# Transport for New South Wales
# Piling Report

160,162 & 172 Lord Sheffield Circuit, North Penrith

# Document Control Record

| | |
|---|---|
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| **Signed:** |  |
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| | | | |

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# 1. Introduction

This report has been prepared to summarize the shoring wall design for the proposed development site location at 160,162 & 172 Lord Sheffield Circuit, North Penrith, in order to investigate any potential adverse effects on the adjacent Transport for New South Wales (TfNSW) infrastructure.

The western portion of the site accommodates the Thornton Community Garden. The site is immediately adjacent to the northern entrance of Penrith Station (west boundary). The Eastern boundary is adjacent a parcel of defence land (east boundary). The Southern boundary has a direct interface with the railway corridor.

This report will compare the results of the soil-structure interaction analyses performed by Van der Meer Consulting to the minimum design criteria as outlined in the "Technical Direction Geotechnology" GTD 2020/001 issued by Transport for New South Wales, date 2 July 2020., and make conclusions based on these results.

# 2. References

This report is provided based on the following documents, and should be viewed in conjunctions with the following:

- Geotechnical Investigation Report: EI Australia, Report No. E25358.G03_Rev 1, dated 23 September 2022;
- Technical Direction Geotechnology – Transport for New South Wales, GTD 2020/001, dated 2 July 2022;
- Architectural Drawings number A1000 to A1014, A1401-A1404, A1501-A1502.
- Structural Drawings number S02-01 to S02-51.

# 3. Summary of Ground Conditions

The following section summarises the results obtained from the mentioned geotechnical report for retaining wall design.

**Table 1:** Definition of geotechnical units, Reference Geotechnical Report No. E25358.G03, Table 1

| Geotechnical Unit | Material Description |
|---|---|
| **Unit 1:** Topsoil/ Fill | Topsoil/ fill composed of silty clay with traces of rootlets. |
| **Unit 2a:** Silty/ Sandy Clay (Fluvial Soil) | Low to high plasticity, firm to very stiff silty/sandy clay. |
| **Unit 2b:** Clayey/ Silty Sand (Fluvial Soil) | Fine to medium grained, loose to medium dense clayey/silty sand. |
| **Unit 2c:** Sandy Gravel (Fluvial Soil) | Sandy Gravel, sub-angular to rounded fine to coarse gravel with medium to coarse grained sand, with rounded cobbles, trace silt and clay. |
| **Unit 3:** Very Low to Low Strength Sandstone/Shale | The very low to low strength sandstone/ shale generally consisted of closely to moderately spaced defects consisting of sub-vertical joints and decomposed zones. |
| **Unit 4:** Medium to High Strength Laminite/Sandstone/Shale | Medium to high strength laminate/ sandstone/ shale generally consisted of moderately spaced defects consisting of sub-vertical joints, sub-horizontal bedding partings and decomposed zones. |

**Table 2:** Depth and thicknesses of geotechnical units, Reference Geotechnical Report No. E25358.G03, Table 2

| Geotechnical Unit | Depth to top of unit | Unit Thickness (m) |
|---|---|---|
| Unit 1: Topsoil/ Fill | Surface Level | 0.2 to 1.20 |
| Unit 2a:<br>Silty/ Sandy Clay (Fluvial Soil) | 0.20 to 1.20 | 3.0 to 5.60 |
| Unit 2b:<br>Clayey/ Silty Sand (Fluvial Soil) | 3.50 to 6.80 | 1.00 to 3.70 |
| Unit 2c: Sandy Gravel (Fluvial Soil) | 6.0 to 8.10 | 3.70 to 6.50 |
| Unit 3: Very Low to Low Strength Sandstone/Shale | 11.45 to 14.30 | 0.20 to 0.75 |
| Unit 4: Medium to High Strength Laminite/Sandstone/Shale | 11.10 to 14.50 | Observed up to termination depth in all boreholes. |

**Table 3:** Design Parameters for retaining wall design, Reference Geotechnical Report No. E25358.G03, Table 5

| Material | Bulk Density (kN/m3) | Effective Cohesion c' (kPa) | Effective Friction Angle φ' (degrees) | Coefficient of Earth Pressure at rest, Ko | Elastic Modulus (MPa) |
|---|---|---|---|---|---|
| Unit 1: Topsoil/ Fill | 18 | 0 | 25 | 0.58 | 5 |
| Unit 2a: Silty/ Sandy Clay (Fluvial Soil) | 20 | 15 | 25 | 0.58 | 15 |
| Unit 2b: Clayey/ Silty Sand (Fluvial Soil) | 20 | 5 | 33 | 0.45 | 20 |
| Unit 2c: Sandy Gravel (Fluvial Soil) | 22 | 5 | 33 | 0.45 | 40 |
| Unit 3: Very Low to Low Strength Sandstone/Shale | 24 | 75 | 37 | 0.40 | 75 |
| Unit 4: Medium to High Strength Laminite/Sandstone/Shale | 24 | 200 | 45 | - | 500 |

# 4. Analysis

Commercially available software WALLAP is used for the soil-structure interaction analysis of the retaining wall. The horizontal displacements, internal pile bending moment and shear forces, and the anchor loads are obtained my modelling each of the construction stages.

Several WALLAP analyses has been performed on multiple sections along the wall in order to accurately capture the whole length of the retaining wall. The results of the analysis are presented in Appendix A.

The output from WALLAP is used to design the secant piles, shotcrete walls and the anchors. Concrete design software RCC is used to design the reinforcements in the piles. The shoring system is designed and detailed based on general engineering principles and our vast experience in similar successful projects.

# 5. Assumptions

A soil-structure interaction retaining wall analysis using the software program WALLAP, an industry standard analysis program, has been undertaken on different wall design sections along 160,162 & 172 Lord Sheffield Circuit, North Penrith.

## 5.1. Surcharge Loads

A nominal 10 kPa surcharge is applied to the first 5 meters from the shoring, followed by 30kPa allowed for the railway.

Groundwater Levels

Based on the recommendations of the mentioned geotechnical report, for the analysis, we have adopted a groundwater table at level 7.10 for BH2 and 7.60 for BH6 in both temporary and permanent conditions.

## 5.2. Wall Properties

The secant pile wall will be generally constructed using soft piles 900mm diameter at 1.4m centre to centra and hard piles 900mm diameter piles spaced at 1.4m centre to centre.

Young's Modulus = 20e6 kPa

Moment of Inertia = $\frac{\pi d^4}{64}$ divided by the pile spacing (m4/m run of wall)

= 0.023 m4/m

## 5.3. Strut Properties - Basement 1 Slab

Slab thickness = 350mm

Cross Sectional Area= 0.35m2

Young's Modulus = 20e6 kPa

## 5.4. Construction Sequence

Due to the changes in the natural ground level and the soil and rock layers along the boundary, several WALLAP runs are performed, and appropriate construction sequences are defined for each

of the cases. The construction sequence of Run ID: Section 2 (BH2) (along Grid A) is presented herein. The details of the other runs are presented in Appendix A.

1 Apply surcharge no.1 at elevation 0.00

2 Apply surcharge no.2 at elevation 0.00

3 Excavate to elevation -4.00 on RIGHT side

4 Install strut or anchor no.1 at elevation -3.00

5 Excavate to elevation -7.10 on RIGHT side

6 Apply water pressure profile no.1

7 Excavate to elevation -9.50 on RIGHT side

For detailed construction methodology please refer to the Appendix C.

# 6. Summary of Findings

The results of one of the analyses for each of the runs are presented in the following tables.

**Table 4:** WALLAP results for Section 2 (BH2)

| | |
|---|---|
| Maximum wall bending moment (working), $M_{working}$ | 301.2kNm/m |
| Maximum wall shear force (working), $S_{working}$ | 113.9kN/m |
| Maximum predicted lateral wall deflection at the ground level | 21mm |
| Strut | |
| Design strut load (working) | 129.86kN/m run |

**Table 5:** WALLAP results for Section 6 (BH6)

| | |
|---|---|
| Maximum wall bending moment (working), $M_{working}$ | 311.2kNm/m |
| Maximum wall shear force (working), $S_{working}$ | 119.5kN/m |
| Maximum predicted lateral wall deflection at the ground level | 19mm |
| Strut | |
| Design strut load (working) | 139.43kN/m run |

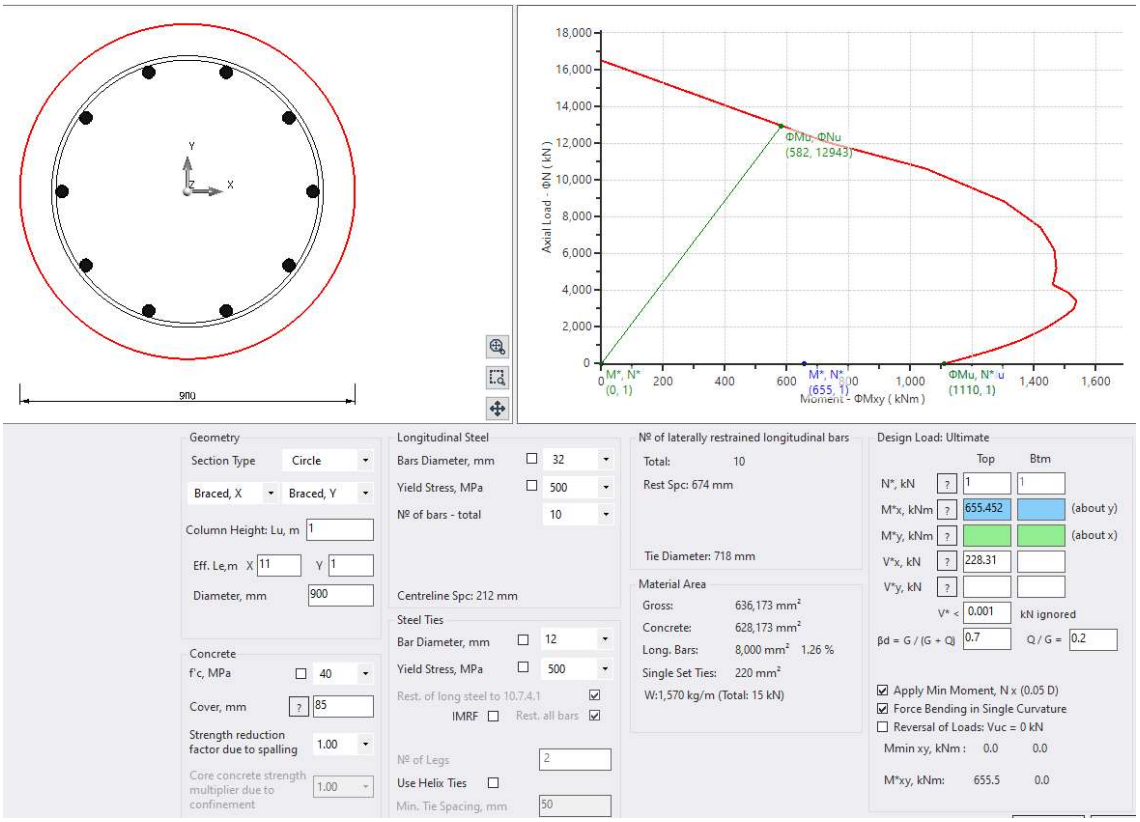



**Figure 1:** Pile type P1 structural capacity

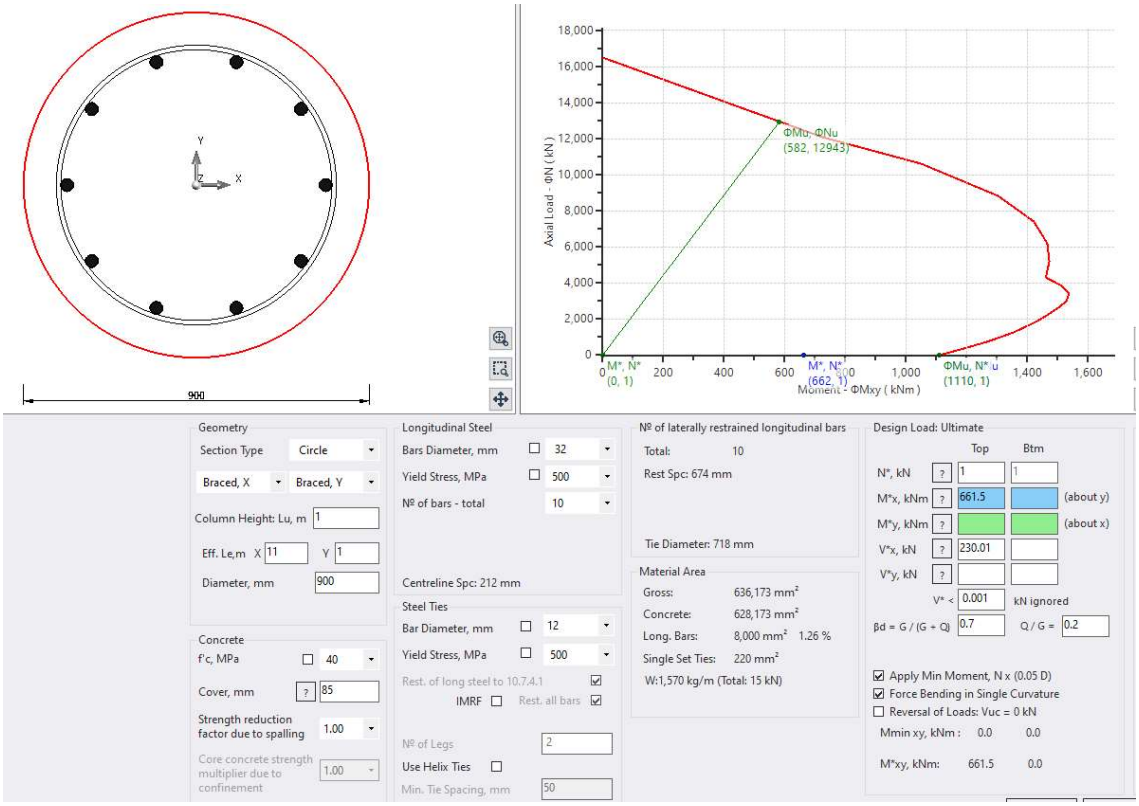



**Figure 2:** Pile type P1structural capacity

# 7. Lateral Wall Deflection of the Ground behind the Wall

TfNSW have indicated the total (serviceability) lateral deflection of the wall in any one direction acceptable for non-sensitive TfNSW assets is to be limited to 0.5% of the excavated height or 30mm, whichever is lesser. The maximum retained wall height is 9.5m, and therefore the maximum allowable horizontal wall defections is:

$0.005 \times 9500 = 47.5mm \rightarrow 30mm$

Our WALLAP analysis predicts a maximum 21mm of horizontal wall deflection and this falls within the TfNSW guideline.

# Appendix A: WALLAP Output

## A.1. Section_2 (BH2)

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                          Licensed from GEOSOLVE                 | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```

**INPUT DATA**

**SOIL PROFILE**

| Stratum no. | Elevation of top of stratum | Soil types Left side | Right side |
|---|---|---|---|
| 1 | 0.00 | 1 Fill | 1 Fill |
| 2 | -1.20 | 2 Silty Clay | 2 Silty Clay |
| 3 | -3.70 | 2 Silty Clay | 2 Silty Clay |
| 4 | -6.80 | 3 Silty Sand | 3 Silty Sand |
| 5 | -7.80 | 5 Sandy Gravel | 5 Sandy Gravel |
| 6 | -14.50 | 6 Sandstone(medium) | 6 Sandstone(medium) |

**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 Fill | 18.00 | 5000 | 0.580 | OC (0.300) | 0.403 (0.000) | 3.222 ( 0.000) | |
| 2 Silty Clay | 20.00 | 15000 | 0.580 | OC (0.300) | 0.356 (1.380) | 3.222 ( 4.760) | 15.00d |
| 3 Silty Sand | 20.00 | 20000 | 0.450 | OC (0.300) | 0.254 (1.149) | 5.160 ( 6.407) | 5.000d |
| 4 Not defined | | | | | | | |
| 5 Sandy Gravel | 22.00 | 40000 | 0.450 | OC (0.300) | 0.254 (1.149) | 5.160 ( 6.407) | 5.000d |
| 6 Sandstone(-medium) | 24.00 | 500000 | 0.000 | OC (0.250) | 0.151 (0.849) | 11.75 (10.745) | 200.0d |

**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 Fill | 25.00 | 0.022 | 0.00 | 25.00 | 0.475 | 0.00 |
| 2 Silty Clay | 25.00 | 0.575 | 0.00 | 25.00 | 0.475 | 0.00 |
| 3 Silty Sand | 33.00 | 0.554 | 0.00 | 33.00 | 0.456 | 0.00 |
| 4 Not defined | | | | | | |
| 5 Sandy Gravel | 33.00 | 0.554 | 0.00 | 33.00 | 0.456 | 0.00 |
| 6 Sandstone(medium) | 45.00 | 0.364 | 0.00 | 45.00 | 0.364 | 0.00 |

**GROUND WATER CONDITIONS**

Density of water = 10.00 kN/m3

| | Left side | Right side |
|---|---|---|
| Initial water table elevation | -7.10 | -7.10 |

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 | -7.10 | -7.10 | 0.0 | 1 | -10.00 | -10.00 | 0.0 |

**WALL PROPERTIES**

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.90 m
Soldier Pile spacing = 1.40 m
Passive mobilisation factor = 3.00
Elevation of toe of wall = -16.00
Maximum finite element length = 0.80 m
Youngs modulus of wall E = 2.0000E+07 kN/m2
Moment of inertia of wall I = 0.023000 m4/m run
= 0.032200 m4 per pile
E.I = 460000 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 | -3.00 | 1.00 | 0.350000 | 2.000E+07 | 370.0 | 0.00 | 1.00 | Strut | Yes | R |

**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 | 0.00 | 0.00(L) | 30.00 | 5.00 | 10.00 | = | N/A | N/A |
| 2 | 0.00 | 5.00(L) | 30.00 | 15.00 | 20.00 | = | 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 0.00 |
| 2 | Apply surcharge no.2 at elevation 0.00 |
| 3 | Excavate to elevation -4.00 on RIGHT side |
| 4 | Install strut or anchor no.1 at elevation -3.00 |
| 5 | Excavate to elevation -7.10 on RIGHT side |
| 6 | Apply water pressure profile no.1 |
| 7 | Excavate to elevation -9.50 on RIGHT side |

**FACTORS OF SAFETY and ANALYSIS OPTIONS**

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

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 - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on Left side of wall = 20.00 m
Width of excavation on Right side of wall = 20.00 m

Distance to rigid boundary on Left side = 20.00 m
Distance to rigid boundary on Right side = 20.00 m

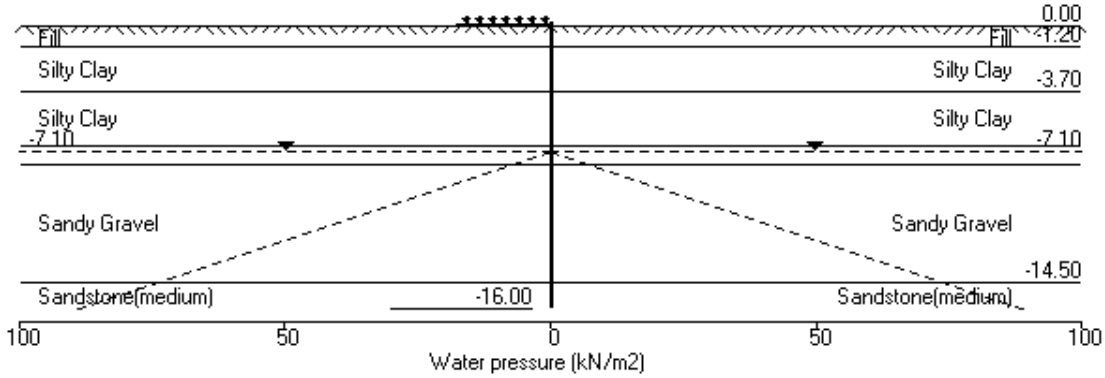
**OUTPUT OPTIONS**

| Stage no. | Stage description | Output options: Displacement, Bending mom., Shear force | Active, Passive pressures | Graph. output |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Apply surcharge no.1 at elev. 0.00 | Yes | Yes | Yes |
| 2 | Apply surcharge no.2 at elev. 0.00 | Yes | Yes | Yes |
| 3 | Excav. to elev. -4.00 on RIGHT side | Yes | Yes | Yes |
| 4 | Install prop no.1 at elev. -3.00 | Yes | Yes | Yes |
| 5 | Excav. to elev. -7.10 on RIGHT side | Yes | Yes | Yes |
| 6 | Apply water pressure profile no.1 | Yes | Yes | Yes |
| 7 | Excav. to elev. -9.50 on RIGHT side | Yes | Yes | Yes |
| * | Summary output | Yes | - | Yes |

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 0.00



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 0.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.002 | 1.83E-04 | 0.0 | 0.0 | |
| 2 | -0.60 | 2.06 | 0.001 | 1.82E-04 | 1.8 | 0.7 | |
| 3 | -1.20 | 2.21 | 0.001 | 1.80E-04 | 3.1 | 2.2 | |
| | | -1.91 | 0.001 | 1.80E-04 | 3.1 | 2.2 | |
| 4 | -1.65 | -1.57 | 0.001 | 1.78E-04 | 2.3 | 3.4 | |
| 5 | -2.10 | -1.27 | 0.001 | 1.74E-04 | 1.7 | 4.3 | |
| 6 | -2.55 | -0.99 | 0.001 | 1.69E-04 | 1.2 | 4.9 | |
| 7 | -3.00 | -0.73 | 0.001 | 1.64E-04 | 0.8 | 5.3 | |
| 8 | -3.70 | -0.39 | 0.001 | 1.56E-04 | 0.4 | 5.7 | |
| 9 | -4.00 | -0.25 | 0.001 | 1.52E-04 | 0.3 | 5.8 | |
| 10 | -4.80 | 0.06 | 0.001 | 1.42E-04 | 0.2 | 6.0 | |
| 11 | -5.60 | 0.34 | 0.001 | 1.31E-04 | 0.4 | 6.1 | |
| 12 | -6.20 | 0.52 | 0.001 | 1.23E-04 | 0.6 | 6.4 | |
| 13 | -6.80 | 0.69 | 0.001 | 1.15E-04 | 1.0 | 6.9 | |
| | | -0.08 | 0.001 | 1.15E-04 | 1.0 | 6.9 | |
| 14 | -7.10 | 0.05 | 0.000 | 1.10E-04 | 1.0 | 7.2 | |
| 15 | -7.80 | 0.32 | 0.000 | 9.89E-05 | 1.1 | 7.9 | |
| | | -2.10 | 0.000 | 9.89E-05 | 1.1 | 7.9 | |
| 16 | -8.23 | -1.71 | 0.000 | 9.15E-05 | 0.3 | 8.2 | |
| 17 | -8.65 | -1.35 | 0.000 | 8.40E-05 | -0.3 | 8.2 | |
| 18 | -9.08 | -1.03 | 0.000 | 7.66E-05 | -0.8 | 7.9 | |
| 19 | -9.50 | -0.74 | 0.000 | 6.95E-05 | -1.2 | 7.4 | |
| 20 | -10.00 | -0.45 | 0.000 | 6.18E-05 | -1.5 | 6.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | -10.60 | -0.14 | 0.000 | 5.37E-05 | -1.7 | 5.7 |
| 22 | -11.20 | 0.12 | 0.000 | 4.69E-05 | -1.7 | 4.7 |
| 23 | -12.00 | 0.41 | 0.000 | 3.99E-05 | -1.5 | 3.4 |
| 24 | -12.80 | 0.65 | 0.000 | 3.50E-05 | -1.1 | 2.3 |
| 25 | -13.60 | 0.86 | 0.000 | 3.16E-05 | -0.5 | 1.6 |
| 26 | -14.05 | 0.97 | 0.000 | 3.00E-05 | -0.0 | 1.5 |
| 27 | -14.50 | 1.08 | 0.000 | 2.85E-05 | 0.4 | 1.6 |
| | | -2.82 | 0.000 | 2.85E-05 | 0.4 | 1.6 |
| 28 | -15.25 | -1.34 | 0.000 | 2.63E-05 | -1.1 | 1.1 |
| 29 | -16.00 | 4.36 | -0.000 | 2.53E-05 | 0.0 | -0.0 |

(continued)

Stage No.1 Apply surcharge no.1 at elevation 0.00

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 760 |
| 2 | -0.60 | 0.00 | 20.79 | 8.38 | 66.98 | 9.44 | 9.44 | 760 |
| 3 | -1.20 | 0.00 | 31.54 | 12.71 | 101.62 | 15.76 | 15.76 | 760 |
| | | 0.00 | 31.54 | 0.00 | 173.04 | 13.71 | 13.71 | 2280 |
| 4 | -1.65 | 0.00 | 40.46 | 0.00 | 201.77 | 19.07 | 19.07 | 2280 |
| 5 | -2.10 | 0.00 | 49.34 | 0.00 | 230.37 | 24.42 | 24.42 | 2280 |
| 6 | -2.55 | 0.00 | 58.17 | 0.01 | 258.81 | 29.75 | 29.75 | 2280 |
| 7 | -3.00 | 0.00 | 66.96 | 3.14 | 287.13 | 35.05 | 35.05 | 2280 |
| 8 | -3.70 | 0.00 | 80.57 | 7.98 | 330.99 | 43.26 | 43.26 | 2280 |
| 9 | -4.00 | 0.00 | 86.38 | 10.05 | 349.73 | 46.76 | 46.76 | 2280 |
| 10 | -4.80 | 0.00 | 101.87 | 15.57 | 399.62 | 56.09 | 56.09 | 2280 |
| 11 | -5.60 | 0.00 | 117.34 | 21.07 | 449.47 | 65.40 | 65.40 | 2280 |
| 12 | -6.20 | 0.00 | 128.95 | 25.21 | 486.87 | 72.36 | 72.36 | 2280 |
| 13 | -6.80 | 0.00 | 140.57 | 29.34 | 524.32 | 79.32 | 79.32 | 2280 |
| | | 0.00 | 140.57 | 29.90 | 757.45 | 61.57 | 61.57 | 3041 |
| 14 | -7.10 | 0.00 | 146.39 | 31.38 | 787.47 | 64.30 | 64.30 | 3041 |
| 15 | -7.80 | 7.00 | 152.98 | 33.05 | 821.47 | 67.49 | 74.49 | 3041 |
| | | 7.00 | 152.98 | 33.05 | 821.47 | 66.29 | 73.29 | 6081 |
| 16 | -8.23 | 11.25 | 157.84 | 34.28 | 846.57 | 68.73 | 79.98 | 6081 |
| 17 | -8.65 | 15.50 | 162.71 | 35.52 | 871.72 | 71.15 | 86.65 | 6081 |
| 18 | -9.08 | 19.75 | 167.60 | 36.76 | 896.91 | 73.56 | 93.31 | 6081 |
| 19 | -9.50 | 24.00 | 172.49 | 38.00 | 922.15 | 75.95 | 99.95 | 6081 |
| 20 | -10.00 | 29.00 | 178.25 | 39.46 | 951.91 | 78.75 | 107.75 | 6081 |
| 21 | -10.60 | 35.00 | 185.19 | 41.22 | 987.70 | 82.09 | 117.09 | 6081 |
| 22 | -11.20 | 41.00 | 192.14 | 42.98 | 1023.57 | 85.41 | 126.41 | 6081 |
| 23 | -12.00 | 49.00 | 201.43 | 45.34 | 1071.52 | 89.80 | 138.80 | 6081 |
| 24 | -12.80 | 57.00 | 210.75 | 47.70 | 1119.60 | 94.18 | 151.18 | 6081 |
| 25 | -13.60 | 65.00 | 220.09 | 50.07 | 1167.79 | 98.55 | 163.55 | 6081 |
| 26 | -14.05 | 69.50 | 225.35 | 51.40 | 1194.95 | 101.01 | 170.51 | 6081 |
| 27 | -14.50 | 74.00 | 230.62 | 52.74 | 1222.14 | 103.46 | 177.46 | 6081 |
| | | 74.00 | 230.62 | 0.00 | 4857.74 | 0.00 | 74.00a | 72380 |
| 28 | -15.25 | 81.50 | 240.91 | 0.00 | 4978.65 | 0.00 | 81.50a | 72380 |
| 29 | -16.00 | 89.00 | 251.22 | 0.00 | 5099.73 | 4.36 | 93.36 | 4065999 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 760 |
| 2 | -0.60 | 0.00 | 10.80 | 4.35 | 34.79 | 7.38 | 7.38 | 760 |
| 3 | -1.20 | 0.00 | 21.60 | 8.70 | 69.58 | 13.56 | 13.56 | 760 |
| | | 0.00 | 21.60 | 0.00 | 141.00 | 15.61 | 15.61 | 2280 |
| 4 | -1.65 | 0.00 | 30.60 | 0.00 | 169.99 | 20.65 | 20.65 | 2280 |
| 5 | -2.10 | 0.00 | 39.60 | 0.00 | 198.99 | 25.69 | 25.69 | 2280 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | -2.55 | 0.00 | 48.60 | 0.00 | 227.99 | 30.73 | 30.73 | 2280 |
| 7 | -3.00 | 0.00 | 57.60 | 0.00 | 256.99 | 35.78 | 35.78 | 2280 |
| 8 | -3.70 | 0.00 | 71.60 | 4.79 | 302.10 | 43.64 | 43.64 | 2280 |
| 9 | -4.00 | 0.00 | 77.60 | 6.93 | 321.43 | 47.02 | 47.02 | 2280 |
| 10 | -4.80 | 0.00 | 93.60 | 12.62 | 372.98 | 56.03 | 56.03 | 2280 |
| 11 | -5.60 | 0.00 | 109.60 | 18.32 | 424.53 | 65.06 | 65.06 | 2280 |
| 12 | -6.20 | 0.00 | 121.60 | 22.59 | 463.20 | 71.84 | 71.84 | 2280 |
| 13 | -6.80 | 0.00 | 133.60 | 26.86 | 501.86 | 78.64 | 78.64 | 2280 |
| | | 0.00 | 133.60 | 28.14 | 721.47 | 61.65 | 61.65 | 3041 |

(continued)

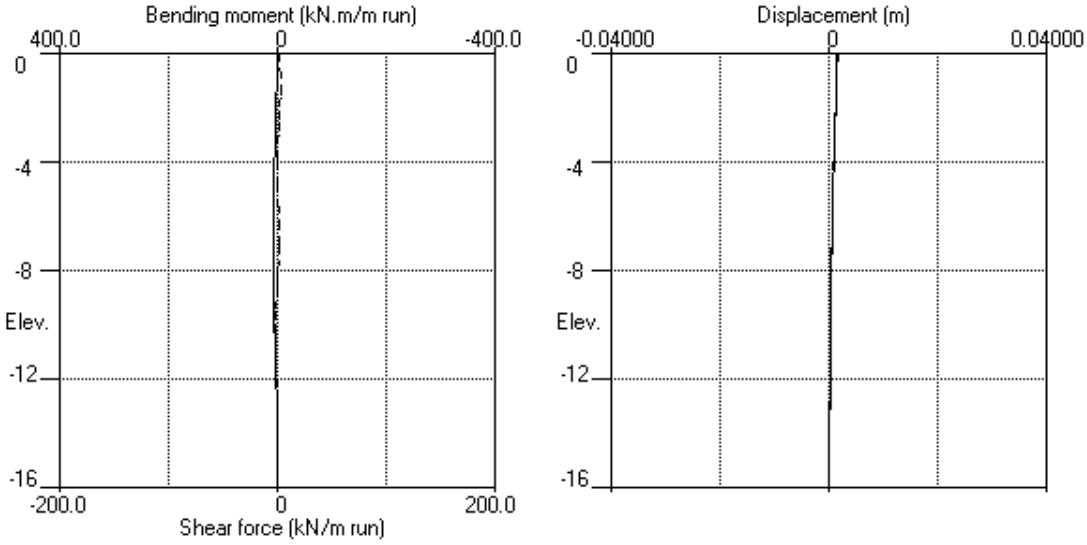
Stage No.1 Apply surcharge no.1 at elevation 0.00

