	57.47	0.018	4.79E-05	-130.4	-172.6		572444
14	-2.60	62.96	0.017	2.64E-04	-94.3	-240.1		572444
15	-3.20	68.07	0.017	5.39E-04	-55.0	-284.8		572444
16	-4.00	75.77	0.017	9.52E-04	2.6	-306.0		572444
17	-4.50	80.69	0.016	1.21E-03	41.7	-294.9		572444
18	-5.00	85.29	0.015	1.45E-03	83.2	-263.6		572444
		65.35	0.015	1.45E-03	83.2	-263.6		
19	-5.20	59.54	0.015	1.54E-03	95.7	-245.6		572444
		-18.91	0.015	1.54E-03	95.7	-245.6		
20	-5.80	-6.83	0.014	1.77E-03	87.9	-194.4		572444
21	-6.40	-14.24	0.013	1.95E-03	81.6	-144.7		572444
22	-7.20	-31.74	0.011	2.11E-03	63.2	-85.7		572444
23	-8.00	-25.21	0.010	2.20E-03	40.4	-45.3		572444
24	-8.80	-13.84	0.008	2.25E-03	24.8	-21.0		572444
25	-9.40	-10.61	0.006	2.27E-03	17.5	-8.6		572444
26	-10.00	-28.61	0.005	2.27E-03	5.7	0.0		0

(continued)

Stage No.8 Apply load no.1 at elevation 2.10

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.40	25.36	0.004	0	5.1	0.0		0
		-7.79	0.004	0	5.1	0.0		
28	-11.70	70.52	0.001	0	45.8	0.0		0
		-42.62	0.001	0	45.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 136.6 kN/m run
At elev. -1.30 Prop force = 206.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	13.09	13.09	9971
3	2.65	0.00	25.85	7.99	99.98	12.52	12.52	9971
4	2.10	0.00	36.59	11.31	141.55	13.68	13.68	9971
5	2.00	0.00	38.50	11.90	148.93	12.24	12.24	9971
6	1.50	0.00	47.88	14.80	185.22	16.03	16.03	9971
7	1.00	0.00	57.04	17.63	220.65	22.28	22.28	9971
		0.00	57.04	14.47	216.38	30.29	30.29	4985
8	0.50	0.00	66.05	17.64	247.37	33.75	33.75	5235
9	0.00	0.00	74.94	20.76	277.99	38.39	38.39	5484
10	-0.65	0.00	86.39	24.78	317.40	44.92	44.92	5808
11	-1.30	0.00	97.75	28.77	356.50	51.68	51.68	6132
12	-1.50	0.00	101.23	29.99	368.48	52.72	52.72	6232
13	-2.00	0.00	109.91	33.04	398.36	57.47	57.47	6481
14	-2.60	0.00	120.29	36.69	434.09	62.96	62.96	6780
15	-3.20	0.00	130.64	40.33	469.73	68.07	68.07	7079
16	-4.00	0.00	144.41	45.16	517.11	75.77	75.77	7478
17	-4.50	5.00	147.99	46.42	529.46	75.69	80.69	7727
18	-5.00	10.00	151.57	47.68	541.78	75.29	85.29	7977
19	-5.20	12.00	153.00	48.18	546.69	74.30	86.30	8076
		12.00	153.00	30.94	726.88	35.25	47.25	29913
20	-5.80	18.00	159.08	32.66	753.43	73.55	91.55	29913
21	-6.40	24.00	165.15	34.38	779.94	92.36	116.36	29913
22	-7.20	32.00	173.22	36.67	815.23	109.90	141.90	29913
23	-8.00	40.00	181.29	38.95	850.47	126.18	166.18	29913
24	-8.80	48.00	189.34	41.24	885.66	139.86	187.86	29913
25	-9.40	54.00	195.38	42.95	912.03	147.42	201.42	29913
26	-10.00	60.00	201.40	44.65	938.38	144.69	204.69	29913
27	-10.40	64.00	205.42	45.79	955.93	175.41	239.41	29913
		64.00	205.42	35.52	1014.29	158.84	222.84	49855
28	-11.70	77.00	222.37	40.47	1088.33	214.98	291.98	49855
		77.00	222.37	0.00	6309.29	171.39	248.39	997093
29	-13.85	98.50	258.96	0.00	6817.44	229.34	327.84	997093
30	-16.00	120.00	295.53	0.00	7325.15	265.81	385.81	997093
31	-18.00	140.00	329.52	0.00	7797.13	299.45	439.45	997093
32	-20.00	160.00	363.49	0.00	8268.84	329.32	489.32	997093

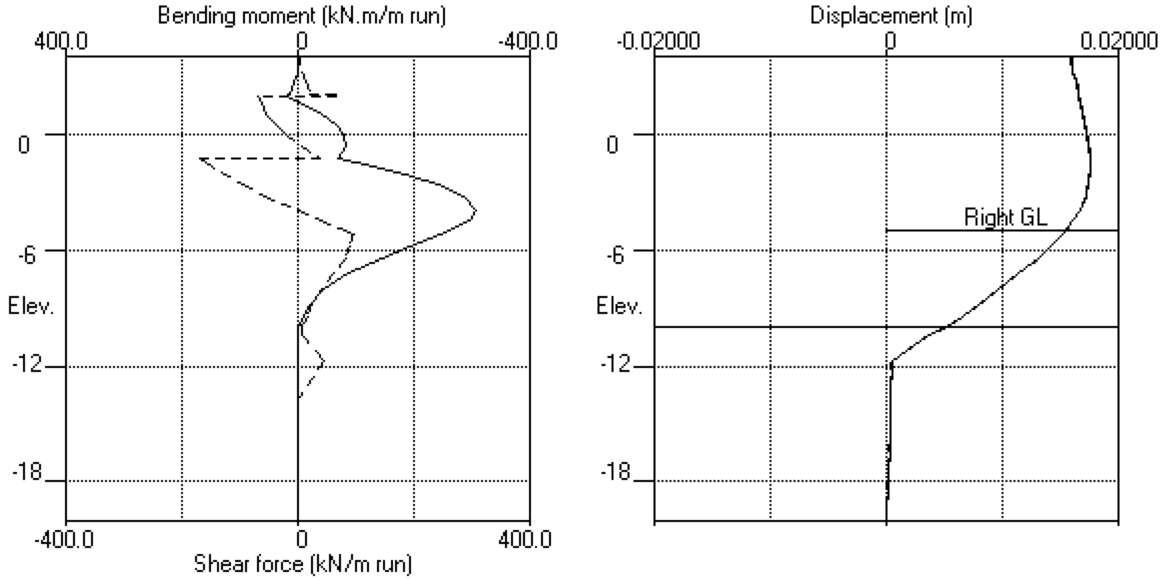
(continued)

Stage No.8 Apply load no.1 at elevation 2.10

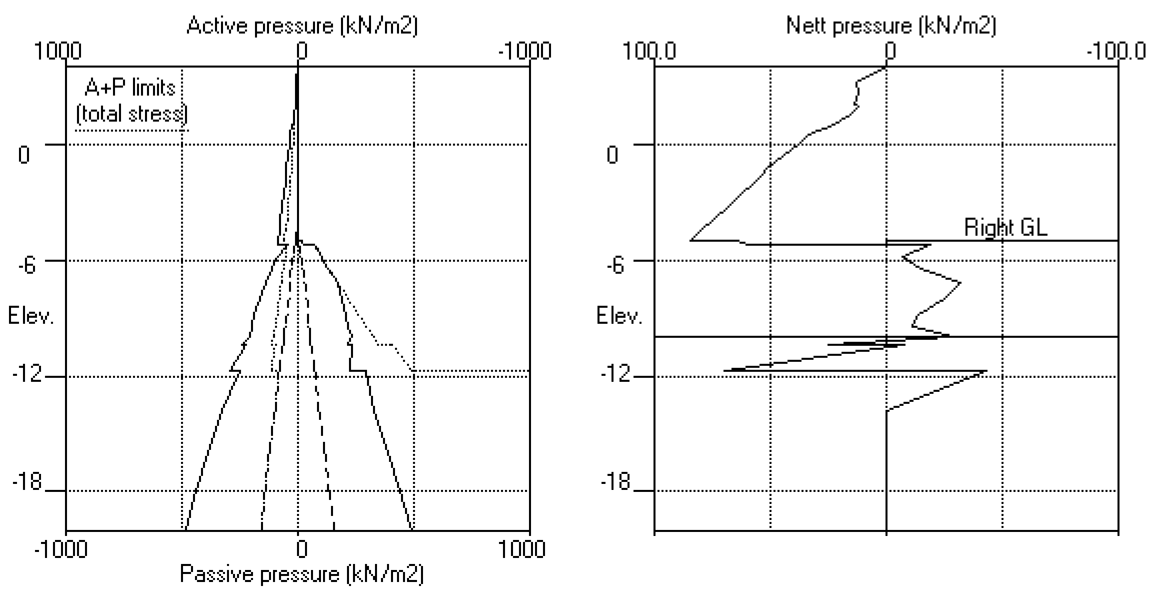
		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.94	19.94	7977
19	-5.20	2.00	1.40	0.00	24.85	24.76	26.76	8077
		2.00	1.40	0.00	64.48	64.16	66.16	29915
20	-5.80	8.00	7.40	0.00	90.70	90.38	98.38	29915
21	-6.40	14.00	13.40	0.00	116.92	116.61	130.61	29915
22	-7.20	22.00	21.41	0.00	151.91	151.63	173.63	29915
23	-8.00	30.00	29.43	0.00	186.94	161.39	191.39	29915
24	-8.80	38.00	37.46	0.00	222.02	163.70	201.70	29915
25	-9.40	44.00	43.49	0.00	248.36	168.03	212.03	29915
26	-10.00	50.00	49.52	1.62	274.75	183.30	233.30	29915
27	-10.40	54.00	53.56	2.76	292.37	160.05	214.05	29915
		54.00	53.56	0.00	350.73	176.64	230.64	49858
28	-11.70	67.00	70.60	0.00	425.18	154.46	221.46	49858
		67.00	70.60	0.00	4201.77	224.01	291.01	997169
29	-13.85	88.50	107.51	0.00	4714.42	239.33	327.83	997169
30	-16.00	110.00	144.64	0.00	5229.91	275.81	385.81	997169
31	-18.00	130.00	179.38	0.00	5712.28	309.44	439.44	997169
32	-20.00	150.00	214.32	0.00	6197.55	339.40	489.40	997169

Units: kN,m

Stage No.8 Apply load no.1 at elev. 2.10



Stage No.8 Apply load no.1 at elev. 2.10



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                             Licensed from GEOSOLVE           | Made by :   DJC
Data filename/Run ID: Section_4                               |
Albert Street Development                                     | Date:16-11-2022
Section 4                                                     | Checked :
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                                                     Units: kN,m
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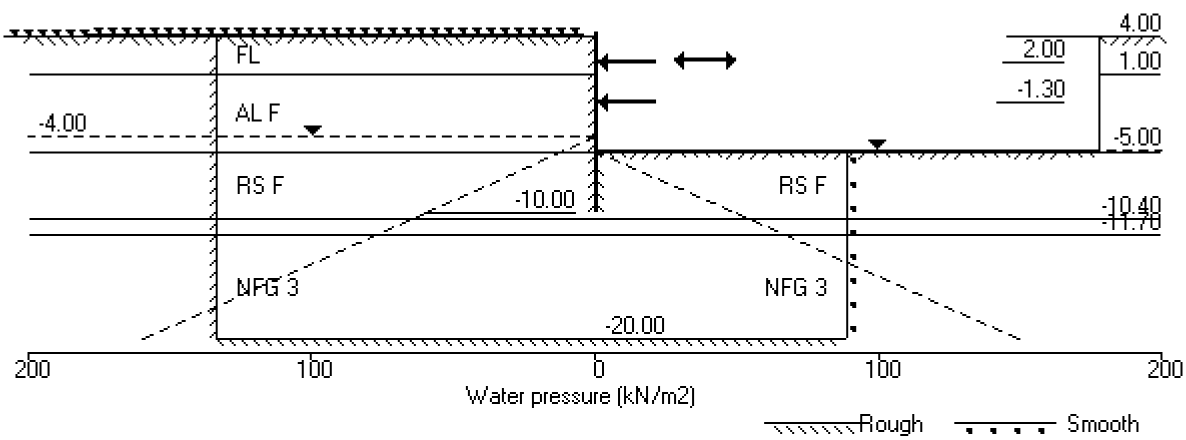
Stage No.9   Apply load no.2 at elev. 2.10



Units: kN,m

Stage No. 9 Apply load no.2 at elevation 2.10

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
9	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-5.34E-04	0.0	-0.0		572444
2	3.20	14.54	0.015	-5.35E-04	5.8	1.2		572444
3	2.65	13.55	0.016	-5.39E-04	13.5	7.0		572444
4	2.10	14.51	0.016	-5.50E-04	21.3	16.9		572444
5	2.00	12.87	0.016	-5.53E-04	22.6	19.1	-98.5	572444
		12.87	0.016	-5.53E-04	-75.9	19.1		
6	1.50	16.45	0.016	-5.54E-04	-68.6	-16.3		572444
7	1.00	22.44	0.017	-5.26E-04	-58.9	-48.4		572444
		30.36	0.017	-5.26E-04	-58.9	-48.4		
8	0.50	33.86	0.017	-4.73E-04	-42.8	-73.7		572444
9	0.00	38.46	0.017	-4.01E-04	-24.7	-90.6		572444
10	-0.65	44.93	0.017	-2.94E-04	2.4	-98.0		572444
11	-1.30	51.63	0.017	-1.89E-04	33.8	-86.5	-198.8	572444
		51.63	0.017	-1.89E-04	-165.0	-86.5		
12	-1.50	52.64	0.017	-1.53E-04	-154.6	-118.4		572444
13	-2.00	57.37	0.018	-1.98E-05	-127.1	-188.6		572444
14	-2.60	62.83	0.017	2.12E-04	-91.0	-254.1		572444
15	-3.20	67.92	0.017	5.01E-04	-51.8	-297.0		572444
16	-4.00	75.62	0.017	9.29E-04	5.6	-315.6		572444
17	-4.50	80.54	0.016	1.19E-03	44.6	-303.0		572444
18	-5.00	85.14	0.015	1.44E-03	86.1	-270.3		572444
		65.11	0.015	1.44E-03	86.1	-270.3		
19	-5.20	59.32	0.015	1.54E-03	98.5	-251.8		572444
		-19.70	0.015	1.54E-03	98.5	-251.8		
20	-5.80	-7.58	0.014	1.77E-03	90.3	-199.0		572444
21	-6.40	-14.96	0.013	1.95E-03	83.6	-148.0		572444
22	-7.20	-32.36	0.011	2.12E-03	64.6	-87.6		572444
23	-8.00	-25.72	0.010	2.21E-03	41.4	-46.3		572444
24	-8.80	-14.26	0.008	2.26E-03	25.4	-21.4		572444
25	-9.40	-10.98	0.007	2.28E-03	17.8	-8.7		572444
26	-10.00	-29.08	0.005	2.28E-03	5.8	0.0		0
27	-10.40	25.36	0.004	0	5.1	0.0		0
		-7.79	0.004	0	5.1	0.0		

(continued)

Stage No.9 Apply load no.2 at elevation 2.10

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	70.52	0.001	0	45.8	0.0		0
		-42.62	0.001	0	45.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 98.5 kN/m run
At elev. -1.30 Prop force = 198.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	14.54	14.54	9971
3	2.65	0.00	25.85	7.99	99.98	13.55	13.55	9971
4	2.10	0.00	36.59	11.31	141.55	14.51	14.51	9971
5	2.00	0.00	38.50	11.90	148.93	12.87	12.87	9971
6	1.50	0.00	47.88	14.80	185.22	16.45	16.45	9971
7	1.00	0.00	57.04	17.63	220.65	22.44	22.44	9971
		0.00	57.04	14.47	216.38	30.36	30.36	4985
8	0.50	0.00	66.05	17.64	247.37	33.86	33.86	5235
9	0.00	0.00	74.94	20.76	277.99	38.46	38.46	5484
10	-0.65	0.00	86.39	24.78	317.40	44.93	44.93	5808
11	-1.30	0.00	97.75	28.77	356.50	51.63	51.63	6132
12	-1.50	0.00	101.23	29.99	368.48	52.64	52.64	6232
13	-2.00	0.00	109.91	33.04	398.36	57.37	57.37	6481
14	-2.60	0.00	120.29	36.69	434.09	62.83	62.83	6780
15	-3.20	0.00	130.64	40.33	469.73	67.92	67.92	7079
16	-4.00	0.00	144.41	45.16	517.11	75.62	75.62	7478
17	-4.50	5.00	147.99	46.42	529.46	75.54	80.54	7727
18	-5.00	10.00	151.57	47.68	541.78	75.14	85.14	7977
19	-5.20	12.00	153.00	48.18	546.69	74.17	86.17	8076
		12.00	153.00	30.94	726.88	34.77	46.77	29913
20	-5.80	18.00	159.08	32.66	753.43	73.11	91.11	29913
21	-6.40	24.00	165.15	34.38	779.94	91.96	115.96	29913
22	-7.20	32.00	173.22	36.67	815.23	109.55	141.55	29913
23	-8.00	40.00	181.29	38.95	850.47	125.90	165.90	29913
24	-8.80	48.00	189.34	41.24	885.66	139.64	187.64	29913
25	-9.40	54.00	195.38	42.95	912.03	147.22	201.22	29913
26	-10.00	60.00	201.40	44.65	938.38	144.45	204.45	29913
27	-10.40	64.00	205.42	45.79	955.93	175.41	239.41	29913
		64.00	205.42	35.52	1014.29	158.84	222.84	49855
28	-11.70	77.00	222.37	40.47	1088.33	214.98	291.98	49855
		77.00	222.37	0.00	6309.29	171.38	248.38	997093
29	-13.85	98.50	258.96	0.00	6817.44	229.33	327.83	997093
30	-16.00	120.00	295.53	0.00	7325.15	265.81	385.81	997093
31	-18.00	140.00	329.52	0.00	7797.13	299.45	439.45	997093
32	-20.00	160.00	363.49	0.00	8268.84	329.32	489.32	997093

(continued)

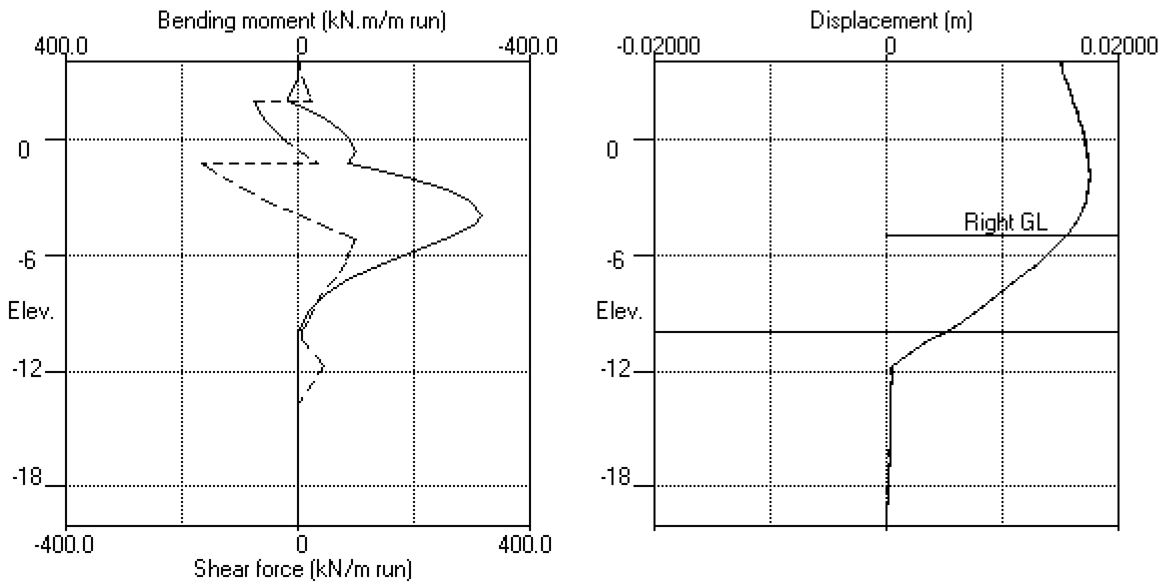
Stage No.9 Apply load no.2 at elevation 2.10

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.20	2.00	1.40	0.00	24.85	24.85	26.85p	8077
		2.00	1.40	0.00	64.48	64.48	66.48p	29915
20	-5.80	8.00	7.40	0.00	90.70	90.70	98.70p	29915
21	-6.40	14.00	13.40	0.00	116.92	116.92	130.92p	29915
22	-7.20	22.00	21.41	0.00	151.91	151.91	173.91p	29915
23	-8.00	30.00	29.43	0.00	186.94	161.62	191.62	29915
24	-8.80	38.00	37.46	0.00	222.02	163.90	201.90	29915
25	-9.40	44.00	43.49	0.00	248.36	168.20	212.20	29915
26	-10.00	50.00	49.52	1.62	274.75	183.53	233.53	29915
27	-10.40	54.00	53.56	2.76	292.37	160.05	214.05	29915
		54.00	53.56	0.00	350.73	176.63	230.63	49858
28	-11.70	67.00	70.60	0.00	425.18	154.46	221.46	49858
		67.00	70.60	0.00	4201.77	224.00	291.00	997169
29	-13.85	88.50	107.51	0.00	4714.42	239.32	327.82	997169
30	-16.00	110.00	144.64	0.00	5229.91	275.80	385.80	997169
31	-18.00	130.00	179.38	0.00	5712.28	309.44	439.44	997169
32	-20.00	150.00	214.32	0.00	6197.55	339.40	489.40	997169

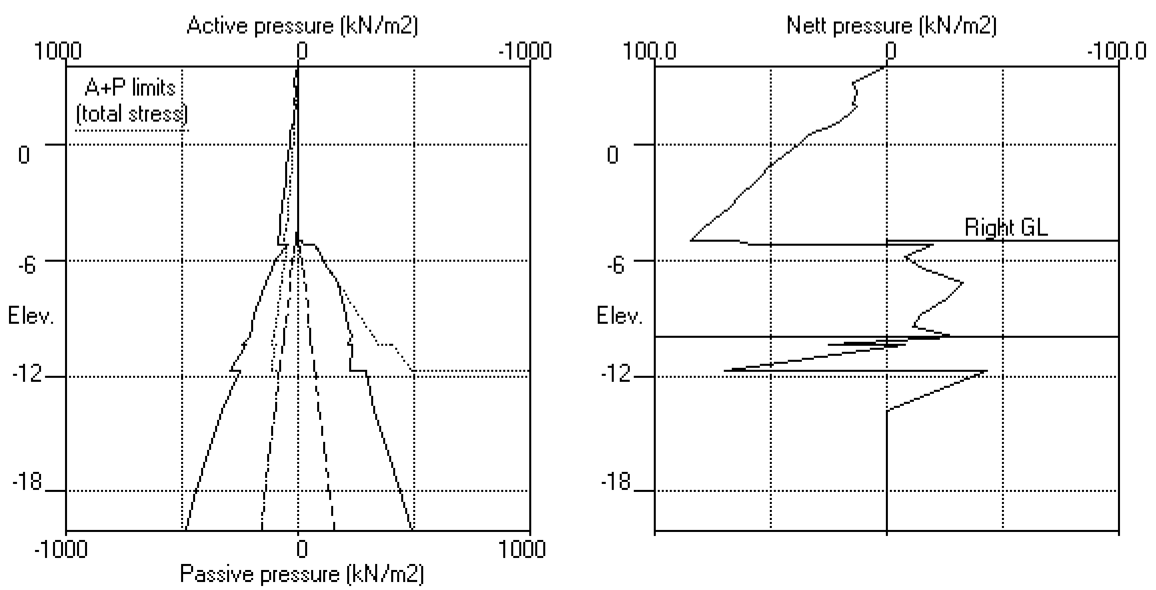
Note: 12.34 a Soil pressure at active limit
173.91 p Soil pressure at passive limit

Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.10

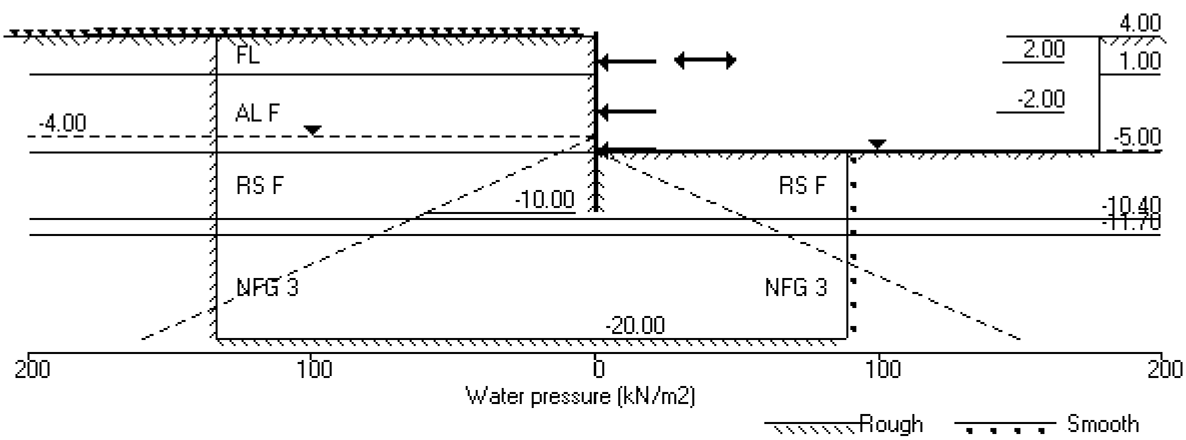


Stage No.9 Apply load no.2 at elev. 2.10



Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No. 12 Remove strut or anchor no.2 at elevation -1.30

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
12	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-6.39E-04	0.0	-0.0		572444
2	3.20	14.62	0.016	-6.40E-04	5.8	1.2		572444
3	2.65	13.35	0.016	-6.44E-04	13.5	7.0		572444
4	2.10	14.15	0.016	-6.55E-04	21.1	16.8		572444
5	2.00	12.34	0.016	-6.58E-04	22.4	19.0	-123.5	572444
		12.34	0.016	-6.58E-04	-101.1	19.0		
6	1.50	15.75	0.017	-6.54E-04	-94.1	-29.0		572444
7	1.00	21.45	0.017	-6.09E-04	-84.8	-73.9		572444
		29.87	0.017	-6.09E-04	-84.8	-73.9		
8	0.50	33.23	0.017	-5.28E-04	-69.0	-112.2		572444
9	0.00	37.72	0.018	-4.17E-04	-51.3	-142.3		572444
10	-0.65	44.11	0.018	-2.41E-04	-24.7	-167.1		572444
11	-1.30	50.85	0.018	-4.81E-05	6.2	-173.3		572444
12	-1.50	52.02	0.018	1.20E-05	16.5	-171.1		572444
13	-2.00	57.00	0.018	1.54E-04	43.7	-155.8	-176.3	572444
		57.00	0.018	1.54E-04	-132.6	-155.8		
14	-2.60	62.67	0.018	3.54E-04	-96.7	-224.7		572444
15	-3.20	67.90	0.017	6.13E-04	-57.5	-271.0		572444
16	-4.00	75.67	0.017	1.00E-03	-0.1	-294.2		572444
17	-4.50	80.61	0.016	1.26E-03	39.0	-284.4		572444
18	-5.00	85.20	0.015	1.49E-03	80.4	-254.5	0.8	572444
		65.17	0.015	1.49E-03	81.2	-254.5		
19	-5.20	59.34	0.015	1.58E-03	93.7	-237.0		572444
		-19.63	0.015	1.58E-03	93.7	-237.0		
20	-5.80	-7.10	0.014	1.80E-03	85.7	-187.1		572444
21	-6.40	-14.11	0.013	1.97E-03	79.3	-138.8		572444
22	-7.20	-31.40	0.011	2.12E-03	61.1	-81.6		572444
23	-8.00	-24.76	0.010	2.21E-03	38.6	-42.7		572444
24	-8.80	-13.30	0.008	2.26E-03	23.4	-19.8		572444
25	-9.40	-9.84	0.006	2.27E-03	16.5	-8.1		572444
26	-10.00	-27.02	0.005	2.27E-03	5.4	0.0		0
27	-10.40	25.36	0.004	0	5.1	0.0		0
		-7.79	0.004	0	5.1	0.0		

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	70.52	0.001	0	45.8	0.0		0
		-42.62	0.001	0	45.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 123.5 kN/m run
At elev. -2.00 Prop force = 176.3 kN/m run
At elev. -5.00 Prop force = -0.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	14.62	14.62	9971
3	2.65	0.00	25.85	7.99	99.98	13.35	13.35	9971
4	2.10	0.00	36.59	11.31	141.55	14.15	14.15	9971
5	2.00	0.00	38.50	11.90	148.93	12.34	12.34	9971
6	1.50	0.00	47.88	14.80	185.22	15.75	15.75	9971
7	1.00	0.00	57.04	17.63	220.65	21.45	21.45	9971
		0.00	57.04	14.47	216.38	29.87	29.87	4985
8	0.50	0.00	66.05	17.64	247.37	33.23	33.23	5235
9	0.00	0.00	74.94	20.76	277.99	37.72	37.72	5484
10	-0.65	0.00	86.39	24.78	317.40	44.11	44.11	5808
11	-1.30	0.00	97.75	28.77	356.50	50.85	50.85	6132
12	-1.50	0.00	101.23	29.99	368.48	52.02	52.02	6232
13	-2.00	0.00	109.91	33.04	398.36	57.00	57.00	6481
14	-2.60	0.00	120.29	36.69	434.09	62.67	62.67	6780
15	-3.20	0.00	130.64	40.33	469.73	67.90	67.90	7079
16	-4.00	0.00	144.41	45.16	517.11	75.67	75.67	7478
17	-4.50	5.00	147.99	46.42	529.46	75.61	80.61	7727
18	-5.00	10.00	151.57	47.68	541.78	75.20	85.20	7977
19	-5.20	12.00	153.00	48.18	546.69	74.19	86.19	8076
		12.00	153.00	30.94	726.88	34.85	46.85	29913
20	-5.80	18.00	159.08	32.66	753.43	73.51	91.51	29913
21	-6.40	24.00	165.15	34.38	779.94	92.49	116.49	29913
22	-7.20	32.00	173.22	36.67	815.23	110.10	142.10	29913
23	-8.00	40.00	181.29	38.95	850.47	126.43	166.43	29913
24	-8.80	48.00	189.34	41.24	885.66	140.15	188.15	29913
25	-9.40	54.00	195.38	42.95	912.03	147.82	201.82	29913
26	-10.00	60.00	201.40	44.65	938.38	145.49	205.49	29913
27	-10.40	64.00	205.42	45.79	955.93	175.42	239.42	29913
		64.00	205.42	35.52	1014.29	158.86	222.86	49855
28	-11.70	77.00	222.37	40.47	1088.33	214.98	291.98	49855
		77.00	222.37	0.00	6309.29	171.40	248.40	997093
29	-13.85	98.50	258.96	0.00	6817.44	229.35	327.85	997093
30	-16.00	120.00	295.53	0.00	7325.15	265.82	385.82	997093
31	-18.00	140.00	329.52	0.00	7797.13	299.45	439.45	997093
32	-20.00	160.00	363.49	0.00	8268.84	329.32	489.32	997093

(continued)

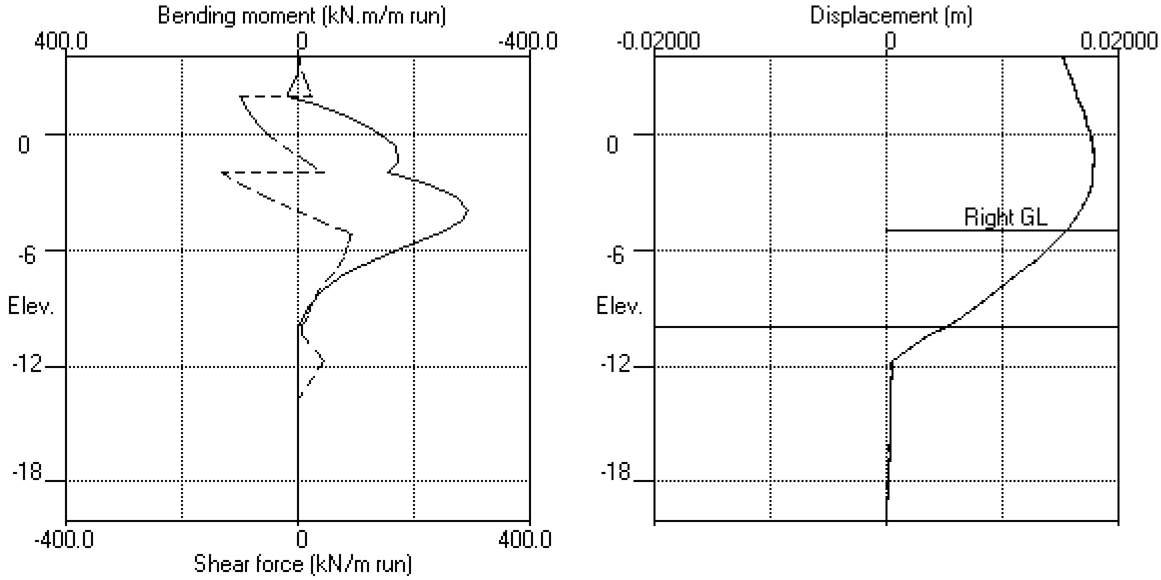
Stage No.12 Remove strut or anchor no.2 at elevation -1.30

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.20	2.00	1.40	0.00	24.85	24.85	26.85p	8077
		2.00	1.40	0.00	64.48	64.48	66.48p	29915
20	-5.80	8.00	7.40	0.00	90.70	90.61	98.61	29915
21	-6.40	14.00	13.40	0.00	116.92	116.60	130.60	29915
22	-7.20	22.00	21.41	0.00	151.91	151.50	173.50	29915
23	-8.00	30.00	29.43	0.00	186.94	161.19	191.19	29915
24	-8.80	38.00	37.46	0.00	222.02	163.45	201.45	29915
25	-9.40	44.00	43.49	0.00	248.36	167.66	211.66	29915
26	-10.00	50.00	49.52	1.62	274.75	182.51	232.51	29915
27	-10.40	54.00	53.56	2.76	292.37	160.06	214.06	29915
		54.00	53.56	0.00	350.73	176.65	230.65	49858
28	-11.70	67.00	70.60	0.00	425.18	154.46	221.46	49858
		67.00	70.60	0.00	4201.77	224.02	291.02	997169
29	-13.85	88.50	107.51	0.00	4714.42	239.34	327.84	997169
30	-16.00	110.00	144.64	0.00	5229.91	275.81	385.81	997169
31	-18.00	130.00	179.38	0.00	5712.28	309.45	439.45	997169
32	-20.00	150.00	214.32	0.00	6197.55	339.40	489.40	997169

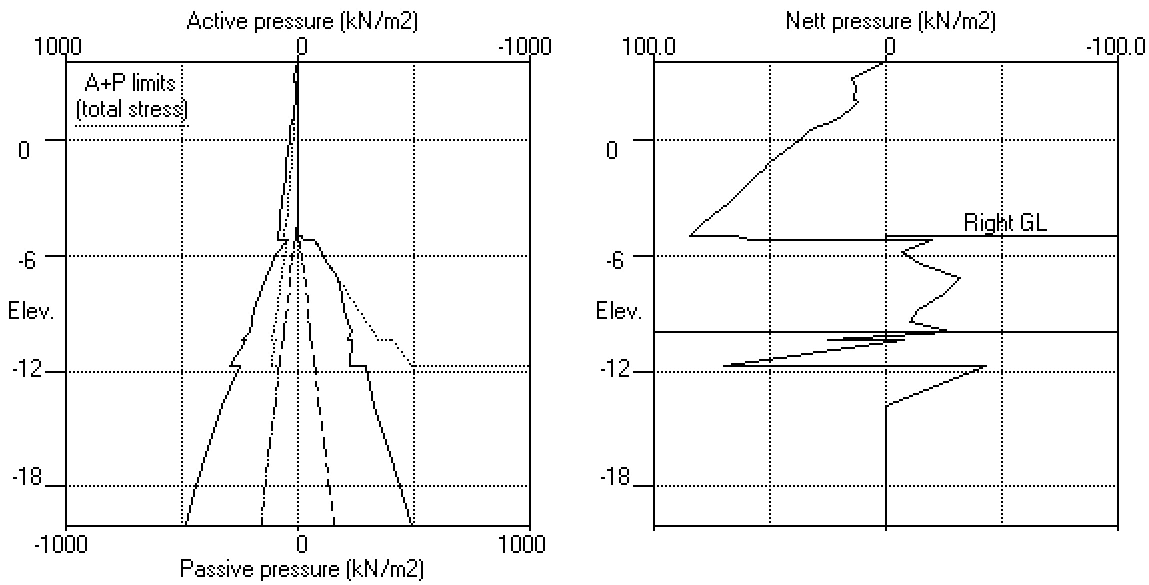
Note: 12.34 a Soil pressure at active limit
66.48 p Soil pressure at passive limit

Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30

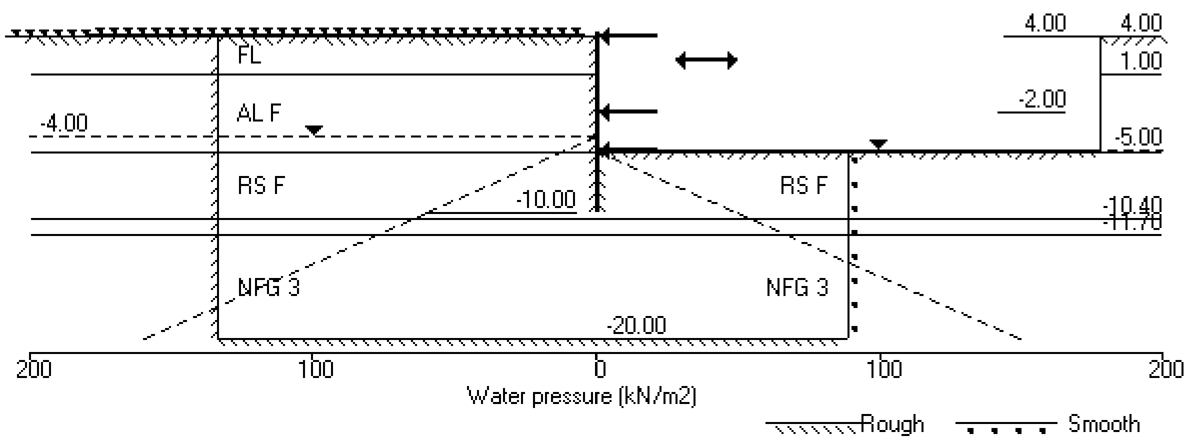


Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No. 14 Remove strut or anchor no.1 at elevation 2.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -10.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
14	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.00E-03	-70.2	-0.0	-70.2	572444
2	3.20	14.64	0.016	-9.64E-04	-64.4	-54.9		572444
3	2.65	12.19	0.016	-8.96E-04	-57.0	-87.8		572444
4	2.10	12.49	0.017	-7.98E-04	-50.2	-116.9		572444
5	2.00	10.45	0.017	-7.77E-04	-49.0	-121.9		572444
6	1.50	13.89	0.017	-6.61E-04	-43.0	-144.1		572444
7	1.00	19.85	0.018	-5.26E-04	-34.5	-163.7		572444
		29.07	0.018	-5.26E-04	-34.5	-163.7		
8	0.50	32.42	0.018	-3.77E-04	-19.2	-177.0		572444
9	0.00	37.06	0.018	-2.20E-04	-1.8	-182.3		572444
10	-0.65	43.70	0.018	-1.80E-05	24.5	-175.1		572444
11	-1.30	50.67	0.018	1.66E-04	55.1	-149.4		572444
12	-1.50	52.04	0.018	2.16E-04	65.4	-137.3		572444
13	-2.00	57.19	0.018	3.18E-04	92.7	-97.6	-243.5	572444
		57.19	0.018	3.18E-04	-150.8	-97.6		
14	-2.60	62.98	0.018	4.62E-04	-114.7	-177.4		572444
15	-3.20	68.24	0.017	6.78E-04	-75.3	-234.4		572444
16	-4.00	75.99	0.017	1.03E-03	-17.7	-271.8		572444
17	-4.50	80.89	0.016	1.26E-03	21.6	-270.7		572444
18	-5.00	85.43	0.015	1.49E-03	63.1	-249.4	15.3	572444
		65.62	0.015	1.49E-03	78.4	-249.4		
19	-5.20	59.67	0.015	1.58E-03	91.0	-232.5		572444
		-18.43	0.015	1.58E-03	91.0	-232.5		
20	-5.80	-6.17	0.014	1.79E-03	83.6	-184.0		572444
21	-6.40	-13.33	0.013	1.96E-03	77.7	-136.8		572444
22	-7.20	-30.79	0.011	2.11E-03	60.1	-80.5		572444
23	-8.00	-24.31	0.010	2.20E-03	38.1	-42.3		572444
24	-8.80	-12.98	0.008	2.24E-03	23.1	-19.6		572444
25	-9.40	-9.64	0.006	2.26E-03	16.4	-8.1		572444
26	-10.00	-26.94	0.005	2.26E-03	5.4	0.0		0
27	-10.40	25.36	0.004	0	5.1	0.0		0
		-7.79	0.004	0	5.1	0.0		

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	70.52	0.001	0	45.8	0.0		0
		-42.62	0.001	0	45.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 70.2 kN/m run
At elev. -2.00 Prop force = 243.5 kN/m run
At elev. -5.00 Prop force = -15.3 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	14.64	14.64	9971
3	2.65	0.00	25.85	7.99	99.98	12.19	12.19	9971
4	2.10	0.00	36.59	11.31	141.55	12.49	12.49	9971
5	2.00	0.00	38.50	11.90	148.93	10.45	10.45A	9971
6	1.50	0.00	47.88	14.80	185.22	13.89	13.89A	9971
7	1.00	0.00	57.04	17.63	220.65	19.85	19.85	9971
		0.00	57.04	14.47	216.38	29.07	29.07	4985
8	0.50	0.00	66.05	17.64	247.37	32.42	32.42	5235
9	0.00	0.00	74.94	20.76	277.99	37.06	37.06	5484
10	-0.65	0.00	86.39	24.78	317.40	43.70	43.70	5808
11	-1.30	0.00	97.75	28.77	356.50	50.67	50.67	6132
12	-1.50	0.00	101.23	29.99	368.48	52.04	52.04	6232
13	-2.00	0.00	109.91	33.04	398.36	57.19	57.19	6481
14	-2.60	0.00	120.29	36.69	434.09	62.98	62.98	6780
15	-3.20	0.00	130.64	40.33	469.73	68.24	68.24	7079
16	-4.00	0.00	144.41	45.16	517.11	75.99	75.99	7478
17	-4.50	5.00	147.99	46.42	529.46	75.89	80.89	7727
18	-5.00	10.00	151.57	47.68	541.78	75.43	85.43	7977
19	-5.20	12.00	153.00	48.18	546.69	74.37	86.37	8076
		12.00	153.00	30.94	726.88	35.52	47.52	29913
20	-5.80	18.00	159.08	32.66	753.43	74.05	92.05	29913
21	-6.40	24.00	165.15	34.38	779.94	92.94	116.94	29913
22	-7.20	32.00	173.22	36.67	815.23	110.45	142.45	29913
23	-8.00	40.00	181.29	38.95	850.47	126.69	166.69	29913
24	-8.80	48.00	189.34	41.24	885.66	140.33	188.33	29913
25	-9.40	54.00	195.38	42.95	912.03	147.94	201.94	29913
26	-10.00	60.00	201.40	44.65	938.38	145.54	205.54	29913
27	-10.40	64.00	205.42	45.79	955.93	175.43	239.43	29913
		64.00	205.42	35.52	1014.29	158.87	222.87	49855
28	-11.70	77.00	222.37	40.47	1088.33	214.98	291.98	49855
		77.00	222.37	0.00	6309.29	171.41	248.41	997093
29	-13.85	98.50	258.96	0.00	6817.44	229.36	327.86	997093
30	-16.00	120.00	295.53	0.00	7325.15	265.83	385.83	997093
31	-18.00	140.00	329.52	0.00	7797.13	299.46	439.46	997093
32	-20.00	160.00	363.49	0.00	8268.84	329.32	489.32	997093

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.81	19.81	7977
19	-5.20	2.00	1.40	0.00	24.85	24.71	26.71	8077
		2.00	1.40	0.00	64.48	63.95	65.95	29915
20	-5.80	8.00	7.40	0.00	90.70	90.21	98.21	29915
21	-6.40	14.00	13.40	0.00	116.92	116.27	130.27	29915
22	-7.20	22.00	21.41	0.00	151.91	151.24	173.24	29915
23	-8.00	30.00	29.43	0.00	186.94	161.00	191.00	29915
24	-8.80	38.00	37.46	0.00	222.02	163.32	201.32	29915
25	-9.40	44.00	43.49	0.00	248.36	167.57	211.57	29915
26	-10.00	50.00	49.52	1.62	274.75	182.48	232.48	29915
27	-10.40	54.00	53.56	2.76	292.37	160.07	214.07	29915
		54.00	53.56	0.00	350.73	176.66	230.66	49858
28	-11.70	67.00	70.60	0.00	425.18	154.46	221.46	49858
		67.00	70.60	0.00	4201.77	224.03	291.03	997169
29	-13.85	88.50	107.51	0.00	4714.42	239.35	327.85	997169
30	-16.00	110.00	144.64	0.00	5229.91	275.82	385.82	997169
31	-18.00	130.00	179.38	0.00	5712.28	309.45	439.45	997169
32	-20.00	150.00	214.32	0.00	6197.55	339.40	489.40	997169

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
13.89A Arching - soil pressure below active limit

```
EDG CONSULTING PTY LTD                                           | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  B01493
                               Licensed from GEOSOLVE            | Made by :   DJC
Data filename/Run ID: Section_4                                  |
Albert Street Development                                        | Date:16-11-2022
Section 4                                                        | Checked :
------------------------------------------------------------------------------
                                                        Units: kN,m
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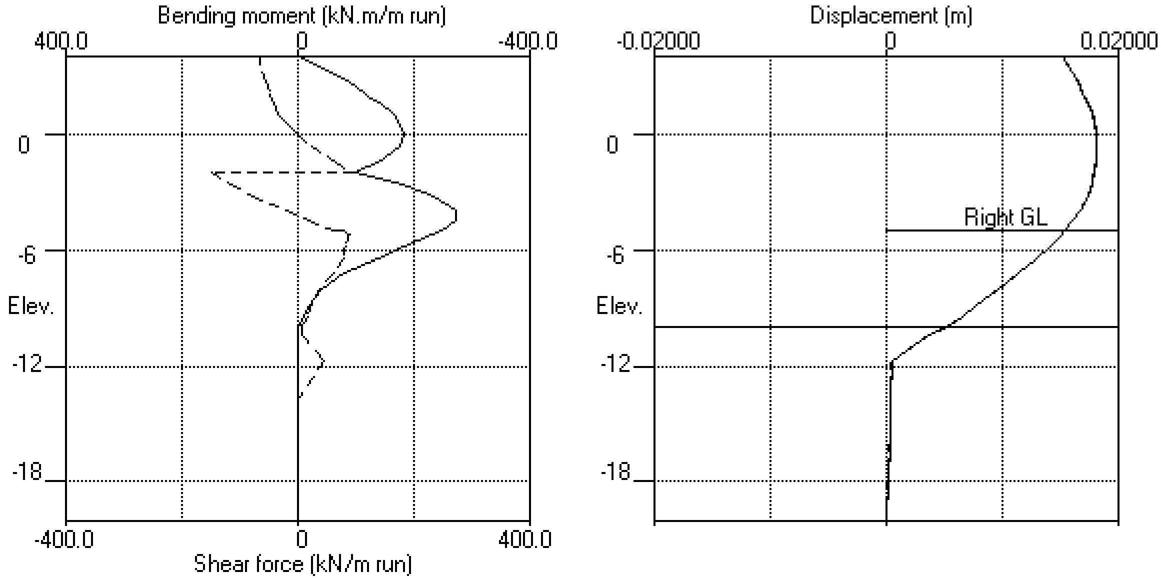
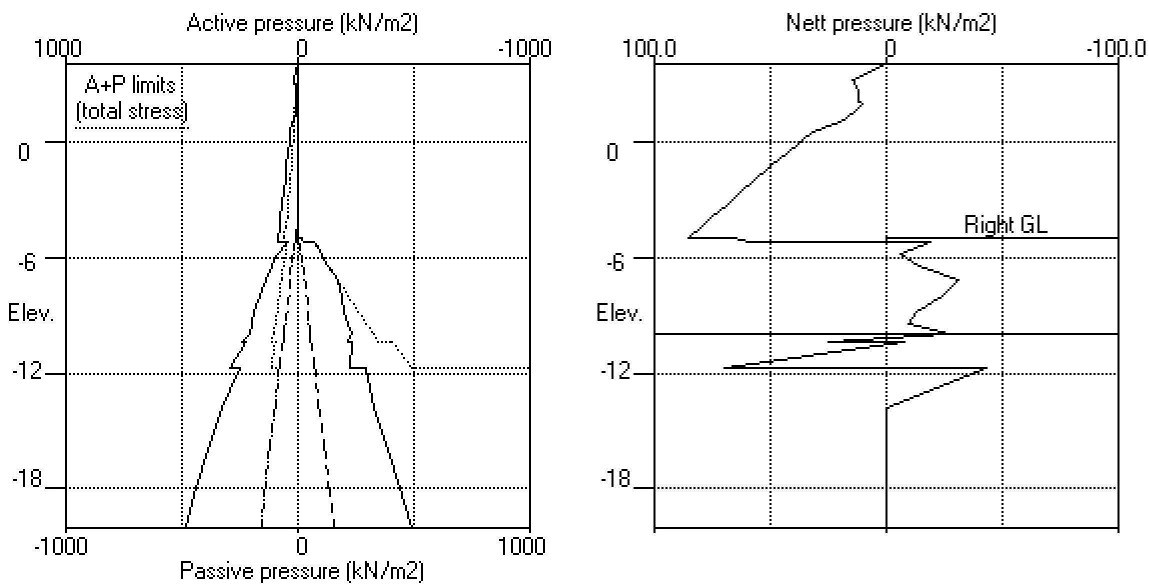
Stage No.14 Remove prop no.1 at elev. 2.00

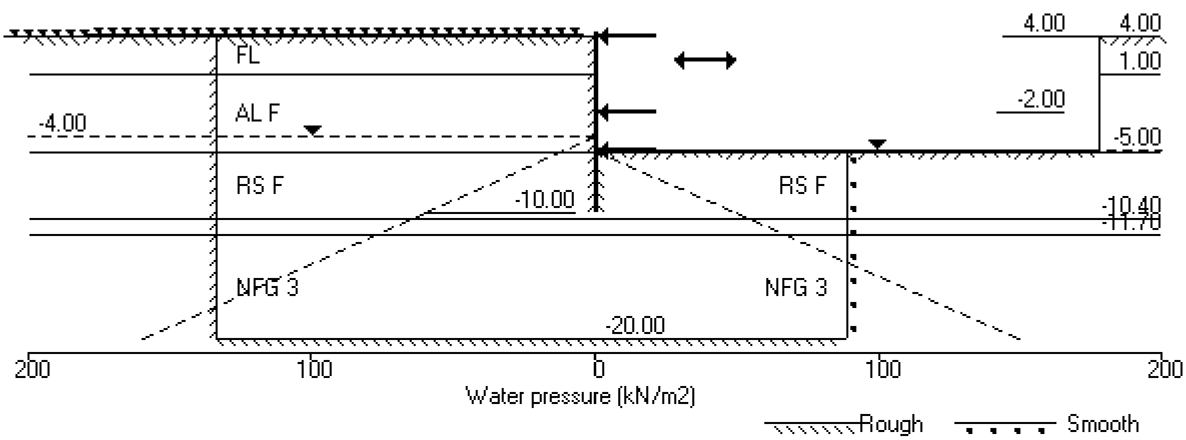


Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No.15 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No. 15 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
15	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.08E-03	-59.2	-0.0	-59.2	400711
2	3.20	14.72	0.016	-1.03E-03	-53.3	-48.1		400711
3	2.65	12.03	0.017	-9.52E-04	-45.9	-76.3		400711
4	2.10	12.23	0.017	-8.36E-04	-39.2	-100.7		400711
5	2.00	10.12	0.017	-8.12E-04	-38.1	-104.8		400711
6	1.50	13.53	0.018	-6.77E-04	-32.2	-122.9		400711
7	1.00	19.49	0.018	-5.22E-04	-24.0	-138.4		400711
		28.89	0.018	-5.22E-04	-24.0	-138.4		
8	0.50	32.23	0.018	-3.54E-04	-8.7	-147.7		400711
9	0.00	36.90	0.018	-1.81E-04	8.6	-148.9		400711
10	-0.65	43.62	0.018	3.26E-05	34.8	-136.6		400711
11	-1.30	50.68	0.018	2.09E-04	65.4	-105.8		400711
12	-1.50	52.14	0.018	2.51E-04	75.7	-92.1		400711
13	-2.00	57.31	0.018	3.21E-04	103.1	-48.4	-255.1	400711
		57.31	0.018	3.21E-04	-152.1	-48.4		
14	-2.60	63.00	0.018	4.32E-04	-116.0	-128.8		400711
15	-3.20	68.10	0.017	6.46E-04	-76.7	-186.4		400711
16	-4.00	75.72	0.017	1.02E-03	-19.1	-224.6		400711
17	-4.50	80.56	0.016	1.29E-03	19.9	-224.1		400711
18	-5.00	85.09	0.015	1.54E-03	61.4	-203.5	4.2	400711
		65.06	0.015	1.54E-03	65.5	-203.5		
19	-5.20	59.21	0.015	1.63E-03	78.0	-188.5		400711
		-20.12	0.015	1.63E-03	78.0	-188.5		
20	-5.80	-7.26	0.014	1.86E-03	69.8	-146.3		400711
21	-6.40	-13.47	0.013	2.03E-03	63.5	-105.6		400711
22	-7.20	-29.69	0.011	2.18E-03	46.3	-58.1		400711
23	-8.00	-22.06	0.009	2.25E-03	25.6	-28.2		400711
24	-8.80	-9.64	0.008	2.29E-03	12.9	-12.6		400711
25	-9.40	-4.19	0.006	2.30E-03	8.8	-5.3		400711
26	-10.00	-14.99	0.005	2.30E-03	3.0	0.0		0
27	-10.40	25.36	0.004	0	5.1	0.0		0
		-7.79	0.004	0	5.1	0.0		

(continued)

Stage No.15 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.70	70.52	0.001	0	45.8	0.0		0
		-42.62	0.001	0	45.8	0.0		
29	-13.85	0.01	0.000	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 59.2 kN/m run
At elev. -2.00 Prop force = 255.1 kN/m run
At elev. -5.00 Prop force = -4.2 kN/m run

		LEFT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	14.72	14.72	9971
3	2.65	0.00	25.85	7.99	99.98	12.03	12.03	9971
4	2.10	0.00	36.59	11.31	141.55	12.23	12.23	9971
5	2.00	0.00	38.50	11.90	148.93	10.12	10.12A	9971
6	1.50	0.00	47.88	14.80	185.22	13.53	13.53A	9971
7	1.00	0.00	57.04	17.63	220.65	19.49	19.49	9971
		0.00	57.04	14.47	216.38	28.89	28.89	4985
8	0.50	0.00	66.05	17.64	247.37	32.23	32.23	5235
9	0.00	0.00	74.94	20.76	277.99	36.90	36.90	5484
10	-0.65	0.00	86.39	24.78	317.40	43.62	43.62	5808
11	-1.30	0.00	97.75	28.77	356.50	50.68	50.68	6132
12	-1.50	0.00	101.23	29.99	368.48	52.14	52.14	6232
13	-2.00	0.00	109.91	33.04	398.36	57.31	57.31	6481
14	-2.60	0.00	120.29	36.69	434.09	63.00	63.00	6780
15	-3.20	0.00	130.64	40.33	469.73	68.10	68.10	7079
16	-4.00	0.00	144.41	45.16	517.11	75.72	75.72	7478
17	-4.50	5.00	147.99	46.42	529.46	75.56	80.56	7727
18	-5.00	10.00	151.57	47.68	541.78	75.09	85.09	7977
19	-5.20	12.00	153.00	48.18	546.69	74.06	86.06	8076
		12.00	153.00	30.94	726.88	34.35	46.35	29913
20	-5.80	18.00	159.08	32.66	753.43	73.43	91.43	29913
21	-6.40	24.00	165.15	34.38	779.94	92.93	116.93	29913
22	-7.20	32.00	173.22	36.67	815.23	111.05	143.05	29913
23	-8.00	40.00	181.29	38.95	850.47	127.85	167.85	29913
24	-8.80	48.00	189.34	41.24	885.66	142.04	190.04	29913
25	-9.40	54.00	195.38	42.95	912.03	150.70	204.70	29913
26	-10.00	60.00	201.40	44.65	938.38	151.47	211.47	29913
27	-10.40	64.00	205.42	45.79	955.93	175.46	239.46	29913
		64.00	205.42	35.52	1014.29	158.93	222.93	49855
28	-11.70	77.00	222.37	40.47	1088.33	214.98	291.98	49855
		77.00	222.37	0.00	6309.29	171.41	248.41	997093
29	-13.85	98.50	258.96	0.00	6817.44	229.36	327.86	997093
30	-16.00	120.00	295.53	0.00	7325.15	265.82	385.82	997093
31	-18.00	140.00	329.52	0.00	7797.13	299.46	439.46	997093
32	-20.00	160.00	363.49	0.00	8268.84	329.33	489.33	997093

(continued)

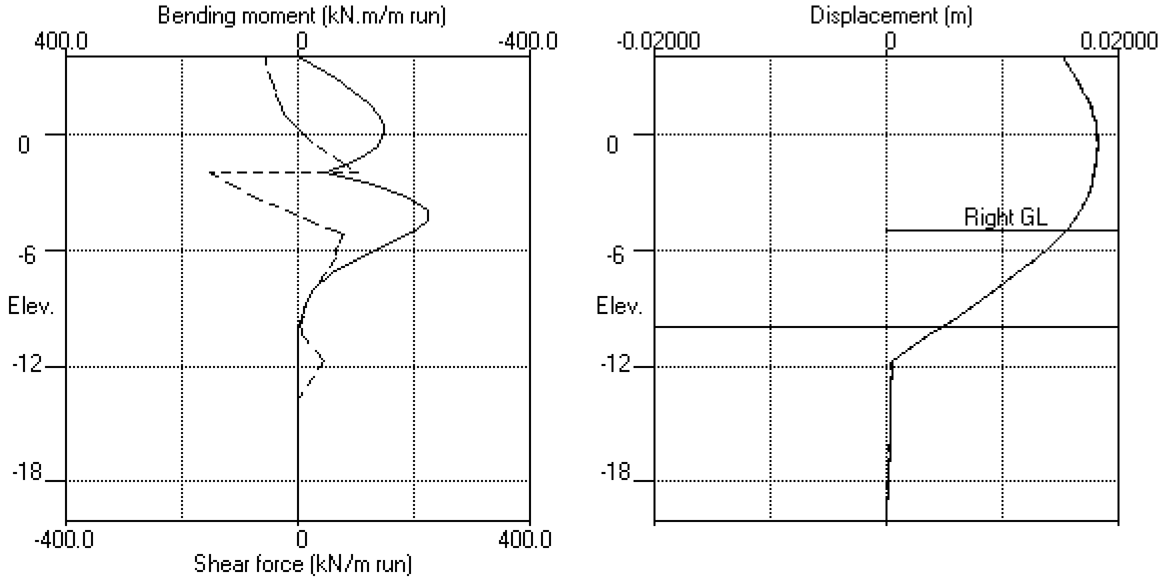
Stage No.15 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side: Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.20	2.00	1.40	0.00	24.85	24.85	26.85p	8077
		2.00	1.40	0.00	64.48	64.48	66.48p	29915
20	-5.80	8.00	7.40	0.00	90.70	90.70	98.70p	29915
21	-6.40	14.00	13.40	0.00	116.92	116.40	130.40	29915
22	-7.20	22.00	21.41	0.00	151.91	150.74	172.74	29915
23	-8.00	30.00	29.43	0.00	186.94	159.91	189.91	29915
24	-8.80	38.00	37.46	0.00	222.02	161.68	199.68	29915
25	-9.40	44.00	43.49	0.00	248.36	164.89	208.89	29915
26	-10.00	50.00	49.52	1.62	274.75	176.46	226.46	29915
27	-10.40	54.00	53.56	2.76	292.37	160.10	214.10	29915
		54.00	53.56	0.00	350.73	176.72	230.72	49858
28	-11.70	67.00	70.60	0.00	425.18	154.46	221.46	49858
		67.00	70.60	0.00	4201.77	224.03	291.03	997169
29	-13.85	88.50	107.51	0.00	4714.42	239.35	327.85	997169
30	-16.00	110.00	144.64	0.00	5229.91	275.82	385.82	997169
31	-18.00	130.00	179.38	0.00	5712.28	309.45	439.45	997169
32	-20.00	150.00	214.32	0.00	6197.55	339.41	489.41	997169

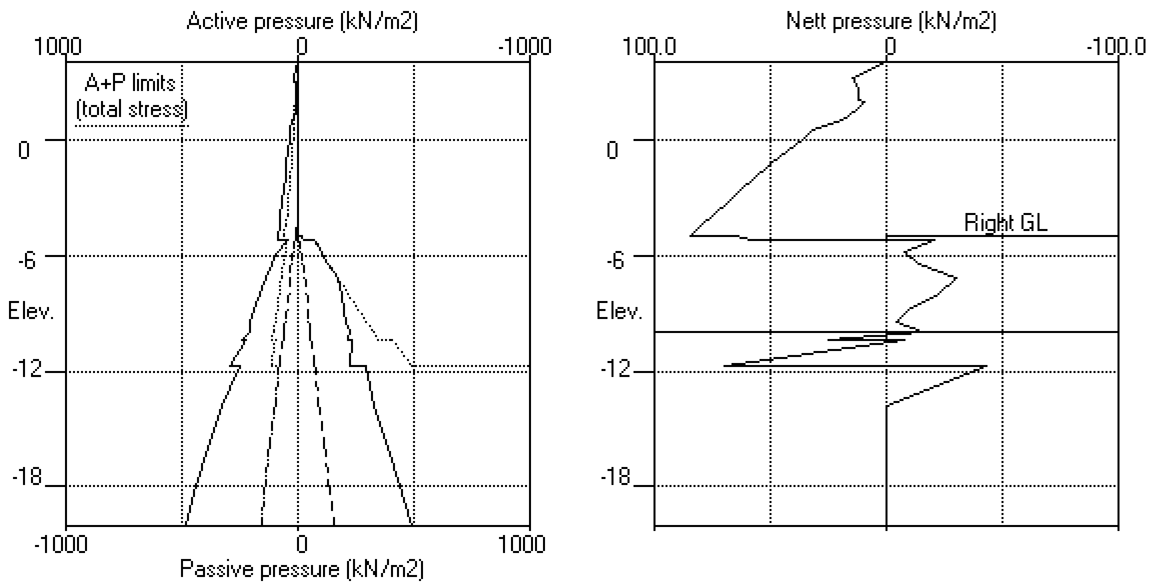
Note: 12.34 a Soil pressure at active limit
98.70 p Soil pressure at passive limit
13.53A Arching - soil pressure below active limit

Units: kN,m

Stage No.15 Change EI of wall to 400711kN.m2/m run

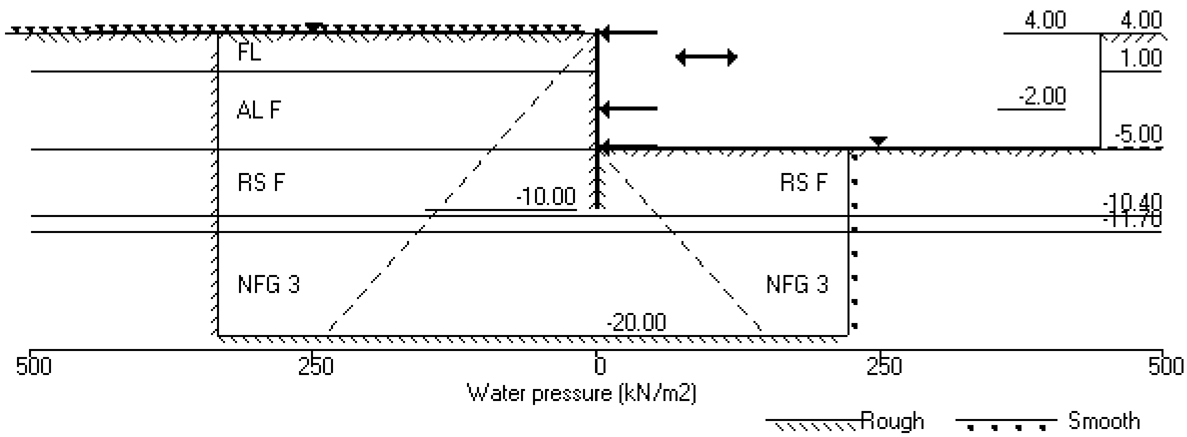


Stage No.15 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No.16 Apply water pressure profile no.1



Units: kN,m

Stage No. 16 Apply water pressure profile no.1

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00 Factor of Safety	FoS for toe elev. = -10.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
16	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.28E-03	-80.9	-0.0	-80.9	400711
2	3.20	19.50	0.016	-1.22E-03	-73.1	-65.0		400711
3	2.65	19.46	0.017	-1.11E-03	-62.4	-103.1		400711
4	2.10	22.59	0.017	-9.53E-04	-50.8	-135.4		400711
5	2.00	20.92	0.018	-9.20E-04	-48.6	-140.6		400711
6	1.50	27.16	0.018	-7.38E-04	-36.6	-162.5		400711
7	1.00	36.07	0.018	-5.34E-04	-20.8	-178.3		400711
		45.75	0.018	-5.34E-04	-20.8	-178.3		
8	0.50	51.90	0.018	-3.18E-04	3.6	-183.8		400711
9	0.00	59.51	0.019	-1.05E-04	31.5	-176.3		400711
10	-0.65	70.16	0.019	1.36E-04	73.6	-144.0		400711
11	-1.30	81.18	0.018	3.00E-04	122.8	-82.1		400711
12	-1.50	84.02	0.018	3.28E-04	139.3	-56.4		400711
13	-2.00	92.22	0.018	3.31E-04	183.4	23.2	-390.6	400711
		92.22	0.018	3.31E-04	-207.2	23.2		
14	-2.60	101.40	0.018	3.54E-04	-149.1	-83.7		400711
15	-3.20	109.91	0.018	5.10E-04	-85.7	-154.1		400711
16	-4.00	122.09	0.017	8.21E-04	7.1	-185.7		400711
17	-4.50	126.92	0.017	1.02E-03	69.3	-166.4		400711
18	-5.00	131.45	0.016	1.18E-03	133.9	-115.2	-176.1	400711
		112.25	0.016	1.18E-03	-42.2	-115.2		
19	-5.20	105.96	0.016	1.23E-03	-20.4	-120.8		400711
		29.44	0.016	1.23E-03	-20.4	-120.8		
20	-5.80	37.22	0.015	1.40E-03	-0.4	-128.7		400711
21	-6.40	26.46	0.014	1.57E-03	18.7	-122.1		400711
22	-7.20	5.62	0.013	1.77E-03	31.6	-97.7		400711
23	-8.00	-1.99	0.011	1.93E-03	33.0	-68.1		400711
24	-8.80	2.31	0.010	2.03E-03	33.2	-40.2		400711
25	-9.40	-6.98	0.009	2.07E-03	31.8	-18.6		400711
26	-10.00	-59.34	0.007	2.08E-03	11.9	0.0		0
27	-10.40	40.80	0.005	0	8.2	0.0		0
		-12.54	0.005	0	8.2	0.0		

(continued)

Stage No.16 Apply water pressure profile no.1

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
28	-11.70	111.98	0.001	0	72.8	0.0		0
		-67.69	0.001	0	72.8	0.0		
29	-13.85	0.01	0.001	0	0.0	0.0		0
30	-16.00	0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 80.9 kN/m run
At elev. -2.00 Prop force = 390.6 kN/m run
At elev. -5.00 Prop force = 176.1 kN/m run

LEFT side

Node no.	Y coord	Water press.	Effective stresses Vertic-al				Total earth pressure	Adjusted soil modulus
			Vertic -al	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	8.00	6.79	2.10	26.27	11.50	19.50	9971
3	2.65	13.50	12.35	3.82	47.76	5.96	19.46	9971
4	2.10	19.00	17.59	5.44	68.05	3.59	22.59A	9971
5	2.00	20.00	18.50	5.72	71.57	0.92	20.92A	9971
6	1.50	25.00	22.88	7.07	88.51	2.16	27.16A	9971
7	1.00	30.00	27.04	8.36	104.60	6.07	36.07A	9971
		30.00	27.04	3.93	113.11	15.75	45.75	4985
8	0.50	35.00	31.05	5.34	126.89	16.90	51.90	5235
9	0.00	40.00	34.94	6.71	140.30	19.51	59.51	5484
10	-0.65	46.50	39.89	8.45	157.34	23.66	70.16	5808
11	-1.30	53.00	44.75	10.15	174.06	28.18	81.18	6132
12	-1.50	55.00	46.23	10.67	179.16	29.02	84.02	6232
13	-2.00	60.00	49.91	11.97	191.83	32.22	92.22	6481
14	-2.60	66.00	54.29	13.51	206.91	35.40	101.40	6780
15	-3.20	72.00	58.64	15.03	221.89	37.91	109.91	7079
16	-4.00	80.00	64.41	17.06	241.73	42.09	122.09	7478
17	-4.50	85.00	67.99	18.32	254.08	41.92	126.92	7727
18	-5.00	90.00	71.57	19.58	266.40	41.45	131.45	7977
19	-5.20	92.00	73.00	20.08	271.31	40.17	132.17	8076
		92.00	73.00	8.27	377.33	1.53	93.53A	29913
20	-5.80	98.00	79.08	9.99	403.88	37.92	135.92	29913
21	-6.40	104.00	85.15	11.71	430.39	53.38	157.38	29913
22	-7.20	112.00	93.22	14.00	465.68	67.53	179.53	29913
23	-8.00	120.00	101.29	16.29	500.92	80.45	200.45	29913
24	-8.80	128.00	109.34	18.57	536.11	90.62	218.62	29913
25	-9.40	134.00	115.38	20.28	562.48	91.87	225.87	29913
26	-10.00	140.00	121.40	21.99	588.82	72.34	212.34	29913
27	-10.40	144.00	125.42	23.13	606.38	125.87	269.87	29913
		144.00	125.42	12.14	664.74	99.13	243.13	49855
28	-11.70	157.00	142.37	17.09	738.78	178.57	335.57	49855
		157.00	142.37	0.00	5198.41	109.03	266.03	997093
29	-13.85	178.50	178.96	0.00	5706.56	179.51	358.01	997093
30	-16.00	200.00	215.53	0.00	6214.28	215.98	415.98	997093
31	-18.00	220.00	249.52	0.00	6686.25	249.43	469.43	997093
32	-20.00	240.00	283.49	0.00	7157.96	274.87	514.87	997093

(continued)

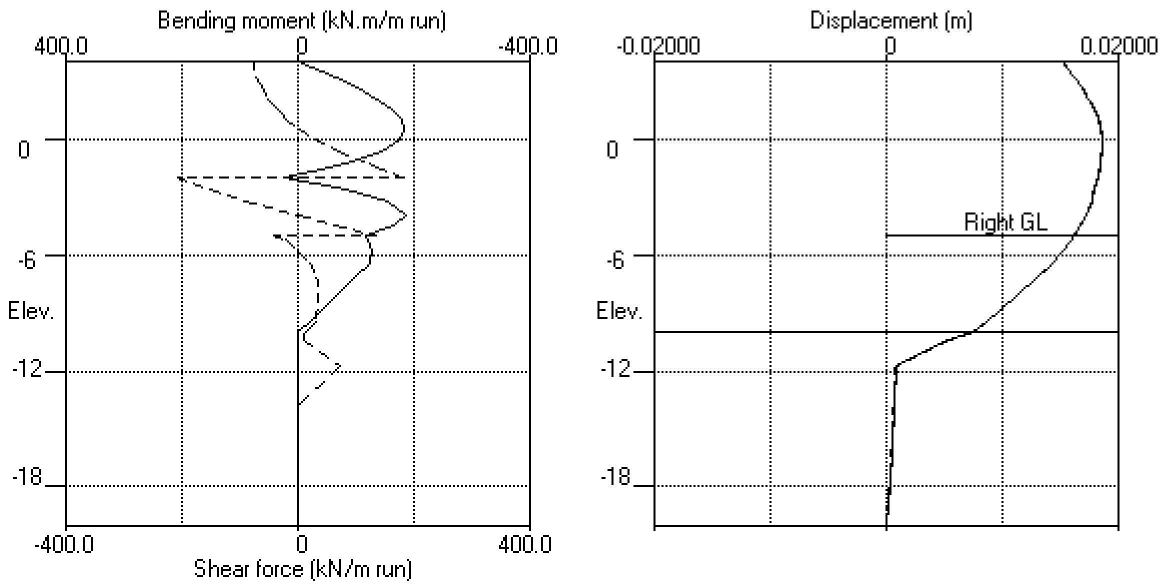
Stage No.16 Apply water pressure profile no.1

		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.20	19.20	7977
19	-5.20	2.00	1.40	0.00	24.85	24.21	26.21	8077
		2.00	1.40	0.00	64.48	62.09	64.09	29915
20	-5.80	8.00	7.40	0.00	90.70	90.70	98.70p	29915
21	-6.40	14.00	13.40	0.00	116.92	116.92	130.92p	29915
22	-7.20	22.00	21.41	0.00	151.91	151.91	173.91p	29915
23	-8.00	30.00	29.43	0.00	186.94	172.44	202.44	29915
24	-8.80	38.00	37.46	0.00	222.02	178.30	216.30	29915
25	-9.40	44.00	43.49	0.00	248.36	188.85	232.85	29915
26	-10.00	50.00	49.52	1.62	274.75	221.67	271.67	29915
27	-10.40	54.00	53.56	2.76	292.37	175.07	229.07	29915
		54.00	53.56	0.00	350.73	201.67	255.67	49858
28	-11.70	67.00	70.60	0.00	425.18	156.60	223.60	49858
		67.00	70.60	0.00	4201.77	266.72	333.72	997169
29	-13.85	88.50	107.51	0.00	4714.42	269.50	358.00	997169
30	-16.00	110.00	144.64	0.00	5229.91	305.98	415.98	997169
31	-18.00	130.00	179.38	0.00	5712.28	339.42	469.42	997169
32	-20.00	150.00	214.32	0.00	6197.55	364.95	514.95	997169

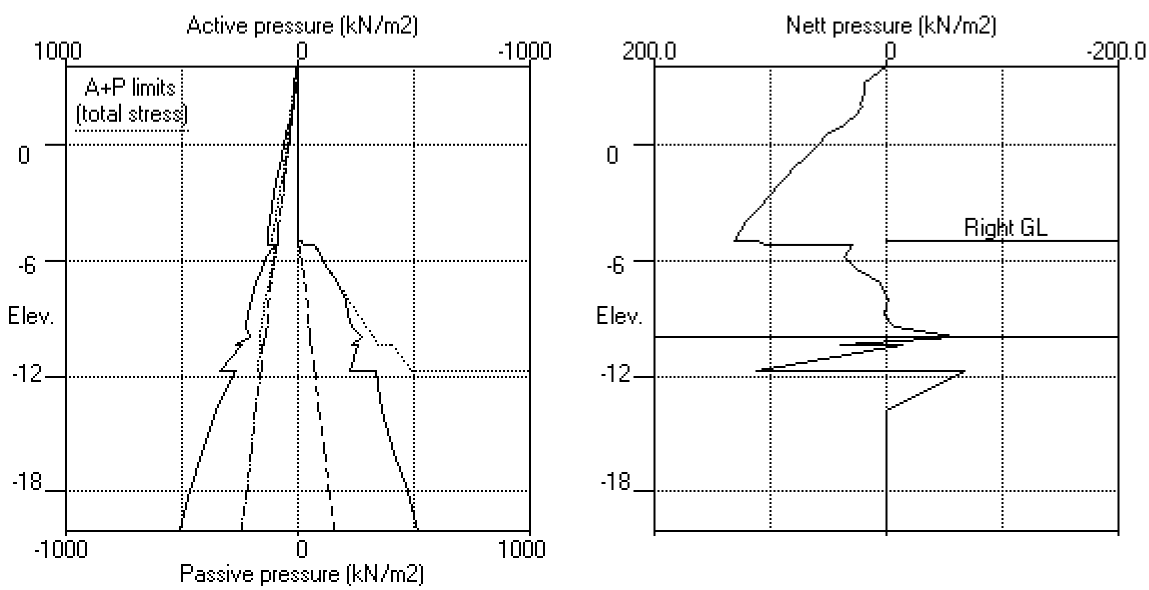
Note: 12.34 a Soil pressure at active limit
173.91 p Soil pressure at passive limit
93.53A Arching - soil pressure below active limit

Units: kN,m

Stage No.16 Apply water pressure profile no.1



Stage No.16 Apply water pressure profile no.1



Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

				FoS for toe elev. = -10.00		**Toe elev. for FoS = 1.500**		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				
2	4.00	2.00	Cant.	12.542	-7.69	-0.21	2.21	L to R
3	4.00	2.00		No analysis at this stage				
4	4.00	-1.50	2.00	9.383	n/a	-3.36	1.86	L to R
5	4.00	-1.50		No analysis at this stage				

All remaining stages have more than one prop - FoS calculation n/a

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Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries:	Left side 30.00 from wall	Rough boundary
	Right side 20.00 from wall	Smooth boundary
Lower rigid boundary at elevation -20.00		Rough boundary

Bending moment, shear force and displacement envelopes

Node	Y	Displacement		Bending moment		Shear force	
no.	coord	maximum	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	4.00	0.018	0.000	0.0	-0.0	0.0	-80.9
2	3.20	0.017	0.000	1.2	-65.0	5.8	-73.1
3	2.65	0.017	0.000	7.0	-103.1	13.5	-62.4
4	2.10	0.017	0.000	16.9	-135.4	64.5	-50.8
5	2.00	0.018	0.000	22.0	-140.6	65.8	-101.1
6	1.50	0.018	0.000	15.8	-162.5	10.9	-94.5
7	1.00	0.018	0.000	19.4	-178.3	4.6	-85.2
8	0.50	0.018	0.000	22.1	-183.8	5.6	-69.2
9	0.00	0.019	0.000	25.0	-182.3	31.5	-51.3
10	-0.65	0.019	0.000	28.9	-175.1	73.6	-24.7
11	-1.30	0.018	0.000	33.3	-178.1	122.8	-168.4
12	-1.50	0.018	0.000	34.8	-175.3	139.3	-158.0
13	-2.00	0.018	0.000	38.8	-188.6	183.4	-207.2
14	-2.60	0.018	0.000	44.4	-254.1	40.8	-149.1
15	-3.20	0.018	0.000	51.0	-297.0	49.5	-85.7
16	-4.00	0.017	0.000	61.7	-315.6	60.6	-19.1
17	-4.50	0.017	0.000	69.4	-303.0	69.3	0.0
18	-5.00	0.016	0.000	77.8	-270.3	133.9	-42.2
19	-5.20	0.016	0.000	81.3	-251.8	98.5	-20.4
20	-5.80	0.015	0.000	81.7	-199.0	90.3	-6.5
21	-6.40	0.014	0.000	73.5	-148.0	83.6	-17.1
22	-7.20	0.013	0.000	56.2	-97.7	64.6	-23.2
23	-8.00	0.011	0.000	36.4	-68.1	41.4	-23.8
24	-8.80	0.010	0.000	18.0	-40.2	33.2	-20.4
25	-9.40	0.009	0.000	6.9	-18.6	31.8	-15.0
26	-10.00	0.007	0.000	0.0	-0.0	11.9	-4.6
27	-10.40	0.005	0.000	0.0	0.0	8.2	0.0
28	-11.70	0.001	0.000	0.0	0.0	72.8	0.0
29	-13.85	0.001	0.000	0.0	0.0	0.0	-0.0
30	-16.00	0.000	0.000	0.0	0.0	0.1	-0.0
31	-18.00	0.000	0.000	0.0	0.0	0.1	0.0
32	-20.00	0.000	0.000	0.0	0.0	0.0	0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force			
no.	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	2.2	-6.40	-9.8	-1.50	5.0	-5.20	-3.2	1.50
2	81.7	-5.80	-0.0	4.00	17.0	-5.00	-23.8	-8.00
3	No calculation at this stage							
4	46.4	-6.40	-178.1	-1.30	73.1	-5.20	-101.1	2.00
5	No calculation at this stage							
6	36.0	-6.40	-170.3	-1.30	71.1	-5.20	-98.9	2.00
7	19.1	2.00	-315.6	-4.00	98.5	-5.20	-165.0	-1.30
8	22.0	2.00	-306.0	-4.00	95.7	-5.20	-168.4	-1.30
9	19.1	2.00	-315.6	-4.00	98.5	-5.20	-165.0	-1.30
10	No calculation at this stage							
11	No calculation at this stage							
12	19.0	2.00	-294.2	-4.00	93.7	-5.20	-132.6	-2.00
13	No calculation at this stage							
14	0.0	-10.00	-271.8	-4.00	92.7	-2.00	-150.8	-2.00
15	0.0	-10.00	-224.6	-4.00	103.1	-2.00	-152.1	-2.00
16	23.2	-2.00	-185.7	-4.00	183.4	-2.00	-207.2	-2.00

Maximum and minimum displacement at each stage

Stage	Displacement				
no.	maximum m	elev.	minimum m	elev.	Stage description
1	0.001	4.00	0.000	4.00	Apply surcharge no.1 at elev. 4.00
2	0.018	4.00	0.000	4.00	Excav. to elev. 2.00 on RIGHT side
3	No calculation at this stage				Install prop no.1 at elev. 2.00
4	0.017	4.00	0.000	4.00	Excav. to elev. -1.50 on RIGHT side
5	No calculation at this stage				Install prop no.2 at elev. -1.30
6	0.017	4.00	0.000	4.00	Apply water pressure profile no.2
7	0.018	-2.00	0.000	4.00	Excav. to elev. -5.00 on RIGHT side
8	0.018	-2.00	0.000	4.00	Apply load no.1 at elev. 2.10
9	0.018	-2.00	0.000	4.00	Apply load no.2 at elev. 2.10
10	No calculation at this stage				Install prop no.3 at elev. -5.00
11	No calculation at this stage				Install prop no.4 at elev. -2.00
12	0.018	-1.50	0.000	4.00	Remove prop no.2 at elev. -1.30
13	No calculation at this stage				Install prop no.5 at elev. 4.00
14	0.018	-0.65	0.000	4.00	Remove prop no.1 at elev. 2.00
15	0.018	-0.65	0.000	4.00	Change EI of wall to 400711kN.m2/m run
16	0.019	0.00	0.000	4.00	Apply water pressure profile no.1

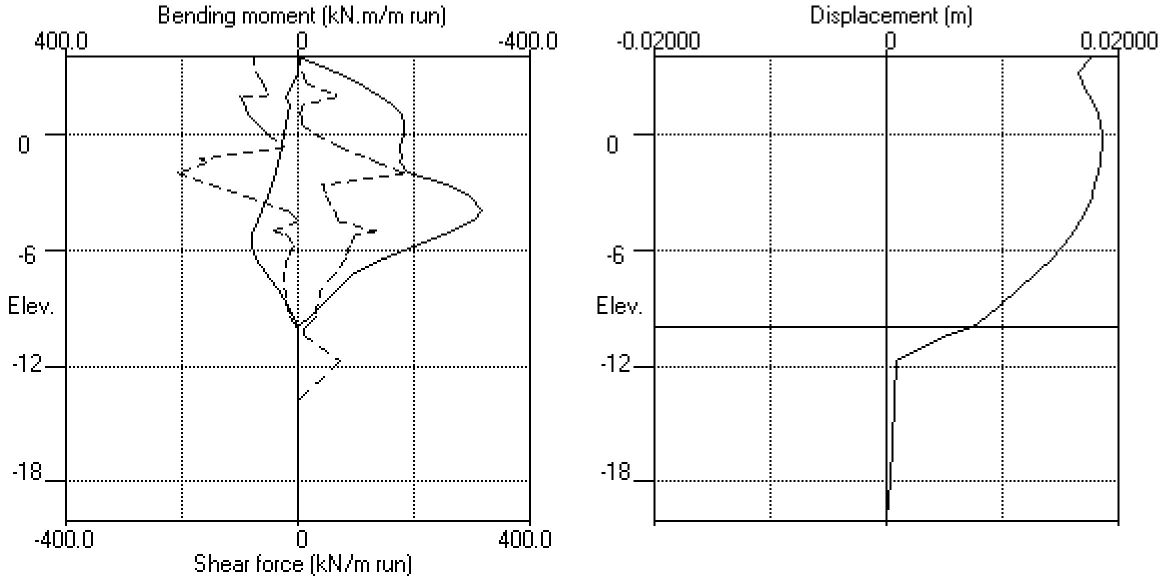
Summary of results (continued)

Prop forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 2.00		Strut no. 2 at elev.-1.30		Strut no. 3 at elev.-5.00	
	kN/m run	kN/prop	kN/m run	kN/prop	kN/m run	kN/prop
4	117.36	880.22	---	---	---	---
6	115.50	866.22	7.05	52.86	---	---
7	98.53	739.00	198.80	1490.98	---	---
8	136.58	1024.32	206.78	1550.82	---	---
9	98.53	739.00	198.80	1490.98	---	---
12	123.52	926.37	---	---	-0.81	-0.81
14	---	---	---	---	-15.31	-15.31
15	---	---	---	---	-4.19	-4.19
16	---	---	---	---	176.10	176.10

Stage no.	Strut no. 4 at elev.-2.00		Strut no. 5 at elev. 4.00	
	kN/m run	kN/prop	kN/m run	kN/prop
12	176.35	176.35	---	---
14	243.47	243.47	70.22	70.22
15	255.14	255.14	59.16	59.16
16	390.58	390.58	80.88	80.88

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Left side		Soil types Right side	
1	4.00	1	FL	1	FL
2	1.00	2	AL F	2	AL F
3	-5.30	4	RS F	4	RS F
4	-9.80	5	NFG 5	5	NFG 5
5	-13.00	6	NFG 3	6	NFG 3

SOIL PROPERTIES

-- Soil type -- No. Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1 FL	17.00	10000	0.700	OC	0.309	3.868	
				(0.300)	(0.000)	(0.000)	
2 AL F	17.00	5000	0.700	OC	0.351	3.442	4.000d
(1.00)		(500.0)		(0.300)	(1.391)	(5.007)	
3 Not defined							
4 RS F	20.00	30000	1.000	OC	0.283	4.369	10.00d
				(0.300)	(1.241)	(5.836)	
5 NFG 5	23.00	50000	1.000	OC	0.292	4.369	20.00d
				(0.300)	(1.226)	(5.836)	
6 NFG 3	27.00	1000000	1.000	OC	0.146	13.89	250.0d
				(0.200)	(0.854)	(12.886)	

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No. Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 FL	28.00	0.670	0.00	28.00	0.500	0.00
2 AL F	25.00	0.670	0.00	26.00	0.500	0.00
3 Not defined						
4 RS F	30.00	0.670	0.00	30.00	0.500	0.00
5 NFG 5	30.00	0.500	0.00	30.00	0.500	0.00
6 NFG 3	45.00	0.500	0.00	45.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-4.00	-4.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Left side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Right side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	4.00	4.00	0.0	1	-5.00	-5.00	0.0
2	1	-4.00	-4.00	0.0	1	-5.00	-5.00	0.0

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.90 m
Soldier Pile spacing = 1.80 m
Passive mobilisation factor = 3.00
Elevation of toe of wall = -8.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2000E+07 kN/m2
Moment of inertia of wall I = 0.017889 m4/m run
= 0.032200 m4 per pile
E.I = 572444 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Prop no.	Elev.	Prop spacing m	Cross-section area sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /prop kN	Strut or Anchor	Allow tension ?	L/R
1	2.00	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
2	-1.30	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
3	-5.00	1.00	0.150000	3.280E+07	20.00	0.00	0	Strut	Yes	R
4	-2.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
5	1.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
6	4.00	1.00	0.400000	3.280E+07	20.00	0.00	0	Strut	Yes	R

HORIZONTAL and MOMENT LOADS/RESTRAINTS

Load no.	Elevation	Horizontal load kN/m run	Moment load kN.m/m run	Moment restraint kN.m/m/rad	Partial factor (Category)
1	2.10	45.00	0	0	N/A
2	2.10	-45.00	0	0	N/A

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge kN/m2 Near edge	Surcharge kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	4.00	3.00(L)	100.00	100.00	25.00	=	N/A	N/A

Note: L = Left side, R = Right side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 4.00
2	Excavate to elevation 2.00 on RIGHT side
3	Install strut or anchor no.1 at elevation 2.00
4	Excavate to elevation -1.50 on RIGHT side
5	Install strut or anchor no.2 at elevation -1.30
6	Apply water pressure profile no.2
7	Excavate to elevation -5.00 on RIGHT side
8	Apply load no.1 at elevation 2.10
9	Apply load no.2 at elevation 2.10
10	Install strut or anchor no.3 at elevation -5.00
11	Install strut or anchor no.4 at elevation -2.00
12	Remove strut or anchor no.2 at elevation -1.30
13	Install strut or anchor no.5 at elevation 1.00
14	Install strut or anchor no.6 at elevation 4.00
15	Remove strut or anchor no.1 at elevation 2.00
16	Change EI of wall to 400711 kN.m2/m run Allow wall to relax with new modulus value
17	Apply water pressure profile no.1

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:
Method of analysis - Burland-Potts
Factor on passive for calculating wall depth = 1.50

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - 2-D finite element model
Open Tension Crack analysis? - No
Active limit arching modelled? - Yes
Non-linear Modulus Parameter (L) = 9.000 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 40.00 m

Width of excavation on Left side of wall = 60.00 m
Width of excavation on Right side of wall = 60.00 m

Distance to rigid boundary on Left side = 20.00 m
Distance to rigid boundary on Right side = 30.00 m
Elevation of rigid lower boundary = -20.00

Lower rigid boundary at elevation -20.00 - Rough
Rigid boundary on Left side - Rough
Rigid boundary on Right side - Smooth
Wall / soil interface - Rough

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 4.00	Yes	Yes	Yes
2	Excav. to elev. 2.00 on RIGHT side	Yes	Yes	Yes
3	Install prop no.1 at elev. 2.00	Yes	Yes	Yes
4	Excav. to elev. -1.50 on RIGHT side	Yes	Yes	Yes
5	Install prop no.2 at elev. -1.30	Yes	Yes	Yes
6	Apply water pressure profile no.2	Yes	Yes	Yes
7	Excav. to elev. -5.00 on RIGHT side	Yes	Yes	Yes
8	Apply load no.1 at elev. 2.10	Yes	Yes	Yes
9	Apply load no.2 at elev. 2.10	Yes	Yes	Yes
10	Install prop no.3 at elev. -5.00	Yes	Yes	Yes
11	Install prop no.4 at elev. -2.00	Yes	Yes	Yes
12	Remove prop no.2 at elev. -1.30	Yes	Yes	Yes
13	Install prop no.5 at elev. 1.00	Yes	Yes	Yes
14	Install prop no.6 at elev. 4.00	Yes	Yes	Yes
15	Remove prop no.1 at elev. 2.00	Yes	Yes	Yes
16	Change EI of wall to 400711kN.m2/m run	Yes	Yes	Yes
17	Apply water pressure profile no.1	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

```
EDG CONSULTING PTY LTD                                       | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58          | Job No.  B01493
                             Licensed from GEOSOLVE          | Made by :   DJC
Data filename/Run ID: Section_5                              |
Albert Street Development                                    | Date:16-11-2022
Section 5                                                    | Checked :
-----------------------------------------------------------------------------
                                                    Units: kN,m
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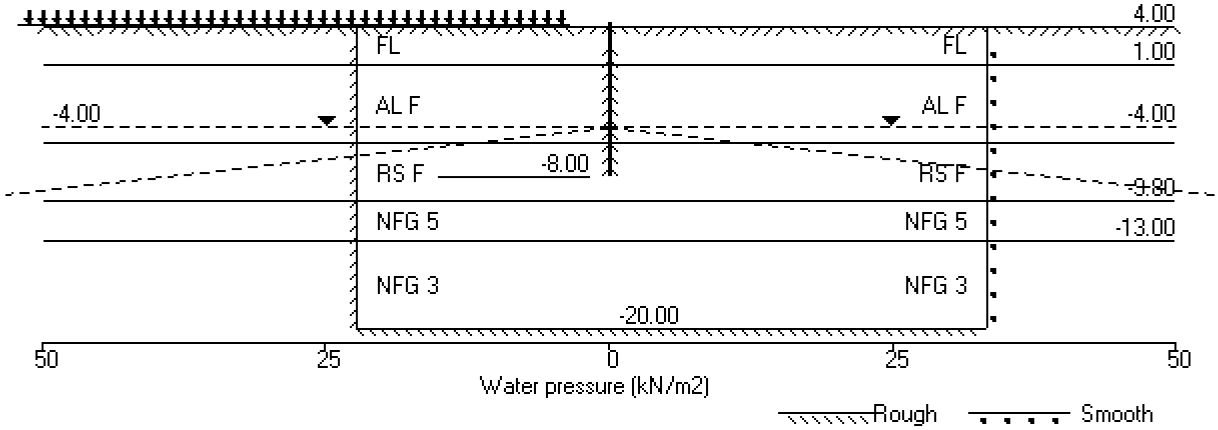
Stage No.1   Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 4.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.001	-6.23E-05	0.0	0.0		572444
2	3.50	-2.52	0.001	-6.23E-05	-0.6	0.0		572444
3	3.00	-2.18	0.001	-6.21E-05	-1.8	-0.6		572444
4	2.55	-1.98	0.001	-6.12E-05	-2.7	-1.6		572444
5	2.10	-1.68	0.001	-5.93E-05	-3.6	-3.1		572444
6	2.00	-1.65	0.001	-5.87E-05	-3.7	-3.4		572444
7	1.50	-1.17	0.001	-5.49E-05	-4.4	-5.5		572444
8	1.00	-0.70	0.001	-4.90E-05	-4.9	-7.8		572444
		0.62	0.001	-4.90E-05	-4.9	-7.8		
9	0.50	0.77	0.001	-4.12E-05	-4.6	-10.2		572444
10	0.00	1.08	0.001	-3.14E-05	-4.1	-12.3		572444
11	-0.60	1.50	0.001	-1.73E-05	-3.3	-14.5		572444
12	-0.95	1.66	0.001	-8.12E-06	-2.8	-15.6		572444
13	-1.30	1.86	0.001	1.68E-06	-2.1	-16.5		572444
14	-1.50	1.89	0.001	7.50E-06	-1.8	-16.9		572444
15	-2.00	2.16	0.001	2.25E-05	-0.8	-17.5		572444
16	-2.50	2.35	0.001	3.78E-05	0.4	-17.6		572444
17	-3.00	2.53	0.001	5.29E-05	1.6	-17.1		572444
18	-3.50	2.68	0.001	6.74E-05	2.9	-16.0		572444
19	-4.00	2.78	0.001	8.05E-05	4.3	-14.2		572444
20	-4.50	2.79	0.001	9.18E-05	5.6	-11.7		572444
21	-5.00	2.61	0.001	1.00E-04	7.0	-8.5		572444
22	-5.30	2.02	0.001	1.04E-04	7.7	-6.3		572444
		-10.16	0.001	1.04E-04	7.7	-6.3		
23	-5.65	-5.05	0.001	1.07E-04	5.0	-4.2		572444
24	-6.00	-3.29	0.001	1.09E-04	3.6	-2.8		572444
25	-6.60	-2.10	0.001	1.12E-04	2.0	-1.2		572444
26	-7.20	-1.28	0.001	1.12E-04	0.9	-0.4		572444
27	-7.60	-0.92	0.001	1.13E-04	0.5	-0.1		572444
28	-8.00	-1.16	0.001	1.13E-04	0.1	-0.0		0
29	-8.15	-0.10	0.001	0	-0.0	0.0		0
30	-9.80	1.93	0.001	0	1.5	0.0		0
		-1.96	0.001	0	1.5	0.0		

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
31	-11.40	0.01	0.000	0	-0.1	0.0		0
32	-13.00	7.64	0.000	0	6.1	0.0		0
		-6.41	0.000	0	6.1	0.0		
33	-14.90	0.00	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	-0.0	0.0		0
36	-20.00	0.01	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	4.64	4.64	9981
3	3.00	0.00	17.35	5.36	67.10	10.83	10.83	9981
4	2.55	0.00	25.58	7.90	98.95	16.41	16.41	9981
5	2.10	0.00	34.09	10.53	131.87	22.11	22.11	9981
6	2.00	0.00	36.01	11.13	139.30	23.36	23.36	9981
7	1.50	0.00	45.73	14.13	176.89	29.81	29.81	9981
8	1.00	0.00	55.54	17.16	214.84	36.27	36.27	9981
		0.00	55.54	13.95	211.21	36.96	36.96	4991
9	0.50	0.00	65.35	17.39	244.99	43.26	43.26	5240
10	0.00	0.00	75.11	20.82	278.59	49.64	49.64	5490
11	-0.60	0.00	86.71	24.90	318.51	57.29	57.29	5789
12	-0.95	0.00	93.41	27.25	341.58	61.69	61.69	5964
13	-1.30	0.00	100.07	29.59	364.48	66.11	66.11	6138
14	-1.50	0.00	103.85	30.91	377.50	68.59	68.59	6238
15	-2.00	0.00	113.24	34.21	409.82	74.86	74.86	6488
16	-2.50	0.00	122.54	37.48	441.84	81.08	81.08	6737
17	-3.00	0.00	131.77	40.72	473.60	87.27	87.27	6987
18	-3.50	0.00	140.92	43.94	505.11	93.44	93.44	7236
19	-4.00	0.00	150.02	47.13	536.42	99.57	99.57	7486
20	-4.50	5.00	154.05	48.55	550.32	102.14	107.14	7735
21	-5.00	10.00	158.05	49.95	564.06	104.60	114.60	7985
22	-5.30	13.00	160.42	50.79	572.23	105.86	118.86	8135
		13.00	160.42	33.04	759.29	143.30	156.30	29943
23	-5.65	16.50	164.22	34.12	775.89	149.36	165.86	29943
24	-6.00	20.00	168.00	35.19	792.42	153.81	173.81	29943
25	-6.60	26.00	174.44	37.02	820.58	160.50	186.50	29943
26	-7.20	32.00	180.85	38.83	848.54	167.00	199.00	29943
27	-7.60	36.00	185.09	40.03	867.09	171.23	207.23	29943
28	-8.00	40.00	189.32	41.23	885.57	175.17	215.17	29943
29	-8.15	41.50	190.90	41.68	892.48	177.21	218.71	29943
30	-9.80	58.00	208.19	46.58	968.01	194.91	252.91	29943
		58.00	208.19	36.32	1026.37	192.95	250.95	49905
31	-11.40	74.00	229.57	42.58	1119.82	214.87	288.87	49905
32	-13.00	90.00	250.83	48.79	1212.70	239.62	329.62	49905
		90.00	250.83	0.00	6704.52	230.80	320.80	998109
33	-14.90	109.00	283.54	0.00	7158.75	266.35	375.35	998109
34	-16.80	128.00	316.14	0.00	7611.40	298.71	426.71	998109
35	-18.40	144.00	343.52	0.00	7991.58	325.94	469.94	998109
36	-20.00	160.00	370.84	0.00	8371.01	352.64	512.64	998109

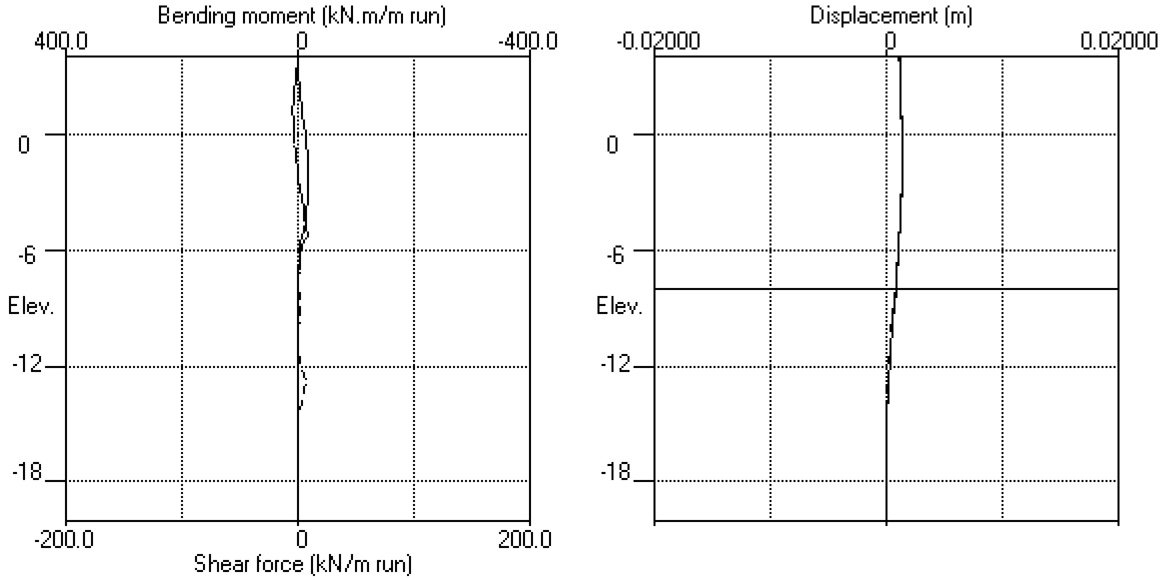
(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

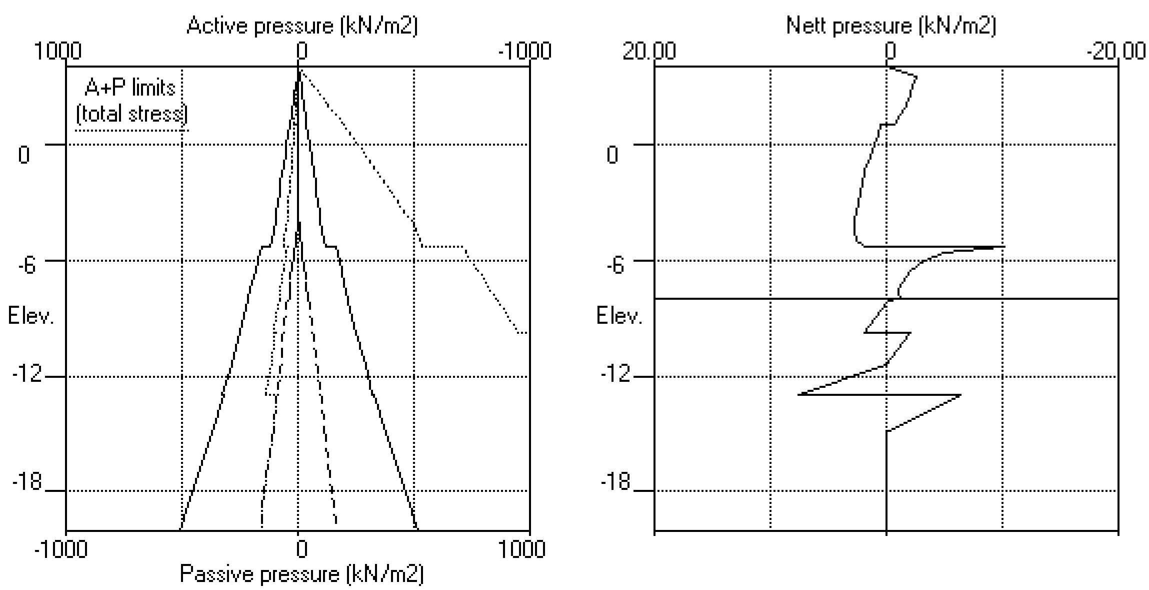
		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	10053
2	3.50	0.00	8.50	2.63	32.88	7.16	7.16	10053
3	3.00	0.00	17.00	5.25	65.76	13.01	13.01	10053
4	2.55	0.00	24.65	7.62	95.35	18.39	18.39	10053
5	2.10	0.00	32.30	9.98	124.95	23.78	23.78	10053
6	2.00	0.00	34.00	10.51	131.52	25.01	25.01	10053
7	1.50	0.00	42.50	13.13	164.40	30.98	30.98	10053
8	1.00	0.00	51.00	15.76	197.28	36.97	36.97	10053
		0.00	51.00	12.35	195.58	36.34	36.34	5027
9	0.50	0.00	59.50	15.34	224.84	42.49	42.49	5278
10	0.00	0.00	68.00	18.32	254.10	48.56	48.56	5529
11	-0.60	0.00	78.20	21.91	289.21	55.79	55.79	5831
12	-0.95	0.00	84.15	24.00	309.69	60.03	60.03	6007
13	-1.30	0.00	90.10	26.09	330.17	64.25	64.25	6183
14	-1.50	0.00	93.50	27.28	341.88	66.70	66.70	6283
15	-2.00	0.00	102.00	30.27	371.14	72.70	72.70	6535
16	-2.50	0.00	110.50	33.25	400.40	78.73	78.73	6786
17	-3.00	0.00	119.00	36.24	429.66	84.75	84.75	7037
18	-3.50	0.00	127.50	39.22	458.91	90.76	90.76	7289
19	-4.00	0.00	136.00	42.21	488.17	96.79	96.79	7540
20	-4.50	5.00	139.50	43.44	500.22	99.35	104.35	7791
21	-5.00	10.00	143.00	44.67	512.27	101.99	111.99	8043
22	-5.30	13.00	145.10	45.41	519.50	103.84	116.84	8193
		13.00	145.10	28.70	692.36	153.46	166.46	30160
23	-5.65	16.50	148.60	29.69	707.65	154.41	170.91	30160
24	-6.00	20.00	152.10	30.68	722.94	157.10	177.10	30160
25	-6.60	26.00	158.10	32.38	749.16	162.60	188.60	30160
26	-7.20	32.00	164.10	34.08	775.38	168.28	200.28	30160
27	-7.60	36.00	168.10	35.22	792.85	172.15	208.15	30160
28	-8.00	40.00	172.10	36.35	810.33	176.33	216.33	30160
29	-8.15	41.50	173.60	36.78	816.88	177.31	218.81	30160
30	-9.80	58.00	190.10	41.45	888.98	192.98	250.98	30160
		58.00	190.10	31.04	947.34	194.90	252.90	50266
31	-11.40	74.00	210.90	37.12	1038.22	214.86	288.86	50266
32	-13.00	90.00	231.70	43.20	1129.11	231.98	321.98	50266
		90.00	231.70	0.00	6438.86	237.21	327.21	1005321
33	-14.90	109.00	264.00	0.00	6887.38	266.35	375.35	1005321
34	-16.80	128.00	296.30	0.00	7335.89	298.70	426.70	1005321
35	-18.40	144.00	323.50	0.00	7713.59	325.94	469.94	1005321
36	-20.00	160.00	350.70	0.00	8091.29	352.63	512.63	1005321

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00

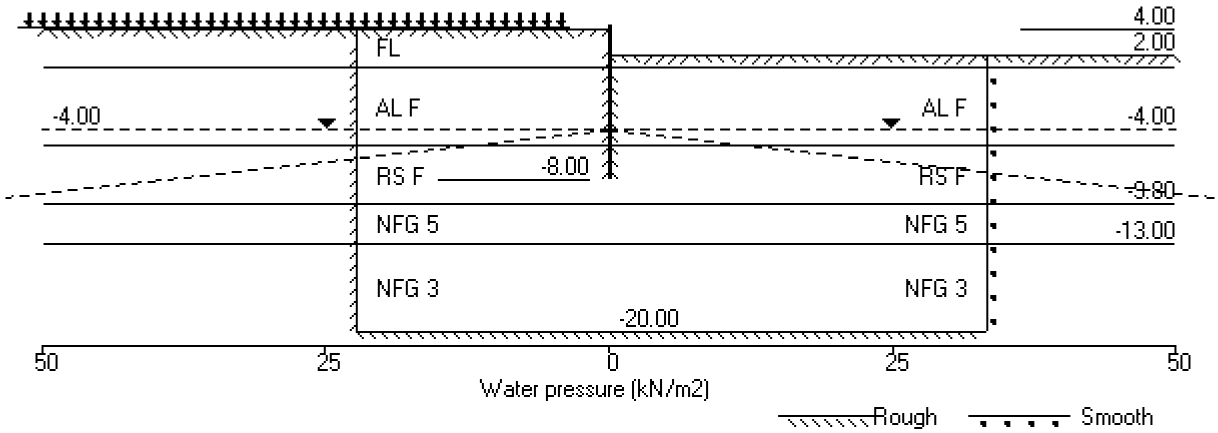


Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No. 2 Excavate to elevation 2.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -8.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
2	4.00	2.00	Cant.	11.179	-6.47	-0.12	2.12	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.018	1.51E-03	0.0	0.0		572444
2	3.50	2.64	0.017	1.51E-03	0.7	0.3		572444
3	3.00	5.36	0.017	1.51E-03	2.7	1.2		572444
4	2.55	7.90	0.016	1.51E-03	5.6	3.1		572444
5	2.10	10.53	0.015	1.50E-03	9.8	6.7		572444
6	2.00	11.13	0.015	1.50E-03	10.9	7.7		572444
7	1.50	-17.33	0.014	1.49E-03	9.3	14.1		572444
8	1.00	-13.26	0.014	1.48E-03	1.7	16.6		572444
		1.63	0.014	1.48E-03	1.7	16.6		
9	0.50	-0.78	0.013	1.46E-03	1.9	17.7		572444
10	0.00	-0.62	0.012	1.45E-03	1.5	18.6		572444
11	-0.60	0.19	0.011	1.43E-03	1.4	19.4		572444
12	-0.95	0.64	0.011	1.42E-03	1.6	19.9		572444
13	-1.30	1.14	0.010	1.40E-03	1.9	20.5		572444
14	-1.50	1.39	0.010	1.40E-03	2.1	20.9		572444
15	-2.00	2.09	0.009	1.38E-03	3.0	22.2		572444
16	-2.50	2.73	0.009	1.36E-03	4.2	24.0		572444
17	-3.00	3.29	0.008	1.33E-03	5.7	26.4		572444
18	-3.50	3.71	0.007	1.31E-03	7.5	29.7		572444
19	-4.00	3.85	0.007	1.28E-03	9.3	33.9		572444
20	-4.50	3.34	0.006	1.25E-03	11.1	39.0		572444
21	-5.00	1.44	0.005	1.21E-03	12.3	45.0		572444
22	-5.30	-3.16	0.005	1.19E-03	12.1	48.8		572444
		-68.28	0.005	1.19E-03	12.1	48.8		
23	-5.65	-34.61	0.005	1.16E-03	-5.9	48.9		572444
24	-6.00	-19.47	0.004	1.13E-03	-15.4	44.7		572444
25	-6.60	-7.64	0.003	1.09E-03	-23.5	31.9		572444
26	-7.20	3.35	0.003	1.07E-03	-24.8	16.5		572444
27	-7.60	17.75	0.002	1.06E-03	-20.6	6.8		572444
28	-8.00	61.95	0.002	1.05E-03	-4.6	-0.0		0
29	-8.15	-0.10	0.002	0	-0.0	0.0		0
30	-9.80	5.52	0.002	0	4.5	0.0		0
		-5.66	0.002	0	4.5	0.0		

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
31	-11.40	0.01	0.001	0	-0.1	0.0		0
32	-13.00	21.13	0.000	0	16.9	0.0		0
		-17.77	0.000	0	16.9	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	-0.0	0.0		0
36	-20.00	0.00	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press.	Vertic -al	Effective stresses Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	2.64	2.64a	9981
3	3.00	0.00	17.35	5.36	67.10	5.36	5.36a	9981
4	2.55	0.00	25.58	7.90	98.95	7.90	7.90a	9981
5	2.10	0.00	34.09	10.53	131.87	10.53	10.53a	9981
6	2.00	0.00	36.01	11.13	139.30	11.13	11.13a	9981
7	1.50	0.00	45.73	14.13	176.89	15.55	15.55	9981
8	1.00	0.00	55.54	17.16	214.84	24.83	24.83	9981
		0.00	55.54	13.95	211.21	31.24	31.24	4991
9	0.50	0.00	65.35	17.39	244.99	35.99	35.99	5240
10	0.00	0.00	75.11	20.82	278.59	42.05	42.05	5490
11	-0.60	0.00	86.71	24.90	318.51	49.73	49.73	5789
12	-0.95	0.00	93.41	27.25	341.58	54.18	54.18	5964
13	-1.30	0.00	100.07	29.59	364.48	58.69	58.69	6138
14	-1.50	0.00	103.85	30.91	377.50	61.23	61.23	6238
15	-2.00	0.00	113.24	34.21	409.82	67.66	67.66	6488
16	-2.50	0.00	122.54	37.48	441.84	74.05	74.05	6737
17	-3.00	0.00	131.77	40.72	473.60	80.40	80.40	6987
18	-3.50	0.00	140.92	43.94	505.11	86.67	86.67	7236
19	-4.00	0.00	150.02	47.13	536.42	92.79	92.79	7486
20	-4.50	5.00	154.05	48.55	550.32	95.08	100.08	7735
21	-5.00	10.00	158.05	49.95	564.06	96.66	106.66	7985
22	-5.30	13.00	160.42	50.79	572.23	96.06	109.06	8135
		13.00	160.42	33.04	759.29	107.23	120.23	29943
23	-5.65	16.50	164.22	34.12	775.89	127.15	143.65	29943
24	-6.00	20.00	168.00	35.19	792.42	138.28	158.28	29943
25	-6.60	26.00	174.44	37.02	820.58	150.28	176.28	29943
26	-7.20	32.00	180.85	38.83	848.54	161.86	193.86	29943
27	-7.60	36.00	185.09	40.03	867.09	173.21	209.21	29943
28	-8.00	40.00	189.32	41.23	885.57	198.14	238.14	29943
29	-8.15	41.50	190.90	41.68	892.48	170.02	211.52	29943
30	-9.80	58.00	208.19	46.58	968.01	189.30	247.30	29943
		58.00	208.19	36.32	1026.37	183.60	241.60	49905
31	-11.40	74.00	229.57	42.58	1119.82	207.44	281.44	49905
32	-13.00	90.00	250.83	48.79	1212.70	239.10	329.10	49905
		90.00	250.83	0.00	6704.52	220.58	310.58	998109
33	-14.90	109.00	283.54	0.00	7158.75	261.77	370.77	998109
34	-16.80	128.00	316.14	0.00	7611.40	294.19	422.19	998109
35	-18.40	144.00	343.52	0.00	7991.58	321.52	465.52	998109
36	-20.00	160.00	370.84	0.00	8371.01	347.39	507.39	998109

(continued)

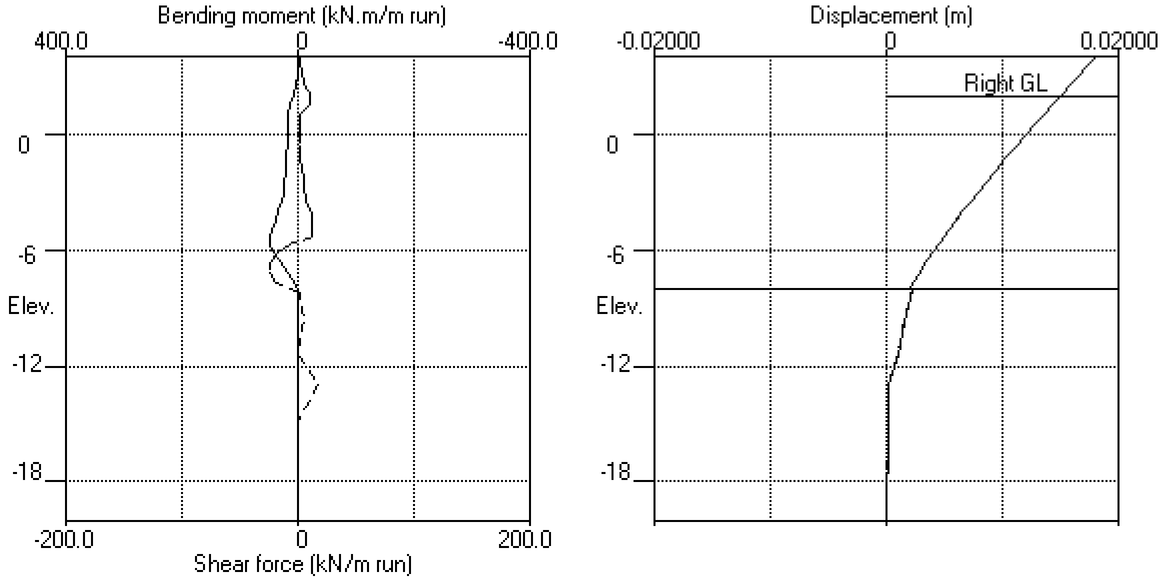
Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	RIGHT side: Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	10048
7	1.50	0.00	8.50	2.63	32.88	32.88	32.88p	10048
8	1.00	0.00	17.00	5.25	65.76	38.10	38.10	10048
		0.00	17.00	0.41	78.55	29.61	29.61	5024
9	0.50	0.00	25.50	3.39	107.81	36.77	36.77	5275
10	0.00	0.00	34.00	6.38	137.07	42.67	42.67	5527
11	-0.60	0.00	44.20	9.96	172.18	49.54	49.54	5828
12	-0.95	0.00	50.15	12.05	192.66	53.54	53.54	6004
13	-1.30	0.00	56.10	14.14	213.15	57.55	57.55	6180
14	-1.50	0.00	59.50	15.34	224.85	59.83	59.83	6280
15	-2.00	0.00	68.00	18.32	254.12	65.57	65.57	6531
16	-2.50	0.00	76.51	21.31	283.38	71.32	71.32	6783
17	-3.00	0.00	85.01	24.30	312.65	77.11	77.11	7034
18	-3.50	0.00	93.51	27.28	341.92	82.96	82.96	7285
19	-4.00	0.00	102.01	30.27	371.19	88.94	88.94	7536
20	-4.50	5.00	105.52	31.50	383.25	91.74	96.74	7787
21	-5.00	10.00	109.02	32.73	395.31	95.22	105.22	8039
22	-5.30	13.00	111.13	33.47	402.55	99.23	112.23	8189
		13.00	111.13	19.07	543.91	175.51	188.51	30145
23	-5.65	16.50	114.63	20.07	559.22	161.76	178.26	30145
24	-6.00	20.00	118.13	21.06	574.53	157.74	177.74	30145
25	-6.60	26.00	124.14	22.76	600.78	157.92	183.92	30145
26	-7.20	32.00	130.15	24.46	627.04	158.51	190.51	30145
27	-7.60	36.00	134.16	25.60	644.54	155.46	191.46	30145
28	-8.00	40.00	138.16	26.74	662.05	136.19	176.19	30145
29	-8.15	41.50	139.67	27.16	668.62	170.11	211.61	30145
30	-9.80	58.00	156.20	31.85	740.88	183.79	241.79	30145
		58.00	156.20	21.13	799.24	189.26	247.26	50241
31	-11.40	74.00	177.05	27.23	890.33	207.43	281.43	50241
32	-13.00	90.00	197.91	33.32	981.46	217.97	307.97	50241
		90.00	197.91	0.00	5969.65	238.36	328.36	1004823
33	-14.90	109.00	230.29	0.00	6419.34	261.77	370.77	1004823
34	-16.80	128.00	262.70	0.00	6869.28	294.18	422.18	1004823
35	-18.40	144.00	290.00	0.00	7248.37	321.52	465.52	1004823
36	-20.00	160.00	317.31	0.00	7627.65	347.39	507.39	1004823

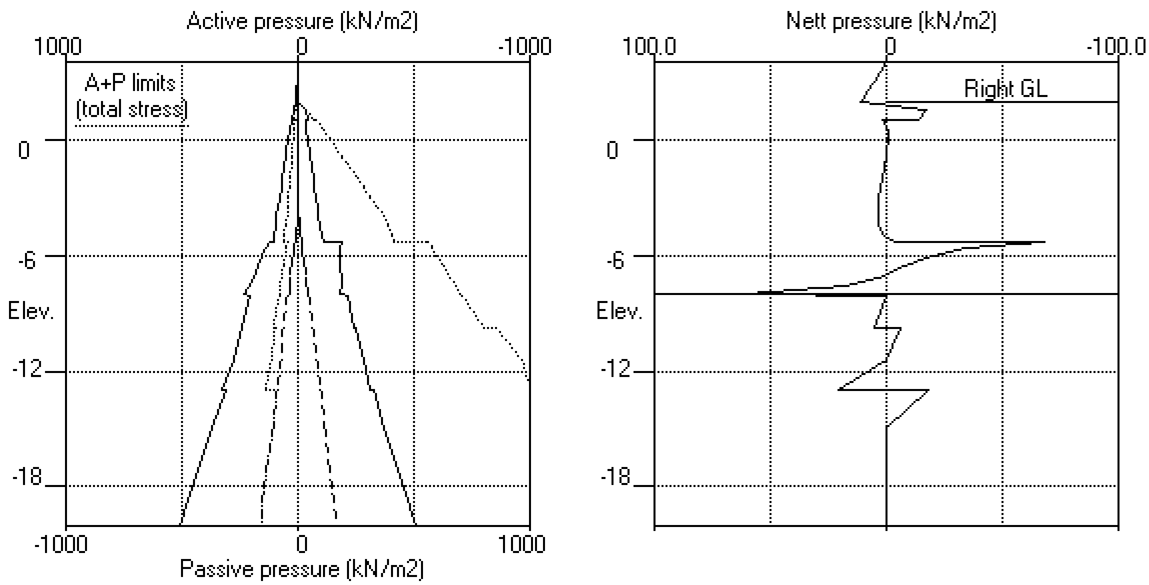
Note: 11.13 a Soil pressure at active limit
32.88 p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side

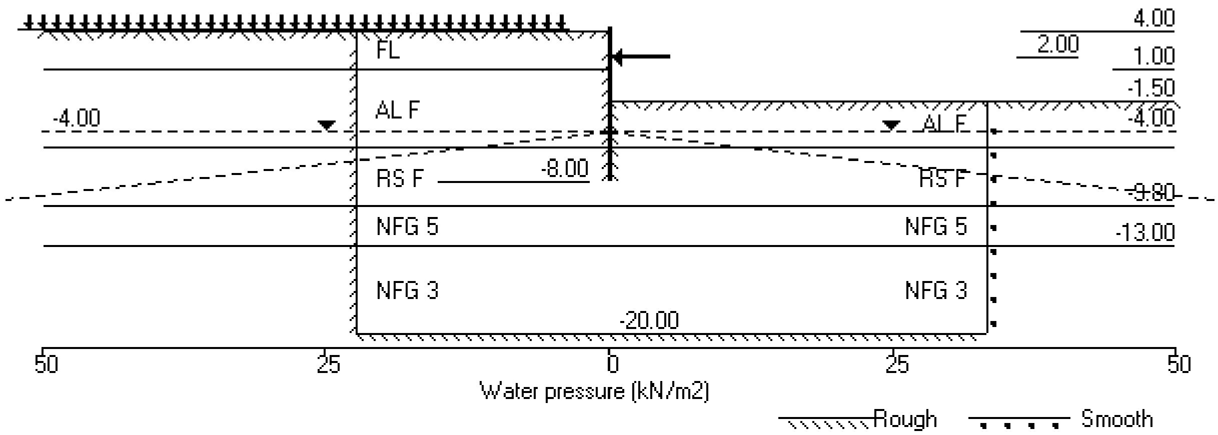


Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -1.50 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
4	4.00	-1.50	2.00	6.687	n/a	-3.41	1.91	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries:	Left side 20.00 from wall	Rough boundary
	Right side 30.00 from wall	Smooth boundary
Lower rigid boundary at elevation -20.00		Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	2.06E-04	0.0	-0.0		572444
2	3.50	8.59	0.017	2.06E-04	2.1	0.3		572444
3	3.00	8.80	0.017	2.05E-04	6.5	2.7		572444
4	2.55	9.41	0.017	2.01E-04	10.6	6.7		572444
5	2.10	10.70	0.017	1.93E-04	15.1	12.6		572444
6	2.00	9.90	0.017	1.91E-04	16.1	14.2	-118.2	572444
		9.90	0.017	1.91E-04	-102.1	14.2		
7	1.50	12.71	0.017	2.00E-04	-96.4	-34.7		572444
8	1.00	19.68	0.016	2.50E-04	-88.3	-81.0		572444
		28.67	0.016	2.50E-04	-88.3	-81.0		
9	0.50	32.57	0.016	3.39E-04	-73.0	-121.3		572444
10	0.00	37.82	0.016	4.59E-04	-55.4	-153.5		572444
11	-0.60	44.77	0.016	6.33E-04	-30.6	-179.5		572444
12	-0.95	48.56	0.016	7.45E-04	-14.3	-187.4		572444
13	-1.30	52.68	0.015	8.60E-04	3.4	-189.3		572444
14	-1.50	54.77	0.015	9.26E-04	14.2	-187.5		572444
		34.74	0.015	9.26E-04	14.2	-187.5		
15	-2.00	14.86	0.015	1.08E-03	26.6	-176.7		572444
16	-2.50	14.73	0.014	1.23E-03	34.0	-161.6		572444
17	-3.00	14.46	0.013	1.36E-03	41.3	-142.7		572444
18	-3.50	14.19	0.013	1.48E-03	48.4	-120.3		572444
19	-4.00	13.68	0.012	1.57E-03	55.4	-94.3		572444
20	-4.50	12.26	0.011	1.64E-03	61.9	-64.9		572444
21	-5.00	8.66	0.010	1.68E-03	67.1	-32.4		572444
22	-5.30	0.92	0.010	1.69E-03	68.5	-11.9		572444
		-121.64	0.010	1.69E-03	68.5	-11.9		
23	-5.65	-64.79	0.009	1.70E-03	35.9	4.7		572444
24	-6.00	-41.47	0.009	1.69E-03	17.3	13.3		572444
25	-6.60	-24.16	0.008	1.67E-03	-2.4	16.2		572444
26	-7.20	-9.34	0.007	1.66E-03	-12.4	10.4		572444
27	-7.60	6.19	0.006	1.66E-03	-13.1	4.7		572444
28	-8.00	42.97	0.005	1.65E-03	-3.2	-0.0		0

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-8.15	-0.10	0.005	0	-0.0	0.0		0
30	-9.80	11.82	0.003	0	9.7	0.0		0
		-12.15	0.003	0	9.7	0.0		
31	-11.40	0.01	0.002	0	-0.1	0.0		0
32	-13.00	44.86	0.000	0	35.8	0.0		0
		-37.76	0.000	0	35.8	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 118.2 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	8.59	8.59	9981
3	3.00	0.00	17.35	5.36	67.10	8.80	8.80	9981
4	2.55	0.00	25.58	7.90	98.95	9.41	9.41	9981
5	2.10	0.00	34.09	10.53	131.87	10.70	10.70	9981
6	2.00	0.00	36.01	11.13	139.30	9.90	9.90A	9981
7	1.50	0.00	45.73	14.13	176.89	12.71	12.71A	9981
8	1.00	0.00	55.54	17.16	214.84	19.68	19.68	9981
		0.00	55.54	13.95	211.21	28.67	28.67	4991
9	0.50	0.00	65.35	17.39	244.99	32.57	32.57	5240
10	0.00	0.00	75.11	20.82	278.59	37.82	37.82	5490
11	-0.60	0.00	86.71	24.90	318.51	44.77	44.77	5789
12	-0.95	0.00	93.41	27.25	341.58	48.56	48.56	5964
13	-1.30	0.00	100.07	29.59	364.48	52.68	52.68	6138
14	-1.50	0.00	103.85	30.91	377.50	54.77	54.77	6238
15	-2.00	0.00	113.24	34.21	409.82	60.82	60.82	6488
16	-2.50	0.00	122.54	37.48	441.84	66.79	66.79	6737
17	-3.00	0.00	131.77	40.72	473.60	72.79	72.79	6987
18	-3.50	0.00	140.92	43.94	505.11	78.78	78.78	7236
19	-4.00	0.00	150.02	47.13	536.42	84.63	84.63	7486
20	-4.50	5.00	154.05	48.55	550.32	86.52	91.52	7735
21	-5.00	10.00	158.05	49.95	564.06	87.27	97.27	7985
22	-5.30	13.00	160.42	50.79	572.23	85.36	98.36	8135
		13.00	160.42	33.04	759.29	67.82	80.82	29943
23	-5.65	16.50	164.22	34.12	775.89	98.99	115.49	29943
24	-6.00	20.00	168.00	35.19	792.42	114.21	134.21	29943
25	-6.60	26.00	174.44	37.02	820.58	128.97	154.97	29943
26	-7.20	32.00	180.85	38.83	848.54	142.50	174.50	29943
27	-7.60	36.00	185.09	40.03	867.09	154.41	190.41	29943
28	-8.00	40.00	189.32	41.23	885.57	175.92	215.92	29943
29	-8.15	41.50	190.90	41.68	892.48	157.01	198.51	29943
30	-9.80	58.00	208.19	46.58	968.01	179.58	237.58	29943
		58.00	208.19	36.32	1026.37	167.40	225.40	49905
31	-11.40	74.00	229.57	42.58	1119.82	194.57	268.57	49905
32	-13.00	90.00	250.83	48.79	1212.70	238.22	328.22	49905
		90.00	250.83	0.00	6704.52	202.85	292.85	998109
33	-14.90	109.00	283.54	0.00	7158.75	254.03	363.03	998109
34	-16.80	128.00	316.14	0.00	7611.40	286.52	414.52	998109
35	-18.40	144.00	343.52	0.00	7991.58	313.92	457.92	998109
36	-20.00	160.00	370.84	0.00	8371.01	338.20	498.20	998109

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	6274
15	-2.00	0.00	8.50	0.00	49.29	45.96	45.96	6525
16	-2.50	0.00	17.00	0.41	78.55	52.05	52.05	6776
17	-3.00	0.00	25.50	3.39	107.81	58.33	58.33	7027
18	-3.50	0.00	34.00	6.38	137.07	64.59	64.59	7278
19	-4.00	0.00	42.50	9.37	166.33	70.95	70.95	7529
20	-4.50	5.00	46.00	10.60	178.39	74.26	79.26	7780
21	-5.00	10.00	49.51	11.83	190.45	78.61	88.61	8031
22	-5.30	13.00	51.61	12.56	197.68	84.44	97.44	8181
		13.00	51.61	2.21	283.86	189.46	202.46	30115
23	-5.65	16.50	55.11	3.20	299.17	163.78	180.28	30115
24	-6.00	20.00	58.62	4.20	314.48	155.68	175.68	30115
25	-6.60	26.00	64.62	5.90	340.73	153.13	179.13	30115
26	-7.20	32.00	70.63	7.60	366.99	151.84	183.84	30115
27	-7.60	36.00	74.64	8.74	384.50	148.22	184.22	30115
28	-8.00	40.00	78.65	9.87	402.01	132.95	172.95	30115
29	-8.15	41.50	80.15	10.30	408.58	157.11	198.61	30115
30	-9.80	58.00	96.70	14.99	480.89	167.76	225.76	30115
		58.00	96.70	3.74	539.25	179.56	237.56	50192
31	-11.40	74.00	117.57	9.84	630.44	194.56	268.56	50192
32	-13.00	90.00	138.47	15.95	721.74	193.35	283.35	50192
		90.00	138.47	0.00	5144.24	240.61	330.61	1003838
33	-14.90	109.00	170.92	0.00	5594.83	254.02	363.02	1003838
34	-16.80	128.00	203.41	0.00	6046.03	286.51	414.51	1003838
35	-18.40	144.00	230.81	0.00	6426.49	313.92	457.92	1003838
36	-20.00	160.00	258.24	0.00	6807.43	338.21	498.21	1003838

Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit
12.71A Arching - soil pressure below active limit

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                            Licensed from GEOSOLVE            | Made by :   DJC
Data filename/Run ID: Section_5                               |
Albert Street Development                                     | Date:16-11-2022
Section 5                                                     | Checked :
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                                                     Units: kN,m
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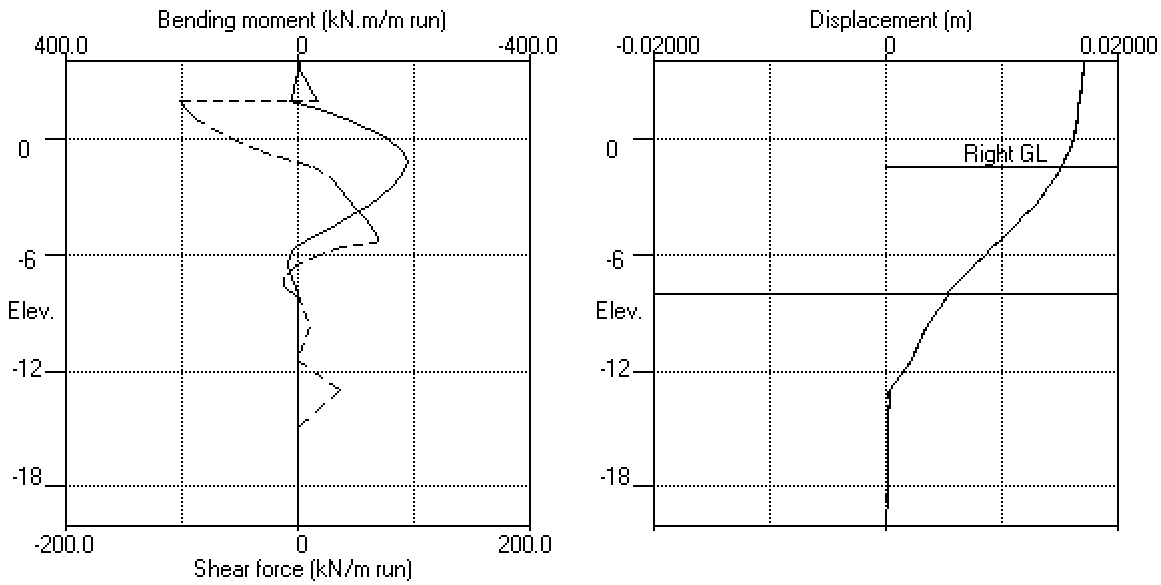
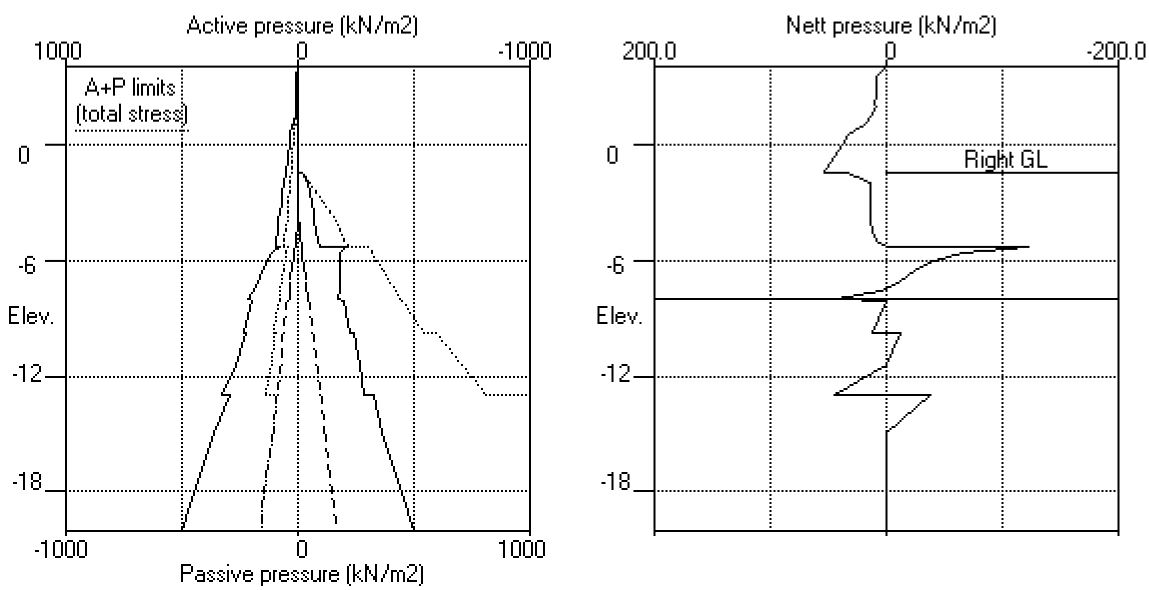
Stage No.4 Excav. to elev. -1.50 on RIGHT side

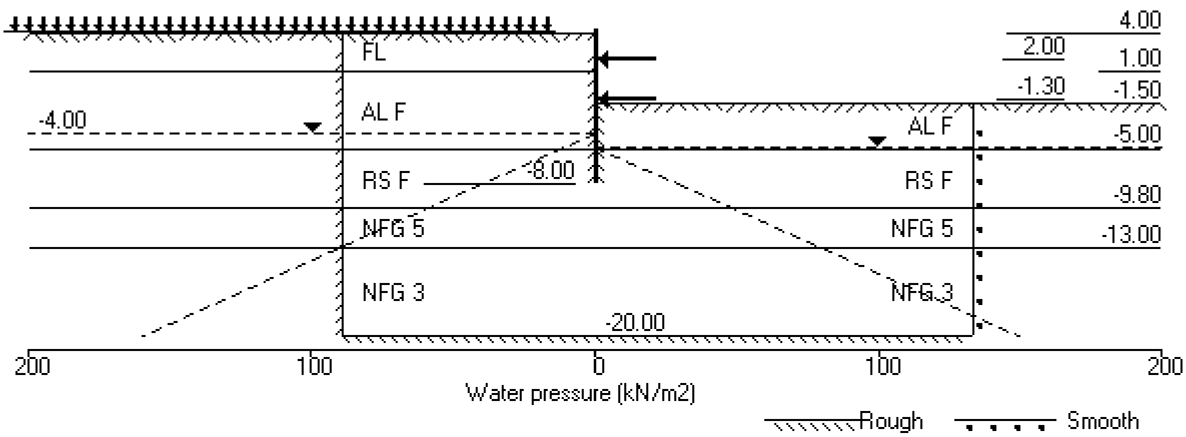


Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No. 6 Apply water pressure profile no.2

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
6	4.00	-1.50		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	1.77E-04	0.0	-0.0		572444
2	3.50	8.81	0.017	1.77E-04	2.2	0.3		572444
3	3.00	8.99	0.017	1.76E-04	6.6	2.7		572444
4	2.55	9.58	0.017	1.72E-04	10.8	6.8		572444
5	2.10	10.85	0.017	1.64E-04	15.4	12.9		572444
6	2.00	10.04	0.017	1.62E-04	16.5	14.5	-116.0	572444
		10.04	0.017	1.62E-04	-99.5	14.5		
7	1.50	12.84	0.017	1.70E-04	-93.8	-33.1		572444
8	1.00	19.81	0.016	2.19E-04	-85.6	-78.1		572444
		28.73	0.016	2.19E-04	-85.6	-78.1		
9	0.50	32.63	0.016	3.04E-04	-70.3	-117.0		572444
10	0.00	37.88	0.016	4.19E-04	-52.7	-147.8		572444
11	-0.60	44.82	0.016	5.87E-04	-27.8	-172.1		572444
12	-0.95	48.61	0.016	6.94E-04	-11.5	-179.1		572444
13	-1.30	52.72	0.015	8.04E-04	6.2	-180.0	-6.8	572444
		52.72	0.015	8.04E-04	-0.6	-180.0		
14	-1.50	54.79	0.015	8.67E-04	10.2	-179.1		572444
		34.95	0.015	8.67E-04	10.2	-179.1		
15	-2.00	14.99	0.015	1.01E-03	22.7	-170.2		572444
16	-2.50	14.75	0.014	1.16E-03	30.1	-157.0		572444
17	-3.00	14.35	0.014	1.29E-03	37.4	-140.1		572444
18	-3.50	13.94	0.013	1.40E-03	44.4	-119.6		572444
19	-4.00	13.28	0.012	1.49E-03	51.3	-95.6		572444
20	-4.50	14.55	0.011	1.57E-03	58.2	-68.2		572444
21	-5.00	13.65	0.011	1.61E-03	65.3	-37.1		572444
22	-5.30	5.76	0.010	1.63E-03	68.2	-16.9		572444
		-119.13	0.010	1.63E-03	68.2	-16.9		
23	-5.65	-62.13	0.010	1.63E-03	36.4	-0.4		572444
24	-6.00	-39.44	0.009	1.63E-03	18.7	8.6		572444
25	-6.60	-22.99	0.008	1.62E-03	-0.1	12.7		572444
26	-7.20	-9.27	0.007	1.61E-03	-9.7	8.6		572444
27	-7.60	4.47	0.006	1.60E-03	-10.7	3.9		572444

(continued)

Stage No.6 Apply water pressure profile no.2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	35.64	0.006	1.60E-03	-2.7	-0.0		0
29	-8.15	-0.10	0.006	0	-0.0	0.0		0
30	-9.80	13.23	0.004	0	10.8	0.0		0
		-13.61	0.004	0	10.8	0.0		
31	-11.40	0.01	0.002	0	-0.1	0.0		0
32	-13.00	49.99	0.000	0	39.9	0.0		0
		-42.07	0.000	0	39.9	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 116.0 kN/m run
At elev. -1.30 Prop force = 6.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	8.81	8.81	9981
3	3.00	0.00	17.35	5.36	67.10	8.99	8.99	9981
4	2.55	0.00	25.58	7.90	98.95	9.58	9.58	9981
5	2.10	0.00	34.09	10.53	131.87	10.85	10.85	9981
6	2.00	0.00	36.01	11.13	139.30	10.04	10.04A	9981
7	1.50	0.00	45.73	14.13	176.89	12.84	12.84A	9981
8	1.00	0.00	55.54	17.16	214.84	19.81	19.81	9981
		0.00	55.54	13.95	211.21	28.73	28.73	4991
9	0.50	0.00	65.35	17.39	244.99	32.63	32.63	5240
10	0.00	0.00	75.11	20.82	278.59	37.88	37.88	5490
11	-0.60	0.00	86.71	24.90	318.51	44.82	44.82	5789
12	-0.95	0.00	93.41	27.25	341.58	48.61	48.61	5964
13	-1.30	0.00	100.07	29.59	364.48	52.72	52.72	6138
14	-1.50	0.00	103.85	30.91	377.50	54.79	54.79	6238
15	-2.00	0.00	113.24	34.21	409.82	60.81	60.81	6488
16	-2.50	0.00	122.54	37.48	441.84	66.73	66.73	6737
17	-3.00	0.00	131.77	40.72	473.60	72.67	72.67	6987
18	-3.50	0.00	140.92	43.94	505.11	78.60	78.60	7236
19	-4.00	0.00	150.02	47.13	536.42	84.38	84.38	7486
20	-4.50	5.00	154.05	48.55	550.32	86.19	91.19	7735
21	-5.00	10.00	158.05	49.95	564.06	86.88	96.88	7985
22	-5.30	13.00	160.42	50.79	572.23	84.91	97.91	8135
		13.00	160.42	33.04	759.29	66.17	79.17	29943
23	-5.65	16.50	164.22	34.12	775.89	97.41	113.91	29943
24	-6.00	20.00	168.00	35.19	792.42	112.31	132.31	29943
25	-6.60	26.00	174.44	37.02	820.58	126.65	152.65	29943
26	-7.20	32.00	180.85	38.83	848.54	139.63	171.63	29943
27	-7.60	36.00	185.09	40.03	867.09	150.64	186.64	29943
28	-8.00	40.00	189.32	41.23	885.57	169.48	209.48	29943
29	-8.15	41.50	190.90	41.68	892.48	154.09	195.59	29943
30	-9.80	58.00	208.19	46.58	968.01	177.41	235.41	29943
		58.00	208.19	36.32	1026.37	163.78	221.78	49905
31	-11.40	74.00	229.57	42.58	1119.82	191.69	265.69	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.92	327.92	49905
		90.00	250.83	0.00	6704.52	196.89	286.89	998109
33	-14.90	109.00	283.54	0.00	7158.75	250.23	359.23	998109
34	-16.80	128.00	316.14	0.00	7611.40	282.73	410.73	998109