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 14 | -7.10 | 0.00 | 139.60 | 29.66 | 752.43 | 64.25 | 64.25 | 3041 |
| 15 | -7.80 | 7.00 | 146.60 | 31.43 | 788.56 | 67.18 | 74.18 | 3041 |
| | | 7.00 | 146.60 | 31.43 | 788.56 | 68.39 | 75.39 | 6081 |
| 16 | -8.23 | 11.25 | 151.70 | 32.73 | 814.88 | 70.44 | 81.69 | 6081 |
| 17 | -8.65 | 15.50 | 156.80 | 34.02 | 841.19 | 72.50 | 88.00 | 6081 |
| 18 | -9.08 | 19.75 | 161.90 | 35.31 | 867.51 | 74.59 | 94.34 | 6081 |
| 19 | -9.50 | 24.00 | 167.00 | 36.61 | 893.83 | 76.70 | 100.70 | 6081 |
| 20 | -10.00 | 29.00 | 173.00 | 38.13 | 924.79 | 79.20 | 108.20 | 6081 |
| 21 | -10.60 | 35.00 | 180.20 | 39.95 | 961.95 | 82.23 | 117.23 | 6081 |
| 22 | -11.20 | 41.00 | 187.40 | 41.78 | 999.10 | 85.29 | 126.29 | 6081 |
| 23 | -12.00 | 49.00 | 197.00 | 44.21 | 1048.65 | 89.39 | 138.39 | 6081 |
| 24 | -12.80 | 57.00 | 206.60 | 46.65 | 1098.19 | 93.53 | 150.53 | 6081 |
| 25 | -13.60 | 65.00 | 216.20 | 49.08 | 1147.73 | 97.69 | 162.69 | 6081 |
| 26 | -14.05 | 69.50 | 221.60 | 50.45 | 1175.59 | 100.04 | 169.54 | 6081 |
| 27 | -14.50 | 74.00 | 227.00 | 51.82 | 1203.46 | 102.39 | 176.39 | 6081 |
| | | 74.00 | 227.00 | 0.00 | 4815.23 | 2.82 | 76.82 | 72380 |
| 28 | -15.25 | 81.50 | 237.50 | 0.00 | 4938.56 | 1.34 | 82.84 | 72380 |
| 29 | -16.00 | 89.00 | 248.00 | 0.00 | 5061.88 | 0.00 | 89.00a | 4065999 |

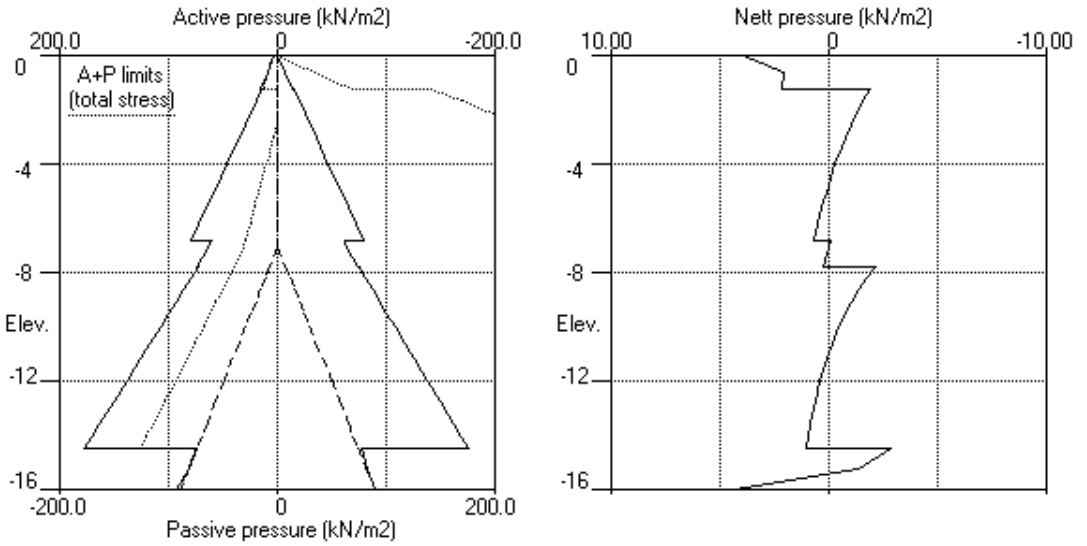
Note: 89.00 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                              Licensed from GEOSOLVE             | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```

Stage No.1 Apply surcharge no.1 at elev. 0.00

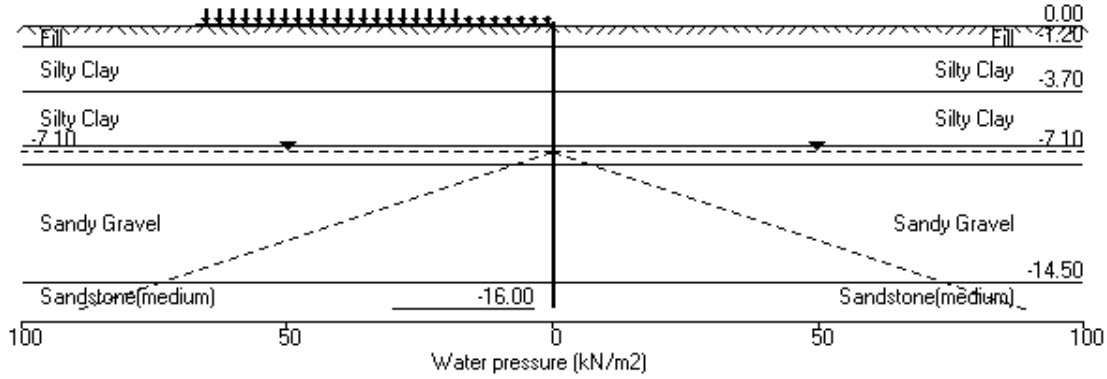



Stage No.1 Apply surcharge no.1 at elev. 0.00



Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 0.00



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 0.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Ground level Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 2 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.002 | 1.36E-04 | 0.0 | 0.0 | |
| 2 | -0.60 | 1.85 | 0.002 | 1.36E-04 | 1.8 | 0.7 | |
| 3 | -1.20 | 2.01 | 0.002 | 1.34E-04 | 2.9 | 2.1 | |
| | | -2.58 | 0.002 | 1.34E-04 | 2.9 | 2.1 | |
| 4 | -1.65 | -2.24 | 0.002 | 1.31E-04 | 1.8 | 3.2 | |
| 5 | -2.10 | -1.89 | 0.001 | 1.28E-04 | 0.9 | 3.8 | |
| 6 | -2.55 | -1.53 | 0.001 | 1.24E-04 | 0.1 | 4.0 | |
| 7 | -3.00 | -1.16 | 0.001 | 1.20E-04 | -0.5 | 3.9 | |
| 8 | -3.70 | -0.59 | 0.001 | 1.14E-04 | -1.1 | 3.3 | |
| 9 | -4.00 | -0.35 | 0.001 | 1.12E-04 | -1.2 | 3.0 | |
| 10 | -4.80 | 0.27 | 0.001 | 1.08E-04 | -1.3 | 1.9 | |
| 11 | -5.60 | 0.86 | 0.001 | 1.06E-04 | -0.8 | 1.0 | |
| 12 | -6.20 | 1.27 | 0.001 | 1.04E-04 | -0.2 | 0.7 | |
| 13 | -6.80 | 1.66 | 0.001 | 1.03E-04 | 0.7 | 0.8 | |
| | | 0.47 | 0.001 | 1.03E-04 | 0.7 | 0.8 | |
| 14 | -7.10 | 0.70 | 0.001 | 1.03E-04 | 0.9 | 1.1 | |
| 15 | -7.80 | 1.21 | 0.001 | 1.01E-04 | 1.6 | 1.9 | |
| | | -2.92 | 0.001 | 1.01E-04 | 1.6 | 1.9 | |
| 16 | -8.23 | -2.38 | 0.001 | 9.91E-05 | 0.4 | 2.3 | |
| 17 | -8.65 | -1.87 | 0.001 | 9.70E-05 | -0.5 | 2.2 | |
| 18 | -9.08 | -1.39 | 0.001 | 9.51E-05 | -1.2 | 1.9 | |
| 19 | -9.50 | -0.94 | 0.001 | 9.36E-05 | -1.7 | 1.3 | |
| 20 | -10.00 | -0.44 | 0.001 | 9.28E-05 | -2.0 | 0.3 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | -10.60 | 0.12 | 0.001 | 9.32E-05 | -2.1 | -1.0 |
| 22 | -11.20 | 0.66 | 0.001 | 9.53E-05 | -1.9 | -2.2 |
| 23 | -12.00 | 1.35 | 0.000 | 1.00E-04 | -1.1 | -3.5 |
| 24 | -12.80 | 2.03 | 0.000 | 1.06E-04 | 0.3 | -3.9 |
| 25 | -13.60 | 2.72 | 0.000 | 1.12E-04 | 2.2 | -3.0 |
| 26 | -14.05 | 3.12 | 0.000 | 1.15E-04 | 3.5 | -1.8 |
| 27 | -14.50 | 3.51 | 0.000 | 1.15E-04 | 5.0 | 0.1 |
| | | -9.23 | 0.000 | 1.15E-04 | 5.0 | 0.1 |
| 28 | -15.25 | -4.89 | 0.000 | 1.14E-04 | -0.3 | 1.2 |
| 29 | -16.00 | 5.70 | 0.000 | 1.13E-04 | 0.0 | -0.0 |

(continued)

Stage No.2 Apply surcharge no.2 at elevation 0.00

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 459 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 9.33 | 9.33 | 459 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 15.69 | 15.69 | 459 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 13.39 | 13.39 | 1378 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 18.80 | 18.80 | 1378 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 24.22 | 24.22 | 1378 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 29.65 | 29.65 | 1378 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 35.09 | 35.09 | 1378 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 43.56 | 43.56 | 1378 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 47.19 | 47.19 | 1378 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 56.87 | 56.87 | 1378 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 66.52 | 66.52 | 1378 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 73.74 | 73.74 | 1378 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 80.93 | 80.93 | 1378 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 62.97 | 62.97 | 1837 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 65.81 | 65.81 | 1837 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 69.24 | 76.24 | 1837 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 67.18 | 74.18 | 3674 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 69.76 | 81.01 | 3674 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 72.32 | 87.82 | 3674 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 74.86 | 94.61 | 3674 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 77.39 | 101.39 | 3674 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 80.34 | 109.34 | 3674 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 83.85 | 118.85 | 3674 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 87.35 | 128.35 | 3674 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 91.99 | 140.99 | 3674 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 96.61 | 153.61 | 3674 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 101.24 | 166.24 | 3674 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 103.84 | 173.34 | 3674 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 106.44 | 180.44 | 3674 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 43217 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 43217 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 6.39 | 95.39 | 43217 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 459 |
| 2 | -0.60 | 0.00 | 10.80 | 4.35 | 34.79 | 7.48 | 7.48 | 459 |
| 3 | -1.20 | 0.00 | 21.60 | 8.70 | 69.58 | 13.68 | 13.68 | 459 |
| | | 0.00 | 21.60 | 0.00 | 141.00 | 15.97 | 15.97 | 1378 |
| 4 | -1.65 | 0.00 | 30.60 | 0.00 | 169.99 | 21.04 | 21.04 | 1378 |
| 5 | -2.10 | 0.00 | 39.60 | 0.00 | 198.99 | 26.10 | 26.10 | 1378 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | -2.55 | 0.00 | 48.60 | 0.00 | 227.99 | 31.18 | 31.18 | 1378 |
| 7 | -3.00 | 0.00 | 57.60 | 0.00 | 256.99 | 36.25 | 36.25 | 1378 |
| 8 | -3.70 | 0.00 | 71.60 | 4.79 | 302.10 | 44.16 | 44.16 | 1378 |
| 9 | -4.00 | 0.00 | 77.60 | 6.93 | 321.43 | 47.55 | 47.55 | 1378 |
| 10 | -4.80 | 0.00 | 93.60 | 12.62 | 372.98 | 56.60 | 56.60 | 1378 |
| 11 | -5.60 | 0.00 | 109.60 | 18.32 | 424.53 | 65.66 | 65.66 | 1378 |
| 12 | -6.20 | 0.00 | 121.60 | 22.59 | 463.20 | 72.47 | 72.47 | 1378 |
| 13 | -6.80 | 0.00 | 133.60 | 26.86 | 501.86 | 79.27 | 79.27 | 1378 |
| | | 0.00 | 133.60 | 28.14 | 721.47 | 62.50 | 62.50 | 1837 |

(continued)

Stage No.2 Apply surcharge no.2 at elevation 0.00

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 14 | -7.10 | 0.00 | 139.60 | 29.66 | 752.43 | 65.10 | 65.10 | 1837 |
| 15 | -7.80 | 7.00 | 146.60 | 31.43 | 788.56 | 68.03 | 75.03 | 1837 |
| | | 7.00 | 146.60 | 31.43 | 788.56 | 70.10 | 77.10 | 3674 |
| 16 | -8.23 | 11.25 | 151.70 | 32.73 | 814.88 | 72.14 | 83.39 | 3674 |
| 17 | -8.65 | 15.50 | 156.80 | 34.02 | 841.19 | 74.19 | 89.69 | 3674 |
| 18 | -9.08 | 19.75 | 161.90 | 35.31 | 867.51 | 76.26 | 96.01 | 3674 |
| 19 | -9.50 | 24.00 | 167.00 | 36.61 | 893.83 | 78.33 | 102.33 | 3674 |
| 20 | -10.00 | 29.00 | 173.00 | 38.13 | 924.79 | 80.78 | 109.78 | 3674 |
| 21 | -10.60 | 35.00 | 180.20 | 39.95 | 961.95 | 83.73 | 118.73 | 3674 |
| 22 | -11.20 | 41.00 | 187.40 | 41.78 | 999.10 | 86.69 | 127.69 | 3674 |
| 23 | -12.00 | 49.00 | 197.00 | 44.21 | 1048.65 | 90.64 | 139.64 | 3674 |
| 24 | -12.80 | 57.00 | 206.60 | 46.65 | 1098.19 | 94.58 | 151.58 | 3674 |
| 25 | -13.60 | 65.00 | 216.20 | 49.08 | 1147.73 | 98.52 | 163.52 | 3674 |
| 26 | -14.05 | 69.50 | 221.60 | 50.45 | 1175.59 | 100.73 | 170.23 | 3674 |
| 27 | -14.50 | 74.00 | 227.00 | 51.82 | 1203.46 | 102.93 | 176.93 | 3674 |
| | | 74.00 | 227.00 | 0.00 | 4815.23 | 9.23 | 83.23 | 43217 |
| 28 | -15.25 | 81.50 | 237.50 | 0.00 | 4938.56 | 4.89 | 86.39 | 43217 |
| 29 | -16.00 | 89.00 | 248.00 | 0.00 | 5061.88 | 0.69 | 89.69 | 43217 |

Note: 81.50 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                              Licensed from GEOSOLVE             | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
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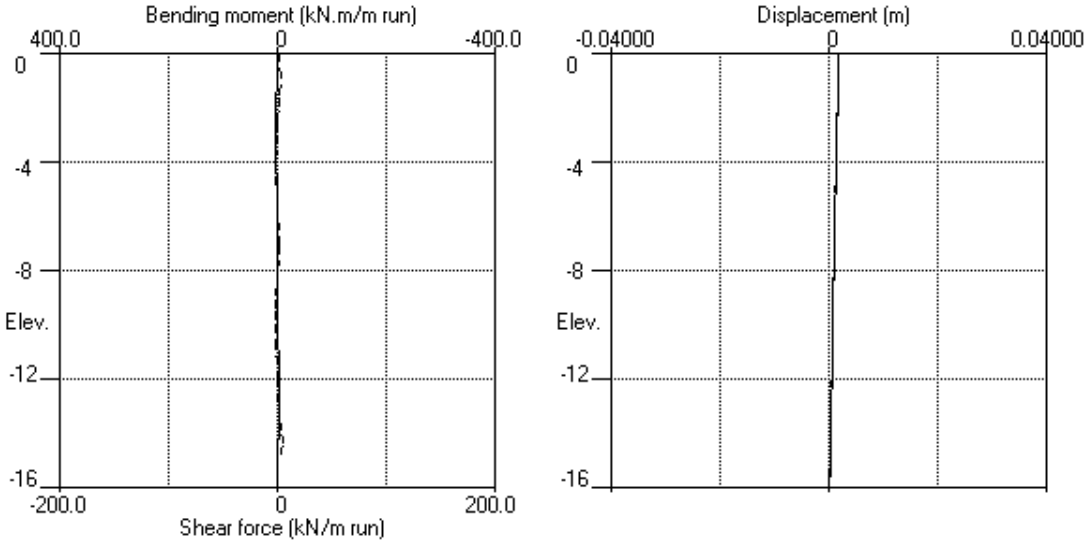
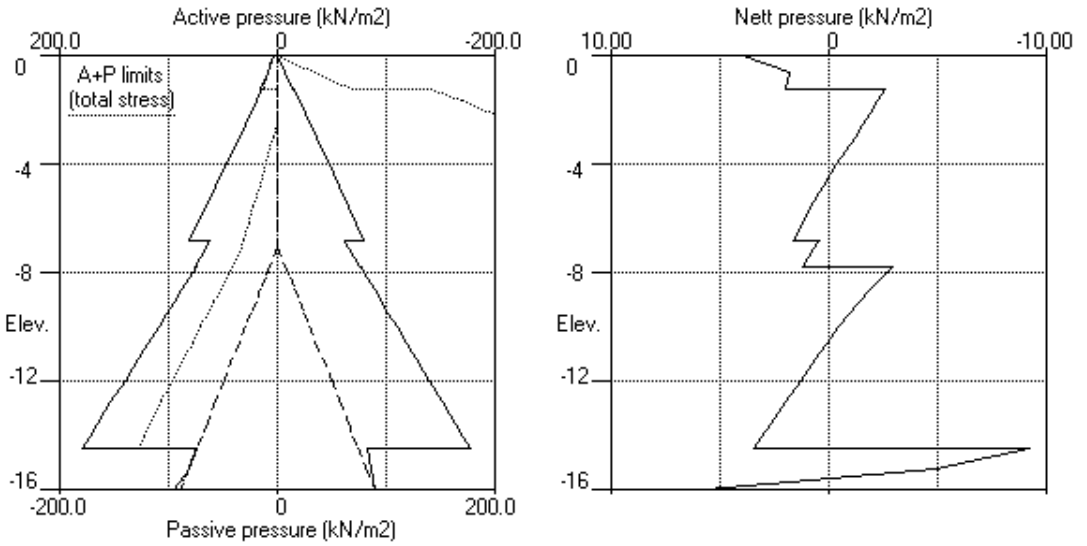
Stage No.2 Apply surcharge no.2 at elev. 0.00

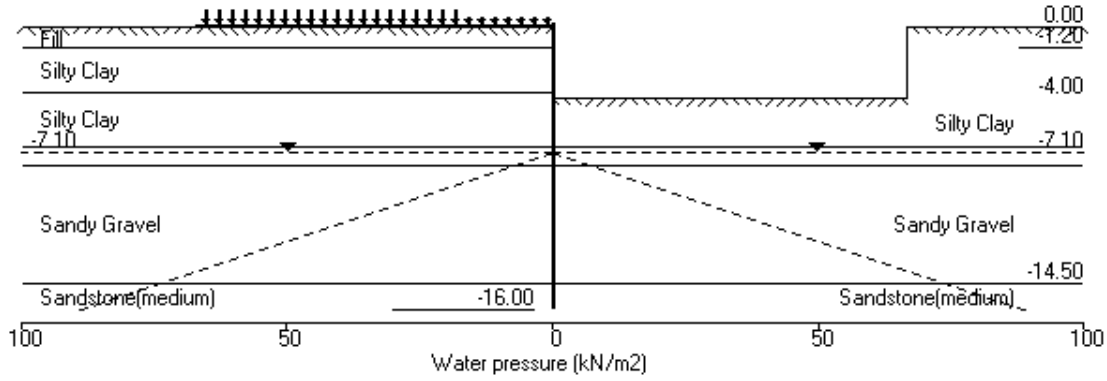



Stage No.2 Apply surcharge no.2 at elev. 0.00



Units: kN,m

Stage No.3 Excav. to elev. -4.00 on RIGHT side



Units: kN,m

Stage No. 3 Excavate to elevation -4.00 on RIGHT side

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 3 | 0.00 | -4.00 | Cant. | 3.063 | -15.12 | -5.28 | 1.28 | L to R |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.019 | 1.95E-03 | 0.0 | 0.0 | |
| 2 | -0.60 | 8.38 | 0.018 | 1.95E-03 | 3.7 | 1.1 | |
| 3 | -1.20 | 12.75 | 0.017 | 1.95E-03 | 10.1 | 5.1 | |
| | | 0.00 | 0.017 | 1.95E-03 | 10.1 | 5.1 | |
| 4 | -1.65 | 0.00 | 0.016 | 1.94E-03 | 10.1 | 9.7 | |
| 5 | -2.10 | 0.00 | 0.015 | 1.93E-03 | 10.1 | 14.2 | |
| 6 | -2.55 | 1.44 | 0.014 | 1.91E-03 | 10.4 | 19.7 | |
| 7 | -3.00 | 8.65 | 0.013 | 1.89E-03 | 12.7 | 24.7 | |
| 8 | -3.70 | 19.82 | 0.012 | 1.84E-03 | 22.6 | 36.3 | |
| 9 | -4.00 | 24.58 | 0.012 | 1.82E-03 | 29.3 | 44.1 | |
| | | -17.53 | 0.012 | 1.82E-03 | 29.3 | 44.1 | |
| 10 | -4.80 | -10.38 | 0.010 | 1.72E-03 | 18.1 | 61.9 | |
| 11 | -5.60 | -3.66 | 0.009 | 1.61E-03 | 12.5 | 73.1 | |
| 12 | -6.20 | 1.02 | 0.008 | 1.51E-03 | 11.7 | 79.9 | |
| 13 | -6.80 | 5.37 | 0.007 | 1.40E-03 | 13.6 | 87.1 | |
| | | -5.66 | 0.007 | 1.40E-03 | 13.6 | 87.1 | |
| 14 | -7.10 | -2.95 | 0.007 | 1.34E-03 | 12.3 | 91.0 | |
| 15 | -7.80 | 2.87 | 0.006 | 1.19E-03 | 12.3 | 98.9 | |
| | | -32.77 | 0.006 | 1.19E-03 | 12.3 | 98.9 | |
| 16 | -8.23 | -26.41 | 0.005 | 1.10E-03 | -0.3 | 101.2 | |
| 17 | -8.65 | -20.60 | 0.005 | 1.01E-03 | -10.3 | 98.7 | |
| 18 | -9.08 | -15.31 | 0.004 | 9.26E-04 | -17.9 | 92.4 | |
| 19 | -9.50 | -10.52 | 0.004 | 8.45E-04 | -23.4 | 83.4 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | -10.00 | -5.46 | 0.004 | 7.61E-04 | -27.4 | 70.4 |
| 21 | -10.60 | -0.09 | 0.003 | 6.81E-04 | -29.0 | 53.0 |
| 22 | -11.20 | 4.69 | 0.003 | 6.23E-04 | -27.7 | 35.6 |
| 23 | -12.00 | 10.43 | 0.002 | 5.79E-04 | -21.6 | 14.9 |
| 24 | -12.80 | 15.78 | 0.002 | 5.65E-04 | -11.1 | 0.9 |
| 25 | -13.60 | 21.00 | 0.001 | 5.67E-04 | 3.6 | -3.0 |
| 26 | -14.05 | 23.92 | 0.001 | 5.68E-04 | 13.7 | 0.7 |
| 27 | -14.50 | 26.81 | 0.001 | 5.63E-04 | 25.1 | 9.3 |
| | | -55.51 | 0.001 | 5.63E-04 | 25.1 | 9.3 |
| 28 | -15.25 | -27.13 | 0.000 | 5.46E-04 | -5.9 | 12.1 |

(continued)

Stage No.3 Excavate to elevation -4.00 on RIGHT side

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 29 | -16.00 | 42.87 | 0.000 | 5.36E-04 | 0.0 | -0.0 | |

LEFT side

| Node no. | Y coord | Effective stresses: Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 732 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 8.38 | 8.38a | 732 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 12.75 | 12.75a | 732 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 0.00 | 0.00a | 2197 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.00 | 0.00a | 2197 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.00 | 0.00a | 2197 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 1.44 | 1.44 | 2197 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 8.65 | 8.65 | 2197 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 19.82 | 19.82 | 2197 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 24.58 | 24.58 | 2197 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 37.18 | 37.18 | 2197 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 49.58 | 49.58 | 2197 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 58.72 | 58.72 | 2197 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 67.70 | 67.70 | 2197 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 45.33 | 45.33 | 2929 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 49.28 | 49.28 | 2929 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 55.12 | 62.12 | 2929 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 38.93 | 45.93 | 5858 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 44.13 | 55.38 | 5858 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 49.09 | 64.59 | 5858 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 53.81 | 73.56 | 5858 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 58.30 | 82.30 | 5858 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 63.33 | 92.33 | 5858 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 69.05 | 104.05 | 5858 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 74.50 | 115.50 | 5858 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 81.48 | 130.48 | 5858 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 88.30 | 145.30 | 5858 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 95.07 | 160.07 | 5858 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 98.87 | 168.37 | 5858 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 102.66 | 176.66 | 5858 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 69695 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 69695 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 42.87 | 131.87 | 9951284 |

RIGHT side

| Node no. | Y coord | Effective stresses: Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 71.40 | 42.11 | 42.11 | 2703 |

(continued)

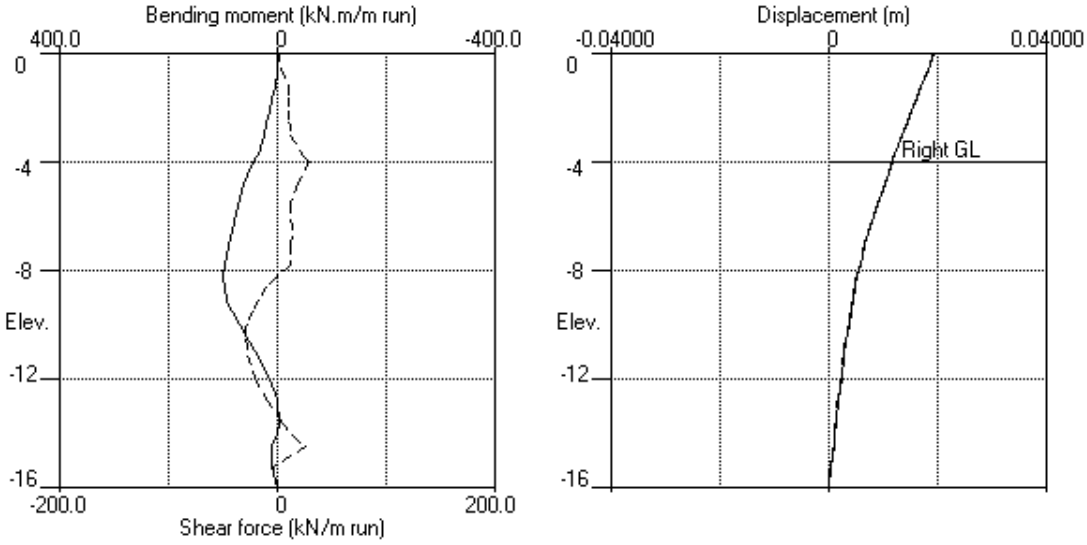
Stage No.3 Excavate to elevation -4.00 on RIGHT side

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 10 | -4.80 | 0.00 | 16.00 | 0.00 | 122.96 | 47.56 | 47.56 | 2703 |
| 11 | -5.60 | 0.00 | 32.02 | 0.00 | 174.56 | 53.25 | 53.25 | 2703 |
| 12 | -6.20 | 0.00 | 44.04 | 0.00 | 213.31 | 57.70 | 57.70 | 2703 |
| 13 | -6.80 | 0.00 | 56.09 | 0.00 | 252.12 | 62.34 | 62.34 | 2703 |
| | | 0.00 | 56.09 | 8.48 | 321.47 | 50.99 | 50.99 | 3604 |
| 14 | -7.10 | 0.00 | 62.12 | 10.01 | 352.60 | 52.23 | 52.23 | 3604 |
| 15 | -7.80 | 7.00 | 69.22 | 11.81 | 389.22 | 52.25 | 59.25 | 3604 |
| | | 7.00 | 69.22 | 11.81 | 389.22 | 71.70 | 78.70 | 7208 |
| 16 | -8.23 | 11.25 | 74.39 | 13.12 | 415.94 | 70.54 | 81.79 | 7208 |
| 17 | -8.65 | 15.50 | 79.59 | 14.44 | 442.75 | 69.69 | 85.19 | 7208 |
| 18 | -9.08 | 19.75 | 84.80 | 15.76 | 469.64 | 69.12 | 88.87 | 7208 |
| 19 | -9.50 | 24.00 | 90.03 | 17.08 | 496.62 | 68.82 | 92.82 | 7208 |
| 20 | -10.00 | 29.00 | 96.20 | 18.65 | 528.48 | 68.79 | 97.79 | 7208 |
| 21 | -10.60 | 35.00 | 103.65 | 20.54 | 566.89 | 69.14 | 104.14 | 7208 |
| 22 | -11.20 | 41.00 | 111.13 | 22.44 | 605.50 | 69.81 | 110.81 | 7208 |
| 23 | -12.00 | 49.00 | 121.16 | 24.98 | 657.29 | 71.06 | 120.06 | 7208 |
| 24 | -12.80 | 57.00 | 131.27 | 27.54 | 709.43 | 72.52 | 129.52 | 7208 |
| 25 | -13.60 | 65.00 | 141.44 | 30.12 | 761.91 | 74.07 | 139.07 | 7208 |
| 26 | -14.05 | 69.50 | 147.18 | 31.58 | 791.57 | 74.95 | 144.45 | 7208 |
| 27 | -14.50 | 74.00 | 152.95 | 33.04 | 821.33 | 75.85 | 149.85 | 7208 |
| | | 74.00 | 152.95 | 0.00 | 3945.51 | 55.51 | 129.51 | 85953 |
| 28 | -15.25 | 81.50 | 164.10 | 0.00 | 4076.50 | 27.13 | 108.63 | 85953 |
| 29 | -16.00 | 89.00 | 175.30 | 0.00 | 4208.04 | 0.00 | 89.00a | 9951284 |

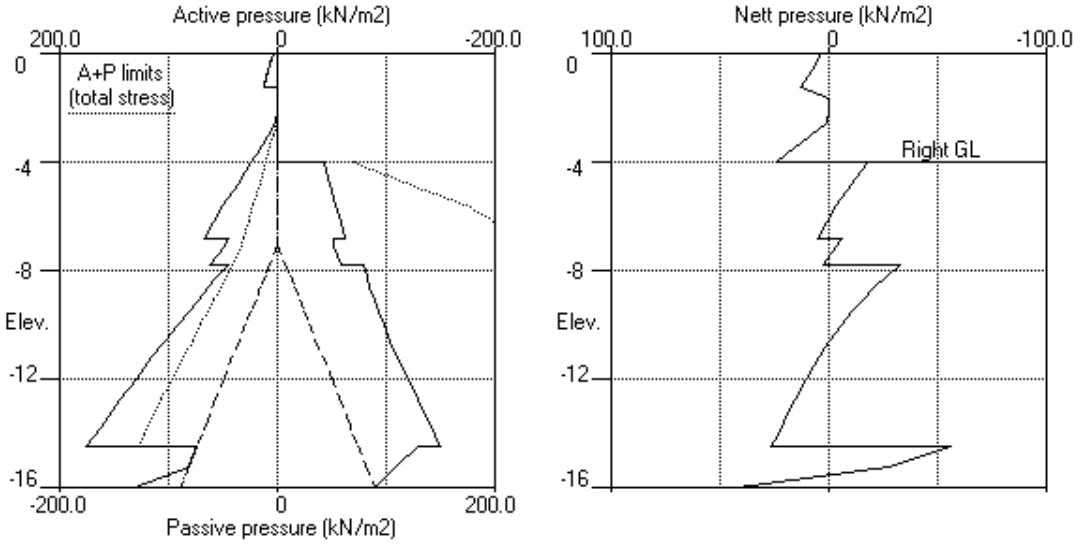
Note: 89.00 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. -4.00 on RIGHT side