(continued)

Stage No.6 Apply water pressure profile no.2

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
35	-18.40	144.00	343.52	0.00	7991.58	310.13	454.13	998109
36	-20.00	160.00	370.84	0.00	8371.01	333.65	493.65	998109

RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.84	19.84	6274
15	-2.00	0.00	8.50	0.00	49.29	45.82	45.82	6525
16	-2.50	0.00	17.00	0.41	78.55	51.97	51.97	6776
17	-3.00	0.00	25.50	3.39	107.81	58.32	58.32	7027
18	-3.50	0.00	34.00	6.38	137.07	64.66	64.66	7278
19	-4.00	0.00	42.50	9.37	166.33	71.11	71.11	7529
20	-4.50	0.00	51.00	12.35	195.60	76.65	76.65	7780
21	-5.00	0.00	59.51	15.34	224.87	83.23	83.23	8031
22	-5.30	3.00	61.61	16.08	232.11	89.15	92.15	8181
		3.00	61.61	5.04	327.56	195.30	198.30	30115
23	-5.65	6.50	65.11	6.04	342.86	169.54	176.04	30115
24	-6.00	10.00	68.62	7.03	358.17	161.76	171.76	30115
25	-6.60	16.00	74.62	8.73	384.42	159.64	175.64	30115
26	-7.20	22.00	80.63	10.43	410.68	158.89	180.89	30115
27	-7.60	26.00	84.64	11.57	428.19	156.17	182.17	30115
28	-8.00	30.00	88.65	12.71	445.70	143.84	173.84	30115
29	-8.15	31.50	90.15	13.13	452.27	164.19	195.69	30115
30	-9.80	48.00	106.70	17.82	524.58	174.18	222.18	30115
		48.00	106.70	6.67	582.94	187.39	235.39	50192
31	-11.40	64.00	127.57	12.77	674.13	201.67	265.67	50192
32	-13.00	80.00	148.47	18.87	765.43	197.93	277.93	50192
		80.00	148.47	0.00	5283.10	248.97	328.97	1003838
33	-14.90	99.00	180.92	0.00	5733.69	260.22	359.22	1003838
34	-16.80	118.00	213.41	0.00	6184.89	292.72	410.72	1003838
35	-18.40	134.00	240.81	0.00	6565.35	320.12	454.12	1003838
36	-20.00	150.00	268.24	0.00	6946.29	343.66	493.66	1003838

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
12.84A Arching - soil pressure below active limit

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Program: WALLAP  Version 6.07  Revision A55.B74.R58             | Job No.  B01493
                               Licensed from GEOSOLVE           | Made by :   DJC
Data filename/Run ID: Section_5                                 |
Albert Street Development                                       | Date:16-11-2022
Section 5                                                       | Checked :
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                                                        Units: kN,m
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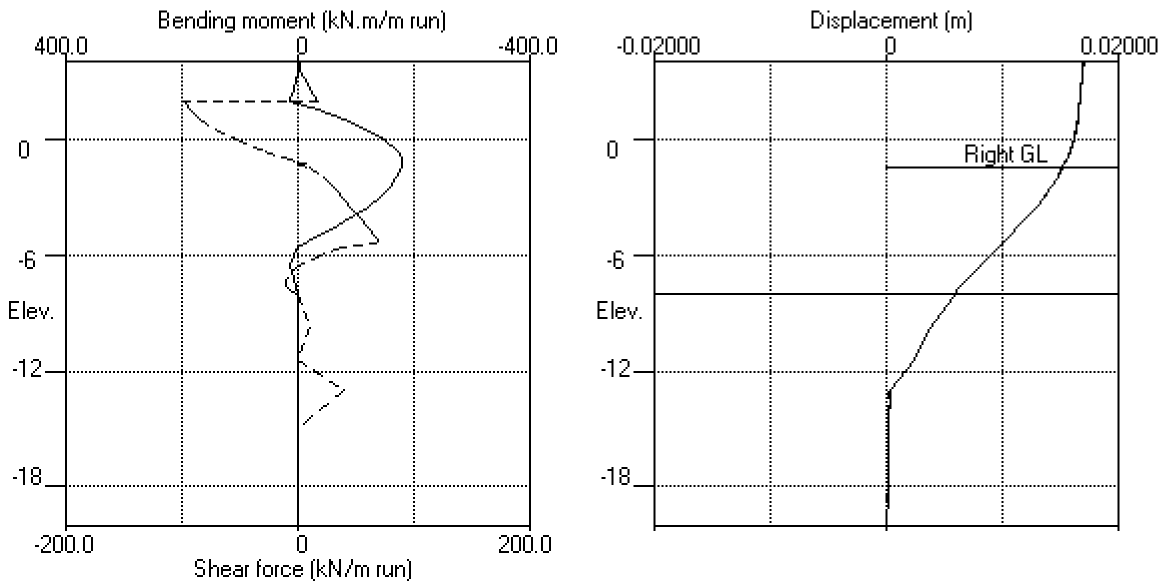
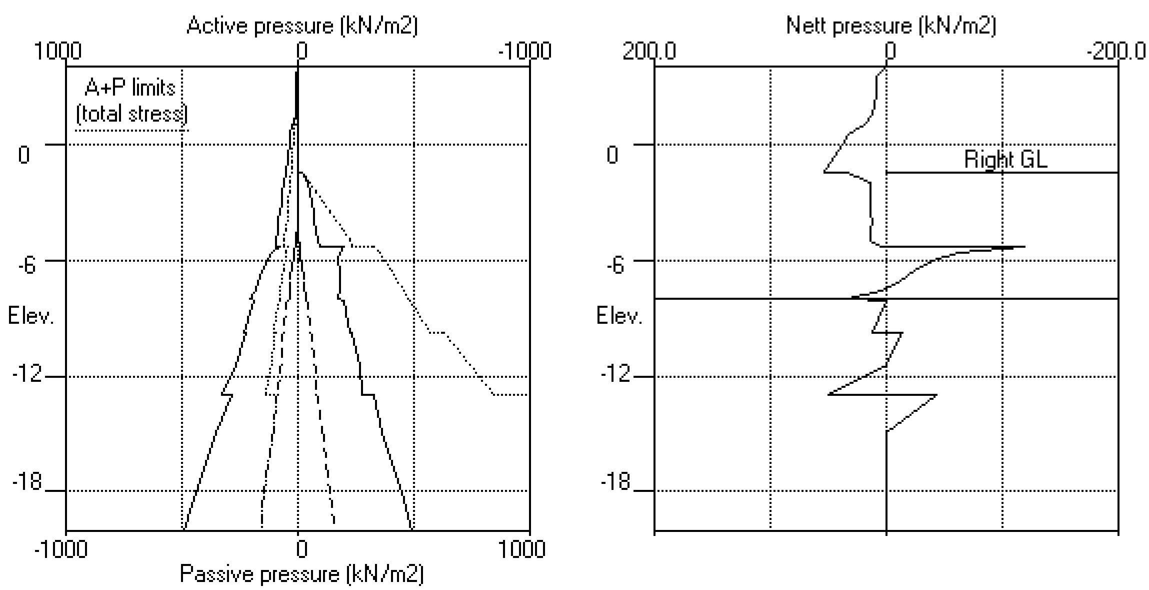
Stage No.6 Apply water pressure profile no.2

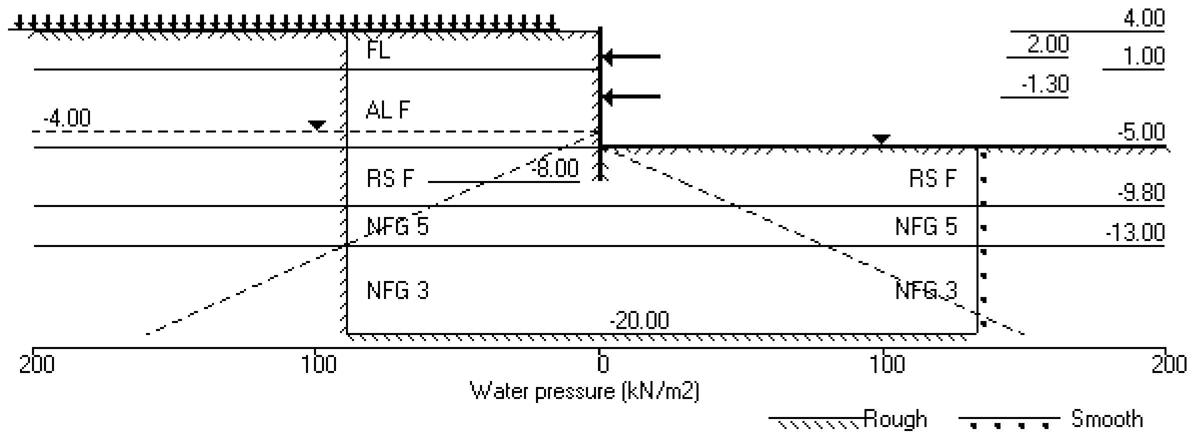


Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -5.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
7	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-6.09E-04	0.0	-0.0		572444
2	3.50	14.25	0.015	-6.09E-04	3.6	0.3		572444
3	3.00	13.11	0.016	-6.11E-04	10.4	4.1		572444
4	2.55	12.79	0.016	-6.17E-04	16.2	10.3		572444
5	2.10	13.46	0.016	-6.29E-04	22.1	19.1		572444
6	2.00	12.06	0.016	-6.32E-04	23.4	21.4	-92.8	572444
		12.06	0.016	-6.32E-04	-69.4	21.4		
7	1.50	14.23	0.017	-6.37E-04	-62.8	-10.8		572444
8	1.00	20.38	0.017	-6.14E-04	-54.2	-40.2		572444
		29.02	0.017	-6.14E-04	-54.2	-40.2		
9	0.50	32.78	0.017	-5.69E-04	-38.7	-63.4		572444
10	0.00	37.77	0.018	-5.07E-04	-21.1	-78.3		572444
11	-0.60	44.38	0.018	-4.22E-04	3.6	-83.7		572444
12	-0.95	47.73	0.018	-3.72E-04	19.7	-79.7		572444
13	-1.30	51.44	0.018	-3.27E-04	37.0	-69.8	-199.5	572444
		51.44	0.018	-3.27E-04	-162.4	-69.8		
14	-1.50	52.86	0.018	-2.97E-04	-152.0	-101.2		572444
15	-2.00	57.99	0.018	-1.78E-04	-124.3	-170.1		572444
16	-2.50	62.67	0.018	-6.37E-06	-94.1	-224.8		572444
17	-3.00	67.33	0.018	2.06E-04	-61.6	-263.7		572444
18	-3.50	71.97	0.018	4.46E-04	-26.8	-285.8		572444
19	-4.00	76.52	0.018	6.98E-04	10.3	-290.0		572444
20	-4.50	82.09	0.017	9.45E-04	50.0	-274.9		572444
21	-5.00	86.53	0.017	1.16E-03	92.1	-239.3		572444
		66.50	0.017	1.16E-03	92.1	-239.3		
22	-5.30	56.21	0.017	1.28E-03	110.5	-208.6		572444
		-33.49	0.017	1.28E-03	110.5	-208.6		
23	-5.65	-11.03	0.016	1.40E-03	102.7	-172.8		572444
24	-6.00	-12.24	0.016	1.49E-03	98.7	-138.0		572444
25	-6.60	-26.33	0.015	1.61E-03	87.1	-82.7		572444
26	-7.20	-43.76	0.014	1.67E-03	66.1	-35.8		572444
27	-7.60	-62.88	0.013	1.69E-03	44.7	-12.9		572444

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	-116.95	0.012	1.69E-03	8.8	-0.0		0
29	-8.15	-0.10	0.011	0	-0.0	0.0		0
30	-9.80	19.54	0.006	0	16.0	0.0		0
		-20.12	0.006	0	16.0	0.0		
31	-11.40	0.01	0.004	0	-0.1	0.0		0
32	-13.00	73.79	0.001	0	59.0	0.0		0
		-62.12	0.001	0	59.0	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 92.8 kN/m run
At elev. -1.30 Prop force = 199.5 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	14.25	14.25	9981
3	3.00	0.00	17.35	5.36	67.10	13.11	13.11	9981
4	2.55	0.00	25.58	7.90	98.95	12.79	12.79	9981
5	2.10	0.00	34.09	10.53	131.87	13.46	13.46	9981
6	2.00	0.00	36.01	11.13	139.30	12.06	12.06	9981
7	1.50	0.00	45.73	14.13	176.89	14.23	14.23	9981
8	1.00	0.00	55.54	17.16	214.84	20.38	20.38	9981
		0.00	55.54	13.95	211.21	29.02	29.02	4991
9	0.50	0.00	65.35	17.39	244.99	32.78	32.78	5240
10	0.00	0.00	75.11	20.82	278.59	37.77	37.77	5490
11	-0.60	0.00	86.71	24.90	318.51	44.38	44.38	5789
12	-0.95	0.00	93.41	27.25	341.58	47.73	47.73	5964
13	-1.30	0.00	100.07	29.59	364.48	51.44	51.44	6138
14	-1.50	0.00	103.85	30.91	377.50	52.86	52.86	6238
15	-2.00	0.00	113.24	34.21	409.82	57.99	57.99	6488
16	-2.50	0.00	122.54	37.48	441.84	62.67	62.67	6737
17	-3.00	0.00	131.77	40.72	473.60	67.33	67.33	6987
18	-3.50	0.00	140.92	43.94	505.11	71.97	71.97	7236
19	-4.00	0.00	150.02	47.13	536.42	76.52	76.52	7486
20	-4.50	5.00	154.05	48.55	550.32	77.09	82.09	7735
21	-5.00	10.00	158.05	49.95	564.06	76.53	86.53	7985
22	-5.30	13.00	160.42	50.79	572.23	73.47	86.47	8135
		13.00	160.42	33.04	759.29	24.05	37.05A	29943
23	-5.65	16.50	164.22	34.12	775.89	61.79	78.29	29943
24	-6.00	20.00	168.00	35.19	792.42	75.88	95.88	29943
25	-6.60	26.00	174.44	37.02	820.58	88.02	114.02	29943
26	-7.20	32.00	180.85	38.83	848.54	96.81	128.81	29943
27	-7.60	36.00	185.09	40.03	867.09	95.17	131.17	29943
28	-8.00	40.00	189.32	41.23	885.57	58.60	98.60	29943
29	-8.15	41.50	190.90	41.68	892.48	140.20	181.70	29943
30	-9.80	58.00	208.19	46.58	968.01	167.59	225.59	29943
		58.00	208.19	36.32	1026.37	147.42	205.42	49905
31	-11.40	74.00	229.57	42.58	1119.82	178.71	252.71	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.03	327.03	49905
		90.00	250.83	0.00	6704.52	179.06	269.06	998109
33	-14.90	109.00	283.54	0.00	7158.75	242.39	351.39	998109
34	-16.80	128.00	316.14	0.00	7611.40	274.97	402.97	998109

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
35	-18.40	144.00	343.52	0.00	7991.58	302.43	446.43	998109
36	-20.00	160.00	370.84	0.00	8371.01	324.27	484.27	998109

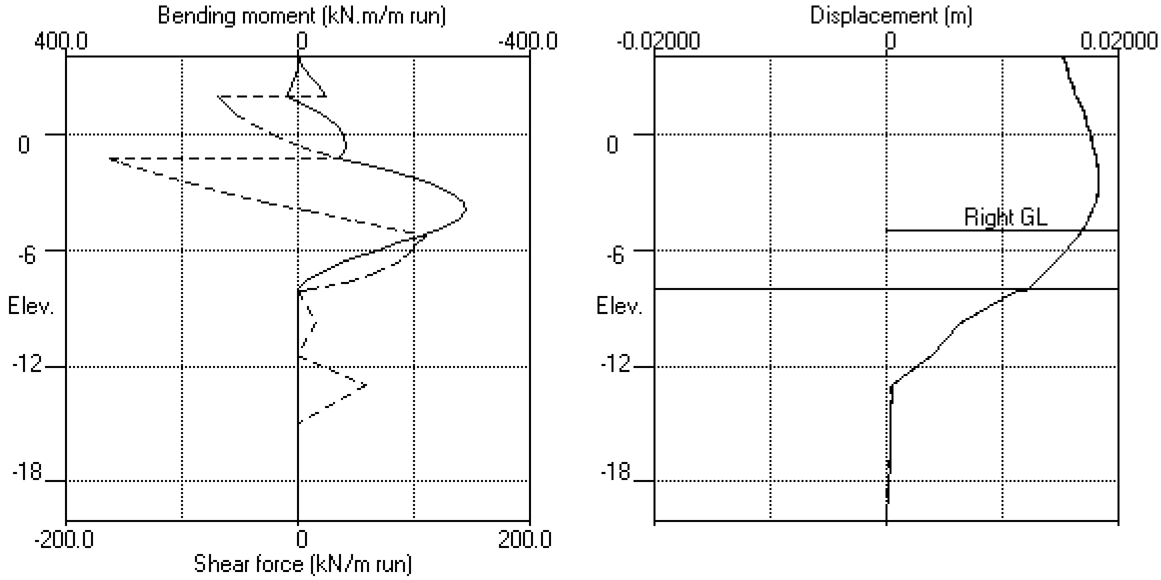
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	8021
22	-5.30	3.00	2.10	0.00	27.26	27.26	30.26p	8172
		3.00	2.10	0.00	67.54	67.54	70.54p	30080
23	-5.65	6.50	5.60	0.00	82.83	82.83	89.33p	30080
24	-6.00	10.00	9.10	0.00	98.12	98.12	108.12p	30080
25	-6.60	16.00	15.10	0.00	124.34	124.34	140.34p	30080
26	-7.20	22.00	21.10	0.00	150.57	150.57	172.57p	30080
27	-7.60	26.00	25.11	0.00	168.05	168.05	194.05p	30080
28	-8.00	30.00	29.11	0.00	185.54	185.54	215.54p	30080
29	-8.15	31.50	30.61	0.00	192.10	150.30	181.80	30080
30	-9.80	48.00	47.13	0.94	264.30	158.05	206.05	30080
		48.00	47.13	0.00	322.66	177.53	225.53	50133
31	-11.40	64.00	67.98	0.00	413.74	188.70	252.70	50133
32	-13.00	80.00	88.85	1.45	504.94	173.24	253.24	50133
		80.00	88.85	0.00	4455.26	251.18	331.18	1002652
33	-14.90	99.00	121.28	0.00	4905.61	252.38	351.38	1002652
34	-16.80	118.00	153.77	0.00	5356.75	284.96	402.96	1002652
35	-18.40	134.00	181.18	0.00	5737.37	312.43	446.43	1002652
36	-20.00	150.00	208.64	0.00	6118.70	334.28	484.28	1002652

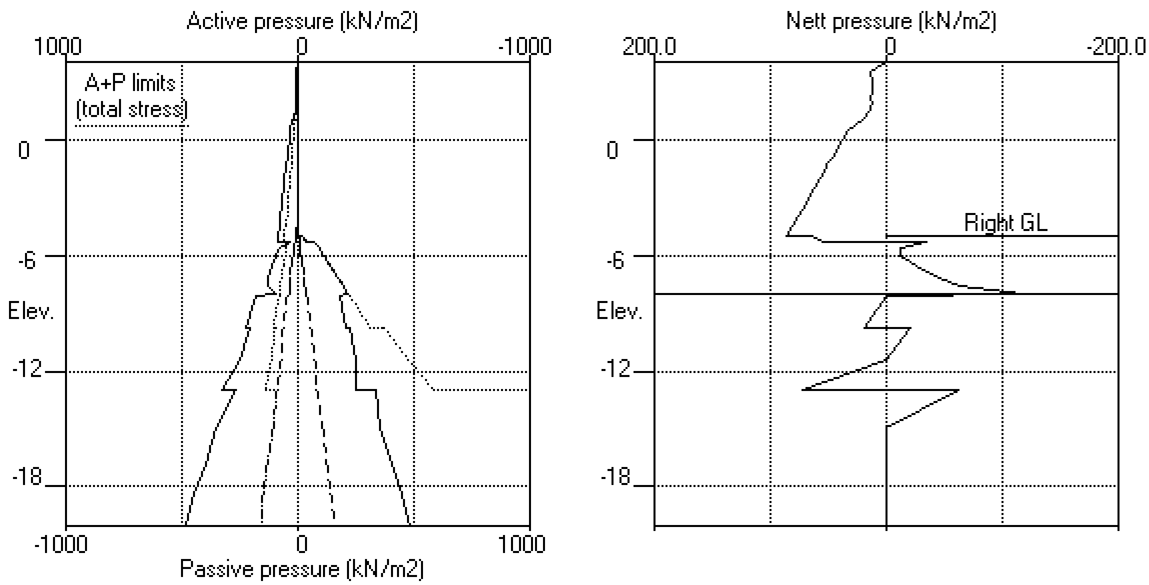
Note: 12.34 a Soil pressure at active limit
215.54 p Soil pressure at passive limit
37.05A Arching - soil pressure below active limit

Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side



Stage No.7 Excav. to elev. -5.00 on RIGHT side



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                             Licensed from GEOSOLVE            | Made by :   DJC
Data filename/Run ID: Section_5                                |
Albert Street Development                                      | Date:16-11-2022
Section 5                                                      | Checked :
-----------------------------------------------------------------------------
                                                     Units: kN,m
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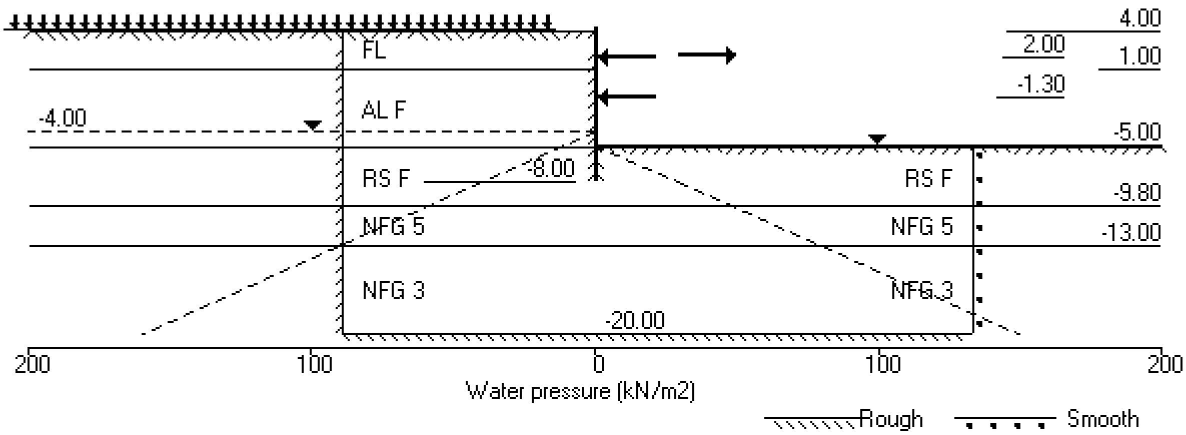
Stage No.8   Apply load no.1 at elev. 2.10



Units: kN,m

Stage No. 8 Apply load no.1 at elevation 2.10

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

				FoS for toe elev. = -8.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
8	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	-4.64E-04	0.0	-0.0		572444
2	3.50	12.57	0.016	-4.64E-04	3.1	0.3		572444
3	3.00	11.85	0.016	-4.65E-04	9.2	3.7		572444
4	2.55	11.79	0.017	-4.71E-04	14.6	9.2		572444
5	2.10	12.63	0.017	-4.81E-04	20.1	17.2	45.0	572444
		12.63	0.017	-4.81E-04	65.1	17.2		
6	2.00	11.41	0.017	-4.84E-04	66.3	23.8	-130.5	572444
		11.41	0.017	-4.84E-04	-64.2	23.8		
7	1.50	13.77	0.017	-4.92E-04	-57.9	-6.0		572444
8	1.00	20.19	0.017	-4.75E-04	-49.4	-33.0		572444
		28.92	0.017	-4.75E-04	-49.4	-33.0		
9	0.50	32.66	0.018	-4.37E-04	-34.0	-53.7		572444
10	0.00	37.69	0.018	-3.85E-04	-16.4	-66.4		572444
11	-0.60	44.34	0.018	-3.14E-04	8.2	-69.0		572444
12	-0.95	47.74	0.018	-2.74E-04	24.3	-63.4		572444
13	-1.30	51.48	0.018	-2.38E-04	41.7	-51.8	-207.5	572444
		51.48	0.018	-2.38E-04	-165.9	-51.8		
14	-1.50	52.93	0.018	-2.15E-04	-155.4	-84.0		572444
15	-2.00	58.08	0.018	-1.10E-04	-127.7	-154.6		572444
16	-2.50	62.78	0.018	4.87E-05	-97.5	-210.9		572444
17	-3.00	67.45	0.018	2.50E-04	-64.9	-251.5		572444
18	-3.50	72.11	0.018	4.80E-04	-30.0	-275.2		572444
19	-4.00	76.66	0.018	7.23E-04	7.2	-281.0		572444
20	-4.50	82.23	0.017	9.63E-04	46.9	-267.4		572444
21	-5.00	86.66	0.017	1.18E-03	89.1	-233.3		572444
		66.70	0.017	1.18E-03	89.1	-233.3		
22	-5.30	56.41	0.016	1.29E-03	107.6	-203.6		572444
		-32.76	0.016	1.29E-03	107.6	-203.6		
23	-5.65	-10.33	0.016	1.41E-03	100.0	-168.8		572444
24	-6.00	-11.48	0.015	1.50E-03	96.2	-134.9		572444
25	-6.60	-25.51	0.015	1.61E-03	85.1	-80.9		572444
26	-7.20	-42.85	0.014	1.67E-03	64.6	-35.0		572444

(continued)

Stage No.8 Apply load no.1 at elevation 2.10

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
27	-7.60	-61.66	0.013	1.69E-03	43.7	-12.6		572444
28	-8.00	-114.14	0.012	1.69E-03	8.6	-0.0		0
29	-8.15	-0.10	0.011	0	-0.0	0.0		0
30	-9.80	19.54	0.006	0	16.0	0.0		0
		-20.12	0.006	0	16.0	0.0		
31	-11.40	0.01	0.004	0	-0.1	0.0		0
32	-13.00	73.79	0.001	0	59.0	0.0		0
		-62.12	0.001	0	59.0	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 130.5 kN/m run
At elev. -1.30 Prop force = 207.5 kN/m run

		LEFT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	12.57	12.57	9981
3	3.00	0.00	17.35	5.36	67.10	11.85	11.85	9981
4	2.55	0.00	25.58	7.90	98.95	11.79	11.79	9981
5	2.10	0.00	34.09	10.53	131.87	12.63	12.63	9981
6	2.00	0.00	36.01	11.13	139.30	11.41	11.41	9981
7	1.50	0.00	45.73	14.13	176.89	13.77	13.77A	9981
8	1.00	0.00	55.54	17.16	214.84	20.19	20.19	9981
		0.00	55.54	13.95	211.21	28.92	28.92	4991
9	0.50	0.00	65.35	17.39	244.99	32.66	32.66	5240
10	0.00	0.00	75.11	20.82	278.59	37.69	37.69	5490
11	-0.60	0.00	86.71	24.90	318.51	44.34	44.34	5789
12	-0.95	0.00	93.41	27.25	341.58	47.74	47.74	5964
13	-1.30	0.00	100.07	29.59	364.48	51.48	51.48	6138
14	-1.50	0.00	103.85	30.91	377.50	52.93	52.93	6238
15	-2.00	0.00	113.24	34.21	409.82	58.08	58.08	6488
16	-2.50	0.00	122.54	37.48	441.84	62.78	62.78	6737
17	-3.00	0.00	131.77	40.72	473.60	67.45	67.45	6987
18	-3.50	0.00	140.92	43.94	505.11	72.11	72.11	7236
19	-4.00	0.00	150.02	47.13	536.42	76.66	76.66	7486
20	-4.50	5.00	154.05	48.55	550.32	77.23	82.23	7735
21	-5.00	10.00	158.05	49.95	564.06	76.66	86.66	7985
22	-5.30	13.00	160.42	50.79	572.23	73.59	86.59	8135
		13.00	160.42	33.04	759.29	24.50	37.50A	29943
23	-5.65	16.50	164.22	34.12	775.89	62.22	78.72	29943
24	-6.00	20.00	168.00	35.19	792.42	76.32	96.32	29943
25	-6.60	26.00	174.44	37.02	820.58	88.46	114.46	29943
26	-7.20	32.00	180.85	38.83	848.54	97.30	129.30	29943
27	-7.60	36.00	185.09	40.03	867.09	95.81	131.81	29943
28	-8.00	40.00	189.32	41.23	885.57	59.97	99.97	29943
29	-8.15	41.50	190.90	41.68	892.48	140.23	181.73	29943
30	-9.80	58.00	208.19	46.58	968.01	167.60	225.60	29943
		58.00	208.19	36.32	1026.37	147.43	205.43	49905
31	-11.40	74.00	229.57	42.58	1119.82	178.71	252.71	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.03	327.03	49905
		90.00	250.83	0.00	6704.52	179.07	269.07	998109
33	-14.90	109.00	283.54	0.00	7158.75	242.39	351.39	998109

(continued)

Stage No.8 Apply load no.1 at elevation 2.10

LEFT side

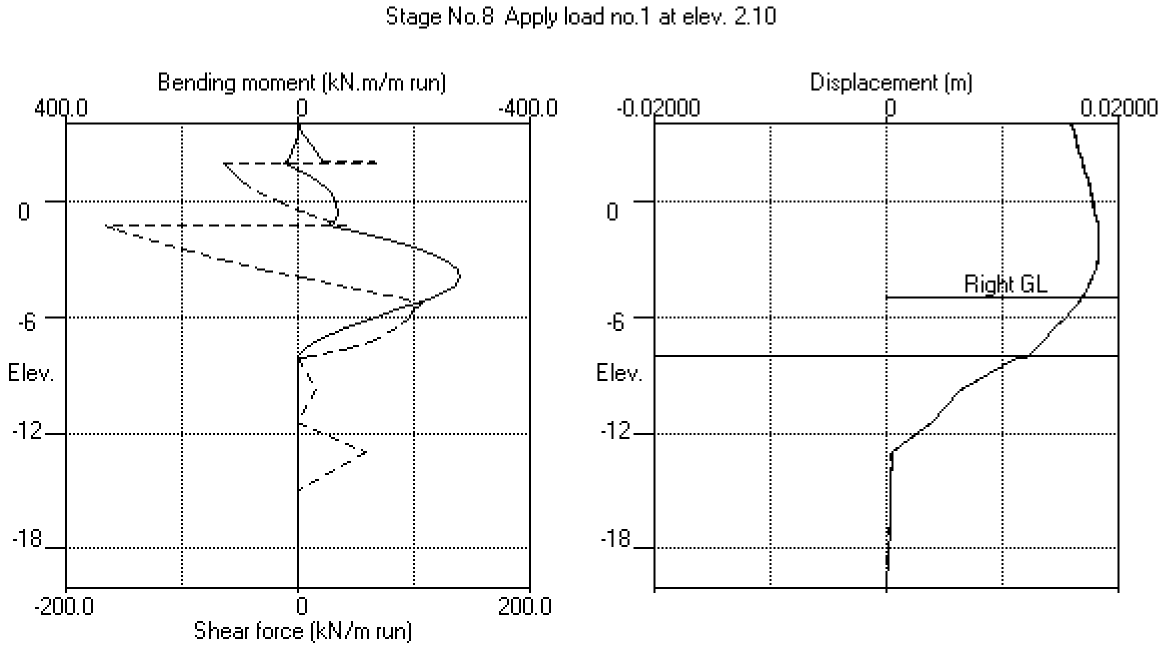
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-16.80	128.00	316.14	0.00	7611.40	274.96	402.96	998109
35	-18.40	144.00	343.52	0.00	7991.58	302.43	446.43	998109
36	-20.00	160.00	370.84	0.00	8371.01	324.27	484.27	998109

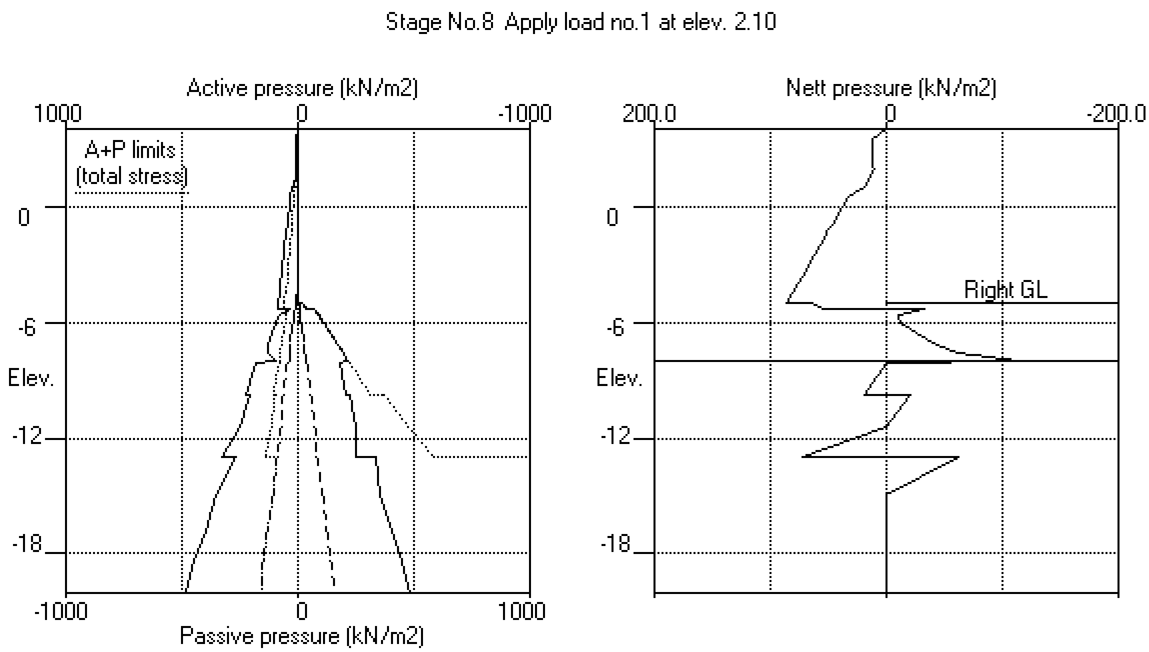
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.96	19.96	8021
22	-5.30	3.00	2.10	0.00	27.26	27.18	30.18	8172
		3.00	2.10	0.00	67.54	67.25	70.25	30080
23	-5.65	6.50	5.60	0.00	82.83	82.54	89.04	30080
24	-6.00	10.00	9.10	0.00	98.12	97.79	107.79	30080
25	-6.60	16.00	15.10	0.00	124.34	123.97	139.97	30080
26	-7.20	22.00	21.10	0.00	150.57	150.14	172.14	30080
27	-7.60	26.00	25.11	0.00	168.05	167.47	193.47	30080
28	-8.00	30.00	29.11	0.00	185.54	184.11	214.11	30080
29	-8.15	31.50	30.61	0.00	192.10	150.33	181.83	30080
30	-9.80	48.00	47.13	0.94	264.30	158.06	206.06	30080
		48.00	47.13	0.00	322.66	177.54	225.54	50133
31	-11.40	64.00	67.98	0.00	413.74	188.70	252.70	50133
32	-13.00	80.00	88.85	1.45	504.94	173.24	253.24	50133
		80.00	88.85	0.00	4455.26	251.19	331.19	1002652
33	-14.90	99.00	121.28	0.00	4905.61	252.39	351.39	1002652
34	-16.80	118.00	153.77	0.00	5356.75	284.96	402.96	1002652
35	-18.40	134.00	181.18	0.00	5737.37	312.43	446.43	1002652
36	-20.00	150.00	208.64	0.00	6118.70	334.28	484.28	1002652

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
37.50A Arching - soil pressure below active limit

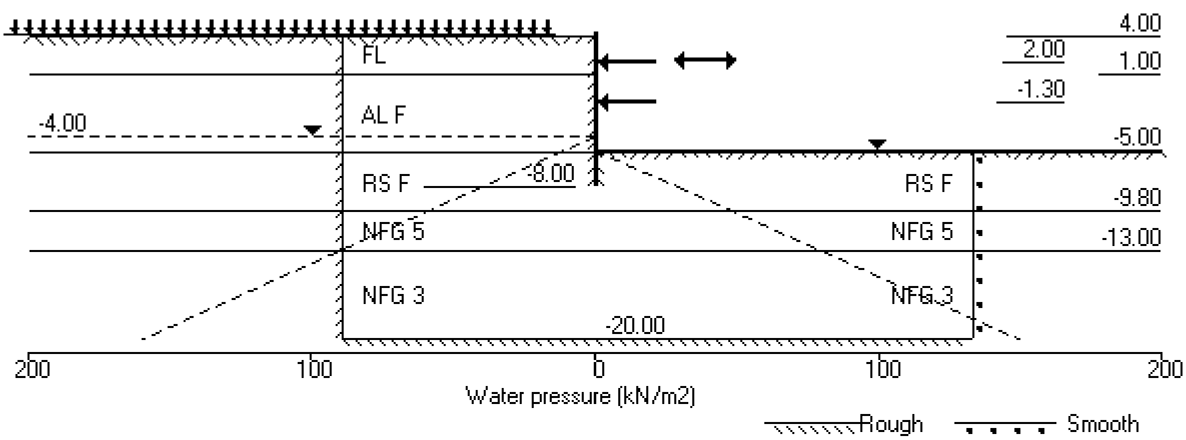
Units: kN,m


Stage No.8 Apply load no.1 at elev. 2.10
Bending moment (kN.m/m run)
400.0
0
-400.0
Displacement (m)
-0.02000
0
0.02000
0
-6
Elev.
-12
-18
Right GL
-200.0
0
200.0
Shear force (kN/m run)


Stage No.8 Apply load no.1 at elev. 2.10
Active pressure (kN/m2)
1000
0
-1000
Nett pressure (kN/m2)
200.0
0
-200.0
A+P limits
(total stress)
0
-6
Elev.
-12
-18
Right GL
-1000
0
1000
Passive pressure (kN/m2)

Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.10



Units: kN,m

Stage No. 9 Apply load no.2 at elevation 2.10

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
9	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-6.09E-04	0.0	-0.0		572444
2	3.50	14.25	0.015	-6.09E-04	3.6	0.3		572444
3	3.00	13.11	0.016	-6.11E-04	10.4	4.1		572444
4	2.55	12.79	0.016	-6.17E-04	16.2	10.3		572444
5	2.10	13.46	0.016	-6.29E-04	22.1	19.1		572444
6	2.00	12.06	0.016	-6.32E-04	23.4	21.4	-92.8	572444
		12.06	0.016	-6.32E-04	-69.4	21.4		
7	1.50	14.23	0.017	-6.37E-04	-62.8	-10.8		572444
8	1.00	20.38	0.017	-6.14E-04	-54.2	-40.2		572444
		29.02	0.017	-6.14E-04	-54.2	-40.2		
9	0.50	32.78	0.017	-5.69E-04	-38.7	-63.4		572444
10	0.00	37.77	0.018	-5.07E-04	-21.1	-78.3		572444
11	-0.60	44.38	0.018	-4.22E-04	3.6	-83.7		572444
12	-0.95	47.73	0.018	-3.72E-04	19.7	-79.7		572444
13	-1.30	51.44	0.018	-3.27E-04	37.0	-69.8	-199.5	572444
		51.44	0.018	-3.27E-04	-162.4	-69.8		
14	-1.50	52.86	0.018	-2.97E-04	-152.0	-101.2		572444
15	-2.00	57.99	0.018	-1.78E-04	-124.3	-170.1		572444
16	-2.50	62.67	0.018	-6.37E-06	-94.1	-224.8		572444
17	-3.00	67.33	0.018	2.06E-04	-61.6	-263.7		572444
18	-3.50	71.97	0.018	4.46E-04	-26.8	-285.8		572444
19	-4.00	76.52	0.018	6.98E-04	10.3	-290.0		572444
20	-4.50	82.09	0.017	9.45E-04	50.0	-274.9		572444
21	-5.00	86.53	0.017	1.16E-03	92.1	-239.3		572444
		66.50	0.017	1.16E-03	92.1	-239.3		
22	-5.30	56.21	0.017	1.28E-03	110.5	-208.6		572444
		-33.49	0.017	1.28E-03	110.5	-208.6		
23	-5.65	-11.03	0.016	1.40E-03	102.7	-172.8		572444
24	-6.00	-12.24	0.016	1.49E-03	98.7	-138.0		572444
25	-6.60	-26.33	0.015	1.61E-03	87.1	-82.7		572444
26	-7.20	-43.76	0.014	1.67E-03	66.1	-35.8		572444
27	-7.60	-62.88	0.013	1.69E-03	44.7	-12.9		572444

(continued)

Stage No.9 Apply load no.2 at elevation 2.10

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
28	-8.00	-116.95	0.012	1.69E-03	8.8	-0.0		0
29	-8.15	-0.10	0.011	0	-0.0	0.0		0
30	-9.80	19.54	0.006	0	16.0	0.0		0
		-20.12	0.006	0	16.0	0.0		
31	-11.40	0.01	0.004	0	-0.1	0.0		0
32	-13.00	73.79	0.001	0	59.0	0.0		0
		-62.12	0.001	0	59.0	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 92.8 kN/m run
At elev. -1.30 Prop force = 199.5 kN/m run

LEFT side

Node no.	Y coord	Water press.	Vertic -al	Active limit (Effective stresses)	Passive limit (Effective stresses)	Earth pressure (Effective stresses)	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	14.25	14.25	9981
3	3.00	0.00	17.35	5.36	67.10	13.11	13.11	9981
4	2.55	0.00	25.58	7.90	98.95	12.79	12.79	9981
5	2.10	0.00	34.09	10.53	131.87	13.46	13.46	9981
6	2.00	0.00	36.01	11.13	139.30	12.06	12.06	9981
7	1.50	0.00	45.73	14.13	176.89	14.23	14.23	9981
8	1.00	0.00	55.54	17.16	214.84	20.38	20.38	9981
		0.00	55.54	13.95	211.21	29.02	29.02	4991
9	0.50	0.00	65.35	17.39	244.99	32.78	32.78	5240
10	0.00	0.00	75.11	20.82	278.59	37.77	37.77	5490
11	-0.60	0.00	86.71	24.90	318.51	44.38	44.38	5789
12	-0.95	0.00	93.41	27.25	341.58	47.73	47.73	5964
13	-1.30	0.00	100.07	29.59	364.48	51.44	51.44	6138
14	-1.50	0.00	103.85	30.91	377.50	52.86	52.86	6238
15	-2.00	0.00	113.24	34.21	409.82	57.99	57.99	6488
16	-2.50	0.00	122.54	37.48	441.84	62.67	62.67	6737
17	-3.00	0.00	131.77	40.72	473.60	67.33	67.33	6987
18	-3.50	0.00	140.92	43.94	505.11	71.97	71.97	7236
19	-4.00	0.00	150.02	47.13	536.42	76.52	76.52	7486
20	-4.50	5.00	154.05	48.55	550.32	77.09	82.09	7735
21	-5.00	10.00	158.05	49.95	564.06	76.53	86.53	7985
22	-5.30	13.00	160.42	50.79	572.23	73.47	86.47	8135
		13.00	160.42	33.04	759.29	24.05	37.05A	29943
23	-5.65	16.50	164.22	34.12	775.89	61.79	78.29	29943
24	-6.00	20.00	168.00	35.19	792.42	75.88	95.88	29943
25	-6.60	26.00	174.44	37.02	820.58	88.02	114.02	29943
26	-7.20	32.00	180.85	38.83	848.54	96.81	128.81	29943
27	-7.60	36.00	185.09	40.03	867.09	95.17	131.17	29943
28	-8.00	40.00	189.32	41.23	885.57	58.60	98.60	29943
29	-8.15	41.50	190.90	41.68	892.48	140.20	181.70	29943
30	-9.80	58.00	208.19	46.58	968.01	167.59	225.59	29943
		58.00	208.19	36.32	1026.37	147.42	205.42	49905
31	-11.40	74.00	229.57	42.58	1119.82	178.71	252.71	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.03	327.03	49905
		90.00	250.83	0.00	6704.52	179.06	269.06	998109
33	-14.90	109.00	283.54	0.00	7158.75	242.39	351.39	998109
34	-16.80	128.00	316.14	0.00	7611.40	274.97	402.97	998109

(continued)

Stage No.9 Apply load no.2 at elevation 2.10

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
35	-18.40	144.00	343.52	0.00	7991.58	302.43	446.43	998109
36	-20.00	160.00	370.84	0.00	8371.01	324.27	484.27	998109

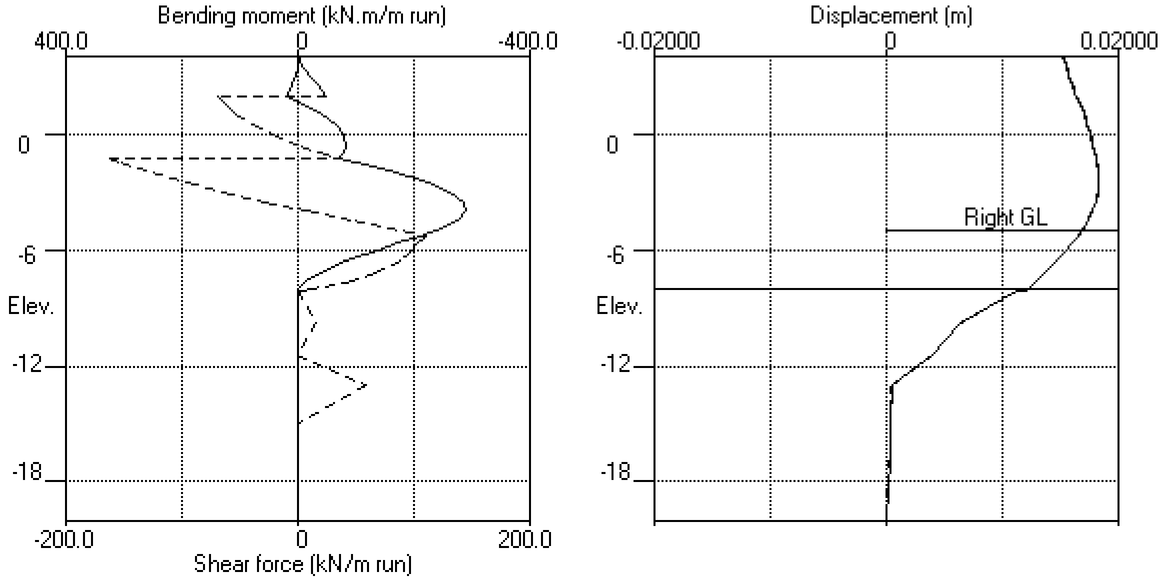
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	8021
22	-5.30	3.00	2.10	0.00	27.26	27.26	30.26p	8172
		3.00	2.10	0.00	67.54	67.54	70.54p	30080
23	-5.65	6.50	5.60	0.00	82.83	82.83	89.33p	30080
24	-6.00	10.00	9.10	0.00	98.12	98.12	108.12p	30080
25	-6.60	16.00	15.10	0.00	124.34	124.34	140.34p	30080
26	-7.20	22.00	21.10	0.00	150.57	150.57	172.57p	30080
27	-7.60	26.00	25.11	0.00	168.05	168.05	194.05p	30080
28	-8.00	30.00	29.11	0.00	185.54	185.54	215.54p	30080
29	-8.15	31.50	30.61	0.00	192.10	150.30	181.80	30080
30	-9.80	48.00	47.13	0.94	264.30	158.05	206.05	30080
		48.00	47.13	0.00	322.66	177.53	225.53	50133
31	-11.40	64.00	67.98	0.00	413.74	188.70	252.70	50133
32	-13.00	80.00	88.85	1.45	504.94	173.24	253.24	50133
		80.00	88.85	0.00	4455.26	251.18	331.18	1002652
33	-14.90	99.00	121.28	0.00	4905.61	252.38	351.38	1002652
34	-16.80	118.00	153.77	0.00	5356.75	284.96	402.96	1002652
35	-18.40	134.00	181.18	0.00	5737.37	312.43	446.43	1002652
36	-20.00	150.00	208.64	0.00	6118.70	334.28	484.28	1002652

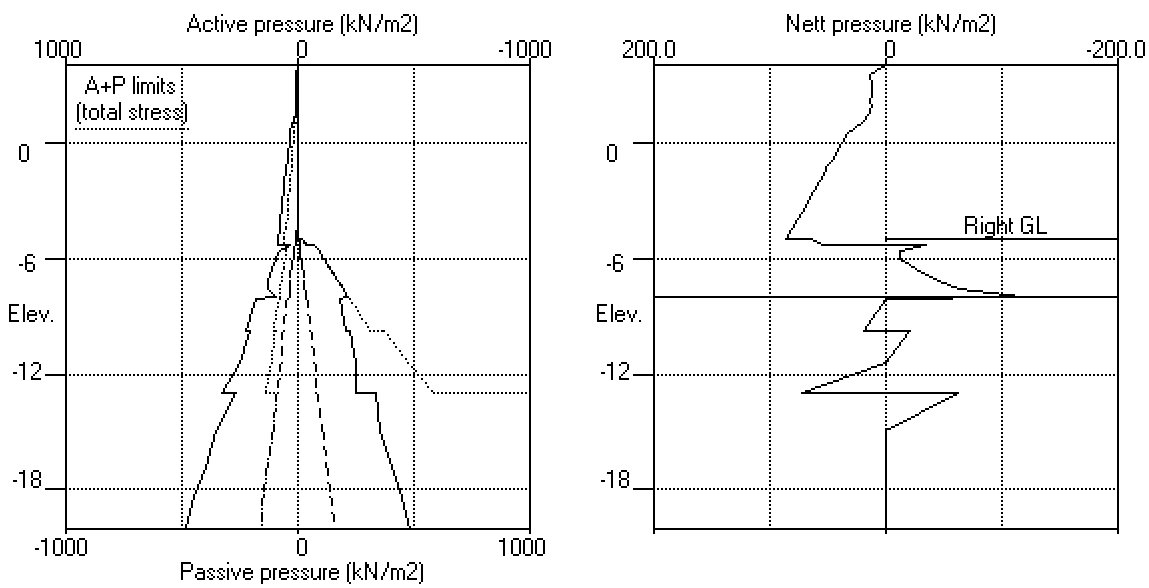
Note: 12.34 a Soil pressure at active limit
215.54 p Soil pressure at passive limit
37.05A Arching - soil pressure below active limit

Units: kN,m

Stage No.9 Apply load no.2 at elev. 2.10

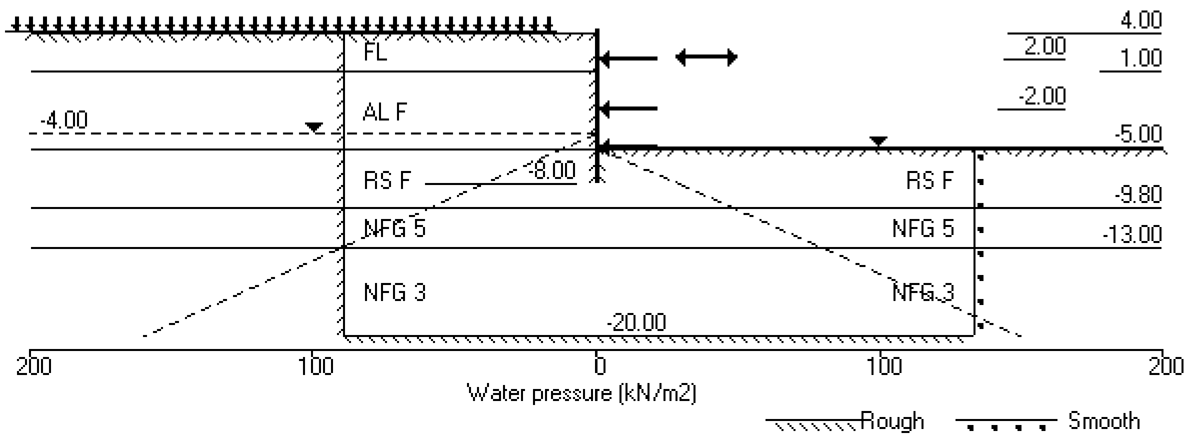


Stage No.9 Apply load no.2 at elev. 2.10



Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No. 12 Remove strut or anchor no.2 at elevation -1.30

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
12	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-7.15E-04	0.0	-0.0		572444
2	3.50	14.42	0.016	-7.15E-04	3.6	0.3		572444
3	3.00	13.05	0.016	-7.17E-04	10.5	4.2		572444
4	2.55	12.54	0.016	-7.23E-04	16.2	10.4		572444
5	2.10	13.07	0.017	-7.34E-04	22.0	19.1		572444
6	2.00	11.52	0.017	-7.38E-04	23.2	21.4	-117.8	572444
		11.52	0.017	-7.38E-04	-94.6	21.4		
7	1.50	13.50	0.017	-7.37E-04	-88.4	-23.5		572444
8	1.00	19.37	0.017	-6.98E-04	-80.2	-65.8		572444
		28.51	0.017	-6.98E-04	-80.2	-65.8		
9	0.50	32.13	0.018	-6.25E-04	-65.0	-102.0		572444
10	0.00	37.02	0.018	-5.23E-04	-47.7	-130.2		572444
11	-0.60	43.55	0.018	-3.76E-04	-23.5	-151.7		572444
12	-0.95	46.89	0.018	-2.81E-04	-7.7	-157.2		572444
13	-1.30	50.65	0.019	-1.85E-04	9.4	-156.9		572444
14	-1.50	52.22	0.019	-1.31E-04	19.6	-154.0		572444
15	-2.00	57.59	0.019	-4.38E-06	47.1	-137.1	-178.1	572444
		57.59	0.019	-4.38E-06	-131.0	-137.1		
16	-2.50	62.46	0.019	1.40E-04	-101.0	-195.2		572444
17	-3.00	67.24	0.018	3.29E-04	-68.6	-237.6		572444
18	-3.50	71.95	0.018	5.48E-04	-33.8	-263.2		572444
19	-4.00	76.54	0.018	7.81E-04	3.3	-270.8		572444
20	-4.50	82.13	0.017	1.01E-03	43.0	-259.2		572444
21	-5.00	86.55	0.017	1.22E-03	85.2	-227.0	1.9	572444
		66.52	0.017	1.22E-03	87.1	-227.0		
22	-5.30	56.17	0.016	1.33E-03	105.5	-197.9		572444
		-33.62	0.016	1.33E-03	105.5	-197.9		
23	-5.65	-10.83	0.016	1.44E-03	97.7	-163.9		572444
24	-6.00	-11.61	0.015	1.53E-03	93.8	-130.8		572444
25	-6.60	-25.19	0.015	1.64E-03	82.8	-78.3		572444
26	-7.20	-42.06	0.014	1.70E-03	62.6	-33.7		572444
27	-7.60	-60.09	0.013	1.72E-03	42.2	-12.1		572444

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	-109.66	0.012	1.72E-03	8.2	-0.0		0
29	-8.15	-0.10	0.011	0	-0.0	0.0		0
30	-9.80	19.54	0.006	0	16.0	0.0		0
		-20.12	0.006	0	16.0	0.0		
31	-11.40	0.01	0.004	0	-0.1	0.0		0
32	-13.00	73.79	0.001	0	59.0	0.0		0
		-62.12	0.001	0	59.0	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 117.8 kN/m run
At elev. -2.00 Prop force = 178.1 kN/m run
At elev. -5.00 Prop force = -1.9 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	14.42	14.42	9981
3	3.00	0.00	17.35	5.36	67.10	13.05	13.05	9981
4	2.55	0.00	25.58	7.90	98.95	12.54	12.54	9981
5	2.10	0.00	34.09	10.53	131.87	13.07	13.07	9981
6	2.00	0.00	36.01	11.13	139.30	11.52	11.52	9981
7	1.50	0.00	45.73	14.13	176.89	13.50	13.50A	9981
8	1.00	0.00	55.54	17.16	214.84	19.37	19.37	9981
		0.00	55.54	13.95	211.21	28.51	28.51	4991
9	0.50	0.00	65.35	17.39	244.99	32.13	32.13	5240
10	0.00	0.00	75.11	20.82	278.59	37.02	37.02	5490
11	-0.60	0.00	86.71	24.90	318.51	43.55	43.55	5789
12	-0.95	0.00	93.41	27.25	341.58	46.89	46.89	5964
13	-1.30	0.00	100.07	29.59	364.48	50.65	50.65	6138
14	-1.50	0.00	103.85	30.91	377.50	52.22	52.22	6238
15	-2.00	0.00	113.24	34.21	409.82	57.59	57.59	6488
16	-2.50	0.00	122.54	37.48	441.84	62.46	62.46	6737
17	-3.00	0.00	131.77	40.72	473.60	67.24	67.24	6987
18	-3.50	0.00	140.92	43.94	505.11	71.95	71.95	7236
19	-4.00	0.00	150.02	47.13	536.42	76.54	76.54	7486
20	-4.50	5.00	154.05	48.55	550.32	77.13	82.13	7735
21	-5.00	10.00	158.05	49.95	564.06	76.55	86.55	7985
22	-5.30	13.00	160.42	50.79	572.23	73.43	86.43	8135
		13.00	160.42	33.04	759.29	23.91	36.91A	29943
23	-5.65	16.50	164.22	34.12	775.89	62.00	78.50	29943
24	-6.00	20.00	168.00	35.19	792.42	76.33	96.33	29943
25	-6.60	26.00	174.44	37.02	820.58	88.68	114.68	29943
26	-7.20	32.00	180.85	38.83	848.54	97.74	129.74	29943
27	-7.60	36.00	185.09	40.03	867.09	96.64	132.64	29943
28	-8.00	40.00	189.32	41.23	885.57	62.17	102.17	29943
29	-8.15	41.50	190.90	41.68	892.48	140.27	181.77	29943
30	-9.80	58.00	208.19	46.58	968.01	167.61	225.61	29943
		58.00	208.19	36.32	1026.37	147.45	205.45	49905
31	-11.40	74.00	229.57	42.58	1119.82	178.72	252.72	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.03	327.03	49905
		90.00	250.83	0.00	6704.52	179.08	269.08	998109
33	-14.90	109.00	283.54	0.00	7158.75	242.40	351.40	998109

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-16.80	128.00	316.14	0.00	7611.40	274.97	402.97	998109
35	-18.40	144.00	343.52	0.00	7991.58	302.44	446.44	998109
36	-20.00	160.00	370.84	0.00	8371.01	324.28	484.28	998109

RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	8021
22	-5.30	3.00	2.10	0.00	27.26	27.26	30.26p	8172
		3.00	2.10	0.00	67.54	67.54	70.54p	30080
23	-5.65	6.50	5.60	0.00	82.83	82.83	89.33p	30080
24	-6.00	10.00	9.10	0.00	98.12	97.95	107.95	30080
25	-6.60	16.00	15.10	0.00	124.34	123.88	139.88	30080
26	-7.20	22.00	21.10	0.00	150.57	149.79	171.79	30080
27	-7.60	26.00	25.11	0.00	168.05	166.73	192.73	30080
28	-8.00	30.00	29.11	0.00	185.54	181.83	211.83	30080
29	-8.15	31.50	30.61	0.00	192.10	150.37	181.87	30080
30	-9.80	48.00	47.13	0.94	264.30	158.07	206.07	30080
		48.00	47.13	0.00	322.66	177.56	225.56	50133
31	-11.40	64.00	67.98	0.00	413.74	188.71	252.71	50133
32	-13.00	80.00	88.85	1.45	504.94	173.24	253.24	50133
		80.00	88.85	0.00	4455.26	251.19	331.19	1002652
33	-14.90	99.00	121.28	0.00	4905.61	252.39	351.39	1002652
34	-16.80	118.00	153.77	0.00	5356.75	284.97	402.97	1002652
35	-18.40	134.00	181.18	0.00	5737.37	312.43	446.43	1002652
36	-20.00	150.00	208.64	0.00	6118.70	334.29	484.29	1002652

Note: 12.34 a Soil pressure at active limit
89.33 p Soil pressure at passive limit
36.91A Arching - soil pressure below active limit

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Program: WALLAP  Version 6.07  Revision A55.B74.R58         | Job No.  B01493
                                Licensed from GEOSOLVE      | Made by :   DJC
Data filename/Run ID: Section_5                             |
Albert Street Development                                   | Date:16-11-2022
Section 5                                                   | Checked :
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                                                     Units: kN,m
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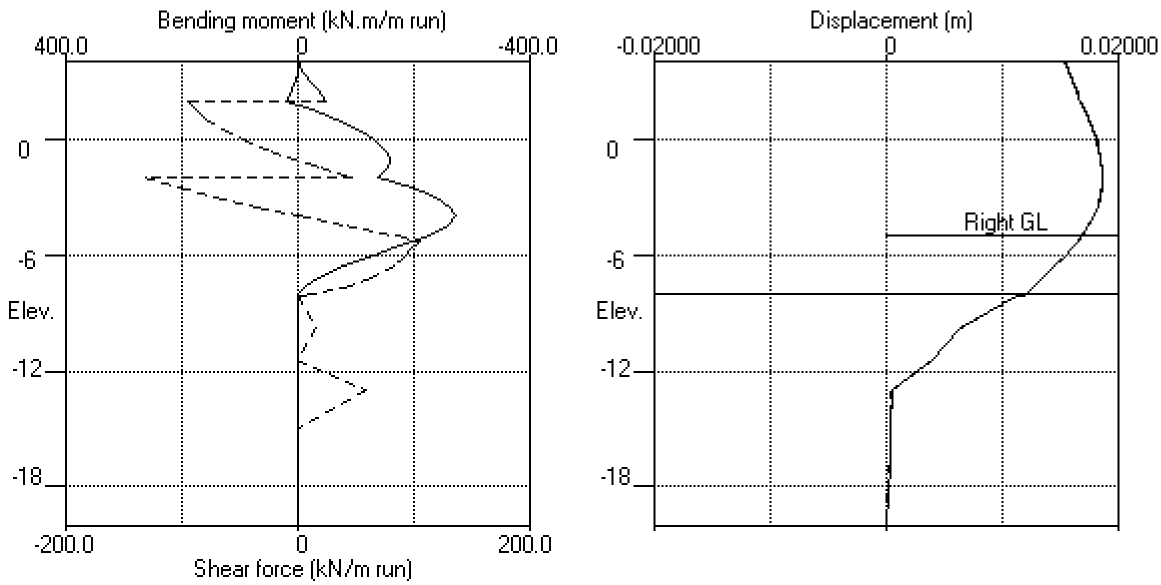
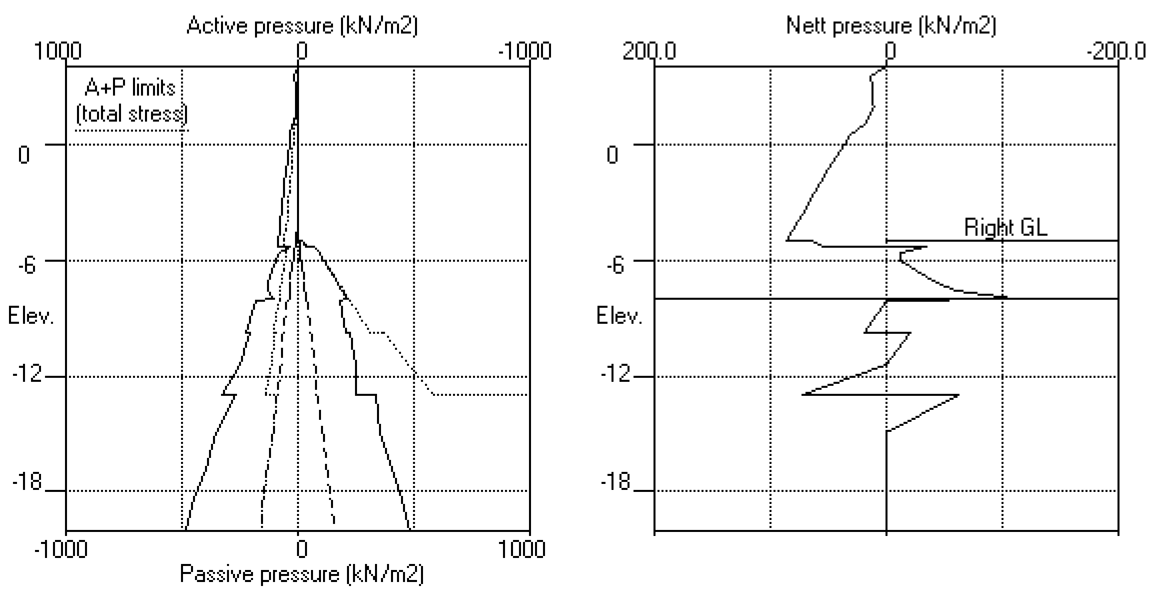
Stage No.12 Remove prop no.2 at elev. -1.30



Stage No.12 Remove prop no.2 at elev. -1.30



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EDG CONSULTING PTY LTD                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58             | Job No.  B01493
                             Licensed from GEOSOLVE             | Made by :   DJC
Data filename/Run ID: Section_5                                 |
Albert Street Development                                       | Date:16-11-2022
Section 5                                                       | Checked :
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                                                        Units: kN,m
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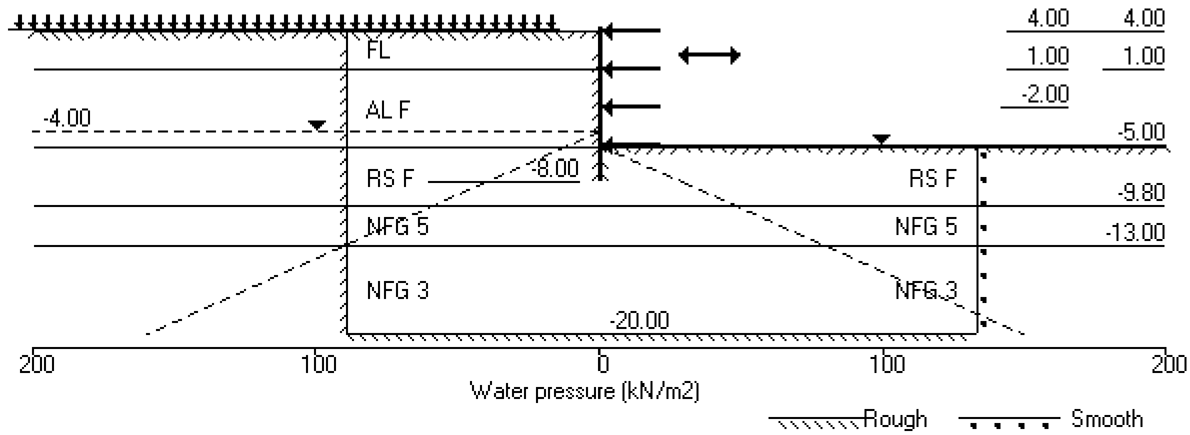
Stage No.15 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No. 15 Remove strut or anchor no.1 at elevation 2.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -8.00		**Toe elev. for FoS = 1.500**		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
15	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
1	4.00	0.00	0.015	-8.27E-04	-35.9	-0.0	-35.9	572444
2	3.50	14.46	0.016	-8.19E-04	-32.3	-17.6		572444
3	3.00	12.71	0.016	-7.97E-04	-25.5	-31.7		572444
4	2.55	11.97	0.016	-7.68E-04	-19.9	-41.7		572444
5	2.10	12.40	0.017	-7.33E-04	-14.4	-49.2		572444
6	2.00	10.89	0.017	-7.24E-04	-13.3	-50.6		572444
7	1.50	13.05	0.017	-6.78E-04	-7.3	-54.9		572444
8	1.00	19.22	0.018	-6.29E-04	0.8	-56.7	-80.9	572444
		28.43	0.018	-6.29E-04	-80.1	-56.7		
9	0.50	32.09	0.018	-5.64E-04	-65.0	-92.9		572444
10	0.00	37.00	0.018	-4.70E-04	-47.7	-121.1		572444
11	-0.60	43.56	0.018	-3.32E-04	-23.5	-142.6		572444
12	-0.95	46.92	0.018	-2.43E-04	-7.7	-148.1		572444
13	-1.30	50.70	0.019	-1.53E-04	9.4	-147.8		572444
14	-1.50	52.29	0.019	-1.02E-04	19.7	-144.9		572444
15	-2.00	57.66	0.019	1.69E-05	47.2	-128.0	-181.3	572444
		57.66	0.019	1.69E-05	-134.1	-128.0		
16	-2.50	62.54	0.019	1.54E-04	-104.0	-187.6		572444
17	-3.00	67.31	0.018	3.37E-04	-71.6	-231.5		572444
18	-3.50	72.03	0.018	5.51E-04	-36.7	-258.6		572444
19	-4.00	76.61	0.018	7.81E-04	0.4	-267.7		572444
20	-4.50	82.18	0.017	1.01E-03	40.1	-257.6		572444
21	-5.00	86.60	0.017	1.22E-03	82.3	-226.8	4.6	572444
		66.62	0.017	1.22E-03	86.9	-226.8		
22	-5.30	56.25	0.016	1.33E-03	105.3	-197.8		572444
		-33.35	0.016	1.33E-03	105.3	-197.8		
23	-5.65	-10.65	0.016	1.44E-03	97.6	-163.8		572444
24	-6.00	-11.48	0.015	1.53E-03	93.7	-130.8		572444
25	-6.60	-25.10	0.015	1.64E-03	82.7	-78.3		572444
26	-7.20	-42.01	0.014	1.70E-03	62.6	-33.8		572444
27	-7.60	-60.08	0.013	1.71E-03	42.2	-12.1		572444
28	-8.00	-109.74	0.012	1.72E-03	8.2	-0.0		0

(continued)

Stage No.15 Remove strut or anchor no.1 at elevation 2.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-8.15	-0.10	0.011	0	-0.0	0.0		0
30	-9.80	19.54	0.006	0	16.0	0.0		0
		-20.12	0.006	0	16.0	0.0		
31	-11.40	0.01	0.004	0	-0.1	0.0		0
32	-13.00	73.79	0.001	0	59.0	0.0		0
		-62.12	0.001	0	59.0	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 35.9 kN/m run
At elev. 1.00 Prop force = 80.9 kN/m run
At elev. -2.00 Prop force = 181.3 kN/m run
At elev. -5.00 Prop force = -4.6 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	14.46	14.46	9981
3	3.00	0.00	17.35	5.36	67.10	12.71	12.71	9981
4	2.55	0.00	25.58	7.90	98.95	11.97	11.97	9981
5	2.10	0.00	34.09	10.53	131.87	12.40	12.40	9981
6	2.00	0.00	36.01	11.13	139.30	10.89	10.89A	9981
7	1.50	0.00	45.73	14.13	176.89	13.05	13.05A	9981
8	1.00	0.00	55.54	17.16	214.84	19.22	19.22	9981
		0.00	55.54	13.95	211.21	28.43	28.43	4991
9	0.50	0.00	65.35	17.39	244.99	32.09	32.09	5240
10	0.00	0.00	75.11	20.82	278.59	37.00	37.00	5490
11	-0.60	0.00	86.71	24.90	318.51	43.56	43.56	5789
12	-0.95	0.00	93.41	27.25	341.58	46.92	46.92	5964
13	-1.30	0.00	100.07	29.59	364.48	50.70	50.70	6138
14	-1.50	0.00	103.85	30.91	377.50	52.29	52.29	6238
15	-2.00	0.00	113.24	34.21	409.82	57.66	57.66	6488
16	-2.50	0.00	122.54	37.48	441.84	62.54	62.54	6737
17	-3.00	0.00	131.77	40.72	473.60	67.31	67.31	6987
18	-3.50	0.00	140.92	43.94	505.11	72.03	72.03	7236
19	-4.00	0.00	150.02	47.13	536.42	76.61	76.61	7486
20	-4.50	5.00	154.05	48.55	550.32	77.18	82.18	7735
21	-5.00	10.00	158.05	49.95	564.06	76.60	86.60	7985
22	-5.30	13.00	160.42	50.79	572.23	73.47	86.47	8135
		13.00	160.42	33.04	759.29	24.05	37.05A	29943
23	-5.65	16.50	164.22	34.12	775.89	62.10	78.60	29943
24	-6.00	20.00	168.00	35.19	792.42	76.41	96.41	29943
25	-6.60	26.00	174.44	37.02	820.58	88.74	114.74	29943
26	-7.20	32.00	180.85	38.83	848.54	97.77	129.77	29943
27	-7.60	36.00	185.09	40.03	867.09	96.65	132.65	29943
28	-8.00	40.00	189.32	41.23	885.57	62.14	102.14	29943
29	-8.15	41.50	190.90	41.68	892.48	140.27	181.77	29943
30	-9.80	58.00	208.19	46.58	968.01	167.61	225.61	29943
		58.00	208.19	36.32	1026.37	147.45	205.45	49905
31	-11.40	74.00	229.57	42.58	1119.82	178.72	252.72	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.03	327.03	49905
		90.00	250.83	0.00	6704.52	179.08	269.08	998109
33	-14.90	109.00	283.54	0.00	7158.75	242.40	351.40	998109

(continued)

Stage No.15 Remove strut or anchor no.1 at elevation 2.00

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-16.80	128.00	316.14	0.00	7611.40	274.97	402.97	998109
35	-18.40	144.00	343.52	0.00	7991.58	302.44	446.44	998109
36	-20.00	160.00	370.84	0.00	8371.01	324.28	484.28	998109

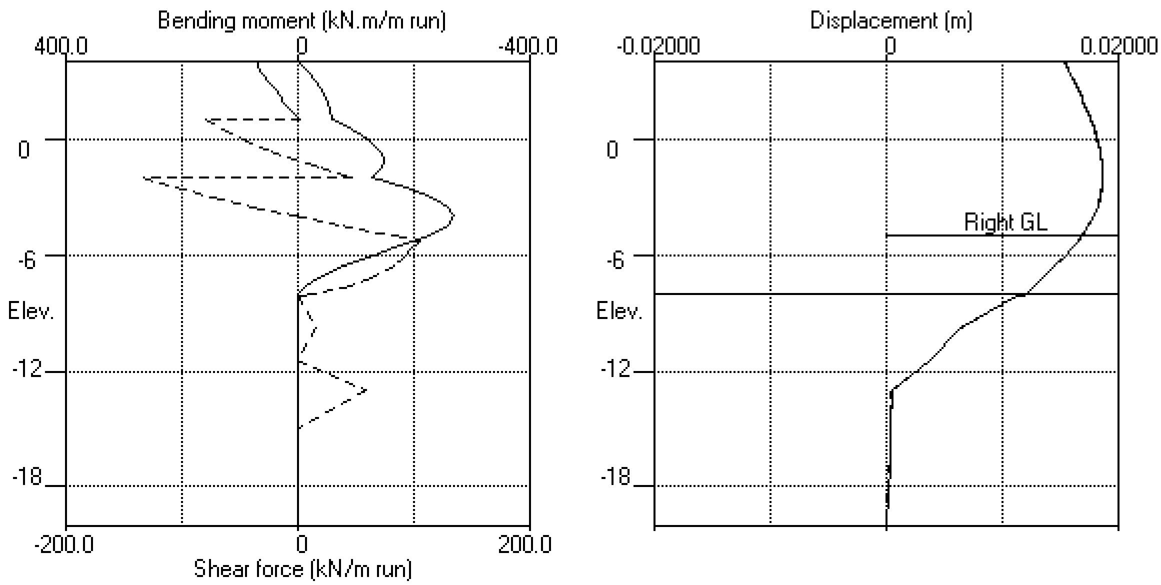
RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.97	19.97	8021
22	-5.30	3.00	2.10	0.00	27.26	27.22	30.22	8172
		3.00	2.10	0.00	67.54	67.40	70.40	30080
23	-5.65	6.50	5.60	0.00	82.83	82.74	89.24	30080
24	-6.00	10.00	9.10	0.00	98.12	97.89	107.89	30080
25	-6.60	16.00	15.10	0.00	124.34	123.84	139.84	30080
26	-7.20	22.00	21.10	0.00	150.57	149.77	171.77	30080
27	-7.60	26.00	25.11	0.00	168.05	166.73	192.73	30080
28	-8.00	30.00	29.11	0.00	185.54	181.88	211.88	30080
29	-8.15	31.50	30.61	0.00	192.10	150.37	181.87	30080
30	-9.80	48.00	47.13	0.94	264.30	158.07	206.07	30080
		48.00	47.13	0.00	322.66	177.56	225.56	50133
31	-11.40	64.00	67.98	0.00	413.74	188.71	252.71	50133
32	-13.00	80.00	88.85	1.45	504.94	173.24	253.24	50133
		80.00	88.85	0.00	4455.26	251.20	331.20	1002652
33	-14.90	99.00	121.28	0.00	4905.61	252.39	351.39	1002652
34	-16.80	118.00	153.77	0.00	5356.75	284.97	402.97	1002652
35	-18.40	134.00	181.18	0.00	5737.37	312.43	446.43	1002652
36	-20.00	150.00	208.64	0.00	6118.70	334.29	484.29	1002652

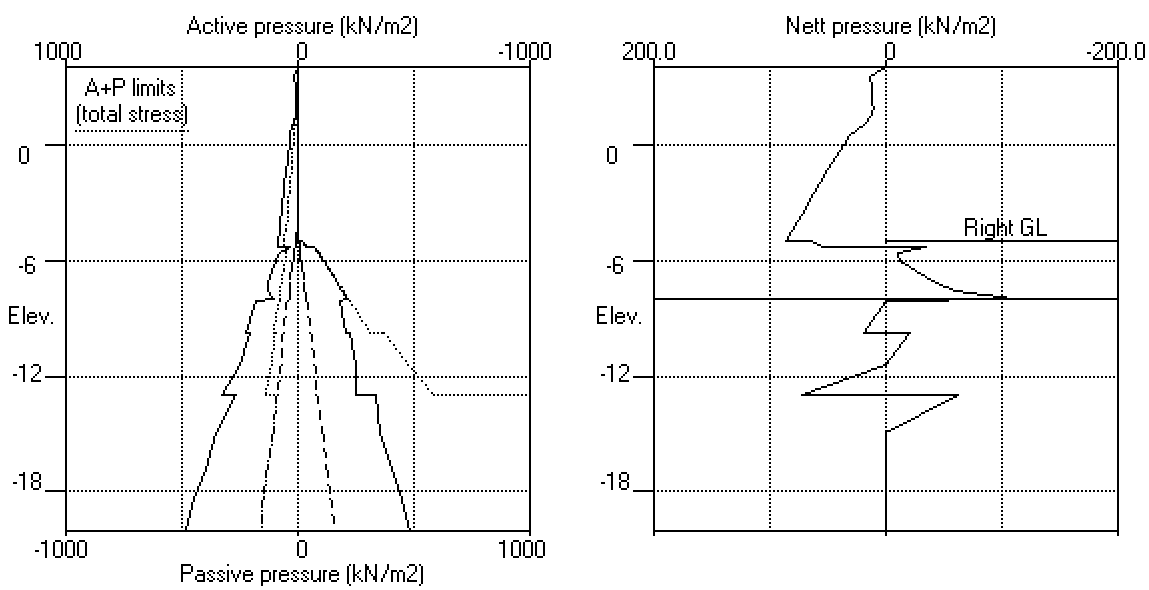
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
37.05A Arching - soil pressure below active limit

Units: kN,m

Stage No.15 Remove prop no.1 at elev. 2.00

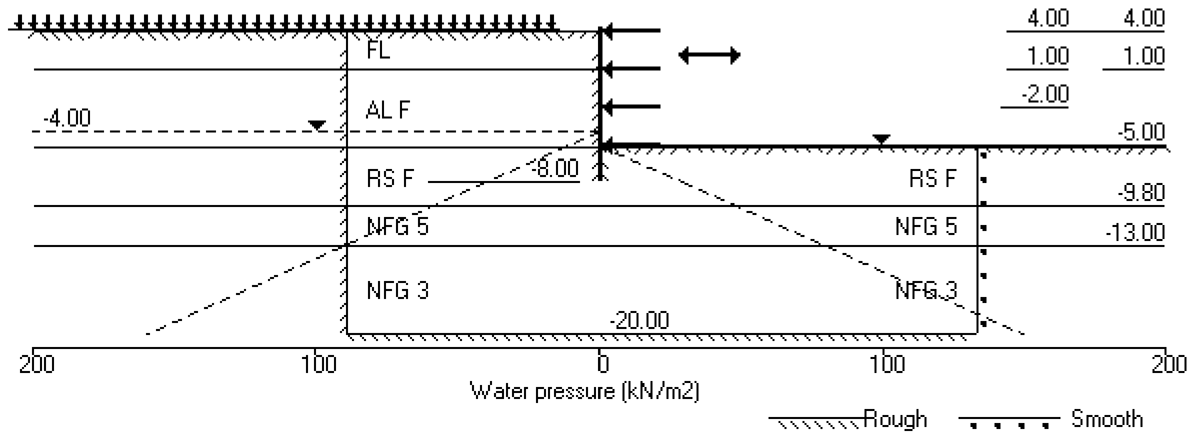


Stage No.15 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No.16 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No. 16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
16	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-8.31E-04	-28.2	-0.0	-28.2	400711
2	3.50	14.48	0.016	-8.22E-04	-24.6	-14.7		400711
3	3.00	12.72	0.016	-7.99E-04	-17.8	-25.8		400711
4	2.55	11.97	0.016	-7.68E-04	-12.3	-33.2		400711
5	2.10	12.41	0.017	-7.31E-04	-6.8	-38.1		400711
6	2.00	10.91	0.017	-7.23E-04	-5.6	-38.9		400711
7	1.50	13.08	0.017	-6.78E-04	0.4	-40.2		400711
8	1.00	19.24	0.018	-6.35E-04	8.5	-39.0	-76.4	400711
		28.44	0.018	-6.35E-04	-67.9	-39.0		
9	0.50	32.09	0.018	-5.74E-04	-52.8	-70.5		400711
10	0.00	36.99	0.018	-4.81E-04	-35.5	-94.0		400711
11	-0.60	43.55	0.018	-3.41E-04	-11.3	-109.9		400711
12	-0.95	46.92	0.018	-2.53E-04	4.5	-112.1		400711
13	-1.30	50.70	0.019	-1.67E-04	21.6	-108.5		400711
14	-1.50	52.29	0.019	-1.20E-04	31.9	-103.8		400711
15	-2.00	57.63	0.019	-2.06E-05	59.4	-82.2	-199.1	400711
		57.63	0.019	-2.06E-05	-139.8	-82.2		
16	-2.50	62.39	0.019	1.03E-04	-109.8	-143.9		400711
17	-3.00	67.00	0.018	2.96E-04	-77.4	-190.1		400711
18	-3.50	71.58	0.018	5.36E-04	-42.8	-219.5		400711
19	-4.00	76.06	0.018	8.03E-04	-5.9	-230.9		400711
20	-4.50	81.60	0.017	1.07E-03	33.6	-223.2		400711
21	-5.00	86.00	0.017	1.32E-03	75.5	-195.1	-2.9	400711
		65.97	0.017	1.32E-03	72.5	-195.1		
22	-5.30	55.59	0.016	1.45E-03	90.8	-169.4		400711
		-35.78	0.016	1.45E-03	90.8	-169.4		
23	-5.65	-12.03	0.016	1.57E-03	82.4	-139.4		400711
24	-6.00	-12.01	0.015	1.68E-03	78.2	-110.5		400711
25	-6.60	-23.40	0.014	1.80E-03	67.6	-65.3		400711
26	-7.20	-37.11	0.013	1.87E-03	49.4	-27.5		400711
27	-7.60	-49.82	0.012	1.88E-03	32.0	-9.6		400711

(continued)

Stage No.16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-8.00	-80.25	0.012	1.89E-03	6.0	-0.0		0
29	-8.15	-0.10	0.011	0	-0.0	0.0		0
30	-9.80	19.54	0.006	0	16.0	0.0		0
		-20.12	0.006	0	16.0	0.0		
31	-11.40	0.01	0.004	0	-0.1	0.0		0
32	-13.00	73.79	0.001	0	59.0	0.0		0
		-62.12	0.001	0	59.0	0.0		
33	-14.90	0.01	0.000	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 28.2 kN/m run
At elev. 1.00 Prop force = 76.4 kN/m run
At elev. -2.00 Prop force = 199.1 kN/m run
At elev. -5.00 Prop force = 2.9 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	0.00	8.55	2.64	33.06	14.48	14.48	9981
3	3.00	0.00	17.35	5.36	67.10	12.72	12.72	9981
4	2.55	0.00	25.58	7.90	98.95	11.97	11.97	9981
5	2.10	0.00	34.09	10.53	131.87	12.41	12.41	9981
6	2.00	0.00	36.01	11.13	139.30	10.91	10.91A	9981
7	1.50	0.00	45.73	14.13	176.89	13.08	13.08A	9981
8	1.00	0.00	55.54	17.16	214.84	19.24	19.24	9981
		0.00	55.54	13.95	211.21	28.44	28.44	4991
9	0.50	0.00	65.35	17.39	244.99	32.09	32.09	5240
10	0.00	0.00	75.11	20.82	278.59	36.99	36.99	5490
11	-0.60	0.00	86.71	24.90	318.51	43.55	43.55	5789
12	-0.95	0.00	93.41	27.25	341.58	46.92	46.92	5964
13	-1.30	0.00	100.07	29.59	364.48	50.70	50.70	6138
14	-1.50	0.00	103.85	30.91	377.50	52.29	52.29	6238
15	-2.00	0.00	113.24	34.21	409.82	57.63	57.63	6488
16	-2.50	0.00	122.54	37.48	441.84	62.39	62.39	6737
17	-3.00	0.00	131.77	40.72	473.60	67.00	67.00	6987
18	-3.50	0.00	140.92	43.94	505.11	71.58	71.58	7236
19	-4.00	0.00	150.02	47.13	536.42	76.06	76.06	7486
20	-4.50	5.00	154.05	48.55	550.32	76.60	81.60	7735
21	-5.00	10.00	158.05	49.95	564.06	76.00	86.00	7985
22	-5.30	13.00	160.42	50.79	572.23	72.84	85.84	8135
		13.00	160.42	33.04	759.29	21.76	34.76A	29943
23	-5.65	16.50	164.22	34.12	775.89	60.80	77.30	29943
24	-6.00	20.00	168.00	35.19	792.42	76.11	96.11	29943
25	-6.60	26.00	174.44	37.02	820.58	89.71	115.71	29943
26	-7.20	32.00	180.85	38.83	848.54	100.31	132.31	29943
27	-7.60	36.00	185.09	40.03	867.09	101.91	137.91	29943
28	-8.00	40.00	189.32	41.23	885.57	76.46	116.46	29943
29	-8.15	41.50	190.90	41.68	892.48	140.43	181.93	29943
30	-9.80	58.00	208.19	46.58	968.01	167.63	225.63	29943
		58.00	208.19	36.32	1026.37	147.49	205.49	49905
31	-11.40	74.00	229.57	42.58	1119.82	178.74	252.74	49905
32	-13.00	90.00	250.83	48.79	1212.70	237.03	327.03	49905
		90.00	250.83	0.00	6704.52	179.10	269.10	998109

(continued)

Stage No.16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
33	-14.90	109.00	283.54	0.00	7158.75	242.42	351.42	998109
34	-16.80	128.00	316.14	0.00	7611.40	274.99	402.99	998109
35	-18.40	144.00	343.52	0.00	7991.58	302.44	446.44	998109
36	-20.00	160.00	370.84	0.00	8371.01	324.29	484.29	998109

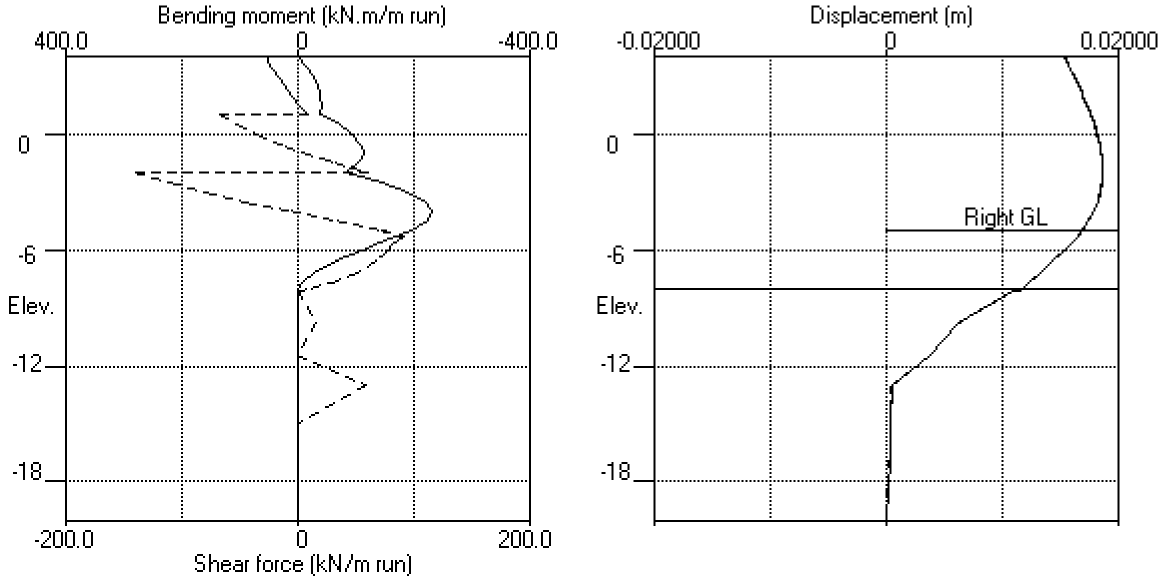
RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	8021
22	-5.30	3.00	2.10	0.00	27.26	27.26	30.26p	8172
		3.00	2.10	0.00	67.54	67.54	70.54p	30080
23	-5.65	6.50	5.60	0.00	82.83	82.83	89.33p	30080
24	-6.00	10.00	9.10	0.00	98.12	98.12	108.12p	30080
25	-6.60	16.00	15.10	0.00	124.34	123.11	139.11	30080
26	-7.20	22.00	21.10	0.00	150.57	147.42	169.42	30080
27	-7.60	26.00	25.11	0.00	168.05	161.72	187.72	30080
28	-8.00	30.00	29.11	0.00	185.54	166.71	196.71	30080
29	-8.15	31.50	30.61	0.00	192.10	150.53	182.03	30080
30	-9.80	48.00	47.13	0.94	264.30	158.09	206.09	30080
		48.00	47.13	0.00	322.66	177.60	225.60	50133
31	-11.40	64.00	67.98	0.00	413.74	188.73	252.73	50133
32	-13.00	80.00	88.85	1.45	504.94	173.24	253.24	50133
		80.00	88.85	0.00	4455.26	251.21	331.21	1002652
33	-14.90	99.00	121.28	0.00	4905.61	252.41	351.41	1002652
34	-16.80	118.00	153.77	0.00	5356.75	284.98	402.98	1002652
35	-18.40	134.00	181.18	0.00	5737.37	312.44	446.44	1002652
36	-20.00	150.00	208.64	0.00	6118.70	334.30	484.30	1002652

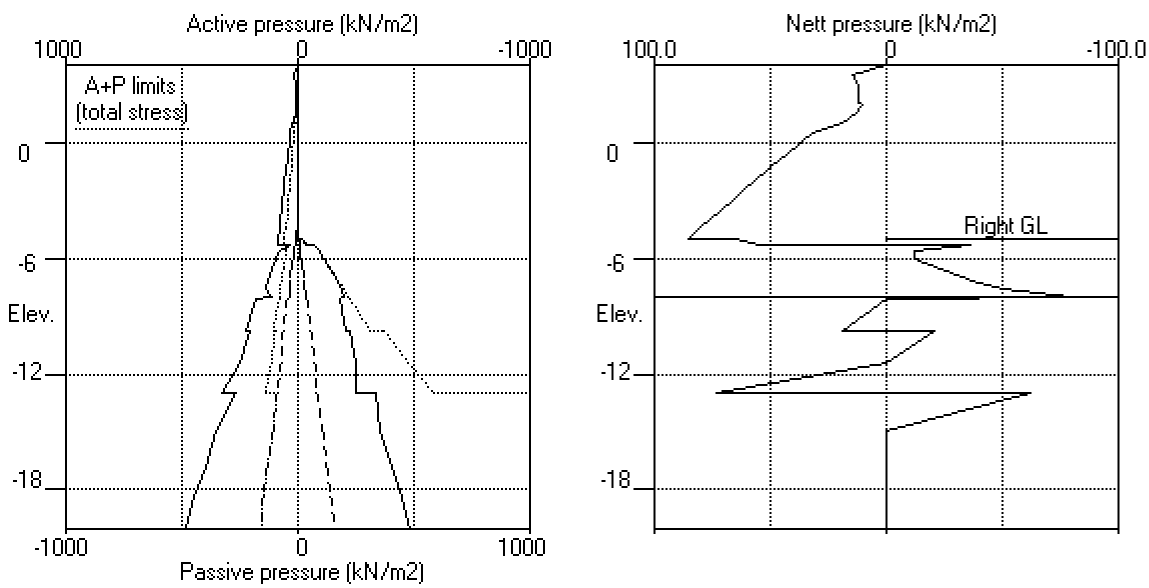
Note: 12.34 a Soil pressure at active limit
108.12 p Soil pressure at passive limit
34.76A Arching - soil pressure below active limit

Units: kN,m

Stage No.16 Change EI of wall to 400711kN.m2/m run

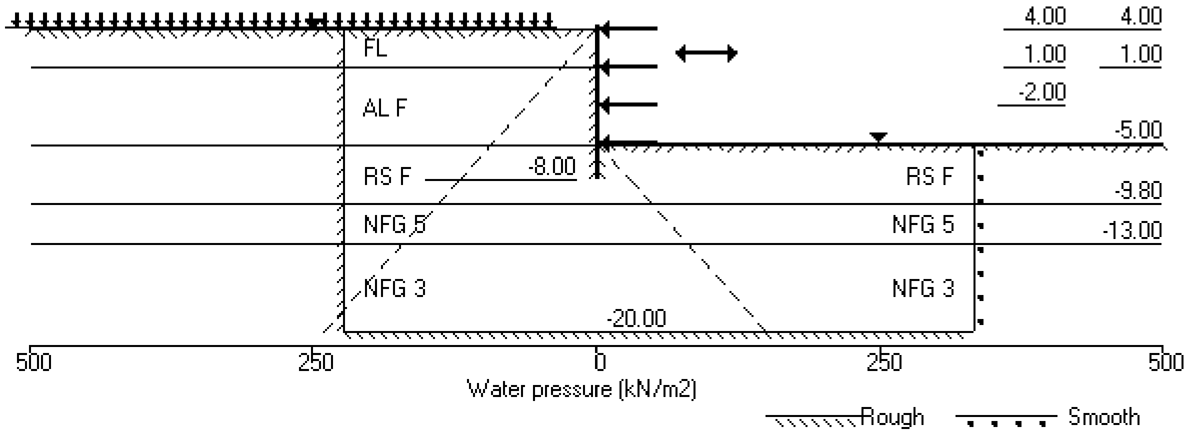


Stage No.16 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No.17 Apply water pressure profile no.1



Units: kN,m

Stage No. 17 Apply water pressure profile no.1

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -8.00: Factor of Safety	FoS for toe elev. = -8.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
17	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-8.65E-04	-33.9	-0.0	-33.9	400711
2	3.50	17.28	0.016	-8.54E-04	-29.6	-17.4		400711
3	3.00	18.45	0.016	-8.26E-04	-20.7	-30.6		400711
4	2.55	20.34	0.017	-7.89E-04	-12.0	-38.6		400711
5	2.10	23.41	0.017	-7.47E-04	-2.1	-42.4		400711
6	2.00	22.53	0.017	-7.38E-04	0.2	-42.7		400711
7	1.50	27.66	0.017	-6.91E-04	12.7	-39.6		400711
8	1.00	36.85	0.018	-6.54E-04	28.8	-30.3	-119.5	400711
		45.82	0.018	-6.54E-04	-90.7	-30.3		
9	0.50	52.29	0.018	-5.98E-04	-66.2	-70.9		400711
10	0.00	60.06	0.018	-5.02E-04	-38.1	-98.4		400711
11	-0.60	70.10	0.018	-3.58E-04	1.0	-111.5		400711
12	-0.95	75.55	0.019	-2.71E-04	26.5	-107.7		400711
13	-1.30	81.41	0.019	-1.93E-04	53.9	-94.7		400711
14	-1.50	84.26	0.019	-1.54E-04	70.5	-82.8		400711
15	-2.00	92.58	0.019	-9.57E-05	114.7	-37.9	-287.7	400711
		92.58	0.019	-9.57E-05	-173.0	-37.9		
16	-2.50	100.27	0.019	-1.91E-05	-124.8	-111.7		400711
17	-3.00	107.80	0.019	1.34E-04	-72.8	-160.6		400711
18	-3.50	115.31	0.019	3.33E-04	-17.0	-182.4		400711
19	-4.00	122.78	0.018	5.42E-04	42.5	-175.4		400711
20	-4.50	128.45	0.018	7.24E-04	105.3	-137.7		400711
21	-5.00	132.95	0.018	8.40E-04	170.7	-67.8	-208.9	400711
		115.21	0.018	8.40E-04	-38.2	-67.8		
22	-5.30	104.25	0.017	8.86E-04	-5.3	-73.1		400711
		33.31	0.017	8.86E-04	-5.3	-73.1		
23	-5.65	39.25	0.017	9.43E-04	7.4	-72.8		400711
24	-6.00	31.66	0.017	9.98E-04	19.8	-67.0		400711
25	-6.60	14.24	0.016	1.07E-03	33.6	-49.0		400711
26	-7.20	-6.73	0.016	1.12E-03	35.8	-24.8		400711
27	-7.60	-28.95	0.015	1.14E-03	28.7	-9.9		400711
28	-8.00	-83.23	0.015	1.14E-03	6.2	-0.0		0

(continued)

Stage No.17 Apply water pressure profile no.1

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-8.15	-0.10	0.014	0	-0.0	0.0		0
30	-9.80	30.84	0.009	0	25.4	0.0		0
		-31.77	0.009	0	25.4	0.0		
31	-11.40	0.01	0.006	0	-0.1	0.0		0
32	-13.00	114.78	0.001	0	91.8	0.0		0
		-96.63	0.001	0	91.8	0.0		
33	-14.90	0.01	0.001	0	-0.0	0.0		0
34	-16.80	0.01	0.000	0	-0.0	0.0		0
35	-18.40	0.00	0.000	0	0.0	0.0		0
36	-20.00	-0.01	0.000	0	0.0	0.0		---

At elev. 4.00 Prop force = 33.9 kN/m run
At elev. 1.00 Prop force = 119.5 kN/m run
At elev. -2.00 Prop force = 287.7 kN/m run
At elev. -5.00 Prop force = 208.9 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9981
2	3.50	5.00	3.55	1.10	13.72	12.28	17.28	9981
3	3.00	10.00	7.35	2.27	28.42	8.45	18.45	9981
4	2.55	14.50	11.08	3.42	42.86	5.84	20.34	9981
5	2.10	19.00	15.09	4.66	58.37	4.41	23.41A	9981
6	2.00	20.00	16.01	4.95	61.94	2.53	22.53A	9981
7	1.50	25.00	20.73	6.41	80.18	2.66	27.66A	9981
8	1.00	30.00	25.54	7.89	98.80	6.85	36.85A	9981
		30.00	25.54	3.41	107.94	15.82	45.82	4991
9	0.50	35.00	30.35	5.10	124.52	17.29	52.29	5240
10	0.00	40.00	35.11	6.77	140.90	20.06	60.06	5490
11	-0.60	46.00	40.71	8.74	160.17	24.10	70.10	5789
12	-0.95	49.50	43.91	9.86	171.19	26.05	75.55	5964
13	-1.30	53.00	47.07	10.97	182.05	28.41	81.41	6138
14	-1.50	55.00	48.85	11.59	188.18	29.26	84.26	6238
15	-2.00	60.00	53.24	13.14	203.28	32.58	92.58	6488
16	-2.50	65.00	57.54	14.65	218.09	35.27	100.27	6737
17	-3.00	70.00	61.77	16.13	232.64	37.80	107.80	6987
18	-3.50	75.00	65.92	17.59	246.95	40.31	115.31	7236
19	-4.00	80.00	70.02	19.03	261.04	42.78	122.78	7486
20	-4.50	85.00	74.05	20.45	274.94	43.45	128.45	7735
21	-5.00	90.00	78.05	21.85	288.68	42.95	132.95	7985
22	-5.30	93.00	80.42	22.68	296.85	39.76	132.76	8135
		93.00	80.42	10.37	409.74	4.42	97.42A	29943
23	-5.65	96.50	84.22	11.45	426.34	28.28	124.78	29943
24	-6.00	100.00	88.00	12.52	442.87	39.78	139.78	29943
25	-6.60	106.00	94.44	14.35	471.03	48.58	154.58	29943
26	-7.20	112.00	100.85	16.16	498.99	53.84	165.84	29943
27	-7.60	116.00	105.09	17.36	517.54	49.10	165.10	29943
28	-8.00	120.00	109.32	18.56	536.02	12.31	132.31A	29943
29	-8.15	121.50	110.90	19.01	542.93	82.83	204.33	29943
30	-9.80	138.00	128.19	23.91	618.45	115.91	253.91	29943
		138.00	128.19	12.94	676.81	84.14	222.14	49905
31	-11.40	154.00	149.57	19.20	770.27	121.37	275.37	49905
32	-13.00	170.00	170.83	25.41	863.15	200.36	370.36	49905
		170.00	170.83	0.00	5593.65	111.50	281.50	998109
33	-14.90	189.00	203.54	0.00	6047.87	192.06	381.06	998109

(continued)

Stage No.17 Apply water pressure profile no.1

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
34	-16.80	208.00	236.14	0.00	6500.52	224.72	432.72	998109
35	-18.40	224.00	263.52	0.00	6880.71	252.14	476.14	998109
36	-20.00	240.00	290.84	0.00	7260.13	267.96	507.96	998109

RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	17.74	17.74	8021
22	-5.30	3.00	2.10	0.00	27.26	25.51	28.51	8172
		3.00	2.10	0.00	67.54	61.11	64.11	30080
23	-5.65	6.50	5.60	0.00	82.83	79.02	85.52	30080
24	-6.00	10.00	9.10	0.00	98.12	98.12	108.12p	30080
25	-6.60	16.00	15.10	0.00	124.34	124.34	140.34p	30080
26	-7.20	22.00	21.10	0.00	150.57	150.57	172.57p	30080
27	-7.60	26.00	25.11	0.00	168.05	168.05	194.05p	30080
28	-8.00	30.00	29.11	0.00	185.54	185.54	215.54p	30080
29	-8.15	31.50	30.61	0.00	192.10	172.92	204.42	30080
30	-9.80	48.00	47.13	0.94	264.30	175.08	223.08	30080
		48.00	47.13	0.00	322.66	205.91	253.91	50133
31	-11.40	64.00	67.98	0.00	413.74	211.36	275.36	50133
32	-13.00	80.00	88.85	1.45	504.94	175.59	255.59	50133
		80.00	88.85	0.00	4455.26	298.13	378.13	1002652
33	-14.90	99.00	121.28	0.00	4905.61	282.05	381.05	1002652
34	-16.80	118.00	153.77	0.00	5356.75	314.71	432.71	1002652
35	-18.40	134.00	181.18	0.00	5737.37	342.14	476.14	1002652
36	-20.00	150.00	208.64	0.00	6118.70	357.98	507.98	1002652

Note: 12.34 a Soil pressure at active limit
215.54 p Soil pressure at passive limit
132.31A Arching - soil pressure below active limit

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Program: WALLAP  Version 6.07  Revision A55.B74.R58             | Job No.  B01493
                                 Licensed from GEOSOLVE         | Made by :   DJC
Data filename/Run ID: Section_5                                 |
Albert Street Development                                       | Date:16-11-2022
Section 5                                                       | Checked :
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                                                          Units: kN,m
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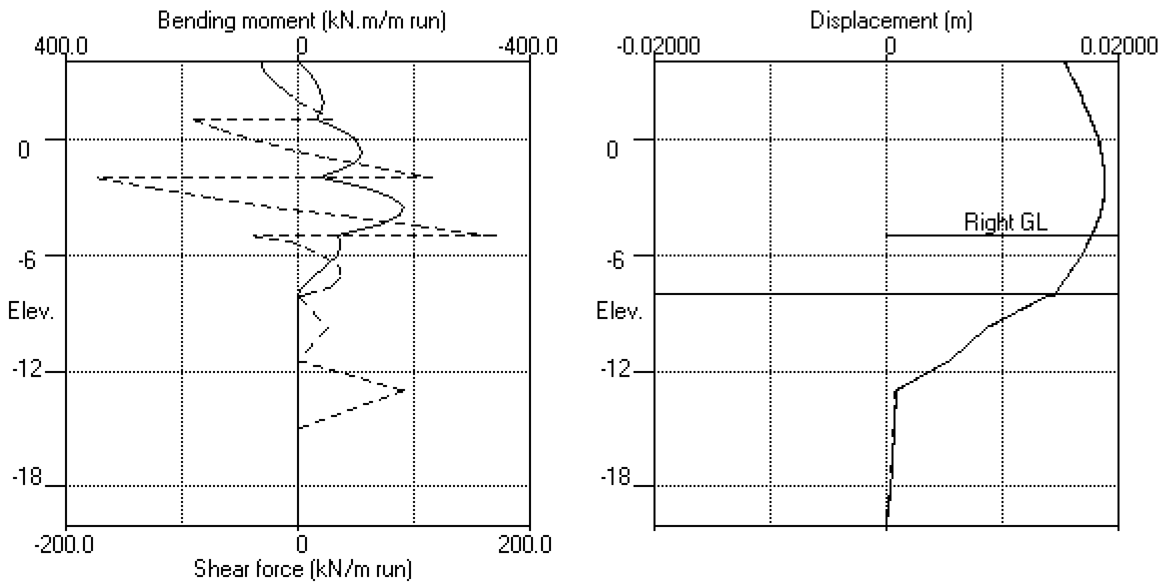
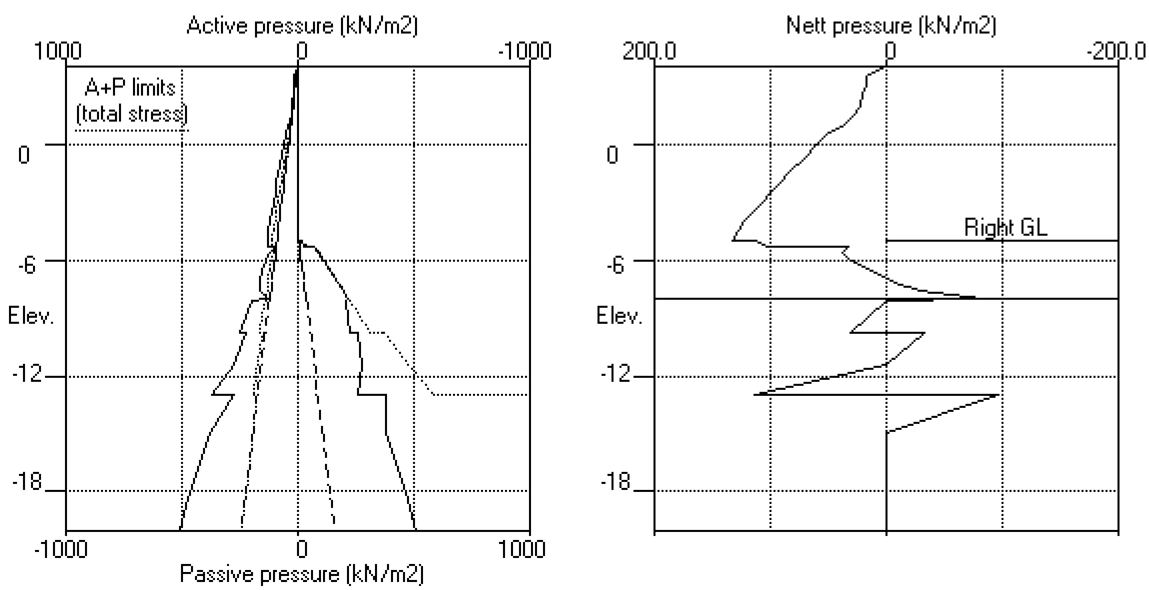
Stage No.17 Apply water pressure profile no.1



Stage No.17 Apply water pressure profile no.1



Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

				FoS for toe elev. = -8.00		**Toe elev. for FoS = 1.500**		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				
2	4.00	2.00	Cant.	11.179	-6.47	-0.12	2.12	L to R
3	4.00	2.00		No analysis at this stage				
4	4.00	-1.50	2.00	6.687	n/a	-3.41	1.91	L to R
5	4.00	-1.50		No analysis at this stage				

All remaining stages have more than one prop - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 40.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall Rough boundary
Right side 30.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Bending moment, shear force and displacement envelopes

Node	Y	Displacement		Bending moment		Shear force	
no.	coord	maximum	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	4.00	0.018	0.000	0.0	-0.0	0.0	-35.9
2	3.50	0.017	0.000	0.3	-17.6	3.6	-32.3
3	3.00	0.017	0.000	4.2	-31.7	10.5	-25.5
4	2.55	0.017	0.000	10.4	-41.7	16.2	-19.9
5	2.10	0.017	0.000	19.1	-49.2	65.1	-14.4
6	2.00	0.017	0.000	23.8	-50.6	66.3	-102.1
7	1.50	0.017	0.000	14.1	-54.9	12.7	-96.4
8	1.00	0.018	0.000	16.6	-81.0	28.8	-90.7
9	0.50	0.018	0.000	17.7	-121.3	1.9	-73.0
10	0.00	0.018	0.000	18.6	-153.5	1.5	-55.4
11	-0.60	0.018	0.000	19.4	-179.5	8.2	-30.6
12	-0.95	0.019	0.000	19.9	-187.4	26.5	-14.3
13	-1.30	0.019	0.000	20.5	-189.3	53.9	-165.9
14	-1.50	0.019	0.000	20.9	-187.5	70.5	-155.4
15	-2.00	0.019	0.000	22.2	-176.7	114.7	-173.0
16	-2.50	0.019	0.000	24.0	-224.8	34.0	-124.8
17	-3.00	0.019	0.000	26.4	-263.7	41.3	-77.4
18	-3.50	0.019	0.000	29.7	-285.8	48.4	-42.8
19	-4.00	0.018	0.000	33.9	-290.0	55.4	-5.9
20	-4.50	0.018	0.000	39.0	-274.9	105.3	0.0
21	-5.00	0.018	0.000	45.0	-239.3	170.7	-38.2
22	-5.30	0.017	0.000	48.8	-208.6	110.5	-5.3
23	-5.65	0.017	0.000	48.9	-172.8	102.7	-5.9
24	-6.00	0.017	0.000	44.7	-138.0	98.7	-15.4
25	-6.60	0.016	0.000	31.9	-82.7	87.1	-23.5
26	-7.20	0.016	0.000	16.5	-35.8	66.1	-24.8
27	-7.60	0.015	0.000	6.8	-12.9	44.7	-20.6
28	-8.00	0.015	0.000	0.0	-0.0	8.8	-4.6
29	-8.15	0.014	0.000	0.0	0.0	0.0	-0.0
30	-9.80	0.009	0.000	0.0	0.0	25.4	0.0
31	-11.40	0.006	0.000	0.0	0.0	0.0	-0.1
32	-13.00	0.001	0.000	0.0	0.0	91.8	0.0
33	-14.90	0.001	0.000	0.0	0.0	0.0	-0.0
34	-16.80	0.000	0.000	0.0	0.0	0.0	-0.0
35	-18.40	0.000	0.000	0.0	0.0	0.0	-0.0
36	-20.00	0.000	0.000	0.0	0.0	0.0	0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment maximum kN.m/m	elev.	Bending moment minimum kN.m/m	elev.	Shear force maximum kN/m	elev.	Shear force minimum kN/m	elev.
1	0.0	3.50	-17.6	-2.50	7.7	-5.30	-4.9	1.00
2	48.9	-5.65	-0.0	-8.00	16.9	-13.00	-24.8	-7.20
3	No calculation at this stage							
4	16.2	-6.60	-189.3	-1.30	68.5	-5.30	-102.1	2.00
5	No calculation at this stage							
6	14.5	2.00	-180.0	-1.30	68.2	-5.30	-99.5	2.00
7	21.4	2.00	-290.0	-4.00	110.5	-5.30	-162.4	-1.30
8	23.8	2.00	-281.0	-4.00	107.6	-5.30	-165.9	-1.30
9	21.4	2.00	-290.0	-4.00	110.5	-5.30	-162.4	-1.30
10	No calculation at this stage							
11	No calculation at this stage							
12	21.4	2.00	-270.8	-4.00	105.5	-5.30	-131.0	-2.00
13	No calculation at this stage							
14	No calculation at this stage							
15	0.0	4.00	-267.7	-4.00	105.3	-5.30	-134.1	-2.00
16	0.0	4.00	-230.9	-4.00	90.8	-5.30	-139.8	-2.00
17	0.0	4.00	-182.4	-3.50	170.7	-5.00	-173.0	-2.00

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	Displacement minimum m	elev.	Stage description
1	0.001	-1.30	0.000	4.00	Apply surcharge no.1 at elev. 4.00
2	0.018	4.00	0.000	4.00	Excav. to elev. 2.00 on RIGHT side
3	No calculation at this stage				Install prop no.1 at elev. 2.00
4	0.017	4.00	0.000	4.00	Excav. to elev. -1.50 on RIGHT side
5	No calculation at this stage				Install prop no.2 at elev. -1.30
6	0.017	4.00	0.000	4.00	Apply water pressure profile no.2
7	0.018	-2.50	0.000	4.00	Excav. to elev. -5.00 on RIGHT side
8	0.018	-2.50	0.000	4.00	Apply load no.1 at elev. 2.10
9	0.018	-2.50	0.000	4.00	Apply load no.2 at elev. 2.10
10	No calculation at this stage				Install prop no.3 at elev. -5.00
11	No calculation at this stage				Install prop no.4 at elev. -2.00
12	0.019	-2.00	0.000	4.00	Remove prop no.2 at elev. -1.30
13	No calculation at this stage				Install prop no.5 at elev. 1.00
14	No calculation at this stage				Install prop no.6 at elev. 4.00
15	0.019	-2.00	0.000	4.00	Remove prop no.1 at elev. 2.00
16	0.019	-2.00	0.000	4.00	Change EI of wall to 400711kN.m2/m run
17	0.019	-2.50	0.000	4.00	Apply water pressure profile no.1

Summary of results (continued)

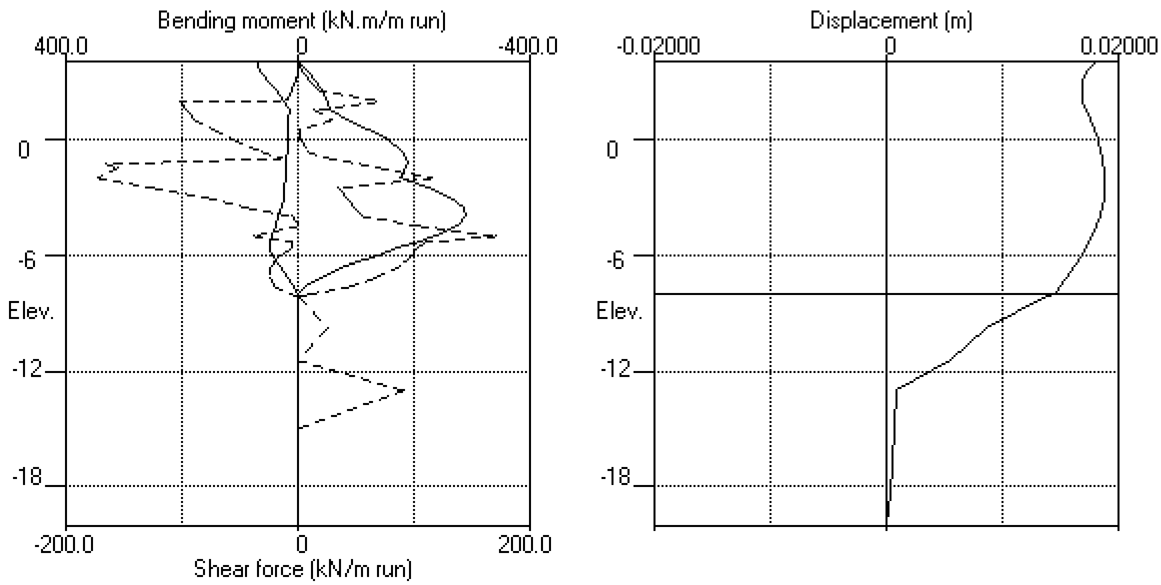
Prop forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 2.00 kN/m run	Strut no. 1 at elev. 2.00 kN/prop	Strut no. 2 at elev.-1.30 kN/m run	Strut no. 2 at elev.-1.30 kN/prop	Strut no. 3 at elev.-5.00 kN/m run	Strut no. 3 at elev.-5.00 kN/prop
4	118.22	886.66	---	---	---	---
6	115.98	869.83	6.81	51.10	---	---
7	92.80	695.99	199.49	1496.21	---	---
8	130.48	978.57	207.53	1556.47	---	---
9	92.80	695.99	199.49	1496.21	---	---
12	117.85	883.84	---	---	-1.93	-1.93
15	---	---	---	---	-4.55	-4.55
16	---	---	---	---	2.92	2.92
17	---	---	---	---	208.91	208.91

Stage no.	Strut no. 4 at elev.-2.00 kN/m run	Strut no. 4 at elev.-2.00 kN/prop	Strut no. 5 at elev. 1.00 kN/m run	Strut no. 5 at elev. 1.00 kN/prop	Strut no. 6 at elev. 4.00 kN/m run	Strut no. 6 at elev. 4.00 kN/prop
12	178.11	178.11	---	---	---	---
15	181.26	181.26	80.89	80.89	35.87	35.87
16	199.13	199.13	76.37	76.37	28.24	28.24
17	287.71	287.71	119.54	119.54	33.95	33.95

```
EDG CONSULTING PTY LTD                                             | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58                | Job No.  B01493
                             Licensed from GEOSOLVE                | Made by :   DJC
Data filename/Run ID: Section_5                                    |
Albert Street Development                                          | Date:16-11-2022
Section 5                                                          | Checked :
-----------------------------------------------------------------------------
                                                          Units: kN,m
```

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Left side		Soil types Right side	
1	4.00	1	FL	1	FL
2	0.80	2	AL F	2	AL F
3	-6.60	3	AL C	3	AL C
4	-8.10	4	RS F	4	RS F
5	-11.00	5	NFG 5	5	NFG 5
6	-12.80	6	NFG 3	6	NFG 3

SOIL PROPERTIES

-- Soil type -- No. Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1 FL	17.00	10000	0.700	OC	0.309	3.868	
				(0.300)	(0.000)	(0.000)	
2 AL F	17.00	5000	0.700	OC	0.351	3.442	4.000d
(1.00)		(500.0)		(0.300)	(1.391)	(5.007)	
3 AL C	17.00	20000	0.700	OC	0.292	4.369	
				(0.300)	(0.000)	(0.000)	
4 RS F	20.00	30000	1.000	OC	0.283	4.369	10.00d
				(0.300)	(1.241)	(5.836)	
5 NFG 5	23.00	50000	1.000	OC	0.292	4.369	20.00d
				(0.300)	(1.226)	(5.836)	
6 NFG 3	27.00	1000000	1.000	OC	0.146	13.89	250.0d
				(0.200)	(0.854)	(12.886)	

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No. Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 FL	28.00	0.670	0.00	28.00	0.500	0.00
2 AL F	25.00	0.670	0.00	26.00	0.500	0.00
3 AL C	30.00	0.500	0.00	30.00	0.500	0.00
4 RS F	30.00	0.670	0.00	30.00	0.500	0.00
5 NFG 5	30.00	0.500	0.00	30.00	0.500	0.00
6 NFG 3	45.00	0.500	0.00	45.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-4.00	-4.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Left side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Right side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	4.00	4.00	0.0	1	-5.00	-5.00	0.0
2	1	-4.00	-4.00	0.0	1	-5.00	-5.00	0.0

WALL PROPERTIES

Type of structure	= Soldier Pile Wall
Soldier Pile width	= 0.90 m
Soldier Pile spacing	= 1.80 m
Passive mobilisation factor	= 3.00
Elevation of toe of wall	= -10.00
Maximum finite element length	= 0.80 m
Youngs modulus of wall E	= 3.2000E+07 kN/m2
Moment of inertia of wall I	= 0.017889 m4/m run
	= 0.032200 m4 per pile
E.I	= 572444 kN.m2/m run
Yield Moment of wall	= Not defined

STRUTS and ANCHORS

Prop no.	Elev.	Prop spacing m	Cross-section area sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /prop kN	Strut or Anchor	Allow tension ?	L/R
1	2.00	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
2	-1.30	7.50	0.053698	2.000E+08	20.00	0.00	0	Strut	No	R
3	-5.00	1.00	0.150000	3.280E+07	20.00	0.00	0	Strut	Yes	R
4	-2.00	1.00	0.350000	3.280E+07	20.00	0.00	0	Strut	Yes	R
5	1.00	1.00	0.425000	3.280E+07	20.00	0.00	0	Strut	Yes	R

HORIZONTAL and MOMENT LOADS/RESTRAINTS

Load no.	Elevation	Horizontal load kN/m run	Moment load kN.m/m run	Moment restraint kN.m/m/rad	Partial factor (Category)
1	1.90	51.20	0	0	N/A
2	1.90	-51.20	0	0	N/A

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	4.00	1.00(L)	100.00	100.00	10.00	=	N/A	N/A

Note: L = Left side, R = Right side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 4.00
2	Excavate to elevation 2.00 on RIGHT side
3	Install strut or anchor no.1 at elevation 2.00
4	Excavate to elevation -1.50 on RIGHT side
5	Install strut or anchor no.2 at elevation -1.30
6	Apply water pressure profile no.2
7	Excavate to elevation -5.00 on RIGHT side
8	Apply load no.1 at elevation 1.90
9	Apply load no.2 at elevation 1.90
10	Install strut or anchor no.3 at elevation -5.00
11	Install strut or anchor no.4 at elevation -2.00
12	Remove strut or anchor no.2 at elevation -1.30
13	Install strut or anchor no.5 at elevation 1.00
14	Remove strut or anchor no.1 at elevation 2.00
15	Apply water pressure profile no.1
16	Change EI of wall to 400711 kN.m2/m run Allow wall to relax with new modulus value

FACTORS OF SAFETY and ANALYSIS OPTIONS

```
 Stability analysis:
  Method of analysis  -  Burland-Potts
  Factor on passive for calculating wall depth = 1.50

 Parameters for undrained strata:
  Minimum equivalent fluid density             =   5.00 kN/m3
  Maximum depth of water filled tension crack  =   0.00 m

 Bending moment and displacement calculation:
  Method  -  2-D finite element model
  Open Tension Crack analysis? - No
  Active limit arching modelled?  -  Yes
  Non-linear Modulus Parameter (L) = 9.000 m

 Boundary conditions:
  Length of wall (normal to plane of analysis) = 60.00 m

  Width of excavation on Left  side of wall  = 40.00 m
  Width of excavation on Right side of wall  = 40.00 m

  Distance to rigid boundary on Left side  = 30.00 m
  Distance to rigid boundary on Right side = 20.00 m
  Elevation of rigid lower boundary = -20.00

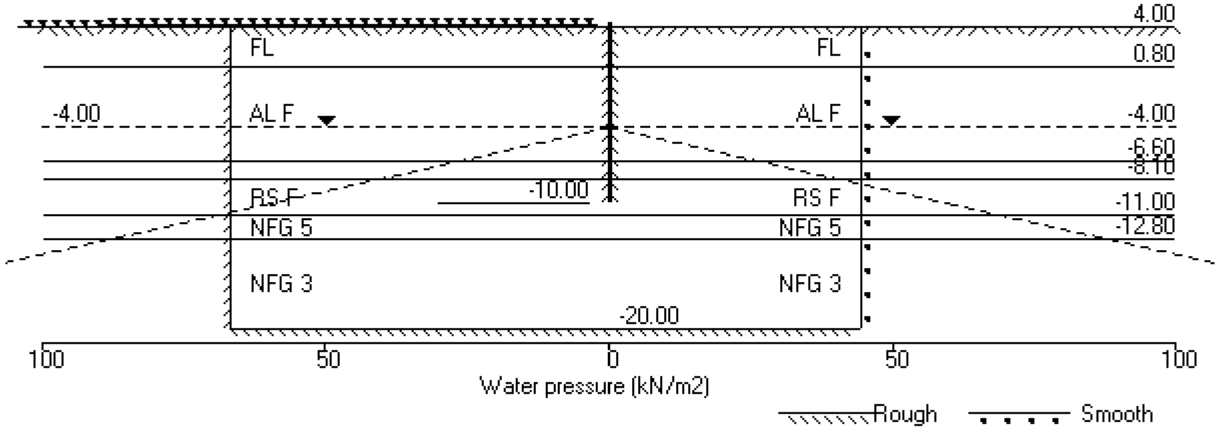
  Lower rigid boundary at elevation -20.00 - Rough
  Rigid boundary on Left side           - Rough
  Rigid boundary on Right side          - Smooth
  Wall / soil interface                   - Rough
```

OUTPUT OPTIONS

```
 Stage ------ Stage description ----------- ------- Output options -------
  no.                                       Displacement   Active,  Graph.
                                            Bending mom.   Passive  output
                                            Shear force   pressures
   1 Apply surcharge no.1 at elev. 4.00         Yes          Yes     Yes
   2 Excav. to elev. 2.00 on RIGHT side         Yes          Yes     Yes
   3 Install prop no.1 at elev. 2.00            Yes          Yes     Yes
   4 Excav. to elev. -1.50 on RIGHT side        Yes          Yes     Yes
   5 Install prop no.2 at elev. -1.30           Yes          Yes     Yes
   6 Apply water pressure profile no.2          Yes          Yes     Yes
   7 Excav. to elev. -5.00 on RIGHT side        Yes          Yes     Yes
   8 Apply load no.1 at elev. 1.90              Yes          Yes     Yes
   9 Apply load no.2 at elev. 1.90              Yes          Yes     Yes
  10 Install prop no.3 at elev. -5.00           Yes          Yes     Yes
  11 Install prop no.4 at elev. -2.00           Yes          Yes     Yes
  12 Remove prop no.2 at elev. -1.30            Yes          Yes     Yes
  13 Install prop no.5 at elev. 1.00            Yes          Yes     Yes
  14 Remove prop no.1 at elev. 2.00             Yes          Yes     Yes
  15 Apply water pressure profile no.1          Yes          Yes     Yes
  16 Change EI of wall to 400711kN.m2/m run     Yes          Yes     Yes
   * Summary output                             Yes           -      Yes
```

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 4.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.001	-6.45E-06	0.0	0.0		572444
2	3.20	-2.66	0.001	-6.49E-06	-1.1	0.1		572444
3	2.60	-1.55	0.001	-5.99E-06	-2.3	-1.0		572444
4	2.00	-0.90	0.001	-4.07E-06	-3.1	-2.7		572444
5	1.90	-0.78	0.001	-3.58E-06	-3.1	-3.0		572444
6	1.45	-0.43	0.001	-6.69E-07	-3.4	-4.4		572444
7	1.00	-0.09	0.001	3.44E-06	-3.5	-6.0		572444
8	0.80	-0.15	0.001	5.67E-06	-3.6	-6.7		572444
		1.24	0.001	5.67E-06	-3.6	-6.7		
9	0.00	1.15	0.001	1.67E-05	-2.6	-9.1		572444
10	-0.65	1.11	0.001	2.79E-05	-1.9	-10.6		572444
11	-1.30	1.14	0.001	4.05E-05	-1.1	-11.6		572444
12	-1.50	1.05	0.001	4.46E-05	-0.9	-11.8		572444
13	-2.00	1.06	0.001	5.50E-05	-0.4	-12.1		572444
14	-2.60	1.04	0.001	6.77E-05	0.2	-12.1		572444
15	-3.20	1.02	0.001	8.02E-05	0.9	-11.8		572444
16	-4.00	1.04	0.001	9.59E-05	1.7	-10.8		572444
17	-4.50	1.02	0.001	1.04E-04	2.2	-9.8		572444
18	-5.00	0.99	0.001	1.12E-04	2.7	-8.6		572444
19	-5.80	0.90	0.001	1.23E-04	3.5	-6.1		572444
20	-6.60	0.65	0.001	1.29E-04	4.1	-3.0		572444
		-3.31	0.001	1.29E-04	4.1	-3.0		
21	-7.35	-1.44	0.001	1.32E-04	2.3	-0.9		572444
22	-8.10	-1.03	0.001	1.32E-04	1.4	0.4		572444
		-3.45	0.001	1.32E-04	1.4	0.4		
23	-8.58	-1.67	0.001	1.32E-04	0.1	0.7		572444
24	-9.05	-0.72	0.000	1.31E-04	-0.4	0.5		572444
25	-9.53	0.12	0.000	1.31E-04	-0.6	0.3		572444
26	-10.00	1.59	0.000	1.31E-04	-0.2	0.0		0
27	-10.20	-0.00	0.000	0	-0.0	0.0		0
28	-11.00	1.22	0.000	0	0.5	0.0		0
		-0.55	0.000	0	0.5	0.0		

(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-12.80	3.68	0.000	0	3.3	0.0		0
		-2.07	0.000	0	3.3	0.0		
30	-16.00	0.00	0.000	0	-0.0	0.0		0
31	-18.00	0.00	0.000	0	0.0	0.0		0
32	-20.00	-0.00	0.000	0	-0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	8.49	8.49	9971
3	2.60	0.00	26.84	8.29	103.83	16.58	16.58	9971
4	2.00	0.00	38.50	11.90	148.93	24.36	24.36	9971
5	1.90	0.00	40.40	12.48	156.28	25.65	25.65	9971
6	1.45	0.00	48.81	15.08	188.80	31.34	31.34	9971
7	1.00	0.00	57.04	17.63	220.65	36.99	36.99	9971
8	0.80	0.00	60.66	18.74	234.64	39.39	39.39	9971
		0.00	60.66	15.74	228.83	40.06	40.06	5085
9	0.00	0.00	74.94	20.76	277.99	49.68	49.68	5484
10	-0.65	0.00	86.39	24.78	317.40	57.49	57.49	5808
11	-1.30	0.00	97.75	28.77	356.50	65.30	65.30	6132
12	-1.50	0.00	101.23	29.99	368.48	67.65	67.65	6232
13	-2.00	0.00	109.91	33.04	398.36	73.64	73.64	6481
14	-2.60	0.00	120.29	36.69	434.09	80.81	80.81	6780
15	-3.20	0.00	130.64	40.33	469.73	87.97	87.97	7079
16	-4.00	0.00	144.41	45.16	517.11	97.54	97.54	7478
17	-4.50	5.00	147.99	46.42	529.46	100.00	105.00	7727
18	-5.00	10.00	151.57	47.68	541.78	102.45	112.45	7977
19	-5.80	18.00	157.28	49.68	561.42	106.34	124.34	8376
20	-6.60	26.00	162.97	51.68	581.00	110.15	136.15	8774
		26.00	162.97	47.59	712.00	108.18	134.18	19942
21	-7.35	33.50	168.29	49.14	735.24	112.80	146.30	19942
22	-8.10	41.00	173.59	50.69	758.43	116.70	157.70	19942
		41.00	173.59	36.77	816.86	164.90	205.90	29913
23	-8.58	45.75	178.38	38.13	837.75	170.54	216.29	29913
24	-9.05	50.50	183.16	39.48	858.64	175.78	226.28	29913
25	-9.53	55.25	187.93	40.84	879.51	180.95	236.20	29913
26	-10.00	60.00	192.70	42.19	900.36	186.42	246.42	29913
27	-10.20	62.00	194.71	42.76	909.14	187.66	249.66	29913
28	-11.00	70.00	202.75	45.03	944.23	196.26	266.26	29913
		70.00	202.75	34.73	1002.59	195.38	265.38	49855
29	-12.80	88.00	226.20	41.59	1105.06	220.89	308.89	49855
		88.00	226.20	0.00	6362.43	217.24	305.24	997093
30	-16.00	120.00	280.63	0.00	7118.25	272.69	392.69	997093
31	-18.00	140.00	314.62	0.00	7590.22	306.67	446.67	997093
32	-20.00	160.00	348.59	0.00	8061.94	340.46	500.46	997093

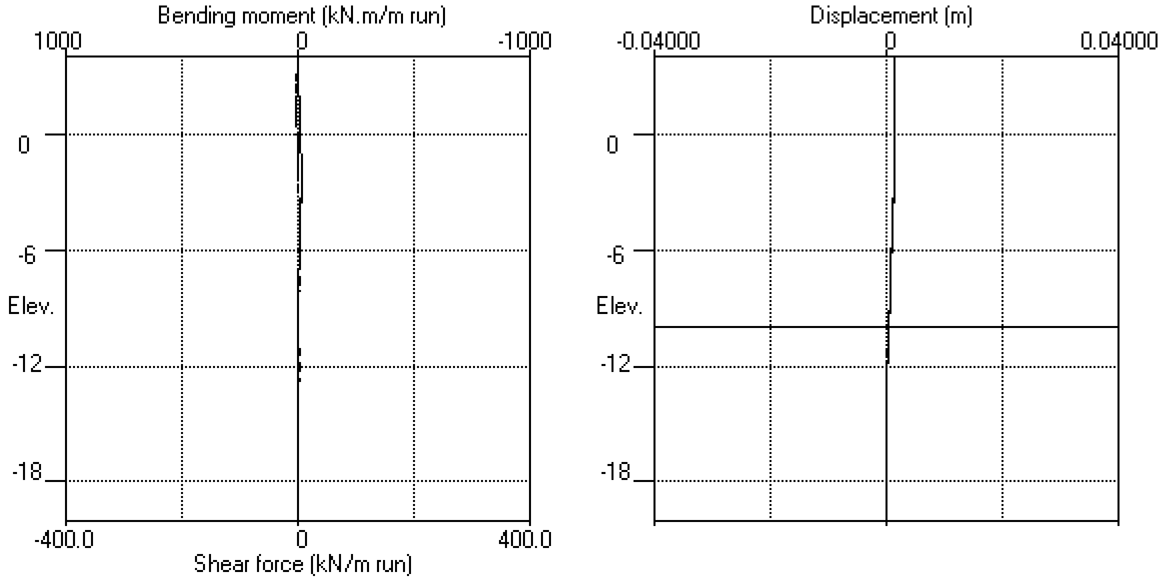
(continued)

Stage No.1 Apply surcharge no.1 at elevation 4.00

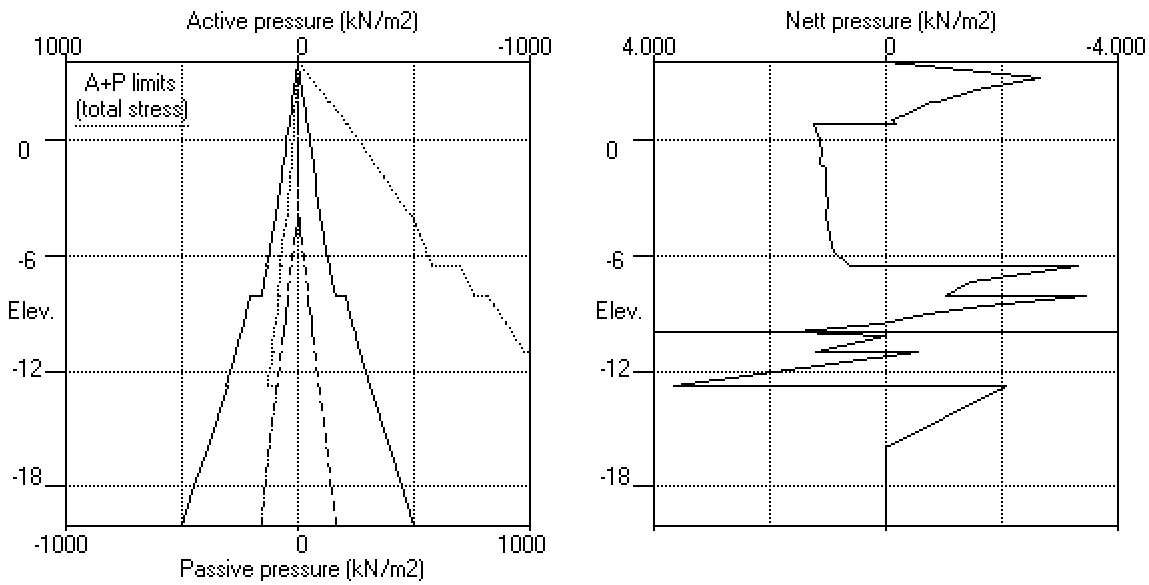
		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9945
2	3.20	0.00	13.60	4.20	52.61	11.15	11.15	9945
3	2.60	0.00	23.80	7.35	92.07	18.13	18.13	9945
4	2.00	0.00	34.00	10.51	131.52	25.25	25.25	9945
5	1.90	0.00	35.70	11.03	138.10	26.43	26.43	9945
6	1.45	0.00	43.35	13.40	167.69	31.77	31.77	9945
7	1.00	0.00	51.00	15.76	197.28	37.08	37.08	9945
8	0.80	0.00	54.40	16.81	210.43	39.54	39.54	9945
		0.00	54.40	13.54	207.29	38.82	38.82	5072
9	0.00	0.00	68.00	18.32	254.10	48.53	48.53	5470
10	-0.65	0.00	79.05	22.20	292.14	56.37	56.37	5793
11	-1.30	0.00	90.10	26.09	330.17	64.16	64.16	6116
12	-1.50	0.00	93.50	27.28	341.88	66.60	66.60	6216
13	-2.00	0.00	102.00	30.27	371.14	72.59	72.59	6464
14	-2.60	0.00	112.20	33.85	406.25	79.77	79.77	6763
15	-3.20	0.00	122.40	37.43	441.36	86.96	86.96	7061
16	-4.00	0.00	136.00	42.21	488.17	96.50	96.50	7459
17	-4.50	5.00	139.50	43.44	500.22	98.98	103.98	7708
18	-5.00	10.00	143.00	44.67	512.27	101.46	111.46	7956
19	-5.80	18.00	148.60	46.63	531.55	105.44	123.44	8354
20	-6.60	26.00	154.20	48.60	550.82	109.50	135.50	8752
		26.00	154.20	45.03	673.70	111.49	137.49	19891
21	-7.35	33.50	159.45	46.56	696.64	114.24	147.74	19891
22	-8.10	41.00	164.70	48.09	719.57	117.73	158.73	19891
		41.00	164.70	34.25	778.00	168.36	209.36	29836
23	-8.58	45.75	169.45	35.60	798.75	172.21	217.96	29836
24	-9.05	50.50	174.20	36.95	819.51	176.50	227.00	29836
25	-9.53	55.25	178.95	38.29	840.26	180.84	236.09	29836
26	-10.00	60.00	183.70	39.64	861.02	184.82	244.82	29836
27	-10.20	62.00	185.70	40.20	869.75	187.66	249.66	29836
28	-11.00	70.00	193.70	42.47	904.71	195.04	265.04	29836
		70.00	193.70	32.09	963.07	195.93	265.93	49726
29	-12.80	88.00	217.10	38.93	1065.31	217.21	305.21	49726
		88.00	217.10	0.00	6236.12	219.31	307.31	994529
30	-16.00	120.00	271.50	0.00	6991.52	272.68	392.68	994529
31	-18.00	140.00	305.50	0.00	7463.64	306.66	446.66	994529
32	-20.00	160.00	339.50	0.00	7935.76	340.46	500.46	994529

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 4.00

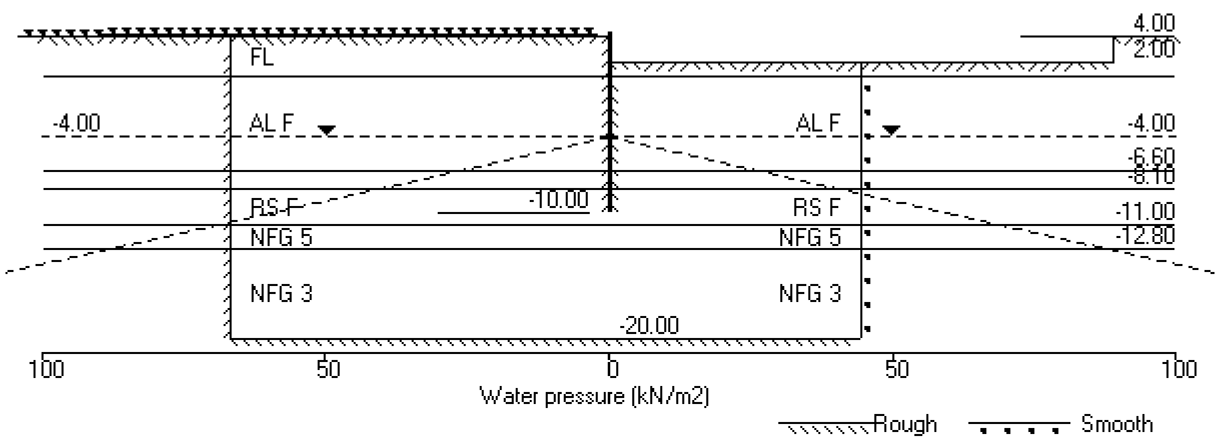


Stage No.1 Apply surcharge no.1 at elev. 4.00



Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No. 2 Excavate to elevation 2.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr-ation	Direction of failure
2	4.00	2.00	Cant.	12.246	-8.04	-0.24	2.24	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.019	1.44E-03	0.0	-0.0		572444
2	3.20	4.57	0.017	1.44E-03	1.8	1.2		572444
3	2.60	8.29	0.017	1.44E-03	5.7	3.6		572444
4	2.00	11.90	0.016	1.43E-03	11.7	9.0		572444
5	1.90	5.91	0.015	1.43E-03	12.6	10.2		572444
6	1.45	-18.93	0.015	1.42E-03	9.7	16.3		572444
7	1.00	-15.18	0.014	1.40E-03	2.0	18.8		572444
8	0.80	-10.72	0.014	1.40E-03	-0.6	18.9		572444
		2.99	0.014	1.40E-03	-0.6	18.9		
9	0.00	-0.13	0.013	1.37E-03	0.6	19.4		572444
10	-0.65	-0.24	0.012	1.35E-03	0.5	19.8		572444
11	-1.30	0.17	0.011	1.32E-03	0.4	20.1		572444
12	-1.50	0.20	0.011	1.32E-03	0.5	20.2		572444
13	-2.00	0.55	0.010	1.30E-03	0.7	20.4		572444
14	-2.60	0.98	0.009	1.28E-03	1.1	20.9		572444
15	-3.20	1.41	0.009	1.26E-03	1.8	21.8		572444
16	-4.00	1.96	0.008	1.22E-03	3.2	23.7		572444
17	-4.50	2.23	0.007	1.20E-03	4.2	25.6		572444
18	-5.00	2.32	0.006	1.18E-03	5.4	28.0		572444
19	-5.80	1.75	0.005	1.14E-03	7.0	33.0		572444
20	-6.60	-0.20	0.005	1.09E-03	7.6	39.2		572444
		-23.71	0.005	1.09E-03	7.6	39.2		
21	-7.35	-10.14	0.004	1.04E-03	-5.1	38.2		572444
22	-8.10	-6.73	0.003	9.94E-04	-11.4	31.6		572444
		-19.23	0.003	9.94E-04	-11.4	31.6		
23	-8.58	-6.55	0.003	9.71E-04	-17.5	24.0		572444
24	-9.05	1.43	0.002	9.55E-04	-18.7	15.0		572444
25	-9.53	11.15	0.002	9.46E-04	-15.7	6.2		572444
26	-10.00	38.80	0.001	9.43E-04	-3.9	-0.0		0
27	-10.20	0.00	0.001	0	0.0	0.0		0
28	-11.00	5.77	0.001	0	2.3	0.0		0
		-2.55	0.001	0	2.3	0.0		