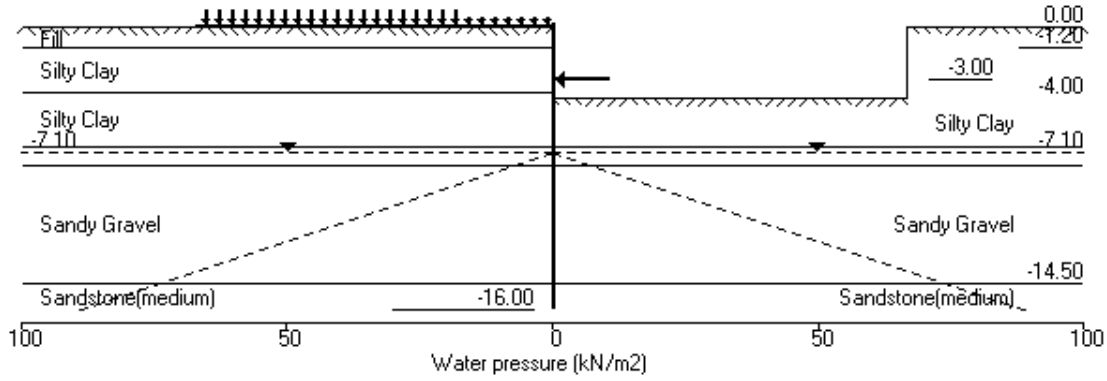



Stage No.3 Excav. to elev. -4.00 on RIGHT side



Units: kN,m

Stage No.4 Install prop no.1 at elev. -3.00



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 4 Install strut or anchor no.1 at elevation -3.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Ground level Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 4 | 0.00 | -4.00 | -3.00 | Conditions not suitable for FoS calc. | | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.10 | 0.019 | 1.94E-03 | 0.0 | 0.0 | |
| 2 | -0.60 | 8.45 | 0.018 | 1.94E-03 | 3.8 | 1.1 | |
| 3 | -1.20 | 12.81 | 0.017 | 1.94E-03 | 10.1 | 5.2 | |
| | | 0.17 | 0.017 | 1.94E-03 | 10.1 | 5.2 | |
| 4 | -1.65 | 0.16 | 0.016 | 1.93E-03 | 10.2 | 9.7 | |
| 5 | -2.10 | 0.15 | 0.015 | 1.92E-03 | 10.3 | 14.4 | |
| 6 | -2.55 | 1.59 | 0.014 | 1.90E-03 | 10.7 | 20.0 | |
| 7 | -3.00 | 8.78 | 0.013 | 1.88E-03 | 13.0 | 25.1 | -1.0 |
| | | 8.78 | 0.013 | 1.88E-03 | 12.0 | 25.1 | |
| 8 | -3.70 | 19.93 | 0.012 | 1.83E-03 | 22.1 | 36.3 | |
| 9 | -4.00 | 24.68 | 0.012 | 1.80E-03 | 28.7 | 43.9 | |
| | | -17.27 | 0.012 | 1.80E-03 | 28.7 | 43.9 | |
| 10 | -4.80 | -10.17 | 0.010 | 1.71E-03 | 17.8 | 61.4 | |
| 11 | -5.60 | -3.51 | 0.009 | 1.60E-03 | 12.3 | 72.4 | |
| 12 | -6.20 | 1.14 | 0.008 | 1.50E-03 | 11.6 | 79.1 | |
| 13 | -6.80 | 5.46 | 0.007 | 1.39E-03 | 13.6 | 86.3 | |
| | | -5.54 | 0.007 | 1.39E-03 | 13.6 | 86.3 | |
| 14 | -7.10 | -2.85 | 0.007 | 1.33E-03 | 12.3 | 90.1 | |
| 15 | -7.80 | 2.93 | 0.006 | 1.19E-03 | 12.3 | 98.0 | |
| | | -32.64 | 0.006 | 1.19E-03 | 12.3 | 98.0 | |
| 16 | -8.23 | -26.32 | 0.005 | 1.10E-03 | -0.2 | 100.3 | |
| 17 | -8.65 | -20.53 | 0.005 | 1.01E-03 | -10.1 | 97.9 | |
| 18 | -9.08 | -15.27 | 0.004 | 9.23E-04 | -17.8 | 91.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | -9.50 | -10.50 | 0.004 | 8.42E-04 | -23.2 | 82.8 |
| 20 | -10.00 | -5.46 | 0.004 | 7.59E-04 | -27.2 | 69.9 |
| 21 | -10.60 | -0.10 | 0.003 | 6.80E-04 | -28.9 | 52.5 |
| 22 | -11.20 | 4.66 | 0.003 | 6.22E-04 | -27.5 | 35.2 |
| 23 | -12.00 | 10.40 | 0.002 | 5.79E-04 | -21.5 | 14.6 |
| 24 | -12.80 | 15.75 | 0.002 | 5.66E-04 | -11.0 | 0.7 |
| 25 | -13.60 | 20.98 | 0.001 | 5.68E-04 | 3.7 | -3.1 |
| 26 | -14.05 | 23.90 | 0.001 | 5.69E-04 | 13.8 | 0.7 |
| 27 | -14.50 | 26.79 | 0.001 | 5.64E-04 | 25.2 | 9.3 |
| | | -55.59 | 0.001 | 5.64E-04 | 25.2 | 9.3 |

(continued)

Stage No.4 Install strut or anchor no.1 at elevation -3.00

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 28 | -15.25 | -27.18 | 0.000 | 5.47E-04 | -5.9 | 12.1 | |
| 29 | -16.00 | 42.86 | 0.000 | 5.37E-04 | 0.0 | -0.0 | |

At elev. -3.00 Prop force = 1.0 kN/m run

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.10 | 4.10 | 832 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 8.45 | 8.45 | 832 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 12.81 | 12.81 | 832 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 0.17 | 0.17 | 2495 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.16 | 0.16 | 2495 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.15 | 0.15 | 2495 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 1.59 | 1.59 | 2495 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 8.78 | 8.78 | 2495 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 19.93 | 19.93 | 2495 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 24.68 | 24.68 | 2495 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 37.26 | 37.26 | 2495 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 49.64 | 49.64 | 2495 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 58.77 | 58.77 | 2495 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 67.74 | 67.74 | 2495 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 45.38 | 45.38 | 3327 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 49.32 | 49.32 | 3327 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 55.14 | 62.14 | 3327 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 38.98 | 45.98 | 6654 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 44.17 | 55.42 | 6654 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 49.11 | 64.61 | 6654 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 53.82 | 73.57 | 6654 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 58.31 | 82.31 | 6654 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 63.33 | 92.33 | 6587 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 69.04 | 104.04 | 6587 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 74.49 | 115.49 | 6587 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 81.47 | 130.47 | 6587 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 88.29 | 145.29 | 6587 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 95.06 | 160.06 | 6587 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 98.86 | 168.36 | 6587 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 102.65 | 176.65 | 6587 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 78472 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 78472 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 42.87 | 131.87 | 78472 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|

| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

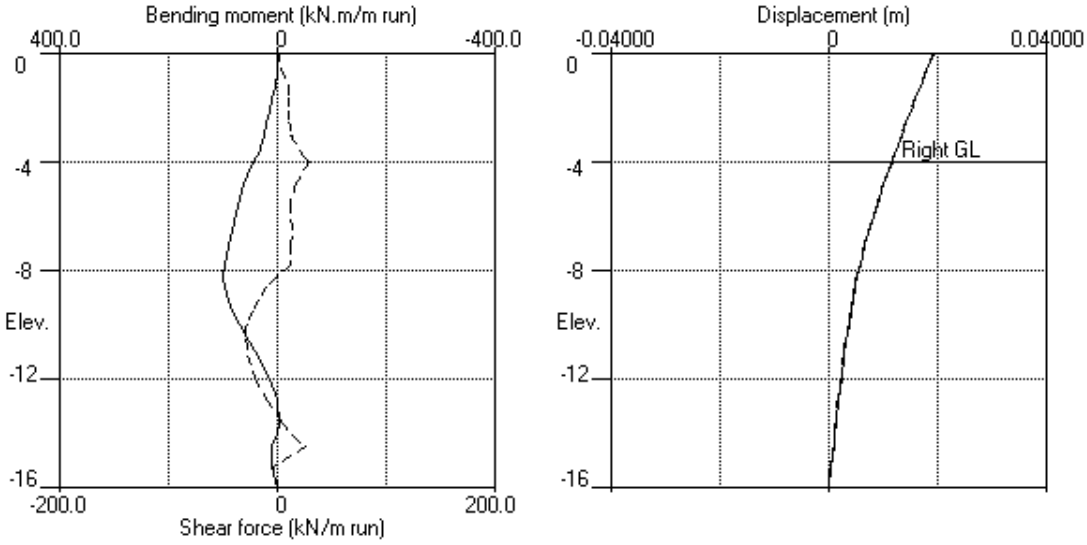
Stage No.4 Install strut or anchor no.1 at elevation -3.00

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 71.40 | 41.95 | 41.95 | 3883 |
| 10 | -4.80 | 0.00 | 16.00 | 0.00 | 122.96 | 47.44 | 47.44 | 3883 |
| 11 | -5.60 | 0.00 | 32.02 | 0.00 | 174.56 | 53.15 | 53.15 | 3883 |
| 12 | -6.20 | 0.00 | 44.04 | 0.00 | 213.31 | 57.63 | 57.63 | 3883 |
| 13 | -6.80 | 0.00 | 56.09 | 0.00 | 252.12 | 62.28 | 62.28 | 3883 |
| | | 0.00 | 56.09 | 8.48 | 321.47 | 50.92 | 50.92 | 5178 |
| 14 | -7.10 | 0.00 | 62.12 | 10.01 | 352.60 | 52.17 | 52.17 | 5178 |
| 15 | -7.80 | 7.00 | 69.22 | 11.81 | 389.22 | 52.21 | 59.21 | 5178 |
| | | 7.00 | 69.22 | 11.81 | 389.22 | 71.61 | 78.61 | 10356 |
| 16 | -8.23 | 11.25 | 74.39 | 13.12 | 415.94 | 70.48 | 81.73 | 10356 |
| 17 | -8.65 | 15.50 | 79.59 | 14.44 | 442.75 | 69.65 | 85.15 | 10356 |
| 18 | -9.08 | 19.75 | 84.80 | 15.76 | 469.64 | 69.09 | 88.84 | 10356 |
| 19 | -9.50 | 24.00 | 90.03 | 17.08 | 496.62 | 68.81 | 92.81 | 10356 |
| 20 | -10.00 | 29.00 | 96.20 | 18.65 | 528.48 | 68.79 | 97.79 | 6587 |
| 21 | -10.60 | 35.00 | 103.65 | 20.54 | 566.89 | 69.14 | 104.14 | 6587 |
| 22 | -11.20 | 41.00 | 111.13 | 22.44 | 605.50 | 69.82 | 110.82 | 6587 |
| 23 | -12.00 | 49.00 | 121.16 | 24.98 | 657.29 | 71.07 | 120.07 | 6587 |
| 24 | -12.80 | 57.00 | 131.27 | 27.54 | 709.43 | 72.54 | 129.54 | 6587 |
| 25 | -13.60 | 65.00 | 141.44 | 30.12 | 761.91 | 74.08 | 139.08 | 6587 |
| 26 | -14.05 | 69.50 | 147.18 | 31.58 | 791.57 | 74.96 | 144.46 | 6587 |
| 27 | -14.50 | 74.00 | 152.95 | 33.04 | 821.33 | 75.86 | 149.86 | 6587 |
| | | 74.00 | 152.95 | 0.00 | 3945.51 | 55.59 | 129.59 | 78472 |
| 28 | -15.25 | 81.50 | 164.10 | 0.00 | 4076.50 | 27.18 | 108.68 | 78472 |
| 29 | -16.00 | 89.00 | 175.30 | 0.00 | 4208.04 | 0.01 | 89.01 | 78472 |

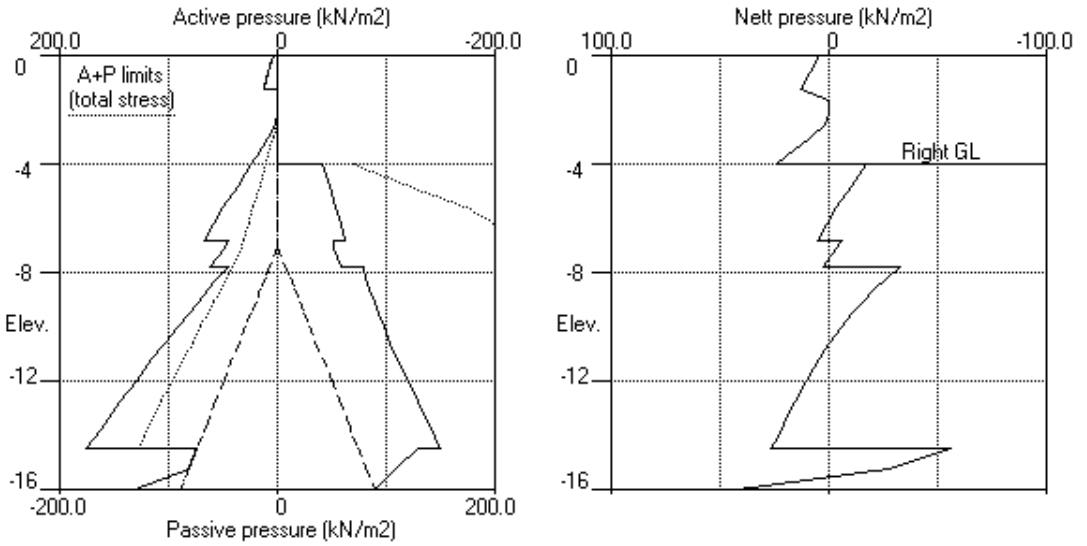
Note: 81.50 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

Units: kN,m

Stage No.4 Install prop no.1 at elev. -3.00

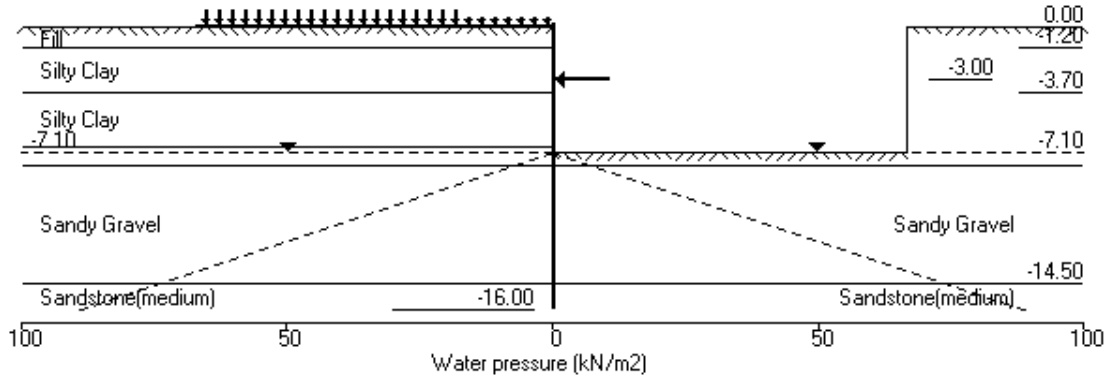



Stage No.4 Install prop no.1 at elev. -3.00



Units: kN,m

Stage No.5 Excav. to elev. -7.10 on RIGHT side



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 5 Excavate to elevation -7.10 on RIGHT side

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 5 | 0.00 | -7.10 | -3.00 | 4.445 | n/a | -8.28 | 1.18 | L to R |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.021 | 1.08E-03 | 0.0 | 0.0 | |
| 2 | -0.60 | 8.38 | 0.020 | 1.08E-03 | 3.7 | 1.1 | |
| 3 | -1.20 | 12.75 | 0.019 | 1.08E-03 | 10.1 | 5.1 | |
| | | 0.00 | 0.019 | 1.08E-03 | 10.1 | 5.1 | |
| 4 | -1.65 | 0.00 | 0.019 | 1.07E-03 | 10.1 | 9.7 | |
| 5 | -2.10 | 0.00 | 0.018 | 1.06E-03 | 10.1 | 14.2 | |
| 6 | -2.55 | 0.30 | 0.018 | 1.04E-03 | 10.1 | 19.7 | |
| 7 | -3.00 | 3.56 | 0.017 | 1.02E-03 | 11.0 | 24.3 | -76.5 |
| | | 3.56 | 0.017 | 1.02E-03 | -65.5 | 24.3 | |
| 8 | -3.70 | 13.00 | 0.017 | 1.02E-03 | -59.7 | -19.6 | |
| 9 | -4.00 | 17.39 | 0.016 | 1.03E-03 | -55.1 | -36.9 | |
| 10 | -4.80 | 29.15 | 0.015 | 1.13E-03 | -36.5 | -74.8 | |
| 11 | -5.60 | 40.98 | 0.015 | 1.28E-03 | -8.5 | -94.1 | |
| 12 | -6.20 | 49.91 | 0.014 | 1.40E-03 | 18.8 | -91.5 | |
| 13 | -6.80 | 58.89 | 0.013 | 1.50E-03 | 51.4 | -71.0 | |
| | | 33.57 | 0.013 | 1.50E-03 | 51.4 | -71.0 | |
| 14 | -7.10 | 37.62 | 0.012 | 1.55E-03 | 62.1 | -54.0 | |
| | | 5.58 | 0.012 | 1.55E-03 | 62.1 | -54.0 | |
| 15 | -7.80 | 1.90 | 0.011 | 1.59E-03 | 64.7 | -8.6 | |
| | | -33.58 | 0.011 | 1.59E-03 | 64.7 | -8.6 | |
| 16 | -8.23 | -39.63 | 0.011 | 1.59E-03 | 49.2 | 16.5 | |
| 17 | -8.65 | -36.13 | 0.010 | 1.57E-03 | 33.1 | 33.7 | |
| 18 | -9.08 | -32.77 | 0.009 | 1.53E-03 | 18.4 | 44.4 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | -9.50 | -29.58 | 0.009 | 1.49E-03 | 5.2 | 49.1 |
| 20 | -10.00 | -21.44 | 0.008 | 1.43E-03 | -7.6 | 48.8 |
| 21 | -10.60 | -11.92 | 0.007 | 1.38E-03 | -17.6 | 40.4 |
| 22 | -11.20 | -2.90 | 0.006 | 1.33E-03 | -22.0 | 27.7 |
| 23 | -12.00 | 8.60 | 0.005 | 1.30E-03 | -19.7 | 9.1 |
| 24 | -12.80 | 19.78 | 0.004 | 1.29E-03 | -8.4 | -3.9 |
| 25 | -13.60 | 30.86 | 0.003 | 1.30E-03 | 11.9 | -4.4 |
| 26 | -14.05 | 37.07 | 0.002 | 1.30E-03 | 27.1 | 4.1 |
| 27 | -14.50 | 43.23 | 0.002 | 1.29E-03 | 45.2 | 20.1 |
| | | -109.13 | 0.002 | 1.29E-03 | 45.2 | 20.1 |

(continued)

Stage No.5 Excavate to elevation -7.10 on RIGHT side

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 28 | -15.25 | -42.80 | 0.001 | 1.26E-03 | -11.8 | 22.9 | |
| 29 | -16.00 | 74.17 | 0.000 | 1.24E-03 | 0.0 | -0.0 | |
| At elev. | -3.00 | | Prop force = | | 76.5 kN/m run | | |

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 504 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 8.38 | 8.38a | 504 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 12.75 | 12.75a | 504 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 0.00 | 0.00a | 1513 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.00 | 0.00a | 1513 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.00 | 0.00a | 1513 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 0.30 | 0.30a | 1513 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 3.56 | 3.56a | 1513 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 13.00 | 13.00 | 1513 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 17.39 | 17.39 | 1513 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 29.15 | 29.15 | 1513 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 40.98 | 40.98 | 1513 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 49.91 | 49.91 | 1513 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 58.89 | 58.89 | 1513 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 33.57 | 33.57 | 2017 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 37.62 | 37.62 | 2017 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 43.89 | 50.89 | 2017 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 34.59 | 41.59a | 4035 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 35.90 | 47.15a | 4035 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 37.21 | 52.71a | 4035 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 38.51 | 58.26a | 4035 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 39.81 | 63.81a | 4035 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 45.92 | 74.92 | 4035 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 53.30 | 88.30 | 4035 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 60.46 | 101.46 | 4035 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 69.77 | 118.77 | 4035 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 78.95 | 135.95 | 4035 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 88.09 | 153.09 | 4035 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 93.23 | 162.73 | 4035 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 98.36 | 172.36 | 4035 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 47633 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 47633 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 74.17 | 163.17 | 3635061 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|

| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

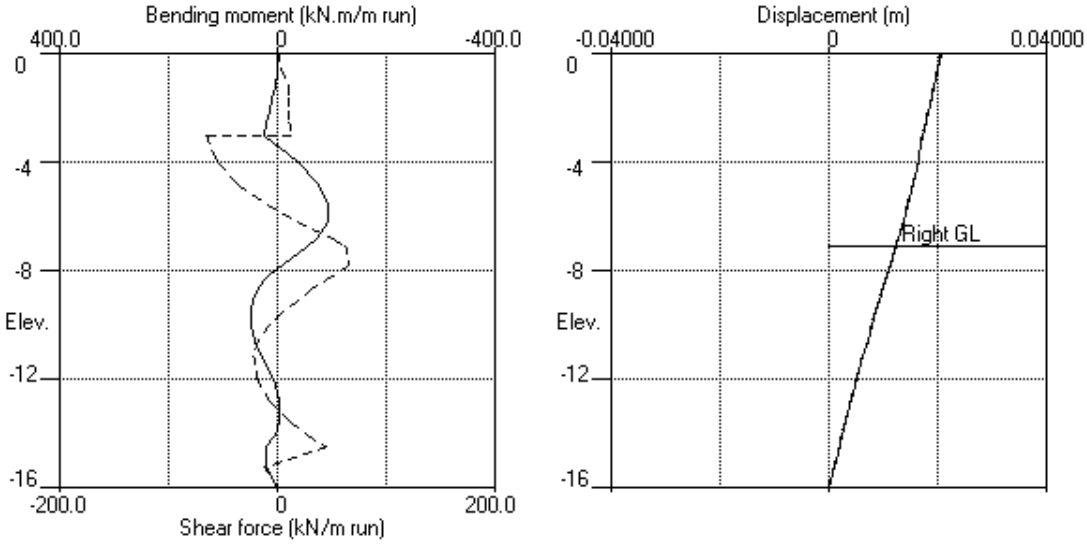
Stage No.5 Excavate to elevation -7.10 on RIGHT side

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | -4.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | -5.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | -6.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | -6.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | -7.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 32.03 | 32.03 | 32.03p | 2945 |
| 15 | -7.80 | 7.00 | 7.00 | 0.00 | 68.17 | 41.98 | 48.98 | 2945 |
| | | 7.00 | 7.00 | 0.00 | 68.17 | 68.17 | 75.17p | 5890 |
| 16 | -8.23 | 11.25 | 12.11 | 0.00 | 94.53 | 75.54 | 86.79 | 5890 |
| 17 | -8.65 | 15.50 | 17.23 | 0.00 | 120.93 | 73.34 | 88.84 | 5890 |
| 18 | -9.08 | 19.75 | 22.36 | 0.00 | 147.40 | 71.29 | 91.04 | 5890 |
| 19 | -9.50 | 24.00 | 27.50 | 1.23 | 173.95 | 69.39 | 93.39 | 5890 |
| 20 | -10.00 | 29.00 | 33.58 | 2.77 | 205.30 | 67.36 | 96.36 | 5890 |
| 21 | -10.60 | 35.00 | 40.91 | 4.63 | 243.13 | 65.23 | 100.23 | 5890 |
| 22 | -11.20 | 41.00 | 48.29 | 6.50 | 281.21 | 63.36 | 104.36 | 5890 |
| 23 | -12.00 | 49.00 | 58.21 | 9.02 | 332.44 | 61.17 | 110.17 | 5890 |
| 24 | -12.80 | 57.00 | 68.25 | 11.56 | 384.23 | 59.17 | 116.17 | 5890 |
| 25 | -13.60 | 65.00 | 78.40 | 14.14 | 436.63 | 57.23 | 122.23 | 5890 |
| 26 | -14.05 | 69.50 | 84.17 | 15.60 | 466.38 | 56.17 | 125.67 | 5890 |
| 27 | -14.50 | 74.00 | 89.97 | 17.07 | 496.33 | 55.13 | 129.13 | 5890 |
| | | 74.00 | 89.97 | 0.00 | 3205.79 | 109.13 | 183.13 | 70081 |
| 28 | -15.25 | 81.50 | 101.23 | 0.00 | 3338.05 | 42.80 | 124.30 | 70081 |
| 29 | -16.00 | 89.00 | 112.60 | 0.00 | 3471.56 | 0.00 | 89.00a | 3635061 |

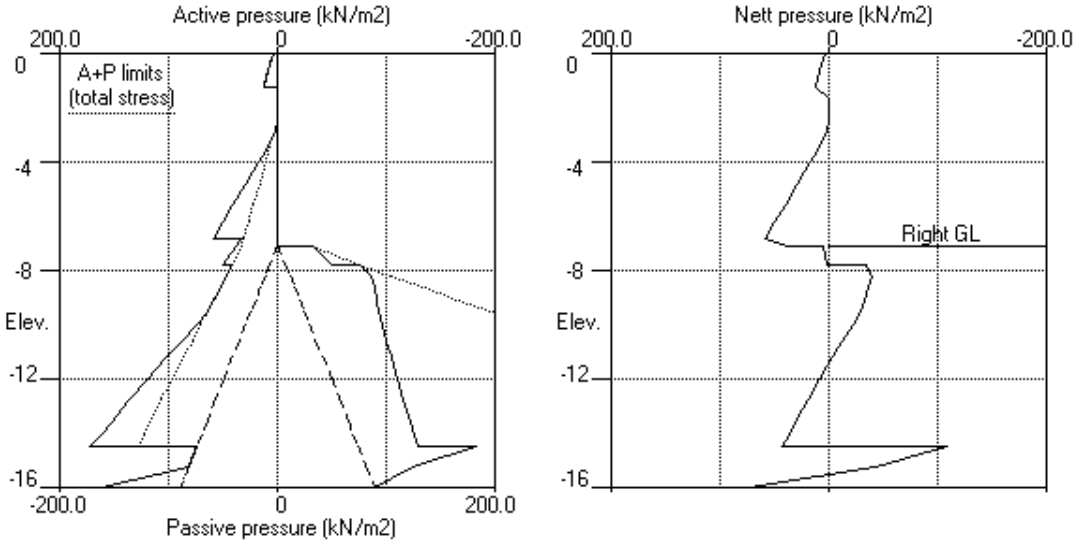
Note: 89.00 a Soil pressure at active limit
75.17 p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. -7.10 on RIGHT side



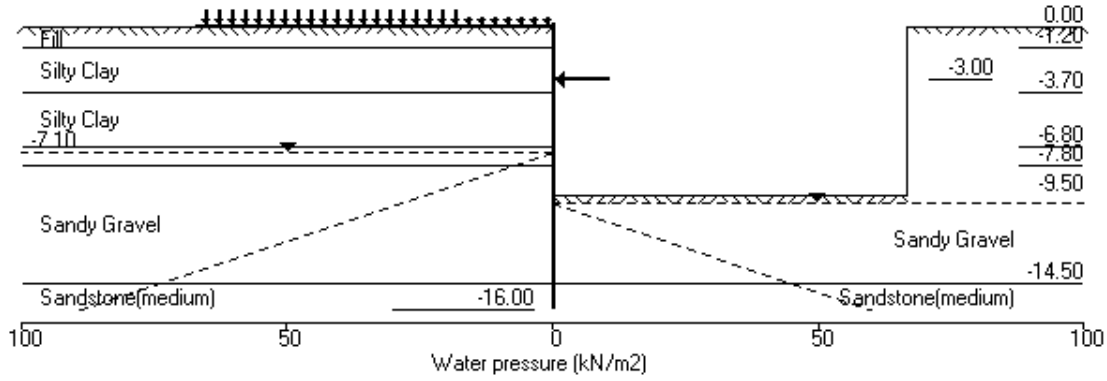

Stage No.5 Excav. to elev. -7.10 on RIGHT side



| | |
|---|---|
| VAN der MEER CONSULTING | Sheet No. |
| Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070 |
| Licensed from GEOSOLVE | Made by : MS |
| Data filename/Run ID: Section_2(BH2) | |
| Penrith | Date: 7-10-2022 |
| Section A | Checked : |

Units: kN,m

Stage No.7 Excav. to elev. -9.50 on RIGHT side



Units: kN,m

Stage No. 7 Excavate to elevation -9.50 on RIGHT side

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 7 | 0.00 | -9.50 | -3.00 | 3.180 | n/a | -11.53 | 2.03 | L to R |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 10.79 | 0.018 | -6.22E-04 | 0.0 | 0.0 | |
| 2 | -0.60 | 12.11 | 0.019 | -6.23E-04 | 6.9 | 2.3 | |
| 3 | -1.20 | 13.45 | 0.019 | -6.31E-04 | 14.5 | 8.9 | |
| | | 2.09 | 0.019 | -6.31E-04 | 14.5 | 8.9 | |
| 4 | -1.65 | 0.00 | 0.019 | -6.43E-04 | 15.0 | 15.6 | |
| 5 | -2.10 | 0.00 | 0.020 | -6.61E-04 | 15.0 | 22.4 | |
| 6 | -2.55 | 0.30 | 0.020 | -6.87E-04 | 15.1 | 30.1 | |
| 7 | -3.00 | 3.56 | 0.020 | -7.20E-04 | 15.9 | 37.0 | -129.9 |
| | | 3.56 | 0.020 | -7.20E-04 | -113.9 | 37.0 | |
| 8 | -3.70 | 8.66 | 0.021 | -7.16E-04 | -109.6 | -41.1 | |
| 9 | -4.00 | 10.85 | 0.021 | -6.79E-04 | -106.7 | -73.6 | |
| 10 | -4.80 | 19.51 | 0.021 | -4.81E-04 | -94.6 | -154.3 | |
| 11 | -5.60 | 29.35 | 0.022 | -1.53E-04 | -75.0 | -223.1 | |
| 12 | -6.20 | 36.97 | 0.022 | 1.63E-04 | -55.1 | -262.5 | |
| 13 | -6.80 | 44.85 | 0.021 | 5.22E-04 | -30.6 | -288.6 | |
| | | 31.23 | 0.021 | 5.22E-04 | -30.6 | -288.6 | |
| 14 | -7.10 | 32.78 | 0.021 | 7.13E-04 | -21.0 | -296.4 | |
| 15 | -7.80 | 41.59 | 0.021 | 1.16E-03 | 5.1 | -301.2 | |
| 16 | -8.23 | 47.15 | 0.020 | 1.44E-03 | 23.9 | -294.4 | |
| 17 | -8.65 | 52.71 | 0.019 | 1.70E-03 | 45.1 | -280.0 | |
| 18 | -9.08 | 58.26 | 0.019 | 1.95E-03 | 68.7 | -256.1 | |
| 19 | -9.50 | 63.81 | 0.018 | 2.17E-03 | 94.7 | -221.6 | |
| | | 31.78 | 0.018 | 2.17E-03 | 94.7 | -221.6 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | -10.00 | -18.47 | 0.017 | 2.39E-03 | 98.0 | -172.0 |
| 21 | -10.60 | -40.42 | 0.015 | 2.57E-03 | 80.3 | -115.0 |
| 22 | -11.20 | -30.88 | 0.013 | 2.70E-03 | 58.9 | -74.5 |
| 23 | -12.00 | -17.67 | 0.011 | 2.79E-03 | 39.5 | -38.0 |
| 24 | -12.80 | 3.71 | 0.009 | 2.84E-03 | 33.9 | -10.3 |
| 25 | -13.60 | 29.08 | 0.007 | 2.83E-03 | 47.0 | 18.0 |
| 26 | -14.05 | 43.14 | 0.005 | 2.80E-03 | 63.3 | 42.1 |
| 27 | -14.50 | 56.92 | 0.004 | 2.74E-03 | 85.8 | 75.0 |
| | | -256.80 | 0.004 | 2.74E-03 | 85.8 | 75.0 |
| 28 | -15.25 | -102.28 | 0.002 | 2.63E-03 | -48.9 | 66.7 |

(continued)

Stage No.7 Excavate to elevation -9.50 on RIGHT side

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 29 | -16.00 | 232.55 | 0.000 | 2.57E-03 | 0.0 | -0.0 | |
| At elev. | -3.00 | | | Prop force = | 129.9 kN/m run | | |

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 10.79 | 10.79 | 3082 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 12.11 | 12.11 | 3082 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 13.45 | 13.45 | 3082 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 2.09 | 2.09 | 9245 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.00 | 0.00a | 1640 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.00 | 0.00a | 1640 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 0.30 | 0.30a | 1640 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 3.56 | 3.56a | 1640 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 8.66 | 8.66a | 1640 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 10.85 | 10.85a | 1640 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 19.51 | 19.51 | 1640 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 29.35 | 29.35 | 1640 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 36.97 | 36.97 | 1640 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 44.85 | 44.85 | 1640 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 31.23 | 31.23a | 2186 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 32.78 | 32.78a | 2186 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 34.59 | 41.59a | 2186 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 34.59 | 41.59a | 4372 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 35.90 | 47.15a | 4372 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 37.21 | 52.71a | 4372 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 38.51 | 58.26a | 4372 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 39.81 | 63.81a | 4372 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 41.33 | 70.33a | 4372 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 43.15 | 78.15a | 4372 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 44.96 | 85.96a | 4372 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 47.37 | 96.37a | 4372 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 57.75 | 114.75 | 4372 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 72.24 | 137.24 | 4372 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 80.34 | 149.84 | 4372 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 88.35 | 162.35 | 4372 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 51734 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 51734 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 203.55 | 292.55 | 4384164 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

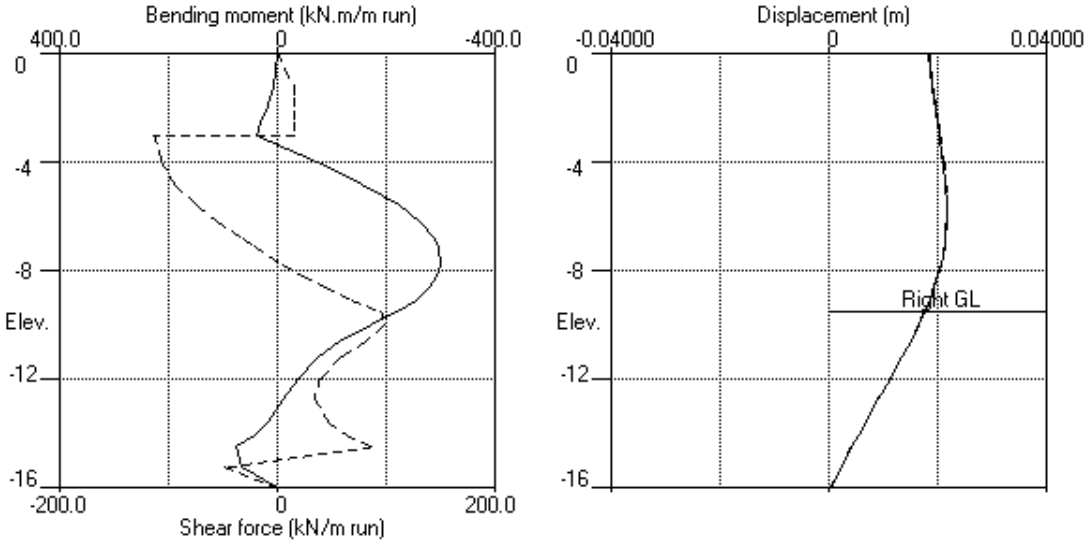
Stage No.7 Excavate to elevation -9.50 on RIGHT side

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 10 | -4.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | -5.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | -6.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | -6.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | -7.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 15 | -7.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 16 | -8.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 17 | -8.65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 18 | -9.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 19 | -9.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 32.03 | 32.03 | 32.03p | 7668 |
| 20 | -10.00 | 0.00 | 11.00 | 0.00 | 88.80 | 88.80 | 88.80p | 7668 |
| 21 | -10.60 | 6.00 | 18.21 | 0.00 | 126.02 | 112.57 | 118.57 | 7668 |
| 22 | -11.20 | 12.00 | 25.45 | 0.71 | 163.36 | 104.84 | 116.84 | 7668 |
| 23 | -12.00 | 20.00 | 35.16 | 3.17 | 213.45 | 94.03 | 114.03 | 7668 |
| 24 | -12.80 | 28.00 | 44.95 | 5.65 | 264.01 | 83.04 | 111.04 | 7668 |
| 25 | -13.60 | 36.00 | 54.86 | 8.17 | 315.16 | 72.16 | 108.16 | 7668 |
| 26 | -14.05 | 40.50 | 60.50 | 9.60 | 344.23 | 66.20 | 106.70 | 7668 |
| 27 | -14.50 | 45.00 | 66.18 | 11.04 | 373.54 | 60.43 | 105.43 | 7668 |
| | | 45.00 | 66.18 | 0.00 | 2926.33 | 285.80 | 330.80 | 91497 |
| 28 | -15.25 | 52.50 | 77.25 | 0.00 | 3056.39 | 131.28 | 183.78 | 91497 |
| 29 | -16.00 | 60.00 | 88.47 | 0.00 | 3188.11 | 0.00 | 60.00a | 4384164 |

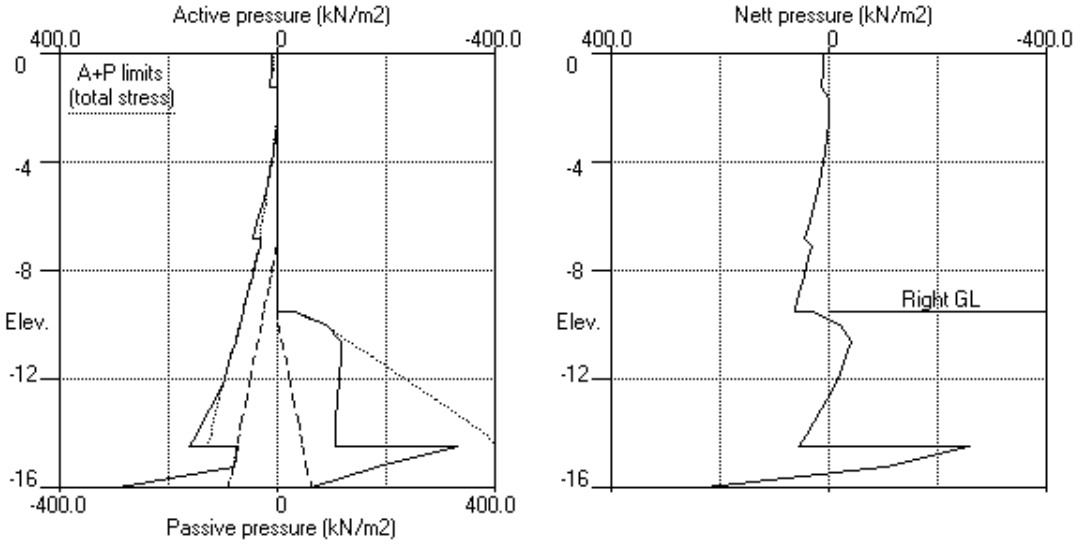
Note: 60.00 a Soil pressure at active limit
88.80 p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. -9.50 on RIGHT side




Stage No.7 Excav. to elev. -9.50 on RIGHT side



Units: kN,m

**Summary of results**

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |
| 2 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |
| 3 | 0.00 | -4.00 | Cant. | 3.063 | -15.12 | -5.28 | 1.28 | L to R |
| 4 | 0.00 | -4.00 | -3.00 | Conditions not suitable for FoS calc. | | | | |
| 5 | 0.00 | -7.10 | -3.00 | 4.445 | n/a | -8.28 | 1.18 | L to R |
| 6 | 0.00 | -7.10 | -3.00 | 4.797 | n/a | -7.98 | 0.88 | L to R |
| 7 | 0.00 | -9.50 | -3.00 | 3.180 | n/a | -11.53 | 2.03 | L to R |

Units: kN,m

**Summary of results**

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**

**Analysis options**

Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

**Bending moment, shear force and displacement envelopes**

| Node no. | Y coord | Displacement maximum | Displacement minimum | Bending moment maximum | Bending moment minimum | Shear force maximum | Shear force minimum |
|---|---|---|---|---|---|---|---|
| | | m | m | kN.m/m | kN.m/m | kN/m | kN/m |
| 1 | 0.00 | 0.021 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | -0.60 | 0.020 | 0.000 | 2.3 | 0.0 | 6.9 | 0.0 |
| 3 | -1.20 | 0.019 | 0.000 | 8.9 | 0.0 | 14.5 | 0.0 |
| 4 | -1.65 | 0.019 | 0.000 | 15.6 | 0.0 | 15.0 | 0.0 |
| 5 | -2.10 | 0.020 | 0.000 | 22.4 | 0.0 | 15.0 | 0.0 |
| 6 | -2.55 | 0.020 | 0.000 | 30.1 | 0.0 | 15.1 | 0.0 |
| 7 | -3.00 | 0.020 | 0.000 | 37.0 | 0.0 | 15.9 | -113.9 |
| 8 | -3.70 | 0.021 | 0.000 | 36.3 | -41.1 | 22.6 | -109.6 |
| 9 | -4.00 | 0.021 | 0.000 | 44.1 | -73.6 | 29.3 | -106.7 |
| 10 | -4.80 | 0.021 | 0.000 | 61.9 | -154.3 | 18.1 | -94.6 |
| 11 | -5.60 | 0.022 | 0.000 | 73.1 | -223.1 | 12.5 | -75.0 |
| 12 | -6.20 | 0.022 | 0.000 | 79.9 | -262.5 | 18.8 | -55.1 |
| 13 | -6.80 | 0.021 | 0.000 | 87.1 | -288.6 | 51.4 | -30.6 |
| 14 | -7.10 | 0.021 | 0.000 | 91.0 | -296.4 | 62.1 | -21.0 |
| 15 | -7.80 | 0.021 | 0.000 | 98.9 | -301.2 | 64.7 | 0.0 |
| 16 | -8.23 | 0.020 | 0.000 | 101.2 | -294.4 | 49.2 | -0.3 |
| 17 | -8.65 | 0.019 | 0.000 | 98.7 | -280.0 | 45.1 | -10.3 |
| 18 | -9.08 | 0.019 | 0.000 | 92.4 | -256.1 | 68.7 | -17.9 |
| 19 | -9.50 | 0.018 | 0.000 | 83.4 | -221.6 | 94.7 | -23.4 |
| 20 | -10.00 | 0.017 | 0.000 | 70.4 | -172.0 | 98.0 | -27.4 |
| 21 | -10.60 | 0.015 | 0.000 | 53.0 | -115.0 | 80.3 | -29.0 |
| 22 | -11.20 | 0.013 | 0.000 | 35.6 | -74.5 | 58.9 | -27.7 |
| 23 | -12.00 | 0.011 | 0.000 | 14.9 | -38.0 | 39.5 | -21.6 |
| 24 | -12.80 | 0.009 | 0.000 | 2.3 | -38.3 | 33.9 | -11.1 |
| 25 | -13.60 | 0.007 | 0.000 | 18.0 | -30.8 | 47.0 | -0.5 |
| 26 | -14.05 | 0.005 | 0.000 | 42.1 | -15.8 | 63.3 | -0.0 |
| 27 | -14.50 | 0.004 | 0.000 | 75.0 | 0.0 | 85.8 | 0.0 |
| 28 | -15.25 | 0.002 | 0.000 | 66.7 | 0.0 | 0.0 | -48.9 |
| 29 | -16.00 | 0.000 | -0.000 | 0.0 | -0.0 | 0.0 | 0.0 |

**Maximum and minimum bending moment and shear force at each stage**

| Stage no. | Bending moment maximum | Bending moment elev. | Bending moment minimum | Bending moment elev. | Shear force maximum | Shear force elev. | Shear force minimum | Shear force elev. |
|---|---|---|---|---|---|---|---|---|

| | kN.m/m | | kN.m/m | | kN/m | | kN/m | |
|---|---|---|---|---|---|---|---|---|
| 1 | 8.2 | -8.23 | -0.0 | -16.00 | 3.1 | -1.20 | -1.7 | -11.20 |
| 2 | 4.0 | -2.55 | -3.9 | -12.80 | 5.0 | -14.50 | -2.1 | -10.60 |
| 3 | 101.2 | -8.23 | -3.0 | -13.60 | 29.3 | -4.00 | -29.0 | -10.60 |
| 4 | 100.3 | -8.23 | -3.1 | -13.60 | 28.7 | -4.00 | -28.9 | -10.60 |
| 5 | 49.1 | -9.50 | -94.1 | -5.60 | 64.7 | -7.80 | -65.5 | -3.00 |
| 6 | 27.3 | -3.00 | -101.9 | -6.20 | 65.7 | -14.50 | -68.6 | -3.00 |
| 7 | 75.0 | -14.50 | -301.2 | -7.80 | 98.0 | -10.00 | -113.9 | -3.00 |

**Summary of results (continued)**

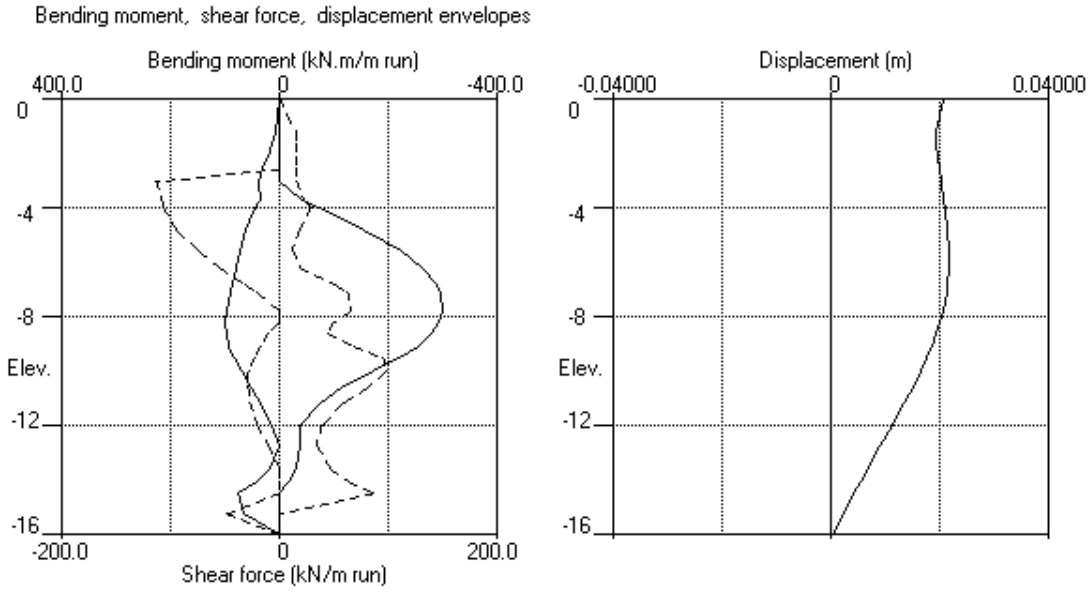
**Maximum and minimum displacement at each stage**

| Stage no. | Displacement maximum | elev. | minimum | elev. | Stage description |
|---|---|---|---|---|---|
| | m | | m | | |
| 1 | 0.002 | 0.00 | -0.000 | -16.00 | Apply surcharge no.1 at elev. 0.00 |
| 2 | 0.002 | 0.00 | 0.000 | 0.00 | Apply surcharge no.2 at elev. 0.00 |
| 3 | 0.019 | 0.00 | 0.000 | 0.00 | Excav. to elev. -4.00 on RIGHT side |
| 4 | 0.019 | 0.00 | 0.000 | 0.00 | Install prop no.1 at elev. -3.00 |
| 5 | 0.021 | 0.00 | 0.000 | 0.00 | Excav. to elev. -7.10 on RIGHT side |
| 6 | 0.020 | 0.00 | 0.000 | 0.00 | Apply water pressure profile no.1 |
| 7 | 0.022 | -5.60 | 0.000 | 0.00 | Excav. to elev. -9.50 on RIGHT side |

**Prop forces at each stage (horizontal components)**

| Stage no. | --- Strut no. 1 --- at elev.-3.00 | |
|---|---|---|
| | kN/m run | kN/prop |
| 4 | 1.00 | 1.00 |
| 5 | 76.49 | 76.49 |
| 6 | 81.00 | 81.00 |
| 7 | 129.86 | 129.86 |

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                            Licensed from GEOSOLVE               | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```




## A.2. Section_6 (BH6)

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                            Licensed from GEOSOLVE               | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```

**INPUT DATA**

**SOIL PROFILE**

| Stratum no. | Elevation of top of stratum | Soil types Left side | Soil types Right side |
|---|---|---|---|
| 1 | 0.00 | 1 Fill | 1 Fill |
| 2 | -1.20 | 2 Silty Clay | 2 Silty Clay |

| | | | | | |
|---|---|---|---|---|---|
| 3 | -3.70 | 2 | Silty Clay | 2 | Silty Clay |
| 4 | -6.80 | 3 | Silty Sand | 3 | Silty Sand |
| 5 | -7.80 | 5 | Sandy Gravel | 5 | Sandy Gravel |
| 6 | -14.50 | 6 | Sandstone(medium) | 6 | Sandstone(medium) |

**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 | Fill | 18.00 | 5000 | 0.580 | OC (0.300) | 0.403 (0.000) | 3.222 ( 0.000) | |
| 2 | Silty Clay | 20.00 | 15000 | 0.580 | OC (0.300) | 0.356 (1.380) | 3.222 ( 4.760) | 15.00d |
| 3 | Silty Sand | 20.00 | 20000 | 0.450 | OC (0.300) | 0.254 (1.149) | 5.160 ( 6.407) | 5.000d |
| 4 | Not defined | | | | | | | |
| 5 | Sandy Gravel | 22.00 | 40000 | 0.450 | OC (0.300) | 0.254 (1.149) | 5.160 ( 6.407) | 5.000d |
| 6 | Sandstone(-medium) | 24.00 | 500000 | 0.000 | OC (0.250) | 0.151 (0.849) | 11.75 (10.745) | 200.0d |

**Additional soil parameters associated with Ka and Kp**

| | | --- parameters for Ka --- | | | --- parameters for Kp --- | | |
|---|---|---|---|---|---|---|---|
| ------- Soil type ------- No. | Description | Soil friction angle | Wall adhesion coeff. | Back-fill angle | Soil friction angle | Wall adhesion coeff. | Back-fill angle |
| 1 | Fill | 25.00 | 0.022 | 0.00 | 25.00 | 0.475 | 0.00 |
| 2 | Silty Clay | 25.00 | 0.575 | 0.00 | 25.00 | 0.475 | 0.00 |
| 3 | Silty Sand | 33.00 | 0.554 | 0.00 | 33.00 | 0.456 | 0.00 |
| 4 | Not defined | | | | | | |
| 5 | Sandy Gravel | 33.00 | 0.554 | 0.00 | 33.00 | 0.456 | 0.00 |
| 6 | Sandstone(medium) | 45.00 | 0.364 | 0.00 | 45.00 | 0.364 | 0.00 |

**GROUND WATER CONDITIONS**

Density of water = 10.00 kN/m3

| | Left side | Right side |
|---|---|---|
| Initial water table elevation | -7.10 | -7.10 |

Automatic water pressure balancing at toe of wall : No

| Water press. profile no. | Point no. | Left side Elev. m | Piezo elev. m | Water press. kN/m2 | Point no. | Right side Elev. m | Piezo elev. m | Water press. kN/m2 |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | -7.10 | -7.10 | 0.0 | 1 | -10.00 | -10.00 | 0.0 |

**WALL PROPERTIES**

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.90 m
Soldier Pile spacing = 1.40 m
Passive mobilisation factor = 3.00
Elevation of toe of wall = -16.00
Maximum finite element length = 0.80 m
Youngs modulus of wall E = 2.0000E+07 kN/m2
Moment of inertia of wall I = 0.023000 m4/m run
= 0.032200 m4 per pile

E.I = 460000 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 | -3.00 | 1.00 | 0.350000 | 2.000E+07 | 370.0 | 0.00 | 1.00 | Strut | Yes | R |

**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 | 0.00 | 0.00(L) | 30.00 | 5.00 | 10.00 | = | N/A | N/A |
| 2 | 0.00 | 5.00(L) | 30.00 | 15.00 | 20.00 | = | 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 0.00 |
| 2 | Apply surcharge no.2 at elevation 0.00 |
| 3 | Excavate to elevation -4.00 on RIGHT side |
| 4 | Install strut or anchor no.1 at elevation -3.00 |
| 5 | Excavate to elevation -7.10 on RIGHT side |
| 6 | Apply water pressure profile no.1 |
| 7 | Excavate to elevation -9.50 on RIGHT side |

**FACTORS OF SAFETY and ANALYSIS OPTIONS**

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

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 - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on Left side of wall = 20.00 m
Width of excavation on Right side of wall = 20.00 m

Distance to rigid boundary on Left side = 20.00 m
Distance to rigid boundary on Right side = 20.00 m

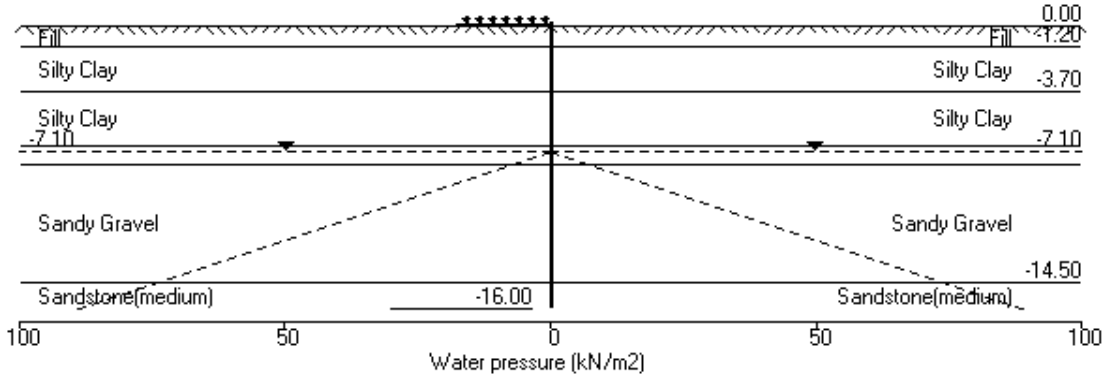
**OUTPUT OPTIONS**

| Stage no. | Stage description | Output options: Displacement, Bending mom., Shear force | Active, Passive pressures | Graph. output |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Apply surcharge no.1 at elev. 0.00 | Yes | Yes | Yes |
| 2 | Apply surcharge no.2 at elev. 0.00 | Yes | Yes | Yes |
| 3 | Excav. to elev. -4.00 on RIGHT side | Yes | Yes | Yes |
| 4 | Install prop no.1 at elev. -3.00 | Yes | Yes | Yes |
| 5 | Excav. to elev. -7.10 on RIGHT side | Yes | Yes | Yes |
| 6 | Apply water pressure profile no.1 | Yes | Yes | Yes |
| 7 | Excav. to elev. -9.50 on RIGHT side | Yes | Yes | Yes |
| * | Summary output | Yes | - | Yes |

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 0.00



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 0.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.002 | 1.83E-04 | 0.0 | 0.0 | |
| 2 | -0.60 | 2.06 | 0.001 | 1.82E-04 | 1.8 | 0.7 | |
| 3 | -1.20 | 2.21 | 0.001 | 1.80E-04 | 3.1 | 2.2 | |
| | | -1.91 | 0.001 | 1.80E-04 | 3.1 | 2.2 | |
| 4 | -1.65 | -1.57 | 0.001 | 1.78E-04 | 2.3 | 3.4 | |
| 5 | -2.10 | -1.27 | 0.001 | 1.74E-04 | 1.7 | 4.3 | |
| 6 | -2.55 | -0.99 | 0.001 | 1.69E-04 | 1.2 | 4.9 | |
| 7 | -3.00 | -0.73 | 0.001 | 1.64E-04 | 0.8 | 5.3 | |
| 8 | -3.70 | -0.39 | 0.001 | 1.56E-04 | 0.4 | 5.7 | |
| 9 | -4.00 | -0.25 | 0.001 | 1.52E-04 | 0.3 | 5.8 | |
| 10 | -4.80 | 0.06 | 0.001 | 1.42E-04 | 0.2 | 6.0 | |
| 11 | -5.60 | 0.34 | 0.001 | 1.31E-04 | 0.4 | 6.1 | |
| 12 | -6.20 | 0.52 | 0.001 | 1.23E-04 | 0.6 | 6.4 | |
| 13 | -6.80 | 0.69 | 0.001 | 1.15E-04 | 1.0 | 6.9 | |
| | | -0.08 | 0.001 | 1.15E-04 | 1.0 | 6.9 | |
| 14 | -7.10 | 0.05 | 0.000 | 1.10E-04 | 1.0 | 7.2 | |
| 15 | -7.80 | 0.32 | 0.000 | 9.89E-05 | 1.1 | 7.9 | |
| | | -2.10 | 0.000 | 9.89E-05 | 1.1 | 7.9 | |
| 16 | -8.23 | -1.71 | 0.000 | 9.15E-05 | 0.3 | 8.2 | |
| 17 | -8.65 | -1.35 | 0.000 | 8.40E-05 | -0.3 | 8.2 | |
| 18 | -9.08 | -1.03 | 0.000 | 7.66E-05 | -0.8 | 7.9 | |
| 19 | -9.50 | -0.74 | 0.000 | 6.95E-05 | -1.2 | 7.4 | |
| 20 | -10.00 | -0.45 | 0.000 | 6.18E-05 | -1.5 | 6.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | -10.60 | -0.14 | 0.000 | 5.37E-05 | -1.7 | 5.7 |
| 22 | -11.20 | 0.12 | 0.000 | 4.69E-05 | -1.7 | 4.7 |
| 23 | -12.00 | 0.41 | 0.000 | 3.99E-05 | -1.5 | 3.4 |
| 24 | -12.80 | 0.65 | 0.000 | 3.50E-05 | -1.1 | 2.3 |
| 25 | -13.60 | 0.86 | 0.000 | 3.16E-05 | -0.5 | 1.6 |
| 26 | -14.05 | 0.97 | 0.000 | 3.00E-05 | -0.0 | 1.5 |
| 27 | -14.50 | 1.08 | 0.000 | 2.85E-05 | 0.4 | 1.6 |
| | | -2.82 | 0.000 | 2.85E-05 | 0.4 | 1.6 |
| 28 | -15.25 | -1.34 | 0.000 | 2.63E-05 | -1.1 | 1.1 |
| 29 | -16.00 | 4.36 | -0.000 | 2.53E-05 | 0.0 | -0.0 |

(continued)

Stage No.1 Apply surcharge no.1 at elevation 0.00

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 760 |
| 2 | -0.60 | 0.00 | 20.79 | 8.38 | 66.98 | 9.44 | 9.44 | 760 |
| 3 | -1.20 | 0.00 | 31.54 | 12.71 | 101.62 | 15.76 | 15.76 | 760 |
| | | 0.00 | 31.54 | 0.00 | 173.04 | 13.71 | 13.71 | 2280 |
| 4 | -1.65 | 0.00 | 40.46 | 0.00 | 201.77 | 19.07 | 19.07 | 2280 |
| 5 | -2.10 | 0.00 | 49.34 | 0.00 | 230.37 | 24.42 | 24.42 | 2280 |
| 6 | -2.55 | 0.00 | 58.17 | 0.01 | 258.81 | 29.75 | 29.75 | 2280 |
| 7 | -3.00 | 0.00 | 66.96 | 3.14 | 287.13 | 35.05 | 35.05 | 2280 |
| 8 | -3.70 | 0.00 | 80.57 | 7.98 | 330.99 | 43.26 | 43.26 | 2280 |
| 9 | -4.00 | 0.00 | 86.38 | 10.05 | 349.73 | 46.76 | 46.76 | 2280 |
| 10 | -4.80 | 0.00 | 101.87 | 15.57 | 399.62 | 56.09 | 56.09 | 2280 |
| 11 | -5.60 | 0.00 | 117.34 | 21.07 | 449.47 | 65.40 | 65.40 | 2280 |
| 12 | -6.20 | 0.00 | 128.95 | 25.21 | 486.87 | 72.36 | 72.36 | 2280 |
| 13 | -6.80 | 0.00 | 140.57 | 29.34 | 524.32 | 79.32 | 79.32 | 2280 |
| | | 0.00 | 140.57 | 29.90 | 757.45 | 61.57 | 61.57 | 3041 |
| 14 | -7.10 | 0.00 | 146.39 | 31.38 | 787.47 | 64.30 | 64.30 | 3041 |
| 15 | -7.80 | 7.00 | 152.98 | 33.05 | 821.47 | 67.49 | 74.49 | 3041 |
| | | 7.00 | 152.98 | 33.05 | 821.47 | 66.29 | 73.29 | 6081 |
| 16 | -8.23 | 11.25 | 157.84 | 34.28 | 846.57 | 68.73 | 79.98 | 6081 |
| 17 | -8.65 | 15.50 | 162.71 | 35.52 | 871.72 | 71.15 | 86.65 | 6081 |
| 18 | -9.08 | 19.75 | 167.60 | 36.76 | 896.91 | 73.56 | 93.31 | 6081 |
| 19 | -9.50 | 24.00 | 172.49 | 38.00 | 922.15 | 75.95 | 99.95 | 6081 |
| 20 | -10.00 | 29.00 | 178.25 | 39.46 | 951.91 | 78.75 | 107.75 | 6081 |
| 21 | -10.60 | 35.00 | 185.19 | 41.22 | 987.70 | 82.09 | 117.09 | 6081 |
| 22 | -11.20 | 41.00 | 192.14 | 42.98 | 1023.57 | 85.41 | 126.41 | 6081 |
| 23 | -12.00 | 49.00 | 201.43 | 45.34 | 1071.52 | 89.80 | 138.80 | 6081 |
| 24 | -12.80 | 57.00 | 210.75 | 47.70 | 1119.60 | 94.18 | 151.18 | 6081 |
| 25 | -13.60 | 65.00 | 220.09 | 50.07 | 1167.79 | 98.55 | 163.55 | 6081 |
| 26 | -14.05 | 69.50 | 225.35 | 51.40 | 1194.95 | 101.01 | 170.51 | 6081 |
| 27 | -14.50 | 74.00 | 230.62 | 52.74 | 1222.14 | 103.46 | 177.46 | 6081 |
| | | 74.00 | 230.62 | 0.00 | 4857.74 | 0.00 | 74.00a | 72380 |
| 28 | -15.25 | 81.50 | 240.91 | 0.00 | 4978.65 | 0.00 | 81.50a | 72380 |
| 29 | -16.00 | 89.00 | 251.22 | 0.00 | 5099.73 | 4.36 | 93.36 | 4065999 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 760 |
| 2 | -0.60 | 0.00 | 10.80 | 4.35 | 34.79 | 7.38 | 7.38 | 760 |
| 3 | -1.20 | 0.00 | 21.60 | 8.70 | 69.58 | 13.56 | 13.56 | 760 |
| | | 0.00 | 21.60 | 0.00 | 141.00 | 15.61 | 15.61 | 2280 |
| 4 | -1.65 | 0.00 | 30.60 | 0.00 | 169.99 | 20.65 | 20.65 | 2280 |
| 5 | -2.10 | 0.00 | 39.60 | 0.00 | 198.99 | 25.69 | 25.69 | 2280 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | -2.55 | 0.00 | 48.60 | 0.00 | 227.99 | 30.73 | 30.73 | 2280 |
| 7 | -3.00 | 0.00 | 57.60 | 0.00 | 256.99 | 35.78 | 35.78 | 2280 |
| 8 | -3.70 | 0.00 | 71.60 | 4.79 | 302.10 | 43.64 | 43.64 | 2280 |
| 9 | -4.00 | 0.00 | 77.60 | 6.93 | 321.43 | 47.02 | 47.02 | 2280 |
| 10 | -4.80 | 0.00 | 93.60 | 12.62 | 372.98 | 56.03 | 56.03 | 2280 |
| 11 | -5.60 | 0.00 | 109.60 | 18.32 | 424.53 | 65.06 | 65.06 | 2280 |
| 12 | -6.20 | 0.00 | 121.60 | 22.59 | 463.20 | 71.84 | 71.84 | 2280 |
| 13 | -6.80 | 0.00 | 133.60 | 26.86 | 501.86 | 78.64 | 78.64 | 2280 |
| | | 0.00 | 133.60 | 28.14 | 721.47 | 61.65 | 61.65 | 3041 |