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
29	-12.80	17.19	0.000	0	15.5	0.0		0
		-9.65	0.000	0	15.5	0.0		
30	-16.00	-0.01	0.000	0	0.0	0.0		0
31	-18.00	0.00	0.000	0	0.0	0.0		0
32	-20.00	-0.03	0.000	0	0.0	0.0		---

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	4.57	4.57a	9971
3	2.60	0.00	26.84	8.29	103.83	8.29	8.29a	9971
4	2.00	0.00	38.50	11.90	148.93	11.90	11.90a	9971
5	1.90	0.00	40.40	12.48	156.28	12.48	12.48a	9971
6	1.45	0.00	48.81	15.08	188.80	17.24	17.24	9971
7	1.00	0.00	57.04	17.63	220.65	24.99	24.99	9971
8	0.80	0.00	60.66	18.74	234.64	28.55	28.55	9971
		0.00	60.66	15.74	228.83	34.53	34.53	5085
9	0.00	0.00	74.94	20.76	277.99	42.56	42.56	5484
10	-0.65	0.00	86.39	24.78	317.40	50.13	50.13	5808
11	-1.30	0.00	97.75	28.77	356.50	58.03	58.03	6132
12	-1.50	0.00	101.23	29.99	368.48	60.39	60.39	6232
13	-2.00	0.00	109.91	33.04	398.36	66.50	66.50	6481
14	-2.60	0.00	120.29	36.69	434.09	73.84	73.84	6780
15	-3.20	0.00	130.64	40.33	469.73	81.18	81.18	7079
16	-4.00	0.00	144.41	45.16	517.11	90.96	90.96	7478
17	-4.50	5.00	147.99	46.42	529.46	93.54	98.54	7727
18	-5.00	10.00	151.57	47.68	541.78	96.02	106.02	7977
19	-5.80	18.00	157.28	49.68	561.42	99.64	117.64	8376
20	-6.60	26.00	162.97	51.68	581.00	102.58	128.58	8774
		26.00	162.97	47.59	712.00	90.98	116.98	19942
21	-7.35	33.50	168.29	49.14	735.24	101.37	134.87	19942
22	-8.10	41.00	173.59	50.69	758.43	106.78	147.78	19942
		41.00	173.59	36.77	816.86	150.04	191.04	29913
23	-8.58	45.75	178.38	38.13	837.75	161.08	206.83	29913
24	-9.05	50.50	183.16	39.48	858.64	169.83	220.33	29913
25	-9.53	55.25	187.93	40.84	879.51	179.50	234.75	29913
26	-10.00	60.00	192.70	42.19	900.36	197.48	257.48	29913
27	-10.20	62.00	194.71	42.76	909.14	180.86	242.86	29913
28	-11.00	70.00	202.75	45.03	944.23	191.43	261.43	29913
		70.00	202.75	34.73	1002.59	187.33	257.33	49855
29	-12.80	88.00	226.20	41.59	1105.06	220.51	308.51	49855
		88.00	226.20	0.00	6362.43	209.62	297.62	997093
30	-16.00	120.00	280.63	0.00	7118.25	268.88	388.88	997093
31	-18.00	140.00	314.62	0.00	7590.22	302.78	442.78	997093
32	-20.00	160.00	348.59	0.00	8061.94	335.80	495.80	997093

(continued)

Stage No.2 Excavate to elevation 2.00 on RIGHT side

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	9951
5	1.90	0.00	1.70	0.53	6.58	6.58	6.58p	9951
6	1.45	0.00	9.35	2.89	36.17	36.17	36.17p	9951
7	1.00	0.00	17.00	5.25	65.76	40.17	40.17	9951
8	0.80	0.00	20.40	6.30	78.91	39.27	39.27	9951
		0.00	20.40	1.60	90.25	31.55	31.55	5075
9	0.00	0.00	34.00	6.38	137.07	42.69	42.69	5473
10	-0.65	0.00	45.05	10.26	175.12	50.37	50.37	5797
11	-1.30	0.00	56.11	14.14	213.17	57.87	57.87	6120
12	-1.50	0.00	59.51	15.34	224.88	60.19	60.19	6220
13	-2.00	0.00	68.01	18.33	254.15	65.95	65.95	6468
14	-2.60	0.00	78.22	21.91	289.29	72.86	72.86	6767
15	-3.20	0.00	88.43	25.50	324.43	79.77	79.77	7066
16	-4.00	0.00	102.05	30.28	371.30	89.00	89.00	7464
17	-4.50	5.00	105.56	31.52	383.39	91.30	96.30	7712
18	-5.00	10.00	109.07	32.75	395.49	93.70	103.70	7961
19	-5.80	18.00	114.70	34.73	414.86	97.89	115.89	8359
20	-6.60	26.00	120.34	36.71	434.25	102.79	128.79	8757
		26.00	120.34	35.14	525.75	114.70	140.70	19903
21	-7.35	33.50	125.62	36.68	548.85	111.51	145.01	19903
22	-8.10	41.00	130.92	38.23	571.97	113.51	154.51	19903
		41.00	130.92	24.68	630.38	169.27	210.27	29854
23	-8.58	45.75	135.70	26.04	651.27	167.62	213.37	29854
24	-9.05	50.50	140.48	27.39	672.16	168.40	218.90	29854
25	-9.53	55.25	145.26	28.75	693.07	168.35	223.60	29854
26	-10.00	60.00	150.05	30.10	713.99	158.68	218.68	29854
27	-10.20	62.00	152.07	30.67	722.80	180.85	242.85	29854
28	-11.00	70.00	160.14	32.96	758.07	185.65	255.65	29854
		70.00	160.14	22.28	816.43	189.88	259.88	49757
29	-12.80	88.00	183.73	29.18	919.49	203.32	291.32	49757
		88.00	183.73	0.00	5772.70	219.27	307.27	995147
30	-16.00	120.00	238.55	0.00	6534.01	268.89	388.89	995147
31	-18.00	140.00	272.88	0.00	7010.65	302.77	442.77	995147
32	-20.00	160.00	307.24	0.00	7487.86	335.83	495.83	995147

Note: 12.48 a Soil pressure at active limit
36.17 p Soil pressure at passive limit

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Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  B01493
                          Licensed from GEOSOLVE                 | Made by :    DL
Data filename/Run ID: Section_6                                  |
Albert Street Development                                        | Date:16-11-2022
Section 6                                                        | Checked :
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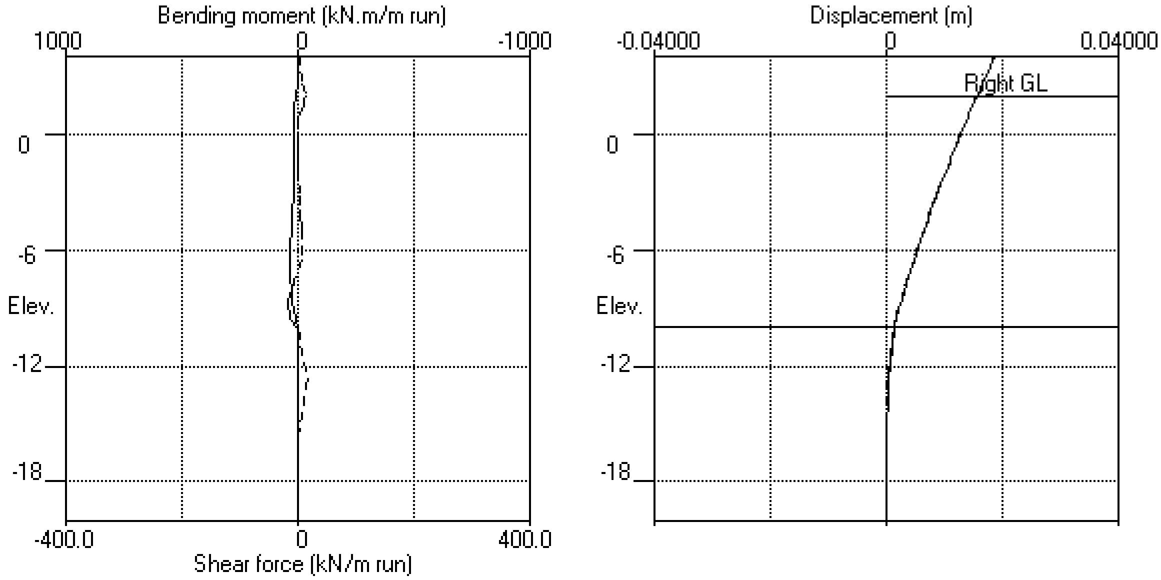
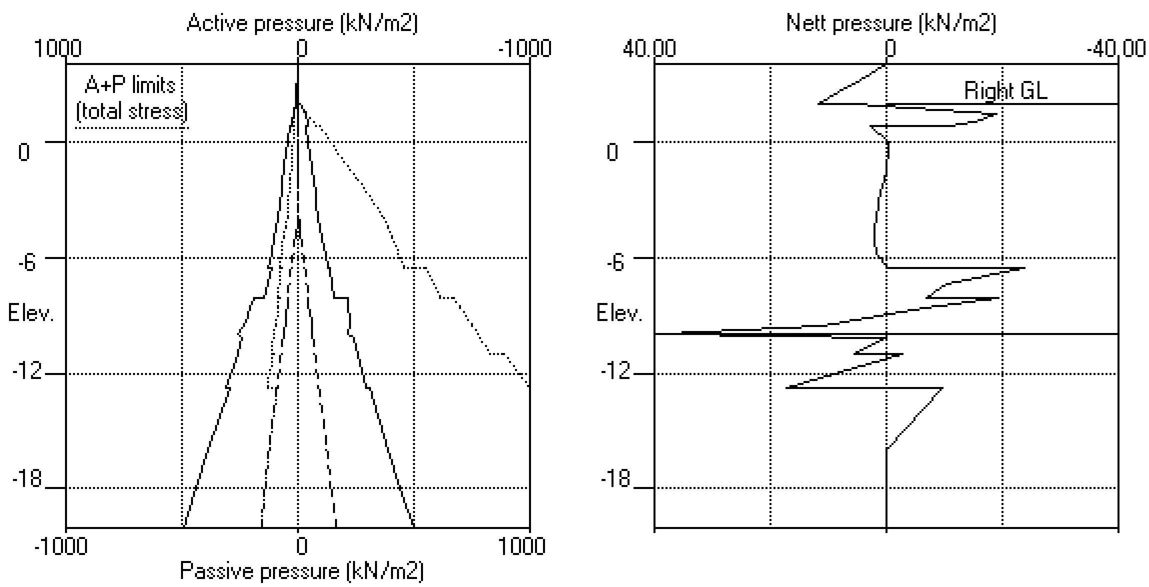
Units: kN,m

Stage No.2 Excav. to elev. 2.00 on RIGHT side

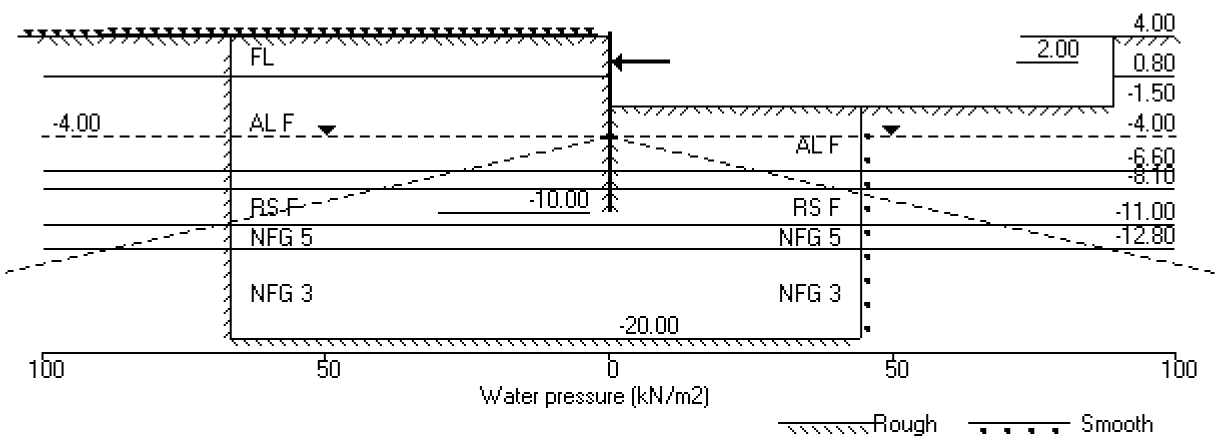


Stage No.2 Excav. to elev. 2.00 on RIGHT side



Units: kN,m

Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -1.50 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -10.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
4	4.00	-1.50	2.00	7.528	n/a	-3.36	1.86	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	-1.48E-04	0.0	-0.0		572444
2	3.20	10.93	0.017	-1.49E-04	4.4	1.2		572444
3	2.60	11.07	0.017	-1.53E-04	11.0	6.3		572444
4	2.00	12.65	0.017	-1.64E-04	18.1	15.3	-127.4	572444
		12.65	0.017	-1.64E-04	-109.3	15.3		
5	1.90	11.44	0.017	-1.66E-04	-108.1	4.5		572444
6	1.45	14.54	0.018	-1.51E-04	-102.3	-42.2		572444
7	1.00	20.39	0.018	-1.00E-04	-94.4	-86.6		572444
8	0.80	21.38	0.018	-6.72E-05	-90.2	-105.1		572444
		30.88	0.018	-6.72E-05	-90.2	-105.1		
9	0.00	38.06	0.018	1.22E-04	-62.7	-166.2		572444
10	-0.65	44.40	0.017	3.29E-04	-35.9	-198.3		572444
11	-1.30	51.47	0.017	5.62E-04	-4.7	-211.7		572444
12	-1.50	53.07	0.017	6.35E-04	5.7	-211.6		572444
		33.04	0.017	6.35E-04	5.7	-211.6		
13	-2.00	11.52	0.017	8.18E-04	16.9	-205.2		572444
14	-2.60	10.64	0.016	1.02E-03	23.5	-193.0		572444
15	-3.20	9.57	0.015	1.22E-03	29.6	-177.0		572444
16	-4.00	9.20	0.014	1.44E-03	37.1	-150.2		572444
17	-4.50	8.68	0.014	1.57E-03	41.6	-130.5		572444
18	-5.00	8.15	0.013	1.67E-03	45.8	-108.7		572444
19	-5.80	6.59	0.011	1.80E-03	51.7	-69.4		572444
20	-6.60	2.80	0.010	1.86E-03	55.4	-26.0		572444
		-49.38	0.010	1.86E-03	55.4	-26.0		
21	-7.35	-23.44	0.009	1.88E-03	28.1	1.7		572444
22	-8.10	-17.49	0.007	1.87E-03	12.8	16.2		572444
		-48.14	0.007	1.87E-03	12.8	16.2		
23	-8.58	-23.25	0.006	1.85E-03	-4.2	16.8		572444
24	-9.05	-9.12	0.005	1.84E-03	-11.9	12.2		572444
25	-9.53	4.90	0.004	1.83E-03	-12.9	5.6		572444
26	-10.00	34.68	0.004	1.83E-03	-3.5	-0.0		0
27	-10.20	0.01	0.003	0	0.0	0.0		0

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
28	-11.00	13.83	0.002	0	5.5	0.0		0
		-6.11	0.002	0	5.5	0.0		
29	-12.80	41.19	0.000	0	37.1	0.0		0
		-23.13	0.000	0	37.1	0.0		
30	-16.00	-0.02	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.07	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 127.4 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Effective stresses Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	10.93	10.93	9971
3	2.60	0.00	26.84	8.29	103.83	11.07	11.07	9971
4	2.00	0.00	38.50	11.90	148.93	12.65	12.65	9971
5	1.90	0.00	40.40	12.48	156.28	11.44	11.44A	9971
6	1.45	0.00	48.81	15.08	188.80	14.54	14.54A	9971
7	1.00	0.00	57.04	17.63	220.65	20.39	20.39	9971
8	0.80	0.00	60.66	18.74	234.64	21.38	21.38	9971
		0.00	60.66	15.74	228.83	30.88	30.88	5085
9	0.00	0.00	74.94	20.76	277.99	38.06	38.06	5484
10	-0.65	0.00	86.39	24.78	317.40	44.40	44.40	5808
11	-1.30	0.00	97.75	28.77	356.50	51.47	51.47	6132
12	-1.50	0.00	101.23	29.99	368.48	53.07	53.07	6232
13	-2.00	0.00	109.91	33.04	398.36	58.62	58.62	6481
14	-2.60	0.00	120.29	36.69	434.09	65.32	65.32	6780
15	-3.20	0.00	130.64	40.33	469.73	72.04	72.04	7079
16	-4.00	0.00	144.41	45.16	517.11	81.47	81.47	7478
17	-4.50	5.00	147.99	46.42	529.46	83.73	88.73	7727
18	-5.00	10.00	151.57	47.68	541.78	85.96	95.96	7977
19	-5.80	18.00	157.28	49.68	561.42	89.13	107.13	8376
20	-6.60	26.00	162.97	51.68	581.00	91.29	117.29	8774
		26.00	162.97	47.59	712.00	65.31	91.31	19942
21	-7.35	33.50	168.29	49.14	735.24	81.85	115.35	19942
22	-8.10	41.00	173.59	50.69	758.43	88.63	129.63	19942
		41.00	173.59	36.77	816.86	122.80	163.80	29913
23	-8.58	45.75	178.38	38.13	837.75	139.91	185.66	29913
24	-9.05	50.50	183.16	39.48	858.64	151.76	202.26	29913
25	-9.53	55.25	187.93	40.84	879.51	163.58	218.83	29913
26	-10.00	60.00	192.70	42.19	900.36	182.66	242.66	29913
27	-10.20	62.00	194.71	42.76	909.14	168.09	230.09	29913
28	-11.00	70.00	202.75	45.03	944.23	182.72	252.72	29913
		70.00	202.75	34.73	1002.59	172.81	242.81	49855
29	-12.80	88.00	226.20	41.59	1105.06	219.81	307.81	49855
		88.00	226.20	0.00	6362.43	195.68	283.68	997093
30	-16.00	120.00	280.63	0.00	7118.25	261.73	381.73	997093
31	-18.00	140.00	314.62	0.00	7590.22	295.58	435.58	997093
32	-20.00	160.00	348.59	0.00	8061.94	327.34	487.34	997093

(continued)

Stage No.4 Excavate to elevation -1.50 on RIGHT side

		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	6226
13	-2.00	0.00	8.50	0.00	49.29	47.10	47.10	6475
14	-2.60	0.00	18.70	1.00	84.40	54.68	54.68	6774
15	-3.20	0.00	28.90	4.59	119.52	62.47	62.47	7073
16	-4.00	0.00	42.51	9.37	166.36	72.27	72.27	7471
17	-4.50	5.00	46.02	10.60	178.43	75.05	80.05	7720
18	-5.00	10.00	49.53	11.83	190.51	77.81	87.81	7969
19	-5.80	18.00	55.15	13.81	209.86	82.54	100.54	8368
20	-6.60	26.00	60.78	15.79	229.25	88.49	114.49	8766
		26.00	60.78	17.75	265.55	114.69	140.69	19923
21	-7.35	33.50	66.07	19.29	288.66	105.29	138.79	19923
22	-8.10	41.00	71.37	20.84	311.83	106.11	147.11	19923
		41.00	71.37	7.81	370.21	170.94	211.94	29884
23	-8.58	45.75	76.16	9.17	391.14	163.15	208.90	29884
24	-9.05	50.50	80.96	10.53	412.09	160.87	211.37	29884
25	-9.53	55.25	85.76	11.89	433.06	158.68	213.93	29884
26	-10.00	60.00	90.56	13.25	454.06	147.98	207.98	29884
27	-10.20	62.00	92.59	13.82	462.90	168.08	230.08	29884
28	-11.00	70.00	100.70	16.12	498.35	168.89	238.89	29884
		70.00	100.70	4.91	556.71	178.92	248.92	49807
29	-12.80	88.00	124.42	11.84	660.34	178.62	266.62	49807
		88.00	124.42	0.00	4949.12	218.81	306.81	996147
30	-16.00	120.00	179.63	0.00	5715.81	261.75	381.75	996147
31	-18.00	140.00	214.30	0.00	6197.31	295.57	435.57	996147
32	-20.00	160.00	249.11	0.00	6680.57	327.40	487.40	996147

Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit
14.54A Arching - soil pressure below active limit

```
EDG CONSULTING PTY LTD                                      | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58         | Job No.  B01493
                            Licensed from GEOSOLVE          | Made by :    DL
Data filename/Run ID: Section_6                             |
Albert Street Development                                   | Date:16-11-2022
Section 6                                                   | Checked :
------------------------------------------------------------------------------
                                                   Units: kN,m
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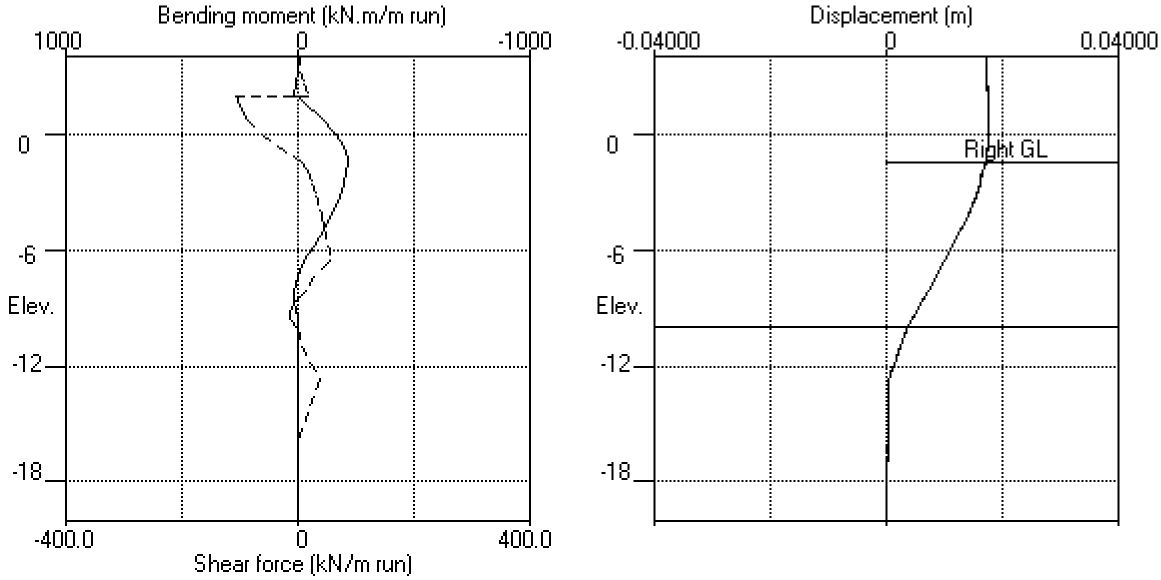
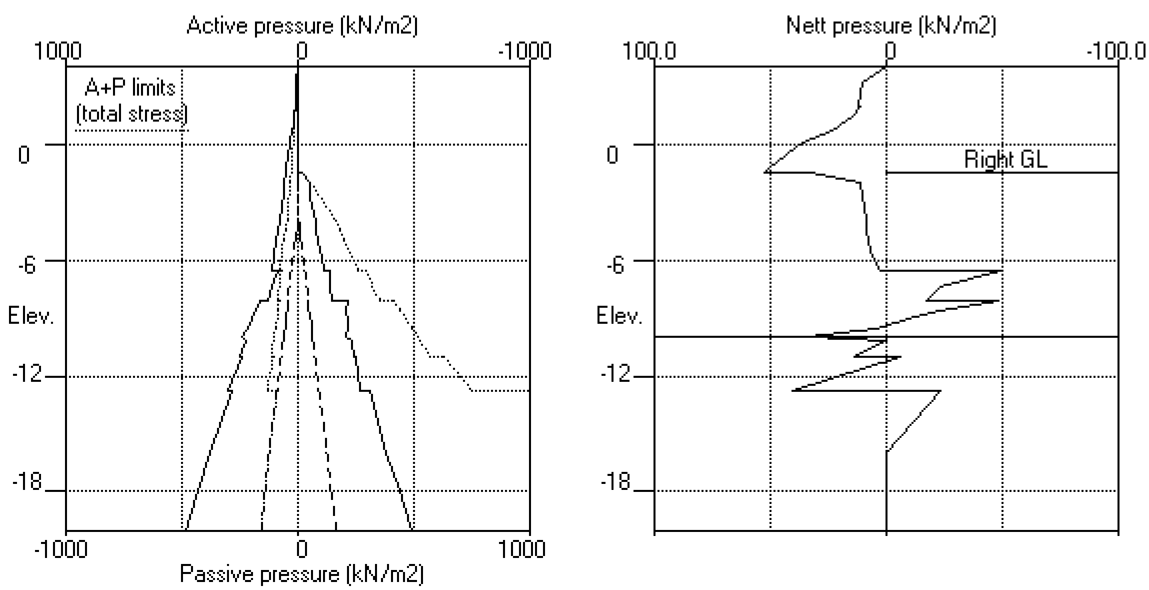
Stage No.4 Excav. to elev. -1.50 on RIGHT side

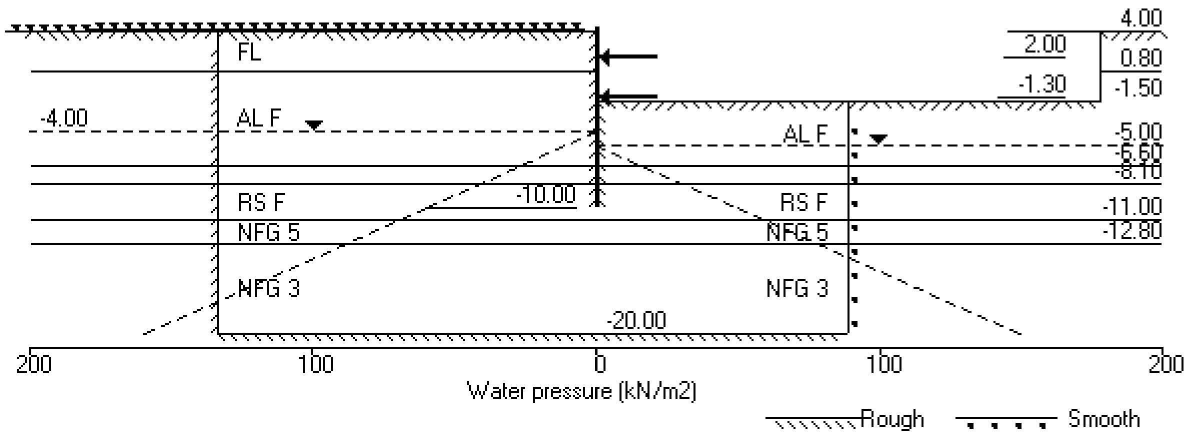


Stage No.4 Excav. to elev. -1.50 on RIGHT side



Units: kN,m

Stage No.6 Apply water pressure profile no.2



Units: kN,m

Stage No. 6 Apply water pressure profile no.2

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
6	4.00	-1.50		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	-1.86E-04	0.0	-0.0		572444
2	3.20	11.20	0.017	-1.87E-04	4.5	1.2		572444
3	2.60	11.29	0.017	-1.91E-04	11.2	6.4		572444
4	2.00	12.84	0.017	-2.02E-04	18.5	15.6	-124.9	572444
		12.84	0.017	-2.02E-04	-106.5	15.6		
5	1.90	11.60	0.017	-2.04E-04	-105.2	5.1		572444
6	1.45	14.69	0.017	-1.90E-04	-99.3	-40.3		572444
7	1.00	20.52	0.018	-1.42E-04	-91.4	-83.4		572444
8	0.80	21.50	0.018	-1.10E-04	-87.2	-101.2		572444
		30.94	0.018	-1.10E-04	-87.2	-101.2		
9	0.00	38.12	0.018	7.24E-05	-59.6	-159.9		572444
10	-0.65	44.44	0.018	2.71E-04	-32.7	-190.0		572444
11	-1.30	51.49	0.017	4.93E-04	-1.6	-201.4	-9.0	572444
		51.49	0.017	4.93E-04	-10.6	-201.4		
12	-1.50	53.05	0.017	5.63E-04	-0.2	-202.4		572444
		33.16	0.017	5.63E-04	-0.2	-202.4		
13	-2.00	11.54	0.017	7.39E-04	11.0	-199.0		572444
14	-2.60	10.49	0.016	9.43E-04	17.6	-190.3		572444
15	-3.20	9.18	0.016	1.13E-03	23.5	-177.8		572444
16	-4.00	8.56	0.015	1.36E-03	30.6	-156.0		572444
17	-4.50	10.65	0.014	1.49E-03	35.4	-139.5		572444
18	-5.00	12.72	0.013	1.61E-03	41.3	-120.4		572444
19	-5.80	10.87	0.012	1.75E-03	50.7	-83.3		572444
20	-6.60	6.77	0.010	1.83E-03	57.8	-39.2		572444
		-47.61	0.010	1.83E-03	57.8	-39.2		
21	-7.35	-21.57	0.009	1.87E-03	31.8	-9.3		572444
22	-8.10	-16.03	0.008	1.87E-03	17.7	8.5		572444
		-48.80	0.008	1.87E-03	17.7	8.5		
23	-8.58	-23.81	0.007	1.86E-03	0.5	11.4		572444
24	-9.05	-10.18	0.006	1.85E-03	-7.6	9.0		572444
25	-9.53	2.40	0.005	1.84E-03	-9.4	4.2		572444
26	-10.00	26.30	0.004	1.84E-03	-2.6	-0.0		0

(continued)

Stage No.6 Apply water pressure profile no.2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.20	0.01	0.004	0	0.0	0.0		0
28	-11.00	15.63	0.003	0	6.3	0.0		0
		-6.91	0.003	0	6.3	0.0		
29	-12.80	46.38	0.000	0	41.8	0.0		0
		-26.05	0.000	0	41.8	0.0		
30	-16.00	-0.02	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.07	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 124.9 kN/m run
At elev. -1.30 Prop force = 9.0 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	11.20	11.20	9971
3	2.60	0.00	26.84	8.29	103.83	11.29	11.29	9971
4	2.00	0.00	38.50	11.90	148.93	12.84	12.84	9971
5	1.90	0.00	40.40	12.48	156.28	11.60	11.60A	9971
6	1.45	0.00	48.81	15.08	188.80	14.69	14.69A	9971
7	1.00	0.00	57.04	17.63	220.65	20.52	20.52	9971
8	0.80	0.00	60.66	18.74	234.64	21.50	21.50	9971
		0.00	60.66	15.74	228.83	30.94	30.94	5085
9	0.00	0.00	74.94	20.76	277.99	38.12	38.12	5484
10	-0.65	0.00	86.39	24.78	317.40	44.44	44.44	5808
11	-1.30	0.00	97.75	28.77	356.50	51.49	51.49	6132
12	-1.50	0.00	101.23	29.99	368.48	53.05	53.05	6232
13	-2.00	0.00	109.91	33.04	398.36	58.55	58.55	6481
14	-2.60	0.00	120.29	36.69	434.09	65.17	65.17	6780
15	-3.20	0.00	130.64	40.33	469.73	71.79	71.79	7079
16	-4.00	0.00	144.41	45.16	517.11	81.10	81.10	7478
17	-4.50	5.00	147.99	46.42	529.46	83.24	88.24	7727
18	-5.00	10.00	151.57	47.68	541.78	85.35	95.35	7977
19	-5.80	18.00	157.28	49.68	561.42	88.38	106.38	8376
20	-6.60	26.00	162.97	51.68	581.00	90.41	116.41	8774
		26.00	162.97	47.59	712.00	63.31	89.31	19942
21	-7.35	33.50	168.29	49.14	735.24	79.90	113.40	19942
22	-8.10	41.00	173.59	50.69	758.43	86.48	127.48	19942
		41.00	173.59	36.77	816.86	119.58	160.58	29913
23	-8.58	45.75	178.38	38.13	837.75	136.74	182.49	29913
24	-9.05	50.50	183.16	39.48	858.64	148.34	198.84	29913
25	-9.53	55.25	187.93	40.84	879.51	159.44	214.69	29913
26	-10.00	60.00	192.70	42.19	900.36	175.70	235.70	29913
27	-10.20	62.00	194.71	42.76	909.14	165.16	227.16	29913
28	-11.00	70.00	202.75	45.03	944.23	180.75	250.75	29913
		70.00	202.75	34.73	1002.59	169.53	239.53	49855
29	-12.80	88.00	226.20	41.59	1105.06	219.55	307.55	49855
		88.00	226.20	0.00	6362.43	190.48	278.48	997093
30	-16.00	120.00	280.63	0.00	7118.25	258.00	378.00	997093
31	-18.00	140.00	314.62	0.00	7590.22	291.82	431.82	997093
32	-20.00	160.00	348.59	0.00	8061.94	323.02	483.02	997093

(continued)

Stage No.6 Apply water pressure profile no.2

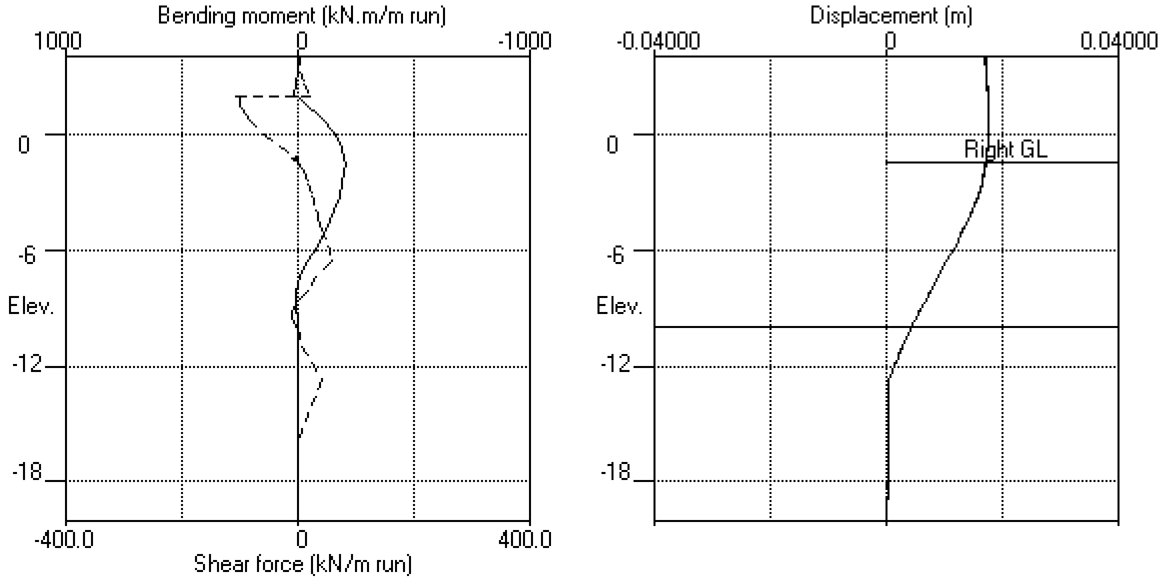
		RIGHT side						
			Effective stresses				Total	Adjusted
Node	Y	Water	Vertic	Active	Passive	Earth	earth	soil
no.	coord	press.	-al	limit	limit	pressure	pressure	modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.89	19.89	6226
13	-2.00	0.00	8.50	0.00	49.29	47.01	47.01	6475
14	-2.60	0.00	18.70	1.00	84.40	54.68	54.68	6774
15	-3.20	0.00	28.90	4.59	119.52	62.61	62.61	7073
16	-4.00	0.00	42.51	9.37	166.36	72.54	72.54	7471
17	-4.50	0.00	51.02	12.36	195.64	77.59	77.59	7720
18	-5.00	0.00	59.53	15.35	224.93	82.63	82.63	7969
19	-5.80	8.00	65.15	17.32	244.29	87.51	95.51	8368
20	-6.60	16.00	70.78	19.30	263.67	93.63	109.63	8766
		16.00	70.78	20.67	309.24	120.92	136.92	19923
21	-7.35	23.50	76.07	22.21	332.35	111.48	134.98	19923
22	-8.10	31.00	81.37	23.76	355.52	112.51	143.51	19923
		31.00	81.37	10.64	413.91	178.39	209.39	29884
23	-8.58	35.75	86.16	12.00	434.83	170.55	206.30	29884
24	-9.05	40.50	90.96	13.36	455.78	168.52	209.02	29884
25	-9.53	45.25	95.76	14.72	476.75	167.04	212.29	29884
26	-10.00	50.00	100.56	16.08	497.75	159.40	209.40	29884
27	-10.20	52.00	102.59	16.65	506.60	175.15	227.15	29884
28	-11.00	60.00	110.70	18.95	542.04	175.12	235.12	29884
		60.00	110.70	7.83	600.40	186.45	246.45	49807
29	-12.80	78.00	134.42	14.77	704.03	183.17	261.17	49807
		78.00	134.42	0.00	5087.98	226.53	304.53	996147
30	-16.00	110.00	189.63	0.00	5854.67	268.01	378.01	996147
31	-18.00	130.00	224.30	0.00	6336.17	301.82	431.82	996147
32	-20.00	150.00	259.11	0.00	6819.43	333.09	483.09	996147

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
14.69A Arching - soil pressure below active limit

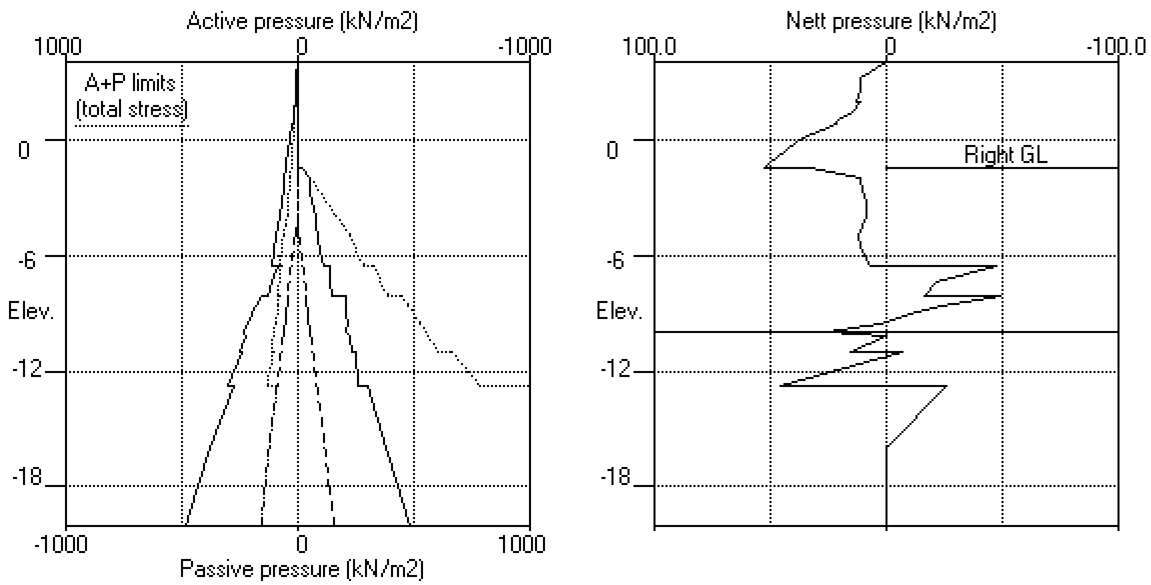
EDG CONSULTING PTY LTD | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. B01493
Licensed from GEOSOLVE | Made by : DL
Data filename/Run ID: Section_6 |
Albert Street Development | Date:16-11-2022
Section 6 | Checked :

Units: kN,m

Stage No.6 Apply water pressure profile no.2



Stage No.6 Apply water pressure profile no.2



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Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  B01493
                             Licensed from GEOSOLVE              | Made by :    DL
Data filename/Run ID: Section_6                                  |
Albert Street Development                                        | Date:16-11-2022
Section 6                                                        | Checked :
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                                                        Units: kN,m
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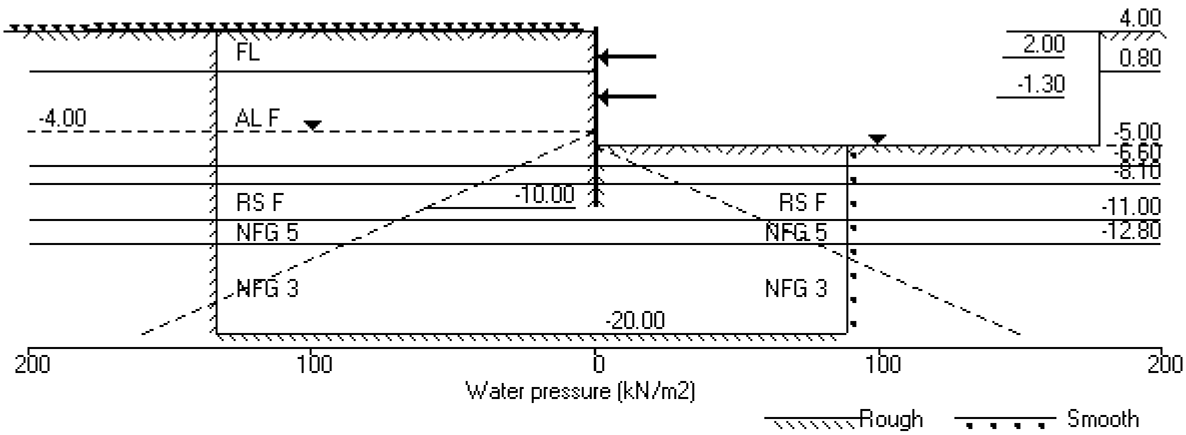
Stage No.7 Excav. to elev. -5.00 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -5.00 on RIGHT side

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
7	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.07E-03	0.0	-0.0		572444
2	3.20	16.68	0.016	-1.07E-03	6.7	1.2		572444
3	2.60	15.10	0.016	-1.08E-03	16.2	8.7		572444
4	2.00	15.78	0.017	-1.09E-03	25.5	21.6	-100.7	572444
		15.78	0.017	-1.09E-03	-75.3	21.6		
5	1.90	13.82	0.017	-1.10E-03	-73.8	14.2		572444
6	1.45	16.27	0.018	-1.10E-03	-67.0	-16.8		572444
7	1.00	21.36	0.018	-1.07E-03	-58.5	-45.2		572444
8	0.80	21.51	0.018	-1.05E-03	-54.3	-56.4		572444
		30.94	0.018	-1.05E-03	-54.3	-56.4		
9	0.00	37.90	0.019	-9.58E-04	-26.7	-88.7		572444
10	-0.65	43.62	0.020	-8.52E-04	-0.2	-97.5		572444
11	-1.30	50.02	0.020	-7.47E-04	30.2	-87.9	-225.1	572444
		50.02	0.020	-7.47E-04	-194.9	-87.9		
12	-1.50	50.68	0.020	-7.10E-04	-184.8	-125.9		572444
13	-2.00	55.07	0.021	-5.62E-04	-158.4	-211.4		572444
14	-2.60	60.08	0.021	-2.96E-04	-123.8	-296.1		572444
15	-3.20	64.75	0.021	4.66E-05	-86.4	-359.1		572444
16	-4.00	72.34	0.021	5.81E-04	-31.6	-406.4		572444
17	-4.50	77.97	0.020	9.39E-04	6.0	-412.8		572444
18	-5.00	83.81	0.020	1.29E-03	46.5	-399.7		572444
		63.78	0.020	1.29E-03	46.5	-399.7		
19	-5.80	46.19	0.019	1.81E-03	90.5	-343.7		572444
20	-6.60	27.66	0.017	2.23E-03	120.0	-257.9		572444
		-7.81	0.017	2.23E-03	120.0	-257.9		
21	-7.35	-9.21	0.015	2.51E-03	113.6	-173.2		572444
22	-8.10	-25.01	0.013	2.69E-03	100.8	-91.9		572444
		-63.55	0.013	2.69E-03	100.8	-91.9		
23	-8.58	-61.05	0.012	2.74E-03	71.2	-51.2		572444
24	-9.05	-47.09	0.011	2.78E-03	45.5	-24.2		572444
25	-9.53	-37.13	0.009	2.79E-03	25.5	-7.9		572444
26	-10.00	-49.45	0.008	2.79E-03	4.9	-0.0		0

(continued)

Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.20	0.00	0.007	0	0.0	0.0		0
28	-11.00	23.72	0.005	0	9.5	0.0		0
		-10.52	0.005	0	9.5	0.0		
29	-12.80	70.61	0.001	0	63.6	0.0		0
		-39.67	0.001	0	63.6	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 100.7 kN/m run
At elev. -1.30 Prop force = 225.1 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	16.68	16.68	9971
3	2.60	0.00	26.84	8.29	103.83	15.10	15.10	9971
4	2.00	0.00	38.50	11.90	148.93	15.78	15.78	9971
5	1.90	0.00	40.40	12.48	156.28	13.82	13.82	9971
6	1.45	0.00	48.81	15.08	188.80	16.27	16.27	9971
7	1.00	0.00	57.04	17.63	220.65	21.36	21.36	9971
8	0.80	0.00	60.66	18.74	234.64	21.51	21.51	9971
		0.00	60.66	15.74	228.83	30.94	30.94	5085
9	0.00	0.00	74.94	20.76	277.99	37.90	37.90	5484
10	-0.65	0.00	86.39	24.78	317.40	43.62	43.62	5808
11	-1.30	0.00	97.75	28.77	356.50	50.02	50.02	6132
12	-1.50	0.00	101.23	29.99	368.48	50.68	50.68	6232
13	-2.00	0.00	109.91	33.04	398.36	55.07	55.07	6481
14	-2.60	0.00	120.29	36.69	434.09	60.08	60.08	6780
15	-3.20	0.00	130.64	40.33	469.73	64.75	64.75	7079
16	-4.00	0.00	144.41	45.16	517.11	72.34	72.34	7478
17	-4.50	5.00	147.99	46.42	529.46	72.97	77.97	7727
18	-5.00	10.00	151.57	47.68	541.78	73.81	83.81	7977
19	-5.80	18.00	157.28	49.68	561.42	75.50	93.50	8376
20	-6.60	26.00	162.97	51.68	581.00	76.25	102.25	8774
		26.00	162.97	47.59	712.00	31.14	57.14A	19942
21	-7.35	33.50	168.29	49.14	735.24	52.71	86.21	19942
22	-8.10	41.00	173.59	50.69	758.43	59.93	100.93	19942
		41.00	173.59	36.77	816.86	79.76	120.76	29913
23	-8.58	45.75	178.38	38.13	837.75	103.08	148.83	29913
24	-9.05	50.50	183.16	39.48	858.64	116.94	167.44	29913
25	-9.53	55.25	187.93	40.84	879.51	126.64	181.89	29913
26	-10.00	60.00	192.70	42.19	900.36	125.83	185.83	29913
27	-10.20	62.00	194.71	42.76	909.14	151.78	213.78	29913
28	-11.00	70.00	202.75	45.03	944.23	171.96	241.96	29913
		70.00	202.75	34.73	1002.59	154.88	224.88	49855
29	-12.80	88.00	226.20	41.59	1105.06	218.85	306.85	49855
		88.00	226.20	0.00	6362.43	176.48	264.48	997093
30	-16.00	120.00	280.63	0.00	7118.25	250.77	370.77	997093
31	-18.00	140.00	314.62	0.00	7590.22	284.48	424.48	997093
32	-20.00	160.00	348.59	0.00	8061.94	314.30	474.30	997093

(continued)

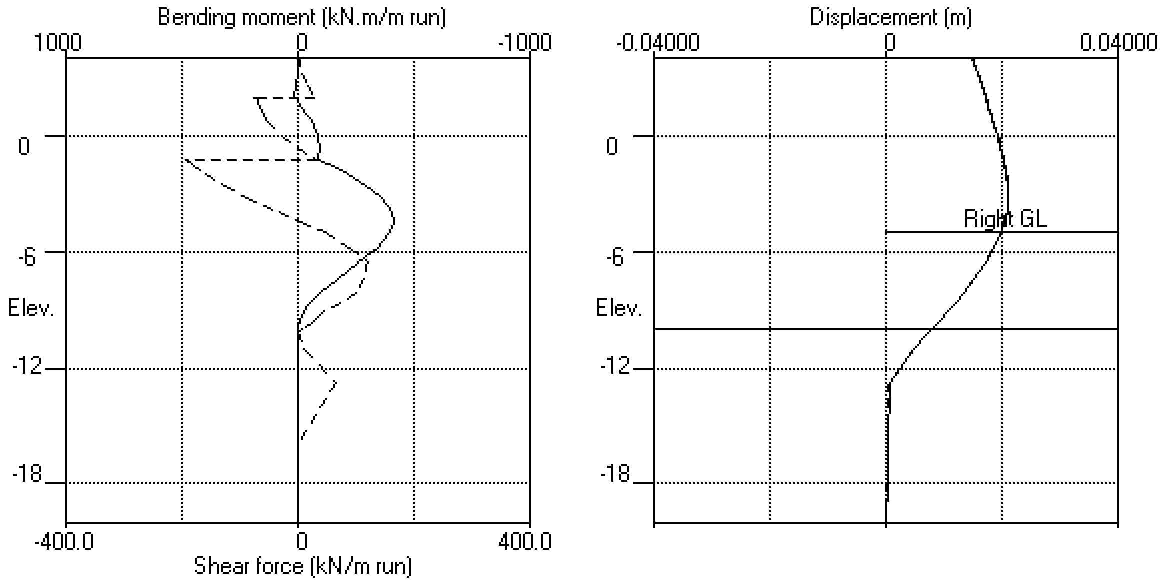
Stage No.7 Excavate to elevation -5.00 on RIGHT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
		RIGHT side						
			Effective stresses					
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.80	8.00	5.60	0.00	39.31	39.31	47.31p	8376
20	-6.60	16.00	11.20	0.00	58.60	58.60	74.60p	8775
		16.00	11.20	3.27	48.95	48.95	64.95p	19943
21	-7.35	23.50	16.46	4.81	71.93	71.93	95.43p	19943
22	-8.10	31.00	21.73	6.35	94.94	94.94	125.94p	19943
		31.00	21.73	0.00	153.31	153.31	184.31p	29915
23	-8.58	35.75	26.50	0.00	174.13	174.13	209.88p	29915
24	-9.05	40.50	31.27	0.00	194.98	174.03	214.53	29915
25	-9.53	45.25	36.04	0.00	215.84	173.77	219.02	29915
26	-10.00	50.00	40.82	0.00	236.74	185.28	235.28	29915
27	-10.20	52.00	42.84	0.00	245.54	161.78	213.78	29915
28	-11.00	60.00	50.91	2.01	280.82	158.24	218.24	29915
		60.00	50.91	0.00	339.18	175.40	235.40	49858
29	-12.80	78.00	74.56	0.00	442.50	158.25	236.25	49858
		78.00	74.56	0.00	4256.83	226.15	304.15	997169
30	-16.00	110.00	129.74	0.00	5023.01	260.79	370.79	997169
31	-18.00	130.00	164.48	0.00	5505.38	294.48	424.48	997169
32	-20.00	150.00	199.42	0.00	5990.65	324.38	474.38	997169

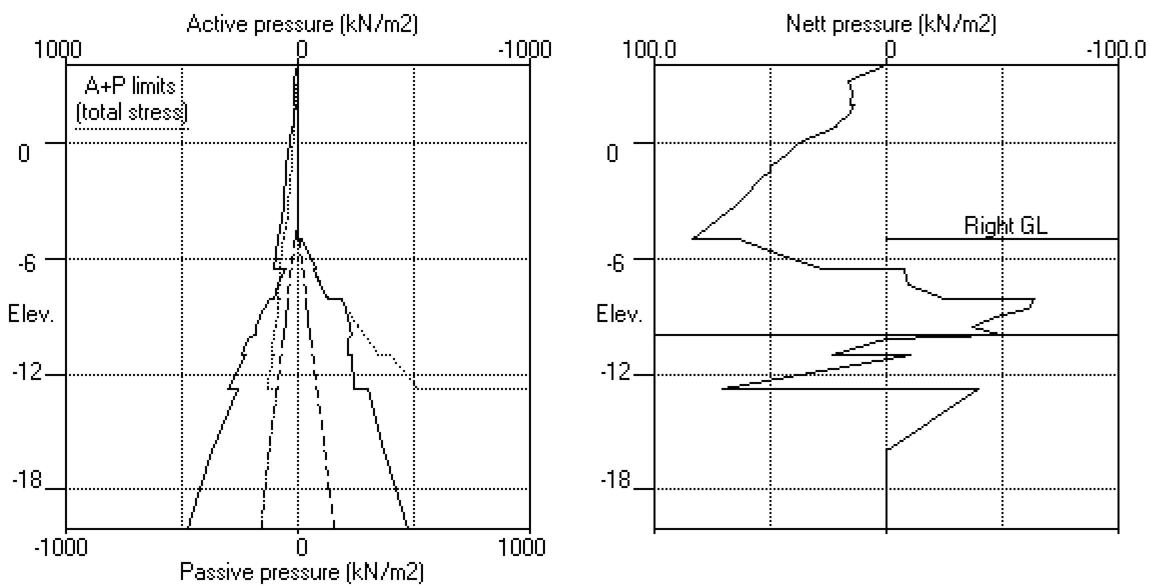
Note: 12.34 a Soil pressure at active limit
209.88 p Soil pressure at passive limit
57.14A Arching - soil pressure below active limit

Units: kN,m

Stage No.7 Excav. to elev. -5.00 on RIGHT side



Stage No.7 Excav. to elev. -5.00 on RIGHT side



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Program: WALLAP  Version 6.07  Revision A55.B74.R58         | Job No.  B01493
                            Licensed from GEOSOLVE          | Made by :    DL
Data filename/Run ID: Section_6                             |
Albert Street Development                                   | Date:16-11-2022
Section 6                                                   | Checked :
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                                                     Units: kN,m
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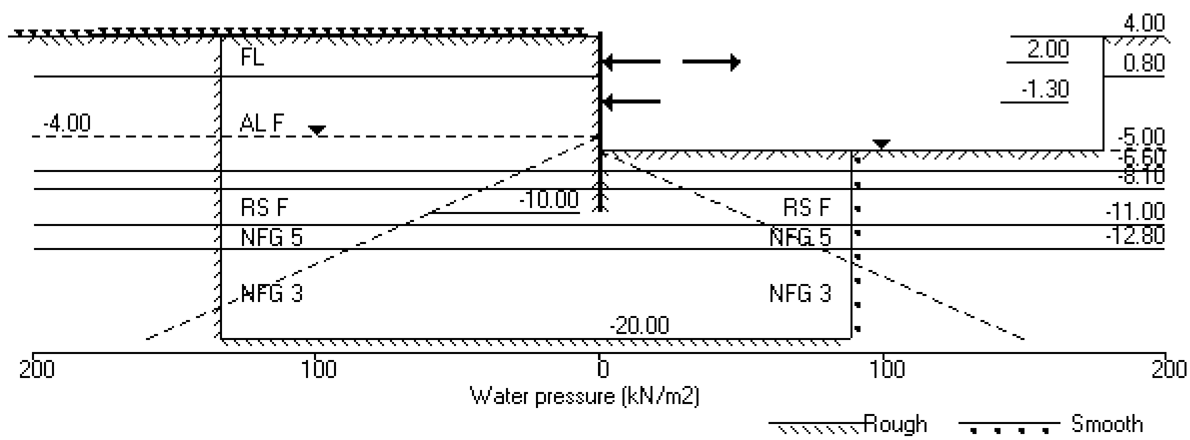
Stage No.8 Apply load no.1 at elev. 1.90



Units: kN,m

Stage No. 8 Apply load no.1 at elevation 1.90

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

				FoS for toe elev. = -10.00		Toe elev. for FoS = 1.500		
Stage No.	Ground level Act.	Pass.	Prop Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
8	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.016	-9.44E-04	0.0	-0.0		572444
2	3.20	15.26	0.016	-9.45E-04	6.1	1.2		572444
3	2.60	14.07	0.017	-9.50E-04	14.9	8.1		572444
4	2.00	14.92	0.018	-9.64E-04	23.6	20.1	-141.8	572444
		14.92	0.018	-9.64E-04	-118.2	20.1		
5	1.90	13.11	0.018	-9.67E-04	-116.8	8.3	51.2	572444
		13.11	0.018	-9.67E-04	-65.6	8.3		
6	1.45	15.71	0.018	-9.63E-04	-59.1	-19.1		572444
7	1.00	20.99	0.019	-9.38E-04	-50.9	-43.9		572444
8	0.80	21.34	0.019	-9.21E-04	-46.6	-53.7		572444
		30.86	0.019	-9.21E-04	-46.6	-53.7		
9	0.00	37.79	0.019	-8.27E-04	-19.2	-79.9		572444
10	-0.65	43.58	0.020	-7.34E-04	7.3	-83.9		572444
11	-1.30	50.04	0.020	-6.47E-04	37.7	-69.4	-235.7	572444
		50.04	0.020	-6.47E-04	-198.0	-69.4		
12	-1.50	50.75	0.021	-6.16E-04	-187.9	-108.0		572444
13	-2.00	55.16	0.021	-4.84E-04	-161.4	-195.1		572444
14	-2.60	60.21	0.021	-2.34E-04	-126.8	-281.6		572444
15	-3.20	64.91	0.021	9.43E-05	-89.3	-346.3		572444
16	-4.00	72.52	0.021	6.13E-04	-34.3	-395.9		572444
17	-4.50	78.15	0.020	9.62E-04	3.3	-403.7		572444
18	-5.00	83.99	0.020	1.30E-03	43.9	-391.9		572444
		64.02	0.020	1.30E-03	43.9	-391.9		
19	-5.80	46.46	0.019	1.81E-03	88.1	-337.9		572444
20	-6.60	27.94	0.017	2.23E-03	117.8	-253.9		572444
		-7.17	0.017	2.23E-03	117.8	-253.9		
21	-7.35	-8.67	0.015	2.51E-03	111.9	-170.6		572444
22	-8.10	-24.50	0.013	2.68E-03	99.4	-90.5		572444
		-62.79	0.013	2.68E-03	99.4	-90.5		
23	-8.58	-60.43	0.012	2.74E-03	70.2	-50.3		572444
24	-9.05	-46.53	0.011	2.77E-03	44.8	-23.8		572444
25	-9.53	-36.56	0.009	2.78E-03	25.0	-7.8		572444

(continued)

Stage No.8 Apply load no.1 at elevation 1.90

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
26	-10.00	-48.48	0.008	2.78E-03	4.8	-0.0		0
27	-10.20	0.00	0.007	0	0.0	0.0		0
28	-11.00	23.72	0.005	0	9.5	0.0		0
		-10.52	0.005	0	9.5	0.0		
29	-12.80	70.61	0.001	0	63.6	0.0		0
		-39.67	0.001	0	63.6	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 141.8 kN/m run
At elev. -1.30 Prop force = 235.7 kN/m run

LEFT side

			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	15.26	15.26	9971
3	2.60	0.00	26.84	8.29	103.83	14.07	14.07	9971
4	2.00	0.00	38.50	11.90	148.93	14.92	14.92	9971
5	1.90	0.00	40.40	12.48	156.28	13.11	13.11	9971
6	1.45	0.00	48.81	15.08	188.80	15.71	15.71	9971
7	1.00	0.00	57.04	17.63	220.65	20.99	20.99	9971
8	0.80	0.00	60.66	18.74	234.64	21.34	21.34	9971
		0.00	60.66	15.74	228.83	30.86	30.86	5085
9	0.00	0.00	74.94	20.76	277.99	37.79	37.79	5484
10	-0.65	0.00	86.39	24.78	317.40	43.58	43.58	5808
11	-1.30	0.00	97.75	28.77	356.50	50.04	50.04	6132
12	-1.50	0.00	101.23	29.99	368.48	50.75	50.75	6232
13	-2.00	0.00	109.91	33.04	398.36	55.16	55.16	6481
14	-2.60	0.00	120.29	36.69	434.09	60.21	60.21	6780
15	-3.20	0.00	130.64	40.33	469.73	64.91	64.91	7079
16	-4.00	0.00	144.41	45.16	517.11	72.52	72.52	7478
17	-4.50	5.00	147.99	46.42	529.46	73.15	78.15	7727
18	-5.00	10.00	151.57	47.68	541.78	73.99	83.99	7977
19	-5.80	18.00	157.28	49.68	561.42	75.67	93.67	8376
20	-6.60	26.00	162.97	51.68	581.00	76.41	102.41	8774
		26.00	162.97	47.59	712.00	31.50	57.50A	19942
21	-7.35	33.50	168.29	49.14	735.24	53.01	86.51	19942
22	-8.10	41.00	173.59	50.69	758.43	60.20	101.20	19942
		41.00	173.59	36.77	816.86	80.16	121.16	29913
23	-8.58	45.75	178.38	38.13	837.75	103.41	149.16	29913
24	-9.05	50.50	183.16	39.48	858.64	117.24	167.74	29913
25	-9.53	55.25	187.93	40.84	879.51	126.94	182.19	29913
26	-10.00	60.00	192.70	42.19	900.36	126.31	186.31	29913
27	-10.20	62.00	194.71	42.76	909.14	151.80	213.80	29913
28	-11.00	70.00	202.75	45.03	944.23	171.96	241.96	29913
		70.00	202.75	34.73	1002.59	154.89	224.89	49855
29	-12.80	88.00	226.20	41.59	1105.06	218.85	306.85	49855
		88.00	226.20	0.00	6362.43	176.49	264.49	997093
30	-16.00	120.00	280.63	0.00	7118.25	250.78	370.78	997093
31	-18.00	140.00	314.62	0.00	7590.22	284.49	424.49	997093
32	-20.00	160.00	348.59	0.00	8061.94	314.30	474.30	997093

(continued)

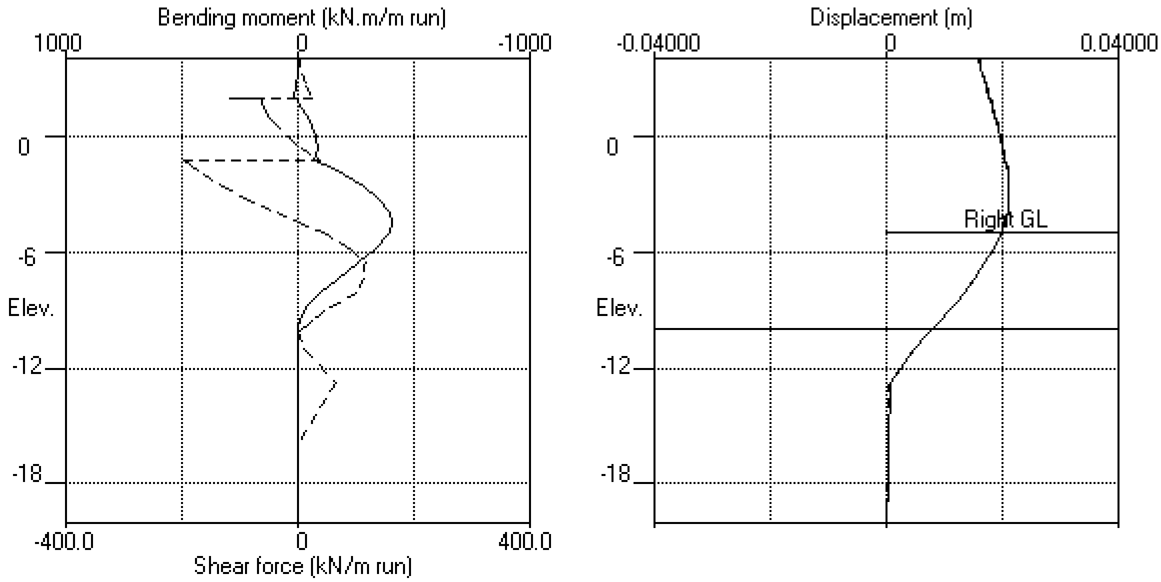
Stage No.8 Apply load no.1 at elevation 1.90

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.97	19.97	7977
19	-5.80	8.00	5.60	0.00	39.31	39.21	47.21	8376
20	-6.60	16.00	11.20	0.00	58.60	58.48	74.48	8775
		16.00	11.20	3.27	48.95	48.68	64.68	19943
21	-7.35	23.50	16.46	4.81	71.93	71.69	95.19	19943
22	-8.10	31.00	21.73	6.35	94.94	94.70	125.70	19943
		31.00	21.73	0.00	153.31	152.95	183.95	29915
23	-8.58	35.75	26.50	0.00	174.13	173.84	209.59	29915
24	-9.05	40.50	31.27	0.00	194.98	173.77	214.27	29915
25	-9.53	45.25	36.04	0.00	215.84	173.50	218.75	29915
26	-10.00	50.00	40.82	0.00	236.74	184.79	234.79	29915
27	-10.20	52.00	42.84	0.00	245.54	161.79	213.79	29915
28	-11.00	60.00	50.91	2.01	280.82	158.24	218.24	29915
		60.00	50.91	0.00	339.18	175.40	235.40	49858
29	-12.80	78.00	74.56	0.00	442.50	158.25	236.25	49858
		78.00	74.56	0.00	4256.83	226.17	304.17	997169
30	-16.00	110.00	129.74	0.00	5023.01	260.79	370.79	997169
31	-18.00	130.00	164.48	0.00	5505.38	294.48	424.48	997169
32	-20.00	150.00	199.42	0.00	5990.65	324.38	474.38	997169

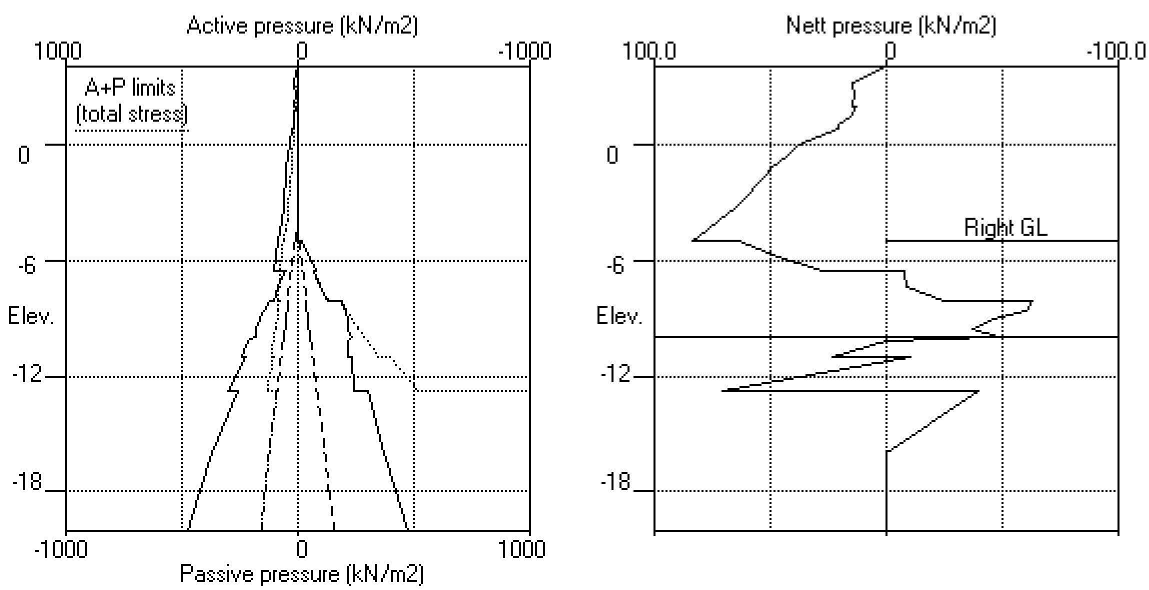
Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
57.50A Arching - soil pressure below active limit

Units: kN,m

Stage No.8 Apply load no.1 at elev. 1.90

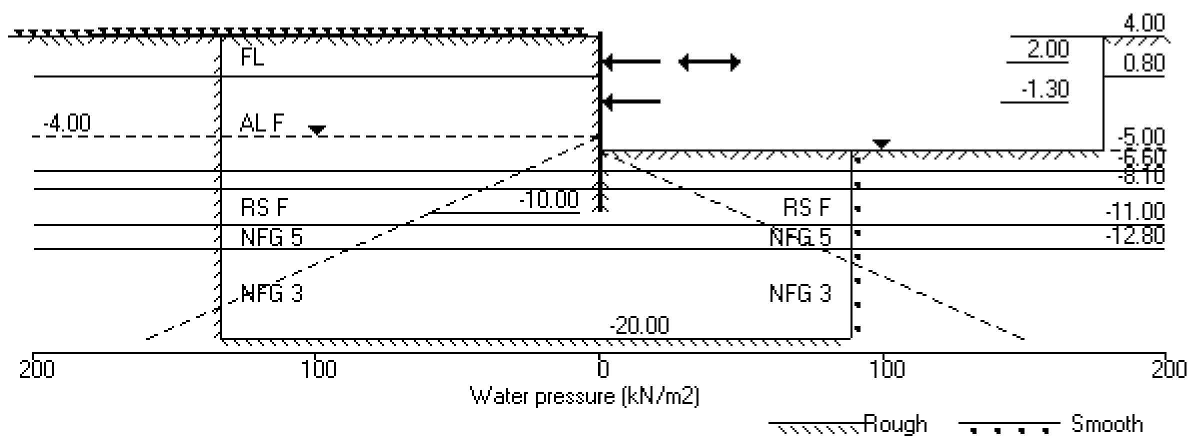


Stage No.8 Apply load no.1 at elev. 1.90



Units: kN,m

Stage No.9 Apply load no.2 at elev. 1.90



Units: kN,m

Stage No. 9 Apply load no.2 at elevation 1.90

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr-ation	Direction of failure
9	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall
Analysis options
Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.07E-03	0.0	-0.0		572444
2	3.20	16.68	0.016	-1.07E-03	6.7	1.2		572444
3	2.60	15.10	0.016	-1.08E-03	16.2	8.7		572444
4	2.00	15.78	0.017	-1.09E-03	25.5	21.6	-100.7	572444
		15.78	0.017	-1.09E-03	-75.3	21.6		
5	1.90	13.82	0.017	-1.10E-03	-73.8	14.2		572444
6	1.45	16.27	0.018	-1.10E-03	-67.0	-16.8		572444
7	1.00	21.36	0.018	-1.07E-03	-58.5	-45.2		572444
8	0.80	21.51	0.018	-1.05E-03	-54.3	-56.4		572444
		30.94	0.018	-1.05E-03	-54.3	-56.4		
9	0.00	37.90	0.019	-9.58E-04	-26.7	-88.7		572444
10	-0.65	43.62	0.020	-8.52E-04	-0.2	-97.5		572444
11	-1.30	50.02	0.020	-7.47E-04	30.2	-87.9	-225.1	572444
		50.02	0.020	-7.47E-04	-194.9	-87.9		
12	-1.50	50.68	0.020	-7.10E-04	-184.8	-125.9		572444
13	-2.00	55.07	0.021	-5.62E-04	-158.4	-211.4		572444
14	-2.60	60.08	0.021	-2.96E-04	-123.8	-296.1		572444
15	-3.20	64.75	0.021	4.66E-05	-86.4	-359.1		572444
16	-4.00	72.34	0.021	5.81E-04	-31.6	-406.4		572444
17	-4.50	77.97	0.020	9.39E-04	6.0	-412.8		572444
18	-5.00	83.81	0.020	1.29E-03	46.5	-399.7		572444
		63.78	0.020	1.29E-03	46.5	-399.7		
19	-5.80	46.19	0.019	1.81E-03	90.5	-343.7		572444
20	-6.60	27.66	0.017	2.23E-03	120.0	-257.9		572444
		-7.81	0.017	2.23E-03	120.0	-257.9		
21	-7.35	-9.21	0.015	2.51E-03	113.6	-173.2		572444
22	-8.10	-25.01	0.013	2.69E-03	100.8	-91.9		572444
		-63.55	0.013	2.69E-03	100.8	-91.9		
23	-8.58	-61.05	0.012	2.74E-03	71.2	-51.2		572444
24	-9.05	-47.09	0.011	2.78E-03	45.5	-24.2		572444
25	-9.53	-37.13	0.009	2.79E-03	25.5	-7.9		572444
26	-10.00	-49.45	0.008	2.79E-03	4.9	-0.0		0

(continued)

Stage No.9 Apply load no.2 at elevation 1.90

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.20	0.00	0.007	0	0.0	0.0		0
28	-11.00	23.72	0.005	0	9.5	0.0		0
		-10.52	0.005	0	9.5	0.0		
29	-12.80	70.61	0.001	0	63.6	0.0		0
		-39.67	0.001	0	63.6	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 100.7 kN/m run
At elev. -1.30 Prop force = 225.1 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	16.68	16.68	9971
3	2.60	0.00	26.84	8.29	103.83	15.10	15.10	9971
4	2.00	0.00	38.50	11.90	148.93	15.78	15.78	9971
5	1.90	0.00	40.40	12.48	156.28	13.82	13.82	9971
6	1.45	0.00	48.81	15.08	188.80	16.27	16.27	9971
7	1.00	0.00	57.04	17.63	220.65	21.36	21.36	9971
8	0.80	0.00	60.66	18.74	234.64	21.51	21.51	9971
		0.00	60.66	15.74	228.83	30.94	30.94	5085
9	0.00	0.00	74.94	20.76	277.99	37.90	37.90	5484
10	-0.65	0.00	86.39	24.78	317.40	43.62	43.62	5808
11	-1.30	0.00	97.75	28.77	356.50	50.02	50.02	6132
12	-1.50	0.00	101.23	29.99	368.48	50.68	50.68	6232
13	-2.00	0.00	109.91	33.04	398.36	55.07	55.07	6481
14	-2.60	0.00	120.29	36.69	434.09	60.08	60.08	6780
15	-3.20	0.00	130.64	40.33	469.73	64.75	64.75	7079
16	-4.00	0.00	144.41	45.16	517.11	72.34	72.34	7478
17	-4.50	5.00	147.99	46.42	529.46	72.97	77.97	7727
18	-5.00	10.00	151.57	47.68	541.78	73.81	83.81	7977
19	-5.80	18.00	157.28	49.68	561.42	75.50	93.50	8376
20	-6.60	26.00	162.97	51.68	581.00	76.25	102.25	8774
		26.00	162.97	47.59	712.00	31.14	57.14A	19942
21	-7.35	33.50	168.29	49.14	735.24	52.71	86.21	19942
22	-8.10	41.00	173.59	50.69	758.43	59.93	100.93	19942
		41.00	173.59	36.77	816.86	79.76	120.76	29913
23	-8.58	45.75	178.38	38.13	837.75	103.08	148.83	29913
24	-9.05	50.50	183.16	39.48	858.64	116.94	167.44	29913
25	-9.53	55.25	187.93	40.84	879.51	126.64	181.89	29913
26	-10.00	60.00	192.70	42.19	900.36	125.83	185.83	29913
27	-10.20	62.00	194.71	42.76	909.14	151.78	213.78	29913
28	-11.00	70.00	202.75	45.03	944.23	171.96	241.96	29913
		70.00	202.75	34.73	1002.59	154.88	224.88	49855
29	-12.80	88.00	226.20	41.59	1105.06	218.85	306.85	49855
		88.00	226.20	0.00	6362.43	176.48	264.48	997093
30	-16.00	120.00	280.63	0.00	7118.25	250.77	370.77	997093
31	-18.00	140.00	314.62	0.00	7590.22	284.48	424.48	997093
32	-20.00	160.00	348.59	0.00	8061.94	314.30	474.30	997093

(continued)

Stage No.9 Apply load no.2 at elevation 1.90

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.80	8.00	5.60	0.00	39.31	39.31	47.31p	8376
20	-6.60	16.00	11.20	0.00	58.60	58.60	74.60p	8775
		16.00	11.20	3.27	48.95	48.95	64.95p	19943
21	-7.35	23.50	16.46	4.81	71.93	71.93	95.43p	19943
22	-8.10	31.00	21.73	6.35	94.94	94.94	125.94p	19943
		31.00	21.73	0.00	153.31	153.31	184.31p	29915
23	-8.58	35.75	26.50	0.00	174.13	174.13	209.88p	29915
24	-9.05	40.50	31.27	0.00	194.98	174.03	214.53	29915
25	-9.53	45.25	36.04	0.00	215.84	173.77	219.02	29915
26	-10.00	50.00	40.82	0.00	236.74	185.28	235.28	29915
27	-10.20	52.00	42.84	0.00	245.54	161.78	213.78	29915
28	-11.00	60.00	50.91	2.01	280.82	158.24	218.24	29915
		60.00	50.91	0.00	339.18	175.40	235.40	49858
29	-12.80	78.00	74.56	0.00	442.50	158.25	236.25	49858
		78.00	74.56	0.00	4256.83	226.15	304.15	997169
30	-16.00	110.00	129.74	0.00	5023.01	260.79	370.79	997169
31	-18.00	130.00	164.48	0.00	5505.38	294.48	424.48	997169
32	-20.00	150.00	199.42	0.00	5990.65	324.38	474.38	997169

Note: 12.34 a Soil pressure at active limit
209.88 p Soil pressure at passive limit
57.14A Arching - soil pressure below active limit

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EDG CONSULTING PTY LTD                                       | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58          | Job No.  B01493
                             Licensed from GEOSOLVE          | Made by :    DL
Data filename/Run ID: Section_6                              |
Albert Street Development                                    | Date:16-11-2022
Section 6                                                    | Checked :
-----------------------------------------------------------------------------
                                                  Units: kN,m
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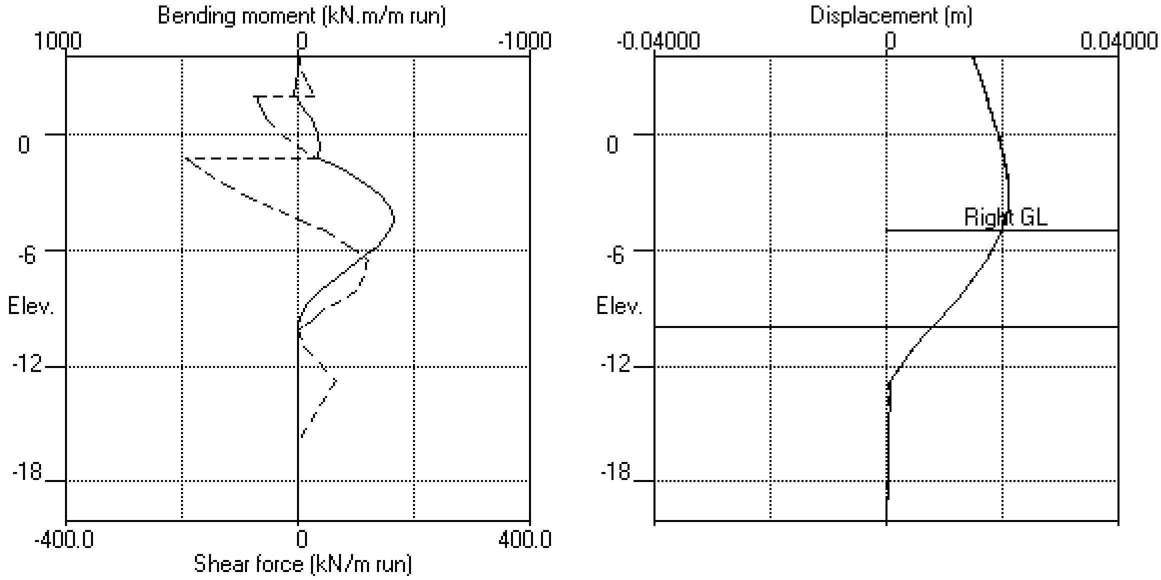
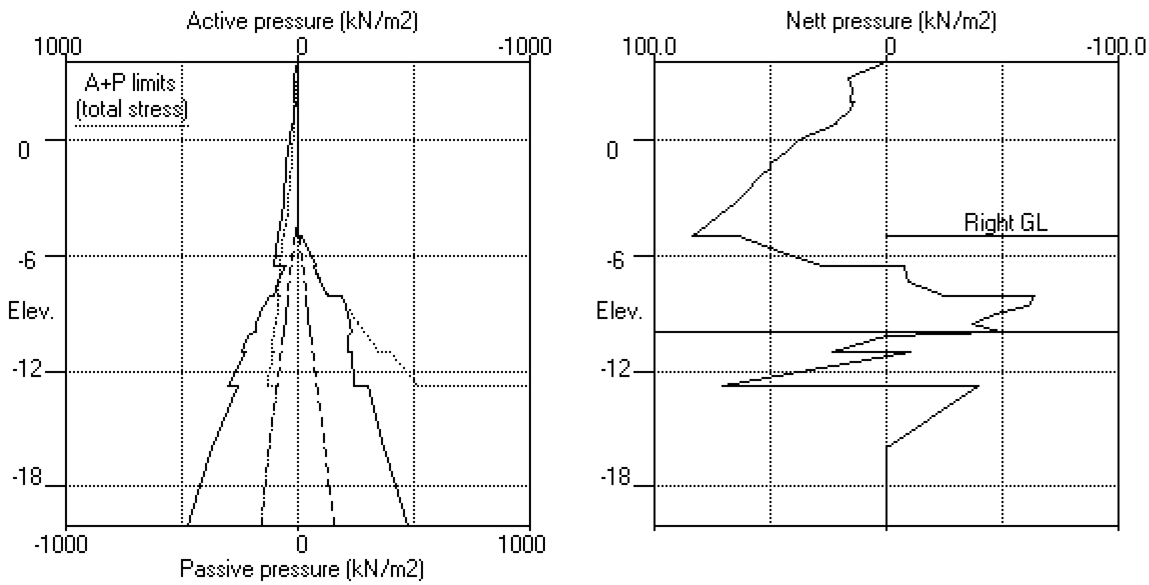
Stage No.9 Apply load no.2 at elev. 1.90

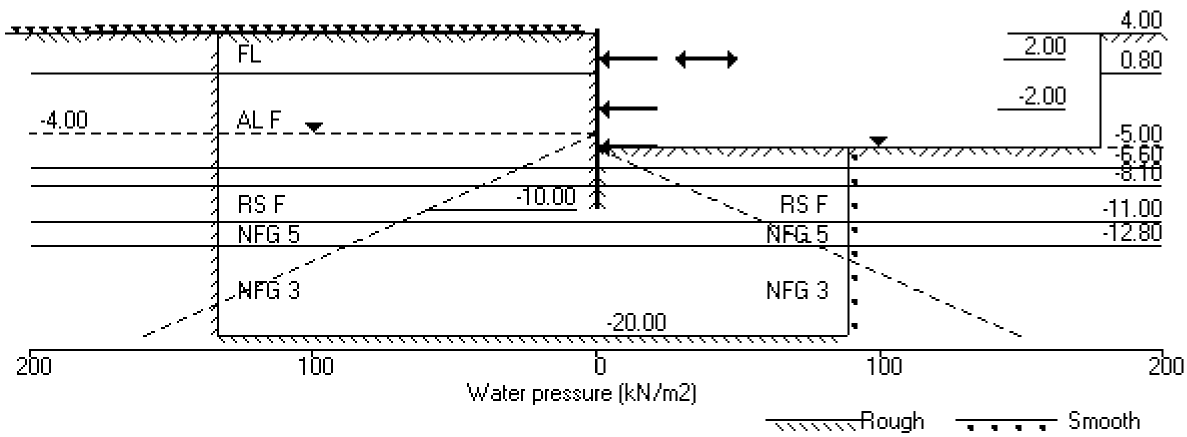


Stage No.9 Apply load no.2 at elev. 1.90



Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No. 12 Remove strut or anchor no.2 at elevation -1.30

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr-ation	Direction of failure
12	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.015	-1.19E-03	0.0	-0.0		572444
2	3.20	16.77	0.016	-1.19E-03	6.7	1.2		572444
3	2.60	14.87	0.017	-1.20E-03	16.2	8.8		572444
4	2.00	15.35	0.017	-1.21E-03	25.3	21.6	-129.0	572444
		15.35	0.017	-1.21E-03	-103.8	21.6		
5	1.90	13.20	0.018	-1.22E-03	-102.4	11.3		572444
6	1.45	15.47	0.018	-1.21E-03	-95.9	-32.6		572444
7	1.00	20.35	0.019	-1.17E-03	-87.8	-74.0		572444
8	0.80	20.18	0.019	-1.14E-03	-83.8	-91.2		572444
		30.27	0.019	-1.14E-03	-83.8	-91.2		
9	0.00	37.10	0.020	-9.76E-04	-56.8	-147.3		572444
10	-0.65	42.71	0.020	-7.92E-04	-30.9	-175.9		572444
11	-1.30	49.15	0.021	-5.86E-04	-1.0	-186.4		572444
12	-1.50	50.00	0.021	-5.21E-04	8.9	-185.6		572444
13	-2.00	54.68	0.021	-3.64E-04	35.0	-174.4	-199.9	572444
		54.68	0.021	-3.64E-04	-164.9	-174.4		
14	-2.60	59.94	0.021	-1.35E-04	-130.5	-263.0		572444
15	-3.20	64.77	0.021	1.75E-04	-93.1	-330.0		572444
16	-4.00	72.46	0.021	6.73E-04	-38.2	-382.7		572444
17	-4.50	78.14	0.020	1.01E-03	-0.5	-392.4		572444
18	-5.00	84.02	0.020	1.35E-03	40.0	-382.6	1.6	572444
		63.99	0.020	1.35E-03	41.6	-382.6		
19	-5.80	46.43	0.019	1.84E-03	85.8	-330.3		572444
20	-6.60	27.97	0.017	2.25E-03	115.6	-248.2		572444
		-7.11	0.017	2.25E-03	115.6	-248.2		
21	-7.35	-8.43	0.015	2.52E-03	109.7	-166.6		572444
22	-8.10	-24.18	0.013	2.69E-03	97.5	-87.9		572444
		-62.31	0.013	2.69E-03	97.5	-87.9		
23	-8.58	-59.86	0.012	2.74E-03	68.5	-48.6		572444
24	-9.05	-45.85	0.011	2.77E-03	43.4	-22.9		572444
25	-9.53	-35.60	0.009	2.78E-03	24.1	-7.4		572444
26	-10.00	-46.22	0.008	2.79E-03	4.6	-0.0		0

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.20	0.00	0.007	0	0.0	0.0		0
28	-11.00	23.72	0.005	0	9.5	0.0		0
		-10.52	0.005	0	9.5	0.0		
29	-12.80	70.61	0.001	0	63.6	0.0		0
		-39.67	0.001	0	63.6	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 2.00 Prop force = 129.0 kN/m run
At elev. -2.00 Prop force = 199.9 kN/m run
At elev. -5.00 Prop force = -1.6 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	16.77	16.77	9971
3	2.60	0.00	26.84	8.29	103.83	14.87	14.87	9971
4	2.00	0.00	38.50	11.90	148.93	15.35	15.35	9971
5	1.90	0.00	40.40	12.48	156.28	13.20	13.20	9971
6	1.45	0.00	48.81	15.08	188.80	15.47	15.47	9971
7	1.00	0.00	57.04	17.63	220.65	20.35	20.35	9971
8	0.80	0.00	60.66	18.74	234.64	20.18	20.18	9971
		0.00	60.66	15.74	228.83	30.27	30.27	5085
9	0.00	0.00	74.94	20.76	277.99	37.10	37.10	5484
10	-0.65	0.00	86.39	24.78	317.40	42.71	42.71	5808
11	-1.30	0.00	97.75	28.77	356.50	49.15	49.15	6132
12	-1.50	0.00	101.23	29.99	368.48	50.00	50.00	6232
13	-2.00	0.00	109.91	33.04	398.36	54.68	54.68	6481
14	-2.60	0.00	120.29	36.69	434.09	59.94	59.94	6780
15	-3.20	0.00	130.64	40.33	469.73	64.77	64.77	7079
16	-4.00	0.00	144.41	45.16	517.11	72.46	72.46	7478
17	-4.50	5.00	147.99	46.42	529.46	73.14	78.14	7727
18	-5.00	10.00	151.57	47.68	541.78	74.02	84.02	7977
19	-5.80	18.00	157.28	49.68	561.42	75.72	93.72	8376
20	-6.60	26.00	162.97	51.68	581.00	76.45	102.45	8774
		26.00	162.97	47.59	712.00	31.59	57.59A	19942
21	-7.35	33.50	168.29	49.14	735.24	53.17	86.67	19942
22	-8.10	41.00	173.59	50.69	758.43	60.38	101.38	19942
		41.00	173.59	36.77	816.86	80.43	121.43	29913
23	-8.58	45.75	178.38	38.13	837.75	103.72	149.47	29913
24	-9.05	50.50	183.16	39.48	858.64	117.60	168.10	29913
25	-9.53	55.25	187.93	40.84	879.51	127.45	182.70	29913
26	-10.00	60.00	192.70	42.19	900.36	127.43	187.43	29913
27	-10.20	62.00	194.71	42.76	909.14	151.83	213.83	29913
28	-11.00	70.00	202.75	45.03	944.23	171.97	241.97	29913
		70.00	202.75	34.73	1002.59	154.90	224.90	49855
29	-12.80	88.00	226.20	41.59	1105.06	218.85	306.85	49855
		88.00	226.20	0.00	6362.43	176.50	264.50	997093
30	-16.00	120.00	280.63	0.00	7118.25	250.78	370.78	997093
31	-18.00	140.00	314.62	0.00	7590.22	284.49	424.49	997093
32	-20.00	160.00	348.59	0.00	8061.94	314.30	474.30	997093

(continued)

Stage No.12 Remove strut or anchor no.2 at elevation -1.30

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	20.03	20.03p	7977
19	-5.80	8.00	5.60	0.00	39.31	39.29	47.29	8376
20	-6.60	16.00	11.20	0.00	58.60	58.48	74.48	8775
		16.00	11.20	3.27	48.95	48.69	64.69	19943
21	-7.35	23.50	16.46	4.81	71.93	71.60	95.10	19943
22	-8.10	31.00	21.73	6.35	94.94	94.56	125.56	19943
		31.00	21.73	0.00	153.31	152.75	183.75	29915
23	-8.58	35.75	26.50	0.00	174.13	173.58	209.33	29915
24	-9.05	40.50	31.27	0.00	194.98	173.45	213.95	29915
25	-9.53	45.25	36.04	0.00	215.84	173.04	218.29	29915
26	-10.00	50.00	40.82	0.00	236.74	183.65	233.65	29915
27	-10.20	52.00	42.84	0.00	245.54	161.82	213.82	29915
28	-11.00	60.00	50.91	2.01	280.82	158.25	218.25	29915
		60.00	50.91	0.00	339.18	175.41	235.41	49858
29	-12.80	78.00	74.56	0.00	442.50	158.25	236.25	49858
		78.00	74.56	0.00	4256.83	226.17	304.17	997169
30	-16.00	110.00	129.74	0.00	5023.01	260.80	370.80	997169
31	-18.00	130.00	164.48	0.00	5505.38	294.48	424.48	997169
32	-20.00	150.00	199.42	0.00	5990.65	324.38	474.38	997169

Note: 12.34 a Soil pressure at active limit
20.03 p Soil pressure at passive limit
57.59A Arching - soil pressure below active limit

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EDG CONSULTING PTY LTD                                        | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58           | Job No.  B01493
                              Licensed from GEOSOLVE          | Made by :    DL
Data filename/Run ID: Section_6                               |
Albert Street Development                                     | Date:16-11-2022
Section 6                                                     | Checked :
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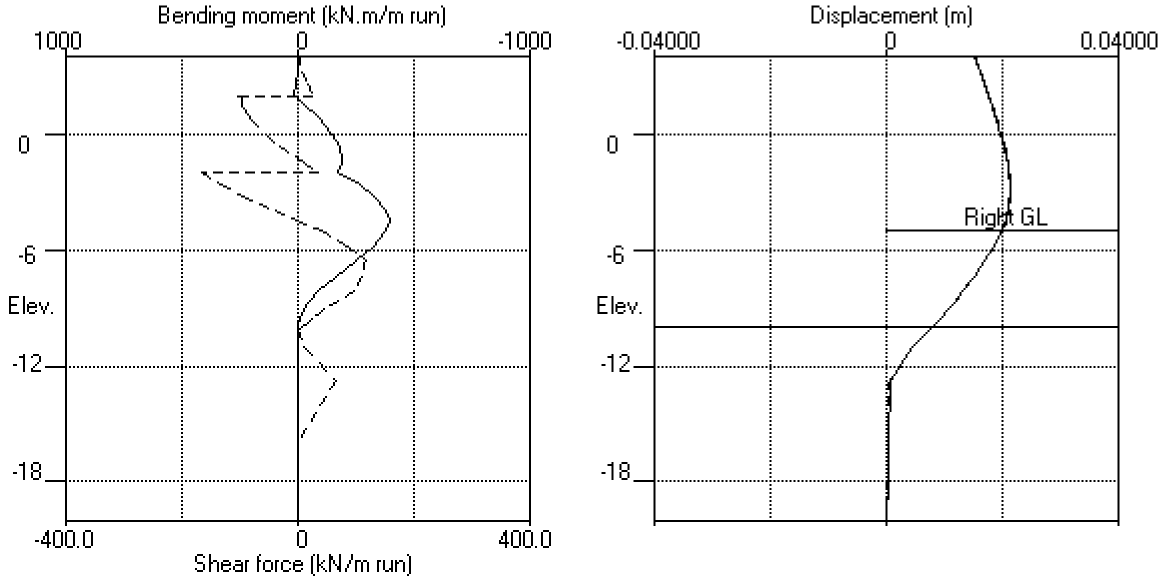
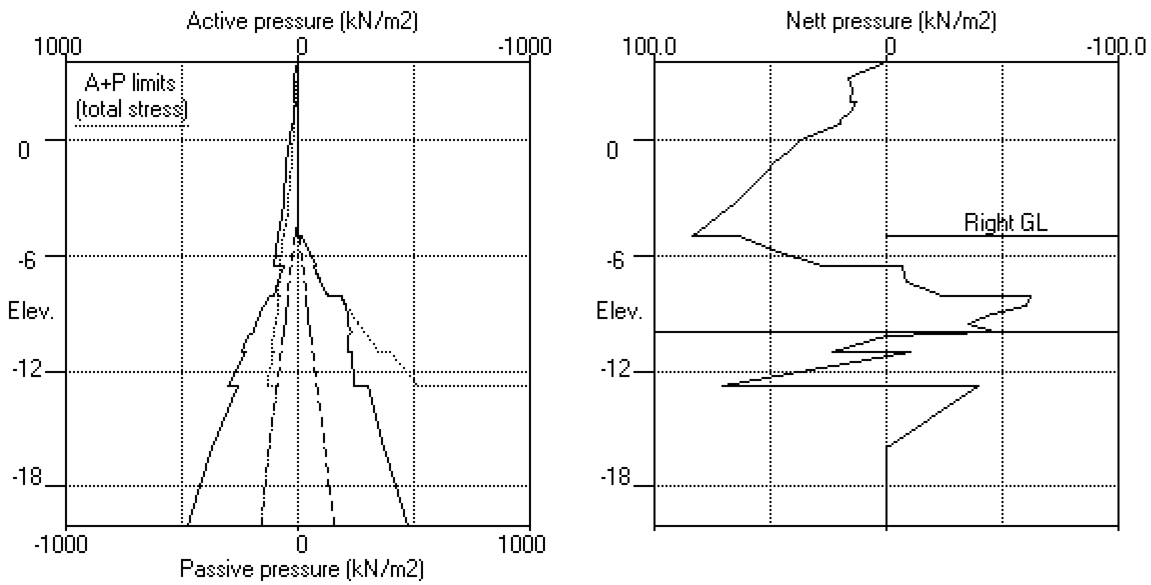
Units: kN,m

Stage No.12 Remove prop no.2 at elev. -1.30

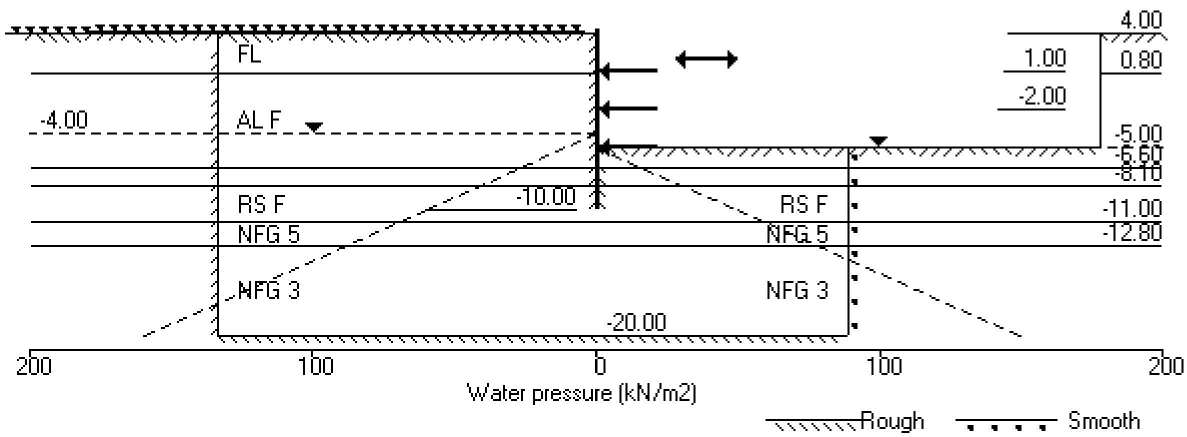


Stage No.12 Remove prop no.2 at elev. -1.30



Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00



Units: kN,m

Stage No. 14 Remove strut or anchor no.1 at elevation 2.00

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method

Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
14	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	-7.77E-04	0.0	-0.0		572444
2	3.20	13.89	0.017	-7.78E-04	5.6	1.2		572444
3	2.60	13.24	0.018	-7.83E-04	13.7	7.5		572444
4	2.00	14.38	0.018	-7.97E-04	22.0	18.6		572444
5	1.90	12.86	0.018	-8.00E-04	23.3	20.9		572444
6	1.45	15.73	0.019	-8.21E-04	29.8	33.5		572444
7	1.00	21.24	0.019	-8.54E-04	38.1	48.7	-166.5	572444
		21.24	0.019	-8.54E-04	-128.4	48.7		
8	0.80	21.55	0.019	-8.66E-04	-124.1	23.4		572444
		30.97	0.019	-8.66E-04	-124.1	23.4		
9	0.00	37.71	0.020	-8.37E-04	-96.6	-64.7		572444
10	-0.65	43.27	0.020	-7.33E-04	-70.3	-119.0		572444
11	-1.30	49.62	0.021	-5.78E-04	-40.1	-155.0		572444
12	-1.50	50.40	0.021	-5.22E-04	-30.1	-162.0		572444
13	-2.00	54.99	0.021	-3.77E-04	-3.8	-170.3	-163.9	572444
		54.99	0.021	-3.77E-04	-167.6	-170.3		
14	-2.60	60.17	0.021	-1.51E-04	-133.1	-260.5		572444
15	-3.20	64.93	0.021	1.57E-04	-95.6	-329.0		572444
16	-4.00	72.57	0.021	6.55E-04	-40.6	-383.6		572444
17	-4.50	78.21	0.020	9.95E-04	-2.9	-394.5		572444
18	-5.00	84.05	0.020	1.33E-03	37.7	-385.9	4.7	572444
		64.11	0.020	1.33E-03	42.3	-385.9		
19	-5.80	46.46	0.019	1.83E-03	86.6	-333.0		572444
20	-6.60	27.97	0.017	2.24E-03	116.4	-250.3		572444
		-7.09	0.017	2.24E-03	116.4	-250.3		
21	-7.35	-8.50	0.015	2.51E-03	110.5	-168.0		572444
22	-8.10	-24.29	0.013	2.68E-03	98.2	-88.9		572444
		-62.47	0.013	2.68E-03	98.2	-88.9		
23	-8.58	-60.06	0.012	2.74E-03	69.1	-49.3		572444
24	-9.05	-46.09	0.011	2.77E-03	43.9	-23.2		572444
25	-9.53	-35.95	0.009	2.78E-03	24.4	-7.5		572444
26	-10.00	-47.05	0.008	2.79E-03	4.7	-0.0		0

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.20	0.00	0.007	0	0.0	0.0		0
28	-11.00	23.72	0.005	0	9.5	0.0		0
		-10.52	0.005	0	9.5	0.0		
29	-12.80	70.61	0.001	0	63.6	0.0		0
		-39.67	0.001	0	63.6	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 1.00 Prop force = 166.5 kN/m run
At elev. -2.00 Prop force = 163.9 kN/m run
At elev. -5.00 Prop force = -4.7 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	0.00	14.79	4.57	57.21	13.89	13.89	9971
3	2.60	0.00	26.84	8.29	103.83	13.24	13.24	9971
4	2.00	0.00	38.50	11.90	148.93	14.38	14.38	9971
5	1.90	0.00	40.40	12.48	156.28	12.86	12.86	9971
6	1.45	0.00	48.81	15.08	188.80	15.73	15.73	9971
7	1.00	0.00	57.04	17.63	220.65	21.24	21.24	9971
8	0.80	0.00	60.66	18.74	234.64	21.55	21.55	9971
		0.00	60.66	15.74	228.83	30.97	30.97	5085
9	0.00	0.00	74.94	20.76	277.99	37.71	37.71	5484
10	-0.65	0.00	86.39	24.78	317.40	43.27	43.27	5808
11	-1.30	0.00	97.75	28.77	356.50	49.62	49.62	6132
12	-1.50	0.00	101.23	29.99	368.48	50.40	50.40	6232
13	-2.00	0.00	109.91	33.04	398.36	54.99	54.99	6481
14	-2.60	0.00	120.29	36.69	434.09	60.17	60.17	6780
15	-3.20	0.00	130.64	40.33	469.73	64.93	64.93	7079
16	-4.00	0.00	144.41	45.16	517.11	72.57	72.57	7478
17	-4.50	5.00	147.99	46.42	529.46	73.21	78.21	7727
18	-5.00	10.00	151.57	47.68	541.78	74.05	84.05	7977
19	-5.80	18.00	157.28	49.68	561.42	75.73	93.73	8376
20	-6.60	26.00	162.97	51.68	581.00	76.45	102.45	8774
		26.00	162.97	47.59	712.00	31.60	57.60A	19942
21	-7.35	33.50	168.29	49.14	735.24	53.13	86.63	19942
22	-8.10	41.00	173.59	50.69	758.43	60.33	101.33	19942
		41.00	173.59	36.77	816.86	80.36	121.36	29913
23	-8.58	45.75	178.38	38.13	837.75	103.63	149.38	29913
24	-9.05	50.50	183.16	39.48	858.64	117.48	167.98	29913
25	-9.53	55.25	187.93	40.84	879.51	127.27	182.52	29913
26	-10.00	60.00	192.70	42.19	900.36	127.02	187.02	29913
27	-10.20	62.00	194.71	42.76	909.14	151.82	213.82	29913
28	-11.00	70.00	202.75	45.03	944.23	171.97	241.97	29913
		70.00	202.75	34.73	1002.59	154.90	224.90	49855
29	-12.80	88.00	226.20	41.59	1105.06	218.86	306.86	49855
		88.00	226.20	0.00	6362.43	176.51	264.51	997093
30	-16.00	120.00	280.63	0.00	7118.25	250.78	370.78	997093
31	-18.00	140.00	314.62	0.00	7590.22	284.49	424.49	997093
32	-20.00	160.00	348.59	0.00	8061.94	314.30	474.30	997093

(continued)

Stage No.14 Remove strut or anchor no.1 at elevation 2.00

		RIGHT side						
			Effective stresses				Total	Adjusted
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.94	19.94	7977
19	-5.80	8.00	5.60	0.00	39.31	39.26	47.26	8376
20	-6.60	16.00	11.20	0.00	58.60	58.48	74.48	8775
		16.00	11.20	3.27	48.95	48.69	64.69	19943
21	-7.35	23.50	16.46	4.81	71.93	71.63	95.13	19943
22	-8.10	31.00	21.73	6.35	94.94	94.62	125.62	19943
		31.00	21.73	0.00	153.31	152.83	183.83	29915
23	-8.58	35.75	26.50	0.00	174.13	173.68	209.43	29915
24	-9.05	40.50	31.27	0.00	194.98	173.57	214.07	29915
25	-9.53	45.25	36.04	0.00	215.84	173.22	218.47	29915
26	-10.00	50.00	40.82	0.00	236.74	184.07	234.07	29915
27	-10.20	52.00	42.84	0.00	245.54	161.81	213.81	29915
28	-11.00	60.00	50.91	2.01	280.82	158.25	218.25	29915
		60.00	50.91	0.00	339.18	175.41	235.41	49858
29	-12.80	78.00	74.56	0.00	442.50	158.25	236.25	49858
		78.00	74.56	0.00	4256.83	226.18	304.18	997169
30	-16.00	110.00	129.74	0.00	5023.01	260.80	370.80	997169
31	-18.00	130.00	164.48	0.00	5505.38	294.48	424.48	997169
32	-20.00	150.00	199.42	0.00	5990.65	324.38	474.38	997169

Note: 12.34 a Soil pressure at active limit
123.45 p Soil pressure at passive limit
57.60A Arching - soil pressure below active limit

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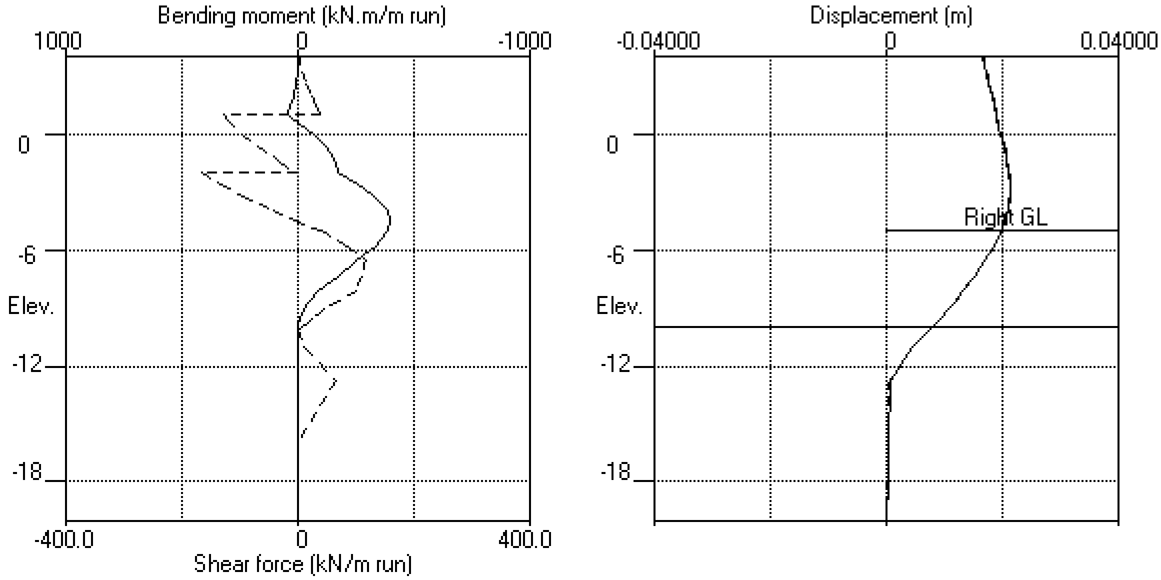
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. B01493
Licensed from GEOSOLVE | Made by : DL
Data filename/Run ID: Section_6 |
Albert Street Development | Date:16-11-2022
Section 6 | Checked :

Units: kN,m

Stage No.14 Remove prop no.1 at elev. 2.00



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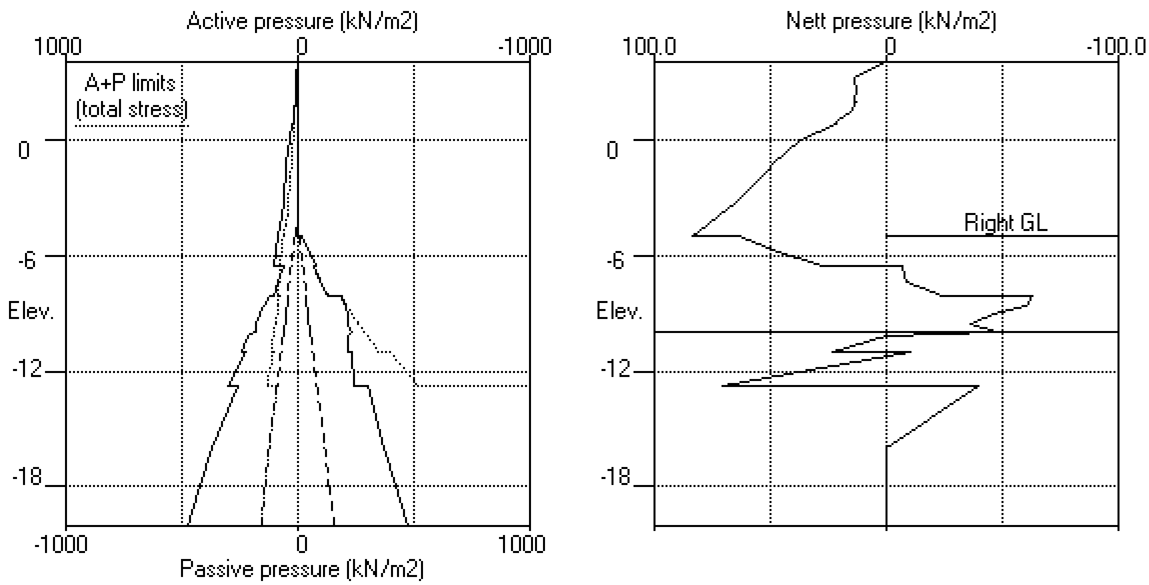

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Data filename/Run ID: Section_6                               |
Albert Street Development                                     | Date:16-11-2022
Section 6                                                     | Checked :
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                                                   Units: kN,m
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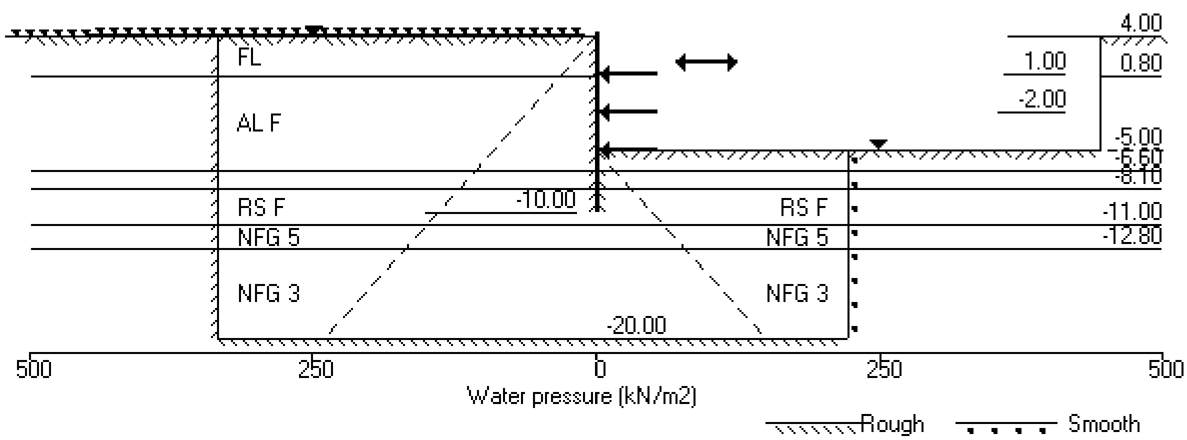
Stage No.15   Apply water pressure profile no.1



Units: kN,m

Stage No. 15 Apply water pressure profile no.1

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00 Factor of Safety	FoS for toe elev. = -10.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetration	Direction of failure
15	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	-7.24E-04	0.0	-0.0		572444
2	3.20	18.12	0.017	-7.26E-04	7.2	1.7		572444
3	2.60	21.25	0.018	-7.32E-04	19.1	10.0		572444
4	2.00	26.00	0.018	-7.51E-04	33.2	25.9		572444
5	1.90	25.20	0.018	-7.55E-04	35.8	29.4		572444
6	1.45	30.78	0.019	-7.86E-04	48.4	49.0		572444
7	1.00	39.01	0.019	-8.35E-04	64.1	74.1	-216.2	572444
		39.01	0.019	-8.35E-04	-152.1	74.1		
8	0.80	40.66	0.019	-8.55E-04	-144.2	44.5		572444
		49.67	0.019	-8.55E-04	-144.2	44.5		
9	0.00	60.93	0.020	-8.49E-04	-99.9	-53.3		572444
10	-0.65	70.26	0.020	-7.60E-04	-57.3	-104.5		572444
11	-1.30	80.41	0.021	-6.29E-04	-8.3	-126.1		572444
12	-1.50	82.41	0.021	-5.85E-04	8.0	-126.1		572444
13	-2.00	89.92	0.021	-4.81E-04	51.1	-111.2	-254.8	572444
		89.92	0.021	-4.81E-04	-203.8	-111.2		
14	-2.60	98.54	0.021	-3.09E-04	-147.2	-216.6		572444
15	-3.20	106.71	0.022	-4.60E-05	-85.6	-286.5		572444
16	-4.00	118.89	0.021	3.77E-04	4.6	-319.3		572444
17	-4.50	124.47	0.021	6.48E-04	65.4	-301.8		572444
18	-5.00	130.01	0.021	8.90E-04	129.1	-253.2	-213.8	572444
		111.46	0.021	8.90E-04	-84.7	-253.2		
19	-5.80	92.17	0.020	1.26E-03	-3.3	-286.9		572444
20	-6.60	71.99	0.019	1.65E-03	62.4	-261.4		572444
		41.05	0.019	1.65E-03	62.4	-261.4		
21	-7.35	30.43	0.017	1.95E-03	89.2	-206.4		572444
22	-8.10	11.67	0.016	2.17E-03	105.0	-132.3		572444
		-31.39	0.016	2.17E-03	105.0	-132.3		
23	-8.58	-32.36	0.015	2.27E-03	89.8	-85.9		572444
24	-9.05	-43.80	0.014	2.32E-03	71.7	-46.9		572444
25	-9.53	-50.25	0.013	2.35E-03	49.4	-17.8		572444
26	-10.00	-111.01	0.011	2.35E-03	11.1	-0.0		0

(continued)

Stage No.15 Apply water pressure profile no.1

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
27	-10.20	0.00	0.010	0	0.0	0.0		0
28	-11.00	38.15	0.007	0	15.3	0.0		0
		-16.93	0.007	0	15.3	0.0		
29	-12.80	112.15	0.001	0	101.0	0.0		0
		-63.04	0.001	0	101.0	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 1.00 Prop force = 216.2 kN/m run
At elev. -2.00 Prop force = 254.8 kN/m run
At elev. -5.00 Prop force = 213.8 kN/m run

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic-al kN/m2	Effective stresses: Active limit kN/m2	Effective stresses: Passive limit kN/m2	Effective stresses: Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	8.00	6.79	2.10	26.27	10.12	18.12	9971
3	2.60	14.00	12.84	3.97	49.67	7.25	21.25	9971
4	2.00	20.00	18.50	5.72	71.57	6.00	26.00	9971
5	1.90	21.00	19.40	5.99	75.04	4.20	25.20A	9971
6	1.45	25.50	23.31	7.20	90.16	5.28	30.78A	9971
7	1.00	30.00	27.04	8.36	104.60	9.01	39.01	9971
8	0.80	32.00	28.66	8.86	110.86	8.66	40.66A	9971
		32.00	28.66	4.50	118.68	17.67	49.67	5085
9	0.00	40.00	34.94	6.71	140.30	20.93	60.93	5484
10	-0.65	46.50	39.89	8.45	157.34	23.76	70.26	5808
11	-1.30	53.00	44.75	10.15	174.06	27.41	80.41	6132
12	-1.50	55.00	46.23	10.67	179.16	27.41	82.41	6232
13	-2.00	60.00	49.91	11.97	191.83	29.92	89.92	6481
14	-2.60	66.00	54.29	13.51	206.91	32.54	98.54	6780
15	-3.20	72.00	58.64	15.03	221.89	34.71	106.71	7079
16	-4.00	80.00	64.41	17.06	241.73	38.89	118.89	7478
17	-4.50	85.00	67.99	18.32	254.08	39.47	124.47	7727
18	-5.00	90.00	71.57	19.58	266.40	40.01	130.01	7977
19	-5.80	98.00	77.28	21.58	286.04	40.90	138.90	8376
20	-6.60	106.00	82.97	23.58	305.62	40.59	146.59	8774
		106.00	82.97	24.23	362.48	0.00	106.00A	19942
21	-7.35	113.50	88.29	25.78	385.72	12.36	125.86A	19942
22	-8.10	121.00	93.59	27.33	408.91	16.61	137.61A	19942
		121.00	93.59	14.11	467.31	31.91	152.91	29913
23	-8.58	125.75	98.38	15.46	488.20	51.77	177.52	29913
24	-9.05	130.50	103.16	16.82	509.09	61.12	191.62	29913
25	-9.53	135.25	107.93	18.17	529.95	62.52	197.77	29913
26	-10.00	140.00	112.70	19.52	550.81	35.73	175.73	29913
27	-10.20	142.00	114.71	20.09	559.59	93.98	235.98	29913
28	-11.00	150.00	122.75	22.37	594.68	121.91	271.91	29913
		150.00	122.75	11.35	653.04	94.33	244.33	49855
29	-12.80	168.00	146.20	18.21	755.51	182.49	350.49	49855
		168.00	146.20	0.00	5251.56	114.85	282.85	997093
30	-16.00	200.00	200.63	0.00	6007.38	200.84	400.84	997093
31	-18.00	220.00	234.62	0.00	6479.35	234.40	454.40	997093
32	-20.00	240.00	268.59	0.00	6951.06	259.80	499.80	997093

(continued)

Stage No.15 Apply water pressure profile no.1

		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Adjusted soil modulus kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	18.55	18.55	7977
19	-5.80	8.00	5.60	0.00	39.31	38.73	46.73	8376
20	-6.60	16.00	11.20	0.00	58.60	58.60	74.60p	8775
		16.00	11.20	3.27	48.95	48.95	64.95p	19943
21	-7.35	23.50	16.46	4.81	71.93	71.93	95.43p	19943
22	-8.10	31.00	21.73	6.35	94.94	94.94	125.94p	19943
		31.00	21.73	0.00	153.31	153.31	184.31p	29915
23	-8.58	35.75	26.50	0.00	174.13	174.13	209.88p	29915
24	-9.05	40.50	31.27	0.00	194.98	194.92	235.42	29915
25	-9.53	45.25	36.04	0.00	215.84	202.77	248.02	29915
26	-10.00	50.00	40.82	0.00	236.74	236.74	286.74p	29915
27	-10.20	52.00	42.84	0.00	245.54	183.97	235.97	29915
28	-11.00	60.00	50.91	2.01	280.82	173.76	233.76	29915
		60.00	50.91	0.00	339.18	201.26	261.26	49858
29	-12.80	78.00	74.56	0.00	442.50	160.33	238.33	49858
		78.00	74.56	0.00	4256.83	267.89	345.89	997169
30	-16.00	110.00	129.74	0.00	5023.01	290.85	400.85	997169
31	-18.00	130.00	164.48	0.00	5505.38	324.39	454.39	997169
32	-20.00	150.00	199.42	0.00	5990.65	349.88	499.88	997169

Note: 12.34 a Soil pressure at active limit
286.74 p Soil pressure at passive limit
137.61A Arching - soil pressure below active limit

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Program: WALLAP  Version 6.07  Revision A55.B74.R58          | Job No.  B01493
                               Licensed from GEOSOLVE        | Made by :    DL
Data filename/Run ID: Section_6                              |
Albert Street Development                                    | Date:16-11-2022
Section 6                                                    | Checked :
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                                                        Units: kN,m
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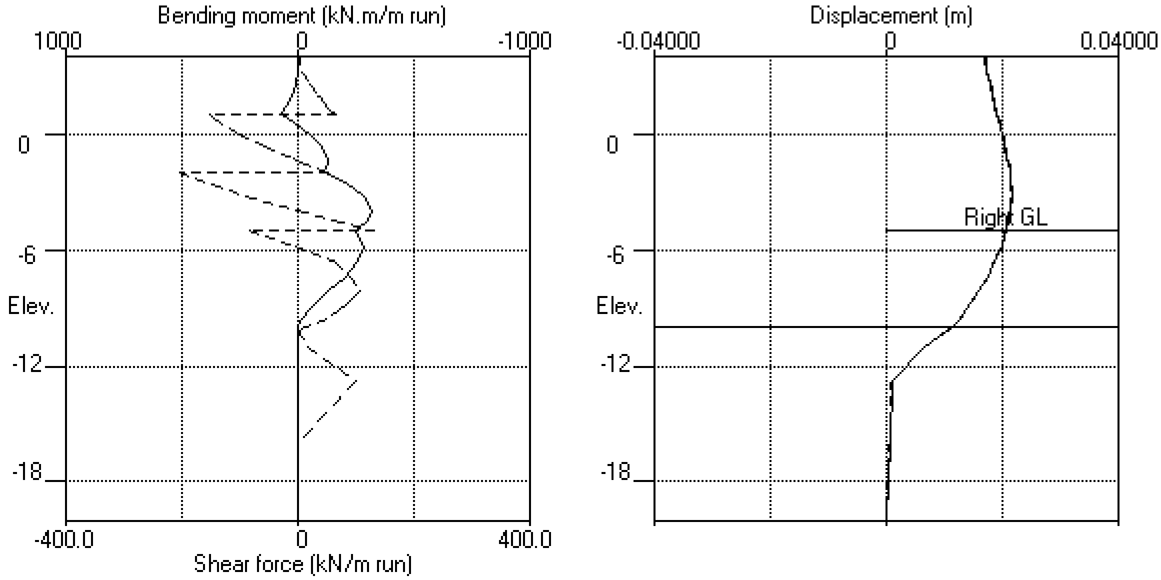
Stage No.15 Apply water pressure profile no.1



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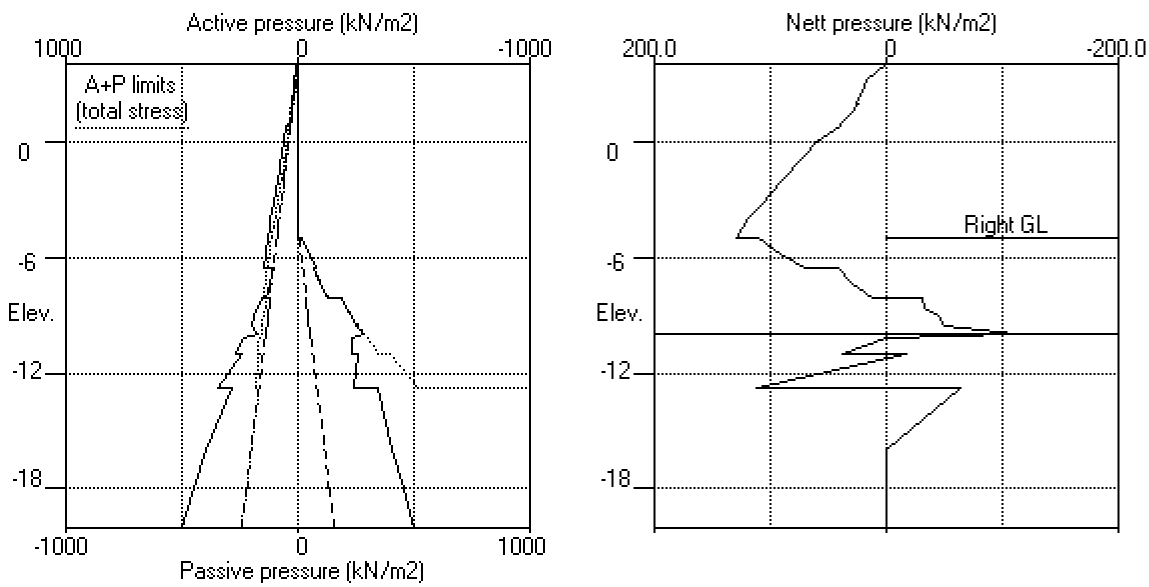
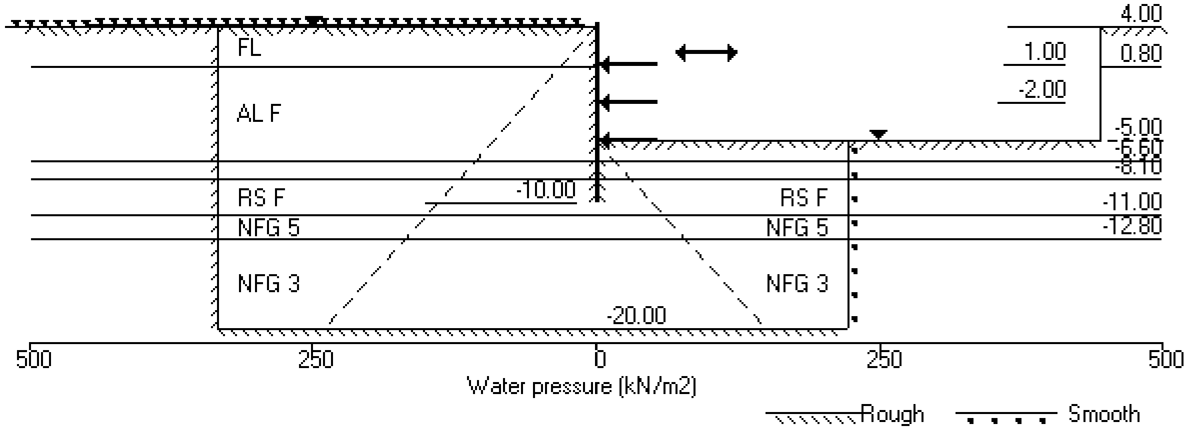


Units: kN,m

Stage No.16 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Stage No. 16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00: Factor of Safety	FoS for toe elev. = -10.00: Moment equilib. at elev.	Toe elev. for FoS = 1.500: Toe elev.	Toe elev. for FoS = 1.500: Wall Penetr -ation	Direction of failure
16	4.00	-5.00		More than one prop. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m	EI of wall kN.m2/m
1	4.00	0.00	0.017	-6.63E-04	0.0	-0.0		400711
2	3.20	17.86	0.017	-6.65E-04	7.1	1.7		400711
3	2.60	21.19	0.018	-6.74E-04	18.9	9.9		400711
4	2.00	26.05	0.018	-7.00E-04	33.0	25.8		400711
5	1.90	25.34	0.018	-7.07E-04	35.6	29.2		400711
6	1.45	30.98	0.019	-7.51E-04	48.3	48.7		400711
7	1.00	39.26	0.019	-8.20E-04	64.1	73.8	-197.1	400711
		39.26	0.019	-8.20E-04	-133.0	73.8		
8	0.80	40.89	0.019	-8.50E-04	-125.0	47.1		400711
		49.79	0.019	-8.50E-04	-125.0	47.1		
9	0.00	61.02	0.020	-8.63E-04	-80.7	-38.8		400711
10	-0.65	70.32	0.020	-7.76E-04	-38.0	-80.4		400711
11	-1.30	80.47	0.021	-6.50E-04	11.0	-92.4		400711
12	-1.50	82.48	0.021	-6.10E-04	27.3	-89.4		400711
13	-2.00	89.96	0.021	-5.27E-04	70.4	-67.0	-265.9	400711
		89.96	0.021	-5.27E-04	-195.5	-67.0		
14	-2.60	98.44	0.021	-3.72E-04	-139.0	-168.6		400711
15	-3.20	106.44	0.022	-9.26E-05	-77.5	-234.7		400711
16	-4.00	118.53	0.022	3.71E-04	12.5	-262.6		400711
17	-4.50	124.11	0.021	6.64E-04	73.1	-242.1		400711
18	-5.00	129.66	0.021	9.11E-04	136.6	-190.6	-237.5	400711
		110.64	0.021	9.11E-04	-100.9	-190.6		
19	-5.80	91.23	0.020	1.30E-03	-20.2	-234.4		400711
20	-6.60	71.50	0.019	1.72E-03	44.9	-219.6		400711
		41.05	0.019	1.72E-03	44.9	-219.6		
21	-7.35	29.79	0.017	2.07E-03	71.5	-174.6		400711
22	-8.10	11.63	0.016	2.32E-03	87.0	-110.8		400711
		-31.46	0.016	2.32E-03	87.0	-110.8		
23	-8.58	-29.98	0.015	2.42E-03	72.4	-71.1		400711
24	-9.05	-38.62	0.013	2.48E-03	56.1	-38.2		400711
25	-9.53	-40.10	0.012	2.51E-03	37.4	-14.3		400711

(continued)

Stage No.16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure	Wall disp.	Wall rotation	Shear force	Bending moment	Prop forces	EI of wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
26	-10.00	-82.73	0.011	2.52E-03	8.3	-0.0		0
27	-10.20	0.00	0.010	0	0.0	0.0		0
28	-11.00	38.15	0.007	0	15.3	0.0		0
		-16.93	0.007	0	15.3	0.0		
29	-12.80	112.15	0.001	0	101.0	0.0		0
		-63.04	0.001	0	101.0	0.0		
30	-16.00	-0.01	0.000	0	0.1	0.0		0
31	-18.00	0.01	0.000	0	0.1	0.0		0
32	-20.00	-0.08	0.000	0	0.0	0.0		---

At elev. 1.00 Prop force = 197.1 kN/m run
At elev. -2.00 Prop force = 265.9 kN/m run
At elev. -5.00 Prop force = 237.5 kN/m run

LEFT side

Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
			Effective stresses					
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	9971
2	3.20	8.00	6.79	2.10	26.27	9.86	17.86	9971
3	2.60	14.00	12.84	3.97	49.67	7.19	21.19	9971
4	2.00	20.00	18.50	5.72	71.57	6.05	26.05	9971
5	1.90	21.00	19.40	5.99	75.04	4.34	25.34A	9971
6	1.45	25.50	23.31	7.20	90.16	5.48	30.98A	9971
7	1.00	30.00	27.04	8.36	104.60	9.26	39.26	9971
8	0.80	32.00	28.66	8.86	110.86	8.89	40.89	9971
		32.00	28.66	4.50	118.68	17.79	49.79	5085
9	0.00	40.00	34.94	6.71	140.30	21.02	61.02	5484
10	-0.65	46.50	39.89	8.45	157.34	23.82	70.32	5808
11	-1.30	53.00	44.75	10.15	174.06	27.47	80.47	6132
12	-1.50	55.00	46.23	10.67	179.16	27.48	82.48	6232
13	-2.00	60.00	49.91	11.97	191.83	29.96	89.96	6481
14	-2.60	66.00	54.29	13.51	206.91	32.44	98.44	6780
15	-3.20	72.00	58.64	15.03	221.89	34.44	106.44	7079
16	-4.00	80.00	64.41	17.06	241.73	38.53	118.53	7478
17	-4.50	85.00	67.99	18.32	254.08	39.11	124.11	7727
18	-5.00	90.00	71.57	19.58	266.40	39.66	129.66	7977
19	-5.80	98.00	77.28	21.58	286.04	40.45	138.45	8376
20	-6.60	106.00	82.97	23.58	305.62	40.09	146.09	8774
		106.00	82.97	24.23	362.48	0.00	106.00A	19942
21	-7.35	113.50	88.29	25.78	385.72	11.72	125.22A	19942
22	-8.10	121.00	93.59	27.33	408.91	16.56	137.56A	19942
		121.00	93.59	14.11	467.31	31.85	152.85	29913
23	-8.58	125.75	98.38	15.46	488.20	53.00	178.75	29913
24	-9.05	130.50	103.16	16.82	509.09	63.75	194.25	29913
25	-9.53	135.25	107.93	18.17	529.95	67.67	202.92	29913
26	-10.00	140.00	112.70	19.52	550.81	49.52	189.52	29913
27	-10.20	142.00	114.71	20.09	559.59	94.19	236.19	29913
28	-11.00	150.00	122.75	22.37	594.68	121.93	271.93	29913
		150.00	122.75	11.35	653.04	94.35	244.35	49855
29	-12.80	168.00	146.20	18.21	755.51	182.49	350.49	49855
		168.00	146.20	0.00	5251.56	114.85	282.85	997093
30	-16.00	200.00	200.63	0.00	6007.38	200.84	400.84	997093
31	-18.00	220.00	234.62	0.00	6479.35	234.40	454.40	997093
32	-20.00	240.00	268.59	0.00	6951.06	259.81	499.81	997093

(continued)

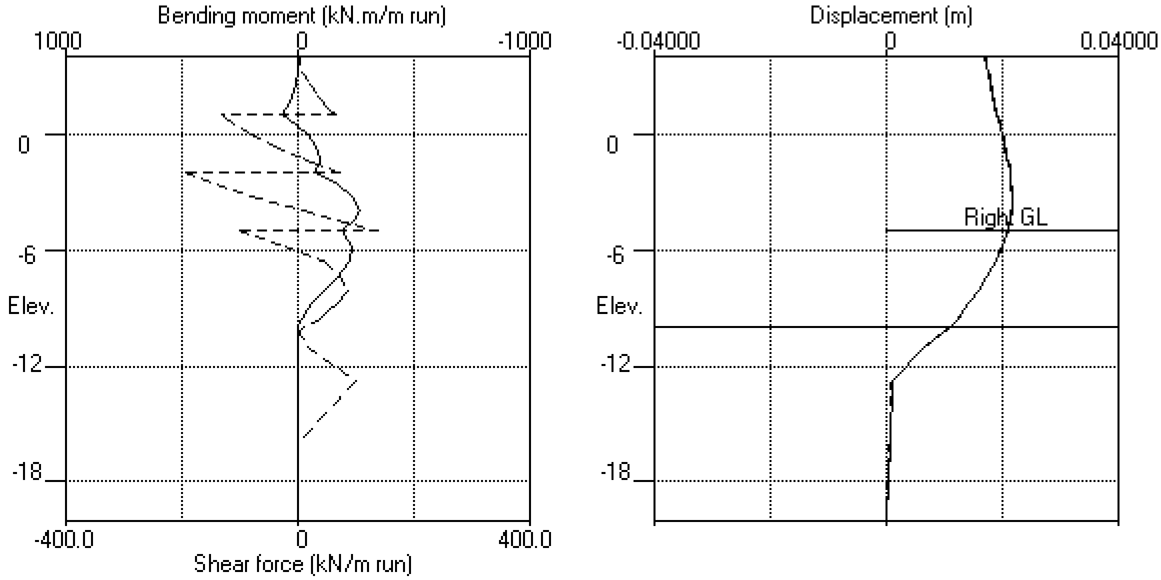
Stage No.16 Change EI of wall to 400711 kN.m2/m run
Allow wall to relax with new modulus value

		RIGHT side						
			Effective stresses					
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Adjusted soil modulus
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2
1	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	-2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	-3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	-4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	-4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	-5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	20.03	19.02	19.02	7977
19	-5.80	8.00	5.60	0.00	39.31	39.22	47.22	8376
20	-6.60	16.00	11.20	0.00	58.60	58.60	74.60p	8775
		16.00	11.20	3.27	48.95	48.95	64.95p	19943
21	-7.35	23.50	16.46	4.81	71.93	71.93	95.43p	19943
22	-8.10	31.00	21.73	6.35	94.94	94.94	125.94p	19943
		31.00	21.73	0.00	153.31	153.31	184.31p	29915
23	-8.58	35.75	26.50	0.00	174.13	172.98	208.73	29915
24	-9.05	40.50	31.27	0.00	194.98	192.37	232.87	29915
25	-9.53	45.25	36.04	0.00	215.84	197.77	243.02	29915
26	-10.00	50.00	40.82	0.00	236.74	222.25	272.25	29915
27	-10.20	52.00	42.84	0.00	245.54	184.18	236.18	29915
28	-11.00	60.00	50.91	2.01	280.82	173.77	233.77	29915
		60.00	50.91	0.00	339.18	201.28	261.28	49858
29	-12.80	78.00	74.56	0.00	442.50	160.33	238.33	49858
		78.00	74.56	0.00	4256.83	267.89	345.89	997169
30	-16.00	110.00	129.74	0.00	5023.01	290.85	400.85	997169
31	-18.00	130.00	164.48	0.00	5505.38	324.39	454.39	997169
32	-20.00	150.00	199.42	0.00	5990.65	349.89	499.89	997169

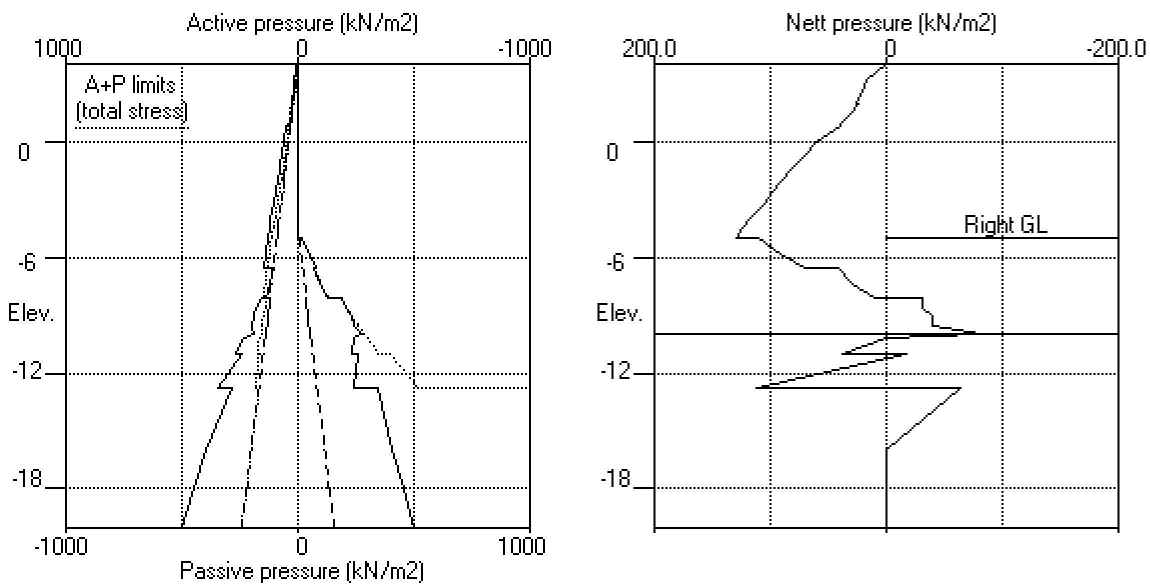
Note: 12.34 a Soil pressure at active limit
184.31 p Soil pressure at passive limit
137.56A Arching - soil pressure below active limit

Units: kN,m

Stage No.16 Change EI of wall to 400711kN.m2/m run



Stage No.16 Change EI of wall to 400711kN.m2/m run



Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Burland-Potts method
Factor of safety on nett available passive

Stage No.	Ground level Act.	Ground level Pass.	Prop Elev.	FoS for toe elev. = -10.00 Factor of Safety	FoS for toe elev. = -10.00 Moment equilib. at elev.	Toe elev. for FoS = 1.500 Toe elev.	Toe elev. for FoS = 1.500 Wall Penetr -ation	Direction of failure
1	4.00	4.00	---	Conditions not suitable for FoS calc.				
2	4.00	2.00	Cant.	12.246	-8.04	-0.24	2.24	L to R
3	4.00	2.00		No analysis at this stage				
4	4.00	-1.50	2.00	7.528	n/a	-3.36	1.86	L to R
5	4.00	-1.50		No analysis at this stage				

All remaining stages have more than one prop - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.90m; spacing = 1.80m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 60.00m
2-D finite element model. Active limit arching modelled.
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 30.00 from wall Rough boundary
Right side 20.00 from wall Smooth boundary
Lower rigid boundary at elevation -20.00 Rough boundary

Bending moment, shear force and displacement envelopes

Node	Y	Displacement		Bending moment		Shear force	
no.	coord	maximum	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	4.00	0.019	0.000	0.0	-0.0	0.0	0.0
2	3.20	0.017	0.000	1.7	0.0	7.2	-1.1
3	2.60	0.018	0.000	10.0	-1.0	19.1	-2.3
4	2.00	0.018	0.000	25.9	-2.7	33.2	-118.2
5	1.90	0.018	0.000	29.4	-3.0	35.8	-116.8
6	1.45	0.019	0.000	49.0	-42.2	48.4	-102.3
7	1.00	0.019	0.000	74.1	-86.6	64.1	-152.1
8	0.80	0.019	0.000	47.1	-105.1	0.0	-144.2
9	0.00	0.020	0.000	19.4	-166.2	0.6	-99.9
10	-0.65	0.020	0.000	19.8	-198.3	7.3	-70.3
11	-1.30	0.021	0.000	20.1	-211.7	37.7	-198.0
12	-1.50	0.021	0.000	20.2	-211.6	27.3	-187.9
13	-2.00	0.021	0.000	20.4	-211.4	70.4	-203.8
14	-2.60	0.021	0.000	20.9	-296.1	23.5	-147.2
15	-3.20	0.022	0.000	21.8	-359.1	29.6	-95.6
16	-4.00	0.022	0.000	23.7	-406.4	37.1	-40.6
17	-4.50	0.021	0.000	25.6	-412.8	73.1	-2.9
18	-5.00	0.021	0.000	28.0	-399.7	136.6	-100.9
19	-5.80	0.020	0.000	33.0	-343.7	90.5	-20.2
20	-6.60	0.019	0.000	39.2	-261.4	120.0	0.0
21	-7.35	0.017	0.000	38.2	-206.4	113.6	-5.1
22	-8.10	0.016	0.000	31.6	-132.3	105.0	-11.4
23	-8.58	0.015	0.000	24.0	-85.9	89.8	-17.5
24	-9.05	0.014	0.000	15.0	-46.9	71.7	-18.7
25	-9.53	0.013	0.000	6.2	-17.8	49.4	-15.7
26	-10.00	0.011	0.000	0.0	-0.0	11.1	-3.9
27	-10.20	0.010	0.000	0.0	0.0	0.0	-0.0
28	-11.00	0.007	0.000	0.0	0.0	15.3	0.0
29	-12.80	0.001	0.000	0.0	0.0	101.0	0.0
30	-16.00	0.000	0.000	0.0	0.0	0.1	-0.0
31	-18.00	0.000	0.000	0.0	0.0	0.1	0.0
32	-20.00	0.000	0.000	0.0	0.0	0.0	-0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment maximum kN.m/m	elev.	Bending moment minimum kN.m/m	elev.	Shear force maximum kN/m	elev.	Shear force minimum kN/m	elev.
1	0.7	-8.58	-12.1	-2.60	4.1	-6.60	-3.6	0.80
2	39.2	-6.60	-0.0	-10.00	15.5	-12.80	-18.7	-9.05
3	No calculation at this stage							
4	16.8	-8.58	-211.7	-1.30	55.4	-6.60	-109.3	2.00
5	No calculation at this stage							
6	15.6	2.00	-202.4	-1.50	57.8	-6.60	-106.5	2.00
7	21.6	2.00	-412.8	-4.50	120.0	-6.60	-194.9	-1.30
8	20.1	2.00	-403.7	-4.50	117.8	-6.60	-198.0	-1.30
9	21.6	2.00	-412.8	-4.50	120.0	-6.60	-194.9	-1.30
10	No calculation at this stage							
11	No calculation at this stage							
12	21.6	2.00	-392.4	-4.50	115.6	-6.60	-164.9	-2.00
13	No calculation at this stage							
14	48.7	1.00	-394.5	-4.50	116.4	-6.60	-167.6	-2.00
15	74.1	1.00	-319.3	-4.00	129.1	-5.00	-203.8	-2.00
16	73.8	1.00	-262.6	-4.00	136.6	-5.00	-195.5	-2.00

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	Displacement minimum m	elev.	Stage description
1	0.001	1.45	0.000	4.00	Apply surcharge no.1 at elev. 4.00
2	0.019	4.00	0.000	4.00	Excav. to elev. 2.00 on RIGHT side
3	No calculation at this stage				Install prop no.1 at elev. 2.00
4	0.018	0.80	0.000	4.00	Excav. to elev. -1.50 on RIGHT side
5	No calculation at this stage				Install prop no.2 at elev. -1.30
6	0.018	0.00	0.000	4.00	Apply water pressure profile no.2
7	0.021	-3.20	0.000	4.00	Excav. to elev. -5.00 on RIGHT side
8	0.021	-3.20	0.000	4.00	Apply load no.1 at elev. 1.90
9	0.021	-3.20	0.000	4.00	Apply load no.2 at elev. 1.90
10	No calculation at this stage				Install prop no.3 at elev. -5.00
11	No calculation at this stage				Install prop no.4 at elev. -2.00
12	0.021	-2.60	0.000	4.00	Remove prop no.2 at elev. -1.30
13	No calculation at this stage				Install prop no.5 at elev. 1.00
14	0.021	-3.20	0.000	4.00	Remove prop no.1 at elev. 2.00
15	0.022	-3.20	0.000	4.00	Apply water pressure profile no.1
16	0.022	-3.20	0.000	4.00	Change EI of wall to 400711kN.m2/m run

Summary of results (continued)

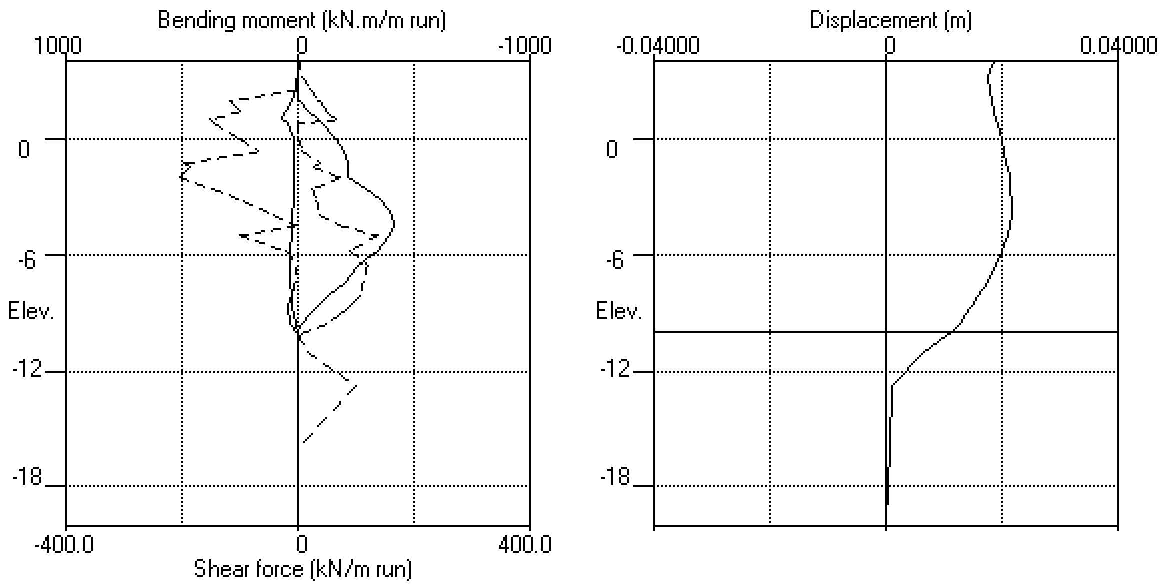
Prop forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 2.00 kN/m run	Strut no. 1 kN/prop	Strut no. 2 at elev.-1.30 kN/m run	Strut no. 2 kN/prop	Strut no. 3 at elev.-5.00 kN/m run	Strut no. 3 kN/prop
4	127.42	955.62	---	---	---	---
6	124.93	936.95	9.03	67.74	---	---
7	100.73	755.48	225.11	1688.31	---	---
8	141.82	1063.65	235.68	1767.61	---	---
9	100.73	755.48	225.11	1688.31	---	---
12	129.05	967.84	---	---	-1.64	-1.64
14	---	---	---	---	-4.65	-4.65
15	---	---	---	---	213.80	213.80
16	---	---	---	---	237.48	237.48

Stage no.	Strut no. 4 at elev.-2.00 kN/m run	Strut no. 4 kN/prop	Strut no. 5 at elev. 1.00 kN/m run	Strut no. 5 kN/prop
12	199.91	199.91	---	---
14	163.88	163.88	166.46	166.46
15	254.81	254.81	216.22	216.22
16	265.93	265.93	197.10	197.10