(continued)

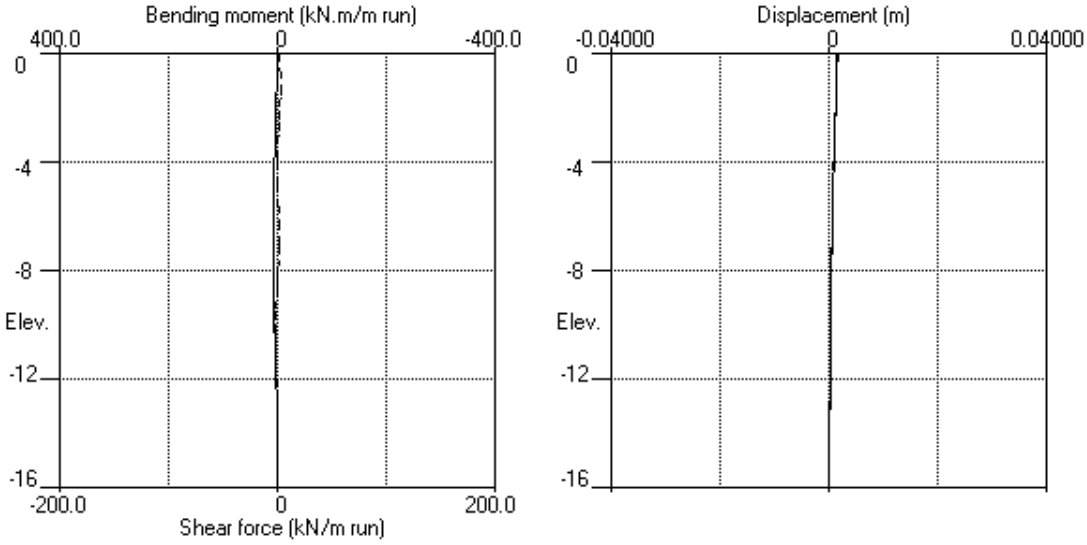
Stage No.1 Apply surcharge no.1 at elevation 0.00

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 14 | -7.10 | 0.00 | 139.60 | 29.66 | 752.43 | 64.25 | 64.25 | 3041 |
| 15 | -7.80 | 7.00 | 146.60 | 31.43 | 788.56 | 67.18 | 74.18 | 3041 |
| | | 7.00 | 146.60 | 31.43 | 788.56 | 68.39 | 75.39 | 6081 |
| 16 | -8.23 | 11.25 | 151.70 | 32.73 | 814.88 | 70.44 | 81.69 | 6081 |
| 17 | -8.65 | 15.50 | 156.80 | 34.02 | 841.19 | 72.50 | 88.00 | 6081 |
| 18 | -9.08 | 19.75 | 161.90 | 35.31 | 867.51 | 74.59 | 94.34 | 6081 |
| 19 | -9.50 | 24.00 | 167.00 | 36.61 | 893.83 | 76.70 | 100.70 | 6081 |
| 20 | -10.00 | 29.00 | 173.00 | 38.13 | 924.79 | 79.20 | 108.20 | 6081 |
| 21 | -10.60 | 35.00 | 180.20 | 39.95 | 961.95 | 82.23 | 117.23 | 6081 |
| 22 | -11.20 | 41.00 | 187.40 | 41.78 | 999.10 | 85.29 | 126.29 | 6081 |
| 23 | -12.00 | 49.00 | 197.00 | 44.21 | 1048.65 | 89.39 | 138.39 | 6081 |
| 24 | -12.80 | 57.00 | 206.60 | 46.65 | 1098.19 | 93.53 | 150.53 | 6081 |
| 25 | -13.60 | 65.00 | 216.20 | 49.08 | 1147.73 | 97.69 | 162.69 | 6081 |
| 26 | -14.05 | 69.50 | 221.60 | 50.45 | 1175.59 | 100.04 | 169.54 | 6081 |
| 27 | -14.50 | 74.00 | 227.00 | 51.82 | 1203.46 | 102.39 | 176.39 | 6081 |
| | | 74.00 | 227.00 | 0.00 | 4815.23 | 2.82 | 76.82 | 72380 |
| 28 | -15.25 | 81.50 | 237.50 | 0.00 | 4938.56 | 1.34 | 82.84 | 72380 |
| 29 | -16.00 | 89.00 | 248.00 | 0.00 | 5061.88 | 0.00 | 89.00a | 4065999 |

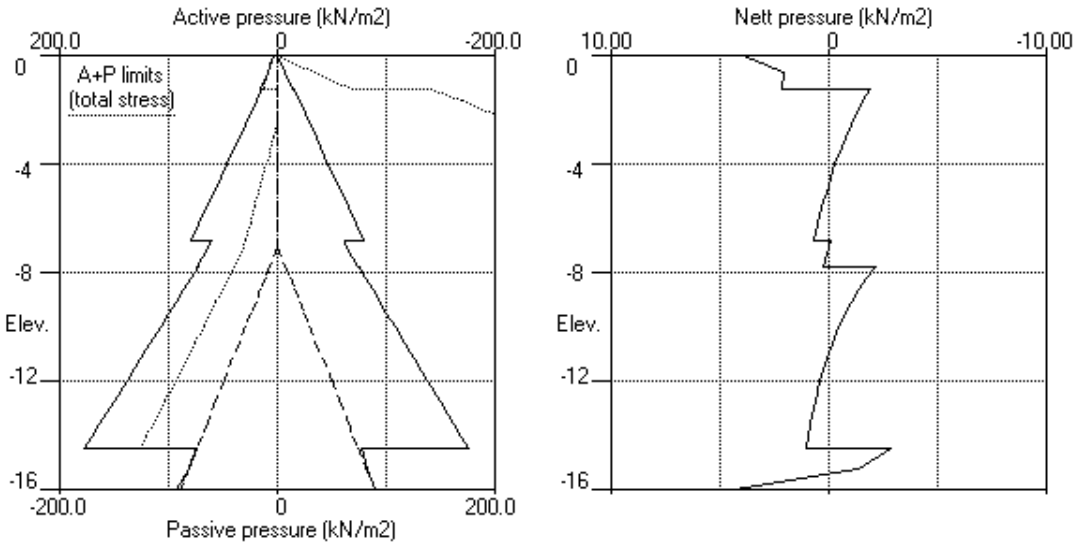
Note: 89.00 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                              Licensed from GEOSOLVE             | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```

Stage No.1 Apply surcharge no.1 at elev. 0.00

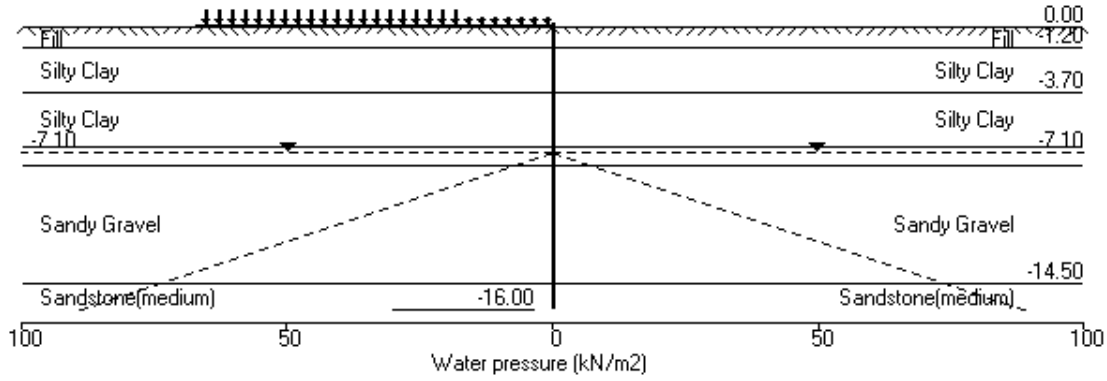



Stage No.1 Apply surcharge no.1 at elev. 0.00



Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 0.00



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 0.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Ground level Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 2 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.002 | 1.36E-04 | 0.0 | 0.0 | |
| 2 | -0.60 | 1.85 | 0.002 | 1.36E-04 | 1.8 | 0.7 | |
| 3 | -1.20 | 2.01 | 0.002 | 1.34E-04 | 2.9 | 2.1 | |
| | | -2.58 | 0.002 | 1.34E-04 | 2.9 | 2.1 | |
| 4 | -1.65 | -2.24 | 0.002 | 1.31E-04 | 1.8 | 3.2 | |
| 5 | -2.10 | -1.89 | 0.001 | 1.28E-04 | 0.9 | 3.8 | |
| 6 | -2.55 | -1.53 | 0.001 | 1.24E-04 | 0.1 | 4.0 | |
| 7 | -3.00 | -1.16 | 0.001 | 1.20E-04 | -0.5 | 3.9 | |
| 8 | -3.70 | -0.59 | 0.001 | 1.14E-04 | -1.1 | 3.3 | |
| 9 | -4.00 | -0.35 | 0.001 | 1.12E-04 | -1.2 | 3.0 | |
| 10 | -4.80 | 0.27 | 0.001 | 1.08E-04 | -1.3 | 1.9 | |
| 11 | -5.60 | 0.86 | 0.001 | 1.06E-04 | -0.8 | 1.0 | |
| 12 | -6.20 | 1.27 | 0.001 | 1.04E-04 | -0.2 | 0.7 | |
| 13 | -6.80 | 1.66 | 0.001 | 1.03E-04 | 0.7 | 0.8 | |
| | | 0.47 | 0.001 | 1.03E-04 | 0.7 | 0.8 | |
| 14 | -7.10 | 0.70 | 0.001 | 1.03E-04 | 0.9 | 1.1 | |
| 15 | -7.80 | 1.21 | 0.001 | 1.01E-04 | 1.6 | 1.9 | |
| | | -2.92 | 0.001 | 1.01E-04 | 1.6 | 1.9 | |
| 16 | -8.23 | -2.38 | 0.001 | 9.91E-05 | 0.4 | 2.3 | |
| 17 | -8.65 | -1.87 | 0.001 | 9.70E-05 | -0.5 | 2.2 | |
| 18 | -9.08 | -1.39 | 0.001 | 9.51E-05 | -1.2 | 1.9 | |
| 19 | -9.50 | -0.94 | 0.001 | 9.36E-05 | -1.7 | 1.3 | |
| 20 | -10.00 | -0.44 | 0.001 | 9.28E-05 | -2.0 | 0.3 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | -10.60 | 0.12 | 0.001 | 9.32E-05 | -2.1 | -1.0 |
| 22 | -11.20 | 0.66 | 0.001 | 9.53E-05 | -1.9 | -2.2 |
| 23 | -12.00 | 1.35 | 0.000 | 1.00E-04 | -1.1 | -3.5 |
| 24 | -12.80 | 2.03 | 0.000 | 1.06E-04 | 0.3 | -3.9 |
| 25 | -13.60 | 2.72 | 0.000 | 1.12E-04 | 2.2 | -3.0 |
| 26 | -14.05 | 3.12 | 0.000 | 1.15E-04 | 3.5 | -1.8 |
| 27 | -14.50 | 3.51 | 0.000 | 1.15E-04 | 5.0 | 0.1 |
| | | -9.23 | 0.000 | 1.15E-04 | 5.0 | 0.1 |
| 28 | -15.25 | -4.89 | 0.000 | 1.14E-04 | -0.3 | 1.2 |
| 29 | -16.00 | 5.70 | 0.000 | 1.13E-04 | 0.0 | -0.0 |

(continued)

Stage No.2 Apply surcharge no.2 at elevation 0.00

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 459 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 9.33 | 9.33 | 459 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 15.69 | 15.69 | 459 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 13.39 | 13.39 | 1378 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 18.80 | 18.80 | 1378 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 24.22 | 24.22 | 1378 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 29.65 | 29.65 | 1378 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 35.09 | 35.09 | 1378 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 43.56 | 43.56 | 1378 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 47.19 | 47.19 | 1378 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 56.87 | 56.87 | 1378 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 66.52 | 66.52 | 1378 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 73.74 | 73.74 | 1378 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 80.93 | 80.93 | 1378 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 62.97 | 62.97 | 1837 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 65.81 | 65.81 | 1837 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 69.24 | 76.24 | 1837 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 67.18 | 74.18 | 3674 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 69.76 | 81.01 | 3674 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 72.32 | 87.82 | 3674 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 74.86 | 94.61 | 3674 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 77.39 | 101.39 | 3674 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 80.34 | 109.34 | 3674 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 83.85 | 118.85 | 3674 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 87.35 | 128.35 | 3674 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 91.99 | 140.99 | 3674 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 96.61 | 153.61 | 3674 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 101.24 | 166.24 | 3674 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 103.84 | 173.34 | 3674 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 106.44 | 180.44 | 3674 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 43217 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 43217 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 6.39 | 95.39 | 43217 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 459 |
| 2 | -0.60 | 0.00 | 10.80 | 4.35 | 34.79 | 7.48 | 7.48 | 459 |
| 3 | -1.20 | 0.00 | 21.60 | 8.70 | 69.58 | 13.68 | 13.68 | 459 |
| | | 0.00 | 21.60 | 0.00 | 141.00 | 15.97 | 15.97 | 1378 |
| 4 | -1.65 | 0.00 | 30.60 | 0.00 | 169.99 | 21.04 | 21.04 | 1378 |
| 5 | -2.10 | 0.00 | 39.60 | 0.00 | 198.99 | 26.10 | 26.10 | 1378 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | -2.55 | 0.00 | 48.60 | 0.00 | 227.99 | 31.18 | 31.18 | 1378 |
| 7 | -3.00 | 0.00 | 57.60 | 0.00 | 256.99 | 36.25 | 36.25 | 1378 |
| 8 | -3.70 | 0.00 | 71.60 | 4.79 | 302.10 | 44.16 | 44.16 | 1378 |
| 9 | -4.00 | 0.00 | 77.60 | 6.93 | 321.43 | 47.55 | 47.55 | 1378 |
| 10 | -4.80 | 0.00 | 93.60 | 12.62 | 372.98 | 56.60 | 56.60 | 1378 |
| 11 | -5.60 | 0.00 | 109.60 | 18.32 | 424.53 | 65.66 | 65.66 | 1378 |
| 12 | -6.20 | 0.00 | 121.60 | 22.59 | 463.20 | 72.47 | 72.47 | 1378 |
| 13 | -6.80 | 0.00 | 133.60 | 26.86 | 501.86 | 79.27 | 79.27 | 1378 |
| | | 0.00 | 133.60 | 28.14 | 721.47 | 62.50 | 62.50 | 1837 |

(continued)

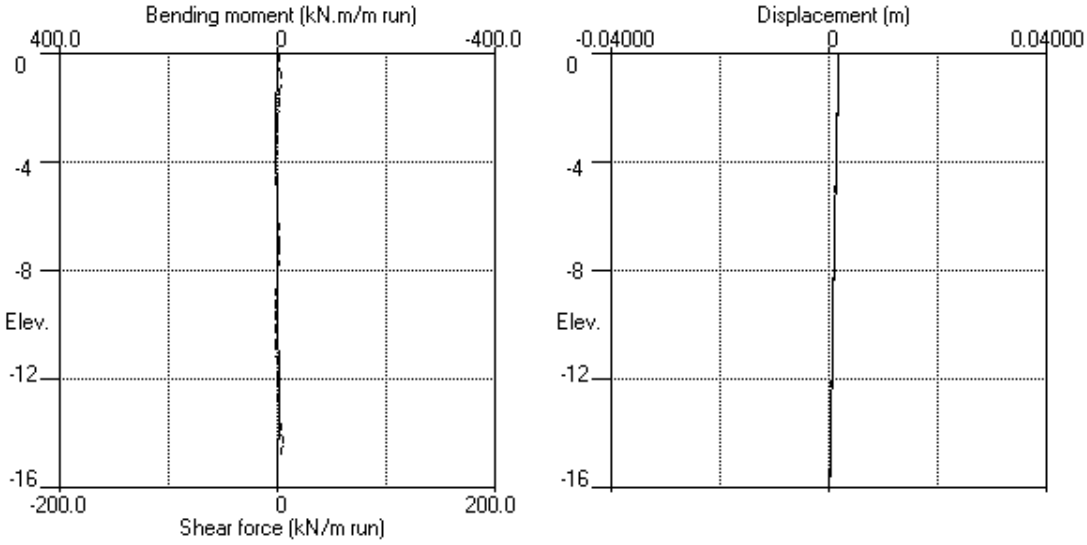
Stage No.2 Apply surcharge no.2 at elevation 0.00

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 14 | -7.10 | 0.00 | 139.60 | 29.66 | 752.43 | 65.10 | 65.10 | 1837 |
| 15 | -7.80 | 7.00 | 146.60 | 31.43 | 788.56 | 68.03 | 75.03 | 1837 |
| | | 7.00 | 146.60 | 31.43 | 788.56 | 70.10 | 77.10 | 3674 |
| 16 | -8.23 | 11.25 | 151.70 | 32.73 | 814.88 | 72.14 | 83.39 | 3674 |
| 17 | -8.65 | 15.50 | 156.80 | 34.02 | 841.19 | 74.19 | 89.69 | 3674 |
| 18 | -9.08 | 19.75 | 161.90 | 35.31 | 867.51 | 76.26 | 96.01 | 3674 |
| 19 | -9.50 | 24.00 | 167.00 | 36.61 | 893.83 | 78.33 | 102.33 | 3674 |
| 20 | -10.00 | 29.00 | 173.00 | 38.13 | 924.79 | 80.78 | 109.78 | 3674 |
| 21 | -10.60 | 35.00 | 180.20 | 39.95 | 961.95 | 83.73 | 118.73 | 3674 |
| 22 | -11.20 | 41.00 | 187.40 | 41.78 | 999.10 | 86.69 | 127.69 | 3674 |
| 23 | -12.00 | 49.00 | 197.00 | 44.21 | 1048.65 | 90.64 | 139.64 | 3674 |
| 24 | -12.80 | 57.00 | 206.60 | 46.65 | 1098.19 | 94.58 | 151.58 | 3674 |
| 25 | -13.60 | 65.00 | 216.20 | 49.08 | 1147.73 | 98.52 | 163.52 | 3674 |
| 26 | -14.05 | 69.50 | 221.60 | 50.45 | 1175.59 | 100.73 | 170.23 | 3674 |
| 27 | -14.50 | 74.00 | 227.00 | 51.82 | 1203.46 | 102.93 | 176.93 | 3674 |
| | | 74.00 | 227.00 | 0.00 | 4815.23 | 9.23 | 83.23 | 43217 |
| 28 | -15.25 | 81.50 | 237.50 | 0.00 | 4938.56 | 4.89 | 86.39 | 43217 |
| 29 | -16.00 | 89.00 | 248.00 | 0.00 | 5061.88 | 0.69 | 89.69 | 43217 |

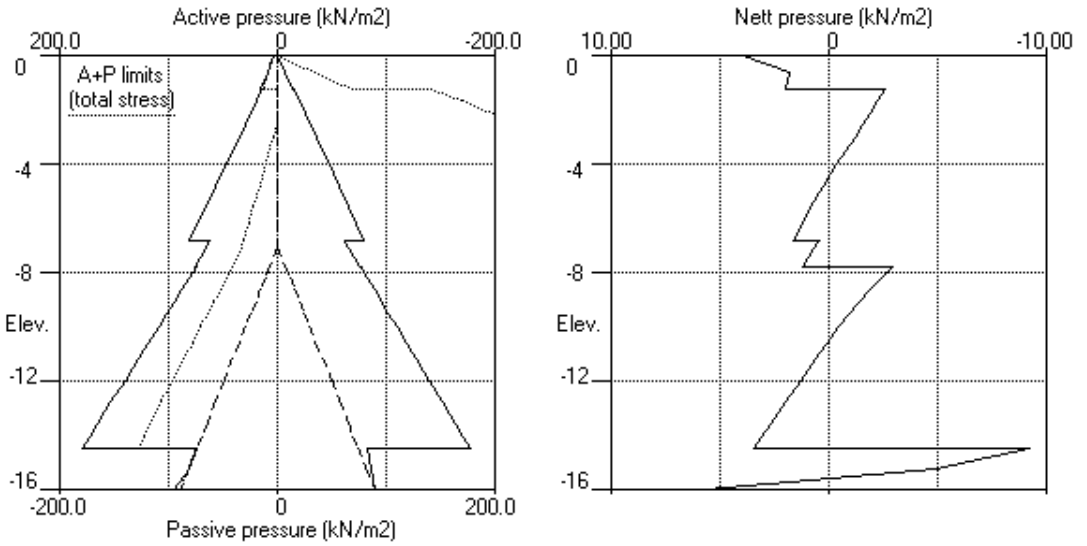
Note: 81.50 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                              Licensed from GEOSOLVE             | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```

Stage No.2 Apply surcharge no.2 at elev. 0.00




Stage No.2 Apply surcharge no.2 at elev. 0.00



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VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                              Licensed from GEOSOLVE             | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```
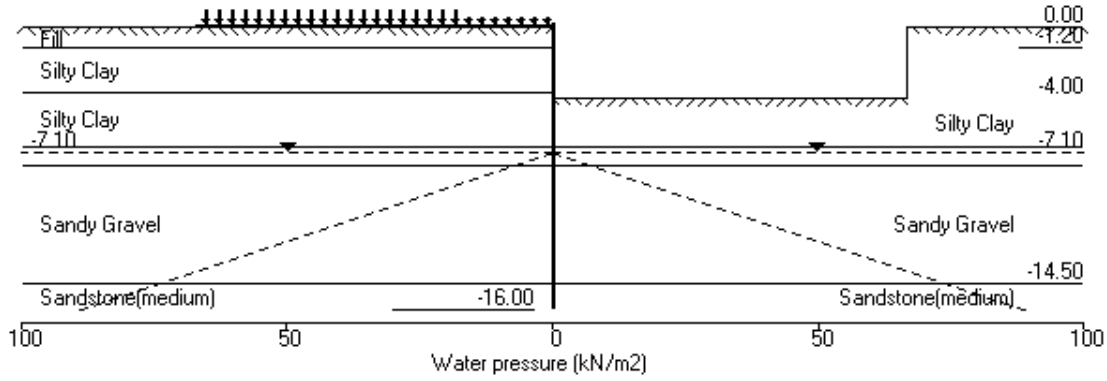

Stage No.3  Excav. to elev. -4.00 on RIGHT side



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 3 Excavate to elevation -4.00 on RIGHT side

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 3 | 0.00 | -4.00 | Cant. | 3.063 | -15.12 | -5.28 | 1.28 | L to R |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.019 | 1.95E-03 | 0.0 | 0.0 | |
| 2 | -0.60 | 8.38 | 0.018 | 1.95E-03 | 3.7 | 1.1 | |
| 3 | -1.20 | 12.75 | 0.017 | 1.95E-03 | 10.1 | 5.1 | |
| | | 0.00 | 0.017 | 1.95E-03 | 10.1 | 5.1 | |
| 4 | -1.65 | 0.00 | 0.016 | 1.94E-03 | 10.1 | 9.7 | |
| 5 | -2.10 | 0.00 | 0.015 | 1.93E-03 | 10.1 | 14.2 | |
| 6 | -2.55 | 1.44 | 0.014 | 1.91E-03 | 10.4 | 19.7 | |
| 7 | -3.00 | 8.65 | 0.013 | 1.89E-03 | 12.7 | 24.7 | |
| 8 | -3.70 | 19.82 | 0.012 | 1.84E-03 | 22.6 | 36.3 | |
| 9 | -4.00 | 24.58 | 0.012 | 1.82E-03 | 29.3 | 44.1 | |
| | | -17.53 | 0.012 | 1.82E-03 | 29.3 | 44.1 | |
| 10 | -4.80 | -10.38 | 0.010 | 1.72E-03 | 18.1 | 61.9 | |
| 11 | -5.60 | -3.66 | 0.009 | 1.61E-03 | 12.5 | 73.1 | |
| 12 | -6.20 | 1.02 | 0.008 | 1.51E-03 | 11.7 | 79.9 | |
| 13 | -6.80 | 5.37 | 0.007 | 1.40E-03 | 13.6 | 87.1 | |
| | | -5.66 | 0.007 | 1.40E-03 | 13.6 | 87.1 | |
| 14 | -7.10 | -2.95 | 0.007 | 1.34E-03 | 12.3 | 91.0 | |
| 15 | -7.80 | 2.87 | 0.006 | 1.19E-03 | 12.3 | 98.9 | |
| | | -32.77 | 0.006 | 1.19E-03 | 12.3 | 98.9 | |
| 16 | -8.23 | -26.41 | 0.005 | 1.10E-03 | -0.3 | 101.2 | |
| 17 | -8.65 | -20.60 | 0.005 | 1.01E-03 | -10.3 | 98.7 | |
| 18 | -9.08 | -15.31 | 0.004 | 9.26E-04 | -17.9 | 92.4 | |
| 19 | -9.50 | -10.52 | 0.004 | 8.45E-04 | -23.4 | 83.4 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | -10.00 | -5.46 | 0.004 | 7.61E-04 | -27.4 | 70.4 |
| 21 | -10.60 | -0.09 | 0.003 | 6.81E-04 | -29.0 | 53.0 |
| 22 | -11.20 | 4.69 | 0.003 | 6.23E-04 | -27.7 | 35.6 |
| 23 | -12.00 | 10.43 | 0.002 | 5.79E-04 | -21.6 | 14.9 |
| 24 | -12.80 | 15.78 | 0.002 | 5.65E-04 | -11.1 | 0.9 |
| 25 | -13.60 | 21.00 | 0.001 | 5.67E-04 | 3.6 | -3.0 |
| 26 | -14.05 | 23.92 | 0.001 | 5.68E-04 | 13.7 | 0.7 |
| 27 | -14.50 | 26.81 | 0.001 | 5.63E-04 | 25.1 | 9.3 |
| | | -55.51 | 0.001 | 5.63E-04 | 25.1 | 9.3 |
| 28 | -15.25 | -27.13 | 0.000 | 5.46E-04 | -5.9 | 12.1 |

(continued)

Stage No.3 Excavate to elevation -4.00 on RIGHT side

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 29 | -16.00 | 42.87 | 0.000 | 5.36E-04 | 0.0 | -0.0 | |

LEFT side

| Node no. | Y coord | Effective stresses: Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 732 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 8.38 | 8.38a | 732 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 12.75 | 12.75a | 732 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 0.00 | 0.00a | 2197 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.00 | 0.00a | 2197 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.00 | 0.00a | 2197 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 1.44 | 1.44 | 2197 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 8.65 | 8.65 | 2197 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 19.82 | 19.82 | 2197 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 24.58 | 24.58 | 2197 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 37.18 | 37.18 | 2197 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 49.58 | 49.58 | 2197 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 58.72 | 58.72 | 2197 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 67.70 | 67.70 | 2197 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 45.33 | 45.33 | 2929 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 49.28 | 49.28 | 2929 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 55.12 | 62.12 | 2929 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 38.93 | 45.93 | 5858 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 44.13 | 55.38 | 5858 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 49.09 | 64.59 | 5858 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 53.81 | 73.56 | 5858 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 58.30 | 82.30 | 5858 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 63.33 | 92.33 | 5858 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 69.05 | 104.05 | 5858 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 74.50 | 115.50 | 5858 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 81.48 | 130.48 | 5858 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 88.30 | 145.30 | 5858 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 95.07 | 160.07 | 5858 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 98.87 | 168.37 | 5858 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 102.66 | 176.66 | 5858 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 69695 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 69695 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 42.87 | 131.87 | 9951284 |

RIGHT side

| Node no. | Y coord | Effective stresses: Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 71.40 | 42.11 | 42.11 | 2703 |

(continued)

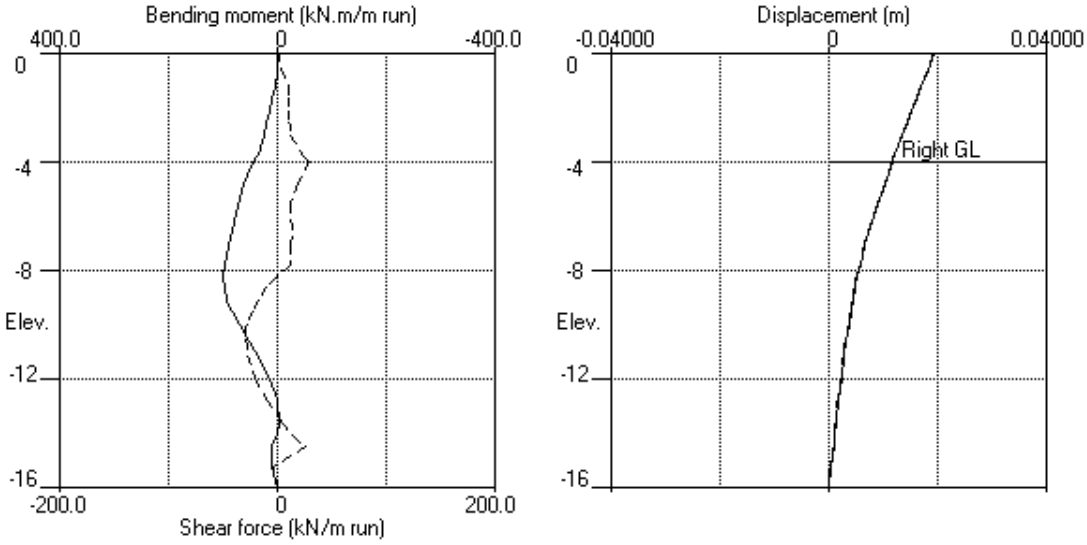
Stage No.3 Excavate to elevation -4.00 on RIGHT side