```
EDG CONSULTING PTY LTD                                             | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58                | Job No.  B01493
                             Licensed from GEOSOLVE                | Made by :    DL
Data filename/Run ID: Section_6                                    |
Albert Street Development                                          | Date:16-11-2022
Section 6                                                          | Checked :
-----------------------------------------------------------------------------
                                                      Units: kN,m
```

Bending moment, shear force, displacement envelopes



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Appendix D EDG Geotechnical Engineering Cavern Assessment Report

EDG consulting

Albert Street Cavern Assessment Report
Albert Street - Future Over Station Development
Brisbane, QLD

Prepared for:
QIC

Document Reference:
B01493-1AE

Version:
12 December 2022

Document:
Albert Street Cavern Assessment Report
Albert Street - Future Over Station Development
Brisbane, QLD

Prepared for:
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Brisbane Qld 4006

Document Reference:
B01493-1AE

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Appendices

1 Project Background

The Queensland Investment Corporation (QIC) has been awarded the development rights for the Cross River Rail (CRR) precincts, including the proposed development at Albert Street in the Brisbane CBD.

The Albert Street development will consist of a commercial tower, which will be in the order of 200m tall with approximately 45 floors above ground level. The building will include a multi-level basement, which must be designed to satisfy the requirements of the Cross River Rail Delivery Authority (CRRDA), due to the presence of CRR assets below.

RCP Australia Pty Ltd (RCP) has, on behalf of QIC, engaged EDG Consulting Pty Ltd (EDG) to provide geotechnical services for the project in three stages:

- Stage 1 – Geotechnical advice to help inform the Development Application (DA).
- Stage 2 – Geotechnical design as part of the detailed design of the building.
- Stage 3 – Geotechnical investigation and reporting to verify the basis of the design.

An assessment of ground stresses associated with the proposed building loads must be carried out and included in the DA submission. The purpose of the assessment is to allow a comparison of ground stresses and deformations at the Albert Street cavern from the proposed building loads, with ground stresses and deformations at the Albert Street cavern associated with the design load cases as nominated in the CRR Project Scope and Technical Requirements (PSTR).

The assessment intends to provide confidence at this early design stage that the predicted effects associated with the proposed building loads are within those calculated as part of the cavern permanent lining design.

This report presents our assessment of ground stresses and deformations, which adopts details appropriate to inform the DA submission. Further analysis would be required at detailed design stage.

2 Site Details

Site details, including location, ground stratigraphy, soil and rock parameters, groundwater and geotechnical advice relating to building elements such as the retention system, foundations, construction aspects and the like have been reported in our Geotechnical Engineering report (Ref. B01493-1AC, dated 8 December 2022. Only selected information presented in that report is repeated herein for ease of reference.

3 Basis of Analysis

3.1 Analysis Methodology

To help assess the effects on the Albert St cavern, we have developed a simplified 3D finite element model to assess ground stresses associated with the proposed building loads and the Future Over Station Development (FOSD) load cases. The assessment adopts the process shown in Diagram 1.

Develop a simplified 3D FE model representing the Lot 2 site

↓

Use the model to assess normal stress on the cavern lining and cavern distortion, arising from the CRR PSTR FOSD Load Cases

↓

Use the model to assess normal stress on the cavern lining and cavern distortion, arising from the proposed building loads

↓

Compare the analysis outcomes

↓

Smaller ground stresses and deflections from the proposed building load cases compared with the FOSD cases would suggest that the proposed building loads are within design limits.

↓

Further analysis to be carried out during detailed design

Diagram 1 – Analysis Process

3.2 Model Calibration

Ideally, the finite element model developed as part of this assessment would be calibrated with the finite element model used in the design of the cavern lining, by comparing the direct analysis outcomes that relate to specific load cases.

We have reviewed the information presented in the Albert Street cavern detailed design report, aiming to extract key modelling outcomes that relate to the FOSD load cases, for comparison with outcomes from the modelling carried out in this assessment. The cavern design modelling outcomes, however, are presented in a summarised format and therefore the exact analysis outcomes that directly relate to the FOSD load cases are not available.

We have therefore carried out the following comparisons to gain confidence that the cavern design modelling and the modelling as part of this assessment similar:

- The ground stratigraphy adopted for the cavern assessment was compared with the ground stratigraphy adopted for the cavern design analysis (as presented in the CRR Geotechnical Interpretative Report GIR), and both were assessed to be similar.
- The soil and rock material parameters adopted in the cavern assessment were all the same or similar to those adopted for the cavern design analysis, as presented in the CRR GIR.
- The cavern permanent lining details adopted in the cavern assessment, were based on the IFC drawings and were consistent with the details adopted in the cavern design.

3.3 Load Cases

The CRR PSTR nominates that design of the cavern lining must consider several FOSD load cases. Those load cases are defined in PSTR clauses OSD-31, OSD-46, OSD-47 and OSD-48. For ease of reference, those clauses are presented in Table 1, and are shown graphically on the attached sketches attached in Appendix A.

Table 1 – Assessment Load Cases

Load Case[1]	Additional Loading	Excavation or Distortion	PSTR Ref.
1	375kPa working load applied over part or the entire Albert Street Lot 2 site, applied at RL +4.0m		OSD-31
2	375kPa working load applied over part or the entire Albert Street Lot 2 site, applied at RL +4.0m	Excavation over the Albert Street Lot 2 site to RL-8.0m	OSD-31
3		Excavation over the Albert Street Lot 2 site to RL-8.0m	OSD-46
4		Excavation over the Albert Street Lot 2 site to RL-8.0m in the restricted zone and to RL -20m in other parts of the site	OSD-47
5	Vertical load of 50kPa acting on the ground 1 m from the Tunnel crown, plus an additional 20kPa applied at ground surface		OSD-48
6		i) Up to 7m below natural surface to allow for future development ii) with a minimum of 10m residual ground cover above the Tunnel crown iii) with a minimum 10m pillar width between the side wall of the Tunnel and any adjacent building basement excavation.	OSD-48
7	Vertical load of 75kPa acting on the ground 1 m from the Tunnel crown, plus an additional 20kPa applied at ground surface	Permanent support to accommodate additional distortion of 15mm/span.	OSD-48

Notes: 1 – Load case numbers shown relate to this document only. Load cases may be referred to differently in other relevant documents

We consider that interpretation of Load Cases 1 to 6 is relatively straightforward and is as illustrated on the sketches included in Appendix A. Our interpretation of Load Case 7 is that the additional loading of 75kPa acting on the ground 1m from the tunnel crown and the additional 20kPa applied at ground surface are applied first and the associated cavern distortion calculated. An additional distortion of 7.5mm/radius is then combined with the distortion calculated following application of the 75kPa and 20kPa loads. Therefore, the total cavern distortion considered in the design from Load Case 7, is the combination of the calculated distortion and the additional distortion allowance of 7.5mm/radius.

4 Finite Element Modelling

4.1 Model Details

Modelling of the proposed works was carried out using the commercially available finite element software package Plaxis 3D (2020). The model adopted horizontal soil and rock layers that were generally consistent with the ground stratigraphy adopted in the cavern design as shown on the geological sections presented in the CRR GIR.

Soil and rock behaviour was represented by a linear-elastic perfectly plastic continuum constitutive model for all material units apart from the Alluvium, where the Hardening Soil constitutive model was used. Plasticity was controlled by a stress-dependent Mohr-Coulomb failure criterion for all soil types, based on the material parameters presented in Table B1, included in Appendix B. Drained shear strength parameters were used for all materials in all stages. Structural loads were defined by RBG and were applied as point loads at the pile heads or at the column location for the shallow footings. A hydrostatic groundwater equal to RL-4m was considered, with the tunnel internal volume set to dry as well as the basement excavation.

Details of the structural elements used in the analysis are presented in Table 2.

Table 2 – Finite Element Model Structural Elements

Component	Plaxis Element Type	Details
Cavern Liner	Plate	The crown and sidewalls are modelled as a 700mm thick plate element. The base slab is modelled as a 300mm thick plate element. An elastic modulus value of 32.8GPa has been assigned to both plates.
Retention Piles	Beam	Retention piles are modelled as a 0.9m diameter circular beam with centre to centre spacing of 1.8m. An elastic modulus value of 32.8GPa has been assigned to the beams.
Shotcrete for retention wall	Plate	The shotcrete panels between the retention piles are modelled as 150mm thick plate elements. An elastic modulus value of 24GPa has been assigned to all plates.
Prop (914x19 CHS GR350LO)	Node to Node Anchor	All props are modelled as node to node anchors. A stiffness value (EA) of 10.7 GN has been assigned to all node to node anchors. No pre-stress was included in any of the props.
Twin waler beam (1200WB455 GR400)	Beam	The twin waler beam has been modelled as a single beam element in our model, adopting material properties representative of the twin waler beam. An elastic modulus value of 200GPa has been assigned to all beams. Second moment of area values of 30.67×10^9mm^4 and 8.91×10^9mm^4 have been adopted in the two orthogonal bending directions.
Concrete Core Slab (PC3)	Soil Volume	The concrete core slab has been modelled as a 3m thick volume of linear elastic material. An elastic modulus value of 39.6GPa has been assigned to the volume.
Core Piles	Embedded Beam	All core piles are modeled as 1.2m diameter embedded beams. An elastic modulus value of 34.8GPa has been assigned to all beams. Skin friction values as per report Ref. B01493-1AC are adopted for the material units. No skin friction has been allowed for piles within the steel sleeved zones.
Podium Pile Cap (PC1)	Plate	The podium pile caps are modelled as 2.5m thick plate elements. An elastic modulus value of 39.6GPa has been assigned to all plates.

Component	Plaxis Element Type	Details
Podium Piles	Embedded Beam	All podium piles are modeled as 1.6m diameter embedded beams. An elastic modulus value of 34.8GPa has been assigned to all beams. Skin friction values as per report Ref. B01493-1AC are adopted for the material units. No skin friction has been allowed for piles within the steel sleeved zones.
Shallow Foundation Footing Type 1 (PF1)	Plate	Shallow footings type 1 (PF1) are modelled as 1.5m thick plate elements. An elastic modulus value of 34.8GPa has been assigned to all plates.
Shallow Foundation Footing Type 2 (PC2)	Plate	Shallow footings type 2 (PC2) are modelled as 1.2m thick plate elements. An elastic modulus value of 34.8GPa has been assigned to all plates.

The finite element model is shown indicatively in Diagram 2.

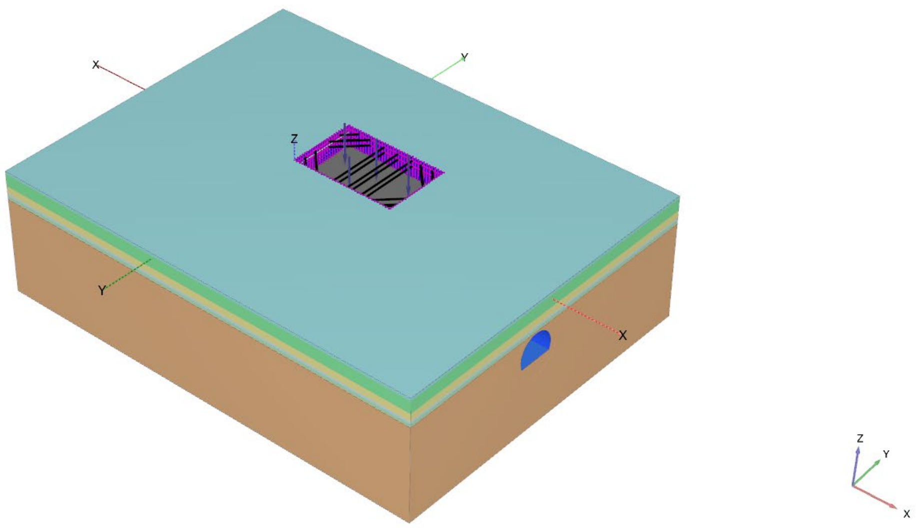


Diagram 2 – Finite Element Model

The analysis adopted the construction stages as presented in Table 3.

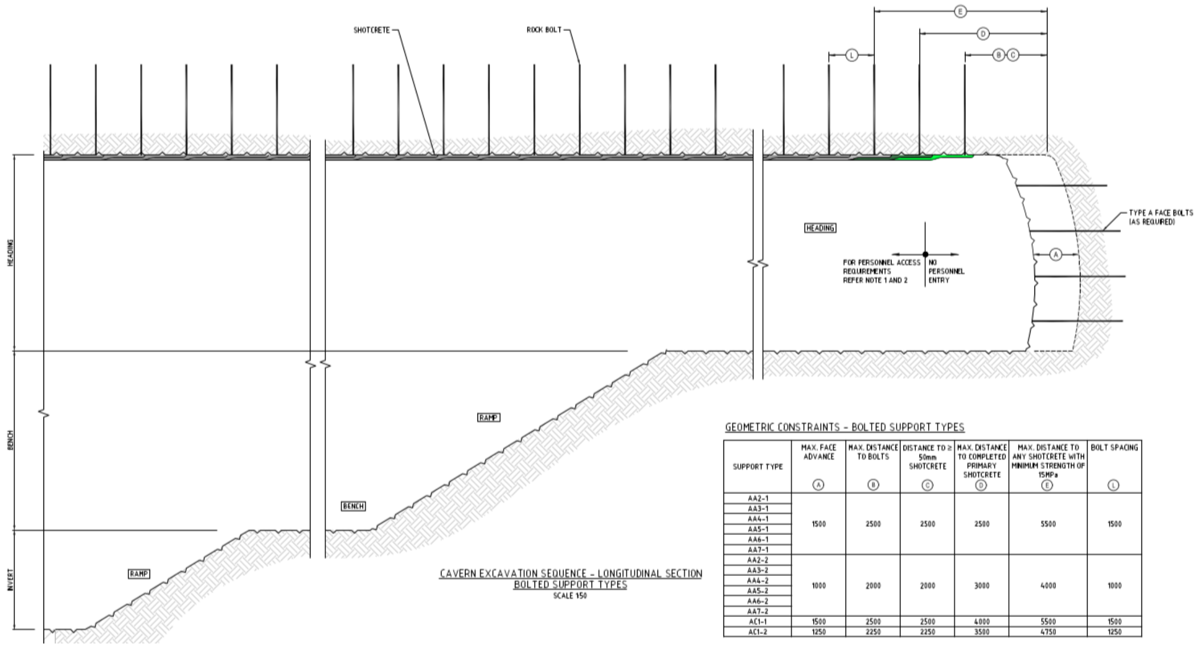
Table 3 – Construction Sequence

Analysis Stage	Description	Details
1	Initial stage	Initial stresses are defined in the model using the K_0 procedure.
2	Tunnel excavation	The tunnel is excavated across the model. Stress relaxation of the tunnel is represented using the ΣM_{Stage} factor.
3	Tunnel liner installation	The tunnel liner is activated after stress relaxation from the previous stage. The tunnel liner is modelled as plate elements.
4	Retention piles installation	Retention piles around the perimeter of the site are activated. The retention piles are modelled as beam elements.

Analysis Stage	Description	Details
5	Excavation no.1	Shaft excavation is undertaken in three stages. The first stage of the excavation extends to 0.5m below the elevation of the upper row of strut and waler beams.
6	Upper prop and waler installation	The upper row of prop and waler beam is activated. The props are modelled as node to node anchors. The waler beams are modelled as beam elements.
7	Excavation no. 2	Shaft excavation is undertaken in three stages. The second stage of the excavation extends to 0.5m below the elevation of the lower row of strut and waler beams.
8	Lower prop and waler installation	The lower row of prop and waler beam is activated. The props are modelled as node to node anchors. The waler beams are modelled as beam elements.
9	Excavation no. 3	Shaft excavation is undertaken in three stages. The third stage of the excavation extends to the final excavation elevation.
10	Shallow footings, core slab, pile cap and pile installation	All shallow footings, core slab, pile caps and piles are installed in a single stage. The shallow footings and pile caps are modeled as plate elements. The core slab is modelled as a material volume. The individual piles are modelled as embedded beam rows.
11	Apply loading	Axial and lateral loads for the piles, as provided by RBG, are applied at the head of each individual piles as point loads. The vertical loads along the retention system has been modelled as line loads acting at the top of the retaining piles.

4.2 Cavern Construction

The primary lining detailed design drawing (CRRTSD-300-0322-DRG-PSMQ-1330-180302) shows that the adit primary lining comprises a 50mm thick shotcrete lining combined with rock bolts spaced at 1.25m horizontally. The primary lining is installed progressively in overlapping shotcrete layers, resulting in a maximum longitudinal distance of 4.75m between the excavation face and the where the shotcrete has achieved a minimum of 15MPa compressive strength (design strength). The relative geometry of the cavern excavation and primary lining is illustrated in Diagram 3.



SUPPORT TYPE	MAX. FACE ADVANCE (A)	MAX. DISTANCE TO BOLTS (B)	DISTANCE TO ≥ 50mm SHOTCRETE (C)	MAX. DISTANCE TO COMPLETED PRIMARY SHOTCRETE (D)	MAX. DISTANCE TO ANY SHOTCRETE WITH MINIMUM STRENGTH OF 15MPa (E)	BOLT SPACING (L)
AA2-1 AA3-1 AA4-1 AA5-1 AA6-1 AA7-1	1500	2500	2500	2500	5500	1500
AA2-2 AA3-2 AA4-2 AA5-2 AA6-2 AA7-2	1000	2000	2000	3000	4000	1000
AC1-1	1500	2500	2500	4000	5500	1500
AC1-2	1250	2250	2250	3500	4750	1250

Diagram 3 – Cavern Primary Lining Details

We have made allowance for the progressive installation of primary lining by assessing the stress relaxation prior to support installation following the method by Hoek (2008[1]). This method assesses the proportion of convergence experienced at a point of interest back from the tunnel face. Using this method, we are therefore able to estimate the relative proportion of convergence due to tunnelling that would have occurred prior to installation of the primary lining.

Our calculations indicate that approximately 60% of the total convergence due to tunnelling would have already occurred prior to application of the primary lining. Therefore, our analysis models the adits with support (primary lining) installed after an unsupported excavation stage that was progressed to balance 60% of the total forces (in Plaxis setting M_{Stage} to 0.6).

To consider the potential variability in the degree of stress relaxation of the tunnel, we have undertaken sensitivity assessments considering a convergence factor of 50% and 70% (i.e. in Plaxis, setting M_{Stage} to 0.5 and 0.7). Outcomes of the sensitivity analysis are discussed in Section 4.4.

4.3 Analysis Results

The results of the analysis are presented graphically on the plots included in Appendix C, are summarised in Table 4 and discussed in the following section.

[1] Hoek, E., Carranza-Torres, C., Diederichs, M.S. and Corkum, B. 2008. Integration of geotechnical and structural design in tunnelling. Proceedings University of Minnesota 56th Annual Geotechnical Engineering Conference. Minneapolis, 29 February 2008, 1-53

Table 4 – Summary of Analysis Outcomes

Analysis Outcome	Relevant Load Case(s)	Results
Cavern crown vertical distortion	LC1 to LC6	Approximately 2mm to 7mm
	LC7 (including additional distortion of 7.5mm/radius)	Approximately 15mm
	Reported SLS distortion from cavern lining design report[1]	Approximately 26mm
	Proposed building loads	Approximately 7mm
Cavern horizontal distortion	LC1 to LC6	Approximately ±2mm
	LC7 (including additional distortion of 7.5mm/radius)	Approximately ±9mm
	Reported SLS distortion from cavern lining design report[1]	Approximately ±5mm
	Proposed building loads	Approximately ±1mm
Cavern normal stresses	LC1 to LC7	Approximately 50kPa to 200kPa
	Proposed building loads	Approximately 100kPa to 150kPa

Notes: 1 – SLS cavern distortions from most onerous cavern crown distortion load case reported in Albert St. permanent lining design report (Ref. CRRTSD-300-0323-RPT-PSMQ-1330-190089), reproduced, and annotated as Diagram 4.

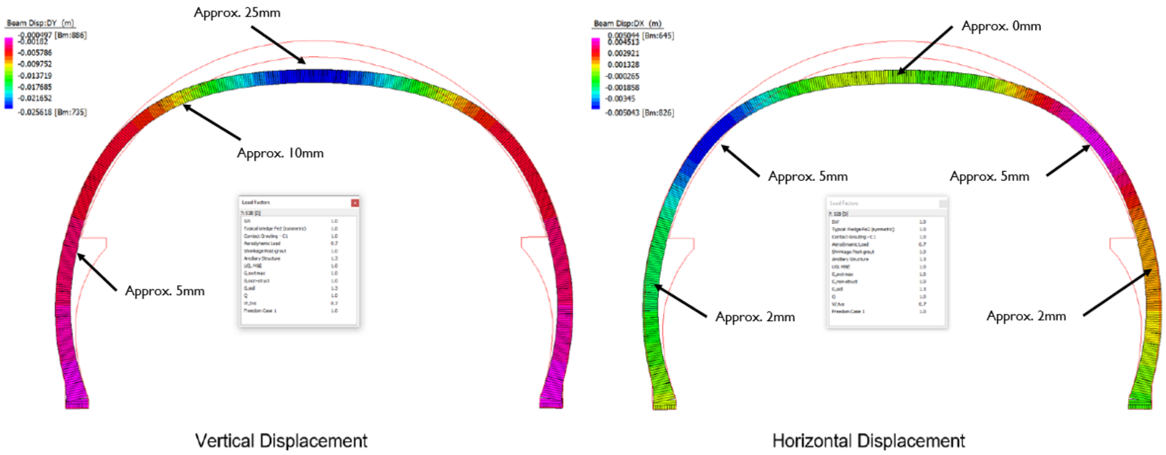


Diagram 4 – Reported SLS cavern distortions

4.3.1 Sensitivity Analysis

This assessment has also investigated the sensitivity of key factors that could affect the assessment outcomes. The factors investigated are the tunnel relaxation factor (i.e. the amount that the ground stresses are allowed to relax following tunnel excavation, prior to application of tunnel support), and the elastic modulus of the rock surrounding the cavern.

The adopted sensitivity analysis cases are described below, and the associated results presented in Tables 5 to 7.

- **Case S1:** The analysis is based on the same ground conditions and parameters as per the primary analysis cases, however considered a tunnel relaxations factor of 0.5 (M_{Stage} = 0.5).

- **Case S2:** The analysis is based on the same ground conditions and parameters as per the primary analysis cases, however considered a tunnel relaxations factor of 0.7 (M_{Stage} = 0.7).
- **Case S3:** The analysis is based on the same ground conditions and parameters as per the primary analysis cases, however considered a reduced elastic modulus within the NFG2/1 unit (50% of original value = 2.5GPa). M_{Stage} = 0.6.
- **Case S4:** The analysis is based on the same ground conditions and parameters as per the primary analysis cases, however considered an increased elastic modulus within the NFG2/1 unit (200% of original value = 10GPa). M_{Stage} = 0.6.

Table 5 – Sensitivity Analysis Outcomes (Vertical Displacement)

Sensitivity Load Case	Description	Results	
		PSTR Load Cases	Proposed Building Load Case
S1	Analysis based on lower relaxation factor (M_{Stage} = 0.5)	7.5mm	7mm
S2	Analysis based on higher relaxation factor (M_{Stage} = 0.7)	8.8mm	8mm
S3	Analysis based on NFG2/1 elastic Modulus set to 50% of design value (2.5GPa)	12mm	12mm
S4	Analysis based on NFG2/1 elastic Modulus set to 200% of design value (10GPa)	5.3mm	5mm

Table 6 – Sensitivity Analysis Outcomes (Horizontal Displacement)

Sensitivity Load Case	Description	Results	
		PSTR Load Cases	Proposed Building Load Case
S1	Analysis based on lower relaxation factor (M_{Stage} = 0.5)	1.7mm	1.4mm
S2	Analysis based on higher relaxation factor (M_{Stage} = 0.7)	1.7mm	1.4mm
S3	Analysis based on NFG2/1 elastic Modulus set to 50% of design value (2.5GPa)	3mm	2.6mm
S4	Analysis based on NFG2/1 elastic Modulus set to 200% of design value (10GPa)	0.9mm	0.7mm

Table 7 – Sensitivity Analysis Outcomes (Normal Stress at Crown)

Sensitivity Load Case	Description	Results	
		PSTR Load Cases	Proposed Building Load Case
S1	Analysis based on lower relaxation factor (M_{Stage} = 0.5)	185kPa	150kPa
S2	Analysis based on higher relaxation factor (M_{Stage} = 0.7)	130kPa	90kPa
S3	Analysis based on NFG2/1 elastic Modulus set to 50% of design value (2.5GPa)	180kPa	130kPa
S4	Analysis based on NFG2/1 elastic Modulus set to 200% of design value (10GPa)	130kPa	85kPa

4.4 Discussion

The calculated vertical and horizontal distortions associated with the proposed building loads are generally within the calculated values from the CRR PSTR Load Cases 1 to 6.

The calculated vertical and horizontal distortions are well within peak values when comparing with the additional distortion allowance as per CRR PSTR Annexure B Table B2 (Load Case 7).

The Albert St. cavern permanent lining design report, presented calculated SLS cavern distortion values in excess of the calculated cavern distortion values relating to the proposed building loads.

Calculated cavern lining normal stresses from the proposed building load case were within those calculated from Load Cases 1 to 7, however locally spike at the cavern corner closest to applied load. This is considered to be an artefact of the preliminary modelling and not representative of the lining stress. This will be further addressed in subsequent design stages.

We consider that the analysis outcomes suggest that predicted effects associated with the proposed building loads within the effects associated with the PSTR design load cases.

The sensitivity analysis cases suggest that the outcomes of the assessment are not sensitive to the parameters adopted in the analysis. These include the tunnel relaxation factor and the stiffness of the rock surrounding the cavern.

The level of analysis carried out in this assessment is considered to be appropriate for this design stage and appropriate for a proof of concept assessment. Further work will be required during detailed design including further development of the geotechnical model and updates to the finite element model to include buried infrastructure such as adits that connect to the cavern, etc. where necessary.

For and on behalf of EDG Consulting Pty Ltd

David Cunliffe
Principal

Ground conditions and the natural environment often present the highest potential risks to project construction and operation. Helping our clients manage their geotechnical risk is fundamental to the role of EDG. We have prepared these notes to assist our clients to understand the information we provide and to help them to manage their risk. Where there is uncertainty about the site, project or geotechnical conditions, contact EDG for assistance.

Scope of Services

The information provided in this document is based on the scope of services defined in the client's agreement with EDG Consulting Pty Ltd (EDG). In undertaking the work, EDG has relied on information provided by the client and other individuals and organisations. Unless stated in the document, EDG has not verified the accuracy of that information and does not accept responsibility for the conclusions, recommendations or designs developed based on that information should it be incorrect, misrepresented or withheld.

Unless specifically stated to the contrary, this document does not cover geo-environmental issues, which require significantly different equipment, techniques and personnel. A geo-environmental specialist should be engaged to provide such advice.

The document is based on specific project details

The information provided in this document is relevant to the subject site and project only. The document has been prepared based on the specific details and requirements of your project and may not be relevant if any changes to the project occur. Should changes occur, must review the report to identify if and how such changes will affect the conclusions, recommendations or designs provided. EDG accepts no responsibility if the client elects not to consult in the event of changes to the project.

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Should you choose to engage an alternative party for advice based on the information in the document, it must be understood that the alternative party will be less familiar with the site conditions and basis of information provided, and there is a potential for misinterpretation. EDG will not be held liable in any way from such misinterpretation.

EDG will not be liable to update or revise the document to take into account information any events or circumstances or facts occurring or becoming apparent after the date of the report.

All site conditions cannot be identified

The scope of work undertaken represents a professional assessment of the information cited to develop a basic geotechnical model of the site based on EDG's understanding of the client's risk profile. In some cases, increasing the frequency of investigations and/or sampling, or considering alternative investigation techniques may improve the interpretation, but may not identify all relevant subsurface conditions at the site.

The document presents an interpretation

Geotechnical information is an interpretation of conditions evident based on a limited number of facts established during a site investigation. Engineering logs are an interpretation of observations of samples and test results at discrete locations in the subsurface profile. A geotechnical model is an interpretation of site conditions, developed using information from discrete locations on the site and an understanding of geological processes. Interpreted conditions at and between investigation locations may be different to those inferred on the engineering logs and geotechnical model. The client must consider how variations in conditions could affect the project and seek advice to reduce risk if it is unacceptable to the client.

Conditions can change

The geotechnical information provided is based on the conditions observed at the time of the investigation. Such conditions may be time dependent and subject to external influences. Many things could influence the site conditions, including geological processes, variation in groundwater or surface water levels, other natural cycles and influence from human activities (on this site or nearby sites). Specific advice should be sought if conditions on site change from those observed at the time the report was prepared.

How to deal with different site conditions

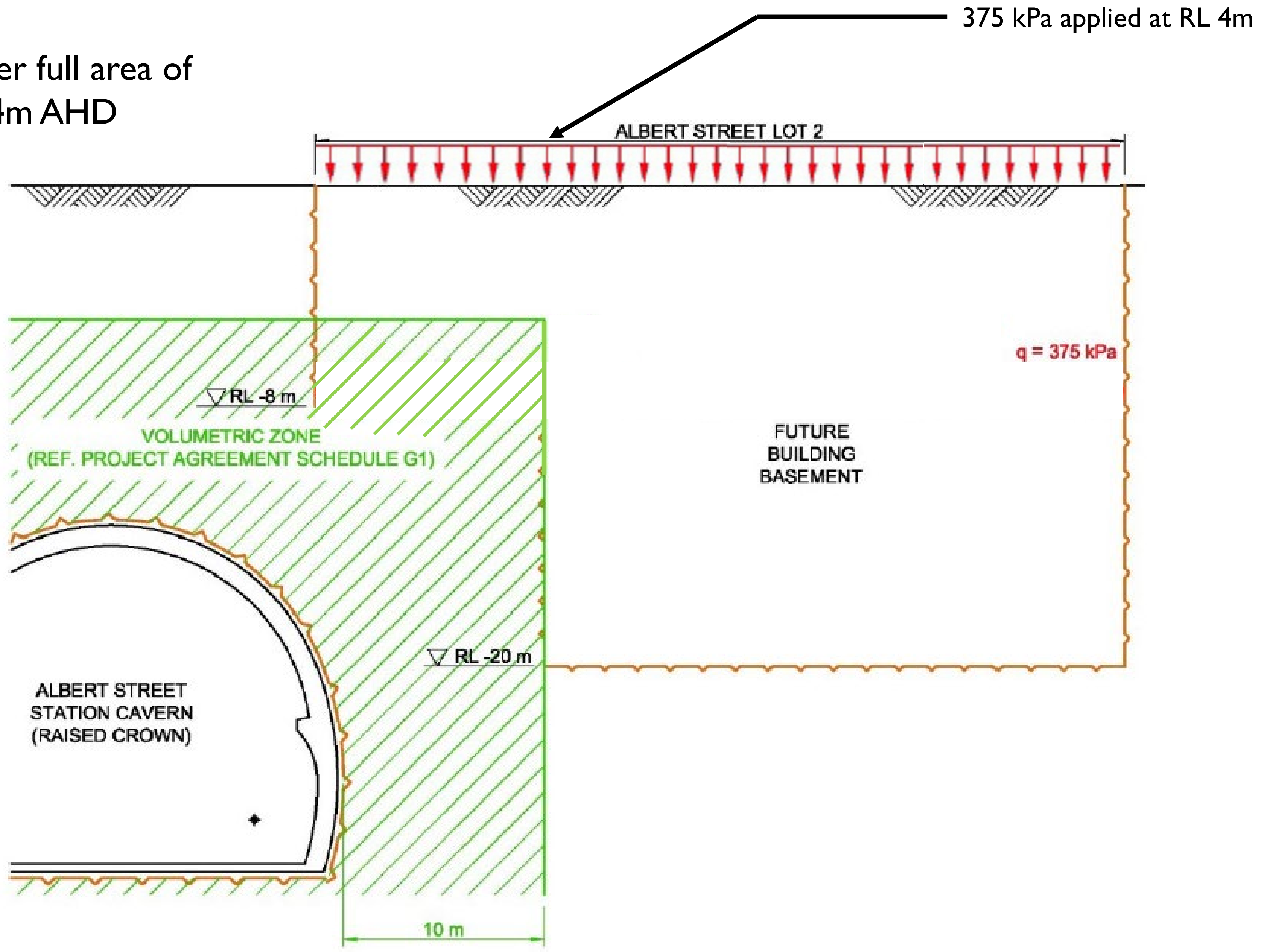
The sub-surface conditions on the site may not be as inferred in this report. Geotechnical uncertainties can be managed throughout the project life cycle, but particularly during construction.

Knowledge of site conditions must be further developed as the ground is exposed during construction and/or operation. It is essential that the client implements the nominated design and construction requirements, including observation, interpretation and assessment of the exposed conditions during construction and operation using skilled staff familiar with the design assumptions and assumed geotechnical conditions, or engaging EDG to undertake this role on your behalf. EDG will not be held liable in any way from such misinterpretation.

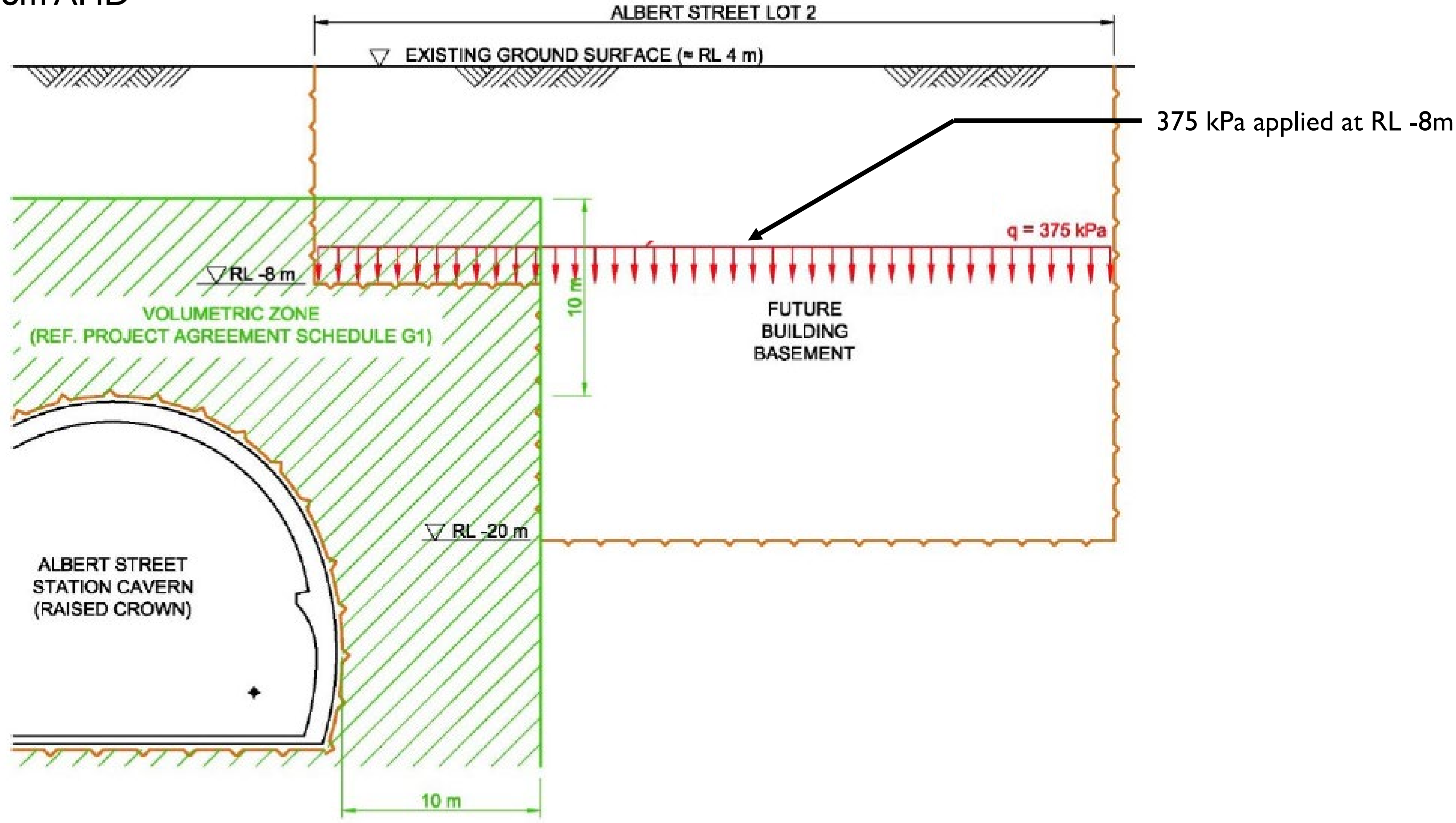
Appendix A

CRR PSTR Load Cases

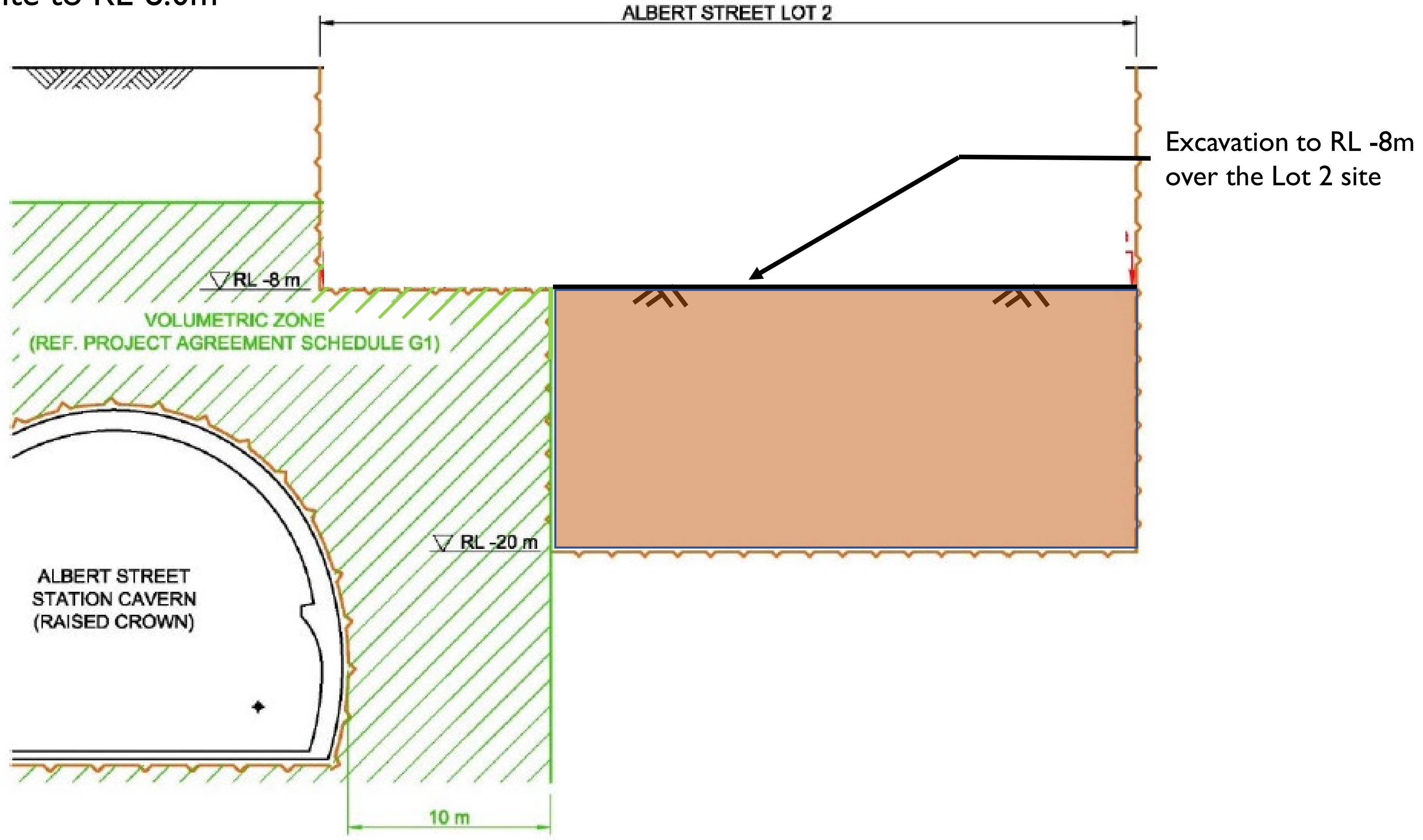
Case 1 – 375kPa over full area of Lot 2, applied at RL 4m AHD **(OSD-31)**



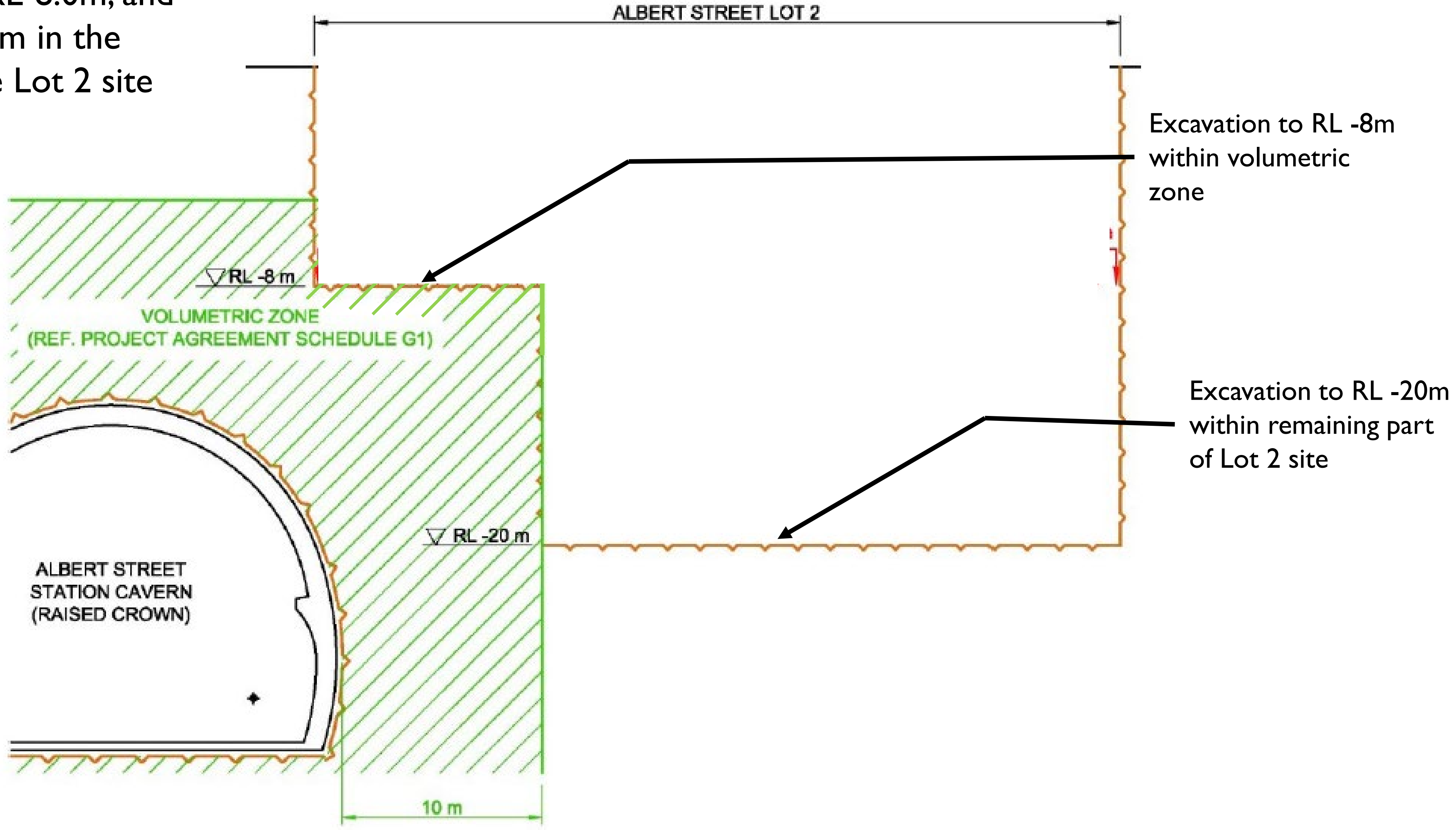
Case 2 – 375kPa over full area of Lot 2, applied at RL -8m AHD **(OSD-31)**



Case 3 – Excavation over the entire Albert Street Lot 2 site to RL-8.0m **(OSD-46)**



Case 4 – Excavation in the volumetric zone to RL-8.0m, and excavation to RL -20m in the remaining part of the Lot 2 site **(OSD-47)**



Case 5:

- 50kPa applied at 1m above cavern crown
- 20kPa applied at ground surface

(OSD-48)

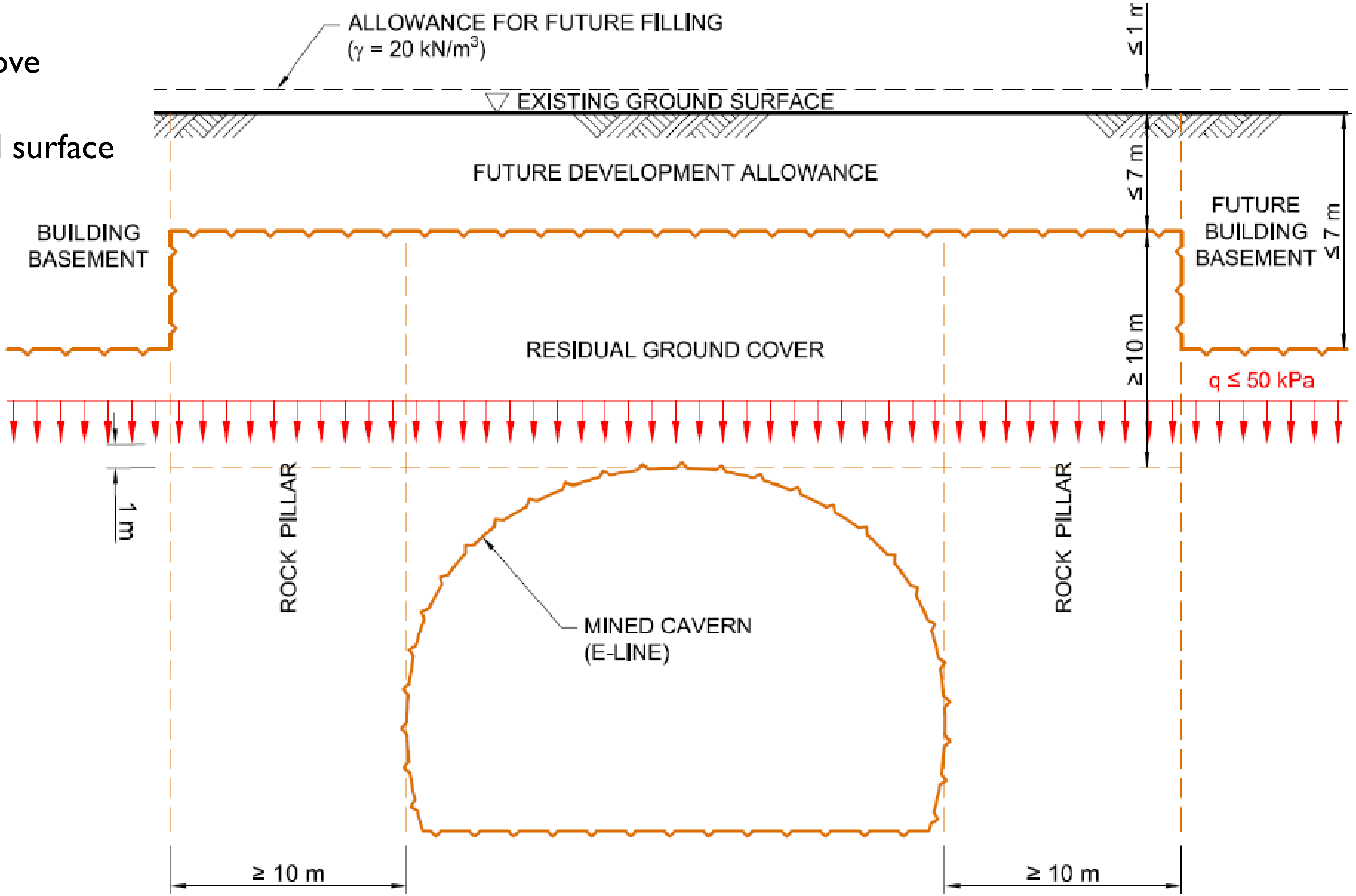


Figure 13 FOSD loading for caverns – Future development allowance Case 1 (Ref. Table B2-A, Annexure B, PSTR)

Case 6:

- 7m excavation over Lot 2 site to RL -3m

(OSD-48)

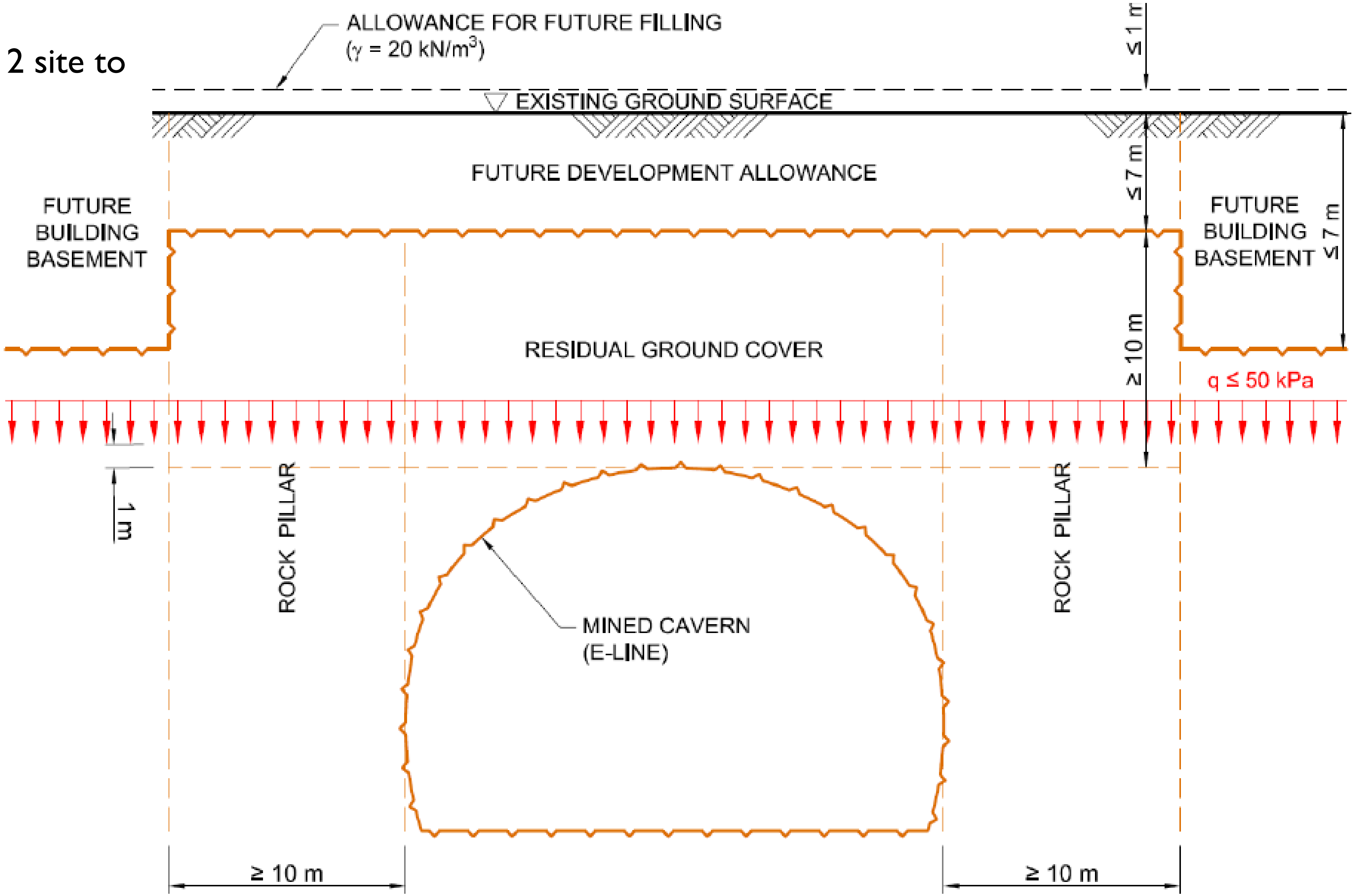


Figure 13 FOSD loading for caverns – Future development allowance Case 1 (Ref. Table B2-A, Annexure B, PSTR)

Case 7:

- 75kPa applied at ground surface
- 20kPa applied at ground surface
- Additional cavern distortion of ±15mm on diameter

(OSD-48)

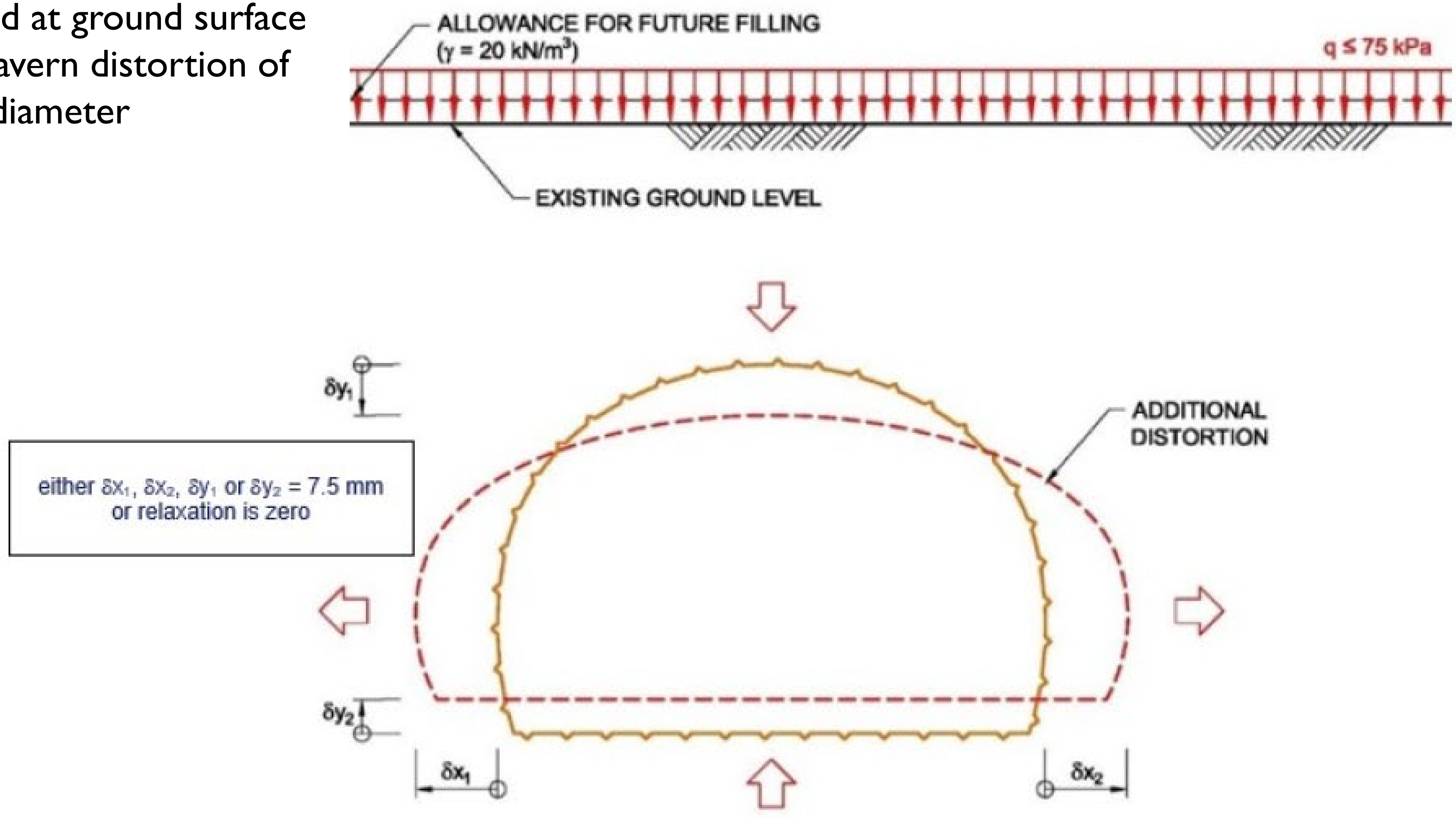


Figure 15 FOSD loading for caverns – Future development allowance Case 2 (Ref. Table B2-B, Annexure B, PSTR)

Appendix B

Geotechnical Parameters

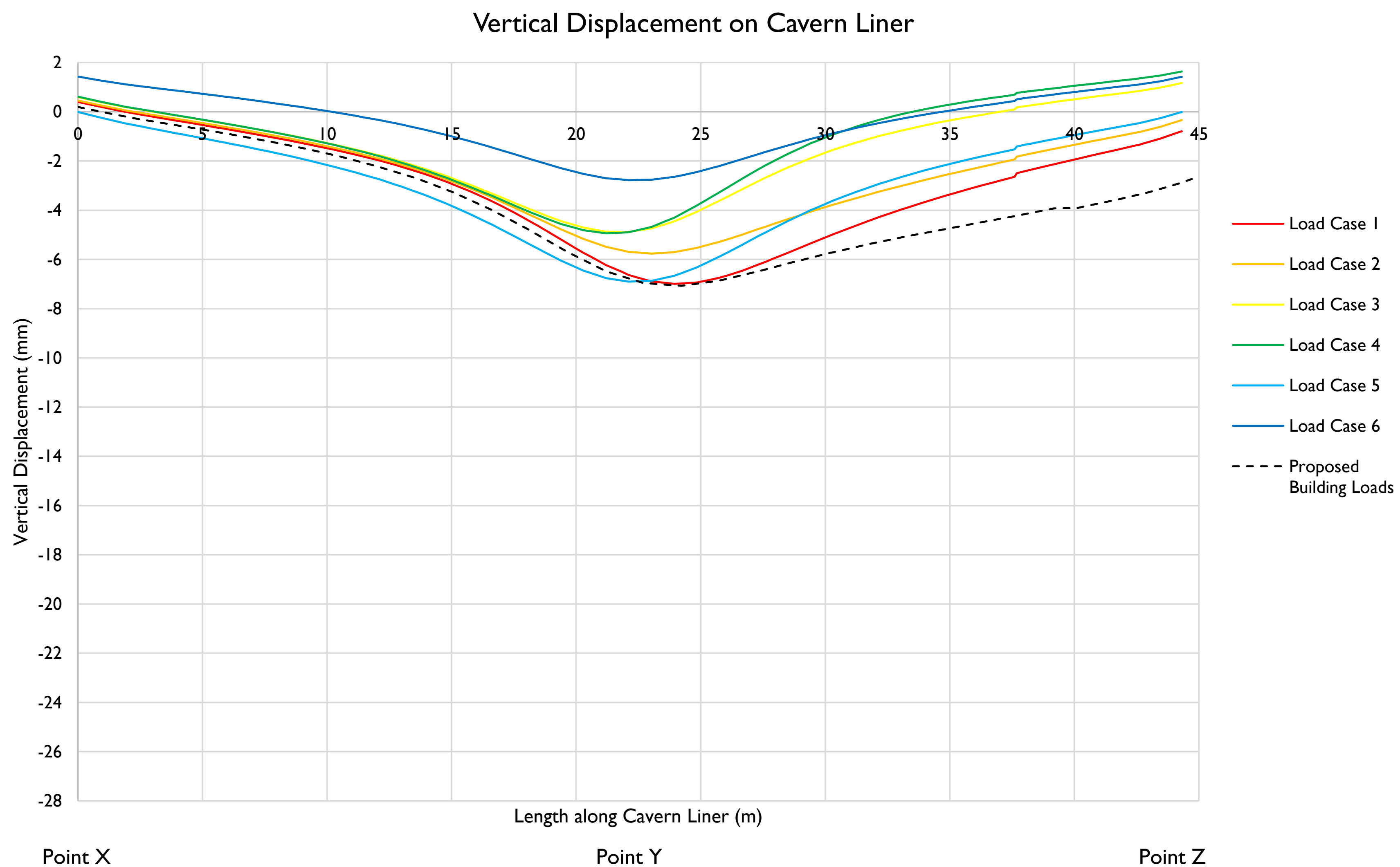
Table B1 – Geotechnical Parameters

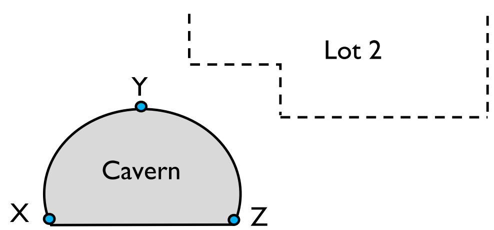
Geological Age	Unit	Sub Unit	Materials	Elevation	Thickness	Unit Weight	Undrained Shear Strength	Drained Cohesion	Drained Friction Angle	Tensile Strength	Drained Young's Modulus	Drained Poisson's Ratio	Secant Stiffness in Standard Drained Triaxial Test [1]	Tangent Stiffness for Primary Oedometer Loading [1]	Unloading / Reloading Stiffness [1]	Over Consolidation Ratio	At Rest Earth Pressure Coefficient
				(RL m)	(m)	(kN/m³)	s_u (kPa)	c' (kPa)	θ' (degrees)	σ_t (kPa)	E' (MPa)	v'	E_{50}^{ref} (MPa)	E_{oed}^{ref} (MPa)	E_{ur}^{ref} (MPa)	OCR	K_0
Holocene	Fill	Fill (FL)	Various material including concrete, bricks, granular and fine grained fill	4 to 2.4	1.6	17	N/A	0	25	N/A	10	0.3	N/A	N/A	N/A	N/A	0.7
	Holocene Alluvium	Holocene Clay (AL F)	Mainly clay (soft to firm)	2.4 to -5	7.4	17	25 + 2z	4	26	N/A	5 + 0.4z	0.3	3.0	2.0	20	1.5	0.7
Devonian	Neranleigh Fernvale Beds	Residual Soil (RS F)	Mainly clay (stiff to hard)	-5 to -9.6	4.6	20	100	10	30	N/A	25	0.3	N/A	N/A	N/A	3.0	1
		Extremely Weathered Material to Very Low Strength Rock (NFG 5)	Silt and sand sized sedimentary rocks; slightly metamorphosed (typically called greywacke, phyllite, argillite)	-9.6 to -10.8	1.2	23	N/A	20	30	N/A	50	0.3	N/A	N/A	N/A	N/A	1
		Medium Strength Rock (NFG 3)		-10.8 to -13	2.2	27	N/A	250	45	15	1,000	0.2	N/A	N/A	N/A	N/A	1
		High to Very High Strength Rock (NFG 2/1)		Below -13	>50	27	N/A	400	55	70	5,000	0.2	N/A	N/A	N/A	N/A	1

Notes: [1] All stiffness parameters associated with the Hardening Soil Model are presented based on a reference pressure equal to 100 kPa.

Appendix C

Calculation Outputs





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date:	8/12/2022	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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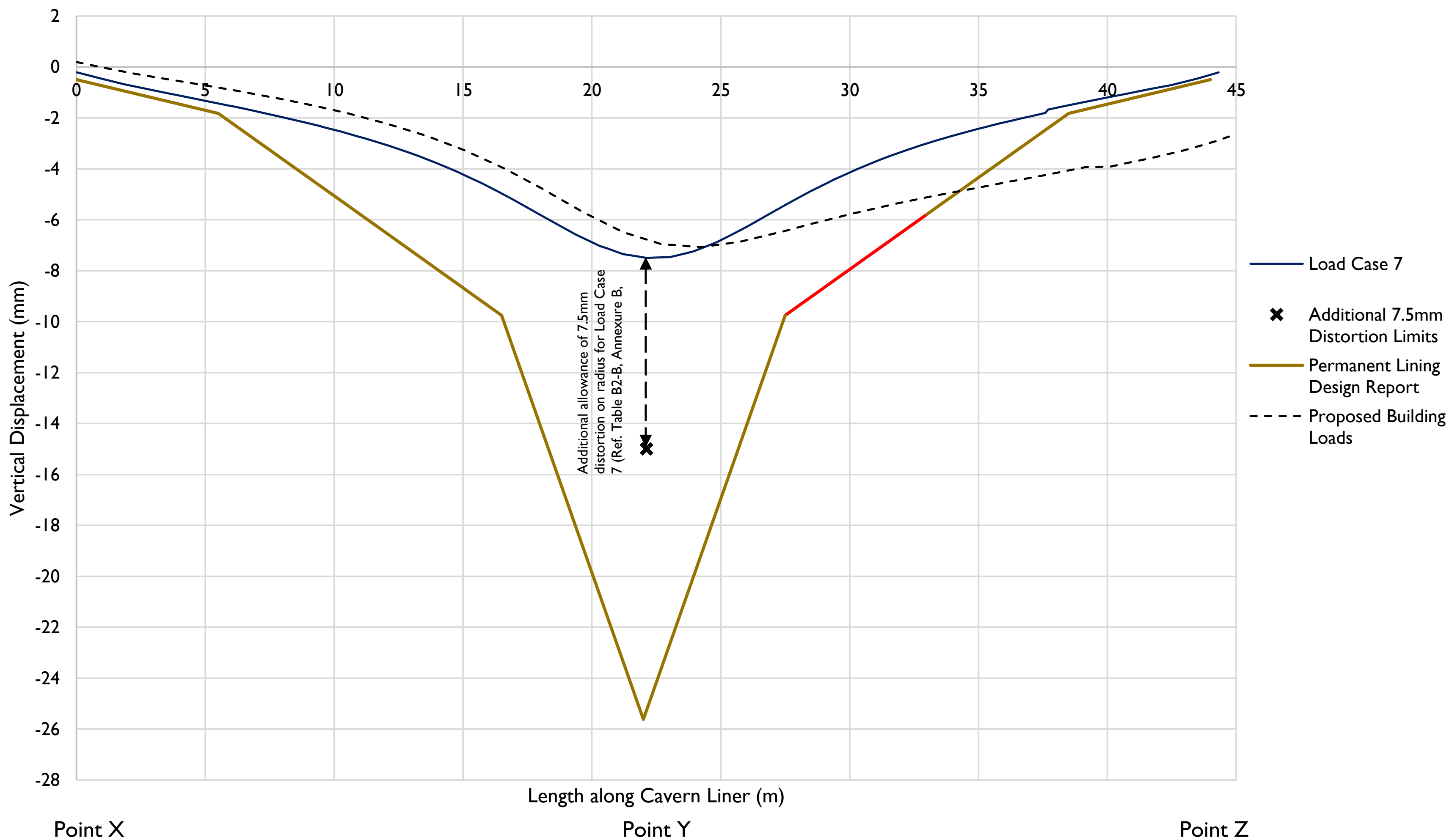
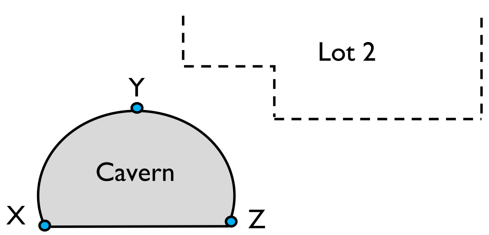
figure: 1

Vertical Displacement on Cavern Liner





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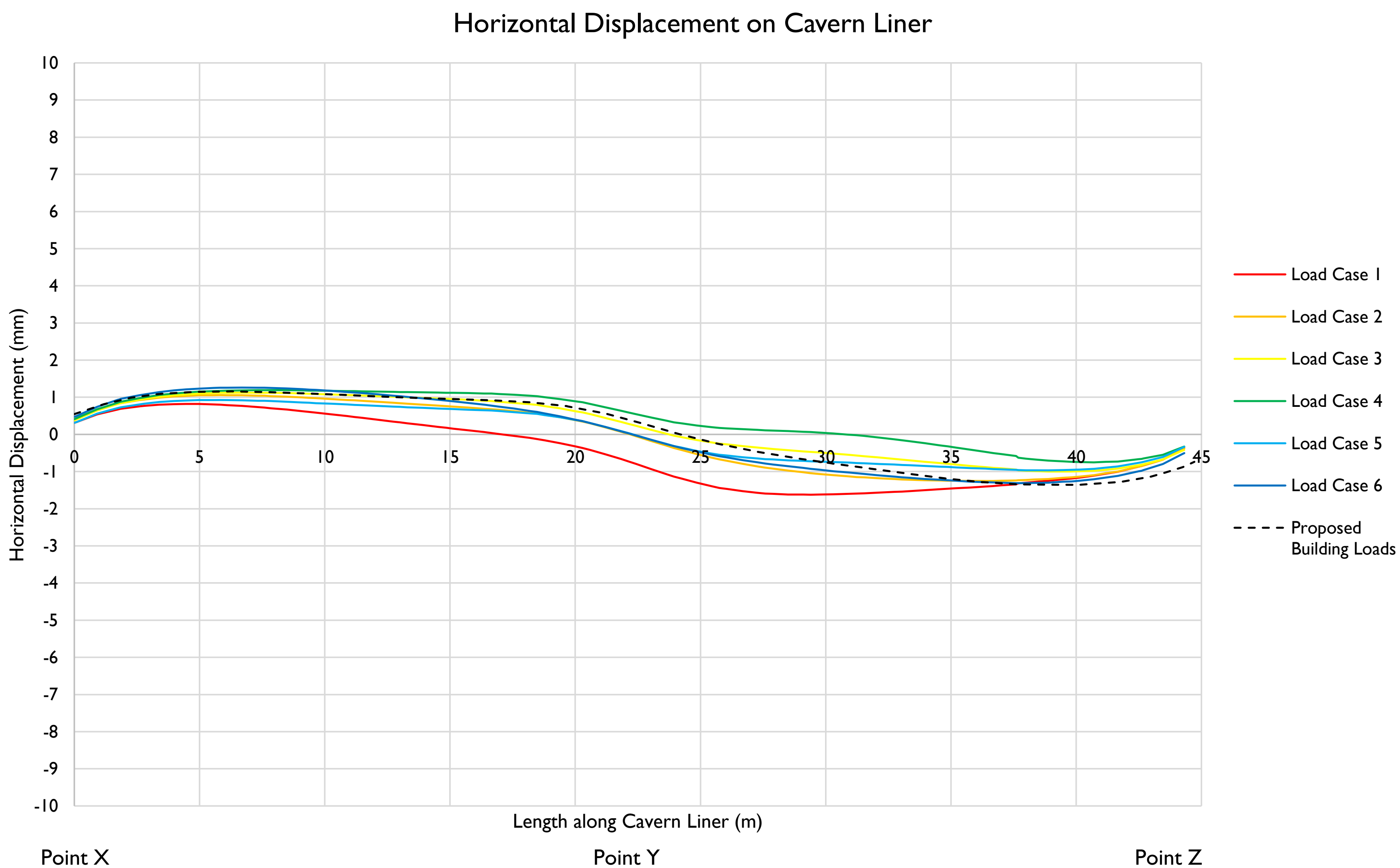

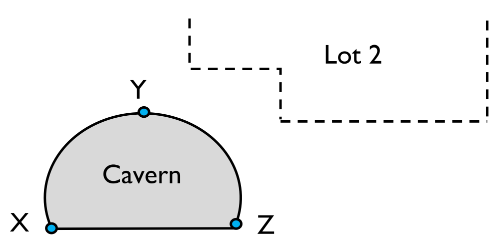

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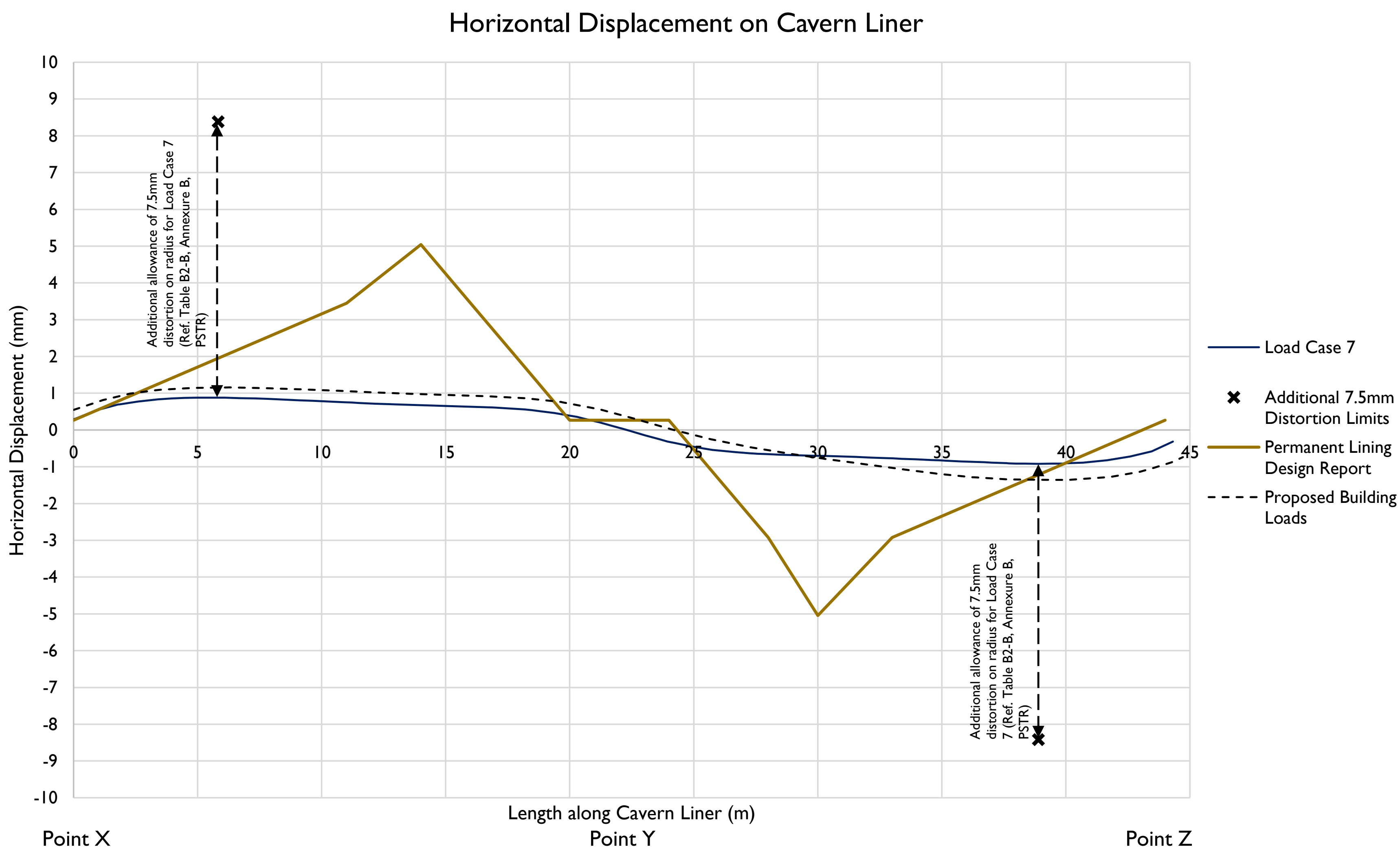
date:	8/12/2022	*project:*	Albert Street Development	engineering | design | geosciences
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* 3



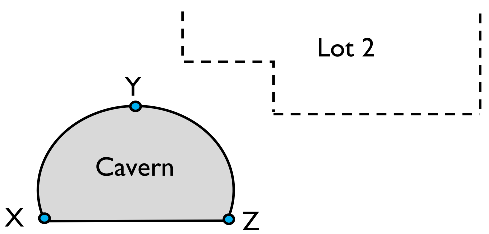


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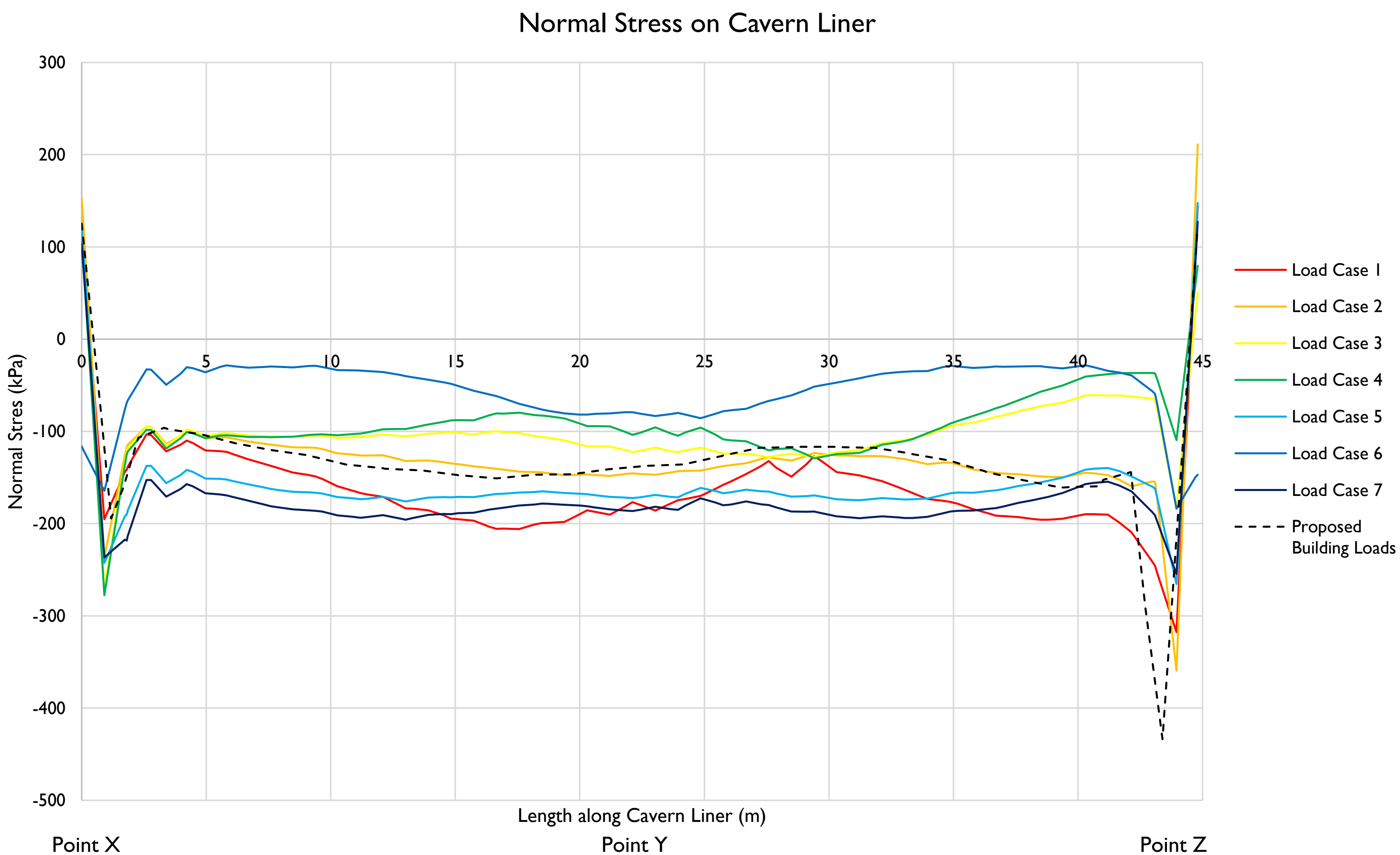
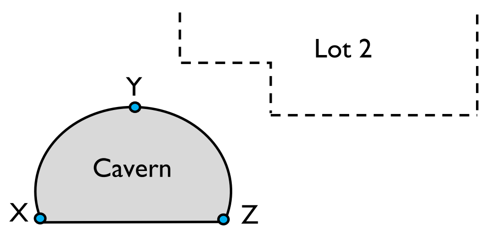
figure: 4





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date:	8/12/2022	*project:*	Albert Street Development	engineering | design | geosciences
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* 5

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Appendix E Geotechnical Engineering Brief

Robert **Bird** Group

Geotechnical Investigation Brief – Revision B

ALBERT STREET COMMERCIAL TOWER

6 June 2022

Prepared For: Queensland Investment Corporation

Project No.: 22131S

Document No.: 22131-RBG-ZZ-XX-RP-ST-00001

Table of Contents

REVISION/ISSUE AUTHOR:

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Signing for and on behalf of
Robert Bird Group Pty Ltd
Date: 06 June 2022

REVIEWER:

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Mark Avery
Signing for and on behalf of
Robert Bird Group Pty Ltd
Date: 06 June 2022

1 Site Description

The proposed Albert Street Commercial Development site is located opposite the proposed Albert Street Cross River Rail Station. The site is noted as FOSD Lot 2 on the map below.

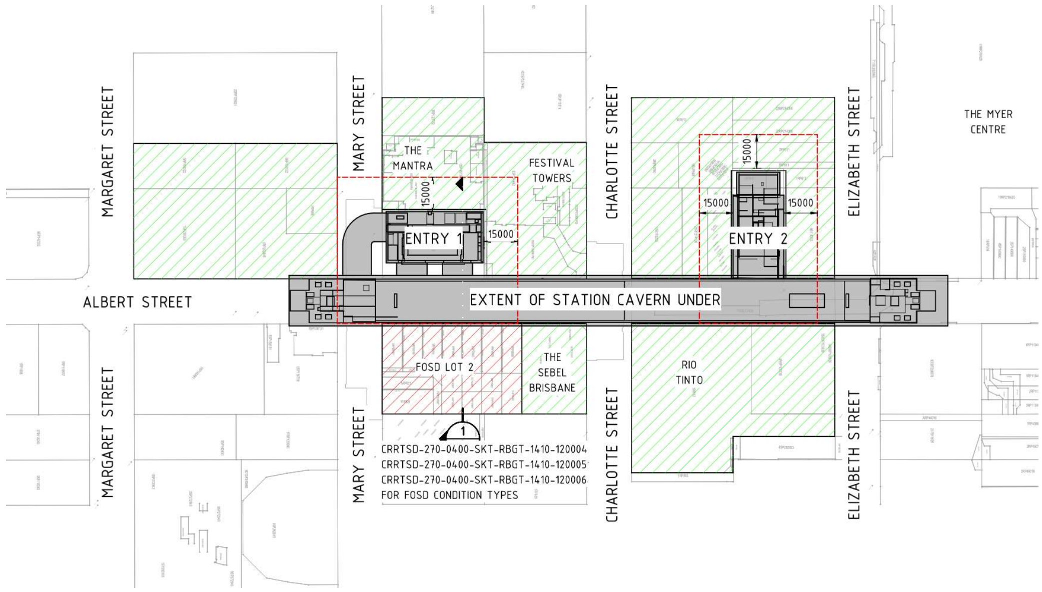

Figure 1: Site Map

The site abuts the Station Cavern that runs under Albert Street and sits between Mary Street and the Brisbane Sebel development. Two developments abut the Northern boundary being 110 mary Street and 119 Charlotte Street. Refer Figure 2 below.

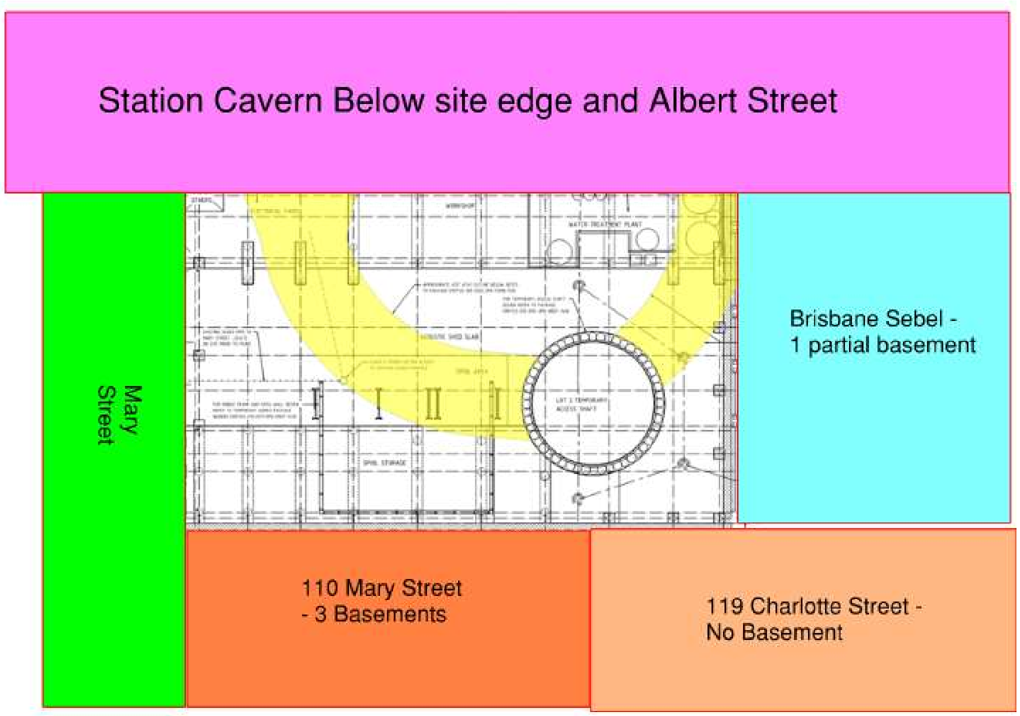

Figure 2: Site Plan

The site is currently occupied by a temporary acoustic structure that services construction of the Albert Street Cross River Rail Station. The temporary structure is an industrial shed that feeds material to the CRR Station via a temporary shaft and two access adits that connect to the adjoining station Cavern below ground.

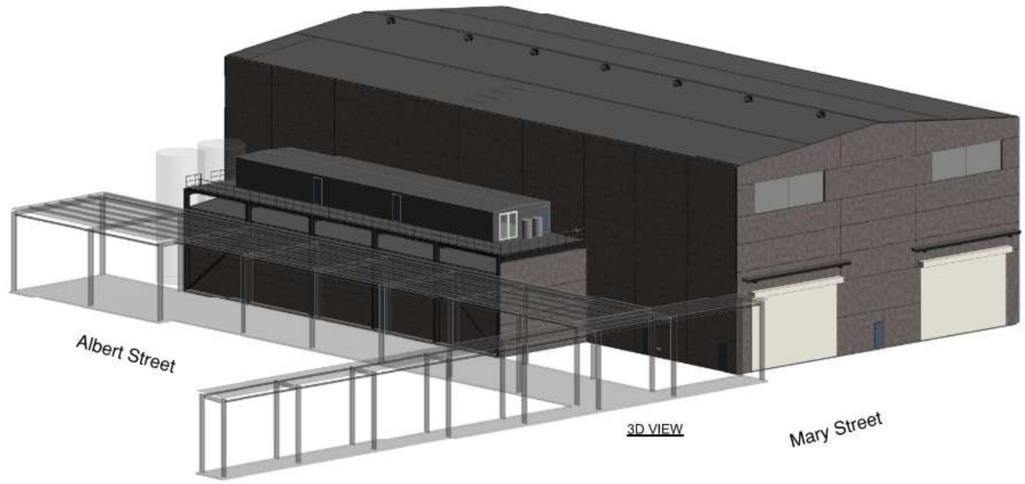

Figure 3: Existing CRR Acoustic Shed

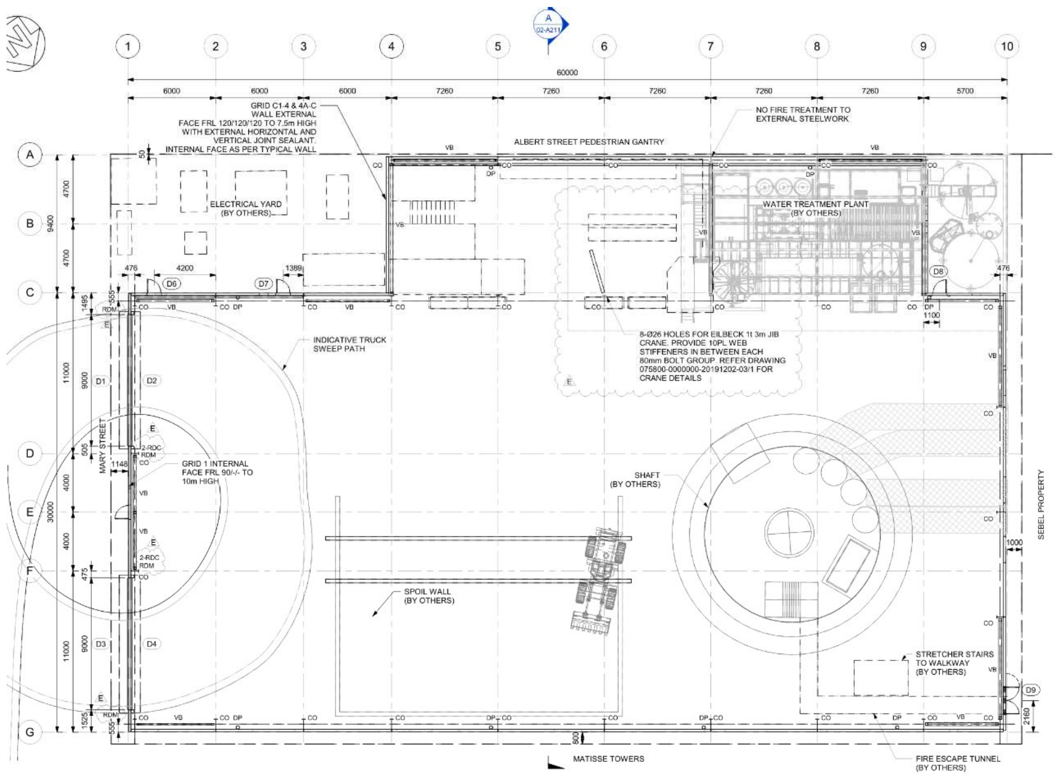

Figure 4: Plan Existing CRR Accoustic Shed

The existing shed has a heavy duty suspended slab on grade that is pile supported so as to reduce surcharge on adjacent basement structures. Upon completion of the Cross River Rail station the shed and the slab on ground will be removed. It is understood that existing piles will be cut off at grade level. The access shaft and temporary adits are to be filled. The methodology and material for filling the shafts and adits needs to be developed with input required under this geotechnical commission. Access for any drilling of boreholes will be restricted by this existing temporary structure and by the cavern under Albert Street.

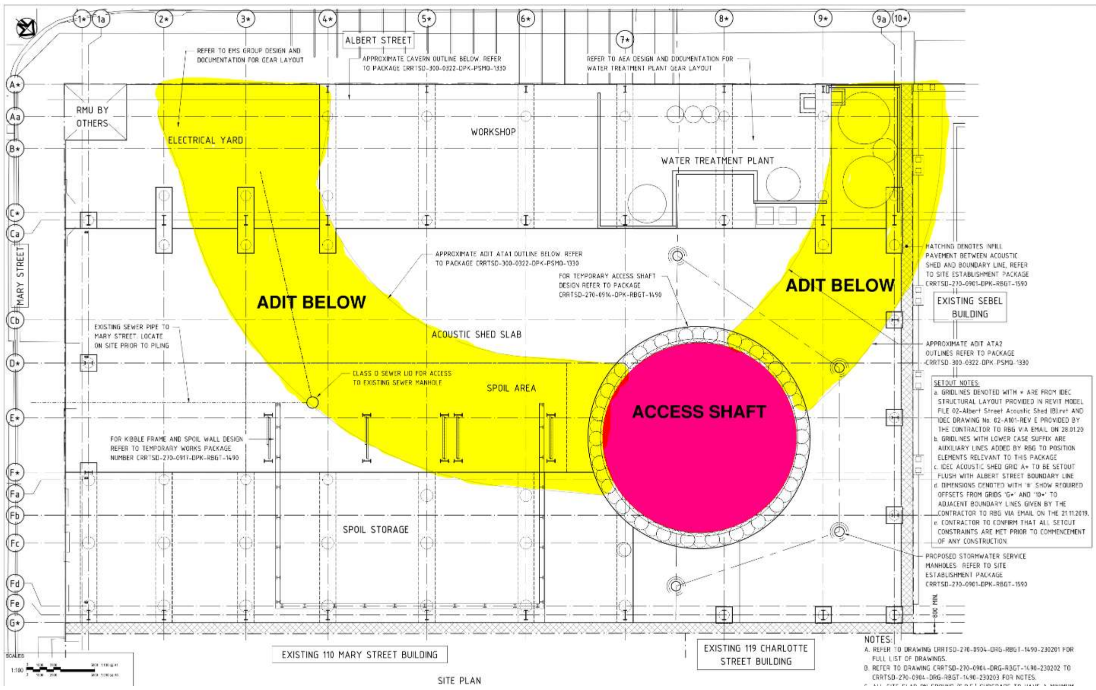

Figure 5: Plan Existing CRR Accoustic Shed Substructure

2 Proposed Development

The proposed development is anticipated to comprise a predominantly commercial tower of circa 35,000m2 NLA. The commercial space will sit above a podium that will contain related uses. It is anticipated that two or three basement levels will be required for loading dock and parking facilities to service the tower. The tower is anticipated to be in the order of 200m tall with circa 45 above ground levels.

The basement will extend to the full site extent but may need to set back away from Albert street if the depth exceeds RL -8.0m due to excavation constraints imposed by CRRDA as discussed further below.

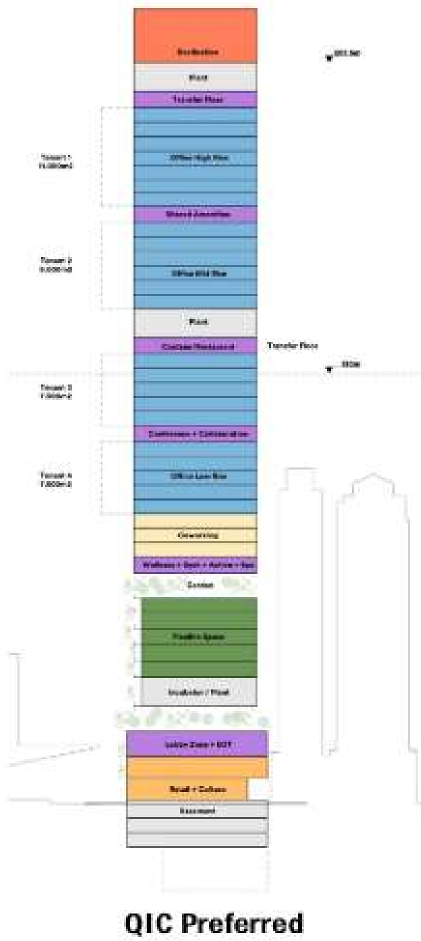

Figure 6: Indicative Tower Stacking Diagram