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 10 | -4.80 | 0.00 | 16.00 | 0.00 | 122.96 | 47.56 | 47.56 | 2703 |
| 11 | -5.60 | 0.00 | 32.02 | 0.00 | 174.56 | 53.25 | 53.25 | 2703 |
| 12 | -6.20 | 0.00 | 44.04 | 0.00 | 213.31 | 57.70 | 57.70 | 2703 |
| 13 | -6.80 | 0.00 | 56.09 | 0.00 | 252.12 | 62.34 | 62.34 | 2703 |
| | | 0.00 | 56.09 | 8.48 | 321.47 | 50.99 | 50.99 | 3604 |
| 14 | -7.10 | 0.00 | 62.12 | 10.01 | 352.60 | 52.23 | 52.23 | 3604 |
| 15 | -7.80 | 7.00 | 69.22 | 11.81 | 389.22 | 52.25 | 59.25 | 3604 |
| | | 7.00 | 69.22 | 11.81 | 389.22 | 71.70 | 78.70 | 7208 |
| 16 | -8.23 | 11.25 | 74.39 | 13.12 | 415.94 | 70.54 | 81.79 | 7208 |
| 17 | -8.65 | 15.50 | 79.59 | 14.44 | 442.75 | 69.69 | 85.19 | 7208 |
| 18 | -9.08 | 19.75 | 84.80 | 15.76 | 469.64 | 69.12 | 88.87 | 7208 |
| 19 | -9.50 | 24.00 | 90.03 | 17.08 | 496.62 | 68.82 | 92.82 | 7208 |
| 20 | -10.00 | 29.00 | 96.20 | 18.65 | 528.48 | 68.79 | 97.79 | 7208 |
| 21 | -10.60 | 35.00 | 103.65 | 20.54 | 566.89 | 69.14 | 104.14 | 7208 |
| 22 | -11.20 | 41.00 | 111.13 | 22.44 | 605.50 | 69.81 | 110.81 | 7208 |
| 23 | -12.00 | 49.00 | 121.16 | 24.98 | 657.29 | 71.06 | 120.06 | 7208 |
| 24 | -12.80 | 57.00 | 131.27 | 27.54 | 709.43 | 72.52 | 129.52 | 7208 |
| 25 | -13.60 | 65.00 | 141.44 | 30.12 | 761.91 | 74.07 | 139.07 | 7208 |
| 26 | -14.05 | 69.50 | 147.18 | 31.58 | 791.57 | 74.95 | 144.45 | 7208 |
| 27 | -14.50 | 74.00 | 152.95 | 33.04 | 821.33 | 75.85 | 149.85 | 7208 |
| | | 74.00 | 152.95 | 0.00 | 3945.51 | 55.51 | 129.51 | 85953 |
| 28 | -15.25 | 81.50 | 164.10 | 0.00 | 4076.50 | 27.13 | 108.63 | 85953 |
| 29 | -16.00 | 89.00 | 175.30 | 0.00 | 4208.04 | 0.00 | 89.00a | 9951284 |

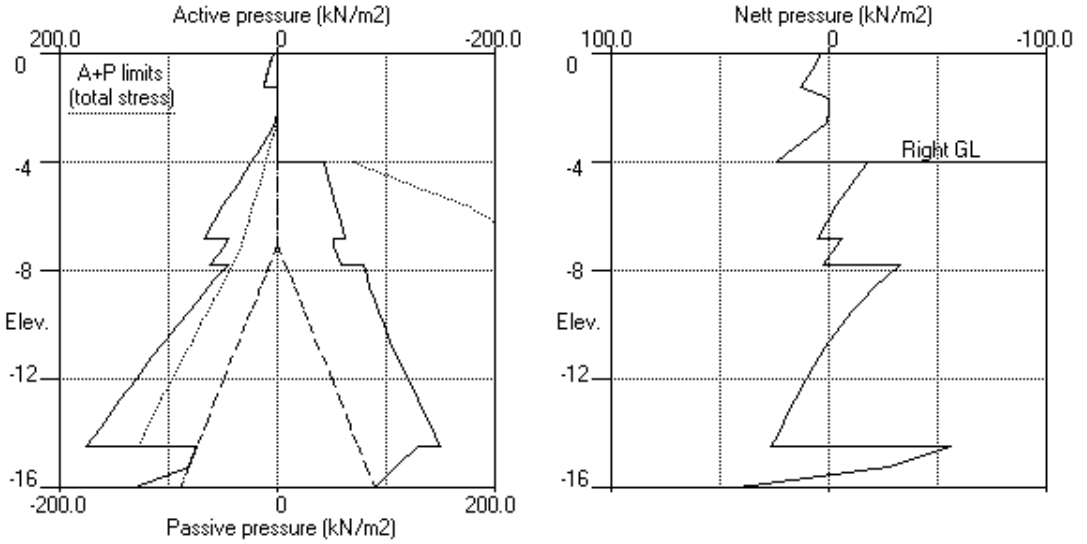
Note: 89.00 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. -4.00 on RIGHT side

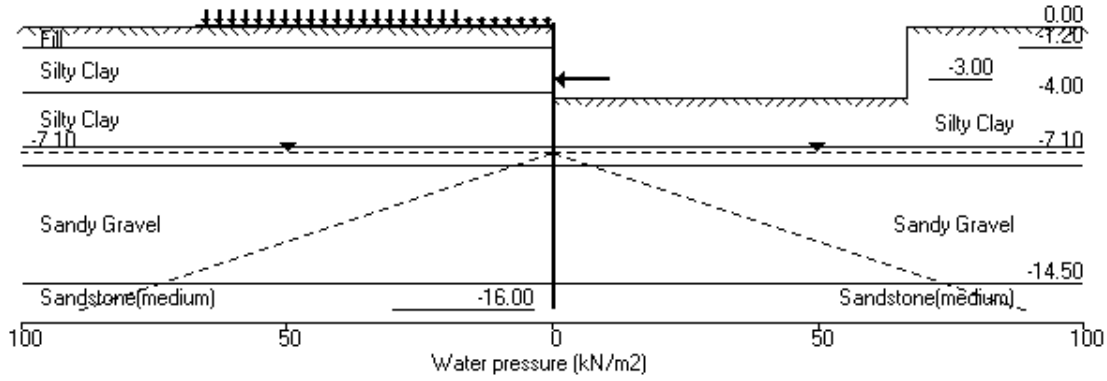



Stage No.3 Excav. to elev. -4.00 on RIGHT side



Units: kN,m

Stage No.4 Install prop no.1 at elev. -3.00



Units: kN,m

Stage No. 4 Install strut or anchor no.1 at elevation -3.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**

Factor of safety on soil strength

| Stage No. | Ground level Act. | Ground level Pass. | Prop Elev. | FoS for toe elev. = -16.00: Factor of Safety | FoS for toe elev. = -16.00: Moment equilib. at elev. | Toe elev. for FoS = 1.000 | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 4 | 0.00 | -4.00 | -3.00 | Conditions not suitable for FoS calc. | | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**

**Analysis options**

Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.10 | 0.019 | 1.94E-03 | 0.0 | 0.0 | |
| 2 | -0.60 | 8.45 | 0.018 | 1.94E-03 | 3.8 | 1.1 | |
| 3 | -1.20 | 12.81 | 0.017 | 1.94E-03 | 10.1 | 5.2 | |
| | | 0.17 | 0.017 | 1.94E-03 | 10.1 | 5.2 | |
| 4 | -1.65 | 0.16 | 0.016 | 1.93E-03 | 10.2 | 9.7 | |
| 5 | -2.10 | 0.15 | 0.015 | 1.92E-03 | 10.3 | 14.4 | |
| 6 | -2.55 | 1.59 | 0.014 | 1.90E-03 | 10.7 | 20.0 | |
| 7 | -3.00 | 8.78 | 0.013 | 1.88E-03 | 13.0 | 25.1 | -1.0 |
| | | 8.78 | 0.013 | 1.88E-03 | 12.0 | 25.1 | |
| 8 | -3.70 | 19.93 | 0.012 | 1.83E-03 | 22.1 | 36.3 | |
| 9 | -4.00 | 24.68 | 0.012 | 1.80E-03 | 28.7 | 43.9 | |
| | | -17.27 | 0.012 | 1.80E-03 | 28.7 | 43.9 | |
| 10 | -4.80 | -10.17 | 0.010 | 1.71E-03 | 17.8 | 61.4 | |
| 11 | -5.60 | -3.51 | 0.009 | 1.60E-03 | 12.3 | 72.4 | |
| 12 | -6.20 | 1.14 | 0.008 | 1.50E-03 | 11.6 | 79.1 | |
| 13 | -6.80 | 5.46 | 0.007 | 1.39E-03 | 13.6 | 86.3 | |
| | | -5.54 | 0.007 | 1.39E-03 | 13.6 | 86.3 | |
| 14 | -7.10 | -2.85 | 0.007 | 1.33E-03 | 12.3 | 90.1 | |
| 15 | -7.80 | 2.93 | 0.006 | 1.19E-03 | 12.3 | 98.0 | |
| | | -32.64 | 0.006 | 1.19E-03 | 12.3 | 98.0 | |
| 16 | -8.23 | -26.32 | 0.005 | 1.10E-03 | -0.2 | 100.3 | |
| 17 | -8.65 | -20.53 | 0.005 | 1.01E-03 | -10.1 | 97.9 | |
| 18 | -9.08 | -15.27 | 0.004 | 9.23E-04 | -17.8 | 91.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | -9.50 | -10.50 | 0.004 | 8.42E-04 | -23.2 | 82.8 |
| 20 | -10.00 | -5.46 | 0.004 | 7.59E-04 | -27.2 | 69.9 |
| 21 | -10.60 | -0.10 | 0.003 | 6.80E-04 | -28.9 | 52.5 |
| 22 | -11.20 | 4.66 | 0.003 | 6.22E-04 | -27.5 | 35.2 |
| 23 | -12.00 | 10.40 | 0.002 | 5.79E-04 | -21.5 | 14.6 |
| 24 | -12.80 | 15.75 | 0.002 | 5.66E-04 | -11.0 | 0.7 |
| 25 | -13.60 | 20.98 | 0.001 | 5.68E-04 | 3.7 | -3.1 |
| 26 | -14.05 | 23.90 | 0.001 | 5.69E-04 | 13.8 | 0.7 |
| 27 | -14.50 | 26.79 | 0.001 | 5.64E-04 | 25.2 | 9.3 |
| | | -55.59 | 0.001 | 5.64E-04 | 25.2 | 9.3 |

(continued)

Stage No.4 Install strut or anchor no.1 at elevation -3.00

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 28 | -15.25 | -27.18 | 0.000 | 5.47E-04 | -5.9 | 12.1 | |
| 29 | -16.00 | 42.86 | 0.000 | 5.37E-04 | 0.0 | -0.0 | |

At elev. -3.00 Prop force = 1.0 kN/m run

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.10 | 4.10 | 832 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 8.45 | 8.45 | 832 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 12.81 | 12.81 | 832 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 0.17 | 0.17 | 2495 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.16 | 0.16 | 2495 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.15 | 0.15 | 2495 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 1.59 | 1.59 | 2495 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 8.78 | 8.78 | 2495 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 19.93 | 19.93 | 2495 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 24.68 | 24.68 | 2495 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 37.26 | 37.26 | 2495 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 49.64 | 49.64 | 2495 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 58.77 | 58.77 | 2495 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 67.74 | 67.74 | 2495 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 45.38 | 45.38 | 3327 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 49.32 | 49.32 | 3327 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 55.14 | 62.14 | 3327 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 38.98 | 45.98 | 6654 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 44.17 | 55.42 | 6654 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 49.11 | 64.61 | 6654 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 53.82 | 73.57 | 6654 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 58.31 | 82.31 | 6654 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 63.33 | 92.33 | 6587 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 69.04 | 104.04 | 6587 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 74.49 | 115.49 | 6587 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 81.47 | 130.47 | 6587 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 88.29 | 145.29 | 6587 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 95.06 | 160.06 | 6587 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 98.86 | 168.36 | 6587 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 102.65 | 176.65 | 6587 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 78472 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 78472 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 42.87 | 131.87 | 78472 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|

| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

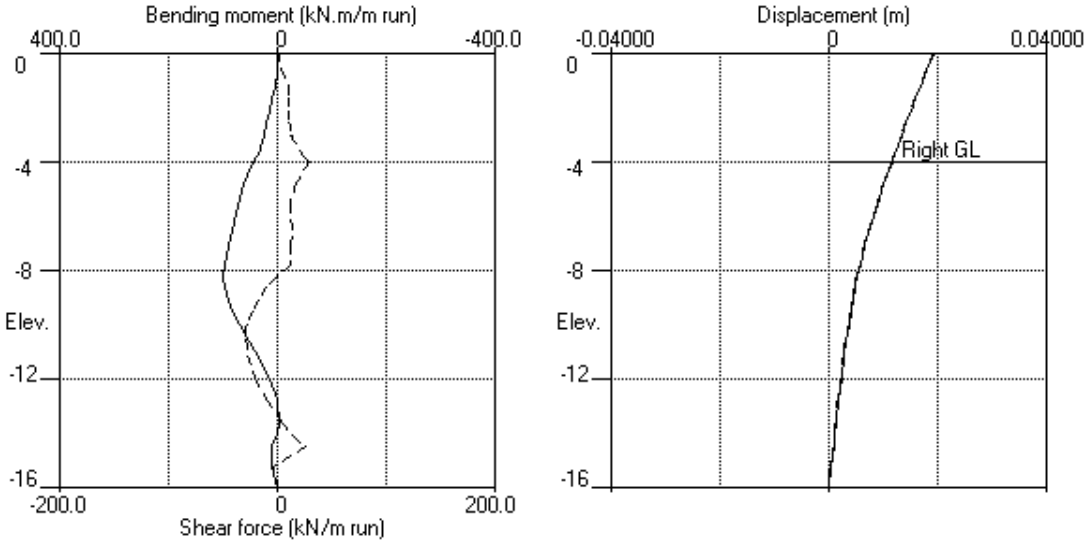
Stage No.4 Install strut or anchor no.1 at elevation -3.00

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 71.40 | 41.95 | 41.95 | 3883 |
| 10 | -4.80 | 0.00 | 16.00 | 0.00 | 122.96 | 47.44 | 47.44 | 3883 |
| 11 | -5.60 | 0.00 | 32.02 | 0.00 | 174.56 | 53.15 | 53.15 | 3883 |
| 12 | -6.20 | 0.00 | 44.04 | 0.00 | 213.31 | 57.63 | 57.63 | 3883 |
| 13 | -6.80 | 0.00 | 56.09 | 0.00 | 252.12 | 62.28 | 62.28 | 3883 |
| | | 0.00 | 56.09 | 8.48 | 321.47 | 50.92 | 50.92 | 5178 |
| 14 | -7.10 | 0.00 | 62.12 | 10.01 | 352.60 | 52.17 | 52.17 | 5178 |
| 15 | -7.80 | 7.00 | 69.22 | 11.81 | 389.22 | 52.21 | 59.21 | 5178 |
| | | 7.00 | 69.22 | 11.81 | 389.22 | 71.61 | 78.61 | 10356 |
| 16 | -8.23 | 11.25 | 74.39 | 13.12 | 415.94 | 70.48 | 81.73 | 10356 |
| 17 | -8.65 | 15.50 | 79.59 | 14.44 | 442.75 | 69.65 | 85.15 | 10356 |
| 18 | -9.08 | 19.75 | 84.80 | 15.76 | 469.64 | 69.09 | 88.84 | 10356 |
| 19 | -9.50 | 24.00 | 90.03 | 17.08 | 496.62 | 68.81 | 92.81 | 10356 |
| 20 | -10.00 | 29.00 | 96.20 | 18.65 | 528.48 | 68.79 | 97.79 | 6587 |
| 21 | -10.60 | 35.00 | 103.65 | 20.54 | 566.89 | 69.14 | 104.14 | 6587 |
| 22 | -11.20 | 41.00 | 111.13 | 22.44 | 605.50 | 69.82 | 110.82 | 6587 |
| 23 | -12.00 | 49.00 | 121.16 | 24.98 | 657.29 | 71.07 | 120.07 | 6587 |
| 24 | -12.80 | 57.00 | 131.27 | 27.54 | 709.43 | 72.54 | 129.54 | 6587 |
| 25 | -13.60 | 65.00 | 141.44 | 30.12 | 761.91 | 74.08 | 139.08 | 6587 |
| 26 | -14.05 | 69.50 | 147.18 | 31.58 | 791.57 | 74.96 | 144.46 | 6587 |
| 27 | -14.50 | 74.00 | 152.95 | 33.04 | 821.33 | 75.86 | 149.86 | 6587 |
| | | 74.00 | 152.95 | 0.00 | 3945.51 | 55.59 | 129.59 | 78472 |
| 28 | -15.25 | 81.50 | 164.10 | 0.00 | 4076.50 | 27.18 | 108.68 | 78472 |
| 29 | -16.00 | 89.00 | 175.30 | 0.00 | 4208.04 | 0.01 | 89.01 | 78472 |

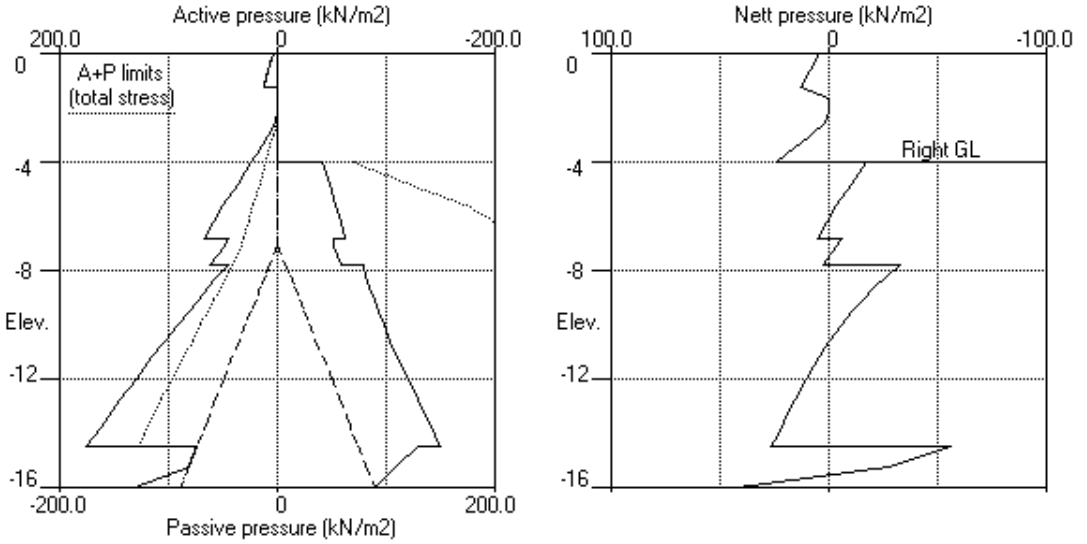
Note: 81.50 a Soil pressure at active limit
123.45 p Soil pressure at passive limit

```
VAN der MEER CONSULTING                                          | Sheet No.
Program: WALLAP  Version 6.07  Revision A55.B74.R58              | Job No.  220070
                              Licensed from GEOSOLVE             | Made by :    MS
Data filename/Run ID: Section_2(BH2)                             |
Penrith                                                          | Date: 7-10-2022
Section A                                                        | Checked :
-------------------------------------------------------------------------------
                                                          Units: kN,m
```

Stage No.4 Install prop no.1 at elev. -3.00

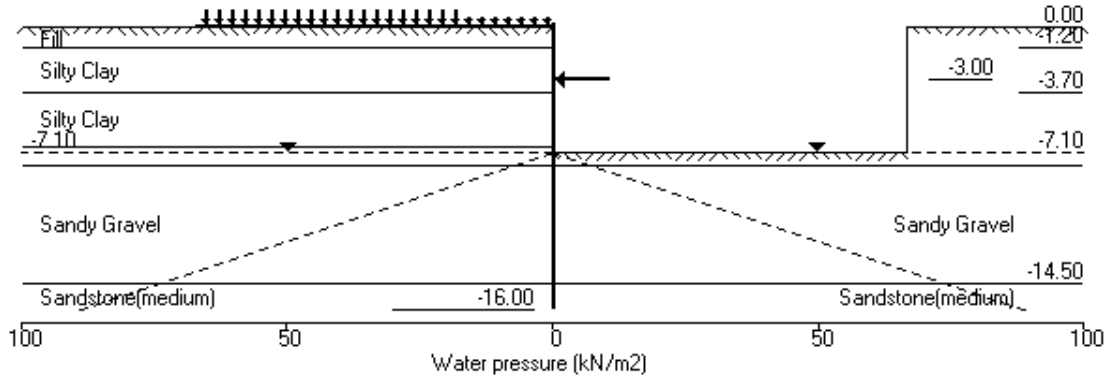



Stage No.4 Install prop no.1 at elev. -3.00



Units: kN,m

Stage No.5 Excav. to elev. -7.10 on RIGHT side



Units: kN,m

Stage No. 5 Excavate to elevation -7.10 on RIGHT side

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 5 | 0.00 | -7.10 | -3.00 | 4.445 | n/a | -8.28 | 1.18 | L to R |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 4.03 | 0.021 | 1.08E-03 | 0.0 | 0.0 | |
| 2 | -0.60 | 8.38 | 0.020 | 1.08E-03 | 3.7 | 1.1 | |
| 3 | -1.20 | 12.75 | 0.019 | 1.08E-03 | 10.1 | 5.1 | |
| | | 0.00 | 0.019 | 1.08E-03 | 10.1 | 5.1 | |
| 4 | -1.65 | 0.00 | 0.019 | 1.07E-03 | 10.1 | 9.7 | |
| 5 | -2.10 | 0.00 | 0.018 | 1.06E-03 | 10.1 | 14.2 | |
| 6 | -2.55 | 0.30 | 0.018 | 1.04E-03 | 10.1 | 19.7 | |
| 7 | -3.00 | 3.56 | 0.017 | 1.02E-03 | 11.0 | 24.3 | -76.5 |
| | | 3.56 | 0.017 | 1.02E-03 | -65.5 | 24.3 | |
| 8 | -3.70 | 13.00 | 0.017 | 1.02E-03 | -59.7 | -19.6 | |
| 9 | -4.00 | 17.39 | 0.016 | 1.03E-03 | -55.1 | -36.9 | |
| 10 | -4.80 | 29.15 | 0.015 | 1.13E-03 | -36.5 | -74.8 | |
| 11 | -5.60 | 40.98 | 0.015 | 1.28E-03 | -8.5 | -94.1 | |
| 12 | -6.20 | 49.91 | 0.014 | 1.40E-03 | 18.8 | -91.5 | |
| 13 | -6.80 | 58.89 | 0.013 | 1.50E-03 | 51.4 | -71.0 | |
| | | 33.57 | 0.013 | 1.50E-03 | 51.4 | -71.0 | |
| 14 | -7.10 | 37.62 | 0.012 | 1.55E-03 | 62.1 | -54.0 | |
| | | 5.58 | 0.012 | 1.55E-03 | 62.1 | -54.0 | |
| 15 | -7.80 | 1.90 | 0.011 | 1.59E-03 | 64.7 | -8.6 | |
| | | -33.58 | 0.011 | 1.59E-03 | 64.7 | -8.6 | |
| 16 | -8.23 | -39.63 | 0.011 | 1.59E-03 | 49.2 | 16.5 | |
| 17 | -8.65 | -36.13 | 0.010 | 1.57E-03 | 33.1 | 33.7 | |
| 18 | -9.08 | -32.77 | 0.009 | 1.53E-03 | 18.4 | 44.4 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | -9.50 | -29.58 | 0.009 | 1.49E-03 | 5.2 | 49.1 |
| 20 | -10.00 | -21.44 | 0.008 | 1.43E-03 | -7.6 | 48.8 |
| 21 | -10.60 | -11.92 | 0.007 | 1.38E-03 | -17.6 | 40.4 |
| 22 | -11.20 | -2.90 | 0.006 | 1.33E-03 | -22.0 | 27.7 |
| 23 | -12.00 | 8.60 | 0.005 | 1.30E-03 | -19.7 | 9.1 |
| 24 | -12.80 | 19.78 | 0.004 | 1.29E-03 | -8.4 | -3.9 |
| 25 | -13.60 | 30.86 | 0.003 | 1.30E-03 | 11.9 | -4.4 |
| 26 | -14.05 | 37.07 | 0.002 | 1.30E-03 | 27.1 | 4.1 |
| 27 | -14.50 | 43.23 | 0.002 | 1.29E-03 | 45.2 | 20.1 |
| | | -109.13 | 0.002 | 1.29E-03 | 45.2 | 20.1 |

(continued)

Stage No.5 Excavate to elevation -7.10 on RIGHT side

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 28 | -15.25 | -42.80 | 0.001 | 1.26E-03 | -11.8 | 22.9 | |
| 29 | -16.00 | 74.17 | 0.000 | 1.24E-03 | 0.0 | -0.0 | |
| At elev. | -3.00 | | | Prop force = | 76.5 kN/m run | | |

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 4.03 | 4.03a | 504 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 8.38 | 8.38a | 504 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 12.75 | 12.75a | 504 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 0.00 | 0.00a | 1513 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.00 | 0.00a | 1513 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.00 | 0.00a | 1513 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 0.30 | 0.30a | 1513 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 3.56 | 3.56a | 1513 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 13.00 | 13.00 | 1513 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 17.39 | 17.39 | 1513 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 29.15 | 29.15 | 1513 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 40.98 | 40.98 | 1513 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 49.91 | 49.91 | 1513 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 58.89 | 58.89 | 1513 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 33.57 | 33.57 | 2017 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 37.62 | 37.62 | 2017 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 43.89 | 50.89 | 2017 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 34.59 | 41.59a | 4035 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 35.90 | 47.15a | 4035 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 37.21 | 52.71a | 4035 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 38.51 | 58.26a | 4035 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 39.81 | 63.81a | 4035 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 45.92 | 74.92 | 4035 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 53.30 | 88.30 | 4035 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 60.46 | 101.46 | 4035 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 69.77 | 118.77 | 4035 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 78.95 | 135.95 | 4035 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 88.09 | 153.09 | 4035 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 93.23 | 162.73 | 4035 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 98.36 | 172.36 | 4035 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 47633 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 47633 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 74.17 | 163.17 | 3635061 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic-al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|

| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

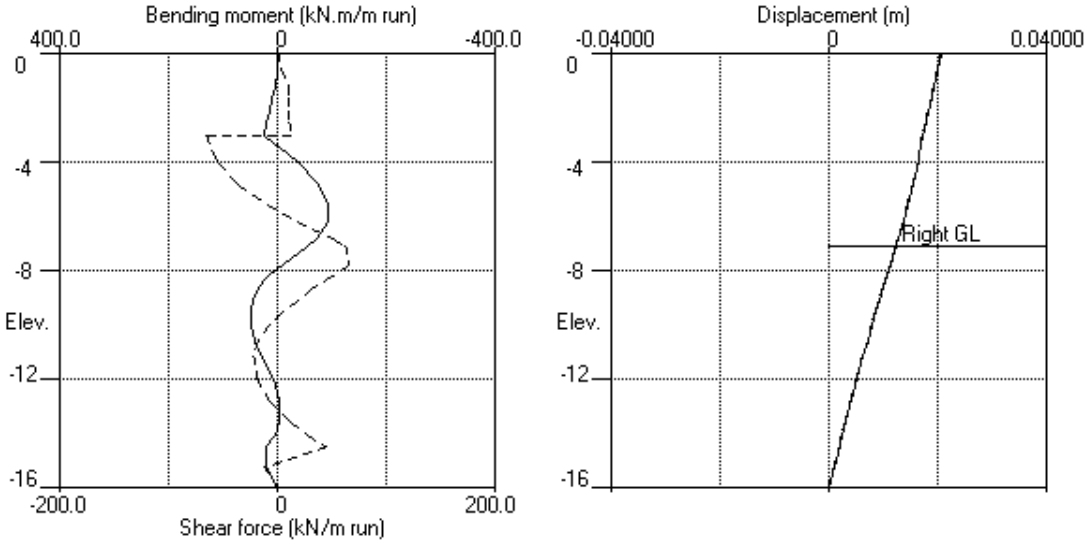
Stage No.5 Excavate to elevation -7.10 on RIGHT side

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | -4.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | -5.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | -6.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | -6.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | -7.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 32.03 | 32.03 | 32.03p | 2945 |
| 15 | -7.80 | 7.00 | 7.00 | 0.00 | 68.17 | 41.98 | 48.98 | 2945 |
| | | 7.00 | 7.00 | 0.00 | 68.17 | 68.17 | 75.17p | 5890 |
| 16 | -8.23 | 11.25 | 12.11 | 0.00 | 94.53 | 75.54 | 86.79 | 5890 |
| 17 | -8.65 | 15.50 | 17.23 | 0.00 | 120.93 | 73.34 | 88.84 | 5890 |
| 18 | -9.08 | 19.75 | 22.36 | 0.00 | 147.40 | 71.29 | 91.04 | 5890 |
| 19 | -9.50 | 24.00 | 27.50 | 1.23 | 173.95 | 69.39 | 93.39 | 5890 |
| 20 | -10.00 | 29.00 | 33.58 | 2.77 | 205.30 | 67.36 | 96.36 | 5890 |
| 21 | -10.60 | 35.00 | 40.91 | 4.63 | 243.13 | 65.23 | 100.23 | 5890 |
| 22 | -11.20 | 41.00 | 48.29 | 6.50 | 281.21 | 63.36 | 104.36 | 5890 |
| 23 | -12.00 | 49.00 | 58.21 | 9.02 | 332.44 | 61.17 | 110.17 | 5890 |
| 24 | -12.80 | 57.00 | 68.25 | 11.56 | 384.23 | 59.17 | 116.17 | 5890 |
| 25 | -13.60 | 65.00 | 78.40 | 14.14 | 436.63 | 57.23 | 122.23 | 5890 |
| 26 | -14.05 | 69.50 | 84.17 | 15.60 | 466.38 | 56.17 | 125.67 | 5890 |
| 27 | -14.50 | 74.00 | 89.97 | 17.07 | 496.33 | 55.13 | 129.13 | 5890 |
| | | 74.00 | 89.97 | 0.00 | 3205.79 | 109.13 | 183.13 | 70081 |
| 28 | -15.25 | 81.50 | 101.23 | 0.00 | 3338.05 | 42.80 | 124.30 | 70081 |
| 29 | -16.00 | 89.00 | 112.60 | 0.00 | 3471.56 | 0.00 | 89.00a | 3635061 |

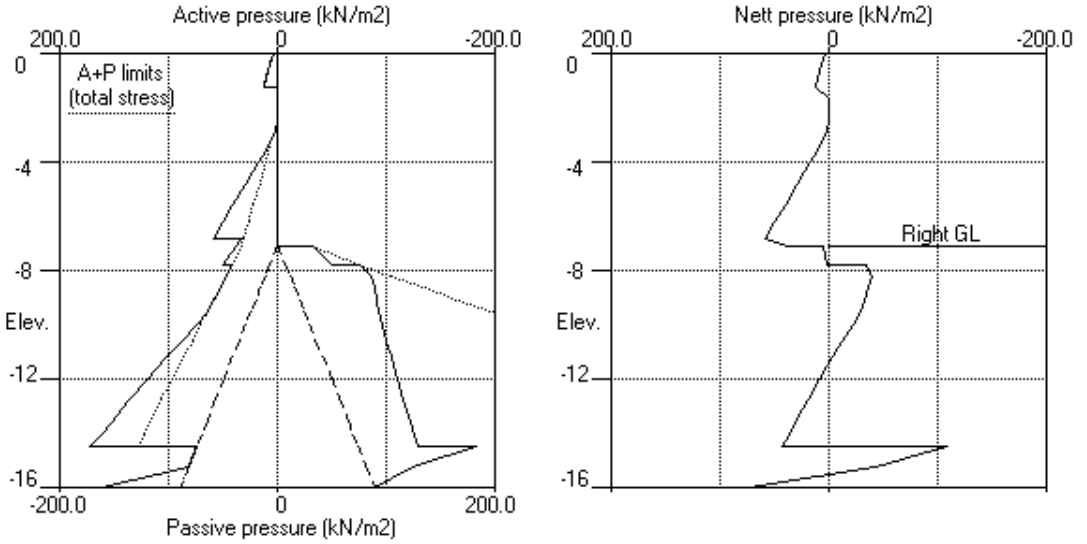
Note: 89.00 a Soil pressure at active limit
75.17 p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. -7.10 on RIGHT side

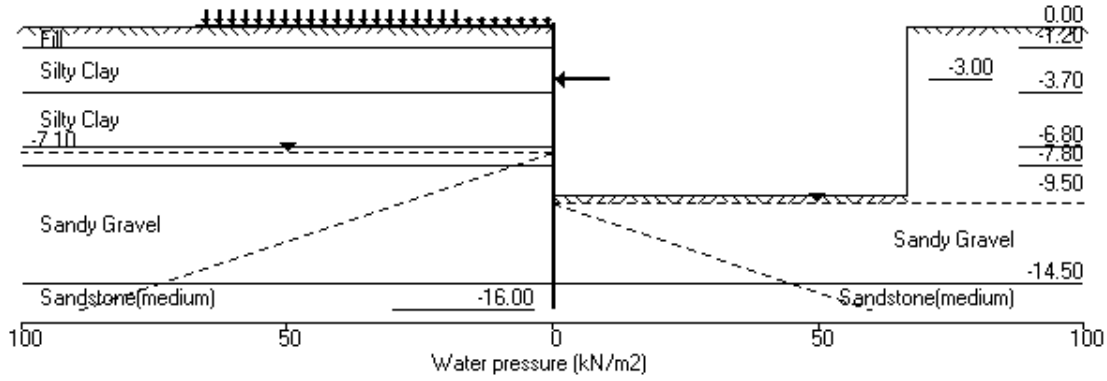



Stage No.5 Excav. to elev. -7.10 on RIGHT side



Units: kN,m

Stage No.7 Excav. to elev. -9.50 on RIGHT side



VAN der MEER CONSULTING | Sheet No.
Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070
Licensed from GEOSOLVE | Made by : MS
Data filename/Run ID: Section_2(BH2) |
Penrith | Date: 7-10-2022
Section A | Checked :

Units: kN,m

Stage No. 7 Excavate to elevation -9.50 on RIGHT side

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr-ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 7 | 0.00 | -9.50 | -3.00 | 3.180 | n/a | -11.53 | 2.03 | L to R |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**
**Analysis options**
Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

| 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 |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 10.79 | 0.018 | -6.22E-04 | 0.0 | 0.0 | |
| 2 | -0.60 | 12.11 | 0.019 | -6.23E-04 | 6.9 | 2.3 | |
| 3 | -1.20 | 13.45 | 0.019 | -6.31E-04 | 14.5 | 8.9 | |
| | | 2.09 | 0.019 | -6.31E-04 | 14.5 | 8.9 | |
| 4 | -1.65 | 0.00 | 0.019 | -6.43E-04 | 15.0 | 15.6 | |
| 5 | -2.10 | 0.00 | 0.020 | -6.61E-04 | 15.0 | 22.4 | |
| 6 | -2.55 | 0.30 | 0.020 | -6.87E-04 | 15.1 | 30.1 | |
| 7 | -3.00 | 3.56 | 0.020 | -7.20E-04 | 15.9 | 37.0 | -129.9 |
| | | 3.56 | 0.020 | -7.20E-04 | -113.9 | 37.0 | |
| 8 | -3.70 | 8.66 | 0.021 | -7.16E-04 | -109.6 | -41.1 | |
| 9 | -4.00 | 10.85 | 0.021 | -6.79E-04 | -106.7 | -73.6 | |
| 10 | -4.80 | 19.51 | 0.021 | -4.81E-04 | -94.6 | -154.3 | |
| 11 | -5.60 | 29.35 | 0.022 | -1.53E-04 | -75.0 | -223.1 | |
| 12 | -6.20 | 36.97 | 0.022 | 1.63E-04 | -55.1 | -262.5 | |
| 13 | -6.80 | 44.85 | 0.021 | 5.22E-04 | -30.6 | -288.6 | |
| | | 31.23 | 0.021 | 5.22E-04 | -30.6 | -288.6 | |
| 14 | -7.10 | 32.78 | 0.021 | 7.13E-04 | -21.0 | -296.4 | |
| 15 | -7.80 | 41.59 | 0.021 | 1.16E-03 | 5.1 | -301.2 | |
| 16 | -8.23 | 47.15 | 0.020 | 1.44E-03 | 23.9 | -294.4 | |
| 17 | -8.65 | 52.71 | 0.019 | 1.70E-03 | 45.1 | -280.0 | |
| 18 | -9.08 | 58.26 | 0.019 | 1.95E-03 | 68.7 | -256.1 | |
| 19 | -9.50 | 63.81 | 0.018 | 2.17E-03 | 94.7 | -221.6 | |
| | | 31.78 | 0.018 | 2.17E-03 | 94.7 | -221.6 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | -10.00 | -18.47 | 0.017 | 2.39E-03 | 98.0 | -172.0 |
| 21 | -10.60 | -40.42 | 0.015 | 2.57E-03 | 80.3 | -115.0 |
| 22 | -11.20 | -30.88 | 0.013 | 2.70E-03 | 58.9 | -74.5 |
| 23 | -12.00 | -17.67 | 0.011 | 2.79E-03 | 39.5 | -38.0 |
| 24 | -12.80 | 3.71 | 0.009 | 2.84E-03 | 33.9 | -10.3 |
| 25 | -13.60 | 29.08 | 0.007 | 2.83E-03 | 47.0 | 18.0 |
| 26 | -14.05 | 43.14 | 0.005 | 2.80E-03 | 63.3 | 42.1 |
| 27 | -14.50 | 56.92 | 0.004 | 2.74E-03 | 85.8 | 75.0 |
| | | -256.80 | 0.004 | 2.74E-03 | 85.8 | 75.0 |
| 28 | -15.25 | -102.28 | 0.002 | 2.63E-03 | -48.9 | 66.7 |

(continued)

Stage No.7 Excavate to elevation -9.50 on RIGHT side

| Node no. | Y coord | Nett pressure | Wall disp. | Wall rotation | Shear force | Bending moment | Prop forces |
|---|---|---|---|---|---|---|---|
| | | kN/m2 | m | rad. | kN/m | kN.m/m | kN/m |
| 29 | -16.00 | 232.55 | 0.000 | 2.57E-03 | 0.0 | -0.0 | |
| At elev. | -3.00 | | | Prop force = | 129.9 kN/m run | | |

LEFT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 0.00 | 0.00 | 10.00 | 4.03 | 32.22 | 10.79 | 10.79 | 3082 |
| 2 | -0.60 | 0.00 | 20.81 | 8.38 | 67.03 | 12.11 | 12.11 | 3082 |
| 3 | -1.20 | 0.00 | 31.65 | 12.75 | 101.96 | 13.45 | 13.45 | 3082 |
| | | 0.00 | 31.65 | 0.00 | 173.38 | 2.09 | 2.09 | 9245 |
| 4 | -1.65 | 0.00 | 40.72 | 0.00 | 202.61 | 0.00 | 0.00a | 1640 |
| 5 | -2.10 | 0.00 | 49.83 | 0.00 | 231.96 | 0.00 | 0.00a | 1640 |
| 6 | -2.55 | 0.00 | 58.98 | 0.30 | 261.44 | 0.30 | 0.30a | 1640 |
| 7 | -3.00 | 0.00 | 68.16 | 3.56 | 291.01 | 3.56 | 3.56a | 1640 |
| 8 | -3.70 | 0.00 | 82.48 | 8.66 | 337.15 | 8.66 | 8.66a | 1640 |
| 9 | -4.00 | 0.00 | 88.63 | 10.85 | 356.95 | 10.85 | 10.85a | 1640 |
| 10 | -4.80 | 0.00 | 105.01 | 16.68 | 409.75 | 19.51 | 19.51 | 1640 |
| 11 | -5.60 | 0.00 | 121.37 | 22.51 | 462.46 | 29.35 | 29.35 | 1640 |
| 12 | -6.20 | 0.00 | 133.61 | 26.87 | 501.89 | 36.97 | 36.97 | 1640 |
| 13 | -6.80 | 0.00 | 145.81 | 31.21 | 541.20 | 44.85 | 44.85 | 1640 |
| | | 0.00 | 145.81 | 31.23 | 784.48 | 31.23 | 31.23a | 2186 |
| 14 | -7.10 | 0.00 | 151.90 | 32.78 | 815.89 | 32.78 | 32.78a | 2186 |
| 15 | -7.80 | 7.00 | 159.06 | 34.59 | 852.85 | 34.59 | 41.59a | 2186 |
| | | 7.00 | 159.06 | 34.59 | 852.85 | 34.59 | 41.59a | 4372 |
| 16 | -8.23 | 11.25 | 164.23 | 35.90 | 879.54 | 35.90 | 47.15a | 4372 |
| 17 | -8.65 | 15.50 | 169.38 | 37.21 | 906.14 | 37.21 | 52.71a | 4372 |
| 18 | -9.08 | 19.75 | 174.52 | 38.51 | 932.64 | 38.51 | 58.26a | 4372 |
| 19 | -9.50 | 24.00 | 179.64 | 39.81 | 959.04 | 39.81 | 63.81a | 4372 |
| 20 | -10.00 | 29.00 | 185.63 | 41.33 | 990.00 | 41.33 | 70.33a | 4372 |
| 21 | -10.60 | 35.00 | 192.80 | 43.15 | 1026.99 | 43.15 | 78.15a | 4372 |
| 22 | -11.20 | 41.00 | 199.94 | 44.96 | 1063.84 | 44.96 | 85.96a | 4372 |
| 23 | -12.00 | 49.00 | 209.43 | 47.37 | 1112.77 | 47.37 | 96.37a | 4372 |
| 24 | -12.80 | 57.00 | 218.87 | 49.76 | 1161.50 | 57.75 | 114.75 | 4372 |
| 25 | -13.60 | 65.00 | 228.28 | 52.15 | 1210.06 | 72.24 | 137.24 | 4372 |
| 26 | -14.05 | 69.50 | 233.56 | 53.49 | 1237.32 | 80.34 | 149.84 | 4372 |
| 27 | -14.50 | 74.00 | 238.83 | 54.82 | 1264.53 | 88.35 | 162.35 | 4372 |
| | | 74.00 | 238.83 | 0.00 | 4954.24 | 0.00 | 74.00a | 51734 |
| 28 | -15.25 | 81.50 | 249.11 | 0.00 | 5074.92 | 0.00 | 81.50a | 51734 |
| 29 | -16.00 | 89.00 | 259.37 | 0.00 | 5195.43 | 203.55 | 292.55 | 4384164 |

RIGHT side

| Node no. | Y coord | Water press. | Effective stresses: Vertic -al | Active limit | Passive limit | Earth pressure | Total earth pressure | Coeff. of subgrade reaction |
|---|---|---|---|---|---|---|---|---|
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | -0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | -1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | -1.65 | 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 | -2.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | -3.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | -3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | -4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

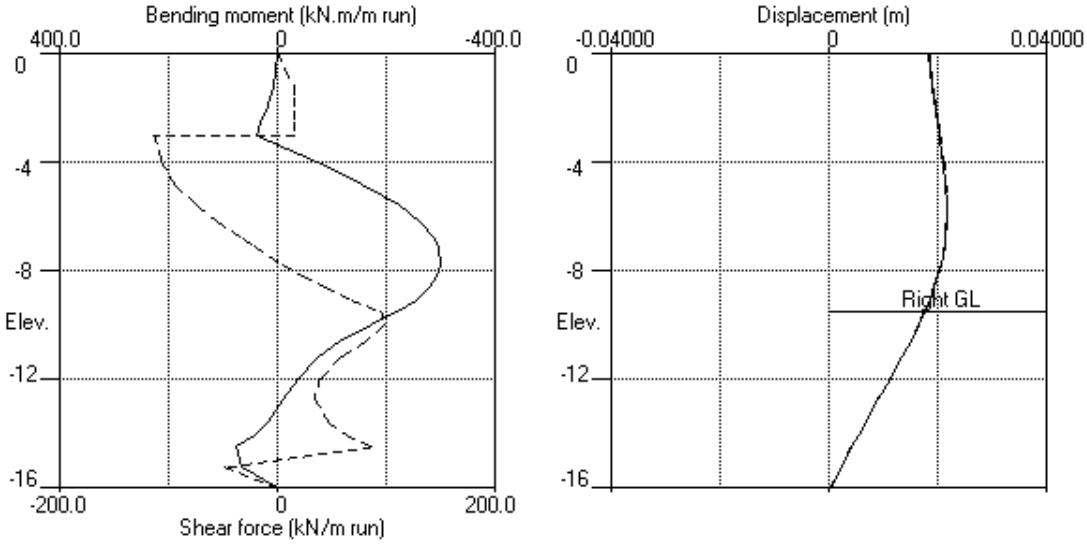
Stage No.7 Excavate to elevation -9.50 on RIGHT side

| | | RIGHT side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total | Coeff. of |
| Node no. | Y coord | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | earth pressure | subgrade reaction |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 10 | -4.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | -5.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | -6.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | -6.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | -7.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 15 | -7.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 16 | -8.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 17 | -8.65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 18 | -9.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 19 | -9.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 32.03 | 32.03 | 32.03p | 7668 |
| 20 | -10.00 | 0.00 | 11.00 | 0.00 | 88.80 | 88.80 | 88.80p | 7668 |
| 21 | -10.60 | 6.00 | 18.21 | 0.00 | 126.02 | 112.57 | 118.57 | 7668 |
| 22 | -11.20 | 12.00 | 25.45 | 0.71 | 163.36 | 104.84 | 116.84 | 7668 |
| 23 | -12.00 | 20.00 | 35.16 | 3.17 | 213.45 | 94.03 | 114.03 | 7668 |
| 24 | -12.80 | 28.00 | 44.95 | 5.65 | 264.01 | 83.04 | 111.04 | 7668 |
| 25 | -13.60 | 36.00 | 54.86 | 8.17 | 315.16 | 72.16 | 108.16 | 7668 |
| 26 | -14.05 | 40.50 | 60.50 | 9.60 | 344.23 | 66.20 | 106.70 | 7668 |
| 27 | -14.50 | 45.00 | 66.18 | 11.04 | 373.54 | 60.43 | 105.43 | 7668 |
| | | 45.00 | 66.18 | 0.00 | 2926.33 | 285.80 | 330.80 | 91497 |
| 28 | -15.25 | 52.50 | 77.25 | 0.00 | 3056.39 | 131.28 | 183.78 | 91497 |
| 29 | -16.00 | 60.00 | 88.47 | 0.00 | 3188.11 | 0.00 | 60.00a | 4384164 |

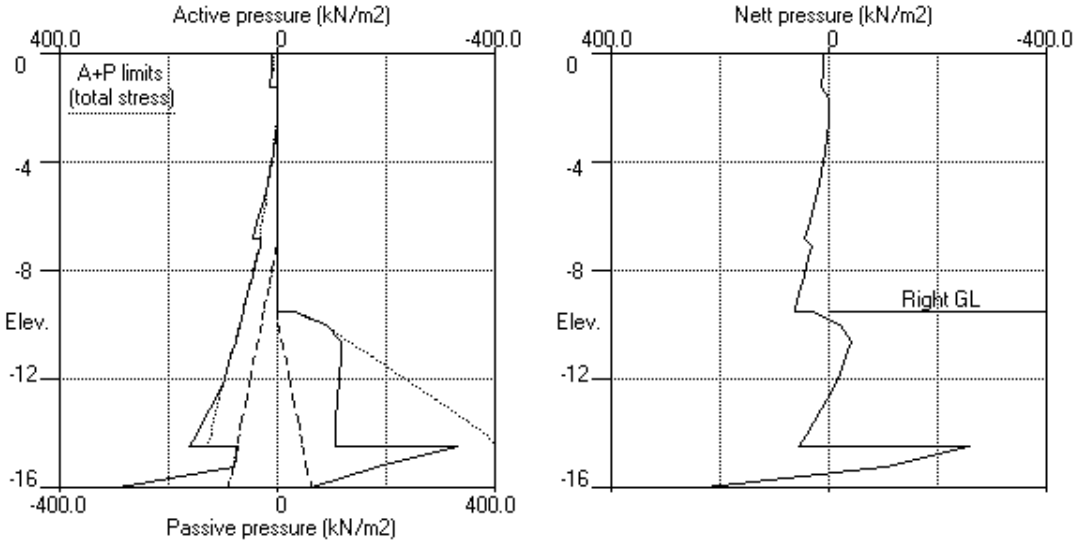
Note: 60.00 a Soil pressure at active limit
88.80 p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. -9.50 on RIGHT side




Stage No.7 Excav. to elev. -9.50 on RIGHT side



Units: kN,m

**Summary of results**

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | Ground level Act. | Pass. | Prop Elev. | FoS for toe elev. = -16.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation | Direction of failure |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |
| 2 | 0.00 | 0.00 | Cant. | Conditions not suitable for FoS calc. | | | | |
| 3 | 0.00 | -4.00 | Cant. | 3.063 | -15.12 | -5.28 | 1.28 | L to R |
| 4 | 0.00 | -4.00 | -3.00 | Conditions not suitable for FoS calc. | | | | |
| 5 | 0.00 | -7.10 | -3.00 | 4.445 | n/a | -8.28 | 1.18 | L to R |
| 6 | 0.00 | -7.10 | -3.00 | 4.797 | n/a | -7.98 | 0.88 | L to R |
| 7 | 0.00 | -9.50 | -3.00 | 3.180 | n/a | -11.53 | 2.03 | L to R |

Units: kN,m

**Summary of results**

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**

**Analysis options**

Soldier Pile width = 0.90m; spacing = 1.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Left side 20.00 from wall
Right side 20.00 from wall

**Bending moment, shear force and displacement envelopes**

| Node no. | Y coord | Displacement maximum | Displacement minimum | Bending moment maximum | Bending moment minimum | Shear force maximum | Shear force minimum |
|---|---|---|---|---|---|---|---|
| | | m | m | kN.m/m | kN.m/m | kN/m | kN/m |
| 1 | 0.00 | 0.021 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | -0.60 | 0.020 | 0.000 | 2.3 | 0.0 | 6.9 | 0.0 |
| 3 | -1.20 | 0.019 | 0.000 | 8.9 | 0.0 | 14.5 | 0.0 |
| 4 | -1.65 | 0.019 | 0.000 | 15.6 | 0.0 | 15.0 | 0.0 |
| 5 | -2.10 | 0.020 | 0.000 | 22.4 | 0.0 | 15.0 | 0.0 |
| 6 | -2.55 | 0.020 | 0.000 | 30.1 | 0.0 | 15.1 | 0.0 |
| 7 | -3.00 | 0.020 | 0.000 | 37.0 | 0.0 | 15.9 | -113.9 |
| 8 | -3.70 | 0.021 | 0.000 | 36.3 | -41.1 | 22.6 | -109.6 |
| 9 | -4.00 | 0.021 | 0.000 | 44.1 | -73.6 | 29.3 | -106.7 |
| 10 | -4.80 | 0.021 | 0.000 | 61.9 | -154.3 | 18.1 | -94.6 |
| 11 | -5.60 | 0.022 | 0.000 | 73.1 | -223.1 | 12.5 | -75.0 |
| 12 | -6.20 | 0.022 | 0.000 | 79.9 | -262.5 | 18.8 | -55.1 |
| 13 | -6.80 | 0.021 | 0.000 | 87.1 | -288.6 | 51.4 | -30.6 |
| 14 | -7.10 | 0.021 | 0.000 | 91.0 | -296.4 | 62.1 | -21.0 |
| 15 | -7.80 | 0.021 | 0.000 | 98.9 | -301.2 | 64.7 | 0.0 |
| 16 | -8.23 | 0.020 | 0.000 | 101.2 | -294.4 | 49.2 | -0.3 |
| 17 | -8.65 | 0.019 | 0.000 | 98.7 | -280.0 | 45.1 | -10.3 |
| 18 | -9.08 | 0.019 | 0.000 | 92.4 | -256.1 | 68.7 | -17.9 |
| 19 | -9.50 | 0.018 | 0.000 | 83.4 | -221.6 | 94.7 | -23.4 |
| 20 | -10.00 | 0.017 | 0.000 | 70.4 | -172.0 | 98.0 | -27.4 |
| 21 | -10.60 | 0.015 | 0.000 | 53.0 | -115.0 | 80.3 | -29.0 |
| 22 | -11.20 | 0.013 | 0.000 | 35.6 | -74.5 | 58.9 | -27.7 |
| 23 | -12.00 | 0.011 | 0.000 | 14.9 | -38.0 | 39.5 | -21.6 |
| 24 | -12.80 | 0.009 | 0.000 | 2.3 | -38.3 | 33.9 | -11.1 |
| 25 | -13.60 | 0.007 | 0.000 | 18.0 | -30.8 | 47.0 | -0.5 |
| 26 | -14.05 | 0.005 | 0.000 | 42.1 | -15.8 | 63.3 | -0.0 |
| 27 | -14.50 | 0.004 | 0.000 | 75.0 | 0.0 | 85.8 | 0.0 |
| 28 | -15.25 | 0.002 | 0.000 | 66.7 | 0.0 | 0.0 | -48.9 |
| 29 | -16.00 | 0.000 | -0.000 | 0.0 | -0.0 | 0.0 | 0.0 |

**Maximum and minimum bending moment and shear force at each stage**

| Stage no. | Bending moment maximum | Bending moment elev. | Bending moment minimum | Bending moment elev. | Shear force maximum | Shear force elev. | Shear force minimum | Shear force elev. |
|---|---|---|---|---|---|---|---|---|

| | kN.m/m | | kN.m/m | | kN/m | | kN/m | |
|---|---|---|---|---|---|---|---|---|
| 1 | 8.2 | -8.23 | -0.0 | -16.00 | 3.1 | -1.20 | -1.7 | -11.20 |
| 2 | 4.0 | -2.55 | -3.9 | -12.80 | 5.0 | -14.50 | -2.1 | -10.60 |
| 3 | 101.2 | -8.23 | -3.0 | -13.60 | 29.3 | -4.00 | -29.0 | -10.60 |
| 4 | 100.3 | -8.23 | -3.1 | -13.60 | 28.7 | -4.00 | -28.9 | -10.60 |
| 5 | 49.1 | -9.50 | -94.1 | -5.60 | 64.7 | -7.80 | -65.5 | -3.00 |
| 6 | 27.3 | -3.00 | -101.9 | -6.20 | 65.7 | -14.50 | -68.6 | -3.00 |
| 7 | 75.0 | -14.50 | -301.2 | -7.80 | 98.0 | -10.00 | -113.9 | -3.00 |

**Summary of results (continued)**

**Maximum and minimum displacement at each stage**

| Stage no. | Displacement maximum (m) | elev. | minimum (m) | elev. | Stage description |
|---|---|---|---|---|---|
| 1 | 0.002 | 0.00 | -0.000 | -16.00 | Apply surcharge no.1 at elev. 0.00 |
| 2 | 0.002 | 0.00 | 0.000 | 0.00 | Apply surcharge no.2 at elev. 0.00 |
| 3 | 0.019 | 0.00 | 0.000 | 0.00 | Excav. to elev. -4.00 on RIGHT side |
| 4 | 0.019 | 0.00 | 0.000 | 0.00 | Install prop no.1 at elev. -3.00 |
| 5 | 0.021 | 0.00 | 0.000 | 0.00 | Excav. to elev. -7.10 on RIGHT side |
| 6 | 0.020 | 0.00 | 0.000 | 0.00 | Apply water pressure profile no.1 |
| 7 | 0.022 | -5.60 | 0.000 | 0.00 | Excav. to elev. -9.50 on RIGHT side |

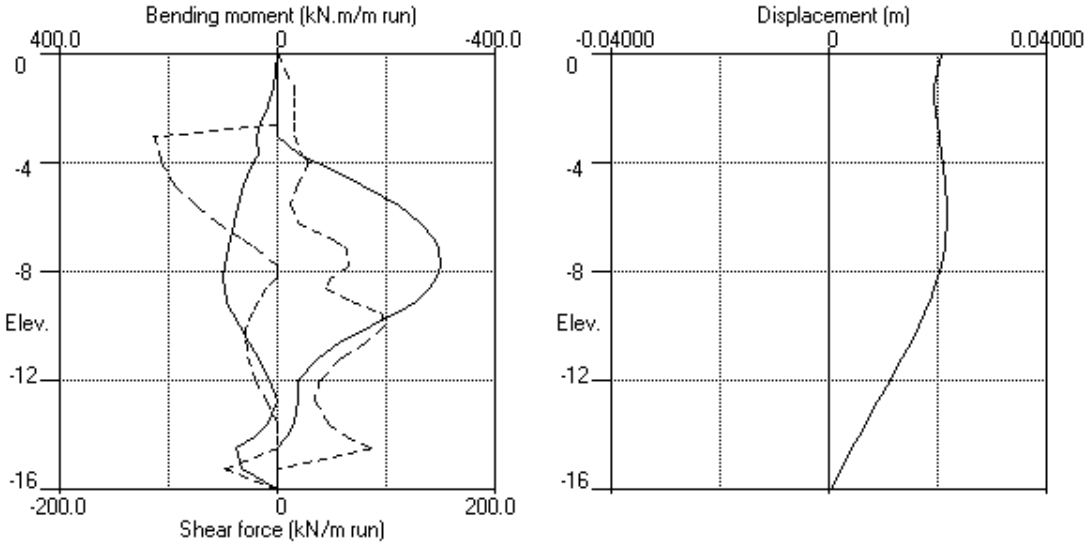
**Prop forces at each stage (horizontal components)**

| Stage no. | --- Strut no. 1 --- at elev.-3.00 kN/m run | kN/prop |
|---|---|---|
| 4 | 1.00 | 1.00 |
| 5 | 76.49 | 76.49 |
| 6 | 81.00 | 81.00 |
| 7 | 129.86 | 129.86 |

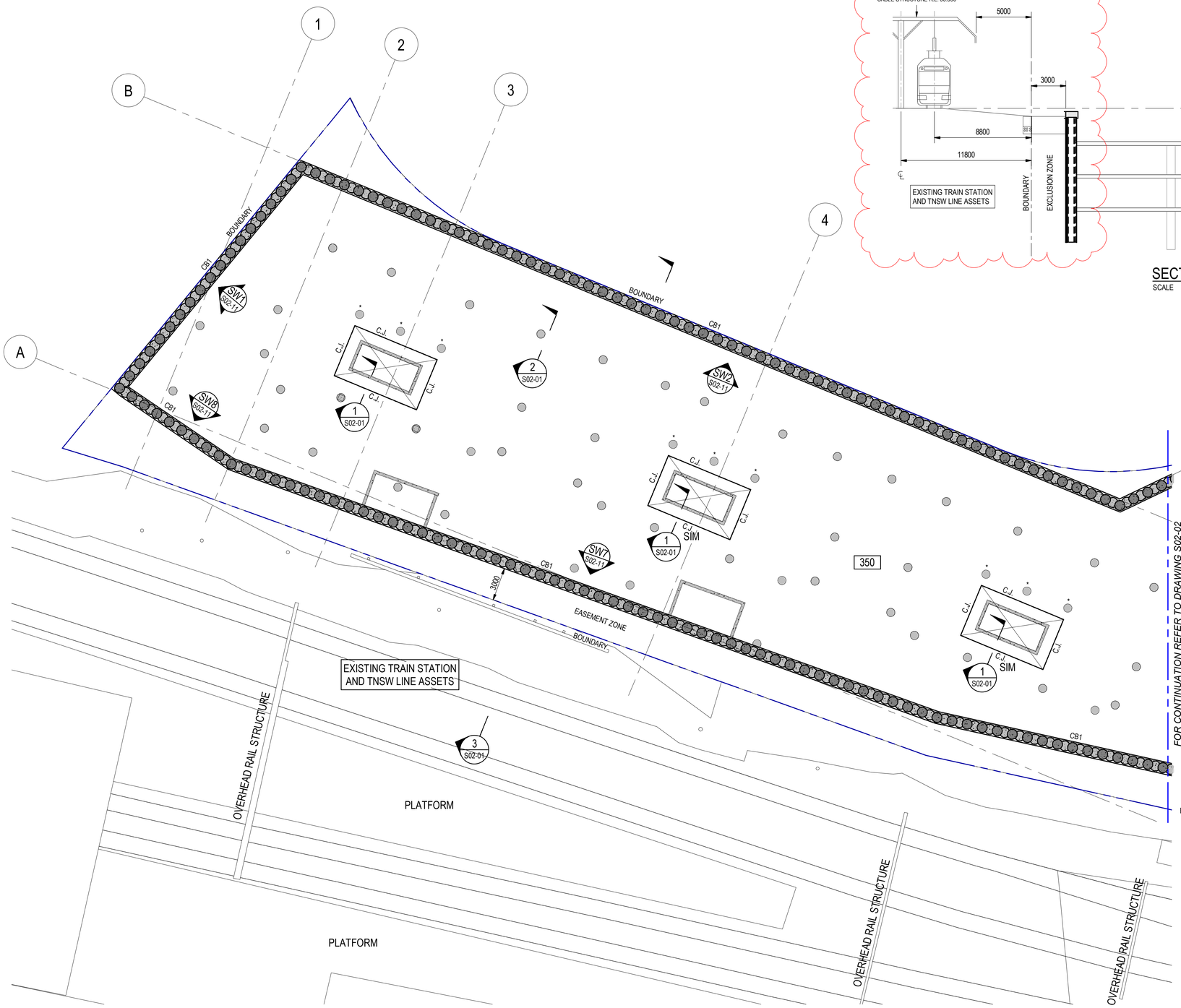
| | |
|---|---|
| VAN der MEER CONSULTING | Sheet No. |
| Program: WALLAP Version 6.07 Revision A55.B74.R58 | Job No. 220070 |
| Licensed from GEOSOLVE | Made by : MS |
| Data filename/Run ID: Section_2(BH2) | |
| Penrith | Date: 7-10-2022 |
| Section A | Checked : |

Units: kN,m

Bending moment, shear force, displacement envelopes



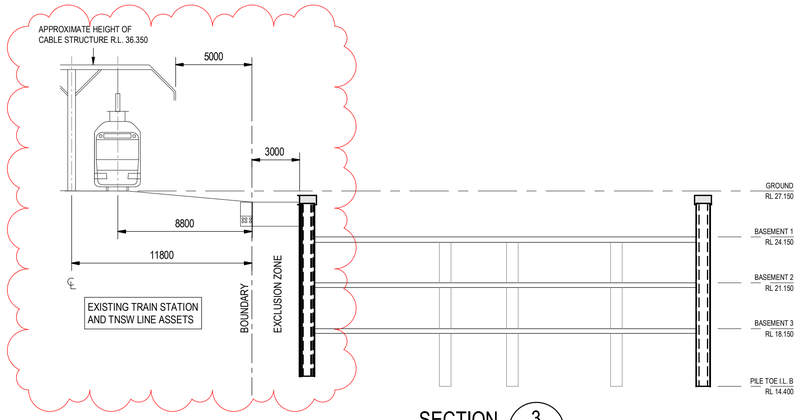
# Appendix B: Van der Meer Structural drawings




## RETENTION PLAN - SHEET 1 (BASEMENT 1 SLAB)

SCALE 1 : 200

NOTES:
* DENOTES TEMPORARY PILE




SECTION 3 / S02-01
SCALE 1 : 200

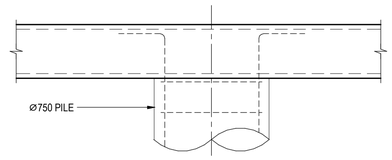
## NOTES:

1. REFER DRG. No. S01-02 AND S01-03 FOR STRUCTURAL NOTES
2. REFER DRG. No. S01-05 FOR TYPICAL DETAILS
3. FOR ALL SET OUT DIMENSIONS, LEVELS, SET DOWNS, HOBS, KERBS AND FALLS, REFER TO ARCHITECTS DRAWINGS.

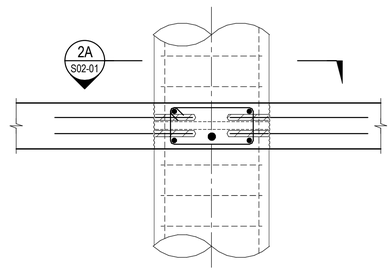
PROPOSED CONSTRUCTION METHODOLOGY:
1. CONSTRUCT THE SHORING PILES FROM GROUND LEVEL & POUR THE CAPPING BEAM.
2. EXCAVATE TO THE BASMENT LEVEL 1.
3. CONSTRUCT THE PERMANENT & TEMPORARY PILES.
4. FORM UP AND POUR BASEMENT 1 SLAB.