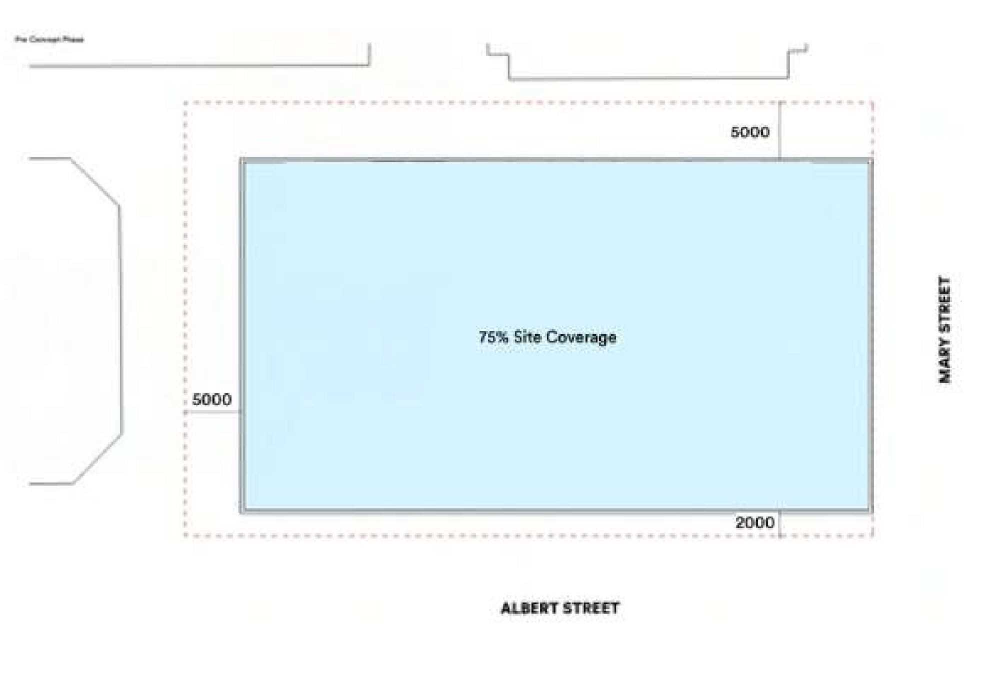

Figure 7: Indicative Tower Site Coverage and Setbacks

3 Cross River Rail Site Constraints

3.1.1 Excavation

The Albert Street site has always been considered a development site and specific additional considerations have been made during the station and cavern design for the CRR Albert Street Station to facilitate development of the Lot 2 site.

The site can be shored around its perimeter and excavation is permitted across the full site to extend down to RL -8.0m. No excavation below RL-8.0m is permitted in the zone 10m from the cavern as illustrated below. Note this includes temporary or permanent excavation in the Licensed area. This will need to be considered in any foundation or shoring solution as it may impact actual excavation level. It will dictate that no anchoring or rock bolting into the licenced area will be permitted which will influence the shoring solutions available.

Excavation can extend to RL -20.0m across the section of the site that is greater than 10m away from the station cavern, refer Figure 8 and Figure 9. Existing ground level is approximately RL +4m.

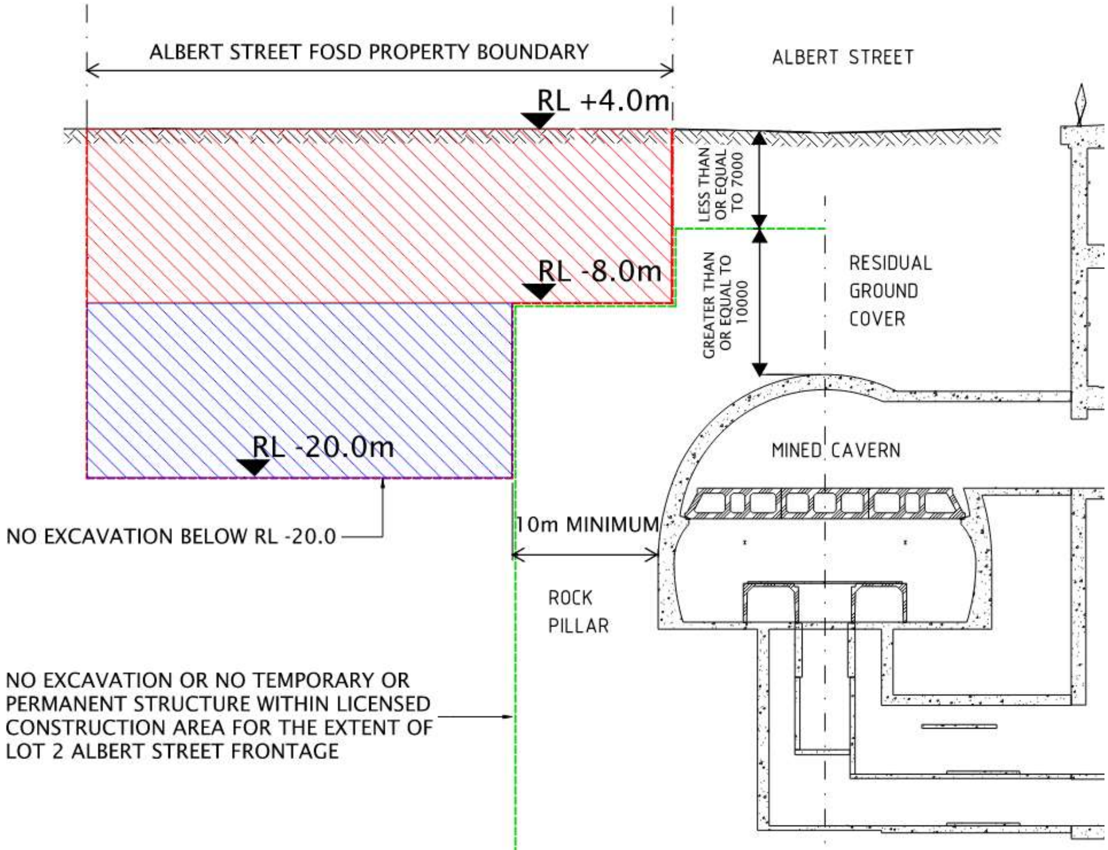

Figure 8: CRRDA Excavation Limitations Lot 2

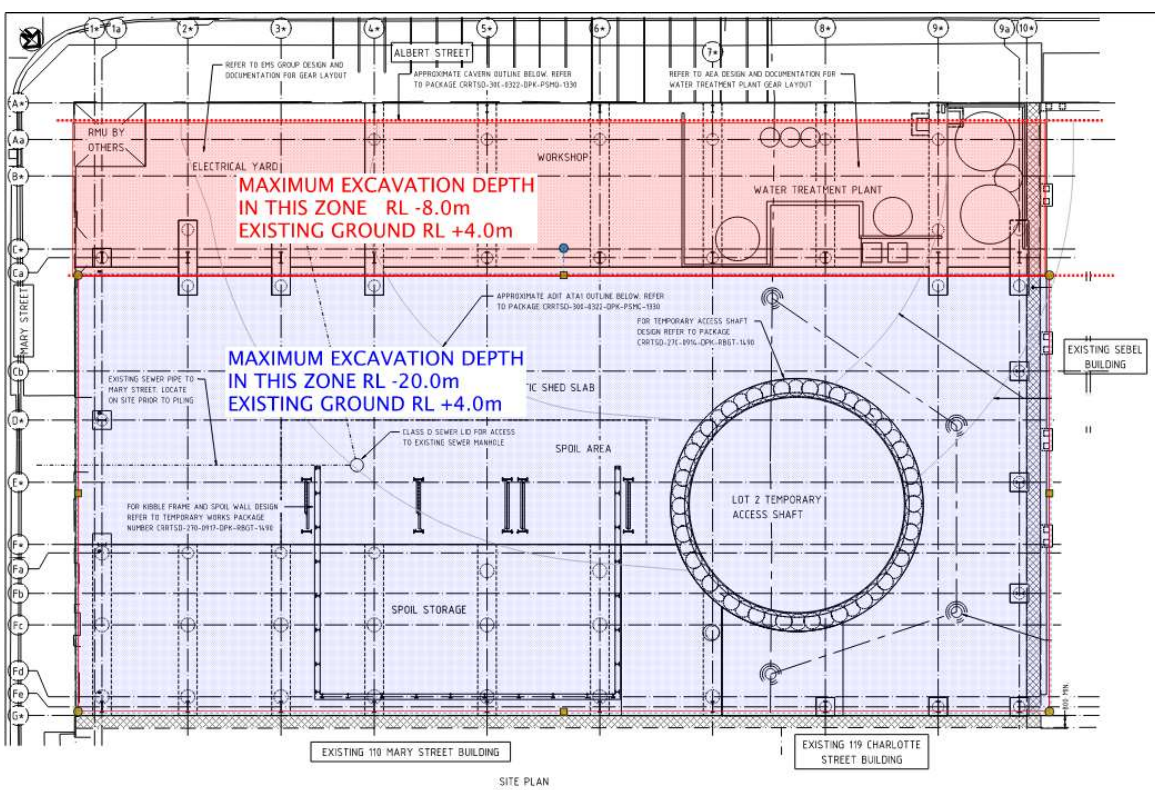

Figure 9: CRRDA Excavation Limitations Lot 2

3.1.2 Load Limitations

The station cavern has been designed to accommodate a 375kPa uniform surcharge from a future building. It is assumed that this is an unfactored working load and that it can be applied across the stepped excavation profile, refer Figure 10 below. This is not explicitly written in the documentation RBG have received and will need to be confirmed.

Loads landing on the rock pillar within the 10m zone from the cavern will be critical and cannot exceed the 375kPa. This zone is shaded in red in Figure 4 above. In the zone beyond the rock pillar (shaded in purple in Figure 4 above) there is potential to increase the loading if a piled solution is adopted utilising sleeved large diameter bored piles that impose loads below the cavern zone of influence. A piled solution that fully founds below the influence zone of the cavern will allow a taller building with additional floors.

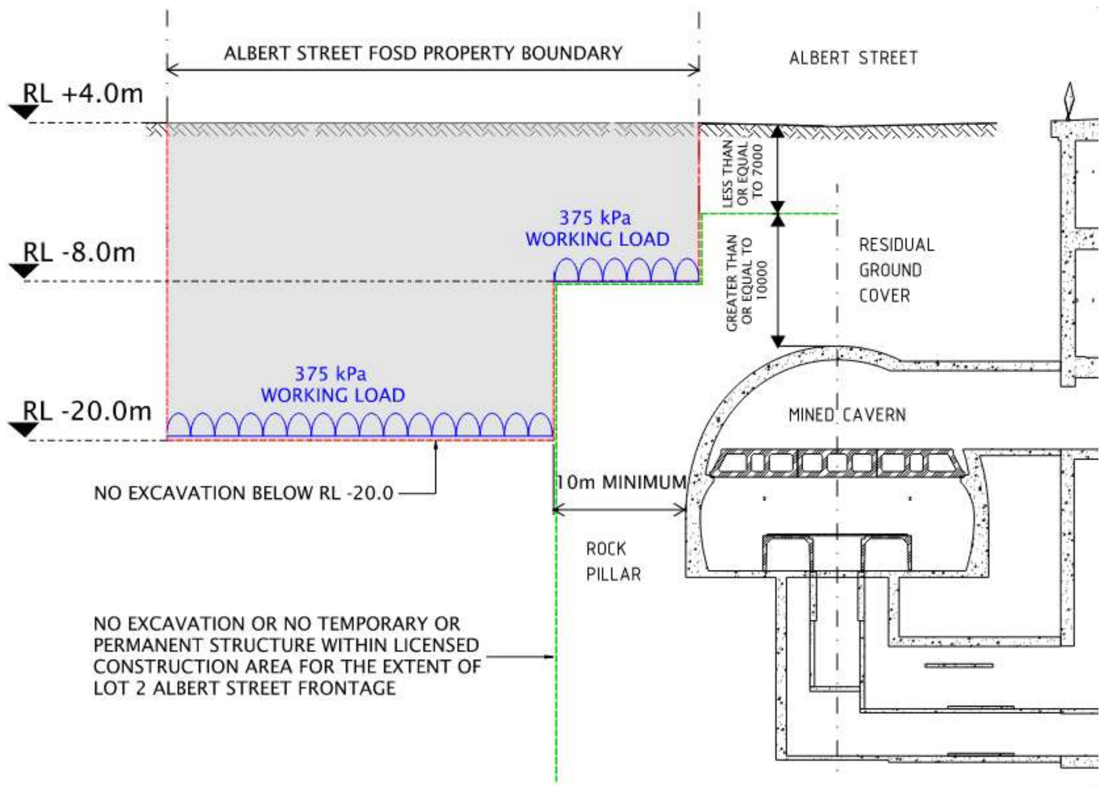

Figure 10: CRRDA Load Limitations Lot 2

A detailed analysis followed by a detailed technical report will be required by the geotechnical engineer to verify that the CRRDA criteria are achieved by the proposed Lot 2 Commercial Tower. The scope of analysis is discussed further in Section 6.0 below. RBG anticipate that the tower solution and its actual loads (to be provided by RBG) will need to be modelled in 3D by the Geotechnical Engineer to verify the actual distribution of stresses in the rock at the tunnel. It is likely that CRRDA will need to be consulted to verify the criteria illustrated above and the extent of variation permitted between the assumed average and the expected actual stress distribution. The criteria above as extracted from the Cavern Design Manual and it is silent on the issue of net pressure at the cavern crown level and the impacts of excavation on the allowable design loads is not discussed. The geotechnical engineer will be required to consult with CRRDA to verify the geotechnical criteria part of the required scope.

3.1.3 Temporary Structures

The existing shaft and adits as highlighted in Section 1 above (Figure 5) have the potential to impact the structural design and feasibility of a future development. These temporary structures will be filled following CRR construction, however, the fill material has not been confirmed. The current CRRDA documents only note lists that fill is to support the nominated allowable load capacity of 375kPa.

Foundation structures may need to be piled to below the shaft and adits. This will be extremely challenging for the adits as they fall within the cavern pillar exclusion zone. The preferred structural outcome is for the adits to be concrete filled and the shaft concrete filled up to an agreed depth that corresponds to the proposed basement depth. Assistance with specification of the shaft and adit fill material will be required so its influence on foundation load capacity and settlement performance can be assessed.

After the temporary acoustic shed is removed the existing slab on grade will be removed leaving in situ the existing piles for the shed. Pending excavation level these piles will likely remain and their impact on future tower foundations will need to be considered by the geotechnical engineer

4 Existing Information and Access for Investigation

The site has been investigated as part of the Cross River Rail Development and the findings are contained in the Report "CRRTSD-000-351-RPT-PSMQ-1120-030021, "Geotechnical Interpretive Report (GIR)". It is anticipated that the selected Geotechnical Consultant will be given access to this report via QIC. There is also a site specific Ground Model for the Albert Street site and it is reported in "CRRTSD-270-0460-DAN-PSMQ-1120-500225, "Site Specific Ground Model Update – Albert Street Lot 1". We also anticipate that this Ground Model Report will also be made available via QIC to the selected Geotechnical Consultant.

The following diagram illustrates the locations of borehole data that will be made available via QIC.

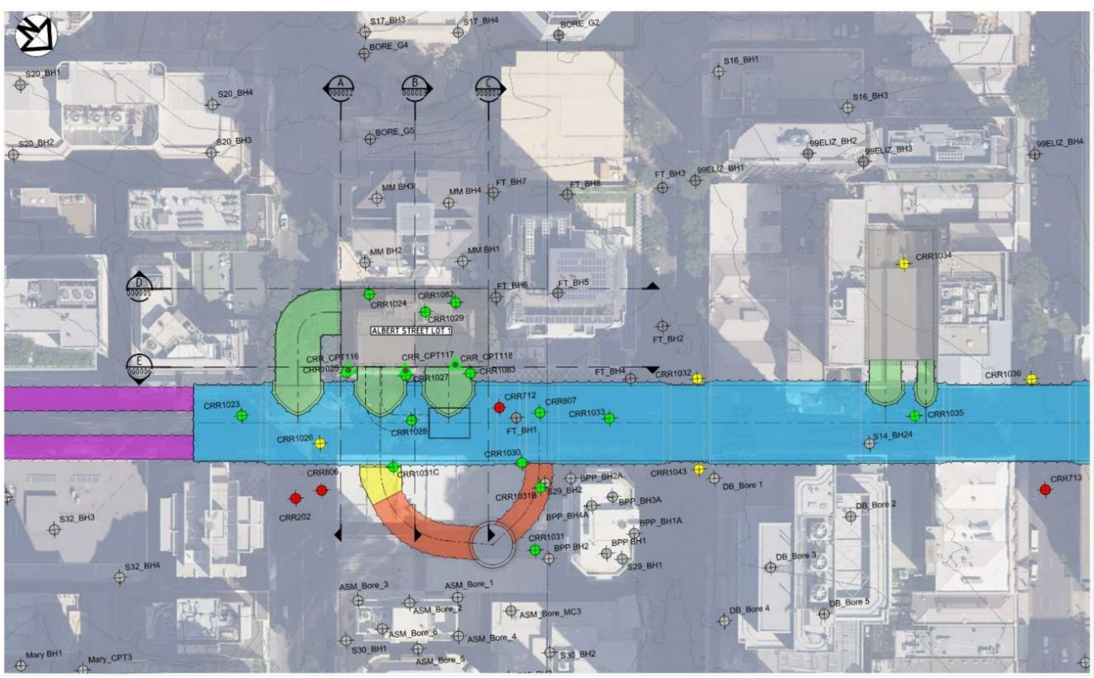

Figure 11: CRRDA Investigation Albert Street Station Precinct

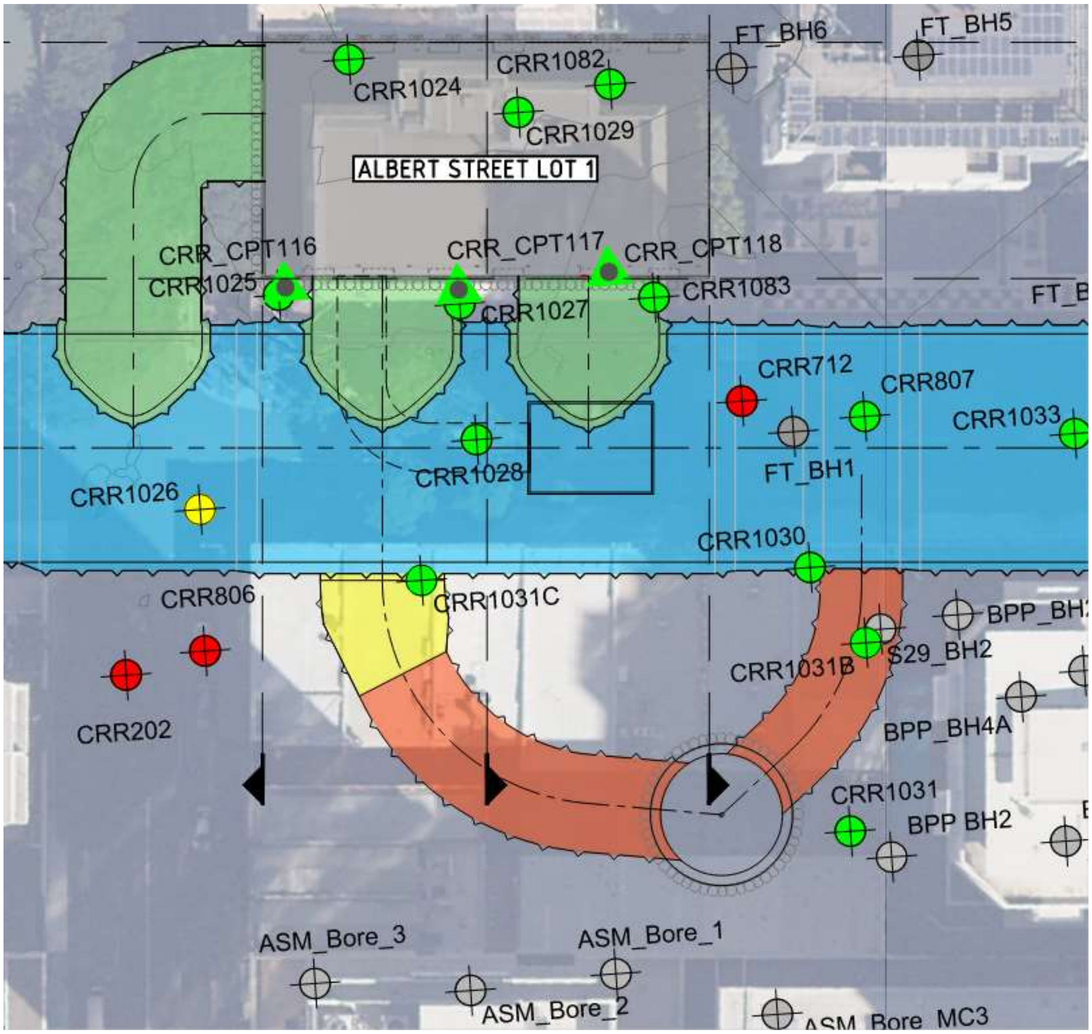

Figure 12: CRRDA Albert Street Lot 2 Area

Robert Bird Group were the engineers on a number of adjoining projects including:

- The Brisbane Sebel.
- 119 Charlotte Street.
- Festival Towers.
- 123 Albert Street.

Available geotechnical information on these projects will be shared for information as available.

Further boreholes are not likely to be feasible until the temporary acoustic shed and slab are removed. This is anticipated to be in 2024. Future boreholes will be required for the verification stage. The initial phase of services including the analysis phase will need to be based on assessment of available information.

5 Methodology

The proposed methodology for the geotechnical services shall be broken in to three distinct stages with stage one and two potentially overlapping. Stage One shall be a detailed desktop assessment of the existing information followed by preparation of a desktop reporting that addresses the scope items in section 6.0 below. The methodology for the initial desktop assessment phase shall be set out in the Geotechnical Consultants proposal. It shall include the estimated hours and costs to prepare an initial desktop study reports that address the items in the scope section below. This stage will rely on the ability of the consultant to interpret the available information and to supplement the available information with existing knowledge of the site and surrounds where required. The consultant should set out their experience in the local area in their proposal.

Following the desktop stage and possibly overlapping the desktop study will be an analysis phase. This phase is to asesss the development proposal versus the CRRDA site constraints.

The analysis stage requirements are set out in the scope below. The analysis stage will be focussed on assessing the proposed development, loads and geometry and assessing the proposal against the Cross River Rail Development Authority site constraints.

This stage will require the preparation of analysis models, iterations of assessment and finally preparing a detailed assessment report that sets out compliance with the CRRDA constraints .

The Geotechnical Consultant shall set out in their proposal the analysis methodology proposed for the assessment together with times and costs for design iterations that may be required to reach a point where it is agreed the design proposal meets the CRRDA constraints. The consultant should set out their knowledge of the constraints and the analysis methodology that will be applied to demonstrate that the development complies with the CRRDA constraints.

The final stage of the services shall include a detailed verification stage as set out below.

As noted above a verification stage will be required that is focussed on confirming assumptions and design parameters provided in the early project stages. The verification phase shall include a minimum of 5 boreholes across the site with two shallow bores to RL-8.0m on the Albert street edge and three deep bore holes to RL-20m , one being central to the site and two located adjoining the 110 Mary Street building and the 119 Charlotte street building. The verification stage is to also include boreholes and testing to confirm adequacy of filling placed in the access shaft and adits. This is anticipated to include boreholes and insitu testing. The Geotechnical engineer should nominate the number of recommended bores and tests for the verification stage in their proposal and the depths that will be drilled and/or tests that are proposed should be nominated in the proposal. Standpipes to ascertain groundwater levels, fluctuations and verify assumptions in the groundwater model shall be included together with verification of groundwater inflows should a drained basement be adopted. Marked up plans suggesting proposed locations of same are to be included in your proposal.

The timing for the completion of the reports for each stage should be nominated in the proposal. The proposal shall also include the team structure and resumes for key nominated staff with their experience in similar projects highlighted.

6 Scope of Investigation

As noted above the scope is split into three key stages.

Stage 1 – Desktop Data Review and Reporting:

Upon review of the information at hand a report is requested which reviews all relevant accessible information, and provides site and development specific advice which is to cover the following areas:

- Review of all relevant existing subsurface information and reports available.
- Provide a review of the details and descriptions of the existing strata including laboratory test results for various soil characteristics at various depths as appropriate from the new boreholes advised.
- Review shrink / swell characteristics and moisture reactivity classification of soils (and your advice in relation to further testing is required).
- Groundwater conditions, variability, likely rates of inflow at various depths, and design water table heights.Suitability of drained versus non drained hydrostatic basement solutions.
- Should a drained solution be recommended provide advice on required drainage and recommended pump rates.
- Temporary and long-term dewatering options and estimated pumping rates if required.
- Suitable foundation options as appropriate and design parameters – Pad and strip footings / bored piers / precast piles / tension piles, tension anchors for core over-turning.Advice regarding parameters for various strata that are likely to be encountered is required together with testing requirements that match the recommended bearing capacities.
- Specific advice regarding the Cross River Rail constraints and suggested foundation solutions
- Specific advice regarding the treatment of foundations above or adjacent the access shaft or adits and recommendations for the required fill material and filling process are also required. Should foundations above or adjacent these elements require alternate solutions these should be set out together with design criteria to be adopted.
- Permanent and temporary retention options and design parameters. Note that an anchored solution is ulikely to be feasible. Provide advice specific to an internally propped solution including advice on required prop preload force recommendations together with movement estimates for the proposed solutions.
- Allow to undertake Plaxis or Wallap type analysis to each boundary variation. This should include a minimum of 5 initial sections and analysis runs to extract propping forces, and wall bending moments and shear forces. Assume a three level basement will be adopted.
- Stability criteria for open excavations and advice regarding excavation staging including bench heights and the like. Advice regarding construction methodology and a review of the proposed staging is also required.
- Advice on earthworks, excavatability, and on site trafficability after disturbance of the site at excavated levels.
- Advice on recommended vibration limits for excavation and shoring works
- Erosion and sediment control guidance.
- Advice on construction difficulties likely to be encountered.
- Geotechnical design parameters are to be provided in both ultimate and working load formats.
- Settlement characteristics of proposed foundation options and differential settlement estimates.
- Pavement design parameters.
- Options for slab on ground components including the basement and external slabs– floating or suspended and hydrostatic or non-hydrostatic.
- Anticipated construction aspects.

- Review available Site Contamination/Environmental investigations and summarize review findings, including Acid Sulphates and identified
- All borehole locations to be pegged and labelled to allow a surveyor to accurately locate them on the project survey.

Stage 2 – Desktop Analysis of Proposed Scheme for Compliance to CRRDA Constraints

Cross River Rail have set out design constraints in the Cavern and Station Design Manuals with respect to future development above and adjoining the CRRDA assets. The geotechnical consultant is required to fully famiarize themselves with the CRRDA requirements. As part of the planning process the team will need to demonstrate compliance to the criteria in a suitable report.

The geotechnical consultant will therefore be required to undertake the following during this phase of the services:

- Verify that the RBG solution conceptually will comply with the intent of the constraints. Initiallly this will involve high level analysis based on loads provided by RBG of the resultant impacts on the CRRDA assets.
- In order to assess the impact of the proposed tower loads on the adjoining cavern it is likely that the first analysis steps will be to determine the stresses in the rock at the cavern crown and at the cavern side from the stated design criteria loads applied at the most adverse locations. This will establish benchmark allowable stresses at the cavern.
- Following the benchmark study above, the analysis is to be repeated for the proposed RBG loads and tower geometry proposed, together with the proposed excavation and results compared to determine if the concept generates stresses higher or lower than the CRRDA design constraints case.
- RBG will then take this advice and adjust the scheme and resultant loads for a subsequent re-analysis by the geotechnical consultant.
- The geotechnical consultant shall allow for three initial runs with varying loads and geometries provided by RBG.
- The geotechnical consultant shall provide a price per analysis run for any additional runs that may be required as the scheme develops.
- When a scheme is agreed and the resultant rock stresses are deemed acceptable with respect to the CRRDA Constraints the geotechnical engineer is to prepare a detailed report setting out their findings and methodology adopted for inclusion with the planning reports to the CRRDA. The report should address each criteria and set out commentary and analysis adopted together with results and opinion on compliance. The report should also set out any assumptions that require verification through future testing when access to the site is available.

Specific Reporting requirements for CRRDA Approval required in Stage 2:

The Cross River Rail Development Authority (CRRDA) have provided specific reporting requirements and the selected geotechnical consultant will be responsible for preparation of specific reports to meet these requirements. The requirements as annotated below from CRRDA set out these specific reporting requirements. Where aspects of the reports will require input from others it has been specifically annotated.

(1) Geotechnical, Shoring and Design Report

(a) Prepare a Geotechnical, Shoring and Design Report (GSDR), by a suitably qualified and experienced RPEQ-geotechnical. The GSDR is to include at a minimum:

(i) Confirmation that the Works are to be designed to equivalent Australian Standards:

(a) AS1726 Geotechnical Site Investigation.

(b) AS2159 Piling – Design and Installation.

(c) AS4678 Earth Retaining Structures.

(d) Any other applicable standard.

(ii) The basis of design for the design performance criteria, and interface with other disciplines.

(iii) The basis of design for the geotechnical design criteria.

(iv) An investigation plan that sets out the proposed geotechnical investigation including laboratory testing and intended purpose of the Work.

(v) An analysis of the existing geological conditions, including the stratigraphy and groundwater level, permanent Works outlines (based on the present available information), excavatability and profiling.

(vi) A table that sets out the geotechnical design parameters that have been used to undertake the detailed designs.

(vii) Where proposed excavations are mostly in rock, the assessment must define potential adverse defect mechanisms (joints, fault zones, volcanic intrusions and weak zones) which have been considered and detailed explanation of mitigation measure to avoid adverse impacts including the effects on adjacent assets.

(viii) An analysis of the durability aspects for buried concrete and reinforcement for all of the areas that will be retained and incorporated into the Development (This will be relevant for the piles and shaft that will be left behind by the project at handover for the temporary shaft and adits, and the foundations/piles for the acoustic sheds); (RBG will assist with this requirement with specialist input sought if required).

(ix) An analysis of groundwater hydrology taking into consideration seasonality, tidal effects, possible fractured ground at depth outlining the impact of dewatering and potential drawdown effects of construction activity and/or changed water table levels during demolition, temporary decommissioning of basement pumps, all interim construction phases and the final permanent solution. In addition, inflow rates into the basement should be calculated and if need be associated mitigation measures defined to reduce these to manageable volumes/rates (for safe construction and if required holding/treatment of contaminated/ASS groundwater).

(x) A current dilapidation survey of each Heritage Place located within 50m of the proposed Works.

(QIC will engage a specialist to undertake the dilapidation study).

(xi) Evidence that the effects of the proposed Works on public utilities located within 20m of the proposed Works, have been assessed and how suitable measures were incorporated to provide protection, including how the requirements of the utility provider(s) will be achieved.

(xii) A Basement Retention and Foundation Assessment that details key aspects of the site, such as, rock excavatability, stability, rock and soil stress profile, groundwater modelling and assessment of seepages and possible dewatering.

(xiii) Critical geotechnical model sections of all proposed excavations must be provided in this GSDR, with reference to the geometry of the retention systems, load and design assumptions, load cases, structural section properties / material parameters, including analysis output (such as moment and shear envelopes and deflections, and changes to stress and groundwater levels during both temporary Stages and permanent configuration. In addition, an assessment of the installation of the retention system on adjacent properties should be included).

(xiv) Design drawings and technical specifications, including any temporary and permanent structures.

RBG will prepare the retention drawings and specifications that reflect the inputs of the geotechnical consultant).

(xv) Details of groundwater chemistry assessment and proposed on-site treatment prior to discharge from site.

(xvi) Details of the basement ground water design philosophy including clarification as to whether the basements are fully tanked and designed for full hydrostatic groundwater pressure, or whether the ground water is collected via a subsoil collection system and pumped out. If groundwater is collected via subsoils drains and pumped out, provide details of where the collected groundwater is pumped to.

(QIC will appoint a hydraulics consultant to document the drainage and pump out system however the geotechnical consultant will be required to provide inputs including anticipated flow rates , drainage medium advice and assumptions so the consultant can document the system).

(xvii) Evidence that that groundwater quality has been properly analysed and evidence that it complies with ANZECC standards for groundwater quality.

(2) Groundwater Management Strategy (subject to ground water analysis):

(a) Submit to the MEDQ a Groundwater Management Strategy, certified by a suitably qualified and experienced person, incorporating at a minimum:

(i) Strategies for managing groundwater during the staged Works phases.

(ii) An assessment of the groundwater conditions to determine appropriate construction management procedures, including modelling in accordance with Australian Groundwater Modelling Guidelines, 2012.

(iii) Strategies for a situation where the groundwater inflow is excessive and additional pumping is required (i.e. cut-off drain).

(iv) Details of the extent of drawdown including plots of groundwater contours and propose mitigation measures to reduce the impact of drawdown on existing infrastructure (i.e. buildings and services).

(v) Strategies for the collection and treatment of stormwater to ensure the stormwater discharge conforms with ANZECC guidelines.

(vi) Supporting information to confirm that the Groundwater Management Strategy was prepared with reference to the relevant documentation prepared in accordance with other related PDA development conditions(s).

(3) Structural Monitoring and Vibration Report:

(a) Prepare a Structural Monitoring and Vibration Report (SMVR), by a suitably qualified and experienced RPEQ structural and vibration, addressing at a minimum:

(RBG will prepare the report for submission and the geotechnical engineer will provide input into each of the aspects below for inclusion in the RBG report)

(i) The process to be adopted for in-situ testing based upon actual construction equipment and methods and based upon actual geotechnical conditions onsite to forecast what vibration can be expected during all Works, including:

A. Excavation of existing basement and shoring.

B. Excavation.

C. Installation of new foundations (i.e. piling).

(i) Details of proposed methods to mitigate and control vibration and ground movements during construction.

(ii) An instrumentation and monitoring plan including drawings are to be provided with the design documentation. The instrumentation and monitoring plan and drawings must detail the frequency of monitoring, trigger levels and actions to be taken should the trigger levels be exceeded. As a minimum, the monitoring must commence before any Excavation, continue during Excavations and construction, and finish one month after the completion of the permanent Works.

(iii) Confirmation that the vibrations limits have been submitted to the adjacent utility providers.

(iv) Confirmation that DTMR has reviewed and endorsed the monitoring procedure for Works adjacent to the CRR tunnel and Station.

(v) Details for the anchors, including:

A. Whether the anchors are temporary or permanent.

B. The lifespan of the anchors.

(vi) Where appropriate, all necessary approvals for anchors from affected owners must be provided.

(vii) A dilapidation survey for all surrounding assets and details of on-going monitoring of these assets. The extent of the existing assets to be monitored is to be determined from predictive modelling.

(viii) In relation to the existing Heritage Places in close proximity. The report is to provide:

A. Existing footing information (i.e. footing construction, footing depth, footing width and founding soil type and consistency).

B. Evidence to demonstrate that interim differential settlements (which may be much higher than final differential settlements) have been taken into account in the predictive analysis and that suitable controls/mitigations have been considered and put in place to protect heritage and other sensitive assets.

C. Evidence that the effects of the high value of lateral retention wall movement arising from the Plaxis modelling has been considered.

D. Evidence that the construction methodology has considered the effects of vibrations, arising from building demolition, retention, excavation and groundwater drawdown (both short and long term).

E. Evidence that the limits for vibration, retention wall movements and groundwater movements for Heritage Places close to the top of the retention structures have been determined;

F. Points A to E are to be considered in the design of the construction methodology proposed shoring, underpinning and stabilisation methods.

G. Evidence to demonstrate that all Heritage Places within the zone of influence (geotechnical and vibrations) are categorised as high risk, and protected accordingly, regardless of the existing condition of the Heritage Place.

H. Appropriate measures to ensure existing roof dormer structures and chimneys are protect from cracking due to building vibration.

(4) Temporary Rock and Ground Anchor Report (where proposed):

(a) Submit to the MEDQ a Temporary Rock and Ground Anchor Report (TRGAR), prepared, and certified by a suitably qualified and experienced RPEQ addressing at a minimum:

(i) Approval from DTMR/CRRDA if temporary rock and ground anchors are proposed to be installed in the ASTS zone of influence, as identified in the ASTS Analysis of Impacts Report approved under condition XX, titled Compliance Assessment – ASTS Analysis of Impacts Report.

(ii) Evidence of consultation with Council and any relevant service authorities if rock and ground anchors are proposed to be installed in Road, confirming that the location of anchors is acceptable. The evidence is to include the date(s) of consultation, the information supplied to Council and each entity, a list of persons consulted, the comments received from Council and each entity (both written and verbal), and a response to the comments received.

(RBG will prepare operation works drawings for submission to Council post the DA that set out any proposed anchors that may be under council roads or footpaths)

(iii) Approval from adjoining landowners if rock and ground anchors are proposed to be installed under adjoining privately owned land.

(If anchors are proposed under adjoining private properties QIC will obtain approvals with assistance on necessary inputs from the geotechnical engineer).

(iv) Geotechnical certification that the construction phase loads will not impact or endanger Heritage Buildings and adjoining infrastructure. This will involve demonstrating the effect of the load-imposed pressure bulb, both prior to the de-stressing of the temporary ground anchors and upon final completion of the building.

(b) Design and construct all Works in accordance with the certified RGAR required under part a) of this condition.

(The geotechnical engineer will be engaged for site inspection services for verification puroses)

(c) Submit to the MEDQ as-constructed drawings and associated test documentation for all rock and ground anchors certified by a suitably qualified and experienced RPEQ that all rock and ground anchors have been constructed in accordance with the RGAR required under part a) of this condition. The as-constructed drawings and documentation is to include at a minimum:

(RBG will provide base drawings for shoring and retentionand the geotechnical engineer will be required to annotate as constructed information related to anchoring changes as noted)

(i) Locality, site, layout and section/elevation plans depicting the anchoring system details including position, length, inclination angle, lock-off load and typical anchor block;

(ii) Location of all bored piers, shoring and bored piling in plan and elevation views together with shoring and bored piling details;

(iii) Construction methodology used during the installation process and the results of any tests undertaken;

(iv) A survey plan of existing Heritage Building foundations and infrastructure (water, stormwater, sewer, street trees, signs and markings) and utility services (telecommunications, electricity, and gas) and adjacent foundation details; and

(by QIC Surveyor)

(v) The surveyed location of all Council pipelines and maintenance holes (including depths of maintenance holes and clearances to anchors) in public/private properties plotted on the shoring plan and wall sections.

(by QIC Surveyor)

(d) Submit to the MEDQ certification by a suitably qualified and experienced RPEQ that the basement design has been constructed in compliance with any relevant approved engineering drawings and this condition.

(Certification by the geotechnical engineer and RBG will be required for relevant aspects)

(e) Submit to the MEDQ certification by a suitably qualified and experienced RPEQ, that all anchors have been de-stressed.

(5) Albert Street Tunnel and Station (ASTS) Analysis of Impacts:

Submit an ASTS Impacts Report, certified by a suitably qualified and experienced RPEQ, and approved by DTMR/CRRDA. The ASTS Analysis of Impacts Report is to contain details of all Works, activities and operations associated with the Development that have the potential to cause impact to the ASTS. The ASTS Analysis of Impacts Report is to be prepared with reference to the Design Manual Stations prepared by RBG. The ASTS Analysis of Impacts Report must demonstrate compliance with the DTMR/CRRDA criteria for the interaction between all Development the subject of this PDA decision notice and the ASTS and detail the acceptable ASTS impact limits and tolerances.

(6) Albert Street Tunnel and Station (ASTS) Construction Management and Monitoring Plan

(a) Prepare a ASTS Construction Management and Monitoring Plan (ASTS CMMP) to address Works that may influence the ASTC impact limits and tolerances, as identified in the ASTS Analysis of Impacts Report approved under condition XX, titled Compliance Assessment – ASTS Analysis of Impacts Report. Undertake consultation with DTMR/CRRDA to confirm that the ASTS CMMP achieves DTMR's operational and statutory requirements for the ASTS.

(b) Submit to the MEDQ each ASTS CMMP prepared in accordance with part a) of this condition, supported by evidence of consultation with CRRDA including the date(s) of consultation, the information supplied to CRRDA, a list of persons consulted, the comments received from DTMR (both written and verbal), and a response to the comments received.

(c) Submit to the MEDQ written advice, certified by a suitably qualified and experienced RPEQ, who meets the DTMR prequalification, confirming that all Works:

(i) Achieve the design criteria as identified in the ASTS Analysis of Impacts Report approved under condition 5, titled Compliance Assessment – ASTS Analysis of Impacts Report.

(ii) Are designed in accordance with the relevant ASTS CMMP submitted to the MEDQ under part b) of this condition, and have considered the current structural integrity of the ASTS, existing geotechnical conditions, Works completed to date, RPEQ certification process, any relevant baseline monitoring and any relevant findings from ongoing structural monitoring and vibration analysis.

(iii) Will not adversely affect the structural integrity of the Albert Street Tunnel and Station.

Stage 3 – Verification Testing and Reporting

As the initial stages will rely on existing geotechnical data, a verification stage geotechnical investigation is proposed once access to site is obtained for drilling and testing. The following scpe is proposed:

- Drill and sample a minimum of five boreholes. Two boreholes on the Albert Street alignment are to be drilled to RL-8.0m. A central borehole and two boreholes on the rear alignment against 110 Mary street and 119 Charlotte Street are to be drilled and sampled to RL-20m.
- Results extracted from these bores are to be compared to assumptions made from the desktop stage. Any revised recommendations as a result of the verification bores are to be set out in a verification report with the assumed and actual values discussed together with the impacts on prior advice.
- A second verification exercise is required on the filling to the access shaft and the two adits. This testing shall comprise additional bores through these elements with insitu sampling and testing to verify the fill properties and to advise on any implications should the results vary from assumed properties. The bores should assess if any voids are present , particularly at the adit crowns and report on treatment if encountered.
- The verification bores shall also be sampled for contaminants and acid sulphates and results compared with desktop studies.
- Installation, monitoring and pump out testing, and sampling from standpipes for groundwater reporting verification
- The results of the verification stage shall be set out in a comprehensive report including the requirements of the stage 1 scope (updated where required by the results of the verification testing) such that this final report becomes the primary source of geotechnical advice for the detailed design phase of the project.
- The geotechnical consultant shall set out in their proposal the extent of testing recommended for this stage and allowances for bores and testing included together with an indicative program for this stage of the investigation and reporting.

7 Insurance

Fee proposals should include confirmation of Public Liability, Professional Indemnity and Workers' Compensation insurance held by the Consultant.

8 Deliverables

Three original hard copies of the report shall be submitted together , with one electronic copy in PDF format for distribution via Aconnex or similar.

A draft of the report shall be provided to QIC and RBG in electronic format for review prior to finalisation of the report.The finalised report is to address any issues raised with the draft

9 Fee Proposals

Fee proposals shall be for a fixed lump sum fee, and nominate separately the GST component of the fee.

Fee proposals shall state the proposed number and depths of boreholes, pits and probes, with rates provided for additions or deletions. The cost of providing traffic barriers and/or diversions or other traffic controls should be included if so required. The proposal shall also set out any other disbursements not included in the lump sum fee together with estimated allowances for all disbursements.

Fees are to be submitted by close of business on 20 June 2022.

Robert
Bird
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