**BASEMENT B1 DOWN** CONSTRUCTION METHODOLGY:
1. EXACAVATE TO BASEMENT 3.
2. INSTALL PILES & PILE CAPS SUPPORTING THE CORE WALLS.
3. POUR BASMENT 3 (HYDRASTATIC SLAB).
4. CONSTRUCT THE CORE WALL AND POUR BASEMENT 2 SLAB.

**BASEMENT B1 UP** CONSTRUCTION METHODOLGY:
1. CONSTRUCT THE COLUMNS ABOVE BASEMENT 1 & POUR GROUND FLOOR SLAB.
2. CONSTUCT THE COLUMNS ON UPPER LEVELS & POUR UPPER SLABS.

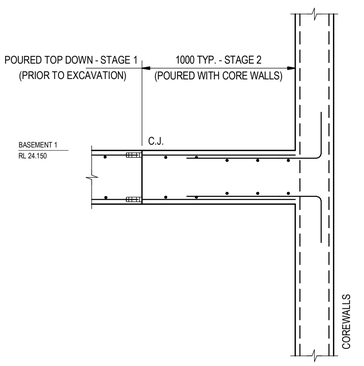



TYPICAL B1 SLAB CONNECTION DETAIL



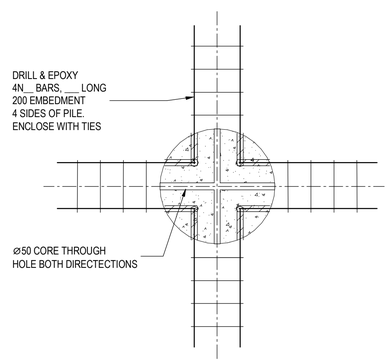

TYPICAL B2/B3 SLAB CONNECTION DETAIL

SECTION 2 / S02-01
SCALE 1 : 20




TYPICAL INFILL SLAB DETAIL AT TEMPORARY PENETRATIONS

SECTION 1 / S02-01
SCALE 1 : 20




SECTION 2A / S02-01
SCALE 1 : 20

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| B | PRELIMINARY ISSUE | W.W. | 02-11-2022 |
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SCALE BAR
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PROJECT TITLE
160, 162 & 172 LORD SHEFFIELD
CIRCUIT, NORTH PENRITH

DRAWING TITLE
RETENTION PLAN - SHEET 1

DRAWING STATUS
**PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

| PROJECT LEADER | DESIGNER | SIGNATURE | |
|---|---|---|---|
| A.A. | M.S. | | |
| DRAFTSPERSON | SCALE | DATE | SHEET SIZE |
| W.W. | 1:20, 1:200 | | A1 |
| JOB No. | DRAWING No. | | REVISION |
| SY220-070 | S02-01 | | C |

## NOTES:

1. REFER DRG. No. S01-02 AND S01-03 FOR STRUCTURAL NOTES
2. REFER DRG. No. S01-05 FOR TYPICAL DETAILS
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1. CONSTRUCT THE COLUMNS ABOVE BASEMENT 1 & POUR GROUND FLOOR SLAB.
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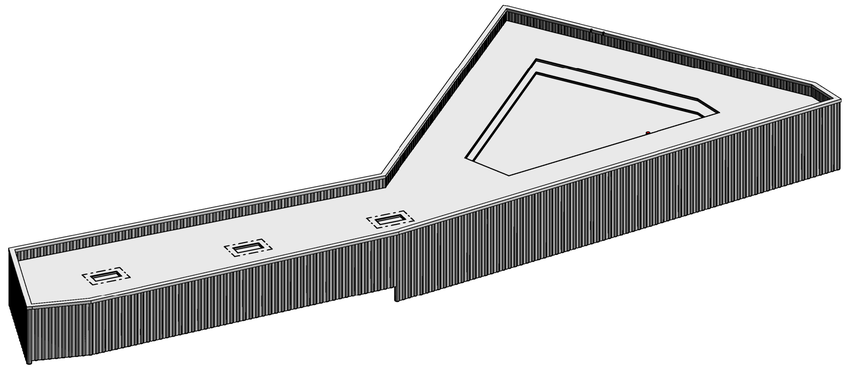
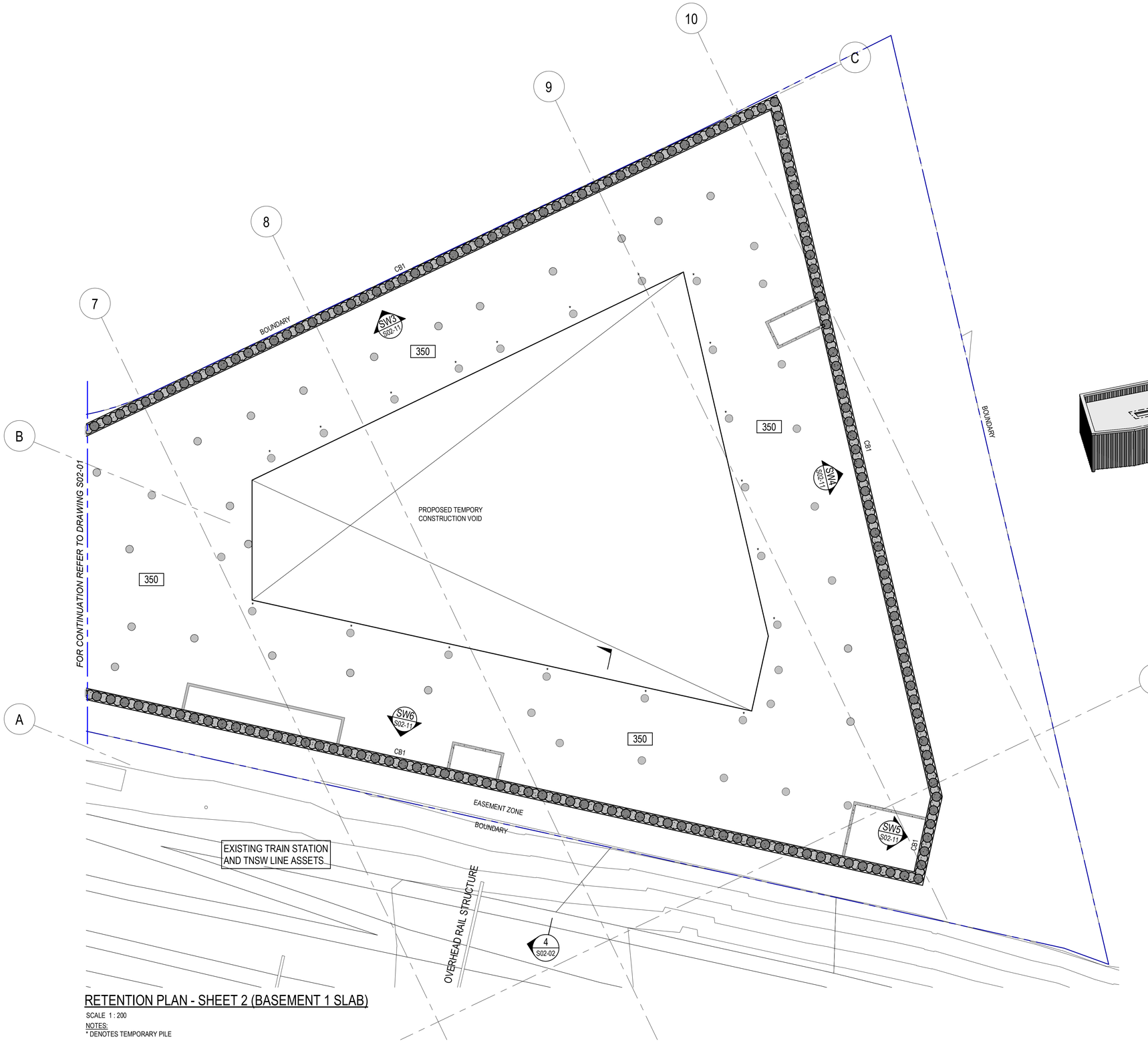


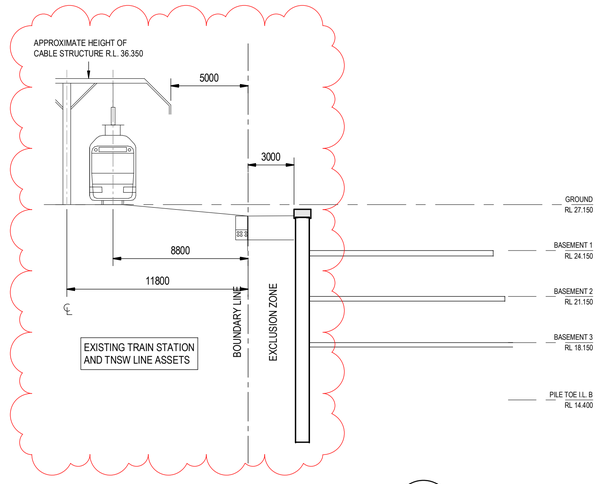
3D VIEW SHORING




RETENTION PLAN - SHEET 2 (BASEMENT 1 SLAB)

SCALE 1 : 200

NOTES:
* DENOTES TEMPORARY PILE




SECTION 4 S02-02
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DRAWING TITLE
RETENTION PLAN - SHEET 2

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| W.W. | 1:200, 1:600 | | A1 |
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**NOTES:**

1. REFER DRG. No. S01-02 AND S01-03 FOR STRUCTURAL NOTES
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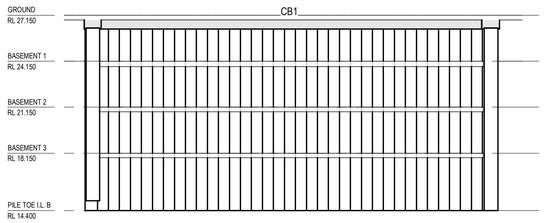


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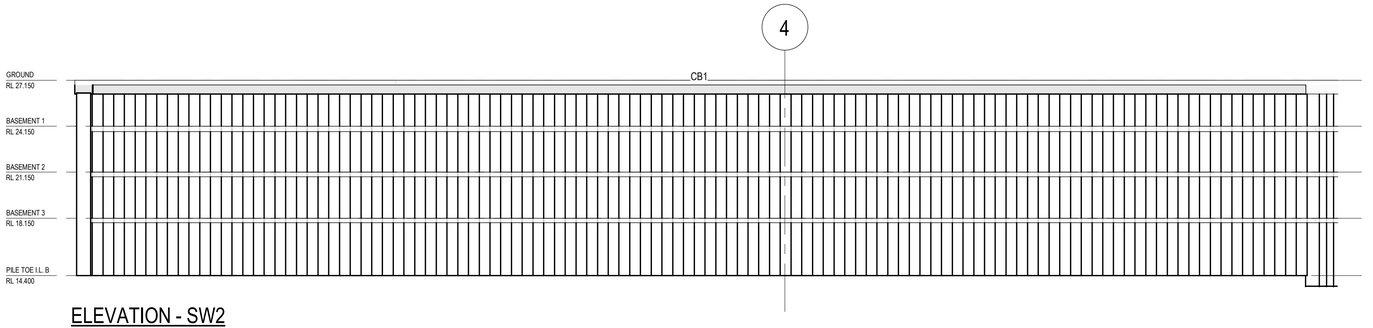


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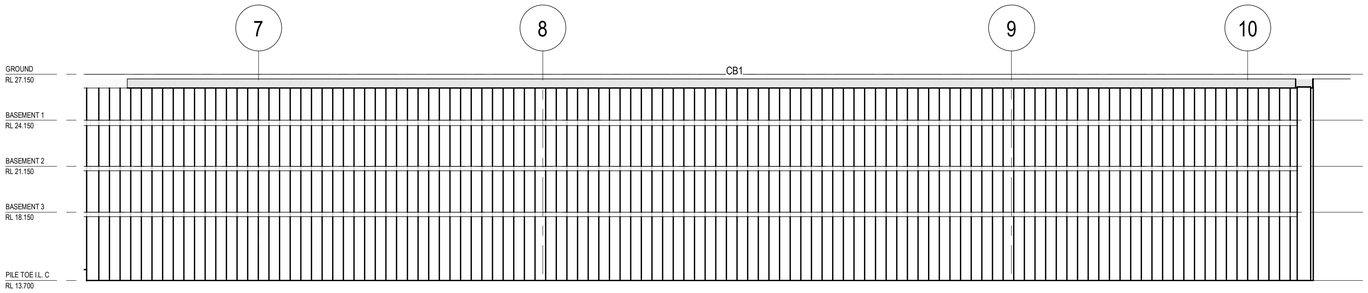


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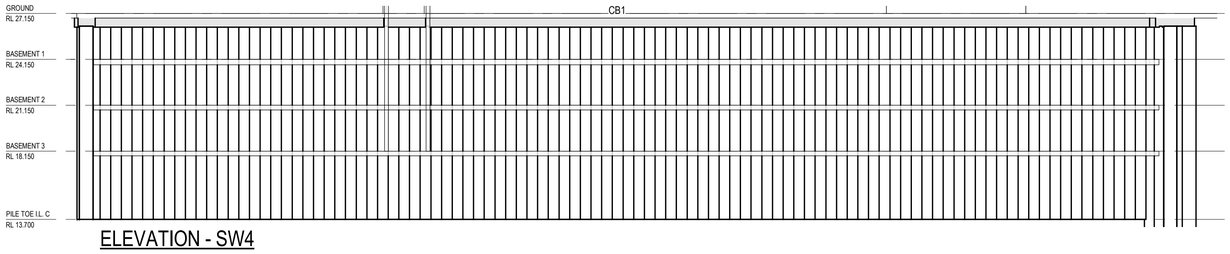


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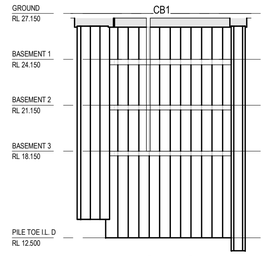


## ELEVATION - SW5

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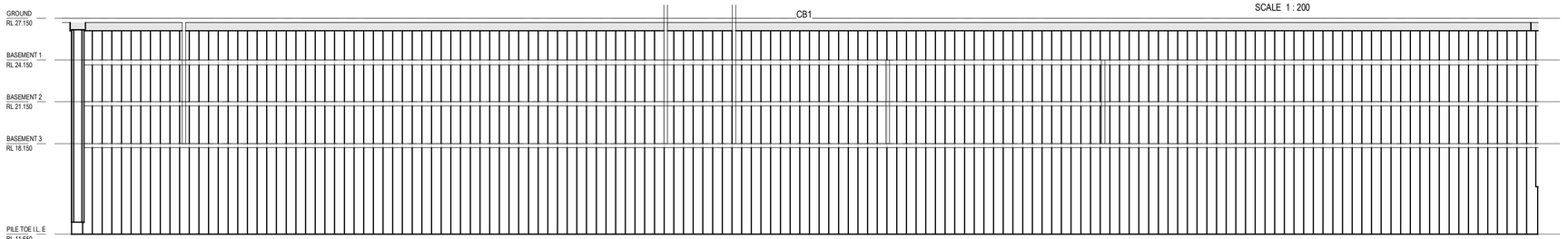


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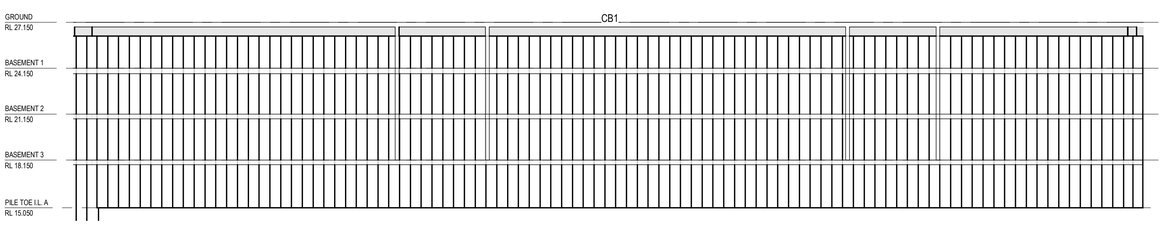


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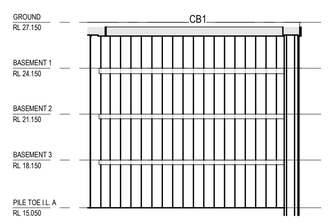


## ELEVATION - SW8

SCALE 1 : 200

REVISIONS

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PROJECT TITLE
160, 162 & 172 LORD SHEFFIELD
CIRCUIT, NORTH PENRITH

DRAWING TITLE
RETENTION ELEVATIONS - SHEET 1

DRAWING STATUS
**PRELIMINARY**
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| DRAFTSPERSON | SCALE | DATE | SHEET SIZE |
| W.W. | 1:200 | | A1 |
| JOB No. | DRAWING No. | | REVISION |
| SY220-070 | S02-11 | | B |

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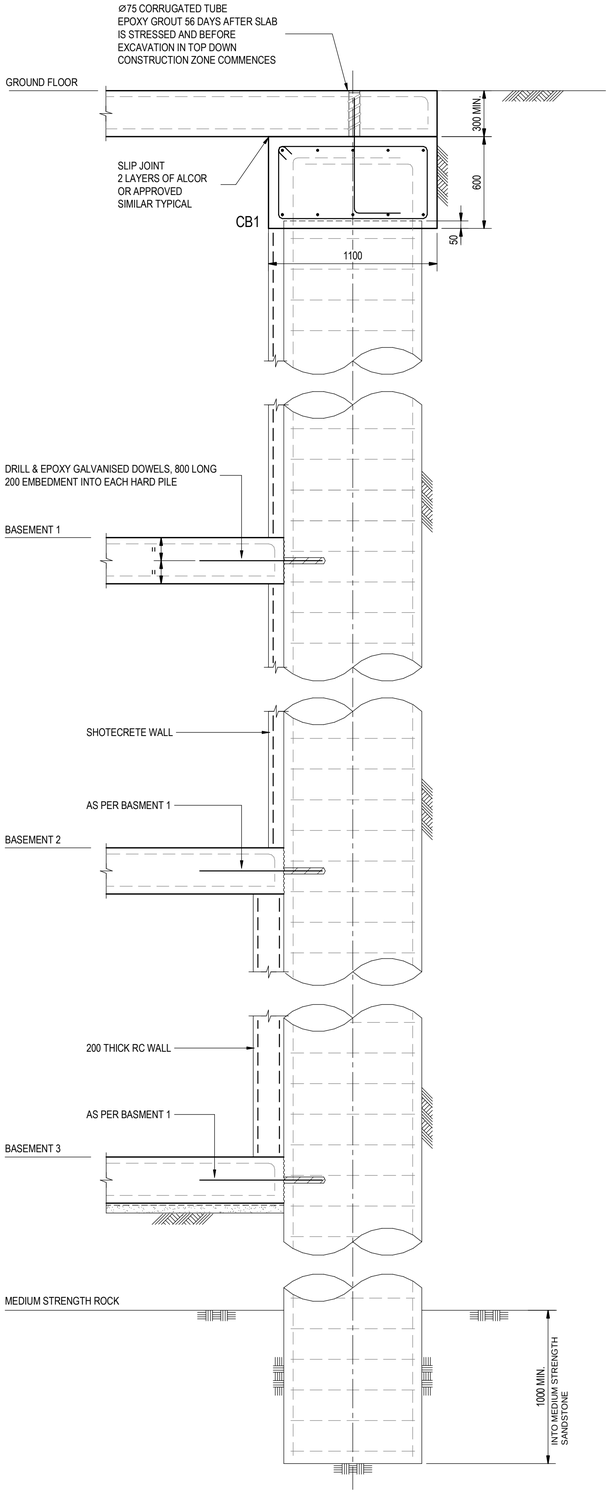
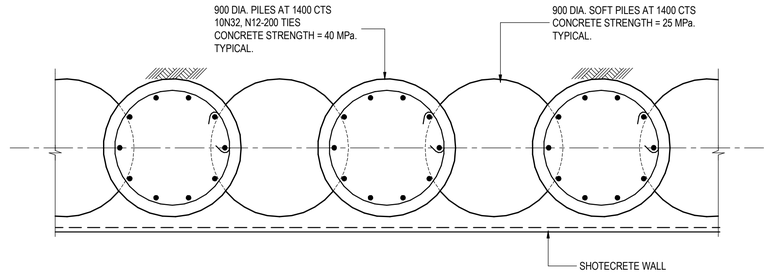
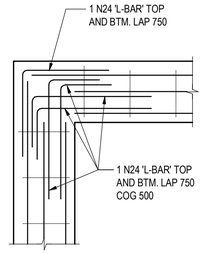
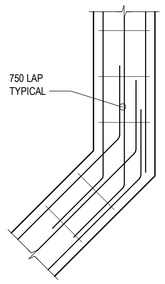



## TYPICAL CONTIGUOUS PILE WALL SECTION

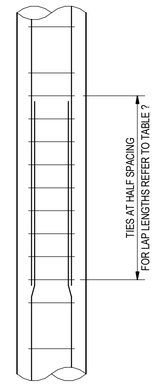



## TYPICAL SECANT PILE PLAN




## TYPICAL CAPPING BEAM CORNER DETAILS




## TYPICAL PILE SPLICE DETAIL

**NOTES:**

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| No. | REVISION DESCRIPTION | DRAWN | DATE |
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PROJECT TITLE
160, 162 & 172 LORD SHEFFIELD
CIRCUIT, NORTH PENRITH

DRAWING TITLE
RETENTION DETAILS - SHEET 1

DRAWING STATUS
**PRELIMINARY**
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|---|---|---|---|
| A.A. | M.S. | | |
| DRAFTSPERSON | SCALE | DATE | SHEET SIZE |
| W.W. | 1:20 | | A1 |
| JOB No. | | DRAWING No. | REVISION |
| SY220-070 | | S02-51 | A |

# Appendix C: Excavation methodology statement

Our Ref: SY220-070
Enquiries to: AA

18 October 2022

URBAN Property
Level 10, 11-15 Deane St
Burwood NSW 2134

**Attention: Mr Chris Georgas**

**RE: 160,162 & 172 LORD SHEFFIELD CIRCUIT, NORTH PENRITH EXCAVATION METHODOLOGY**

This letter has been prepared to detail the excavation methodology for the proposed development located at 160,162 & 172 Lord Sheffield Circuit, North Penrith.

The western portion of the site accommodates the Thornton Community Garden. The site is immediately adjacent to the northern entrance of Penrith Station (west boundary). The Eastern boundary is adjacent a parcel of defence land (east boundary). The Southern boundary has a direct interface with the railway corridor.

Due to the proximity of Transport for New South Wales assets, the use of ground anchors has not been permitted. As a result, the concept design is focused on the top-down construction with the permanent slab restraining the shoring wall at basement 1 level.

Based on the received architectural drawings, the maximum excavation level of 10m is assumed in the preliminary design which accounts for three basements. Ground water level is approximately one meter above the level of the future basement 2 slab and therefore tanked basement with hydrostatic slab is required. To resist water pressure, secant pile wall will be constructed as per the geotechnical advice.

Construction methodology is allowing for the excavation of the soil up to 3.5m to allow construction of the basement 1 slab which will provide restraint to the shoring wall in lieu of ground anchors. The slab will be designed for both temporary and permanent stage. During construction, slab at basement 1 will be used as a working platform to allow not only excavation of the soil from underneath but also construction of the structure above B1 at the same time.

The above design assumptions result is two construction methodologies required:

- Top-down excavation
- Bottom-up construction

Both construction methodologies are detailed below.



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Melbourne VIC 3000
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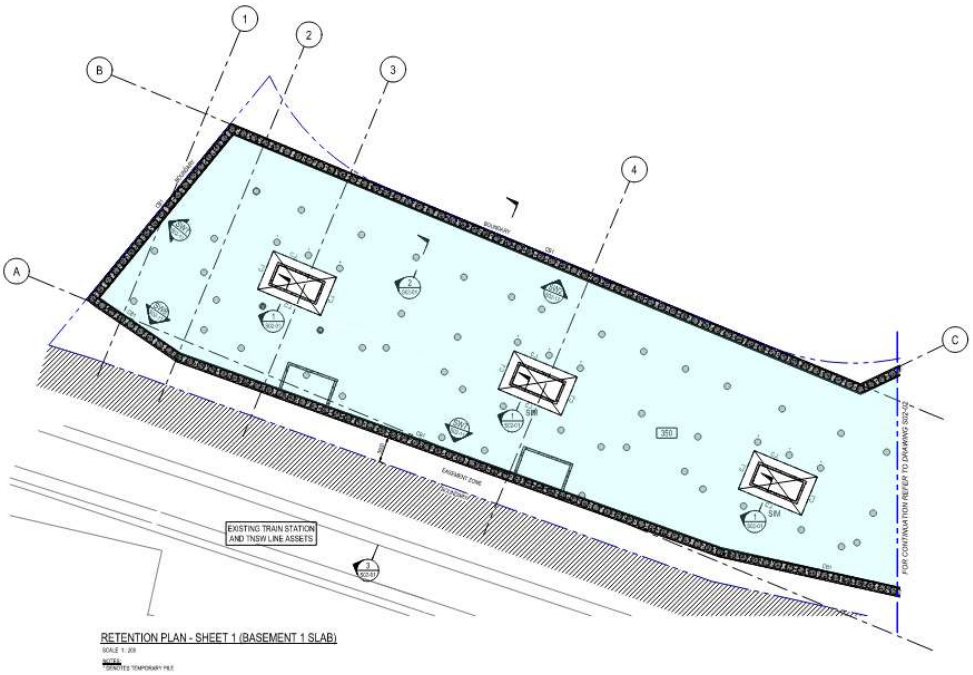
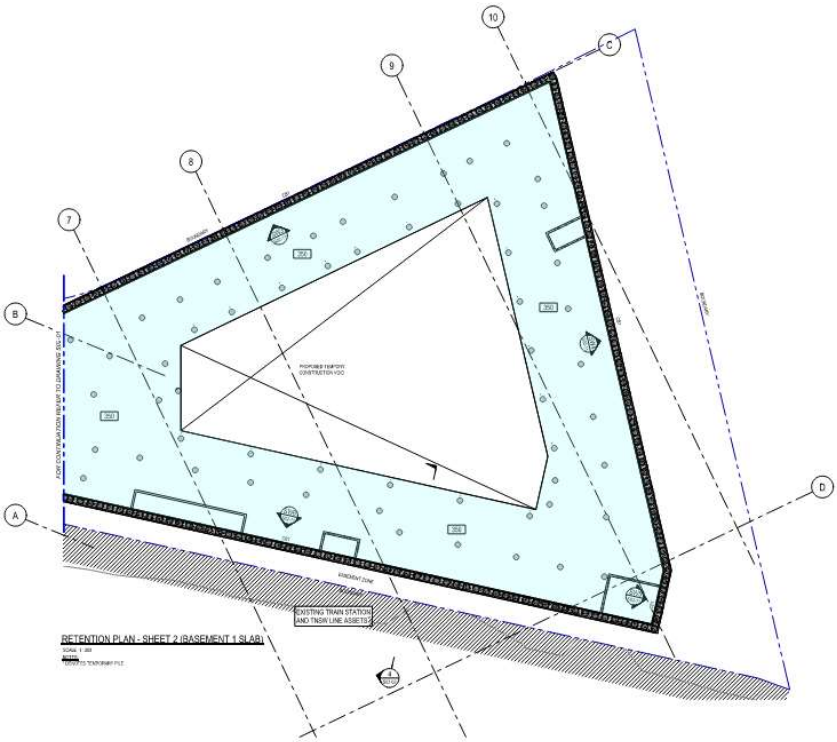
ABN 48 158 266 329

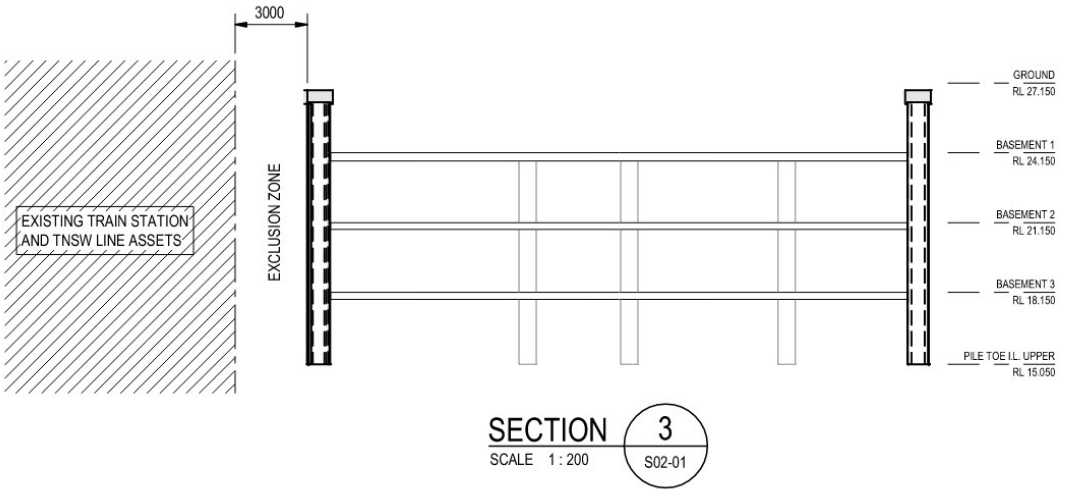
**SYDNEY**
Level 6, 39 Chandos Street
St Leonards NSW 2065
P 02 9436 0433
E NSW-enquiries@vandermeer.com.au
ABN 56 158 266 301

1. **Top-down excavation (basement 3 to basement 1)**

Below is a plan showing our working platform at basement 1 level and section reflecting interaction of the proposed shoring wall in respect to the existing train corridor.






To further elaborate on the sequencing of top-down construction, please find below detailed shoring and excavation sequence advice for the 160,162 & 172 Lord Sheffield Circuit, North Penrith development.

Construction methodology for the basement 3 to basement 1 levels (top-down):

1. Site to be levelled to the top of shoring wall.
2. Shoring soft (unreinforced) piles to be installed in accordance with structural documentation and geotechnical advice.
3. Shoring hard (reinforced) piles to be installed in accordance with structural documentation and geotechnical advice.
4. Capping beam to be poured.
5. Ground to be excavated to 0.5m below the basement 1 level (maximum 3.5m)
6. Permanent and temporary piles supporting future basement 1 slab to be installed in accordance with structural documentation and geotechnical advice.
7. Slab at basement 1 to be formed and poured. Slab at basement 1 will require penetrations left to allow the construction of the future core walls.
8. Ground to be excavated to the BEL level after slab at B1 achieved sufficient design strength.
9. Pile foundations for the core walls to be installed in accordance with structural documentation and geotechnical advice.
10. Pile cap to be formed and poured.
11. Hydrostatic slab on ground to be poured.
12. Core walls from B3 to B2 to be poured.
13. Basement 2 slab to be formed and poured ensuring adequate connections to the permanent piles have been achieved in accordance with the structural documentation.
14. Core walls from B2 to B1 to be poured ensuring that adequate connections to the slab at basement 1 have been achieved in accordance with the structural documentation.

2. **Bottom-up construction (basement 1 – up)**

Construction sequencing has been prepared to allow construction of the levels above the basement 1 slab whilst excavating the soil from underneath the slab. Please find below detailed construction sequencing:

1. Columns and walls at basement 1 to be formed and poured. Core walls to be constructed at the later time after the excavation and piling has been completed.
2. Ground floor slab and upper levels to be formed and poured. Temporary penetrations will be required to allow future construction of the core walls.
3. Steps 1 and 2 to be followed until the core walls have been constructed to the level of the next slab to avoid creating temporary penetration in the slab above.

Yours faithfully
**van der Meer Consulting**

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